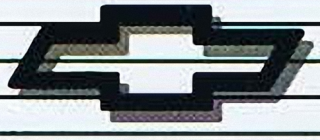
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CARLINE

1994

SERVICE MANUAL



CAMARO



FIREBIRD

BOOK 2 of 2

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

GMP/94F-2

1994 CHEVROLET CAMARO AND PONTIAC FIREBIRD SERVICE MANUAL BOOK 2

FOREWORD

This manual provides information on diagnosis, service procedures, adjustments and specifications for the 1994 Chevrolet Camaro and Pontiac Firebird.

An understanding of the material contained in this manual and in the appropriate Dealer Service Bulletins will help technicians to better serve vehicle owners.

The 1994 Camaro/Firebird service manual has been separated into two books:

Book 1 – Contains all sections EXCEPT Driveability and Emissions (Sections 6E and 6E3) and Electrical Diagnosis (Section 8A).

Book 2 – Contains Driveability and Emissions (Sections 6E and 6E3) and Electrical Diagnosis (Section 8A).

When reference is made in this manual to a brand name, number, or specific tool, an equivalent product may be used in place of the recommended item.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

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6E3	DRIVEABILITY & EMISSIONS PORT (3.4L), SFI (5.7L)
8A	ELECTRICAL DIAGNOSIS
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SECTION 6E

DRIVEABILITY AND EMISSIONS GENERAL INFORMATION

CAUTION: On vehicles 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.

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SECTION CONTENT

The driveability and emissions section describes the function and operation of the engine control module system that controls the driveability and emissions of the vehicle. Emphasis is placed on the diagnosis and repair of problems related to the system.

It is divided into three major sub-sections dealing with diagnosis and repair. They can be summarized as follows:

SECTION A: ENGINE COMPONENTS/WIRING DIAGRAMS/DIAGNOSTIC CHARTS

- Component Locations.
- Wiring Diagrams.
- ECM/PCM/VCM Terminal End View and Terminal Definitions.
- On-Board Diagnostic System Check. This must be the first step of any diagnostic procedure.
- Diagnostic Trouble Code Charts with facing pages containing circuit diagrams, circuit operation information, and helpful diagnostic information.

SECTION B: SYMPTOMS

- This sub-section assists in diagnosis of intermittent problems or problems which don't result in the storing of diagnostic trouble codes. It is arranged by symptoms of poor driveability and emissions and lists possible causes of the problems.

SECTION C: COMPONENT SYSTEMS

- Component and Circuit Descriptions.
- On-Vehicle Service for each Sub-System.
- Functional Checks/Diagnostic Charts.

HOW TO USE ELECTRICAL SYSTEMS DIAGNOSTIC INFORMATION

STRATEGY BASED DIAGNOSTICS

The strategy based diagnostic is a uniform approach to repair all electrical/electronics systems. The diagnostic flow can always be used to resolve an E/E system problem and is the place to start when repairs are necessary. The steps found in Figure 1, that the technician should follow, are outlined below:

1. **Verify the Customer Complaint**
   To verify the customer complaint the technician will need to know the correct t or normal operation of the system and verify the customer complaint is a deviation from normal operation.

2. **Preliminary Checks**
   This step is a visual confirmation of systems or components that are malfunctioning. With the additional information gained the technician may now conduct a thorough visual inspection, consult the service history, listen for unusual sounds or odors, and gather diagnostic code information to further effect a good repair.

3. **Check Bulletins and Other Service Information**
   From the steps above the technician should have enough information updates. This includes videos, newsletters, or Pulsat programs.

4. **Service information (Manual) System Check(s)**
   Most service manual sections contain "System Checks" that verify proper operation of the system and lead the technician on a very organized approach to diagnostics that closely follows the original development process and failure mode testing.

5. **Service Diagnostics (Paper/Electronic)**

5a. DTC Stored - Follow the designated DTC chart exactly to make an effective repair.

5b. No DTC - Select the symptom from the symptom tables and follow the diagnostic paths or suggestions to complete the repair.

5c. No Matching Symptom - Analyze the complaint and develop a plan for diagnostics utilizing the wiring diagrams, theory of operation, call technical assistance for like instances where repair history may be available, and technician knowledge combined with efficient use of the service available information.

5d. Intermittents - Conditions that are not always present are intermittent. These may be resolved by observing history DTC's, evaluating the symptoms and conditions described by the customer and using a check sheet or other method to pinpoint the circuit or electrical system component. Most important is to follow the suggestions for intermittent diagnosis found in the service documentation. The Tech 1 and Fluke 87 both have excellent data capture capabilities that can assist in detection of intermittents.

5e. Vehicle operates as designed/No trouble Found - This condition exists when the vehicle is found to operate normally. It is most important to verify that the condition described by the owner is normal compared to other vehicles. The condition may be intermittent so verify the complaint under the conditions described by the customer before the vehicle is released.

6. **Re-Examine the Complaint**
   When the complaint cannot be successfully found or isolated a re-evaluation is necessary. The complaint should be re-verified and could be found to be intermittent or normal as per 5c or 5e above.

7. **Repair and Verification Tests**
   After a cause has been isolated the repairs should be made and validated for proper operation and verification that the symptom has been corrected. This may involve road testing or other methods to verify the complaint has been resolved under the conditions noted by the customer.

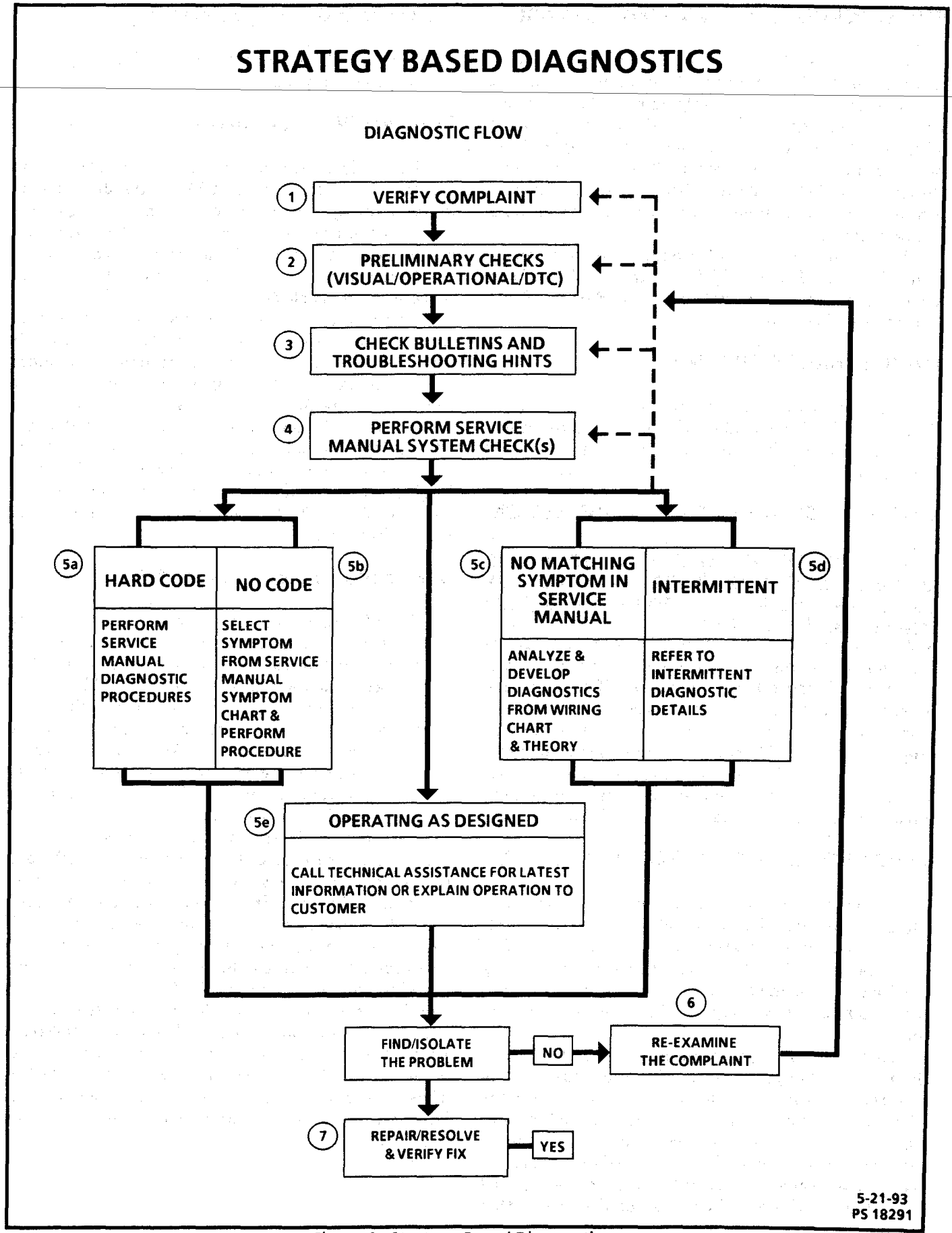


Figure 1 - Strategy Based Diagnostics

EMISSIONS CONTROL INFORMATION LABEL

The underhood "Vehicle Emissions Control Information" label (Figure 2) contains important emission specifications and setting procedures. In the upper left corner is exhaust emission information which identifies the year, the manufacturing division of the engine, the displacement of the engine in liters, the class of vehicle, and type of fuel metering. There is also an illustrated emission components and vacuum hose schematic.

This label is located in the engine compartment of every General Motors vehicle. If the label has been removed, it can be ordered from GM Service Parts Operations (GMSPO).

MAINTENANCE SCHEDULE

Refer to the General Motors Maintenance Schedule in SECTION 0B for the maintenance service that should be performed to retain emission control performance.

VISUAL/PHYSICAL UNDERHOOD INSPECTION

A careful visual and physical underhood inspection must be performed as part of any diagnostic procedure or in finding the cause of an emissions test failure. This can often lead to fixing a problem without further steps. Inspect all vacuum hoses for correct routing, pinches, cuts, or disconnects. Be sure to inspect hoses that are difficult to see beneath the air cleaner, compressor, generator, etc. Inspect all the wires in the engine compartment for proper connections, burned or chafed spots, pinched wires, or contact with sharp edges or hot exhaust manifolds. This visual/physical inspection is very important. It must be done carefully and thoroughly.

BASIC KNOWLEDGE AND TOOLS REQUIRED

To use the driveability and emissions section most effectively, a general understanding of basic electrical circuits and circuit testing tools is required. You should be familiar with wiring diagrams, the meaning of voltage, ohms, amps, the basic theories of electricity, and understand what happens in an open or shorted wire.

To perform system diagnosis, the use of a Tech 1 Diagnostic Computer or equivalent scan tool is required. A test light, ohmmeter, digital voltmeter with 10 megohms impedance, vacuum gauge, and jumper wires are also required. Become acquainted with the special tools and their use before attempting to diagnose a vehicle. Special tools which are required for system service are illustrated at the end of this section.

Electrostatic Discharge Damage

Refer to SECTION 0A for handling electronic discharge service parts.

DIAGNOSTIC INFORMATION

The diagnostic charts in SECTION A and functional checks in SECTION C are designed to locate a faulty circuit or component through logic based on the process of elimination. The charts are prepared with the requirement that the vehicle functioned correctly at the time of assembly and that there are no multiple failures.

There is a continual self-diagnosis on certain control functions. This diagnostic capability is complemented by the diagnostic procedures contained in this manual. The language for communicating the source of a malfunction is a system of diagnostic trouble codes. When a malfunction is detected by the ECM/PCM/VCM, a diagnostic trouble code is set and the Malfunction Indicator Lamp (MIL) "Service Engine Soon" is illuminated on some applications. Refer to SECTION A within each engine section for more information.

Malfunction Indicator Lamp (MIL)

The MIL (Service Engine Soon) lamp is on the instrument panel and has the following functions:

- It informs the driver that a problem has occurred and that the vehicle should be taken for service as soon as reasonably possible.
- Some applications will flash diagnostic trouble codes stored by the ECM/PCM/VCM which help the technician diagnose system problems.
- Some applications will flash "Open Loop" or "Closed Loop" operation.

As a bulb and system check, the MIL (Service Engine Soon) will come "ON" with the key "ON" and the engine not running. When the engine is started, the lamp will turn "OFF." If the lamp remains "ON," the self-diagnostic system has detected a problem. If the problem goes away, the lamp will go out in most cases but a diagnostic trouble code will remain stored.

When the light remains "ON" while the engine is running, or when a malfunction is suspected due to a driveability or emissions problem, an **On-Board Diagnostic System Check must be performed**. The procedures for these checks are given in SECTION A. These checks will expose malfunctions which may not be detected if other diagnostics are performed prematurely.

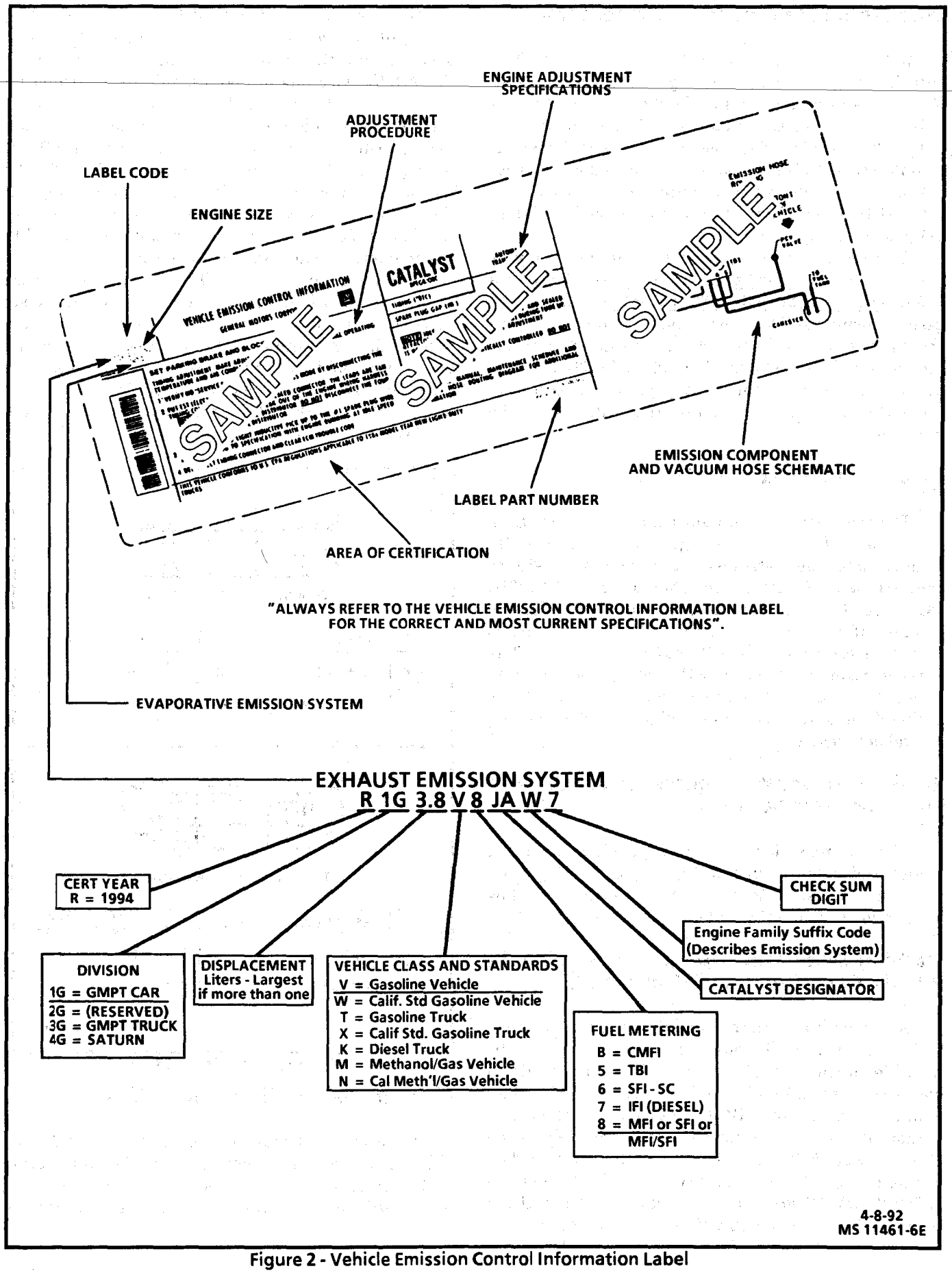


Figure 2 - Vehicle Emission Control Information Label

Intermittent Malfunction Indicator Lamp

In the case of an "Intermittent" problem, the MIL (Service Engine Soon) may light and then go out. However, the corresponding diagnostic trouble code will be stored in the memory. When unexpected diagnostic trouble codes appear during the diagnostic trouble code reading process, one can assume that these diagnostic trouble codes were set by an intermittent malfunction and could be helpful in diagnosing the system.

An intermittent diagnostic trouble code may or may not reset. If it is an intermittent failure, a Diagnostic Trouble Code (DTC) Chart should not be used. Consult the "Diagnostic Aids" on the page facing the diagnostic trouble code chart corresponding to the intermittent diagnostic trouble code. SECTION B also covers the "Intermittents." A physical inspection of the applicable sub-system most often will resolve the problem.

Data Link Connector (DLC)

The provision for communicating is the Data Link Connector (DLC) (refer to Figure 3). It is usually located under the instrument panel and is sometimes covered by a plastic cover labeled "DIAGNOSTIC CONNECTOR." It is used in the assembly plant to receive information in checking that the engine is operating properly before it leaves the plant. The connector can also be used by the service technician to identify stored trouble codes using the procedures outlined below and to read ECM/PCM/VCM data using a hand held scan tool.

Reading Diagnostic Trouble Codes Using a Tech 1 or Other Scan Tool

The recommended method for reading diagnostic trouble code(s) stored in memory is by using diagnostic scan tool plugged into the DLC connector. Follow instructions supplied by tool manufacturer.

Flashing Diagnostic Trouble Codes With 12 Pin DLC Connector (Pin "B" Included)

Although it is recommended that a diagnostic scan tool be used to read diagnostic trouble code(s), it may be possible to flash trouble codes on certain vehicles equipped with a 12 pin DLC connector. The DLC connector terminal "B" (diagnostic terminal, if equipped) is the second terminal from the right of the DLC connector's top row. The terminal is grounded by connecting it to terminal "A" (internal ECM/PCM/VCM ground), the terminal to the right of terminal "B" on the top row of the DLC connector.

Once terminals "A" and "B" have been connected, the ignition switch must be moved to the "ON" position, with the engine *not* running. At this point, the MIL (Service Engine Soon) should flash Diagnostic Trouble Code (DTC) 12 three times consecutively. This would be the following flash sequence: "flash, pause, flash-flash, long pause, flash, pause, flash-flash, long pause, flash, pause, flash-flash." DTC 12 indicates that the diagnostic system is operating. If DTC 12 is not indicated, a problem is present within the diagnostic system itself, and should be referred to the appropriate diagnostic chart in SECTION A.

Following the output of DTC 12, the MIL (Service Engine Soon) will indicate a diagnostic trouble code three times if a diagnostic trouble code is present, or it will continue to output DTC 12. If more than one diagnostic trouble code has been stored in memory, the diagnostic trouble codes will be output from the lowest to the highest, with each diagnostic trouble code being displayed three times.

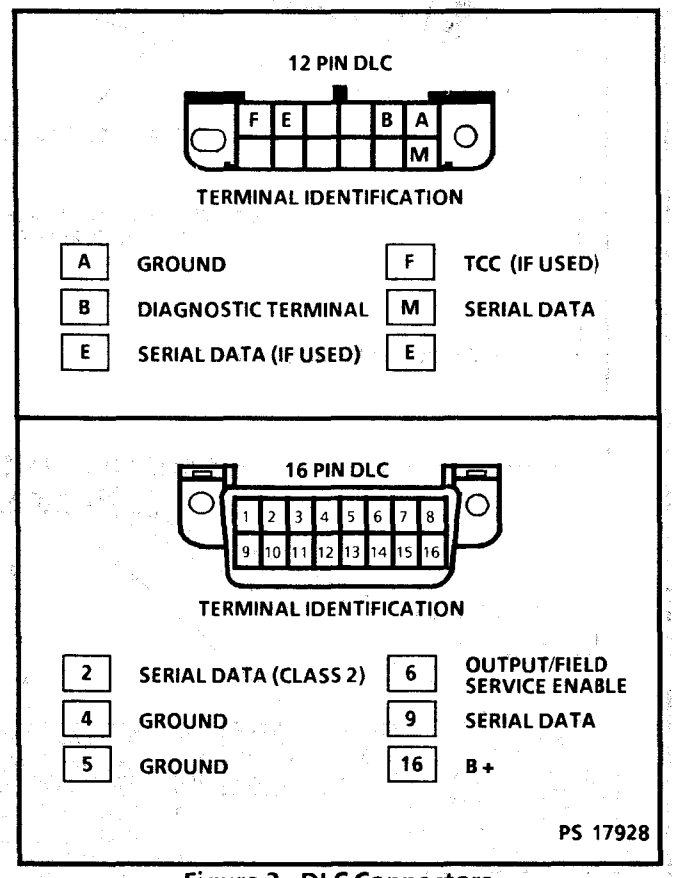


Figure 3 - DLC Connectors

Clearing Diagnostic Trouble Codes

To clear any Diagnostic Trouble Code (DTC) from the memory, either to determine if the malfunction will occur again or because repair has been completed, power feed must be disconnected for at least thirty (30) seconds.

Depending on application, the following methods may be used to clear DTC's:

- Disconnect power source to ECM/PCM/VCM ie., fuse, pigtail at battery etc.
- Disconnect negative battery cable. (The negative battery cable may be disconnected, but other on-board memory data, such as preset radio tuning, will also be lost.)

NOTICE: To prevent system damage, the key must be "OFF" when disconnecting or reconnecting power.

It is also possible to clear a Diagnostic Trouble Code (DTC) using a diagnostic scan tool. Follow instructions supplied by tool manufacturer.

Diagnostic Mode

When the diagnostic terminal is grounded with the ignition "ON" and the engine "OFF," the system will enter what is called the Diagnostic Mode. In this mode the ECM/PCM/VCM will:

1. On certain vehicles with a 12 pin DLC connector (pin "B" included), display a DTC 12 by flashing the MIL (Service Engine Soon) (indicating the system is operating correctly). If any additional DTC's are set, it will flash those DTC's. Each DTC will be flashed three times, then DTC 12 will be flashed again.
2. Energize most system controlled relays and solenoids except fuel pump relay. This allows checking circuits which may be difficult to energize without driving the vehicle and being under particular operating conditions.
3. The IAC valve moves to its fully extended position on most models, blocking the idle air passage. This is useful in checking the minimum idle speed.

Field Service Mode

If the diagnostic terminal is grounded with the engine running, the system will enter the Field Service mode.

In "Open Loop" the MIL (Service Engine Soon) flashes two and one-half times per second.

In "Closed Loop," the light flashes once per second. Also, in "Closed Loop," the light will stay "OFF" most of the time if the system is running lean. It will stay "ON" most of the time if the system is running rich.

While the system is in Field Service Mode, new codes cannot be stored and the "Closed Loop" timer is bypassed.

Learning Ability

The system has a "learning" ability which allows it to make corrections for minor variations in the fuel system to improve driveability. If the battery is disconnected, to clear diagnostic trouble codes or for other repair, the "learning" process resets and begins again. A change may be noted in the vehicle's performance. To "teach" the vehicle, ensure that the engine is at operating temperature. The vehicle should be driven at part throttle, with moderate acceleration and idle conditions until normal performance returns.

ON-BOARD DIAGNOSTIC SYSTEM CHECK

Refer to "On-Board Diagnostic System Check" in SECTION A.

DLC SCAN TOOLS

The system can communicate a variety of information through DLC connector terminals "E" or "M" (depending on the engine). This data is transmitted at a high frequency which requires a Tech 1 Diagnostic Computer (scan) tool for interpretation. There are several scan tools available for reading this information.

With an understanding of the data which the tool displays, and knowledge of the circuits involved, the tool can be very useful in obtaining information which would be more difficult or impossible to obtain with other equipment.

Tech 1 and scan tools do not make the use of diagnostic trouble code charts unnecessary, nor can they indicate exactly where a problem is in a particular circuit. Tree charts incorporate diagnosis procedures using a Tech 1 tool where possible and most charts require the use of a Tech 1 when it is applicable.

A TECH 1 TOOL THAT DISPLAYS FAULTY DATA SHOULD NOT BE USED AND THE PROBLEM SHOULD BE REPORTED TO THE MANUFACTURER. THE USE OF A FAULTY SCAN TOOL CAN RESULT IN MISDIAGNOSIS AND UNNECESSARY PARTS REPLACEMENT.

TECH 1 TOOL USE WITH INTERMITTENTS

In some scan tool applications, the data update rate makes the tool less effective than a voltmeter, such as when trying to detect an intermittent problem which lasts for a very short time. However, the Tech 1 allows manipulation of wiring harnesses or components under the hood with the engine not running, while observing the Tech 1 readout.

The Tech 1 tool can be plugged in and observed while driving the vehicle under the condition when the MIL (Service Engine Soon) turns "ON" momentarily or when the engine driveability is momentarily poor. If the problem seems to be related to certain parameters that can be checked on the Tech 1, they should be checked while driving the vehicle. If there does not seem to be any correlation between the problem and any specific circuit, the Tech 1 can be checked on each position, watching for a period of time to see if there is any change in the readings that indicates intermittent operation.

The Tech 1 is also an easy way to compare the operating parameters of a poorly operating engine with those of a known good one. For example, a sensor may shift in value but not set a diagnostic trouble code. Comparing the sensor's readings with those of a known good vehicle may uncover the problem.

The Tech 1 has the ability to save time in diagnosis and prevent the replacement of good parts. The key to using the Tech 1 successfully for diagnosis lies in the technician's ability to understand the system he is trying to diagnose as well as an understanding of the Tech 1 operation and limitations. The technician should read the tool manufacturer's operating manual to become familiar with the tool's operation.

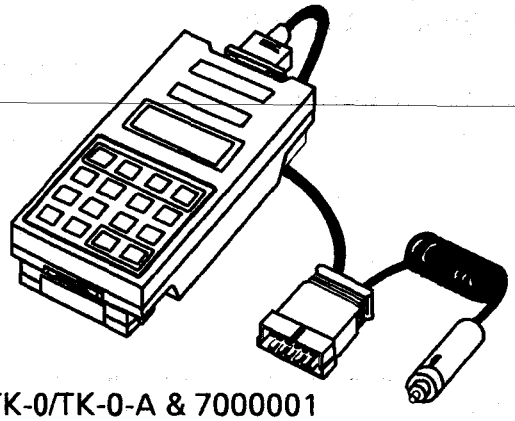
WIRING HARNESS SERVICE

Refer to SECTION 8A for wiring harness service. Special tools needed to service:

J 38125-A	Terminal Repair Kit.
J 34636	Circuit Tester.
J 35689-A	Metri-Pack Terminal Remover.
J 28742-A	Weather-Pack Terminal Remover.
J 33095	Micro-Pack Terminal Remover.

TOOLS NEEDED TO SERVICE THE SYSTEM

Refer to "Special Tools" at the end of this section for driveability and emissions tools needed to service system.

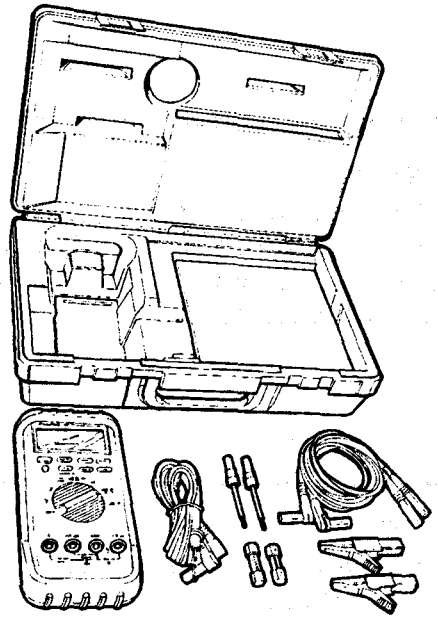


TK-0/TK-0-A & 7000001

TECH 1 DIAGNOSTIC SCAN TOOL
A hand-held scan tool used to analyze and diagnose control module systems. To be used with interchangeable program cartridge kits, or mass storage cartridge.

MASS STORAGE CARTRIDGE KIT
Use with GM Powertrain, Chassis Body System Service Programming Software.

12 to 16 PIN DLC HARNESS ADAPTER - 3000055
Necessary for some applications.



FLUKE 87 WITH Hz METER
HIGH IMPEDANCE MULTIMETER
(DIGITAL VOLTMETER-DVM)

J 39200

REFER TO USERS MANUAL FOR COMPLETE INSTRUCTIONS.

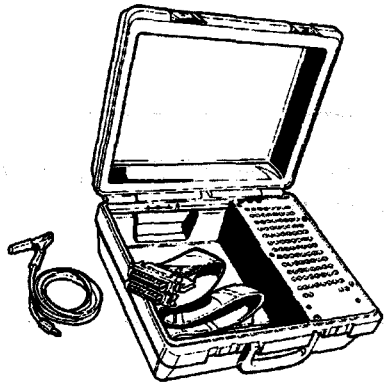
VOLTMETER - Voltage position measures magnitude of voltage when connected in parallel to an existing circuit. A digital voltmeter with a 10 megohm input impedance is used because this type of meter will not load down the circuit and result in faulty readings. Some circuits require accurate low voltage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

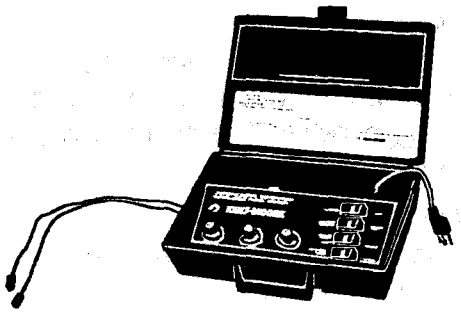
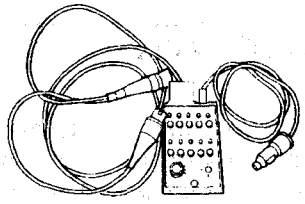
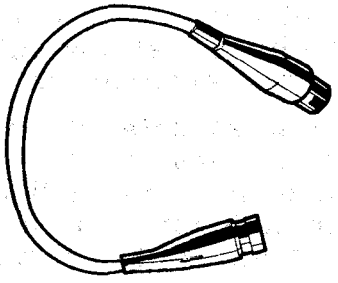
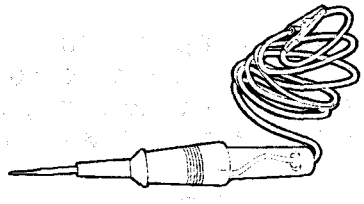
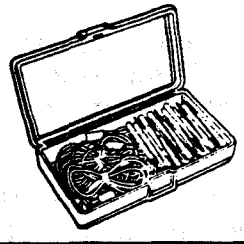
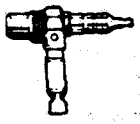
- OL display in all ranges indicates open circuit.
- Zero display in all ranges indicates a short circuit.
- An intermittent connection in a circuit may be indicated by a digital reading that will not stabilize on the circuit.
- Range Switch - Automatic and Manual.
  400Ω – Reads ohms directly
  4K,40K,400KΩ – Reads ohms in thousands
  4M,40MΩ,400MΩ - Reads ohms in millions



J 39700

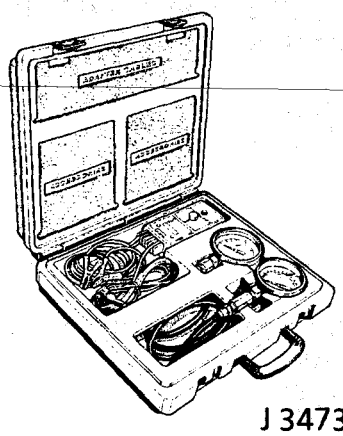
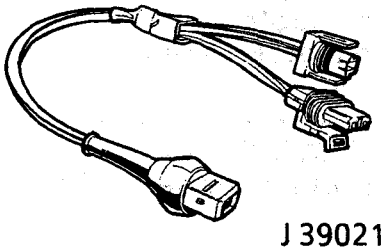
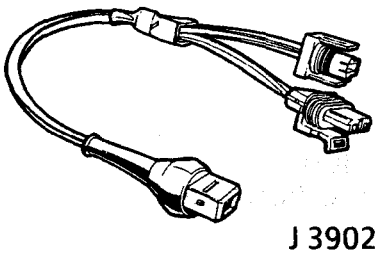
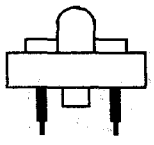
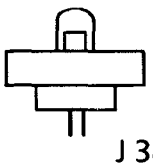
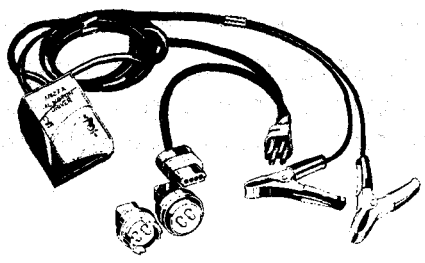
UNIVERSAL BREAKOUT BOX
Used to test individual circuits in the system by monitoring voltage or resistance using a high impedance multimeter. Can also be used for pinout circuit checks by disconnecting the option adapters at the vehicle system control module. Refer to ECM/PCM/VCM Connector End View tables in appropriate engine section for specific engine adapter harness J 39700-XXX.

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7S 3382-6E

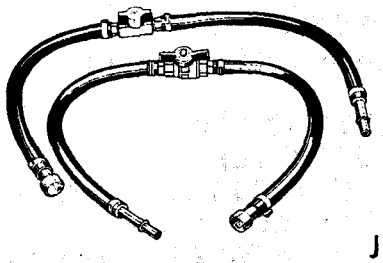
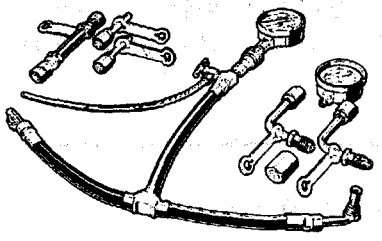
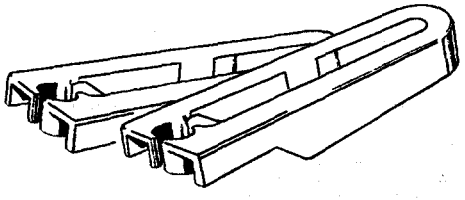
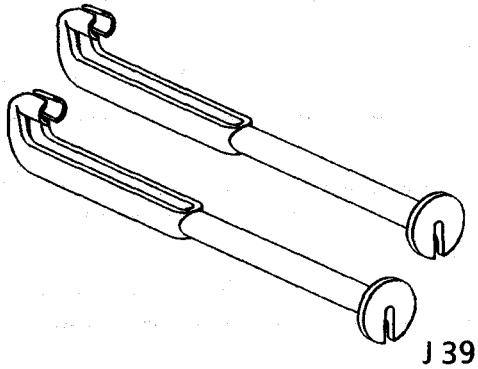
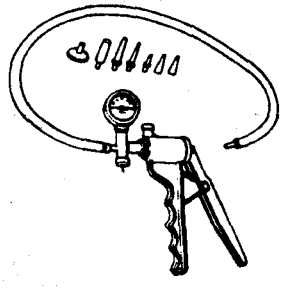
 J 33431-B	**SIGNAL GENERATOR & INSTRUMENT PANEL TESTER** Used to generate VSS signal.
 J 38791	**TRANSAXLE TEST BOX** Refer to appropriate engine section for specific adapter harness J 38791-XX.
 J 39775	**4L60E JUMPER HARNESS** Used to measure electronic component and circuit resistance in the transmission. Also used to test the transmission wiring harness and Powertrain Control Module during diagnosis.
 J 34142-B	**UNPOWERED TEST LIGHT** Used for checking wiring for complete circuit, short to ground, or voltage.
 J 35616-A/BT-8637	**CONNECTOR TEST ADAPTER KIT** Used for making electrical test connections in current Weather Pack, Metri-Pack and Micro-Pack style terminals.
 J 26792/BT-7220-1	**SPARK TESTER** Used for checking available secondary ignition voltage. Also called an ST 125.

6-11-93
MS 11188-6E

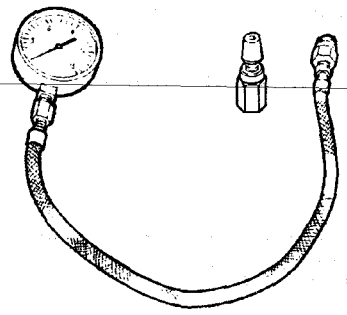
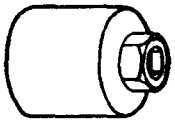
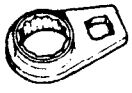
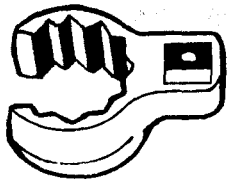
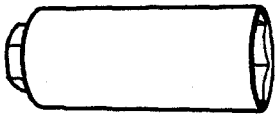
Special Tools (2 of 6)

 J 34730-E	**PORT FUEL INJECTION DIAGNOSTIC KIT** Used to diagnose port fuel injection systems. The kit includes: • Fuel Pressure Gage - (J 34730-1A) • Injector Test Light - (J 34730-2C) • Test Harness Adapter - (J 34730-225) - used to connect J 39021 to CPI engine harness • Injector Poppet Tester - (J 34730-230) - used to check CPI fuel flow. • Fuel Injector Tester - (J 39021) - used to check injector coils and to perform injector balance (fuel flow) check
 J 39021-70	**TEST HARNESS ADAPTER** Used to connect J 39021 to 2.2L Passenger.
 J 39021-60	**TEST HARNESS ADAPTER** Used to connect J 39021 to 2.2L Truck.
 J 34730-350/BT-8320	**INJECTOR HARNESS TESTER** Used for checking the electrical circuit to a TBI fuel injector.
 J 34730-2A/BT-8329A	**INJECTOR HARNESS TESTER** Used for checking the electrical circuit to a TBI fuel injector.
 J 37027-A	**IAC MOTOR ANALYZER** Used to test IAC motors for correct functioning and proper response to commands. J 37027-3 IAC System Check Lights ALSO 222-L IAC Driver and Node Light Kit 6-8-93 MS 11457-6E

Special Tools (3 of 6)

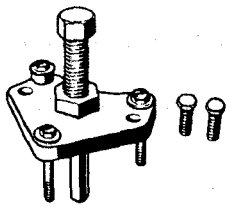
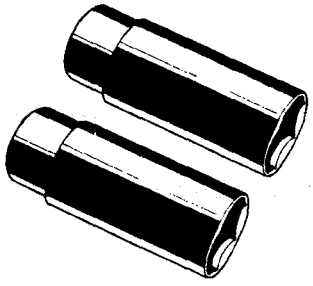
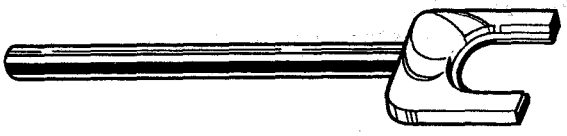
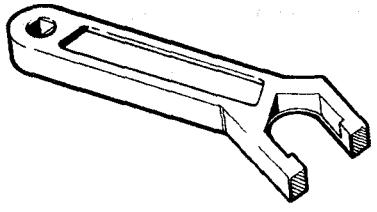
 J 37287	**INLET & RETURN FUEL LINE SHUT-OFF ADAPTERS** Used with J 34730-1 for checking and monitoring fuel line pressure. • J37287-1 Inlet Adapter • J37287-2 Return Adapter
 J 29658-D	**FUEL PRESSURE GAGE KIT** Used for checking and monitoring fuel line pressure of TBI fuel system. • 15 PSI and 60 PSI gages • J 29658-150 Relief Valve • J 29658-82 Fuel Line Adapter • J 29658-85 Fuel Line Adapter • J 29658-89 Quick-Connect Fuel Line Adapter
 J 37088-A/BT-9171	**FUEL LINE QUICK-CONNECT SEPARATOR** Used to release fuel line quick-connect fittings.
 J 29698-A/BT-8251	**FUEL/INJECTION LINE WRENCH** Used to service fuel or injection line.
 J 39504	**FUEL LINE DISCONNECT TOOL SET (W CAR)** Used to disconnect fuel line disconnect locking tabs under ABS modulator.
 J 23738-A	**VACUUM PUMP WITH GAGE (20 IN. HG. MINIMUM)** Use the gage to monitor manifold engine vacuum and use the hand pump to check vacuum sensors, solenoids and valves. 6-11-93 MS 11459-6E

Special Tools (4 of 6)

 J 35314-A/BT-8515/BT-8515A	**EXHAUST BACK PRESSURE TESTER** Used to diagnose a restricted exhaust at O2S. **AIR PUMP ADAPTER** Used to diagnose a restricted exhaust when O2S is inaccessible.
 J 35632/BT-8514A	**IDLE AIR CONTROL REMOVER** Used to remove idle air control assembly on port fuel injection engine.
 J 29533-A/BT-8127	**OXYGEN SENSOR WRENCH** Used for removing or installing the oxygen sensor.
 J 39194-B	**HEATED OXYGEN SENSOR WRENCH** Used to remove or install the heated oxygen sensor.
 J 35748	**OIL PRESSURE SENDING UNIT SOCKET** Used to remove and install oil pressure sending unit.
 J 33031/BT-8130	**IDLE AIR CONTROL WRENCH** Used for removing or installing IAC valve on throttle body.

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Special Tools (5 of 6)

 J 38197/BT-9189	**BALANCER REMOVER** (3800 Engine) Used to remove crankshaft pulley.
 J 38724	**COOLANT SENSOR SOCKETS** (3800 Engine)
 J 38491	**SPARK PLUG BOOT REMOVAL TOOL** (3800 Engine) Used to prevent damage to wire by breaking plug/boot bond.
 J 39228	**OIL PRESSURE SENSOR WRENCH** **(3800 Engine)** Used to remove or install oil pressure sensor.
 J 39294	**SPARK PLUG BOOT PULLER** **(U-Van w/3800 Engine)** Used to remove spark plug wire on rear bank of engine.

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MS 11466-6E

Special Tools (6 of 6)

SECTION 6E3

DRIVEABILITY AND EMISSIONS

SEQUENTIAL MULTIPORT FUEL INJECTION

THIS SECTION APPLIES TO:

3.4L (L32) (VIN S) "F" CARLINE (SFI)

5.7L (LT1) (VIN P) "F" CARLINE (SFI)

CAUTION: The procedures in this section must be followed in the order listed to temporarily disable the Supplemental Inflatable Restraint (SIR) System and prevent false Diagnostic Trouble Codes from setting. Failure to follow procedures 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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3.4L (L32) (VIN S) "F" CARLINE

General Description			3.4L (VIN S)	6E3-3
Diagnosis Procedure			3.4L (VIN S)	6E3-3
Section A	Engine Components/Wiring Diagrams/Diagnostic Charts		3.4L (VIN S)	6E3-A-1
Section B	Symptoms		3.4L (VIN S)	6E3-B-1
Section C	Component Systems		3.4L (VIN S)	6E3-C-1
C1	Powertrain Control Module (PCM) and Sensors		3.4L (VIN S)	6E3-C1-1
C2	Fuel Metering System		3.4L (VIN S)	6E3-C2-1
C3	Evaporative Emission (EVAP) Control System		3.4L (VIN S)	6E3-C3-1
C4	Electronic Ignition (EI) System		3.4L (VIN S)	6E3-C4-1
C5	Knock Sensor (KS) System		3.4L (VIN S)	6E3-C5-1
C6	Secondary Air Injection (AIR) System		3.4L (VIN S)	6E3-C6-1
C7	Exhaust Gas Recirculation (EGR) System		3.4L (VIN S)	6E3-C7-1
C8	Automatic Transmission Control System		3.4L (VIN S)	6E3-C8-1
C10	A/C Compressor Clutch Control		3.4L (VIN S)	6E3-C10-1
Index			End of Section	

C12	Cooling Fan Control	3.4L (VIN S)	6E3-C12-1
C13	Crankcase Ventilation System	3.4L (VIN S)	6E3-C13-1
C14	Air Intake System	3.4L (VIN S)	6E3-C14-1

5.7L (VIN P) "F" CARLINE

General Description		5.7L (VIN P)	6E3-3
Diagnosis Procedure		5.7L (VIN P)	6E3-3
Section A	Engine Components/Wiring Diagrams/Diagnostic Charts	5.7L (VIN P)	6E3-A-1
Section B	Symptoms	5.7L (VIN P)	6E3-B-1
Section C	Component Systems	5.7L (VIN P)	6E3-C-1
C1	Powertrain Control Module (PCM) and Sensors	5.7L (VIN P)	6E3-C1-1
C2	Fuel Metering System	5.7L (VIN P)	6E3-C2-1
C3	Evaporative Emission (EVAP) Control System	5.7L (VIN P)	6E3-C3-1
C4	Distributor Ignition (DI) System	5.7L (VIN P)	6E3-C4-1
C5	Knock Sensor (KS) System	5.7L (VIN P)	6E3-C5-1
C6	Secondary Air Injection (AIR) System	5.7L (VIN P)	6E3-C6-1
C7	Exhaust Gas Recirculation (EGR) System	5.7L (VIN P)	6E3-C7-1
C8	Automatic Transmission Control System	5.7L (VIN P)	6E3-C8-1
C10	A/C Clutch Circuit Diagnosis	5.7L (VIN P)	6E3-C10-1
C12	Electric Cooling Fan(s)	5.7L (VIN P)	6E3-C12-1
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C14	Air Intake System	5.7L (VIN P)	6E3-C14-1
Index		End of Section	

ALL NEW GENERAL MOTORS VEHICLES ARE CERTIFIED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AS CONFORMING TO THE REQUIREMENTS OF THE REGULATIONS FOR THE CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES. THIS CERTIFICATION IS CONTINGENT ON CERTAIN ADJUSTMENTS BEING SET TO FACTORY STANDARDS. IN MOST CASES, THESE ADJUSTMENT POINTS EITHER HAVE BEEN PERMANENTLY SEALED AND/OR MADE INACCESSIBLE, TO PREVENT INDISCRIMINATE OR ROUTINE ADJUSTMENT IN THE FIELD. FOR THIS REASON, THE FACTORY PROCEDURE FOR TEMPORARILY REMOVING PLUGS, CAPS, ETC., FOR PURPOSES OF SERVICING THE PRODUCT, MUST BE STRICTLY FOLLOWED AND, WHEREVER PRACTICABLE, RETURNED TO THE ORIGINAL INTENT OF THE DESIGN.

INTRODUCTION

GENERAL DESCRIPTION

This section applies to the 3.4L (VIN S) and 5.7L (VIN P) engines. These engines have a fuel injector in the intake manifold near the intake valve for each cylinder.

These engines have controls that reduce exhaust emissions, and maintain good driveability and fuel economy.

A Powertrain Control Module (PCM) is the heart of this control system and has sensors used to provide information about engine operation and the various systems it controls. Details of basic operation, diagnosis, functional checks, and on-vehicle service are covered in "Component Systems," Section "6E3-C".

The PCM has the ability to do some diagnosis of itself, and of other parts of the system. When it finds a problem, it will light the Malfunction Indicator Lamp (MIL) "Service Engine Soon" on the instrument panel and a Diagnostic Trouble Code (DTC) will be stored in the PCM memory. This does not mean the engine should be stopped right away, but that the cause of the light coming "ON" should be checked as soon as reasonably possible.

DIAGNOSIS PROCEDURE

The following sections are written for specific engine applications and are clearly identified. Be sure to use only the section which applies to the engine family being diagnosed.

Before using this section of the manual, you should be familiar with the information and the proper diagnostic procedures as described in SECTION 6E. If the proper diagnosis procedures are not followed, as described in SECTION 6E, it may result in unnecessary replacement of good parts.

Diagnostic charts incorporate diagnostic procedures using a Data Link Connector (DLC) scan (Tech 1 Diagnostic Computer) tool, where possible.

The scan tool has the ability to save time in diagnosis and prevent the replacement of good parts.

The key to using a scan tool successfully for diagnosis lies in the technician's ability to understand the system being diagnosed, as well as an understanding of the scan tool's limitations. Refer to SECTION 6E for more information.

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SECTION A
ENGINE COMPONENTS/WIRING DIAGRAMS DIAGNOSTIC CHARTS

BASIC PROCEDURE

If you have not reviewed the basic information on how to use the diagnostic procedures, go the Introduction of this section. The facing page of each chart in this section will provide a general circuit description and in some instances, alternate diagnostic steps or other diagnostic aids specific to that chart or circuit.

ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

The OBD system check verifies the system is functioning correctly and is the starting point for diagnosing. Some special considerations to keep in mind when diagnosing are:

Blocking Drive Wheels

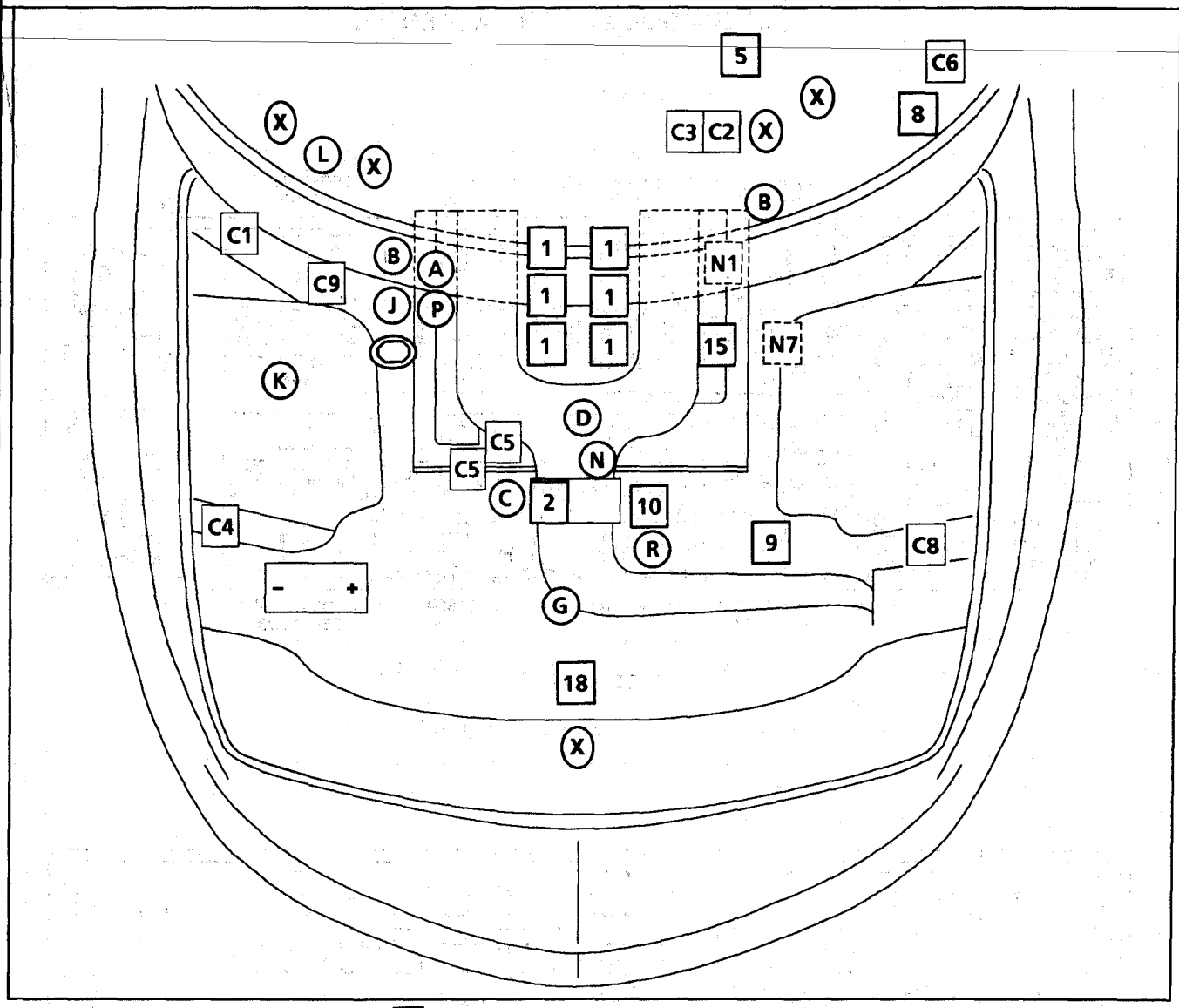
The vehicle drive wheels should always be blocked and the emergency brake set while checking the system.

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Engine and Transmission Tech 1 Data Definitions . . . . . Page A-21
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DTC 85 - PROM Error ..... Page A-129
DTC 87 - EEPROM ERROR ..... Page A-129
DTC 86 - A/D Error ..... Page A-130
DTC 90 - TCC Error ..... Page A-132
DTC 93 - PCS Circuit (Current Error) ..... Page A-134
DTC 96 - Transmission System Voltage Low ..... Page A-136
DTC 98 - Invalid PCM Program ..... Page A-138
DTC 99 - Invalid PCM Program ..... Page A-138

"F" CARLINE RPO:L32 3.4L V6 SFI



COMPUTER HARNESS

- C1 Powertrain Control Module (PCM)
- C2 Data Link Connector (DLC)
- C3 Malfunction Indicator Lamp (MIL) "Service Engine Soon"
- C4 Battery junction block
- C5 PCM harness grounds
- C6 I/P fuse panel
- C8 Underhood electrical center*
- C9 Fuel pump "test" connector

NOT PCM CONNECTED

- N1 Crankcase ventilation valve
- N7 Oil pressure sensor
- N17 Evaporative emission canister (not shown), located in left rear fender, near filler tube

CONTROLLED DEVICES

- 1 Fuel injector
- 2 Idle Air Control (IAC) valve
- 5 Torque Converter Clutch (TCC) connector
- 8 Fuel pump relay
- 9 Air Injection pump
- 10 Ignition coil assembly
- 15 Evaporative emission canister purge solenoid valve
- 18 Engine cooling fan

Digital Exhaust Gas Recirculation (EGR) valve

(X) SIR system components. Refer to SECTION 9J of the service manual, for "Cautions" and information on SIR system components.

INFORMATION SENSORS

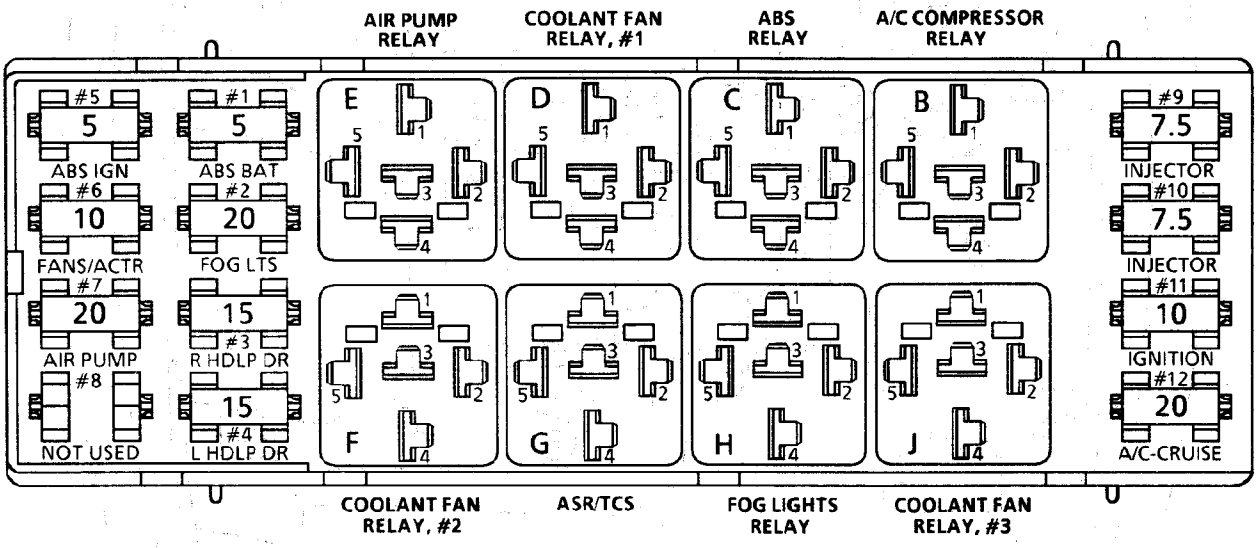
- A Manifold Absolute Pressure (MAP)
- B Oxygen Sensor (O2S)
- C Throttle Position (TP) sensor
- D Engine Coolant Temperature (ECT) sensor (beneath intake plenum)
- F Vehicle Speed Sensor (VSS) (transmission mounted, not shown)
- G Intake Air Temperature (IAT) sensor
- J Knock Sensor (KS)
- K A/C refrigerant pressure sensor
- L A/C evaporator temperature sensor
- N Camshaft position sensor
- P Low resolution 3x crankshaft position sensor
- R High resolution 24x crankshaft position sensor

* See Figure A-2 for full illustration of fuses and relays.

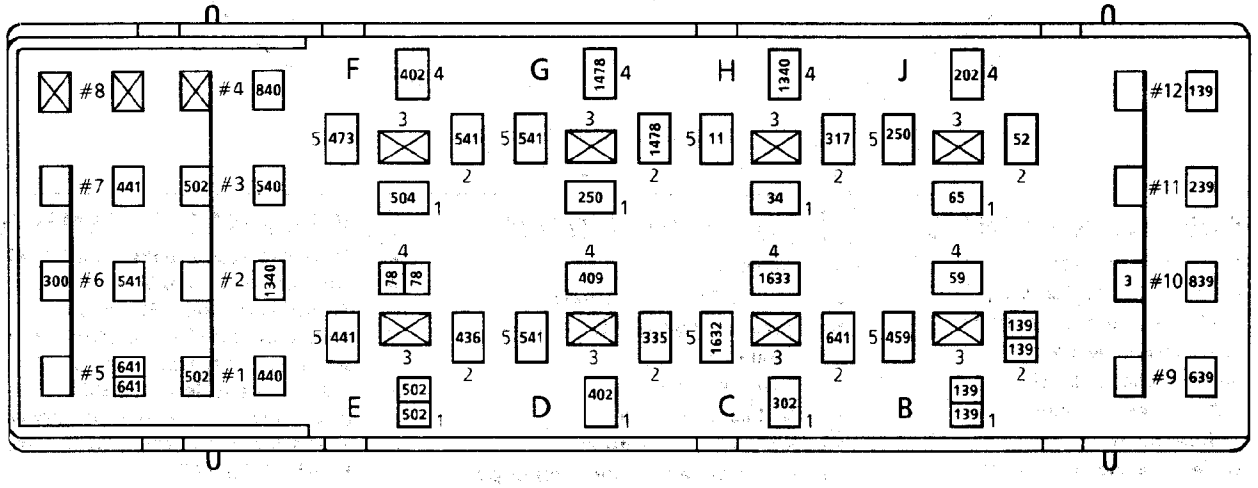
6-29-93
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Figure A-1 - Engine Component Locations 3.4L (VIN S) "F" Carline

UNDERHOOD ELECTRICAL CENTER



TOP VIEW



BACK VIEW

6-26-93W
NS 15595

Figure A-2 - Underhood Electrical Center 3.4L (VIN S) "F" Carline

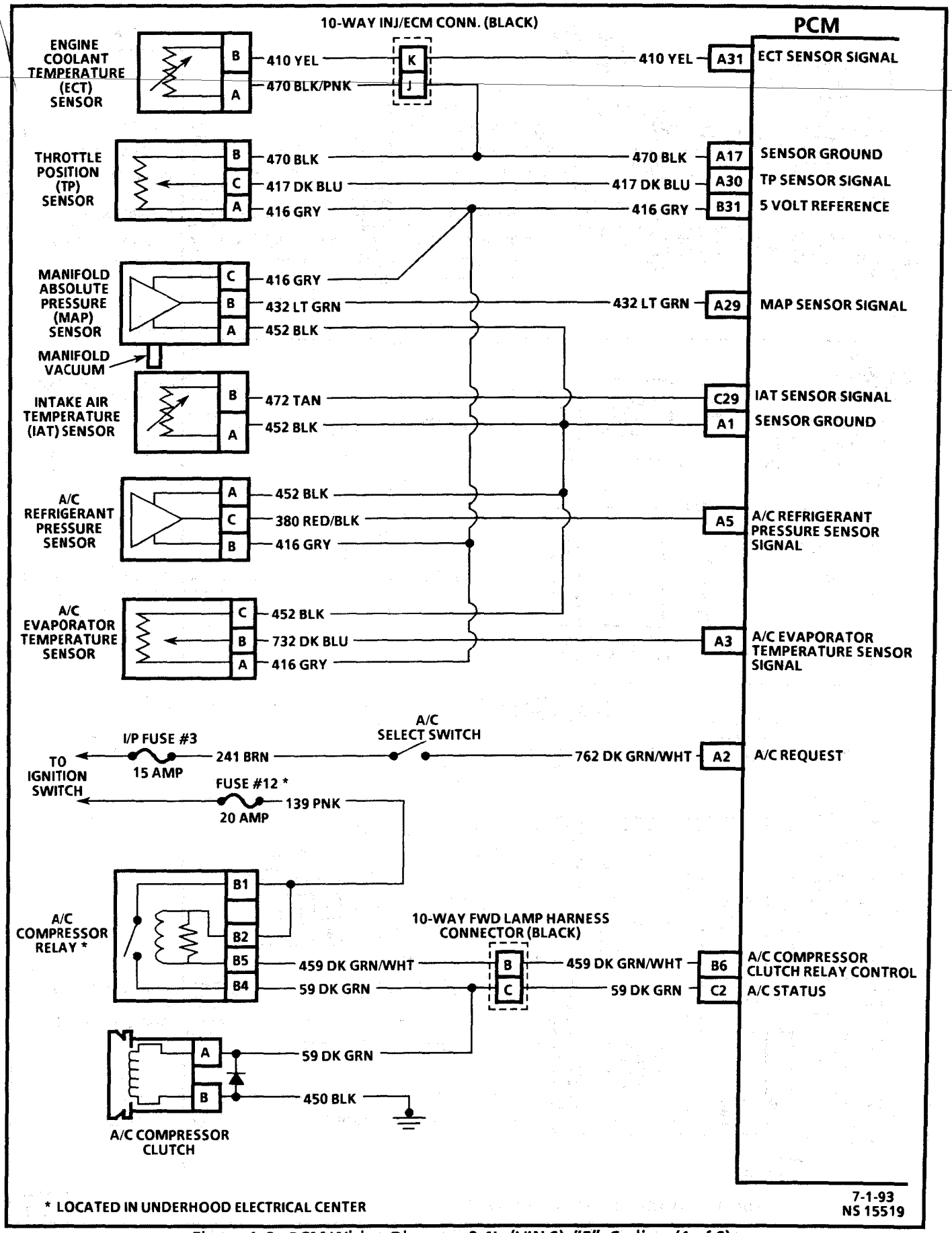


Figure A-3 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (1 of 6)

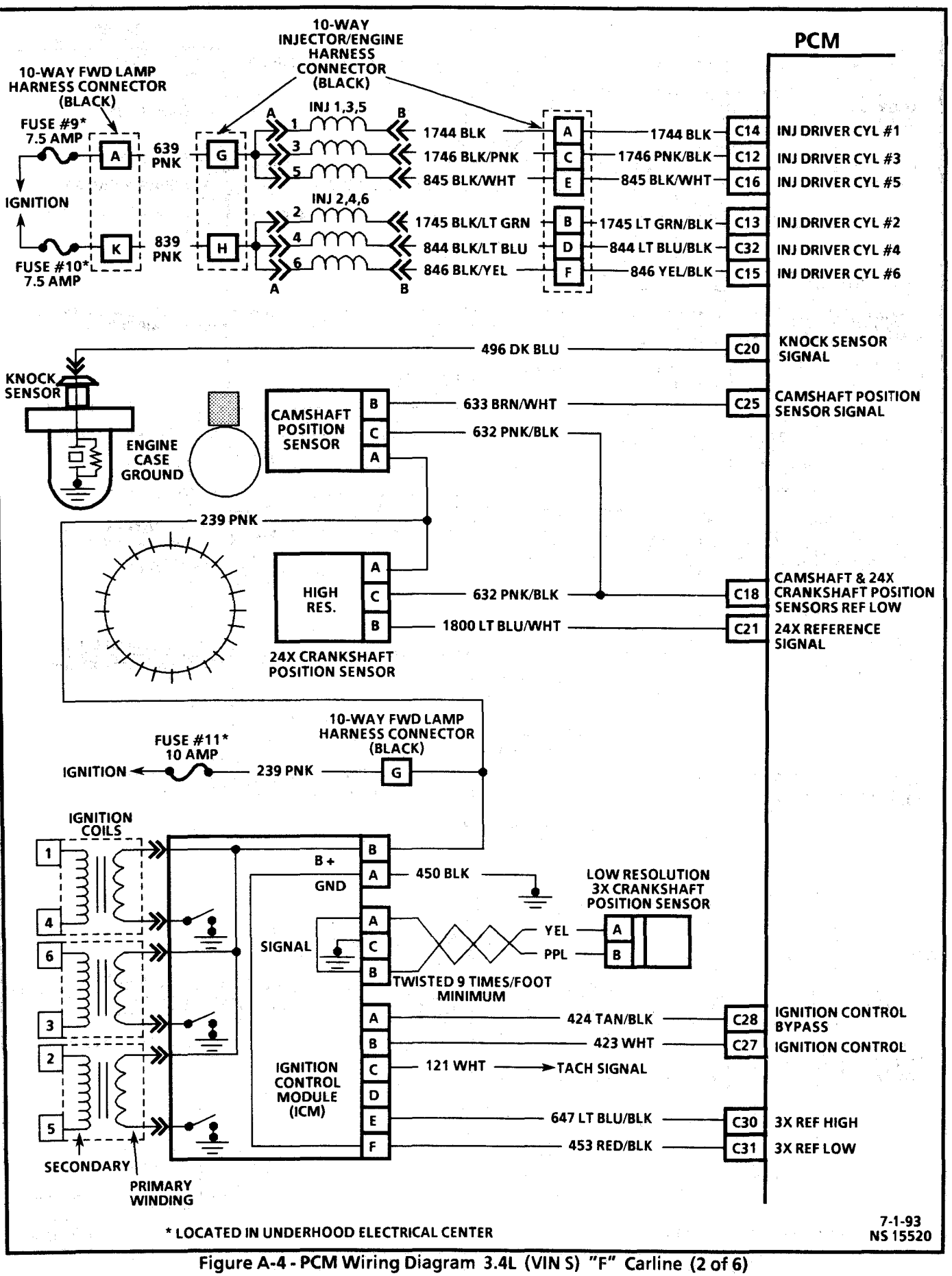


Figure A-4 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (2 of 6)

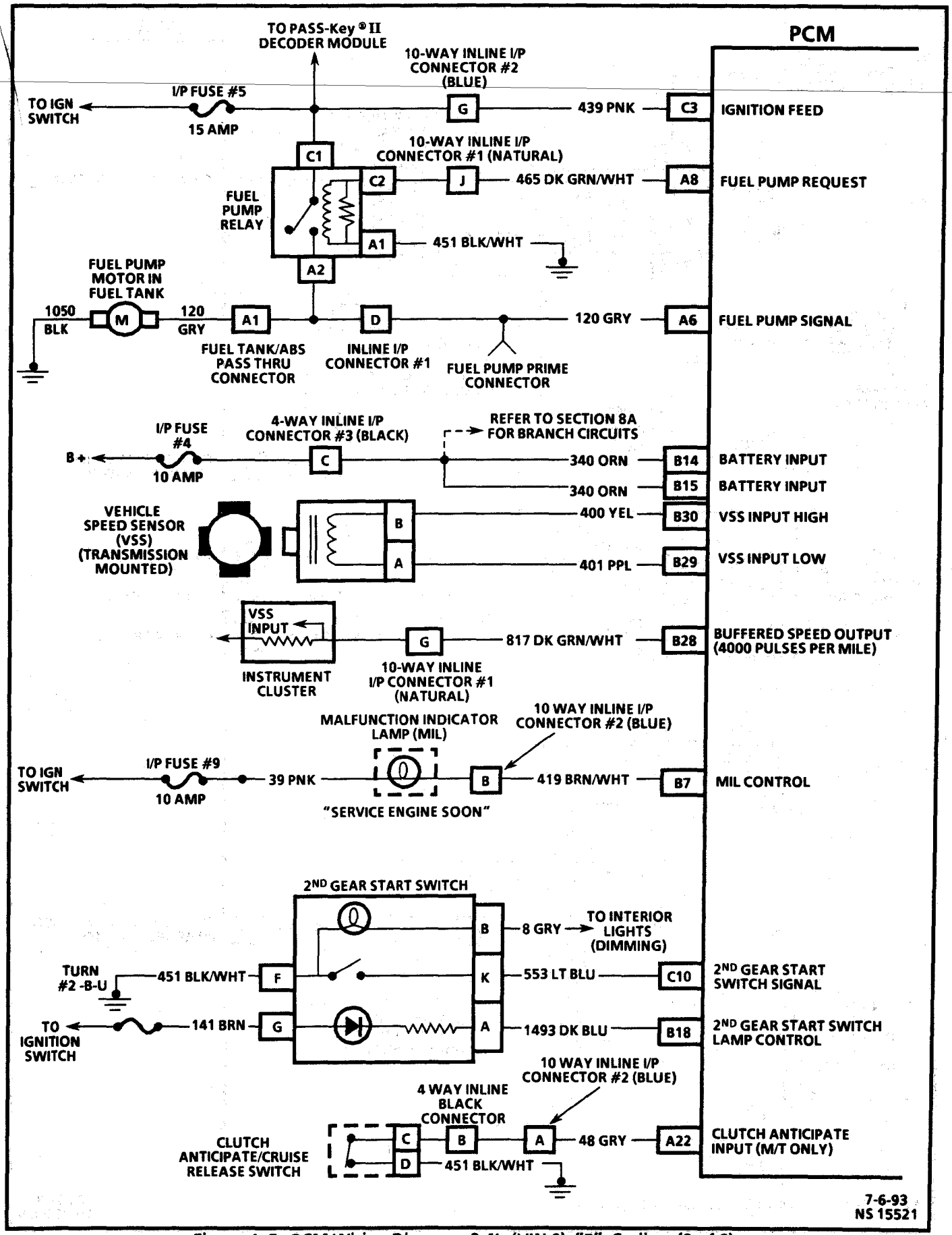
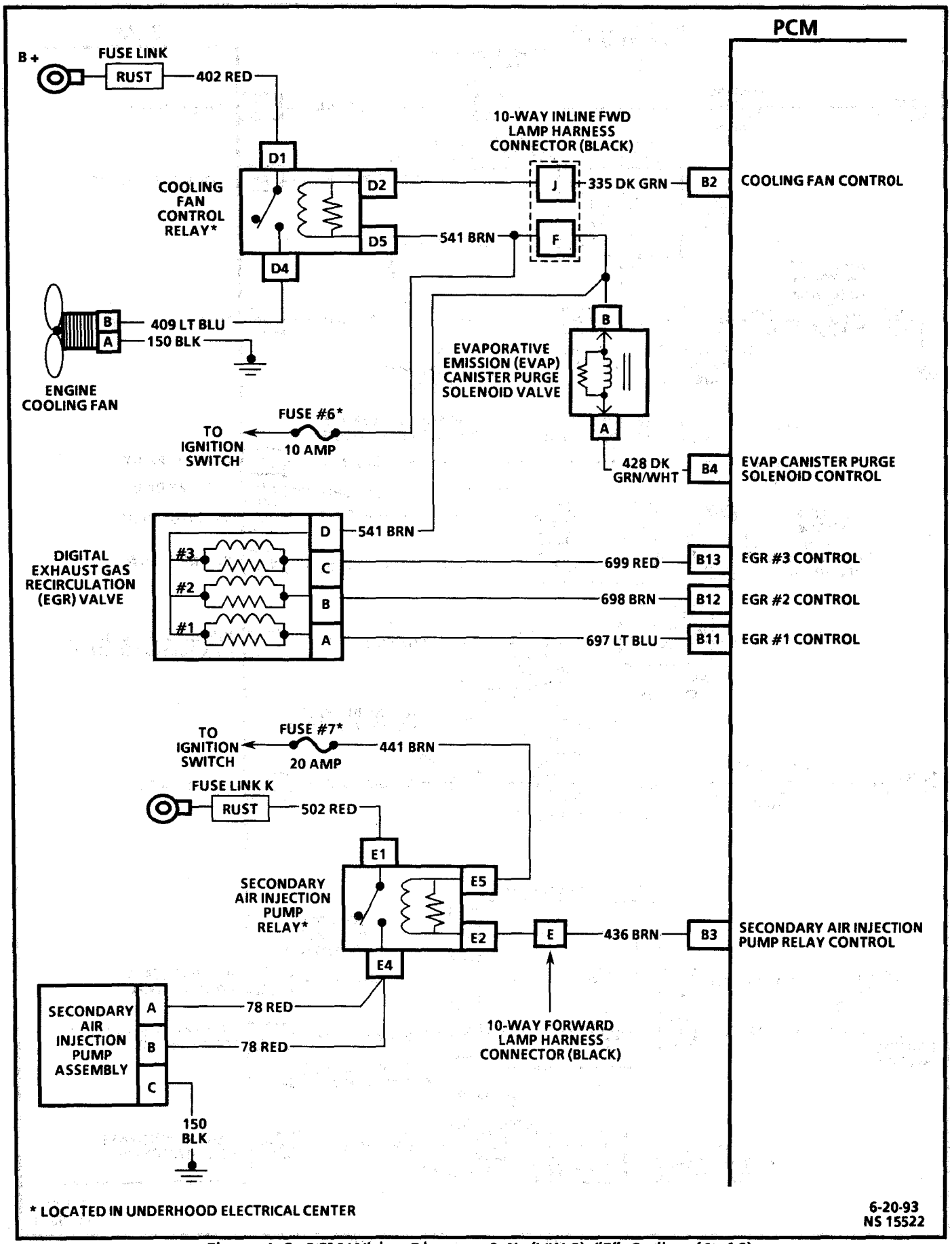


Figure A-5 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (3 of 6)



* LOCATED IN UNDERHOOD ELECTRICAL CENTER

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Figure A-6 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (4 of 6)

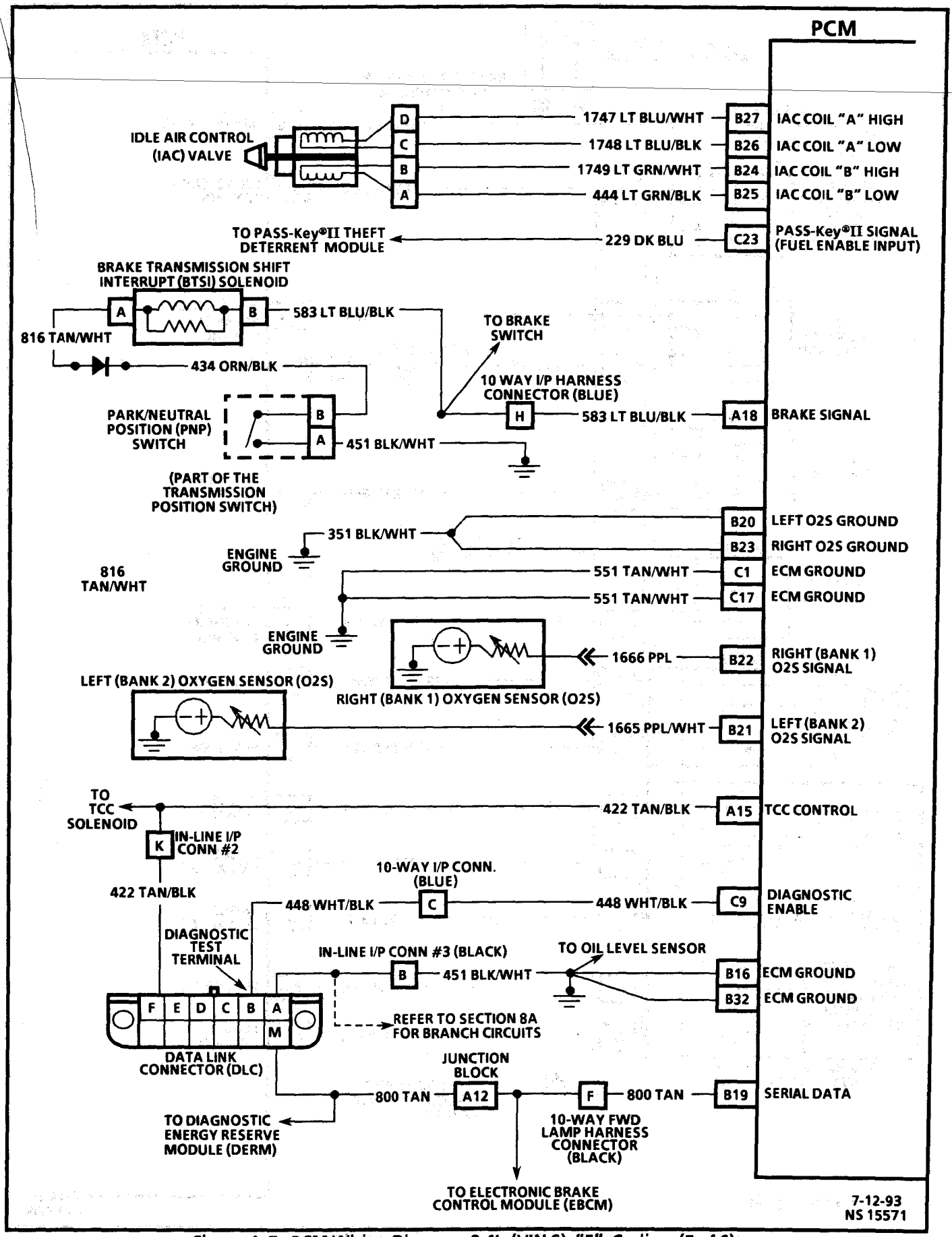


Figure A-7 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (5 of 6)

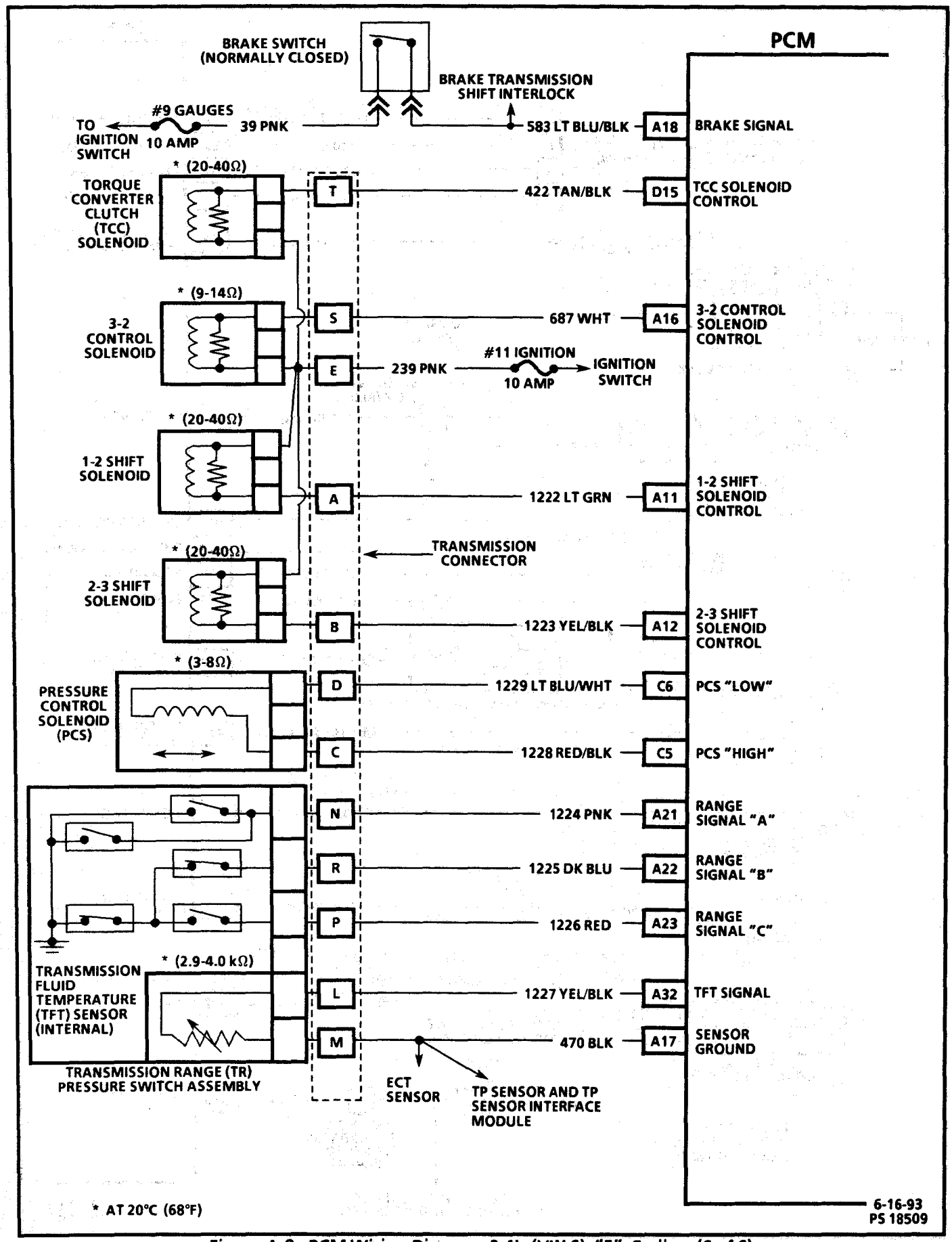
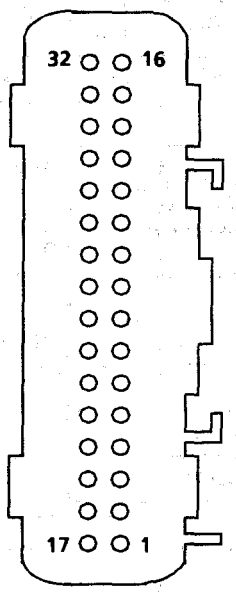
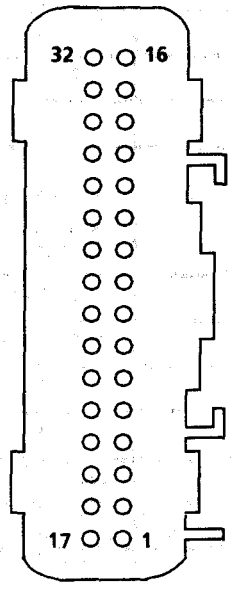


Figure A-8 - PCM Wiring Diagram 3.4L (VIN S) "F" Carline (6 of 6)

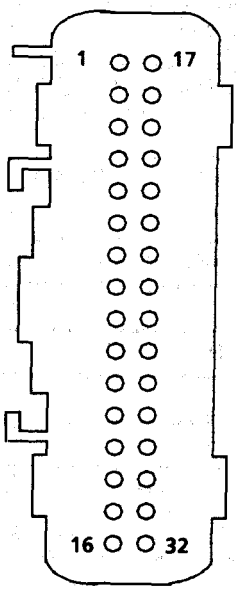
PCM TERMINAL CONNECTOR END VIEWS



FRONT VIEW 32 PIN PCM CONNECTOR "A" (CLEAR)



FRONT VIEW 32 PIN PCM CONNECTOR "B" (BLACK)



FRONT VIEW 32 PIN PCM CONNECTOR "C" (BLUE)

NOTICE: DO NOT BACKPROBE PCM CONNECTORS!
Install the BOB between the PCM harness connectors and the PCM, then probe the pin listed under "BOB PIN #." Voltage may vary due to low battery charge or other reasons, but should be close. All voltages shown in the ENG "RUN" column are typical with engine at idle, closed throttle, normal operating temperature, park or neutral, system in "Closed Loop," all accessories "OFF," and scan tool not installed.

DVM NEGATIVE LEAD MUST BE CONNECTED TO A KNOWN GOOD GROUND.

(1) INCREASES WITH VEHICLE SPEED (MEASURE ON AC SCALE).
(2) NORMAL OPERATING TEMPERATURE.
(3) VARIES
(4) 12 VOLTS FIRST TWO SECONDS.
(5) VARIES WITH TEMPERATURE.
* LESS THAN 1 VOLT.

PCM CONNECTOR "A" (CLEAR)

USE KENT MOORE BREAKOUT BOX (BOB) J 39700 WITH J39700-110 ADAPTER AND J 39700-112 OVERLAY RPO: L32 3.4L (VINS)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	BOB PIN #	VOLTAGE		6E3 REFERENCE
				KEY ON	KEY OFF	
A1 SENSOR GROUND FOR MAP, IAT, A/C REFRIGERANT PRESSURE AND A/C EVAPORATOR TEMPERATURE SENSORS	452	BLK	201	0*	0*	DTC(s) 22,23,33,71
A2 A/C REQUEST	762	DK GRN/WHT	202	A/C OFF 0*	A/C OFF 0*	SEC C-10
A3 A/C EVAPORATOR TEMPERATURE SENSOR SIGNAL	732	DK BLU	203	1.5 (5)	1.5 (5)	DTC(s) 71,73
A4			204			
A5 A/C REFRIGERANT PRESSURE SENSOR SIGNAL	380	RED/BLK	205	A/C OFF .5-1.5	A/C OFF .5-1.5	DTC(s) 66,70
A6 FUEL PUMP SIGNAL	120	GRY	206	0	B+	DTC 54
A7			207			
A8 FUEL PUMP REQUEST	465	DK GRN/WHT	208	0* (4)	B+	DTC 54
A9			209			
A10			210			
A11 SHIFT SOLENOID OUTPUT 1-2	1222	LT GRN	211	B+	0*	SEC C8
A12 SHIFT SOLENOID OUTPUT 2-3	1223	YEL/BLK	212	B+	0*	SEC C8
A13			213			
A14			214			
A15 TCC CONTROL CIRCUIT	422	TAN/BLK	215	B+	B+	DTC 90
A16 3-2 CONTROL SOLENOID	687	WHT	216	B+	B+	SEC C8
A17 SENSOR GROUND FOR TP SENSOR AND ECT SENSOR	470	BLK	217	0	0	DTC(s) 15,21,22
A18 TCC/BRAKE SWITCH INPUT	583	LT BLU/BLK	218	B+	B+	DTC 37
A19			219			
A20			220			
A21 TRANS RANGE PRESSURE SWITCH SIGNAL "A"	1224	PNK	221	B+	B+	DTC 28
A22 TRANS RANGE PRESSURE SWITCH SIGNAL "B" (A/T)	1225	DK BLU	222	0*	0*	DTC(s) 28,80
CLUTCH ANTICIPATE SWITCH - (M/T)	48	GRY	222	0*	0*	SEC C8
A23 TRANS RANGE PRESSURE SWITCH SIGNAL "C"	1226	RED	223	B+	B+	DTC 28
A24			224			
A25			225			
A26			226			
A27			227			
A28			228			
A29 MAP SENSOR SIGNAL	432	LT GRN	229	4.8(3)	1.2(3)	DTC 33,34,44
A30 TP SENSOR SIGNAL	417	DK BLU	230	0*(3)	(3)	DTC(s) 21,22
A31 ECT SENSOR SIGNAL	410	YEL	231	(5)	(5)	DTC(s) 14,15
A32 TRANS TEMPERATURE SENSOR SIGNAL	1227	YEL/BLK	232	(5)	(5)	DTC 58,59,79

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Figure A-9 - PCM Connector Terminal End View (1 of 3)

PCM CONNECTOR "B" (BLACK)

USE KENT MOORE BREAKOUT BOX (BOB) J 39700 WITH J39700-110 ADAPTER AND J 39700-112 OVERLAY RPO: L32 3.4L (VINS)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	BOB PIN #	VOLTAGE KEY ON	VOLTAGE KEY OFF	6E3 REFERNECE
B1			101			
B2 COOLANT FAN RELAY CONTROL	335	DK GRN	102	B +	B +	SEC C12
B3 SECONDARY AIR INJECTION PUMP RELAY CONTROL	436	BRN	103	B +	B +	SEC C6
B4 EVAP CANISTER PURGE CONTROL	428	DK GRN/WHT	104	B +	B +	SEC C3
B5			105			
B6 A/C COMPRESSOR CLUTCH RELAY CONTROL	459	DK GRN/WHT	106	B +	B +	DTC 68
B7 MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON"	419	BRN/WHT	107	0*	B +	CHART A-1
B8			108			
B9			109			
B10			110			
B11 EGR #1 CONTROL	697	LT BLU	111	B +	B +	DTC 75
B12 EGR #2 CONTROL	698	BRN	112	B +	B +	DTC 76
B13 EGR #3 CONTROL	699	RED	113	B +	B +	DTC 77
B14 BATTERY + (KEEP ALIVE MEMORY)	340	ORN	114	B +	B +	CHART A-3
B15 BATTERY + (KEEP ALIVE MEMORY)	340	ORN	115	B +	B +	CHART A-3
B16 PCM GROUND	451	BLK/WHT	116	0	0	CHART A-1
B17			117			
B18 2ND GEAR START INDICATOR LAMP CIRCUIT OUTPUT	1493	BK BLU	118	0*	0*	SEC C8
B19 SERIAL DATA	800	TAN	118	4	4.1	CHART A-1
B20 LEFT (BANK 2) O2S GROUND	351	BLK/WHT	120	0*	0*	DTC(s) 13,44,45
B21 LEFT (BANK 2) O2S SIGNAL	1665	PPL/WHT	121	0*	(3)	DTC(s) 13,44,45
B22 RIGHT (BANK 1) O2S SIGNAL	1666	PPL	122	0*	(3)	DTC(s) 63,64,65
B23 RIGHT (BANK 1) O2S GROUND	351	BLK/WHT	123	0*	0*	DTC(s) 63,64,65
B24 IAC COIL "B" HIGH	1749	LT GRN/WHT	124	(3)	(3)	DTC 35
B25 IAC COIL "B" LOW	444	LT GRN/BLK	125	(3)	(3)	DTC 35
B26 IAC COIL "A" LOW	1748	LT BLU/BLK	126	(3)	(3)	DTC 35
B27 IAC COIL "A" HIGH	1747	LT BLU/WHT	127	(3)	(3)	DTC 35
B28 BUFFERED SPEED OUTPUT (4000 PULSES/MILE)	817	DK GRN/WHT	128	9	10	DTC 24
B29 VSS INPUT LOW	401	PPL	129	0	0* (3)	DTC(s) 24, 72
B30 VSS INPUT HIGH	400	YEL	130	0	0* (3)	DTC(s) 24, 72
B31 5 VOLT REFERENCE - MAP, TP AND A/C REFRIGERANT PRESSURE SENSORS	416	GRY	131	5	5	DTC(s)22,34,66, 67,70,71,73
B32 PCM GROUND	451	BLK/WHT	132	0*	0*	FIG A-1

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Figure A-10 - PCM Connector Terminal End View (2 of 3)

USE KENT MOORE BREAKOUT BOX (BOB)
J 39700 WITH J 39700-110 ADAPTER AND
J 39700-112 OVERLAY

3.4L (VIN S)
RPO: L32

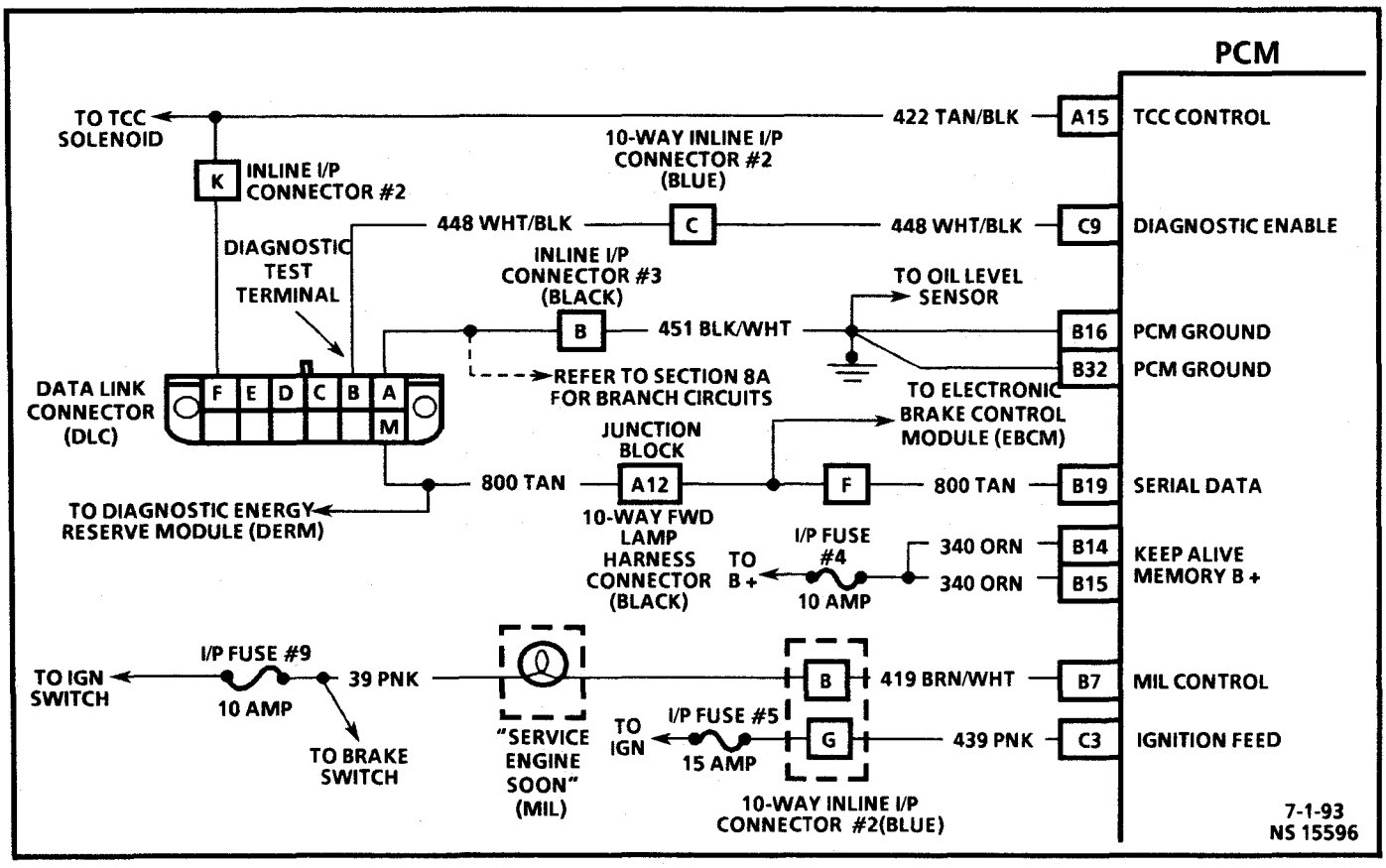
PCM CONNECTOR "C" (BLUE)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	BOB PIN #	VOLTAGE		6E3 REFERENCE
				KEY "ON"	ENG "RUN"	
C1 PCM GROUND	551	TAN/WHT	301	0	0	FIG A-1
C2 A/C STATUS	59	DK GRN	302	A/C OFF 0*	A/C OFF 0*	DTC (S) 68, 69)
C3 IGNITION FEED	439	PNK	303	B+	B+	DTC 82
C4			304			
C5 PRESSURE CONTROL SOLENOID HIGH	1228	RED/BLK	305	0*	7(3)	DTC 93
C6 PRESS URE CONTROL SOLENOID LOW	1229	LT BLU/WHT	306	0*	1.2 (3)	DTC 93
C7			307			
C8			308			
C9 DIAGNOSTIC ENABLE	448	WHT/BLK	309	5	5	OBD SYSTEM CHECK
C10 2ND GEAR START SWITCH SIGNAL	553	LT BLU	310	B+	B+	SEC. C8
C11 PARK/NEUTRAL POSITION SWITCH INPUT	434	ORN/BLK	311			
C12 INJECTOR DRIVER CYL #3	1746	PNK/BLK	312	B+	B+	SEC, C2
C13 INJECTOR DRIVER CYL #2	1745	LT GRN/BLK	313	B+	B+	SEC. C2
C14 INJECTOR DRIVER CYL #1	1744	BLK	314	B+	B+	SEC. C2
C15 INJECTOR DRIVER CYL #6	846	YEL/BLK	315	B+	B+	FIG A1
C16 INJECTOR DRIVER CYL #5	845	BLK/WHT	316	B+	B+	SEC. C2
C17 PCM GROUND	551	TAN/WHT	317	0	0	FIG A1
C18 REFERENCE LOW CAMSHAFT & CRANKSHAFT SENSORS	632	PNK/BLK	318	0	0	SEC . C4
C19			319			
C20 KNOCK SENSOR SIGNAL	496	DK BLU	320	2.3	2.3	DTC 43
C21 24X REFERENCE SIGNAL	1800	LT BLU/WHT	321	B+	5(3)	DTC 36
C22			322			
C23 PASS-Key®II SIGNAL (FUEL ENABLE)	229	DK BLU	323	2.5	2.5	DTC 46
C24			324			
C25 CAMSHAFT POSITION SENSOR SIGNAL	633	BRN/WHT	325	B+	B+	DTC 17
C26			326			
C27 IGNITION CONTROL	423	WHT	327	0*	1.3 (3)	DTC 41
C28 IGNITION CONTROL BYPASS	424	TAN/BLK	328	0*	4.7	DTC 42
C29 IAT SENSOR SIGNAL	472	TAN	329	(5)	(5)	DTC (S) 23.25
C30 3X REFERENCE HIGH	647	LT BLU/BLK	330	0*	2.3 (3)	DTC 82
C31 3X REFERENCE LOW	453	RED/BLK	331	0*	0*	SEC. C4
C32 INJECTOR DRIVER CYL #4	844	LT BLU/BLK	332	B+	B+	SEC. C2

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Figure A-11 - PCM Connector Terminal End View (3 of 3)

BLANK



ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

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

Circuit Description:

The on-board diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction. It must be the starting point for any driveability complaint diagnosis, because it directs the service technician to the next logical step in diagnosing the complaint. Understanding the chart and using it correctly will reduce diagnostic time and prevent the unnecessary replacement of good parts.

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

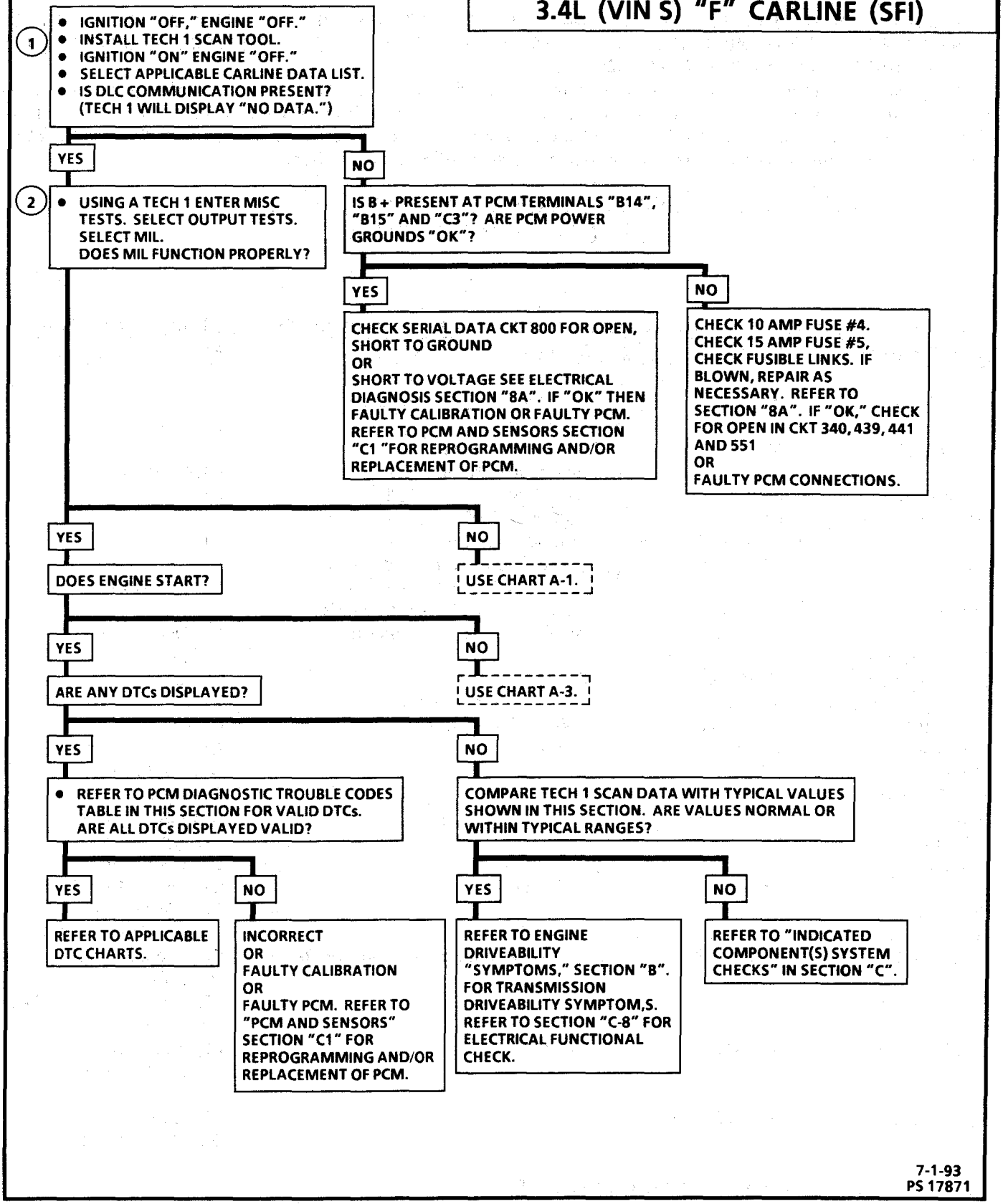
1. This step is to determine if the Tech 1 can establish communication with the PCM. If it cannot, "No DLC Data" will be displayed on the Tech 1.
2. This test is to determine if the PCM can control the MIL using the MIL system check.

Important

- This vehicle is equipped with a Powertrain Control Module (PCM) utilizing an Electrically Erasable Programmable Read Only Memory (EEPROM).
  When diagnostics call for replacement of the PCM, the new PCM must be programmed. Refer to "PCM Replacement and Programming Procedures" in Section "6E3-C1".

ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

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



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If after completing the "On-Board Diagnostic (OBD) System Check" and finding the Tech 1 diagnostics functioning properly and no diagnostic trouble codes displayed, the "Typical Tech 1 Data Values" may be used for comparison with values obtained on the vehicle being diagnosed. The "Typical Tech 1 Data Values," are an average of display values recorded from normally operating vehicles and are intended to represent what a normally functioning system would display.

A SCAN TOOL THAT DISPLAYS FAULTY DATA SHOULD NOT BE USED, AND THE PROBLEM SHOULD BE REPORTED TO THE MANUFACTURER. THE USE OF A FAULTY SCAN TOOL CAN RESULT IN MISDIAGNOSIS AND UNNECESSARY PARTS REPLACEMENT.

Only the parameters listed are used in this manual for diagnosis. If a scan tool reads other parameters, the values are not recommended by General Motors for use in diagnosis. For more description on the values and use of the Tech 1 to diagnosis PCM inputs, refer to the applicable diagnosis section in "Component Systems," Section "6E3-C". If all values are within the range illustrated, refer to "Symptoms," Section "6E3-B".

TYPICAL TECH 1 DATA VALUES
3.4L (VIN S) "F" CARLINE

Idle / Upper Radiator Hose Hot / Closed Throttle / Park or Neutral / "Closed Loop" / Acc. "OFF"

Scan Position	Units Displayed	Typical Data Value	6E3 Reference Sec.
Engine Speed	RPM	± 100 RPM from desired RPM (± 50 RPM in drive)	C2, CHART C-2B
Desired Idle	RPM	ECM idle command (varies with temperature)	C2, CHART C-2B
Engine Coolant Temp	C°/F°	85°C-109°C (185°F-223°F)	C1
Intake Air Temp	C°/F°	10°C-80°C (50°F-176°F) depends on underhood temperature.	C1
MAP	kPa/Volts	29 - 48 kPa (1 - 2 volts) depends on Vac. & Baro pressure.	C1, CHART C-1D
BARO	kPa/Volts	58 - 114 kPa (2.5 - 5.5) depends on altitude & Baro pressure.	C1, CHART C-1D
Throt Position	Volts	.29 - .98	C1, C2
Throttle Angle	0 - 100%	0%	C1, C2
O2S Right (Bank 1)	Millivolts	100-1000 and varying	C1, C2
O2S Left (Bank 2)	Millivolts	100-1000 and varying	C1, C2
S. T. Fuel Trim (Bank 1)	Counts	Varies	C2, Typical Tech 1 Data Definitions
L. T. Fuel Trim (Bank 1)	Counts	110 - 156	C2, Typical Tech 1 Data Definitions
S. T. Fuel Trim (Bank 2)	Counts	Varies	C2, Typical Tech 1 Data Definitions
L. T. Fuel Trim (Bank 2)	Counts	110 - 156	C2, Typical Tech 1 Data Definitions
Loop Status	Open Lp/Closed Lp	Closed Loop	C1, C2, Typical Tech 1
Fuel Trim Cell	Cell Numbers	0 - 16 (Depends on air flow and RPM)	C2, Typical Tech 1 Data Definitions
Fuel Trim Enable	No/Yes	No	C2, Typical Tech 1 Data Definitions
Spark Advance	# of Degrees	Varies	C5, Typical Tech 1 Data Definitions
Spark Retard	# of Degrees	0*	C5, Typical Tech 1 Data Definitions

* **NOTICE:** If maximum retard is indicated, go to CHART C-5.

Knock Signal	No/Yes	No (Yes, indicates knock is being detected)	C5, Typical Tech 1 Data Definitions
EGR 1/EGR 2	Off/On	Off (On when commanded by PCM)	C7
EGR 3	Off/On	Off (On when commanded by PCM)	C7
Idle Air Control	Counts (steps)	5-50	C2, CHART C-2B
Park/Neutral Pos	P-N	Park/Neutral (P-N)	C1, CHART C-1A
MPH Km/h	vehicle speed	0	C1, C8, 8A
Torque Converter Clutch	Off/On	Off/(On with TCC commanded)	C8
System Voltage	Volts	13.5 - 14.5 Volts	Typical Tech 1 Data Definitions
Fuel Pump Volts	Volts	13.5 - 14.5 Volts	C2
Ign Cntrl 3X SIG	RPM	Varies	C1, C4 Typical Tech 1 Data Definitions
Ign Cntrl 24X SIG	RPM	Varies	C1, C4 Typical Tech 1 Data Definitions
Ign Cntrl CAM SIG	0/1	Varies	C1, C4 Typical Tech ! Data Definitions
A/C Request	No/Yes	No (Yes with A/C requested)	C10
A/C Clutch	On/Off	Off (On with A/C commanded On)	C10
A/C Status	On/Off	Off (On with A/C clutch engaged)	C10
A/C Refrigerant Pressure	psi/Volt	Varies (Depends on temperature)	C10, C12
A/C EVAP Temp	°C/°F	Varies (Depends on temperature)	C10, C12
Engine Cool Fan	Off/On	"Off" (On @ 109°C, then "Off" @ 98°C)	C10, C12
Inj. Pulse Width	Milliseconds	1-4 and varying	C2, CHART C-2A
Fuel EVAP Purge	0-100%	0%	C3
TCC	Off/On	Off (On with TCC commanded)	C1, C8, 8A
4th gear switch	Off/On	Off (On when 4th gear switch closes)	C8, 8A
TCC Brake Switch	Closed/Open	Closed (Open with brake depressed)	C1, C8, 8A
Clutch Pedal Switch	Off/On	Off (On with clutch pedal depressed)	C1, C8, 8A
Air Pump Relay	Off/On	Off (On when commanded by PCM)	C6
PASS-Key/Vats	Fault/OK	OK (Fault if DTC 46 is set)	DTC 46, 8A
DTC Ign Counter	# of Key Cycles	0 (Counts Key Cycles)	Typical Tech 1 Data Definitions
DTC Stored	# of DTCs stored	0 (Counts # of DTCs Stored)	Typical Tech 1 Data Definitions
Time From Start	Hrs/Min	Varies	Typical Tech 1 Data Definitions
Injector Fault	No/Yes	No	Tech 1 Data Definitions
TCC Solenoid	Off/On	Off	C-8

TRANSMISSION TECH 1 DATA

Idle / Lower Radiator Hose Hot / Closed Throttle / Park or Neutral / Closed Loop / Accessories off

SCAN Position	Units Displayed	Typical Data Value	Refer To Sec:
Engine Speed	RPM	± 100 RPM From desired	C1
Trans Output Spd	RPM	0 RPM	
Eng Cool Temp	C°/F°	85°C - 105°C (185°F - 221°F)	C1
Trans Fluid Temp	C°/F°	82°C - 94°C (180°F - 200°F)	
Throt Position	Volts	0.3 - 0.9V	C1
Throttle Angle	Percentage	0%	C1
A/B/C RNG	Off/On	Off/On/Off	
Trans Range Sw	Invalid, Rev, Drive 4, Drive 3, Drive 2, Low, Park/Neut	Park/Neut	
Commanded Gear	1-4	1	
Adaptable Shift	No,Yes	No	
1-2 Sol 2-3 Sol	Off/On	On/On	
3-2 Control Sol	Percentage	0%	
Hot Mode	No, Yes	No	
TCC Solenoid	Off/On	Off	
TCC Slip Speed	RPM	± 50 RPM From Engine Speed	
Desired PCS	Amps	1.01 Amps ± 0.1 Amps	
Actual PCS	Amps	1.01 Amps ± 0.1 Amps	
PCS Duty Cycle	Percentage	40% - 60%	
MPH Km/h	0-255	0	
TCC Brake Switch	Closed, Open	Closed	C1
1-2 Shift Time	Seconds	0	
2-3 Shift Time	Seconds	0	
1-2 Shift Time Error	Seconds	0	
Curr Adapt Cell	% TP	N/A < 25%	
Curr Adapt PSI	PSI	0	
2nd GR Start SW	On/Off	Off	
DTC Ign Counter	0-255	0	
DTC Stored	0-255	0	
Time From Start	Hrs/Min/Sec	Varies	
System Voltage	Volts	12.0 - 14.5V	6D

ENGINE AND TRANSMISSION TECH 1 DATA DEFINITIONS

PCM DATA DESCRIPTION

A list of explanations for each data message displayed on the Tech 1 scan tool begins below.
This information will assist in tracking down emission or driveability problems, since the displays can be viewed while the vehicle is being driven. Refer to the "On-Board Diagnostic System Check" for additional information.

ENGINE SPEED - Engine speed is computed by the PCM from the fuel control reference input (low resolution crankshaft position sensor). It should remain close to desired idle under various engine loads with engine idling.

DESIRED IDLE - The calculated idle speed that is commanded by the PCM. The PCM will compensate for various engine loads to keep the engine at the desired idle speed.

ENGINE COOLANT TEMP - The Engine Coolant Temperature (ECT) sensor is mounted in the intake manifold and sends engine temperature information to the PCM. The PCM supplies 5 volts to the ECT sensor circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold (internal resistance high), the PCM monitors a high signal voltage which it interprets as a cold engine. As the sensor warms (internal resistance decreases), the voltage signal will decrease and the PCM will interpret the lower voltage as a warm engine.

INT AIR TEMP SENSOR - The Intake Air Temperature (IAT) sensor is used by the PCM to adjust fuel delivery and spark timing according to incoming air density. The PCM supplies 5 volts to the IAT thermistor. As intake air temperature varies, the resistance changes causing a change in voltage drop across the sensor. The PCM measures the voltage drop and calculates the air temperature at the air intake.

MAP - The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which results from engine load and RPM changes and converts these into a voltage output.

BARO - MAP sensor is also used to measure barometric pressure during ignition key "ON" cycle and during Wide Open Throttle (WOT), allowing the PCM to make adjustments for altitudes. The PCM uses the MAP sensor to control fuel delivery and ignition timing.

THROT POSITION - Used by the PCM to determine the amount of throttle demanded by the driver. Should read .29 - 98 volt at idle to above 4 volts at Wide Open Throttle (WOT).

THROTTLE ANGLE - Computed by the PCM from TP sensor voltage (Throt position); should read 0% at idle, 100% at Wide Open Throttle (WOT).

O2S RIGHT (BANK 1) - Represents the right exhaust Oxygen Sensor (O2S) output voltage. Should fluctuate constantly within a range between 100 mV (lean exhaust) and 1000 mV (rich exhaust) when operating in "Closed Loop."

O2S LEFT (BANK 2) - Represents the left exhaust Oxygen Sensor (O2S) output voltage. Should fluctuate constantly within a range between 100 mV (lean exhaust) and 1000 mV (rich exhaust) when operating in "Closed Loop."

SHORT TERM FUEL TRIM - (Bank 1 or Bank 2) - This represents a short-term correction to fuel delivery by the PCM in response to the amount of time the oxygen sensor voltage spends above or below the 450 mV threshold. If the oxygen sensor voltage has mainly been below 450 mV, indicating a lean air/fuel mixture, short term fuel trim will increase to tell the PCM to add fuel. If the oxygen sensor voltage stays mainly above the threshold, the PCM will reduce fuel delivery to compensate for the indicated rich condition. **Under certain conditions such as extended idle and high ambient temperatures, EVAP canister purge may cause short term fuel trim to read less than 100 counts.**

LONG TERM FUEL TRIM - (Bank 1 or Bank 2) - Long term fuel trim is derived from the short term fuel trim value and is used for long-term correction of fuel delivery. A value of 128 counts indicates that fuel delivery requires no compensation to maintain a 14.7:1 air/fuel ratio. A value below 128 counts means that the fuel system is too rich and fuel delivery is being reduced (decreased injector pulse width). A value above 128 counts indicates that a lean O2S signal condition exists and the PCM is compensating by adding fuel (increased injector pulse width). **Long term fuel trim tends to follow short term fuel trim; normal values of 110-150 counts at idle should not be considered unusual.**

TYPICAL TECH 1 ENGINE DATA DEFINITIONS

FUEL TRIM CELL - The 60° V6 engine uses sixteen fuel trim cells. Cell sixteen is the idle mode cell. Throttle position and MAP determine which cell the engine will be in.

LOOP STATUS - "Closed Loop" displayed indicates that the PCM is controlling fuel delivery according to oxygen sensor voltage. In "Open Loop," the PCM ignores the oxygen sensor voltage and bases the amount of fuel to be delivered on TP sensor, engine coolant, and MAP sensor inputs only. "Closed Loop" operation should begin when both oxygen sensors become active and engine coolant temperature exceeds 65°C (149°F) for more than 30 seconds.

FUEL TRIM ENABLE - (Tech 1 Will Display "YES") - If the fuel trim enable system is learning, the L. T. fuel trim is responding to the S. T. fuel trim. If fuel trim enable reads "NO" then L. T. fuel trim will not respond to changes in S. T. fuel trim.

SPARK ADVANCE - This is a display of the spark advance calculation determined by the Ignition Control (IC) logic which the PCM is delivering to the electronic ignition control module. It computes the desired spark advance using data such as engine coolant temperature, RPM, load, vehicle speed, and operating mode.

SPARK RETARD - Indicates the amount of spark advance the PCM is removing from the Ignition Control (IC) timing in response to the Knock Sensor (KS) signal. Tech 1 should display 0° at idle.

KNOCK SIGNAL - Indicates whether or not a knock signal is being detected by the PCM. Tech 1 should display "NO" at idle.

EGR 1/EGR 2/EGR 3 - Any combination of the EGR solenoids may be opened during engine operation. The Tech 1 can indicate which solenoids are open or when all three are closed, such as at idle. The Tech 1 can cycle each solenoid to evaluate its operation.

IDLE AIR CONTROL - Displays the commanded position of the Idle Air Control (IAC) pintle in counts. The higher the number of counts, the greater the commanded idle speed. Idle Air Control (IAC) should respond fairly quickly to changes in engine load to maintain desired idle RPM.

PARK/NEUTRAL POSITION - P-N displayed indicates the gear select lever is in "Park" or "Neutral."

MPH KM/H - The Vehicle Speed Sensor (VSS) signal is converted into km/h and mph for display.

TORQUE CONVERTER CLUTCH (TCC) - Tech 1 displays TCC "OFF" or "ON" as commanded by the PCM.

SYSTEM VOLTAGE - System voltage with ignition "ON" and engine "OFF" will reflect battery voltage. Ignition "ON" engine "ON" will indicate charging system voltage applied to the PCM ignition input.

FUEL PUMP VOLTS - When the ignition switch is turned to the "ON" position, the PCM turns the fuel pump relay "ON" for two seconds. If the PCM does not receive ignition reference pulses within two seconds, the PCM will shut "OFF" the fuel pump.

IGNITION CONTROL 3X SIGNAL - Indicates the PCM is receiving 3X reference signal from the ignition control module.

IGNITION CONTROL 24X SIGNAL - Indicates the PCM is receiving 24X reference signals from the 24X, high resolution crankshaft position sensor.

IGNITION CONTROL CAM SIGNAL - The ignition control CAM signal provides the PCM with the information to determine when the intake valve on number one cylinder will open. "0" CLOSED, "1" OPENED - The PCM sequences the injectors in cylinder firing order based on the input from the camshaft position sensor.

A/C REQUEST - Represents the state of the A/C request input from the control head.

A/C CLUTCH - Represents the commanded state of the A/C clutch control relay. Clutch should be engaged when "ON" is displayed.

A/C STATUS - The Tech 1 will display "ON" if voltage has been applied to the A/C compressor clutch.

A/C REFRIGERANT PRESSURE - Tech 1 displays refrigerant pressure represented by psi and voltage.

A/C EVAP TEMPERATURE - The Tech 1 will display the A/C system temperature used by the PCM for cooling fan operation, A/C compressor clutch control and A/C diagnostic trouble codes.

ENGINE COOL FAN - When the PCM is commanding the engine cooling fan "ON," the Tech 1 display will switch from "OFF" to "ON." The coolant fan can also be selected as an output test by the Tech 1.

TYPICAL TECH 1 ENGINE DATA DEFINITIONS

INJECTOR PULSE WIDTH - Indicates the on time of the injectors in milliseconds. When engine load is increased, injector pulse width will increase.

FUEL EVAP PURGE - A signal used to control canister purge function. 0% indicates the evaporative emission canister purge solenoid valve is commanded fully closed while 100% indicates that the valve is commanded fully open.

(TCC) - A/T - The Tech 1 only indicates when the PCM has enabled the Torque Converter Clutch (TCC) driver, but this does not confirm that the TCC has engaged. To determine if TCC is operating properly, engine RPM should decrease when TCC is enabled. Refer to Chart C-8.

TCC BRAKE SWITCH - Tech 1 displays "CLOSED" when the brake pedal is at rest and "OPEN" when the brake pedal is applied. The switch sends a signal to the PCM to disengage the TCC.

INJECTOR FAULT - The PCM can determine if any of the six injectors are misfiring. "YES" will be displayed if this is occurring.

CLUTCH PEDAL SWITCH - Tech 1 displays "ON" with the clutch pedal depressed and "OFF" with the clutch pedal at rest.

AIR PUMP RELAY - The Tech 1 displays "ON" when secondary air is commanded by the PCM and "OFF" when conditions do not require secondary air injection.

PASS-Key®II - An input from the PASS-Key®II decoder module that tells the PCM to enable the injectors if the proper signal is received. The Tech 1 will normally display "OK." If the PASS-Key®II test has failed, the display will switch to "FAULT" and the fuel system may be disabled.

DTC IGNITION COUNTER - Tech 1 displays the number of key cycles after a DTC was stored in PCM memory. The count increases by 1 with each key cycle.

DTC STORED - Tech 1 displays the number of history diagnostic trouble codes stored in PCM memory.

TIME FROM START - Range 0:00:00 - 18:12:15 HR/MIN/SEC - A measure of how long the engine has been running. When the engine stops, it is reset to zero.

TCC SOLENOID - This parameter is the commanded state of the TCC solenoid. "ON" indicates a commanded energized state (current flowing through the solenoids). "OFF" indicates a commanded non-energized state (current not flowing through the solenoids).

TRANSMISSION DATA

ENGINE SPEED - Scan tool displays 0 RPM to 8191 RPM - This parameter indicates the rotational speed of the engine expressed as revolutions per minute.

TRANS OUTPUT SPEED - Scan tool displays 0 RPM to 8191 RPM - This parameter indicates the rotational speed of the transmission output shaft expressed as revolutions per minute.

ENGINE (ENG) COOLANT (COOL) TEMPERATURE (TEMP) - Scan tool displays a range of -40°C to 151°C, -40°F to 304°F - This parameter is the input signal of the engine coolant temperature sensor. Engine coolant temperature is high (151°C) when signal voltage is low (0 volt), and engine coolant temperature is low (-40°C) when signal voltage is high (5 volts).

TRANS FLUID TEMP - Scan tool displays a range of -40°C to 151°C, 40°F to 304°F. - This parameter is the signal input of the transmission fluid temperature sensor. Transmission fluid temperature sensor is high (151°C) when signal voltage is low (0 volt), and transmission fluid temperature is low (-40°C) when signal voltage is high (5 volts).

THROTTLE (THROT) POSITION - Scan tool displays a range of 0.00 volt to 5.10 volts. - This parameter indicates the signal input of the throttle position sensor circuit. Low voltage (approximately .3V to 1.3V) indicates closed throttle, high voltage (approximately greater than 4.5V) indicates wide open throttle.

THROTTLE ANGLE - Range of 0-100% - Computed by the PCM from TP sensor voltage (throttle position) and should display 0% at idle and 100% at wide open throttle. Refer to DTC 21 if TP sensor angle is not 0% at idle.

A/B/C RANGE (RNG) - Scan tool displays ON/OFF, ON/OFF, ON/OFF - These parameters are the three inputs from the Transmission Range Pressure Switch Assembly. "ON" represents a B+ voltage signal, "OFF" represents a 0 voltage signal.

TRANS RANGE SWITCH (SW) - Scan tool displays a range of Invalid, Park/Neutral, Reverse, Drive 4, Drive 3, Drive 2, and Low - This parameter is the decoded status of the three A/B/C Range inputs from the Transmission Range Pressure Switch Assembly and represents the position of the transmission manual valve.

COMMANDED GEAR - Scan tool displays a range of 1, 2, 3, or 4 - This parameter is the decoded commanded state of the 1-2 and 2-3 Shift Solenoids. Gear 1 = ON, ON. Gear 2 = OFF, ON. Gear 3 = OFF, OFF. Gear 4 = ON, OFF.

ADAPTABLE SHIFT - Scan tool displays NO/YES - This parameter is the current adaptability of the last 1-2 shift. "YES" indicates the last shift time parametric data may be sued to modify fluid line pressure for the next 1-2 shift. "NO" indicates the last 1-2 shift time parametric data may not be used to modify fluid line pressure.

1 - 2 SOLENOID (SOL)/2-3 SOLENOID (SOL) - Scan tool displays ON/OFF - These parameters are the commanded status of the 1-2 and 2-3 shift solenoids. "ON" represents a commanded energized state (current flowing through solenoid). "OFF" represents a commanded non-energized state (current not flowing through solenoid).

3 - 2 CONTROL SOLENOID (SOL) - Scan tool displays a range of 0% to 100% - This parameter is the commanded percentage of "ON" time of the 3-2 Control Solenoid. "0%" represents a completely "OFF" (non-energized) commanded state. "100%" represents an "ON" (energized) commanded state.

TRANS HOT MODE - Scan tool displays ON/OFF - "ON" indicates transmission fluid temperature has exceeded 146°C (295°F).

TCC SOLENOID - Scan tool displays ON/OFF - This parameter is the commanded state of the TCC solenoid. "ON" indicates a commanded energized state (current flowing through the solenoid). "OFF" indicates a commanded non-energized state (current not flowing through the solenoid).

TCC SLIP SPEED - Scan tool displays a range of -4096 RPM to + 4095 RPM - This parameter is the difference between transmission input speed derived (from the engine speed) and transmission output speed (from the vehicle speed sensor). A negative value indicates input speed is less than output speed (deceleration). A positive value indicates input speed is greater than output speed (acceleration). A value of zero indicates input speed is equal to output speed (TCC applied).

TRANSMISSION DATA

DESIRED PRESSURE CONTROL SOLENOID (PCS) - Scan tool displays a range of 0.00 amp to 1.10 amps - This parameter is the commanded current of the Pressure Control Solenoid circuit. 0.00 amps (no current flow) indicates commended higher line pressure. 1.10 amps (high current flow) indicates commanded lower line pressure.

ACTUAL PRESSURE CONTROL SOLENOID (PCS) - Scan tool displays a range of 0.00 amp to 1.10 amps - This parameter is the actual current of the Pressure Control Solenoid circuit at the Control Module. 0.00 amps (no current flow) indicates actual higher line pressure. 1.10 amps (high current flow) indicates actual lower line pressure.

PRESSURE CONTROL SOLENOID (PCS) DUTY CYCLE - Scan tool displays a range of 0% to 100% - This parameter is the commanded state of the pressure control solenoid expressed as a percent of energized of on time. 0% indicates zero on time (non-energized) or on current flow. 100% indicates maximum on time (energized) or high current flow.

MPH/KM/h - Range 0-255 km/h, mph - The vehicle speed sensor signal is converted into km/h and mph for display.

TCC BRAKE SWITCH - Scan tool displays CLOSED/OPEN - This parameter indicates the state of the TCC Brake Switch circuit input. "OPEN" indicates a 0 voltage input (brake switch open, brake pedal applied). "CLOSED" indicates a B+ voltage input (brake switch closed, brake pedal released).

1 - 2 SHIFT TIME - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the actual time of the last 1-2 shift.

2 - 3 SHIFT TIME - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the actual time of the last 2-3 shift.

1 - 2 SHIFT ERROR - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the difference between the desired 1-2 shift time and the actual 1-2 shift time.

CURRENT (CURR) ADAPT CELL - Scan tool displays a range of NOT USED, 25% TP Cell, 40% TP Cell and 70% TP Cell - This parameter indicates the current throttle position cell used for fluid line pressure modification (adaptation). "NOT USED" represents 0% - 25% throttle angle. "25% TP Cell" represents 25% - 39% throttle cell. "40% TP Cell" represents 40% - 70% throttle angle. "70% TP Cell" represents 70% - 100% throttle angle.

CURRENT (CURR) ADAPT PSI - Tech 1 Displays -5 to + 10 PSI - This parameter indicates the amount of line pressure change due to shift time error at a particular throttle opening. -5 psi represents the maximum decrease in-line pressure for a particular shift. +10 is the maximum increase in-line pressure for a particular shift.

2ND GEAR START SWITCH - Tech 1 Displays ON/OFF - This parameter indicates if 2nd gear start has been selected. The Tech 1 will display "OFF" when the normal shift control program is effective and "ON" when a second gear start is requested.

DTC IGNITION COUNTER - Tech 1 Displays a Range 0 to 255 - This parameter is the number of ignition cycles after the DTC was stored in memory.

DTC STORED - Tech 1 Displays a Range 0 to 255 - This parameter is the number of DTCs stored in memory.

TIME FROM START - Range 0:00:00-18:12:15 HR/MIN/SEC - A measure of how long the engine has been operating. When the ignition is cycled to "OFF" the value is reset to zero.

SYSTEM VOLTAGE - Scan tool displays 0.00 volt to 25.5 volts - This parameter is the battery ignition voltage input to the control module.

6-28-93
NS 15604

PCM DIAGNOSTIC TROUBLE CODES

DTC	DESCRIPTION	ILLUMINATE MIL
DTC 13	Left (Bank 2) Oxygen Sensor (O2S) - Circuit Error	YES
DTC 14	Engine Coolant Temperature (ECT) Sensor Circuit (high temperature indicated)	YES
DTC 15	Engine Coolant Temperature (ECT) Sensor Circuit (low temperature indicated)	YES
DTC 16	System Voltage Discharge (low battery voltage)	YES
DTC 17	Camshaft Position Sensor Circuit Error	NO
DTC 21	Throttle Position (TP) Sensor Circuit (signal voltage high)	YES
DTC 22	Throttle Position (TP) Sensor Circuit (signal voltage low)	YES
DTC 23	Intake Air Temperature (IAT) Sensor Circuit (low temperature indicated)	YES
DTC 24	Vehicle Speed Sensor (VSS) Circuit - (No Signal)	YES
DTC 25	Intake Air Temperature (IAT) Sensor Circuit (high temperature indicated)	YES
DTC 28	Trans Range Pressure Switch Circuit Error	NO
DTC 33	Manifold Absolute Pressure (MAP) Sensor Circuit (signal voltage high-low vacuum)	YES
DTC 34	Manifold Absolute Pressure (MAP) Sensor Circuit (signal voltage low-high vacuum)	YES
DTC 35	Idle Air Control (IAC) Circuit Error	YES
DTC 36	24X Signal Circuit Error	NO
DTC 37	TCC Brake Switch Error	NO
DTC 39	Clutch Switch Error	YES
DTC 41	Ignition Control (IC) Error	NO
DTC 42	Ignition Control (IC) Bypass Error	YES
DTC 43	Knock Sensor (KS) Circuit Error	YES
DTC 44	Left (Bank 2) Oxygen Sensor (O2S) Circuit Error - lean exhaust indicated	YES
DTC 45	Left (Bank 2) Oxygen Sensor (O2S) Circuit Error - rich exhaust indicated	YES
DTC 46	PASS-Key®II Circuit (out of frequency range)	NO
DTC 51	Prom Error (Faulty or Incorrect Calibration)	YES
DTC 53	System Voltage Overcharge (high battery voltage)	YES
DTC 54	Fuel Pump Circuit (low voltage)	YES
DTC 58	Transmission Fluid Temperature Sensor Circuit (low voltage)	NO
DTC 59	Transmission Fluid Temperature Sensor Circuit (high voltage)	NO
DTC 61	A/C System Performance	NO

PCM DIAGNOSTIC TROUBLE CODES (CONT.)

DTC	DESCRIPTION	ILLUMINATE MIL
DTC 63	Right (Bank 1) Oxygen Sensor (O2S) - Circuit Error	YES
DTC 64	Right (Bank 1) Oxygen Sensor (O2S) - Lean Exhaust Indicated	YES
DTC 65	Right (Bank 1) Oxygen Sensor (O2S) - Rich Exhaust Indicated	YES
DTC 66	A/C Refrigerant Pressure Sensor Circuit (low pressure)	NO
DTC 67	A/C Refrigerant Pressure Sensor - Circuit Error	NO
DTC 68	A/C Relay Circuit (Shorted Circuit)	NO
DTC 69	A/C Relay Circuit (Open Circuit)	NO
DTC 70	A/C Refrigerant Pressure Sensor Circuit (high pressure)	NO
DTC 71	A/C Evaporator Temperature Sensor Circuit (low temperature indicated)	NO
DTC 72	VSS Signal Circuit Error	NO
DTC 73	A/C Evaporator Temperature Sensor Circuit (high temperature indicated)	NO
DTC 75	Digital EGR - Exhaust Gas Recirculation (EGR) Circuit (electrical diagnosis, EGR #1 solenoid error)	YES
DTC 76	Digital EGR - Exhaust Gas Recirculation (EGR) Circuit (electrical diagnosis, EGR #2 solenoid error)	YES
DTC 77	Digital EGR - Exhaust Gas Recirculation (EGR) Circuit (electrical diagnosis, EGR #3 solenoid error)	YES
DTC 79	Transmission Fluid Over Temperature	NO
DTC 80	Transmission Component Slipping	NO
DTC 82	Ignition Control 3X Signal Circuit Error	NO
DTC 85	Prom Error (faulty or incorrect calibration)	YES
DTC 86	A/D Error	YES
DTC 87	Electrically Erasable Programmable Read Only Memory (EEPROM) Error	NO
DTC 90	TCC Error	NO
DTC 93	PCS Circuit Error	NO
DTC 96	Transmission System Voltage Low	NO
DTC 98	Invalid PCM Program	NO
DTC 99	Invalid PCM Program	NO

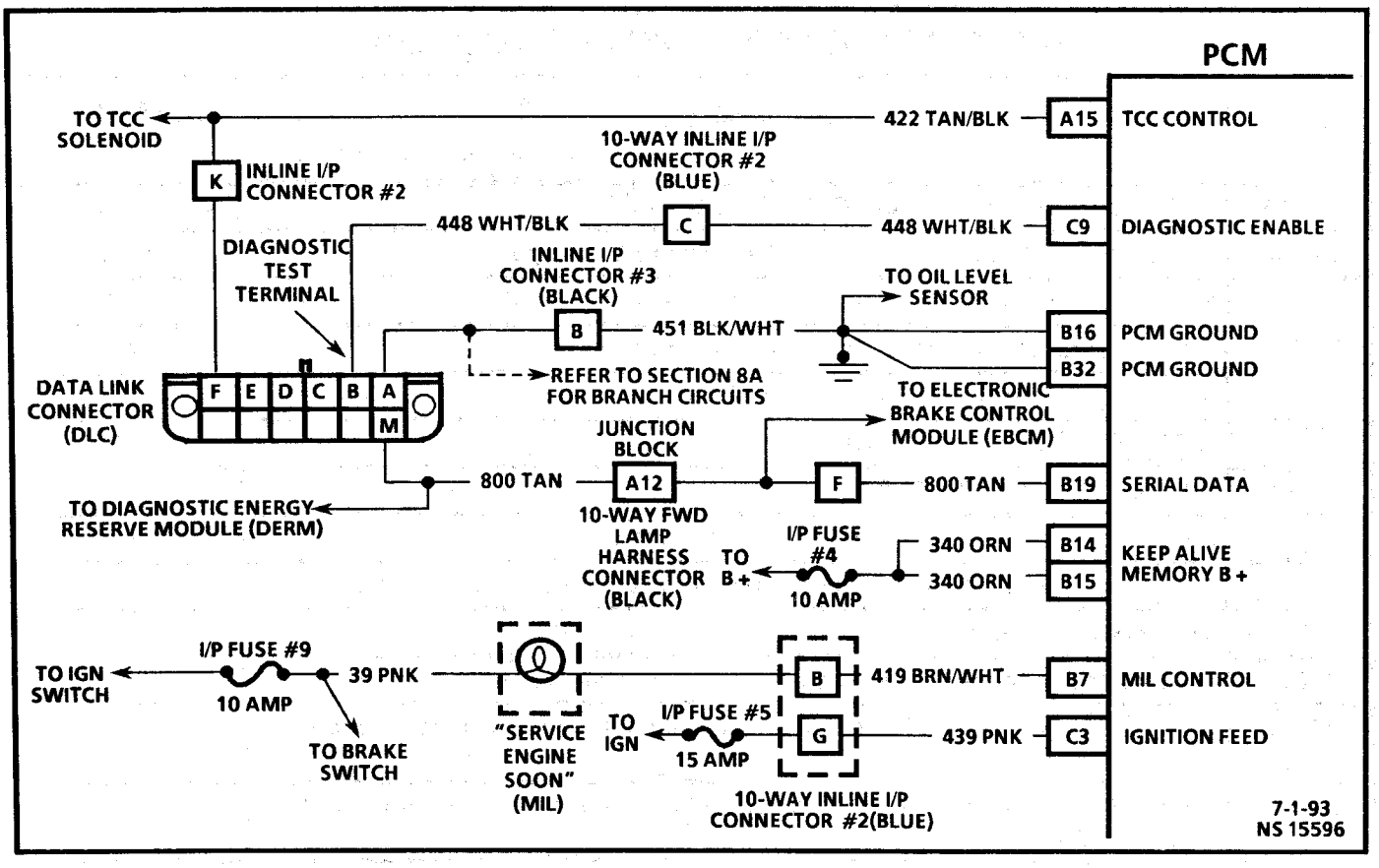


CHART A-1

NO MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON" 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

There should always be a steady Malfunction Indicator Lamp (MIL) "Service Engine Soon" when the ignition switch is "ON" and engine stopped. Battery voltage is supplied directly to the light bulb. The Powertrain Control Module (PCM) will control the light and turn it "ON" by providing a ground path through CKT 419 to the PCM.

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

1. A fused jumper must be used. **Do Not** use a test light.
2. Using a test light connected to B+, probe each of the system ground circuits to be sure a good ground is present. See "PCM Connector Terminal End View" in front of this section for PCM pin locations of ground circuits.
3. If the fusible link is open, determine short to ground in CKT 1002.
4. Make sure to check CKT 439 if the I/P fuse #5 is open and both 340 circuits if the I/P fuse #4 was open.
   Refer to PCM wiring diagrams for information.

Diagnostic Aids: If engine runs OK, check:

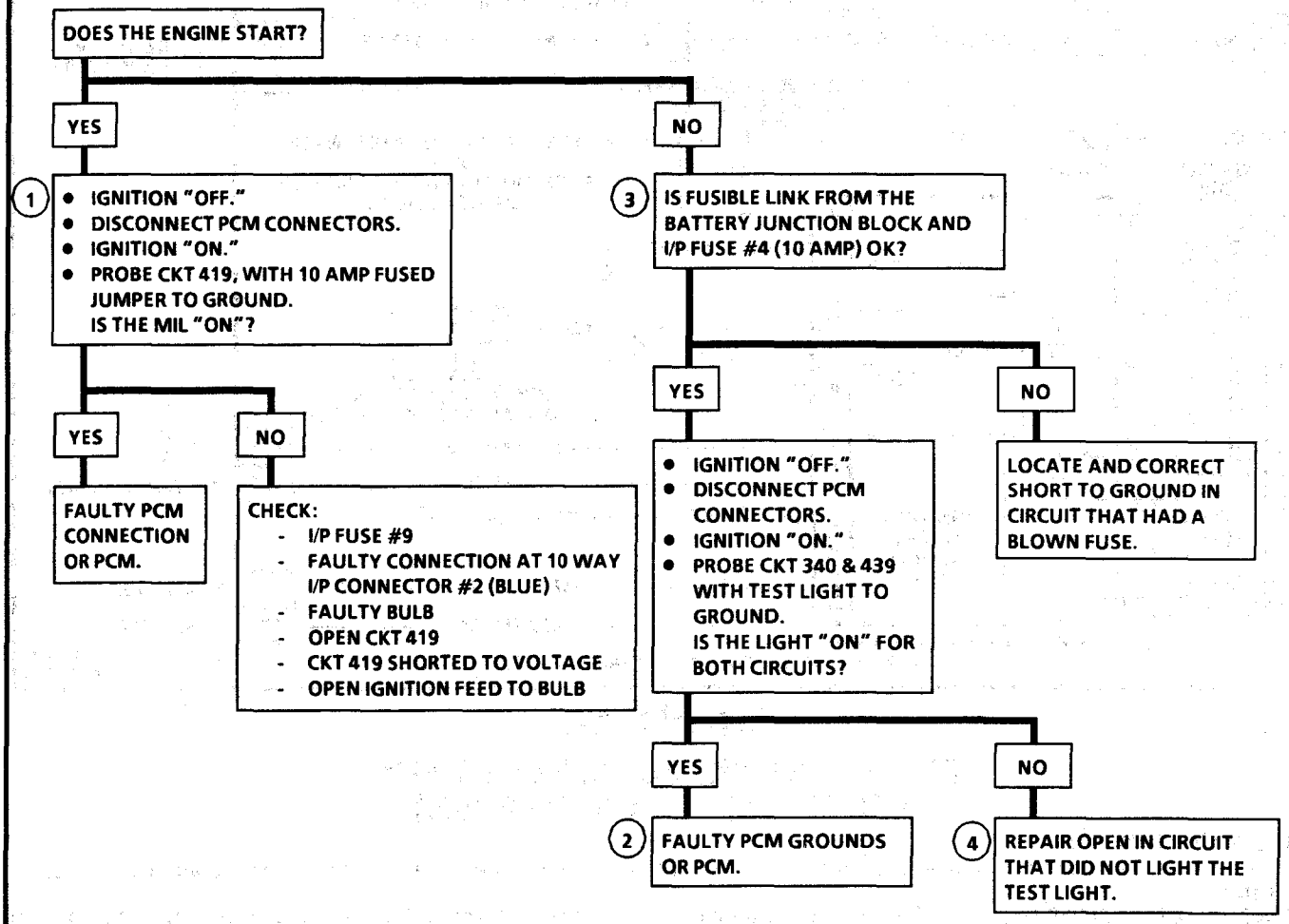
- Faulty light bulb.
- CKT 419 open.
- Open I/P fuse #9.

If engine cranks but will not run, check:

- Continuous battery - fusible link open.
- I/P fuse #4 PCM/BAT open.
- I/P fuse #5 PCM/IGN open.
- Battery CKT 340 to PCM open.
- Ignition CKT 439 to PCM open.
- Poor connection to PCM.
- Faulty PCM ground circuit(s).
- PASS-Key®II circuit problem.

CHART A-1

NO MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON" 3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS-15599-6E

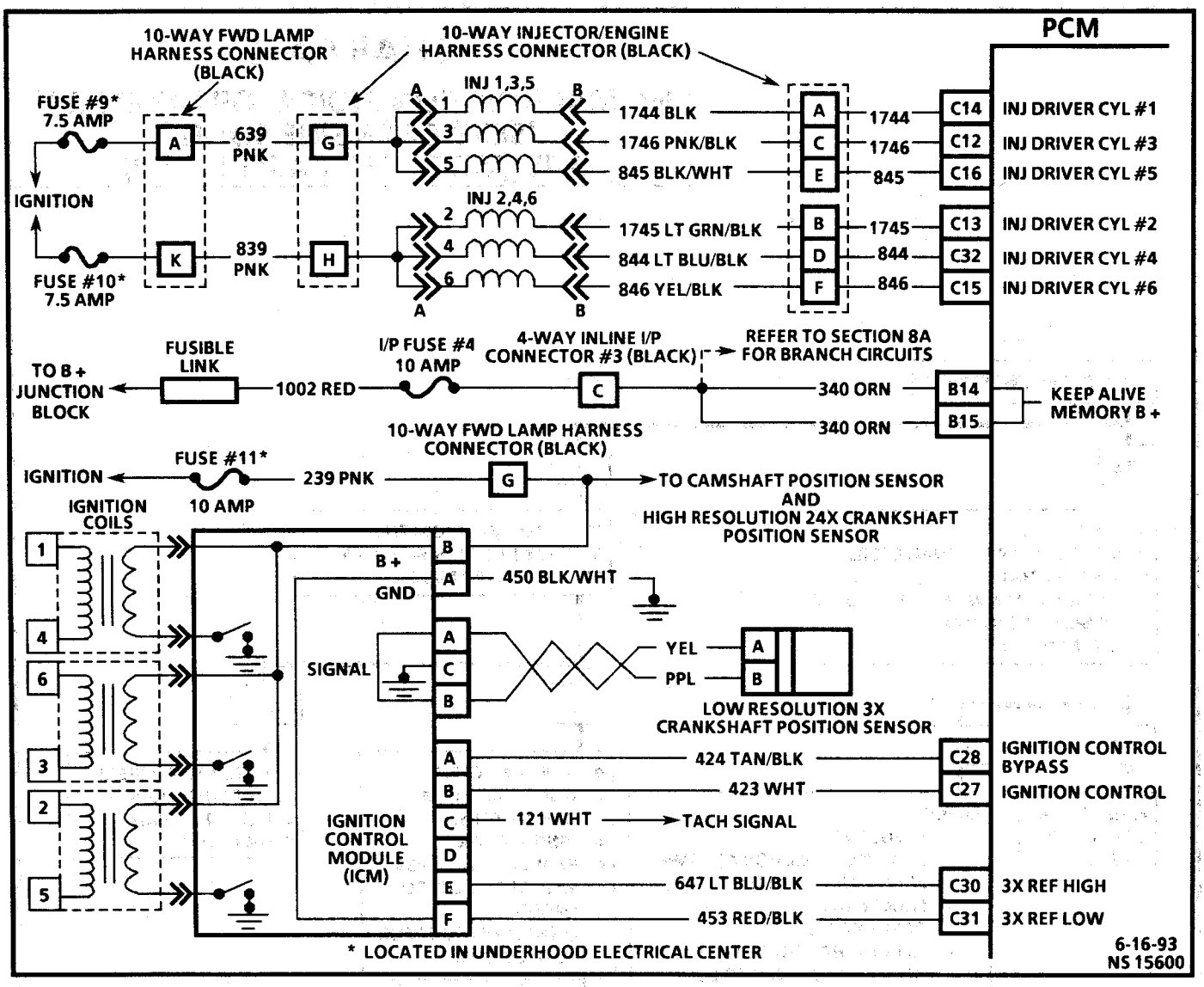


CHART A-3

ENGINE CRANKS BUT WILL NOT RUN
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

This chart assumes that battery condition and engine cranking speed are OK, and there is adequate fuel in the tank.

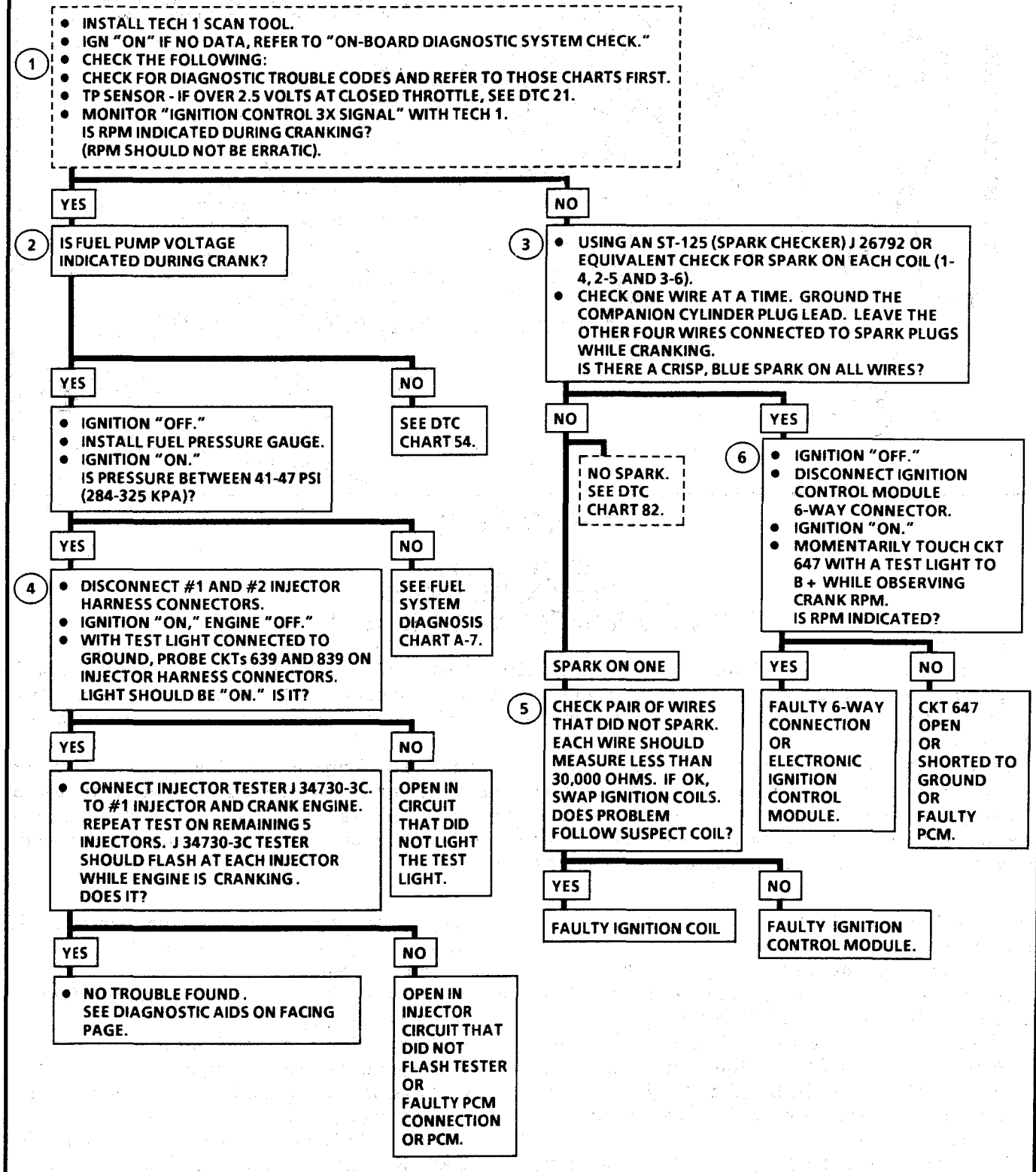
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. A MIL (Service Engine Soon) "ON" is a basic test to determine if there is a 12 volt supply and ignition 12 volts to the PCM. No data may be due to a PCM problem. The engine will not start without reference pulses and therefore the Tech 1 scan tool should display RPM (reference) during crank. If RPM is erratic it is possible that the reluctor wheel on the crankshaft is damaged. See SECTION 6A for base engine information.
2. For the first two seconds with ignition "ON," or whenever reference pulses are being received, the scan tool should indicate fuel pump circuit voltage (8 to 12 volts).
3. Because the electronic ignition control system uses two plugs and wires to complete the circuit of each coil, the companion spark plug lead should be connected to a good ground. If RPM was indicated during crank, the electronic ignition control module is receiving a crank signal, but no spark at this test indicates the electronic ignition control module is not triggering the coils.
4. This test will determine if there is B+ at the injectors. The injectors are powered by 2 fuses located in the underhood electrical center.
5. This test will determine if the ignition control module is not triggering the problem coil or if the tested coil is at fault. This test could also be performed by using another known good coil.
6. This test will determine if the ignition control module is not generating the reference pulse or if the wiring or PCM are at fault. By touching and removing a test light to B+ on CKT 647, a reference pulse should be generated. If RPM is indicated, the PCM and wiring are OK.

Diagnostic Aids: A damaged reluctor wheel may cause a crank but will not run. See SECTION 6A for base engine diagnosis.

CHART A-3

ENGINE CRANKS BUT WILL NOT RUN 3.4L (VIN S) "F" CARLINE (SFI)



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

7-3-93
NS 16197

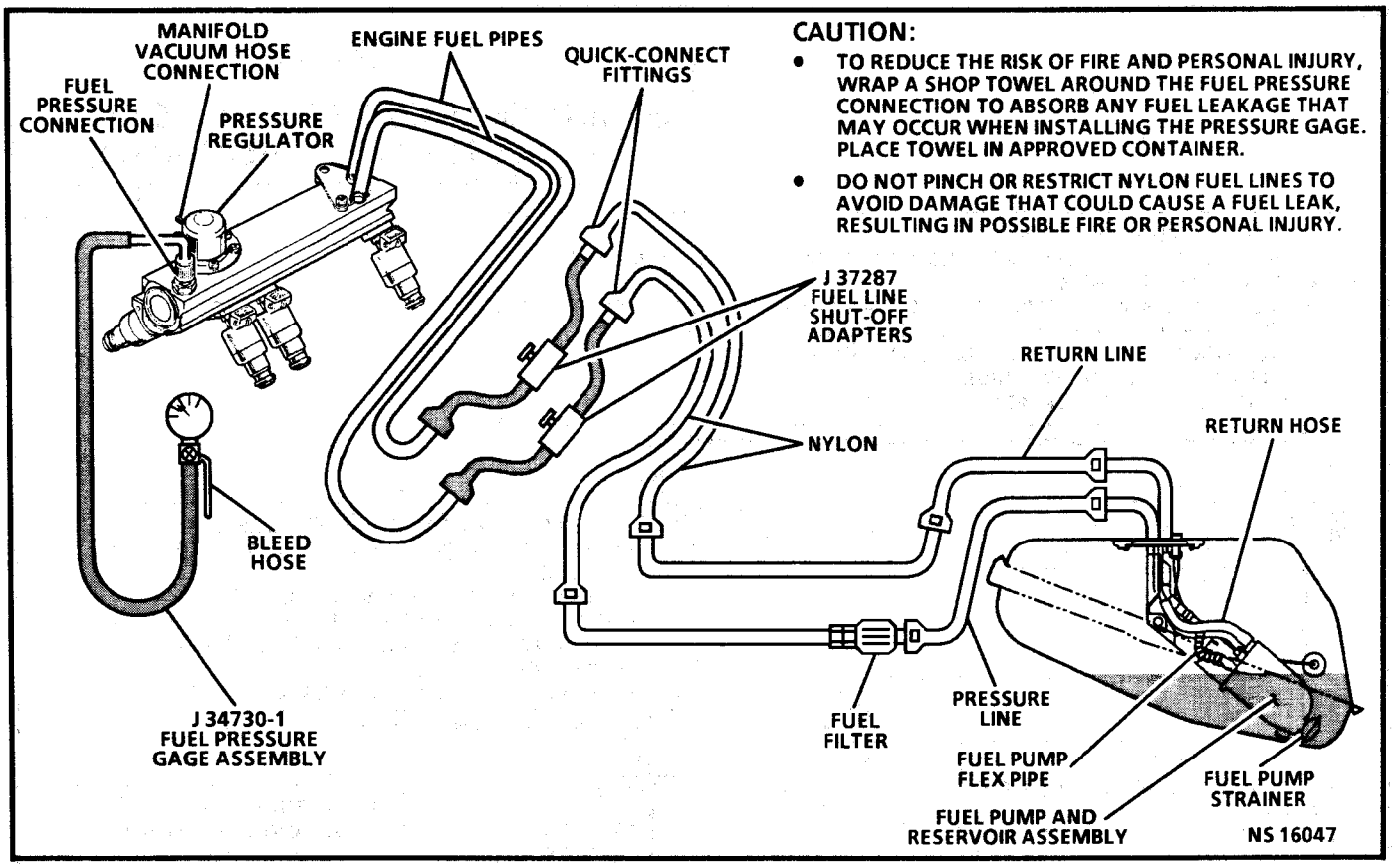


CHART A-7

(Page 1 of 3)
FUEL SYSTEM DIAGNOSIS
3.4L (VIN S) "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 injector. 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 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 a 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 valve.
   - 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).

CHART A-7

(Page 1 of 3)

FUEL SYSTEM DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

1

- INSTALL FUEL PRESSURE GAGE AS SHOWN ON FACING PAGE.
- IGNITION "OFF" FOR 10 SECONDS. A/C "OFF."
- IGNITION "ON." FUEL PUMP WILL RUN FOR ABOUT 2 SECONDS. IT MAY BE NECESSARY TO CYCLE THE IGNITION "ON" MORE THAN ONCE TO OBTAIN MAXIMUM PRESSURE.
- NOTE FUEL PRESSURE WITH PUMP RUNNING, PRESSURE SHOULD BE 284-325 kPa (41-47 psi). WHEN PUMP STOPS, PRESSURE MAY VARY SLIGHTLY THEN SHOULD HOLD STEADY. IS PRESSURE CORRECT AND DOES IT HOLD?

YES

IF FUEL PRESSURE IS WITHIN NORMAL RANGE BUT IS SUSPECTED OF DROPPING OFF DURING ACCELERATION, CRUISE OR HARD CORNERING, SEE CHART A-7 (2 OF 3).

2

- START ENGINE, ALLOW IT TO IDLE AT NORMAL OPERATING TEMPERATURE.
- FUEL PRESSURE NOTED IN STEP (1) SHOULD DROP APPROXIMATELY 21-69 kPa (3-10 psi). DOES IT?

YES

NO TROUBLE FOUND, REVIEW "SYMPTOMS," SECTION "B".

NO

- DISCONNECT VACUUM HOSE FROM PRESSURE REGULATOR ASSEMBLY.
- WITH ENGINE IDLING, APPLY 12-14 INCHES OF VACUUM TO PRESSURE REGULATOR. FUEL PRESSURE NOTED IN STEP (1) SHOULD DROP APPROXIMATELY 21-69 kPa (3-10 psi). DOES IT?

YES

LOCATE AND REPAIR LOSS OF VACUUM TO PRESSURE REGULATOR.

NO

PRESSURE REGULATOR IS FAULTY.

NO

FROM CHART A-3

3

FUEL PRESSURE WITHIN SPEC., BUT DOES NOT HOLD.

- INSTALL J 37287 FUEL LINE SHUT-OFF ADAPTORS, REFER TO PAGES 3 OF 3 AND FACING PAGE ILLUSTRATION.
- MAKE SURE VALVES ARE OPEN.
- IGNITION "OFF."
- USING A 10 AMP FUSED JUMPER WIRE, CONNECT FUEL PUMP "TEST" CONNECTOR TO B + AND WAIT FOR PRESSURE TO BUILD.
- DISCONNECT JUMPER AND CLOSE VALVE IN FUEL PRESSURE LINE. PRESSURE SHOULD HOLD. DOES IT?

NO

- OPEN VALVE IN FUEL PRESSURE LINE.
- RECONNECT PUMP "TEST" JUMPER AND WAIT FOR PRESSURE TO BUILD.
- DISCONNECT JUMPER AND CLOSE VALVE IN FUEL RETURN LINE. PRESSURE SHOULD HOLD. DOES IT?

NO

4

LOCATE AND CORRECT LEAKING INJECTOR(S).

YES

PRESSURE REGULATOR IS FAULTY.

YES

CHECK FOR:

- LEAKING FUEL PUMP FLEX PIPE.

IF OK

FUEL PUMP IS FAULTY. (LEAKING CHECK BALL INSIDE PUMP.)

FUEL PRESSURE OUT OF SPEC.

SEE CHART A-7 (2 OF 3)

NO FUEL PRESSURE

USE DTC 54 CHART TO DIAGNOSE FUEL PUMP ELECTRICAL CIRCUIT.

IF OK

CHECK FOR:

- PLUGGED IN-LINE FILTER.
- RESTRICTED FUEL PRESSURE LINE.
- PLUGGED FUEL PUMP STRAINER.
- LEAKING FUEL PUMP FLEX PIPE.

IF OK

FUEL PUMP IS FAULTY.

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

6-17-93
NS 16048-6E

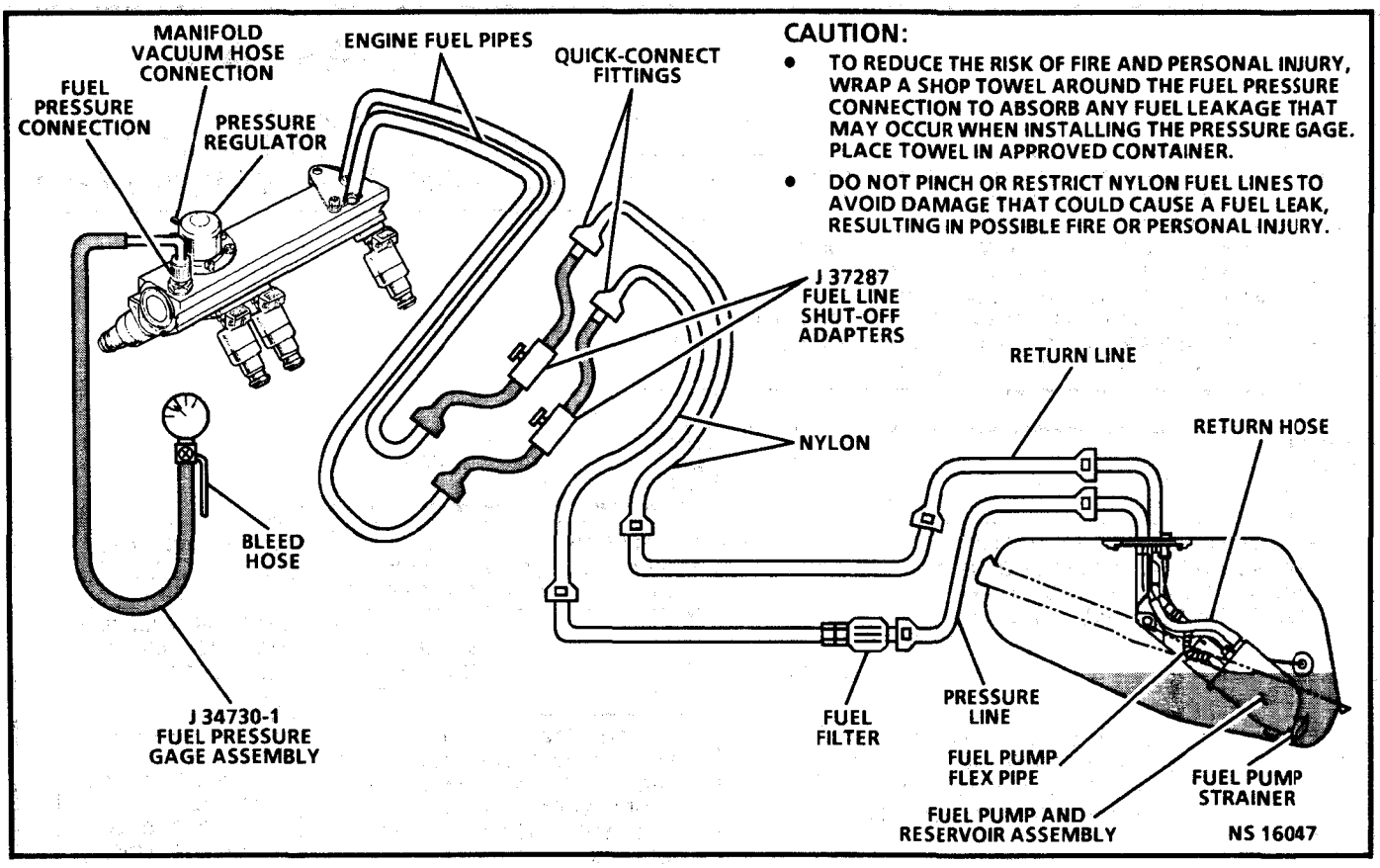


CHART A-7

(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.

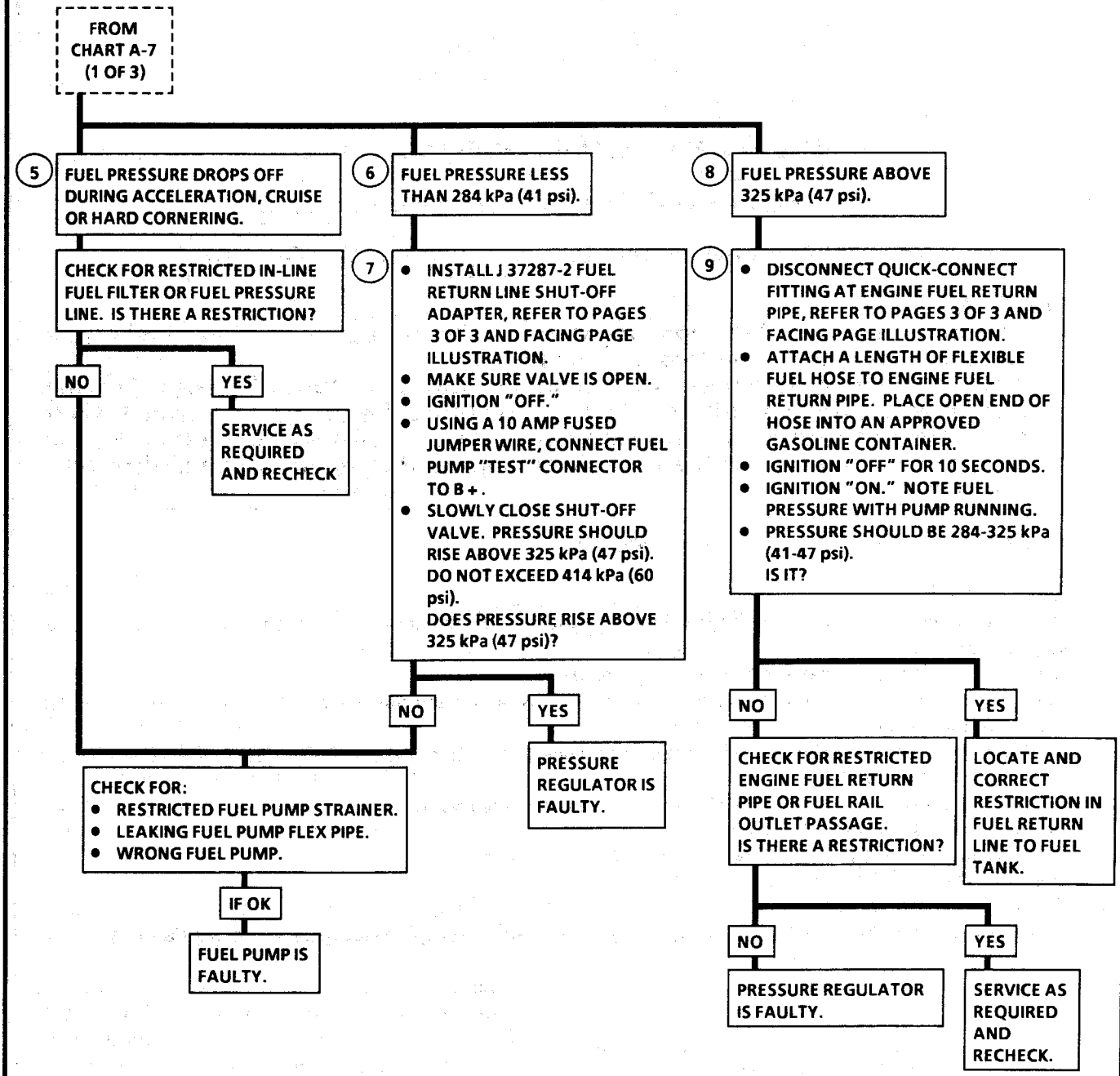
NOTICE: Do not allow pressure to exceed 414 kPa (60 psi) as damage to the regulator may result.

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.

CHART A-7

(Page 2 of 3)

FUEL SYSTEM DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)



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

6-17-93
NS 16049-6E

CHART A-7

(Page 3 of 3)
FUEL SYSTEM DIAGNOSIS
3.4L (VIN S) "F" CARLINE (SFI)

FUEL SYSTEM PRESSURE RELIEF PROCEDURE

Engines With Fuel Pressure Connection

(Must Be Performed Before Disconnecting Fuel Line Fittings)

CAUTION:

- **To reduce the risk of fire and personal injury, it is necessary to relieve fuel system pressure before disconnecting fuel line fittings.**
- **After relieving system pressure, a small amount of fuel may be released when disconnecting fuel line fittings. In order to reduce the chance of personal injury, cover fuel line fittings with a shop towel before disconnecting, to catch any fuel that may leak out. Place the towel in an approved container when disconnect is completed.**

Tool Required: J 34730-1 Fuel Pressure Gage

1. Ignition "OFF."
2. Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.
3. Loosen fuel filler cap to relieve tank vapor pressure.
4. Connect gage J 34730-1 to fuel pressure connection. Wrap a shop towel around fitting while connecting gage to avoid spillage.
5. Install bleed hose into an approved container and open valve to bleed system pressure. Fuel line fittings are now safe for servicing.
6. Drain any fuel remaining in gage into an approved gasoline container.
7. Perform service required.
8. Tighten fuel filler cap.
9. Ignition "OFF."
10. Connect negative battery cable.
11. Cycle ignition "ON" and "OFF" twice, waiting ten seconds between cycles, then check for fuel leaks.

CHART A-7

(Page 3 of 3)

FUEL SYSTEM DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

SERVICING QUICK-CONNECT FITTINGS

Important

- In order to install fuel system diagnostic equipment on vehicles equipped with plastic quick-connect fittings, fuel line separator tools must be used to disconnect the fittings. Using the separator tools to release the fittings will cause the plastic retainer to remain inside the female connector allowing diagnostic equipment to be connected.

  Tools required:
  J 37088-A tool set, fuel line quick-connect separator;
  J 39504 tool set, fuel line quick-connect separator (restricted access).

Remove or Disconnect

1. Relieve fuel system pressure (see "Fuel System Pressure Relief").
2. If equipped, slide dust cover back to access quick-connect fitting.
3. Grasp both sides of fitting. Twist female connector 1/4 turn in each direction to loosen any dirt within fitting.

CAUTION: Safety glasses must be worn when using compressed air, as flying dirt particles may cause eye injury.

4. Using compressed air, blow dirt out of fitting.
5. Choose correct tool from J 37088-A or J 39504 tool set for size of fitting. Insert tool into female connector, then push/pull inward to release locking tabs.
6. Pull connection apart.

Clean and Inspect

NOTICE: If it is necessary to remove rust or burrs from fuel pipe, use emery cloth in a radial motion with the pipe end to prevent damage to O-ring sealing surface.

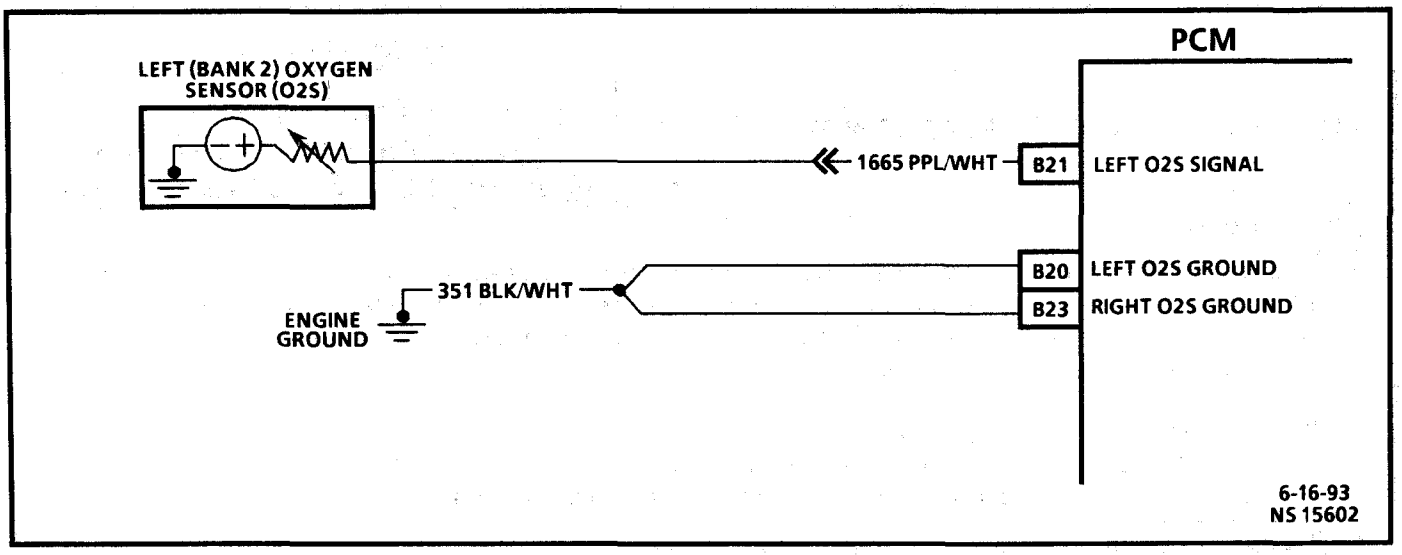
- Using a clean shop towel, wipe off male pipe end.
- Inspect both ends of fitting for dirt and burrs. Clean or replace components/assemblies as required.

Install or Connect

CAUTION: To Reduce the Risk of Fire and Personal Injury:

- **Before connecting fitting, always apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shut-off adapter. This will ensure proper reconnection and prevent a possible fuel leak. (During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.)**

1. Apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shut-off adapter.
2. Push both sides of fitting together to cause the retaining tabs/fingers to snap into place.
3. Once installed, pull on both sides of fitting to make sure connection is secure.
4. If equipped, reposition dust cover over quick-connect fitting.



DTC 13

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM supplies a voltage of about .45 volt between terminals "B20" and "B21". (If measured with a 10 megohm digital voltmeter, this may read as low as .35 volt.) The Oxygen Sensor (O2S) varies the voltage within a range of about 1 volt. If the left (Bank 2) exhaust is rich, the O2S will display close to 1000 millivolts and when the exhaust is lean the O2S will display close to 100 millivolts.

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open O2S circuit or cold O2S causes "Open Loop" operation.

DTC 13 Will Set When: The engine is in "Closed Loop," ECT is greater than 85°C (185°F), O2S voltage is between 350 and 550 millivolts, throttle angle is greater than 3% with all conditions met for 30 seconds.

Action Taken (PCM will default to): The PCM will default to "Open Loop" operation and the MIL will become illuminated.

DTC 13 Will Clear When: A current DTC 13 will clear when the O2S voltage begins to vary outside of the 350 to 550 millivolt window. A history DTC 13 will clear after 50 ignition key cycles without a current DTC 13 being stored.

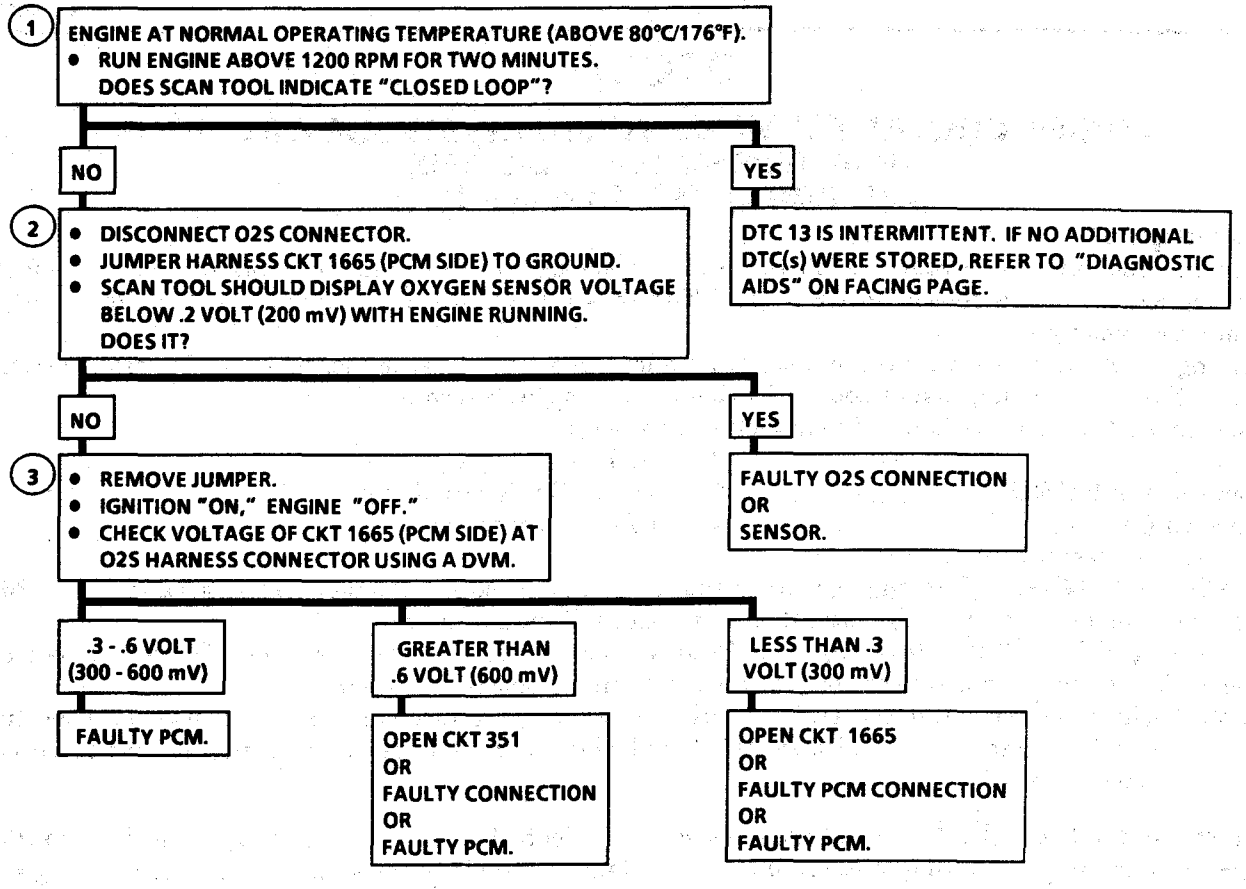
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the conditions for a DTC 13 exist, the system will not go "Closed Loop."
2. This will determine if the sensor is at fault, or the wiring or PCM is the cause of the DTC 13.
3. In doing this test use only a high impedance digital volt ohmmeter. This test checks the continuity of CKT 1665 and CKT 351 because if CKT 351 is open, the PCM voltage on CKT 1665 will be over .6 volt (600 mV).

Diagnostic Aids: Normal Tech 1 scan voltage varies between 100 mV to 999 mV (.1 and 1.0 volt) while in "Closed Loop." DTC 13 sets if voltage remains between .35 and .55 volt, but the system will go "Open Loop" in about 15 seconds. Refer to "Intermittents," in "Symptoms," Section "6E3-B".

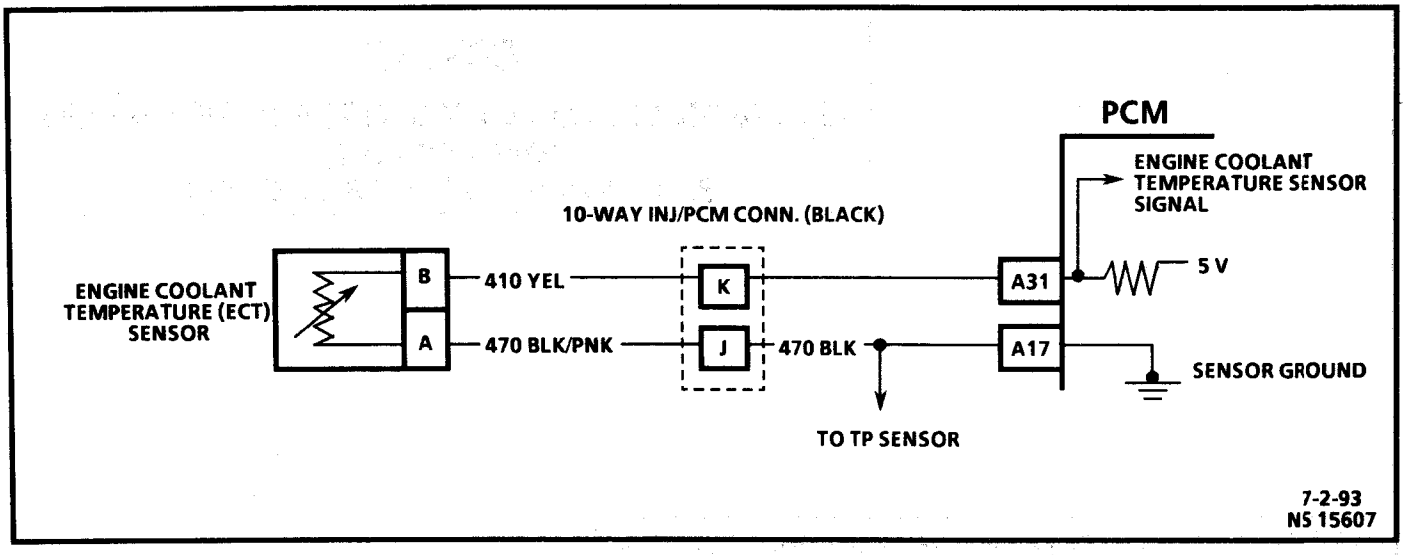
DTC 13

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15603



DTC 14

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Engine Coolant Temperature (ECT) sensor is a thermistor which varies the signal voltage at the PCM. The PCM applies 5 volts to sensor on CKT 410. The sensor's resistance is inversely proportional to the temperature it is sensing.

As the engine warms, the sensor resistance becomes less, and the voltage drops. At normal engine operating temperature, the voltage will measure about 1.5 to 2.0 volts at the PCM terminal "A31".

Engine coolant temperature is one of the inputs used to control:

- Fuel delivery.
- Ignition Control (IC).
- Idle Air Control (IAC).
- Torque Converter Clutch (TCC).
- EVAP canister purge.
- Exhaust Gas Recirculation (EGR).
- Cooling fan operation.

DTC 14 Will Set When: The signal voltage indicates engine coolant temperature is greater than 135°C (275°F). Engine must be running for greater than 20 seconds before this test will begin.

Action Taken (PCM will default to): The PCM will use a default value of 90°C (194°F) for fuel delivery calculations. The cooling fans will be enabled and the MIL will become illuminated.

DTC 14 Will Clear When: Current DTC 14 will clear when the failure is no longer detected (temperature falls below 135°C (275°F) threshold). A history DTC 14 will clear after 50 consecutive ignition key cycles without a current DTC 14 being stored.

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

1. This check is to determine if a DTC 14 is intermittent or a current malfunction.
2. This test will determine if CKT 410 is shorted to ground which will cause the conditions for DTC 14.

Diagnostic Aids: Check harness routing for a potential short to ground in CKT 410. This circuit is routed from the PCM to the 10-way INJ/PCM connector, and then to the Engine Coolant Temperature (ECT) sensor.

Tech 1 scan tool displays engine coolant temperature in degrees centigrade. After the engine is started, the temperature should rise steadily to about 90°C (194°F) then stabilize when the thermostat opens. Refer to "Intermittents" in "Symptoms," Section "6E3-B".

Verify that engine is not overheating and has not been subjected to conditions which could create an overheating condition (i.e. overload, trailer towing, hilly terrain, heavy stop and go traffic, etc.). The "Temperature to Resistance Value" scale at the right may be used to test the engine coolant temperature sensor at various temperature levels to evaluate the possibility of a "shifted" (mis-scaled) sensor. A "shifted" sensor could result in poor driveability complaints.

DTC 14

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

1. DOES SCAN TOOL DISPLAY ENGINE COOLANT TEMPERATURE OF 130°C (266°F) OR HIGHER?
   - NO → DTC 14 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES →
2. • DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR.
   SCAN TOOL SHOULD DISPLAY ENGINE COOLANT TEMPERATURE BELOW -30°C (-22°F).
   DOES IT?
   - NO → CKT 410 SHORTED TO GROUND
     OR
     CKT 410 SHORTED TO SENSOR GROUND CIRCUIT
     OR
     FAULTY PCM.
   - YES → REPLACE ENGINE COOLANT TEMPERATURE SENSOR.

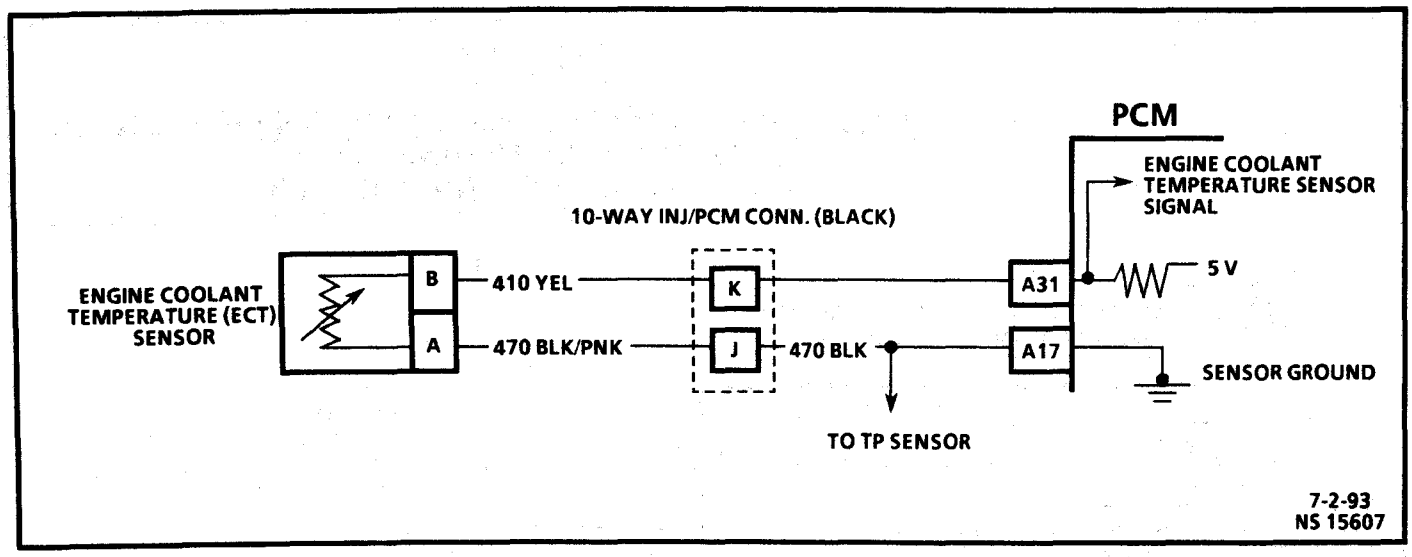
DIAGNOSTIC AID

ENGINE COOLANT TEMPERATURE SENSOR

TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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



DTC 15

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Engine Coolant Temperature (ECT) sensor is a thermistor which varies the signal voltage at the PCM. The PCM applies 5 volts to the sensor on CKT 410. The sensor's resistance is inversely proportional to the temperature it is sensing.

As the engine warms, the sensor resistance becomes less, and the voltage drops. At normal engine operating temperature the voltage will measure about 1.5 to 2.0 volts at the PCM terminal "A31".

Coolant temperature is one of the inputs used to control:

- Fuel delivery.
- Ignition Control (IC).
- Idle Air Control (IAC).
- Torque Converter Clutch (TCC).
- EVAP canister purge.
- Exhaust Gas Recirculation (EGR).
- Cooling fan operation.

DTC 15 Will Set When: A DTC 15 will set when the ECT sensor indicates an engine coolant temperature less than -38°C (-37°F).

Action Taken (PCM will default to): The PCM will use a default value of 90°C (194°F) for fuel delivery calculations. The cooling fans will be enabled and the MIL will become illuminated.

DTC 15 Will Clear When: A current DTC 15 will clear when the low temperature failure is no longer detected [temperature rises above -38°C (-37°F) threshold]. A history DTC 15 will clear after 50 consecutive ignition key cycles without a current DTC 15 being stored.

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

1. This is to verify that the temperature fault is not intermittent.
2. This test simulates a DTC 14. If the PCM recognizes the low signal voltage (high temperature), and the Tech 1 scan tool reads 130°C (266°F), the PCM and wiring are OK.
3. This test will determine if CKT 410 is open. There should be 5 volts present at sensor connector if measured with a DVM.

Diagnostic Aids: Check harness routing for a potential open in CKT 410. This circuit is routed from the PCM through the 10-way INJ/PCM connector and then to the engine coolant temperature sensor.

A Tech 1 scan tool reads engine temperature in degrees centigrade. After the engine is started, the temperature should rise steadily to about 95°C (203°F) then stabilize when the thermostat opens. CKT 410 is routed from the PCM to a mini harness connector, and then to the Engine Coolant Temperature (ECT) sensor.

A faulty connection, or an open in CKT 410 or 470 will result in a DTC 15.

DTCs 15 and 21 stored at the same time could be the result of an open CKT 470 which would also turn the temperature warning indicator "ON."

The "Temperature to Resistance Value" scale at the right may be used to test the engine coolant temperature sensor at various temperature levels to evaluate the possibility of a "shifted" (mis-scaled) sensor. A "shifted" sensor could result in poor driveability complaints.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 15

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

1. DOES TECH 1 SCAN TOOL DISPLAY ENGINE COOLANT TEMPERATURE OF -38°C (-37°F) OR LESS?
   - NO → DTC 15 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES →
2. • DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR.
   • JUMPER HARNESS TERMINALS TOGETHER.
   • TECH 1 SCAN TOOL SHOULD DISPLAY 130°C (266°F) OR MORE. DOES IT?
   - YES → FAULTY CONNECTION OR ENGINE COOLANT TEMPERATURE SENSOR.
   - NO →
3. • JUMPER CKT 410 TO GROUND.
   • TECH 1 SCAN TOOL SHOULD DISPLAY OVER 130°C (266°F). DOES IT?
   - NO → OPEN CKT 410, FAULTY CONNECTION AT PCM, OR FAULTY PCM.
   - YES → OPEN ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT, FAULTY CONNECTION OR FAULTY PCM.

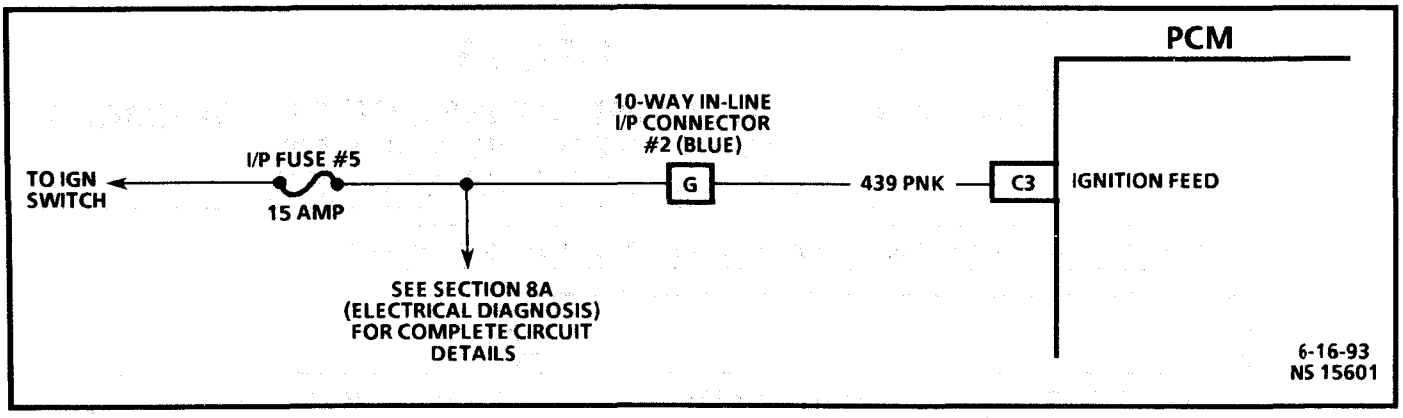
DIAGNOSTIC AID

ENGINE COOLANT TEMPERATURE SENSOR
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

3-10-93
NS 15052



DTC 16

SYSTEM LOW VOLTAGE
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM will perform a test of the ignition voltage applied to pin "C3" of the PCM. A comparison is done between the voltage applied to the input and a calibrated voltage value.

During the time a low voltage failure is present, all PCM outputs will become disabled. This may result in the additional setting of other seemingly unrelated DTCs.

DTC 16 Will Set When: The PCM detects 8 volts or less on the ignition feed CKT 439, engine speed is greater than 1000 RPM with both conditions met for 2 seconds.

Action Taken (PCM will default to): The MIL will become illuminated.

DTC 16 Will Clear When: A current DTC 16 will clear when ignition feed voltage is detected above 8 volts. A history DTC 16 will clear after 50 consecutive ignition key cycles without a current DTC 16 being stored.

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

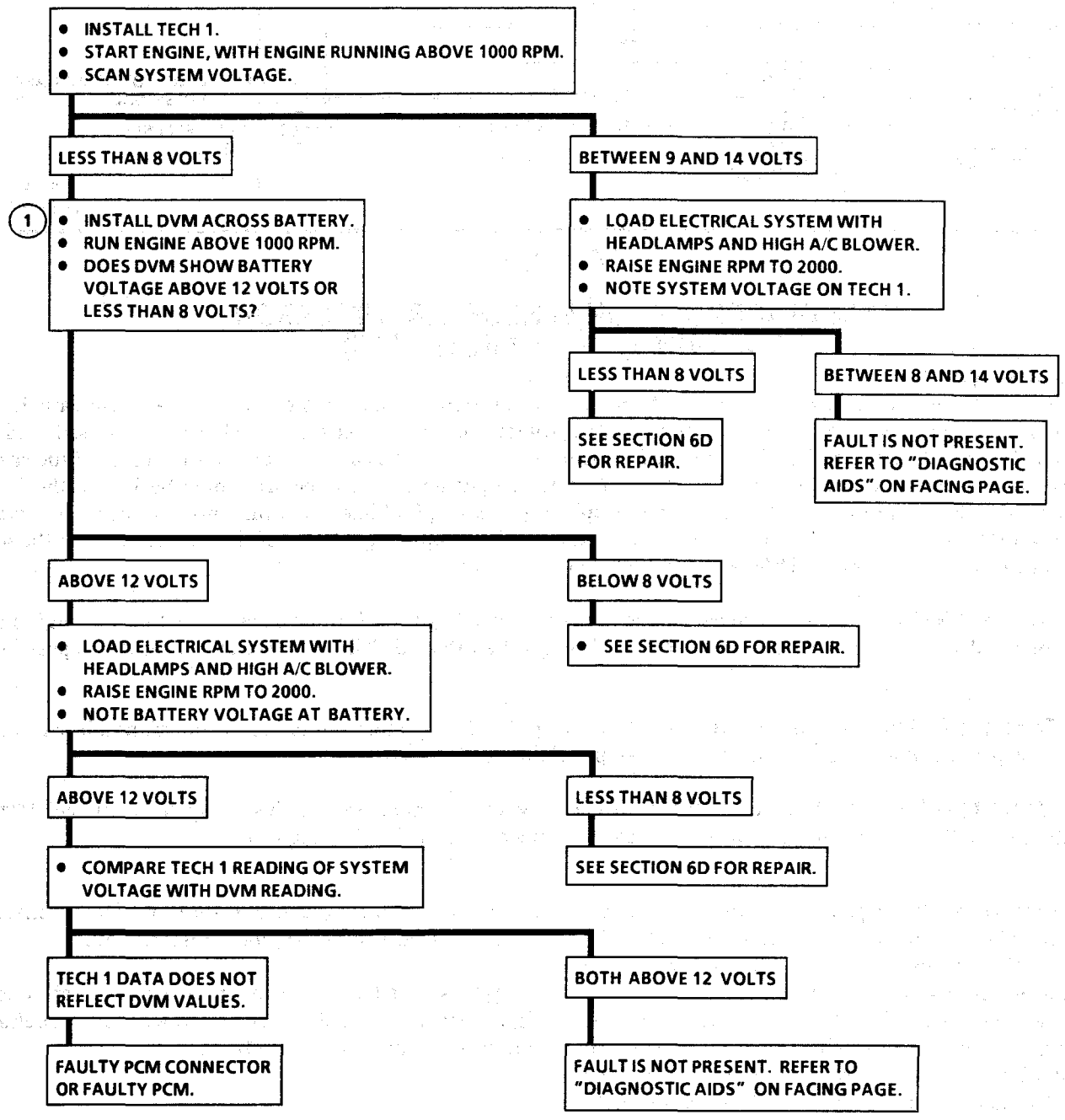
1. Test generator output as outlined in SECTION 6D3 to determine proper operation of the voltage regulator. Run engine at moderate speed and measure voltage across the battery. If less than 8 volts, repair generator as outlined in SECTION 6D3.

Diagnostic Aids: An intermittent may be caused by poor connections, chaffed insulation, a wire broken inside the insulation or poor PCM grounds.

- Intermittent test. Monitor "System Volts" display with a Tech 1 while moving related connectors. If the failure is induced, the display will abruptly change. This may help to isolate the location of the malfunction.

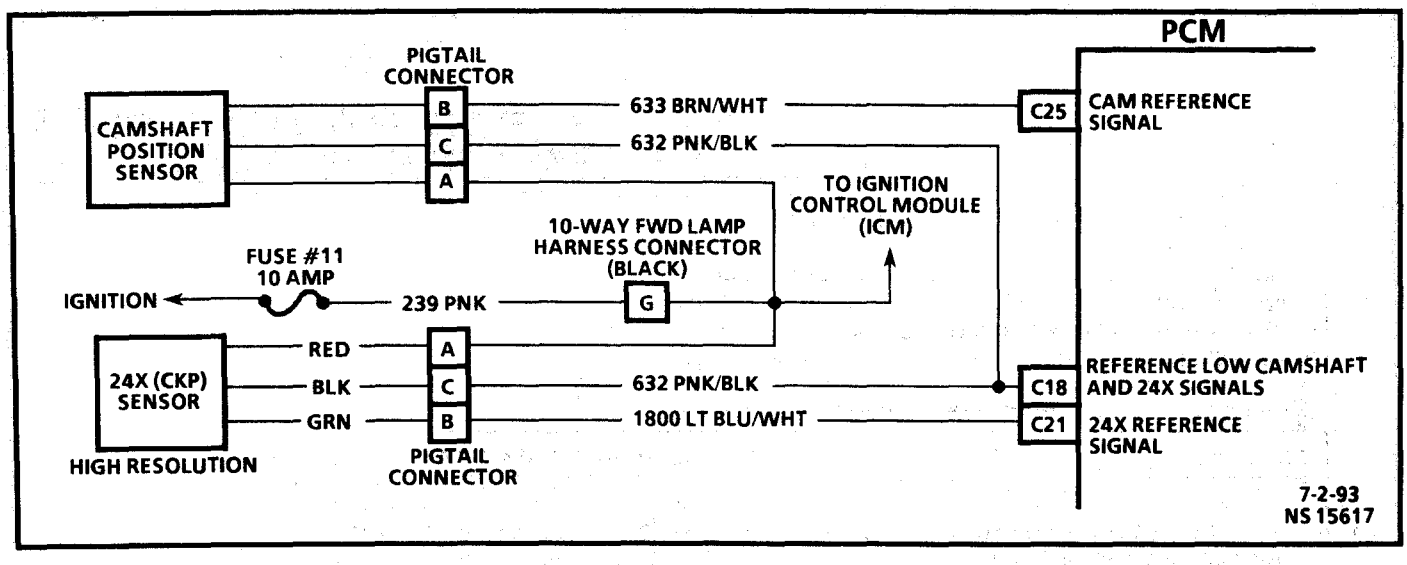
DTC 16

SYSTEM LOW VOLTAGE
3.4L (VIN S) "F" CARLINE (SFI)



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

3-8-93
NS 15043



DTC 17

CAMSHAFT POSITION SENSOR CIRCUIT ERROR 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The camshaft position sensor is a "Hall-effect" switch, located on the front of the engine. The camshaft position sensor sends a signal to the PCM when the #1 cylinder is on the intake stroke. This signal is used by the PCM to synchronize Sequential Fuel Injection (SFI) mode of operation with each intake valve opening. If the cam reference signal is not received by the PCM, the PCM will still pulse the fuel injectors sequentially, but the fuel injectors may not be in synch with each intake valve opening. That is, fuel injector timing may not be as accurate because the PCM does not know the exact time each intake valve is opening. A loss of this signal or extra (false) cam reference signals, above 500 RPM, will set a DTC 17.

DTC 17 Will Set When: Cam reference pulses are not detected by the PCM for 3 seconds while the engine is running, or CAM pulse is missing on the first pass through the internal PCM self test of the camshaft position sensor.

Action Taken (PCM will default to): The PCM will pulse the injectors sequentially though possibly not in the correct sequence. The malfunction indicator lamp will not be illuminated.

DTC 17 Will Clear When: A current DTC 17 will clear when the cam signal begins to toggle. A history DTC 17 will clear after 50 consecutive ignition key cycles without a current DTC 17 being stored.

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

1. The PCM performs a test for DTC 17 when the engine is running or during cranking.
2. By repeatedly "bumping" the starter, the camshaft timing mark and the camshaft position sensor will align with each other. At this point, the voltage from the sensor applied to the PCM should drop to near zero temporarily. This indicates that the camshaft position sensor is capable of sending a signal to the PCM.
3. Before replacing the camshaft position sensor, inspect the sensor for proper installation.

Diagnostic Aids: An intermittent cam reference signal can be caused by poor connections, cracked sensor or internal engine problem.

DTC 17

CAMSHAFT POSITION SENSOR CIRCUIT ERROR 3.4L (VIN S) "F" CARLINE (SFI)

1
- IF ENGINE CRANKS BUT WON'T RUN, USE CHART A-3.
- INSTALL TECH 1 SCAN TOOL.
- IGNITION "ON" ENGINE IDLING. TECH 1 SCAN TOOL SHOULD DISPLAY CAM SIGNAL PULSES CONSTANTLY CHANGING "0" TO "1". DOES IT?

NO
- IGNITION "OFF."
- DISCONNECT PCM HARNESS CONNECTOR "C".
- IGNITION "ON."
- PROBE PCM HARNESS PIN "C25" WITH A DVM TO GROUND (SET DVM TO DC VOLTAGE). DOES DVM DISPLAY APPROXIMATE SYSTEM VOLTAGE?

YES
DTC 17 IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES

2
- WITH KEY IN THE "ON" POSITION, CYCLE IGNITION TO CRANK POSITION MOMENTARILY SEVERAL TIMES WHILE OBSERVING DVM.
- VOLTAGE SHOULD TEMPORARILY DROP TO NEAR ZERO EACH TIME THE CAMSHAFT TIMING MARK ALIGNS WITH THE CAMSHAFT POSITION SENSOR. DOES IT?

NO
- IGNITION "OFF."
- RECONNECT PCM HARNESS CONNECTOR "C".
- DISCONNECT CAM SENSOR 3-WAY HARNESS.
- IGNITION "ON."
- PROBE TERMINAL "C" (PCM HARNESS SIDE) WITH A TEST LIGHT TO BATTERY VOLTAGE. IS TEST LIGHT "ON"?

YES

3
FAULTY HARNESS CONNECTION
OR
OPEN CAMSHAFT POSITION SENSOR GROUND WIRE
OR
FAULTY CAMSHAFT POSITION SENSOR.

NO
OPEN HARNESS GROUND CIRCUIT.

YES
FAULTY PCM CONNECTION
OR
FAULTY PCM.

NO
- IGNITION "OFF."
- DISCONNECT CAMSHAFT POSITION SENSOR PIGTAIL HARNESS CONNECTOR.
- IGNITION "ON."
- CONNECT DVM BETWEEN TERMINAL "A" (PCM HARNESS SIDE) AND GROUND. DOES DVM DISPLAY APPROXIMATE BATTERY VOLTAGE?

YES
- WITH A FUSED JUMPER, JUMP CAM SENSOR PIGTAIL TERMINAL "A" TO BATTERY VOLTAGE.
- PROBE TERMINAL "B" WITH DVM TO GROUND. DOES DVM DISPLAY APPROXIMATE BATTERY VOLTAGE?

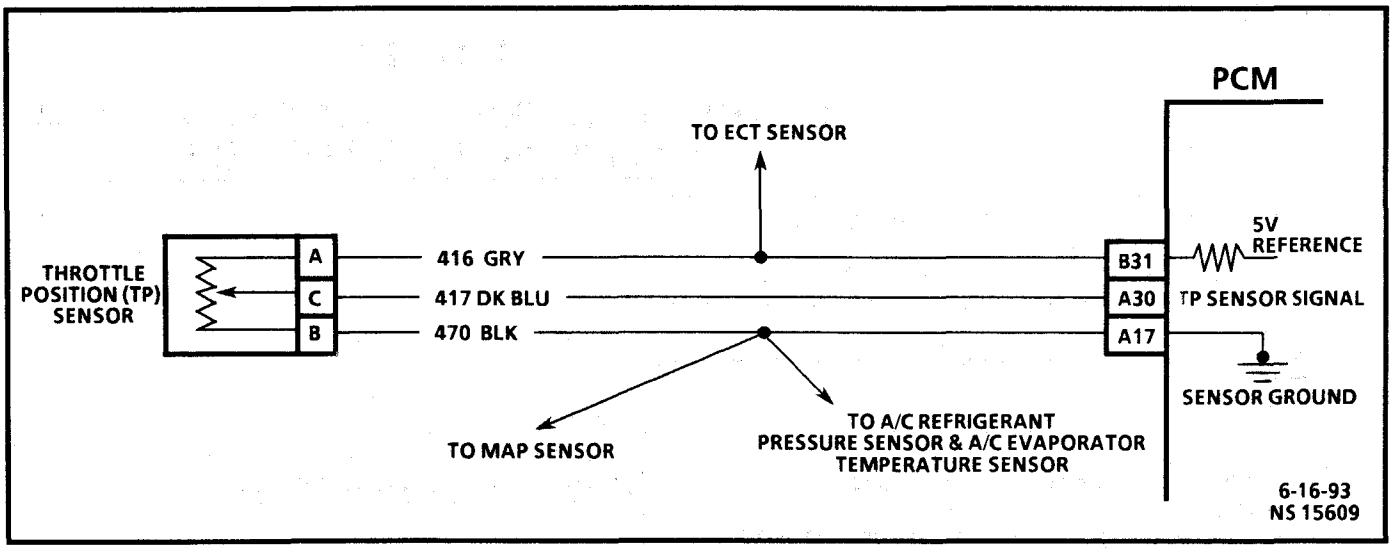
NO
OPEN OR SHORTED CAMSHAFT POSITION SENSOR IGNITION FEED WIRE TO SENSOR
OR
OPEN OR SHORTED CAMSHAFT POSITION SENSOR PIGTAIL SIGNAL WIRE FROM SENSOR
OR
FAULTY CAMSHAFT POSITION SENSOR.

NO
FAULTY HARNESS IGNITION FEED CIRCUIT.

YES
FAULTY CAMSHAFT PIGTAIL CONNECTION
OR
FAULTY PCM CONNECTION
OR
OPEN CAMSHAFT POSITION SENSOR SIGNAL WIRE TO PCM.

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

3-9-93
NS 15255



DTC 21

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Throttle Position (TP) sensor provides a voltage signal to the PCM that increases as the throttle blade angle increases. This signal voltage will vary from approximately .5 volt at idle to 4.8 volts at Wide Open Throttle (WOT). The TP sensor is one of the most important inputs to the PCM for governing fuel control of the engine.

DTC 21 Will Set When: No DTC 33 or DTC 34, TP sensor voltage is greater than 3.8 volts, engine speed is above 600 RPM, both conditions met for 10 seconds under steady throttle, road load conditions, or with throttle closed, the TP sensor should read less than .98 volt. If it doesn't, make sure cruise control and throttle cables are not being held open.

Action Taken (PCM will default to): The PCM will determine fuel and air calculations using calibrated values from a default table. The transmission will have maximum line pressure, no TCC and no 4th gear in hot mode. The MIL will become illuminated.

DTC 21 Will Clear When: A current DTC 21 will clear when a high signal voltage above the calibrated threshold is no longer detected. A history DTC 21 will clear after 50 consecutive ignition key cycles without a current DTC 21 being stored.

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

1. With throttle closed, the TP sensor should read less than .98 volt. If it doesn't, make sure cruise control and throttle cables are not being held open.
2. With the TP sensor disconnected, the TP sensor voltage should go low, if the PCM and wiring are OK.
3. Probing CKT 470 with a test light checks the 5 volt return circuit. A faulty sensor ground circuit will cause a DTC 21. DTC 33, 66 or 71 may also be set.

Diagnostic Aids: A Tech 1 scan tool reads throttle position in volts. Voltage should increase at a steady rate as throttle is moved toward WOT.

Also some scan tools will read: throttle angle 0% = closed throttle, 100% = WOT.

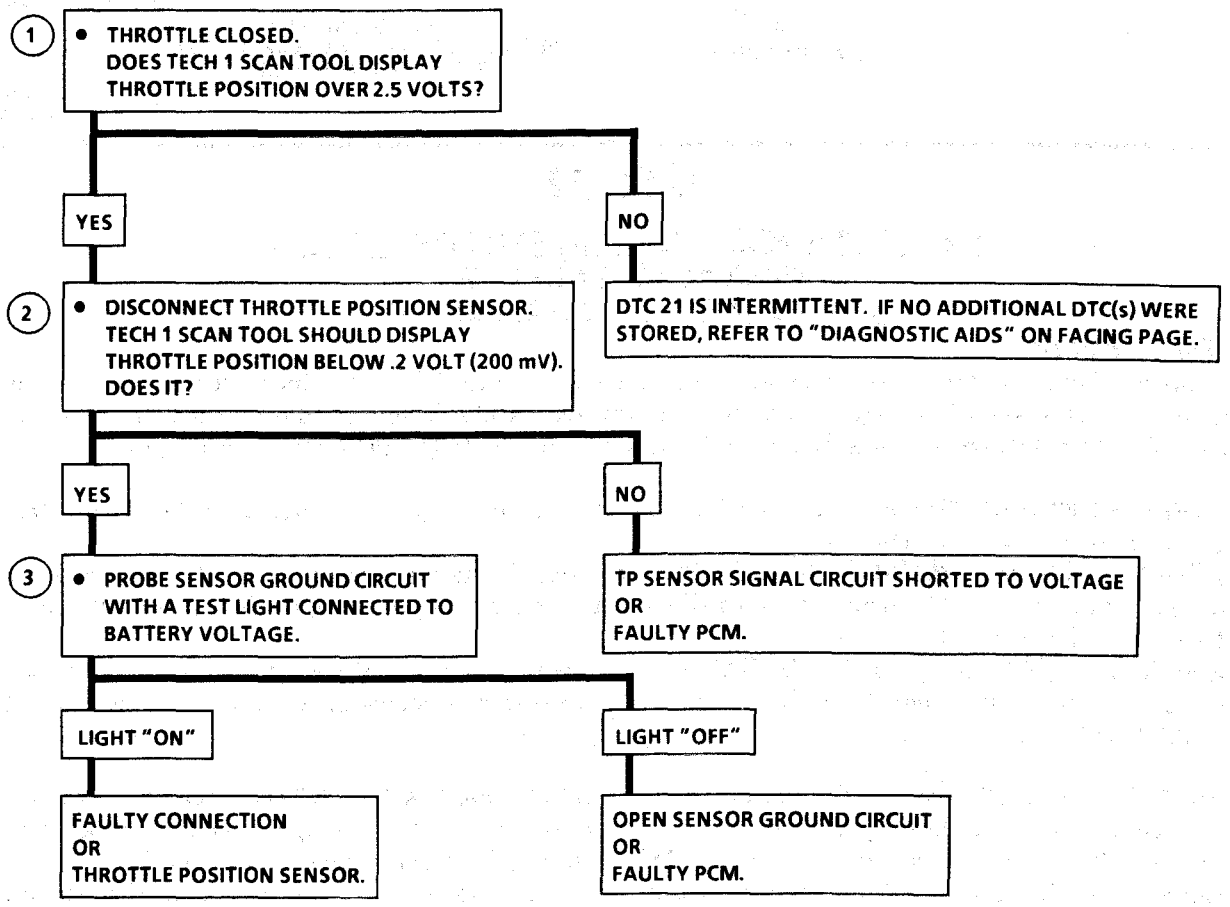
An open in CKT 470 will result in a DTC 21.

Scan TP sensor while depressing accelerator pedal with engine stopped and ignition "ON." Display should vary from about .5 volt when throttle was closed, to about 4.8 volts when throttle is held at Wide Open Throttle (WOT) position.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

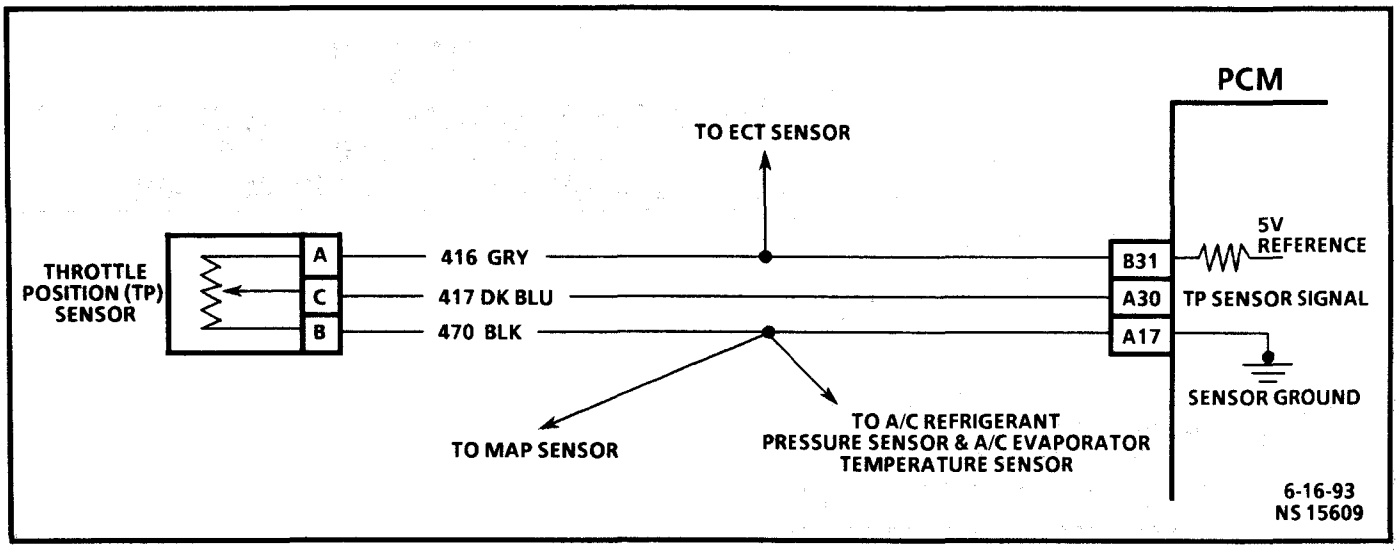
DTC 21

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-4-93
PS 18379



DTC 22

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Throttle Position (TP) sensor provides a voltage signal to the PCM that increases as the throttle blade angle increases. This signal voltage will vary from approximately .5 volt at idle to 4.8 volts at Wide Open Throttle (WOT). The TP sensor is one of the most important inputs to the PCM for governing fuel control of the engine.

DTC 22 Will Set When: TP sensor signal is less than .2 volt with engine running, and RPM greater than 400. Condition must be met for 3 seconds.

Action Taken (PCM will default to): The PCM will determine fuel and air calculations using calibrated values from a default table. The transmission will have maximum line pressure, no TCC and no 4th gear in hot mode. The MIL will become illuminated.

DTC 22 Will Clear When: A current DTC 22 will clear when a low signal voltage below the calibrated DTC 22 threshold is no longer detected. A history DTC 22 will clear after 50 consecutive ignition key cycles without a current DTC 22 being stored.

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

1. Simulates DTC 21 (high voltage): If the PCM recognizes the high signal voltage, the PCM and wiring are OK.
2. TP sensor check: The TP sensor has an auto zeroing feature. If the voltage reading is within the range of 0.29 to 0.98 volt, the PCM will use that value as closed throttle. If the voltage reading is out of the auto zero range on an existing or replacement TP sensor, check for cruise control and throttle cables for being held open.
3. This simulates a high signal voltage to check for an open in CKT 417.
4. CKT 416 is a 5 volts buffered reference signal. If CKT 416 is shorted to ground, DTC 22 will set. To determine if the MAP sensor is causing the DTC 22 problem, disconnect it to see if DTC 22 resets. Be sure TP sensor is connected and clear DTC(s) before testing.

Diagnostic Aids: A Tech 1 scan tool reads throttle position in volts. Voltage should increase at a steady rate as throttle is moved toward WOT.

Also some scan tools will read: throttle angle 0% = closed throttle, 100% = WOT.

An open or short to ground in CKTs 416 or 417 will result in a DTC 22.

Scan TP sensor while depressing accelerator pedal with engine stopped and ignition "ON." Display should vary from about .5 volt when throttle was closed, to about 4.8 volts when throttle is held at Wide Open Throttle (WOT) position.

Also some scan tools will read: throttle angle 0% = closed throttle, 100% = wide open throttle.

If DTC 22 is set, check CKT 416 for faulty wiring or connections.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 22

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW) 3.4L (VIN S) "F" CARLINE (SFI)

- THROTTLE CLOSED.
  DOES TECH 1 SCAN TOOL DISPLAY TP SENSOR .2V (200 mV) OR BELOW?

YES

(1)
- DISCONNECT TP SENSOR.
- JUMPER HARNESS CKTs 416 AND 417 TOGETHER.
  TECH 1 SCAN TOOL SHOULD DISPLAY TP SENSOR OVER 4.0V.
  DOES IT?

NO

(3)
- PROBE CKT 417 WITH A TEST LIGHT CONNECTED TO B+.
  TECH 1 SCAN TOOL SHOULD DISPLAY TP SENSOR OVER 4.0V.
  DOES IT?

YES

(4) CKT 416 OPEN, SHORTED TO GROUND.
IF OK, IT IS A FAULTY CONNECTION
OR
FAULTY PCM.

NO

CKT 417 OPEN, SHORTED TO GROUND,
FAULTY CONNECTION
OR
FAULTY PCM.

NO

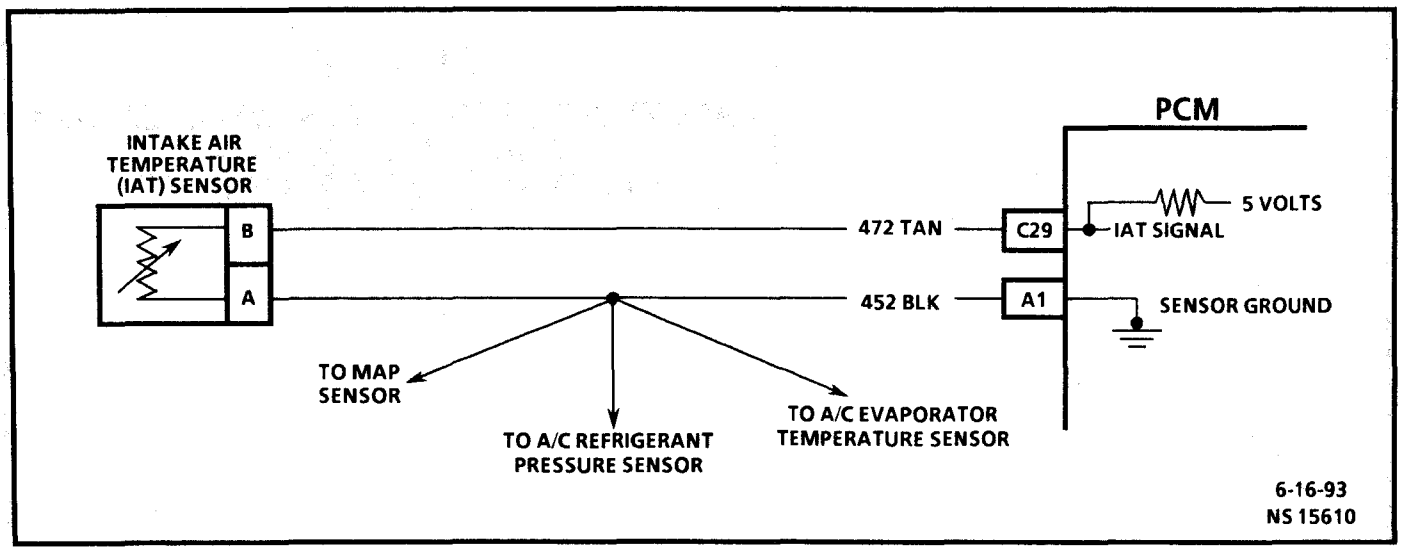
DTC 22 IS INTERMITTENT. IF NO ADDITIONAL DTCs WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES

(2) REFER TO FACING PAGE FOR SPECIFIC INSTRUCTIONS.

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

7-3-93
NS 15387



DTC 23

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Intake Air Temperature (IAT) sensor is a thermistor that controls a signal voltage to the PCM. The PCM applies approximately 5 volts to the sensor on CKT 472. When the intake air is cold, the sensor resistance is high, therefore the voltage sensed at the input "C29" is high. If the air is warm, the sensor resistance will be low, and the voltage input to the PCM will be low.

DTC 23 Will Set When: A signal voltage indicates an Intake Air Temperature (IAT) less than -35.5°C (-35.9°F), a signal voltage indicates that engine coolant temperature is greater than -35.5°C (-31.9°F), time since engine start is 4 minutes or longer, vehicle speed is less than 1 mph with all conditions met for 25 seconds

Action Taken (PCM will default to): The PCM will use an IAT default value of 37°C (108°F) and the MIL will become illuminated.

DTC 23 Will Clear When: A current DTC 23 will clear when the intake air temperature is indicated above the DTC 23 threshold. A history DTC 23 will clear after 50 consecutive ignition key cycles without a current DTC 23 being stored.

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

1. A DTC 23 will set due to an open sensor, wire, or connection. This test will determine if the wiring and PCM are OK.
2. This will determine if the signal CKT 472 or the 5 volts return CKT 802 is open.

Diagnostic Aids: A Tech 1 scan tool reads the temperature of the air entering the engine, and should read close to ambient air temperature when the engine is cold. IAT values will rise as underhood temperature increases.

A faulty connection, or an open in CKT 472 or CKT 452 will result in a DTC 23.

DTCs 23 and 34 stored at the same time could be the result of an open CKT 452. A faulty connection could result in intermittent failures. The "Temperature to Resistance Values" scale at the right may be used to test the IAT sensor at various temperature levels to evaluate the possibility of a "shifted" (mis-scaled) sensor. A "slewed" sensor could result in poor driveability complaints.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 23

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

- DOES TECH 1 SCAN TOOL DISPLAY IAT -37°C (-32°F) OR COLDER?

YES

1. • DISCONNECT SENSOR.
   • JUMPER HARNESS TERMINALS TOGETHER.
   • TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE OVER 140°C (284°F).
   DOES IT?

YES

FAULTY CONNECTION OR SENSOR.

NO

2. • JUMPER CKT 472 TO GROUND.
   • TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE OVER 140°C (284°F).
   DOES IT?

YES

OPEN SENSOR GROUND CIRCUIT, FAULTY CONNECTION OR FAULTY PCM.

NO

OPEN CKT 472, FAULTY CONNECTION OR FAULTY PCM.

NO

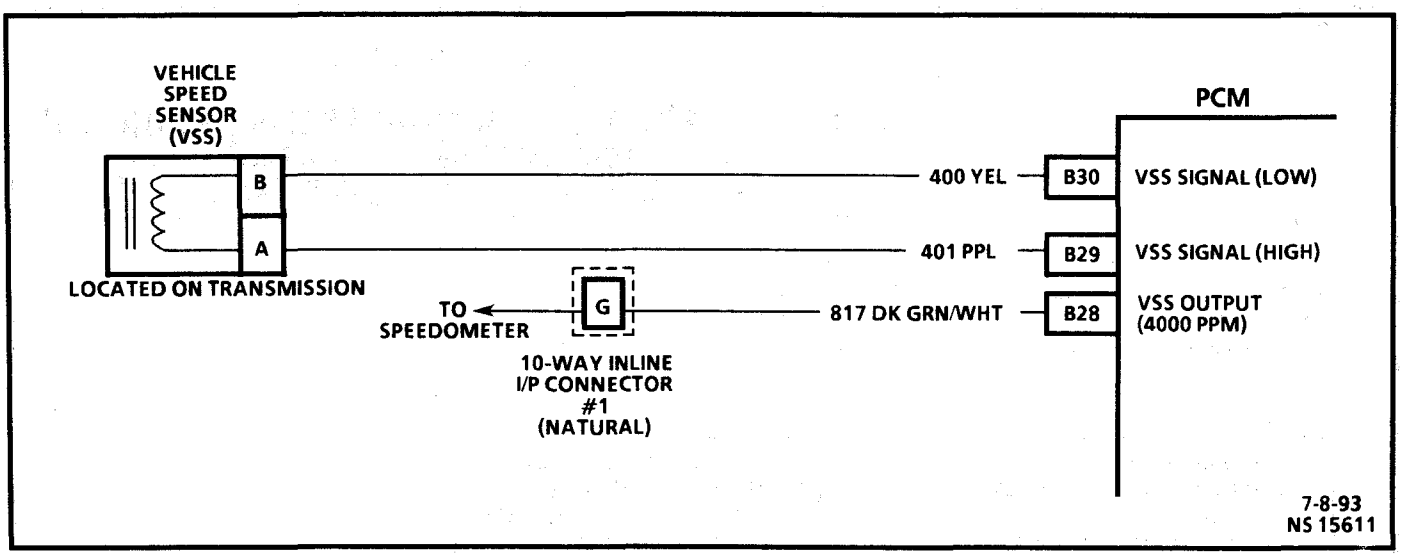
DTC 23 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

3-9-93
PS 17146



DTC 24

VEHICLE SPEED SENSOR (VSS) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Vehicle speed information is provided to the Powertrain Control Module (PCM) by the Vehicle Speed Sensor (VSS), which is a Permanent Magnet (PM) generator mounted in the transmission. The PM generator produces a pulsing voltage whenever vehicle speed is over about 3 mph. The AC voltage level and the number of pulses increases with vehicle speed. The PCM then converts the pulsing voltage to mph, which is used for calculations. The vehicle speed can be displayed with a Tech 1 scan tool.

The PCM supplies a signal, on CKT 817, to operate the speedometer and the odometer. The VSS signal is also sent to the cruise control module.

DTC 24 Will Set When: Engine speed is between 2200 and 4400 RPM, TP sensor voltage less than 290, low load condition (low MAP voltage), high manifold vacuum, transaxle not in park or neutral, VSS less than or equal to 3 mph. All conditions met for 4 seconds.

Action Taken (PCM will default to): The vehicle will default to 3rd gear, the transmission will have maximum line pressure and the MIL will become illuminated.

DTC 24 Will Clear When: A current DTC 24 will clear after each ignition key cycle. A history DTC 24 will clear after 50 consecutive ignition key cycles without a current DTC 24 being stored.

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

1. Disregard DTC 24 that sets when drive wheels are not turning. This can be caused by a faulty PNP switch circuit.
   The sensor only produces a signal if drive wheels are turning faster than 3 mph.
2. If CKTs 400, 401 and 817 are OK, and if the speedometer works properly, DTC 24 is being caused by a faulty PCM, or an incorrect program. If the PCM is faulty and must be replaced, the new PCM must be programmed, also, note that the ESC module will have to be transferred when replacing the PCM. Refer to "PCM Replacement and Programming Procedures" in Section "6E3-C1".

Diagnostic Aids: Tech 1 scan tool should indicate a vehicle speed whenever the drive wheels are turning greater than 3 mph.

A problem in CKT 817 will not affect the VSS input or the readings on a Tech 1 scan tool.

Check CKT 400 and CKT 401 for proper connections to be sure they are clean and tight, and that the harness is routed correctly. Refer to "Intermittents" in "Symptoms," Section "6E3-B".

- A faulty or misadjusted Park/Neutral Position (PNP) switch can result in a false DTC 24. Use a scan tool to check for the proper signal while in a drive range. Refer to CHART C-1A for the PNP switch check.

DTC 24

VEHICLE SPEED SENSOR (VSS) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

DISREGARD DTC 24 IF SET WHILE DRIVE WHEELS ARE NOT TURNING.

(1)
- RAISE DRIVE WHEELS.
- WITH ENGINE IDLING IN GEAR, SCAN TOOL SHOULD DISPLAY VEHICLE SPEED ABOVE 0 MPH. DOES IT?

YES → DTC 24 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO → DOES SPEEDOMETER WORK PROPERLY?

YES → (2) REPLACE PCM.

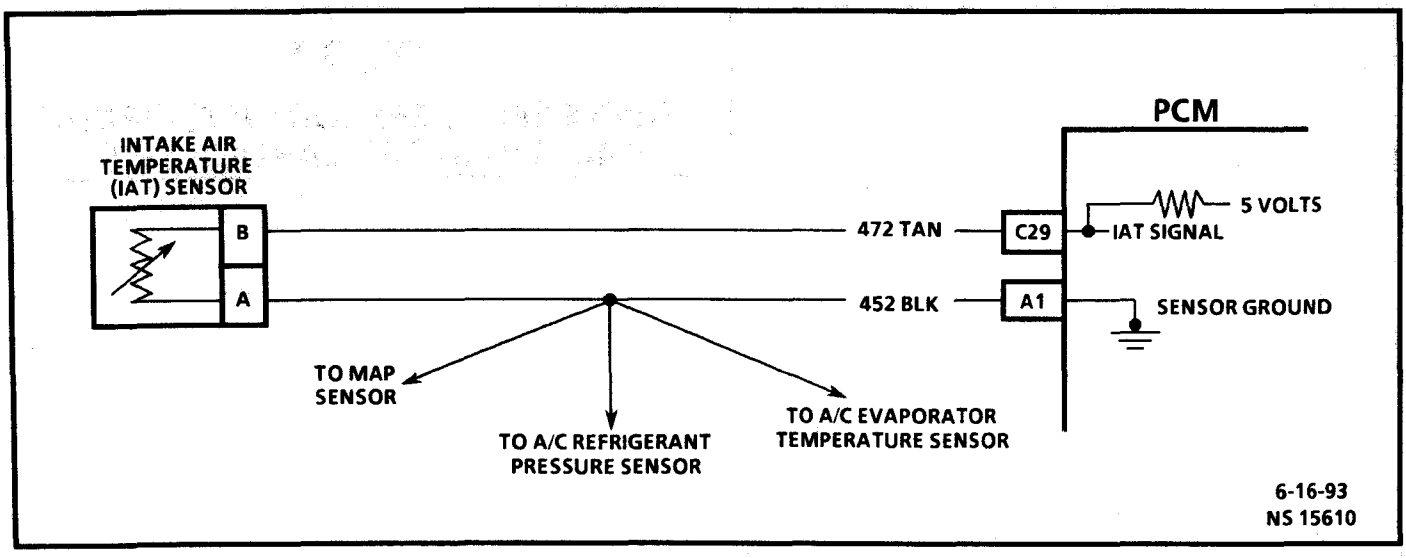
NO →
- IGNITION "OFF."
- DISCONNECT VSS HARNESS CONNECTOR AT TRANSAXLE.
- CONNECT SIGNAL GENERATOR TESTER J 33431-B OR EQUIVALENT TO VSS HARNESS CONNECTOR.
- IGNITION "ON," TOOL "ON" AND SET TO GENERATE A VSS SIGNAL.
- SCAN TOOL SHOULD DISPLAY VEHICLE SPEED ABOVE 0 MPH. DOES IT?

YES → REPLACE VEHICLE SPEED SENSOR.

NO →
CKT 400
OR
401 OPEN, SHORTED TO GROUND, SHORTED TOGETHER, FAULTY CONNECTIONS
OR
FAULTY PCM.

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

6-16-93
NS 15612



DTC 25

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the PCM. The PCM applies a voltage (about 5 volts) on CKT 472 to the sensor. When the air is cold, the sensor (thermistor) resistance is high, therefore the PCM will see a high signal voltage. If the air is warm the sensor resistance is low, therefore the PCM will see a low voltage.

The IAT sensor is located in the rear air intake duct.

DTC 25 Will Set When: Vehicle speed is greater than 1 mph and intake air temperature indicates 145°C (297°F) for 2 seconds.

Action Taken (PCM will default to): The PCM will use an IAT default value of 37°C (108°F) and the MIL will become illuminated.

DTC 25 Will Clear When: A current DTC 25 will clear when the intake air temperature is indicated below the high temperature threshold. A history DTC 25 will clear after 50 consecutive ignition key cycles without a current DTC 25 being stored.

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

1. This test is a verification that the DTC is not intermittent.
2. This test helps determine between a circuit fault and a faulty sensor.

Diagnostic Aids: A Tech 1 scan tool reads the temperature of the air entering the engine and should read close to ambient air temperature when engine is cold. IAT values will rises as underhood temperature increases.

A short to ground in CKT 472 will result in a DTC 25.

The "Temperature to Resistance Values" scale at the right may be used to test the IAT sensor at various temperature levels to evaluate the possibility of a "shifted" (mis-scaled) sensor. A "slewed" sensor could result in poor driveability complaints.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 25

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

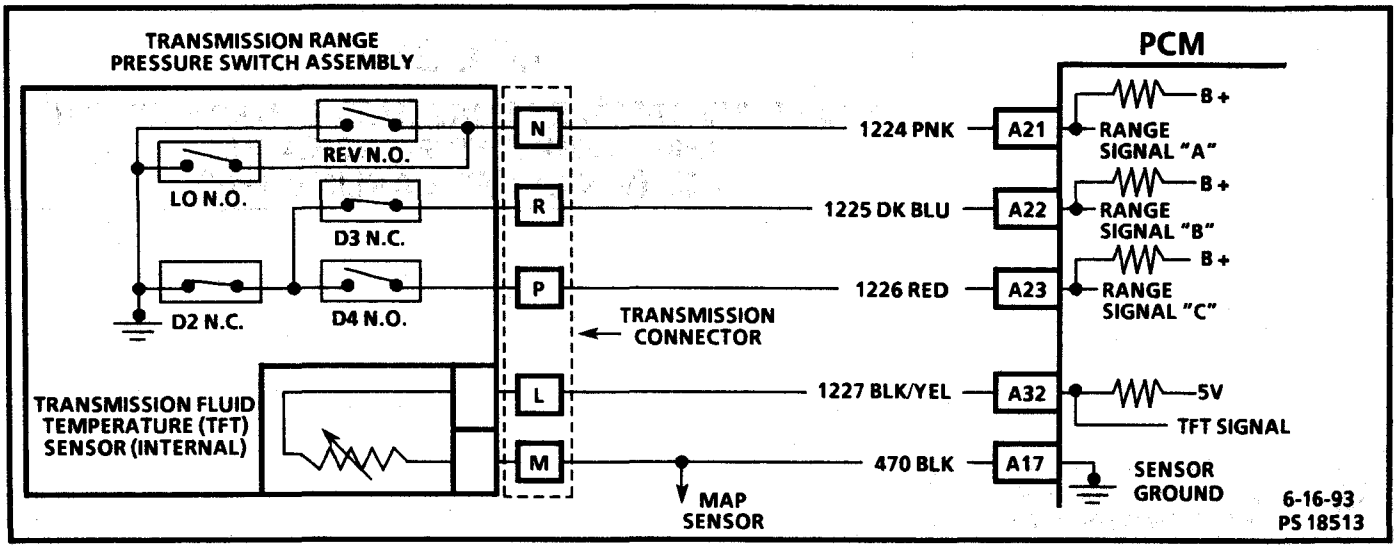
1. DOES TECH 1 SCAN TOOL DISPLAY IAT OF 145°C (293°F) OR HOTTER?
   - NO → DTC 25 IS INTERMITTENT. IF NO ADDITIONAL DTCs WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES →
2. • DISCONNECT SENSOR. TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE BELOW -30°C (-22°F). DOES IT?
   - YES → REPLACE SENSOR.
   - NO → CKT 472 SHORTED TO GROUND OR TO SENSOR GROUND OR PCM IS FAULTY.

DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

4-29-93
PS 17699



DTC 28

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY FAULT 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TR pressure switch assembly consists of five pressure switches (2 normally closed and 3 normally open), and a TFT sensor combined into one unit and mounted on the valve body. The PCM supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the PCM detects which manual valve position has been selected by the vehicle operator. With ignition "ON" and engine "OFF," P/N will be indicated.

DTC 28 Will Set When: Range signals "A" and "C" are both 0 volts ("ON"), for two seconds.

Action Taken (PCM will default to): Drive Range 4 for shift pattern control, harsh shifts. TCC will be inhibited, and if in hot mode, no fourth gear will occur. DTC 28 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 28 Will Clear When: The fault condition(s) no longer exist, and the ignition switch cycled "OFF" then "ON."

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

1. This test checks the indicated range signal to the valve position signal actually selected.
2. This test checks for correct voltage from the PCM to the transmission external connector.
3. This test checks a short to ground in any one of the three valve position circuits.

Diagnostic Aids: DTC 28 will set if the PCM detects one of two "illegal" combinations.

Refer to accompanying chart for various combinations.

Check all connectors for good contact.

Refer to "TR Pressure Switch Assembly Resistance Check" or "Functional Test Procedure" in SECTION 7A14A of the appropriate service manual for further information.

"ON" = Zero Volt/"OFF" = B+

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

Expected Readings

DTC 28

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY FAULT 3.4L (VIN S) "F" CARLINE (SFI)

THIS CHART ASSUMES THAT:
- THE TRANSMISSION LINKAGE FROM THE SELECT LEVER TO THE MANUAL VALVE IS ADJUSTED PROPERLY.
- OBD SYSTEM CHECK HAS BEEN PERFORMED.
- FLUID CHECKING PROCEDURE HAS BEEN PERFORMED.
- ALL DTC(s) HAVE BEEN RECORDED AND THEN CLEARED.
- SCAN TOOL STILL INSTALLED.

(1)
- ENGINE IDLING AT NORMAL OPERATING TEMPERATURE.
- PARKING BRAKE APPLIED AND WHEELS BLOCKED.
- APPLY BRAKE PEDAL AND SELECT EACH TRANSMISSION RANGE D1, D2, D3, D4, N, R, P.

DOES EACH SELECTED TRANSMISSION RANGE MATCH THE SCAN TOOL "TRANS RANGE SW" DISPLAY?

NO

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775 - JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- WITH J 39200 TO GROUND, CHECK VOLTAGE AT HARNESS CONNECTOR TERMINALS "N", "R" AND "P".

DOES J 39200 DISPLAY B + AT ALL THREE CIRCUITS?

NO

(3)
- ON CIRCUIT(S) THAT DID NOT INDICATE B +, CHECK FOR AN OPEN OR SHORT TO GROUND. IF OK, CHECK CONTROL MODULE CONNECTOR TERMINAL TENSION ON THESE CIRCUITS. IF OK, REPLACE CONTROL MODULE.

YES

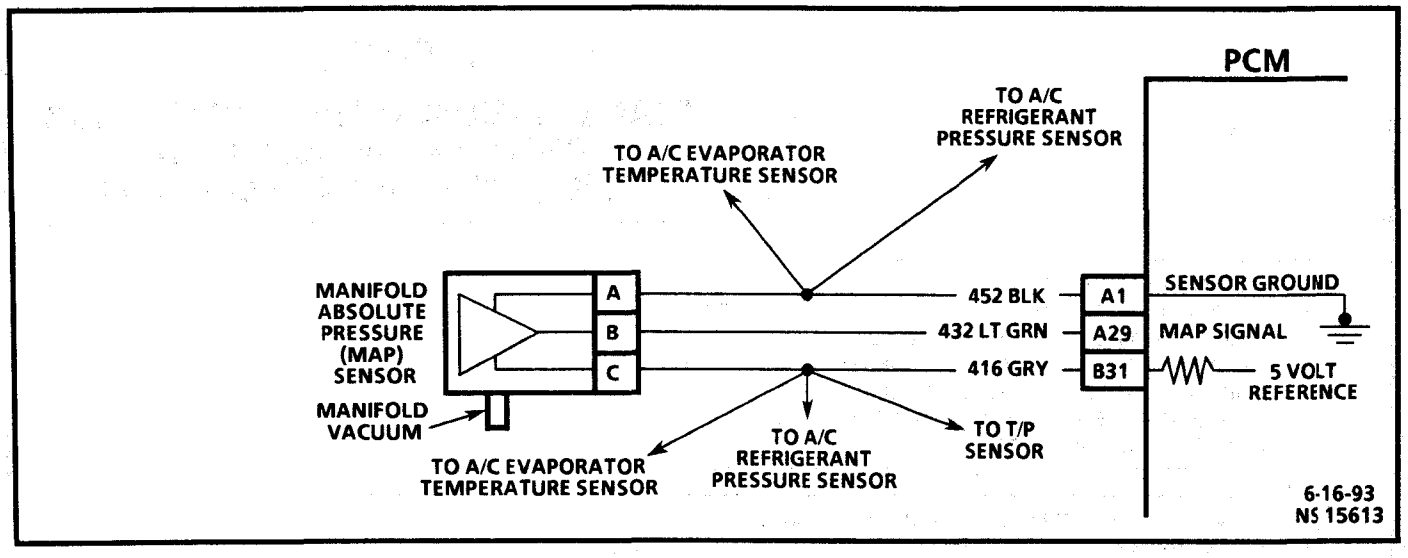
(2) VERIFY THAT CKT(s) 1224, 1225, OR 1226 ARE NOT SHORTED TOGETHER. IF OK, REFER TO "FLUID PRESSURE SWITCH ASSEMBLY RESISTANCE CHECK" SECTION 7A14A (4L60E) OR 7A17A (4L80E) OF THE APPROPRIATE SERVICE MANUAL.

YES

NO TROUBLE FOUND.
REFER TO DIAGNOSTIC AIDS.

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

4-27-93
PS 17065



DTC 33

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

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in the intake manifold pressure. MAP is the inverse of vacuum, so as MAP increases such as during WOT, vacuum decreases.

The MAP sensor should indicate approximately 1-2 volts at idle, and between 4 and 5 volts at Wide Open Throttle (WOT). MAP is one of the most important inputs for calculating fuel delivery.

DTC 33 Will Set When: No current DTC 21 or 22 is present, engine running, MAP is greater than 74 kPa (A/C "OFF") 84 kPa (A/C "ON"), throttle angle is between 3% and 30% and held steady. All conditions met for 4 seconds.

Action Taken (PCM will default to): A default table of MAP values will be used by the PCM to calculate air flow. The MIL will become illuminated and MAP values on the Tech 1 will become maximum (5 volts).

DTC 33 Will Clear When: A current DTC 33 will clear when the MAP value falls below the calibrated high MAP threshold. A history DTC 33 will clear after 50 consecutive key cycles without a current DTC 33 being stored.

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

1. Engine misfire or a low unstable idle may set DTC 33.
2. With the MAP sensor disconnected, the PCM should see a low voltage if the PCM and wiring are OK.

Diagnostic Aids: If idle is rough or unstable, refer to "Symptoms," Section "6E3-B" for items which can cause an unstable idle.

An open in CKT 452 or the connection will result in a DTC 33.

With the ignition "ON" and engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the PCM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same ± .4 volt.

- Check all connections.

Important

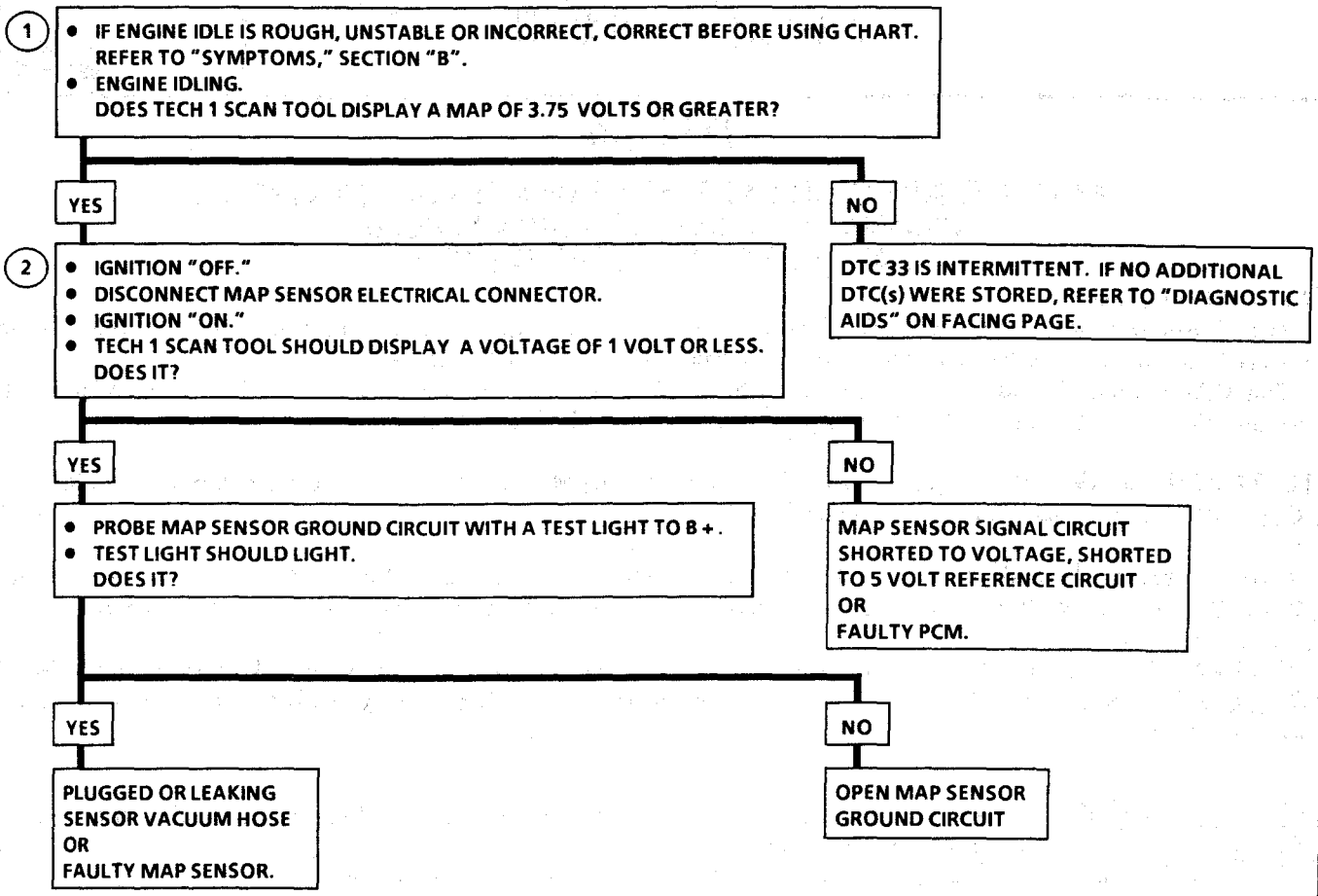
- Make sure electrical connector remains securely fastened.

- Disconnect sensor from bracket and twist sensor by hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connections. If OK, replace sensor.
- Refer to "MAP Sensor Voltage Output Check," CHART C-1D, for further diagnosis.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

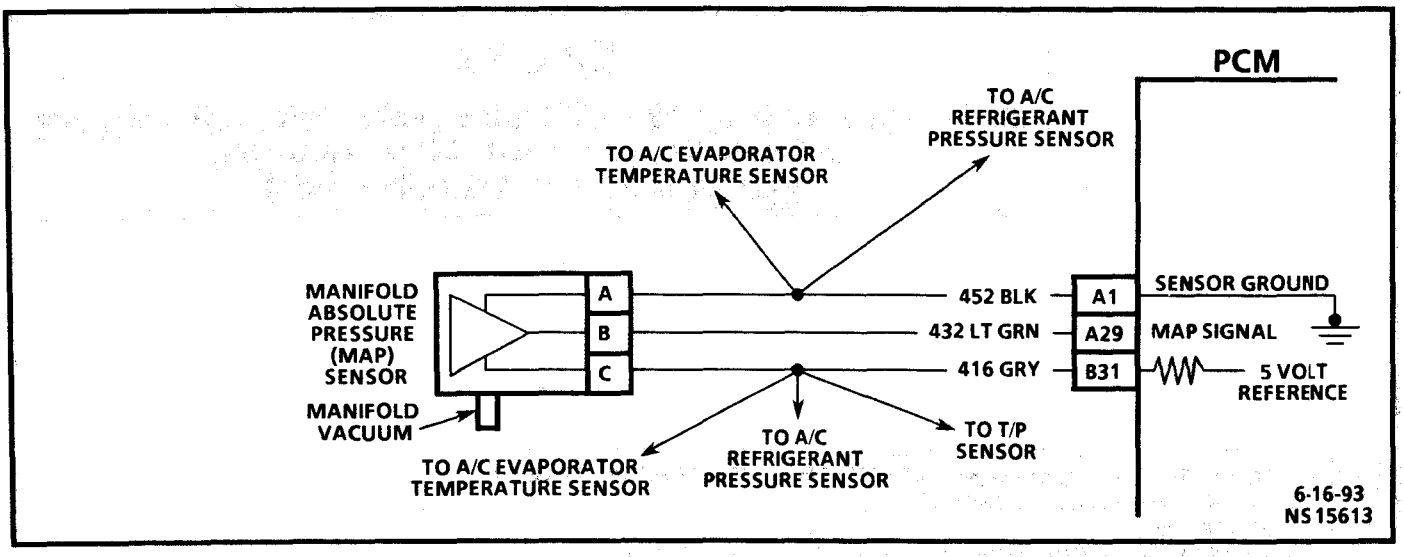
DTC 33

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



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

7-3-93
NS 15614



DTC 34

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

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in intake manifold pressure. MAP is the inverse of vacuum, so as MAP increases such as during WOT, vacuum decreases.

The MAP sensor should indicate approximately 1-2 volts at idle, and between 4 and 5 volts at Wide Open Throttle (WOT). MAP is one of the most important inputs for calculating fuel delivery.

DTC 34 Will Set When: Engine speed is less than 1200 RPM, throttle angle is greater than 2% and MAP is less than 13 kPa. All conditions must be met for 2.5 seconds.

Action Taken (PCM will default to): A default table of MAP values will be used by the PCM to calculate air flow. The MIL will become illuminated and MAP values on the Tech 1 will become minimum (11 kPa).

DTC 34 Will Clear When: A current DTC 34 will clear when the MAP value exceeds the minimum low MAP threshold value. A history DTC 34 will clear after 50 consecutive ignition key cycles without a current DTC 34 being stored.

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

1. This test is to see if the sensor is at fault for the low voltage or if there is a PCM or wiring problem.
2. This simulates a high signal voltage to check for an open in CKT 432. If the test light is bright during this test, CKT 432 is probably shorted to ground. If Tech 1 scan tool reads over 4 volts at this test, CKT 416 can be checked by measuring the voltage at terminal "C" (should be 5 volts).

Diagnostic Aids: An intermittent open in CKT 432 or CKT 416 will result in a DTC 34.

With the ignition "ON" and engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the PCM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Readings should be the same ± .4 volt.

- Check all connections.

Important

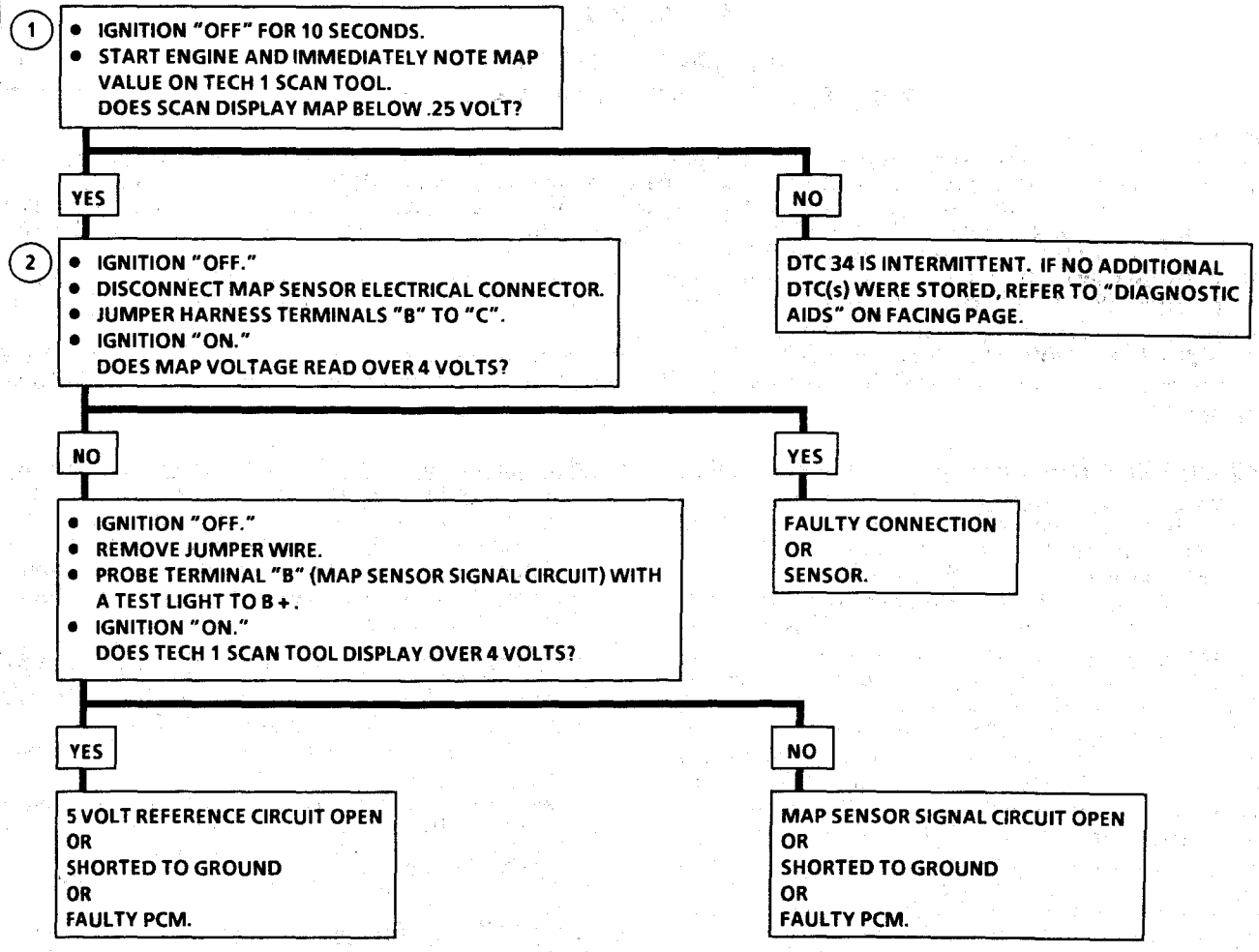
- Make sure electrical connector remains securely fastened.

- Disconnect sensor from bracket and twist sensor by hand (only) to check for intermittent connections. Output changes greater than .1 volt indicates a bad connector or connections. If OK, replace sensor.
- Refer to "MAP Sensor Voltage Output Check," CHART C-1D, for further diagnosis.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

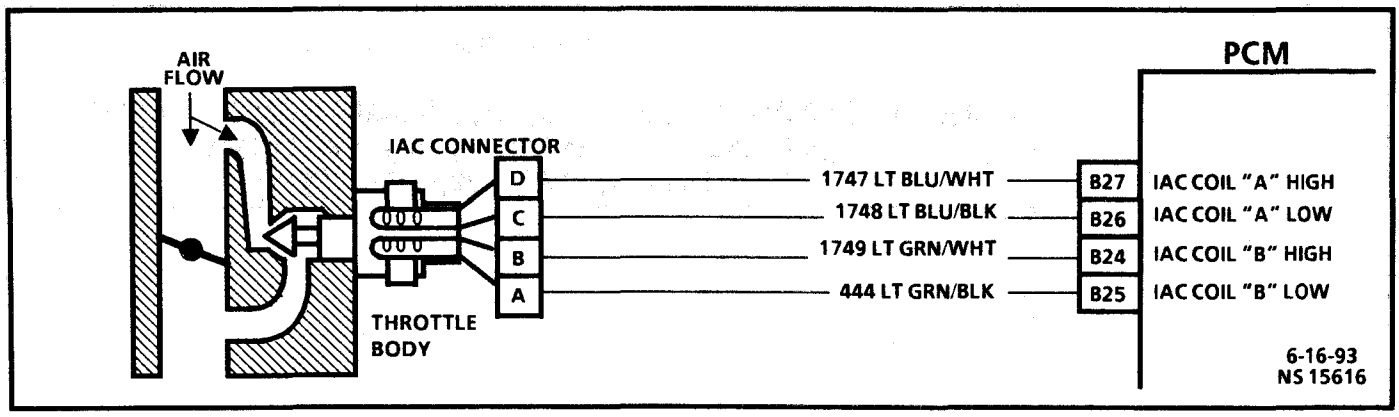
DTC 34

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.

7-3-93
NS 15615



DTC 35

IDLE SPEED ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:
The IAC motor will constantly adjust its valve position to maintain the desired idle speed. If idle speed is below the desired idle, the valve will open to allow more air flow and increase RPM. If the idle is too high, the IAC will slowly close to limit airflow and therefore engine RPM will decrease. If engine RPM becomes out of control for a long enough period, then a DTC 35 will be set. Review the "General Description" of the IAC operation in "Fuel Metering System," Section "6E3-C2".

DTC 35 Will Set When: Closed throttle engine speed is 300 RPM above or below desired idle for 50 seconds.

Action Taken (PCM will default to): The PCM will turn the MIL "ON" and set a DTC 35. The RPM will remain controlling erratically until the problem is corrected.

DTC 35 Will Clear When: A current DTC 35 will clear when the engine speed controls within a 350 RPM range of desired idle. A history DTC 35 will clear after 50 consecutive ignition key cycles without a current DTC 35 being stored.

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

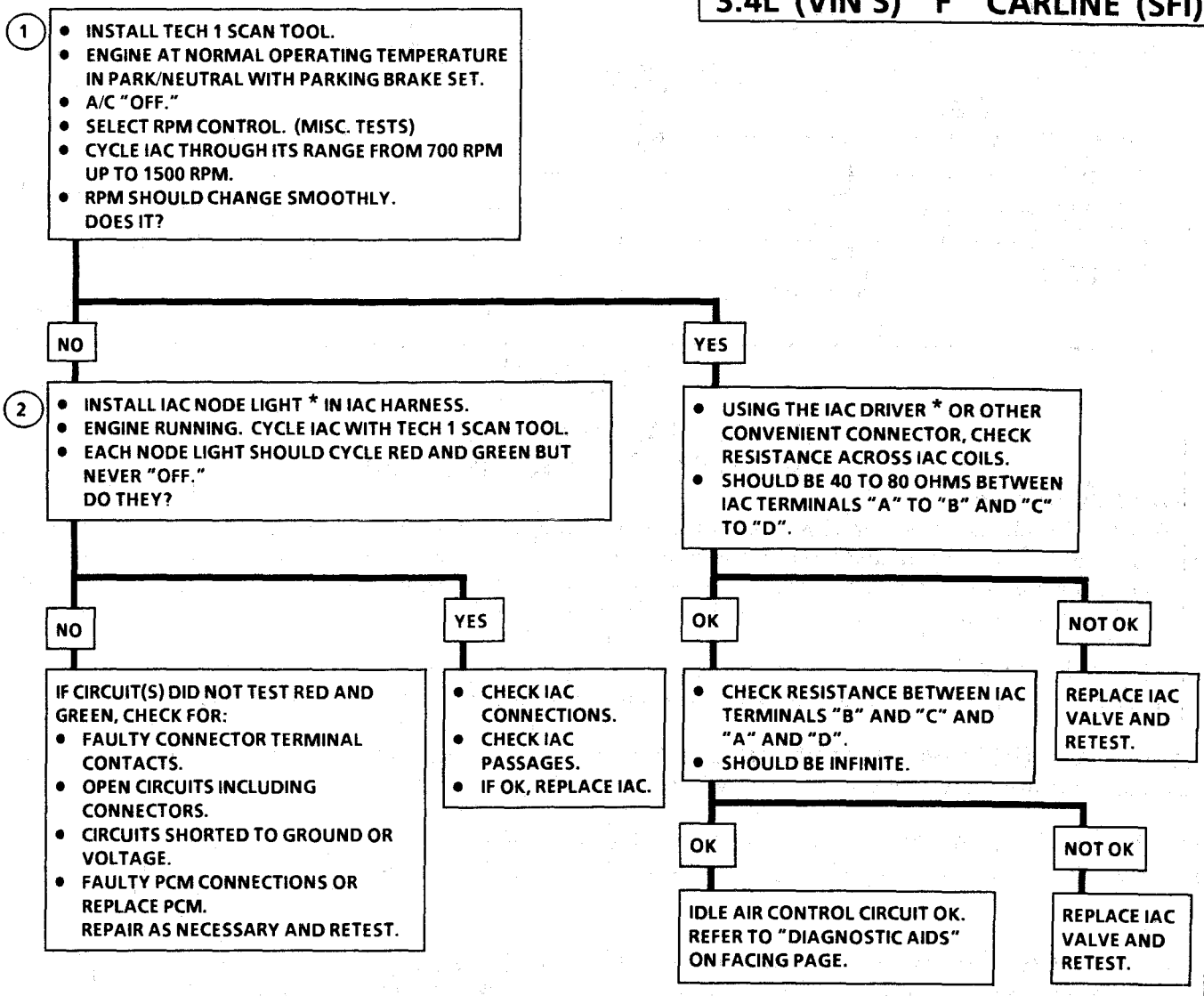
1. The Tech 1 RPM control mode is used to extend and retract the IAC valve. The valve should move smoothly within the specified range. If the idle speed is commanded (IAC extended) too low (below 700 RPM), the engine may stall. This may be normal and would not indicate a problem. Retracting the IAC beyond its controlled range (above 1500 RPM) will cause a delay before the RPMs start dropping. This too is normal.
2. This test uses the Tech 1 scan tool to command the IAC controlled idle speed. The PCM issues commands to obtain commanded idle speed. The node lights each should flash red and green to indicate a good circuit as the PCM issues commands. While the sequence of color is not important if either light is "OFF" or does not flash red and green, check the circuits for faults beginning with poor terminal contacts.

Diagnostic Aids: A slow, unstable, or fast idle may be caused by a non-IAC system problem that cannot be overcome by the IAC valve. Out of range IAC counts will be above 60 if idle is too low and zero counts if idle is too high. If idle speed is above 600-700 RPM in drive with an A/T, locate and correct vacuum leak. If RPM is below spec., check for foreign material around throttle plates. Refer to "Fuel Metering System," Section "6E3-C2". The following checks should be made to repair a non-IAC system problem.

- Vacuum leak (high idle). If idle is too high, stop the engine. Fully extend IAC with tester. Start engine. If idle speed is above 800 RPM, locate and correct vacuum leak including crankcase ventilation system. Also check for binding of throttle blade or linkage.
- System too lean (high air/fuel ratio). The idle speed may be too high or too low. Engine speed may vary up and down and disconnecting the IAC valve does not help. DTC 44 may set. Tech 1 O2S voltage will be less than 300 mV (.3 volt). Check for low regulated fuel pressure, water in the fuel or a restricted injector.
- System too rich (low air/fuel ratio). The idle speed will be too low. Tech 1 IAC counts will usually be above 80. System is obviously rich and may exhibit black smoke in exhaust. DTC 45 may set. Tech 1 scan tool O2S voltage will be fixed above 800 mV (.8 volt).
  Check for high fuel pressure, leaking or sticking injector. Silicone contaminated O2S will cause sluggish voltage variations on Tech 1 scan tool.
- Throttle body. Remove IAC valve and inspect bore for foreign material.
- IAC valve electrical connections. IAC valve connections should be carefully checked for proper contact.
- Crankcase ventilation valve. An incorrect or faulty valve may result in an incorrect idle speed.
- Refer to "Rough, Unstable, Incorrect Idle, or Stalling" in "Symptoms" Section "6E3-B".
- If intermittent poor driveability or idle symptoms are resolved by disconnecting the IAC, carefully recheck connections, valve terminal resistance, or replace IAC.
- A/C compressor or relay failure. Refer to CHART C-10 if the A/C control relay drive circuit is shorted to ground or if the relay is faulty, an idle problem may exist.
- If above are OK, see "Rough, Unstable, Incorrect Idle, or Stalling" in "Symptoms," Section "6E3-B".

DTC 35

IDLE SPEED ERROR
3.4L (VIN S) "F" CARLINE (SFI)

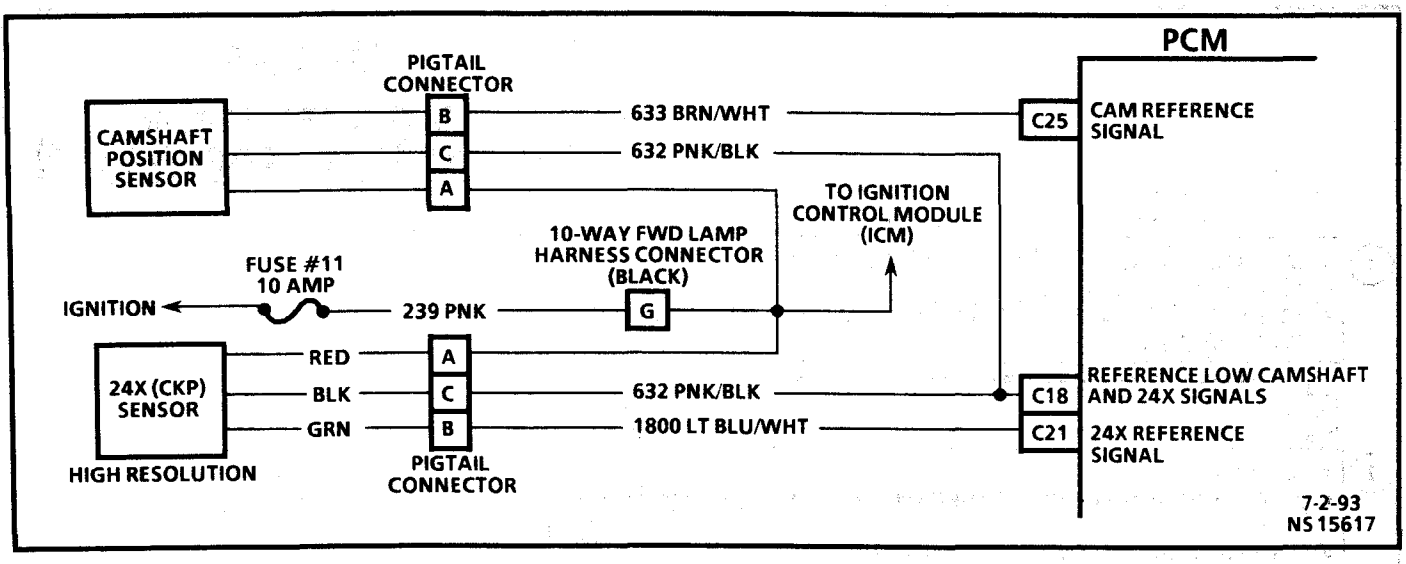


* IAC DRIVER AND NODE LIGHT REQUIRED KIT
222-L FROM: CONCEPT TECHNOLOGY, INC.
J 37027 FROM: KENT-MOORE, INC.

CLEAR DIAGNOSTIC TROUBLE CODES, CONFIRM "CLOSED LOOP" OPERATION, NO MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON." PERFORM IAC RESET PROCEDURE PER APPLICABLE SERVICE MANUAL AND VERIFY CONTROLLED IDLE SPEED IS CORRECT.

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

3-8-93
PS 17150



DTC 36

24X SIGNAL CIRCUIT ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The 24X Crankshaft Position (CKP) sensor is used to improve idle spark control at low engine speeds. The 24X CKP sensor is located behind the harmonic balancer on the front of the engine where it picks up pulses from a reluctor wheel on the crankshaft. Its signal is conditioned by the PCM and used to more accurately control spark at lower engine speeds up to approximately 2000 RPM.

DTC 36 Will Set When: The PCM determines that 6 or more consecutive 24X crankshaft position sensor reference pulses have not occurred. This test is executed once per ignition key cycle immediately after startup.

Action Taken (PCM will default to): The PCM will disregard the 24X sensor input and base timing from the 3X low resolution CKP sensor. The MIL will not become illuminated.

DTC 36 Will Clear When: A current DTC 36 will clear after each ignition key cycle. A history DTC 36 will clear after 50 consecutive ignition key cycles without a current DTC 36 being stored.

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

1. The 24X signal RPM should be the same as engine speed up to approximately 2000 RPM at which time it stops. This test determines if the PCM is putting out a 24X signal.
2. This test determines if signal voltage is present up to the PCM.
3. This will determine if B+ is present at the sensor input.
4. By applying B+ to the 24X crankshaft sensor pigtail circuit, pigtail and sensor integrity can be determined.
5. Ground path continuity is determined with this test.

Diagnostic Aids: An intermittent 24X signal error can be caused by poor connections. Ignition feed, reference low and the signal circuits should all be checked for poor connections.

DTC 36

24X SIGNAL CIRCUIT ERROR
3.4L (VIN S) "F" CARLINE (SFI)

1
- IF ENGINE CRANKS BUT WON'T RUN, USE CHART A-3.
- INSTALL TECH 1 SCAN TOOL.
- IGNITION "ON" ENGINE IDLING. MONITOR "IGNITION CONTROL 24X SIGNAL." IS RPM INDICATED?

NO

2
- IGNITION "OFF."
- DISCONNECT PCM HARNESS CONNECTOR "C".
- IGNITION "ON."
- PROBE PCM HARNESS PIN "C21" WITH A DVM TO GROUND (SET DVM TO DC VOLTAGE). DOES DVM DISPLAY APPROXIMATE SYSTEM VOLTAGE?

YES

5
- IGNITION "OFF."
- RECONNECT PCM HARNESS CONNECTOR "C".
- DISCONNECT 24X SENSOR 3-WAY PIGTAIL HARNESS.
- IGNITION "ON."
- PROBE TERMINAL "C" (PCM HARNESS SIDE) WITH A TEST LIGHT TO B+. IS TEST LIGHT "ON"?

YES

FAULTY HARNESS CONNECTION
OR
OPEN CRANKSHAFT POSITION SENSOR PIGTAIL GROUND WIRE
OR
FAULTY 24X CRANKSHAFT POSITION SENSOR.

NO

OPEN PCM HARNESS GROUND CIRCUIT
OR
FAULTY TERMINAL CONNECTION
OR
FAULTY PCM.

YES

DTC 36 IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

3
- IGNITION "OFF."
- DISCONNECT 24X CRANKSHAFT POSITION SENSOR PIGTAIL HARNESS CONNECTOR.
- IGNITION "ON."
- CONNECT DVM BETWEEN TERMINAL "A" (PCM HARNESS SIDE) AND GROUND. DOES DVM DISPLAY APPROXIMATE BATTERY VOLTAGE?

YES

4
- WITH A FUSED JUMPER, JUMP 24X SENSOR PIGTAILTERMINAL "A" TO B+.
- PROBE TERMINAL "B" WITH DVM TO GROUND. DOES DVM DISPLAY APPROXIMATE BATTERY VOLTAGE?

NO

OPEN OR SHORTED 24X CRANKSHAFT POSITION SENSOR IGNITION FEED PIGTAIL WIRE TO SENSOR
OR
OPEN OR SHORTED CRANKSHAFT POSITION SENSOR PIGTAIL SIGNAL WIRE FROM SENSOR
OR
FAULTY CRANKSHAFT POSITION SENSOR.

YES

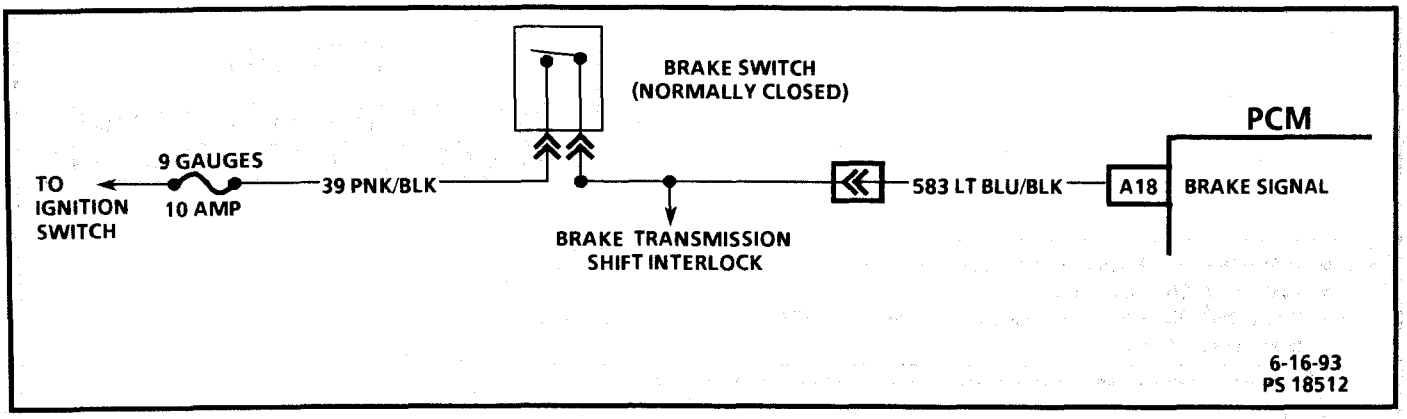
FAULTY CRANKSHAFT SENSOR PIGTAIL CONNECTION
OR
FAULTY PCM CONNECTION
OR
OPEN CRANKSHAFT POSITION SENSOR SIGNAL WIRE TO PCM.

NO

FAULTY HARNESS IGNITION FEED CIRCUIT.

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

7-2-93
PS 18387



DTC 37

TCC BRAKE SWITCH ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TCC brake switch is used to indicate brake pedal status. The normally closed brake switch supplies a B+ signal on CKT 420 to the PCM. The signal voltage is opened when the brakes are applied. The PCM uses this signal to de-energize the TCC solenoid when the brake pedal is applied.

DTC 37 Will Set When:

- No DTC(s) 24 or 72.
- No change in the TCC brake signal to the PCM when:
  - Vehicle speed is greater than 35 mph for greater than 10 seconds.
  - Then vehicle speed is 0 mph.
  - For a total of 4 times.

Action Taken (PCM will default to): An incorrect brake signal can affect TCC scheduling. Also, an incorrect brake signal can inhibit fourth gear operation, if in hot mode. DTC 37 will be stored in PCM memory, but, will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 37 Will Clear When: Fault condition no longer exists.

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

1. This test checks for voltage at brake switch.
2. This test checks the brake switch.
3. This test checks CKT 420 at the PCM.

Diagnostic Aids:

- Check customer driving habits and/or unusual traffic conditions (i.e. stop and go expressway traffic).

DTC 37

TCC BRAKE SWITCH ERROR
3.4L (VIN S) "F" CARLINE (SFI)

- INSTALL SCAN TOOL.
- IGNITION SWITCH "ON," ENGINE "OFF."
- RECORD THEN CLEAR DTC(s).
- APPLY THEN RELEASE BRAKE PEDAL.
- DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE PEDAL APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

NO

YES → NO TROUBLE FOUND. REFER TO "DIAGNOSTIC AIDS."

(1)
- WITH A TEST LIGHT CONNECTED TO GROUND, BACKPROBE IGNITION FEED CIRCUIT ON BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO → REPAIR OPEN IN THE IGNITION FEED CIRCUIT TO THE BRAKE SWITCH. IF THE IGNITION VOLTAGE FEED FUSE IS OPEN, ALSO CHECK CKT 420 FOR A SHORT TO GROUND.

- WITH TEST LIGHT CONNECTED TO GROUND, BACKPROBE HARNESS CKT 420 AT BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO → BRAKE SWITCH OUT OF ADJUSTMENT OR FAULTY BRAKE SWITCH.

(2)
- APPLY BRAKE PEDAL. IS TEST LIGHT "OFF" WHEN BRAKE PEDAL IS APPLIED?

YES

NO → CHECK CKT 420 FOR SHORT TO B+. IF OK, REPLACE BRAKE SWITCH.

- IGNITION "OFF."
- DISCONNECT CONTROL MODULE CONNECTORS.
- IGNITION "ON," ENGINE "OFF."
- WITH A TEST LIGHT CONNECTED TO GROUND, PROBE CONTROL MODULE CKT 420 HARNESS CONNECTOR. IS TEST LIGHT "ON"?

YES

NO → REPAIR OPEN CKT 420 FROM TCC BRAKE SWITCH TO PCM.

(3)
- IGNITION "OFF."
- RECONNECT CONTROL MODULE CONNECTIONS.
- IGNITION "ON."
- APPLY THEN RELEASE BRAKE PEDAL. DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

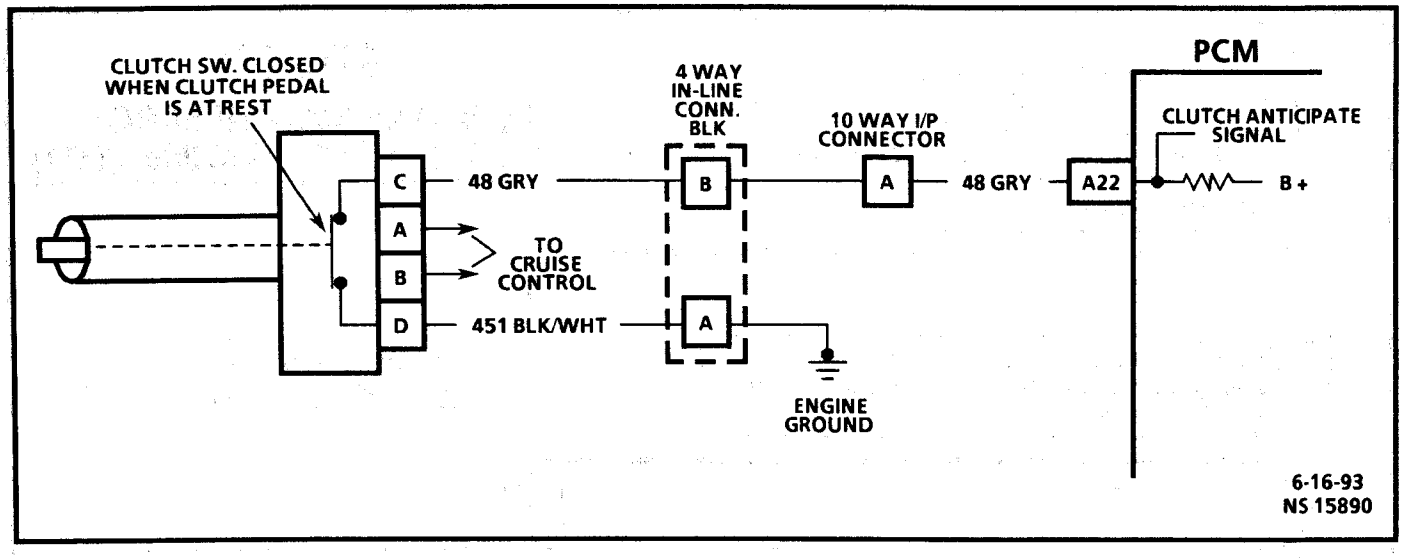
YES

NO → FAULTY CONTROL MODULE.

ELECTRICAL SYSTEM CHECKS OK AT THIS TIME. THE MALFUNCTION MAY BE INTERMITTENT OR MAY HAVE BEEN CORRECTED DURING THIS DIAGNOSTIC PROCEDURE. REFER TO DIAGNOSTIC AIDS.

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

5-3-93
PS 17053



DTC 39

CLUTCH SWITCH ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The clutch switch is normally closed when the clutch pedal is at rest. When the clutch pedal is depressed (clutch disengaged), the switch will change from "OFF" to "ON." The PCM runs a diagnostic check that looks for a change of state in the switch logic. If there is a failure in the clutch switch circuit, a DTC 39 will be stored in memory and the MIL (Service Engine Soon) will be illuminated.

DTC 39 Will Set When: Engine temperature above 90°C (194°F), vehicle speed is greater than or equal to 40 mph, the PCM must see VSS from 0 to 40 mph and back to 0 mph for the clutch diagnostic to run. The clutch switch must fail four consecutive times per ignition cycle.

Action Taken (PCM will default to): DTC 39 will be stored and the MIL will become illuminated.

DTC 39 Will Clear When: A current DTC 39 will clear when the PCM recognizes a change of state in the switch logic from "OFF" to "ON." A history DTC 39 will clear after 50 consecutive ignition key cycles without a current DTC 39 being stored.

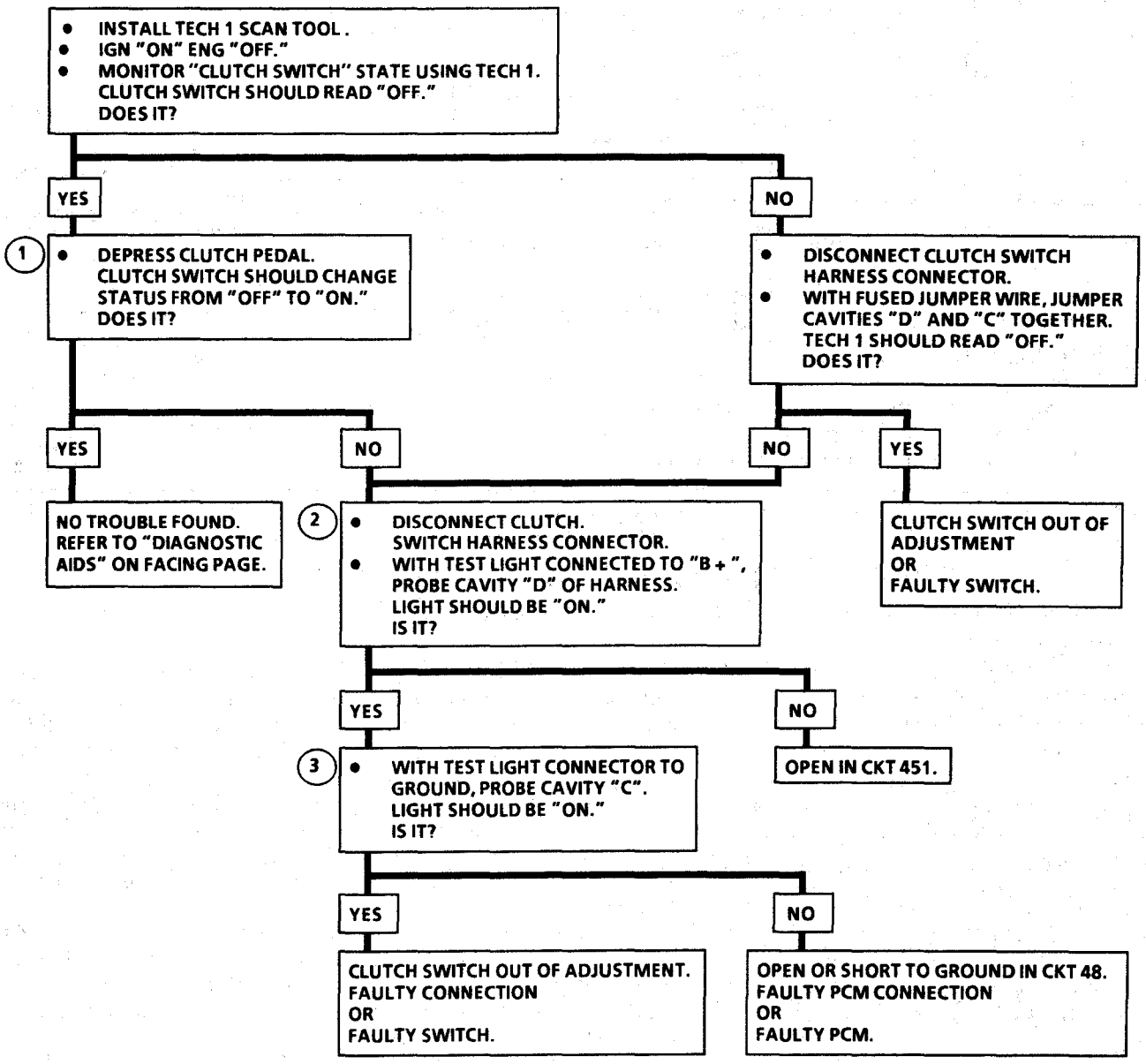
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. When the clutch pedal is depressed, the switch should go from closed to open and the status on the Tech 1 scan tool should change from "OFF" to "ON."
2. This test will check for a poor ground to the clutch switch.
3. This test will determine if the clutch switch is being supplied with "B+" or if CKT 48 is shorted to ground.

Diagnostic Aids: If DTC 39 was stored in memory and no problem was found, make sure clutch switch fastener is secure and is not sticking or binding. The clutch and the cruise control share the same switch.

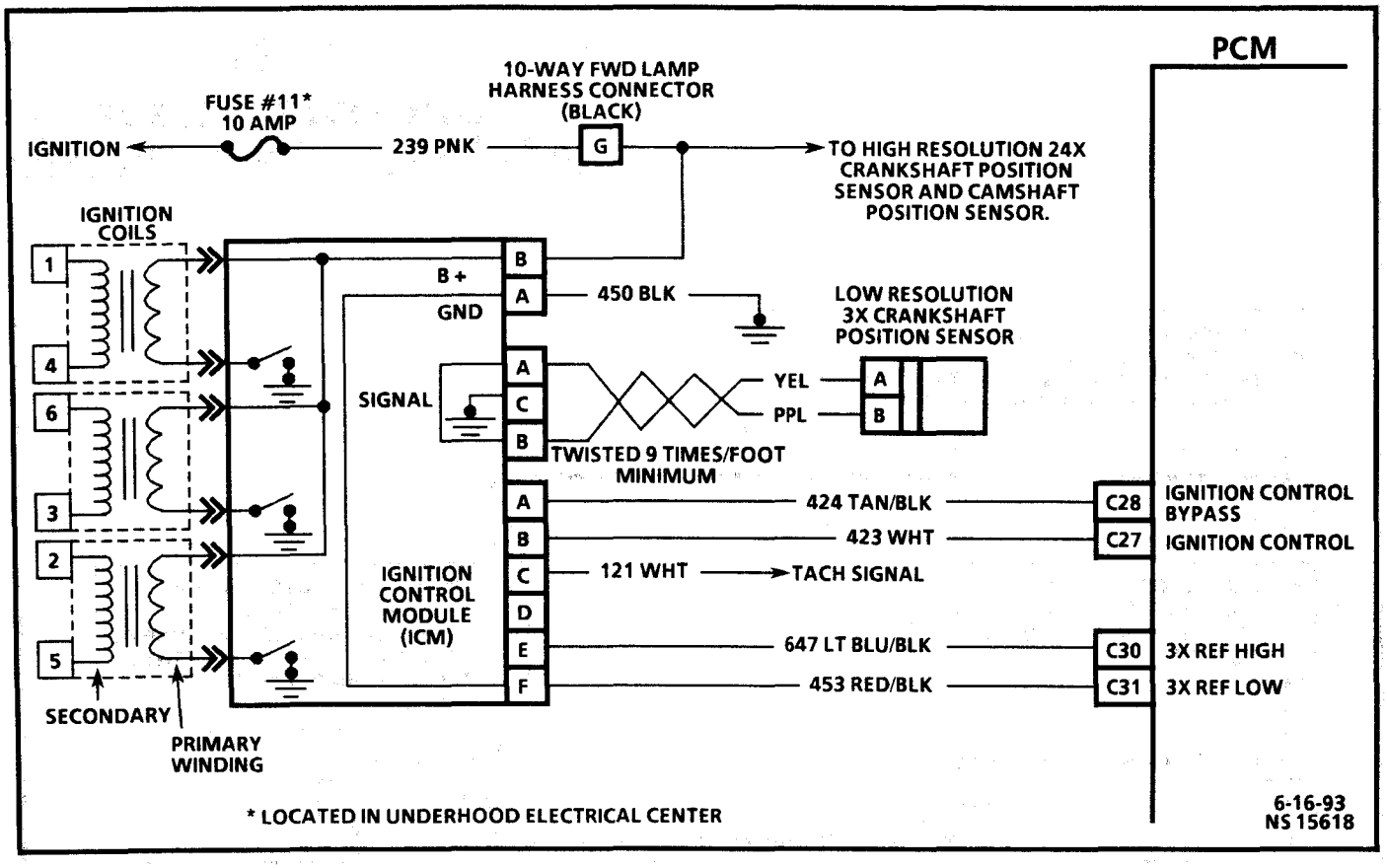
DTC 39

CLUTCH SWITCH ERROR
3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
MS 12599



DTC 41

IGNITION CONTROL (IC) TIMING CIRCUIT ERROR 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Ignition control spark timing is provided by the PCM on CKT 423. Inputs from a number of engine sensors allow the PCM to correctly calculate optimum spark timing. Engine load is calculated from the MAP sensor, engine RPM is derived from the 3X crankshaft position sensor, engine operating temperature from ECT and IAT sensors and engine knock activity from the knock sensor. Other engine functions modify spark to a lesser degree such as TCC engagement and EGR activity.

The bypass circuit controls an internal switch in the electronic Ignition Control Module (ICM). Unless the vehicle is in backup spark (base timing mode), the bypass circuit will have 5 volts applied to it. This 5 volt signal from the PCM allows a solid state switch to direct the IC timing pulses to the ICM for sequencing and energizing the coil packs. If the bypass circuit is not energized, the IC pulses from the ICM are shunted to ground and the electronic ICM uses its own base timing schedule to time and energize the coil packs.

DTC 41 Will Set When: Ignition Control (IC) pulses are detected on CKT 423 when the vehicle is in bypass (no voltage applied to bypass should allow IC pulses to be grounded by the electronic ICM). The test will either pass or fail within the first 1 second of engine running. If it passes, the test will not run until the next key cycle.

Action Taken (PCM will default to): The PCM will allow the electronic ignition control module to control timing using its own base timing schedule. The MIL will become illuminated.

DTC 41 Will Clear When: A current DTC 41 will clear after each ignition key cycle. A history DTC 41 will clear after 50 consecutive ignition key cycles without a current DTC 41 being stored.

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

1. This test confirms DTC 41 and that the fault causing the DTC is present.
2. Checks for a normal IC ground path through the ignition control module. An IC CKT 423 shorted to ground will also read less than 500 ohms; however, this should set a DTC 42.

Diagnostic Aids: The scan tool does not have any ability to help diagnose a DTC 41 problem.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 41

IGNITION CONTROL (IC) TIMING CIRCUIT ERROR 3.4L (VIN S) "F" CARLINE (SFI)

(1)
- CLEAR DTC(s).
- IDLE ENGINE FOR 5 SECONDS OR UNTIL DTC 41 SETS.

DOES DTC 41 SET?

YES

(2)
- IGNITION "OFF."
- DISCONNECT PCM CONNECTOR "C".
- IGNITION "ON."
- SET OHMMETER SELECTOR SWITCH IN THE 1000 TO 2000 OHMS RANGE.
- GROUND THE BLACK (-) OHMMETER LEAD.
- PROBE PCM HARNESS IGNITION CONTROL CKT 423 USING THE RED (+) OHMMETER LEAD. THE OHMMETER SHOULD READ LESS THAN 500 OHMS.

DOES IT?

YES

- FAULTY CONNECTION AT THE PCM.
  OR
  FAULTY PCM.

NO

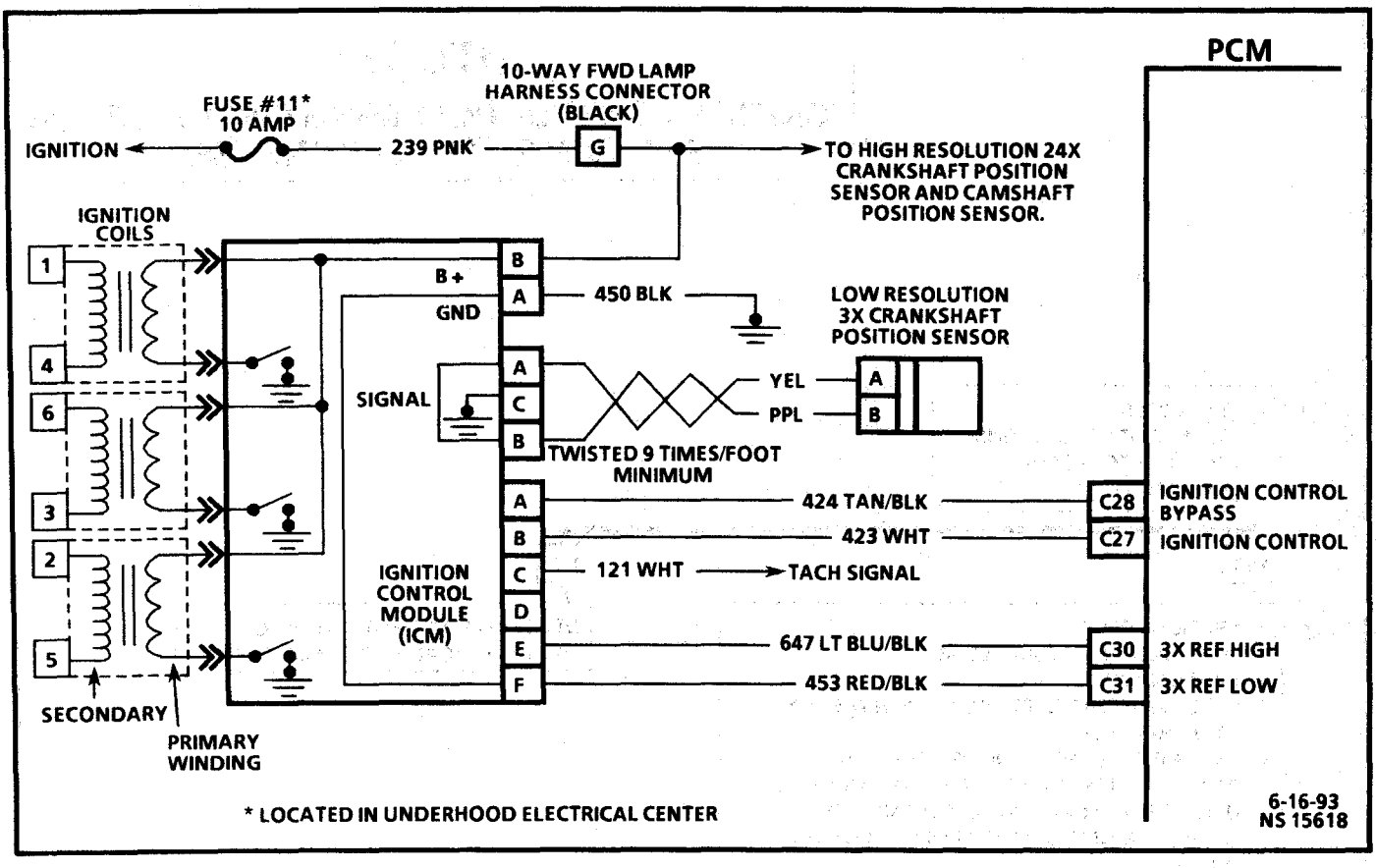
OPEN CKT 423, FAULTY CONNECTION,
OR
FAULTY IGNITION CONTROL MODULE (ICM).

NO

DTC 41 INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

* IF PCM IS FAULTY AND MUST BE REPLACED, THE NEW PCM MUST BE PROGRAMMED. REFER TO PCM REPLACEMENT AND PROGRAMMING PROCEDURES IN SECTION "6E3-C1".

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



DTC 42

IGNITION CONTROL (IC) ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Ignition control timing is provided by the PCM on CKT 423. Using inputs from both the 3X and 24X crankshaft position sensors, spark timing is calculated and delivered to the electronic ignition control module to sequence and energize the coil packs. If this ignition control circuit is grounded, the electronic ICM will control spark timing from a preset base timing schedule and a DTC 42 will be set.

The ignition control bypass circuit should always have 5 volts applied to it. This input controls the solid state switch internal to the ICM, which provides a complete circuit for timing signals delivered from the PCM to the electronic ICM. If the bypass circuit is open or grounded, timing signals from the PCM on the ignition control circuit are grounded inside the electronic ICM. The ICM will use its own base timing schedule and a DTC 42 will be set.

DTC 42 Will Set When: No pulses are detected on the IC circuit by the PCM.

Action Taken (PCM will default to): The PCM will allow the electronic ignition control module to control timing using its own base timing schedule. The MIL will become illuminated.

DTC 42 Will Clear When: A current DTC 42 will clear after each ignition key cycle. A history DTC 42 will clear after 50 consecutive ignition key cycles without a current DTC 42 being stored.

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

1. DTC 42 indicates the PCM has detected an open or short to ground in the bypass circuit. This test confirms DTC 42 and that the fault causing the DTC is present.
2. Checks for a normal IC ground path through the ignition control module. An IC CKT 423 shorted to ground will also read less than 500 ohms; however, this will be checked later.
3. As the test light voltage touches CKT 424, the module should switch causing the ohmmeter to "overrange" if the meter is in the 1000-2000 ohms position. Selecting the 10-20,000 ohms position will indicate above 5000 ohms. The important thing is that the module "switched."
4. The module did not switch and this step checks for:
   - IC CKT 423 shorted to ground.
   - Bypass CKT 424 open.
   - Faulty electronic ignition control module connection or module.
5. Confirms that DTC 42 is a faulty PCM and not an intermittent in CKT 423 or 424.

Diagnostic Aids: The Tech 1 scan tool does not have any ability to help diagnose a DTC 42 problem.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 42

IGNITION CONTROL (IC) ERROR 3.4L (VIN S) "F" CARLINE (SFI)

1. • CLEAR DTC(s).
   • IDLE ENGINE FOR 1 MINUTE OR UNTIL DTC 42 SETS.
   DOES DTC 42 SET?

NO → DTC 42 INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES

2. • IGNITION "OFF."
   • DISCONNECT BLUE PCM CONNECTOR.
   • IGNITION "ON."
   • SET OHMMETER SELECTOR SWITCH IN THE 1000 TO 2000 OHMS RANGE.
   • GROUND THE BLACK (-) OHMMETER LEAD.
   • PROBE PCM HARNESS IGNITION CONTROL CKT 423 USING THE RED (+) OHMMETER LEAD. THE OHMMETER SHOULD READ LESS THAN 500 OHMS.
   DOES IT?

NO → OPEN CKT 423, FAULTY CONNECTION, OR FAULTY ELECTRONIC IGNITION CONTROL MODULE (ICM).

YES

• PROBE PCM HARNESS CONNECTOR CKT 424 WITH A TEST LIGHT TO BATTERY VOLTAGE AND OBSERVE LIGHT.

LIGHT "ON" → DISCONNECT IGNITION CONTROL MODULE 6 PIN CONNECTOR.

- **LIGHT "ON"** → CKT 424 SHORTED TO GROUND.
- **LIGHT "OFF"** → REPLACE IGNITION CONTROL MODULE.

LIGHT "OFF"

3. • WITH OHMMETER STILL CONNECTED TO PCM HARNESS CKT 423 AND GROUND AS DESCRIBED IN STEP #2, AGAIN PROBE PCM HARNESS CKT 424 WITH THE TEST LIGHT CONNECTED TO BATTERY VOLTAGE. AS TEST LIGHT CONTACTS CKT 424, RESISTANCE SHOULD SWITCH FROM HUNDREDS TO THOUSANDS OHMS.
   DOES IT?

YES

5. • RECONNECT PCM AND IDLE ENGINE FOR ONE MINUTE OR UNTIL DTC 42 SETS.
   DOES DTC 42 SET?

- **YES** → REPLACE PCM.
- **NO** → DTC 42 INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

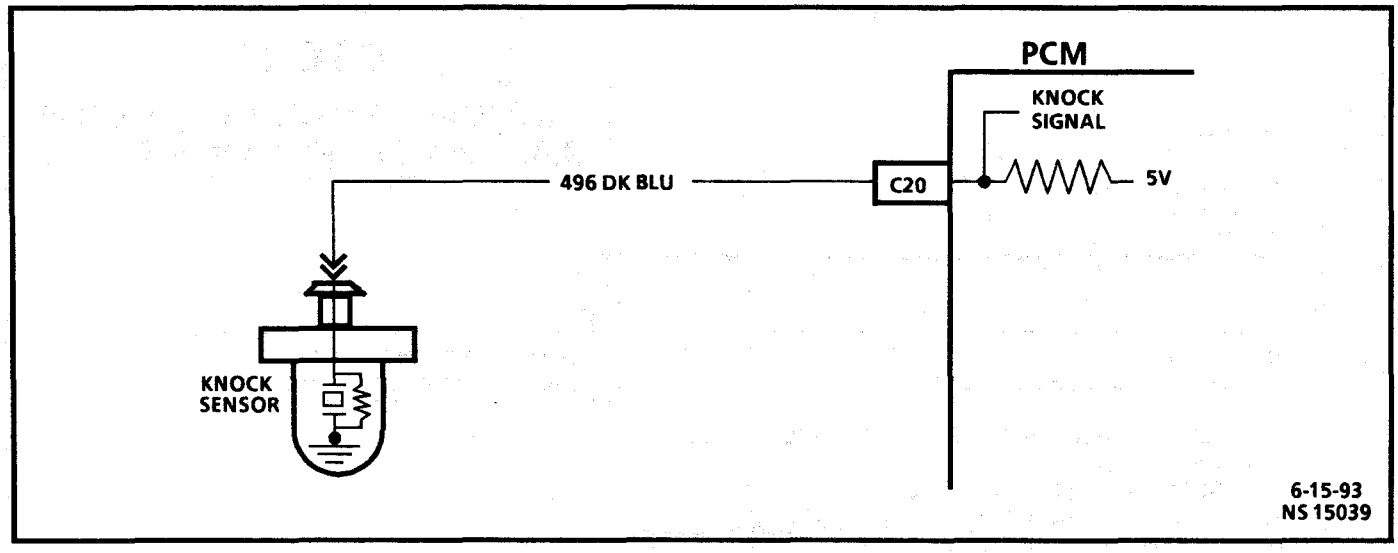
NO

4. • DISCONNECT IGNITION CONTROL MODULE 6 PIN CONNECTOR. NOTE OHMMETER THAT IS STILL CONNECTED TO CKT 423 AND GROUND. RESISTANCE SHOULD HAVE BECOME VERY HIGH (OPEN CIRCUIT).
   DOES IT?

- **YES** → CKT 424 OPEN, FAULTY CONNECTIONS, OR FAULTY IGNITION CONTROL MODULE.
- **NO** → CKT 423 SHORTED TO GROUND.

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

6-16-93
NS 15395



DTC 43

KNOCK SENSOR (KS) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Knock Sensor (KS) is used to detect engine detonation. The PCM receives the knock sensor signal and will retard Ignition Control (IC) timing until knock is not detected.

The circuitry within the KS will drop approximately half of the 5 volts applied to the sensor on CKT 496. When engine detonation occurs, the sensor produces an A/C signal which rides on the 2.5 volt DC signal. The voltage amplitude and frequency is dependent upon the knock level emitted from the engine combustion process.

DTC 43 Will Set When: The PCM detects above 4-6 volts or below .89 volt for 10 seconds, engine coolant temperature is over 90°C (194°F), IAT temperature is over 0°C (32°F), high engine load based on air flow and RPM between 3400 and 4400. This test will be performed continuously when all these conditions are met.

Action Taken (PCM will default to): The MIL will become illuminated. Knock retard will be fixed at 15° of timing retard.

DTC 43 Will Clear When: A current DTC 43 will clear when the PCM senses the signal voltage level between .89 and 4.6 volts. A history DTC 43 will clear after 50 consecutive ignition key cycles without a current DTC being stored.

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

1. If the conditions for DTC 43, as described above, are being met, the Tech 1 scan tool will always indicate "YES" when the knock signal position is selected. If an audible knock is heard from the engine, repair the internal engine problem, as normally no knock should be detected at idle.
2. The PCM applies a 5 volt signal to the sensor on CKT 496.

Diagnostic Aids: Check CKT 496 for a potential open or short to ground.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

If the customer's complaint is the MIL (Service Engine Soon) comes "ON" when in acceleration. There is a possibility that the electronic ignition system was in bypass mode when the DTC 43 test was run. An intermittent open in the IC circuit will put the ignition control module in bypass which will not allow the spark to be advanced so the DTC 43 test would fail. If the PCM also had a DTC 42 stored, then the IC circuit is likely the cause of the DTC 43.

DTC 43

KNOCK SENSOR (KS) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

1. • INSTALL TECH 1.
   • ENGINE IDLING, ENGINE COOLANT TEMP ABOVE 67°C.
   DOES TECH 1 INDICATE A FIXED VALUE OF KNOCK RETARD BETWEEN 4 AND 20 DEGREES?

YES

2. • DISCONNECT KNOCK SENSOR.
   • IGNITION "ON."
   • USING A DVM, MEASURE VOLTAGE BETWEEN HARNESS CKT 496 AND GROUND.
   VOLTAGE SHOULD BE 4-6 VOLTS.
   IS IT?

YES

• MEASURE RESISTANCE OF KNOCK SENSOR BY CONNECTING OHMMETER BETWEEN SENSOR TERMINAL AND ENGINE BLOCK.
SHOULD BE BETWEEN 3.3kΩ AND 4.5kΩ.
IS IT?

YES

• CHECK HARNESS AND SENSOR CONNECTOR.
IF OK:
• REMOVE PCM AND BE SURE KS MODULE IS PROPERLY SEATED INTO PCM.
IF OK:
• REPLACE MODULE.

NO

REMOVE KNOCK SENSOR AND ENSURE THAT THREADS ON SENSOR AND BLOCK ARE CLEAN AND FREE OF CORROSION, TEFLON TAPE, ANTI-SEIZE COMPOUNDS, OR SEALANTS. IF OK, REPLACE FAULTY KNOCK SENSOR.

NO

OVER 6 VOLTS

CHECK FOR CKT 496 BEING ROUTED TOO CLOSE TO SECONDARY IGNITION WIRES
OR
CKT 496 SHORTED TO VOLTAGE
OR
FAULTY PCM.

LESS THAN 4 VOLTS

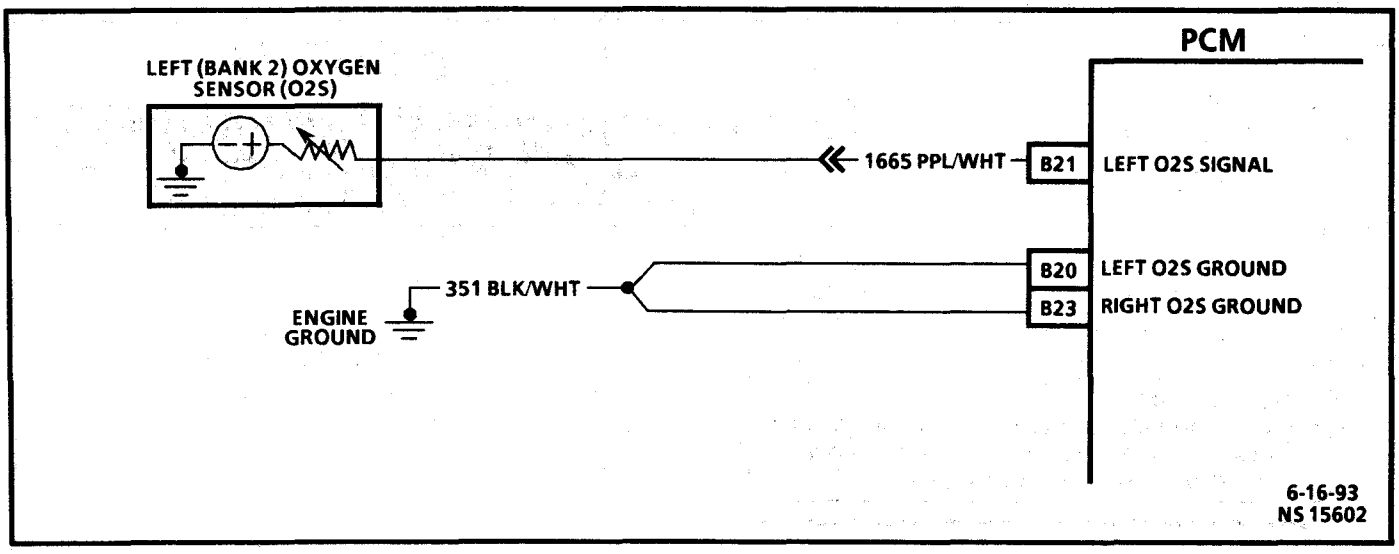
CKT 496 OPEN,
SHORTED TO GROUND
OR
FAULTY PCM.

NO

DTC 43 IS INTERMITTENT. SEE "DIAGNOSTIC AIDS" ON FACING PAGE.

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

3-9-93
NS 15640



DTC 44

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT
(LEAN EXHAUST INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Powertrain Control Module (PCM) supplies a voltage of about .45 volt between terminals "B21" and "B20". (If measured with a 10 megohm digital voltmeter, this may read as low as .32 volt.)

When the O2S reaches operating temperature, it varies this voltage from about 100 millivolts (exhaust is lean) to about 900 millivolts (exhaust is rich).

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open sensor circuit, or cold sensor, causes "Open Loop" operation.

DTC 44 Will Set When: Vehicle is operating in "Closed Loop" and CKT 1665 is below 280 millivolts for greater than 60 seconds.

Action Taken (PCM will default to): Vehicle will operate in "Open Loop" and MIL will become illuminated.

DTC 44 Will Clear When: A current DTC 44 will clear when the O2S voltage rises above the calibrated lean exhaust voltage threshold. A history DTC 44 will clear after 50 consecutive ignition key cycles without a current DTC 44 being stored.

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

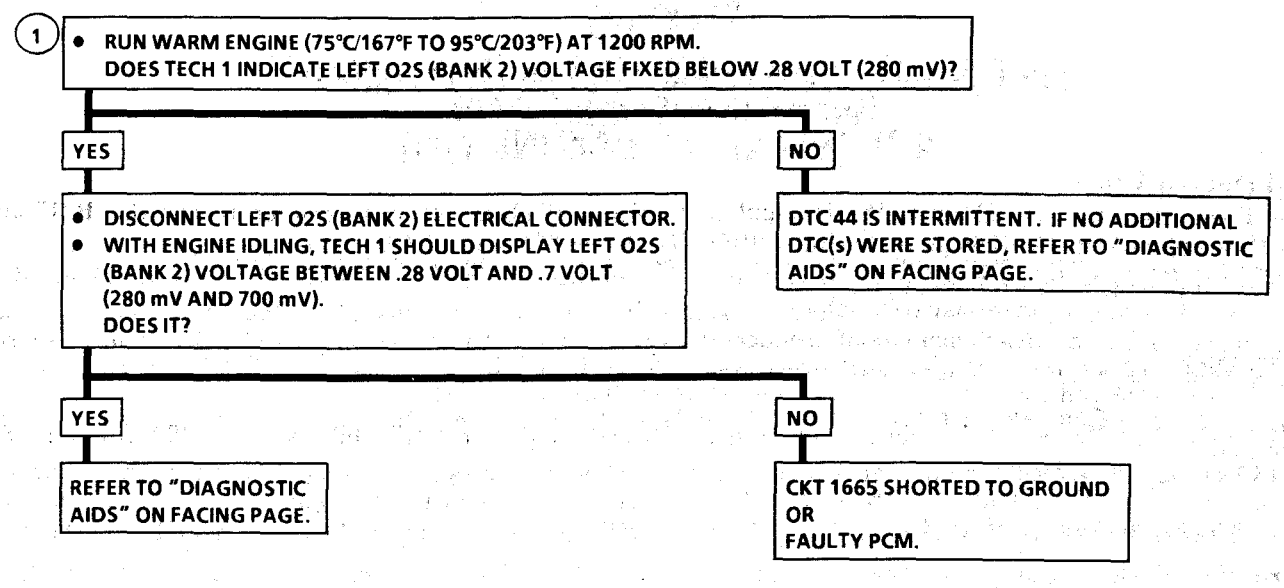
1. The engine must be operating in "Closed Loop" to store DTC 44.

Diagnostic Aids: Using the Tech 1 scan tool, observe the long term fuel trim at different RPM and air flow conditions. The Tech 1 scan tool 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 44 may have been set. If the conditions for DTC 44 exist, the long term fuel trim values will be around 150.

- O2S wire. Sensor pigtail may be mispositioned and contacting the exhaust manifold.
- Check for intermittent ground in wire between connector and sensor.
- Lean injector(s). Perform "Injector/Coil Balance Test," CHART C-2A.
- Fuel contamination. Water, even in small amounts, near the in-tank fuel pump inlet can be delivered to the injectors. The water causes a lean O2S signal and can set a DTC 44.
- Fuel pressure. System will be lean if pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm correct fuel pressures. Refer to "Fuel System Diagnosis," CHART A-7.
- Exhaust leaks. If there is an exhaust leak, the engine can cause outside air to be pulled into the exhaust and past the sensor. Vacuum or crankcase leaks can cause a lean condition.
- If the above are OK, it is a faulty Oxygen Sensor (O2S).

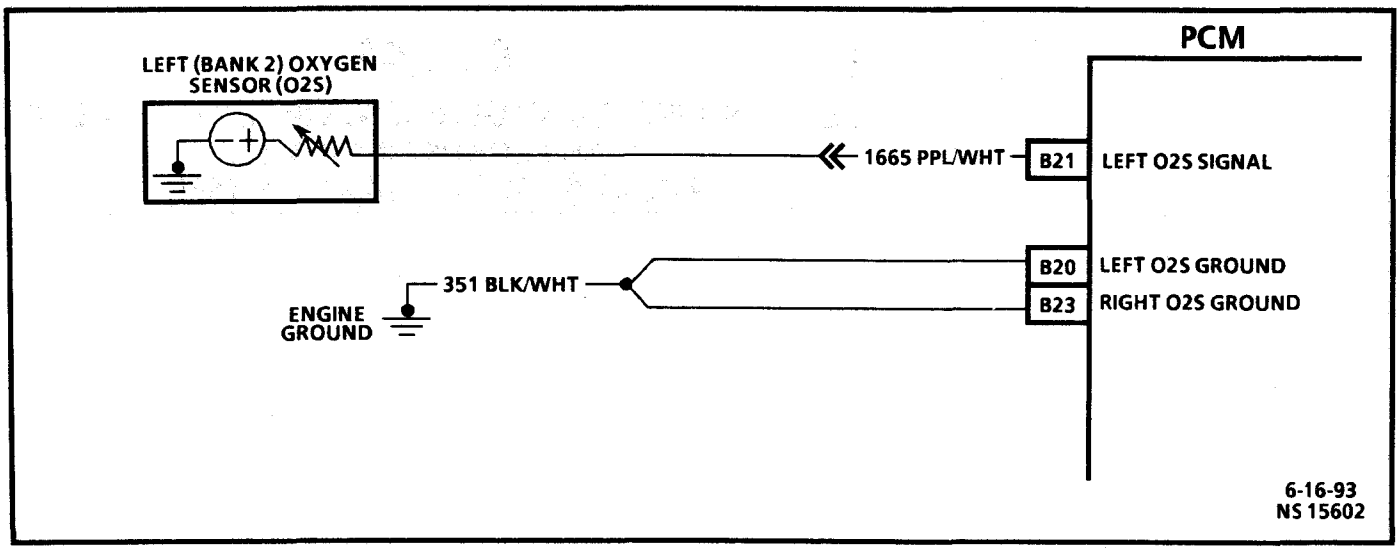
DTC 44

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT
(LEAN EXHAUST INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15620



DTC 45

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT
(RICH EXHAUST INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Powertrain Control Module (PCM) supplies a voltage of about .45 volt between terminals "B21" and "B20". (If measured with a 10 megohm digital voltmeter, this may read as low as .32 volt.)

When the O2S reaches operating temperature, it varies this voltage from about 100 millivolts (exhaust is lean) to about 900 millivolts (exhaust is rich).

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open sensor circuit, or cold sensor, causes "Open Loop" operation.

DTC 45 Will Set When: Vehicle is operating in "Closed Loop," CKT 1665 is above 750 millivolts, throttle angle is between 6% and 20%, condition present for greater than 60 seconds.

Action Taken (PCM will default to): Vehicle will operate in "Open Loop" and MIL will become illuminated.

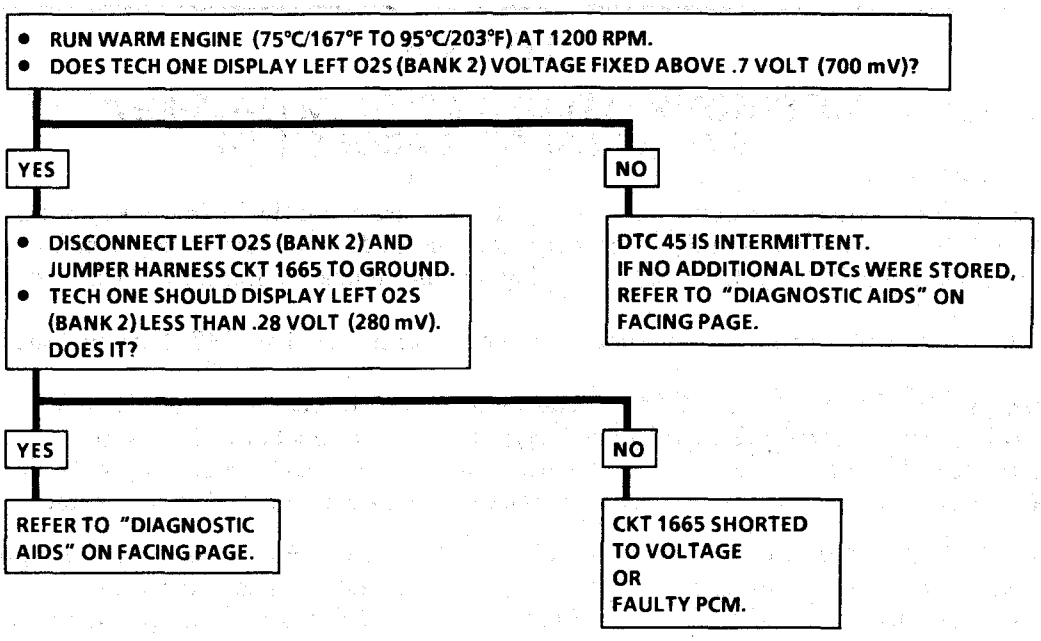
DTC 45 Will Clear When: A current DTC 45 will clear when the O2S signal voltage falls below the calibrated rich exhaust voltage threshold. A history DTC 45 will clear after 50 consecutive ignition key cycles without a current DTC 45 being stored.

Diagnostic Aids: Using the Tech 1 scan tool, observe the long term fuel trim values at different RPM and air flow conditions. The Tech 1 scan tool 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 around 115.

- 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/Coil Balance Test," CHART C-2A.
- Leaking injector. Refer to CHART A-7.
- Crankcase oil. Check for fuel contaminated oil.
- O2S contamination. Inspect Oxygen Sensor (O2S) for silicone contamination from fuel, or use of improper RTV sealant. The sensor may have a white, powdery coating and result in a high but false signal voltage (rich O2S signal indication). The PCM will then reduce the amount of fuel delivered to the engine, causing a severe surge driveability problem.
- An open ground CKT 351 - May result in EMI, or induced electrical "noise." The PCM looks at this "noise" as reference pulses. The additional pulses result in a higher than actual engine speed signal. The PCM then delivers too much fuel, causing system to go rich. Engine tachometer will also show higher than actual engine speed, which can help in diagnosing this problem.
- EVAP canister purge. Check for fuel saturation. If full of fuel, check canister control and hoses. Refer to "Evaporative Emission Control System," Section "6E3-C3".
- Check for leaking fuel pressure regulator diaphragm by checking vacuum line to regulator for fuel.
- Throttle Position (TP) sensor. An intermittent Throttle Position (TP) sensor output will cause the system to go rich, due to a false indication of the engine accelerating.
- EGR. An EGR staying open (especially at idle) will cause the Oxygen Sensor (O2S) to indicate a rich O2S signal and this could result in a DTC 45.
- MAP sensor - An output that causes the PCM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the Manifold Absolute Pressure (MAP) sensor will allow the PCM to set a fixed value for the MAP sensor. Substitute a different MAP sensor if the rich condition is gone, while the sensor is disconnected.

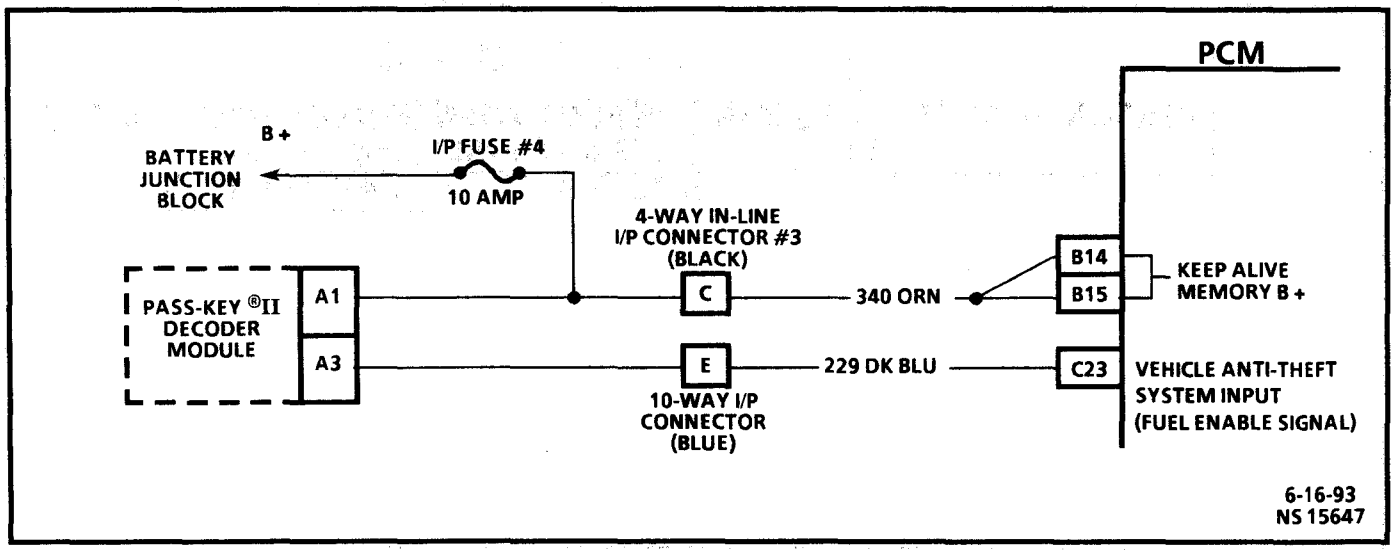
DTC 45

LEFT (BANK 2) OXYGEN SENSOR (O2S) CIRCUIT
(RICH EXHAUST INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)



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

7-2-93
NS 15621



DTC 46

PERSONAL AUTOMOTIVE SECURITY SYSTEM (PASS-Key®II) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PASS-Key®II system is designed to disable vehicle operation if the incorrect key or starting procedure is used. The PASS-Key®II decoder module sends a signal to the PCM if the correct key is being used. If the proper signal does not reach the PCM on CKT 229, the PCM will not pulse the injectors "ON" and thus not allow the vehicle to be started.

DTC 46 Will Set When: The PCM does not receive the proper signal on CKT 229 when the ignition is turned "ON."

Action Taken (PCM will default to): The malfunction indicator lamp will not be illuminated. A PASS-Key®II fault will be stored in the PCM memory; engine will crank but will not start.

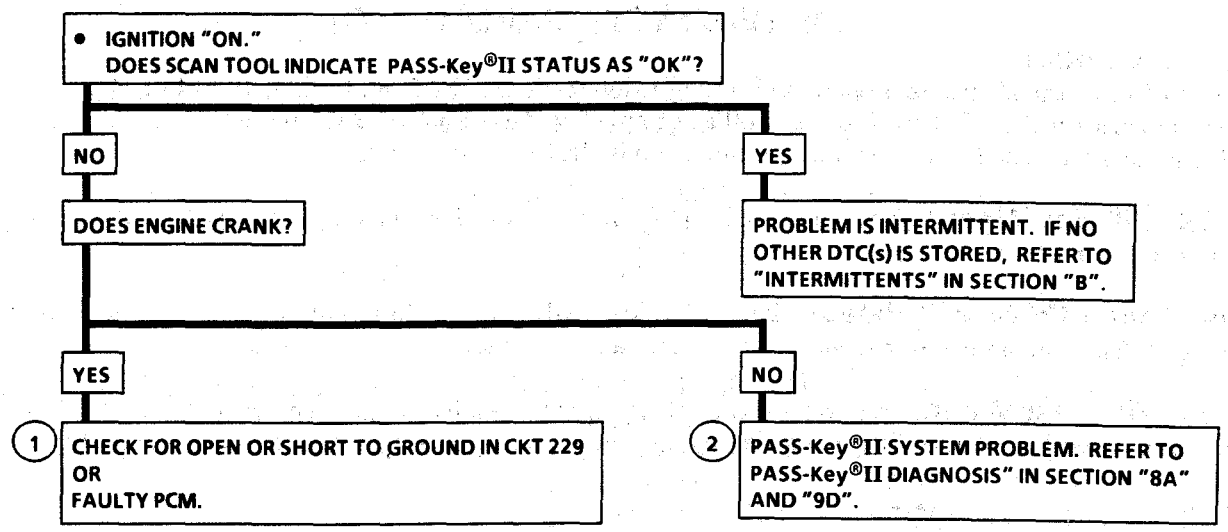
DTC 46 Will Clear When: A current DTC 46 will clear when the PCM receives a proper signal on CKT 229, a history DTC 46 will clear after 50 consecutive key cycles without a current DTC 46 being stored.

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

1. If the engine cranks, but doesn't start. It indicates that the portion of the module which generates the signal to the PCM is not operating or CKT 229 is open or shorted to ground. If the decoder module is found to be OK, as determined from SECTION 8A, the PCM may be at fault, but this is not a likely condition.
2. If DTC 46 is stored, and the engine will not crank, it indicates that there is a PASS-Key®II problem or an incorrect key or starting procedure is being used.

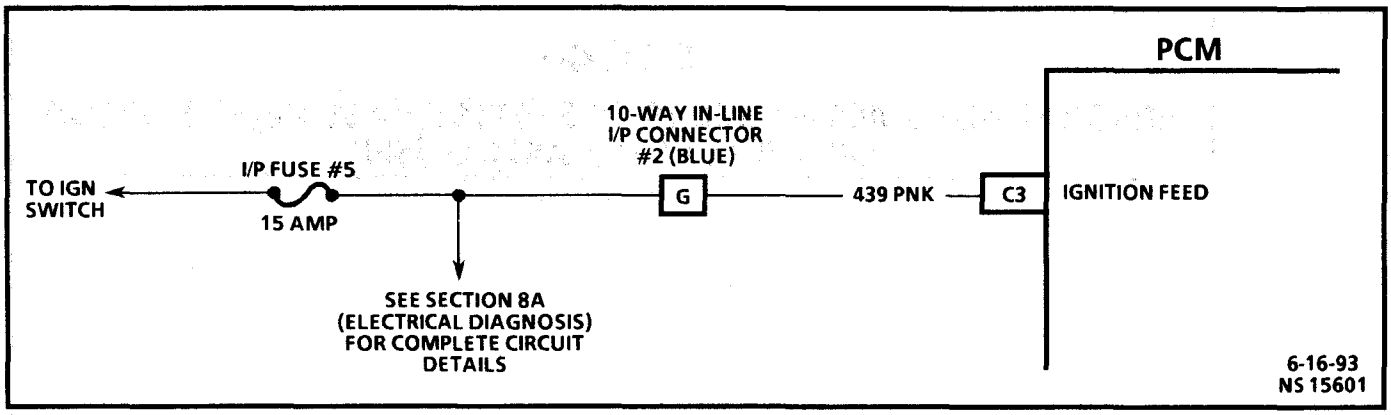
DTC 46

PERSONAL AUTOMOTIVE SECURITY SYSTEM (PASS-Key®II) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)



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

5-13-93
PS 17827



DTC 53

SYSTEM VOLTAGE OVERCHARGE
(HIGH BATTERY VOLTAGE)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM has the ability to determine if the ignition feed circuit has more than 16.5 volts applied to it. This feature is to protect the PCM circuitry as well as components that have voltage applied to them by the PCM. The circuit that is monitored for an over voltage condition is CKT 439 (ignition feed).

DTC 53 Will Set When: The ignition is "ON" and the PCM is sensing greater than 16.5 volts at PCM terminal "C3" for 10 seconds.

Action Taken (PCM will default to): The MIL will become illuminated and all PCM outputs will be disengaged. The transmission will default to 3rd gear and have maximum line pressure.

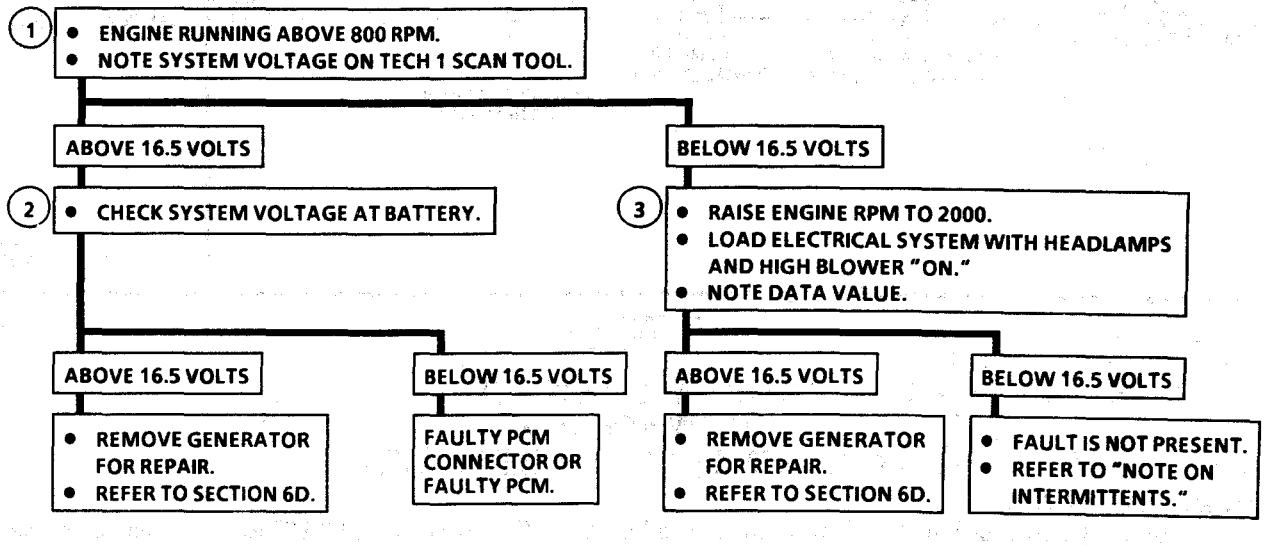
DTC 53 Will Clear When: A current DTC 53 will clear when battery voltage is sensed below 16.5 volts. A history DTC 53 will clear after 50 consecutive ignition key cycles without a current DTC 53 being stored.

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

1. Normal battery output is between 10 - 16.5 volts.
2. Checks to see if the high voltage reading is due to the generator or PCM. With engine running, check voltage at the battery with a DVM. If the voltage is above 12.1 volts, the PCM is OK.
3. Checks to see if generator is faulty under load condition. If the voltage is above 16.5 volts, refer to SECTION 6D.

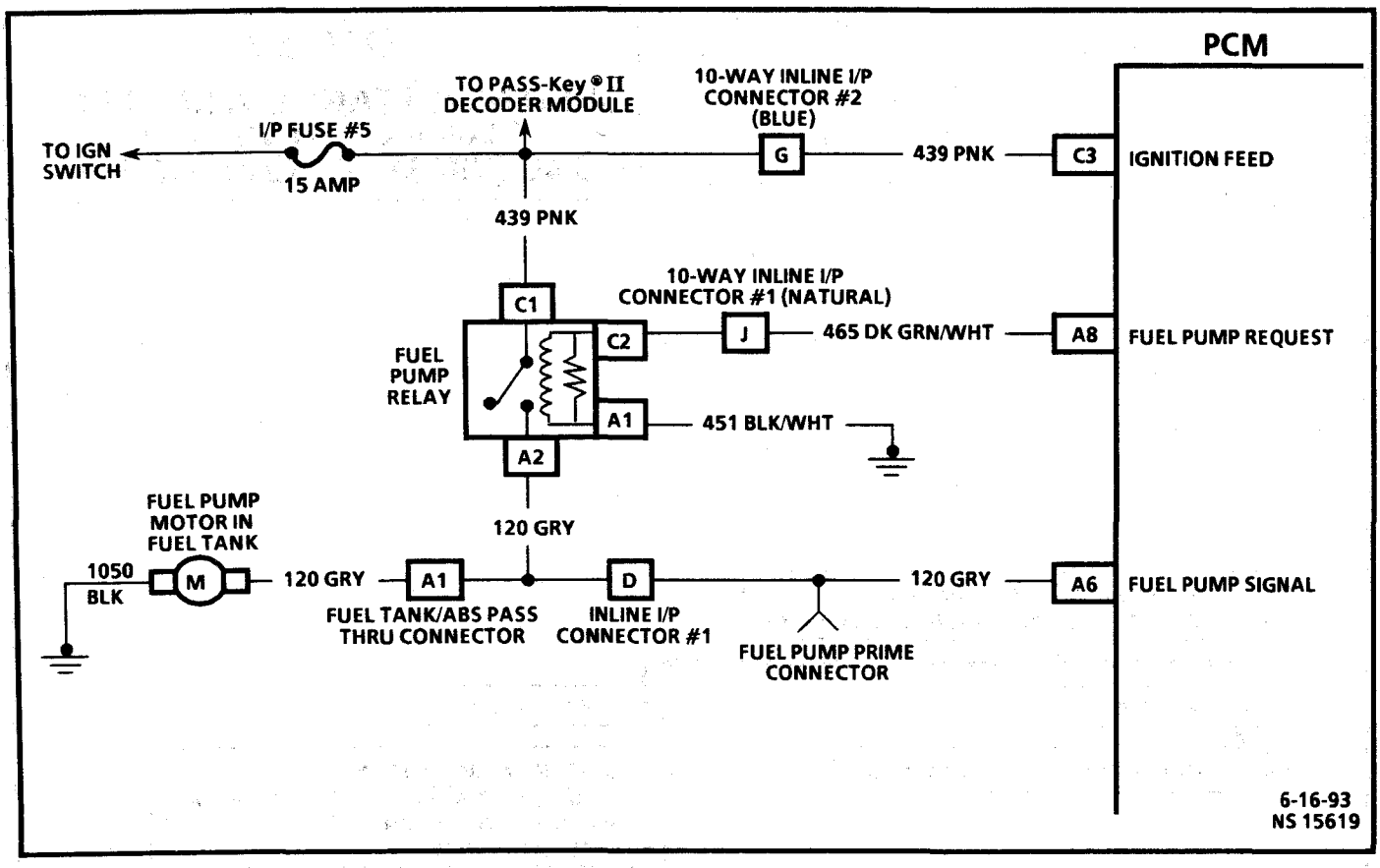
DTC 53

SYSTEM VOLTAGE OVERCHARGE (HIGH BATTERY VOLTAGE) 3.4L (VIN S) "F" CARLINE (SFI)



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

3-9-93
NS 15042



DTC 54

FUEL PUMP CIRCUIT (LOW VOLTAGE) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The status of the fuel pump CKT 120 is monitored by the PCM at terminal "A6" and is used to compensate fuel delivery based on system voltage. This signal is also used to store a diagnostic trouble code if the fuel pump relay is defective or fuel pump voltage is lost while the engine is running. There should be about 12 volts on CKT 120 for 2 seconds after the ignition is turned "ON," or any time reference pulses are being received by the PCM.

This DTC is designed to detect a faulty relay causing extended crank time and the DTC will help the diagnosis of an engine that "Cranks But Will Not Run."

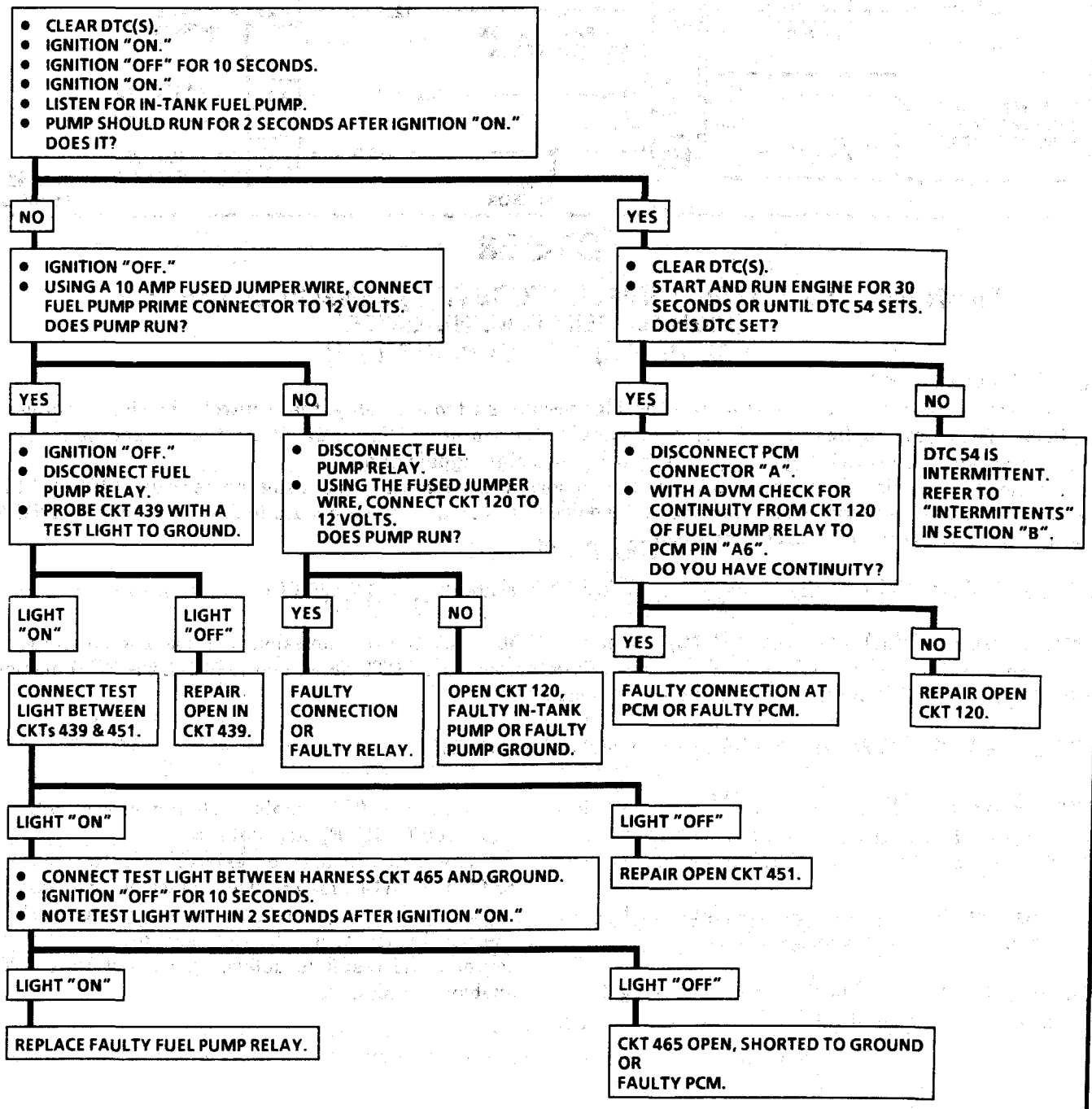
DTC 54 Will Set When: Voltage at terminal "A6" is less than 7 volts for .3 second since the last reference pulse was received.

Action Taken (PCM will default to): If a fault is detected during start-up, the MIL will become illuminated until the ignition is cycled "OFF." If the voltage is detected below 7 volts with the engine running, the light will remain "ON" while the condition exists.

DTC Will Clear When: A current DTC 54 will clear when voltage at the fuel pump monitor is sensed within the calibrated voltage threshold. A history DTC 54 will clear after 50 consecutive ignition key cycles without a current DTC 54 being stored.

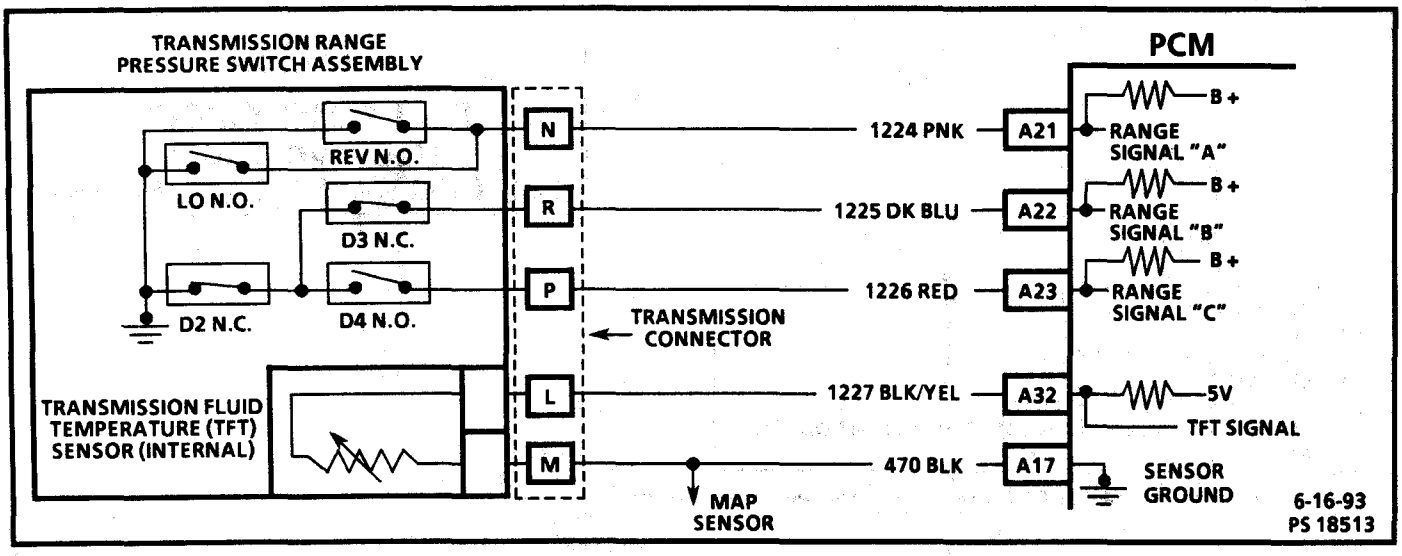
DTC 54

FUEL PUMP CIRCUIT (LOW VOLTAGE) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15623



DTC 58

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT LOW
(HIGH TEMPERATURE INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TFT sensor is a thermistor within the TR pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage.

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts. With a DTC 79 also set, check the transmission cooling system.

DTC 58 Will Set When: Signal voltage indicates TFT greater than 151°C (306°F) for at least 1 second.

Action Taken (PCM will default to): When DTC 58 is set, the transmission will use a warm value for operation, but the scan tool will display the actual fluid temperature. DTC 58 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 58 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for a short to ground or a skewed sensor.
2. This test checks for an internal fault within the transmission by creating an open.

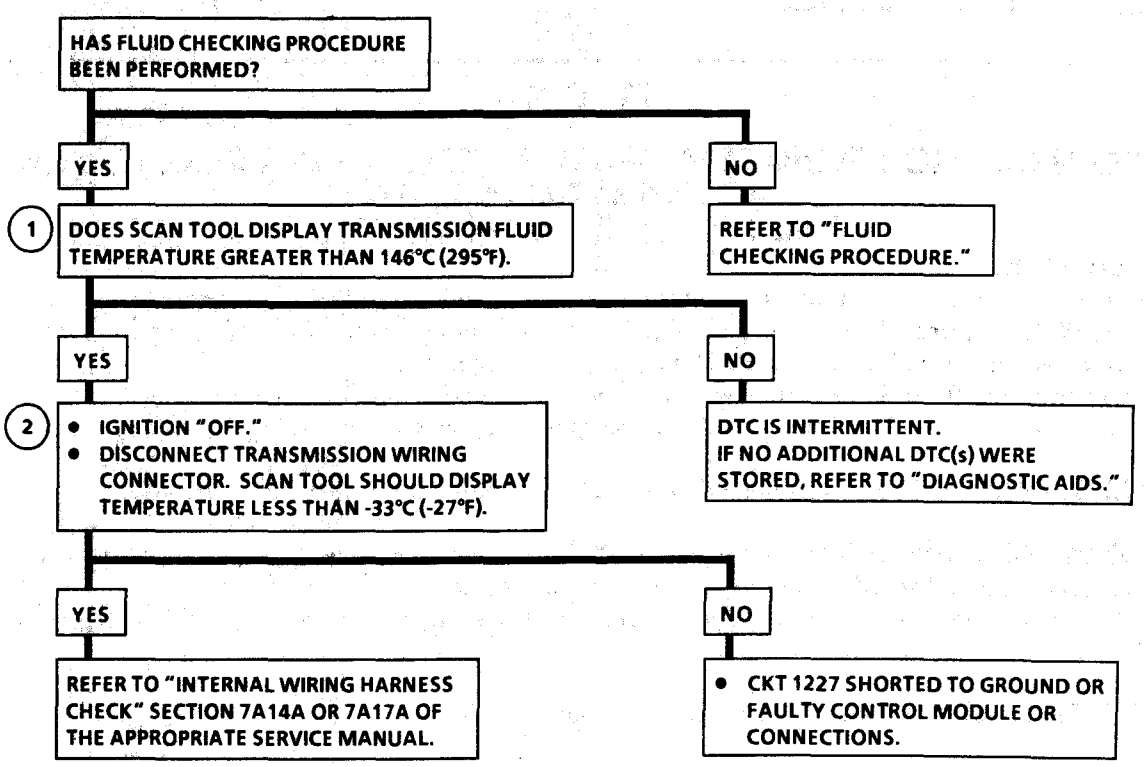
Diagnostic Aids: Check harness routing for a potential short to ground in CKT 1227.

Scan tool TFT displays should rise steadily to about 100°C (212°F) then stabilize.

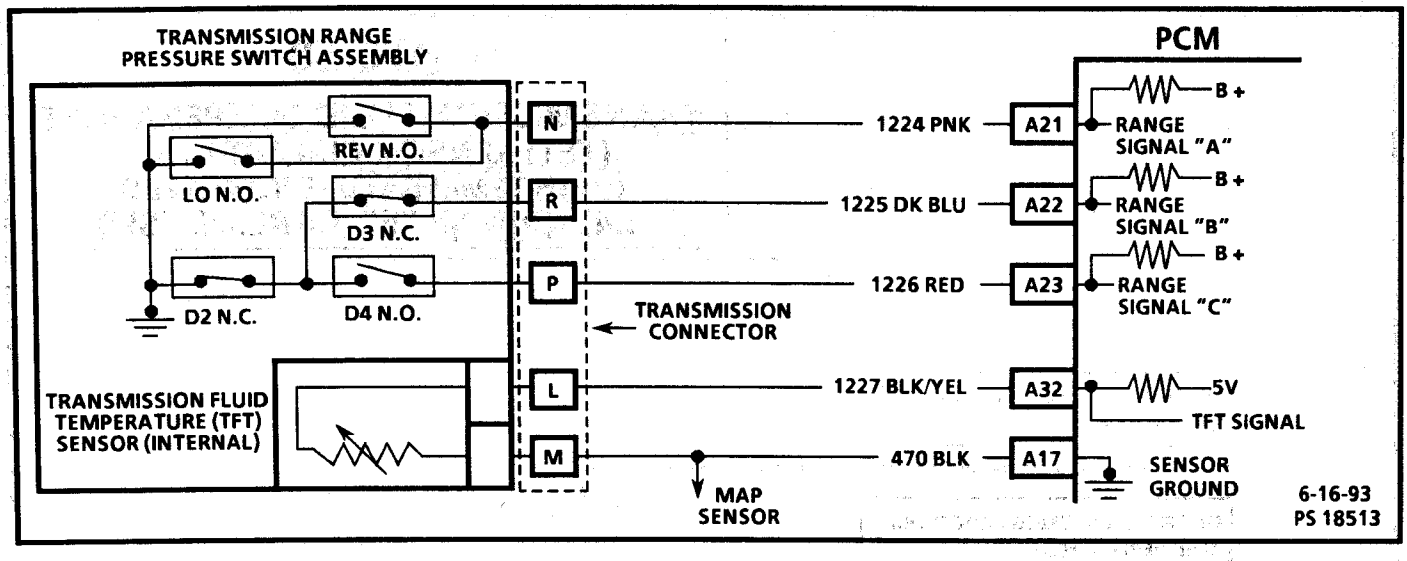
The temperature to resistance value scale in SECTION 7A14A may be used to test the transmission sensor at the various temperature levels to evaluate the possibility of a "skewed" sensor. A "skewed" sensor could result in delayed garage shifts or TCC enabled complaints.

DTC 58

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT LOW (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)



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



DTC 59

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT HIGH
(LOW TEMPERATURE INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TFT sensor is a thermistor within the fluid pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage.

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts.

DTC 59 Will Set When: Signal voltage indicates TFT less than -40°C (-40°F), for 1 second.

Action Taken (PCM will default to): When DTC 59 is set, the transmission will use a warm value for operation, but, the scan tool will display the actual fluid temperature.

When DTC is set, the TCC may not apply properly. DTC 59 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 59 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for a skewed sensor.
2. This test simulates a DTC 58. If the PCM recognizes the low signal voltage (high temperature), and the scan displays 146°C (295°F) or greater, the PCM and wiring are OK.
3. This test checks if CKT 1227 is open. There should be 5 volts present at the sensor connector if measured with J 39200.

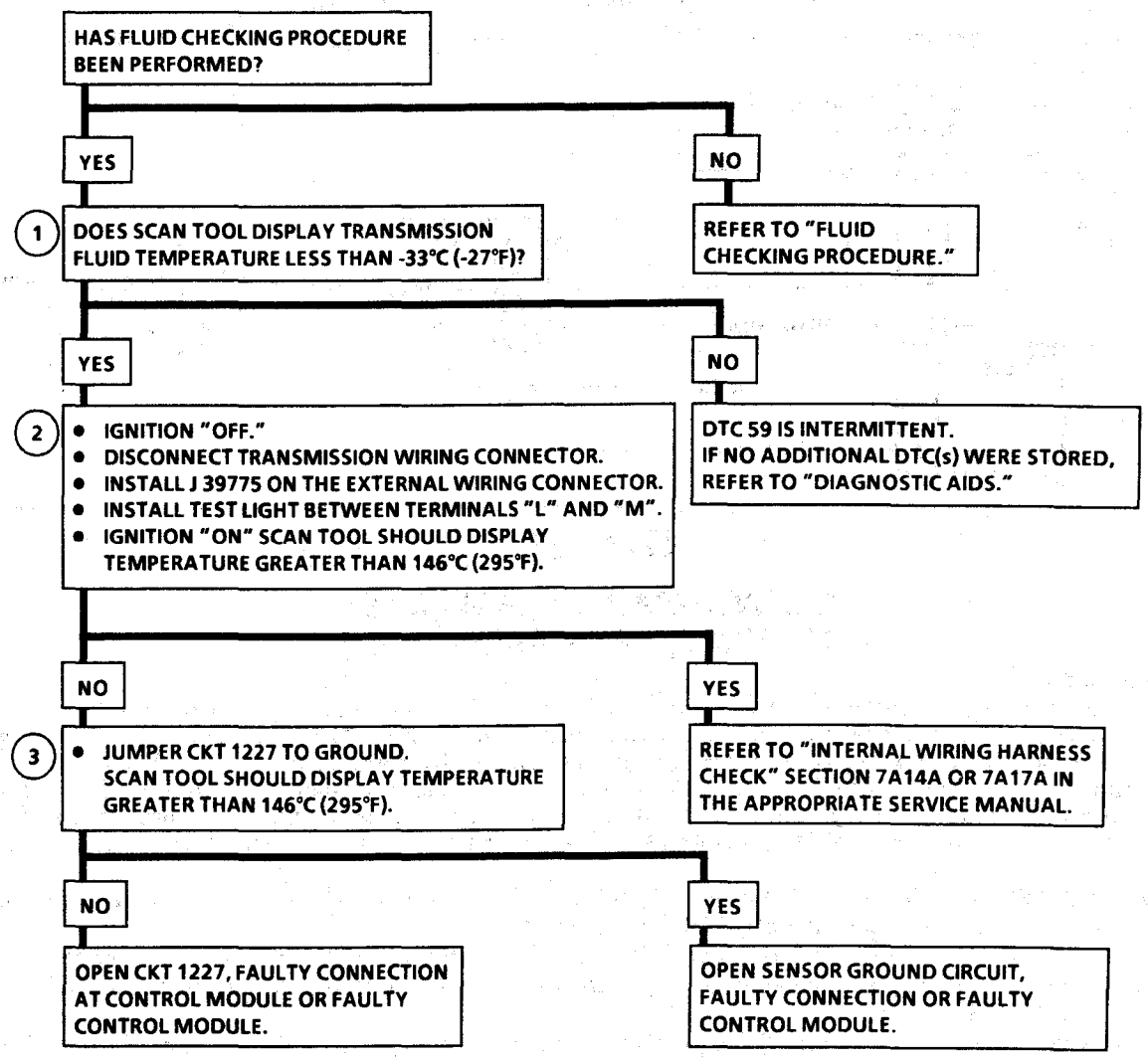
Diagnostic Aids: Scan tool displays fluid transmission temperature in degrees. After transmission is operating, the temperature should rise steadily to about 100°C (212°F) then stabilize.

A faulty connection or an open in CKT 455 or CKT 1227 can result in a DTC 59.

The "Temperature to Resistance Value" scale in SECTION 7A14A may be used to check the TFT sensor at various temperature levels to evaluate the possibility of a "skewed" (mis-scaled) sensor. A "skewed" sensor can result in firm shifts, or TCC enabled.

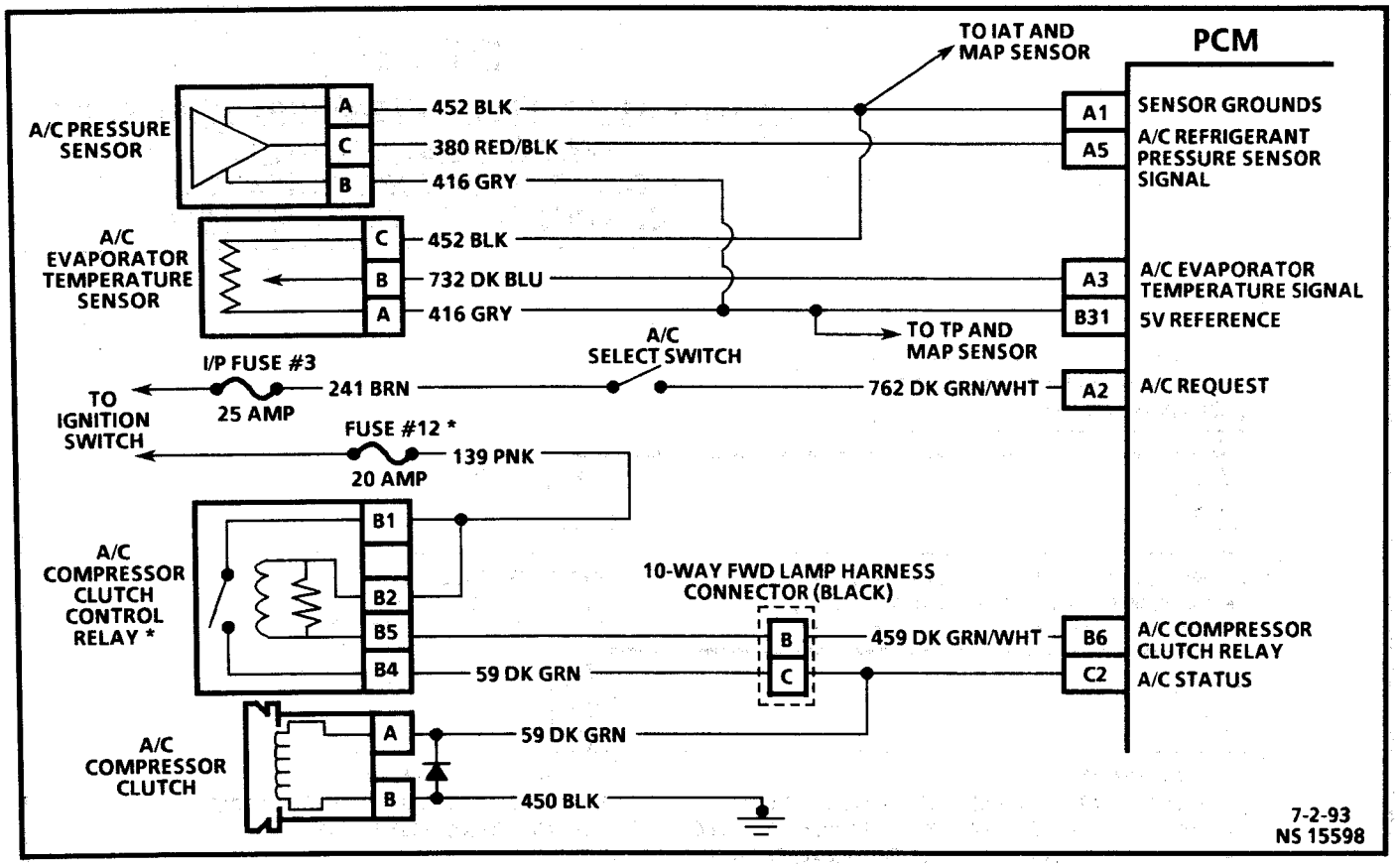
DTC 59

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT HIGH (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)



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

1-25-93
MS 13451



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 61

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

THIS CHART ASSUMES THAT THE A/C SENSORS, CLUTCH CONTROL AND RELAYS ARE FUNCTIONING PROPERLY. IF ANY OF THE ABOVE IS NOT "OK," REFER TO THE APPROPRIATE CHARTS FOR PROPER DIAGNOSIS.

(1)
- IGNITION "OFF," ENGINE "OFF," A/C "OFF."
- INSTALL TECH 1 SCAN TOOL.
- IGNITION "ON," ENGINE IDLING.
- TURN A/C "ON."
- ROAD TEST VEHICLE .

DOES DTC 61 OR ANY OTHER A/C DTCs SET?

YES

REPAIR ALL OTHER A/C DTCs BEFORE CONTINUING

- ENGINE "OFF."
- INSTALL A/C MANIFOLD GAGE SET. (SEE SECTION 1B FOR PROPER INSTALLATION INSTRUCTIONS AND A/C PRESSURE SPECIFICATIONS.)
- IGNITION "ON," ENGINE IDLING, A/C "OFF."
- IS A/C REFRIGERANT PRESSURE WITHIN SPECIFICATION LISTED IN 1B?

YES

(2)
- SCAN A/C PRESSURE USING TECH 1.
- ARE TECH 1 SCAN TOOL PRESSURES WITHIN 20 LBS OF HIGH SIDE GAGE PRESSURE?

YES

- SCAN A/C EVAPORATOR TEMPERATURE USING TECH 1.
- A/C CLUTCH SHOULD ENGAGE WHEN EVAPORATOR TEMPERATURE IS GREATER THAN 39° F AND DISENGAGE WHEN TEMPERATURE IS LESS THAN 36° F.

DOES IT?

YES

(3) REFER TO A/C SECTION 1B1 AND PERFORM A/C PERFORMANCE TEST.

NO

DTC 61 IS INTERMITTENT, REFER TO SECTION 1B1 FOR FURTHER SYSTEM DIAGNOSIS.

NO

SEE SECTION 1B FOR PROPER RECHARGING PROCEDURES.

NO

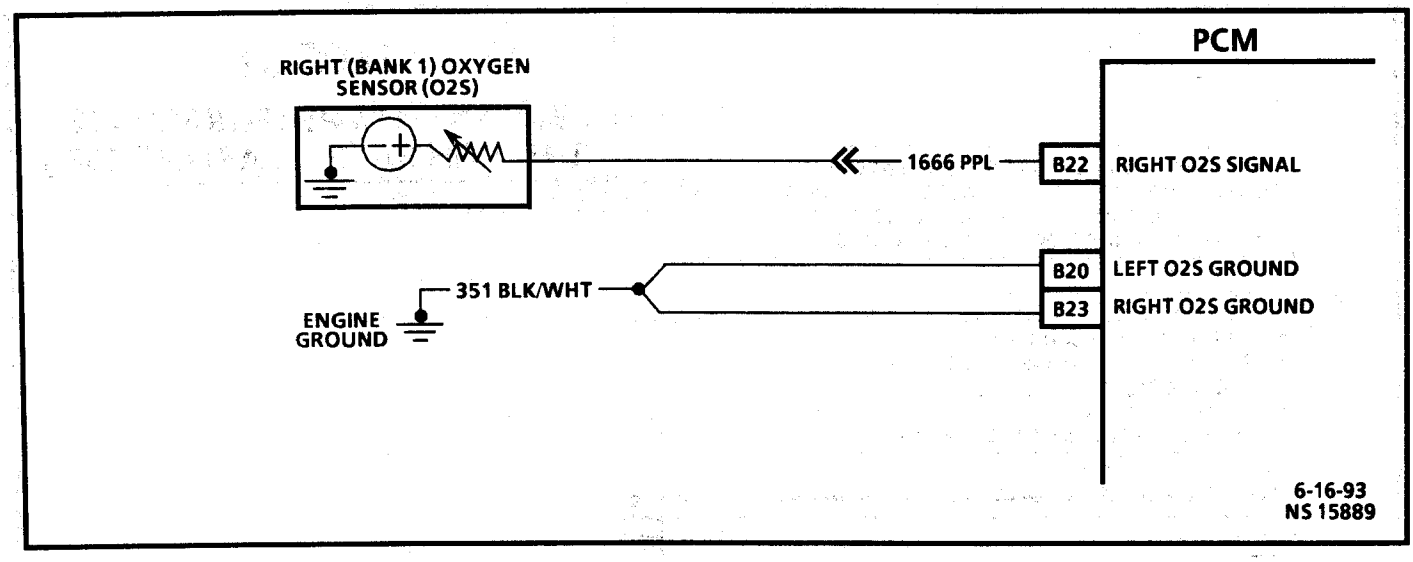
CHECK SENSOR CONNECTIONS. IF OK, REPLACE A/C REFRIGERANT PRESSURE SENSOR.

NO

LOW A/C REFRIGERANT CHARGE
OR
FAULTY A/C EVAPORATOR TEMPERATURE SENSOR CONNECTION
OR
FAULTY A/C EVAPORATOR TEMPERATURE SENSOR
OR
A/C EVAP TEMPERATURE SENSOR IN IMPROPER LOCATION.

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

12-8-92
NS 16211



DTC 63

RIGHT (BANK 1) OXYGEN SENSOR (O2S) CIRCUIT (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM supplies a voltage of about .55 volt between terminals "B22" and "B23". (If measured with a 10 megohm digital voltmeter, this may read as low as .35 volt.) The Oxygen Sensor (O2S) varies the voltage within a range of about 1 volt. If the right (Bank 1) exhaust is rich, the O2S will display close to 1000 millivolts and when the exhaust is lean the O2S will display close to 100 millivolts.

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open O2S circuit or cold O2S causes "Open Loop" operation.

DTC 63 Will Set When: Vehicle is operating in "Closed Loop," engine coolant temperature greater than 85°C (185°F), CKT 1666 voltage steady between 350 millivolts and 550 millivolts, throttle angle greater than 3% with all conditions met and held for 30 seconds.

Action Taken (PCM will default to): Vehicle will operate in "Open Loop" and MIL will become illuminated.

DTC 63 Will Clear When: A current DTC 63 will clear when the O2S voltage falls out of the 350 to 550 millivolt range. A history DTC 63 will clear after 50 consecutive ignition key cycles without a current DTC 63 being stored.

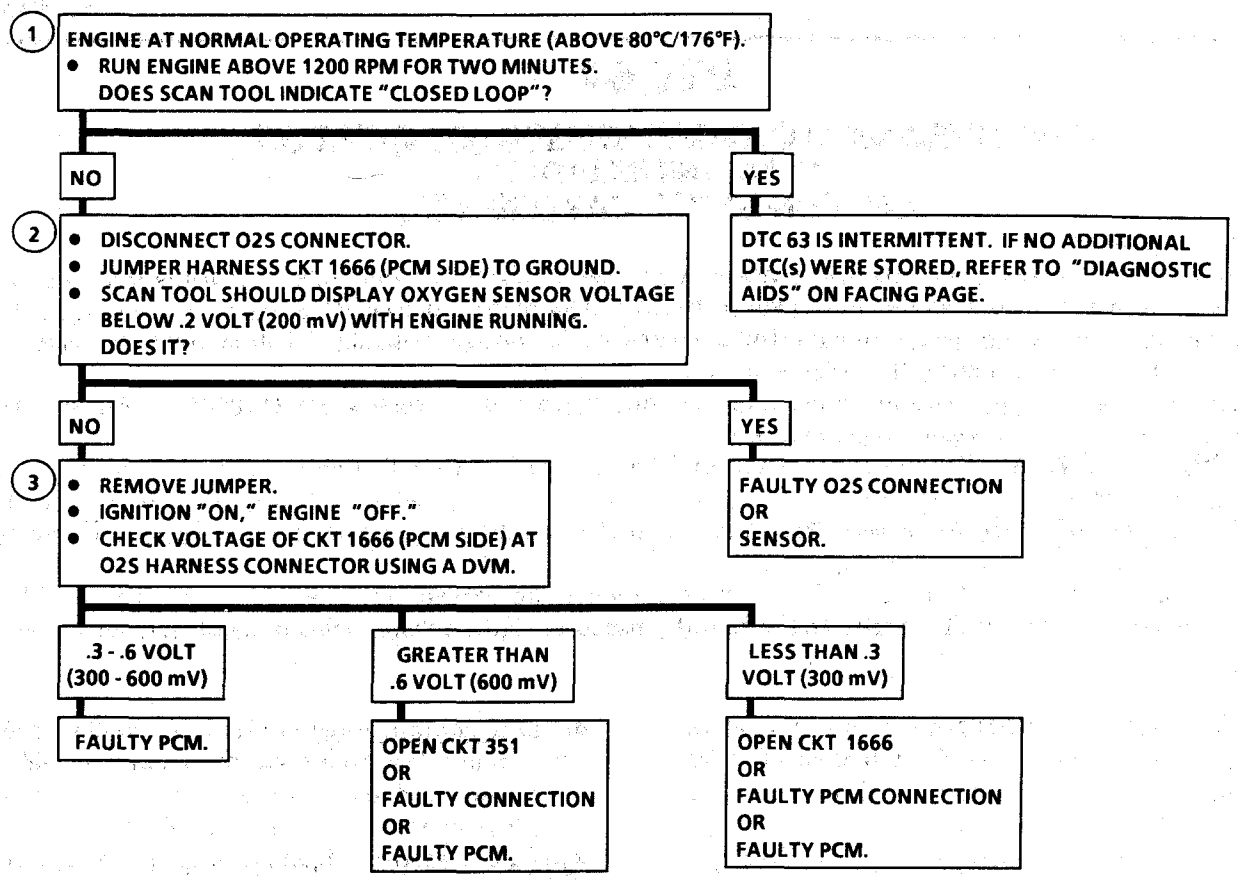
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the conditions for a DTC 63 exist, the system will not go "Closed Loop."
2. This will determine if the sensor is a fault or the wiring or PCM is the cause of the DTC 63.
3. In doing this test use only a high impedance digital volt ohmmeter. This test checks the continuity of CKT 1666 and CKT 351 because if CKT 351 is open, the PCM voltage on CKT 1666 will be greater than .6 volt (600 mV).

Diagnostic Aids: Normal Tech 1 scan voltage varies between 100 mV 999 mV (.1 and 1.0 volt) while in "Closed Loop." DTC 63 sets if voltage remains between 350 millivolts and 550 millivolts, but the system will go "Open Loop" in about 15 seconds. Refer to "Intermittents" in "Symptoms," Section "6E3-B".

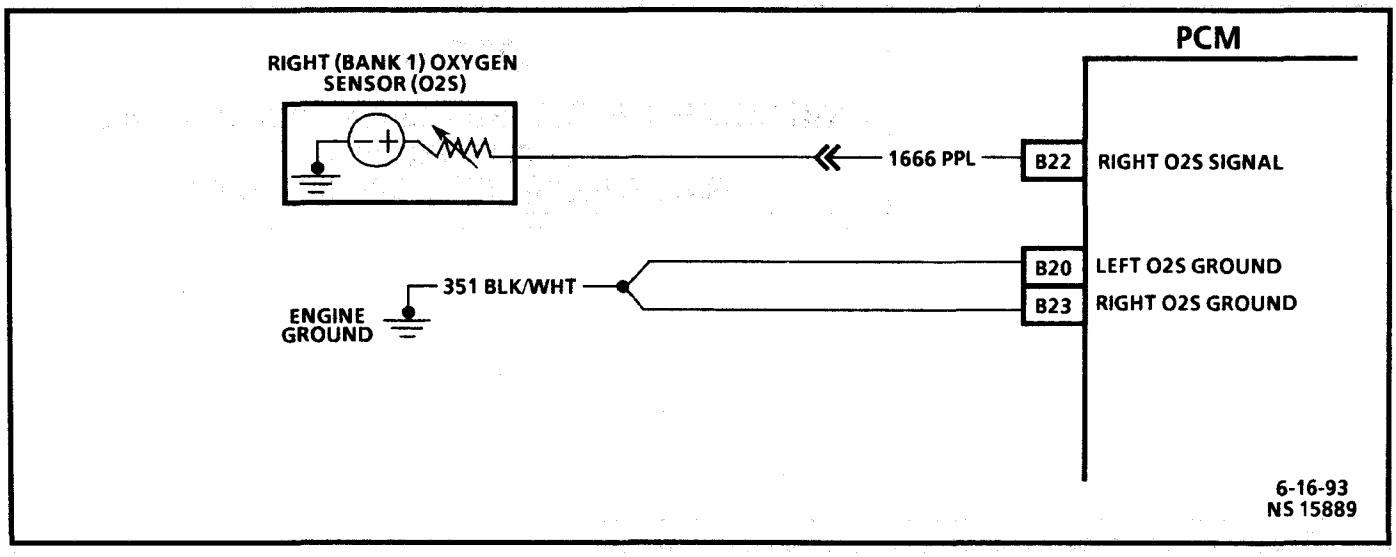
DTC 63

RIGHT (BANK 1) OXYGEN SENSOR (O2S) CIRCUIT (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15928



DTC 64

RIGHT (BANK 1) OXYGEN SENSOR (O2S) CIRCUIT (LEAN EXHAUST INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Powertrain Control Module (PCM) supplies a voltage of about .45 volt between terminals "B22" and "B23". (If measured with a 10 megohm digital voltmeter, this may read as low as .32 volt.)

When the O2S reaches operating temperature, it varies this voltage from about 100 millivolts (exhaust is lean) to about 900 millivolts (exhaust is rich).

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open sensor circuit, or cold sensor, causes "Open Loop" operation.

DTC 64 Will Set When: Vehicle is operating in "Closed Loop" and CKT 1666 is below 280 millivolts for greater than 60 seconds.

Action Taken (PCM will default to): Vehicle will operate in "Open Loop" and MIL will become illuminated.

DTC 64 Will Clear When: A current DTC 64 will clear when the O2S voltage rises above the calibrated lean exhaust threshold. A history DTC 64 will clear after 50 consecutive ignition key cycles without a current DTC 64 being stored.

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

1. The engine must be operating in "Closed Loop" to store DTC 64.

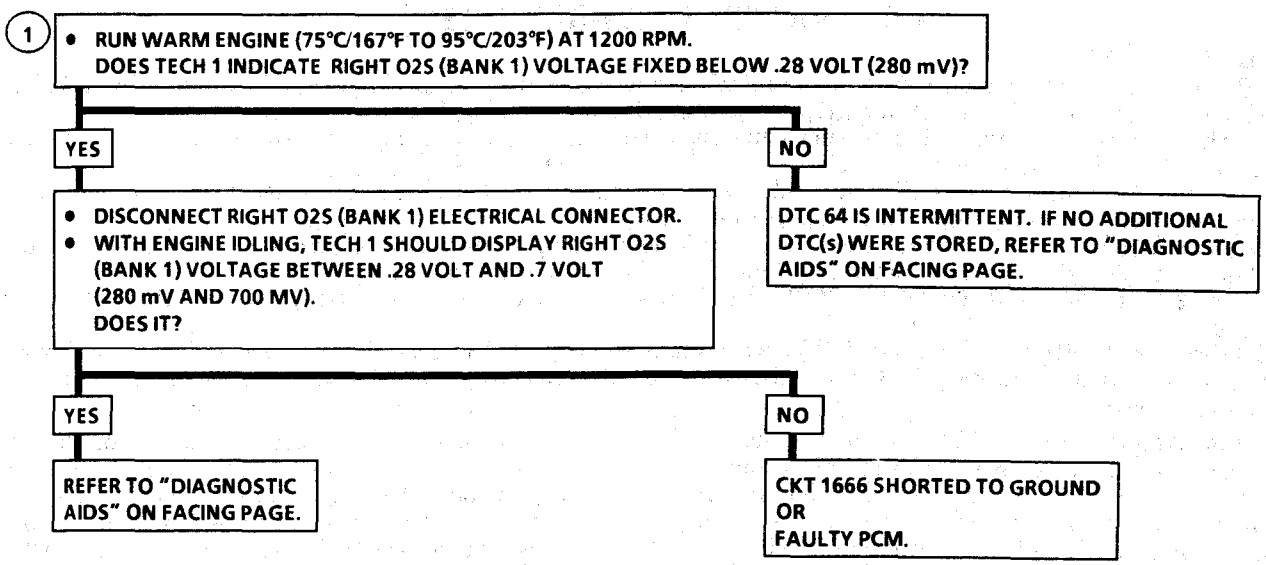
Diagnostic Aids: Using the Tech 1 scan tool, observe the long term fuel trim at different RPM and air flow conditions. The Tech 1 scan tool also displays the fuel trim cells, so the long term fuel trim values can be checked in each of the cells to determine when the DTC 64 may have been set. If the conditions for DTC 64 exist, the long term fuel trim values will be around 150.

Check the following possible causes:

- Oxygen sensor wire - Sensor pigtail may be mispositioned and contacting the exhaust manifold. Check for ground in wire between connector and sensor.
- Lean injector(s). Perform "Injector/Coil Balance Test," CHART C-2A.
- Fuel contamination - Water, even in small amounts, near the in-tank fuel pump inlet can be delivered to the injectors. The water causes a lean exhaust and can set a DTC 64.
- Fuel pressure - System will be lean if fuel pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to "Fuel System Diagnosis," CHART A-7.
- Exhaust leaks - If there is an exhaust leak, the engine can cause outside air to be pulled into the exhaust and past the sensor. Vacuum or crankcase leaks can cause a lean condition.
- If DTC 64 is intermittent, refer to "Symptoms," Section "6E3-B".
- A cracked or otherwise damaged O2S may set an intermittent DTC 64.

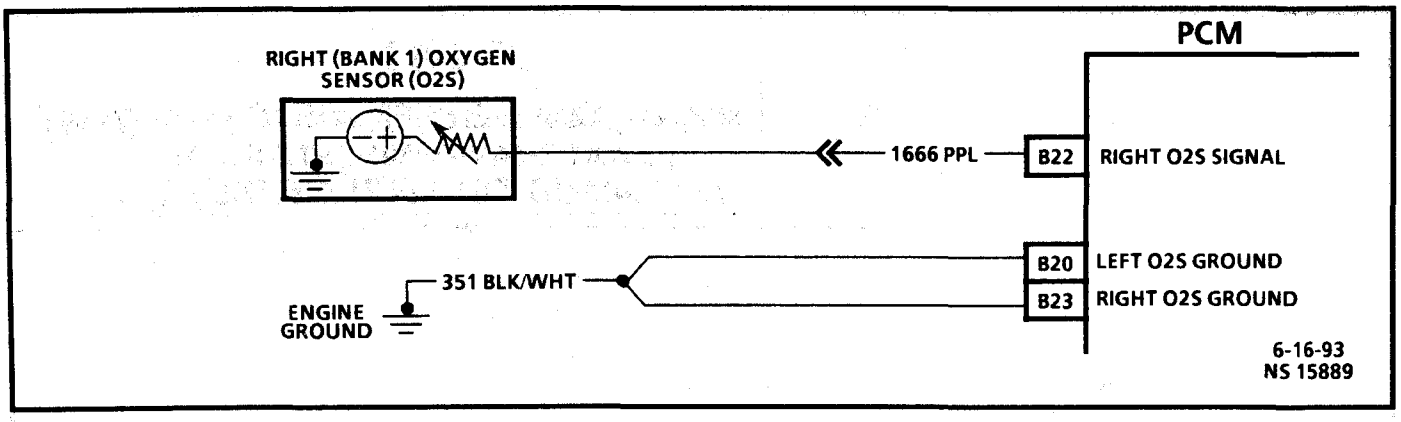
DTC 64

RIGHT (BANK 1) OXYGEN SENSOR (O2S) CIRCUIT
(LEAN EXHAUST INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15930



DTC 65

RIGHT (BANK 1) OXYGEN SENSOR (O2S) (RICH EXHAUST INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Powertrain Control Module (PCM) supplies a voltage of about .45 volt between terminals "B22" and "B23". (If measured with a 10 megohm digital voltmeter, this may read as low as .32 volt.)

When the O2S reaches operating temperature, it varies this voltage from about 100 millivolts (exhaust is lean) to about 900 millivolts (exhaust is rich).

The sensor is like an open circuit and produces no voltage when it is below 316°C (600°F). An open sensor circuit, or cold sensor, causes "Open Loop" operation.

DTC 65 Will Set When: Vehicle is operating in "Closed Loop," CKT 1666 is above 750 millivolts, throttle angle is between 6% and 20%, condition present for greater than 60 seconds.

Action Taken (PCM will default to): Vehicle will operate in "Open Loop" and MIL will become illuminated.

DTC 65 Will Clear When: A current DTC 65 will clear when the O2S signal voltage falls below the calibrated rich exhaust threshold. A history DTC 65 will clear after 50 consecutive ignition key cycles without a current DTC 45 being stored.

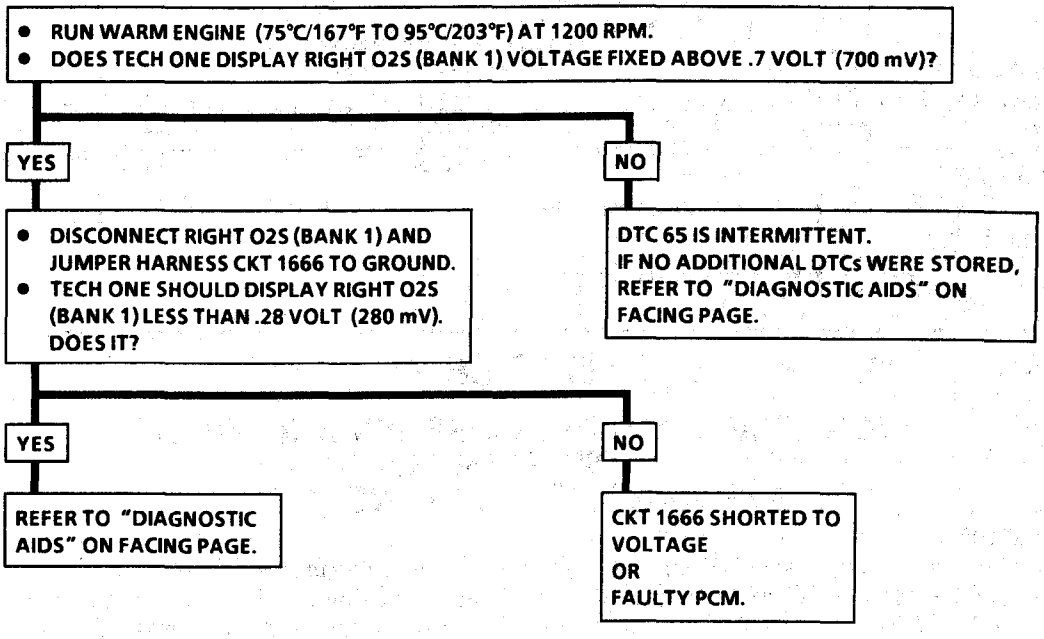
Diagnostic Aids: Using the Tech scan tool, observe the long term fuel trim value at different RPM and air flow conditions. The Tech 1 scan tool also displays the fuel trim cells, so the long term fuel trim values can be checked in each of the cells to determine when the DTC 65 may have been set. If the conditions for DTC 65 exists, the long term fuel trim values will be around 115 or lower.

Check the following possible causes:

- 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 65 will be set. Refer to "Fuel System Diagnosis," CHART A-7.
- Leaking fuel injector(s) - Refer to CHART A-7.
- An open ground CKT 351 - May result in induced electrical "noise." The PCM interprets this "noise" as reference pulses. The additional pulses result in a higher than actual engine speed signal. The PCM then delivers too much fuel causing the system to go rich. The engine tachometer will also show higher than actual engine speed, which can help in diagnosing this problem.
- Canister purge - Check for fuel saturation. If fuel vapor canister is full of fuel, check EVAP canister control valve and hoses. Refer to "Canister Purge" in "Evaporative Emission (EVAP) Control System," Section "6E3-C3".
- MAP sensor - An output that causes the PCM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the Manifold Absolute Pressure (MAP) sensor will allow the PCM to set a fixed value for the MAP sensor. Substitute a different MAP sensor if the rich condition is gone, while the sensor is disconnected.
- TP sensor - An intermittent Throttle Position (TP) sensor output will cause the system to operate richly due to a false indication of the engine accelerating.
- O2S contamination - Inspect Oxygen Sensor (O2S) for silicone contamination from fuel, or use of improper RTV sealant. The sensor may have a white, powdery coating and result in a high but false signal voltage (rich exhaust indication). The PCM will then reduce the amount of fuel delivered to the engine causing a severe surge driveability problem.
- EGR valve - Exhaust Gas Recirculation (EGR) sticking open at idle is usually accompanied by a rough idle and/or stall condition.
- If DTC 65 is intermittent, refer to "Symptoms," Section "6E3-B".
- Engine oil contamination - Fuel fouled engine oil could cause the O2S to sense a rich air/fuel mixture and set a DTC 65.

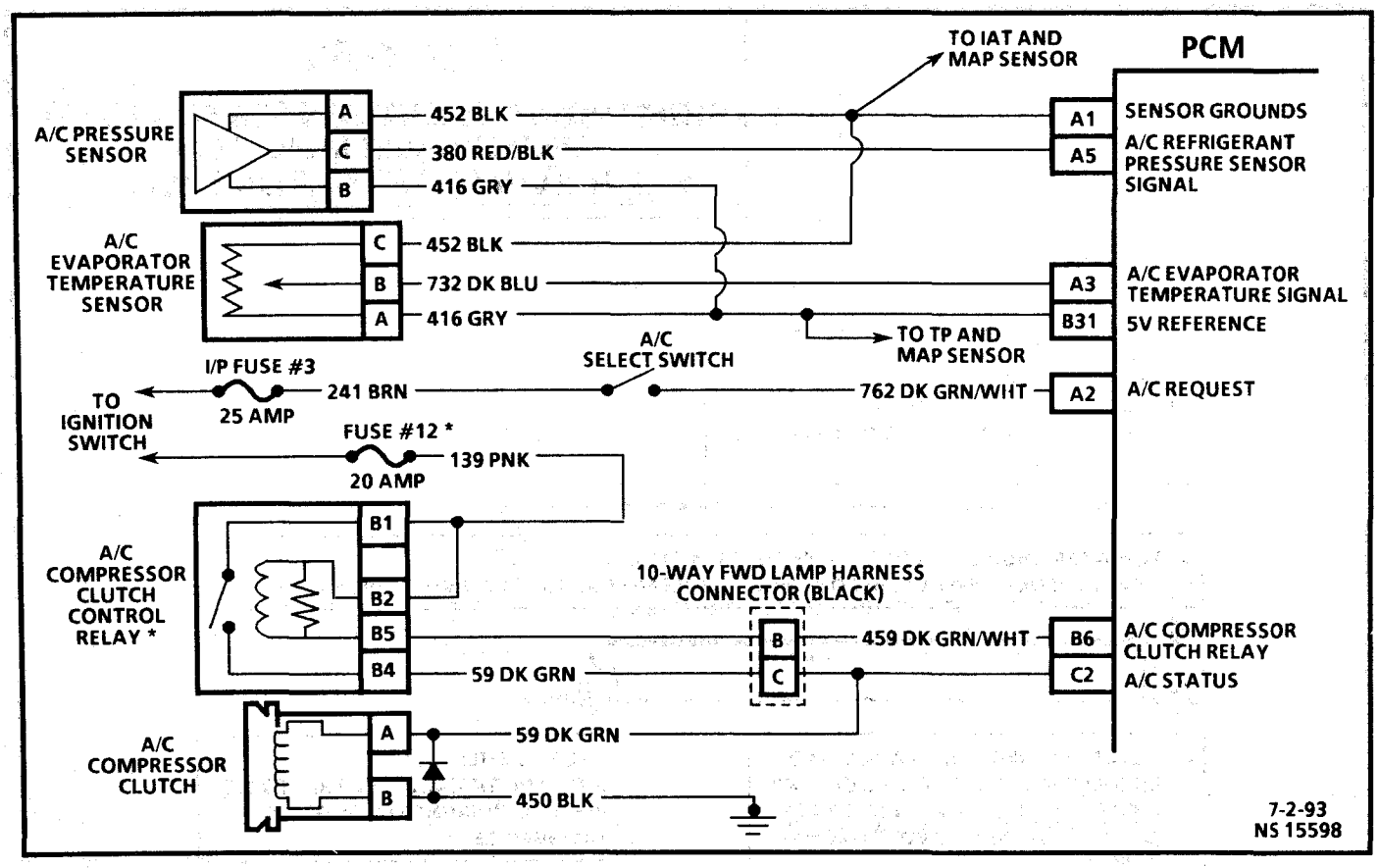
DTC 65

RIGHT (BANK 1) OXYGEN SENSOR (O2S) (RICH EXHAUST INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)



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

7-2-93
NS 15932



DTC 66

A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (LOW PRESSURE) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The A/C refrigerant pressure sensor responds to changes in A/C refrigerant system high side pressure. This input indicates how much load the A/C compressor is putting on the engine and is one of the factors used by the PCM to determine IAC valve position for idle speed control, and engine cooling fan operation. The circuit consists of a 5 volt reference and a ground, both provided by the PCM, and a signal line to the PCM. The signal is a voltage which is proportional to the pressure. The sensor's range of operation is 0 to 450 psi. At 0 psi, the signal will be about .1 volt, varying up to about 4.9 volts at 450 psi or above. DTC 66 sets if the voltage is less than .1 volt (approximately less than 0 psi) for 5 seconds or more. The A/C compressor is disabled by the PCM if DTC 66 is present or if pressure is above or below calibrated values described in "Air Conditioning Compressor Clutch Control," Section "6E3-C10".

DTC 66 Will Set When: The signal voltage sensed at terminal "A5" is below .1 volt for 5 seconds when A/C is selected "ON" and the engine is running.

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 66.

DTC 66 Will Clear When: A current DTC 66 will clear when the refrigerant pressure sensor voltage rises above the calibrated low pressure threshold. A history DTC 66 will clear after 50 consecutive ignition key cycles without a current DTC 66 being stored.

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

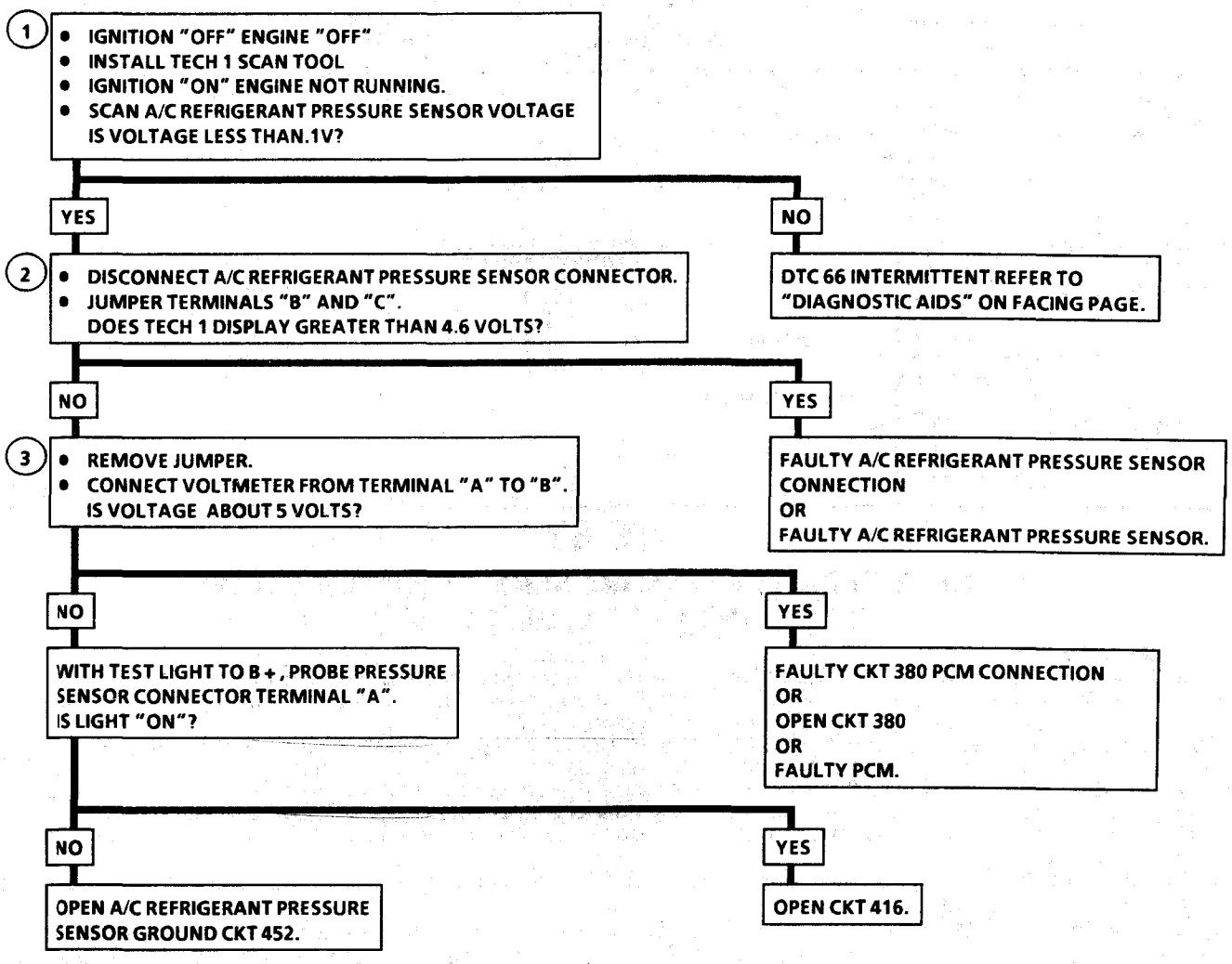
1. This step checks the voltage signal being received by the PCM from the A/C refrigerant pressure sensor.
2. Checks to see if low voltage signal is from the sensor or the circuit. Jumpering the sensor signal CKT 380 to 5 volts checks the circuit, connections, and PCM.
3. This step checks to see if the low signal voltage was due to an open in the sensor circuit or the 5 volt reference circuit since the previous step eliminated the pressure sensor.

Diagnostic Aids: DTC 66 sets when signal voltage falls outside the normal possible range of the sensor and is not due to a refrigerant system problem. If the problem is intermittent, check for opens or shorts in harness or poor connections.

DTC 66

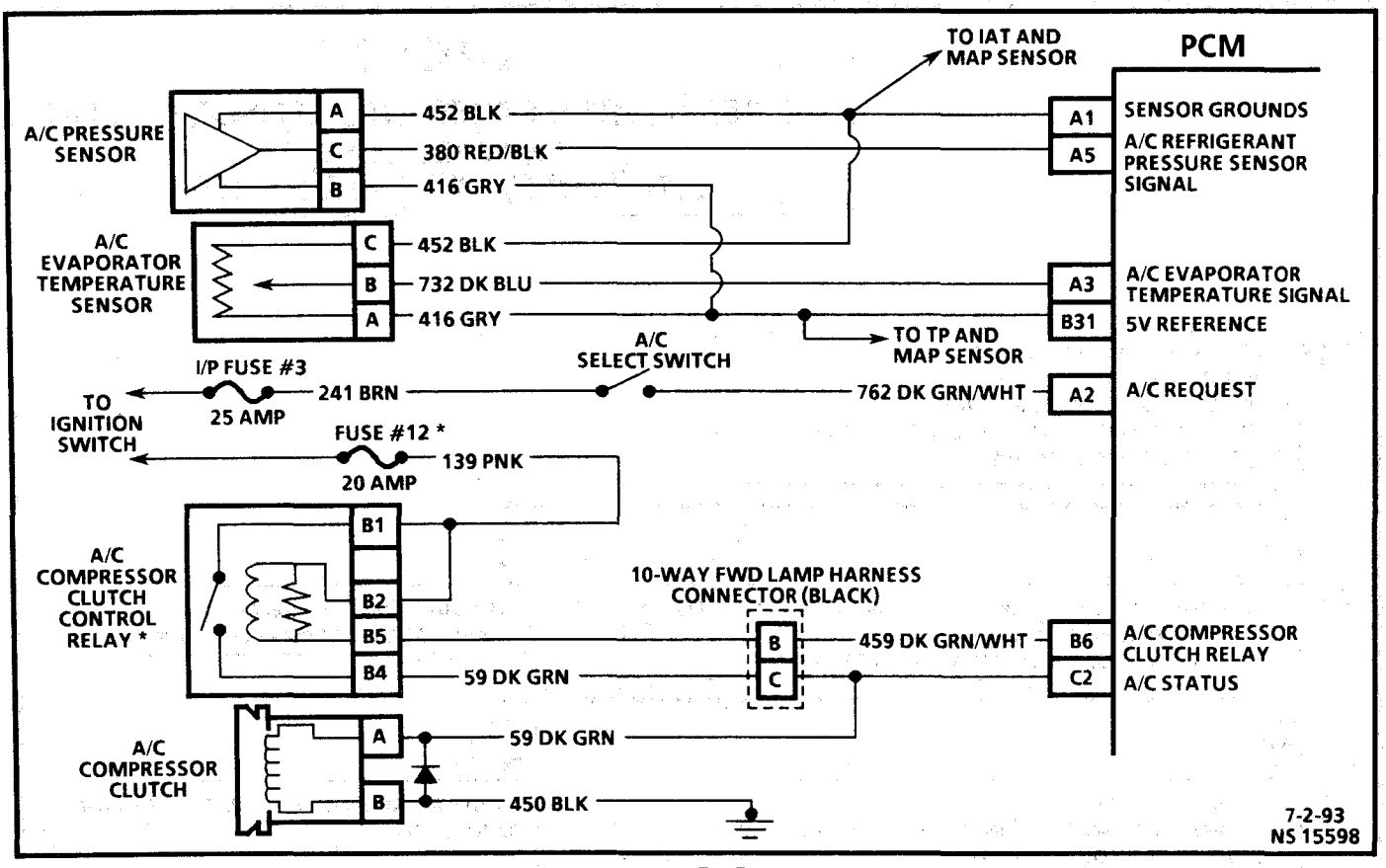
A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (LOW PRESSURE)

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



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

6-16-93
NS 15624



DTC 67

A/C REFRIGERANT PRESSURE SENSOR (CIRCUIT ERROR) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM can determine if the A/C compressor clutch is engaged or not engaged through the A/C clutch status line. If the PCM has grounded the coil of the A/C clutch control relay, current can flow through the relay contacts to the A/C compressor clutch and the PCM on the A/C status circuit.

When voltage is present at the PCM A/C clutch status terminal, A/C status "ON" will be displayed on the Tech 1. As the PCM detects that the A/C compressor clutch has cycled "OFF" (through the A/C control switch etc.), the PCM will record A/C system pressure from the A/C refrigerant pressure sensor. If the A/C refrigerant pressure does not increase more than 9 psi when the A/C clutch is turned back "ON," a DTC 67 will set. This condition can occur if the A/C refrigerant pressure sensor is fixed at one value, or if the A/C refrigerant pressure sensor ground is open.

DTC 67 Will Set When: The PCM does not detect an A/C refrigerant pressure change of more than 9 psi when the A/C clutch has been cycled.

Action Taken (PCM will default to): The MIL will not become illuminated. The A/C compressor will become 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 67.

DTC 67 Will Clear When: A current DTC 67 will clear when the A/C pressure signal shows an increase of more than 9 psi since the last time the A/C clutch has been cycled. A history DTC 67 will clear after 50 consecutive ignition key cycles without a current DTC 67 being stored.

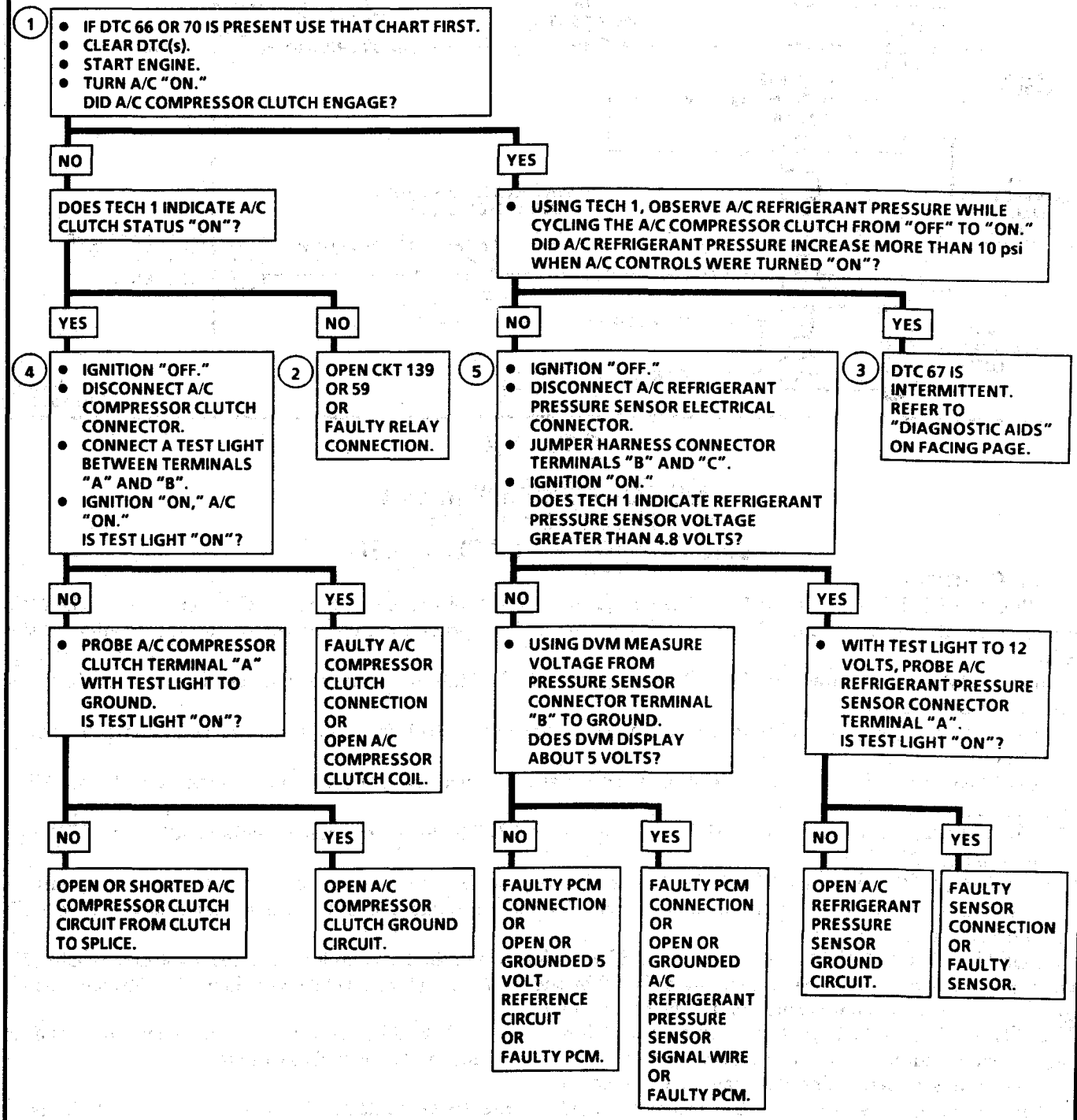
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the PCM detects an A/C refrigerant pressure change of more than 9 psi when the A/C clutch has been cycled.
2. If the relay power feed CKT 139 is intermittent, the A/C clutch status terminal may not detect voltage when A/C is commanded "ON."
3. If the A/C clutch status line becomes intermittently open or shorted while the compressor is "ON," the PCM will be wrongly detecting the A/C clutch going "ON" and "OFF." When the PCM falsely detects the clutch cycling from "ON" to "OFF" and the clutch is remaining "ON," a DTC 67 will set since no pressure change was detected.
4. If the A/C compressor clutch is disconnected or if CKT 59 is open between the splice and the clutch, the A/C compressor clutch will not engage, but the PCM will detect voltage on the A/C status line which will indicate the clutch is "ON." If the A/C controls are cycled from "OFF" to "ON" at this point, a DTC 67 will set since the clutch did not engage and therefore no pressure change was detected.
5. The remaining tests check the A/C refrigerant pressure sensor circuit for proper operation.

Diagnostic Aids: A DTC 67 will store in PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL) "Service Engine Soon."

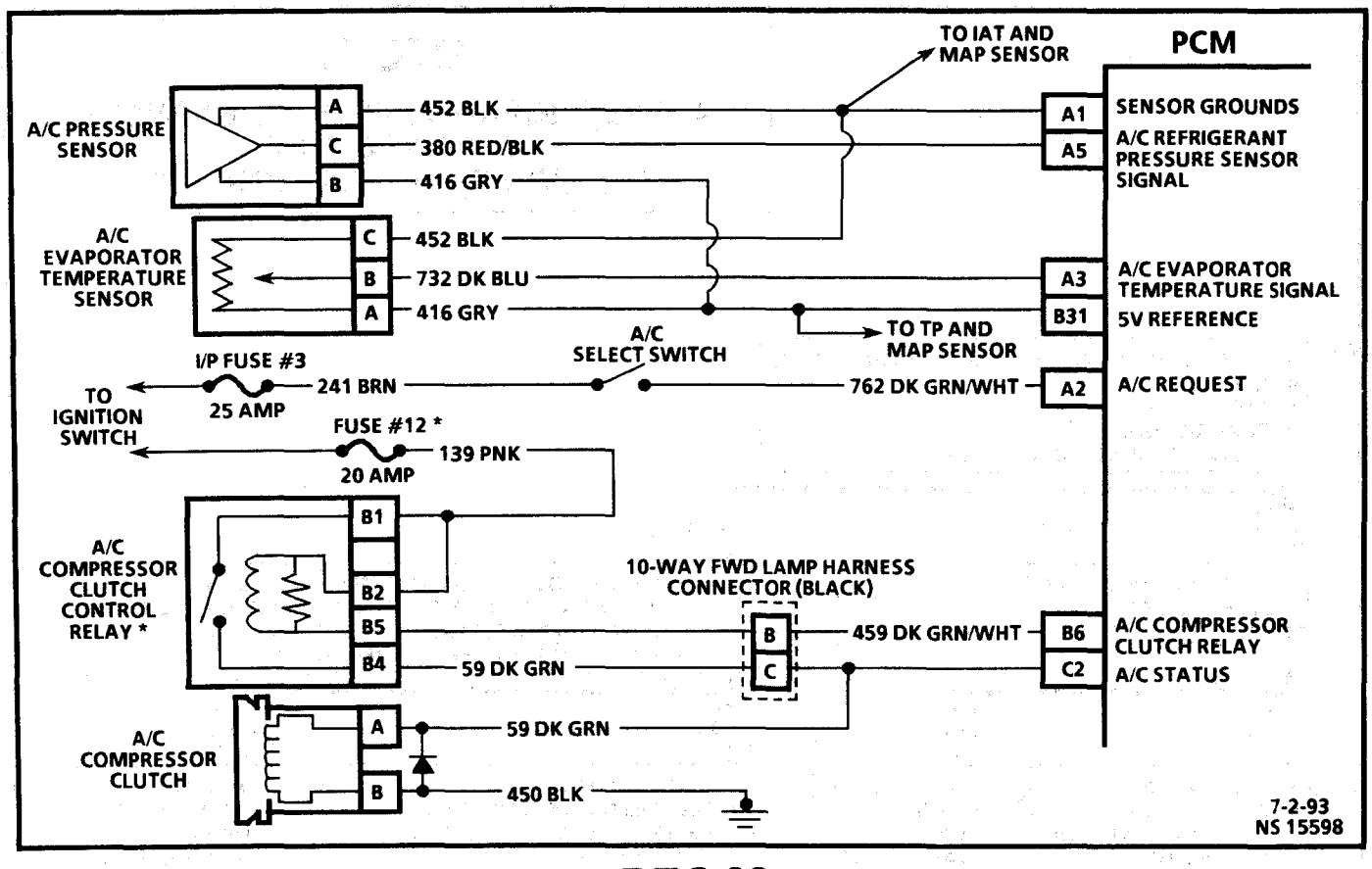
DTC 67

A/C REFRIGERANT PRESSURE SENSOR (CIRCUIT ERROR) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-16-93
NS 15625



DTC 68

A/C COMPRESSOR RELAY (SHORTED CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

When the PCM detects that A/C has been requested, the PCM will activate the A/C clutch relay. When the relay is activated, voltage should be present at both the A/C compressor clutch and the A/C status terminal at the PCM.

If the PCM detects voltage on the A/C status terminal when the A/C relay has not been commanded "ON" by the PCM, a DTC 68 will set.

A short to voltage at any point on CKT 59, a grounded relay control circuit or stuck A/C relay contacts can set a DTC 68.

A DTC 68 fault will be stored in PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL) "Service Engine Soon."

DTC 68 Will Set When: The PCM detects voltage on CKT 59 for more than 10 seconds after the PCM has disengaged the A/C relay.

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 as current DTC 68.

DTC 68 Will Clear When: A current DTC 68 will clear when the PCM no longer detects voltage on CKT 59 when the A/C relay has not been commanded "ON" by the PCM. A history DTC 68 will clear after 50 consecutive ignition key cycles without a current DTC 68 being stored.

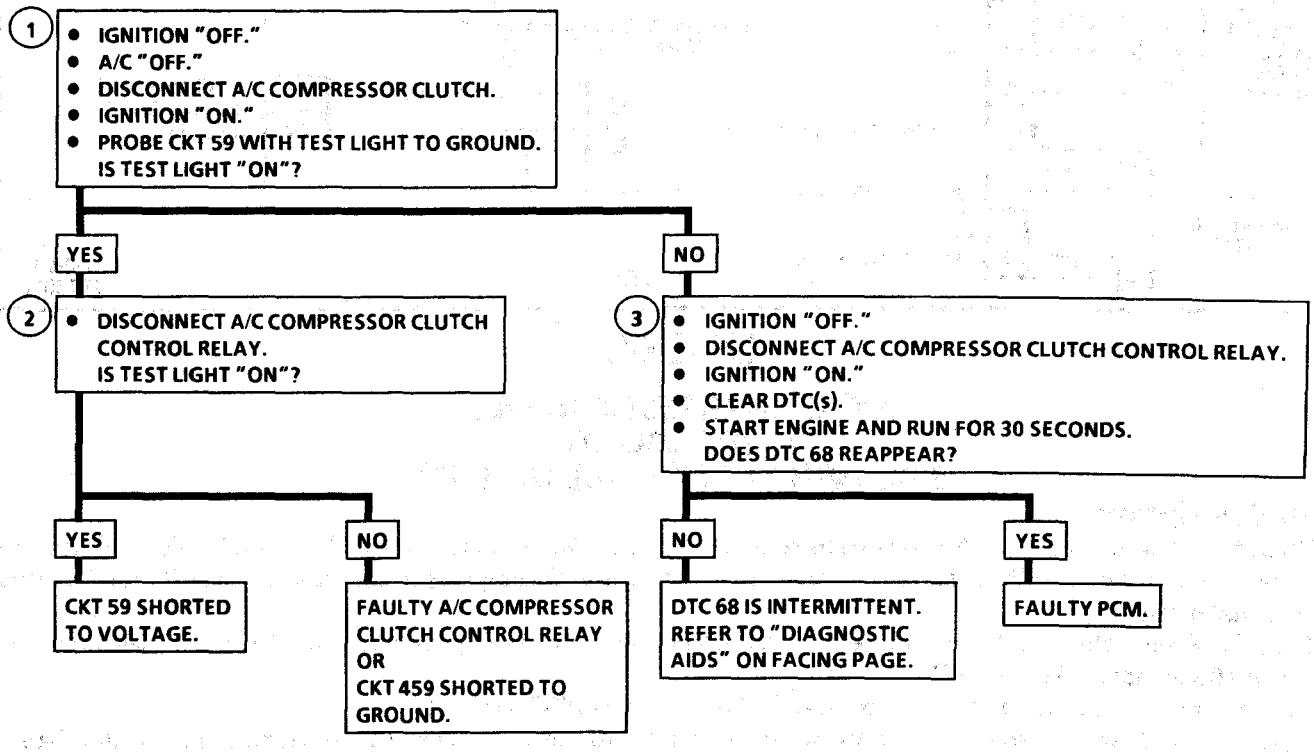
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step is to determine if voltage is detected on the A/C status line after the PCM has disengaged the A/C relay.
2. This will isolate the ignition feed portion of the circuit from the clutch circuit.
3. If DTC 68 reappears at this step, the PCM is internally shorted to voltage.

Diagnostic Aids: Check for intermittent shorts to A/C clutch circuit or sticking A/C relay.

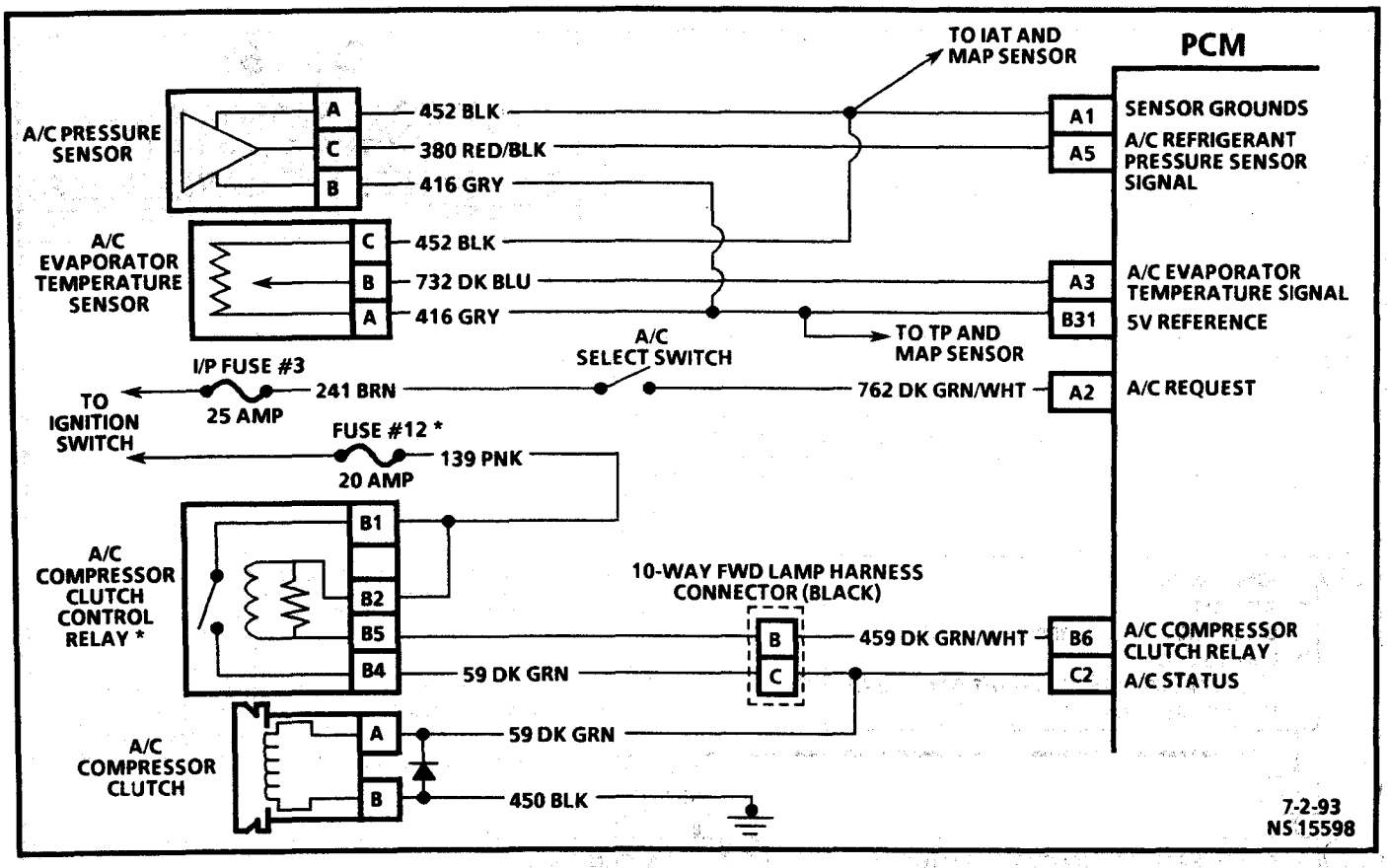
DTC 68

A/C COMPRESSOR RELAY (SHORTED CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-15-93
NS 15626



DTC 69

A/C COMPRESSOR RELAY (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

When the PCM detects that A/C has been requested, the PCM will activate the A/C clutch relay. When the relay has been activated, voltage should be present at both the A/C compressor clutch and the A/C clutch status line terminal of the PCM.

If the PCM activates the A/C clutch relay but does not detect voltage present at the A/C status terminal for more than 10 seconds, a DTC 69 will set.

An open or short to ground at any point in CKT 59 will cause DTC 69 to set.

A DTC 69 fault will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL) "Service Engine Soon."

DTC 69 Will Set When: No voltage is detected by the PCM on CKT 59 after 20 seconds, when the PCM has commanded A/C "ON."

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 69.

DTC 69 Will Clear When: A current DTC 69 will clear when voltage is present on CKT 59, when the PCM has commanded the A/C "ON."

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

1. Determines whether the A/C compressor clutch relay is faulty or poor connections at relay.
2. If the A/C compressor clutch operates properly and the Tech 1 shows A/C status "OFF," then an open exists between the PCM and the splice to the compressor.

DTC 69

A/C COMPRESSOR RELAY (OPEN CIRCUIT) 3.4L (VIN S) "F" CARLINE (SFI)

1. • CLEAR DTC(s).
   • START ENGINE.
   • CYCLE A/C SELECT CONTROLS TO "ON" AND "OFF" WITHIN 20 SECONDS.
   DOES A/C COMPRESSOR CLUTCH OPERATE PROPERLY?

NO

- IGNITION "OFF."
- DISCONNECT A/C COMPRESSOR CLUTCH CONTROL RELAY.
- IGNITION "ON."
- PROBE UNDERHOOD ELECTRICAL CENTER* TERMINALS "B1" AND "B2" WITH A TEST LIGHT TO GROUND.

LIGHT "ON" BOTH

- GROUND DIAGNOSTIC "TEST" TERMINAL.
- PROBE UNDERHOOD ELECTRICAL CENTER* TERMINAL "B5" WITH TEST LIGHT TO B+.

LIGHT "ON"

- JUMPER UNDERHOOD ELECTRICAL CENTER* TERMINALS "B1" TO "B4".
  DOES A/C COMPRESSOR CLUTCH ENGAGE?

YES

FAULTY A/C COMPRESSOR CLUTCH CONTROL RELAY CONNECTION
OR
FAULTY A/C COMPRESSOR CLUTCH CONTROL RELAY.

NO

OPEN IN CKT 59 FROM RELAY TO SPLICE.

LIGHT "OFF"

OPEN A/C COMPRESSOR CLUTCH CONTROL RELAY CIRCUIT
OR
FAULTY PCM CONNECTION
OR
FAULTY PCM.

LIGHT "OFF" ONE OR BOTH

OPEN IN CKT 139 THAT DID NOT LIGHT.

YES

2. DOES TECH 1 INDICATE A/C STATUS "ON"?

NO

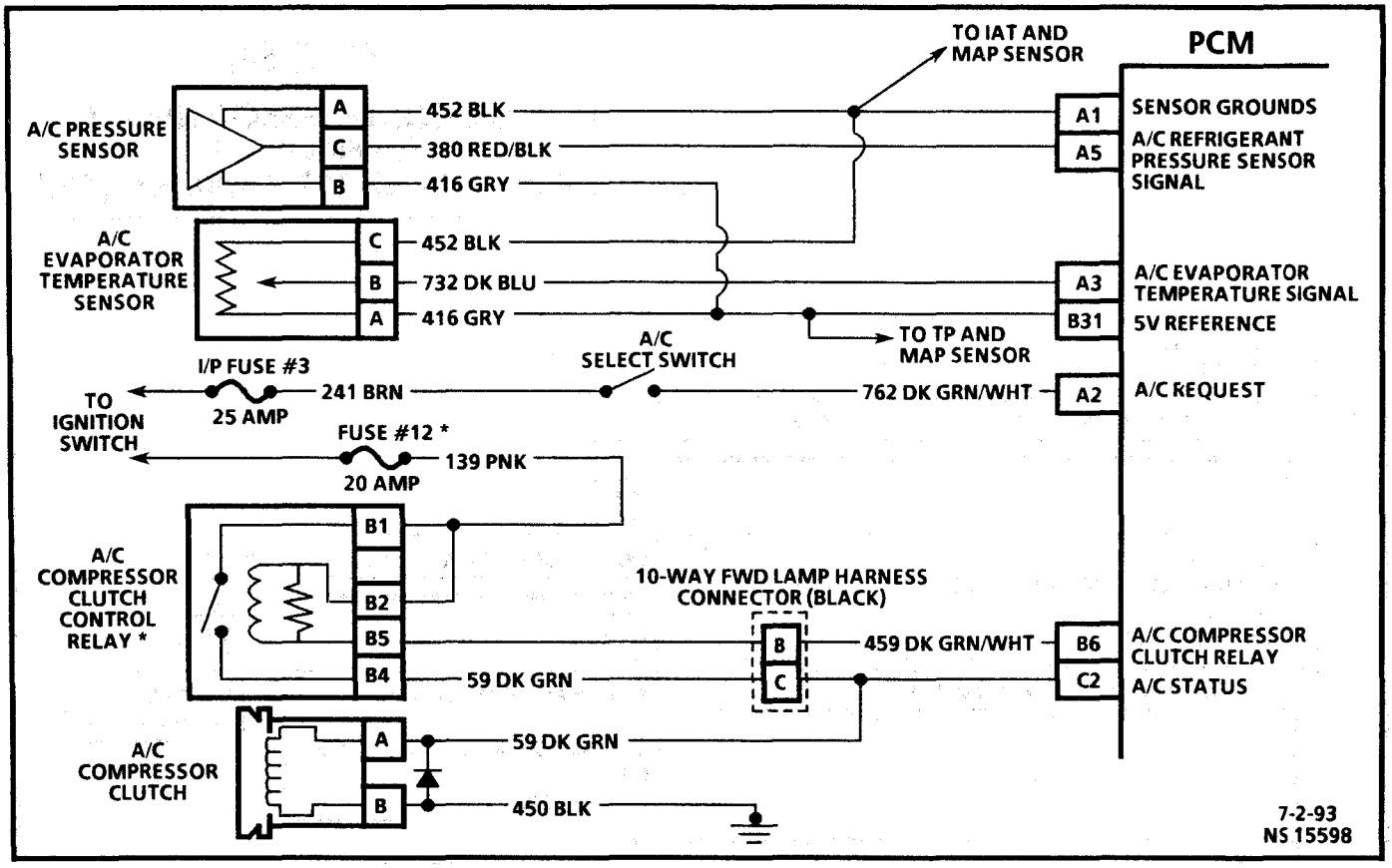
FAULTY PCM CONNECTION
OR
OPEN CKT 59 FROM SPLICE TO PCM
OR
FAULTY PCM.

YES

DTC 69 IS INTERMITTENT.

* REFER TO FIGURE "A2" "UNDERHOOD ELECTRICAL CENTER" FOR RELAY AND TERMINAL LOCATIONS.

* REFER TO FIGURE "A2" "UNDERHOOD ELECTRICAL CENTER" FOR RELAY AND TERMINAL LOCATIONS.



DTC 70

A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (HIGH PRESSURE) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The A/C refrigerant pressure sensor responds to changes in A/C refrigerant system high side pressure. This input indicates how much load the A/C compressor is putting on the engine and is one of the factors used by the PCM to determine IAC valve position for idle speed control. The circuit consists of a 5 volt reference and a ground, both provided by the PCM, and a signal line to the PCM. The signal is a voltage which is proportional to the pressure. The sensor's range of operation is 0 to 450 psi. At 0 psi, the signal will be about .1 volt, varying up to about 4.9 volts at 450 psi or above.

DTC 70 Will Set When: The signal voltage sensed at terminal "A5" is above 4.9 volts for 5 seconds when A/C is selected and the engine is running.

Action Taken (PCM will default to): The MIL will not become illuminated, the A/C compressor will be disabled, the engine 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 70.

DTC 70 Will Clear When: A current DTC 70 will clear when the refrigerant pressure sensor signal falls below the calibrated high pressure threshold. A history DTC 70 will clear after 50 consecutive ignition key cycles without a current DTC 70 being stored.

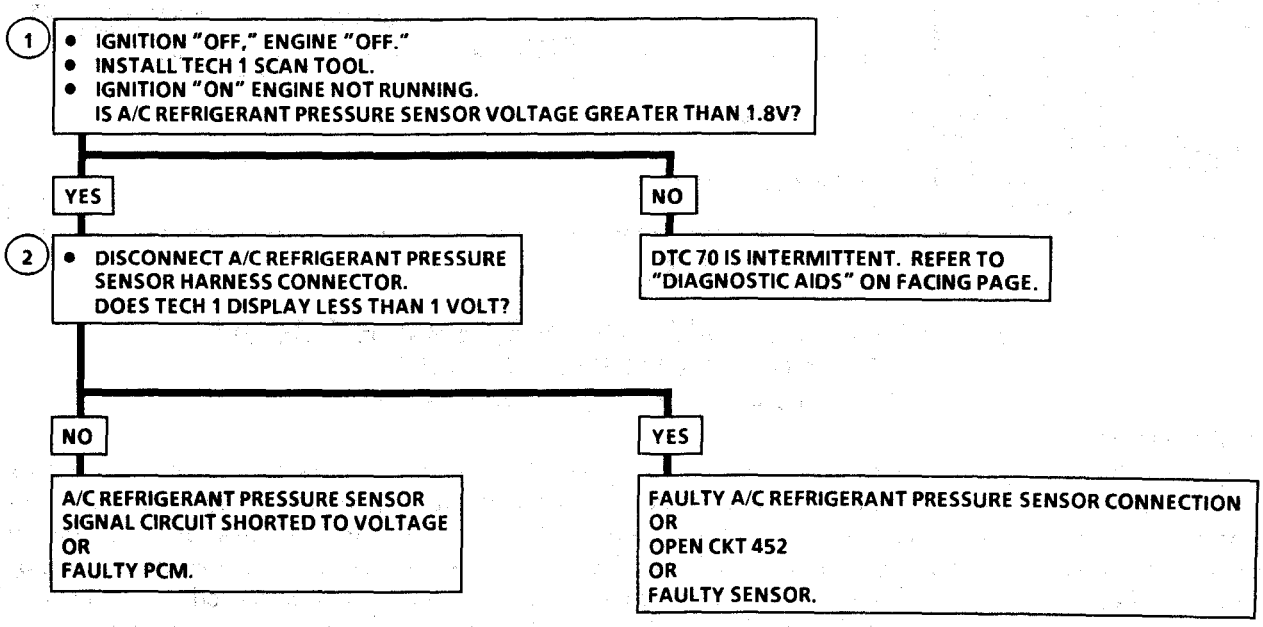
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step checks the voltage signal being received by the PCM from the A/C refrigerant pressure sensor.
2. Checks to see if the high voltage signal is from a shorted sensor or a short to voltage in the circuit. Normally, disconnecting the sensor would make a normal circuit go to near zero volts.

Diagnostic Aids: DTC 70 sets when signal voltage falls outside the normal possible range of the sensor and is not due to a refrigerant system problem. If problem is intermittent, check for opens or shorts in harness or poor connections.

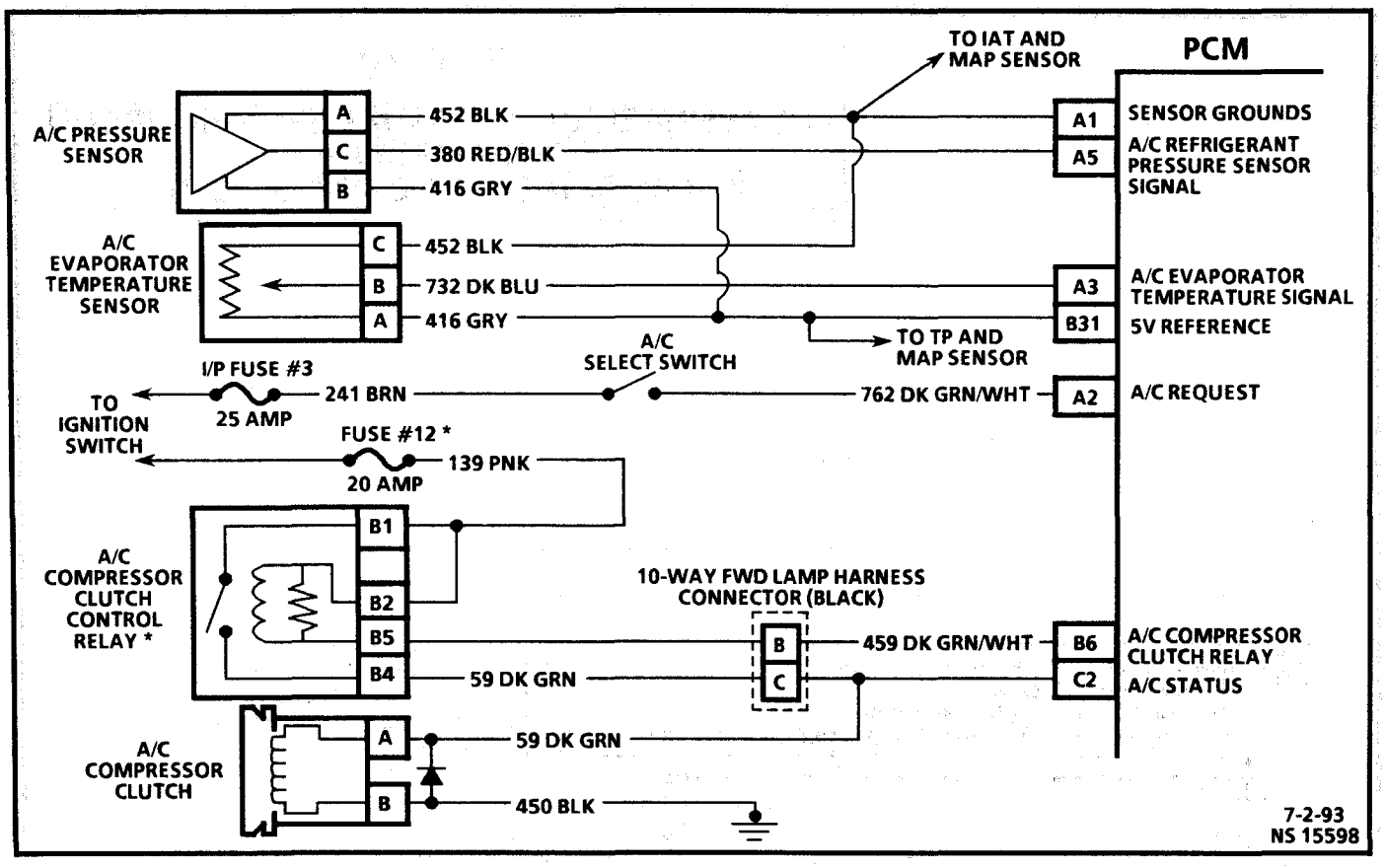
DTC 70

A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (HIGH PRESSURE) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-15-93
NS 15628



DTC 71

A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT (LOW TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Integral to the A/C system is the A/C evaporator temperature sensor. This sensor is mounted to the evaporator which is located within the I/P. The PCM receives a voltage signal inversely proportional to the temperature at the evaporator coils. As the evaporator temperature increases or decreases, the resistance of the sensor changes and varies the voltage signal to the PCM. This voltage is converted to a temperature valve by the PCM and can then be displayed in degrees by the Tech 1. A DTC 71 fault will be stored in the PCM when evaporator temperature is less than -7°C but will not illuminate the Malfunction Indicator Lamp (MIL) "Service Engine Soon."

DTC 71 Will Set When: A/C evaporator temperature indicates less than -7°C (19°F) for 5 seconds.

Action Taken (PCM will default to): The MIL will not become illuminated, the A/C compressor will become 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 71.

DTC 71 Will Clear When: A current DTC 71 will clear when the signal voltage falls within the calibrated threshold of the A/C evaporator temperature sensor. A history DTC 71 will clear after 50 consecutive ignition key cycles without a current DTC 71 being stored.

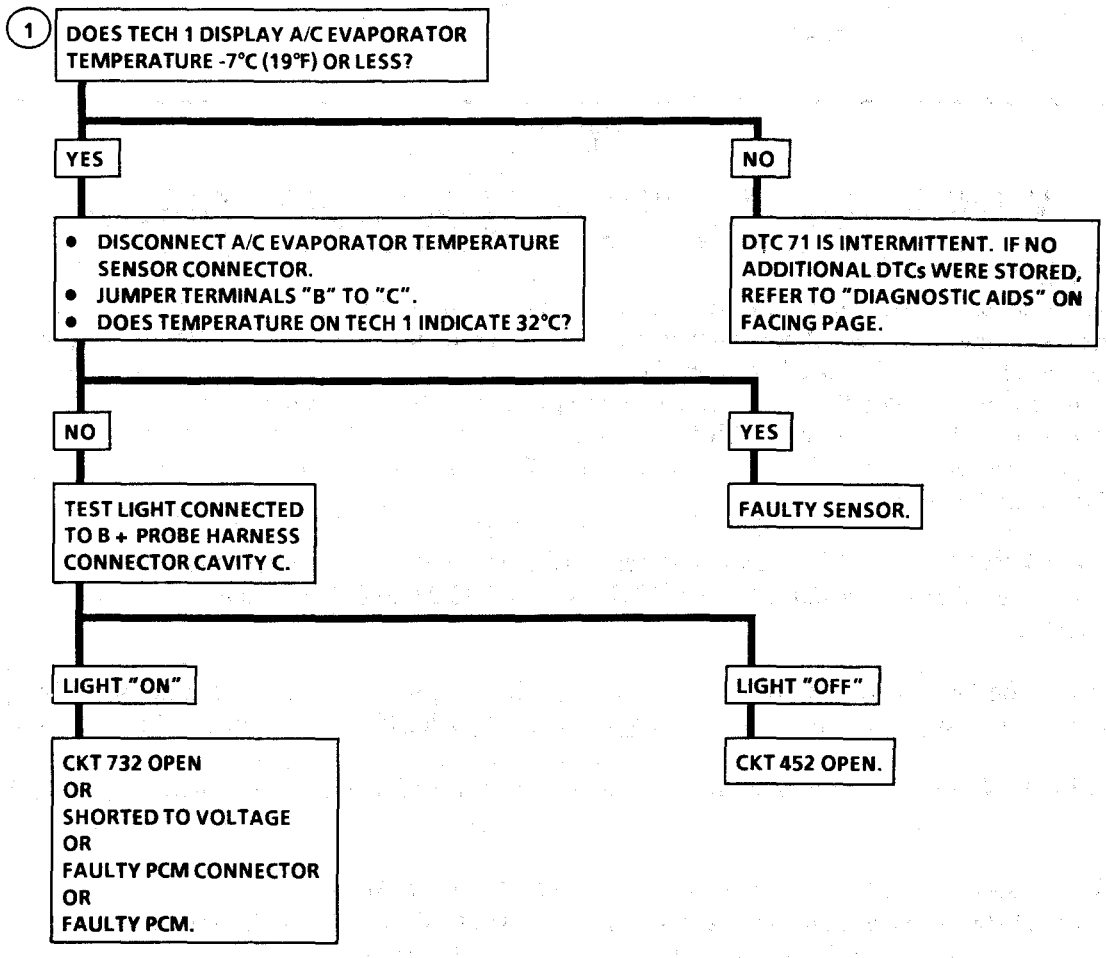
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test is a verification that the DTC is not intermittent.

Diagnostic Aids: If a problem is intermittent, check for opens or shorts in the harness, or poor connections. A sensor which has backed out of the evaporator coil bracket will also set a false DTC.

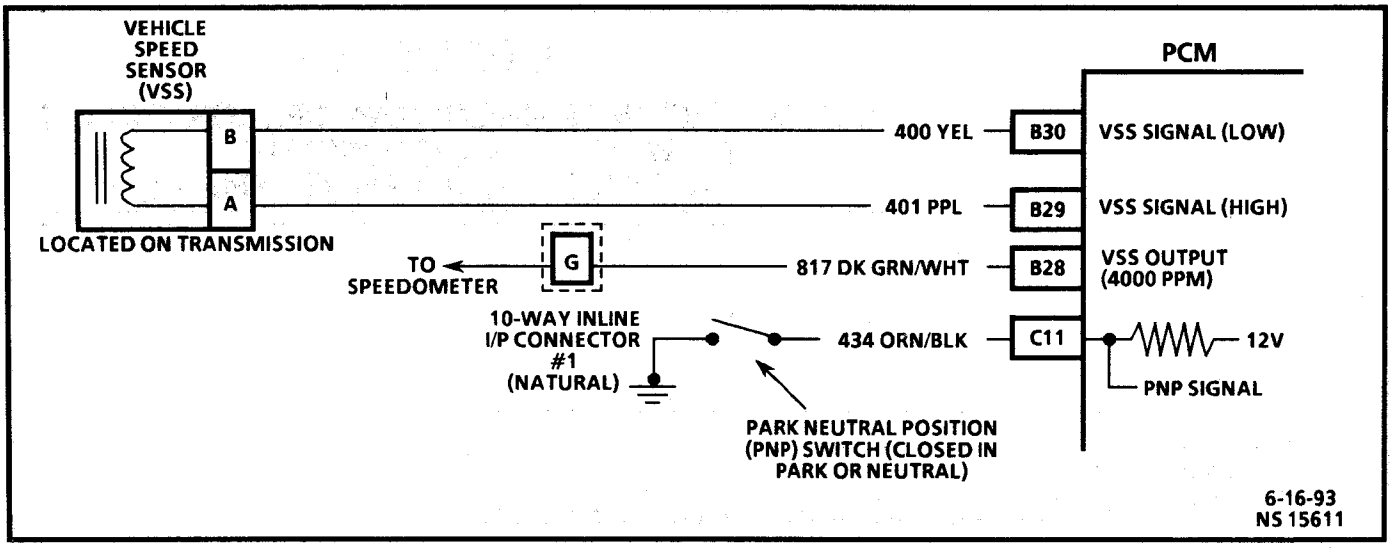
DTC 71

A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT
(LOW TEMPERATURE INDICATED)
3.4L (VIN S) "F" CARLINE (SFI)



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

6-15-93
NS 16234



DTC 72

VEHICLE SPEED SENSOR (VSS) CIRCUIT SIGNAL ERROR 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Vehicle speed information is provided to the Powertrain Control Module (PCM) by the Vehicle Speed Sensor (VSS), which is a Permanent Magnet (PM) generator mounted in the transmission. The PM generator produces a pulsing voltage whenever vehicle speed is over about 3 mph. The AC voltage level and the number of pulses increases with vehicle speed. The PCM then converts the pulsing voltage to mph, which is used for calculations. The vehicle speed can be displayed with a Tech 1 scan tool.

The PCM supplies a signal, on CKT 817, to operate the speedometer and the odometer. The VSS signal is also sent to the cruise control module.

DTC 72 Will Set When: Not in P/N, transmission output speed changes greater than 1000 RPM, or in P/N, transmission output speed change greater than 2048 RPM. No DTC 28, and engine speed greater than 200 RPM. All conditions met for 2 seconds.

Action Taken (PCM will default to): A delayed (soft) landing to third gear and maximum line pressure. DTC 72 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 72 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks the function of the VSS circuit.
2. An intermittent connection at the VSS or PCM may cause a DTC 72 to set. Inspect the harness and all related connections. Check for damaged or pushed out terminals.
3. This test checks to make sure the wire harness is routed away from the exhaust manifold.
4. This test checks for an incorrect PROM or a poor connection.

Diagnostic Aids:

- DTC 24 will set when no vehicle speed is detected at start off.
- DTC 72 will set when vehicle speed has been detected and is lost.

DTC 72

VEHICLE SPEED SENSOR (VSS) CIRCUIT SIGNAL ERROR 3.4L (VIN S) "F" CARLINE (SFI)

1
- IGNITION "OFF."
- RAISE DRIVE WHEELS.
- START ENGINE.
- WITH ENGINE IDLING IN GEAR, TECH 1 SHOULD DISPLAY VEHICLE SPEED ABOVE 0. DOES IT?

NO → DOES SPEEDOMETER WORK?

YES
- DTC IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

DOES SPEEDOMETER WORK?

NO

2
- IGNITION "OFF."
- DISCONNECT VSS HARNESS CONNECTOR AT TRANSMISSION.
- CONNECT SIGNAL GENERATOR TESTER J 33431-B TO VSS HARNESS CONNECTOR.
- IGNITION "ON," TESTER "ON" AND SET TO GENERATE A VSS SIGNAL.
- THE TECH 1 SHOULD DISPLAY VEHICLE SPEED ABOVE 0. DOES IT?

NO

3 CKT 400 OR 401 OPEN, SHORTED TO GROUND, SHORTED TOGETHER, FAULTY PCM CONNECTIONS OR FAULTY PCM.

YES

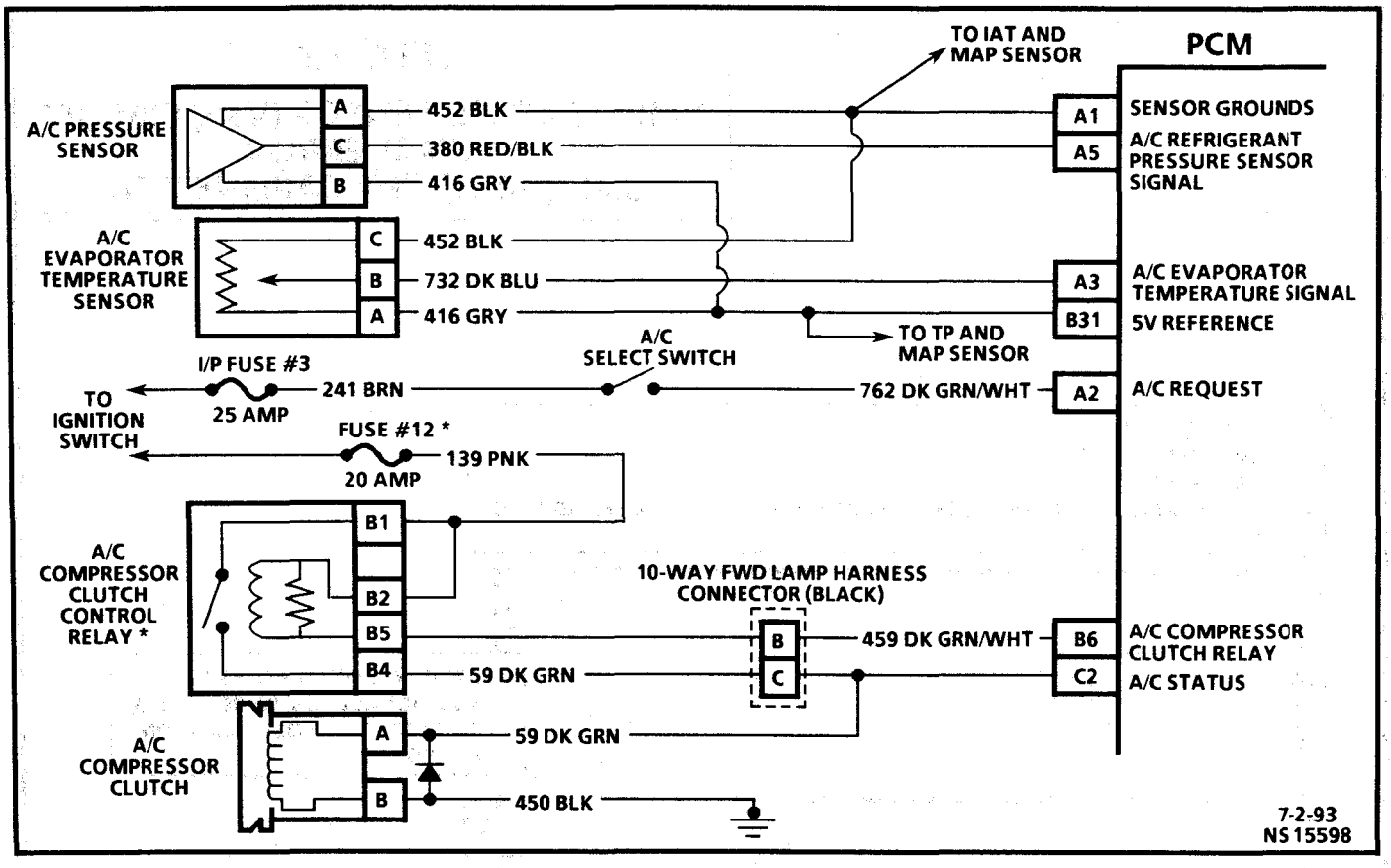
REPLACE VEHICLE SPEED SENSOR.

YES

4
- CHECK CALIBRATION I.D. FOR MOST CURRENT AND/OR INCORRECT SOFTWARE. REFER TO SECTION C1.

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

7-1-93
PS 17923



DTC 73

A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Integral to the A/C system is the A/C evaporator temperature sensor. This sensor is mounted to the evaporator which is located within the I/P. The PCM receives a voltage signal inversely proportional to the temperature at the evaporator coils. As the evaporator temperature increases or decreases, the resistance of the sensor changes and varies the voltage signal to the PCM. This voltage is converted to a temperature value by the PCM and can then be displayed in degrees by the Tech 1. A DTC 73 fault will be stored in the PCM when temperature sensor circuit is greater than 31°C but will not illuminate the Malfunction Indicator Lamp (MIL) "Service Engine Soon."

DTC 73 Will Set When: A/C evaporator temperature indicates greater than 31°C for 5 seconds.

Action Taken (PCM will default to): The MIL will not become illuminated, one 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 73.

DTC 73 Will Clear When: A current DTC 73 will clear when the signal voltage falls within the calibrated threshold of the A/C evaporator temperature sensor. A history DTC 73 will clear after 50 consecutive ignition key cycles without a current DTC 73 being stored.

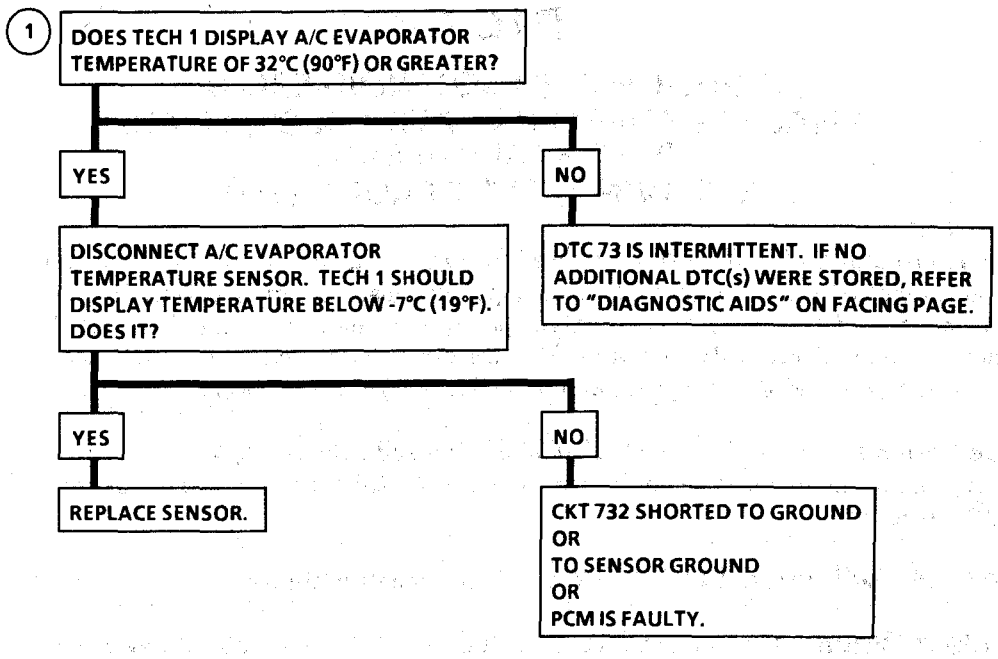
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test is a verification that the DTC is not intermittent.

Diagnostic Aids: If a problem is intermittent, check for opens or shorts in the harness, or poor connections.

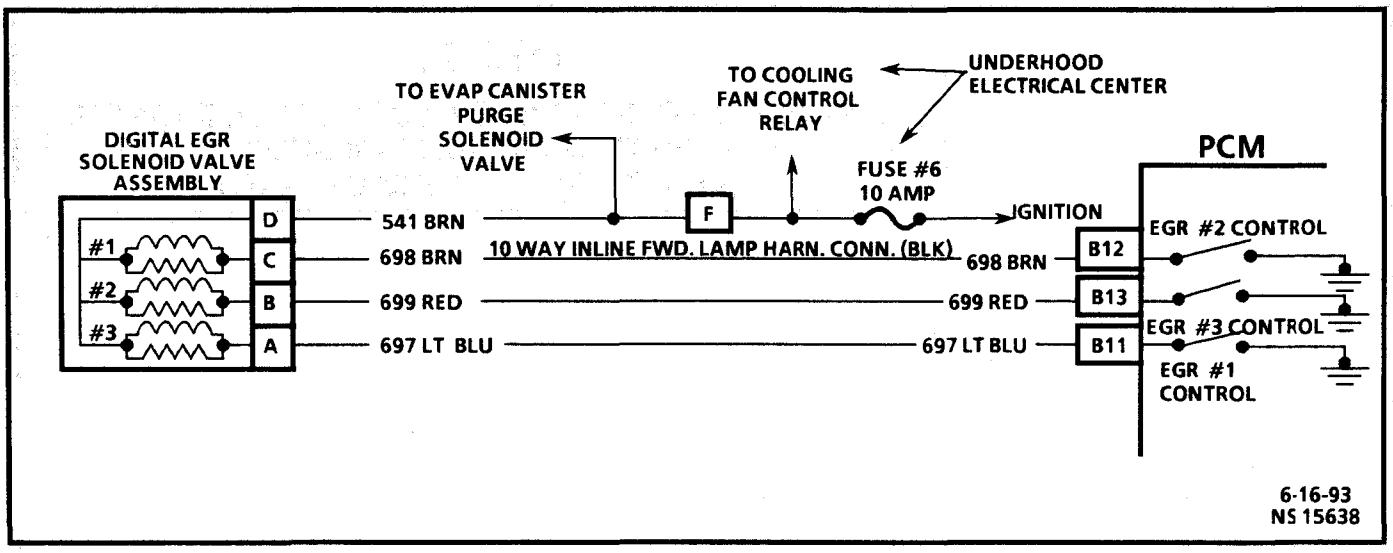
DTC 73

A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT (HIGH TEMPERATURE INDICATED) 3.4L (VIN S) "F" CARLINE (SFI)



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

6-15-93
NS 16237



DTC 75

DIGITAL EGR #1 SOLENOID ERROR EXHAUST GAS RECIRCULATION (EGR) CIRCUIT (ELECTRICAL DIAGNOSIS) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Exhaust Gas Recirculation (EGR) is administered through a digitally controlled 3 solenoid valve unit. Each of the 3 valves is controlled individually and can be open or closed in any combination. During a long closed throttle deceleration, the PCM will cycle each valve open and measure a change in MAP. This test indicates if the valve is nonoperational electrically, or if an EGR passage is obstructed. If the PCM does not detect a change in MAP associated with solenoid #1 being commanded "ON," a DTC 75 will be set.

DTC 75 Will Set When: The engine speed is between 1400 and 2000 RPM, MAP is between 20 and 30 kPa, TP sensor angle is at 0%, all values must be held fairly constant for the test to run. The test must fail 3 consecutive times for a DTC 75 to be set.

Action Taken (PCM will default to): The MIL will become illuminated.

DTC 75 Will Clear When: The current DTC 75 will clear after each ignition key cycle, and will only reset when the test is run and fails again. A history DTC 75 will clear after 50 consecutive ignition key cycles without a current DTC 75 being stored.

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

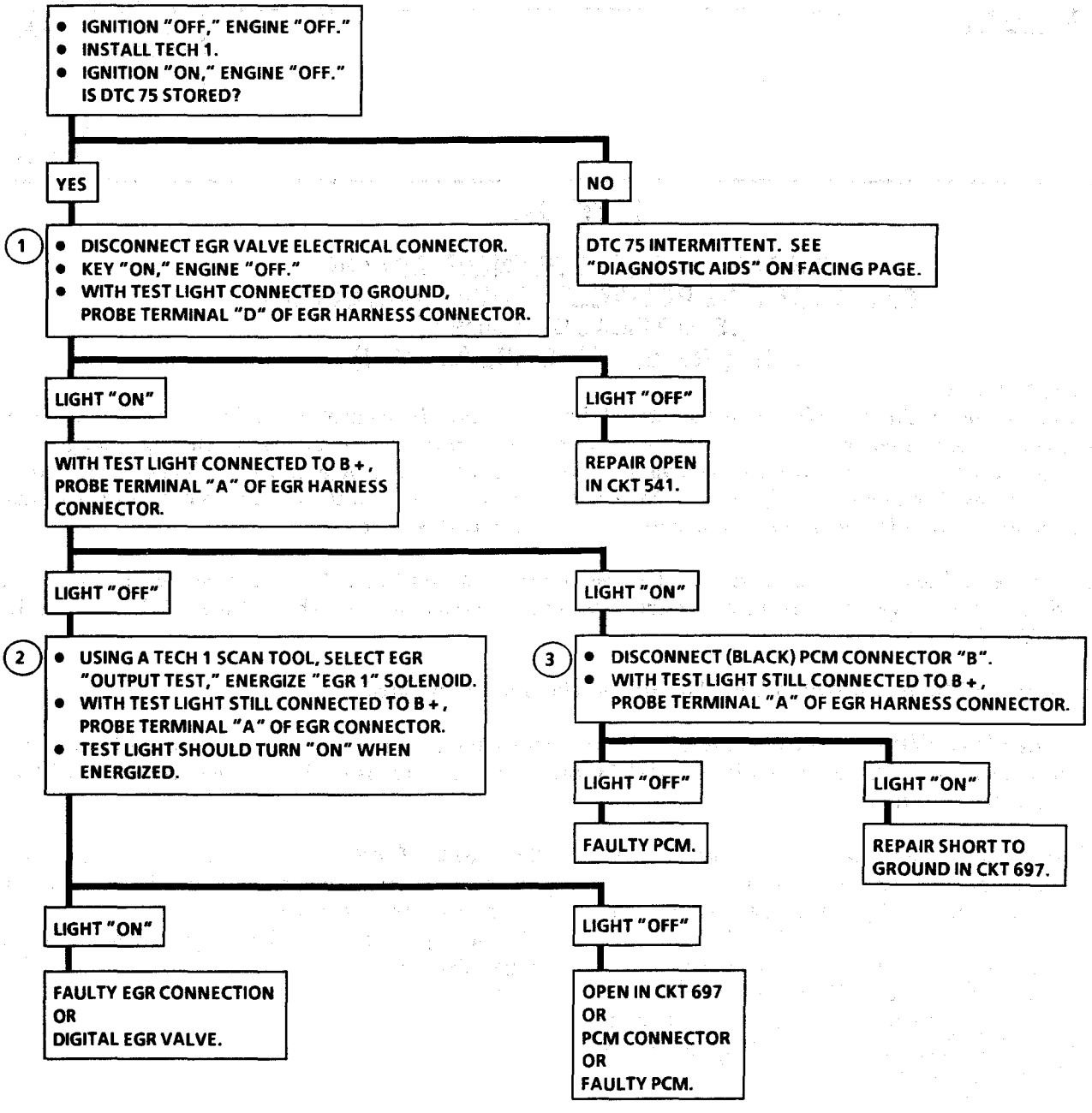
1. This test determines if there is power to the EGR valve.
2. This test will determine if there is an open circuit in the EGR wiring or if the EGR valve is at fault.
3. This test will determine if there is a short to ground in CKT 697 going to the EGR valve or if the PCM is at fault.

Diagnostic Aids: An intermittent may be caused by a poor connection, chaffed wire insulation, or a wire broken inside the insulation.

Intake plenum should be checked for possible plugged passages.

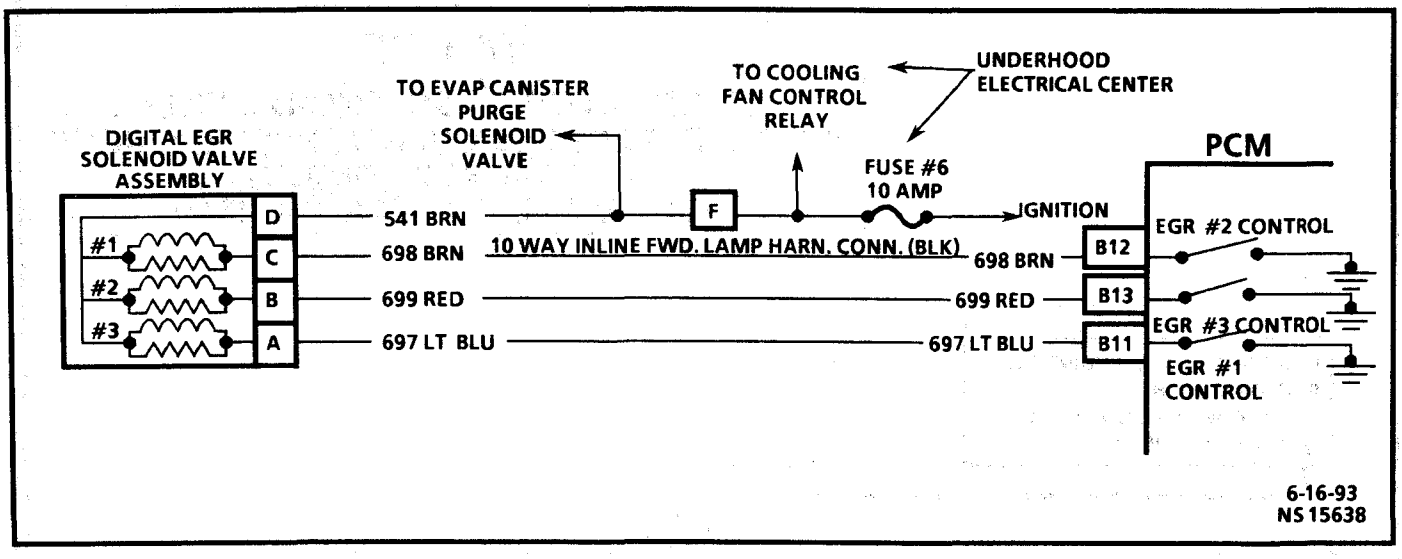
DTC 75

DIGITAL EGR #1 SOLENOID ERROR
EXHAUST GAS RECIRCULATION (EGR) CIRCUIT
(ELECTRICAL DIAGNOSIS)
3.4L (VIN S) "F" CARLINE (SFI)



* THESE STEPS MUST BE DONE VERY QUICKLY AS THE PCM WILL COMPENSATE FUEL DELIVERY.

7-13-93
NS 15641



DTC 76

DIGITAL EGR #2 SOLENOID ERROR
EXHAUST GAS RECIRCULATION (EGR) CIRCUIT
(ELECTRICAL DIAGNOSIS)
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Exhaust Gas Recirculation (EGR) is administered through a digitally controlled 3 solenoid valve unit. Each of the 3 valves is controlled individually and can be open or closed in any combination. During a long closed throttle deceleration, the PCM will cycle each valve open and measure a change in MAP. This test indicates if the valve is nonoperational electrically, or if an EGR passage is obstructed. If the PCM does not detect a change in MAP associated with solenoid #2 being commanded "ON," a DTC 76 will be set.

DTC 76 Will Set When: The engine speed is between 1400 and 2000 RPM, MAP is between 20 and 30 kPa, TP sensor angle is at 0%, all values must be held fairly constant for the test to run. The test must fail 3 consecutive times for a DTC 76 to be set.

Action Taken (PCM will default to): The MIL will become illuminated.

DTC 76 Will Clear When: The current DTC 76 will clear after each ignition key cycle, and will only reset when the test is run and fails again. A history DTC 76 will clear after 50 consecutive ignition key cycles without a current DTC 76 being stored.

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

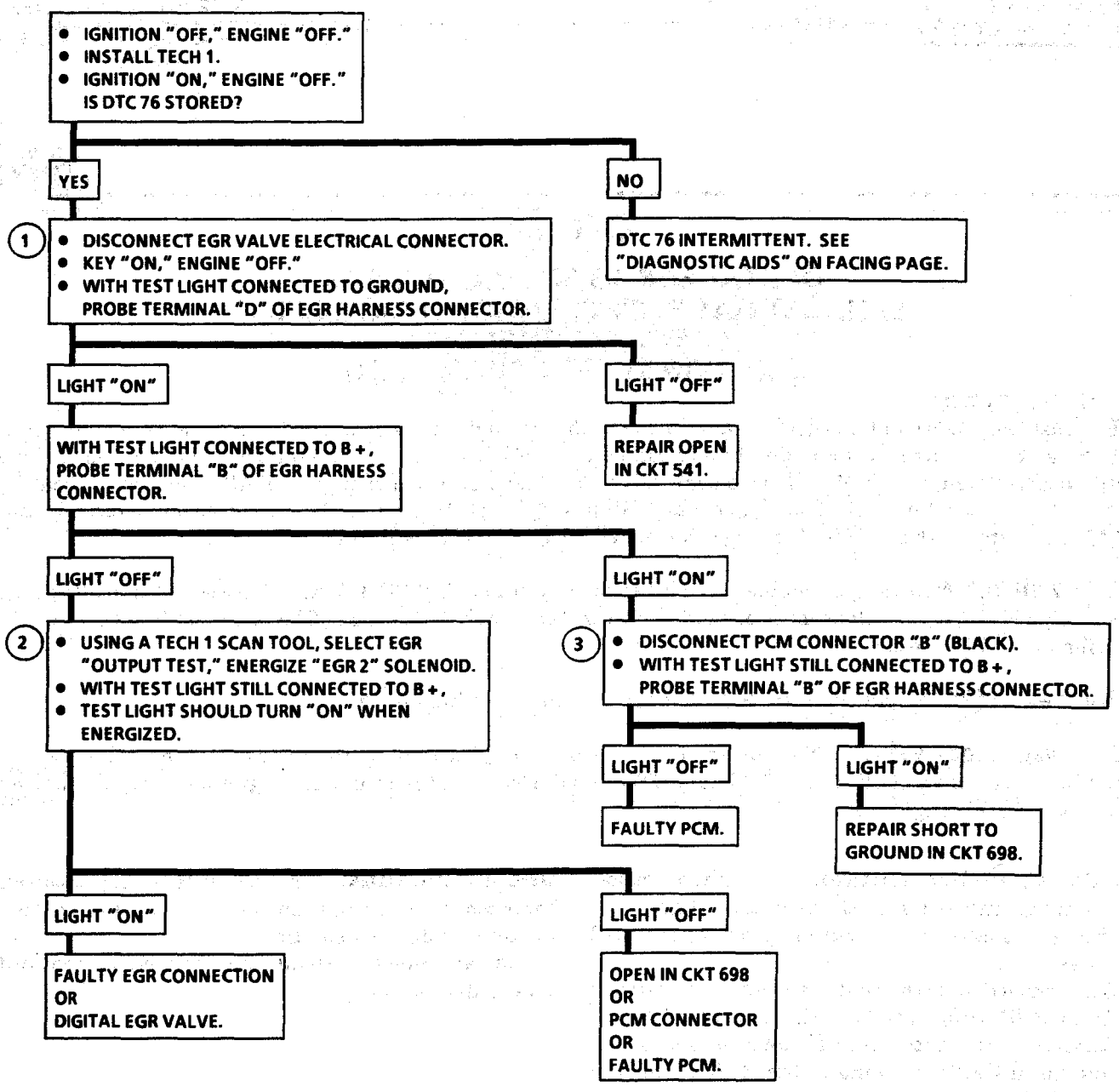
1. This test determines if there is power to the EGR valve.
2. This test will determine if there is an open circuit in the EGR wiring or if the EGR valve is at fault.
3. This test will determine if there is a short to ground in CKT 698 going to the EGR valve or if the PCM is at fault.

Diagnostic Aids: An intermittent may be caused by a poor connection, chaffed wire insulation, or a wire broken inside the insulation.

Intake plenum should be checked for possible plugged passages.

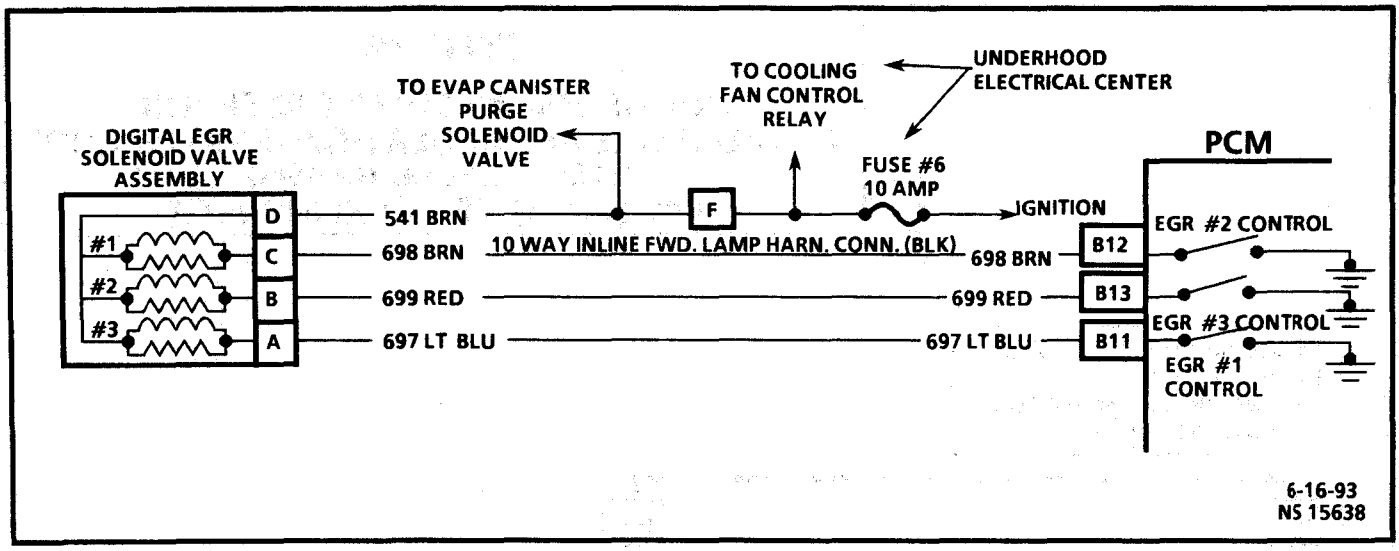
DTC 76

DIGITAL EGR #2 SOLENOID ERROR
EXHAUST GAS RECIRCULATION (EGR) CIRCUIT
(ELECTRICAL DIAGNOSIS)
3.4L (VIN S) "F" CARLINE (SFI)



* THESE STEPS MUST BE DONE VERY QUICKLY AS THE PCM WILL COMPENSATE FUEL DELIVERY.

7-13-93
NS 15642



DTC 77

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

Circuit Description:

Exhaust Gas Recirculation (EGR) is administered through a digitally controlled 3 solenoid valve unit. Each of the 3 valves is controlled individually and can be open or closed in any combination. During a long closed throttle deceleration, the PCM will cycle each valve open and measure a change in MAP. This test indicates if the valve is nonoperational electrically, or if an EGR passage is obstructed. If the PCM does not detect a change in MAP associated with solenoid #1 being commanded "ON," a DTC 77 will be set.

DTC 77 Will Set When: The engine speed is between 1400 and 2000 RPM, MAP is between 20 and 30 kPa, TP sensor angle is at 0%, all values must be held fairly constant for the test to run. The test must fail 3 consecutive times for a DTC 77 to be set.

Action Taken (PCM will default to): The MIL will become illuminated.

DTC 77 Will Clear When: The current DTC 77 will clear after each ignition key cycle, and will only reset when the test is run and fails again. A history DTC 77 will clear after 50 consecutive ignition key cycles without a current DTC 77 being stored.

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

1. This test determines if there is power to the EGR valve.
2. This test will determine if there is an open circuit in the EGR wiring or if the EGR valve is at fault.
3. This test will determine if there is a short to ground in CKT 699 going to the EGR valve or if the PCM is at fault.

Diagnostic Aids: An intermittent may be caused by a poor connection, chaffed wire insulation, or a wire broken inside the insulation.

Intake plenum should be checked for possible plugged passages.

DTC 77

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

- IGNITION "OFF," ENGINE "OFF."
- INSTALL TECH 1.
- IGNITION "ON," ENGINE "OFF."

IS DTC 77 STORED?

YES

1. DISCONNECT EGR VALVE ELECTRICAL CONNECTOR.
2. KEY "ON," ENGINE "OFF."
3. WITH TEST LIGHT CONNECTED TO GROUND, PROBE TERMINAL "D" OF EGR HARNESS CONNECTOR.

LIGHT "ON"

WITH TEST LIGHT CONNECTED TO B+, PROBE TERMINAL "C" OF EGR HARNESS CONNECTOR.

LIGHT "OFF"

2. USING A TECH 1 SCAN TOOL, SELECT EGR "OUTPUT TEST," ENERGIZE "EGR 3" SOLENOID.
3. WITH TEST LIGHT STILL CONNECTED TO B+, PROBE TERMINAL "C" OF EGR CONNECTOR.
4. TEST LIGHT SHOULD TURN "ON" WHEN ENERGIZED.

LIGHT "ON"

FAULTY EGR CONNECTION OR DIGITAL EGR VALVE.

LIGHT "OFF"

OPEN IN CKT 699 OR PCM CONNECTOR OR FAULTY PCM.

NO

DTC 77 INTERMITTENT. SEE "DIAGNOSTIC AIDS" ON FACING PAGE.

LIGHT "OFF"

REPAIR OPEN IN CKT 541.

LIGHT "ON"

3. DISCONNECT PCM CONNECTOR "B" (BLACK).
4. WITH TEST LIGHT STILL CONNECTED TO B+, PROBE TERMINAL "C" OF EGR HARNESS CONNECTOR.

LIGHT "OFF"

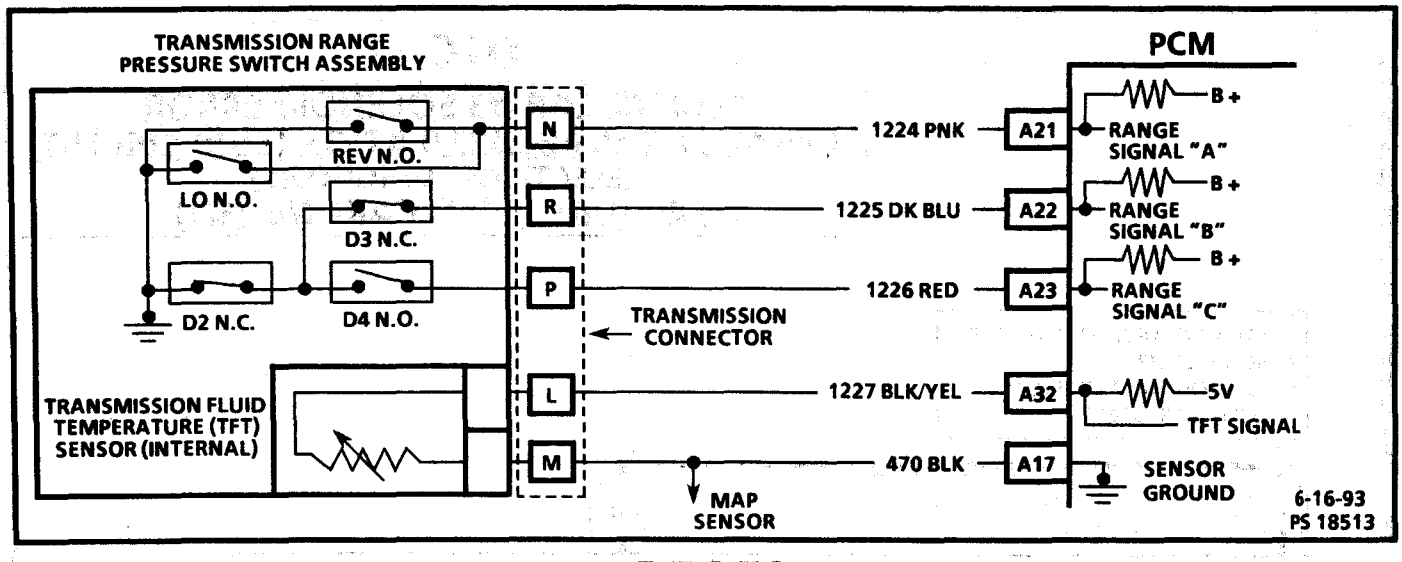
FAULTY PCM.

LIGHT "ON"

REPAIR SHORT TO GROUND IN CKT 699.

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

7-13-93
NS 15643



DTC 79

TRANSMISSION FLUID OVERTEMP
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Transmission Fluid Temperature (TFT) sensor is a thermistor within the TR pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage.

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts.

DTC 79 Will Set When: Signal voltage indicates a transmission fluid temperature greater than 146°C (295°F) and has not cooled to less than 137°C (280°F) for 30 minutes, and no DTC 58 or 59 set. If TFT becomes greater than 151°C (306°F), a DTC 58 will set.

Action Taken (PCM will default to): DTC 79 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 79 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for skewed or shorted circuit.
2. This test simulates a DTC 59.

Diagnostic Aids: Check harness routing for a potential short to ground in CKT 1227.

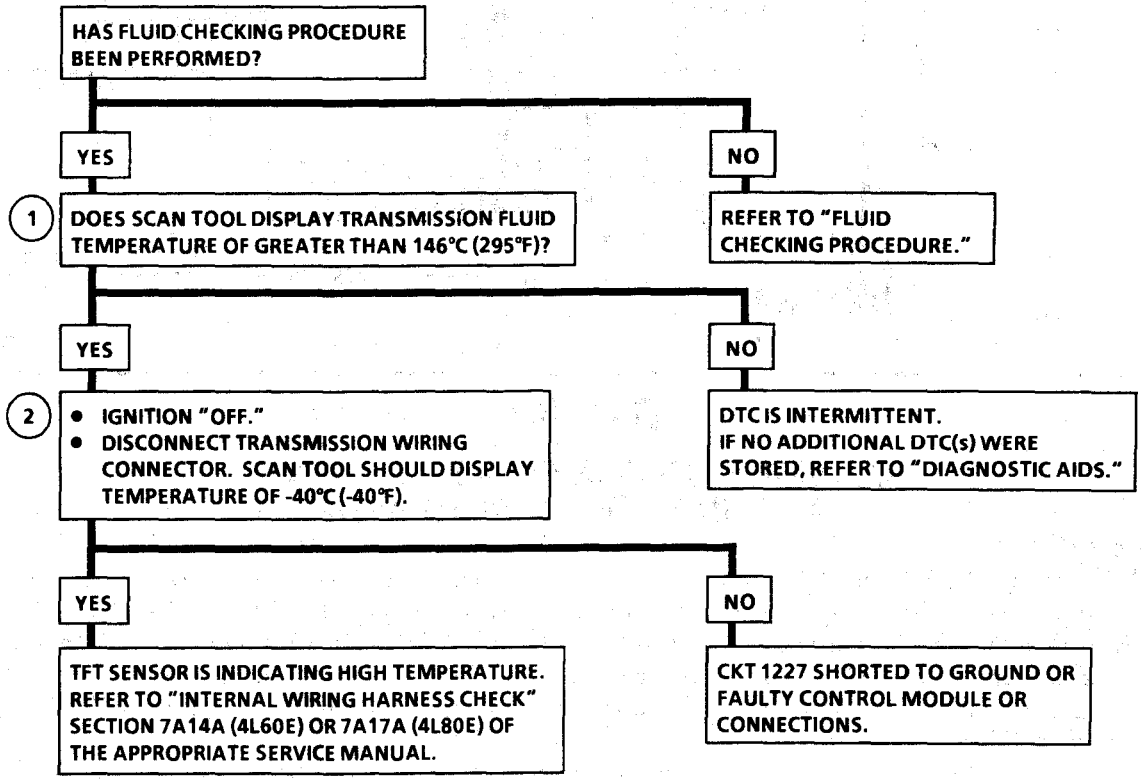
Scan tool TFT displays should rise steadily to about 100°C then stabilize.

The temperature to resistance value scale in SECTION 7A14A may be used to test the transmission sensor at the various temperature levels to evaluate the possibility of a "skewed" sensor. A "skewed" sensor could result in delayed garage shifts or TCC enabled complaints.

Check transmission fluid. Refer to "Fluid Checking Procedure."

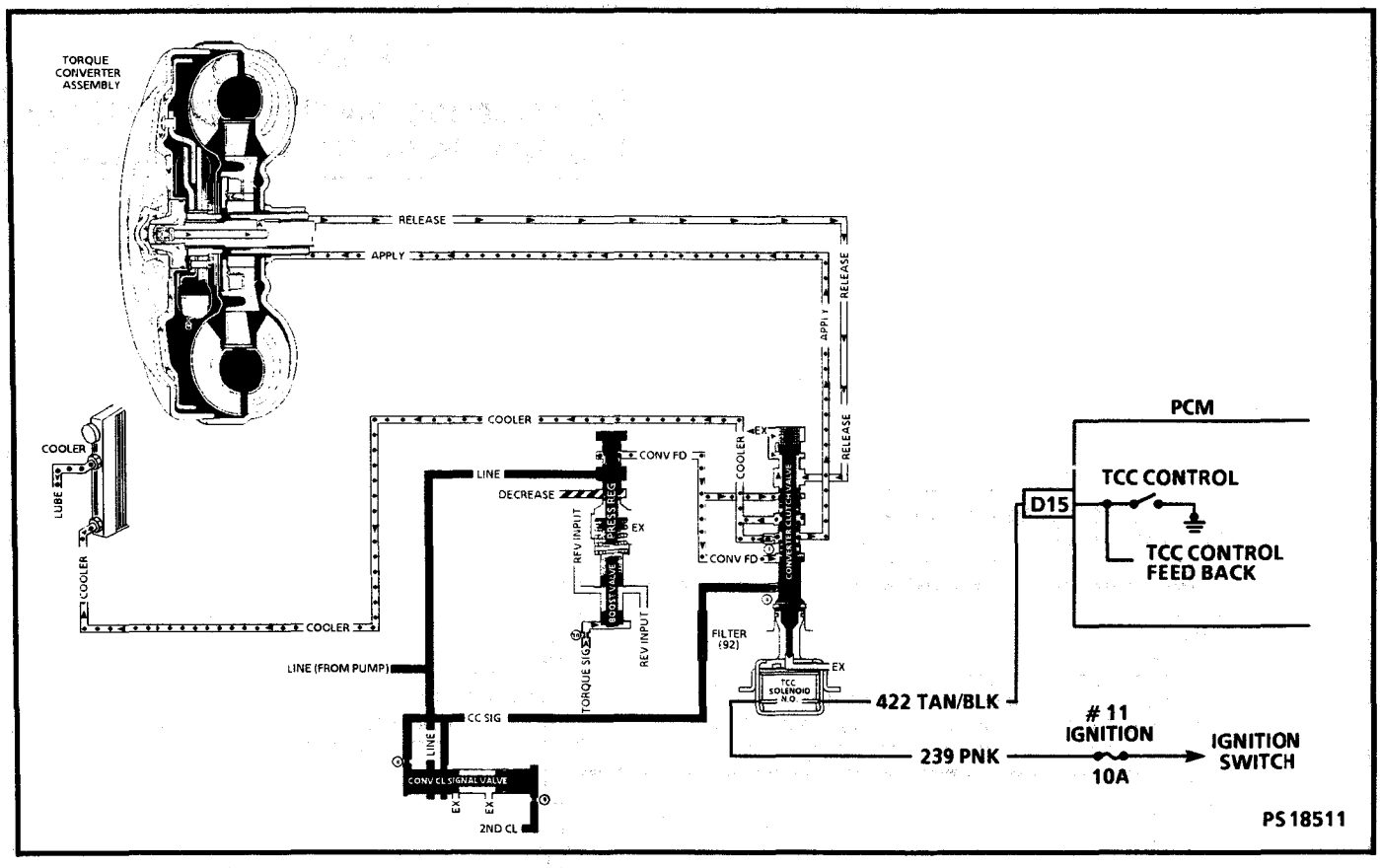
DTC 79

TRANSMISSION FLUID OVERTEMP 3.4L (VIN S) "F" CARLINE (SFI)



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

5-11-93
PS 17931



DTC 80

TRANSMISSION COMPONENT SLIPPING 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM energizes the Torque Converter Clutch (TCC) solenoid by grounding CKT 422. The TCC solenoid allows converter release fluid to exhaust past the #9 check ball, applying the TCC. The TCC solenoid will de-energize when the PCM no longer provides a ground. When the TCC solenoid is de-energized, this will block exhaust fluid, and release the TCC. The PCM moniters the difference in engine speed and the calculated transmission input shaft speed. With the TCC applied, the scan tool should display TCC slip speed of approximately -50 RPM to +50 RPM.

DTC 80 Will Set When: No DTC 28, TCC slip speed is greater than 100 RPM, TCC indicates "ON," gear indicates 2, 3, or 4, trans range switch indicates "D3" or "D4", TP between 0% and 35%, TFT between 60°C and 100°C. All conditions must be met for 10 seconds.

Action Taken (PCM will default to):

- Inhibit TCC operation.
- Set line pressure to max (harsh shifts).
- Inhibit 4th gear if in hot mode.

DTC 80 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 80 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

DTC Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test checks the indicated range signal to the actual selected range.
2. This test checks the torque converter for slippage while in a commanded locked-up state.

Diagnostic Aids:

- Check for poor connections at pass-thru connector.
- A faulty trans range pressure switch assembly may set DTC 80.

DTC 80

TRANSMISSION COMPONENT SLIPPING
3.4L (VIN S) "F" CARLINE (SFI)

NOTICE: PERFORM FLUID CHECKING PROCEDURE BEFORE PROCEEDING WITH DIAGNOSIS CHART.

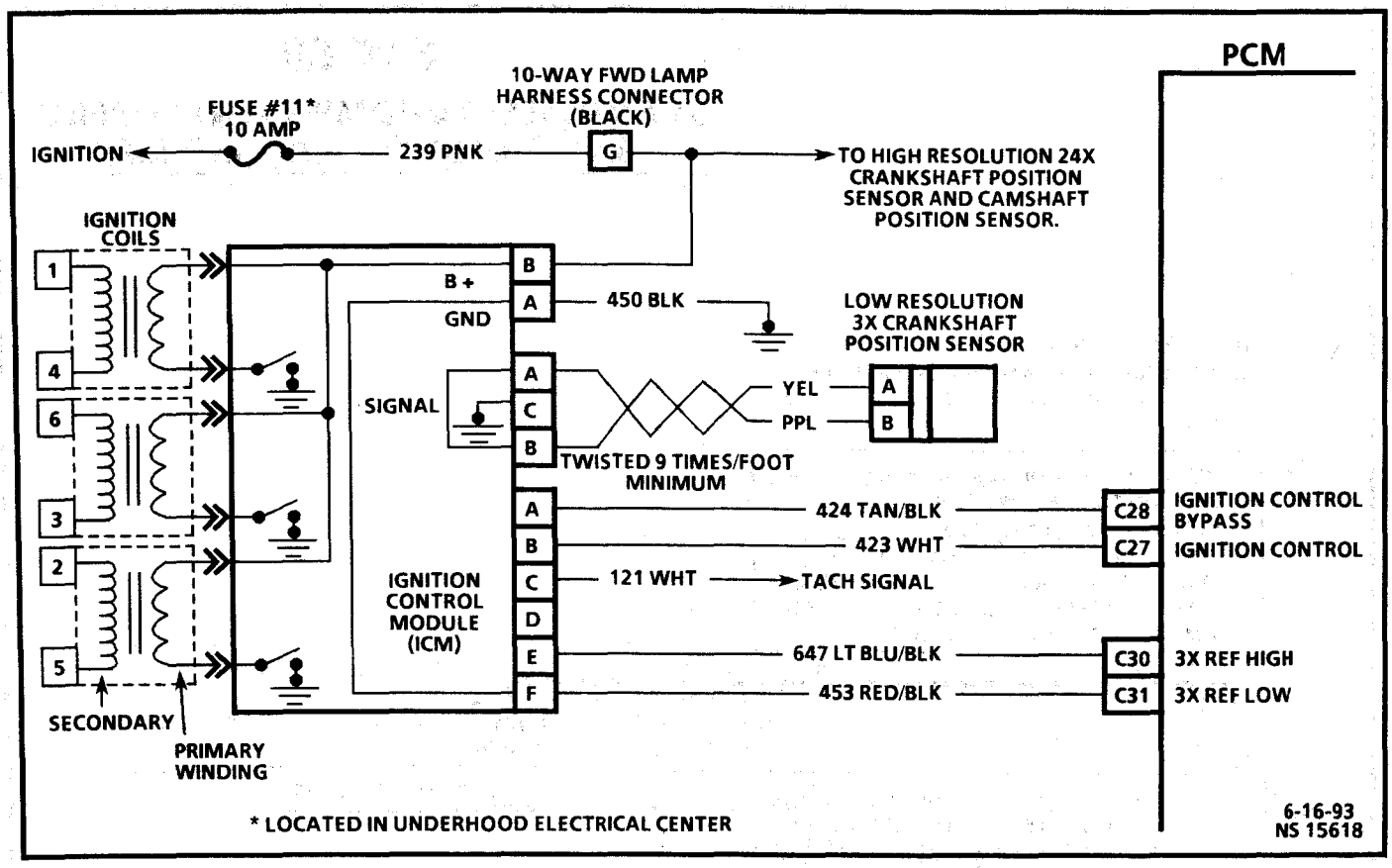
1. • INSTALL SCAN TOOL.
   • IGNITION "ON," ENGINE "OFF."
   • RECORD THEN CLEAR DTC(s).
   • APPLY BRAKE PEDAL AND SELECT EACH TRANSMISSION RANGE D1, D2, D3, D4, N, R, P.
   • DOES EACH SELECTED TRANS RANGE MATCH TRANS RANGE SW ON SCAN TOOL?

- NO → REFER TO DTC CHART 28.
- YES

2. • DRIVE VEHICLE IN 4th GEAR AND TCC ENGAGED.
   • USE SNAPSHOT MODE TO RECORD DATA PARAMETERS.
   • IS TCC SLIP SPEED EVER GREATER THAN 200 RPM FOR 2 SECONDS WHILE TCC IS ENGAGED?

- YES → MECHANICAL COMPONENT FAILURE. REFER TO "SYMPTOM DIAGNOSIS CHARTS" SECTION 7A14A (4L60E), 7A17A (4L80E) FOR PROBABLE MECHANICAL FAILURES.
- NO → THE CONDITION MAY BE INTERMITTENT. REFER TO TORQUE CONVERTER CLUTCH (TCC) DIAGNOSIS IN SECTION 7A14A (4L60E), 7A17A (4L80E) OF THE APPROPRIATE SERVICE MANUAL.

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



DTC 82

IGNITION CONTROL 3X SIGNAL ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

If the Tech 1 scan tool did not indicate a cranking RPM and there is no spark present at the plugs, the problem lies in the electronic ignition control system or the power and ground supplies to the Ignition Control Module (ICM).

The magnetic crank sensor is used to determine engine crankshaft position much the same way as the pick-up coil did in distributor type systems. The sensor is mounted in the block near a seven slot wheel on the crank shaft. The rotation of the wheel creates a magnetic field in the sensor which induces a voltage signal. The electronic ignition control module then processes this signal and creates the reference pulses needed by the PCM and the signal triggers the correct coil at the correct time.

DTC 82 Will Set When: If no 3X reference pulses are detected by the PCM during cranking, a DTC 82 will be set.

Action Taken (PCM will default to): The engine will not start, a DTC 82 will be stored and the MIL will remain illuminated.

DTC 82 Will Clear When: A current DTC 82 is cleared immediately after key "OFF," or when the engine is running. A history DTC 82 will clear after 50 consecutive ignition key cycles without a current DTC 82 being stored.

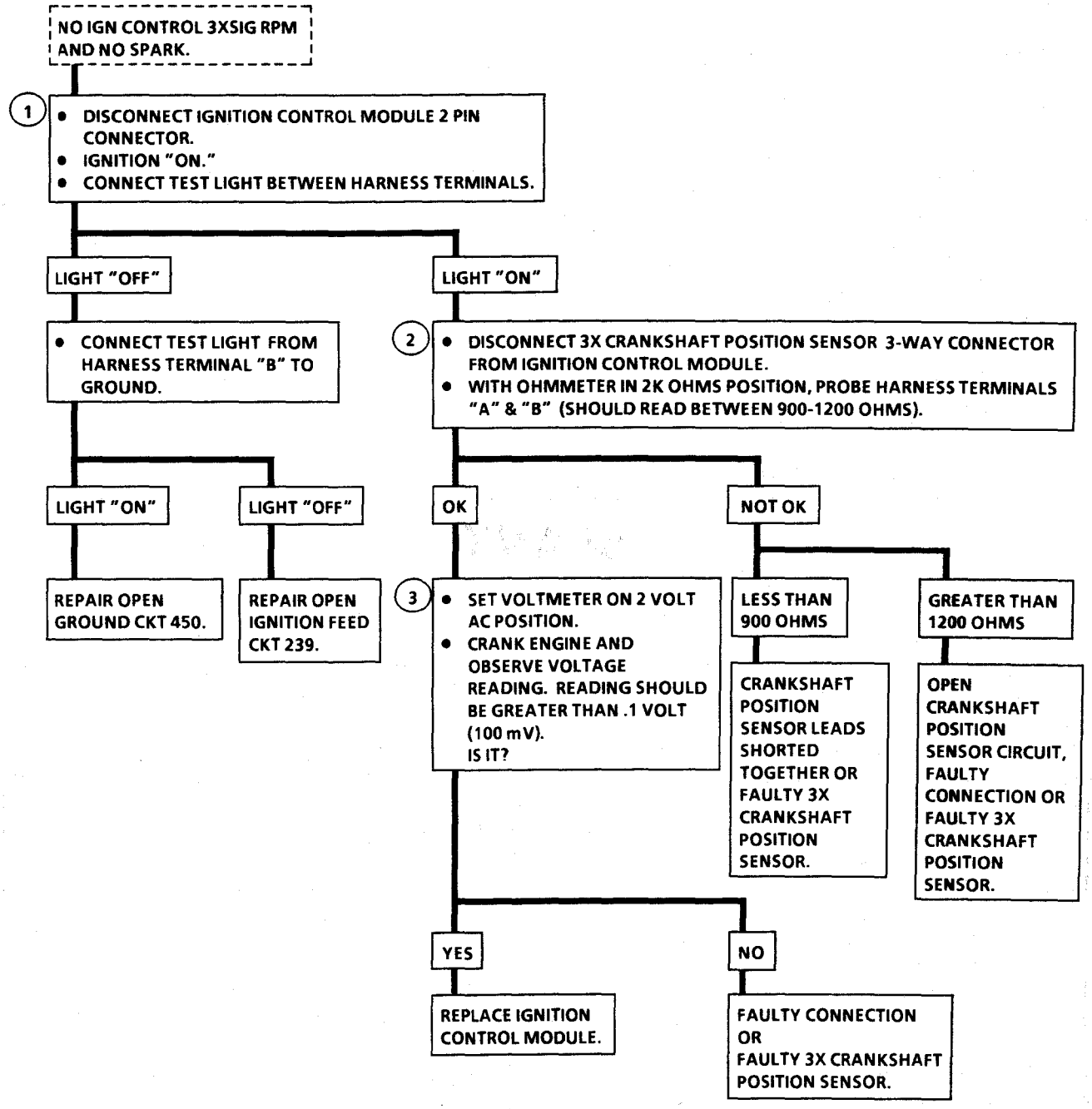
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test will determine if the 12 volt supply and a good ground is available at the electronic ignition control module.
2. Checks for continuity of the crankshaft position sensor and connections.
3. Voltage will vary in this test depending on cranking speed of engine.

Diagnostic Aids: An open or shorted 3X signal will cause a "Cranks But Won't Run" condition. An intermittent connection however may set a DTC 82 and then disappear when a connection is made. A history DTC 82 may indicate poor terminal connections, a marginally faulty sensor or a marginal ICM.

DTC 82

IGNITION CONTROL 3X SIGNAL ERROR 3.4L (VIN S) "F" CARLINE (SFI)



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

11-20-92
NS 15630

BLANK

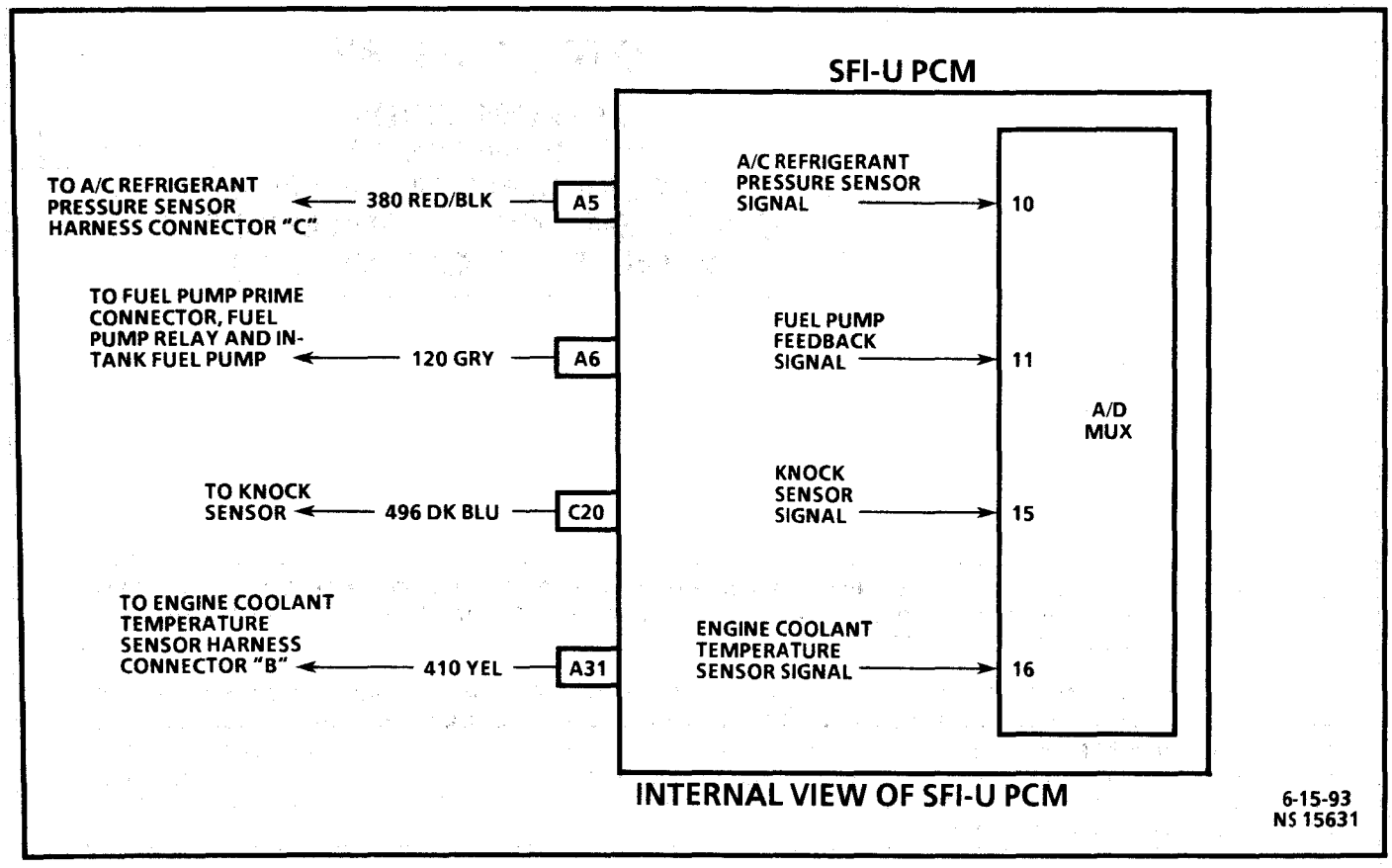
DTC 51, 85, 87

51 PROM ERROR
85 PROM ERROR
87 ELECTRICALLY ERASABLE PROGRAMMABLE READ ONLY MEMORY(EEPROM) ERROR
3.4L (VIN S) "F" CARLINE (SFI)

DTC(s) 51, 85, 87 WILL BE STORED WHEN AN INVALID PROGRAM IS DETECTED BY THE PCM. CHECK THAT ALL CONNECTORS ARE FULLY INSERTED IN THE SOCKET. IF OK, REPROGRAM THE PCM. REFER TO SECTION "6E3-C1" (PCM AND SENSORS). IF PCM WILL NOT REPROGRAM, REPLACE PCM.

NOTICE: REPLACEMENT PCM's MUST BE REPROGRAMMED,. IT IS ALSO NECESSARY TO TRANSFER THE ESC MODULE WHEN REPLACING THE PCM. TO PREVENT POSSIBLE ELECTROSTATIC DISCHARGE DAMAGE TO THE PCM, DO NOT TOUCH THE COMPONENT LEADS.

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



DTC 86

A/D ERROR
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The A/D multiplexer chip is an internal part of the PCM. The above exploded view SFI-U PCM shows sensor inputs to the A/D multiplexer that can affect driveability and diagnostics.

DTC 86 Will Set When: Any of the above circuits is shorted to system voltage for 15 seconds.

Action Taken (PCM will default to): The MIL will become illuminated.

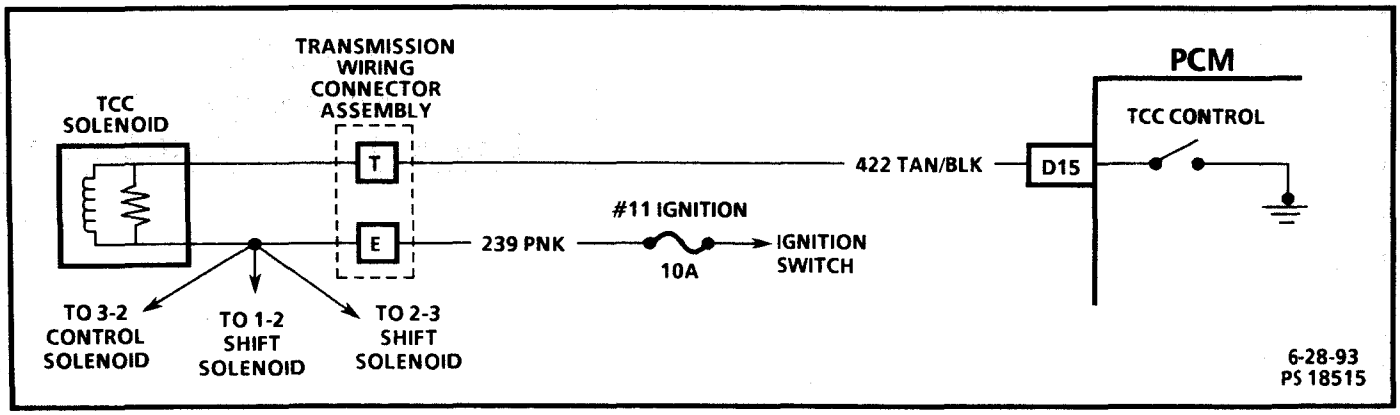
DTC 86 Will Clear When: A current DTC 86 will clear when 12 volts is no longer sensed on the above circuits. A history DTC 86 will clear after 50 consecutive ignition key cycles without a current DTC 86 being stored.

Diagnostic Aids: If DTC 86 is not present, all circuits leading to the PCM that are connected to the A/D multiplexer should be checked for an intermittent short to B+. Move the harnesses of each component and watch the scan data on the Tech 1. The circuit that is shorted to B+ will show erratic changes in data on the Tech 1.

DTC 86
A/D ERROR
3.4L (VIN S) "F" CARLINE (SFI)

FOR DTC 86, CHECK FOR ANY DTCs THAT ARE STORED AND REFER TO THOSE CHARTS. IF NO OTHER DTCs ARE STORED, CHECK ALL PCM CONNECTORS AND TERMINALS FOR PROPER LOCATION. DTC 86 WILL SET ONLY WHEN THE CIRCUITS LEADING TO THE A/D MULTIPLEXER, INTERNAL TO THE PCM GETS SHORTED TO B+. IF DTC 86 IS INTERMITTENT, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

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



DTC 90

TRANSMISSION TCC SOLENOID CIRCUIT (TCC ERROR) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TCC solenoid is an electrical device used to control fluid acting on the TCC converter clutch valve, which then controls TCC apply and release. The PCM monitors T.P. voltage, vehicle speed, and other inputs to determine when to energize the TCC solenoid. Ignition voltage is supplied directly to the TCC solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 422.

DTC 90 Will Set When: The PCM commands the TCC solenoid "ON" and the voltage stays high (B+) for 2 seconds. The PCM commands the TCC solenoid "OFF" and the voltage drops to zero volts for 2 seconds.

Action Taken (PCM will default to): No TCC will occur, and no fourth gear if in hot mode. DTC 90 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 90 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks for a shorted, internal transmission harness or TCC solenoid.
2. This test checks power supply to the TCC solenoid.

Diagnostic Aids: Check all connections at the transmission pass-thru connector.

Some slight TCC slip is normal.

An open in the ignition feed circuit will cause multiple DTC(s) to set.

DTC 90

TRANSMISSION TCC SOLENOID CIRCUIT (TCC ERROR) 3.4L (VIN S) "F" CARLINE (SFI)

(1)
- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON," ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/TCC SOLENOID.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHESCOPE IF NECESSARY).
- DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

(2)
- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM. (ADDITIONAL DTCs WILL SET.)
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND. IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "T" (4L60E) OR "E" TO "S" (4L80E) OF J 39775.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES.
- IS TEST LIGHT "ON" WHEN COMMANDED "ON" AND "OFF" WHEN COMMANDED "OFF"?

NO

- CHECK CKT 422 (4L60E) OR CKT 1350 (4L80E) FOR AN OPEN OR SHORT FROM THE CONTROL MODULE TO THE TRANSMISSION WIRING CONNECTOR. IF OKAY, REPLACE CONTROL MODULE.

YES

EXTERNAL TRANSMISSION WIRING CHECKS OKAY. REFER TO "INTERNAL WIRING HARNESS CHECK" IN SECTION 7A14A (4L60E) OR 7A17A (4L80E).

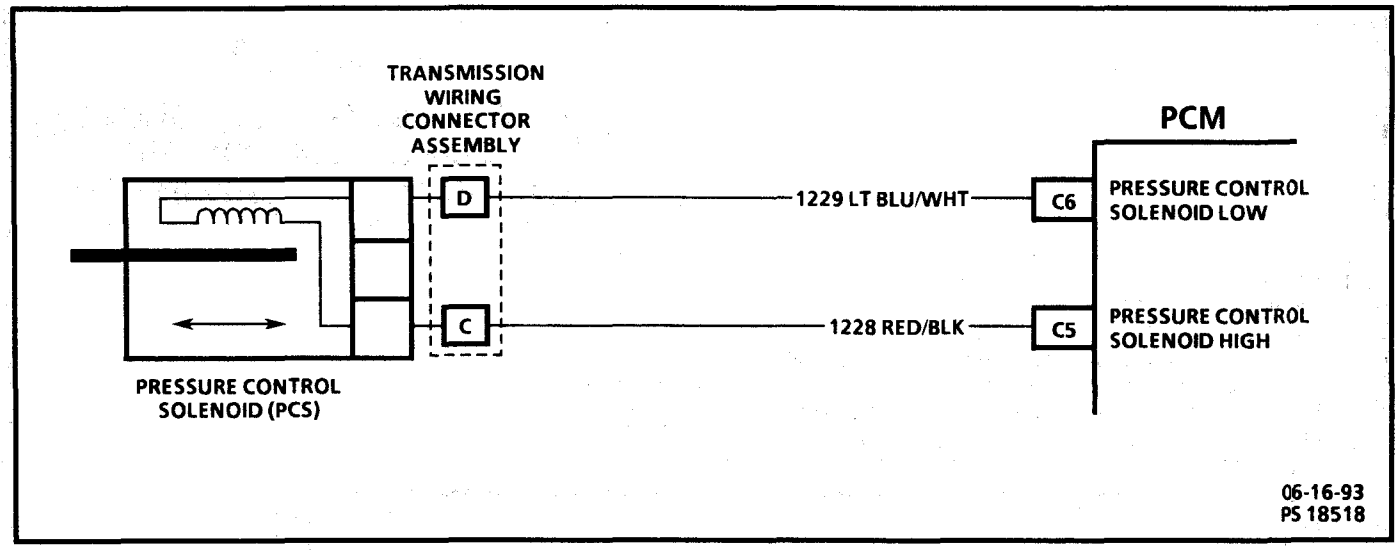
NO

REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION. IF THE FUSE IS OPEN, CHECK THE TRANSMISSION INTERNAL WIRING HARNESS OR SOLENOID FOR SHORT TO GROUND.

YES

ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSTIC AIDS."

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



DTC 93

PRESSURE CONTROL SOLENOID (PCS) CIRCUIT (CURRENT ERROR) 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The pressure control solenoid is a PCM controlled device used to regulate transmission line pressure. The PCM compares TP voltage, engine RPM and other inputs to determine the appropriate line pressure for a given load. The PCM will regulate the pressure by applying a varying amperage to the pressure control solenoid. The applied amperage can vary from 0.1 to 1.1 amp. The PCM then monitors the amperage at the return line.

DTC 93 Will Set When: The return amperage varies greater than 0.16 amp from the commanded amperage for at least one second, and no DTC 75 stored.

Action Taken (PCM will default to): Full line pressure will be applied causing harsh shifts. DTC 73 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 93 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks the ability of the PCM to command the pressure control solenoid.
2. This test checks for voltage at PCM.

Diagnostic Aids: Check for poor connections at PCM and at transmission connector.

DTC 93

PRESSURE CONTROL SOLENOID (PCS) CIRCUIT (CURRENT ERROR) 3.4L (VIN S) "F" CARLINE (SFI)

1. • INSTALL TECH 1.
   • RECORD THEN CLEAR DTC(s).
   • ENGINE OPERATING, TRANSMISSION IN PARK.
   • ENTER MISC TESTS/TRANSMISSION/PCS CONTROL.
   • USING TECH 1, APPLY 1.0 AMPS THRU 0.1 AMPS WHILE OBSERVING DESIRED PCS AND ACTUAL PCS.
   IS ACTUAL PCS READING ALWAYS WITHIN 0.16 AMPS OF DESIRED PCS?

YES → PROBLEM IS INTERMITTENT REFER TO "DIAGNOSTIC AIDS."

NO

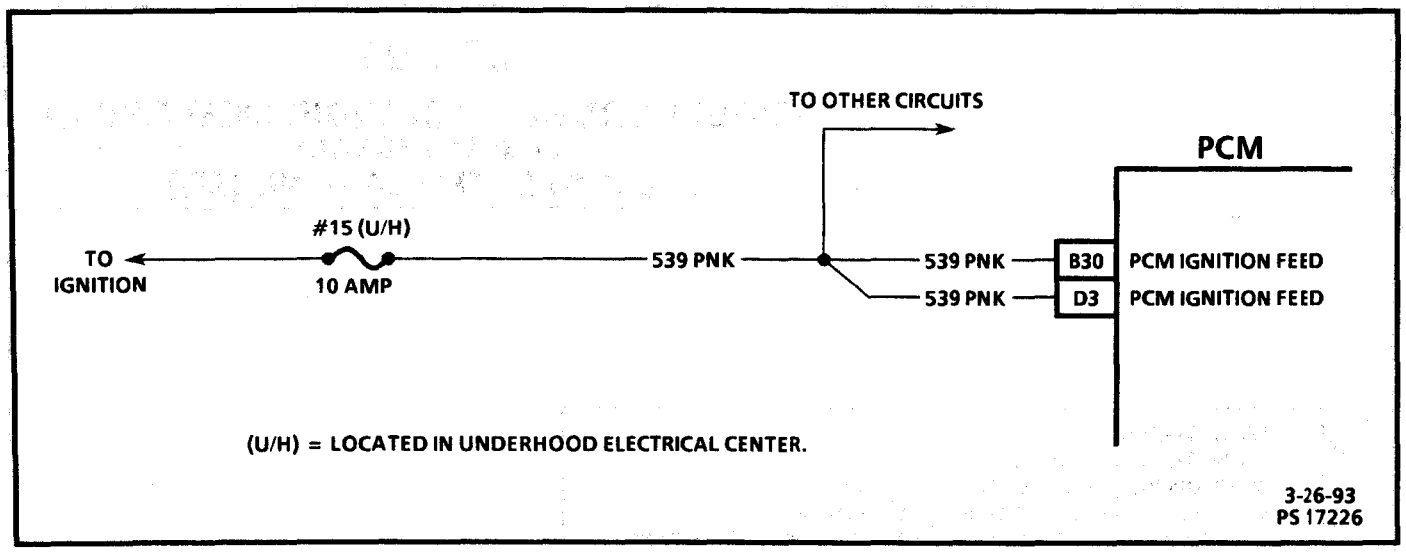
2. • IGNITION "OFF."
   • DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
   • INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE TRANSMISSION EXTERNAL WIRING HARNESS CONNECTOR.
   • JUMPER J 39775 CAVITIES "M" AND "R".
   • USING J 39200 DVM ON 10 AMP SCALE, CONNECT (IN SERIES) TO CAVITIES "C" AND "D."
   • ENGINE OPERATING, TRANSMISSION IN PARK.
   • USING TECH 1, APPLY 1.0 AMPS THRU 0.1 AMPS WHILE OBSERVING DESIRED PCS AND J 39200 DVM READING.
   • IS DESIRED PCS ALWAYS WITHIN 0.16 AMPS OF J 39200 DVM READING?

YES

- IGNITION "OFF."
- CK TRANS WIRING CONNECTOR TERMINAL TENSION ON THE PCS CIRCUITS. IF OK, REFER TO SECTION 7A14A (4L60E) OR 7A17A (4L80E) " INTERNAL WIRING HARNESS CHECK " FOR INTERNAL PCS CIRCUIT DIAGNOSIS.

NO → VERIFY CKTs 1228 AND 1229 ARE NOT OPEN OR SHORTED. ALSO VERIFY TERMINAL TENSION ON THESE CIRCUITS AT THE PCM CONNECTOR. IF OK, REPLACE PCM.

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



DTC 96

TRANSMISSION SYSTEM VOLTAGE LOW
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:
CKT 539 is the ignition feed for the PCM.

DTC 96 Will Set When: The ignition is "ON" and PCM terminals "B30" and "D3" voltage is less than the graduated scale of: -40°C (-40°F) = 7.3 volts, 90°C (194°F) = 10.3 volts, or 150°C (304°F) = 11.7 volts, with engine speed greater than 1000 RPM for 4 seconds.

Action Taken (PCM will default to): During the time the failure is present, the pressure control solenoid is turned "OFF" (maximum line pressure), there is a soft landing to third gear, and TCC operation is inhibited. (The setting of additional diagnostic trouble codes may result.) DTC 96 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 96 Will Clear When: The fault condition(s) no longer exist.

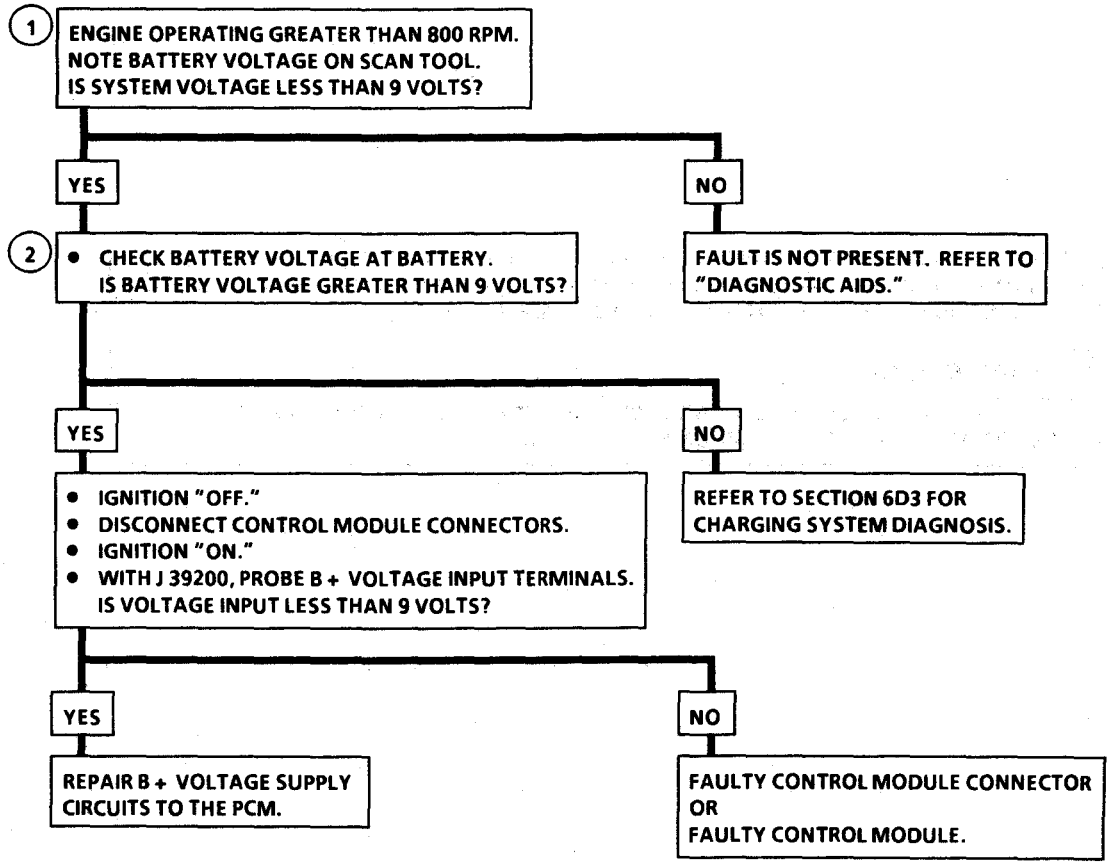
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test checks for normal battery voltage between 9-15 volts.
2. This test checks if the low voltage display is due to the generator, B+ voltage supply CKT(s), or PCM. If the voltage is less than 9 volts, the PCM is OK.

Diagnostic Aids: If diagnostic trouble code sets when an accessory is operated, check for poor connections or excessive current draw. Refer to SECTION 8A of appropriate service manual for circuit details. Also, check for poor connections at starter solenoid or fusible link.

DTC 96

TRANSMISSION SYSTEM VOLTAGE LOW
3.4L (VIN S) "F" CARLINE (SFI)



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

DTCs 98, 99

INVALID PCM PROGRAM
3.4L (VIN S) "F" CARLINE (SFI)

DTC 98 OR 99 WILL BE STORED WHEN AN INVALID PROGRAM IS DETECTED BY THE PCM. REFER TO SECTION 6E3-C1 (PCM AND SENSORS) FOR REPROGRAMMING PROCEDURES. IF DTC 98 OR 99 CONTINUES TO BE DISPLAYED USING A TECH 1, REPLACE PCM.

Important

- THE KNOCK SENSOR (KS) MODULE MUST BE TRANSFERRED TO THE REPLACEMENT PCM. REFER TO SECTION "6E3-C1" FOR COMPONENT REPLACEMENT.

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

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SYMPTOMS
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IMPORTANT PRELIMINARY CHECKS

BEFORE USING THIS SECTION

Before using this section you should have performed the "On-Board Diagnostic (OBD) System Check" and determined that:

1. The PCM and MIL (Service Engine Soon) are operating correctly.
2. There are no diagnostic trouble codes stored, or there is a diagnostic trouble code but no MIL (Service Engine Soon).

SYMPTOM

Verify the customer complaint and locate the correct symptom in the table of contents. Check the items indicated under that symptom.

VISUAL/PHYSICAL CHECK

Several of the symptom procedures call for a careful visual/physical check. The importance of this step cannot be stressed too strongly - it can lead to correcting a problem without further checks and can save valuable time. This check should include:

- PCM grounds and sensors for being clean, tight and in their proper location.
- Vacuum hoses for splits, kinks, and proper connections, as shown on "Vehicle Emission Control Information" label. Check thoroughly for any type of leak or restriction.
- Air leaks at throttle body mounting area and intake manifold sealing surfaces.
- Ignition wires for cracking, hardness, proper routing and carbon tracking.
- Wiring for proper connections, pinches and cuts.

INTERMITTENTS

(Page 1 of 2)

Definition: Problem may or may not turn "ON" the MIL (Service Engine Soon) or store a DTC.

DO NOT use the diagnostic trouble code charts in "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3-A" for intermittent problems. The fault must be present to locate the problem. If a fault is intermittent, use of diagnostic trouble code charts may result in replacement of good parts.

- Most intermittent problems are caused by faulty electrical connections or wiring. Perform careful visual/physical check as described at start of "Symptoms," Section "6E3-B". Check for:
  - Poor mating of the connector halves or terminal not fully seated in the connector body (backed out).
  - Improperly formed or damaged terminal. All connector terminals in the problem circuit should be carefully reformed or replaced to ensure proper contact tension.
  - Poor terminal to wire connection. This requires removing the terminal from the connector body to check. Refer to "Introduction" in SECTION 6E, "Wiring Harness Service."

- If a visual/physical check does not find the cause of the problem, the vehicle can be driven with a voltmeter connected to a suspected circuit. A Tech 1 scan tool can also be used to help detect intermittent conditions. An abnormal voltage or Tech 1 scan tool reading, when the problem occurs, indicates the problem may be in that circuit.

- Loss of diagnostic trouble code memory. To check, disconnect TP sensor and idle engine until MIL (Service Engine Soon) comes "ON." DTC 22 should be stored and kept in memory when ignition is turned "OFF." If not, the PCM connections or the PCM is faulty.

- An intermittent MIL (Service Engine Soon) with no stored diagnostic trouble code may be caused by:
  - Ignition coil shorted to ground and arcing at spark plug wires or plugs.
  - MIL (Service Engine Soon) wire to PCM shorted to ground (CKT 419).
  - Diagnostic enable terminal wire to PCM shorted to ground (CKT 448).
  - PCM grounds, refer to PCM wiring diagrams.
  - Excessive current draw from faulty systems such as damaged cooling fan motor, etc.

INTERMITTENTS

(Page 2 of 2)

Definition: Problem may or may not turn "ON" the MIL (Service Engine Soon) or store a DTC.

- Check for an electrical system interference caused by a defective relay, PCM driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the faulty component is operated.

- Check for improper installation of electrical options such as lights, 2-way radios, etc.

- Ignition control wires should be routed away from spark plug wires, Ignition Control (IC) system wires, Ignition Control (IC) system assembly and generator. Wires from PCM to Ignition Control (IC) system should have a good connection.

- Check for open diode across A/C compressor clutch, and for other open diodes (refer to wiring diagrams).

- If problem has not been found, refer to "PCM Connector Symptom" charts at the end of "Symptoms," Section "6E3-B".

- Check for improperly formed or damaged terminal on CKT 423. Refer to "DTC 41", Section "6E3-A".

HARD START

Definition: Engine cranks OK, but does not start for a long time. Does eventually run, or may start but immediately dies.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Make sure the driver is using the correct starting procedure.

ADDITIONAL CHECKS

- **CHECK:** IAC operation - use CHART C-2B.
- **CHECK:** Basic engine problem. Refer to SECTION 6A.
- **CHECK:** Service bulletins for updates.

SENSORS

- **CHECK:** Engine Coolant Temperature (ECT) sensor using a Tech 1 scan tool, compare engine coolant temperature with ambient temperature on cold engine.
  - If engine coolant temperature readings are 5 degrees greater than or less than ambient air temperature on a cold engine, check resistance in engine coolant temperature sensor circuit or sensor itself. Compare ECT sensor resistance value to the "Diagnostic Aid" chart on DTC 15 chart.
- **CHECK:** MAP sensor. Check for flooding.
- **CHECK:** TP sensor for binding or a high TP sensor voltage with the throttle closed (should read between .29 volt and .98 volt.)

IGNITION SYSTEM

- **CHECK:** For proper ignition voltage output with spark tester J 26792 (ST 125).
- **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:** Bare or shorted wires.
- **CHECK:** Crankshaft position sensor, resistance and connections.

FUEL SYSTEM

- **CHECK:** Fuel pump relay operation - pump should turn "ON" for 2 seconds when ignition is turned "ON." Use DTC 54.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.
- **CHECK:** Both injector fuses (visual inspect).

NOTICE: A faulty in-tank fuel pump check valve will allow the fuel in the lines to drain back to the tank after engine is stopped. To check for this condition, perform fuel system diagnosis CHART A-7.

SURGES AND/OR CHUGGLES

Definition: Engine power variation under steady throttle or cruise feels like the vehicle speeds up and slows down with no change in the accelerator pedal.

PRELIMINARY CHECKS

- Perform the careful visual checks as described at start of "Symptoms," Section "6E3-B".
- Be sure driver understands transmission torque converter clutch and A/C compressor operation as explained in the owner's manual.

ADDITIONAL CHECKS

- **CHECK:** PCM grounds for being clean, tight and in their proper location.
- **CHECK:** Vacuum lines for kinks or leaks.
- **CHECK:** Generator output voltage. Repair if less than 9 volts or more than 16 volts.
- **CHECK:** Speedometer reading with the speed on a Tech 1 scan tool are equal.
- **CHECK:** Service bulletins for updates.

SENSORS

- **CHECK:** Oxygen Sensor(s) O2S. The Oxygen Sensor(s) O2S should respond quickly to different throttle position. If they do not, check the Oxygen Sensor(s) O2S for silicon or other contaminations from fuel or improper use of RTV sealant. The sensor(s) may have a white, powdery coating and result in a high but false signal voltage (rich exhaust indication). The PCM will then reduce the amount of fuel delivered to the engine, causing a severe driveability problem. Also, watch for green (glycol) contamination or cracking.

IGNITION SYSTEM

- **CHECK:** For proper ignition voltage output using spark tester J 26792 (ST 125) or equivalent.
- **CHECK:** Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. Repair or replace as necessary. Also, check spark plug wires.

FUEL SYSTEM

NOTICE: To determine if the condition is caused by a rich or lean system, the vehicle should be driven at the speed of the complaint. Monitoring long term and short term fuel trim will help identify a problem.
Lean - Long term fuel trim above 150. Refer to "Diagnostic Aids" on facing page of DTC 44/64.
Rich - Long term fuel trim below 110. Refer to "Diagnostic Aids" on facing page of DTC 45/65.

- **CHECK:** Fuel pressure while condition exists. Use CHART A-7.
- **CHECK:** In-line fuel filter. Replace if dirty or plugged.

LACK OF POWER, SLUGGISH OR SPONGY

Definition: Engine delivers less than expected power. Little or no increase in speed when accelerator pedal is pushed down part way.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Compare customer's vehicle to similar unit. Make sure the customer has an actual problem.
- Remove air filter and check for dirt, or other contamination. Replace as necessary.

ADDITIONAL CHECKS

- **CHECK:** PCM grounds for being clean, tight and in their proper locations. Refer to PCM wiring diagrams.
- **CHECK:** EGR operation for being open or partly open all the time. Refer to CHART C-7.
- **CHECK:** Generator output voltage. Repair if less than 9 volts or more than 16 volts.
- **CHECK:** Exhaust system for possible restriction.
  - Inspect exhaust system for damaged or collapsed pipes.
  - Inspect muffler for heat distress or possible internal failure.
- **CHECK:** Torque Converter Clutch (TCC) for proper operation. Refer to SECTION 7A.

ENGINE MECHANICAL

- **CHECK:** Engine valve timing and compression.
- **CHECK:** Engine for correct or worn camshaft. Refer to SECTION 6A.

IGNITION SYSTEM

- **CHECK:** Knock Sensor (KS) system for excessive spark retard activity. Refer to CHART C-5. Use Tech 1 scan tool.
- **CHECK:** Secondary voltage using a shop oscilloscope or a spark tester J 26792 (ST 125).

FUEL SYSTEM

- **CHECK:** Restricted fuel filter.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.

DETONATION/SPARK KNOCK

Definition: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that change with throttle opening.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Park/Neutral Position (PNP) switch. Be sure Tech 1 scan indicates drive with gear selector in drive or overdrive. Use CHART C-1A.

NOTICE: If Tech 1 scan tool readings are normal (refer to facing page of "On-Board Diagnostic System Check") and there are no engine mechanical faults, fill fuel tank with a premium gasoline that has a minimum octane reading of 92 and revaluate vehicle performance.

- **CHECK:** EGR system for not opening. Use CHART C-7.
- **CHECK:** TCC operation, TCC applying too soon. Use CHART C-8.

ADDITIONAL CHECKS

- **CHECK:** Service bulletins for updates.

IGNITION SYSTEM

- **CHECK:** Spark plugs for proper heat range. Refer to "Owner's Manual," check should read "OB".
- **CHECK:** Knock Sensor (KS) system for no retard, use CHART C-5.

ENGINE MECHANICAL

- **CHECK:** For excessive oil in the combustion chamber.
  - Valve oil seals for leaking.
- **CHECK:** Combustion chambers for excessive carbon buildup. Remove carbon with top engine cleaner and follow instructions on can.
- **CHECK:** Combustion chamber pressure by performing a compression test. Refer to SECTION 6A.
- **CHECK:** For incorrect basic engine parts such as cam, heads, pistons, etc.

COOLING SYSTEM

- Check for obvious overheating problems:
  - Low engine coolant.
  - Loose water pump belt.
  - Restricted air flow to radiator, or restricted water flow through radiator.
  - Inoperative electric cooling fan circuit, use CHART C-12.
  - Correct coolant solution should be a 50/50 mix of GM #1052753 anti-freeze coolant (or equivalent) and water.

FUEL SYSTEM

NOTICE: To determine if the condition is caused by a rich or lean system, the vehicle should be driven at the speed of the complaint. Monitoring long term fuel trim will help identify problem.
Lean - Long term fuel trim above 150. Refer to "Diagnostic Aids" on facing page of DTC 44/64.
Rich - Long term fuel trim below 110. Refer to "Diagnostic Aids" on facing page of DTC 45/65.

- **CHECK:** Fuel pressure, use CHART A-7.

HESITATION, SAG, STUMBLE

Definition: Momentary lack of response as the accelerator is pushed down. Can occur at all vehicle speeds. Usually most severe when first trying to make the vehicle move, as from a stop sign. May cause engine to stall if severe enough.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

SENSORS

- **CHECK:** TP sensor - Check TP sensor for binding or sticking. Voltage should increase at a steady rate as throttle is moved toward Wide Open Throttle (WOT).
- **CHECK:** MAP sensor - use CHART C-1D.

IGNITION SYSTEM

- **CHECK:** Spark plugs for being fouled or for faulty spark plug wire routing.
- **CHECK:** Ignition Control (IC) system ground, CKT 450.

FUEL SYSTEM

- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.
- **CHECK:** EVAP canister purge system for proper operation. Use CHART C-3.
- **CHECK:** Fuel injectors. Perform injector/coil balance test, use CHART C-2A.

ADDITIONAL CHECKS

- **CHECK:** Service bulletins for updates.
- **CHECK:** EGR operation, use CHART C-7.
- **CHECK:** Engine thermostat functioning correctly and proper heat range.
- **CHECK:** Generator output voltage. Repair if less than 9 volts or more than 16 volts.

CUTS OUT, MISSES

(Page 1 of 2)

Definition: Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases, not normally felt above 1500 RPM or 48 km/h (30 mph). The exhaust has a steady spitting sound at idle or low speed.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

ADDITIONAL CHECKS

- **CHECK:** For Electromagnetic Interference (EMI). A mistake can be caused by Electromagnetic Interference (EMI) on the 3X reference low circuit. EMI can usually be detected by monitoring engine RPM with a Tech 1 scan tool. A sudden increase in RPM with little change in actual engine RPM change indicates EMI is present. If the problem exists, check routing of spark plug wires and ignition control ground circuit.
- **CHECK:** Intake and exhaust manifold passage for casting flash.

IGNITION SYSTEM

- Check for cylinder miss:
  1. Start engine allowing engine to stabilize then disconnect IAC motor. Remove one spark plug wire at a time using insulated pliers.

  CAUTION: Do Not perform this test for more than 2 minutes, as this test may cause damage to the catalytic converter.

  2. If there is an RPM drop on all cylinders (equal to within 50 RPM), go to "Rough, Unstable, or Incorrect Idle, Stalling" symptom. Reconnect IAC valve.
  3. If there is no RPM drop on one or more cylinders or excessive variation in RPM drop, check for spark on the suspected cylinder(s) using a shop oscilloscope or with J 26792 (ST 125) spark tester or equivalent. If no spark, refer to SECTION 6D for intermittent operation or miss. If there is a spark, remove spark plug(s) in these cylinders and check for:
     - Insulator cracks.
     - Wear.
     - Improper gap.
     - Burned electrodes.
     - Heavy deposits.
- **CHECK:** Spark plug wires by connecting ohmmeter to ends of each wire in question. If meter reads over 30,000 ohms, replace wire(s).

CUTS OUT, MISSES

(Page 2 of 2)

Definition: Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases, not normally felt above 1500 RPM or 48 km/h (30 mph). The exhaust has a steady spitting sound at idle or low speed.

ENGINE MECHANICAL

- **CHECK:** Compression. Perform compression check on questionable cylinder(s) found above. If compression is low, repair as necessary. Refer to SECTION 6A.
- **CHECK:** Base engine. Remove rocker covers. Check for bent pushrods, worn rocker arms, broken valve springs, worn camshaft lobes and valve timing. Repair as necessary. Refer to SECTION 6A.

FUEL SYSTEM

- **CHECK:** Fuel system - Plugged fuel filter, low pressure. Use CHART A-7.
- **CHECK:** Contaminated fuel.
- **CHECK:** Injector drivers. Disconnect all injector harness connectors. Connect J 34730-2C injector test light between the harness terminal of each injector connector and note light while cranking. If tester light fails to blink at any connector, it is a faulty injector drive circuit harness, connector or terminal.
- **CHECK:** Perform the injector/coil balance test. Refer to CHART C-2A.

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.

ROUGH, UNSTABLE, OR INCORRECT IDLE, STALLING

(Page 2 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.

FUEL SYSTEM

NOTICE: Monitoring long term fuel trim will help identify the cause of the problem. If the system is running lean (long term fuel trim greater than 150), refer to "Diagnostic Aids" on facing page of DTC 44/64. If the system is running rich (long term fuel trim less than 110), refer to "Diagnostic Aids" on facing page of DTC 45/65.

- **CHECK:** Injector/coil balance. Refer to CHART C-2A.
- **CHECK:** For fuel in pressure regulator hose. If fuel is present, replace regulator assembly.
- **CHECK:** Evaporative Emission (EVAP) Control System, use CHART C-3.
- **CHECK:** The Oxygen Sensor(s) (O2S) should respond quickly to different throttle positions. If they do not, check the Oxygen Sensor(s) (O2S) for silicon contamination from fuel or improper use of RTV sealant. The sensor will have a white, powdery coating and will result in a high but false signal voltage (rich exhaust indication). The PCM will then reduce the amount of fuel delivered to the engine, causing a severe driveability problem.

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 checks 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 filter for dirty or being plugged.
  - Fuel leaks.

ADDITIONAL CHECKS

- **CHECK:** TCC operation. Use CHART C-8. A Tech 1 scan tool should indicate an RPM drop, when the TCC is commanded "ON."
- **CHECK:** For exhaust system restriction.
- **CHECK:** For proper calibration of speedometer.
- **CHECK:** Air intake system and crankcase for air leaks.

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:** For open ignition control CKT 423. Refer to "DTC 41," Section "6E3-A".

COOLING SYSTEM

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

ENGINE MECHANICAL

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

EXCESSIVE EXHAUST EMISSIONS OR ODORS

Definition: Vehicle fails an emission test. Vehicle has excessive "rotten egg" smell. Excessive odors do not necessarily indicate excessive emissions.

PRELIMINARY CHECKS

- Perform "On-Board Diagnostic (OBD) System Check."

NOTICE: If emission test shows excessive CO and HC check items which cause vehicle to run RICH (long term fuel trim less than 110), refer to "Diagnostic Aids" on facing page of DTC 45/65.

NOTICE: If emission test shows excessive NOx, check items which cause vehicle to run lean or too hot such as inoperative cooling fan, or inoperative EGR valve.

ADDITIONAL CHECKS

- **CHECK:** For vacuum leaks.
- **CHECK:** EGR valve for not opening. Use CHART C-7.
- **CHECK:** For lead contamination for catalytic converter (look for the removal of fuel filler neck restrictor).
- **CHECK:** Carbon buildup. Remove carbon with top engine cleaner. Follow instructions on can.
- **CHECK:** Crankcase ventilation valve for being plugged or stuck or fuel in the crankcase.
- **CHECK:** Service bulletins for updates.

IGNITION SYSTEM

- **CHECK:** Spark plugs, plug wires, and ignition components. Refer to SECTION 6D.

COOLING SYSTEM

NOTICE: If the Tech 1 scan tool indicates a very high engine coolant temperature and the system is running lean:

- **CHECK:** Engine coolant level.
- **CHECK:** Engine thermostat for faulty part (always open) or for wrong heat range. Refer to SECTION 6B.
- **CHECK:** Cooling fan operation, use CHART C-12.

FUEL SYSTEM

NOTICE: If the system is running RICH (long term fuel trim near 110), refer to "Diagnostic Aids" on facing page of DTC 45/65.
If the system is running LEAN (long term fuel trim near 150) refer to "Diagnostic Aids" on facing page of DTC 44/64.

- **CHECK:** For properly installed fuel cap.
- **CHECK:** Fuel pressure. Use CHART A-7.
- **CHECK:** Injector/coil balance test. Use CHART C-2A.
- **CHECK:** Evaporative emission canister for fuel loading. Use CHART C-3.

DIESELING, RUN-ON

Definition: Engine continues to run after key is turned "OFF," but runs very roughly. If engine runs smoothly, check ignition switch and adjustment.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

FUEL SYSTEM

- **CHECK:** Injectors for leaking. Refer to "Fuel System Diagnosis," CHART A-7.

BACKFIRE

Definition: Fuel ignites inside intake manifold or in exhaust system, making loud popping noise.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

ADDITIONAL CHECKS

- **CHECK:** EGR gasket for faulty or loose fit.
- **CHECK:** EGR operation for being open all the time. Refer to "Exhaust Gas Recirculation (EGR)," CHART C-7.
- **CHECK:** Intake and exhaust manifold for casting flash.

IGNITION SYSTEM

- **CHECK:** Proper ignition coil output voltage with spark tester J 26792 (ST 125) or equivalent.
- **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:** Spark plug wires for crossfire, also inspect Electronic Ignition (EI) system assembly, spark plug wires, and proper routing of plug wires.

NOTICE: If an intermittent condition exists in the ignition system, refer to "Ignition Control (IC) System," Section "6E3-C4" or SECTION 6D.

ENGINE MECHANICAL

- **CHECK:** Compression - Look for sticking or leaking valves.
- **CHECK:** Valve timing, refer to SECTION 6A.
- **CHECK:** Intake and exhaust manifold passages for casting flash.

FUEL SYSTEM

- **CHECK:** Perform fuel system diagnosis check, see CHART A-7.
- **CHECK:** Fuel injectors. Perform injector/coil balance test, refer to CHART C-2A.

PCM CONNECTOR "A" SYMPTOMS CHART
CLEAR 32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
A1 SENSOR GROUND FOR IAT, MAP, A/C REFRIGERANT PRESSURE AND A/C EVAPORATOR TEMPERATURE SENSORS	452	BLK	IAT, MAP, A/C REF. PRESS SENSORS HARN CONN "A" AND A/C EVAPORATOR TEMP. SENSOR "C"	23 (1) 33 (1) 71 (1) 22 (1)	ENGINE STARTS AND STALLS NO POWER, ENGINE WILL NOT RUN.
A2 A/C REQUEST	762	DK GRN/WHT	HEATER AND A/C CONTROL ASSEMBLY	NONE	A/C INOPERATIVE. REFER TO SECTION C10.
A3 A/C EVAPORATOR TEMPERATURE SENSOR SIGNAL	732	DK BLU	A/C EVAPORATOR TEMP. SENSOR "B"	73 (3) 71 (4)	A/C INOPERATIVE REFER TO TO SECTION C10.
A4					
A5 A/C REFRIGERANT PRESSURE SENSOR SIGNAL	380	RED/BLK	A/C REF. PRESS SENSOR HARN CONN "C"	66 (2) 70 (4)	NO A/C, REFER TO SECTION C10. A/C CLUTCH TOGGLES "OFF"/"ON," HIGH AND UNSTABLE IDLE.
A6 FUEL PUMP SIGNAL	120	GRY	FUEL PUMP RELAY "A2" AND FUEL PUMP PRIME CONNECTOR	54 (2)	HARD TO START, LONG CRANK TIME. REFER TO CHART A7.
A7					
A8 FUEL PUMP ENABLE	465	DK GRN/WHT	FUEL PUMP RELAY "C2"	54 (2)	HARD TO START, LONG CRANK TIME. REFER TO CHART A7.
A9					
A10					
A11 1-2 SHIFT SOLENOID	1222	LT GRN	TRANSMISSION CONNECTOR "A"	NONE	2nd AND 3rd GEAR ONLY - OR - 1st AND 4th GEAR ONLY. REFER TO SECTION C8.
A12 2-3 SHIFT SOLENOID	1223	YEL/BLK	TRANSMISSION CONNECTOR "B"	NONE	3rd AND 4th GEAR ONLY - OR - 1st AND 2nd GEAR ONLY. REFER TO SECTION C8.
A13					
A14					
A15 TCC CONTROL CIRCUIT	422	TAN/BLK	TRANSMISSION CONNECTOR "T"	90	NO TCC, POOR FUEL ECONOMY, CHUGGLE OR TRANS BUMP. REFER TO SECTION C8.
A16 3-2 CONTROL SOLENOID	687	WHT	TRANSMISSION CONNECTOR "S"	NONE	HARSH 3-2 SHIFT - OR - 3-2 SHIFT FLARE. REFER TO SECTION C8.
A17 SENSOR GROUND FOR TP AND ECT SENSORS	470	BLK	ECT SENSOR "A" TP SENSOR "B"	15 (1) 21 (1) 22 (1)	ENGINE STARTS AND STALLS , NO POWER, ENGINE WILL NOT RUN.
A18 TCC BRAKE SWITCH SIGNAL	583	LT BLU/BLK	TCC BRAKE SWITCH "B"	37	NO TCC, POOR FUEL ECONOMY. REFER TO SECTION C8.

* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).
(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN OR GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.

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PCM Connector "A" Symptom Chart (1 of 2)

ECM CONNECTOR "A" SYMPTOMS CHART
CLEAR 32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
A20					
A21					
A22 4th GEAR SWITCH-(A/T)	446	LT BLU	TCC SOLENOID-"B"	NONE	NO 4TH GEAR. POOR FUEL ECONOMY, CHUGGLE OR SHUTTER CONDITION. REFER TO SECTION C8
A22 CLUTCH ANTICIPATE SWITCH-(M/T)	48	GRY	CLUTCH ANTICIPATE CRUISE RELEASE SWITCH-"B"	NONE	IDLE FLARE WITH CLUTCH PEDAL DEPRESSED
A23					
A24					
A25					
A26					
A27					
A28					
A29 MAP SENSOR SIGNAL	432	LT GRN	MAP SENSOR HARN CONN "B"	33 (4) 34 (3) 44 (2)	UNSTABLE IDLE, ROUGH, HESITATION, HIGH IDLE, HUNTING IDLE, LEAN EXHAUST, POOR PERFORMANCE, STALLS, MISS, SURGE.
A30 TP SENSOR SIGNAL	417	DK BLU	TP SENSOR HARN CONN "C"	21 (4) 22 (3)	HIGH IDLE, SURGE, LACK OF PERFORMANCE
A31 ENGINE COOLANT TEMP. SENSOR SIGNAL	410	YEL	ECT SENSOR HARN CONN "B"	14 (2) 15 (1,4)	HARD TO START, LACK OF PERFORMANCE, POOR FUEL ECONOMY.
A32					

* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A)
(1) OPEN CIRCUIT
(2) GROUNDED CIRCUIT
(3) OPEN/GROUNDED CIRCUIT
(4) SHORTED TO VOLTAGE

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PCM Connector "A" Symptom Chart (2 of 2)

PCM CONNECTOR "B" SYMPTOMS CHART
BLACK 32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
B1					
B2 COOLING FAN RELAY CONTROL	335	DK GRN	ENGINE COOLING FAN CONTROL RELAY- "D2"	NONE	INOPERATIVE FAN. FAN RUNS ALL THE TIME. REFER TO SECTION C12.
B3 SECONDARY AIR INJECTION PUMP RELAY CONTROL	436	BRN	SECONDARY AIR INJECTION PUMP RELAY CONN "E2"	NONE	INOPERATIVE AIR BYPASS SOLENOID. HC AND CO EMISSION LEVELS WILL BE TOO HIGH. REFER TO SECTION C6.
B4 EVAP CANISTER PURGE	428	DK GRN/WHT	EVAP CANISTER PURGE SOLENOID CONN "A"	NONE	FUEL LOSS OR FUEL VAPOR ODOR. POOR IDLE, STALLING, POOR DRIVEABILITY. REFER TO SECTION C3.
B5					
B6 A/C COMPRESSOR CLUTCH RELAY CONTROL	459	DK GRN/WHT	A/C RELAY HARN CONN "B5"	68 (2)	NO A/C CLUTCH ENGAGEMENT (1) A/C ON ALL THE TIME (2). REFER TO SECTION C10.
B7 MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON"	419	BRN/WHT	10-WAY IN-LINE I/P CONN. "B"	NONE	NO MIL (1) MIL ON ALL THE TIME (2). REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *
B8					
B9					
B10					
B11 EGR #1 CONTROL	697	LT BLU	DIGITAL EGR HARN CONN "A"	75 (3)	ROUGH IDLE, SPARK KNOCK, STALLS AFTER COLD START, SURGE DURING CRUISE. REFER TO SECTION C6.
B12 EGR #2 CONTROL	698	BRN	DIGITAL EGR HARN CONN "B"	76 (3)	ROUGH IDLE, SPARK KNOCK, STALLS AFTER COLD START, SURGE DURING CRUISE. REFER TO SECTION C6.
B13 EGR #3 CONTROL	699	RED	DIGITAL EGR HARN CONN "C"	77 (3)	ROUGH IDLE, SPARK KNOCK, STALLS AFTER COLD START, SURGE DURING CRUISE. REFER TO SECTION C6.
B14 BATTERY + (KEEP ALIVE MEMORY)	340	ORN	I/P FUSE #4	NONE	CRANKS BUT WILL NOT START IF BOTH BATTERY FEEDS ARE OPEN. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *
B15 BATTERY + (KEEP ALIVE MEMORY)	340	ORN	I/P FUSE #4	NONE	CRANKS BUT WILL NOT START IF BOTH BATTERY FEEDS ARE OPEN. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *
B16 PCM GROUND	451	BLK/WHT	ENGINE GROUND LOCATED AT LFT FRT OF ENGINE	NONE	NO SYMPTOMS, IF BOTH POWER GROUNDS ARE OPEN, ON START. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *
B17					
B18 2ND GEAR START INDICATOR LAMP OUTPUT	1443	DK BLU	SECOND GEAR START SWITCH CONNECTOR "A"	NONE	NO SECOND GEAR INDICATOR LAMP
B19 SERIAL DATA	800	TAN	DATA LINK CONNECTOR "M"	NONE	NO DLC DATA. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *

(1) OPEN CIRCUIT
(2) GROUNDED CIRCUIT
(3) OPEN OR GROUNDED CIRCUIT
* REFER TO SECTION 8A

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PCM Connector "B" Symptom Chart (1 of 2)

PCM CONNECTOR "B" SYMPTOMS CHART
BLACK 22 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
B20 LEFT (BANK 2) O2S GROUND	351	BLK/WHT	LEFT O2S	13, 44, 45	ROUGH OR INCORRECT IDLE, LEAN EXHAUST, POOR PERFORMANCE.
B21 LEFT (BANK 2) O2S SIGNAL	1665	PPL/WHT	LEFT O2S	13, 44, 45	ROUGH OR INCORRECT IDLE, LEAN EXHAUST, POOR PERFORMANCE.
B22 RIGHT (BANK 1) O2S SIGNAL	1666	PPL	RIGHT O2S	63 (1) 64 (3) 65 (4)	ROUGH OR INCORRECT IDLE, LEAN OR RICH EXHAUST, HESITATION, SURGE, POOR PERFORMANCE, POOR FUEL ECONOMY.
B23 RIGHT (BANK 1) O2S GROUND	351	BLK/WHT	RIGHT O2S	63 (1) 64 (3) 65 (4)	ROUGH OR INCORRECT IDLE, LEAN OR RICH EXHAUST, HESITATION, SURGE, POOR PERFORMANCE, POOR FUEL ECONOMY.
B24 IAC COIL "B" HIGH	1749	LT GRN/WHT	IAC HARN CONN "B"	35 (3)	HIGH OR LOW IDLE, STALLS. REFER TO CHART C-2B.
B25 IAC COIL "B" LOW	444	LT GRN/BLK	IAC HARN CONN "A"	35 (3)	HIGH OR LOW IDLE, STALLS. REFER TO CHART C-2B.
B26 IAC COIL "A" LOW	1748	LT BLU/BLK	IAC HARN CONN "C"	35 (3)	HIGH OR LOW IDLE, STALLS. REFER TO CHART C-2B.
B27 IAC COIL "A" HIGH	1747	LT BLU/WHT	IAC HARN CONN "D"	35 (3)	HIGH OR LOW IDLE, STALLS. REFER TO CHART C-2B.
B28 BUFFERED SPEED OUTPUT (4000 PULSES/MILE)	817	DK GRN/WHT	INST. CLUSTER	NONE	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE CONTROL, *
B29 VSS INPUT LOW	401	PPL	VSS HARN CONN "A"	24, 72	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE CONTROL, TRANS SHIFT FROM DRIVE TO NEUTRAL. *
B30 VSS INPUT HIGH	400	YEL	VSS HARN CONN "B"	24, 72	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE CONTROL, TRANS SHIFT FROM DRIVE TO NEUTRAL. *
B31 5 VOLT REF MAP, TP, A/C REFRIGERANT PRESSURE AND EVAPORATOR TEMPERATURE SENSORS	416	GRY	TP SENSOR HARN CONN "A", MAP HARN CONN "C" A/C PRESS SENSOR HARN CONN "B" A/C EVAPORATOR TEMPERATURE SENSOR CONN "A"	22 (3) 34 (3) 66 67 70 71 73	ENGINE STARTS AND STALLS, NO POWER, ENGINE WILL NOT RUN. A/C INOP.
B32 PCM GROUND	451	BLK/WHT	ENGINE GROUND LOCATED AT LEFT FRONT OF ENGINE	NONE	CRANKS BUT WILL NOT START IF BOTH POWER GROUNDS ARE OPEN. CHECK GROUNDS AT ENGINE BLOCK, IGNITION CONTROL SYSTEM, PARK/NEUTRAL POSITION SWITCH. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK." *

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
* REFER TO SECTION 8A.

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PCM Connector "B" Symptom Chart (2 of 2)

PCM CONNECTOR "C" SYMPTOMS CHART
BLUE 32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
C1 PCM GROUND	551	TAN/WHT	ENGINE GROUND LOCATED AT FRONT OF ENGINE	NONE	CRANKS BUT WILL NOT START IF BOTH PCM GROUNDS OPEN, CHECK GROUNDS AT ENGINE BLOCK, IGNITION CONTROL SYSTEM, PARK/NEUTRAL POSITION SWITCH. REFER TO "ON-BOARD DIAGNOSTIC SYSTEM CHECK."
C2 A/C STATUS	59	DK GRN	A/C CLUTCH RELAY "B4"	68 (4) 69 (1)	POOR A/C PERFORMANCE
C3 IGNITION FEED	439	PNK	FUEL PUMP RELAY "C1"	87 (1)	NO START. REFER TO "OBD SYSTEM CHECK."
C4					
C5 PRESSURE CONTROL SOLENOID HIGH	1228	RED/BLK	TRANSMISSION CONNECTOR "C"	93	HARSH SHIFTS
C6 PRESSURE CONTROL SOLENOID LOW	1229	LT BLUE/WHT	TRANSMISSION CONNECTOR "D"	93	HARSH SHIFTS
C7					
C8					
C9 DIAGNOSTIC ENABLE	448	WHT/BLK	DATA LINK CONNECTOR "B"	NONE	NO SYMPTOMS. REFER TO "OBD SYSTEM CHECK."
C10 2ND GEAR START SWITCH SIGNAL	553	LT BLU	2ND GEAR SWITCH CONNECTOR "A"	NONE	1ST GEAR STARTS WHEN 2ND GEAR STARTS ARE SELECTED
C11					
C12 INJECTOR DRIVER CYL #3	1746	PNK/BLK	10-WAY INJ/ ENGINE HARNESS CONN. "C" & INJECTOR #3	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C2A *
C13 INJECTOR DRIVER CYL #2	1745	LT GRN/BLK	10-WAY INJ/ ENGINE HARNESS CONN. "B" & INJECTOR #2	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C2A *
C14 INJECTOR DRIVER CYL #1	1744	BLK	10-WAY INJ/ ENGINE HARNESS CONN. "A" & INJECTOR #1	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C2A *
C15 INJECTOR DRIVER CYL #6	846	YEL/BLK	10-WAY INJ/ ENGINE HARNESS CONN. "F" & INJECTOR #6	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C2A *
C16 INJECTOR DRIVER CYL #5	845	BLK/WHT	10-WAY INJ/ ENGINE HARNESS CONN. "E" & INJECTOR #5	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C2A *
C17 PCM GROUND	551	TAN/WHT	ENGINE GROUND LOCATED AT FRONT OF ENGINE	NONE	NO SYMPTOMS. IF BOTH ECM GROUNDS ARE OPEN, NO START, REFER TO "OBD SYSTEM CHECK."
C18 REFERENCE LOW CAMSHAFT POSITION SENSOR & CRANKSHAFT POSITION SENSOR	632	PNK/BLK	CAMSHAFT POSITION SENSOR HARNESS CONN "C" CRANKSHAFT POSITION SENSOR HARN CONN "C"	36 (3) 17 (3)	SLIGHT ENGINE MISS, POOR PERFORMANCE, POOR FUEL ECONOMY
C19					

(1) OPEN CIRCUIT
(2) GROUNDED CIRCUIT
(3) OPEN/GROUNDED CIRCUIT
(4) SHORTED TO VOLTAGE

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PCM Connector "C" Symptom Chart (1 of 2)

PCM CONNECTOR "C" SYMPTOMS CHART
BLUE 32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
C20 KNOCK SENSOR SIGNAL	496	DK/BLU	KNOCK SENSOR	43 (3)	LACK OF PERFORMANCE, SPARK KNOCK. REFER TO SECTION C5.
C21 24X REFERENCE SIGNAL	1800	LT BLU/WHT	HIGH RESOLUTION 24X CRANKSHAFT POSITION SENSOR "B"	36 (3)	LONG CRANK TIME, INCORRECT IDLE, LACK OF POWER, HESITATION OR SAG.
C22					
C23 PASS-KEY® II SIGNAL (FUEL ENABLE)	229	DK BLU	PASS-KEY® II DECODER MODULE CONNECTOR "A3"	46	CRANKS, BUT WON'T START.
C24					
C25 CAMSHAFT POSITION SENSOR SIGNAL	633	BRN/WHT	CAMSHAFT POSITION SENSOR "B"	17 (3)	SLIGHT ENGINE MISS, POOR PERFORMANCE POOR FUEL ECONOMY.
C26					
C27 IGNITION CONTROL (IC)	423	WHT	IGNITION CONTROL MODULE HARN CONN "B"	42 (2)	SURGE, HESITATION, RUNS ROUGH, STALLS, LACK OF PERFORMANCE.
C28 IGNITION CONTROL BYPASS	424	TAN/BLK	IGNITION CONTROL MODULE HARN CONN "A"	42 (2)	SURGE, HESITATION, RUNS ROUGH, STALLS, LACK OF PERFORMANCE.
C29 IAT SENSOR SIGNAL	472	TAN	IAT HARNESS CONN "B"	23 (1) 25 (2)	HARD TO START, POOR PERFORMANCE.
C30 3X REFERENCE HIGH	647	LT BLU/BLK	IGNITION CONTROL MODULE HARN CONN "E"	82 (3)	CRANKS BUT WILL NOT START. REFER TO "ON-BOARD DIAGNOSTICS SYSTEM CHECK."
C31 3X REFERENCE LOW	453	RED/BLK	IGNITION CONTROL MODULE HARN CONN "F"	NONE	NO SYMPTOMS, REFER TO SECTION C4.
C32 INJECTOR DRIVER CYL #4	844	LT BLU/BLK	10-WAY INJ/ ENGINE HARNESS CONN. "D" INJECTOR #4	NONE	MISFIRE, RUNS ROUGH, POOR PERFORMANCE, POOR FUEL ECONOMY. REFER TO CHART C-2A.

* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).
(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.

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PCM Connector "C" Symptom Chart (2 of 2)

CHART B-1

RESTRICTED EXHAUST SYSTEM CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Proper diagnosis for a restricted exhaust system is essential before any components are replaced. Either of the following procedures may be used for diagnosis, depending upon engine or tool used:

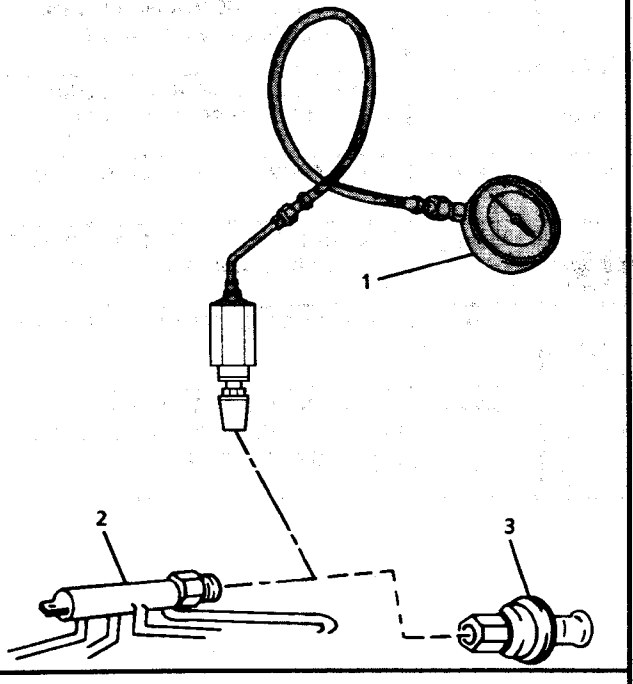
CHECK AT AIR PIPE:

1. Remove the rubber hose at the exhaust manifold AIR pipe check valve. Remove check valve.
2. Connect exhaust backpressure kit (with air adapter) J 35314-A.
3. Insert the adapter into the exhaust manifold AIR pipe.

OR

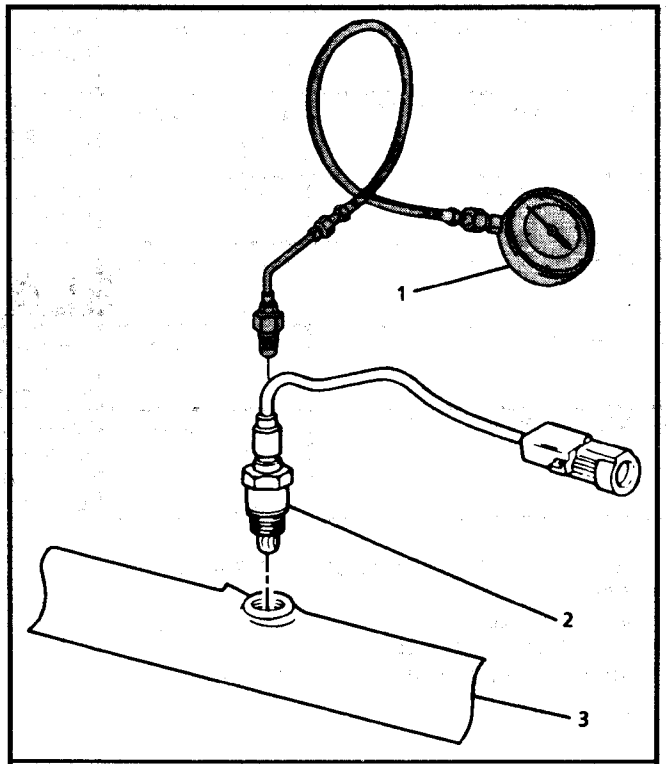
CHECK AT OXYGEN SENSOR (O2S):

1. Carefully remove oxygen sensor.
2. Install exhaust backpressure gage J 35314-A in place of oxygen sensor (refer to illustration).
3. After completing test described below, coat threads of oxygen sensor with anti-seize compound P/N 5613695 or equivalent prior to re-installation.



1 EXHAUST BACK PRESSURE KIT WITH AIR ADAPTER
2 AIR PIPE (EXHAUST PORT)
3 CHECK VALVE

7S 3363-6E



1 BACK PRESSURE GAGE
2 OXYGEN SENSOR (O2S)
3 EXHAUST MANIFOLD

7S 3338-6E

DIAGNOSIS:

1. With the engine idling at normal operating temperature, observe the exhaust system backpressure reading on the gage. Reading should not exceed 8.6 kPa (1.25 psi).
2. Increase engine speed to 2000 RPM and observe gage. Reading should not exceed 20.7 kPa (3 psi).
3. If the backpressure at either speed exceeds specification, a restricted exhaust system is indicated.
4. Inspect the entire exhaust system for a collapsed pipe, heat distress, or possible internal muffler failure.
5. If there are no obvious reasons for the excessive backpressure, the catalytic converter is suspected to be restricted and should be replaced using current recommended procedures.

4-30-92
•7S 3340-6E

BLANK

SECTION C
COMPONENT SYSTEMS

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.

Section "C" provides information on the following:

- General description of components and systems.
- On-vehicle service.
- Part names.
- Diagnostic charts. These include a functional check of the system as well as diagnosis of any problem found in the functional check.

For locations of components, wiring diagrams, and PCM connector end view, refer to the front on the "A" Section of the engine being diagnosed.

Following are the sub-section identification and the system covered:

- C1 Powertrain Control Module (PCM) and Sensors ..... Page C1-1
- C2 Fuel Metering System ..... Page C2-1
- C3 Evaporative Emission (EVAP) Control System ..... Page C3-1
- C4 Electronic Ignition (EI) System ..... Page C4-1
- C5 Knock Sensor (KS) System ..... Page C5-1
- C6 Secondary Air Injection (AIR) System ..... Page C6-1
- C7 Exhaust Gas Recirculation (EGR) System ..... Page C7-1
- C8 Automatic Transmission Control System ..... Page C8-1
- C10 A/C Compressor Clutch Control ..... Page C10-1
- C12 Cooling Fan Control ..... Page C12-1
- C13 Crankcase Ventilation System ..... Page C13-1
- C14 Air Intake System ..... Page C14-1

DIAGNOSTIC CHARTS

The diagnostic charts for each system are found after the on-vehicle service and parts information at the back of each section. Following are the charts found in this section.

- Chart C-1D Manifold Absolute Pressure (MAP) Output Check ..... Page C1-14
- Chart C-2A Injector/Coil Balance Test Procedure (1 of 3) ..... Page C2-16
- Chart C-2B Idle Air Control (IAC) Circuit ..... Page C2-22
- Chart C-3 Evaporative Emission (EVAP) Canister Purge Solenoid Valve Check ..... Page C3-6
- Chart C-4F Misfire ..... Page C4-8
- Chart C-5 Knock Sensor (KS) System Check ..... Page C5-4
- Chart C-6 Secondary Air Injection (AIR) System Check ..... Page C6-6
- Chart C-7 Exhaust Gas Recirculation (EGR) Flow Check ..... Page C7-4
- Chart C-8A Transmission Range (TR) Pressure Switch Assembly Circuit Check ..... Page C8-10
- Chart C-8B 2nd Gear Start Switch Indicator Lamp Control Circuit Check ..... Page C8-12
- Chart C-8C 2nd Gear Start Switch Signal Circuit Check ..... Page C8-14
- Chart C-8D Transmission 1-2 Shift Solenoid Circuit Check ..... Page C8-16
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- Chart C-10 A/C Compressor Clutch Control Circuit Diagnosis (1 of 2) ..... Page C10-4
- Chart C-12 Cooling Fan Control Circuit Diagnosis (1 of 2) ..... Page C12-2

SECTION C1
POWERTRAIN CONTROL MODULE (PCM) AND SENSORS

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GENERAL DESCRIPTION

POWERTRAIN CONTROL MODULE (PCM)

NOTICE: To prevent possible Electrostatic Discharge damage to the PCM, Do Not touch the connector pins or soldered components on the circuit board.

The Powertrain Control Module (PCM) (Figure C1-1), is located under hood between the right shock tower and the bulkhead. It is the control center of the fuel injection system and constantly monitors the information from various sensors and controls the systems that affect vehicle performance. The PCM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) "Service Engine Soon," and store a Diagnostic Trouble Code (DTC) which identifies the problem areas to aid the technician in making repairs. A scan tool must be used to retrieve DTCs from the PCM memory. DTCs can no longer be retrieved by grounding terminals "A" to "B" at the DLC. This also eliminates the PCM function of flashing Code 12. Refer to "Introduction," SECTION 6E for more information on using the diagnostic function of the PCM.

The PCM used on the 3.4L engine is referred to as SFI-66. For service, this PCM consists of only two parts: a dual processor controller and Knock Sensor (KS) module.

PCM FUNCTION

The PCM contains a power supply which regulates the 12 volt vehicle supply input to 5 and 12 volts, and these voltages are used for various internal and external functions.

The PCM supplies a buffered 5 or 12 volts to power various sensors or switches. This is done through resistances in the PCM which are so high in value that a test light will not light when connected to the circuit. In some cases, even an analog shop voltmeter will not give an accurate reading because its resistance is too low. Therefore, the use of a 10 megohm input impedance digital voltmeter or a Tech 1 scan tool is necessary to assure accurate voltage readings.

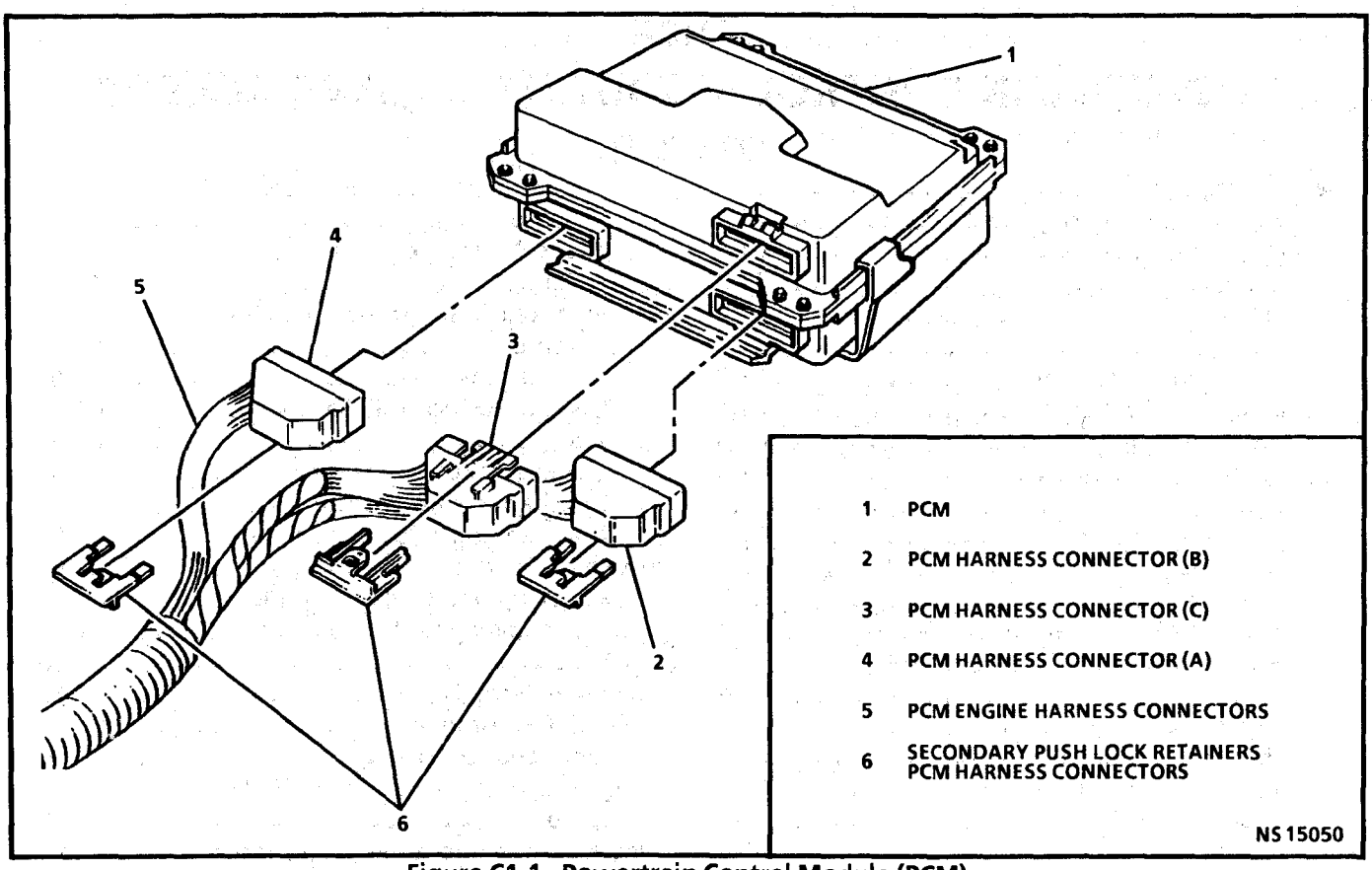


Figure C1-1 - Powertrain Control Module (PCM)

The Input/Output (I/O) devices in the PCM include analog to digital converters, signal buffers, counters and special drivers. The PCM controls output circuits such as the fuel injectors, IAC, cooling fan relay, etc. by controlling the ground circuit through transistors or a device called a "quad-driver" in the PCM.

Memory

There are two types of memory storage within the PCM: EEPROM and RAM.

EEPROM

Electrically Erasable Programmable Read Only Memory (EEPROM) is a permanent memory that is physically soldered to the circuit boards within the PCM. The EEPROM contains the overall control algorithms. The EEPROM can be reprogrammed by using the Tech 1 scan tool or other Techline terminal/equipment.

RAM

Random Access Memory (RAM) is the microprocessor "scratch pad." The processor can write into or read from this memory as needed. This memory is volatile and needs a constant supply of voltage to be retained. If the voltage is lost, the memory is lost and the PCM logs a DTC indicating this loss.

Short Term Fuel Trim

Short term fuel trim is an PCM volatile memory register that will contain a number between 0 and 255. The neutral value for the short term fuel trim is 128; any deviation from this value indicates the short term fuel trim is changing the injector pulse width. The amount of pulse width change depends on how far the short term fuel trim value is from 128. The short term fuel trim changes the pulse width by varying the "Closed Loop" factor of the base pulse width equation. As the PCM monitors the Oxygen Sensor (O2S) inputs, it is constantly varying the short term fuel trim value. The value is updated very quickly, therefore, the short term fuel trim only corrects for short term fuel trim trends. The correction of long term fuel trim trends is the function of the long term fuel trim.

Long Term Fuel Trim

The long term fuel trim is a matrix of cells arranged by RPM and MAP. Each cell of the long term fuel trim is a register like the short term fuel trim. As the engine operating conditions change, the PCM will switch from cell to cell to determine what "long term fuel trim" factor to use in the base pulse width equation.

While in any given cell, the PCM also monitors the short term fuel trim. If the short term fuel trim is far enough from 128, the PCM will change the long term fuel trim value. Once the long term fuel trim value is changed it should force the short term fuel trim back toward 128.

If the mixture is still not correct (as judged by the O2S), the short term fuel trim will continue to have a large deviation from the ideal 128. In this case, the long term fuel trim value will continue to change until the short term fuel trim becomes balanced.

Both the short term fuel trim and long term fuel trim are limited by calibrated values. If the mixture is off enough so that long term fuel trim reaches the limit of its control and still cannot correct the condition, the short term fuel trim would also go to its limit of control in the same direction. If the mixture is still not corrected by both short term fuel trim and long term fuel trim at their extreme values, a DTC 44, 45, 64 or 65 will likely result. Under the conditions of power enrichment, the PCM sets the short term fuel trim to 128 and freezes it there until power enrichment is no longer in effect. This is done so the "Closed Loop" factor and the long term fuel trim will not try to correct for the commanded richness of power enrichment.

SPEED DENSITY SYSTEM

The Sequential Fuel Injection (SFI) system is a speed and air density system. The system is based on "speed density" fuel management which calculates air volume through the intake.

Three specific data sensors provide the PCM with the basic information for the fuel management portion of its operation. That is, three specific signals to the PCM establish the engine speed and air density to determine the optimum fuel delivered by the injectors.

Speed

The engine speed signal from the 3X crankshaft position sensor is conditioned by the electronic Ignition Control Module (ICM) system module. This signal is input to the PCM on the crank reference high, CKT 647. The PCM uses this information to determine the "speed" or RPM factor for fuel and ignition management.

Density

Three sensors contribute to the density factor, the Intake Air Temperature (IAT), the Manifold Absolute Pressure (MAP) and the Engine Coolant Temperature (ECT) sensors.

The IAT sensor is a 2-wire sensor that measures the temperature of the air entering the intake manifold. The IAT sensor is a thermistor that changes its resistance as an inverse function of temperature. When the temperature is low, the resistance is high, and when the temperature is high, the resistance is low.

The engine coolant temperature sensor is also a 2-wire sensor that measures temperature. It is mounted in the engine coolant stream and operates the same way as the IAT sensor.

The IAT and ECT sensors work together to assure that proper temperature information gets to the PCM.

The Manifold Absolute Pressure (MAP) sensor is a 3-wire sensor that monitors the changes in intake manifold pressure which results from changes in engine loading. These pressure changes are supplied to the PCM in the form of analog electrical signals.

As intake manifold pressure increases, the air density in the intake manifold also increases and additional fuel is required. The MAP sensor sends this pressure information to the PCM and the PCM increases the amount of fuel injected by increasing the injector pulse width. Conversely, as manifold pressure decreases, the amount of fuel is decreased.

These four inputs MAP, IAT, ECT sensors, and RPM are the major determinants of the air/fuel mixture delivered by the fuel injection system.

The remaining sensors and switches provide electrical inputs to the PCM which are used for modification of the air/fuel mixture, as well as for other PCM control functions, such as Idle Air Control (IAC).

INFORMATION SENSORS

Engine Coolant Temperature (ECT) Sensor *Figure C1-2*

The engine coolant temperature sensor is a thermistor (a resistor which changes value based on temperature) mounted in the engine coolant stream. Low coolant temperature produces a high resistance (100,000 ohms at -40°C/-40°F) while high temperature causes low resistance (70 ohms at 130°C/266°F).

The PCM supplies a 5 volt signal to the engine coolant temperature sensor through a resistor in the PCM and measures the voltage. The voltage will be high when the engine is cold, and low when the engine is hot. By measuring the voltage, the PCM calculates the engine coolant temperature. Engine coolant temperature affects most systems the PCM controls.

A failure in the coolant sensor circuit should set either a DTC 14 or DTC 15. Remember, these DTC(s) indicate a failure in the coolant temperature circuit so proper use of the chart will lead to either repairing a wiring problem or replacing the sensor to properly repair a problem.

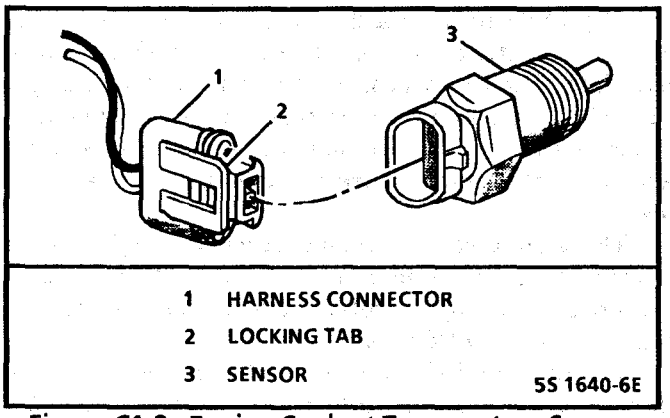


Figure C1-2 - Engine Coolant Temperature Sensor

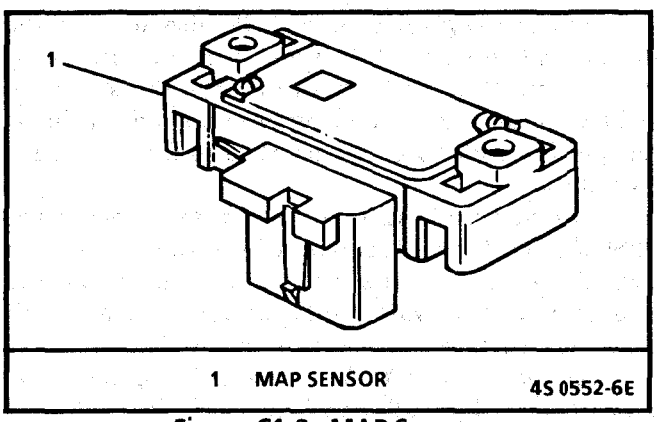


Figure C1-3 - MAP Sensor

Intake Air Temperature (IAT) Sensor

The Intake Air Temperature (IAT) sensor is a thermistor (a resistor which changes value based on the temperature of air entering the engine and is mounted in the air cleaner). Low temperature produces a high resistance (approximately 100,000 ohms at -40°C/-40°F) while high temperature causes low resistance (approximately 70 ohms at 130°C/266°F). The PCM supplies a 5 volt signal to the sensor through a resistor in the PCM and measures the voltage. The voltage will be high when the intake air is cold and low when the air is hot. By measuring the voltage the PCM calculates the intake air temperature.

The IAT sensor is used to control spark timing and delays EGR when the intake air is cold.

A failure in the IAT sensor circuit should set either a DTC 23 or DTC 25. Once a diagnostic trouble code is set, the PCM will use an artificial default value for IAT and some vehicle performance will return.

Manifold Absolute Pressure (MAP) Sensor *Figure C1-3*

The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load and speed changes, and converts this to a voltage output.

A closed throttle on engine coastdown would produce a relatively low MAP output, while a wide-open throttle would produce a high output. Manifold Absolute Pressure (MAP) is the OPPOSITE of what you would measure on a vacuum gage. When manifold pressure is high, vacuum is low. The MAP sensor is also used to measure barometric pressure under certain conditions, which allows the PCM to automatically adjust for different altitudes.

The PCM sends a 5 volt reference signal to the MAP sensor. As the manifold pressure changes, the electrical resistance of the sensor also changes. By monitoring the sensor output voltage, the PCM calculates the manifold pressure. A higher pressure (high voltage) requires more fuel, while a lower pressure (low voltage) requires less fuel.

A failure in the MAP sensor circuit should set a DTC 33 or DTC 34. CHART C-1D can also be used to check this MAP sensor.

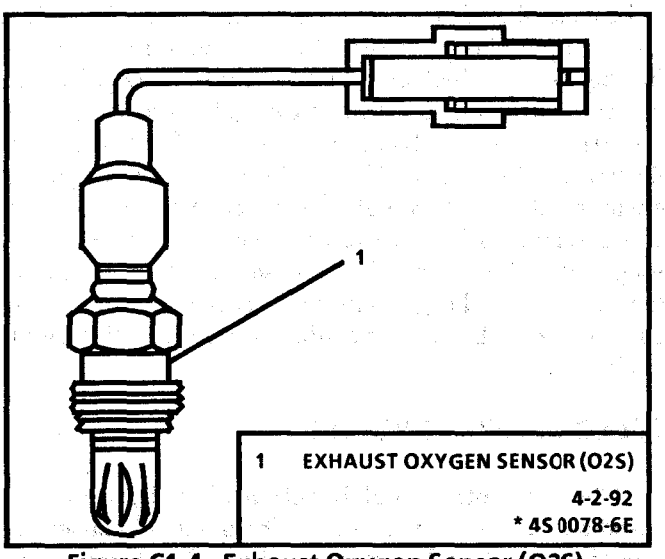


Figure C1-4 - Exhaust Oxygen Sensor (O2S)

Oxygen Sensor (O2S)

The Oxygen Sensors (O2S) are essentially small variable batteries; they have the ability to produce a low voltage signal that feeds information on engine exhaust oxygen content from each bank of cylinders. Two oxygen sensors are used in the 3.4L (VIN S). One sensor is placed in each exhaust manifold to measure the state of the gases produced by each bank of cylinders. This allows for more precise fuel control which lowers emissions and increases efficiency to the PCM (Figure C1-5).

The O2S is constructed from a zirconia/platinum electrolytic element. Zirconia is an electrolyte that conducts electricity under certain chemical conditions. The insulator is made of a ceramic material. The element is an insulator when cold.

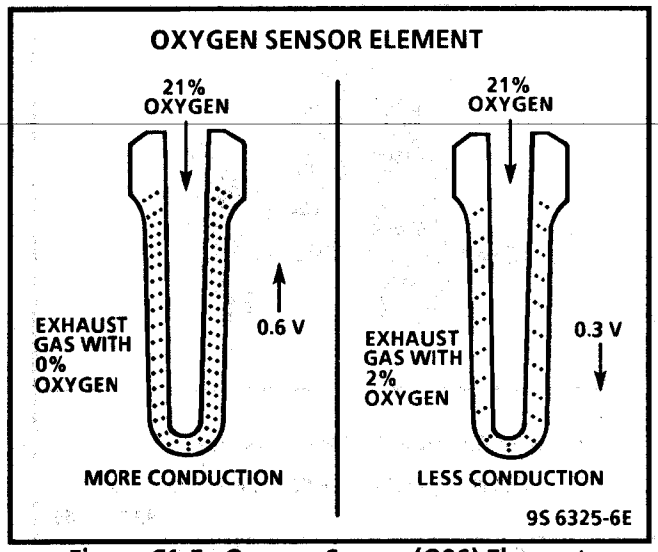


Figure C1-5 - Oxygen Sensor (O2S) Element

At exhaust temperatures around 316°C (600°F), the element becomes a semiconductor. A platinum coating on the outer surface of the element stimulates further combustion of the exhaust gases right at the surface and this helps keep the element up to the desired temperature. The oxygen sensor has an internal cavity which is filled with atmospheric (reference) air. The atmosphere has approximately 21% oxygen in it. In the electrical circuit this internal cavity is the positive (+) terminal. The outer surface of the element is exposed to the exhaust gas stream. It is the negative (-) or ground terminal. Due to the electrolytic properties of the element, the oxygen concentration differences between the reference air and exhaust gases produce small voltages.

A rich exhaust (excessive fuel) has almost no oxygen. When there is a large difference in the amount of oxygen touching the inside and outside surfaces, there is more conduction, and the sensor puts out a voltage signal greater than 0.6 volt.

When lean (excessive oxygen) there is about two percent oxygen in the exhaust. This is a smaller difference in oxygen from the outside surfaces which results in less conduction and a voltage signal less than 0.3 volt. The voltages are monitored and used by the PCM to "fine tune" the air fuel ratio to achieve the ideal mixture desired.

The PCM puts out a reference signal of 0.45 volt (refer to Figure C1-6). The reference signal serves two purposes. The first is to run the engine when it is in "Open Loop" mode of operation. When the air/fuel ratio is correct the PCM "senses" 0.45 volt. When the engine is operating with a rich air/fuel ratio there is a reduction of free oxygen in the exhaust stream and the O2S voltage rises above the reference voltage. When the engine is run lean, the voltage drops below the reference voltage due to excess oxygen in the exhaust stream.

The Oxygen Sensor (O2S) provides the feedback information for the "Closed Loop" operating mode of the fuel delivery system. The oxygen sensor indicates to the PCM what is happening in the exhaust. It does not cause things to happen. It is a type of gage: Lean mixture = high oxygen content in the exhaust = low voltage output; rich mixture = low oxygen content in the exhaust = high voltage output.

An open Oxygen Sensor (O2S) circuit should set a DTC 13 or 63. A constant low voltage in the Oxygen Sensor (O2S) circuit should set a DTC 44 or 64.

Throttle Position (TP) Sensor
Figure C1-7

The Throttle Position (TP) sensor is a potentiometer connected to the throttle shaft on the throttle body. The TP sensor electrical circuit consists of a 5 volt supply line and a ground line, both provided by the PCM. By monitoring the voltage on this signal line the PCM calculates throttle position. As the throttle valve angle is changed (accelerator pedal moved), the output of the TP sensor also changes. At a closed throttle position, the output of the TP sensor is low (approximately .29 to .98 volt). As the throttle valve opens, the output increases so that, at wide-open throttle, the output voltage should be approximately 5 volts.

The PCM can determine fuel delivery based on throttle valve angle (driver demand). A broken or loose TP sensor can cause intermittent bursts of fuel from the injector, and an unstable idle, because the PCM senses the throttle is moving. A problem in any of the TP sensor circuits should set either a DTC 21 or 22. Once a diagnostic trouble code is set, the PCM will use an artificial default value for the TP sensor, and some vehicle performance will return. A high idle will result when either DTC 21 or DTC 22 is set.

Refer to "On-Vehicle Service" for replacement of the TP sensor.

Vehicle Speed Sensor (VSS)

The Vehicle Speed Sensor (VSS) sends a pulsing voltage signal to the PCM which the PCM converts to miles per hour. This sensor mainly controls the operation of the TCC system. There are several different types of vehicle speed sensors. Refer to "Torque Converter Clutch (TCC) System," Section "6E3-C8", DTC 24 or SECTION 8A for more information.

Knock Sensor (KS)

Refer to "Knock Sensor (KS) System," Section "6E3-C5" for description of KS system.

A/C "Request" Signal

This signal tells the PCM that the A/C selector switch is turned "ON." The PCM uses this to adjust the idle speed before turning "ON" the A/C compressor clutch.

If this signal is not available to the PCM, the A/C compressor will be inoperative. Refer to "A/C Compressor Clutch Control," Section "6E3-C10" for repair procedures.

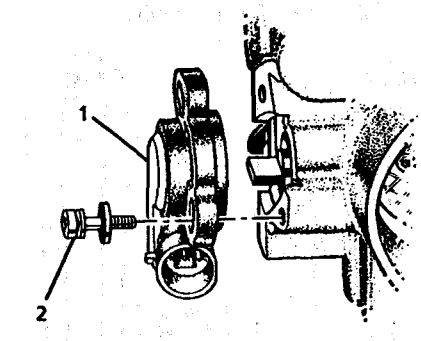
Park/Neutral Position (PNP) Switch (Part of Transmission Position Switch)
Figure C1-8

The Park/Neutral Position (PNP) switch indicates to the PCM when the transmission is in park or neutral or drive. This information is used for the EGR and the IAC valve operation.

Important

- Vehicle should not be driven with transmission position switch disconnected, as idle quality will be affected and a possible false DTC 24 (VSS).

Refer to "On-Vehicle Service" in SECTION 7A for more information on the PNP switch which is part of the transmission position switch assembly, mounted on the transmission shift lever.



1 SENSOR - THROTTLE POSITION (TP)
2 SCREW ASSEMBLY - TP SENSOR ATTACHING
9P 1074-6E

Figure C1-7 - Throttle Position (TP) Sensor

Refer to CHART C-1A for PNP switch check.

3X CRANKSHAFT POSITION SENSOR

The crankshaft position sensor provides a signal through the electronic ignition control module which the PCM uses as reference to calculate RPM and crankshaft position. Refer to "Electronic Ignition (EI) System," Section "6E3-C4" for further information.

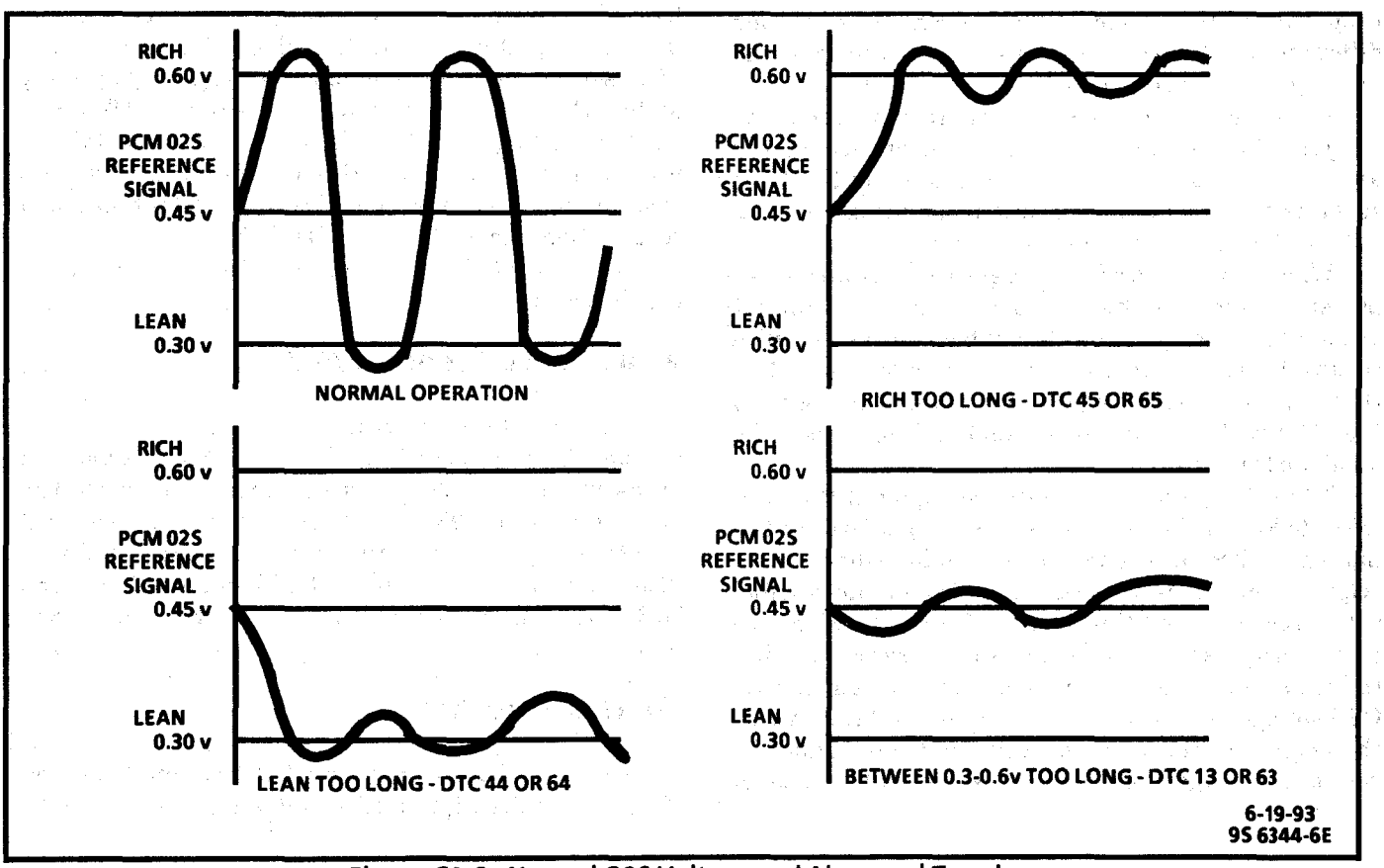
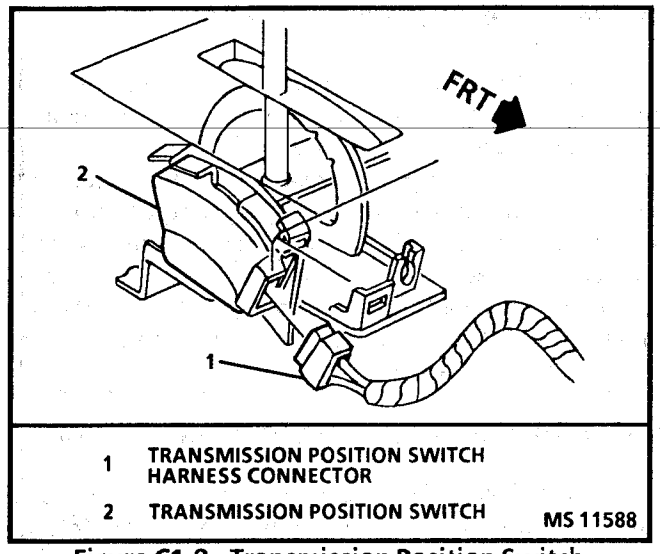


Figure C1-6 - Normal O2S Voltage and Abnormal Trends



1 TRANSMISSION POSITION SWITCH HARNESS CONNECTOR
2 TRANSMISSION POSITION SWITCH
MS 11588

Figure C1-8 - Transmission Position Switch

CAMSHAFT POSITION SENSOR

The camshaft position sensor is a "Hall-effect" switch, located on the front top of the engine. It is supplied ignition voltage and has its own ground. The camshaft position sensor sends a signal to the PCM when the #1 cylinder is on the intake stroke. This signal is used by the PCM to synchronize Sequential Fuel Injection (SFI) mode of operation with the intake valve opening. If the camshaft position sensor signal is not received by the PCM, the PCM will still operate in SFI mode based on the reference signal, however, SFI mode timing may not be as accurate because the PCM does not know the exact time the intake valve is opening. A slightly rough idle would result. A loss of this signal or extra cam signals, above 500 RPM, to the PCM will set a DTC 17.

24X CRANKSHAFT POSITION SENSOR

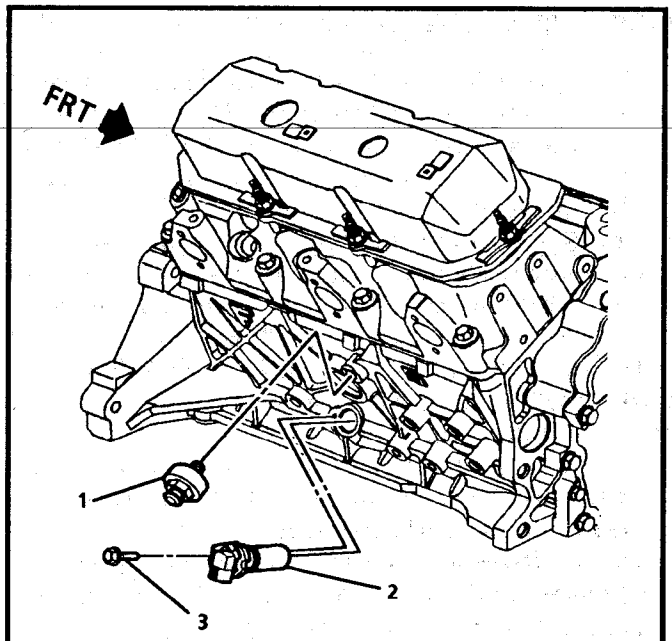
The 24X crankshaft sensor is used to improve idle spark control at engine speeds up to approximately 2000 RPM. Refer to "Electronic Ignition (EI) System," Section "6E3-C4" for further information.

DIAGNOSIS

To read Diagnostic Trouble Code(s) [DTC(s)], use a Tech 1 scan tool. To clear the DTC(s) from memory:

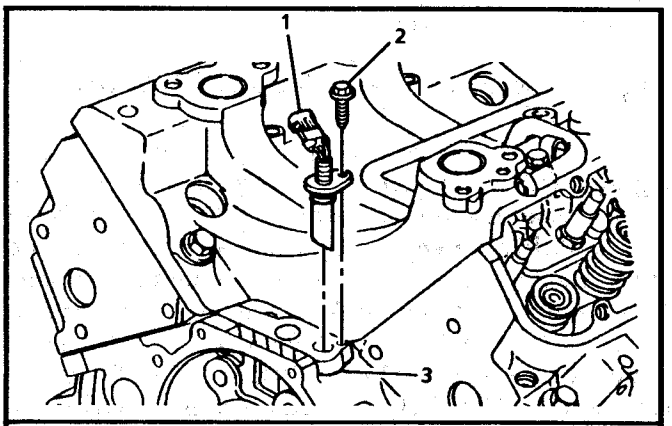
- Ignition "OFF."
- Disconnect I/P Fuse #4 for 30 seconds or use the Tech 1 scan tool to clear DTC(s) function.

Since the PCM can have a failure which may affect only one circuit, following the diagnostic procedures in this section will determine which circuit has a problem and where it is.



1 KNOCK SENSOR
2 3X CRANKSHAFT POSITION SENSOR
3 BOLT/SCREW
NS 15845

Figure C1-9 - Low Resolution 3X Crankshaft Position Sensor



1 CAMSHAFT POSITION SENSOR ASSEMBLY
2 BOLT (1) TORQUE 10 N·m (8 lb. ft.)
3 ENGINE BLOCK ASSEMBLY
NS 15091

Figure C1-10 - Camshaft Position Sensor

If a diagnostic chart indicates that the PCM connections or PCM is the cause of a problem and the PCM is replaced, the Knock Sensor (KS) module must be transferred to the new PCM and the new PCM must then be programmed. If this does not correct the problem, one of the following may be the reason:

- There is a problem with the PCM terminal connections. - The diagnostic chart will say PCM connections or PCM. The terminals may have to be removed from the connector in order to check them properly.

- The problem is intermittent. - This means that the problem is not present at the time the system is being checked. In this case, refer to the "Symptoms," Section "6E3-B" portion of the manual and make a careful physical inspection of all portions of the system involved.
- Shorted solenoid, relay coil, or harness. - Solenoids and relays are turned "ON" and "OFF" by the PCM using internal electronic switches called "drivers." Each driver is part of a group of four called "quad-drivers." Failure of one driver can damage any other driver in the set.

A shorted solenoid, relay coil, or computer harness will not damage the PCM but will cause the component to be inoperative.

J 34636 or BT-8405 testers or equivalent provide a fast, accurate means of checking for a shorted coil or a short to battery voltage.

PCM INPUTS

All of the sensors and input switches can be diagnosed by the use of a Tech 1 scan tool. The following is a short description of how the sensors and switches can be diagnosed by the use of a Tech 1 scan tool. The Tech 1 scan tool can also be used to compare the values for a normal running engine with the engine you're diagnosing.

Engine Coolant Temperature (ECT) Sensor

A Tech 1 scan tool displays engine temperature in degrees centigrade. After the engine is started, the temperature should rise steadily to about 90°C (194°F) then stabilize when the thermostat opens. If the engine has not been run for several hours (overnight) the engine coolant and intake air temperatures should be within 5° of each other. A fault in the ECT sensor circuit should set a DTC 14 or DTC 15. The Diagnostic Trouble Code (DTC) charts also contain a "Diagnostic Aid" chart to check for sensor resistance values relative to temperature.

Intake Air Temperature (IAT) Sensor

A Tech 1 scan tool displays temperature of the air entering the engine and should read close to ambient air temperature when the engine is cold, and rise as underhood temperature increases. If the engine has not been run for several hours (overnight) the IAT temperature and engine coolant temperature should read close to each other. A failure in the IAT sensor circuit should set a DTC 23 or 25. The DTC charts also contain a chart to check for sensor resistance values relative to temperature.

Manifold Absolute Pressure (MAP) Sensor

A Tech 1 scan tool displays manifold pressure in volts. Low pressure (high vacuum) reads a low voltage while a high pressure (low vacuum) reads a high voltage. A failure in the MAP sensor circuit should set a DTC 33 or 34 and using the chart will find the cause of the problem. A DTC 33 may be set if a rough or unstable idle exists. CHART C-1D can also be used to check MAP sensor.

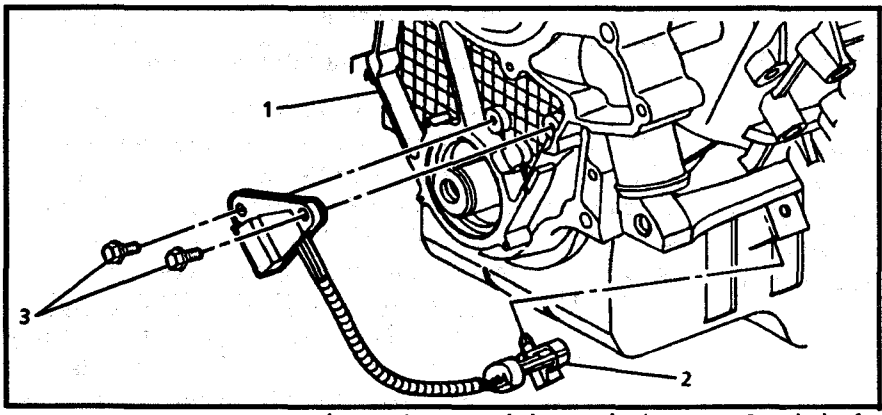
Oxygen Sensor (O2S)

The Tech 1 scan tool has several positions that will indicate the state of the exhaust gases, Oxygen Sensor (O2S) right (Bank 1) and O2S left (Bank 2) voltages, short term fuel trim Bank 1 and 2 and long term fuel trim Bank 1 and 2. Refer to Tech 1 scan tool position information in "Introduction" in SECTION 6E.

A problem in the Oxygen Sensor (O2S) circuits, or fuel system, should set a DTC 13 or 63 (open circuit), DTC 44, 64 (lean indication), DTC 45, 65 (rich indication). Refer to applicable chart if any of these DTC(s) were stored in memory.

Throttle Position (TP) Sensor

A Tech 1 scan tool displays throttle position in volts. Voltage should increase at a steady rate as throttle is moved toward WOT.



1 FRONT ENGINE COVER

2 24x CRANKSHAFT POSITION SENSOR ASSEMBLY

3 BOLT (2) TORQUE 10 N·m (8 lb. ft.)

NS 15606

Figure C1-11 - High Resolution 24X Crankshaft Position Sensor

The PCM has the ability to auto-zero the TP sensor voltage if it is between .29 volt (290 mV) and .98 volt (980 mV). This means that any voltage between .29 and .98 volt will be determined by the PCM to be 0% throttle. Tech 1 scan tools have the ability to read the throttle angle and should display 0% when the throttle is closed. A failure in the TP sensor or circuit should set a DTC 21 or 22.

VSS

A Tech 1 scan tool reading should closely match with speedometer reading with drive wheels turning. A failure in the VSS circuit should set a DTC 24.

Crankshaft Position Sensor

The Tech 1 scan tool displays crankshaft position sensor data as "ENGINE SPEED (RPM)." A failure in this circuit should set a DTC 82.

Camshaft Position Sensor

The Tech 1 scan tool will display camshaft position sensor data as "IGN Control Cam Signal." As the sensor pulses the scan data will switch from 0 to 1. All camshaft position sensor data should be checked at idle. An error in the camshaft position sensor circuit should set a DTC 17 and using the chart will find the cause of the error.

24X Crankshaft Position Sensor

The Tech 1 scan tool will display 24X crankshaft position sensor data as "IGN Control 24X Signal." Data will be displayed in RPM. An error in the 24X sensor circuit should set a DTC 36.

ON-VEHICLE SERVICE

POWERTRAIN CONTROL MODULE (PCM)

Service of the PCM should normally consist of either replacement of the PCM or reprogramming of the EEPROM.

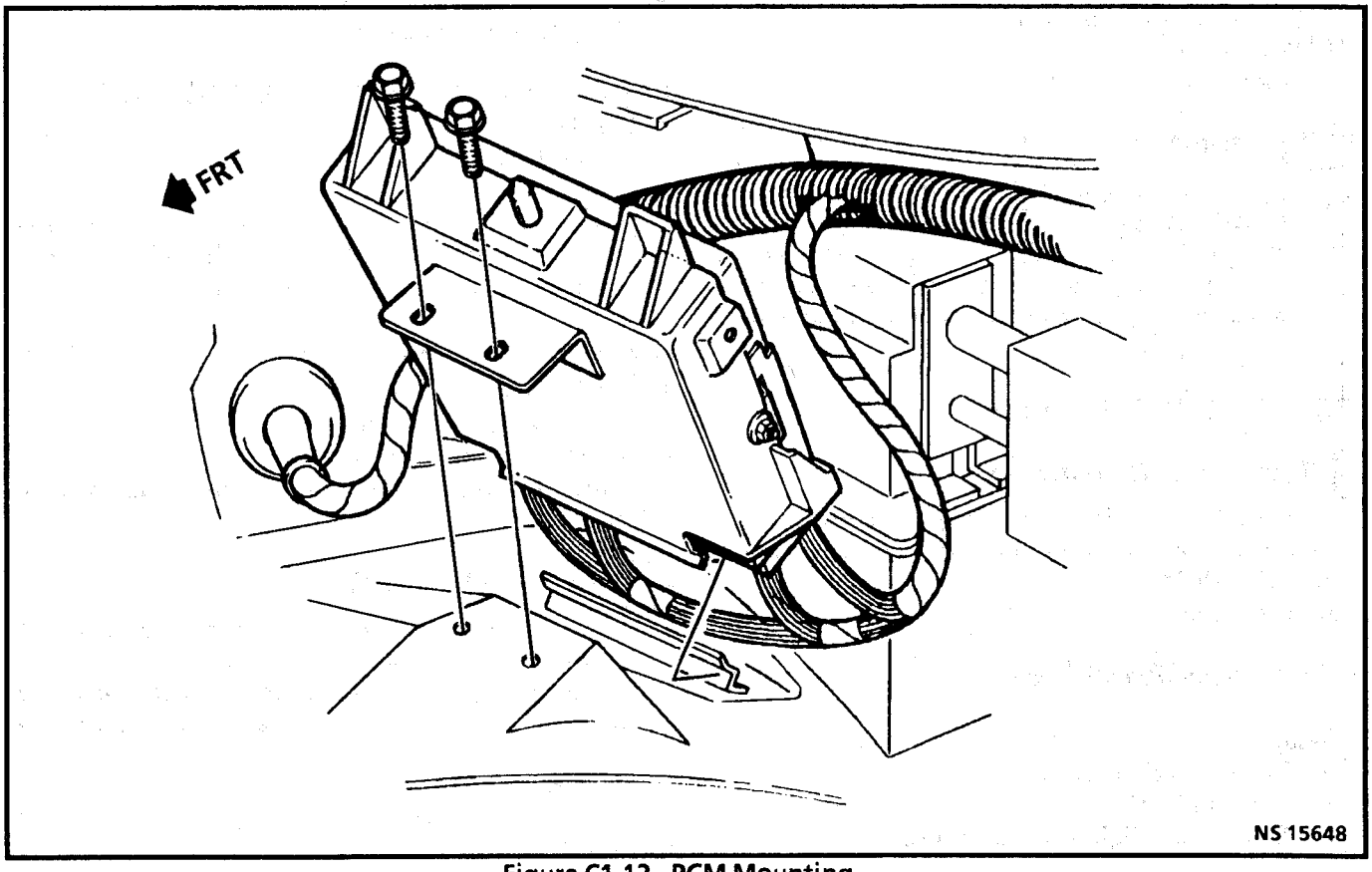


Figure C1-12 - PCM Mounting

Important

- When replacing the production PCM with a service PCM (controller), it is important to transfer the broadcast code and production PCM number to the service PCM label. Please do not record on PCM cover. This will allow positive identification of PCM parts throughout the service life of the vehicle.

Important

- To prevent internal PCM damage, the ignition must be "OFF" when disconnecting or reconnecting power to PCM (for example, battery cable, PCM pigtail, PCM fuse, jumper cables, etc.).

PCM AND COMPONENTS REPLACEMENT

PCM

NOTICE: To prevent possible Electrostatic Discharge damage to the PCM, Do Not touch the connector pins or soldered components on the circuit board.

Remove or Disconnect

1. Negative battery cable.
2. PCM mounting hardware.
3. Connectors from PCM.
4. PCM from engine compartment.
5. PCM access cover.
6. Knock Sensor (KS) module.

Important

- The Knock Sensor (KS) module must be transferred to the replacement PCM.
- The replacement PCM is supplied without a EEPROM program, the replacement PCM must be programmed before the vehicle will run.

IF PCM IS BEING REPLACED

Remove or Disconnect

1. New PCM from its packaging and check the service number to make sure it is the same as the defective PCM.
2. Access cover.

EEPROM PROGRAMMING

1. Setup:
   - Battery is charged.
   - Ignition is "ON."
   - Battery/cig. lighter connection secure.
   - Data Link Connector (DLC), formerly ALDL, must be secure.
2. Refer to up-to-date Techline terminal/equipment user's instructions.
3. If PCM fails to program, do the following:
   - Check all PCM connections.
   - Check Techline terminal/equipment for latest software version.
   - Try again to program the PCM. If it fails again, replace the PCM. Replacement PCM must be programmed.
4. If vehicle is equipped with an aftermarket anti-theft system, it may require a reset procedure. Refer to appropriate service manual/section.

Functional Check

- Use Techline terminal/equipment to perform the "On-Board Diagnostic (OBD) System Check,"
  OR
- Refer to "On-Board Diagnostic (OBD) System Check," in "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3-A" in this service manual.

Install or Connect

1. Knock Sensor (KS) module.
2. Access cover on PCM.
3. Connectors to PCM.
4. PCM located under hood.
5. Negative battery cable.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Figure C1-13

NOTICE: Care must be taken when handling sensor. Damage to sensor will affect proper operation of the fuel injection system.

Remove or Disconnect

1. Relieve coolant pressure.
2. Negative battery cable.
3. Electrical connector.
4. Carefully back out engine coolant temperature sensor.

Install or Connect

1. Coat threads (only) with sealer P/N 9985253 or equivalent torque to 13 N·m (10 lb. ft.).
2. Sensor in engine. Locking tab on sensor assembly must be located within area shown in Figure C1-13.
3. Electrical connector.
4. Negative battery cable.
5. Refill lost coolant.

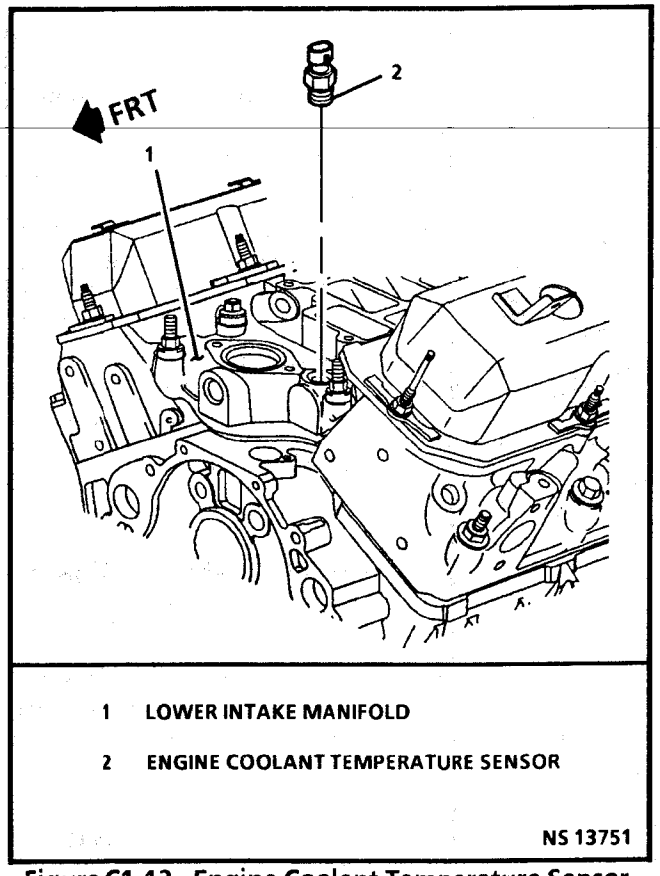


Figure C1-13 - Engine Coolant Temperature Sensor

INTAKE AIR TEMPERATURE (IAT) SENSOR

The IAT sensor is located in the rear air intake duct.

Remove or Disconnect

1. Electrical connecter.
2. Clamp.
3. Sensors.

Install or Connect

1. Sensor.
2. Clamps.
3. Electrical connector.

OXYGEN SENSOR (O2S)
Figure C1-14

NOTICE: The Oxygen Sensors (O2S) use a permanently attached pigtail and connector. This pigtail should not be removed from the oxygen sensor. Damage or removal of the pigtail or connector could affect proper operation of the oxygen sensor.

Important

- Take care when handling the Oxygen Sensor (O2S). The in-line electrical connector and louvered end must be kept free of grease, dirt or other contaminants. Also, avoid using cleaning solvents of any type. Do not drop or roughly handle the Oxygen Sensor (O2S).

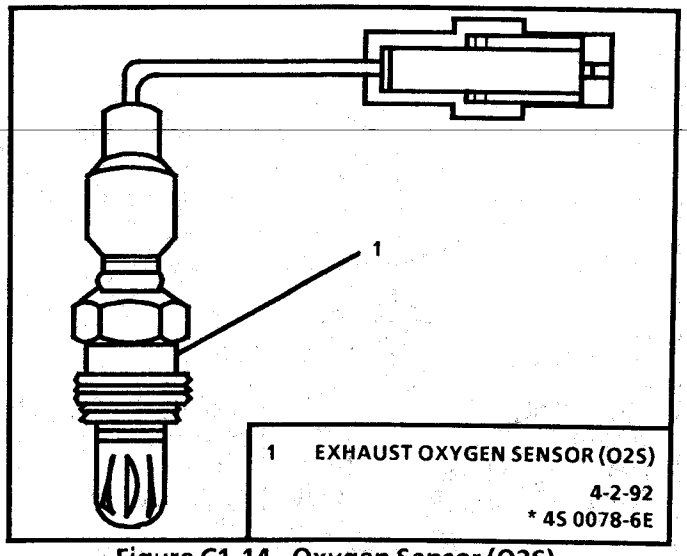


Figure C1-14 - Oxygen Sensor (O2S)

Remove or Disconnect

- The oxygen sensors may be difficult to remove when engine coolant temperature is below 48°C (120°F).

Excessive force may damage threads in exhaust manifold or exhaust pipe.

1. Negative battery cable.
2. Electrical connector.
3. Carefully back out Oxygen Sensor (O2S) using tool J 29533A/BT-8127.

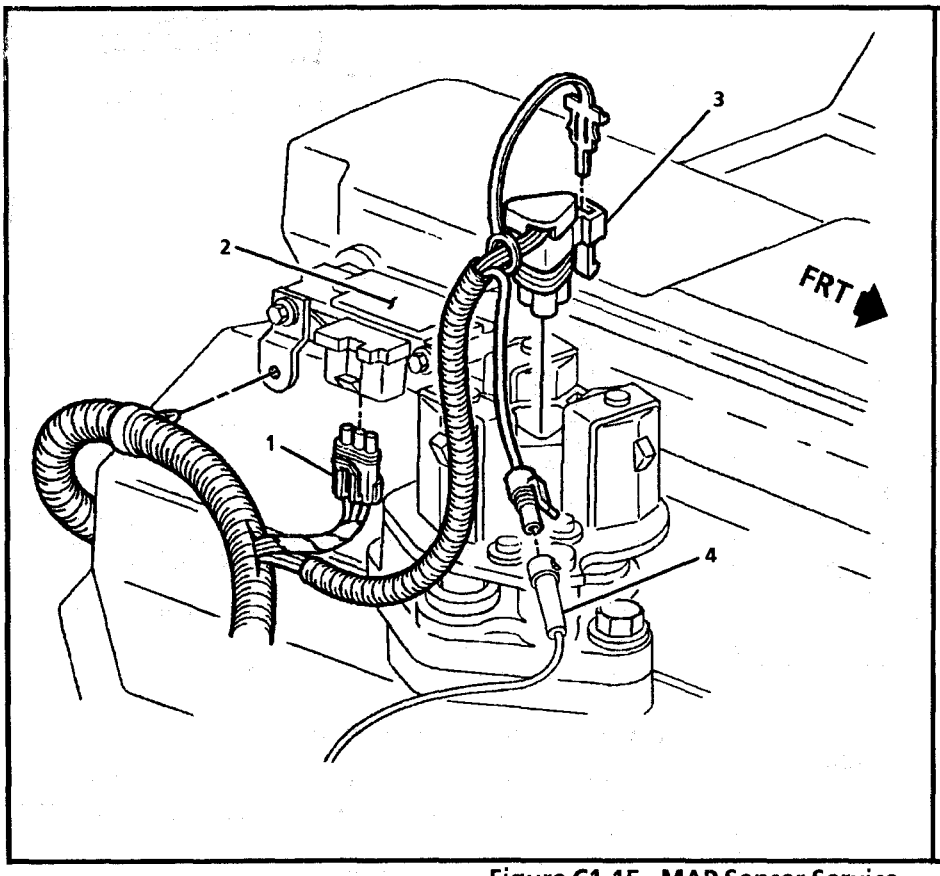
Install or Connect

Important

- A special anti-seize compound is used on the Oxygen Sensor (O2S) threads. The compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain making the sensor easier to remove.

New or service sensors will already have the compound applied to the threads. If a sensor is removed from an engine and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat threads of Oxygen Sensor (O2S) with anti-seize compound P/N 5613695, or equivalent if necessary.
2. Sensor, and torque to 41 N·m (30 lb. ft.).
3. Electrical connector.
4. Negative battery cable.



1 MAP SENSOR CONNECTOR

2 MAP SENSOR

3 EGR CONNECTOR

4 OXYGEN SENSOR (O2S) PIGTAIL

NS 15649

Figure C1-15 - MAP Sensor Service

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Figure C1-15

Remove or Disconnect

1. Negative battery cable.
2. MAP sensor electrical connector.
3. MAP sensor bolts/screws (2).
4. Inlet vacuum hose.
5. MAP sensor. Refer to Figure C1-15.

Install or Connect

1. MAP sensor to intake plenum. Refer to Figure C1-15.
2. Electrical connector.
3. Inlet vacuum hose.
4. Negative battery cable.

THROTTLE POSITION (TP) SENSOR

Remove or Disconnect

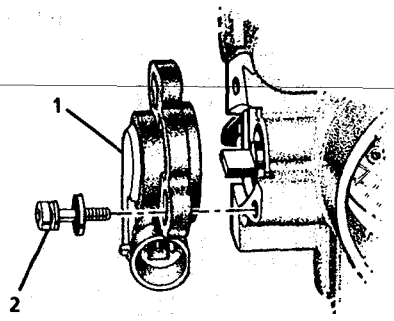
1. TP sensor electrical connector.
2. Remove TP sensor attaching screws and retainers.
3. Sensor.

Install or Connect

1. With throttle valve in the normal closed idle position, install throttle position sensor on throttle body assembly (refer to Figure C1-16).
2. Two TP sensor screws. Tighten to 2.0 N·m (18.0 lb. in.).
3. TP sensor electrical connector.

VSS

Refer to SECTION 7 for transmission mounted VSS.



1 SENSOR - THROTTLE POSITION (TP)

2 SCREW ASSEMBLY - TP SENSOR ATTACHING

9P 1074-AS

Figure C1-16 - Throttle Position (TP) Sensor Service

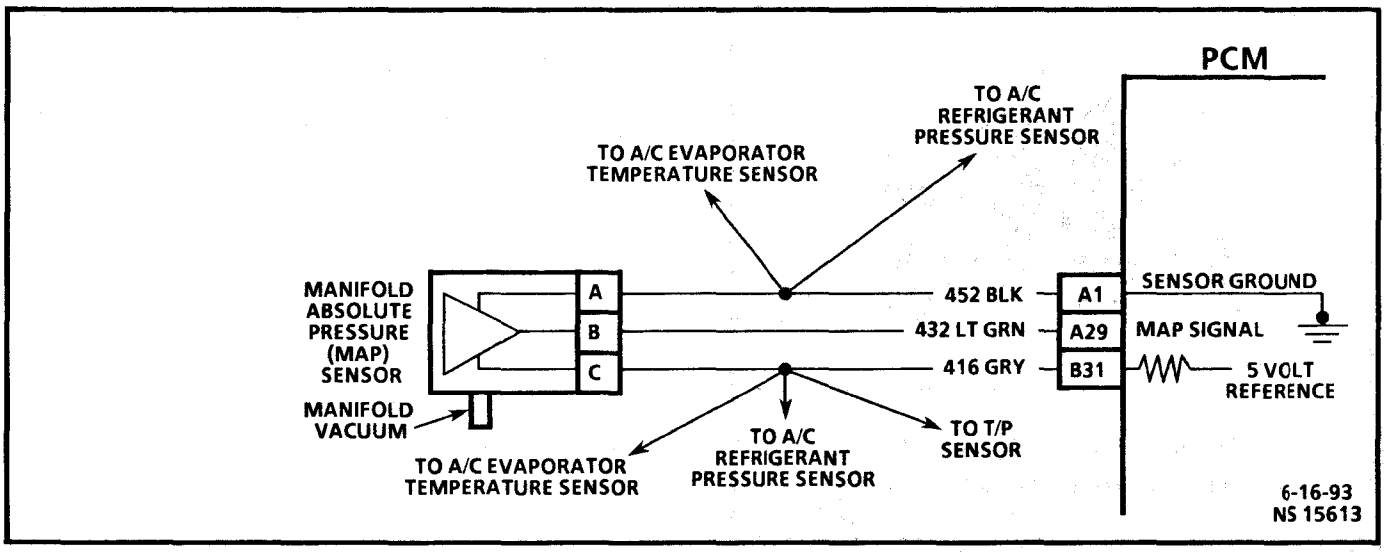


CHART C-1D

MANIFOLD ABSOLUTE PRESSURE (MAP) OUTPUT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and RPM changes and converts these into a voltage output. The PCM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the sensor also changes. By monitoring the sensor output voltage, the PCM calculates the manifold pressure. A lower pressure (low voltage) will be 1-2 volts at idle, while higher pressure (high voltage) output voltage will be 4-4.8 volts at Wide Open Throttle (WOT). The MAP sensor is also used under certain conditions, to measure barometric pressure, allowing the PCM to make adjustments for different altitudes. The PCM uses the MAP sensor to control fuel delivery and ignition timing.

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

Important

- Be sure to use the same Diagnostic Test Equipment for all measurements.

1. When comparing Tech 1 scan tool readings to a known good vehicle, it is important to compare vehicles that use a MAP sensor having the same color insert or having the same "Hot Stamped" number.
2. Applying 34 kPa (10 inch Hg) vacuum to the MAP sensor should cause the voltage to be 1.5 to 2.1 volts less than the voltage at Step 1. Upon applying vacuum to the sensor, the change in voltage should be instantaneous. A slow voltage change indicates a faulty sensor.
3. Check vacuum hose to sensor for leaking or restriction. Be sure no other vacuum devices are connected to the MAP sensor vacuum hose.

   NOTICE: Make sure electrical connector remains securely fastened.

4. Disconnect sensor from bracket and twist sensor (by hand only) to check for intermittent connection. Output changes greater than .1 volt indicates a bad sensor.

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).

1. • IF DTC 33 OR 34 IS SET, USE THOSE CHARTS FIRST.
   • IGNITION "ON," ENGINE "OFF."
   • SCAN TOOL SHOULD INDICATE A MAP SENSOR VOLTAGE.
   • COMPARE THIS READING WITH THE READING OF A KNOWN GOOD VEHICLE. SEE FACING PAGE TEST DESCRIPTION, STEP 1. VOLTAGE READING SHOULD BE WITHIN ± .4 VOLT. IS IT?

   YES → 2

   NO → REPLACE MAP SENSOR.

2. • DISCONNECT AND PLUG VACUUM SOURCE TO MAP SENSOR.
   • CONNECT A HAND VACUUM PUMP TO MAP SENSOR.
   • START ENGINE.
   • NOTE MAP SENSOR VOLTAGE.
   • APPLY 34 kPa (10" Hg) OF VACUUM AND NOTE VOLTAGE CHANGE. SUBTRACT SECOND READING FROM THE FIRST. VOLTAGE VALUE SHOULD BE GREATER THAN 1.5 VOLTS. IS IT?

   YES → 3

   NO → 4

3. NO TROUBLE FOUND. CHECK MAP SENSOR VACUUM SOURCE FOR LEAKAGE OR RESTRICTION. BE SURE THIS SOURCE SUPPLIES VACUUM TO MAP SENSOR ONLY.

4. CHECK MAP SENSOR CONNECTION. IF OK, REPLACE MAP SENSOR.

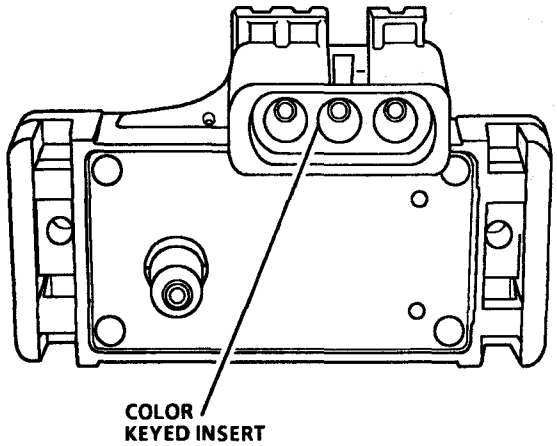


Figure 1 - Color Key Insert

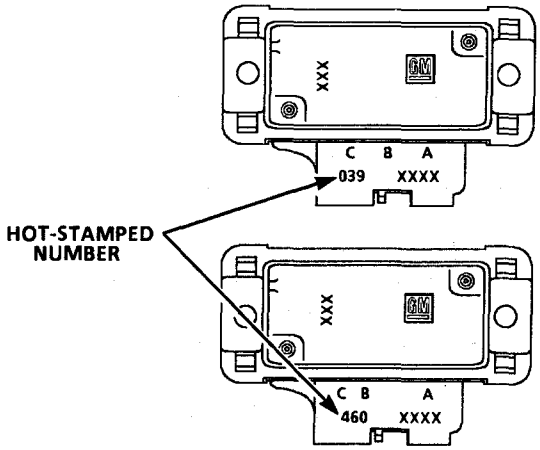


Figure 2 - Hot Stamped Number

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

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SECTION C2
FUEL METERING SYSTEM

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GENERAL DESCRIPTION

PURPOSE

The function of the fuel metering system is to deliver the correct amount of fuel to the engine under all operating conditions.

Fuel is delivered to the engine by individual fuel injectors mounted in the intake manifold near each cylinder.

The main control sensor is the Oxygen Sensor (O2S), located in the exhaust manifold. The O2S tells the Powertrain Control Module (PCM) how much oxygen is in the exhaust gas, and the PCM changes the air/fuel ratio to the engine by controlling the fuel injectors. The best mixture to minimize exhaust emissions is 14.7:1, which allows the three-way catalytic converter to operate most efficiently. Because of the constant measuring and adjusting of the air/fuel ratio, the fuel injection system is called a "Closed Loop" system.

MODES OF OPERATION

The PCM monitors information from several sensors to determine how much fuel to give the engine. The fuel is delivered under one of several conditions called modes. All the modes are controlled by the PCM and are described below.

Starting Mode

When the ignition switch is turned to the "ON" position (before engaging starter), the PCM energizes the fuel pump relay for two seconds allowing the fuel pump to build up pressure. The PCM then checks the Engine Coolant Temperature (ECT) and Throttle Position (TP) sensors and determines the proper air/fuel ratio for starting. This ranges from 1.5:1 at -36°C (-33°F) to 14.7:1 at 94°C (201°F) running temperature. The PCM controls the amount of fuel delivered in the starting mode by changing how long the injectors are energized. This is done by pulsing the injectors for very short times.

Clear Flood Mode

If the engine floods, it can be cleared by pushing the accelerator pedal down all the way. The PCM enables the clear flood mode and temporarily suspends fuel delivery. The PCM maintains the clear flood mode as long as the throttle stays wide open, and the engine speed remains below 600 RPM. If the throttle position becomes less than 62%, the PCM returns to the starting mode.

Run Mode

The run mode has two conditions called "Open Loop" and "Closed Loop."

When the engine is first started and engine speed is above 400 RPM, the system goes into "Open Loop" operation. The PCM ignores the signal from the O2S and calculates the air/fuel ratio based on inputs from the Engine Coolant Temperature (ECT) and Intake Air Temperature (IAT) sensors.

The system stays in "Open Loop" until the following conditions are met:

1. The O2S has varying voltage output, showing that it is hot enough to operate properly. (This depends on temperature.)
2. The ECT sensor is above a specified temperature.
3. A specific amount of time has elapsed after starting the engine.

The specific values for the above conditions vary with different engines, and are stored in the Programmable Read Only Memory (PROM) portion of the PCM. When these values are met, the system goes into "Closed Loop" operation. In "Closed Loop," the PCM calculates the air/fuel ratio (injector on-time) based on the signal from the O2S. This allows the air/fuel ratio to stay very close to 14.7:1.

Acceleration Mode

When the driver pushes on the accelerator pedal, air flow into the cylinders increases rapidly, while fuel flow tends to lag behind. To prevent possible hesitation, the PCM increases the pulse width to the injectors to provide extra fuel during acceleration. The amount of fuel required is based on throttle position, manifold air pressure, and engine speed.

Fuel Cutoff Mode

To prevent possible engine damage from over-speed, the PCM cuts off fuel from the injectors when engine speed is above 6000 RPM with the vehicle in any forward gear position, or in reverse. The PCM also cuts-off fuel to the injectors at vehicle speeds above 108 mph to prevent tire damage.

Deceleration Mode

When the driver releases the accelerator pedal, air flow into the engine is reduced. The corresponding changes in throttle position and manifold air pressure are relayed to the PCM, which reduces the injector pulse width to reduce fuel flow. If the deceleration is very rapid, or for long periods (such as long closed throttle coast-down), the PCM shuts "OFF" fuel completely to protect the catalytic converter.

Catalytic Converter Protection Mode

The PCM constantly monitors engine operation, and estimates conditions that could result in high catalytic converter temperatures. If the PCM determines the converter may overheat, it causes the system to return to "Open Loop" operation and enriches the fuel mixture.

Battery Voltage Correction Mode

When battery voltage is low, the PCM can compensate for the weak spark by:

- Increasing the amount of fuel delivered.
- Increasing the idle RPM.
- Increasing ignition dwell time.

FUEL METERING SYSTEM COMPONENTS

The fuel metering system consists of the following parts:

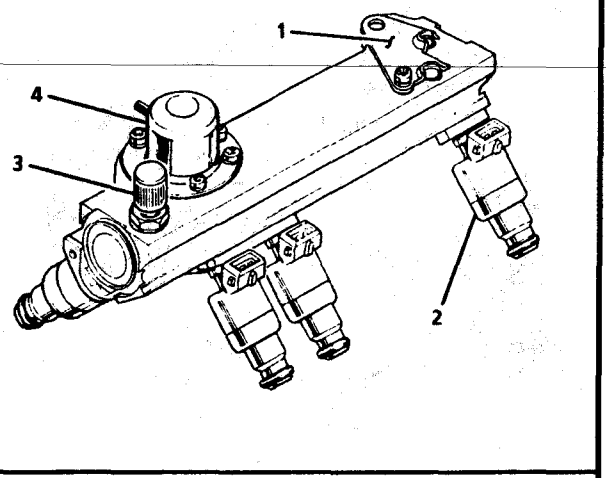
- Fuel supply components (fuel tank, pump, lines).
- Fuel pump electrical circuit.
- Fuel rail assembly, including:
  - Fuel injectors.
  - Fuel pressure regulator.
- Throttle body assembly, including:
  - Idle Air Control (IAC) valve.
  - Throttle Position (TP) sensor.

FUEL SUPPLY COMPONENTS

The fuel supply is stored in the fuel tank. An electric fuel pump, located in the fuel tank with the gage sending unit, pumps fuel through an in-line fuel filter to the fuel rail assembly. The pump is designed to provide fuel at a pressure greater than is needed by the injectors. The pressure regulator, part of the fuel rail assembly, keeps fuel available to the injectors at a regulated pressure. Unused fuel is returned to the fuel tank by a separate line. (For further information see SECTION 6C for replacement procedures covering the fuel tank, fuel pump, in-line filter and fuel lines.)

FUEL PUMP ELECTRICAL CIRCUIT

When the ignition switch is turned to the "ON" position (before engaging starter), the PCM energizes the fuel pump relay for two seconds, causing the fuel pump to pressurize the fuel system. If the PCM does not receive ignition reference pulses (engine cranking or running) within two seconds, it de-energizes the fuel pump relay, causing the fuel pump to stop. If the fuel pump relay fails, Diagnostic Trouble Code (DTC) 54 is set in the PCM.



1	RETAINER - FUEL TUBE
2	INJECTOR ASSEMBLY - MFI FUEL
3	CONNECTION ASSEMBLY - FUEL PRESSURE
4	REGULATOR ASSEMBLY - FUEL PRESSURE

NA 1320-AS

Figure C2-1 - Fuel Rail Assembly

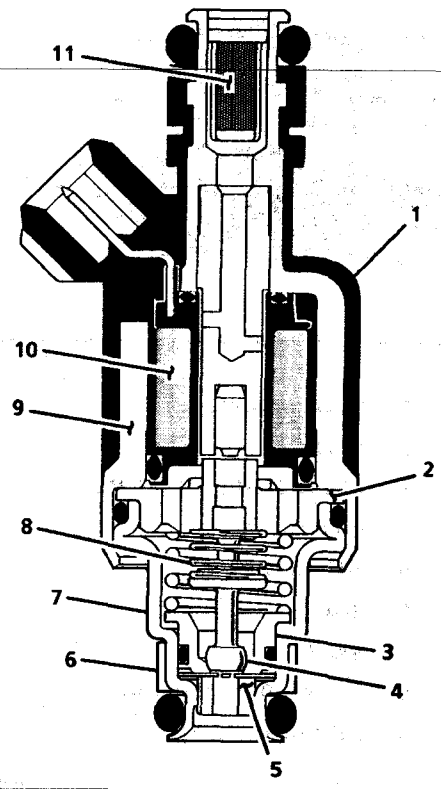
FUEL RAIL ASSEMBLY
Figure C2-1

The fuel rail assembly, mounted in the engine intake manifold, performs several functions. It positions the injectors in the intake manifold, distributes fuel evenly to the injectors, and integrates the fuel pressure regulator into the fuel metering system. The fuel rail also provides a threaded fitting for connecting a pressure gage.

Fuel Injector
Figure C2-2

A fuel injector is a solenoid operated device, controlled by the PCM, that meters pressurized fuel to a single engine cylinder. The PCM energizes the injector solenoid, which opens a ball valve, allowing fuel to flow past the ball valve, and through a recessed flow director plate. The director plate has six machined holes that control the fuel flow, generating a conical spray pattern of finely atomized fuel at the injector tip. Fuel is directed at the intake valve, causing it to become further atomized and vaporized before entering the combustion chamber.

An injector that is stuck partly open would cause loss of pressure after engine shut down. Consequently, long cranking times would be noticed on some engines. Dieseling also could occur because some fuel could be



1	SOLENOID ASSEMBLY	7	HOUSING - SPRAY
2	SPACER & GUIDE ASM	8	SPRING - CORE
3	CORE SEAT	9	HOUSING - SOLENOID
4	VALVE - BALL	10	SOLENOID
5	PLATE - DIRECTOR	11	FILTER - FUEL INLET
6	BACKUP - O-RING		

PA 0496-SY

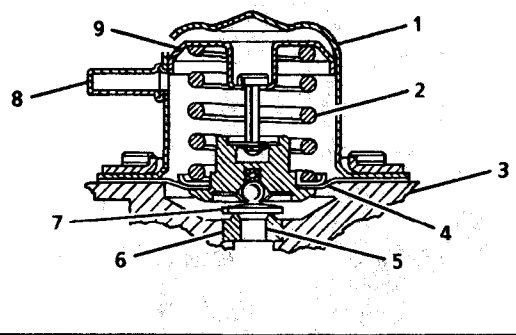
Figure C2-2 - MFI Injector Assembly Cross-Sectional View

delivered to the engine after the ignition is turned "OFF."

Fuel Pressure Regulator Assembly
Figure C2-3

The fuel pressure regulator is a diaphragm-operated relief valve with fuel pump pressure on one side, and regulator spring pressure and intake manifold vacuum on the other. The regulator's function is to maintain a constant pressure differential across the fuel injectors at all times. The pressure regulator compensates for engine load by increasing fuel pressure as engine vacuum drops.

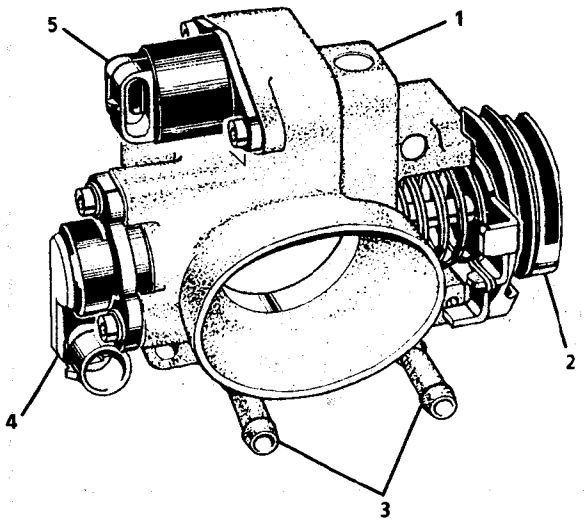
With the ignition "ON" and engine "OFF" (zero vacuum), fuel pressure at the pressure test connection should be 284-325 kPa (41-47 psi). If the pressure is too low, poor performance could result. If the pressure is too high, excessive odor and a DTC 45 may result. CHART A-7 has information on diagnosing fuel pressure conditions.



1 COVER ASSEMBLY
2 SPRING
3 RAIL ASSEMBLY - MFI FUEL
4 DIAPHRAGM
5 FUEL RETURN
6 SEAT
7 VALVE
8 CONNECTION - VACUUM
9 RETAINER - SPRING

8P 0968-AS

Figure C2-3 - Pressure Regulator Assembly



1 BODY ASSEMBLY - THROTTLE
2 LEVER ASSEMBLY - THROTTLE
3 TUBES - COOLANT
4 SENSOR - THROTTLE POSITION (TP)
5 VALVE ASSEMBLY - IDLE AIR CONTROL (IAC)

NA 1321-AS

Figure C2-4 - Throttle Body Assembly

THROTTLE BODY ASSEMBLY
Figure C2-4

The throttle body assembly is attached to the intake manifold air plenum, and is used to control air flow into the engine, thereby controlling engine output. The throttle valve within the throttle body is opened by the driver through the accelerator controls. During engine idle, the throttle valve is almost closed, and air flow control is handled by the Idle Air Control (IAC) valve, described below. To prevent throttle valve icing during cool weather operation, engine coolant is directed through the coolant cavity, on the bottom of the throttle body.

The throttle body also provides the location for mounting the TP sensor, for sensing changes in engine vacuum due to throttle valve position. Vacuum ports are located at, above, or below the throttle valve to generate vacuum signals needed by various components.

Idle Air Control (IAC) Valve Assembly
Figure C2-5

The purpose of the IAC valve assembly is to control engine idle speed, while preventing stalls due to changes in engine load.

The IAC valve, mounted in the throttle body, controls bypass air around the throttle valve. By moving a conical valve known as a pintle, IN toward the seat (to decrease air flow); or "OUT" away from the seat (to increase airflow), a controlled amount of air moves around the throttle plate.

If engine speed is too low, more air is bypassed around the throttle valve to increase RPM. If engine speed is too high, less air is bypassed around the throttle valve to decrease RPM.

The PCM moves the IAC valve in small steps, called counts. These counts can be displayed on a scan tool which plugs into the Data Link Connector (DLC).

During idle, the proper position of the IAC valve is calculated by the PCM, based on battery voltage, coolant temperature, engine load, and engine RPM. If the RPM drops below specification and the throttle valve is closed, the PCM senses a near stall condition and calculates a new valve position to prevent stalling.

If the IAC valve is disconnected and reconnected while the engine is running, the resulting idle RPM may be wrong and resetting of the IAC valve will be required.

After running the engine, the IAC valve resets when the ignition is turned "OFF." When servicing the IAC valve, it should only be disconnected or connected with the ignition "OFF."

If the PCM is without battery power for any reason, the programmed position of the IAC valve pintle is lost, and is replaced with a default value.

Different shaped pintles are used for different IAC valve applications.

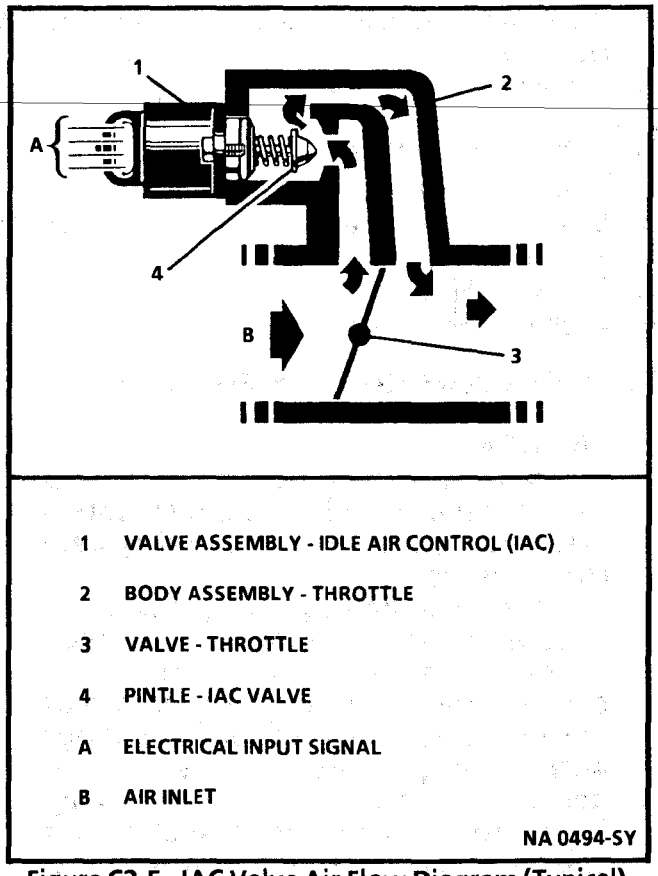


Figure C2-5 - IAC Valve Air Flow Diagram (Typical)

Be sure to use the correct part number, with the correct pintle shape and diameter, when replacement is required.

The IAC valve affects only the idle characteristics of the vehicle. If it is fully retracted, too much air will be allowed into the manifold and idle speed will be high. If it is stuck closed, too little air will be allowed in the manifold, and idle speed will be too low. If it is stuck part way open, the idle may be rough, and will not respond to engine load changes. A DTC 35 should set if a controlled idle cannot be maintained.

Throttle Position (TP) Sensor

The nonadjustable TP sensor is mounted on the side of the throttle body opposite the throttle lever. It senses the throttle valve angle and relays that information to the PCM. Knowledge of throttle angle is needed by the PCM to generate the required injector control signals (pulses). For further information, refer to "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1".

DIAGNOSIS

FUEL PUMP RELAY

The fuel pump relay is mounted behind the driver side kick panel/dead pedal (driver side left foot rest). See illustration in "On-Vehicle Service."

For diagnosis of the fuel pump relay circuit, refer to the Diagnostic Trouble Code (DTC) 54 chart.

FUEL METERING SYSTEM

Some failures of this system will result in an "Engine Cranks But Won't Run Symptom." If this condition exists, see CHART A-3. This chart will determine if the problem is caused by the ignition system, PCM, or fuel pump circuit. If it's determined to be a fuel problem, CHART A-7 will be used. This includes the injectors, pressure regulator, fuel pump, and fuel pump relay.

If a problem occurs in the fuel metering system, it usually results in either a rich or lean O2S signal. This condition is sensed by the O2S and causes the PCM to change the fuel calculation (injector pulse width). The change made to the fuel calculation is indicated by a change in the short and long term fuel trim values which can be monitored with a scan tool. A momentary change to the fuel calculation is indicated by the short term fuel trim value, while a prolonged change is indicated by the long term fuel trim value. Average fuel trim values will be around 128, but will vary slightly from engine to engine.

Important

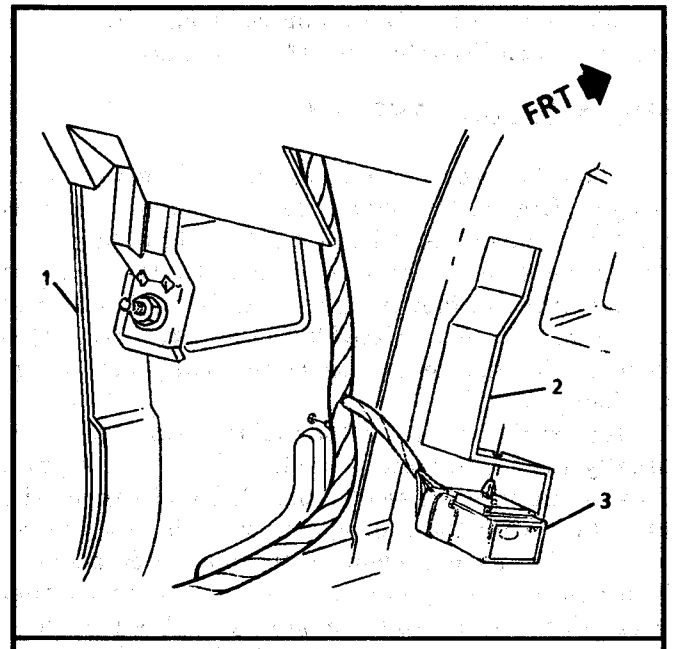
- When using a scan tool to observe fuel trim values, remember that if the system is in control, no action is required unless a driveability symptom is present.

Listed below are examples of lean and rich O2S signals with the system in control and out of control:

- A momentary *lean* O2S *signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value above 128 (adding fuel).
  - Long term fuel trim value around 128.
- A prolonged *lean* O2S *signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value around 128.
  - Long term fuel trim value above 128 (added fuel).
- A prolonged *lean* O2S signal (system is *out of control)* will appear on the scan tool as:
  - Short term fuel trim value well above 128 (adding fuel).
  - Long term fuel trim value well above 128 (added fuel).

If both the short and long term fuel trim values are fixed well above 128, see DTC 44 for items which can cause a lean O2S signal.

- A momentary *rich* O2S *signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value less than 128 (reducing fuel).
  - Long term fuel trim value around 128.



1 LEFT DOOR JAM ("A" PILLAR)
2 DEAD PEDAL BRACKET
3 FUEL PUMP RELAY
NS 15279

Figure C2-6 - Fuel Pump Relay

- A prolonged *rich* O2S *signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value around 128.
  - Long term fuel trim value less than 128 (reduced fuel).
- A prolonged *rich O2S signal* (system is *out of control)* will appear on the scan tool as:
  - Short term fuel trim value much less than 128 (reducing fuel).
  - Long term fuel trim value much less than 128 (reduced fuel).

If both the short and long term fuel trim values are fixed well below 128, see DTC 45 for items which can cause the system to run rich. If a driveability symptom exists, refer to the particular symptom in the "Symptoms," Section "6E3-B" for additional items to check.

ON-VEHICLE SERVICE

FUEL PUMP RELAY
Figure C2-6

The fuel pump relay is mounted behind the driver side kick panel/dead pedal (driver side left foot rest).

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Driver side kick panel/dead pedal (driver side left foot rest).
4. Fuel pump relay from electrical connector.

Install or Connect

1. Fuel pump relay.
2. Driver side kick panel/dead pedal (driver side left foot rest).
3. Ignition "OFF."
4. Negative battery cable.

PORT FUEL INJECTION COMPONENTS

CAUTION:
• To reduce the risk of fire and personal injury, relieve the fuel system pressure before servicing fuel system components.
• After relieving system pressure, a small amount of fuel may be released when servicing fuel lines or connections. To reduce the chance of personal injury, cover fuel line fittings with a shop towel before disconnecting, to catch any fuel that may leak out. Place the towel in an approved container when disconnect is completed.

FUEL PRESSURE RELIEF PROCEDURE

Tool Required:
J 34730-1, Fuel Pressure Gage

1. Ignition "OFF."
2. Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.
3. Loosen fuel filler cap to relieve tank vapor pressure.
4. Connect gage J 34730-1 or equivalent to fuel pressure valve. Wrap a shop towel around fitting while connecting gage to avoid spillage.
5. Install bleed hose into an approved container and open valve to bleed system pressure. Fuel connections are now safe for servicing.
6. Drain any fuel remaining in gage into an approved container.

Engine Fuel Pipes
Figure C2-7

Tools Required:
J 37088-A, Fuel Line Release Tool Set

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.

3. Relieve fuel system pressure. (Refer to "Fuel Pressure Relief Procedure.")
4. Quick-connect fittings at engine fuel pipes.
5. Slide rubber dust covers from quick-connect fittings at engine fuel pipes.
6. Grasp both sides of fitting. Twist female connector $\frac{1}{4}$ turn in each direction to loosen any dirt within fitting.

CAUTION: Safety glasses must be worn when using compressed air, as flying dirt particles may cause eye injury.

7. Using compressed air, blow dirt out of fitting.
8. Choose correct tool from J 37088-A or J 39504 tool set for size of fitting. Insert tool into female connector, then push/pull inward to release locking tabs.
9. Pull connection apart.

Clean and Inspect

NOTICE: If it is necessary to remove rust or burrs from fuel pipe, use emery cloth in a radial motion with the pipe end to prevent damage to O-ring sealing surface.

- Using a clean shop towel, wipe off male pipe end.
- Inspect both ends of fitting for dirt and burrs. Clean or replace components/assemblies as required.

10. Engine fuel pipe retaining bolts.
11. Accelerator cable from routing clip.
12. Fuel tube retainer from fuel rail.
13. Engine fuel pipes.
14. O-rings from fuel rail and discard.

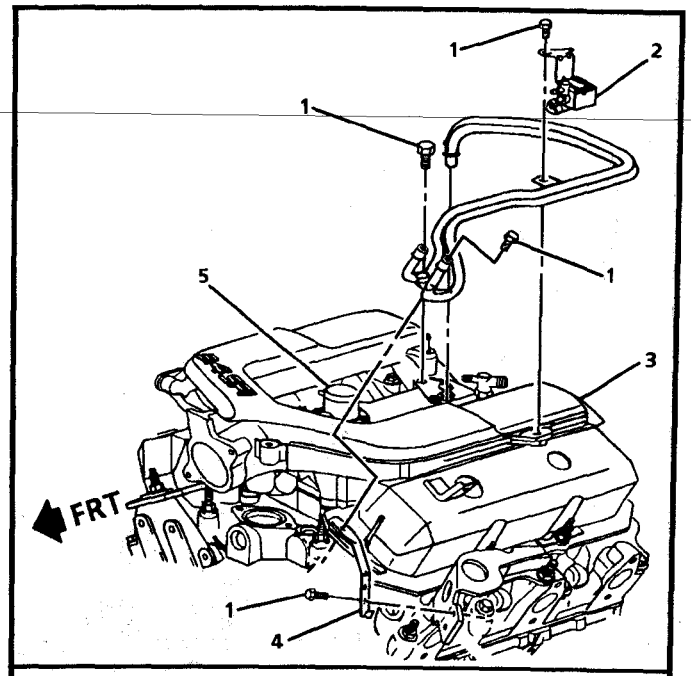
Install or Connect

1. Lubricate new O-rings with clean engine oil and install in fuel rail.
2. Engine fuel pipes to fuel rail.
3. Fuel tube retainer and retainer screw.
   - Finger tighten only.
4. Engine fuel pipe retaining bolts.

Tighten

- Fuel tube retainer screw to 5 N·m (45 lb. in.).

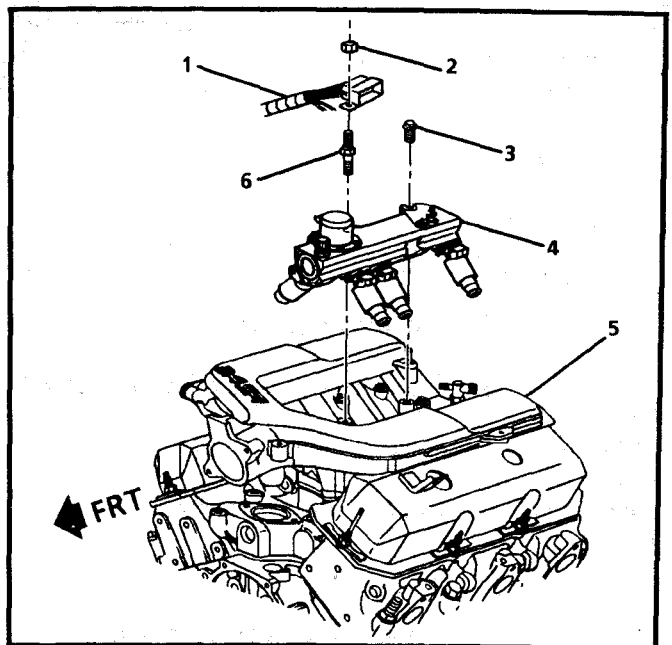
5. Quick-connect fittings to engine fuel pipes.
6. Apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shutoff adapter.
7. Push both sides of fitting together to cause the retaining tabs/fingers to snap into place.
8. Once installed, pull on both sides of fitting to make sure connection is secure.



1	BOLT
2	EVAPORATIVE EMISSION CANISTER PURGE SOLENOID VALVE
3	INTAKE PLENUM
4	BRACE
5	FUEL RAIL ASSEMBLY

NS 15929

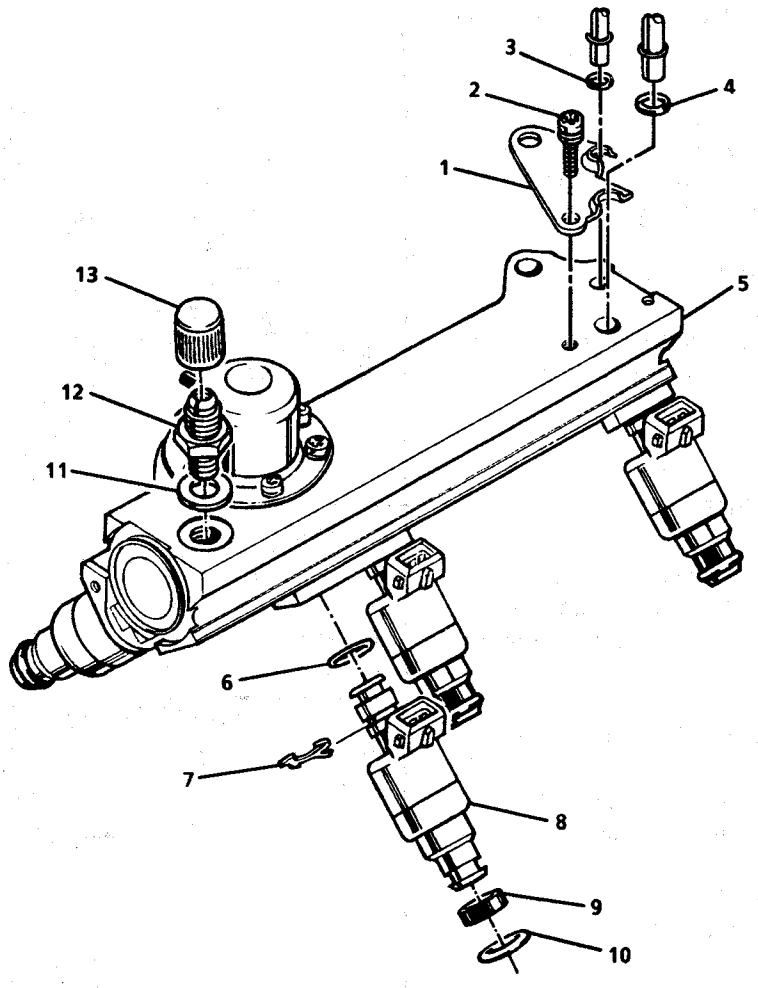
Figure C2-7 - Engine Fuel Pipes



1	INJECTOR WIRING HARNESS
2	NUT
3	BOLT
4	FUEL RAIL
5	INTAKE PLENUM
6	STUD

NS 15924

Figure C2-8 - Fuel Rail Removal



1	RETAINER - FUEL TUBE	8	INJECTOR ASSEMBLY - MFI FUEL
2	SCREW - FUEL TUBE RETAINER ATTACHING	9	BACKUP - O-RING
3	O-RING - FUEL INLET TUBE	10	O-RING - LOWER INJECTOR (BROWN)
4	O-RING - FUEL OUTLET TUBE	11	SEAL - FUEL PRESSURE CONNECTION
5	RAIL ASSEMBLY - MFI FUEL	12	CONNECTION ASSEMBLY - FUEL PRESSURE
6	O-RING - UPPER INJECTOR (BLACK)	13	CAP - FUEL PRESSURE CONNECTION
7	CLIP - FUEL INJECTOR RETAINER		

10-27-92
NA 0197-XV

Figure C2-9 - Fuel Rail Assembly

9. Slide dust covers over quick-connect fittings.
10. Accelerator cable into routing clip.
11. Tighten fuel filler cap.
12. Ignition "OFF."
13. Negative battery cable.

Inspect

- Turn ignition switch to the "ON" position for two seconds, then turn to the "OFF" position for ten seconds. Again turn to the "ON" position and check for leaks.

FUEL RAIL ASSEMBLY
Figures C2-8 through C2-10

The names of component parts appear in the numbered list on the disassembled view.

An eight digit identification number is stamped on the side of the fuel rail. Refer to this number if servicing or part replacement is required.

NOTICE:

- Use care in removing the fuel rail assembly, to prevent damage to the injector electrical connector terminals and the injector spray tips. When removed, support the rail to avoid damaging its components.
- Prevent dirt and other contaminants from entering open lines and passages. Fittings should be capped, and holes plugged, during servicing.

Clean

- Before removal, the fuel rail assembly may be cleaned with a spray type engine cleaner following package instructions. Do Not immerse fuel rail in liquid cleaning solvent.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure. (Refer to "Fuel Pressure Relief Procedure.")
4. Engine fuel pipes. (Refer to "Engine Fuel Pipes.")
5. Vacuum line harness from fuel rail.
6. Main electrical harness connector at fuel rail.
7. Fuel rail attaching bolts.
8. Fuel rail assembly.

Install or Connect

CAUTION: To reduce the risk of fire and personal injury that may result from a fuel leak, always install injector O-rings in the proper position. If the upper and lower O-rings are different colors (black and brown), be sure to install the black O-ring in the upper position and the brown O-ring in the lower position on the injector. The O-rings are the same size but, are made of different materials.

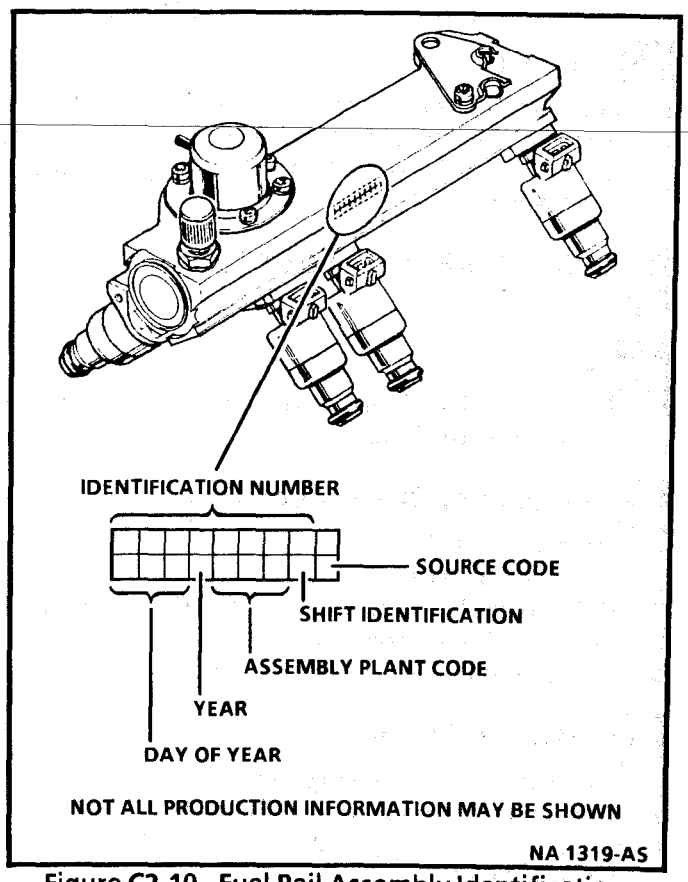


Figure C2-10 - Fuel Rail Assembly Identification

Inspect

- The fuel injector lower O-ring uses a nylon collar, called the O-ring backup, to properly position the O-ring on the injector. Be sure to reinstall the O-ring backup, or the sealing O-ring may move on the injector when installing the fuel rail and result in a possible vacuum leak and driveability complaints will occur.

1. Fuel rail assembly in intake manifold.
   - Tilt rail assembly to install injectors.
2. Fuel rail attaching bolts.

Tighten

- Fuel rail attaching bolts to 25 N·m (18 lb. ft.).

3. Engine fuel pipes to fuel rail.
4. Engine fuel pipes. (Refer to "Engine Fuel Pipes.")
5. Main electrical harness connector at fuel rail.
   - Rotate injector(s) as required to avoid stretching wire harness.
6. Vacuum line harness connector from fuel rail.
7. Tighten fuel filler cap.
8. Ignition "OFF."
9. Negative battery cable.

Inspect

- Turn ignition switch to the "ON" position for two seconds, then turn to the "OFF" position for ten seconds. Again turn to the "ON" position and check for leaks.

FUEL PRESSURE CONNECTION
Figure C2-9

Clean

- Area around fuel pressure connection with GM X-30A or equivalent.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure. (Refer to "Fuel Pressure Relief Procedure.")
4. Fuel pressure connection and seal.

Install or Connect

1. New seal on fuel pressure connection.
2. Fuel pressure connection in fuel rail.

Tighten

- Fuel pressure connection to 13 N·m (115 lb. in.).

3. Tighten fuel filler cap.
4. Ignition "OFF."
5. Negative battery cable.

Inspect

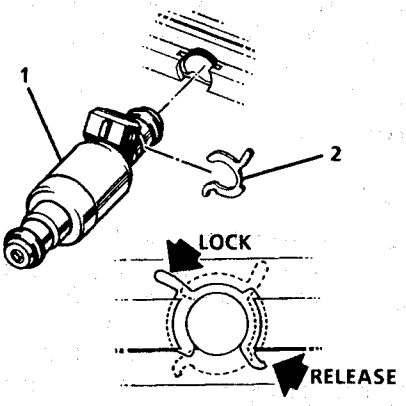
- Turn ignition switch to the "ON" position for two seconds, then turn to the "OFF" position for ten seconds. Again turn to the "ON" position and check for leaks.

FUEL INJECTORS
Figures C2-9, C2-11 and C2-12

NOTICE: Use care in removing injectors to prevent damage to the electrical connector pins on the injector, and the nozzle. The fuel injector is serviced as a complete assembly only. Since it is an electrical component, Do Not immerse it in cleaner.

Remove or Disconnect

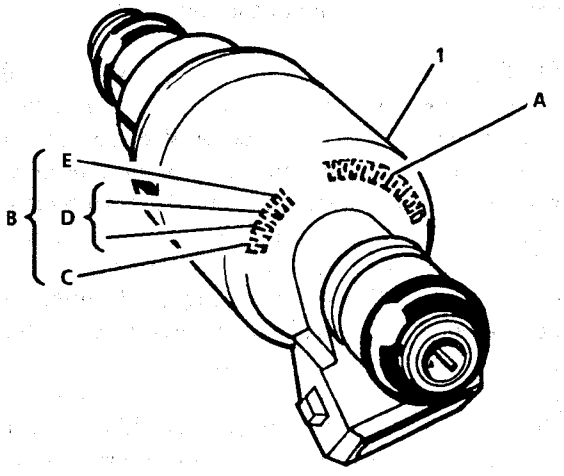
1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure. (Refer to "Fuel Pressure Relief Procedure.")
4. Fuel rail assembly. (Refer to "Fuel Rail Assembly.")



1 INJECTOR ASSEMBLY - MFI FUEL
2 CLIP - INJECTOR RETAINER

9P 1063-AS

Figure C2-11 - MFI Fuel Injector



1 INJECTOR ASSEMBLY - FUEL
A PART NUMBER IDENTIFICATION
B BUILD DATE CODE
C MONTH 1-9 (JAN-SEPT) O, N, D (OCT, NOV, DEC)
D DAY
E YEAR

MP 1222-AS

Figure C2-12 - Injector Part Number Location

Disassemble

1. Rotate injector retainer clip to release position.
2. Fuel injector.
3. Injector O-ring seals from both ends of injector, and discard.
4. Discard injector retainer clip.

Important

- When ordering new fuel injectors, be sure to order the correct injector for the application being serviced.

Assemble

CAUTION: To reduce the risk of fire and personal injury that may result from a fuel leak, always install injector O-rings in the proper position. If the upper and lower O-rings are different colors (black and brown), be sure to install the black O-ring in the upper position and the brown O-ring in the lower position on the injector. The O-rings are the same size but, are made of different materials.

Inspect

- The fuel injector lower O-ring uses a nylon collar, called the O-ring backup, to properly position the O-ring on the injector. Be sure to reinstall the O-ring backup, or the sealing O-ring may move on the injector when installing the fuel rail and result in a possible vacuum leak and driveability complaints will occur.

1. Lubricate new injector O-ring seals with clean engine oil, and install on injector.
2. New retainer clip onto injector.
3. Fuel injector into fuel rail injector socket with electrical connectors facing outward.
4. Rotate injector retainer clip to lock position.

Install or Connect

1. Fuel rail assembly.
2. Tighten fuel filler cap.
3. Ignition "OFF."
4. Negative battery cable.

Inspect

- Turn ignition switch to the "ON" position for two seconds, then turn to the "OFF" position for ten seconds. Again turn to the "ON" position and check for leaks.

PRESSURE REGULATOR ASSEMBLY

Important

- The pressure regulator and fuel rail are serviced as a complete assembly only. Do not attempt to remove the regulator cover from the fuel rail.

THROTTLE BODY ASSEMBLY
Figures C2-13 through C2-15

The throttle body assembly repair procedures cover component replacement with the unit on the vehicle. However, throttle body replacement requires that the complete unit be removed from the engine.

An eight digit part identification number is stamped on the side of the throttle body casting. Refer to this number if servicing, or part replacement is required. For identification of parts during repair, refer to the disassembled view.

NOTICE: The TP sensor and IAC valve should NOT come in contact with solvent or cleaner, as they may be damaged.

Clean

- The throttle bore and valve deposits may be cleaned on-vehicle, using carburetor cleaner and a parts cleaning brush. **Do Not** use a cleaner that contains methyl ethyl ketone, an extremely strong solvent, and not necessary for this type of deposit.
- The throttle body metal parts may be cleaned following disassembly, in a cold immersion-type cleaner such as GM X-55 or equivalent.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Partially drain radiator, to allow coolant hoses at throttle body to be removed.
4. Air inlet duct at throttle body, and crankcase vent pipe at valve cover grommet.
5. TP sensor and IAC valve electrical connectors.
6. Vacuum harness connector from throttle body.
7. Throttle, T.V. (transmission control), and cruise control cables.
8. Coolant hoses from throttle body.
9. Throttle body attaching bolts.
10. Throttle body assembly and flange gasket.
    - Discard gasket.

NOTICE: Use care in cleaning old gasket material from machined aluminum surfaces. Sharp tools may damage sealing surfaces.

Clean

- Gasket surface on intake manifold.

Install or Connect

1. Throttle body assembly with new flange gasket.
2. Throttle body attaching bolts.

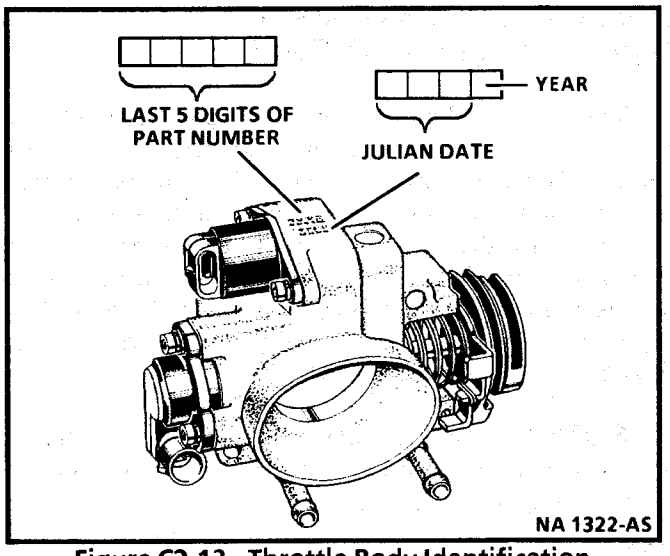


Figure C2-13 - Throttle Body Identification

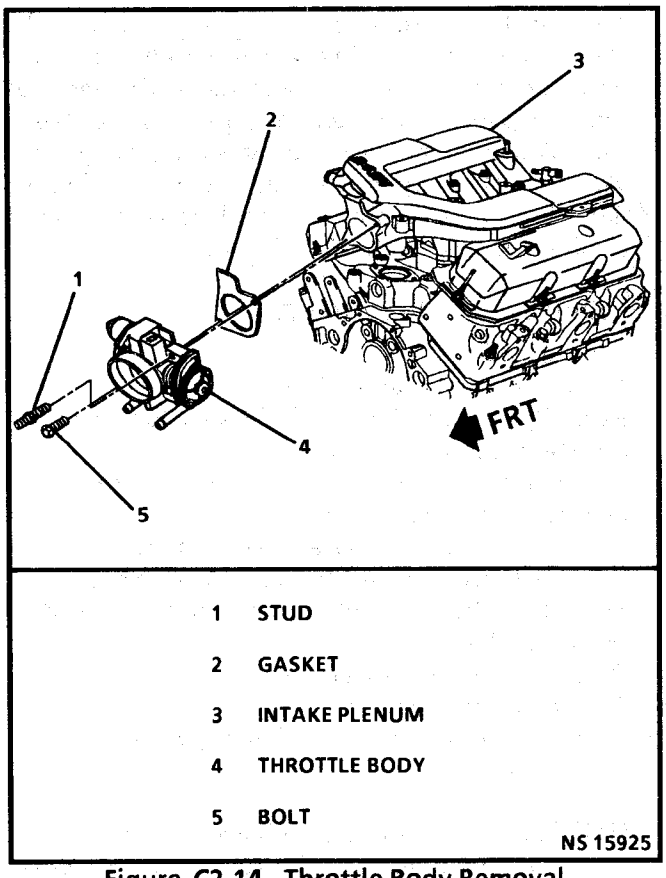


Figure C2-14 - Throttle Body Removal

Tighten

- Throttle body attaching bolts to 27 N·m (20 lb. ft.).

3. Coolant hoses to throttle body.
4. Throttle, T.V., and cruise control cables.

Important

- Make sure throttle and cruise control linkage does not hold throttle open.

Refer to SECTION 6C, for additional information on accelerator controls.

5. Vacuum harness connector.
6. TP sensor and IAC valve electrical connectors.
7. Air inlet duct to throttle body, and crankcase vent pipe to valve cover grommet.
8. Refill radiator.
9. Ignition "OFF."
10. Negative battery cable.

Inspect

- With the engine "OFF," check to see that the accelerator pedal is free:
  - Depress pedal to the floor and release.

THROTTLE POSITION (TP) SENSOR
Figure C2-15

Remove or Disconnect

1. Electrical connector.
2. TP sensor attaching screws.
3. TP sensor.
4. TP sensor static seal.

NOTICE: The TP sensor is an electrical component and must not be soaked in any liquid cleaner or solvent, as damage may result.

Install or Connect

1. TP sensor static seal.
2. With throttle valve closed, position TP sensor on throttle shaft, then align with screw holes.
3. TP sensor attaching screws.

Tighten

- TP sensor attaching screws to 2.0 N·m (18 lb. in.).

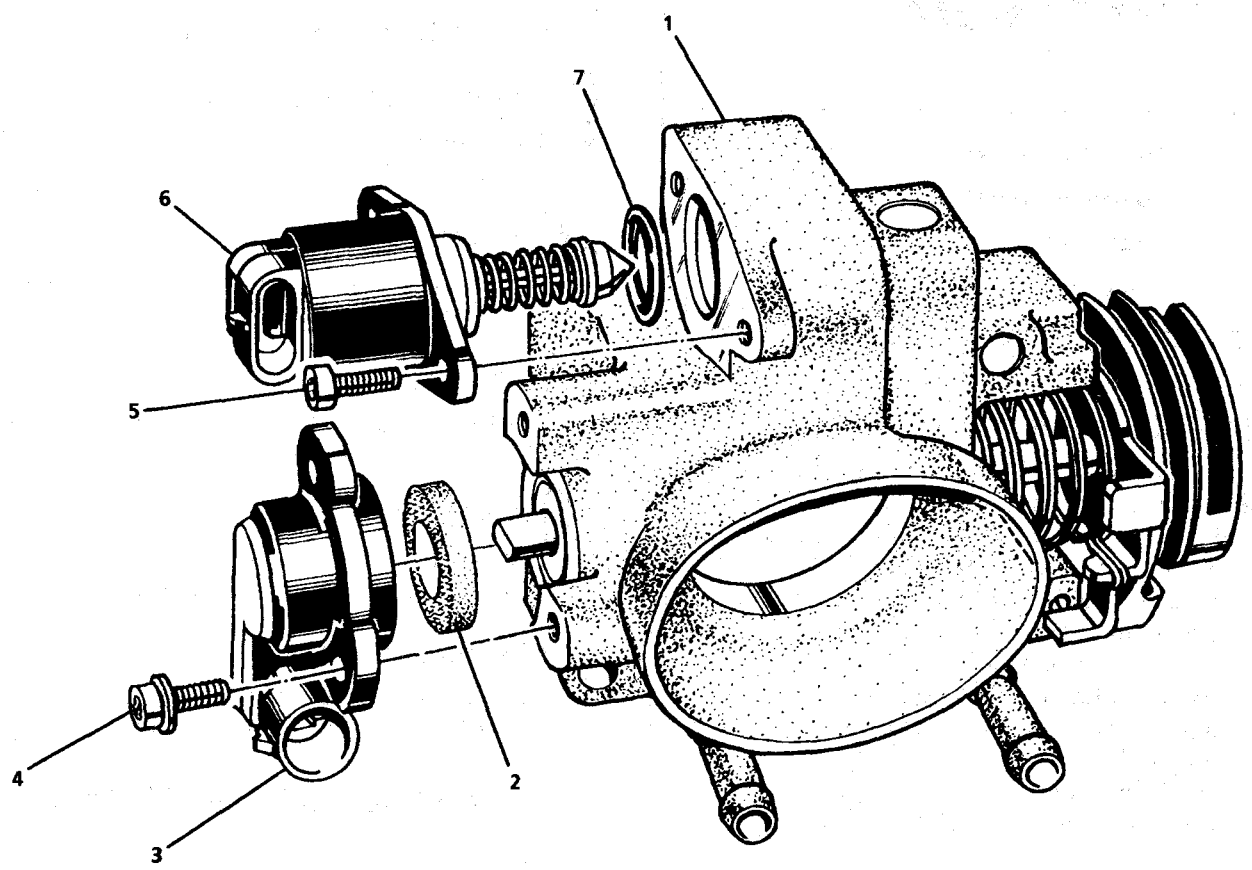
4. Electrical connector.

IDLE AIR CONTROL (IAC) VALVE
Figures C2-15 and C2-16

Remove or Disconnect

1. Electrical connector.
2. IAC valve attaching screws.
3. IAC valve assembly.

NOTICE: On IAC valves that have been in service: Do Not push or pull on the IAC valve pintle. The force required to move the pintle may damage the threads on the worm drive. Also, **Do Not** soak IAC valve in any liquid cleaner or solvent, as damage may result.



1 BODY ASSEMBLY - THROTTLE

2 SEAL - STATIC

3 SENSOR - THROTTLE POSITION (TP)

4 SCREW - TP SENSOR ATTACHING

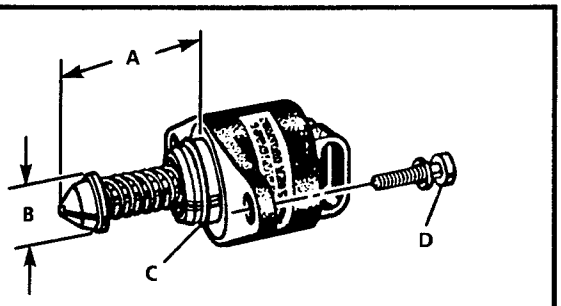
5 SCREW - IAC VALVE ATTACHING

6 VALVE ASSEMBLY - IDLE AIR CONTROL (IAC)

7 O-RING - IAC VALVE

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Figure C2-15 - Throttle Body Assembly



A DISTANCE OF PINTLE EXTENSION
B DIAMETER OF PINTLE
C IACV O-RING
D IACV ATTACHING SCREW ASSEMBLY
7S 3422-6E

Figure C2-16 - Idle Air Control (IAC) Valve

Clean and Inspect

- Clean IAC valve O-ring sealing surface, pintle valve seat and air passage.
  - Use carburetor cleaner and a parts cleaning brush to remove carbon deposits. Do Not use a cleaner that contains methyl ethyl ketone, an extremely strong solvent, and not necessary for this type of deposit.
  - Shiny spots on the pintle or seat are normal, and do not indicate misalignment or a bent pintle shaft.
  - If air passage has heavy deposits, remove throttle body for complete cleaning.
- Inspect IAC valve O-ring for cuts, cracks or distortion. Replace if damaged.

Important

- If installing a new IAC valve, be sure to replace with an identical part. IAC valve pintle shape and diameter are designed for the specific application.

Measure (If Installing a New IAC Valve)

- Distance between tip of IAC valve pintle and mounting flange.
  - If greater than 28 mm, use finger pressure to slowly retract the pintle. The force required to retract the pintle of a *new* valve will not cause damage to the valve.

Install or Connect

1. Lubricate IAC valve O-ring with clean engine oil.
2. IAC valve assembly.
3. Attaching screws.

Tighten

- IAC valve attaching screws to 3.4 N·m (30 lb. in.).
4. Electrical connector.
5. Reset IAC valve pintle position:
   A. Turn ignition "ON" for five seconds.
   B. Turn ignition "OFF" for ten seconds.
   C. Start engine and check for proper idle operation.

THROTTLE BODY REPLACEMENT

Remove or Disconnect

- Throttle body from intake plenum. (Refer to "Throttle Body Assembly.")

Inspect

- Replacement throttle body for items to be transferred from old unit.

Disassemble

- Throttle body removed from engine, following component repair procedures.

Assemble

- Replacement throttle body with transferred parts, following component repair procedures.

Install or Connect

- Replacement throttle body to intake plenum. (Refer to "Throttle Body Assembly.")

TORQUE SPECIFICATIONS

Fuel Tube Retainer screw	5 N·m (45 lb. in.)
Fuel Rail Attaching Bolts	25 N·m (18 lb. ft.)
Fuel Pressure Connection	13 N·m (115 lb. in.)
Throttle Body Attaching Bolts	27 N·m (20 lb. ft.)
Throttle Position (TP) Sensor	2 N·m (18 lb. in.)
Idle Air Control Valve	3.4 N·m (30 lb. in.)

BLANK

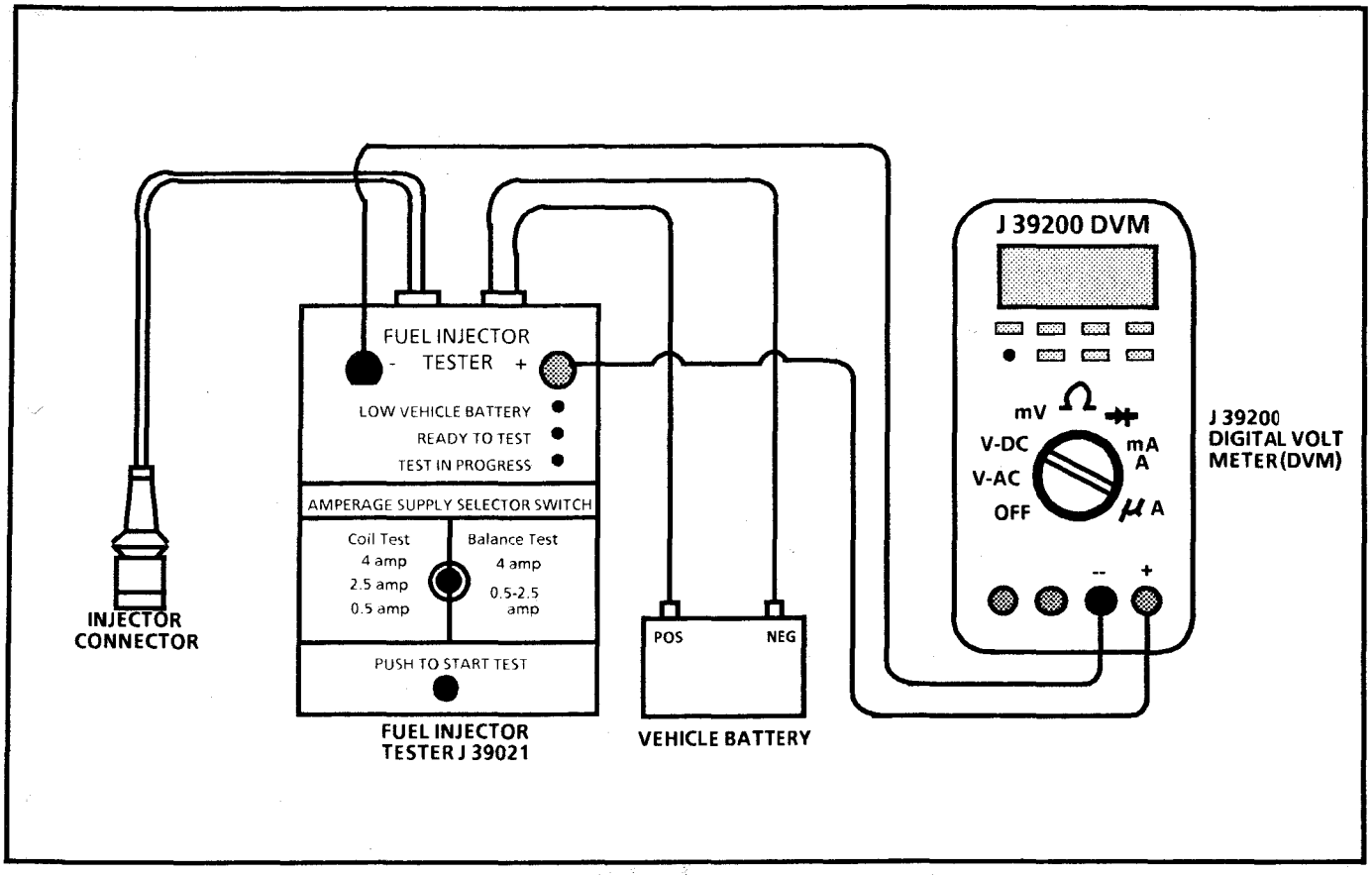


CHART C-2A

(Page 1 of 3)
INJECTOR COIL TEST PROCEDURE
3.4L (VIN S) "F" CARLINE (SFI)

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

1. This is the set-up step for performing the injector coil test. Also read instructions included with tools used for test.
2. Engine coolant temperature affects the tool's ability to detect a faulty injector. If engine coolant temperature is *NOT* between 50°F and 95°F the comparison chart (Page 2 of 3) must be used.
3. The first second of the voltage reading may be inaccurate due to initial current surge, therefore, record the lowest voltage displayed after the first second of test. The voltage reading should be within range (see example). The voltage reading may increase throughout the test as the injector windings warm and the resistance changes. An erratic voltage reading (one that jumps up and down) indicates an intermittent connection within the fuel injector.
4. To check the mechanical (fuel delivery) portion of the fuel injector, perform an injector balance test.

Resistance Ohms	Voltage Spec. at 50° - 95° F
11.8 - 12.6	5.7 - 6.6

Inj#	Reading	Pass/Fail
1	6.3	P
2	5.9	P
3	6.2	P
4	6.1	P
5	**4.8**	**F**
6	6.0	P

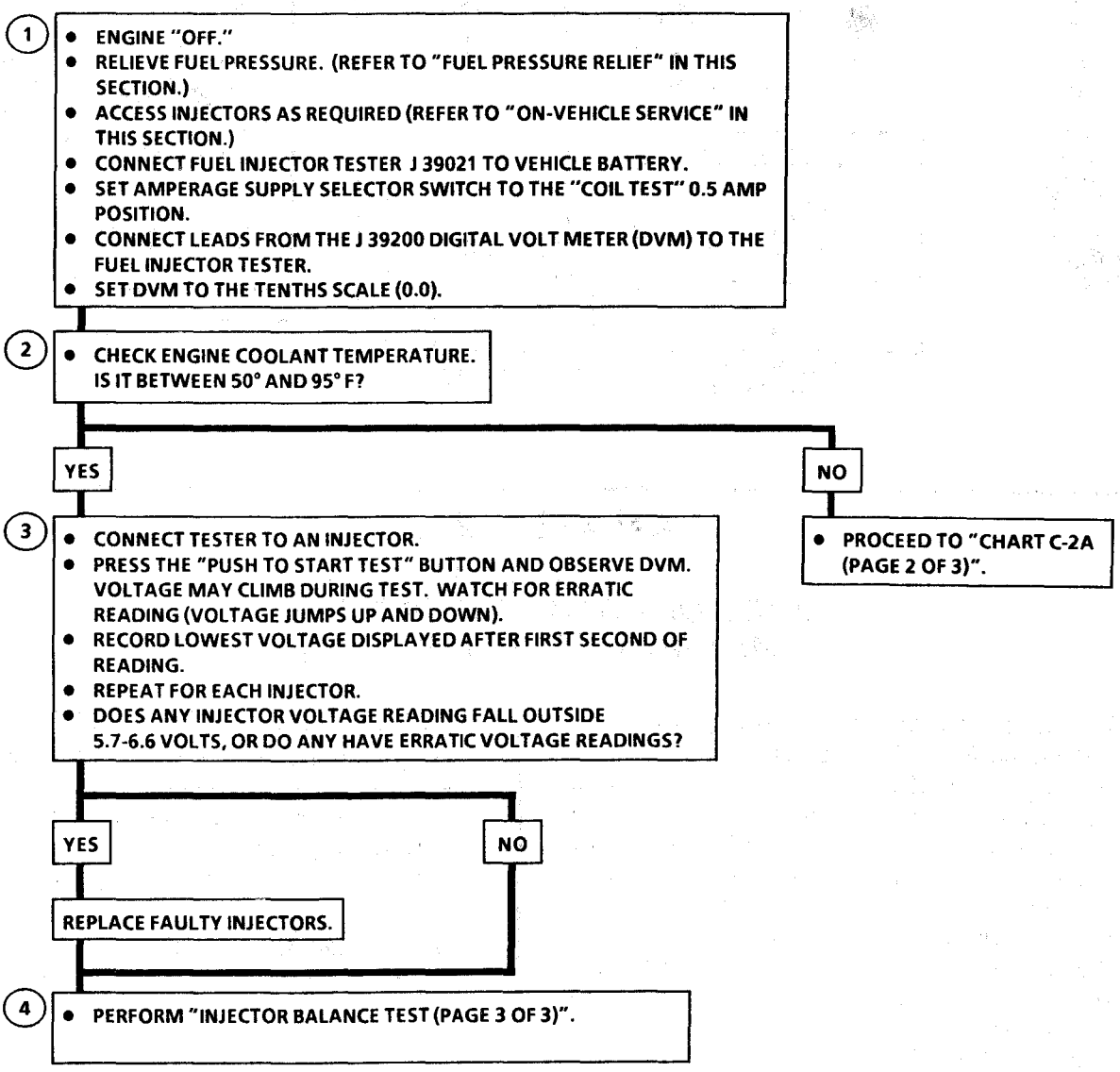
EXAMPLE

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PS 17395

CHART C-2A

(Page 1 of 3)

INJECTOR COIL TEST PROCEDURE 3.4L (VIN S) "F" CARLINE (SFI)



3-24-93
PS 17396

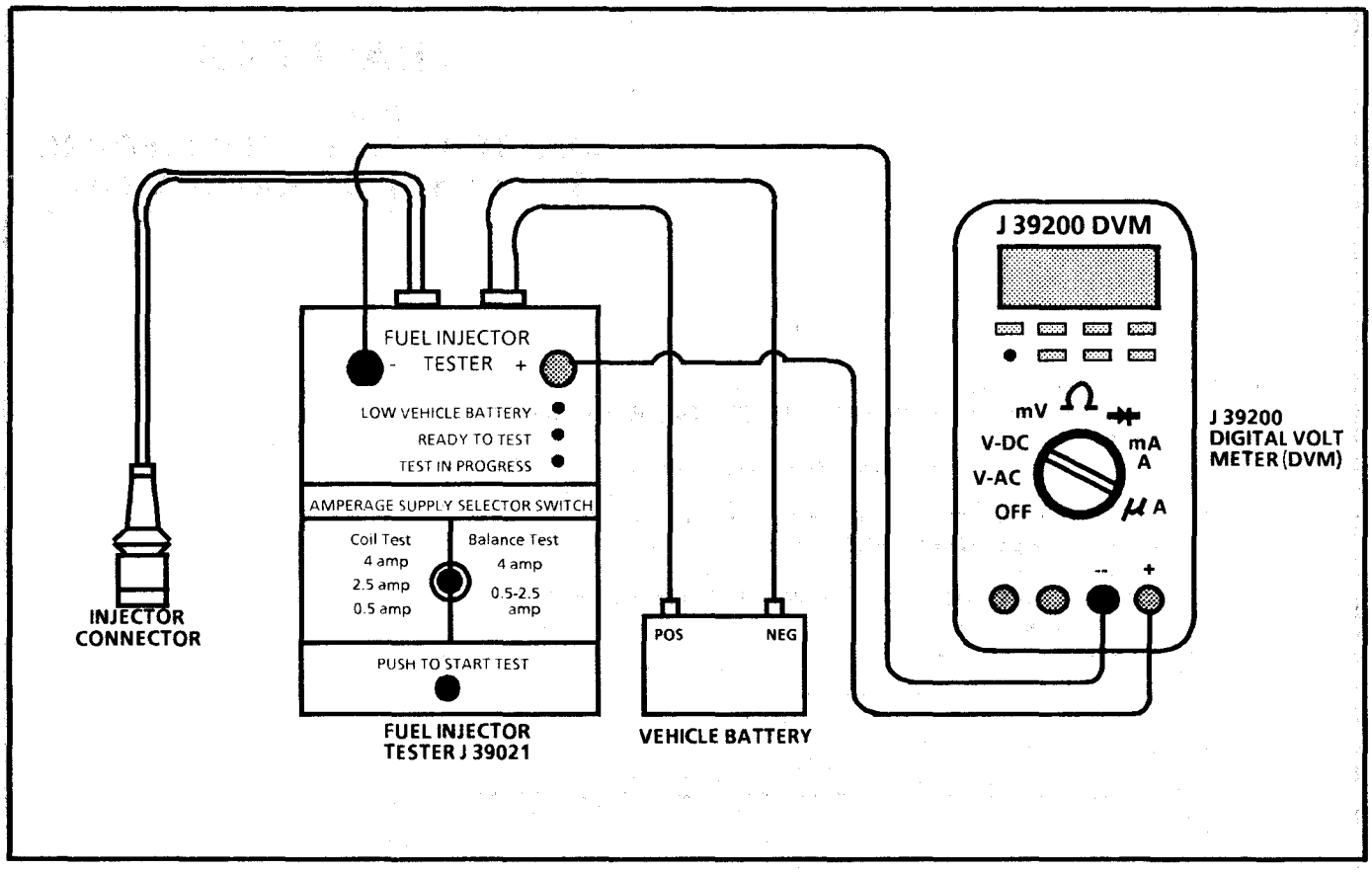


CHART C-2A

(Page 2 of 3)
INJECTOR COIL TEST PROCEDURE
3.4L (VIN S) "F" CARLINE (SFI)

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

1. The first second of the voltage reading may be inaccurate due to initial current surge, therefore, record the lowest voltage displayed after the first second of test. The voltage reading may increase throughout the test as the injector windings warm and the resistance changes. An erratic voltage reading (one that jumps up and down) indicates an intermittent connection within the fuel injector.
2. From recorded voltages (see example), identify the highest voltage reading recorded (other than those above 9.5 volts). Subtract all other voltages from the highest voltage recorded. The subtracted value for any injector must not exceed 0.6 volt.
3. To check the mechanical (fuel delivery) portion of the fuel injector, perform an injector balance test.

Highest Voltage Reading	7.1 Volts
Acceptable Subtracted Value Above/Below 50°-95°F.	0.6 Volt

Inj. No.	Voltage Reading	Subtracted Value	Pass/Fail
1	9.8	---	F
2	6.6	0.5	P
3	6.9	0.2	P
4	5.8	1.3	F
5	7.0	0.1	P
6	7.1	0.0	P

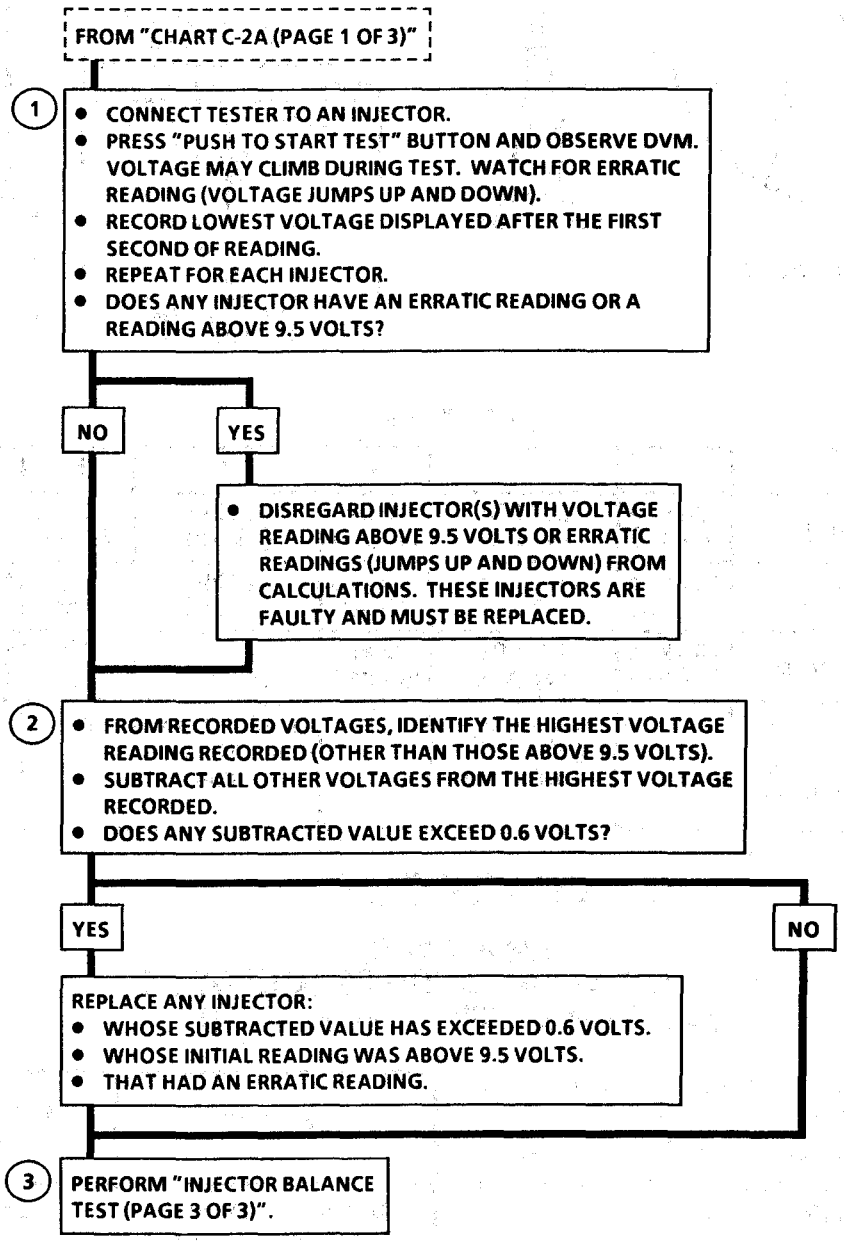
EXAMPLE

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PS 17397

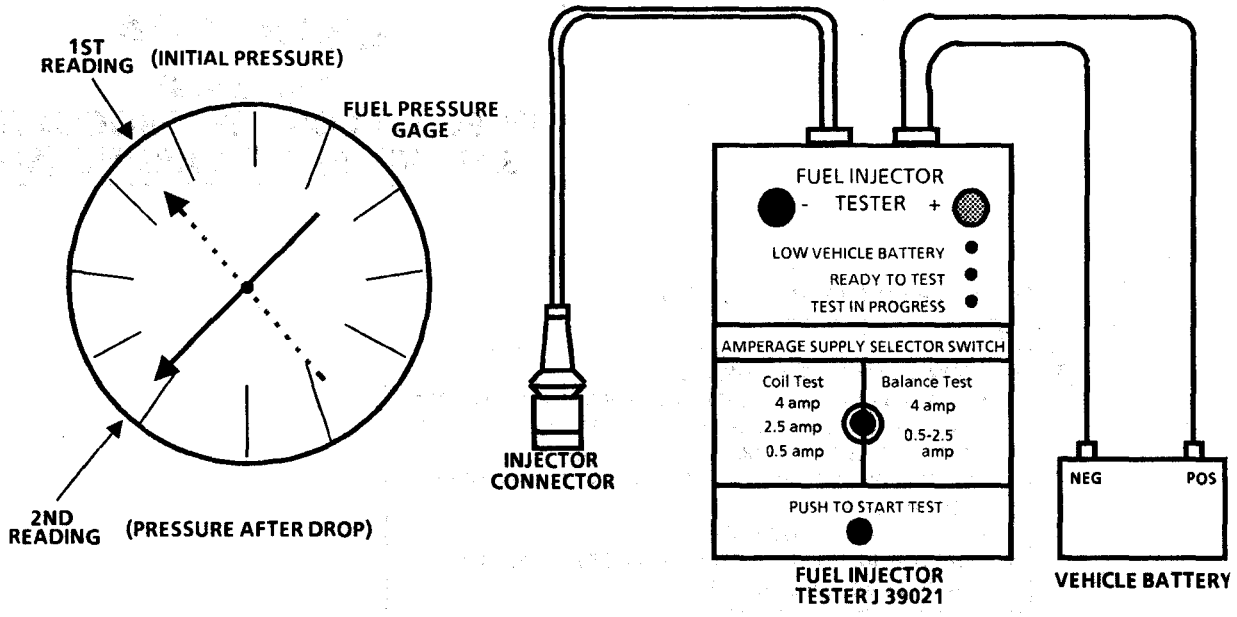
CHART C-2A

(Page 2 of 3)

INJECTOR COIL TEST PROCEDURE 3.4L (VIN S) "F" CARLINE (SFI)



3-24-93
PS 17398



EXAMPLE

CYLINDER	1	2	3	4	5	6
1ST Reading	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)
2ND Reading	131 kPa (19 psi)	117 kPa (17 psi)	124 kPa (18 psi)	145 kPa (21 psi)	131 kPa (19 psi)	130 kPa (19 psi)
Amount of Drop	165 kPa (24 psi)	179 kPa (26 psi)	172 kPa (25 psi)	151 kPa (22 psi)	165 kPa (24 psi)	166 kPa (24 psi)
166 kPa/24 psi ave. ± 10 kPa/1.5 psi 156 kPa to 176 kPa 22.5 psi to 25.5 psi	OK	FAULTY, RICH (TOO MUCH FUEL DROP)	OK	FAULTY, LEAN (TOO LITTLE FUEL DROP)	OK	OK

CHART C-2A

(Page 3 of 3)
INJECTOR BALANCE TEST PROCEDURE
3.4L (VIN S) "F" CARLINE (SFI)

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

1. Engine cool down period (10 minutes) is necessary to avoid irregular fuel pressure readings due to "Hot Soak" fuel boiling.
2. Energize tester one time and record pressure drop at the lowest point (Disregard any slight pressure variations).
3. If the pressure drop of all injectors is within 10 kPa (1.5 psi) of the average fuel pressure drop, the injectors are flowing properly. The actual amount of pressure drop is calculated by subtracting the second pressure reading from the first pressure reading.

ENGINE	FUEL PRESSURE RANGE
All engines EXCEPT 5.7L (VIN J) Corvette 3.1L (VIN W) Lumina VFV	284-325 kPa (41-47 psi)
5.7L (VIN J) Corvette 3.1L (VIN W) Lumina VFV	333-376 kPa (48-55 psi)

5-25-93
PS 17399

CHART C-2A

(Page 3 of 3)

INJECTOR BALANCE TEST PROCEDURE 3.4L (VIN S) "F" CARLINE (SFI)

CAUTION: TO REDUCE THE RISK OF FIRE AND PERSONAL INJURY, WRAP A SHOP TOWEL AROUND THE FUEL PRESSURE CONNECTION TO ABSORB ANY FUEL LEAKAGE THAT MAY OCCUR WHEN INSTALLING THE PRESSURE GAGE. PLACE TOWEL IN APPROVED CONTAINER.

NOTICE: The entire test should NOT be repeated more than once without running the engine to prevent flooding. (This includes any retest on faulty injectors.)

Important

The injector coil test should be performed prior to this test. Refer to Page 1 of 3.

(1)

- IF ENGINE IS AT OPERATING TEMPERATURE, ALLOW A 10 MINUTE "COOL DOWN " PERIOD.
- IGNITION "OFF."
- CONNECT FUEL PRESSURE GAGE.
- ENERGIZE FUEL PUMP USING AVAILABLE METHOD FOR VEHICLE (FUEL PUMP TEST CONNECTOR OR TECH 1 SCAN TOOL ENABLE).
- PLACE OPEN END OF BLEED HOSE INTO AN APPROVED GASOLINE CONTAINER AND BLEED AIR FROM FUEL GAGE.
- WITH FUEL PUMP RUNNING NOTE FUEL PRESSURE, PRESSURE SHOULD BE WITHIN SPECIFIED RANGE SHOWN ON FACING PAGE. IF NOT, REFER TO CHART A-7.
- TURN FUEL PUMP "OFF." WHEN PUMP STOPS, PRESSURE MAY VARY SLIGHTLY THEN SHOULD HOLD STEADY. IF NOT, REFER TO CHART A-7

(2)

- CONNECT FUEL INJECTOR TESTER TO AN INJECTOR.
  - SET AMPERAGE SUPPLY SELECTOR SWITCH TO THE "BALANCE TEST" 0.5 - 2.5 AMP POSITION.
- CYCLE FUEL PUMP "ON"/"OFF"TO PRESSURIZE FUEL SYSTEM.
- RECORD STABILIZED FUEL PRESSURE (1ST PRESSURE READING - SEE EXAMPLE ON FACING PAGE)
- ENERGIZE FUEL INJECTOR BY DEPRESSING "PUSH TO START TEST" BUTTON.
- NOTE FUEL PRESSURE THE INSTANT THE FUEL PRESSURE GAGE NEEDLE STOPS. RECORD FUEL PRESSURE READING (2ND PRESSURE READING - SEE EXAMPLE ON FACING PAGE).

(3)

- REPEAT STEP 2 ON ALL INJECTORS.
- SUBTRACT 2ND PRESSURE READING FROM 1ST PRESSURE READING TO OBTAIN PRESSURE DROP VALUES.
- ADD ALL PRESSURE DROP VALUES AND DIVIDE BY THE NUMBER OF FUEL INJECTORS TO GET THE AVERAGE PRESSURE DROP.
- ANY INJECTOR THAT HAS A 10 kPa (1.5 PSI) DIFFERENCE, EITHER MORE OR LESS FROM THE AVERAGE, IS CONSIDERED FAULTY.
- RETEST ANY INJECTOR THAT APPEARS FAULTY.
- ANY INJECTOR THAT FAILS THE RETEST IS FAULTY AND NEEDS TO BE REPLACED.
- IF NO PROBLEM IS FOUND, REVIEW "SYMPTOMS" SECTION "B".

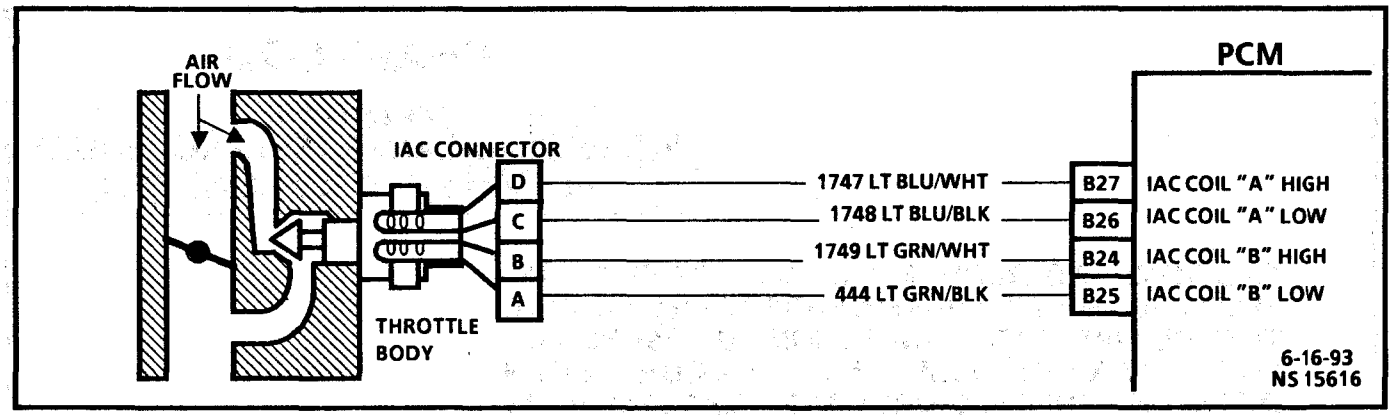


CHART C-2B

IDLE AIR CONTROL (IAC) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The PCM controls engine idle speed with the IAC valve. To increase idle speed, the PCM retracts the IAC valve pintle away from its seat, allowing more air to bypass the throttle bore. To decrease idle speed, it extends the IAC valve pintle towards its seat, reducing bypass air flow. A Tech 1 scan tool will read the PCM commands to the IAC valve in counts. Higher counts indicate more air bypass (higher idle). The lower the counts indicates less air is allowed to bypass (lower idle).

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

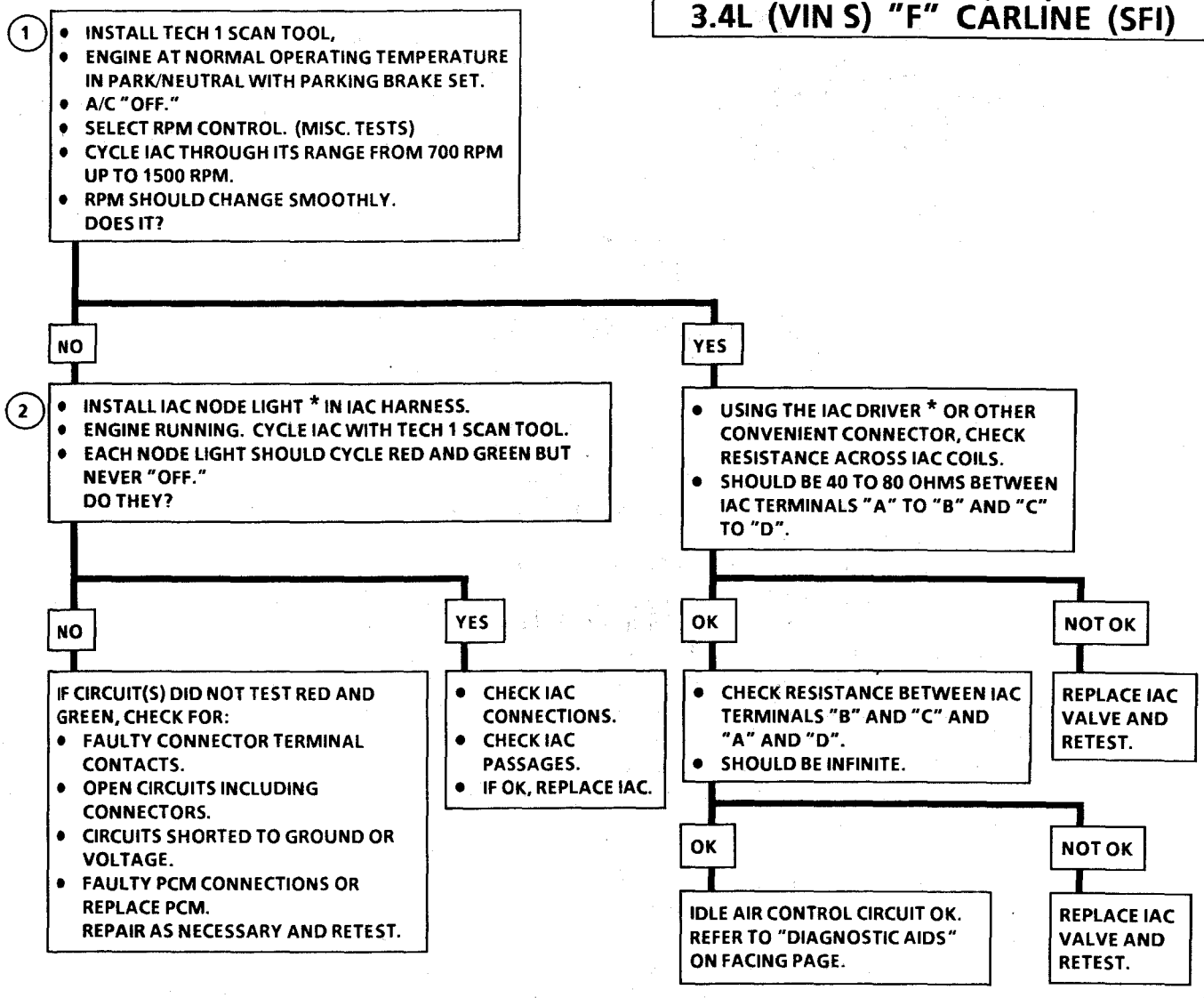
1. The Tech 1 RPM control mode is used to extend and retract the IAC valve. The valve should move smoothly within the specified range. If the idle speed is commanded (IAC extended) too low (below 700 RPM), the engine may stall. This may be normal and would not indicate a problem. Retracting the IAC beyond its controlled range (above 1500 RPM) will cause a delay before the RPM's start dropping. This too is normal.
2. This test uses the Tech 1 to command the IAC controlled idle speed. The PCM issues commands to obtain commanded idle speed. The node lights each should flash red and green to indicate a good circuit as the PCM issues commands. While the sequence of color is not important if either light is "OFF" or does not flash red and green, check the circuits for faults, beginning with poor terminal contacts.

Diagnostic Aids: A slow, unstable, or fast idle may be caused by a non-IAC system problem that cannot be overcome by the IAC valve. Out of control range IAC Tech 1 scan tool counts will be above 60 if idle is too low, and zero counts if idle is too high. The following checks should be made to repair a non-IAC system problem:

- Vacuum leak (high idle). - If idle is too high, stop the engine. Fully extend (low) IAC with tester. Start engine. If idle speed is above 800 RPM, locate and correct vacuum leak including crankcase ventilation system. Also check for binding of throttle blade or linkage.
- System too lean (high air/fuel ratio). - The idle speed may be too high or too low. Engine speed may vary up and down and disconnecting the IAC valve does not help. DTC 44/64 may be set. Tech 1 scan tool O2S voltage will be less than 300 mV (.3 volt). Check for low regulated fuel pressure, water in the fuel or a restricted injector.
- System too rich (low air/fuel ratio). - The idle speed will be too low. Tech 1 scan tool IAC counts will usually be above 80. System is obviously rich and may exhibit black smoke in exhaust.
  Tech 1 scan tool O2S voltage will be fixed above 800 mV (.8 volt).
  Check for high fuel pressure, leaking or sticking injector. Silicone contaminated oxygen sensors Tech 1 scan tool voltage will be slow to respond.
- Throttle body. - Remove IAC valve and inspect bore for foreign material.
- IAC valve electrical connections. - IAC valve connections should be carefully checked for proper contact.
- Crankcase ventilation valve. - An incorrect or faulty valve may result in an incorrect idle speed.
- Refer to "Rough, Unstable, Incorrect Idle or Stalling" in "Symptoms," Section "6E3-B".
- If intermittent poor driveability or idle symptoms are resolved by disconnecting the IAC, carefully recheck connections, valve terminal resistance, or replace IAC.

CHART C-2B

IDLE AIR CONTROL (IAC) CIRCUIT 3.4L (VIN S) "F" CARLINE (SFI)



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

CLEAR DIAGNOSTIC TROUBLE CODES, CONFIRM "CLOSED LOOP" OPERATION, NO MALFUNCTION INDICATOR LAMP (MIL) "SERVICE ENGINE SOON." PERFORM IAC RESET PROCEDURE PER APPLICABLE SERVICE MANUAL AND VERIFY CONTROLLED IDLE SPEED IS CORRECT.

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

7-12-93
PS 18788

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SECTION C3
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

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GENERAL DESCRIPTION

PURPOSE

The Evaporative Emission (EVAP) control system used on all vehicles is the charcoal canister storage method. This method transfers fuel vapor from the fuel tank to an activated carbon (charcoal) storage device (canister) to hold the vapors when the vehicle is not operating. When the engine is running, the fuel vapor is purged from the carbon element by intake air flow and consumed in the normal combustion process.

EVAP CANISTER

The Evaporative Emission (EVAP) control system uses a rear mounted charcoal canister to absorb fuel vapors from the gas tank.

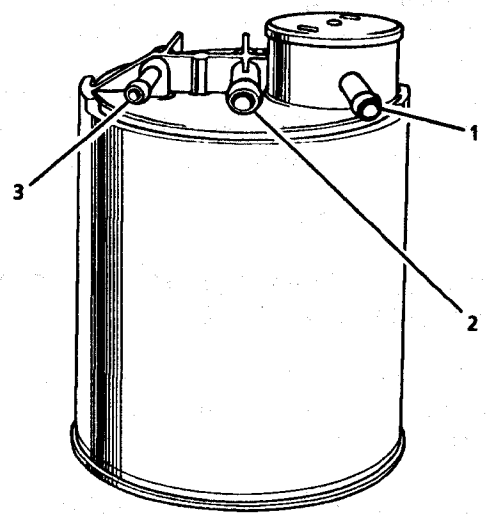
When gasoline vapor builds enough to overcome the spring tension of the EVAP pressure control valve, the vapor will flow to the canister where it is absorbed and stored by the charcoal. Under certain operating conditions the PCM will command the purge solenoid valve to open. This allows the vapor to flow into the intake manifold for combustion.

EVAPORATIVE EMISSION SYSTEM

This system has a remote mounted canister purge control solenoid valve. The PCM operates this solenoid valve to control vacuum to the canister. Under cold engine or idle conditions, the solenoid valve is closed, which prevents vacuum from being applied to the canister.

The PCM activates (or opens) the solenoid valve and allows purge when:

- Engine is warm.
- After the engine has been running a specified period of time.
- Above a specified road speed.



17013138
17093194

1 TANK TUBE
2 AIR TUBE (FRESH AIR INLET)
3 PURGE TUBE

NA 1349-AS

Figure C3-1 - Evaporative Emission Canister

- Above a specified throttle opening.

EVAPORATIVE EMISSION (EVAP) PRESSURE CONTROL VALVE

This system uses an in-line EVAP pressure control valve for pressure relief. Refer to diagram for installation in system. When vapor pressure in the tank exceeds approximately 5 kPa (.7 psi) the diaphragm valve opens, allowing vapors to vent to the canister.

A 1.14 mm (0.045 inch) orifice in the passage leading to the canister tube causes pressure to drop slowly, preventing the valve from oscillating (buzzing). When the tank pressure drops below 5 kPa (.7 psi), the valve closes causing vapors to be held in the fuel tank.

RESULTS OF INCORRECT OPERATION

- Poor idle, stalling and poor driveability can be caused by:
  - Inoperative purge solenoid valve.
  - Damaged canister.
  - Hoses split, cracked and/or not connected to the proper tubes.
- Evidence of fuel loss or fuel vapor odor can be caused by:
  - Liquid fuel leaking from fuel lines.
  - Cracked or damaged canister.
  - Inoperative canister control valve.
  - Disconnected, misrouted, kinked, deteriorated or damaged vapor hoses, or control hoses.

If the solenoid valve is open, or is not receiving power, the canister can purge to the intake manifold at the incorrect time. This can allow extra fuel during warm-up, which can cause rough or unstable idle.

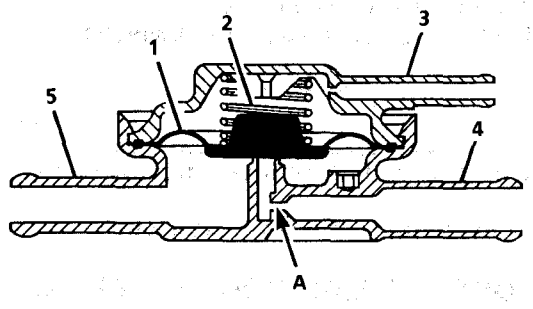
DIAGNOSIS

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE

The Evaporative Emission (EVAP) canister purge solenoid valve operation is covered in CHART C-3 at the end of this section.

VISUAL CHECK OF EVAP CANISTER

- Cracked or damaged, replace EVAP canister.



A	RESTRICTION	3	CONTROL TUBE
1	DIAPHRAGM	4	TUBE TO CANISTER
2	DIAPHRAGM SPRING	5	TUBE TO FUEL TANK

MP 0436-SY

Figure C3-2 - EVAP Pressure Control Valve

FUNCTIONAL TESTS

Evaporative Emission (EVAP) Pressure Control Valve

With a hand vacuum pump, apply approximately 38 cm Hg (15" Hg) to the control vacuum tube. After ten seconds, there should be at least 13 cm Hg (5" Hg) vacuum remaining. Be sure the hand vacuum pump being used does not have an internal leak and the hose connections to control vacuum tube and pump are secure. If after 10 seconds there is less than 13 cm (5" Hg) vacuum, the valve must be replaced.

With 38 cm Hg (15" Hg) vacuum still applied to the control vacuum tube, attach a short piece of hose to the valve's tank tube side. Blow into the tube. You should feel the air pass through the valve. If air does not pass through, the valve must be replaced.

ON-VEHICLE SERVICE

EVAP CANISTER
Figure C3-3

Remove or Disconnect

1. Negative battery cable.
2. Raise vehicle.
3. Driver side rear wheel housing liner.
4. Hoses from canister.
5. Canister from canister bracket by releasing latch on canister bracket.
6. Canister from vehicle.

Install or Connect

1. Canister to vehicle.
2. Canister to canister bracket.
3. Hoses to canister.
4. Driver side rear wheel housing liner.
5. Lower vehicle.
6. Negative battery cable.

EVAP CANISTER PURGE SOLENOID VALVE
Figure C3-4

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector and hoses from solenoid valve.
3. Bracket and solenoid from intake manifold.

Install or Connect

1. Solenoid valve to intake manifold.

Tighten

- Bolt to intake manifold to 10 N·m (7 lb. in.).

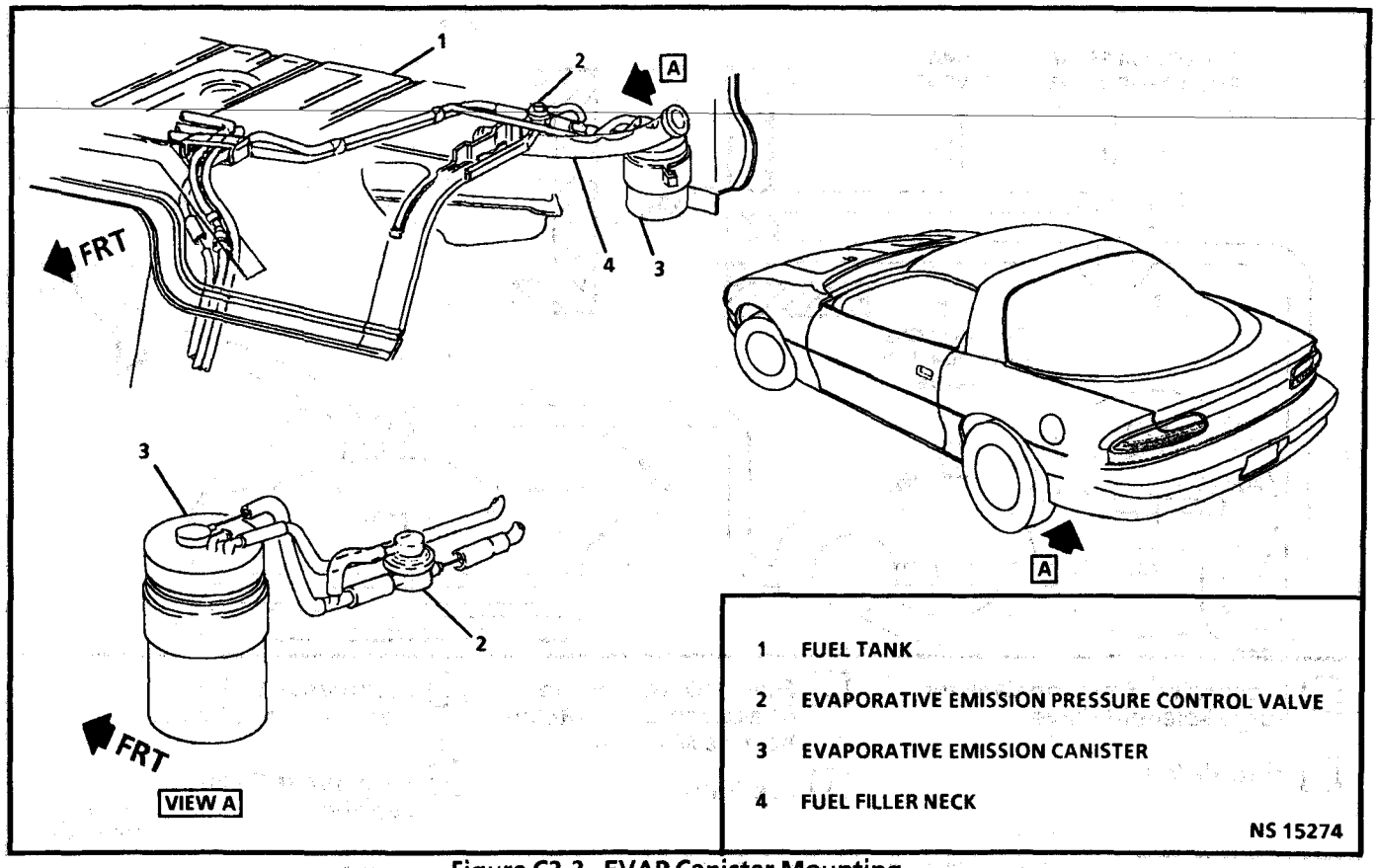


Figure C3-3 - EVAP Canister Mounting

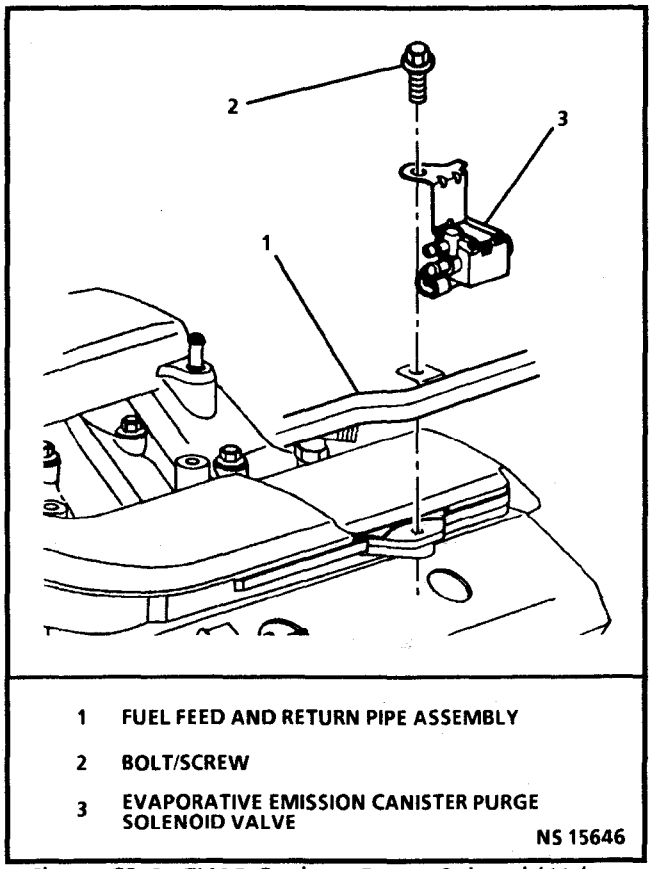


Figure C3-4 - EVAP Canister Purge Solenoid Valve Service

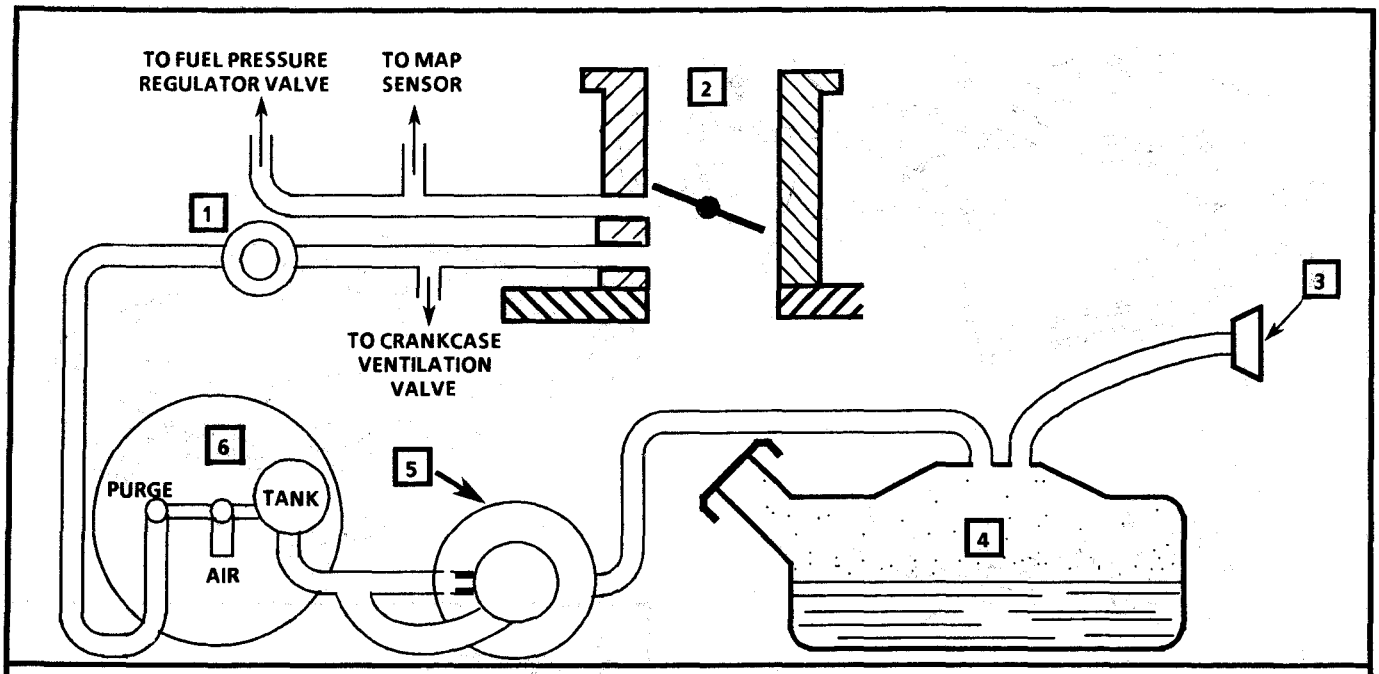
2. Electrical connector and hoses to solenoid valve.
3. Negative battery cable.

EVAP CANISTER HOSES

Refer to "Vehicle Emission Control Information" label for routing of EVAP canister hoses.

TORQUE SPECIFICATIONS

EVAP Canister Purge Solenoid Valve Bolt . . . . . 10 N·m (7 lb. ft.)



1 Evaporative Emission Canister Purge Solenoid Valve

2 Throttle Body

3 Fuel Tank Vent Valve (Pressure/Vacuum Relief) Remote Mounted

4 Fuel Tank

5 Evaporative Emission Pressure Control Valve

6 Evaporative Emission Canister

Figure C3-5 - Evaporative Emissions Control System Schematic

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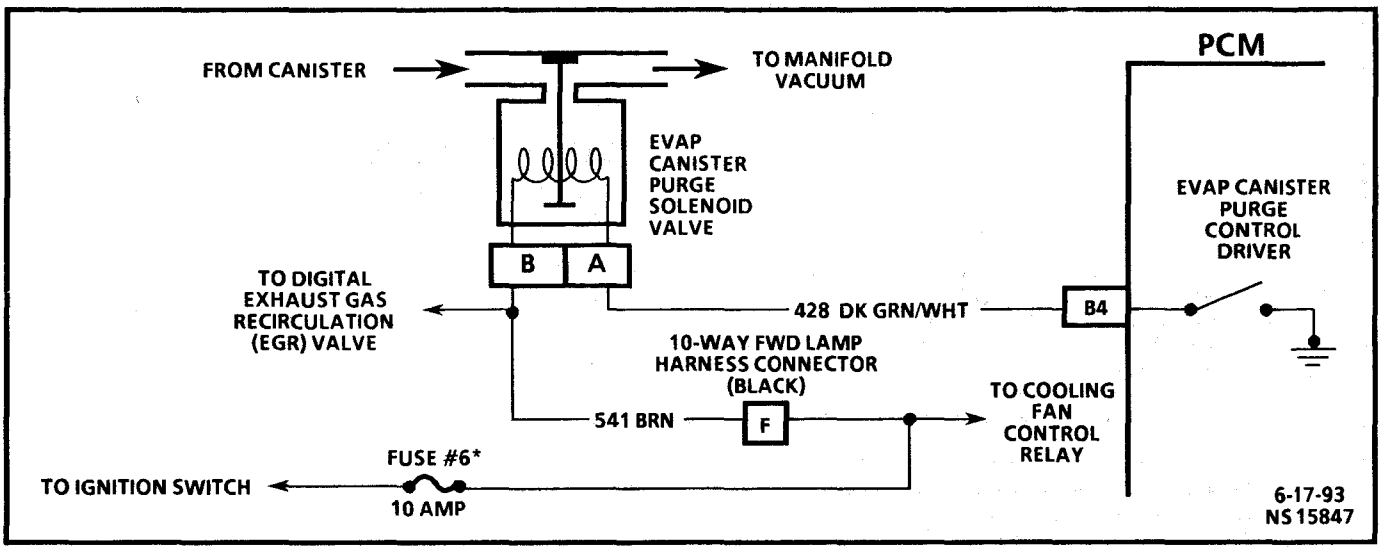


CHART C-3

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

EVAP canister purge is controlled by a solenoid valve that allows manifold vacuum to purge the EVAP canister when energized. The PCM supplies a ground to energize the solenoid valve.

If the following conditions are met with the engine running, the EVAP canister purge solenoid valve will be energized (purge "ON").

- Engine run time after start more than 1 minute.
- Engine coolant temperature above 60°C (140°F).
- Vehicle speed above 1.3 mph.
- Throttle off idle, above 6%.

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

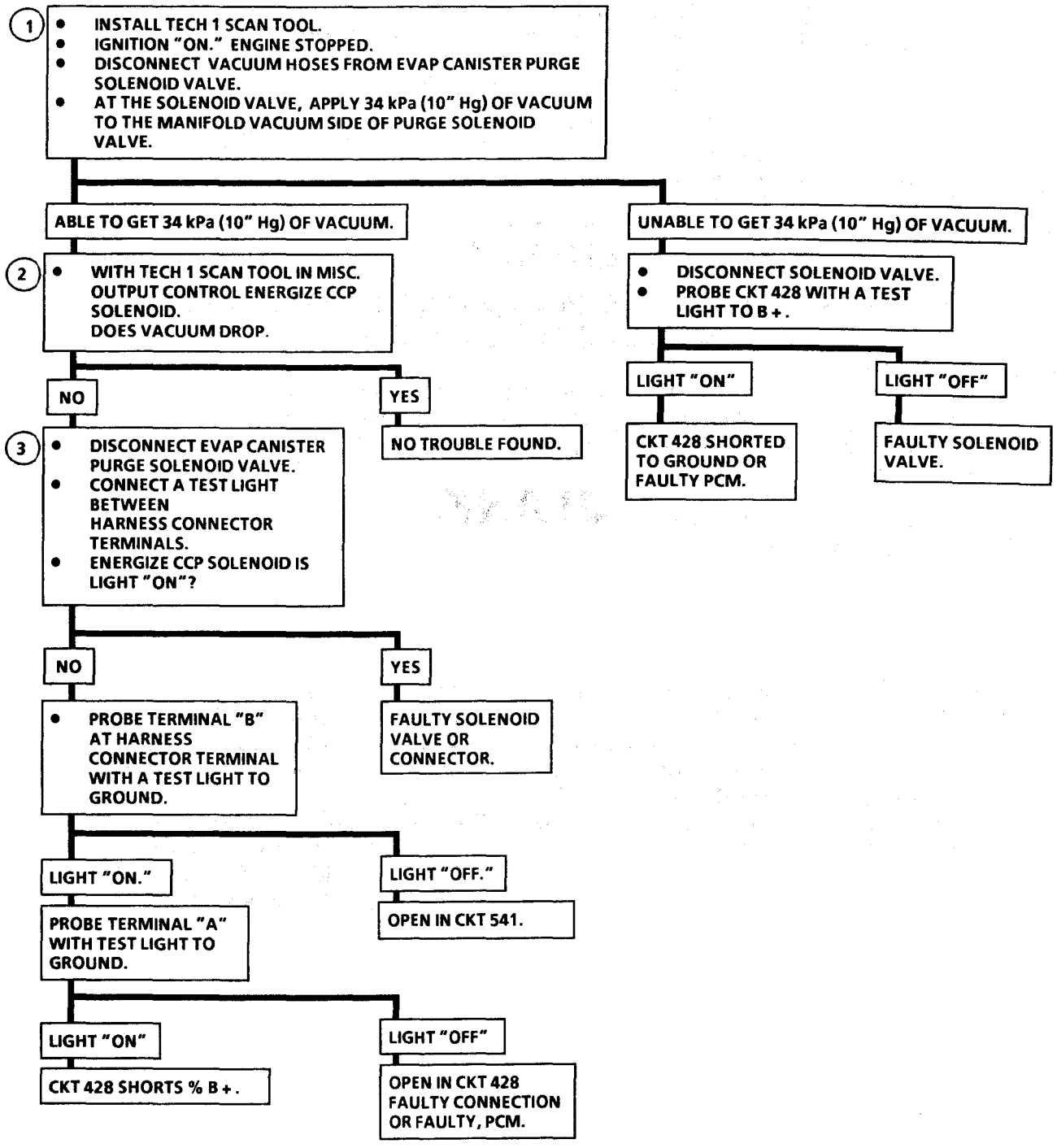
1. Checks to see if the solenoid valve is opened or closed. The solenoid valve is normally closed and should open when energized by the Tech 1.
2. This should energize the solenoid valve and allow the vacuum to drop (purge "ON").
3. Checks for a complete circuit. Normally, there is ignition voltage on CKT 541 and the PCM provides a ground on CKT 428. A shorted solenoid valve could cause an open circuit in the PCM.

Diagnostic Aids: Normal operation of the EVAP canister purge solenoid valve is described as follows:

With the ignition "ON," engine "OFF," the EVAP canister purge solenoid valve should be de-energized.

CHART C-3

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE CHECK 3.4L (VIN S) "F" CARLINE (SFI)



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

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SECTION C4
ELECTRONIC IGNITION (EI) SYSTEM
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Camshaft Position Sensor C4-2
Ignition Coils C4-2
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GENERAL DESCRIPTION

The Electronic Ignition (EI) system controls fuel combustion by providing a spark to ignite the compressed air/fuel mixture at the correct time. To provide optimum engine performance, fuel economy, and control of exhaust emissions, the PCM controls spark advance of the ignition system. Electronic ignition has several advantages over a mechanical system:

- No moving parts.
- Less maintenance.
- Remote mounting capability.
- No mechanical load on the engine.
- More coil cool down time between firing events.
- Elimination of mechanical timing adjustments.
- Increased available ignition coil saturation time.

OPERATION

The electronic ignition system does not use the conventional distributor and coil. The ignition system consists of three ignition coils, an ignition control module, a camshaft position sensor, a dual "Hall-effect" crankshaft position sensor, an engine crankshaft balancer with crankshaft position sensor interrupter ring attached to the rear, related connecting wires, and the ignition control and fuel metering portion of the PCM.

Conventional ignition coils have one end of the secondary winding connected to the engine ground. In this ignition system, neither end of the secondary winding is grounded. Instead, each end of a coil's secondary winding is attached to a spark plug. Each cylinder is paired with the cylinder that is opposite it (1-4, 2-5, 3-6).

These two plugs are on "companion" cylinders, i.e., on top dead center at the same time. When the coil discharges, both plugs fire at the same time to complete the series circuit. The cylinder on compression is said to be the "event" cylinder and the one on exhaust is the "waste" cylinder.

The cylinder on the exhaust stroke requires very little of the available energy to fire the spark plug. The remaining energy will be used as required by the cylinder on the compression stroke. The same process is repeated when the cylinders reverse roles. This method of ignition is called a "waste spark" ignition system.

Since the polarity of the ignition coil primary and secondary windings is fixed, one spark plug always fires with a forward current flow and its "companion" plug fires with a reverse current flow. This is different from a conventional ignition system that fires all the plugs with the same direction of current flow. Since it requires approximately 30% more voltage to fire a spark plug backwards, the ignition coil design is improved, with saturation time and primary current flow increased. This redesign of the system allows higher secondary voltage to be available from the ignition coils - greater than 40 kilovolts (*40,000 volts*) at any engine RPM. The voltage required by each spark plug is determined by the polarity and the cylinder pressure. The cylinder on compression requires more voltage to fire the spark plug than the one on exhaust.

It is possible for one spark plug to fire even though a plug wire from the same coil may be disconnected from its "companion" plug. The disconnected plug wire acts as one plate of a capacitor, with the engine being the other plate. These two "capacitor plates" are charged as a spark jumps across the gap of the connected spark plug. The "plates" are then discharged as the secondary energy is dissipated in an oscillating current across the gap of the still-connected spark plug.

Secondary voltage requirements are very high with an "open" spark plug or wire. The ignition coil has enough reserve energy to fire the still-connected plug at idle, but possibly not under high engine load. A more noticeable misfire may be evident under load; both spark plugs may then be misfiring.

SYSTEM COMPONENTS

24X and 3X Crankshaft Position Sensors

The 24X crankshaft position sensor, secured in an aluminum mounting bracket and bolted to the front side of the engine timing chain cover, is partially behind the crankshaft balancer ("On-Vehicle Service," Figure C4-3).

The 3X crankshaft position sensor uses a two wire connector at the crankshaft position sensor and a three wire connector at the ignition control module. Refer to Figure C4-1.

The 24X crankshaft position sensor contains a "Hall-effect" switch. The magnet and "Hall-effect" switch are separated by an air gap. A "Hall-effect" switch reacts like a solid-state switch, grounding a low-current signal voltage when a magnetic field is present. When the magnetic field is shielded from the switch by a piece of steel placed in the air gap between the magnet and the switch, the signal voltage is not grounded. If the piece of steel (called an interrupter) is repeatedly moved in and out of the air gap, the signal voltage will appear to go "ON-OFF-ON-OFF-ON-OFF." Compared to a conventional mechanical distributor, this "ON-OFF" signal is similar to the signal that a set of breaker points in the distributor would generate as the distributor shaft turned and the points opened and closed.

In the case of the electronic ignition system, a concentric interrupter ring mounted to the rear of the crankshaft balancer has blades and windows that, with crankshaft rotation, either block the magnetic field or allow it to reach the "Hall-effect" switch. The "Hall-effect" switch is called a 24X crankshaft position sensor, because the interrupter ring has 24 evenly-spaced same-width blades and windows. The 24X crankshaft sensor produces 24 "ON-OFF" pulses per crankshaft revolution. The "Hall-effect" switch closest to the crankshaft, the 3X crankshaft position sensor, is so called because the interrupter ring has a special wheel cast on the crankshaft that has seven machined slots, six of which are equally spaced 60° apart. The seventh slot is spaced 10° from one of the other slots. As the interrupter ring rotates with the crankshaft, the slots change the magnetic field. This will cause the 3X "Hall-effect" switch to ground the 3X signal voltage supplied from the ignition control module. The ignition control module interprets the 3X "ON-OFF" signals as an indication of crankshaft position, and must have the 3X signal to "fire" the correct ignition coil.

The 24X interrupter ring and "Hall-effect" switch react similarly. The 24X signal is used for better resolution at a calibrated RPM.

Camshaft Position Sensor

The camshaft position sensor ("On-Vehicle Service," Figure C4-5) is located on the timing cover behind the water pump near the camshaft sprocket.

As the camshaft sprocket turns, a magnet in it activates the "Hall-effect" switch in the cam sensor. When the "Hall-effect" switch is activated, it grounds the signal line to the PCM, pulling the cam signal line's applied voltage low. This is interpreted as a cam signal.

The cam signal is created as piston #1 is on the compression stroke.

When the cam signal is not received by the PCM DTC 17 will be set.

Ignition Coils

Three twin-tower ignition coils are individually mounted to the ignition control module (Figure C4-2). Each coil provides spark for two plugs simultaneously (waste spark distribution). Each coil is serviced separately.

Two terminals connect each coil pack to the module. Each coil is provided a fused ignition feed. The other terminal at each coil is individually connected to the module, which will energize one coil at a time by completing and interrupting the primary circuit ground path to each coil at the proper time.

Ignition Control Module

The ignition control module performs several functions:

- It powers the 3X crankshaft sensor circuit.
- It determines the correct ignition coil firing sequence, based on 3X pulse. This coil sequencing occurs at start-up. After the engine is running, the module determines the sequence, and continues triggering the ignition coils in proper sequence.
- It sends a "3X crankshaft reference" (fuel control) signal to the PCM. The PCM determines engine RPM from this signal. It is also used by the PCM to determine crankshaft position for ignition control spark advance calculations. The signal sent to the PCM by the ignition control module is an "ON-OFF" pulse occurring 3 times per crankshaft revolution.

Circuits Affecting Ignition Control

To properly control timing, the PCM relies on the following information:

- Engine load (manifold pressure or vacuum).
- Atmospheric (barometric) pressure.
- Engine temperature.
- Intake air temperature.
- Crankshaft position.
- Engine speed (RPM).

The IC system consists of the ignition coil and module assembly (ignition coils, electronic ignition control module), the 3X crankshaft position sensor and the 24X crankshaft position sensor, PCM and connecting wires. The Ignition Control Module (ICM) connector terminals are lettered as shown in Figure C4-1. These circuits perform the following functions:

- 3X reference high - CKT 647. - The crankshaft position sensor sends a signal to the electronic ignition control module which generates a reference pulse which is sent to the PCM. The PCM uses this signal to calculate crankshaft position and engine speed (also used to trigger the injector).
- 3X reference low - CKT 453. - This wire is grounded through the module and makes sure the ground circuit has no voltage drop between the ignition module and the PCM, which if open, could affect performance.
- Ignition control bypass - CKT 424. - During initial cranking, the PCM will look for syncronizing pulses from the camshaft and 3X crankshaft position sensor indicating the position of #1 piston and intake valve. 5 volts is applied to the bypass circuit the instant these signals are received by the PCM. This generally occurs within 1 or 2 revolutions of the crankshaft. An open or grounded bypass circuit will set a DTC 42 and the engine will run at base timing. A small amount of advance is built into the ignition control module to enhance performance.
- IC - CKT 423. - The PCM uses this circuit to trigger the ignition control module. The PCM uses the crankshaft reference signal to base its calculation of the amount of spark advance needed under present engine conditions.
- 24X reference signal. - Additional to the electronic ignition system is the 24X crankshaft position sensor. Its function is to increase idle quality and provide good low speed driveability.

How DTC 42 is Determined

An open in the IC circuit while running will result in the engine continuing to run although in a base timing mode (module timing). The timing values are stored in the ignition control module to allow for basic engine performance.

If the IC circuit is shorted to ground, the MIL will be turned "ON," and a DTC 42 will be set and the engine will operate in module timing. Either condition may cause poor performance and reduced fuel economy.

If the bypass line is open or grounded, the ignition control module will not switch to IC timing mode so the IC voltage will be low and DTC 42 will be set.

If the IC circuit is grounded, the ignition control module will switch to base timing and a DTC 42 will be set and MIL illuminated.

DIAGNOSIS

If the engine cranks but will not run, CHART A-3 will be used to determine if the "IC" system is the cause of the problem or if it is another part of the fuel injection system.

If DTC 42 is set, that DTC chart should be used for diagnosis. If no DTC is set and the ignition system is suspected, use CHART C-4F, "Misfire" for diagnosis.

Results of Incorrect Operation

An open or ground in the ignition control or bypass circuit will set a DTC 42. If a fault occurs in the ignition control output circuit when the engine is running, the engine may falter or quit running but will restart and run in base timing mode once the ignition has been cycled. A fault in either circuit will force the ignition system to operate on base timing (10° BTDC), which will result in reduced performance and fuel economy.

The PCM uses information from the engine coolant temperature sensor in addition to RPM to calculate the main spark advance values as follows:

High RPM	=	more advance
Cold engine	=	more advance
Low RPM	=	less advance
Hot engine	=	less advance

Therefore, detonation could be caused by high resistance in the engine coolant temperature sensor circuit. Poor performance could be caused by low resistance in the engine coolant temperature sensor circuit.

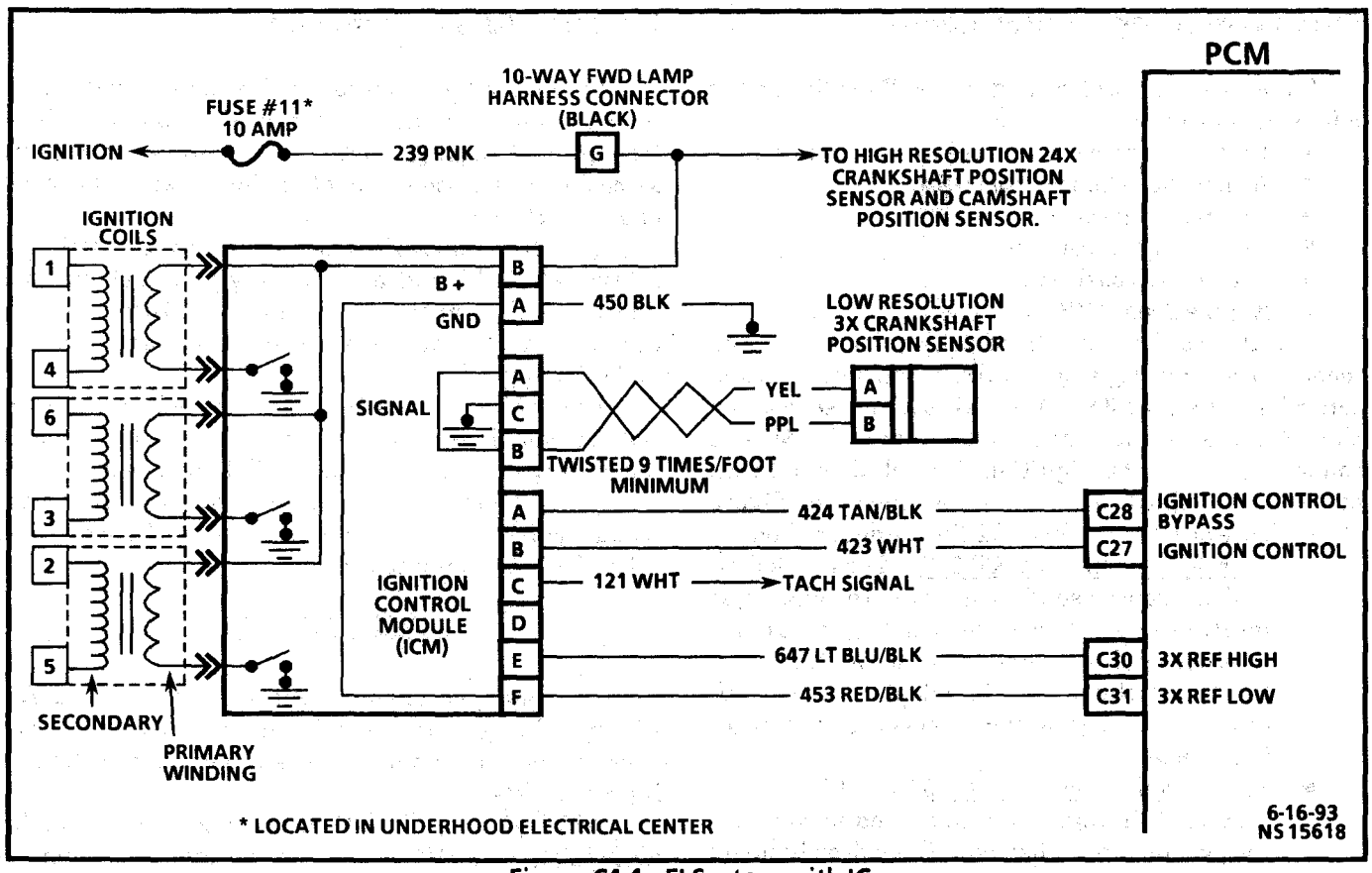


Figure C4-1 - EI System with IC

DIAGNOSIS

If the Engine Cranks But Will Not Run or immediately stalls, CHART A-3 must be used to determine if the failure is in the ignition system or the fuel system.

If a DTC 17, 36 or 82 is set, the appropriate DTC chart must be used for diagnosis.

If the symptom is "Engine Miss" and the ignition system is suspected, CHART C-4F will provide a systematic diagnostic procedure.

ON-VEHICLE SERVICE

IGNITION COIL

Remove or Disconnect

1. Spark plug wires.
2. 2 screws securing coil to ignition control module.
3. Ignition coil. Refer to Figure C4-2.

- It may be helpful to remove the throttle cable bracket to gain access to coil pack 1-4.

Install or Connect

1. Ignition coil.
2. 2 screws, torque to 4-5 N·m (40 lb. in.).
3. Spark plug wires.

IGNITION CONTROL MODULE

Remove or Disconnect

1. 6-way connector, 3-way connector and 2-way connector at ignition control module.
2. Spark plug wires from ignition coils. Refer to Figure C4-2.
3. 6 screws securing ignition coils to ignition control module.
4. Disconnect coils from ignition control module.
5. Ignition control module.

Install or Connect

1. Ignition coils to ignition control module.
2. 6 screws, torque to 4-5 N·m (40 lb. in.).
3. Plug wires.
4. 6-way connector, 3-way connector and 2-way connector to module.

24X CRANKSHAFT POSITION SENSOR

Remove or Disconnect

1. Negative battery cable.
2. Serpentine belt from crankshaft pulley.
3. Raise vehicle on hoist.
4. Using 18 mm socket, remove crankshaft harmonic balancer retaining bolt.

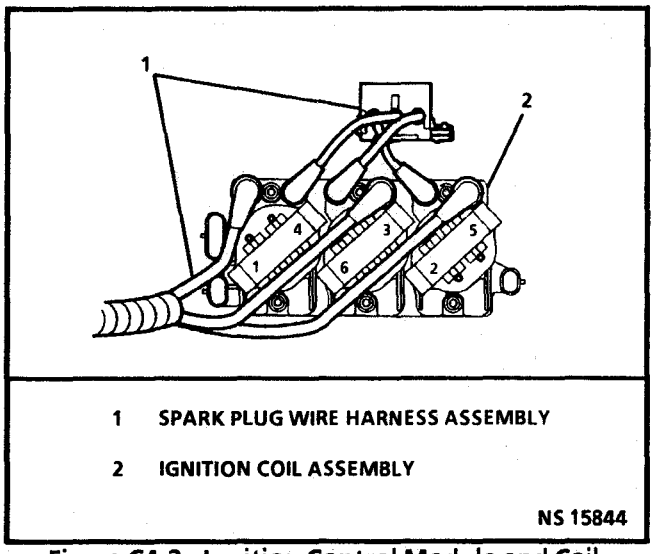


Figure C4-2 - Ignition Control Module and Coil Assembly (Type II Shown)

5. Crankshaft harmonic balancer using special tool (J 38197).
6. Sensor electrical connector.
7. Sensor bolts (2). Refer to Figure C4-3.
8. Sensor.

Install or Connect

1. Crankshaft position sensor with bolt (2). Refer to Figure C4-3.
2. Torque bolts (2) to 10 N·m (8 lb. ft.).
3. Sensor electrical connector.
4. Balancer on crankshaft.
5. Apply thread sealer GM #1052080 or equivalent to threads of crankshaft balancer bolt. Torque bolt to 150 N·m (110 lb. ft.).
6. Lower vehicle.
7. Serpentine belt.
8. Negative battery cable.

3X CRANKSHAFT POSITION (CKP) SENSOR
Figure C4-4

- Disconnect negative battery cable.
- Remove starter motor.

Remove or Disconnect

1. Sensor harness connector at module.
2. Sensor to block bolt (1).
3. Sensor from engine.

Inspect

- Sensor O-ring for wear, cracks or leakage. Replace if necessary. Lube new O-ring with clean engine oil before installing.

Install or Connect

1. Sensor into hole in block.
2. Sensor to block bolt (1).
   - Torque to 8 N·m (71 lb. in.).
3. Sensor harness connector at module.
- Starter motor.
- Negative battery cable.

CAMSHAFT POSITION SENSOR
Figure C4-5

Remove or Disconnect

1. Negative battery cable.
2. Throttle cable shield and bracket from TB.
3. Electrical connector.
4. Bolt (1). Refer to Figure C4-5.
5. Camshaft position sensor.

Install or Connect

1. Camshaft position sensor. Refer to Figure C4-4.
2. Bolt (1) torque to 10 N·m (8 lb. ft.).
3. Harness connector.
4. Throttle cable bracket and shield.
5. Negative battery cable.

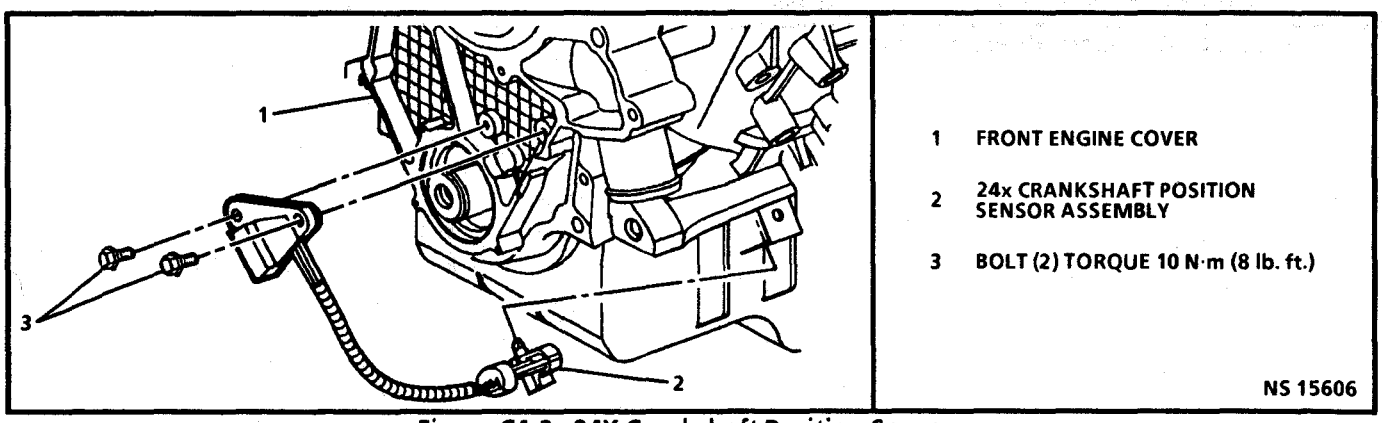
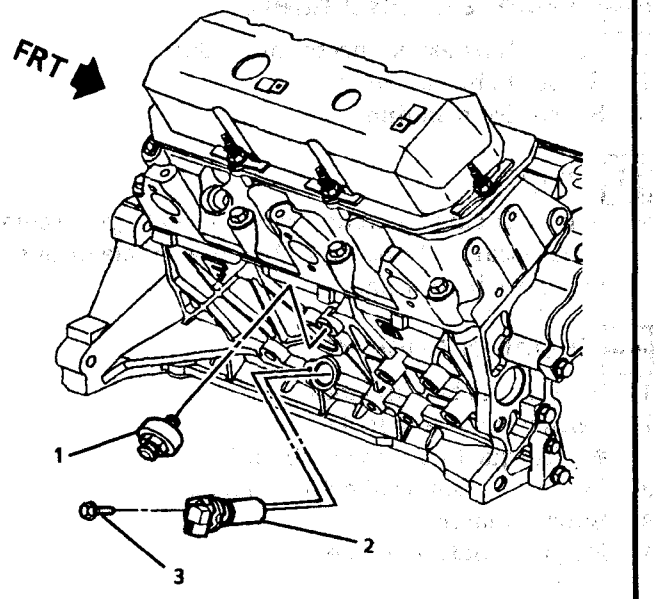


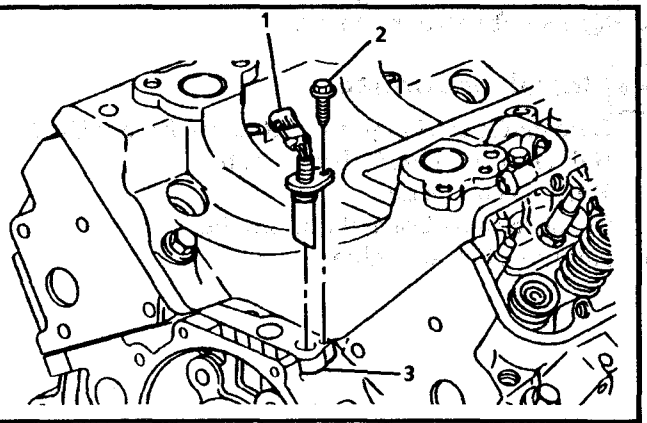
Figure C4-3 - 24X Crankshaft Position Sensor



1	KNOCK SENSOR
2	3X CRANKSHAFT POSITION SENSOR
3	BOLT/SCREW

NS 15845

Figure C4-4 - 3X Crankshaft Position Sensor



1	CAMSHAFT POSITION SENSOR ASSEMBLY
2	BOLT (1) TORQUE 10 N·m (8 lb. ft.)
3	ENGINE BLOCK ASSEMBLY

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Figure C4-5 - Camshaft Position Sensor

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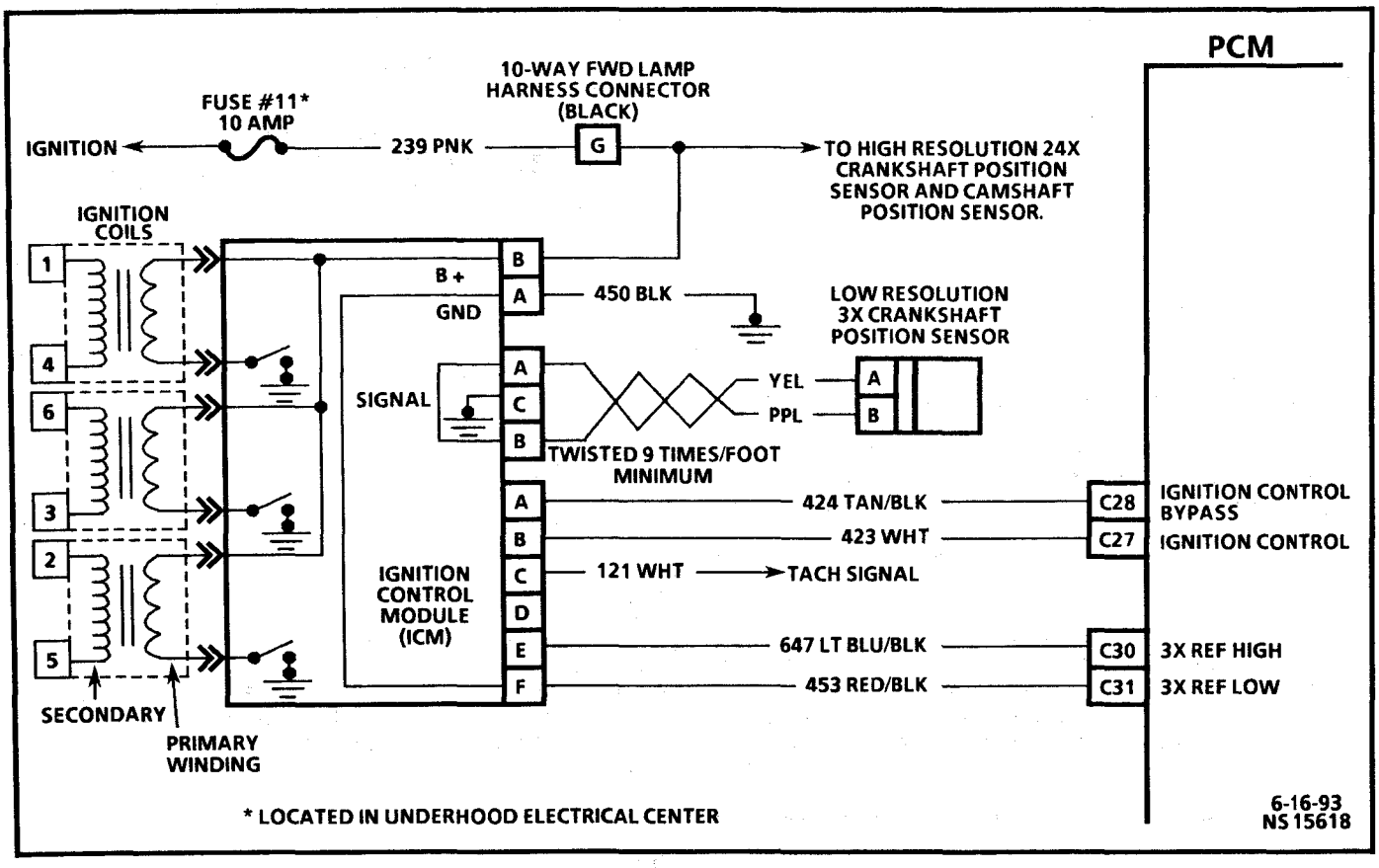


CHART C-4F

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

Circuit Description:

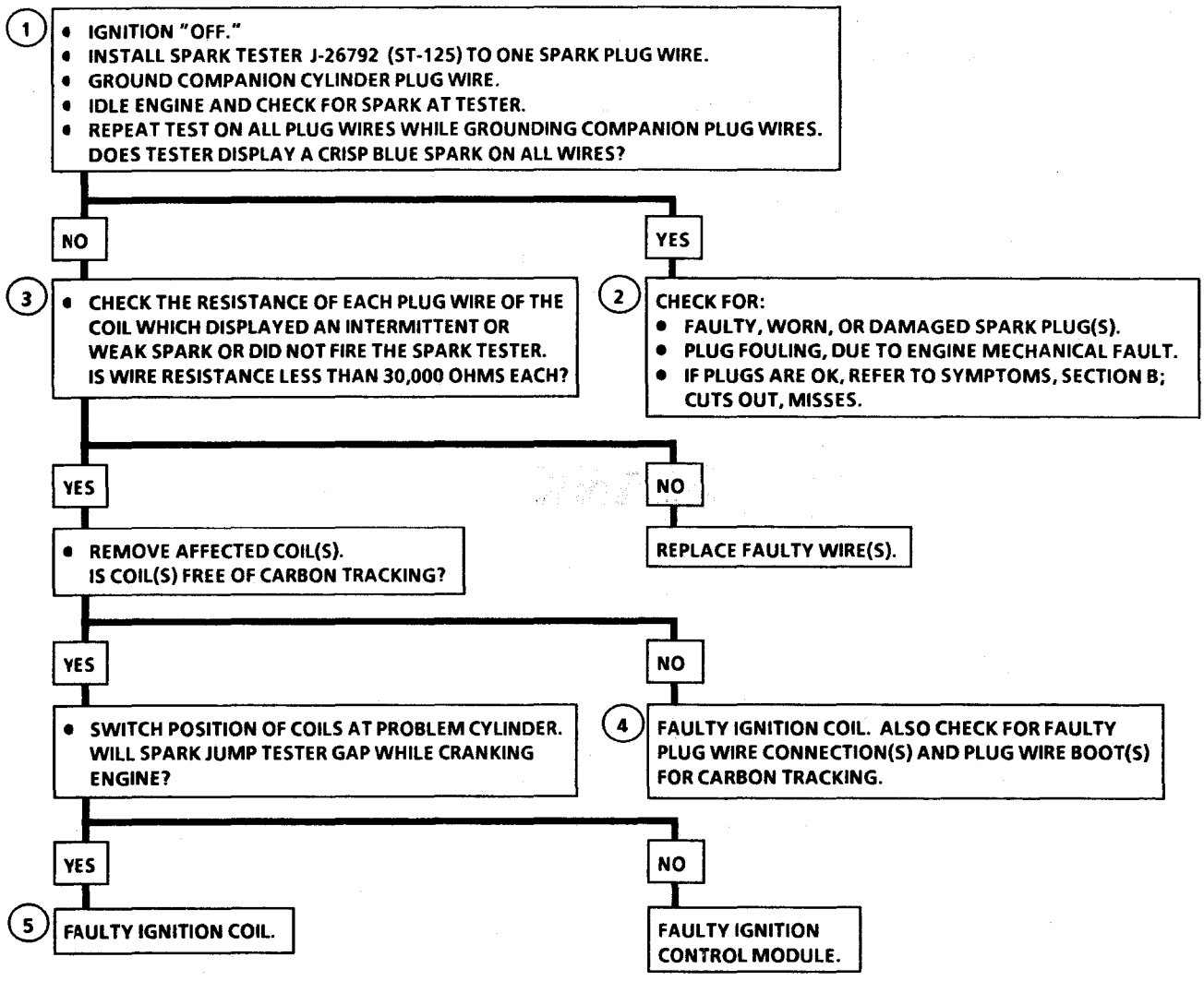
The Electronic Ignition (EI) system uses a waste spark method of distribution. In this type of system, the ignition control module triggers the #1/4 coil pair resulting in both #1 and #4 spark plugs firing at the same time. #1 cylinder is on the compression stroke at the same time #4 is on the exhaust stroke, resulting in a lower energy requirement to fire #4 spark plug. This leaves the remainder of the high voltage to be used to fire #1 spark plug. On this application, the low resolution 3X crankshaft position sensor is mounted to the engine block and protrudes through the block to within approximately .050" of the crankshaft reluctor. Since the reluctor is a machined portion of the crankshaft and the sensor is mounted in a fixed position on the block, timing adjustments are neither possible or necessary.

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

1. Checks for voltage output of ignition system. The companion cylinder spark plug cable in the circuit must be connected to a good ground to create a good spark and avoid overstressing the coil. Test each spark plug cable with the engine idling (the ignition must be cycled "OFF" when moving the ST 125 tester to a different spark plug cable).
   - Keep disconnected spark plug leads away from sensors and other electronic components.
   - Move quickly through this test. Don't leave any spark plug lead disconnected for longer than 15 seconds.
   - Let the engine run normally for 30 seconds between tests to avoid an excessive buildup of fuel.
2. If the spark tester fires on all wires, the ignition system, with the exception of the spark plugs, may be considered in good working order. If the spark plugs show no evidence of wear, damage or fouling, an engine mechanical fault should be suspected. Refer to "Cuts Out, Misses" in "Symptoms," Section "6E3-B".
3. Plug wires should be inspected for cuts or abrasions leading to shorts to ground or other components. This would cause a weak or absent spark yet the resistance valve when measured may be correct.
4. If carbon tracking is evident replace coil and be sure plug wires relating to that coil are clean and tight. Excessive wire resistance or faulty connections could have caused the coil to be damaged.
5. If the no spark condition follows the suspected coil, that coil is faulty. Otherwise, the ignition control module is the cause of no spark. This test could also be performed by substituting a known good coil for the one causing the no spark condition.

CHART C-4F

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



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

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SECTION C5
KNOCK SENSOR (KS) SYSTEM

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Purpose C5-1
Operation C5-1
Diagnosis C5-1
On-Vehicle Service C5-1
Knock Sensor C5-1
Knock Sensor (KS) Module C5-2

GENERAL DESCRIPTION

PURPOSE

Varying octane levels in today's gasoline can cause detonation in high performance engines. Detonation is sometimes called spark knock.

To control spark knock, a Knock Sensor (KS) system is used. This system is designed to retard spark timing up to 10° to reduce spark knock in the engine. This allows the engine to use maximum spark advance to improve driveability and fuel economy.

OPERATION

The KS system has two major components:

- KS module (located in the PCM).
- Knock sensor.

The Knock Sensor (KS) detects abnormal vibration (spark knocking) in the engine. The sensor is mounted in the engine block near the cylinders. The sensor produces an AC output voltage which increases with the severity of the knock. This signal voltage is applied to PCM input. The PCM then adjusts the Ignition Control (IC) timing to reduce spark knocking.

DIAGNOSIS

The Tech 1 scan tool will have two positions to check for diagnosing this circuit. The "knock signal" parameter is used to monitor the input signal from the knock sensor. This display position will display "Yes" when knock is being detected. "Spark retard" is the indication of how much the PCM is retarding the spark.

DTC 43 is designed to diagnose the knock sensor and wiring so problems encountered with this circuit should set the DTC. However, if no DTC 43 was set but the KS system is suspected because detonation was the customer's complaint, refer to CHART C-5.

ON-VEHICLE SERVICE

KNOCK SENSOR

Remove or Disconnect

1. Negative battery cable.

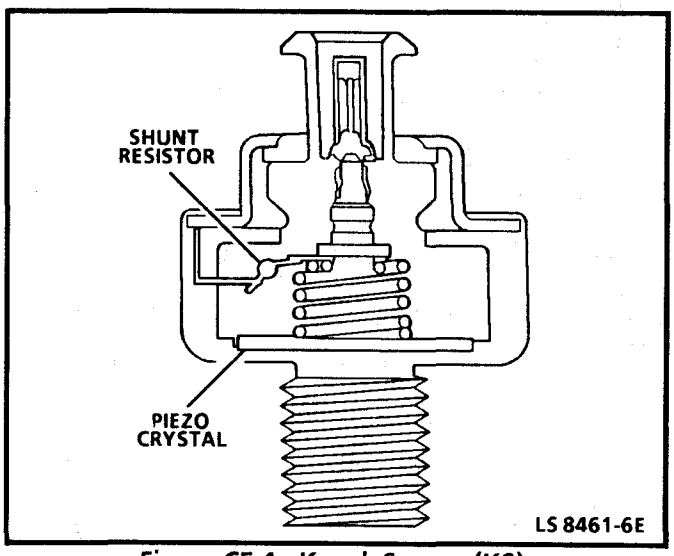
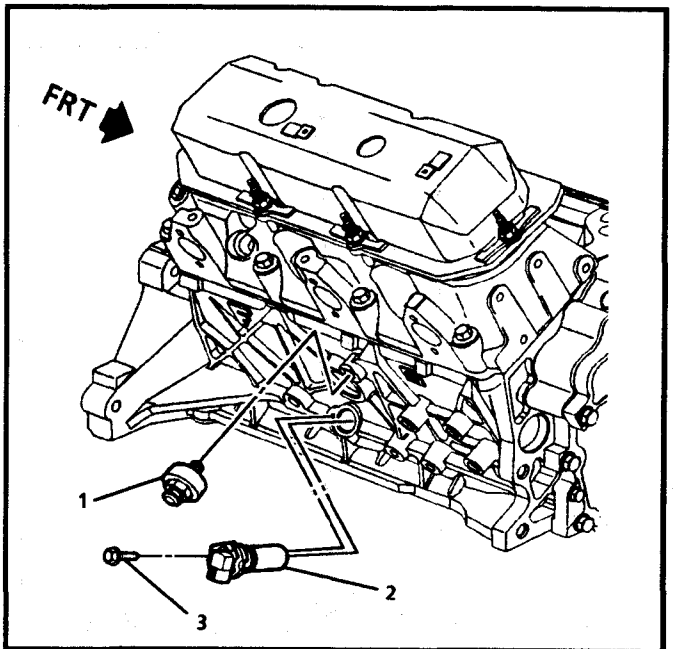


Figure C5-1 - Knock Sensor (KS)



1 KNOCK SENSOR
2 3X CRANKSHAFT POSITION SENSOR
3 BOLT/SCREW

NS 15845

Figure C5-2 - Knock Sensor Assembly

2. Raise vehicle.
3 Starter motor.
4. KS wiring harness connector from knock sensor.
5. Knock sensor from engine block.

Install or Connect

1. Knock sensor into engine block. Be sure threads are clean. Do not over tighten knock sensor. Over torquing could damage the sensor.

Tighten

- Tighten to 19 N·m (14 lb. ft.).

2. KS wiring harness connector to the knock sensor.
3. Starter motor.
4. Lower vehicle.
5. Negative battery cable.

KNOCK SENSOR (KS) MODULE

Remove or Disconnect

1. Wiring harness from Powertrain Control Module (PCM).
2. Mounting bracket from PCM.
3. Access cover from PCM.

Important

- DO NOT remove any other screws.

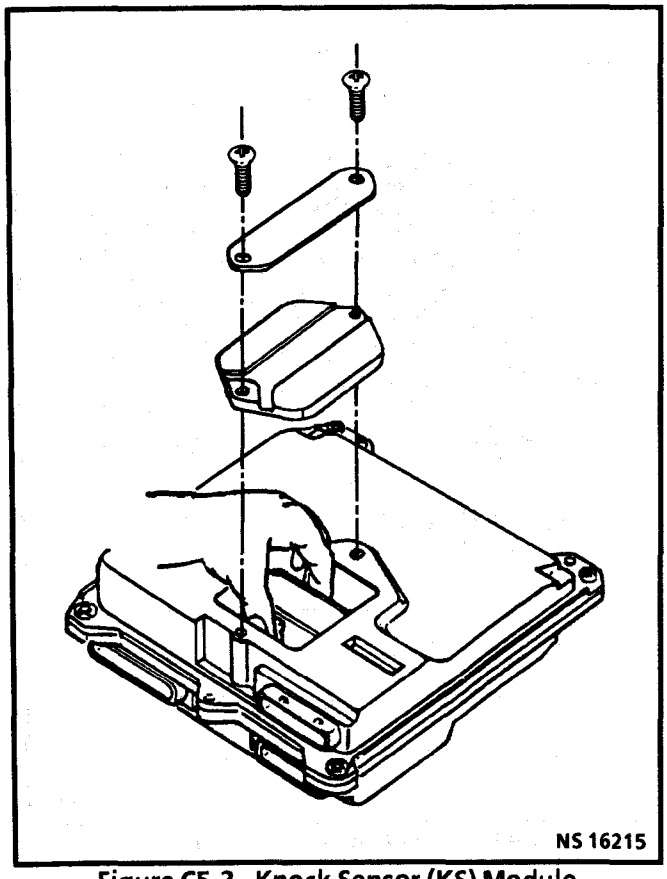


Figure C5-3 - Knock Sensor (KS) Module

Removal of the plug-in knock sensor module can be accomplished by two methods as illustrated.

Method 1:

1. Apply two opposing forces on either side of the latch mechanism as shown below and pull unit up from the header. Reinstallation is accomplished by pushing the unit toward the header.

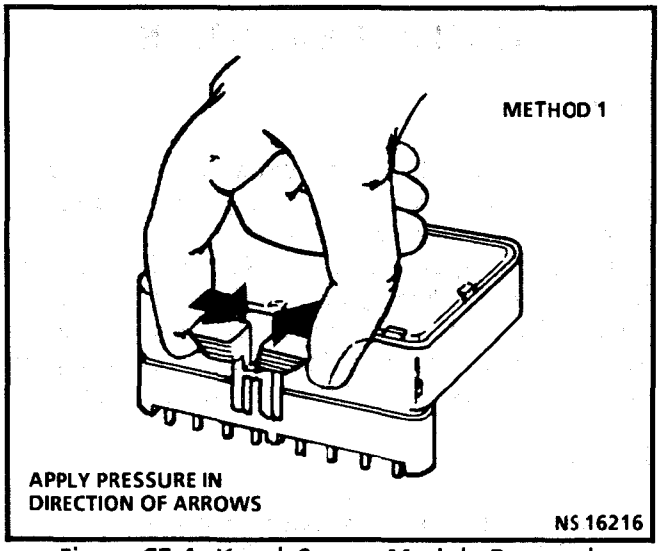


Figure C5-4 - Knock Sensor Module Removal

Method 2:

2. Apply force toward the plug-in knock sensor module with the thumb or forefinger with an opposing force on the opposite side of the module as shown below. Reinstallation is done as stated in Method 1.

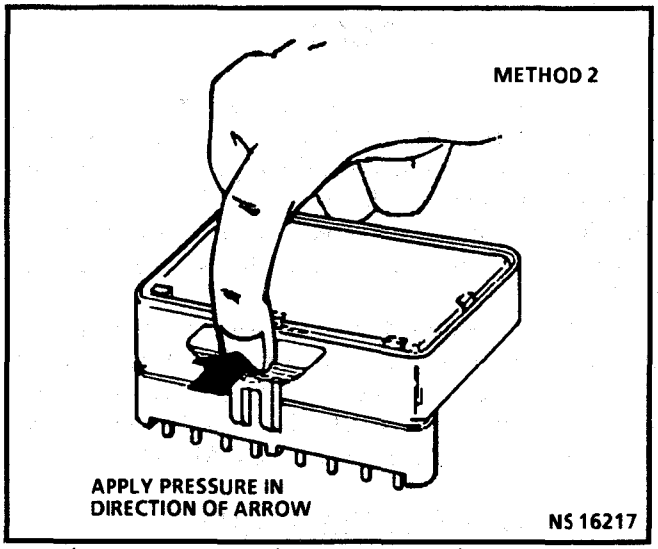


Figure C5-5 - Knock Sensor Module Removal

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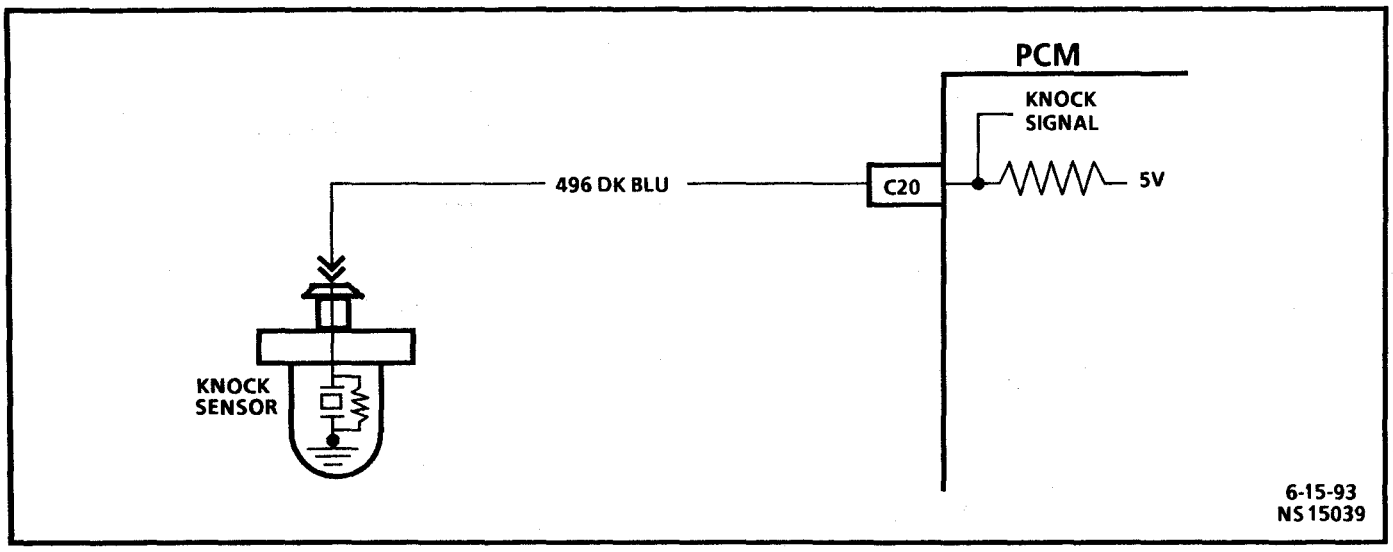


CHART C-5

KNOCK SENSOR (KS) SYSTEM CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Knock Sensor (KS) is used to detect engine detonation and the PCM will retard the ignition control timing based on the signal being received. The circuitry within the knock sensor causes the PCM's 5 volts to be pulled down so that under a no knock condition CKT 496 would measure about 2.5 volts. The knock sensor produces an AC signal which rides on the 2.5 volts DC voltage. The amplitude and frequency are dependent upon the knock level.

The PCM used with this engine contains a knock sensor module which contains the spark control logic that retards spark timing which in turn reduces detonation.

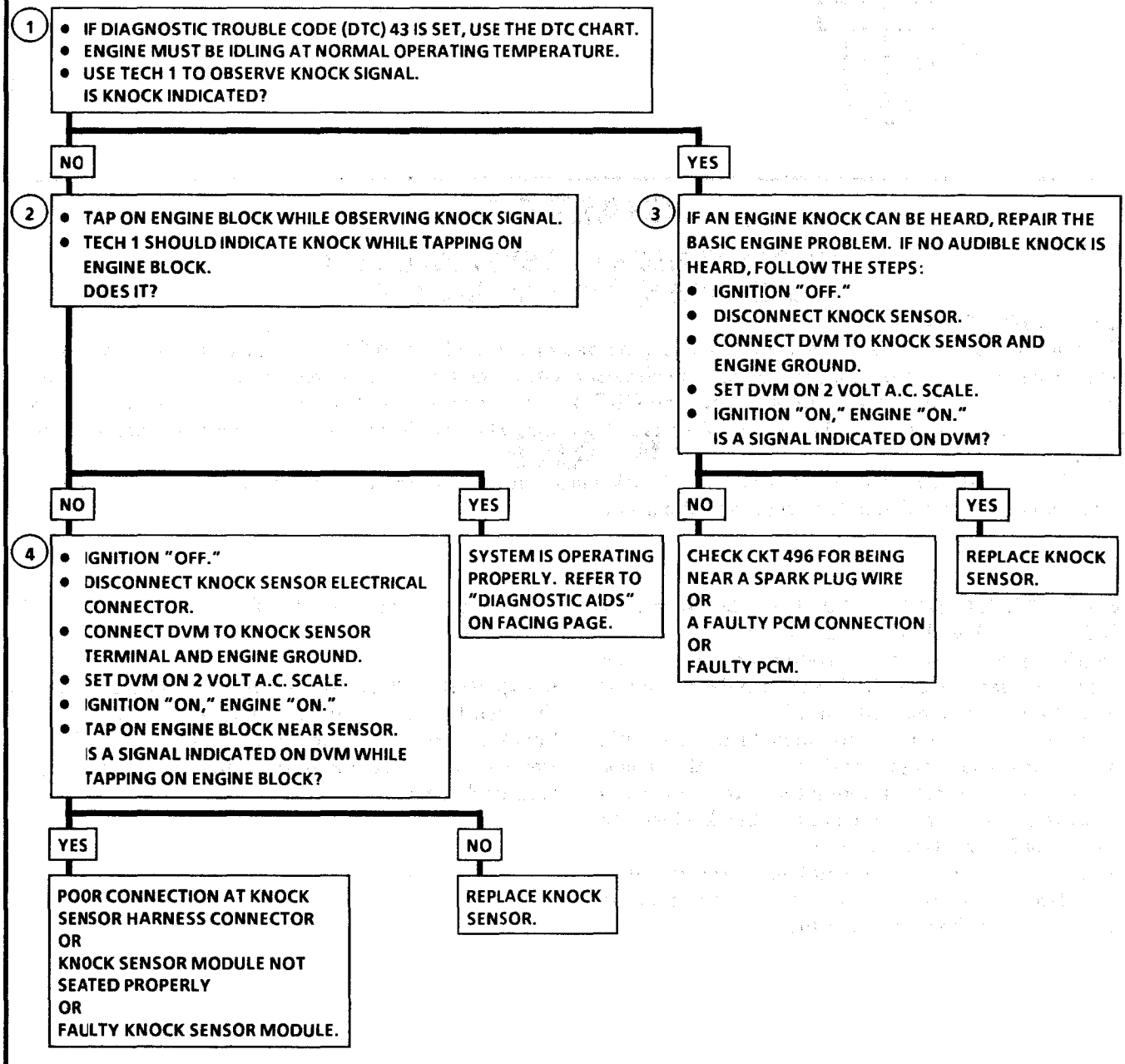
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. With engine idling, there should not be a knock signal present at the PCM, because detonation is not likely under a no load condition.
2. Tapping on the engine lift hook bracket should simulate a knock signal to determine if the sensor is capable of detecting detonation. If no knock is detected, try tapping on engine block closer to sensor before replacing sensor.
3. If the engine has an internal problem which is creating a knock, the knock sensor may be responding to the internal failure.
4. This tests the integrity of the Knock Sensor (KS) module.

Diagnostic Aids: While observing knock signal on the Tech 1 scan tool, there should be an indication that knock is present when detonation can be heard. Detonation is most likely to occur under high engine load conditions.

CHART C-5

KNOCK SENSOR (KS) SYSTEM CHECK 3.4L (VIN S) "F" CARLINE (SFI)



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

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SECTION C6
SECONDARY AIR INJECTION (AIR) SYSTEM
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AIR Pipes and Hoses C6-4
Torque Specifications C6-4

GENERAL DESCRIPTION

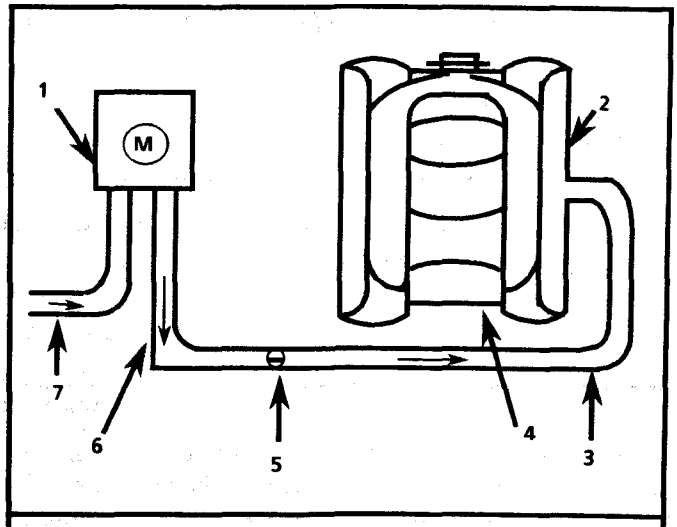
PURPOSE

The Secondary Air Injection (AIR) system helps reduce Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) exhaust emissions. It also heats up the oxidation catalytic converter quickly on engine start-up so conversion of exhaust gases can occur sooner.

OPERATION OF SYSTEM COMPONENTS

The system (Figure C6-1) includes:

- AIR pump. - The AIR pump is located in the left front of the underhood compartment and supplies the air (oxygen) to the AIR system. This electric air pump pressurizes air from the engine air cleaner and pumps it through the check valve and into the exhaust manifold. The AIR pump is controlled by the PCM. Battery voltage to the AIR pump is controlled by the AIR pump relay. An integral stop valve prevents air flow through the pump during "OFF" periods. When the PCM provides a ground circuit for the relay, battery voltage is allowed to power up the AIR pump and integral stop valve. The AIR pump motor is protected by a 20 amp fuse and has its own remote ground.
- Check valve. - The check valve prevents back flow of exhaust gases into the pump in the event of an exhaust backfire.
- Necessary plumbing. - As shown in Figure C6-2.



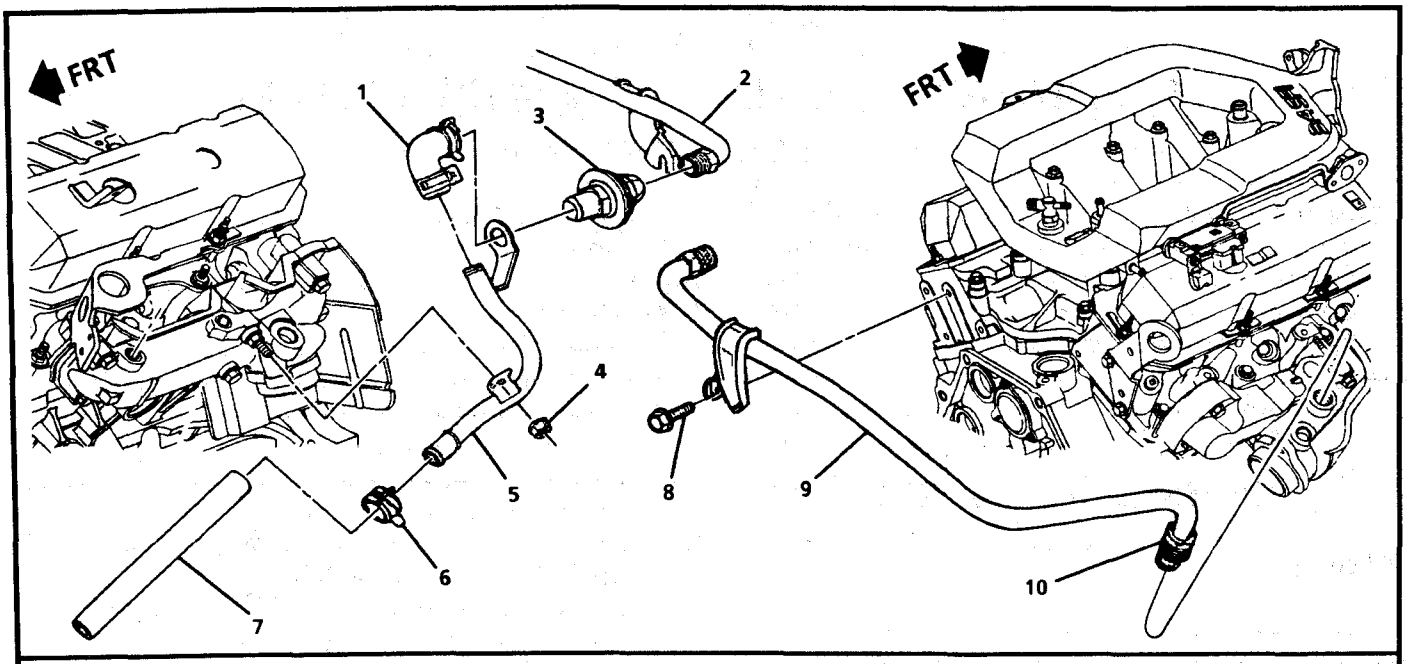
1 AIR INJECTION PUMP
2 EXHAUST MANIFOLD
3 AIR INJECTION PIPE
4 INTAKE MANIFOLD
5 CHECK VALVE
6 AIR INJECTION HOSE (AIR TO EXHAUST PORT)
7 AIR INJECTION HOSE (TO AIR CLEANER ASSEMBLY)

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Figure C6-1 - AIR System Operation

OPERATION

The AIR pump with integral stop valve is controlled by the PCM. The PCM will turn "ON" the AIR pump and opens the stop valve by providing the ground to complete the circuit which energizes the AIR pump relay. When air (oxygen) to the catalyst is desired the PCM turns "ON" both the stop valve and AIR pump.



1	HOSE ASSEMBLY	5	PIPE ASSEMLBY	9	PIPE ASSEMBLY
2	PIPE ASSEMBLY	6	CLAMP	10	INSTALL TO EXHAUST MANIFOLD AS SHOWN
3	CHECK VALVE	7	AIR INJECTION PUMP HOSE		
4	NUT	8	BOLT/SCREW		

NS 15850

Figure C6-2 - AIR System

The PCM turns "ON" the AIR pump after start-up any time engine coolant temperature is above about 12°C (55°F). The AIR pump will operate for a maximum of about 3 minutes, or until the system enters "Closed Loop" operation. At the same time the PCM turns the AIR pump "OFF," it also de-energizes the integral stop valve solenoid so no air is directed to the exhaust ports.

The air system will be disabled under the following conditions:

- When the PCM recognizes a problem and sets a diagnostic trouble code.
- When the fuel system is operating in "Closed Loop."
- The AIR pump has been "ON" for about three minutes.
- RPM is greater than 3200 for greater than 5 seconds.
- MAP is greater than 86 kPa.
- MAP is less than 11 kPa.
- Engine coolant temperature less than 12°C (55°F).
- Battery voltage is less than 10 volts or greater than 16 volts.
- Power Enrichment (PE) is detected.

RESULTS OF INCORRECT OPERATION

If no air (oxygen) flow enters the exhaust stream, HC and CO emission levels will be too high during cold start conditions.

Air flowing to the exhaust stream at all times could increase temperature of the oxidation catalytic converter.

DIAGNOSIS

The diagnosis of the AIR system is covered below, and in CHART C-6 at the end of this section.

OPERATIONAL CHECKS

AIR Pump

The AIR pump is a regenerative turbine type which is permanently lubricated and requires no periodic maintenance.

If the vehicle has been sitting overnight, refer to CHART C-6. If the engine is at or near normal operating temperature use the following procedure: Using the Tech 1 scan tool, select "Miscellaneous Test" then "Output Test." Select "AIR System" in "Output Test" directory. Observe oxygen sensor voltage for right (Bank 1) oxygen sensor.

Using the ↑ arrow enable the "Output Test" for the AIR system. The "Output Test" will energize the AIR pump for only about 5 seconds. When the "Output Test" is enabled, the right (Bank 1) oxygen sensor voltage should remain under 400 mV because air is being directed to the right bank exhaust port. If the voltage remains low during the "Output Test," the AIR pump and integral stop valve are operating satisfactorily.

If the voltage does not remain low when the "Output Test" is commanded "ON," proceed as follows.

Inspect

1. For a seized AIR pump (refer to CHART C-6).
2. Hoses, tubes and all connections for leaks and proper routing.
3. For air flow going to the exhaust manifold.
4. AIR pump for proper mounting.

Hoses and Pipes

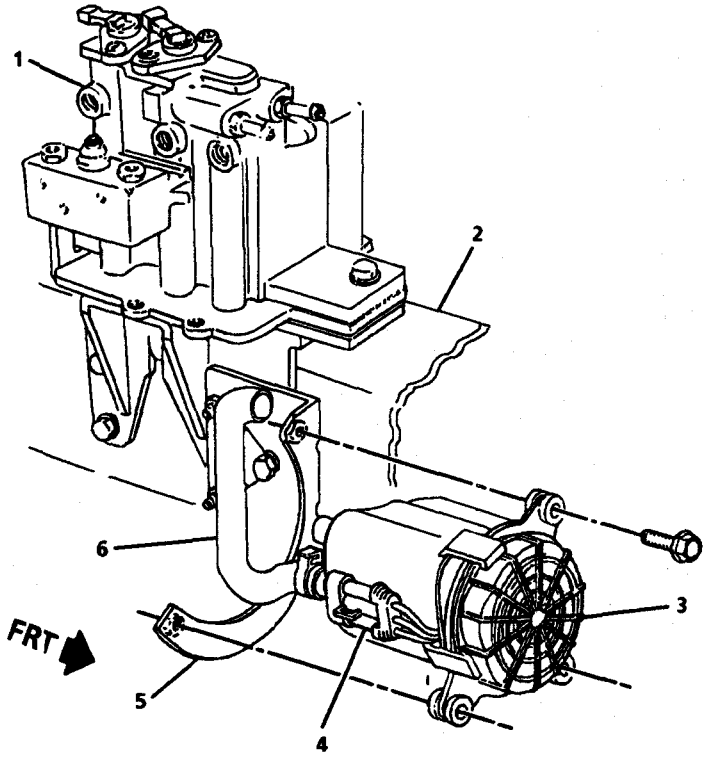
Inspect

1. Hose or pipe for deterioration or holes.
2. All hoses or pipe connections, and clamp tightness.
3. Hose or pipe routing. Interference may cause wear.
4. If a leak is suspected on the pressure side of the system or if a hose or pipe has been disconnected on the pressure side, the connections should be checked for leaks with a soapy water solution. With the AIR pump running, bubbles will form if a leak exists.

Check Valve

Inspect

1. A check valve should be inspected whenever the hose is disconnected from a check valve or whenever check valve failure is suspected. (An AIR pump that had become inoperative and had shown indications of having exhaust gases in the outlet port would indicate check valve failure.)
2. Remove the check valve and blow through the check valve (toward the exhaust manifold), then attempt to blow through the other side of the check valve. Flow should only be in one direction (toward the exhaust manifold). Replace valve which does not operate properly.



1	ABS HYDRAULIC MODULATOR
2	LEFT SIDE FRAME RAIL
3	AIR PUMP
4	AIR PUMP ELECTRICAL CONNECTOR
5	AIR BRACKET
6	HOSE TO AIR CLEANER

NS 15265

Figure C6-3 - AIR Pump Service

ON-VEHICLE SERVICE

AIR PUMP
Figure C6-3

Remove or Disconnect
1. Negative battery cable.
2. Raise vehicle.
3. Harness connector from AIR pump.
4. Outlet and inlet hoses.
5. Air pump mounting bolts (3) from bracket.

Install or Connect
1. AIR pump to bracket.
2. Mounting bolts (3).

Tighten
- Bolts to 12 N ·m (9 lb. ft.).

3. Outlet and inlet hoses to pump.
4. Harness connector to AIR pump.
5. Lower vehicle.
6. Negative battery cable.
7. Check AIR system for proper operation (refer to CHART C-6).

AIR CHECK VALVE

Refer to Figure C6-2.

Remove or Disconnect
1. Check valve clamp.
2. Hose from check valve.
3. Left check valve pipe.
4. Unscrew check valve from AIR pipe.

Install or Connect
1. Screw check valve onto AIR pipe.

Tighten
- Check valve to AIR pipe 19 N·m (14 lb. ft.).

2. Air pipe to exhaust manifold.
3. Air hose to check valve.
4. Check valve clamp.

AIR PIPES AND HOSES

For "On-Vehicle Service" procedures, refer to Figure C6-2.

TORQUE SPECIFICATIONS

Check Valve	19 N·m (14 lb. ft.)
AIR Pump Bolts	12 N·m (9 lb. ft.)

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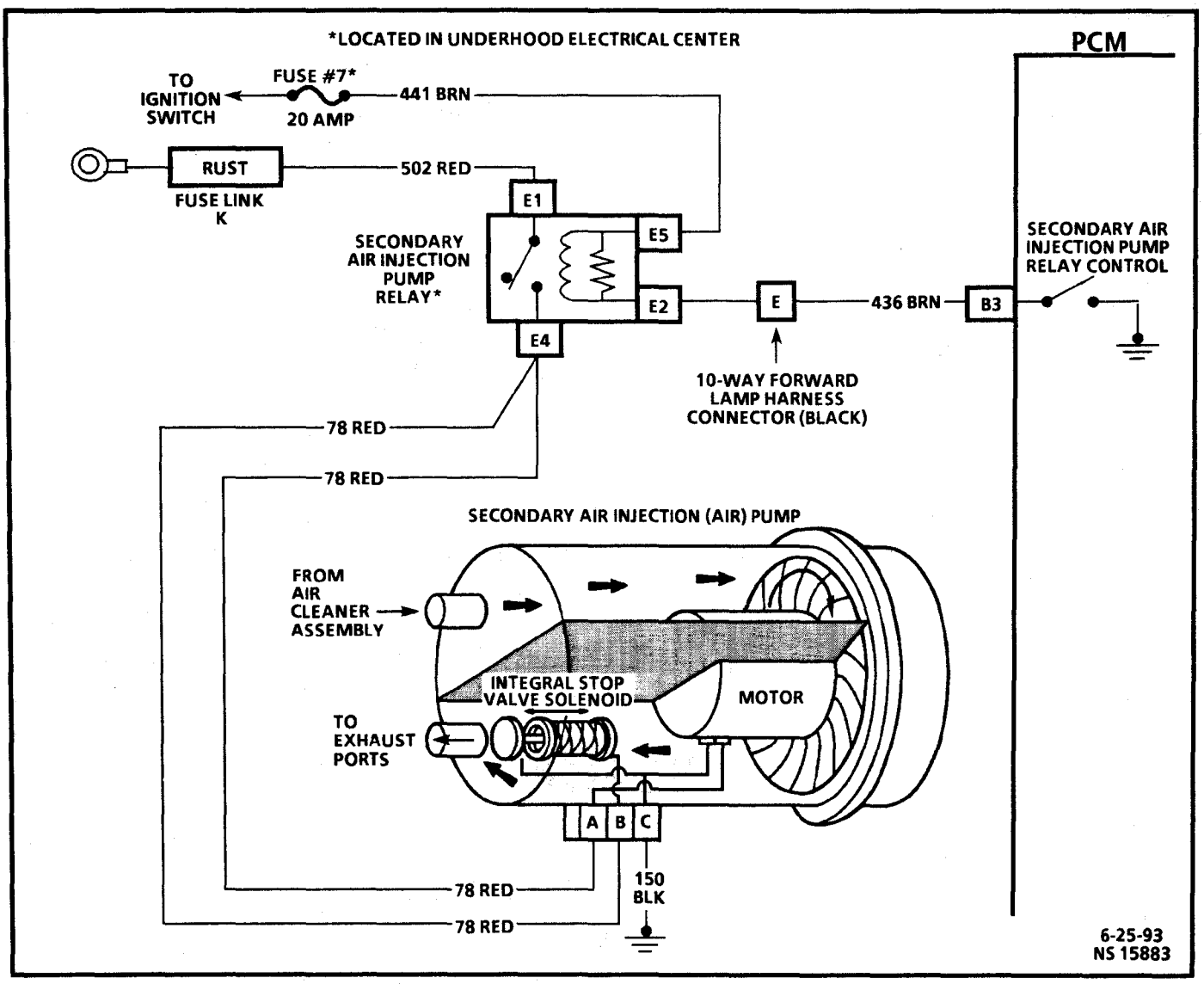


CHART C-6

SECONDARY AIR INJECTION (AIR) SYSTEM CHECK
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

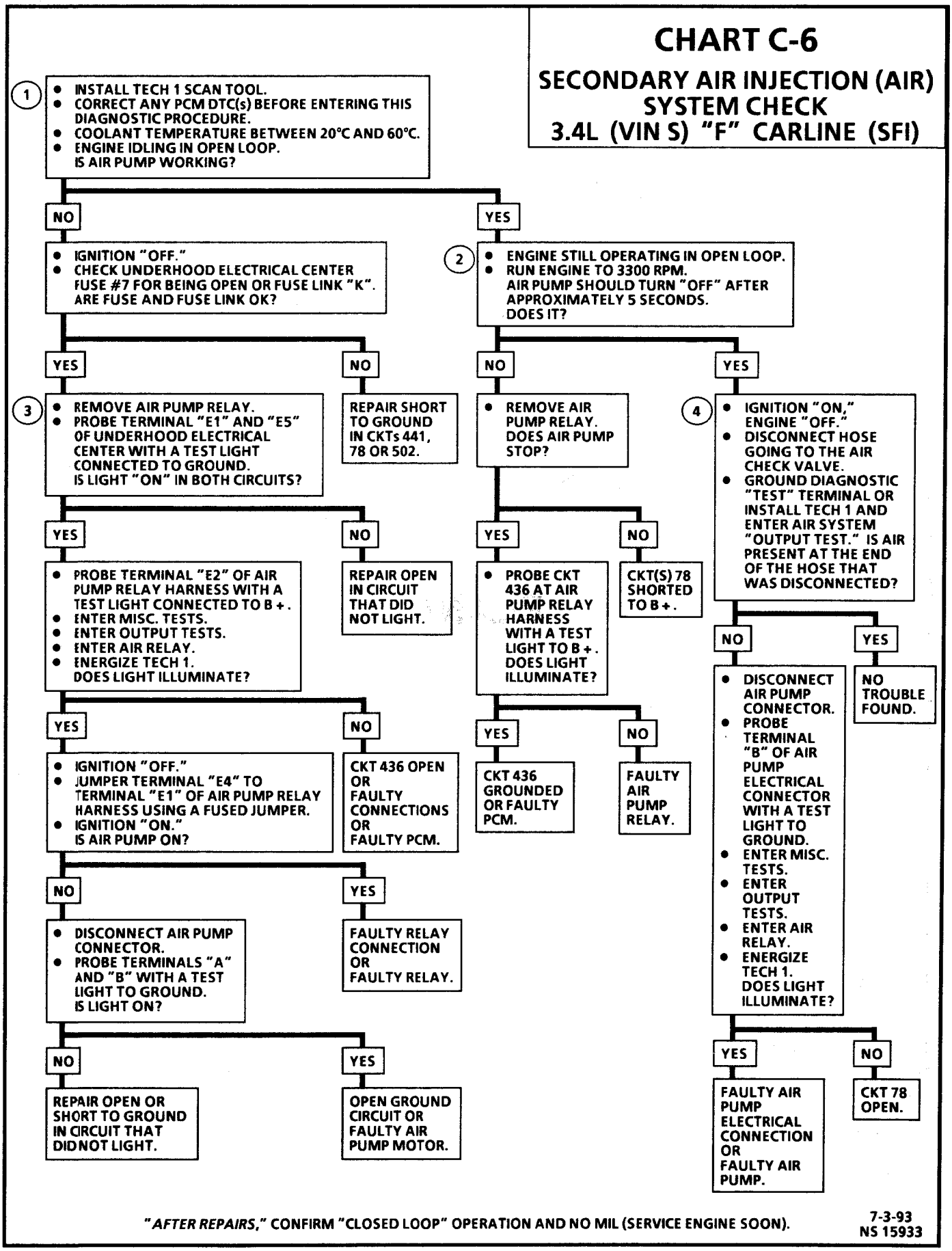
During cold starts, above 12°C (55°F), the PCM completes the ground circuit to the air pump relay which energizes the air pump and integral stop valve. Air is directed to the right side exhaust port whenever the engine is started. Whenever the fuel system goes to "Closed Loop," or the air pump has been "ON" for more than approximately 3 minutes, the PCM opens the ground circuit to the air pump relay, and the air pump is de-energized and integral stop valve closes.

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

1. This is a system performance test. If both the AIR pump and AIR check valve are functioning properly, the amount of fresh air flowing past the O2S will cause a false lean condition (low voltage). Move quickly through these first two steps.
2. Checks the PCM's ability to shut "OFF" the AIR pump. Once turned "OFF," the AIR pump should stay "OFF" for at least 200 seconds.
3. Checks for battery voltage for the energizing coil and switching portions of the AIR pump relay.
4. Checks for an open control circuit. Grounding the diagnostic "Test" terminal or using the Tech 1 "Output Test" will energize the AIR pump relay if the PCM and circuits are normal.

CHART C-6

SECONDARY AIR INJECTION (AIR) SYSTEM CHECK 3.4L (VIN S) "F" CARLINE (SFI)



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

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SECTION C7
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

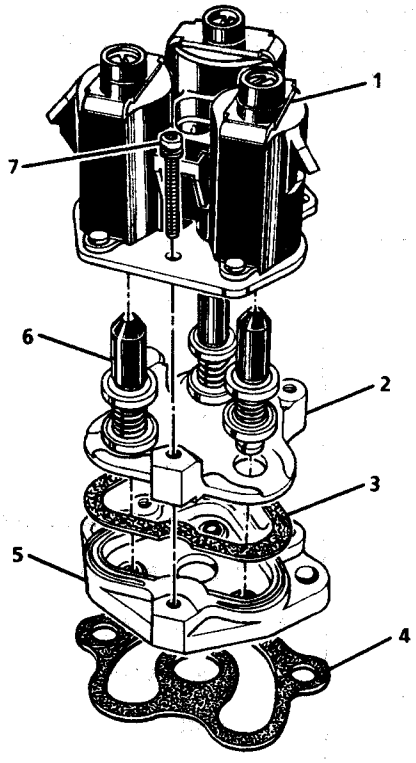
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Digital EGR Valve C7-2

GENERAL DESCRIPTION

PURPOSE

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



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

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.

EGR CONTROL

To regulate EGR flow, the PCM controls the EGR solenoids to vary the amount of EGR flow. The PCM uses information from the following sensors to regulate the solenoid:

- Engine Coolant Temperature (ECT) sensor.
- Throttle Position (TP) sensor.
- Manifold Absolute Pressure (MAP).

DIAGNOSIS

An EGR flow check diagnosis of the digital EGR system is covered in CHART C-7.

RESULTS OF INCORRECT EGR SYSTEM OPERATION

With too much EGR flow at idle, cruise, or cold operation, any of the following conditions may occur:

- Engine stops after cold start.
- Engine stops at idle after deceleration.
- Car surges during cruise.
- Rough idle.

Too little or no EGR flow allows combustion temperatures to get too high. This could cause:

- Spark knock (detonation).
- Engine overheating.
- Emission test failure.

ON-VEHICLE SERVICE

DIGITAL EGR VALVE

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector at solenoid.
3. Two (2) base to flange bolt/screws.
4. Digital EGR valve. Refer to Figure C7-2.

Install or Connect

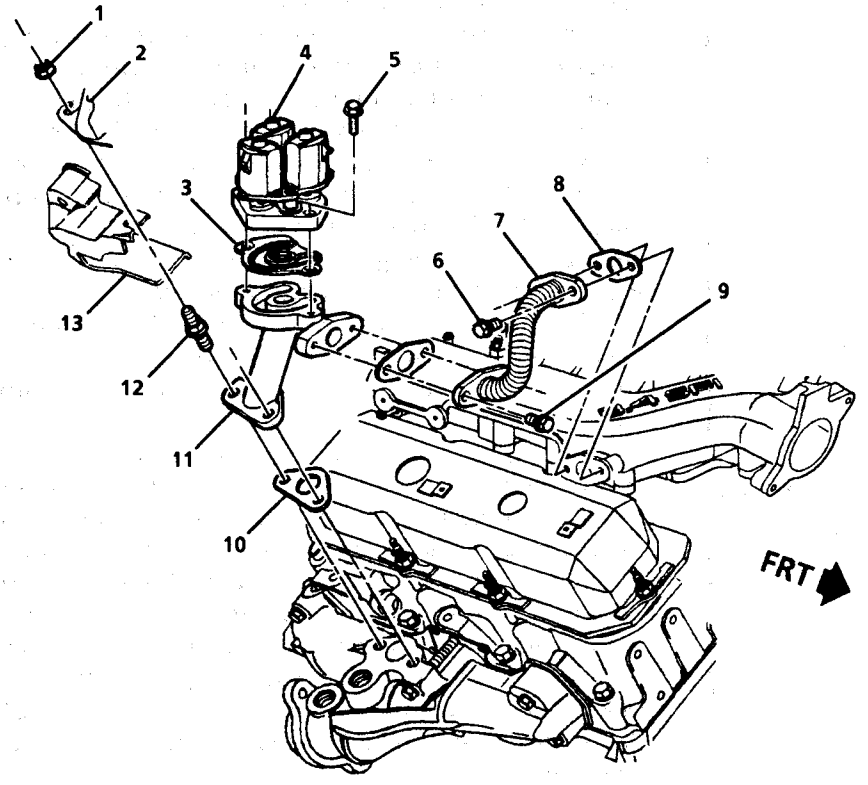
1. EGR valve gasket with "UP" readable after positioning on adaptor.
2. EGR valve assembly.
3. Two (2) bolt/screws finger tight.

Important

- When tightening digital EGR valve bolts, they must be in the following sequence:

Tighten

1. Torque each bolt/screw to 15 N·m (11 lb. ft.).
2. Apply additional torque to each bolt/screw to 30 N·m (22 lb. ft.).



1 SHIELD NUT
2 SHIELD
3 GASKET
4 DIGITAL EGR VALUE ASSEMBLY
5 BOLT/SCREW (2)
6 BOLT/SCREW (4)
7 TUBE ASSEMBLY
8 GASKET
9 BOLT/SCREW (4)
10 GASKET
11 ADAPTOR
12 STUD (2)
13 SHIELD

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Figure C7-2 - Digital EGR Valve Assembly

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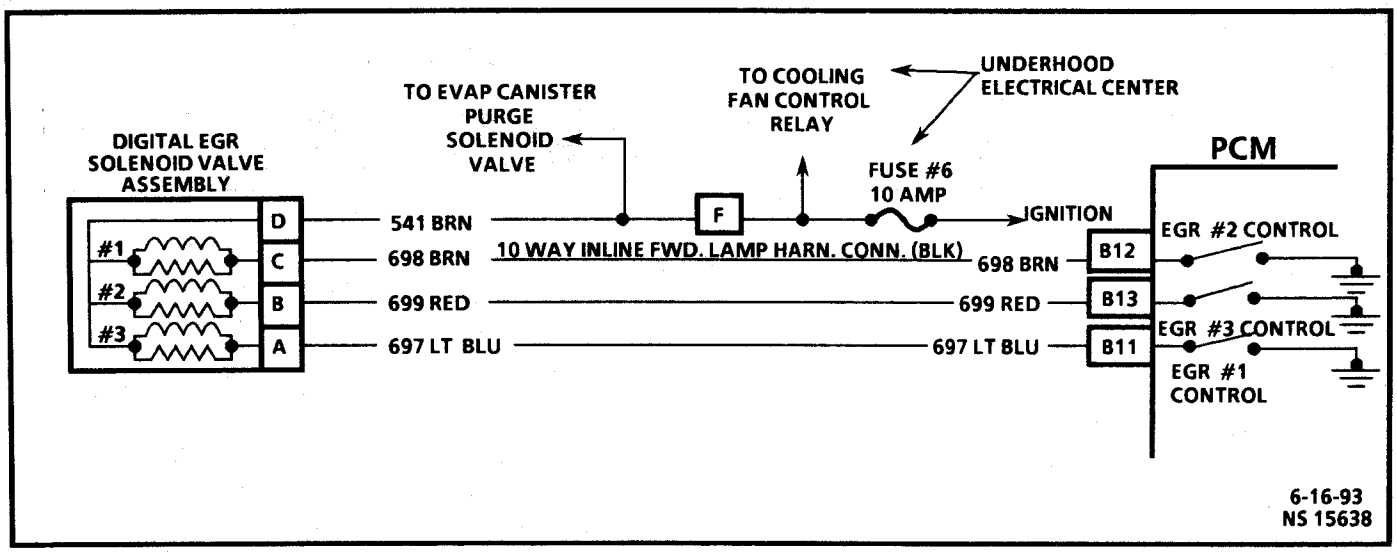


CHART C-7

EXHAUST GAS RECIRCULATION (EGR) FLOW CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

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.

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

1. DTC(s) should be diagnosed using appropriate charts before preparing a functional check.
2. This step activates each solenoid individually. As you energize #1 or #2 solenoid, the engine RPM should drop. #3 solenoid has the largest port and may stall the engine when energized.

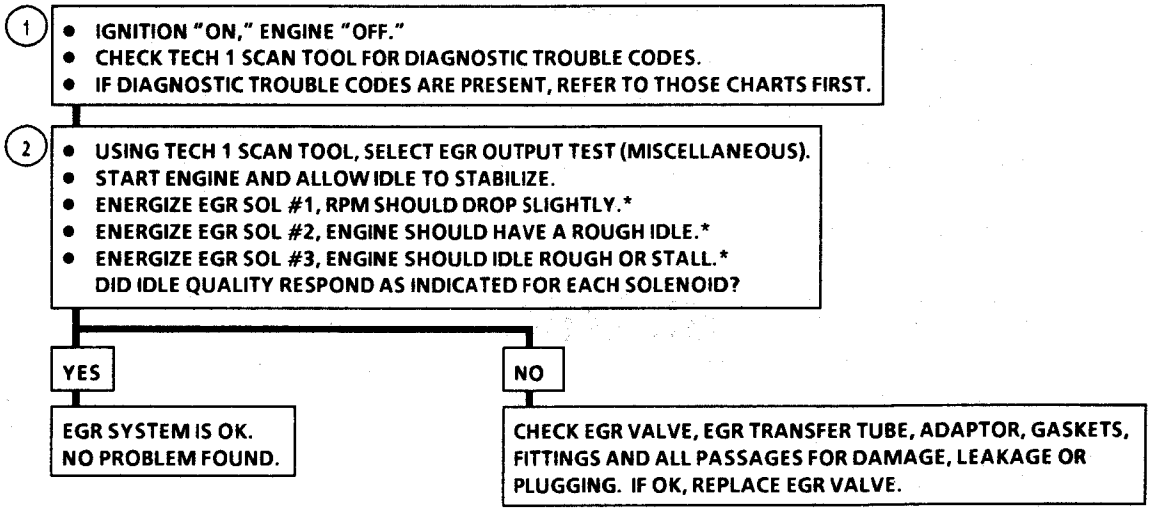
Important

- If the digital EGR valve shows signs of excessive heat (a melted condition), check the exhaust system for blockage (possibly a plugged converter) using the procedure found on CHART B-1. If the exhaust system is restricted, repair the cause. One possibility is an injector which is open due to one of the following:
  - A. Stuck.
  - B. Grounded driver circuit.
  - C. Possibly defective PCM.

  If this condition is found, the oil should be checked for possible fuel contamination.

CHART C-7

EXHAUST GAS RECIRCULATION (EGR) FLOW CHECK 3.4L (VIN S) "F" CARLINE (SFI)



* THESE STEPS MUST BE DONE VERY QUICKLY, AS THE PCM WILL ADJUST THE IDLE AIR CONTROL VALVE TO CORRECT IDLE SPEED.

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

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SECTION C8
AUTOMATIC TRANSMISSION CONTROL SYSTEM
CONTENTS

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Powertrain Control Module (PCM) C8-1
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Information Sensors and Switches C8-1
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GENERAL DESCRIPTION

POWERTRAIN CONTROL MODULE (PCM)
Figure C8-1

The Powertrain Control Module (PCM) is an electronic device which monitors various inputs to control various transmission functions including shift quality and transmission diagnostics. The PCM receives various input information from sensors, switches, and components to process for use within its control program. Based on this input information, the PCM controls various transmission output functions and devices.

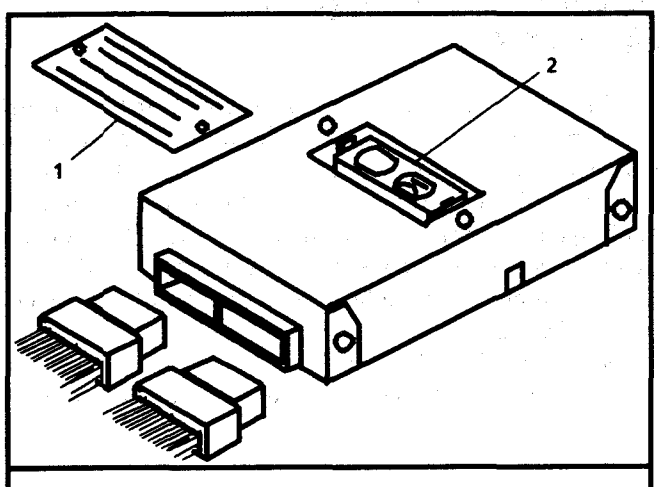


Figure C8-1 - Powertrain Control Module

INPUT INFORMATION

Information Sensors and Switches

The PCM uses the following information sensors to gather data for electronically controlling transmission functions:

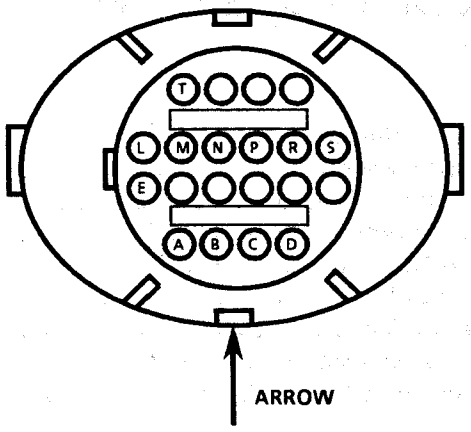
- Transmission Fluid Temperature (TFT) sensor.
- Transmission Range (TR) pressure switch assembly.
- Engine Coolant Temperature (ECT) sensor.
- Throttle Position (TP) sensor.
- Vehicle Speed Sensor (VSS).
- Brake switch.

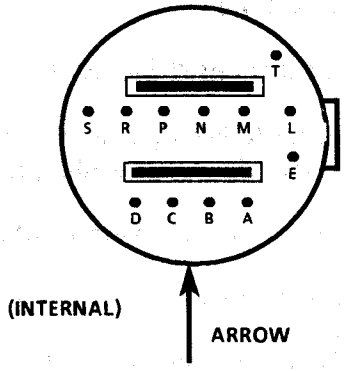
Transmission Fluid Temperature (TFT) Sensor

The TFT sensor is a thermistor (a device that changes resistance according to changes in temperature) used to indicate transmission fluid temperature. High sensor resistance produces high signal input voltage which corresponds to low fluid temperature. Low sensor resistance produces low signal input voltage which corresponds to high fluid temperature. The PCM uses the TFT sensor signal input to determine the following:

- TCC apply and release schedules.
- Hot mode determination.
- Shift quality.

The TFT sensor is part of the transmission range fluid pressure switch assembly and is attached to the control valve body within the transmission.





CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID CONTROL CKT
B	2-3 SHIFT SOLENOID CONTROL CKT
C	PRESSURE CONTROL SOLENOID (HIGH)
D	PRESSURE CONTROL SOLENOID (LOW)
E	BOTH SHIFT SOLENOIDS, TCC SOLENOID, AND 3-2 CONTROL SOLENOID IGNITION (B+) FEED CKT
L	TRANSMISSION FLUID TEMPERATURE (TFT) SIGNAL CKT
M	TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR GROUND CKT
N	RANGE SIGNAL "A" CKT
P	RANGE SIGNAL "C" CKT
R	RANGE SIGNAL "B" CKT
S	3-2 CONTROL SOLENOID CONTROL CKT
T	TCC SOLENOID CONTROL CKT

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Figure C8-2 - Harness Connector

Transmission Range (TR) Pressure Switch Assembly
Figure C8-3

This device is a set of five pressure switches (two normally closed and three normally open), that detect fluid pressure within the valve body passages. The five pressure switches are connected to three signal circuits referred to as range signals A, B, C.

Valid Combination Chart
"ON" = 0 volts/"OFF" = B+

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

The combination of pressure switch states determine the voltage signal (B+ or 0) on each range signal to the PCM. These three range signals are then interpreted by the PCM to indicate the transmission range selected. The transmission range fluid pressure switch assembly contains the trans fluid temperature sensor and attached to the control valve body within the transmission.

Vehicle Speed Sensor (VSS)
Figure C8-4

This device contains a permanent magnet surrounded by a coil of wire producing a magnetic field which is interrupted by rotor teeth pressed on an output shaft. This device is used to provide an output shaft speed signal to the control module. The control module uses the vehicle speed sensor signal input to:

- Calculate vehicle speed, trans output speed, TCC slip speed.
- Control shift quality.

The VSS is attached to the output shaft housing.

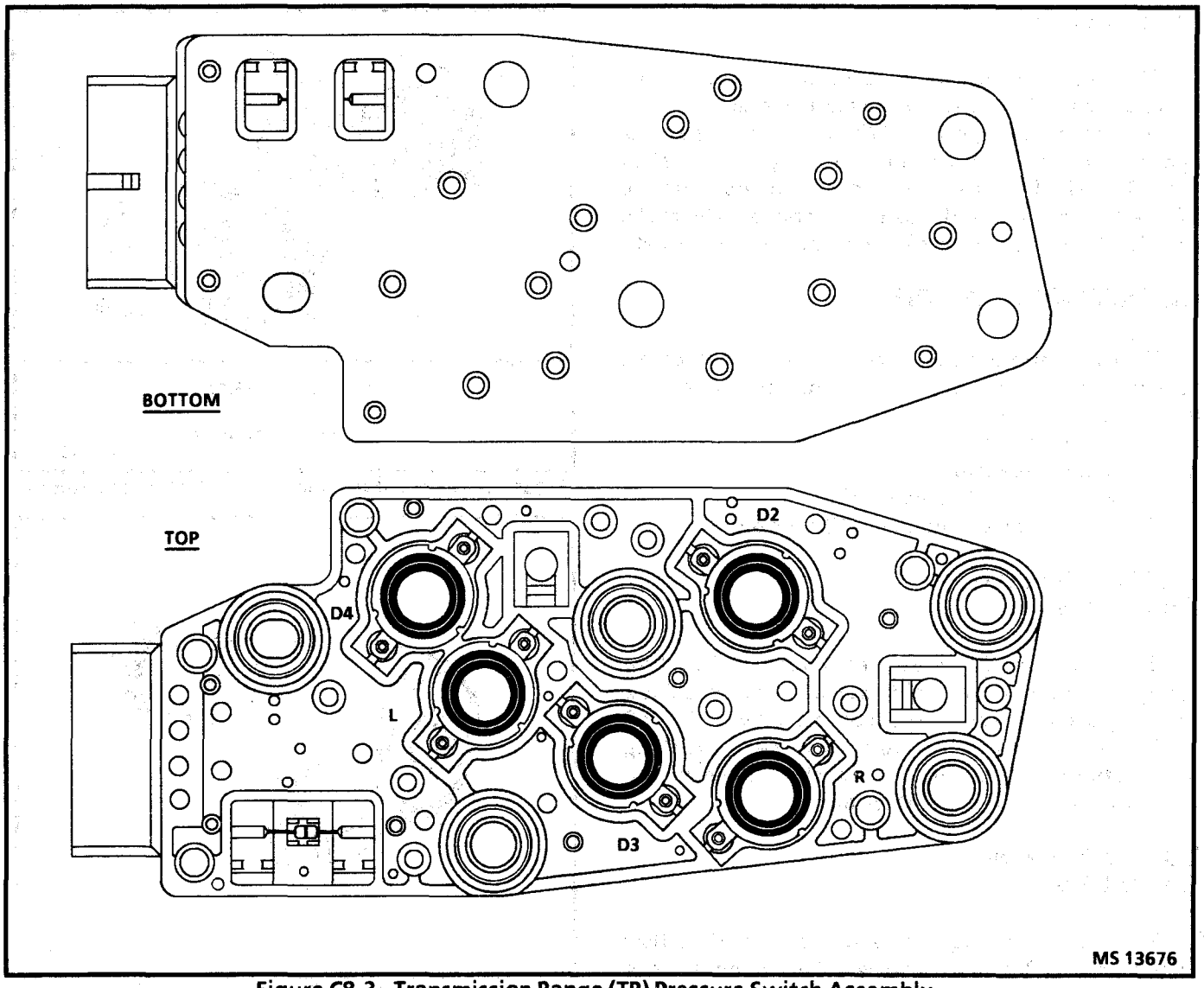


Figure C8-3 - Transmission Range (TR) Pressure Switch Assembly

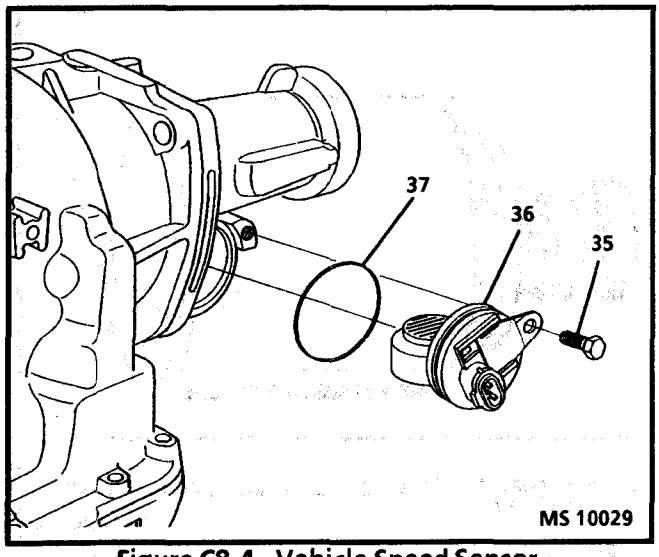


Figure C8-4 - Vehicle Speed Sensor

CHART		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

Brake Switch

This electrical switch is used to indicate brake pedal status. This switch is normally closed when the brake pedal is not applied. When the brake pedal is applied the switch will open, changing the signal to the PCM. The PCM uses this signal to de-energize the TCC solenoid when brake pedal is applied. The brake switch is located on the brake pedal mounting bracket.

OUTPUT INFORMATION

Based on input information, the PCM controls various transmission output functions and devices.

- 1-2 shift solenoid.
- 2-3 shift solenoid.
- 3-2 control solenoid.
- Pressure Control Solenoid (PCS).
- Torque Converter Clutch (TCC) solenoid.

1-2 Shift Solenoid
Figure C8-5

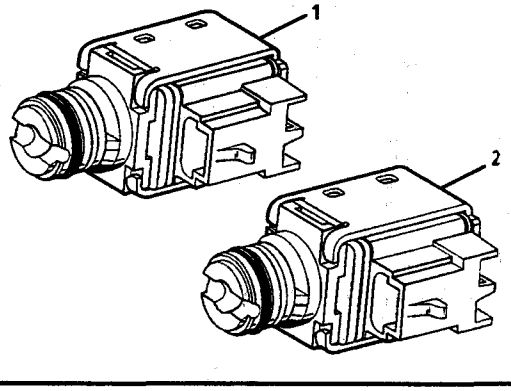
This electrical device is used to control fluid flow acting on the 1-2 and 3-4 shift valves. The solenoid is a normally open exhaust valve that is used with the 2-3 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission.

2-3 Shift Solenoid
Figure C8-5

This electrical device is used to control fluid flow acting on the 2-3 shift valves. The solenoid is a normally open exhaust valve that is used with the 1-2 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission.

3-2 Control Solenoid
Figure C8-6

This electrical device is used to control fluid flow acting on the 3-2 shift valve, which then controls the 2-4 band apply rate and 3-4 clutch release rate. It is a pulse width modulated solenoid that operates on a negative duty cycle. This solenoid controls the 3-2 downshift feel and is attached to the control valve body within the transmission.

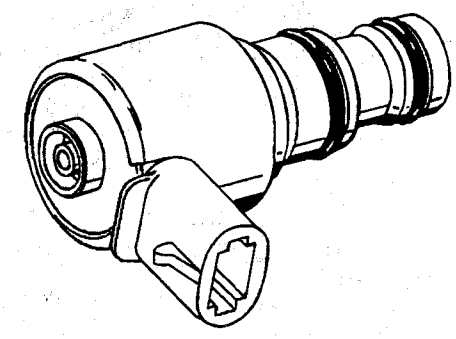


1 1-2 SHIFT SOLENOID

2 2-3 SHIFT SOLENOID

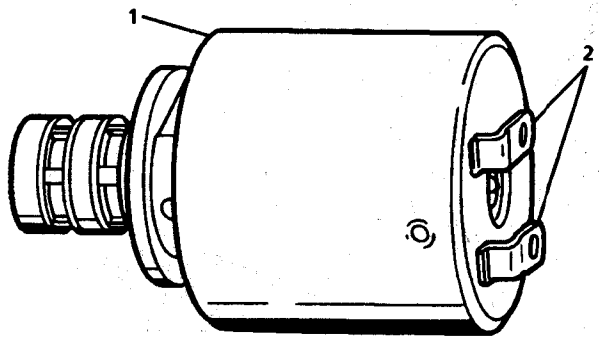
MS 13675-7A

Figure C8-5 - 1-2 Shift Solenoid or 2-3 Shift Solenoid



MS 13678-7A

Figure C8-6 - 3-2 Control Solenoid



1 PRESSURE CONTROL SOLENOID 2 ELECTRICAL CONNECTORS

MS 10090-7A

Figure C8-7 - Pressure Control Solenoid (PCS)

Pressure Control Solenoid (PCS)
Figure C8-7

This electrical device is used to control fluid line pressure by controlling actuator feed limit fluid flow acting on an internal spool valve and spring pressure. The solenoid is a normally closed solenoid valve that controls fluid pressure when operating on a duty cycle. The solenoid is attached to the control valve body within the transmission.

Torque Converter Clutch (TCC) Solenoid
Figure C8-8

This electrical device is used to control fluid acting on the TCC converter clutch valve, which then controls TCC apply and release. This solenoid is attached to the transmission case assembly extending into the pump cover.

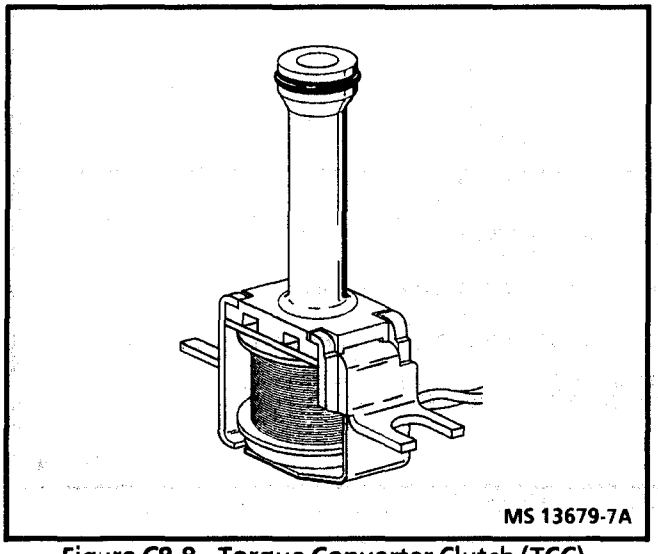


Figure C8-8 - Torque Converter Clutch (TCC) Solenoid

ON-VEHICLE SERVICE

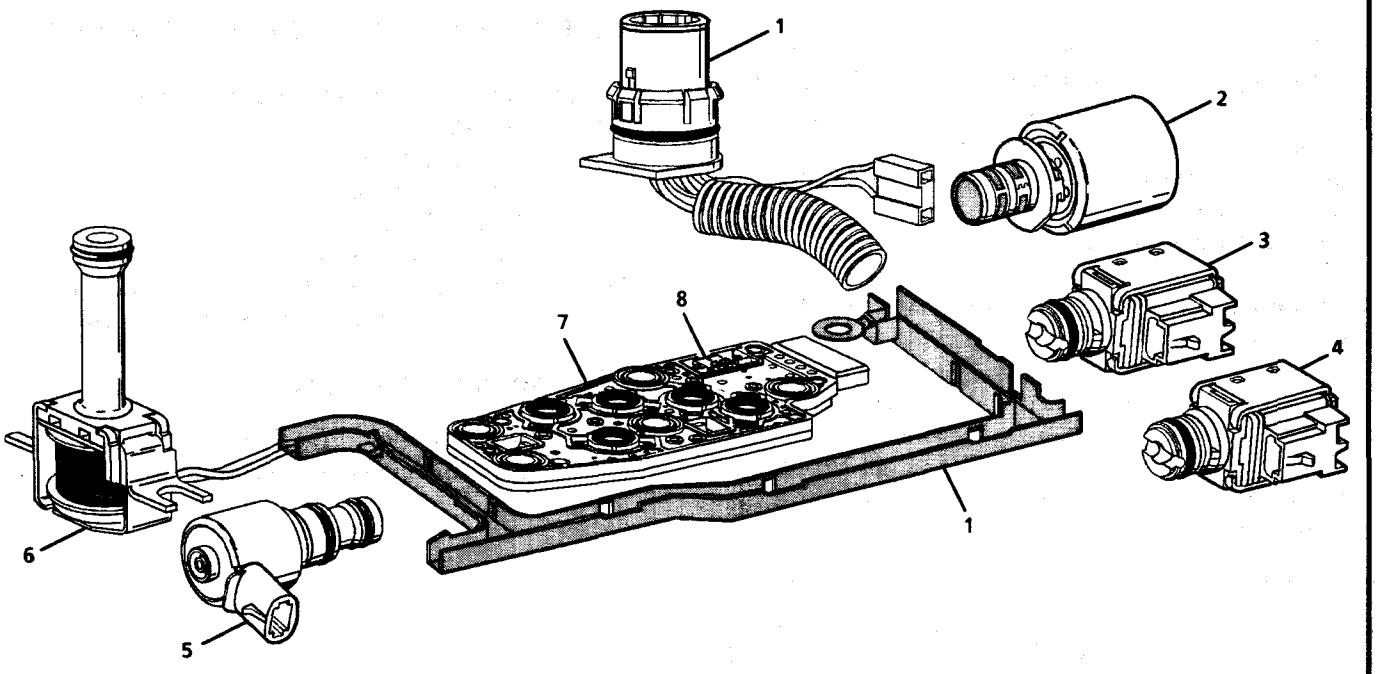
INTERNAL TRANSMISSION COMPONENTS

The following list of components will be serviced in SECTION 7A14A:

- 1 - 2 shift solenoid.
- 2 - 3 shift solenoid.
- 3 - 2 control solenoid.
- Pressure control solenoid.
- TCC solenoid with internal wiring harness.
- Any service that requires removal of the pan.

Vehicle Speed Sensor (VSS)

Refer to SECTION 7 for Vehicle Speed Sensor (VSS) service. The VSS is located on the transmission.



1	WIRING HARNESS ASSEMBLY	5	3-2 CONTROL SOLENOID
2	PRESSURE CONTROL SOLENOID	6	TORQUE CONVERTER CLUTCH SOLENOID
3	1-2 SHIFT SOLENOID	7	TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY
4	2-3 SHIFT SOLENOID	8	TRANSMISSION FLUID TEMPERATURE SENSOR (PART OF TR PRESSURE SWITCH ASSEMBLY)

MS 13680

Figure C8-9 - Electrical Components

TRANSMISSION ELECTRICAL CONNECTOR

THE TRANSMISSION WIRING CONNECTOR IS A VERY IMPORTANT PART OF THE TRANSMISSION OPERATING SYSTEM. ANY INTERFERENCE WITH THE ELECTRICAL CONNECTION CAN CAUSE THE TRANSMISSION TO SET DIAGNOSTIC TROUBLE CODES (DTC)s AND/OR AFFECT PROPER OPERATION.

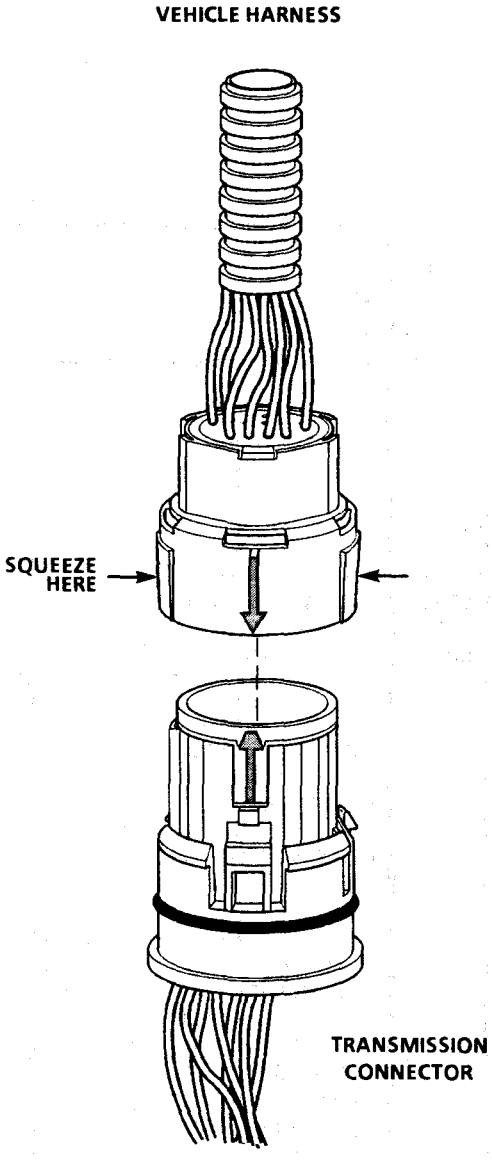
THE FOLLOWING ITEMS CAN AFFECT THE ELECTRICAL CONNECTION:

- BENT PINS IN THE CONNECTOR FROM ROUGH HANDLING DURING CONNECTION AND DISCONNECTION.
- WIRES BACKING AWAY FROM THE PINS OR COMING UNCRIMPED (IN EITHER INTERNAL OR EXTERNAL WIRING HARNESS).
- DIRT CONTAMINATION ENTERING THE CONNECTOR WHEN DISCONNECTED.
- PINS IN THE INTERNAL WIRING CONNECTOR BACKING OUT OF THE CONNECTOR OR PUSHED OUT DURING RECONNECTION.
- EXCESSIVE TRANSMISSION FLUID LEAKING INTO THE CONNECTOR, WICKING UP INTO THE EXTERNAL WIRING HARNESS, AND DEGRADING OF THE WIRE INSULATION. *
- WATER/MOISTURE INTRUSION IN THE CONNECTOR.
- LOW PIN RETENTION IN THE EXTERNAL CONNECTOR FROM EXCESSIVE CONNECTION AND DISCONNECTION OF THE WIRING CONNECTOR ASSEMBLY.
- PIN CORROSION FROM CONTAMINATION.

* THE PRESENCE OF TRANSMISSION FLUID IN THE TRANSMISSION CONNECTOR IS NOT HARMFUL IN ITSELF. THE FLUID ONLY AFFECTS THE EXTERNAL HARNESS WIRING INSULATION IF THE FLUID WICKS UP TO THE HARNESS.

POINTS TO REMEMBER WHEN WORKING WITH THE TRANSMISSION WIRING CONNECTOR ASSEMBLY:

- TO REMOVE THE CONNECTOR, SQUEEZE THE TWO TABS TOWARDS EACH OTHER AND PULL STRAIGHT UP (REFER TO THE ILLUSTRATION).
- CAREFULLY LIMIT TWISTING OR WIGGLING THE CONNECTOR DURING REMOVAL. BENT PINS CAN OCCUR.
- **DO NOT** PRY THE CONNECTOR OFF WITH A SCREWDRIVER OR OTHER TOOL.
- TO REINSTALL THE EXTERNAL WIRING CONNECTOR, FIRST ORIENT THE PINS BY LINING UP THE ARROWS ON EACH HALF OF THE CONNECTOR. PUSH THE CONNECTOR STRAIGHT DOWN INTO THE TRANSMISSION WITHOUT TWISTING OR ANGLING THE MATING PARTS.
- THE CONNECTOR SHOULD CLICK INTO PLACE WITH A POSITIVE FEEL AND/OR NOISE.
- WHENEVER THE TRANSMISSION EXTERNAL WIRING CONNECTOR IS DISCONNECTED FROM THE INTERNAL HARNESS AND THE ENGINE IS OPERATING DTC(s) WILL SET. CLEAR THESE DTC(s) AFTER RECONNECTING THE EXTERNAL CONNECTOR.



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Figure C8-10 - Transmission Electrical Connector

4L60E TRANSMISSION FLUID CHECKING PROCEDURE

1. Warm the transmission to normal operating temperature by driving the vehicle about 15 miles (24 km). Operating temperature is 180-200°F (82-94°C).
2. Park vehicle on a level surface, place shift lever in "P" park and apply the parking brake.
3. Check fluid level on the dipstick (read the lower level).
4. If fluid level is low, add only enough DEXRON®-IIE to bring the fluid level into the hot area.

* It is important to check fluid level when the transmission has reached operating temperature. The hot range is calibrated correspond to the correct fluid level range for fluid between 180 and 200°F(82-94°C).

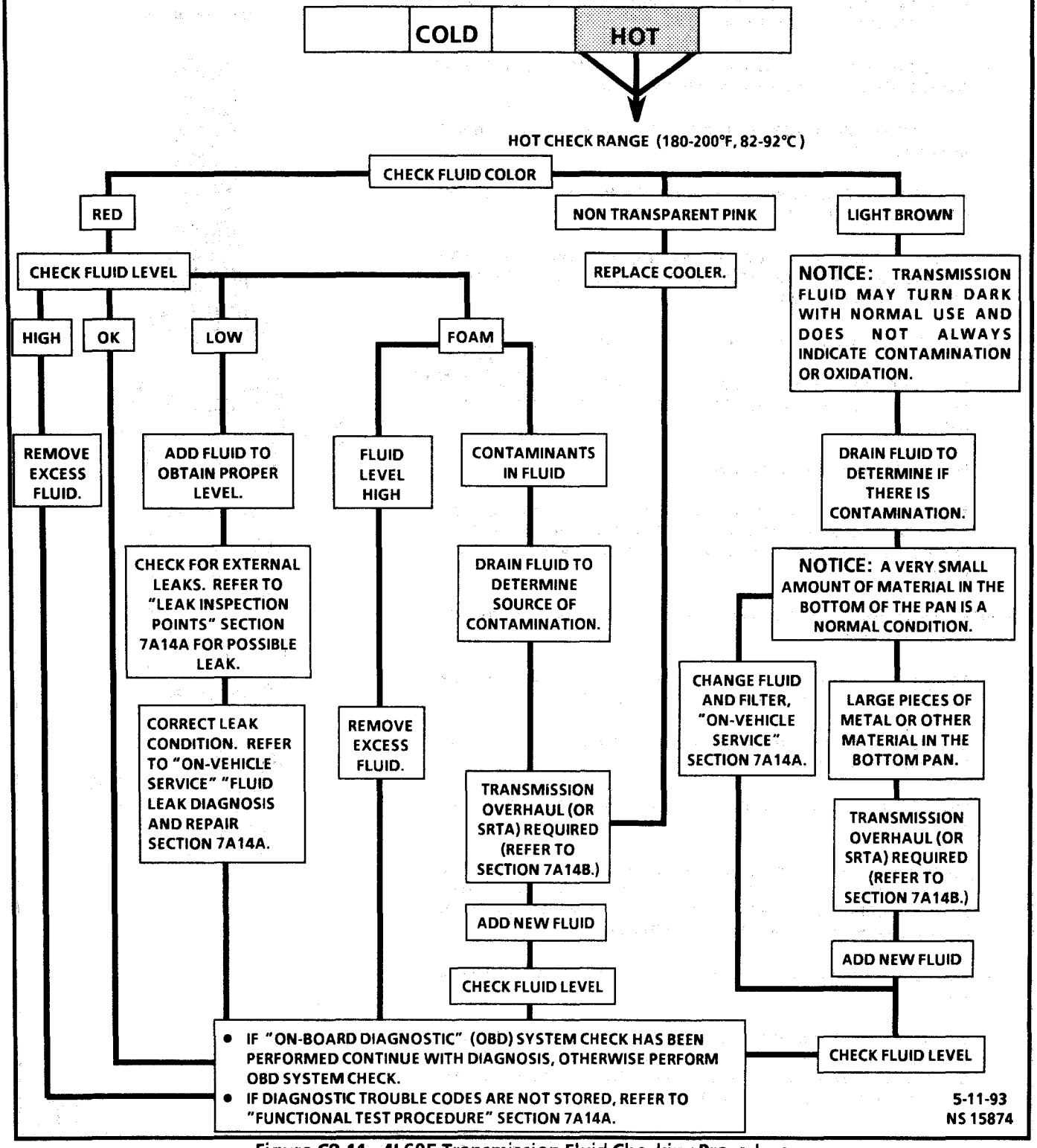


Figure C8-11 - 4L60E Transmission Fluid Checking Procedure

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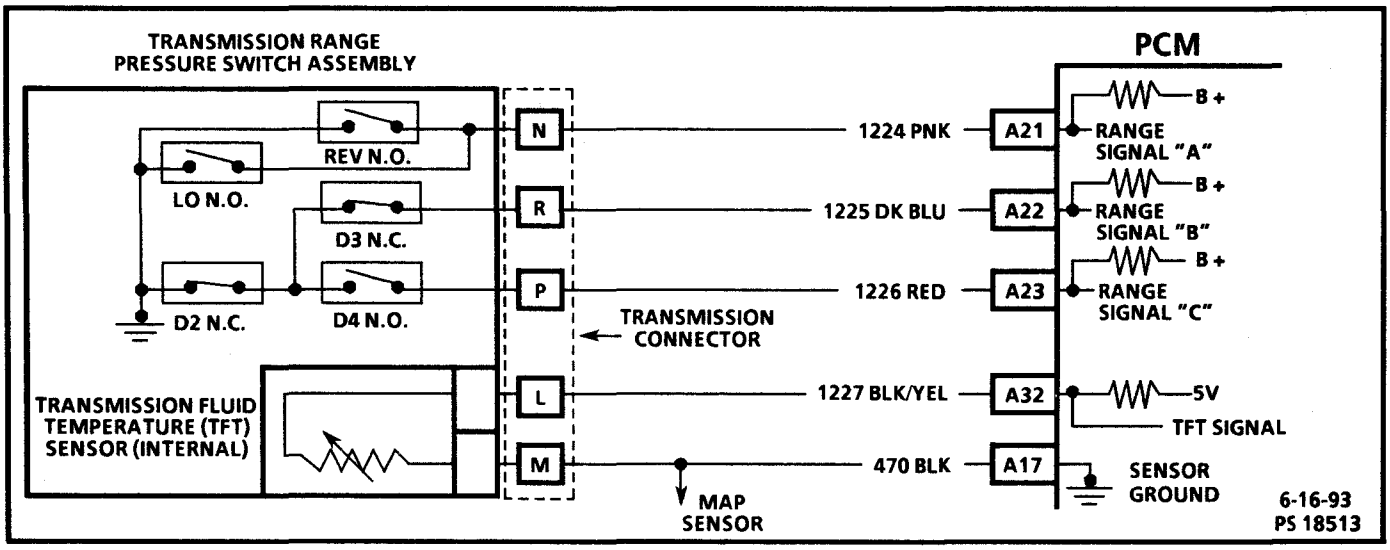


CHART C-8A

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The Transmission Range (TR) switch assembly consists of five pressure switches (two normally closed and three normally open), and a TFT sensor combined into one unit and mounted on the valve body. The PCM supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the PCM detects what manual valve position has been selected by the vehicle operator. With ignition "ON" and engine "OFF," P/N will be indicated. When the transmission electrical connector is disconnected, the ground potential for the three range signals to the PCM will be removed, and with ignition "ON," D2 will be indicated.

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

1. This test checks the indicated range signal to the manual valve position actually selected.
2. This test checks for correct voltage from the PCM to the transmission external connector.
3. This test checks a short to ground or an open in any one of the three circuits.

Diagnostic Aids: Refer to accompanying chart for various A/B/C range combinations. Check all wiring connectors for proper terminal tension.

Refer to "TR Pressure Switch Assembly Resistance Check" or "Functional Test Procedure" in SECTION 7A14A for further information.

Valid Combination Chart
"ON" = 0 volts/"OFF" = B +

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

Expected Readings

CHART C-8A

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

THIS CHART ASSUMES THAT:
- THE TRANSMISSION LINKAGE FROM THE SELECT LEVER TO THE MANUAL VALVE IS ADJUSTED PROPERLY.
- OBD SYSTEM CHECK HAS BEEN PERFORMED.
- FLUID CHECKING PROCEDURE HAS BEEN PERFORMED.
- ALL DTC(s) HAVE BEEN RECORDED AND THEN CLEARED.
- SCAN TOOL STILL INSTALLED.

(1)
- ENGINE IDLING AT NORMAL OPERATING TEMPERATURE.
- PARKING BRAKE APPLIED AND WHEELS BLOCKED.
- APPLY BRAKE PEDAL AND SELECT EACH TRANSMISSION RANGE D1, D2, D3, D4, N, R, P.

DOES EACH SELECTED TRANSMISSION RANGE MATCH THE SCAN TOOL "TRANS RANGE SW" DISPLAY?

NO

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775 - JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- WITH J 39200 TO GROUND, CHECK VOLTAGE AT HARNESS CONNECTOR TERMINALS "N", "R" AND "P".

DOES J 39200 DISPLAY B + AT ALL THREE CIRCUITS?

NO

(3)
- ON CIRCUIT(S) THAT DID NOT INDICATE B + , CHECK FOR AN OPEN OR SHORT TO GROUND. IF OK, CHECK CONTROL MODULE CONNECTOR TERMINAL TENSION ON THESE CIRCUITS. IF OK, REPLACE CONTROL MODULE.

YES

(2) VERIFY THAT CKT(s) 1224, 1225, OR 1226 ARE NOT SHORTED TOGETHER. IF OK, REFER TO "FLUID PRESSURE SWITCH ASSEMBLY RESISTANCE CHECK" SECTION 7A14A (4L60E) OR 7A17A (4L80E) OF THE APPROPRIATE SERVICE MANUAL.

YES

NO TROUBLE FOUND.
REFER TO DIAGNOSTIC AIDS.

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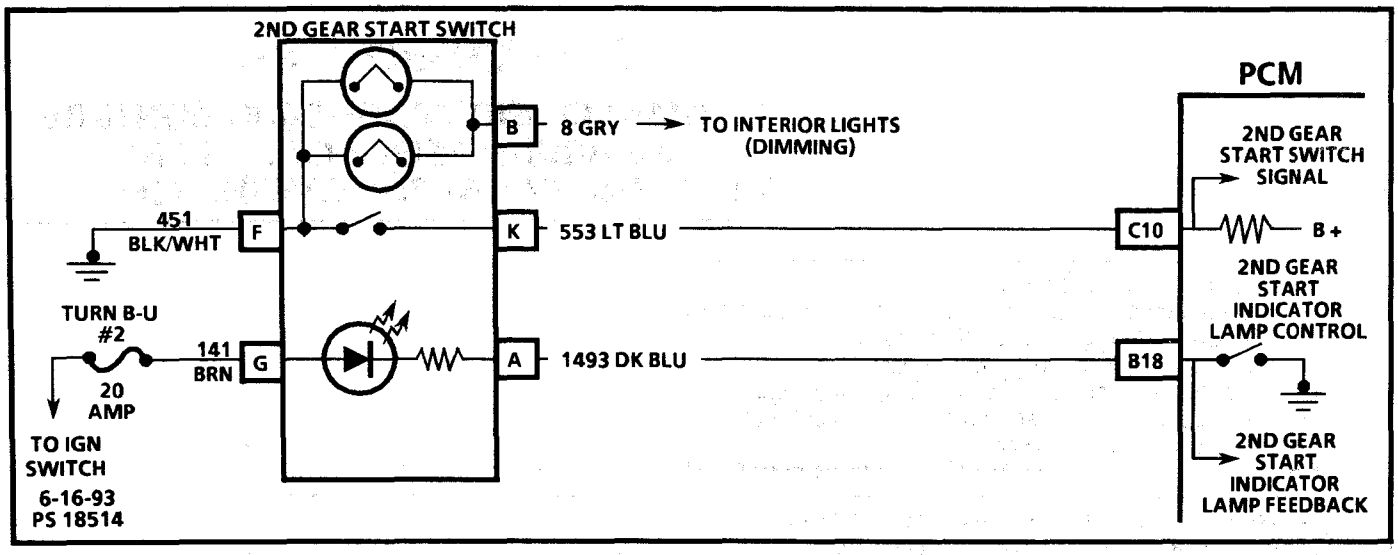


CHART C-8B

2nd GEAR START SWITCH INDICATOR LAMP CONTROL CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The 2nd gear start switch enables the operator to select a 2nd gear start for increased traction. When 2nd gear start is selected, the 2nd gear start switch input signal is momentarily toggled to zero volts. The PCM then turns "ON" the 2nd gear start mode indicator lamp and de-engerizes the 1-2 shift solenoid enabling 2nd gear. During light and medium acceleration conditions the vehicle will start in 2nd gear when selected. However, 2nd gear starts will be overridden and first gear starts will occur if a hard acceleration condition (WOT) is required. Normal 1st gear start mode is obtained by toggling the 2nd gear start switch again, or when the ignition switch is cycled "OFF" then "ON."

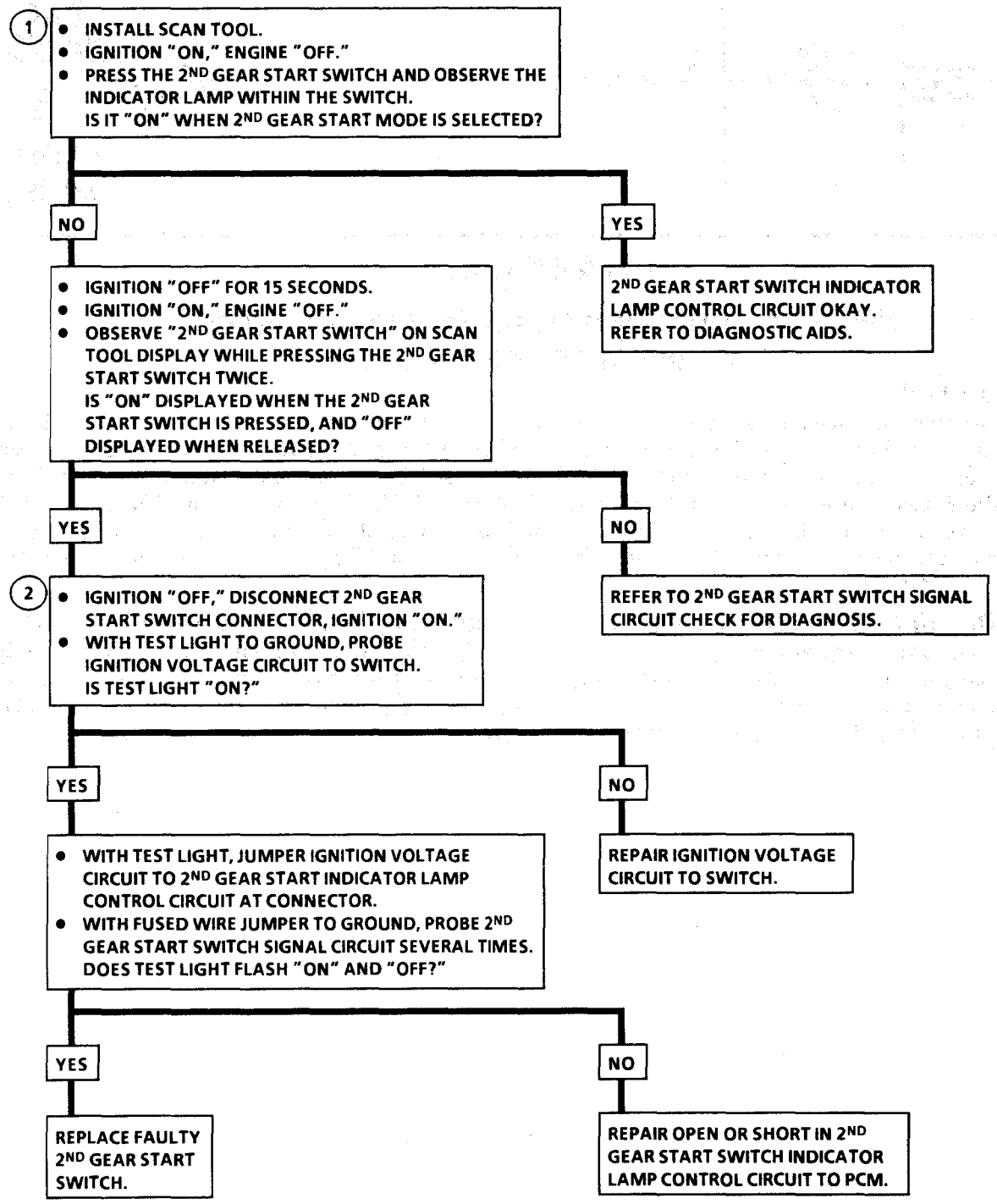
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step checks the entire 2nd gear start switch circuit for a malfunction.
2. At this point, the external circuit is operating correctly.

Diagnostic Aids: If the electrical circuit checks OK and 2nd gear starts are not correct, there may be a mechanical/hydraulic malfunction. Refer to "Automatic Transmission Diagnosis" in SECTION 7A14A.

CHART C-8B

2nd GEAR START SWITCH INDICATOR LAMP CONTROL CIRCUIT CHECK
3.4L (VIN S) "F" CARLINE (SFI)



6-23-93
PS 18647

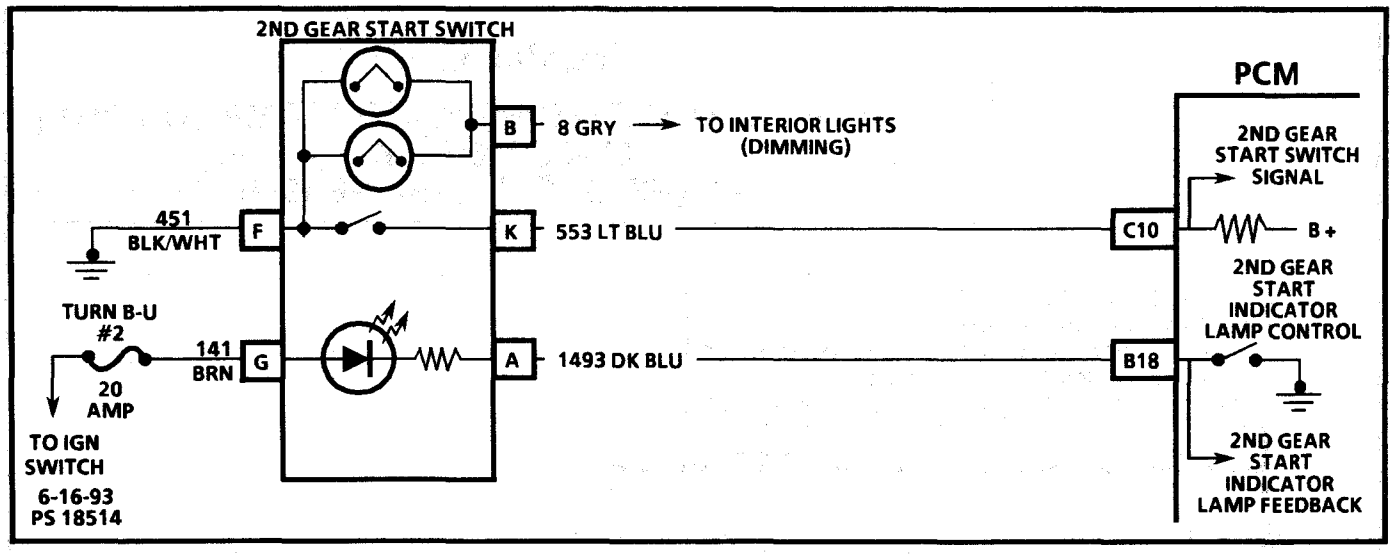


CHART C-8C

2nd GEAR START SWITCH SIGNAL CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The 2nd gear start switch enables the operator to select a 2nd gear start for increased traction. When 2nd gear start is selected, the 2nd gear start switch input signal is momentarily toggled to zero volts. The PCM then turns "ON" the 2nd gear start mode indicator lamp and de-engerizes the 1-2 shift solenoid enabling 2nd gear. During light and medium acceleration conditions the vehicle will start in 2nd gear when selected. However, 2nd gear starts will be overridden and first gear starts will occur if a hard acceleration condition (WOT) is required. Normal 1st gear start mode is obtained by toggling the 2nd gear start switch again, or when the ignition switch is cycled "OFF" then "ON."

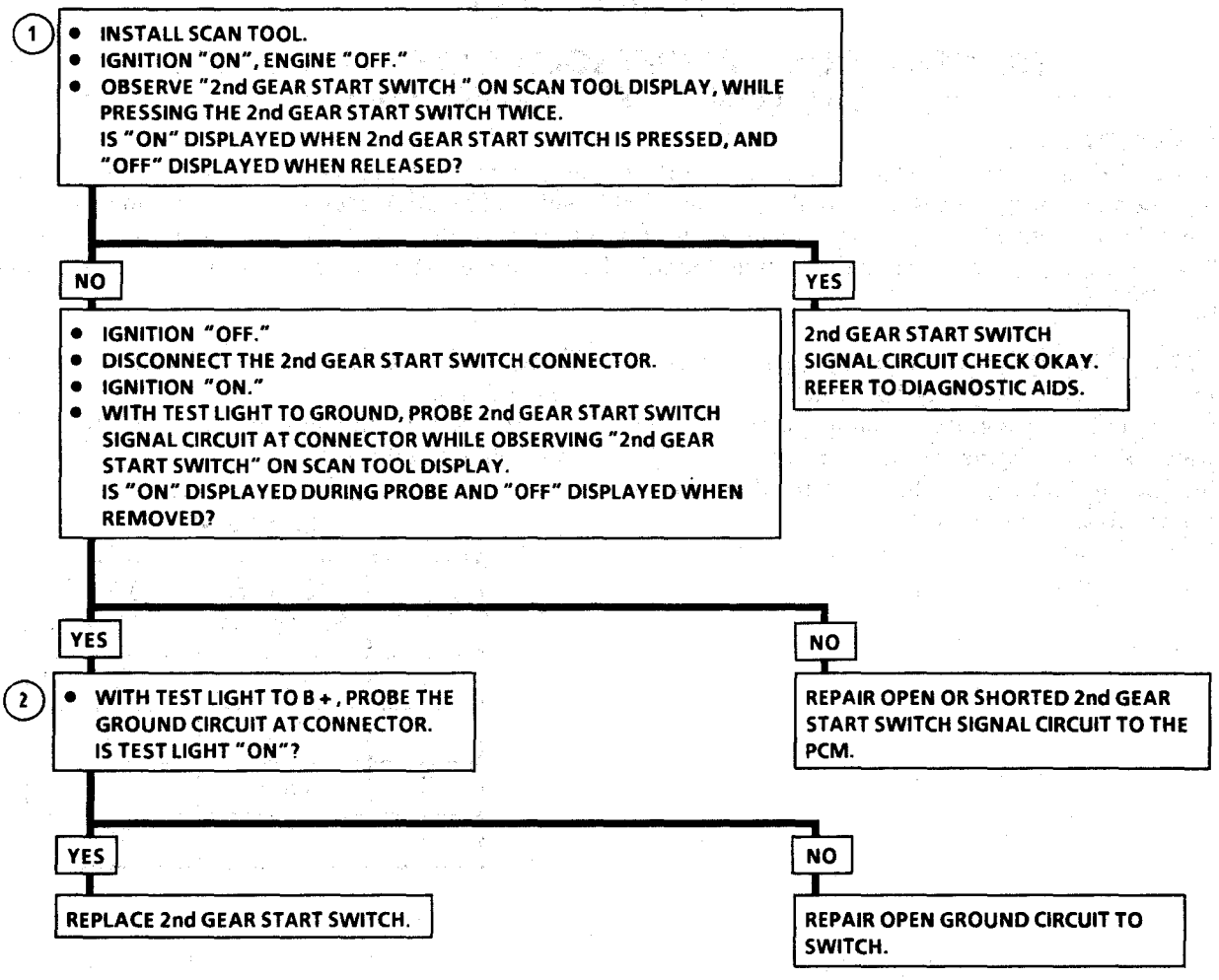
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step checks the entire 2nd gear start switch signal circuit for a malfunction.
2. At this point, the external circuit is operating correctly.

Diagnostic Aids: If the electrical circuit checks OK and 2nd gear starts are not correct, there may be a mechanical/hydraulic malfunction. Refer to "Automatic Transmission Diagnosis" in SECTION 7A14A.

CHART C-8C

2nd GEAR START SWITCH SIGNAL CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)



6-21-93
PS 18648

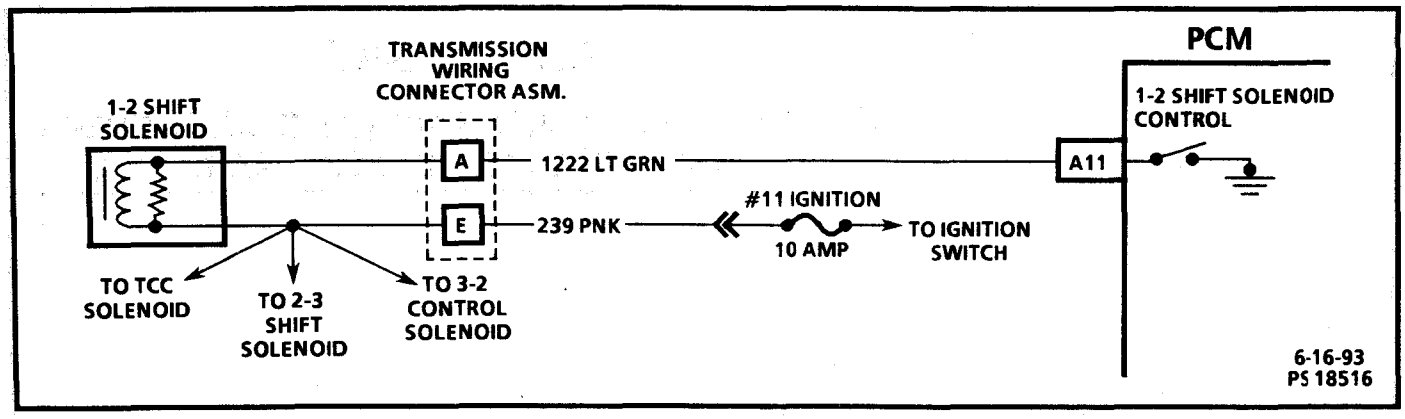


CHART C-8D

TRANSMISSION 1-2 SHIFT SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The 1-2 shift solenoid is used to control fluid flow acting on the 1-2 and 3-4 shift valves. The solenoid is a normally open exhaust valve that is used with the 2-3 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission. Ignition voltage is supplied directly to the 1-2 shift solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 1222.

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

1. This test checks 1-2 shift solenoid and the internal transmission wiring harness for shorts.
2. This test checks for power to 1-2 shift solenoid from the ignition through the fuse.

Diagnostic Aids: Check all connections for the transmission.

An open in the ignition feed circuit can cause multiple DTC(s) to set.

CHART 4L60E		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

CHART C-8D

TRANSMISSION 1-2 SHIFT SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

1
- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON." ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/ 1-2 SOLENOID.
- COMMAND 1-2 SHIFT SOLENOID "ON"/"OFF" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHESCOPE IF NECESSARY).
- DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

2
- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM. (ADDITIONAL DTCs WILL SET.)
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND. IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "A" OF J 39775.
- COMMAND 1-2 SHIFT SOLENOID "ON"/"OFF" THREE TIMES.
- IS TEST LIGHT "ON" WHEN COMMANDED "ON," AND "OFF" WHEN COMMANDED "OFF"?

NO

- CHECK CKT 1222 FOR AN OPEN OR SHORT FROM THE TRANSMISSION EXTERNAL WIRING CONNECTOR TO THE CONTROL MODULE CONNECTOR. IF OKAY, REPLACE PCM.

YES

EXTERNAL TRANSMISSION WIRING CHECK OKAY. REFER TO "INTERNAL WIRING HARNESS CHECK" IN SECTION 7A14A (4L60E) OR 7A17A (4L80E).

YES

ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSTIC AIDS."

NO

REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION. IF THE FUSE IS OPEN, CHECK THE TRANSMISSION INTERNAL WIRING HARNESS OR SOLENOID FOR SHORT TO GROUND.

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

4-13-93
PS 17094

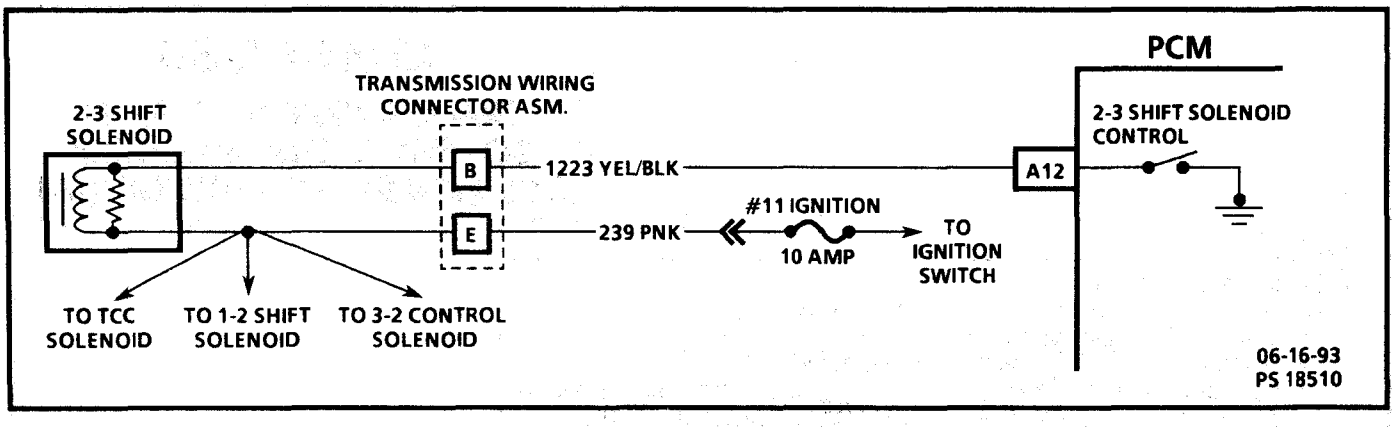


CHART C-8E

TRANSMISSION 2-3 SHIFT SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The 2-3 shift solenoid is used to control fluid flow acting on the 2-3 shift valves. The solenoid is a normally open exhaust valve that is used with the 1-2 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission. Ignition voltage is supplied directly to the 2-3 shift solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 1223.

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

1. This test checks 2-3 shift solenoid and the internal transmission wiring for shorts.
2. This test checks for power to 2-3 shift solenoid from the ignition through the fuse.

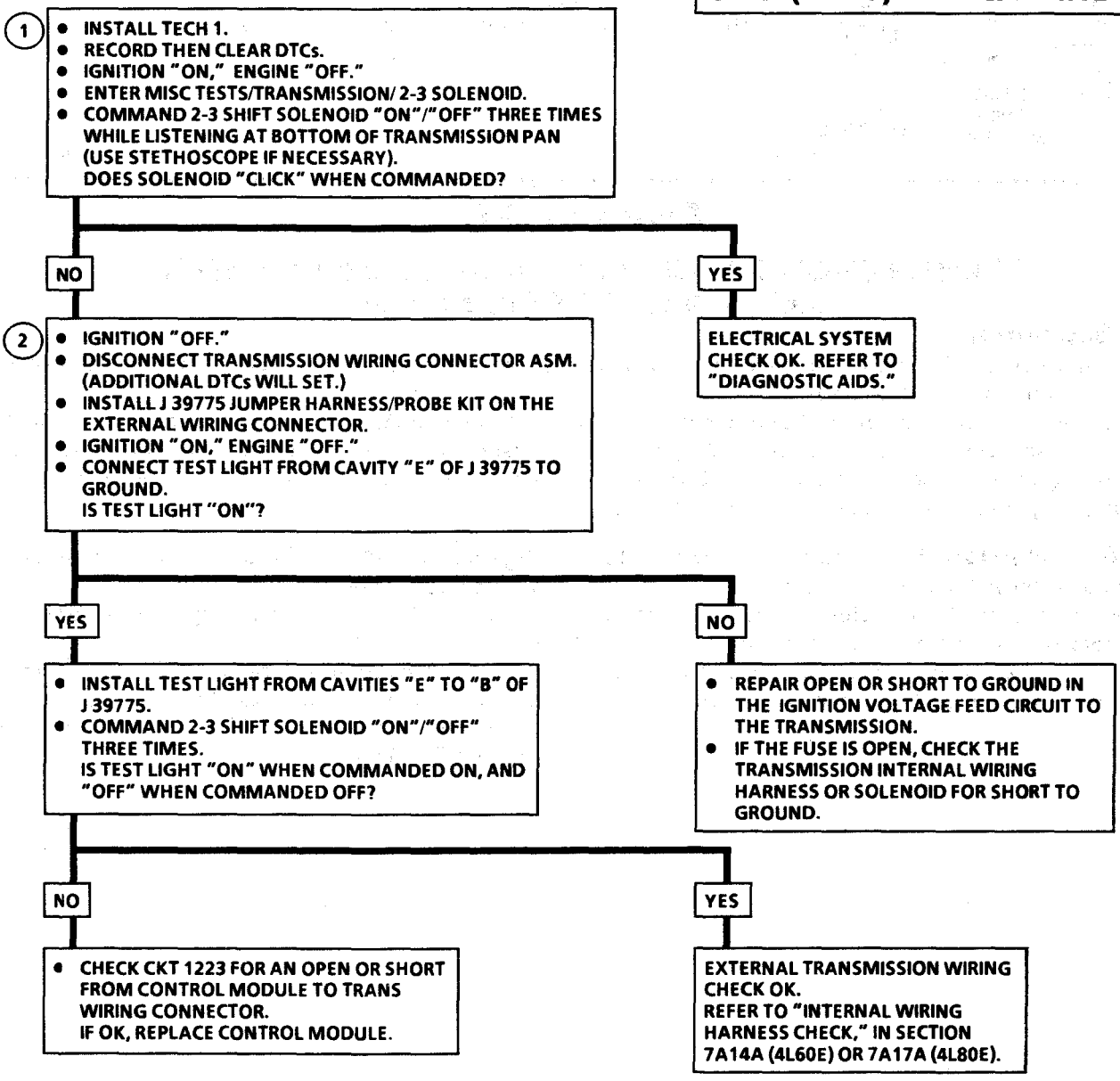
Diagnostic Aids: Check all connections at the transmission.

An open in the ignition feed circuit can cause multiple DTC(s) to set.

CHART 4L60E		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

CHART C-8E

TRANSMISSION 2-3 SHIFT SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)



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

4-13-93
PS 17093

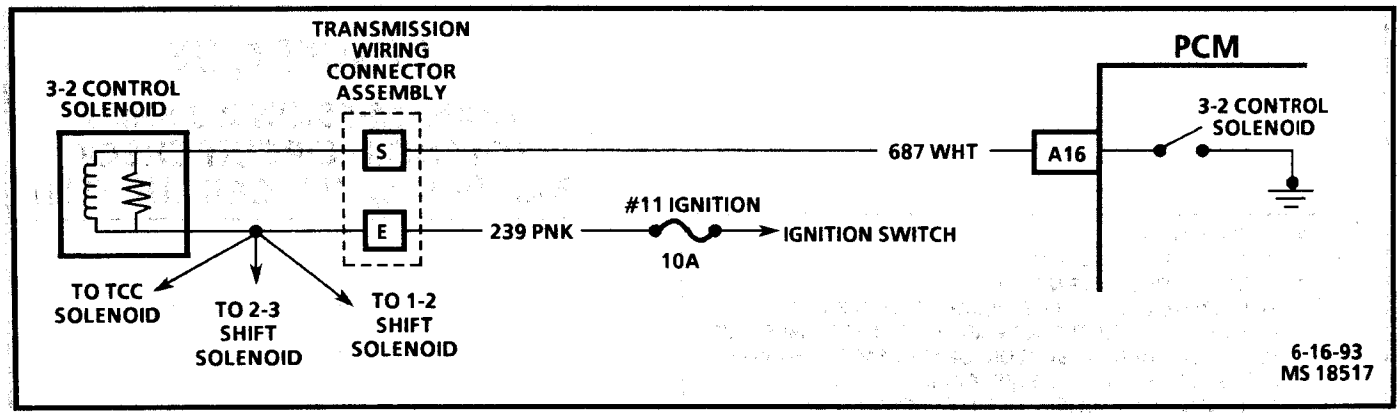


CHART C-8F

TRANSMISSION 3-2 CONTROL SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

Hydraulically, the 3-2 control solenoid coordinates the apply rate of the 2-4 band with the hydraulic release of the 3-4 clutch during a 3-2 downshift.

The PCM continually monitors the 3-2 circuit duty cycle depending on the commanded state of the circuit. When the transmission is in first gear the duty cycle of the solenoid is equal to 0 ("OFF"). When the transmission is in second gear or higher the duty cycle of the solenoid will be about 90% ("ON"). When the transmission downshifts, 3-2, the duty cycle of the solenoid will drop.

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

1. This test checks the function of the 3-2 control solenoid and the internal transmission harness.
2. This test checks for power to the 3-2 control solenoid from the ignition through the fuse.

Diagnostic Aids: Check all connections at the transmission connector.

If OK, refer to "Symptom Diagnosis" in SECTION 7A14A.

The 3-2 control solenoid feedback normally oscillate "ON/OFF" when the duty cycle is applied.

An open in the ignition feed circuit will cause multiple DTC(s) to set.

CHART C-8F

TRANSMISSION 3-2 CONTROL SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

(1)
- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON," ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/ 3-2 SOL.
- COMMAND 3-2 CONTROL SOLENOID "0%/100%" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHOSCOPE IF NECESSARY).
  DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

(2)
- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775-JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND.
  IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "S" OF J 39775.
- COMMAND 3-2 CONTROL SOLENOID "0%/100%" THREE TIMES.
- IS TEST LIGHT "ON" WHEN 3-2 CONTROL SOLENOID IS COMMANDED "ON" TO "100%", AND "OFF" WHEN COMMANDED TO "0%"?

YES

- REMOVE J 39775 FROM THE EXTERNAL WIRING CONNECTOR AND INSTALL IT ON THE TRANSMISSION INTERNAL WIRING CONNECTOR.
- WITH J 39200-DVM MEASURE RESISTANCE ACROSS "E" AND "S" OF J 39775.
  IS RESISTANCE 9-14Ω?

YES

CLEAR DTC(s) AND RETEST.

NO

- REPLACE 3-2 CONTROL SOLENOID OR INTERNAL WIRING HARNESS.
- REFER TO "VALVE BODY" IN "ON-VEHICLE SERVICE" IN SECTION 7A14A FOR REPLACEMENT PROCEDURE.

NO

- CHECK FOR OPEN OR SHORT IN 3-2 CONTROL CIRCUIT.
  IF OK, REPLACE PCM.

NO

REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION.

YES

ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSIS AIDS."

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

4-13-93
MS 13465

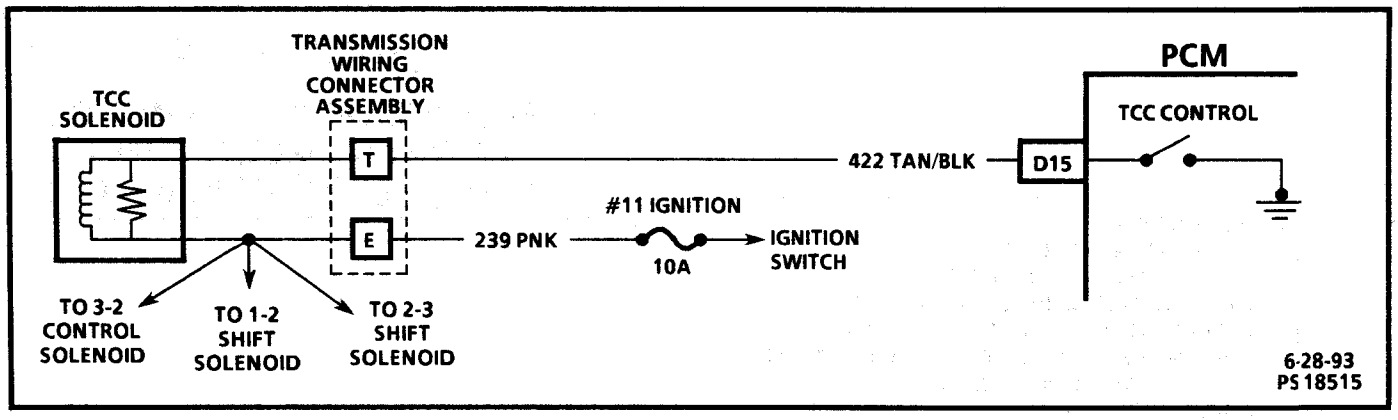


CHART C-8G

TRANSMISSION TCC SOLENOID CIRCUIT CHECK
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The TCC solenoid is an electrical device used to control fluid acting on the TCC converter clutch valve, which then controls TCC apply and release. The PCM monitors TP voltage, vehicle speed and other inputs to determine when to energize the TCC solenoid. Ignition voltage is supplied directly to the TCC solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 422.

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

1. This test checks for a shorted, internal transmission harness or TCC solenoid.
2. This test checks power supply to the TCC solenoid.

Diagnostic Aids: Check all connections at the transmission pass-thru connector.

If OK refer to "Symptom Diagnosis" in SECTION 7A14A.

Some slight TCC slip is normal.

An open in the ignition feed circuit will cause multiple DTC(s) to set.

CHART C-8G

TRANSMISSION TCC SOLENOID CIRCUIT CHECK 3.4L (VIN S) "F" CARLINE (SFI)

(1)
- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON," ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/TCC SOLENOID.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHESCOPE IF NECESSARY).
- DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

(2)
- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM. (ADDITIONAL DTCs WILL SET.)
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND. IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "T" (4L60E) OR "E" TO "S" (4L80E) OF J 39775.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES.
- IS TEST LIGHT "ON" WHEN COMMANDED "ON" AND "OFF" WHEN COMMANDED "OFF"?

NO

- CHECK CKT 422 (4L60E) OR CKT 1350 (4L80E) FOR AN OPEN OR SHORT FROM THE CONTROL MODULE TO THE TRANSMISSION WIRING CONNECTOR. IF OKAY, REPLACE CONTROL MODULE.

YES

EXTERNAL TRANSMISSION WIRING CHECKS OKAY. REFER TO "INTERNAL WIRING HARNESS CHECK" IN SECTION 7A14A (4L60E) OR 7A17A (4L80E).

NO

REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION. IF THE FUSE IS OPEN, CHECK THE TRANSMISSION INTERNAL WIRING HARNESS OR SOLENOID FOR SHORT TO GROUND.

YES

ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSTIC AIDS."

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

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SECTION C10
A/C COMPRESSOR CLUTCH CONTROL

CONTENTS

General Description C10-1
Operation C10-1
Diagnosis C10-1
On-Vehicle Service C10-1
A/C Relay C10-1

GENERAL DESCRIPTION

In order to improve engine operation, and protect the A/C compressor and clutch during Wide Open Throttle (WOT) performance, the A/C compressor operation is controlled by the PCM.

OPERATION

The A/C electrical system consists of an A/C control head, A/C refrigerant low pressure cutoff switch, an A/C refrigerant pressure sensor, an evaporator temperature sensor, a control relay, the compressor clutch, and the PCM.

When A/C is selected "ON" through the A/C control head, a 12 volt signal is supplied to the A/C request input of the PCM. The PCM will poll the A/C refrigerant pressure sensor and A/C evaporator temperature sensor before enabling the compressor clutch control relay. If either switch detects a pressure or temperature variation above or below a calibrated acceptable range, the clutch relay will not be enabled. When the PCM determines that the system temperature and pressure are within acceptable ranges, the A/C compressor clutch relay will be enabled, allowing voltage to be applied to the A/C clutch and A/C status input of the PCM. The A/C status input informs the PCM that the relay has closed and voltage is applied to the clutch, via the A/C compressor low pressure cutoff switch. The A/C compressor low pressure cutoff switch is closed when there is sufficient system pressure (depending on refrigerant charge and ambient temperature). The PCM will also turn the cooling fan "ON" when A/C is requested. Refer to "Cooling Fan Control," Section "6E3-C12" for more information on cooling fan operation. A/C is controlled by the PCM so that the PCM can increase idle speed before turning "ON" the clutch or disable the clutch during WOT or high coolant temperatures.

DIAGNOSIS

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

- Wide Open Throttle (WOT).
- A/C head pressure greater than 492 psi or less than 1 psi (as determined by the A/C refrigerant pressure sensor).
- Evaporator temperature sensor less than 1°C (33°F).
- Low ignition voltage.
- IAT greater than 151°C (304°F).
- Engine speed greater than 5200 RPM.
- ECT greater than 124°C (255°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 monitor the A/C request input to the PCM, A/C status, A/C system pressure, as well as displaying when the PCM has commanded the A/C clutch "ON."

ON-VEHICLE SERVICE

A/C RELAY

Remove or Disconnect

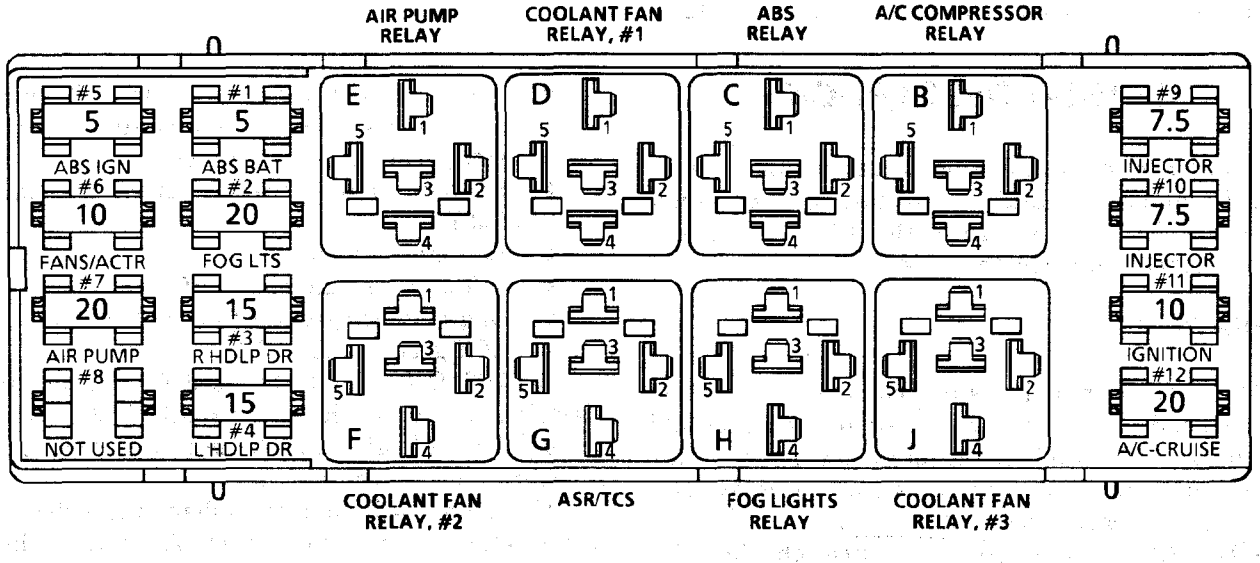
1. Negative battery cable.
2. Cover from underhood electrical center.
3. Relay from underhood electrical center.

Install or Connect

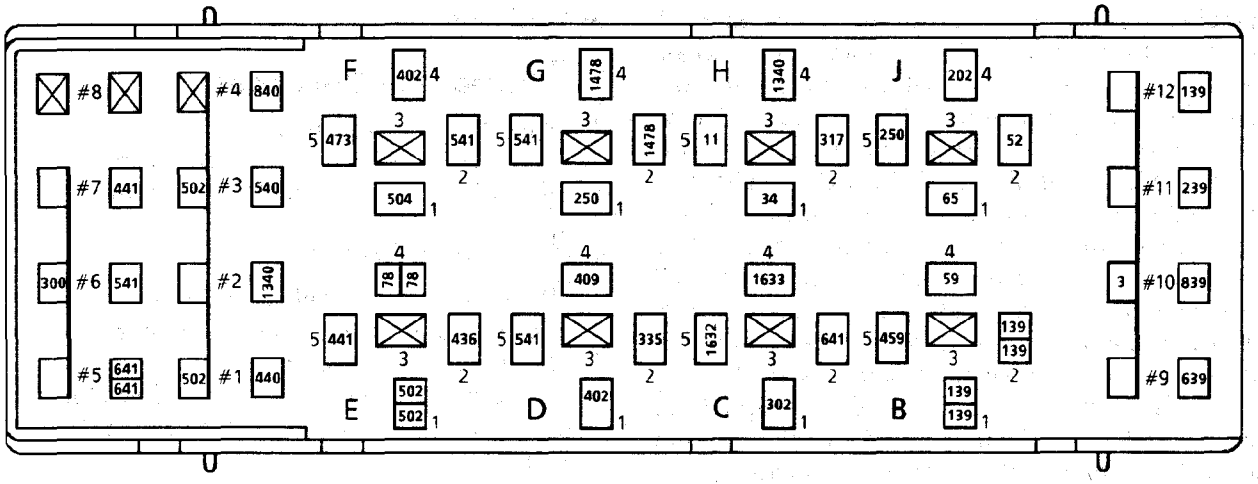
1. Relay to underhood electrical center.
2. Cover to underhood electrical center.
3. Negative battery cable.

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

UNDERHOOD ELECTRICAL CENTER



TOP VIEW



BACK VIEW

NS 15595

Figure C10-1 - A/C Clutch Control Relay Location

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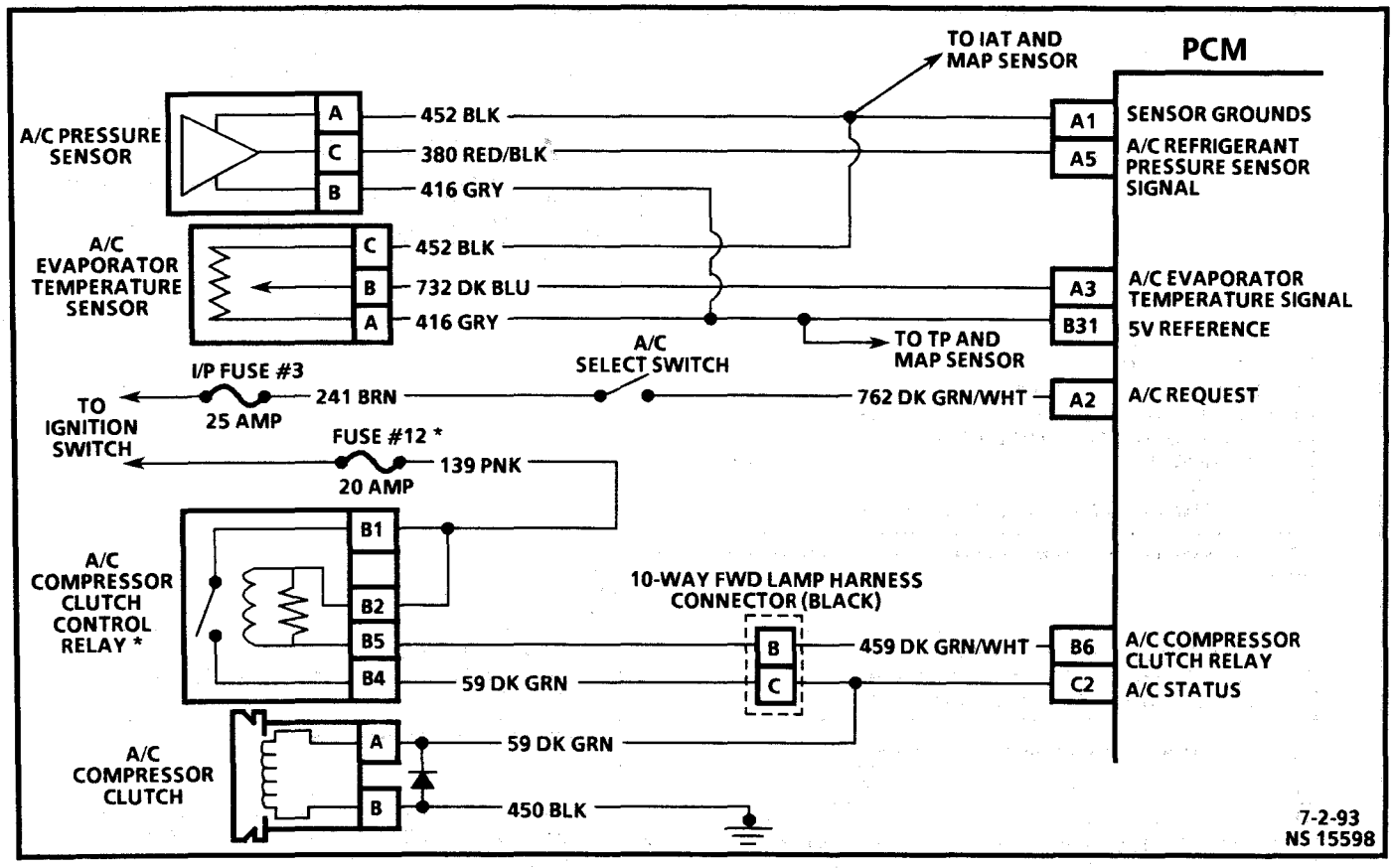


CHART C-10

(Page 1 of 2)

A/C COMPRESSOR CLUTCH CONTROL CIRCUIT DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The A/C compressor clutch control relay is PCM controlled to delay A/C clutch engagement after the A/C is turned "ON." This allows the PCM to adjust engine RPM before the A/C compressor clutch engages.

The PCM will engage the A/C clutch anytime A/C has been requested unless any of the following conditions exist:

- High coolant temperature.
- High engine RPM.
- Low system pressure.
- Wide open throttle.
- High A/C system pressure.
- Any A/C DTC set.

The PCM determines A/C has been requested by receiving a voltage signal from the A/C control head. When the A/C control switch closes, the A/C request input has 12 volts applied to it. This is shown on the Tech 1 as A/C request "YES." A 3-wire A/C refrigerant pressure sensor is used to monitor A/C system pressure. If the A/C refrigerant pressure is greater than 430 psi or lower than 0 psi, the A/C clutch will not engage.

A faulty A/C refrigerant pressure sensor will set a DTC 66 or 67. If the A/C refrigerant pressure sensor signal wire becomes open or shorted to ground, DTC 66 will set. If the signal circuit is shorted to voltage, a DTC 70 will set. If the A/C clutch engages and no pressure change is detected, a DTC 67 will set.

When a request for A/C has been detected by the PCM, the PCM will ground the A/C compressor clutch control relay drive circuit, the relay contacts will close, and current will flow through the relay to the A/C compressor clutch.

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

1. Checks the PCM's ability to control the A/C clutch control relay.
2. Checks for grounded CKT 459 to PCM.

Diagnostic Aids: Before using CHART C-10, be sure no DTC(s) are stored. The PCM will not energize the A/C compressor clutch with a stored DTC.

CHART C-10

(Page 1 of 2)

A/C COMPRESSOR CLUTCH CONTROL CIRCUIT DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

- CHECK "A/C" FUSES.
- ENGINE AT NORMAL OPERATING TEMPERATURE.
- CORRECT ANY DIAGNOSTIC TROUBLE CODES.
- A/C REFRIGERANT PRESSURE NORMAL.
- ENGINE IDLING.
- A/C "OFF."

IS A/C CLUTCH MECHANICALLY ENGAGED?

NO

(1)

- WITH ENGINE IDLING AT NORMAL OPERATING TEMPERATURE, TURN A/C "ON" AND "OFF." DOES A/C CLUTCH CYCLE "ON" AND "OFF"?

NO

- PLACE A/C SELECT IN A/C MODE.
- TECH 1 SHOULD DISPLAY A/C REQUEST "YES." DOES IT?

NO

- IS I/P FUSE #3 (25 AMP) OPEN.

YES

- CHECK FOR SHORT TO GROUND IN CKT 241 OR 762.

YES

REFER TO CHART C-10. PAGE 2 OF 2.

NO

CHECK FOR OPEN CKT 762 OR 241 OR FAULTY AC SELECT SWITCH OR FAULTY PCM CONNECTION OR FAULTY PCM.

YES

NO TROUBLE FOUND. A/C CLUTCH CIRCUIT OK.

YES

- ENGINE STILL RUNNING.
- TECH 1 SHOULD DISPLAY A/C REQUEST "NO." DOES IT?

YES

(2)

- DISCONNECT A/C RELAY.
- PROBE CKT 459 WITH A TEST LIGHT TO B+. IS TEST LIGHT "ON"?

NO

- PROBE CKT 59 WITH A TEST LIGHT TO GROUND. IS TEST LIGHT "ON"?

YES

CKT 59 SHORTED TO VOLTAGE.

NO

FAULTY A/C RELAY.

NO

CKT 762 SHORTED TO VOLTAGE OR FAULTY A/C CONTROL HEAD.

YES

CKT 459 SHORTED TO GROUND OR FAULTY PCM.

6-17-93
NS 16213

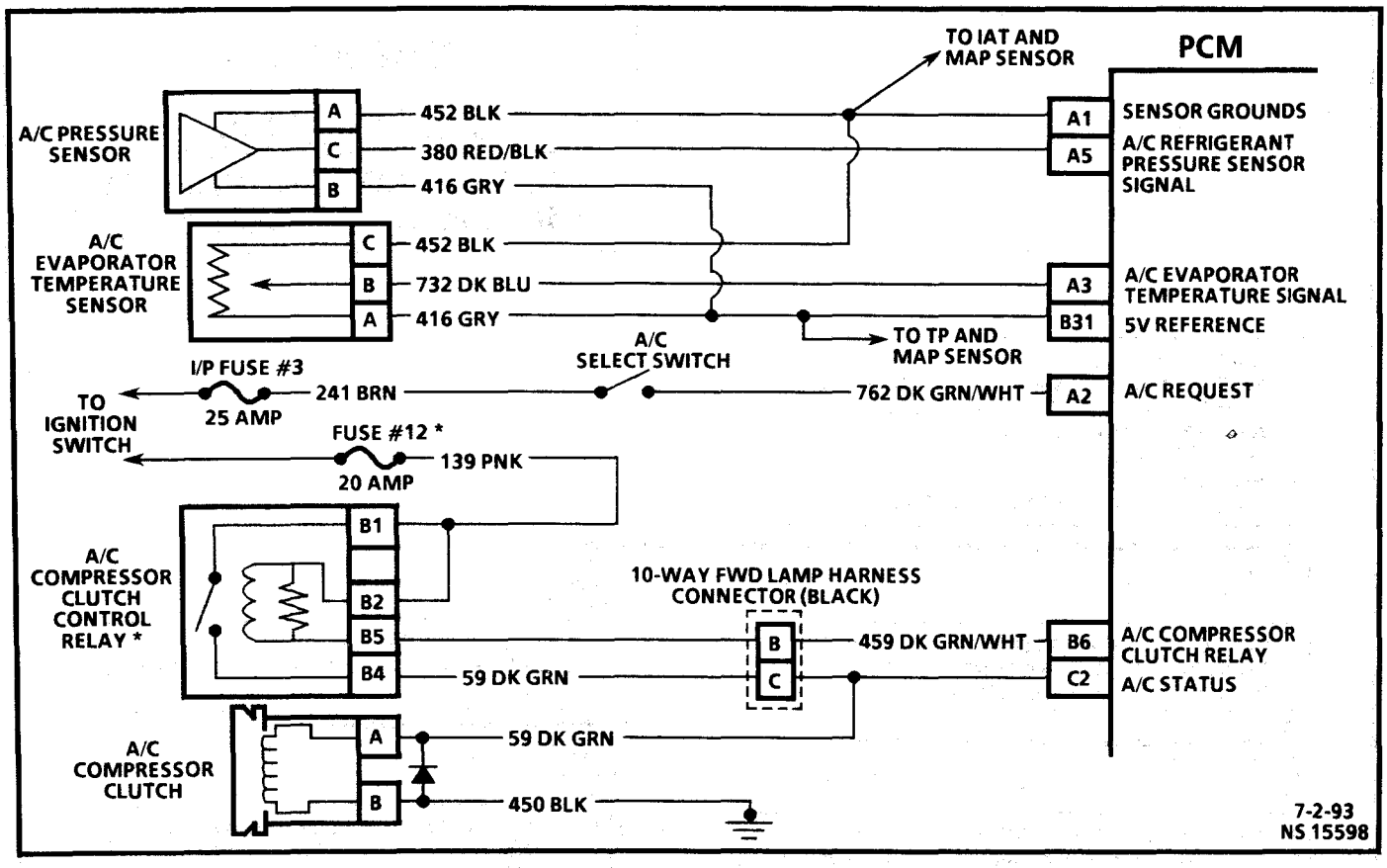


CHART C-10

(Page 2 of 2)
A/C COMPRESSOR CLUTCH CONTROL CIRCUIT DIAGNOSIS
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The A/C clutch control relay is PCM controlled to delay A/C clutch engagement after the A/C is turned "ON." This allows the PCM to adjust engine RPM before the A/C clutch engages.

The PCM will engage the A/C clutch anytime A/C has been requested unless any of the following conditions exist:

- High coolant temperature.
- High engine RPM.
- Low system pressure.
- Wide open throttle.
- High A/C system pressure.
- Any A/C DTC set.

The PCM can determine A/C has been requested by a voltage signal received from the A/C control head. When the A/C select switch closes, the A/C request voltage signal is applied to the PCM A/C request input. This is shown on the Tech 1 as A/C request "ON." A 3-wire A/C refrigerant pressure sensor is used to monitor A/C system pressure. If the A/C refrigerant pressure is greater than 430 psi or lower than 0 psi, the A/C clutch will not engage.

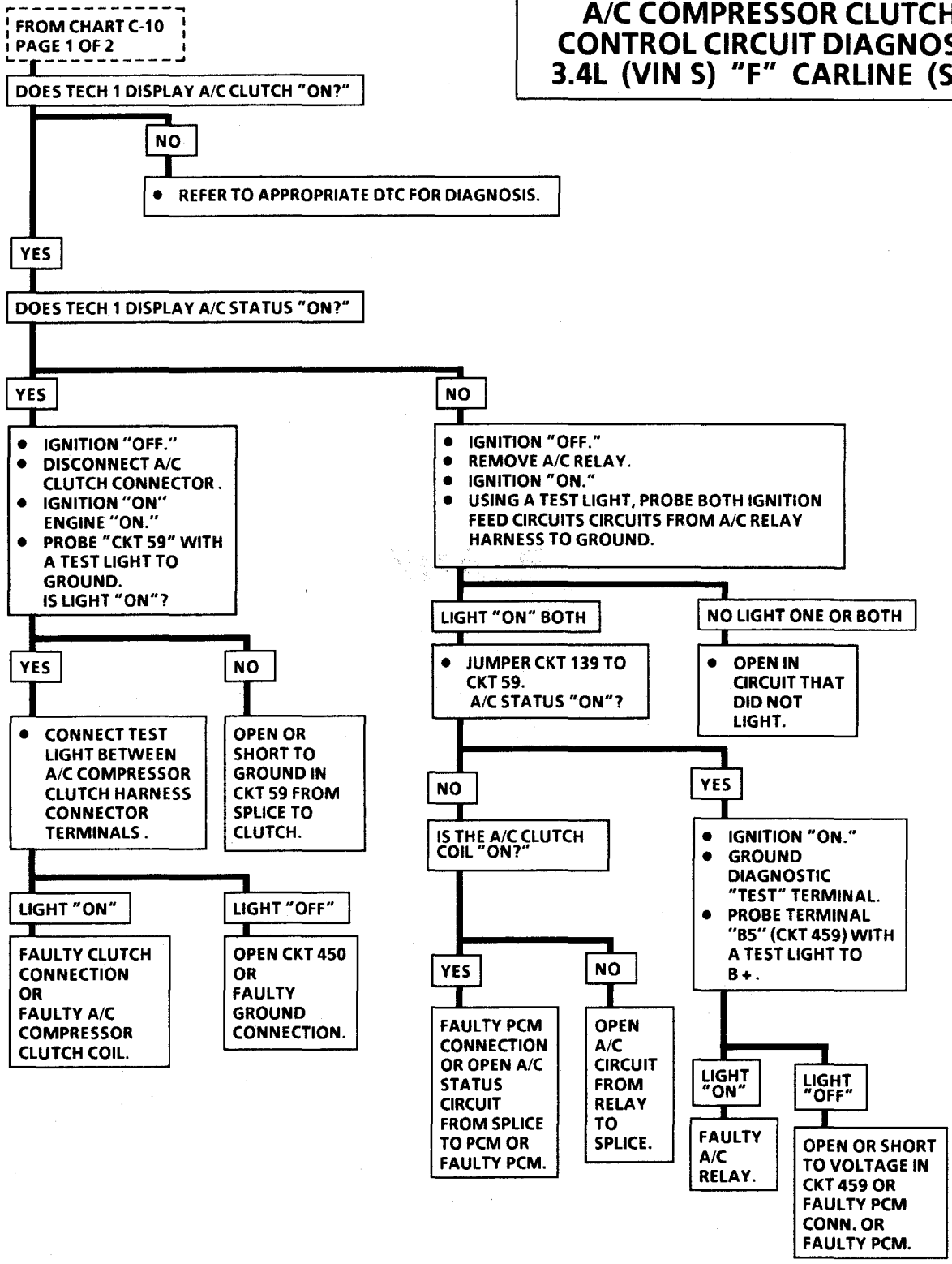
The A/C refrigerant pressure sensor uses DTCs 66, 67 and 70 to indicate sensor or sensor circuit malfunctions. If the A/C refrigerant pressure sensor signal wire becomes open or shorted to ground, DTC 66 will set. If the signal line is shorted to voltage a DTC 70 is set. If the A/C clutch engages and no pressure change is detected, a DTC 67 will set.

When a request for A/C has been detected by the PCM, the PCM will ground the A/C clutch control relay drive circuit, the relay contacts will close, and current will flow through the relay to the A/C compressor clutch via the A/C compressor low pressure cutoff switch.

CHART C-10

(Page 2 of 2)

A/C COMPRESSOR CLUTCH CONTROL CIRCUIT DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)



6-18-93
NS 16214

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SECTION C12
COOLING FAN CONTROL

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General Description C12-1
Operation C12-1
Diagnosis C12-1
On-Vehicle Service C12-1

GENERAL DESCRIPTION

This vehicle utilizes an electric cooling fan for engine and A/C condenser cooling. The fan operates under certain conditions as outlined below.

OPERATION

The engine coolant fan is controlled by the PCM via the coolant fan relay. A calibrated set of criteria programmed into the PCM will energize the fan relay. The following conditions control the fan:

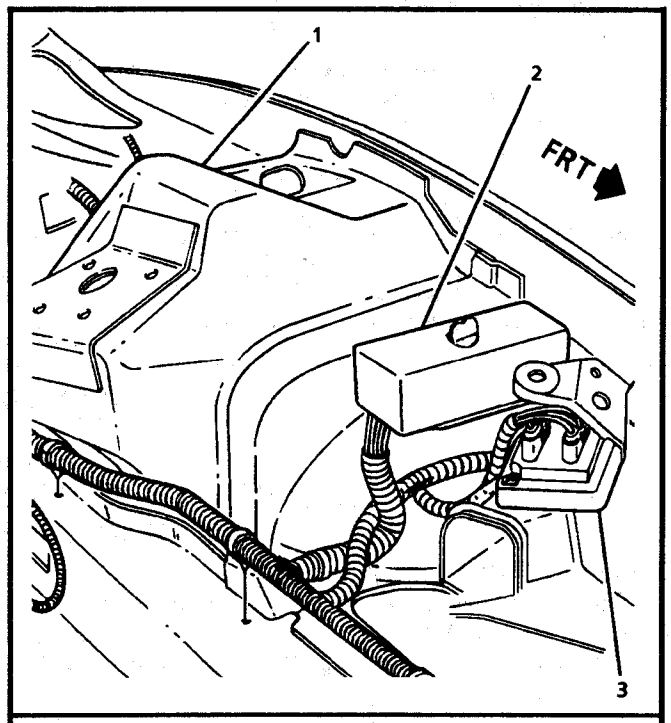
- Engine Coolant Temperature (ECT) sensor signal indicating 109°C (228°F) or greater will turn the coolant fan "ON."
- Engine Coolant Temperature (ECT) sensor signal indicating 98°C or less will turn the fan "OFF."
- The fan will turn "ON" if A/C is requested and vehicle speed is less than 56 km/h (35 mph).
- If vehicle speed is greater than 113 km/h (70 mph) the fan is disabled and will not turn "ON."
- If A/C is requested and refrigerant pressure sensor indicates approximately 20 psi or greater the fan is turned "ON."
- When the PCM is operating in backup the fan will be "ON."
- When any A/C DTC is set the fan will be "ON."

DIAGNOSIS

The following C-12 circuits charts will diagnose the PCM controlled cooling fans.

ON-VEHICLE SERVICE

Cooling system component replacement can be found in SECTION 6B.



1 LEFT SIDE WHEELHOUSE
2 RELAY CENTER
3 HEADLAMP ACTUATOR MODULE

NS 15935

Figure C12-1 - Cooling Fan Relay

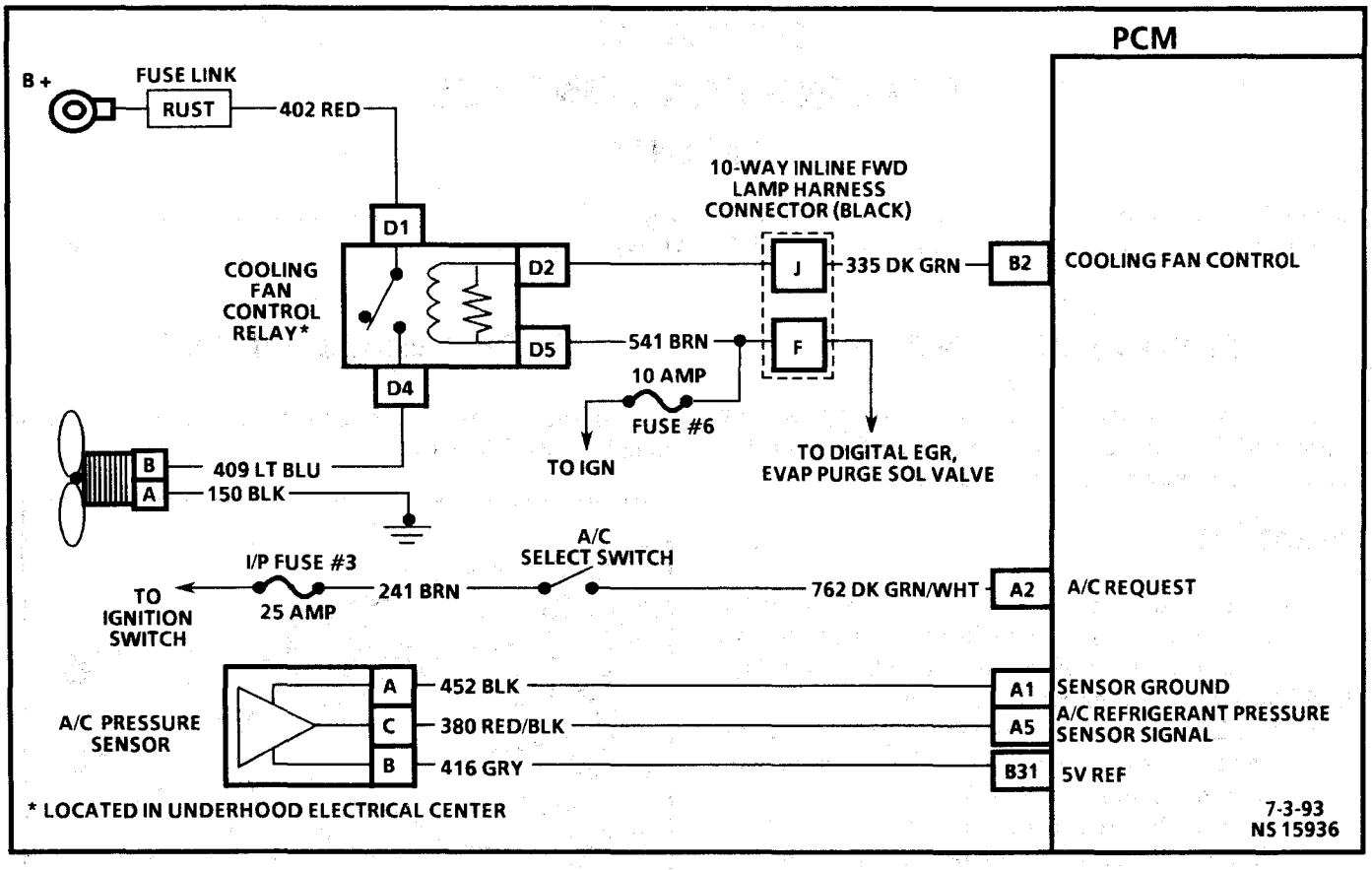


CHART C-12

(Page 1 of 2)
COOLING FAN CONTROL CIRCUIT DIAGNOSIS
3.4L (VIN S) "F" CARLINE (SFI)

Circuit Description:

The electric cooling fan is controlled by the PCM, based on inputs from the Engine Coolant Temperature (ECT) sensor, the A/C control switches, vehicle speed, and state of the A/C refrigerant pressure sensor. The PCM controls the fan by grounding CKT 335 which energizes the fan control relay. Battery voltage is then supplied to the fan motor.

The PCM grounds CKT 335 when engine coolant temperature is over about 109°C (228°F), or when A/C has been requested and the A/C refrigerant pressure is about 1655 kPa (240 psi). Once the PCM turns the relay "ON," it will keep it "ON" for a minimum of 30 seconds, or until vehicle speed exceeds 113 km/h (70 mph).

Also, if DTC 14 or 15 sets or the PCM is in backup, the primary fan will run at all time.

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

1. With the diagnostic terminal grounded, the cooling fan control driver(s) will close, which should energize the fan control relay(s).
2. If the A/C pressure is above 240 psi (1655 kPa) or circuit is open, the fan would run whenever A/C is requested.
3. With A/C clutch engaged and the A/C refrigerant pressure sensor is functioning properly, the fan should come "ON" when pressure exceeds about 20 psi. Under very cold ambient conditions, the fan will remain "OFF." This signal should cause the PCM to energize the cooling fan control relay.
4. This will determine if the A/C refrigerant pressure sensor is faulty or if the PCM or circuitry is faulty.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boilover, a hot light or temp. gage indicated over heating.

If the gage or light indicates overheating, but no boilover is detected, the gage circuit should be checked.

CHART C-12

(Page 1 of 2)

COOLING FAN CONTROL CIRCUIT DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

- ENGINE COOLANT TEMPERATURE SENSOR INDICATING LESS THAN 98°C (208°F).
- IGNITION "ON," ENGINE "OFF," A/C "OFF."
- COOLING FAN SHOULD BE "OFF."
  IS IT?

YES

1. • GROUND DIAGNOSTIC TEST TERMINAL, OR SELECT COOLING FAN "OUTPUT" TEST ON TECH 1. FAN SHOULD TURN "ON."
   DOES IT?

YES

- UNGROUND DIAGNOSTIC TEST TERMINAL OR EXIT OUTPUT TEST.
- START AND IDLE ENGINE.
- A/C "OFF."
- FAN SHOULD BE "OFF" WHILE TEMPERATURE IS UNDER 98°C (208°F)].
  IS IT?

FAN "OFF"

WITHOUT A/C

NO TROUBLE FOUND. REFER TO "DIAGNOSTIC AIDS" OF FACING PAGE.

WITH A/C

2. • ENGINE IDLING, A/C "OFF."
   • USE A TECH 1 SCAN TOOL AND CHECK A/C REFRIGERANT PRESSURE SENSOR.
   DOES TECH 1 SCAN TOOL DISPLAY PRESSURE GREATER THAN 240 psi (1655 kPa)?

NO

3. • ENGINE IDLING, A/C "ON."
   IF A/C IS INOPERATIVE SEE CHART C-10.
   FAN SHOULD TURN "ON" WHEN A/C IS REQUESTED AND HEAD PRESSURE EXCEEDS ABOUT 20 psi.

YES

NO

- DISCONNECT A/C REFRIGERANT PRESSURE SENSOR.
- MEASURE VOLTAGE BETWEEN CONNECTOR TERMINAL "B" AND "A". VOLTMETER SHOULD DISPLAY ABOUT 5 VOLTS.
  DOES IT?

YES

- MEASURE VOLTAGE BETWEEN CONNECTOR TERMINAL "B" AND "C." VOLTMETER SHOULD READ 5 VOLTS.
  DOES IT?

YES

FAULTY SENSOR.

NO

CKT 380 OPEN OR SHORTED TO GROUND OR FAULTY PCM CONNECTION OR PCM.

NO

- MEASURE VOLTAGE BETWEEN CONNECTOR TERMINAL "B" AND GROUND. VOLTMETER SHOULD DISPLAY ABOUT 5 VOLTS.
  DOES IT?

YES

CKT 452 OPEN OR FAULTY PCM CONNECTION OR PCM.

NO

CKT 416 OPEN OR SHORTED TO GROUND OR FAULTY PCM CONNECTION OR PCM.

YES

4. • DISCONNECT A/C REFRIGERANT PRESSURE SENSOR.
   DOES SCAN INDICATE ZERO A/C PRESSURE?

YES

OPEN CKT 452 OR FAULTY SENSOR CONNECTOR OR FAULTY SENSOR.

NO

CKT 380 SHORTED TO VOLTAGE OR FAULTY PCM.

NO

REFER TO CHART C-12 (2 OF 2)

NO

- REMOVE COOLING FAN CONTROL RELAY. FAN SHOULD STOP.
  DOES IT?

YES

PROBE CKT 335 WITH A TEST LIGHT TO 12 VOLTS.

LIGHT "ON"

CKT 335 SHORTED TO GROUND OR FAULTY PCM.

LIGHT "OFF"

FAULTY RELAY.

NO

CKT 409 SHORTED TO VOLTAGE.

FAN "ON"

FAULTY CALIBRATION OR PCM.

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NS 16220

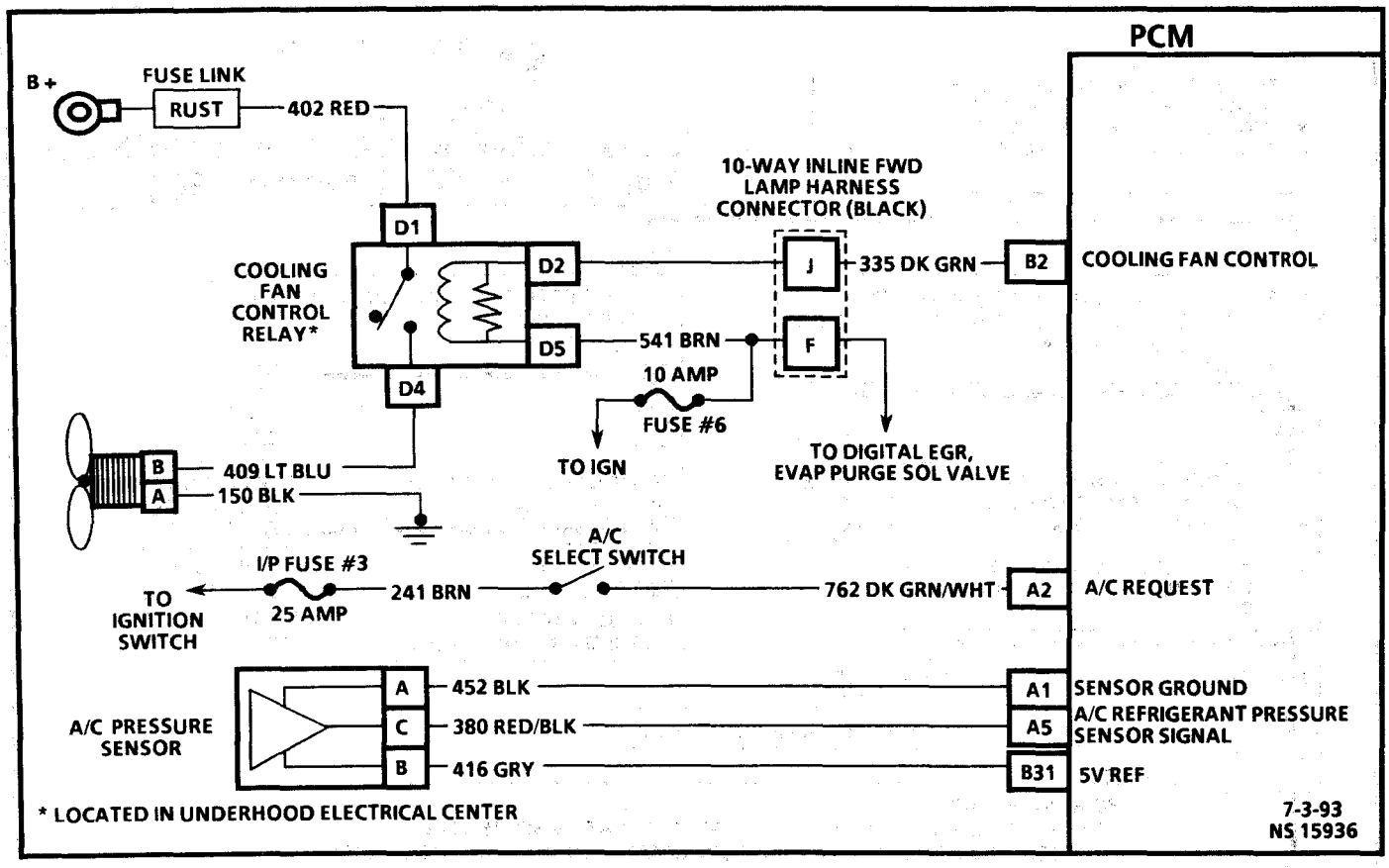


CHART C-12

(Page 2 of 2)
COOLING FAN CONTROL CIRCUIT DIAGNOSIS
3.4L (VIN S) "F" CARLINE (SFI)

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

1. 12 volts should be available to CKT 541 and CKT 402 of the relay when the ignition is "ON."
2. This test checks the ability of the PCM to ground CKT 335. The Malfunction Indicator Lamp (MIL) "Service Engine Soon" should also be flashing at this point. If it isn't flashing, refer to CHART A-2.
3. If the fan does not turn "ON" at this point, CKT 409 or CKT 150 is open, or the cooling fan motor is faulty.

CHART C-12

(Page 2 of 2)

COOLING FAN CONTROL CIRCUIT DIAGNOSIS 3.4L (VIN S) "F" CARLINE (SFI)

FROM CHART C-12 (1 OF 2)

1. • REMOVE COOLING FAN CONTROL RELAY.
   • IGNITION "ON," ENGINE "OFF."
   • PROBE UNDERHOOD ELECTRICAL CENTER CAVITIES "D1" AND "D5" WITH A TEST LIGHT CONNECTED TO GROUND.

- LIGHT "ON" BOTH
- LIGHT "OFF" ONE OR BOTH — REPAIR OPEN OR SHORT TO GROUND IN CIRCUIT THAT DID NOT LIGHT.

2. • DIAGNOSTIC TEST TERMINAL GROUNDED.
   • PROBE CKT 335 WITH A TEST LIGHT CONNECTED TO 12 VOLTS.

- LIGHT "ON"
- LIGHT "OFF" — OPEN OR SHORT TO VOLTAGE IN CKT 335, OR FAULTY CONNECTION AT PCM OR A FAULTY PCM.

3. • JUMPER CAVITIES "D1" AND "D4" TOGETHER USING A FUSED JUMPER.
   • FAN SHOULD RUN. DOES IT?

- NO — WITH CAVITIES STILL JUMPERED, AS ABOVE, CONNECT A TEST LIGHT ACROSS THE COOLING FAN MOTOR HARNESS CONNECTOR "A" AND "B" TERMINALS.
- YES — FAULTY RELAY OR RELAY CONNECTION.

- LIGHT "OFF" — PROBE CKT 409 ON COOLING FAN MOTOR HARNESS CONNECTOR WITH A TEST LIGHT CONNECTED TO GROUND.
- LIGHT "ON" — FAULTY MOTOR.

- LIGHT "ON" — OPEN IN GROUND CKT 150.
- LIGHT "OFF" — REPAIR OPEN IN CKT 409 BETWEEN RELAY AND COOLING FAN MOTOR.

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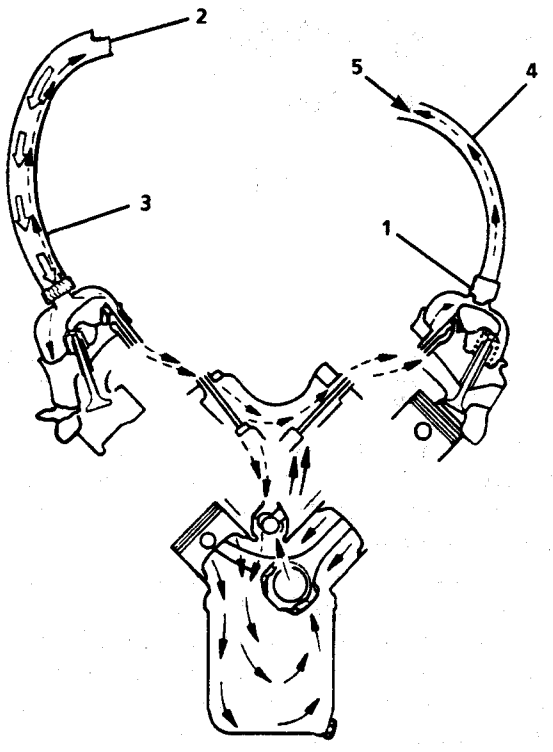
SECTION C13
CRANKCASE VENTILATION SYSTEM

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Operation C13-1
Results of Incorrect Operation C13-1
Diagnosis C13-2
Functional Check of Crankcase Ventilation Valve C13-2
On-Vehicle Service C13-2

GENERAL DESCRIPTION

A crankcase ventilation system is used to provide scavenging of crankcase vapors. Fresh air from the air cleaner is supplied to the crankcase, mixed with blow-by gases and then passed through a crankcase ventilation valve into the intake manifold (Figure C13-1).



1 CRANKCASE VENTILATION VALVE
2 TO THROTTLE BODY
3 CRANKCASE VENT HOSE
4 CRANKCASE VENTILATION VALVE HOSE
5 TO INTAKE MANIFOLD

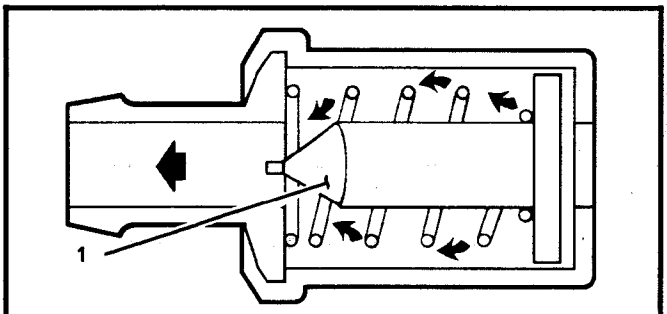
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Figure C13-1 - Crankcase Ventilation Flow (Typical)

OPERATION

The primary control is through the crankcase ventilation valve (Figure C13-2) which meters the flow at a rate depending on manifold vacuum.

To maintain idle quality, this valve restricts the flow when intake manifold vacuum is high. If abnormal operating conditions arise, the system is designed to allow excessive amounts of blow-by gases to back flow through the crankcase vent tube into the air inlet duct to be consumed by normal combustion.



1 CHECK VALVE

4S 0068-6E

Figure C13-2 - Crankcase Ventilation Valve Cross Section

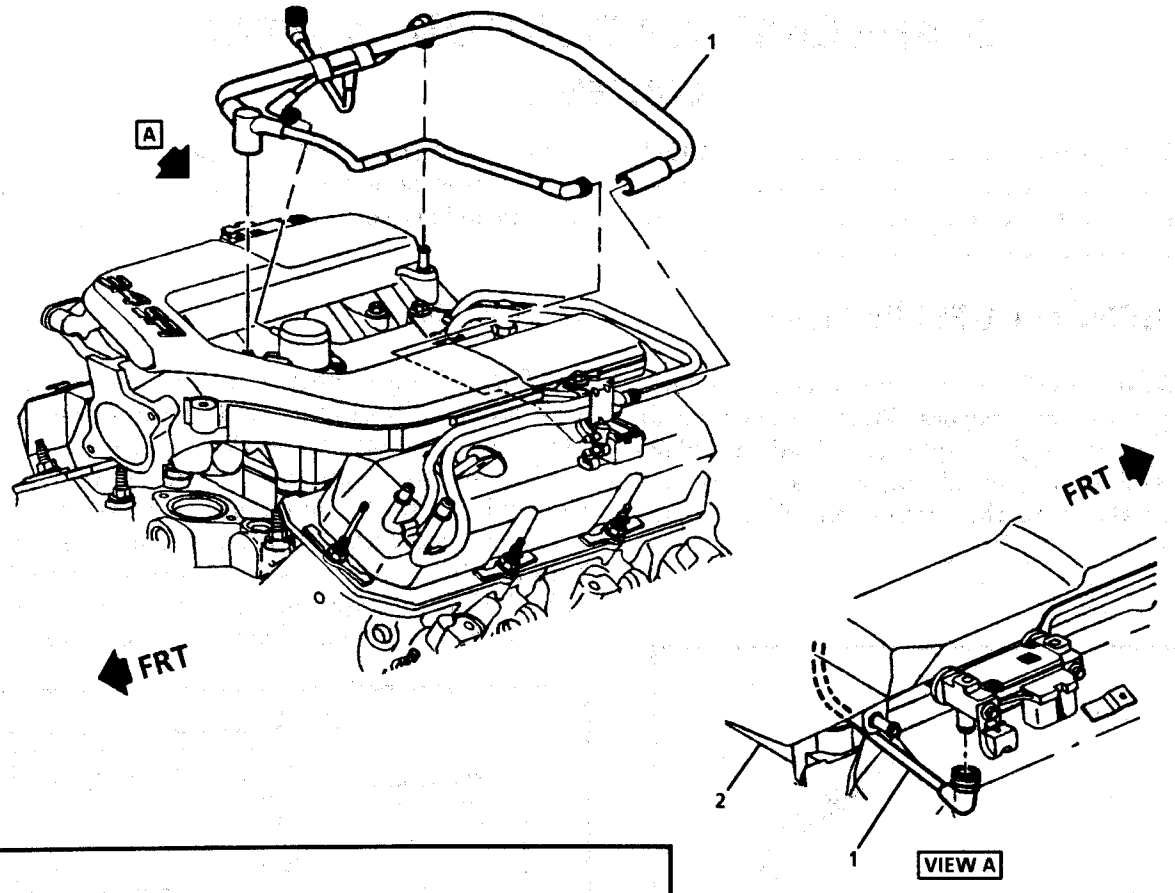
RESULTS OF INCORRECT OPERATION

A plugged valve or hose may cause:

- Rough idle.
- Stalling or slow idle speed.
- Oil leaks.
- Oil in throttle body or plenum.
- Sludge in engine.

A leaking valve or hose would cause:

- Rough idle.
- Stalling.
- High idle speed.



1 CRANKCASE VENTILATION VALVE HARNESS ASSEMBLY

2 UPPER INTAKE MANIFOLD

NS 15884

Figure C13-3 - Crankcase Ventilation System Service

DIAGNOSIS

FUNCTIONAL CHECK OF CRANKCASE VENTILATION VALVE

If an engine is idling rough, check for a clogged crankcase ventilation valve or plugged hose. Check valve part number to be sure the correct valve is installed. Replace as required. Use the following procedure:

1. Remove valve from rocker arm cover.
2. Run the engine at idle.
3. Place your thumb over end of valve to check for vacuum. If there is no vacuum at the valve, check for plugged hoses, manifold port or valve. Replace plugged or deteriorated hoses.
4. Turn "OFF" the engine and remove valve. Shake valve and listen for the rattle of check needle inside the valve. If valve does not rattle, replace valve.

With this system, any blow-by in excess of the system capacity (from a badly-worn engine, sustained heavy load, etc.) is exhausted into the inlet duct and is drawn into the engine.

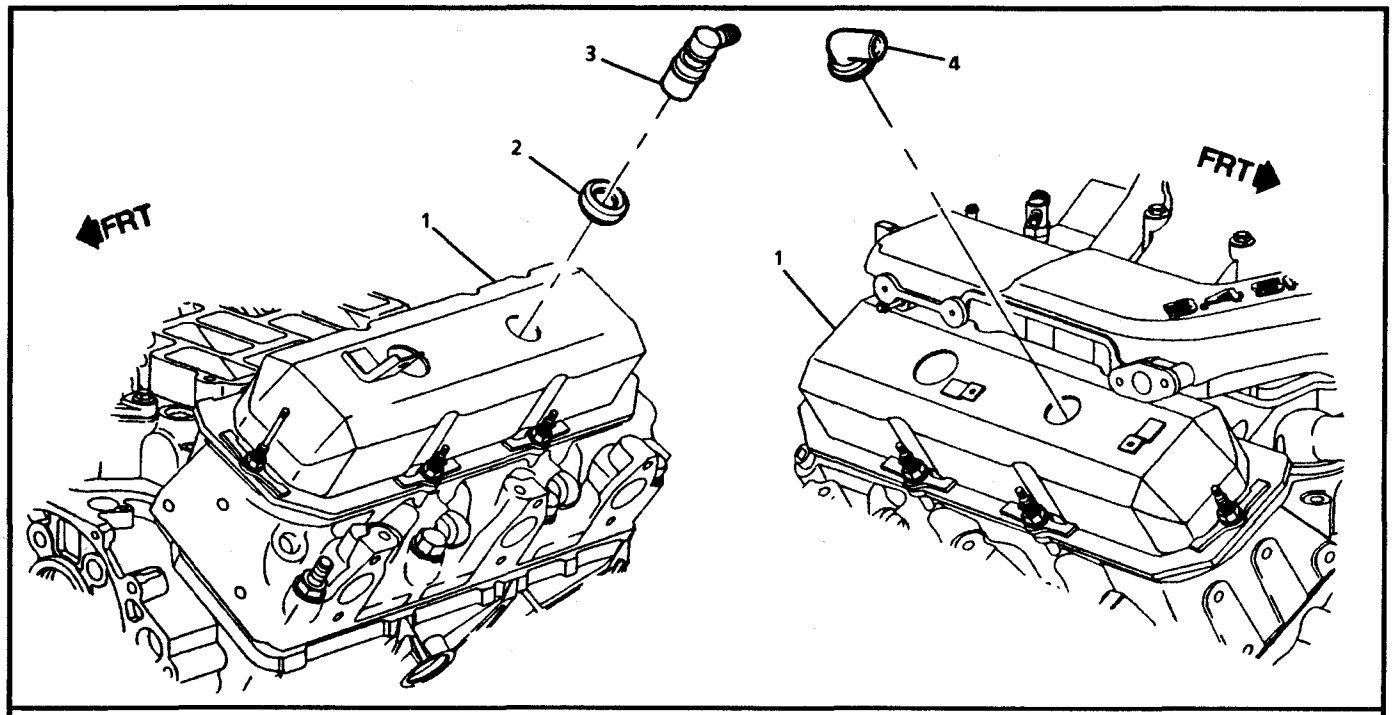
Proper operation of the crankcase ventilation system is dependent upon a sealed engine.

If oil sludging or dilution is noted and the crankcase ventilation system is functioning properly, check engine for possible cause and correct to ensure that system will function as intended.

ON-VEHICLE SERVICE

An engine which is operated without any crankcase ventilation can be damaged. Therefore, it is important to replace the valve at intervals shown in SECTION 0B.

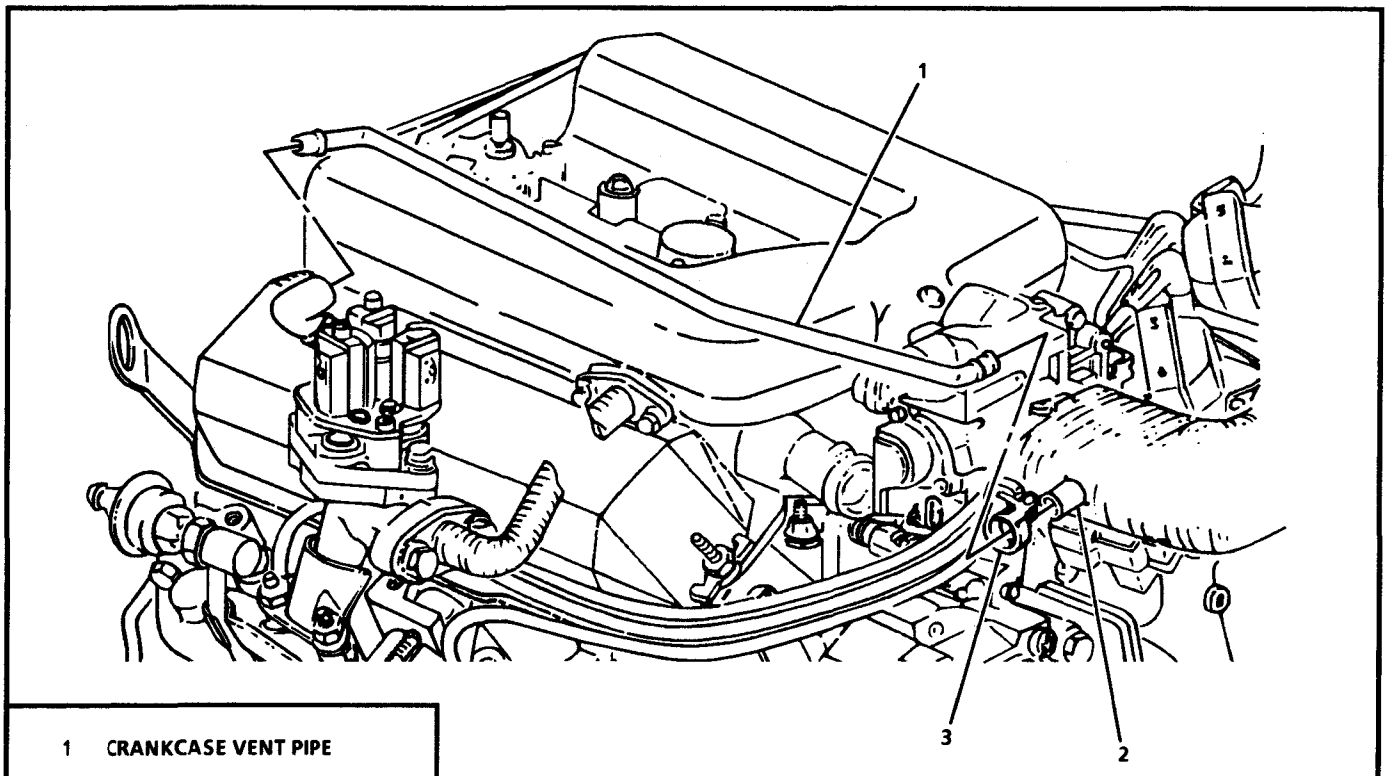
Periodically, inspect the hoses and clamps and replace any showing signs of deterioration.



1	ROCKER COVER ASSEMBLY	3	CRANKCASE VENTILATION VALVE
2	GROMMET	4	GROMMET

NS 15885

Figure C13-4 - Crankcase Ventilation System Service



1	CRANKCASE VENT PIPE
2	AIR DUCT
3	CLAMP

NS 15886

Figure C13-5 - Crankcase Vent Pipe Installation

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SECTION C14
AIR INTAKE SYSTEM

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Air Intake System C14-1
On-Vehicle Service C14-1
Air Cleaner Filter/ Air Cleaner Assembly C14-1
Torque Specifications C14-1

GENERAL DESCRIPTION

AIR INTAKE SYSTEM

Air intake system draws outside air in past the louvered cover of the forward mounted air cleaner. The air cleaner assembly is remotely mounted (refer to Figure C14-2). The air then enters the engine by flowing through the air intake duct throttle body and into the intake manifold. The air is then directed into the intake manifold runners, through the cylinder heads and into the cylinder.

ON-VEHICLE SERVICE

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. The correct torque value must be used, as specified, during reassembly to assure proper retention of all parts, or damage to the part may result.

AIR CLEANER FILTER/AIR CLEANER ASSEMBLY

Remove or Disconnect

1. Loosen clamp at rear air intake duct at throttle body.
2. IAT sensor electrical connector.
3. Retainer from upper radiator support.
4. Crankcase vent pipe from rear air intake duct.
5. Loosen clamp that joins rear air intake duct to air cleaner outlet duct and remove rear air intake duct.
- AIR intake hose.
6. Slide air cleaner housing and air cleaner outlet duct up as a whole assembly.
7. Release latches from air cleaner housing.
8. Air cleaner filter.

Install or Connect

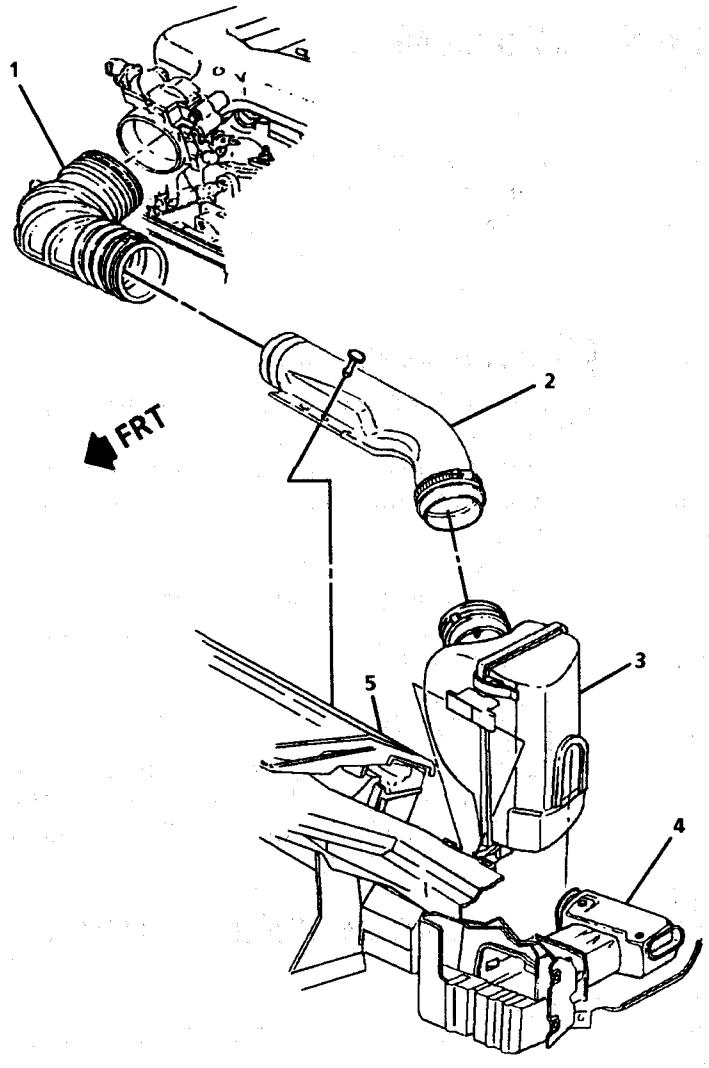
1. Air cleaner filter into air cleaner housing.
2. Snap air cleaner latches into place.
3. Slide air cleaner assembly into retainers.
4. Rear air intake duct to throttle body and tighten clamp.
5. IAT sensor electrical connector.
6. Retainer to upper radiator support.
7. Crankcase vent pipe to rear air intake duct.
8. AIR intake hose.

Important

- Clamp assembly tension adjustment screw should be located on the side of the intake duct for optimum clamp force. This is important for proper sealing.

TORQUE SPECIFICATIONS

Clamp, Rear Air Intake Duct	3.5 N·m (31 lb. in.)
Clamp, Air Cleaner Outlet Duct	3.5 N·m (31 lb. in.)



1	REAR AIR INTAKE DUCT (WITH INTAKE AIR TEMPERATURE SENSOR)
2	AIR CLEANER OUTLET DUCT
3	AIR CLEANER ASSEMBLY
4	FRONT AIR INTAKE DUCT
5	UPPER RADIATOR MOUNTING PANEL

NS 15934

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SECTION A
ENGINE COMPONENTS/WIRING DIAGRAMS/ DIAGNOSTIC CHARTS

BASIC PROCEDURE

If you have not reviewed the basic information on how to use the diagnostic procedures, go to the "Introduction" of this section. The facing page of each chart in this section will provide a general circuit description and in some instances, alternate diagnostic steps or other diagnostic aids specific to that chart or circuit.

ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

The OBD system check must always be the starting point of any Powertrain Control Module (PCM) diagnosis. The "On-Board Diagnostic (OBD) System Check" verifies the system is functioning correctly. Some special considerations to keep in mind while making the "On-Board Diagnostic (OBD) System Check" are:

Blocking Drive Wheels

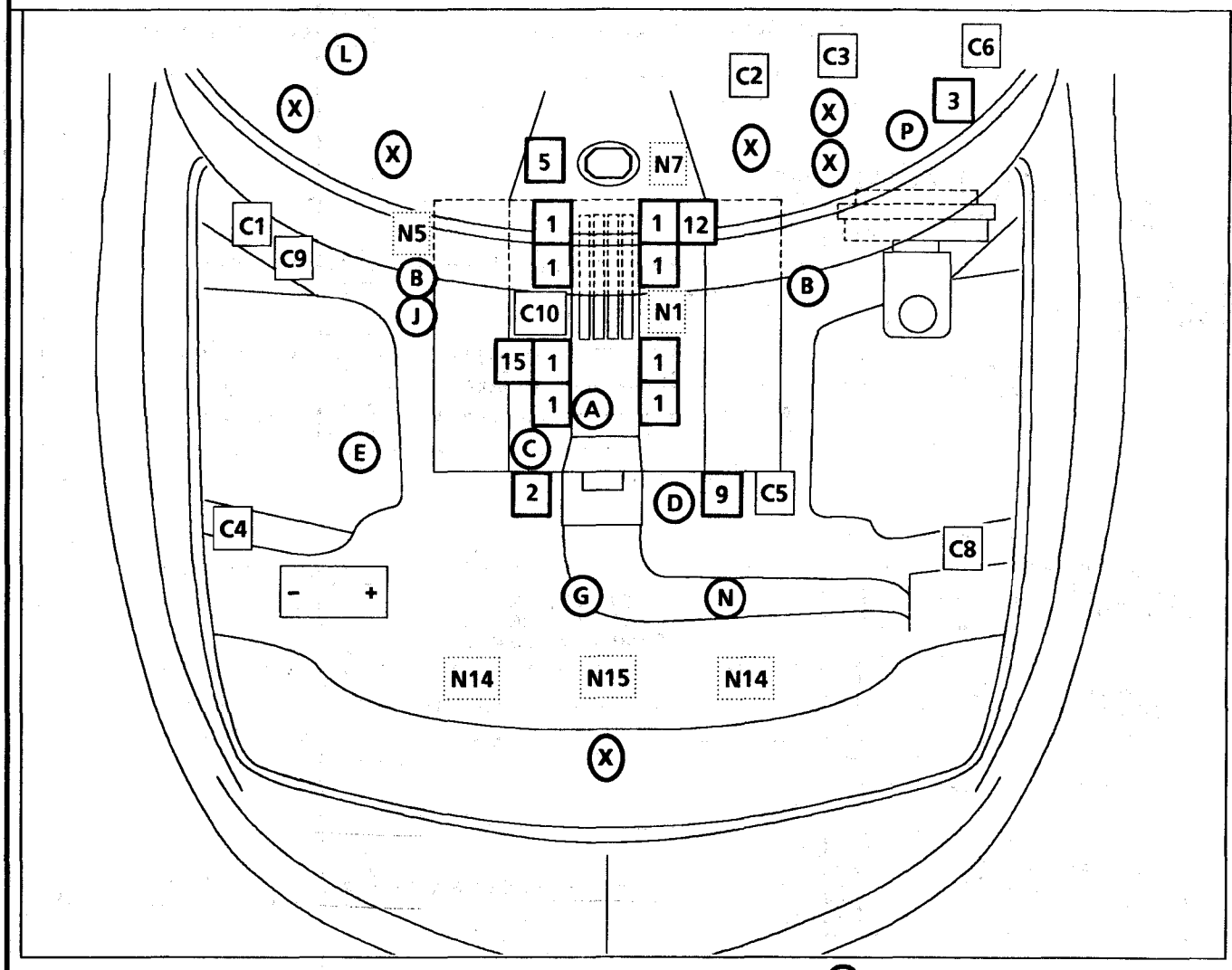
The vehicle drive wheels must always be blocked while checking the system.

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"F" CARLINE RPO: LT1 VIN CODE: P 5.7L V8 SFI



COMPUTER HARNESS

- C1 Powertrain Control Module (PCM)
- C2 Data Link Connector (DLC)
- C3 Malfunction Indicator Lamp (MIL)
- C4 Battery junction block
- C5 PCM harness grounds
- C6 I/P fuse panel
- C8 Underhood electrical center
  - A/C clutch relay
  - Cooling fan relay(s)
  - AIR pump relay
- C9 Fuel pump prime connector
- C10 Ignition test connector

NOT PCM CONNECTED

- N1 Crankcase ventilation valve
- N5 Engine Temp. Sensor (gage overheat)
- N7 Oil pressure sensor
- N14 Cooling fans (with C60)
- N15 Cooling fan (without C60)
- N17 EVAP canister (not shown), located in left rear, near filler tube.

CONTROLLED DEVICES

- 1 Fuel injector(s)
- 2 Idle Air Control (IAC) valve
- 3 Fuel Pump (FP) relay
- 5 Transmission electrical connector
- 9 Secondary Air Injection (AIR) pump
- 12 EGR vacuum control signal solenoid valve
- 15 EVAP canister purge solenoid valve
- 20 Reverse inhibit solenoid (M/T only) (Transmission mounted, not shown)
- 21 Skip Shift solenoid (M/T only) (Transmission mounted, not shown)

Exhaust Gas Recirculation (EGR) valve

INFORMATION SENSORS

- A Manifold Absolute Pressure (MAP) sensor
- B Heated Oxygen Sensor (HO2S)
- C Throttle Position (TP) sensor
- D Engine Coolant Temperature (ECT) sensor
- E A/C refrigerant pressure sensor
- G Intake Air Temperature (IAT) sensor
- J Knock sensor (KS)
- L A/C evaporator temperature sensor
- M Vehicle Speed Sensor (VSS) (Mounted on transmission, not shown)
- N Mass Air Flow (MAF) sensor
- P Brake switch

(X) SIR system components. Refer to Section 9J of the service manual, for "Cautions" and information on SIR system components.

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Figure A-1 - Component Locations 5.7L (VIN P) "F" Carline

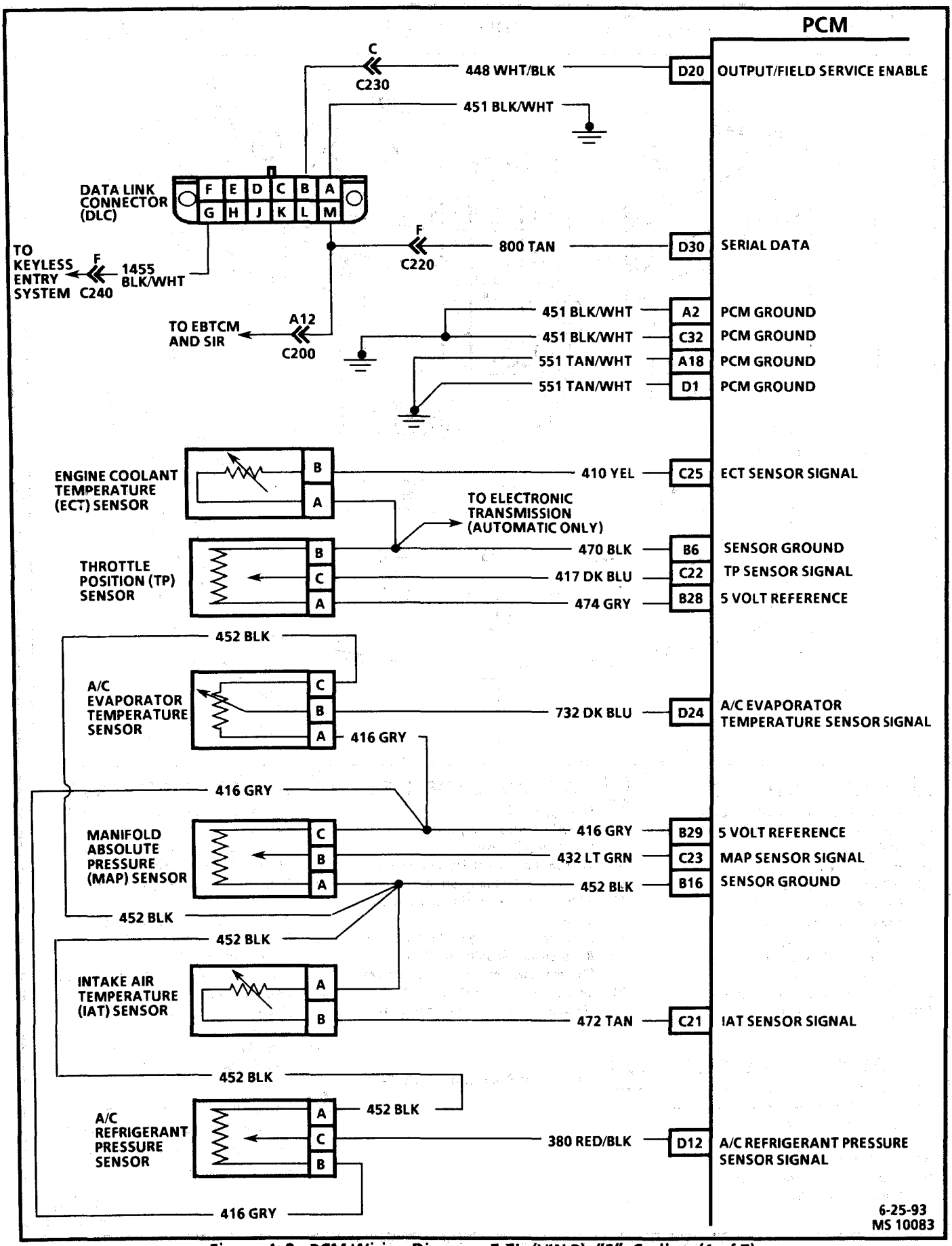


Figure A-2 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (1 of 7)

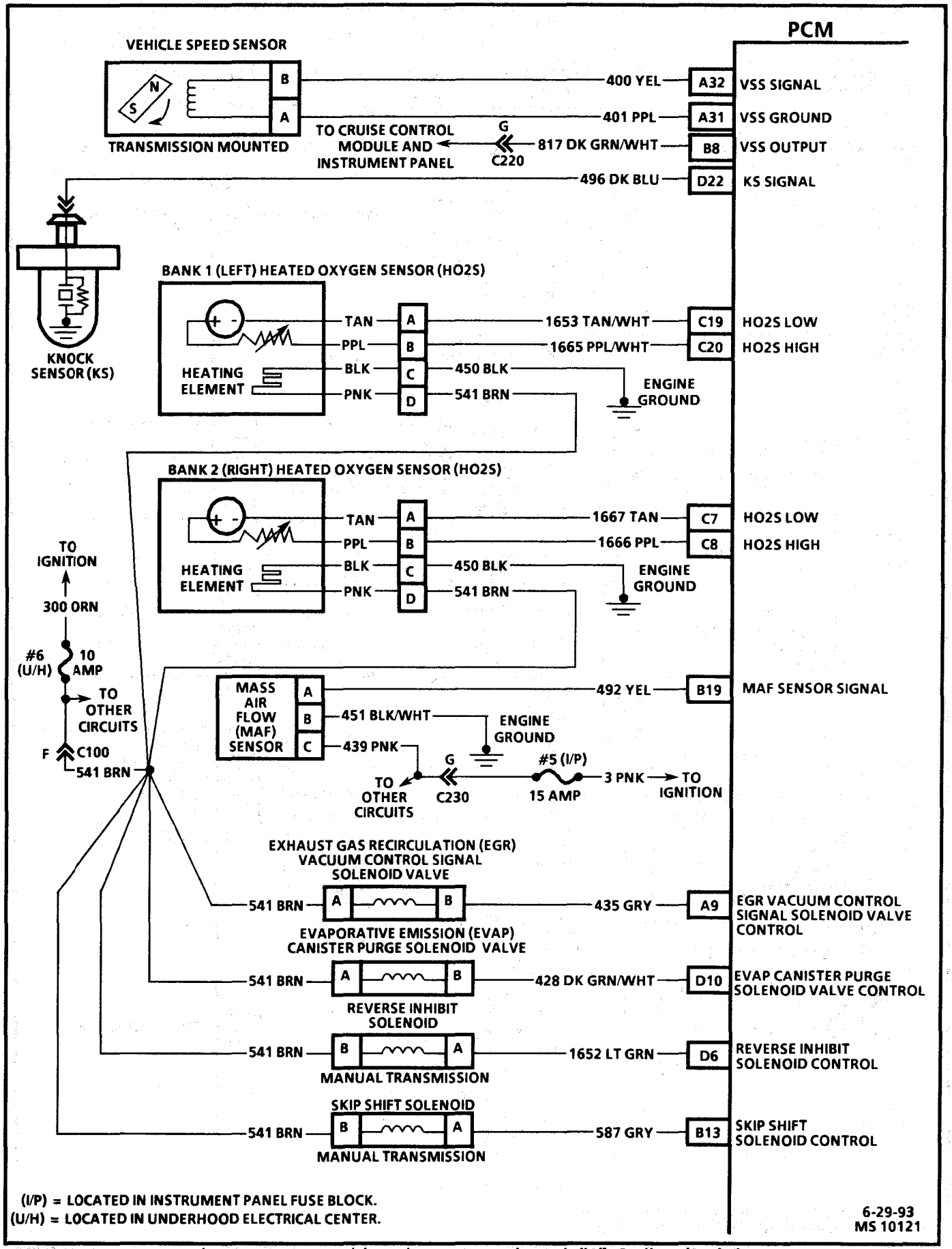


Figure A-3 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (2 of 7)

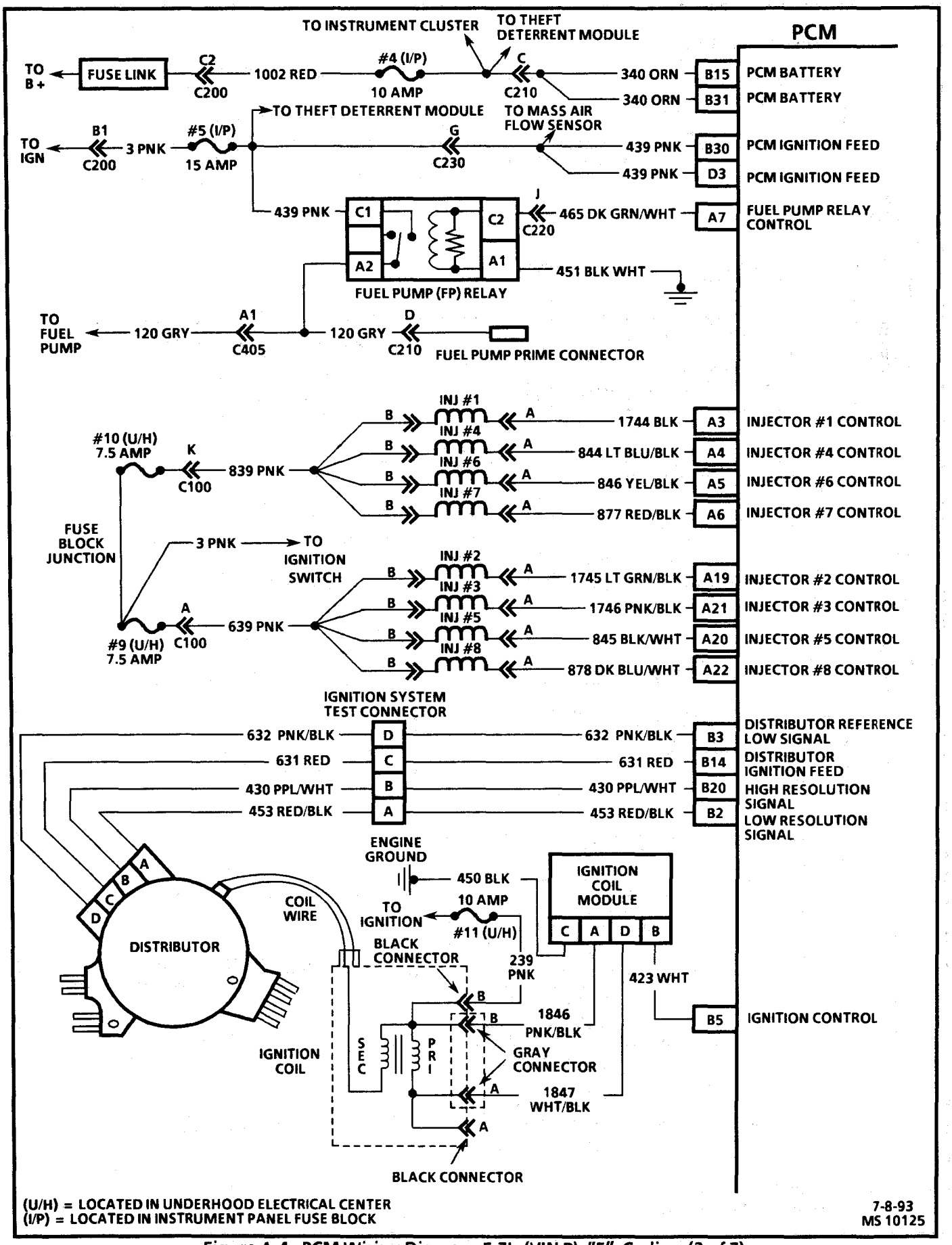


Figure A-4 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (3 of 7)

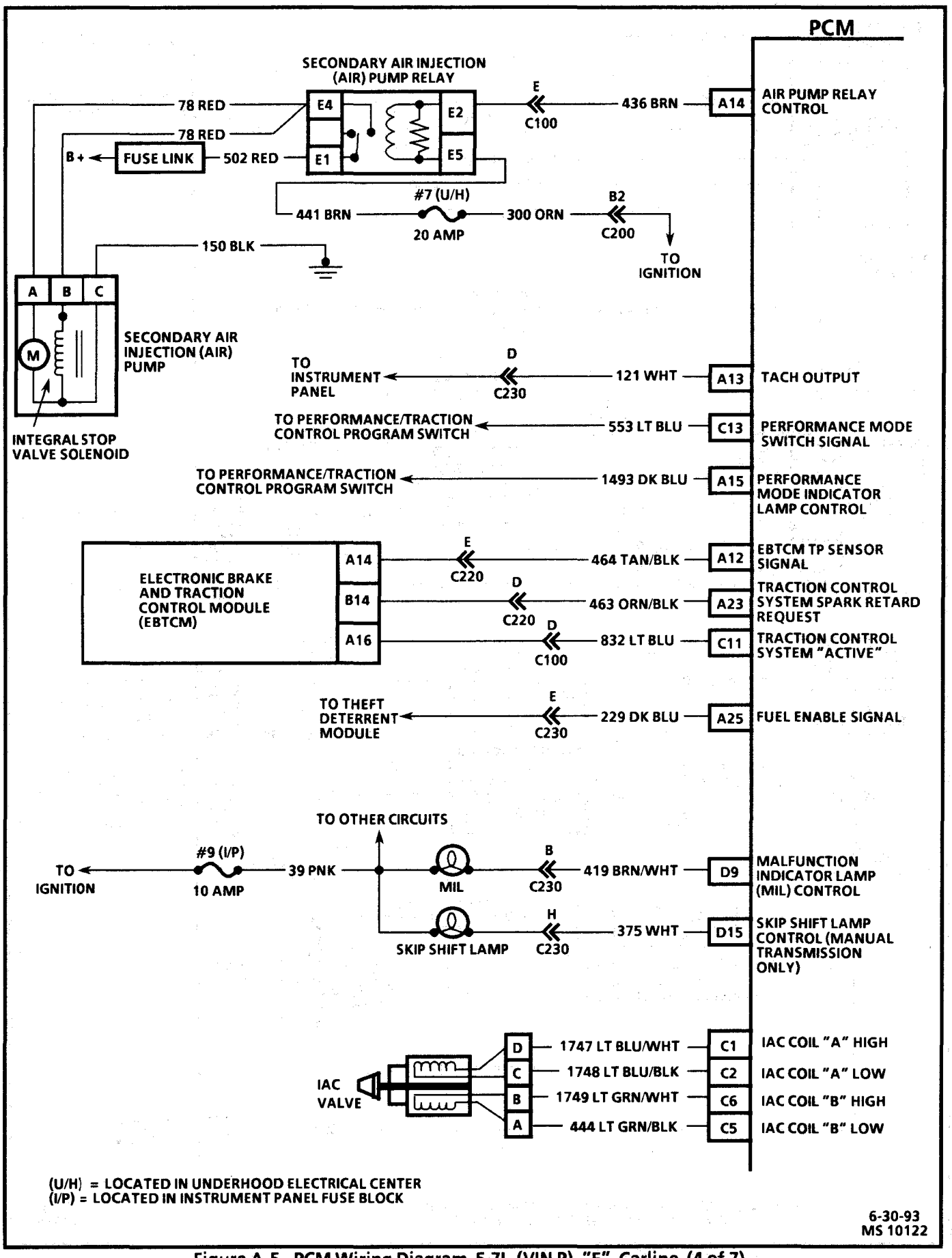


Figure A-5 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (4 of 7)

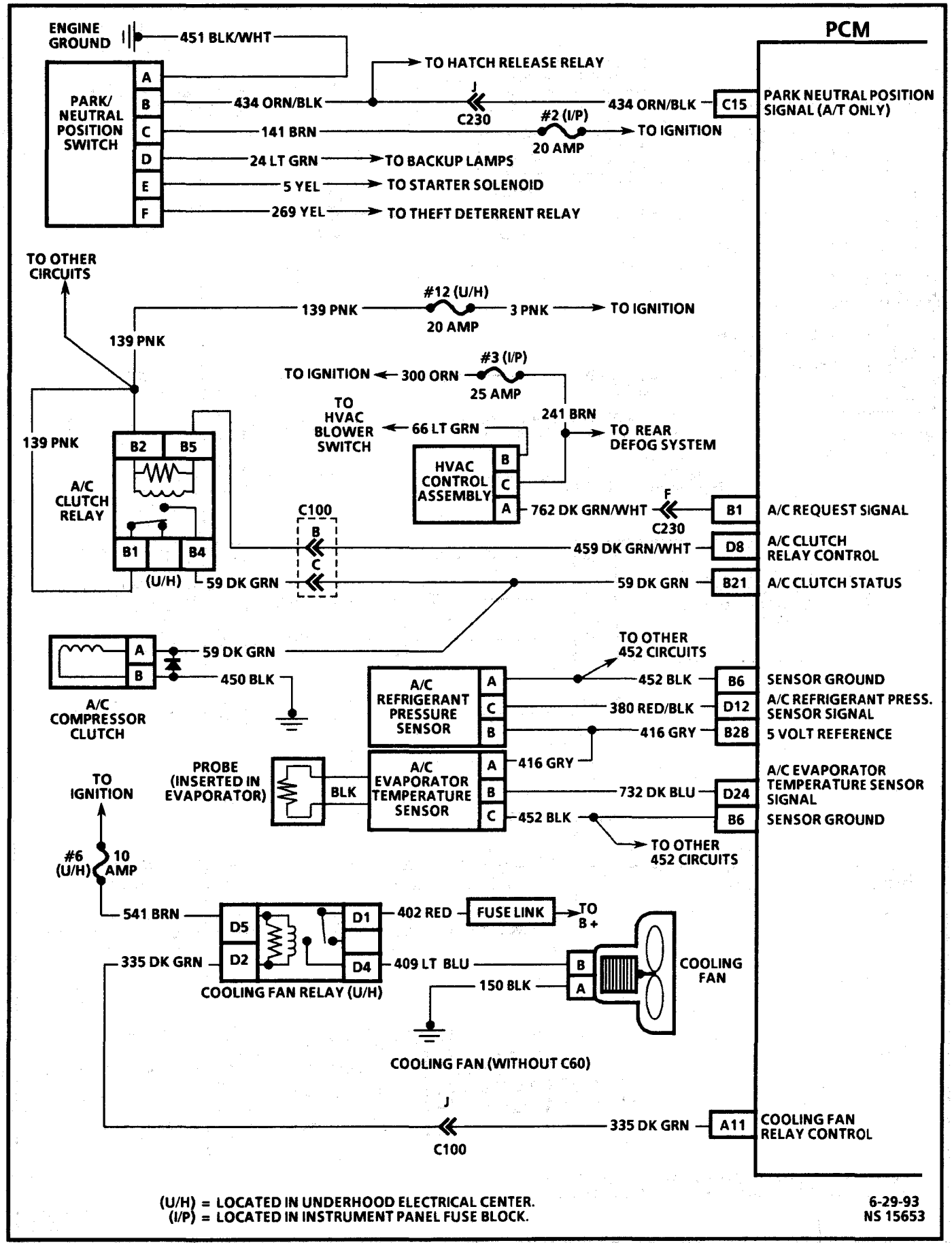


Figure A-6 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (5 of 7)

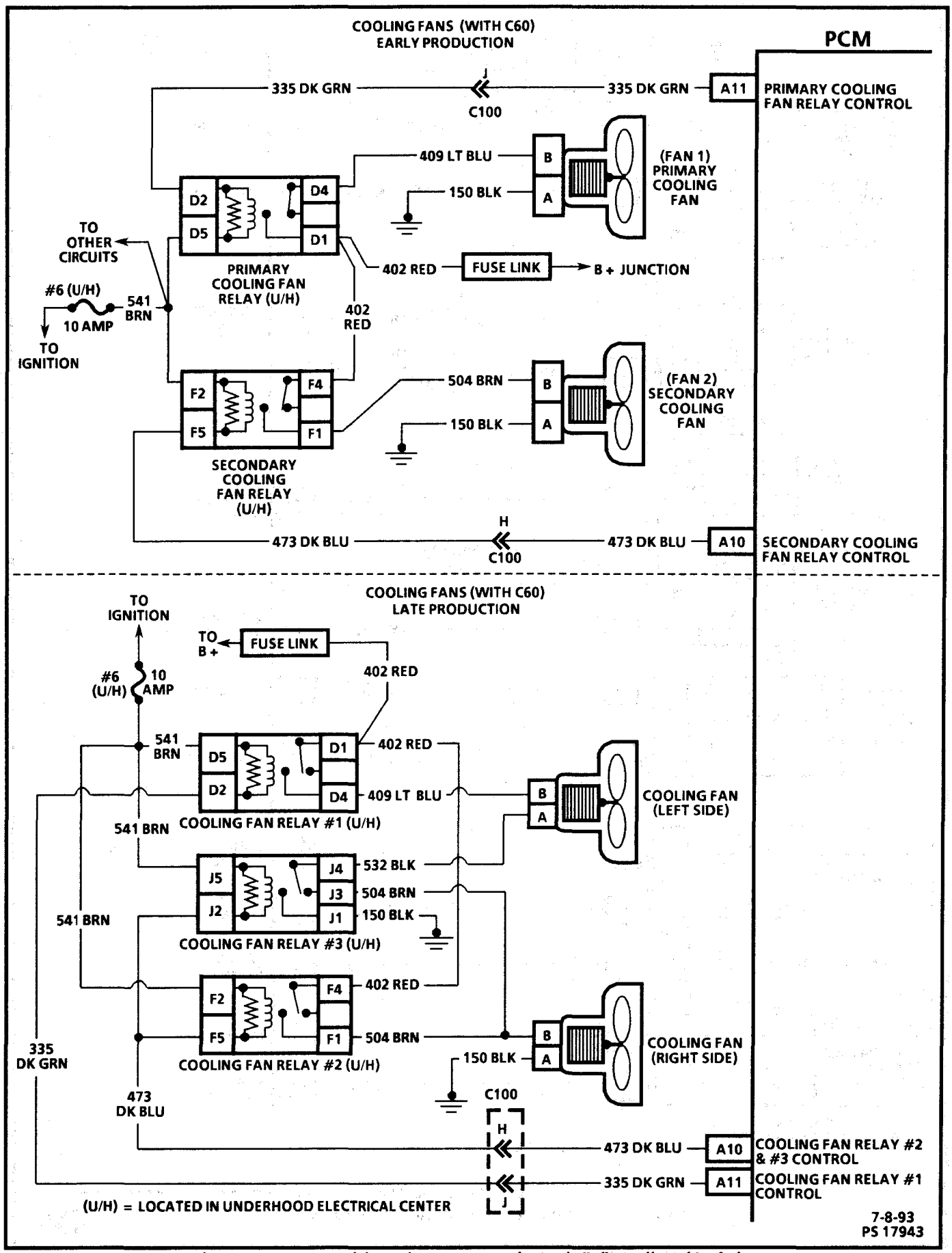


Figure A-7 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (6 of 7)

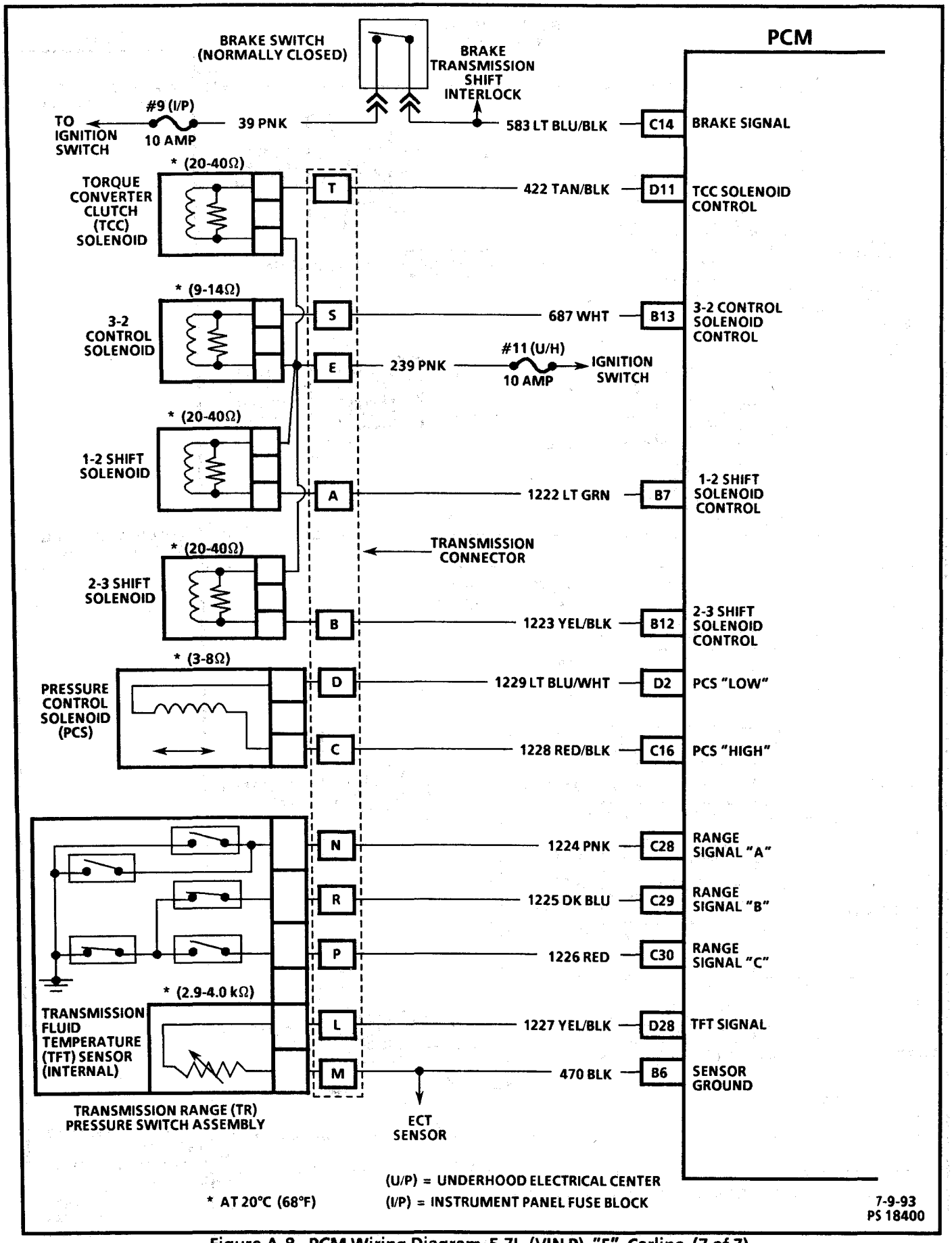
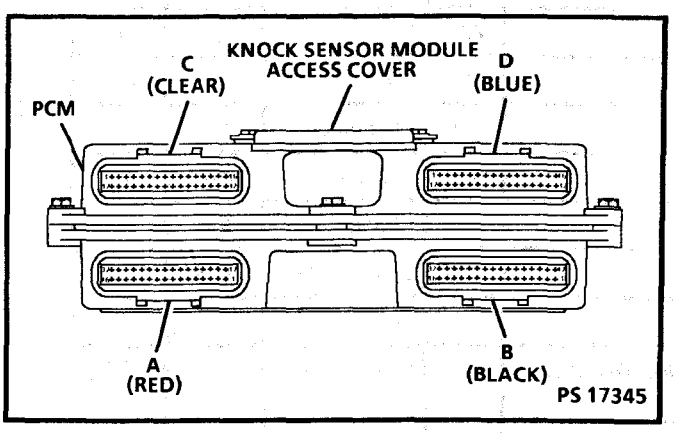


Figure A-8 - PCM Wiring Diagram 5.7L (VIN P) "F" Carline (7 of 7)

"F" CARLINE	PCM CONNECTORS	5.7L (VIN P)
* USE J 39700-A BREAKOUT BOX		RPO: LT1



NOTICE: Do not backprobe PCM connectors! The connectors are sealed for operation in an underhood environment. Backprobing may damage the seal which could eventually cause the connector to fail due to corrosion.

This information applies to the PCM connector charts on the next four pages. These charts may be used with the J 39700-A breakout box in conjunction with J 39700-110 and J 39700-140 cables and high impedance digital multimeter J 39200 to obtain voltage present for each circuit listed. Install the breakout box between the PCM connectors and the PCM. The breakout box PIN numbers correspond with the PCM connector PIN numbers. Voltage may vary slightly, but should be very close. Certain exceptions are called out in the chart legend below.

The following conditions must be met before checking typical voltages:

Key "ON":

- DVM negative (black) lead connected to a known good ground.
- Scan tool not installed.
- All accessories "OFF."
- Battery fully charged.

Engine running:

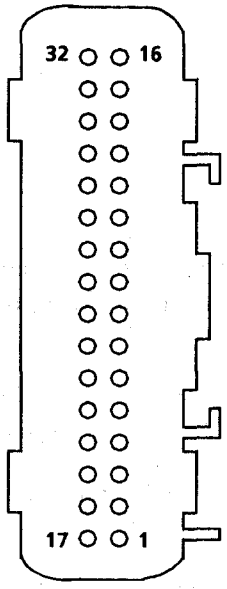
- All conditions listed above.
- Engine at normal operating temperature.
- Engine at idle/closed throttle/operating in "Closed Loop."
- In park or neutral.

Chart Legend:

(1) Less than .5 volt when system enabled.
(2) Battery voltage for first two seconds with ignition "ON."
(3) Varies.
(4) Varies with temperature.
(5) Battery voltage when in gear.
(6) Less than .5 volt with brake pedal applied.
(7) Battery voltage with A/C "ON."
(8) Varies with altitude.
* Less than .5 volt.

PCM CONNECTOR "A" (RED)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	VOLTAGE	
			KEY "ON"	ENG "RUN"
A1				
A2 PCM GROUND	451	BLK/WHT	0*	0*
A3 INJECTOR #1 CONTROL	1744	BLK	B +	B +
A4 INJECTOR #4 CONTROL	844	LT BLU/BLK	B +	B +
A5 INJECTOR #6 CONTROL	846	YEL/BLK	B +	B +
A6 INJECTOR #7 CONTROL	877	RED/BLK	B +	B +
A7 FP RELAY CONTROL	465	DK GRN/WHT	0 (2)	B +
A8				
A9 EGR VACUUM CONTROL SIGNAL SOLENOID VALVE CONTROL	435	GRY	B + (1)	B + (1)
A10 SECONDARY/HIGH SPEED COOLING FAN RELAY CONTROL	473	DK BLU	B + (1)	B + (1)
A11 PRIMARY/LOW SPEED COOLING FAN RELAY CONTROL	335	DK GRN	B + (1)	B + (1)
A12 EBTCM TP SENSOR SIGNAL	464	TAN/BLK		
A13 TACH OUTPUT	121	WHT		
A14 AIR PUMP RELAY CONTROL	436	BRN	B + (1)	B + (1)
A15 TRANS MODE LAMP CONTROL	1493	DK BLU		
A16				
A17				
A18 PCM GROUND	551	TAN/WHT	0*	0*
A19 INJECTOR #2 CONTROL	1745	LT GRN/BLK	B +	B +
A20 INJECTOR #5 CONTROL	845	BLK/WHT	B +	B +
A21 INJECTOR #3 CONTROL	1746	PNK/BLK	B +	B +
A22 INJECTOR #8 CONTROL	878	DK BLU/WHT	B +	B +
A23 TRACTION CONTROL SYSTEM SPARK RETARD REQUEST	463	ORN/BLK	B +	B +
A24				
A25 FUEL ENABLE SIGNAL	229	DK BLU	2.5	2.5
A26				
A27				
A28				
A29				
A30				
A31 VSS GROUND	401	PPL	0*	0*
A32 VSS SIGNAL	400	YEL	(3)	(3)



FRONT VIEW 32 PIN PCM CONNECTOR "A" (RED)

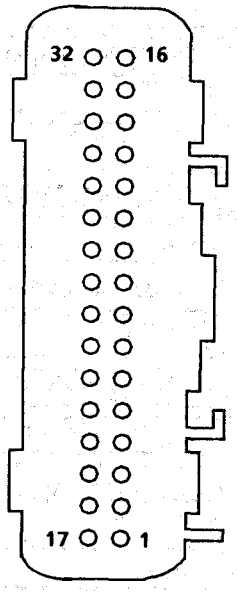
5.7L (VIN P) RPO: LT1

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Figure A-9 - PCM Connector Terminal End View 5.7L (VIN P) "F" Carline (1 of 4)

PCM CONNECTOR "B" (BLACK)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	VOLTAGE	
			KEY "ON"	ENG "RUN"
B1 A/C REQUEST SIGNAL	762	DK GRN/WHT	0* (7)	0* (7)
B2 LOW RESOLUTION SIGNAL	453	RED/BLK	0 OR 5	(3)
B3 DISTRIBUTOR REFERENCE LOW SIGNAL	632	PNK/BLK	0*	0*
B4				
B5 IGNITION CONTROL	423	WHT	0*	(3)
B6 SENSOR GROUND	470	BLK	0*	0*
B7 TRANSMISSION 1-2 SHIFT SOLENOID	1222	LT GRN	B+	0*
B8 VSS OUTPUT	817	DK GRN/WHT	6.5	7.5
B9				
B10				
B11				
B12 TRANSMISSION 2-3 SHIFT SOLENOID	1223	YEL/BLK	B+	0*
B13 TRANSMISSION 3-2 CONTROL SOLENOID (AUTOMATIC) OR SKIP SHIFT SOLENOID CONTROL (MANUAL)	687 OR 587	WHT OR GRY	B+ OR B+	B+ OR B+
B14 DISTRIBUTOR IGNITION FEED	631	RED	B+	B+
B15 PCM BATTERY FEED	340	ORN	B+	B+
B16 SENSOR GROUND	452	BLK	0*	0*
B17				
B18				
B19 MAF SENSOR SIGNAL	492	YEL	5	4.3 (3)
B20 HIGH RESOLUTION SIGNAL	430	PPL/WHT	5	2.6 (3)
B21 A/C CLUTCH STATUS	59	DK GRN	0* (7)	0* (7)
B22				
B23				
B24				
B25				
B26				
B27				
B28 5 VOLT REFERENCE	474	GRY	5	5
B29 5 VOLT REFERENCE	416	GRY	5	5
B30 PCM IGNITION FEED	439	PNK	B+	B+
B31 PCM BATTERY FEED	340	ORN	B+	B+
B32				



FRONT VIEW
32 PIN
PCM CONNECTOR "B"
(BLACK)

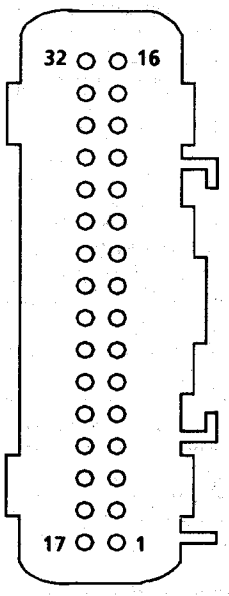
5.7L (VIN P)
RPO: LTI

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Figure A-10 - PCM Connector Terminal End View 5.7L (VIN P) "F" Carline (2 of 4)

PCM CONNECTOR "C" (CLEAR)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	VOLTAGE	
			KEY "ON"	ENG "RUN"
C1 IAC COIL "A" HIGH	1747	LT BLU/WHT	(3)	(3)
C2 IAC COIL "A" LOW	1748	LT BLU/BLK	(3)	(3)
C3				
C4				
C5 IAC COIL "B" LOW	444	LT GRN/BLK	(3)	(3)
C6 IAC COIL "B" HIGH	1749	LT GRN/WHT	(3)	(3)
C7 BANK 2 (RIGHT) HO2S LOW	1667	TAN	0*	0*
C8 BANK 2 (RIGHT) HO2S HIGH	1666	PPL	(3)	.1 TO .9 (3)
C9				
C10				
C11 TRACTION CONTROL SYSTEM "ACTIVE" SIGNAL	832	LT BLU	B +	B +
C12				
C13 PERFORMANCE MODE SWITCH SIGNAL	553	LT BLU	B +	B +
C14 BRAKE SWITCH SIGNAL	583	LT BLU/BLK	B + (6)	B + (6)
C15 PNP SIGNAL	434	ORN/BLK	0* (5)	0* (5)
C16 TRANSMISSION PRESSURE CONTROL SOLENOID HIGH	1228	RED/BLK	0*	6.4
C17				
C18				
C19 BANK 1 (LEFT) HO2S LOW	1653	TAN/WHT	0*	0*
C20 BANK 1 (LEFT) HO2S HIGH	1665	PPL/WHT	(3)	.1 TO .9 (3)
C21 IAT SENSOR SIGNAL	472	TAN	3.9 (4)	3.7 (4)
C22 TP SENSOR SIGNAL	417	DK BLU	.68	.70
C23 MAP SENSOR SIGNAL	432	LT GRN	4.7 (8)	1.1 (8)
C24				
C25 ECT SENSOR SIGNAL	410	YEL	2.3 (4)	2.2 (4)
C26				
C27				
C28 TRANSMISSION RANGE SIGNAL "A"	1224	PNK	B +	B +
C29 TRANSMISSION RANGE SIGNAL "B"	1225	DK BLU	0*	0*
C30 TRANSMISSION RANGE SIGNAL "C"	1226	RED	B +	B +
C31				
C32 PCM GROUND	451	BLK/WHT	0*	0*



FRONT VIEW 32 PIN PCM CONNECTOR "C" (CLEAR)

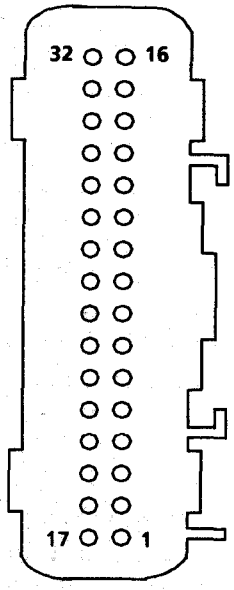
5.7L (VIN P) RPO: LT1

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Figure A-11 - PCM Connector Terminal End View 5.7L (VIN P) "F" Carline (3 of 4)

PCM CONNECTOR "D" (BLUE)

PCM PIN/FUNCTION	CKT#	WIRE COLOR	VOLTAGE	
			KEY "ON"	ENG "RUN"
D1 PCM GROUND	551	TAN/WHT	0*	0*
D2 TRANSMISSION PRESSURE CONTROL SOLENOID LOW	1229	LT BLU/WHT	0*	1.3
D3 PCM IGNITION FEED	439	PNK	B +	B +
D4				
D5				
D6 REVERSE INHIBIT SOLENOID CONTROL	1652	LT GRN		
D7				
D8 A/C CLUTCH RELAY CONTROL	459	DK GRN/WHT	B + (1)	B + (1)
D9 MIL CONTROL	419	BRN/WHT	0*	B + (1)
D10 EVAP CANISTER PURGE SOLENOID VALVE CONTROL	428	DK GRN/WHT	B + (1)	B + (1)
D11 TRANSMISSION TCC SOLENOID	422	TAN/BLK	B +	0
D12 A/C REFRIGERANT PRESSURE SENSOR SIGNAL	380	RED/BLK	(3)	(3)
D13				
D14				
D15 SKIP SHIFT LAMP CONTROL	375	WHT	B +	B +
D16				
D17				
D18				
D19				
D20 OUTPUT/FIELD SERVICE ENABLE	448	WHT/BLK	5	5
D21				
D22 KS SIGNAL	496	DK BLU	1.6	1.5
D23				
D24 A/C EVAPORATOR TEMPERATURE SENSOR SIGNAL	732	DK BLU	1.4 (4)	1.4 (4)
D25				
D26				
D27				
D28 TRANSMISSION FLUID TEMPERATURE SENSOR SIGNAL	1227	YEL/BLK	2.5 (4)	1.6 (4)
D29				
D30 SERIAL DATA	800	TAN	(3)	(3)
D31				
D32				

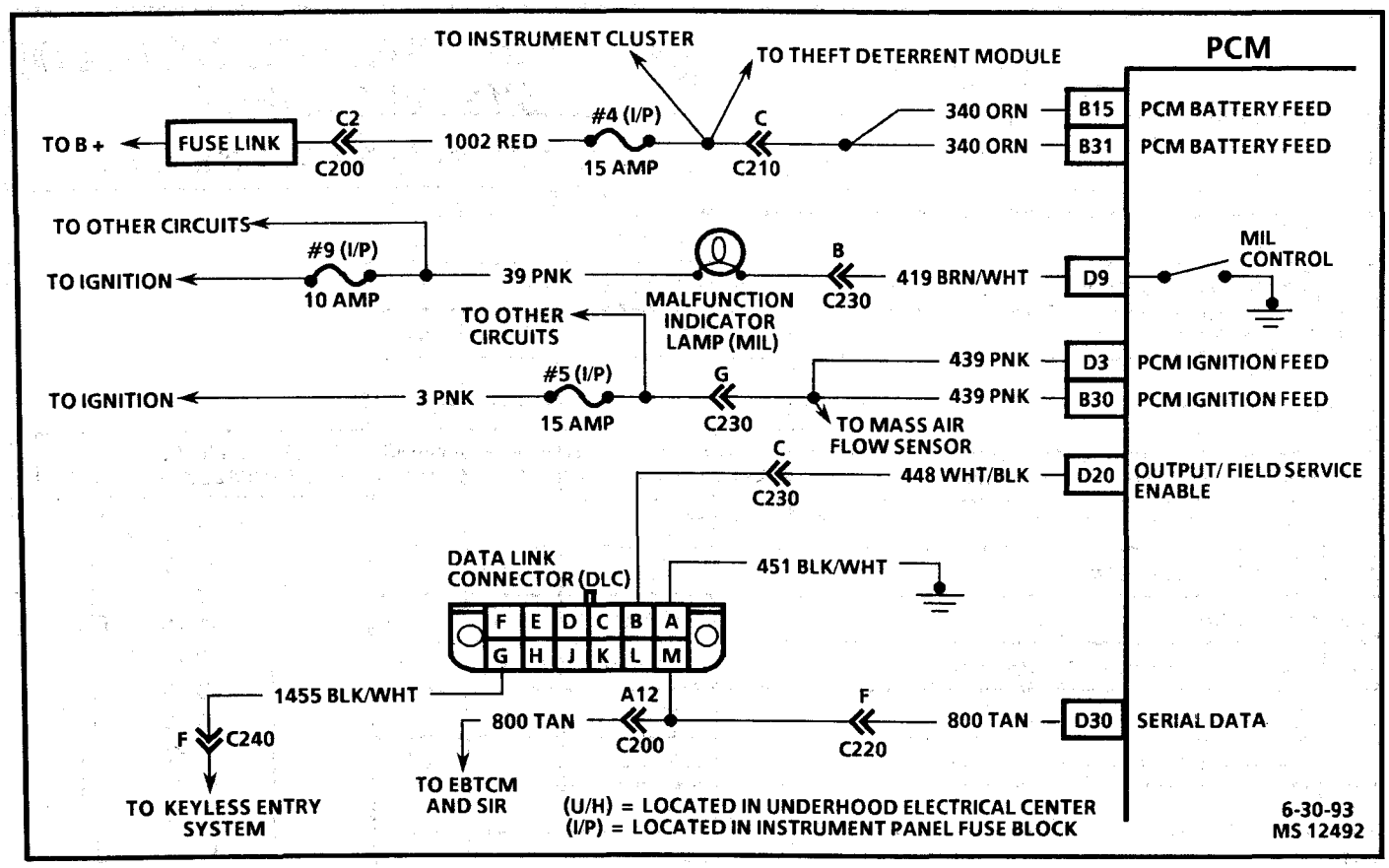


FRONT VIEW 32 PIN PCM CONNECTOR "D" (BLUE)

5.7L (VIN P) RPO: LT1

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Figure A-12 - PCM Connector Terminal End View 5.7L (VIN P) "F" Carline (4 of 4)



ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The On-Board Diagnostic (OBD) system check is an organized approach to identifying a problem created by an electronic engine control system malfunction. It must be the starting point for any driveability complaint diagnosis, because it directs the service technician to the next logical step in diagnosing the complaint. Understanding the chart and using it correctly will reduce diagnostic time and prevent the unnecessary replacement of good parts.

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

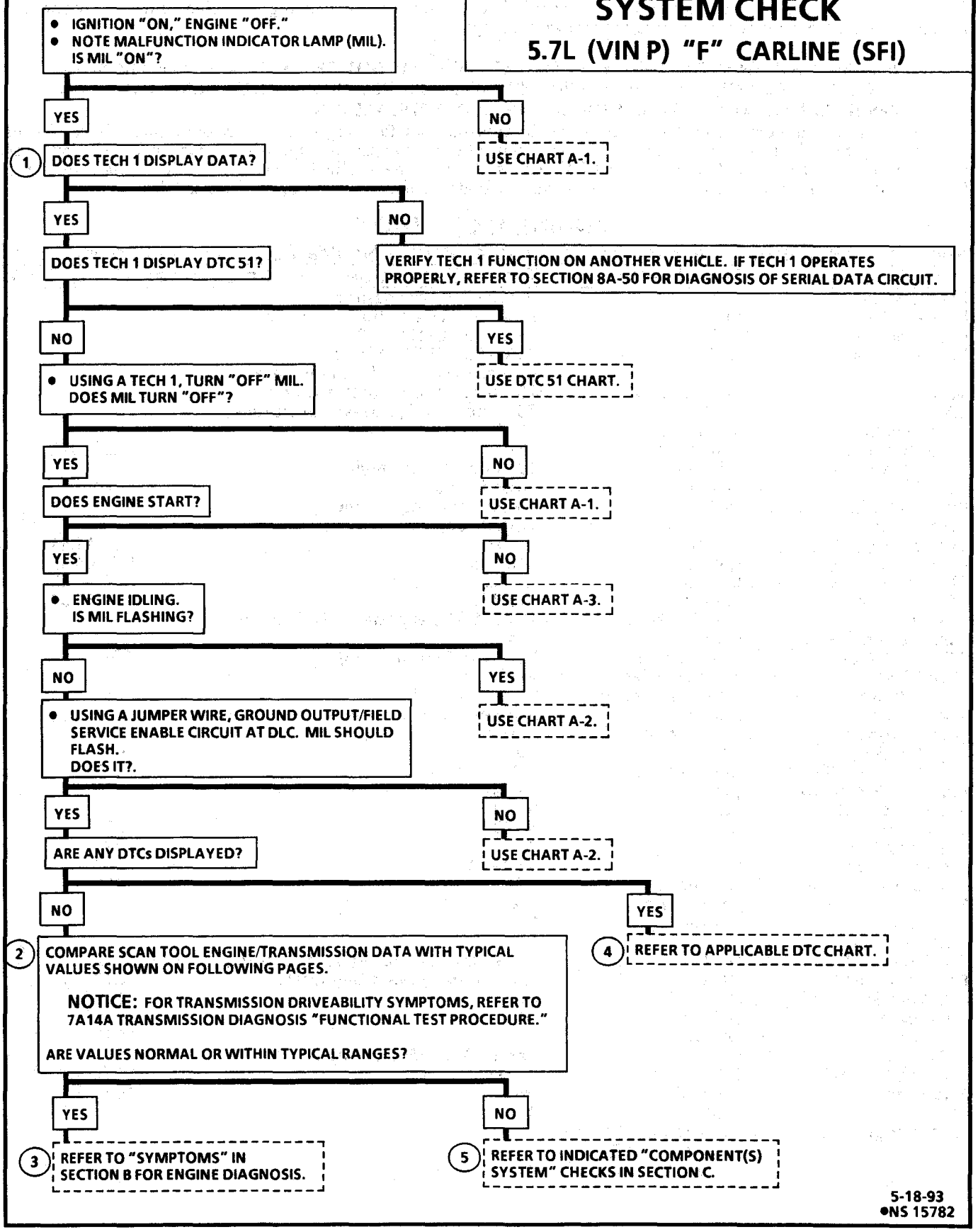
1. This step is to determine if the Tech 1 can establish communication with the Powertrain Control Module (PCM). If there is no communication between the PCM and the Tech 1, no data will be displayed. Refer to SECTION 8A-50 for serial data circuit diagnosis.
2. Comparison of actual control system data with the typical values is a quick check to determine if any parameter is not within limits. Keep in mind that a base engine problem (i.e. advanced cam timing) may substantially alter sensor values.
3. Installation of a scan tool will provide a ground path for the PCM and may hide a driveability complaint due to poor PCM grounds.
4. If multiple DTCs are stored, start with the lowest numbered DTC first, unless DTC chart indicates not to.
5. If the actual data is not within the typical values established, the charts in "Component Systems," Section "6E3-C" will provide a functional check of the suspect component or system.

Important

- This vehicle is equipped with a Powertrain Control Module (PCM) utilizing an Electrically Erasable Programmable Read Only Memory (EEPROM). When diagnostics call for replacement of the PCM, the new PCM must be programmed. Refer to "PCM Replacement and Programming Procedures" in "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1".

ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

5.7L (VIN P) "F" CARLINE (SFI)



5-18-93
•NS 15782

If after completing the On-Board Diagnostic (OBD) system check and finding the Tech 1 diagnostics functioning properly and no DTC(s) displayed,the "Engine/Transmission Tech 1 Data Values" may be used for comparison with values obtained on the vehicle being diagnosed. The "Engine/Transmission Tech 1 Data Values," are an average of display values recorded from normally operating vehicles and are intended to represent what a normally functioning system would display.

A SCAN TOOL THAT DISPLAYS FAULTY DATA SHOULD NOT BE USED, AND THE PROBLEM SHOULD BE REPORTED TO THE MANUFACTURER. THE USE OF A FAULTY SCAN TOOL CAN RESULT IN MISDIAGNOSIS AND UNNECESSARY PARTS REPLACEMENT.

Only the parameters listed below are used in this manual for diagnosis. If a scan tool displays other parameters, the values are not recommended by General Motors for use in diagnosis. For more description on the values and use of the Tech 1 to diagnose PCM inputs, refer to the applicable section in "Component Systems," Section "6E3-C". If all values are within the range illustrated, refer to "Symptoms," Section "6E3-B".

ENGINE TECH 1 DATA

Idle / Lower Radiator Hose Hot / Closed Throttle / Park or Neutral / Closed Loop / Accessories off

SCAN Position	Units Displayed	Typical Data Value	Refer To Section "C1" and:
Engine Speed	RPM	± 100 RPM from desired	
Desired Idle	RPM	PCM commanded (based on temp.)	
Eng Cool Temp.	C°/F°	85°C - 105°C (185°F - 221°F)	
Intake Air Temp.	C°/F°	10°C - 90°C (50°F - 194°F) (Depends on underhood temperature)	
MAP	kPa/Volts	20 - 48/1-2 (Varies with altitude)	
BARO	kPa/Volts	70 - 100/3.5-4.5 (Varies with altitude)	
Throt Position	Volts	.3 - .9	"C2"
Throttle Angle	Percentage	0%	"C2", DTC 21
Left HO2S Bnk 1	Millivolts	10-1000 mV and varying	
Loop Status	Open/Closed Loop	Closed Loop	"C2"
Right HO2S Bnk 2	Millivolts	10-1000 mV and varying	
Loop Status	Open/Closed Loop	Closed Loop	
ST Fuel TR Bnk 1	Counts	Varies	DTC 44,45
LT Fuel TR Bnk 1	Counts	118-138	DTC 44,45
ST Fuel TR Bnk 2	Counts	Varies	DTC 64,65
LT Fuel TR Bnk 2	Counts	118-138	DTC 64,65
Fuel Trim Cell	Cell Number	16 to 18 (depends on Air Flow & RPM)	
Fuel Trim Enable	No/Yes	Yes	
Spark Advance	# of Degrees	Varies (PCM controlled)	"C4"
Mass Air Flow	Grams Per Second	Varies	"C2"
Knock Retard	Degrees of Retard	0	"C5"
Knock Signal	No/Yes	No (Yes, when detonation is detected)	"C5"
Lo Res. Signal	Milliseconds	Varies	"C4"
High Res. Signal	Yes/No	Yes	"C4"
Inj. Pulse Width Bnk 1	Milliseconds	1-4, may vary	"C2"
Inj. Pulse Width Bnk 2	Milliseconds	1-4, may vary	"C2"
Idle Air Control	Counts	5 - 50	"C2"
Learned IAC	Counts	5 - 50	"C2"
EGR Duty Cycle	Percentage	0%	"C7"
System Voltage	Volts	12.0 - 14.5	"6D"
AIR Control	Off/On	Off	"C6"
Fuel EVAP Purge	Percentage	0%	"C3"
Injector Fault	No/Yes	No	
TCS/ASR Active	No/Yes	No	
Fan Ctrl PCM A10	Off/On	Depends on A/C refrigerant pressure,	"C12"
Fan Ctrl PCM A11	Off/On	and engine coolant temperature	"C12"
A/C Request	No/Yes	No	"C10"
A/C Clutch	Off/On	Off	"C10"
A/C Status	Off/On	Off	"C10"
A/C Refrig Pressure	Psi, Volts	Varies (Depends on temp.)	"C10"
A/C EVAP Temp	C°/F°	Varies	"DTC 71"
Skip Shift Active	No/Yes	No	"DTC 84"
MPH	km/h	0	
Trans Range Switch	Park/Neutral, Reverse Drive 4, Drive 3, Drive 2, Low, Invalid	Park/Neutral	

Park/Neutral Pos	P-N--/-R-DL	Park/Neutral (P-N--)	C1-A
Mph Km/h	Mph / Km/h	0	"C8"
TCC Brake Switch	Closed/Open	Closed	
TCC Solenoid	Off/On	Off	
1 - 2 Shift Sol	Off/On	On	"C8"
2 - 3 Shift Sol	Off/On	On	"C8"
A/B/C Rng	Off/On	Off/On/Off	"C8"
Perf Mode Sw	Open/Closed		"C8"
Engine or Trans DTC	No/Yes	No	
Knock Sensor	OK/Open/Grounded	OK	"C8"
Time From Start	Hrs/Min/Sec	Varies	

TRANSMISSION TECH 1 DATA

Idle / Lower Radiator Hose Hot / Closed Throttle / Park or Neutral / Closed Loop / Accessories off

SCAN Position	Units Displayed	Typical Data Value	Refer To Section "C8" and:
Engine Speed	RPM	± 100 RPM From desired	
Trans Output Spd	RPM	0 RPM	
Eng Cool Temp	C°/F°	85°C - 105°C (185°F - 221°F)	
Trans Fluid Temp	C°/F°	82°C - 94°C (180°F - 200°F)	
Throt Position	Volts	0.3 - 0.9V	"C2"
Throttle Angle	Percentage	0%	"C2"
A/B/C RNG	Off/On	Off/On/Off	
Trans Range Sw	Invalid, Rev, Drive 4, Drive 3, Drive 2, Low, Park/Neut	Park/Neut	
Commanded Gear	1-4	1	
Adaptable Shift	No,Yes	No	
1-2 Sol 2-3 Sol	Off/On	On/On	
CTR FDBK 1/2 2/3	OK, Fault	OK/OK	
3-2 Control Sol	Percentage	0%	
3-2 Control FDBK	OK, Fault	OK	
Hot Mode	No, Yes	No	
TCC Slip Speed	RPM	± 50 RPM From Engine Speed	
TCC Solenoid	Off/On	Off	
CTR FDBK TCC Sol	OK/Fault	OK	
Desired PCS	Amps	1.01 Amps	
Actual PCS	Amps	1.01 Amps	
PCS Duty Cycle	Percentage	40% - 60%	
MPH Km/h	0-255	0	
TCS/ASR Active	No, Yes	No	
Cruise Engaged	No, Yes	No	
TCC Brake Switch	Applied/Released	Released	
Kickdown Enabled	No, Yes	No	
1-2 Shift Time	Seconds	0	
2-3 Shift Time	Seconds	0	
1-2 Shift Time Error	Seconds	0	
Curr Adapt Cell	% TP	0	
Performance Mode Switch	No/Yes	No	
Pref Lamp FDBK	OK, Fault	OK	
Pref Mode Status	Normal/Perf	Normal	
Eng or Trans DTC	Yes, No	No	"C1"
Park/Neutral Pos	P-N--/-R-Dl	Park/Neutral (P-N--)	"C1-A"
System Voltage	Volts	12.0 - 14.5V	

ENGINE AND TRANSMISSION TECH 1 DATA DEFINITIONS

A list of each data message displayed on the Tech 1 scan tool will be explained in two groups; "Engine" or "Transmission." This information will assist in emission or driveability problems. The displays can be viewed while the vehicle is being driven. Always perform the "On-Board Diagnostic (OBD) System Check" first. The "OBD System Check" will confirm proper system operation.

With the Tech 1 connected, the ASR system may be disabled and the "Service ASR" lamp may turn "ON."

ENGINE DATA

ENGINE SPEED - Range 0-9999 RPM - Engine speed is computed by the PCM from the distributor reference input (low resolution circuit). It should remain close to desired idle under various engine loads with engine idling.

DESIRED IDLE - Range 0-3187 RPM - The idle speed that is commanded by the PCM. The PCM will compensate for various engine loads based on engine coolant temperature to keep the engine at the desired speed.

ENG COOL TEMP - Range -40°C to 151°C, -40°F to 304°F - The Engine Coolant Temperature (ECT) sensor is mounted in the coolant pump and sends engine temperature information to the PCM. The PCM supplies 5 volts to the ECT sensor circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold (internal resistance high), the PCM monitors a high signal voltage and interprets it as a cold engine. As the sensor warms (internal resistance decreases), the voltage signal will decrease and the PCM will interpret the lower voltage as a warm engine.

INTAKE AIR TEMP - Range -40°C to 151°C, -40°F to 304°F - The PCM converts the resistance of the intake air temperature sensor to degrees. Intake Air Temperature (IAT) is used by the PCM to adjust fuel delivery and spark timing according to incoming air density.

MAP - Range 10-105 kPa/0.00-5.00 Volts - The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure from engine load and speed changes. As intake manifold pressure increases, the air density in the intake manifold also increases and additional fuel is required.

BARO - Range 10-105 kPa/0.00-5.00 Volts - The BARO reading displayed is determined from the MAP sensor at ignition "ON," engine "OFF," and WOT conditions. The BARO reading displayed represents barometric pressure and is used to compensate for altitude differences.

THROT POSITION - Range 0-5.00 Volts - Used by the PCM to determine the amount of throttle demanded by the driver. The display should read 0.36-0.96 volt at idle to greater than 4 volts at wide open throttle.

THROTTLE ANGLE - Range 0 - 100% - Computed by the PCM from TP sensor voltage (throttle position) and should display 0% at idle and 100% at wide open throttle. Refer to DTC 21 if TP sensor angle is not 0% at idle.

HEATED OXYGEN SENSORS (BANK 1 AND 2) - Range 0-1132 mV - Represents the exhaust oxygen sensor output voltage. Should fluctuate constantly within a range between 10 mV (lean exhaust) and 1000 mV (rich exhaust) when operating in "Closed Loop."

LOOP STATUS - Tech 1 Displays OPEN or CLOSED - "Closed Loop" displayed indicates that the PCM is controlling fuel delivery according to oxygen sensor voltage. In "Open Loop," the PCM ignores the oxygen sensor voltage and bases the amount of fuel to be delivered on TP sensor, engine coolant, and MAP sensor inputs only.

SHORT TERM FUEL TRIM - Range 0-255 Counts - Short term fuel trim represents a short-term correction to fuel delivery by the PCM in response to the amount of time the oxygen sensor voltage spends above or below the 450 mV threshold. If the oxygen sensor voltage has mainly remained less than 450 mV, indicating a lean air/fuel mixture, short term fuel trim will increase and the PCM will add fuel. If the oxygen sensor voltage stays mainly above the threshold, the PCM will reduce fuel delivery to compensate for the indicated rich condition.

LONG TERM FUEL TRIM - Range 0-255 Counts - Long term fuel trim is derived from the short term fuel trim value and is used for long-term correction of fuel delivery. A value of 128 counts indicates that fuel delivery requires no compensation to maintain a 14.7:1 air/fuel ratio. A value less than 128 counts indicates that the fuel system is rich and fuel delivery is being reduced (decreased injector pulse width).

A value greater than 128 counts indicates that a lean condition exists and the PCM is compensating by adding fuel (increased injector pulse width).

FUEL TRIM CELL - Range 0-255 - Fuel trim cell is dependent upon engine speed and MAP sensor readings. Fuel trim cell indicates which cell is currently active.

FUEL TRIM ENABLE - Tech 1 displays NO/YES - If the Fuel Trim Enable system is learning "YES" the long term fuel trim is responding to the short term fuel trim. If the Fuel Trim Enable indicates "NO" then long term fuel trim will not respond to changes in short term fuel trim.

SPARK ADVANCE - Tech 1 range 0°-255° - This is a display of the spark advance (IC) calculation which the PCM calculates and then provides all spark advance to the ignition system. The PCM computes the desired spark advance using data such as engine coolant temperature, RPM, load, vehicle speed, and operating mode. There is no adjustment for spark advance.

MASS AIR FLOW - Tech 1 range 0-512 - Displays grams per second. The PCM converts the mass air flow sensor input signal into grams per second, indicating the amount of air flow entering the engine.

KNOCK RETARD - Range 0° to 128° - Indicates the amount of spark advance the PCM is removing from IC in response to the Knock Sensor (KS) signal.

KNOCK SIGNAL - Tech 1 displays YES/NO - Indicates whether or not a knock signal is being detected by the PCM. Should display "NO" at idle.

LO RESOLUTION SIGNAL - Range 0-1000 m/sec. - This signal is generated by the ignition control module and should display time between low resolution signal reference pulses detected by the PCM.

HI RESOLUTION SIGNAL - Tech 1 displays YES/NO - This signal is generated by the ignition control module and will switch from "NO" to "YES" when the PCM detects a high resolution signal.

INJECTOR PULSE WIDTH - Tech 1 range 0.0-1000 m/sec - Indicates the time the injectors remain "ON." When engine load is increased, injector pulse width will increase.

IDLE AIR CONTROL - Range 0-255 - Displays the commanded position of the idle air control pintle in counts. The greater the number of counts, the greater the idle air passages opened. Idle air control should respond fairly quickly to changes in engine load to maintain desired idle RPM.

LEARNED IAC - Range 0-255 counts - Learned IAC is an internal PCM parameter. Each time the vehicle is driven the IAC system learns how many counts is required to produce a given desired idle.

EGR DUTY CYCLE - Range 0-100% - The PCM cycles the EGR solenoid valve "ON" and "OFF." The "ON" time (duty cycle) of the EGR solenoid valve, expressed as a percent, determines how much the exhaust gas is recirculated.

SYSTEM VOLTAGE - Range 0.0-25.5 Volts - This represents the system voltage measured by the PCM.

AIR CONTROL - Tech 1 displays ON/OFF - When the PCM enables the Secondary Air Injection System, the Tech 1 will display Air Control "ON." When the PCM determines that AIR Control is not required the Tech 1 will display "OFF."

FUEL EVAP PURGE - Tech 1 range 0-100% - Used to control EVAP canister purge function. 0% indicates the valve is commanded fully closed while 100% indicates that the valve is fully open.

INJECTOR FAULT - Tech 1 displays YES/NO - "YES" indicates that the PCM does not detect voltage at the injector driver. Injector faults should indicate "NO," when circuits are OK.

TCS/ASR ACTIVE - Tech 1 displays NO/YES - When the "ASR" system is active, the Tech 1 will display "YES."

FAN CONTROL PCM A10 - Tech 1 displays OFF/ON -

- Early Production Vehicles: This will display "ON" when the PCM enables the secondary cooling fan.
- Late Production Vehicles: This will display "ON" when the PCM enables high speed fans.

FAN CONTROL PCM A11 - Tech 1 displays OFF/ON -

- Early Production Vehicles: This will display "ON" when the PCM enables the primary cooling fan.
- Late Production Vehicles: This will display "ON" when the PCM enables low speed fans, and when the PCM enables high speed fans.

A/C REQUEST - Tech 1 displays YES/NO - Represents if the A/C request from the control head is being received by the PCM.

A/C CLUTCH - Tech 1 displays ON/OFF - Represents the command state of the A/C clutch control relay. Clutch should be engaged when "ON" is displayed.

A/C STATUS - Tech 1 displays ON/OFF - The Tech 1 will display "ON" if voltage has been applied to the A/C compressor clutch.

A/C REFRIG PRESSURE - Range 0-459 psi / 0.00-5.0 Volts - The Tech 1 will display the A/C refrigerant pressure used by the PCM for cooling fan operation and A/C diagnostic trouble codes.

A/C EVAP TEMP - -7°C to 32°C, 19°F to 90°F - The Tech 1 will display the A/C evaporator temperature and is used by the PCM to cycle the A/C clutch. The evaporator temperature sensor will also prevent evaporator freeze-up.

SKIP SHIFT ACT - Tech 1 displays NO/YES - When the PCM enables the skip shift system, the Tech 1 will display "YES."

VEHICLE SPEED - Range 0-255 km/h, mph - The vehicle speed sensor signal is converted into km/h and mph for display.

TRANS RANGE SWITCH - Tech 1 displays Park/Neutral, Reverse, Drive 4, Drive 3, Drive 2, Low and Invalid - These values represent the decoded sequence of the Transmission Range (TR) pressure switch assembly circuits and are used to determine manual valve position.

PARK/NEUTRAL POS - Tech 1 displays - P-N-- or -R-DL - P-N-- displayed indicates that the gear select lever is in park or neutral.

TCC BRAKE SWITCH - Tech 1 displays OPEN/CLOSED - When the brake pedal is applied, the switch sends a signal to the PCM to disengage the TCC solenoid.

TCC SOLENOID - Displays OFF/ON - The Tech 1 only indicates when PCM has enabled the TCC Driver, but this does not confirm that the TCC has engaged. To determine if TCC is operating properly, engine RPM should decrease when TCC is enable.

1 - 2 SHIFT SOL - Tech 1 displays ON/OFF - When the transmission in in first or fourth gear, the Tech 1 should display "ON." When the transmission is in second or third gear, the Tech 1 should indicate "OFF.".

2 - 3 SHIFT SOL - Tech 1 displays ON/OFF - When the automatic transmission is in first or second gear, the Tech 1 should indicate "ON." When the transmission is in third or forth gear, the Tech 1 should display "OFF."

A/B/C RANGE (RNG) - Scan tool displays ON/OFF, ON/OFF, ON/OFF - These parameters are the three inputs from the transmission range pressure switch assembly. "ON" represents a B+ voltage signal, "OFF" represents a 0 voltage signal.

PERF MODE SWITCH - Tech 1 Displays OPEN/CLOSED - This parameter indicates the position of the performance mode switch. The Tech 1 will display "YES" when the switch is depressed and then "NO" when the switch is released.

ENG/TRANS DTC DETECTED - Tech 1 Displays YES/NO- This will display "YES" if the PCM detects a fault in an engine or transmission circuit that caused a DTC.

KNOCK SENSOR - Tech 1 displays OK/Open/Grounded - The PCM monitors the KS circuit and can determine if the sensor is open, grounded, or if the circuit is "OK."

TIME FROM START - Range 0:00:00-18:12:15 HR/MIN/SEC - A measure of how long the engine has been operating. When the ignition is cycled to "OFF" the value is reset to zero.

TRANSMISSION DATA

ENGINE SPEED - Scan tool displays 0-9999 RPM - Engine speed is computed by the PCM from the distributor reference input (low resolution circuit). It should remain close to desired idle under various engine loads with engine idling.

TRANS OUTPUT SPEED - Scan tool displays 0 RPM to 8191 RPM - This parameter indicates the rotational speed of the transmission output shaft expressed as revolutions per minute.

ENG COOL TEMPERATURE - Range -40°C to 151°C, - 40° to 304°F - The Engine Coolant Temperature (ECT) sensor is mounted in the coolant pump and sends engine temperature information to the PCM. The PCM supplies 5 volts to the ECT sensor circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold (internal resistance high), the PCM monitors a high signal voltage and interprets it as a resistance decreases), the voltage signal will decrease and the PCM will interpret the lower voltage as a warm engine.

TRANS FLUID TEMP - Scan tool displays a range of -40°C to 151°C, 40°F to 304°F - This parameter is the input signal of the transmission fluid temperature sensor. Transmission fluid temperature is high (151°C) when signal voltage is low (0 volt), and transmission fluid temperature is low (-40°C) when signal voltage is high (5 volts).

THROT POSITION - Range of 0-5.00 Volts - Used by the PCM to determine the amount of throttle demanded by the driver. The display should read 0.36-0.96 volt at idle to greater than 4 volts at wide open throttle.

THROTTLE ANGLE - Range 0-100% - Computed by the PCM from TP sensor voltage (throttle position) and should display 0% at idle and 100% at wide open throttle. Refer to DTC 21 if TP sensor angle is not 0% at idle.

A/B/C RANGE (RNG) - Scan tool displays ON/OFF, ON/OFF, ON/OFF - These parameters are the three inputs from the Transmission Range Pressure Switch Assembly. "ON" represents a B+ voltage signal, "OFF" represents a 0 voltage signal.

TRANS RANGE SWITCH (SW) - Scan tool displays a range of Invalid, Park/Neutral, Reverse, Drive 4, Drive 3, Drive 2, and Low - This parameter is the decoded status of the three A/B/C Range inputs from the Transmission Range Pressure Switch Assembly and represents the position of the transmission manual valve.

COMMANDED GEAR - Scan tool displays a range of 1, 2, 3, or 4 - This parameter is the decoded commanded state of the 1-2 and 2-3 Shift Solenoids. Gear 1 = ON, ON. Gear 2 = OFF, ON. Gear 3 = OFF, OFF. Gear 4 = ON, OFF.

ADAPTABLE SHIFT - This value indicates if the current shift will update the 1-2 adapt tables. The adapt tables are used to modify line pressure. The following items cause a shift not to be adaptable:

- Braking pressure (manual gear ranges).
- Long shift delay (shift delay is the time the solenoid changes state until the shift starts).
- Long shift time.
- Throttle range
- Significant throttle angle change.
- Hot mode.
- Transmission fluid temperature range.
- Manual gear ranges (D1, D2).
- If shift starts too soon after the solenoid state change.
- Diagnostic failures - 21, 22, 24, 28, 53, 58, 59, 72, 73, 75, 79, 81, or 82.
- Time since last shift.
- Time since the last range change.
- Significant vehicle speed change.

1 - 2 SOLENOID (SOL)/2-3 SOLENOID (SOL) - Scan tool displays ON/OFF - These parameters are the commanded status of the 1-2 and 2-3 shift solenoids. "ON" represents a commanded energized state (current flowing through solenoid). "OFF" represents a commanded non-energized state (current not flowing through solenoid).

CONTROL (CTR) FEEDBACK (FDBK) 1/2 2/3 - Scan tool displays OK/FAULT - These parameters are the actual status of the 1-2 and 2-3 shift solenoid driver control circuits.

3 - 2 CONTROL SOLENOID (SOL) - Scan tool displays a range of 0% to 100% - This parameter is the commanded percentage of "ON" time of the 3-2 Control Solenoid. "0%" represents a completely "OFF" (non-energized) commanded state. "100%" represents an "ON" (energized) commanded state.

3-2 CONTROL (CTR) FEEDBACK (FDBK)- Scan Tool displays ON/OFF." - This parameter is the actual state of the 3-2 control solenoid driver control circuit.

HOT MODE - The scan tool will display this value either "ON" or "OFF" When displayed "ON," the transmission fluid temperature has become greater than 135°C and the following actions will occur:

1. The TCC will engage in fourth gear, except when the brakes are applied, low TP signal, or a DTC is stored.
2. When the fluid temperature obtains 150°C but, less than 154°C for 15 minutes, DTC 79 will set. When DTC 79 is set, TCC application will still occur in the same criteria as when hot mode started.
3. When fluid temperature increases from 150°C for 1 second, in a time period less than 15 minutes, DTC 79 will not set. DTC 58 will set when transmission fluid temperature is greater than 154°C for 1 second.
4. When DTC 58 is set and in hot mode, the vehicle will retain hot mode criteria until the next ignition cycle.
5. If fluid temperature cools from 135°C down to less than 125°C, hot mode criteria will discontinue.

TCC SLIP SPEED - Scan tool displays a range of -4096 RPM to +4095 RPM - This parameter is the difference between transmission input speed derived (from the engine speed) and transmission output speed (from the vehicle speed sensor). A negative value indicates input speed is less than output speed (deceleration). A positive value indicates input speed is greater than output speed (acceleration). A value of zero indicates input speed is equal to output speed (TCC applied).

TCC SOLENOID - Scan tool displays ON/OFF - This parameter is the commanded state of the TCC solenoid. "ON" indicates a commanded energized state (current flowing through the solenoid). "OFF" indicates a commended non-energized state (current not flowing through the solenoid).

CONTROL (CTR) FEEDBACK (FDBK) TCC SOL - Scan tool displays OK/FAULT - This parameter is the actual state of the TCC solenoid driver control circuit.

DESIRED PRESSURE CONTROL SOLENOID (PCS) - Scan tool displays a range of 0.00 amp to 1.10 amps - This parameter is the commanded current of the Pressure Control Solenoid circuit. 0.00 amps (no current flow) indicates commended higher line pressure. 1.10 amps (high current flow) indicates commanded lower line pressure.

ACTUAL PRESSURE CONTROL SOLENOID (PCS) - Scan tool displays a range of 0.00 amp to 1.10 amps - This parameter is the actual current of the Pressure Control Solenoid circuit at the Control Module. 0.00 amps (no current flow) indicates actual higher line pressure. 1.10 amps (high current flow) indicates actual lower line pressure.

PRESSURE CONTROL SOLENOID (PCS) DUTY CYCLE - Scan tool displays a range of 0% to 100% - This parameter is the commanded state of the pressure control solenoid expressed as a percent of energized of on time. 0% indicates zero on time (non-energized) or on current flow. 100% indicates maximum on time (energized) or high current flow.

MPH/Km/h - Range 0-255 km/h, mph - The vehicle speed sensor signal is converted into km/h and mph for display.

TCS/ASR ACTIVE - Tech 1 Displays YES/NO - When the "ASR" SYSTEM is active, the Tech 1 will display "YES."

CRUISE ENGAGED - Scan tool displays NO/YES - This parameter is the signal state of the cruise control ON/OFF switch. "NO" indicates a 0 voltage signal (cruise control not requested). "YES" indicates a B+ voltage (cruise control requested).

TCC BRAKE SWITCH - Scan tool displays APPLIED/RELEASED - This parameter indicates the state of the TCC Brake Switch circuit input. "APPLIED" indicates a 0 voltage input (brake switch open, brake pedal applied). "RELEASED" indicates a B+ voltage input (brake switch closed, brake pedal released).

KICKDOWN ENABLED - Scan tool displays NO/YES - This parameter indicates whether enabling conditions exists for an acceleration mode downshift. "NO" indicates enabling conditions (throttle position, vehicle speed, input speed, etc.) do not exists for an acceleration mode downshift. "YES" indicates enabling conditions exists for an acceleration mode downshift.

1 - 2 SHIFT TIME - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the actual time of the last 1-2 shift. This parameter is not accurate at less than 25% throttle position.

2 - 3 SHIFT TIME - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the actual time of the last 2-3 shift.

1 - 2 SHIFT ERROR - Scan tool displays a range of 0.00 seconds to 6.38 seconds - This parameter is the difference between the desired 1-2 shift time and the actual 1-2 shift time. This parameter is not accurate at less than 25% throttle position

CURRENT (CURR) ADAPT CELL - Scan tool displays a range of NOT USED, 25% TP Cell, 40% TP Cell and 70% TP Cell - This parameter indicates the current throttle position cell used for fluid line pressure modification (adaptation). "NOT USED" represents 0% - 25% throttle angle. "25% TP Cell" represents 25% - 39% throttle cell. "40% TP Cell" represents 40% - 70% throttle angle. "70% TP Cell" represents 70% - 100% throttle angle.

PERF MODE SWITCH - Tech 1 Displays OPEN/CLOSED - This parameter indicates the position of the performance mode switch. The Tech 1 will display "CLOSED" when the switch is depressed and then "OPEN" when the switch is released.

PERF LAMP FDBK - Tech 1 Displays OK/Fault - This parameter is the actual state of the performance mode indicator lamp circuit. The Tech 1 will display FAULT when the lamp is "ON" while commanded "OFF" or when the lamp is "OFF" while commanded "ON." The Tech 1 will display OK when the lamp is "ON" while commanded "ON" or when the lamp is "OFF" while commanded "OFF."

PERF MODE STATUS - Tech 1 Displays Normal/PERF - This parameter is the actual state of the performance mode control program (within the PCM). The Tech 1 will display "PERF" when the performance mode is active (Performance Shift Calibration). The Tech 1 will display "Normal"when the performance mode is not active (Normal Shift Calibration)

ENG/TRANS DTC DETECTED - Tech 1 Displays YES/NO - This will display "YES" if the PCM detects a fault in an engine or transmission circuit that caused a DTC.

PARK/NEUTRAL POS - Tech 1 displays - P-N-- or -R-DL - P-N-- displayed indicates that the gear select lever is in park or neutral.

SYSTEM VOLTAGE - Scan tool displays 0.00 volt to 25.5 volts - This parameter is the battery ignition voltage input to the control module.

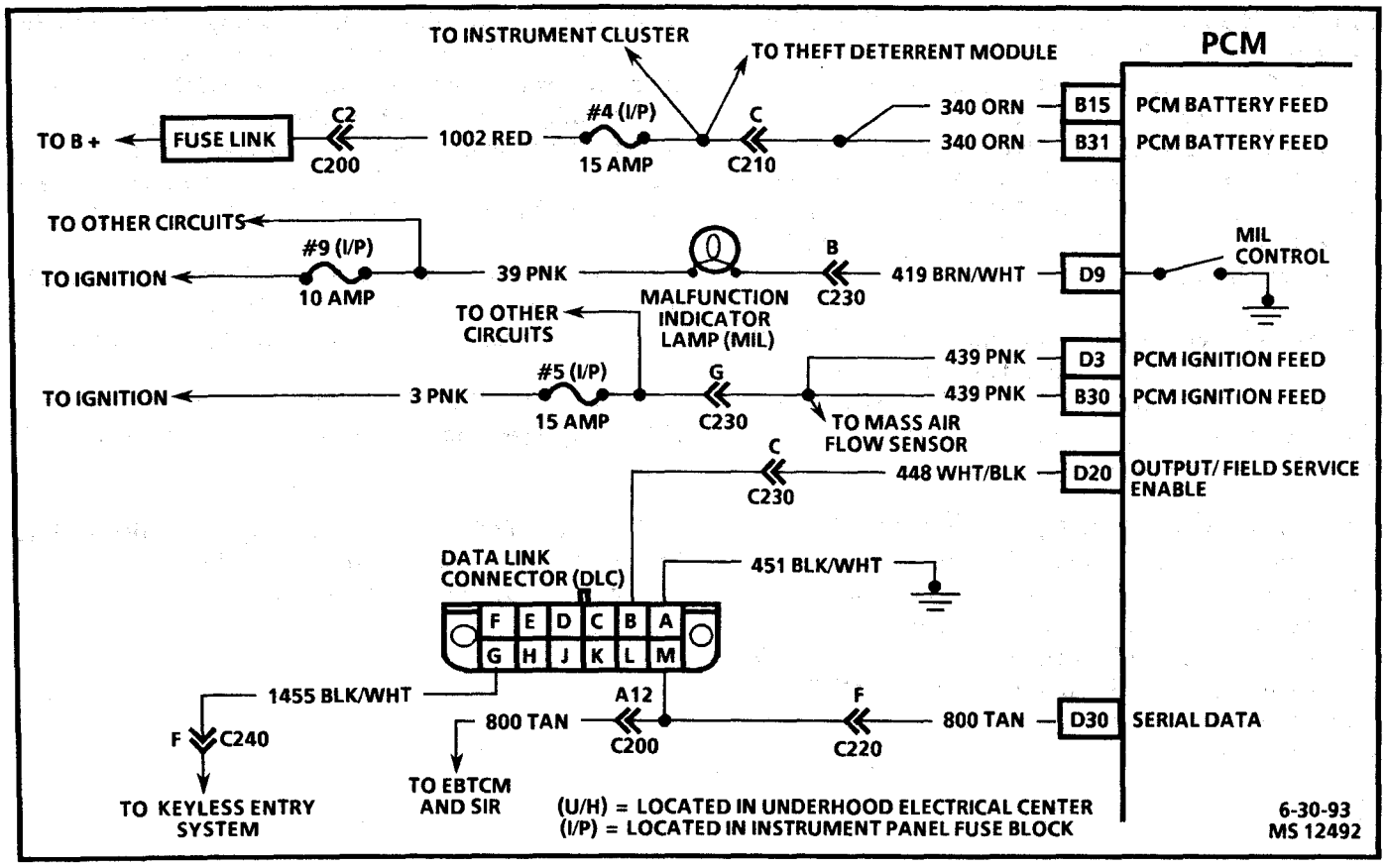


CHART A-1

NO MALFUNCTION INDICATOR LAMP (MIL)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

There should always be a steady MIL when the ignition is "ON" and engine stopped. Ignition voltage is supplied to the bulb on CKT 39. The Powertrain Control Module (PCM) will turn the light "ON" by providing the ground path through CKT 419.

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

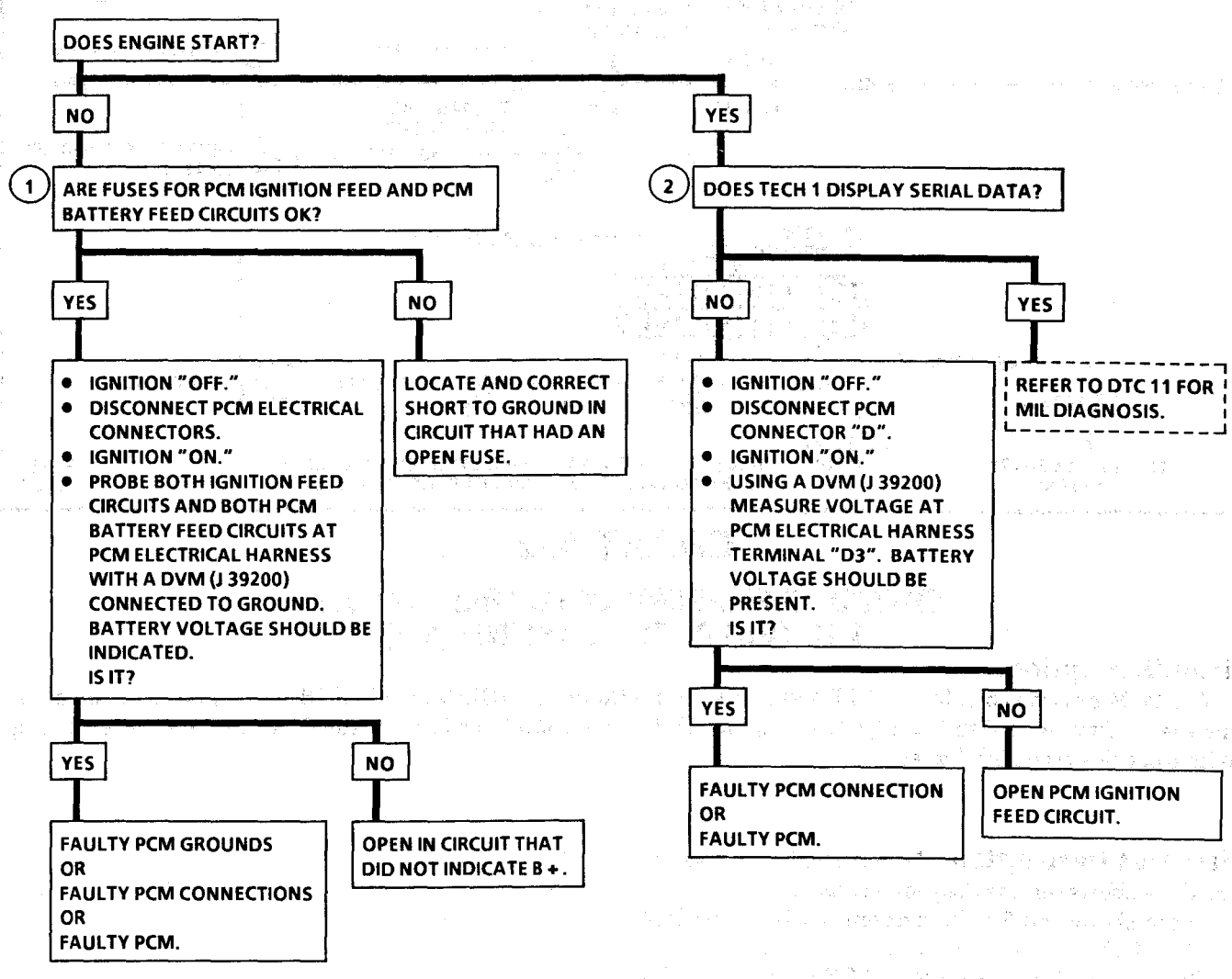
1. Fuse #4 and #5 feed several circuits in addition to the PCM. Check thoroughly for a short to ground or a shorted component that may cause either fuse to open. Refer to SECTION 8A for detailed circuit diagnosis.
2. Low voltage on "D3" will cause a high idle and soft landing to 3rd gear. If the voltage is extremely low, the MIL may not operate and/or serial data may be lost. If serial data appears to be functioning, cycle the ignition "OFF/ON" and recheck.

Diagnostic Aids: An open circuit to "D3" will cause a high idle, no serial data and soft landing to 3rd gear.

An open circuit to "B30" will cause a no start and no MIL. An open CKT 340 between the fuse and the splice will cause a no start and no MIL. "B15" and "B31" are connected internally within the PCM.

CHART A-1

NO MALFUNCTION INDICATOR LAMP (MIL) 5.7L (VIN P) "F" CARLINE (SFI)



5-25-93
PS 17787

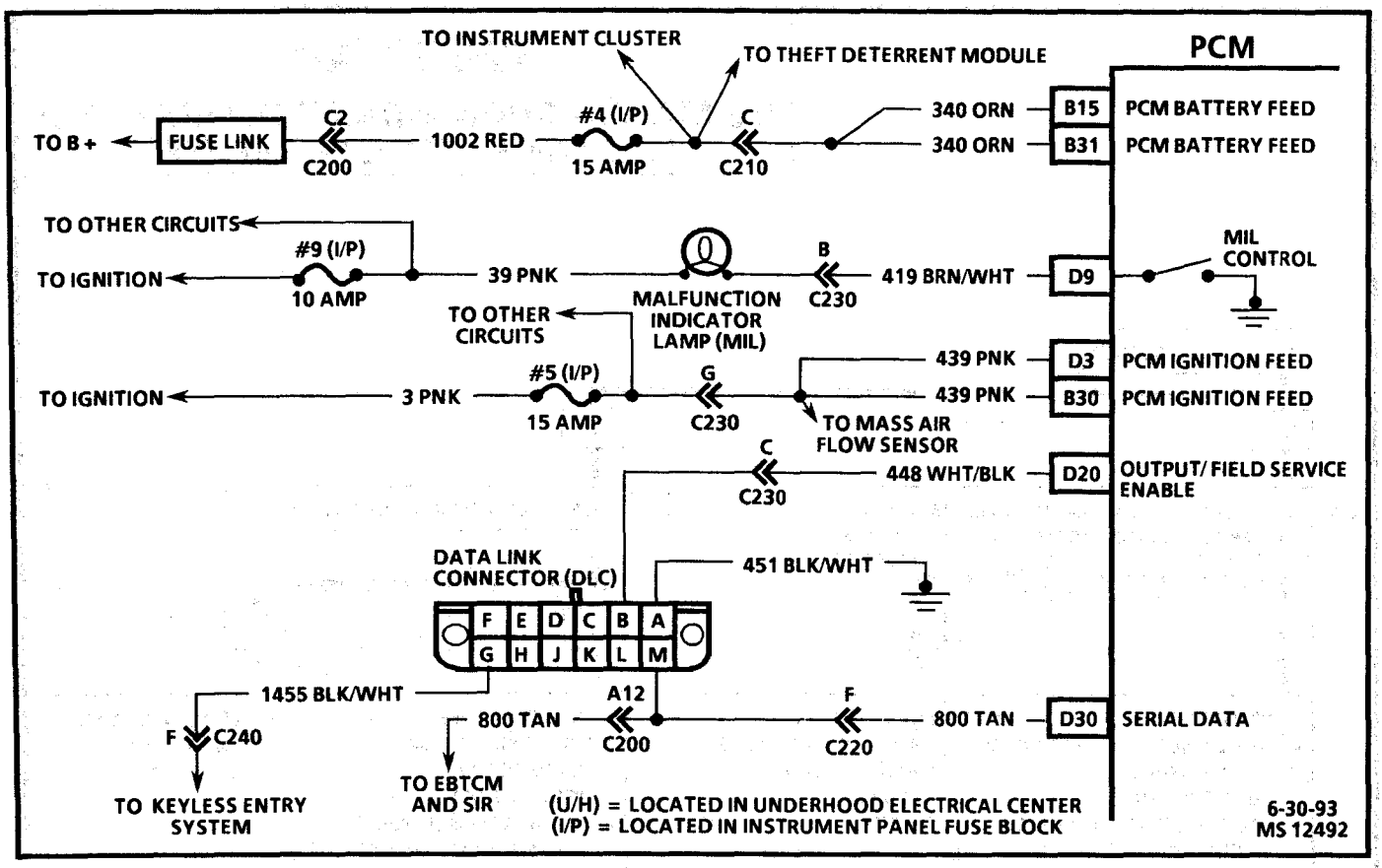


CHART A-2

OUTPUT/FIELD SERVICE ENABLE CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM provides 5 volts on CKT 448 to Data Link Connector (DLC) terminal "B". Grounding terminal "B" pulls the 5 volts low. With the key "ON" engine "OFF," most outputs will be enabled. With the engine running, the field service mode is enabled.

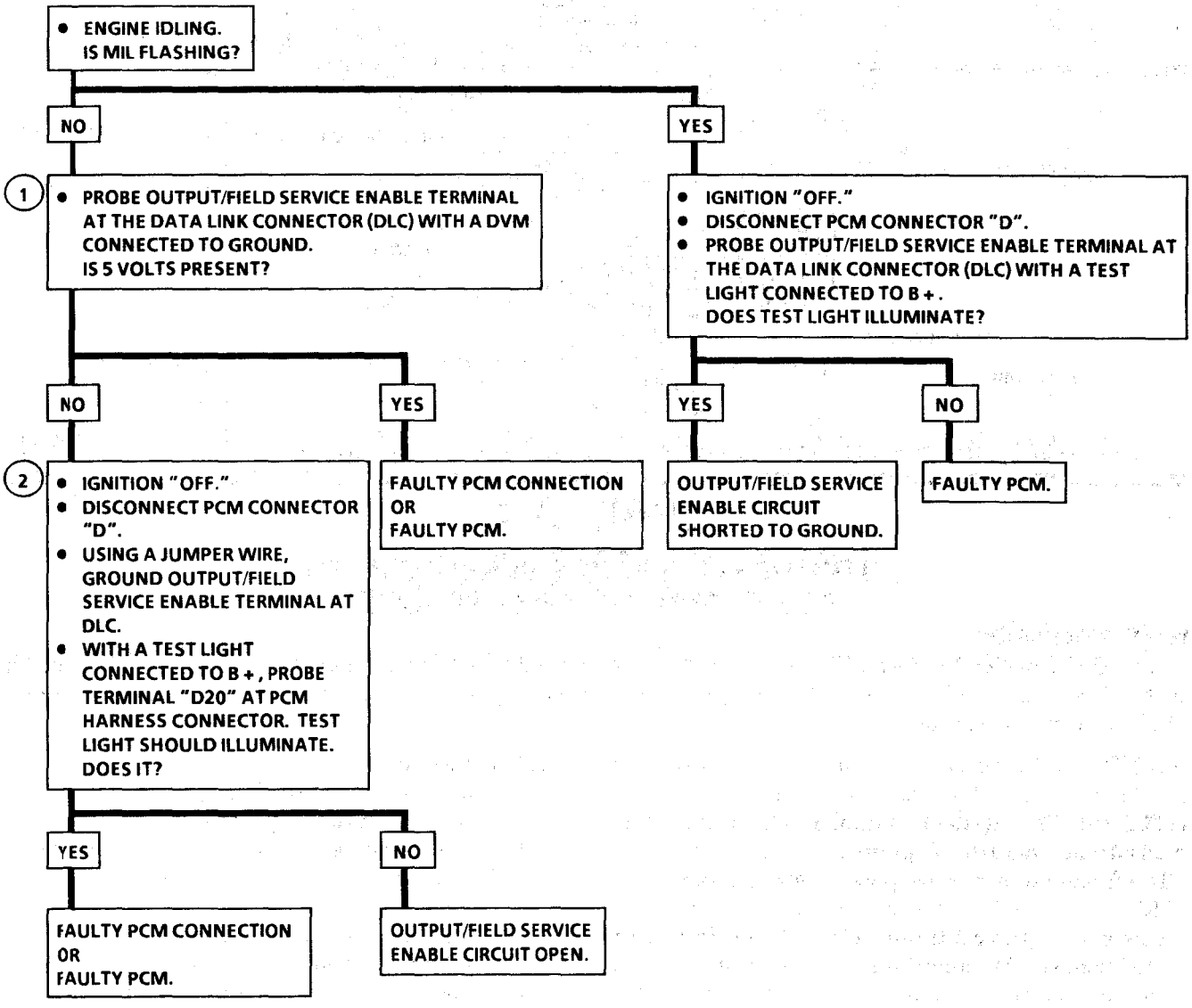
Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. There should be 5 volts present at DLC terminal "B".
2. This checks the continuity of CKT 448 from the DLC to the PCM connector.

CHART A-2

OUTPUT/FIELD SERVICE ENABLE CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



5-20-93
PS 17788

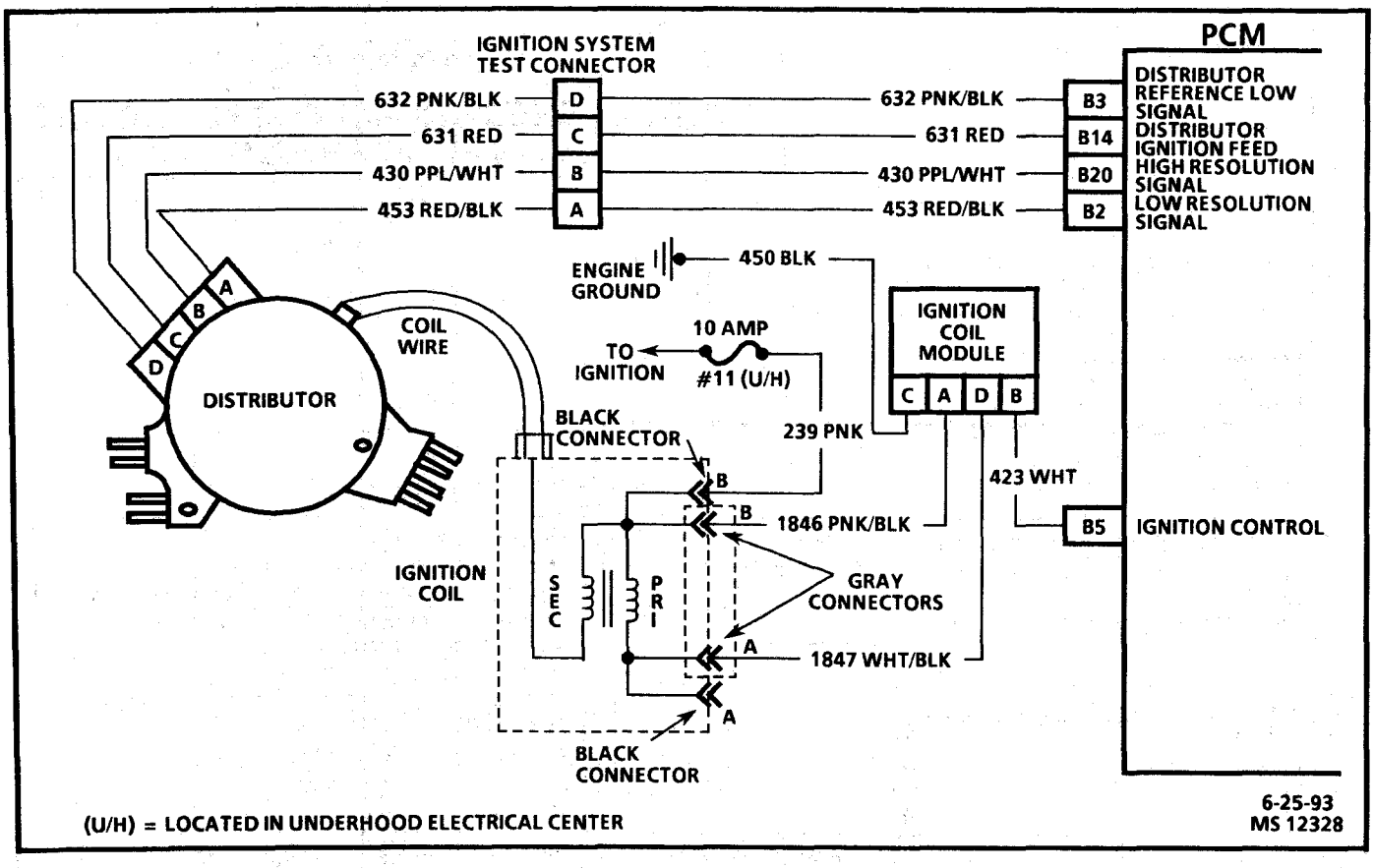


CHART A-3

ENGINE CRANKS BUT WILL NOT RUN
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

This chart assumes that battery condition and engine cranking speed are OK, and there is adequate fuel in the tank.

Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. Perform OBD system check to determine if the PCM and the MIL (Malfunction Indicator Lamp) are functioning, before proceeding with this chart.
2. An injector with a resistance value too low will cause an injector fuse to open. If Injector #9 or #10 fuse is open, 4 injectors will be disabled and a no start may occur. The resistance of each injector should be within one ohm of each other.
3. Use fuel pressure gage J 34730-1. Wrap a shop towel around the fuel pressure tap to absorb any small amount of fuel leakage that may occur when installing the gage.
4. CHART C-4 will address all problems related to the causes of a no spark condition.

Diagnostic Aids:

- An EGR valve sticking open can cause a low air/fuel ratio during cranking.
- Unless engine enters "Clear Flood" at the first indication of a flooding condition, it can result in a no start.
- Check duct work between mass air flow sensor and throttle body for air leaks.
- A defective Mass Air Flow (MAF) sensor may cause a no start or a stall after start. Disconnect the MAF sensor. The PCM will default to speed density (MAP, IAT, RPM) to calculate load and air flow. If the condition is corrected and the connections are OK, replace the MAF sensor.

If above are all OK, refer to "Hard Start" in "Symptoms," Section "6E3-B".

CHART A-3

ENGINE CRANKS BUT WILL NOT RUN
5.7L (VIN P) "F" CARLINE (SFI)

1. • PERFORM ON-BOARD DIAGNOSTIC SYSTEM CHECK BEFORE PROCEEDING WITH THIS CHART. ALSO CHECK THE FOLLOWING:
   - IF PCM DTC(s) 16, 18, 41, 42, 46 OR 48 ARE STORED, USE THOSE CHARTS FIRST.
   - ACTUAL ENGINE TEMPERATURE AND ECT TEMPERATURE ON THE TECH 1 SHOULD BE CLOSE TO THE SAME, IF NOT, REFER TO DTC 15.
   - TP SENSOR - IF OVER 2.5 VOLTS AT CLOSED THROTTLE, USE THE DTC 21 CHART.

   IS RPM INDICATED ON TECH 1 DURING CRANKING?

YES

- USING A ST-125 (SPARK CHECKER), J 26792, CHECK FOR SPARK WHILE CRANKING (CHECK TWO WIRES). IS SPARK PRESENT?

YES

2. • CHECK INJECTOR FUSES FOR BEING OPEN. ARE FUSE(s) OK?

YES

- USING TECH 1, ENABLE FUEL PUMP. DOES FUEL PUMP OPERATE?

YES

3. • IGNITION "OFF."
   • INSTALL FUEL PRESSURE GAGE AND NOTE PRESSURE AFTER IGNITION "ON." SHOULD BE (283-325 kPa) 41-47 psi.

OK

- REVIEW THE "DIAGNOSTIC AIDS" ON FACING PAGE FOR ADDITIONAL ITEMS TO CHECK. IF ALL ARE OK, SFI SYSTEM IS OK. REFER TO "HARD START" IN "SYMPTOMS," SECTION "B".

NOT OK

USE CHART A-7.

NO

USE CHART A-5.

NO

CHECK INJECTOR(s) OR INJECTOR CIRCUITS FOR BEING SHORTED TO GROUND.

NO

4. BASIC IGNITION SYSTEM PROBLEM. REFER TO CHART C-4.

NO

- IGNITION "OFF."
- DISCONNECT DISTRIBUTOR ELECTRICAL CONNECTOR.
- IGNITION "ON."
- PROBE TERMINAL "C" WITH A TEST LIGHT TO GROUND.
- LIGHT SHOULD BE "ON."

  IS IT?

YES

- CHECK FOR CONTINUITY BETWEEN DISTRIBUTOR CONNECTOR TERMINAL "D" AND GROUND.
- CIRCUIT SHOULD HAVE CONTINUITY.

  DOES IT?

YES

FAULTY DISTRIBUTOR CONNECTION
OR
FAULTY DISTRIBUTOR.

NO

FAULTY PCM CONNECTION
OR
OPEN OR GROUNDED IGNITION FEED CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

NO

FAULTY PCM CONNECTION
OR
OPEN GROUND CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

6-25-93
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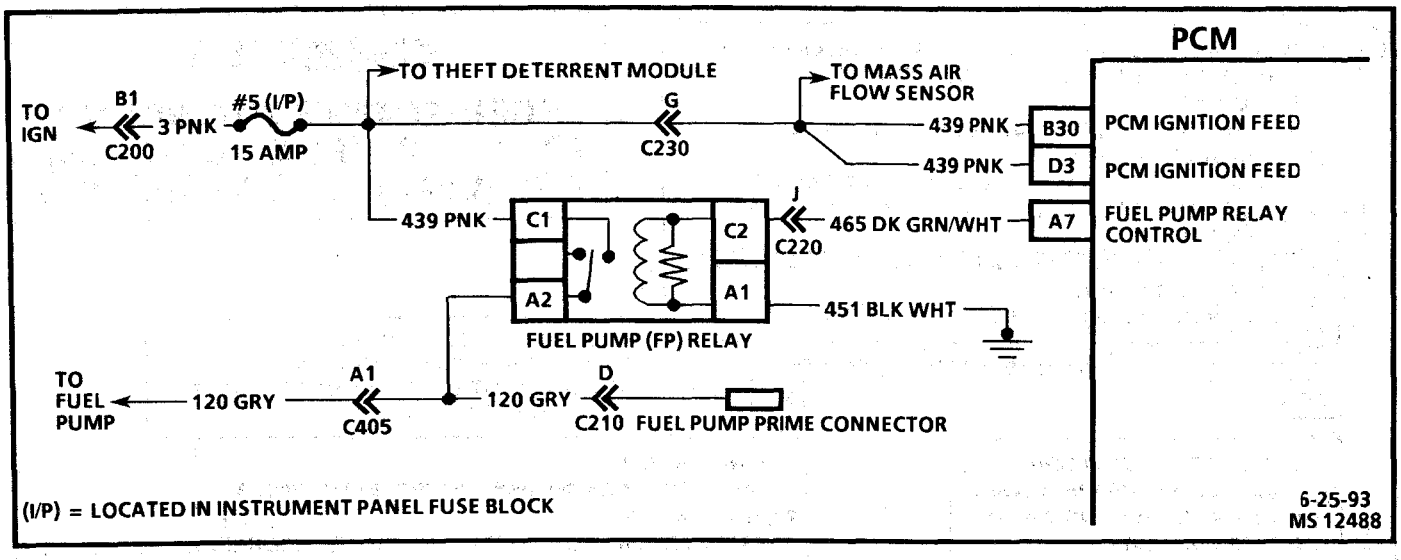


CHART A-5

FUEL PUMP RELAY CIRCUIT
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 PCM is receiving low resolution reference pulses from the distributor ignition system.

If there are no reference pulses, the PCM will shut "OFF" the fuel pump about 2-3 seconds after key "ON," or when engine stops. When sufficient oil pressure is present to close the oil pressure switch, the fuel pump will remain "ON."

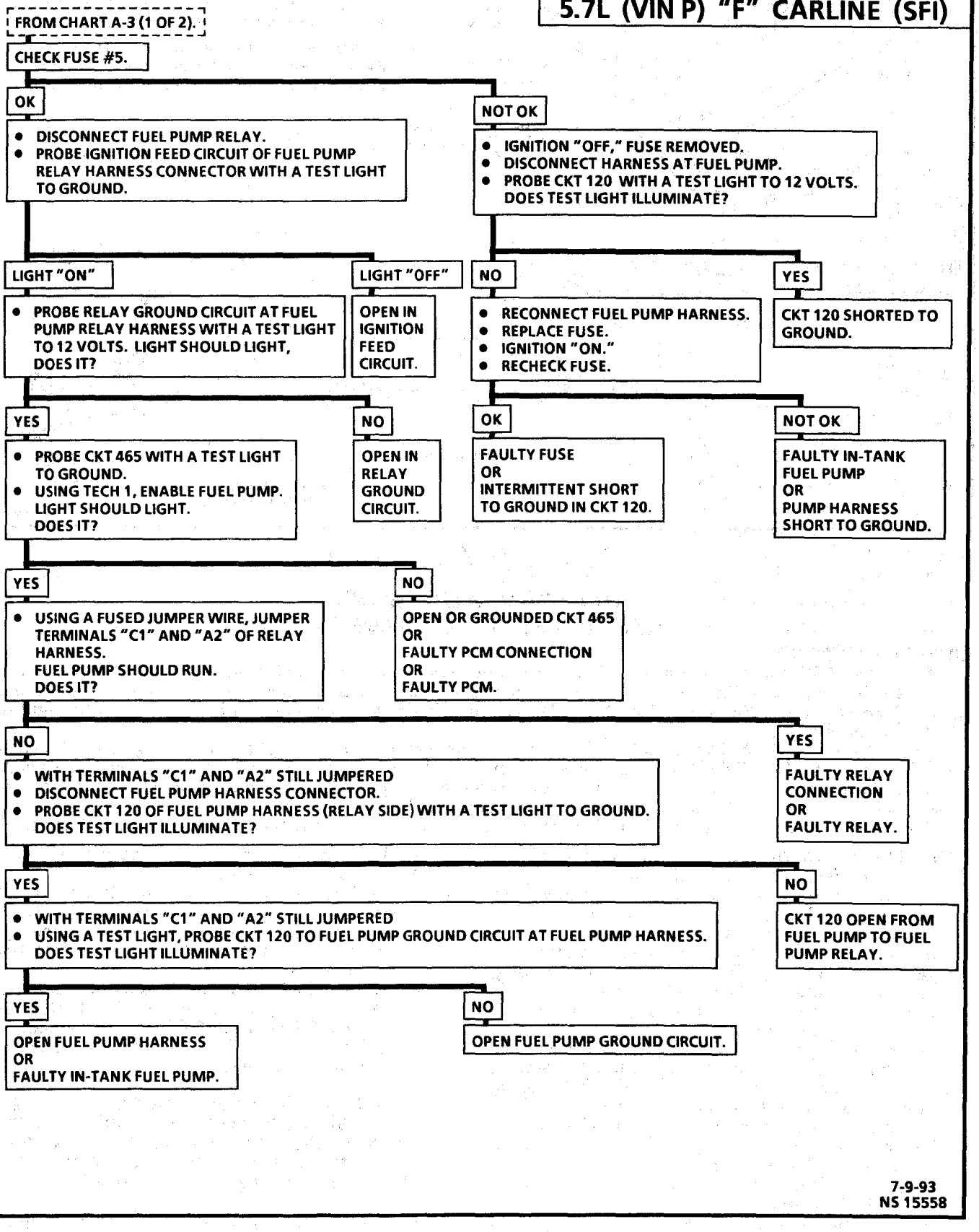
The pump will deliver fuel to the fuel rail and injectors, then to the pressure regulator, where the system pressure is controlled to 284-325 kPa (41-47 psi). Excess fuel is then returned to the fuel tank.

When the engine is stopped, the fuel pump can be turned "ON" by using the Tech 1. Improper fuel system pressure will result in one or all of the following symptoms:

- Cranks but won't run.
- DTC 44 and 64.
- DTC 45 and 65.
- Cuts out, may feel like ignition problem.
- Poor fuel economy, loss of power.
- Hesitation.
- DTC 55.

CHART A-5

FUEL PUMP RELAY CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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NS 15558

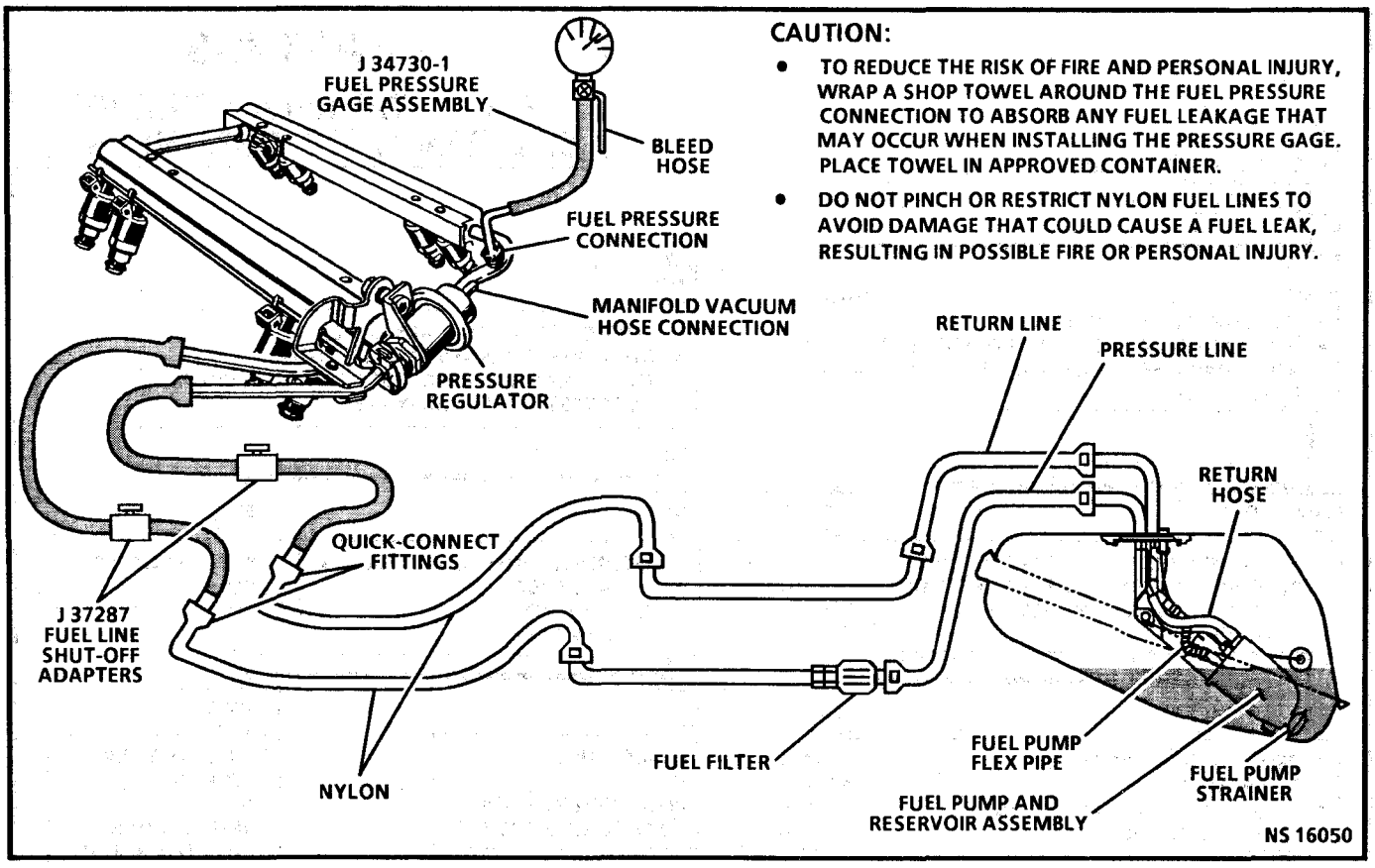


CHART A-7 (Page 1 of 3)

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.

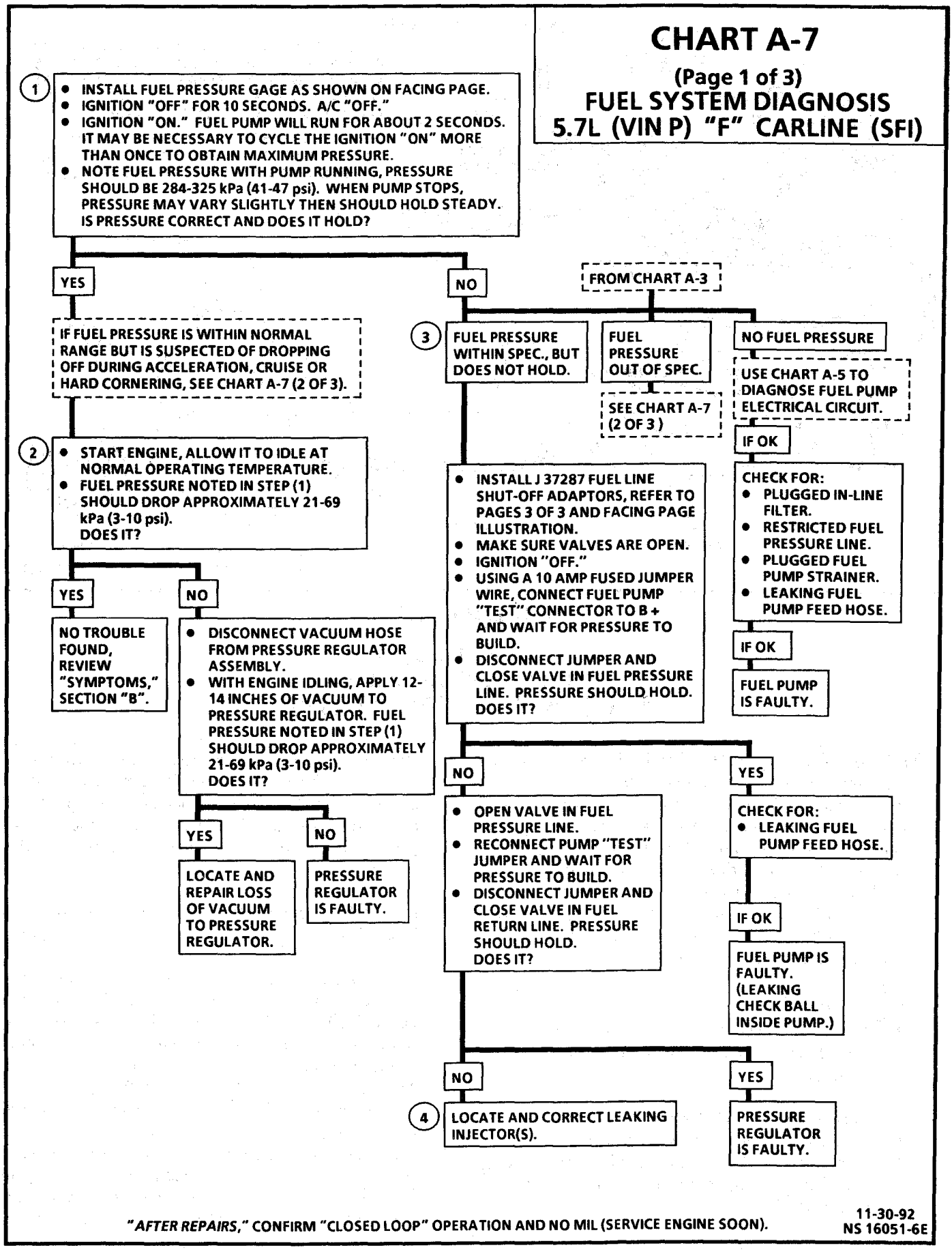
1. Connect fuel pressure gage as shown in illustration. Wrap a shop towel around the fuel pressure connection to absorb any small amount of fuel leakage that may occur when installing the gage. With ignition "ON" and fuel pump running, pressure should be 284-325 kPa (41-47 psi). This pressure is controlled 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.

CHART A-7

(Page 1 of 3)
FUEL SYSTEM DIAGNOSIS
5.7L (VIN P) "F" CARLINE (SFI)



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

11-30-92
NS 16051-6E

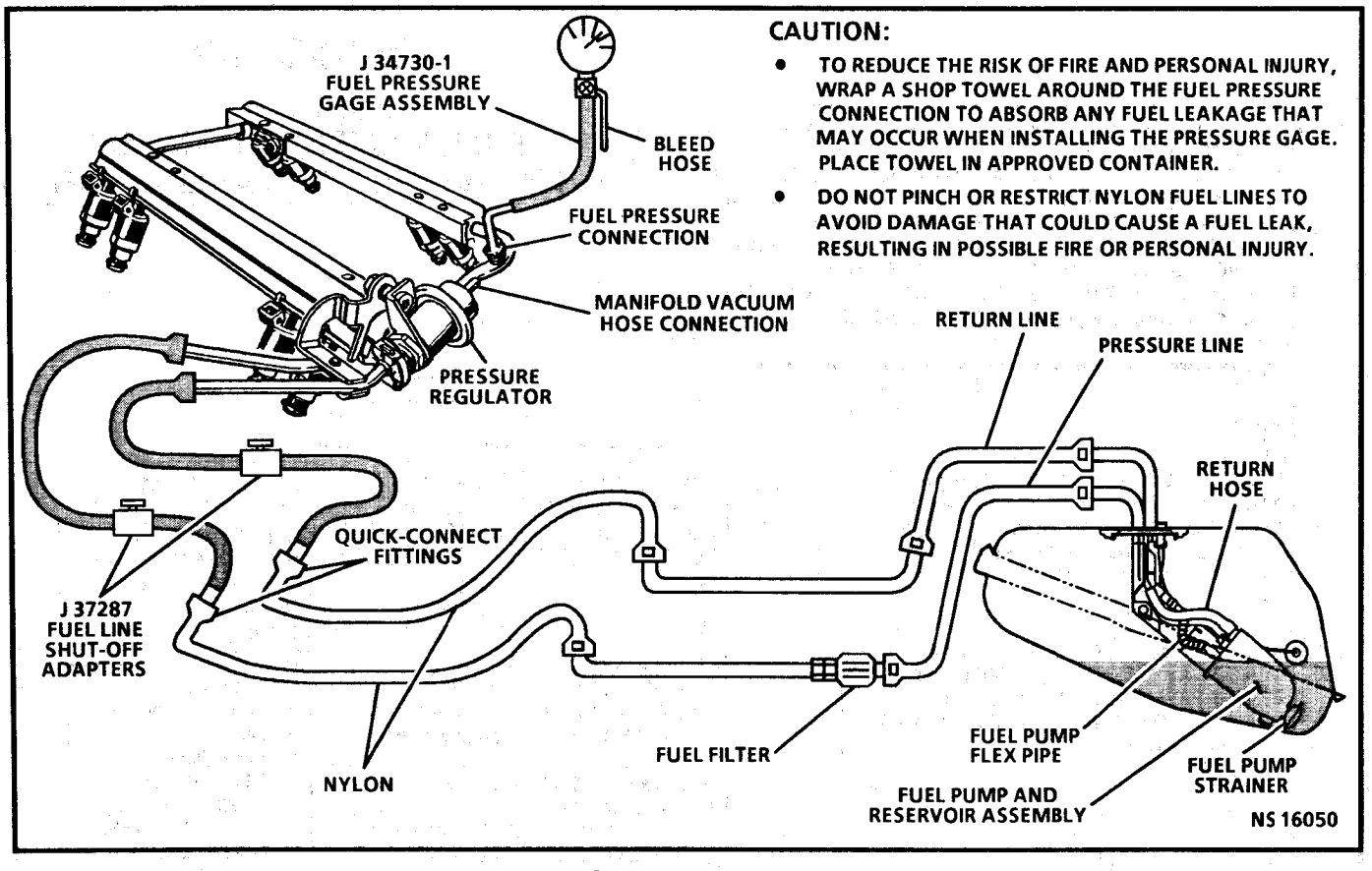


CHART A-7

(Page 2 of 3)
FUEL SYSTEM DIAGNOSIS
5.7L (VIN P) "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 300 mV. Also, injector pulse width will increase.

Important

- Make sure system is not operating at "Fuel-Cutoff" 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.

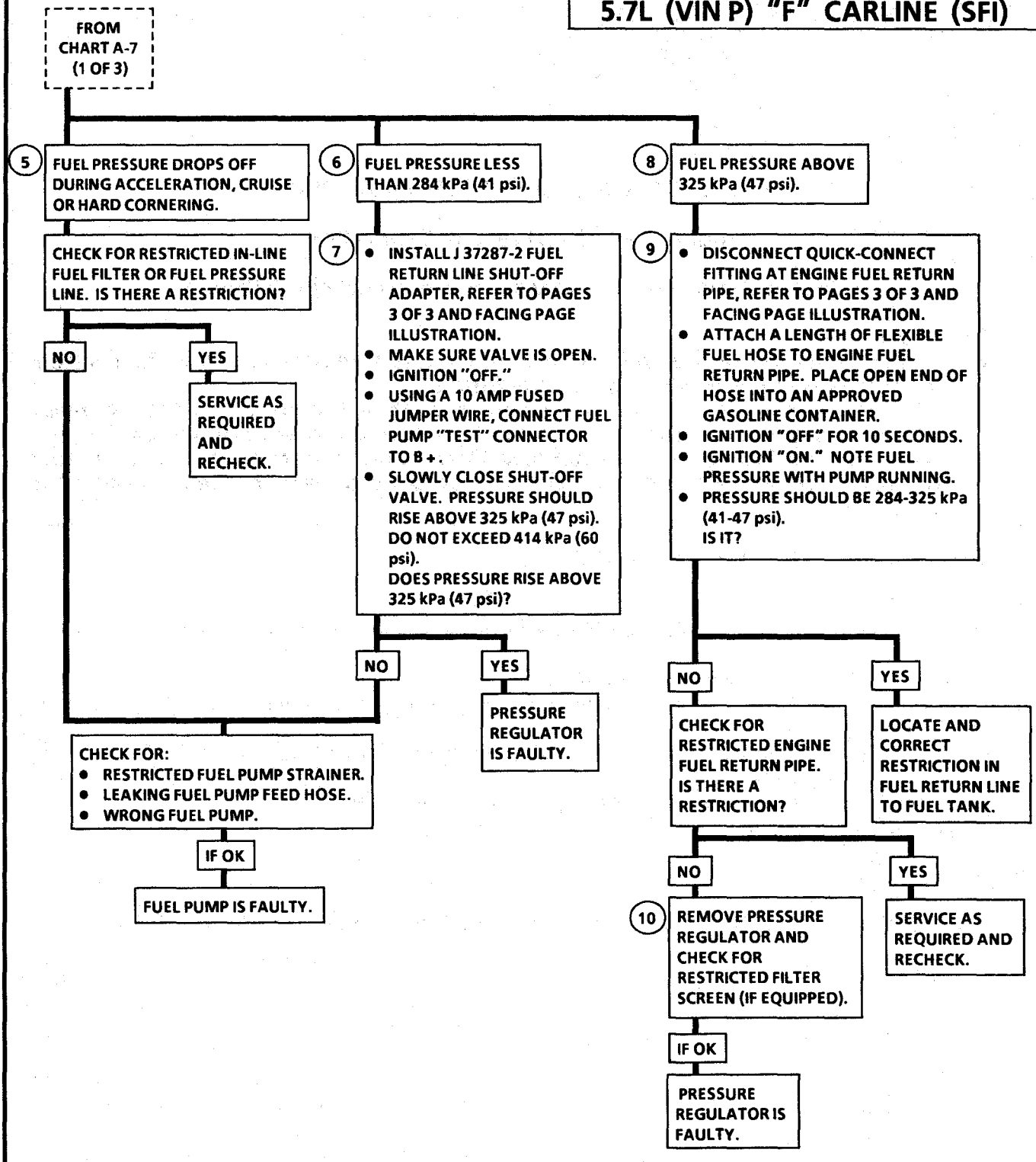
NOTICE: Do not allow pressure to exceed 414 kPa (60 psi) as damage to the regulator may result.

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.
10. The pressure regulator filter screen is designed to trap any contaminants introduced during engine assembly. If dirty, it can be removed with a small pick and discarded without potential harm to the regulator.

CHART A-7

(Page 2 of 3)

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



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

11-30-92
NS 16052-6E

CHART A-7

(Page 3 of 3)
FUEL SYSTEM PRESSURE TEST
5.7L (VIN P) "F" CARLINE (SFI)

FUEL SYSTEM PRESSURE RELIEF PROCEDURE

Engines With Fuel Pressure Connection

(Must Be Performed Before Disconnecting Fuel Line Fittings)

CAUTION:

- **To reduce the risk of fire and personal injury, it is necessary to relieve fuel system pressure before disconnecting fuel line fittings.**
- **After relieving system pressure, a small amount of fuel may be released when disconnecting fuel line fittings. In order to reduce the chance of personal injury, cover fuel line fittings with a shop towel before disconnecting, to catch any fuel that may leak out. Place the towel in an approved container when disconnect is completed.**

Tool Required: J 34730-1 Fuel Pressure Gage

1. Ignition "OFF."
2. Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.
3. Loosen fuel filler cap to relieve tank vapor pressure.
4. Connect gage J 34730-1 to fuel pressure connection. Wrap a shop towel around fitting while connecting gage to avoid spillage.
5. Install bleed hose into an approved container and open valve to bleed system pressure. Fuel line fittings are now safe for servicing.
6. Drain any fuel remaining in gage into an approved gasoline container.
7. Perform service required.
8. Tighten fuel filler cap.
9. Ignition "OFF."
10. Connect negative battery cable.
11. Cycle ignition "ON" and "OFF" twice, waiting ten seconds between cycles, then check for fuel leaks.

SERVICING QUICK-CONNECT FITTINGS

CHART A-7

(Page 3 of 3)
FUEL SYSTEM PRESSURE TEST
5.7L (VIN P) "F" CARLINE (SFI)

Important

- In order to install fuel system diagnostic equipment on vehicles equipped with plastic quick-connect fittings, fuel line separator tools must be used to disconnect the fittings. Using the separator tools to release the fittings will cause the plastic retainer to remain inside the female connector allowing diagnostic equipment to be connected.

  Tools required:
  J 37088-A tool set, fuel line quick-connect separator;
  J 39504 tool set, fuel line quick-connect separator (restricted access).

Remove or Disconnect

1. Relieve fuel system pressure (see "Fuel System Pressure Relief").
2. If equipped, slide dust cover back to access quick-connect fitting.
3. Grasp both sides of fitting. Twist female connector 1/4 turn in each direction to loosen any dirt within fitting.

CAUTION: Safety glasses must be worn when using compressed air, as flying dirt particles may cause eye injury.

4. Using compressed air, blow dirt out of fitting.
5. Choose correct tool from J 37088-A or J 39504 tool set for size of fitting. Insert tool into female connector, then push/pull inward to release locking tabs.
6. Pull connection apart.

Clean and Inspect

NOTICE: If it is necessary to remove rust or burrs from fuel pipe, use emery cloth in a radial motion with the pipe end to prevent damage to O-ring sealing surface.

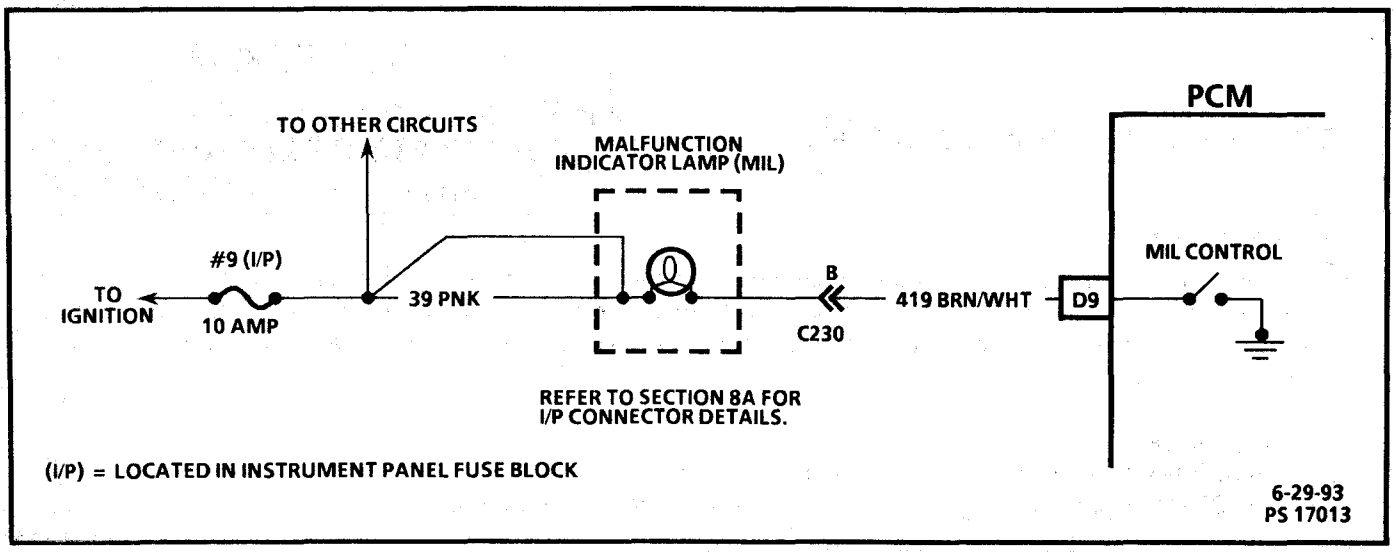
- Using a clean shop towel, wipe off male pipe end.
- Inspect both ends of fitting for dirt and burrs. Clean or replace components/assemblies as required.

Install or Connect

CAUTION: To Reduce the Risk of Fire and Personal Injury:

- **Before connecting fitting, always apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shut-off adapter. This will ensure proper reconnection and prevent a possible fuel leak. (During normal operation, the O-rings located in the female connector will swell and may prevent proper reconnection if not lubricated.)**

1. Apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shut-off adapter.
2. Push both sides of fitting together to cause the retaining tabs/fingers to snap into place.
3. Once installed, pull on both sides of fitting to make sure connection is secure.
4. If equipped, reposition dust cover over quick-connect fitting.



DTC 11

MALFUNCTION INDICATOR LAMP (MIL) CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

There should always be a steady MIL with the ignition "ON" and engine stopped. Ignition voltage is supplied directly to the bulb on CKT 39. The Powertrain Control Module (PCM) controls the light by providing the ground path through CKT 419.

DTC 11 Will Set When: The PCM detects the wrong voltage potential on CKT 419 for 26 seconds.

Action Taken (PCM will default to): None.

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

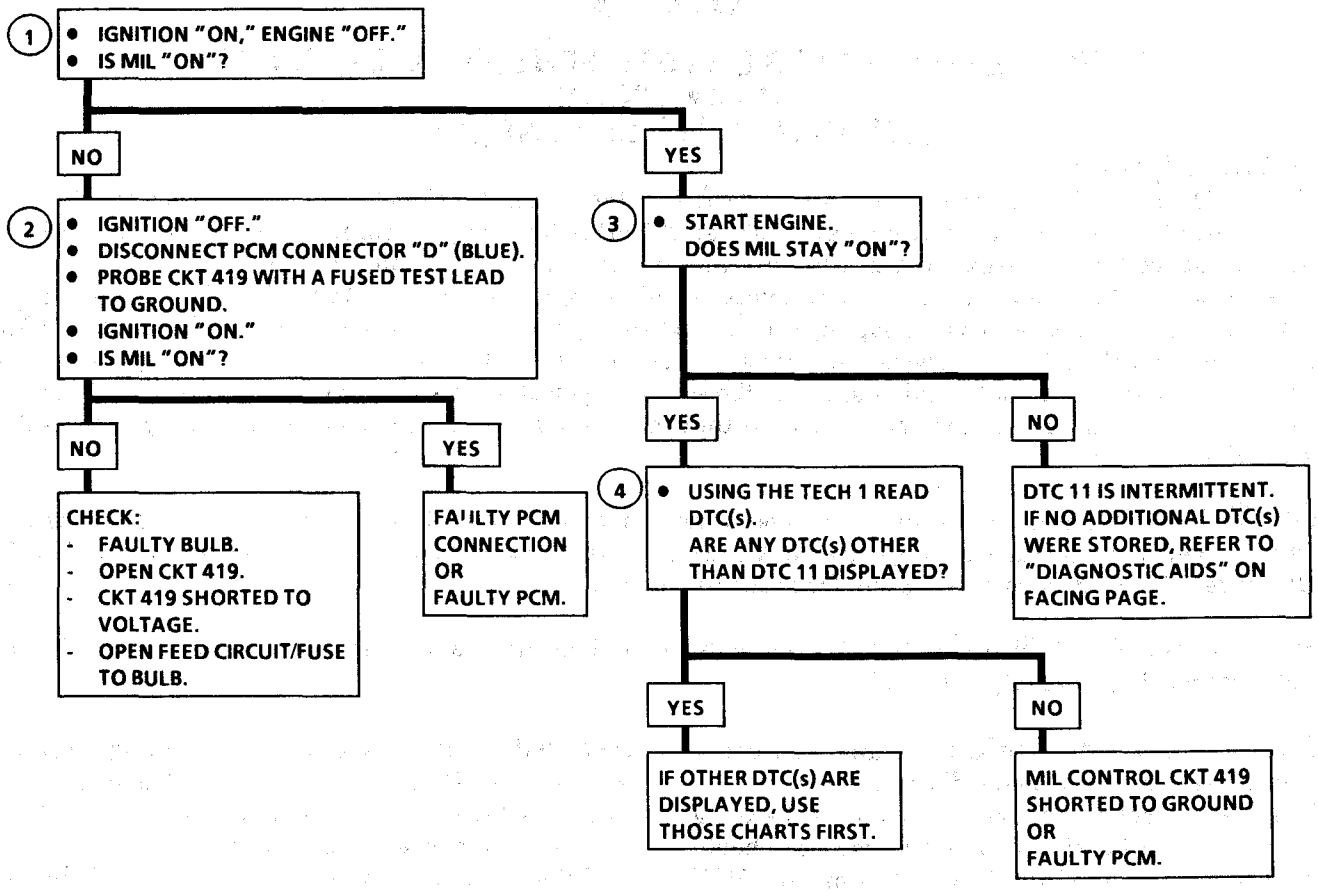
1. If CKT 419 is open or ignition feed circuit to the bulb is open, the Malfunction Indicator Lamp (MIL) will not illuminate.
2. Use J 35616-A tool kit to probe PCM harness terminals, so that you do not damage them.
3. The MIL should go "OFF" after the engine starts. If it does, the problem is not present at this time. If not, CKT 419 is shorted to ground between the PCM and MIL or the PCM is faulty.
4. If other DTCs are displayed along with DTC 11, repair other DTCs first, then restart at the beginning of this chart.

Diagnostic Aids: If ignition feed circuit is suspected of being open, check and see if other bulbs on that circuit illuminate.

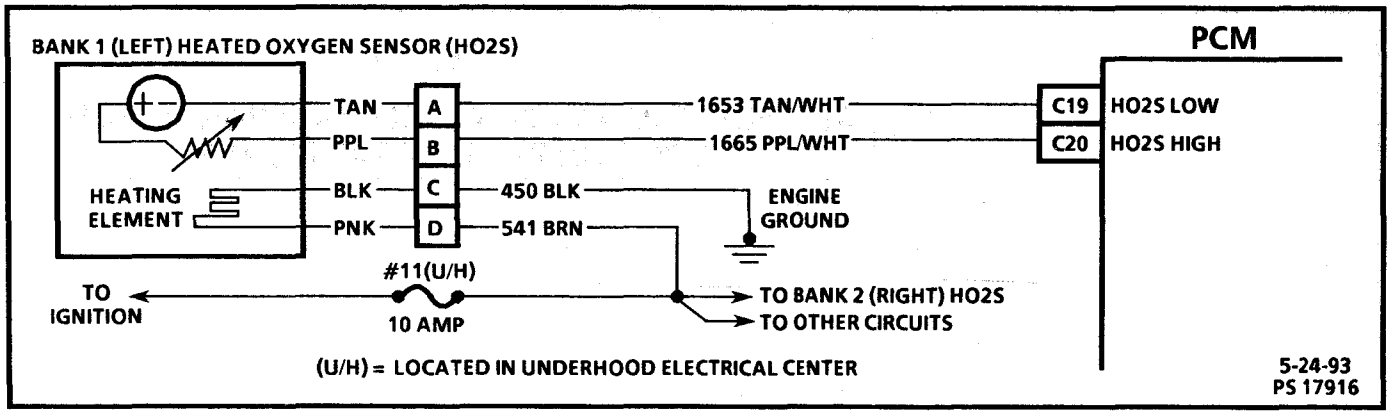
The MIL will be "ON" if DTC 11 is stored and the MIL circuit becomes operational.

DTC 11

MALFUNCTION INDICATOR LAMP (MIL) CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 13

BANK 1 (LEFT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (OPEN CIRCUIT) 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 display as low as 320 mV.) The oxygen sensor 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 13 Will Set When: Engine at normal operating temperature (70°C/158°F), engine operating more than 2 minutes, oxygen signal voltage steady between 350 mV to 550 mV, throttle position angle above 5% and DTCs 21 and 22 not set. All conditions must be met for about 60 seconds.

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. This test checks the oxygen sensor's heating element. The heating element resistance should be 3.5 ohms at 20°C (68°F) or 14 ohms at 350°C (622°F). An inoperative HO2S heater could cause a DTC 13 to set.
2. This will determine if the oxygen sensor is at fault, or if the cause of the DTC 13 is elsewhere in the circuit.
3. For this test use only a high impedance digital volt ohmmeter (J 39200). This test checks the continuity of CKT 1665.

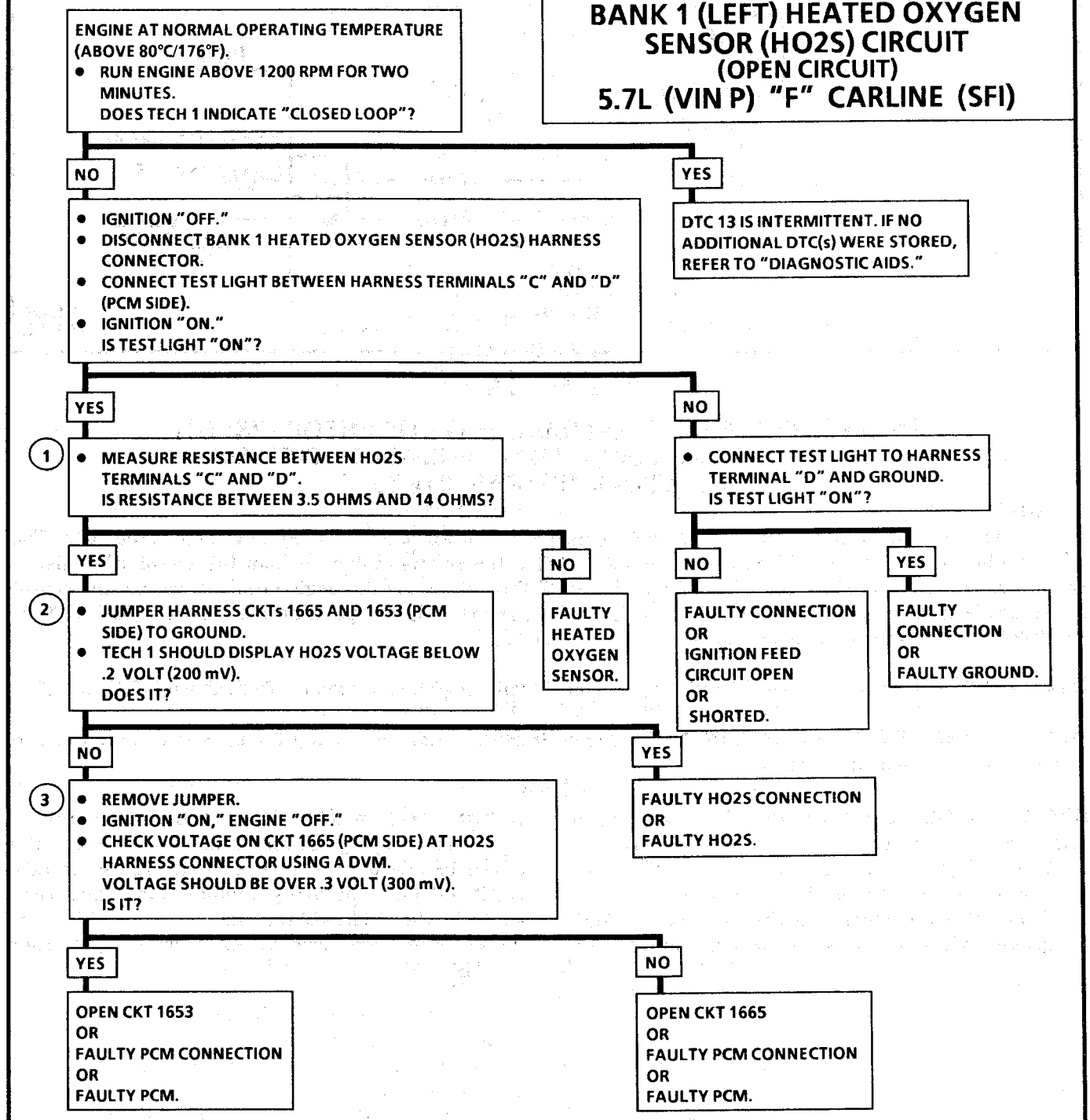
Diagnostic Aids: Normal Tech 1 voltage readings vary between 10 mV to 1000 mV (.01 and 1.0 volt), while in "Closed Loop." The system will go into "Open Loop" operation when DTC 13 sets.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

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.

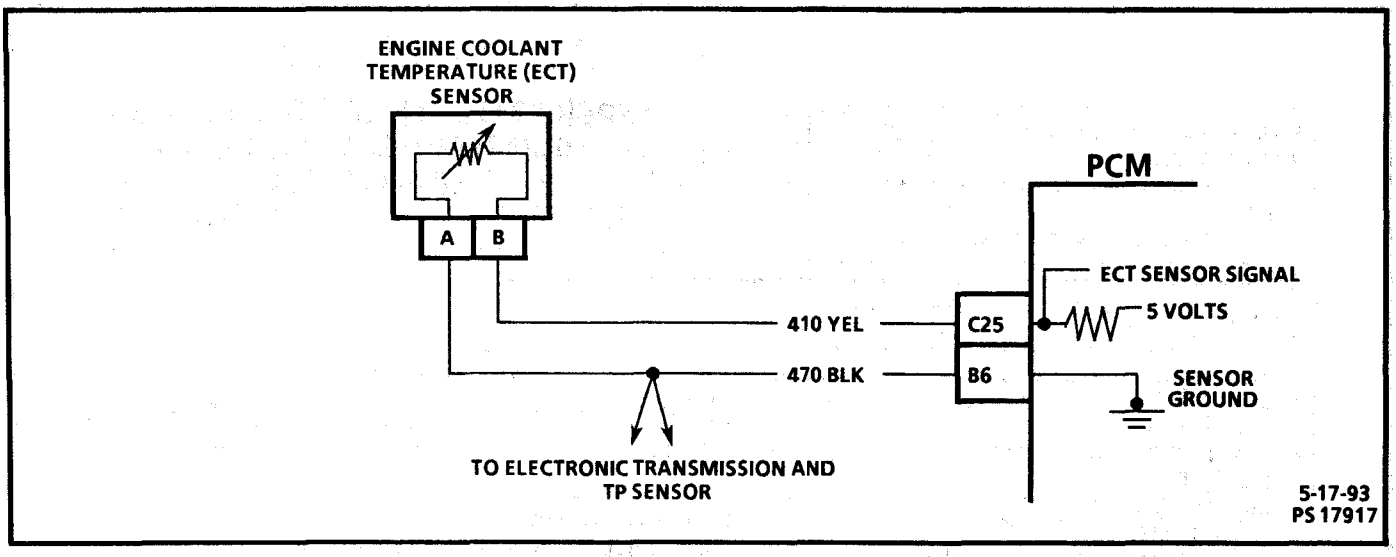
DTC 13

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



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

6-29-93
PS 17254



DTC 14

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW, HIGH TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Engine Coolant Temperature (ECT) sensor uses a thermistor to control a signal voltage to the PCM. The PCM applies a voltage on CKT 410 to the sensor. When the engine coolant is cold, the sensor (thermistor) resistance is high, therefore, the PCM signal voltage will be high. As the engine coolant warms, the sensor resistance becomes less, and the PCM voltage drops. At normal engine operating temperature (85°C-95°C or 185°F-203°F) the voltage should measure about 1.5 to 2.0 volts.

DTC 14 Will Set When: The PCM indicates engine coolant temperature signal voltage above 140°C (284°F).

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate, and transmission TCC will apply early.

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

1. Monitoring ECT will determine if the fault is a hard failure or an intermittent condition.
2. This test will determine if CKT 410 is shorted to ground, which will cause the condition for DTC 14.

Diagnostic Aids: Tech 1 displays engine temperature in degrees celsius and fahrenheit. After engine is started, the temperature should rise steadily, reach normal operating temperature, and then stabilize when thermostat opens.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 14

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW, HIGH TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

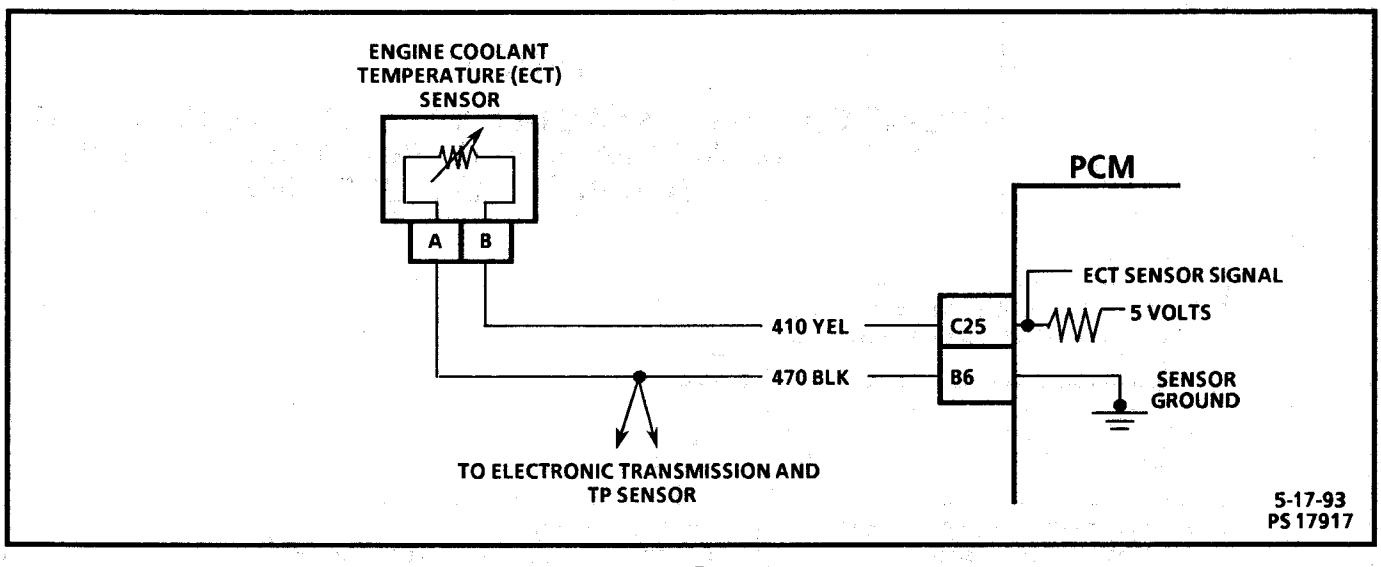
1. DOES TECH 1 DISPLAY ENGINE COOLANT TEMPERATURE OF 140°C (284°F) OR HIGHER?
   - YES
   - NO → DTC 14 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
2. • DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR.
   TECH 1 SHOULD DISPLAY ENGINE COOLANT TEMPERATURE BELOW -30°C (-22°F).
   DOES IT?
   - YES → REPLACE ENGINE COOLANT TEMPERATURE SENSOR.
   - NO → CKT 410 SHORTED TO GROUND
     OR
     CKT 410 SHORTED TO SENSOR GROUND CIRCUIT
     OR
     FAULTY PCM.

DIAGNOSTIC AID

ENGINE COOLANT TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

12-18-92
MS 8926-6E



DTC 15

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH, LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Engine Coolant Temperature (ECT) sensor uses a thermistor to control the signal voltage to the PCM. The PCM applies a voltage on CKT 410 to the sensor. When the engine coolant is cold, the sensor (thermistor) resistance is high, therefore the PCM signal voltage will be high. As the engine coolant warms, the sensor resistance becomes less, and the PCM voltage drops. At normal engine operating temperature (85°C–95°C or 185°F–203°F), the voltage should measure about 1.5 to 2.0 volts at the PCM.

DTC 15 Will Set When: The PCM indicates engine coolant temperature signal -49°C (-56°F) or lower for 2 seconds.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate, and transmission TCC will apply early.

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

1. Monitoring ECT will determine if the fault is a hard failure or an intermittent condition.
2. This test simulates a DTC 14. If the PCM recognizes the low signal voltage, (high temperature) and the Tech 1 displays 130°C (266°F) or above, the PCM and wiring are OK.
3. This test will determine if CKT 410 is open. There should be 5 volts present at sensor connector, if measured with a DVM.

Diagnostic Aids: A Tech 1 displays engine coolant temperature in degrees celsius and fahrenheit. After engine is started, the temperature should rise steadily, reach normal operating temperature, and then stabilize when the thermostat opens.

A faulty connection, or an open in CKT 410 or 470, will result in a DTC 15.

If DTC 21 or 59 is also set, check CKT 470 for faulty wiring or connections. Check terminals at sensor for good contact.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 15

ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH, LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

1. • DOES TECH 1 DISPLAY ENGINE COOLANT TEMPERATURE OF -40°C (-40°F) OR LESS?
   - YES
   - NO: DTC 15 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
2. • DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR.
   • JUMPER HARNESS TERMINALS TOGETHER.
   • TECH 1 SHOULD DISPLAY 130°C (266°F) OR MORE. DOES IT?
   - NO
   - YES: FAULTY CONNECTION OR ENGINE COOLANT TEMPERATURE SENSOR.
3. • JUMPER CKT 410 TO GROUND.
   • TECH 1 SHOULD DISPLAY OVER 130°C (266°F). DOES IT?
   - YES: OPEN ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT, FAULTY CONNECTION OR FAULTY PCM.
   - NO: OPEN CKT 410, FAULTY CONNECTION AT PCM, OR FAULTY PCM.

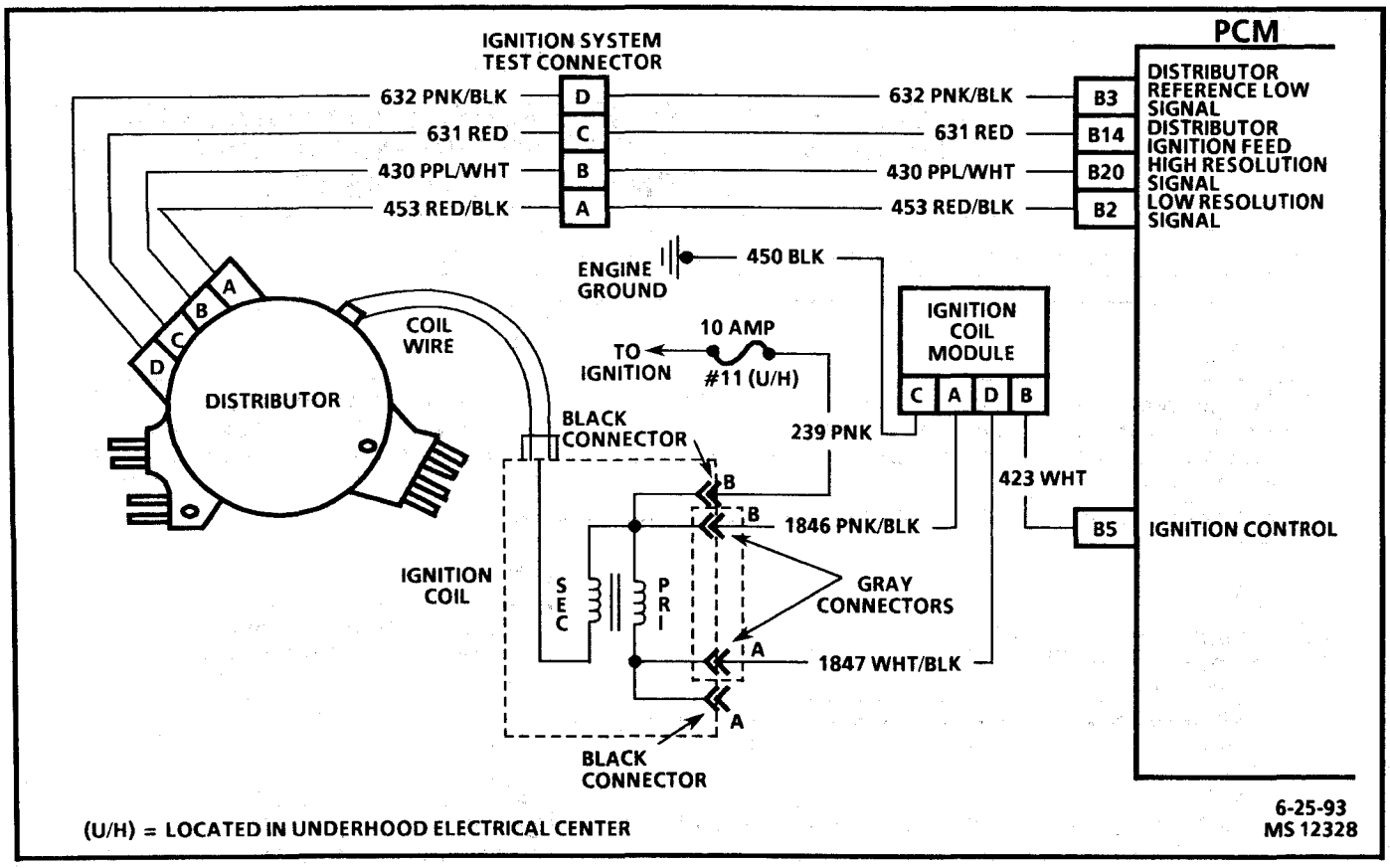
DIAGNOSTIC AID

ENGINE COOLANT TEMPERATURE SENSOR
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

5-1-93
MS 8829-6E



DTC 16

DISTRIBUTOR IGNITION SYSTEM
(LOW RESOLUTION PULSE)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The distributor ignition system supplies two timing inputs to the PCM, a high resolution signal (360 pulses per one crankshaft revolution) and a low resolution signal (4 pulses per one crankshaft revolution). The PCM can determine if one of the timing inputs is not being received by comparing the two inputs. If the PCM detects the high resolution timing pulse without detecting the low resolution timing pulse, this DTC will set.

The reference signals toggle between 0 and 5 volts as the camshaft turns. Therefore, an open, a short to voltage, a short to ground, or a defective sensor inside the distributor can prevent the voltage from pulsing at the PCM.

DTC 16 Will Set When: The PCM detects 720 high resolution timing pulses before any low resolution pulses are detected.

Action Taken (PCM will default to): DTC 16 will be stored in the PCM memory, but will not turn "ON" the Malfunction Indicator Lamp (MIL). Fuel pump and injector operation will be disabled.

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

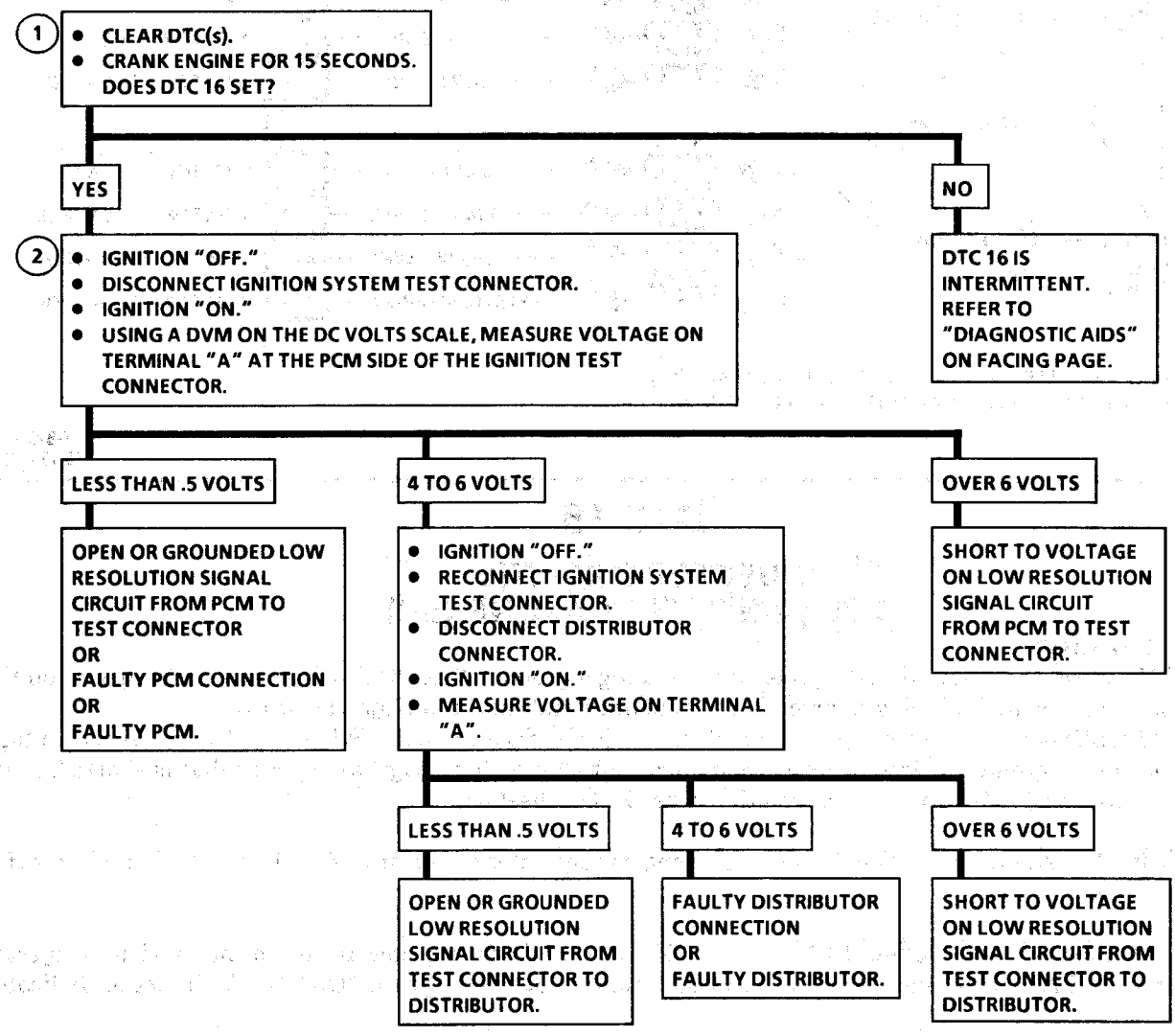
1. If the engine starts at this point, DTC 16 is intermittent.
2. This test will determine if the PCM is sending out a signal to the distributor for processing. If this signal is not available or is shorted to ground or voltage, the distributor cannot ground it to produce reference pulses.

Diagnostic Aids: DTC 16 will set if the high and low resolution signal circuits are shorted to each other. Before replacing any components, make sure these circuits are not shorted together. If DTC 16 does not reset and the vehicle still does not start, refer to CHART A-3 "Engine Cranks But Will Not Run."

If distributor components must be replaced, check distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4."

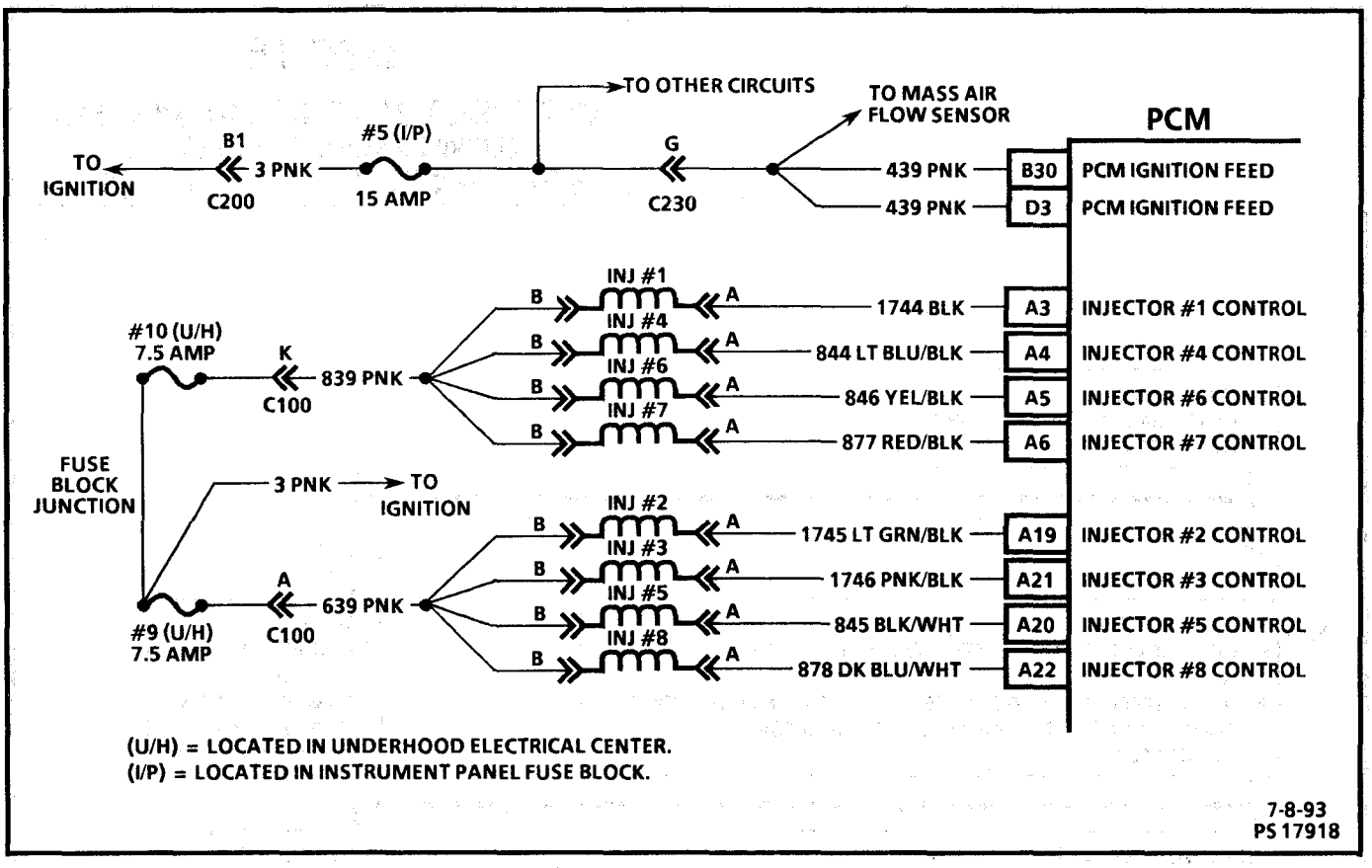
DTC 16

DISTRIBUTOR IGNITION SYSTEM (LOW RESOLUTION PULSE) 5.7L (VIN P) "F" CARLINE (SFI)



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

6-25-93
MS 8828-6E



DTC 18

INJECTOR CIRCUIT(S)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM controls each individual injector by providing a ground. The PCM will enable each injector on the intake stroke of each cylinder and is referred to as Sequential Multiport Fuel Injection (SFI).

The PCM continuously monitors the voltage of each injector driver circuit. When the PCM detects a voltage that is out of range, (grounded circuit, open circuit, a circuit shorted to voltage, an injector that is shorted, open, or has a low resistance), a DTC 18 will set and the driver will be disabled.

DTC 18 Will Set When: The PCM detects the wrong voltage potential on any of the injector driver circuits for 4 seconds or more.

Action Taken (PCM will default to): The PCM will disable the injector driver on the particular injector that had a fault. DTC 18 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

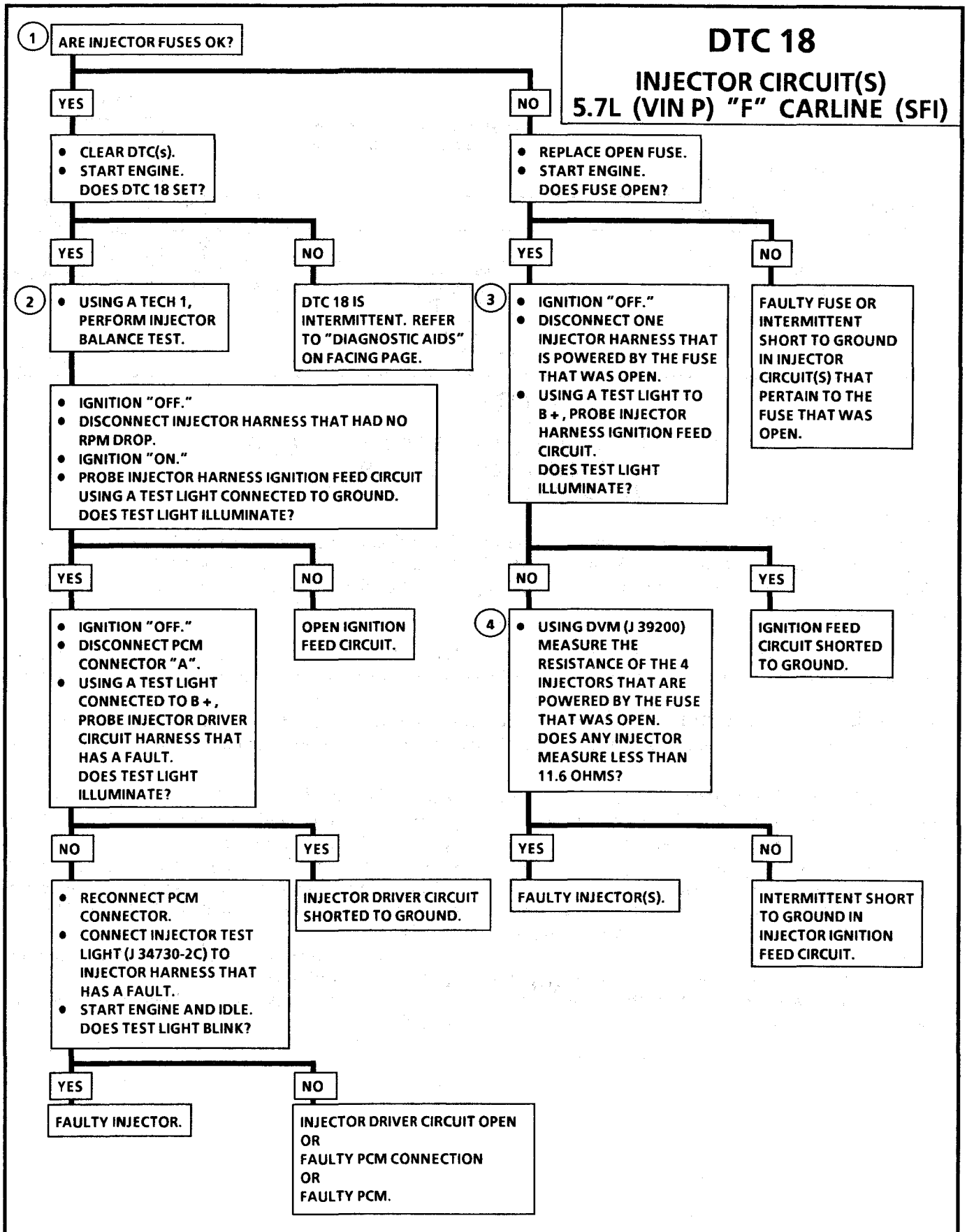
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The injector fuse(s) are located in the underhood electrical center.
2. Performing an injector balance test is necessary to locate what injector circuit is faulty.
3. Fuse #9 feeds injectors 2, 3, 5, 8, and fuse #10 feeds injectors 1, 4, 6, 7.
4. When checking injector resistance, engine coolant temperature should be about 21°C (70°F).

Diagnostic Aids: If an injector is disconnected and then reconnected while the engine is operating, the injector driver will be disabled for a predetermined time and a DTC 18 will set. When the driver is disabled, an engine miss will be apparent.

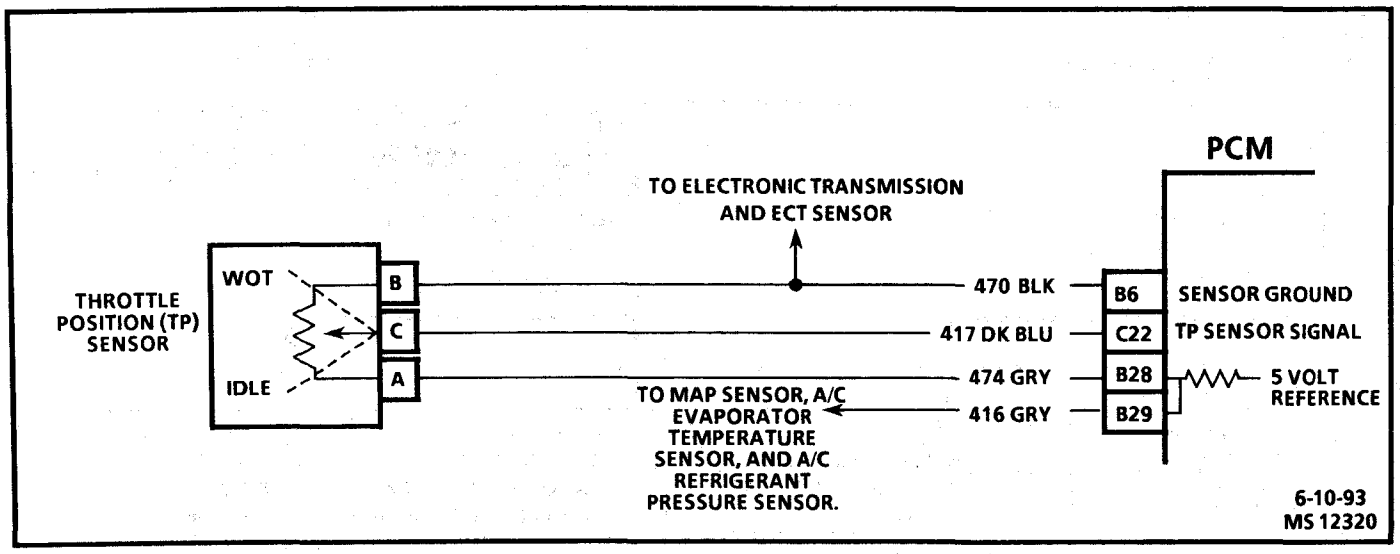
DTC 18

INJECTOR CIRCUIT(S)
5.7L (VIN P) "F" CARLINE (SFI)



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

3-25-93
PS 16657



DTC 21

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Throttle Position (TP) sensor provides a voltage signal that changes, as throttle blade opens or closes. Signal voltage should vary from about .6 volt at idle to about 5 volts at Wide Open Throttle (WOT).

The TP sensor signal is one of the most important inputs used by the PCM for fuel control and for most of the PCM controlled outputs.

DTC 21 Will Set When: TP sensor signal is greater than 2.5 volts, engine idling (less than 10 grams per second of air flow), all conditions met for 5 seconds or TP sensor signal voltage over 4.8 volts with ignition "ON."

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate, transmission TCC will not apply, high transmission line pressure, fixed shift points, hard shifts and no fourth gear in hot mode.

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

1. With throttle closed, the TP sensor should display between .3 and .9 volt. If it does not, check throttle cable adjustment and throttle shaft.
2. With the TP sensor disconnected, the TP sensor voltage should go low, if the PCM and wiring are OK.
3. Probing CKT 452 with a test light to 12 volts checks the sensor ground. A faulty sensor ground will cause a DTC 21.

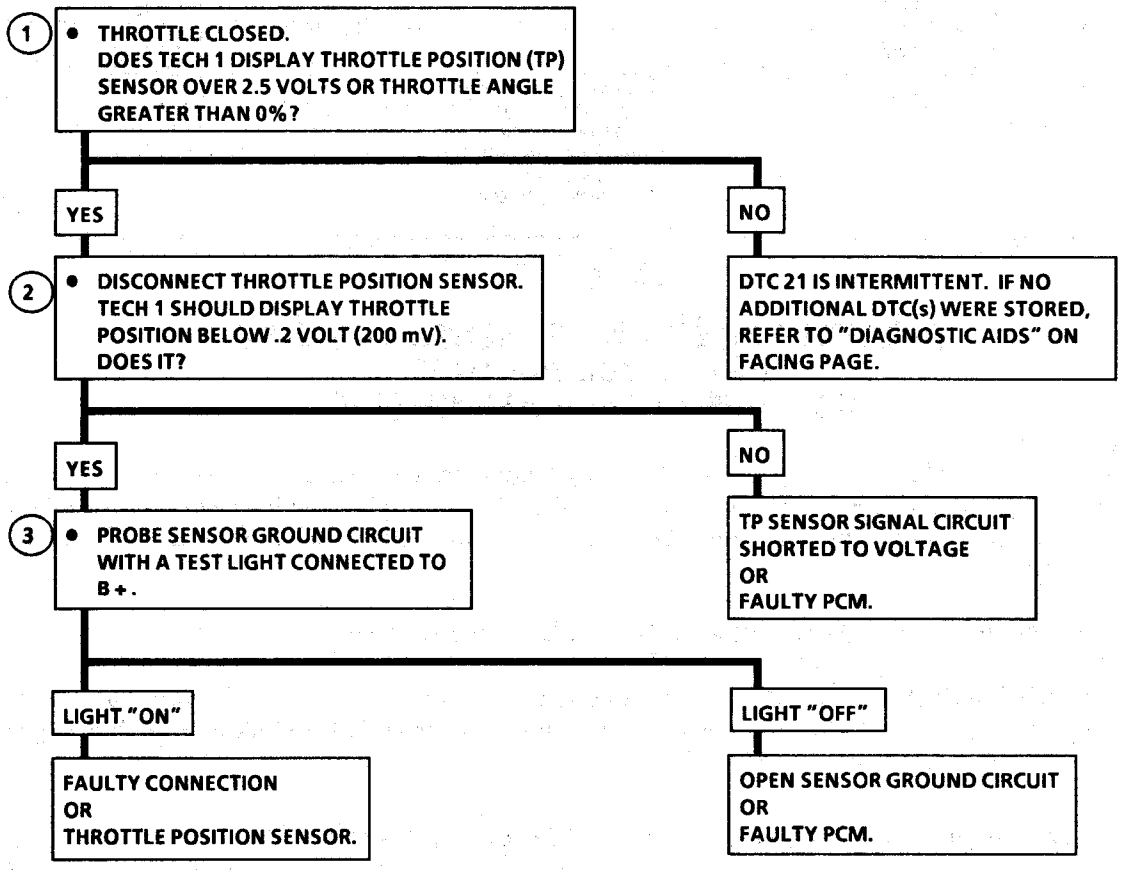
Diagnostic Aids: The Tech 1 displays throttle position in voltage and percentage of throttle blade opening. With ignition "ON" or at idle, TP sensor signal voltage should display between .3 and .9 volt with the throttle closed and increase at a steady rate as throttle is moved toward Wide Open Throttle (WOT).

If DTC 15 or 59 is also set, check CKT 470 for being open or a faulty PCM connection.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 21

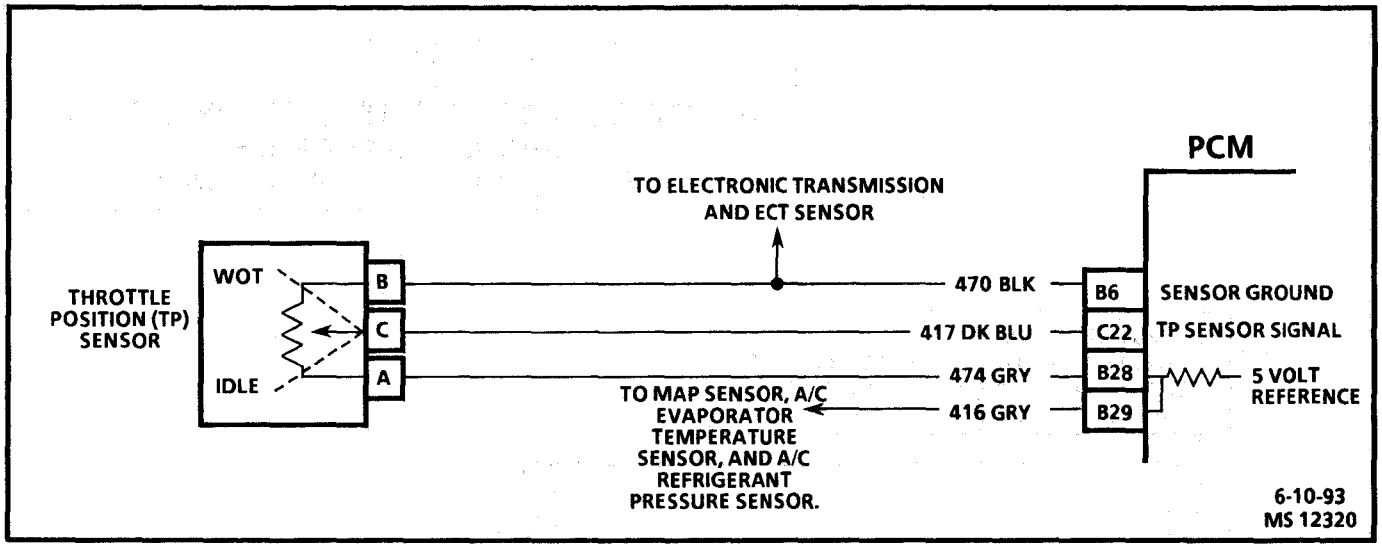
THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH) 5.7L (VIN P) "F" CARLINE (SFI)



REFER TO SECTION "5E2" TO CLEAR ANY EBTCM DTC(s) THAT MAY HAVE SET.

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

6-29-93
PS 17920



DTC 22

THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Throttle Position (TP) sensor provides a voltage signal that changes, relative to the throttle blade position. Signal voltage should vary from about .6 volt at idle to about 5 volts at Wide Open Throttle (WOT).

The TP sensor signal is one of the most important inputs used by the PCM for fuel control and for most of the PCM controlled outputs.

DTC 22 Will Set When: TP sensor signal voltage is less than about .23 volt.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate, transmission TCC will not apply, high transmission line pressure, harsh shifts, fixed shift points and no fourth gear in hot mode.

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

1. The TP sensor has an auto zeroing feature. If the voltage reading is within the range of about .3 to .9 volt, the PCM will use that value as closed throttle. If the voltage reading is out of the auto zero range at closed throttle, check for a binding throttle cable and throttle shaft operation.
2. Simulates DTC 21: (high voltage) If the PCM recognizes the high signal voltage, the PCM and wiring are OK.
3. This simulates a high signal voltage to check for an open in CKT 417.

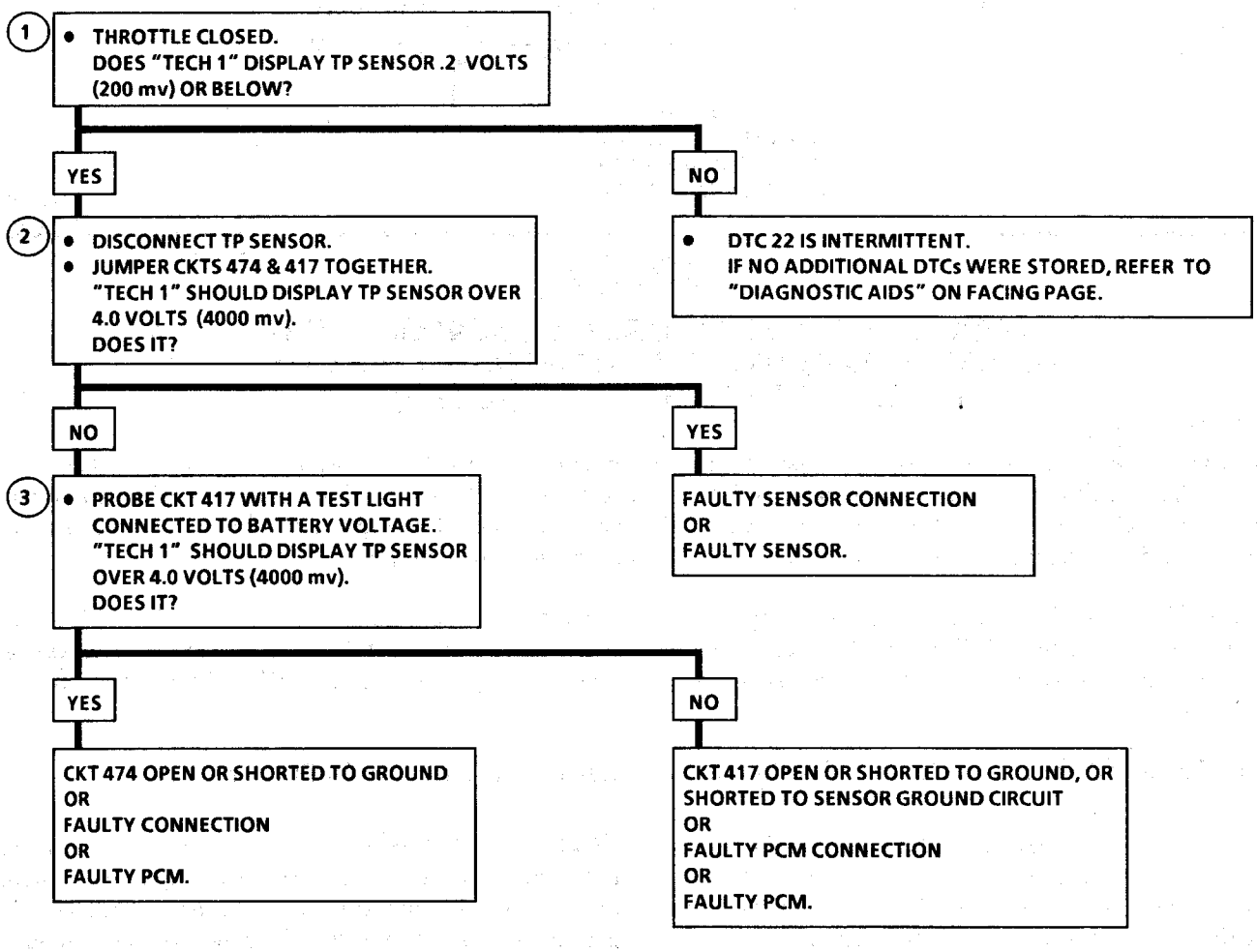
Diagnostic Aids: The Tech 1 displays throttle position in voltage and percentage of throttle blade opening. With ignition "ON" or at idle, TP sensor signal voltage should display between .3 and .9 volt with the throttle closed and increase at a steady rate as throttle is moved toward Wide Open Throttle (WOT).

An open or short to ground in CKT 474 or CKT 417 will result in a DTC 22.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 22

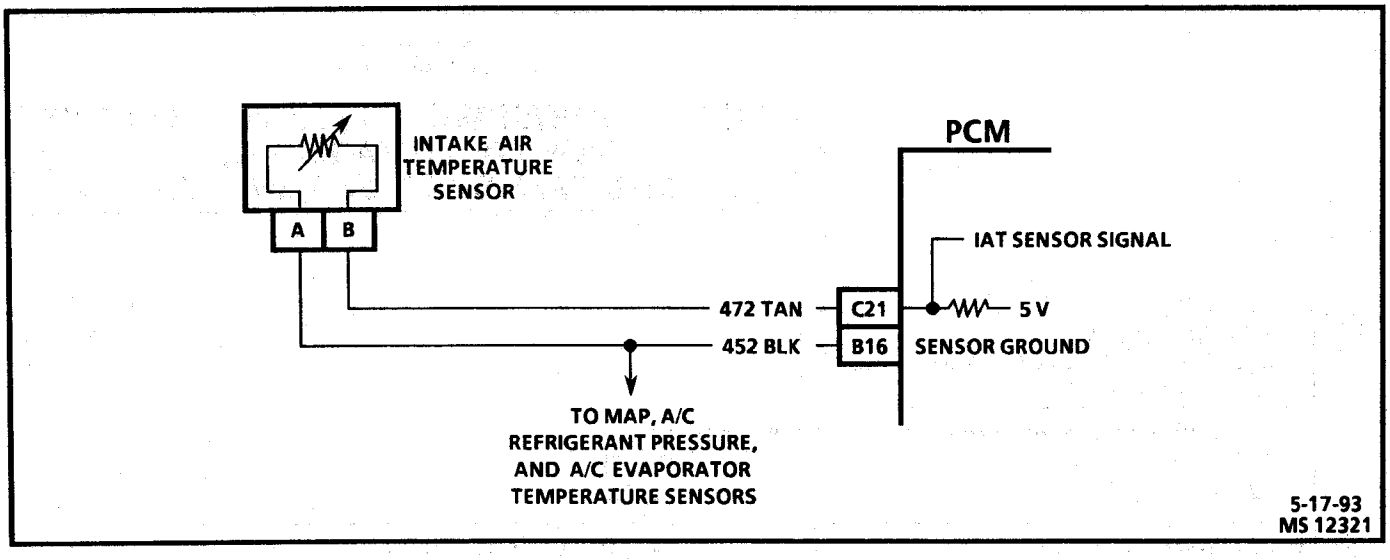
THROTTLE POSITION (TP) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW) 5.7L (VIN P) "F" CARLINE (SFI)



REFER TO SECTION "5E2" TO CLEAR ANY EBTCM DTC(s) THAT MAY HAVE SET.

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

6-29-93
9S 7843-6E



DTC 23

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH, LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the PCM. The PCM applies a voltage (about 5 volts) on CKT 472 to the sensor. When the intake air is cold, the sensor (thermistor) resistance is high, therefore, the PCM will sense a high signal voltage. If the intake air is warm, the sensor (thermistor) resistance is low, therefore, the PCM will sense a low voltage.

DTC 23 Will Set When: IAT signal voltage indicates an intake air temperature below -35°C (-31°F), ECT above 85°C (185°F), engine idling, no VSS and all conditions met for 60 seconds or IAT signal voltage indicates an intake air temperature below -35°C (-31°F), DTC 14 or 15 present, engine idling, no VSS and all conditions met for 7 minutes.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. Monitoring IAT with a Tech 1 will determine if the fault is a hard failure or an intermittent condition.
2. A DTC 23 will set, due to an open sensor, wire, or connection. This test will determine if the wiring and PCM are OK.
3. This will determine if the IAT sensor signal (CKT 472) or the IAT sensor ground (CKT 452) is open.

Diagnostic Aids: The scan tool displays temperature of the air entering the engine and should display close to ambient air temperature when engine is cold, and rise as underhood temperature increases.

Carefully check harness and connections for possible open.

If DTC 33, 66 or 71 are also set, check CKT 452 for being open or faulty PCM connection.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

If the engine has been allowed to sit overnight, the intake air temperature and engine coolant temperature values should display within a few degrees of each other.

DTC 23

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH, LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

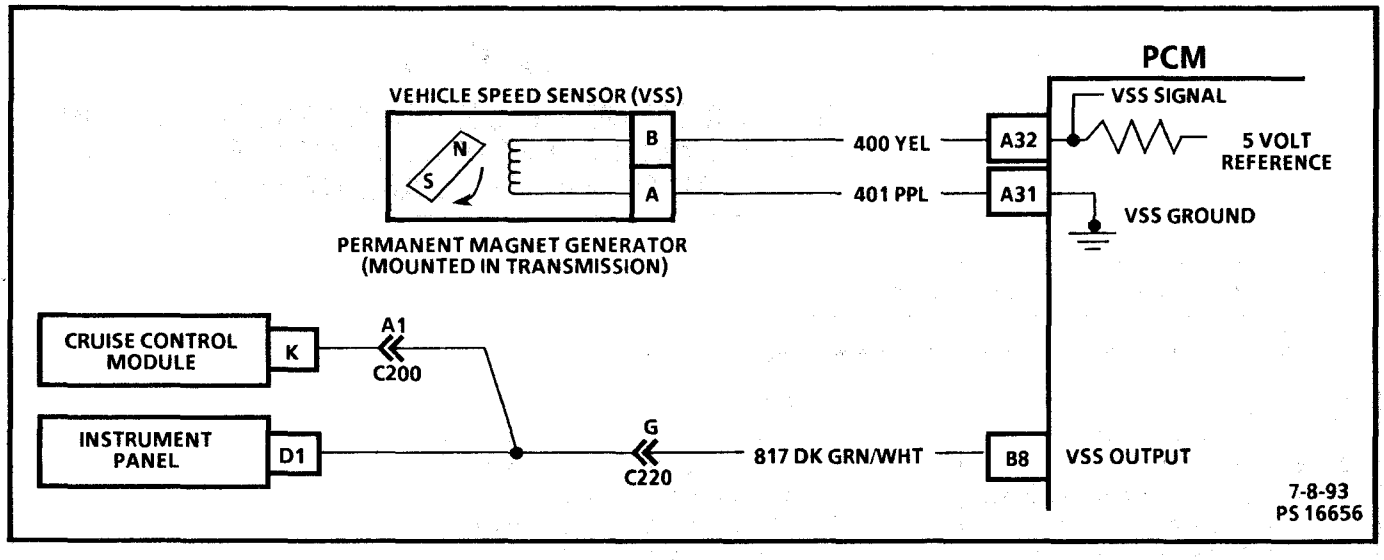
1. • DOES TECH 1 DISPLAY IAT -40°C (-40°F) OR COLDER?
   - YES
     2. • DISCONNECT SENSOR.
        • JUMPER HARNESS TERMINALS TOGETHER.
        • TECH 1 SHOULD DISPLAY TEMPERATURE OVER 130°C (266°F).
        DOES IT?
        - YES → FAULTY CONNECTION OR SENSOR.
        - NO
          3. • JUMPER CKT 472 TO GROUND.
             • TECH 1 SHOULD DISPLAY TEMPERATURE OVER 130°C (266°F).
             DOES IT?
             - YES → OPEN SENSOR GROUND CIRCUIT, FAULTY CONNECTION OR FAULTY PCM.
             - NO → OPEN CKT 472, FAULTY CONNECTION OR FAULTY PCM.
   - NO → DTC 23 IS INTERMITTENT. IF NO ADDITIONAL DTC(S) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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

5-1-93
MS 8427-6E



DTC 24

VEHICLE SPEED SENSOR (VSS) CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Vehicle speed information is provided to the PCM by the Vehicle Speed Sensor (VSS), which is a Permanent Magnet (PM) generator located in the transmission. The PM generator produces a pulsing AC voltage. The AC voltage level and the number of pulses increases as the speed of the vehicle increases. The PCM then converts the pulsing voltage to vehicle speed which is used for calculations. The vehicle speed can be displayed with a Tech 1.

The PCM supplies a signal, on CKT 817, to the instrument cluster for operating the speedometer and odometer and to the cruise control module.

DTC 24 Will Set When:

- (Automatic transmission) - Transmission output speed is less than 250 RPM when engine speed is greater than 3000 RPM, not in park or neutral, and DTCs 21, 22, 28, 33 and 34 not set and MAP greater than 20 kPa but less than 99 kPa. All conditions met for 3 seconds.
- (Manual transmission) - Transmission output speed is less than 3 RPM when engine RPM is greater than 1250 RPM, TP angle less than 1%, MAP between 11 kPa and 21 kPa, DTCs 21, 22, 33 and 34 not set. All conditions met for 6 seconds.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate, transmission will default to third gear, high transmission line pressure.

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

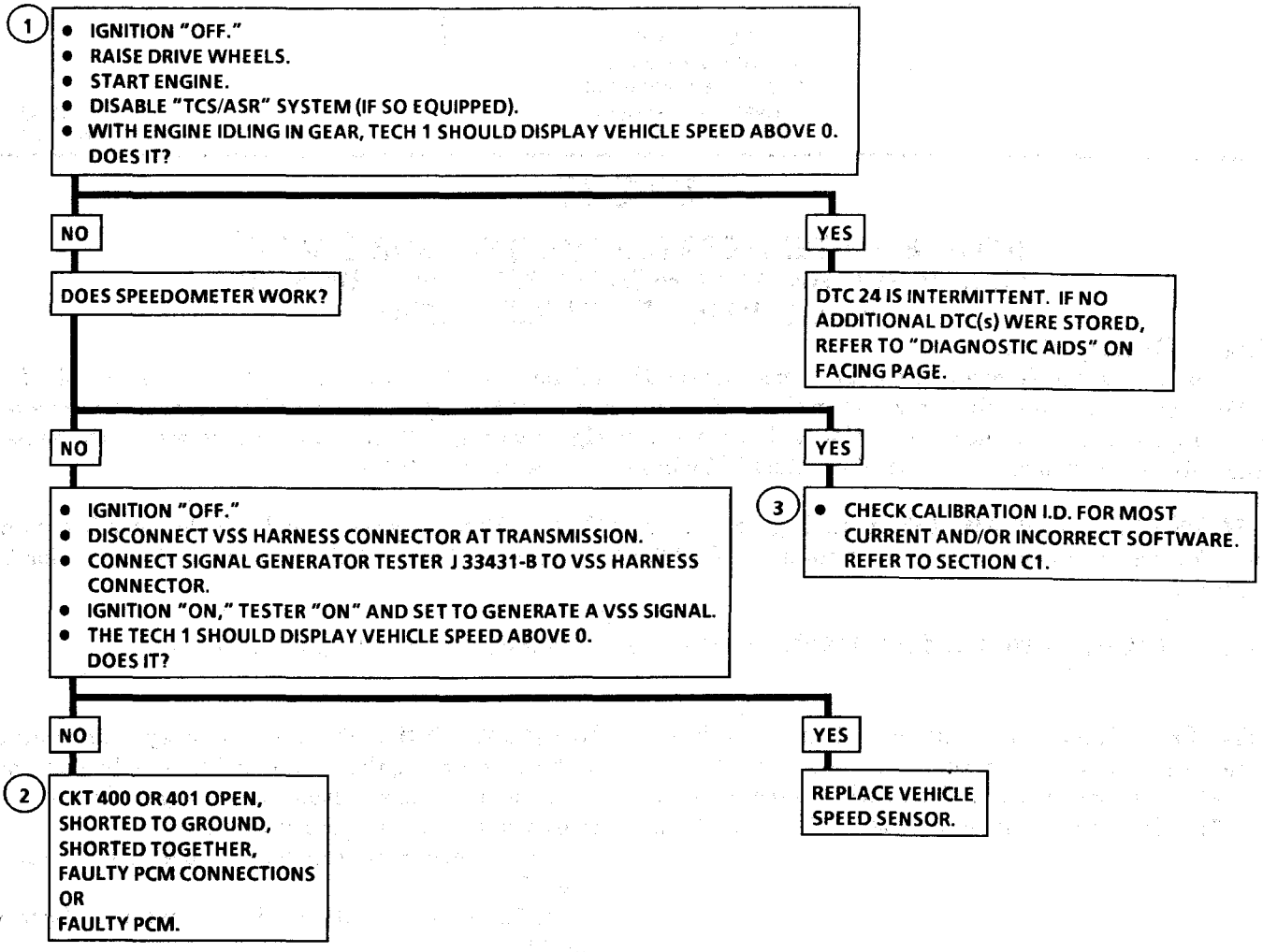
1. The ASR system must be disabled when performing this step. Whenever the ignition key is cycled to the "OFF" position and then cycled back "ON" the ASR system will default "ON."
2. If software/calibration is correct and DTC 24 sets, replace PCM.
3. Be sure harness is routed away from hot exhaust components.

Diagnostic Aids: The Tech 1 should indicate a vehicle speed whenever the drive wheels are turning.

Check CKTs 400 and 401 for proper connections to be sure they're clean and tight and the harness is routed correctly.

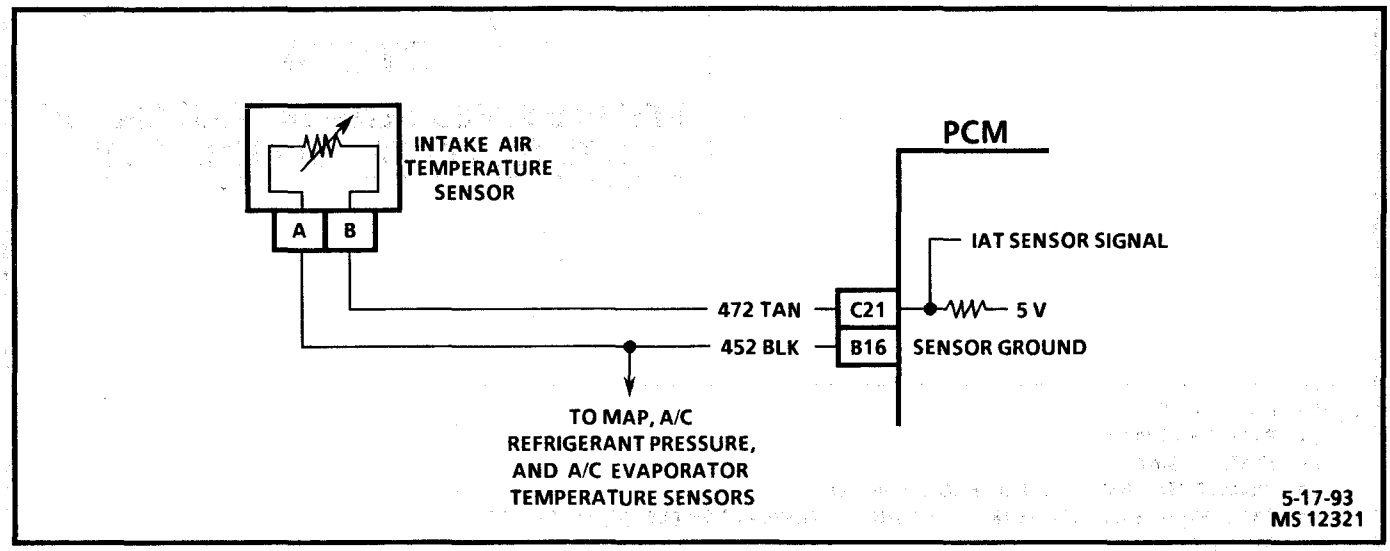
DTC 24

VEHICLE SPEED SENSOR (VSS) CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

6-29-93
PS 17922



DTC 25

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW, HIGH TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the PCM. The PCM applies a voltage (about 5 volts) on CKT 472 to the sensor. When intake air is cold, the sensor (thermistor) resistance is high, therefore, the PCM will sense a high signal voltage. If the intake air is warm, the sensor (thermistor) resistance is low, therefore, the PCM will sense a low signal voltage.

DTC 25 Will Set When: IAT signal is greater than 145°C (293°F) for 12 seconds and vehicle speed is greater than 5 mph or IAT signal is greater than 145°C (293°F), no vehicle speed and all above conditions met for 60 seconds.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. Monitoring IAT with a Tech 1 will determine if the fault is a hard failure or an intermittent condition.

Diagnostic Aids: The Tech 1 displays temperature of the air entering the engine and should display close to ambient air temperature, when engine is cold, and rise as underhood temperature increases.

Check harness routing for possible short to ground in CKT 472.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 25

INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW, HIGH TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

1. DOES TECH 1 DISPLAY IAT OF 145°C (293°F) OR HOTTER?

YES

- DISCONNECT SENSOR. TECH 1 SHOULD DISPLAY TEMPERATURE BELOW -30°C (-22°F). DOES IT?

YES

REPLACE SENSOR.

NO

CKT 472 SHORTED TO GROUND
OR
TO SENSOR GROUND
OR
PCM IS FAULTY.

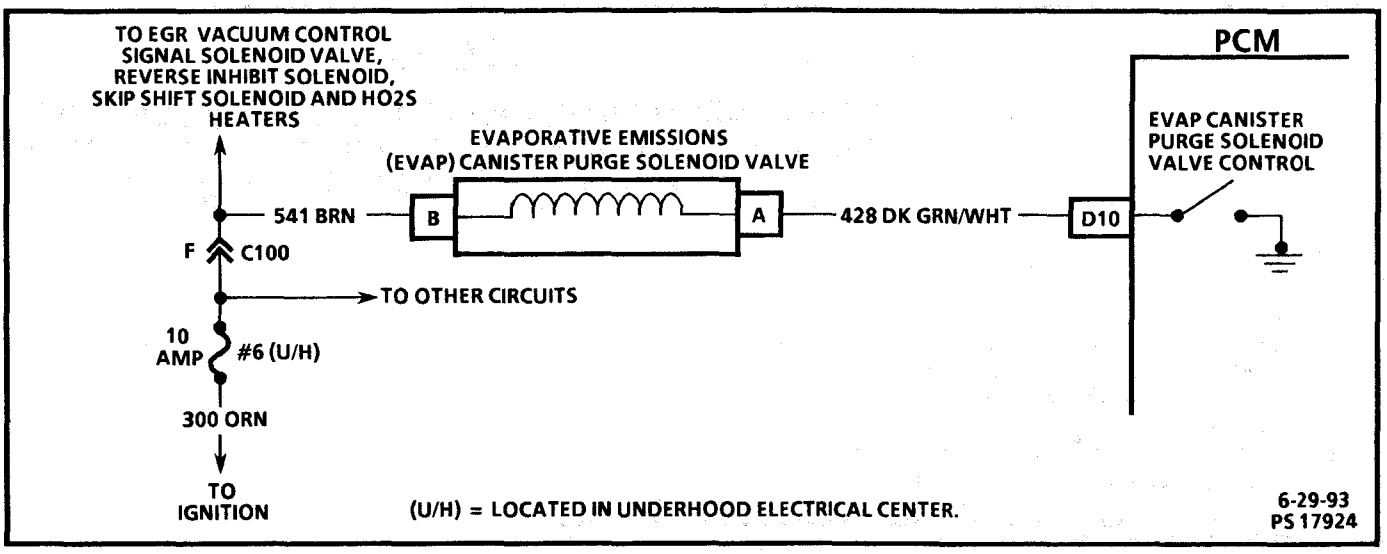
NO

DTC 25 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
-5	23	12300
-10	14	16180
-15	5	21450
-20	-4	28680
-30	-22	52700
-40	-40	100700

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



DTC 26

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

Circuit Description:

Ignition voltage is supplied directly to the EVAP canister purge solenoid valve on CKT 541. The Powertrain Control Module (PCM) controls the solenoid valve by providing the ground path through CKT 428.

When the PCM is commanding a component "ON," the voltage of the control circuit should be "low" (near 0 volts). When the PCM is commanding the control circuit to a component "OFF," the voltage potential of the circuit should be "high" (near battery voltage). The primary function of the driver is to supply the ground for the component being controlled.

Each driver has a fault line which is monitored by the PCM. The PCM will monitor the voltage at the driver. If the fault detection circuit senses a voltage other than what is expected, the fault line status will change and the DTC will set.

DTC 26 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 428.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate and the PCM disables the driver for this circuit to prevent internal PCM damage.

DTC 26 Will Clear When: The fault condition(s) no longer exist, and the ignition switch cycled "OFF" then "ON."

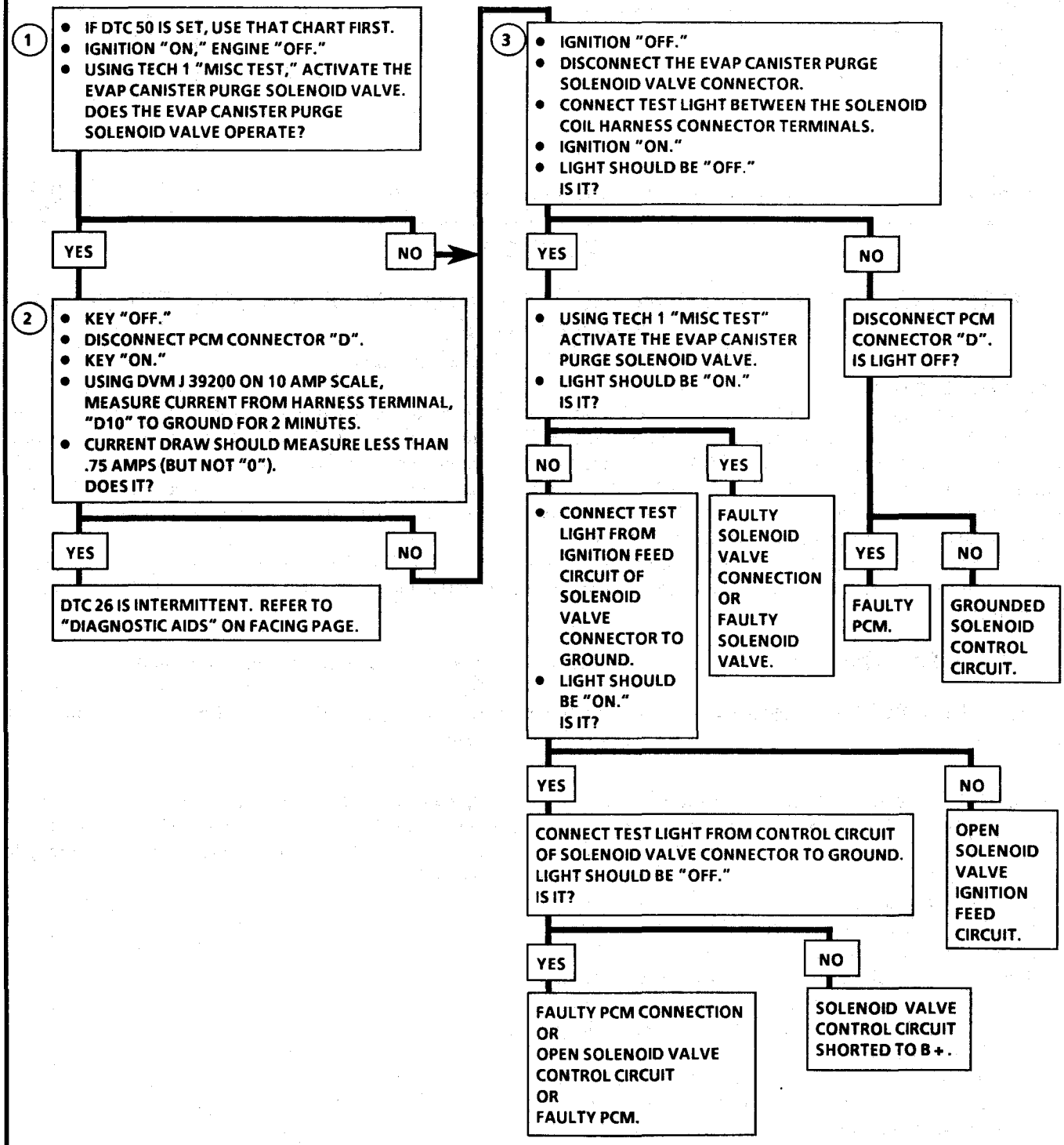
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test determines if the device can be controlled by the PCM.
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. The remaining circuit checks will identify a circuit problem that has caused an excessive current flow or inoperative solenoid.

Diagnostic Aids: Inspect the harness and all related connectors including connections at the PCM. These may cause an intermittent. Check for damaged or pushed out terminals.

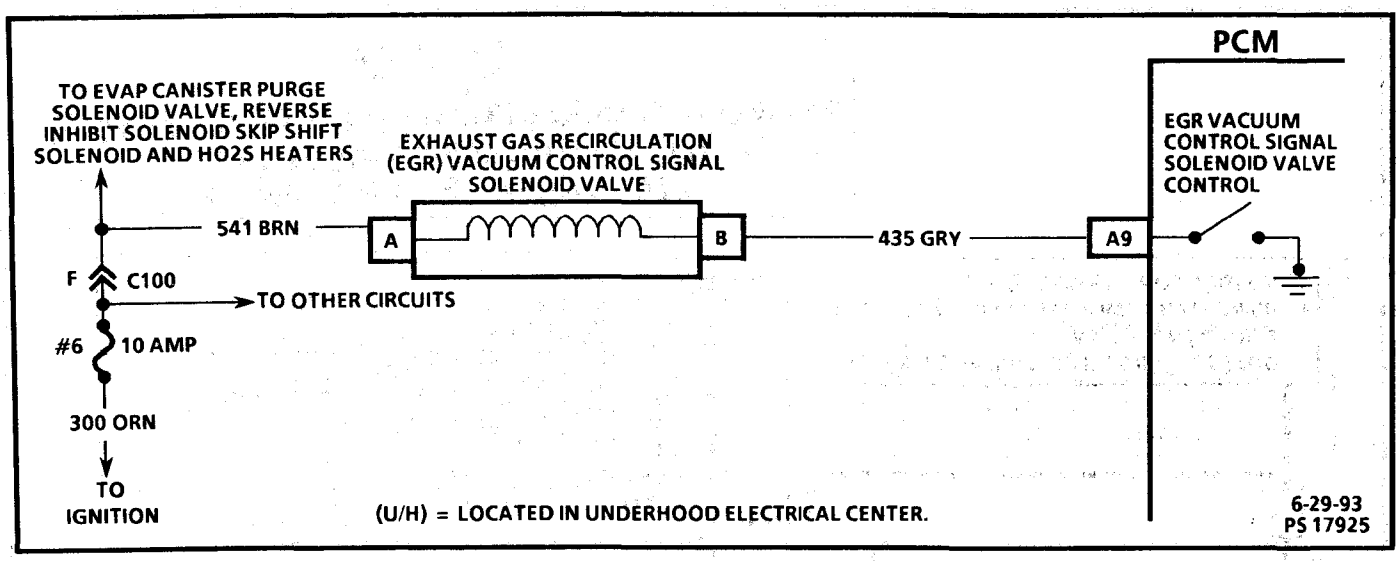
DTC 26

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.

6-11-93
MS 9731



DTC 27

EXHAUST GAS RECIRCULATION (EGR) VACUUM CONTROL SIGNAL SOLENOID VALVE CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Ignition voltage is supplied directly to the Exhaust Gas Recirculation (EGR) vacuum control signal solenoid valve on CKT 541 . The Powertrain Control Module (PCM) controls the solenoid valve by providing the ground path through CKT 435. When the PCM is commanding a component "ON," the voltage of the control circuit should be "low" (near 0 volts). When the PCM is commanding the control circuit to a component "OFF," the voltage potential of the circuit should be "high" (near battery voltage). The primary function of the driver is to supply the ground for the component being controlled.

Each driver has a fault line which is monitored by the PCM. The PCM will monitor the voltage at the driver. If the fault detection circuit senses a voltage other than what is expected, the fault line status will change and the DTC will set.

DTC 27 Will Set When: The PCM detects the wrong voltage potential on CKT 435 for 26 seconds.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate and the PCM disables the driver for this circuit to prevent internal PCM damage.

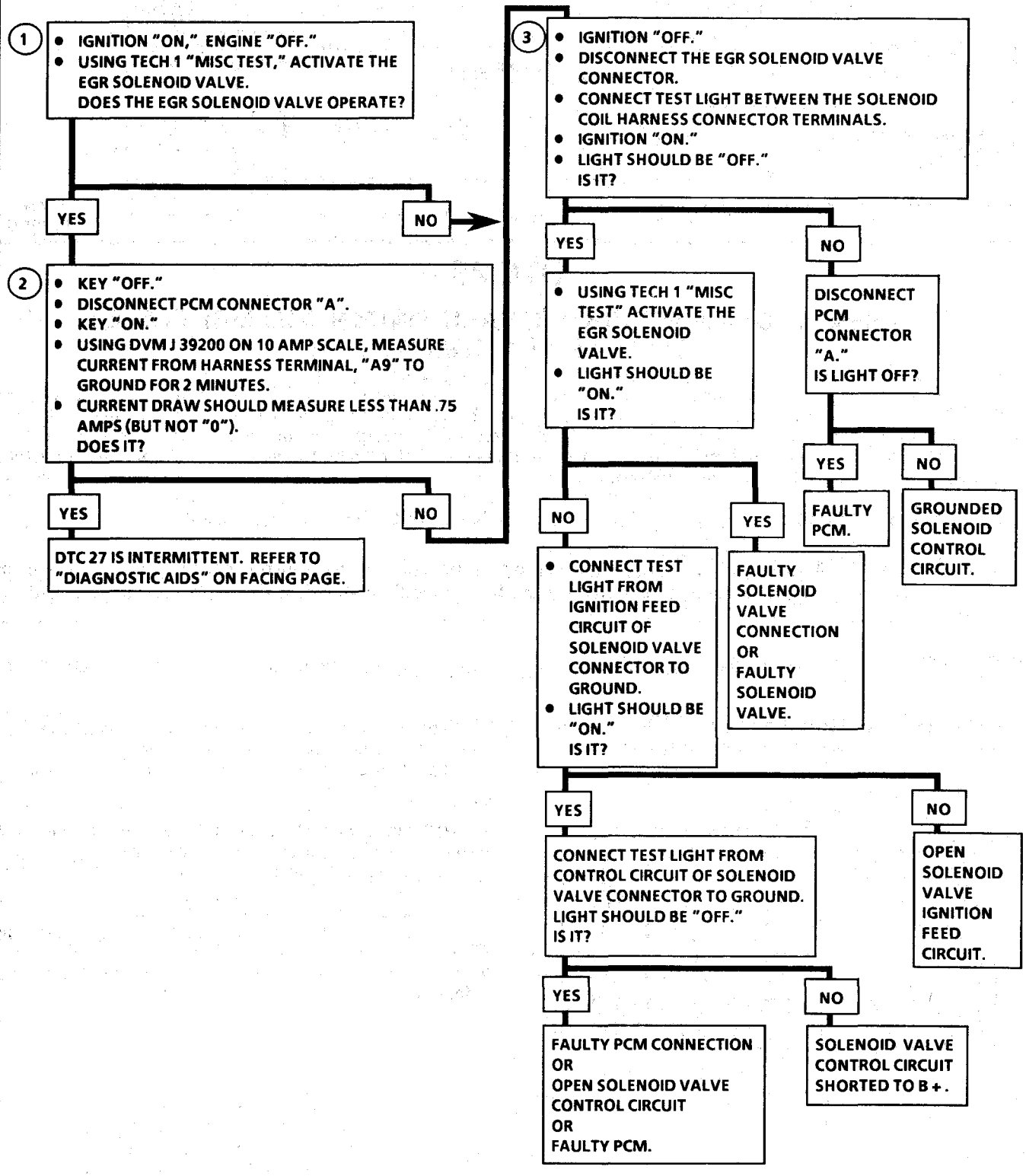
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test determines if the device can be controlled by the PCM.
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. The remaining checks will identify a circuit problem that has caused an excessive current flow or inoperative solenoid.

Diagnostic Aids: Inspect the harness and all related connectors including connections at the PCM. These may cause an intermittent. Check for damaged or pushed out terminals.

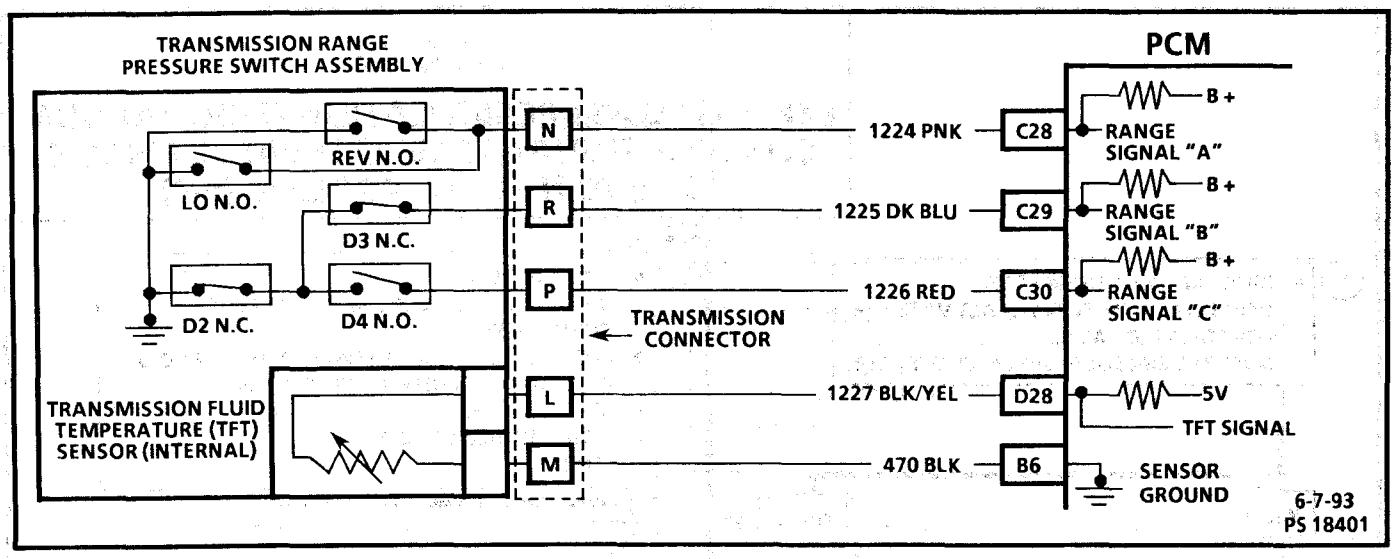
DTC 27

EXHAUST GAS RECIRCULATION (EGR) VACUUM CONTROL SIGNAL 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.

6-12-93
PS 16536



DTC 28

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY FAULT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:
The TR pressure switch assembly consists of five pressure switches (2 normally closed and 3 normally open), and a TFT sensor combined into one unit and mounted on the valve body. The PCM supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the PCM detects which manual valve position has been selected by the vehicle operator. With ignition "ON" and engine "OFF," P/N will be indicated.

DTC 28 Will Set When: Range signals "A" and "C" are both 0 volt ("ON"), for two seconds.

Action Taken (PCM will default to): Drive Range 4 for shift pattern control, harsh shifts. TCC will be inhibited, and if in hot mode, no fourth gear will occur. DTC 28 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 28 Will Clear When: The fault condition(s) no longer exist, and the ignition switch cycled "OFF" then "ON."

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

1. This test checks the indicated range signal to the valve position signal actually selected.
2. This test checks for correct voltage from the PCM to the transmission external connector.
3. This test checks a short to ground in any one of the three valve position circuits.

"ON" = Zero Volt/"OFF" = B+

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

Expected Readings

Diagnostic Aids: DTC 28 will set if the PCM detects one of two "illegal" combinations.

Refer to accompanying chart for various combinations.

Check all connectors for good contact.

Refer to "TR Pressure Switch Assembly Resistance Check" or "Functional Test Procedure" in SECTION 7A14A of the appropriate service manual for further information.

DTC 28

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY FAULT 5.7L (VIN P) "F" CARLINE (SFI)

THIS CHART ASSUMES THAT:
- THE TRANSMISSION LINKAGE FROM THE SELECT LEVER TO THE MANUAL VALVE IS ADJUSTED PROPERLY.
- OBD SYSTEM CHECK HAS BEEN PERFORMED.
- FLUID CHECKING PROCEDURE HAS BEEN PERFORMED.
- ALL DTC(s) HAVE BEEN RECORDED AND THEN CLEARED.
- SCAN TOOL STILL INSTALLED.

(1)
- ENGINE IDLING AT NORMAL OPERATING TEMPERATURE.
- PARKING BRAKE APPLIED AND WHEELS BLOCKED.
- APPLY BRAKE PEDAL AND SELECT EACH TRANSMISSION RANGE D1, D2, D3, D4, N, R, P.

DOES EACH SELECTED TRANSMISSION RANGE MATCH THE SCAN TOOL "TRANS RANGE SW" DISPLAY?

YES

NO TROUBLE FOUND.
REFER TO DIAGNOSTIC AIDS.

NO

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775 - JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- WITH J 39200 TO GROUND, CHECK VOLTAGE AT HARNESS CONNECTOR TERMINALS "N", "R" AND "P".

DOES J 39200 DISPLAY B + AT ALL THREE CIRCUITS?

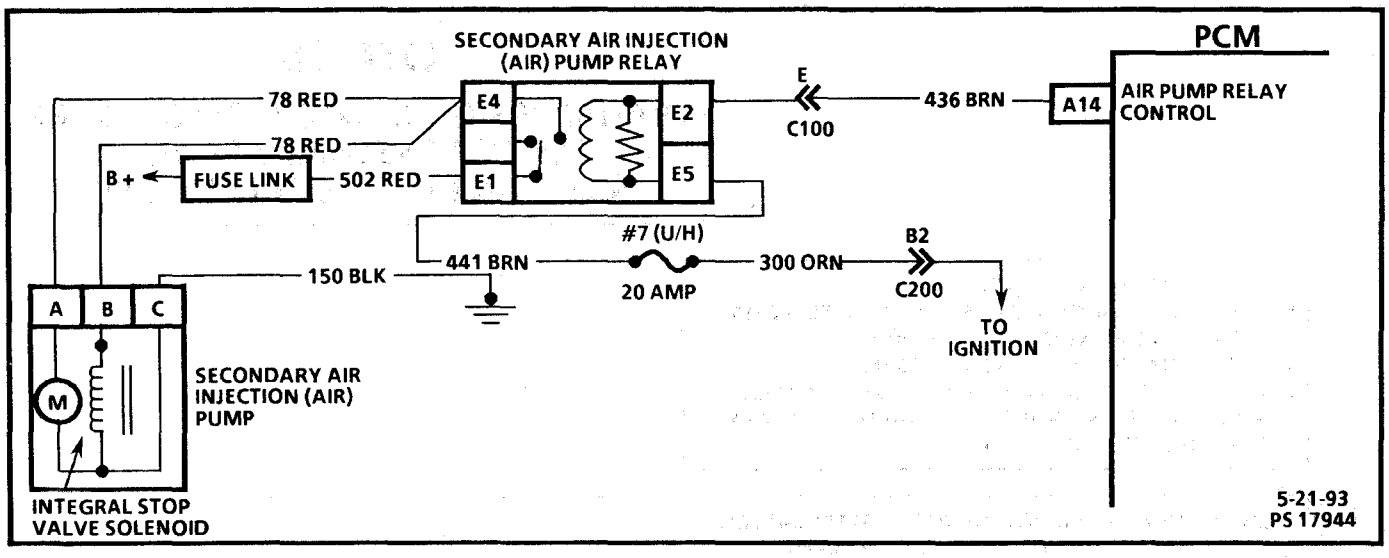
YES

(2) VERIFY THAT CKT(s) 1224, 1225, OR 1226 ARE NOT SHORTED TOGETHER. IF OK, REFER TO "FLUID PRESSURE SWITCH ASSEMBLY RESISTANCE CHECK" SECTION 7A14A (4L60E) OR 7A17A (4L80E) OF THE APPROPRIATE SERVICE MANUAL.

NO

(3)
- ON CIRCUIT(S) THAT DID NOT INDICATE B +, CHECK FOR AN OPEN OR SHORT TO GROUND. IF OK, CHECK CONTROL MODULE CONNECTOR TERMINAL TENSION ON THESE CIRCUITS. IF OK, REPLACE CONTROL MODULE.

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



DTC 29

SECONDARY AIR INJECTION (AIR) PUMP CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Ignition voltage is supplied directly to the air pump relay coil on CKT 441. The Powertrain Control Module (PCM) controls the relay by providing the ground path through CKT 436. When the PCM is commanding a component "ON," the voltage of the control circuit should be "low" (near 0 volts). When the PCM is commanding the control circuit to a component "OFF," the voltage potential of the circuit should be "high" (near battery voltage). The primary function of the driver is to supply the ground for the component being controlled.

Each driver has a fault line which is monitored by the PCM. The PCM will monitor the voltage at the driver. If the fault detection circuit senses a voltage other than what is expected, the fault line status will change and the DTC will set.

DTC 29 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 436.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate and the PCM disables the driver for this circuit to prevent internal PCM damage.

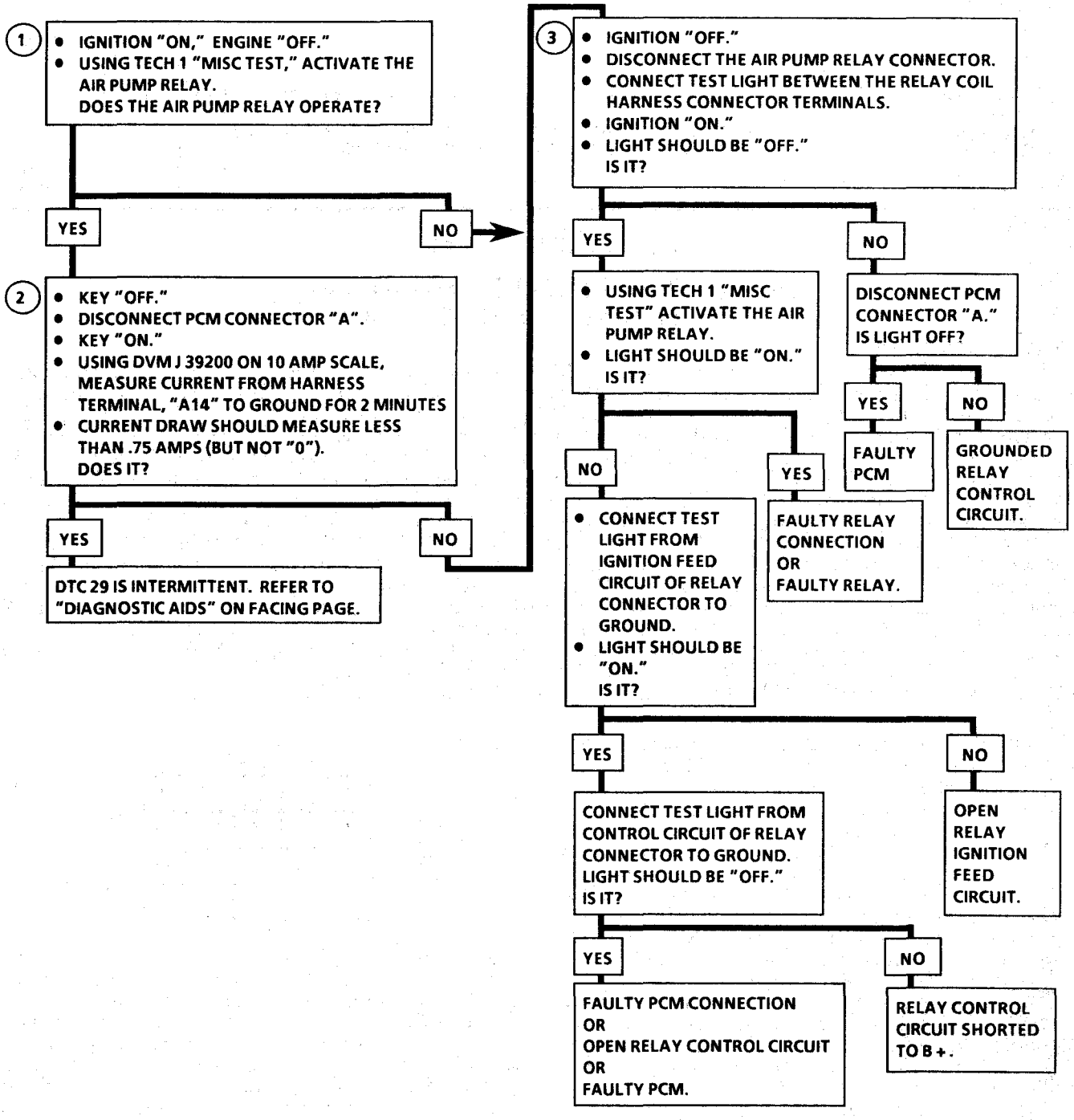
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test determines if the device can be controlled by the PCM.
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. The remaining circuit checks will identify a circuit problem that has caused an excessive current flow or inoperative relay. If a circuit check is done on a relay, it is important to identify and test the relay coil terminals ("E2" and "E5") to avoid improper diagnosis.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM. These may cause an intermittent. Check for damaged or pushed out terminals.

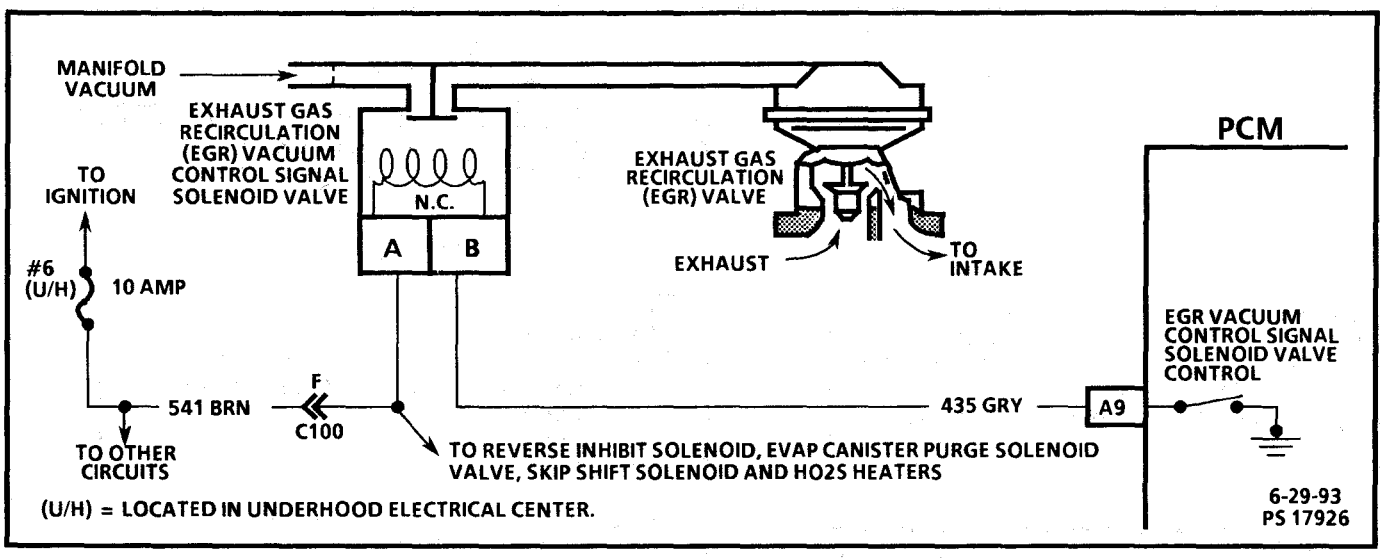
DTC 29

SECONDARY AIR INJECTION (AIR) PUMP CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

5-28-93
PS 16537



DTC 32 (Page 1 of 2)

EXHAUST GAS RECIRCULATION (EGR) 5.7L (VIN P) "" CARLINE (SFI)

Circuit Description:

Vacuum to the Exhaust Gas Recirculation (EGR) valve is controlled by the EGR vacuum control signal solenoid valve. Ignition voltage is supplied directly to the solenoid valve on CKT 541. The PCM controls the solenoid valve by providing the ground path through CKT 435. The vacuum signal to the EGR valve is regulated by varying the duty cycle ("on-time") of the solenoid valve. The duty cycle is calculated by the PCM based on data from the Engine Coolant Temperature (ECT) sensor, Mass Air Flow (MAF) sensor and RPM. If Intake Air Temperature (IAT) is below 15°C (59°F) when the vehicle is started, EGR will not be enabled until ECT is above 82°C (180°F). If IAT is above 15°C (59°F) at start up, EGR will not be enabled until ECT is above 32°C (90°F). There should also be no EGR when in park/neutral or when Throttle Position (TP) sensor is below a specified value or at Wide Open Throttle (WOT). During specific driving conditions the PCM will test the EGR system.

DTC 32 Will Set When: Vehicle speed between 16-50 for Automatic Transmission (A/T) or 25-65 for Manual Transmission (M/T), vehicle coasting A/T, throttle angle 0% A/T or throttle angle between 8% and 20% M/T, transmission in 3rd gear or higher, MAP within range as shown in table (depends on altitude), no change in A/C status, DTCs 21, 22, 24, 33, 34 not set, BARO greater than 80 kPa (depends on altitude), all conditions met for 2.5 seconds, and the PCM does not detect at least 1.0 kPa change in MAP when it commands EGR "ON" A/T or when the PCM commands the EGR "OFF" M/T within the 1.5 second period of the test.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. **Intake Passage:** Shut "OFF" engine and remove the EGR valve from the manifold. Plug the exhaust side hole with a suitable stopper. With the intake side hole open, attempt to start the engine. If the engine runs at a very high idle (up to 3000 RPM is possible) or starts and stalls, the EGR passages are not restricted. If the engine starts and idles normally, the EGR intake side passage in the intake manifold is restricted.
   Exhaust Passage: With EGR valve still removed, plug the intake side hole with a suitable stopper. With the exhaust side hole open, check for the presence of exhaust gas. If no exhaust gas is present, the EGR exhaust side passage in the intake manifold is restricted.
2. The Tech 1 actuates the EGR vacuum control signal solenoid valve when in the "Field Service" mode. The system should hold vacuum which should be indicated at the vacuum pump gage and at the vacuum gage installed in place of the EGR valve.
3. Exiting "Field Service" will de-energize the EGR solenoid valve.

MAP RANGE FOR TEST	BARO 100	95	90	85	80	
	30	25	20	15	10	(A/T)
	50	45	40	35	30	
	43	38	33	28	23	(M/T)
	65	60	55	50	45	

kPa

The vacuum gage should bleed off through a vent in the solenoid valve. The pump gage may or may not bleed off but this does not indicate a problem.

Diagnostic Aids: Suction from shop exhaust hoses can alter backpressure and may affect the operation of the EGR valve during in stall testing. A DTC 32 can be caused by a leaking exhaust system. An exhaust leak will alter backpressure. Thoroughly check exhaust system for leaks.

Vacuum lines should be thoroughly checked for proper routing. Vacuum source goes to orifice side of the solenoid valve. Refer to "Vehicle Emissions Control Information" label.

When TCC is enabled, EGR will be operating at a reduced duty cycle.

DTC 32

(Page 1 of 2)

EXHAUST GAS RECIRCULATION (EGR) 5.7L (VIN P) "F" CARLINE (SFI)

BEFORE USING THIS CHART, CHECK FOR MANIFOLD VACUUM TO EGR SOLENOID VALVE, ALSO CHECK HOSES FOR LEAKS OR RESTRICTIONS. SHOULD BE AT LEAST 7" Hg VACUUM AT 2000 RPM.

- IF DTC 27 IS SET, USE THAT CHART FIRST.
- WITH ENGINE AT IDLE AND AT NORMAL OPERATING TEMPERATURE, MANUALLY LIFT EGR VALVE DIAPHRAGM.
- RPM SHOULD DECREASE OR ENGINE SHOULD STALL. DOES IT?

YES

- DISCONNECT EGR VACUUM HARNESS AT SOLENOID VALVE. INSTALL A VACUUM GAGE TO MANIFOLD SIDE OF HARNESS AND CHECK FOR VACUUM SUPPLY TO SOLENOID VALVE.
- VACUUM SHOULD BE AT LEAST 25 kPa (7" Hg) OF VACUUM AT 2000 RPM. IS IT?

NO

(1) CHECK FOR PLUGGED EGR PASSAGES.

YES

(2)
- ROTATE VACUUM HARNESS AND REINSTALL ONLY THE EGR VALVE SIDE, TO THE SOLENOID VALVE.
- INSTALL A VACUUM GAGE IN PLACE OF EGR VALVE.
- INSTALL A HAND HELD VACUUM PUMP TO MANIFOLD SIDE OF EGR SOLENOID VALVE.
- IGNITION "ON," ENGINE STOPPED.
- USING TECH 1 SELECT "FIELD SERVICE" MODE.
- APPLY 34 kPa (10" Hg) VACUUM AND OBSERVE GAGE.
- GAGE SHOULD READ VACUUM APPLIED BY PUMP. DOES IT?

NO

PLUGGED VACUUM PORT AT INTAKE MANIFOLD. LEAKING OR RESTRICTED VACUUM SUPPLY LINE TO EGR SOLENOID VALVE.

YES

(3)
- USING TECH 1, EXIT "FIELD SERVICE" MODE.
- VACUUM SHOULD BLEED OFF COMPLETELY AT GAGE. DOES IT?

NO

- CONNECT VACUUM PUMP TO EGR VALVE SIDE OF HARNESS.
- APPLY VACUUM AND OBSERVE GAGE.
- GAGE SHOULD READ VACUUM APPLIED BY PUMP. DOES IT?

YES

REFER TO EGR CHART (2 OF 2).

NO

- DISCONNECT SOLENOID VALVE ELECTRICAL CONNECTOR. DOES VACUUM BLEED OFF RAPIDLY AT GAGE?

YES

PCM DRIVER CIRCUIT OPEN OR FAULTY PCM.

NO

REPLACE SOLENOID VALVE.

YES

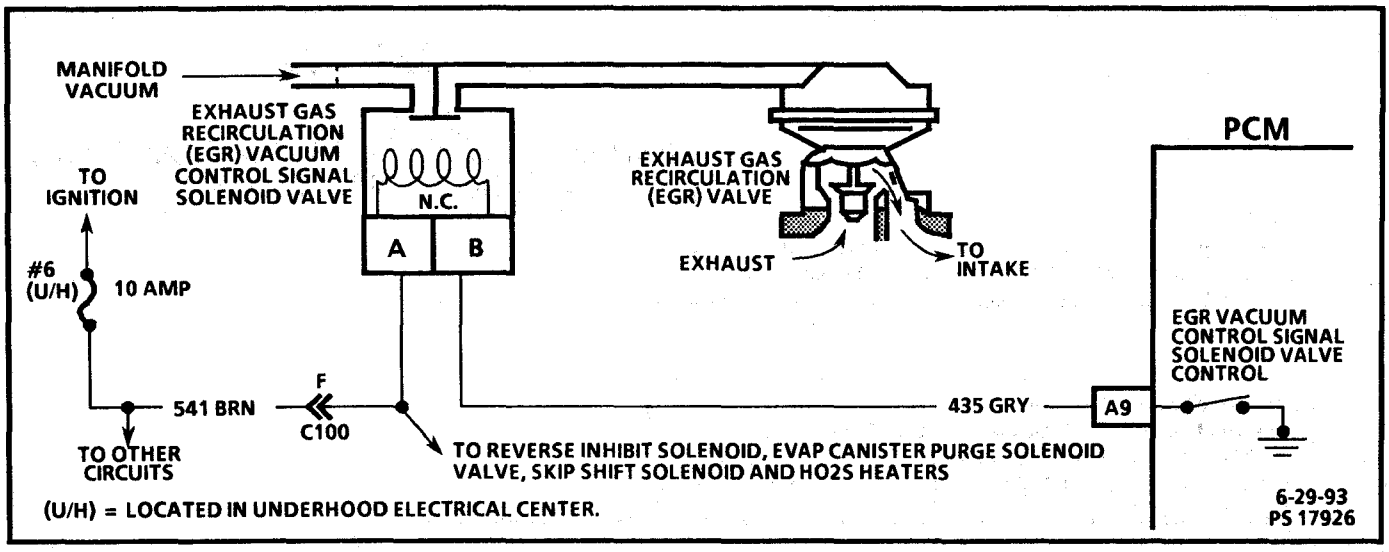
FAULTY SOLENOID VALVE CONNECTION OR FAULTY SOLENOID VALVE.

NO

FAULTY VACUUM SUPPLY LINE TO EGR VALVE.

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

1-28-93
MS 9329-6E



DTC 32 (Page 2 of 2)

EXHAUST GAS RECIRCULATION (EGR) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Vacuum to the Exhaust Gas Recirculation (EGR) valve is controlled by the EGR vacuum control signal solenoid valve. Ignition voltage is supplied directly to the solenoid valve on CKT 541. The PCM controls the solenoid valve by providing the ground path through CKT 435. The vacuum signal to the EGR valve is regulated by varying the duty cycle ("on-time") of the solenoid valve. The duty cycle is calculated by the PCM based on data from the Engine Coolant Temperature (ECT) sensor, Mass Air Flow (MAF) sensor and RPM. If Intake Air Temperature (IAT) is below 15°C (59°F) when the vehicle is started, EGR will not be enabled until ECT is above 82°C (180°F). If IAT is above 15°C (59°F) at startup, EGR will not be enabled until ECT is above 32°C (90°F). There should also be no EGR when in park/neutral or when Throttle Position (TP) sensor is below a specified value or at Wide Open Throttle (WOT). During specific driving conditions the PCM will test the EGR system.

DTC 32 Will Set When: Vehicle speed between 16-50 for Automatic Transmission (A/T) or 25-65 for Manual Transmission (M/T), vehicle coasting A/T, throttle angle 0% A/T or throttle angle between 8% and 20% M/T, transmission in 3rd gear or higher, MAP within range as shown in table (depends on altitude), no change in A/C status, DTCs 21, 22, 24, 33, 34 not set, BARO greater than 80 kPa (depends on altitude), all conditions met for 2.5 seconds, and the PCM does not detect at least 1.0 kPa change in MAP when it commands EGR "ON" A/T or when the PCM commands the EGR "OFF" M/T within the 1.5 second period of the test.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. The remaining test checks the ability of the EGR valve to interact with the exhaust system. This system uses a negative backpressure EGR valve which should hold vacuum with engine "OFF."
2. When engine is started, exhaust backpressure at the base of the EGR valve should open the valve's internal bleed and vent the applied vacuum allowing the valve to seat.

Diagnostic Aids: The EGR circuit can be inoperative if the Park/Neutral Position (PNP) switch is misadjusted or faulty. The EGR is disabled when in park or neutral. To check the PNP switch, refer to CHART C-1A.

During normal EGR valve operation, the movement of the EGR valve pintle is small.

MAP RANGE FOR TEST

BARO 100	95	90	85	80	
30	25	20	15	10	(A/T)
50	45	40	35	30	
43	38	33	28	23	(M/T)
65	60	55	50	45	

kPa

It is important to determine whether or not the valve pintle moves and not how much it moves.

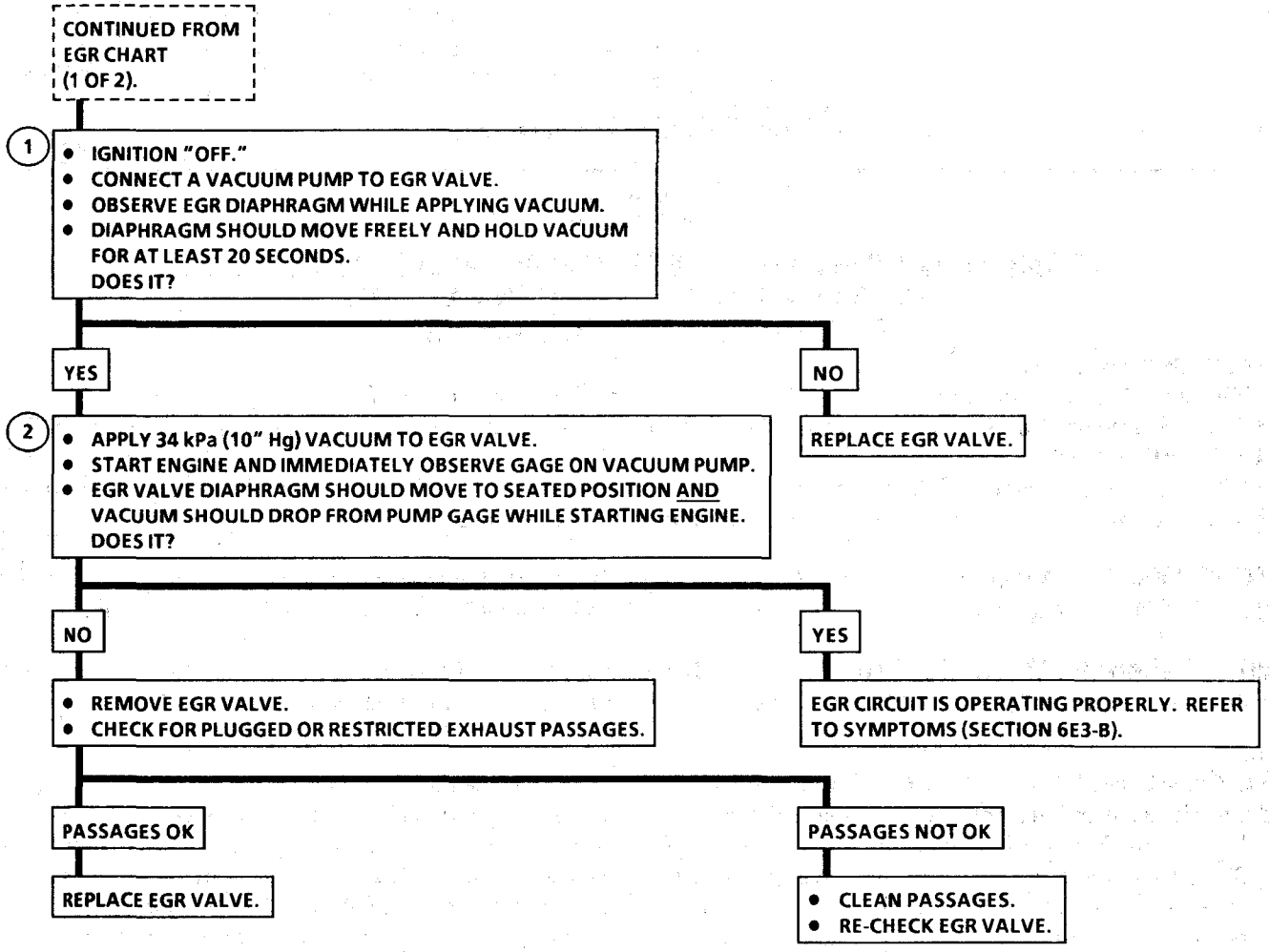
Suction from shop exhaust hoses can alter backpressure and may affect the functional check of the EGR valve. A DTC 32 can be caused by a leaking exhaust system. An exhaust leak will alter backpressure. Thoroughly check exhaust system for leaks.

When TCC is enabled, EGR will be operating at a reduced duty cycle.

DTC 32

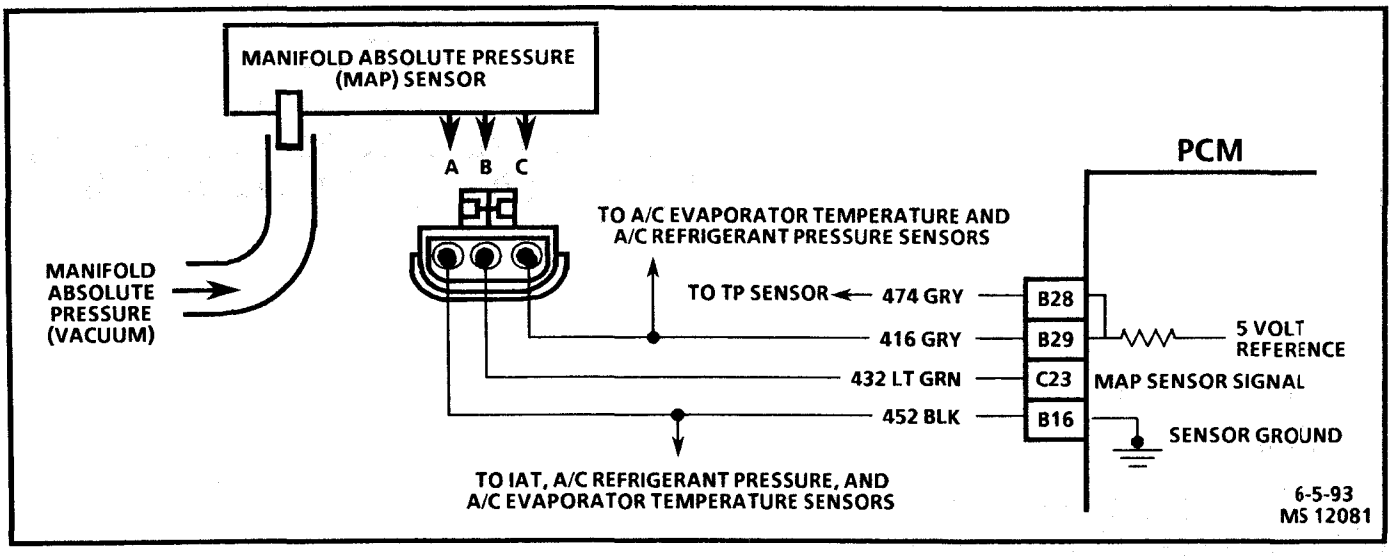
(Page 2 of 2)

EXHAUST GAS RECIRCULATION (EGR) 5.7L (VIN P) "F" CARLINE (SFI)



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

10-9-90
MS 10854



DTC 33

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT (SIGNAL VOLTAGE HIGH - LOW VACUUM) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The PCM receives this information as a signal voltage that will vary from about 1 - 1.5 volts at idle to 4.0 - 4.8 volts at Wide Open Throttle (WOT).

The Tech 1 displays manifold pressure in kPa of pressure and voltage. Low pressure (high vacuum) indicates a low voltage while a high pressure (low vacuum) indicates a high voltage.

DTC 33 Will Set When: Less than 3% throttle angle, MAP greater than 80 kPa, MAP greater than 90 kPa with A/C "ON," RPM greater than 500 RPM, and DTCs 21 and 22 not set. All conditions met for 1 second.

Action Taken (PCM will default to): If the MAP sensor fails, the PCM will calculate a MAP value based on throttle position and engine speed (RPM). The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. Engine misfire or a low unstable idle may set DTC 33. Disconnect MAP sensor and system will go into backup mode. If the misfire or idle condition remains, refer to "Symptoms," Section "6E3-B".
2. If the PCM recognizes the low MAP signal, the PCM and wiring are OK.
3. An open in CKT 452 will result in a DTC 33.

Diagnostic Aids: If the idle is rough or unstable, refer to "Symptoms," Section "6E3-B" for items which can cause an unstable idle.

With the ignition "ON," and the engine "OFF," the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the PCM as an indication of vehicle altitude and is referred to as BARO. Comparison of this BARO reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Reading should be the same, ± .4 volt.

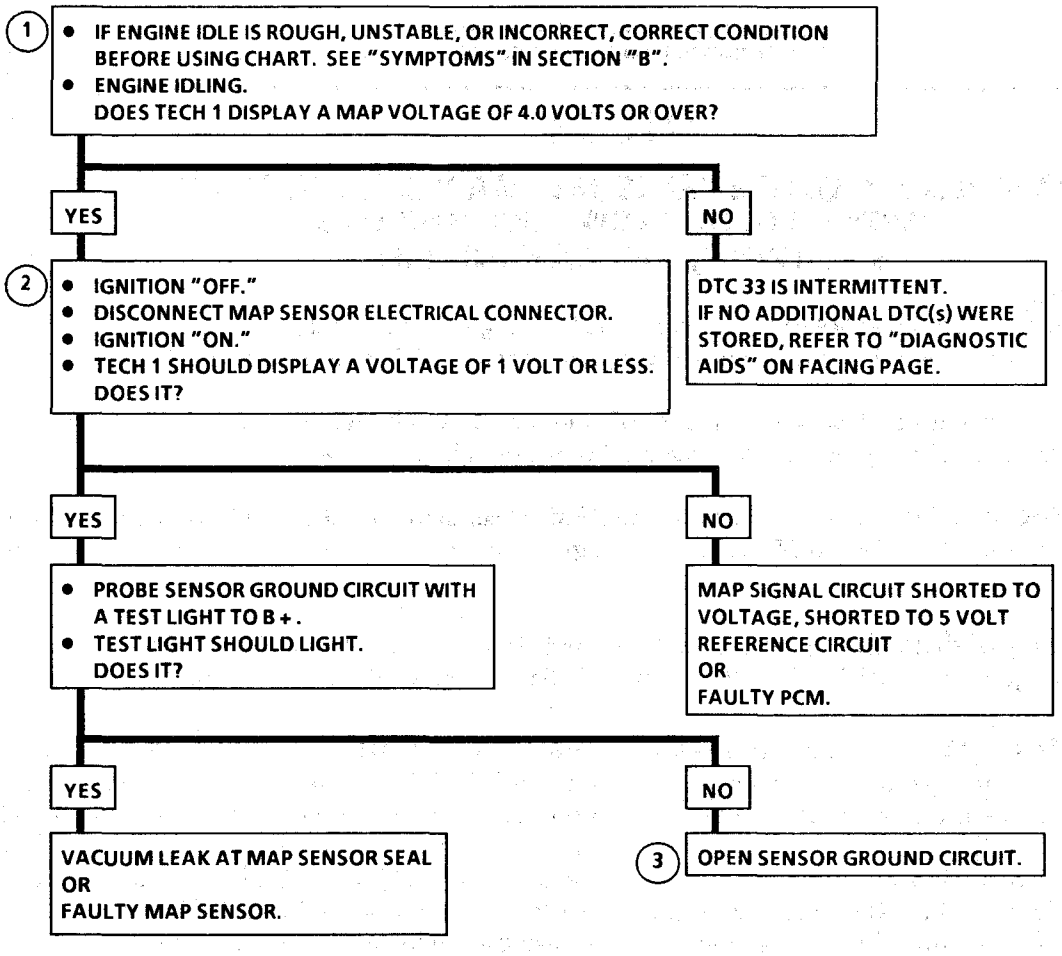
Also, CHART C-1D can be used to test the MAP sensor.

If DTC 23, 66 or 71 is also set, check CKT 452 for faulty wiring or connections.

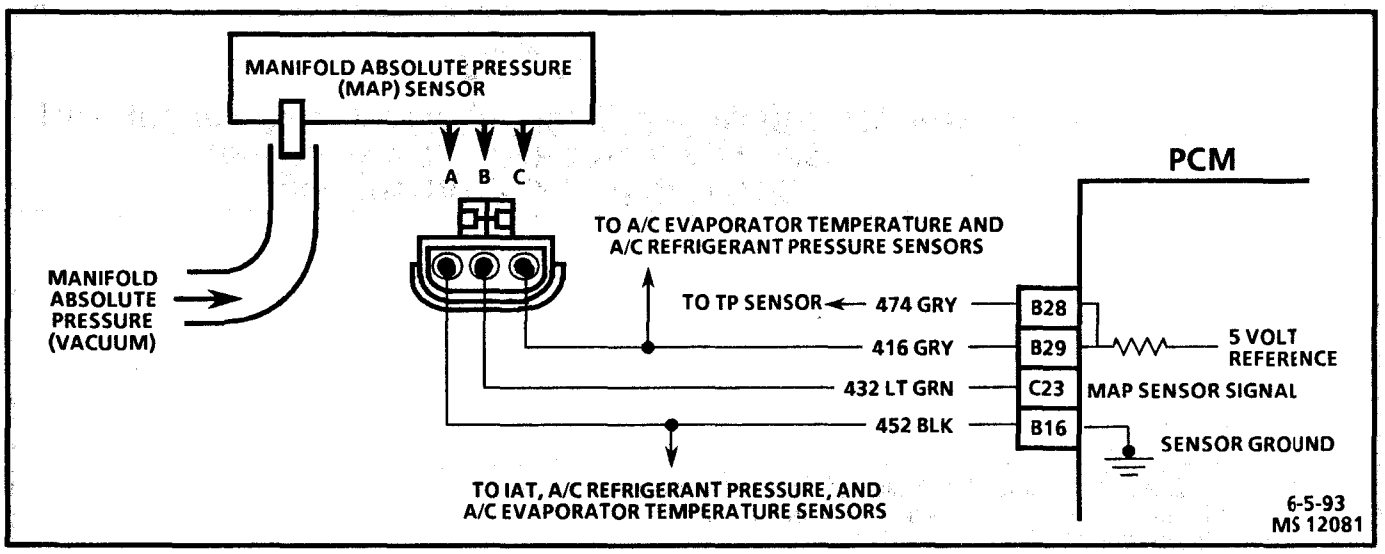
Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 33

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
(SIGNAL VOLTAGE HIGH - LOW VACUUM)
5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 34

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT (SIGNAL VOLTAGE LOW - HIGH VACUUM) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor responds to changes in manifold pressure (vacuum). The PCM receives this information as a signal voltage that will vary from about 1 - 1.5 volts at idle to 4.0 - 4.8 volts at Wide Open Throttle (WOT).

The scan tool displays manifold pressure in kPa of pressure and voltage. Low pressure (high vacuum) indicates a low voltage while a high pressure (low vacuum) indicates a high voltage.

DTC 34 Will Set When: MAP is less than 16 kPa, and RPM is less than 700 RPM, DTC 21 not set or MAP less than 16 kPa, RPM greater than 700 RPM, TP sensor angle greater than 26% and DTC 21 not set and all conditions met for 1 second.

Action Taken (PCM will default to): If the MAP sensor fails, the PCM will calculate a MAP value based on throttle position and engine speed (RPM). The Malfunction Indicator Lamp (MIL) will illuminate.

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

1. If the PCM recognizes the high MAP signal, the PCM and wiring are OK.
2. The Tech 1 will not display 12 volts. The important thing is that the PCM recognizes the voltage as more than 4 volts, indicating that the PCM and CKT 432 are OK.
3. An intermittent open in CKT 432 or CKT 416 will result in a DTC 34.

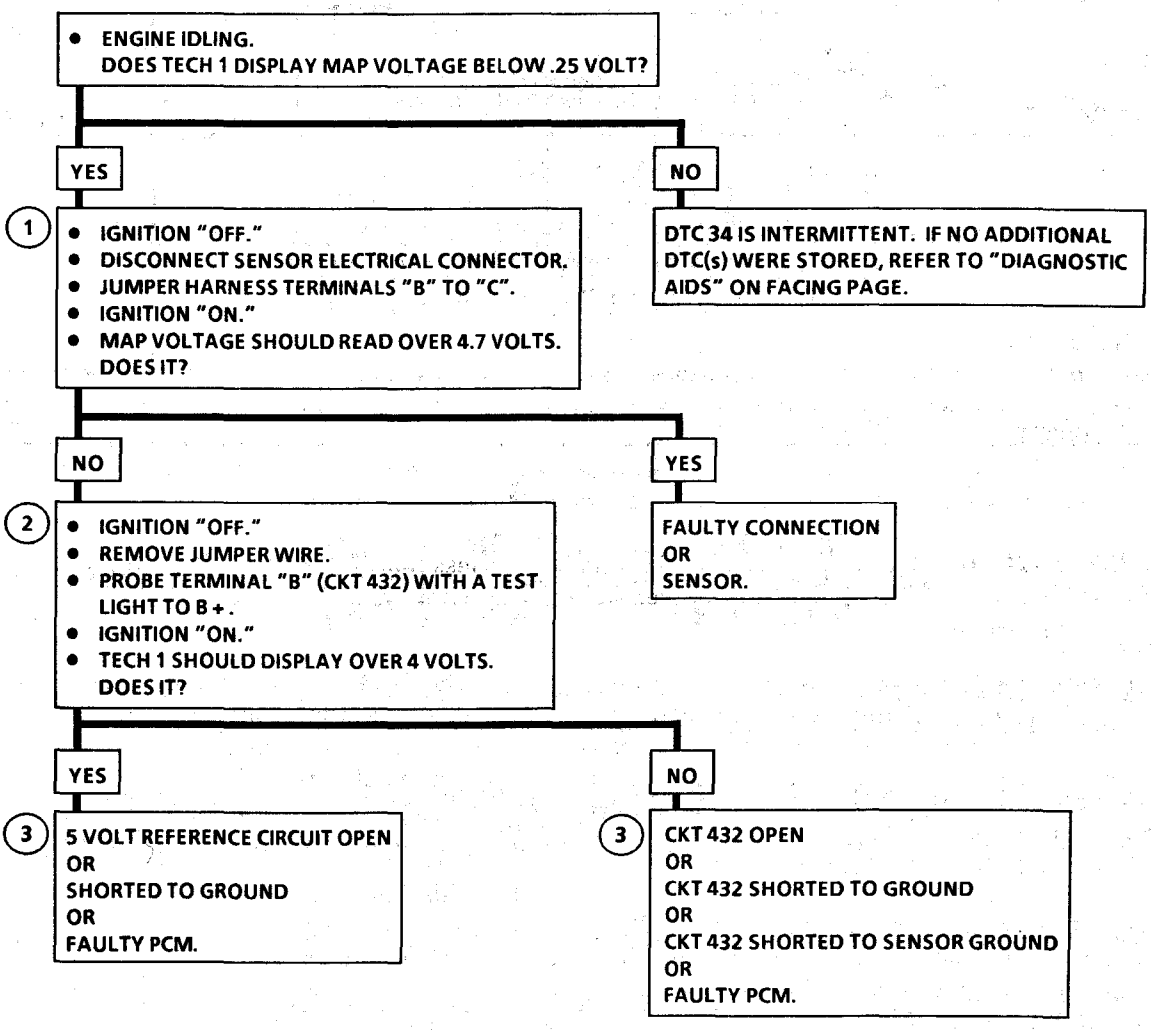
Diagnostic Aids: With the ignition "ON" and engine "OFF," the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the PCM as an indication of vehicle altitude and is referred to as BARO. Comparison of this BARO reading with a known good vehicle with the same sensor is a good way to check accuracy of a "suspect" sensor. Reading should be the same, ± .4 volt.

Also, CHART C-1D can be used to test the MAP sensor.

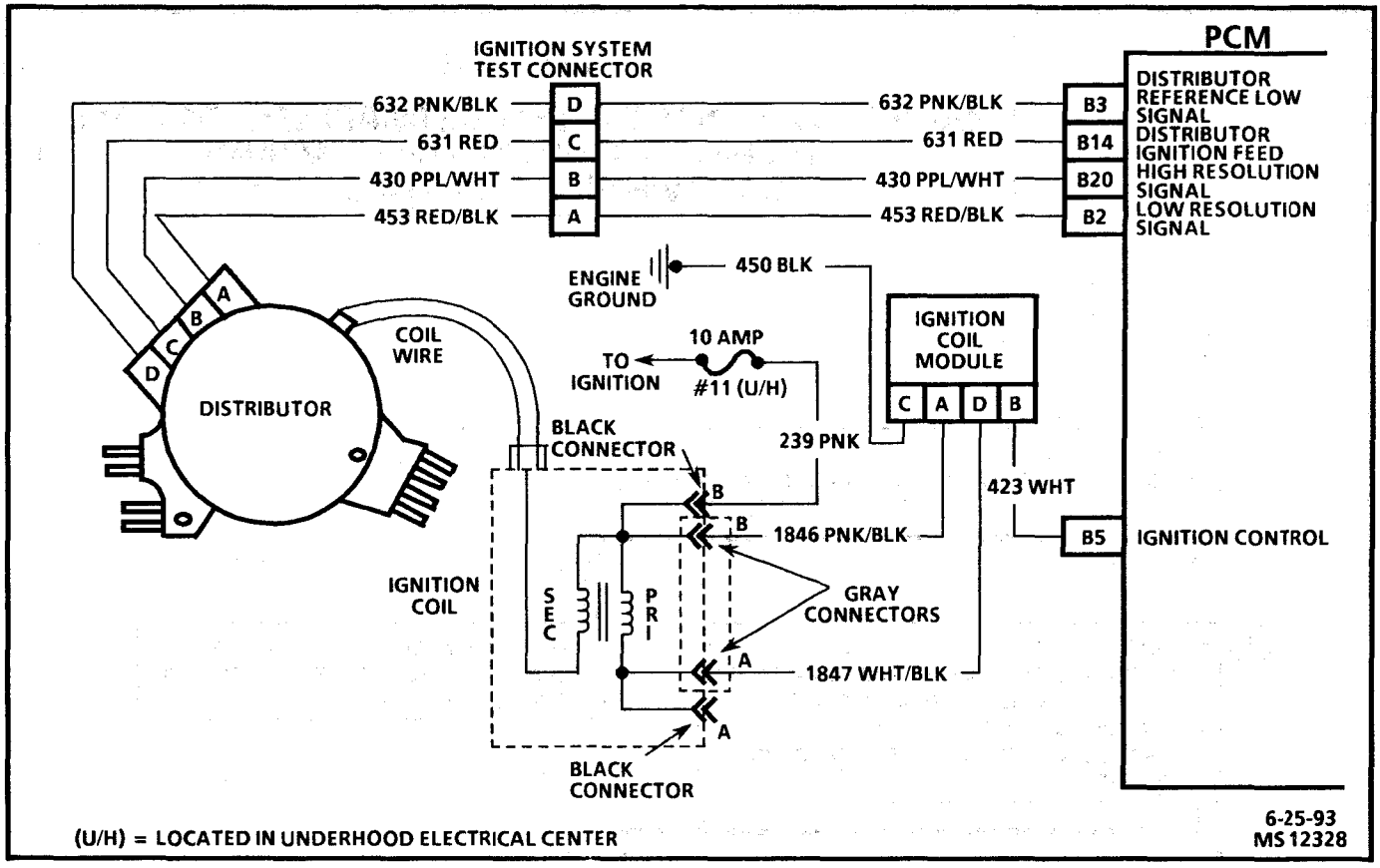
Refer to "Intermittents" in "Symptoms," Section "6E3-B".

DTC 34

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
(SIGNAL VOLTAGE LOW - HIGH VACUUM)
5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 36

DISTRIBUTOR IGNITION SYSTEM
(FAULTY HIGH RESOLUTION PULSE OR EXTRA LOW RESOLUTION PULSE DETECTED)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The distributor ignition system supplies two timing inputs to the PCM, a high resolution signal (360 pulses per one crankshaft revolution) and a low resolution signal (4 pulses per one crankshaft revolution). The PCM can determine if one of the timing inputs is not being received by comparing the two inputs. If the PCM detects the low resolution timing pulse without detecting the high resolution timing pulse, this DTC will set.

The reference signals toggle between 0 and 5 volts as the camshaft turns. Therefore, an open, a short to voltage, a short to ground, or a defective sensor inside the distributor can prevent the voltage from pulsing at the PCM.

DTC 36 Will Set When: 40 low resolution pulses occur before any high resolution pulses are detected.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

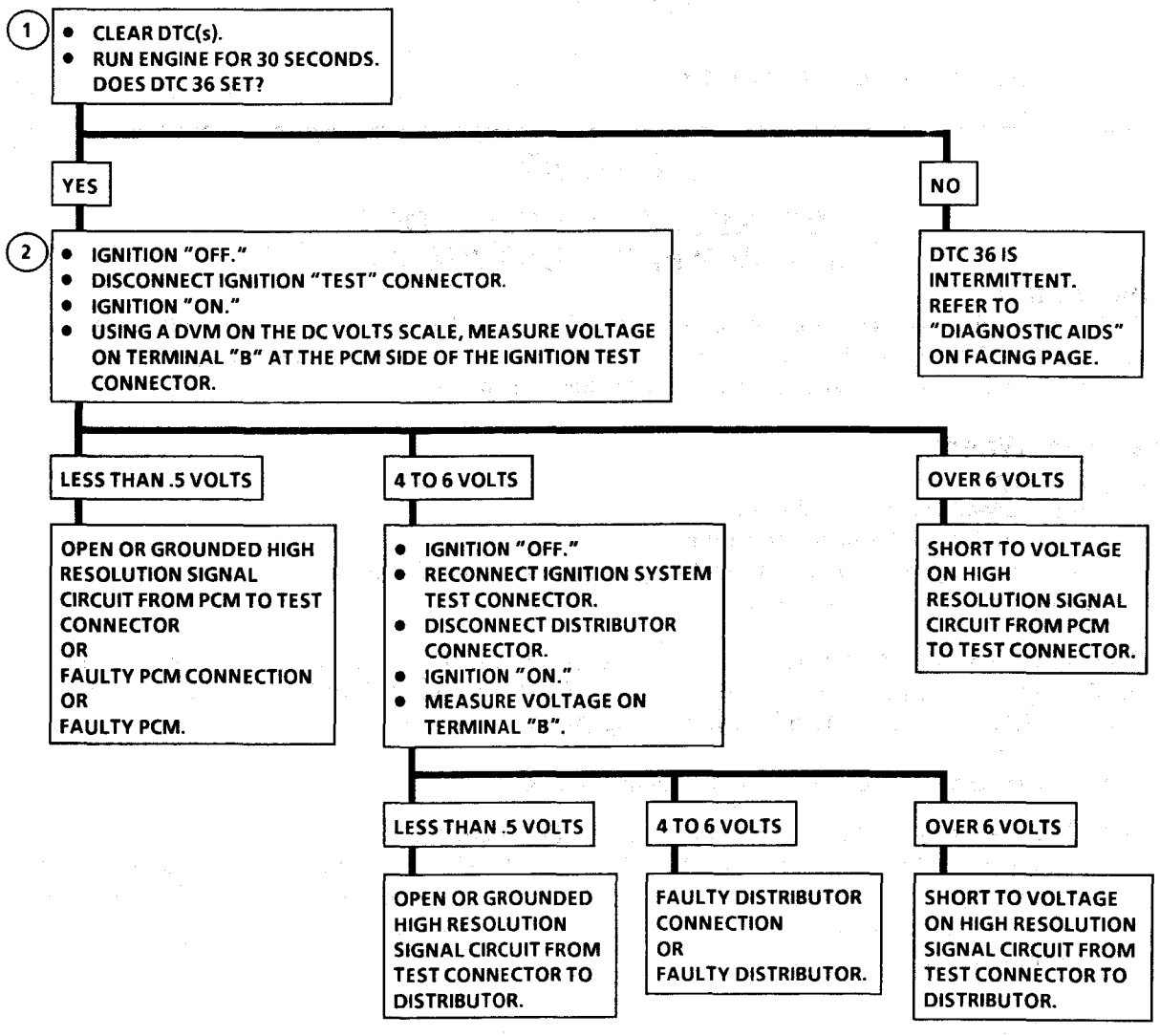
1. This determines if the DTC 36 is intermittent.
2. This test will determine if the PCM is sending out a signal to the distributor for processing. If this signal is not available, or is shorted to ground or voltage, the distributor cannot ground it to produce reference pulses.

Diagnostic Aids: The engine does not need the high resolution pulse to operate. If a DTC 36 is present and the vehicle will not start, check for DTC 16 and use that chart first. If the engine will still not run, refer to CHART A-3 "Engine Cranks But Will Not Run."

If distributor components must be replaced, check distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

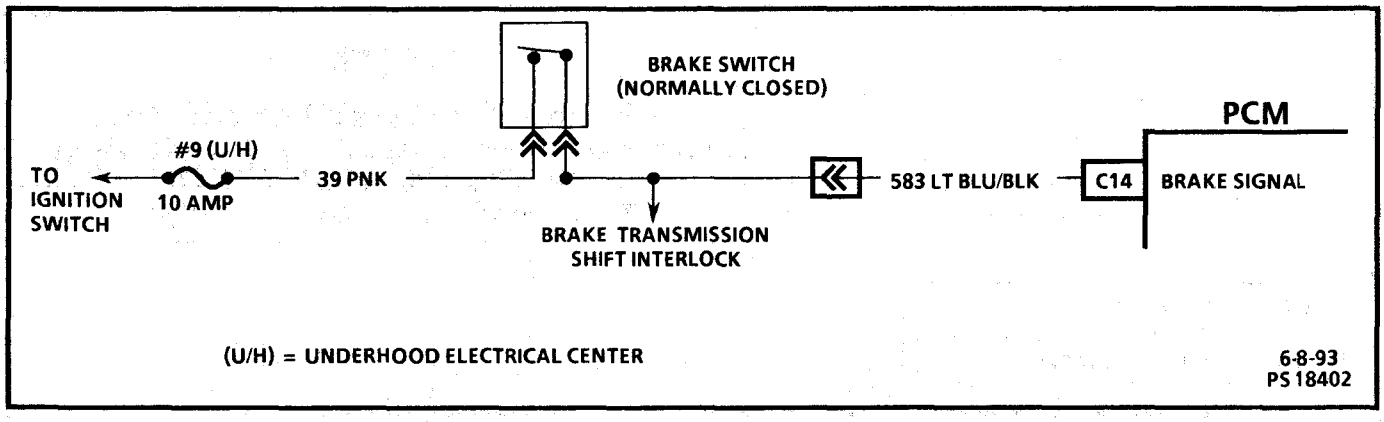
DTC 36

DISTRIBUTOR IGNITION SYSTEM (FAULTY HIGH RESOLUTION PULSE OR EXTRA LOW RESOLUTION PULSE DETECTED) 5.7L (VIN P) "F" CARLINE (SFI)



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

2-24-93
MS 9026-6E



DTC 37

BRAKE SWITCH STUCK "ON"
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The TCC brake switch is used to indicate brake pedal status. The normally closed brake switch supplies a B+ signal on CKT 420 to the PCM. The signal voltage is opened when the brakes are applied. The PCM uses this signal to de-energize the TCC solenoid when the brakes are applied.

DTC 37 Will Set When:

- CKT 420 is open.
  - Vehicle speed is less than 5 mph.
  - Then vehicle speed is between 5 mph.
  - Then vehicle speed is greater than 30 mph for greater than 6 seconds.
  - For a complete total of seven times.

Action Taken (PCM will default to): An incorrect brake signal can affect TCC scheduling. Also, an incorrect brake signal can inhibit fourth gear operation, if in hot mode. DTC 37 will be stored in PCM memory, but, will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 37 Will Clear When: Fault condition no longer exists.

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

1. This test checks for voltage at brake switch.
2. This test checks the brake switch.
3. This test checks CKT 420 at the PCM.

Diagnostic Aids:

- Check customer driving habits and/or unusual traffic conditions (i.e. stop and go expressway traffic).

DTC 37

BRAKE SWITCH STUCK "ON" 5.7L (VIN P) "F" CARLINE (SFI)

- INSTALL SCAN TOOL.
- IGNITION SWITCH "ON," ENGINE "OFF."
- RECORD THEN CLEAR DTC(s).
- APPLY THEN RELEASE BRAKE PEDAL.
- DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE PEDAL APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

NO

YES

NO TROUBLE FOUND. REFER TO "DIAGNOSTIC AIDS."

(1)
- WITH A TEST LIGHT CONNECTED TO GROUND, BACKPROBE IGNITION FEED CIRCUIT ON BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO

REPAIR OPEN IN THE IGNITION FEED CIRCUIT TO THE BRAKE SWITCH. IF THE IGNITION VOLTAGE FEED FUSE IS OPEN, ALSO CHECK CKT 420 FOR A SHORT TO GROUND.

- WITH TEST LIGHT CONNECTED TO GROUND, BACKPROBE HARNESS CKT 420 AT BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO

BRAKE SWITCH OUT OF ADJUSTMENT OR FAULTY BRAKE SWITCH.

(2)
- APPLY BRAKE PEDAL. IS TEST LIGHT "OFF" WHEN BRAKE PEDAL IS APPLIED?

YES

NO

CHECK CKT 420 FOR SHORT TO B+. IF OK, REPLACE BRAKE SWITCH.

- IGNITION "OFF."
- DISCONNECT CONTROL MODULE CONNECTORS.
- IGNITION "ON," ENGINE "OFF."
- WITH A TEST LIGHT CONNECTED TO GROUND, PROBE CONTROL MODULE CKT 420 HARNESS CONNECTOR. IS TEST LIGHT "ON"?

YES

NO

REPAIR OPEN CKT 420 FROM TCC BRAKE SWITCH TO PCM.

(3)
- IGNITION "OFF."
- RECONNECT CONTROL MODULE CONNECTIONS.
- IGNITION "ON."
- APPLY THEN RELEASE BRAKE PEDAL. DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

YES

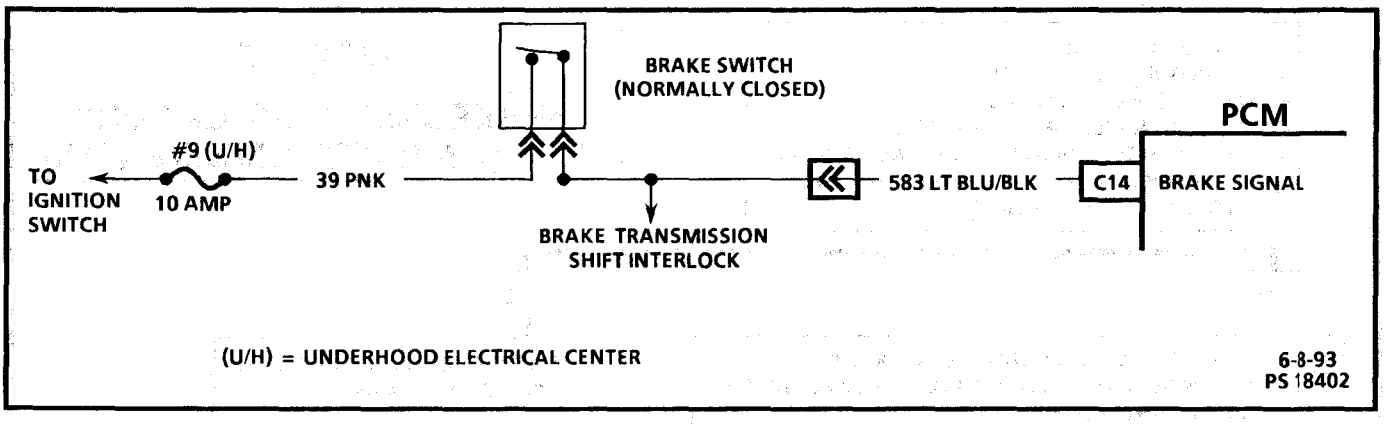
NO

ELECTRICAL SYSTEM CHECKS OK AT THIS TIME. THE MALFUNCTION MAY BE INTERMITTENT OR MAY HAVE BEEN CORRECTED DURING THIS DIAGNOSTIC PROCEDURE. REFER TO DIAGNOSTIC AIDS.

FAULTY CONTROL MODULE.

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

5-3-93
PS 17053



DTC 38

BRAKE SWITCH STUCK "OFF"
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The TCC brake switch is used to indicate brake pedal status. The normally closed brake switch supplies a B+ signal on CKT 420 to the PCM. The signal voltage is opened when the brakes are applied. The PCM uses this signal to de-energize the TCC solenoid when the brakes are applied.

DTC 38 Will Set When:

- CKT 420 has constant voltage.
  - Vehicle speed is less than 5 mph.
  - Then vehicle speed is greater than 20 mph for greater than 6 seconds.
  - Then vehicle speed is between 5 mph and 20 mph for greater than 6 seconds.
  - For a complete total of seven times.

Action Taken (PCM will default to): An incorrect brake signal can affect TCC scheduling. Also, an incorrect brake signal can inhibit fourth gear operation, if in hot mode. DTC 38 will be stored in PCM memory, but, will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 38 Will Clear When: Fault condition no longer exists.

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

1. This test checks for voltage at brake switch.
2. This test checks the brake switch.
3. This test checks CKT 420 at the PCM.

Diagnostic Aids:

- Check customer driving habits and/or unusual traffic conditions (i.e. stop and go expressway traffic).

DTC 38

BRAKE SWITCH STUCK "OFF"
5.7L (VIN P) "F" CARLINE (SFI)

- INSTALL SCAN TOOL.
- IGNITION SWITCH "ON," ENGINE "OFF."
- RECORD THEN CLEAR DTC(s).
- APPLY THEN RELEASE BRAKE PEDAL.
- DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE PEDAL APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

NO

YES

NO TROUBLE FOUND. REFER TO "DIAGNOSTIC AIDS."

(1)

- WITH A TEST LIGHT CONNECTED TO GROUND, BACKPROBE IGNITION FEED CIRCUIT ON BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO

REPAIR OPEN IN THE IGNITION FEED CIRCUIT TO THE BRAKE SWITCH. IF THE IGNITION VOLTAGE FEED FUSE IS OPEN, ALSO CHECK CKT 420 FOR A SHORT TO GROUND.

- WITH TEST LIGHT CONNECTED TO GROUND, BACKPROBE HARNESS CKT 420 AT BRAKE SWITCH. IS TEST LIGHT "ON"?

YES

NO

BRAKE SWITCH OUT OF ADJUSTMENT OR FAULTY BRAKE SWITCH.

(2)

- APPLY BRAKE PEDAL. IS TEST LIGHT "OFF" WHEN BRAKE PEDAL IS APPLIED?

YES

NO

CHECK CKT 420 FOR SHORT TO B+. IF OK, REPLACE BRAKE SWITCH.

- IGNITION "OFF."
- DISCONNECT CONTROL MODULE CONNECTORS.
- IGNITION "ON," ENGINE "OFF."
- WITH A TEST LIGHT CONNECTED TO GROUND, PROBE CONTROL MODULE CKT 420 HARNESS CONNECTOR. IS TEST LIGHT "ON"?

YES

NO

REPAIR OPEN CKT 420 FROM TCC BRAKE SWITCH TO PCM.

(3)

- IGNITION "OFF."
- RECONNECT CONTROL MODULE CONNECTIONS.
- IGNITION "ON."
- APPLY THEN RELEASE BRAKE PEDAL. DOES SCAN TOOL DISPLAY TCC BRAKE SW "OPEN" WITH BRAKE APPLIED, AND THEN DISPLAY "CLOSED" WHEN RELEASED?

YES

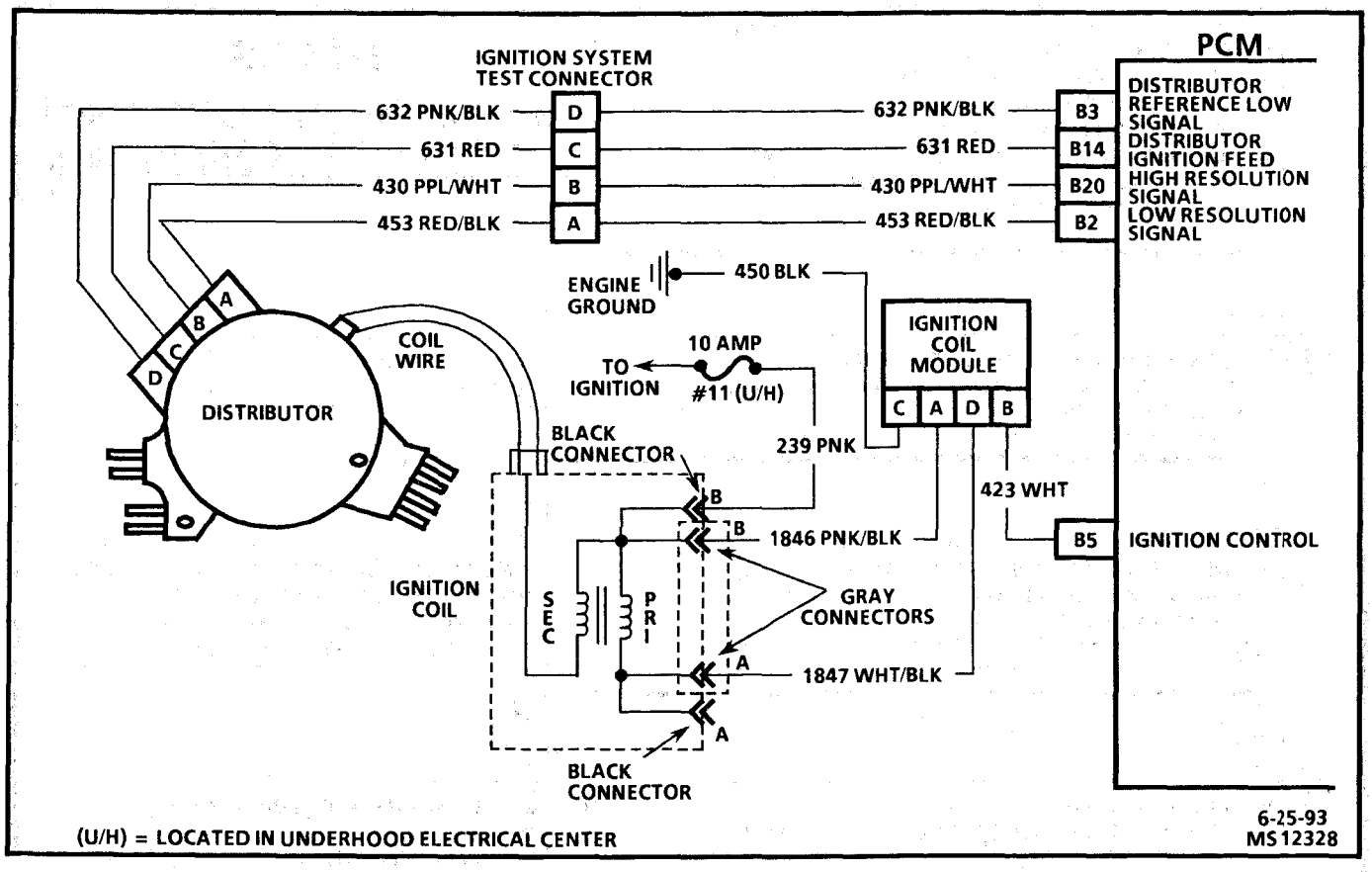
NO

FAULTY CONTROL MODULE.

ELECTRICAL SYSTEM CHECKS OK AT THIS TIME. THE MALFUNCTION MAY BE INTERMITTENT OR MAY HAVE BEEN CORRECTED DURING THIS DIAGNOSTIC PROCEDURE. REFER TO DIAGNOSTIC AIDS.

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

5-3-93
PS 17053



DTC 41

IGNITION CONTROL (IC) CIRCUIT (OPEN CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The distributor ignition system provides two timing inputs to the PCM, high resolution signal (360 pulses per crankshaft revolution) and low resolution signal (4 pulses per crankshaft revolution). The PCM uses these two reference pulses to determine individual ignition spark timing for each cylinder.

Once the PCM calculates ignition timing, the timing signal will be sent to the ignition coil module on the IC circuit. Each timing pulse received by the ignition coil module, on the IC circuit, will trigger the coil module to operate the ignition coil. Secondary ignition voltage is induced and is then sent to the distributor for distribution to each spark plug.

The IC signal voltage ranges from about .5 volt to 4.5 volts.

DTC 41 Will Set When: Voltage on CKT 423 exceeds 4.6 volts and engine speed is less than 1500 RPM.

Action Taken (PCM will default to): If a DTC 41 is detected, the PCM will disable the fuel injectors to prevent flooding of the engine. DTC 41 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.

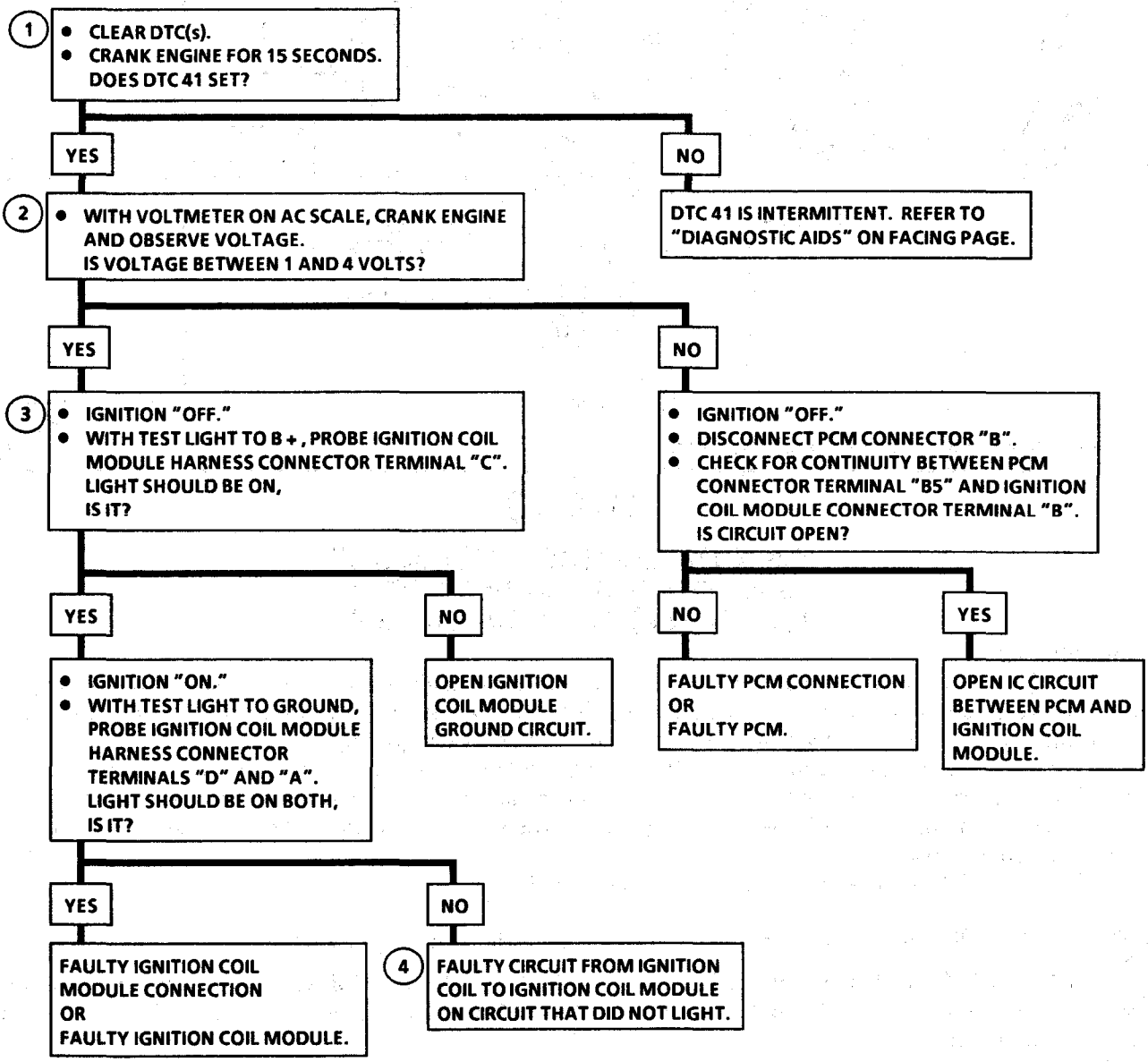
1. This determines if the DTC 41 is intermittent.
2. This check determines if the IC signal from the PCM is available at the ignition coil driver. The IC circuit voltage should be between about .5 and 4.5 volts.
3. The remaining tests begin to check that the coil driver circuitry is OK.
4. If all wiring and connections are OK, check the ignition coil or the ignition coil voltage supply. Check coil fuse for being open.

Diagnostic Aids: Since the coil driver gets its power from the coil, check the ignition feed circuit to the ignition coil for opens.

DTC 41 will set only during cranking.

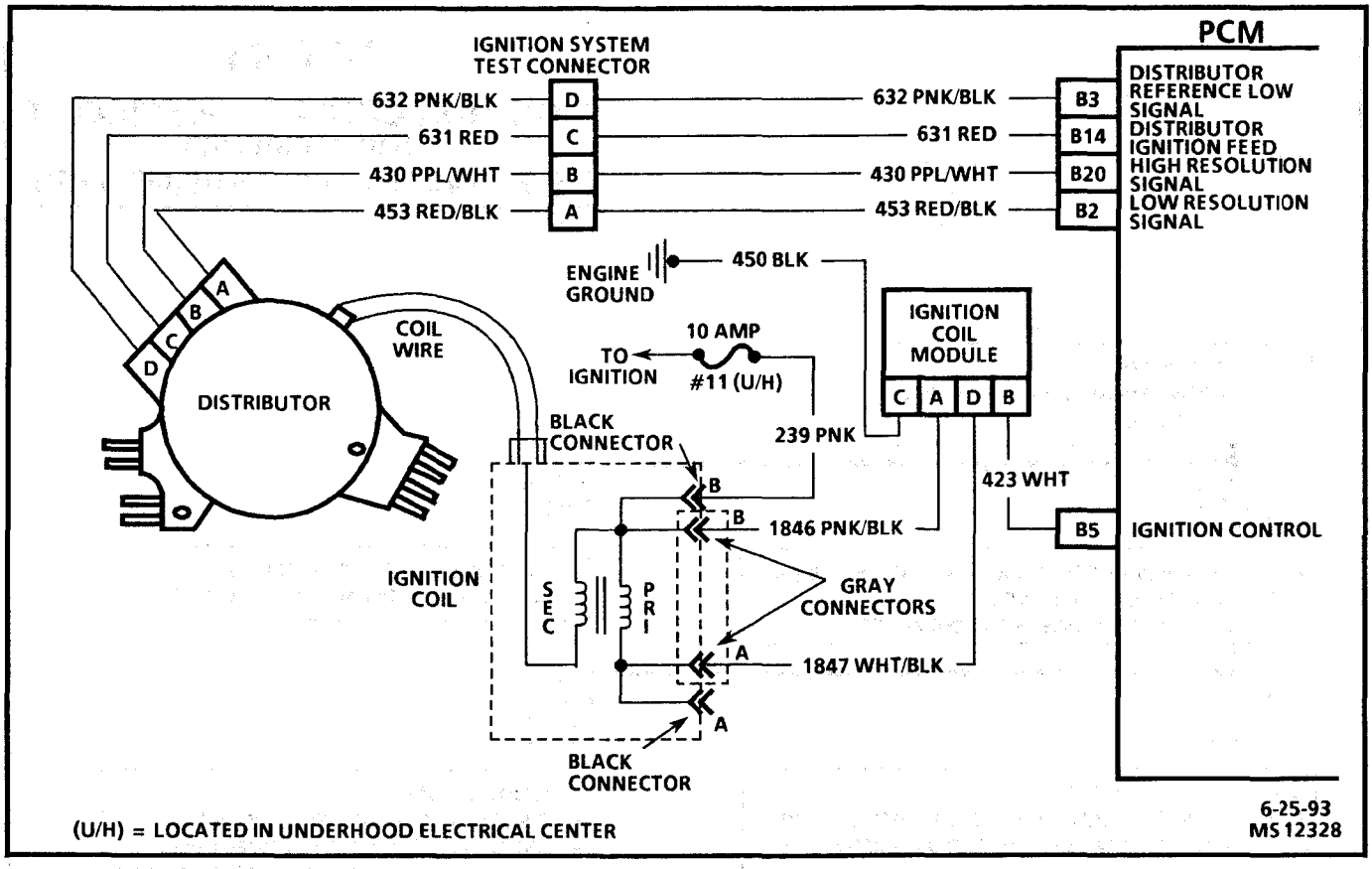
DTC 41

IGNITION CONTROL (IC) CIRCUIT (OPEN CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)



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

4-19-93
9S 5271-6E



DTC 42

IGNITION CONTROL (IC) CIRCUIT (SHORTED OR GROUNDED CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The distributor ignition system provides two timing inputs to the PCM, high resolution signal (360 pulses per crankshaft revolution) and low resolution signal (4 pulses per crankshaft revolution). The PCM uses these two reference pulses to determine individual ignition spark timing for each cylinder.

Once the PCM calculates ignition timing, the timing signal will be sent to the ignition coil module on the IC circuit. Each timing pulse received by the ignition coil module on the IC circuit will trigger the ignition coil module to operate the ignition coil. Secondary ignition voltage is induced and is then sent to the distributor for distribution to each spark plug.

The IC signal voltage ranges from about .5 volt to 4.5 volts.

DTC 42 Will Set When: PCM detects 84 crankshaft revolutions without any IC activity.

Action Taken (PCM will default to): If DTC 42 is detected, the PCM will disable the fuel injectors to prevent flooding of the engine. DTC 42 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

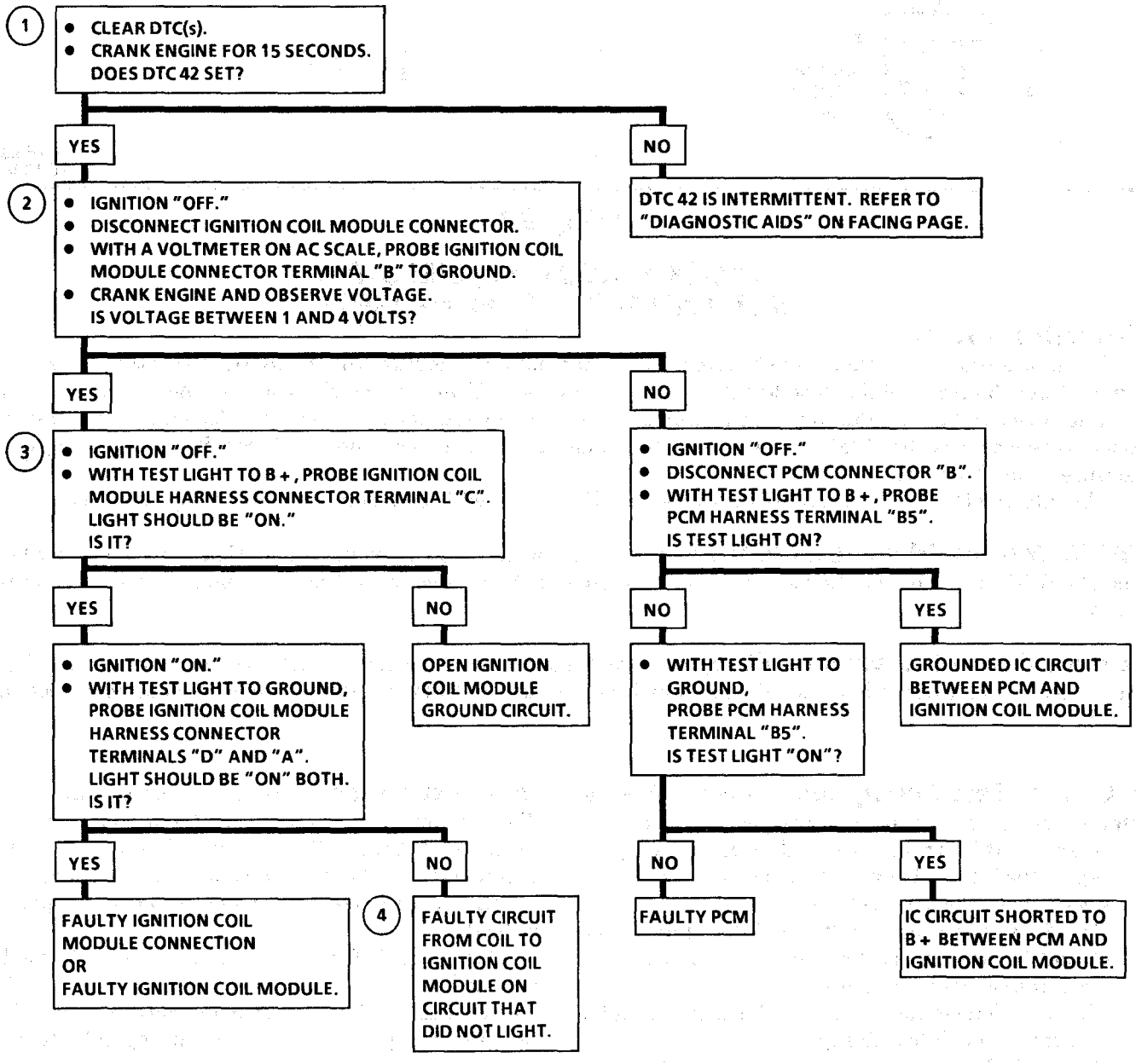
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the engine starts at this point, DTC 42 is intermittent.
2. This check determines if the IC signal from the PCM is available at the ignition coil module.
3. The remaining tests begin to check that the ignition coil module circuitry is OK. If the ignition coil module loses its voltage source, secondary voltage will not be produced and a DTC 42 will set.
4. Since the ignition coil module gets its power from the coil, check the ignition feed circuit to the ignition coil for opens.

Diagnostic Aids: DTC 42 will set only during cranking.

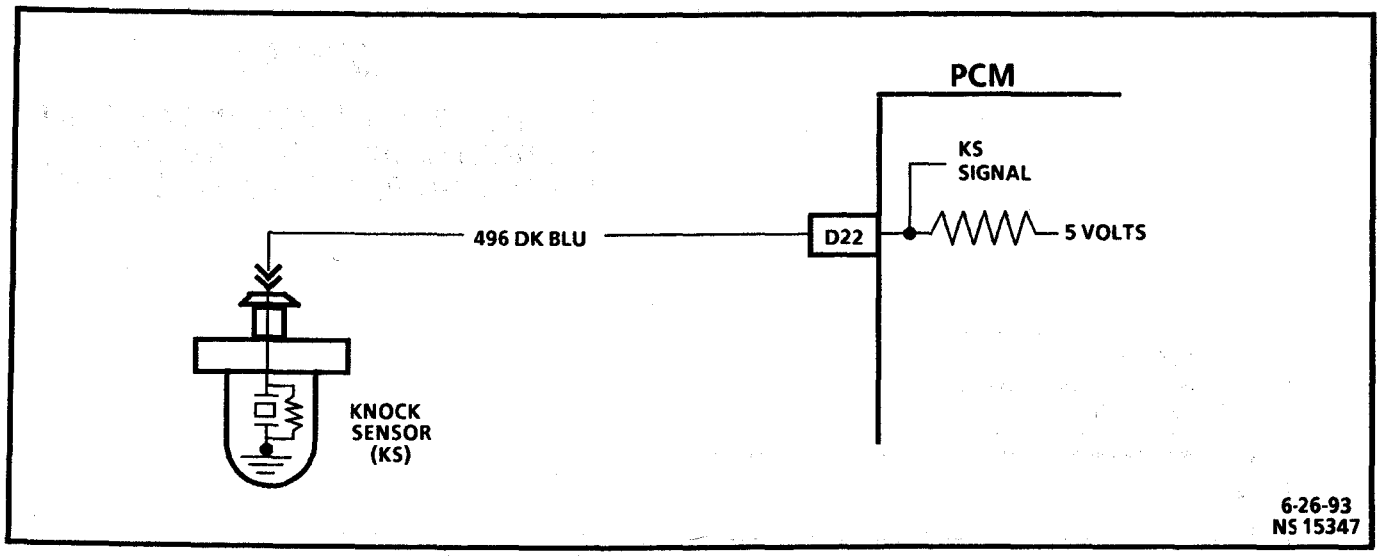
DTC 42

IGNITION CONTROL (IC) CIRCUIT (SHORTED OR GROUNDED CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)



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

5-1-93
MS 8943-6E



DTC 43

KNOCK SENSOR (KS) CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The knock sensor system is used to detect engine detonation. The PCM will retard the spark timing based on signals from the KS module. The knock sensor produces an AC voltage which is sent to the KS module. The amount of AC voltage produced by the sensor is determined by the amount of knock. The circuitry within the knock sensor causes the PCM's 5 volts to be pulled down so that under a no knock condition, CKT 496 would measure about 2.5 volts.

The internal PCM test run on the Knock Sensor (KS) circuit will determine if it is operating correctly.

DTC 43 Will Set When: If the PCM detects that any of the following voltage conditions have been met for 5 seconds, DTC 43 will be set: Sensor open - voltage greater than 4.1 volts, or sensor grounded - voltage less than .78 volt.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate. The PCM will retard timing to a predetermined maximum based on current RPM and MAP. Some loss of performance will result.

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

1. If an audible knock is heard from the engine, repair the internal engine problem, as normally no knock should be detected at idle.
   The PCM supplies 5 volts on CKT 496 which should be present at the knock sensor terminal when the sensor is disconnected.
2. This test determines if the knock sensor is faulty or if the KS module is faulty.
3. CKT 496 shorted to voltage will set DTC 43 and indicate on Tech 1 as sensor open. With the sensor and the PCM disconnected, no voltage should be present on CKT 496.
4. An improperly installed knock sensor can prevent the knock sensor from grounding to the block.

Diagnostic Aids: The PCM has the ability to diagnose opens and shorts in the KS circuit. The Tech 1 will display if the sensor is open or if it is grounded when the PCM detects these conditions.

Check CKT 496 for a potential open or short to ground.

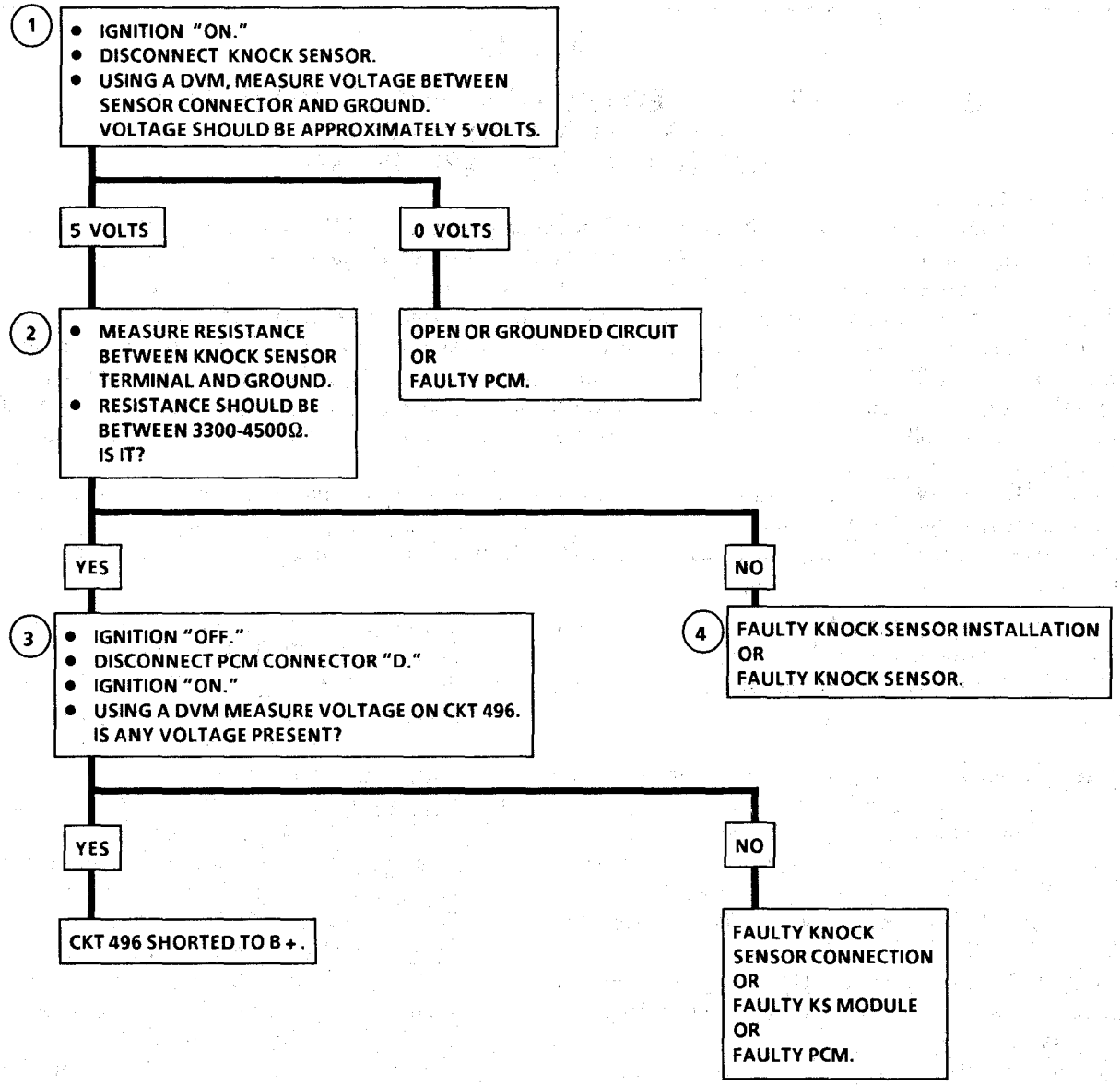
Also, check for proper installation of the KS module.

KS sensor wire is routed too close to secondary ignition components may be susceptible to EMI interference.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

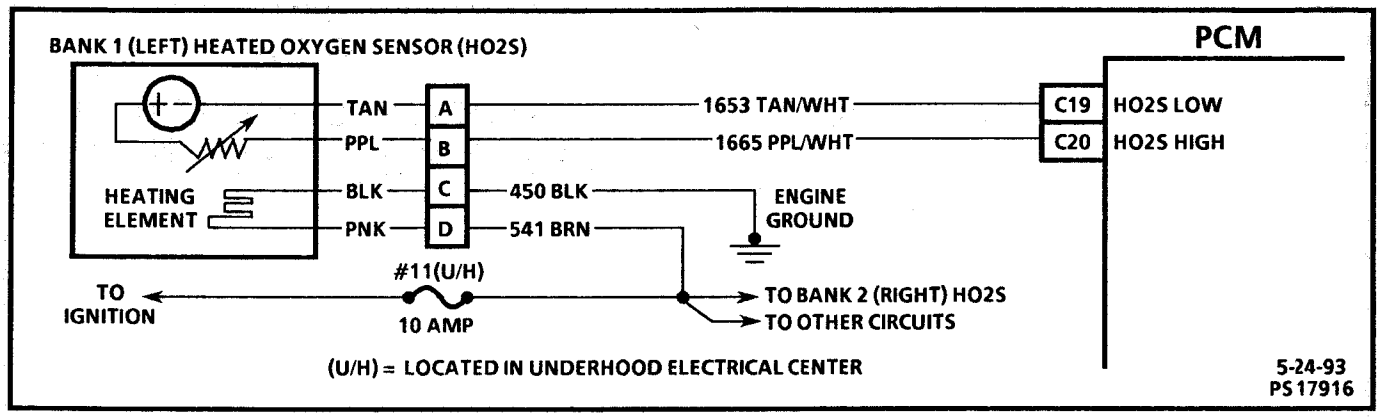
DTC 43

KNOCK SENSOR (KS) CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

5-24-93
PS 17927



DTC 44

BANK 1 (LEFT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT
(LEAN 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 display 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 44 Will Set When: System is operating in "Closed Loop," not in power enrichment, and signal voltage remains below 200 mV for 50 seconds.

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.

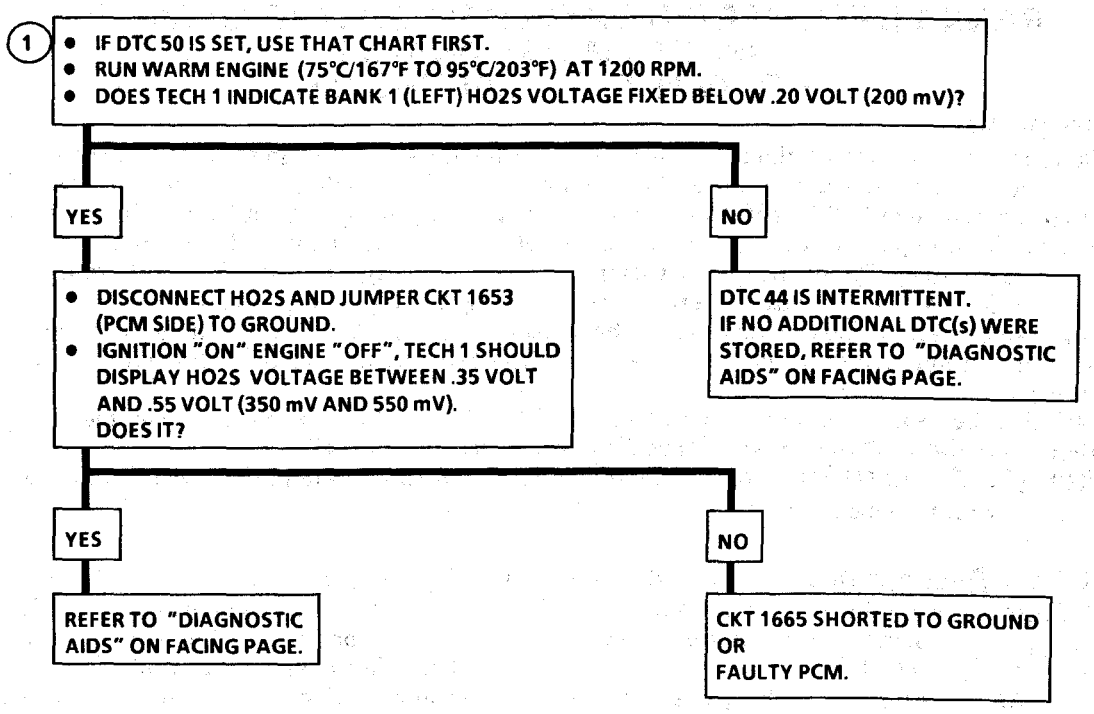
1. Engine must be at normal operating temperature before performing this test.

Diagnostic Aids: Using the Tech 1, observe the long term fuel trim values at different RPM and air flow 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 44 may have been set. If the conditions for DTC 44 exist, the long term fuel trim values will be near 160.

- Heated Oxygen Sensor (HO2S) wires. Sensor pigtail may be mispositioned and contacting the exhaust manifold.
  Check for intermittent ground in signal wire between connector and 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.
- Lean injector(s). Perform "Injector Balance Test," using Tech 1 or CHART C-2A.
- Fuel contamination. Water, even in small amounts, near the in-tank fuel pump inlet can be delivered to the injectors. The water causes a lean exhaust and can set a DTC 44.
- Fuel pressure. System will be lean if pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to "Fuel System Diagnosis," CHART A-7.
- Exhaust leaks. If there is an exhaust leak, above the oxygen sensor, the engine can cause outside air to be pulled into the exhaust stream and flow past the sensor causing lean condition. Vacuum or crankcase leaks can cause a lean condition.
- AIR system. Make sure the secondary air pump is not operating in "Closed Loop." While monitoring long term fuel trim, squeeze the air hose going to the exhaust ports (left bank). If long term fuel trim values go down, refer to CHART C-6.
- If the above are OK, the oxygen sensor may be at fault.

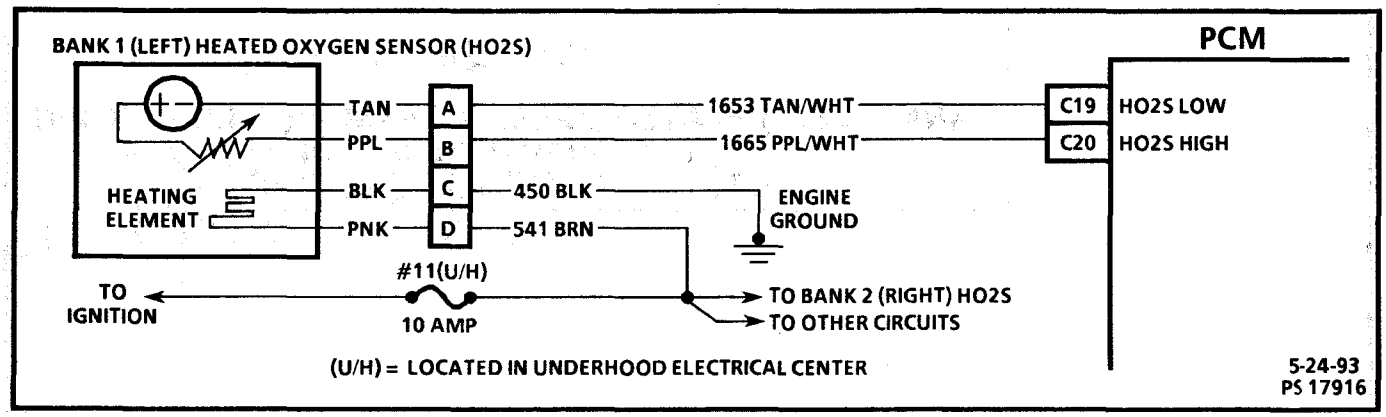
DTC 44

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



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

6-11-93
MS 8311



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.

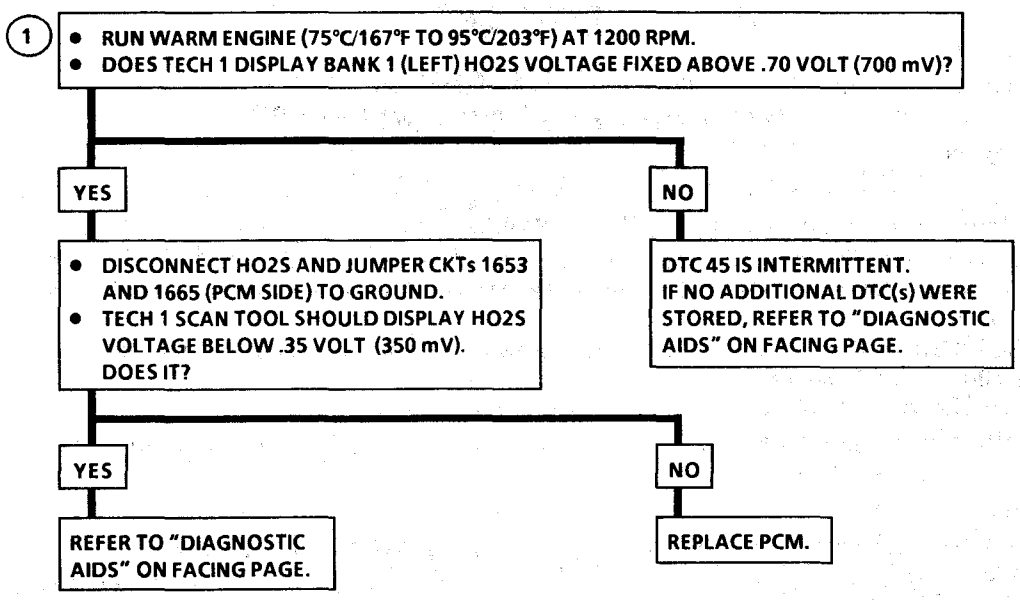
1. Engine must be at normal operating temperature before performing this test.

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.

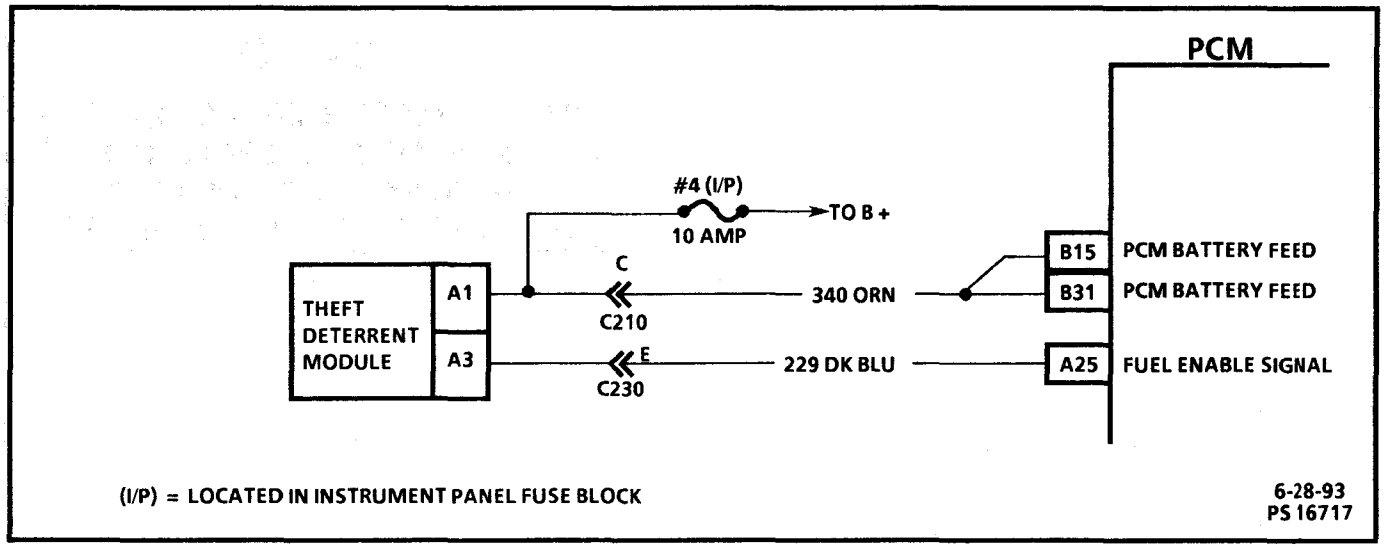
- Fuel pressure. System will go rich if pressure is too high. The PCM can compensate for some increase. However, if it gets too high, a DTC 45 may be set. Refer to "Fuel System Diagnosis," CHART A-7.
- Rich injector. Perform "Injector Balance Test," using Tech 1 or CHART C-2A.
- Leaking injector. Refer 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 45

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



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



DTC 46

PASS-KEY®II CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PASS-Key®II system is designed to disable vehicle operation if the incorrect key or starting procedure is used. The theft deterrent module enables the crank circuit to the starter and sends a signal to the PCM if the correct key is being used. If the proper signal does not reach the PCM on CKT 229, the PCM will not pulse the injectors "ON" and thus not allow the vehicle to continue to run, even if the crank circuit is bypassed.

DTC 46 Will Set When: DTC 46 will set and the engine will stall if the proper signal is not being received on CKT 229 by the PCM after 1.7 seconds.

Action Taken (PCM will default to): DTC 46 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

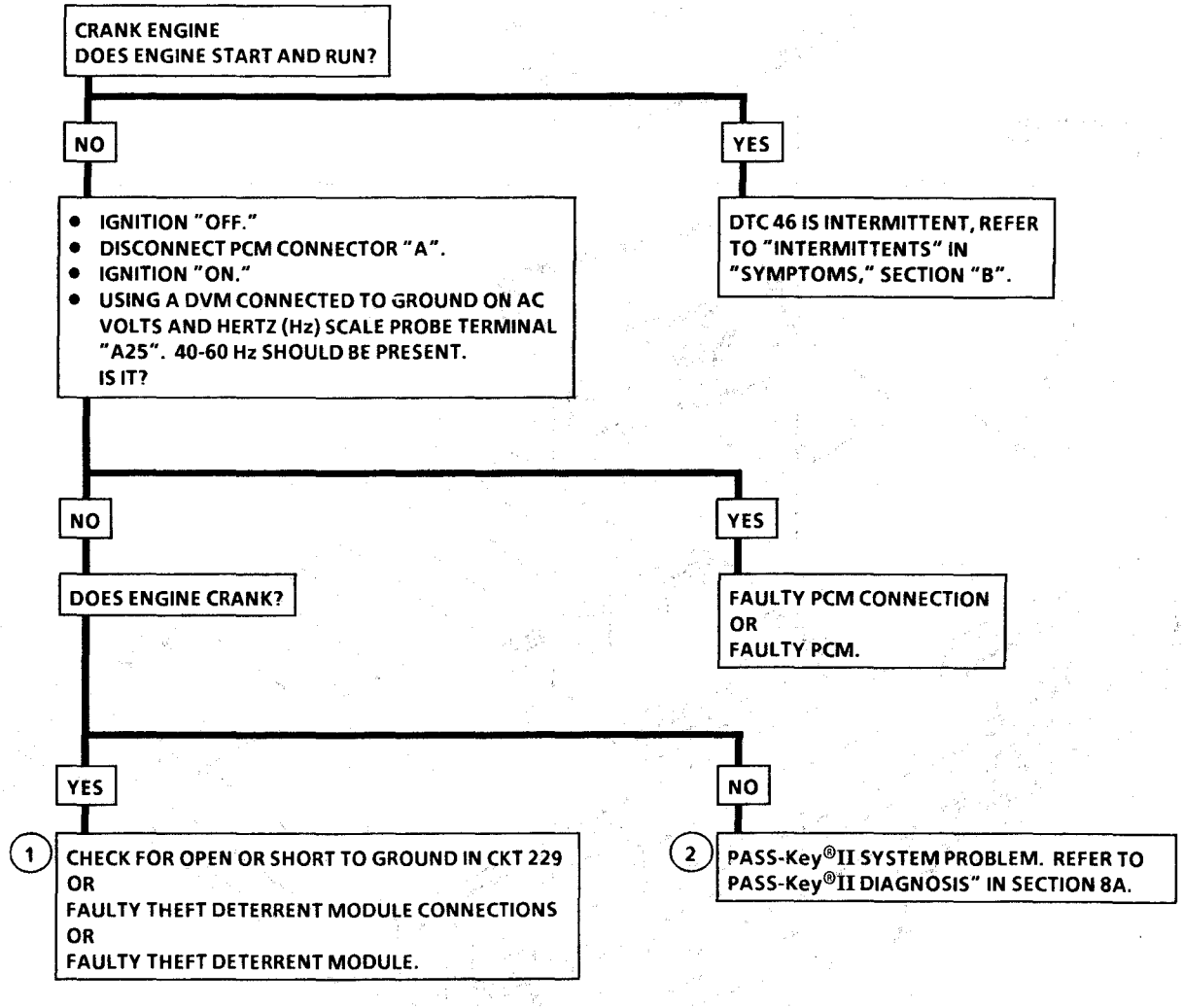
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If the engine starts and then stalls, it indicates that the portion of the theft deterrent module, which generates the signal to the PCM is not operating or CKT 229 is open or shorted to ground. If theft deterrent module is found to be OK, as determined from SECTION 8A or 8D, the PCM may be at fault, but this is not a likely condition.
2. If DTC 46 is stored, and the engine will not crank, it indicates that there is a PASS-Key®II problem or an incorrect key or starting procedure is being used.

Diagnostic Aids: If the proper signal is not received on CKT 229 by the PCM, the engine will start then stall. The proper signal is between 40 - 60 Hz and must be measured using the AC scale on the DVM.

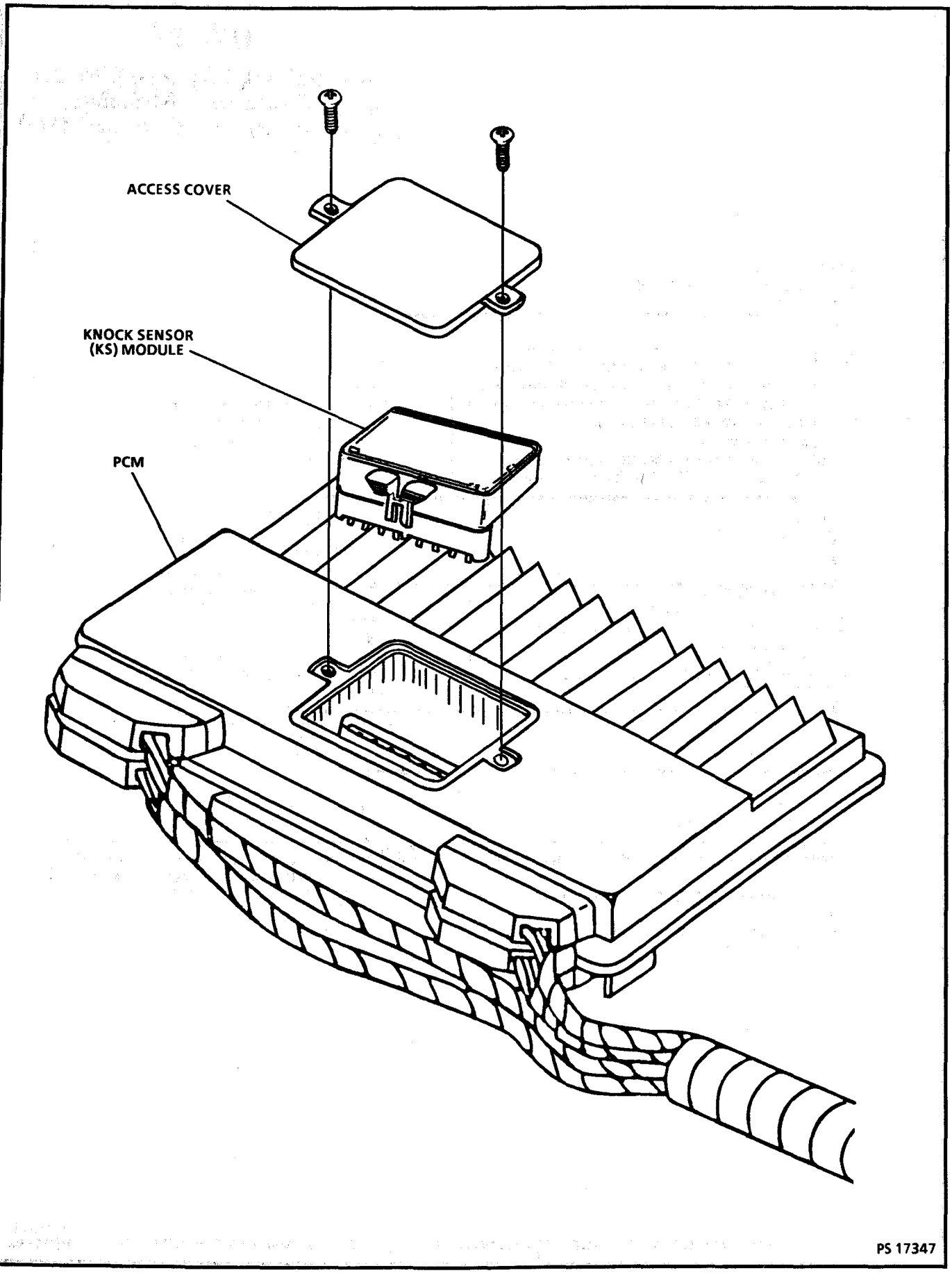
DTC 46

PASS-Key®II CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)



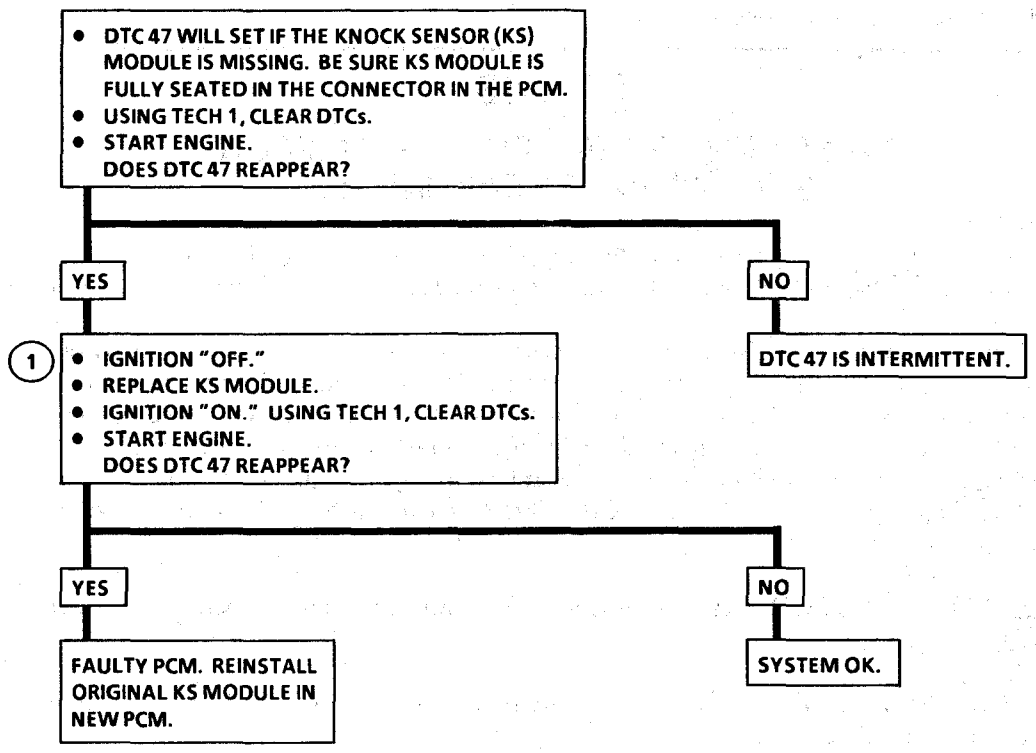
"AFTER REPAIRS," REFER TO DTC CRITERIA ON FACING PAGE AND CONFIRM DTC DOES NOT RESET.

6-26-93
NS 15561


ACCESS COVER
KNOCK SENSOR (KS) MODULE
PCM
PS 17347

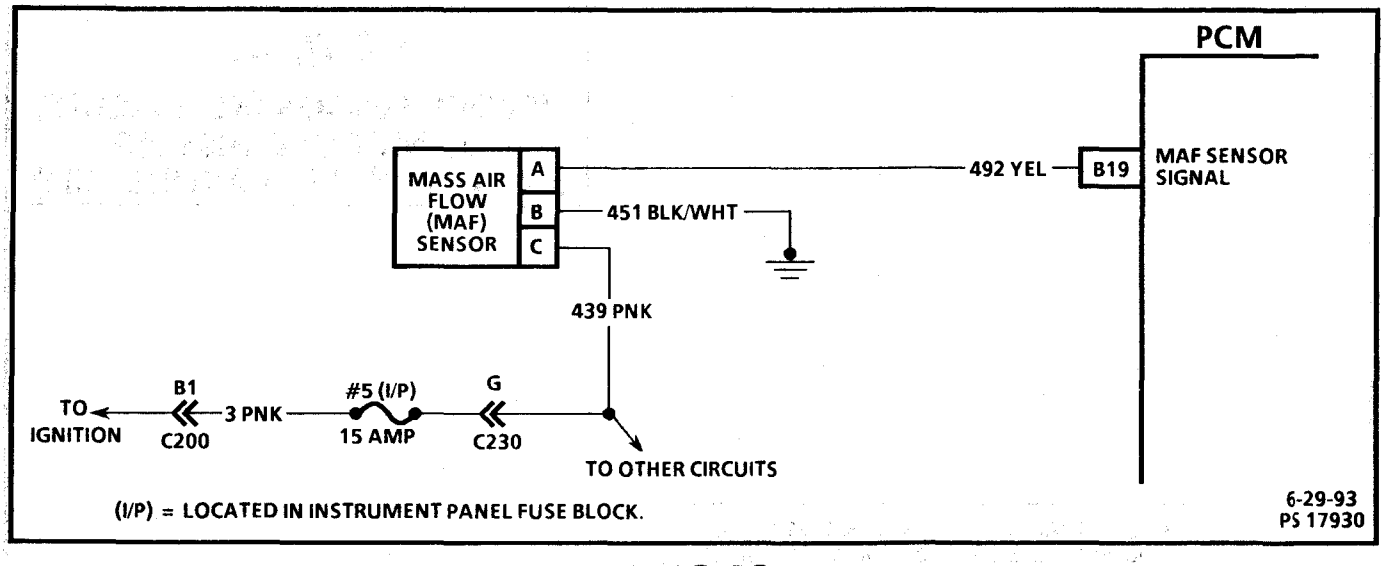
DTC 47

KNOCK SENSOR (KS) CIRCUIT OR MODULE MISSING 5.7L (VIN P) "F" CARLINE (SFI)



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

4-19-93
PS 16662



DTC 48

MASS AIR FLOW (MAF) SENSOR CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Mass Air Flow (MAF) sensor measures the amount of air that is ingested by a vehicles' engine. This information is required by the engine's Powertrain Control Module (PCM) to schedule fuel and maintain the desired air/fuel ratio.

The MAF sensor used on this vehicle is a hot wire type and is used to measure air flow rate. The Mass Air Flow (MAF) output frequency is a function of the power required to keep the air flow sensing elements (hot wires) at a fixed temperature above ambient temperature. As air flows through the MAF sensor, the "hot wires" are cooled. The amount of cooling is proportional to the rate of air flow. As air flow increases, a greater amount of current is required to maintain the "hot wires" at a constant temperature. The MAF sensor converts the changes in current draw to a frequency signal read by the PCM. The PCM calculates air flow (grams per second) based on this signal.

DTC 48 Will Set When: The PCM detects engine reference pulses without detecting a frequency signal from the Mass Air Flow (MAF) sensor.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate and speed density will be used for fuel management.

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

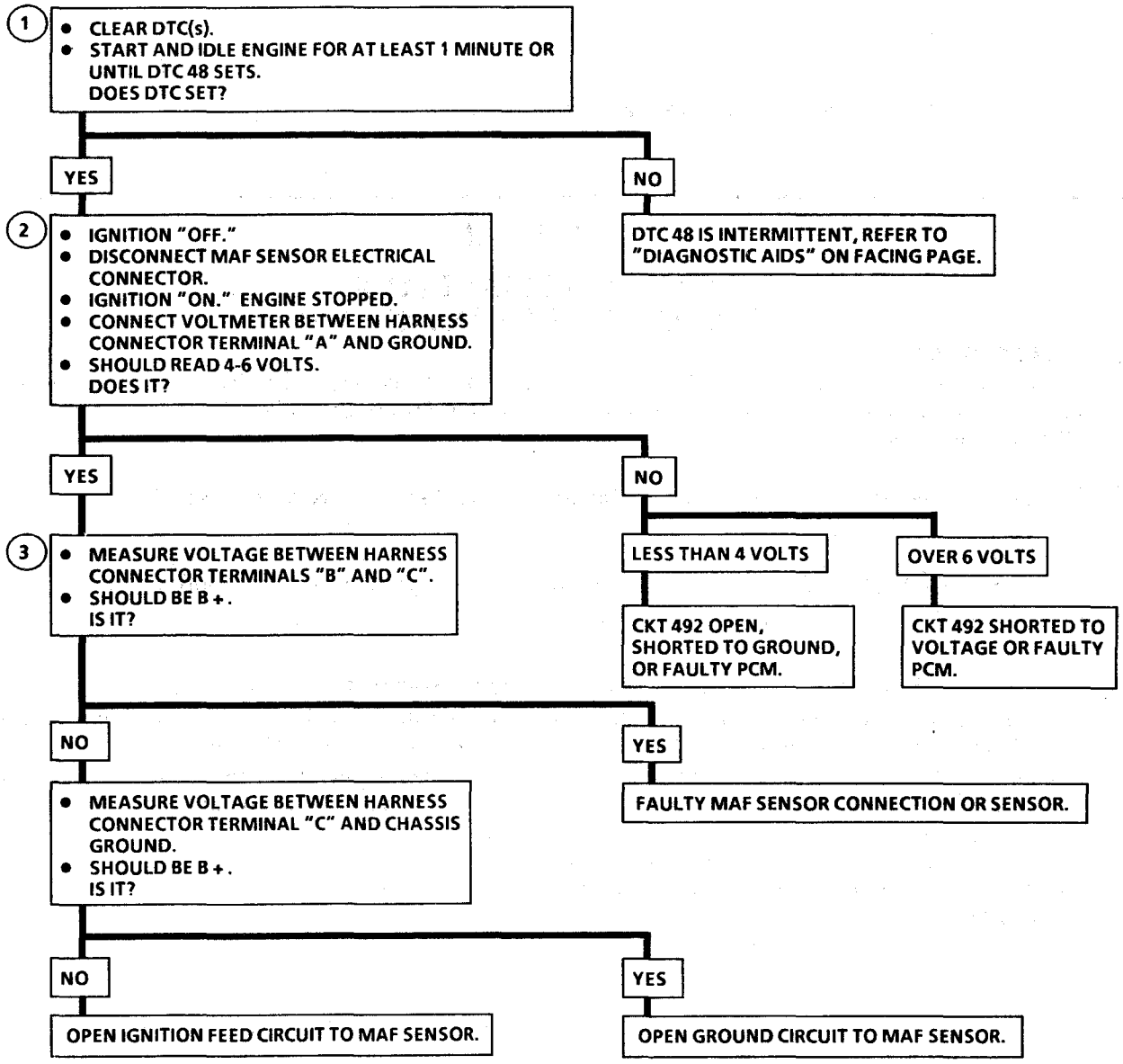
1. This step will determine if the fault is a hard failure or an intermittent condition.
2. This step checks for a 5 volt reference from the PCM.
3. Verifies that both ignition voltage and a good ground circuit are available.

Diagnostic Aids: An intermittent may be caused by a poor connection, mis-routed harness, rubbed through wire insulation, or a broken wire inside the insulation.

A DTC 48 could be caused by a vacuum leak. Check short and long term fuel trim for being in the optimal range (both banks).

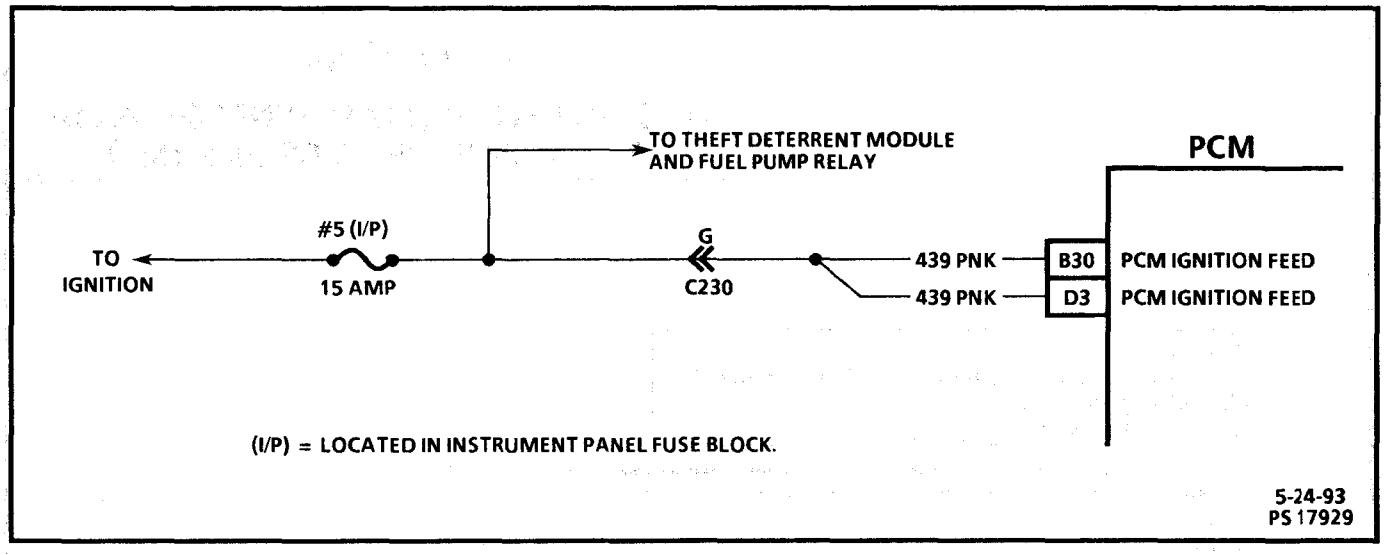
DTC 48

MASS AIR FLOW (MAF) SENSOR CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

2-3-93
PS 16534



DTC 50

SYSTEM VOLTAGE LOW
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

CKT 439 is the ignition feed to the PCM on terminals "B30" and "D3". The PCM monitors the voltage at terminal "D3". When voltage on "D3" drops below 8.0 volts, DTC 50 will set and the Malfunction Indicator Lamp (MIL) will be illuminated.

DTC 50 Will Set When: The engine is running and the PCM senses a voltage of less than 8.0 volts on PCM terminal "D3".

Action Taken (PCM will default to): High idle, and 3rd gear starts. The Malfunction Indicator Lamp (MIL) will illuminate.

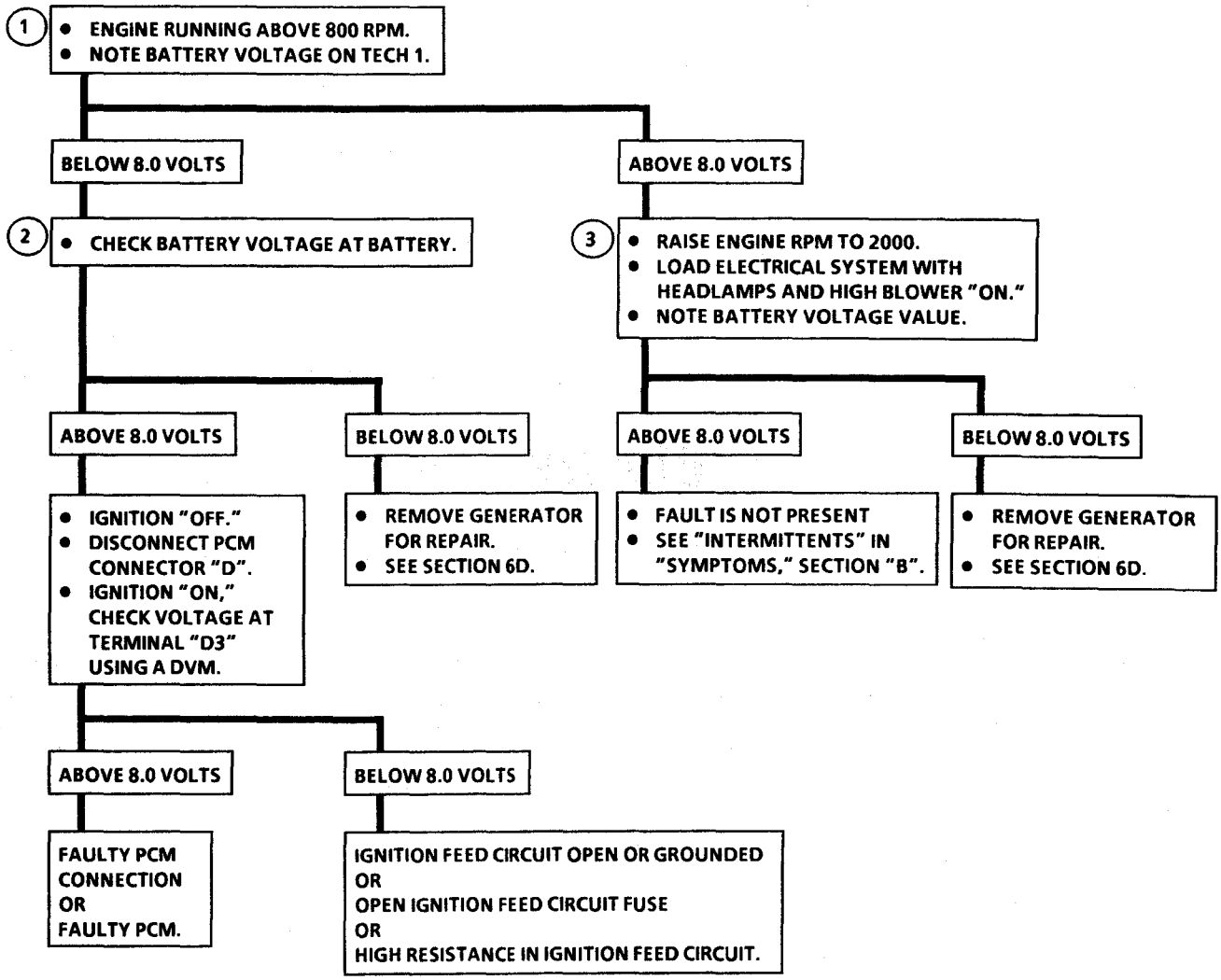
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Normal battery output is between 9.6 - 16.0 volts.
2. Checks to see if the low voltage reading is due to the generator. With engine running, check voltage at the battery.
3. Checks to see if generator is faulty under load condition. If the voltage is below 8.0 volts, refer to SECTION 6D.

Diagnostic Aids: An open circuit, or extremely low voltage (below 5.5 volts) to "D3" may cause loss of serial data and the MIL may not function. Additional DTCs may be set. An open circuit to "B30" will cause a no start and the MIL will not illuminate.

DTC 50

SYSTEM VOLTAGE LOW
5.7L (VIN P) "F" CARLINE (SFI)



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

2-3-93
PS 16547

BLANK

DTC 51

EEPROM PROGRAMMING ERROR
5.7L (VIN P) "F" CARLINE (SFI)

PCM CALIBRATIONS ARE STORED IN THE EEPROM (ELECTRONICALLY ERASABLE PROGRAMMABLE READ ONLY MEMORY). THE EEPROM IS NOT REMOVABLE FROM THE PCM. DTC 51 WILL SET IF NO CALIBRATION WAS PROGRAMMED IN THE PCM, OR WHEN THE PCM DETECTS AN INTERNAL PROGRAM FAULT (CHECKSUM ERROR). IF DTC 51 SETS DURING NORMAL VEHICLE OPERATION, REPLACE THE PCM. THE REPLACEMENT PCM MUST BE PROGRAMMED USING TECH 1 (T1) OR CAMS (T100)

USE THE FOLLOWING PROCEDURE TO REPROGRAM THE PCM:

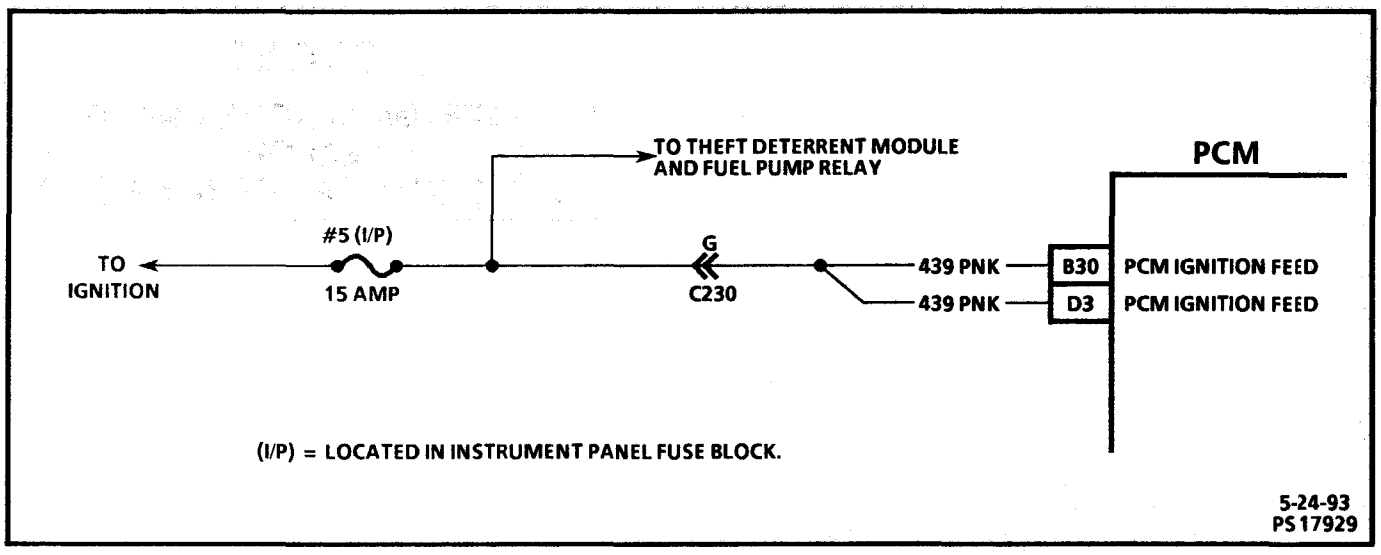
CAUTION: THE SOFTWARE/CALIBRATION USED FOR PCM REPROGRAMMING MUST MATCH THE VEHICLE APPLICATION, OR IMPROPER OPERATION AND/OR VEHICLE DAMAGE MAY OCCUR.

- BATTERY IS CHARGED.
- IGNITION IS "ON."
- CONNECTIONS TO THE DLC AND BATTERY/CIG. LIGHTER SECURE.
- FOLLOW THE MOST CURRENT TECHLINE TERMINAL/EQUIPMENT INSTRUCTIONS.

IF THE PCM FAILS TO PROGRAM, OR IF DTC 51 SETS DURING PROGRAMMING:

- CHECK ALL PCM CONNECTIONS.
- CHECK TECHLINE TERMINAL/EQUIPMENT FOR LATEST SOFTWARE VERSION.
- REPEAT REPROGRAMMING PROCEDURE. IF IT FAILS AGAIN, REPLACE THE PCM. THE REPLACEMENT PCM MUST BE PROGRAMMED.

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



DTC 53

SYSTEM VOLTAGE HIGH
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

CKT 439 is the ignition feed to the PCM on terminals "B30" and "D3". The PCM monitors the voltage at terminal "D3".

DTC 53 Will Set When: DTC 53 will set when the engine is running and the PCM senses a voltage of more than 17.1 volts on PCM terminal "D3".

Action Taken (PCM will default to): During the time the fault is present, all PCM outputs will be disengaged and the Malfunction Indicator Lamp (MIL) will illuminate.

During the time the failure is present, the pressure control solenoid is turned "OFF," causing maximum line pressure, the 3-2 control solenoid is turned "OFF," transmission shifts immediately to third gear, and TCC operation is inhibited. (The setting of additional diagnostic trouble codes may result.)

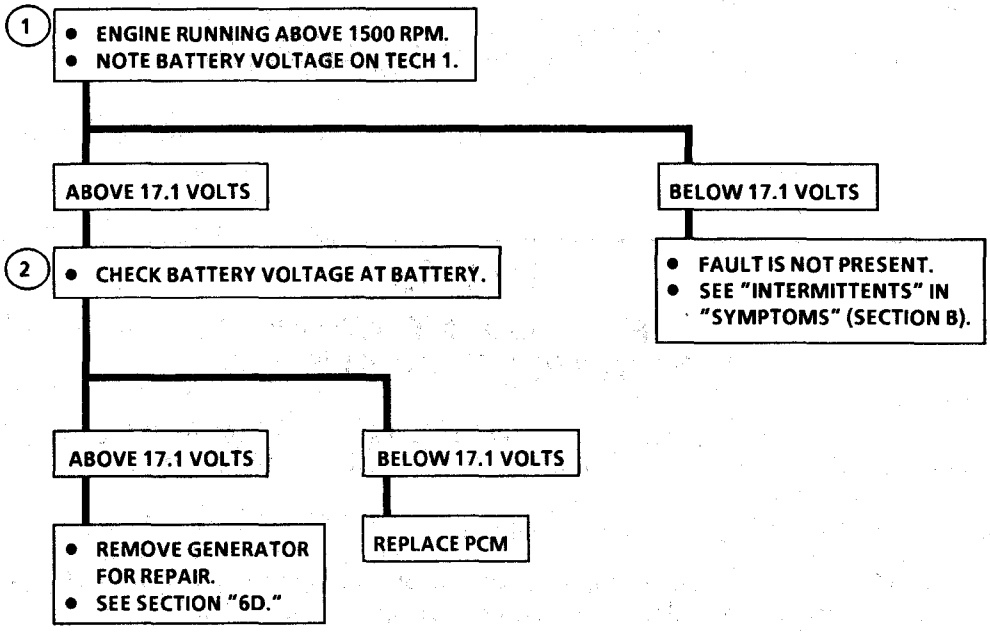
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Normal battery output is between 9.6 - 16.0 volts.
2. Checks to see if the high voltage reading is due to the generator or PCM. With engine running, check voltage at the battery.
   If the voltage is above 17.1 volts, the PCM is OK.

Diagnostic Aids: During the time the failure is present, all PCM outputs will be disengaged to protect the hardware. The setting of additional DTCs may result.

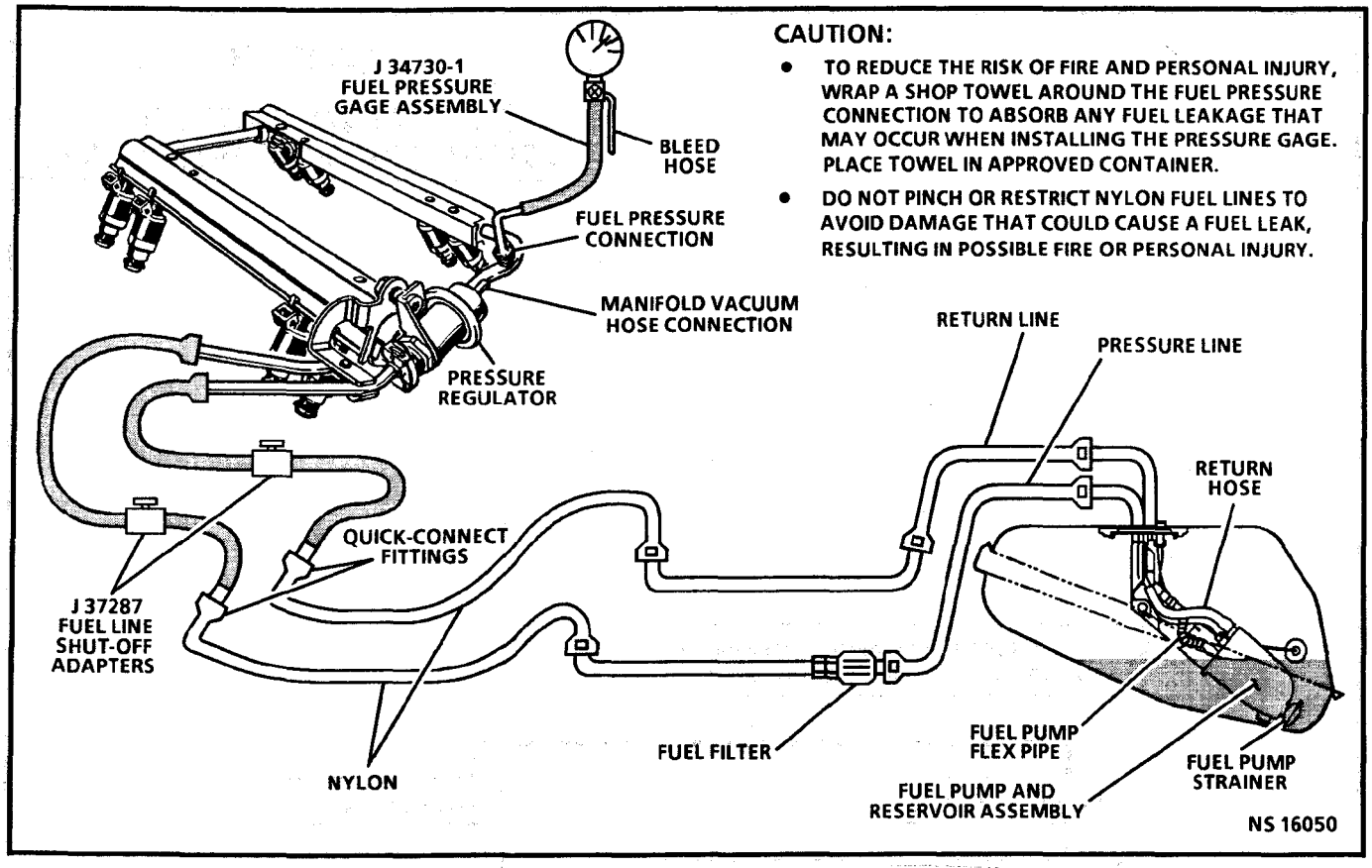
DTC 53

SYSTEM VOLTAGE HIGH
5.7L (VIN P) "F" CARLINE (SFI)



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

1-15-93
PS 16548



DTC 55

FUEL LEAN MONITOR
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM's internal circuitry can identify if the vehicle fuel system is capable of supplying adequate amounts of fuel during heavy acceleration (power enrichment). When a power enrichment mode of operation is requested during "Closed Loop" operation (by heavy acceleration), the PCM will provide more fuel to the engine. Under these conditions, the PCM should detect a "rich" condition.

DTC 55 Will Set When: Engine operating in "Closed Loop," not in fuel cutoff, no DTCs 44, 45, 64, 65 set. If the PCM detects lean oxygen sensor voltage for 3 seconds during power enrichment modes of operation, DTC 55 will set.

Action Taken (PCM will default to): The Malfunction Indicator Lamp (MIL) will illuminate.

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

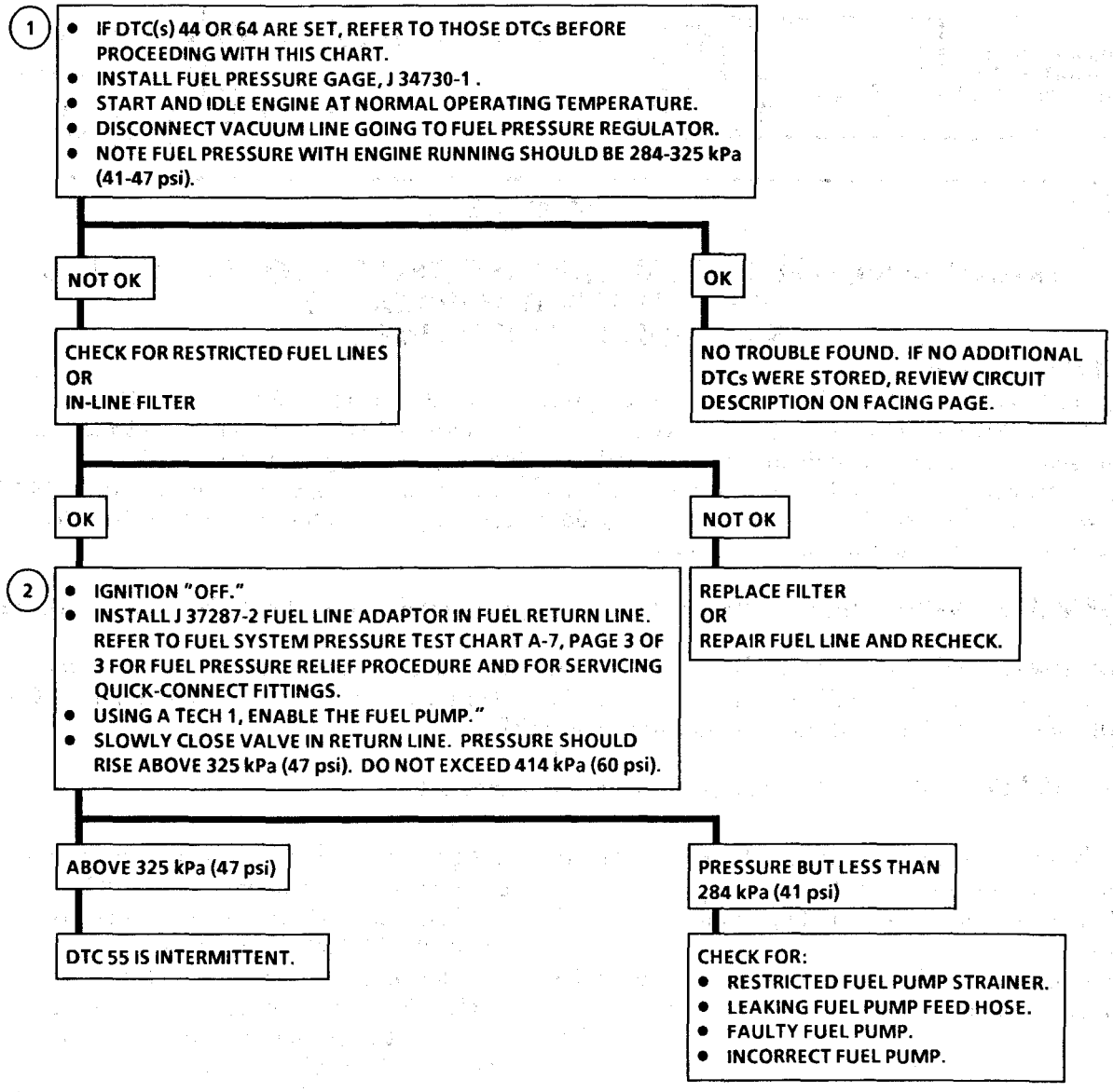
1. Wrap a shop towel around the fuel pressure connector to absorb any small amount of fuel leakage that may occur when installing the gage. Ignition "ON," pump pressure should be 284-325 kPa (41-47 psi). This pressure is controlled by spring pressure within the regular assembly. Pressure below 284 kPa (41 psi) may cause a lean condition and may set a DTC 44 or 64. It could also cause hard starting cold and poor driveability. Low enough pressure will cause the engine not to run at all. Restricted flow may allow the engine to run at idle, or low speeds, but may cause a surge and stall when more fuel is required, as when accelerating or driving at high speeds. Low fuel pressure under heavy acceleration conditions may set a DTC 55.
2. Restricting the fuel return line allows the fuel pressure to build above regulated pressure. With a Tech 1 enable the fuel pump, pressure should rise above 325 kPa (47 psi) as the valve in the return line is partially closed.

Diagnostic Aids: A restricted fuel filter can supply adequate amounts of fuel at idle but may not be able to supply enough fuel during heavy acceleration. A vapor lock condition can cause a DTC 55.

If a DTC 55 can not be duplicated, it may have been caused by the customer running the vehicle out of fuel.

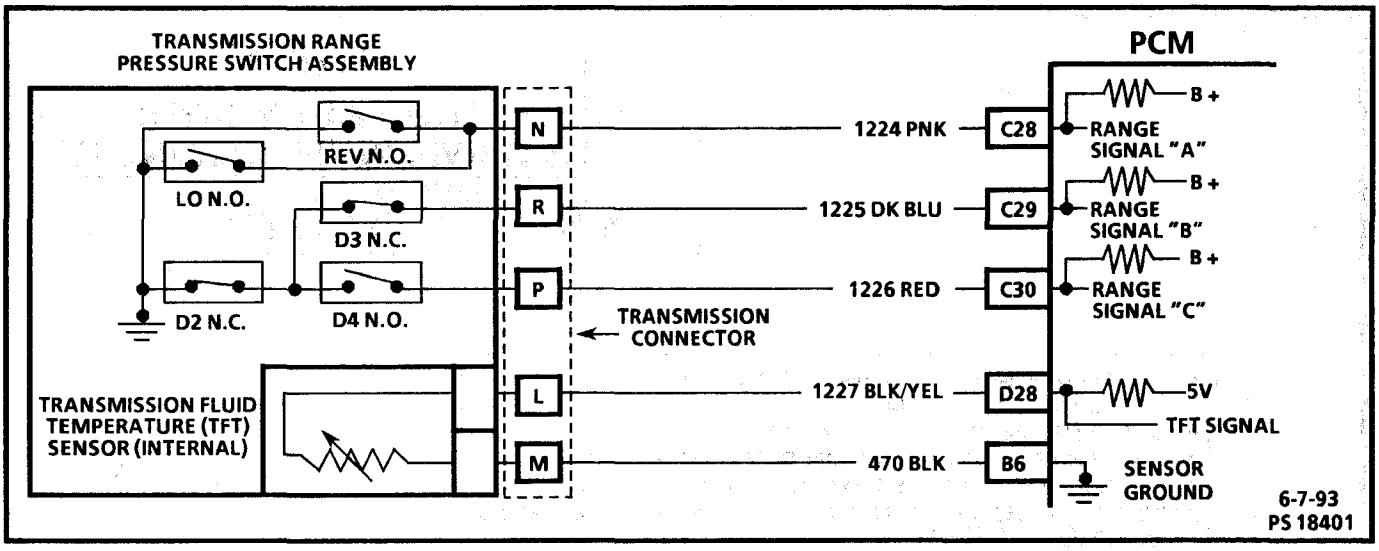
DTC 55

FUEL LEAN MONITOR
5.7L (VIN P) "F" CARLINE (SFI)



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

11-16-92
MS 12893



DTC 58

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT LOW
(HIGH TEMPERATURE INDICATED)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The TFT sensor is a thermistor within the TR pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage on terminal "D28".

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts. With a DTC 79 also set, check the transmission cooling system.

DTC 58 Will Set When: Signal voltage indicates TFT greater than 151°C (306°F) for at least 1 second.

Action Taken (PCM will default to): When DTC 58 is set, the transmission will use a warm value for operation, but the scan tool will display the actual fluid temperature. DTC 58 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 58 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for a short to ground or a skewed sensor.
2. This test checks for an internal fault within the transmission by creating an open.

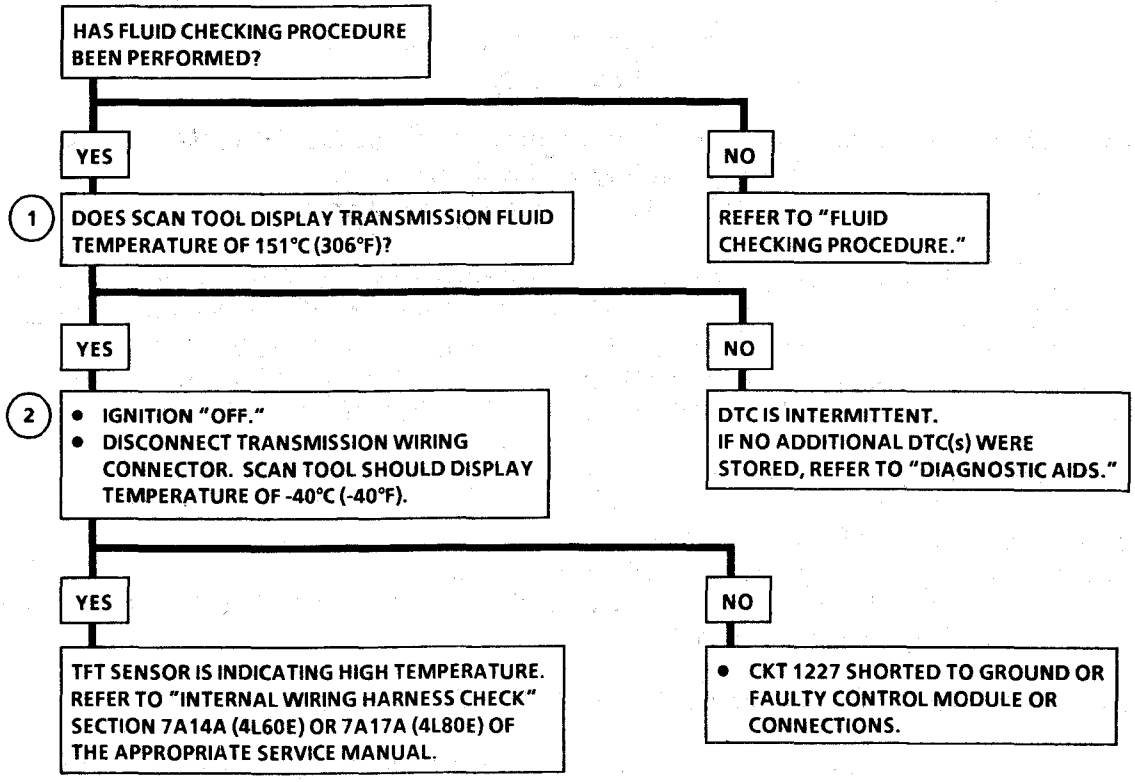
Diagnostic Aids: Check harness routing for a potential short to ground in CKT 1227.

Scan tool TFT displays should rise steadily to about 100°C (212°F) then stabilize.

The temperature to resistance value scale in SECTION 7A14A may be used to test the transmission sensor at the various temperature levels to evaluate the possibility of a "skewed" sensor. A "skewed" sensor could result in delayed garage shifts or TCC enabled complaints.

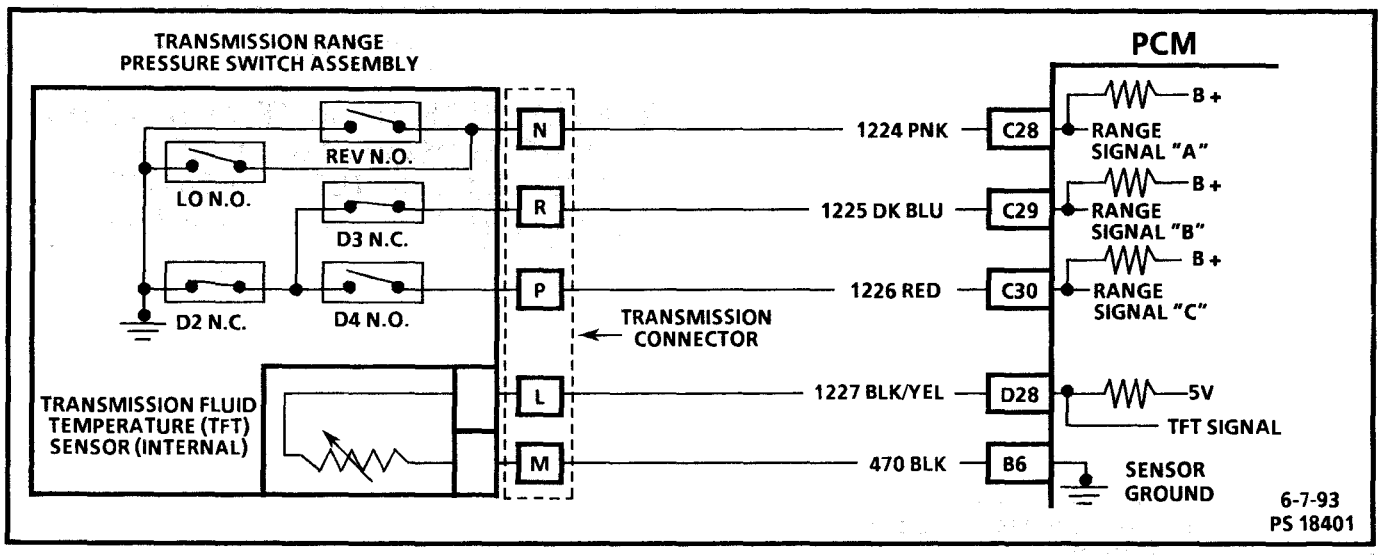
DTC 58

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT LOW (HIGH TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)



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

4-29-93
MS 13671



DTC 59

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT HIGH (LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The TFT sensor is a thermistor within the fluid pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage on terminal "D28".

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts.

DTC 59 Will Set When: Signal voltage indicates TFT less than -40°C (-40°F), for 1 second.

Action Taken (PCM will default to): When DTC 59 is set, the transmission will use a warm value for operation, but, the scan tool will display the actual fluid temperature.

When DTC is set, the TCC may not apply properly. DTC 59 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 59 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for a skewed sensor.
2. This test simulates a DTC 58. If the PCM recognizes the low signal voltage (high temperature), and the scan displays 151°C (306°F), the PCM and wiring are OK.
3. This test checks if CKT 1227 is open. There should be 5 volts present at the sensor connector if measured with J 39200.

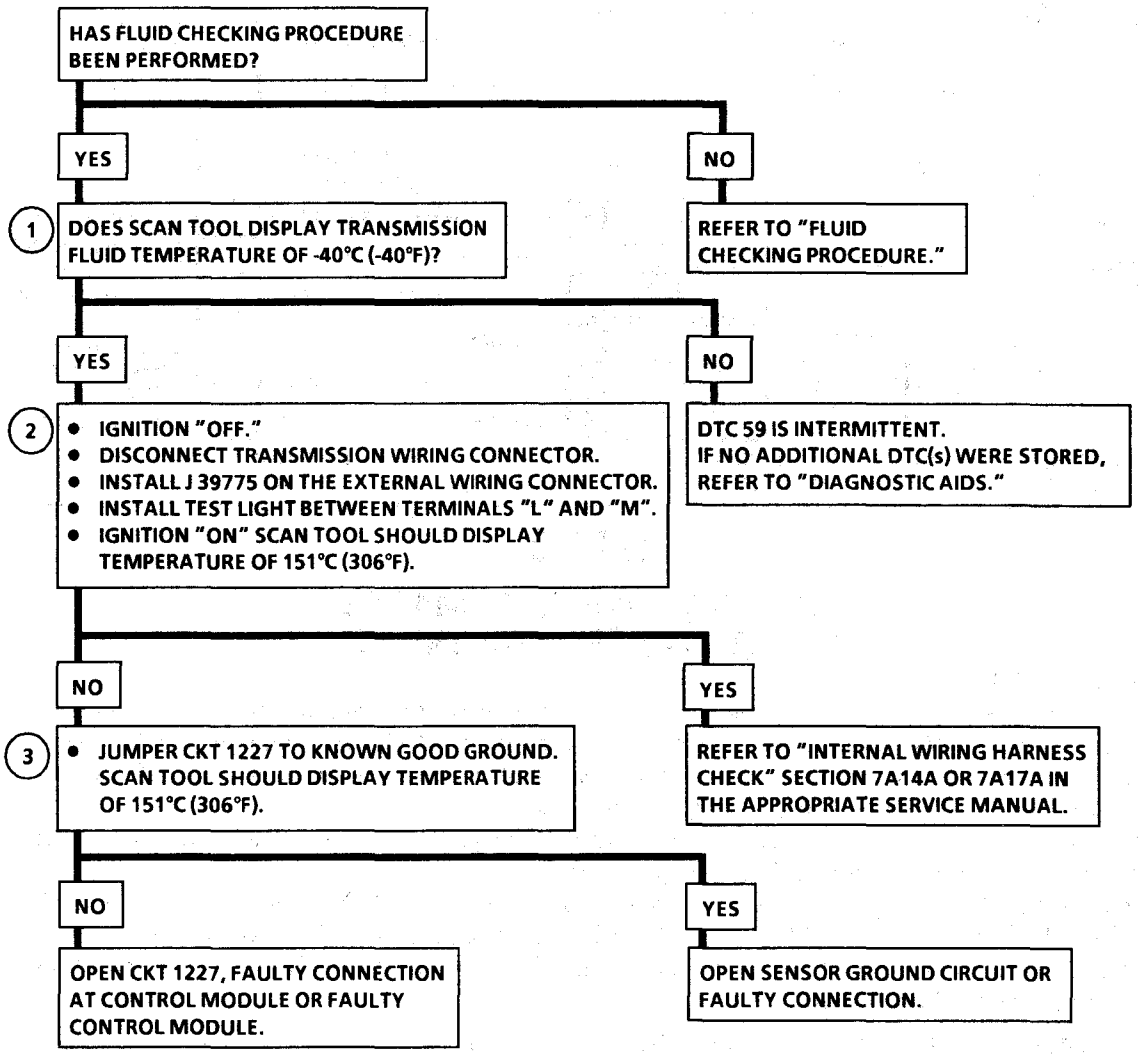
Diagnostic Aids: Scan tool displays fluid transmission temperature in degrees. After transmission is operating, the temperature should rise steadily to about 100°C (212°F) then stabilize.

A faulty connection or an open in CKT 455 or CKT 1227 can result in a DTC 59.

The "Temperature to Resistance Value" scale in SECTION 7A14A may be used to check the TFT sensor at various temperature levels to evaluate the possibility of a "skewed" (mis-scaled) sensor. A "skewed" sensor can result in firm shifts, or TCC enabled.

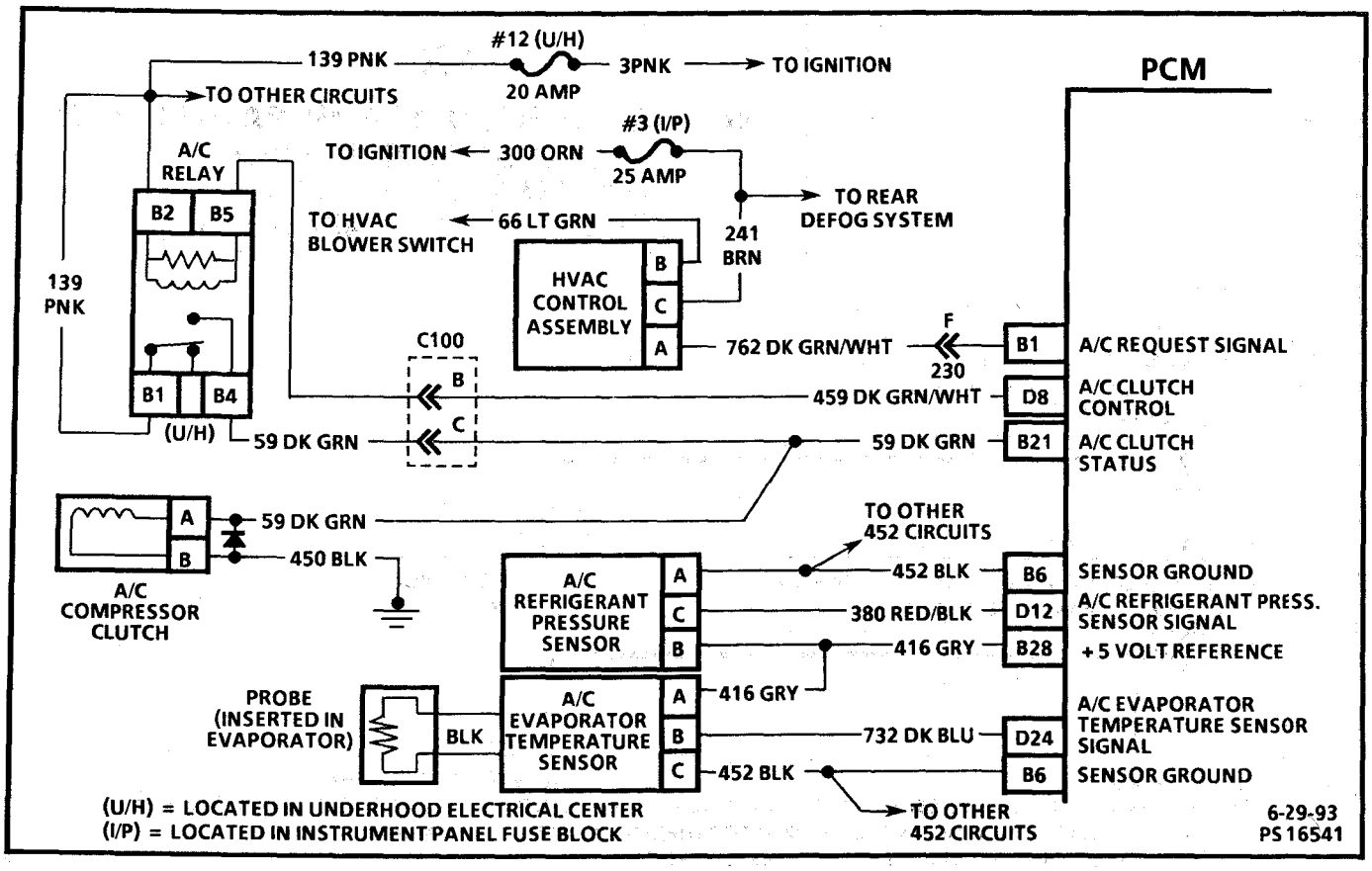
DTC 59

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT HIGH (LOW TEMPERATURE INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)



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

4-26-93
MS 13451



DTC 61

A/C SYSTEM PERFORMANCE
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM monitors A/C refrigerant pressure and A/C evaporator temperature to determine if the A/C system has adequate refrigerant (R134a) charge. The PCM will disable the A/C clutch whenever A/C refrigerant charge drops below a predetermined value, to reduce the chance of compressor damage. The PCM will cycle the compressor more frequently if the charge is only slightly low.

The PCM determines A/C charge based on A/C refrigerant pressure and A/C evaporator temperature. The PCM uses these two inputs to calculate A/C refrigerant charge.

DTC 61 Will Set When: The PCM calculates refrigerant charge to be below a predetermined level.

Action Taken (PCM will default to): If the PCM determines A/C refrigerant charge to be low, the A/C clutch will be disabled and DTC 61 will be set. DTC 61 will be stored in the PCM memory, but will not turn "ON" the Malfunction Indicator Lamp (MIL).

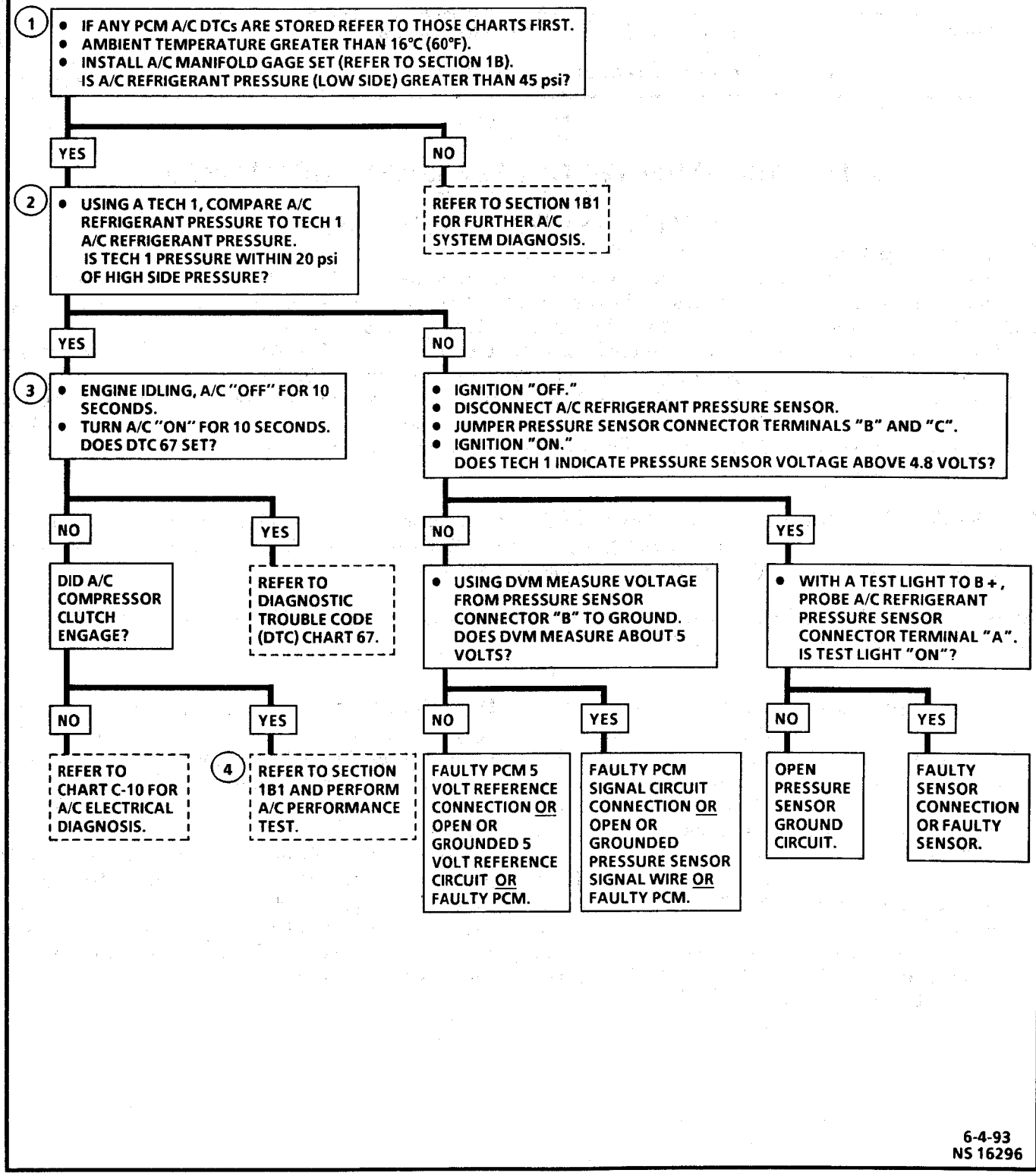
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. DTC 61 could be caused by other DTCs, so refer to those charts before proceeding with this diagnostic chart.
2. If the A/C refrigerant pressure sensor is "slewed" or "shifted" in value, the PCM could be detecting a lower than normal pressure. Therefore, the PCM would be sensing a low refrigerant change and DTC 61 could result.
3. The conditions to set a DTC 67 could cause DTC 61 to set. DTC 67 will set if the PCM does not detect an A/C refrigerant pressure change of more than 4 psi when the A/C clutch is cycled from "OFF" to "ON."
4. The A/C performance test (refer to SECTION 1B1) must be performed, because A/C system hardware (A/C compressor, thermal expansion valve etc.) could cause a DTC 61.

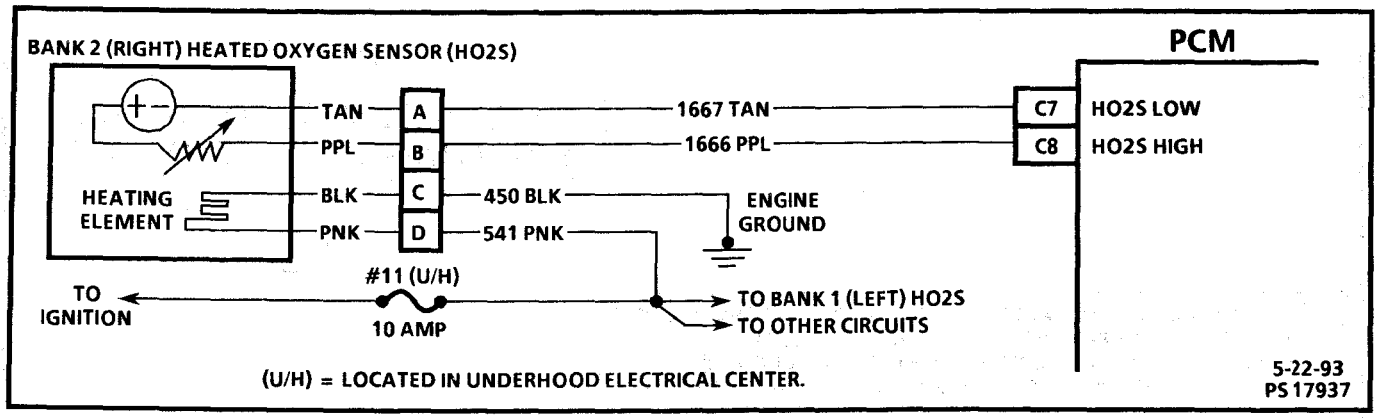
Diagnostic Aids: An A/C evaporator temperature sensor and/or an A/C refrigerant pressure sensor that is "slewed" (shifted in value) could cause a DTC 61.

DTC 61

A/C SYSTEM PERFORMANCE 5.7L (VIN P) "F" CARLINE (SFI)



6-4-93
NS 16296



DTC 63

BANK 2 (RIGHT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (OPEN CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM supplies a voltage of about 450 mV between terminals "C8" and "C7". (If measured with a 10 megohm digital voltmeter, this may read as low as 320 mV.) The oxygen sensor 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 63 Will Set When: Engine is at normal operating temperature (above 70°C/158°F), engine operating more than 2 minutes, oxygen signal voltage steady between 350 mV to 550 mV, throttle position angle above 5% and DTCs 21 and 22 not set. All conditions met for about 60 seconds.

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. This test checks the oxygen sensor's heating element. The heating element resistance should be 3.5 ohms at 20°C (68°F) or 14 ohms at 350°C (622°F). An inoperative HO2S heater could cause a DTC 13 to set.
2. This will determine if the oxygen sensor is at fault, or if the cause of the DTC 63 is elsewhere in the circuit.
3. For this test use only a high impedance digital volt ohmmeter (J 39200). This test checks the continuity of CKT 1666.

Diagnostic Aids: Normal Tech 1 voltage readings vary between 10 mV to 1000 mV (.01 and 1.0 volt), while in "Closed Loop." The system will go into "Open Loop" operation when DTC 63 sets.

Refer to "Intermittents" in "Symptoms," Section "6E3-B".

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 63

BANK 2 (RIGHT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (OPEN CIRCUIT)

5.7L (VIN P) "F" CARLINE (SFI)

ENGINE AT NORMAL OPERATING TEMPERATURE (ABOVE 80°C/176°F).
- RUN ENGINE ABOVE 1200 RPM FOR TWO MINUTES. DOES TECH 1 INDICATE "CLOSED LOOP"?

NO

- IGNITION "OFF."
- DISCONNECT BANK 1 HEATED OXYGEN SENSOR (HO2S) HARNESS CONNECTOR.
- CONNECT TEST LIGHT BETWEEN HARNESS TERMINALS "C" AND "D".
- IGNITION "ON." IS TEST LIGHT "ON"?

YES

1. MEASURE RESISTANCE BETWEEN HO2S TERMINALS "C" AND "D". IS RESISTANCE BETWEEN 3.5 OHMS AND 14 OHMS?

YES

2. JUMPER HARNESS CKT 1666 AND CKT 1667 (PCM SIDE) TO GROUND.
- TECH 1 SHOULD DISPLAY HO2S VOLTAGE BELOW .2 VOLT (200 mV). DOES IT?

NO

3. REMOVE JUMPER.
- IGNITION "ON," ENGINE "OFF."
- CHECK VOLTAGE ON CKT 1666 (PCM SIDE) AT HO2S HARNESS CONNECTOR USING A DVM. VOLTAGE SHOULD BE OVER .3 VOLT (300 mV). IS IT?

YES

OPEN CKT 1667
OR
FAULTY PCM CONNECTION
OR
FAULTY PCM.

NO

OPEN CKT 1666
OR
FAULTY PCM CONNECTION
OR
FAULTY PCM.

NO

FAULTY HEATED OXYGEN SENSOR.

YES

FAULTY HO2S CONNECTION
OR
FAULTY HO2S.

YES

DTC 13 IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS."

NO

- CONNECT TEST LIGHT TO HARNESS TERMINAL "D" AND GROUND. IS TEST LIGHT "ON"?

NO

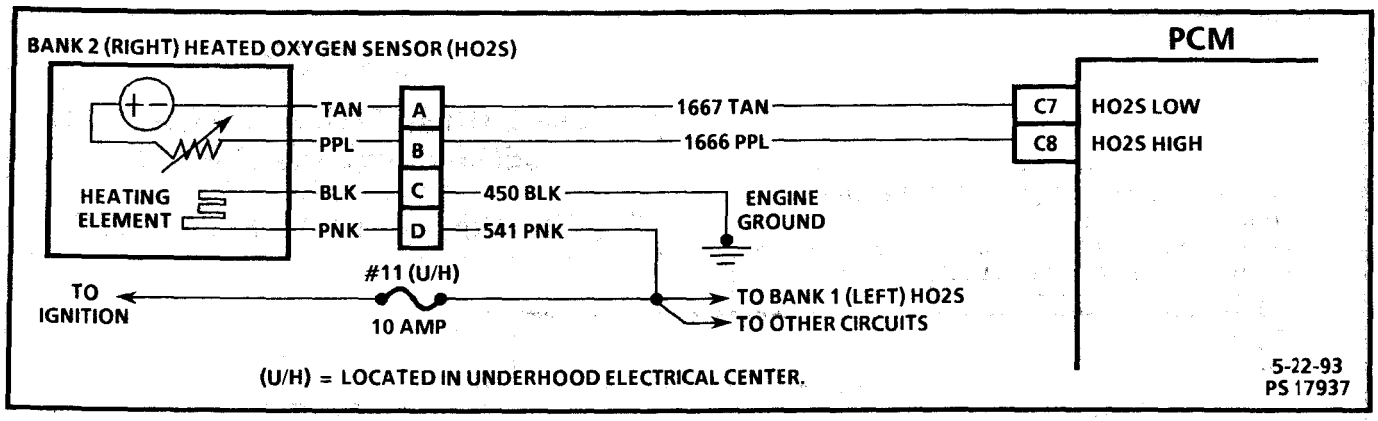
FAULTY CONNECTION
OR
IGNITION FEED CIRCUIT OPEN
OR
SHORTED.

YES

FAULTY CONNECTION
OR
FAULTY GROUND.

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

5-27-93
PS 17255



DTC 64

BANK 2 (RIGHT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT
(LEAN EXHAUST INDICATED)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM supplies a voltage of about 450 mV between terminals "C8" and "C7". (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 64 Will Set When: System is operating in "Closed Loop," not in power enrichment, and signal voltage remains below 200 mV for 50 seconds.

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.

Diagnostic Aids: Using the Tech 1, observe the long term fuel trim values at different RPM and air flow 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 DTC 64 may have been set. If the conditions for DTC 64 exist, the long term fuel trim values will be near 160.

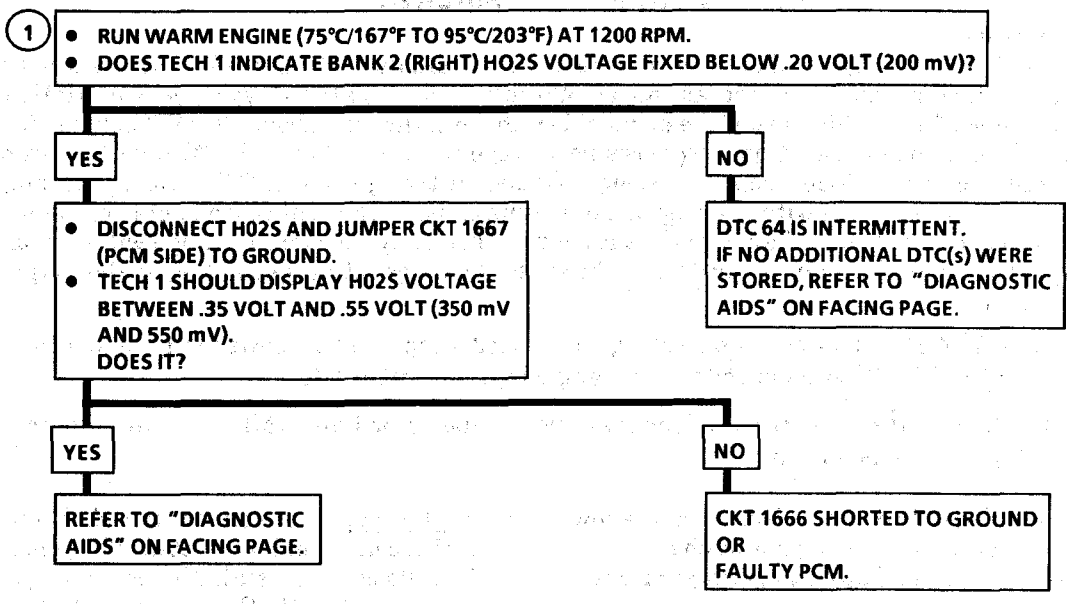
- Low system voltage can cause a DTC 64 to set. If DTC 50 is set, proceed to that chart first.
- Heated Oxygen Sensor (HO2S) wire. Sensor pigtail may be mispositioned and contacting the exhaust manifold.

  Check for intermittent ground in signal wire between connector and sensor

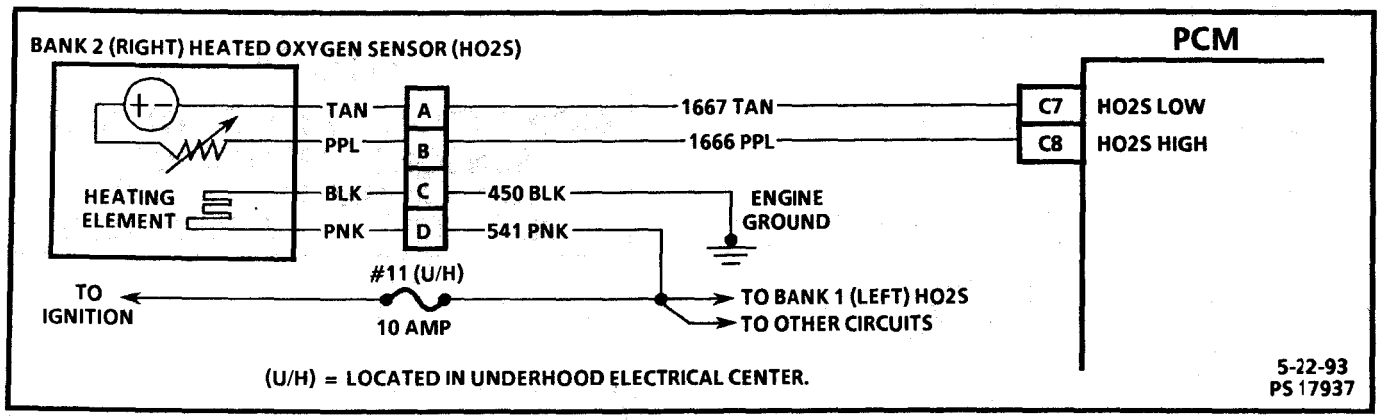
  An oxygen supply inside the HO2S is necessary for proper HO2S operation. This supply of oxygen is supplied through the HO2S wires. All HO2S wires and connections should be inspected for breaks or contamination that could prevent reference oxygen from reaching the HO2S.
- Lean injector(s). Perform "Injector Balance Test," using Tech 1 or CHART C-2A.
- Fuel contamination. Water, even in small amounts, near the in-tank fuel pump inlet can be delivered to the injectors. The water causes a lean exhaust and can set a DTC 64.
- Fuel pressure. System will be lean if pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to "Fuel System Diagnosis," CHART A-7.
- Exhaust leaks. If there is an exhaust leak, above the oxygen sensor, the engine can cause outside air to be pulled into the exhaust stream and flow past the sensor causing lean condition. Vacuum or crankcase leaks can cause a lean condition.
- Air system. Make sure the secondary air pump is not operating in "Closed Loop." While monitoring long term fuel trim, squeeze the air hose going to the exhaust ports (right bank). If long term fuel trim values go down, refer to CHART C-6.
- If the above are OK, the oxygen sensor may be at fault.

DTC 64

BANK 2 (RIGHT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (LEAN EXHAUST INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 65

BANK 2 (RIGHT) 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 "C8" and "C7". (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 65 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.

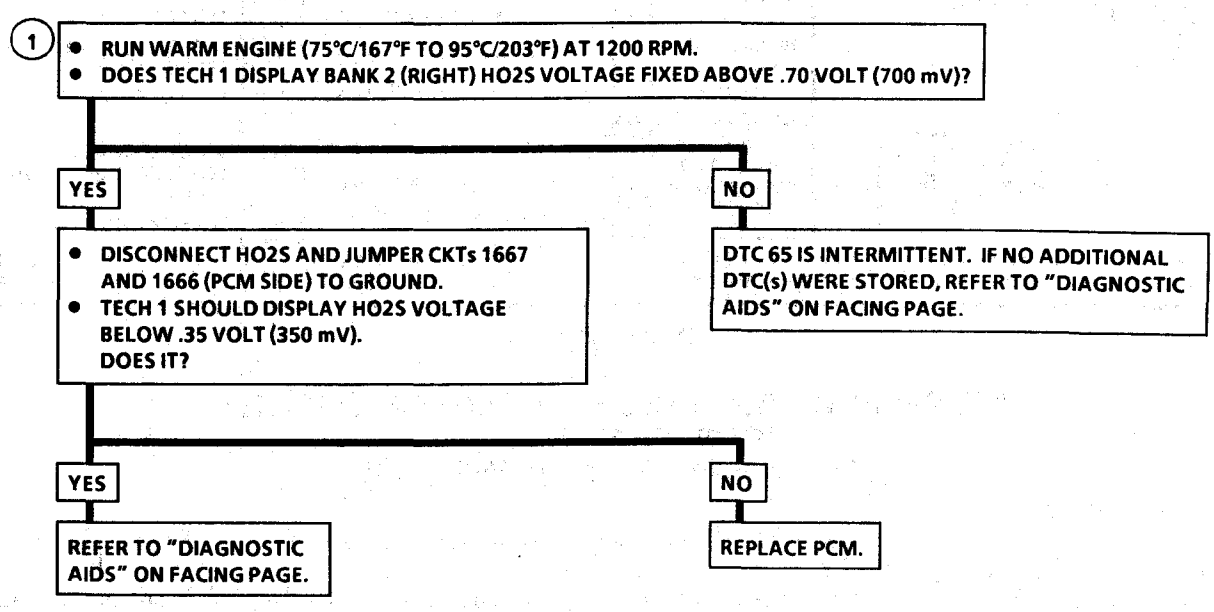
Diagnostic Aids: Using the Tech 1, observe the long term fuel trim values at different RPM and load conditions. The Tech 1 also displays the fuel trim cells, so the long term fuel trim values can be checked in each of the cells to determine when the DTC 65 may have been set. If the conditions for DTC 65 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 65 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 installation is correct, 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 65.

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.

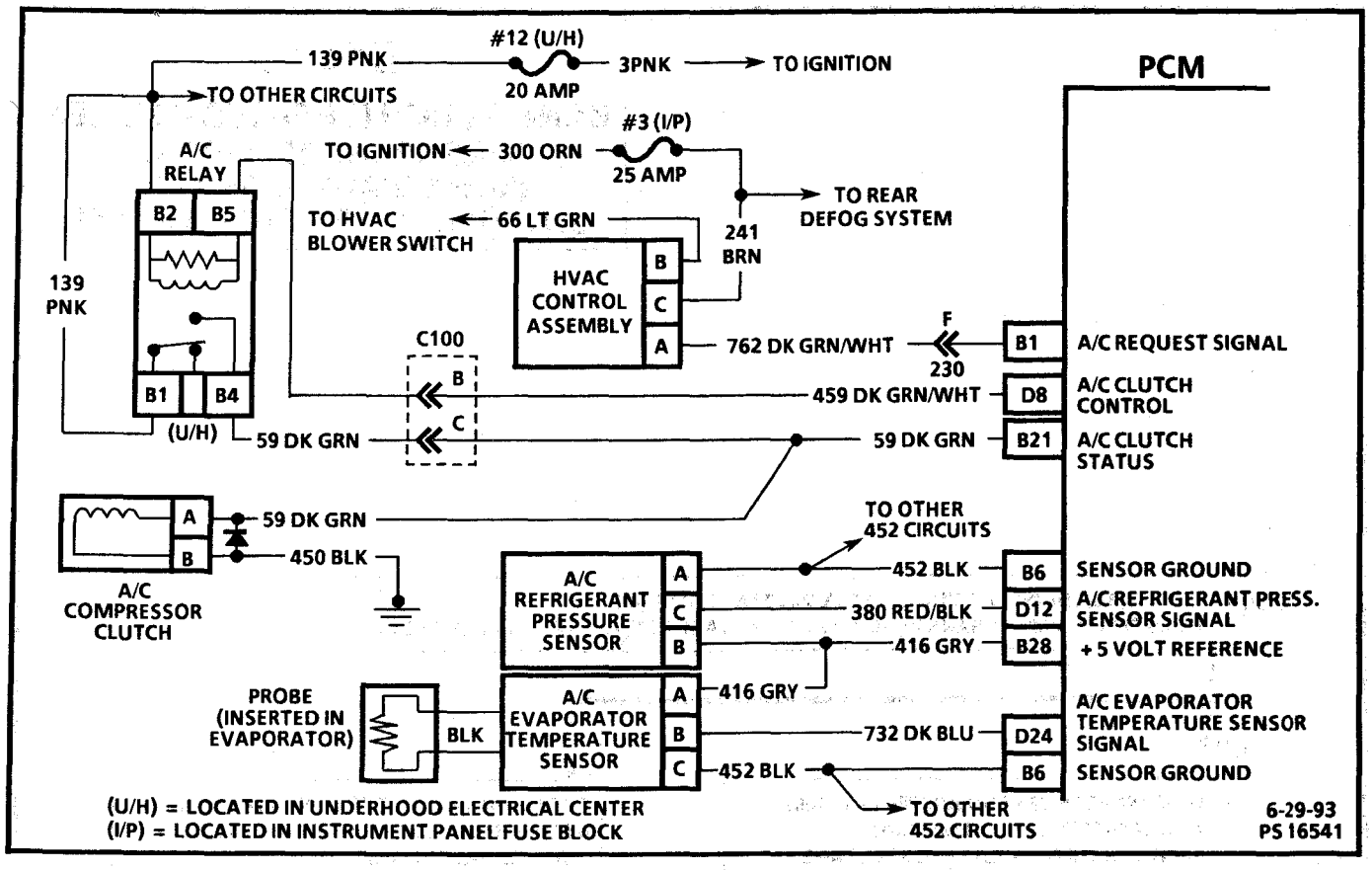
DTC 65

BANK 2 (RIGHT) HEATED OXYGEN SENSOR (HO2S) CIRCUIT (RICH EXHAUST INDICATED) 5.7L (VIN P) "F" CARLINE (SFI)



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

6-4-93
9S 6746-6E



DTC 66

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

Circuit Description:

The A/C system uses an A/C refrigerant pressure sensor mounted in the high side of the A/C system to monitor A/C pressure for use by the PCM.

The PCM can use this information to turn "ON" the engine cooling fans when A/C refrigerant pressure is high. The PCM can prevent compressor damage by disabling the compressor clutch if head pressure gets too high.

The A/C refrigerant pressure sensor operates much like other 3-wire sensors. A 5 volt reference is supplied to the sensor and returned to the PCM on the signal line. As the A/C refrigerant pressure increases or decreases, the resistance of the sensor changes and varies the amount of signal returning to the PCM. The amount of signal returned to the PCM is then converted to a pressure value which can be displayed on the Tech 1.

DTC 66 Will Set When: A/C refrigerant pressure sensor indicates A/C refrigerant pressure is below -8 psi (.12 volt) for 10 seconds or A/C refrigerant pressure sensor indicates A/C refrigerant pressure is above 448 psi (4.86 volts) for 10 seconds.

Action Taken (PCM will default to): DTC 66 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL), A/C operation will be disabled.

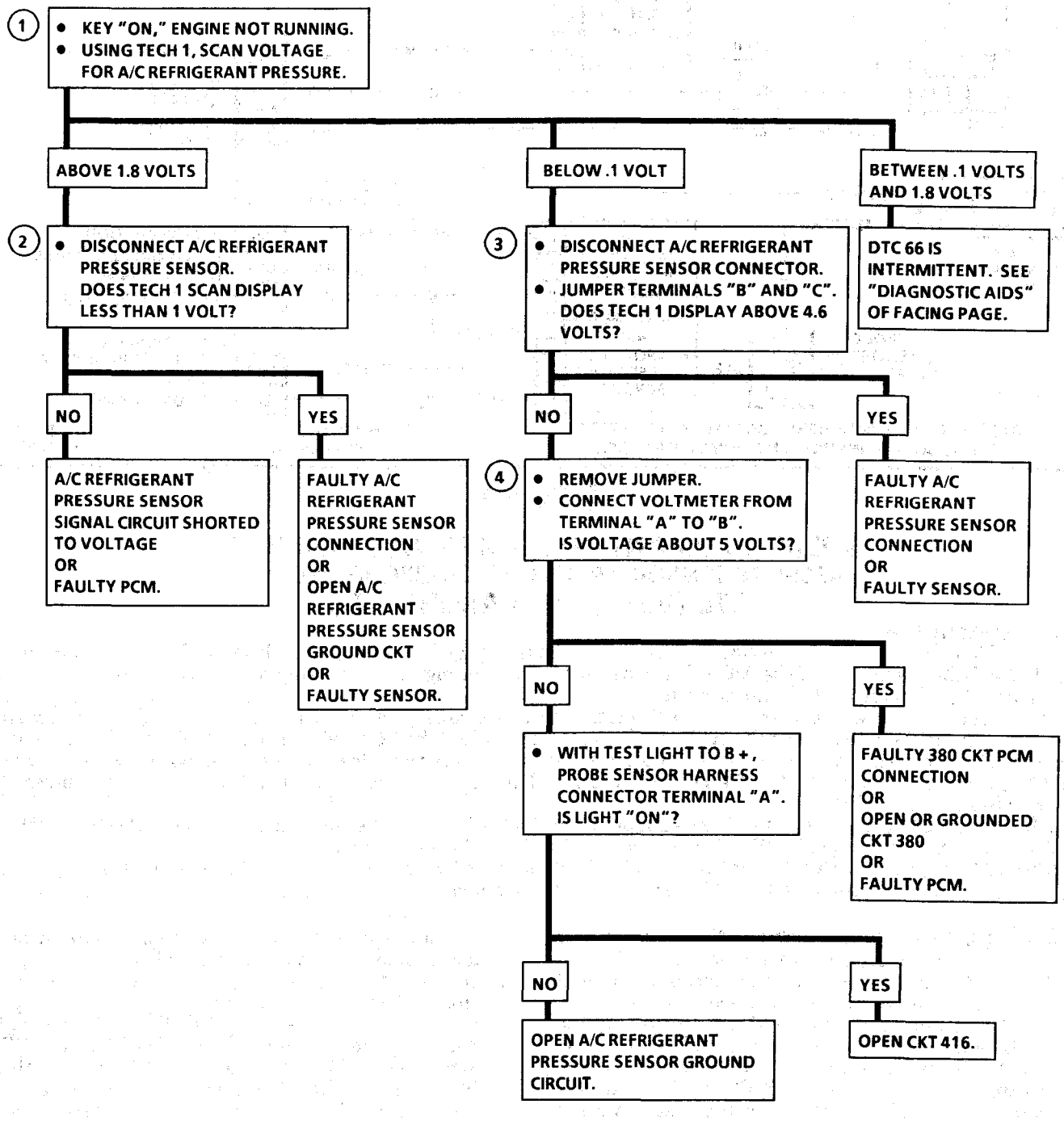
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Normal voltage is between .1 and 1.8 volt.
2. Checks to see if the high voltage signal is from a shorted sensor or a short to voltage in the circuit. Normally, disconnecting the sensor would make a normal circuit go to near zero volt.
3. Checks to see if low voltage signal is from the sensor or the circuit. Jumpering the sensor signal CKT 380 to 5 volts checks the circuit, connections and PCM.
4. This step checks to see if the low voltage signal was due to an open in the sensor circuit or the 5 volts reference circuit since the prior step eliminated the pressure sensor.

Diagnostic Aids: DTC 66 sets when signal voltage falls outside the normal range of the sensor and is not due to a refrigerant system problem. If problem is intermittent, check for opens or shorts in the harness, or poor connections.

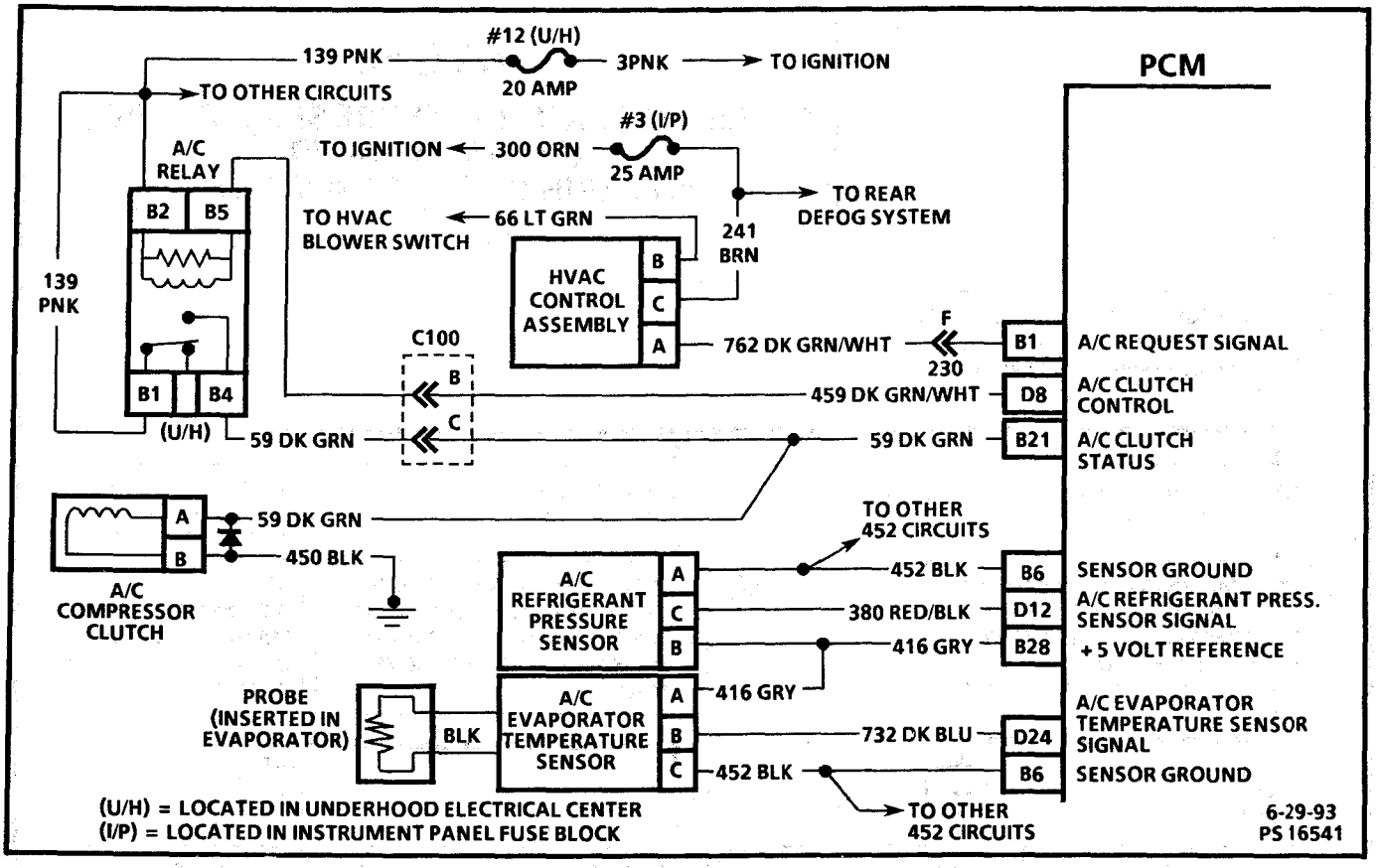
DTC 66

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.

5-27-93
9S 5595-6E



DTC 67

A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (PRESSURE SENSOR OR A/C CLUTCH CIRCUIT PROBLEM) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM can determine if the A/C compressor clutch is engaged or not engaged through the A/C clutch status line. If the PCM has grounded the A/C relay, current can flow through the A/C relay to the A/C compressor clutch and back to the PCM on the A/C status circuit.

When voltage is present at the PCM A/C clutch status terminal, A/C status "ON" will be displayed on the Tech 1. As the PCM detects that the A/C clutch has cycled "OFF," the PCM will record A/C refrigerant pressure from the A/C refrigerant pressure sensor. If the A/C refrigerant pressure does not increase more than 4 psi when the A/C clutch is turned back "ON," a DTC 67 will set. This condition can occur if the A/C refrigerant pressure sensor is fixed at one value.

DTC 67 Will Set When: The PCM does not detect an A/C refrigerant pressure change of more than 4 psi when the A/C clutch has been cycled "OFF" for 10 seconds, then "ON" for 10 seconds.

Action Taken (PCM will default to): DTC 67 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL), A/C operation will be disabled.

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

1. If the A/C compressor clutch is disconnected or if CKT 59 is open between the splice and the clutch, the A/C compressor clutch will not engage, but the PCM will detect voltage on the A/C status line which will indicate the clutch is "ON." If the A/C controls are cycled from "OFF" to "ON" at this point, a DTC 67 will set since the clutch did not engage and therefore no pressure change was detected.
2. If the relay power feed CKT 139 is intermittent, the A/C clutch status terminal may not detect voltage when A/C is commanded "ON."
3. Visually check A/C compressor electrical harness for problems that may prevent it from engaging.
4. If the A/C clutch status line becomes intermittently open or shorted while the compressor is "ON," the PCM will be wrongly detecting the A/C clutch going "ON" and "OFF." When the PCM falsely detects the clutch cycling from "ON" to "OFF" and the clutch is remaining "ON," a DTC 67 will set since no refrigerant pressure change was detected.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

DTC 67

A/C REFRIGERANT PRESSURE SENSOR CIRCUIT (PRESSURE SENSOR OR A/C CLUTCH CIRCUIT PROBLEM) 5.7L (VIN P) "F" CARLINE (SFI)

- IF DTC(s) 66, 69 OR 70 ARE PRESENT USE THOSE CHARTS FIRST.
- CLEAR DTC(s).
- START ENGINE.
- TURN A/C "ON."

DID CLUTCH ENGAGE?

NO

DOES TECH 1 INDICATE A/C CLUTCH STATUS "ON"?

YES

YES

1.
   - IGNITION "OFF."
   - DISCONNECT A/C COMPRESSOR CLUTCH CONNECTOR.
   - CONNECT A TEST LIGHT BETWEEN A/C CLUTCH HARNESS CONNECTOR TERMINALS.
   - START ENGINE.
   - A/C "ON."

   IS TEST LIGHT "ON"?

NO

2. INTERMITTENT A/C CLUTCH CIRCUIT FROM A/C RELAY TO SPLICE. SEE FACING PAGE.

NO

- PROBE BATTERY FEED TO A/C CLUTCH COIL WITH A TEST LIGHT TO GROUND.

IS TEST LIGHT "ON"?

YES

FAULTY A/C CLUTCH CONNECTION OR OPEN A/C CLUTCH COIL.

NO

OPEN OR SHORTED A/C CLUTCH CIRCUIT FROM CLUTCH TO SPLICE.

YES

OPEN A/C CLUTCH GROUND CIRCUIT.

3.
   - USING TECH 1, OBSERVE A/C REFRIGERANT PRESSURE. A/C CLUTCH "OFF" FOR 10 SECONDS, THEN "ON" FOR 10 SECONDS.

   DID A/C REFRIGERANT PRESSURE INCREASE MORE THAN 5 psi WHEN A/C CONTROLS WERE TURNED "ON"?

NO

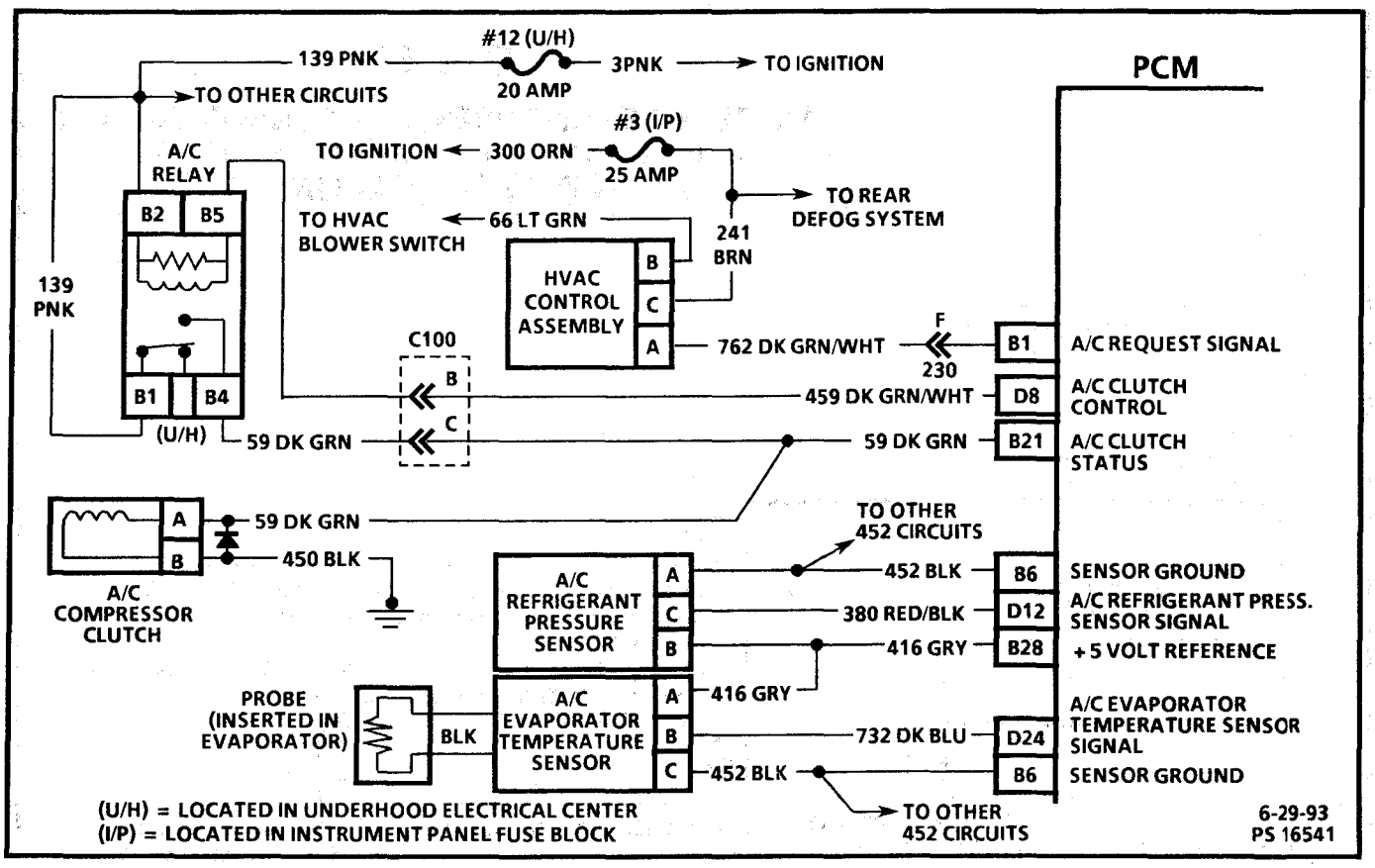
FAULTY SENSOR CONNECTION OR FAULTY SENSOR.

YES

4. DTC 67 IS INTERMITTENT. SEE "DIAGNOSTIC AIDS" ON FACING PAGE.

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

6-7-93
PS 17337



DTC 68

A/C RELAY CIRCUIT (SHORTED CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

When the PCM detects that A/C has been requested, the PCM will activate the A/C clutch relay. When the relay is activated, voltage should be present at both the A/C compressor clutch and the A/C clutch status terminal at the PCM.

If the PCM detects voltage on the A/C clutch status terminal when the A/C has not been requested a DTC 68 will set.

A short to voltage at any point in CKT 59, a grounded relay control circuit or stuck A/C relay contacts can set a DTC 68.

DTC 68 Will Set When: Voltage is detected on the A/C status line for more than 25 seconds after the PCM has disengaged the A/C relay.

Action Taken (PCM will default to): DTC 68 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL), A/C operation will be disabled.

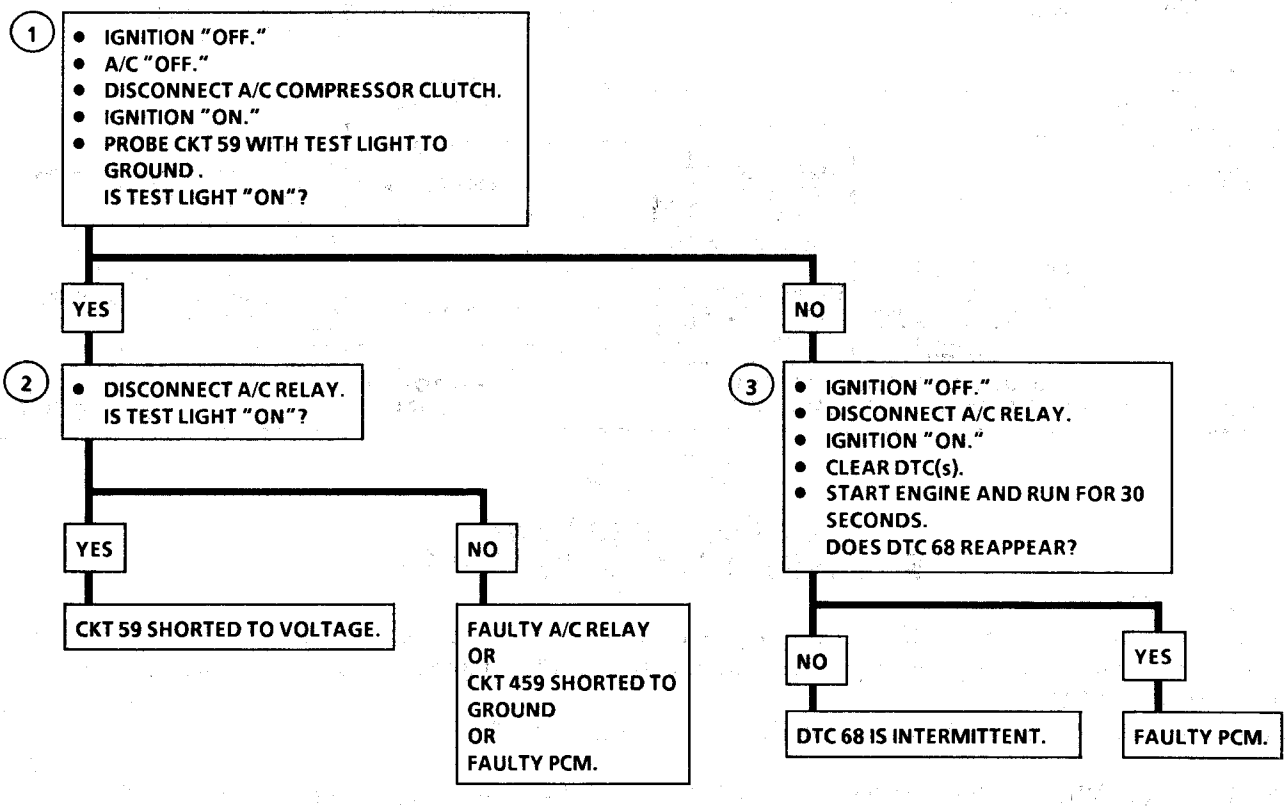
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. A/C must be "OFF" while performing test.
2. This will isolate the ignition feed portion of the circuit from the clutch circuit.
3. If DTC 68 reappears at this step the PCM is internally shorted to voltage.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connectors. These may cause an intermittent. Check for damaged or pushed out terminals.

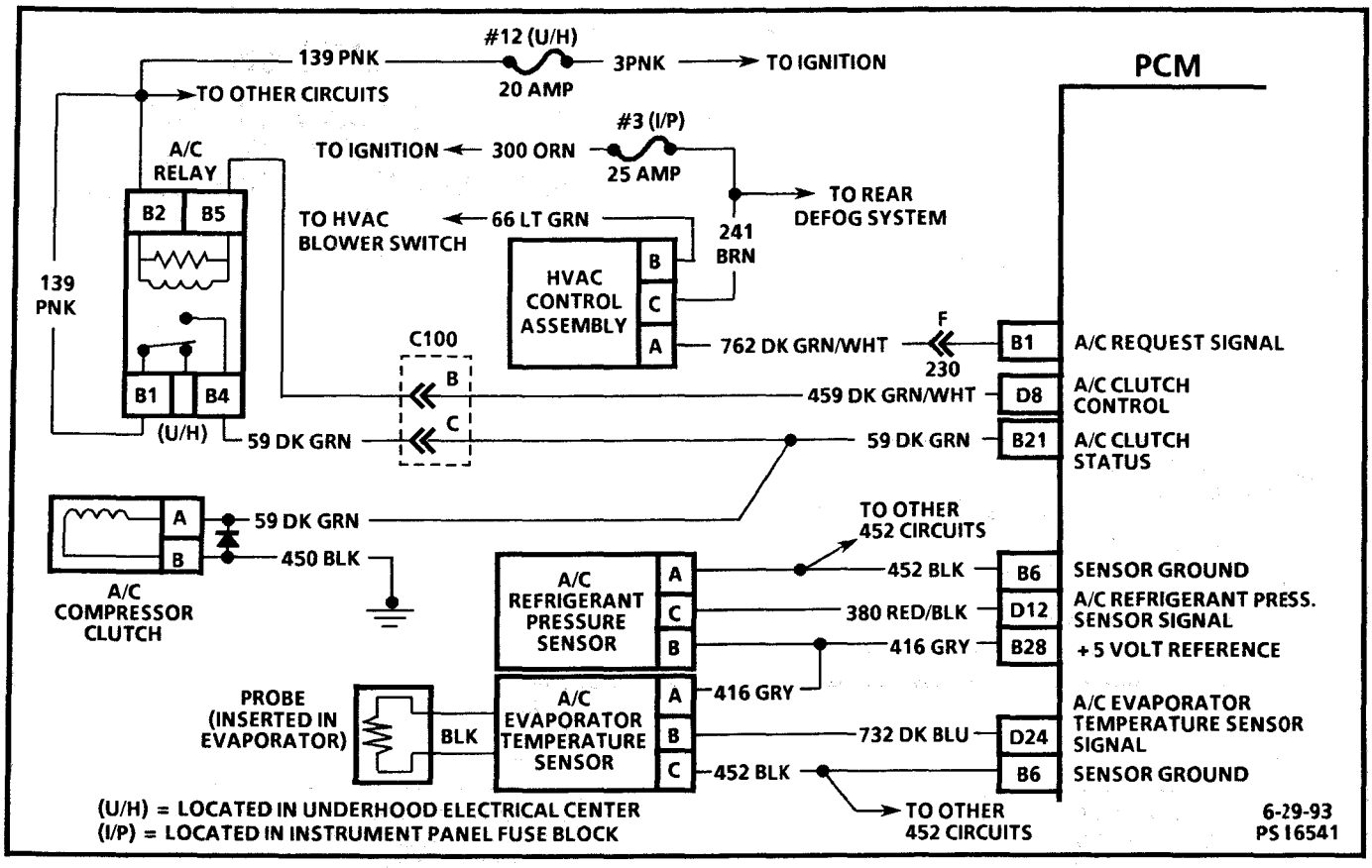
DTC 68

A/C RELAY CIRCUIT (SHORTED CIRCUIT) 5.7L (VIN P) "F" CARLINE (SFI)



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

2-4-93
9S 5514-6E



DTC 69

A/C CLUTCH CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

When the PCM detects that A/C has been requested, the PCM will activate the A/C clutch relay. When the relay has been activated, voltage should be present at both the A/C compressor clutch and the A/C clutch status line terminal of the PCM.

An open or short to ground at any point in CKT 59 will cause DTC 69 to set.

DTC 69 Will Set When: The PCM has commanded A/C "ON" and no voltage is detected on the A/C status line for more than 25 seconds.

Action Taken (PCM will default to): DTC 69 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL), A/C operation will be disabled.

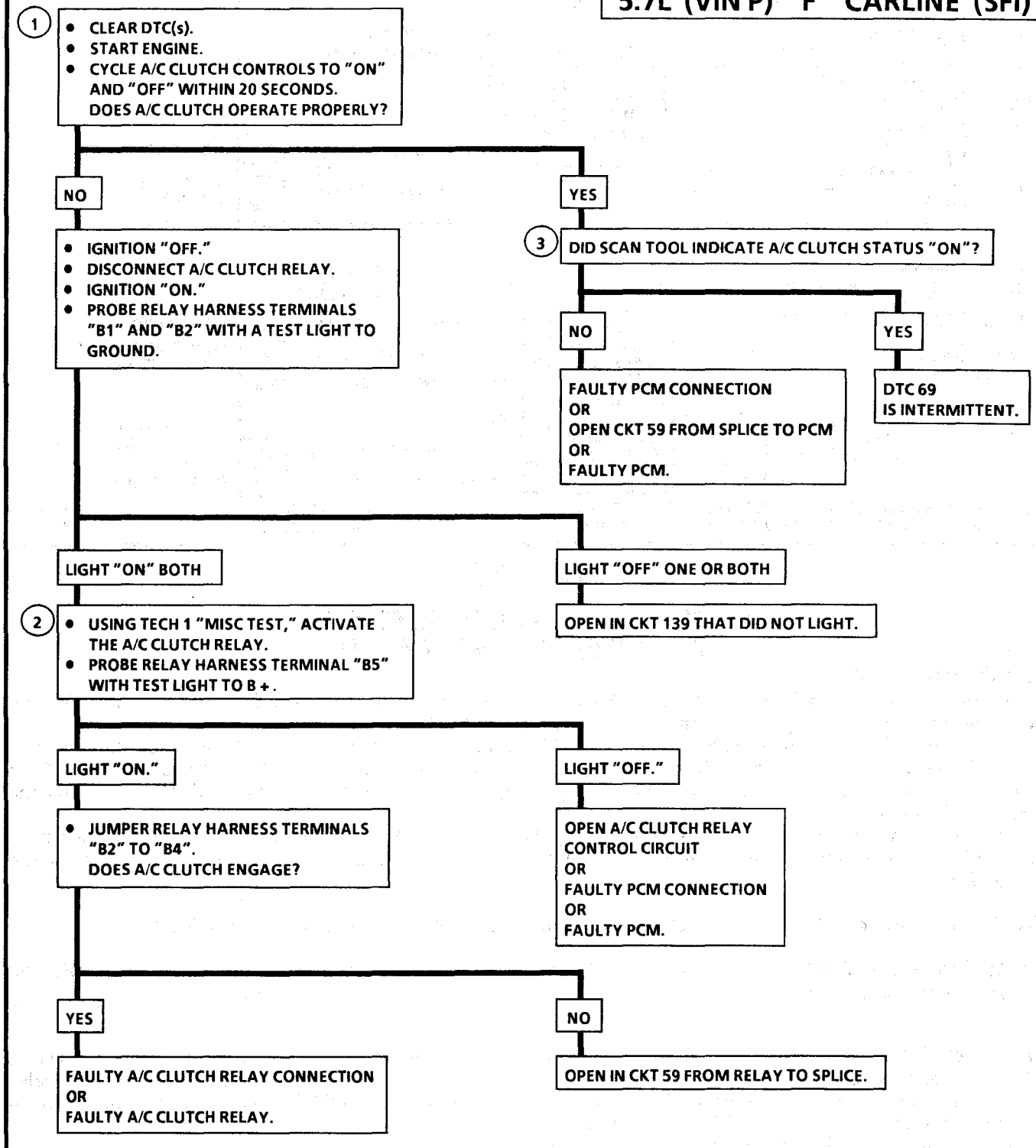
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. A problem that may prevent the compressor from engaging may or may not cause DTC 69 to set.
2. Tech 1 will enable clutch circuit for 5 seconds.
3. If the A/C clutch operates properly and the Tech 1 shows A/C clutch status "OFF," then an open exists between the PCM and the splice to the compressor.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

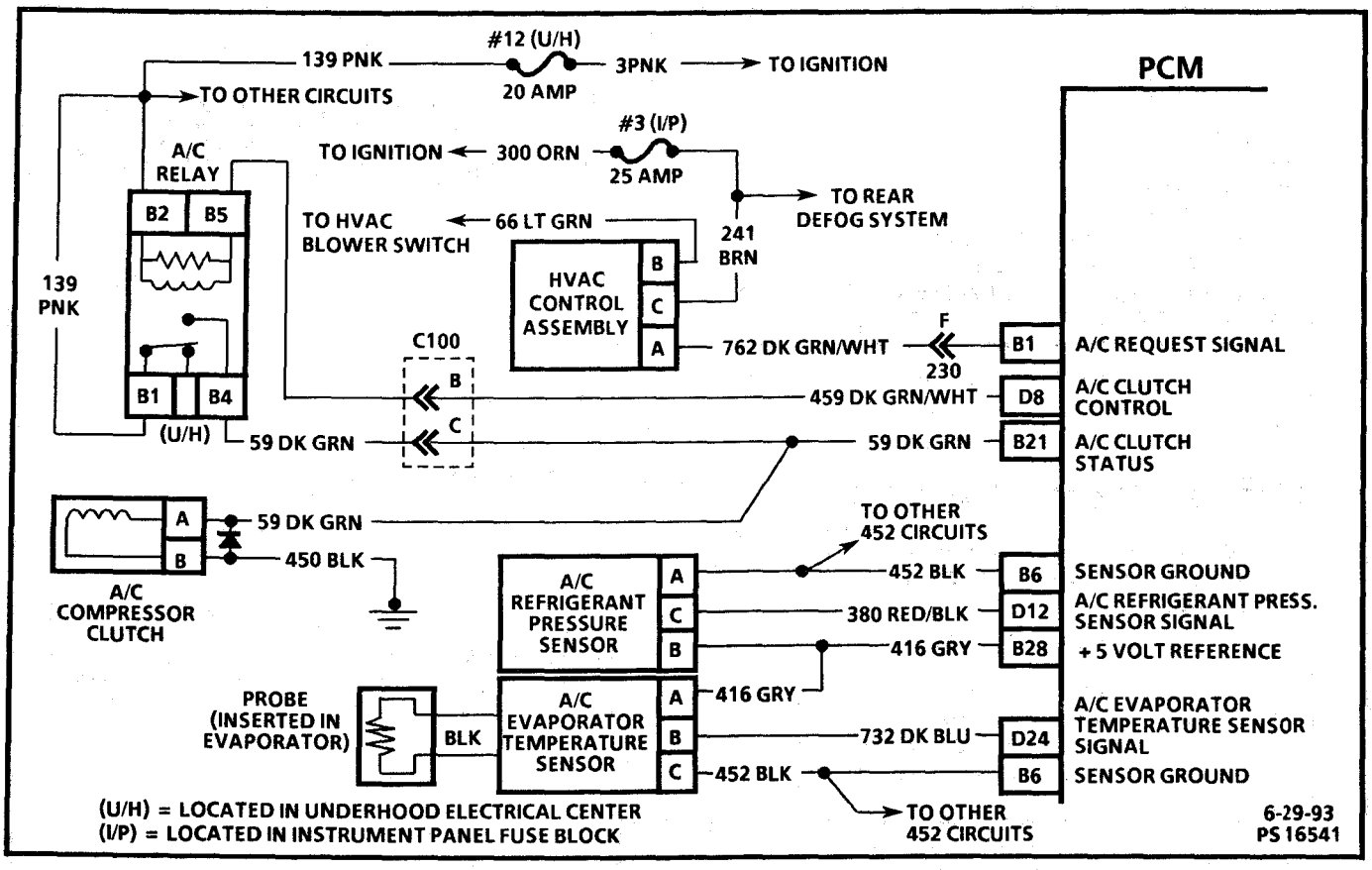
DTC 69

A/C CLUTCH CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)



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

6-29-93
PS 17938



DTC 70

A/C CLUTCH RELAY DRIVER CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Ignition voltage is supplied directly to the A/C clutch relay coil on CKT 139. The Powertrain Control Module (PCM) controls the relay by providing the ground path through CKT 459.

When the PCM is commanding a component "ON," the voltage of the control circuit should be "low" (near 0 volts). When the PCM is commanding the control circuit to a component "OFF," the voltage potential of the circuit should be "high" (near battery voltage). The primary function of the driver is to supply the ground for the component being controlled.

Each driver has a fault line which is monitored by the PCM. The PCM will monitor the voltage at the driver. If the fault detection circuit senses a voltage other than what is expected, the fault line status will change and the DTC will set.

DTC 70 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 459.

Action Taken (PCM will default to): DTC 70 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

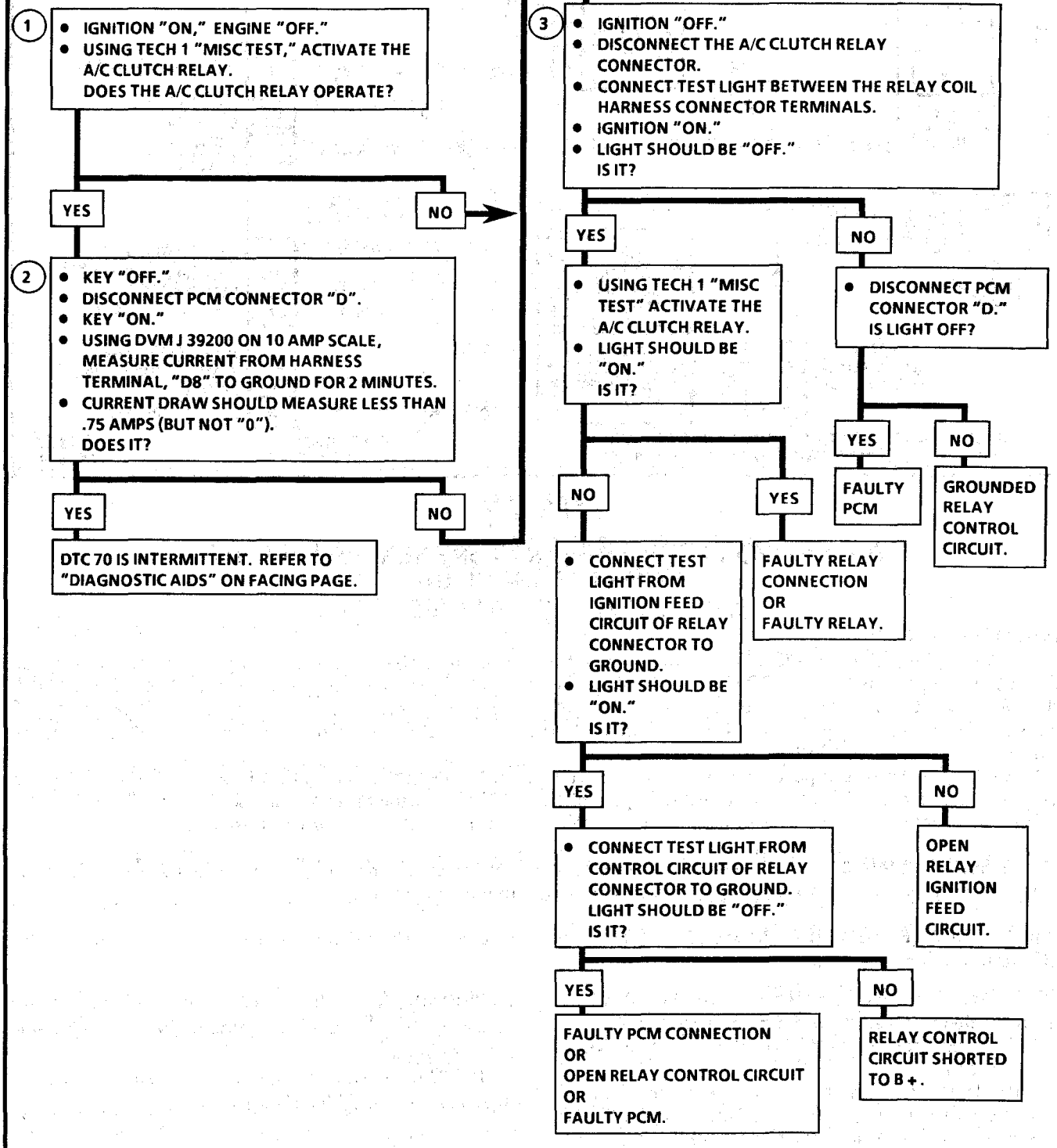
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The Tech 1 will enable the circuit for 5 seconds.
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. The remaining circuit checks will identify a circuit problem that has caused an excessive current flow or inoperative relay. If a circuit check is done on a relay, it is important to identify and test the relay coil terminals ("B2" and "B5") to avoid improper diagnosis.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

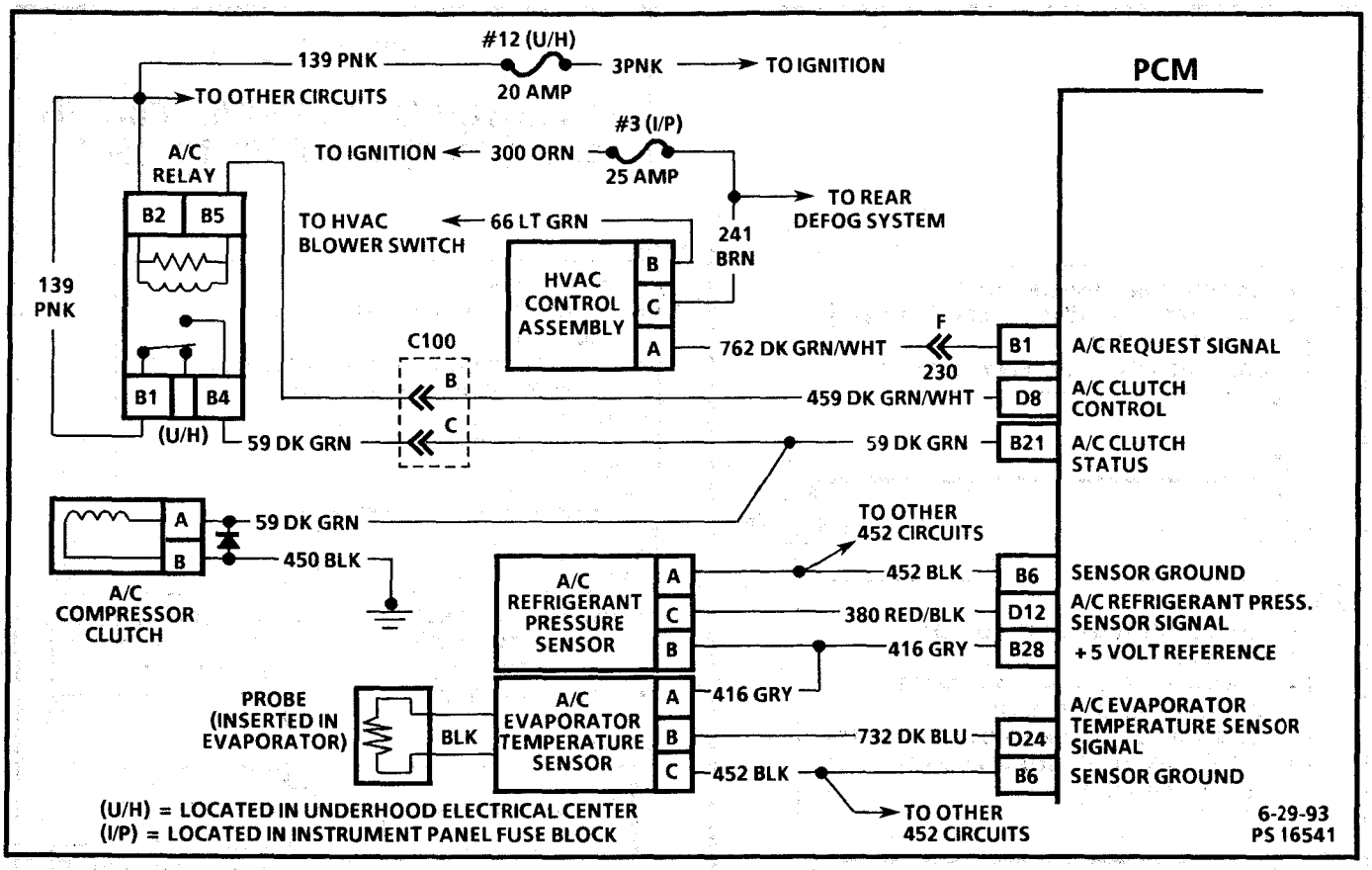
DTC 70

A/C CLUTCH RELAY DRIVER CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

6-29-93
PS 16538



DTC 71

A/C EVAPORATOR TEMPERATURE SENSOR CIRCUIT (OPEN OR SHORTED) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The A/C system uses an A/C evaporator temperature sensor mounted in the A/C evaporator core to monitor A/C temperature for use by the PCM. The PCM uses this information to cycle the A/C compressor clutch "ON" and "OFF," so optimum cooling is attained. The A/C evaporator temperature sensor will also prevent A/C evaporator core freeze up. The PCM will disable the A/C compressor clutch whenever A/C evaporator temperature is below 2°C (36°F).

The A/C evaporator temperature sensor contains a two wire probe (thermistor) that is positioned in the center of the evaporator core. The two wire probe is part of the A/C evaporator temperature sensor interface module. The interface module works in conjunction with the PCM to determine A/C evaporator temperature.

DTC 71 Will Set When: A/C is requested, the PCM detects an open, short to ground, or a short to voltage in the A/C evaporator temperature circuits, and all conditions met for 3 seconds.

Action Taken (PCM will default to): DTC 71 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.

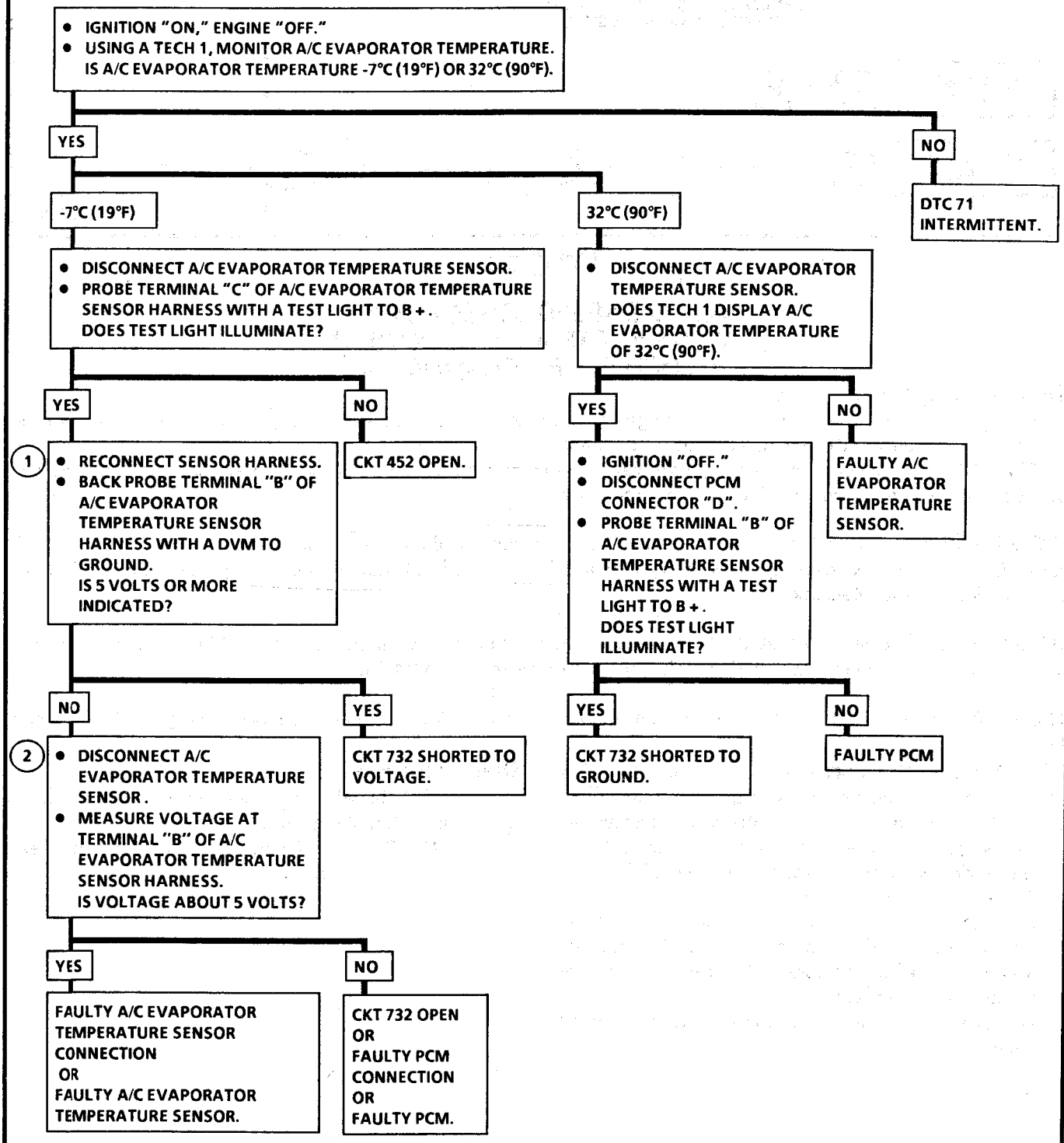
1. A/C evaporator temperature should be between these values.
2. With the A/C evaporator temperature sensor harness disconnected, normal voltage on CKT 732 is near 5 volts. If a short to voltage is suspected, reconnect sensor harness and backprobe terminal "B" of sensor harness using a DVM. If 5 volts or more is indicated, then CKT 732 is shorted voltage.

Diagnostic Aids: The A/C evaporator temperature sensor and harness is located under the passenger side instrument panel.

If A/C evaporator temperature sensor needs to be replace, refer to SECTION 1B.

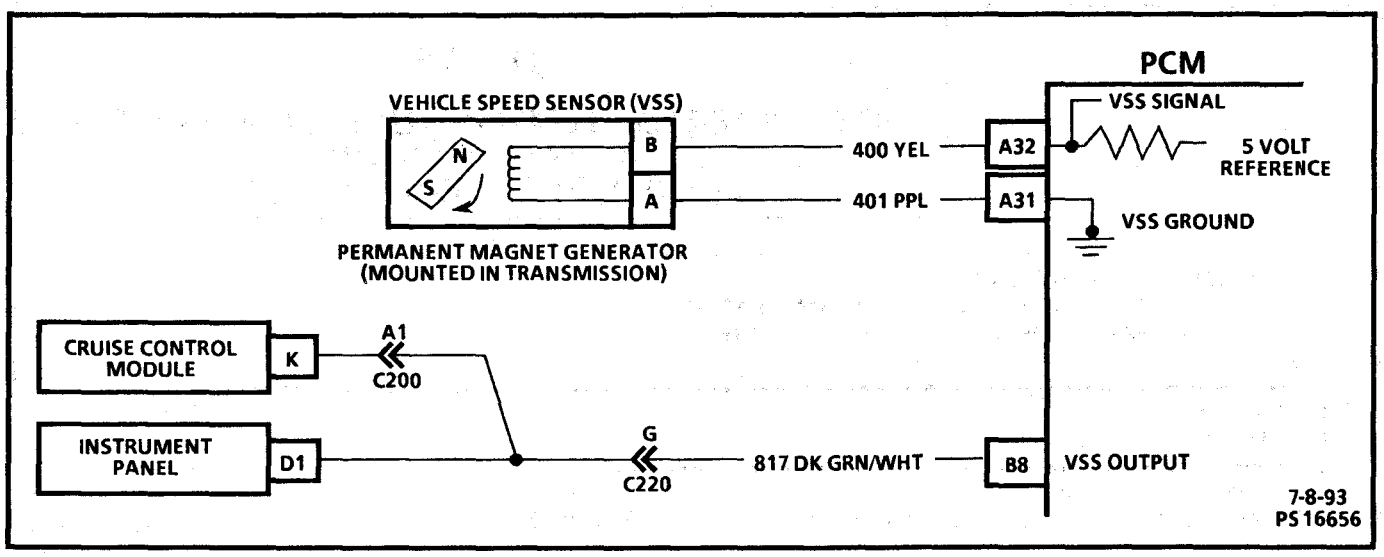
DTC 71

A/C EVAPORATOR TEMPERATURE 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.

6-26-93
PS 16542



DTC 72

VEHICLE SPEED SENSOR LOSS (AUTOMATIC TRANSMISSION ONLY) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The speed sensor circuit consists of a magnetic induction type sensor and wiring. Gear teeth pressed on the output shaft induce an alternating current in the sensor.

The PCM compensates for various axle ratios and converts the signal into a square wave for use by the speedometer, cruise control, antilock brakes, and TC system.

DTC 72 Will Set When: Not in P/N, transmission output speed changes greater than 1000 RPM, or in P/N, transmission output speed change greater than 2048 RPM. No DTC 28, and engine speed greater than 200 RPM. All conditions met for 2 seconds.

Action Taken (PCM will default to): A delayed (soft) landing to third gear. DTC 72 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 72 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. The TC system must be disabled when performing this step. Whenever the ignition key is cycled to the "OFF" position and then cycled back "ON," the TC system will default "ON."
2. An intermittent connection at the VSS or PCM may cause a DTC 72 to set. Inspect the harness and all related connectors. Check for damaged or pushed out terminals.
3. Be sure harness is routed away from hot exhaust components.

Diagnostic Aids:

- DTC 24 will set when no vehicle speed is detected at start off.
- DTC 72 will set when vehicle speed has been detected and is lost.

DTC 72

VEHICLE SPEED SENSOR LOSS (AUTOMATIC TRANSMISSION ONLY) 5.7L (VIN P) "F" CARLINE (SFI)

(1)
- IGNITION "OFF."
- RAISE DRIVE WHEELS.
- START ENGINE.
- DISABLE "TC" SYSTEM.
- WITH ENGINE IDLING IN GEAR, TECH 1 SHOULD DISPLAY VEHICLE SPEED ABOVE 0. DOES IT?

NO

DOES SPEEDOMETER WORK?

YES

- DTC IS INTERMITTENT. IF NO ADDITIONAL DTC(s) WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

- IGNITION "OFF."
- DISCONNECT VSS HARNESS CONNECTOR AT TRANSMISSION.
- CONNECT SIGNAL GENERATOR TESTER J 33431-B TO VSS HARNESS CONNECTOR.
- IGNITION "ON," TESTER "ON" AND SET TO GENERATE A VSS SIGNAL.
- THE TECH 1 SHOULD DISPLAY VEHICLE SPEED ABOVE 0. DOES IT?

YES

(2)
- CHECK CALIBRATION I.D. FOR MOST CURRENT AND/OR INCORRECT SOFTWARE. REFER TO SECTION C1.

NO

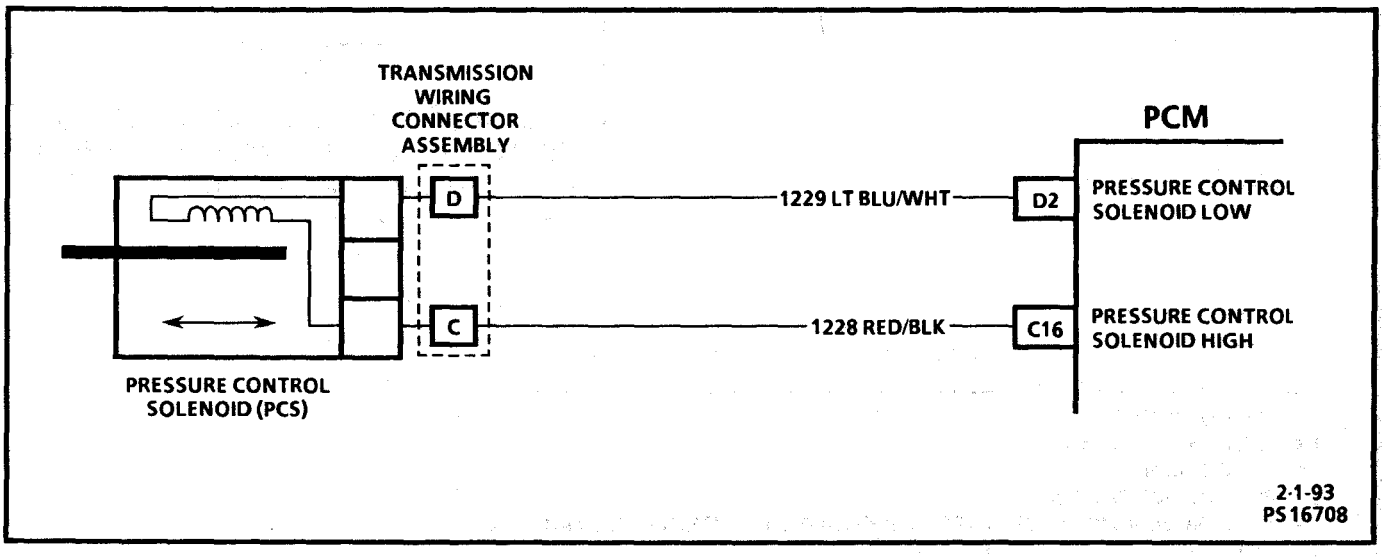
(3) CKT 400 OR 401 OPEN, SHORTED TO GROUND, SHORTED TOGETHER, FAULTY PCM CONNECTIONS OR FAULTY PCM.

YES

REPLACE VEHICLE SPEED SENSOR.

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

7-12-93
PS 16652



DTC 73

PRESSURE CONTROL SOLENOID (PCS) CIRCUIT
(CURRENT ERROR)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The pressure control solenoid is a PCM controlled device used to regulate transmission line pressure. The PCM compares TP voltage, engine RPM and other inputs to determine the appropriate line pressure for a given load. The PCM will regulate the pressure by applying a varying amperage to the pressure control solenoid. The applied amperage can vary from 0.1 to 1.1 amp. The PCM then monitors the amperage at the return line.

DTC 73 Will Set When: The return amperage varies greater than 0.16 amp from the commanded amperage for at least one second, and no DTC 75 stored.

Action Taken (PCM will default to): Full line pressure will be applied causing harsh shifts. DTC 73 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 73 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks the ability of the PCM to command the pressure control solenoid.
2. This test checks for voltage at PCM.

Diagnostic Aids: Check for poor connections at PCM and at transmission connector.

DTC 73

PRESSURE CONTROL SOLENOID (PCS) CIRCUIT (CURRENT ERROR) 5.7L (VIN P) "F" CARLINE (SFI)

1
- INSTALL TECH 1.
- RECORD THEN CLEAR DTC(s).
- ENGINE OPERATING, TRANSMISSION IN PARK.
- ENTER MISC TESTS/TRANSMISSION/PCS CONTROL.
- USING TECH 1, APPLY 1.0 AMPS THRU 0.1 AMPS WHILE OBSERVING DESIRED PCS AND ACTUAL PCS.

IS ACTUAL PCS READING ALWAYS WITHIN 0.16 AMPS OF DESIRED PCS?

YES → PROBLEM IS INTERMITTENT REFER TO "DIAGNOSTIC AIDS."

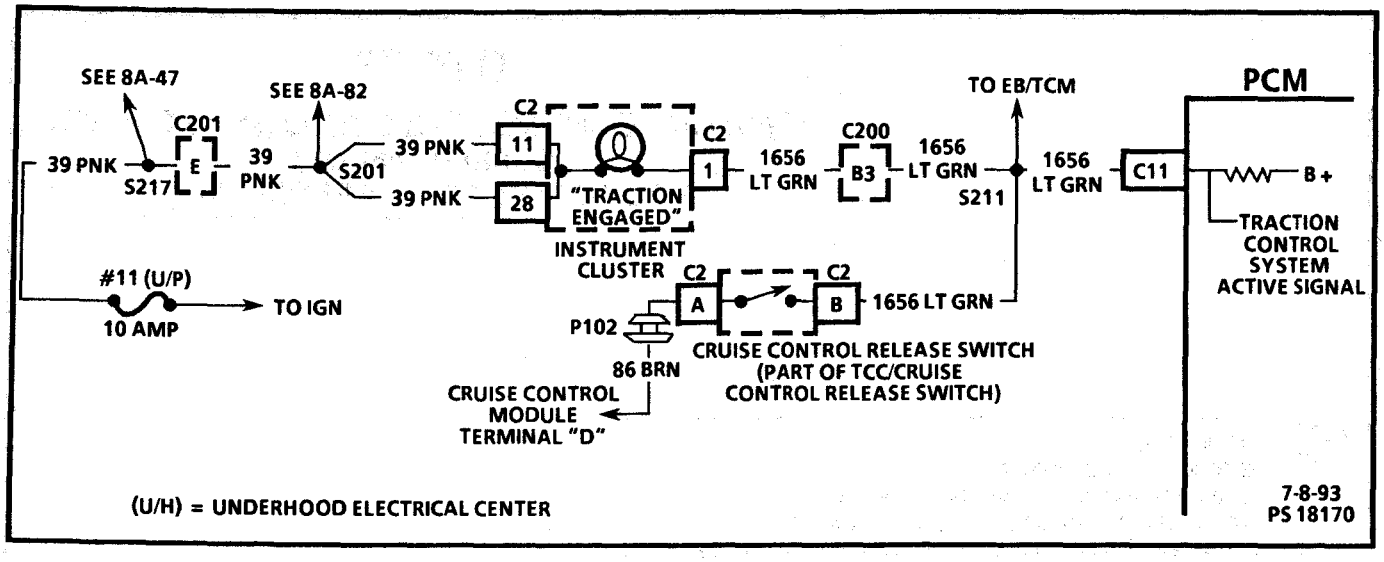
NO

2
- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE TRANSMISSION EXTERNAL WIRING HARNESS CONNECTOR.
- JUMPER J 39775 CAVITIES "M" AND "R".
- USING J 39200 DVM ON 10 AMP SCALE, CONNECT (IN SERIES) TO CAVITIES "C" AND "D."
- ENGINE OPERATING, TRANSMISSION IN PARK.
- USING TECH 1, APPLY 1.0 AMPS THRU 0.1 AMPS WHILE OBSERVING DESIRED PCS AND J 39200 DVM READING.
- IS DESIRED PCS ALWAYS WITHIN 0.16 AMPS OF J 39200 DVM READING?

YES
- IGNITION "OFF."
- CK TRANS WIRING CONNECTOR TERMINAL TENSION ON THE PCS CIRCUITS. IF OK, REFER TO SECTION 7A14A (4L60E) OR 7A17A (4L80E) " INTERNAL WIRING HARNESS CHECK " FOR INTERNAL PCS CIRCUIT DIAGNOSIS.

NO → VERIFY CKTs 1228 AND 1229 ARE NOT OPEN OR SHORTED. ALSO VERIFY TERMINAL TENSION ON THESE CIRCUITS AT THE PCM CONNECTOR. IF OK, REPLACE PCM.

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



DTC 74

TRACTION CONTROL SYSTEM (TCS) CIRCUIT LOW 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM receives an input signal from the traction control system to indicate when a traction control event is occurring. The B+ signal during normal operation is pulled to zero volts during the traction control event. The PCM will inhibit upshifts, downshifts and TCC operation during a traction control event.

DTC 74 Will Set When:

- Transmission range in park or neutral.
- TCS/ASR active signal input at zero volts.
- All condition(s) met for longer than 2 seconds.

Action Taken (PCM will default to):

- Inhibit TCC operation.
- Inhibit 4th gear if in hot mode.

DTC 74 Will Clear When: Fault conditions no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. If fault conditions are present, the scan tool will display "YES." A short to ground in an external component or wiring could be the cause.

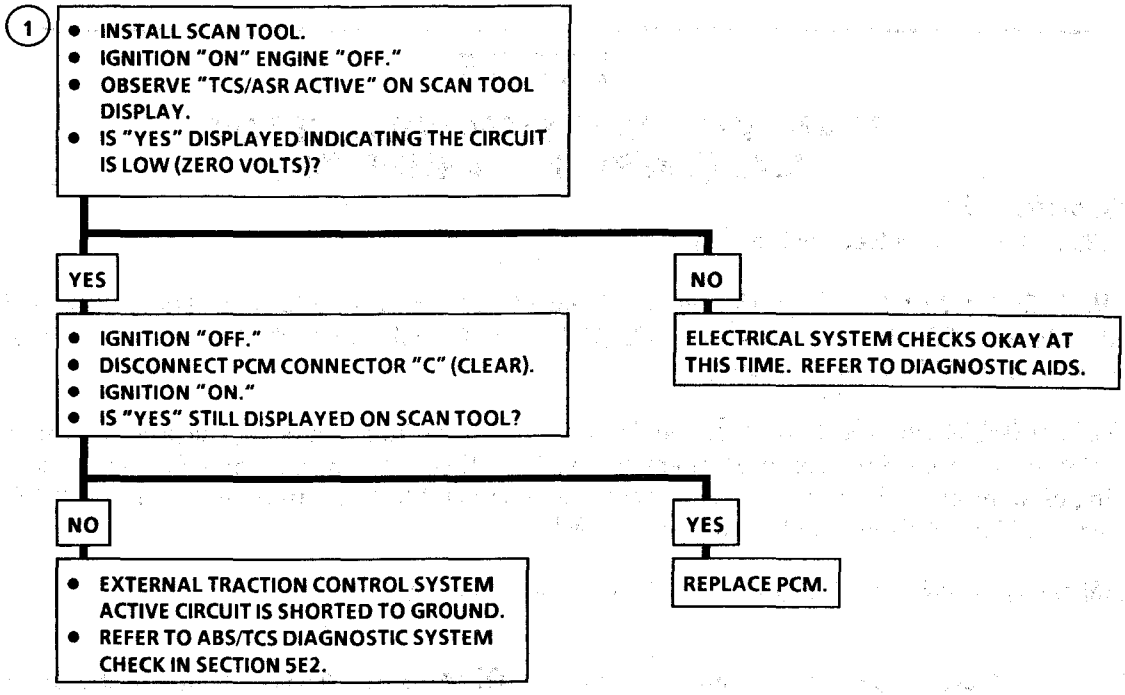
Diagnostic Aids: If this DTC sets intermittently, wiggle wire harness and connectors while observing scan display. If scan display changes from "NO" to "YES" then wiring is faulty.

Use shapshot mode to trigger on this DTC, then review data when DTC set to identify code setting conditions.

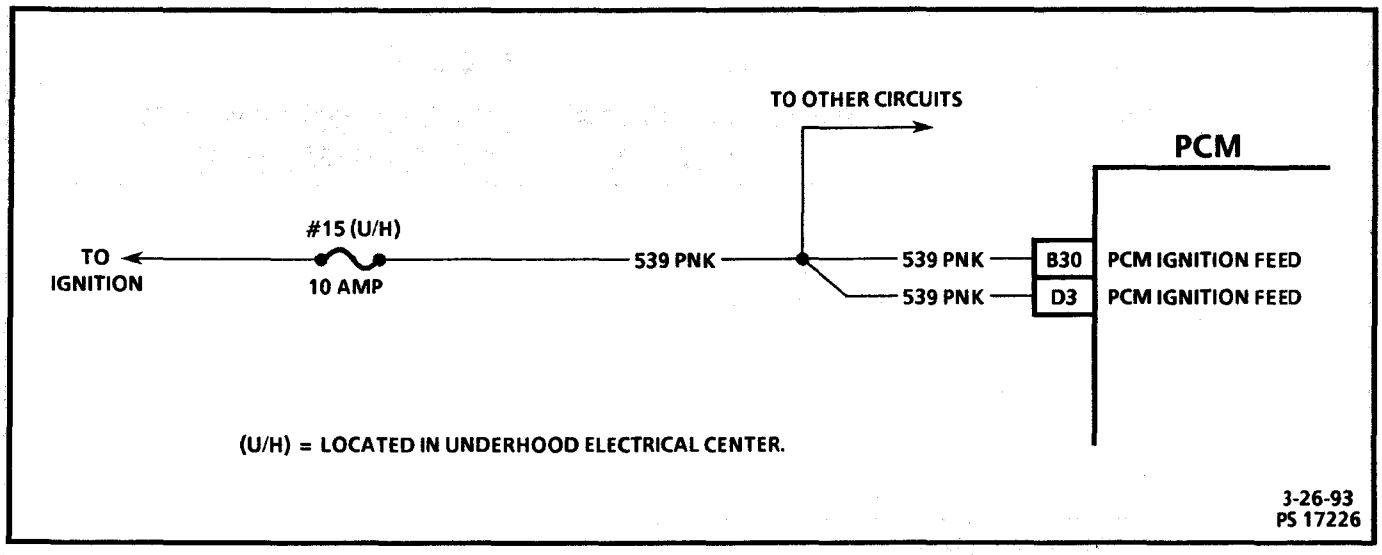
Refer to SECTION 8A for electrical circuit wiring.

DTC 74

TRACTION CONTROL SYSTEM (TCS) CIRCUIT LOW 5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 75

TRANSMISSION SYSTEM VOLTAGE LOW
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:
CKT 539 is the ignition feed for the PCM.

DTC 75 Will Set When: The ignition is "ON" and PCM terminals "B30" and "D3" voltage is less than the graduated scale of: -40°C (-40°F) = 7.3 volts, 90°C (194°F) = 10.3 volts, or 150°C (304°F) = 11.7 volts, with engine speed greater than 1000 RPM for 4 seconds.

Action Taken (PCM will default to): During the time the failure is present, the pressure control solenoid is turned "OFF" (maximum line pressure), there is a soft landing to third gear, and TCC operation is inhibited. (The setting of additional diagnostic trouble codes may result.) DTC 75 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 75 Will Clear When: The fault condition(s) no longer exist.

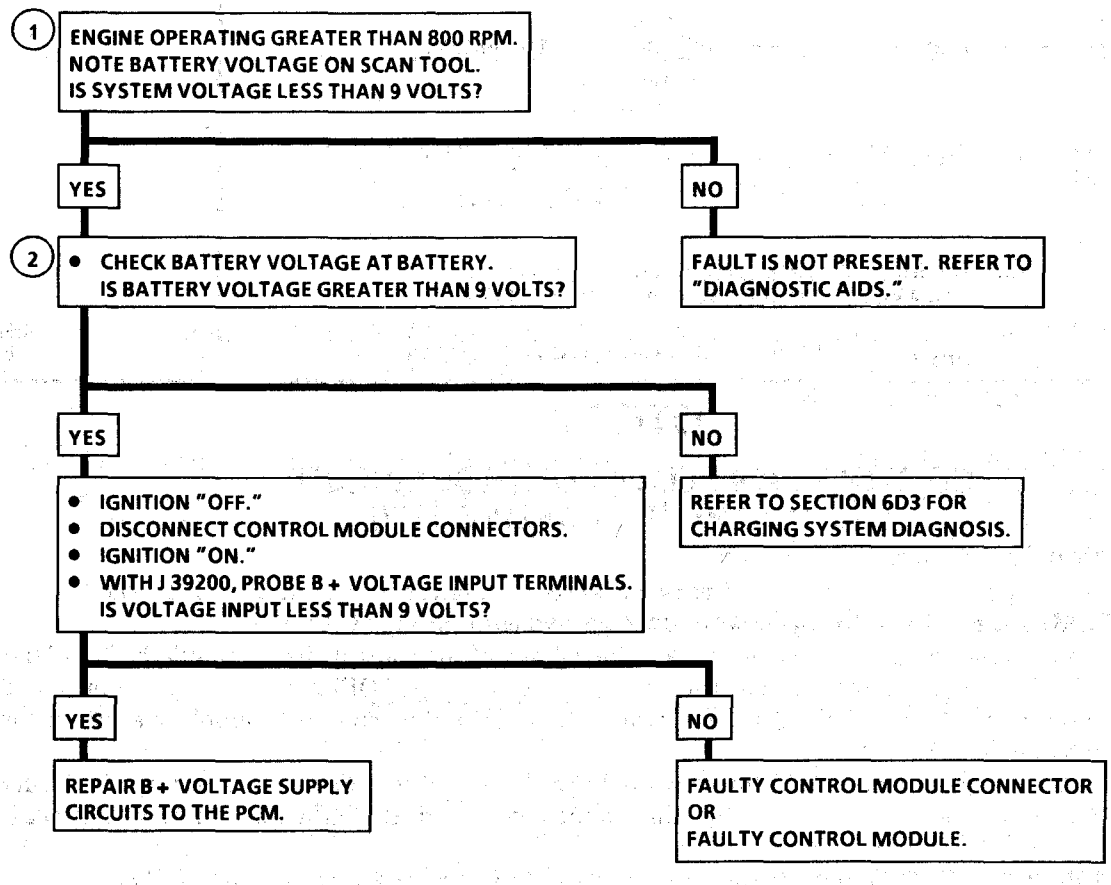
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test checks for normal battery voltage between 9-15 volts.
2. This test checks if the low voltage display is due to the generator, B+ voltage supply CKT(s), or PCM. If the voltage is less than 9 volts, the PCM is OK.

Diagnostic Aids: If diagnostic trouble code sets when an accessory is operated, check for poor connections or excessive current draw. Refer to SECTION 8A of appropriate service manual for circuit details. Also, check for poor connections at starter solenoid or fusible link.

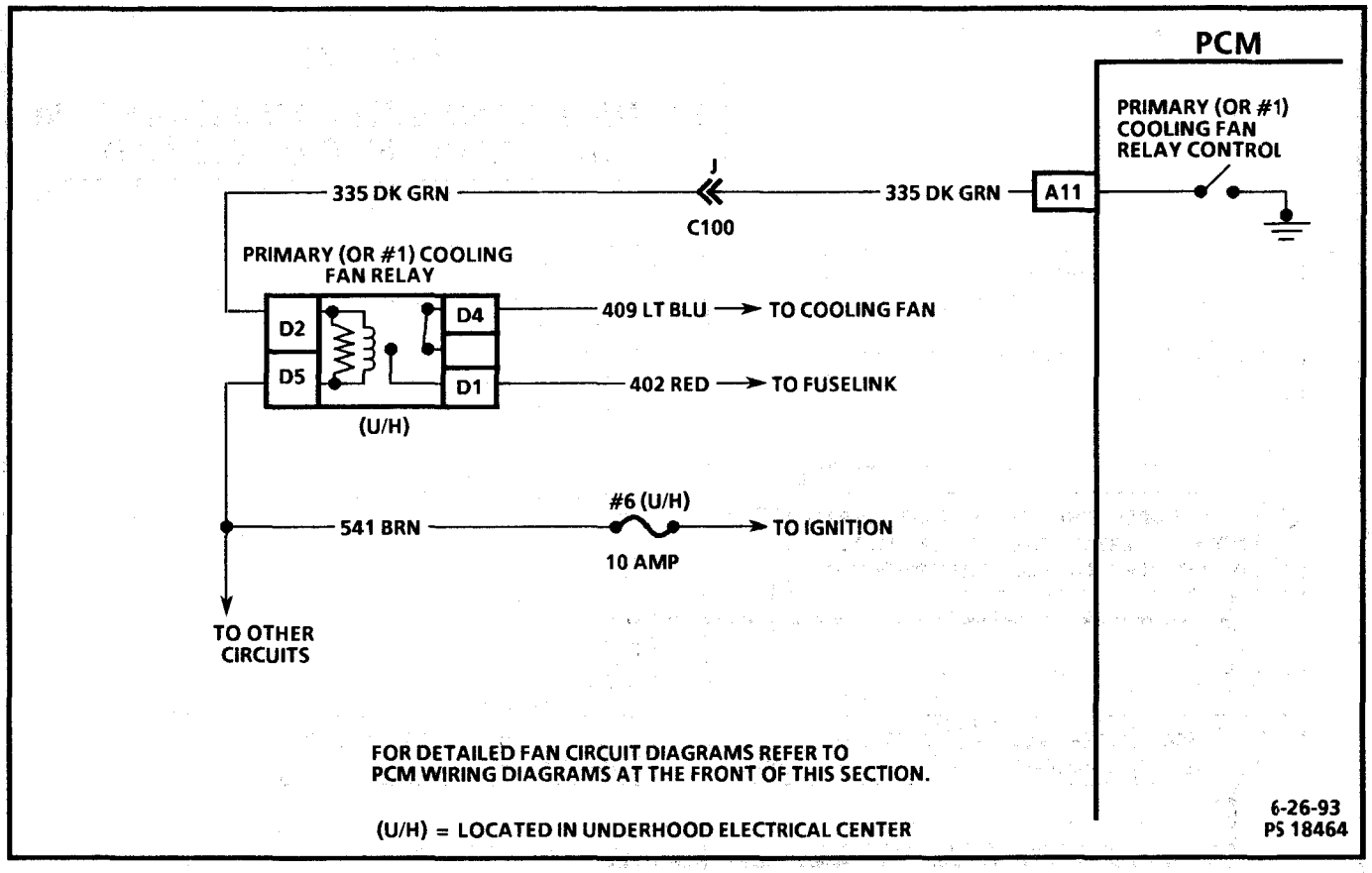
DTC 75

TRANSMISSION SYSTEM VOLTAGE LOW 5.7L (VIN P) "F" CARLINE (SFI)



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

5-7-93
PS 17066



DTC 77

COOLING FAN RELAY CONTROL CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Ignition voltage is supplied directly to the primary (or #1) cooling fan relay coil on CKT 541. The Powertrain Control Module (PCM) controls the relay by providing the ground path through CKT 335.

When the PCM is commanding a component "ON," the voltage of the control circuit should be "low" (near 0 volts). When the PCM is commanding the control circuit to a component "OFF," the voltage potential of the circuit should be "high" (near battery voltage). The primary function of the driver is to supply the ground for the component being controlled.

Each driver has a fault line which is monitored by the PCM. The PCM will monitor the voltage at the driver. If the fault detection circuit senses a voltage other than what is expected, the fault line status will change and the DTC will set.

DTC 77 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 335.

Action Taken (PCM will default to): DTC 77 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

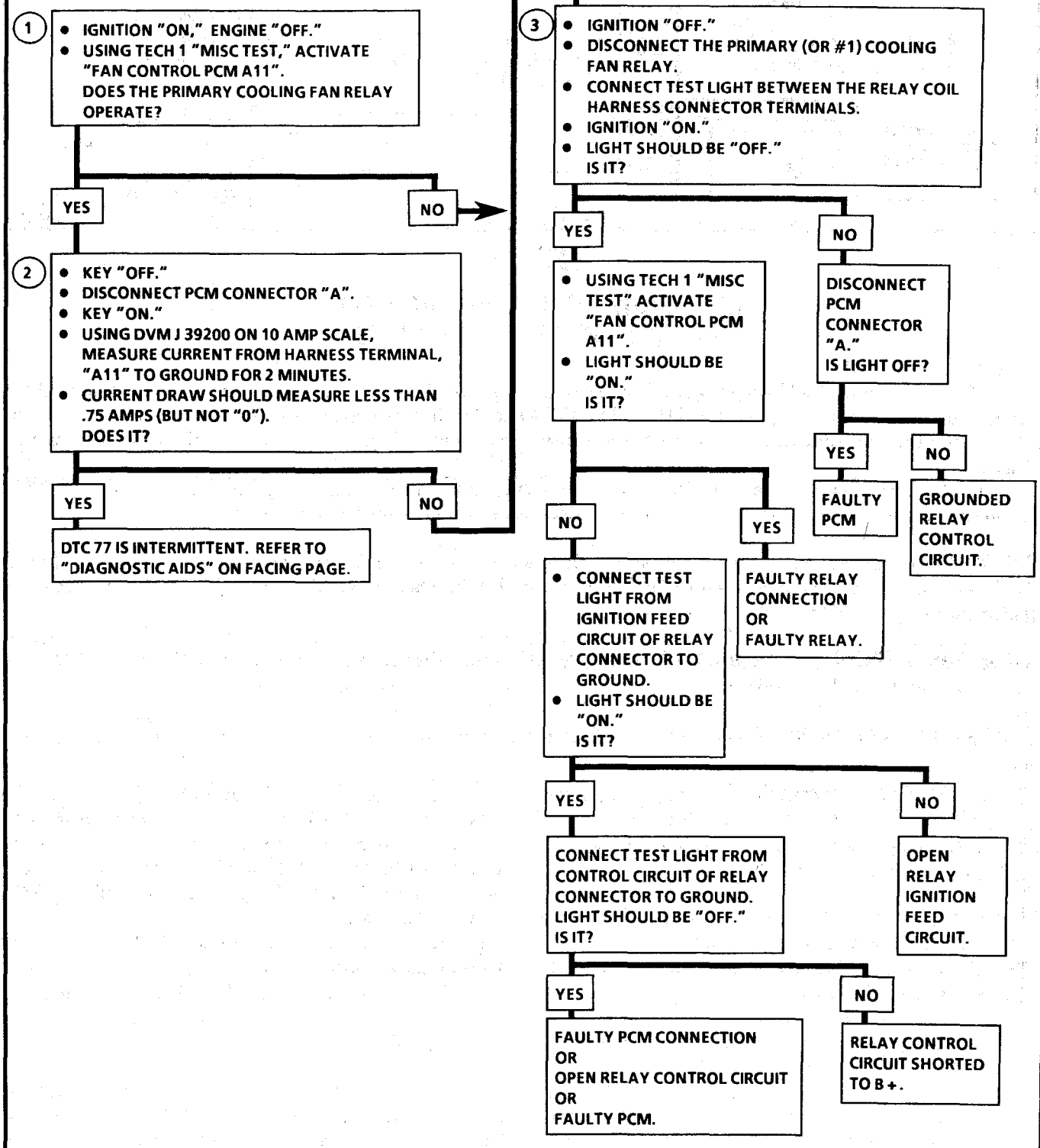
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The Tech 1 will enable the circuit for 4 minutes.
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. The remaining circuit checks will identify a circuit problem that has caused an excessive current flow or inoperative relay. If a circuit check is done on a relay, it is important to identify and test the relay coil terminals ("D2" and "D5") to avoid improper diagnosis.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

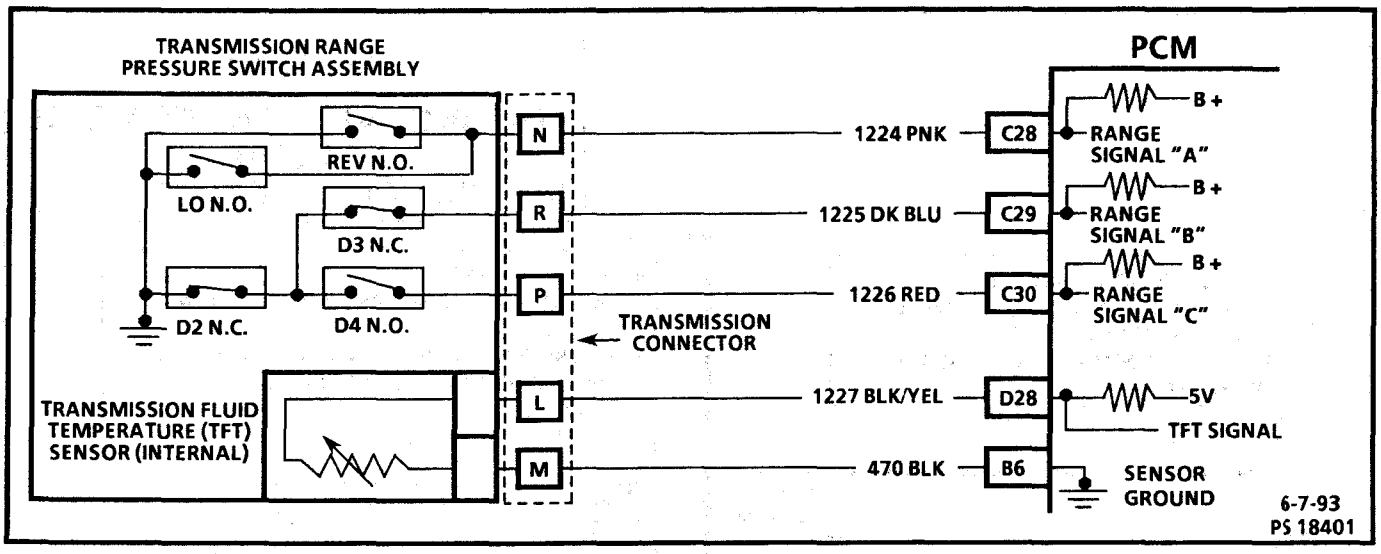
DTC 77

COOLING FAN RELAY CONTROL CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)



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

6-29-93
PS 18654



DTC 79

TRANSMISSION FLUID OVERTEMP
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Transmission Fluid Temperature (TFT) sensor is a thermistor within the TR pressure switch assembly, that controls the signal voltage to the PCM. The PCM supplies a 5 volt reference signal to the sensor on CKT 1227. When the transmission fluid is cold, the sensor resistance is high and the PCM will sense high signal voltage.

As the transmission fluid temperature warms to normal transmission operating temperature 100°C (212°F), the sensor resistance becomes less and the voltage decreases to approximately 1.5 to 2.0 volts.

DTC 79 Will Set When: Signal voltage indicates a transmission fluid temperature greater than 146°C (295°F) and has not cooled to less than 137°C (280°F) for 30 minutes, and no DTC 58 or 59 set. If TFT becomes greater than 151°C (306°F), a DTC 58 will set.

Action Taken (PCM will default to): DTC 79 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 79 Will Clear When: The fault condition(s) no longer exist.

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

1. This test checks for skewed or shorted circuit.
2. This test simulates a DTC 59.

Diagnostic Aids: Check harness routing for a potential short to ground in CKT 1227.

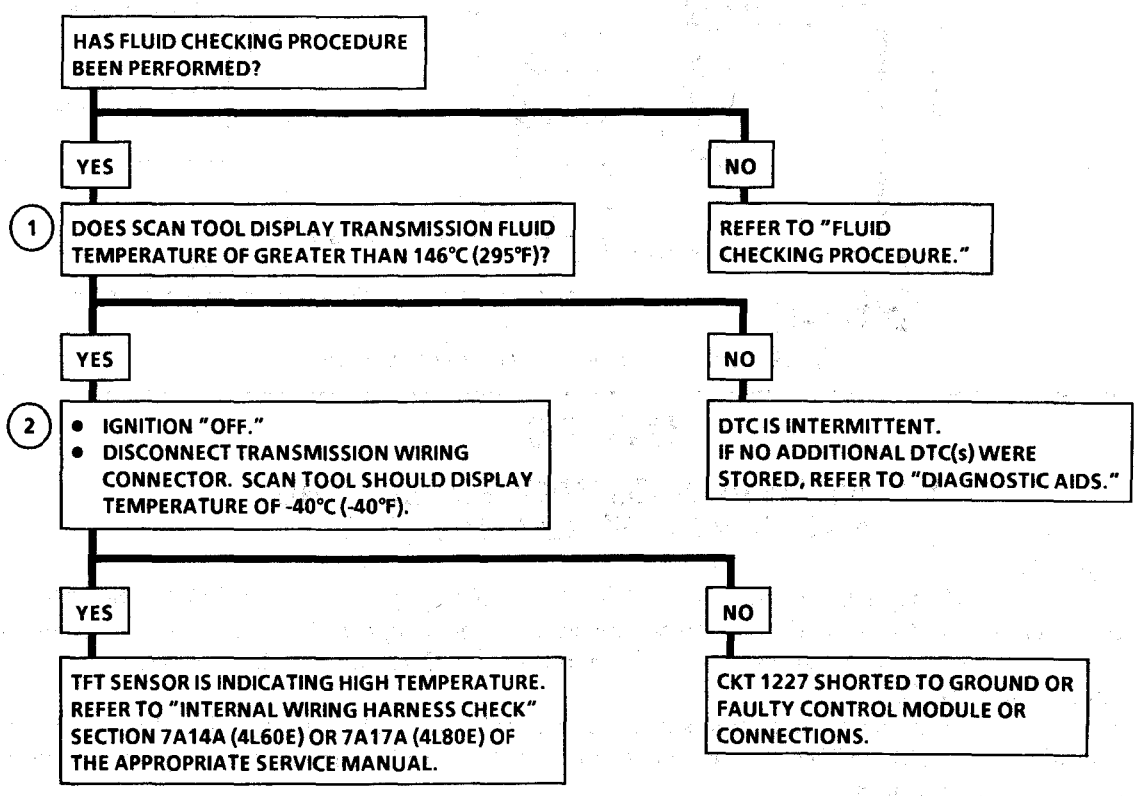
Scan tool TFT displays should rise steadily to about 100°C then stabilize.

The temperature to resistance value scale in SECTION 7A14A may be used to test the transmission sensor at the various temperature levels to evaluate the possibility of a "skewed" sensor. A "skewed" sensor could result in delayed garage shifts or TCC enabled complaints.

Check transmission fluid. Refer to "Fluid Checking Procedure."

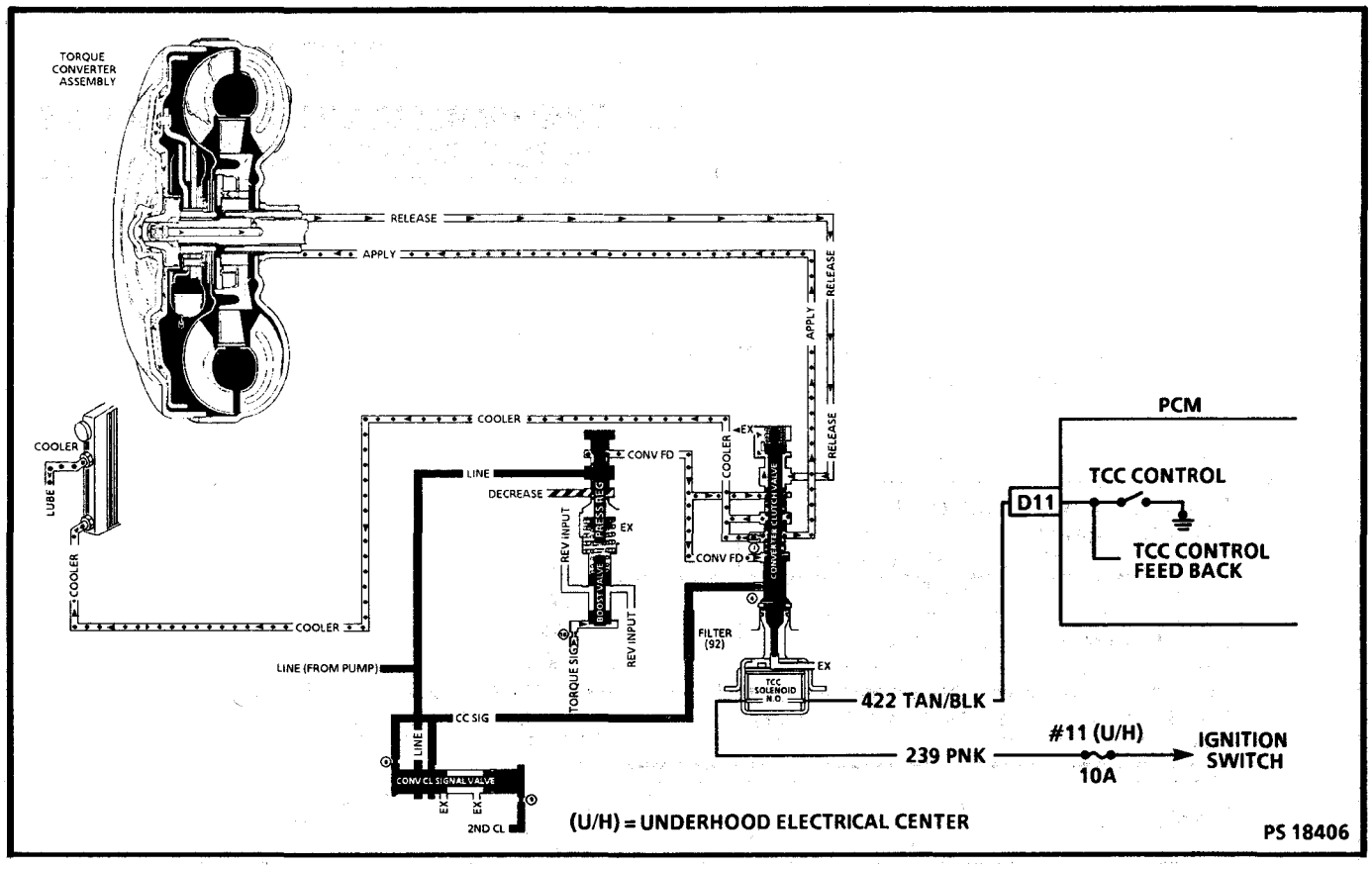
DTC 79

TRANSMISSION FLUID OVERTEMP 5.7L (VIN P) "F" CARLINE (SFI)



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

5-11-93
PS 17931



DTC 80

TRANSMISSION COMPONENT SLIPPING
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM energizes the Torque Converter Clutch (TCC) solenoid by grounding CKT 422. The TCC solenoid allows converter release fluid to exhaust past the #9 check ball, applying the TCC. The TCC solenoid will de-energize when the PCM no longer provides a ground. When the TCC solenoid is de-energized, this will block exhaust fluid, and release the TCC.

The PCM monitors the difference in engine speed and the calculated transmission input shaft speed. With the transmission selector in "D3" or "D4", indicated gear 2, 3, or 4, and TCC locked, the scan tool should display TCC slip speed of -50 RPM to +50 RPM.

DTC 80 Will Set When: TCC slip speed is greater than 100 RPM, TCC indicates "ON," gear indicates 2, 3, or 4, manual valve indicates "D3" or "D4", no DTC 28, TP between 0% and 35%, TFT between 60°C and 100°C. All conditions must be met for 10 seconds.

Action Taken (PCM will default to):

- Inhibit TCC operation.
- Set line pressure to max (harsh shifts).
- Inhibit 4th gear if in hot mode.

DTC 80 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 80 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks the indicated range signal to the actual selected range.
2. This test checks the torque converter for slippage while in a commanded locked-up state.

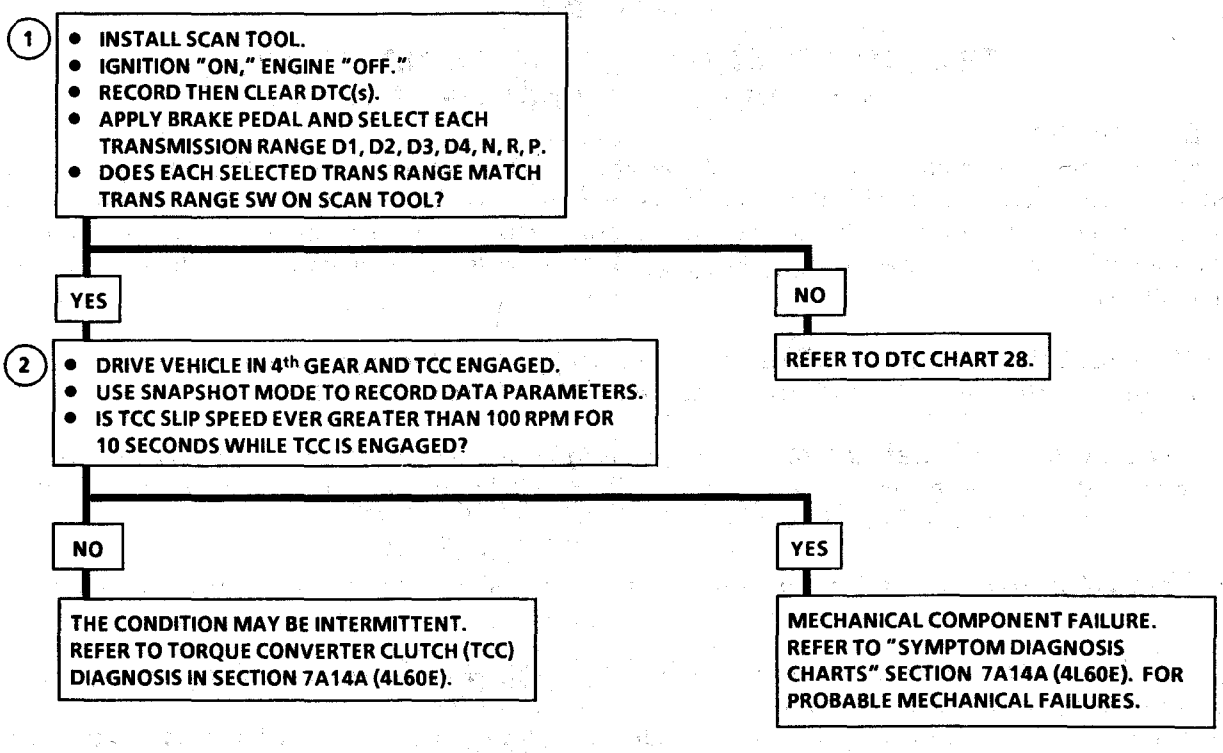
Diagnostic Aids:

- Check for poor connections at pass-thru connector.
- A faulty trans range pressure switch assembly may set DTC 80.

DTC 80

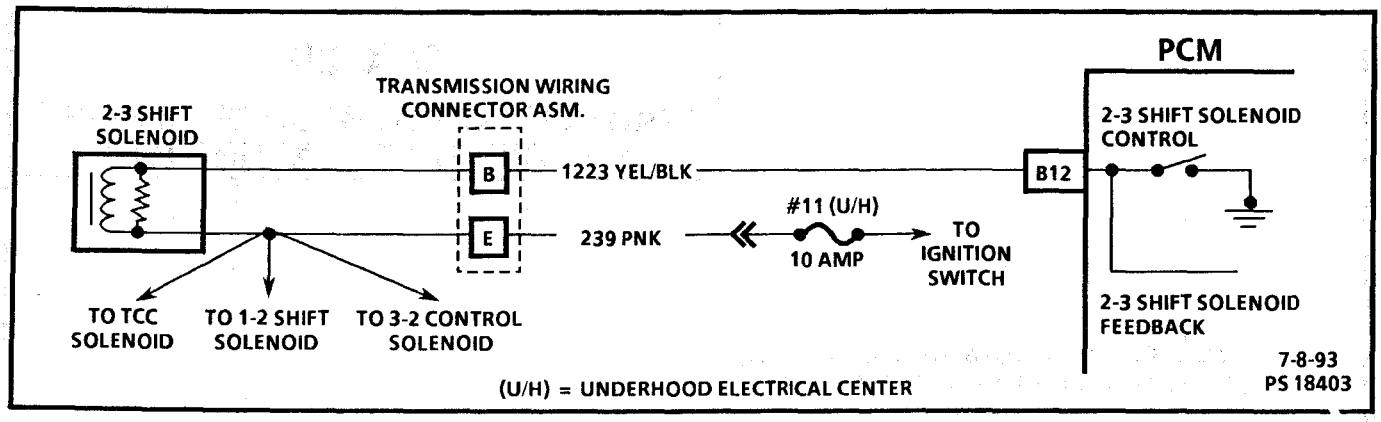
TRANSMISSION COMPONENT SLIPPING 5.7L (VIN P) "F" CARLINE (SFI)

NOTICE: PERFORM FLUID CHECKING PROCEDURE BEFORE PROCEEDING WITH DIAGNOSIS CHART.



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

6-24-93
PS 18605



DTC 81

TRANSMISSION 2-3 SHIFT SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The 2-3 shift solenoid is used to control fluid flow acting on the 2-3 shift valves. The solenoid is a normally open exhaust valve that is used with the 1-2 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission. Ignition voltage is supplied directly to the 2-3 shift solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 1223.

DTC 81 Will Set When: The PCM commands the solenoid "ON" and voltage remains high (B+) for 2 seconds. The PCM commands the solenoid "OFF" and voltage remains low (zero volts) for 2 seconds.

Action Taken (PCM will default to): If the solenoid is shorted "OFF" third gear only will occur. If the solenoid is shorted "ON" second gear only will occur. DTC 81 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 81 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks 2-3 shift solenoid and the internal transmission wiring for shorts.
2. This test checks for power to 2-3 shift solenoid from the ignition through the fuse.

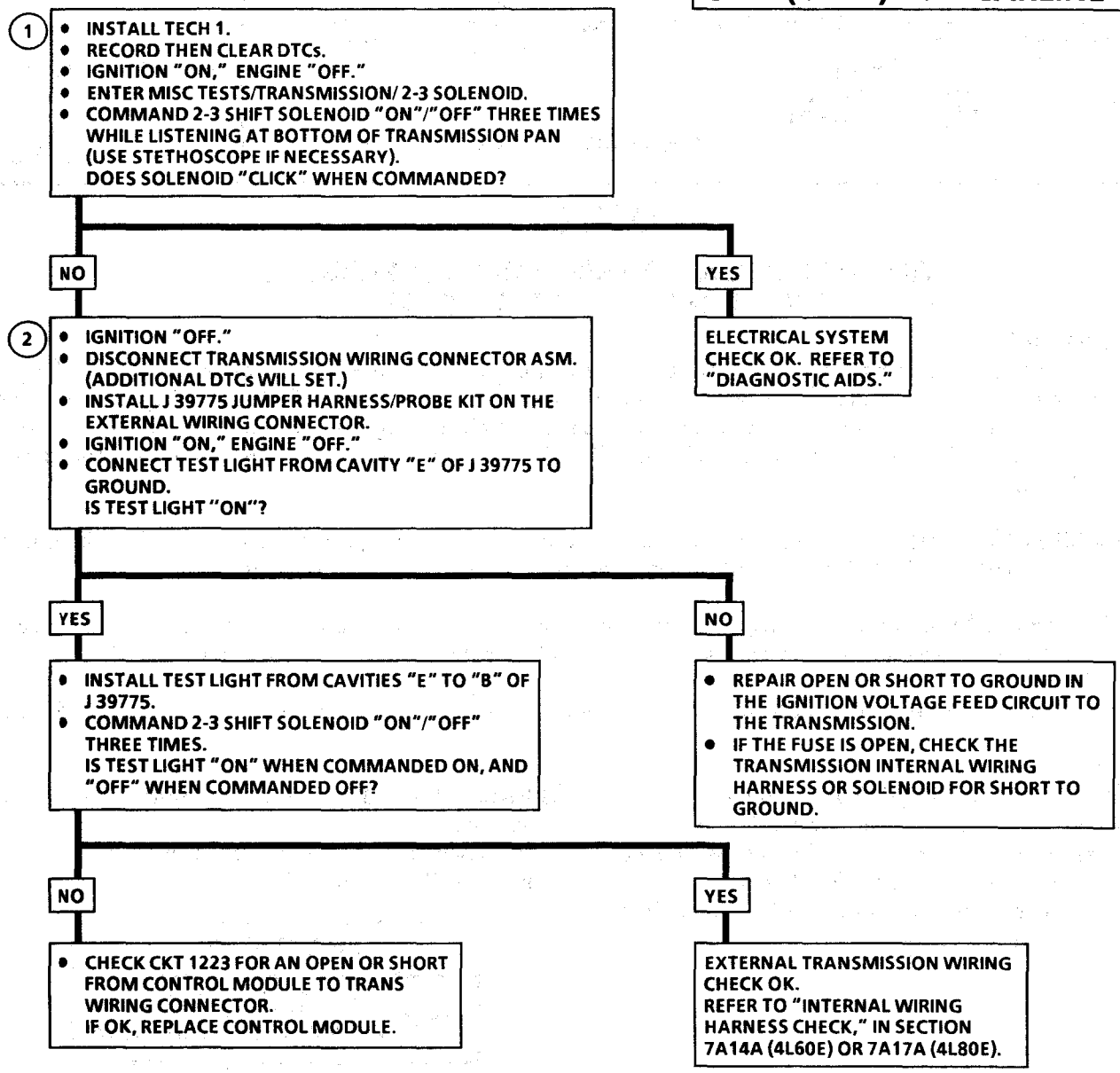
Diagnostic Aids: Check all connections at the transmission.

An open in the ignition feed circuit can cause multiple DTC(s) to set.

CHART 4L60E		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

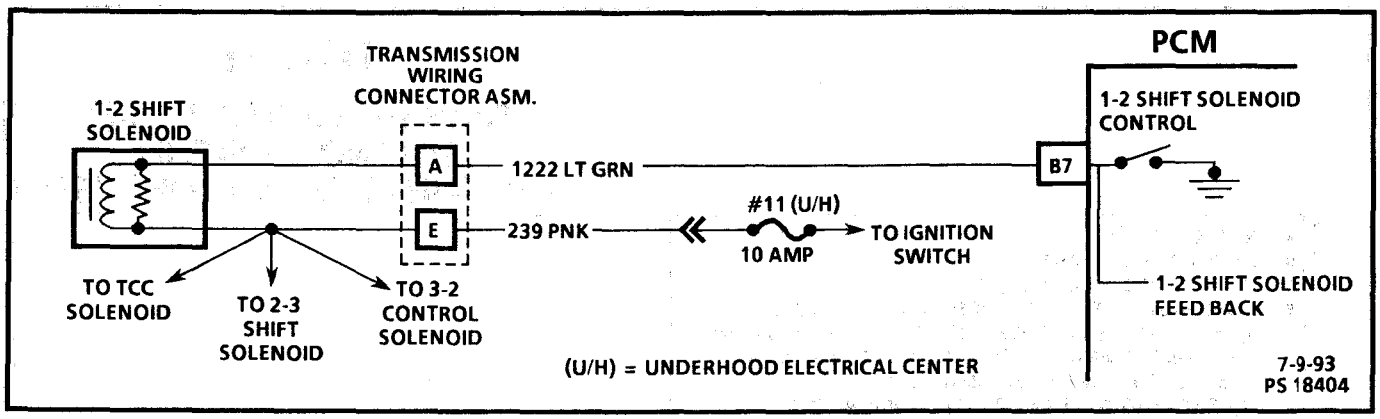
DTC 81

TRANSMISSION 2-3 SHIFT SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

4-13-93
PS 17093



DTC 82

TRANSMISSION 1-2 SHIFT SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The 1-2 shift solenoid is used to control fluid flow acting on the 1-2 and 3-4 shift valves. The solenoid is a normally open exhaust valve that is used with the 2-3 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission. Ignition voltage is supplied directly to the 1-2 shift solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 1222.

DTC 82 Will Set When: The PCM commands the solenoid "ON" and voltage remains high (B+) for 2 seconds. The PCM commands the solenoid "OFF" and voltage remains low (zero volts) for 2 seconds.

Action Taken (PCM will default to): The transmission will only allow second and third gear, or first and fourth gear. DTC 82 will set if the PCM detects the wrong voltage potential for 26 seconds on CKT 459.

DTC 82 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks 1-2 shift solenoid and the internal transmission wiring harness for shorts.
2. This test checks for power to 1-2 shift solenoid from the ignition through the fuse.

Diagnostic Aids: Check all connections for the transmission.

An open in the ignition feed circuit can cause multiple DTC(s) to set.

CHART 4L60E		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

DTC 82

TRANSMISSION 1-2 SHIFT SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

1

- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON." ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/ 1-2 SOLENOID.
- COMMAND 1-2 SHIFT SOLENOID "ON"/"OFF" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHESCOPE IF NECESSARY).
- DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

2

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM. (ADDITIONAL DTCs WILL SET.)
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND. IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "A" OF J 39775.
- COMMAND 1-2 SHIFT SOLENOID "ON"/"OFF" THREE TIMES.
- IS TEST LIGHT "ON" WHEN COMMANDED "ON," AND "OFF" WHEN COMMANDED "OFF"?

NO

- CHECK CKT 1222 FOR AN OPEN OR SHORT FROM THE TRANSMISSION EXTERNAL WIRING CONNECTOR TO THE CONTROL MODULE CONNECTOR. IF OKAY, REPLACE PCM.

YES

EXTERNAL TRANSMISSION WIRING CHECK OKAY. REFER TO "INTERNAL WIRING HARNESS CHECK" IN SECTION 7A14A (4L60E) OR 7A17A (4L80E).

NO

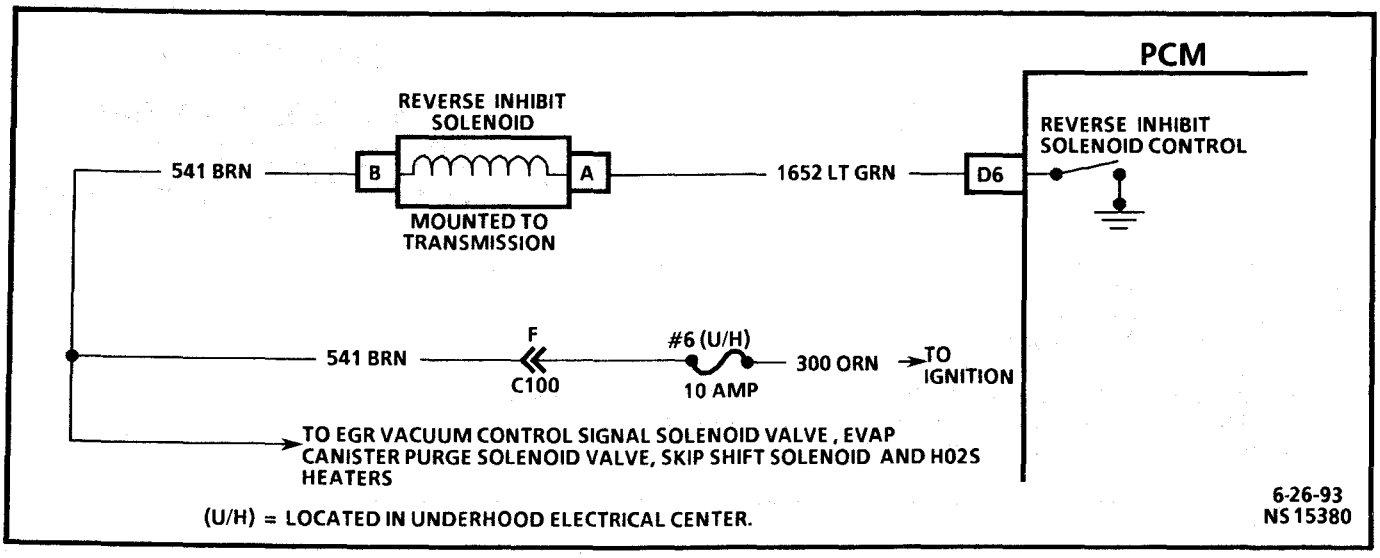
REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION. IF THE FUSE IS OPEN, CHECK THE TRANSMISSION INTERNAL WIRING HARNESS OR SOLENOID FOR SHORT TO GROUND.

YES

ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSTIC AIDS."

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

4-13-93
PS 17094



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.

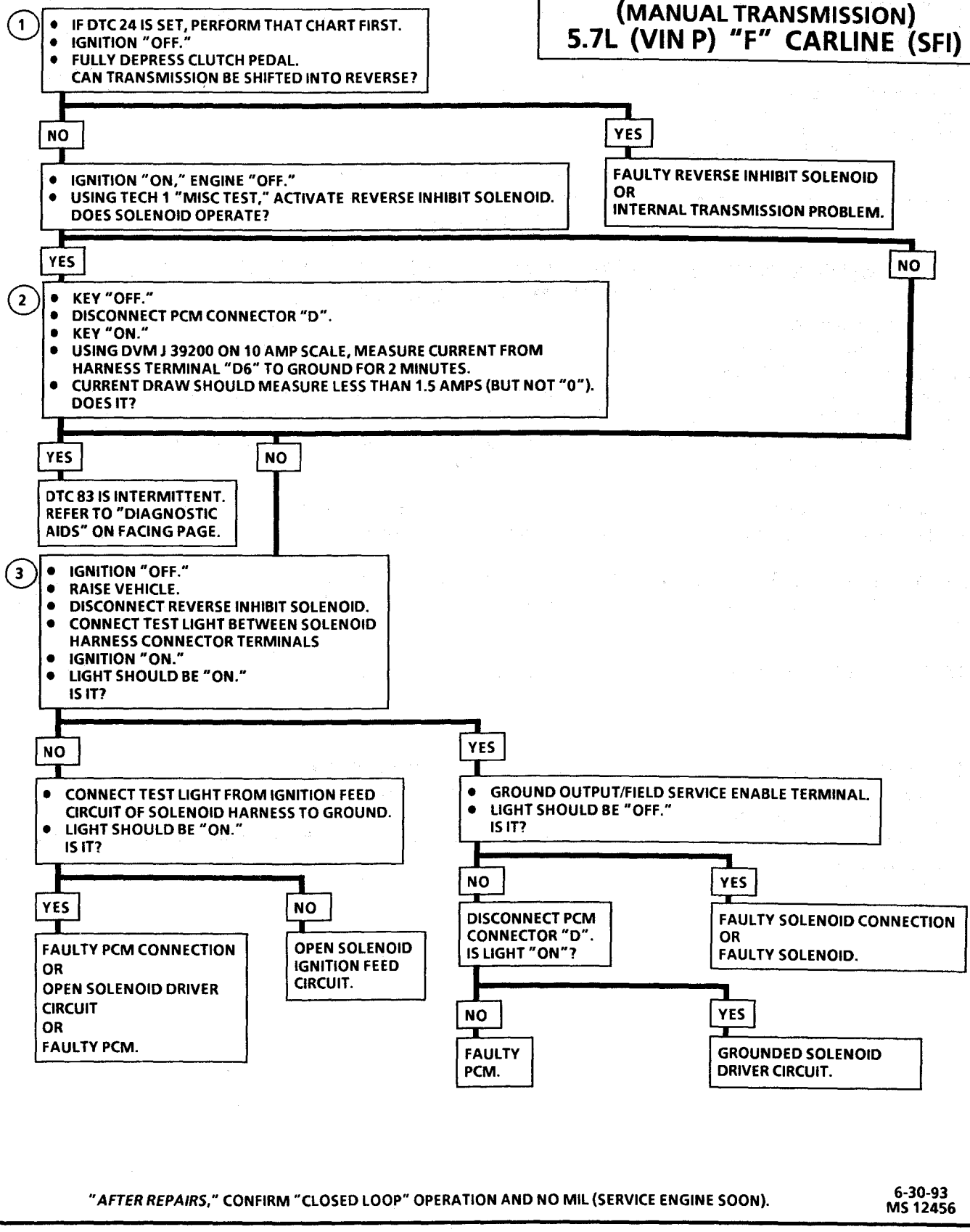
Action Taken (PCM will default to): DTC 83 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

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."

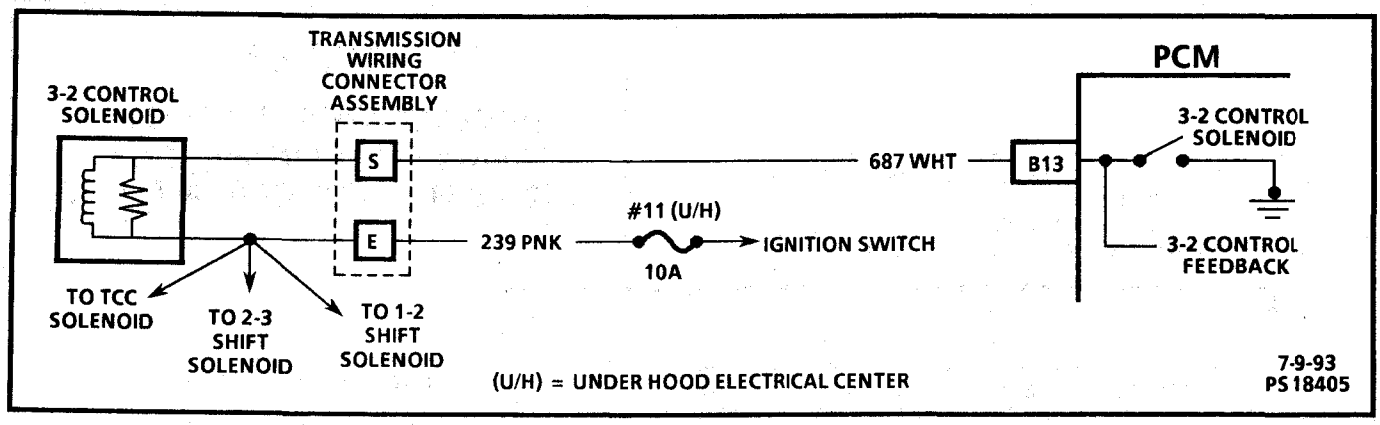
DTC 83

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



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

6-30-93
MS 12456



DTC 84

AUTOMATIC TRANSMISSION 3-2 CONTROL SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Hydraulically, the 3-2 control solenoid coordinates the apply rate of the 2-4 band with the hydraulic release of the 3-4 clutch during a 3-2 downshift.

The PCM continually monitors the 3-2 circuit duty cycle depending on the commanded state of the circuit terminal "B13". When the transmission is in first gear the duty cycle of the solenoid is equal to 0 ("OFF"). When the transmission is in second gear or higher the duty cycle of the solenoid will be about 90% ("ON"). When the transmission downshifts, 3-2, the duty cycle of the solenoid will drop.

DTC 84 Will Set When: The PCM commands the solenoid "ON," and the voltage remains high (B+) for 5 seconds or the PCM commands the solenoid "OFF," and the voltage remains low (zero volts) for 5 seconds.

Action Taken (PCM will default to): A soft landing to third gear and maximum transmission line pressure. DTC 84 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 84 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks the function of the 3-2 control solenoid and the internal transmission harness.
2. This test checks for power to the 3-2 control solenoid from the ignition through the fuse.

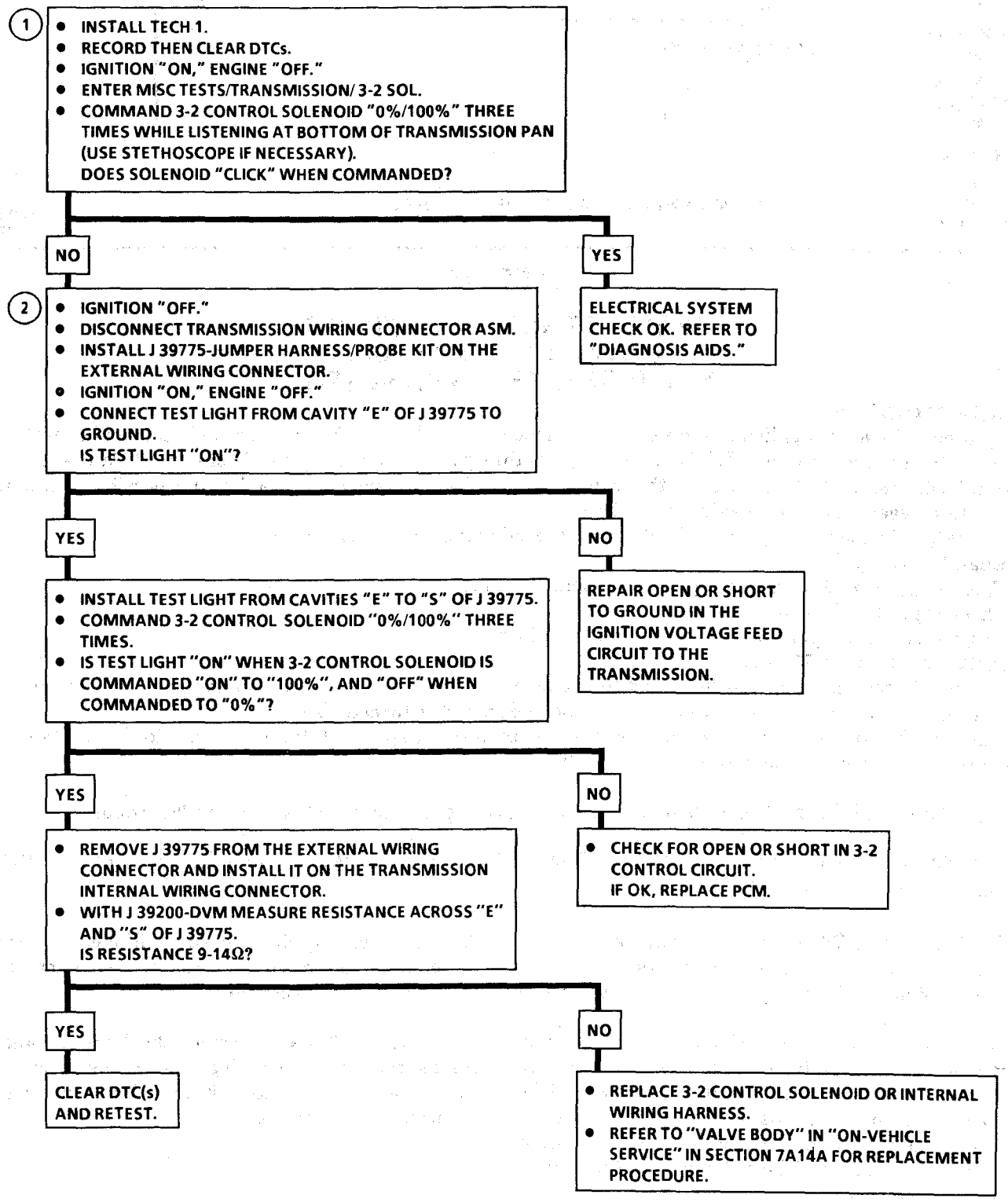
Diagnostic Aids: Check all connections at the transmission connector.

The 3-2 control solenoid feedback normally oscillate "ON/OFF" when the duty cycle is applied.

An open in the ignition feed circuit will cause multiple DTC(s) to set.

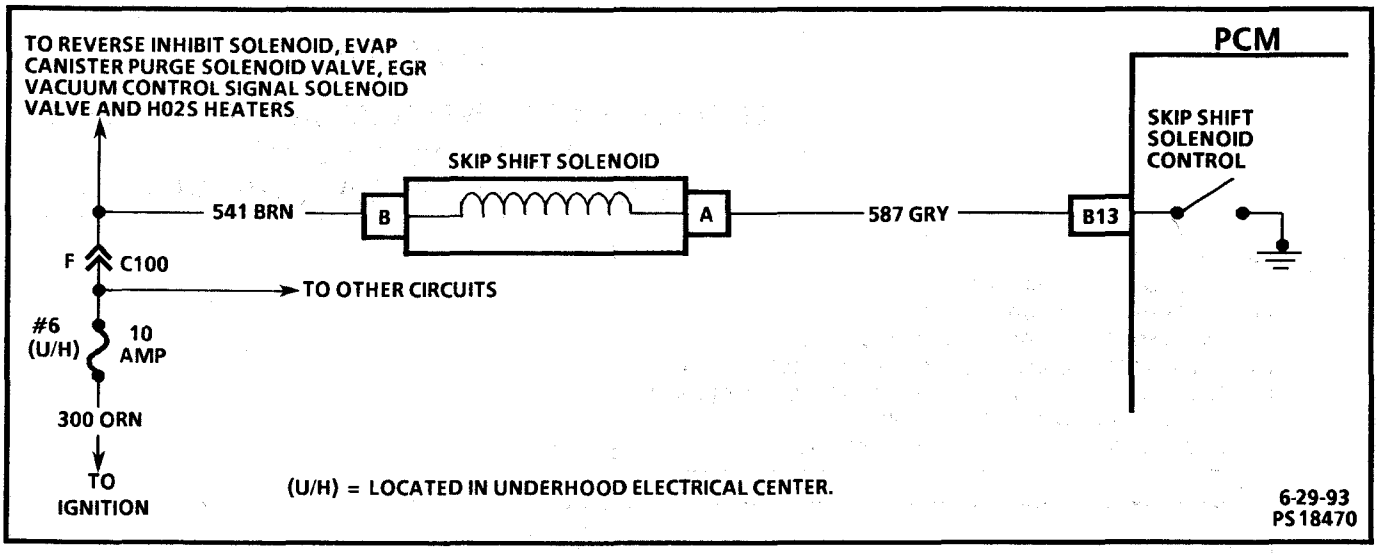
DTC 84

AUTOMATIC TRANSMISSION 3-2 CONTROL SOLENOID CIRCUIT 5.7L (VIN P) "F" CARLINE (SFI)



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

4-13-93
MS 13465



DTC 84

SKIP SHIFT SOLENOID CIRCUIT (MANUAL TRANSMISSION) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

Ignition voltage is supplied to the skip shift solenoid on CKT 541. The PCM controls solenoid operation by providing the ground path for CKT 587. During certain light load operating conditions the PCM energizes the skip shift solenoid which is mounted on the transmission. When this system is enabled, it is possible to shift from 1st gear to 4th gear only. This maximizes fuel economy.

The skip shift solenoid will be enabled if all of the following conditions are met.

- Engine running.
- Vehicle speed greater than 15 mph but less than 21 mph.
- Throttle position less than 35%.
- Engine coolant temperature greater than 77°C (171°F).
- BARO greater than 76 kPa.

The PCM uses the measured RPM and the vehicle speed to calculate what gear the vehicle is in. It is this calculation that determines when the skip shift solenoid should be turned "ON."

The skip shift (if all above criteria are met) will occur only once per upshift cycle. The skip shift system is not re-enabled unless vehicle speed drops below 1 mph.

DTC 84 Will Set When: The PCM detects the wrong voltage potential on CKT 587 for 26 seconds.

Action Taken (PCM will default to): DTC 84 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

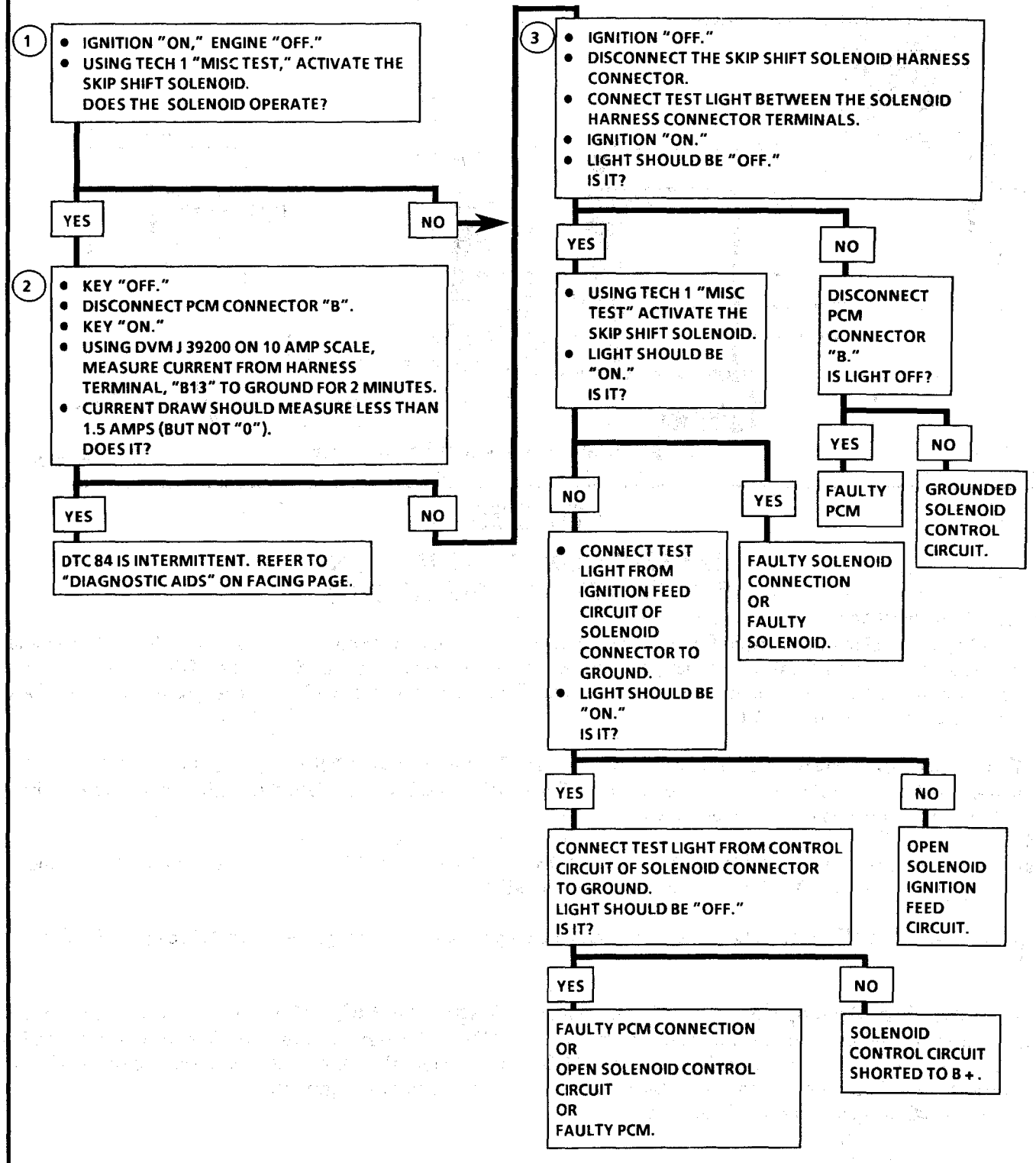
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test determines if the device can be controlled by the PCM.
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. The remaining circuit checks will identify a circuit problem that has caused an excessive current flow or inoperative solenoid.

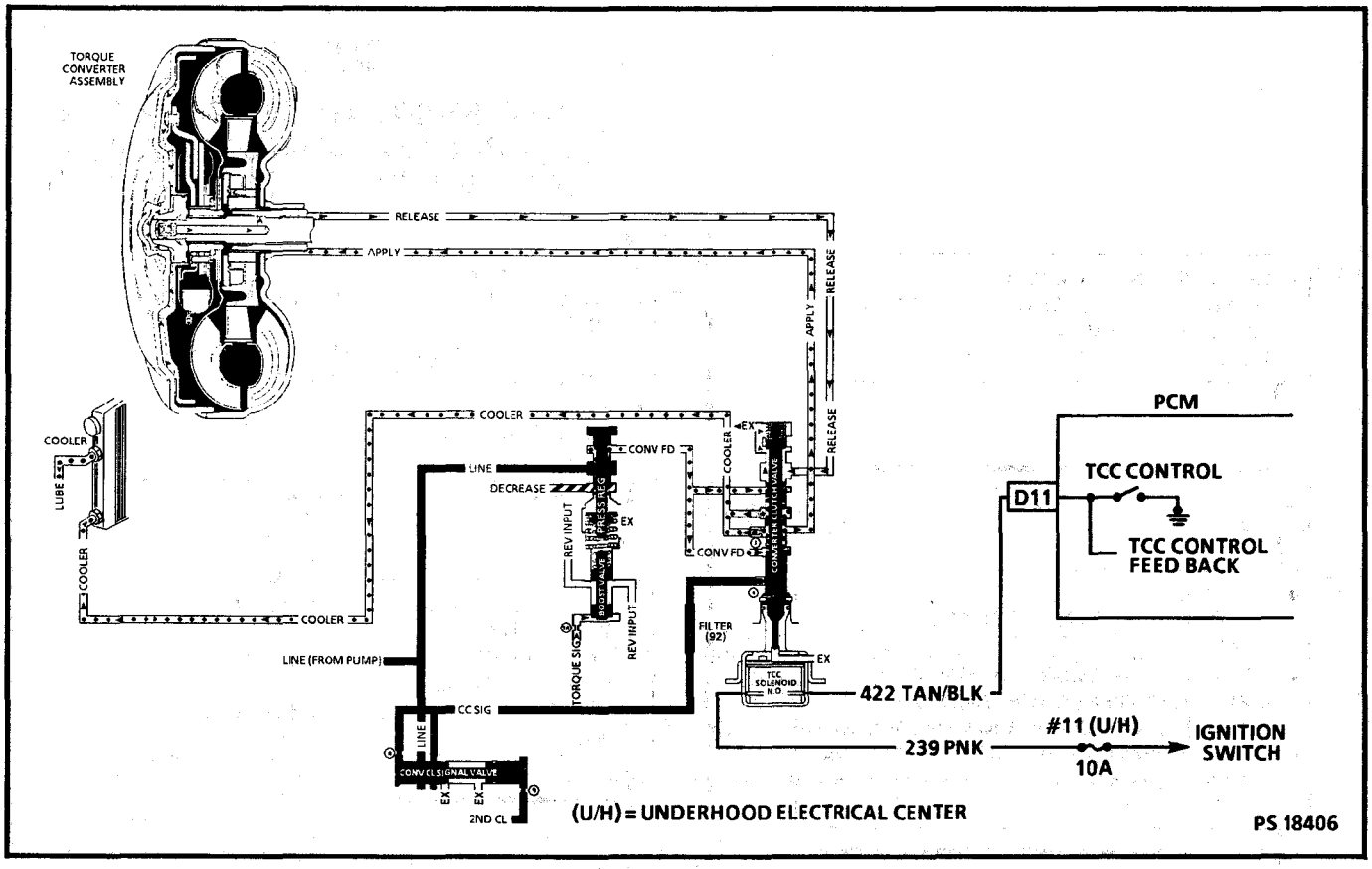
Diagnostic Aids: Inspect the harness and all related connectors including connections at the PCM. These may cause an intermittent. Check for damaged or pushed out terminals.

DTC 84

SKIP SHIFT SOLENOID CIRCUIT (MANUAL TRANSMISSION) 5.7L (VIN P) "F" CARLINE (SFI)



6-29-93
PS 18653



DTC 85

TRANSMISSION TCC STUCK "ON"
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM energizes the Torque Converter Clutch (TCC) solenoid by grounding CKT 422. The TCC solenoid allows converter release fluid to exhaust past the #9 check ball, applying the TCC. The TCC solenoid will de-energize when the PCM no longer provides a ground. When the TCC solenoid is de-energized, this will block exhaust fluid, and release the TCC.

DTC 85 Will Set When: TCC slip speed -20 to +20, TCC commanded "OFF," gear indicates 2, 3, or 4, TP indicates greater than 25%, manual valve indicates "D3" or "D4", no DTC 21, 22, or 28, engine speed greater than 300 RPM. All conditions must be met for 4 seconds.

Action Taken (PCM will default to): TCC is "ON" in all gears. DTC 85 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 85 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

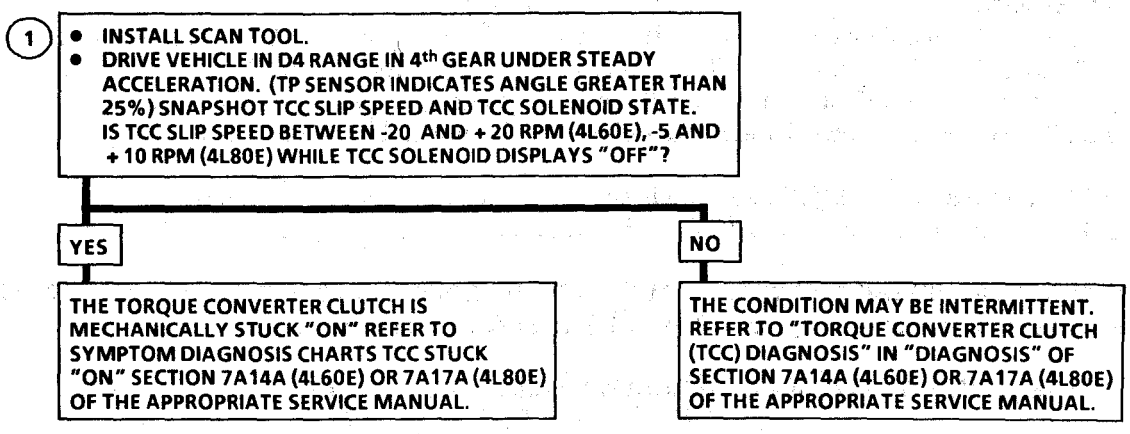
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test checks the mechanical state of the TCC when the PCM commands the TCC solenoid "OFF." TCC slip speed should increase.

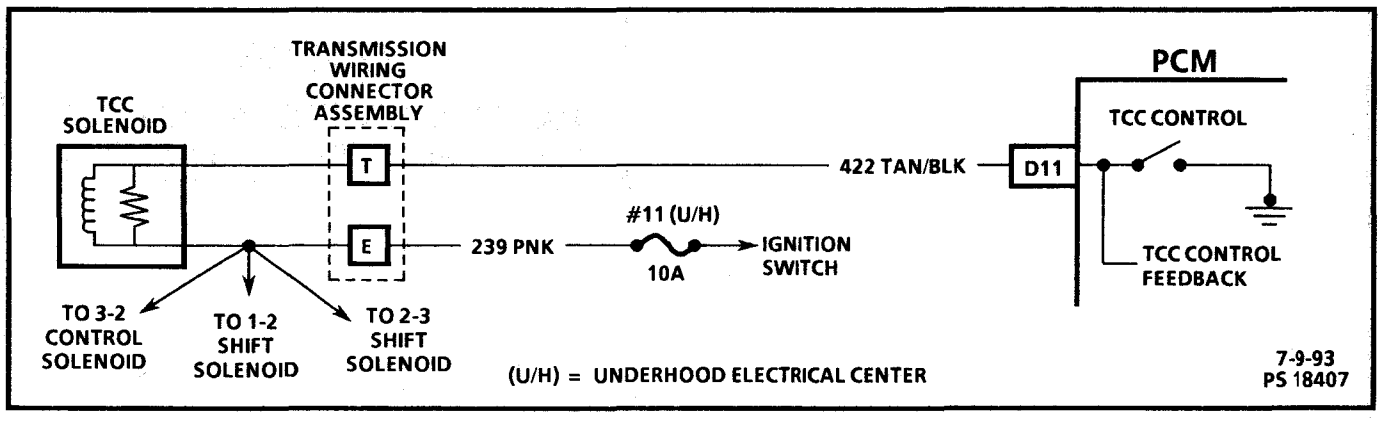
Diagnostic Aids: If the TCC is mechanically stuck "ON," vehicle speed is zero, brakes are applied, and D2 is selected, the TCC fluid will mechanically apply the TCC causing an engine stall.

DTC 85

TRANSMISSION TCC STUCK "ON" 5.7L (VIN P) "F" CARLINE (SFI)



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



DTC 90

TRANSMISSION TCC SOLENOID CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The TCC solenoid is an electrical device used to control fluid acting on the TCC converter clutch valve, which then controls TCC apply and release. The PCM monitors TP voltage, vehicle speed and other inputs to determine when to energize the TCC solenoid. Ignition voltage is supplied directly to the TCC solenoid. The Powertrain Control Module (PCM) controls the solenoid by providing the ground path through CKT 422.

DTC 90 Will Set When: The PCM commands the TCC solenoid "ON" and the voltage stays high (B+) for 2 seconds. The PCM commands the TCC solenoid "OFF" and the voltage drops to zero volts for 2 seconds.

Action Taken (PCM will default to): No TCC will occur, and no fourth gear if in hot mode. DTC 90 will be stored in the PCM memory but will not turn "ON" the Malfunction Indicator Lamp (MIL).

DTC 90 Will Clear When: The fault condition(s) no longer exist, and the ignition switch is cycled "OFF" then "ON."

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

1. This test checks for a shorted, internal transmission harness or TCC solenoid.
2. This test checks power supply to the TCC solenoid.

Diagnostic Aids: Check all connections at the transmission pass-thru connector.

Some slight TCC slip is normal.

An open in the ignition feed circuit will cause multiple DTC(s) to set.

DTC 90

TRANSMISSION TCC SOLENOID CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

1

- INSTALL TECH 1.
- RECORD THEN CLEAR DTCs.
- IGNITION "ON," ENGINE "OFF."
- ENTER MISC TESTS/TRANSMISSION/TCC SOLENOID.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES WHILE LISTENING AT BOTTOM OF TRANSMISSION PAN (USE STETHESCOPE IF NECESSARY).
- DOES SOLENOID "CLICK" WHEN COMMANDED?

NO

2

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM. (ADDITIONAL DTCs WILL SET.)
- INSTALL J 39775 JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- CONNECT TEST LIGHT FROM CAVITY "E" OF J 39775 TO GROUND. IS TEST LIGHT "ON"?

YES

- INSTALL TEST LIGHT FROM CAVITIES "E" TO "T" (4L60E) OR "E" TO "S" (4L80E) OF J 39775.
- COMMAND TCC SOLENOID "ON"/"OFF" THREE TIMES.
- IS TEST LIGHT "ON" WHEN COMMANDED "ON" AND "OFF" WHEN COMMANDED "OFF"?

NO

- CHECK CKT 422 (4L60E) OR CKT 1350 (4L80E) FOR AN OPEN OR SHORT FROM THE CONTROL MODULE TO THE TRANSMISSION WIRING CONNECTOR. IF OKAY, REPLACE CONTROL MODULE.

YES

EXTERNAL TRANSMISSION WIRING CHECKS OKAY. REFER TO "INTERNAL WIRING HARNESS CHECK" IN SECTION 7A14A (4L60E) OR 7A17A (4L80E).

YES

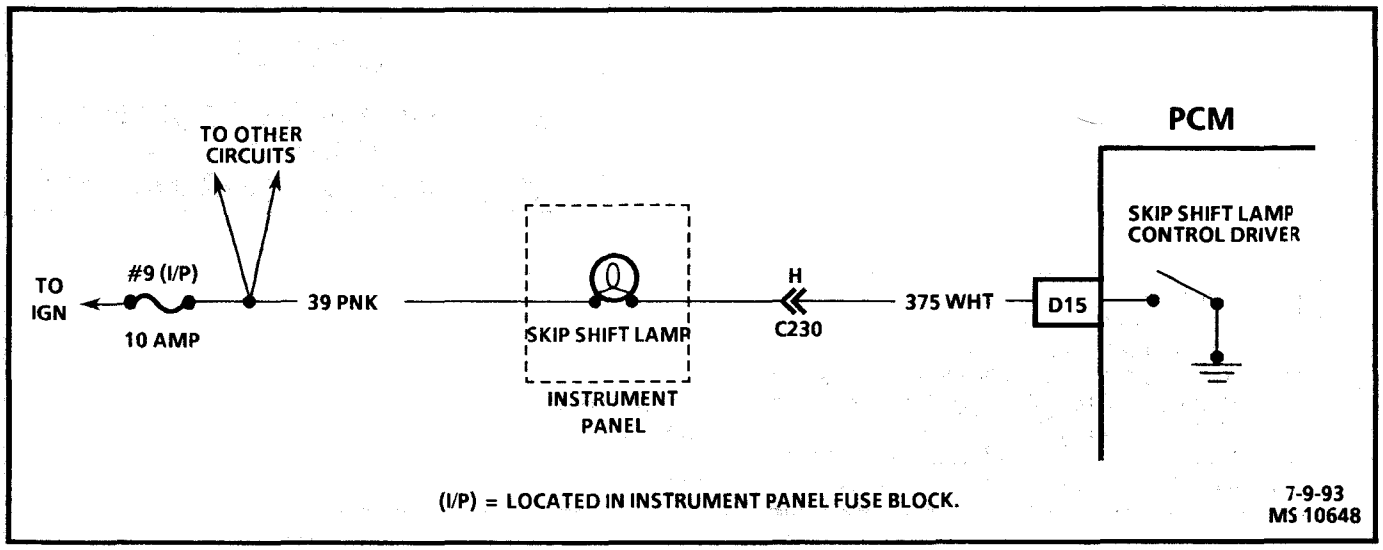
ELECTRICAL SYSTEM CHECK OK. REFER TO "DIAGNOSTIC AIDS."

NO

REPAIR OPEN OR SHORT TO GROUND IN THE IGNITION VOLTAGE FEED CIRCUIT TO THE TRANSMISSION. IF THE FUSE IS OPEN, CHECK THE TRANSMISSION INTERNAL WIRING HARNESS OR SOLENOID FOR SHORT TO GROUND.

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

4-13-93
PS 17530



DTC 91

SKIP SHIFT LAMP CIRCUIT (MANUAL TRANSMISSION) 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The skip shift lamp display is in the instrument panel. When the skip shift lamp is illuminated, the PCM is energizing the skip shift solenoid in the transmission and the gear shift can only be moved from 1st to 4th gear. This increases fuel economy. The lamp is controlled by the PCM and is turned "ON" by grounding CKT 375. The skip shift lamp will be enabled if all of the following conditions are met.

- Engine running.
- Vehicle speed greater than 15 mph but less than 21 mph.
- Throttle position less than 35%.
- Engine coolant temperature greater than 77°C (171°F).
- BARO greater than 76 kPa.

The PCM uses the measured RPM and the vehicle speed to calculate what gear the vehicle is in. It is this calculation that determines when the skip shift lamp should be turned "ON."

The skip shift (if all above criteria are met) will occur only once per upshift cycle. The skip shift system is not re-enabled unless vehicle speed drops below 1 mph.

DTC 91 Will Set When: The PCM detects the wrong voltage potential on CKT 375 for 26 seconds.

Action Taken (PCM will default to): DTC 91 will be stored in the PCM memory, but will not illuminate the Malfunction Indicator Lamp (MIL).

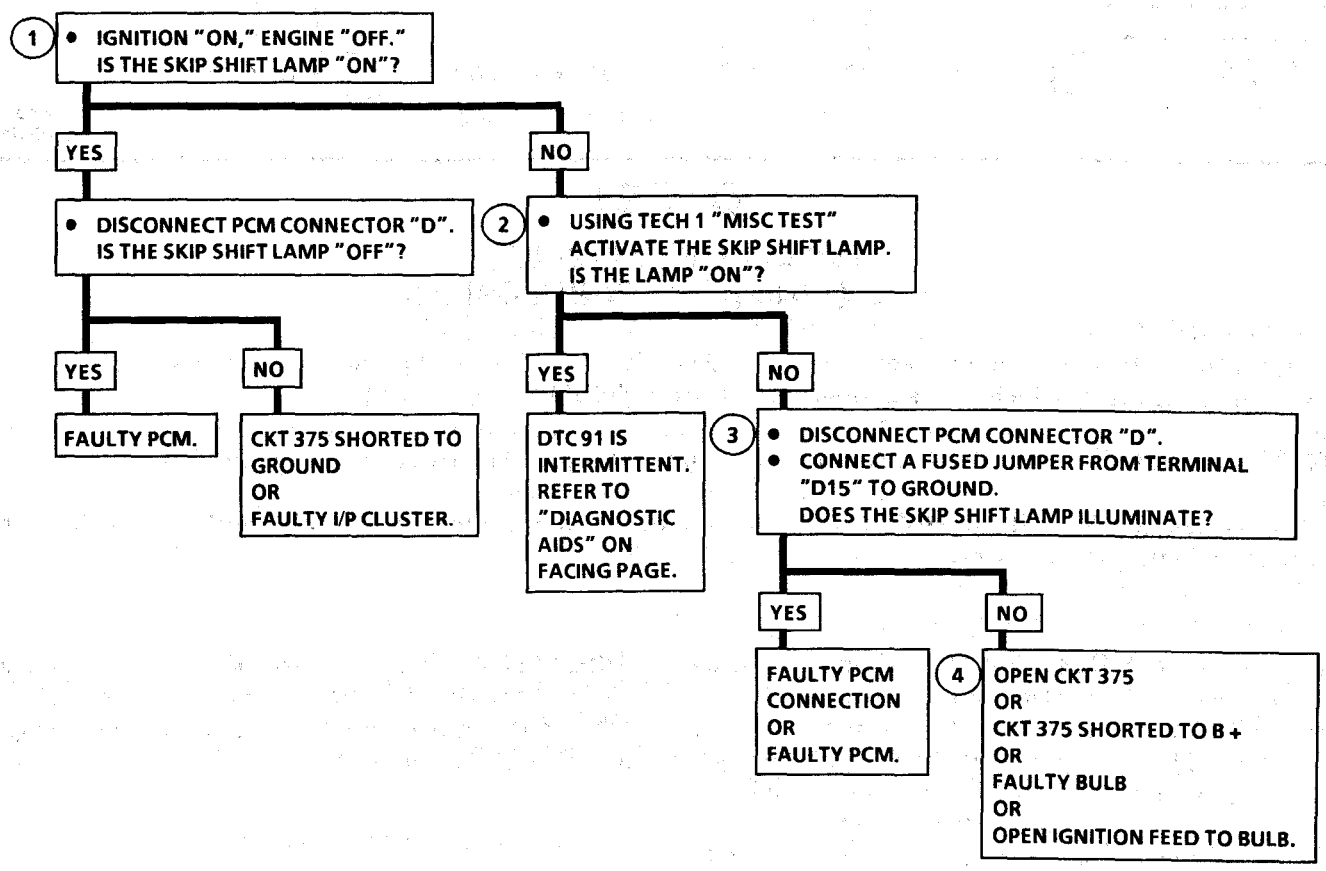
DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This should not turn "ON" the skip shift lamp. If the lamp is "ON," there is a short to ground in CKT 375 wiring or a fault in the PCM.
2. The PCM should ground CKT 375 and the skip shift lamp should come "ON."
3. This checks the skip shift lamp circuit up to the PCM connector. If the skip shift lamp illuminates, then the PCM connector is faulty or the PCM does not have the ability to ground the circuit.
4. For electrical diagnosis of the instrument panel, refer to SECTION 8A. For skip shift lamp bulb replacement, refer to SECTION 8C.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

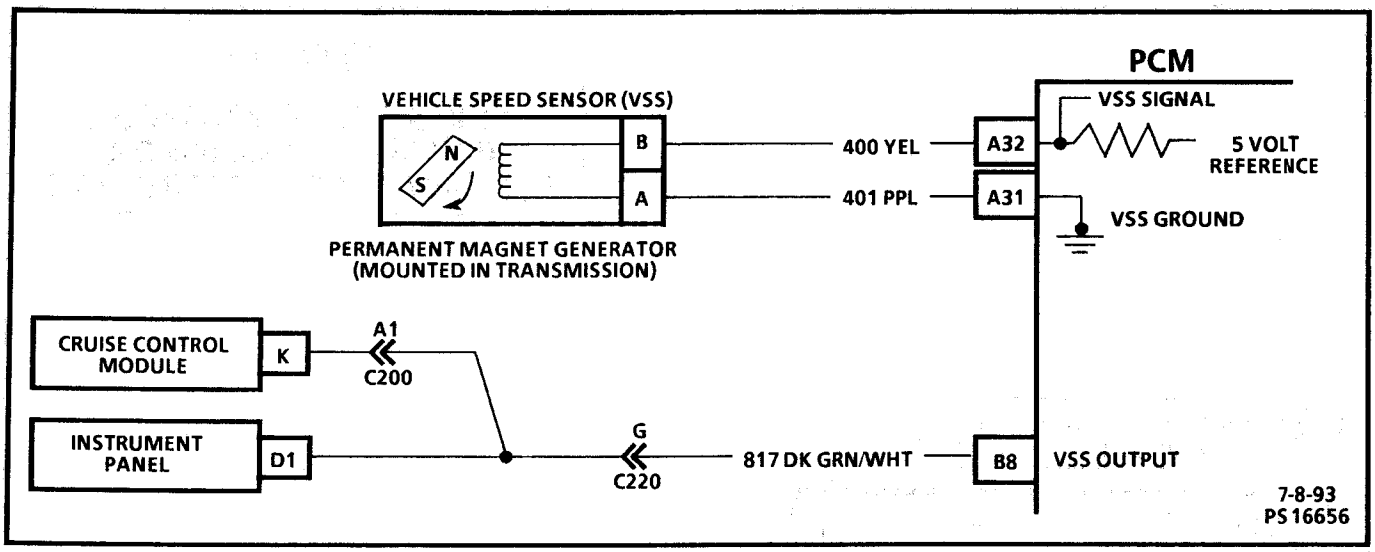
DTC 91

SKIP SHIFT LAMP CIRCUIT (MANUAL TRANSMISSION) 5.7L (VIN P) "F" CARLINE (SFI)



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

6-5-93
PS 18469



DTC 97

VSS OUTPUT CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM receives the vehicle speed sensor signal on CKT 400. The PCM processes this signal and sends it to the various components which use vehicle speed data through CKT 817.

DTC 97 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 817.

Action Taken (PCM will default to): DTC 97 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 ASR system must be disabled when performing this step. Whenever the ignition key is cycled to the "OFF" position and then cycled back "ON" the ASR system will default "ON."
2. Use J 35616-A (connector test adapter kit) to probe PCM harness terminals so damage does not occur to the terminals.
3. Refer to SECTION 8A-33 for complete diagnosis of CKT 817.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

DTC 97

VSS OUTPUT CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

NOTICE: THIS CHART ASSUMES THERE IS NO DTC 24 OR 72 SET.

1. IGNITION "OFF."
   - RAISE DRIVE WHEELS.
   - START ENGINE.
   - DISABLE "TC" SYSTEM.
   - WITH ENGINE IDLING IN GEAR, SPEEDOMETER SHOULD DISPLAY VEHICLE SPEED ABOVE 0. DOES IT?

YES → DTC 97 IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

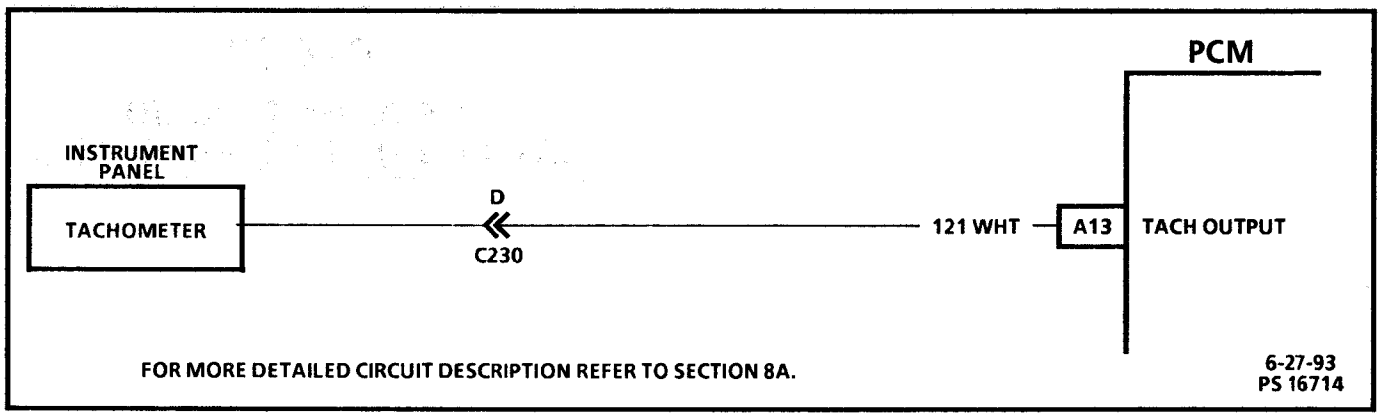
2. IGNITION "OFF."
   - DISCONNECT PCM CONNECTOR "B".
   - INSTALL SIGNAL GENERATOR TESTER J 33431-B TO PCM ELECTRICAL HARNESS TERMINAL "B8" (ONE TERMINAL CONNECTED TO THE PCM ELECTRICAL HARNESS AND THE OTHER TO GROUND).
   - IGNITION "ON," TESTER "ON" AND SET TO GENERATE A VEHICLE SPEED SIGNAL. DOES SPEEDOMETER INDICATE VEHICLE SPEED?

YES → FAULTY PCM CONNECTION OR FAULTY PCM.

NO

3. FOR FURTHER DIAGNOSIS OF CKT 817, REFER TO SECTION 8A-33.

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



DTC 99

TACH OUTPUT CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM receives the low resolution signal from the distributor on CKT 453. The PCM modifies this signal and sends it to the tachometer on CKT 121.

DTC 99 Will Set When: The PCM detects the wrong voltage potential for 26 seconds on CKT 121.

Action Taken (PCM will default to): DTC 99 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. Use J 35616-A (connector test adapter kit) to probe PCM harness terminal so damage does not occur to the terminals.
2. Refer to SECTION 8A-81 for further diagnosis of CKT 121.

Diagnostic Aids: Inspect the harness and all related connectors including the PCM connections. These may cause an intermittent. Check for damaged or pushed out terminals.

DTC 99

TACH OUTPUT CIRCUIT
5.7L (VIN P) "F" CARLINE (SFI)

- START ENGINE.
- WITH ENGINE IDLING, TACHOMETER SHOULD INDICATE ENGINE RPM. DOES IT?

NO

(1)

- IGNITION "OFF."
- DISCONNECT PCM CONNECTOR "A".
- INSTALL SIGNAL GENERATOR TESTER J 33431-B TO PCM ELECTRICAL HARNESS TERMINAL "A13" (ONE TERMINAL CONNECTED TO THE PCM ELECTRICAL HARNESS AND THE OTHER TO GROUND).
- IGNITION "ON," TESTER "ON" AND SET TO GENERATE A VEHICLE SPEED SIGNAL. DOES TACHOMETER INDICATE ENGINE RPM?

NO

(2) FOR FURTHER DIAGNOSIS OF CKT 121, REFER TO SECTION 8A.

YES

FAULTY PCM CONNECTION OR FAULTY PCM.

YES

DTC 99 IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

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

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SYMPTOMS
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IMPORTANT PRELIMINARY CHECKS

BEFORE STARTING

Before using this section you should have performed the "On-Board Diagnostic (OBD) System Check" and determined that:

1. The PCM and MIL are operating correctly.
2. There are no DTC(s) stored.
3. Tech 1 data is within normal operating range as listed in "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3- A".

SYMPTOM

Verify the customer complaint, and locate the correct symptom in the table of contents. Check the items indicated under that symptom.

VISUAL/PHYSICAL CHECK

Several of the symptom procedures call for a Careful Visual/Physical Check. The importance of this step cannot be stressed too strongly - it can lead to correcting a problem without further checks and can save valuable time. This check should include:

- PCM grounds for being clean, tight and in their proper location.
- Vacuum hoses for splits, kinks, and proper connections, as shown on "Vehicle Emission Control Information" label. Check thoroughly for any type of leak or restriction.
- Mass Air Flow (MAF) sensor installation. The arrows on the plastic portion of the sensor must point toward the engine.
- Air intake ducts for collapsed or damaged areas.
- Air leaks at throttle body mounting area, Mass Air Flow (MAF) sensor and intake manifold sealing surfaces.
- Ignition wires for cracking, hardness, proper routing and carbon tracking.
- Wiring for proper connections, pinches and cuts.

INTERMITTENTS

(Page 1 of 2)

Definition: Problem may or may not turn "ON" the MIL or store a DTC.

DO NOT use the Diagnostic Trouble Code (DTC) charts in "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3-A" for intermittent problems. The fault must be present to locate the problem.

- Most intermittent problems are caused by faulty electrical connections or wiring. Perform careful visual/physical check as described at start of "Symptoms," Section "6E3-B". Check for:
  - Poor mating of the connector halves or a terminal not fully seated in the connector body (backed out).
  - Improperly formed or damaged terminal. All connector terminals in the problem circuit should be carefully reformed or replaced to ensure proper contact tension.
  - Poor terminal to wire connection. This requires removing the terminal from the connector body to check. Refer to "Introduction" in SECTION 8A. Also, check underhood electrical center for corrosion.

- If a visual/physical check does not find the cause of the problem, the vehicle may be driven with a J 39200 Digital Multimeter connected to a suspected circuit. A Tech 1 can also be used to help detect intermittent conditions. An abnormal voltage, or reading, when the problem occurs, indicates the problem may be in that circuit. If the wiring and connectors check OK, and a DTC was stored for a circuit having a sensor, except for DTCs 43, 44, 45, 64, and 65 substitute a known good sensor and recheck.

- Loss of diagnostic code memory. To check, disconnect MAP and idle engine until the MIL comes "ON." DTC 34 should be stored, and kept in memory when ignition is turned "OFF." If not, the PCM is faulty.

- An intermittent MIL with no stored DTC may be caused by:
  - Ignition coil shorted to ground and arcing at ignition wires or plugs.
  - MIL wire to PCM shorted to ground.
  - Output/field service enable terminal/wire to PCM, shorted to ground.
  - PCM grounds, refer to PCM wiring diagrams.

- If the intermittent condition exists as a "start and then stall," check for DTC(s) relating to the theft deterrent systems.

INTERMITTENTS

(Page 2 of 2)

Definition: Problem may or may not turn "ON" the MIL or store a DTC.

- Check for an electrical system interference caused by a defective relay, PCM driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the faulty component is operated.

- Check for improper installation of electrical options such as lights, cellular phones, etc.

- All Ignition Control (IC) wires should be routed away from secondary ignition wires, distributor, coil and generator. All wires from the PCM to distributor should have a good connection.

- Check for open diode across A/C compressor clutch, and for other open diodes (refer to wiring diagrams).

- If problem has not been found, refer to "PCM Connector Symptom" charts at the end of "Symptoms," Section "6E3-B".

HARD START

Definition: Engine cranks OK, but does not start for a long time. Does eventually run, or may start but immediately dies.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Make sure the driver is using the correct starting procedure.

SENSORS

- **CHECK:** Engine Coolant Temperature (ECT) sensor using a scan tool, compare engine coolant temperature with ambient temperature on a cold engine.
  - If engine coolant temperature reading is 5 degrees greater than or less than ambient air temperature on a cold engine, check resistance in engine coolant sensor circuit or sensor itself. Compare ECT resistance value to the "Diagnostic Aids" chart on DTC 15 chart.
- **CHECK:** MAP sensor, use CHART C-1D.
- **CHECK:** Mass Air Flow (MAF) sensor installation. A MAF sensor that is installed backwards can cause a rich condition. A malfunctioning MAF sensor may cause a no start or hard starts.
- **CHECK:** TP sensor for binding or a high TP sensor voltage with the throttle closed (should read between .3 and .9 volt).

FUEL SYSTEM

- **CHECK:** Fuel pump relay operation - pump should turn "ON" for 2 seconds when ignition is turned "ON." Use CHART A-5.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.
- **CHECK:** Both injector fuses (visual inspect).

NOTICE: A faulty in-tank fuel pump check valve will allow the fuel in the lines to drain back to the tank after engine is stopped. To check for this condition, perform fuel system diagnosis CHART A-7.

IGNITION SYSTEM

- **CHECK:** For proper ignition voltage output with spark tester J 26792 (ST 125).
- **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:** Bare or shorted ignition wires.
- **CHECK:** Loose ignition coil ground.
- **CHECK:** Coil fuse.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ADDITIONAL CHECKS

- **CHECK:** IAC operation - use CHART C-2C.
- **CHECK:** Basic engine problem. Refer to SECTION 6A.
- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)

SURGES AND/OR CHUGGLES

Definition: Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and slows down with no change in the accelerator pedal.

PRELIMINARY CHECKS

- Perform the careful visual/physical check as described at start of "Symptoms," Section "6E3-B".
- Be sure driver understands transmission torque converter clutch, and A/C compressor operation as explained in the owner's manual.

SENSORS

- **CHECK:** Heated Oxygen Sensors (HO2S). The Heated Oxygen Sensors (HO2S) should respond quickly to different throttle position, if they don't, check the HO2S for silicon or other contaminates from fuel, or use of improper RTV sealant. The sensors may have a white powdery coating and result in a high but false signal voltage (rich exhaust indication). The PCM will then reduce the amount of fuel delivered to the engine, causing a severe driveability problem. For more information, refer to "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1".

FUEL SYSTEM

NOTICE: To determine if the condition is caused by a rich or lean system, the vehicle should be driven at the speed of the complaint. Monitoring long term fuel trim will help identify a problem.

Lean - Long term fuel trim near 160. Refer to "Diagnostic Aids" on facing page of DTCs 44 and 64.

Rich - Long term fuel trim near 108. Refer to "Diagnostic Aids" on facing page of DTCs 45 and 65.

- **CHECK:** Fuel pressure while condition exists, use CHART A-7.
- **CHECK:** In-line fuel filter. Replace if dirty or plugged.

IGNITION SYSTEM

- **CHECK:** For ignition misfire, refer to "6E3-C4".
- **CHECK:** For proper ignition voltage output using spark tester J 26792 (ST 125).
- **CHECK:** Spark plugs. Remove spark plugs, check for wet plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. Repair or replace as necessary. Also, check condition of distributor cap, rotor and ignition wires.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ADDITIONAL CHECKS

- **CHECK:** Injector harness locations. Make sure each injector harness is connected to the correct injector/cylinder according to the firing order (firing order: 1-8-4-3-6-5-7-2).
- **CHECK:** PCM grounds for being clean, tight and in their proper location.
- **CHECK:** MAF connections.
- **CHECK:** Vacuum lines for kinks or leaks.
- **CHECK:** EGR - There should be no EGR at idle, use CHART C-7.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.
- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)

LACK OF POWER, SLUGGISH OR SPONGY

Definition: Engine delivers less than expected power. Little or no increase in speed when accelerator pedal is pushed down part way.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Compare customer's vehicle to similar unit. Make sure the customer has an actual problem.
- Remove and check air filter for dirt, or for being plugged. Replace as necessary.

FUEL SYSTEM

- **CHECK:** Restricted fuel filter.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.

IGNITION SYSTEM

- **CHECK:** KS system for excessive spark retard activity. Refer to CHART C-5. Use Tech 1.
- **CHECK:** Secondary voltage using a shop oscilloscope or a spark tester J 26792 (ST 125), to check for a weak coil.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ADDITIONAL CHECKS

- **CHECK:** PCM grounds for being clean, tight and in their proper locations. Refer to PCM wiring diagrams.
- **CHECK:** EGR operation for being open or partly open all the time. Use CHART C-7.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.
- **CHECK:** Exhaust system for possible restriction, use CHART B-1.
  - Inspect exhaust system for damaged or collapsed pipes.
  - Inspect mufflers for heat distress or possible internal failure.
  - For possible plugged catalytic converter. Check backpressure by removing AIR check valves near exhaust manifolds.
- **CHECK:** TC system cable adjuster assembly. Loss of performance can result from an improperly adjusted system which could prevent the throttle from attaining WOT. Refer to SECTION 5E2.
- **CHECK:** Torque Converter Clutch (TCC) for proper operation. Refer to SECTION C-8.
- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)

ENGINE MECHANICAL

- **CHECK:** Engine valve timing and compression. Refer to SECTION 6A.
- **CHECK:** Engine for correct or worn camshaft. Refer to SECTION 6A.

DETONATION/SPARK KNOCK

Definition: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that change with throttle opening.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".
- Park/Neutral Position (PNP) switch. Be sure Tech 1 indicates drive with gear selector in drive or overdrive, use CHART C-1A.
- If Tech 1 readings are normal (refer to facing page of "On-Board Diagnostic (OBD) System Check") and there are no engine mechanical faults, fill fuel tank with a premium gasoline that has a minimum octane reading of 92 and re-evaluate vehicle performance.
- **CHECK:** EGR system for not opening, use CHART C-7.
- **CHECK:** TCC operation, TCC applying too soon, refer to SECTION 7A14A or Automatic Transmission Control System," Section "6E3-C8".

COOLING SYSTEM

- Check for obvious overheating problems:
  - Low engine coolant.
  - Restricted air flow to radiator, or restricted water flow through radiator.
  - Inoperative electric cooling fan circuit(s), use CHART C-12.
  - Correct coolant solution should be a 50/50 mix of GM #1052753 or equivalent anti-freeze coolant and water.

FUEL SYSTEM

NOTICE: To determine if the condition is caused by a rich or lean system, the vehicle should be driven at the speed of the complaint. Monitoring long term fuel trim will help identify problem.
Lean - Long term fuel trim near 160. Refer to "Diagnostic Aids" on facing page of DTCs 44 and 64.
Rich - Long term fuel trim near 108. Refer to "Diagnostic Aids" on facing page of DTCs 45 and 65.

- **CHECK:** Fuel pressure, use CHART A-7.

IGNITION SYSTEM

- **CHECK:** Spark plugs for proper heat range. Refer to "Owner's Manual."
- **CHECK:** KS system for no retard, use CHART C-5.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ENGINE MECHANICAL

- **CHECK:** For excessive oil in the combustion chamber.
  - Valve oil seals for leaking.
- **CHECK:** Combustion chambers for excessive carbon buildup. Remove carbon with top engine cleaner and follow instructions on can.
- **CHECK:** Perform a cylinder compression test. Refer to SECTION 6A.
- **CHECK:** For incorrect basic engine parts such as cam, heads, pistons, etc.

ADDITIONAL CHECKS

- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)

HESITATION, SAG, STUMBLE

Definition: Momentary lack of response as the accelerator is pushed down. Can occur at all vehicle speeds. Usually more severe when first trying to make the vehicle move, as from a stop sign. May cause engine to stall if severe enough.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

SENSORS

- **CHECK:** TP sensor - Check TP sensor for binding or sticking. TP sensor signal voltage should increase at a steady rate as throttle is moved toward Wide Open Throttle (WOT).
- **CHECK:** MAP sensor - use CHART C-1D.

FUEL SYSTEM

- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Contaminated fuel.
- **CHECK:** Evaporative Emission (EVAP) canister purge system for proper operation, use CHART C-3.
- **CHECK:** Fuel injectors. Perform injector balance test, use CHART C-2A/Tech 1.

IGNITION SYSTEM

- **CHECK:** Spark plugs for being fouled, or for there being faulty secondary wiring.
- **CHECK:** Ignition system ground.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ADDITIONAL CHECKS

- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)
- **CHECK:** EGR operation, use CHART C-7.
- **CHECK:** Engine thermostat functioning correctly and proper heat range.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.
- **CHECK:** Injector harness locations. Make sure injector harness is connected to the correct injector/cylinder according to the firing order (firing order 1-8-4-3-6-5-7-2).

CUTS OUT, MISSES

Definition: Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases, not normally felt above 1500 RPM or 48 km/h (30 mph). The exhaust has a steady spitting sound at idle or low speed.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

CYLINDER BALANCE TEST

- Perform misfire check in "Distributor Ignition (DI) System," Section "6E3-C4".

ENGINE MECHANICAL

- **CHECK:** Compression. Perform compression check on questionable cylinder(s). If compression is low, repair as necessary. Refer to SECTION 6A.
- **CHECK:** Base engine. Remove rocker covers, check for bent pushrods, worn rocker arms, broken valve springs, worn camshaft lobes and valve timing, repair as necessary. Refer to SECTION 6A.

ADDITIONAL CHECKS

- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".
- **CHECK:** For EMI interference. An engine miss condition can be caused by Electromagnetic Interference (EMI) on the reference circuit. EMI can usually be detected by monitoring engine RPM with a scan tool. A sudden increase in RPM with little change in actual engine RPM change, indicates EMI is present. If the problem exists, check routing of secondary ignition wires, check distributor ground circuit.
- **CHECK:** Intake and exhaust manifold passage for casting flash.

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 the 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.

FUEL SYSTEM

NOTICE: Monitoring long term fuel trim will help identify the cause of the problem. If the system is running lean (long term fuel trim near 160), refer to "Diagnostic Aids" on facing page of DTCs 44 and 64. If the system is running rich (long term fuel trim near 108), refer to "Diagnostic Aids" on facing page of DTCs 45 and 65.

- **CHECK:** Incorrect minimum idle speed may be caused by foreign material accumulation in the throttle bore, coking on the throttle valve or on the throttle shaft, or throttle body tampering.
- **CHECK:** Injector harness locations make sure each injector harness is connected to the correct injector/cylinder according to the firing order (firing order: 1-8-4-3-6-5-7-2).
- **CHECK:** For injectors that are shorted internally. Compare injector resistance. Injector resistance should be within one ohm of each other.
- **CHECK:** Injector balance, use CHART C-2A.
- **CHECK:** For fuel in pressure regulator hose. If fuel is present, replace regulator assembly.
- **CHECK:** Evaporative Emission (EVAP) control system, use CHART C-3.
- **CHECK:** The Heated Oxygen Sensors (HO2S) should respond quickly to different throttle positions, if they don't, check the Heated Oxygen Sensors (HO2S) for silicon contamination from fuel, or use of improper RTV sealant. The sensors will have a white powdery coating, and will result in a high but false signal voltage (rich exhaust indication). The PCM will then reduce the amount of fuel delivered to the engine, causing a severe driveability problem. Refer to "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1" for more information.

IGNITION SYSTEM

- **CHECK:** For proper ignition voltage output with spark tester J 26792 (ST 125).
- **CHECK:** Perform misfire check in "Distributor Ignition (DI) System," Section "6E3-C4".
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ENGINE MECHANICAL

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

ROUGH, UNSTABLE, OR INCORRECT IDLE, STALLING

(Page 2 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 the engine.

ADDITIONAL CHECKS

- **CHECK:** MAP sensor, use CHART C-1D.
- **CHECK:** Throttle linkage for sticking or binding.
- **CHECK:** PNP switch circuit. Use CHART C-1A, or use Tech 1 and be sure scan 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, use CHART C-7.
- **CHECK:** A/C signal to PCM, Tech 1 should indicate A/C is being requested whenever A/C is selected. If problem exists with A/C "ON," check A/C system operation, use CHART C-10.
- **CHECK:** Check AIR system. There should be no air to exhaust ports while in "Closed Loop." Use CHART C-6.
- **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 System," Section "6E3-C13".
- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)
- **CHECK:** For broken motor mounts.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.

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.

EXCESSIVE EXHAUST EMISSIONS OR ODORS

Definition: Vehicle fails an emission test. Vehicle has excessive "rotten egg" smell. (Excessive odors do not necessarily indicate excessive emissions.)

PRELIMINARY CHECKS

- Perform "On-Board Diagnostic (OBD) System Check."
- If emission test shows excessive CO and HC check items which can cause an engine to run rich (long term fuel trim near 108), refer to "Diagnostic Aids" on facing page of DTCs 45 and 65.
- If emission test shows excessive NOx, check items which can cause an engine to run lean or too hot.

COOLING SYSTEM

- If the Tech 1 indicates a very high engine coolant temperature and the system is running lean:
  - **CHECK:** Engine coolant level.
  - **CHECK:** Engine thermostat for faulty part or for wrong heat range. Refer to SECTION 6B.
  - **CHECK:** Cooling fan operation, use CHART C-12.

FUEL SYSTEM

NOTICE: If the system is running rich (long term fuel trim near 108), refer to "Diagnostic Aids" on facing page of DTCs 45 and 65.
If the system is running lean (long term fuel trim near 160) refer to "Diagnostic Aids" on facing page of DTCs 44 and 64.

- **CHECK:** For properly installed fuel cap.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** Injector harness locations. Make sure each injector is connected to the correct injector/cylinder according to the firing order (firing order: 1-8-4-3-6-5-7-2).
- **CHECK:** Injector balance test, use CHART C-2A/Tech 1.
- **CHECK:** EVAP canister for fuel loading, use CHART C-3.

IGNITION SYSTEM

- **CHECK:** Spark plugs, ignition wires, and ignition components. Refer to SECTION 6D.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

ADDITIONAL CHECKS

- **CHECK:** For vacuum leaks.
- **CHECK:** EGR valve for not opening, use CHART C-7.
- **CHECK:** For lead contamination of catalytic converter (look for the removal of fuel filler neck restrictor).
- **CHECK:** Carbon build-up. Remove carbon with top engine cleaner. Follow instructions on can.
- **CHECK:** Crankcase ventilation valve for being plugged, stuck or blocked crankcase ventilation hose or fuel in the crankcase.
- **CHECK:** Calibration I.D. for most current and/or incorrect software. (Refer to service bulletins.)

DIESELING, RUN-ON

Definition: Engine continues to run after key is turned "OFF," but runs very roughly. If engine runs smoothly, check ignition switch and adjustment.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

FUEL SYSTEM

- **CHECK:** Injectors for leaking. Refer to "Fuel System Diagnosis," CHART A-7.

BACKFIRE

Definition: Fuel ignites in the intake manifold, or in exhaust system, making loud popping noise.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," Section "6E3-B".

IGNITION SYSTEM

- **CHECK:** Proper ignition coil output voltage with spark tester J 26792 (ST 125).
- **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:** Ignition wires for crossfire, also inspect distributor cap, ignition wires, and proper routing of ignition wires.
- **CHECK:** Distributor vent system (if so equipped). Refer to "Distributor Ignition (DI) System," Section "6E3-C4".

NOTICE: If an intermittent condition exists in the distributor ignition system, refer to "Distributor Ignition (DI) System," Section "6E3-C4" or SECTION 6D.

ENGINE MECHANICAL

- **CHECK:** Compression - Look for sticking or leaking valves, worn camshaft lobe, refer to SECTION 6A.
- **CHECK:** Valve timing, refer to SECTION 6A.
- **CHECK:** Intake and exhaust manifold passages for casting flash.

FUEL SYSTEM

- **CHECK:** Perform fuel system diagnosis check, use CHART A-7.
- **CHECK:** Fuel injectors. Perform injector balance test, use CHART C-2A/Tech 1.

ADDITIONAL CHECKS

- **CHECK:** EGR gasket for faulty or loose fit.
- **CHECK:** EGR operation for being open all the time, use "Exhaust Gas Recirculation (EGR)" CHART C-7.
- **CHECK:** Secondary air injection system, use CHART C-6.
- **CHECK:** Intake and exhaust manifold for casting flash.

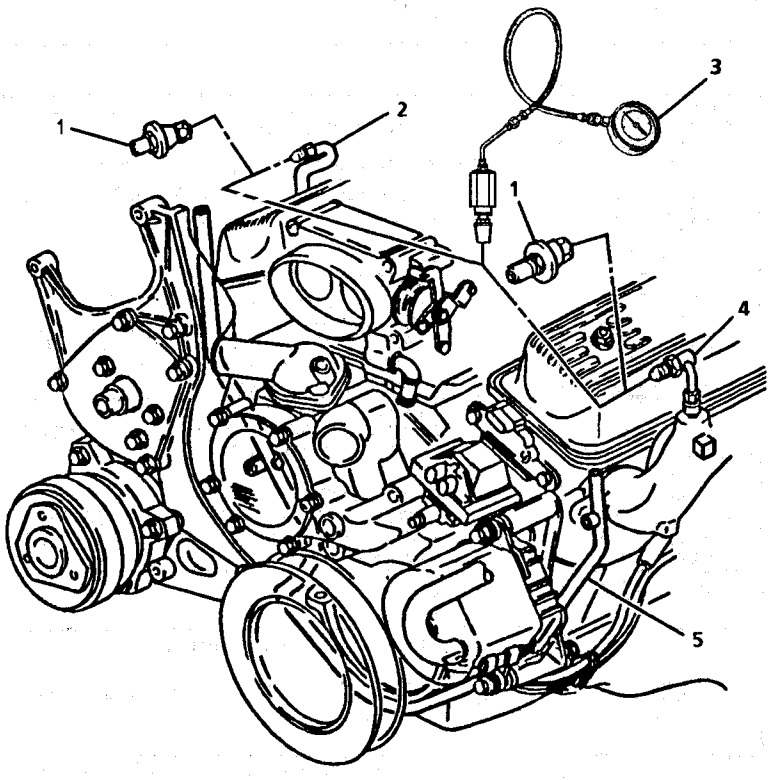
CHART B-1

RESTRICTED EXHAUST SYSTEM CHECK

Proper diagnosis for a restricted exhaust system is essential before any components are replaced.

CHECK AT AIR PIPE: (Left and Right Side AIR Pipes)

1. Remove the rubber hose at the exhaust manifold AIR pipe check valve. Remove check valve.
2. Connect Exhaust Backpressure kit (with air adapter) J 35314-A.
3. Insert the nipple into the exhaust manifold AIR pipe.



1 CHECK VALVE

2 RIGHT SIDE AIR PIPE

3 EXHAUST BACKPRESSURE KIT (J 35314-A)

4 LEFT SIDE AIR PIPE

5 AIR CROSSUNDER PIPE

PS 17500

DIAGNOSIS:

1. With the engine idling at normal operating temperature, observe the exhaust system backpressure reading on the gage. Reading should not exceed 8.6 kPa (1.25 psi).
2. Increase engine speed to 2000 RPM and observe gage. Reading should not exceed 20.7 kPa (3 psi).
3. If the backpressure at either speed exceeds specification, a restricted exhaust system is indicated.
4. Inspect the entire exhaust system for a collapsed pipe, heat distress, or possible internal muffler failure.
5. If there are no obvious reasons for the excessive backpressure, the three way catalytic converter is suspected to be restricted and should be replaced using current recommended procedures.

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CONNECTOR "A" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
A1					
A2 PCM GROUND	451	BLK/WHT	ENGINE GROUND		ENGINE CRANKS BUT WILL NOT START
A3 INJECTOR #1 CONTROL	1744	BLK	INJECTOR #1 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A4 INJECTOR #4 CONTROL	844	LT BLU/BLK	INJECTOR #4 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A5 INJECTOR #6 CONTROL	846	YEL/BLK	INJECTOR #6 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A6 INJECTOR #7 CONTROL	877	RED/BLK	INJECTOR #7 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A7 FP RELAY CONTROL	465	DK GRN/WHT	FUEL PUMP RELAY "C2"		LONG CRANK TIME BEFORE ENGINE STARTS
A8					
A9 EGR VACUUM CONTROL SIGNAL SOLENOID VALVE CONTROL	435	GRY	EGR VACUUM CONTROL SOL. VALVE "B"	27 (3) 32	DETONATION, STALL, ROUGH IDLE, AND POOR PERFORMANCE
A10 SECONDARY COOLING FAN/HIGH SPEED FAN CONTROL	473	DK BLU	EARLY PRODUCTION; SECONDARY COOLING FAN RELAY "F5" LATE PRODUCTION: COOLING FAN RELAY #2 "F5" AND COOLING FAN RELAY #3 "J2"		EARLY PRODUCTION: SECONDARY COOLING FAN INOPERATIVE OR "ON" AT ALL TIMES. LATE PRODUCTION: HIGH SPEED FANS INOPERATIVE (OPERATING AT LOW SPEED ONLY), HIGH SPEED FANS OPERATE WHENEVER LOW SPEED REQUESTED AND RIGHT FAN ON HIGH AT ALL TIMES.
A11 PRIMARY COOLING FAN/LOW SPEED FAN CONTROL	335	DK GRN	EARLY PRODUCTION: PRIMARY COOLING FAN RELAY "D2" LATE PRODUCTION: COOLING FAN RELAY #1 "D2"	77 (3, 4)	EARLY PRODUCTION: PRIMARY COOLING FAN INOPERATIVE OR "ON" AT ALL TIMES. LATE PRODUCTION: LOW SPEED FANS INOPERATIVE OR "ON" AT ALL TIMES. HIGH SPEED FANS: RIGHT FAN ONLY.
A12 EBTCM TP SENSOR SIGNAL	464	TAN/BLK	EBTCM "A14"		
A13 TACH OUTPUT	121	WHT	*	99 (3)	INOPERATIVE TACHOMETER
A14 AIR PUMP RELAY CONTROL	436	BRN	AIR PUMP RELAY "E2"	29 (3)	AIR PUMP INOPERATIVE OR "ON" AT ALL TIMES
A15 TRANS MODE LAMP CONTROL	1493	DK BLU	*	*	LAMP "ON" AT ALL TIMES OR "OFF" AT ALL TIMES
A16					
A17					

(1) OPEN CIRCUIT
(2) GROUNDED CIRCUIT
(3) OPEN/GROUNDED CIRCUIT
(4) SHORTED TO VOLTAGE
* REFER TO SECTION 8A.

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CONT.

PCM Connector "A" Symptom Chart (1 of 8)

CONNECTOR "A" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
A18 PCM GROUND	551	TAN/WHT	ENGINE GROUND		ENGINE CRANKS BUT WILL NOT START
A19 INJECTOR #2 CONTROL	1745	LT GRN/BLK	INJECTOR #2 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A20 INJECTOR #5 CONTROL	845	BLK/WHT	INJECTOR #5 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A21 INJECTOR #3 CONTROL	1746	PNK/BLK	INJECTOR #3 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A22 INJECTOR #8 CONTROL	878	DK BLU/WHT	INJECTOR #8 "A"	18 (3)	ROUGH IDLE, ENGINE MISS
A23 TRACTION CONTROL SYSTEM SPARK RETARD REQUEST	463	ORN/BLK	EBTCM "B14"		POOR PERFORMANCE, EBTCM DTC 74
A24					
A25 FUEL ENABLE SIGNAL	229	DK BLU	THEFT DETERRENT MODULE	46 (3)	ENGINE CRANKS BUT WILL NOT START
A26					
A27					
A28					
A29					
A30					
A31 VSS GROUND	401	PPL	VSS "A"	24 (1)	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE CONTROL
A32 VSS SIGNAL	400	YEL	VSS "B"	24 (3)	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE CONTROL

(1) OPEN CIRCUIT
(2) GROUNDED CIRCUIT
(3) OPEN/GROUNDED CIRCUIT
(4) SHORTED TO VOLTAGE
* REFER TO SECTION 8A

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PCM Connector "A" Symptom Chart (2 of 8)

CONNECTOR "B" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
B1 A/C REQUEST SIGNAL	762	DK GRN/WHT	HVAC CONTROL ASSEMBLY "A"		INOPERATIVE A/C (1) A/C "ON" AT ALL TIMES (2)
B2 LOW RESOLUTION SIGNAL	453	RED/BLK	TEST CONNECTOR "D" DISTRIBUTOR "A"	16 (3)	ENGINE CRANKS BUT WILL NOT START
B3 DISTRIBUTOR REFERENCE LOW SIGNAL	632	PNK/BLK	TEST CONNECTOR "D" DISTRIBUTOR "D"		ENGINE CRANKS BUT WILL NOT START (1)
B4					
B5 IGNITION CONTROL	423	WHT	IGNITION COIL MODULE "B"	41 (1,4) 42 (2)	ENGINE CRANKS BUT WILL NOT START
B6 SENSOR GROUND	470	BLK	ECT "A" TP SENSOR "B" ELECTRONIC TRANS "M"	15 (1) 21 (1)	LACK OF POWER, ROUGH IDLE, HIGH IDLE
B7 TRANSMISSION 1-2 SHIFT SOLENOID	1222	LT GRN	TRANSMISSION "A"	82 (3,4)	2nd AND 3rd, OR 1st AND 4th GEARS ONLY
B8 VSS OUTPUT	817	DK GRN/WHT	CRUISE MODULE "K" I/P "D1"	97 (3,4)	INOPERATIVE SPEEDOMETER, INOPERATIVE CRUISE
B9					
B10					
B11					
B12 TRANSMISSION 2-3 SHIFT SOLENOID	1223	YEL/BLK	TRANSMISSION "B"	81 (3,4)	2nd OR 3rd GEAR ONLY, NO TCC APPLY
B13 TRANSMISSION 3-2 SHIFT SOLENOID CONTROL (AUTOMATIC) OR SKIP SHIFT SOLENOID CONTROL (MANUAL)	687 OR 587	WHT OR GRY	TRANSMISSION "S" OR SOLENOID "A"	84 (3,4) OR 84 (1, 2)	HARSH 3-2 DOWNSHIFT, 3rd GEAR ONLY OR INOPERATIVE SKIP SHIFT (1), 4th GEAR ONLY (2)
B14 DISTRIBUTOR IGNITION FEED	631	RED	TEST CONNECTOR "C" DISTRIBUTOR "C"		ENGINE CRANKS BUT WILL NOT START (3)
B15 PCM BATTERY FEED	340	ORN		*	ENGINE CRANKS BUT WILL NOT START (3)
B16 SENSOR GROUND	452	BLK	MAP "A" IAT "A" A/C REFIG. PRESSURE SENSOR "A" A/C EVAP TEMP SENSOR "C"	23 (1) 33 (1) 66 (1) 71 (1)	POOR PERFORMANCE A/C INOPERATIVE
B17					
B18					
B19 MAF SENSOR SIGNAL	492	YEL	MAF "A"	48 (3,4)	ENGINE STALL, HESITATION WHEN MALFUNCTION OCCURS

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO SECTION 8A.

CONT'D

PCM Connector "B" Symptom Chart (3 of 8)

CONNECTOR "B" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
B20 HIGH RESOLUTION SIGNAL	430	PPL/WHT	TEST CONNECTOR "B" DISTRIBUTOR "B"	36 (3,4)	ENGINE SURGE, LACK OF PERFORMANCE
B21 A/C CLUTCH STATUS	59	DK GRN	A/C CLUTCH RELAY "B4" A/C CLUTCH "A"	68 (4) 69 (1)	A/C INOPERATIVE
B22					
B23					
B24					
B25					
B26					
B27					
B28 5 VOLT REFERENCE	474	GRY	TP SENSOR "A"	22 (3)	HIGH IDLE, LACK OF PERFORMANCE
B29 5 VOLT REFERENCE	416	GRY	A/C EVAPORATOR TEMPERATURE, SENSOR "A", MAP "C", A/C REFRIGERANT PRESSURE SENSOR "B"	34 (3) 66 (3)	INOPERATIVE A/C
B30 PCM IGNITION FEED	439	PNK	*		ENGINE CRANKS BUT WILL NOT START (3)
B31 PCM BATTERY FEED	340	ORN	*		
B32					

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO SECTION 8A.

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PCM Connector "B" Symptom Chart (4 of 8)

CONNECTOR "C" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
C1 IAC COIL "A" HIGH	1747	LT BLU/WHT	IAC "D"		INCORRECT IDLE, SURGE, STALL
C2 IAC COIL "A" LOW	1748	LT BLU/BLK	IAC "C"		INCORRECT IDLE, SURGE, STALL
C3					
C4					
C5 IAC COIL "B" LOW	444	LT GRN/BLK	IAC "A"		INCORRECT IDLE, SURGE, STALL
C6 IAC COIL "B" HIGH	1749	LT GRN/WHT	IAC "B"		INCORRECT IDLE, SURGE, STALL
C7 BANK 2 (RIGHT) HO2S LOW	1667	TAN	HO2S "A"	63 (1)	ROUGH IDLE, LEAN EXHAUST, POOR PERFORMANCE AND POOR FUEL ECONOMY
C8 BANK 2 (RIGHT) HO2S HIGH	1666	PPL	HO2S "B"	63 (1) 64 (2)	EXHAUST ODOR, POOR PERFORMANCE, POOR FUEL ECONOMY AND "OPEN LOOP".
C9					
C10					
C11 TRACTION CONTROL SYSTEM "ACTIVE" SIGNAL	832	LT BLU	EBTCM "A16"	74 (2)	
C12					
C13 PERFORMANCE MODE SWITCH SIGNAL	553	LT BLU	PERFORMANCE/ TRACTION CONTROL PROGRAM SWITCH "K"	*	NO AGGRESSIVE SHIFT PATTERN
C14 BRAKE SWITCH SIGNAL	420	PPL	BRAKE SWITCH "A"	37 (3) 38 (4)	NO TCC
C15 PNP SIGNAL	434	ORN/BLK	PNP SWITCH "B"		POOR FUEL ECONOMY, STALL, INCORRECT IDLE
C16 TRANSMISSION PRESSURE CONTROL SOLENOID HIGH	1228	RED/BLK	TRANSMISSION "C"	73 (3)	HARSH TRANSMISSION SHIFTS
C17					
C18					
C19 BANK 1 (LEFT) HO2S LOW	1653	TAN/WHT	HO2S "A"	13 (1)	ROUGH IDLE, LEAN EXHAUST, POOR PERFORMANCE AND POOR FUEL ECONOMY

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).

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CONT'D

PCM Connector "C" Symptom Chart (5 of 8)

CONNECTOR "C" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
C20 BANK 1 (LEFT) HO2S HIGH	1665	PPL/WHT	HO2S "B"	13 (1) 44 (2)	EXHAUST ODOR, POOR PERFORMANCE, POOR FUEL ECONOMY AND "OPEN LOOP" STATUS
C21 IAT SENSOR SIGNAL	472	TAN	IAT "B"	23 (1) 25 (2)	POOR FUEL ECONOMY
C22 TP SENSOR SIGNAL	417	DK BLU	TP SENSOR "C"	21 (4) 22 (3)	HIGH IDLE, LACK OF PERFORMANCE HARSH TRANSMISSION SHIFTS
C23 MAP SENSOR SIGNAL	432	LT GRN	MAP "B"	33 (4) 34 (3)	MODIFIED TRANSMISSION SHIFT PATTERN
C24					
C25 ECT SENSOR SIGNAL	410	YEL	ECT "B"	14 (2) 15 (1)	EXHAUST ODOR, ROUGH IDLE, POOR FUEL ECONOMY, TCC APPLY COLD
C26					
C27					
C28 TRANSMISSION RANGE SIGNAL "A"	1224	PNK	TRANSMISSION "N"	28 (3)	NO TCC, HARSH SHIFTS
C29 TRANSMISSION RANGE SIGNAL "B"	1225	DK BLU	TRANSMISSION "R"	28 (3)	NO TCC, HARSH SHIFTS
C30 TRANSMISSION RANGE SIGNAL "C"	1226	RED	TRANSMISSION "P"	28 (3)	NO TCC, HARSH SHIFTS
C31					
C32 PCM GROUND	451	BLK/WHT	ENGINE BLOCK		ENGINE CRANKS BUT WILL NOT START

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).

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PCM Connector "C" Symptom Chart (6 of 8)

CONNECTOR "D" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
D1 PCM GROUND	551	TAN/WHT	ENGINE BLOCK		ENGINE CRANKS BUT WILL NOT START
D2 TRANSMISSION PRESSURE CONTROL SOLENOID LOW	1229	LT BLU/WHT	TRANSMISSION "D"	73 (3)	HARSH TRANSMISSION SHIFTS
D3 PCM IGNITION FEED	439	PNK	*		ENGINE CRANKS BUT WILL NOT START
D4					
D5					
D6 REVERSE INHIBIT SOLENOID CONTROL	1652	LT GRN	MANUAL TRANSMISSION "A"	83 (3, 4)	UNABLE TO SHIFT INTO REVERSE OR WILL GO INTO REVERSE AT ANY SPEED
D7					
D8 A/C CLUTCH RELAY CONTROL	459	DK GRN/WHT	A/C CLUTCH RELAY "B5"	68 (2) 70 (3)	A/C INOPERATIVE
D9 MIL CONTROL	419	BRN/WHT	*	11 (3, 4)	MIL "ON" AT ALL TIMES OR MIL "OFF" AT ALL TIMES
D10 EVAP CANISTER PURGE SOLENOID VALVE CONTROL	428	DK GRN/WHT	EVAP CANISTER PURGE SOLENOID VALVE "B"	26 (3) 45 (2)	ROUGH RUN, FUEL ODOR
D11 TRANSMISSION TCC SOLENOID	422	TAN/BLK	TRANSMISSION "T"	90 (3)	NO TCC APPLY
D12 A/C REFRIGERANT PRESSURE SENSOR SIGNAL	380	RED/BLK	A/C REFRIGERANT PRESSURE SENSOR "C"	66 (3,4)	A/C INOPERATIVE
D13					
D14					
D15 SKIP SHIFT LAMP CONTROL	375	WHT	*	91 (3, 4)	SKIP SHIFT LAMP "ON" AT ALL TIMES OR "OFF" AT ALL TIMES
D16					
D17					
D18					
D19					

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).

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CONT.

PCM Connector "D" Symptom Chart (7 of 8)

CONNECTOR "D" SYMPTOMS CHART
32 PIN CONNECTOR

PIN FUNCTION	CKT #	WIRE COLOR	COMPONENT CONNECTOR CAVITY	DTC(s) AFFECTED	POSSIBLE SYMPTOMS FROM FAULTY CIRCUIT
D20 OUTPUT/FIELD SERVICE ENABLE	448	WHT/BLK	DLC "B"		FIELD SERVICE INOPERATIVE (1) MIL FLASHING WHILE ENGINE IS RUNNING (2)
D21					
D22 KS SIGNAL	496	DK BLU	KNOCK SENSOR	43 (3,4)	LACK OF PERFORMANCE DETONATION
D23					
D24 A/C EVAPORATOR TEMPERATURE SENSOR SIGNAL	732	DK BLU	A/C EVAPORATOR TEMPERATURE SENSOR "B"	71 (3)	INOPERATIVE A/C
D25					
D26					
D27					
D28 TRANSMISSION FLUID TEMPERATURE SENSOR SIGNAL	1227	YEL/BLK	TRANSMISSION "L"	58 (2) 59 (1,4)	EARLY OR DELAYED TRANSMISSION SHIFTS
D29					
D30 SERIAL DATA	800	TAN	DLC "M" EBTCM "A11" DERM "B11"		NO TECH 1 COMMUNICATIONS (NO DATA)
D31					
D32					

(1) OPEN CIRCUIT.
(2) GROUNDED CIRCUIT.
(3) OPEN/GROUNDED CIRCUIT.
(4) SHORTED TO VOLTAGE.
* REFER TO ELECTRICAL DIAGNOSIS (SECTION 8A).

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PCM Connector "D" Symptom Chart (8 of 8)

SECTION C
COMPONENT SYSTEMS

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.

Section "C" provides information on the following:

- General description of components and systems.
- On-vehicle service.
- Part names and group numbers.
- Diagnostic charts. These include a functional check of the system as well as diagnosis of any problem found in the functional check.

For locations of components, wiring diagrams, and PCM terminal end view, refer to the front of Section "6E3-A".

Following are the sub-section identification and the system covered:

- C1 Powertrain Control Module (PCM) and Sensors ..... Page C1-1
- C2 Fuel Metering System ..... Page C2-1
- C3 Evaporative Emission (EVAP) Control System ..... Page C3-1
- C4 Distributor Ignition (DI) System ..... Page C4-1
- C5 Knock Sensor (KS) System ..... Page C5-1
- C6 Secondary Air Injection (AIR) System ..... Page C6-1
- C7 Exhaust Gas Recirculation (EGR) System ..... Page C7-1
- C8 Automatic Transmission Control System ..... Page C8-1
- C10 A/C Clutch Circuit Diagnosis ..... Page C10-1
- C12 Electric Cooling Fan(s) ..... Page C12-1
- C13 Crankcase Ventilation System ..... Page C13-1
- C14 Air Intake System ..... Page C14-1

DIAGNOSTIC CHARTS

The diagnostic charts for each system are found after the on-vehicle service and parts information at the back of each section. Following are the charts found in this section.

- Chart C-1A Park/Neutral Position (PNP) Switch Diagnosis ..... Page C1-16
- Chart C-1D Manifold Absolute Pressure (MAP) Output Check ..... Page C1-18
- Chart C-2C Idle Air Control (IAC) Valve Check ..... Page C2-20
- Chart C-3 Evaporative Emission (EVAP) Canister Purge Solenoid Valve Check ..... Page C3-6
- Chart C-4A Distributor Ignition (DI) System Check (1 of 2) ..... Page C4-4
- Chart C-4B Misfire Check ..... Page C4-8
- Chart C-5 Knock Sensor (KS) System Check ..... Page C5-4
- Chart C-6 Secondary Air Injection (AIR) System Check ..... Page C6-6
- Chart C-7 Exhaust Gas Recirculation (EGR) System Check (1 of 2) ..... Page C7-4
- Chart C-8A Transmission Range (TR) Pressure Switch Assembly Circuit Check ..... Page C8-10
- Chart C-8B Performance Mode Switch Indicator Lamp Control Circuit Check ..... Page C8-12
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- Chart C-10 A/C Clutch Circuit Diagnosis (1 of 3) ..... Page C10-4
- Chart C-12A Electric Cooling Fan Control Circuit Diagnosis (1 of 2) (Non A/C and Early Production A/C) ..... Page C12-4
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SECTION C1
POWERTRAIN CONTROL MODULE (PCM) AND SENSORS

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GENERAL DESCRIPTION

POWERTRAIN CONTROL MODULE (PCM)

The Powertrain Control Module (PCM) (Figure C1-1) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance.

The PCM also performs a diagnostic function check of the system. It can recognize operational problems and alert the driver through the Malfunction Indicator Lamp (MIL) and store a DTC or DTCs which identify the problem areas to aid the technician in making repairs.

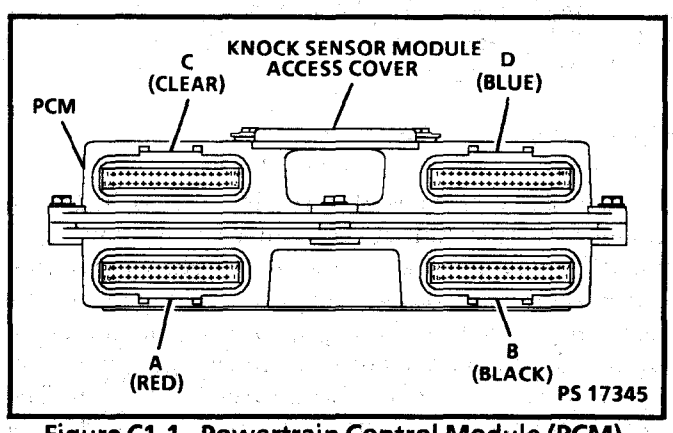


Figure C1-1 - Powertrain Control Module (PCM)

Refer to "Introduction," SECTION 6E for more information on using the diagnostic function of the PCM.

PCM Function

The PCM supplies 5 or 12 volts to power various sensors or switches. This is done through resistances in the PCM which are so high in value that a test light will not light when connected to the circuit. In some cases, even an ordinary shop voltmeter will not give an accurate reading because its resistance is too low. Therefore, the use of a 10 megohm input impedance digital voltmeter (J 39200) is required to assure accurate voltage readings.

Memory

There are three types of memory storage within the PCM: ROM, RAM and EEPROM.

ROM

Read Only Memory (ROM) is a permanent memory that is physically soldered to the circuit boards within the PCM. The ROM contains the overall control programs. Once the ROM is programmed, it cannot be changed. The ROM memory is non-erasable, and does not need power to be retained.

RAM

Random Access Memory (RAM) is the microprocessor "scratch pad." The processor can write into, or read from this memory as needed. This memory is erasable and needs a constant supply of voltage to be retained. If the voltage is lost, the memory is lost.

EEPROM

Electrically Erasable Programmable Read Only Memory (EEPROM) is a permanent memory that is physically soldered to the circuit boards within the PCM. The EEPROM contains the overall control algorithms. The EEPROM can be reprogrammed by using the Tech 1 scan tool or other Techline terminal/equipment.

Short Term Fuel Trim

The short term fuel trim is a PCM erasable memory register that will contain a number between 0 and 255. The neutral value for the short term fuel trim is 128; any deviation from this value indicates the short term fuel trim is changing the injector pulse width. The amount of pulse width change depends on how far the short term fuel trim value is from 128. The short term fuel trim changes the pulse width by varying the "Closed Loop" factor of the base pulse width equation. As the PCM monitors the oxygen sensor's input, it is constantly varying the short term fuel trim value. The value is updated very quickly, therefore, the short term fuel trim only corrects for short term mixture trends. The correction of long term mixture trends is the function of long term fuel trim.

Long Term Fuel Trim

The long term fuel trim is a matrix of cells arranged by RPM and MAP. Each cell of the long term fuel trim is a register like the short term fuel trim. As the engine operating conditions change, the PCM will switch from cell to cell to determine what "long term fuel trim" factor to use in the base pulse width equation.

While in any given cell, the PCM also monitors the short term fuel trim. If the short term fuel trim is far enough from 128, the PCM will change the long term fuel trim value. Once the long term fuel trim value is changed, it should force the short term fuel trim back toward 128.

If the mixture is still not correct (as judged by the HO2S), the short term fuel trim will continue to have a large deviation from the ideal 128. In this case, the long term fuel trim value will continue to change until the short term fuel trim becomes balanced.

Both the short term fuel trim and long term fuel trim have limits which vary by calibration. If the mixture is off enough so that long term fuel trim reaches the limit of its control and still cannot correct the condition, the short term fuel trim would also go to its limit of control in the same direction. If the mixture is still not corrected by both short term fuel trim and long term fuel trim at their extreme values, a Heated Oxygen Sensor (HO2S) DTC will likely result. Under the conditions of power enrichment, the PCM sets the short term fuel trim to 128 and freezes it there until power enrichment is no longer in effect. This is done so the "Closed Loop" factor and the long term fuel trim will not try to correct for the commanded richness of power enrichment.

SPEED DENSITY SYSTEM

Three specific data sensors provide the PCM with the basic information for fuel management portion of its operation. That is three specific signals to the PCM establish the engine speed and air density factors.

The engine speed signal comes from the distributor low resolution circuit. The PCM uses this information to determine engine speed (RPM).

Air density is derived from IAT and MAP sensor inputs. The IAT sensor measures the air temperature that is entering the engine. The IAT signal works in conjunction with the MAP sensor to determine air density. As the intake manifold pressure increases, the air density in the intake manifold also increases and additional fuel is required.

This information from the IAT and MAP sensors is used by the PCM to control injector pulse width.

The speed density system is only needed when there is a Mass Air Flow (MAF) sensor malfunction. If the PCM detects a malfunction with the MAF sensor circuit, the PCM will default to speed density fuel management.

INFORMATION SENSORS

Engine Coolant Temperature (ECT) Sensor

The Engine Coolant Temperature (ECT) sensor (Figure C1-2) is a thermistor (a resistor which changes value based on temperature) immersed in the engine coolant stream. Low coolant temperature produces a high resistance, while high temperature causes low resistance.

The PCM supplies a 5 volt signal to the ECT through a resistor in the PCM and measures the voltage. The voltage will be high when the engine is cold, and low when the engine is hot. By measuring the voltage, the PCM knows the engine coolant temperature. Engine coolant temperature affects most systems the PCM controls.

A failure in the ECT circuit should set either a DTC 14 or 15. Remember, these DTCs indicate a failure in the engine coolant temperature sensor circuit, so proper use of the chart will lead to either repairing a wiring problem or replacing the sensor to properly repair a problem.

Knock Sensor

The knock sensor (Figure C1-4) is mounted to the right lower side of the engine block.

When abnormal engine vibrations (spark knock) are present, the sensor produces a voltage signal which is sent to the PCM.

Refer to "Knock Sensor (KS) System," Section "6E3-C5" for further information on the Knock Sensor (KS) system.

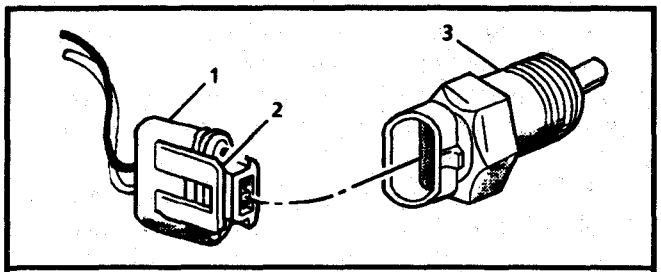


Figure C1-2 - Engine Coolant Temperature (ECT) Sensor

Manifold Absolute Pressure (MAP) Sensor

The Manifold Absolute Pressure (MAP) sensor (Figure C1-5), is a pressure sensor that measures changes in intake manifold pressure. The pressure changes as a result of engine load and speed. The MAP sensor converts this to a voltage output.

A closed throttle on engine coastdown would produce a relatively low MAP output voltage, while a wide-open throttle would produce a high MAP output voltage. This high output voltage is produced because the pressure inside the manifold is the same as outside the manifold, so you measure 100% of outside air pressure. Manifold Absolute Pressure (MAP) is the OPPOSITE of what you would measure on a vacuum gage. When manifold pressure is high, vacuum is low. The MAP sensor is also used to measure barometric pressure under certain conditions, which allows the PCM to automatically adjust for different altitudes.

The PCM sends a 5 volt reference signal to the MAP sensor. As the manifold pressure changes, the electrical resistance of the MAP sensor also changes. By monitoring the sensor output voltage, the PCM knows the manifold pressure. The PCM uses the MAP sensor to control ignition timing. The MAP sensor is also used for speed density fuel management. When the PCM detects a malfunction with the Mass Air Flow (MAF) sensor circuit, the PCM will default to speed density.

MAP

kPa	100	90	80	70	60	50	40	30	20	10	0
Hg	29.6	26.6	23.7	20.7	17.7	14.8	11.8	8.9	5.9	2.9	0
V	4.9	4.4	3.8	3.3	2.7	2.2	1.7	1.1	0.6	0.3	0.3

Mass Air Flow (MAF) Sensor

The Mass Air Flow (MAF) sensor (Figure C1-3) measures the amount of air that is ingested by a vehicle's engine. This information is required by the engine's Powertrain Control Module (PCM) to schedule fuel and maintain the desired air/fuel ratio.

The MAF sensor used on this vehicle is a hot wire type and is used to measure air flow rate. The Mass Air Flow (MAF) output frequency is a function of the power required to keep the air flow sensing elements (hot wires) at a fixed temperature above ambient temperature. As air flows through the MAF sensor, the "hot wires" are cooled. The amount of cooling is proportional to the rate of air flow. As air flow increases, a greater amount of current is required to maintain the "hot wires" at a constant temperature. The MAF sensor converts the changes in current draw to a frequency signal read by the PCM. The PCM calculates air flow (grams per second) based on this signal. A failure in the MAF sensor circuit should set a DTC 48.

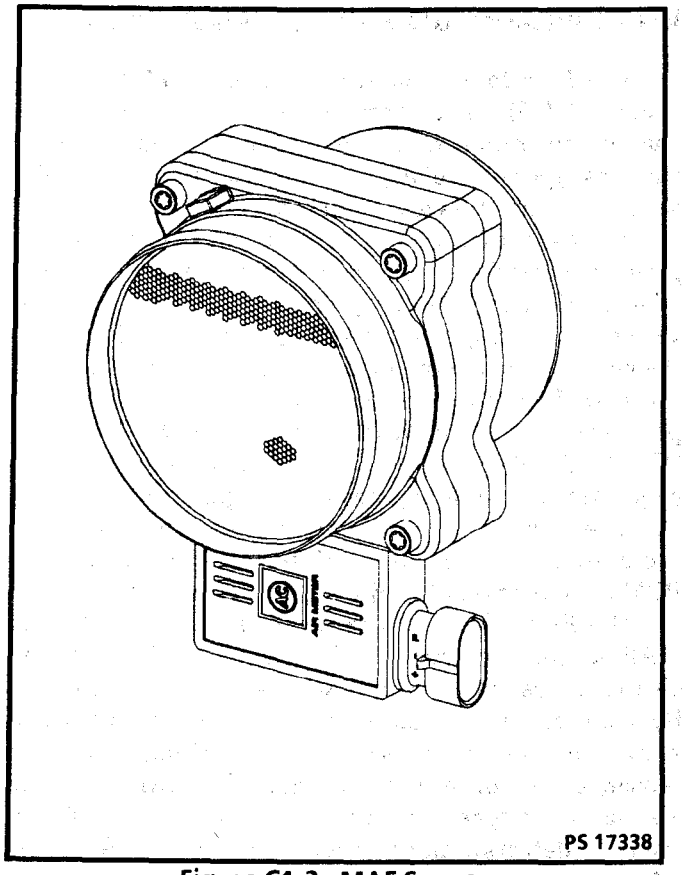


Figure C1-3 - MAF Sensor

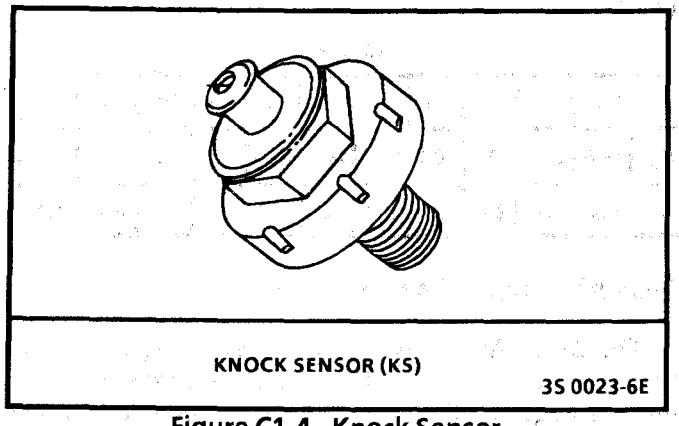


Figure C1-4 - Knock Sensor

Intake Air Temperature (IAT) Sensor

The Intake Air Temperature (IAT) sensor (Figure C1-6) is a thermistor (a resistor which changes value based on temperature). It is mounted in the air intake duct. Low temperature produces a high resistance and high temperature causes low resistance.

The PCM supplies a 5 volt signal to the sensor through a resistor in the PCM and measures the voltage. The voltage will be high when the intake air is cold, and low when the intake manifold air is hot. By measuring the voltage, the PCM knows the intake air temperature.

A failure in the IAT sensor circuit should set either a DTC 23 or DTC 25.

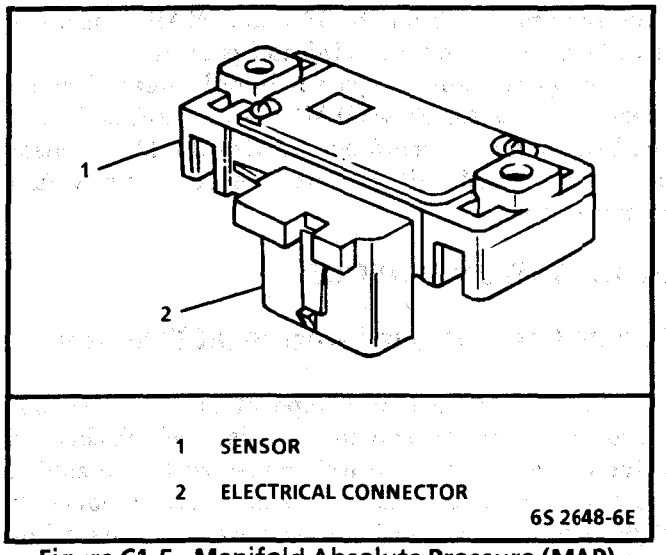


Figure C1-5 - Manifold Absolute Pressure (MAP)

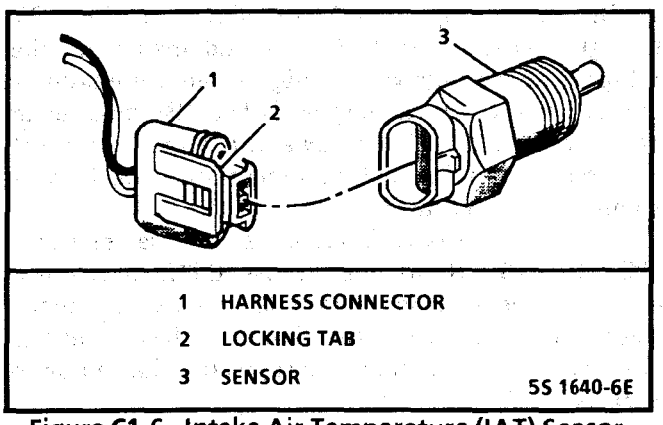


Figure C1-6 - Intake Air Temperature (IAT) Sensor

Heated Oxygen Sensor (HO2S)

The Heated Oxygen Sensor (HO2S) (Figure C1-7) is essentially a small variable battery; it has the ability to produce a low voltage signal that feeds information on engine exhaust oxygen content to the PCM.

The HO2S is constructed from a material (zirconia/platinum) that conducts electricity under certain conditions. At operating temperature, 315°C (600°F), the element becomes a semiconductor. A platinum coating on the outer surface of the element stimulates further combustion of the exhaust gases right at the surface and this helps keep the element up to the desired temperature. The HO2S has an inter cavity which is filled with atmospheric (reference) air. The atmosphere has approximately 21% oxygen in it. In this electrical circuit this inter cavity is the positive (+) terminal. The outer surface of the element is exposed to the exhaust gas stream. It is the negative (-) or ground terminal. The oxygen concentration differences between the reference air and exhaust gases produce small voltages (refer to Figure C1-8).

A rich exhaust (excessive fuel) has almost no oxygen. When there is a large difference in the amount of oxygen touching the inside and outside surfaces, there is more conduction, and the sensor puts out a voltage signal above 600 mV. With lean exhaust (excessive oxygen) there is about two percent oxygen in the exhaust. This is a smaller difference in oxygen from the outside surfaces which results in less conduction and a voltage signal below 300 mV. The voltages are monitored and used by the PCM to "fine tune" the air/fuel ratio to achieve the ideal mixture desired.

The PCM sends a reference signal of 450 mV. The reference signal serves to run the engine when it is in "Open Loop" mode of operation. When the air/fuel ratio is correct the PCM displays 450 mV. When the engine is operating with a rich air/fuel ratio, there is a reduction of free oxygen in the exhaust stream and the oxygen voltage rises above the reference voltage.

When the engine is run lean, the voltage drops below the reference voltage due to excess oxygen in the exhaust stream. The HO2S provides the feedback information for the "Closed Loop" operating mode of the fuel delivery system. The HO2S indicates to the PCM what is happening in the exhaust. It does not cause things to happen. It is a type of gage: Low voltage output = lean mixture = high oxygen content in exhaust; high voltage output = rich mixture = low oxygen content in the exhaust.

An open Heated Oxygen Sensor (HO2S) circuit, should set a DTC 13 or 63. A constant low voltage in the HO2S circuit should set a DTC 44 or 64. A constant high voltage in the circuit should set a DTC 45 or 65 (refer to Figure C1-9). DTCs 44, 45, 64, or 65 could also be set as a result of fuel system problems. Refer to "DTC Charts" for conditions that can cause a lean or rich system.

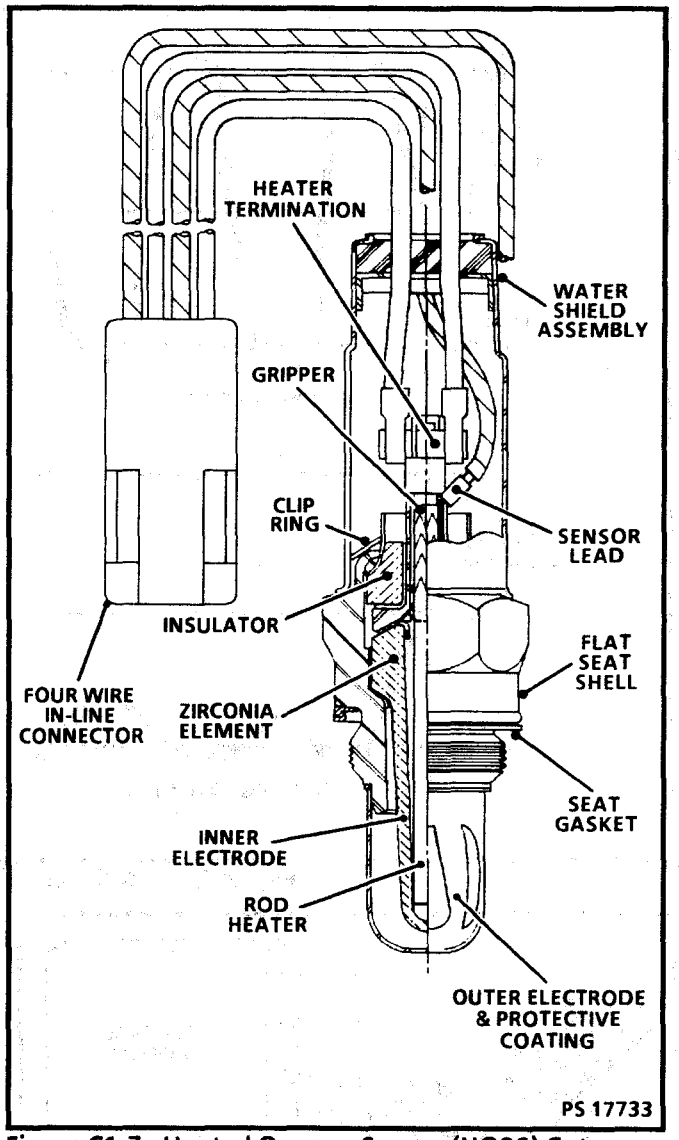


Figure C1-7 - Heated Oxygen Sensor (HO2S) Cutaway View

Throttle Position (TP) Sensor

The Throttle Position (TP) sensor (Figure C1-10) is a potentiometer connected to the throttle shaft on the throttle body and is one of the most important sensors for engine/transmission control. The TP sensor has one end connected to 5 volts from the PCM and the other to PCM ground. A third wire is connected to the PCM to measure the voltage from the TP sensor. As the throttle valve angle is changed (accelerator pedal moved), the voltage output of the TP sensor also changes.

At a closed throttle position, the voltage output of the TP sensor is low (approximately .5 volt). As the throttle valve opens, the output increases so that at wide-open throttle, the output voltage should be near 5 volts.

By monitoring the output voltage from the TP sensor, the PCM can determine fuel delivery based on throttle valve angle (driver demand).

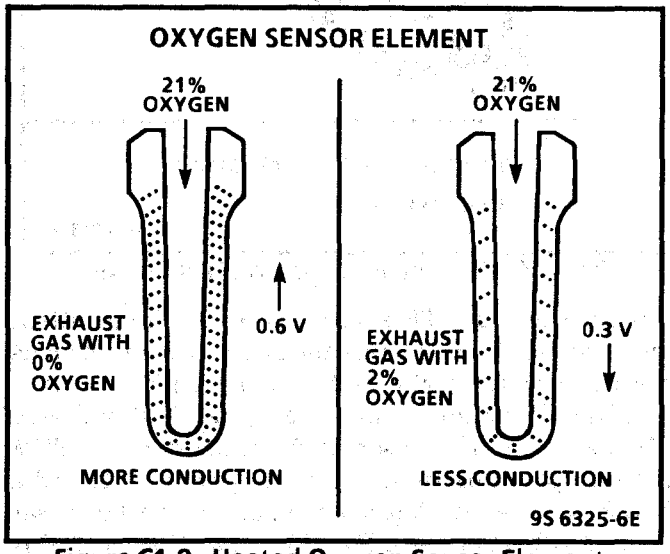


Figure C1-8 - Heated Oxygen Sensor Element

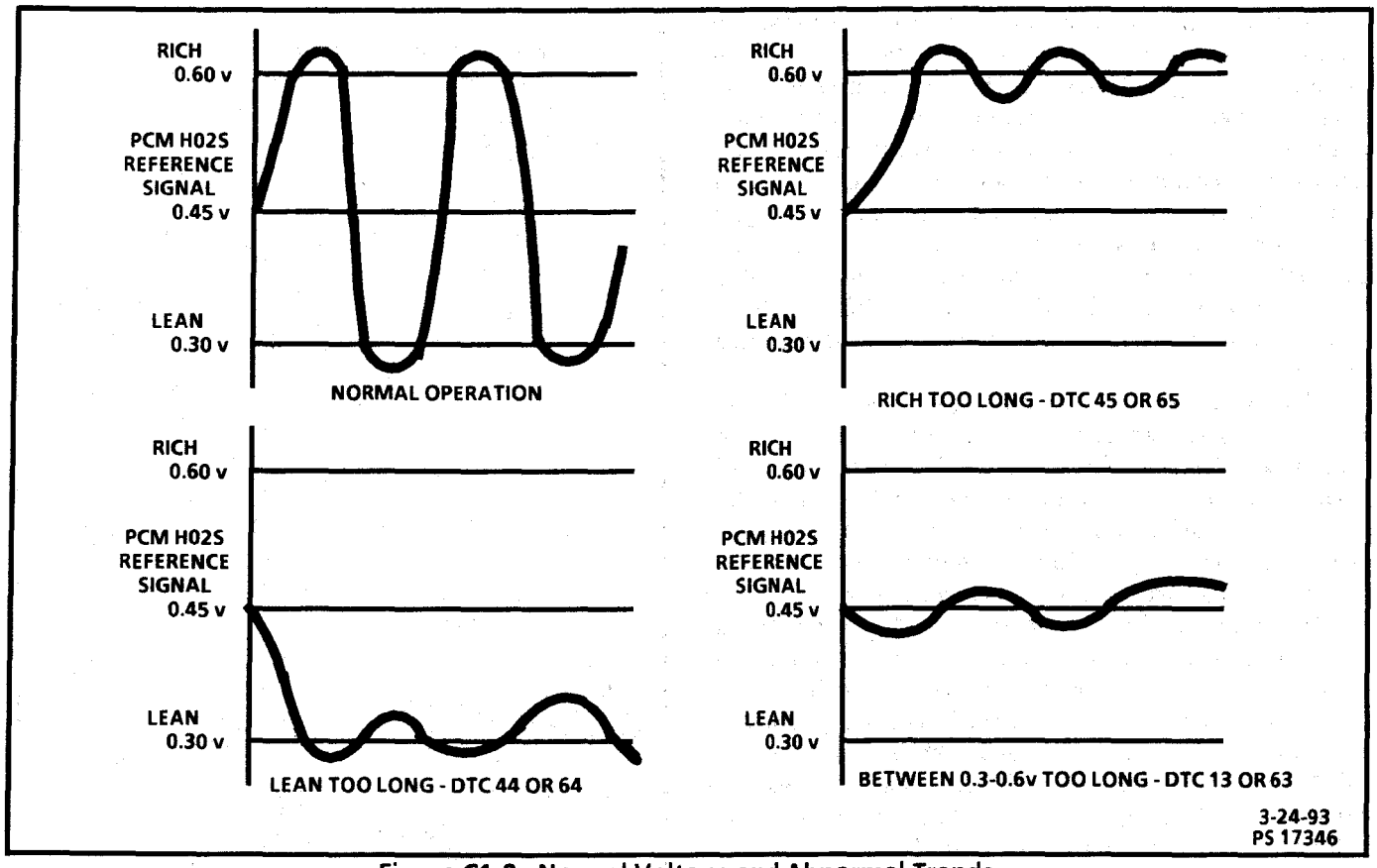


Figure C1-9 - Normal Voltage and Abnormal Trends

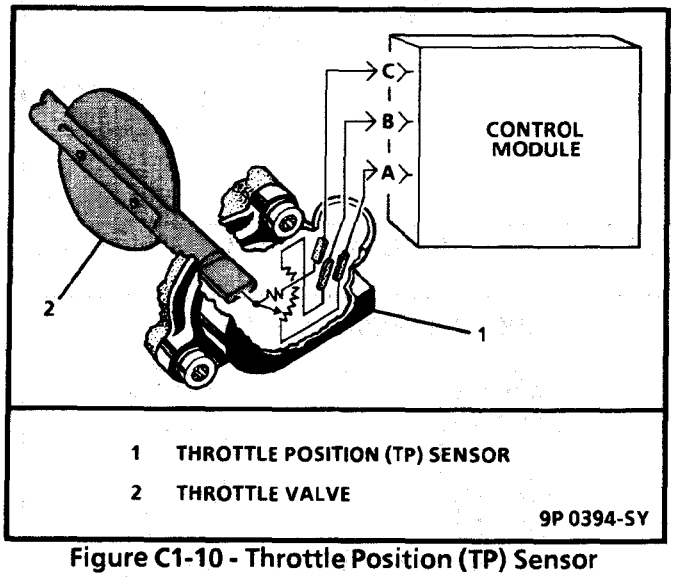


Figure C1-10 - Throttle Position (TP) Sensor

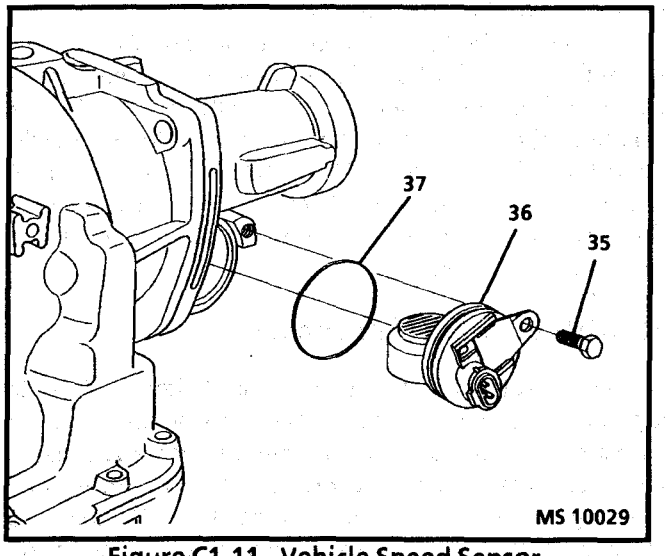


Figure C1-11 - Vehicle Speed Sensor

A broken or loose TP sensor can cause intermittent bursts of fuel from the injector and cause an unstable idle, because the PCM detects the throttle is moving.

If the TP sensor circuit is open, the PCM will set a DTC 22. If the TP sensor circuit is shorted, the PCM will interpret this signal as wide open throttle and a DTC 21 will be set. A problem in any of the TP sensor circuits will set either a DTC 21 or 22. Once a DTC is set, the PCM will use a default value for TP sensor, and some vehicle performance will return.

Refer to "On-Vehicle Service" for replacement of TP sensor.

Vehicle Speed Sensor (VSS)

The Vehicle Speed Sensor (VSS) (Figure C1-11) is a pulse counter type input that informs the PCM how fast the vehicle is being driven. The VSS system uses an inductive sensor mounted in the tail housing of the transmission and a toothed reluctor wheel on the tail shaft. As the reluctor rotates, the teeth alternately interfere with the magnetic field of the sensor creating an induced voltage pulse.

The VSS produces an AC voltage signal that increases with vehicle speed. The PCM processes this signal and sends it to the instrument panel, chime module and cruise control module on CKT 817. Refer to DTC 24 or DTC 72.

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

The TFT sensor is a thermistor (a device that changes resistance according to changes in temperature) used to indicate transmission fluid temperature. High sensor resistance produces high signal input voltage which corresponds to low fluid temperature. Low sensor resistance produces low signal input voltage which corresponds to high fluid temperature. The PCM uses the TFT sensor signal input to determine the following:

- TCC apply and release schedules.
- Hot mode determination.
- Shift quality.

The TFT sensor is part of the transmission range fluid pressure switch assembly and is attached to the control valve body within the transmission. A fault in the Transmission Fluid Temperature (TFT) sensor circuit will set a DTC 58, 59, or 79.

A/C Refrigerant Pressure Sensor

This signal is used by the PCM to enable cooling fans when head pressure reaches about 189 psi. If a fault is present in the A/C refrigerant pressure sensor circuit, a DTC 66 and 67 will set, and the A/C clutch would be disabled.

A/C Evaporator Temperature Sensor

This signal is used by the PCM to cycle the A/C clutch "ON" and "OFF." The PCM will cycle the clutch "ON" at 4°C (39°F) and "OFF" at 2°C (36°F). A failure in the A/C evaporator temperature sensor circuit will result in a DTC 71 and A/C clutch would be disabled.

A/C Request Signal

This signal tells the PCM that the A/C selector switch is turned "ON." The PCM uses this information to adjust the idle speed when the air conditioning is working. If this signal is not available to the PCM, the A/C compressor will not engage.

Park/Neutral Position (PNP) Switch (Automatic Only)

The Park/Neutral Position (PNP) switch indicates to the PCM when the transmission is in park, neutral, or drive. This information is used for the EGR and the IAC valve operation.

Important

- Vehicle should not be driven with park/neutral position switch disconnected, as idle quality will be affected and a possible false DTC 24 (VSS) may set.

Refer to SECTION 8A for more information on the PNP switch, which is part of the neutral/start and backup light switch assembly. Refer to CHART C-1A for PNP switch check.

Reference Signal

The distributor ignition system sends a signal to the PCM to tell it both engine RPM and crankshaft position. Refer to "Distributor Ignition (DI) System," Section "6E3-C4" for further information.

DIAGNOSIS

To display diagnostic trouble codes, use a Tech 1. Grounding the DLC will not flash DTC(s), but will enable most outputs when the ignition is "ON," engine "OFF." Grounding the DLC while the engine is running will cause the MIL to flash to indicate "Open" or "Closed Loop." This is referred to as "Field Service Mode."

To clear the DTCs from memory use the Tech 1 or:

- Ignition "OFF."
- Disconnect the #4 fuse (located in the instrument panel fuse block), for 30 seconds.

Since the PCM can have a failure which may affect only one circuit, following the diagnostic procedures in this section will determine which circuit has a problem and where it is.

If a diagnostic chart indicates that the PCM connections or PCM is the cause of a problem and the PCM is replaced, the Knock Sensor (KS) module must be transferred to the new PCM and the new PCM must then be programmed. If this does not correct the problem, one of the following may be the reason:

- There is a problem with the PCM terminal connections. - The diagnostic chart will say PCM connections or PCM. The terminals may have to be removed from the connector in order to check them properly.
- The problem is intermittent. - This means that the problem is not present at the time the system is being checked. In this case, refer to the "Symptoms," Section "6E3-B" portion of the manual and make a careful physical inspection of all portions of the system involved.

- Shorted solenoid, relay coil, or harness. - Solenoids and relays are turned "ON" and "OFF" by the PCM using internal electronic switches called "drivers."

A shorted solenoid, relay coil, or PCM harness will not damage the PCM but will cause the component to be inoperative.

J 34636 or BT-8405 testers or equivalent provide a fast, accurate means of checking for a shorted coil or a short to battery voltage.

PCM INPUTS

All of the sensors and input switches can be diagnosed by the use of a Tech 1. Following is a short description of how the sensors and switches can be diagnosed by the use of a Tech 1. The Tech 1 can also be used to compare the values for a normal running engine with the engine you are diagnosing.

Engine Coolant Temperature (ECT) Sensor

The Tech 1 displays engine coolant temperature in degrees celsius and fahrenheit. After engine is started, the temperature should rise steadily to about 90°C (194°F) then stabilize when the thermostat opens. If the engine has not been run for several hours (overnight), the ECT and IAT should be close to each other. A fault in the Engine Coolant Temperature (ECT) sensor circuit should set a DTC 14 or 15. The DTC charts also contain a chart to check for Engine Coolant Temperature (ECT) sensor resistance values relative to temperature.

Knock Sensor

The Tech 1 will indicate when knock is present. Refer to "Knock Sensor (KS) System," Section "6E3-C5" for further information on the KS system.

MAP Sensor

The Tech 1 displays manifold absolute pressure and will display volts and kPa of pressure. Key "ON," engine stopped (no vacuum), MAP will display high voltage or pressure, while at idle (high vacuum), MAP will display low voltage or pressure. Likewise, on acceleration MAP will display high and on deceleration will display low voltage.

A failure in the MAP sensor circuit should result in a DTC 33 or DTC 34.

MAF Sensor

The Tech 1 displays grams per second. The PCM converts the mass air flow sensor input signal into grams per second, indicating the amount of air flow entering the engine. A failure in the MAF sensor circuit should result in a DTC 48.

IAT Sensor

The Tech 1 displays temperature of the air entering the engine and should be close to ambient air temperature when engine is cold, and rise as underhood temperature increases. If the engine has not been run for several hours (overnight) the IAT sensor temperature and ECT sensors should display temperature readings close to each other. A failure in the IAT sensor circuit should set a DTC 23 or 25. The DTC charts also contain a chart to check for sensor resistance values relative to temperature.

Heated Oxygen Sensor (HO2S)

The Tech 1 has several positions that will indicate the state of the exhaust gases, HO2S voltage, short term fuel trim, and long term fuel trim.

Normal Tech 1 voltage varies between 10 mV to 1000 mV (.01 and 1.0 volt) while in "Closed Loop." DTC 13 and 63 will set in one minute if voltage remains between 350 mV and 550 mV, but the system will go "Open Loop" in about 15 seconds.

The PCM self-diagnostic circuit looks for trends in HO2S voltage. If a trend is detected, the MIL (Service Engine Soon) comes "ON."

A rich exhaust trend causes the sensor voltage to stay above 700 mV for too long. This sets DTC 45 or DTC 65.

Lean exhaust causes voltage to stay below 300 mV for too long. This sets DTC 44 or 64. If voltage stays between 350 mV and 550 mV for too long, the PCM sets DTC 13 or 63. This indicates an open HO2S circuit.

Response Time

Not only is it necessary for the HO2S to produce a voltage signal for rich or lean exhaust, it is also important to respond quickly to changes. The PCM senses the response times. If the HO2S responds slowly, the customer may complain of poor fuel economy, rough idle or lack of performance. It may also set false PCM DTCs because the PCM uses oxygen sensor voltages for system checks.

Heated Oxygen Sensor Contaminants

Carbon

Black carbon or soot deposits result from over-rich mixtures. However, carbon does not harm a sensor. Deposits can be burned off in the engine by running it at least part throttle for two minutes.

Silica

Certain RTV silicone gasket materials give off vapors that contaminate the oxygen sensor. The sand-like particles from the RTV silica embed in the molecules of the sensor element and plug up the surface. This results in "lazy" HO2S response and engine control. The sensor will also have a white-like appearance.

There is also a possibility of silica contamination caused by silicone in the fuel. Careless fuel handling practices with the transport containers can result in unacceptable concentrations of silicone in the fuel at the pump.

There is also a possibility of silica contamination caused by silicon in lubricants used to install vacuum hoses on fittings.

Lead

Lead glazes sensors. It can be introduced when regular, or leaded fuel, is burned. It is difficult to detect lead contamination by visual inspection.

Other Substances

Oil deposits will ultimately prevent sensor operation. The sensor will have a dark brown appearance. Causes of high oil consumption should be checked. The additives in ethylene glycol can also affect sensor performance.

This produces a white-like appearance. If antifreeze enters the exhaust system, you will likely encounter other, more obvious, symptoms of cooling system trouble.

Multiple Failures

If you encounter multiple or repeat HO2S failures on the same vehicle, consider contamination.

Leaded fuel, silica contamination from uncured, low-grade (unapproved) RTV sealant, and high oil consumption are possible.

A problem in the HO2S circuit or fuel system should set a DTC 13 or 63 (open circuit), DTC 44 or 64 (lean indication) or DTC 45 or 65 (rich indication). Refer to applicable chart if any of these DTCs were stored in memory.

Throttle Position (TP) Sensor

The Tech 1 displays throttle position in volts and percentage of throttle blade opening. The value should display between about .3-.9 volt, with throttle closed and ignition "ON," or at idle. Voltage should increase at a steady rate as throttle is moved toward WOT (about 4.6 volts).

The PCM has the ability to auto-zero the TP sensor voltage if it is between about .3-.9 volt. This means that any voltage in this window will be determined by the PCM to be 0% throttle. A failure in the TP sensor circuit should set a DTC 21 or 22. The Tech 1 has the ability to display the throttle angle and should be 0% when the throttle is closed.

A/C Request Signal

The Tech 1 should indicate A/C request as "YES," when A/C is requested.

Park/Neutral Position (PNP) Switch

The Tech 1 should display "P-N" when in park or neutral and "-R-DL" when in drive or reverse. Refer to CHART C-1A for PNP switch diagnosis.

Reference Signal

The Tech 1 will display this signal in RPM. Refer to "Distributor Ignition (DI) System," Section "6E3-C4" for more information on the distributor ignition system.

Vehicle Speed Sensor (VSS)

The Tech 1 reading should closely match the speedometer reading with drive wheels turning. A failure in the VSS circuit should set a DTC 24 or 72.

ON-VEHICLE SERVICE

POWERTRAIN CONTROL MODULE (PCM)

Service of the PCM should normally consist of either replacement of the PCM or knock sensor module.

PCM AND COMPONENTS REPLACEMENT

PCM

Important

- To prevent internal PCM damage, the ignition must be "OFF," when disconnecting or reconnecting power to PCM (for example, battery cable, PCM fuse, jumper cables, etc.).

Remove or Disconnect

1. Negative battery cable.
2. PCM mounting hardware.
3. Connectors from PCM.
4. PCM from engine compartment.
5. PCM access cover.
6. Knock Sensor (KS) module.

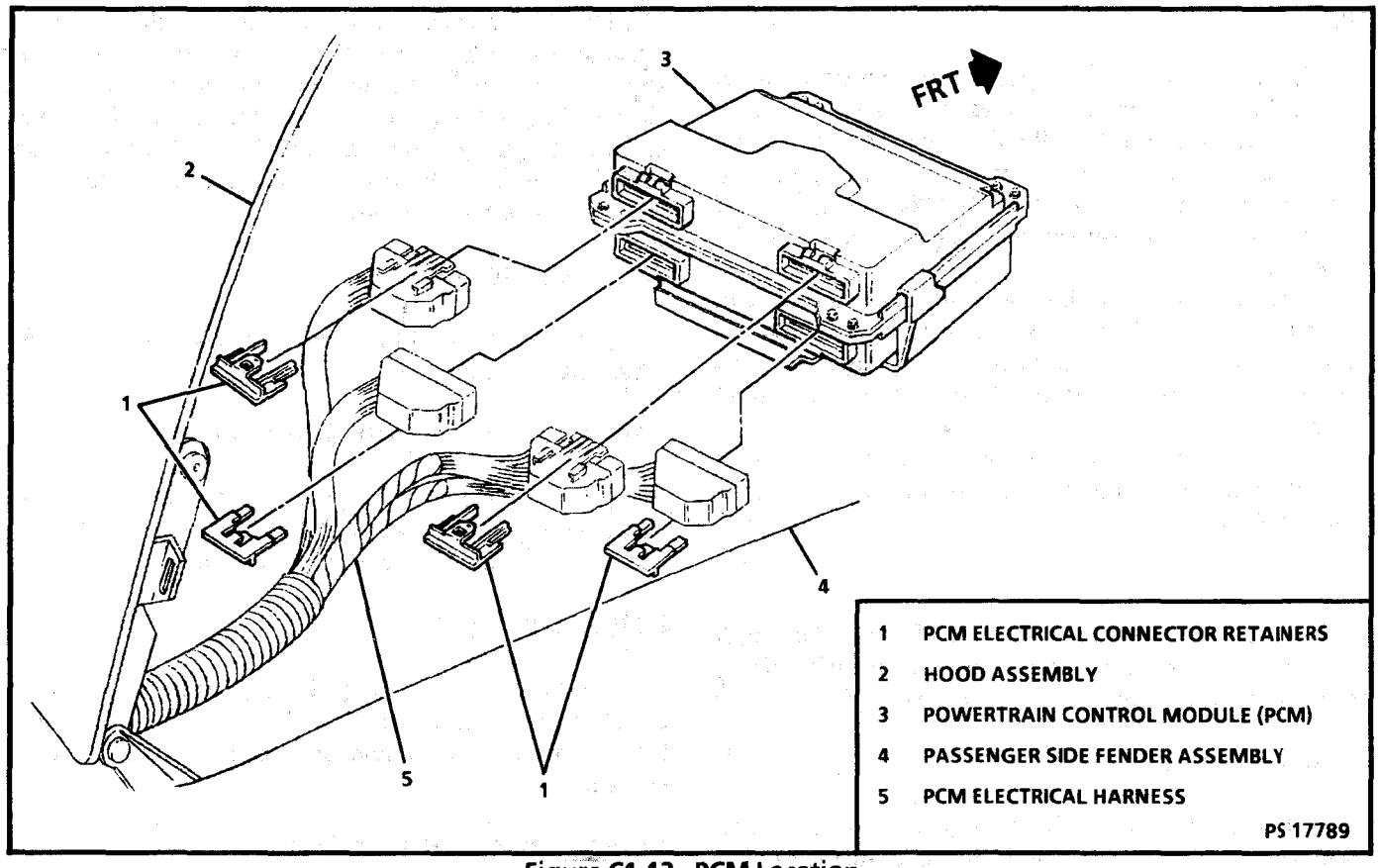


Figure C1-12 - PCM Location

Important

- The Knock Sensor (KS) module must be transferred to the replacement PCM.
- The replacement PCM is supplied without a EEPROM program. The replacement PCM must be programmed before the vehicle will run.

Install or Connect

1. New PCM.
2. Knock sensor module.
3. Knock sensor module access cover.
4. PCM electrical connectors.
5. PCM mounting hardware.
6. Negative battery cable.

EEPROM PROGRAMMING

Use the following procedure to reprogram the PCM:

CAUTION: The software/calibration used for PCM reprogramming must match the vehicle application, or improper operation and/or vehicle damage may occur.

- Battery is charged.
- Ignition is "ON."
- Connections to the DLC and battery/cig. lighter secure.
- Follow the most current Techline terminal/equipment instructions.

If the PCM fails to program, or if DTC 51 sets during programming:

- Check all PCM connections.
- Check Techline terminal/equipment for latest software version
- Repeat reprogramming procedure. If it fails again, replace the PCM. The replacement PCM must be programmed.

Functional Check

Refer to "On-Board Diagnostic (OBD) System Check," in "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3-A" in this service manual.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

NOTICE: Care must be taken when handling engine coolant temperature sensor. Damage to engine coolant temperature sensor could affect proper operation of the fuel injection system.

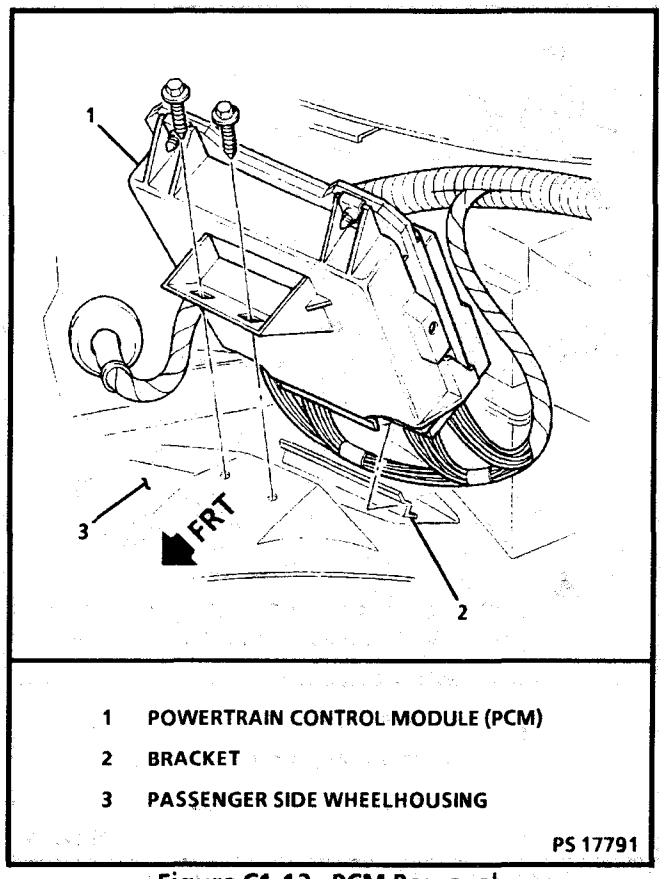


Figure C1-13 - PCM Removal

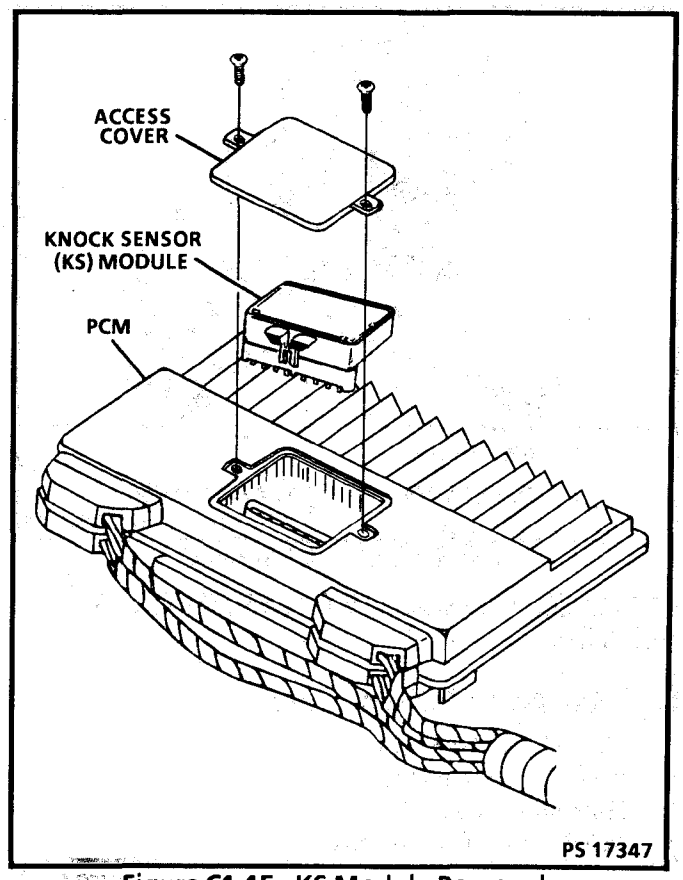


Figure C1-15 - KS Module Removal

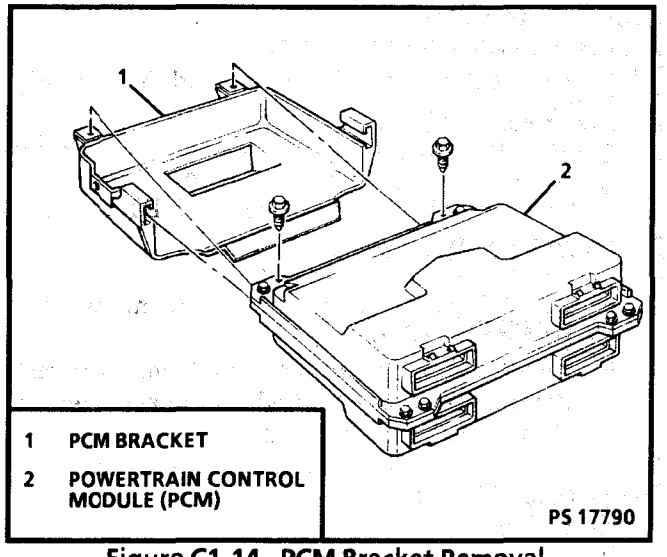


Figure C1-14 - PCM Bracket Removal

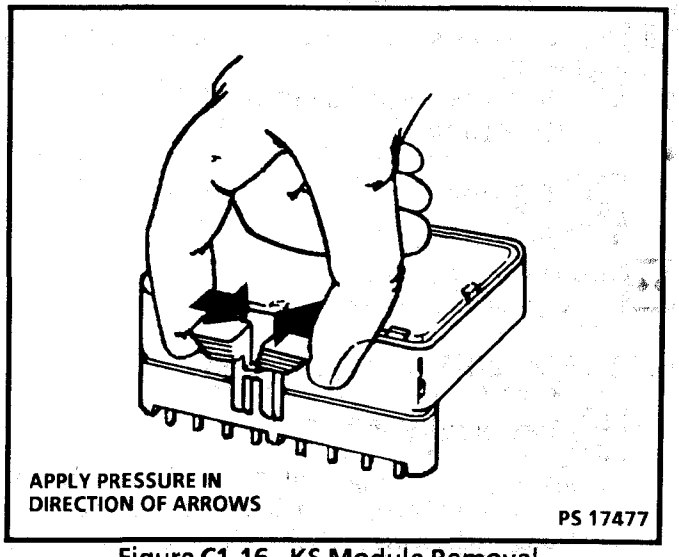


Figure C1-16 - KS Module Removal

Remove or Disconnect

1. Negative battery cable.
2. Drain coolant, refer to SECTION 6B.
3. Raise vehicle.
4. ECT electrical connector.
5. Carefully back out engine coolant temperature sensor from coolant pump.

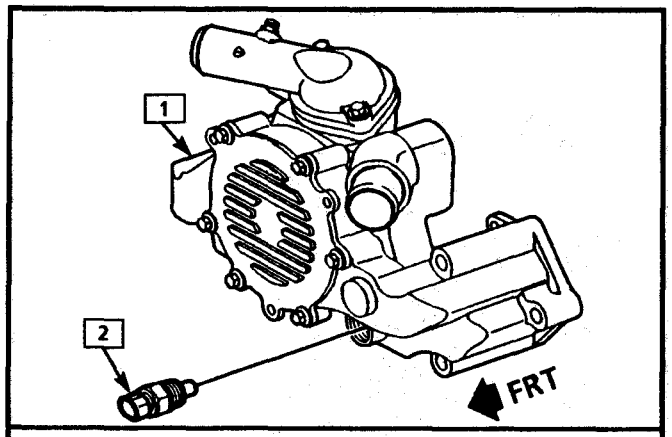
Install or Connect

1. Coat threads (ONLY) with sealer PN 1052080.
2. Engine coolant temperature sensor in coolant pump.

Tighten

- Sensor to 23 N·m (17 lb. ft.).

3. Electrical connector.
4. Lower vehicle.
5. Fill coolant. Refer to SECTION 6B.
6. Negative battery cable.



1 WATER PUMP
2 ENGINE COOLANT TEMPERATURE SENSOR
MS 12021-6E

Figure C1-17 - ECT Service

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector.
3. Hold down bolts (2).
4. MAP sensor from intake manifold.

Install or Connect

1. New MAP sensor seal (lightly coated with clean engine oil).
2. MAP sensor to intake manifold.
3. Hold down bolts.

Tighten

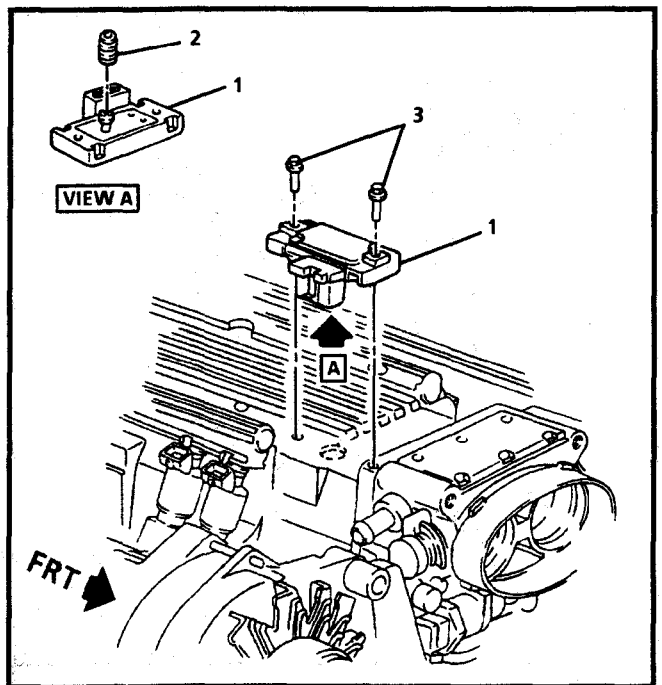
- Bolts to 6 N·m (50 lb. in.).

4. Electrical connector.
5. Negative battery cable.

MASS AIR FLOW (MAF) SENSOR

Important

- Take care when handling the MAF. Do not dent, puncture, or otherwise damage the Honeycell located at the air inlet end of the MAF. Do not touch the sensing elements or allow anything (including cleaning solvents and lubricants) to come in contact with them. A small amount of GM lubricant (P/N = 99855406) may be used on the air duct only, to aid in installation. Do not drop or roughly handle the MAF.



1 MAP SENSOR
2 MAP SENSOR SEAL
3 BOLTS
PS 17019

Figure C1-18 - MAP Sensor Service

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector.
3. Carefully loosen air duct clamps and remove MAF sensor.

Install or Connect

Important

- Embossed arrows on MAF sensor indicate air flow and must point toward engine.

1. MAF sensor into air duct and tighten clamps.

Tighten

- MAF sensor clamps to 4 N·m (36 lb. in.).

2. Electrical connector.
3. Negative battery cable.

INTAKE AIR TEMPERATURE (IAT) SENSOR

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector.
3. Carefully back out intake air temperature sensor from air duct.

Install or Connect

1. Intake air temperature sensor into air duct.
2. Electrical connector.
3. Negative battery cable.

HEATED OXYGEN SENSOR (HO2S) (BANK 1 OR BANK 2)

NOTICE: The HO2S uses a permanently attached pigtail and connector. This pigtail should not be removed from the HO2S. Damage or removal of the pigtail or connector could affect proper operation of the HO2S.

Important

- Take care when handling the HO2S. The in-line electrical connector and louvered end must be kept free of grease, dirt, or other contaminants. Also, avoid using cleaning solvents of any type. Do Not drop or roughly handle the HO2S.

Remove or Disconnect

- The HO2S may be difficult to remove when engine temperature is below 48°C (120°F).
- Excessive force may damage threads in exhaust manifold or exhaust pipe.

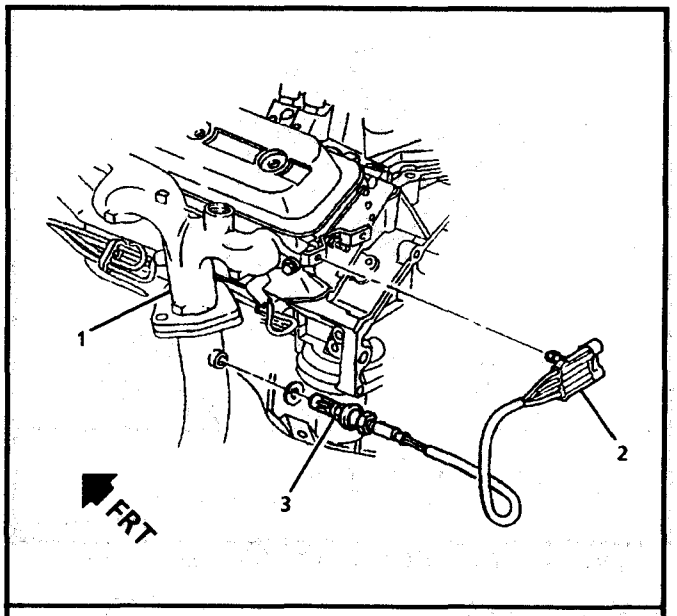
1. Negative battery cable.
2. Raise vehicle.
3. Electrical connector.
4. Carefully back out HO2S.

Install or Connect

Important

- A special anti-seize compound is used on the HO2S threads. The compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New HO2S will already have the compound applied to the threads. If a sensor is removed from an engine, and if for any reason it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat threads of HO2S with anti-seize compound P/N 5613695 if necessary.



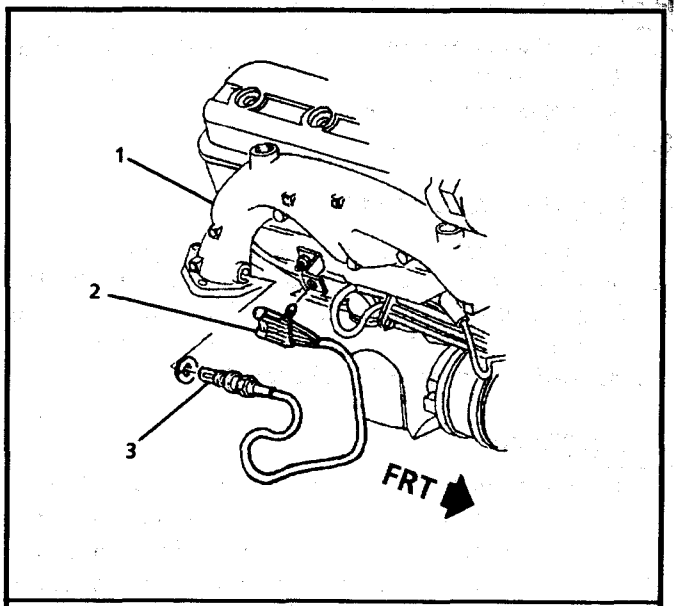
1 DRIVER SIDE EXHAUST MANIFOLD

2 HO2S ELECTRICAL CONNECTOR

3 BANK 1 HO2S

PS 17792

Figure C1-19 - Bank 1 Heated Oxygen Sensor (HO2S)



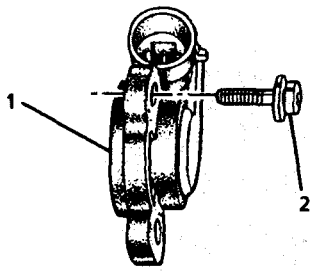
1 PASSENGER SIDE EXHAUST MANIFOLD

2 HO2S ELECTRICAL CONNECTOR

3 BANK 2 HO2S

PS 17793

Figure C1-20 - Bank 2 Heated Oxygen Sensor (HO2S)



1 SENSOR - THROTTLE POSITION (TP)

2 SCREW - TP SENSOR ATTACHING

MP 1224-AS

Figure C1-21 - Throttle Position (TP) Sensor Service

Tighten

- HO2S to 41 N·m (30 lb. ft.).

2. Electrical connector.
3. Lower vehicle.
4. Negative battery cable.

THROTTLE POSITION (TP) SENSOR

Remove or Disconnect

1 Electrical connector.
2. Two TP sensor attaching screws, lockwashers and retainers.
3. Throttle position sensor.

Install or Connect

1. With throttle valve in the normal closed idle position, install throttle position sensor on throttle body assembly, making sure TP sensor pickup lever lines up with tang on throttle actuator lever.
2. Retainers and two TP sensor screws.

Tighten

- TP sensor attaching screws to 2.0 N·m (18 lb. in.).

PARK/NEUTRAL POSITION (PNP) SWITCH

The park neutral position switch is part of the transmission position switch assembly.

Refer to SECTION 7A for location of PNP switch. On-vehicle service and adjustment procedures are also listed there.

VEHICLE SPEED SENSOR (VSS)

For on-vehicle service procedures of the Vehicle Speed Sensor (VSS); refer to SECTION 7.

KNOCK SENSOR (KS)

For on-vehicle service procedures of the knock sensor, refer to "Knock Sensor (KS) System," Section "6E3-C5".

TORQUE SPECIFICATIONS

PCM	3 N·m (26 lb. in.)
ECT Sensor	23 N·m (17 lb. ft.)
MAP Sensor Bolt	6 N·m (50 lb. in.)
Heated Oxygen Sensor (HO2S)	41 N·m (30 lb. ft.)
TP Sensor Attaching Screws	2.0 N·m (18 lb. in.)

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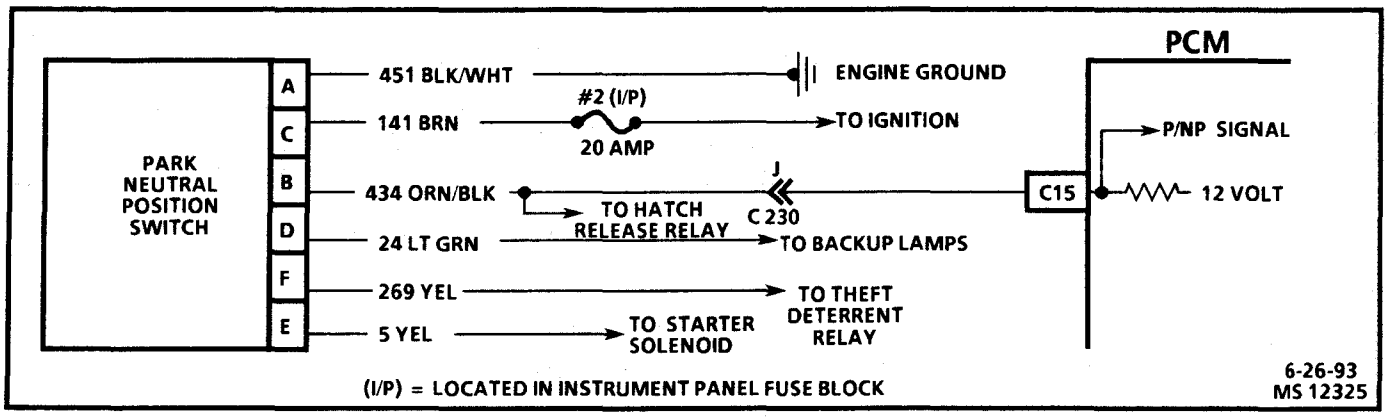


CHART C-1A

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.

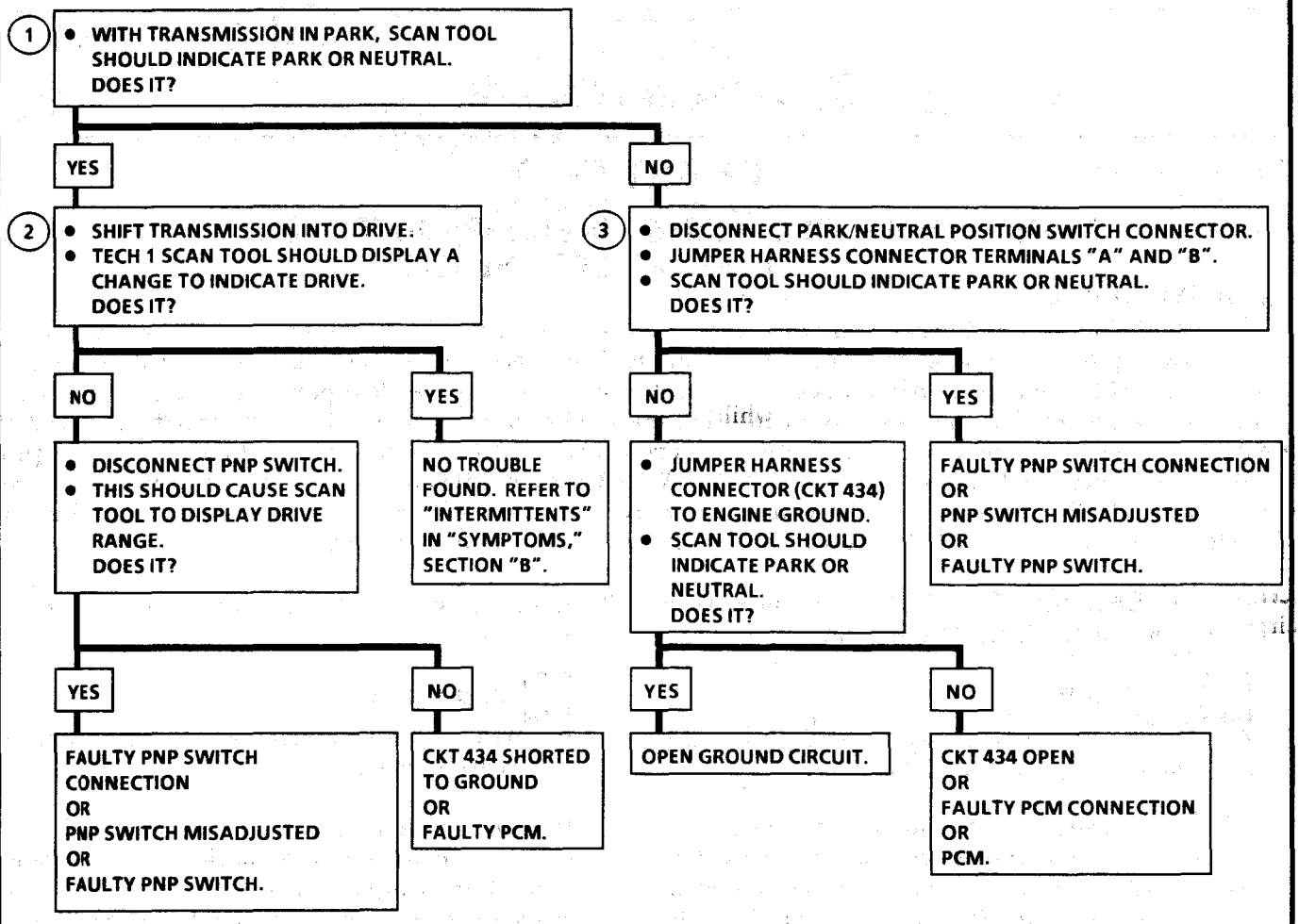
Chart Test Description:

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-1A

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



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

5-21-93
MS 12891

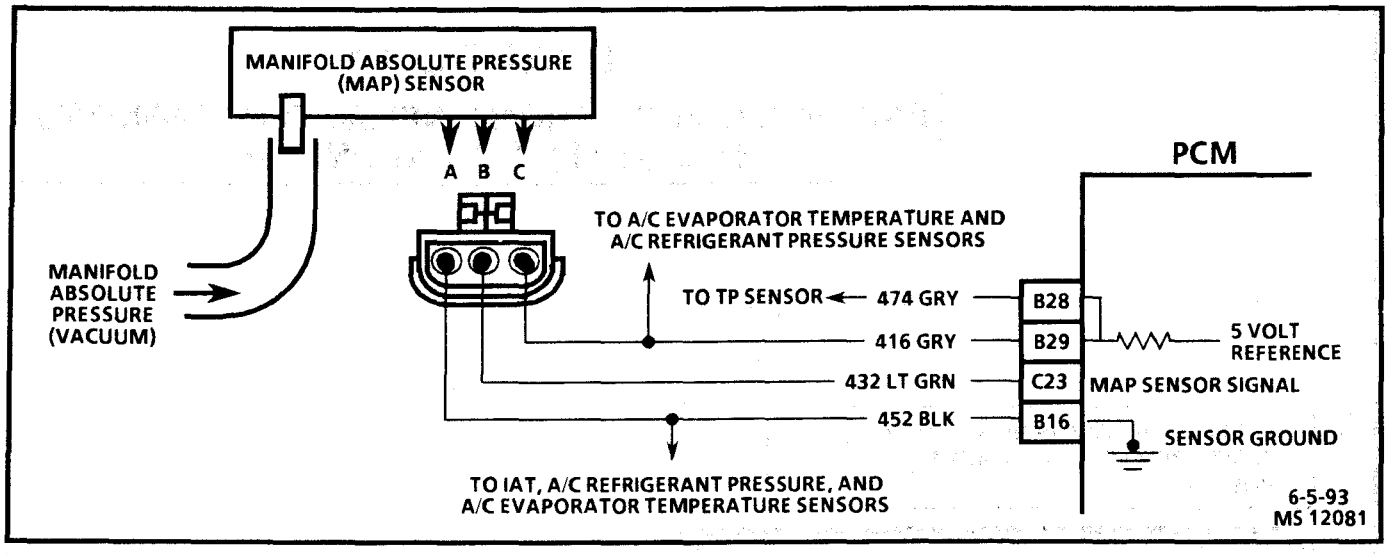


CHART C-1D

MANIFOLD ABSOLUTE PRESSURE (MAP) OUTPUT CHECK 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and RPM changes; and converts these into a voltage output. The PCM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the sensor also changes. By monitoring the sensor output voltage, the PCM knows the manifold pressure. A lower pressure (low voltage) output voltage will be about 1 - 2 volts at idle. While a higher pressure (high voltage) output voltage will be about 4 - 4.8 at Wide Open Throttle (WOT). The MAP sensor is also used, under certain conditions, to measure barometric pressure, allowing the PCM to make adjustments for different altitudes. The PCM uses the MAP sensor to control fuel delivery and ignition timing.

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

Important

- Be sure to use the same Diagnostic Test Equipment for all measurements.

1. When comparing Tech 1 reading to a known good vehicle, it is important to compare vehicles that use a MAP sensor having the same color insert or having the same "Hot Stamped" number. Refer to figures on facing page.
   If MAP sensor voltage is greater than 5 volts, check for a short to voltage on the MAP sensor signal circuit.
2. Applying 34 kPa (10" Hg) vacuum to the MAP sensor should cause the voltage to change. Voltage change should be greater than 1.5 volts. Upon applying vacuum to the sensor, the change in voltage should be instantaneous. A slow voltage change indicates a faulty sensor.
3. Check for vacuum leaks or restrictions at intake mounting surface.

Important

- Make sure electrical connector remains securely fastened.

4. Remove sensor from intake manifold and twist sensor by hand (only) to check for intermittent connection. Output changes greater than .10 volt would indicate a bad sensor. If OK, replace sensor.

CHART C-1D

MANIFOLD ABSOLUTE PRESSURE (MAP) OUTPUT CHECK 5.7L (VIN P) "F" CARLINE (SFI)

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

1
- IF DTC 33 OR 34 IS SET, USE THOSE CHARTS FIRST.
- IGNITION "ON," ENGINE "OFF."
- SCAN TOOL SHOULD INDICATE A MAP SENSOR VOLTAGE.
- COMPARE THIS READING WITH THE READING OF A KNOWN GOOD VEHICLE. SEE FACING PAGE TEST DESCRIPTION, STEP 1. VOLTAGE READING SHOULD BE WITHIN ± .4 VOLT. IS IT?

YES → **2**

NO → REPLACE MAP SENSOR.

2
- DISCONNECT AND PLUG VACUUM SOURCE TO MAP SENSOR.
- CONNECT A HAND VACUUM PUMP TO MAP SENSOR.
- START ENGINE.
- NOTE MAP SENSOR VOLTAGE.
- APPLY 34 kPa (10" Hg) OF VACUUM AND NOTE VOLTAGE CHANGE. SUBTRACT SECOND READING FROM THE FIRST. VOLTAGE VALUE SHOULD BE GREATER THAN 1.5 VOLTS. IS IT?

YES → **3** NO TROUBLE FOUND. CHECK MAP SENSOR VACUUM SOURCE FOR LEAKAGE OR RESTRICTION. BE SURE THIS SOURCE SUPPLIES VACUUM TO MAP SENSOR ONLY.

NO → **4** CHECK MAP SENSOR CONNECTION. IF OK, REPLACE MAP SENSOR.

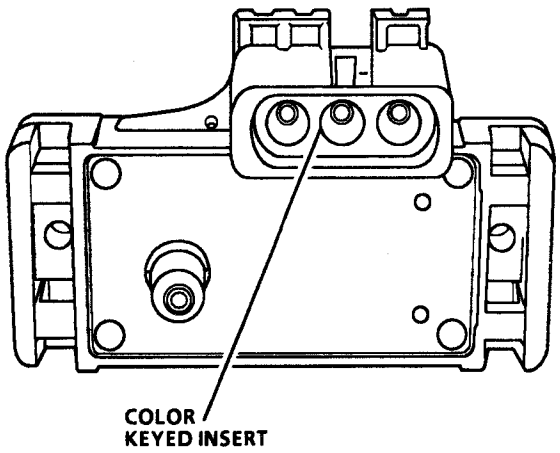


Figure 1 - Color Key Insert

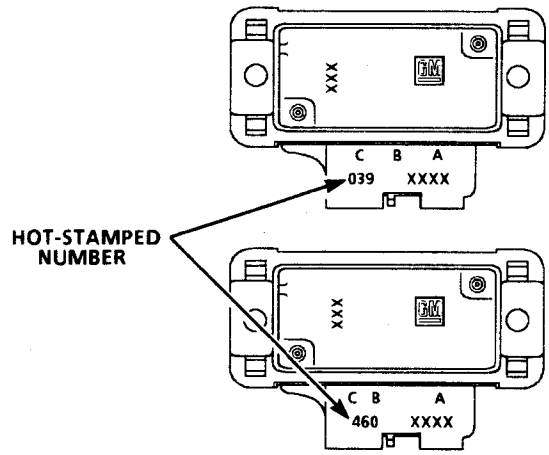


Figure 2 - Hot Stamped Number

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

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SECTION C2
FUEL METERING SYSTEM

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GENERAL DESCRIPTION

PURPOSE

The function of the fuel metering system is to deliver the correct amount of fuel to the engine under all operating conditions. Fuel is delivered to the engine by individual fuel injectors mounted in the intake manifold near each cylinder.

The main control sensors are the Heated Oxygen Sensors (HO2S) located in the exhaust system. The HO2S tells the Powertrain Control Module (PCM) how much oxygen is in the exhaust gas. The PCM changes the air/fuel ratio to the engine by controlling the fuel injectors. The best mixture to minimize exhaust emissions is 14.7 to 1, which allows the three-way catalytic converters to operate the most efficiently. Because of the constant measuring and adjusting of the air/fuel ratio, the fuel injection system is called a "Closed Loop" system.

MODES OF OPERATION

The PCM looks at voltages from several sensors to determine how much fuel to give the engine. The fuel is delivered under one of several conditions called modes. All modes are controlled by the PCM and are described below.

Starting Mode

When the ignition switch is turned to the "ON" position (before engaging starter), the PCM energizes the fuel pump relay for two seconds allowing the fuel pump to build up pressure. The PCM first checks speed density, then switches to the Mass Air Flow (MAF) sensor. Engine Coolant Temperature (ECT), Throttle Position (TP), and Manifold Absolute Pressure (MAP) sensors are also used to determine the proper air/fuel ratio for starting. This ranges from 1.5:1 at -36°C (-33°F) to 14.7:1 at 94°C (201°F) running temperature. The PCM controls the amount of fuel delivered in the starting mode by changing how long the injectors are energized. This is done by pulsing the injectors for very short times.

Clear Flood Mode

If the engine floods, it can be cleared by pushing the accelerator pedal down all the way. The PCM then pulses the injectors at an air/fuel ratio of 20:1. The PCM holds this injector rate as long as the throttle stays wide open and the engine speed is below 300 RPM. If the throttle position becomes less than 80%, the PCM returns to the starting mode.

Run Mode

The run mode has two conditions called "Open Loop" and "Closed Loop."

When the engine is first started, and engine speed is above 400 RPM, the system begins "Open Loop" operation. The PCM ignores the signal from the HO2S and calculates the air/fuel ratio based on inputs from the ECT, MAP, MAF, and TP sensors.

The system stays in "Open Loop" until the following conditions are met:

1. Both HO2S have varying voltage output, showing that they are hot enough to operate properly. (This depends on temperature.)
2. The ECT sensor is above a specified temperature .
3. A specific amount of time has elapsed after starting the engine.

Specific values for the above conditions exist for each different engine, and are stored in the Electrically Erasable Programmable Read Only Memory (EEPROM). When these values are reached, the system begins "Closed Loop" operation.

In "Closed Loop," the PCM calculates the air/fuel ratio (injector on-time) based on the signal from various sensors, but mainly the HO2S. This allows the air/fuel ratio to stay very close to 14.7:1.

Acceleration Mode

When the driver pushes on the accelerator pedal, air flow into the cylinders increases rapidly, while fuel flow tends to lag behind. To prevent possible hesitation, the PCM increases the pulse width to the injectors to provide extra fuel during acceleration. The amount of fuel required is based on throttle position, coolant temperature, manifold air pressure, mass air flow and engine speed.

Deceleration Mode

When the driver releases the accelerator pedal, air flow into the engine is reduced.

The corresponding changes in throttle position, manifold air pressure and mass air flow are relayed to the PCM, which reduces the injector pulse width to reduce fuel flow. If the deceleration is very rapid, or for long periods (such as long closed throttle coast-down), the PCM shuts "OFF" fuel completely to protect the Warm-Up three-way catalytic converter.

Battery Voltage Correction Mode

When battery voltage is low, the PCM compensates for the weak spark delivered by the distributor by:

- Increasing the amount of fuel delivered;
- Increasing the idle RPM; and
- Increasing ignition dwell time.

Fuel Cutoff Mode

To prevent possible engine damage from over-speed, the PCM cuts off fuel from the injectors when the engine speed is above approximately 5800 RPM. Also, see rapid deceleration in "Deceleration Mode."

FUEL METERING SYSTEM COMPONENTS

The fuel metering system is made up of the following parts:

- Fuel supply components (fuel tank, pump, lines).
- Fuel pump electrical circuit.
- Fuel rail assembly, including:
  - Fuel injectors.
  - Fuel pressure regulator assembly.
- Throttle body assembly, including:
  - Idle Air Control (IAC) valve.
  - Throttle Position (TP) sensor.

FUEL SUPPLY COMPONENTS

The fuel supply is stored in the fuel tank. An electric fuel pump, located in the fuel tank with the fuel level sensor assembly, pumps fuel through an in-line fuel filter to the fuel rail assembly. The pump is designed to provide fuel at a pressure greater than is needed by the injectors. The fuel pressure regulator, part of the fuel rail assembly, keeps fuel available to the injectors at a regulated pressure. Unused fuel is returned to the fuel tank via a separate line. For further information, refer to SECTION 6C for replacement procedures covering the fuel tank, fuel pump, in-line filter, and fuel lines.

FUEL PUMP ELECTRICAL CIRCUIT

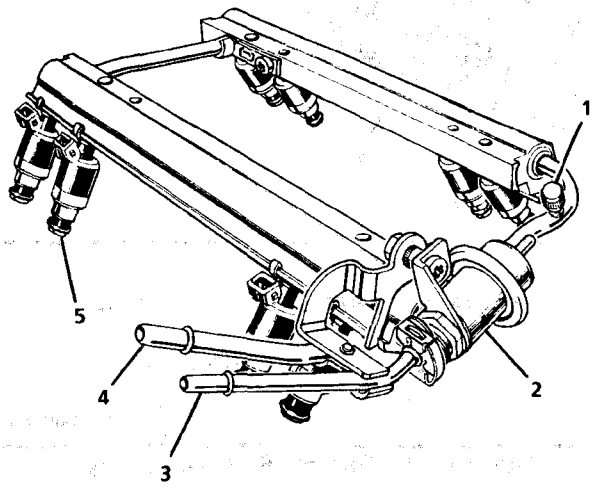
When the ignition switch is turned to the "ON" position (before engaging starter), the PCM energizes the fuel pump relay for two seconds, causing the fuel pump to pressurize the fuel system. If the PCM does not receive ignition reference pulses (engine cranking or running) within two seconds, it shuts "OFF" the fuel pump relay, causing the fuel pump to stop.

As a backup system to the fuel pump relay, the fuel pump also can be energized by the fuel pump and engine oil pressure indicator switch. The switch has two internal circuits. One operates the oil pressure indicator or gage in the instrument cluster, and the other is a normally open switch which closes when oil pressure reaches about 28 kPa (4 psi). If the fuel pump relay fails, the fuel pump and engine oil pressure indicator switch run the fuel pump.

An inoperative fuel pump relay can result in long cranking times, particularly if the engine is cold. The fuel pump and engine oil pressure indicator switch energizes the fuel pump as soon as oil pressure reaches about 28 kPa (4 psi).

FUEL RAIL ASSEMBLY
Figure C2-1

The fuel rail assembly is mounted to the engine intake manifold and performs several functions; it positions the injectors in the intake manifold, it distributes fuel evenly to the injectors, and it integrates the fuel pressure regulator into the fuel metering system.



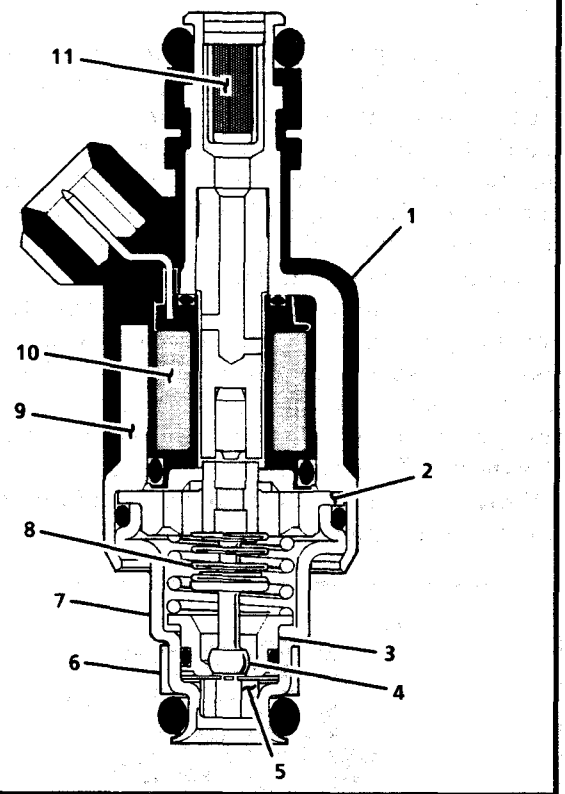
1	CONNECTION - FUEL PRESSURE
2	REGULATOR ASSEMBLY - FUEL PRESSURE
3	TUBE - FUEL OUTLET
4	TUBE - FUEL INLET
5	INJECTOR ASSEMBLY - FUEL

PA 1374-AS

Figure C2-1 - Fuel Rail Assembly

Fuel Injector
Figure C2-2

The sequential multiport fuel injection (SFI) top-feed fuel injector assembly is a solenoid- operated



1	SOLENOID ASSEMBLY	7	HOUSING - SPRAY
2	SPACER & GUIDE ASM	8	SPRING - CORE
3	CORE SEAT	9	HOUSING - SOLENOID
4	VALVE - BALL	10	SOLENOID
5	PLATE - DIRECTOR	11	FILTER - FUEL INLET
6	BACKUP - O-RING		

PA 0496 SY

Figure C2-2 - Fuel Injector Assembly

device, controlled by the PCM, that meters pressurized fuel to a single engine cylinder. The PCM energizes the injector solenoid, which opens a ball valve, allowing fuel to flow past the ball valve, and through a recessed flow director plate. The director plate has six machined holes that control the fuel flow, generating a conical spray pattern of finely atomized fuel at the injector tip.

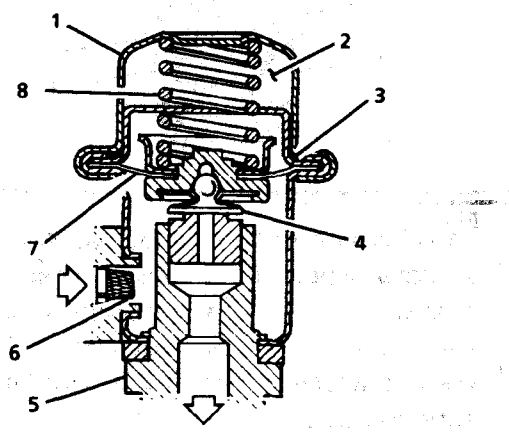
Fuel is directed at the intake valve, causing it to become further atomized and vaporized before entering the combustion chamber.

An injector that is stuck partly open would cause loss of pressure after engine shut down. Consequently, long cranking times would be noticed on some engines. Dieseling could also occur, because some fuel could be delivered to the engine after the ignition is turned "OFF."

Fuel Pressure Regulator Assembly
Figure C2-3

The fuel pressure regulator is a diaphragm-operated relief valve with fuel pump pressure on one side, and regulator spring pressure and intake manifold vacuum on the other. The regulator's function is to maintain a constant pressure differential across the injectors at all times. The pressure regulator compensates for engine load by increasing fuel pressure as engine vacuum drops.

With the ignition "ON" and engine "OFF" (zero vacuum), system fuel pressure at the pressure test connection should be 284-325 kPa (41-47 psi). If the pressure is too low, poor performance could result. If the pressure is too high, excessive odor and a Diagnostic Trouble Code (DTC) 45/65 may result. CHART A-7 has information on diagnosing fuel pressure conditions.



1	COVER
2	VACUUM CHAMBER (VACUUM SOURCE TUBE NOT SHOWN)
3	SEAL - O-RING
4	VALVE - FUEL PRESSURE REGULATOR
5	BASE ASSEMBLY
6	FILTER - SCREEN (IF EQUIPPED)
7	DIAPHRAGM
8	SPRING

NA 0493-SY

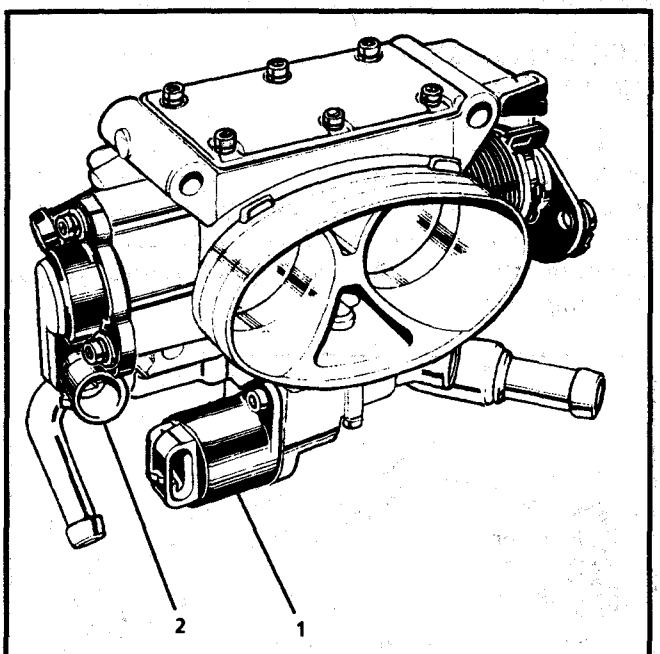
Figure C2-3 - Fuel Pressure Regulator Assembly (Typical)

THROTTLE BODY ASSEMBLY
Figure C2-4

The throttle body assembly is attached to the intake manifold, and is used to control air flow into the engine, thereby controlling engine output. The throttle valves within the throttle body are opened by the vehicle operator through the accelerator controls. During engine idle, the throttle valves are almost closed, and air flow control is handled by a fixed air bypass orifice and the Idle Air Control (IAC) valve, described below. To prevent throttle valve icing during cool weather operation, engine coolant is directed through the coolant cavity on the bottom of the throttle body.

The throttle body also provides the location for mounting the Throttle Position (TP) sensor and for sensing changes in engine vacuum due to throttle valve position.

Vacuum ports are located at, above, or below the throttle valve to generate vacuum signals needed by various components.



1	VALVE ASSEMBLY - IDLE AIR CONTROL
2	SENSOR - THROTTLE POSITION (TP)

PA 1382 AS

Figure C2-4 - Throttle Body Assembly

Idle Air Control (IAC) Valve
Figure C2-5

The purpose of the IAC valve assembly is to control engine idle speed, while preventing stalls due to changes in engine load.

The IAC valve, mounted in the throttle body, controls a portion of the bypass air. An orifice located between the throttle valves also supplies a constant amount of bypass air. By moving a conical valve known as a pintle, "IN," towards the seat (to decrease air flow); or "OUT," away from the seat (to increase air flow), a controlled amount of air can be bypassed. If engine speed is too low, more air is bypassed to increase RPM. If engine speed is too high, less air is bypassed to decrease RPM.

The PCM moves the IAC valve in small steps, called counts. These can be measured and displayed by a scan tool, which plugs into the Data Link Connector (DLC).

During idle, the proper position of the IAC valve is calculated by the PCM, based on battery voltage, coolant temperature, engine load, and engine RPM. If the RPM drops below specification and the throttle valve is closed, the PCM senses a near stall condition and calculates a new valve position to prevent stalling.

- Engine idle speed is a function of total air flow into the engine based on IAC valve pintle position + crankcase ventilation valve flow + throttle valve opening + bypass orifice air flow + calibrated vacuum loss through accessories.
- Controlled idle speed is programmed into the PCM, which determines the correct IAC valve pintle position to maintain the desired idle speed for all engine operating conditions and loads.
- The minimum idle air rate is set at the factory with a stop screw. This setting allows enough air flow by the throttle valves to cause the IAC valve pintle to be positioned a calibrated number of steps (counts), from the seat, during controlled idle operation.
- If the IAC valve is disconnected and reconnected with the engine running, the idle speed may be wrong. If this occurs, reset the IAC valve by depressing the accelerator pedal slightly, start and run engine for five seconds, then turn ignition "OFF" for ten seconds.

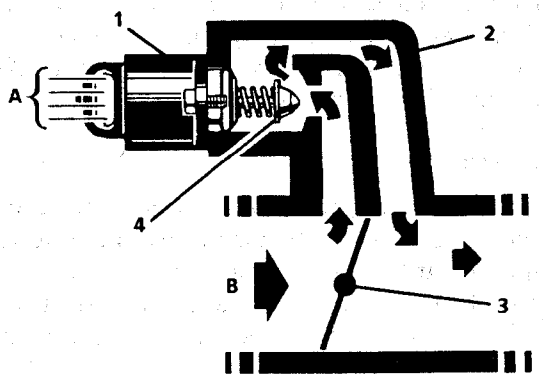
Throttle Position (TP) Sensor

The TP sensor is mounted on the side of the throttle body opposite the throttle lever. It senses the throttle valve angle and relays that information to the PCM. Knowledge of throttle angle is needed by the PCM to generate the required injector control signals (pulses). Refer to "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1".

DIAGNOSIS

FUEL PUMP RELAY
Figure C2-6

The fuel pump relay is mounted behind the driver side kick panel/dead pedal (left foot rest). For diagnosis of the fuel pump relay circuit, refer to CHART A-5.



1	VALVE ASSEMBLY - IDLE AIR CONTROL (IAC)
2	BODY ASSEMBLY - THROTTLE
3	VALVE - THROTTLE
4	PINTLE - IAC VALVE
A	ELECTRICAL INPUT SIGNAL
B	AIR INLET

NA 0494-SY

Figure C2-5 - IAC Valve Air Flow Diagram

FUEL PUMP AND ENGINE OIL PRESSURE INDICATOR SWITCH

The fuel pump and engine oil pressure indicator is threaded into a TEE fitting at the rear of the engine. Refer to "On-Vehicle Service" for the locator view. For diagnosis of the fuel pump relay circuit, refer to CHART A-5.

FUEL METERING SYSTEM

Always start with the On-Board Diagnostic (OBD) system check in the "Engine Components/Wiring Diagrams/Diagnostic Charts," Section "6E3-A". This will reduce diagnosis time and prevent unnecessary parts replacement. Diagnosis of the "Fuel Metering System," is covered in CHART A-3, "Engine Cranks But Won't Run," and CHART A-7, "Fuel System Diagnosis." These charts cover the diagnosis of the injectors, pressure regulator, and the fuel pump.

A malfunction in the fuel metering system usually results in either a rich or lean HO2S signal. This signal causes the PCM to change the fuel calculation (injector pulse width). The change made to the fuel calculation is indicated by a change in the short and long term fuel trim values which can be monitored with a scan tool.

A momentary change to the fuel calculation is indicated by the short term fuel trim value, while a prolonged change is indicated by the long term fuel trim value. Average fuel trim values are around 128, but vary slightly from engine to engine.

Important

- When using a scan tool to observe fuel trim values, remember that if the system is in control, no action is required unless a driveability symptom is present. Listed below are examples of lean and rich HO2S signals with the system in control and out of control.
- A momentary *lean HO2S signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value above 128 (adding fuel).
  - Long term fuel trim value around 128.
- A prolonged *lean HO2S signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value around 128.
  - Long term fuel trim value above 128 (added fuel).
- A prolonged *lean HO2S signal* (system is *out of control)* will appear on the scan tool as:
  - Short term fuel trim value well above 128 (adding fuel).
  - Long term fuel trim value well above 128 (added fuel).

If both fuel trim values are fixed well above 128, refer to DTC 44 or 64 for items which can cause a lean HO2S signal.

- A momentary *rich HO2S signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value less than 128 (reducing fuel).
  - Long term fuel trim value around 128.
- A prolonged *rich HO2S signal* (system is *in* control) will appear on the scan tool as:
  - Short term fuel trim value around 128.
  - Long term fuel trim value less than 128 (reduced fuel).
- A prolonged *rich HO2S signal* (system is *out of control)* will appear on the scan tool as:
  - Short term fuel trim value much less than 128 (reducing fuel).
  - Long term fuel trim value much less than 128 (reduced fuel).

If the fuel trim values are fixed well below 128, refer to DTC 45 or 65 for items which can cause the fuel control system to run rich. If a driveability symptom exists, refer to the particular symptom in the "Symptoms," Section "6E3-B" for additional items to check.

ON-VEHICLE SERVICE

SERVICE INFORMATION

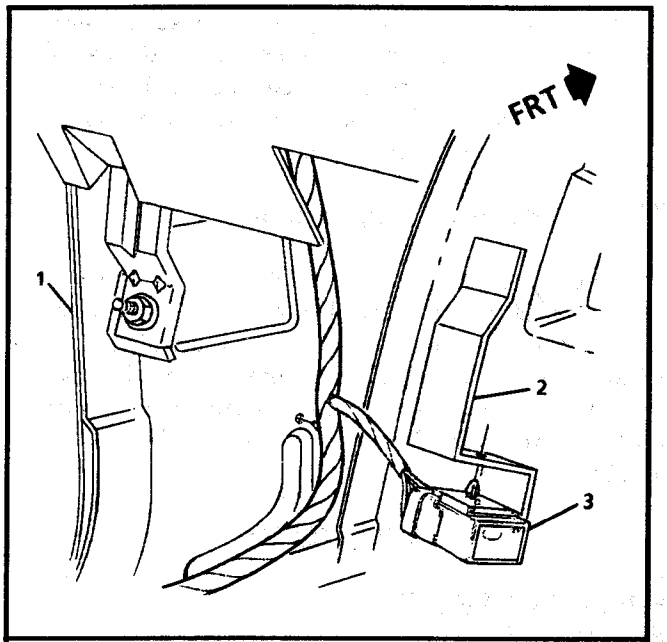
Thread-Locking Material

Important

- The hardware used to attach the Throttle Position (TP) sensor is coated with thread-locking adhesive. If the TP sensor is removed for service, inspect the attaching screw threads. There should be enough thread-locking material (adhesive or compound) on the threads to insure proper relocking. If not, clean the threads and apply Loctite 262 to the threads before reassembly. Replacement screws are included in the service screw assortment package. New attaching hardware is included in the service packages.

FUEL PUMP RELAY
Figure C2-6

The fuel pump relay is mounted inside the passenger compartment, under the dash as shown in Figure C2-6.



1 LEFT DOOR JAM ("A" PILLAR)
2 DEAD PEDAL BRACKET
3 FUEL PUMP RELAY
NS 15279

Figure C2-6 - Fuel Pump Relay

Remove or Disconnect

1. Negative battery cable.
2. Fuel pump relay.

Install or Connect

1. Fuel pump relay.
2. Negative battery cable.

FUEL PUMP AND ENGINE OIL PRESSURE INDICATOR SWITCH
Figure C2-7

The switch is threaded into a TEE fitting at the rear of the engine (Figure C2-7).

Remove or Disconnect

1. Electrical connector.
2. Fuel pump and engine oil pressure indicator switch.

Install or Connect

1. Fuel pump and engine oil pressure indicator switch.
2. Electrical connector.

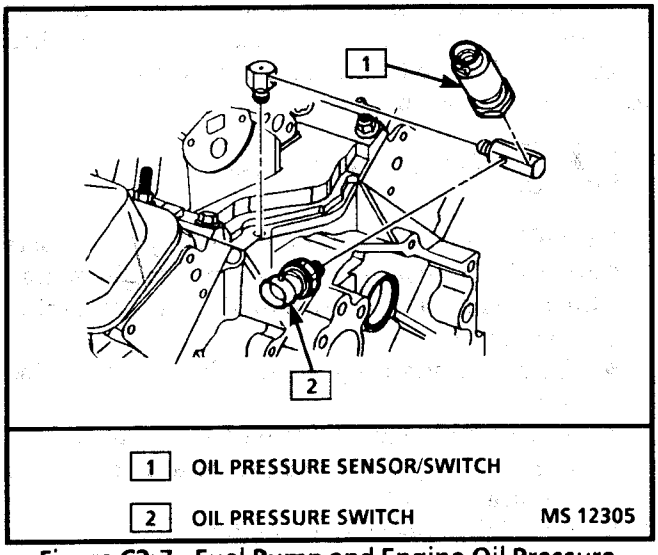


Figure C2-7 - Fuel Pump and Engine Oil Pressure Indicator Switch

SEQUENTIAL MULTIPORT FUEL INJECTION (SFI) COMPONENTS

CAUTION:
• To reduce the risk of fire and personal injury, relieve the fuel system pressure before servicing fuel system components.
• After relieving system pressure, a small amount of fuel may be released when servicing fuel lines or connections. To reduce the chance of personal injury, cover fuel line fittings with a shop towel before disconnecting to catch any fuel that may leak out. Place the towel in an approved container when disconnect is completed.

FUEL PRESSURE RELIEF PROCEDURE

Tool Required:
J 34730-1 Fuel Pressure Gage

1. Ignition "OFF."
2. Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.
3. Loosen fuel filler cap to relieve tank vapor pressure.
4. Connect gage J 34730-1 to fuel pressure valve. Wrap a shop towel around fitting while connecting gage to avoid spillage.
5. Install bleed hose into an approved container and open valve to bleed system pressure. Fuel connections are now safe for servicing.
6. Drain any fuel remaining in gage into an approved container.

FUEL RAIL ASSEMBLY
Figures C2-8 through C2-10

Tools Required:
J 37088-A Fuel Line Release Tool Set

An eight digit identification number is stamped on the fuel rail assembly. Refer to this model identification number if servicing or part replacement is required.

Names of component parts will be found on the numbered list that accompanies the disassembled view.

NOTICE:
- Use care in removing the fuel rail assembly to prevent damage to the injector electrical connector terminals and the injector spray tips. When removed, support the rail to avoid damaging its components.
- Prevent dirt and other contaminants from entering open lines and passages. Fittings should be capped, and holes plugged, during servicing
- The upper and lower O-rings are different colors (black and brown). Be sure to install the black O-ring in the upper position and the brown O-ring in the lower position on the injector. The O-rings are the same size but are made of different materials.

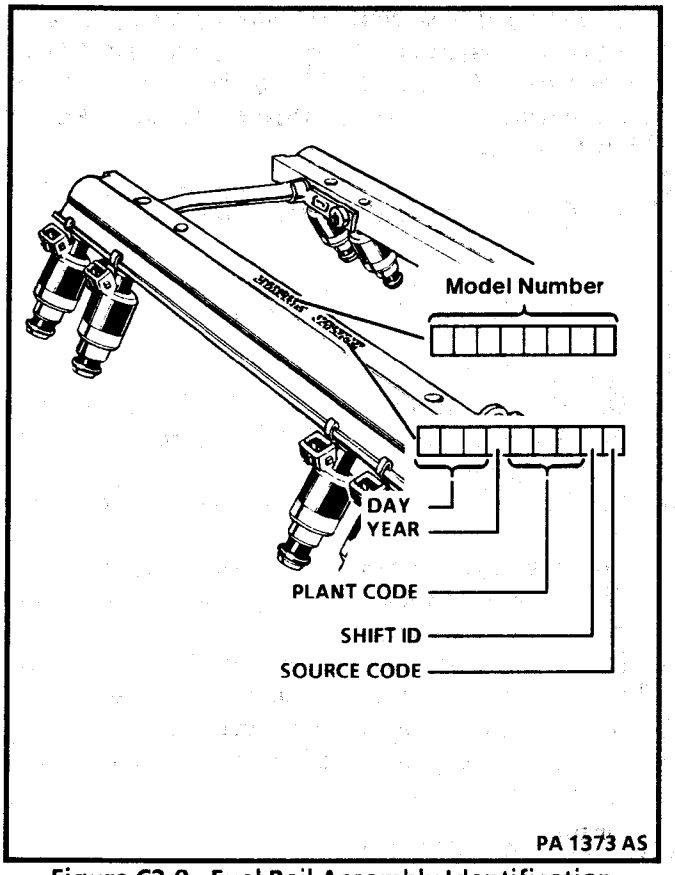


Figure C2-8 - Fuel Rail Assembly Identification

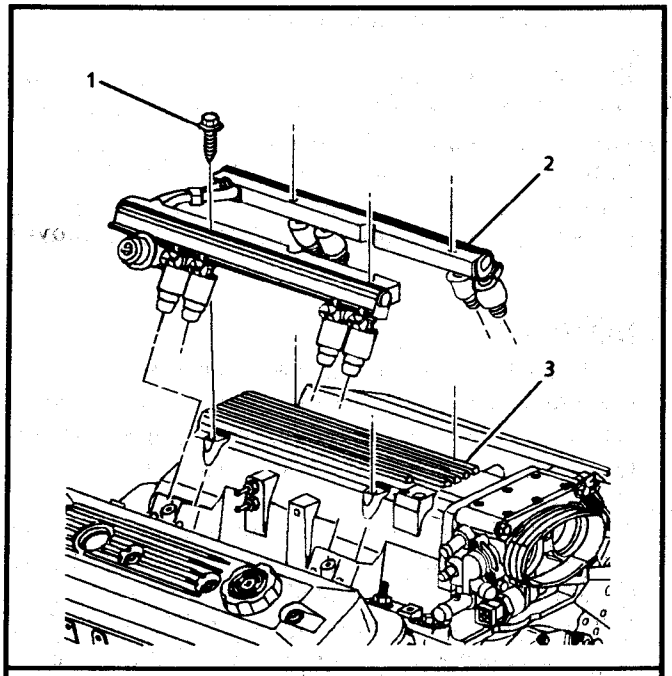


Figure C2-9 - Fuel Rail Removal and Installation

Clean

- Before removal, the fuel rail assembly may be cleaned with a spray type engine cleaner, GM X-30A or equivalent, following package instructions. Do Not soak fuel rails in liquid cleaning solvent.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure. (Refer to the "Fuel Pressure Relief Procedure.")
4. Fuel rail cover.
5. Quick-connect fittings at engine fuel pipes.
6. Slide rubber dust covers from quick-connect fittings at engine fuel pipes.
7. Grasp both sides of fitting. Twist female connector 1/4 turn in each direction to loosen any dirt within fitting.

CAUTION: Safety glasses must be worn when using compressed air, as flying dirt particles may cause eye injury.

8. Using compressed air, blow dirt out of fitting.
9. Choose correct tool from J 37088-A tool set for size of fitting. Insert tool into female connector, then push/pull inward to release locking tabs.
10. Pull connection apart.

Clean and Inspect

NOTICE: If it is necessary to remove rust or burrs from fuel pipe, use emery cloth in a radial motion with the pipe end to prevent damage to O-ring sealing surface.

- Using a clean shop towel, wipe off male pipe end.
- Inspect both ends of fitting for dirt and burrs. Clean or replace components/assemblies as required.

11. Vacuum line at pressure regulator.
12. Vacuum lines to gain access to fuel rail and engine fuel pipes.
13. Electrical harness from routing clips on fuel rail.
14. Engine fuel pipe retaining bolt.
15. Injector electrical connectors.
    - Identify connectors to their corresponding injectors to assure correct sequential injector firing order after reassembly.
16. Fuel rail attaching bolts.
17. Fuel rail assembly.

Disassemble

- Injector lower O-ring (brown) from spray tip end of each injector. Discard O-ring seals. Save O-ring back-up.

Important

- The fuel injector lower O-ring (brown) uses a nylon collar, called the O-ring backup, to properly position the O-ring on the injector. Be sure to reinstall the O-ring backup, or the sealing O-ring may move on the injector when installing the fuel rail and result in a possible vacuum leak and driveability complaints will occur.

Assemble

- Lubricate new lower injector O-rings (brown) and install on spray tip end of each injector.

Install or Connect

1. Fuel rail assembly in intake manifold.
2. Fuel rail attaching bolts.

Tighten

- Fuel rail attaching bolts to 20 N·m (15 lb. ft.).

3. Injector electrical connectors.
   - Make sure that each connector is installed on the proper injector to assure correct sequential injector firing order.
   - Rotate injector(s) as required to avoid stretching wire harness.
4. Engine fuel pipe retaining nut.
5. Electrical harness into routing clips on fuel rail.
6. Vacuum lines to intake manifold and fuel pressure regulator.
7. Quick-connect fittings to engine fuel pipes.
8. Apply a few drops of clean engine oil to the male pipe end of engine fuel pipe, pressure gage adapter or fuel line shutoff adapter.
9. Push both sides of fitting together to cause the retaining tabs/fingers to snap into place.
10. Once installed, pull on both sides of fitting to make sure connection is secure.
11. Slide dust covers over quick-connect fittings.
12. Fuel rail cover.
13. Tighten fuel filler cap.
14. Ignition "OFF."
15. Negative battery cable.

Inspect

- Turn ignition switch to "ON" position for two seconds, then turn "OFF" for ten seconds. Again turn to "ON" position and check for fuel leaks.

FUEL PRESSURE CONNECTION VALVE ASSEMBLY

Figure C2-10

Clean

- Area around fuel pressure connection with GM X-30A or equivalent.

Remove or Disconnect

1. Negative battery cable.
2. Relieve fuel system pressure.
   - Refer to the "Fuel Pressure Relief Procedure."
3. Fuel pressure connection valve assembly.

Install or Connect

1. Fuel pressure connection valve assembly.
2. Tighten fuel filler cap.
3. Negative battery cable.

Inspect

- Turn ignition switch to the "ON" position for two seconds, then turn to the "OFF" position for ten seconds. Again turn the "ON" position, and check for fuel leaks.

FUEL OUTLET TUBE

Figure C2-11

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure.
   - Refer to the "Fuel Pressure Relief Procedure."
4. Fuel rail assembly.
   - Refer to the "Fuel Rail Assembly Removal Procedure."

Disassemble

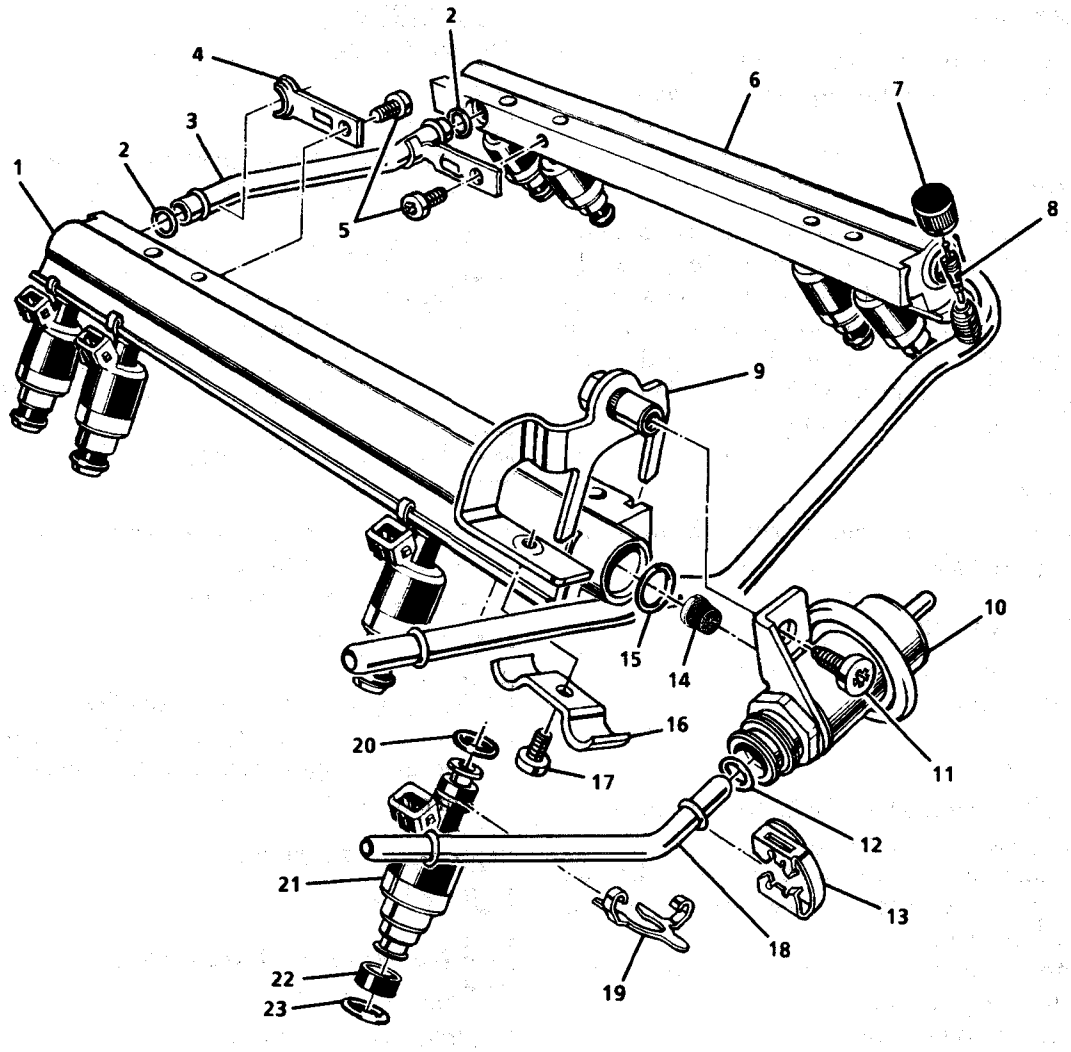
1. Fuel tube bracket and retaining screw.
2. Fuel outlet tube retainer clip.
3. Fuel outlet tube from pressure regulator.
4. O-Ring from outlet tube and discard.

Assemble

1. Lubricate new O-ring with clean engine oil and install on fuel outlet tube.
2. Push fuel outlet tube into fuel pressure regulator.
3. Fuel outlet tube retainer clip.
4. Fuel tube bracket and attaching screw.

Tighten

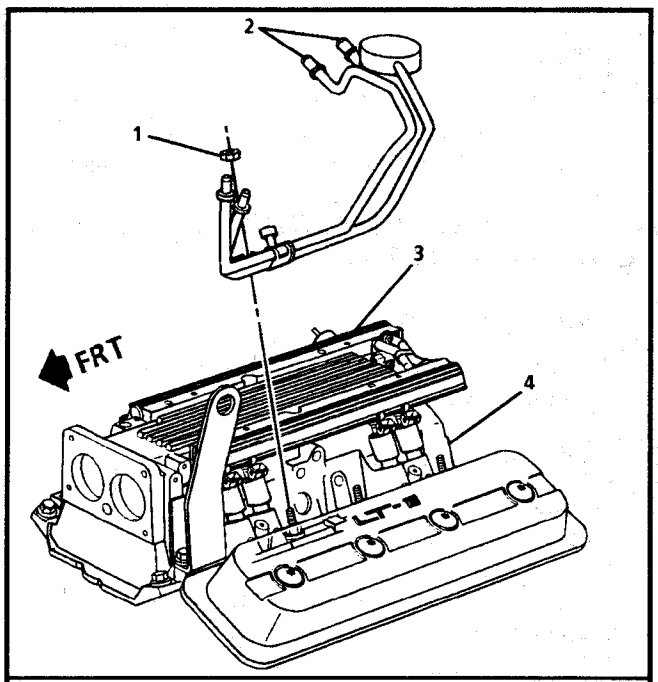
- Fuel tube bracket attaching screw to 5 N·m (44 lb. in.).



1	RAIL ASSEMBLY - LH FUEL	13	CLIP - FUEL OUTLET TUBE RETAINER
2	O-RING - FUEL CROSSOVER TUBE	14	SCREEN - FILTER
3	TUBE ASSEMBLY - FUEL CROSSOVER	15	O-RING - FUEL INLET FITTING
4	RETAINER - CROSSOVER TUBE	16	BRACKET - FUEL TUBE
5	SCREW - CROSSOVER TUBE RETAINER ATTACHING	17	SCREW - FUEL TUBE BRACKET ATTACHING
6	RAIL ASSEMBLY - RH FUEL	18	TUBE ASSEMBLY - FUEL OUTLET
7	CAP - FUEL PRESSURE CONNECTION	19	CLIP - INJECTOR RETAINER
8	VALVE ASSEMBLY - FUEL PRESSURE CONNECTION	20	O-RING - UPPER INJECTOR
9	RETAINER AND SPACER ASSEMBLY	21	INJECTOR ASSEMBLY - FUEL
10	REGULATOR ASSEMBLY - FUEL PRESSURE	22	BACKUP - O-RING
11	SCREW - PRESSURE REGULATOR ATTACHING	22	O-RING - LOWER INJECTOR
12	O-RING - FUEL OUTLET TUBE		

PA 0206 XV

Figure C2-10 - Fuel Rail Assembly



1 RETAINING NUT
2 ENGINE FUEL PIPE
3 FUEL RAIL
4 INTAKE MANIFOLD

NS 15927

Figure C2-11 - Fuel Outlet Tube

Install or Connect

1. Fuel rail assembly.
2. Ignition "OFF."
3. Negative battery cable.

Inspect

- Turn ignition switch to "ON" position for two seconds, then turn "OFF" for ten seconds. Again turn to "ON" position and check for fuel leaks.

FUEL CROSSOVER TUBE ASSEMBLY
Figure C2-10

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure.
   - Refer to the "Fuel Pressure Relief Procedure."
4. Fuel rail assembly.
   - Refer to the "Fuel Rail Assembly Removal Procedure."

Disassemble

1. Fuel tube bracket attaching screw and bracket.
2. Crossover tube retainer attaching screws.
3. Crossover tube assembly from fuel rails.
4. O-rings from crossover tube assembly and discard.

Install or Connect

1. Lubricate new crossover tube assembly O-Rings with clean engine oil and install on crossover tube.
2. Crossover tube assembly into fuel rail sections.
3. Crossover tube retainer attaching screws.

Tighten

- crossover tube retainer attaching screws to 5 N·m (44 lb. in.).

4. Fuel tube bracket and attaching screw.

Tighten

- Fuel tube bracket attaching screw to 5 N·m (44 lb. in.).

5. Fuel rail assembly.
6. Ignition "OFF."
7. Negative battery cable.

Inspect

- Turn ignition switch to "ON" position for two seconds, then turn to "OFF" for ten seconds. Again turn to "ON" position and check for fuel leaks.

FUEL INJECTORS
Figures C2-12 and C2-13

Important

- Use care in removing the fuel injectors to prevent damage to the electrical connector pins on the injector and the nozzle. The fuel injector is serviced as a complete assembly only. The fuel injector is an electrical component and should not be immersed in any type of cleaner.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure.
   - Refer to the "Fuel Pressure Relief Procedure."
4. Fuel rail cover.
5. Fuel rail assembly.
   - Refer to the "Fuel Rail Assembly Removal Procedure."

Disassemble

1. Spread injector retainer clip to release injector from rail.
2. Fuel injector.
3. Injector O-ring seals from both ends of injector, and discard. Save O-Ring backup for use in reinstallation.

Important

- When ordering new fuel injectors, be sure to order the correct injector for the application being serviced.
- The upper and lower fuel injector O-rings use different part numbers. To identify the the correct O-ring, the upper O-ring is black and the lower O-ring is brown. Both are the same size but are made of different material.
- When replacing injector O-rings, be sure to install the brown O-ring in the lower position.
- The fuel injector lower O-ring uses a nylon collar, called the O-ring backup, to properly position the O-ring on the injector. Be sure to reinstall the O-ring backup, or the sealing O-ring may move on the injector when installing the fuel rail and result in a possible vacuum leak.

Assemble

1. Lubricate new injector O-ring seals with clean engine oil, and install on injector.
2. New retainer clip onto injector.
   - Position clip on right side of the injector's electrical connector.

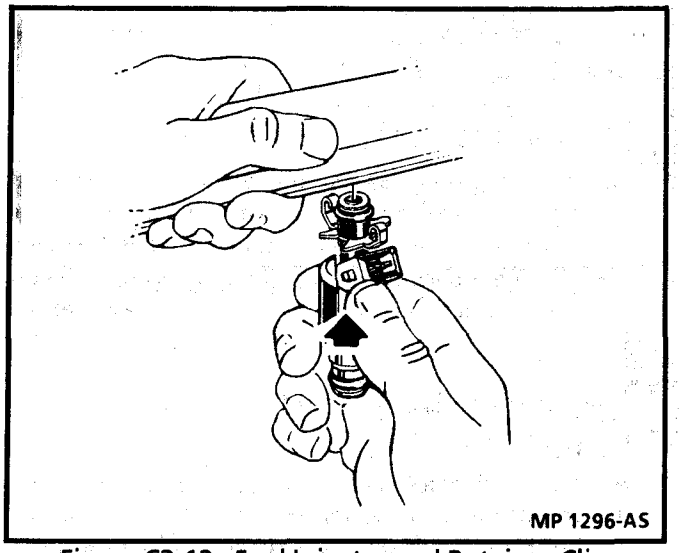


Figure C2-12 - Fuel Injector and Retainer Clip

3. Fuel injector assembly into fuel rail injector socket, with electrical connector facing outward.
4. Push injector into socket until retainer clip locks onto flange on fuel rail.

Install or Connect

1. Fuel rail assembly.
2. Fuel rail cover.
3. Tighten fuel filler cap.
4. Ignition "OFF."
5. Negative battery cable.

Inspect

- Turn ignition switch to "ON" position for two seconds, then turn to "OFF" for ten seconds. Again turn to "ON" position and check for fuel leaks.

FUEL PRESSURE REGULATOR ASSEMBLY
Figure C2-4 and C2-10

Important

- The pressure regulator is serviced as a complete assembly only.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Relieve fuel system pressure.
   - Refer to "Fuel Pressure Relief Procedure."
4. Fuel rail cover.
5. Fuel rail assembly.
   - Refer to "Fuel Rail Removal."

Disassemble

1. Fuel tube bracket attaching screw and bracket.
2. Pressure regulator attaching screw.
3. Pressure regulator from fuel rail.
4. Fuel outlet tube retainer clip and fuel outlet tube from pressure regulator.
5. Pressure regulator inlet O-ring and discard.
6. Fuel outlet tube O-ring and discard.

Inspect

- Filter screen for contamination. If contaminated, remove and discard.

Assemble

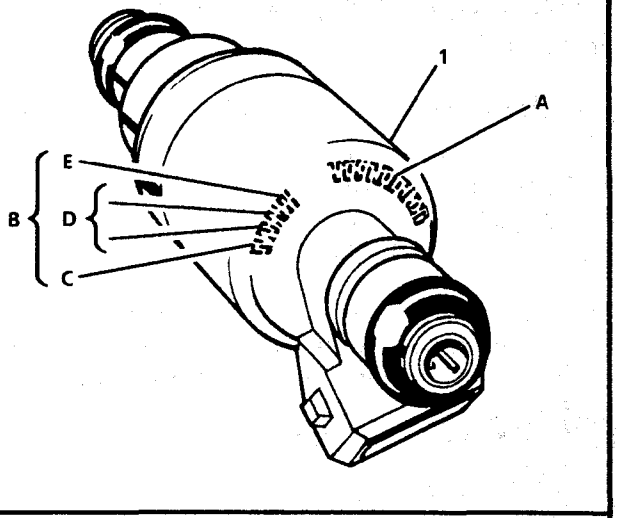
1. Lubricate new pressure regulator inlet O-ring with clean engine oil and install on regulator.
2. Lubricate new fuel outlet tube O-ring with clean engine oil and install on fuel outlet tube.
3. Fuel outlet tube into regulator and install retainer clip.
4. Push pressure regulator into rail.
5. Pressure regulator attaching screw.

Tighten

- Pressure regulator attaching screw to 10 N·m (89 lb. in.).
  - Refer to "Thread-Locking Material."
6. Fuel tube bracket and attaching screw.

Tighten

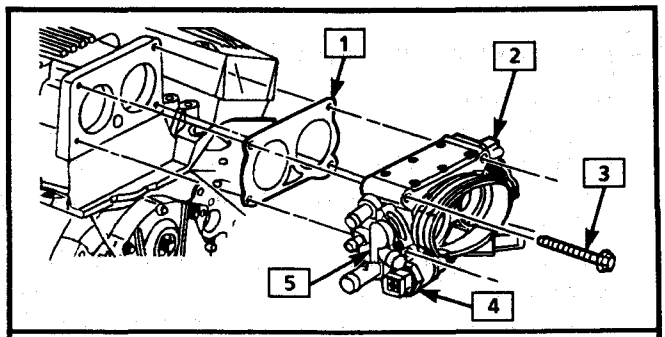
- Fuel tube bracket attaching screw to 5 N·m (44 lb. in.).



1 INJECTOR ASSEMBLY - FUEL
A PART NUMBER IDENTIFICATION
B BUILD DATE CODE
C MONTH 1-9 (JAN-SEPT) O, N, D (OCT, NOV, DEC)
D DAY
E YEAR

MP 1222-AS

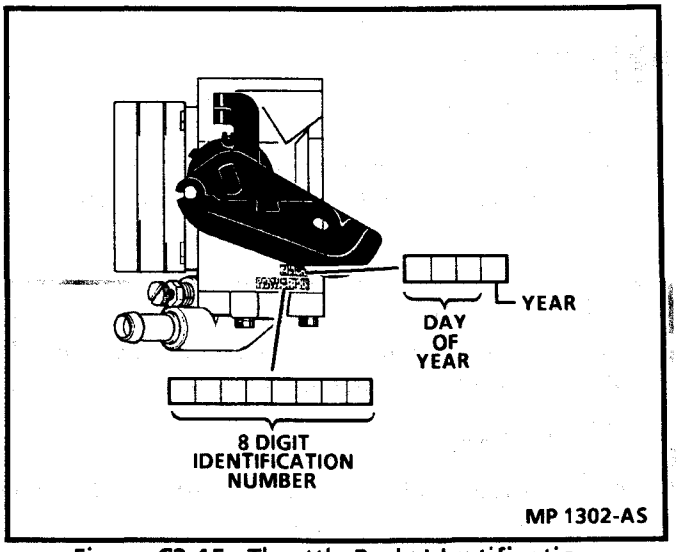
Figure C2-13 - Injector Part Number Location



1 GASKET
2 THROTTLE BODY ASSEMBLY
3 BOLT
4 IDLE AIR CONTROL (IAC) VALVE
5 THROTTLE POSITION SENSOR (TPS)

MS 12304-6E

Figure C2-14 - Throttle Body Removal (Typical)



MP 1302-AS

Figure C2-15 - Throttle Body Identification

Install or Connect

1. Fuel rail assembly.
2. Fuel rail cover.
3. Tighten fuel filler cap.
4. Ignition "OFF."
5. Negative battery cable.

Inspect

- Turn ignition switch to "ON" position for two seconds, then turn to "OFF" for ten seconds. Again turn to "ON" position and check for fuel leaks.

THROTTLE BODY ASSEMBLY
Figure C2-14 through C2-16

The throttle body assembly repair procedures cover component replacement with the unit on the vehicle. However, throttle body replacement requires that the complete unit be removed from the engine.

An eight digit part identification number is stamped on the throttle body casting as shown in Figure C2-14. Refer to this number if servicing, or part replacement is required. For identification of parts during repair, refer to the disassembled view (Figure C2-15).

Clean

Important

- Do not soak the throttle body in cold immersion type cleaner. The throttle valves have a factory applied sealing compound (DAG material is applied to outside edge of each valve and throttle bore) to prevent air bypass at closed throttle. Strong solvents or brushing will remove the material. To clean the throttle body following disassembly, use a spray type cleaner such as GM X66-A or GM 1052626. Use a shop towel to remove heavy deposits.

NOTICE: The TP sensor and IAC valve are electrical components and should NOT come in contact with solvent or cleaner, as they may be damaged.

Remove or Disconnect

1. Ignition "OFF."
2. Negative battery cable.
3. Partially drain cooling system to allow hoses at throttle body to be removed. Refer to SECTION 6B.
4. Air intake duct. Refer to "Air Intake System," Section "6E3-C14".
5. Electrical connectors from TP sensor and IAC valve.
6. Vacuum lines.
7. Coolant hoses from throttle body.
8. Accelerator cable shield.
9. Accelerator control cable(s).
10. Throttle body attaching bolts.
11. Throttle body assembly and flange gasket.
- Discard gasket.

Clean

NOTICE: Use care in cleaning old gasket material from machined aluminum surfaces as sharp tools may damage sealing surfaces.

- Gasket sealing surfaces.

Install or connect

1. Throttle body assembly with new flange gasket.
2. Throttle body attaching bolts.

Tighten

- Throttle body attaching bolts to 15 N·m (11 lb. ft.).

3. Accelerator control cable(s).
4. Coolant hoses to throttle body.
5. Vacuum lines.
6. Electrical connectors to TP sensor and IAC valve.
7. Accelerator cable shield.
8. Air intake assembly. Refer to "Air Intake System," Section "6E3-C14".
9. Refill radiator. Refer to SECTION 6B.
10. Ignition "OFF."
11. Negative battery cable.

Inspect

- With the engine "OFF," check to see that the accelerator pedal is free.
  - Depress pedal to the floor and release.

12. Reset IAC valve pintle position:
    A. Depress accelerator pedal slightly.
    B. Start and run engine for five seconds.
    C. Turn ignition "OFF" for ten seconds.
    D. Restart engine and check for proper idle operation.

THROTTLE POSITION (TP) SENSOR
Figure C2-16

Remove or Disconnect

1. Electrical connector.
2. TP sensor attaching screws.
3. TP sensor.
4. TP sensor static seal.

NOTICE: The TP sensor is an electrical component and must not be soaked in any liquid cleaner or solvent as damage may result.

Install or Connect

1. TP sensor static seal.
2. With throttle valve in the closed position, install the TP sensor on the throttle body assembly, making sure TP sensor lever lines up with the TP sensor drive lever on the throttle shaft.
3. TP sensor attaching screws coated with appropriate thread-locking material.
   - Refer to "Thread-Locking Material."

Tighten

- TP sensor attaching screws to 2.0 N·m (18 lb. in.).

4. TP sensor electrical connector.

IDLE AIR CONTROL (IAC) VALVE
Figures C2-16 and C2-17

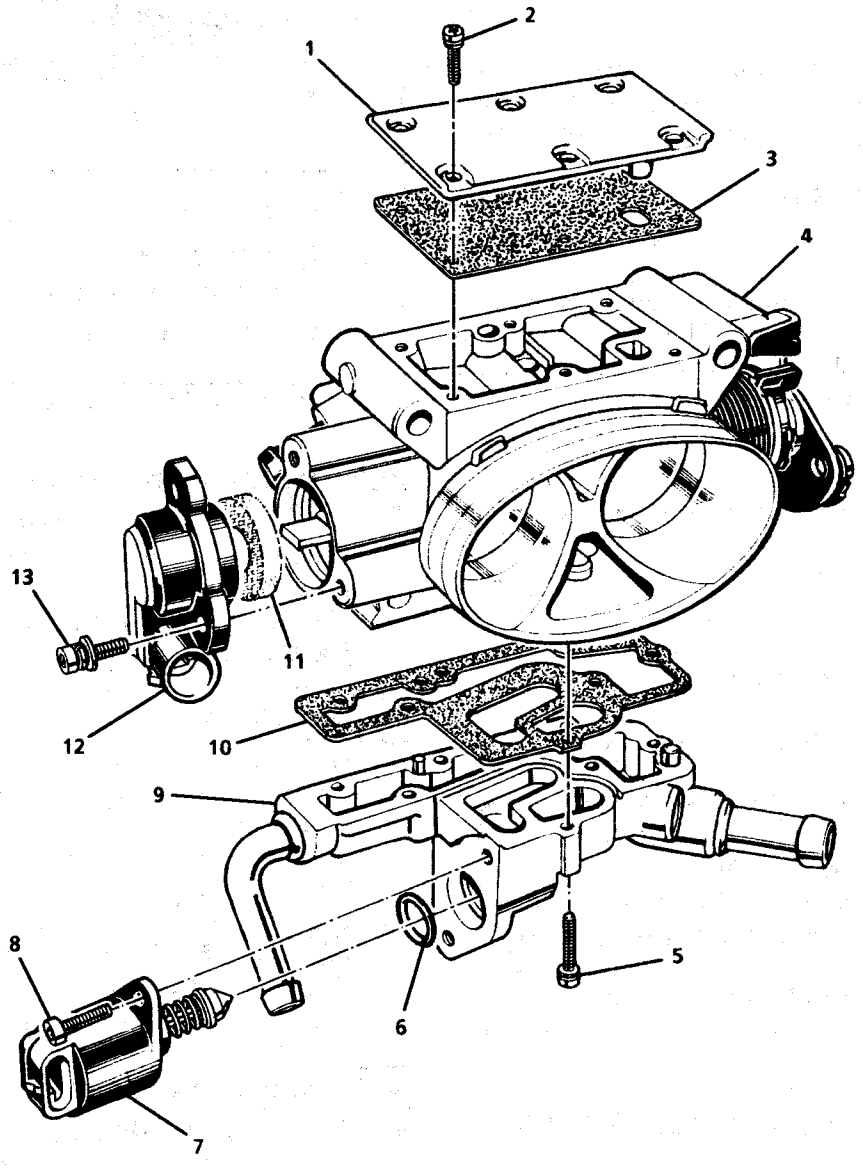
Remove or Disconnect

1. Electrical connector from IAC valve.
2. Air inlet assembly. Refer to "Air Intake System," Section "6E3-C14".
3. IAC valve assembly attaching screws.
   - IAC valve assembly.

NOTICE: On IAC valves that have been in service: Do Not push or pull on the IAC valve pintle. The force required to move the pintle may damage the threads on the worm drive. Also, do not soak IAC valve in any liquid cleaner or solvent, as damage may result.

Clean and Inspect

- Clean IAC valve O-ring sealing surface, pintle valve seat and air passage.
  - The IAC valve may be cleaned using GM cleaner 1052626 or GM X-66A. Use a shop towel or parts brush to remove heavy deposits.
  - Shiny spots on the pintle or seat are normal, and do not indicate misalignment or a bent pintle shaft.



1	COVER - CLEAN AIR	8	SCREW - IAC VALVE ATTACHING
2	SCREW - CLEAN AIR COVER ATTACHING	9	COVER ASSEMBLY - IACV/COOLANT
3	GASKET - CLEAN AIR COVER	10	GASKET - IACV/COOLANT COVER TO THROTTLE BODY
4	BODY ASSEMBLY - THROTTLE	11	SEAL - STATIC
5	SCREW - IACV/COOLANT COVER ATTACHING	12	SENSOR - THROTTLE POSITION (TP)
6	O-RING - IAC VALVE ASSEMBLY	13	SCREW - TP SENSOR ATTACHING
7	VALVE ASSEMBLY - IDLE AIR CONTROL (IAC)		

PA 0211 XV

Figure C2-16 - Throttle Body Assembly

If air passage has heavy deposits, remove throttle body for complete cleaning.

- Inspect IAC valve O-ring for cuts, cracks, or distortion. Replace if damaged.

Important

- If installing a new IAC valve, be sure to replace with an identical part. IAC valve pintle shape and diameter are designed for the specific application.

Measure (If Installing a New IAC Valve)

- Distance between tip of IAC valve pintle and mounting surface.
  - If greater than 28 mm, use finger pressure to slowly retract the pintle. The force required to retract the pintle of a *new* valve will not cause damage to the valve.

Install or Connect

1. Lubricate IAC valve O-ring with clean engine oil.
2. IAC valve assembly.
3. IAC valve attaching screws.

Tighten

- IAC valve attaching screws to 3 N·m (27 lb. in.).

4. Air inlet assembly. Refer to "Air Intake System," Section "6E3-C14".
5. Electrical connectors to TP sensor, IAT sensor, and IAC valve.
6. Reset IAC valve pintle position:
   A. Depress accelerator pedal slightly.
   B. Start and release accelerator pedal, run engine for five seconds.
   C. Turn ignition "OFF" for ten seconds.
   D. Restart engine and check for proper idle operation.

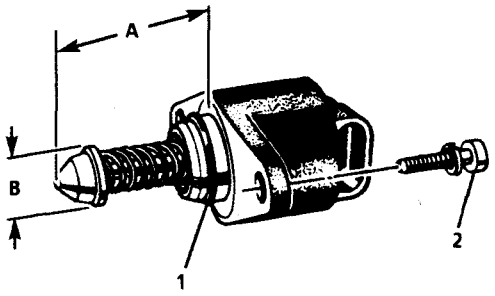
IDLE AIR CONTROL VALVE/COOLANT COVER ASSEMBLY
Figure C2-16

Remove or Disconnect

- Throttle body from intake manifold.
  - Refer to "Throttle Body Assembly."

Disassemble

1. IAC valve.
   - Refer to "Idle Air Control (IAC) Valve."
2. Idle air control valve/coolant cover assembly screws.
3. Idle air control valve/coolant cover assembly and gasket.
   - Discard gasket.



1	O-RING - IAC VALVE
2	SCREW ASSEMBLY - IAC VALVE ATTACHING
A	DISTANCE OF PINTLE EXTENSION
B	DIAMETER OF PINTLE

LP 1220 AS

Figure C2-17 - Idle Air Control Valve Assembly

Clean and Inspect

- Clean gasket sealing surface.
- Inspect gasket sealing surface for corrosion or damage that would cause a coolant leak. Replace idle air control valve/coolant cover assembly or throttle body if necessary.

Assemble

1. New gasket.
2. Idle air control valve/coolant cover assembly assembly.
3. Idle air control valve/coolant cover assembly screws.

Tighten

- Idle air control valve/coolant cover assembly screws to 3.2 N·m (28 lb. in.).

Install and Connect

- Throttle body to intake manifold.
  - Refer to "Throttle Body Assembly."

CLEAN AIR COVER AND GASKET
Figure C2-15

Remove or Disconnect

1. Clean air cover attaching screws.
2. Clean air cover and gasket.
   - Discard gasket.

Clean

- Gasket sealing surface.

Install or Connect

1. New clean air cover gasket on throttle body.
2. Clean air cover.

3. Clean air cover attaching screws.

Tighten

- Clean air cover attaching screws to 3.2 N·m (28 lb. in.).

AIR VENT VALVE ASSEMBLY

Figure C2-16

Remove or Disconnect

- Air vent valve assembly.

Install and Connect

- Air vent valve assembly.

Tighten

- Air vent valve fitting to 5.0 N·m (44 lb. in.).

TORQUE SPECIFICATIONS

Fuel Rail Attaching Bolts	20.0 N·m (15 lb. ft.)
Fuel Tube Bracket Attaching Screw	5 N·m (44 lb. in.)
Crossover Tube Retainer Attaching Screws	5 N·m (44 lb. in.)
Fuel Pressure Regulator Attaching Screw	10 N·m (89 lb. in.)
Fuel Tube Retainer Attaching Screw	5 N·m (44 lb. in.)
Throttle Body Attaching Bolts	15.0 N·m (11 lb. ft.)
TP Sensor Attaching Screws	2.0 N·m (18 lb. in.)
IAC Valve Attaching Screws	3.0 N·m (27 lb. in.)
IAC Valve/Coolant Cover Attaching Screws	3.2 N·m (28 lb. in.)
Clean Air Cover Attaching Screws	3.2 N·m (28 lb. in.)
Air Vent Valve Assembly	5.0 N·m (44 lb. in.)

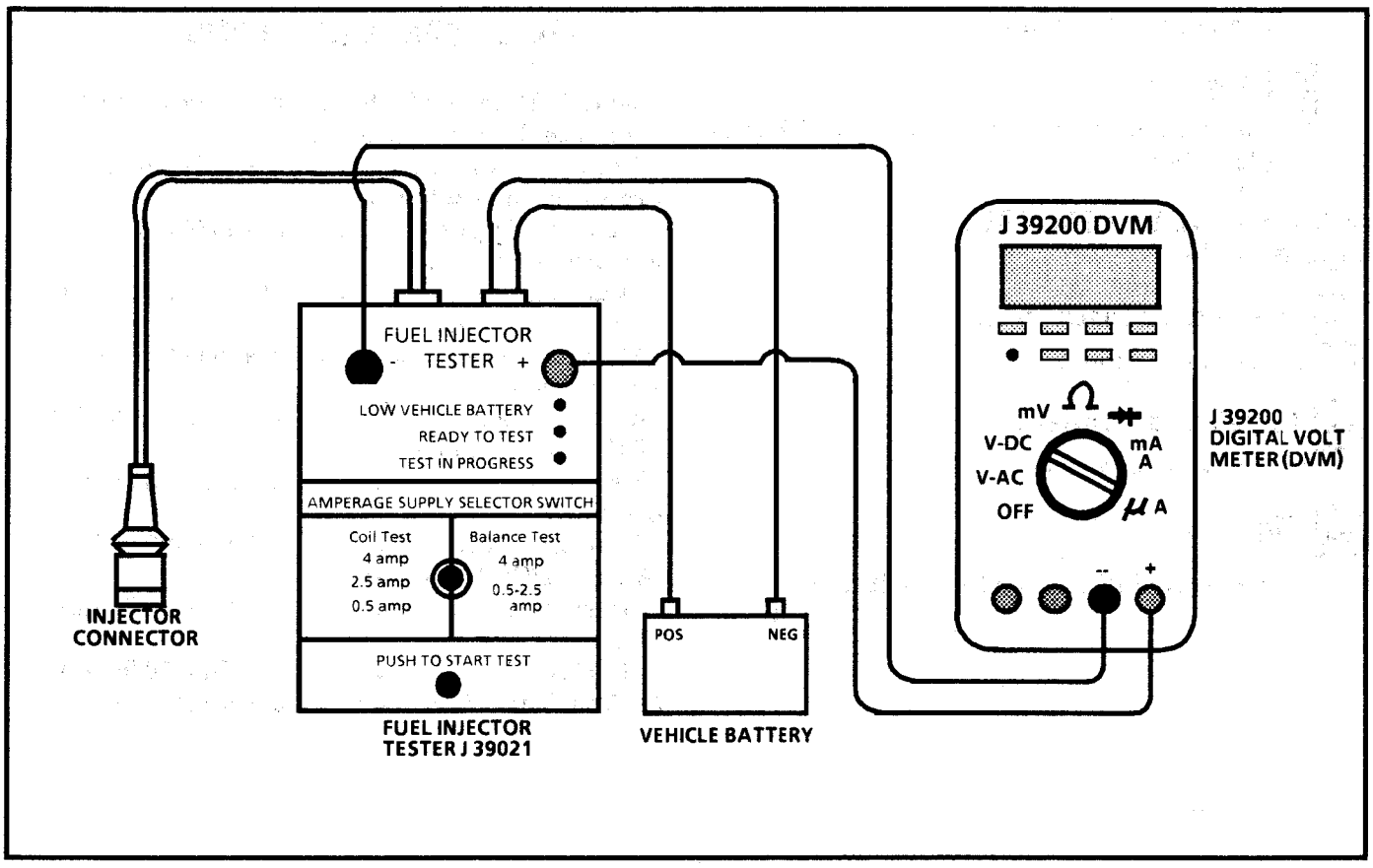


CHART C-2A

(Page 1 of 3)
INJECTOR COIL TEST PROCEDURE
5.7L (VIN P) "F" CARLINE

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

1. This is the set-up step for performing the injector coil test. Also read instructions included with tools used for test.
2. Engine coolant temperature affects the tool's ability to detect a faulty injector. If engine coolant temperature is *NOT* between 50°F and 95°F the comparison chart (Page 2 of 3) must be used.
3. The first second of the voltage reading may be inaccurate due to initial current surge, therefore, record the lowest voltage displayed after the first second of test. The voltage reading should be within range (see example). The voltage reading may increase throughout the test as the injector windings warm and the resistance changes. An erratic voltage reading (one that jumps up and down) indicates an intermittent connection within the fuel injector.
4. To check the mechanical (fuel delivery) portion of the fuel injector, perform an injector balance test.

Resistance Ohms	Voltage Spec. at 50° - 95° F
11.8 - 12.6	5.7 - 6.6

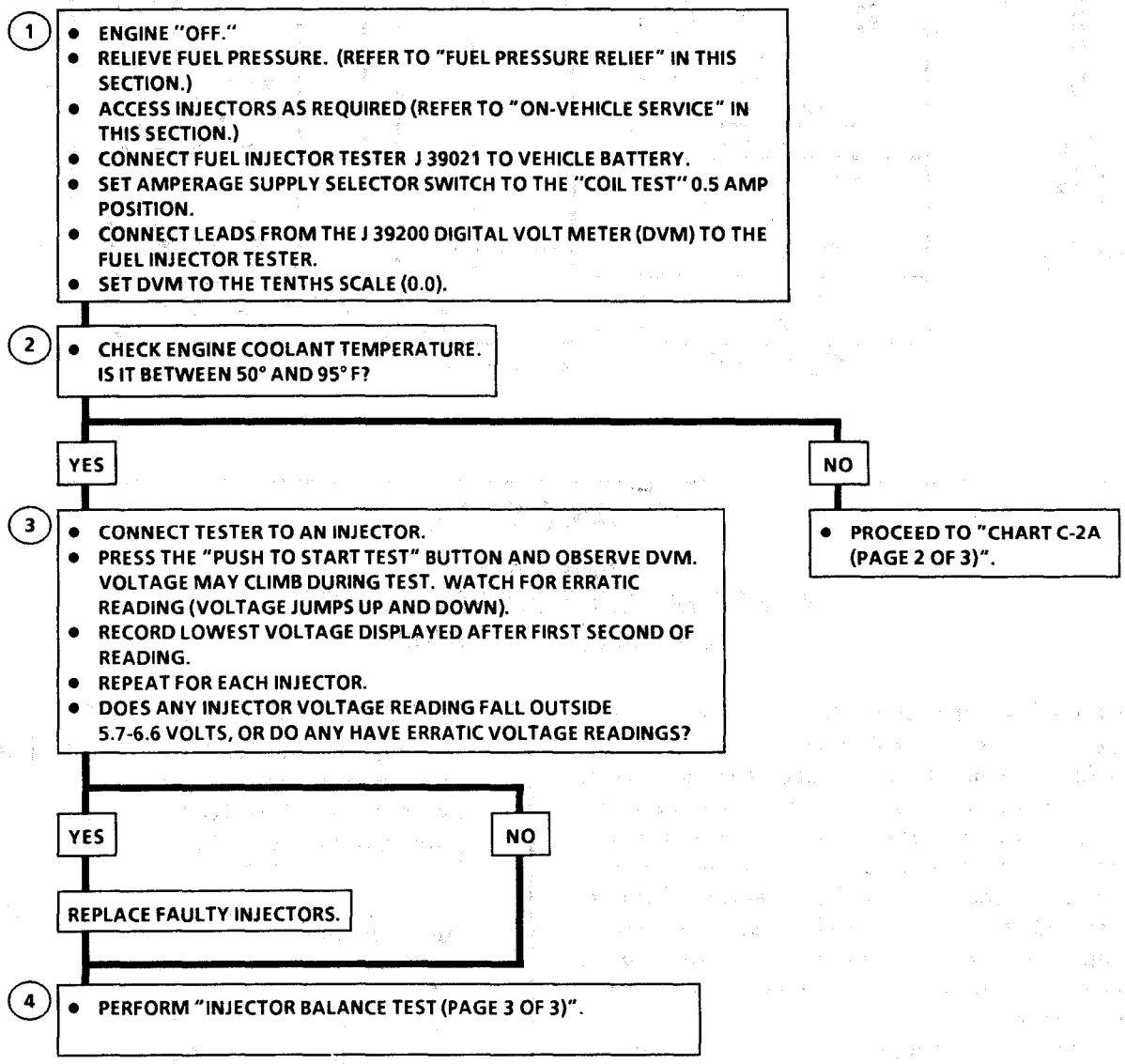
Inj#	Reading	Pass/Fail
1	6.3	P
2	5.9	P
3	6.2	P
4	6.1	P
5	**4.8**	**F**
6	6.0	P

EXAMPLE

5-20-93
PS 17395

CHART C-2A

(Page 1 of 3)
INJECTOR COIL TEST PROCEDURE
5.7L (VIN P) "F" CARLINE



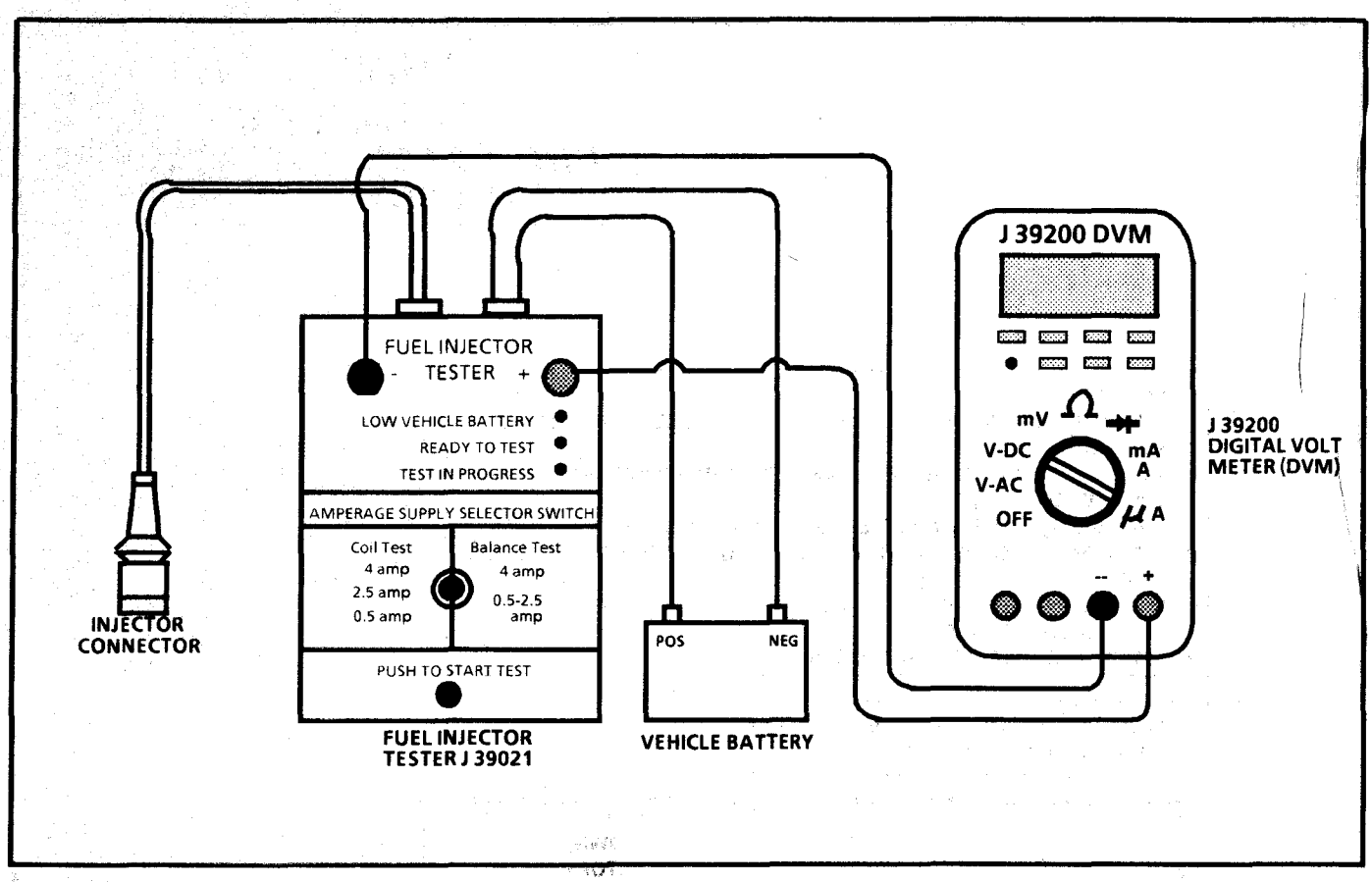


CHART C-2A

(Page 2 of 3)
INJECTOR COIL TEST PROCEDURE
5.7L (VIN P) "F" CARLINE

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

1. The first second of the voltage reading may be inaccurate due to initial current surge, therefore, record the lowest voltage displayed after the first second of test. The voltage reading may increase throughout the test as the injector windings warm and the resistance changes. An erratic voltage reading (one that jumps up and down) indicates an intermittent connection within the fuel injector.
2. From recorded voltages (see example), identify the highest voltage reading recorded (other than those above 9.5 volts). Subtract all other voltages from the highest voltage recorded. The subtracted value for any injector must not exceed 0.6 volt.
3. To check the mechanical (fuel delivery) portion of the fuel injector, perform an injector balance test.

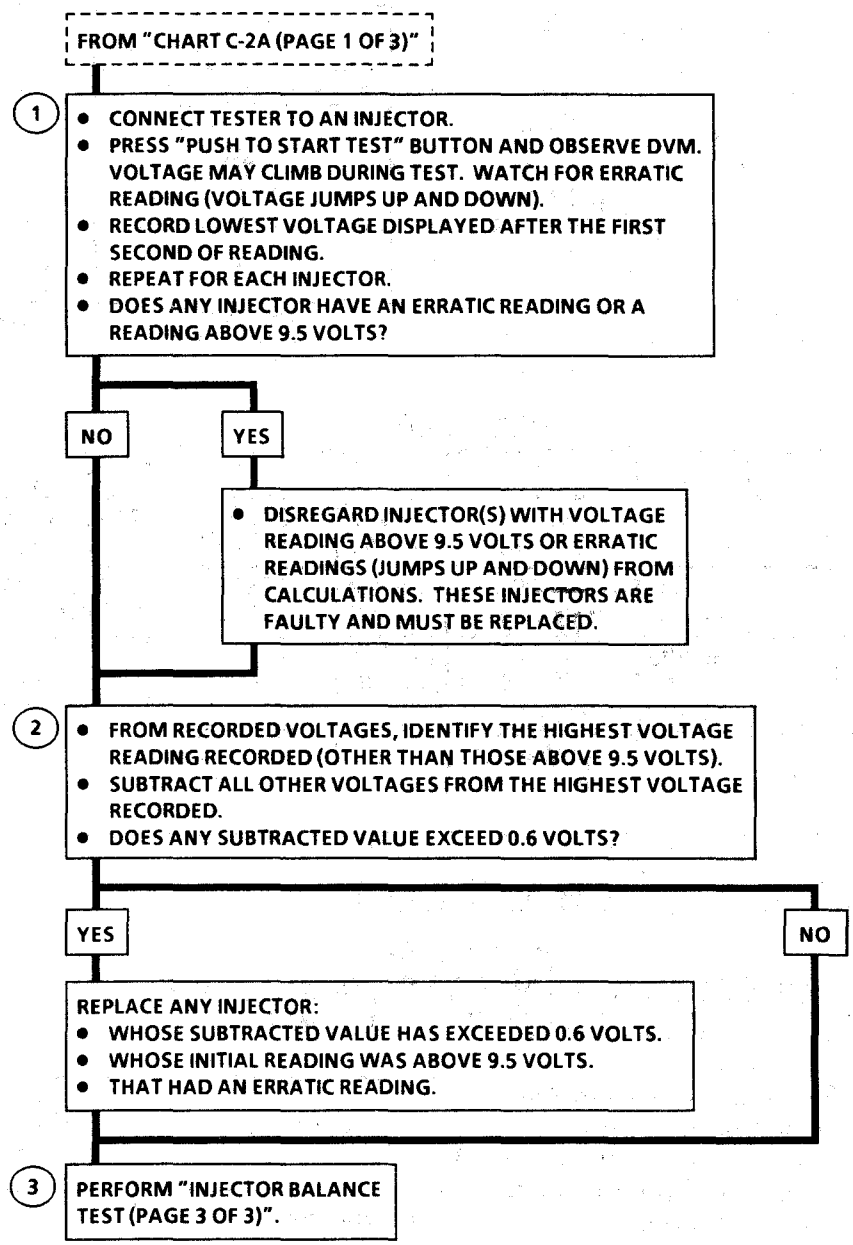
Highest Voltage Reading	7.1 Volts
Acceptable Subtracted Value Above/Below 50°-95°F.	0.6 Volt

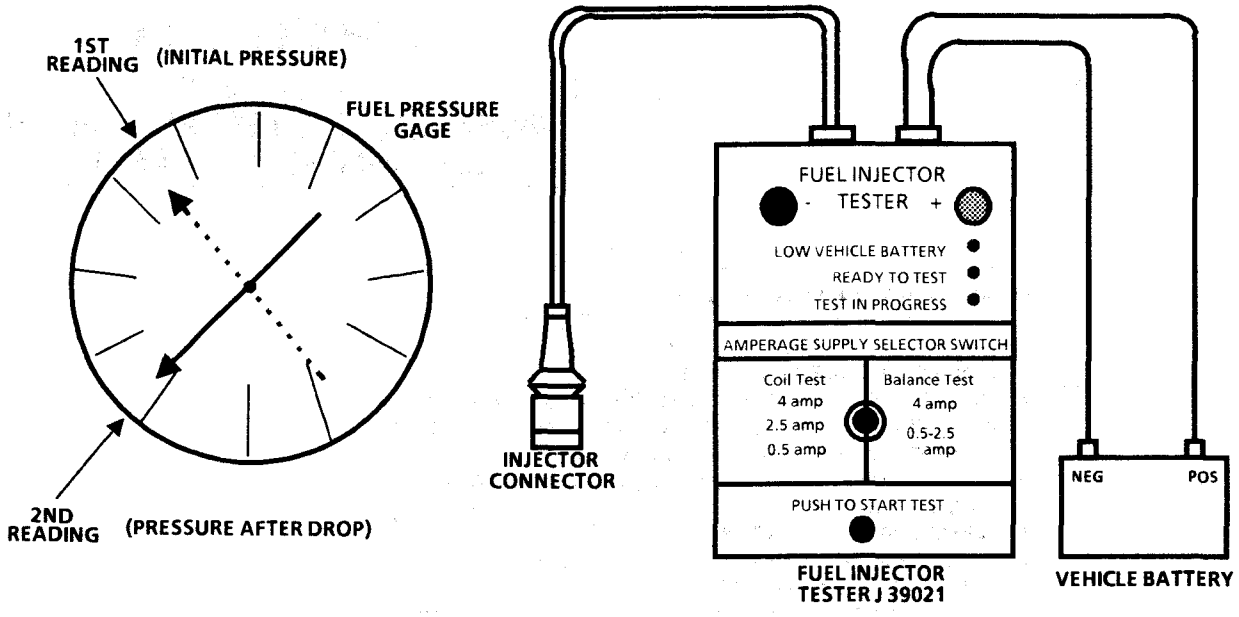
Inj. No.	Voltage Reading	Subtracted Value	Pass/Fail
1	9.8	---	F
2	6.6	0.5	P
3	6.9	0.2	P
4	5.8	1.3	F
5	7.0	0.1	P
6	7.1	0.0	P

EXAMPLE

CHART C-2A

(Page 2 of 3)
INJECTOR COIL TEST PROCEDURE
5.7L (VIN P) "F" CARLINE





EXAMPLE

CYLINDER	1	2	3	4	5	6
1ST Reading	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)
2ND Reading	131 kPa (19 psi)	117 kPa (17 psi)	124 kPa (18 psi)	145 kPa (21 psi)	131 kPa (19 psi)	130 kPa (19 psi)
Amount of Drop	165 kPa (24 psi)	179 kPa (26 psi)	172 kPa (25 psi)	151 kPa (22 psi)	165 kPa (24 psi)	166 kPa (24 psi)
166 kPa/24 psi ave. ± 10 kPa/1.5 psi 156 kPa to 176 kPa 22.5 psi to 25.5 psi	OK	FAULTY, RICH (TOO MUCH FUEL DROP)	OK	FAULTY, LEAN (TOO LITTLE FUEL DROP)	OK	OK

CHART C-2A

(Page 3 of 3)
INJECTOR BALANCE TEST PROCEDURE
5.7L (VIN P) "F" CARLINE

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

1. Engine cool down period (10 minutes) is necessary to avoid irregular fuel pressure readings due to "Hot Soak" fuel boiling.
2. Energize tester one time and record pressure drop at the lowest point (Disregard any slight pressure variations).
3. If the pressure drop of all injectors is within 10 kPa (1.5 psi) of the average fuel pressure drop, the injectors are flowing properly. The actual amount of pressure drop is calculated by subtracting the second pressure reading from the first pressure reading.

ENGINE	FUEL PRESSURE RANGE
All engines EXCEPT 5.7L (VIN J) Corvette 3.1L (VIN W) Lumina VFV	284-325 kPa (41-47 psi)
5.7L (VIN J) Corvette 3.1L(VIN W) Lumina VFV	333-376 kPa (48-55 psi)

6-14-93
PS 17399

CHART C-2A

(Page 3 of 3)
INJECTOR BALANCE TEST PROCEDURE 5.7L (VIN P) "F" CARLINE

CAUTION: TO REDUCE THE RISK OF FIRE AND PERSONAL INJURY, WRAP A SHOP TOWEL AROUND THE FUEL PRESSURE CONNECTION TO ABSORB ANY FUEL LEAKAGE THAT MAY OCCUR WHEN INSTALLING THE PRESSURE GAGE. PLACE TOWEL IN APPROVED CONTAINER.

NOTICE: The entire test should NOT be repeated more than once without running the engine to prevent flooding. (This includes any retest on faulty injectors.)

Important
The injector coil test should be performed prior to this test. Refer to Page 1 of 3.

1. IF ENGINE IS AT OPERATING TEMPERATURE, ALLOW A 10 MINUTE "COOL DOWN " PERIOD.
   - IGNITION "OFF."
   - CONNECT FUEL PRESSURE GAGE.
   - ENERGIZE FUEL PUMP USING AVAILABLE METHOD FOR VEHICLE (FUEL PUMP TEST CONNECTOR OR TECH 1 SCAN TOOL ENABLE).
   - PLACE OPEN END OF BLEED HOSE INTO AN APPROVED GASOLINE CONTAINER AND BLEED AIR FROM FUEL GAGE.
   - WITH FUEL PUMP RUNNING NOTE FUEL PRESSURE, PRESSURE SHOULD BE WITHIN SPECIFIED RANGE SHOWN ON FACING PAGE. IF NOT, REFER TO CHART A-7.
   - TURN FUEL PUMP "OFF." WHEN PUMP STOPS, PRESSURE MAY VARY SLIGHTLY THEN SHOULD HOLD STEADY. IF NOT, REFER TO CHART A-7

2. - CONNECT FUEL INJECTOR TESTER TO AN INJECTOR.
     - SET AMPERAGE SUPPLY SELECTOR SWITCH TO THE "BALANCE TEST" 0.5 - 2.5 AMP POSITION.
   - CYCLE FUEL PUMP "ON"/"OFF"TO PRESSURIZE FUEL SYSTEM.
   - RECORD STABILIZED FUEL PRESSURE (1ST PRESSURE READING - SEE EXAMPLE ON FACING PAGE)
   - ENERGIZE FUEL INJECTOR BY DEPRESSING "PUSH TO START TEST" BUTTON.
   - NOTE FUEL PRESSURE THE INSTANT THE FUEL PRESSURE GAGE NEEDLE STOPS. RECORD FUEL PRESSURE READING (2ND PRESSURE READING - SEE EXAMPLE ON FACING PAGE).

3. - REPEAT STEP 2 ON ALL INJECTORS.
   - SUBTRACT 2ND PRESSURE READING FROM 1ST PRESSURE READING TO OBTAIN PRESSURE DROP VALUES.
   - ADD ALL PRESSURE DROP VALUES AND DIVIDE BY THE NUMBER OF FUEL INJECTORS TO GET THE AVERAGE PRESSURE DROP.
   - ANY INJECTOR THAT HAS A 10 kPa (1.5 PSI) DIFFERENCE, EITHER MORE OR LESS FROM THE AVERAGE, IS CONSIDERED FAULTY.
   - RETEST ANY INJECTOR THAT APPEARS FAULTY.
   - ANY INJECTOR THAT FAILS THE RETEST IS FAULTY AND NEEDS TO BE REPLACED.
   - IF NO PROBLEM IS FOUND, REVIEW "SYMPTOMS" SECTION "B".

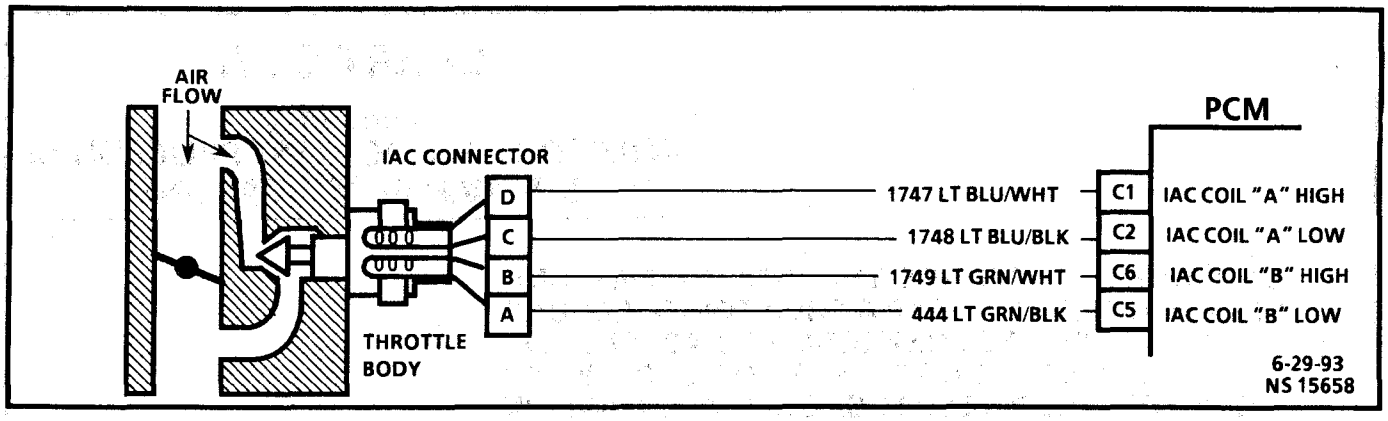


CHART C-2C

IDLE AIR CONTROL (IAC) VALVE CHECK 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The PCM controls engine idle speed with the IAC valve. To increase idle speed, the PCM retracts the IAC valve pintle away from its seat, allowing more air to bypass the throttle bore. To decrease idle speed, it extends the IAC valve pintle towards its seat, reducing bypass air flow. The scan tool will display the PCM commands to the IAC valve in counts. Higher the counts indicate more air bypass (higher idle). The Lower counts indicate less air is allowed to bypass (lower idle).

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

1. The IAC tester is used to extend and retract the IAC valve. Valve movement is verified by an engine speed change. If no change in engine speed occurs, the valve can be retested when removed from the throttle body.
2. This step checks the quality of the IAC movement in Step 1. Between 700 RPM and about 1500 RPM, the engine speed should change smoothly with each flash of the tester light in both extend and retract. If the IAC valve is retracted beyond the control range (about 1500 RPM), it may take many flashes in the extend position before engine speed will begin to drop. This is normal on certain engines, fully extending IAC may cause engine stall. This may be normal.
3. Steps 1 and 2 verified proper IAC valve operation while this step checks the IAC circuits. Each lamp on the node light should flash red and green while the IAC valve is cycled. While the sequence of color is not important, if either light is "OFF" or does not flash red and green, check the circuits for faults, beginning with poor terminal contacts.

Diagnostic Aids: A slow, unstable, or fast idle may be caused by a non-IAC system problem that cannot be overcome by the IAC valve. Out of control range IAC scan tool counts will be above 60 if idle is too low, and zero counts if idle is too high. The following checks should be made to repair a non-IAC system problem:

- Vacuum leak (high idle) - If idle is too high, stop the engine. Fully extend (low) IAC with tester. Start engine. If idle speed is above 800 RPM, locate and correct vacuum leaks including crankcase ventilation. Also, check for binding of throttle blade or linkage.
- System too lean (high air/fuel ratio) - The idle speed may be too high or too low. Engine speed may vary up and down and disconnecting the IAC valve does not help. DTC 44 or 46 may be set.
  Tech 1 HO2S voltage will be less than 300 mV (.3 volt). Check for low regulated fuel pressure, water in the fuel or a restricted injector(s).
- System too rich (low air/fuel ratio) - The idle speed will be too low. Tech 1 IAC counts will usually be above 80. System is obviously rich and may exhibit black smoke in exhaust.
  Tech 1 HO2S voltage will be fixed above 800 mV (.8 volt). DTC 45 or 65 may set.
  Check for high fuel pressure, leaking or sticking injector(s). Silicone contaminated oxygen sensors will be slow to respond.
- Throttle body - Remove IAC valve and inspect bore for foreign material.
- IAC valve electrical connections - IAC valve connections should be carefully checked for proper contact.
- Crankcase ventilation valve - An incorrect or faulty crankcase ventilation valve may result in an incorrect idle speed.
- Refer to "Rough, Unstable, Incorrect Idle or Stalling" in "Symptoms," Section "6E2-B".
- If intermittent poor driveability or idle symptoms are resolved by disconnecting the IAC, carefully recheck connections, valve terminal resistance, or replace IAC.

CHART C-2C

IDLE AIR CONTROL (IAC) VALVE CHECK 5.7L (VIN P) "F" CARLINE (SFI)

1. • IGNITION "OFF," CONNECT IAC DRIVER * TO IAC VALVE.
   • SET PARKING BRAKE, BLOCK WHEELS, A/C "OFF."
   • IDLE ENGINE IN PARK.
   • INSTALL TECH 1 SCAN TOOL AND DISPLAY RPM.
   • WITH IAC DRIVER, EXTEND AND RETRACT IAC VALVE.
   • ENGINE RPM SHOULD DECREASE AND INCREASE AS IAC IS CYCLED.

- RPM CHANGES
- NO RPM CHANGE
  - • CHECK IAC PASSAGES.
  - • IF OK, REPLACE IAC.

2. • RPM SHOULD CHANGE SMOOTHLY WITH EACH FLASH OF THE IAC DRIVER LIGHT FROM 700 RPM TO ABOUT 1500 RPM.
   DOES IT?

- YES
- NO
  - • CHECK IAC PASSAGES.
  - • IF OK, REPLACE IAC.

3. • INSTALL APPROPRIATE IAC NODE LIGHT * IN IAC HARNESS.
   • CYCLE IAC DRIVER AND NOTE LIGHTS.
   • BOTH LIGHTS SHOULD CYCLE RED AND GREEN BUT NEVER "OFF" AS RPM IS CHANGED OVER ITS RANGE.
   DO THEY?

- NO
  - IF CIRCUIT(S) DID NOT TEST GREEN AND RED, CHECK FOR:
    • FAULTY CONNECTOR TERMINAL CONTACTS.
    • OPEN CIRCUITS INCLUDING CONNECTIONS.
    • CIRCUITS SHORTED TO GROUND OR VOLTAGE.
    • FAULTY PCM CONNECTION OR PCM.
    REPAIR AS NECESSARY AND RETEST.
- YES
  - • USING THE OTHER CONNECTOR ON THE IAC DRIVER PIGTAIL, CHECK RESISTANCE ACROSS IAC COILS.
  - • SHOULD BE 40 TO 80 OHMS BETWEEN IAC TERMINALS "A" TO "B" AND "C" TO "D".
    - OK
      - • CHECK RESISTANCE BETWEEN IAC TERMINALS "B" AND "C" AND "A" AND "D".
      - • SHOULD BE INFINITE.
        - OK
          - IDLE AIR CONTROL VALVE AND CIRCUIT OK. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
        - NOT OK
          - REPLACE IAC VALVE AND RETEST.
    - NOT OK
      - REPLACE IAC VALVE AND RETEST.

* 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).

7-9-93
MS 12719

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SECTION C3
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

CONTENTS

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EVAP Canister C3-1
Evaporative Emission System C3-1
Evaporative Emission (EVAP) Pressure Control Valve C3-2
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Diagnosis C3-2
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GENERAL DESCRIPTION

PURPOSE

The Evaporative Emission (EVAP) control system used on all vehicles is the charcoal canister storage method. This method transfers fuel vapor from the fuel tank to an activated carbon (charcoal) storage device (canister) to hold the vapors when the vehicle is not operating. When the engine is running, the fuel vapor is purged from the carbon element by intake air flow and consumed in the normal combustion process.

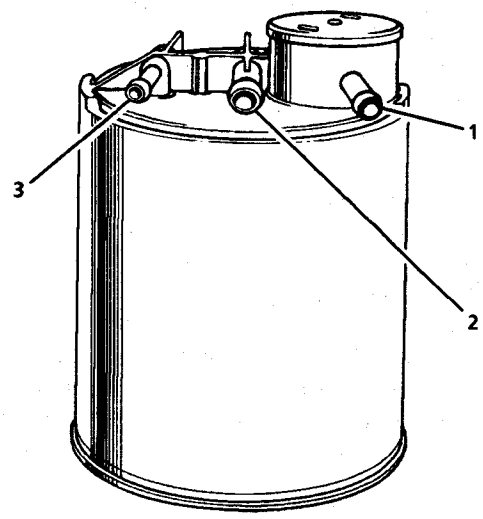
EVAP CANISTER

The Evaporative Emission (EVAP) control system uses a 1500 cc charcoal canister to absorb fuel vapors from the gas tank.

When gasoline vapor builds enough to overcome the spring tension of the EVAP pressure control valve, the vapor will flow to the canister where it is absorbed and stored by the charcoal. Under certain operating conditions the PCM will command the purge solenoid valve to open. This allows the vapor to flow into the intake manifold for combustion.

EVAPORATIVE EMISSION SYSTEM

This system has a remote mounted canister purge control solenoid valve. The PCM operates this solenoid valve to control vacuum to the canister. Under cold engine or idle conditions, the solenoid valve is closed, which prevents vacuum from being applied to the canister.



17013138
17093194

1 TANK TUBE
2 AIR TUBE (FRESH AIR INLET)
3 PURGE TUBE

NA 1349-AS

Figure C3-1 - Fuel Vapor Canister

The PCM activates (or opens) the solenoid valve and allows purge when:

- Engine is warm.
- After the engine has been running a specified period of time.
- Above a specified road speed.
- Above a specified throttle opening.

EVAPORATIVE EMISSION (EVAP) PRESSURE CONTROL VALVE

This system uses an in-line EVAP pressure control valve as a pressure relief valve. Refer to diagram for installation in system. When vapor pressure in the tank exceeds approximately .5 kPa (.7 psi) the diaphragm valve opens, allowing vapors to vent to the canister. A 1.14 mm (0.045 inch) orifice in the passage leading to the canister tube causes pressure to drop slowly, preventing the valve from oscillating (buzzing). When the tank pressure drops below 5 kPa (.7 psi), the valve closes causing vapors to be held in the fuel tank.

RESULTS OF INCORRECT OPERATION

- Poor idle, stalling and poor driveability can be caused by:
  - Inoperative purge solenoid valve.
  - Damaged canister.
  - Hoses split, cracked and, or not connected to the proper tubes.
- Evidence of fuel loss or fuel vapor odor can be caused by:
  - Liquid fuel leaking from fuel lines.
  - Cracked or damaged canister.
  - Inoperative canister control valve.
  - Disconnected, misrouted, kinked, deteriorated or damaged vapor hoses, or control hoses.

If the solenoid valve is open, or is not receiving power, the canister can purge to the intake manifold at the incorrect time. This can allow extra fuel during warm-up, which can cause rough or unstable idle.

DIAGNOSIS

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE

The Evaporative Emission (EVAP) canister purge solenoid valve operation is covered in CHART C-3 at the end of this section.

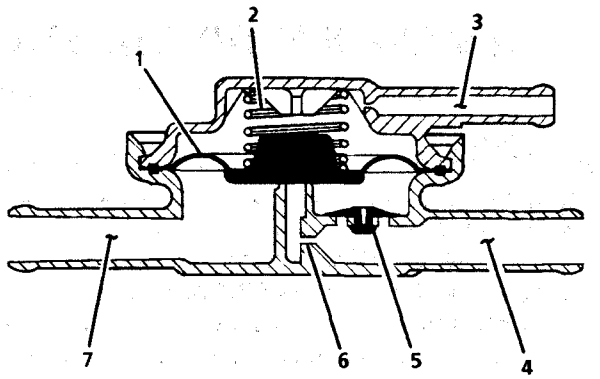
VISUAL CHECK OF EVAP CANISTER

- Cracked or damaged, replace EVAP canister.

FUNCTIONAL TESTS

Evaporative Emission (EVAP) Pressure Control Valve

With a hand vacuum pump, apply approximately 51 kPa (15" Hg) to the control vacuum tube. After ten seconds, there should be at least 17 kPa (5" Hg) vacuum remaining. Be sure the hand vacuum pump being used does not have an internal leak and the hose



1	DIAPHRAGM
2	DIAPHRAGM SPRING
3	CONTROL TUBE
4	TUBE TO CANISTER
5	UMBRELLA VALVE
6	RESTRICTION
7	TUBE TO FUEL TANK

NA 1358-AS

Figure C3-2 - EVAP Pressure Control Valve

connections to control vacuum tube and pump are secure. If after 10 seconds there is less than 17 kPa (5" Hg) vacuum, the valve must be replaced.

With 51 kPa (15" Hg) vacuum still applied to the control vacuum tube, attach a short piece of hose to the valve's tank tube side. Blow into the tube. You should feel the air pass through the valve. If air does not pass through, the valve must be replaced.

ON-VEHICLE SERVICE

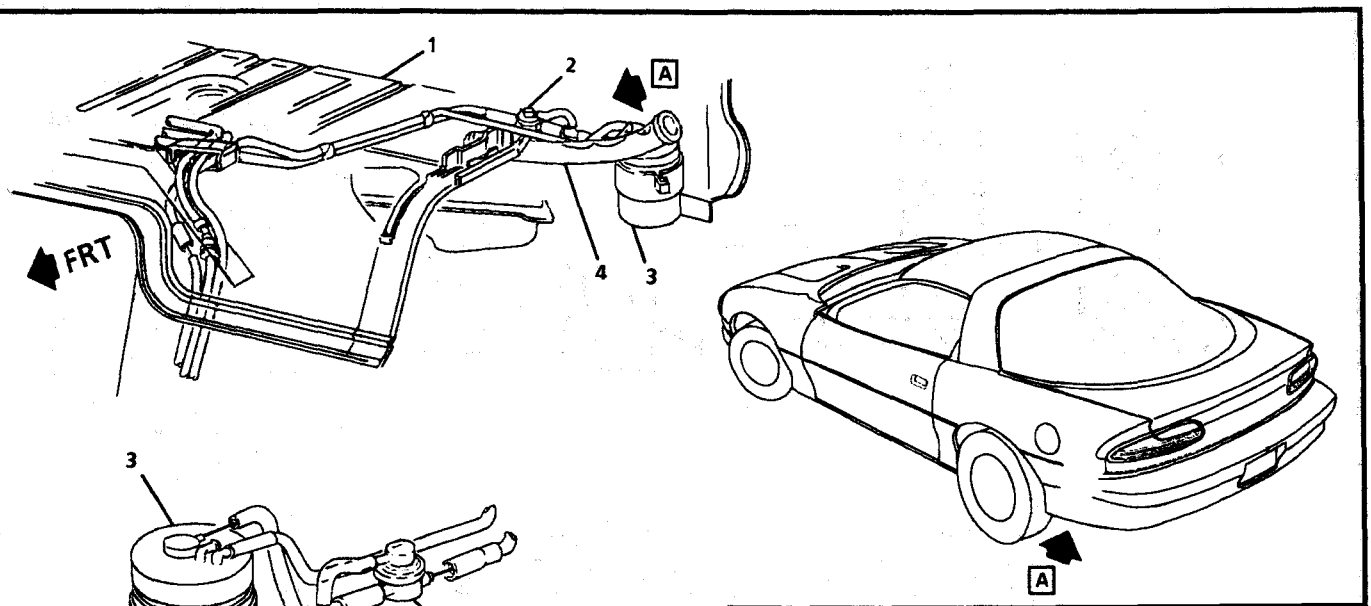
EVAP CANISTER

Remove or Disconnect

1. Negative battery cable.
2. Raise vehicle.
3. Driver side rear wheel housing liner.
4. Hoses from canister.
5. Canister from canister bracket.
6. Canister from vehicle.

Install or Connect

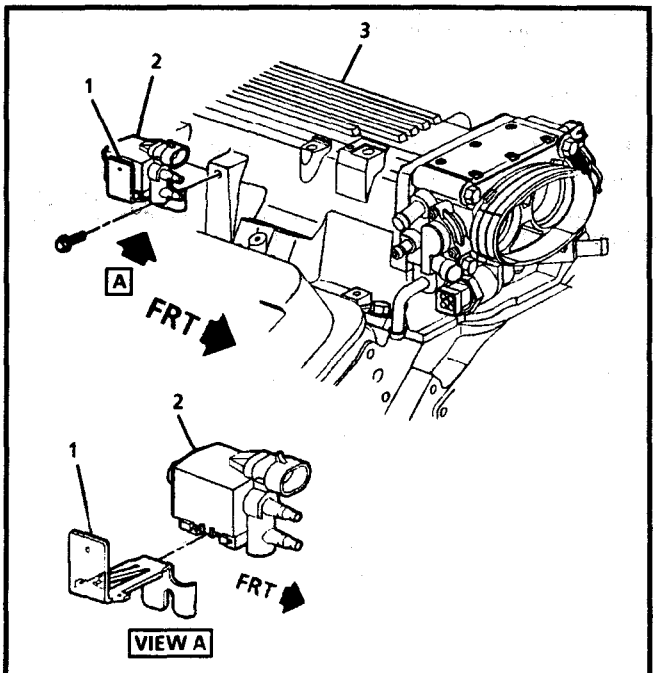
1. Canister to vehicle.
2. Canister to canister bracket.
3. Hoses to canister.
4. Driver side rear wheel housing liner.
5. Lower vehicle.
6. Negative battery cable.



1 FUEL TANK
2 EVAPORATIVE EMISSION PRESSURE CONTROL VALVE
3 EVAPORATIVE EMISSION CANISTER
4 FUEL FILLER NECK

NS 15274

Figure C3-3 - EVAP Canister Mounting



1 BRACKET
2 EVAPORATIVE EMISSION CANISTER PURGE SOLENOID VALVE
3 INTAKE MANIFOLD

NS 15268

Figure C3-4 - EVAP Canister Purge Solenoid Valve Service

EVAP CANISTER PURGE SOLENOID VALVE

Remove or Disconnect

1. Negative battery cable.
2. Ignition system test connector.
3. Electrical connector and hoses from solenoid valve.
4. Bracket and solenoid from intake manifold.

Install or Connect

1. Solenoid valve to intake manifold.

Tighten

- Bolt to intake manifold to 5.8 N·m (52 lb. in.).

2. Electrical connector and hoses to solenoid valve.
3. Ignition test connector.
4. Negative battery cable.

EVAP CANISTER HOSES

Refer to "Vehicle Emission Control Information" label for routing of EVAP canister hoses.

TORQUE SPECIFICATIONS

EVAP Canister Purge Solenoid Valve Bolt	5.8 N·m (52 lb. in.)

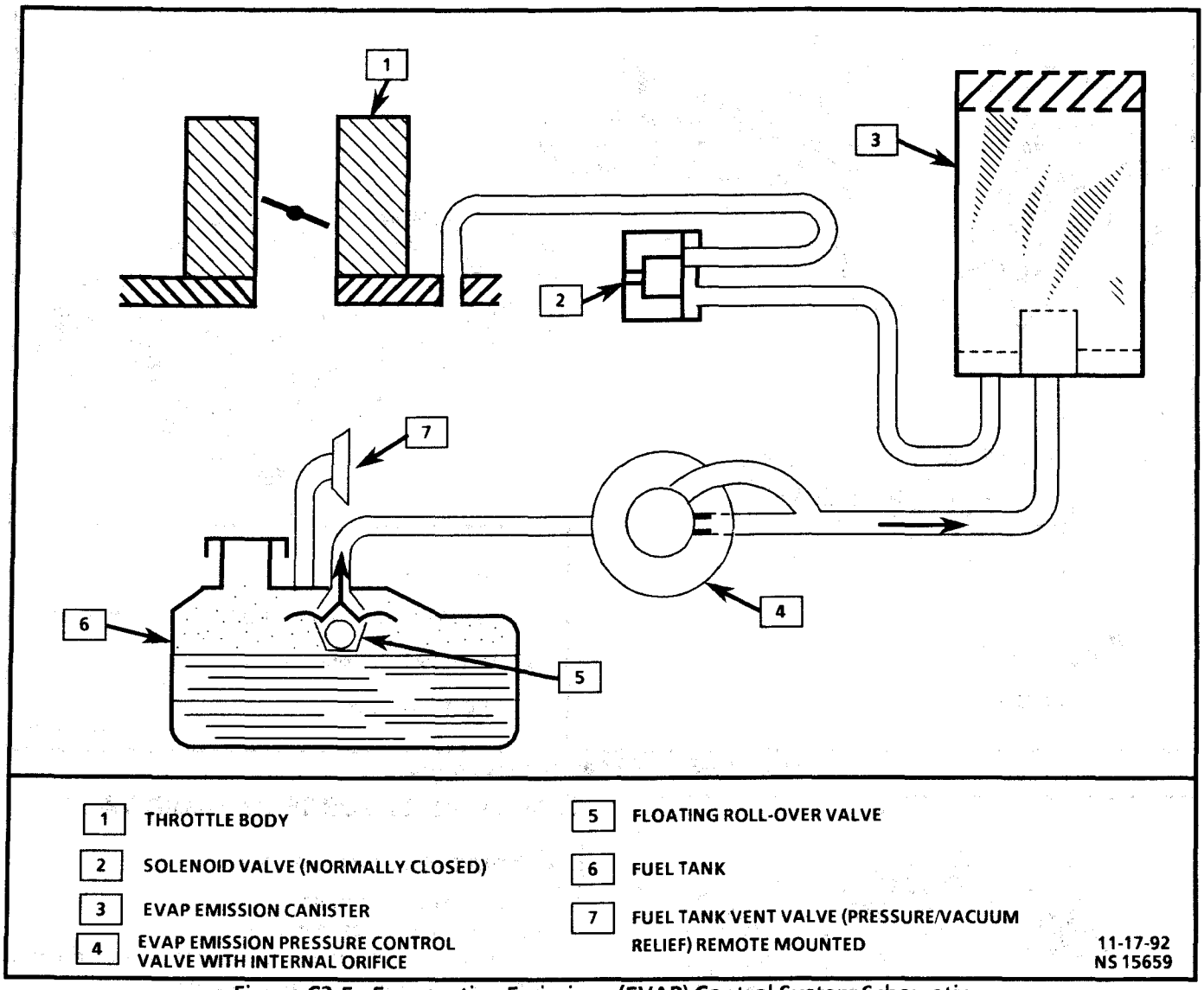


Figure C3-5 - Evaporative Emissions (EVAP) Control System Schematic

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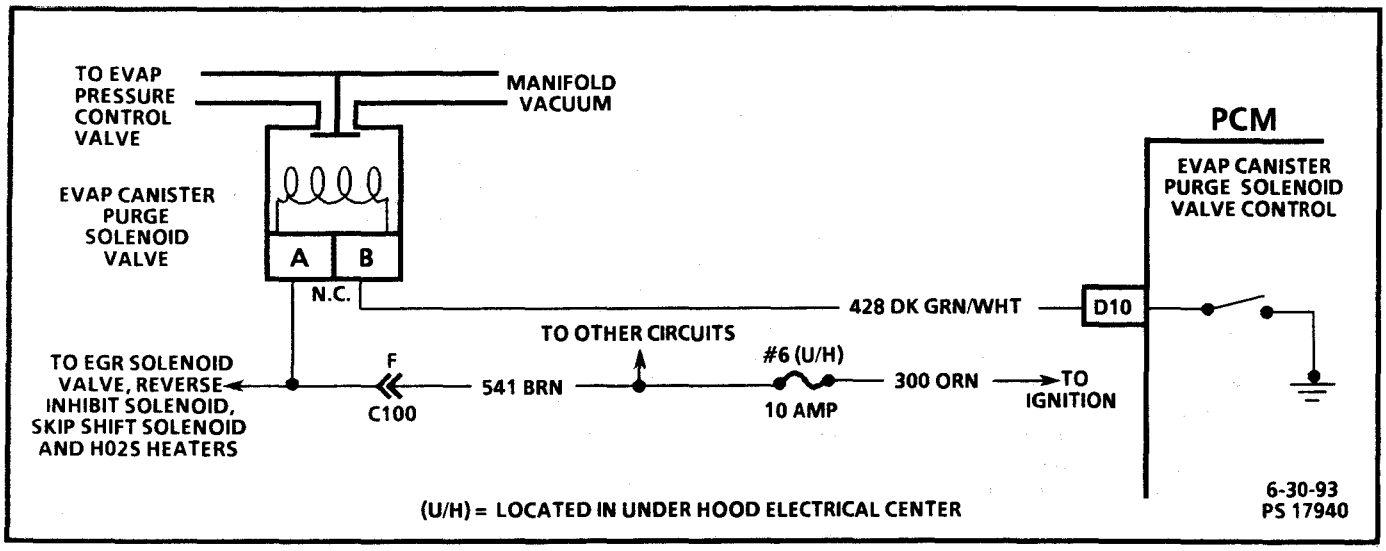


CHART C-3

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE CHECK 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

EVAP canister purge is controlled by a solenoid valve that allows manifold vacuum to purge the EVAP canister when energized. The PCM supplies a ground to energize the solenoid valve.

If the "output/field service enable" terminal is grounded with the engine stopped and ignition "ON," or the following conditions are met with the engine running, the EVAP canister purge solenoid valve will be energized (purge "ON").

- Engine coolant temperature above 60°C (140°F).
- Vehicle speed above 2 mph.
- Throttle off idle, above 4.3%.

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

1. Checks to see if the solenoid valve is opened or closed. The solenoid valve is normally closed and should open when actuated by Tech 1 or the "output/field service enable" terminal is grounded.
2. This should energize the solenoid valve and allow the vacuum to drop (purge "ON").

Diagnostic Aids: Normal operation of the EVAP canister purge solenoid valve is described as follows:

With the ignition "ON," engine "OFF," "output/field service enable" terminal grounded, the EVAP canister purge solenoid valve should be energized.

CHART C-3

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID VALVE CHECK 5.7L (VIN P) "F" CARLINE (SFI)

- IF PCM DTC 26 IS SET, REFER TO DTC 26 CHART FIRST.
- WITH ENGINE RUNNING AT 2000 RPM, DISCONNECT THROTTLE BODY SIDE OF EVAP VACUUM HOSE AT SOLENOID VALVE.
- INSTALL A VACUUM GAGE AND CHECK FOR VACUUM SUPPLY TO SOLENOID VALVE.
- VACUUM SHOULD BE AT LEAST 25 kPa (7" Hg) AT 2000 RPM.

IS IT?

YES

NO — LEAKING OR RESTRICTED VACUUM SUPPLY LINE TO EVAP SOLENOID VALVE.

(1)
- IGNITION "OFF."
- REINSTALL VACUUM HOSE FROM THROTTLE BODY TO SOLENOID VALVE.
- DISCONNECT VACUUM HOSE TO EVAP SOLENOID FROM CANISTER.
- INSTALL HAND-HELD VACUUM PUMP TO SOLENOID VALVE.
- APPLY 34 kPa (10" Hg) OF VACUUM. VACUUM SHOULD HOLD.

DOES IT?

YES

NO — FAULTY SOLENOID VALVE.

(2)
- WITH VACUUM STILL APPLIED AT 34 kPa (10" Hg).
- USING A TECH 1 "MISC TEST" ACTIVATE SOLENOID VALVE. VACUUM SHOULD DROP.

DOES IT?

YES — SOLENOID VALVE OPERATING PROPERLY.

NO — FAULTY SOLENOID VALVE.

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

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SECTION C4
DISTRIBUTOR IGNITION (DI) SYSTEM
CONTENTS

General Description C4-1
Purpose C4-1
Description C4-1
Operation C4-2
Results of Incorrect Operation C4-2
Diagnosis C4-2
On-Vehicle Service C4-2
Torque Specifications C4-2

GENERAL DESCRIPTION

PURPOSE

The distributor ignition system controls fuel combustion by providing a spark to ignite the compressed air/fuel mixture at the correct time. To provide improved engine performance, fuel economy, and control of exhaust emissions, the PCM controls distributor spark advance (timing) with an Ignition Control (IC) system.

Only the IC system will be described here. Additional information on the system is found in SECTION 6D.

To properly control ignition/combustion timing the PCM needs to know:

- Camshaft position.
- Engine speed (RPM).
- Engine load (manifold pressure or vacuum).
- Atmospheric (barometric) pressure.
- Engine coolant temperature.
- The amount of detonation.

DESCRIPTION

The distributor ignition system is a net build distributor (no timing adjustment) that provides angle based timing information to the PCM for individual cylinder spark timing. The ignition module is capable of providing both 4X and 360X timing pulses each crankshaft revolution. Using these timing pulses, the PCM processes ignition spark timing and sends an IC signal to the ignition coil module to activate the secondary ignition system.

The PCM provides power, ground, and two 5 volt reference voltages to the ignition control module. As the camshaft turns (during crank or run), a slotted two-track timing disk is rotated inside the ignition control module. Each time a slot in either track of the disk is properly aligned, the ignition control module will pulse one of the 5 volt reference voltages to ground.

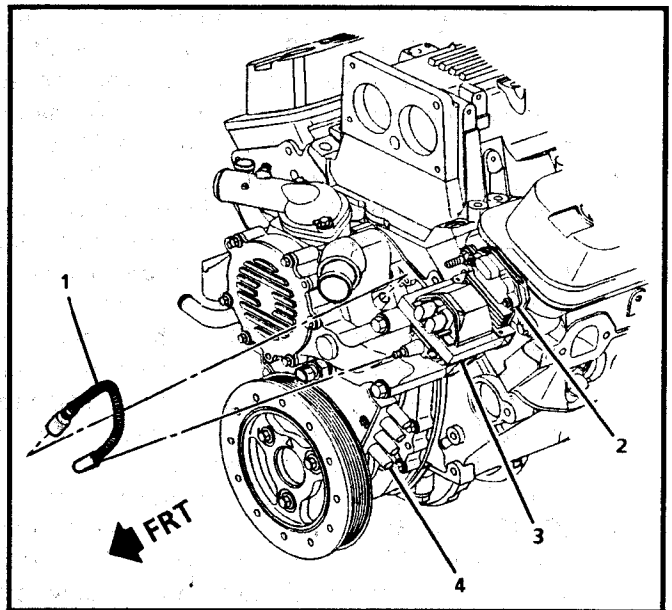


Figure C4-1 - Distributor Ignition System

A reference signal is generated each time the PCM detects that the reference voltages have been grounded by the ignition control module. When the PCM detects reference signals, ignition timing can be processed.

The PCM will also compare the 4X and the 360X signals to each other to determine the location of the number one cylinder and top dead center. In addition, if only one signal is being received by the PCM a Diagnostic Trouble Code (DTC) will be set. DTC 16 will be set if the 4X signal is missing and DTC 36 will be set if the 360X signal is missing. The vehicle will not run if the 4X (REFERENCE) signal is not available at the PCM for processing.

OPERATION

The Ignition Control (IC) system consists of the camshaft position sensor, ignition coil, ignition coil module, and PCM. The connector terminals are lettered as shown in CHART C-4.

These circuits perform the following functions:

- Low resolution signal reference (CKT 453). - This provides the PCM with reference signals, firing order, and camshaft position information. If the low resolution signal circuit becomes open or grounded, the engine will not run because the PCM will not operate the ignition coil module, fuel pump, or the fuel injectors. A DTC 16 will set if the PCM receives high resolution signal references without the low resolution signals. If engine cranks but will not start refer to CHART A-3.
- High resolution signal reference (CKT 430). - This provides the PCM with detailed reference signals and crankshaft position information. If this circuit becomes open or grounded a DTC 36 will set and the engine will still run.
- System ground (CKT 631). - This circuit is grounded at the PCM and provides ground for the distributor to generate low and high resolution signal reference signals. If this circuit becomes open, the engine will not run since there will be no reference information.
- IC (CKT 423). - This circuit controls the ignition coil "ON" and "OFF" time. It signals the ignition coil module to begin primary coil dwell current when the IC is high. The ignition coil module shuts "OFF" ignition coil current when the signal goes low. If this circuit becomes open, shorted to voltage, or grounded, the engine will not start and a DTC 41 or 42 will set.

RESULTS OF INCORRECT OPERATION

An open IC circuit will set a DTC 41. A grounded IC circuit will set a DTC 42. An open or grounded IC circuit will result in a engine cranks but will not run.

An open or ground in the low resolution signal circuit will set a DTC 16 and the engine will not start. If the high resolution signal circuit becomes open or grounded a DTC 36 would set. This will cause reduced performance and poor fuel economy.

NOTICE: An inoperative distributor vent system may cause premature distributor failure. To check system operation, with engine idling, connect a vacuum gage to the air inlet filter. Vacuum should be present. If not, check for clogged inlet filter, damaged/pinched hoses, a poor seal between the cap and distributor, or a plugged vacuum source.

The PCM uses information from the MAP and engine coolant temperature sensor in addition to RPM to calculate spark advance as follows:

- Cold engine = More spark advance.
- Engine under minimum load based on RPM and low amount of air flow - More spark advance.
- Hot engine = Less spark advance.
- Engine under heavy load based on RPM and high amount of air flow - Less spark advance.

DIAGNOSIS

The description, operation and repair procedures of the distributor ignition system components are found in SECTION 6D of this manual. For misfire or ignition control check, refer to CHART C-4 at the end of this section.

ON-VEHICLE SERVICE

For removal and replacement of the distributor ignition system components, refer to SECTION 6D4, "Ignition System."

TORQUE SPECIFICATIONS

Distributor Mounting Bolts	11 N·m (8 lb. ft.)
Ignition Coil Mounting Fasteners	2.8 N·m (25 lb. in.)
Ignition Coil Module Fasteners	1.6 N·m (14 lb. in.)

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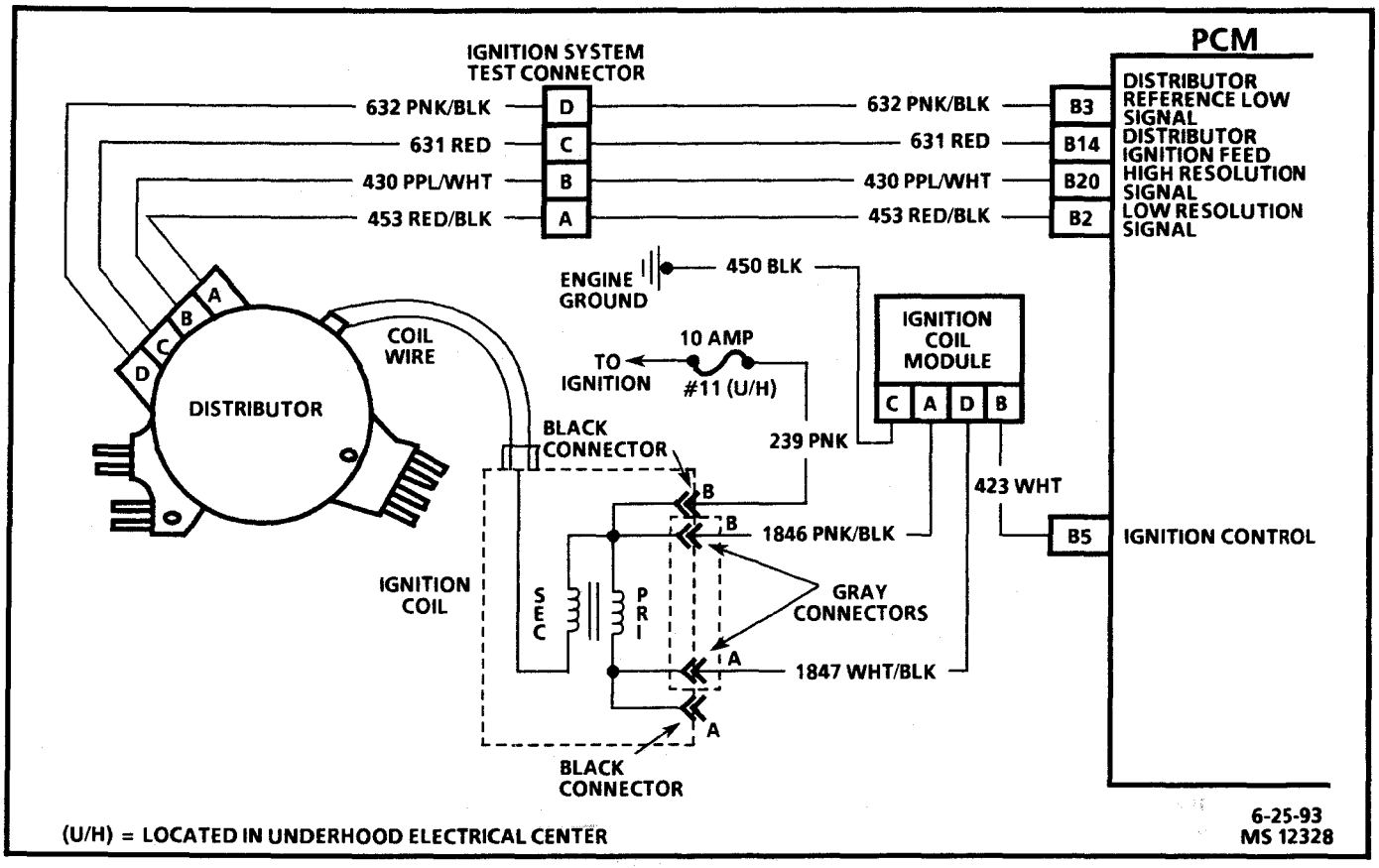


CHART C-4A

(Page 1 of 2)
DISTRIBUTOR IGNITION (DI) SYSTEM CHECK
5.7L (VIN P) "F" CARLINE (SFI)

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

The battery should be fully charged prior to any tests.

1. Checks for proper output from the distributor ignition system. The spark tester requires a minimum of 25,000 volts to fire. This check can be used in case of an ignition miss, because the system may provide enough voltage to run the engine but not enough to fire a spark plug under heavy load.
2. This test will separate the distributor cap, rotor and ignition wires from the ignition coil to help identify a secondary ignition system problem.
3. This will determine if the proper available voltage exists in the primary ignition circuit.
4. This check will begin to determine if the PCM is providing a signal to the ignition coil module or not. If the PCM is not providing a signal to the ignition coil module, the problem exists between the distributor and PCM.
5. A grounded coil circuit will cause the ignition fuse to open, and a no-start condition will occur.

Diagnostic Aids: An ignition coil wire that is open or shorted to ground can cause a no start condition.

CHART C-4A

(Page 1 of 2)

DISTRIBUTOR IGNITION (DI) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)

1. • PERFORM ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK BEFORE PROCEEDING WITH THIS TEST. [DISCONNECT TACHOMETER (IF EQUIPPED) BEFORE PROCEEDING WITH THE TEST.]
   • CHECK SPARK AT PLUG WITH SPARK TESTER J 26792 (ST-125) WHILE CRANKING (IF NO SPARK ON ONE WIRE, CHECK A SECOND WIRE) A FEW SPARKS AND THEN NOTHING IS CONSIDERED NO SPARK.

- NO SPARK
- SPARK → CHECK FUEL, SPARK PLUGS, ETC. SEE 6E3-B "SYMPTOMS."

2. • CHECK FOR SPARK AT IGNITION COIL WIRE WITH TESTER WHILE CRANKING. (LEAVE SPARK TESTER CONNECTED TO IGNITION COIL WIRE FOR STEPS 3-6.)

- NO SPARK
- SPARK → INSPECT CAP FOR CRACKS, SECONDARY WIRES FOR OPENS; SHORTS; OR POOR CONNECTIONS. IF OK, REPLACE DISTRIBUTOR.

3. • DISCONNECT IGNITION COIL MODULE CONNECTOR.
   • IGNITION "ON."
   • WITH DVM, CHECK VOLTAGE FROM HARNESS TERMINALS "A" AND "D" TO GROUND.

- BOTH TERMINALS 10 VOLTS OR MORE
- BOTH TERMINALS UNDER 10 VOLTS
- EITHER TERMINAL UNDER 10 VOLTS → FAULTY CIRCUIT FROM TERMINAL TO COIL OR FAULTY COIL CONNECTION OR FAULTY COIL.

4. • WITH DVM ON AC SCALE, CONNECTED FROM IGNITION COIL MODULE CONNECTOR TERMINAL "B" TO GROUND, CRANK ENGINE AND OBSERVE VOLTAGE. IS VOLTAGE BETWEEN 1 AND 4 VOLTS?

5. FAULTY IGNITION FEED CIRCUIT TO IGNITION COIL OR GROUNDED EXTERNAL COIL CIRCUIT OR FAULTY IGNITION COIL.

- YES → PROBE IGNITION COIL MODULE CONNECTOR TERMINAL "C" WITH TEST LIGHT TO B+. IS LIGHT ON?
- NO → TO CHART C-4 2 OF 2.

- NO → OPEN IGNITION COIL MODULE GROUND CIRCUIT.
- YES → FAULTY IGNITION COIL MODULE CONNECTION OR FAULTY IGNITION COIL MODULE.

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

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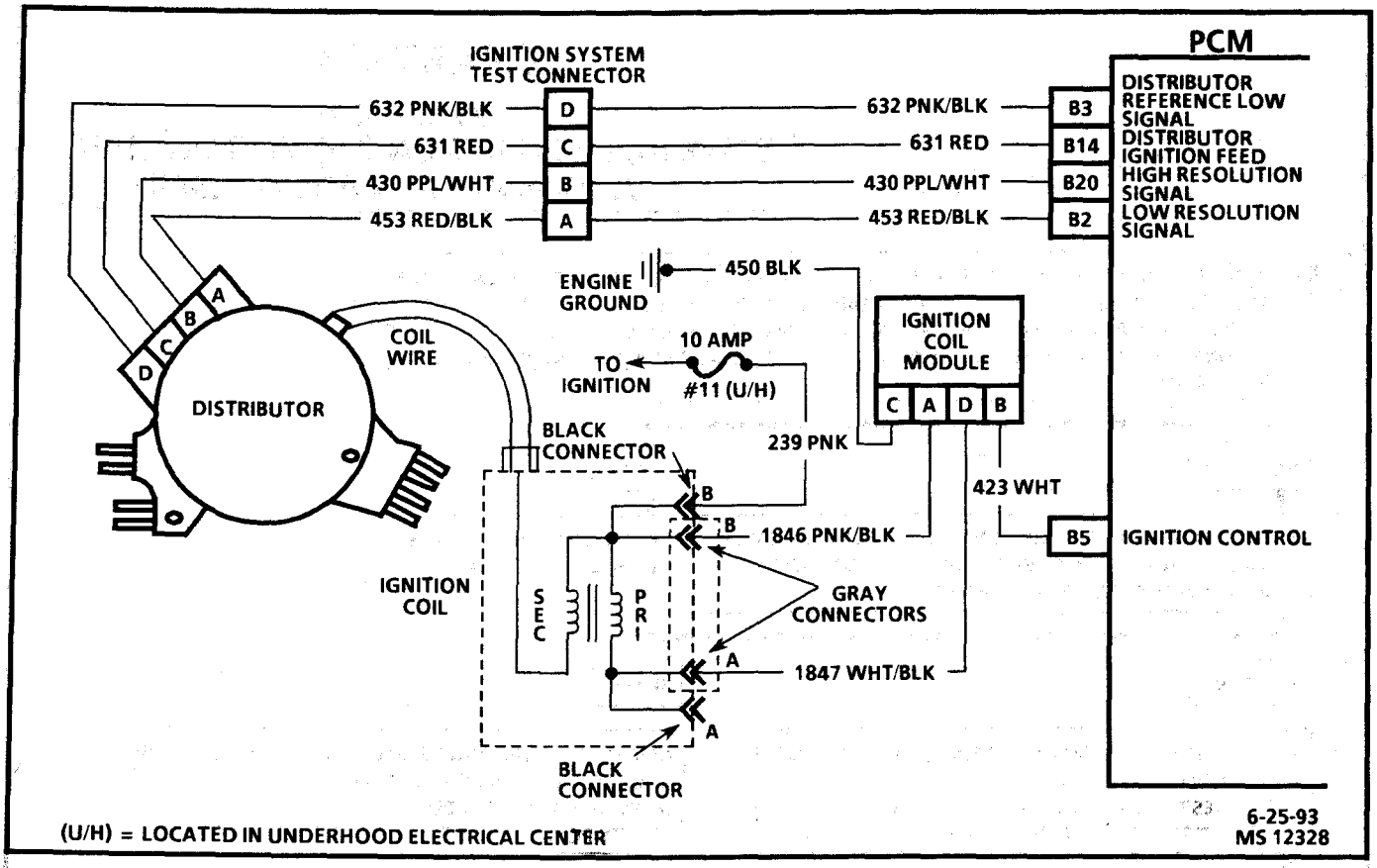


CHART C-4A

(Page 2 of 2)
DISTRIBUTOR IGNITION (DI) SYSTEM CHECK
5.7L (VIN P) "F" CARLINE (SFI)

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

1. If the PCM is detecting low resolution signal pulses and no IC signal was available at the ignition coil module, a problem exists with the PCM or the circuit to the ignition coil module.
2. If the PCM does not detect low resolution signal pulses the distributor or distributor to PCM circuitry is most likely the problem. The remaining tests will determine if the proper signals are being sent and received from both the distributor and PCM.

CHART C-4A

(Page 2 of 2)

DISTRIBUTOR IGNITION (DI) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)

FROM CHART C-4 1 OF 2.

1. • CRANK ENGINE WHILE OBSERVING LOW RESOLUTION SIGNAL ON TECH 1.
   • IS LOW RESOLUTION SIGNAL INDICATED?

NO

2. • IGNITION "OFF."
   • DISCONNECT DISTRIBUTOR ELECTRICAL CONNECTOR.
   • IGNITION "ON."
   • PROBE TERMINAL "C" WITH A TEST LIGHT TO GROUND.
   • LIGHT SHOULD BE "ON."
   • IS IT?

YES

- CHECK FOR CONTINUITY BETWEEN DISTRIBUTOR CONNECTOR TERMINAL "D" AND GROUND.
- CIRCUIT SHOULD HAVE CONTINUITY.
- DOES IT?

YES

- USING A DVM ON DC SCALE, MEASURE VOLTAGE AT DISTRIBUTOR CONNECTOR TERMINAL "A".
- VOLTAGE SHOULD BE ABOUT 5 VOLTS.
- IS IT?

YES

- MEASURE VOLTAGE AT DISTRIBUTOR CONNECTOR TERMINAL "B".
- VOLTAGE SHOULD BE ABOUT 5 VOLTS.
- IS IT?

YES

FAULTY DISTRIBUTOR CONNECTION
OR
FAULTY DISTRIBUTOR.

YES

FAULTY IGNITION CONTROL CONNECTION AT PCM
OR
OPEN IGNITION CONTROL CIRCUIT
OR
FAULTY PCM.

NO

FAULTY PCM CONNECTION
OR
OPEN IGNITION FEED CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

NO

FAULTY PCM CONNECTION
OR
OPEN GROUND CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

NO

FAULTY PCM CONNECTION
OR
FAULTY LOW RESOLUTION SIGNAL CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

NO

FAULTY PCM CONNECTION
OR
FAULTY HIGH RESOLUTION SIGNAL CIRCUIT FROM DISTRIBUTOR TO PCM
OR
FAULTY PCM.

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

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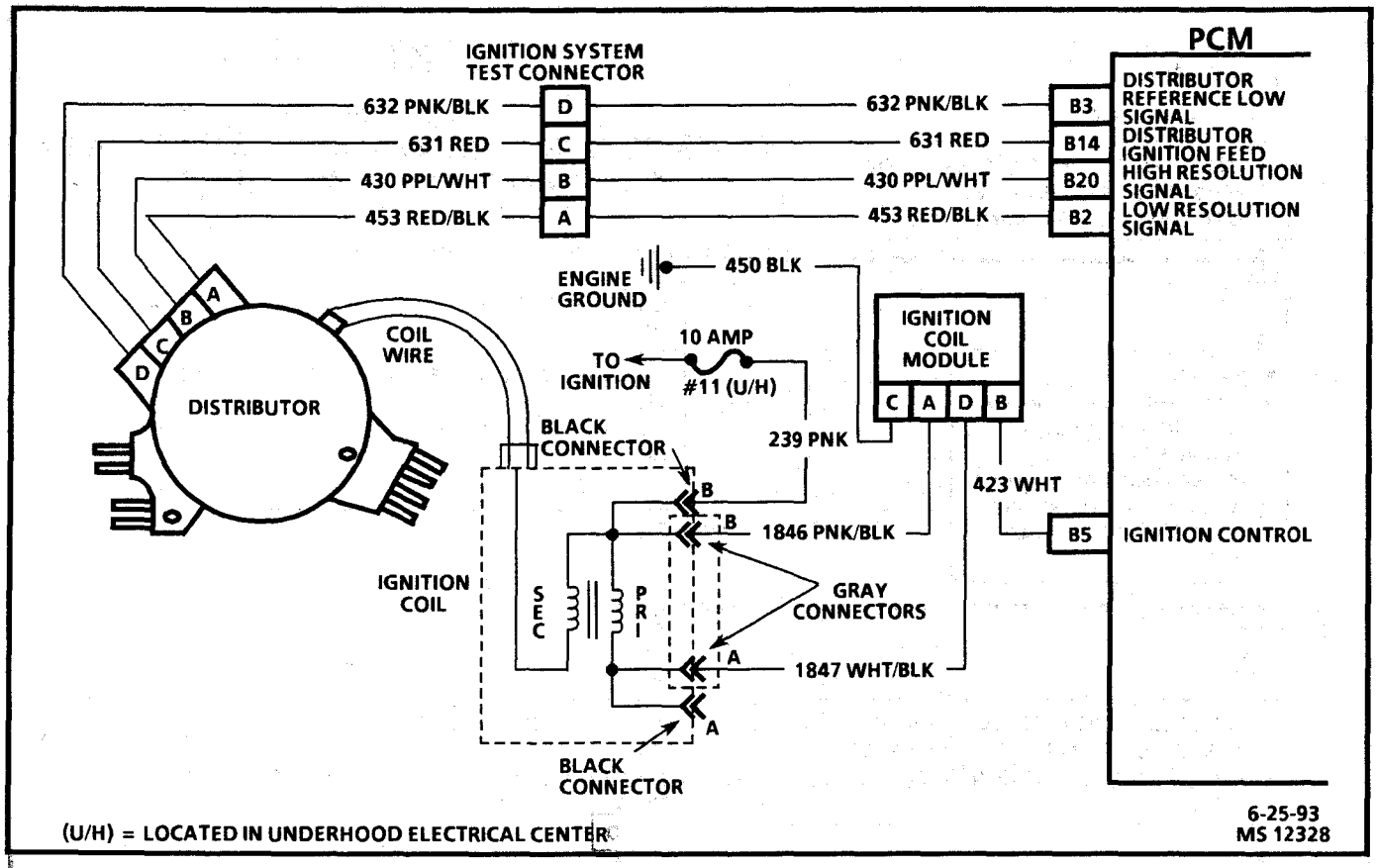


CHART C-4B

MISFIRE CHECK
5.7L (VIN P) "F" CARLINE (SFI)

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

1. By performing CHART C-2A first all injectors must be operating OK at this point. This chart covers ignition system related misfire only.
2. A thorough visual/physical check of the engine components which typically may cause a misfire may eliminate the need for further diagnostics. Use fuel pressure gage J 34730-1. Check fuel pressure. Pressure after ignition "ON" should be (283-325 kPa) 41-47 psi. If fuel pressure is not within spec, perform "Fuel System Check," CHART A-7.
3. A spark tester such as a ST-125 must be used because it is essential to verify adequate available secondary voltage at the spark plug. (25,000 volts.) This simulates a "load" condition.
4. With engine running, try to induce the misfire by moving related harness connectors. This may help locate an intermittent connection.
5. If spark plugs check OK a mechanical engine problem may be causing misfire (ie. worn camshaft, bent pushrod, low compression, etc.). Refer to SECTION 6A.

Diagnostic Aids: The distributor vent system should also be checked. A blocked air supply to the distributor will cause vacuum to build within the distributor causing misfire. Refer to the beginning of this section for distributor vent system check procedure.

CHART C-4B

MISFIRE CHECK
5.7L (VIN P) "F" CARLINE (SFI)

1
- THIS CHART ASSUMES THAT THE INJECTORS ARE OPERATING. CHART C2-A MUST BE PERFORMED BEFORE PROCEEDING WITH THIS DIAGNOSIS.

2
- IF ANY DTCs ARE SET USE THOSE CHARTS BEFORE PROCEEDING WITH THIS DIAGNOSTIC CHART.
- VISUALLY/PHYSICALLY INSPECT THE FOLLOWING ITEMS:
  - SECONDARY IGNITION WIRES FOR CRACKING, HARDNESS, SHORTED TO GROUND, PROPER ROUTING AND CARBON TRACKING.
  - INJECTOR HARNESS ROUTING (ACCORDING TO FIRING ORDER).
  - INJECTOR HARNESS WIRING FOR PROPER CONNECTIONS, PINCHES AND BEING BARE.
  - PCM GROUNDS FOR BEING CLEAN, TIGHT AND IN THEIR PROPER LOCATIONS.
  - CHECK FOR VACUUM LEAKS.
  - CHECK FUEL PRESSURE REFER TO FUEL SYSTEM DIAGNOSIS CHART A-7.

  WAS A PROBLEM FOUND IN ANY OF THE ABOVE ITEMS?

YES

REPAIR
OR
REPLACE ANY FAULTY ITEMS FOUND.

NO

3
- DISCONNECT COIL WIRE FROM DISTRIBUTOR AND INSTALL SPARK TESTER (ST125).
- CRANK ENGINE, SPARK SHOULD JUMP TESTER GAP.

  DOES IT?

NO

CHECK RESISTANCE OF COIL WIRE. REPLACE COIL WIRE IF RESISTANCE IS MORE THAN 30K. IF RESISTANCE IS LESS THAN 30K REPLACE IGNITION COIL.

YES
- RECONNECT COIL WIRE.
- USING TECH 1 MISC TESTS, SELECT INJECTOR BALANCE TEST.
- DISABLE INJECTORS ONE AT A TIME AND RECORD RPM DROP.

  DID AN RPM DROP OCCUR FOR EACH CYLINDER?

YES

4
PROBLEM INTERMITTENT, PERFORM CHECK LIST IN CUTSOUT, MISSES, AND ROUGH, UNSTABLE OR INCORRECT IDLE, STALLING IN "SYMPTOMS" SECTION 6E3-B.

NO

3
- INSTALL SPARK TESTER (ST125) J 26792 ON IGNITION WIRE FOR CYLINDER THAT HAS FAULT AND CLIP TO GROUND.
- START ENGINE, SPARK. SHOULD JUMP TESTER GAP.

  DOES IT?

YES

5
CHECK FOR:
- FAULTY, CRACKED OR WORN SPARK PLUG.
- FOULED SPARK PLUG
- POSSIBLE MECHANICAL PROBLEM.

NO
- CHECK RESISTANCE OF IGNITION WIRE OF FAULTY CYLINDER, IT SHOULD BE LESS THAN 30K OHMS AND NOT GROUNDED.

  IGNITION WIRE OK?

NO

REPLACE FAULTY IGNITION WIRE AND RETEST.

YES

4
CHECK ALL IGNITION SYSTEM WIRING FOR POOR CONNECTIONS.
IF ALL CONNECTIONS ARE OK, REPLACE DISTRIBUTOR.

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

6-15-93
PS 17365

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SECTION C5
KNOCK SENSOR (KS) SYSTEM

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GENERAL DESCRIPTION

PURPOSE

Varying octane levels in today's gasoline can cause detonation in high performance engines. Detonation is sometimes called spark knock.

To control spark knock, a Knock Sensor (KS) system is used. This system is designed to retard spark timing up to 20° to reduce spark knock in the engine. This allows the engine to use maximum spark advance to improve driveability and fuel economy.

OPERATION

The knock sensor system is used to detect engine detonation. The PCM will retard the spark timing based on signals from the KS module. The knock sensors produce an AC voltage which is sent to the KS module. The amount of AC voltage produced by the sensor is determined by the amount of knock. This signal voltage is input to the PCM. The PCM then adjusts the Ignition Control (IC) to reduce spark knocking.

DIAGNOSIS

The Tech 1 has several positions to check for diagnosing KS circuit. "Knock signal" is used to monitor the input signal from the knock sensor. This position should display "YES" to indicate when a knock is being detected. "Knock retard" is the indication of how much the PCM is retarding the spark.

DTC 43 is designed to diagnose the knock sensor circuit. Problems encountered with this circuit should set DTC 43. However, if no DTC 43 was set but the KS system is suspected, refer to CHART C-5.

ON-VEHICLE SERVICE

KNOCK SENSOR

Remove or Disconnect

1. Negative battery cable.
2. Drain coolant, refer to SECTION 6B.

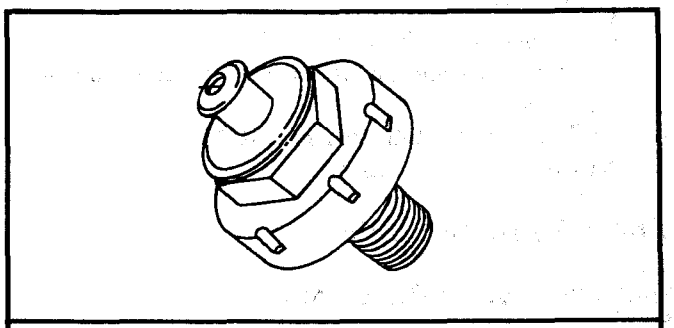


Figure C5-1 - Knock Sensor

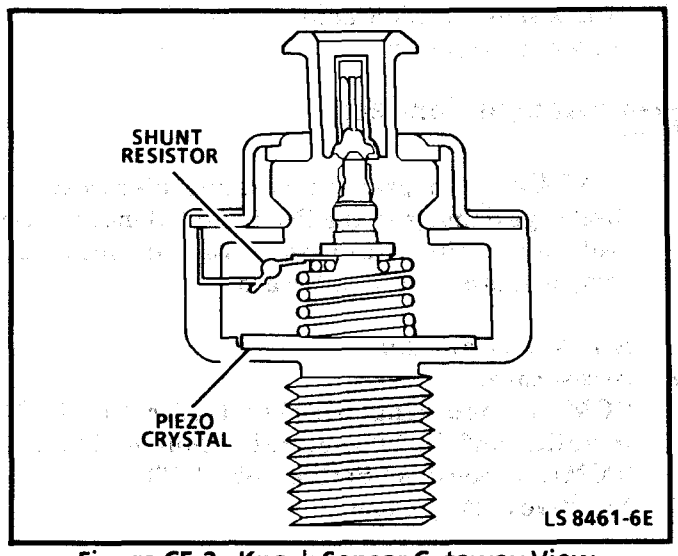


Figure C5-2 - Knock Sensor Cutaway View

3. Raise vehicle.
4. Knock sensor wiring harness connector from knock sensor.

CAUTION: Engine coolant may be hot. The knock sensor is mounted in the engine block cooling passage. Engine coolant in the block will drain when the knock sensor is removed.

5. Knock sensor from engine block.

Install or Connect

NOTICE: Do not apply thread sealant to sensor threads. Sensor is coated at factory and applying additional sealant will affect the sensor's ability to detect detonation.

1. Knock sensor into engine block. Be sure threads are clean.

Tighten

- Sensor to 19 N·m (14 lb. ft.).

2. KS wiring harness connector to the knock sensor.
3. Lower vehicle.
4. Refill coolant. Refer to SECTION 6B.
5. Negative battery cable.

Knock Sensor Module

Remove or Disconnect

1. Negative battery cable.
2. PCM from mounting bracket (refer to "PCM Removal" in "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1").
3. Knock sensor module access cover.
4. Knock sensor module.

Install or Connect

NOTICE: To prevent possible electrostatic discharge damage to the PCM and KS module, Do Not touch the connector pins or soldered components on the circuit board.

1. Knock sensor module.
2. Access cover.
3. PCM to mounting bracket (refer to "PCM Installation" in "Powertrain Control Module (PCM) and Sensors," Section "6E3-C1").
4. Negative battery cable.

TORQUE SPECIFICATIONS

Knock Sensor	19 N·m (14 lb. ft.)

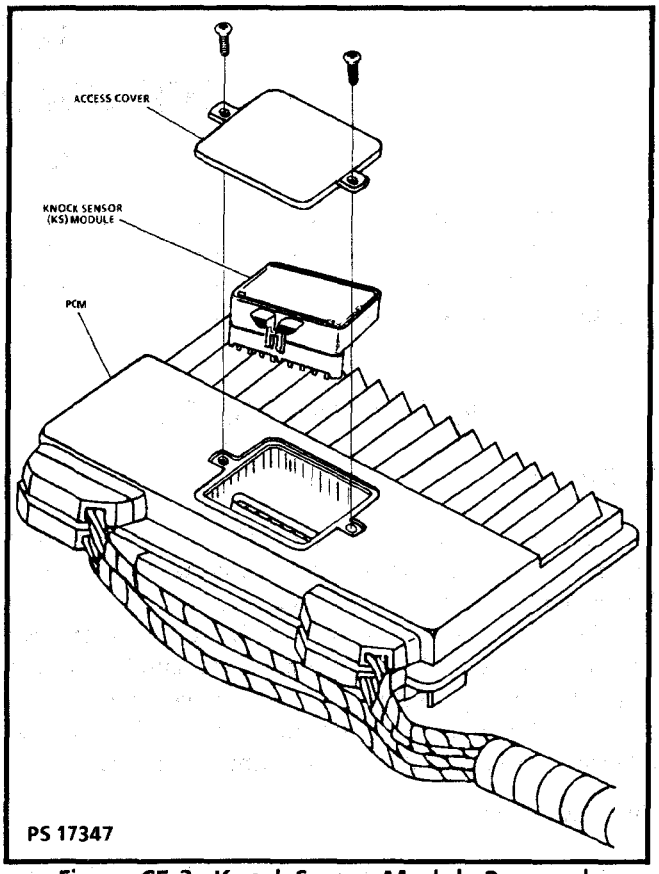


Figure C5-3 - Knock Sensor Module Removal

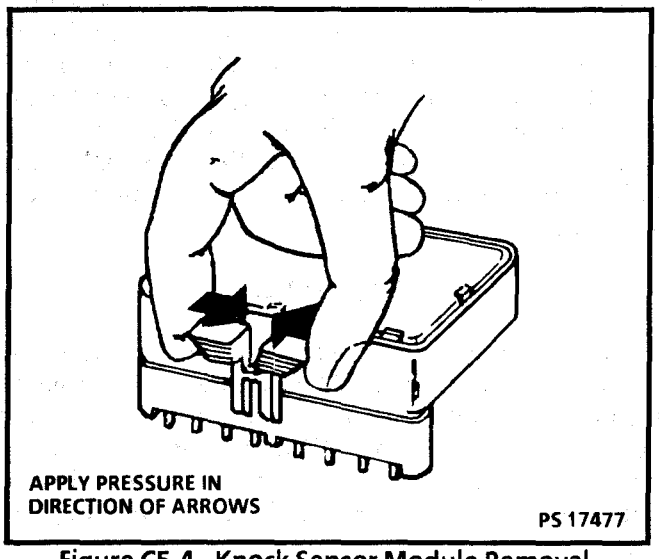


Figure C5-4 - Knock Sensor Module Removal

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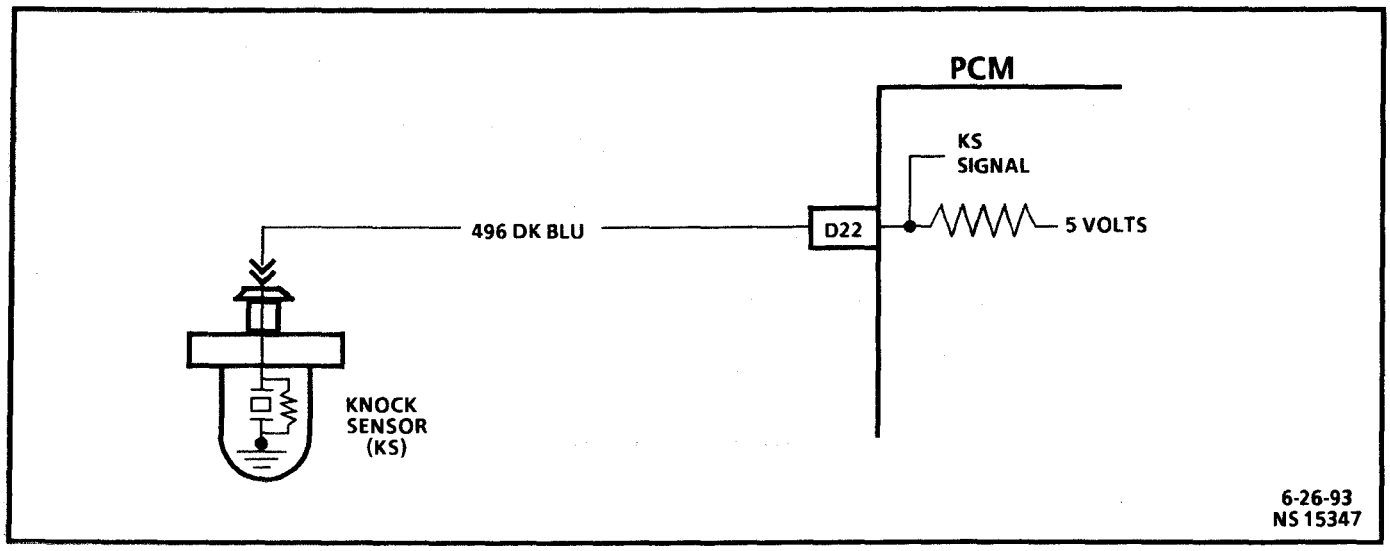


CHART C-5

KNOCK SENSOR (KS) SYSTEM CHECK
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The knock sensor system is used to detect engine detonation. The PCM will retard the spark timing based on signals from the KS module. The knock sensor produces an AC voltage which is sent to the KS module. The amount of AC voltage produced by the sensor is determined by the amount of knock. The circuitry within the knock sensor causes the PCM's 5 volts to be pulled down so that under a no knock condition, CKT 496 would measure about 2.5 volts.

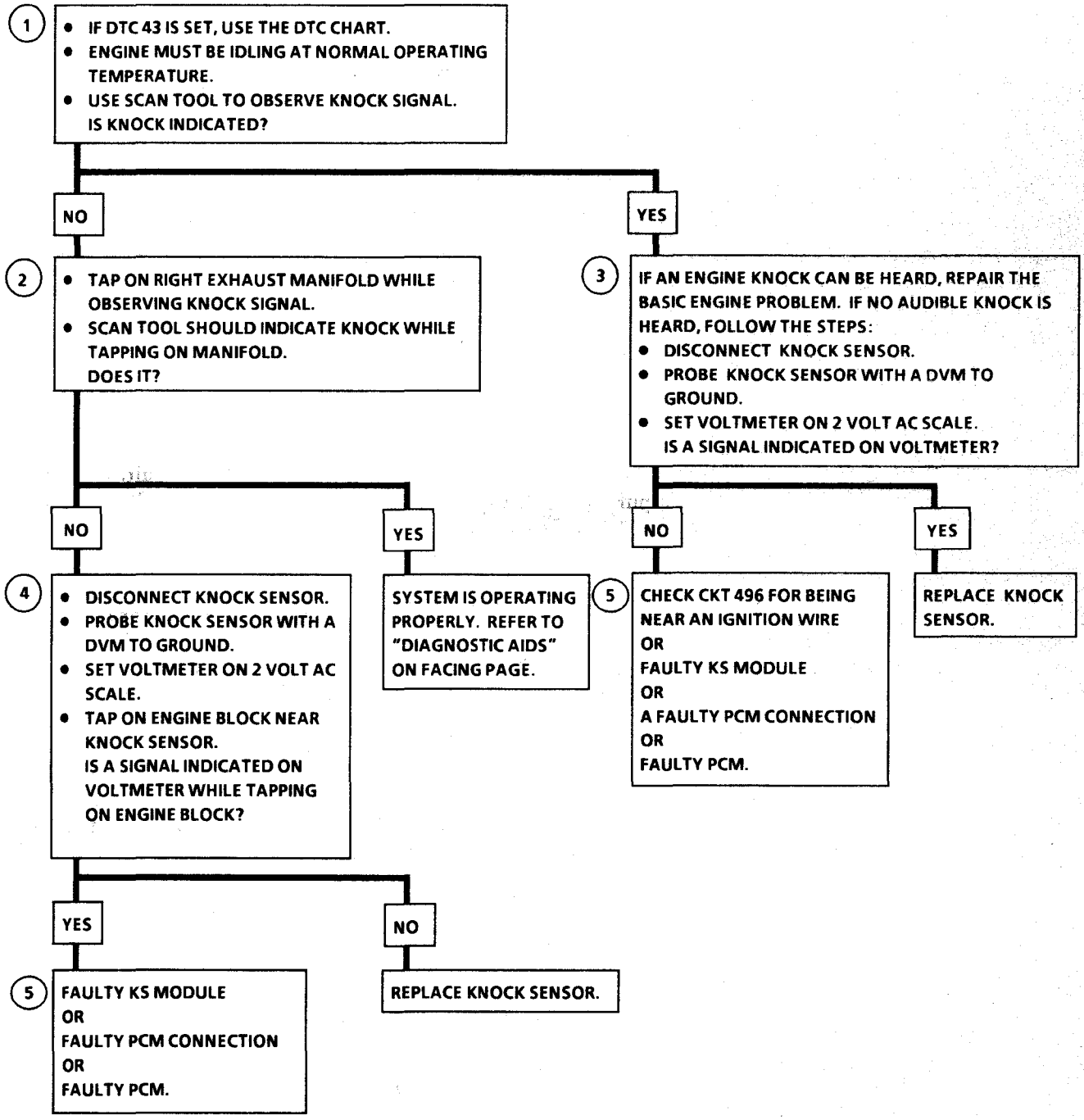
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. With engine idling, there should not be a knock signal present at the PCM, because detonation is not likely under a no load condition.
2. Tapping on the engines right side exhaust manifold should simulate a knock signal to determine if the sensor is capable of detecting detonation. If no knock is detected, try tapping on engine block closer to the sensor before replacing the sensor.
3. If the engine has an internal problem which is creating a knock, the knock sensor may be responding to the internal failure.
4. This test determines if a knock sensor is faulty or if the problem is elsewhere in the circuit.
5. Replace KS module with a known good module. If the malfunction is not corrected, install a new PCM with the original KS module.

Diagnostic Aids: While observing knock signal on the Tech 1, there should be an indication that knock is present when detonation can be heard. Detonation is most likely to occur under high engine load conditions.

CHART C-5

KNOCK SENSOR (KS) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)



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

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SECTION C6
SECONDARY AIR INJECTION (AIR) SYSTEM
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Hoses and Pipes C6-3
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Left Side C6-3
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GENERAL DESCRIPTION

PURPOSE

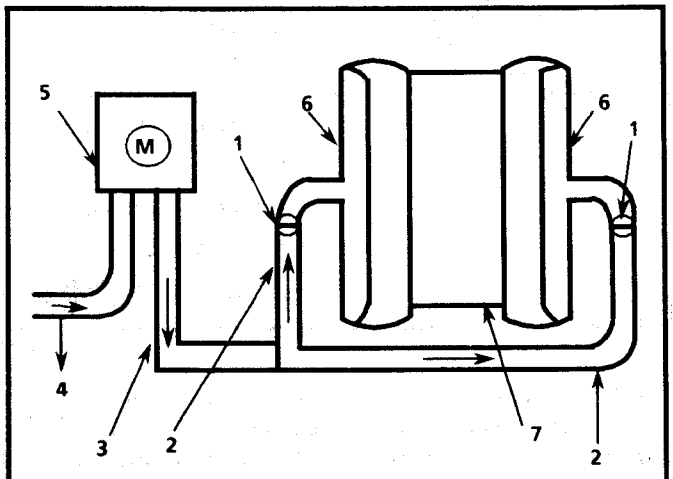
The Secondary Air Injection (AIR) system helps reduce Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) exhaust emissions. It also heats up the oxidation catalytic converter quickly on engine startup so conversion of exhaust gases can occur sooner.

OPERATION OF SYSTEM COMPONENTS

The system (Figure C6-1) includes:

- AIR Pump. - The AIR pump is mounted to the lower left front of the engine and supplies the air to the AIR system. The electric air pump pressurizes air from the engine air cleaner and pumps it to the check valves near the exhaust manifolds.

  The AIR pump is controlled by the PCM. Battery voltage to the AIR pump is controlled by the AIR pump relay. An integral stop valve prevents air flow through the pump during "OFF" periods. When the PCM provides a ground circuit for the secondary AIR pump relay, battery voltage is allowed to power up the AIR pump and integral stop valve.
- Check Valves. - The check valves prevent back flow of exhaust gases into the pump in the event of an exhaust backfire.
- Necessary Plumbing. - As shown in Figure C6-4.



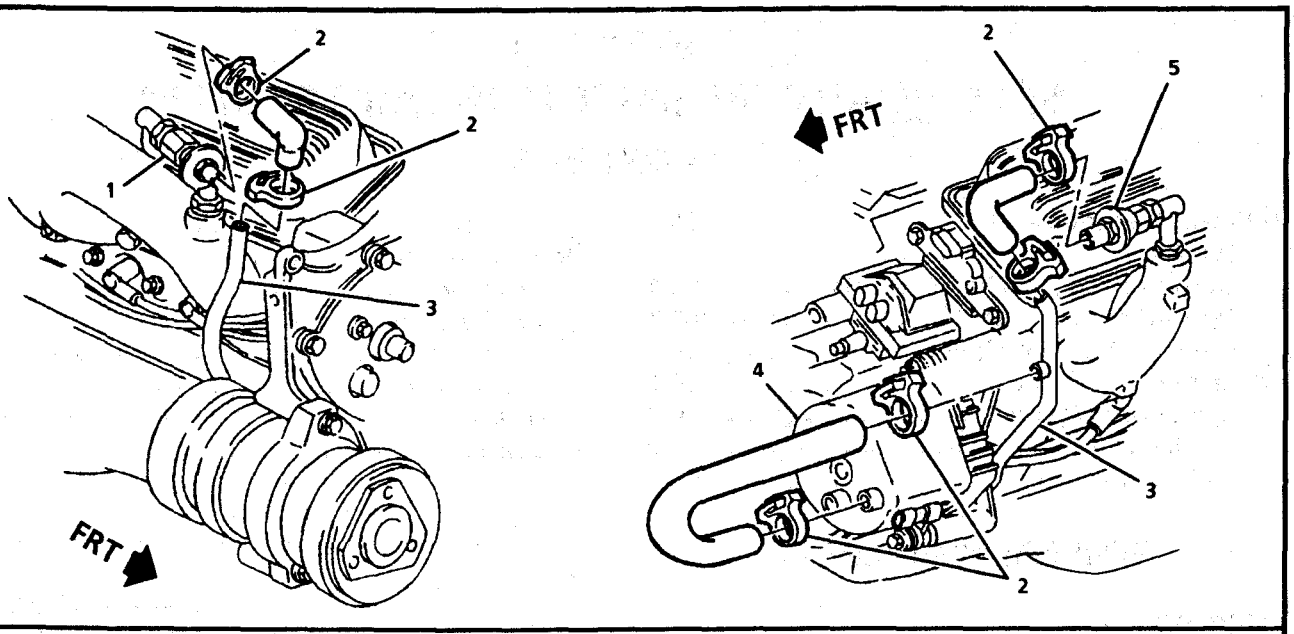
1 CHECK VALVES
2 AIR INJECTION PIPES
3 AIR TO EXHAUST PORTS
4 TO AIR CLEANER ASSEMBLY
5 SECONDARY AIR INJECTION (AIR) PUMP (PCM CONTROLLED)
6 EXHAUST MANIFOLD
7 INTAKE MANIFOLD

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Figure C6-1 - AIR System Operation

OPERATION

The AIR pump with integral stop valve is controlled by the PCM. The PCM will turn "ON" the AIR pump by providing the ground to complete the circuit which energizes the AIR pump relay. When air to the exhaust ports is desired, the PCM turns "ON" both the integral stop valve and AIR pump.



1 SECONDARY AIR INJECTION (AIR) RIGHT SIDE PIPE AND CHECK VALVE
2 CLAMP
3 SECONDARY AIR INJECTION (AIR) CROSS UNDER PIPE
4 SECONDARY AIR INJECTION (AIR) PIPE
5 SECONDARY AIR INJECTION (AIR) LEFT SIDE PIPE AND CHECK VALVE

PS 17017

Figure C6-2 - AIR System (Typical)

The PCM turns "ON" the AIR pump after startup any time engine coolant temperature is above 15°C (59°F). The AIR pump will operate for a maximum of 240 seconds, or until the system enters "Closed Loop" operation. At the same time the PCM turns the AIR pump "OFF," it also de-energizes the integral stop valve solenoid so no air is directed to the exhaust ports.

The air system will be disabled under the following conditions:

- When the PCM recognizes a problem and sets a diagnostic trouble code.
- When the fuel system is operating in "Closed Loop."
- The AIR pump has been "ON" for 240 seconds.
- RPM is greater than 2825.
- MAP is greater than 96 kPa with VSS over 60 mph.
- MAP is less than 20 kPa.
- ECT less than 15°C (59°F).
- Oxidation catalytic converter over temperature detected.
- Short and long term fuel trim are not in their normal ranges.
- Engine RPM below 400 RPM.
- Power enrichment is detected.

RESULTS OF INCORRECT OPERATION

If no air (oxygen) flow enters the exhaust stream at the exhaust ports, HC and CO emission levels will be too high.

Air flowing to the exhaust ports at all times could increase temperature of the oxidation catalytic converter.

DIAGNOSIS

The diagnosis of the AIR system is covered in CHART C-6 at the end of this section.

OPERATIONAL CHECKS

AIR Pump

The AIR pump is a regenerative turbine type which is permanently lubricated and requires no periodic maintenance.

The engine should be at normal operating temperature in neutral at idle. Using the scan tool select "Miscellaneous Test" then "Output Test." Select "AIR System" in "Output Test" directory. Select HO2S voltages for both Bank 1 and Bank 2 HO2S.

Enable the "Output Test" for the AIR system. The "Output Test" will energize the AIR pump for only 5 seconds. When the "Output Test" is enabled, the HO2S voltages for both sensors should remain under 300 mV because air is being directed to the exhaust ports. If the HO2S voltages remain low during the "Output Test," the AIR pump and integral stop valve are operating satisfactorily.

If the HO2S voltage does not remain low when the "Output Test" is commanded "ON," proceed as follows.

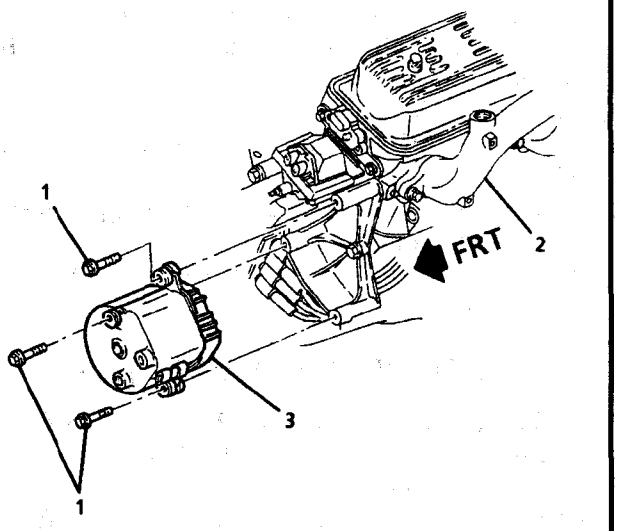
Inspect

1. For a seized AIR pump (refer to CHART C-6).
2. Hoses, tubes and all connections for leaks and proper routing.
3. For air flow going to the exhaust ports.
4. AIR pump for proper mounting.

Hoses and Pipes

Inspect

1. Hose or pipe for deterioration or holes.
2. All hoses or pipe connections, and clamp tightness.
3. Hose or pipe routing. Interference may cause wear.



1 MOUNTING BOLTS
2 EXHAUST MANIFOLD
3 SECONDARY AIR INJECTION (AIR) PUMP

PS 17018

Figure C6-3 - AIR Pump Service

4. If a leak is suspected on the pressure side of the system or if a hose or pipe has been disconnected on the pressure side, the connections should be checked for leaks with a soapy water solution. With the AIR pump running, bubbles will form if a leak exists.

Check Valve

Inspect

1. A check valve should be inspected whenever the hose is disconnected from a check valve or whenever check valve failure is suspected. (An AIR pump that had become inoperative and had shown indications of having exhaust gases in the outlet port would indicate check valve failure.)
2. Blow through the check valve (toward the cylinder head) then attempt to suck back through the check valve. Flow should only be in one direction (toward the exhaust manifold). Replace valve which does not operate properly.

ON-VEHICLE SERVICE

AIR PUMP
Figure C6-3

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector from AIR pump.
3. Outlet and inlet hoses.
4. Air pump mounting bolts (3) from bracket.

Install or Connect

1. AIR pump to bracket.
2. Mounting bolts (3).

Tighten

- Bolts to 5.6 N·m (50 lb. in.).

3. Outlet and inlet hoses to pump.
4. Electric connector to AIR pump.
5. Negative battery cable.
6. Check AIR system for proper operation (refer to CHART C-6).

AIR CHECK VALVE/AIR PIPES
Figure C6-2

Left Side

Remove or Disconnect

1. Check valve clamp.
2. Hose from check valve.
3. Left check valve pipe.
4. Unscrew check valve from AIR pipe.

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.

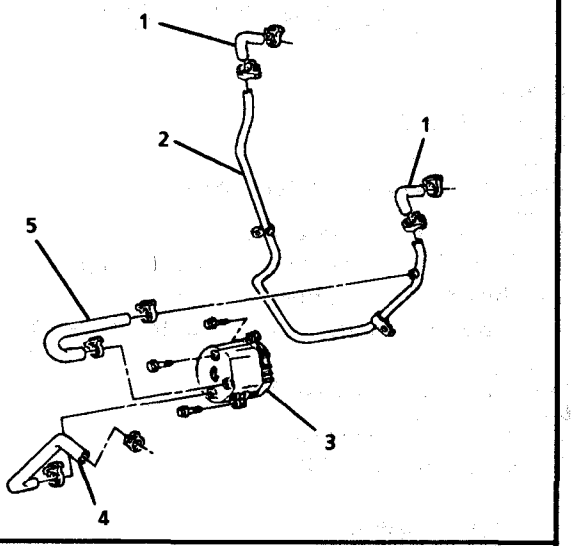
Right Side

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.)

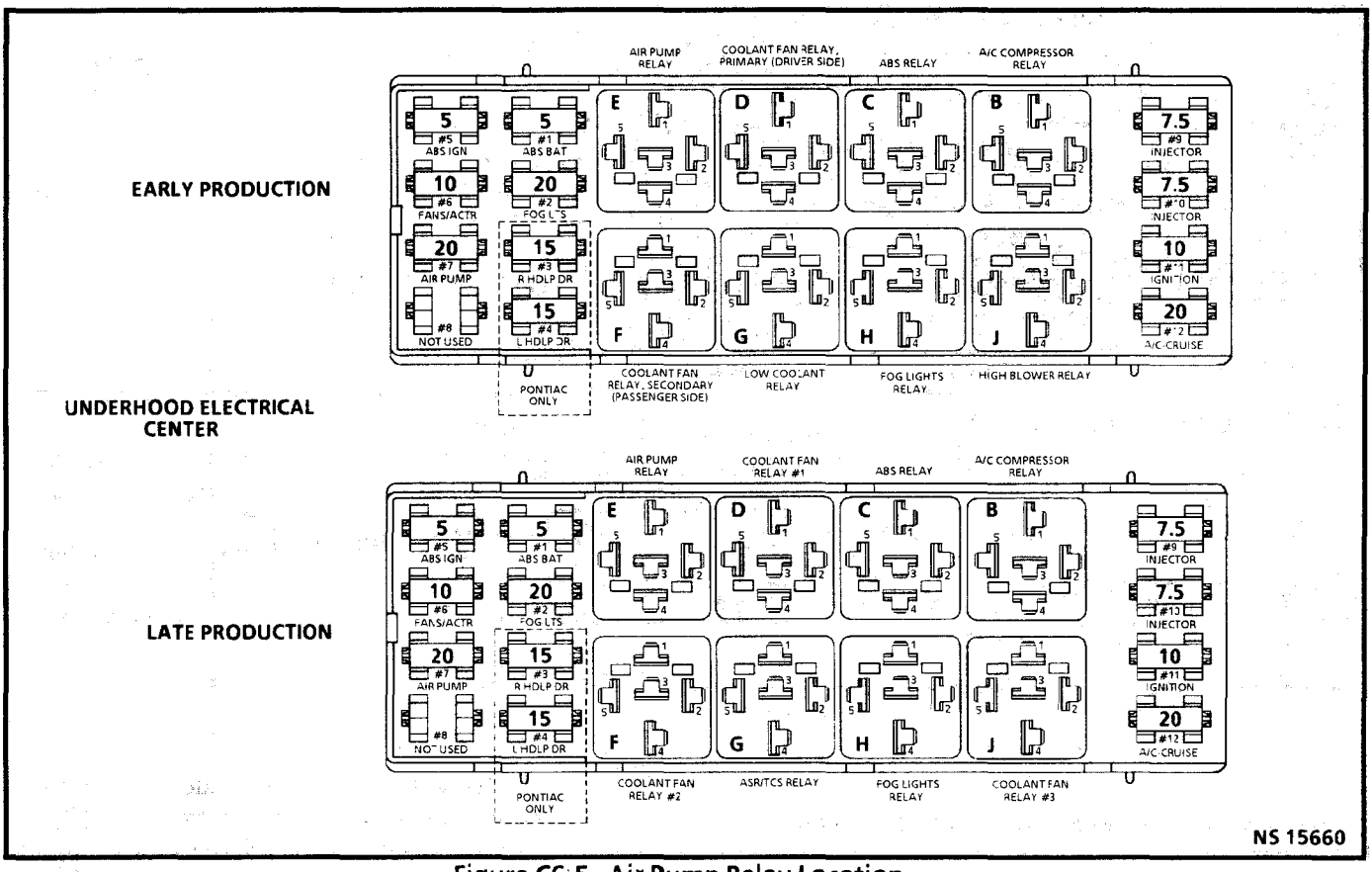


Figure C6-5 - Air Pump Relay Location

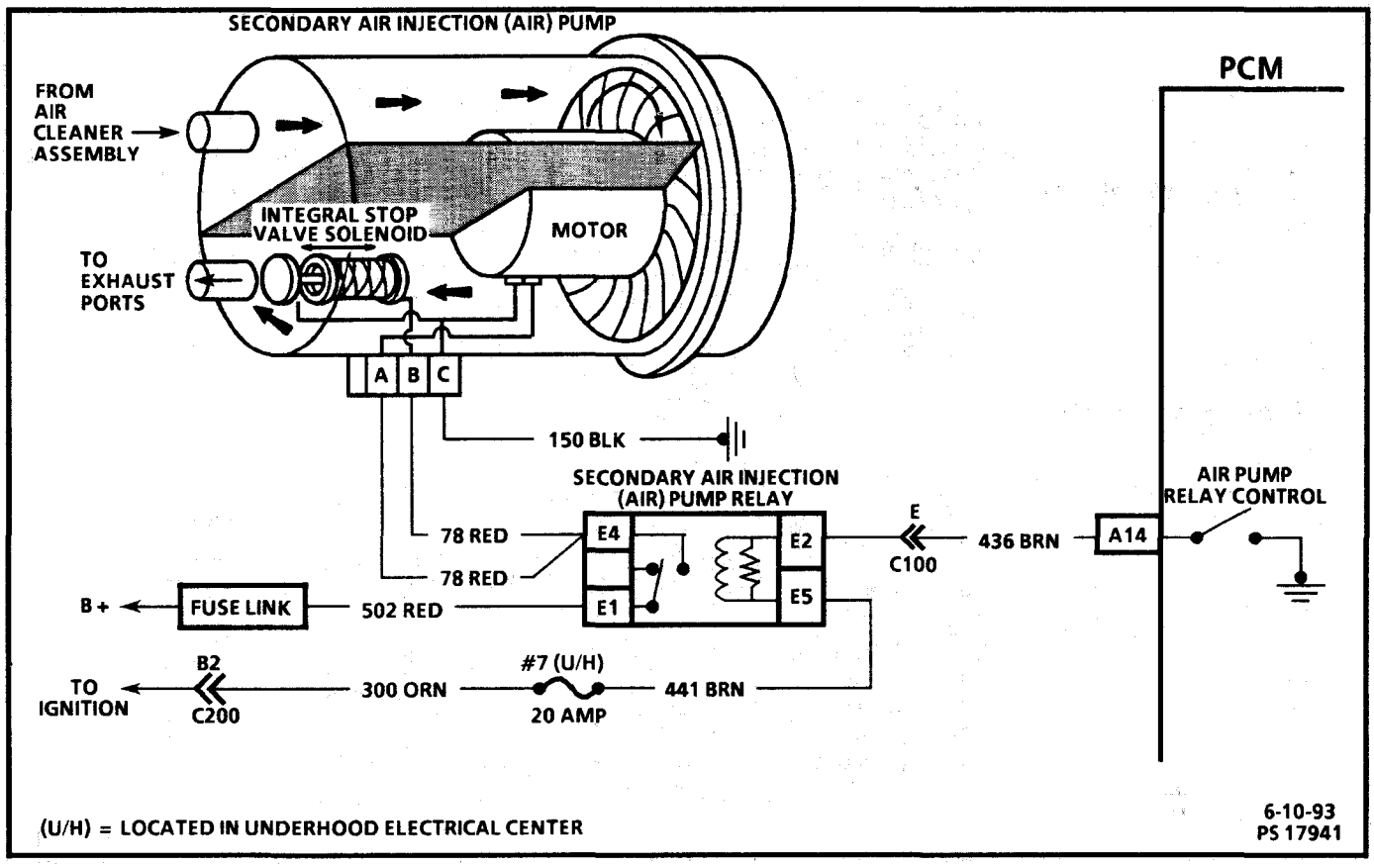


CHART C-6

SECONDARY AIR INJECTION (AIR) SYSTEM CHECK
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

During cold starts, above 15°C (59°F), the PCM completes the ground circuit to the air pump relay which enables the air pump and integral stop valve. Air is directed to the exhaust ports whenever the engine is started. Whenever the fuel system goes to "Closed Loop," or the air pump has been "ON" for greater than 240 seconds, the PCM opens the ground circuit to the air pump relay, and the air pump is de-energized and the integral stop valve closes.

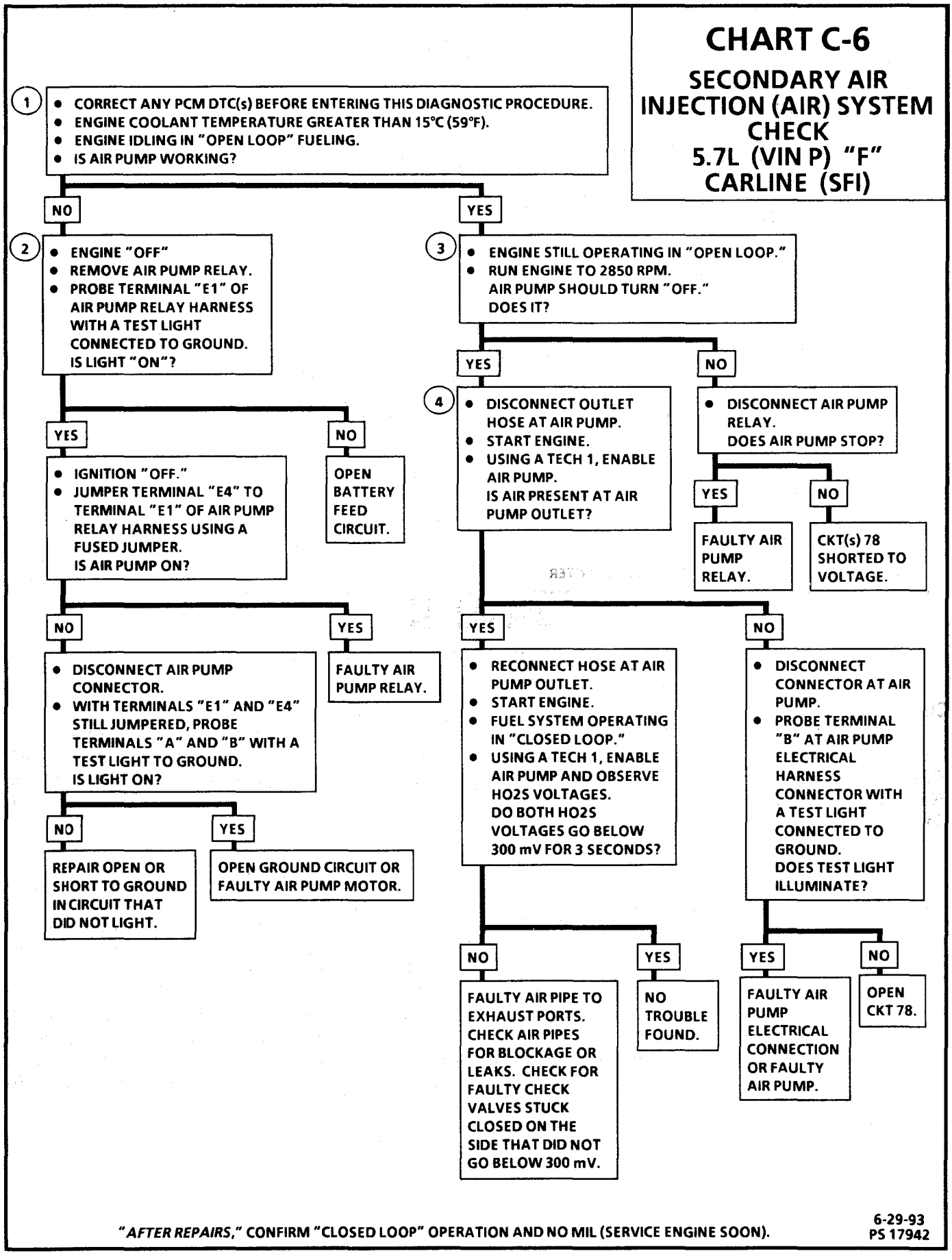
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The PCM should energize the air pump when engine coolant temperature is greater than 15°C (59°F) and fuel system not in "Closed Loop." If any Diagnostic Trouble Codes (DTCs) are present the PCM will not energize the AIR pump.
   The fuel system must be operating in "Open Loop" to perform this test. If the system goes to "Closed Loop," stop the engine and allow some time to cool down then restart.
2. Air pump relay is located in the underhood electrical center.
3. The PCM should de-energize the air pump relay when engine speed exceeds 2825 RPM.
4. Selecting "Miscellaneous Test" then outputs and then AIR system on the Tech 1 should enable the AIR pump and integral stop valve.

There is a possibility that the AIR pump motor will be operating, but no air is being distributed to the AIR system. A restriction in the AIR hoses or pipes may be the cause or the integral stop valve may not be opening. The integral stop valve is part of the AIR pump.

CHART C-6

SECONDARY AIR INJECTION (AIR) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)



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

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SECTION C7
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

CONTENTS

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EGR Valve C7-2
EGR Manifold Passage C7-2
EGR Vacuum Control Signal Solenoid Valve C7-3
Torque Specifications C7-3

GENERAL DESCRIPTION

PURPOSE

The Exhaust Gas Recirculation (EGR) system is used to lower NOx (Oxides of Nitrogen) emission levels caused by high combustion temperature and excessive oxygen. It does this by decreasing combustion temperature and displacing oxygen.

The main element of the system is the EGR valve mounted on the intake manifold and operated by vacuum.

The EGR valve feeds small amounts of exhaust gas back into the combustion chamber as shown in (Figure C7-1).

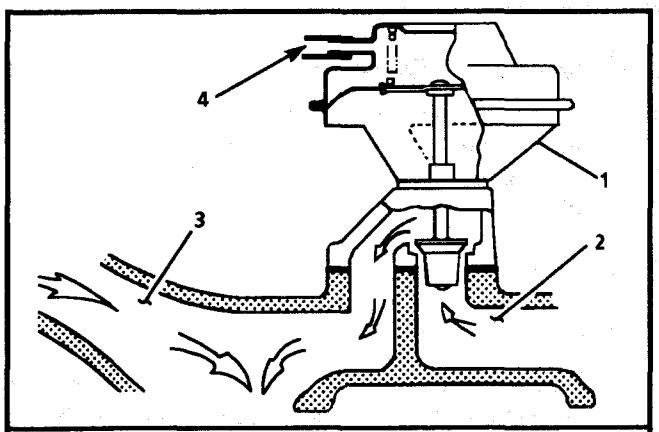


Figure C7-1 - Exhaust Gas Recirculation

OPERATION

The EGR valve is opened by vacuum to let 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 EGR valve. The EGR valve is usually open during warm engine operation when the vehicle is above idle speed.

EGR CONTROL

The EGR vacuum control has a vacuum solenoid valve that is controlled by pulse width modulation. This means the PCM turns the solenoid valve "ON" and "OFF" many times a second and varies the amount of "ON" time ("pulse width") to vary the amount of vacuum applied to the EGR valve.

The PCM uses RPM and information from the following sensors to regulate the EGR solenoid valve:

- Engine Coolant Temperature (ECT) sensor.
- Intake Air Temperature (IAT) sensor.
- Throttle Position (TP) sensor.
- Manifold Absolute Pressure (MAP) sensor.
- Park/Neutral Position (PNP) switch.
- Vehicle Speed Sensor (VSS).

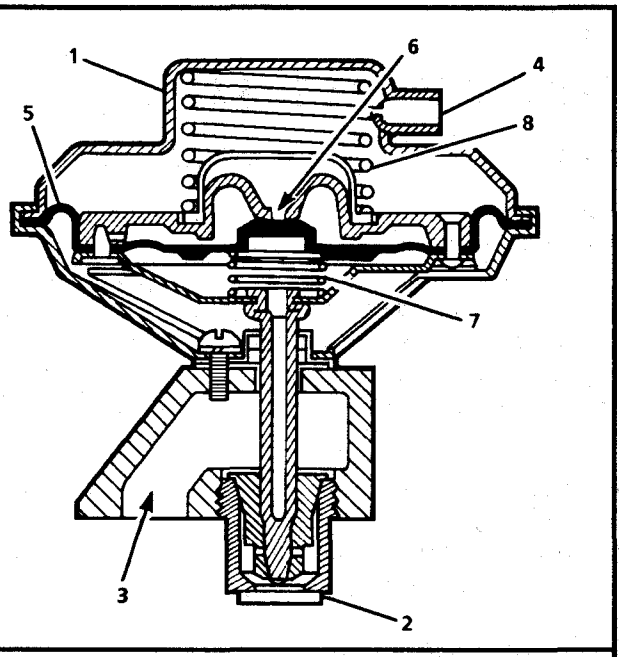
Grounding the DLC output/field service enable terminal, with the ignition "ON" and the engine not running, will energize the solenoid valve and allow vacuum to the EGR valve.

NEGATIVE BACKPRESSURE EGR VALVE

The EGR valve used on this engine is a negative backpressure valve. It varies the amount of exhaust gas flow into the manifold depending on manifold vacuum and variations in exhaust backpressure.

The diaphragm on this EGR valve (shown in Figure C7-2) has an internal vacuum bleed hole which is held closed by a small spring when there is no exhaust backpressure. The amount of vacuum to the valve is controlled by an PCM controlled solenoid valve.

Engine vacuum opens the EGR valve against the pressure of a large spring. When vacuum combines with negative exhaust backpressure, the vacuum bleed hole opens and the EGR valve closes.



1	EGR VALVE	6	AIR BLEED HOLE
2	EXHAUST GAS	7	SMALL SPRING
3	INTAKE AIR	8	LARGE SPRING
4	VACUUM PORT		
5	DIAPHRAGM		

Figure C7-2 - Negative Backpressure EGR Valve

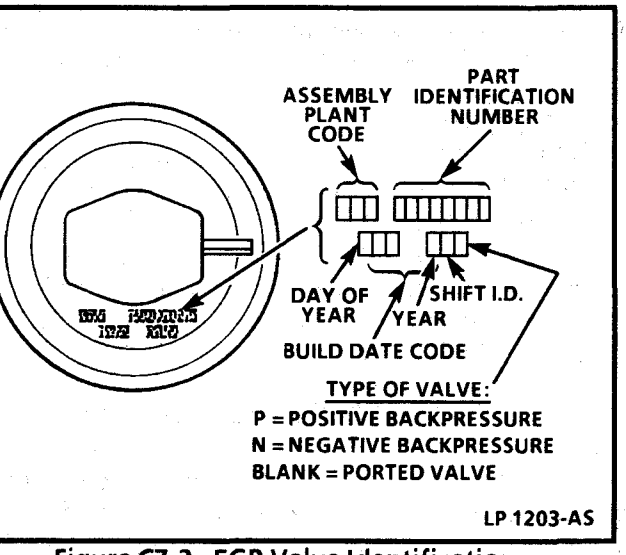


Figure C7-3 - EGR Valve Identification

EGR VALVE IDENTIFICATION

- Negative backpressure EGR valves will have a "N" stamped on the top side of the valve after the part number.
- Positive backpressure EGR valves will have a "P" stamped on the top side of the valve, after the part number.
- Port EGR valves have no identification stamped after the part number.

When replacing an EGR valve, always check for correct part number in the parts catalog or supplemental bulletin.

RESULTS OF INCORRECT OPERATION

Too much EGR flow dilutes the fresh intake air/fuel mixture, causing the engine to run roughly or stall. With too much EGR flow (at idle, cruise, or cold operation) tends to weaken combustion and may result in any of the following conditions:

- Engine stops after cold start.
- Engine stops at idle after deceleration.
- Vehicle surges during cruise.
- Rough idle.

Too little or no EGR flow allows combustion temperatures to get too high during acceleration and load conditions. This could cause:

- Spark knock (detonation).
- Engine overheating.
- Emission test failure.

DIAGNOSIS

Diagnosis of the EGR system is covered in CHART C-7 at the end of this section, if DTC 27 or 32 was not set.

ON-VEHICLE SERVICE

EGR VALVE

Remove or Disconnect

1. Negative battery cable.
2. Vacuum line.
3. Retaining nuts.
4. EGR valve.

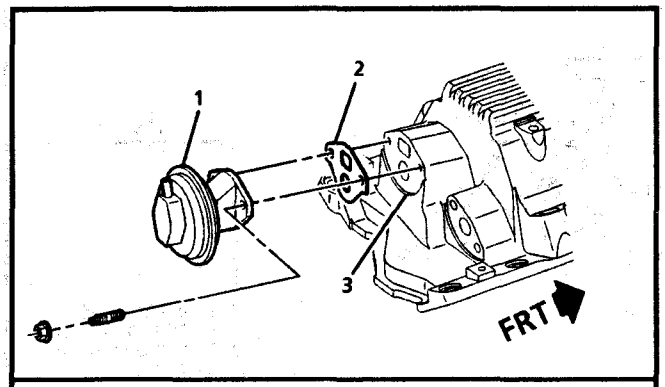
EGR Manifold Passage

Inspect

- If EGR passages in the inlet manifold indicate excessive build-up of deposits, the passages should be cleaned. Care should be taken to ensure that all loose particles are completely removed to prevent them from clogging the EGR valve or from being ingested into the engine.

Clean

1. With a wire wheel, buff the exhaust deposits from the mounting surface and around the valve.
2. Look for exhaust deposits in the valve outlet. Remove deposit build-up with a screwdriver.
3. Clean mounting surfaces of intake manifold and valve assembly.



1 EGR VALVE
2 GASKET
3 INTAKE MANIFOLD
NS 15267

Figure C7-4 - EGR Valve Service

Install or Connect

1. EGR valve on intake manifold using new gasket.

Tighten

- Bolts to 22 N·m (16 lb. ft.).

2. Vacuum hose to valve.
3. Negative battery cable.

EGR VACUUM CONTROL SIGNAL SOLENOID VALVE

Remove or Disconnect

1. Negative battery cable.
2. Electrical connector at solenoid valve.
3. Vacuum hoses.
4. Nut and solenoid valve.

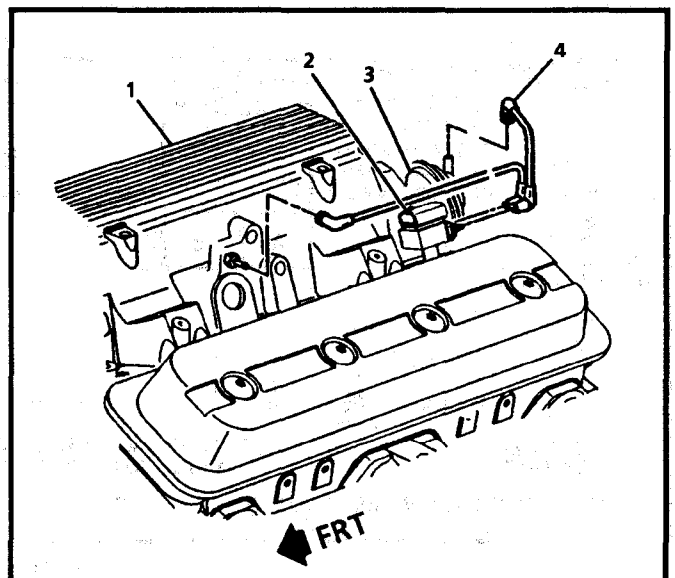
Install or Connect

1. Solenoid and bracket.

Tighten

- Nut to 34 N·m (25 lb. ft.).

2. Vacuum hoses.
3. Electrical connector.
4. Negative battery cable.



1 INTAKE MANIFOLD
2 EGR VACUUM CONTROL SIGNAL SOLENOID VALVE
3 EGR
4 VACUUM HOSE HARNESS
NS 15266

Figure C7-5 - EGR Vacuum Control Signal Solenoid Valve

TORQUE SPECIFICATIONS

EGR Valve Bolts to Intake Manifold	22 N·m (16 lb. ft.)
Solenoid Valve and Bracket, Nut to Intake Manifold	34 N·m (25 lb. ft.)

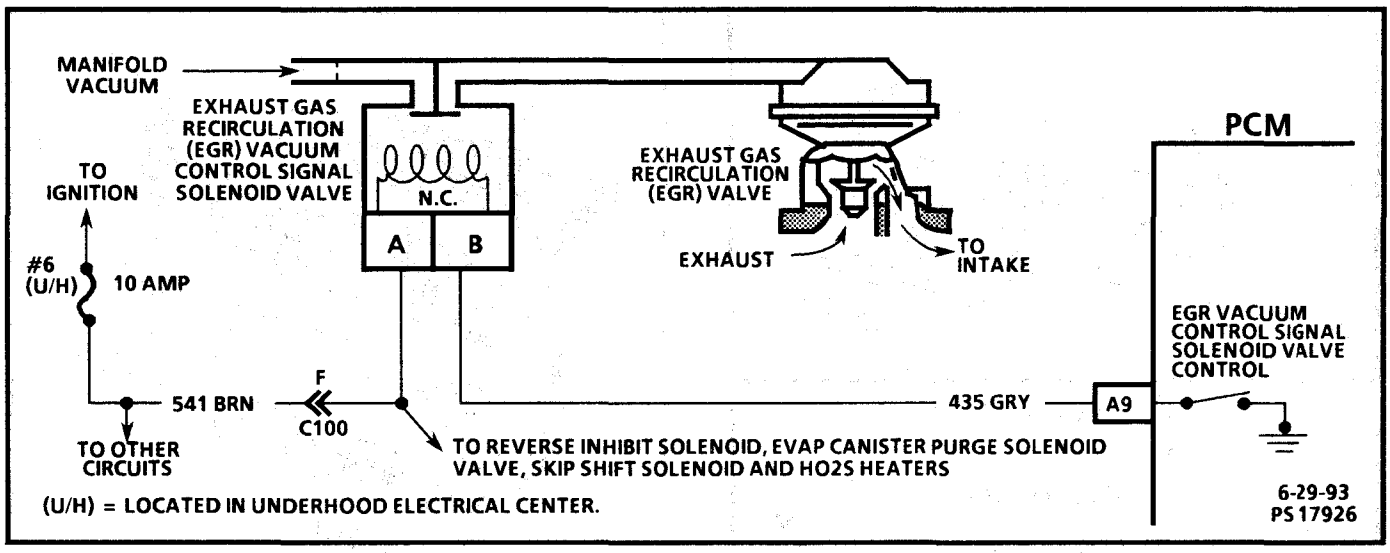


CHART C-7

(Page 1 of 2)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Exhaust Gas Recirculation (EGR) valve is controlled by a normally closed solenoid valve. The PCM turns the solenoid valve "ON" to allow vacuum to pass to the EGR, and turns the solenoid valve "OFF" to prevent EGR operation.

The duty cycle is calculated by the PCM based on information from the ECT, IAT, TP sensor, and MAP sensors. Also, engine RPM and the PNP switch input affect EGR. There should be no EGR when in park or neutral, TP sensor below a calibrated value (manual transmission), or TP sensor indicating WOT.

With the ignition "ON" and engine "OFF," the EGR solenoid valve is de-energized. The solenoid valve, however, should be energized, if the output/field service enable terminal is grounded with the ignition "ON" and engine "OFF."

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

1. **Intake Passage:** Shut "OFF" engine and remove the EGR valve from the manifold. Plug the exhaust side hole with a shop rag or suitable stopper. Leaving the intake side hole open, attempt to start the engine. If the engine runs at a very high idle (up to 3000 RPM is possible) or starts and stalls, the EGR passages are not restricted. If the engine starts and idles normally, the EGR intake side passage in the intake manifold is restricted.

   Exhaust Passage: With EGR valve still removed, plug the intake side hole with a suitable stopper. With the exhaust side hole open, check for the presence of exhaust gas. If no exhaust gas is present, the EGR exhaust side passage in the intake manifold is restricted.
2. The vacuum at the gage may or may not slowly bleed off. It is important that the gage is able to read the amount of vacuum being applied.
3. When the output/field service enable terminal is grounded, or Tech 1 is used, the vacuum gage should bleed off through a vent in the solenoid valve. The pump gage may or may not bleed off but this does not indicate a problem.

Diagnostic Aids: Vacuum lines should be thoroughly checked for proper routing. Refer to "Vehicle Emission Control Information" label.

Suction from shop exhaust hoses can alter backpressure and may affect the functional check of the EGR valve.

When the transmission enables TCC, the EGR will be in a reduced duty cycle.

CHART C-7

(Page 1 of 2)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)

BEFORE USING THIS CHART, CHECK FOR MANIFOLD VACUUM TO EGR SOLENOID VALVE, ALSO CHECK HOSES FOR LEAKS OR RESTRICTIONS. SHOULD BE AT LEAST 7" Hg VACUUM AT 2000 RPM.

- IF DTC 27 IS SET, USE THAT CHART FIRST.
- WITH ENGINE AT IDLE AND AT NORMAL OPERATING TEMPERATURE, MANUALLY LIFT EGR VALVE DIAPHRAGM.
- RPM SHOULD DECREASE OR ENGINE SHOULD STALL. DOES IT?

YES

- DISCONNECT EGR VACUUM HARNESS AT SOLENOID VALVE. INSTALL A VACUUM GAGE TO MANIFOLD SIDE OF HARNESS AND CHECK FOR VACUUM SUPPLY TO SOLENOID VALVE.
- VACUUM SHOULD BE AT LEAST 25 kPa (7" Hg) OF VACUUM AT 2000 RPM. IS IT?

NO

(1) CHECK FOR PLUGGED EGR PASSAGES.

YES

(2)

- ROTATE VACUUM HARNESS AND REINSTALL ONLY THE EGR VALVE SIDE, TO THE SOLENOID VALVE.
- INSTALL A VACUUM GAGE IN PLACE OF EGR VALVE.
- INSTALL A HAND HELD VACUUM PUMP TO MANIFOLD SIDE OF EGR SOLENOID VALVE.
- IGNITION "ON," ENGINE STOPPED.
- USING TECH 1 SELECT "FIELD SERVICE" MODE.
- APPLY 34 kPa (10" Hg) VACUUM AND OBSERVE GAGE.
- GAGE SHOULD READ VACUUM APPLIED BY PUMP. DOES IT?

NO

PLUGGED VACUUM PORT AT INTAKE MANIFOLD. LEAKING OR RESTRICTED VACUUM SUPPLY LINE TO EGR SOLENOID VALVE.

YES

(3)

- USING TECH 1, EXIT "FIELD SERVICE" MODE.
- VACUUM SHOULD BLEED OFF COMPLETELY AT GAGE. DOES IT?

NO

- CONNECT VACUUM PUMP TO EGR VALVE SIDE OF HARNESS.
- APPLY VACUUM AND OBSERVE GAGE.
- GAGE SHOULD READ VACUUM APPLIED BY PUMP. DOES IT?

YES

REFER TO EGR CHART (2 OF 2).

NO

- DISCONNECT SOLENOID VALVE ELECTRICAL CONNECTOR. DOES VACUUM BLEED OFF RAPIDLY AT GAGE?

YES

PCM DRIVER CIRCUIT OPEN OR FAULTY PCM.

NO

REPLACE SOLENOID VALVE.

YES

FAULTY SOLENOID VALVE CONNECTION OR FAULTY SOLENOID VALVE.

NO

FAULTY VACUUM SUPPLY LINE TO EGR VALVE.

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

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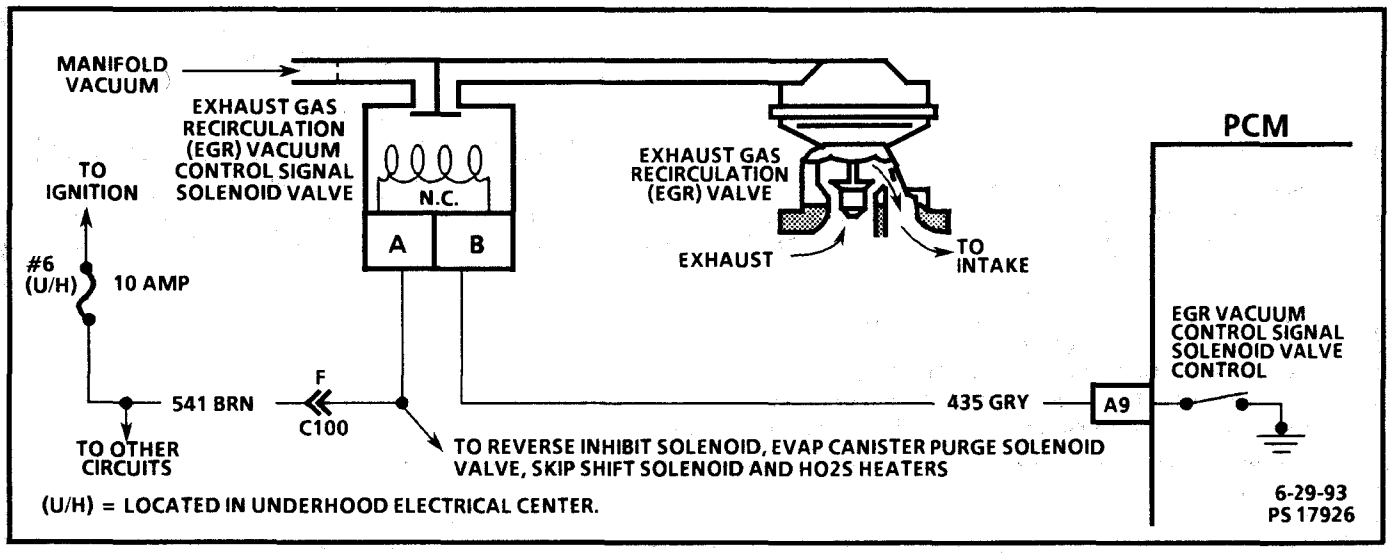


CHART C-7

(Page 2 of 2)
EXHAUST GAS RECIRCULATION (EGR) SYSTEM CHECK
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The Exhaust Gas Recirculation (EGR) valve is controlled by a normally closed solenoid valve. The PCM turns the solenoid valve "ON" to allow vacuum to pass to the EGR, and turns the solenoid valve "OFF" to prevent EGR operation.

The duty cycle is calculated by the PCM based on information from the TP sensor, ECT, IAT, and MAP sensors. Also, engine RPM and the PNP switch input affect EGR. There should be no EGR when in park or neutral, TP sensor below a calibrated value (manual transmission), or TP sensor indicating WOT.

With the ignition "ON" and engine "OFF," the EGR solenoid valve is de-energized. The solenoid valve, however, should be energized, if the output/field service enable terminal is grounded with the ignition "ON" and engine "OFF."

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

1 The remaining test checks the ability of the EGR valve to interact with the exhaust system. This system uses a negative backpressure EGR valve which should hold vacuum with engine "OFF."

2. When engine is started, exhaust backpressure at the base of the EGR valve should open the valve's internal bleed and vent the applied vacuum allowing the valve to seat.

Diagnostic Aids: Suction from shop exhaust hoses can alter backpressure and may affect the functional check of the EGR valve.

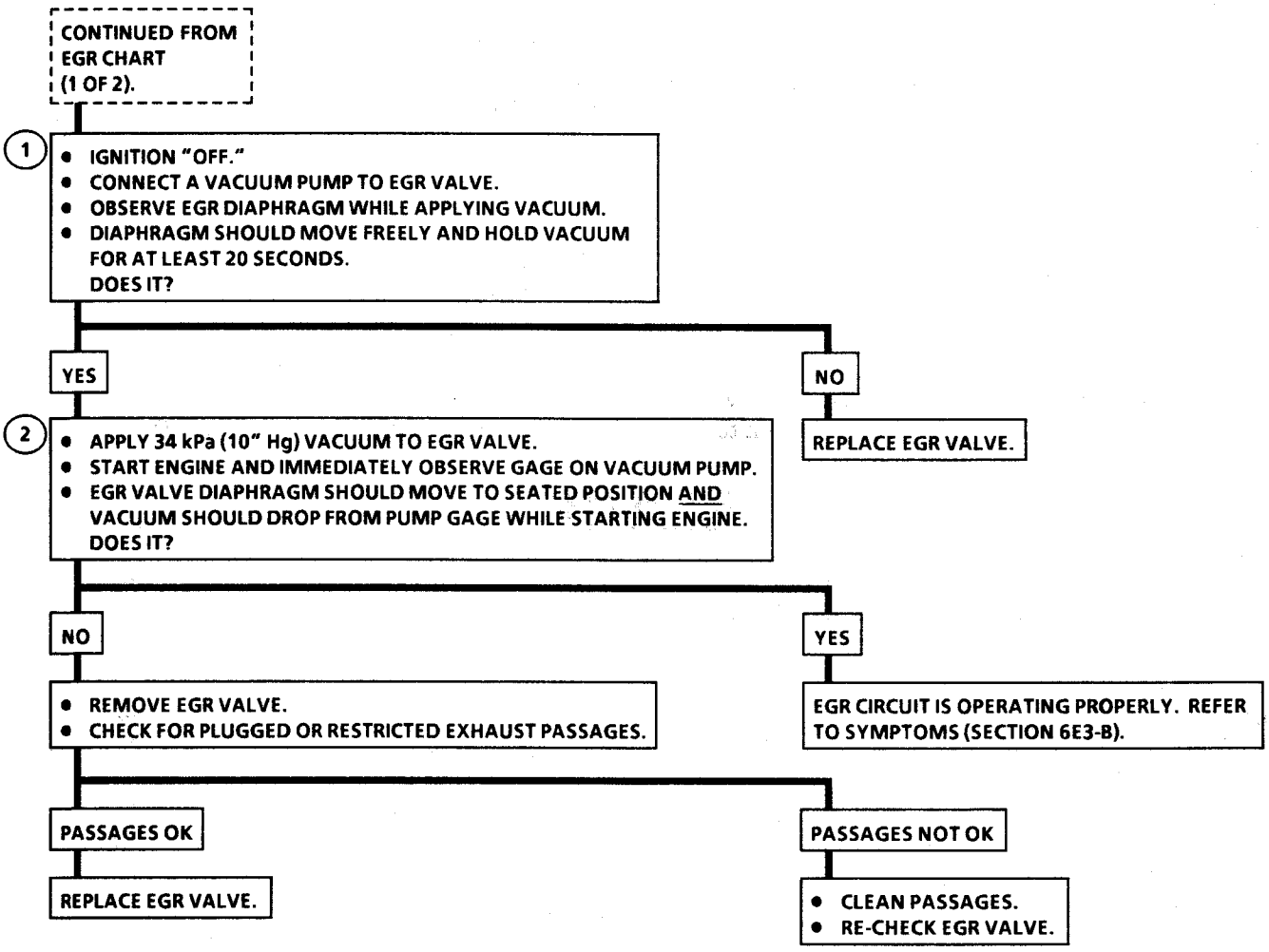
During normal EGR valve operation, the movement of the EGR pintle is small. It is important to determine whether the valve pintle moves and not how much it moves.

When the transmission enables TCC the EGR will be in a reduced duty cycle.

CHART C-7

(Page 2 of 2)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM CHECK 5.7L (VIN P) "F" CARLINE (SFI)



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

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SECTION C8
AUTOMATIC TRANSMISSION CONTROL SYSTEM
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Powertrain Control Module (PCM) C8-1
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Information Sensors and Switches C8-1
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Vehicle Speed Sensor (VSS) C8-5

GENERAL DESCRIPTION

POWERTRAIN CONTROL MODULE (PCM)
Figure C8-1

The Powertrain Control Module (PCM) is an electronic device which monitors various inputs to control various transmission functions including shift quality and transmission diagnostics. The PCM receives various input information from sensors, switches, and components to process for use within its control program. Based on this input information, the PCM controls various transmission output functions and devices.

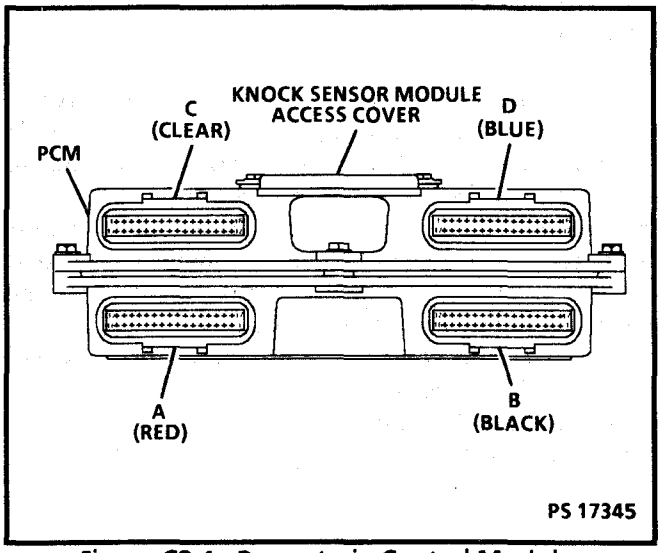


Figure C8-1 - Powertrain Control Module

INPUT INFORMATION

Information Sensors and Switches

The PCM uses the following information sensors to gather data for electronically controlling transmission functions.

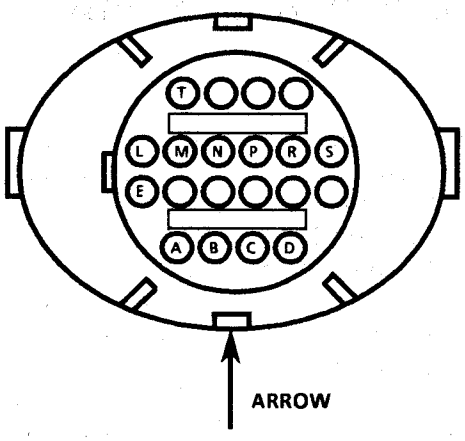
- Transmission Fluid Temperature (TFT) sensor.
- Transmission Range (TR) pressure switch assembly.
- Engine Coolant Temperature (ECT) sensor.
- Throttle Position (TP) sensor.
- Vehicle Speed Sensor (VSS).
- Brake switch.

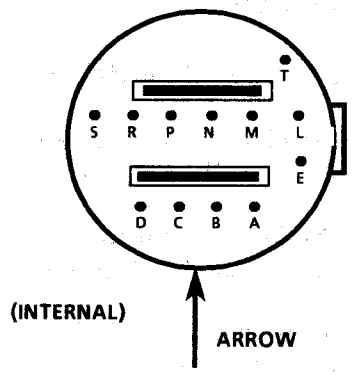
Transmission Fluid Temperature (TFT) Sensor

The TFT sensor is a thermistor (a device that changes resistance according to changes in temperature) used to indicate transmission fluid temperature. High sensor resistance produces high signal input voltage which corresponds to low fluid temperature. Low sensor resistance produces low signal input voltage which corresponds to high fluid temperature. The PCM uses the TFT sensor signal input to determine the following:

- TCC apply and release schedules.
- Hot mode determination.
- Shift quality.

The TFT sensor is part of the transmission range fluid pressure switch assembly and is attached to the control valve body within the transmission.





CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID CONTROL CKT
B	2-3 SHIFT SOLENOID CONTROL CKT
C	PRESSURE CONTROL SOLENOID (HIGH)
D	PRESSURE CONTROL SOLENOID (LOW)
E	BOTH SHIFT SOLENOIDS, TCC SOLENOID, AND 3-2 CONTROL SOLENOID IGNITION (B+) FEED CKT
L	TRANSMISSION FLUID TEMPERATURE (TFT) SIGNAL CKT
M	TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR GROUND CKT
N	RANGE SIGNAL "A" CKT
P	RANGE SIGNAL "C" CKT
R	RANGE SIGNAL "B" CKT
S	3-2 CONTROL SOLENOID CONTROL CKT
T	TCC SOLENOID CONTROL CKT

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MS 13631

Figure C8-2 - Harness Connector

Transmission Range (TR) Pressure Switch Assembly
Figure C8-3

This device is a set of five pressure switches (two normally closed and three normally open), that detect fluid pressure within the valve body passages. The five pressure switches are connected to three signal circuits referred to as range signals A, B, C.

Valid Combination Chart
"ON" = O volts/"OFF" = B+

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

The combination of pressure switch states determine the voltage signal (B+ or 0) on each range signal to the PCM. These three range signals are then interpreted by the PCM to indicate the transmission range selected. The transmission range fluid pressure switch assembly contains the trans fluid temperature sensor and attached to the control valve body within the transmission.

Vehicle Speed Sensor (VSS)
Figure C8-4

This device contains a permanent magnet surrounded by a coil of wire producing a magnetic field which is interrupted by rotor teeth pressed on an output shaft. As the rotor interrupts the magnetic field, an AC voltage is generated in the circuit. This device is used to provide an output shaft speed signal to the control module. The control module uses the vehicle speed sensor signal input to:

- Calculate vehicle speed, trans output speed, TCC slip speed.
- Control shift quality.

The VSS is attached to the output shaft housing.

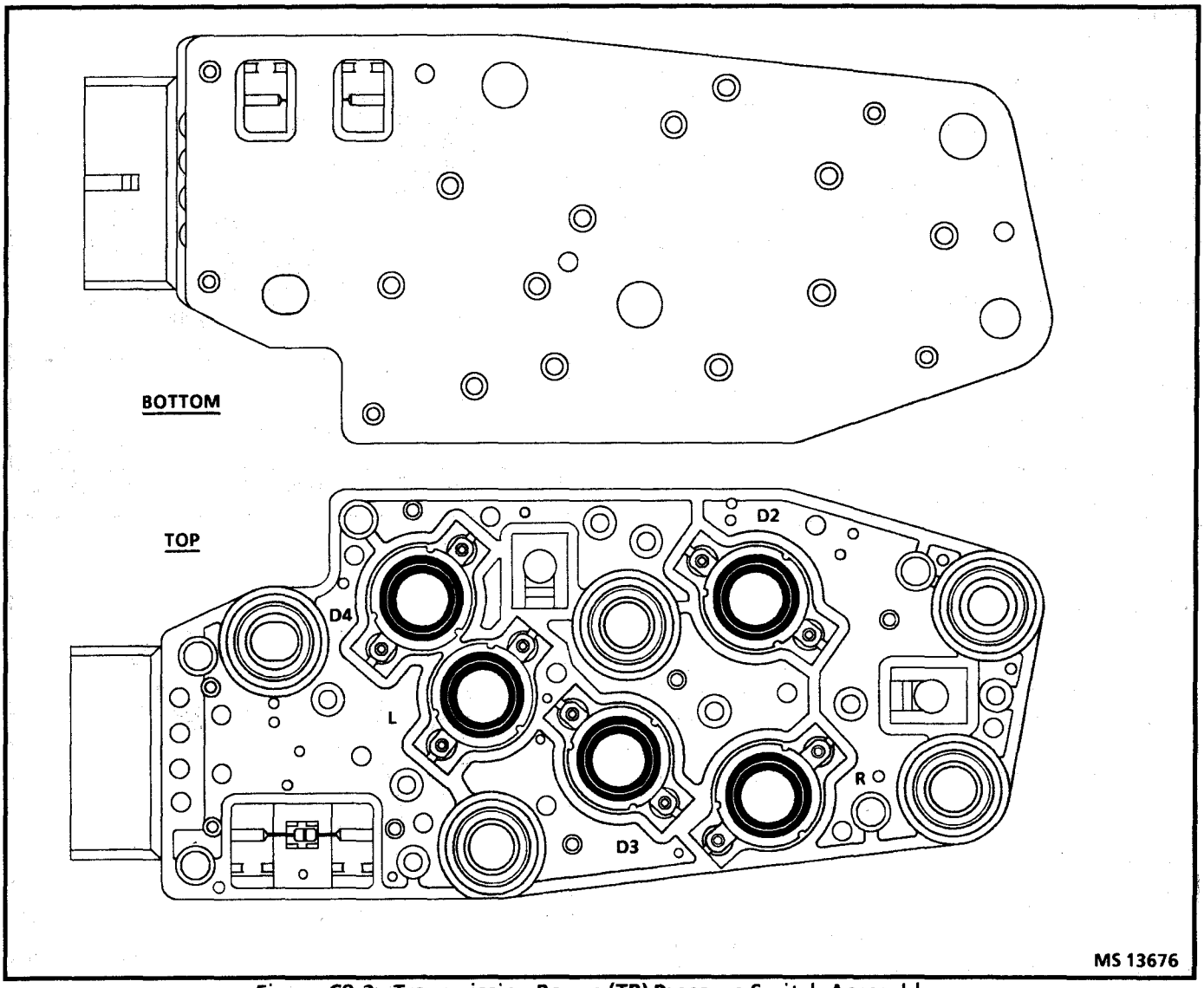


Figure C8-3 - Transmission Range (TR) Pressure Switch Assembly

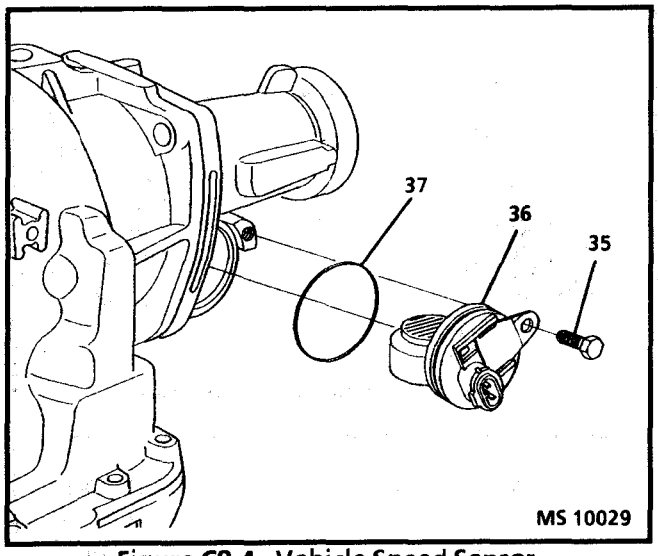


Figure C8-4 - Vehicle Speed Sensor

CHART		
Gear	1-2 Shift Solenoid	2-3 Shift Solenoid
1	ON	ON
2	OFF	ON
3	OFF	OFF
4	ON	OFF

Brake Switch

This electrical switch is used to indicate brake pedal status. This switch is normally closed when the brake pedal is not applied. When the brake pedal is applied the switch will open, changing the signal to the PCM. The PCM uses this signal to de-energize the TCC solenoid when brake pedal is applied. The brake switch is located on the brake pedal mounting bracket.

OUTPUT INFORMATION

Based on input information, the PCM controls various transmission output functions and devices.

- 1-2 Shift Solenoid.
- 2-3 Shift Solenoid.
- 3-2 Control Solenoid.
- Pressure Control Solenoid (PCS).
- Torque Converter Clutch (TCC) Solenoid.

1-2 Shift Solenoid
Figure C8-5

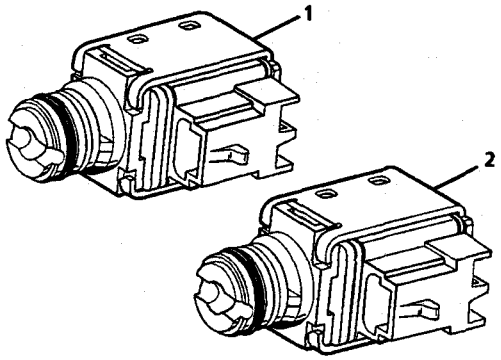
This electrical device is used to control fluid flow acting on the 1-2 and 3-4 shift valves. The solenoid is a normally open exhaust valve that is used with the 2-3 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission.

2-3 Shift Solenoid
Figure C8-5

This electrical device is used to control fluid flow acting on the 2-3 shift valves. The solenoid is a normally open exhaust valve that is used with the 1-2 shift solenoid to allow four different shifting combinations. The solenoid is attached to the control valve body within the transmission.

3-2 Control Solenoid
Figure C8-6

This electrical device is used to control fluid flow acting on the 3-2 shift valve, which then controls the 2-4 band apply rate and 3-4 clutch release rate. It is a pulse width modulated solenoid that operates on a negative duty cycle. This solenoid controls the 3-2 downshift feel and is attached to the control valve body within the transmission.

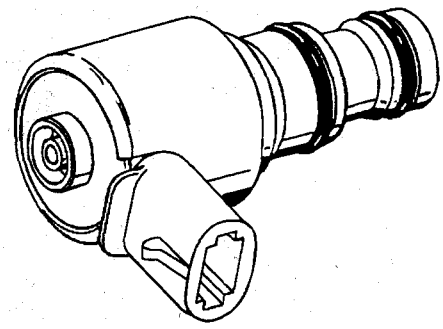


1 1-2 SHIFT SOLENOID

2 2-3 SHIFT SOLENOID

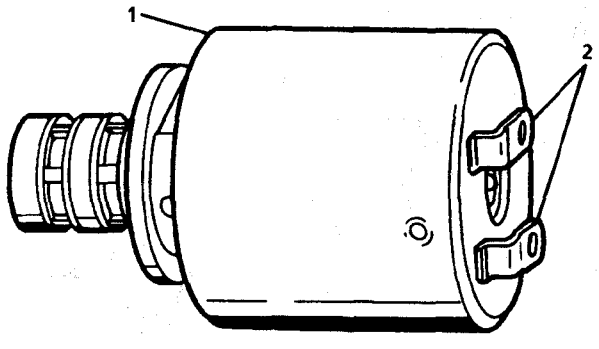
MS 13675-7A

Figure C8-5 - 1-2 Shift Solenoid or 2-3 Shift Solenoid



MS 13678-7A

Figure C8-6 - 3-2 Control Solenoid



1 PRESSURE CONTROL SOLENOID 2 ELECTRICAL CONNECTORS

MS 10090-7A

Figure C8-7 - Pressure Control Solenoid (PCS)

Pressure Control Solenoid (PCS)
Figure C8-7

This electrical device is used to control fluid line pressure by controlling actuator feed limit fluid flow acting on an internal spool valve and spring pressure. The solenoid is a normally closed solenoid valve that controls fluid pressure when operating on a duty cycle. The solenoid is attached to the control valve body within the transmission.

Torque Converter Clutch (TCC) Solenoid
Figure C8-8

This electrical device is used to control fluid acting on the TCC converter clutch valve, which then controls TCC apply and release. This solenoid is attached to the transmission case assembly extending into the pump cover.

ON-VEHICLE SERVICE

INTERNAL TRANSMISSION COMPONENTS

The following list of components will be serviced in SECTION 7A14A of the appropriate service manual.

- 1 - 2 shift solenoid.
- 2 - 3 shift solenoid.
- 3 - 2 control solenoid.
- Pressure control solenoid.
- TCC solenoid with internal wiring harness.
- Any service that requires removal of the pan.

Vehicle Speed Sensor (VSS)

Refer to SECTION 7 of the appropriate service manual for Vehicle Speed Sensor (VSS) service. The VSS is located on the transmission.

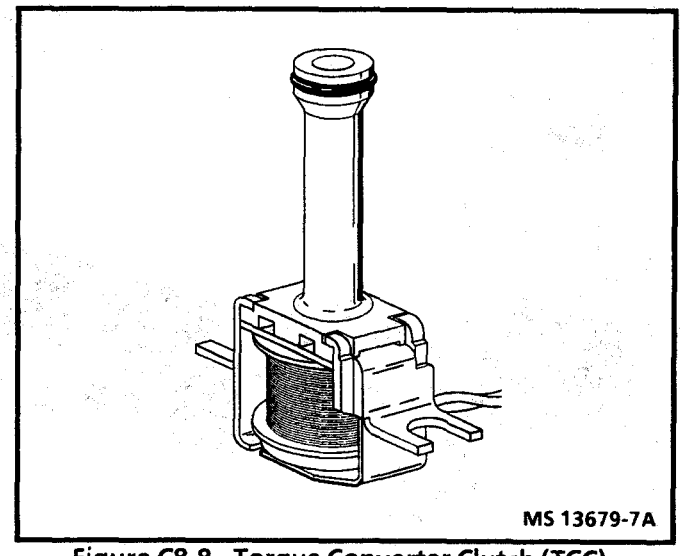
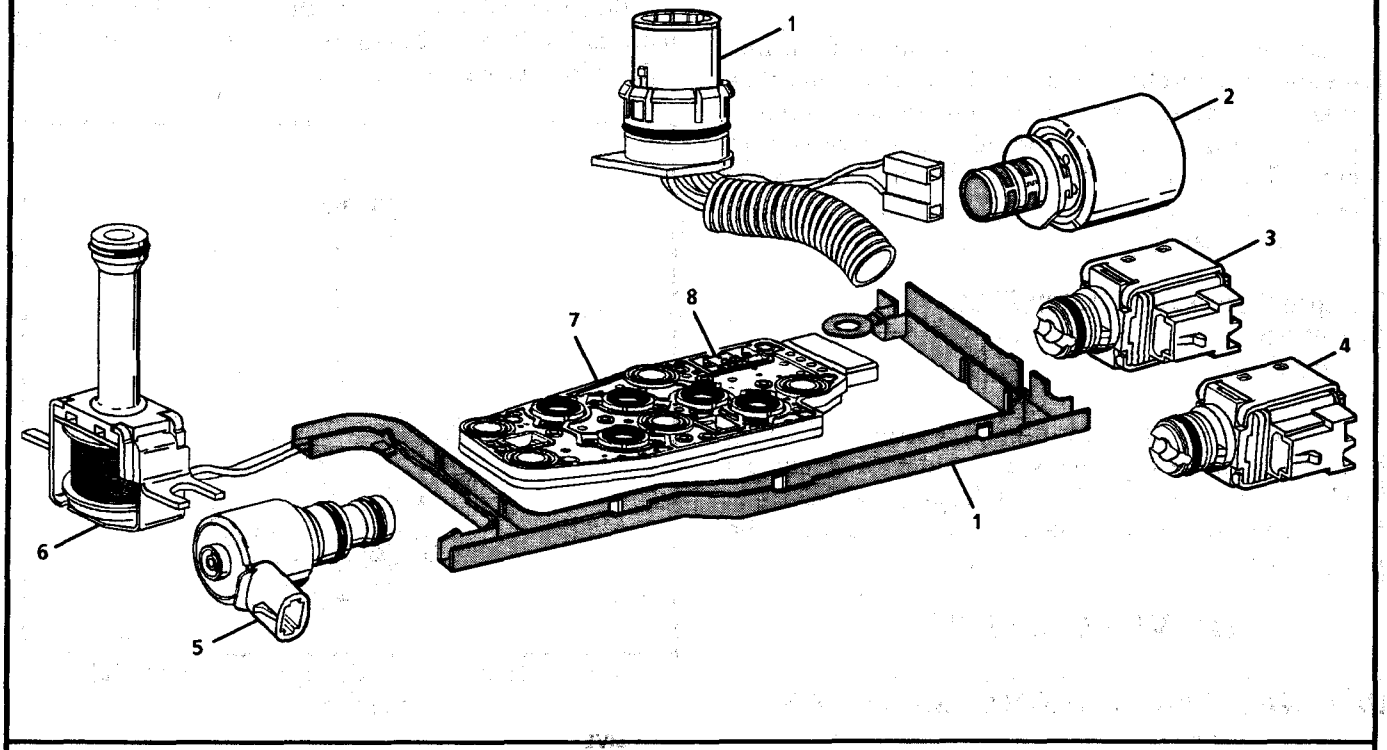


Figure C8-8 - Torque Converter Clutch (TCC) Solenoid



1	WIRING HARNESS ASSEMBLY	5	3-2 CONTROL SOLENOID
2	PRESSURE CONTROL SOLENOID	6	TORQUE CONVERTER CLUTCH SOLENOID
3	1-2 SHIFT SOLENOID	7	TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY
4	2-3 SHIFT SOLENOID	8	TRANSMISSION FLUID TEMPERATURE SENSOR (PART OF TR PRESSURE SWITCH ASSEMBLY)

MS 13680

Figure C8-9 - Electrical Components

TRANSMISSION ELECTRICAL CONNECTOR

THE TRANSMISSION WIRING CONNECTOR IS A VERY IMPORTANT PART OF THE TRANSMISSION OPERATING SYSTEM. ANY INTERFERENCE WITH THE ELECTRICAL CONNECTION CAN CAUSE THE TRANSMISSION TO SET DIAGNOSTIC TROUBLE CODES (DTC)s AND/OR AFFECT PROPER OPERATION.

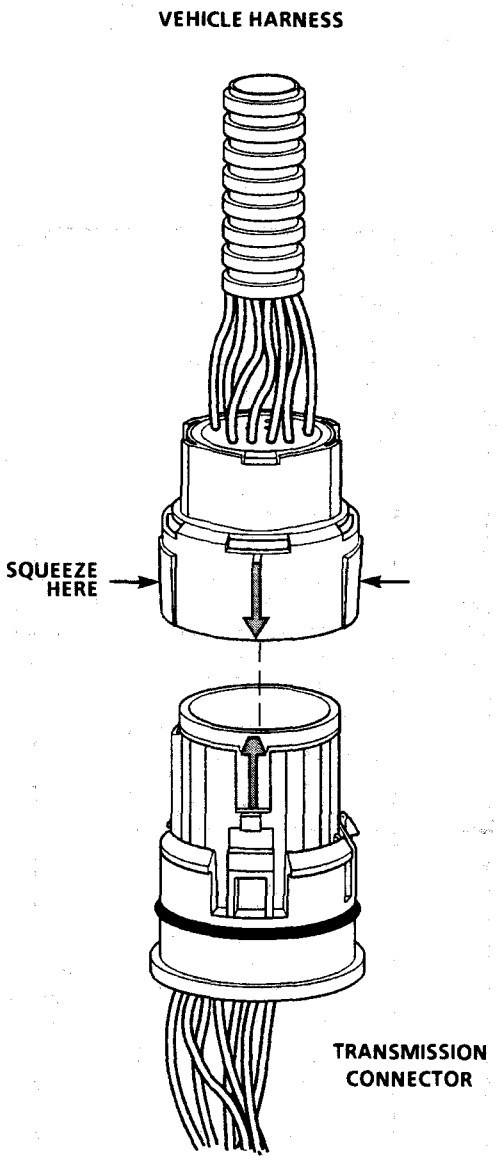
THE FOLLOWING ITEMS CAN AFFECT THE ELECTRICAL CONNECTION:

- BENT PINS IN THE CONNECTOR FROM ROUGH HANDLING DURING CONNECTION AND DISCONNECTION.
- WIRES BACKING AWAY FROM THE PINS OR COMING UNCRIMPED (IN EITHER INTERNAL OR EXTERNAL WIRING HARNESS).
- DIRT CONTAMINATION ENTERING THE CONNECTOR WHEN DISCONNECTED.
- PINS IN THE INTERNAL WIRING CONNECTOR BACKING OUT OF THE CONNECTOR OR PUSHED OUT DURING RECONNECTION.
- EXCESSIVE TRANSMISSION FLUID LEAKING INTO THE CONNECTOR, WICKING UP INTO THE EXTERNAL WIRING HARNESS, AND DEGRADING OF THE WIRE INSULATION. *
- WATER/MOISTURE INTRUSION IN THE CONNECTOR.
- LOW PIN RETENTION IN THE EXTERNAL CONNECTOR FROM EXCESSIVE CONNECTION AND DISCONNECTION OF THE WIRING CONNECTOR ASSEMBLY.
- PIN CORROSION FROM CONTAMINATION.

* THE PRESENCE OF TRANSMISSION FLUID IN THE TRANSMISSION CONNECTOR IS NOT HARMFUL IN ITSELF. THE FLUID ONLY AFFECTS THE EXTERNAL HARNESS WIRING INSULATION IF THE FLUID WICKS UP TO THE HARNESS.

POINTS TO REMEMBER WHEN WORKING WITH THE TRANSMISSION WIRING CONNECTOR ASSEMBLY:

- TO REMOVE THE CONNECTOR, SQUEEZE THE TWO TABS TOWARDS EACH OTHER AND PULL STRAIGHT UP (REFER TO THE ILLUSTRATION).
- CAREFULLY LIMIT TWISTING OR WIGGLING THE CONNECTOR DURING REMOVAL. BENT PINS CAN OCCUR.
- **DO NOT** PRY THE CONNECTOR OFF WITH A SCREWDRIVER OR OTHER TOOL.
- TO REINSTALL THE EXTERNAL WIRING CONNECTOR, FIRST ORIENT THE PINS BY LINING UP THE ARROWS ON EACH HALF OF THE CONNECTOR. PUSH THE CONNECTOR STRAIGHT DOWN INTO THE TRANSMISSION WITHOUT TWISTING OR ANGLING THE MATING PARTS.
- THE CONNECTOR SHOULD CLICK INTO PLACE WITH A POSITIVE FEEL AND/OR NOISE.
- WHENEVER THE TRANSMISSION EXTERNAL WIRING CONNECTOR IS DISCONNECTED FROM THE INTERNAL HARNESS AND THE ENGINE IS OPERATING DTC(s) WILL SET. CLEAR THESE DTC(s) AFTER RECONNECTING THE EXTERNAL CONNECTOR.



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NS 15891

Figure C8-10 - Transmission Electrical Connector

4L60E TRANSMISSION FLUID CHECKING PROCEDURE

1. Warm the transmission to normal operating temperature by driving the vehicle about 15 miles (24 km). Operating temperature is 180-200°F (82-94°C).
2. Park vehicle on a level surface, place shift lever in "P" park and apply the parking brake.
3. Check fluid level on the dipstick (read the lower level).
4. If fluid level is low, add only enough DEXRON®-IIE to bring the fluid level into the hot area.

* It is important to check fluid level when the transmission has reached operating temperature. The hot range is calibrated correspond to the correct fluid level range for fluid between 180 and 200°F(82-94°C).

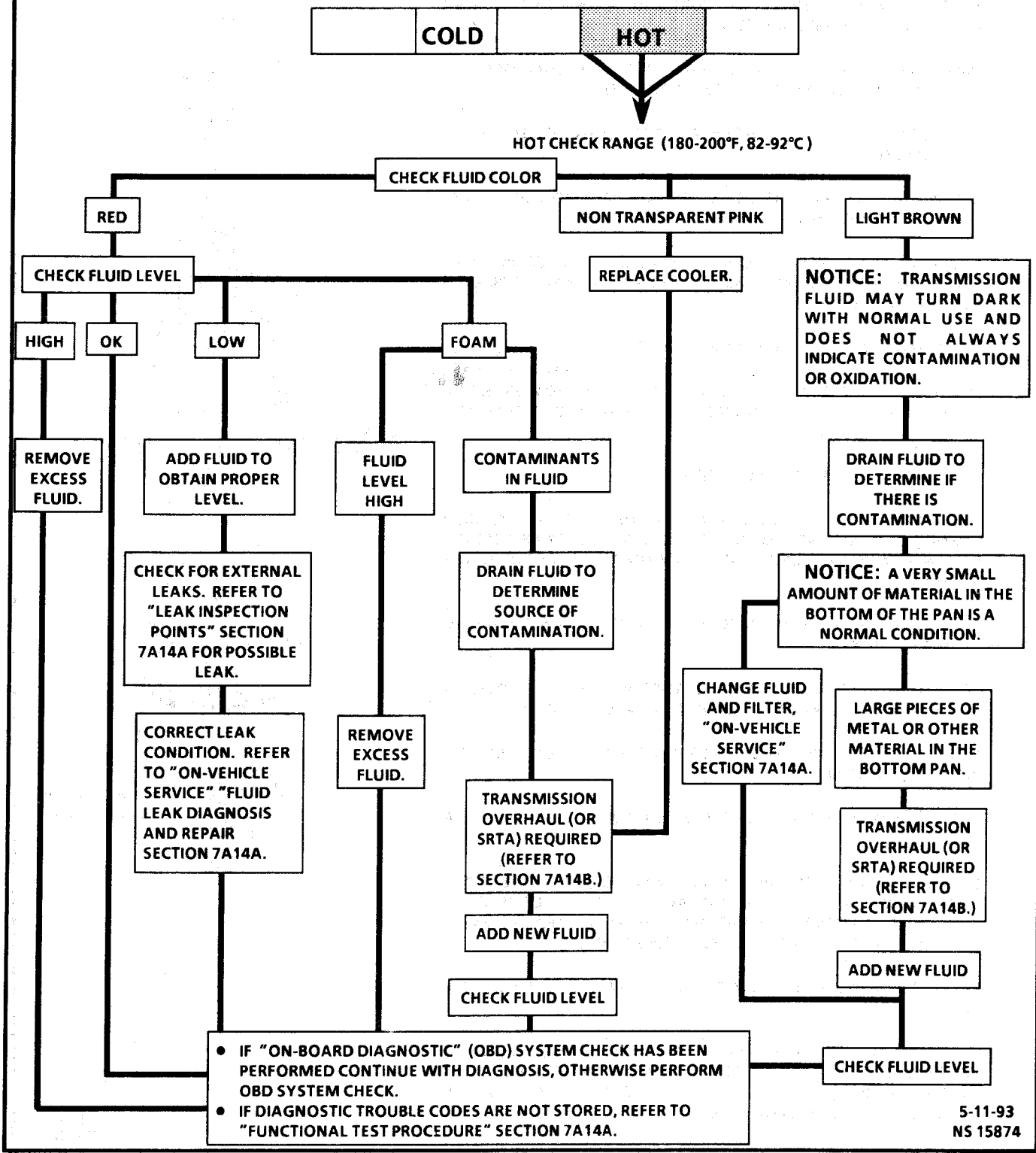


Figure C8-11 - 4L60E Transmission Fluid Checking Procedure

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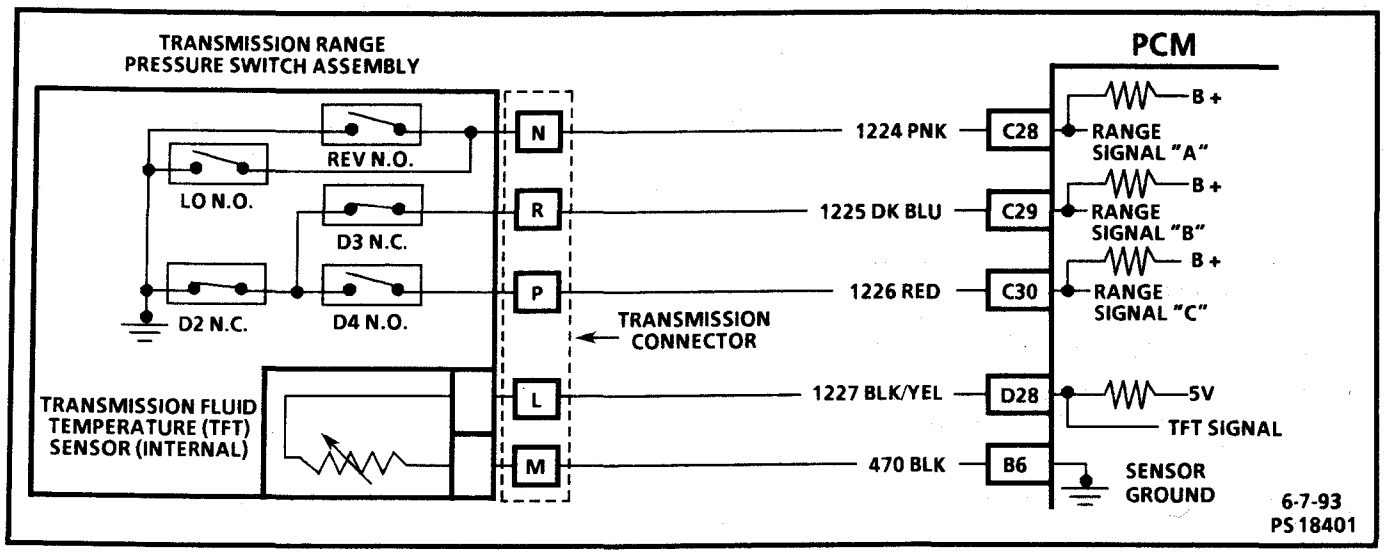


CHART C-8A

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY CIRCUIT CHECK

Circuit Description:

The Transmission Range (TR) switch assembly consists of five pressure switches (two normally closed and three normally open), and a TFT sensor combined into one unit and mounted on the valve body. The PCM supplies battery voltage to each range signal. By grounding one or more of these circuits through various combinations of the pressure switches, the PCM detects what manual valve position has been selected by the vehicle operator. With ignition "ON" and engine "OFF," P/N will be indicated. When the transmission electrical connector is disconnected, the ground potential for the three range signals to the PCM will be removed, and with ignition "ON," D2 will be indicated.

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

1. This test checks the indicated range signal to the manual valve position actually selected.
2. This test checks for correct voltage from the PCM to the transmission external connector.
3. This test checks a short to ground or an open in any one of the three circuits.

Diagnostic Aids: Refer to accompanying chart for various A/B/C range combinations. Check all wiring connectors for proper terminal tension.

Refer to "TR Pressure Switch Assembly Resistance Check" or "Functional Test Procedure" in SECTION 7A14A of the appropriate service manual for further information.

Valid Combination Chart
"ON" = 0 volts/"OFF" = B +

Range Signal	A	B	C
Park	OFF	ON	OFF
Rev	ON	ON	OFF
Neutral	OFF	ON	OFF
D4	OFF	ON	ON
D3	OFF	OFF	ON
D2	OFF	OFF	OFF
D1	ON	OFF	OFF
Illegal	ON	OFF	ON
Illegal	ON	ON	ON

Expected Readings

CHART C-8A

TRANSMISSION RANGE (TR) PRESSURE SWITCH ASSEMBLY CIRCUIT CHECK

THIS CHART ASSUMES THAT:
- THE TRANSMISSION LINKAGE FROM THE SELECT LEVER TO THE MANUAL VALVE IS ADJUSTED PROPERLY.
- OBD SYSTEM CHECK HAS BEEN PERFORMED.
- FLUID CHECKING PROCEDURE HAS BEEN PERFORMED.
- ALL DTC(s) HAVE BEEN RECORDED AND THEN CLEARED.
- SCAN TOOL STILL INSTALLED.

(1)
- ENGINE IDLING AT NORMAL OPERATING TEMPERATURE.
- PARKING BRAKE APPLIED AND WHEELS BLOCKED.
- APPLY BRAKE PEDAL AND SELECT EACH TRANSMISSION RANGE D1, D2, D3, D4, N, R, P.

DOES EACH SELECTED TRANSMISSION RANGE MATCH THE SCAN TOOL "TRANS RANGE SW" DISPLAY?

YES

NO TROUBLE FOUND.
REFER TO DIAGNOSTIC AIDS.

NO

- IGNITION "OFF."
- DISCONNECT TRANSMISSION WIRING CONNECTOR ASM.
- INSTALL J 39775 - JUMPER HARNESS/PROBE KIT ON THE EXTERNAL WIRING CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- WITH J 39200 TO GROUND, CHECK VOLTAGE AT HARNESS CONNECTOR TERMINALS "N", "R" AND "P".

DOES J 39200 DISPLAY B + AT ALL THREE CIRCUITS?

YES

(2) VERIFY THAT CKT(s) 1224, 1225, OR 1226 ARE NOT SHORTED TOGETHER. IF OK, REFER TO "FLUID PRESSURE SWITCH ASSEMBLY RESISTANCE CHECK" SECTION 7A14A (4L60E) OR 7A17A (4L80E) OF THE APPROPRIATE SERVICE MANUAL.

NO

(3)
- ON CIRCUIT(S) THAT DID NOT INDICATE B +, CHECK FOR AN OPEN OR SHORT TO GROUND. IF OK, CHECK CONTROL MODULE CONNECTOR TERMINAL TENSION ON THESE CIRCUITS. IF OK, REPLACE CONTROL MODULE.

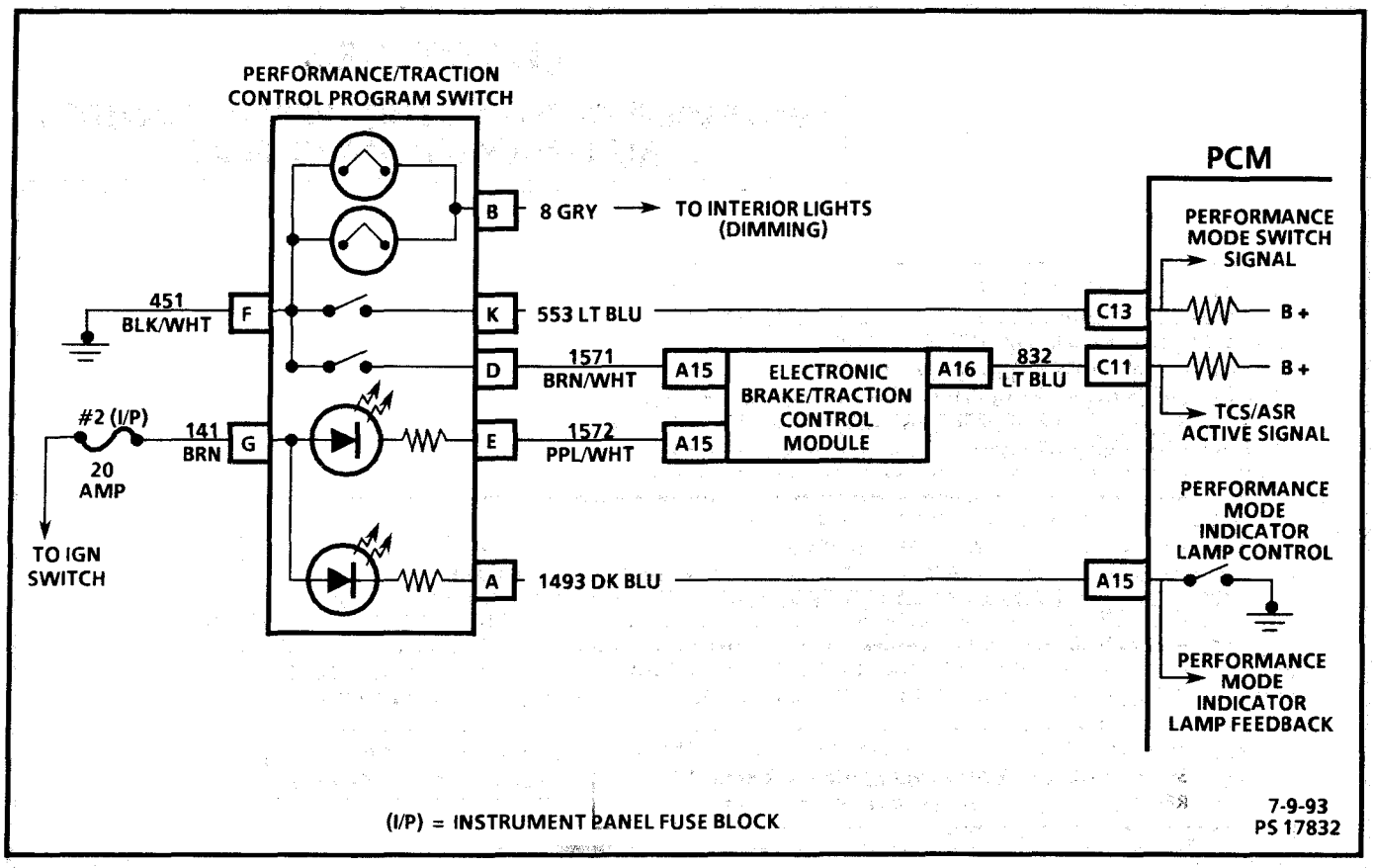


CHART C-8B

PERFORMANCE MODE SWITCH INDICATOR LAMP CONTROL CIRCUIT CHECK

Circuit Description:

The performance mode switch enables the operator to select a more aggressive shift pattern within the midrange throttle position (40%-100%). When performance mode is selected, the B+ performance mode input signal is momentarily toggled to zero volts. The PCM enters performance mode and turns on the performance mode indicator lamp (within the switch). While in performance mode, shifts will be firmer and delayed 1-3 mph (upshifts) or advanced 1-3 mph downshifts). Normal mode operation is obtained by toggling the performance mode switch again, or when the ignition switch is cycled "OFF" then "ON."

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

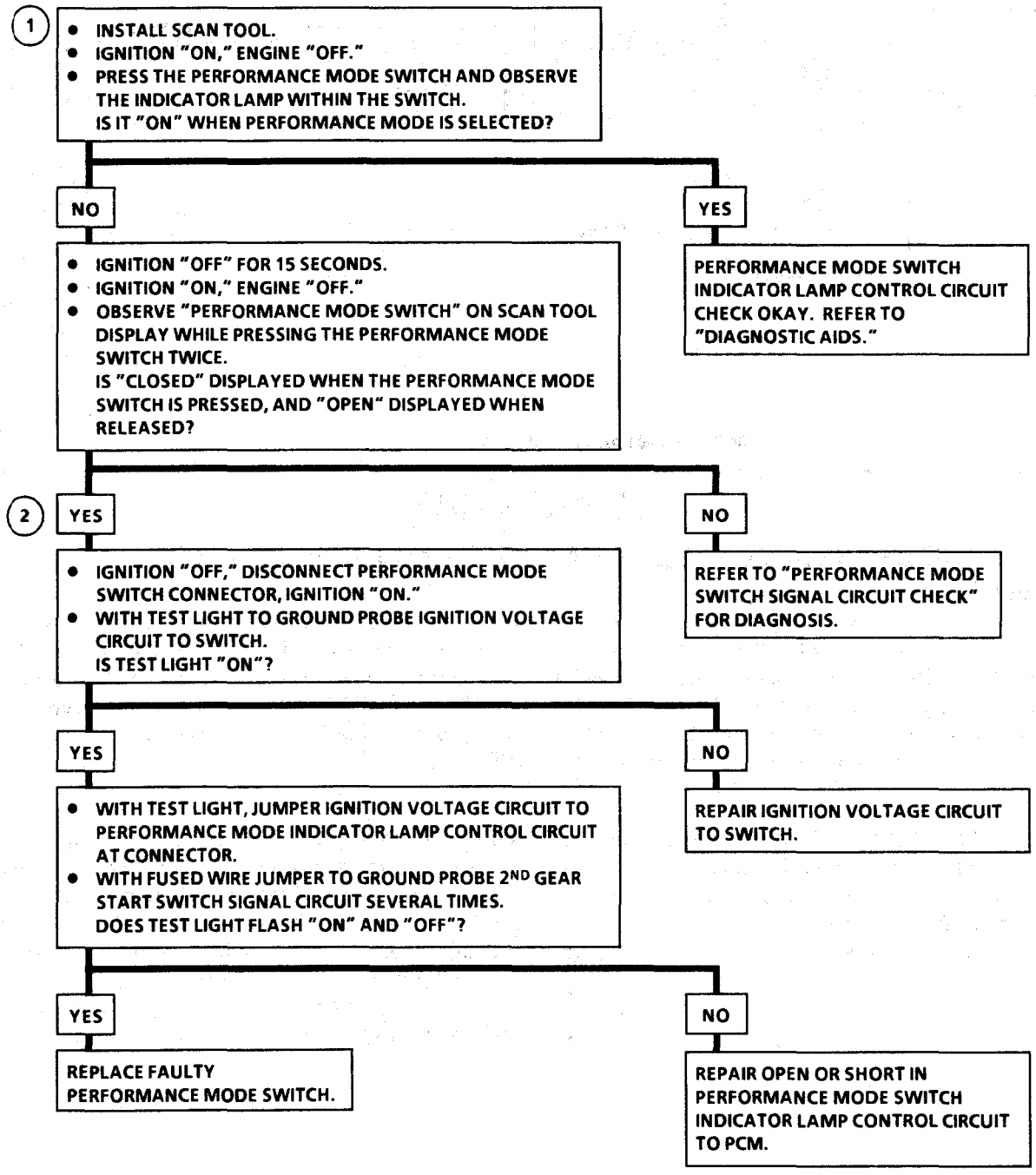
1. This step checks the entire performance mode switch circuit for a malfunction.
2. At this point, the external circuit is operating correctly.

Diagnostic Aids: If, during performance mode, increase performance is not perceived, use snapshot mode on scan tool. Record data in normal mode then in performance mode. When reviewing data observe mph and pressure control solenoid duty cycle for differences during upshifts and downshifts.

A malfunction within the performance mode switch circuit will result in normal mode operation only.

CHART C-8B

PERFORMANCE MODE SWITCH INDICATOR LAMP CONTROL CIRCUIT CHECK



6-15-93
PS 18645

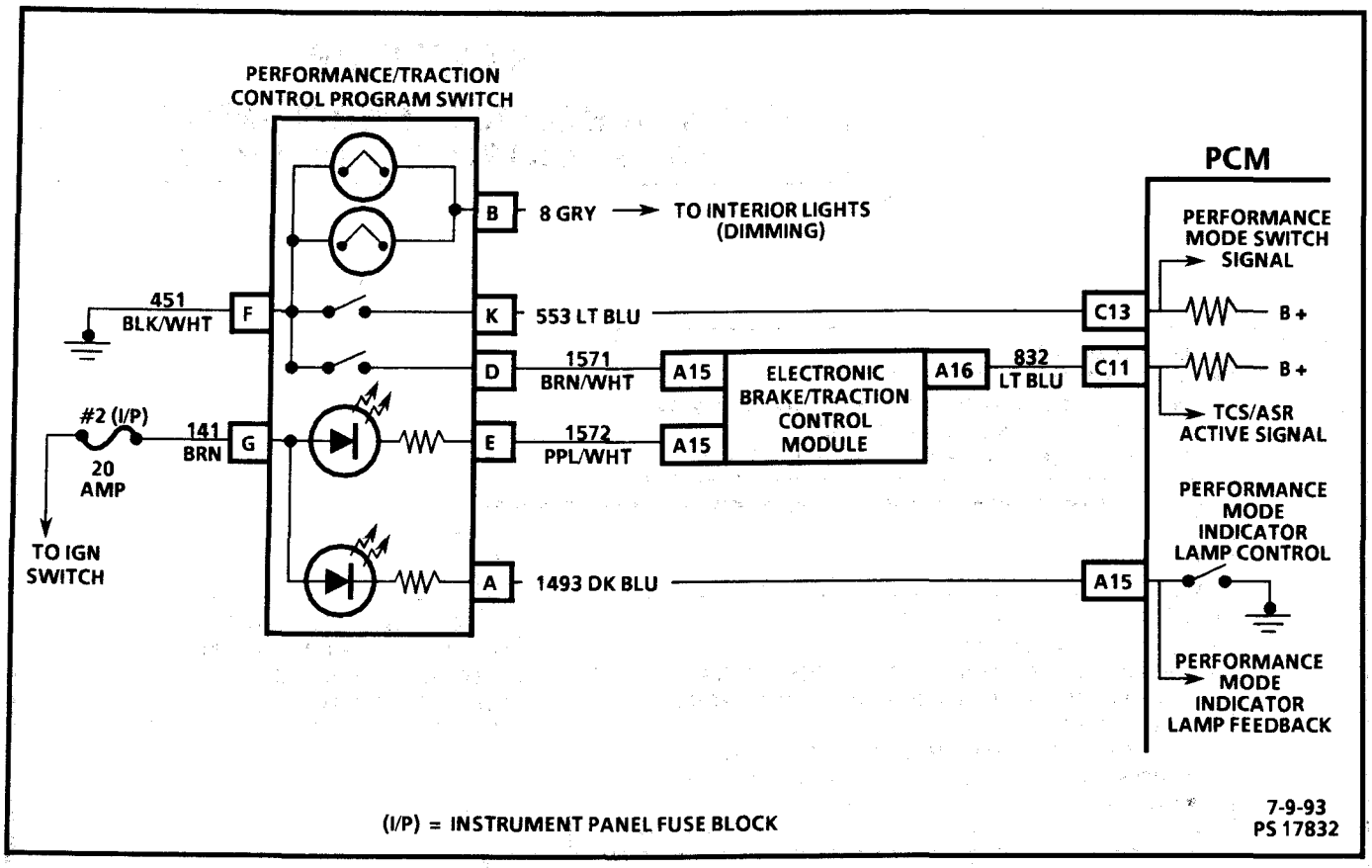


CHART C-8C

PERFORMANCE MODE SWITCH SIGNAL CIRCUIT CHECK

Circuit Description:

The performance mode switch enables the operator to select a more aggressive shift pattern within the midrange throttle position (40%-100%). When performance mode is selected, the B+ performance mode input signal is momentarily toggled to zero volts. The PCM enters performance mode and turns on the performance mode indicator lamp (within the switch). While in performance mode, shifts will be firmer and delayed 1-3 mph (upshifts) or advanced 1-3 mph downshifts). Normal mode operation is obtained by toggling the performance mode switch again, or when the ignition switch is cycled "OFF" then "ON."

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

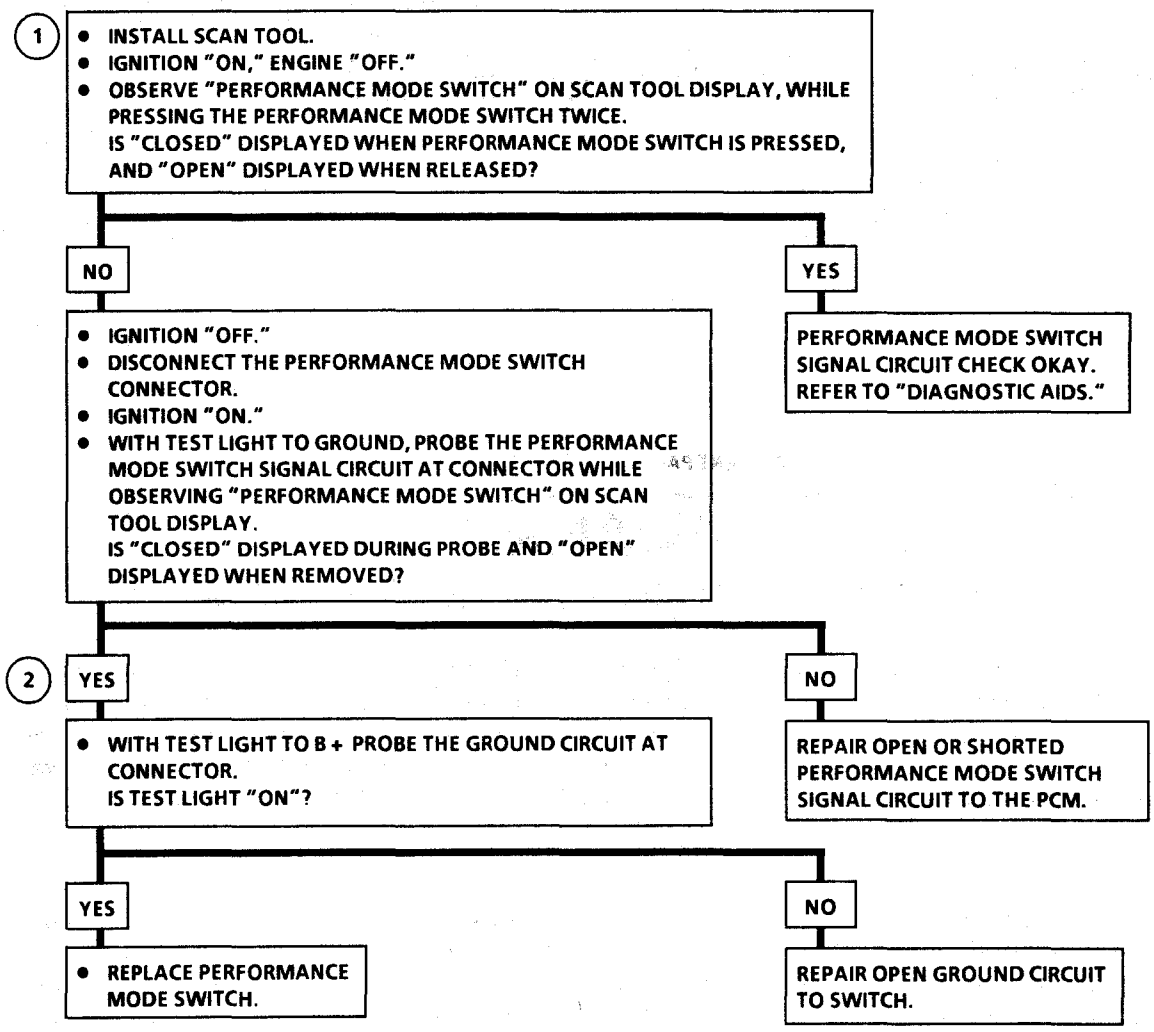
1. This step checks the entire performance mode switch circuit for a malfunction.
2. At this point, the external circuit is operating correctly.

Diagnostic Aids: If, during performance mode, increase performance is not perceived, use snapshot mode on scan tool. Record data in normal mode then in performance mode. When reviewing data observe mph and pressure control solenoid duty cycle for differences during upshifts and downshifts.

A malfunction within the performance mode switch circuit will result in normal mode operation only.

CHART C-8C

PERFORMANCE MODE SWITCH SIGNAL CIRCUIT CHECK



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SECTION C10
A/C CLUTCH CIRCUIT DIAGNOSIS

CONTENTS

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

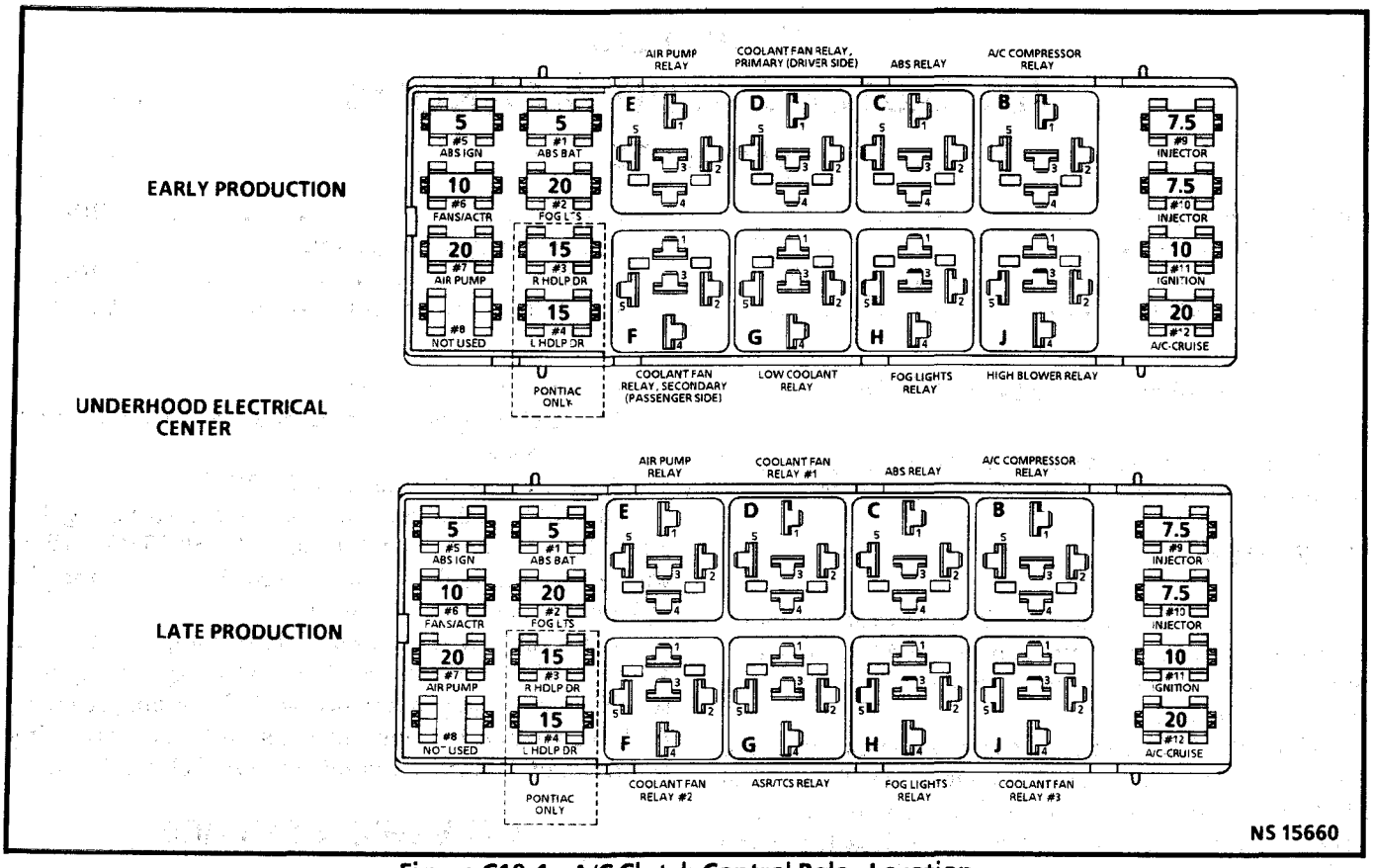


Figure C10-1 - A/C Clutch Control Relay Location

Install or Connect

1. A/C refrigerant pressure sensor to A/C refrigerant line.
2. Electrical connector.
3. Negative battery cable.

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

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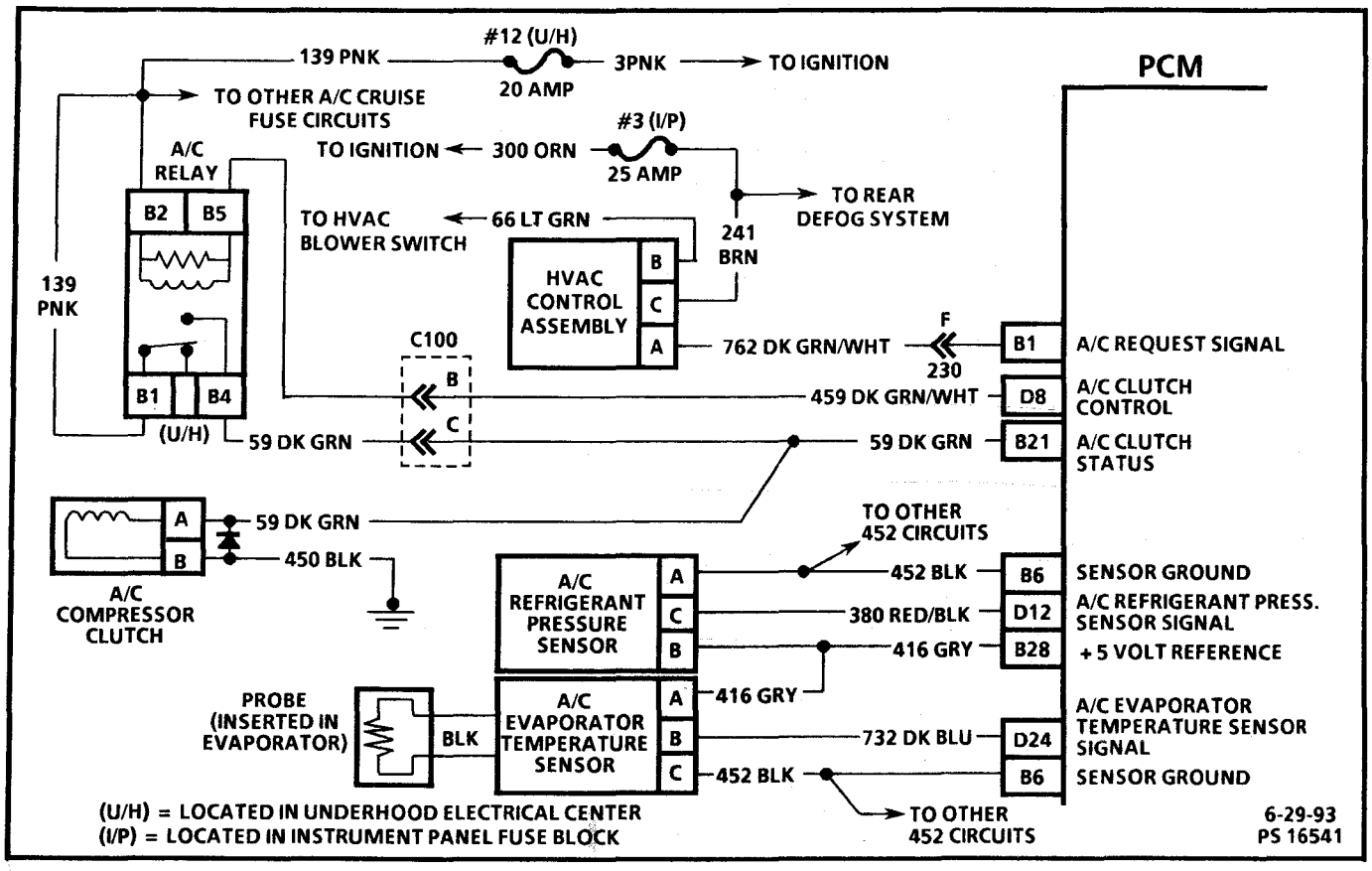


CHART C-10 (Page 1 of 3)

A/C CLUTCH CIRCUIT DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The A/C clutch control relay is PCM controlled to delay A/C clutch engagement after the A/C is turned "ON." This allows the PCM to adjust engine RPM before the A/C clutch engages.

The PCM will engage the A/C clutch any time A/C has been requested unless any of the following conditions exist:

- High coolant temperature.
- Low battery voltage.
- High A/C system pressure.
- Low evaporator temperature.
- High engine RPM.
- Low A/C system pressure.

When the HVAC control assembly is placed in the A/C mode, A 12 volt signal is sent to the PCM. When the PCM receives this signal the PCM will ground CKT 459 to energize the A/C relay. This will be displayed on the Tech 1 as A/C request "YES." A 3-wire A/C refrigerant pressure sensor is used to monitor A/C system pressure. If the A/C refrigerant pressure is greater than 414 psi or lower than 38 psi, the A/C clutch will not engage.

The A/C refrigerant pressure sensor uses DTCs 66 and 67. If the A/C refrigerant pressure sensor signal wire becomes open, shorted to ground or shorted to voltage, DTC 66 will set. If the A/C clutch engages and no pressure change is detected, a DTC 67 will set.

The PCM also monitors A/C evaporator temperature. The PCM utilizes this information to cycle the A/C clutch. If A/C evaporator temperature is out of range (high or low), the PCM will disable the A/C clutch relay.

The A/C evaporator temperature sensor uses DTC 71. If the A/C evaporator temperature sensor circuits becomes open, shorted to ground or shorted to voltage, DTC 71 will set.

When a request for A/C has been detected by the PCM, the PCM will ground the A/C clutch control relay driver circuit, the relay contacts will close, and current will flow through the relay to the A/C compressor clutch.

When A/C request has been detected by the PCM, the cooling fan(s) will be turned "ON" unless vehicle speed is too high.

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

1. Checks the PCM's ability to control the A/C clutch control relay.
2. Before replacing C60 A/C control components, refer to SECTION 1B for further diagnostics.
3. Checks for grounded CKT 459 to PCM.

Diagnostic Aids: Before using CHART C-10, be sure no DTC(s) are stored. The PCM will not activate the A/C clutch with a stored DTC.

CHART C-10 (Page 1 of 3)

A/C CLUTCH CIRCUIT DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)

- CHECK "A/C" FUSES.
- ENGINE COOLANT AT NORMAL OPERATING TEMPERATURE.
- CORRECT ANY PCM DIAGNOSTIC TROUBLE CODES.
- A/C REFRIGERANT PRESSURE AND A/C EVAPORATOR TEMPERATURE NORMAL.
- ENGINE IDLING.
- A/C "OFF."

IS A/C CLUTCH ENGAGED?

NO

(1)
- WITH ENGINE IDLING AT NORMAL OPERATING TEMPERATURE, TURN A/C "ON" AND "OFF." DOES A/C CLUTCH CYCLE "ON" AND "OFF"?

NO
- PLACE A/C CONTROL IN A/C MODE.
- TECH 1 SHOULD DISPLAY A/C REQUEST "YES." DOES IT?

NO
- IGNITION "OFF."
- DISCONNECT HVAC CONTROL ASSEMBLY.
- IGNITION "ON."
- PROBE TERMINAL "C" OF HVAC CONTROL ASSEMBLY HARNESS WITH A TEST LIGHT CONNECTED TO GROUND.
- TEST LIGHT SHOULD ILLUMINATE. DOES IT?

YES
- USING A FUSED JUMPER WIRE, JUMPER TERMINAL "C" TO "A" AT HVAC HARNESS CONNECTOR.
- TECH 1 SHOULD INDICATE A/C REQUEST "YES." DOES IT?

YES

(2) FAULTY HVAC CONTROL ASSEMBLY CONNECTION OR FAULTY HVAC CONTROL ASSEMBLY.

NO

CKT 762 OPEN OR FAULTY PCM CONNECTION OR FAULTY PCM.

NO

OPEN IN IGNITION FEED CIRCUIT TO HVAC CONTROL ASSEMBLY.

YES

REFER TO CHART C-10 (PAGE 3 OF 3).

YES

REFER TO CHART C-10. (PAGE 2 OF 3.)

YES
- ENGINE STILL RUNNING.
- TECH 1 SHOULD DISPLAY A/C REQUEST "NO." DOES IT?

YES

(3)
- DISCONNECT A/C RELAY.
- PROBE CKT 459 WITH A TEST LIGHT TO B+. IS TEST LIGHT "ON"?

NO
- PROBE CKT 59 AT RELAY HARNESS WITH A TEST LIGHT TO GROUND. IS TEST LIGHT "ON"?

YES

CKT 59 SHORTED TO VOLTAGE.

NO

FAULTY A/C RELAY.

NO

(2) CKT 762 SHORTED TO VOLTAGE OR FAULTY HVAC CONTROL ASSEMBLY OR FAULTY PCM.

YES

CKT 459 SHORTED TO GROUND OR FAULTY PCM.

6-29-93
NS 15559

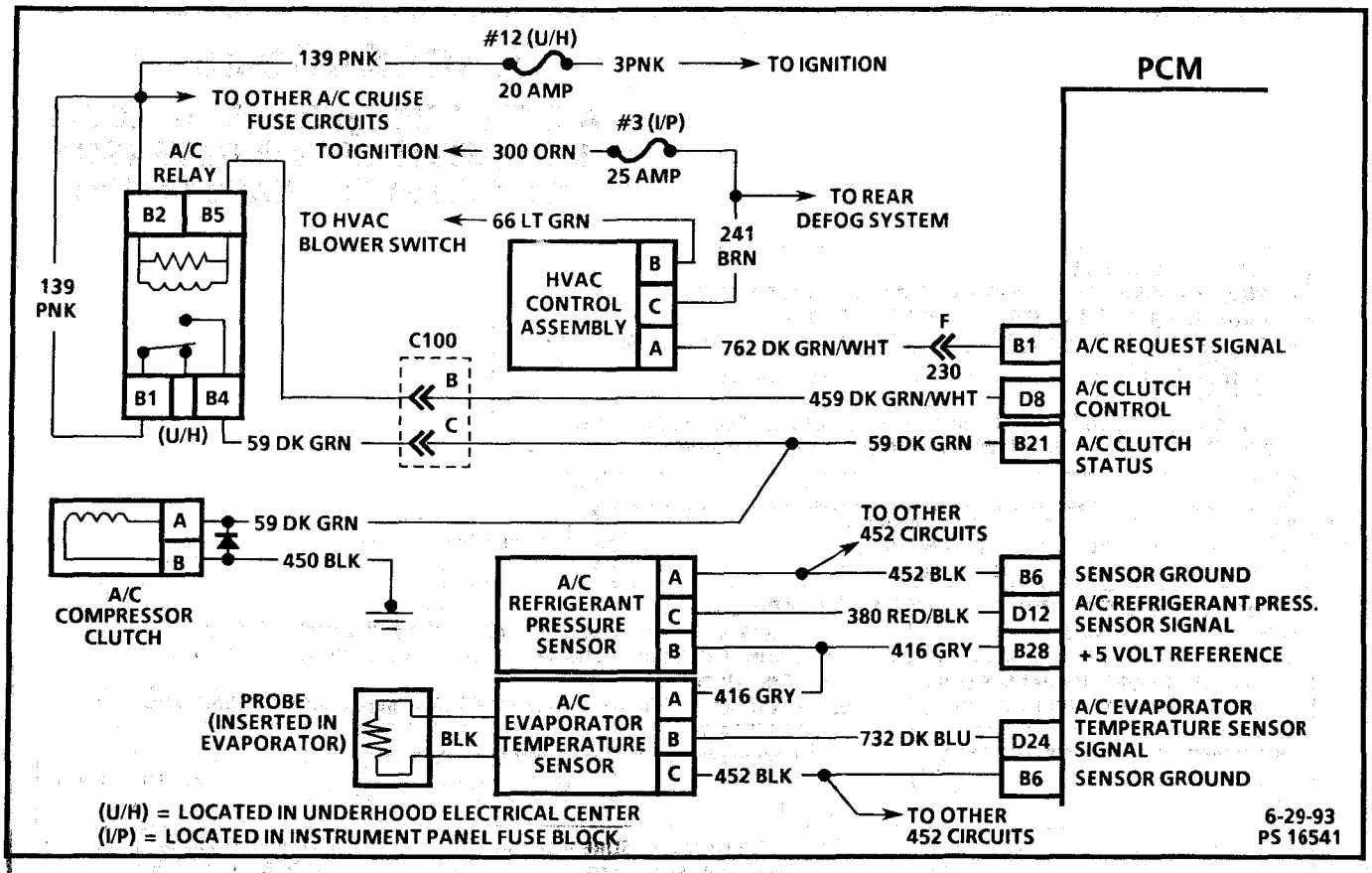


CHART C-10

(Page 2 of 3)
A/C CLUTCH CIRCUIT DIAGNOSIS
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The A/C clutch control relay is PCM controlled to delay A/C clutch engagement after the A/C is turned "ON." This allows the PCM to adjust engine RPM before the A/C clutch engages.

The PCM will engage the A/C clutch any time A/C has been requested unless any of the following conditions exist:

- High coolant temperature.
- Low battery voltage.
- High A/C system pressure.
- Low evaporator temperature
- High engine RPM.
- Low A/C system pressure.

When the HVAC control assembly is placed in the A/C mode, a 12 volt signal is sent to the PCM. When the PCM receives this signal the PCM will ground CKT 459 to energize the A/C relay. This will be displayed on the Tech 1 as A/C request "YES." A 3-wire A/C refrigerant pressure sensor is used to monitor A/C system pressure. If the A/C refrigerant pressure is greater than 414 psi or lower than 38 psi, the A/C clutch will not engage.

The A/C refrigerant pressure sensor uses DTCs 66 and 67. If the A/C refrigerant pressure sensor signal wire becomes open, shorted to ground or shorted to voltage, DTC 66 will set. If the A/C clutch engages and no pressure change is detected, a DTC 67 will set.

The PCM also monitors A/C evaporator temperature. The PCM utilizes this information to cycle the A/C clutch. If A/C evaporator temperature is out of range (high or low), the PCM will disable the A/C clutch relay.

The A/C evaporator temperature sensor uses DTC 71. If the A/C evaporator temperature sensor circuits becomes open, shorted to ground or shorted to voltage, DTC 71 will set.

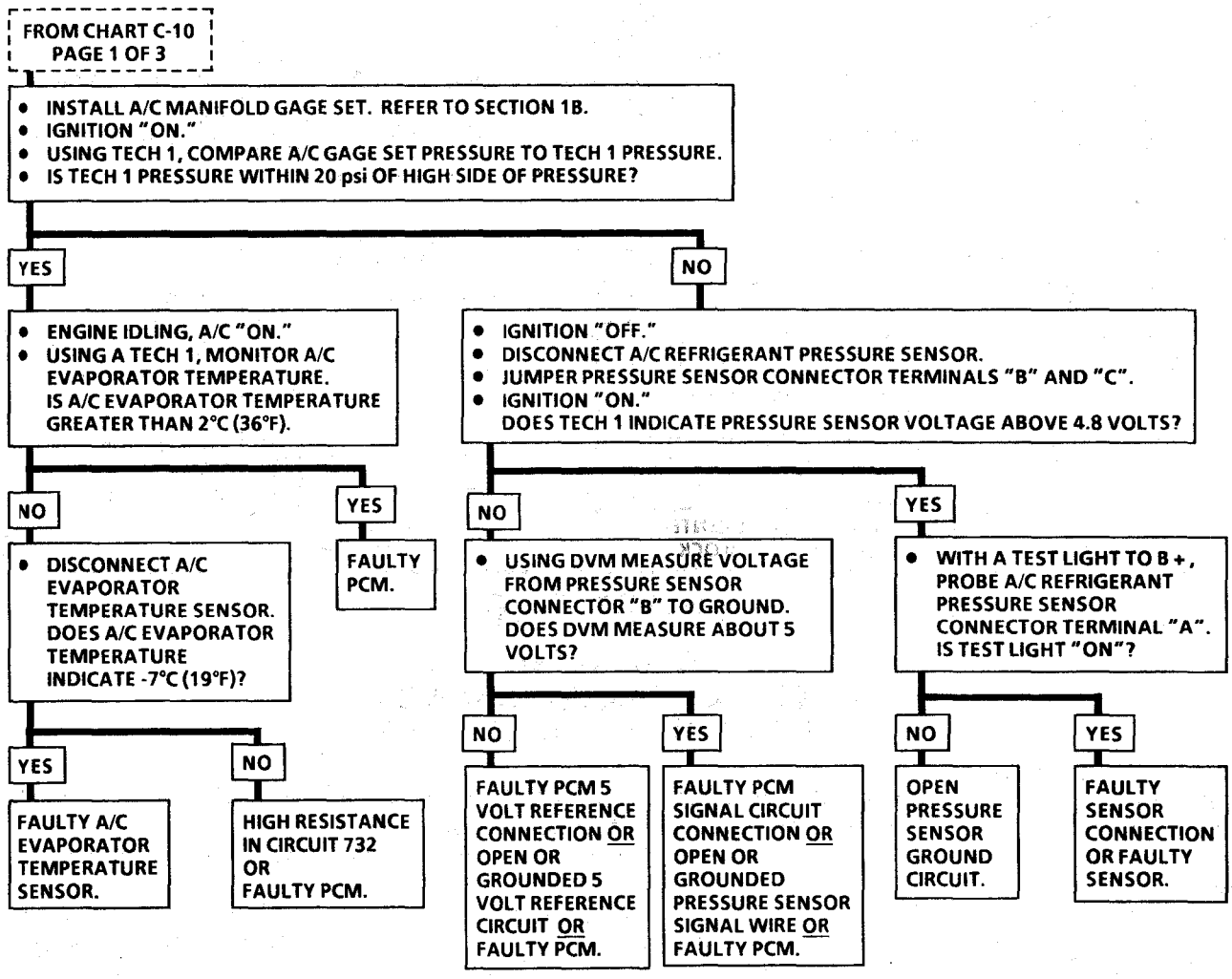
When a request for A/C has been detected by the PCM, the PCM will ground the A/C clutch control relay driver circuit, the relay contacts will close, and current will flow through the relay to the A/C compressor clutch.

When A/C request has been detected by the PCM, the cooling fan(s) will be turned "ON" unless vehicle speed is too high.

CHART C-10

(Page 2 of 3)

A/C CLUTCH CIRCUIT DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)



6-29-93
NS 15570

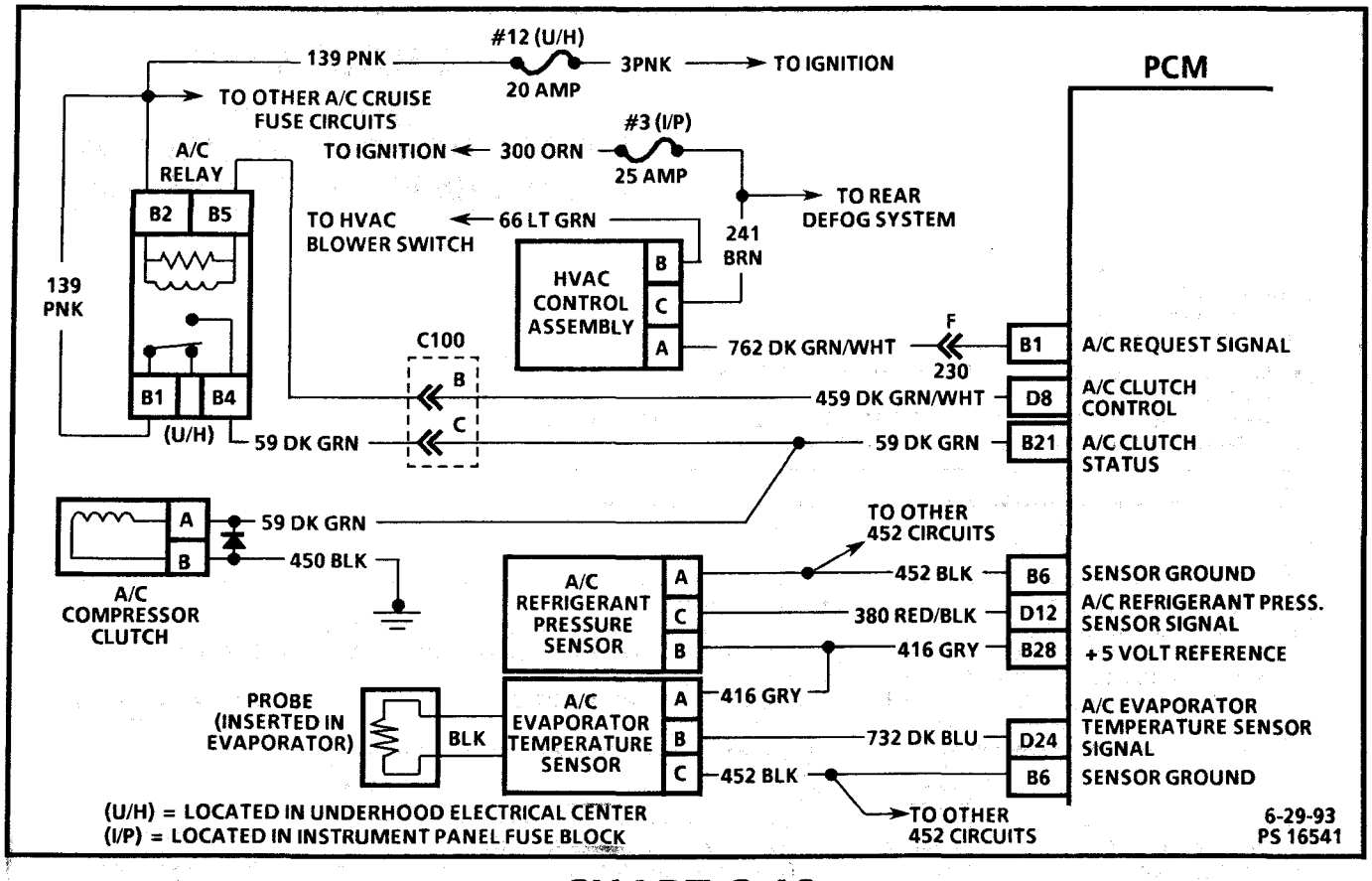


CHART C-10

(Page 3 of 3)
A/C CLUTCH CIRCUIT DIAGNOSIS
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The A/C clutch control relay is PCM controlled to delay A/C clutch engagement after the A/C is turned "ON." This allows the PCM to adjust engine RPM before the A/C clutch engages.

The PCM will engage the A/C clutch any time A/C has been requested unless any of the following conditions exist:

- High coolant temperature.
- Low battery voltage.
- High A/C system pressure.
- Low evaporator temperature.
- High engine RPM.
- Low A/C system pressure.

When the HVAC control assembly is placed in the A/C mode, a 12 volt signal is sent to the PCM. When the PCM receives this signal the PCM will ground CKT 459 to energize the A/C relay. This will be displayed on the Tech 1 as A/C request "YES." A 3-wire A/C refrigerant pressure sensor is used to monitor A/C system pressure. If the A/C refrigerant pressure is greater than 414 psi or lower than 38 psi, the A/C clutch will not engage.

The A/C refrigerant pressure sensor uses DTCs 66 and 67. If the A/C refrigerant pressure sensor signal wire becomes open, shorted to ground or shorted to voltage, DTC 66 will set. If the A/C clutch engages and no pressure change is detected, a DTC 67 will set.

The PCM also monitors A/C evaporator temperature. The PCM utilizes this information to cycle the A/C clutch. If A/C evaporator temperature is out of range (high or low), the PCM will disable the A/C clutch relay.

The A/C evaporator temperature sensor uses DTC 71. If the A/C evaporator temperature sensor circuits becomes open, shorted to ground or shorted to voltage, DTC 71 will set.

When a request for A/C has been detected by the PCM, the PCM will ground the A/C clutch control relay driver circuit, the relay contacts will close, and current will flow through the relay to the A/C compressor clutch.

When A/C request has been detected by the PCM, the cooling fan(s) will be turned "ON" unless vehicle speed is too high.

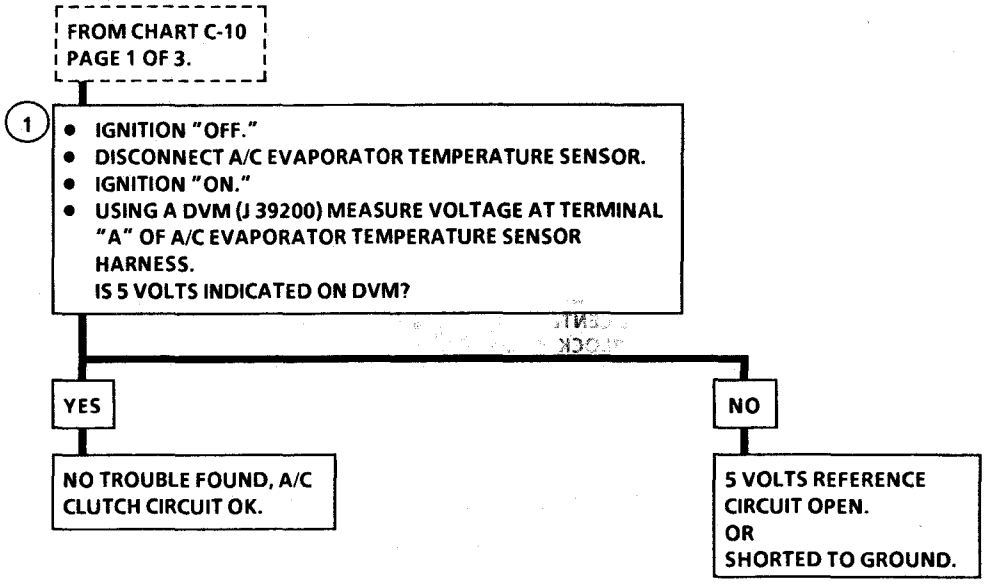
Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. If 5 volt reference is not present at the A/C evaporator temperature sensor, the A/C evaporator temperature would be at a fixed value. This would cause A/C clutch to be engaged at all times when A/C is requested.

CHART C-10

(Page 3 of 3)

A/C CLUTCH CIRCUIT DIAGNOSIS 5.7L (VIN P) "F" CARLINE (SFI)



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SECTION C12
ELECTRIC COOLING FAN(S)

CONTENTS

General Description C12-1
Operation C12-1
Non A/C and Early Production A/C ... C12-1
Late Production A/C C12-1
On-Vehicle Service C12-3
Cooling Fan Relay C12-3

GENERAL DESCRIPTION

The electric cooling fan(s) are used to cool engine coolant flowing through the radiator. They are also used to cool the refrigerant (R134a) flowing through the A/C condenser.

Vehicles without A/C use a single electric cooling fan. Vehicles with A/C will have either an early production or late production system both using dual electric cooling fans. The two systems have completely different operating strategies.

OPERATION - NON A/C AND EARLY PRODUCTION A/C

The electric cooling fan(s) are controlled by the PCM. The PCM controls the ground path for the cooling fan relay(s).

The relay(s) are used to control the high current flow to power the cooling fan motor(s). The PCM determines operation of the independent fans based on various sensor inputs.

Primary Cooling Fan (Fan 1)

The primary cooling fan is controlled by the PCM based on inputs from the A/C system, Engine Coolant Temperature (ECT) sensor, Vehicle Speed Sensor (VSS).

The PCM will turn the primary cooling fan "ON" when any of the following conditions exist at idle.

- Certain PCM Diagnostic Trouble Codes (DTCs) set.
- ECT above 108°C (226°F).
- A/C head pressure above 248 psi.

If the primary fan has been turned "ON" by the Engine Coolant Temperature (ECT) sensor, the PCM will turn the fan "OFF" when that temperature has dropped about 3°C (5°F). If the primary cooling fan has been turned "ON" by high A/C head pressure, the PCM will turn the fan "OFF" when the pressure has dropped to 208 psi. The minimum "ON" time for the primary cooling fan is 50 seconds.

Secondary Cooling Fan (Fan 2) (With A/C)

The secondary cooling fan is controlled by the PCM based on inputs from the A/C system, Engine Coolant Temperature (ECT) sensor, Vehicle Speed Sensor (VSS).

The PCM will turn the secondary cooling fan "ON" when any of the following conditions exist at idle:

- Certain Diagnostic Trouble Codes (DTCs) set.
- ECT above 113°C (235°F).
- A/C head pressure above 248 psi.

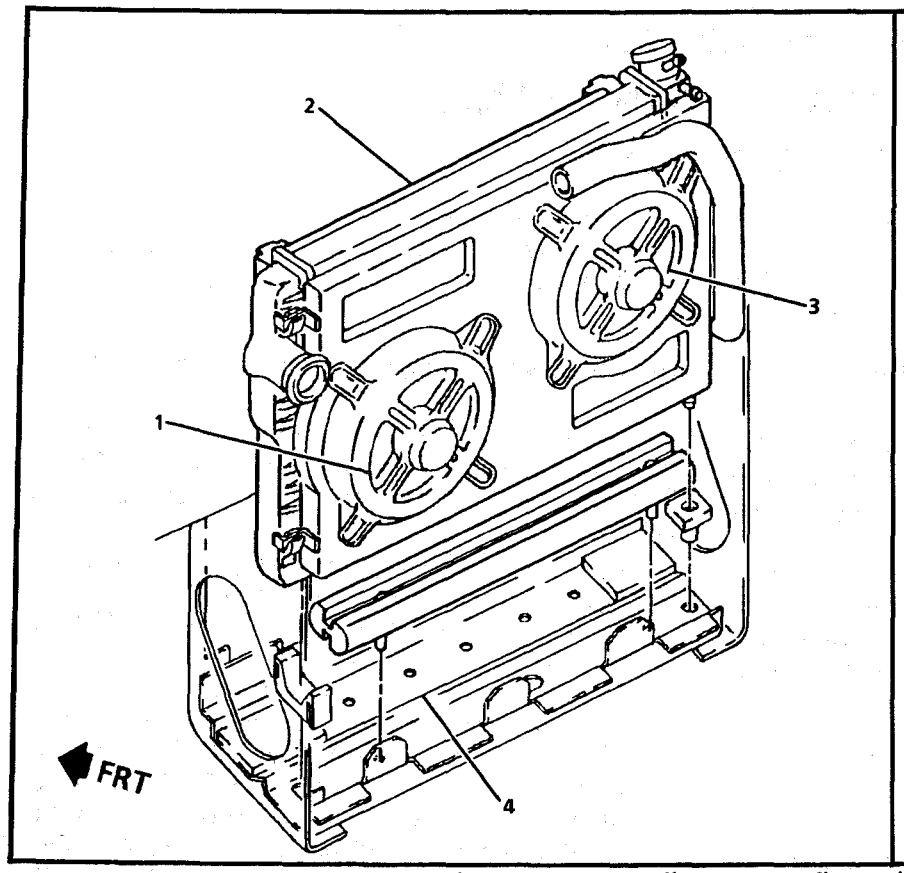
Once the secondary fan has been turned "ON" by the ECT, the PCM will turn the fan "OFF" when that temperature has dropped about 3°C (5°F). If the secondary cooling fan has been turned "ON" by high A/C head pressure, the PCM will turn the fan "OFF" when the pressure has dropped to 208 psi. The minimum "ON" time for the secondary cooling fan is 30 seconds.

OPERATION - LATE PRODUCTION A/C

The electric cooling fans are controlled by the PCM. The PCM controls the ground path for the three cooling fan relays. The relays are used to control the high current flow to power the cooling fan motors. Both fans operate together. When minimum cooling is required, the PCM energizes cooling fan relay #1 and both fans operate at low speed, since the fan are connected in series through cooling fan relay #3, and cooling fan relay #2 is open. When maximum cooling is required, the PCM energizes all three cooling fan relays. The left fan is still powered through cooling fan relay #1, but is now grounded through cooling fan relay #3. The right fan is now powered directly through cooling fan relay #2 and both fans operate at high speed.

Low Speed Fans

The cooling fans are controlled by the PCM based on inputs from the A/C system, Engine Coolant Temperature (ECT) sensor and Vehicle Speed Sensor (VSS).



1 PRIMARY COOLING FAN MOTOR

2 RADIATOR

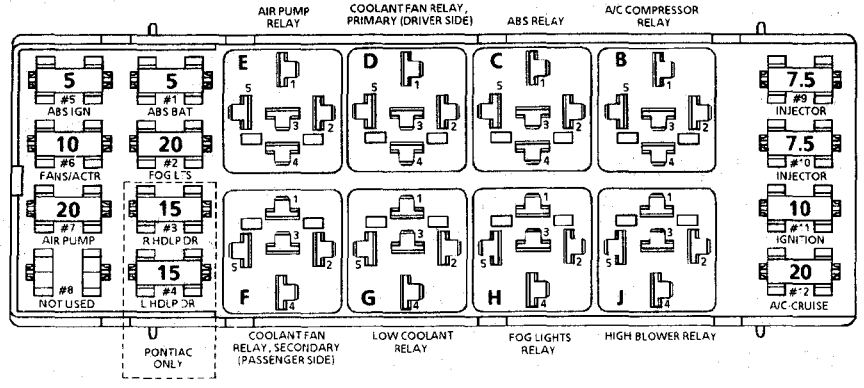
3 SECONDARY COOLING FAN MOTOR

4 LOWER RADIATOR SUPPORT

NS 15383

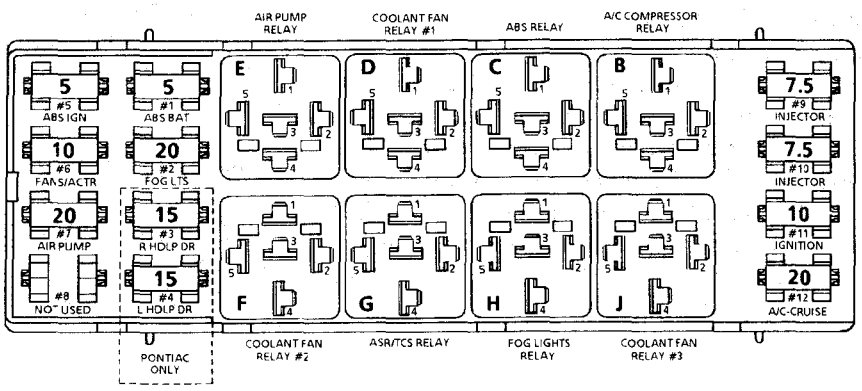
Figure C12-1 - Cooling Fan Configurations

EARLY PRODUCTION



UNDERHOOD ELECTRICAL CENTER

LATE PRODUCTION



NS 15660

Figure C12-2 - Cooling Fan Relay Location

The PCM will command low speed fans "ON" when Engine Coolant Temperature (ECT) is above 108°C (226°F). The PCM will turn the fans "OFF" when the temperature drops about 3°C (5°F). The minimum "ON" time for low speed fans is 50 seconds.

High Speed Fans

The PCM will command high speed fans "ON" when any of the following conditions exist at idle.

- Certain Diagnostic Trouble Codes (DTCs) set.
- ECT above 113°C (235°F).
- A/C head pressure above 248 psi.

If the high speed fans were turned "ON" by the ECT, the PCM will switch the fans back to low speed when the temperature drops about 3°C (5°F). Minimum "ON" time for HI speed fans is 30 seconds.

ON-VEHICLE SERVICE

COOLING FAN 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.

Cooling system component replacement can be found in SECTION 6B.

For removal and replacement procedures of A/C components, refer to SECTION 1B.

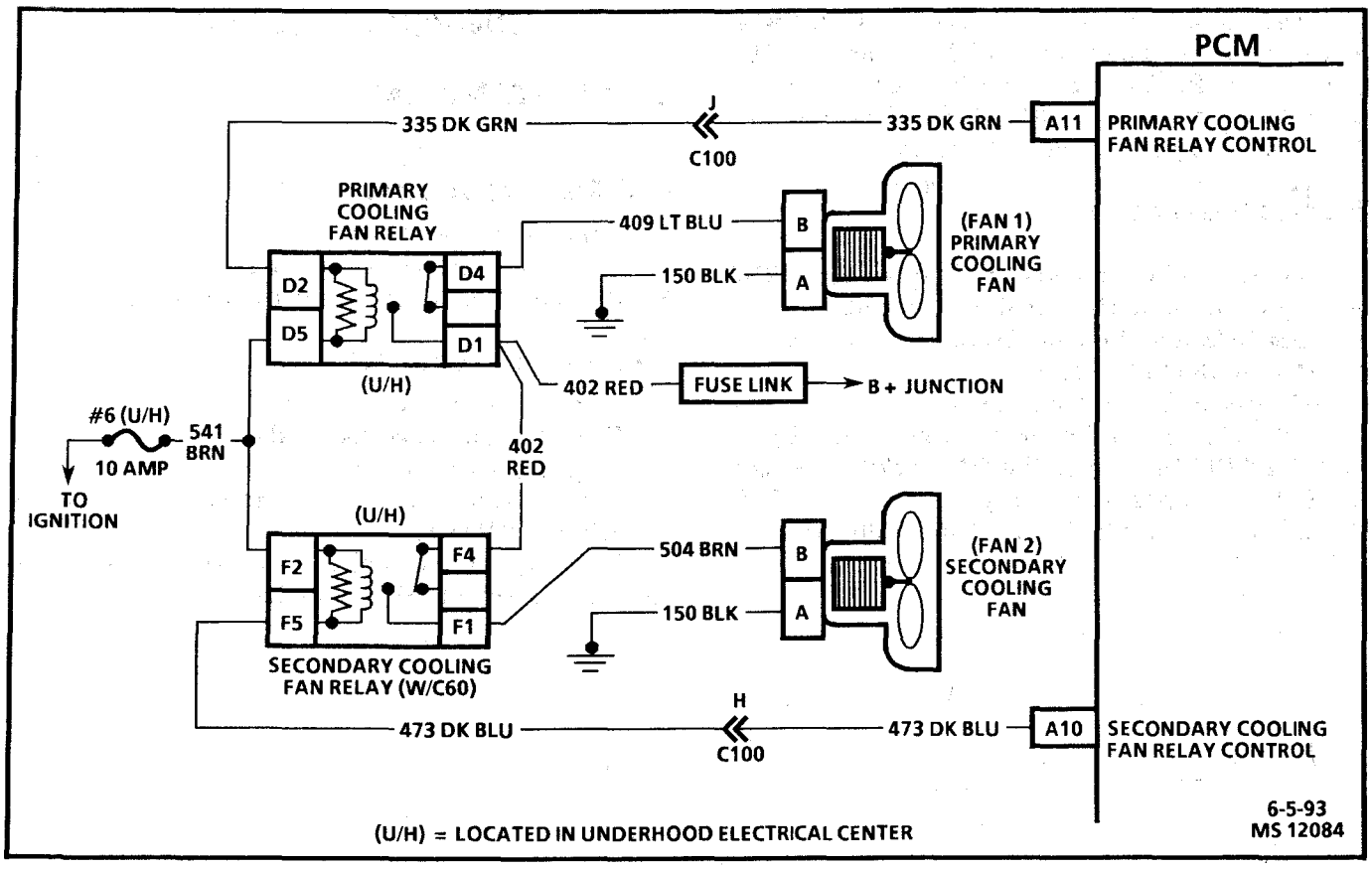


CHART C-12A (Page 1 of 2)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(NON A/C AND EARLY PRODUCTION A/C)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Battery voltage is supplied to the primary fan relay on terminal "D1" and on "F4" of the secondary fan relay. Ignition voltage is supplied to terminal "D5" of the primary fan relay and "F2" of the secondary fan relay. Grounding CKT 335 (relay terminal "D2") will energize the primary cooling fan relay (Fan 1) and supply battery voltage to the primary cooling fan motor. Grounding CKT 473 (relay terminal "F5") will energize the secondary cooling fan relay (Fan 2) and supply battery voltage to the secondary fan motor.

When certain Diagnostic Trouble Codes (DTCs) are set, the PCM will enable the cooling fans.

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

1. With the output/field service enable terminal grounded, the cooling fan control driver(s) will close, which should energize the fan control relay(s).
   If vehicle is equipped with one cooling fan (non A/C) and cooling fan operation is OK, refer to diagnostic aids below for further diagnosis of cooling system.
2. Engine coolant temperature must be below 100°C (212°F) to perform this step. The cooling fans should come "ON" anytime A/C system is operating.
3. Comparing Tech 1 pressure and manifold gage set pressure will determine if the A/C refrigerant pressure sensor is out of range. An out of range A/C refrigerant pressure sensor can cause the cooling fans to operate at the wrong times.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the warning indicator light, or engine coolant temperature gage indicated overheating.

The gage accuracy can also be checked by comparing the Engine Coolant Temperature (ECT) sensor reading using a Tech 1 and comparing its reading with the gage reading.

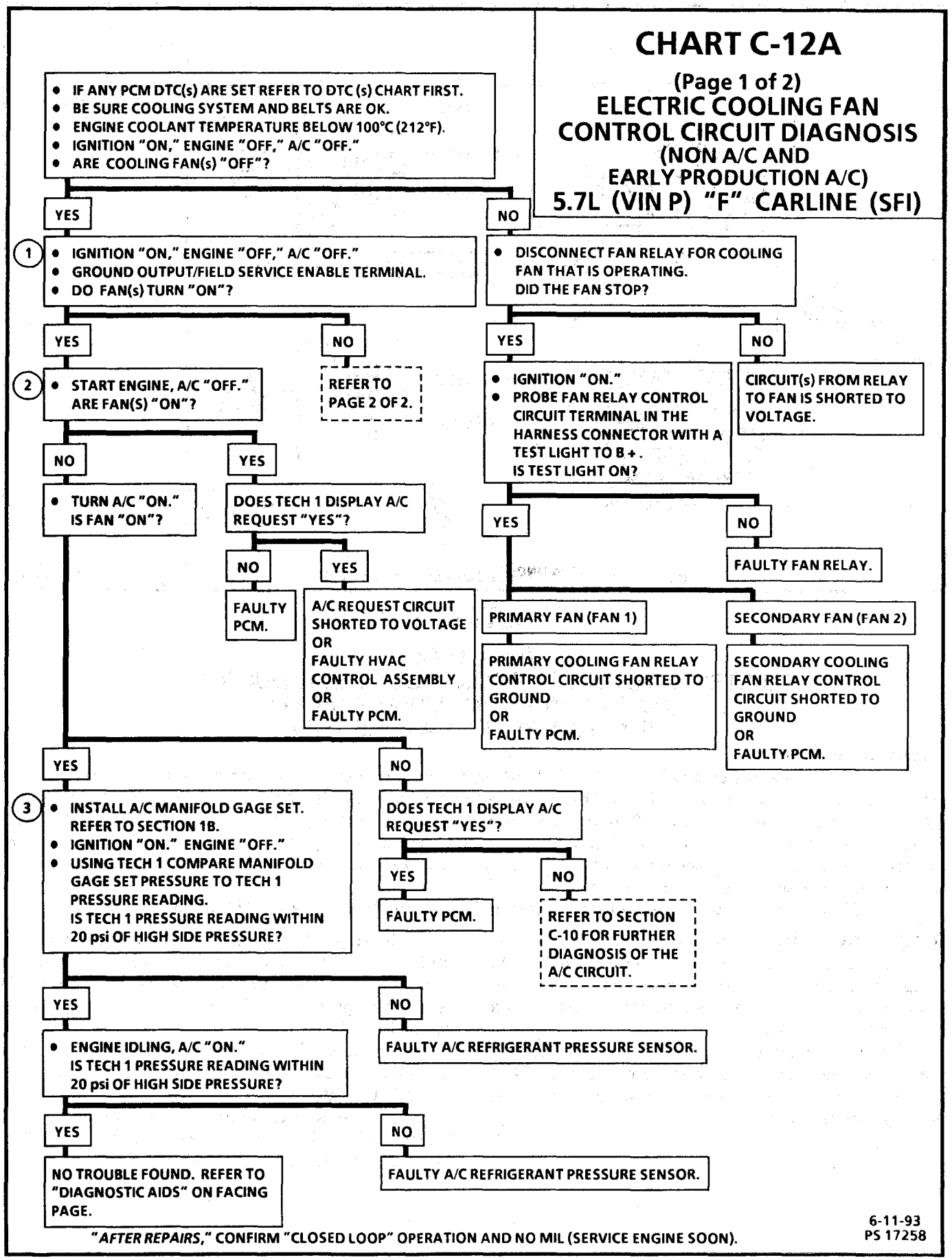
If the engine is actually overheating and the gage indicated overheating, but the cooling fan is not coming "ON," the Engine Coolant Temperature (ECT) sensor has probably shifted out of calibration and should be replaced.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command fan 1 "ON" at 108°C (226°F) and "OFF" at 105°C (221°F) and, fan 2 "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

CHART C-12A

(Page 1 of 2)
ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(NON A/C AND EARLY PRODUCTION A/C)
5.7L (VIN P) "F" CARLINE (SFI)



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

6-11-93
PS 17258

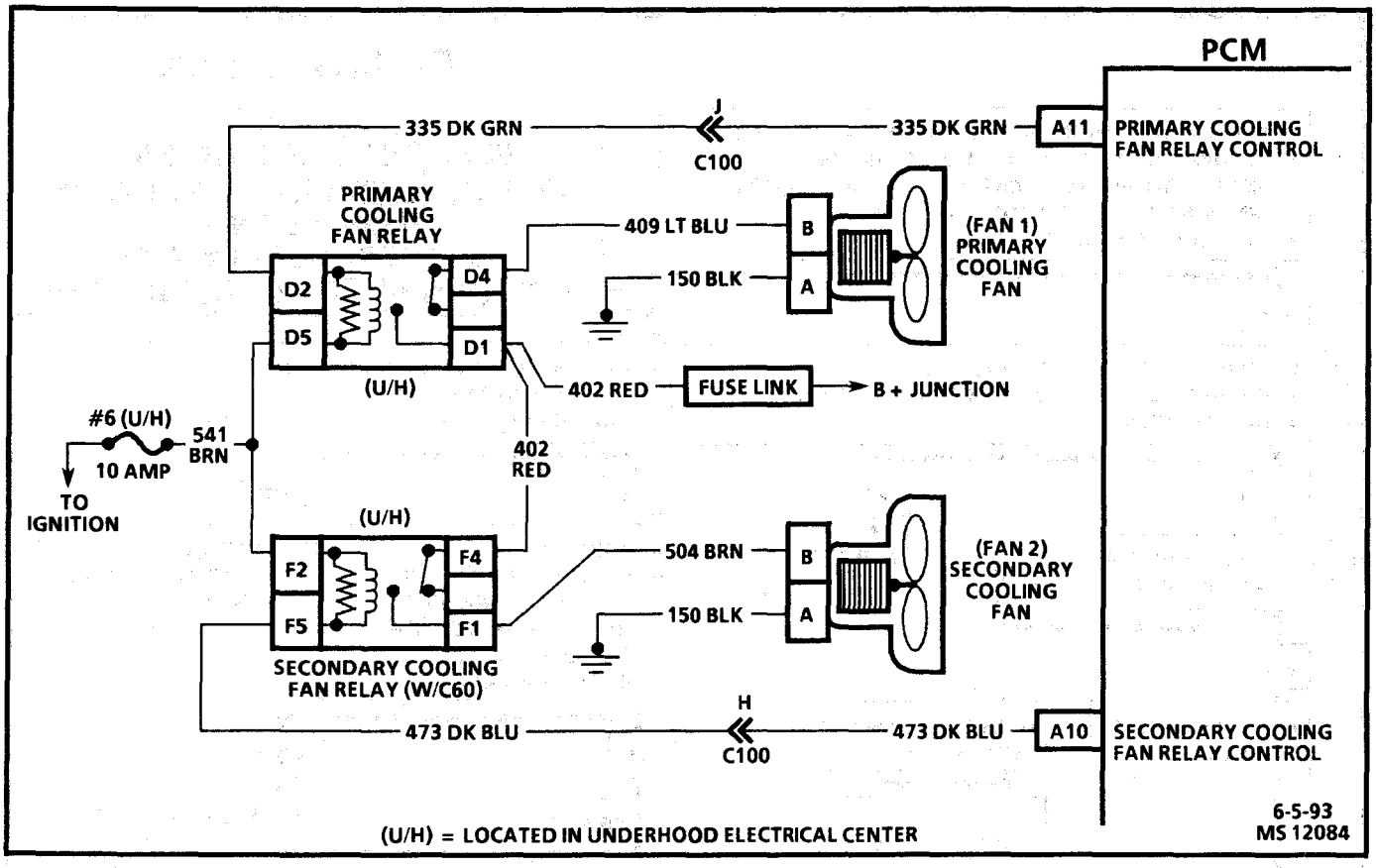


CHART C-12A

(Page 2 of 2)
ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(NON A/C AND EARLY PRODUCTION A/C)
5.7L (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Battery voltage is supplied to the primary fan relay on terminals "D1" and "F4" of the secondary fan relay. Ignition voltage is supplied to terminal "D5" of the primary fan relay and "F2" of the secondary fan relay. Grounding CKT 335 (relay terminal "D2") will energize the primary cooling fan relay (Fan 1) and supply battery voltage to the primary cooling fan motor. Grounding CKT 473 (relay terminal "F5") will energize the secondary cooling fan relay (Fan 2) and supply battery voltage to the secondary fan motor.

The PCM will enable the cooling fans, when certain Diagnostic Trouble Codes (DTCs) are set.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, the warning indicator light, or engine coolant temperature gage indicated overheating.

The gage accuracy can also be checked by comparing the Engine Coolant Temperature (ECT) sensor reading using a Tech 1 and comparing its reading with the gage reading.

If the engine is actually overheating and the gage indicated overheating, but the cooling fan is not coming "ON," the Engine Coolant Temperature (ECT) sensor has probably shifted out of calibration and should be replaced.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command fan 1 "ON" at 108°C (226°F) and "OFF" at 105°C (221°F) and an 2 "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

CHART C-12A (Page 2 of 2)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS (NON A/C AND EARLY PRODUCTION A/C) 5.7L (VIN P) "F" CARLINE (SFI)

FROM CHART C-12 (1 OF 2)

PRIMARY

- IGNITION "OFF."
- DISCONNECT PRIMARY COOLING FAN RELAY
- IGNITION "ON."
- PROBE FAN RELAY HARNESS TERMINALS "D1" AND "D5" WITH A TEST LIGHT CONNECTED TO GROUND.

LIGHT "ON" BOTH

- USING TECH 1 ACTIVATE "FAN CTRL PCM A11."
- PROBE HARNESS TERMINAL "D2" WITH A TEST LIGHT CONNECTED TO B+. IS TEST LIGHT "ON"?

YES

- USING A FUSED JUMPER WIRE, JUMPER FAN RELAY HARNESS TERMINALS "D1" AND "D4" TOGETHER. DOES FAN OPERATE?

NO

- IGNITION "OFF."
- DISCONNECT PRIMARY COOLING FAN ELECTRICAL CONNECTOR
- IGNITION "ON."
- JUMPER WIRE STILL INSTALLED AT RELAY HARNESS.
- CONNECT A TEST LIGHT ACROSS COOLING FAN ELECTRICAL CONNECTOR TERMINALS. IS TEST LIGHT "ON."

NO

- PROBE COOLING FAN MOTOR HARNESS CONNECTOR TERMINAL "B" WITH A TEST LIGHT CONNECTED TO GROUND. IS TEST LIGHT "ON"?

YES

FAULTY FAN MOTOR CONNECTION OR CIRCUIT 150 OPEN.

NO

OPEN IN CIRCUIT 409 BETWEEN RELAY AND COOLING FAN MOTOR.

YES

FAULTY CONNECTION AT FAN MOTOR OR FAULTY FAN MOTOR.

NO

REPAIR OPEN OR SHORT TO VOLTAGE IN CKT 335. OR FAULTY PCM CONNECTION OR FAULTY PCM.

YES

FAULTY RELAY CONNECTION OR FAULTY RELAY.

LIGHT "OFF" ONE OR BOTH

REPAIR OPEN OR SHORT TO GROUND IN CIRCUIT THAT DID NOT LIGHT.

SECONDARY

- IGNITION "OFF."
- DISCONNECT SECONDARY COOLING FAN RELAY
- IGNITION "ON."
- PROBE FAN RELAY HARNESS TERMINALS "F2" AND "F4" WITH A TEST LIGHT CONNECTED TO GROUND.

LIGHT "ON" BOTH

- USING TECH 1 ACTIVATE "FAN CTRL PCM A10."
- PROBE HARNESS TERMINAL "F5" WITH A TEST LIGHT CONNECTED TO B+. IS TEST LIGHT "ON"?

YES

- USING A FUSED JUMPER WIRE, JUMPER FAN RELAY HARNESS TERMINALS "F1" AND "F4" TOGETHER. DOES FAN OPERATE?

NO

- IGNITION "OFF."
- DISCONNECT SECONDARY COOLING FAN ELECTRICAL CONNECTOR
- IGNITION "ON."
- JUMPER WIRE STILL INSTALLED AT RELAY HARNESS.
- CONNECT A TEST LIGHT ACROSS COOLING FAN ELECTRICAL CONNECTOR TERMINALS. IS TEST LIGHT "ON."

NO

- PROBE COOLING FAN MOTOR HARNESS CONNECTOR TERMINAL "B" WITH A TEST LIGHT CONNECTED TO GROUND. IS TEST LIGHT "ON"?

YES

FAULTY FAN MOTOR CONNECTION OR CIRCUIT 150 OPEN.

NO

OPEN IN CIRCUIT 504 BETWEEN RELAY AND COOLING FAN MOTOR.

YES

FAULTY CONNECTION AT FAN MOTOR OR FAULTY FAN MOTOR.

NO

REPAIR OPEN OR SHORT TO VOLTAGE IN CKT 473. OR FAULTY PCM CONNECTION OR FAULTY PCM.

YES

FAULTY RELAY CONNECTION OR FAULTY RELAY.

LIGHT "OFF" ONE OR BOTH

REPAIR OPEN OR SHORT TO GROUND IN CIRCUIT THAT DID NOT LIGHT.

6-29-93
PS 18475

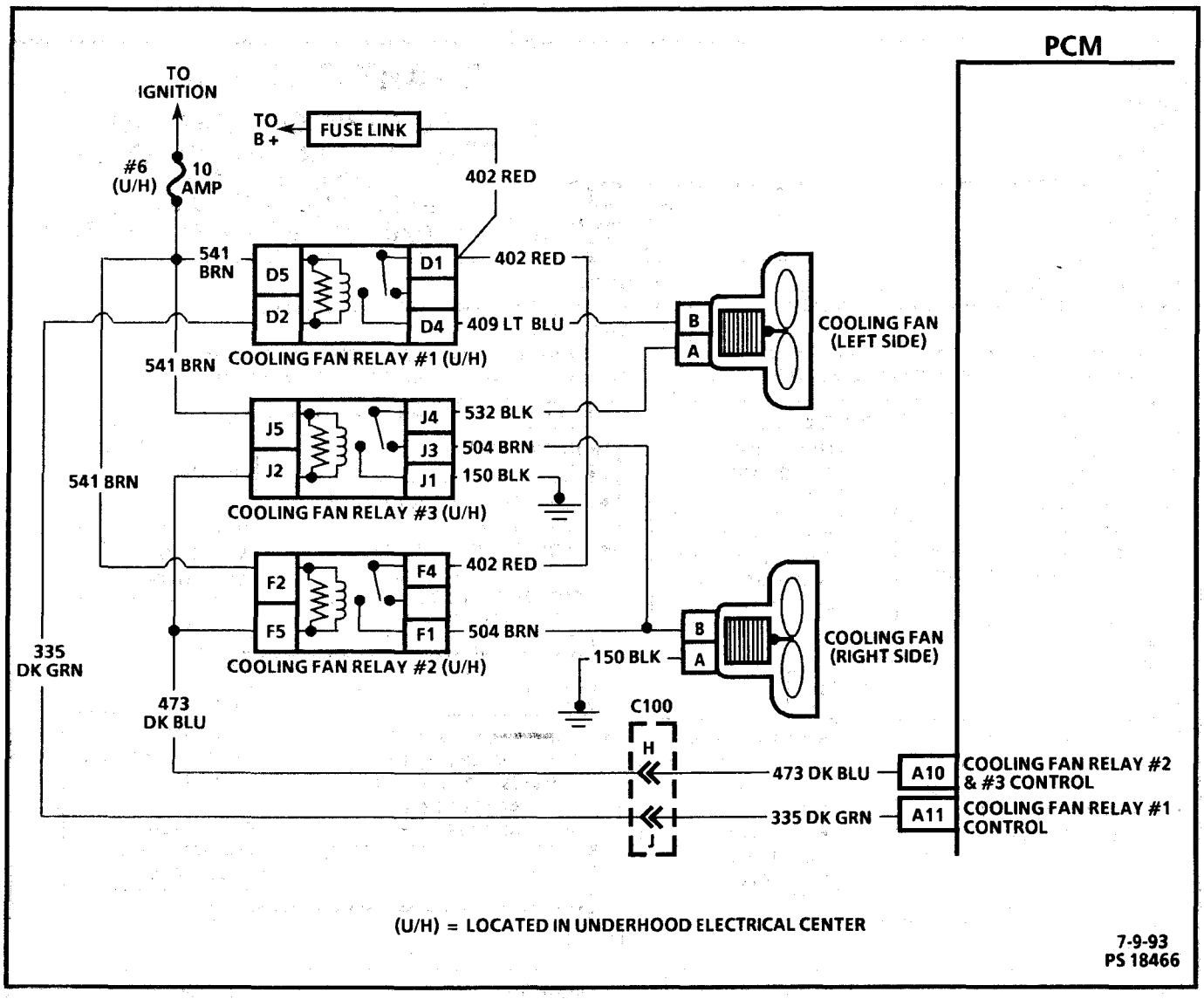


CHART C-12B (Page 1 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(LATE PRODUCTION A/C)
5.7 (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Ignition voltage is supplied to all three cooling fan relay coils on CKT 541. The PCM controls cooling fan relay #1 by providing the ground path through CKT 335. The PCM controls cooling fan relays #2 and #3 together by providing the ground path through CKT 473. When cooling fan relay #1 is energized the cooling fans are connected in series and operate together at low speed. When all three relays are energized the fans are connected in parallel and operate together at high speed. When certain DTCs are set, the PCM will enable cooling fans.

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

1. The cooling fans should come "ON" anytime A/C system is operating.
2. Comparing Tech 1 pressure and manifold gage set pressure will determine if the A/C refrigerant pressure sensor is out of range. An out of range A/C refrigerant pressure sensor can cause the cooling fans to operate at the wrong times.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the warning indicator light, or engine coolant temperature gage indicated overheating.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command low speed fans "ON" at 108°C (226°F) and "OFF" at 105° C (221°F) and, high speed fans "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

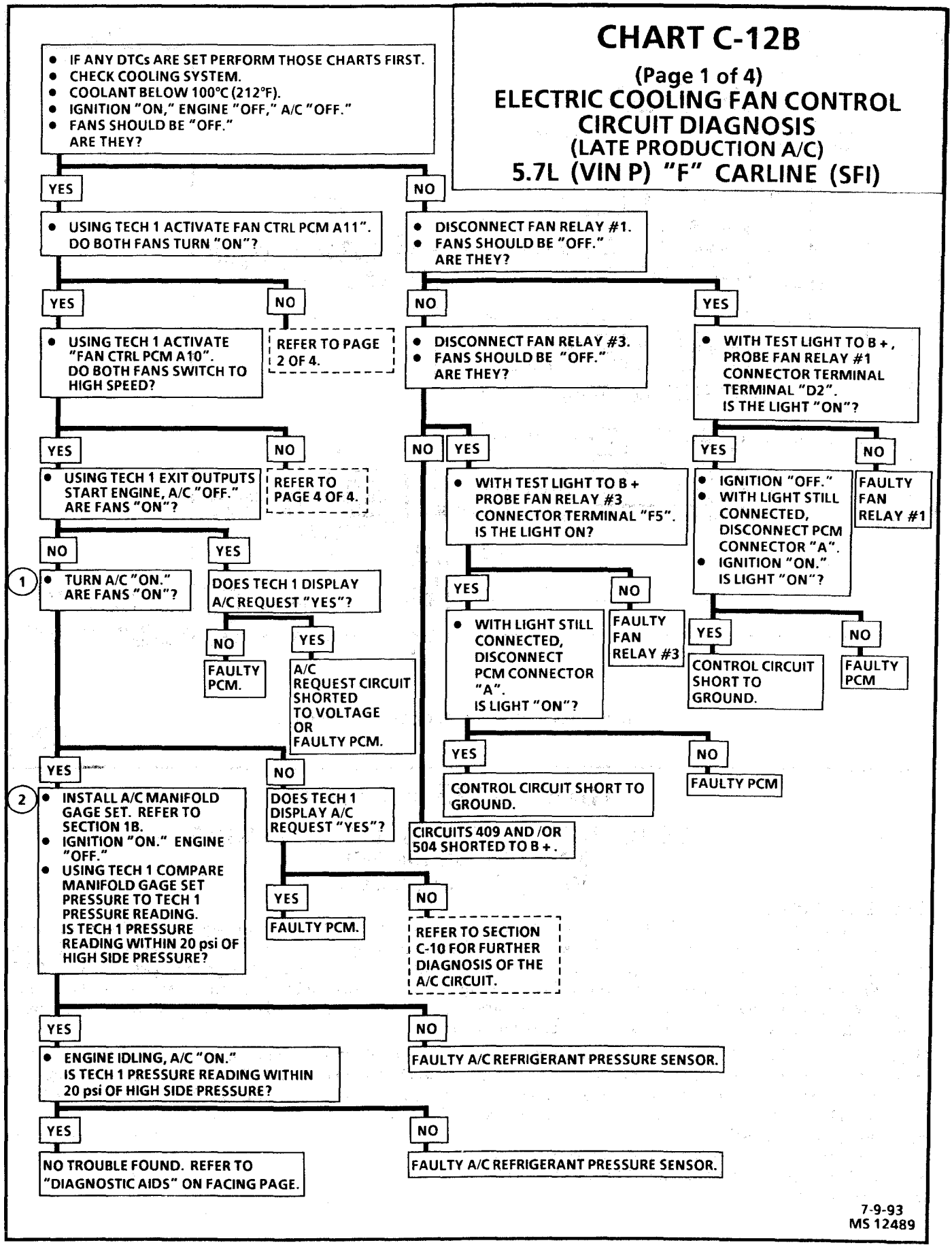
CHART C-12B

(Page 1 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS

(LATE PRODUCTION A/C)

5.7L (VIN P) "F" CARLINE (SFI)



7-9-93
MS 12489

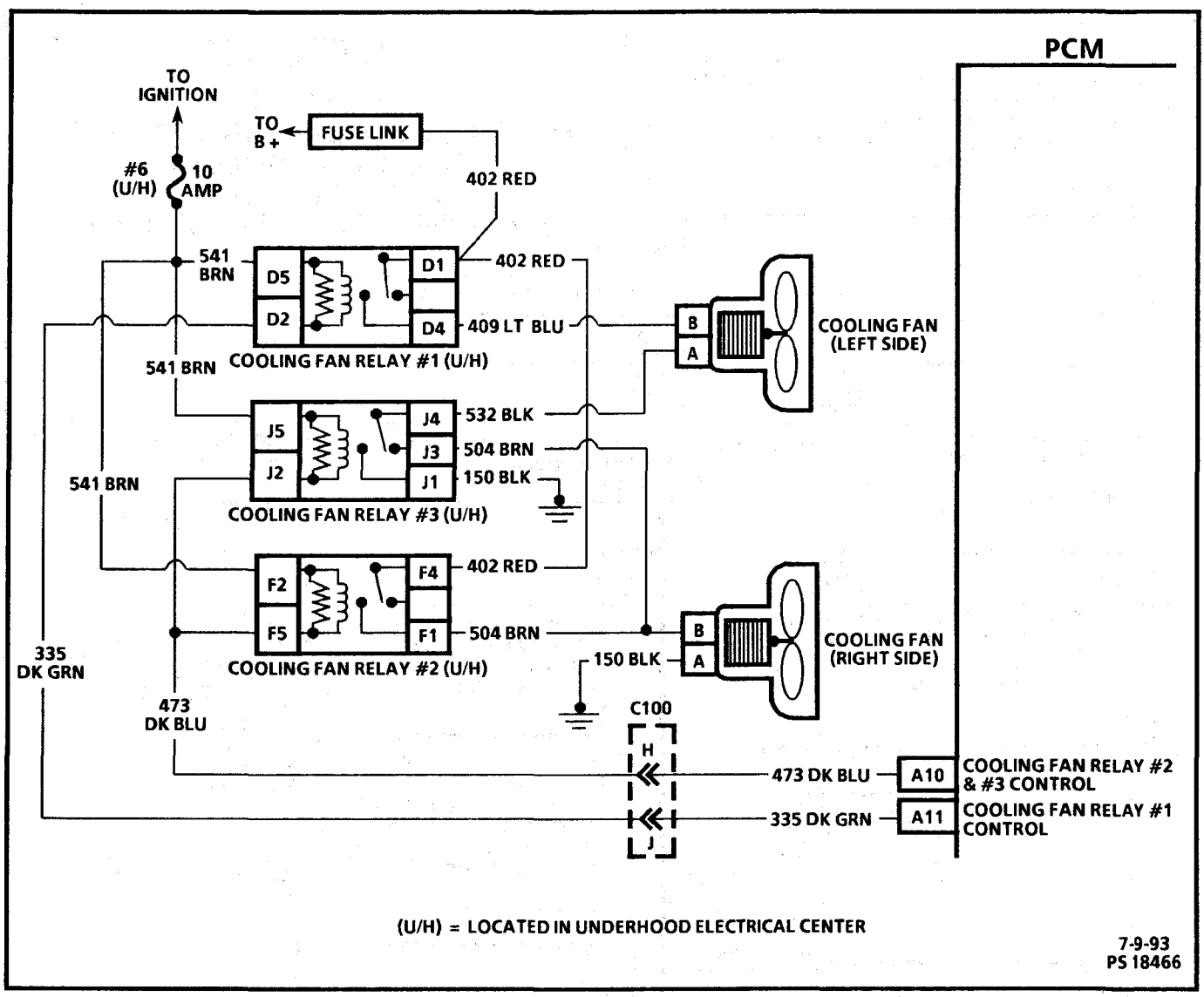


CHART C-12B (Page 2 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(LATE PRODUCTION A/C)
5.7 (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Ignition voltage is supplied to all three cooling fan relay coils on CKT 541. The PCM controls cooling fan relay #1 by providing the ground path through CKT 335. The PCM controls cooling fan relays #2 and #3 together by providing the ground path through CKT 473. When cooling fan relay #1 is energerized the cooling fans are connected in series and operate together at low speed. When all three relays are energized the fans are connected in parallel and operate together at high speed. When certain DTCs are set, the PCM will enable cooling fans.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the warning indicator light, or engine coolant temperature gage indicated overheating.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command low speed fans "ON" at 108°C (226°F) and "OFF" at 105° C (221°F) and, high speed fans "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

CHART C-12B

(Page 2 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS

(LATE PRODUCTION A/C)

5.7L (VIN P) "F" CARLINE (SFI)

FROM CHART C-12 1 OF 4.

DID EITHER FAN TURN "ON"?

NO

- USING TECH 1 ACTIVATE "FAN CTRL PCM A11".
- DISCONNECT FAN RELAY #1
- WITH TEST LIGHT TO B+, PROBE RELAY CONNECTOR TERMINAL "D2". IS LIGHT "ON"?

YES

- WITH TEST LIGHT TO GROUND PROBE FAN RELAY CONNECTOR TERMINALS "D5" AND "D1."
- LIGHT SHOULD BE "ON" FOR BOTH CIRCUITS. IS IT?

YES

- CONNECT A JUMPER BETWEEN FAN RELAY CONNECTOR TERMINALS "D1" AND "D4". LEAVE THIS JUMPER IN PLACE FOR THE REMAINDER OF THIS CHART. DO THE FANS COME "ON"?

NO

- DISCONNECT THE LEFT FAN.
- WITH A TEST LIGHT TO GROUND, PROBE FAN HARNESS CONNECTOR TERMINAL "B". IS THE LIGHT "ON"?

YES

- CONNECT A SECOND FUSED JUMPER WIRE BETWEEN FAN HARNESS CONNECTOR TERMINALS. IS THE RIGHT FAN "ON"?

NO

- RECONNECT LEFT FAN.
- DISCONNECT FAN RELAY #3.
- USING A TEST LIGHT TO GROUND. PROBE FAN RELAY #3 HARNESS CONNECTOR TERMINAL "J4." IS THE LIGHT "ON"?

YES

CONTINUED ON PAGE 3 OF 4.

NO

OPEN CIRCUIT 532.

NO

REPAIR OPEN OR SHORT TO GROUND ON CIRCUIT THAT DID NOT LIGHT.

NO

- TEST LIGHT STILL CONNECTED.
- IGNITION "OFF."
- DISCONNECT PCM CONNECTOR "A".
- PROBE PCM HARNESS CONNECTOR TERMINAL "A11" WITH FUSED JUMPER TO GROUND. IS LIGHT "ON"?

NO

RELAY CONTROL CIRCUIT OPEN OR SHORTED TO B+.

YES

FAULTY PCM CONNECTIONS OR FAULTY PCM.

YES

FAN RELAY #1 FAULTY

NO

OPEN CIRCUIT 409.

YES

FAULTY LEFT FAN MOTOR CONNECTIONS OR FAULTY LEFT FAN MOTOR.

YES

- USING TECH 1 ACTIVATE "FAN CTRL PCM A11".
- DISCONNECT THE FAN WHICH IS NOT OPERATING. DID THE OTHER FAN TURN "OFF"?

NO

- DISCONNECT FAN RELAY #2. DID THE FAN TURN "OFF"?

YES

RELAY #2 FAULTY.

YES

THE FAN WHICH WAS NOT OPERATING IS FAULTY.

NO

CIRCUIT 532 SHORTED TO GROUND.

6-30-93
NS 15382

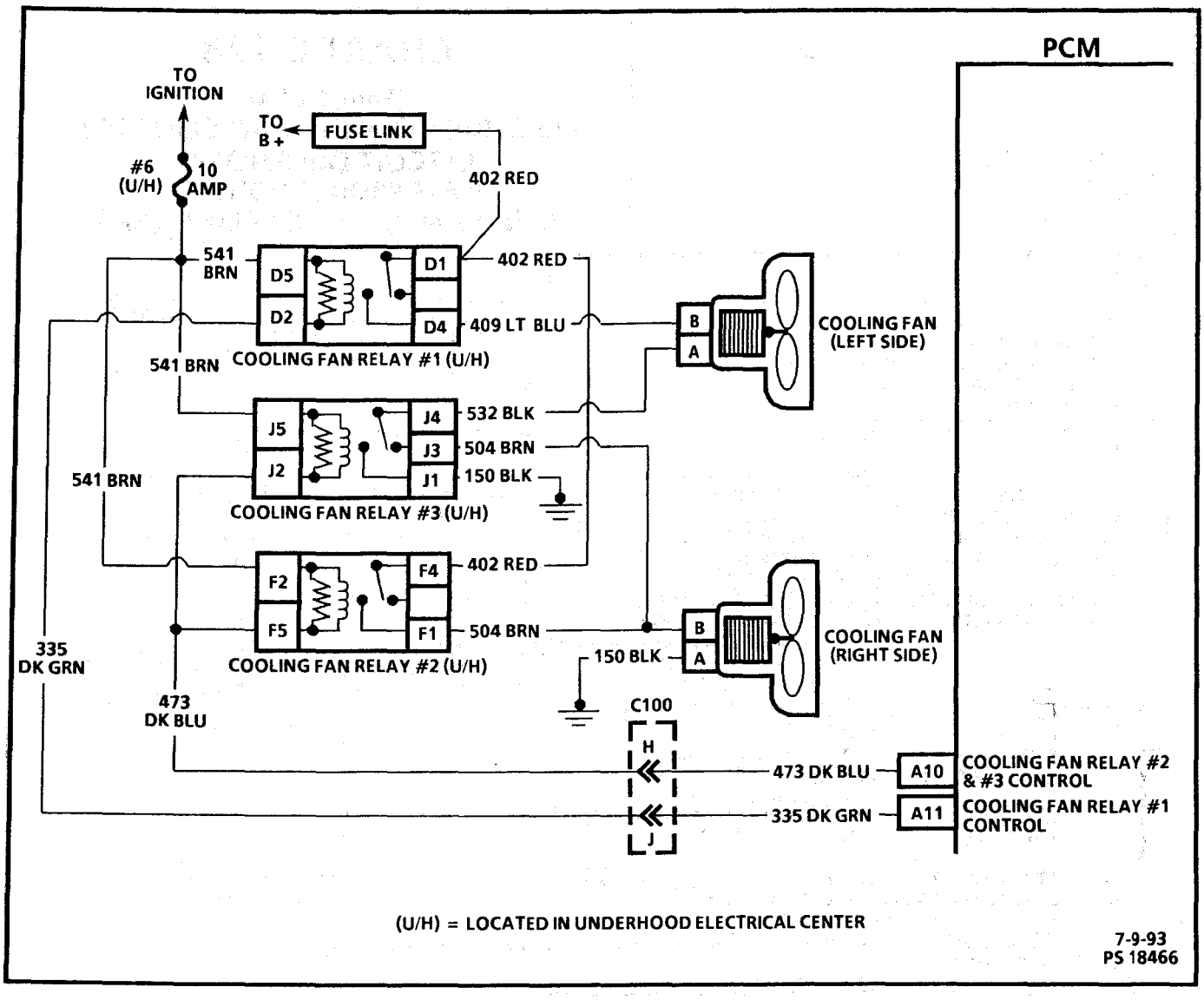


CHART C-12B (Page 3 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(LATE PRODUCTION A/C)
5.7 (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Ignition voltage is supplied to all three cooling fan relay coils on CKT 541. The PCM controls cooling fan relay #1 by providing the ground path through CKT 335. The PCM controls cooling fan relays #2 and #3 together by providing the ground path through CKT 473. When cooling fan relay #1 is energerized the cooling fans are connected in series and operate together at low speed. When all three relays are energized the fans are connected in parallel and operate together at high speed. When certain DTCs are set, the PCM will enable cooling fans.

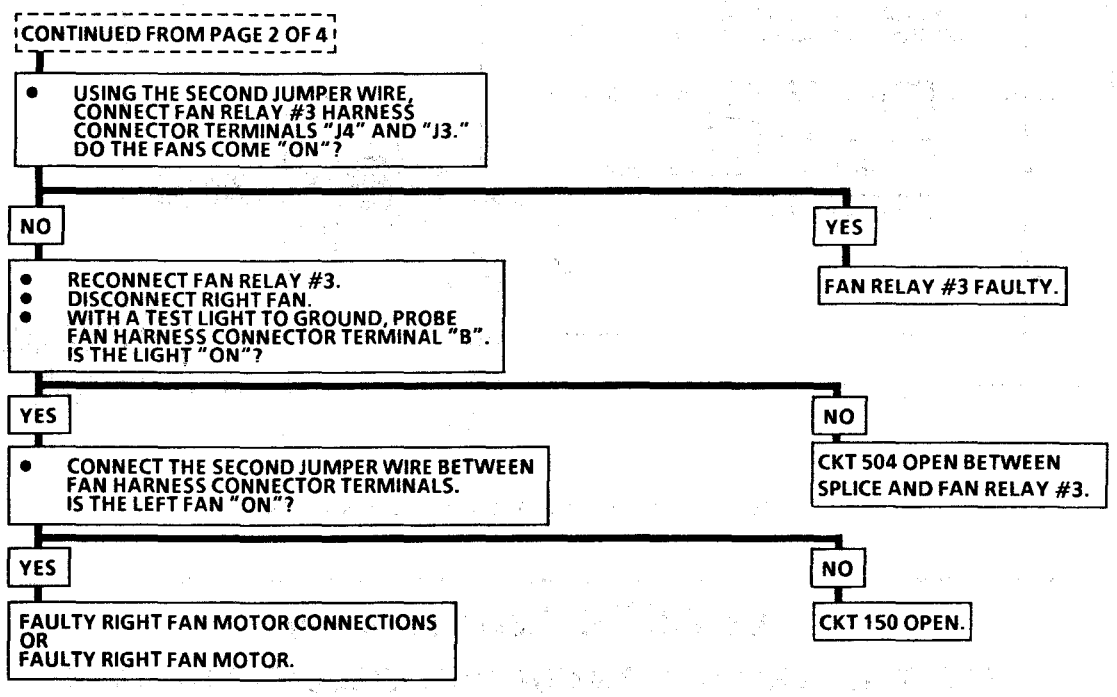
Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the warning indicator light, or engine coolant temperature gage indicated overheating.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command low speed fans "ON" at 108°C (226°F) and "OFF" at 105° C (221°F) and, high speed fans "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

CHART C-12B

(Page 3 of 4)
ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(LATE PRODUCTION A/C)
5.7L (VIN P) "F" CARLINE (SFI)



6-30-93
PS 18463

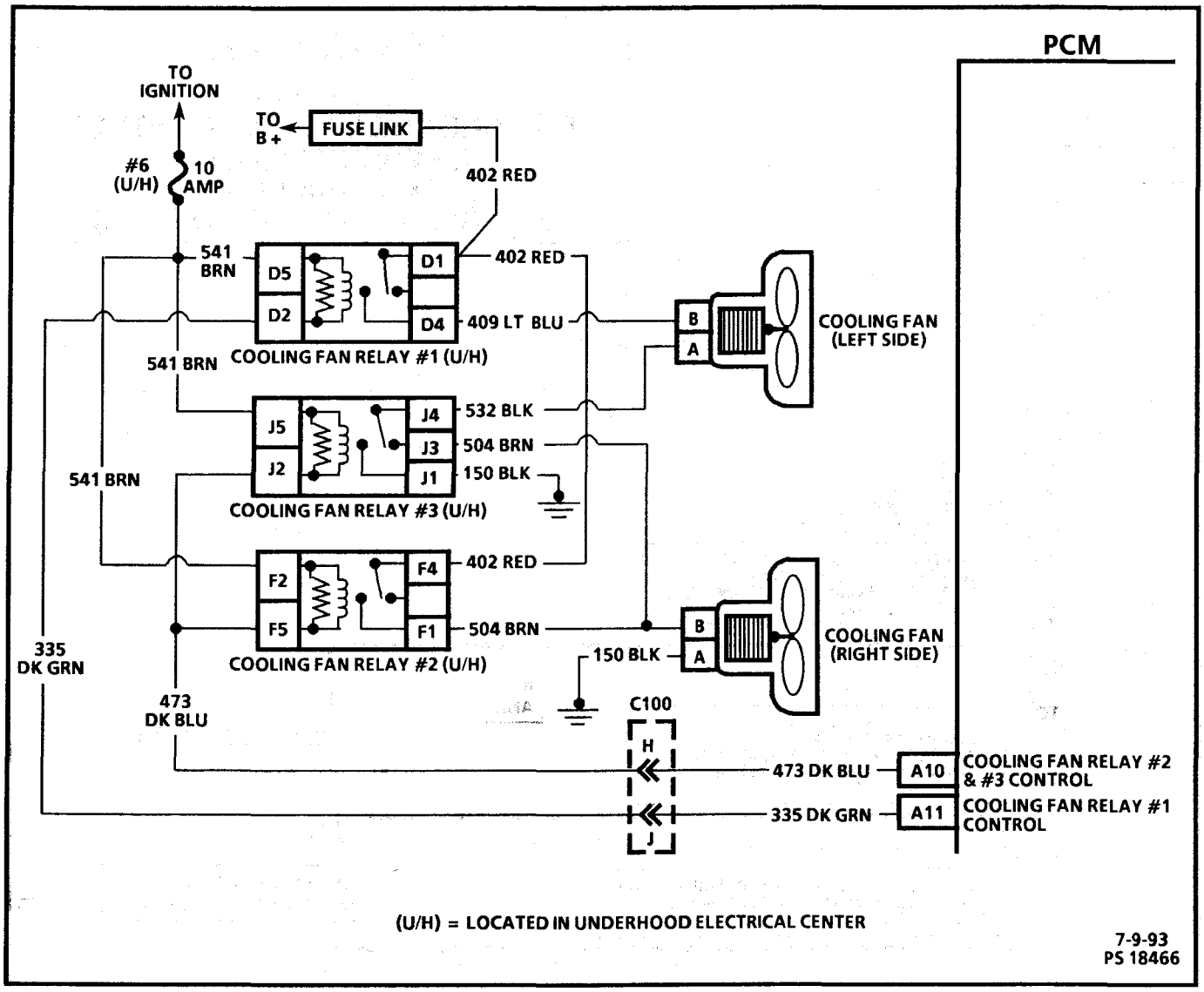


CHART C-12B (Page 4 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS
(LATE PRODUCTION A/C)
5.7 (VIN P) "F" CARLINE (SFI)

Circuit Description:

The cooling fans are controlled by the PCM based on various inputs. Ignition voltage is supplied to all three cooling fan relay coils on CKT 541. The PCM controls cooling fan relay #1 by providing the ground path through CKT 335. The PCM controls cooling fan relays #2 and #3 together by providing the ground path through CKT 473. When cooling fan relay #1 is energized the cooling fans are connected in series and operate together at low speed. When all three relays are energized the fans are connected in parallel and operate together at high speed. When certain DTCs are set, the PCM will enable cooling fans.

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

1. It may be necessary to raise the vehicle and observe the cooling fans from underneath during this test. Both fans should operate at low speed when "FAN CTRL PCM A11" is activated. Both fans should operate at high speed when "FAN CTRL PCM A10" is activated.

Diagnostic Aids: If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the warning indicator light, or engine coolant temperature gage indicated overheating.

If the engine is overheating and the cooling fans are "ON," the cooling system should be checked, refer to SECTION 6B.

The PCM will command low speed fans "ON" at 108°C (226°F) and "OFF" at 105° C (221°F) and, high speed fans "ON" at 113°C (235°F) and "OFF" at 110°C (230°F).

CHART C-12B

(Page 4 of 4)

ELECTRIC COOLING FAN CONTROL CIRCUIT DIAGNOSIS

(LATE PRODUCTION A/C)

5.7L (VIN P) "F" CARLINE (SFI)

FROM CHART C-12 1 OF 4.

(1)
- USING TECH 1 ACTIVATE "FAN CTRL PCM A11".
- WHILE OBSERVING FANS, ACTIVATE "FAN CTRL PCM A10".

BOTH FANS OPERATE (NO CHANGE).

- IGNITION "OFF."
- DISCONNECT PCM CONNECTOR "A".
- DISCONNECT FAN RELAY #1.
- JUMPER RELAY HARNESS CONNECTOR TERMINAL "D1" TO "D4".
- IGNITION "ON."
- PROBE PCM HARNESS CONNECTOR TERMINAL "A10" WITH A FUSED JUMPER TO GROUND.

DO THE FANS SWITCH FROM LOW TO HIGH SPEED?

- NO → CKT 473 OPEN OR SHORTED TO B+.
- YES → FAULTY PCM CONNECTIONS OR FAULTY PCM.

LEFT FAN STOPS OPERATING.

- DISCONNECT FAN RELAY #3.
- PROBE RELAY HARNESS CONNECTOR TERMINAL "J2" WITH A TEST LIGHT TO B+.
- USING TECH 1 ACTIVATE "FAN CTRL PCM A10".

IS THE LIGHT "ON"?

- NO → CIRCUIT 473 OPEN BETWEEN FAN RELAY #3 AND SPLICE.
- YES →
  - PROBE FAN RELAY #3 HARNESS CONNECTOR TERMINAL "J1" WITH A TEST LIGHT TO B+.

  IS THE LIGHT "ON"?
  - NO → CKT 150 OPEN.
  - YES →
    - PROBE FAN RELAY #3 HARNESS CONNECTOR TERMINAL "J5" WITH A TEST LIGHT TO GROUND.

    IS THE LIGHT "ON"?
    - NO → CIRCUIT 541 OPEN TO FAN RELAY #3.
    - YES → FAN RELAY #3 FAULTY.

RIGHT FAN STOPS OPERATING.

- DISCONNECT FAN RELAY #2.
- PROBE RELAY HARNESS CONNECTOR TERMINAL "F5" WITH A TEST LIGHT TO B+.
- USING TECH 1 ACTIVATE "FAN CTRL PCM A10".

IS THE LIGHT "ON"?

- NO → CIRCUIT 473 OPEN BETWEEN FAN RELAY #2 AND SPLICE.
- YES →
  - PROBE FAN RELAY #2 HARNESS CONNECTOR TERMINAL "F2" WITH A TEST LIGHT TO GROUND.

  IS THE LIGHT "ON"?
  - NO → CIRCUIT 402 OPEN BETWEEN RELAY #2 AND FUSELINK.
  - YES →
    - PROBE RELAY #2 HARNESS CONNECTOR TERMINAL "F4" WITH A TEST LIGHT TO GROUND.

    IS THE LIGHT "ON"?
    - NO → CKT 541 OPEN TO FAN RELAY #2.
    - YES →
      - JUMPER RELAY #2 HARNESS CONNECTOR TERMINAL "F4" TO "F1".

      IS THE RIGHT FAN "ON"?
      - NO → CIRCUIT 504 OPEN BETWEEN FAN RELAY #2 AND SPLICE.
      - YES → FAN RELAY #2 FAULTY.

6-30-93
PS 17946

BLANK

SECTION C13
CRANKCASE VENTILATION SYSTEM

CONTENTS

General Description C13-1
Operation C13-1
Results of Incorrect Operation C13-1
Diagnosis C13-1
Functional Check of Crankcase Ventilation Valve C13-1
Functional Check of Crankcase Ventilation Valve System C13-2
On-Vehicle Service C13-2

GENERAL DESCRIPTION

A "closed" crankcase ventilation system is used to provide a more complete scavenging of crankcase vapors. Fresh air from the air cleaner is supplied to the crankcase, mixed with blow-by gases and then passed through a crankcase ventilation valve into the intake manifold (Figure C13-1).

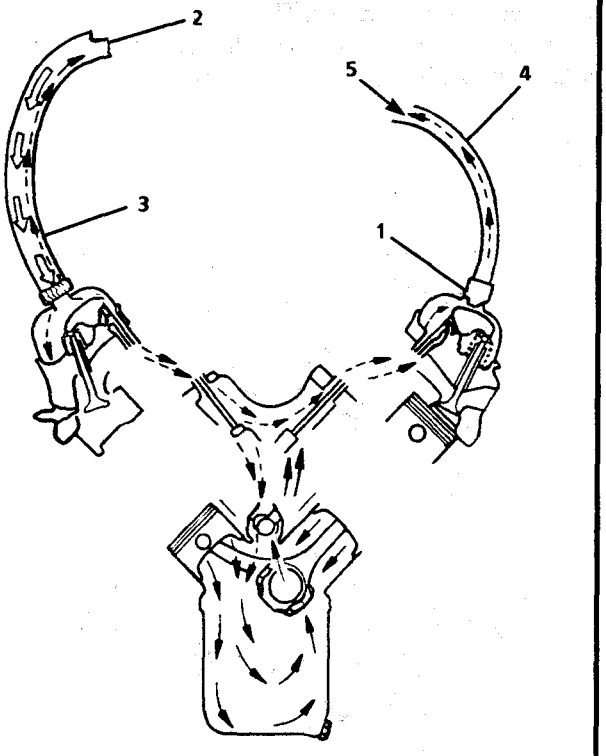


Figure C13-1 - Crankcase Ventilation Valve Flow (Typical)

OPERATION

The primary control is through the crankcase ventilation valve (Figure C13-2) which meters the flow at a rate depending on manifold vacuum.

To maintain idle quality, the crankcase ventilation valve restricts the flow when intake manifold vacuum is high. If abnormal operating conditions arise, the system is designed to allow excessive amounts of blow-by gases to back flow through the crankcase vent tube into the engine air inlet to be consumed by normal combustion.

RESULTS OF INCORRECT OPERATION

A plugged valve or hose may cause:
- Rough idle.
- Stalling or slow idle speed.
- Oil leaks.
- Sludge in engine.

A leaking valve or hose would cause:
- Rough idle.
- Stalling.
- High idle speed.

DIAGNOSIS

FUNCTIONAL CHECK OF CRANKCASE VENTILATION VALVE

If an engine is idling rough, check for a clogged crankcase ventilation valve or plugged hose. Replace as required. Use the following procedure:

1. Remove crankcase ventilation valve from rocker arm cover.
2. Run the engine at idle.
3. Place your thumb over end of valve to check for vacuum. If there is no vacuum at the valve, check for plugged hoses or manifold port, or crankcase ventilation valve. Replace plugged or deteriorated hoses.
4. Turn "OFF" the engine and remove crankcase ventilation valve. Shake valve and listen for the rattle of check needle inside the valve. If valve does not rattle, replace valve.

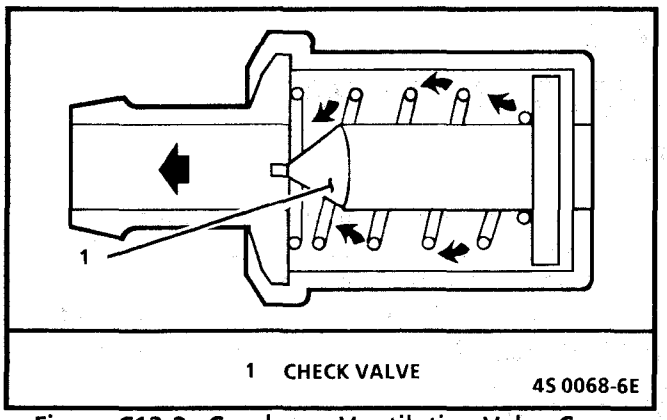


Figure C13-2 - Crankcase Ventilation Valve Cross Section

With this system, any blow-by in excess of the system capacity (from a badly-worn engine, sustained heavy load, etc.) is exhausted into the intake manifold and is drawn into the engine. Proper operation of the crankcase ventilation system is dependent upon a sealed engine. If oil sludging or dilution is noted, and the crankcase ventilation system is functioning properly, check engine for possible cause and correct to ensure that system will function as intended.

FUNCTIONAL CHECK OF CRANKCASE VENTILATION VALVE SYSTEM

1. Check crankcase ventilation valve for correct application.
2. Engine at normal operating temperature.
3. Block off crankcase ventilation system fresh air intake passage.
4. Remove engine oil dipstick and install a vacuum gage on dipstick tube.
5. Run engine at 1500 RPM for 30 seconds then read vacuum gage while at 1500 RPM.
   If vacuum is present the crankcase ventilation system is functioning properly. No vacuum indicated the engine may not be sealed and/or is drawing in outside air. Check valve cover, oil pan gasket for leaks. If the vacuum gage registers a pressure or the vacuum gage is pushed out of the dipstick tube, check for the correct crankcase ventilation valve, a plugged hose or excessive engine blow-by.

ON-VEHICLE SERVICE

An engine which is operated without any crankcase ventilation can be damaged. Therefore, it is important to replace the crankcase ventilation valve at intervals shown in SECTION 0B.

Periodically, inspect the hoses and clamps and replace any showing signs of deterioration.

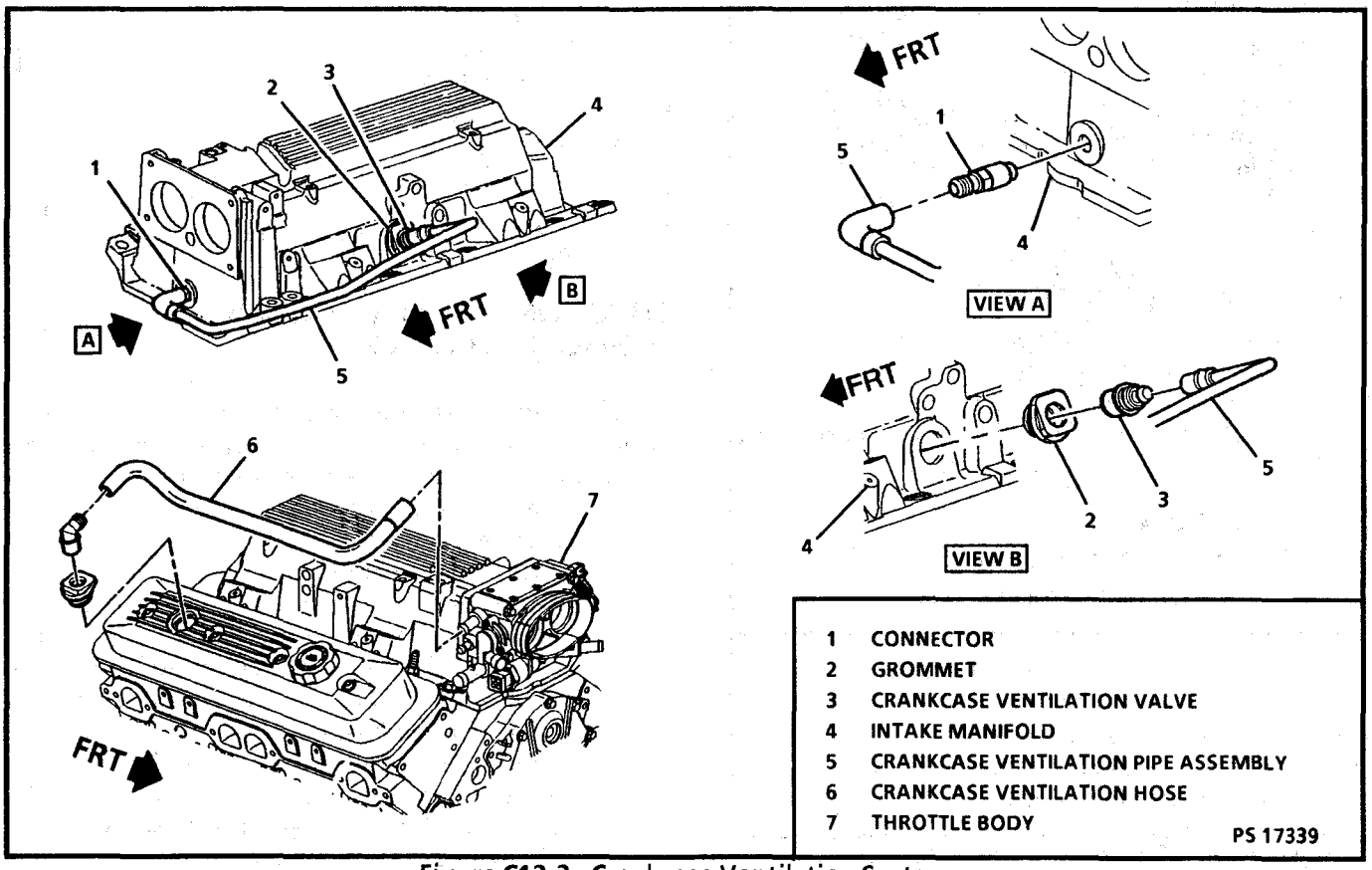


Figure C13-3 - Crankcase Ventilation System

SECTION C14
AIR INTAKE SYSTEM

CONTENTS

General Description C14-1
Air Intake System C14-1
On-Vehicle Service C14-1
Air Filter Element/Air Cleaner Assembly C14-1

GENERAL DESCRIPTION

AIR INTAKE SYSTEM

Outside air is drawn through the air filter element. The air cleaner is remotely mounted (refer to Figure C14-1). The air passes through the Mass Air Flow (MAF) sensor, and the intake duct to the throttle body. The air then flows into the intake manifold, through the cylinder heads and into the cylinder.

ON-VEHICLE SERVICE

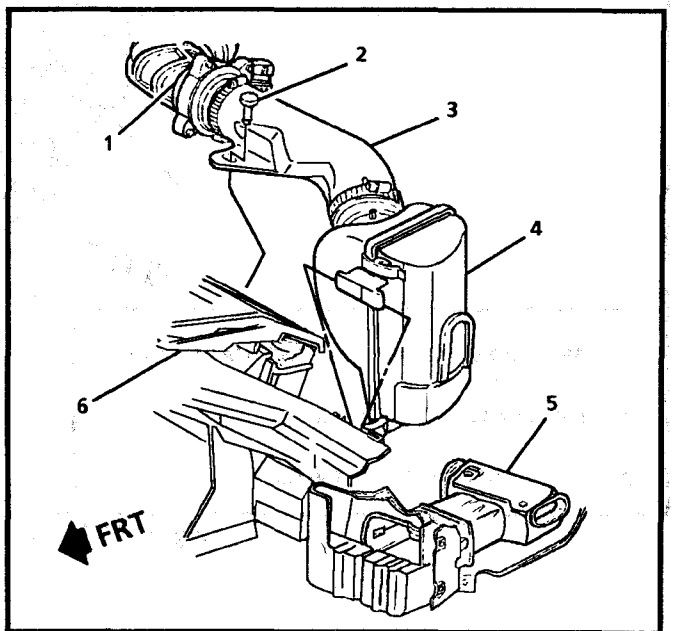
AIR FILTER ELEMENT/AIR CLEANER ASSEMBLY

Remove or Disconnect

1. Loosen clamp at air intake duct at throttle body.
2. IAT and MAF electrical connectors.
3. Retainer from upper radiator support.
4. Hose from air intake duct.
5. Disconnect air intake duct from throttle body.
6. Slide air cleaner housing up and air intake duct as a whole assembly.
7. Release latches from air cleaner housing.
8. Air filter element.

Install or Connect

1. Air filter element into air cleaner housing.
2. Snap air cleaner latches into place.
3. Slide air cleaner assembly into retainers.
4. Air intake duct to throttle body and tighten clamp.
5. IAT and MAF electrical connectors.
6. Retainer to upper radiator support.
7. Hose to air intake duct.



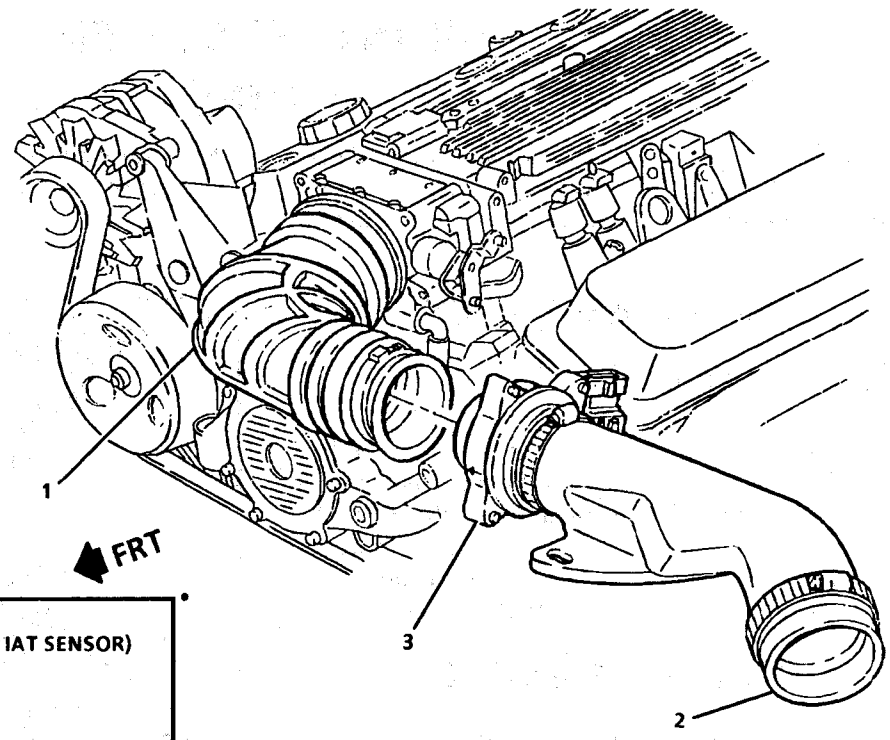
1 MASS AIR FLOW (MAF) SENSOR
2 RETAINER
3 AIR CLEANER OUTLET DUCT
4 AIR CLEANER ASSEMBLY
5 FRONT AIR INTAKE DUCT
6 UPPER RADIATOR MOUNTING PANEL

PS 17794

Figure C14-1 - Air Intake Components

Important

- If the Mass Air Flow (MAF) sensor is installed backwards, the system will go rich. An arrow cast into the plastic portion of the sensor indicates proper air flow direction. The arrow must point toward the engine.



1	AIR CLEANER OUTLET DUCT (WITH IAT SENSOR)
2	AIR CLEANER OUTLET DUCT
3	MASS AIR FLOW (MAF) SENSOR

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SECTION 8A
ELECTRICAL DIAGNOSIS
1994 CHEVROLET, PONTIAC

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.

8A SECTION	SECTION CONTENT	Chevy Camaro	Pontiac Firebird
1	INDEX	Y	Y
2	INTRODUCTION	Y	Y
3	SYMBOLS	Y	Y
4	TROUBLESHOOTING PROCEDURES	Y	Y
5	REPAIR PROCEDURES	Y	Y
9	VEHICLE ZONING	Y	Y
10	POWER DISTRIBUTION	Y	Y
11	FUSE BLOCK DETAILS	Y	Y
14	GROUND DISTRIBUTION	Y	Y
15	RETAINED ACCESSORY POWER (RAP): WITH AU3	Y	Y
20	SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S (3.4L L32)	Y	Y
21	SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P (5.7L LT1)	Y	Y
30	STARTER AND CHARGING	Y	Y
31	COOLANT FANS	Y	Y
32	ENGINE COOLANT HEATER (K05)	Y	Y
33	VEHICLE SPEED SENSOR	Y	Y
34	CRUISE CONTROL (K34)	Y	Y
39	ELECTRONIC TRANSMISSION CONTROLS (M30)	Y	Y
40	HORNS	Y	Y
41	BRAKE WARNING SYSTEM	Y	Y
44	ANTILOCK BRAKES/TRACTION CONTROL (NW9)	Y	Y
47	SUPPLEMENTAL INFLATABLE RESTRAINTS (SIR)	Y	Y
50	DATA LINK CONNECTOR (DLC): PIN ASSIGNMENT	Y	Y
60	HEATER (C41)	Y	Y
61	DEFOGGER (C49)	Y	Y
63	HVAC BLOWER CONTROL (C60)	Y	Y
64	HVAC COMPRESSOR CONTROL (C60)	Y	Y
65	HVAC AIR DELIVERY AND TEMPERATURE CONTROL (REFER TO SECTION 1B)	Y	Y
76	AUDIBLE WARNINGS: TONE	Y	Y
81	INSTRUMENT CLUSTER: WITH GAGES	Y	Y
89	STEERING WHEEL CONTROLS: RADIO (UK3) (REFER TO 8A-150-1)	N/A	Y
91	WIPER/WASHER: PULSE	Y	Y
100	HEADLIGHTS AND FOG LIGHTS: WITHOUT DRL (T61)	Y	Y
102	HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61)	Y	Y

(CONTINUED ON NEXT PAGE)

(CONTINUED FROM PREVIOUS PAGE)

8A SECTION	SECTION CONTENT	Chevy Camaro	Pontiac Firebird
104	HEADLIGHT DOORS	N/A	Y
110	EXTERIOR LIGHTS	Y	Y
112	BACKUP LIGHTS	Y	Y
114	INTERIOR LIGHTS	Y	Y
117	INTERIOR LIGHTS DIMMING	Y	Y
120	POWER WINDOWS (A31)	Y	Y
121	CONVERTIBLE TOP	Y	Y
130	POWER DOOR LOCKS (AU3)	Y	Y
132	KEYLESS ENTRY (AU0)	Y	Y
133	THEFT DETERRENT SYSTEM: PASS-Key® II	Y	Y
135	HATCH RELEASE (A90)	Y	Y
138	BRAKE TRANSMISSION SHIFT INTERLOCK (AUTOMATIC TRANSMISSION)	Y	Y
140	POWER SEAT: DRIVER 6-WAY (AC3)	Y	Y
141	POWER SEATS: ULTIMA (AQ9)	N/A	Y
147	POWER MIRRORS (DG7)	Y	Y
150	RADIO	Y	Y
200	SERVICE PARTS INFORMATION	Y	Y
201	COMPONENT LOCATION VIEWS	Y	Y
202	HARNESS CONNECTOR FACES	Y	Y
203	HARNESS ROUTING VIEWS	Y	Y

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INTRODUCTION

DIAGNOSTIC INFORMATION

The Electrical Diagnosis section contains the following types of diagnostic information (the way in which the information is arranged may vary from system to system or vehicle to vehicle):

- Electrical Schematics
- Component Location Lists
- Harness Connector Faces
- Troubleshooting Hints
- System Checks
- System Diagnosis
- Circuit Operation Descriptions
- Harness Routing Views

Using these elements together will make electrical troubleshooting faster and easier. Each element is described below.

The **Circuit Schematic** shows the electrical current paths when a circuit is operating properly. It is essential to understand how a circuit *should* work before trying to diagnose a failure.

The **Component Location List** helps to find where the components of a system can be located. A brief statement of the location is given and also a reference to a drawing that shows the component and its connecting wires. These **Component Location Views** are in SECTION 8A-201.

The **Harness Connector Faces** show the cavity or terminal locations in all the 4 pin or larger connectors shown in the schematic. Together with the wire colors and terminals given in the schematic, they help locate test points. The drawings show the connector faces as seen after the harness connector has been disconnected from a component or mating connector.

The **Troubleshooting Hints** offer short-cuts or checks to help determine the cause of a complaint. They are not intended to be a rigid procedure for solving an electrical situation. Rather, Troubleshooting Hints represent a common-sense approach, based on an understanding of the circuit.

The **System Check** gives a summary of how the system should be operated and what should happen. This is especially important when working on a new system. The System Check will help identify symptoms, lead to diagnosis and confirm normal operation of the system after repair.

The **System Diagnosis** provides a procedure to follow that will locate the condition in a circuit causing a malfunction. If your own knowledge of the system and the Troubleshooting Hints have not produced a quick fix, follow the System Diagnosis. All procedures are based on symptoms to assist in locating the condition as fast as possible.

The **Circuit Operation** describes the components and how the circuit works.

Harness Routing Views are found in SECTION 8A-203. These views show the routing of the major wiring harnesses and the in-line connectors between the major harnesses.

SECTION/PAGE NUMBER

Sections are organized by sub-systems with most containing a circuit schematic and the associated text. This makes the section easy to use, since the page number will stay the same year after year. For example, the Cruise Control schematic will always begin on page 8A-34-0. The other information for Cruise Control follows and is paged 8A-34-1, 8A-34-2, etc.

Some sections may have more than one circuit schematic, such as Power Distribution, Interior Lights and Air Conditioning. The circuit of interest can either be located by using the Index or by a quick look through the related section.

All the engine circuits for a particular engine VIN type are in the same section. This makes that section easy to use, since schematics for other engines are not in your way. The Instrument Panel schematics are organized similarly. If you are working on a vehicle with a Digital Cluster, only the schematics that apply to that vehicle's Digital Cluster will be in the section you use. Information on the Indicators and Gages Clusters will be in other sections.

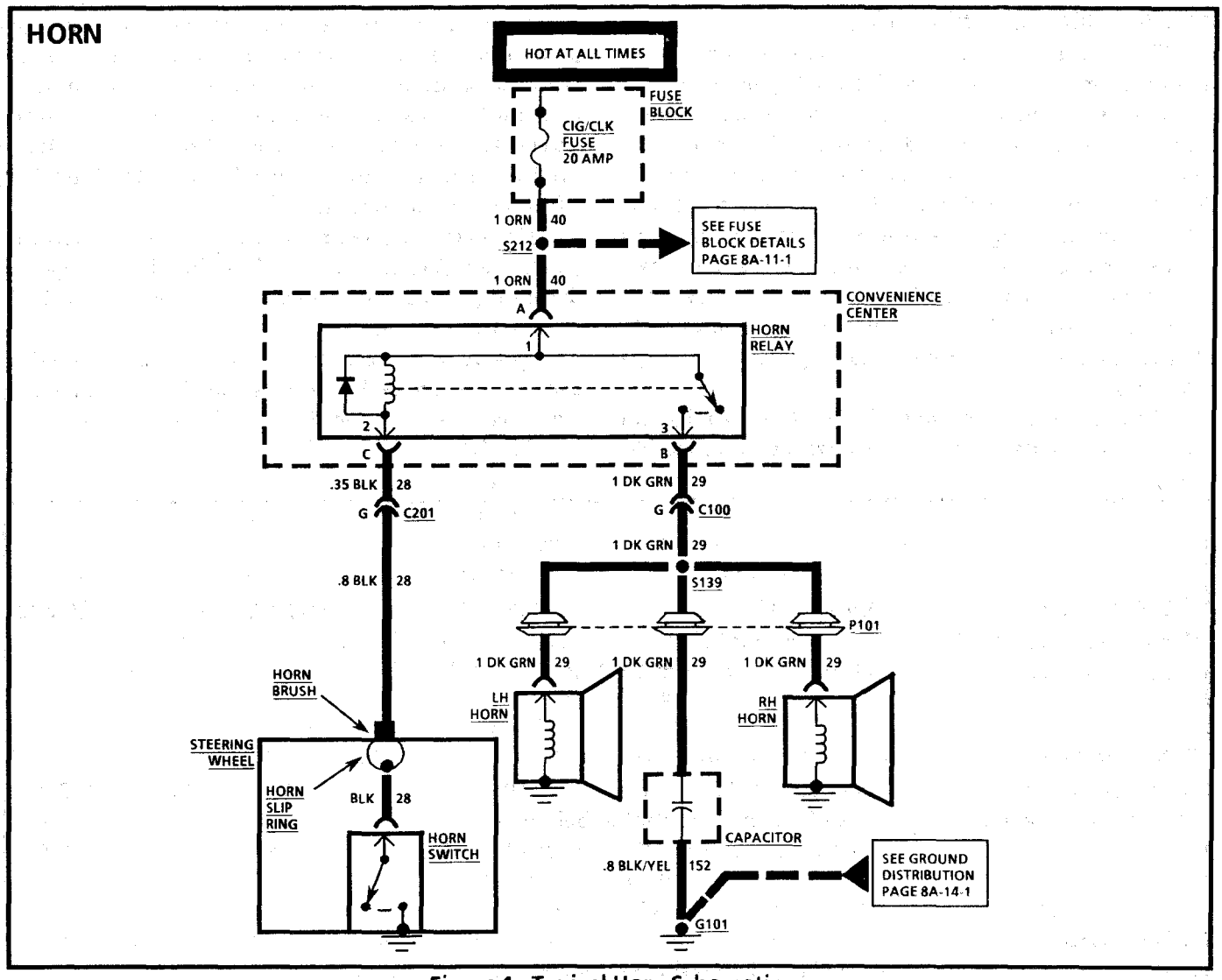


Figure 1 - Typical Horn Schematic

SCHEMATICS

Schematics break the entire electrical system down into individual circuits. Wiring which is not part of the circuit of interest is referenced to another page, where the circuit is shown complete.

Important:

- It is important to realize that no attempt is made on the schematic to represent components and wiring as they physically appear on the vehicle. For example, a 4-foot length of wire is treated no differently in a schematic from one which is only a few inches long. The number of cavities for each connector is listed in the Component Location List. Similarly, switches and other components are shown as simply as possible, with regard to function only.

When diagnosing a Horn problem, the technician would reference the Horn section. The schematic in Figure 1 is a typical example of what would be found in a Horn section of SECTION 8A, along with the following text.

Voltage is applied to the Horn Relay at all times. When the relay coil is grounded by closing the Horn Switch, the relay contacts close. When the relay contacts are closed, both the LH and RH Horns are energized.

INTRODUCTION

COMPONENT LOCATIONS

To locate the schematic components on the vehicle, use the Component Location List, see Figure 2.

Listed in the left hand column are the components, connectors, grounds and splices shown on the schematic. To the right of the component is the location, "Under RH side of I/P." Reference to LH and RH is made as though the technician was sitting in the driver's seat. On the same line, in the next two columns, are page and figure references for SECTION 8A-201, "Component Location Views." In this case, you are directed to Figure 4 on page 8A-201-1.

Where connectors are listed, the number of cavities is provided. This represents the total number of cavities in the connector, regardless of how many are actually used. This information is provided to help identify connectors on the vehicle. In the far right column is a page reference where a view of the connector face may be found. Connectors with 3 cavities or less are not included in SECTION 8A-202, "Harness Connector Faces."

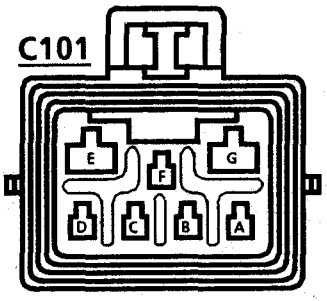
Grounds are listed next in the table. The location description for G101 reads, "Behind LH Composite Headlamp." You are directed to page 8A-201-8, Figure 14.

Nearly every component, connector, ground or splice shown on a schematic can be pinpointed visually by using the Component Location View figures.

COMPONENT	LOCATION	201-PG	FIG.	CONN
Convenience Center	Under RH side of I/P	1	4	
Fuse Block	Behind I/P Compartment Door	0	2	
CONNECTORS				
C100 (34 cavities)	Mounted to LH Hood Hinge	7	11	202-0
C210 (15 cavities)	Above Convenience Center, behind I/P Compartment	18	23	202-2
GROUNDS				
G101	Behind LH Composite Headlamp	8	14	
SPLICES				
S139	Forward Lamp Wiring Harn, behind RH Composite Headlamp	8	15	
S212	I/P Wiring Harn, behind I/P, above Steering Column	6	8	

Figure 2 - Typical Entries in the Component Location List

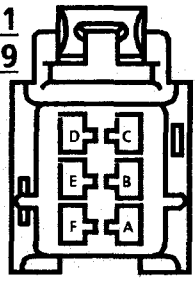
C101



12059472

7-WAY F METRI-PACK MIXED SERIES
BLK

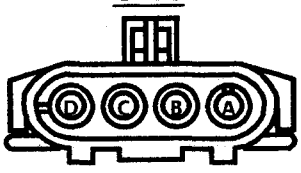
C201
C209



12064752

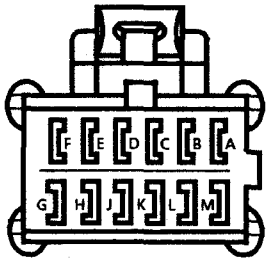
6-WAY F METRI-PACK 280 SERIES
BLK

C406



12034297

4-WAY WEATHER PACK
BLK



12065666

12-WAY PC EDGEBOARD
BLK

CRUISE CONTROL MODULE

Figure 3 - Typical Harness Connector Faces

HARNESS CONNECTOR FACES

The connectors, see Figure 3, are labeled with the component they are connected to, or the connector number. In addition the color of the connector is given along with the family/series name.

If you need to backprobe a connector while it is on the component (refer to page 8A-4-3 for probing procedures), the order of the terminals must be mentally reversed. The wire color is a help in this situation. If there is more than one wire of the same color, you may need to locate a test point from its terminal number. A useful trick is to imagine that you are probing a terminal from behind the page you are looking at. Then mentally locate that terminal with respect to the keyway or other reference mark.

INTRODUCTION

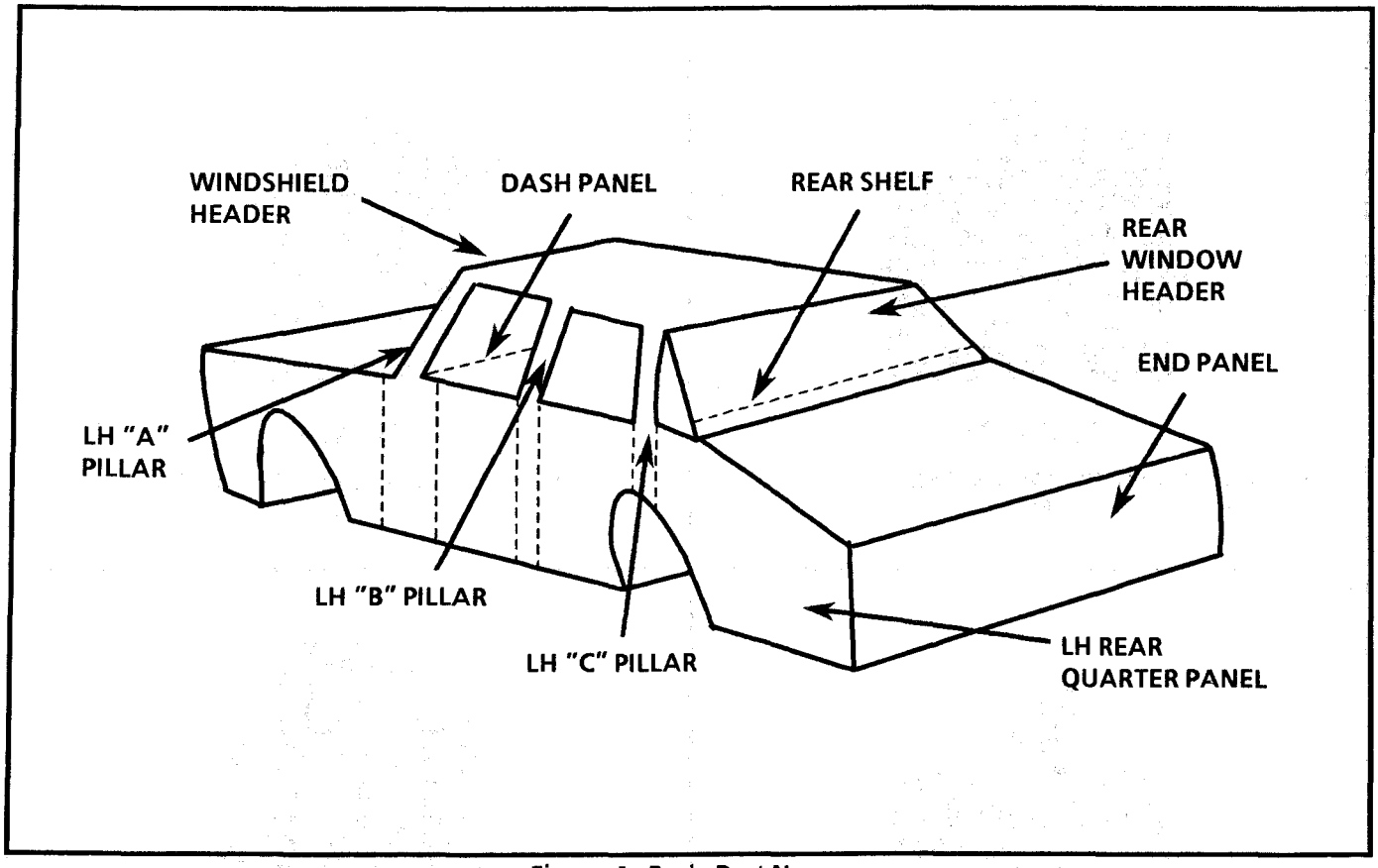


Figure 4 - Body Part Names

OTHER INFORMATION

BODY PART NAMES

Refer to Figure 4 for the correct body part names.

VIN REFERENCES

If schematics for more than one variation of an engine type – V6, for example – are shown, then the schematics will be labeled with VIN designation to distinguish the variations.

SERVICE PARTS IDENTIFICATION LABEL

To aid service and parts personnel in identifying options and parts originally installed, a Service Parts Identification Label has been placed in the vehicle. See SECTION 0A for the location of the label and the definition of the option codes.

ABBREVIATIONS

A/C	Air Conditioning
CCM	Central Control Module
CKT	Circuit
CONN	Connector
EBCM	Electronic Brake Control Module
EBTCM	Electronic Brake and Traction Control Module
ECM	Engine Control Module
HARN	Harness
I/P	Instrument Panel
LH	Left Hand
PCM	Powertrain Control Module
RH	Right Hand
TERM	Terminal

For a list of additional abbreviations, refer to SECTION 0A.

POWER DISTRIBUTION

The Power Distribution schematic shows the wiring from the Battery and Generator to the Starter Solenoid, Fuse Block, Ignition Switch and Light Switch. The first component after a Fusible Link is also shown. In certain instances, the first component after a Fuse Block fuse and Light Switch is also shown.

The Power Distribution schematic refers to Fuse Block Details or the appropriate section schematics. By using these schematics, power distribution wiring can be followed from the Battery and Generator to the first component after a Fusible Link, Fuse or Light Switch. The ability to follow the power distribution wiring to the first component in each circuit is extremely helpful in locating short circuits which cause fusible links and fuses to open.

Figure 5 is a sample Power Distribution schematic. It shows how voltage is applied from the positive battery terminal to the various circuits on the vehicle. For example, battery voltage is applied to the Starter Solenoid, Fusible Link D, Fuses 1 and 2 in the Fuse Block and the Light Switch in the LH Pod. These fuses are said to be Hot At All Times, since battery voltage is always applied to them.

Notice that battery voltage is also applied to Fusible Link F and Coolant Fan Relay.

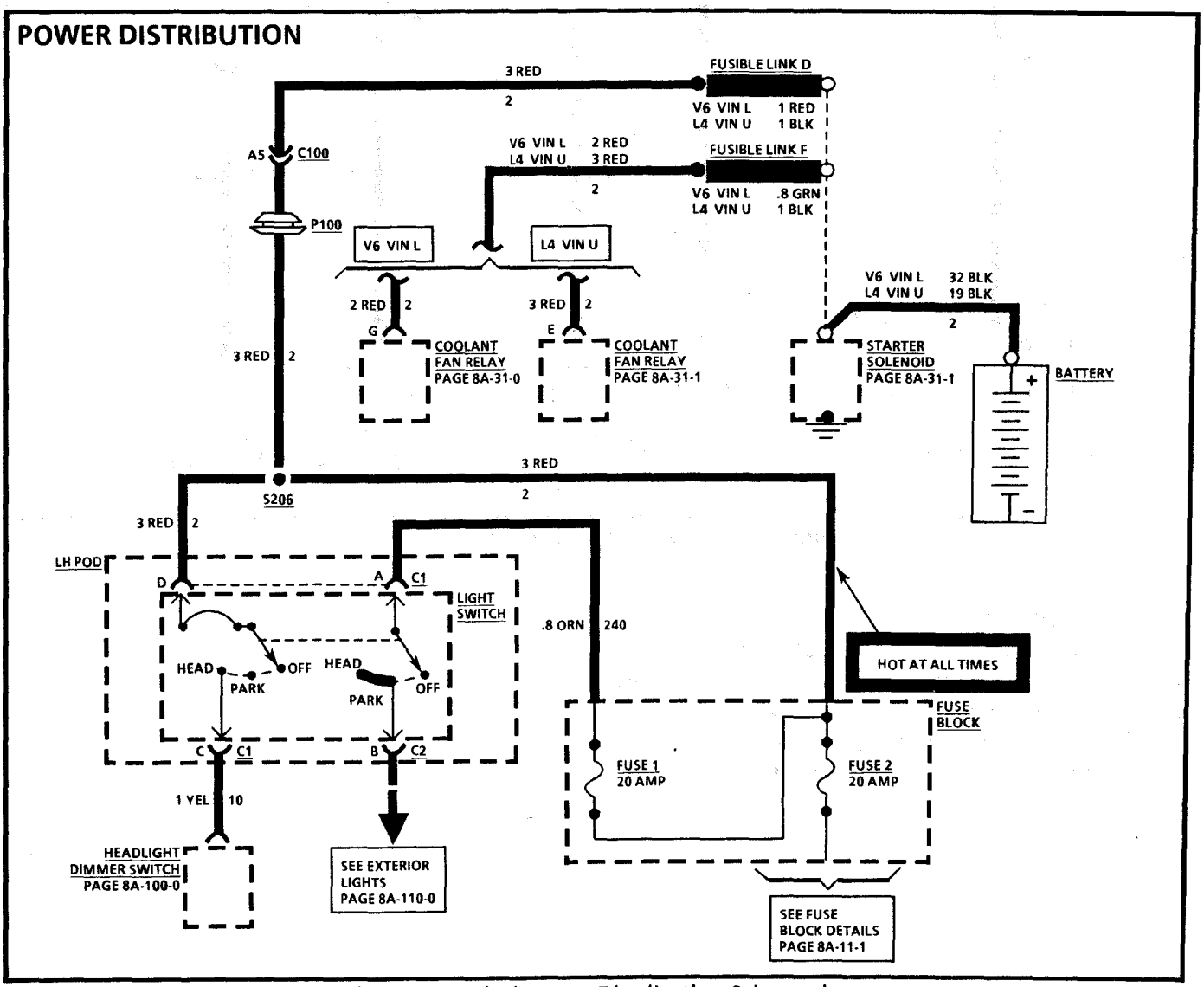


Figure 5 - Typical Power Distribution Schematic

INTRODUCTION

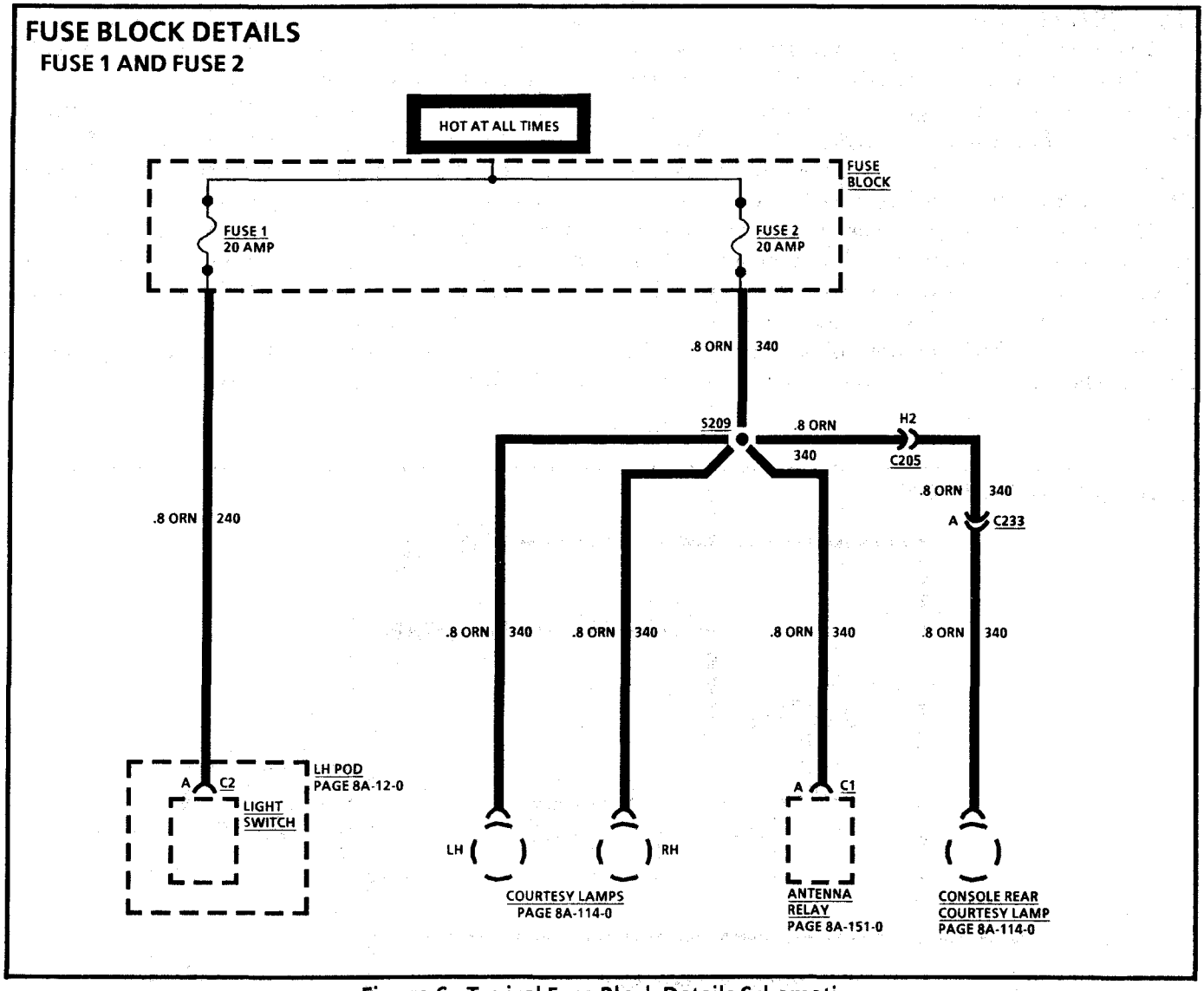


Figure 6 - Typical Fuse Block Details Schematic

FUSE BLOCK DETAILS

The Fuse Block Details schematic, see Figure 6, shows all of the wiring between a fuse and the components connected to the fuse. The Fuse Block Details schematic is extremely helpful in locating a short circuit that causes a fuse to open.

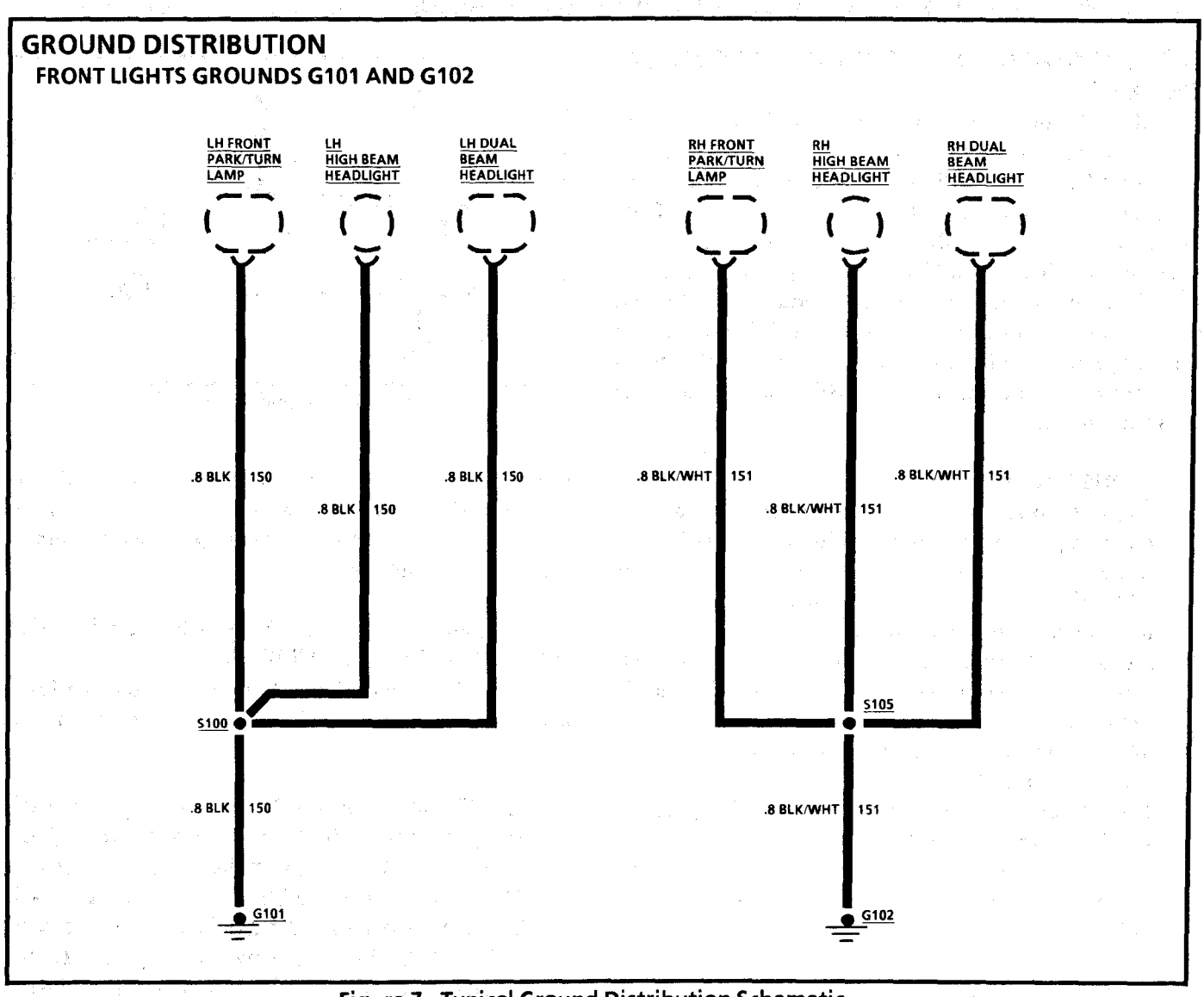


Figure 7 - Typical Ground Distribution Schematic

GROUND DISTRIBUTION

Figure 7 is a sample Ground Distribution schematic for the Headlamps. It shows exactly which components share each ground. This information can often be a time-saver when troubleshooting ground circuits.

For example, if both Headlamps and the Park/Turn Lamp on one side are out, suspect an open in their common ground wire or the ground connection itself. On the other hand, if one of the lamps work, the ground and the wire up to the splice are good. You have learned this just by inspecting the schematic and knowing the vehicle's symptoms. No actual work on the lighting system was needed.

SYMBOLS

ELECTROSTATIC DISCHARGE (ESD) AND SUPPLEMENTAL INFLATABLE RESTRAINT (SIR)

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are Solid State and the following information applies to them.

The ESD symbol (Figure 1) is used on schematics (Figure 2) to indicate which components are ESD sensitive. When handling any electronic part, the service technician should follow the guidelines below to reduce any possible electrostatic charge build-up on the service technician's body and inadvertent discharge to the electronic part. If it is not known whether or not a component is ESD sensitive, assume it is susceptible.

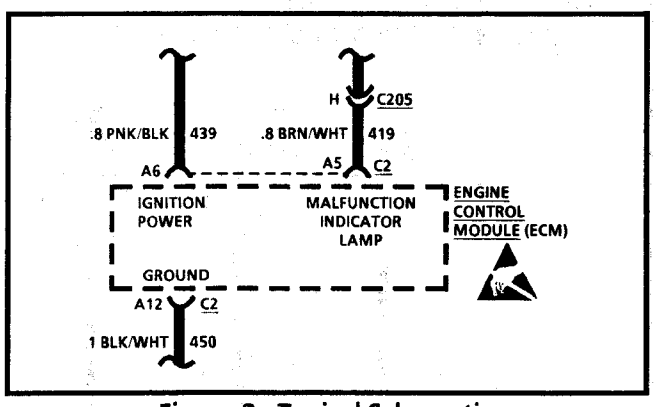


Figure 2 - Typical Schematic

HANDLING PROCEDURES

1. Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position or walking a distance.
2. Avoid touching electrical terminals of the part, unless so instructed by a written diagnostic procedure.
3. When using a voltmeter, be sure to connect the ground lead first.
4. Do not remove a part from its protective package until it is time to install the part.
5. Before removing the part from its package, ground the package to a known good ground on the vehicle.

MEASURING PROCEDURES

The circuits shown within the boxes are greatly simplified. Do not troubleshoot by measuring resistance at any terminal of these devices unless so instructed by a written diagnostic procedure. Due to the simplification of the schematics, resistance measurements could be misleading, or could lead to electrostatic discharge.

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) SYSTEM: IF EQUIPPED

The SIR symbol (Figure 3) is used on schematics to alert the technician of the following important caution:

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.

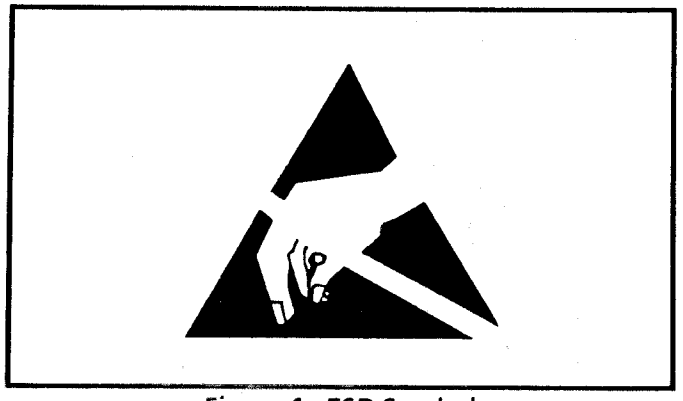


Figure 1 - ESD Symbol



Figure 3 - SIR Symbol

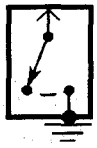
SYMBOLS



ENTIRE COMPONENT SHOWN

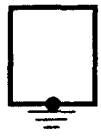


PART OF A COMPONENT SHOWN



NAME OF COMPONENT

DETAILS ABOUT COMPONENT OR ITS OPERATION

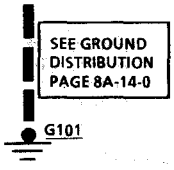


COMPONENT CASE IS DIRECTLY ATTACHED TO METAL PART OF VEHICLE (GROUNDED).



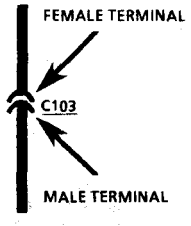
WIRE IS ATTACHED TO METAL PART OF VEHICLE (GROUNDED).

GROUND IS NUMBERED FOR REFERENCE ON COMPONENT LOCATION LIST.



WIRE IS INDIRECTLY CONNECTED TO GROUND.

WIRE MAY HAVE ONE OR MORE SPLICES OR CONNECTORS BEFORE IT IS GROUNDED.

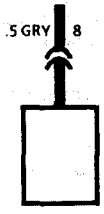


CONNECTOR REFERENCE NUMBER FOR COMPONENT LOCATION LIST

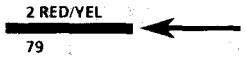
LIST ALSO SHOWS TOTAL NUMBER OF TERMINALS POSSIBLE. C103 (6 CAVITIES)



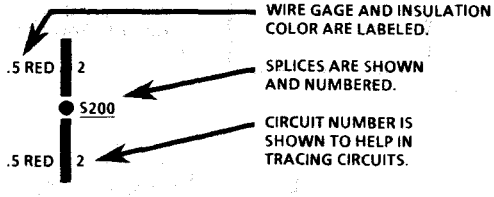
CONNECTOR ATTACHED TO COMPONENT



CONNECTOR ON COMPONENT LEAD (PIGTAIL)



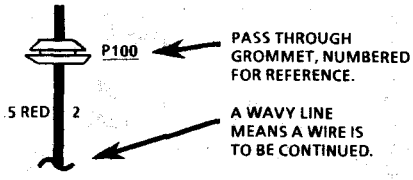
WIRE INSULATION IS RED WITH A YELLOW STRIPE.



WIRE GAGE AND INSULATION COLOR ARE LABELED.

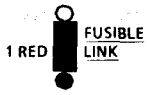
SPLICES ARE SHOWN AND NUMBERED.

CIRCUIT NUMBER IS SHOWN TO HELP IN TRACING CIRCUITS.



PASS THROUGH GROMMET, NUMBERED FOR REFERENCE.

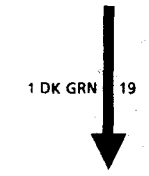
A WAVY LINE MEANS A WIRE IS TO BE CONTINUED.



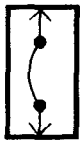
FUSIBLE LINK SIZE AND INSULATION COLOR ARE LABELED.



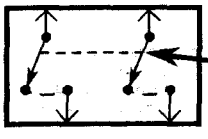
CURRENT PATH IS CONTINUED AS LABELED. THE ARROW SHOWS THE DIRECTION OF CURRENT FLOW AND IS REPEATED WHERE CURRENT PATH CONTINUES.



A WIRE WHICH CONNECTS TO ANOTHER CIRCUIT. THE WIRE IS SHOWN AGAIN ON THAT CIRCUIT.



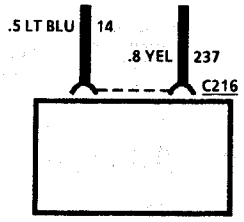
CIRCUIT BREAKER



SWITCH CONTACTS THAT MOVE TOGETHER

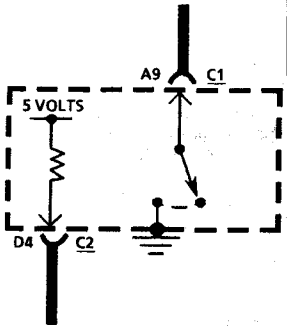
DASHED LINE SHOWS A MECHANICAL CONNECTION BETWEEN SWITCH CONTACTS.

SYMBOLS



TWO TERMINALS IN THE SAME CONNECTOR

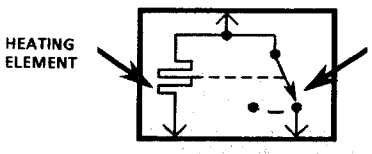
DASHED LINE SHOWS A PHYSICAL CONNECTION BETWEEN PARTS (SAME CONNECTOR).

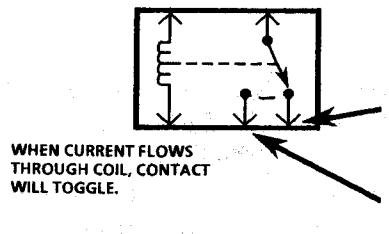


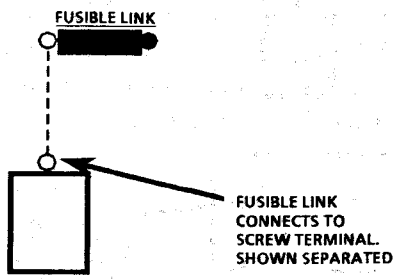
ECM CONNECTOR IDENTIFICATION
C1 - BLACK - 32 WAY
C2 - BLACK - 24 WAY

ENGINE CONTROL MODULE (ECM)

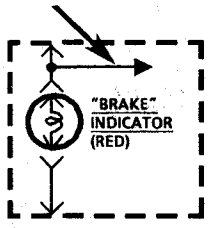
ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES ARE IDENTIFIED. REFER TO PAGE 8A-3-0 FOR HANDLING AND MEASURING PROCEDURES.



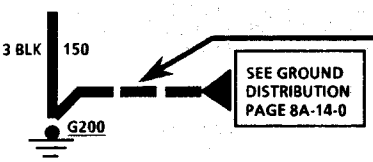




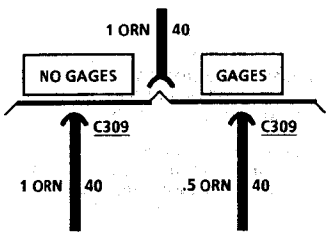
INDICATES THIS CIRCUIT CONTINUES WITHIN DEVICE; I.E., OTHER BULBS



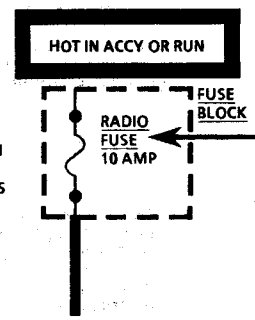
AN INDICATOR WHICH DISPLAYS THE LIGHTED WORD "BRAKE"



INDICATES THAT THE CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL BUT IS COMPLETE ON THE INDICATED PAGE



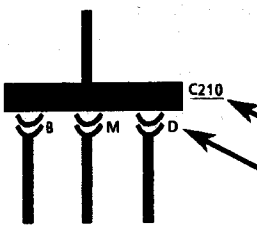
WIRE CHOICES FOR OPTIONS OR DIFFERENT MODELS ARE SHOWN AND LABELED.



LABEL OF FUSE BLOCK CONNECTOR CAVITY



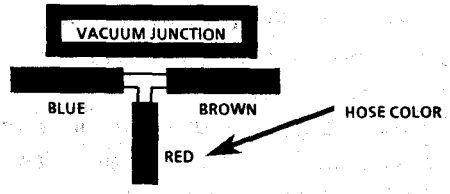
DIODE
ALLOWS CURRENT TO FLOW IN ONE DIRECTION ONLY

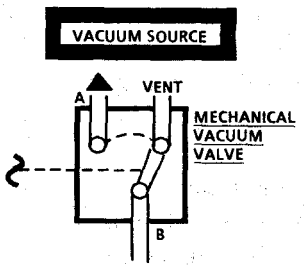


3 CONNECTORS ARE SHOWN CONNECTED TOGETHER AT A JUNCTION BLOCK. FOURTH WIRE IS SOLDERED TO COMMON CONNECTION ON BLOCK.

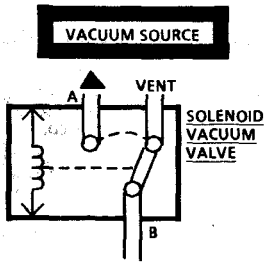
NUMBER FOR TOTAL CONNECTOR

LETTERS FOR EACH CONNECTOR TERMINAL





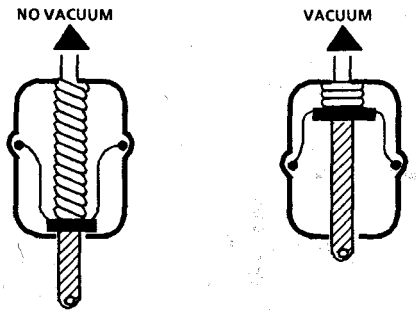
IN THE "AT REST" POSITION SHOWN, THE VALVE DOES THE FOLLOWING:
PORT A IS SEALED.
PORT B IS VENTED TO THE ATMOSPHERE.



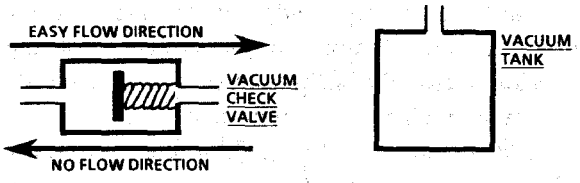
WHEN THE VALVE IS MOVED TO THE "OPERATED" POSITION, VACUUM FROM PORT A IS CONNECTED TO PORT B.

THE SOLENOID VACUUM VALVE USES THE SOLENOID TO MOVE THE VALVE.

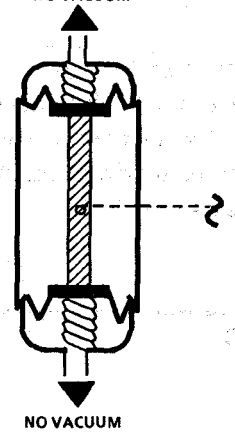
SINGLE DIAPHRAGM MOTOR



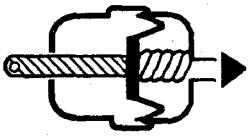
Vacuum Motors operate like electrical solenoids, mechanically pushing or pulling a shaft between two fixed positions. When vacuum is applied, the shaft is pulled in. When no vacuum is applied, the shaft is pushed all the way out by a spring.



DOUBLE DIAPHRAGM MOTOR
NO VACUUM



SERVO MOTOR



Double Diaphragm Motors can be operated by vacuum in two directions. When there is no vacuum, the motor is in the center "at rest" position.

Some Vacuum Motors such as the Servo Motor in the Cruise Control can position the actuating arm at any position between fully extended and fully retracted. The servo is operated by a control valve that applies varying amounts of vacuum to the motor. The higher the vacuum level, the greater the retraction of the motor arm. Servo Motors work like the two position motors; the only difference is in the way the vacuum is applied. Servo Motors are generally larger and provide a calibrated control.

TROUBLESHOOTING PROCEDURES

BASIC KNOWLEDGE REQUIRED

Without a basic knowledge of electricity, it will be difficult to use the diagnostic procedures contained in this section. You should understand the basic theory of electricity and know the meaning of voltage, current (amps) and resistance (ohms). You should understand what happens in a circuit with an open or a shorted wire. You should be able to read and understand a wiring diagram.

The following four-step troubleshooting procedure is recommended:

Step 1: Check the Problem

Perform a System Check to determine a symptom. Don't waste time fixing part of the problem! Do not begin disassembly or testing until you have narrowed down the possible causes.

Step 2: Read the Electrical Schematic

Study the schematic. Read the Circuit Operation text if you do not understand how the circuit should work. Check circuits that share wiring with the problem circuit. (Shared circuits are shown on Power Distribution, Ground Distribution, Fuse Block Details and Light Switch Details pages.) Try to operate the shared circuits. If the shared circuits work, then the shared wiring is OK. The cause must be within the wiring used only by the problem circuit. If several circuits fail at the same time, chances are the power (fuse) or ground circuit is faulty.

Step 3: Find the fault and repair

- Narrow down the possible causes.
- Use the Troubleshooting Hints.
- Make the necessary measurements or checks as given in the System Diagnosis.

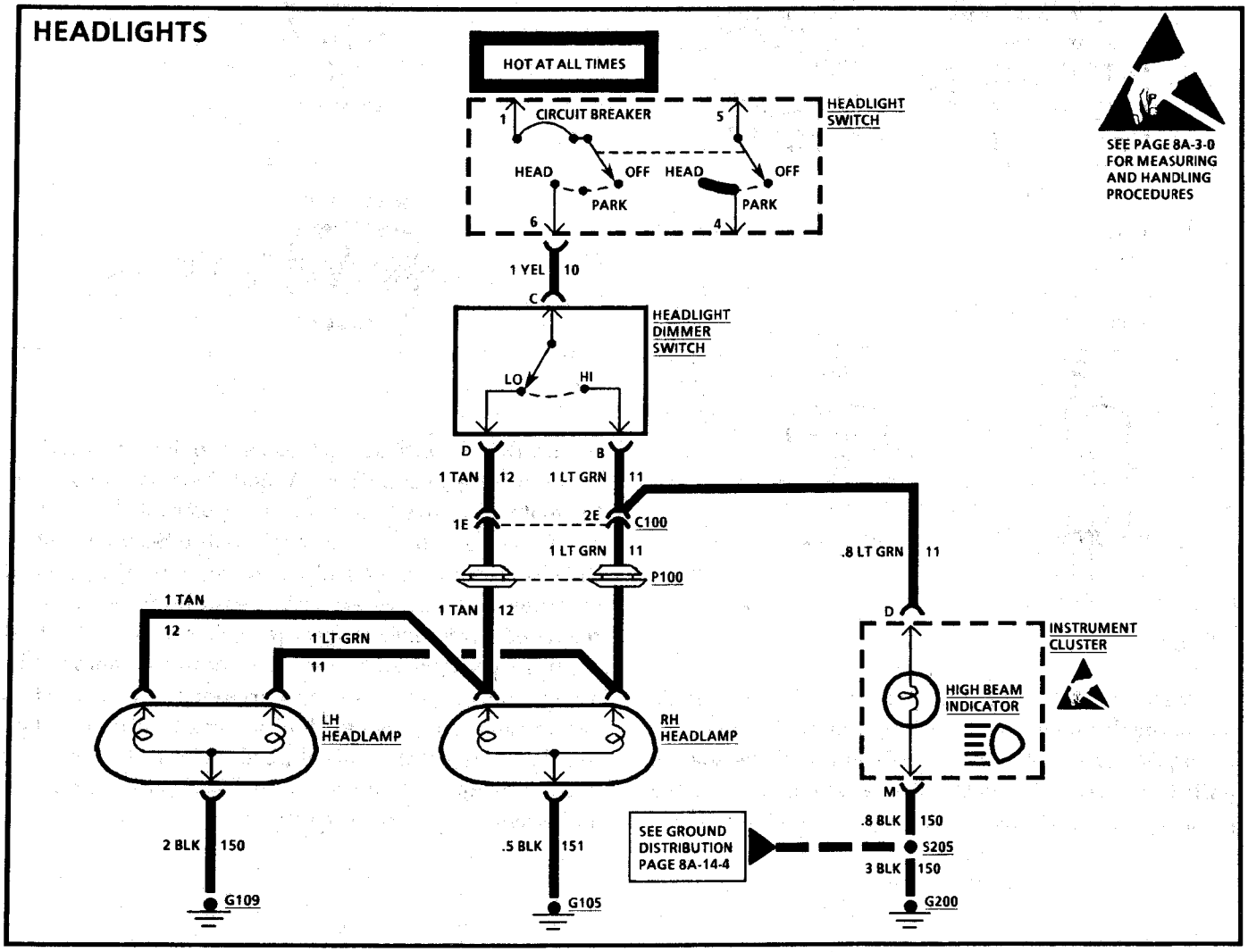


Figure 1 - Typical Headlights Schematic

- Before replacing a component, check power, signal and ground wires at the component harness connector. If the checks and connections are OK, the most probable cause is component failure.

Step 4: Test the Repair

Repeat the System Check to verify the fault has been corrected and that no other faults were induced during the repair.

Example:

A customer brings in a vehicle and says that the HI beams do not work.

Step 1: Perform a System Check on the Headlight Circuit. You may discover that both LO beams operate. In "HI," you may notice that the HI Beam Indicator comes on, but neither HI beam operates.

Step 2: Read the Headlights Electrical Schematic, see Figure 1. This is the step that will save time and labor. Remember, it is essential to understand how a circuit should work, before trying to figure out why it doesn't.

After you understand how the circuit should operate, read the schematic again, this time keeping in mind what you have learned by operating the circuit.

Since both LO beams work, you know that the Headlight Switch, the YEL wire, the LO contacts of the Headlight Dimmer Switch, terminal "1E" of C100, the TAN wires and grounds G105 and G109 are all good.

Furthermore, since you saw that the HI Beam Indicator came on when the Headlight Dimmer Switch was moved to "HI," you know that the HI contacts of the Headlight Dimmer Switch and the LT GRN wire between the Headlight Dimmer Switch and C100 are good.

At this point, you could test for voltage at the RH Headlamp with the Headlight Dimmer Switch in "HI." However, it is extremely unlikely that the HI beam filaments have burned out in both headlamps, or that both headlamps connections are bad. The cause must be a bad connection at C100, or a break in the LT GRN wire between C100 and the RH Headlamp.

You have quickly narrowed the possible causes down to one specific area, and have *done* absolutely *no* work on the vehicle itself.

Step 3: Find the fault and repair it. Using the Component Location List and the corresponding figure, you can quickly find C100 and the LT GRN wire, locate the exact trouble point and make the repair.

Step 4: Check the repair by performing a System Check on the Headlights Circuit. This, of course, means making sure that both HI beams, both LO beams and the HI Beam Indicator are all working.

Now suppose that the symptoms were different. You may have operated the Headlamps and found that the LO beams were working, but neither the HI beams nor the HI Beam Indicator were working. Looking at the schematic, you might conclude that it is unlikely that both HI beam filaments and the HI Beam Indicator have all burned out at once. The cause is probably the Headlight Dimmer Switch or its connector.

TROUBLESHOOTING TOOLS

Electrical troubleshooting requires the use of common electrical test equipment.

TEST LIGHT/DIGITAL VOLTMETER

Use a test light to check for voltage. A Test Light (J 34142-B) is made up of a 12 volt light bulb with a pair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. When the bulb goes on, there is voltage at the point being tested.

A DVM can be used instead of a test light. While a test light shows whether or not voltage is present, a DVM indicates how much voltage is present.

An increasing number of circuits include solid state control modules. One example is the Engine Control Module (ECM). Voltages in these circuits should be tested only with a 10-megohm or higher impedance DVM or multimeter (J 39200). Unless directed to within the diagnostics, never use a test light on circuits that contain solid state components, since damage to these components may result.

TROUBLESHOOTING PROCEDURES

When testing for voltage or continuity at the connection, it is not necessary to separate the two halves of the connector. Unless testing a Weather Pack® connector, always probe the connector from the back. Always check both sides of the connector. An accumulation of dirt and corrosion between contact surfaces is sometimes a cause of electrical problems. A terminal contact checking procedure can be found on page 8A-4-6.

CONNECTOR TEST ADAPTERS

Connector Test Adapter Kit (J 35616-A) is available for making tests and measurements at separated connectors. This kit contains an assortment of probes which mate with many of the types of terminals you will see. Avoid using paper clips and other substitutes since they can damage terminals and cause incorrect measurements.

SELF-POWERED TEST LIGHT

A self-powered test light (J 21008-A) can be used to check for continuity. This tool is made up of a light bulb, Battery and two leads. If the leads are touched together, the bulb will go on.

A self-powered test light is used only on an unpowered circuit. First remove the fuse which feeds the circuit you're working on. Select two specific points along the circuit through which there should be continuity. Connect one lead of the self-powered test light to each point. If there is continuity, the test light circuit will be completed and the bulb will go on.

Never use a self-powered test light on circuits that contain solid state components, since damage to these components may result.

OHMMETER

An ohmmeter can be used instead of a self-powered test light. The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

Circuits which include any solid state control modules, such as the Engine Control Module (ECM), should be tested only with a 10-megohm or higher impedance digital multimeter (J 39200).

When measuring resistance with a DVM, the vehicle Battery should be disconnected. This will prevent incorrect readings. DVMs apply such a small voltage to measure resistance that the presence of voltages can upset a resistance reading.

Diodes and solid state components in a circuit can cause an ohmmeter to give a false reading. To find out if a component is affecting a measurement, take a reading once, reverse the leads and take a second reading. If the readings differ, the solid state component is affecting the measurement.

FUSED JUMPER WIRE

A fused jumper (J 36169) is available with small clamp connectors providing adaptation to most connectors without damage. This fused jumper wire is supplied with a 20 amp fuse which may not be suitable for some circuits. Do not use a fuse with a higher rating than the fuse that protects the circuit being tested.

NOTICE: A fused jumper may not protect solid state components from being damaged.

SHORT FINDER

Short Finders (J 8681-A) are available to locate hidden shorts to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

FUSE TESTER

A simple tester (J 34764) can detect a blown fuse. To check a fuse, the tester is applied directly to the fuse in the Fuse Block. Two probes contact the fuse, either into the slots of a flat fuse or to the metal ends of a glass fuse. With power on, a red LED in the tester lights if the fuse is open. The handle of the tester is a tool for removing either type of fuse.

TROUBLESHOOTING TESTS

Always check for aftermarket accessories (non OEM) as the first step in diagnosing electrical problems. If the vehicle is so equipped, disconnect the system to verify that these add-on accessories are not the cause of the problems.

Some possible causes of vehicle problems related to aftermarket accessories include:

1. Power feeds connected to points other than the Battery.
2. Antenna location.
3. Transceiver wiring located too close to vehicle electronic modules or wiring.
4. Poor shielding or poor connectors on antenna feedline.

Refer to 1990/1991 model year bulletin entitled, "Installation Guidelines for Aftermarket Accessories" for specific information.

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.

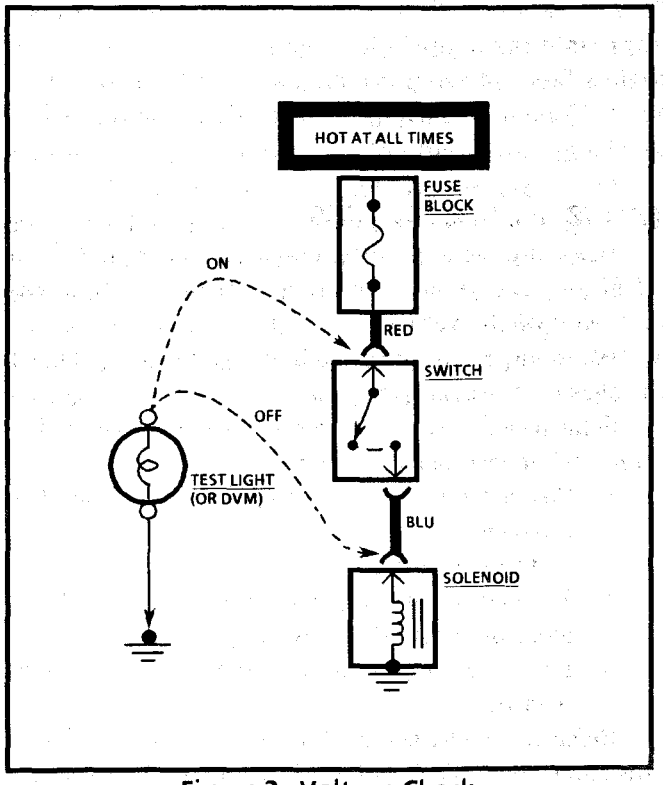


Figure 2 - Voltage Check

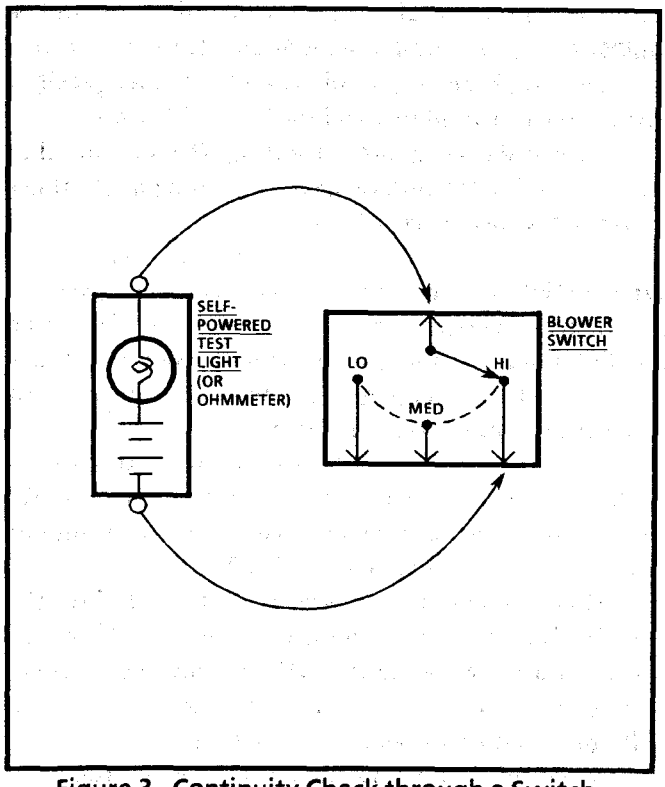


Figure 3 - Continuity Check through a Switch

TROUBLESHOOTING PROCEDURES

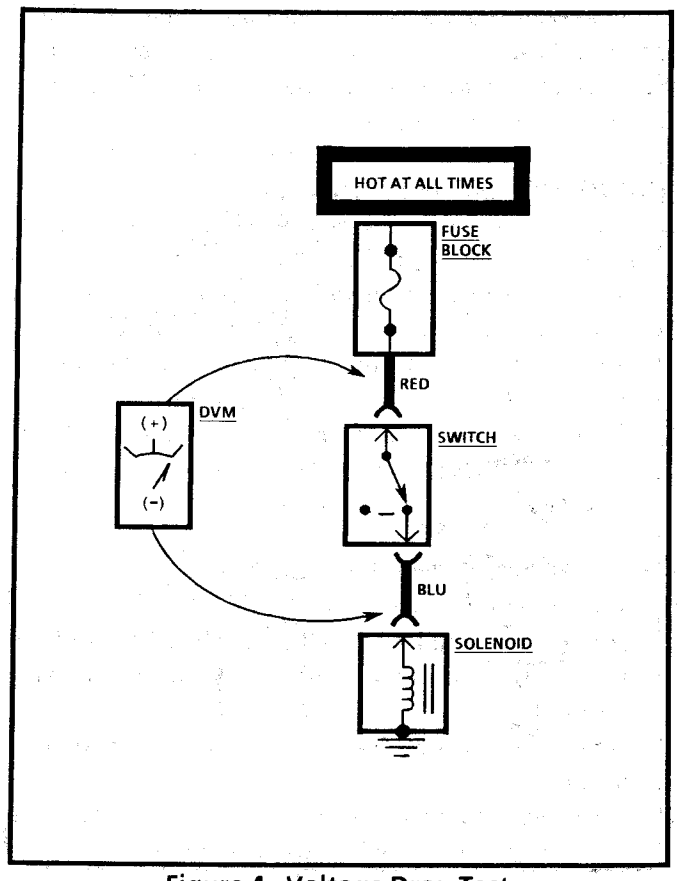


Figure 4 - Voltage Drop Test

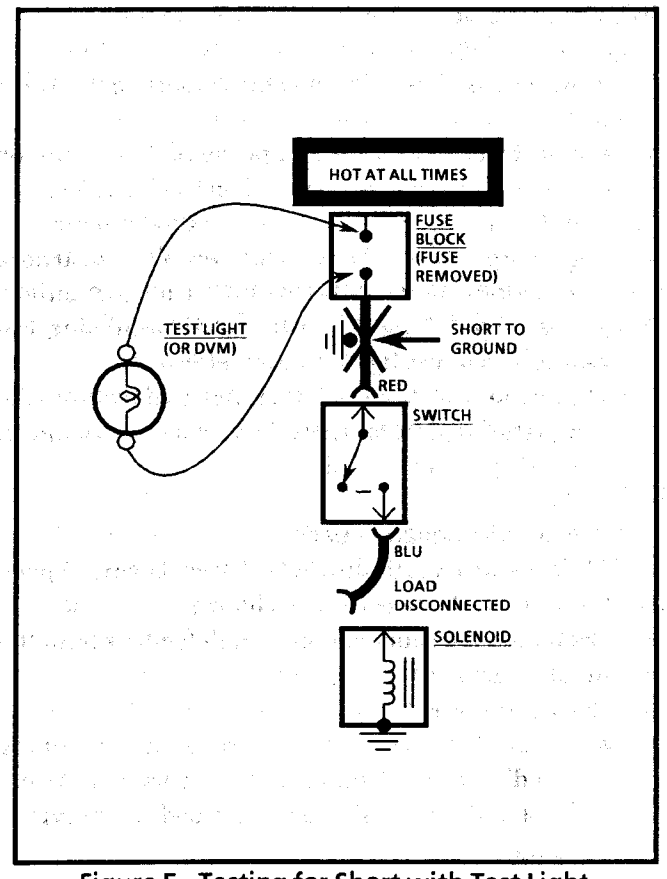


Figure 5 - Testing for Short with Test Light or DVM

TESTING FOR VOLTAGE DROP (Figure 4)

This test checks for voltage being lost along a wire, or through a connection or switch.

1. Connect the positive lead of a DVM to the end of the wire (or to one side of the connection or switch) which is closer to the Battery.
2. Connect the negative lead to the other end of the wire (or the other side of the connection or switch).
3. Operate the circuit.
4. The DVM will show the difference in voltage between the two points.

TESTING FOR SHORT TO GROUND With a Test Light or DVM (Figure 5)

1. Remove the blown fuse and disconnect the load.
2. Connect a test light or voltmeter across the fuse terminals (be sure that the fuse is powered).
3. Beginning near the Fuse Block, wiggle the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the test light or DVM.
4. When the test light glows, or the DVM registers, there is a short to ground in the wiring near that point.

With a Self-Powered Test Light or Ohmmeter (Figure 6)

1. Remove the blown fuse and disconnect the Battery and load.
2. Connect one lead of a self-powered test light or ohmmeter to the fuse terminal on the load side.
3. Connect the other lead to a known good ground.
4. Beginning near the Fuse Block, wiggle the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the self-powered test light or ohmmeter.
5. When the self-powered test light glows, or the ohmmeter registers, there is a short to ground in the wiring near that point.

Fuses Powering Several Loads

1. Find the schematic in "Fuse Block Details," page 8A-11-0 for the fuse that has blown.
2. Open the first connector or switch leading from the fuse to each load.
3. Replace the fuse.
   - If the fuse blows, the short is in the wiring leading to the first connector or switch. Use a test light or meter as described on previous page.
   - If fuse does not blow, refer to next step.
4. Close each connector or switch until the fuse blows in order to find which circuit has the short. Connect test lamp or meter at the connector to the suspect circuit (disconnected) rather than at the fuse terminals.

JUMP STARTING PROCEDURE

Refer to SECTION 6D-1 for jump starting procedure.

INTERMITTENTS AND POOR CONNECTIONS

Most intermittents are caused by faulty electrical connections or wiring, although occasionally a sticking relay or solenoid can be a problem. Some items to check are:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.

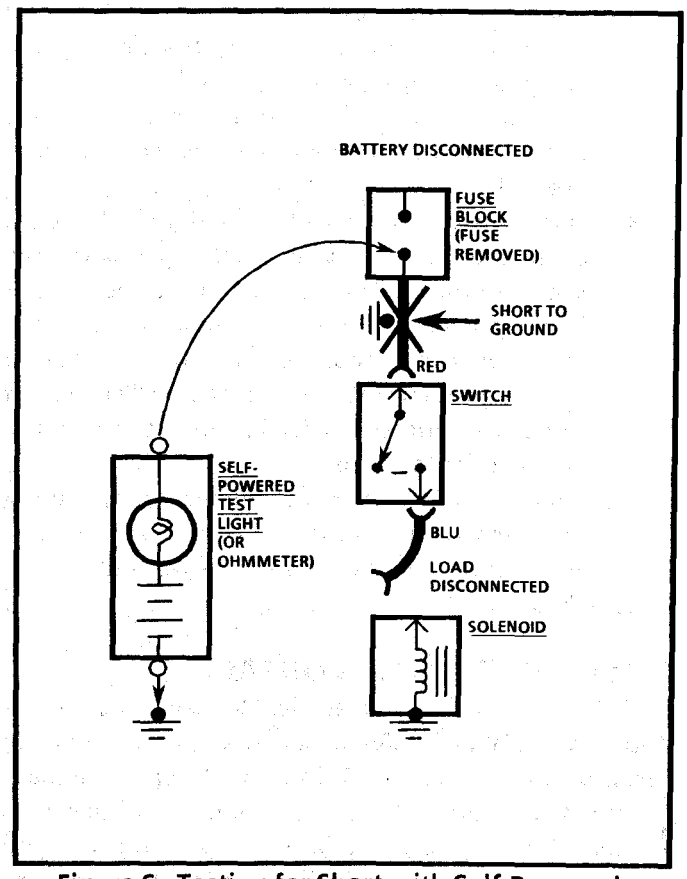


Figure 6 - Testing for Short with Self-Powered Test Light or Ohmmeter

- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals. All connector terminals in problem circuits should be checked carefully to ensure good contact tension. Use a corresponding mating terminal to check for proper tension. Refer to "Checking Terminal Contact" in this section for the specific procedure.
- The J 35616-A Connector Test Adapter Kit must be used whenever a diagnostic procedure requests checking or probing a terminal. Using the adapter will ensure that no damage to the terminal will occur, as well as giving an idea of whether contact tension is sufficient. If contact tension seems incorrect, refer to "Checking Terminal Contact" in this section for specifics.

TROUBLESHOOTING PROCEDURES

- Poor terminal-to-wire connection. Some conditions which fall under this description are poor crimps, poor solder joints, crimping over wire insulation rather than the wire itself, corrosion in the wire-to-terminal contact area, etc.
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.

To avoid any of the above problems when making wiring or terminal repairs, always follow the instructions for wiring and terminal repair outlined in SECTION 8A-5.

CHECKING TERMINAL CONTACT

When diagnosing an electrical system that utilizes Metri-Pack 150/280/480/630 series terminals (refer to Terminal Repair Kit, J 38125-A, instruction manual, J 38125-4 for terminal identification), it is important to check terminal contact between a connector and component, or between in-line connectors, before replacing a suspect component.

Frequently, a diagnostic chart leads to a step that reads: "Check for poor connection." Mating terminals must be inspected to assure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

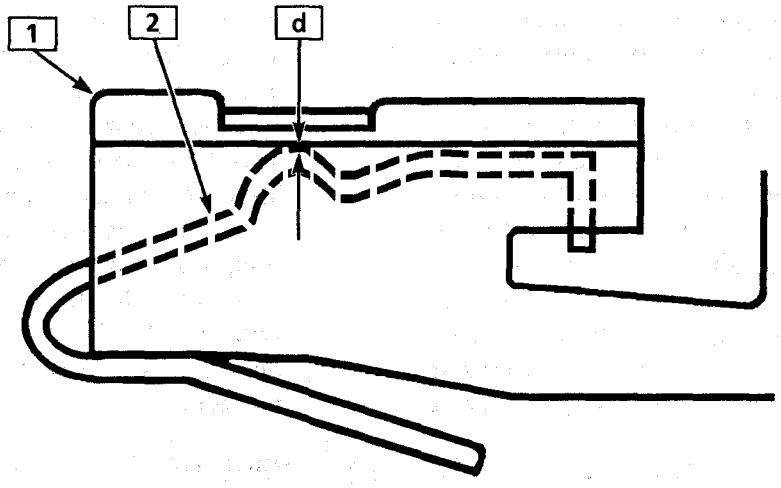
Contamination is caused by the connector halves being improperly connected, a missing or damaged connector seal, or damage to the connector itself, exposing the terminals to moisture and dirt. Contamination, usually in underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter, improperly joining the connector halves or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact, see figure 7, causing an open or intermittently open circuit.

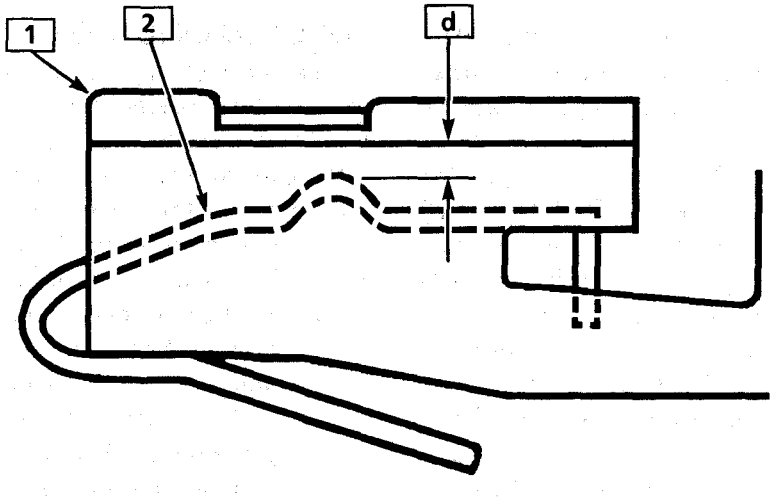
Follow the procedure below to check terminal contact.

1. Separate the connector halves. Refer to Terminal Repair Kit, J 38125-A, instruction manual, J 38125-4.
2. Inspect the connector halves for contamination. Contamination will result in a white or green build-up within the connector body or between terminals, causing high terminal resistance, intermittent contact or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals and connector body.
3. Using an equivalent male terminal from the Terminal Repair Kit, J 38125-A, check the retention force of the female terminal in question by inserting and removing the male terminal to the female terminal in the connector body. Good terminal contact will require a certain amount of force to separate the terminals.
4. Using an equivalent female terminal from the Terminal Repair Kit, J 38125-A, compare the retention force of this terminal to the female terminal in question by joining and separating the male terminal to the good female terminal, and then joining and separating the male terminal to the female terminal in question. If the retention force is significantly different between the two female terminals, replace the female terminal in question, refer to Terminal Repair Kit, J 38125-A.

If a visual (physical) check does not reveal the cause of the problem, the vehicle may be able to be driven with a DVM connected to the suspected circuit. An abnormal voltage reading when the problem occurs indicates the problem may be in that circuit.



d ABOUT EQUAL TO 0, GOOD TERMINAL CONTACT



d MUCH GREATER THAN 0, POOR TERMINAL CONTACT

1 TYPICAL METRI-PACK 150/280/480/630 SERIES FEMALE TERMINAL (150 SERIES PUSH-TO-SEAT SHOWN)

2 CONTACT TANG

d AMOUNT OF DEFORMATION

Figure 7 - Deformation of a Typical Metri-Pack 150/280/480/630 Series Female Terminal

TROUBLESHOOTING PROCEDURES

DETECTING ELECTRICAL INTERMITTENTS

Use the following procedure to detect intermittent terminal contact or a broken wire with an intermittent connection inside the insulation.

The J 39200 Digital Multimeter has the ability to monitor current, resistance, or voltage while recording the minimum (MIN) and maximum (MAX) values measured. The meter can also be set to display the average (AVG) value measured.

When diagnosing circuits that have voltage applied, use the voltage setting to monitor a connector (or length of a circuit) which is suspected of having an intermittent connection but is currently operating normally.

1. Connect the J 39200 Digital Multimeter to both sides of a suspect connector (still connected) or from one end of a suspect circuit to the other. This will continuously monitor the terminal contacts or length of wire being checked. See "Meter Connections" for examples of the various methods for connecting the meter to the circuit.
2. Set the meter for voltage. Since the "MIN MAX" mode does not use auto ranging, manually select the voltage range necessary before proceeding.
3. Press the "MIN MAX" button. The meter should read "100 ms RECORD" (100 millisecond record) and emit a 1/4 second beep. The meter is now ready to record and will generate an audible tone for any change in voltage. At this point, you may wish to press the "PEAK MIN MAX" button, which will record any voltage variations that occur for at least 1 millisecond.
4. Try to simulate the condition that is potentially causing an intermittent connection, either by wiggling connections or wiring, test driving or performing other operations. If an open or resistance is created, a voltage will be present and the meter will emit a tone for as long as the open or resistance exists. Any change in voltage will cause the meter to emit a tone for no less than 1/4 second. (Listening for a tone while manipulating wiring is very helpful for narrowing in on an intermittent connection.)

   Use the MIN and MAX values when the meter is out of sight or sound range, in noisy areas or for test driving when it may not be possible to monitor the meter.

   To check the MIN and MAX recorded voltages press "MIN MAX" once for MAX and twice for MIN. A variation between MIN and MAX recorded voltages (unless nearly 0 volts) suggests an intermittent open or resistance exists and should be repaired as necessary. Refer to SECTION 8A-5 of any current GM Service Manual for approved repair procedures.

Important:

- The "100 ms RECORD" (100 millisecond record) mode is NOT the amount of time allowed to perform a specific procedure. It is the amount of time used to record each snapshot of information used for calculating "AVG" when in the "MIN MAX" mode.

METER CONNECTIONS

The previous diagnostic procedure was written to detect intermittents using the meter set to voltage. Whether using the current, voltage or resistance setting to detect intermittents, it is necessary to connect the meter to the circuit.

Following are examples of the various methods of connecting the meter to the circuit to be checked:

- Backprobe both ends of the connector and either hold the leads in place while manipulating the connector or tape the leads to the harness for continuous monitoring while performing other operations or test driving. (Do not backprobe "Weather Pack" type connectors.)
- Disconnect the harness at both ends of the suspect circuit where it connects either to a component or to other harnesses.
- Use Connector Test Adapter Kit J 35616-A to connect the meter to the circuit.
- If the system being diagnosed has a specified pinout or breakout box, it may be used to simplify connecting the meter to the circuit or for checking multiple circuits quickly.

ADDITIONAL INFORMATION

NOTICE: Turn off power to the test circuit before attempting in-circuit resistance measurements to prevent false readings or damage to the meter. Do not use the meter to measure resistance through a solid state module.

Continuity tests that work well for detecting intermittent shorts to ground can be performed by setting the meter to ohms then pressing the "PEAK MIN MAX" button. An audible tone will be heard whenever the meter detects continuity for at least 1 millisecond.

The J 39200 Instruction Manual is a good source of information and should be read thoroughly upon receipt of the meter as well as kept on hand for reference during new procedures.

REPAIR PROCEDURES

ELECTRICAL REPAIRS

This section provides instruction in the following repairs:

- Circuit Protection
- Typical Electrical Repairs
- Splicing Copper Wire
- Splicing Twisted/Shielded Cable
- Repairing Connectors (Except Weather Pack®)
- Repairing Weather Pack® (Environmental) Connectors
- Terminal Repair

After any electrical repair is made, always test the circuit afterwards by operating the devices in the circuit. This confirms not only that the repair is correct, but also, that it was the cause of the complaint.

CIRCUIT PROTECTION

The purpose of circuit protection is to protect the wiring assembly during normal and overload conditions. An overload is defined as a current requirement that is higher than normal. This overload could be caused by a short circuit or system malfunction. The short circuit could be the result of a pinched or cut wire or an internal device short circuit, such as an electronic module failure.

The circuit protection device is only applied to protect the wiring assembly, and not the electrical load at the end of the assembly. For example, if an electronic component short circuits, the circuit protection device will assure a minimal amount of damage to the wiring assembly. However, it will not necessarily prevent damage to the component.

CIRCUIT PROTECTION DEVICES

There are three basic types of circuit protection devices: Circuit Breaker, Fuse and Fusible Link.

CIRCUIT BREAKERS

A circuit breaker is a protective device designed to open the circuit when a current load is in excess of rated breaker capacity. If there is a short or other type of overload condition in the circuit, the excessive current will open the circuit between the circuit breaker terminals. There are two basic types of circuit breakers used in GM vehicles: cycling and non-cycling.

CYCLING CIRCUIT BREAKER

The cycling breaker will open due to heat generated when excessive current passes through it for a period of time. Once the circuit breaker cools, it will close again after a few seconds. If the cause of the high current is still present it will open again. It will continue to cycle open and closed until the condition causing the high current is removed.

NON-CYCLING CIRCUIT BREAKER

There are two types of non-cycling circuit breakers. One type is mechanical and is nearly the same as a cycling breaker. The difference is a small heater wire within the non-cycling circuit breaker. This wire provides enough heat to keep the bimetallic element open until the current source is removed.

The other type is solid state, called out in this section as Electronic Circuit Breaker (ECB). This device has a Positive Temperature Coefficient. It increases its resistance greatly when excessive current passes through it. The excessive current heats the ECB. As it heats, its resistance increases, therefore having a Positive Temperature Coefficient. Eventually the resistance gets so high that the circuit is effectively open. The ECB will not reset until the circuit is opened, removing voltage from its terminals. Once voltage is removed, the circuit breaker will re-close within a second or two.

FUSES

The most common method of automotive wiring circuit protection is the fuse (Figure 1). A fuse is a device that, by the melting of its element, opens an electrical circuit when the current exceeds a given level for a sufficient time. The action is non-reversible and the fuse must be replaced each time a circuit is overloaded or after a malfunction is repaired.

Fuses are color coded. The standardized color identification and ratings are shown in Figure 2. For service replacement, non-color coded fuses of the same respective current rating can be used.

Examine a suspect fuse for a break in the element. If the element is broken or melted, replace the fuse with one of equal current rating.

There are additional specific circuits with in-line fuses. These fuses are located within the individual wiring harness and will appear to be an open circuit if blown.

AUTOFUSE

The Autofuse, normally referred to simply as "Fuse," is the most common circuit protection device in today's vehicle. The Autofuse is most often used to protect the wiring assembly between the Fuse Block and the system components.

MAXIFUSE

The Maxifuse was designed to replace the fusible link and Pacific Fuse Elements. The Maxifuse is designed to protect cables, normally between the Battery and Fuse Block, from both direct short circuits and resistive short circuits.

Compared to a fusible link or a Pacific Fuse Element, the Maxifuse performs much more like an Autofuse, although the average opening time is slightly longer. This is because the Maxifuse was designed to be a slower blowing fuse, with less chance of nuisance blows.

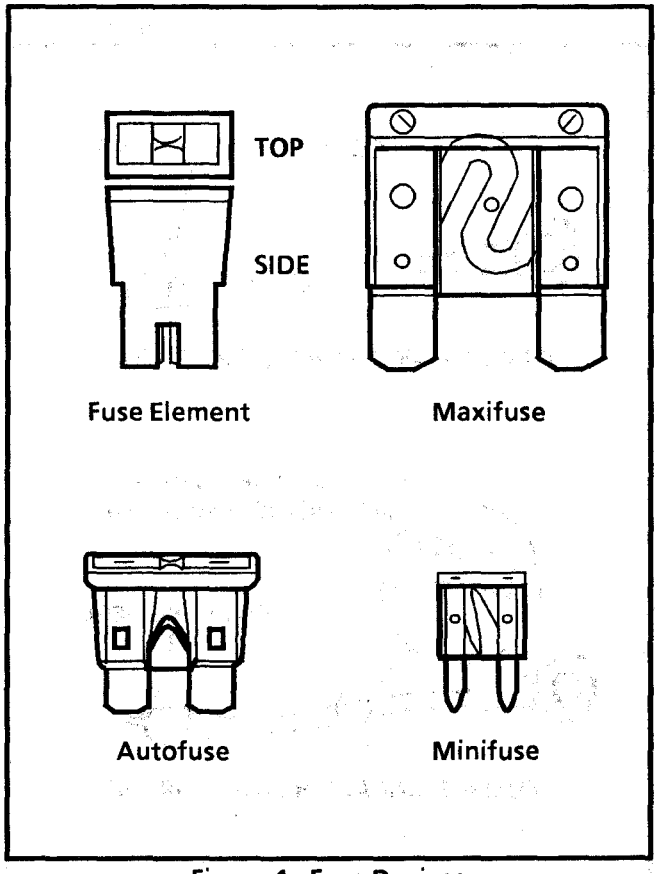


Figure 1 - Fuse Devices

AUTOFUSE

CURRENT RATING	COLOR
3	VIOLET
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

MAXIFUSE

CURRENT RATING	COLOR
20	YELLOW
30	GREEN
40	AMBER
50	RED
60	BLUE
70	BROWN
80	NATURAL

MINIFUSE

CURRENT RATING	COLOR
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	WHITE
30	GREEN

PACIFIC FUSE ELEMENT

CURRENT RATING	COLOR
30	PINK
40	GREEN
50	RED
60	YELLOW

Figure 2 - Fuse Rating and Color

REPAIR PROCEDURES

MINIFUSE

The Minifuse is a smaller version of the Autofuse and has a similar performance. As with the Autofuse, the Minifuse is usually used to protect the wiring assembly between a Fuse Block and system components. Since the Minifuse is a smaller device, it allows for more system specific fusing to be accomplished within the same amount of space as Autofuses.

PACIFIC FUSE ELEMENT/MAXIFUSE

The Pacific Fuse Element and Maxifuse were developed to be a replacement for the fusible link. Like a fusible link, the fuses are designed to protect wiring from a direct short to ground. These elements are easier to service and inspect than a fusible link and will eventually replace fusible links in all future vehicle applications.

FUSIBLE LINKS

In addition to circuit breakers and fuses, some circuits use fusible links to protect the wiring. Like fuses, fusible links are "one-time" protection devices that will melt and create an open circuit (see Figure 3).

Not all fusible link open circuits can be detected by observation. Always inspect that there is battery voltage past the fusible link to verify continuity.

Fusible links are used instead of a fuse in wiring circuits that are not normally fused, such as the ignition circuit. For AWG sizes, each fusible link is four wire gage sizes smaller than the wire it is designed to protect. For example: to protect a 10 gage wire use a 14 gage link or for metric, to protect a 5 mm^2 wire use a 2 mm^2 link (see Figure 6). Links are marked on the insulation with wire-gage size because the heavy insulation makes the link appear to be a heavier gage than it actually is. The same wire size fusible link must be used when replacing a blown fusible link.

Fusible links are available with three types of insulation: Hypalon®, Silicone/GXL (SIL/GXL) and Expanded Duty. All future vehicles that use fusible links will utilize the Expanded Duty type of fusible link. When servicing fusible links, all fusible links can be replaced with the Expanded Duty type. SIL/GXI fusible links can be used to replace either SIL/GXI or Hypalon® fusible links. Hypalon® fusible links can only be used to replace Hypalon® fusible links.

Determining characteristics of the types of fusible links:

- Hypalon® (limited use): only available in .35 mm^2 or smaller and its insulation is one color all the way through.
- SIL/GXL (widely used): available in all sizes and has a white inner core under the outer color of insulation.
- Expanded Duty: available in all sizes, has an insulation that is one color all the way through and has three dots following the writing on the insulation.

Service fusible links are available in many lengths. Choose the shortest length that is suitable. If the fusible link is to be cut from a spool, it should be cut 150-225 mm (approx 6-9 in.) long. NEVER make a fusible link longer than 225 mm (approx 9 in.).

CAUTION: Fusible links cut longer than 225 mm (approx 9 in.) will not provide sufficient overload protection.

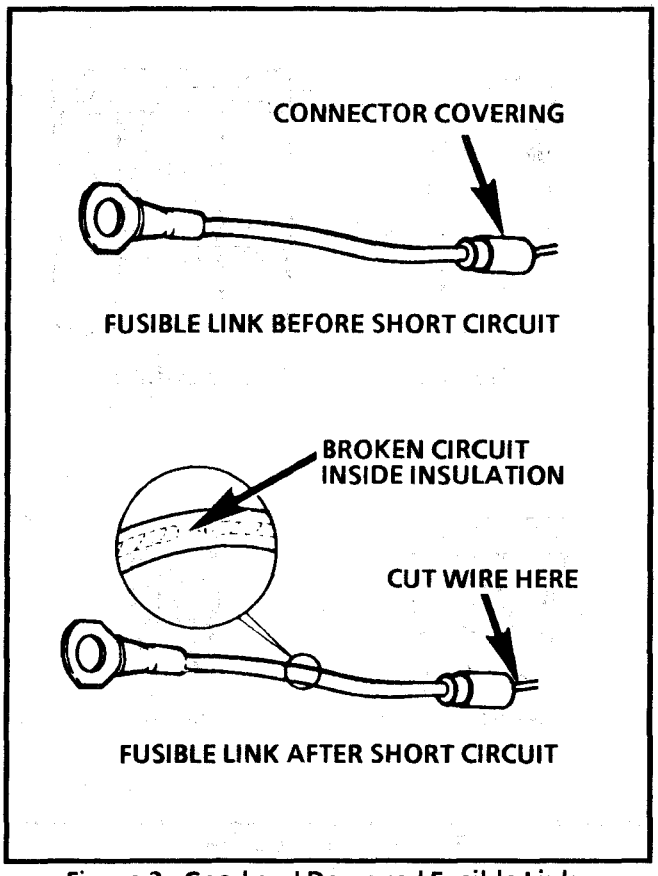


Figure 3 - Good and Damaged Fusible Links

To replace a damaged fusible link (Figure 4), cut it off beyond the splice. Replace with a repair link. When connecting the repair link, strip wire and use staking-type pliers to crimp the splice securely in two places. For more details on splicing procedures, see "Splicing Copper Wire." Use Crimp and Seal splices whenever possible. When using Splice Clips, refer to page 8A-5-3; when using Crimp and Seal splice sleeves, refer to page 8A-5-6.

To replace a damaged fusible link which feeds two harness wires, cut them both off beyond the splice. Use two repair links, one spliced to each harness wire (see Figure 5).

TYPICAL ELECTRICAL REPAIRS

An open circuit is an incomplete circuit. Power cannot reach the load or reach ground. If a circuit is open, active components do not energize. A short circuit is an unwanted connection between one part of the circuit and either ground or another part of the circuit. A short circuit causes a fuse to blow or a circuit breaker to open.

SHORT CIRCUITS CAUSED BY DAMAGED WIRE INSULATION

- Locate the damaged wire.
- Find and correct the cause of the wire insulation damage.
- For minor damage, tape over the wire. If damage is more extensive, replace the faulty segment of the wire (Refer to the splicing instructions for copper or shielded cable for the correct splicing procedure).

SPLICING COPPER WIRE USING SPLICE CLIPS

Splice Clips are included in the J 38125-A Terminal Repair Kit. The Splice Clip is a general purpose wire repair device. It may not be acceptable for applications having special requirements such as moisture sealing. Refer to the appropriate Service Manual Section to determine if there are any special requirements.

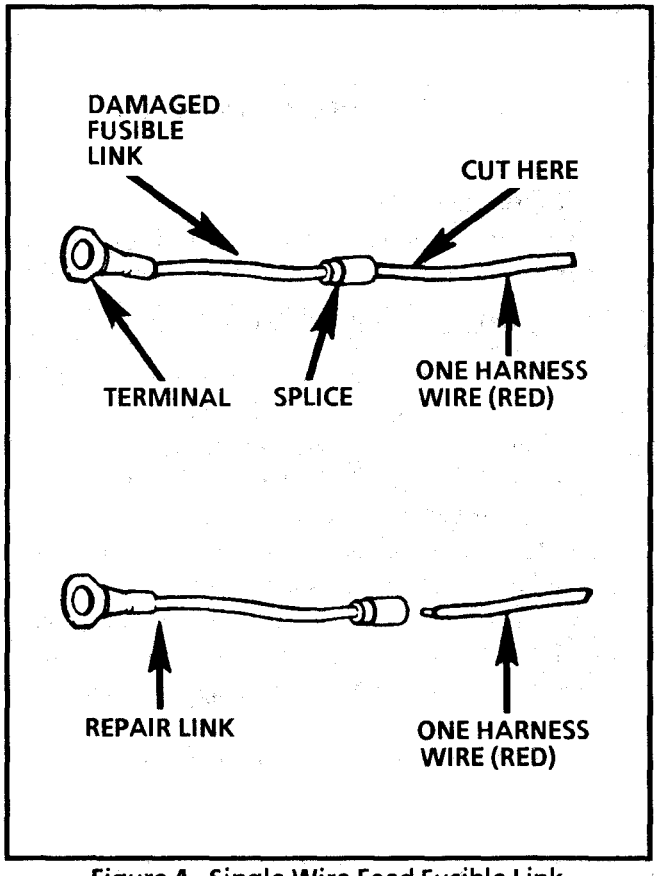


Figure 4 - Single Wire Feed Fusible Link

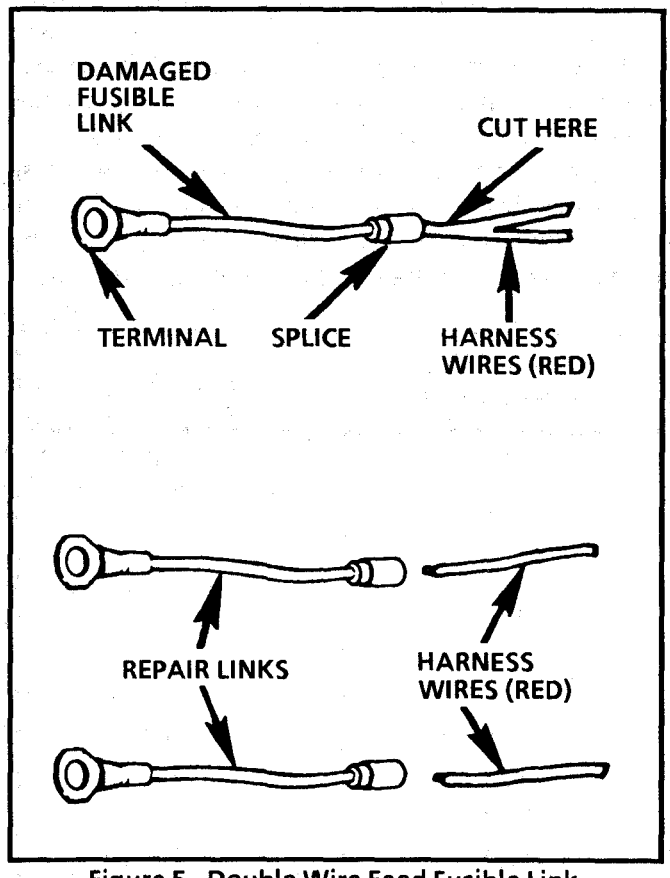


Figure 5 - Double Wire Feed Fusible Link

REPAIR PROCEDURES

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). If the harness has a black plastic conduit, simply pull out the desired wire.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of the wire later if you decide to cut more wire off to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm (1½") away from other splices, harness branches or connectors.

Step 3: Strip the Insulation

When replacing a wire, use a wire of the same size as the original wire or larger. The schematics list wire size in metric units. The following table (Figure 6) shows the commercial (AWG) wire sizes that can be used to replace each metric wire size. Each AWG size is either equal to or larger than the equivalent metric size.

To find the correct wire size either find the wire on the schematic page and convert the metric size to the AWG size, or use an AWG wire gage.

If you aren't sure of the wire size, start with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Be careful to avoid nicking or cutting any of the wires.

METRIC WIRE SIZES (mm^2)	AWG SIZES
.22	24
.35	22
.5	20
.8	18
1.0	16
2.0	14
3.0	12
5.0	10
8.0	8
13.0	6
19.0	4
32.0	2

Figure 6 - Wire Size Conversion Table

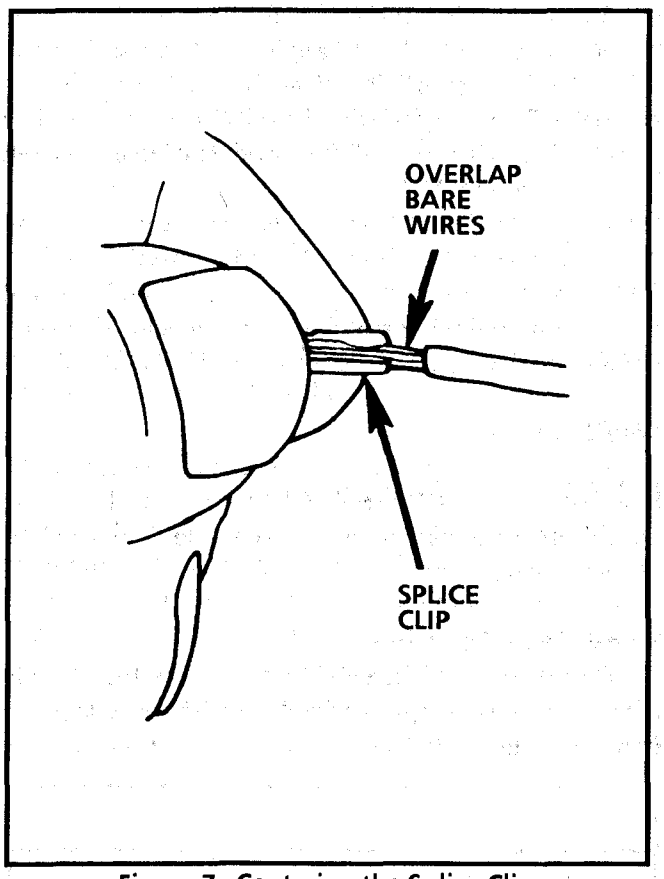


Figure 7 - Centering the Splice Clip

Step 4: Crimp the Wires

Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, follow the directions included in the J 38125-A Terminal Repair Kit. Select the correct anvil on the crimper. On most crimpers your choice is limited to either a small or large anvil. Overlap the stripped wire ends and hold them between your thumb and forefinger as shown in Figure 7. Then, center the splice clip under the stripped wires and hold it in place.

- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the former touches the wings of the clip.

- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes (see Figure 8).
- Before crimping the ends of the clip, be sure that:
  - The wires extend beyond the clip in each direction.
  - No strands of wire are cut loose, and
  - No insulation is caught under the clip.

Crimp the splice again, once on each end. Do not let the crimping tool extend beyond the edge of the clip or you may damage or nick the wires (Figure 9).

Step 5: Solder

Apply 60/40 rosin core solder to the opening in the back of the clip (see Figure 10). Follow the manufacturer's instruction for the solder equipment you are using.

Step 6: Tape the Splice

Center and roll the splicing tape. The tape should cover the entire splice. Roll on enough tape to duplicate the thickness of the insulation on the existing wires. Do not flag the tape. Flagged tape may not provide enough insulation, and the flagged ends will tangle with the other wires in the harness (see Figure 11).

If the wire does not belong in a conduit or other harness covering, tape the wire again. Use a winding motion to cover the first piece of tape (Figure 12).

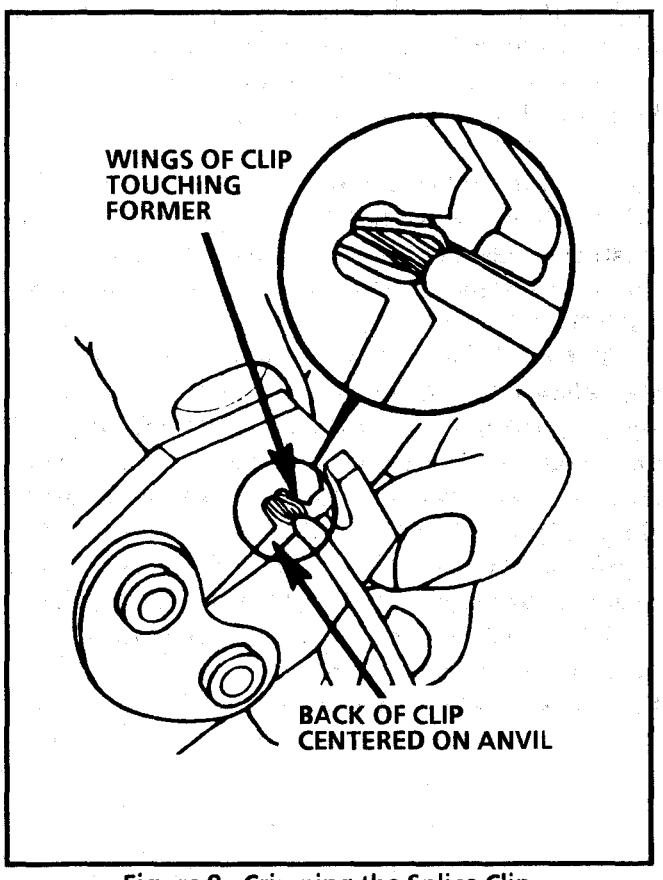


Figure 8 - Crimping the Splice Clip

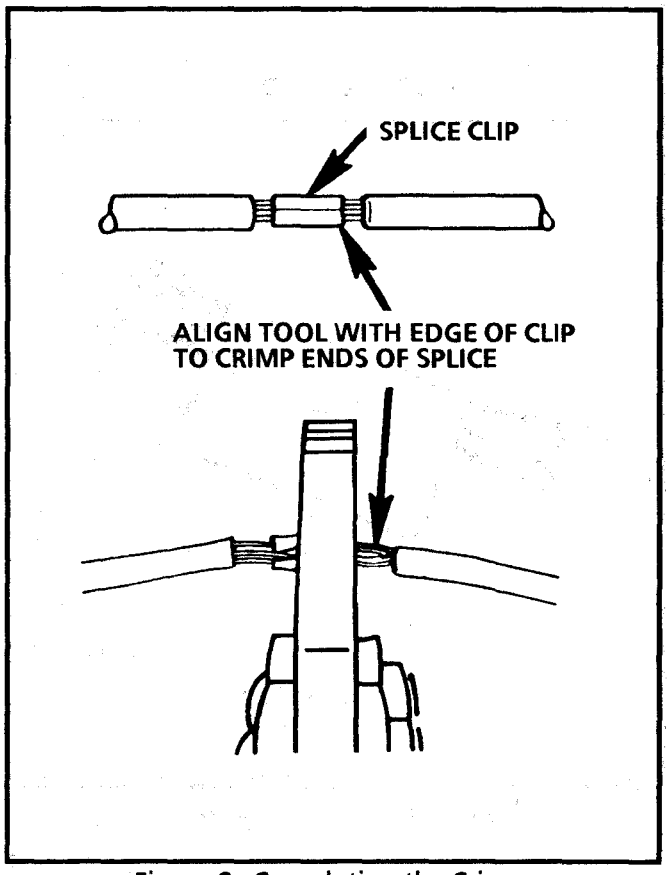


Figure 9 - Completing the Crimp

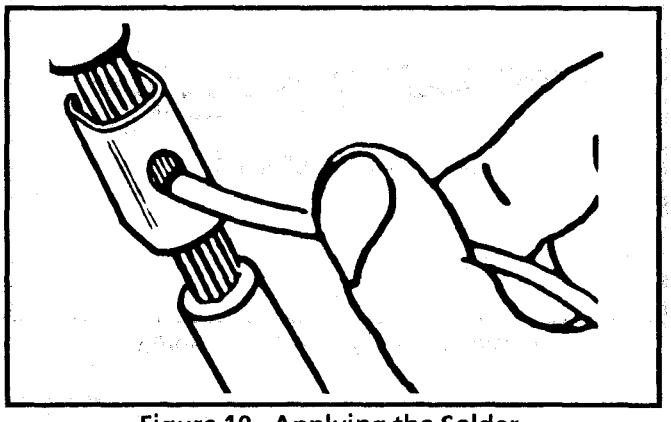


Figure 10 - Applying the Solder

REPAIR PROCEDURES

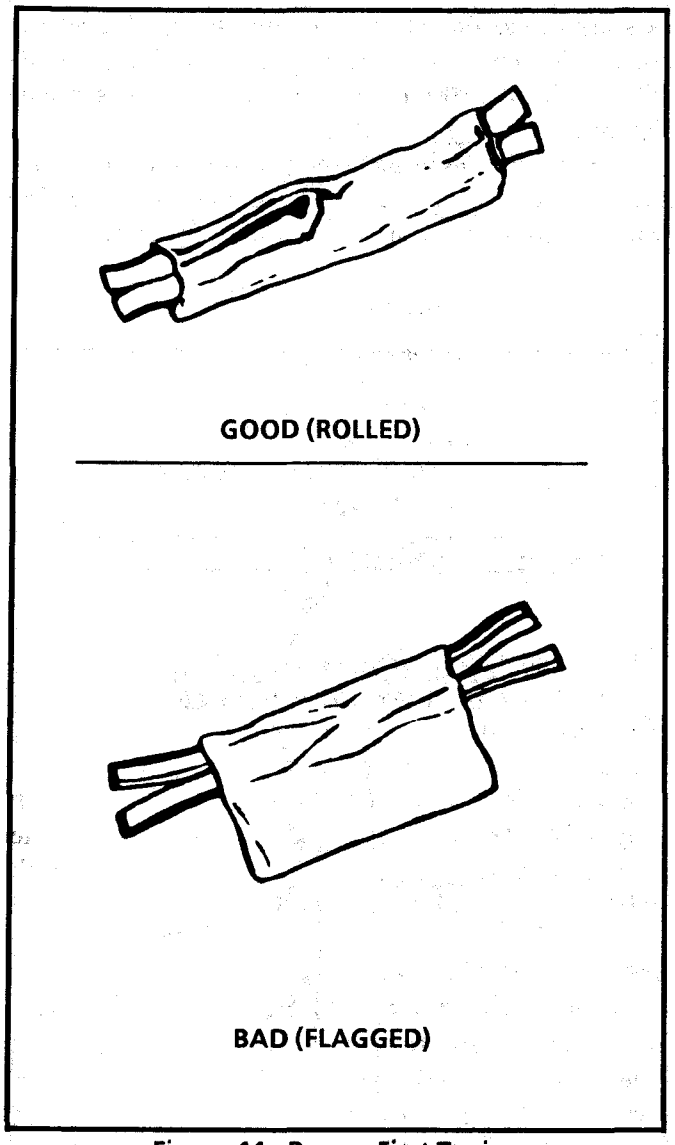


Figure 11 - Proper First Taping

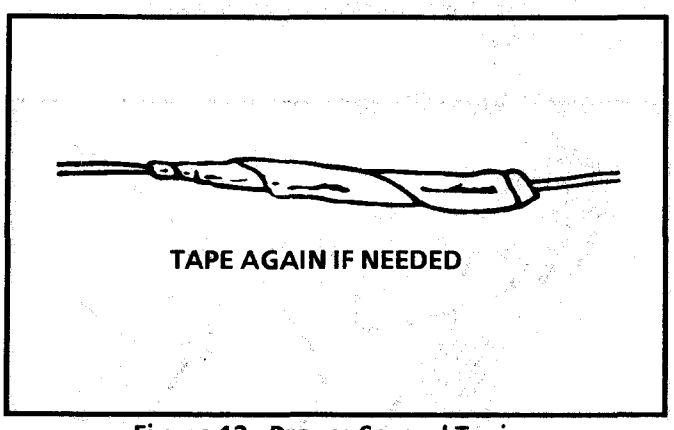


Figure 12 - Proper Second Taping

SPLICING COPPER WIRE USING CRIMP AND SEAL SPLICE SLEEVES

Crimp and Seal splice sleeves may be used on all types of insulation except tefzel and coaxial to form a one to one splice. They are to be used where there are special requirements such as moisture sealing. Refer to the appropriate section of the Service Manual to determine if the Crimp and Seal is necessary. Crimp and Seal splice sleeves are included in the J 38125-A Terminal Repair Kit.

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). The Crimp and Seal splice sleeves may be used on all types of insulation except tefzel and coaxial and may only be used to form a one to one splice.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of wire later if you decide to cut more wire to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm (1.5 in.) away from other splices, harness branches or connectors. This will help prevent moisture from bridging adjacent splices and causing damage.

Step 3: Strip the Insulation

If it is necessary to add a length of wire to the existing harness, be certain to use the same size as the original wire (refer to Figure 6, "Wire Size Conversion Table").

To find the correct wire size either find the wire on the schematic and convert the metric size to the equivalent AWG size or use an AWG wire gage. If unsure about the wire size, begin with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Strip approximately 7.5 mm (5/16 in.) of insulation from each wire to be spliced. Be careful to avoid nicking or cutting any of the wires. Check the stripped wire for nicks or cut strands. If the wire is damaged, repeat this procedure after removing the damaged section.

Step 4: Select and Position the Splice Sleeve

Select the proper splice sleeve according to wire size. The splice sleeves and tool nests are color coded (see following chart).

CRIMP AND SEAL SPLICE SLEEVE CHART

Color splice sleeve	Crimp tool nest color	Wire gage AWG / (metric)
Salmon (yellowish-pink)	Red	20, 18/ (0.5, 0.8)
Blue	Blue	16, 14/ (1.0, 2.0)
Yellow	Yellow	12, 10/ (3.0, 5.0)

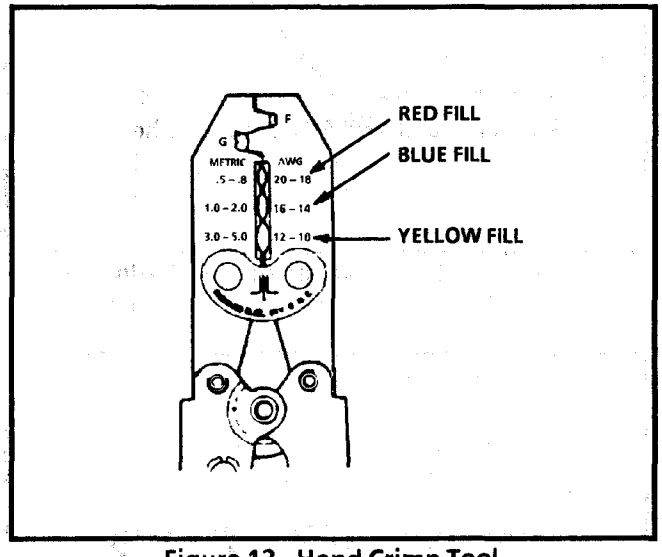


Figure 13 - Hand Crimp Tool

Using the J 38125-8 splice crimp tool (Figure 13), position the splice sleeve in the proper color nest of the hand crimp tool. Place the splice sleeve in the nest so that the crimp falls midway between the end of the barrel and the stop.

The sleeve has a stop in the middle of the barrel to prevent the wire from going further (Figure 14). Close the hand crimper handles slightly to hold the splice sleeve firmly in the proper nest.

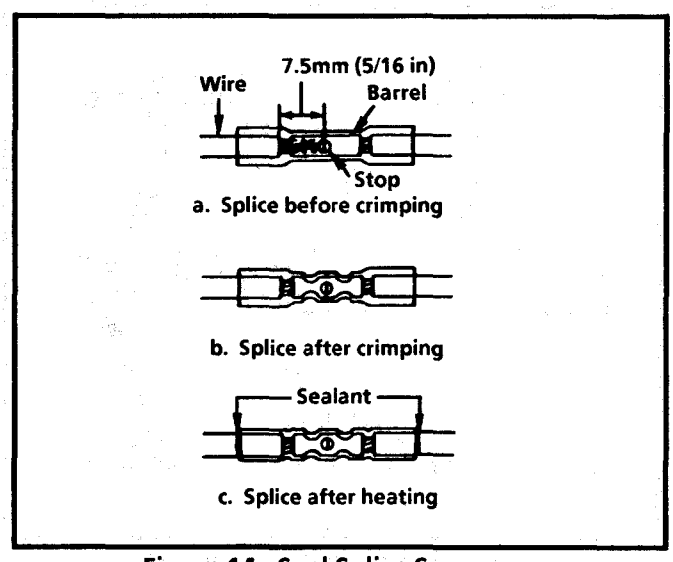


Figure 14 - Seal Splice Sequence

Step 5: Insert Wires into Splice Sleeve and Crimp

Insert the wire into the splice sleeve until it hits the barrel stop and close the handles of the J 38125-8 crimper tightly until the crimper handles open when released. The crimper handles will not open until the proper amount of pressure is applied to the splice sleeve. Repeat steps 4 and 5 for opposite end of the splice.

Step 6: Shrink the Insulation around the Splice

Using the Ultratorch J 38125-5 (follow instructions that accompany Ultratorch), apply heat where the barrel is crimped. Gradually move the heat barrel to the open end of the tubing, shrinking the tubing completely as the heat is moved along the insulation. A small amount of sealant will come out of the end of the tubing when sufficient shrinking is achieved (Figure 14).

SPLICING TWISTED/SHIELDED CABLE

Twisted/shielded cable is sometimes used to protect wiring from electrical noise (stray signals). For example, two-conductor cable of this construction is used between the ECM and the distributor. See Figure 15 for a breakdown of twisted/shielded cable construction.

REPAIR PROCEDURES

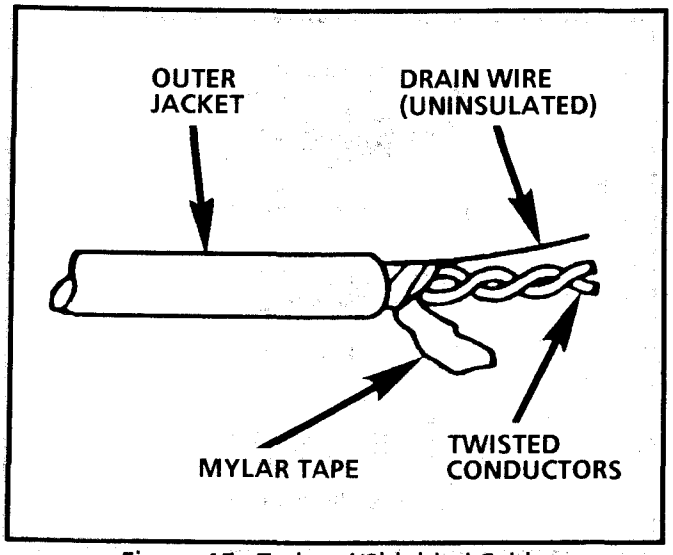


Figure 15 - Twisted/Shielded Cable

Step 1: Remove Outer Jacket

Remove the outer jacket and discard it. Be careful to avoid cutting into the drain wire or the mylar tape.

Step 2: Unwrap the Tape

Unwrap the aluminum/mylar tape, but do not remove it. The tape will be used to rewrap the twisted conductors after the splices have been made.

Step 3: Prepare the Splice

Untwist the conductors. Then, prepare the splice by following the splicing instructions for copper wire presented earlier. Remember to stagger splices to avoid shorts (Figure 16).

Step 4: Re-assemble the Cable

After you have spliced and taped each wire, rewrap the conductors with the mylar tape. Be careful to avoid wrapping the drain wire in the tape.

Next, splice the drain wire following the splicing instructions for copper wire. Then, wrap the drain wire around the conductors and mylar tape (Figure 17).

Step 5: Tape the Cable

Tape over the entire cable using a winding motion (see Figure 18). This tape will replace the section of the jacket you removed to make the repair.

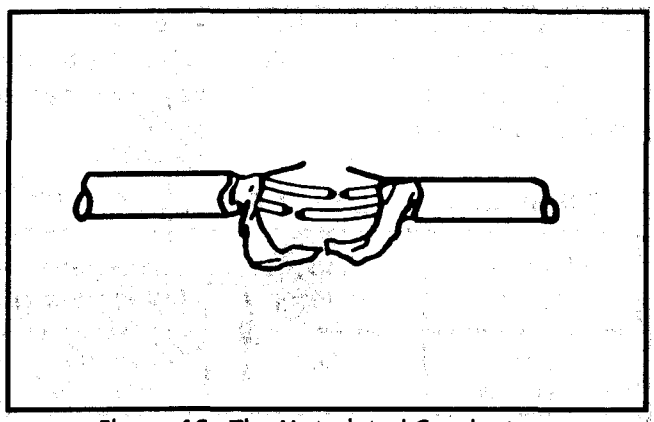


Figure 16 - The Untwisted Conductors

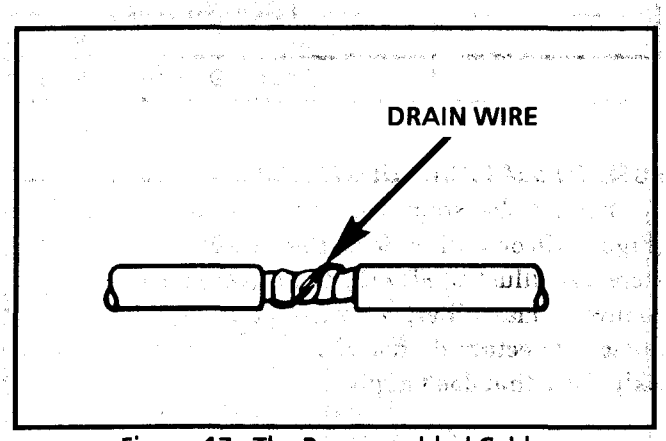


Figure 17 - The Re-assembled Cable

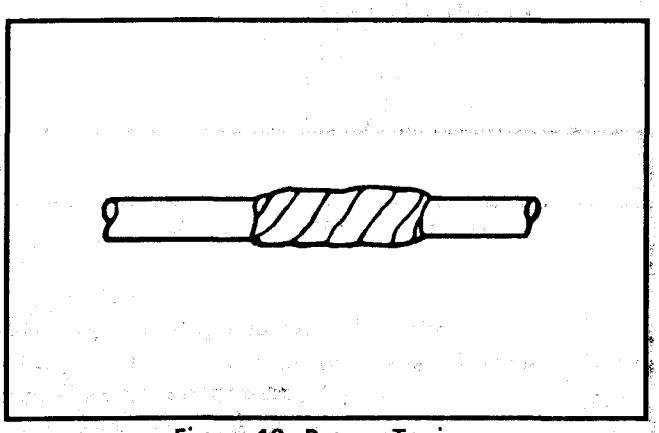


Figure 18 - Proper Taping

REPAIRING CONNECTORS

- The following general repair procedures can be used to repair most types of connectors. The repair procedures are divided into three general groups: Push-to-Seat and Pull-to-Seat and Weather Pack®.
- See "Harness Connector Faces," page 8A-202-0 to determine which type of connector is to be serviced.
- Use the proper Pick(s) or Tool(s) that apply to the terminal.
- The Terminal Repair Kit (J 38125-A) contains further information.

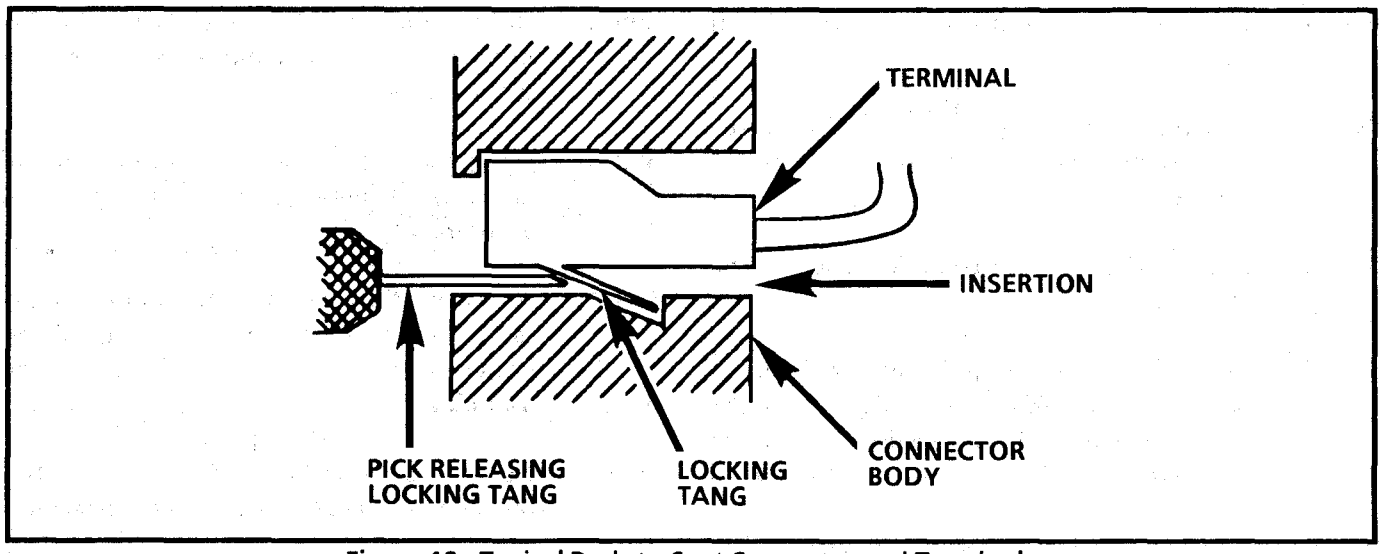


Figure 19 - Typical Push-to-Seat Connector and Terminal

PUSH-TO-SEAT AND PULL-TO-SEAT

Follow the steps below to repair Push-to-Seat (Figure 19) or Pull-to-Seat (Figure 20) connectors. The steps are illustrated with typical connectors. Your connector may differ, but the repair steps are similar. Some connectors do not require all the steps shown. Skip those that don't apply.

Step 1: Remove any CPA (Connector Position Assurance) Locks. CPAs are designed to retain connectors when mated.

Step 2: Remove any TPA (Terminal Position Assurance) Locks. TPAs are designed to keep the terminal from backing out of the connector.

NOTICE: The TPA must be removed prior to terminal removal and must be replaced when the terminal is repaired and reseated.

Step 3: Open any secondary locks. A secondary lock aids in terminal retention and is usually molded to the connector.

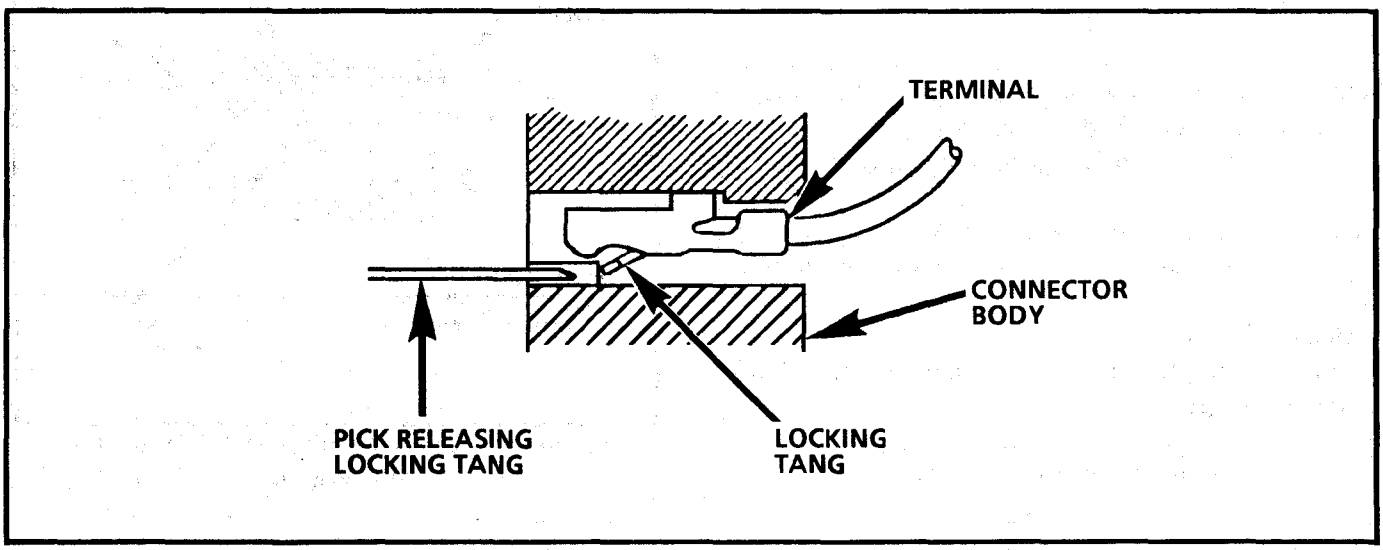


Figure 20 - Typical Pull-to-Seat Connector and Terminal

REPAIR PROCEDURES

Step 4: Separate the connector halves and back out seals.

Step 5: Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 6: Locate the terminal lock tang in the connector canal.

Step 7: Insert the proper size pick (refer to Terminal Repair Kit J 38125-A) straight into the connector canal at the mating end of the connector.

Step 8: Depress the locking tang to unseat the terminal.

Push-to-Seat – Gently pull on the lead to remove the terminal through the back of the connector.

Pull-to-Seat – Gently push on the lead to remove the terminal through the front of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 9: Inspect terminal and connector for damage. Repair as necessary (see "Terminal Repair," page 8A-5-11).

Step 10: Reform lock tang and reseat terminal in connector body. Apply grease if connector was originally equipped with grease.

Step 11: Install any CPAs or TPAs, close any secondary locks and join connector halves.

WEATHER PACK®

Follow the steps below to repair Weather Pack® connectors (Figure 21).

Step 1: Separate the connector halves.

Step 2: Open secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector.

Step 3: Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 4: Insert the Weather Pack® terminal removal tool into the front (mating end) of the connector cavity until it rests on the cavity shoulder.

Step 5: Gently pull on the lead to remove the terminal through the back of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 6: Inspect the terminal and connector for damage. Repair as necessary (see "Terminal Repair," on the following page).

Step 7: Reform the lock tang and reseat terminal in connector body.

Step 8: Close secondary locks and join connector halves.

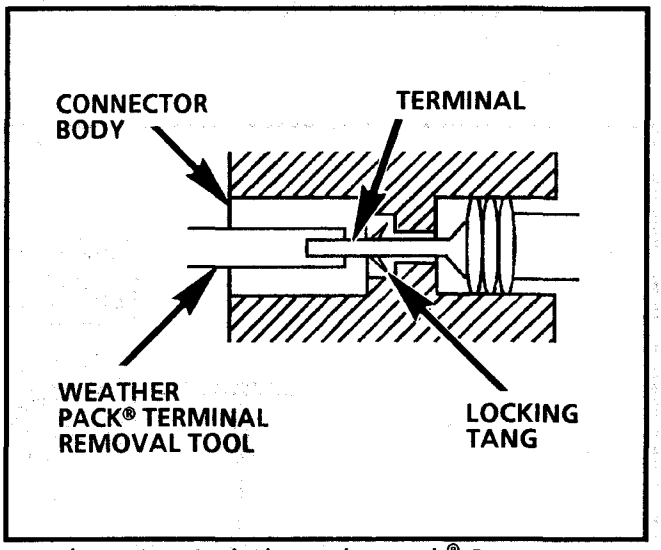


Figure 21 - Typical Weather Pack® Connector and Terminal

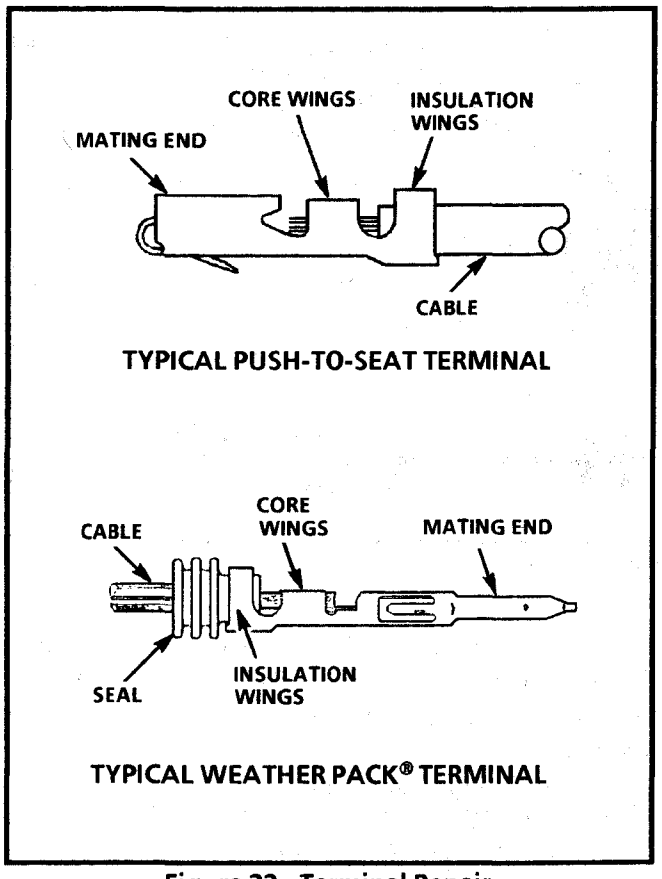


Figure 22 - Terminal Repair

TERMINAL REPAIR

The following repair procedures can be used to repair Push-to-Seat, Pull-to-Seat or Weather Pack® terminals (Figure 22). Some terminals do not require all steps shown. Skip those that don't apply. The Terminal Repair Kit (J 38125-A) contains further information.

Step 1: Cut off terminal between core and insulation crimp (minimize wire loss) and remove seal for Weather Pack® terminals.

Step 2: Apply correct seal per gauge size of wire and slide back along wire to enable insulation removal (Weather Pack® terminals only).

Step 3: Remove insulation.

Step 4: Align seal with end of cable insulation (Weather Pack® terminals only).

Step 5: Position strip (and seal for Weather Pack®) in terminal.

Step 6: Hand crimp core wings.

Step 7: Hand crimp insulation wings (non-Weather Pack®). Hand crimp insulation wings around seal and cable (Weather Pack®).

Step 8: Solder all hand crimped terminals.

DIODE REPLACEMENT

Many vehicle electrical systems use a diode to isolate circuits and protect the components from voltage spikes. When installing a new diode, use the following procedure:

Step 1: Open the Harness

If the diode is taped to the harness, remove all of the tape.

Step 2: Remove Inoperative Diode

Paying attention to current flow direction, remove inoperative diode from the harness with a suitable soldering tool. If the diode is located next to a connector terminal, remove the terminal(s) from the connector to prevent damage from the soldering tool.

Step 3: Strip the Insulation

Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.

Step 4: Install New Diode

Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position. Reference Figure 23 for replacement diode symbols and current flow explanations. Attach the new diode to the wire(s) using 60/40 rosin core solder. Use a heat sink (aluminum alligator clip) attached across the diode wire ends to protect the diode from excess heat. Follow the manufacturer's instructions for the soldering equipment you are using.

REPAIR PROCEDURES

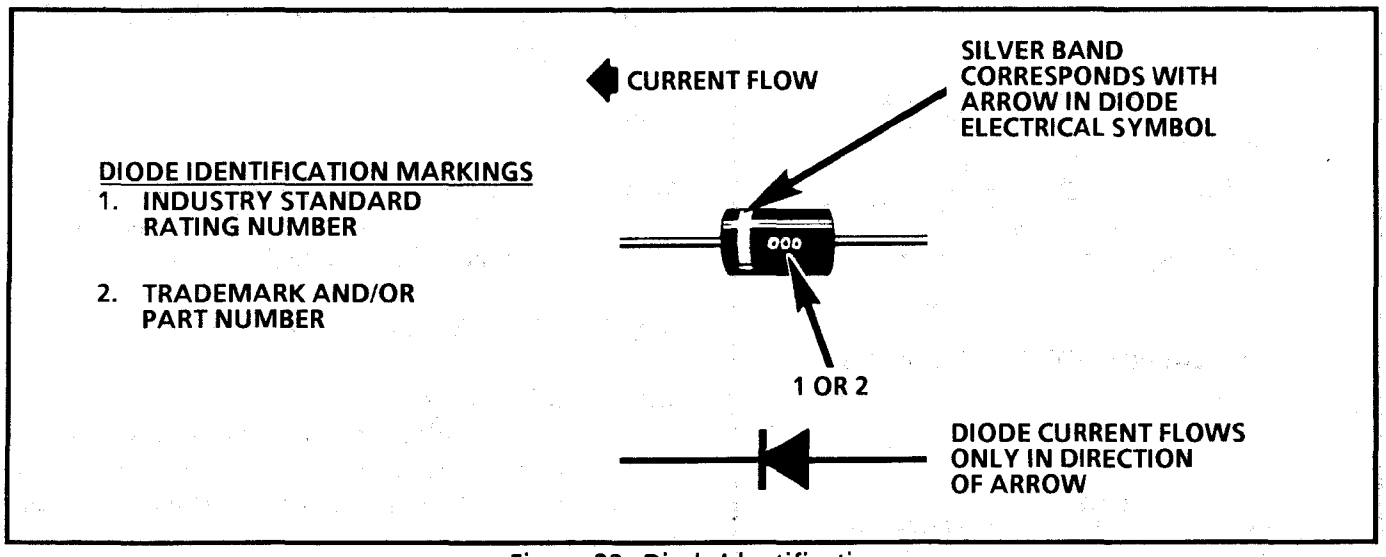


Figure 23 - Diode Identification

Step 5: Install Terminal(s)

Install terminal(s) into the connector body if previously removed in step 2.

Step 6: Tape Diode to Harness

Tape the diode to the harness or connector using electrical tape. To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points.

ACCEPTABLE DIODE REPLACEMENTS

Diode Brand	Rating Number	RATING	P/N
GMSPO	1N4004	1 amp, 400 PIV	12112421
GMSPO	1N5404	3 amp, 400 PIV	12112422
GMSPO	1N4001	1 amp, 50 PIV	16020519
GMSPO	1N4005	1 amp, 600 PIV	16011840
GMSPO	1N4004	1 amp, 400 PIV	16039386

In the event 1 amp, 50 PIV (Peak Inverse Rating) diodes are unavailable, a universal diode with a 1 amp, 400 PIV rating can be used for the following applications:

- A/C Compressor Clutch
- ABS/4WAL (the ABS Diode on the Delco Moraine is hidden inside of an electrical connector under the carpet at the right panel)
- Wiper
- Charging System (hidden in wire harness)
- Parking Brake (vehicle with ABS)
- Relays
- Solenoids
- Diesel Glow Plug Circuit

HEATED OXYGEN SENSOR (O2S) REPAIR

If the Heated Oxygen Sensor pigtail wiring, connector or terminal is damaged, the entire Oxygen Sensor Assembly must be replaced. Do not attempt to repair the wiring, connector or terminals. In order for the sensor to function properly, it must have provided to it a clean air reference. This clean air reference is obtained by way of the Oxygen Sensor signal and heater wires. Any attempt to repair the wires, connectors or terminals could result in the obstruction of the air reference and degraded Oxygen Sensor performance.

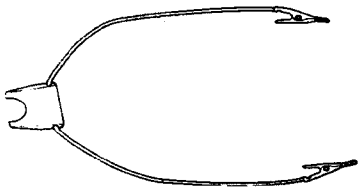
The following guidelines should be used when servicing the Heated Oxygen Sensor:

- Do not apply contact cleaner or other materials to the sensor or vehicle harness connectors. These materials may get into the sensor causing poor performance. Also, the sensor pigtail and harness wires must not be damaged in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and cause performance problems.
- Neither the sensor or vehicle lead wires should be bent sharply or kinked. Sharp bends, kinks, etc., could block the reference air path through the lead wire.
- Do not remove or defeat the Oxygen Sensor ground wire (where applicable). Vehicles that utilize the ground wired sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will also cause poor engine performance.
- To prevent damage due to water intrusion, be sure that the peripheral seal remains intact on the vehicle harness connector.

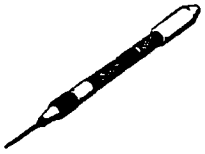
The Engine Harness may be repaired using Packard's Crimp and Splice Seals Terminal Repair Kit J 38125-A. Under no circumstances should repairs be soldered since this could result in the air reference being obstructed.

REPAIR PROCEDURES

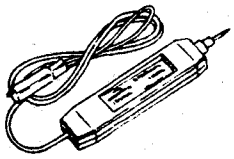
SPECIAL TOOLS



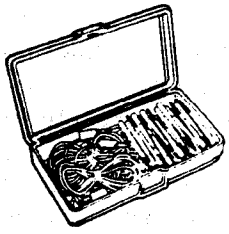
J 36169
Jumper Wire



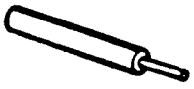
J 35689-A
Micro-Pack Connector
Terminal Remover



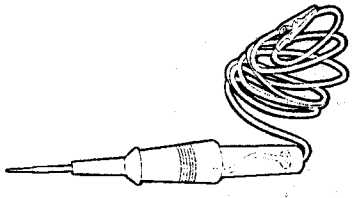
J 34636
Solenoid, Relay and
Circuit Tester



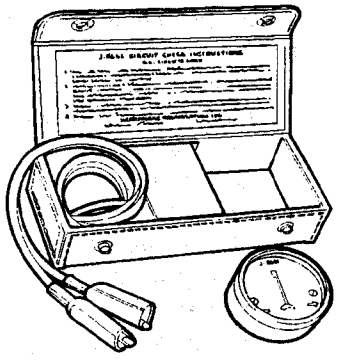
J 35616-A
Connector Test Adapter Kit



J 28742-A
Weather Pack II Terminal Remover



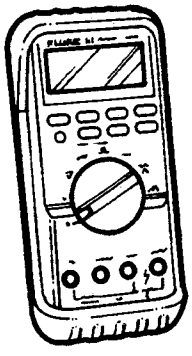
J 34142-B
Unpowered Test Light

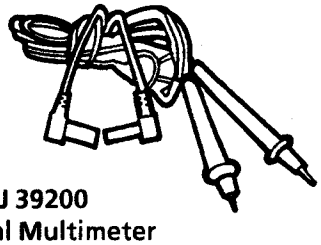


J 8681-A
Universal Short Checker

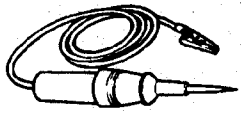


J 22727
Electrical Terminal Remover

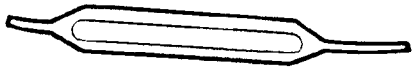




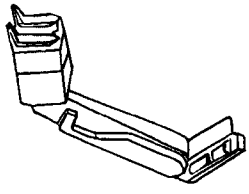
J 39200
Digital Multimeter



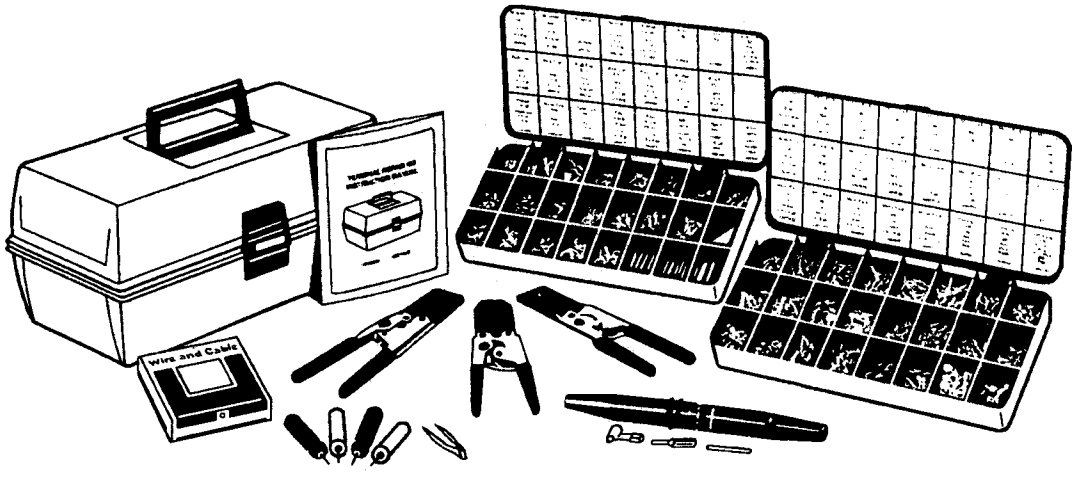
J 21008-A
Self-Powered Test Light



J 33095
Terminal Remover: Micro-Pack,
Com-Pack III and ECM Edgeboard
Connectors



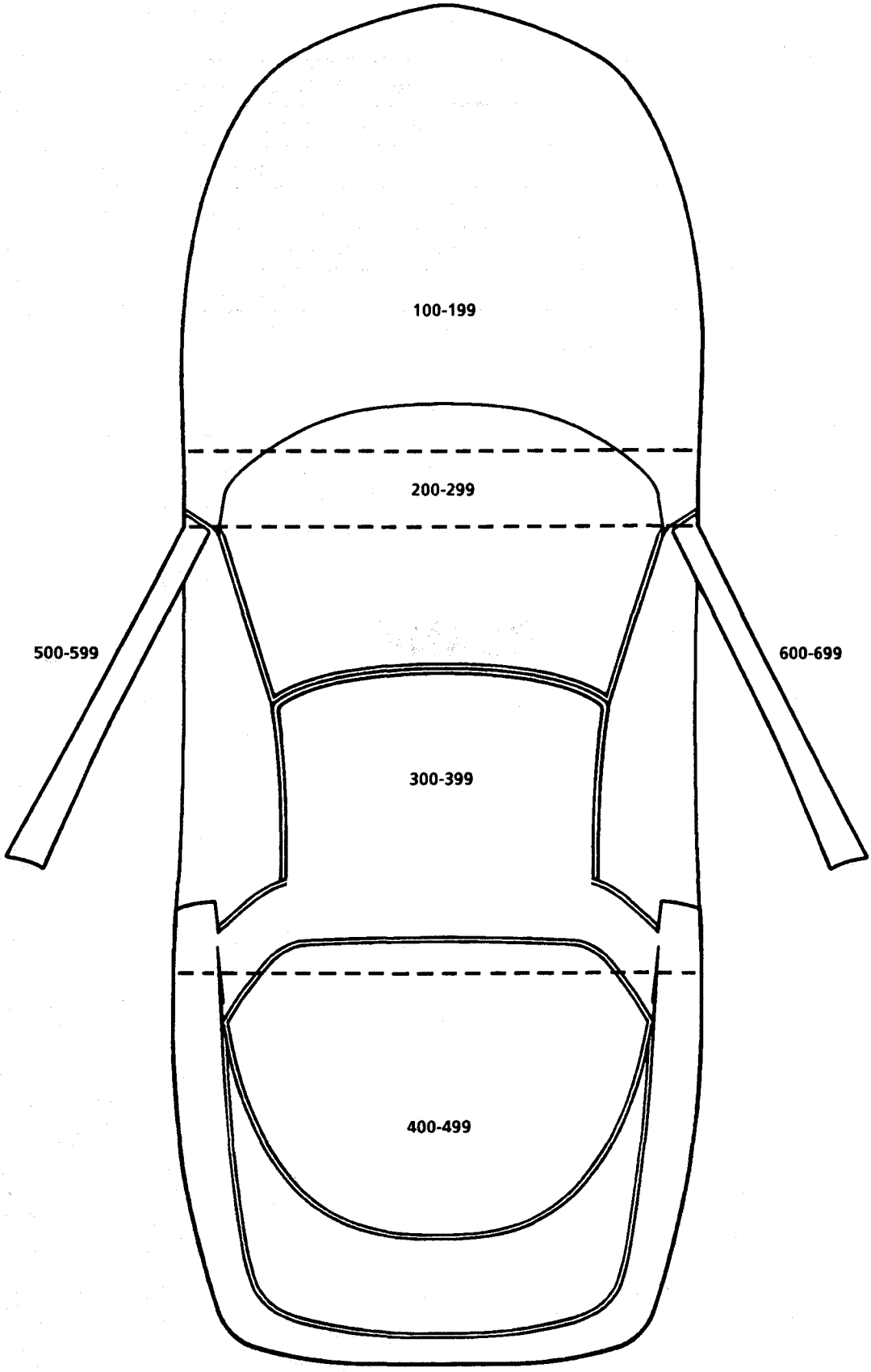
J 34764
Autofuse Tester



J 38125-A
Terminal Repair Kit

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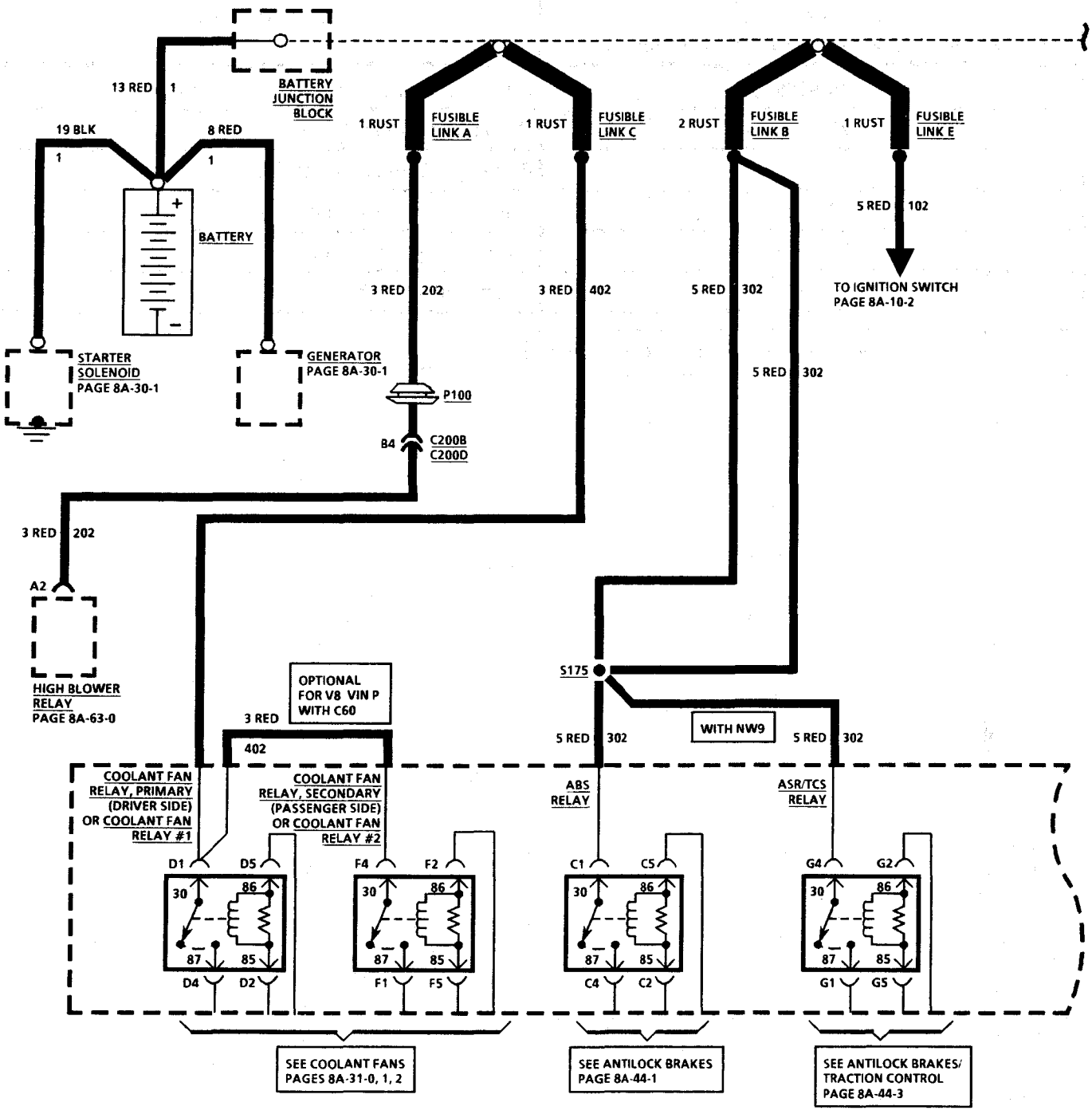
VEHICLE ZONING

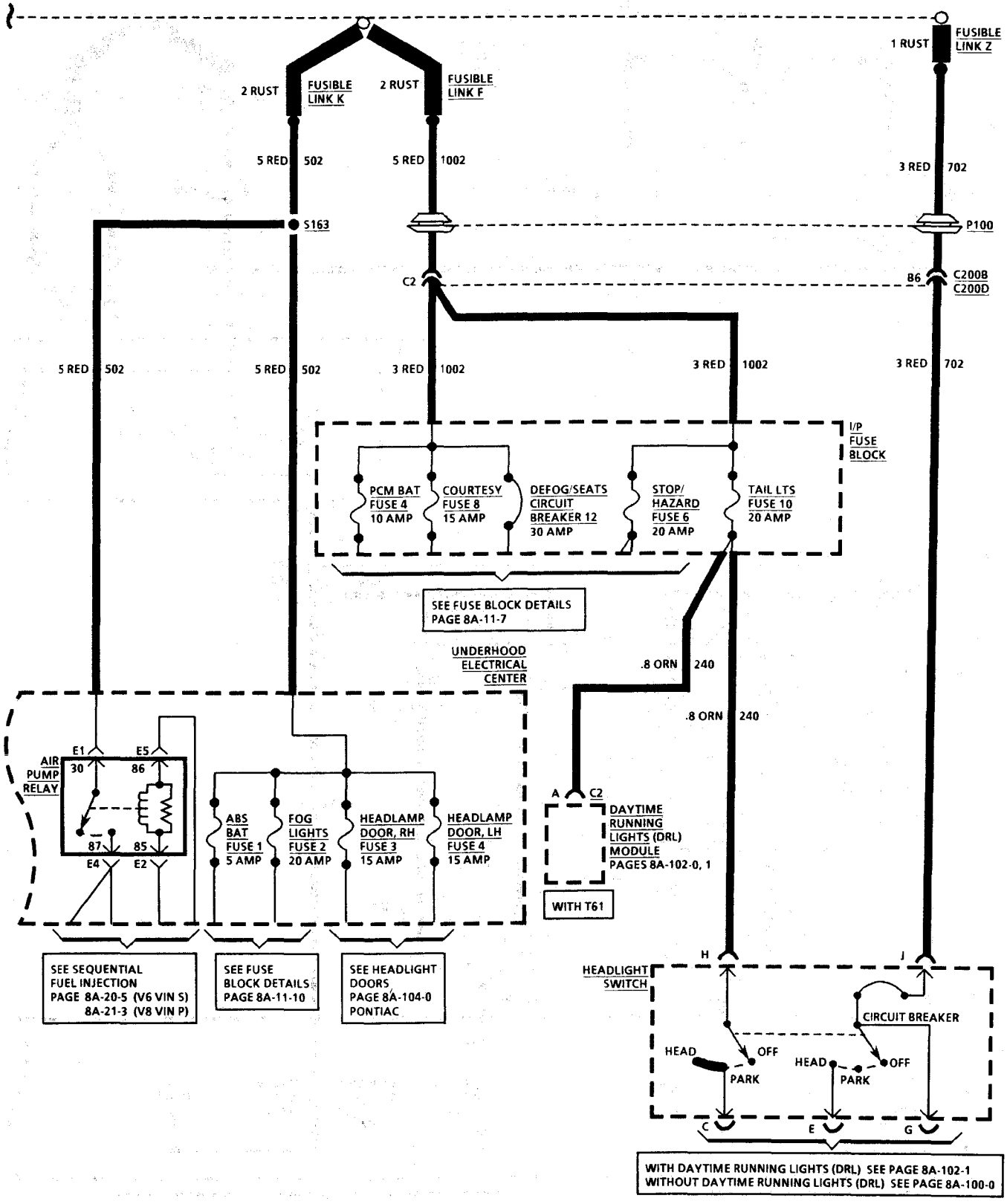


CALLOUT NUMBERS (For Splices, Connectors and Pass Thru Grommets)	ZONE DESCRIPTION
100-199	All forward of and including dash panel
200-299	Within Instrument Panel area
300-399	Passenger Compartment, forward of hatch
400-499	Hatch area, to rear of vehicle
500-599	To and within left door
600-699	To and within right door

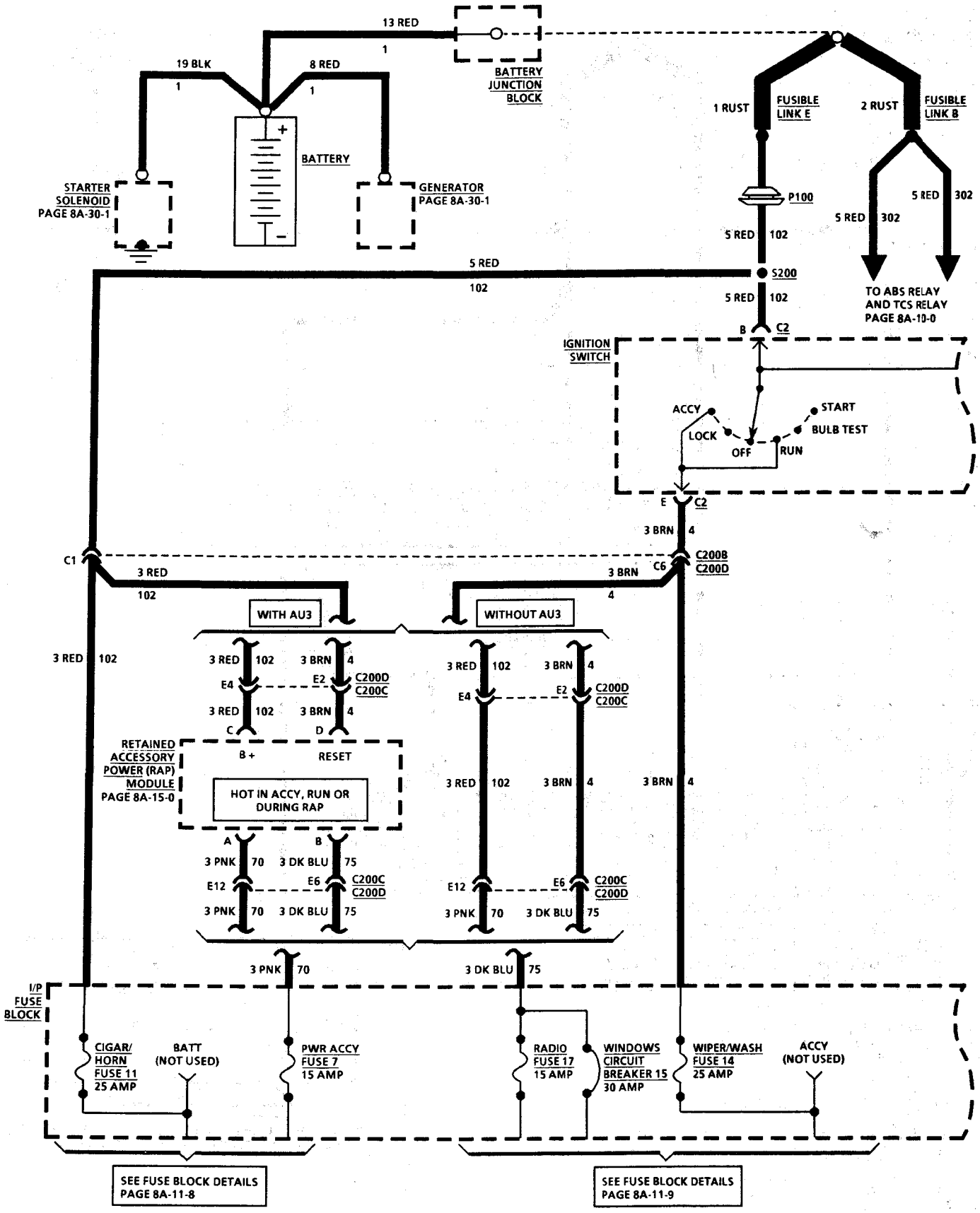
For a Harness Routing View, refer to SECTION 8A-203.

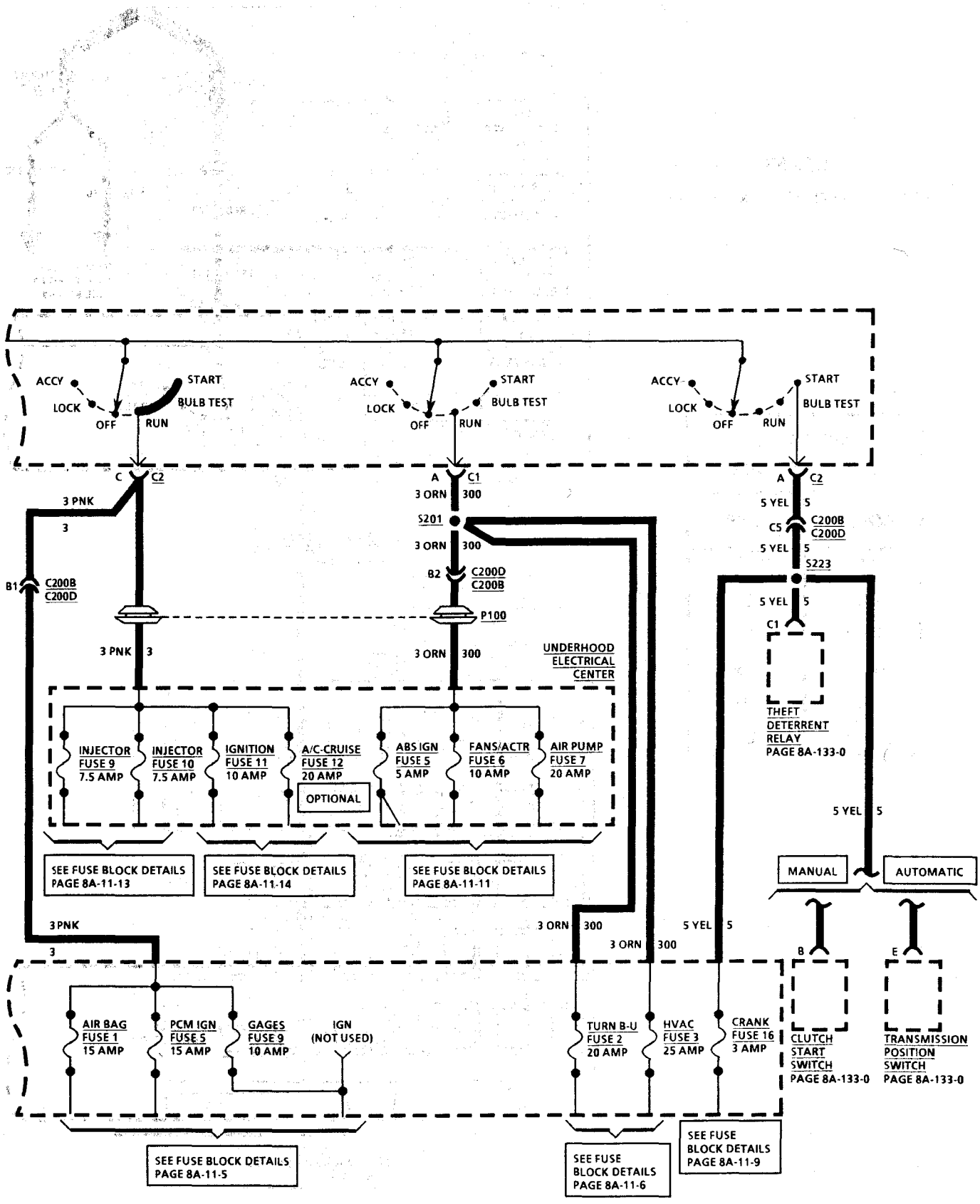
POWER DISTRIBUTION




1 RUST
FUSIBLE LINK Z
2 RUST
FUSIBLE LINK K
2 RUST
FUSIBLE LINK F
5 RED 502
5 RED 1002
3 RED 702
S163
P100
C2
B6
C200B
C200D
5 RED 502
5 RED 502
3 RED 1002
3 RED 1002
3 RED 702
I/P FUSE BLOCK
PCM BAT FUSE 4 10 AMP
COURTESY FUSE 8 15 AMP
DEFOG/SEATS CIRCUIT BREAKER 12 30 AMP
STOP/ HAZARD FUSE 6 20 AMP
TAIL LTS FUSE 10 20 AMP
SEE FUSE BLOCK DETAILS PAGE 8A-11-7
UNDERHOOD ELECTRICAL CENTER
.8 ORN 240
.8 ORN 240
AIR PUMP RELAY
E1
E5
30
86
87
85
E4
E2
ABS BAT FUSE 1 5 AMP
FOG LIGHTS FUSE 2 20 AMP
HEADLAMP DOOR, RH FUSE 3 15 AMP
HEADLAMP DOOR, LH FUSE 4 15 AMP
A
C2
DAYTIME RUNNING LIGHTS (DRL) MODULE PAGES 8A-102-0, 1
WITH T61
SEE SEQUENTIAL FUEL INJECTION PAGE 8A-20-5 (V6 VIN S) 8A-21-3 (V8 VIN P)
SEE FUSE BLOCK DETAILS PAGE 8A-11-10
SEE HEADLIGHT DOORS PAGE 8A-104-0 PONTIAC
H
J
HEADLIGHT SWITCH
CIRCUIT BREAKER
HEAD
OFF
PARK
HEAD
OFF
PARK
C
E
G
WITH DAYTIME RUNNING LIGHTS (DRL) SEE PAGE 8A-102-1
WITHOUT DAYTIME RUNNING LIGHTS (DRL) SEE PAGE 8A-100-0

POWER DISTRIBUTION




ACCY
LOCK
OFF
RUN
START
BULB TEST
C
C2
A
C1
3 PNK
3
3 ORN
300
S201
B1
C200B
C200D
B2
P100
5 YEL
5
C5
S223
UNDERHOOD ELECTRICAL CENTER
INJECTOR FUSE 9 7.5 AMP
INJECTOR FUSE 10 7.5 AMP
IGNITION FUSE 11 10 AMP
A/C-CRUISE FUSE 12 20 AMP
OPTIONAL
ABS IGN FUSE 5 5 AMP
FANS/ACTR FUSE 6 10 AMP
AIR PUMP FUSE 7 20 AMP
THEFT DETERRENT RELAY
PAGE 8A-133-0
SEE FUSE BLOCK DETAILS PAGE 8A-11-13
SEE FUSE BLOCK DETAILS PAGE 8A-11-14
SEE FUSE BLOCK DETAILS PAGE 8A-11-11
MANUAL
AUTOMATIC
B
E
AIR BAG FUSE 1 15 AMP
PCM IGN FUSE 5 15 AMP
GAGES FUSE 9 10 AMP
IGN (NOT USED)
TURN B-U FUSE 2 20 AMP
HVAC FUSE 3 25 AMP
CRANK FUSE 16 3 AMP
CLUTCH START SWITCH
PAGE 8A-133-0
TRANSMISSION POSITION SWITCH
PAGE 8A-133-0
SEE FUSE BLOCK DETAILS PAGE 8A-11-5
SEE FUSE BLOCK DETAILS PAGE 8A-11-6
SEE FUSE BLOCK DETAILS PAGE 8A-11-9

FUSE BLOCK DETAILS (CHEVY)

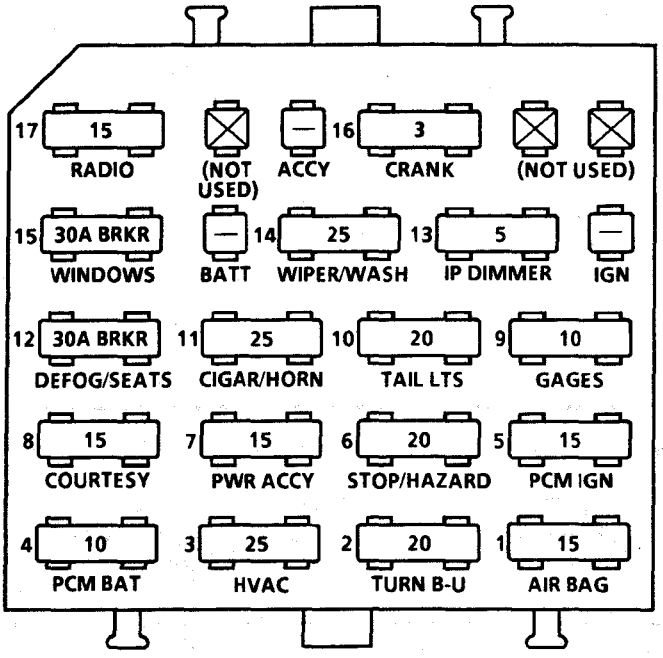
I/P FUSE BLOCK

12052685

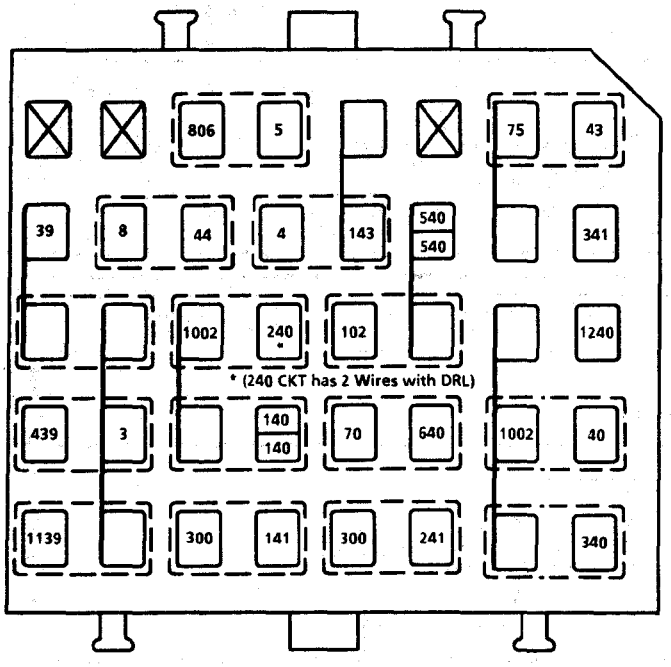
BASE FUSE BLOCK PACK-CON III

BLK

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



FRONT VIEW



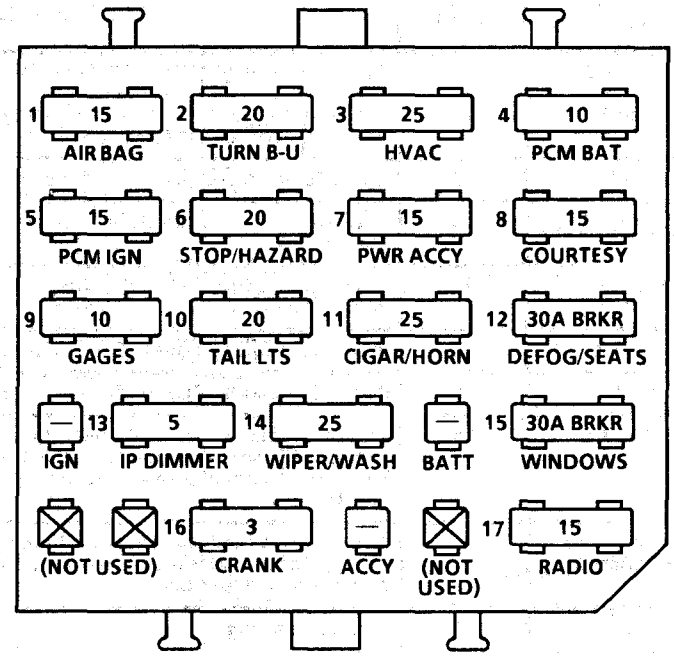
REAR VIEW

FUSE BLOCK DETAILS (PONTIAC)

I/P FUSE BLOCK

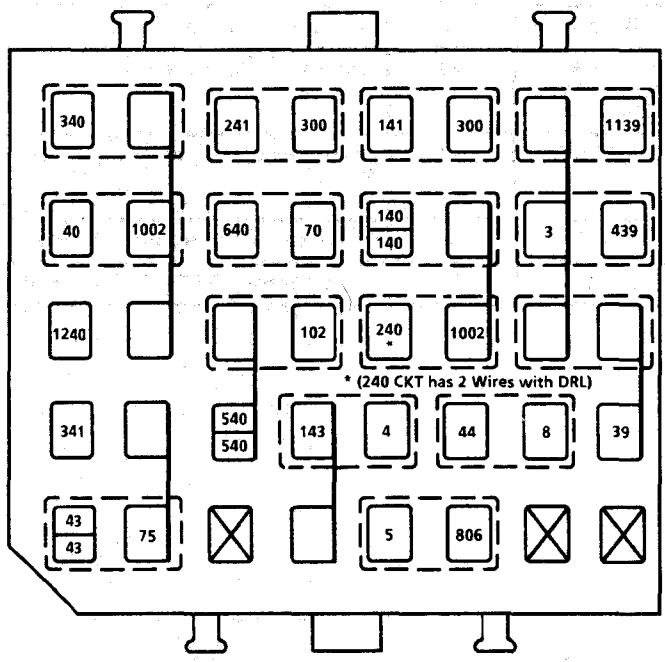
12052685

BASE FUSE BLOCK PACK-CON III
BLK



FRONT VIEW

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



REAR VIEW

FUSE BLOCK DETAILS

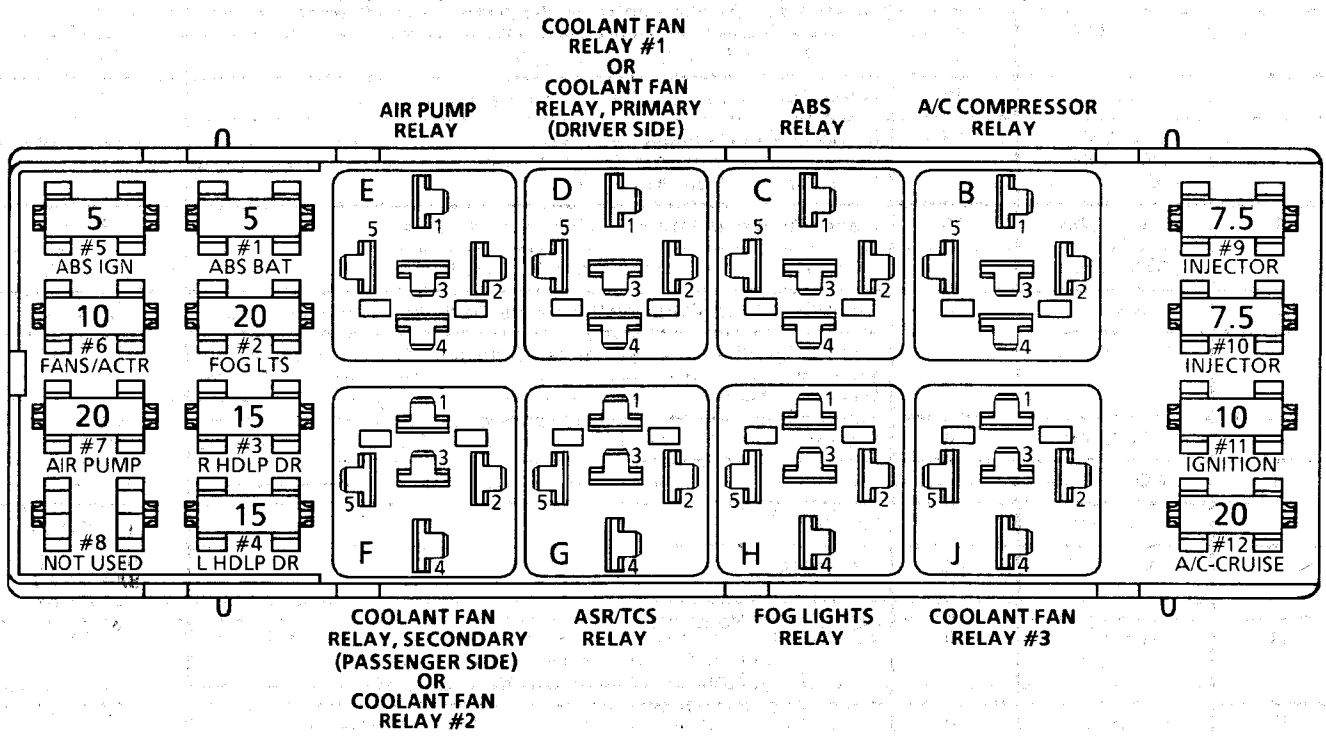
I/P FUSE BLOCK

FUSE NUMBER	FUSE NAME	RATING (AMPS)	RELATED CIRCUITRY	PAGE
1	AIR BAG	15	Diagnostic Energy Reserve Module, Dual Pole Arming Sensor	8A-11-5
2	TURN B-U	20	Backup Light Switch, Daytime Running Lights Module, Turn Flasher, Performance/Traction Control Switch, Transmission Position Switch	8A-11-6
3	HVAC	25	HVAC Selector Switch, Rear Defogger	8A-11-6
4	PCM BAT	10	Powertrain Control Module, Instrument Cluster, Theft Deterrent Module	8A-11-7
5	PCM IGN	15	Powertrain Control Module, Theft Deterrent Module, Fuel Pump Relay, Mass Air Flow (MAF) Sensor	8A-11-5
6	STOP/HAZARD	20	Brake Light/Cruise Release Switch, Hazard Flasher	8A-11-7
7	PWR ACCY	15	Power Door Locks, Power Mirrors, Hatch Release	8A-11-8
8	COURTESY	15	Amplifier, Audio Alarm Module, Bose Relay, Hatch Release Relay, Lamps: Console Compartment, I/P Compartment, Dome, Courtesy, Rear Compartment Lamp, Keyless Entry Receiver, Rearview Mirror and Radio	8A-11-8
9	GAGES AND IGN TERMINAL	10	Audio Alarm Module, Daytime Running Lights Module, Diagnostic Energy Reserve Module, Instrument Cluster, Keyless Entry Receiver, Brake Switch Assembly	8A-11-5
10	TAIL LTS	20	Exterior Lighting	With DRL (Z49) 8A-102-1, 3 Without DRL (Z49) 8A-100-0, 2
11	CIGAR/HORN AND BATT TERMINAL	25	Cigar Lighter, Horn Relay	8A-11-8
12 (Circuit Breaker)	DEFOG/SEATS	30	Power Seats, Rear Defogger	8A-11-7
13	I/P DIMMER	5	Interior Lights Dimming	8A-117-0
14	WIPER/WASHER AND ACCY TERMINAL	25	Windshield Wiper/Washer	8A-91-0 or 8A-11-9
15 (Circuit Breaker)	WINDOWS	30	Power Windows, Coolant Level Latching Module, Convertible Top Switch	8A-120-0 or 8A-11-9
16	CRANK	3	Diagnostic Energy Reserve Module	8A-11-9
17	RADIO	15	Radio, Steering Wheel Controls (Radio)	8A-11-9

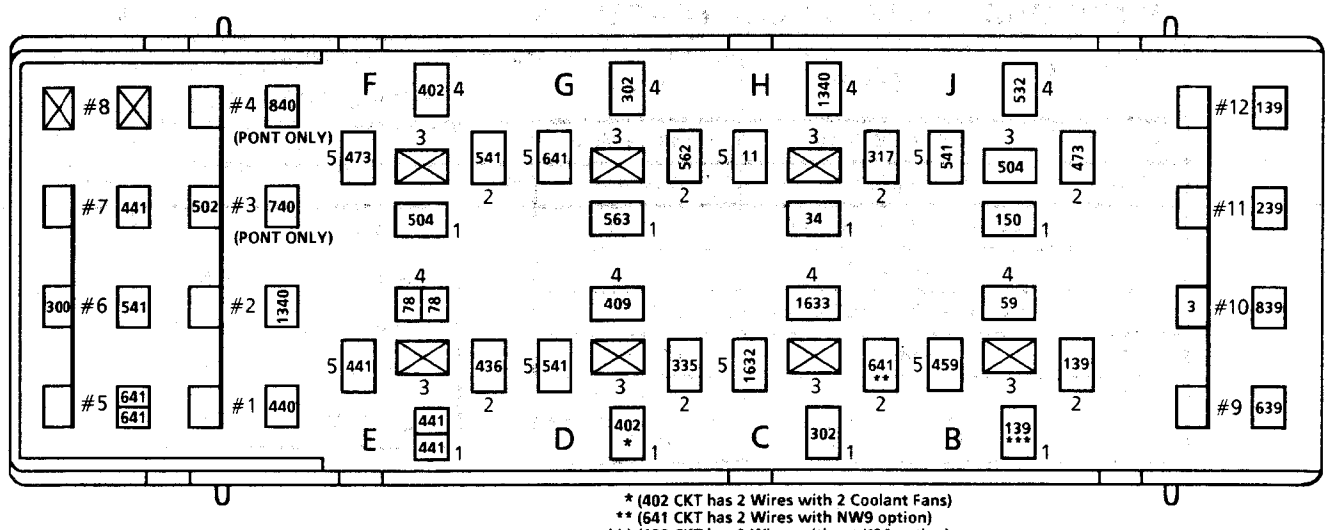
FUSE BLOCK DETAILS
UNDERHOOD ELECTRICAL CENTER

12110396
ASSEMBLY CONVENIENCE CENTER
BLK (BLOCK)

12129351
COVER CONVENIENCE CENTER
BLK (COVER)



TOP VIEW



* (402 CKT has 2 Wires with 2 Coolant Fans)
** (641 CKT has 2 Wires with NW9 option)
*** (139 CKT has 2 Wires without K34 option)

BACK VIEW

FUSE BLOCK DETAILS

UNDERHOOD ELECTRICAL CENTER – FUSES

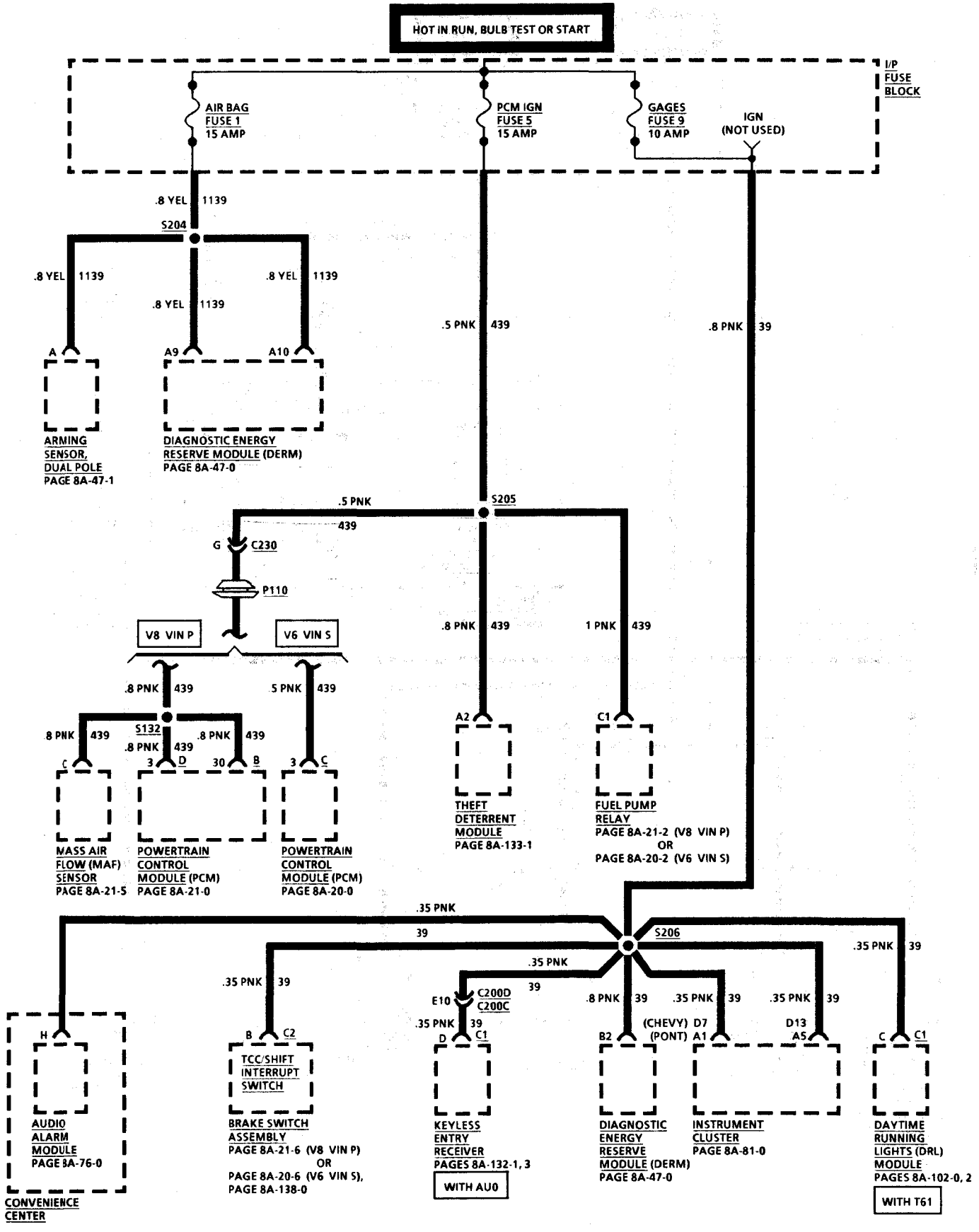
FUSE NUMBER	FUSE NAME	RATING (AMPS)	RELATED CIRCUITRY	PAGE
1	ABS BAT	5	Electronic Brake Control Module or Electronic Brake/Traction Control Module	8A-11-10
2	FOG LTS	20	Fog Lights	8A-11-10
3	HEADLAMP DOOR, RH (PONT ONLY)	15	Headlight Doors Module	8A-11-10
4	HEADLAMP DOOR, LH (PONT ONLY)	15	Headlight Doors Module	8A-11-10
5	ABS IGN	5	Antilock Brake System, Traction Control System	8A-11-11
6	FANS/ACTR	10	Coolant Fan Relays, EVAP Canister Purge Solenoid, Exhaust Gas Recirculation, Reverse Lockout Solenoid, Skip Shift Solenoid, Heated Oxygen Sensors	8A-11-12
7	AIR PUMP	20	Air Pump Relay	8A-11-11
8	NOT USED	–		–
9	INJECTOR	7.5	Fuel Injectors	(V6 VIN S) 8A-11-14, (V8 VIN P) 8A-11-13
10	INJECTOR	7.5	Fuel Injectors	
11	IGNITION	10	V6 VIN S: Camshaft Position Sensor, Crankshaft Position Sensor, Ignition Control Module, Automatic Transmission V8 VIN P: Ignition Coil, Ignition Coil Module, Automatic Transmission	8A-11-15
12	A/C-CRUISE	20	A/C Compressor Relay, Cruise Control Switches and Module	8A-11-15

UNDERHOOD ELECTRICAL CENTER – RELAYS

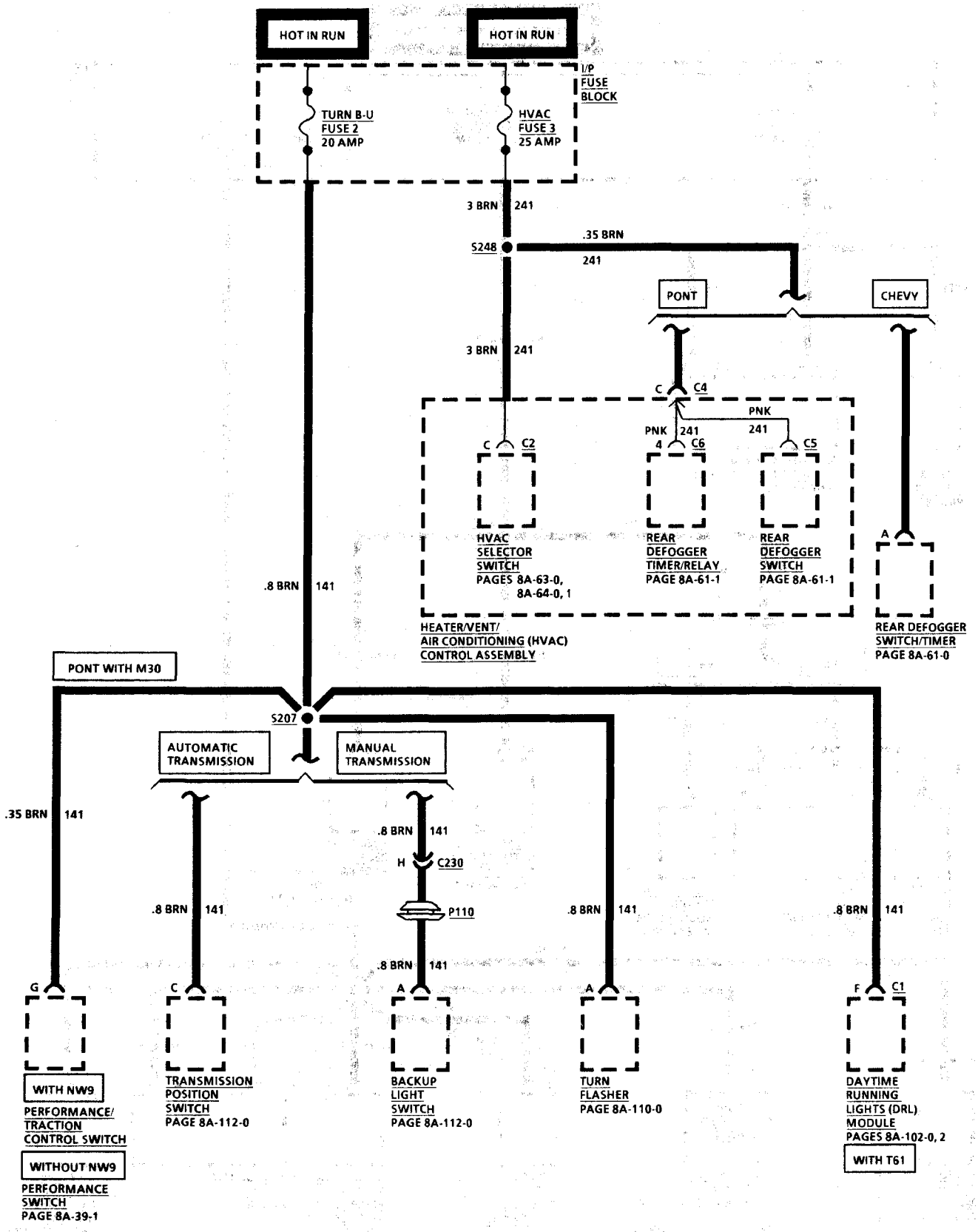
RELAY LOCATION	RELAY NAME	PAGE
B	A/C COMPRESSOR	8A-11-15
C	ABS	8A-11-11
D	COOLANT FAN, PRIMARY	8A-11-12
E	AIR PUMP	8A-11-11
F	COOLANT FAN, SECONDARY	8A-11-12
G	ASR/TCS	8A-11-11
H	FOG LIGHTS	8A-11-10
J	COOLANT FAN #3	8A-11-12

AUTOFUSE FUSE COLOR/RATINGS	
COLOR	AMPS
TAN	5
BROWN	7.5
RED	10
BLUE	15
YELLOW	20

FUSE BLOCK DETAILS
I/P FUSES 1, 5 AND 9

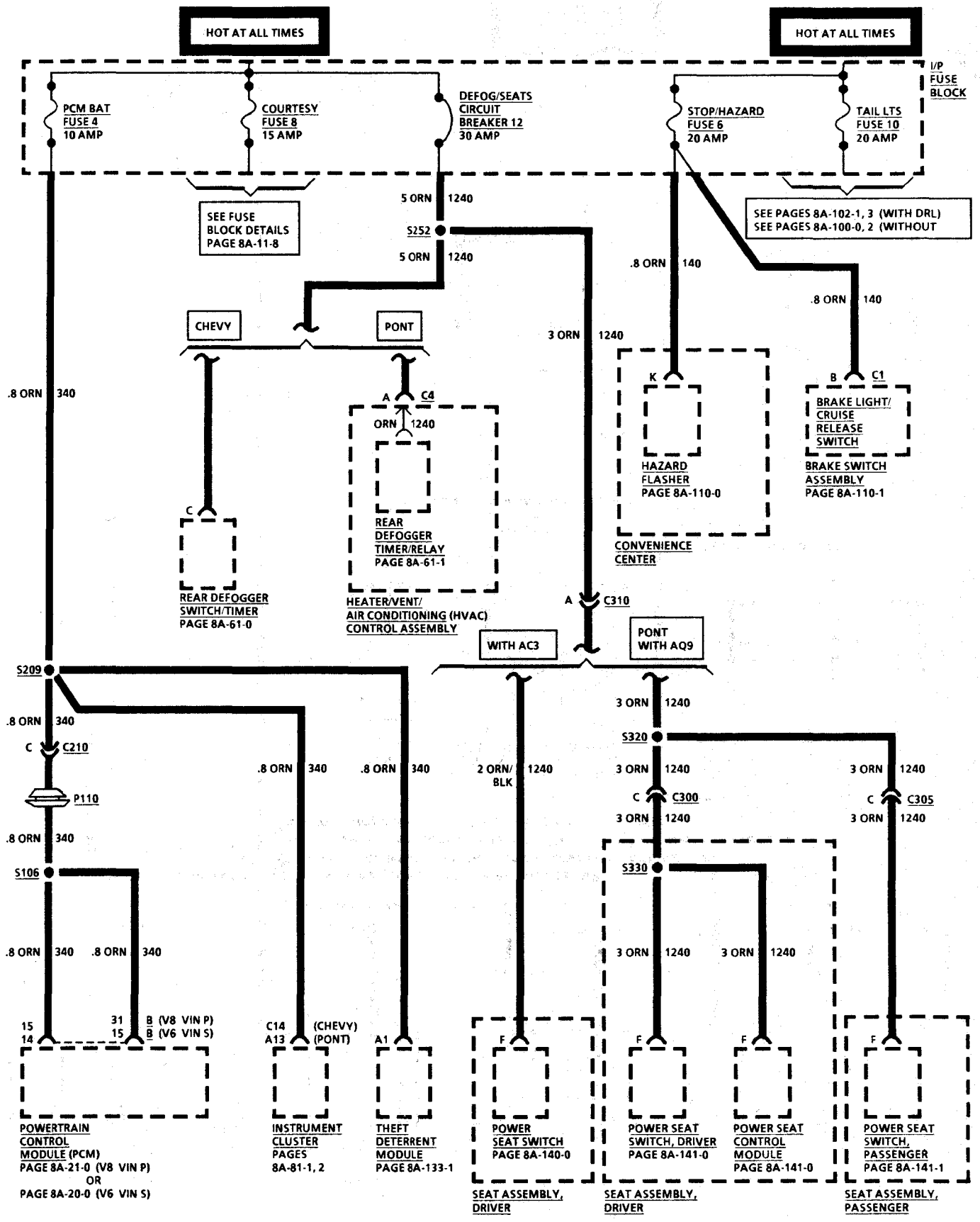


FUSE BLOCK DETAILS
I/P FUSES 2 AND 3

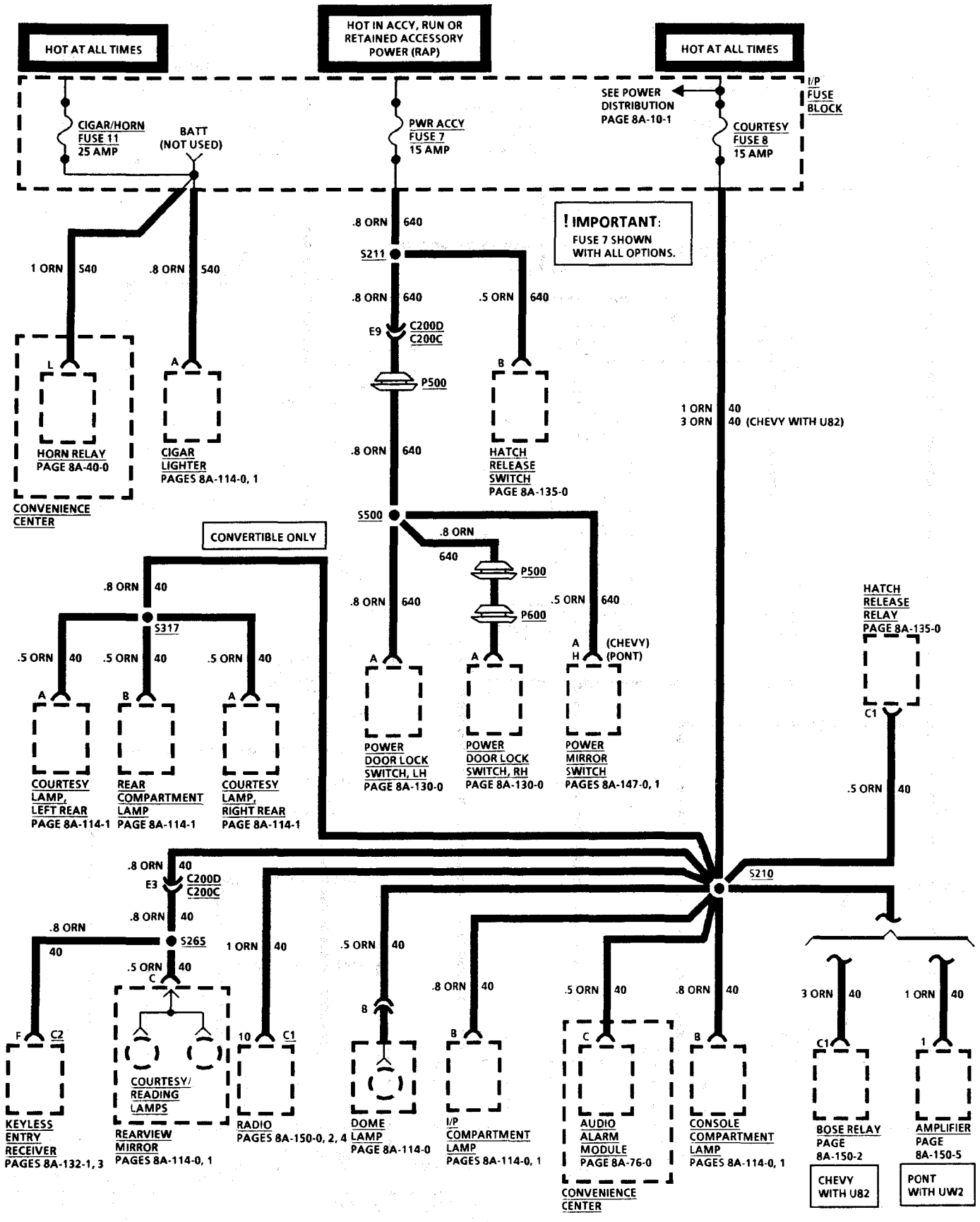


FUSE BLOCK DETAILS

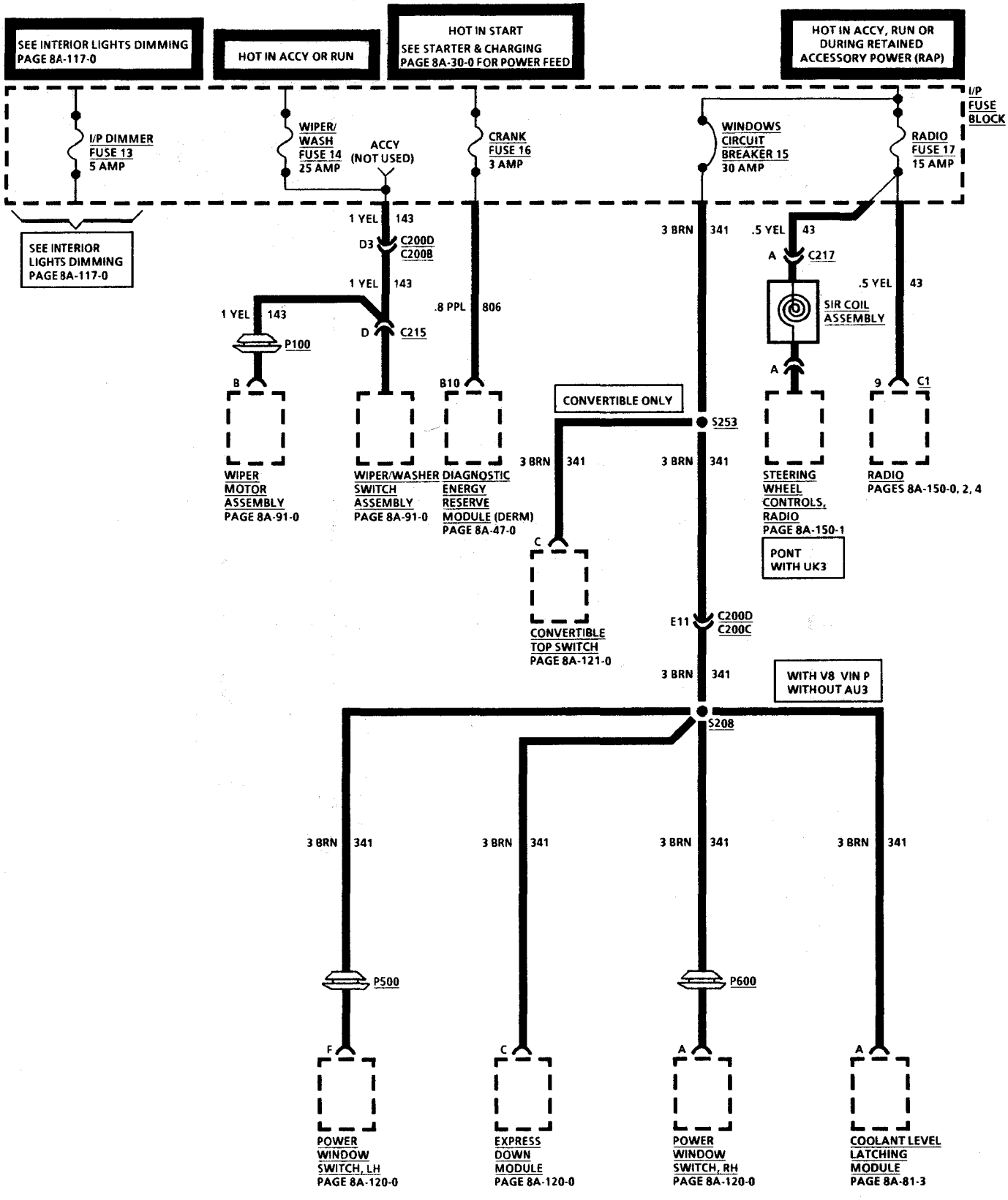
I/P FUSES 4, 6 AND DEFOG/SEATS CIRCUIT BREAKER



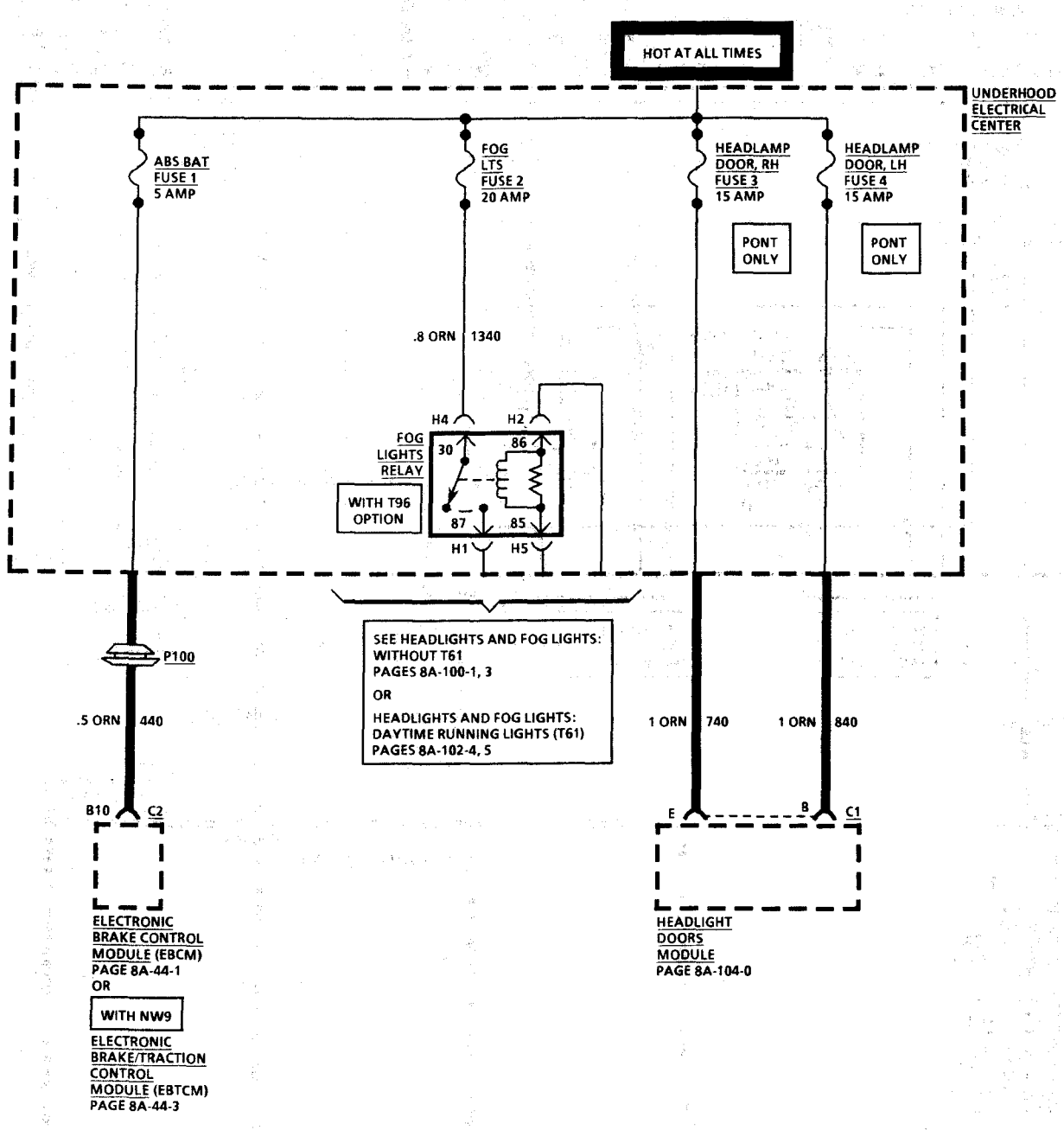
FUSE BLOCK DETAILS
I/P FUSES 7, 8 AND 11



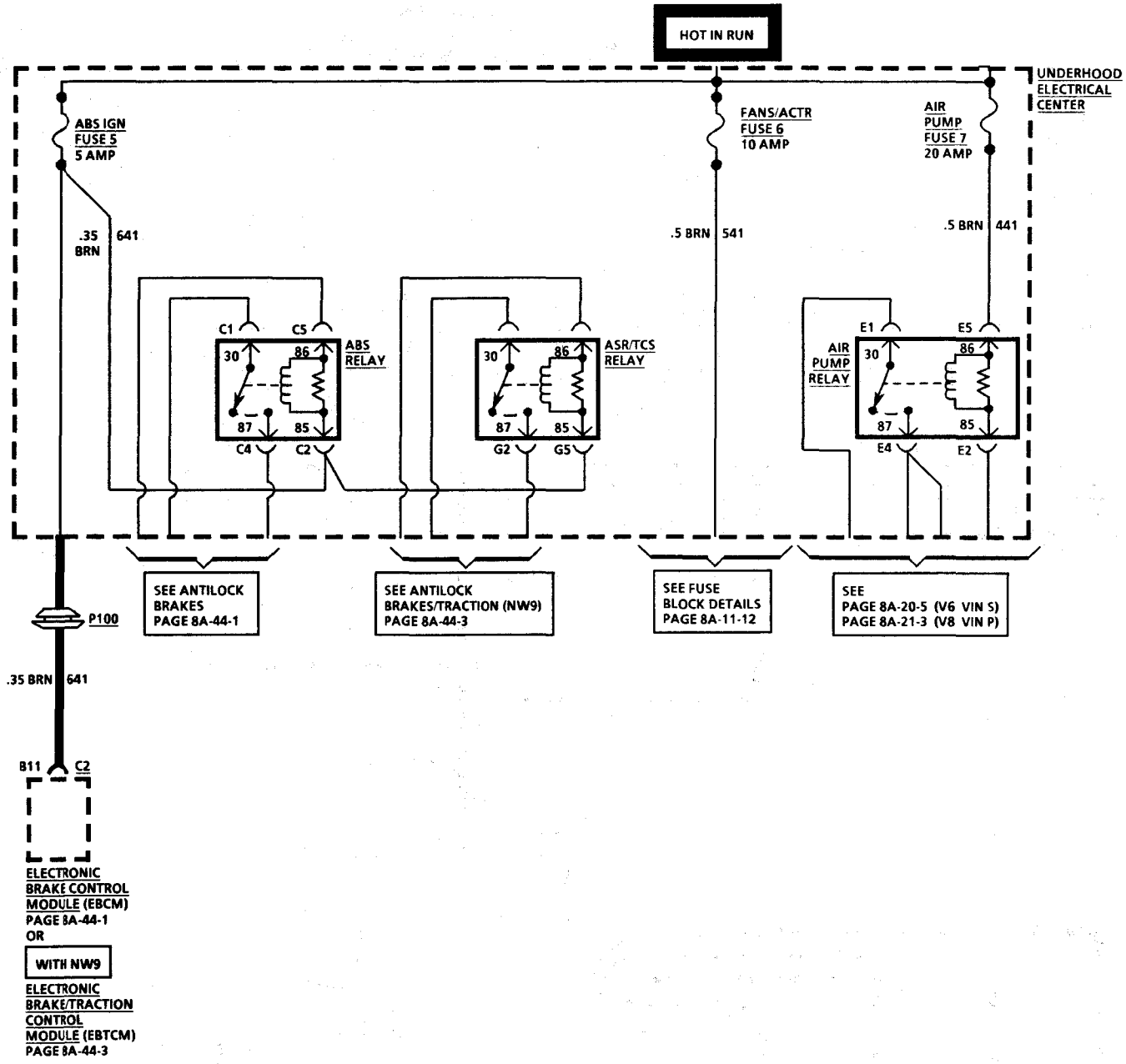
FUSE BLOCK DETAILS
I/P FUSES 13, 14, 16, 17 AND WINDOWS CIRCUIT BREAKER



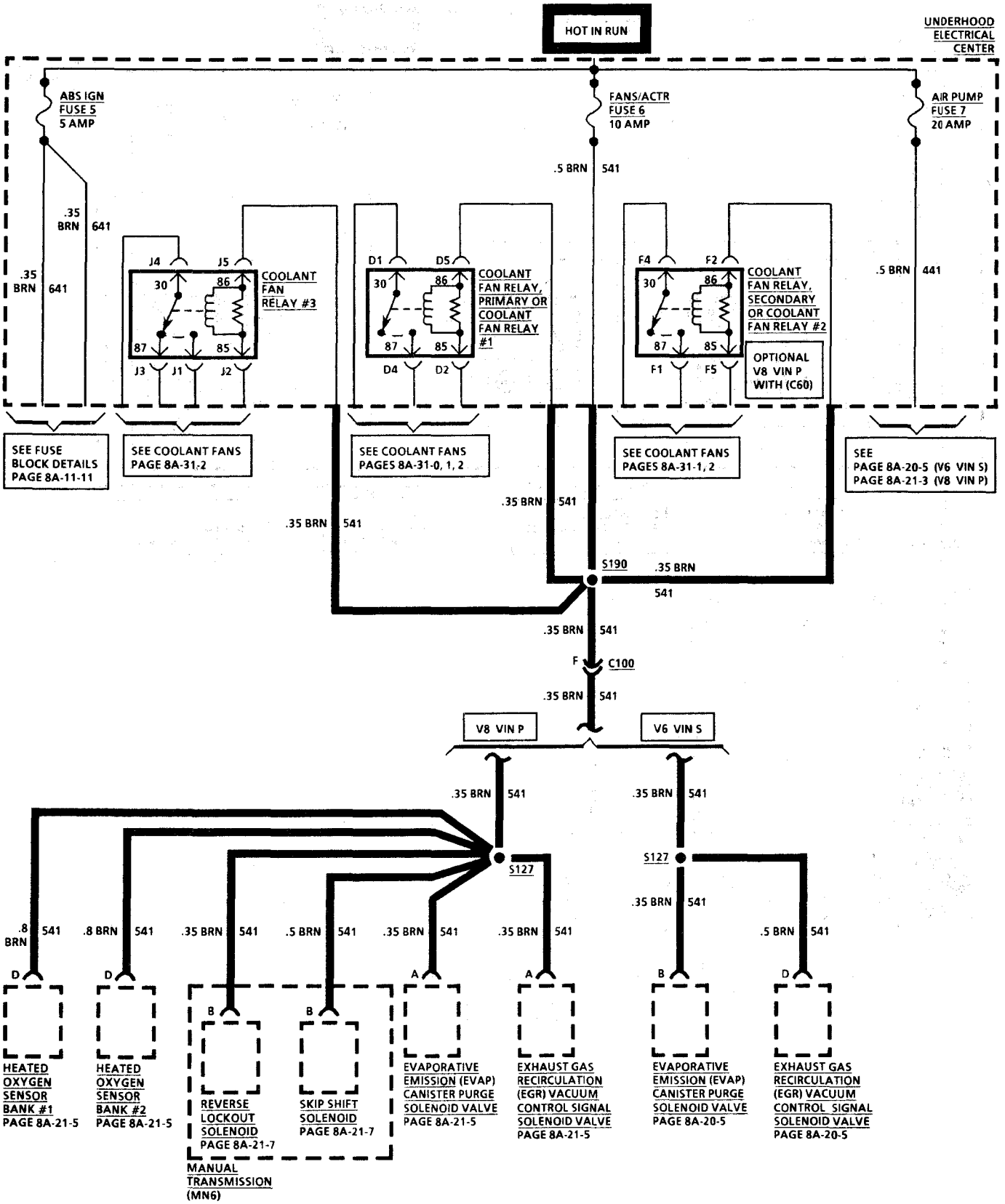
FUSE BLOCK DETAILS
UNDERHOOD FUSES 1, 2, 3, 4 AND FOG LIGHTS RELAY



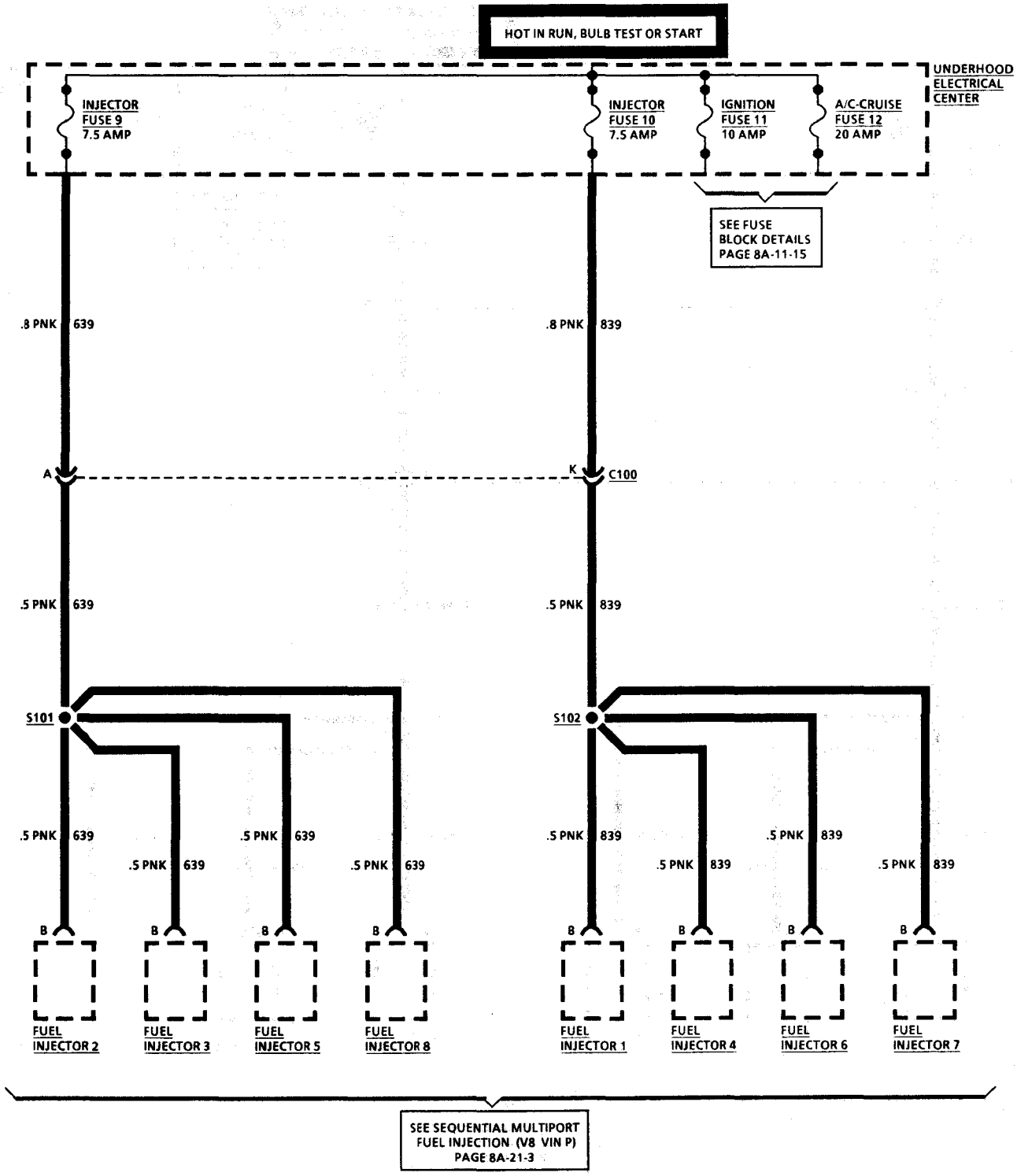
FUSE BLOCK DETAILS
UNDERHOOD FUSES 5 AND 7, ABS RELAY, ASR/TCS RELAY AND AIR PUMP



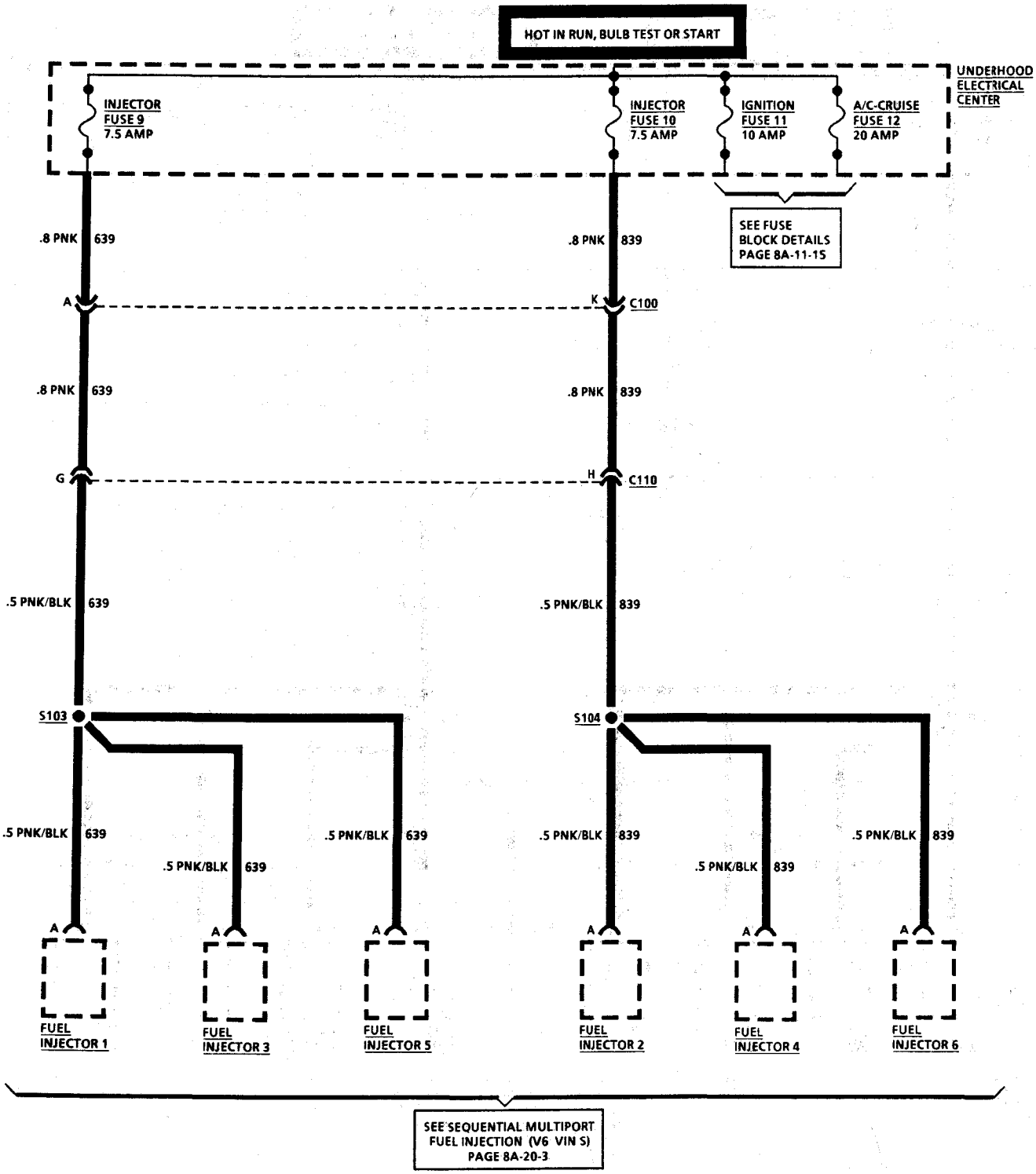
FUSE BLOCK DETAILS
UNDERHOOD FUSE 6, COOLANT FAN RELAYS



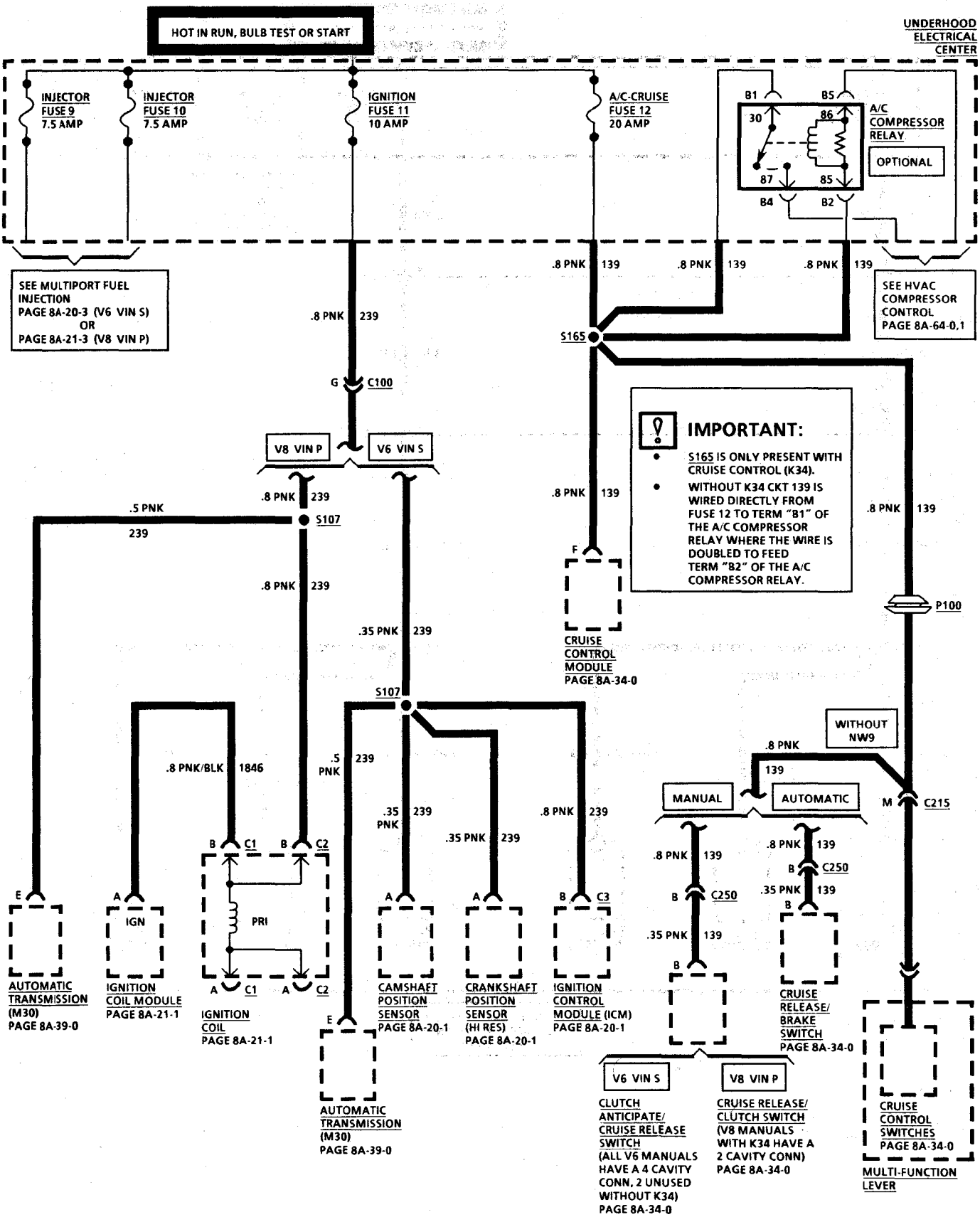
FUSE BLOCK DETAILS
UNDERHOOD FUSES 9 AND 10 (V8 VIN P)



FUSE BLOCK DETAILS
UNDERHOOD FUSES 9 AND 10 (V6 VIN S)



FUSE BLOCK DETAILS
UNDERHOOD FUSES 11, 12 AND A/C COMPRESSOR RELAY



FUSE BLOCK DETAILS

COMPONENT	LOCATION	201-PG	FIG.	CONN
Amplifier (part of UW2 Speaker Option)	Mounted behind Right Rear Armrest, on Rail	44	83	202-9
Arming Sensor, Dual Pole	Mounted to Floor Tunnel Bracket, under console	43	81	202-19
Backup Light Switch (M49) (V6 VIN S)	Middle of Transmission, left side	16	30	
Backup Light Switch (MM6) (V8 VIN P)	Middle of Transmission, right side	26	51	
Bose Relay	Below center A/C Duct, mounted to SIR Bracket	22	41	202-21
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Camshaft Position Sensor (V6 VIN S)	In front top of Engine Block, between Intake and Water Pump	13	24	
Cigar Lighter	Mounted on front of console	43	81	
Clutch Anticipate/ Cruise Release Switch (all V6 Manual)	Mounted in clutch pedal bracket (4 cavity conn)	0	1	202-20
Console Compartment Lamp	Under Console Compartment Door	43	81	
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Convertible Top Switch	Left side of upper console (Chevy) or lower console (Pont)	42	78, 80	202-20
Coolant Level Latching Module	In molded pocket of dash mat, center above floor tunnel	45	84	202-20
Courtesy Lamp, Left Rear	Mounted in left sail panel			
Courtesy Lamp, Right Rear	Mounted in right sail panel			
Crankshaft Position Sensor, HI Resolution (V6 VIN S)	Lower front of Engine Block, pigtail comes out LH side of crank	11	20	
Cruise Control Module	Front LH side of vehicle, mounted to frame rail, forward of wheelhouse	19	36	202-11
Cruise Release/Brake Switch (all with K34)	Mounted in upper hole of brake pedal bracket (2 cavity conn)	0	1	
Cruise Release/Clutch Switch (V8 Manual with K34)	Mounted in clutch pedal bracket (2 cavity conn)	0	1	
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Diagnostic Energy Reserve Module (DERM)	Snapped in bracket, behind RH side of I/P Compartment	8	15	202-12
Dome Lamp	On roof, near hatch	4	6	
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Evaporative Emission (EVAP) Canister Purge Solenoid Valve (V6 VIN S)	Left side of Engine, mounted to Intake Plenum	13	24	

COMPONENT	LOCATION	201-PG	FIG.	CONN
Evaporative Emission (EVAP) Canister Purge Solenoid Valve (V8 VIN P)	Right center of Engine, mounted to Manifold	26	50	
Exhaust Gas Recirculation (EGR) Vacuum Control Signal Solenoid Valve (V6 VIN S)	Right side of Engine, mounted to Manifold	12	23	202-20
Exhaust Gas Recirculation (EGR) Vacuum Control Signal Solenoid Valve (V8 VIN P)	Left rear of Engine, mounted to Intake Plenum	24	44	
Express Down Module	Mounted to center of dash mat, above floor tunnel	9	17	202-21
Fuel Injectors (V6 VIN S)	Mounted on Intake Manifold, part of Fuel Rail			
Fuel Injectors (V8 VIN P)	Mounted on Intake Manifold, part of Fuel Rail	24	44	
Fuel Pump Relay	Forward of LH kick panel, mounted to foot rest bracket under carpet	7	13	202-21
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	
Headlight Doors Module	Forward of LH front wheelhouse, mounted to Air Intake	19	36	202-21
Heated Oxygen Sensor Bank #1	Mounted in left Exhaust Manifold	24	44	202-22
Heated Oxygen Sensor Bank #2	Mounted in right Exhaust Manifold	40	72	202-22
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
I/P Compartment Lamp	Inside top center of compartment	22	41	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Coil (V8 VIN P)	Front LH side of Engine	16	29	
Ignition Coil Module (V8 VIN P)	Front LH side of Engine	16	29	202-22
Ignition Control Module (ICM) (V6 VIN S)	Left front of Engine	27	52	202-22
Instrument Cluster	LH side of I/P			202-23
Keyless Entry Receiver	Behind RH side kick panel, in molded pocket	40	71	202-23
Mass Air Flow (MAF) Sensor	Mounted on air duct, in front of Intake Manifold	24	45	
Multi-Function Lever	Left Arm on Steering Column	27	53	
Performance Switch	Mounted in center console behind shifter			202-24
Performance/Traction Control Switch	Mounted in center console behind shifter	42	79	202-24
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
Power Mirror Switch	Mounted in left door armrest	18	33	202-24
Power Seat Control Module (AQ9)	Under Driver's Seat	47	86	202-24
Power Seat Switch (AC3)	On left side of Driver's Seat	41	76	202-24
Power Seat Switch, Driver (AQ9)	On left side of Driver's Seat	47	86	202-24
Power Seat Switch, Passenger (AQ9)	On right side of Passenger Seat	47	86	202-24
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Power Window Switch, LH	Mounted in left door armrest	18	33	202-27
Power Window Switch, RH	Mounted in right door armrest	18	33	202-27

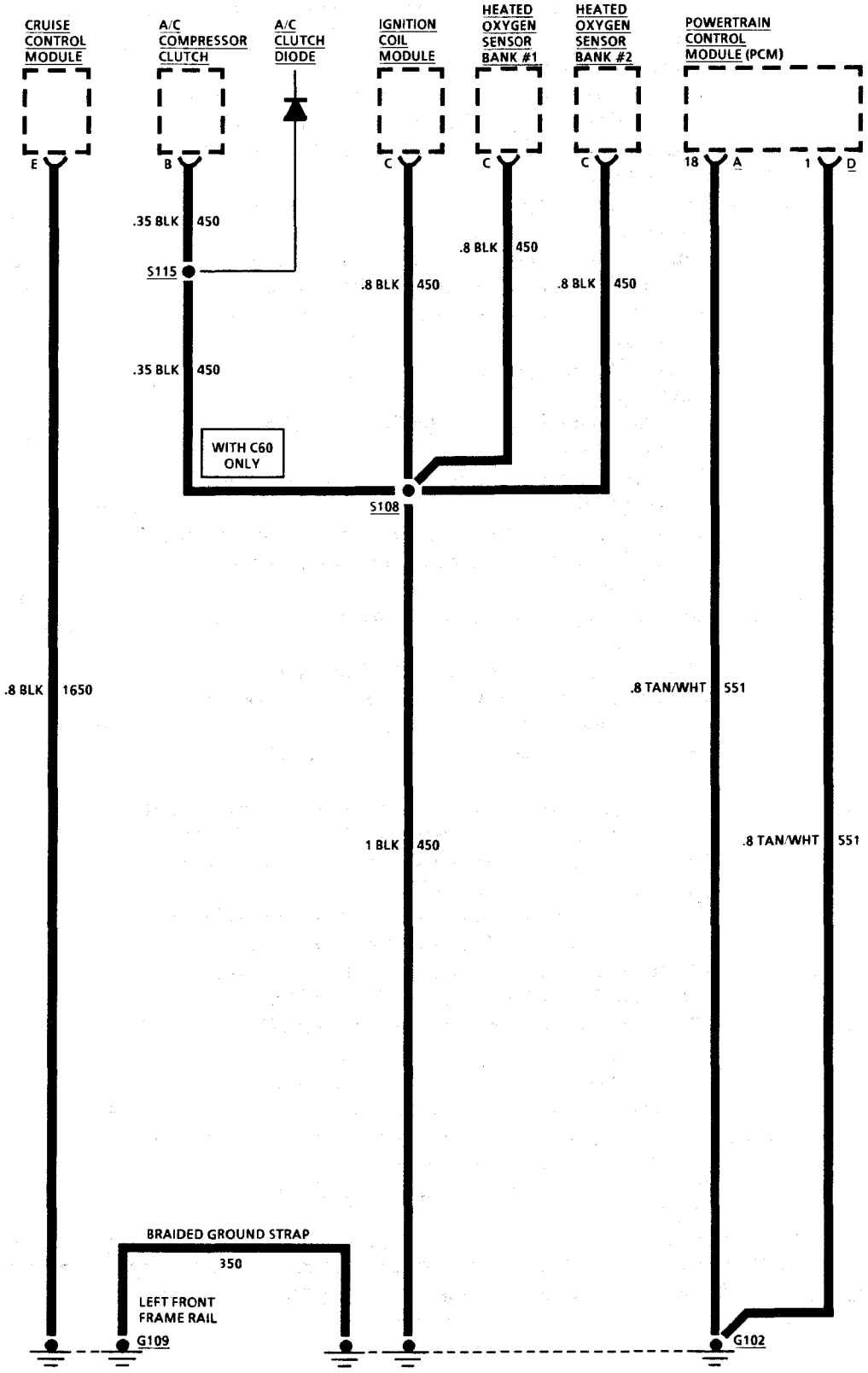
FUSE BLOCK DETAILS

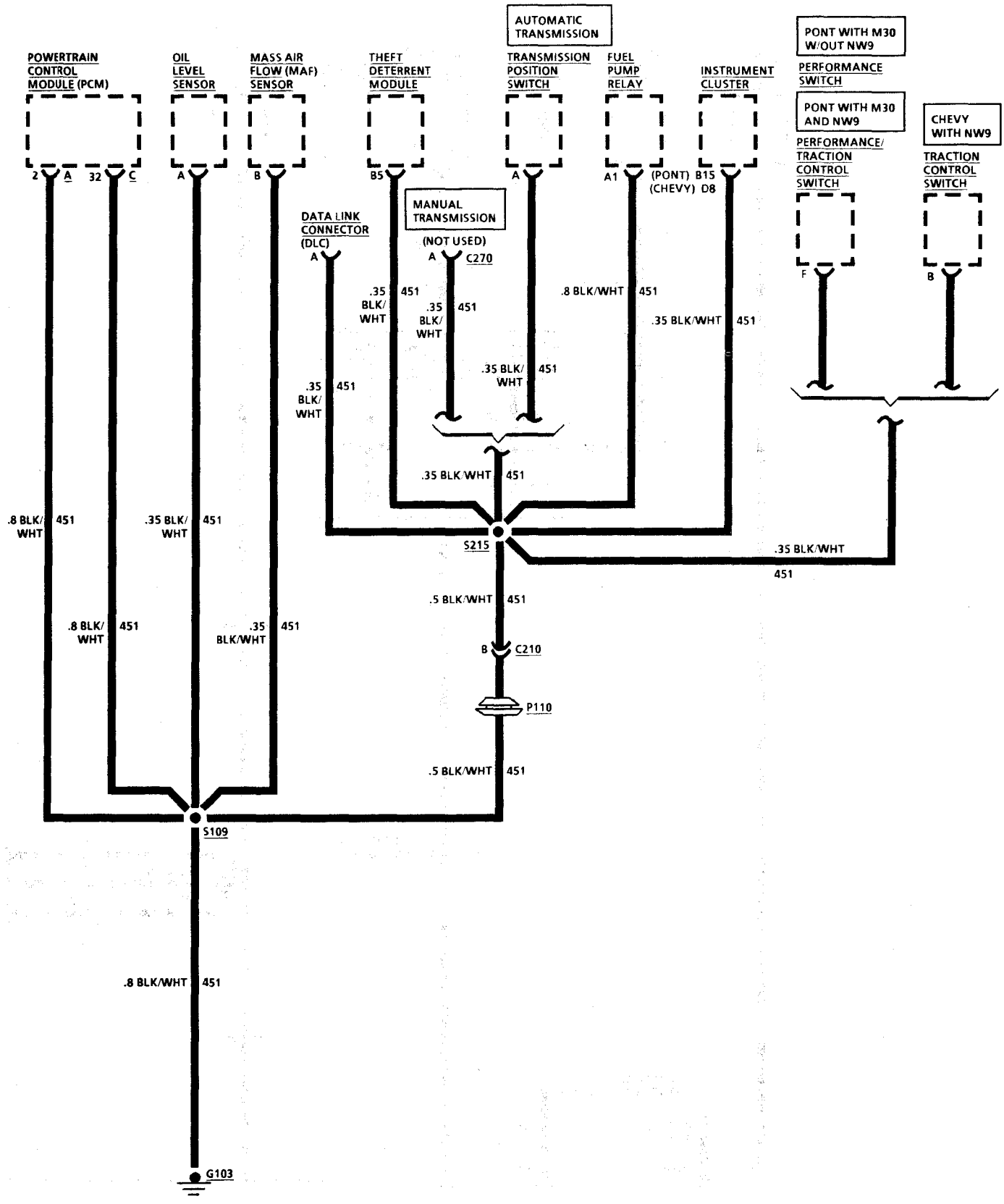
COMPONENT	LOCATION	201-PG	FIG.	CONN
Radio	Center of I/P Carrier	36	65	202-16
Rear Compartment Lamp	Center of rear compartment below Hatch Release Actuator	30	58	
Rear Defogger Switch	Part of HVAC Assembly	21	39	
Rear Defogger Switch/Timer	Mounted on I/P knee bolster, right of Steering Column	37	66	202-27
Rear Defogger Timer/Relay	Part of HVAC Assembly	21	39	
Rearview Mirror	Top center of windshield			202-27
Reverse Lockout Solenoid (V8 VIN P Manual)	Rear LH side of Transmission	26	51	
SIR Coil Assembly	Top of Steering Column	3, 34	5, 51	
Skip Shift Solenoid	Center LH side of Transmission	26	51	
Steering Wheel Controls, Radio (UK3)	On Steering Wheel	2	3	202-27
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
Turn Flasher	Mounted to bracket, right of Steering Column, above Data Link Conn	8	15	
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
Wiper Motor Assembly	Rear of LH Shock Tower, mounted to dash panel below LH Wiper Mount	10	18	202-28
Wiper/Washer Switch Assembly	In left side of Steering Column, actuated by Multi-Function Lever	3	5	
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C110 (10 cavities) (L32)	Engine to Injector Harn, top center of Intake Manifold	12	22	202-1
C200B (18 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C215 (11 cavities)	Near base of Steering Column	35	64	202-4
C217 (4 cavities)	Near base of Steering Column	34	63	202-19
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C250 (2 cavities)	Forward Lamp Harn to Clutch Jumper Harn or Switch, near brake/clutch pedal bracket	0, 1	1, 2	
C300 (6 cavities) (AQ9)	Under Driver Seat Assembly	47	86	202-19
C305 (6 cavities) (AQ9)	Under Passenger Seat Assembly	46	85	202-19
C310 (2 cavities)	Between rear mounting bolt of Driver Seat near #3 Rail	6	11	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S101 (LT1)	Engine Harn, between Injectors 4 and 6 breakouts	26	50	

COMPONENT	LOCATION	201-PG	FIG.	CONN
S102 (LT1)	Engine Harn, approx 5 cm from Injector 3 breakout	24	44	
S103 (L32)	Injector Jumper Harn, approx 7 cm from LH Branch breakout			
S104 (L32)	Injector Jumper Harn, approx 9 cm from Injector 6			
S106 (L32)	Engine Harn, approx 25 cm from PCM Connectors			
S106 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S107 (LT1)	Engine Harn, approx 7 cm from main breakout, at right rear of Engine			
S107 (L32)	Engine Harn, approx 30 cm from C110 breakout	12	22	
S127 (L32)	Engine Harn, approx 13 cm from RH branch			
S127 (LT1)	Engine Harn, approx 8 cm from left clip, on Intake Manifold	24	44	
S132 (LT1)	Engine Harn, approx 2 cm from clip near PCM and main branch			
S165	Forward Lamp Harn, approx 7 cm from Electrical Center breakout			
S190	Forward Lamp Harn, approx 8 cm from Electrical Center breakout	36	68	
S204	I/P Harn, approx 10 cm from Steering Column breakout			
S205	I/P Harn, approx 31 cm from Convenience Center breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S207	I/P Harn, approx 4 cm before DLC breakout			
S208	Cross Car Harn, approx 5 cm from Express Down Module breakout	45	84	
S209	I/P Harn, approx 24 cm from Convenience Center breakout			
S210	I/P Harn, approx 44 cm from Convenience Center (Pont) or 12 cm from RR Defog Switch (Chevy) breakouts			
S211	I/P Harn, approx 4 cm from antenna cable (Chevy) or Convenience Center (Pont) breakouts			
S248	I/P Harn, approx 4 cm before RR Defog Switch (Chevy) or from Instrument Cluster (Pont) breakouts			
S252	I/P Harn, approx 17 cm back from HVAC Controls (Pont) or RR Defogger Switch/Timer (Chevy)			
S253	I/P Harn, approx 35 cm from Convenience Center breakout			
S265	Cross Car Harn, approx 20 cm from Rearview Mirror breakout	45	84	
S317	I/P Harn, approx at rear edge of door below left sail panel			
S320	Seat Jumper Harn, near rosebud under Driver Seat			
S330	Driver Seat Harn, approx 22 cm from Power Seat Switch Conn			
S500	Cross Car Harn, approx 6 cm from Speaker breakout	17	31	

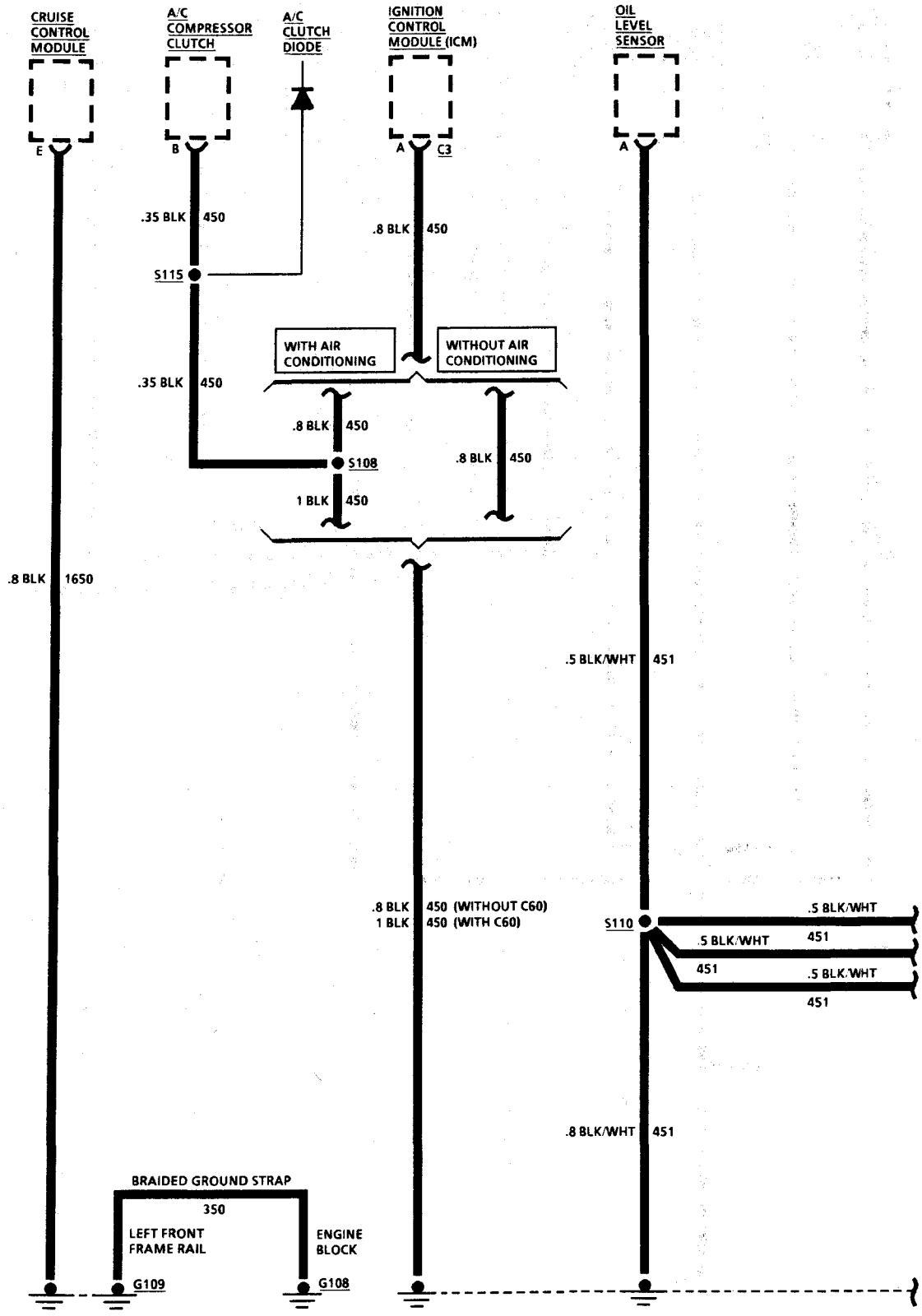
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

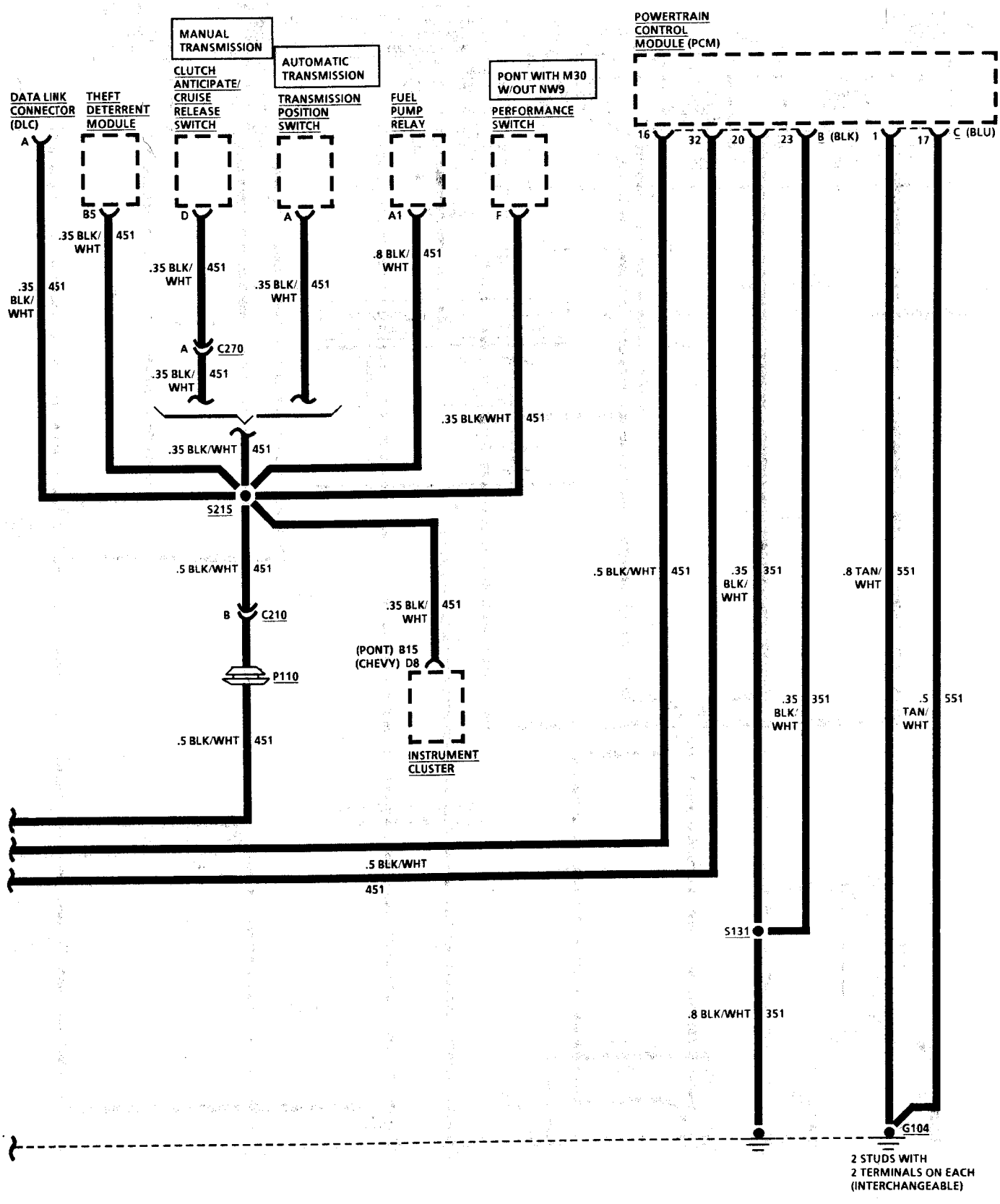
GROUND DISTRIBUTION
V8 VIN P




POWERTRAIN CONTROL MODULE (PCM)
OIL LEVEL SENSOR
MASS AIR FLOW (MAF) SENSOR
THEFT DETERRENT MODULE
AUTOMATIC TRANSMISSION
TRANSMISSION POSITION SWITCH
FUEL PUMP RELAY
INSTRUMENT CLUSTER
PONT WITH M30 W/OUT NW9
PERFORMANCE SWITCH
PONT WITH M30 AND NW9
PERFORMANCE/ TRACTION CONTROL SWITCH
CHEVY WITH NW9
TRACTION CONTROL SWITCH
MANUAL TRANSMISSION
(NOT USED)
C270
DATA LINK CONNECTOR (DLC)
2 A 32 C
A
B
B5
A
A1
(PONT) (CHEVY) B15 D8
F
B
.8 BLK/WHT 451
.35 BLK/WHT 451
.5 BLK/WHT 451
S215
S109
C210
P110
G103

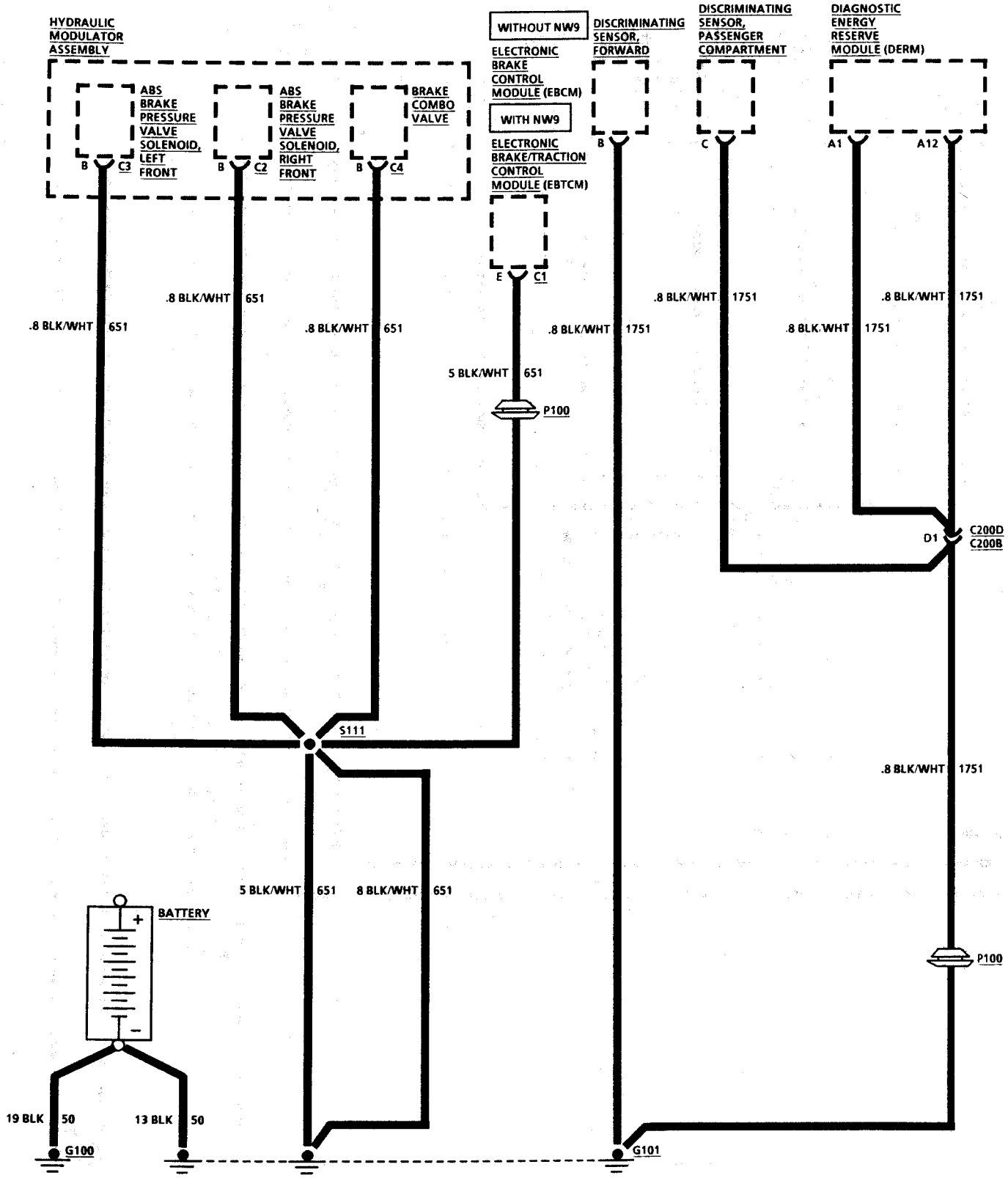
GROUND DISTRIBUTION
V6 VIN S



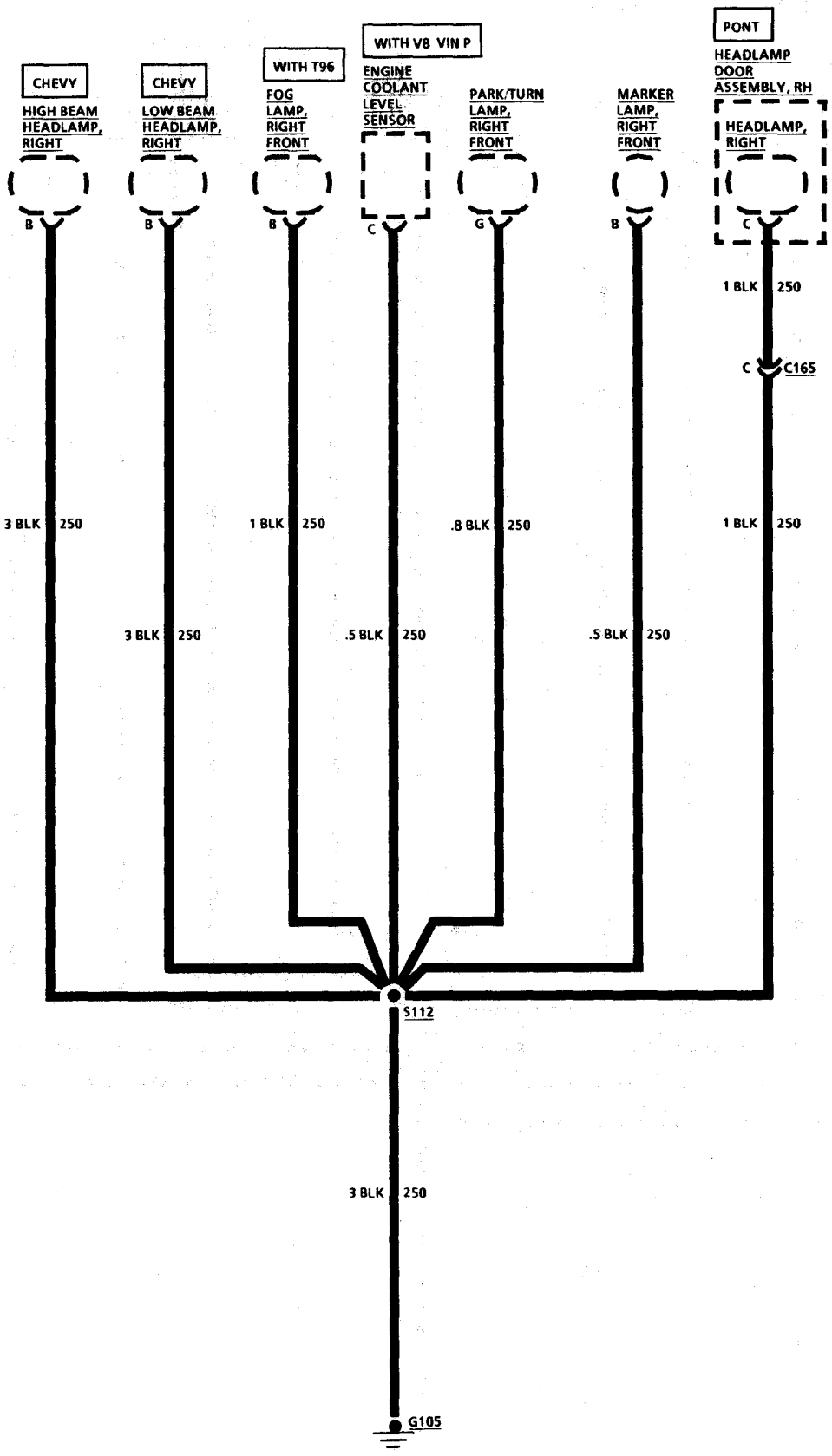

MANUAL TRANSMISSION
AUTOMATIC TRANSMISSION
PONT WITH M30 W/OUT NW9
POWERTRAIN CONTROL MODULE (PCM)
DATA LINK CONNECTOR (DLC)
THEFT DETERRENT MODULE
CLUTCH ANTICIPATE/ CRUISE RELEASE SWITCH
TRANSMISSION POSITION SWITCH
FUEL PUMP RELAY
PERFORMANCE SWITCH
A
B5
D
A
A1
F
16
32
20
23
B (BLK)
1
17
C (BLU)
.35 BLK/WHT 451
.8 BLK/WHT 451
.5 BLK/WHT 451
C270
S215
C210
P110
S131
G104
.35 BLK/WHT 351
.8 TAN/WHT 551
.5 TAN/WHT 551
.8 BLK/WHT 351
(PONT) B15
(CHEVY) D8
INSTRUMENT CLUSTER
2 STUDS WITH 2 TERMINALS ON EACH (INTERCHANGEABLE)

GROUND DISTRIBUTION

ANTILOCK BRAKE SYSTEM (ABS) OR TRACTION CONTROL SYSTEM (NW9) AND SUPPLEMENTAL INFLATABLE RESTRAINT (SIR)

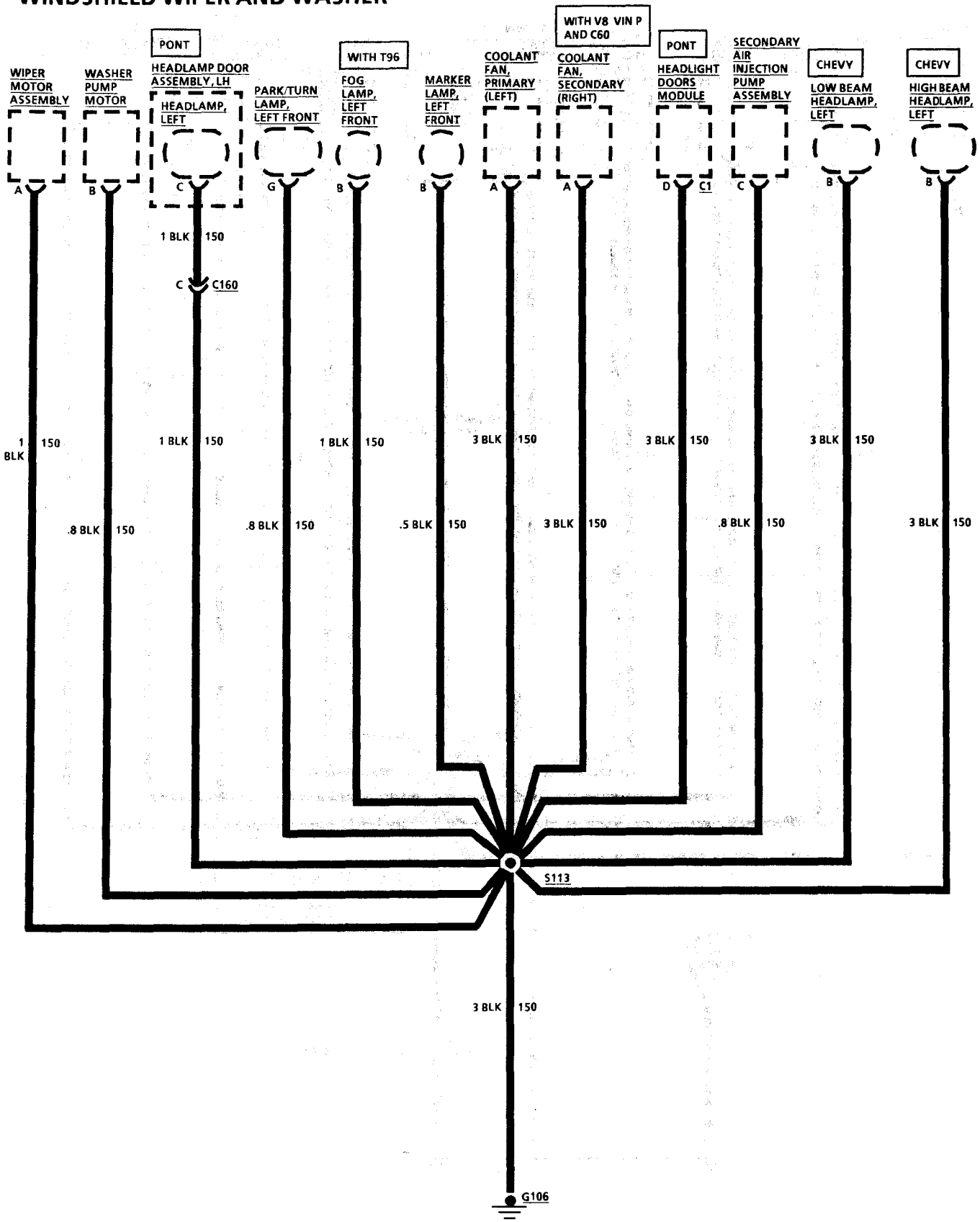


GROUND DISTRIBUTION
ENGINE COOLANT LEVEL SENSOR AND FORWARD LAMP

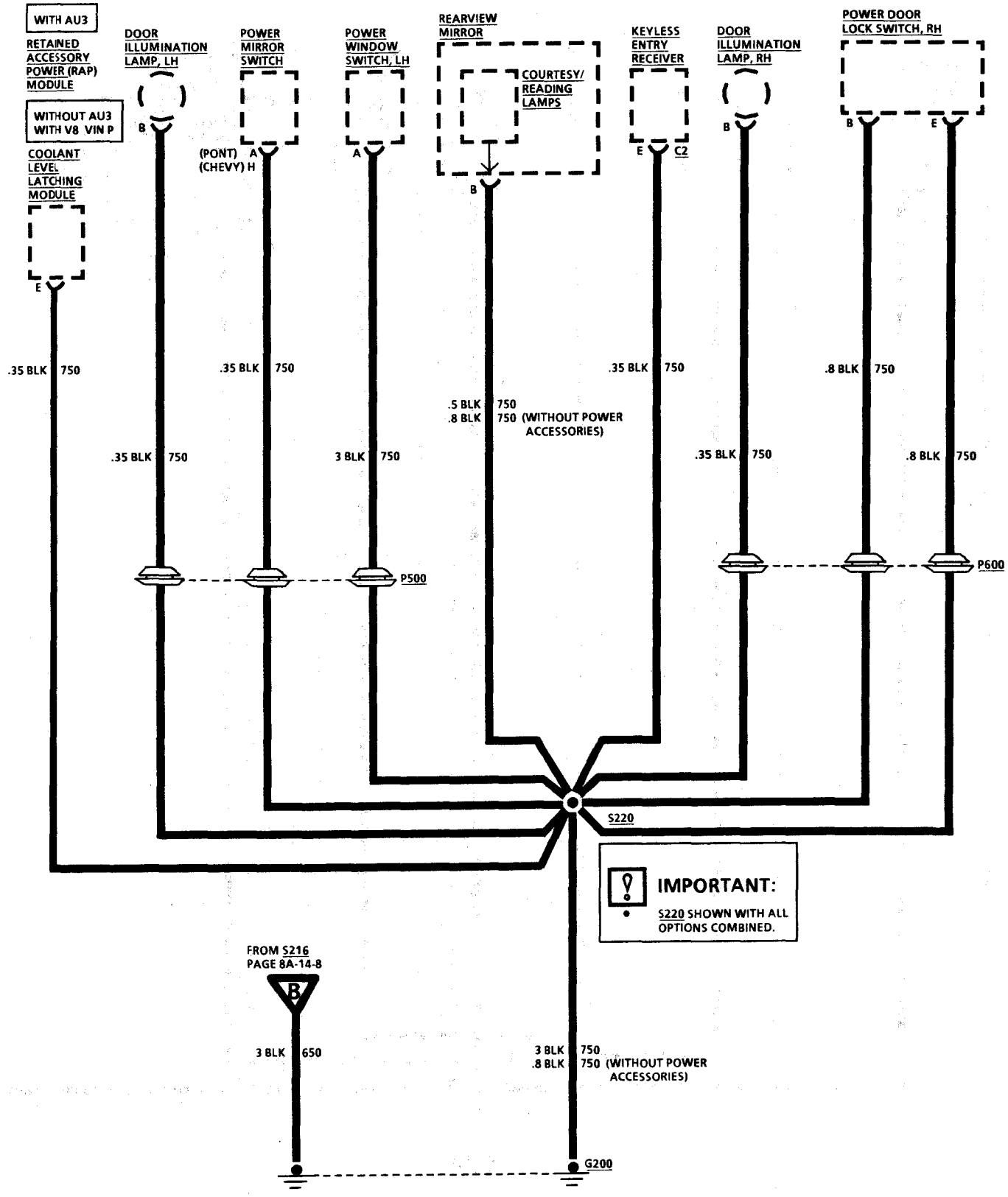


GROUND DISTRIBUTION

AIR PUMP, COOLANT FAN, HEADLIGHT DOOR MODULE, FORWARD LAMP, WINDSHIELD WIPER AND WASHER

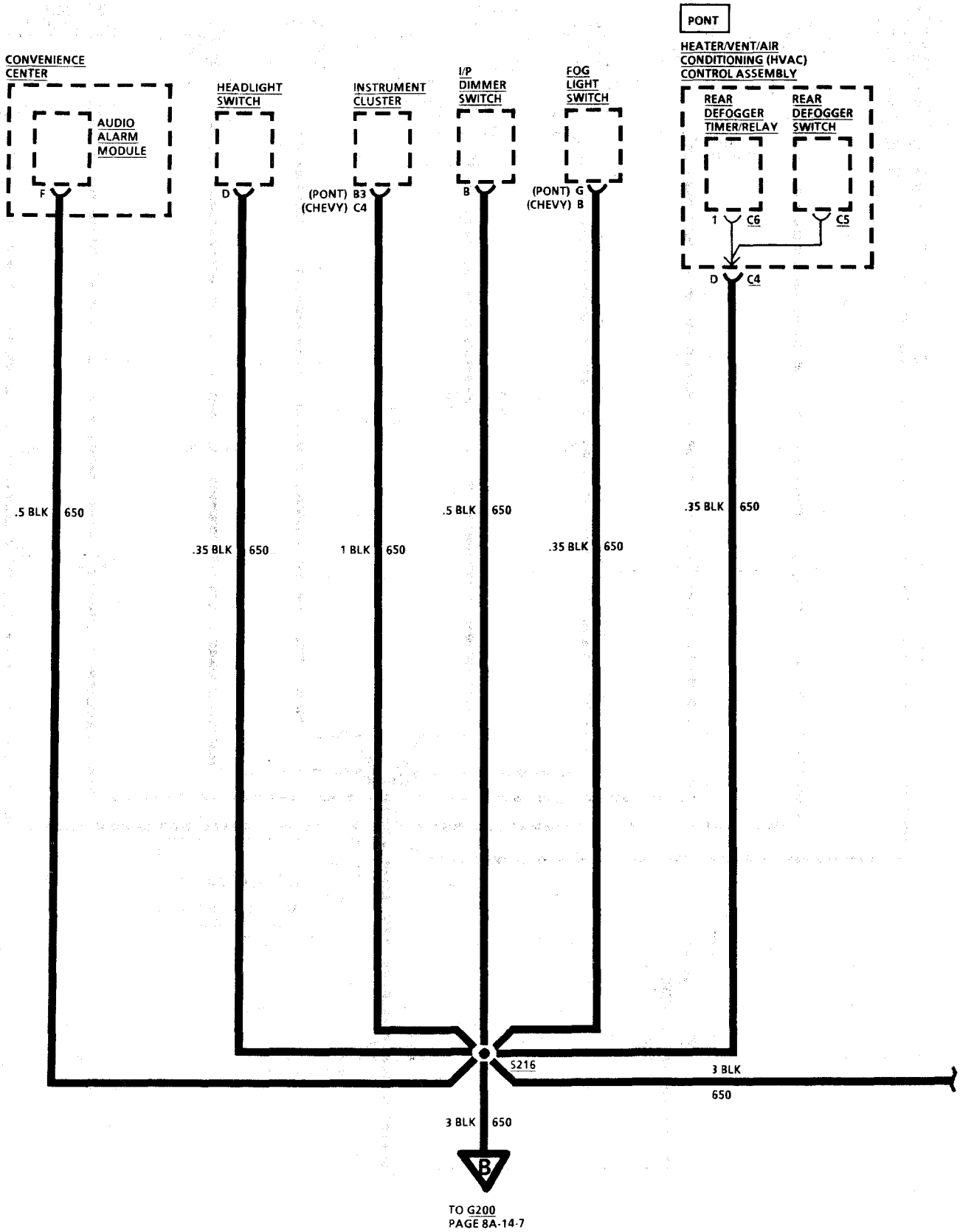


GROUND DISTRIBUTION
POWER DOORS, LOCKS, MIRRORS AND WINDOWS



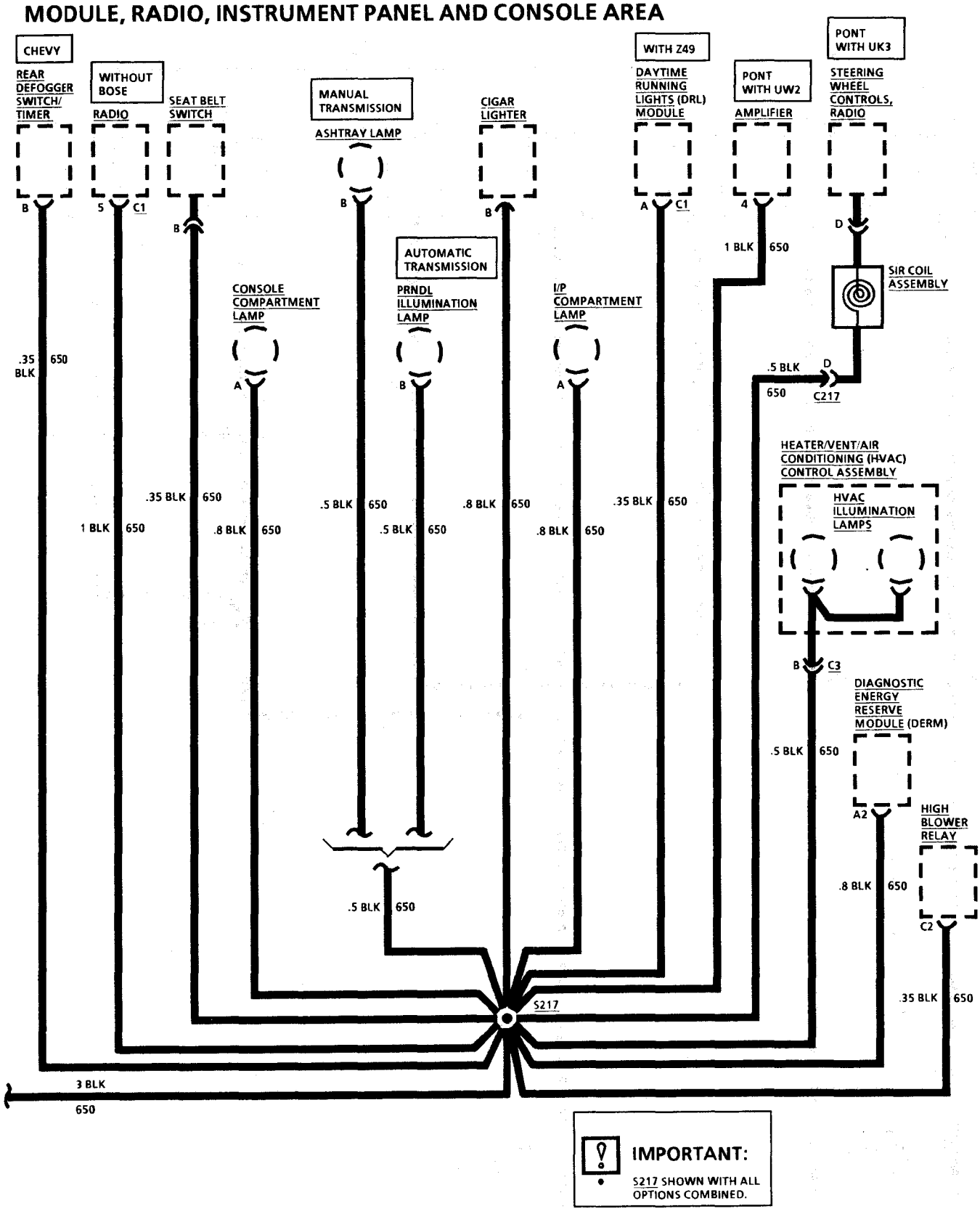
GROUND DISTRIBUTION

AUDIO ALARM MODULE, HATCH RELEASE, LIGHT SWITCHES, POWER SEATS AND REAR DEFOGGER



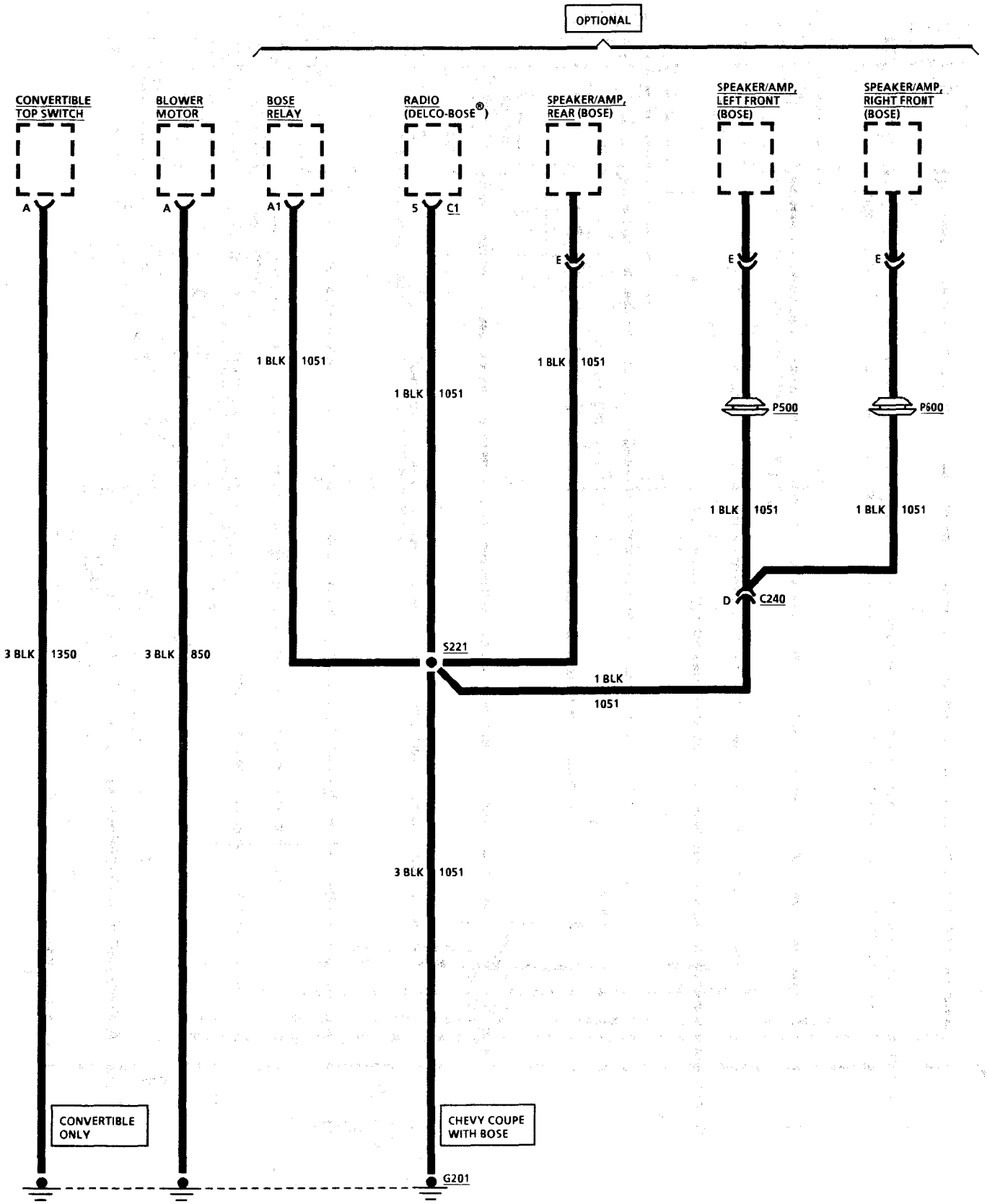
GROUND DISTRIBUTION

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



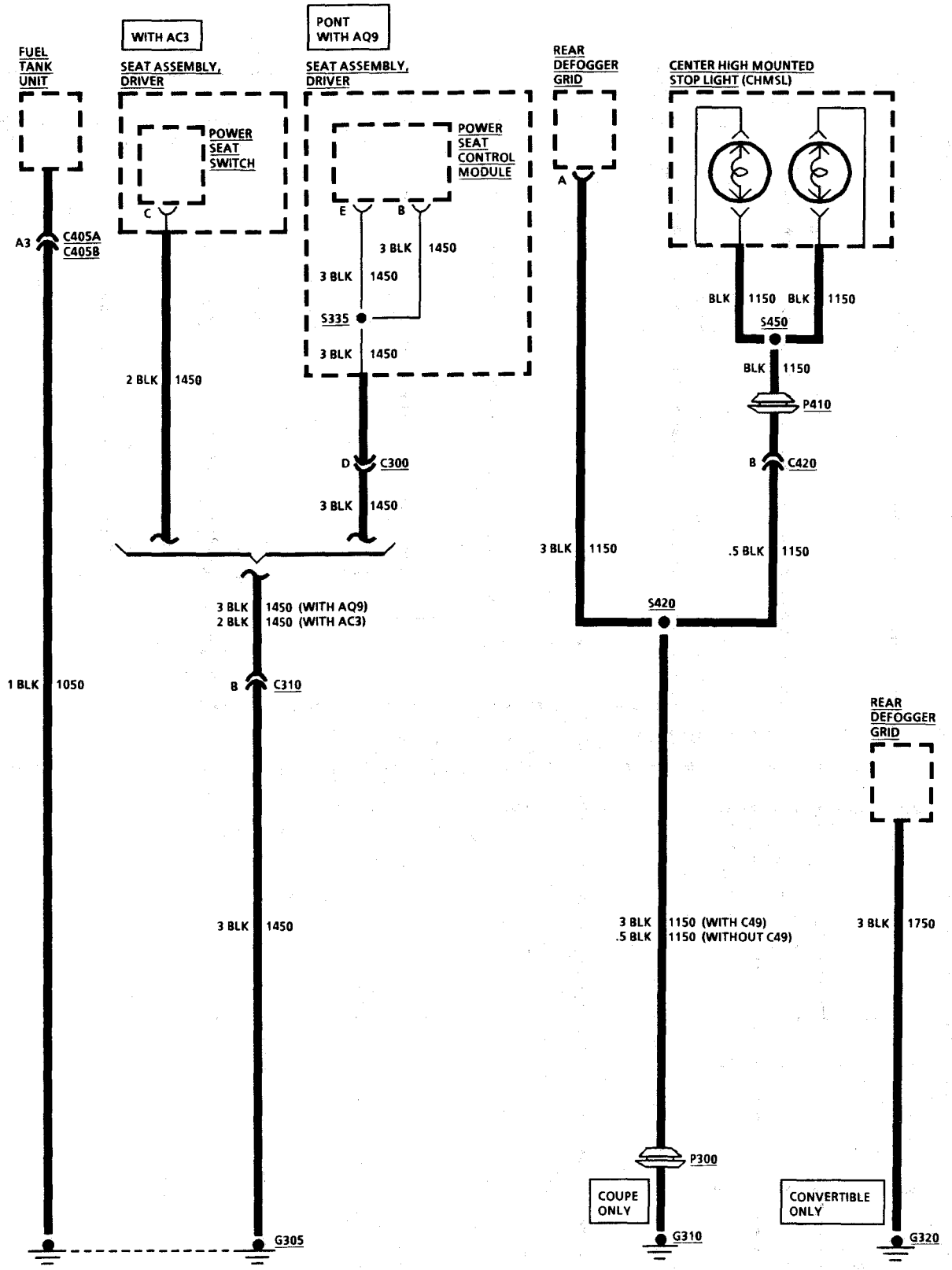
GROUND DISTRIBUTION

BLOWER MOTOR, BOSE RADIO AND CONVERTIBLE TOP SWITCH

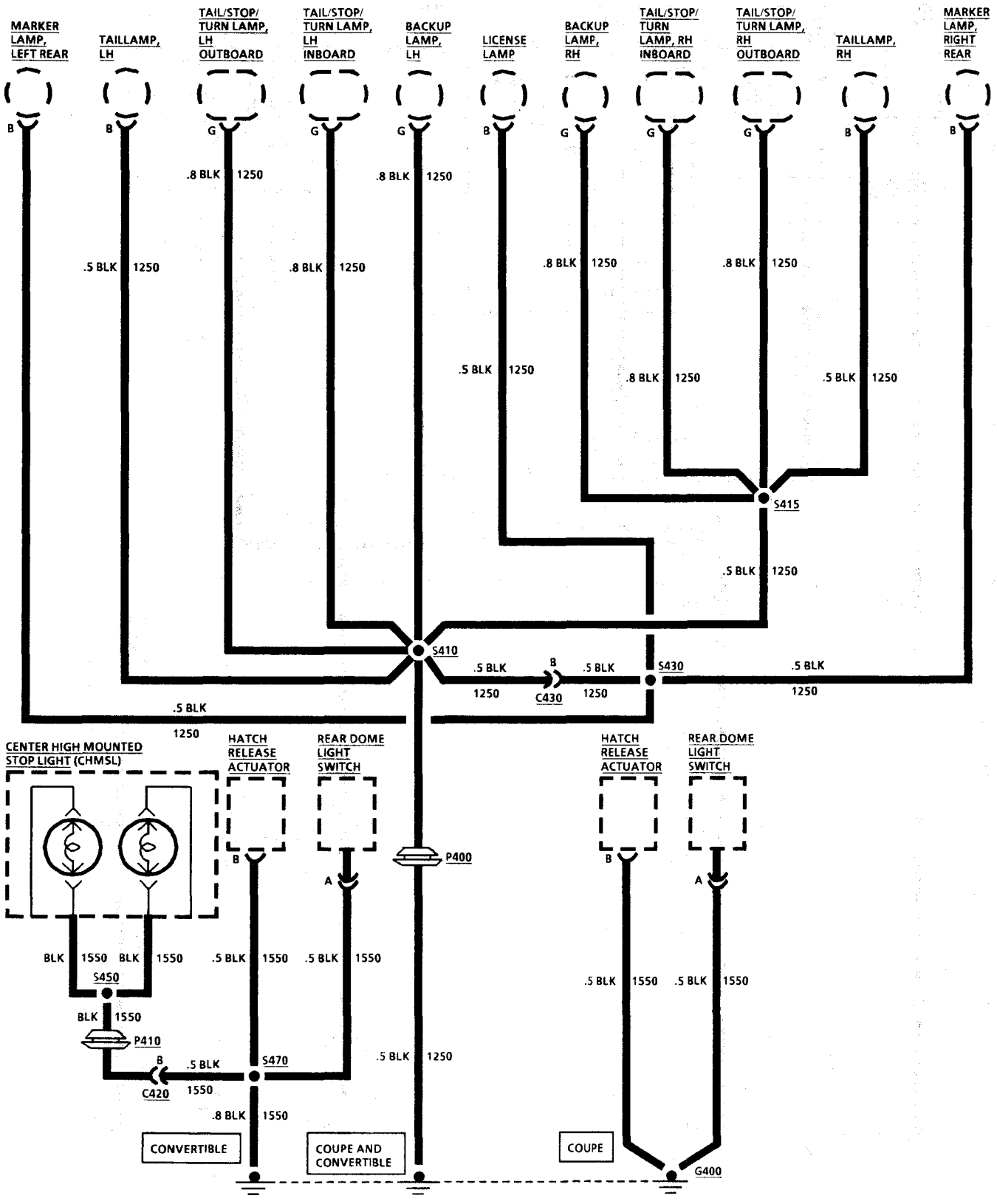


GROUND DISTRIBUTION

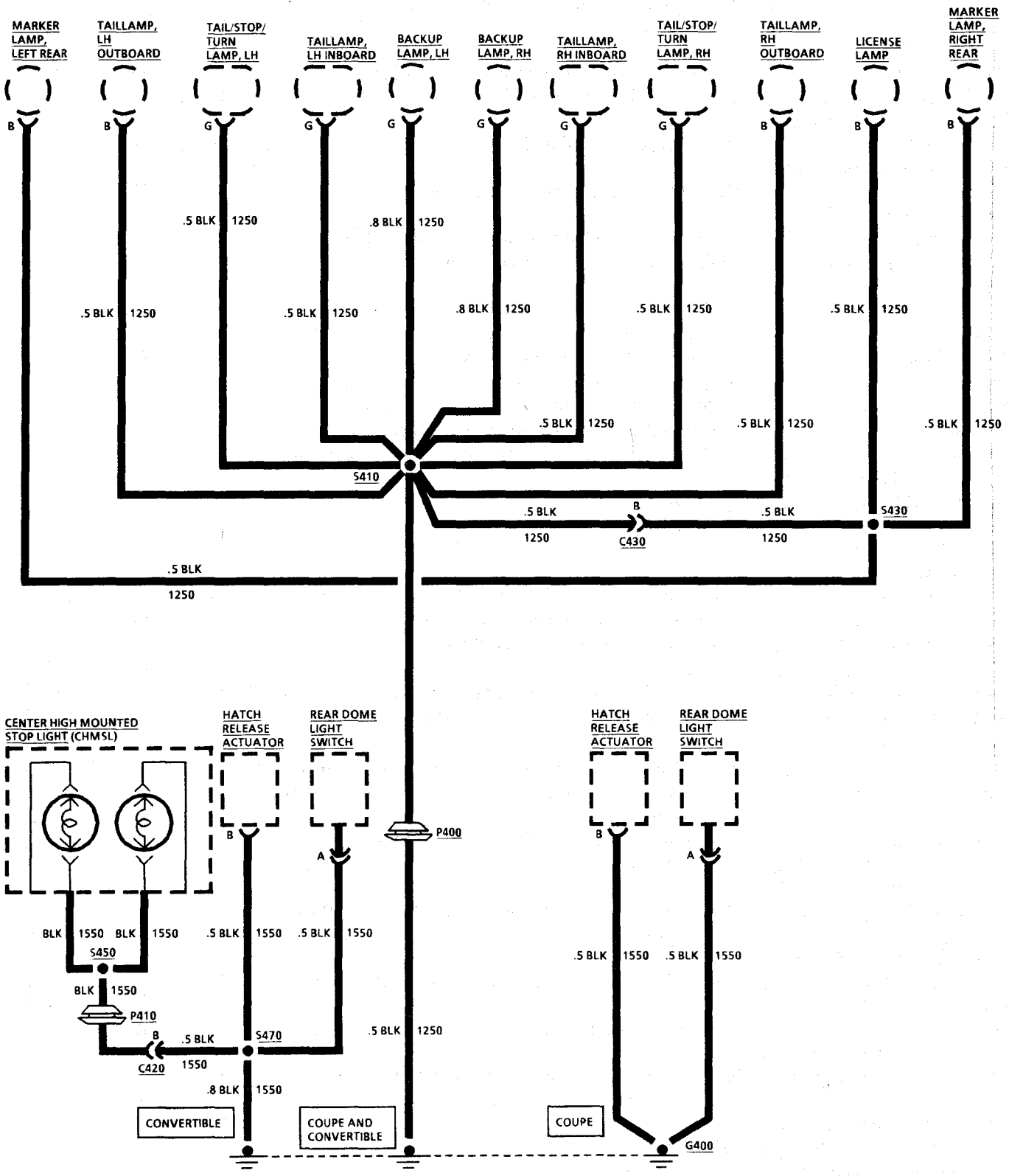
FUEL PUMP/SENDER, POWER SEATS, REAR DEFOGGER, CHMSL



GROUND DISTRIBUTION (PONTIAC)
REAR LIGHTS



GROUND DISTRIBUTION (CHEVROLET)
REAR LIGHTS



GROUND DISTRIBUTION

COMPONENT	LOCATION	201-PG	FIG.	CONN
A/C Clutch Diode (V6 VIN S)	Sealed in Harn, 10 cm from A/C Compressor Clutch Conn	28	54	
A/C Clutch Diode (V8 VIN P)	Sealed in Harn, 12 cm from Generator breakout	14	26	
A/C Compressor Clutch	RH side of Engine, below Generator	14, 28	26, 54	
ABS Brake Pressure Valve Solenoid, LF	Part of Hydraulic Modulator Assembly	39	68	
ABS Brake Pressure Valve Solenoid, RF	Part of Hydraulic Modulator Assembly	39	68	
Amplifier (part of UW2 Speaker Option)	Mounted behind Right Rear Armrest, on Rail	44	83	202-9
Ashtray Lamp (Auto Trans)	Lighting Tube from PRNDL Lamp			
Ashtray Lamp (Manual Trans)	Rearward of shifter, in ashtray	43	82	
Backup Lamp, LH	Mounted in Taillamp Assembly	32, 33	61, 62	
Backup Lamp, RH	Mounted in Taillamp Assembly	32, 33	61, 62	
Battery	RH front of Engine Compartment	19	35	
Blower Motor	Under lower RH side of I/P, mounted in HVAC Module	20	37	
Bose Relay	Below center A/C Duct, mounted to SIR Bracket	22	41	202-21
Brake Combo Valve (ABS)	Part of Hydraulic Modulator Assembly, inward side	39	68	
Center High Mounted Stop Light (CHMSL)	Rear center of Spoiler			
Cigar Lighter	Mounted on front of console	43	81	
Clutch Anticipate/ Cruise Release Switch (all V6 Manual)	Mounted in clutch pedal bracket (4 cavity conn)	0	1	202-20
Console Compartment Lamp	Under Console Compartment Door	43	81	
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Convertible Top Switch	Left side of upper console (Chevy) or lower console (Pont)	42	78, 80	202-20
Coolant Fans	Behind radiator			
Coolant Level Latching Module	In molded pocket of dash mat, center above floor tunnel	45	84	202-20
Cruise Control Module	Front LH side of vehicle, mounted to frame rail, forward of wheelhouse	19	36	202-11
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Diagnostic Energy Reserve Module (DERM)	Snapped in bracket, behind RH side of I/P Compartment	8	15	202-12
Discriminating Sensor, Forward	Mounted to center of front end Tie Bar, near hood latch	19	36	
Discriminating Sensor, Passenger Compartment	Mounted to upper dash, just right of Steering Column Support Bracket	20	38	
Door Illumination Lamp, LH	Behind door trim panel	17	31	
Door Illumination Lamp, RH	Behind door trim panel	17	31	
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13

COMPONENT	LOCATION	201-PG	FIG.	CONN
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Engine Coolant Level Sensor (V8 VIN P)	Mounted on upper right side of radiator	19	35	
Fog Lamp, Left Front	Lower LH side of front Fascia			
Fog Lamp, Right Front	Lower RH side of front Fascia			
Fog Light Switch	Lower LH side of I/P	37, 38	66, 67	202-21
Fuel Pump Relay	Forward of LH kick panel, mounted to foot rest bracket under carpet	7	13	202-21
Fuel Tank Unit	Under rear of vehicle			
Hatch Release Actuator	Center of end panel, in Cargo Compartment	30	57	
Headlamp, Left (PONT)	LH front of vehicle	23	43	
Headlamp, Right (PONT)	RH front of vehicle			
Headlight Doors Module	Forward of LH front wheelhouse, mounted to Air Intake	19	36	202-21
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
Heated Oxygen Sensor Bank #1	Mounted in left Exhaust Manifold	24	44	202-22
Heated Oxygen Sensor Bank #2	Mounted in right Exhaust Manifold	40	72	202-22
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
High Beam Headlamp, Left (CHEVY)	Exterior, left front			
High Beam Headlamp, Right (CHEVY)	Exterior, right front			
High Blower Relay	Under I/P, above left side of floor tunnel	42	77	
Hydraulic Modulator Assembly	Front left of Engine Compartment	39	68	
I/P Compartment Lamp	Inside top center of compartment	22	41	
I/P Dimmer Switch	Lower LH side of I/P	37, 38	66, 67	202-23
Ignition Coil Module (V8 VIN P)	Front LH side of Engine	16	29	202-22
Ignition Control Module (ICM) (V6 VIN S)	Left front of Engine	27	52	202-22
Instrument Cluster	LH side of I/P			202-23
Keyless Entry Receiver	Behind RH side kick panel, in molded pocket	40	71	202-23
License Lamp	Center of rear Fascia, above license plate	31	59	
Low Beam Headlamp, Left (CHEVY)	Exterior, left front			
Low Beam Headlamp, Right (CHEVY)	Exterior, right front			
Marker Lamp, Left Front	Exterior, left front	17	32	
Marker Lamp, Left Rear	Exterior, left rear	31	59	
Marker Lamp, Right Front	Exterior, right front	17	32	
Marker Lamp, Right Rear	Exterior, right rear	31	59	
Mass Air Flow (MAF) Sensor	Mounted on air duct, in front of Intake Manifold	24	45	
Oil Level Sensor	Lower left side of Engine, in oil pan	11, 24	20, 44	
Park/Turn Lamp, Left Front	Exterior, left front	17	32	
Park/Turn Lamp, Right Front	Exterior, right front	17	32	

(CONTINUED ON NEXT PAGE)

GROUND DISTRIBUTION

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Performance Switch	Mounted in center console behind shifter			202-24
Performance/Traction Control Switch	Mounted in center console behind shifter	42	79	202-24
Power Door Lock Switch, RH	Mounted in right door armrest	18	33	202-24
Power Mirror Switch	Mounted in left door arrmrest	18	33	202-24
Power Seat Control Module (AQ9)	Under Driver's Seat	47	86	202-24
Power Seat Switch (AC3)	On left side of Driver's Seat	41	76	202-24
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Power Window Switch, LH	Mounted in left door armrest	18	33	202-27
PRNDL Illumination Lamp (Auto Trans)	Under console, left of Shifter	43	81	
Radio	Center of I/P Carrier	36	65	202-16
Rear Defogger Grid	Mounted on rear windshield	4	7	
Rear Defogger Switch (PONT)	Part of HVAC Assembly	21	39	
Rear Defogger Switch/Timer (CHEVY)	Mounted on I/P knee bolster, right of Steering Column	37	66	202-27
Rear Defogger Timer/Relay (PONT)	Part of HVAC Assembly	21	39	
Rear Dome Light Switch	Center of end panel, in Cargo Compartment	30	57	
Rearview Mirror	Top center of windshield			202-27
Retained Accessory Power (RAP) Module	In molded pocket of dash mat, center above floor tunnel	9	17	202-27
Seat Belt Switch	Part of Driver's Seat Buckle Assembly	43	81	
Secondary Air Injection Pump Assembly	Front LH Frame Rail, in Engine Compartment	11	21	
SIR Coil Assembly	Top of Steering Column	3, 34	5, 51	
Speaker/Amp, Left Front (BOSE)	Mounted in left door	17	31	202-27
Speaker/Amp, Rear (BOSE)	Mounted in left rear Cargo Compartment trim	5	8	202-27
Speaker/Amp, Right Front (BOSE)	Mounted in right door	17	31	202-27
Steering Wheel Controls, Radio (UK3)	On Steering Wheel	2	3	202-27
Taillamp, LH Inboard (CHEVY)	Exterior, left rear	32	61	
Taillamp, RH Inboard (CHEVY)	Exterior, right rear	32	61	
Taillamp, LH Outboard (CHEVY)	Exterior, left rear	32	61	
Taillamp, RH Outboard (CHEVY)	Exterior, right rear	33	62	
Taillamp, LH (PONT)	Exterior, left rear	33	62	
Taillamp, RH (PONT)	Exterior, right rear	33	62	
Tail/Stop/Turn Lamp, LH (CHEVY)	Exterior, left rear	32	61	
Tail/Stop/Turn Lamp, RH (CHEVY)	Exterior, right rear	32	61	

COMPONENT	LOCATION	201-PG	FIG.	CONN
Tail/Stop/Turn Lamp, LH Inboard (PONT)	Exterior, left rear	33	62	
Tail/Stop/Turn Lamp, LH Outboard (PONT)	Exterior, left rear	33	62	
Tail/Stop/Turn Lamp, RH Inboard (PONT)	Exterior, right rear	33	62	
Tail/Stop/Turn Lamp, RH Outboard (PONT)	Exterior, right rear	33	62	
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Traction Control Switch	Left side of upper console	42	78	
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
Washer Pump Motor	Front of vehicle, below Engine Hood Latch	25	46	
Wiper Motor Assembly	Rear of LH Shock Tower, mounted to dash panel below LH Wiper Mount	10	18	202-28
C160 (3 cavities)	LH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C165 (3 cavities)	RH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C200B (18 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C217 (4 cavities)	Near base of Steering Column	34	63	202-19
C240	Under RH side of I/P, behind kick panel	20	37	202-19
C270 (2 cavities)	I/P Harn to Clutch Jumper Harn, near brake/clutch pedal bracket	1	2	
C300 (6 cavities) (AQ9)	Under Driver Seat Assembly	47	86	202-19
C310 (2 cavities)	Between rear mounting bolt of Driver Seat near #3 Rail	6	11	
C405A (4 cavities)	Part of Pass Thru Conn, forward of rear axle, to Fuel Tank Unit	5	9	202-8
C405B (10 cavities)	Part of Pass Thru Conn, forward of rear axle, to Pass Thru Panel	5	9	202-8
C420	LH side of Hatch, between Hatch Frame and plastic panel	4	7	
C430 (2 cavities)	Between Rear Fascia and rear end panel, on LH side	32, 33	61, 62	
G100 (L32)	Bolted to Belt Tension Bracket Bolt, lower RH front of Engine (1 ring, 1 wire)	13	25	
G100 (LT1)	Bolted to RH side of Engine Block, same bolt used for A/C Compressor if equipped (1 ring, 1 wire)	39	69	
G101	Top of RH Shock Tower (3 rings, 5 wires)	10	19	
G102 (LT1)	LH front of Engine Block, just below head (4 rings, 3 wires and braided strap)	23	40	
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
G105	Near top RH side of radiator, in top of T-Bar	19	36	
G106	Near top LH side of radiator, in top of T-Bar	19	35	
G108 (L32)	Braided ground strap, bolted to forward left side of Engine Block	11	20	
G109	Bolted to left front frame rail (2 rings,1 wire and braided strap)	11	21	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	

(CONTINUED ON NEXT PAGE)

GROUND DISTRIBUTION

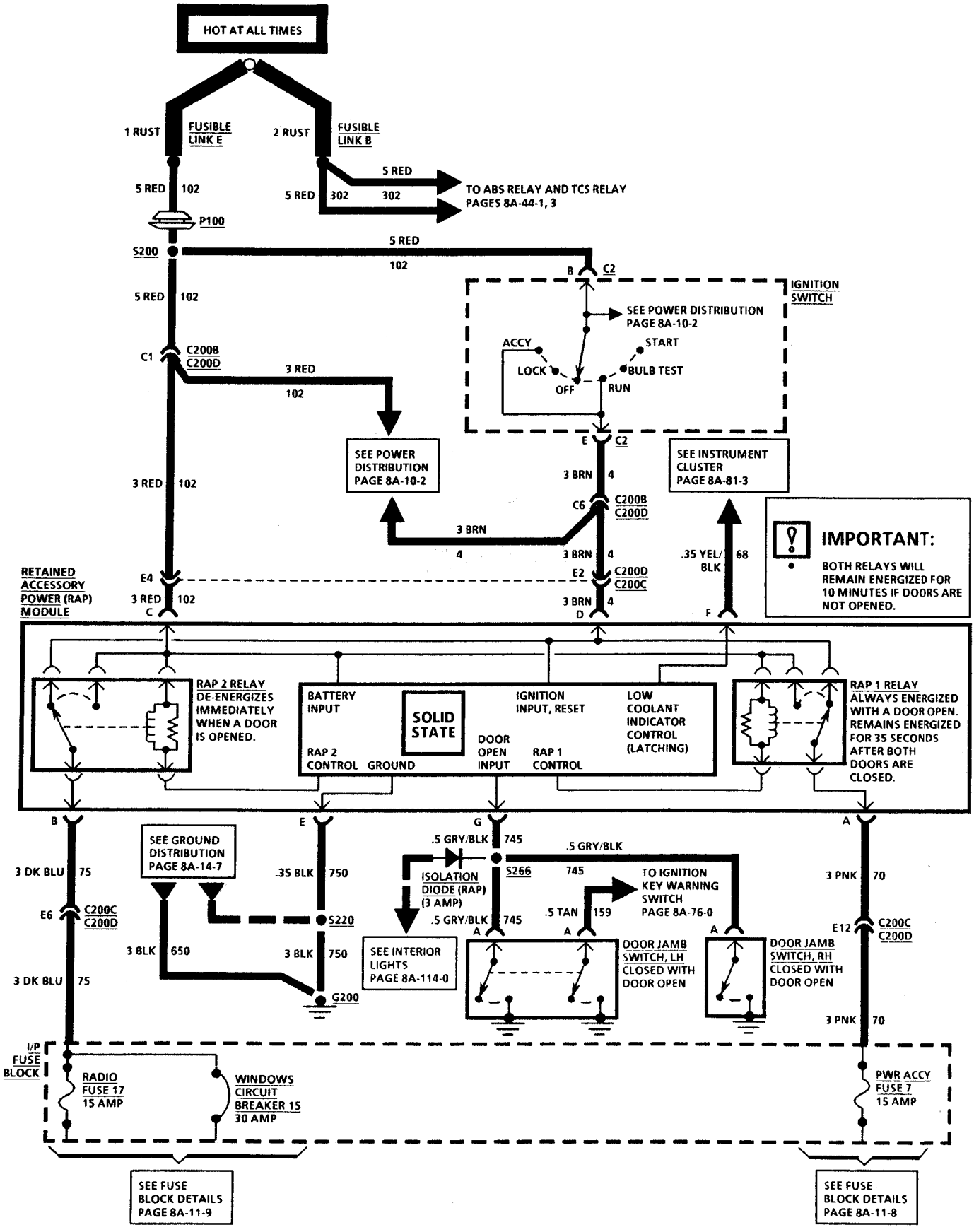
(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
G310	Bolted to roof, left of Dome Lamp (1 ring, 1 wire)	4	6	
G320	Bolted to body frame above RH rear wheelhouse			
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
P300	In rear center of roof, near Dome Lamp	4	7	
P400	Left rear in end gate panel	30	57	
P410	In left side spoiler			
P500	Between LH door and "A" pillar	32	49	
P600	Between RH door and "A" pillar	32	49	
S108 (L32)	Engine Harn, approx 4 cm from braided ground strap	11	20	
S108 (LT1)	Engine Harn, approx 17 cm from Injector 3 breakout	24	44	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S111	Forward Lamp Harn, approx 3 cm from Wiper Motor Assembly breakout			
S112	Forward Lamp Harn, approx 10 cm from G105 breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S115 (L32)	Engine Harn, approx 10 cm from A/C Compressor Clutch Conn	28	54	
S115 (LT1)	Engine Harn, approx 12 cm from Generator breakout	14	26	
S131 (L32)	Engine Harn, approx 17 cm from RH branch			
S215	I/P Harn, approx 30 cm before DLC breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S221	I/P Harn, approx 7 cm from DERM breakout			
S335	Driver Seat Harn, approx 12 cm from Power Seat Control Module Conn			
S410	Rear Body Harn, approx 7 cm from Left Backup Lamp breakout	33	62	
S415	Rear Body Harn, approx 20 cm from Left Backup Lamp breakout	33	62	
S420	Hatch Harn, approx 7 cm from P300	4	7	
S430	Rear Fascia Harn, approx 5 cm from License Lamp breakout	31	59	
S450	CHMSL Jumper Harn, approx 15 cm from bulbs			
S470	I/P Harn, approx 24 cm from Hatch Release Actuator			

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

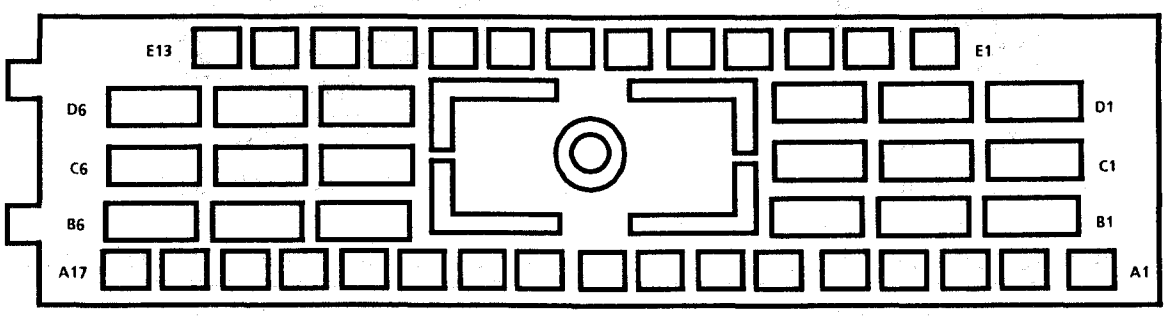
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RETAINED ACCESSORY POWER (RAP): WITH AU3



C200D

I/P HARNESS TO FORWARD LAMP/CROSS CAR HARNESS



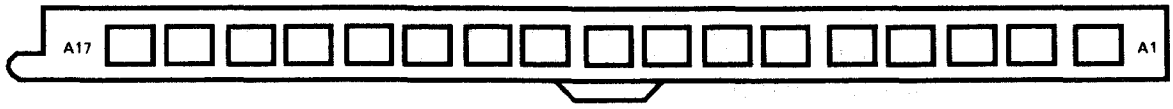
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M - CONNECTOR
F - TERMINAL

48-WAY M METRI-PACK MIXED SERIES
BLK

C200A

FORWARD LAMP HARNESS TO I/P HARNESS

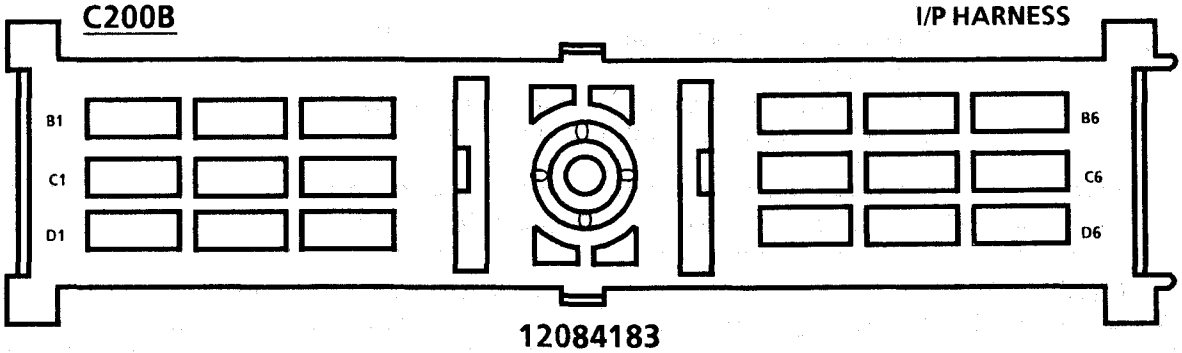


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17-WAY F METRI-PACK 150 SERIES
BLK

C200B

FORWARD LAMP HARNESS TO I/P HARNESS



12084183

18-WAY F METRI-PACK MIXED SERIES
BLK

C200C

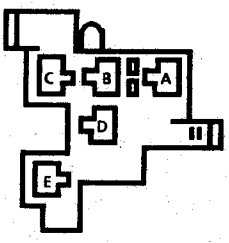
CROSS CAR HARNESS TO I/P HARNESS



12047840

13-WAY F METRI-PACK 280 SERIES
GRY

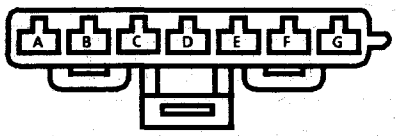
RETAINED ACCESSORY POWER (RAP): WITH AU3



12010966

5-WAY F 56 SERIES
BLU

IGNITION SWITCH (C2)



12052854

7-WAY F METRI-PACK 280 SERIES
BLK

RETAINED ACCESSORY POWER (RAP) MODULE

COMPONENT	LOCATION	201-PG	FIG.	CONN
Door Jamb Switch, LH	Near base of LH "A" pillar	45	84	
Door Jamb Switch, RH	Near base of RH "A" pillar	32	49	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Switch	Part of Steering Column	34	63	202-23
Isolation Diode (RAP)	Sealed in Harn, approx 9 cm right of Rearview Mirror breakout	45	84	
Retained Accessory Power (RAP) Module	In molded pocket of dash mat, center above floor tunnel	9	17	202-27
C200B (18 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S200	Forward Lamp Harn, approx 5 cm from EBCM breakout	8	14	
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S266	Cross Car Harn, approx 9 cm from Rearview Mirror breakout	45	84	

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check Fusible Link E for open.
2. Check Window Circuit Breaker 15, Radio Fuse 17 and PWR ACCY Fuse 7 for an open. If open, replace fuse or circuit breaker. If fuse blows again or circuit breaker reopens, use schematics and DVM to check suspect power circuits for a short to ground potential, either through a faulty component or wiring.
3. Check for poor connections at C200 terminals "C1", "E2", "E4", "E6" and "E12".
4. Check that G200 is clean and tight.

- 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.

SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Ignition "OFF." • Open either LH or RH door.	• Power Door Locks, Hatch Release and Power Mirrors all operate as long as a door is open. • Radio and Power Windows do not operate.
[2] • Close doors.	• Power Door Locks, Hatch Release and Power Mirrors all continue to operate for approximately 35 seconds. • Radio and Power Windows do not operate.
[3] • Ignition Switch to "ACCY" or "RUN."	• Power Door Locks, Hatch Release and Power Mirrors all operate as long as the Ignition Switch is in "ACCY" or "RUN." • Radio and Power Windows operate as long as the Ignition Switch is in "ACCY" or "RUN."
[4] • Ignition Switch to "OFF."	• Power Door Locks, Hatch Release and Power Mirrors all operate for approximately 10 minutes. • Radio and Power Windows operate for approximately 10 minutes.
[5] • Ignition Switch to "RUN." • Ignition Switch to "OFF." • Open either LH or RH door.	• Power Door Locks, Hatch Release and Power Mirrors all operate as long as a door is open. • Radio and Power Windows are disabled immediately when a door is opened.
[6] • Close doors.	• Power Door Locks, Hatch Release and Power Mirrors all continue to operate for approximately 35 seconds. • Radio and Power Windows do not operate.

Important:

- If aftermarket equipment is installed on any circuit(s) for the Retained Accessory Power (RAP) System and a problem exists with the Retained Accessory Power System operation, disconnect the aftermarket equipment and retest.
- These diagnostic procedures assume related fuse(s) or circuit breaker(s) and the circuitry to their related components are all good.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Components on PWR ACCY Fuse 7, Radio Fuse 17 and Windows Circuit Breaker 15 totally inoperative.	Chart #1	8A-15-5
Retained Accessory Power (RAP) Feature inoperative, components on PWR ACCY Fuse 7, Radio Fuse 17 and Windows Circuit Breaker 15 operate with Ignition Switch in "RUN" or "ACCY" only.	Chart #2	8A-15-5

(CONTINUED ON NEXT PAGE)

RETAINED ACCESSORY POWER (RAP): WITH AU3

(CONTINUED FROM PREVIOUS PAGE)

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Components on Windows Circuit Breaker 15 and Radio Fuse 17 totally inoperative, components on PWR ACCY Fuse 7 operate normally.	Chart #3	8A-15-6
Components on Windows Circuit Breaker 15 and Radio Fuse 17 do not operate during Retained Accessory Power (RAP), operation is normal with Ignition Switch in "ACCY" or "RUN" (components on PWR ACCY Fuse 7 operate normally during RAP).	Replace Retained Accessory Power (RAP) Module.	
Components on PWR ACCY Fuse 7 totally inoperative, components on Windows Circuit Breaker 15 and Radio Fuse 17 operate normally.	Chart #4	8A-15-6
Components on PWR ACCY Fuse 7 do not operate during Retained Accessory Power (RAP), operation is normal with Ignition Switch in "ACCY" or "RUN" (components on Circuit Breaker 15 and Radio Fuse 17 operate normally during RAP).	Replace Retained Accessory Power (RAP) Module.	
Retained Accessory Power (RAP) deactivates when another vehicle system is used (otherwise RAP times out normally).	• If use of Interior Lights causes deactivation of Retained Accessory Power (RAP), check Isolation Diode (RAP). • Narrow in on system causing deactivation and shield or filter power and grounds to component, then retest system. • If unable to correct complaint, contact technical assistance.	
Retained Accessory Power (RAP) deactivates before specified time has elapsed (deactivation not caused by the use of other vehicle systems).	• Refer to System Check to make sure the RAP System is not operating properly. • Check for technical service bulletins. If above checks do not correct symptom, replace Retained Accessory Power (RAP) Module.	
PWR ACCY Fuse 7 receives voltage continuously (past the approximately 10 minute period) with doors closed and Ignition Switch in "OFF."	• Check for short to B + in CKT 70. • Check for short to ground through CKT 745, including a bad Door Jamb Switch. • Check for poor connections at RAP Module Connector. If OK, replace Retained Accessory Power (RAP) Module.	
Radio Fuse 17 and Windows Circuit Breaker 15 receive voltage continuously (past the approximately 10 minute period) with doors open and Ignition Switch in "OFF."	• Check for short to B + in CKT 75. If OK, replace Retained Accessory Power (RAP) Module.	
• Power Door Locks do not operate when one or both doors are opened. • Power Door Locks only operate with Ignition "ON," or for 10 minutes after Ignition is turned "OFF." (Opening the door does not disable the 10 minute timer or enable "PWR ACCY" Fuse 7.)	• Check for bad Door Jamb Switch on side of entry. • Check for open in CKT 745. • Check for poor connection at RAP Module. If OK, replace Retained Accessory Power (RAP) Module.	

CHART #1
COMPONENTS ON PWR ACCY FUSE 7, RADIO FUSE 17 AND WINDOWS CIRCUIT BREAKER 15 TOTALLY INOPERATIVE

IMPORTANT:

- THIS CHART ASSUMES RELATED FUSE(S) OR CIRCUIT BREAKER(S) AND THE CIRCUITRY TO THEIR RELATED COMPONENTS ARE ALL GOOD, AND INSTALLED AFTERMARKET EQUIPMENT IS NOT A PROBLEM.

- IGNITION SWITCH TO "RUN."
- WITH A TEST LIGHT TO GROUND, BACKPROBE RETAINED ACCESSORY POWER (RAP) MODULE CONN TERM "D". IS TEST LIGHT "ON"?

YES

CHECK FOR:
- POOR CONNECTIONS AT RETAINED ACCESSORY POWER (RAP) MODULE CONNECTOR.
- POOR CONNECTIONS AT C200 TERM "E6" AND TERM "E12".
- WIRING DAMAGE THAT MAY CAUSE AN OPEN IN CKT 70 AND CKT 75.

IF ABOVE CHECKS ARE OK, REPLACE RETAINED ACCESSORY POWER (RAP) MODULE.

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE IGNITION SWITCH CONN C2 TERM "B". IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE IGNITION SWITCH CONN C2 TERM "E". IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTION AT C200 TERM "C6" AND TERM "E2". IF OK, REPAIR OPEN IN CKT 4 BETWEEN IGNITION SWITCH AND RETAINED ACCESSORY POWER (RAP) MODULE.

NO

- CHECK FOR POOR CONNECTION AT IGNITION SWITCH. IF OK, REPLACE IGNITION SWITCH.

NO

- CHECK FOR OPEN IN FUSIBLE LINK "E". IF OK, REPAIR OPEN IN CKT 102 BETWEEN IGNITION SWITCH AND FUSIBLE LINK.

CHART #2
RETAINED ACCESSORY POWER (RAP) FEATURE INOPERATIVE, COMPONENTS ON PWR ACCY FUSE 7, RADIO FUSE 17 AND WINDOWS CIRCUIT BREAKER 15 OPERATE WITH IGNITION SWITCH IN "RUN" OR "ACCY" ONLY

IMPORTANT:

- THIS CHART ASSUMES RELATED FUSE(S) OR CIRCUIT BREAKER(S) AND THE CIRCUITRY TO THEIR RELATED COMPONENTS ARE ALL GOOD, AND INSTALLED AFTERMARKET EQUIPMENT IS NOT A PROBLEM.

- WITH A TEST LIGHT TO GROUND, BACKPROBE RETAINED ACCESSORY POWER (RAP) MODULE CONN TERM "C". IS TEST LIGHT "ON"?

YES

- DISCONNECT RETAINED ACCESSORY POWER (RAP) MODULE CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN TERMINALS "C" AND "E" OF THE RAP MODULE CONNECTOR. IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTIONS AT RETAINED ACCESSORY POWER (RAP) MODULE CONNECTOR.
- IF OK, REPLACE RETAINED ACCESSORY POWER MODULE. (IF POWER ACCY FUSE RECEIVES VOLTAGE CONTINUOUSLY WITH DOORS CLOSED AND IGNITION SWITCH "OFF," CHECK FOR A SHORT TO GROUND THROUGH CKT 745, INCLUDING A BAD RAP ISOLATION DIODE OR DOOR JAMB SWITCH.)

NO

- CHECK FOR POOR CONNECTIONS AT RAP MODULE CONNECTOR.
- IF OK, CHECK FOR OPEN IN CKT 750 BETWEEN RAP MODULE AND G200.

NO

- CHECK FOR POOR CONNECTION AT C200 TERM "C1" AND TERM "E4". IF OK, REPAIR OPEN IN CKT 102 BETWEEN RETAINED ACCESSORY POWER (RAP) MODULE CONNECTOR AND S200.

RETAINED ACCESSORY POWER (RAP): WITH AU3

CHART #3
COMPONENTS ON WINDOWS CIRCUIT BREAKER 15 AND RADIO FUSE 17 TOTALLY INOPERATIVE, COMPONENTS ON PWR ACCY FUSE 7 OPERATE NORMALLY

IMPORTANT:

- THIS CHART ASSUMES RELATED FUSE(S) OR CIRCUIT BREAKER(S) AND THE CIRCUITRY TO THEIR RELATED COMPONENTS ARE ALL GOOD, AND INSTALLED AFTERMARKET EQUIPMENT IS NOT A PROBLEM.

- IGNITION SWITCH TO "RUN."
- WITH A TEST LIGHT TO GROUND, FRONTPROBE RADIO FUSE 17. IS TEST LIGHT "ON"?

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE RAP MODULE CONN TERM "B". IS TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT RAP MODULE CONN TERM "B". IF OK, REPLACE RAP MODULE.

YES

- CHECK FOR POOR CONNECTION AT C200 TERM "E6". IF OK, REPAIR OPEN IN CKT 75 BETWEEN RAP MODULE CONNECTOR AND I/P FUSE BLOCK.

YES

- CHECK I/P FUSE BLOCK FOR POOR WIRE CONNECTIONS OR POSSIBLE DAMAGE.
- IF OK, REFER TO "RADIO," PAGE 8A-150-0.

CHART #4
COMPONENTS ON PWR ACCY FUSE 7 TOTALLY INOPERATIVE, COMPONENTS ON WINDOWS CIRCUIT BREAKER 15 AND RADIO FUSE 17 OPERATE NORMALLY

IMPORTANT:

- THIS CHART ASSUMES RELATED FUSE(S) OR CIRCUIT BREAKER(S) AND THE CIRCUITRY TO THEIR RELATED COMPONENTS ARE ALL GOOD, AND INSTALLED AFTERMARKET EQUIPMENT IS NOT A PROBLEM.

- IGNITION SWITCH TO "RUN."
- WITH A TEST LIGHT TO GROUND, FRONTPROBE PWR ACCY FUSE 7. IS TEST LIGHT "ON"?

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE RAP MODULE CONN TERM "A". IS TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT RAP MODULE CONN TERM "A". IF OK, REPLACE RAP MODULE.

YES

- CHECK FOR POOR CONNECTION AT C200 TERM "E12". IF OK, REPAIR OPEN IN CKT 70 BETWEEN RAP MODULE CONNECTOR AND I/P FUSE BLOCK.

YES

- CHECK I/P FUSE BLOCK FOR POOR WIRE CONNECTIONS OR POSSIBLE DAMAGE.
- IF OK, REFER TO "POWER DOOR LOCKS," PAGE 8A-130-0.

CIRCUIT OPERATION

The Retained Accessory Power (RAP) System is designed to increase convenience and provide increased security. Some Vehicle Systems will remain operational for approximately 10 minutes after the Ignition Switch is turned to "OFF" or until a door is opened. Other systems will also be operational with Ignition Switch "OFF" whenever a door is open or for approximately 35 seconds after both doors are closed.

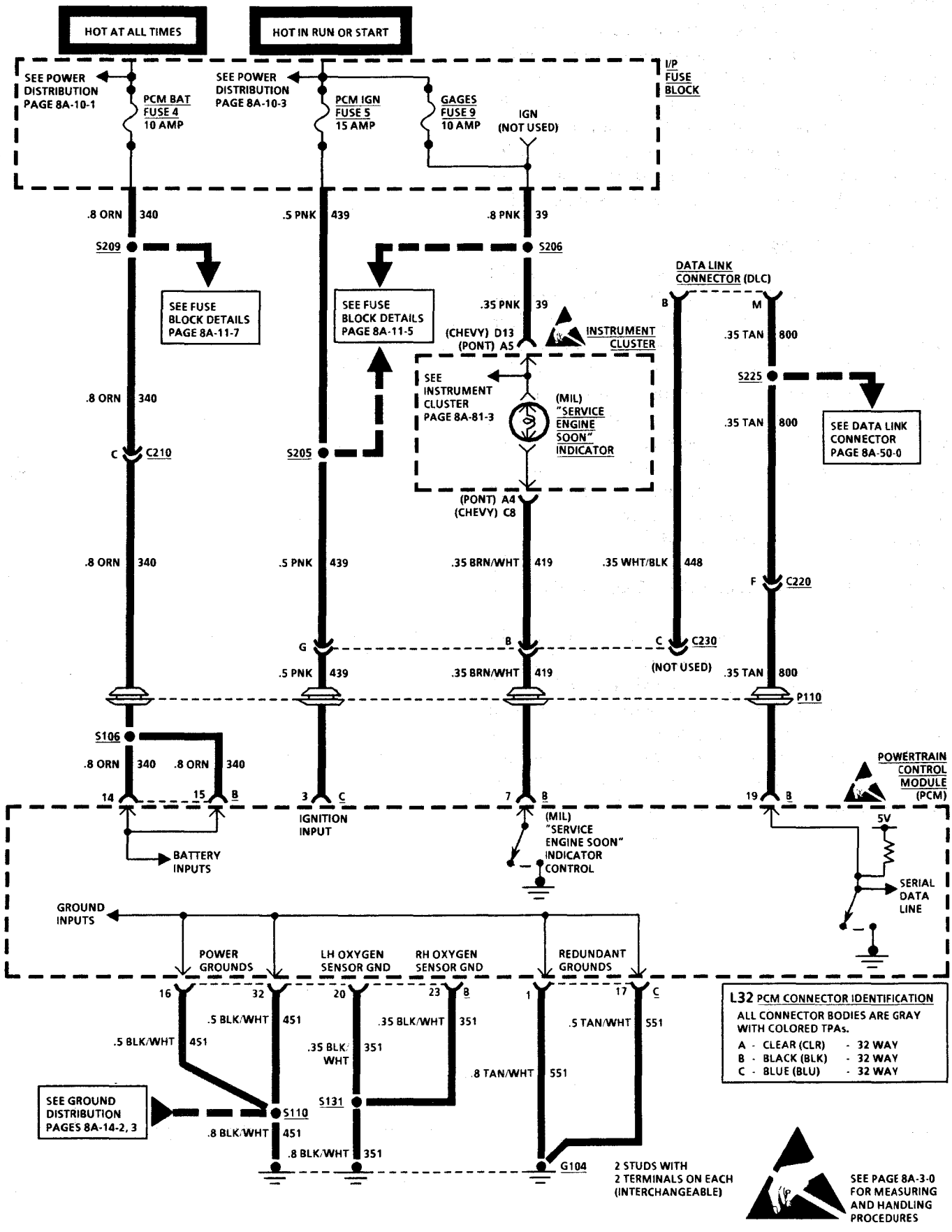
PWR ACCY FUSE 7 OPERATION

The Retained Accessory Power (RAP) Module will enable the Power Door Locks, Hatch Release and Power Mirrors to operate with the Ignition Switch in "OFF" whenever either door is open or for 35 seconds after both doors are closed. All components on this circuit will be enabled as long as the Ignition Switch is in "ACCY" or "RUN." After the Ignition Switch is turned to "OFF" and both doors remain closed, the components on this circuit will be enabled for approximately 10 minutes. If either door opens, the 10 minute timer cancels, and the components remain enabled as long as a door is opened.

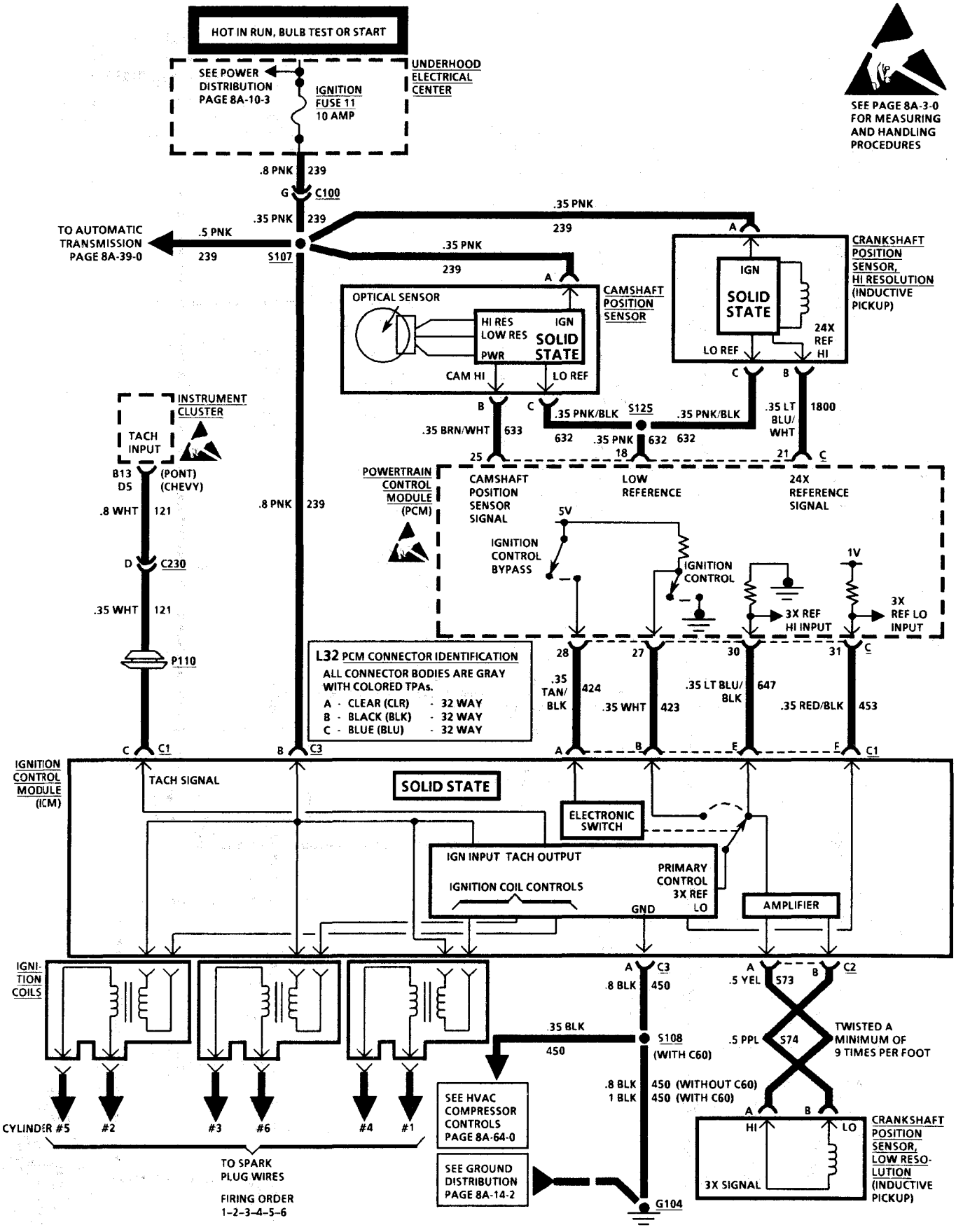
RADIO FUSE 17 AND WINDOWS CIRCUIT BREAKER OPERATION

The Retained Accessory Power (RAP) Module will enable the Radio, Power Windows and Convertible Top to operate whenever the Ignition Switch is in "ACCY" or "RUN." After the Ignition Switch is turned to "OFF" and both doors remain closed, the Radio, Power Windows and Convertible Top will be enabled for approximately 10 minutes. If either door opens, these components will be disabled immediately.

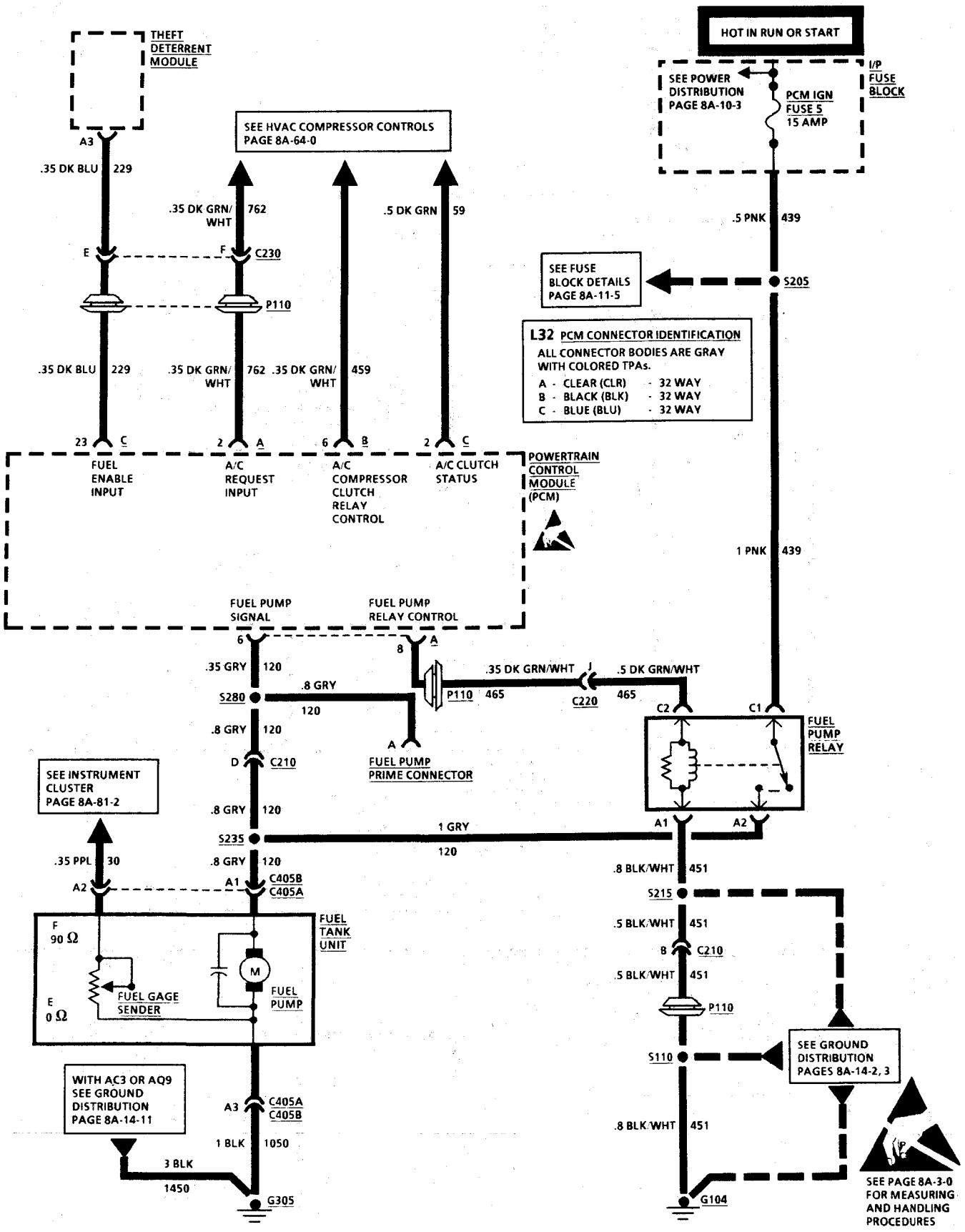
SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
DATA LINK, GROUND AND POWER



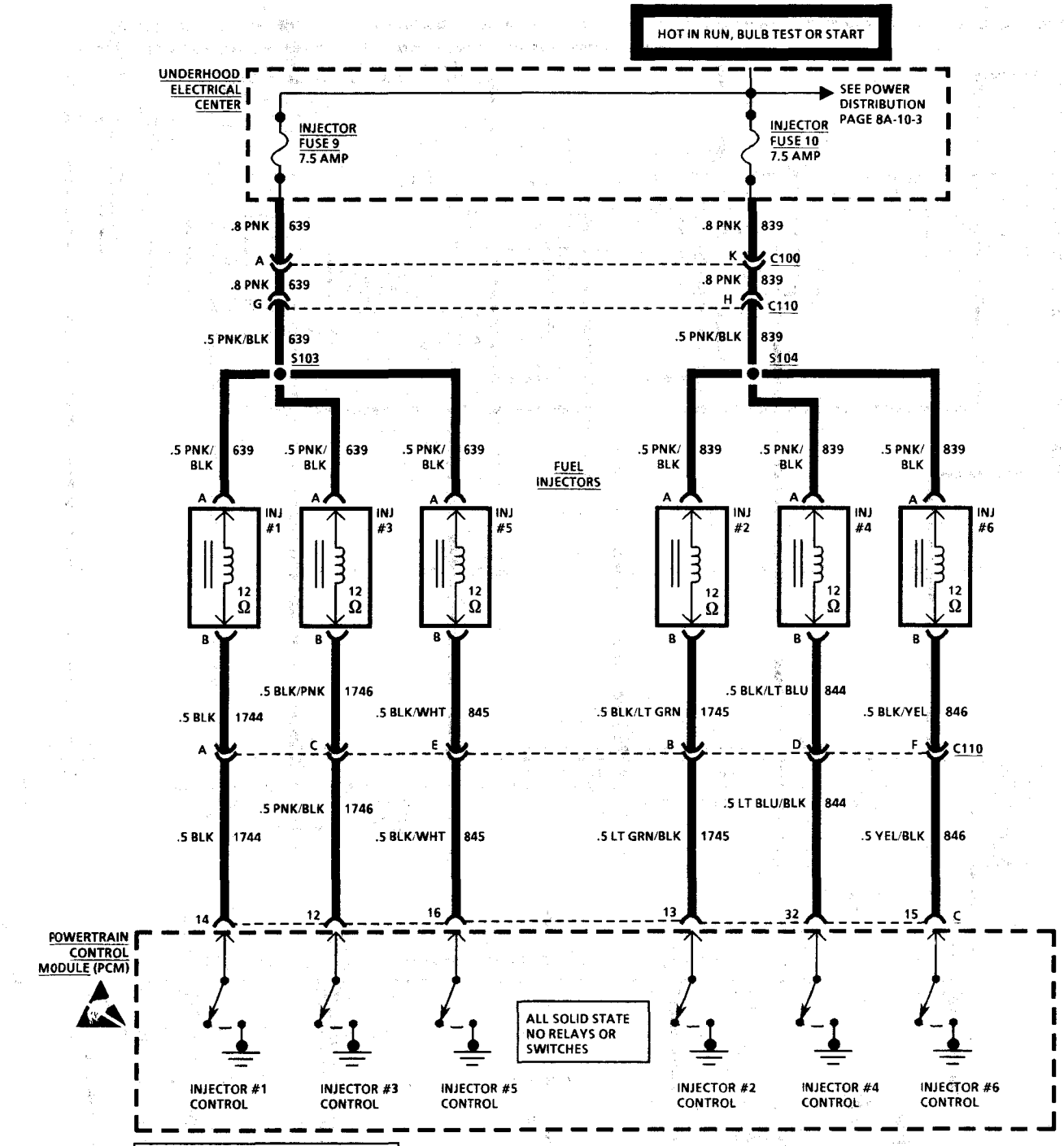
SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
IGNITION



SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
FUEL PUMP, HVAC AND PASS-Key® II INPUT



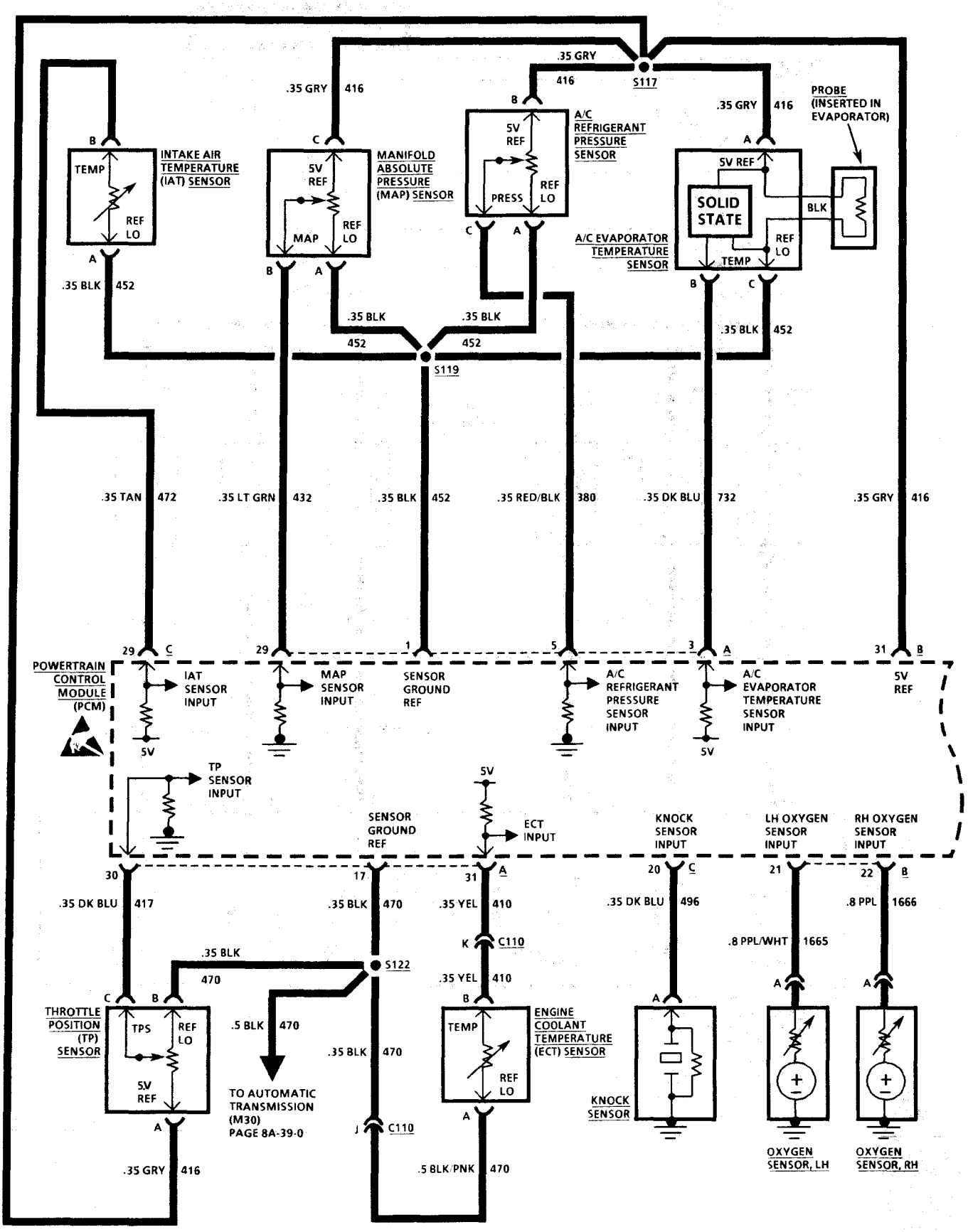
SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
INJECTORS



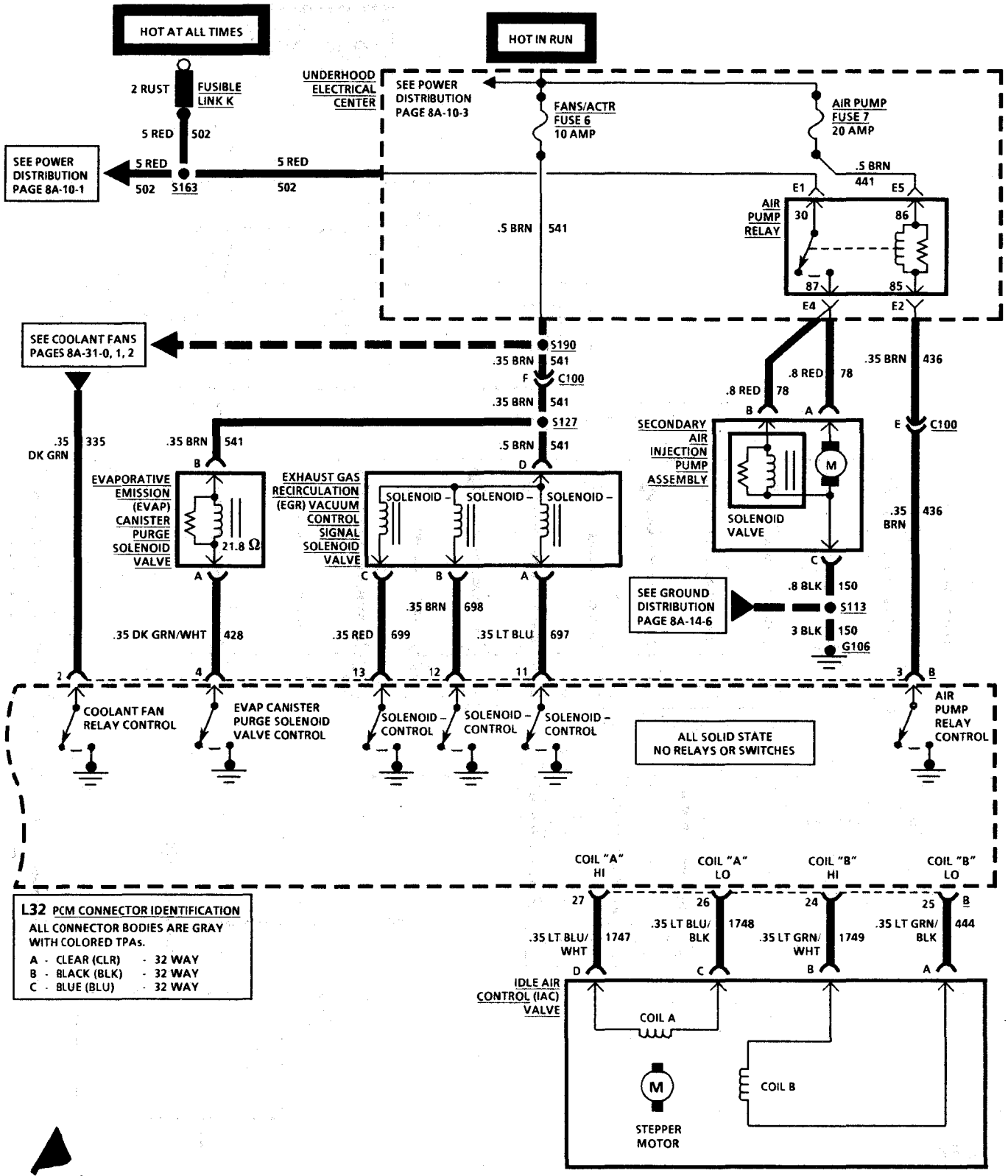
L32 PCM CONNECTOR IDENTIFICATION
ALL CONNECTOR BODIES ARE GRAY WITH COLORED TPAs.
A - CLEAR (CLR) - 32 WAY
B - BLACK (BLK) - 32 WAY
C - BLUE (BLU) - 32 WAY

SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
ENGINE DATA SENSORS

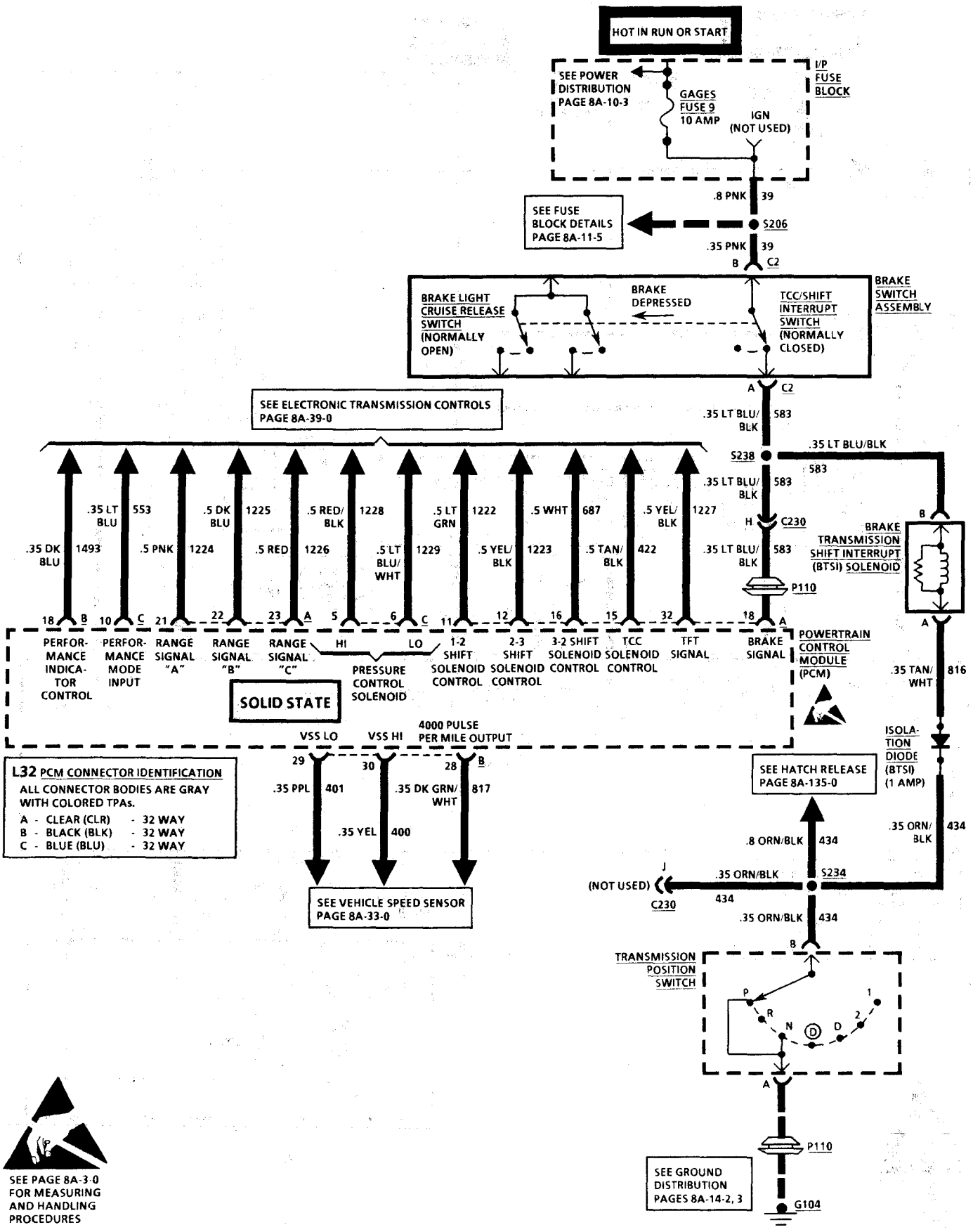


SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
CONTROLLED DEVICES

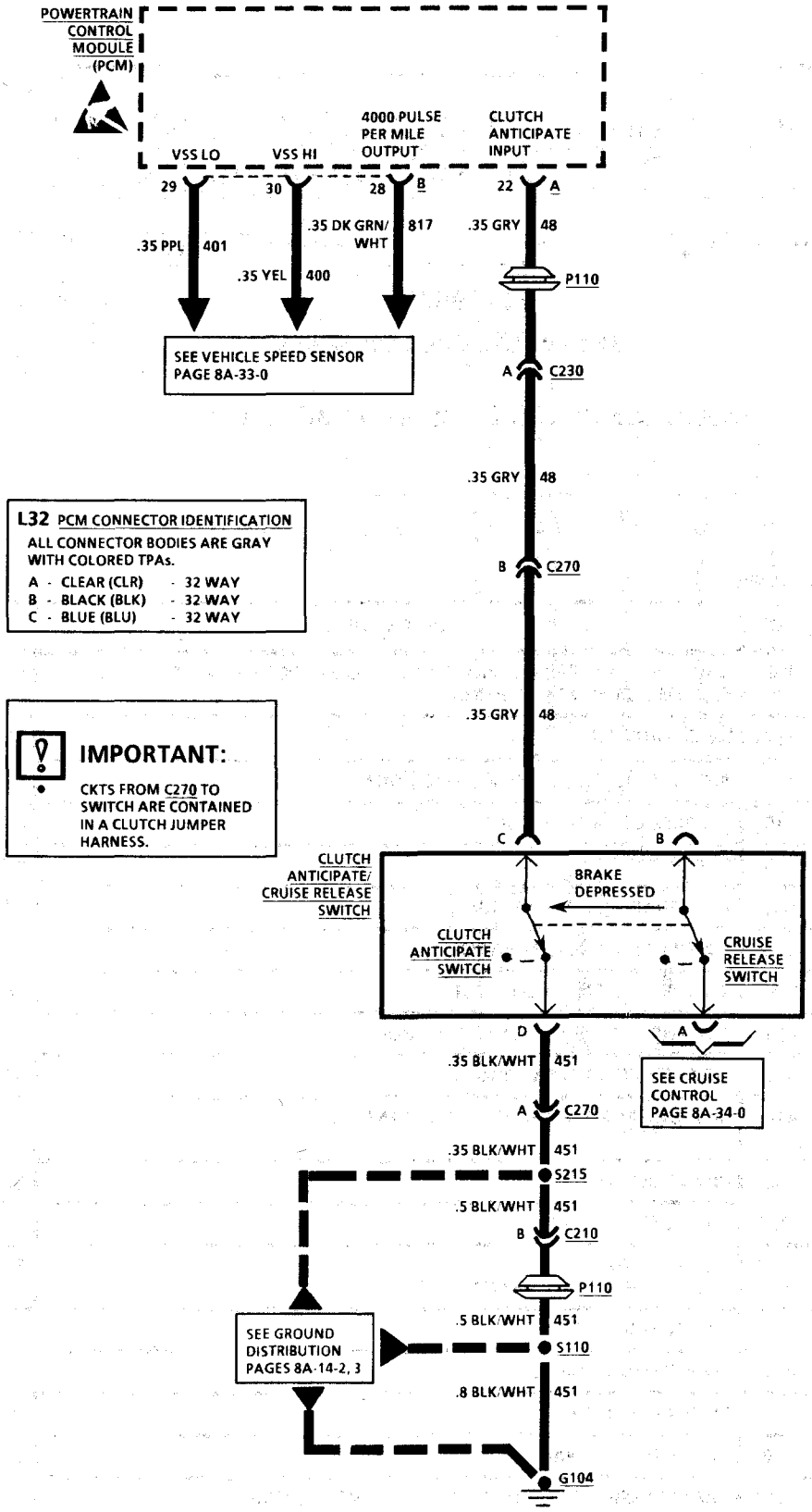


SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
AUTOMATIC TRANSMISSION CONTROLS (M30) AND VSS

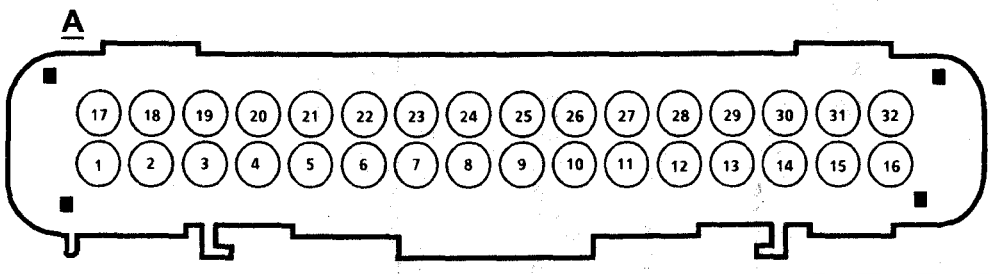


SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S
MANUAL TRANSMISSION CONTROLS (MM5) AND VSS



SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S



12129025

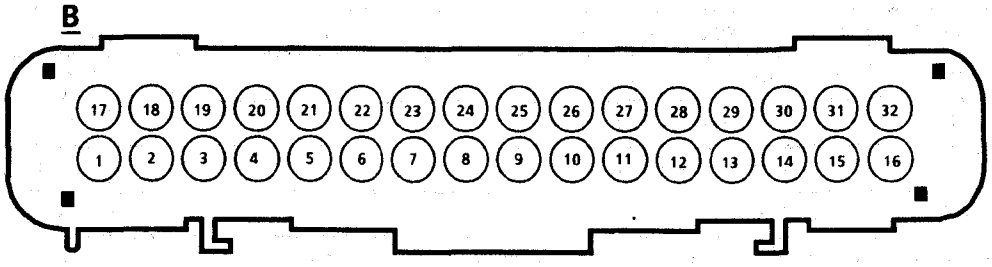
32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129022 (CLR)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

POWERTRAIN CONTROL MODULE (PCM) (V6 VIN S)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
1	BLK	452	MAP, IAT, A/C REFRIGERANT AND A/C EVAPORATOR TEMPERATURE SENSORS GROUND REFERENCE	DTC(s) 22, 23, 33, 71
2	DK GRN/WHT	762	A/C REQUEST	SEC C10
3	DK BLU	732	A/C EVAPORATOR TEMPERATURE SIGNAL	DTC(s) 71, 73
5	RED/BLK	380	A/C REFRIGERANT PRESSURE SIGNAL	DTC(s) 66, 70
6	GRY	120	FUEL PUMP SIGNAL	DTC 54
8	DK GRN/WHT	465	FUEL PUMP RELAY CONTROL	DTC 54
11	LT GRN	1222	1-2 SHIFT SOLENOID CONTROL	SEC C8
12	YEL/BLK	1223	2-3 SHIFT SOLENOID CONTROL	SEC C8
15	TAN/BLK	422	TORQUE CONVERTER CLUTCH ENABLE	SEC C8, DTC 90
16	WHT	687	3-2 SHIFT SOLENOID CONTROL	SEC C8
17	BLK	470	SENSOR GROUND FOR ECT AND TP SENSORS	DTC(s) 15, 21, 22, 58, 59
18	LT BLU/BLK	583	BRAKE SIGNAL	DTC 37
21	PNK	1224	RANGE SIGNAL "A"	DTC 28
22 22	DK BLU GRY	1225 48	RANGE SIGNAL "B" CLUTCH ANTICIPATE SWITCH (M/T)	SEC C8
23	RED	1226	RANGE SIGNAL "C"	DTC 28
29	LT GRN	432	MAP SENSOR SIGNAL	DTC(s) 33, 34, 44
30	DK BLU	417	TP SENSOR SIGNAL	DTC(s) 21, 22
31	YEL	410	ECT SENSOR SIGNAL	DTC(s) 14, 15
32	YEL/BLK	1227	TRANSMISSION FLUID TEMPERATURE SENSOR SIGNAL	DTC(s) 58, 59



12129025

32-WAY F MICRO-PACK 100 SERIES
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CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

POWERTRAIN CONTROL MODULE (PCM) (V6 VIN S)

**CAVITIES NOT LISTED ARE NOT USED

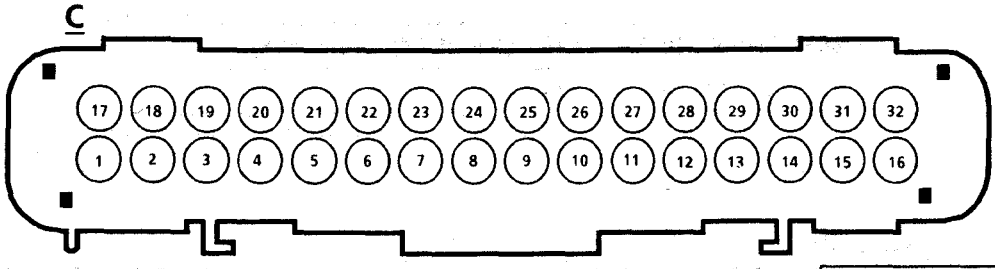
CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
2	DK GRN	335	COOLANT FAN RELAY CONTROL	SEC C12
3	BRN	436	SECONDARY AIR INJECTION SYSTEM AIR BYPASS SOLENOID	SEC C6
4	DK GRN/WHT	428	EVAP CANISTER PURGE SOLENOID VALVE CONTROL	SEC C3
6	DK GRN/WHT	459	A/C COMPRESSOR CLUTCH RELAY CONTROL	DTC 68
7	BRN/WHT	419	MIL (SERVICE ENGINE SOON) INDICATOR CONTROL	CHART A-1
11	LT BLU	697	EGR #1 CONTROL	DTC 75
12	BRN	698	EGR #2 CONTROL	DTC 76
13	RED	699	EGR #3 CONTROL	DTC 77
14	ORN	340	BATTERY (KEEP ALIVE MEMORY)	CHART A-3
15	ORN	340	BATTERY (KEEP ALIVE MEMORY)	CHART A-3
16	BLK/WHT	451	PCM GROUND	CHART A-1
18	DK BLU	1493	2ND GEAR START MODE INDICATOR LAMP CONTROL - PERFORMANCE	SEC C8
19	TAN	800	SERIAL DATA	CHART A-1
20	BLK/WHT	351	LEFT O2S GROUND	DTC(s) 13, 44, 45
21	PPL/WHT	1665	LEFT O2S SIGNAL	DTC(s) 13, 44, 45
22	PPL	1666	RIGHT O2S SIGNAL	DTC(s) 63, 64, 65
23	BLK/WHT	351	RIGHT O2S GROUND	DTC(s) 63, 64, 65
24	LT GRN/WHT	1749	IAC COIL "B" HIGH	DTC 35
25	LT GRN/BLK	444	IAC COIL "B" LOW	DTC 35

(CONTINUED ON NEXT PAGE)

SEQUENTIAL MULTIPORT 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

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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)

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CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
17	TAN/WHT	551	PCM GROUND	FIG A-1
18	PNK/BLK	632	REFERENCE LOW CAMSHAFT AND CRANKSHAFT SENSORS	SEC C4
20	DK BLU	496	KNOCK SENSOR SIGNAL	DTC 43
21	LT BLU/WHT	1800	24X REFERENCE SIGNAL	DTC 36
23	DK BLU	229	FUEL ENABLE SIGNAL	DTC 46
25	BRN/WHT	633	CAMSHAFT POSITION SENSOR SIGNAL	DTC 17
27	WHT	423	IGNITION CONTROL	DTC 41
28	TAN/BLK	424	IGNITION CONTROL BYPASS	DTC 42
29	TAN	472	IAT SENSOR SIGNAL	DTC(s) 23, 25
30	LT BLU/BLK	647	3X REFERENCE HIGH	DTC 82
31	RED/BLK	453	3X REFERENCE LOW	SEC C4
32	LT BLU/BLK	844	INJECTOR DRIVER CYLINDER #4	CHART #A-3

COMPONENT	LOCATION	201-PG	FIG.	CONN
A/C Evaporator Temperature Sensor	Mounted in Evaporator Core	20	37	
A/C Refrigerant Pressure Sensor	Above RH Shock Tower, forward of A/C Compressor Low Pressure Cut Off Switch	19	35	
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Brake Transmission Shift Interrupt (BTSI) Solenoid	In console, under PRNDL Display	22	42	
Camshaft Position Sensor	In front top of Engine Block, between Intake and Water Pump	13	24	
Clutch Anticipate/ Cruise Release Switch (all V6 Manual)	Mounted in clutch pedal bracket (4 cavity conn)	0	1	202-20
Crankshaft Position Sensor, HI Resolution	Lower front of Engine Block, pigtail comes out LH side of crank	11	20	
Crankshaft Position Sensor, LO Resolution	Lower RH side of Engine Block, has no pigtail	28	54	
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Engine Coolant Temperature (ECT) Sensor	Mounted in front top of Engine, under plenum			
Evaporative Emission (EVAP) Canister Purge Solenoid Valve	Left side of Engine, mounted to Intake Plenum	13	24	
Exhaust Gas Recirculation (EGR) Vacuum Control Signal Solenoid Valve	Right side of Engine, mounted to Manifold	12	23	202-20
Fuel Injectors	Mounted on Intake Manifold, part of Fuel Rail			

(CONTINUED ON NEXT PAGE)

SEQUENTIAL MULTIPORT FUEL INJECTION: V6 VIN S

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Fuel Pump Prime Conn	Top rear of RH Shock Tower, 1 way conn out of Harn	15	28	
Fuel Pump Relay	Forward of LH kick panel, mounted to foot rest bracket under carpet	7	13	202-21
Fuel Tank Unit	Under rear of vehicle			
Fusible Links	Above RH shock tower	10	19	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Idle Air Control (IAC) Valve	Right front on Throttle Body	29	56	202-22
Ignition Control Module (ICM)	Left front of Engine	27	52	202-22
Instrument Cluster	LH side of I/P			202-23
Intake Air Temperature (IAT) Sensor	Mounted on air duct, in front of Intake Manifold	24	45	
Isolation Diode (BTSI)	Sealed in Harn, approx 6 cm from DERM breakout			
Knock Sensor	In bottom RH side of Engine Block	28, 40	54, 72	
Manifold Absolute Pressure (MAP) Sensor	Mounted to RH side of Intake Manifold	12, 26	23, 50	
Oxygen Sensor, LH	Mounted in left Exhaust Manifold	13	24	
Oxygen Sensor, RH	Mounted in right Exhaust Manifold	12	23	
Powertrain Control Module (PCM)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Secondary Air Injection Pump Assembly	Front LH Frame Rail, in Engine Compartment	11	21	
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Throttle Position (TP) Sensor	Mounted to right front side of intake	14, 29	27, 56	
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C110 (10 cavities)	Engine to Injector Harn, top center of Intake Manifold	12	22	202-1
C200A (17 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C270 (2 cavities)	I/P Harn to Clutch Jumper Harn, near brake/clutch pedal bracket	1	2	
C405A (4 cavities)	Part of Pass Thru Conn, forward of rear axle, to Fuel Tank Unit	5	9	202-8
C405B (10 cavities)	Part of Pass Thru Conn, forward of rear axle, to Pass Thru Panel	5	9	202-8
G104	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
G106	Near top LH side of radiator, in top of T-Bar	19	35	

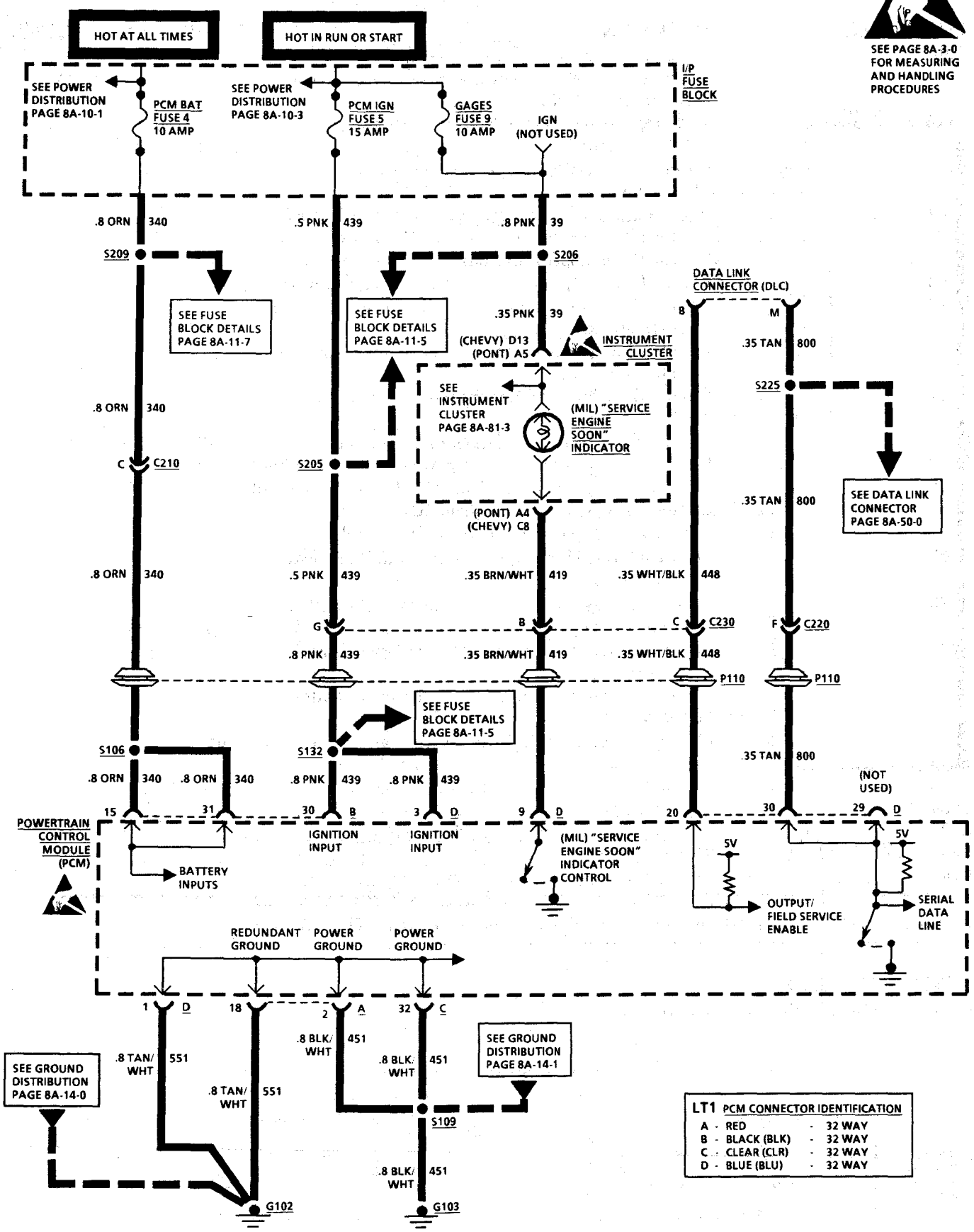
COMPONENT	LOCATION	201-PG	FIG.	CONN
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S103	Injector Jumper Harn, approx 7 cm from LH Branch breakout			
S104	Injector Jumper Harn, approx 9 cm from Injector 6			
S106	Engine Harn, approx 25 cm from PCM Connectors			
S107	Engine Harn, approx 30 cm from C110 breakout	12	22	
S108	Engine Harn, approx 4 cm from braided ground strap	11	20	
S110	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S117	Engine Harn, approx 5 cm from main branch and PCM breakout			
S119	Engine Harn, at RH Oxygen Sensor breakout	12	23	
S122	Engine Harn, approx 4 cm from MAP Sensor breakout	12	23	
S125	Engine Harn, approx 3 cm from MAP Sensor breakout	12	23	
S127	Engine Harn, approx 13 cm from RH branch			
S131	Engine Harn, approx 17 cm from RH branch			
S163	Forward Lamp Harn, approx 7 cm from Electrical Center breakout			
S190	Forward Lamp Harn, approx 8 cm from Electrical Center breakout	36	68	
S205	I/P Harn, approx 31 cm from Convenience Center breakout			
S206	I/P Harn, approx 18 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			
S225	I/P Harn, approx 4 cm before DLC breakout			
S234 (Automatic)	I/P Harn, approx 4 cm from G201 breakout			
S235	I/P Harn, approx 7 cm from G200 breakout	7	13	
S238 (Automatic)	I/P Harn, approx 7 cm from Center Console breakout			
S280	Engine Harn, approx 14 cm from C220 breakout			

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

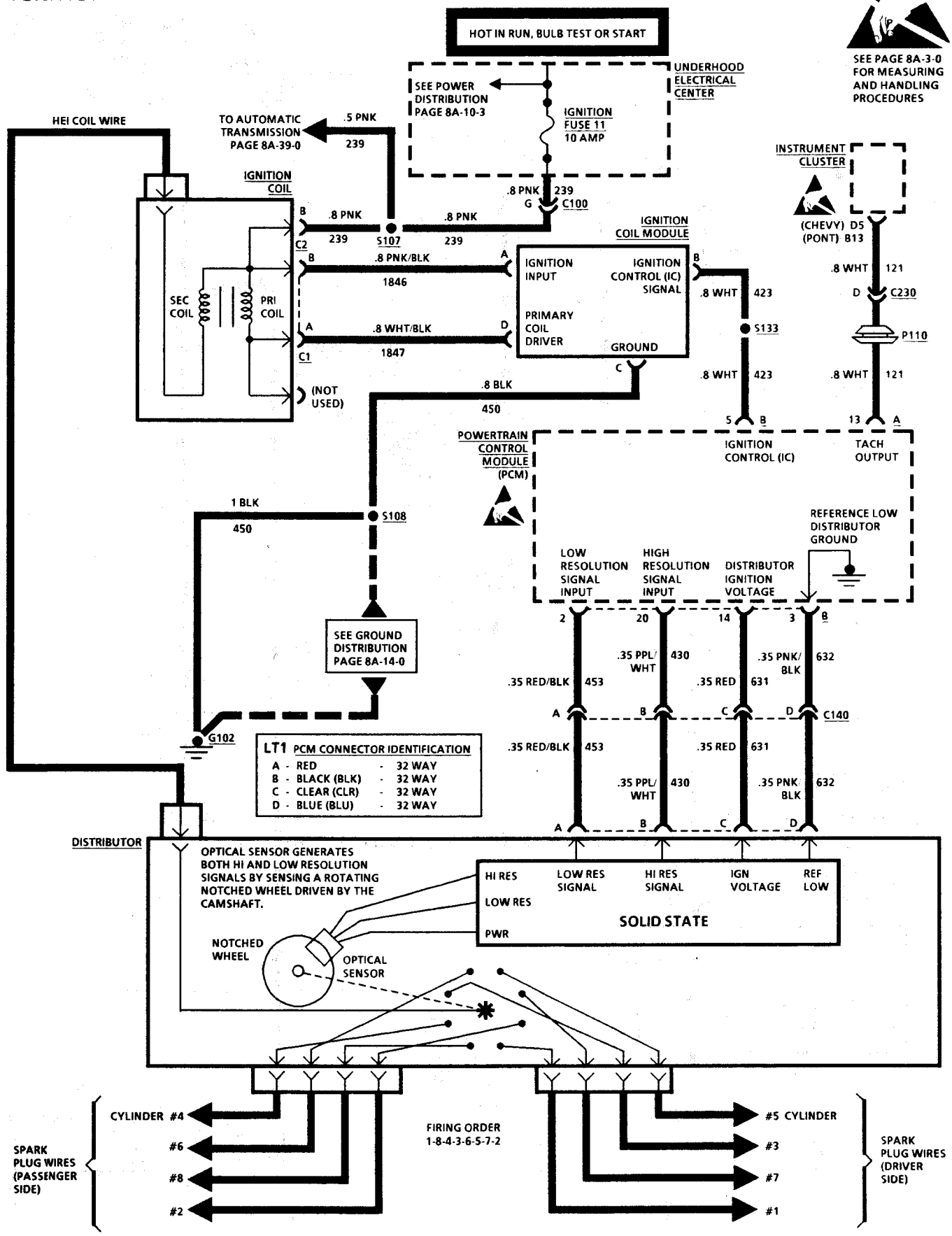
SYSTEM DIAGNOSIS

- Refer to SECTION 6E3 for diagnosis.

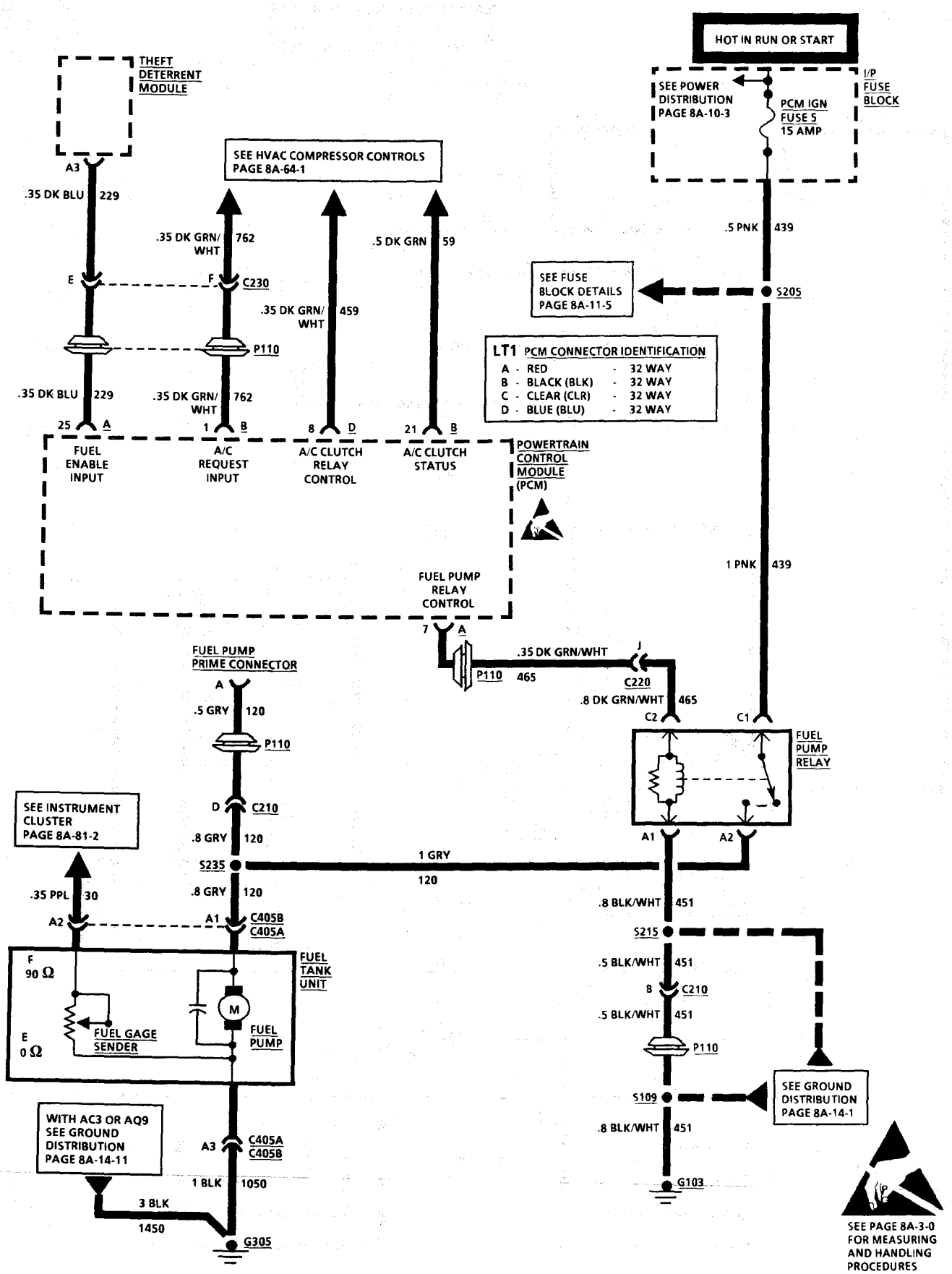
SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
DATA LINK, GROUND AND POWER



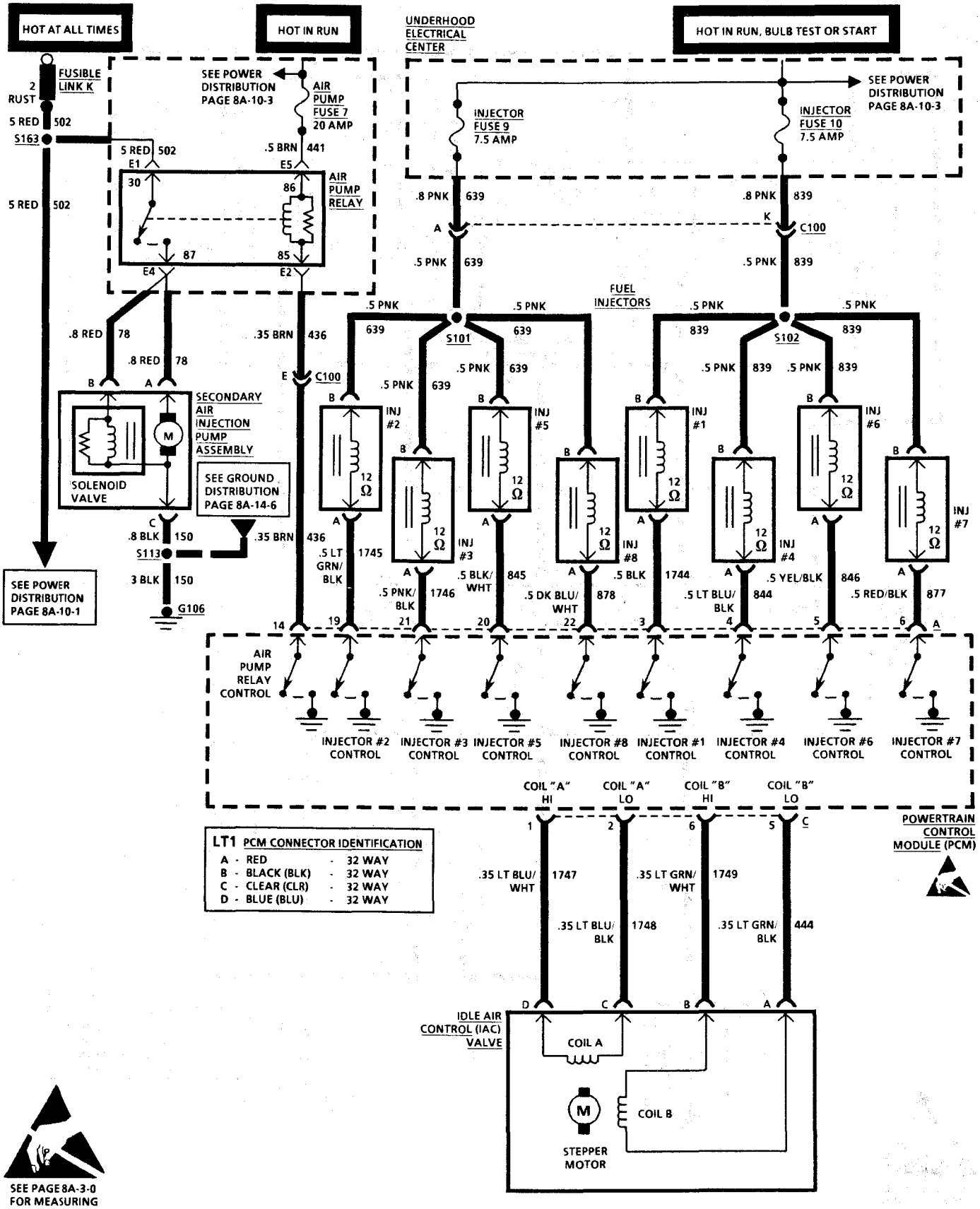
SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
IGNITION



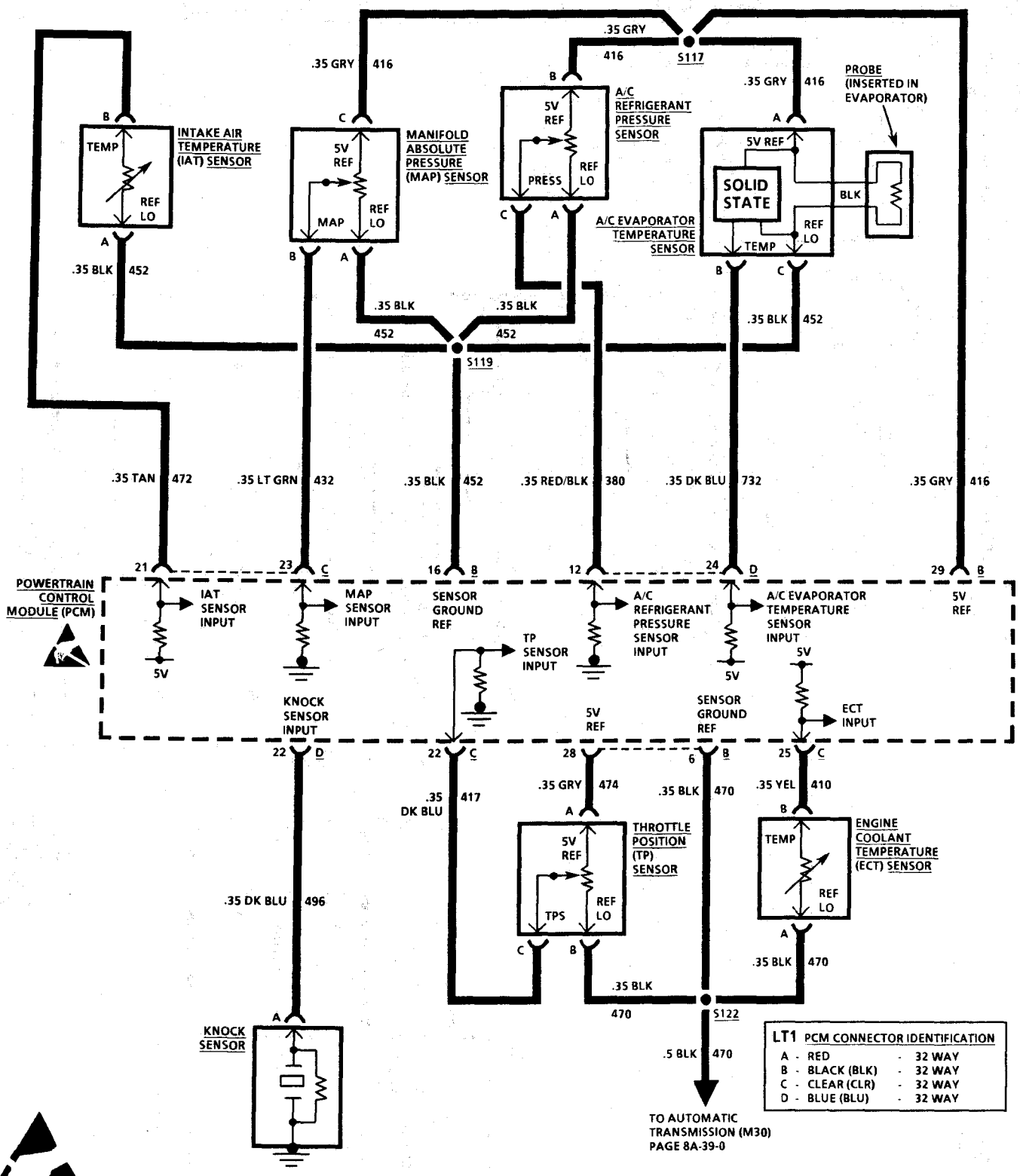
SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
FUEL PUMP, HVAC AND PASS-KEY®II INPUT



SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
CONTROLLED DEVICES AND INJECTORS

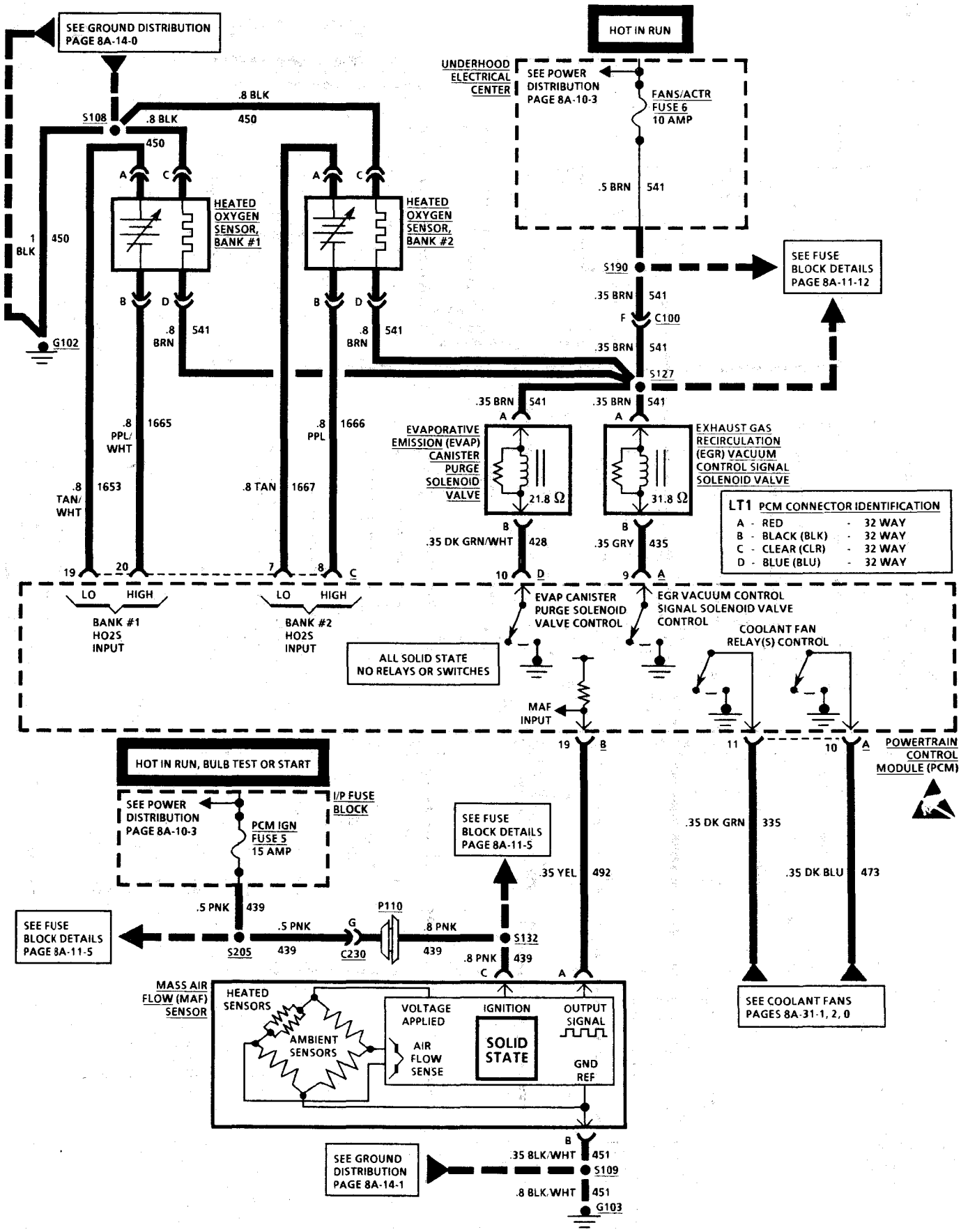


SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
ENGINE DATA SENSORS

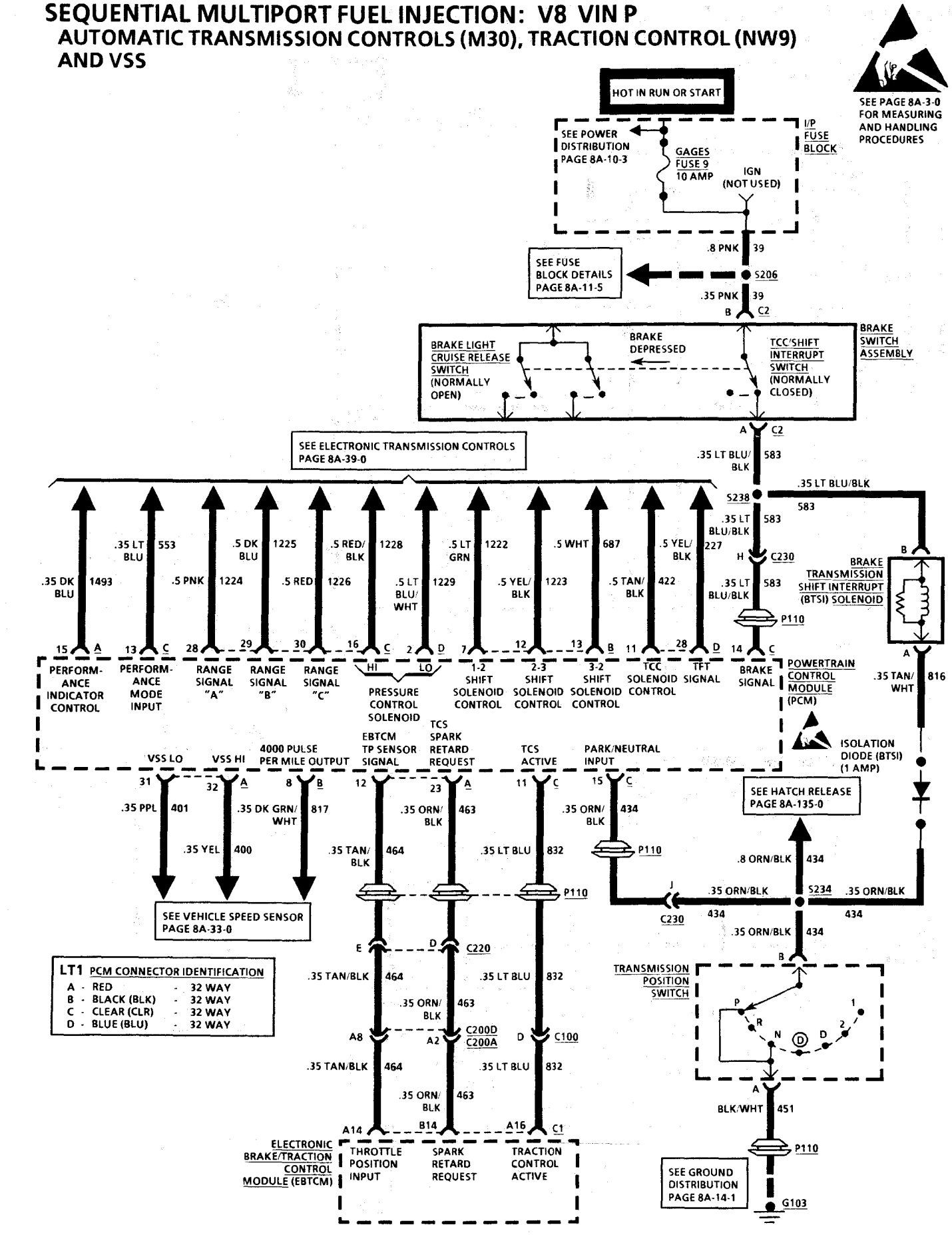


SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

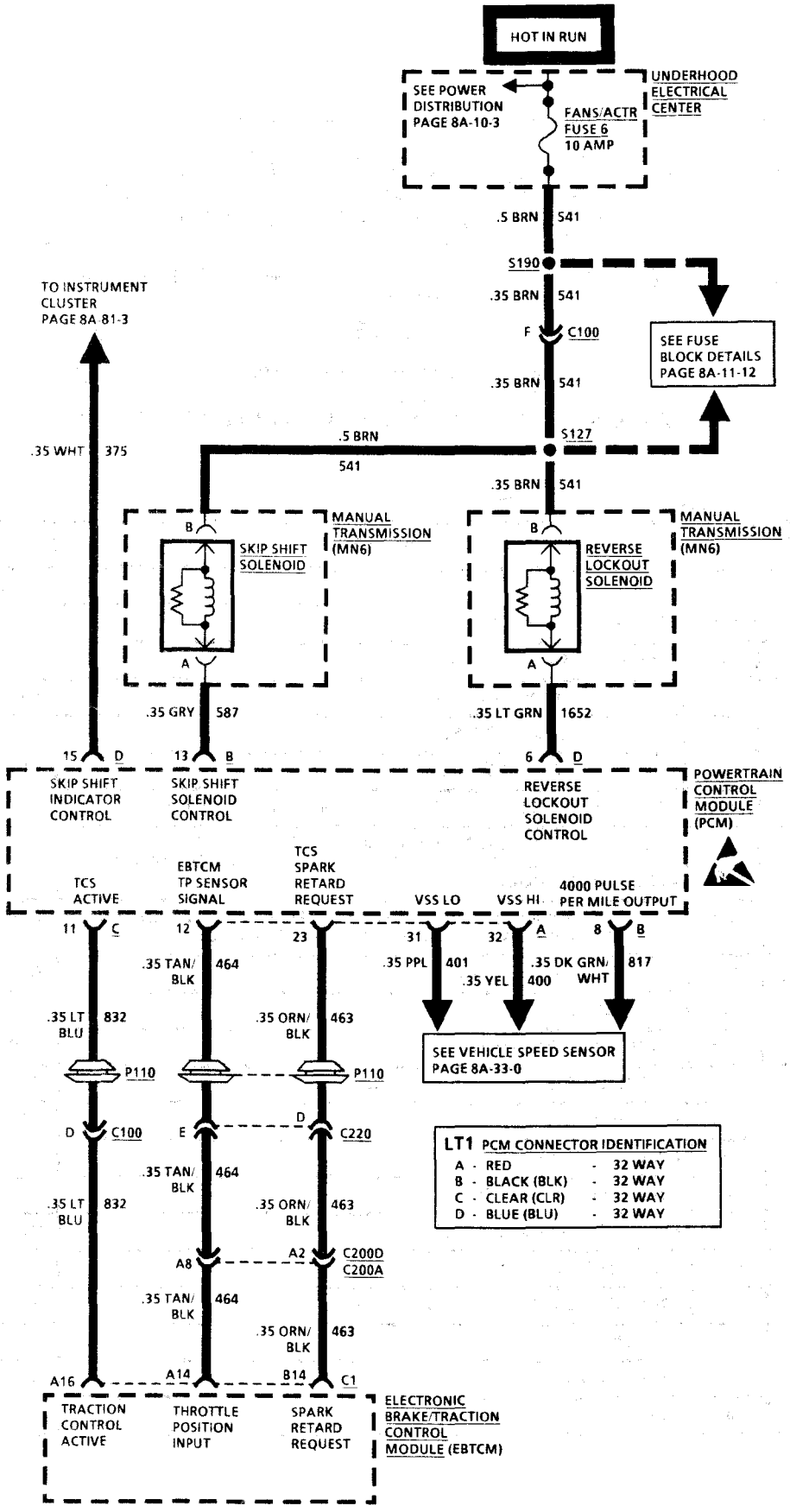
SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
CONTROLLED DEVICES, ENGINE DATA SENSORS



SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
AUTOMATIC TRANSMISSION CONTROLS (M30), TRACTION CONTROL (NW9) AND VSS

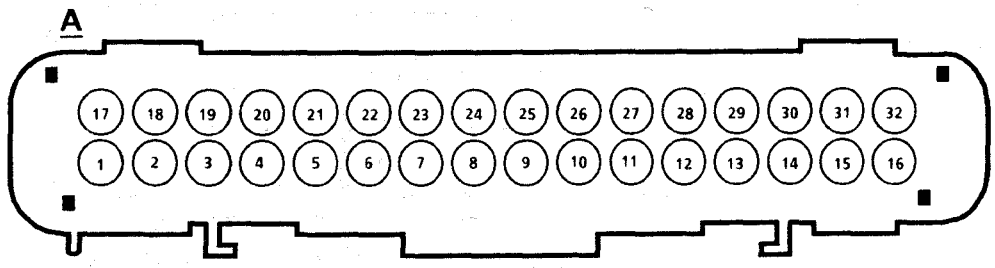


SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P
MANUAL TRANSMISSION CONTROLS (MN6), TRACTION CONTROL (NW9) AND VSS



SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P



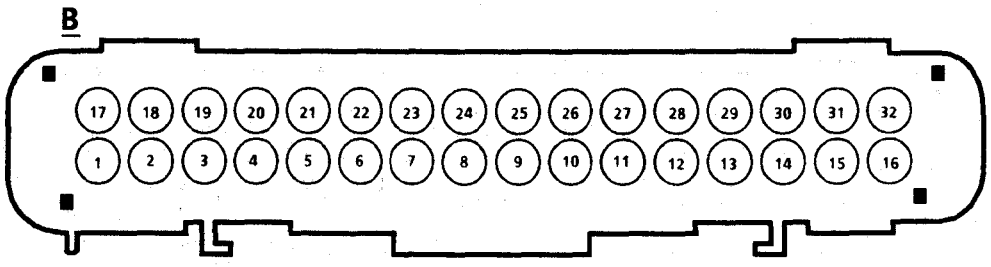
12129025

32-WAY F MICRO-PACK 100 SERIES
NAT
POWERTRAIN CONTROL MODULE (PCM) (V8 VIN P)

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129024 (RED)
SEAL	- 12146093
STRAIN RELIEF	- 12129028
CONNECTOR	- 12129025

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
2	BLK/WHT	451	PCM GROUND	SECTION B
3	BLK	1744	FUEL INJECTOR #1 CONTROL	DTC 18
4	LT BLU/BLK	844	FUEL INJECTOR #4 CONTROL	DTC 18
5	YEL/BLK	846	FUEL INJECTOR #6 CONTROL	DTC 18
6	RED/BLK	877	FUEL INJECTOR #7 CONTROL	DTC 18
7	DK GRN/WHT	465	FUEL PUMP RELAY CONTROL	CHART A-5
9	GRY	435	EGR VACUUM CONTROL SIGNAL SOLENOID VALVE CONTROL	DTC 27, SECTION C7
10	DK BLU	473	SECONDARY COOLANT FAN RELAY CONTROL (WITH C60 EARLY PRODUCTION) OR COOLANT FAN RELAY #2 AND #3 CONTROL (WITH C60 LATER PRODUCTION)	SECTION C12
11	DK GRN	335	PRIMARY COOLANT FAN RELAY CONTROL (EARLY PRODUCTION) OR COOLANT FAN RELAY#1 CONTROL (LATER PRODUCTION)	DTC 27, SECTION C12
12	TAN/BLK	464	EBTCM TP SENSOR SIGNAL	REFER TO SECTION 5E2
13	WHT	121	TACH OUTPUT	DTC 99
14	BRN	436	AIR PUMP RELAY CONTROL	DTC 29, SECTION C6
15	DK BLU	1493	PERFORMANCE INDICATOR CONTROL	SECTION C8
18	TAN/WHT	551	PCM GROUND	SECTION B
19	LT GRN/BLK	1745	FUEL INJECTOR #2 CONTROL	DTC 18
20	BLK/WHT	845	FUEL INJECTOR #5 CONTROL	DTC 18
21	PNK/BLK	1746	FUEL INJECTOR #3 CONTROL	DTC 18
22	DK BLU/WHT	878	FUEL INJECTOR #8 CONTROL	DTC 18
23	ORN/BLK	463	TRACTION CONTROL SYSTEM SPARK RETARD REQUEST	REFER TO SECTION 5E2
25	DK BLU	229	FUEL ENABLE SIGNAL	DTC 46
31	PPL	401	VSS GROUND	DTC(s) 24, 72
32	YEL	400	VSS SIGNAL	DTC(s) 24, 72



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32-WAY F MICRO-PACK 100 SERIES
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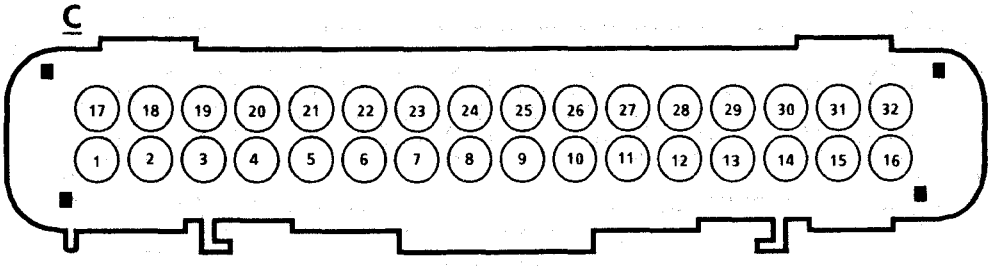
CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129028
CONNECTOR	- 12129025

POWERTRAIN CONTROL MODULE (PCM) (V8 VIN P)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
1	DK GRN/WHT	762	A/C REQUEST	SECTION C10
2	RED/BLK	453	LOW RESOLUTION SIGNAL	DTC 16, SECTION C4
3	PNK/BLK	632	DISTRIBUTOR REFERENCE LOW SIGNAL	SECTION C4
5	WHT	423	IGNITION CONTROL (IC)	DTC(s) 41, 42, SECTION C4
6	BLK	470	TP SENSOR, ECT GROUND REFERENCE	DTC(s) 58, 59
7	LT GRN	1222	1-2 SHIFT SOLENOID CONTROL	DTC 82
8	DK GRN/WHT	817	VSS OUTPUT (4000 PPM)	DTC 97
12	YEL/BLK	1223	2-3 SHIFT SOLENOID CONTROL	DTC 81
13	GRY WHT	587 687	SKIP SHIFT SOLENOID CONTROL 3-2 SHIFT SOLENOID CONTROL	DTC 84
14	RED	631	DISTRIBUTOR IGNITION FEED	SECTION C4
15	ORN	340	BATTERY FEED	CHART A-1
16	BLK	452	IAT, MAP, A/C REFRIGERANT, A/C EVAP TEMP SENSORS GROUND REFERENCE	DTC(s) AFFECTED
19	YEL	492	MAF SIGNAL	DTC 48
20	PPL/WHT	430	HIGH RESOLUTION SIGNAL	DTC 36
21	DK GRN	59	A/C CLUTCH STATUS	DTC 69, SECTION C10
28	GRY	474	+ 5 VOLTS REFERENCE	DTC(s) AFFECTED
29	GRY	416	+ 5 VOLTS REFERENCE	DTC(s) AFFECTED
30	PNK	439	IGNITION FEED	CHART A-1
31	ORN	340	BATTERY FEED	CHART A-1

SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P



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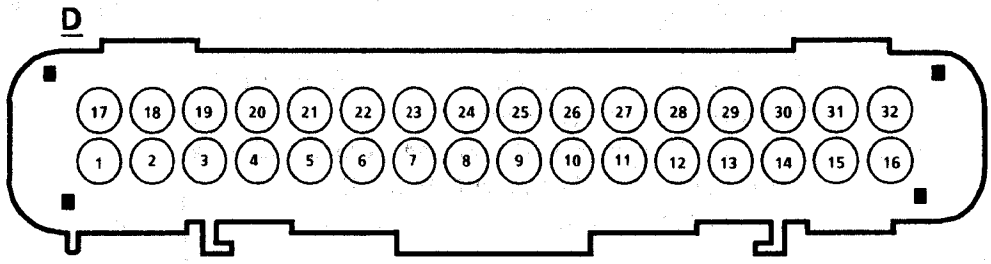
32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129022 (CLR)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

POWERTRAIN CONTROL MODULE (PCM)
(V8 VIN P)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
1	LT BLU/WHT	1747	IAC COIL "A" HIGH	SECTION C2
2	LT BLU/BLK	1748	IAC COIL "A" LOW	SECTION C2
5	LT GRN/BLK	444	IAC COIL "B" LOW	SECTION C2
6	LT GRN/WHT	1749	IAC COIL "B" HIGH	SECTION C2
7	TAN	1667	BANK #2 HO2S LOW	DTC 63
8	PPL	1666	BANK #2 HO2S HIGH	DTC(s) 63, 64, 65
11	LT BLU	832	TRACTION CONTROL SYSTEM ACTIVE	DTC 74
13	LT BLU	553	PERFORMANCE MODE INPUT	SECTION C8
14	LT BLU/BLK	583	BRAKE SIGNAL	DTC(s) 37, 38
15	ORN/BLK	434	PNP SIGNAL	CHART C-1A
16	RED/BLK	1228	PRESSURE CONTROL SOLENOID HIGH	DTC 73
19	TAN/WHT	1653	BANK #1 HO2S LOW	DTC 13
20	PPL/WHT	1665	BANK #1 HO2S HIGH	DTC(s) 13, 44, 45
21	TAN	472	IAT SIGNAL	DTC(s) 23, 25
22	DK BLU	417	TP SENSOR SIGNAL	DTC(s) 21, 22
23	LT GRN	432	MAP SIGNAL	DTC(s) 33, 34
25	YEL	410	ECT SIGNAL	DTC(s)14, 15
28	PNK	1224	RANGE SIGNAL "A"	DTC 28
29	DK BLU	1225	RANGE SIGNAL "B"	SECTION C8
30	RED	1226	RANGE SIGNAL "C"	DTC 28
32	BLK/WHT	451	PCM GROUND	SECTION B



12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129023 (BLU)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

POWERTRAIN CONTROL MODULE (PCM) (V8 VIN P)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	6E3 REFERENCE
1	TAN/WHT	551	PCM GROUND	SECTION B
2	LT BLU/WHT	1229	PRESSURE CONTROL SOLENOID LOW	DTC 73
3	PNK	439	IGNITION FEED	DTC (s) 50, 53, 75
6	LT GRN	1652	REVERSE LOCKOUT SOLENOID CONTROL	DTC 83, SECTION C8
8	DK GRN/WHT	459	A/C CLUTCH RELAY CONTROL	DTC 70, SECTION C10
9	BRN/WHT	419	MIL (SERVICE ENGINE SOON) INDICATOR CONTROL	CHARTS A-1, A-2
10	DK GRN/WHT	428	EVAP CANISTER PURGE SOLENOID VALVE CONTROL	DTC 26, SECTION C3
11	TAN/BLK	422	TCC SOLENOID CONTROL	DTC 90
12	RED/BLK	380	A/C REFRIGERANT PRESSURE SENSOR SIGNAL	DTC(s) 66, 67
15	WHT	375	SKIP SHIFT INDICATOR CONTROL	DTC 91
20	WHT/BLK	448	OUTPUT/FIELD SERVICE ENABLE TERMINAL	CHART A-2
22	DK BLU	496	KNOCK SENSOR SIGNAL	DTC 43
24	DK BLU	732	A/C TEMPERATURE SENSOR SIGNAL	DTC (s) 66, 67
28	YEL/BLK	1227	TRANSMISSION FLUID TEMPERATURE SENSOR SIGNAL	DTC 58, 59
30	TAN	800	SERIAL DATA	CHART A-2

SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P

COMPONENT	LOCATION	201-PG	FIG.	CONN
A/C Evaporator Temperature Sensor	Mounted in Evaporator Core	20	37	
A/C Refrigerant Pressure Sensor	Above RH Shock Tower, forward of A/C Compressor Low Pressure Cut-off Switch	19	35	
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Brake Transmission Shift Interrupt (BTSI) Solenoid	In console, under PRNDL Display	22	42	
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Distributor	In front center of Engine	41	74	202-20
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Engine Coolant Temperature (ECT) Sensor	Front of Engine, mounted in water pump	24	45	
Evaporative Emission (EVAP) Canister Purge Solenoid Valve	Right center of Engine, mounted to Manifold	26	50	
Exhaust Gas Recirculation (EGR) Vacuum Control Signal Solenoid Valve	Left rear of Engine, mounted to Intake Plenum	24	44	
Fuel Injectors	Mounted on Intake Manifold, part of Fuel Rail	24	44	
Fuel Pump Prime Conn	Top rear of RH Shock Tower, 1 way conn out of Harn	15	28	
Fuel Pump Relay	Forward of LH kick panel, mounted to foot rest bracket under carpet	7	13	202-21
Fuel Tank Unit	Under rear of vehicle			
Fusible Links	Above RH Shock Tower	10	19	
Heated Oxygen Sensor Bank #1	Mounted in left Exhaust Manifold	24	44	202-22
Heated Oxygen Sensor Bank #2	Mounted in right Exhaust Manifold	40	72	202-22
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Idle Air Control (IAC) Valve	Right front on Throttle Body	14	27	202-22
Ignition Coil	Front LH side of Engine	16	29	
Ignition Coil Module	Front LH side of Engine	16	29	202-22
Instrument Cluster	LH side of I/P			202-23
Intake Air Temperature (IAT) Sensor	Mounted on air duct, in front of Intake Manifold	24	45	
Isolation Diode (BTSI)	Sealed in Harn, approx 6 cm from DERM breakout			
Knock Sensor	In bottom RH side of Engine Block	28, 40	54, 72	
Manifold Absolute Pressure (MAP) Sensor	Mounted to RH side of Intake Manifold	12, 26	23, 50	
Mass Air Flow (MAF) Sensor	Mounted on air duct, in front of Intake Manifold	24	45	
Powertrain Control Module (PCM)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26

COMPONENT	LOCATION	201-PG	FIG.	CONN
Reverse Lockout Solenoid (Manual)	Rear LH side of Transmission	26	51	
Secondary Air Injection Pump Assembly	Front LH Frame Rail, in Engine Compartment	11	21	
Skip Shift Solenoid	Center LH side of Transmission	26	51	
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Throttle Position (TP) Sensor	Mounted to right front side of intake	14, 29	27, 56	
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C140 (4 cavities)	Right side of Intake Plenum, attached to Evaporator Solenoid Valve	26	50	202-19
C200A (17 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C405A (4 cavities)	Part of Pass Thru Conn, forward of rear axle, to Fuel Tank Unit	5	9	202-8
C405B (10 cavities)	Part of Pass Thru Conn, forward of rear axle, to Pass Thru Panel	5	9	202-8
G102	Front of LH cylinder head (3 rings, 3 wires and braided strap)	16	29	
G103	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G106	Near top LH side of radiator, in top of T-Bar	19	35	
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S101	Engine Harn, between Injectors 4 and 6 breakouts	26	50	
S102	Engine Harn, approx 5 cm from Injector 3 breakout	24	44	
S106	Engine Harn, approx 4 cm from main branch and PCM breakout			
S107	Engine Harn, approx 7 cm from main breakout at right rear of Engine			
S108	Engine Harn, approx 17 cm from Injector 3 breakout	24	44	
S109	Engine Harn, approx 4 cm from main branch and PCM breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			

(CONTINUED ON NEXT PAGE)

SEQUENTIAL MULTIPORT FUEL INJECTION: V8 VIN P

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
S117	Engine Harn, approx 5 cm from clip near PCM and main branch			
S119	Engine Harn, approx 18 cm from main branch and PCM breakout			
S122	Engine Harn, approx 25 cm from main branch and PCM breakout			
S127	Engine Harn, approx 8 cm from left clip, on Intake Manifold	24	44	
S132	Engine Harn, approx 2 cm from clip near PCM and main branch			
S133	Engine Harn, approx 11 cm from Injector 3 breakout	24	44	
S163	Forward Lamp Harn, approx 7 cm from Electrical Center breakout			
S190	Forward Lamp Harn, approx 8 cm from Electrical Center breakout	36	68	
S205	I/P Harn, approx 31 cm from Convenience Center breakout			
S206	I/P Harn, approx 18 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			
S225	I/P Harn, approx 4 cm before DLC breakout			
S234 (Automatic)	I/P Harn, approx 4 cm from G201 breakout			
S235	I/P Harn, approx 7 cm from G200 breakout	7	13	
S238 (Automatic)	I/P Harn, approx 7 cm from center console breakout			

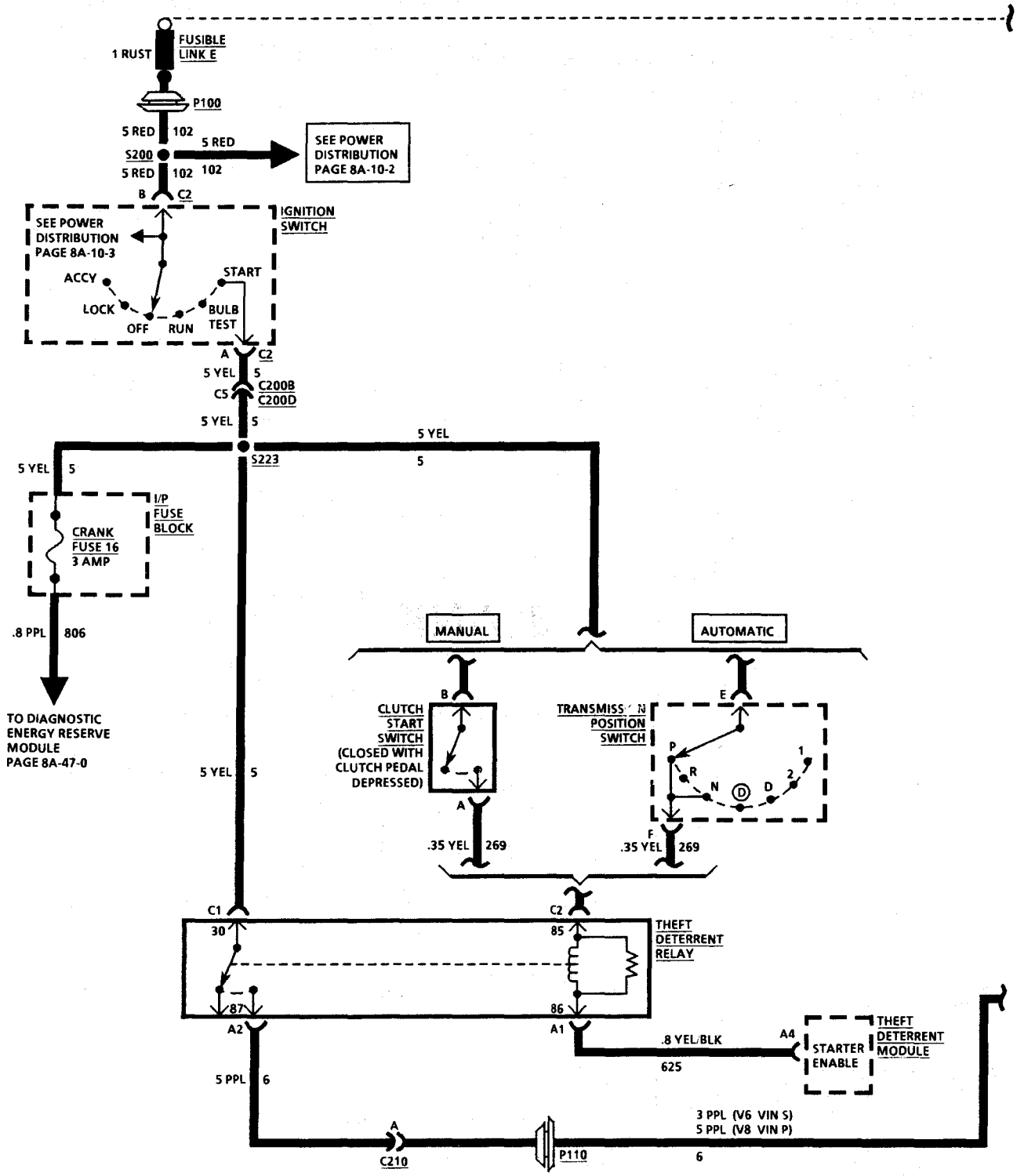
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

- Refer to SECTION 6E3 for diagnosis.

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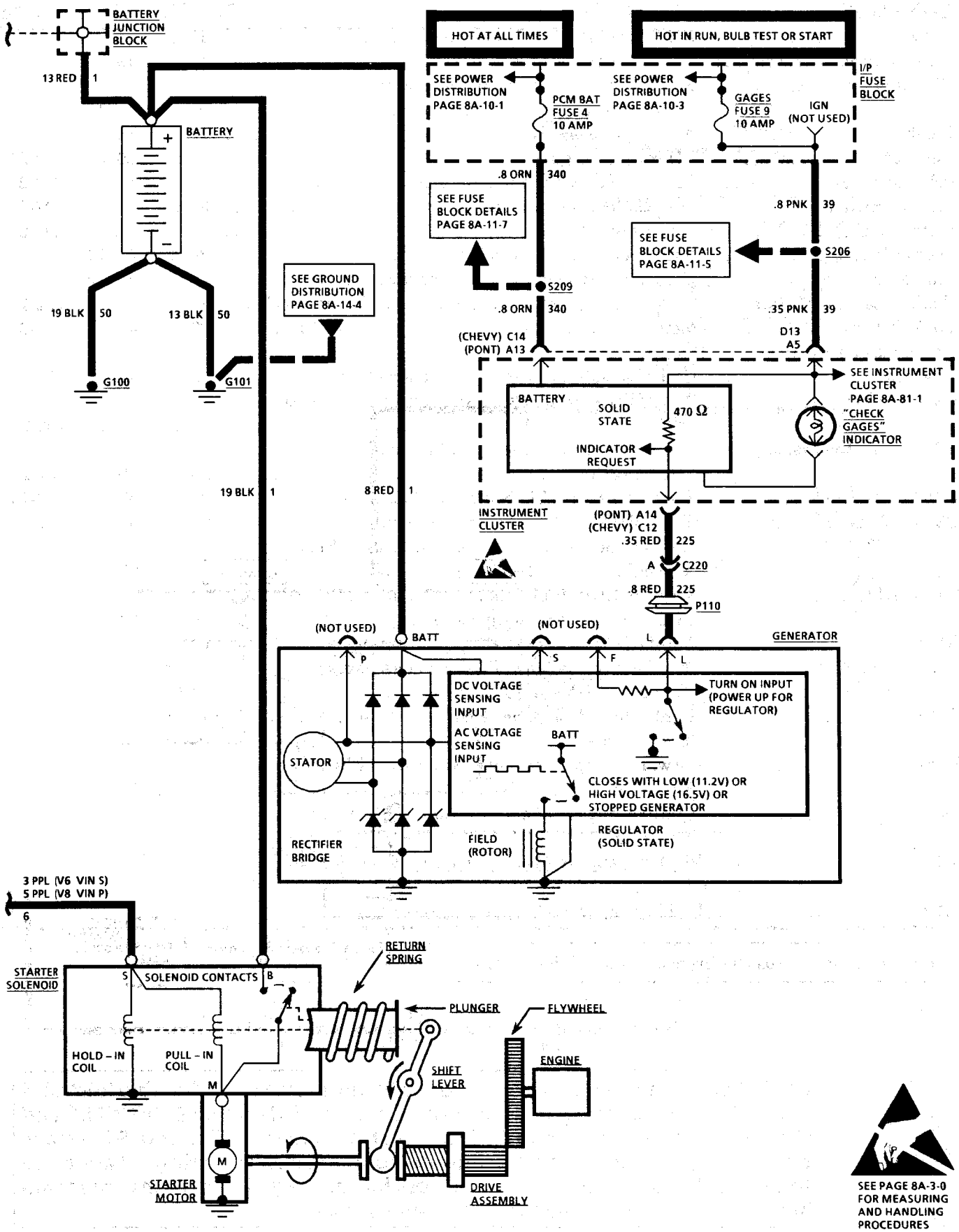
STARTER AND CHARGING





SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

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.



SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

STARTER AND CHARGING

COMPONENT	LOCATION	201-PG	FIG.	CONN
Battery	RH front of Engine Compartment	19	35	
Battery Junction Block	Top of RH Shock Tower	10	19	
Clutch Start Switch	Mounted to clutch pedal bracket, behind Convenience Center	0	1	
Fusible Links	Above RH Shock Tower	10	19	
Generator	RH front of Engine	14, 29	26, 56	202-21
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Switch	Part of Steering Column	34	63	202-23
Instrument Cluster	LH side of I/P			202-23
Starter Motor	Bottom of RH side of Engine	28, 40	54, 72	
Starter Solenoid	Bottom of RH side of Engine, above Starter Motor	28, 40	54, 72	
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Theft Deterrent Relay	Mounted to right side of SIR Bracket, behind I/P	22	41	202-27
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
C200B (18 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
G100 (L32)	Bolted to Belt Tension Bracket Bolt, lower RH front of Engine (1 ring, 1 wire)	13	25	
G100 (LT1)	Bolted to RH side of Engine Block, same bolt used for A/C Compressor if equipped (1 ring, 1 wire)	39	69	
G101	Top of RH Shock Tower (3 rings, 5 wires)	10	19	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S200	Forward Lamp Harn, approx 5 cm from EBCM breakout	8	14	
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S209	I/P Harn, approx 24 cm from Convenience Center breakout			
S223	I/P Harn, approx 11 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)

STARTER

1. Visually inspect the hydrometer (built into Battery).
   - Green eye – Battery is charged.
   - Dark eye – Charge and load test Battery, refer to SECTION 6D1. If Battery passes load test, refer to System Diagnosis, page 8A-30-3.
   - Clear or light yellow eye – Battery electrolyte is low. Replace Battery.
2. Always note condition of "SECURITY" Indicator if Engine does not crank. If the indicator stays "ON" or flashes continuously, refer to "Theft Deterrent System," page 8A-133-0.
3. Check that Starter Solenoid terminals "S" and "B" and Battery connections are clean and tight.
4. Check that Fusible Link E is undamaged. If Fusible Link E is open, check for a short to ground through CKT 5 or CKT 6.
5. Check that G100 and G101 are clean and tight.

- 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.

CHARGING SYSTEM

1. Visually inspect the hydrometer (built into Battery).
   - Green eye – Battery is charged.
   - Dark eye – Charge and load test Battery, refer to SECTION 6D1. If Battery passes load test, refer to System Diagnosis, page 8A-30-3.
   - Clear or light yellow eye – Battery electrolyte is low. Replace Battery.
2. Check Gages Fuse 9 for open.
3. Check that the Generator connector and Generator "BAT" terminal are both clean and tight.
4. Check that the Battery connections are clean and tight.
5. Check Generator belt.

- 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

Important:

- The following tests are designed for engines and batteries at normal operating temperatures and assumes that there are no engine symptoms which would cause a no-start symptom. The Battery must be in a charged state before doing diagnosis. To use the tests under other conditions could result in misdiagnosis.

Important:

- Perform the On-Board Diagnostic System Check described in SECTION 6E3 to be certain no trouble codes are stored in PCM memory which may lead to misdiagnosis, specifically Diagnostic Trouble Code (DTC) 46, indicating a problem in the PASS-Key®II Fuel Enable circuit.
- Always note condition of "SECURITY" Indicator if Engine will not crank. If the indicator stays "ON" or flashes continuously, refer to "Theft Deterrent System," page 8A-133-0.

STARTER AND CHARGING

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Engine does not crank, Starter Solenoid does not click.	Chart #1	8A-30-4
Starter Solenoid clicks, but Engine cranks slowly or not at all.	Chart #2	8A-30-6
Battery is undercharged or overcharged.	Chart #3	8A-30-7
"CHECK GAGES" Indicator on at all times.	Refer to page 8A-81-1.	
"CHECK GAGES" Indicator inoperative.	Refer to page 8A-81-1.	
Slower or no crank only after extended periods of vehicle non-use.	See Parasitic Load Test. Refer to SECTION 6D1.	

CHART #1
ENGINE DOES NOT CRANK, STARTER SOLENOID DOES NOT CLICK

IMPORTANT:
- BATTERY MUST BE IN A CHARGED STATE TO AVOID MISDIAGNOSIS. FOR BATTERY CHARGING OR TESTING, REFER TO SECTION 6D1.
- IF "SECURITY" INDICATOR STAYS "ON" OR FLASHERS CONTINUOUSLY, REFER TO "THEFT DETERRENT SYSTEM," PAGE 8A-133-0 (NORMAL BULB CHECK IS APPROXIMATELY 5 SECONDS.
- TO AVOID MISDIAGNOSIS, CHECK FOR DIAGNOSTIC TROUBLE CODES. SEE SECTION 6E3.

- DISCONNECT THEFT DETERRENT RELAY.
- ATTACH A TEST LIGHT BETWEEN THEFT DETERRENT RELAY CONN TERM "A1" AND B+.
- WHILE OBSERVING TEST LIGHT, TURN IGNITION SWITCH TO "START."
  DOES TEST LIGHT ILLUMINATE?

YES

- CONNECT A TEST LIGHT BETWEEN THEFT DETERRENT RELAY CONN TERM "C1" AND GROUND.
- WHILE OBSERVING TEST LIGHT, TURN IGNITION SWITCH TO "START."
  DOES TEST LIGHT ILLUMINATE?

YES

- CONNECT A TEST LIGHT BETWEEN THEFT DETERRENT RELAY CONN TERM "C2" AND GROUND.
- WHILE OBSERVING TEST LIGHT, TURN IGNITION SWITCH TO "START."
  DOES TEST LIGHT ILLUMINATE?

YES

IMPORTANT:
- DO NOT ALLOW STARTER TO CRANK LONGER THAN 15 SECONDS OR DAMAGE TO THE STARTER MAY OCCUR.
- ATTACH A 30 AMP FUSED JUMPER BETWEEN THEFT DETERRENT RELAY CONN TERM "C1" AND TERM "A2".
- TRANSMISSION IN "PARK" OR "NEUTRAL" (AUTO TRANS) OR WITH CLUTCH PEDAL DEPRESSED (MANUAL TRANS).
- IGNITION SWITCH TO "START."
  DOES ENGINE CRANK?

A (CONTINUED ON NEXT PAGE)

NO

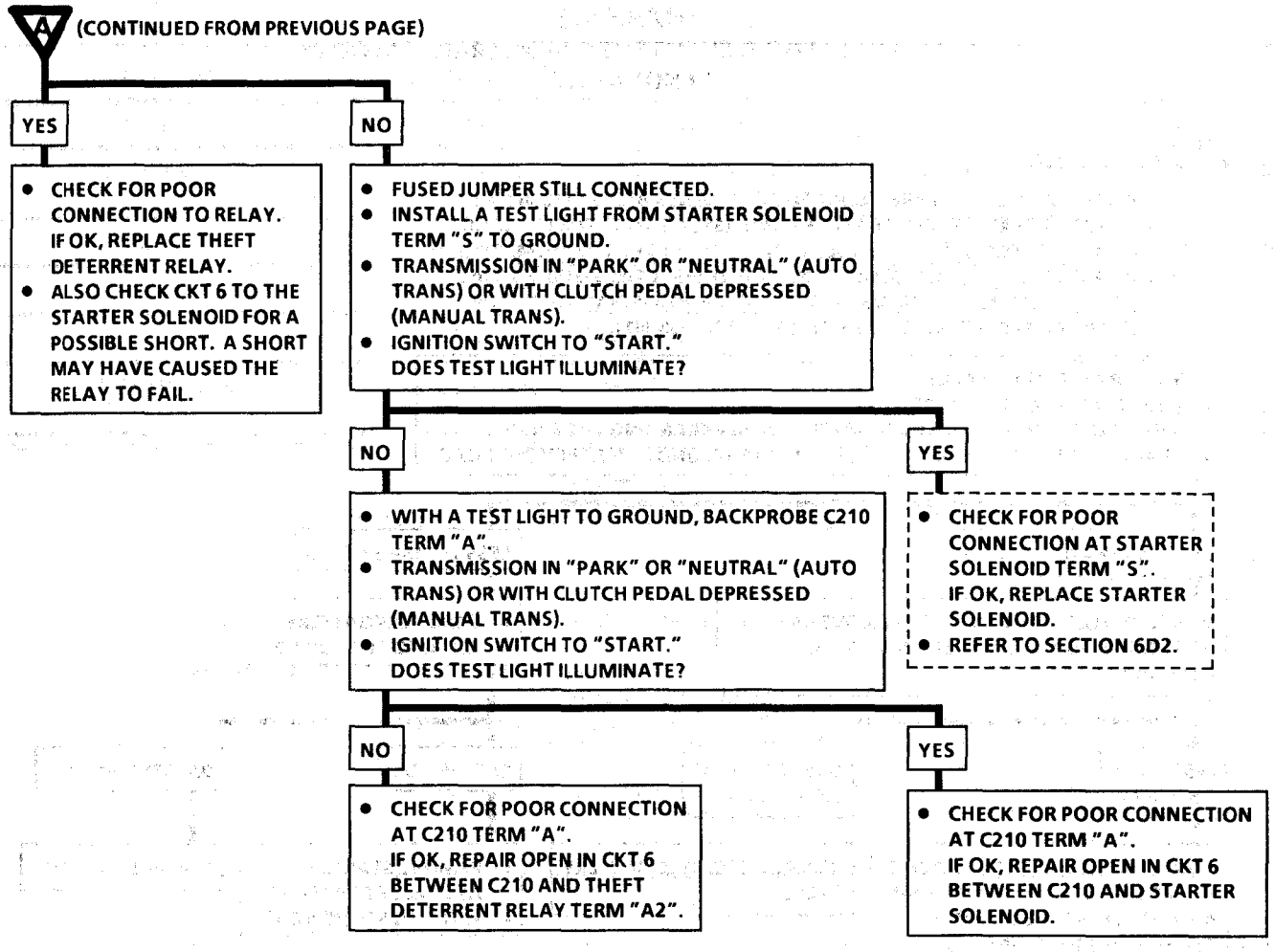
REFER TO "THEFT DETERRENT SYSTEM PASS-Key®II", SECTION 8A-133, CHART #1.

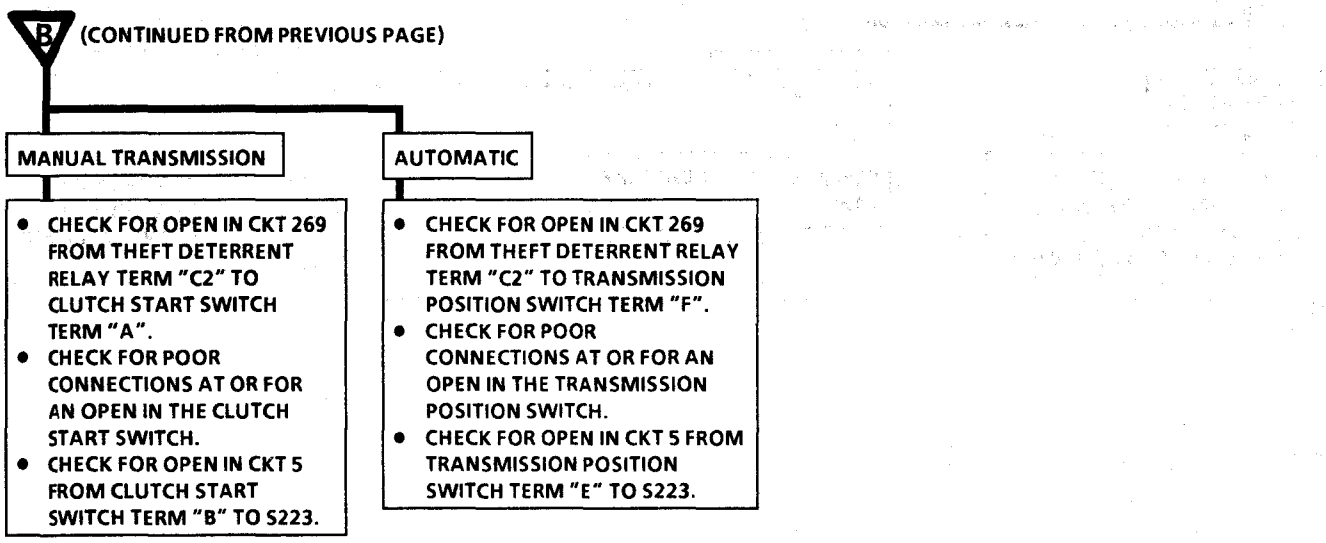
NO

CHECK FOR OPEN IN CKT 5 OR OPEN IN POWER FEED CKT 102 INCLUDING IGNITION SWITCH AND FUSIBLE LINK E.

NO

B (CONTINUED ON NEXT PAGE)


A
(CONTINUED FROM PREVIOUS PAGE)
YES
NO
• CHECK FOR POOR CONNECTION TO RELAY. IF OK, REPLACE THEFT DETERRENT RELAY.
• ALSO CHECK CKT 6 TO THE STARTER SOLENOID FOR A POSSIBLE SHORT. A SHORT MAY HAVE CAUSED THE RELAY TO FAIL.
• FUSED JUMPER STILL CONNECTED.
• INSTALL A TEST LIGHT FROM STARTER SOLENOID TERM "S" TO GROUND.
• TRANSMISSION IN "PARK" OR "NEUTRAL" (AUTO TRANS) OR WITH CLUTCH PEDAL DEPRESSED (MANUAL TRANS).
• IGNITION SWITCH TO "START." DOES TEST LIGHT ILLUMINATE?
NO
YES
• WITH A TEST LIGHT TO GROUND, BACKPROBE C210 TERM "A".
• TRANSMISSION IN "PARK" OR "NEUTRAL" (AUTO TRANS) OR WITH CLUTCH PEDAL DEPRESSED (MANUAL TRANS).
• IGNITION SWITCH TO "START." DOES TEST LIGHT ILLUMINATE?
• CHECK FOR POOR CONNECTION AT STARTER SOLENOID TERM "S". IF OK, REPLACE STARTER SOLENOID.
• REFER TO SECTION 6D2.
NO
YES
• CHECK FOR POOR CONNECTION AT C210 TERM "A". IF OK, REPAIR OPEN IN CKT 6 BETWEEN C210 AND THEFT DETERRENT RELAY TERM "A2".
• CHECK FOR POOR CONNECTION AT C210 TERM "A". IF OK, REPAIR OPEN IN CKT 6 BETWEEN C210 AND STARTER SOLENOID.


B
(CONTINUED FROM PREVIOUS PAGE)
MANUAL TRANSMISSION
AUTOMATIC
• CHECK FOR OPEN IN CKT 269 FROM THEFT DETERRENT RELAY TERM "C2" TO CLUTCH START SWITCH TERM "A".
• CHECK FOR POOR CONNECTIONS AT OR FOR AN OPEN IN THE CLUTCH START SWITCH.
• CHECK FOR OPEN IN CKT 5 FROM CLUTCH START SWITCH TERM "B" TO S223.
• CHECK FOR OPEN IN CKT 269 FROM THEFT DETERRENT RELAY TERM "C2" TO TRANSMISSION POSITION SWITCH TERM "F".
• CHECK FOR POOR CONNECTIONS AT OR FOR AN OPEN IN THE TRANSMISSION POSITION SWITCH.
• CHECK FOR OPEN IN CKT 5 FROM TRANSMISSION POSITION SWITCH TERM "E" TO S223.

STARTER AND CHARGING

CHART #2
STARTER SOLENOID CLICKS BUT ENGINE CRANKS SLOWLY OR NOT AT ALL

IMPORTANT:

- THE FOLLOWING TESTS ARE DESIGNED FOR ENGINES AND BATTERIES AT NORMAL OPERATING TEMPERATURES AND ASSUME THAT THERE ARE NO ENGINE SYMPTOMS WHICH WOULD CAUSE A NO-START SYMPTOM. TO USE THE TESTS UNDER OTHER CONDITIONS COULD RESULT IN MISDIAGNOSIS.
- BATTERY MUST BE IN A CHARGED STATE TO AVOID MISDIAGNOSIS. FOR BATTERY CHARGING OR TESTING, REFER TO SECTION 6D1.

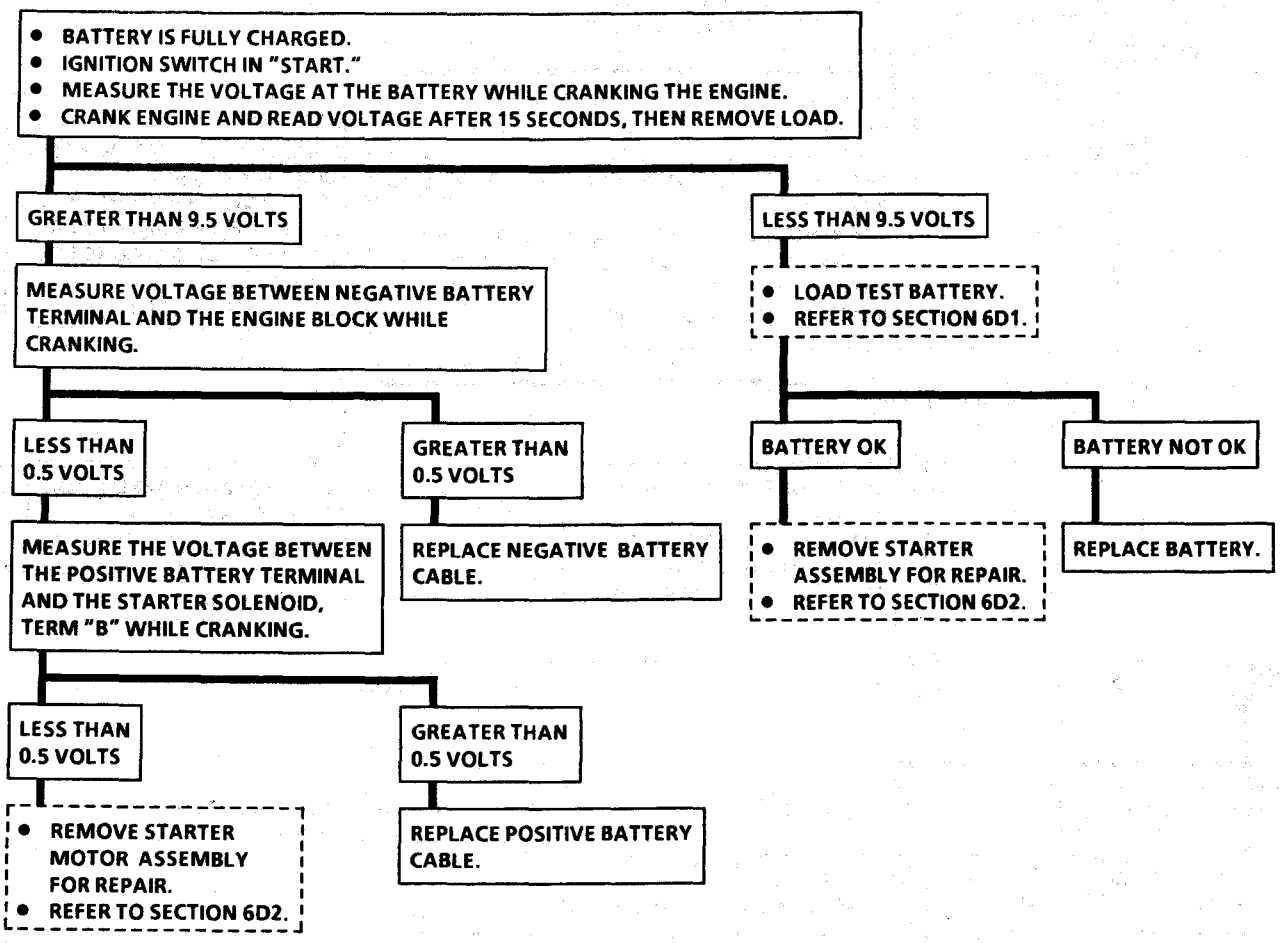
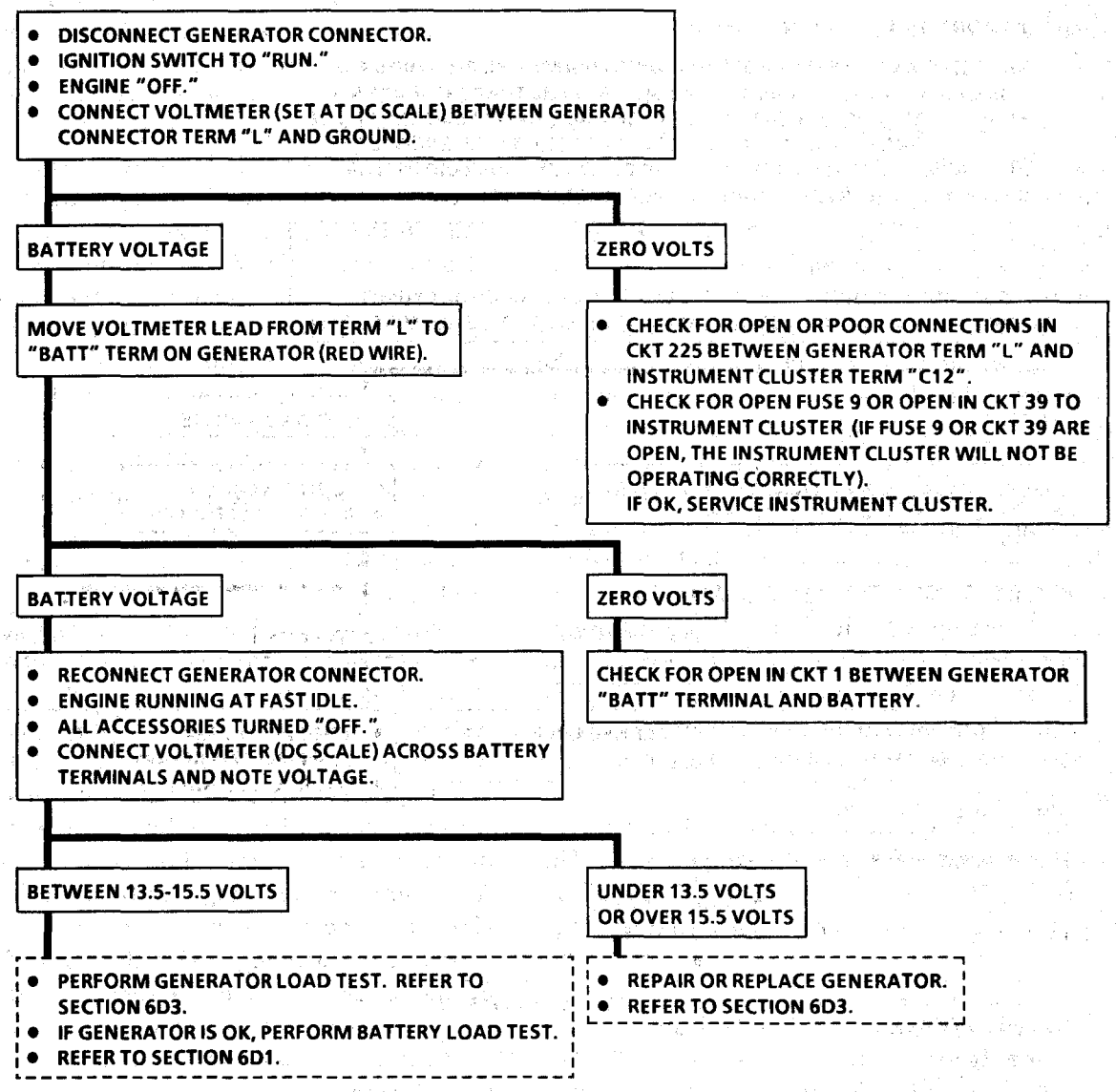


CHART #3
BATTERY UNDERCHARGED OR OVERCHARGED



STARTER AND CHARGING

CIRCUIT OPERATION

BATTERY

Refer to SECTION 6D1.

CHARGING (ALSO REFERENCE SECTION 6D3)

The Generator provides voltage to operate the vehicle's electrical system and to charge its Battery. A magnetic field is created when current flows through the Rotor. This field rotates as the Rotor is driven by the Engine, creating an AC voltage in the Stator windings. The AC voltage is converted to DC by the Rectifier Bridge and is supplied to the electrical system at the Battery terminal.

The Generator's Regulator uses digital techniques to supply the Rotor current and thereby control the output voltage. The Rotor current is proportional to the width of the electrical pulses supplied by the Regulator. When the Ignition Switch is placed in "RUN," voltage is supplied to terminal "L", turning on the Regulator. Narrow width pulses are supplied to the Rotor, creating a weak magnetic field. When the Engine is started, the Regulator senses Generator rotation by detecting AC voltage at the Stator through an internal wire. Once the Engine is running, the Regulator varies the field current by controlling the pulse width. This regulates the Generator output voltage for proper Battery Charging and Electrical System Operation.

The Digital Regulator controls the Charge Indicator light with a Solid State lamp driver. The lamp driver turns "ON" the light whenever an undervoltage, overvoltage or stopped Generator is detected.

STARTER (ALSO REFERENCE SECTION 6D2)

When the Ignition Switch is moved to the "START" position, voltage is supplied to the normally open contacts of the Theft Deterrent Relay. Voltage is also supplied through, either the Transmission Position Switch (Automatic Transmission) when in "PARK" or "NEUTRAL," or Clutch Start Switch (Manual Transmission) when the clutch pedal is depressed, to the Theft Deterrent Relay Coil. The Theft Deterrent Module energizes the Theft Deterrent Relay by grounding one side of the Relay Coil only when the Theft Deterrent System has not been activated (See "Theft Deterrent System," page 8A-133-0).

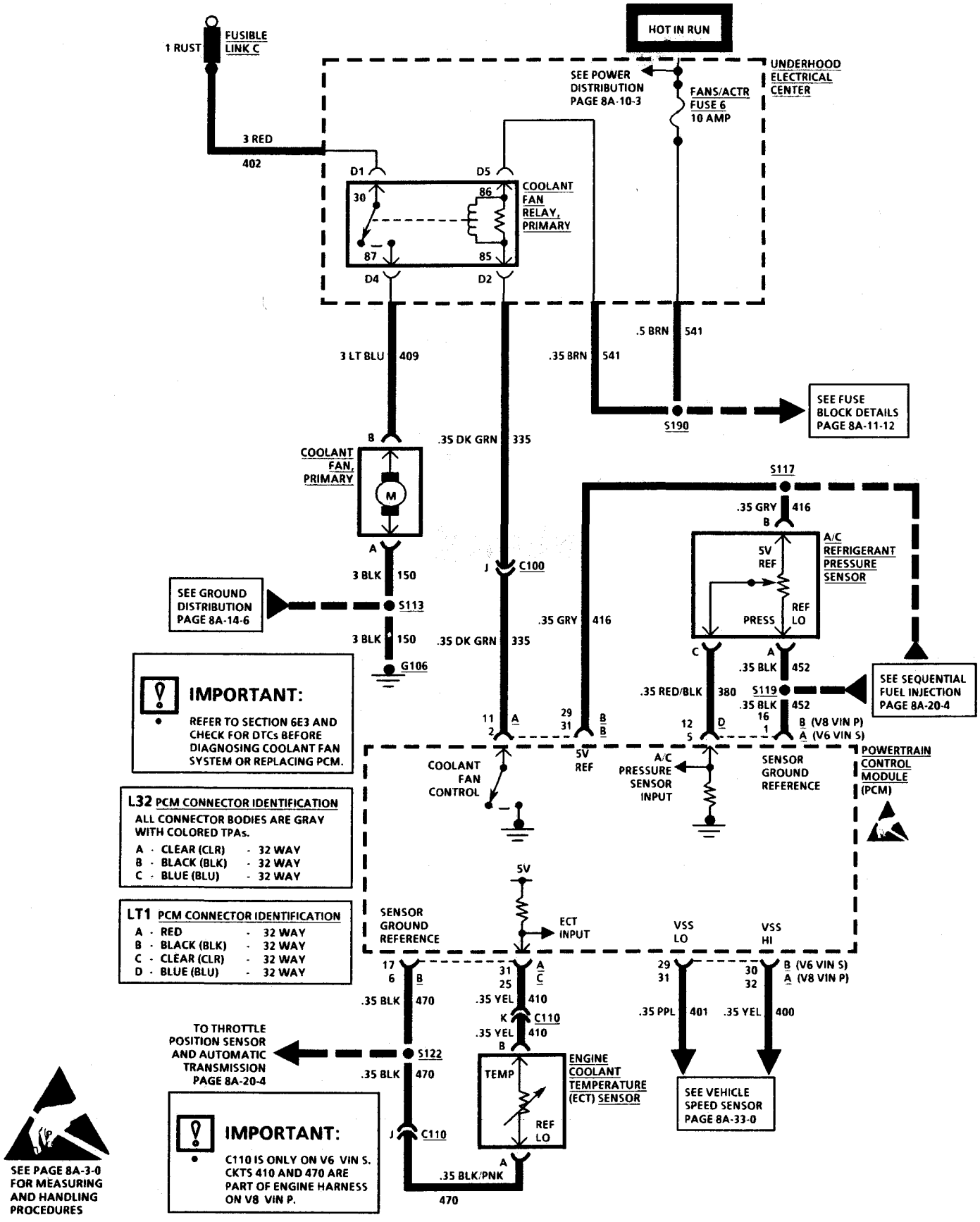
When the Theft Deterrent Relay is energized, the normally open contacts close, completing the circuit to the Starter Solenoid. When the Starter Solenoid circuit is completed, both the Hold-In and Pull-In Windings are energized. The circuit through the Pull-In Winding is completed to ground through the Starter Motor. The windings work together magnetically to pull in and hold in the Plunger. The Plunger moves the Shift Lever. This action causes the Drive Assembly to rotate as it engages the Flywheel ring gear on the Engine. At the same time, the Plunger also closes the solenoid switch contacts in the Starter Solenoid. Full battery voltage is then applied directly to the Starter Motor and it cranks the Engine.

As soon as the Solenoid Switch contacts close, voltage is no longer applied to the Pull-In Winding since battery voltage is applied to both ends of the windings. The Hold-In Winding remains energized and its magnetic field is strong enough to hold the Plunger, the Shift Lever and the Drive Assembly Solenoid Switch contacts in place to continue cranking the Engine.

When the Ignition Switch is released from the "START" position, battery voltage is removed from the PPL wire and the junction of the two windings. Voltage is applied through the motor contacts to both windings to ground at the end of the Hold-In Windings. However, the direction of current flow through the Pull-In Winding is now opposite the direction of the current flow when the winding was first energized. The magnetic fields of the Pull-In and Hold-In Windings now oppose one another. This action of the windings, with the help of the Return Spring, causes the Drive Assembly to disengage and the Solenoid Switch contacts to open simultaneously. As soon as the contacts open, the starter circuit is turned "OFF."

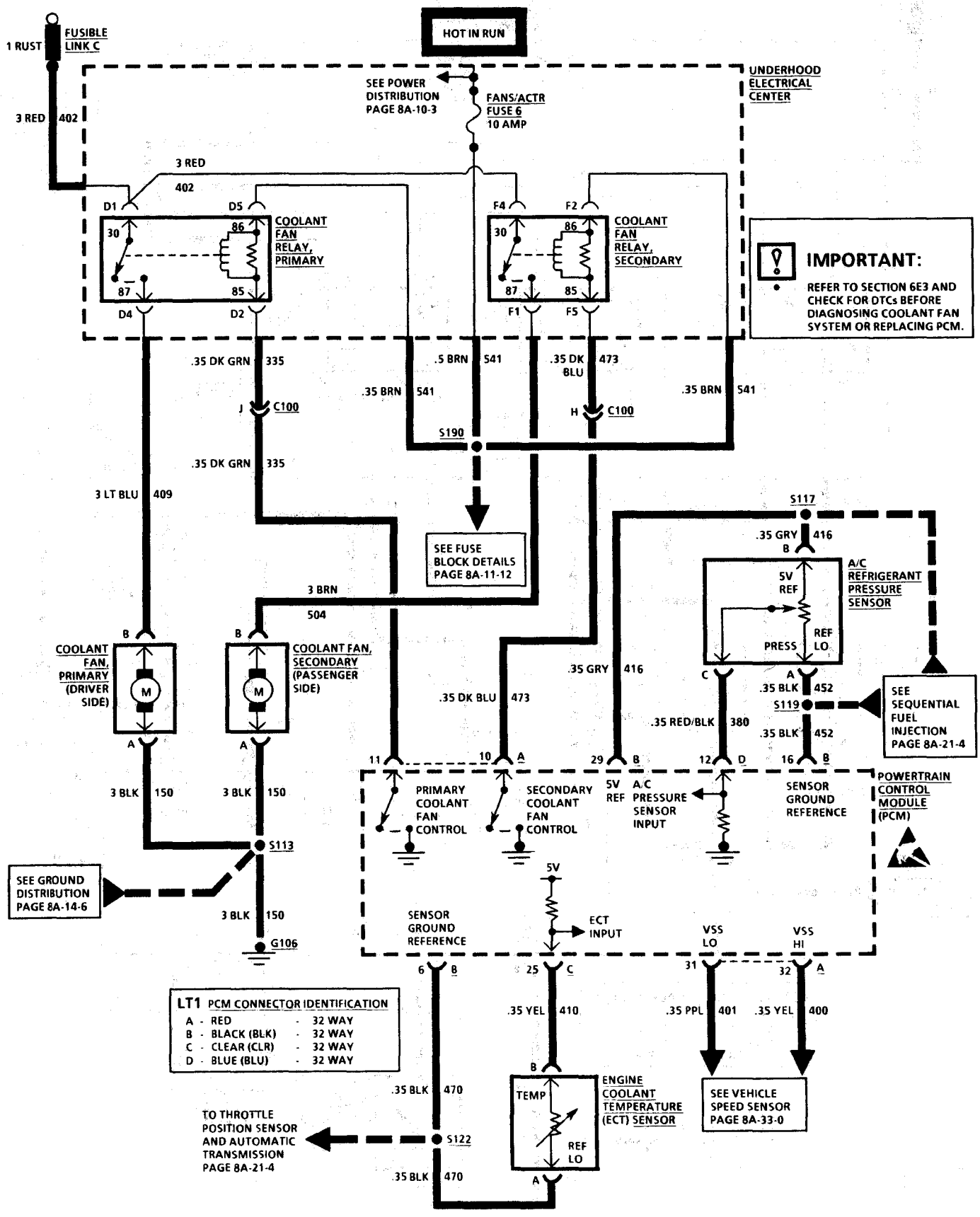
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COOLANT FANS
V6 VIN S OR V8 VIN P (WITH C41)



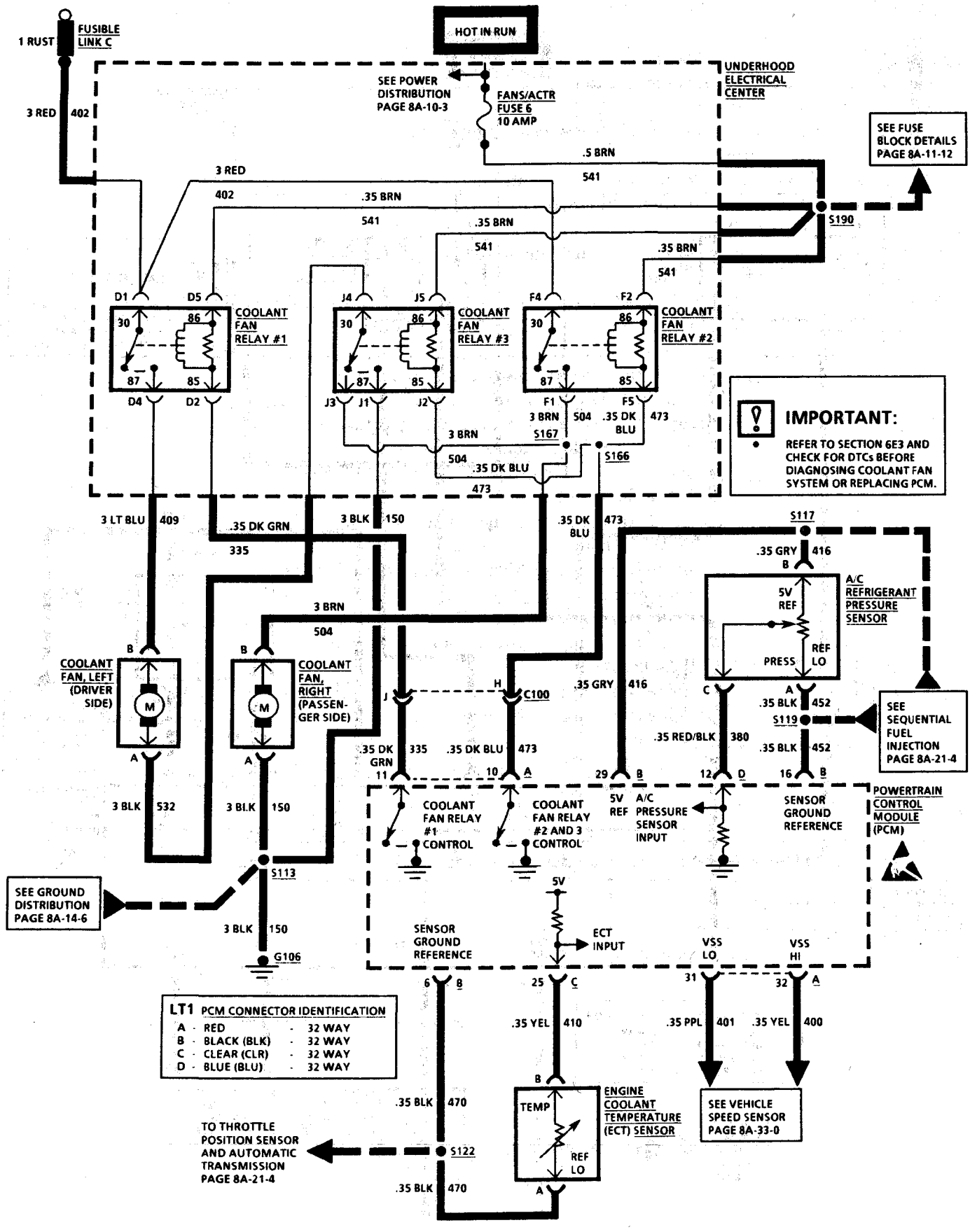
COOLANT FANS

V8 VIN P (WITH C60) EARLY PRODUCTION VEHICLES



COOLANT FANS

V8 VIN P (WITH C60) ALL OTHER VEHICLES



COOLANT FANS

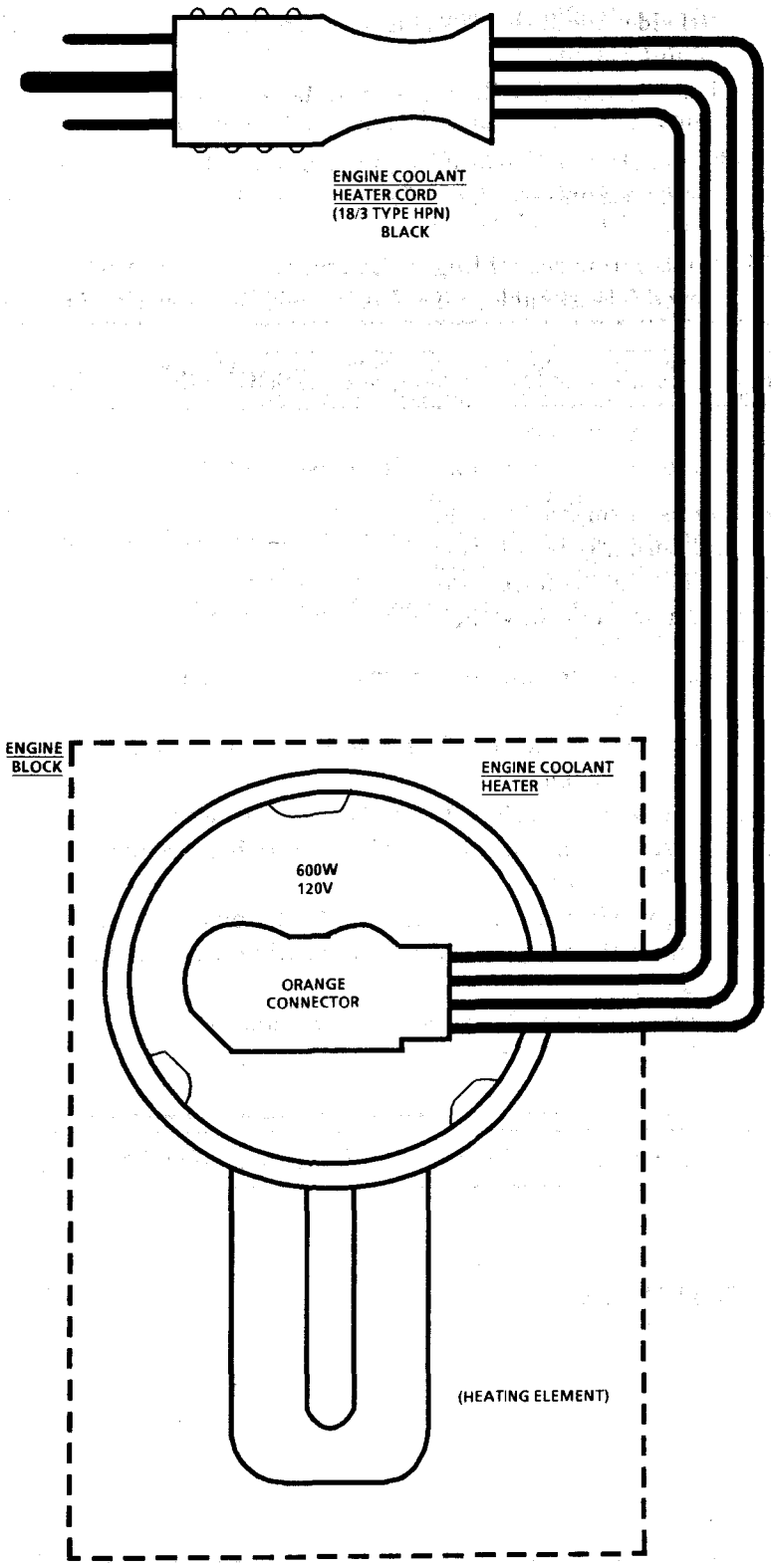
COMPONENT	LOCATION	201-PG	FIG.	CONN
A/C Refrigerant Pressure Sensor	Above RH Shock Tower	19	35	
Coolant Fans	Behind radiator			
Engine Coolant Temperature (ECT) Sensor (V6 VIN S)	Mounted in front top of Engine, under plenum			
Engine Coolant Temperature (ECT) Sensor (V8 VIN P)	Front of Engine, mounted in water pump	24	45	
Fusible Links	Above RH Shock Tower	10	19	
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C110 (10 cavities) (L32)	Engine to Injector Harn, top center of Intake Manifold	12	22	202-1
G106	Near top LH side of radiator, in top of T-Bar	19	35	
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S117 (L32)	Engine Harn, approx 5 cm from main branch and PCM breakout			
S117 (LT1)	Engine Harn, approx 5 cm from clip near PCM and main branch			
S119 (L32)	Engine Harn, at RH Oxygen Sensor breakout	12	23	
S119 (LT1)	Engine Harn, approx 18 cm from main branch and PCM breakout			
S122 (L32)	Engine Harn, approx 4 cm from MAP Sensor breakout	12	23	
S122 (LT1)	Engine Harn, approx 25 cm from main branch and PCM breakout			
S190	Forward Lamp Harn, approx 8 cm from Electrical Center breakout	36	68	

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

SYSTEM DIAGNOSIS

- For Diagnosis, refer to SECTION 6E3.

ENGINE COOLANT HEATER: (K05)



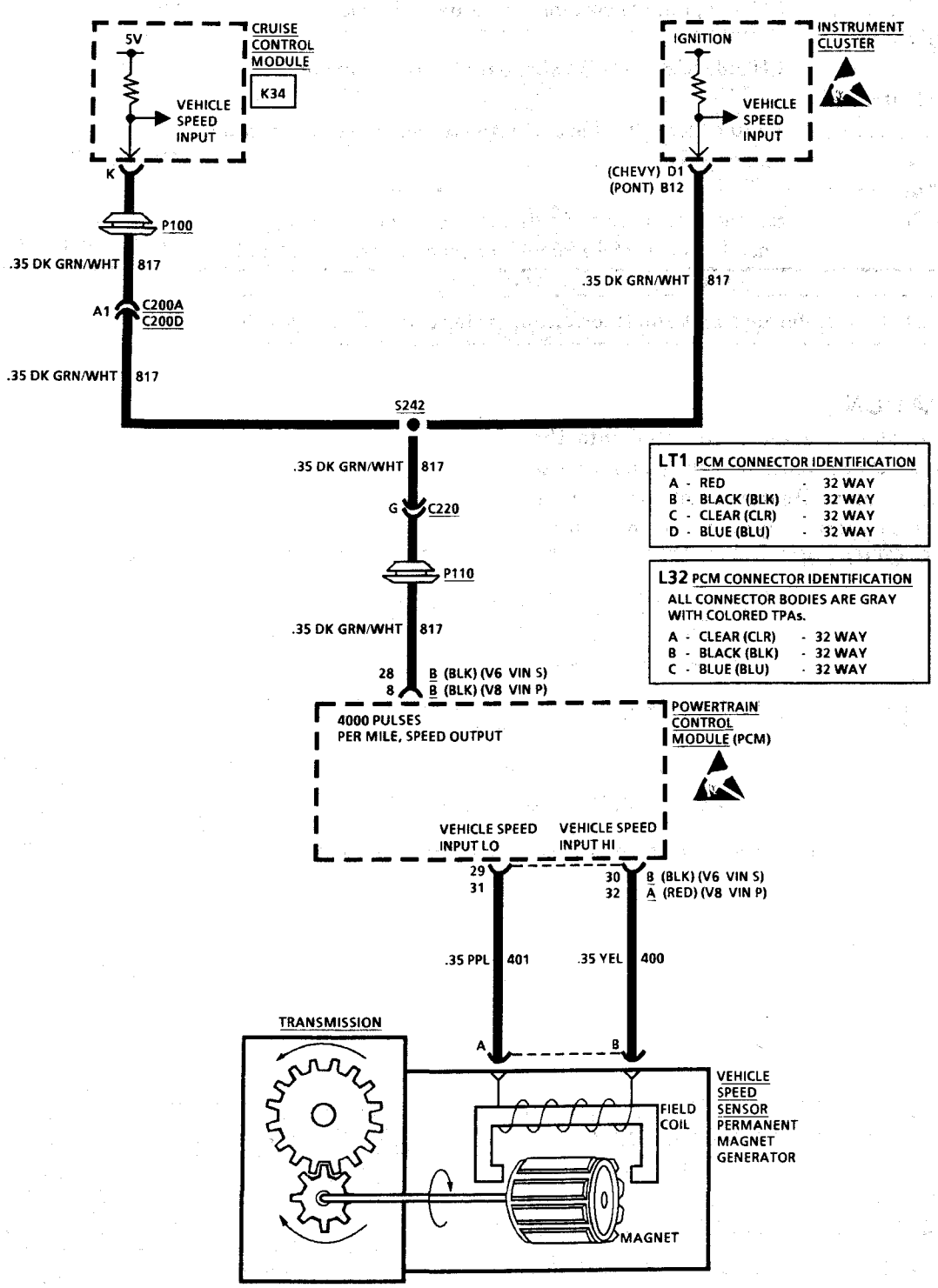
COMPONENT	LOCATION	201-PG	FIG.	CONN
Engine Coolant Heater (V6 VIN S)	RH side, middle bottom of Engine, in block	28	54	
Engine Coolant Heater (V8 VIN P)	LH side of Engine Block, near Oil Level Sensor			
Engine Coolant Heater Cord (V6 VIN S)	Routed from RH side of Engine to positive Battery cable, strapped on	19	35	
Engine Coolant Heater Cord (V8 VIN P)	Routed from rear of Engine Compartment, strapped to hood release cable, near Underhood Electrical Center	19	36	

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

CIRCUIT OPERATION

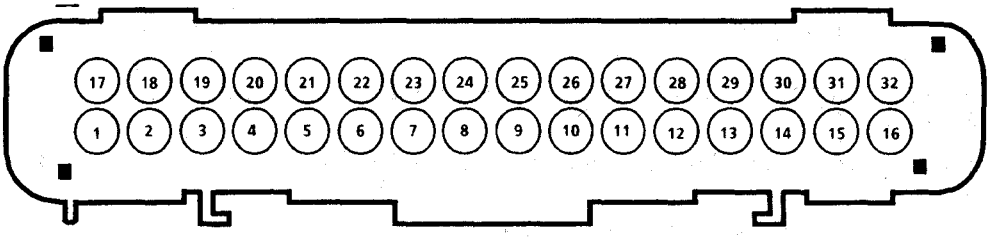
The Engine Coolant Heater is inserted into the Engine Block where there would normally be a Freeze Plug. The Engine Coolant Heater is not connected to the vehicle's 12 volt electrical system. For on-vehicle Service, refer to SECTION 9E.

VEHICLE SPEED SENSOR



SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

A

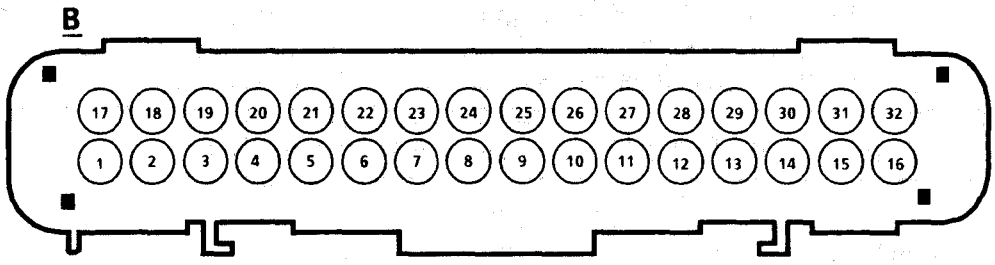


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT
POWERTRAIN CONTROL MODULE (PCM) (V8 VIN P)

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129022 (CLR)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

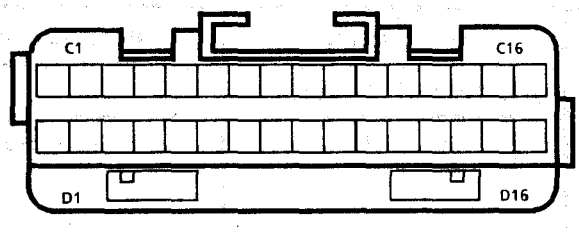
B



12129025

32-WAY F MICRO-PACK 100 SERIES
NAT
POWERTRAIN CONTROL MODULE (PCM) (V6 VIN S)

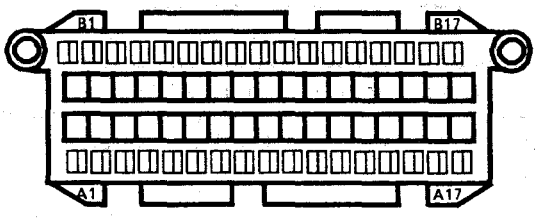
CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025



12045575

32-WAY F MICRO-PACK 100 SERIES
BLK

INSTRUMENT CLUSTER (CHEVY)



12065803

34-WAY F MICRO-PACK 100 SERIES
BLK

INSTRUMENT CLUSTER (PONT)

VEHICLE SPEED SENSOR

COMPONENT	LOCATION	201-PG	FIG.	CONN
Cruise Control Module	Front LH side of vehicle, mounted to frame rail, forward of wheelhouse	19	36	202-11
Instrument Cluster	LH side of I/P			202-23
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Vehicle Speed Sensor (M30 Automatic)	Rear LH side of Transmission			
Vehicle Speed Sensor (M49 or MM6 Manual)	Rear LH side of Transmission	16, 26	30, 51	
C200A (17 cavities)	Part of Forward Lamp 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
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S242	I/P Harn, approx 26 cm from Instrument Cluster Conn			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- 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.

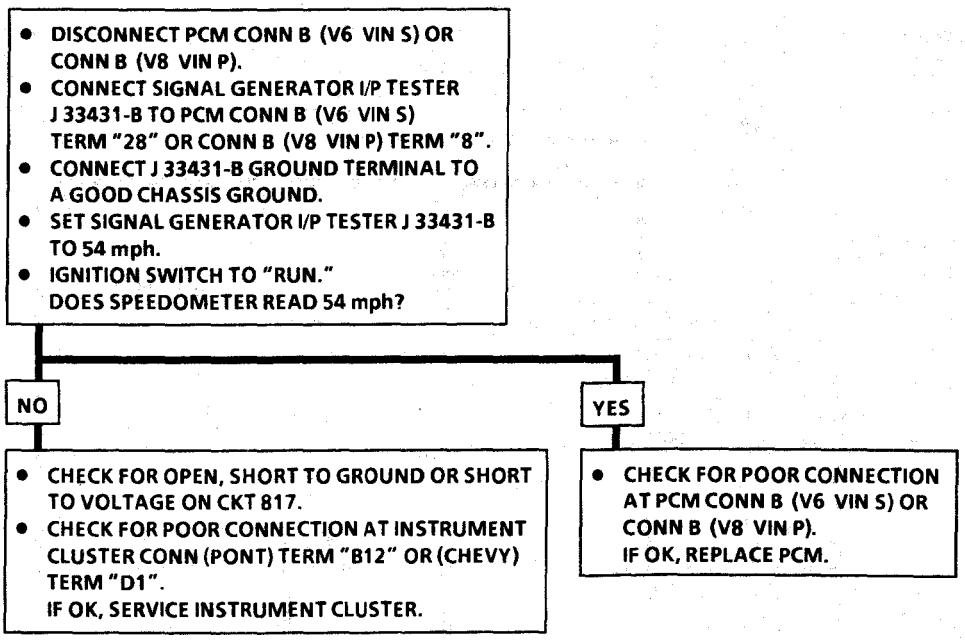
SYSTEM DIAGNOSIS

- Refer to the Symptom Table for the appropriate diagnostic procedures.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Speedometer inoperative. DTC 24 set.	Refer to SECTION 6E3.	
Speedometer and Cruise Control inoperative; DTC 24 not set.	Chart #1	8A-33-3
Speedometer inoperative. DTC 24 not set. Cruise Control operates.	Check for open in CKT 817 between S242 and Instrument Cluster Connector. Also check for poor connection at terminal "B12". If OK, service Instrument Cluster.	

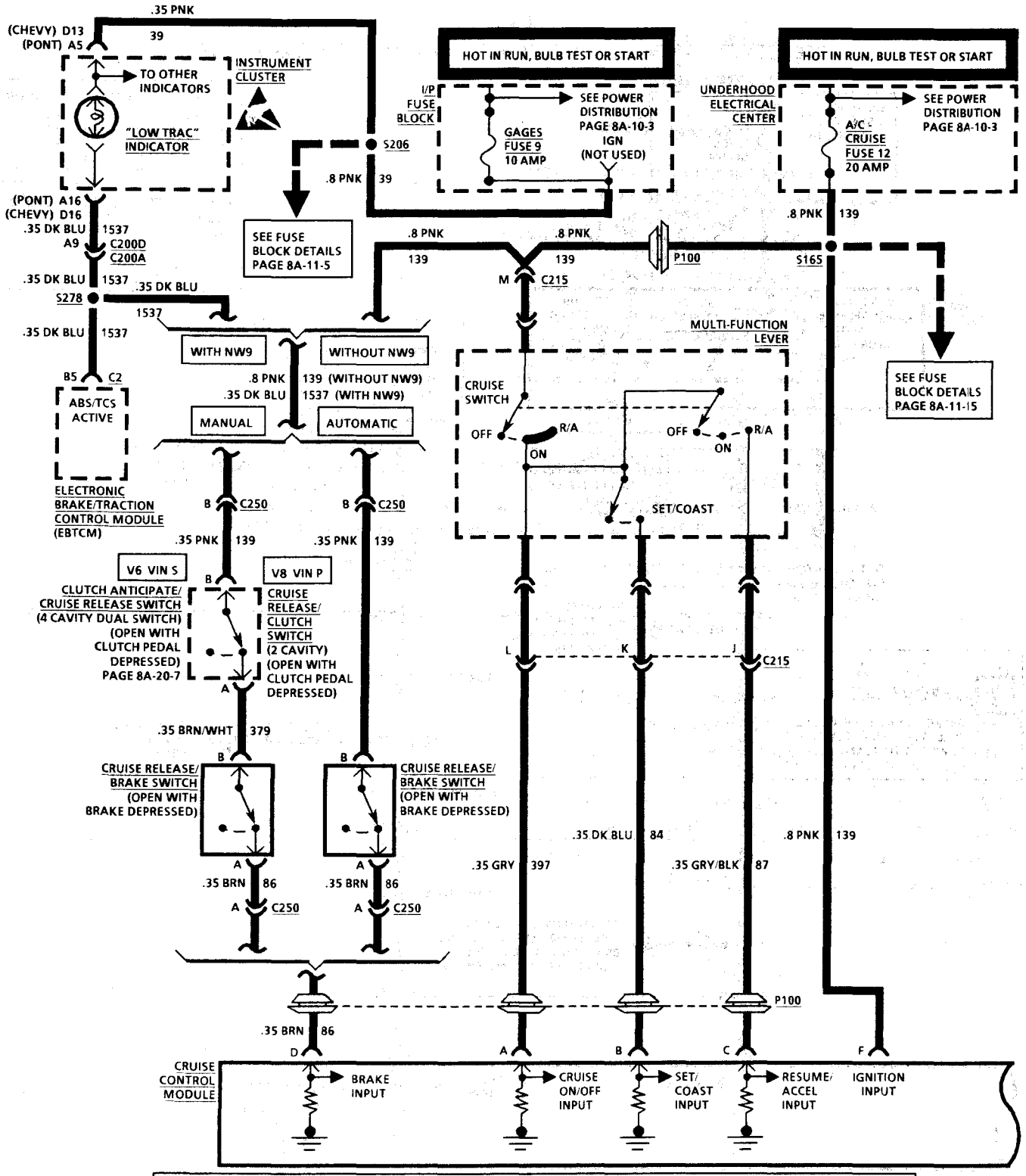
CHART #1
SPEEDOMETER AND CRUISE CONTROL INOPERATIVE; CODE 24 NOT SET



CIRCUIT OPERATION

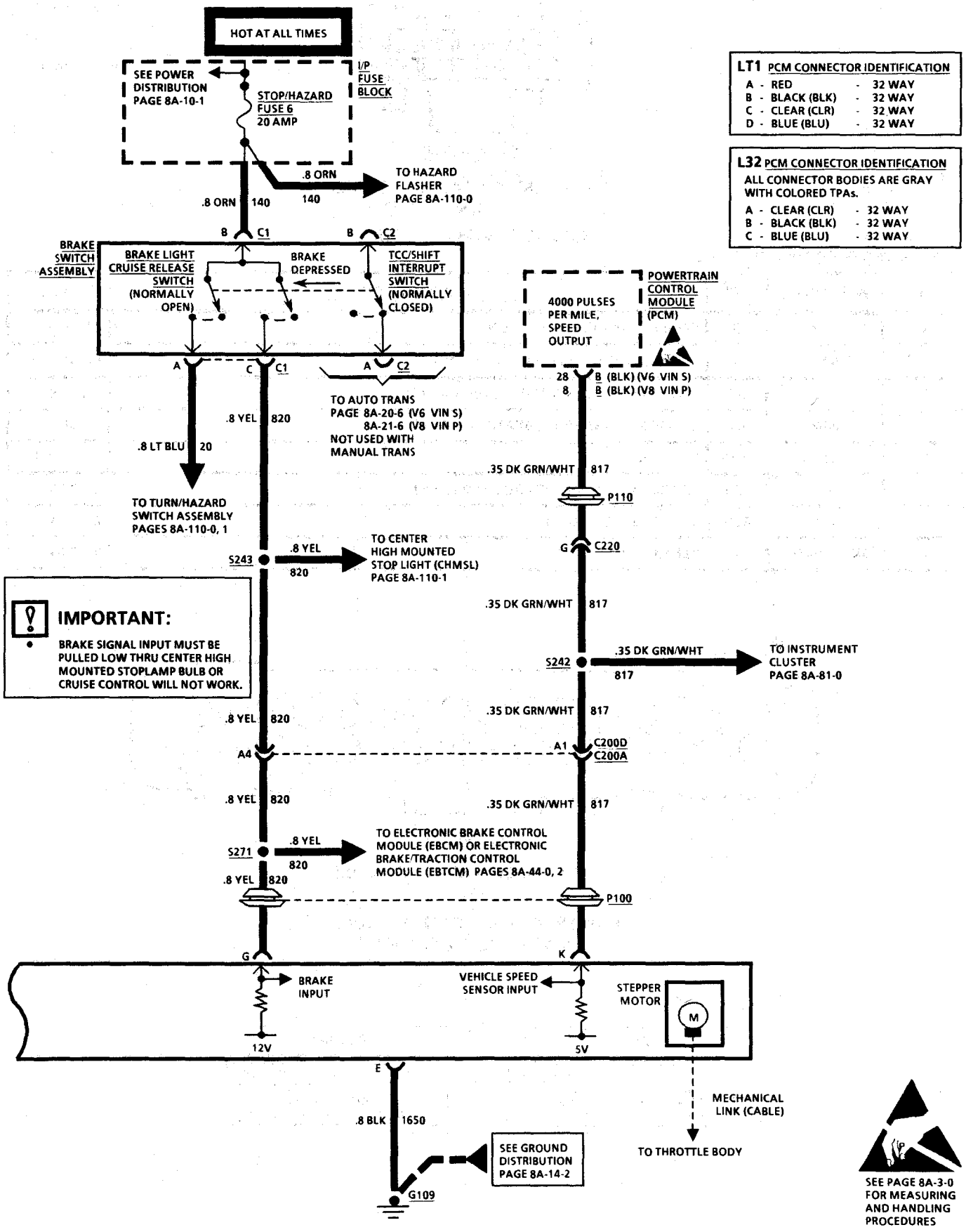
The Vehicle Speed Sensor is a gear-driven Permanent Magnet Generator housed in the vehicle's Transaxle. This sensor generates a sine wave output with a frequency proportional to vehicle speed. The PCM converts this signal to an output that is switched to ground at a frequency of 4000 pulses per mile at the DK GRN/WHT wire (CKT 817), which feeds the Instrument Cluster and Cruise Control Module.

CRUISE CONTROL (K34)

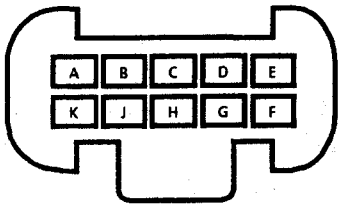


IMPORTANT:

- THE "SET TO GET CRUISE" FEATURE REQUIRES THE OPERATOR TO SET AN INITIAL SPEED BY USING THE "SET/COAST" BUTTON BEFORE THE "RESUME/ACCEL" SLIDER SWITCH WOULD BE ACTIVE.
- THE "BRAKE BEFORE CRUISE" FEATURE REQUIRES THE CRUISE MODULE TO SEE BRAKE INPUT AT TERMINAL "D" TO CHANGE STATES ONCE EACH IGNITION CYCLE BEFORE ALLOWING CRUISE TO OPERATE. (LATER PRODUCTION VEHICLES REQUIRE BRAKE INPUT AT EITHER TERMINAL "D" or "G").


HOT AT ALL TIMES
SEE POWER DISTRIBUTION PAGE 8A-10-1
I/P FUSE BLOCK
STOP/HAZARD FUSE 6 20 AMP
.8 ORN
TO HAZARD FLASHER PAGE 8A-110-0
.8 ORN 140
140
B C1
B C2
BRAKE SWITCH ASSEMBLY
BRAKE LIGHT CRUISE RELEASE SWITCH (NORMALLY OPEN)
BRAKE DEPRESSED
TCC/SHIFT INTERRUPT SWITCH (NORMALLY CLOSED)
A C C1
A C2
.8 YEL 820
.8 LT BLU 20
TO TURN/HAZARD SWITCH ASSEMBLY PAGES 8A-110-0, 1
TO AUTO TRANS PAGE 8A-20-6 (V6 VIN S) 8A-21-6 (V8 VIN P) NOT USED WITH MANUAL TRANS
S243
.8 YEL 820
TO CENTER HIGH MOUNTED STOP LIGHT (CHMSL) PAGE 8A-110-1
IMPORTANT:
BRAKE SIGNAL INPUT MUST BE PULLED LOW THRU CENTER HIGH MOUNTED STOPLAMP BULB OR CRUISE CONTROL WILL NOT WORK.
.8 YEL 820
A4
.8 YEL 820
S271
.8 YEL 820
TO ELECTRONIC BRAKE CONTROL MODULE (EBCM) OR ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM) PAGES 8A-44-0, 2
.8 YEL 820
G
BRAKE INPUT
12V
4000 PULSES PER MILE, SPEED OUTPUT
POWERTRAIN CONTROL MODULE (PCM)
28 B (BLK) (V6 VIN S)
8 B (BLK) (V8 VIN P)
.35 DK GRN/WHT 817
P110
G C220
.35 DK GRN/WHT 817
S242
.35 DK GRN/WHT 817
TO INSTRUMENT CLUSTER PAGE 8A-81-0
.35 DK GRN/WHT 817
A1 C200D C200A
.35 DK GRN/WHT 817
P100
K
VEHICLE SPEED SENSOR INPUT
5V
STEPPER MOTOR
M
MECHANICAL LINK (CABLE)
TO THROTTLE BODY
E
.8 BLK 1650
G109
SEE GROUND DISTRIBUTION PAGE 8A-14-2
LT1 PCM CONNECTOR IDENTIFICATION
A - RED - 32 WAY
B - BLACK (BLK) - 32 WAY
C - CLEAR (CLR) - 32 WAY
D - BLUE (BLU) - 32 WAY
L32 PCM CONNECTOR IDENTIFICATION
ALL CONNECTOR BODIES ARE GRAY WITH COLORED TPAs.
A - CLEAR (CLR) - 32 WAY
B - BLACK (BLK) - 32 WAY
C - BLUE (BLU) - 32 WAY
SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

CRUISE CONTROL (K34)



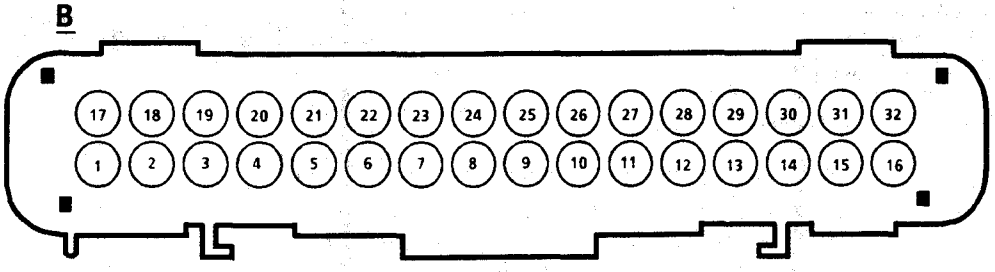
12065425

10-WAY F METRI-PACK 150 SERIES
BLK

CRUISE CONTROL MODULE

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	GRY	397	CRUISE CONTROL SWITCH - ON	8A-34-0
B	DK BLU	84	CRUISE CONTROL SWITCH - SET/COAST	8A-34-0
C	GRY/BLK	87	CRUISE CONTROL SWITCH - RESUME/ACCEL	8A-34-0
D	BRN	86	CRUISE RELEASE/BRAKE SWITCH OUTPUT	8A-34-0
E	BLK	1650	GROUND	8A-14-0, 2
F	PNK	139	POWER FEED FROM A/C-CRUISE FUSE #12	8A-34-0
G	YEL	820	BRAKE DEPRESSED INPUT	8A-34-1
K	DK GRN/WHT	817	VEHICLE SPEED SIGNAL	8A-34-1



12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

POWERTRAIN CONTROL MODULE
(V6 VIN S) AND (V8 VIN P)

V6 VIN S	
CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

V8 VIN P	
CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129028
CONNECTOR	- 12129025



FORWARD LAMP HARNESS TO STEERING COLUMN HARNESS

06294509

11-WAY F PACK-CON I
BLK

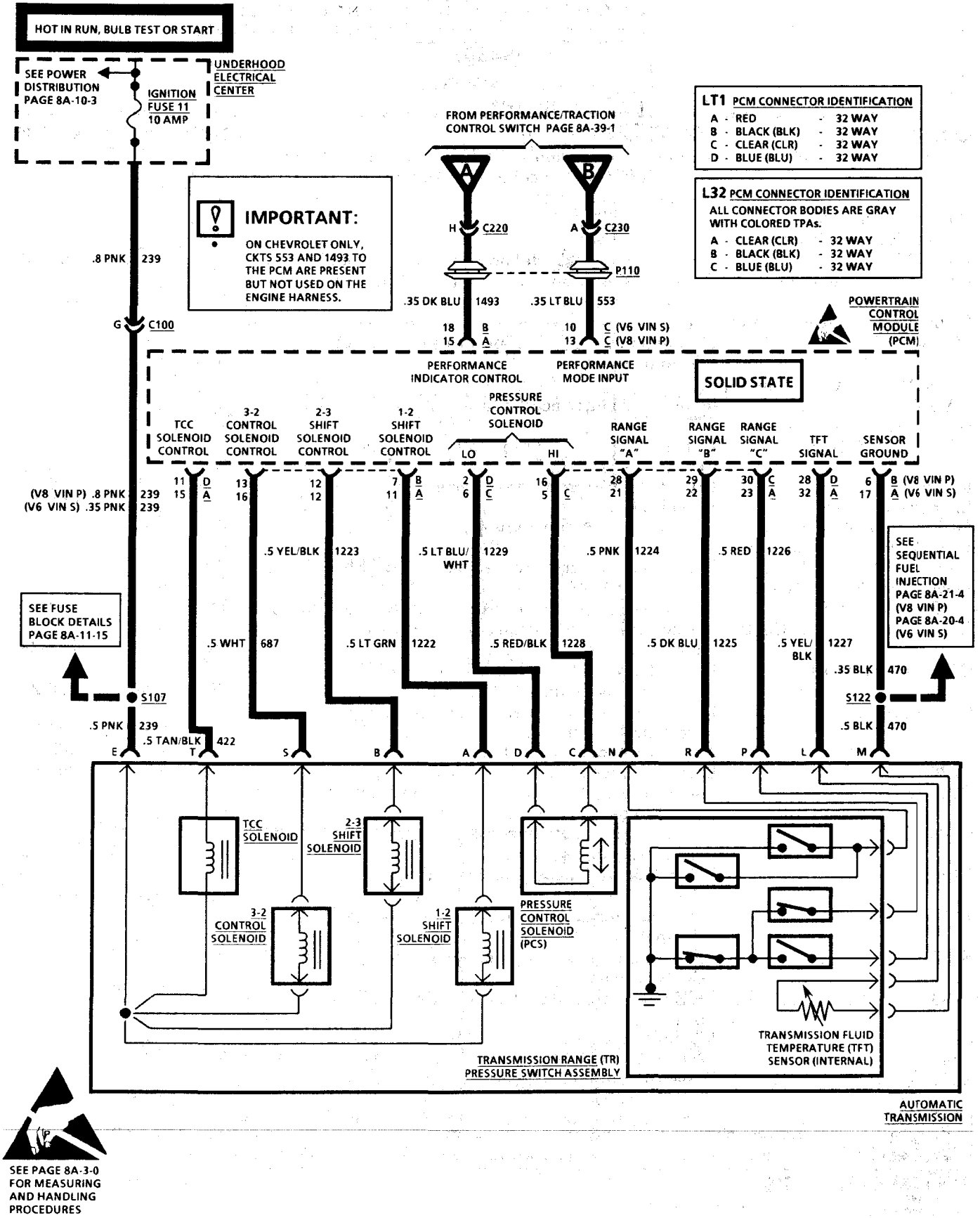
COMPONENT	LOCATION	201-PG	FIG.	CONN
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Clutch Anticipate/ Cruise Release Switch (all V6 Manual)	Mounted in clutch pedal bracket (4 cavity conn)	0	1	202-20
Cruise Control Module	Front LH side of vehicle, mounted to frame rail, forward of wheelhouse	19	36	202-11
Cruise Release/Brake Switch (all with K34)	Mounted in upper hole of brake pedal bracket (2 cavity conn)	0	1	
Cruise Release/Clutch Switch (V8 Manual with K34)	Mounted in clutch pedal bracket (2 cavity conn)	0	1	
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Instrument Cluster	LH side of I/P			202-23
Multi-Function Lever	Left Arm on Steering Column	27	53	
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C200A (17 cavities)	Part of Forward Lamp 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
C215 (11 cavities)	Near base of Steering Column	35	64	202-4
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C250 (2 cavities)	Forward Lamp Harn to Clutch Jumper Harn or Switch, near brake/clutch pedal bracket	0, 1	1, 2	
G109	Bolted to left front frame rail (2 rings,1 wire and braided strap)	11	21	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S165	Forward Lamp Harn, approx 7 cm from Electrical Center breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S242	I/P Harn, approx 26 cm from Instrument Cluster Conn			
S243	I/P Harn, approx 14 cm from Fuel Pump Relay breakout	7	13	
S271	Forward Lamp Harn, approx 19 cm from breakout inboard of P100	8	14	
S278	Forward Lamp Harn, approx 9 cm from EBCM breakout			

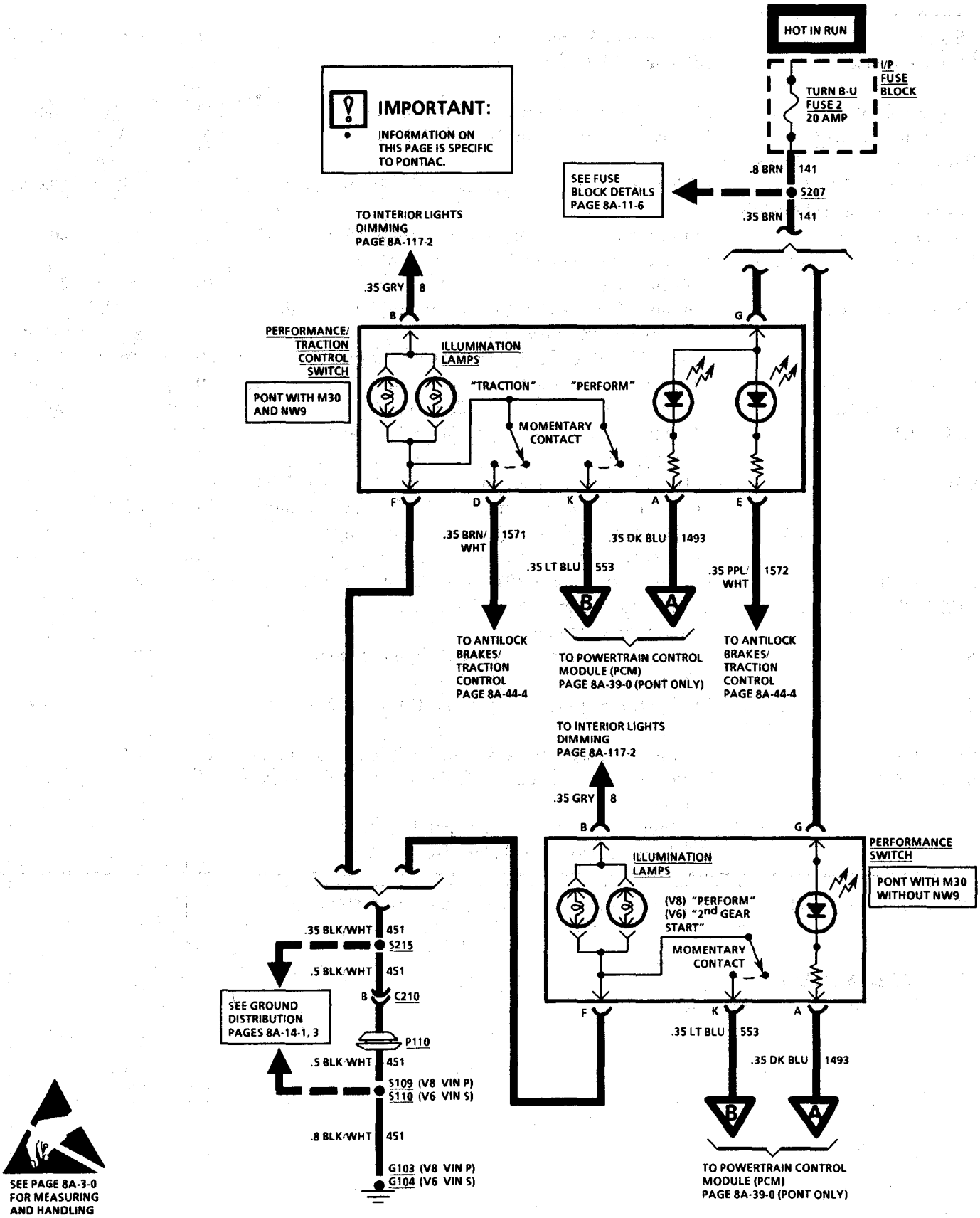
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

- For Diagnosis, refer to SECTION 9B.

ELECTRONIC TRANSMISSION CONTROLS




HOT IN RUN
I/P FUSE BLOCK
TURN B-U FUSE 2 20 AMP
.8 BRN 141
S207
.35 BRN 141
SEE FUSE BLOCK DETAILS PAGE 8A-11-6
IMPORTANT:
INFORMATION ON THIS PAGE IS SPECIFIC TO PONTIAC.
TO INTERIOR LIGHTS DIMMING PAGE 8A-117-2
.35 GRY 8
B
G
PERFORMANCE/ TRACTION CONTROL SWITCH
PONT WITH M30 AND NW9
ILLUMINATION LAMPS
"TRACTION"
"PERFORM"
MOMENTARY CONTACT
F
D
K
A
E
.35 BRN/ WHT 1571
.35 LT BLU 553
.35 DK BLU 1493
.35 PPL/ WHT 1572
TO ANTILOCK BRAKES/ TRACTION CONTROL PAGE 8A-44-4
TO POWERTRAIN CONTROL MODULE (PCM) PAGE 8A-39-0 (PONT ONLY)
TO ANTILOCK BRAKES/ TRACTION CONTROL PAGE 8A-44-4
TO INTERIOR LIGHTS DIMMING PAGE 8A-117-2
.35 GRY 8
B
G
PERFORMANCE SWITCH
PONT WITH M30 WITHOUT NW9
ILLUMINATION LAMPS
(V8) "PERFORM"
(V6) "2nd GEAR START"
MOMENTARY CONTACT
F
K
A
.35 LT BLU 553
.35 DK BLU 1493
TO POWERTRAIN CONTROL MODULE (PCM) PAGE 8A-39-0 (PONT ONLY)
.35 BLK/WHT 451
S215
.5 BLK/WHT 451
B
C210
SEE GROUND DISTRIBUTION PAGES 8A-14-1, 3
P110
.5 BLK/WHT 451
S109 (V8 VIN P)
S110 (V6 VIN S)
.8 BLK/WHT 451
G103 (V8 VIN P)
G104 (V6 VIN S)
SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

ELECTRONIC TRANSMISSION CONTROLS

COMPONENT	LOCATION	201-PG	FIG.	CONN
Automatic Transmission Conn	RH center of Transmission	41	73	202-10
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Performance/Traction Control Switch	Mounted in center console behind shifter	42	79	202-24
Performance Switch	Mounted in center console behind shifter			202-24
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S107 (L32)	Engine Harn, approx 30 cm from C110 breakout	12	22	
S107 (LT1)	Engine Harn, approx 7 cm from main breakout at right rear of Engine			
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S122 (L32)	Engine Harn, approx 4 cm from MAP Sensor breakout	12	23	
S122 (LT1)	Engine Harn, approx 25 cm from main branch and PCM breakout			
S207	I/P Harn, approx 4 cm before DLC breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			

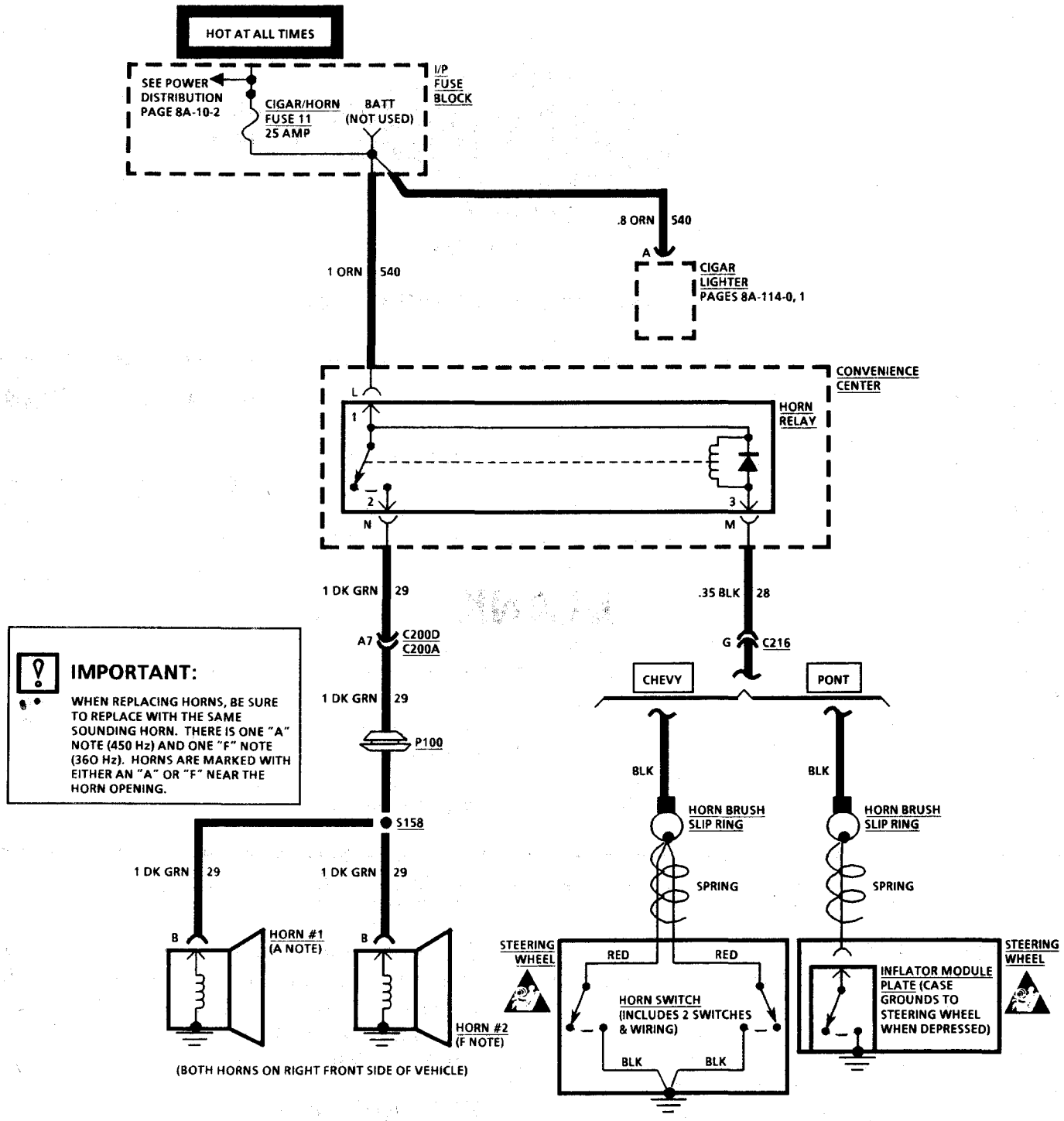
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

- Refer to SECTION 6E3 for diagnosis.

BLANK

HORNS



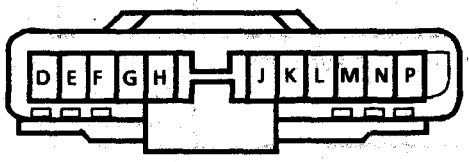
IMPORTANT:

WHEN REPLACING HORNS, BE SURE TO REPLACE WITH THE SAME SOUNDING HORN. THERE IS ONE "A" NOTE (450 Hz) AND ONE "F" NOTE (360 Hz). HORNS ARE MARKED WITH EITHER AN "A" OR "F" NEAR THE HORN OPENING.

SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

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.

C216



12004147

11-WAY F PACK-CON I
BLK

I/P HARNESS TO STEERING COLUMN HARNESS

COMPONENT	LOCATION	201-PG	FIG.	CONN
Cigar Lighter	Mounted on front of console	43	81	
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Horn #1 (A note)	RH side, front of vehicle directly below Headlamps	19	35	
Horn #2 (F note)	RH side, front of vehicle directly below Headlamps	19	35	
Horn Switch	In Steering Wheel	2	3	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
C200A (17 cavities)	Part of Forward Lamp 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
C216 (11 cavities)	Attached to base of Steering Column	34	63	202-5
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S158	Forward Lamp Harn, approx 7 cm from breakout on horn branch			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- Check Fuse 7. An accessory plugged into the Cigar Lighter may have caused an overload.
- 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

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

HORNS

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Horns inoperative from switch(es).	Chart #1	8A-40-2
Horns inoperative from one switch only (Chevrolet).	Check for open in BLK or RED wire leading to inoperative switch. If OK, replace Horn Switch as necessary.	
One Horn inoperative.	Remove connector from inoperative Horn. Attach one end of a fused jumper to B +. Momentarily touch the other end to the Horn. If the Horn sounds, repair open in CKT 29. If the Horn does not sound, check the Horn for a clean and tight ground at its case. If OK, replace Horn.	
Horns "ON" at all times.	Chart #2	8A-40-3

CHART #1
HORNS INOPERATIVE FROM SWITCH(ES)

- CHECK FUSE 7. IS FUSE 7 OPEN?

NO

- REMOVE HORN RELAY.
- CONNECT A TEST LIGHT FROM CONVENIENCE CENTER TERM "L" TO GROUND. DID TEST LIGHT COME "ON"?

YES

- CONNECT A TEST LIGHT FROM THE CONVENIENCE CENTER TERM "L" TO TERM "M".
- PRESS HORN SWITCH. DID TEST LIGHT COME "ON"?

YES

- RECONNECT HORN RELAY.
- BACKPROBE CONVENIENCE CENTER TERM "N" WITH A TEST LIGHT TO GROUND.
- PRESS HORN SWITCH. DID TEST LIGHT COME "ON"?

A (CONTINUED ON NEXT PAGE)

NO

- DISCONNECT C216.
- CONNECT A TEST LIGHT FROM CONVENIENCE CENTER TERM "L" TO C216 TERM "G" (STEERING COLUMN SIDE).
- PRESS HORN SWITCH. DID TEST LIGHT COME "ON"?

YES

REPAIR OPEN IN CKT 28 BETWEEN C216 AND HORN RELAY.

NO

- CHECK FOR OPEN IN BLK WIRES ATTACHED TO HORN BRUSH SLIP RING AND FOR CONTACT AT THE SLIP RING, OR CHECK FOR CLEAN AND TIGHT GROUND AT CASE OF HORN SWITCHES (CHEVY) OR CONNECTION AT INFLATOR MODULE (PONT). IF OK, REPLACE HORN SWITCH(ES) AS NECESSARY.

YES

- CHECK FOR A SHORT TO GROUND THROUGH CKT 540 OR CKT 29, REPAIR AS NECESSARY. IT IS POSSIBLE THAT AN ACCESSORY PLUGGED INTO THE CIGAR LIGHTER MAY HAVE CAUSED THE OVERLOAD.
- REPLACE FUSE 7.

NO

REPAIR OPEN IN CKT 540 OR POWER FEED TO FUSE 7.

CHART #1 (continued)
HORNS INOPERATIVE FROM BOTH SWITCHES

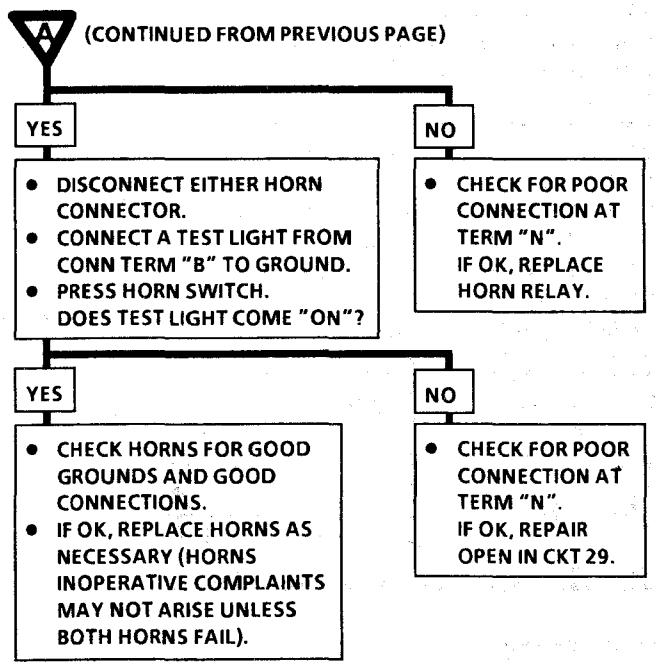
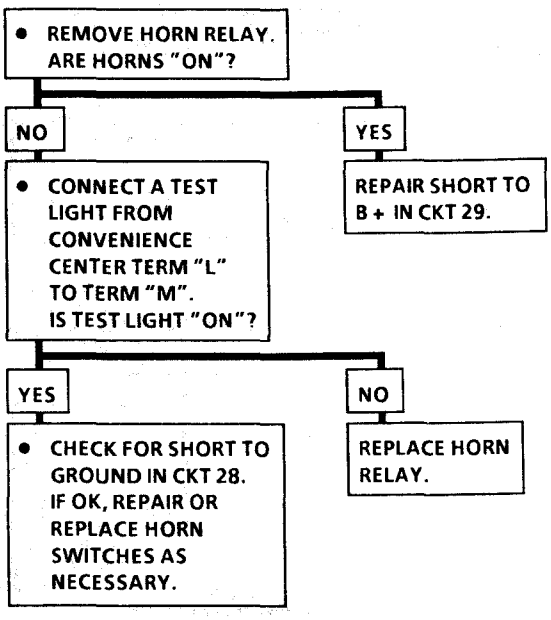


CHART #2
HORNS "ON" AT ALL TIMES



CIRCUIT OPERATION

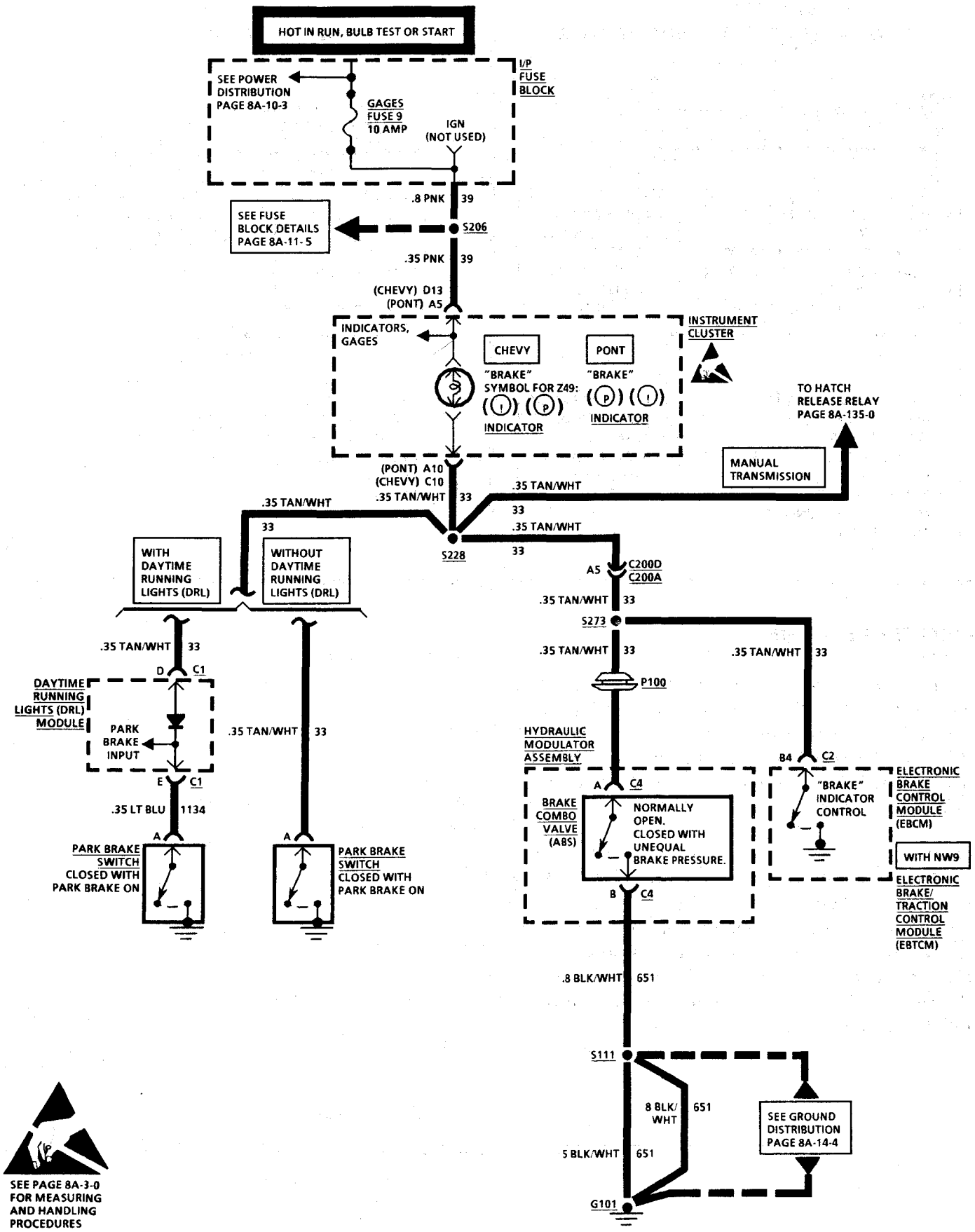
CHEVROLET

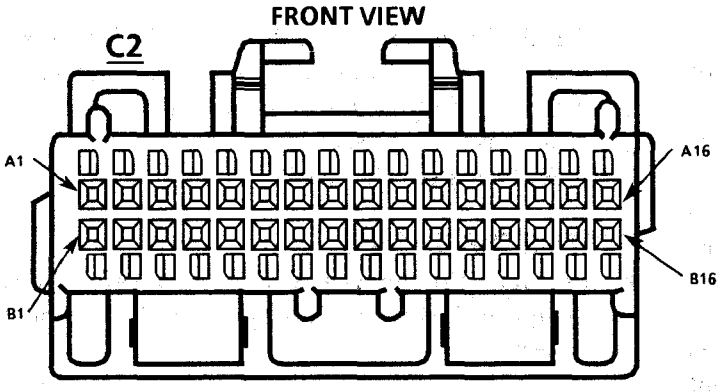
Battery voltage is applied at all times to the Horn Relay at terminal "L". When a Horn Switch is pressed, it provides a ground to the Horn Relay Coil. The Horn Relay contacts close, applying battery voltage to the horns. The horns continue to sound until the Horn Switch is released.

PONTIAC

Battery voltage is applied at all times to the Horn Relay at terminal "L". A ground path is provided through a spring loaded plate to energize the Horn Relay, whenever the Inflator Module is pressed. The Horn Relay contacts close, applying battery voltage to the horns. The horns continue to sound until the Inflator Module is released.

BRAKE WARNING SYSTEM

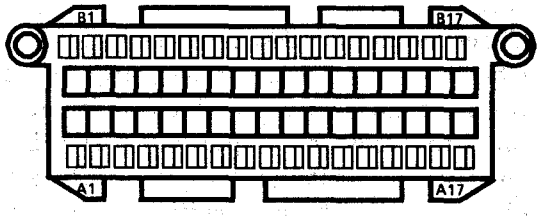




12110113

32-WAY F MICRO-PACK 100 SERIES
DK RED

ELECTRONIC BRAKE CONTROL MODULE (EBCM)
OR
ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM)



12065803

34-WAY F MICRO-PACK 100 SERIES
BLK

INSTRUMENT CLUSTER

COMPONENT	LOCATION	201-PG	FIG.	CONN
Brake Combo Valve (ABS)	Part of Hydraulic Modulator Assembly, inward side	39	68	
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Hydraulic Modulator Assembly	Front left of Engine Compartment	39	68	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Instrument Cluster	LH side of I/P			202-23
Park Brake Switch	In console, at base of Park Brake Lever	43	81	
C200A (17 cavities)	Part of Forward Lamp 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
G101	Top of RH Shock Tower (3 rings, 5 wires)	10	19	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S111	Forward Lamp Harn, approx 3 cm from Wiper Motor Assembly breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S228	I/P Harn, approx 15 cm before DLC breakout			
S273	Forward Lamp Harn, approx 25 cm from breakout inboard of P100	8	14	

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

BRAKE WARNING SYSTEM

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- Check for Antilock Brake or Traction Control DTC(s).
- Check for an open GAGES Fuse 9.
- 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.

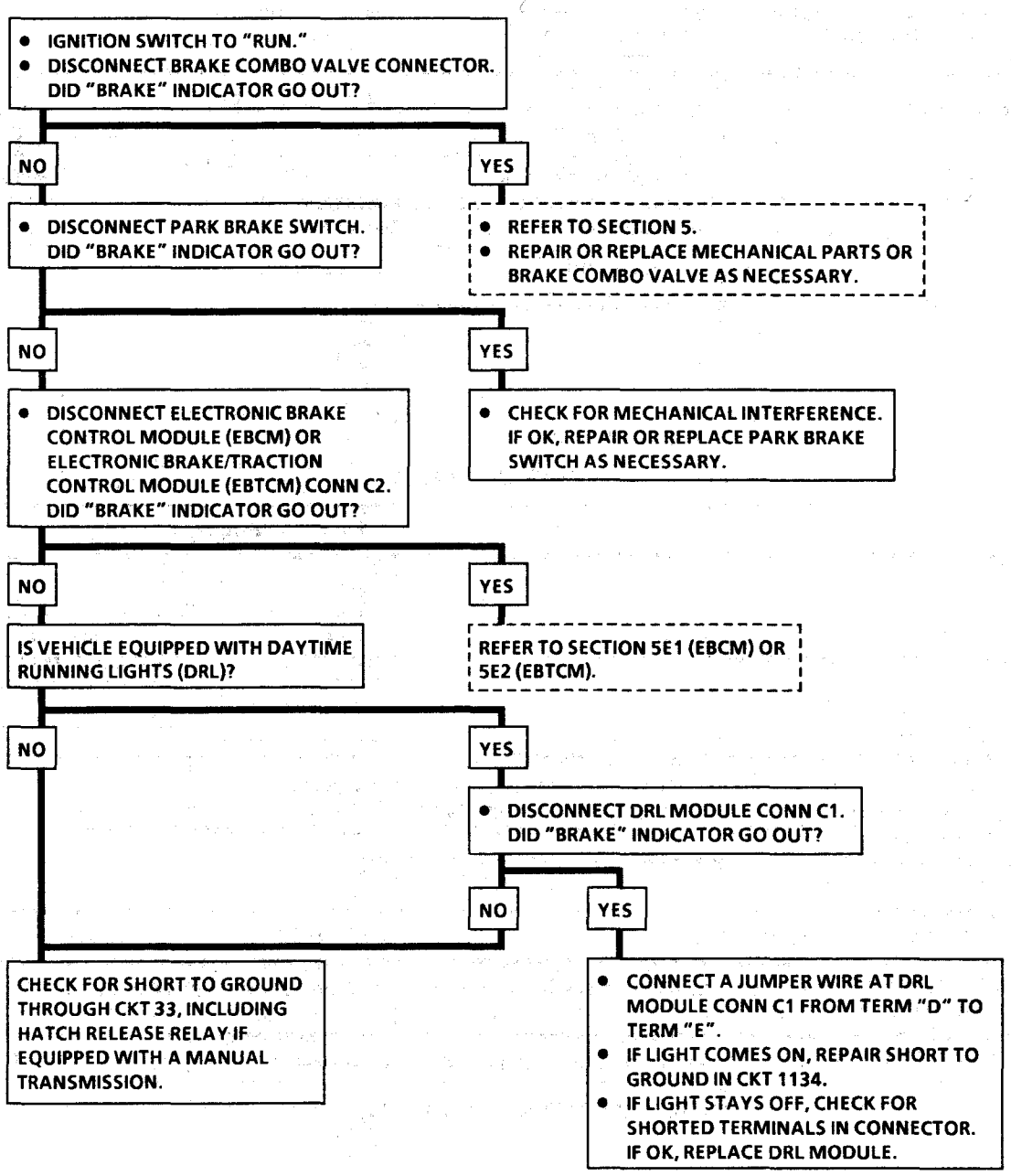
SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Park Brake released. • Turn Ignition Switch to "RUN" position.	"BRAKE" Indicator lights for approximately 3 seconds then goes "OFF."
[2] • Ignition Switch in "RUN." • Apply Park Brake.	"BRAKE" Indicator lights.
[3] • Release Park Brake.	"BRAKE" Indicator does not light.

SYMPTOM TABLE

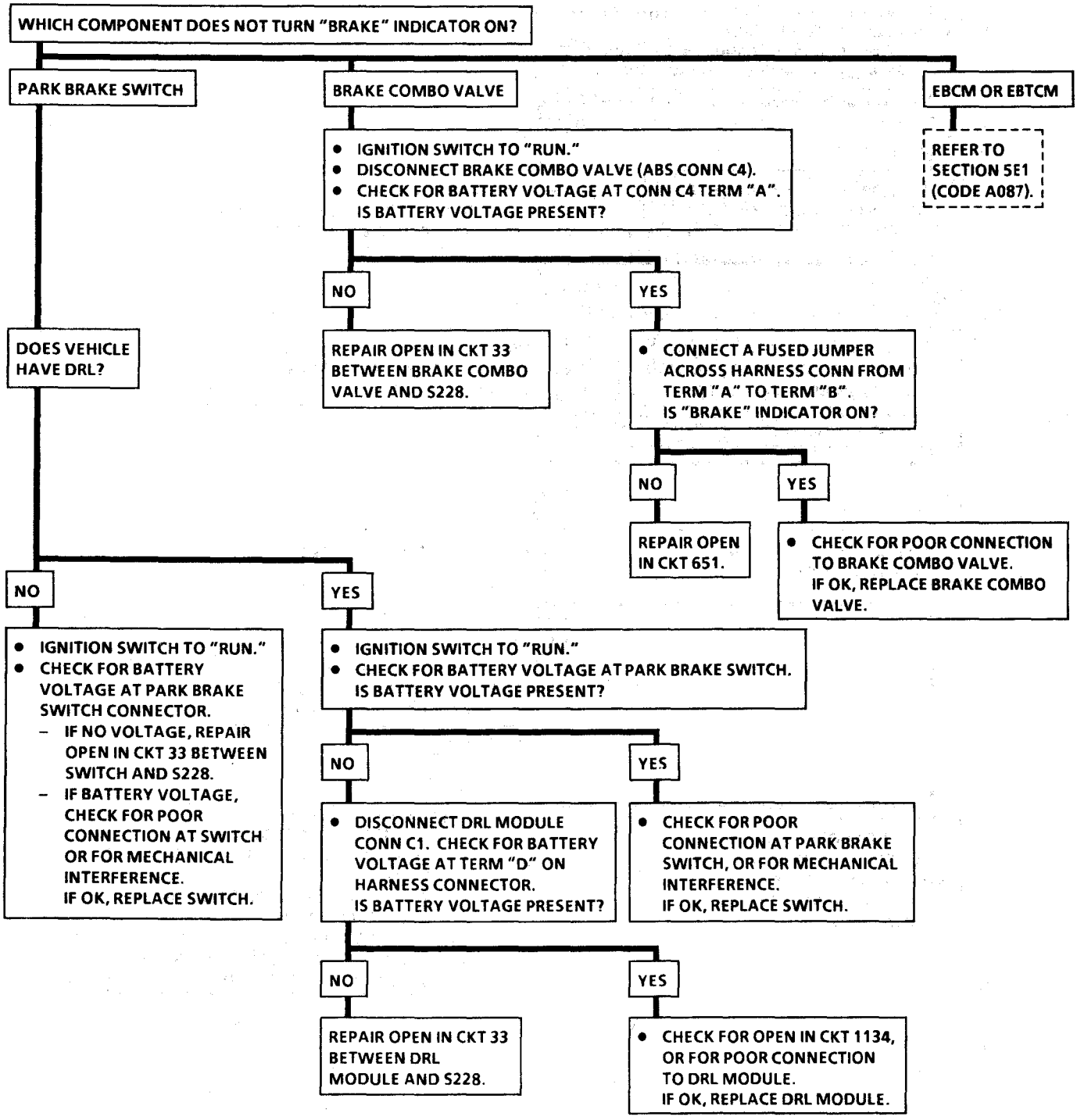
SYMPTOM	PROCEDURE	PAGE NUMBER
"BRAKE" Indicator remains on with Ignition Switch in "RUN" and Park Brake released.	Chart #1	8A-41-3
"BRAKE" Indicator does not turn on for only one condition.	Chart #2	8A-41-4

CHART #1
"BRAKE" INDICATOR REMAINS ON WITH IGNITION SWITCH IN "RUN" AND PARK BRAKE RELEASED



BRAKE WARNING SYSTEM

CHART #2
"BRAKE" INDICATOR DOES NOT TURN ON FOR ONLY ONE CONDITION

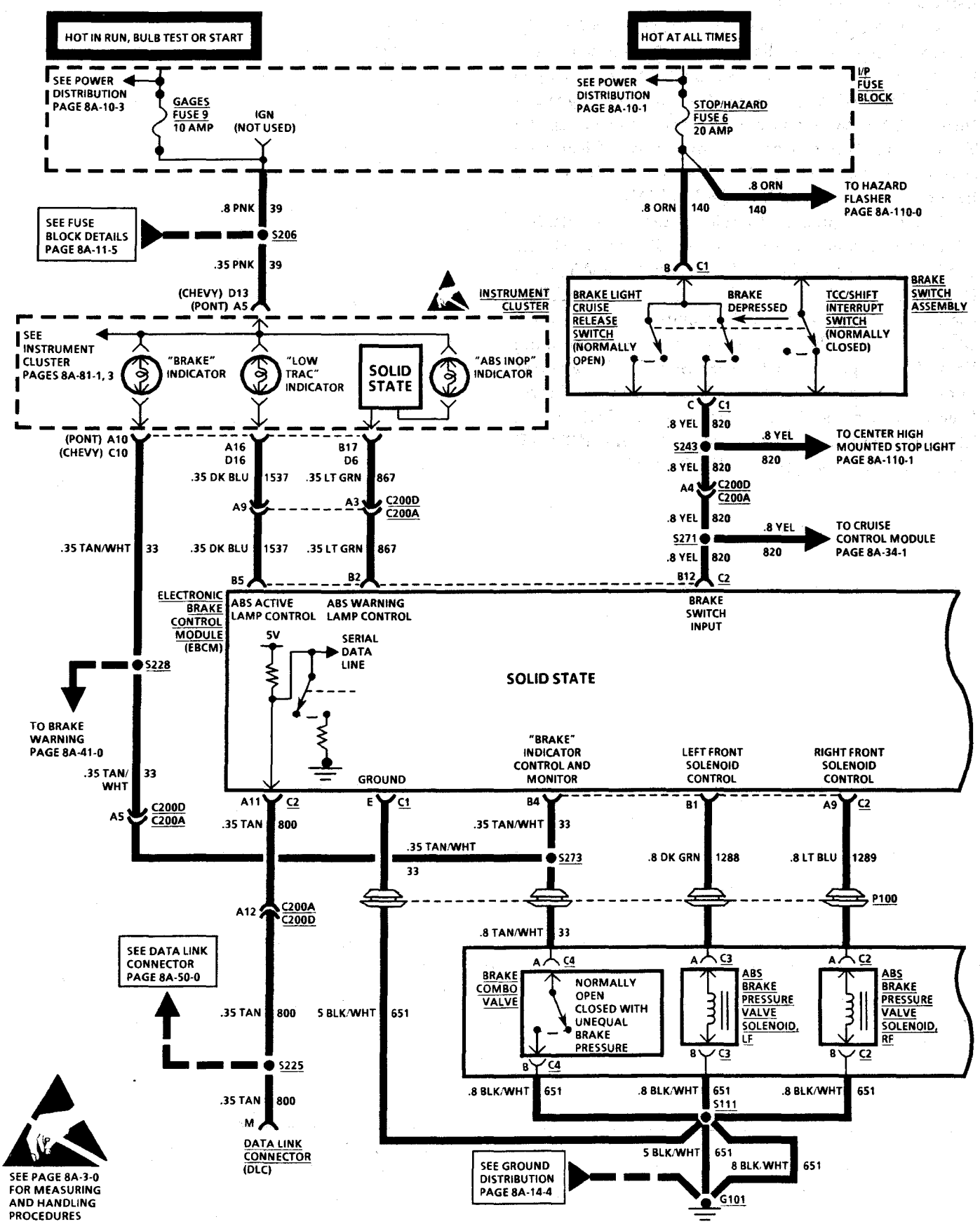


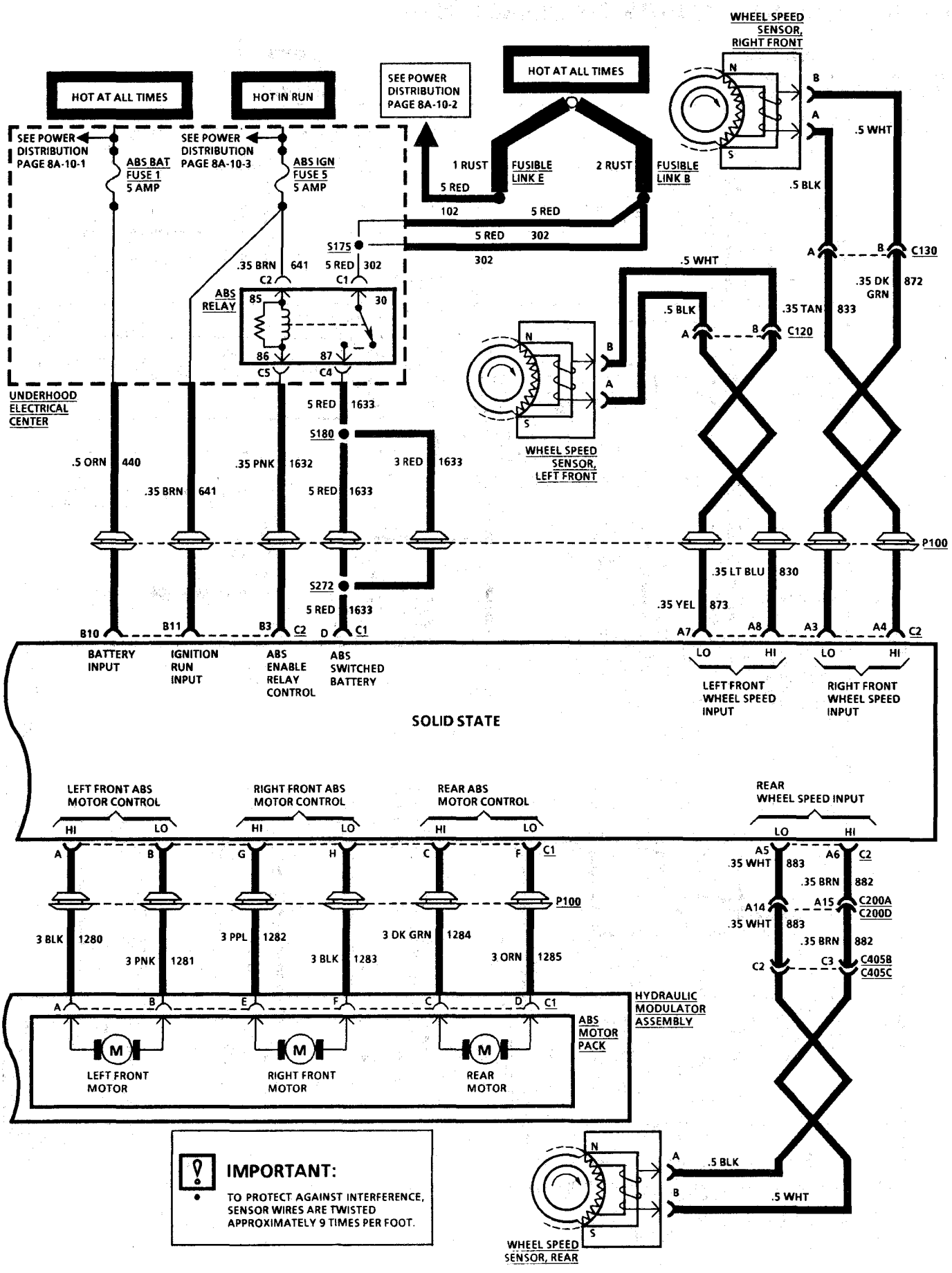
CIRCUIT OPERATION

When the Ignition Switch is turned to "RUN," "BULB TEST" or "START," voltage is applied to the Instrument Cluster through CKT 39 from Gages Fuse 9. The "BRAKE" Indicator receives a ground through CKT 33 by any one of three components: the Park Brake Switch, Brake Combo Valve, Electronic Brake Control Module (EBCM) or the Electronic Brake/Traction Control Module (EBTCM).

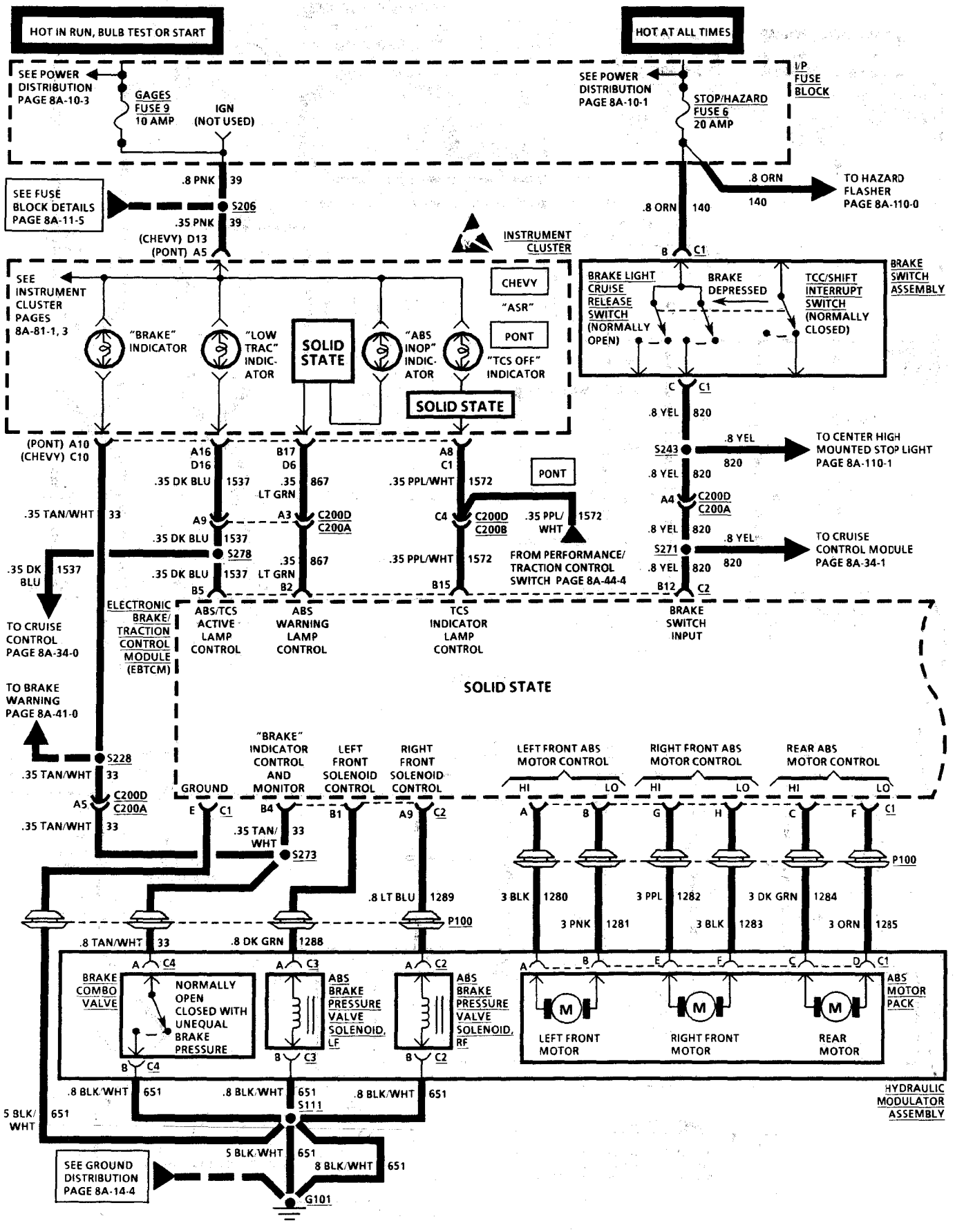
When the Ignition Switch is turned to "RUN," CKT 33 is grounded through the Electronic Brake Control Module (EBCM) or Electronic Brake/Traction Control Module (EBTCM), illuminating the "BRAKE" Indicator for approximately 3 seconds. When the Park Brake is set, the Park Brake Switch closes, grounding CKT 33 through the Park Brake Switch. For a better understanding of when the Brake Combo Valve, Electronic Brake Control Module (EBCM) or the Electronic Brake/Traction Control Module (EBTCM) will ground CKT 33, refer to SECTION 5E1.

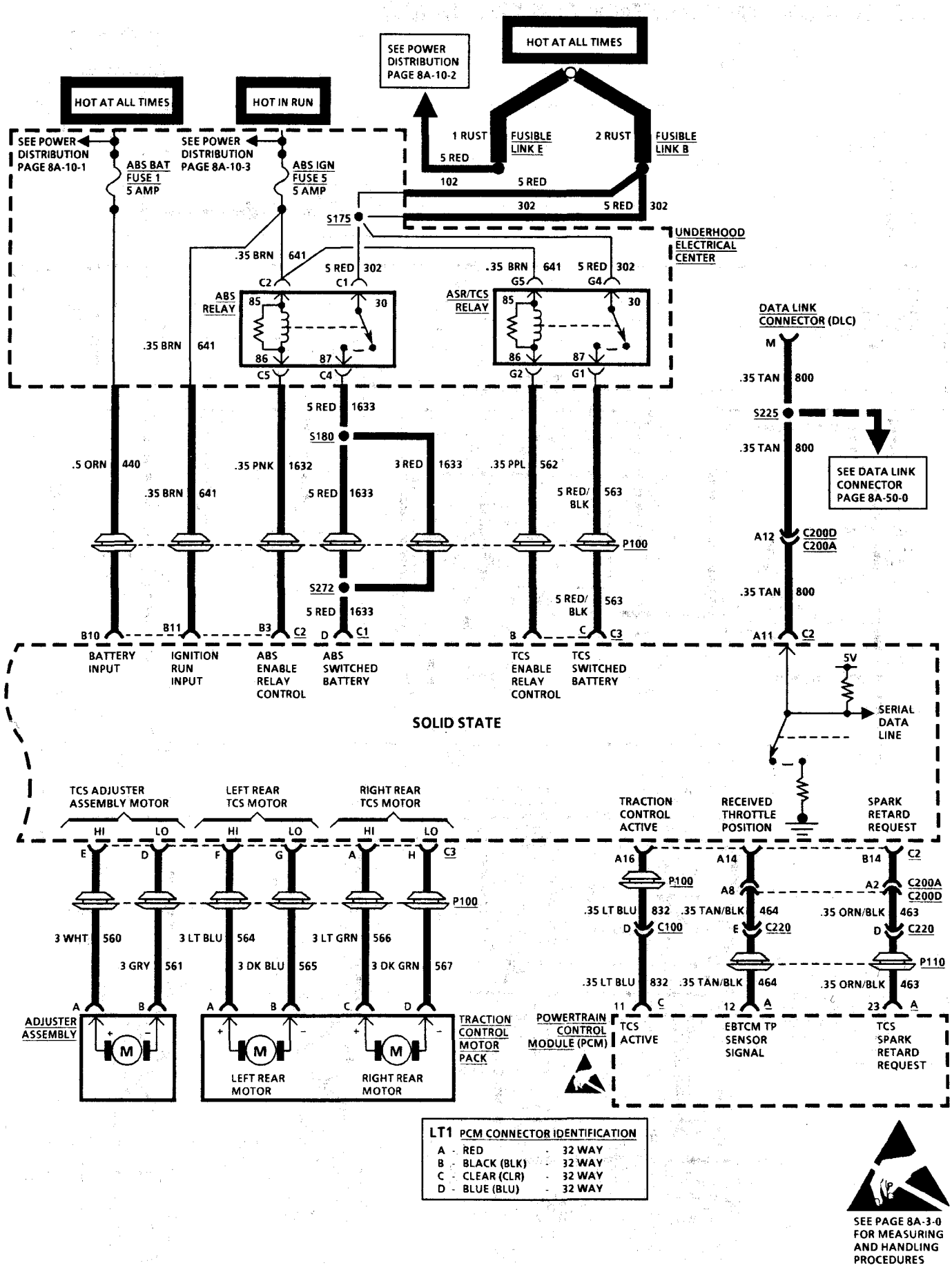
ANTILOCK BRAKES (WITHOUT NW9)




HOT AT ALL TIMES
HOT IN RUN
SEE POWER DISTRIBUTION PAGE 8A-10-2
HOT AT ALL TIMES
WHEEL SPEED SENSOR, RIGHT FRONT
SEE POWER DISTRIBUTION PAGE 8A-10-1
ABS BAT FUSE 1 5 AMP
SEE POWER DISTRIBUTION PAGE 8A-10-3
ABS IGN FUSE 5 5 AMP
1 RUST
FUSIBLE LINK E
2 RUST
FUSIBLE LINK B
5 RED
102
5 RED
302
5 RED
302
302
S175
.35 BRN
641
5 RED
302
C2
C1
ABS RELAY
85
30
86
87
C5
C4
.5 WHT
.5 BLK
A
B
C130
.35 DK GRN
872
.5 BLK
.35 TAN
833
A
B
C120
WHEEL SPEED SENSOR, LEFT FRONT
UNDERHOOD ELECTRICAL CENTER
5 RED
1633
S180
.5 ORN
440
.35 PNK
1632
3 RED
1633
.35 BRN
641
5 RED
1633
P100
S272
5 RED
1633
.35 LT BLU
830
.35 YEL
873
B10
B11
B3
C2
D
C1
A7
A8
A3
A4
C2
BATTERY INPUT
IGNITION RUN INPUT
ABS ENABLE RELAY CONTROL
ABS SWITCHED BATTERY
LO
HI
LEFT FRONT WHEEL SPEED INPUT
LO
HI
RIGHT FRONT WHEEL SPEED INPUT
SOLID STATE
LEFT FRONT ABS MOTOR CONTROL
RIGHT FRONT ABS MOTOR CONTROL
REAR ABS MOTOR CONTROL
REAR WHEEL SPEED INPUT
HI
LO
HI
LO
HI
LO
LO
HI
A
B
G
H
C
F
C1
A5
.35 WHT
883
A6
C2
.35 BRN
882
P100
A14
A15
C200A
C200D
.35 WHT
883
.35 BRN
882
3 BLK
1280
3 PNK
1281
3 PPL
1282
3 BLK
1283
3 DK GRN
1284
3 ORN
1285
C2
C3
C405B
C405C
A
B
E
F
C
D
C1
HYDRAULIC MODULATOR ASSEMBLY
ABS MOTOR PACK
M
M
M
LEFT FRONT MOTOR
RIGHT FRONT MOTOR
REAR MOTOR
IMPORTANT:
TO PROTECT AGAINST INTERFERENCE, SENSOR WIRES ARE TWISTED APPROXIMATELY 9 TIMES PER FOOT.
A
.5 BLK
B
.5 WHT
WHEEL SPEED SENSOR, REAR

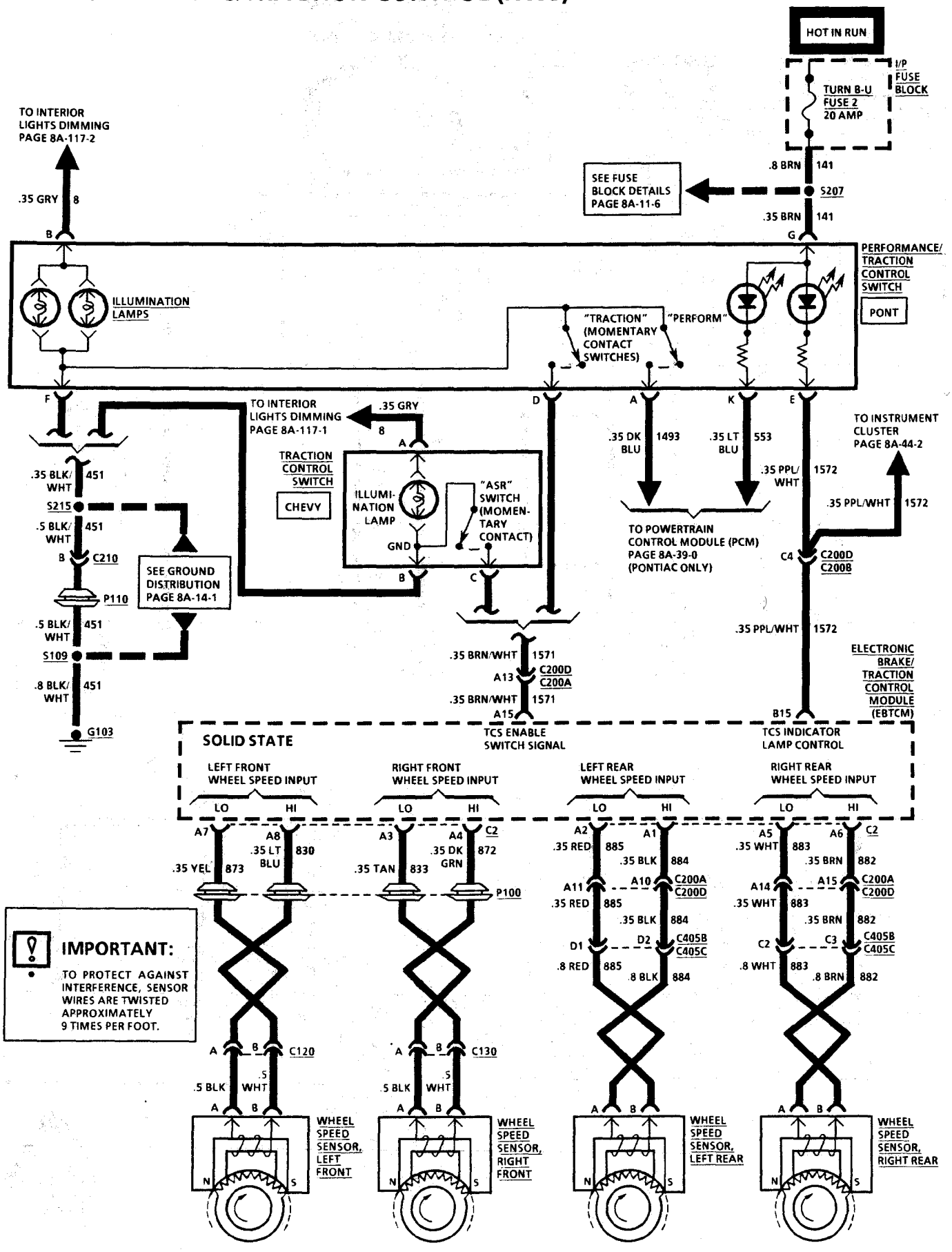
ANTILOCK BRAKES/TRACTION CONTROL (NW9)



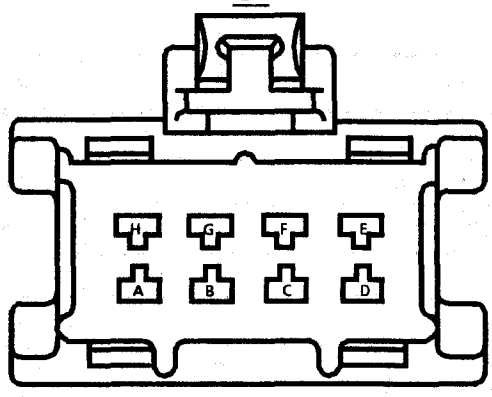


SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

ANTILOCK BRAKES/TRACTION CONTROL (NW9)



C1

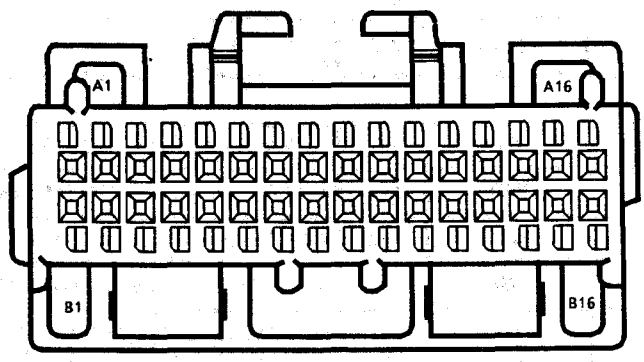


12110626

8-WAY F METRI-PACK 280 FLX LK
LT GRY

ELECTRONIC BRAKE CONTROL MODULE (EBCM)
OR
ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

C2

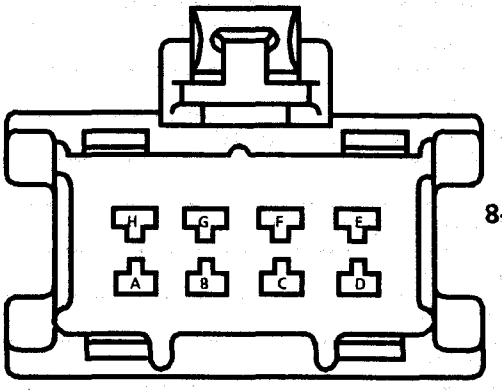


12110113

32-WAY F MICRO-PACK 100 SERIES
DK RED

ELECTRONIC BRAKE CONTROL MODULE (EBCM)
OR
ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

C3 (WITH NW9)



12129088

8-WAY F METRI-PACK 280 SERIES FLX LK
BLK

ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1				
A	BLK	1280	LEFT FRONT ABS MOTOR FEED	8A-44-1, 2
B	PNK	1281	LEFT FRONT ABS MOTOR RETURN	8A-44-1, 2
C	DK GRN	1284	REAR ABS MOTOR FEED	8A-44-1, 2
D	RED	1633	ABS RELAY OUTPUT - SWITCHED TO BATTERY	8A-44-1, 3
E	BLK/WHT	651	GROUND	8A-44-0, 2
F	ORN	1285	REAR ABS MOTOR RETURN	8A-44-1, 2
G	PPL	1282	RIGHT FRONT ABS MOTOR FEED	8A-44-1, 2
H	BLK	1283	RIGHT FRONT ABS MOTOR RETURN	8A-44-1, 2

(CONTINUED ON NEXT PAGE)

ANTILOCK BRAKES/TRACTION CONTROL (NW9)

(CONTINUED FROM PREVIOUS PAGE)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C2				
A1	BLK	884	LEFT REAR WHEEL SPEED SENSOR SIGNAL (WITH NW9)	8A-44-4
A2	RED	885	LEFT REAR WHEEL SPEED SENSOR RETURN (WITH NW9)	8A-44-4
A3	TAN	833	RIGHT FRONT WHEEL SPEED SENSOR RETURN	8A-44-1, 4
A4	DK GRN	872	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL	8A-44-1, 4
A5 A5	WHT WHT	883 883	REAR WHEEL SPEED SENSOR RETURN RIGHT REAR WHEEL SPEED SENSOR RETURN (WITH NW9)	8A-44-1 8A-44-4
A6 A6	BRN BRN	882 882	REAR WHEEL SPEED SENSOR SIGNAL RIGHT REAR WHEEL SPEED SENSOR SIGNAL (WITH NW9)	8A-44-1 8A-44-4
A7	YEL	873	LEFT FRONT WHEEL SPEED SENSOR RETURN	8A-44-1, 4
A8	LT BLU	830	LEFT FRONT WHEEL SPEED SENSOR SIGNAL	8A-44-1, 4
A9	LT BLU	1289	RIGHT FRONT SOLENOID FEED	8A-44-0, 2
A11	TAN	800	SERIAL DATA SIGNAL	8A-50-0
A14	TAN/BLK	464	THROTTLE POSITION SENSOR SIGNAL (WITH NW9)	8A-44-3
A15	BRN/WHT	1571	TRACTION CONTROL SYSTEM ENABLE SWITCH SIGNAL (WITH NW9)	8A-44-4
A16	LT BLU	832	TRACTION CONTROL ACTIVE (WITH NW9)	8A-44-3
B1	DK GRN	1288	LEFT FRONT SOLENOID FEED	8A-44-0, 2
B2	LT GRN	867	ABS WARNING INPUT TO INSTRUMENT CLUSTER (SOLID STATE)	8A-44-0, 2
B3	PNK	1632	ABS ENABLE FEED TO RELAY	8A-44-1, 3
B4	TAN/WHT	33	"BRAKE" INDICATOR LAMP (SWITCHED GROUND)	8A-44-0, 2
B5	DK BLU	1537	"LOW TRAC" INDICATOR LAMP CONTROL	8A-44-0, 2
B10	ORN	440	POWER FEED FROM ABS BAT FUSE #1	8A-44-1, 3
B11	BRN	641	POWER FEED FROM ABS IGN FUSE #5	8A-44-1, 3
B12	YEL	820	BRAKE DEPRESSED INPUT	8A-44-0, 2
B14	ORN/BLK	463	SPARK RETARD REQUEST (WITH NW9)	8A-44-3
B15	PPL/WHT	1572	"ASR" (CHEVY) OR "TCS OFF" (PONT) INDICATOR LAMP CONTROL (WITH NW9)	8A-44-2, 4
C3 (WITH NW9)				
A	LT GRN	566	RIGHT REAR TCS MOTOR FEED	8A-44-3
B	PPL	562	TCS ENABLE FEED TO RELAY	8A-44-3
C	RED/BLK	563	TCS RELAY OUTPUT - SWITCHED TO BATTERY	8A-44-3
D	GRY	561	THROTTLE RELAXER MOTOR RETURN	8A-44-3
E	WHT	560	THROTTLE RELAXER MOTOR FEED	8A-44-3
F	LT BLU	564	LEFT REAR TCS MOTOR FEED	8A-44-3
G	DK BLU	565	LEFT REAR TCS MOTOR RETURN	8A-44-3
H	DK GRN	567	RIGHT REAR TCS MOTOR RETURN	8A-44-3

COMPONENT	LOCATION	201-PG	FIG.	CONN
ABS Brake Pressure Valve Solenoid, LF	Part of Hydraulic Modulator Assembly	39	68	
ABS Brake Pressure Valve Solenoid, RF	Part of Hydraulic Modulator Assembly	39	68	
ABS Motor Pack	Part of Hydraulic Modulator Assembly	39	68	202-19
Adjuster Assembly	LH top center of Engine	41	75	
Brake Combo Valve (ABS)	Part of Hydraulic Modulator Assembly, inward side	39	68	
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Fusible Links	Above RH Shock Tower	10	19	
Hydraulic Modulator Assembly	Front left of Engine Compartment	39	68	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Instrument Cluster	LH side of I/P			202-23
Performance/Traction Control Switch	Mounted in center console behind shifter	42	79	202-24
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Traction Control Motor Pack	Mounted to left front frame rail, below Hydraulic Modulator	39	70	202-28
Traction Control Switch	Left side of upper console	42	78	
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
Wheel Speed Sensor, Left Front	Middle of left front steering knuckle	25	47	
Wheel Speed Sensor, Left Rear	Mounted to rear backing plate of wheel disc	28	55	
Wheel Speed Sensor, Rear	Top of Rear Differential	20	38	
Wheel Speed Sensor, Right Front	Middle of right front steering knuckle	25	47	
Wheel Speed Sensor, Right Rear	Mounted to rear backing plate of wheel disc	28	55	
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C120 (2 cavities)	LH Wheel Speed Sensor Pigtail, mounted to LH Frame Rail			

(CONTINUED ON NEXT PAGE)

ANTILOCK BRAKES/TRACTION CONTROL (NW9)

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
C130 (2 cavities)	RH Wheel Speed Sensor Pigtail, mounted to RH Frame Rail			
C200A (17 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
C200B (18 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C405B (10 cavities)	Part of Pass Thru Conn, forward of rear axle, to Pass Thru Panel	5	9	202-8
C405C (4 cavities)	Part of Pass Thru Conn, forward of rear axle, to Speed Sensor (ABS)	5	9	202-8
G101	Top of RH Shock Tower (3 rings, 5 wires)	10	19	
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S111	Forward Lamp Harn, approx 3 cm from Wiper Motor Assembly breakout			
S175	Forward Lamp Harn, approx 12 cm from Electrical Center breakout	39	68	
S180	Forward Lamp Harn, approx 16 cm from Electrical Center breakout	36	68	
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S207	I/P Harn, approx 4 cm before DLC breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S225	I/P Harn, approx 4 cm before DLC breakout			
S228	I/P Harn, approx 15 cm before DLC breakout			
S243	I/P Harn, approx 14 cm from Fuel Pump Relay breakout	7	13	
S271	Forward Lamp Harn, approx 19 cm from breakout inboard of P100	8	14	
S272	Forward Lamp Harn, approx 18 cm from breakout inboard of P100	8	14	
S273	Forward Lamp Harn, approx 25 cm from breakout inboard of P100	8	14	
S278	Forward Lamp Harn, approx 9 cm from EBCM breakout			

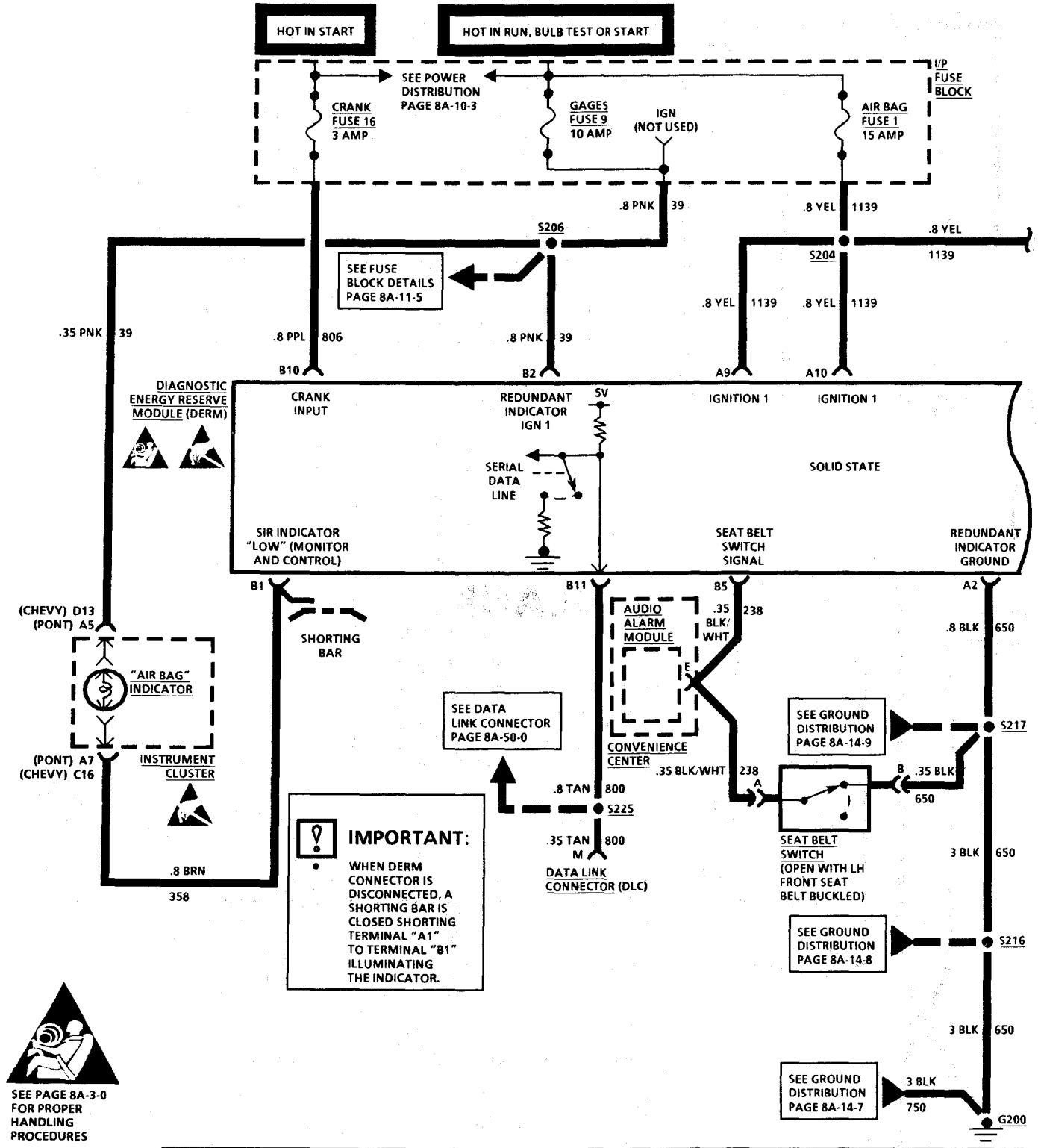
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

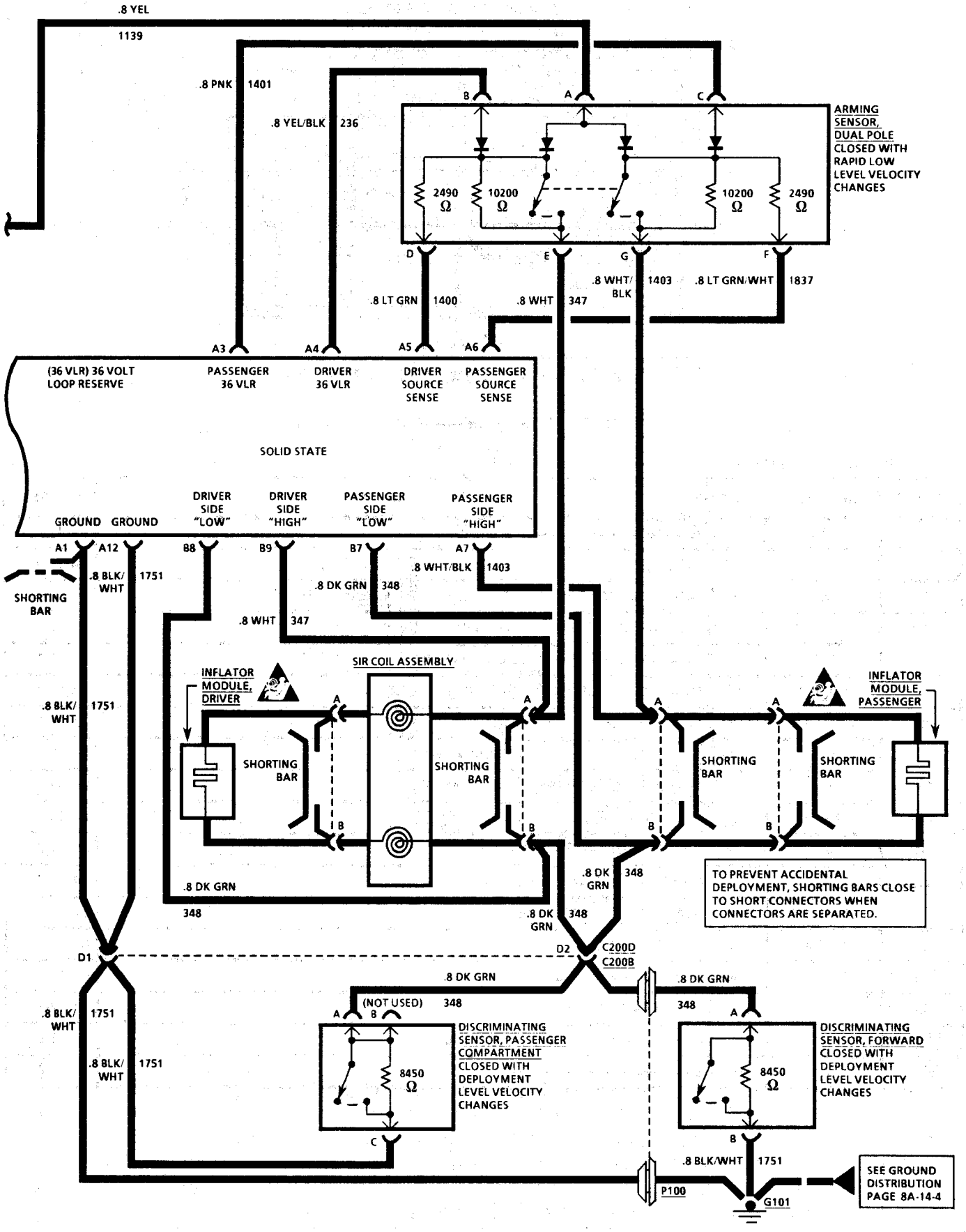
- Refer to SECTION 5E1 or 5E2 for Diagnosis.

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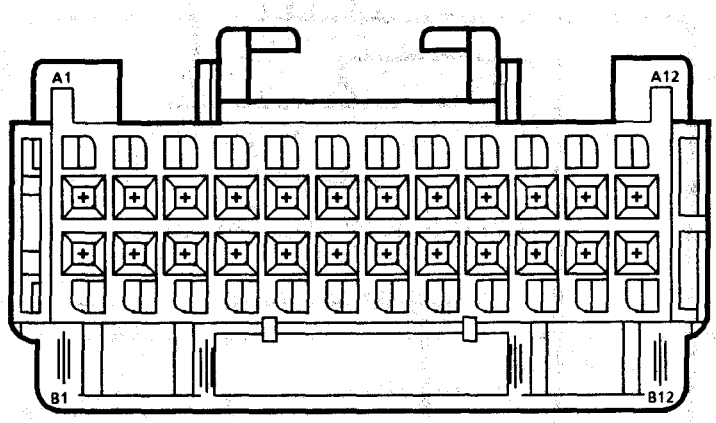
SUPPLEMENTAL INFLATABLE RESTRAINTS (SIR)



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.


.8 YEL
1139
.8 PNK 1401
.8 YEL/BLK 236
B
A
C
ARMING SENSOR, DUAL POLE CLOSED WITH RAPID LOW LEVEL VELOCITY CHANGES
2490 Ω
10200 Ω
10200 Ω
2490 Ω
D
E
G
F
.8 LT GRN 1400
.8 WHT 347
.8 WHT/ BLK 1403
.8 LT GRN/WHT 1837
A3
A4
A5
A6
(36 VLR) 36 VOLT LOOP RESERVE
PASSENGER 36 VLR
DRIVER 36 VLR
DRIVER SOURCE SENSE
PASSENGER SOURCE SENSE
SOLID STATE
GROUND
GROUND
DRIVER SIDE "LOW"
DRIVER SIDE "HIGH"
PASSENGER SIDE "LOW"
PASSENGER SIDE "HIGH"
A1
A12
B8
B9
B7
A7
SHORTING BAR
.8 BLK/ WHT 1751
.8 WHT/BLK 1403
.8 DK GRN 348
.8 WHT 347
SIR COIL ASSEMBLY
INFLATOR MODULE, DRIVER
INFLATOR MODULE, PASSENGER
SHORTING BAR
SHORTING BAR
SHORTING BAR
SHORTING BAR
.8 DK GRN 348
.8 DK GRN 348
.8 DK GRN 348
TO PREVENT ACCIDENTAL DEPLOYMENT, SHORTING BARS CLOSE TO SHORT CONNECTORS WHEN CONNECTORS ARE SEPARATED.
D1
D2
C200D
C200B
.8 DK GRN
.8 DK GRN
(NOT USED) 348
348
.8 BLK/ WHT 1751
.8 BLK/ WHT 1751
8450 Ω
DISCRIMINATING SENSOR, PASSENGER COMPARTMENT CLOSED WITH DEPLOYMENT LEVEL VELOCITY CHANGES
8450 Ω
DISCRIMINATING SENSOR, FORWARD CLOSED WITH DEPLOYMENT LEVEL VELOCITY CHANGES
.8 BLK/WHT 1751
P100
G101
SEE GROUND DISTRIBUTION PAGE 8A-14-4

SUPPLEMENTAL INFLATABLE RESTRAINTS (SIR)



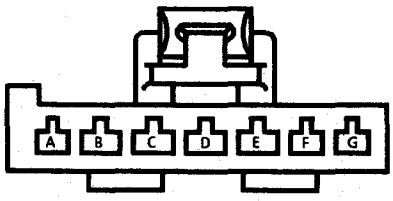
12092689

24-WAY F MICRO-PACK 100 SERIES
YEL

DIAGNOSTIC ENERGY RESERVE MODULE (DERM)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	BLK/WHT	1751	GROUND	8A-14-4
A2	BLK	650	GROUND	8A-14-8, 9
A3	PNK	1401	DUAL ARMING SENSOR FEED - PASSENGER - 36 VOLT	8A-47-1
A4	YEL/BLK	236	DUAL ARMING SENSOR FEED - DRIVER - 36 VOLT	8A-47-1
A5	LT GRN	1400	DUAL ARMING SENSOR SIGNAL - DRIVER	8A-47-1
A6	LT GRN/WHT	1837	DUAL ARMING SENSOR SIGNAL - PASSENGER	8A-47-1
A7	WHT/BLK	1403	INFLATOR FEED - PASSENGER	8A-47-1
A9	YEL	1139	POWER FEED FROM AIR BAG FUSE #1	8A-47-0, 1
A10	YEL	1139	POWER FEED FROM AIR BAG FUSE #1	8A-47-0, 1
A12	BLK/WHT	1751	GROUND	8A-14-4
B1	BRN	358	AIR BAG INDICATOR LAMP FEED	8A-47-0
B2	PNK	39	POWER FEED FROM GAGES FUSE #9	8A-11-5
B5	BLK/WHT	238	SEAT BELT SWITCH SIGNAL	8A-47-0
B7	DK GRN	348	SIR INFLATOR OUTPUT	8A-47-1
B8	DK GRN	348	SIR INFLATOR OUTPUT	8A-47-1
B9	WHT	347	INFLATOR FEED - DRIVER	8A-47-1
B10	PPL	806	POWER FEED FROM CRANK FUSE #16	8A-11-9
B11	TAN	800	SERIAL DATA SIGNAL	8A-50-0



12092761

7-WAY F METRI-PACK 280 SERIES
YEL

ARMING SENSOR, DUAL POLE

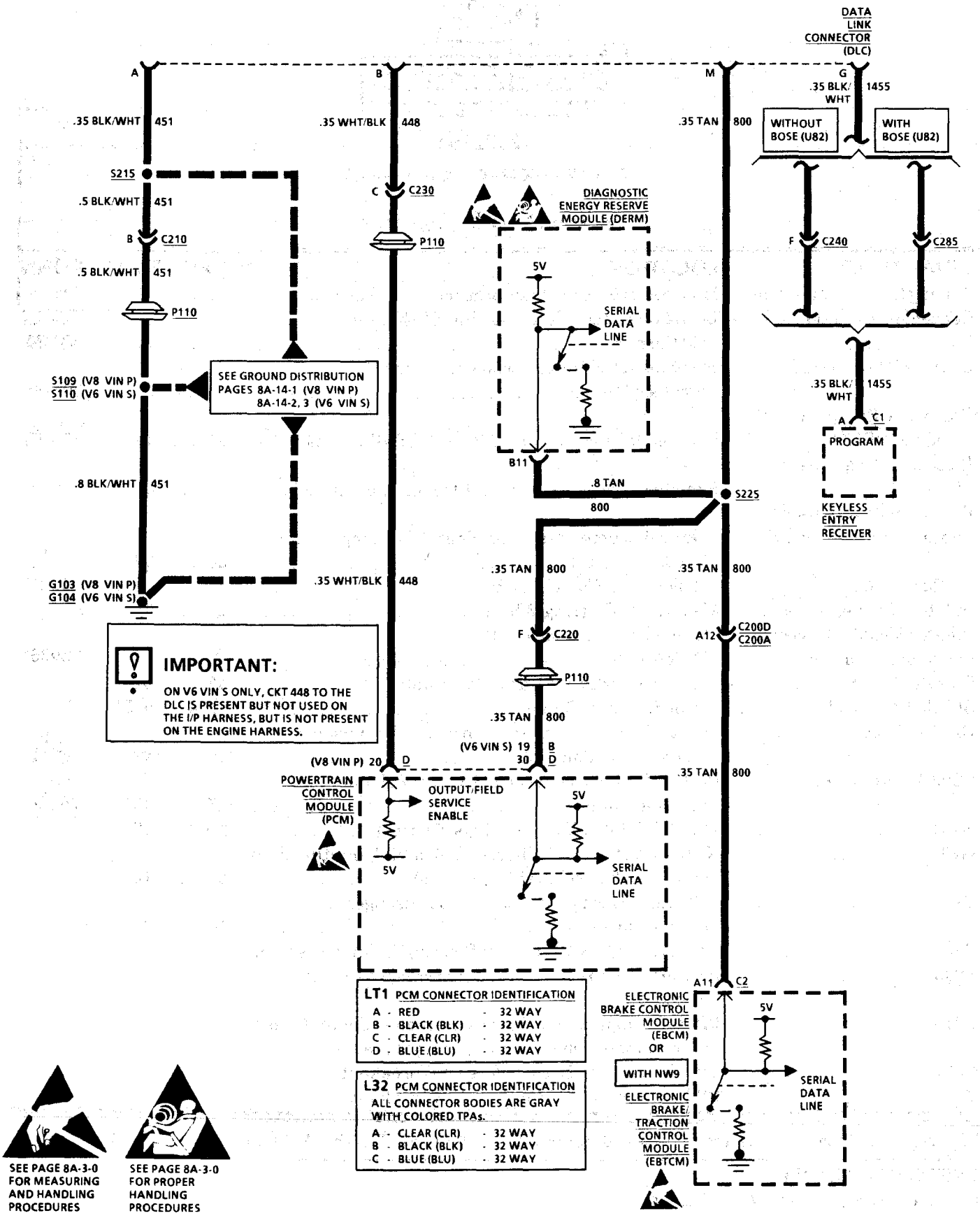
COMPONENT	LOCATION	201-PG	FIG.	CONN
Arming Sensor, Dual Pole	Mounted to Floor Tunnel Bracket, under console	43	81	202-19
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Diagnostic Energy Reserve Module (DERM)	Snapped in bracket, behind RH side of I/P Compartment	8	15	202-12
Discriminating Sensor, Forward	Mounted to center of front end Tie Bar, near hood latch	19	36	
Discriminating Sensor, Passenger Compartment	Mounted to upper dash, just right of Steering Column Support Bracket	20	38	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Inflator Module, Driver	Mounted on Steering Wheel	2	3	
Inflator Module, Passenger	Mounted on right side of I/P			
Instrument Cluster	LH side of I/P			202-23
Seat Belt Switch	Part of Driver's Seat Buckle Assembly	43	81	
SIR Coil Assembly	Top of Steering Column	3, 34	5, 51	
C200B (18 cavities)	Part of Forward Lamp 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
G101	Top of RH Shock Tower (3 rings, 5 wires)	10	19	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S204	I/P Harn, approx 10 cm from Steering Column breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S225	I/P Harn, approx 4 cm before DLC breakout			

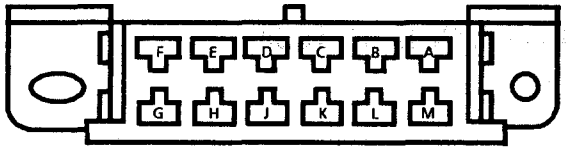
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

- Refer to SECTION 9J-A for diagnosis.

DATA LINK CONNECTOR (DLC): PIN ASSIGNMENT





12020043
12-WAY F METRI-PACK 280 SERIES
BLK
DATA LINK CONNECTOR (DLC)

**CAVITIES NOT LISTED ARE NOT USED

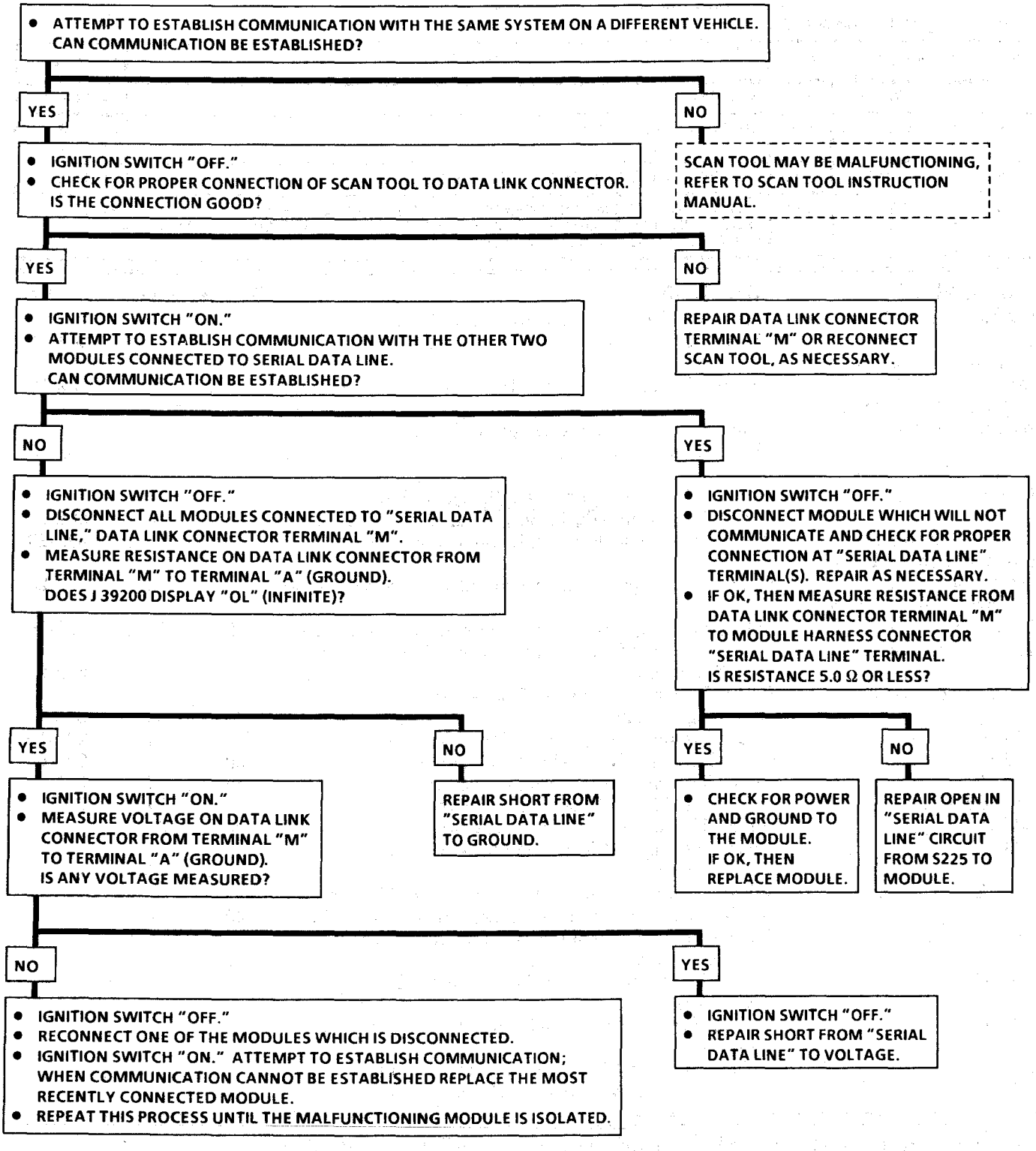
CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	BLK/WHT	451	GROUND	8A-14-1, 2, 3
B	WHT/BLK	448	DIAGNOSTIC REQUEST, PCM	8A-20-0, 8A-21-0
G	BLK/WHT	1455	PROGRAM INPUT, KEYLESS ENTRY RECEIVER	8A-132-1
M	TAN	800	SERIAL DATA LINE, DIAGNOSTIC ENERGY RESERVE MODULE (DERM), ELECTRONIC BRAKE CONTROL MODULE (EBCM), ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM) AND PCM	8A-50-0

COMPONENT	LOCATION	201-PG	FIG.	CONN
Data Link Conn (DLC)	Mounted to I/P Tie Bar, below and right of Steering Column			202-11
Diagnostic Energy Reserve Module (DERM)	Snapped in bracket, behind RH side of I/P Compartment	8	15	202-12
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Keyless Entry Receiver	Behind RH side kick panel, in molded pocket	40	71	202-23
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
C200A (17 cavities)	Part of Forward Lamp 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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C240 (6 cavities)	Under RH side of I/P, behind kick panel	20	37	202-19
C285 (1 cavity)	Under RH side of I/P, behind kick panel	20	37	
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S225	I/P Harn, approx 4 cm before DLC breakout			

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

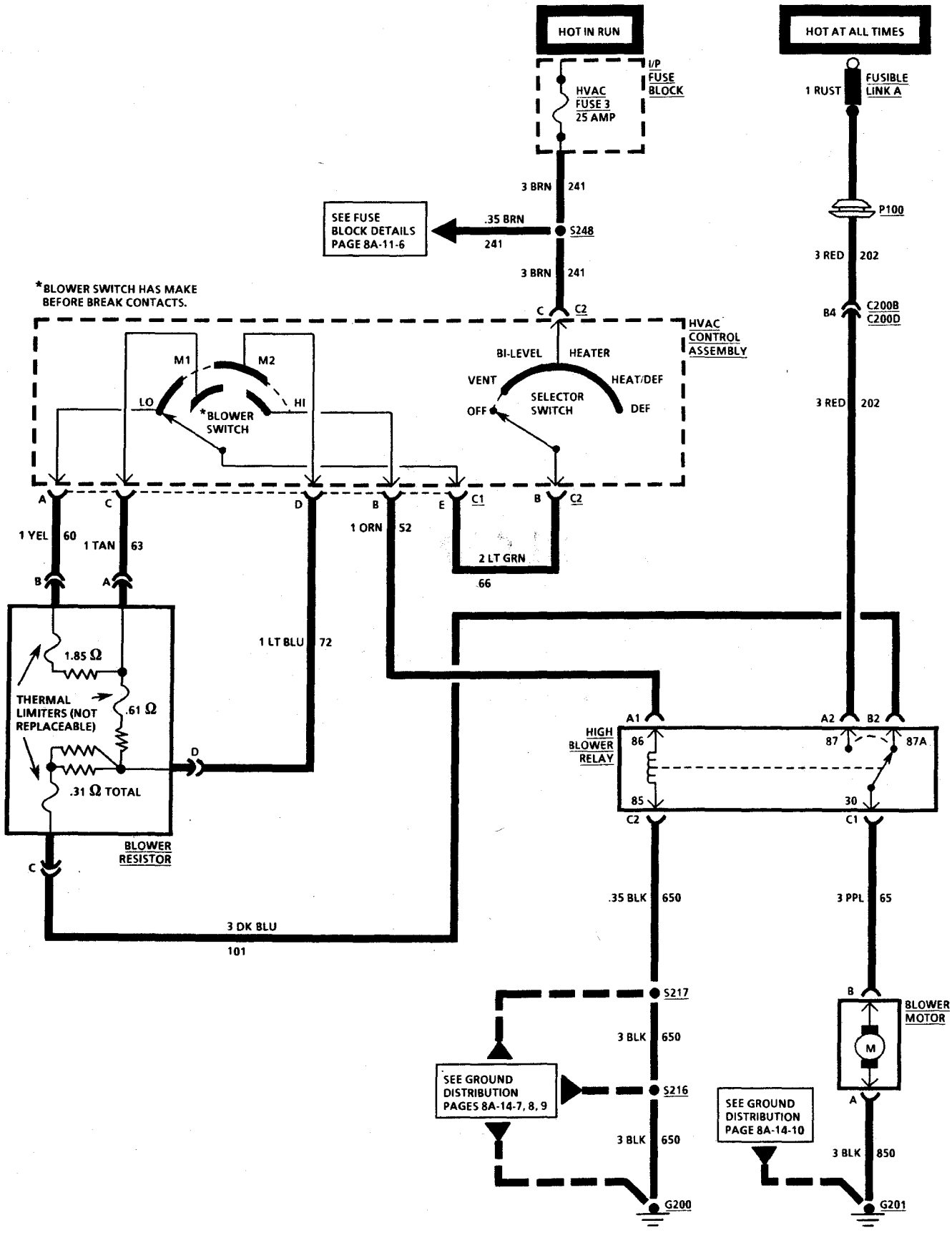
DATA LINK CONNECTOR (DLC): PIN ASSIGNMENT

SERIAL DATA LINE DIAGNOSIS



BLANK

HEATER (C41)


HOT IN RUN
HOT AT ALL TIMES
I/P FUSE BLOCK
HVAC FUSE 3 25 AMP
1 RUST
FUSIBLE LINK A
3 BRN 241
SEE FUSE BLOCK DETAILS PAGE 8A-11-6
.35 BRN 241
S248
P100
3 RED 202
3 BRN 241
C C2
B4 C200B C200D
*BLOWER SWITCH HAS MAKE BEFORE BREAK CONTACTS.
HVAC CONTROL ASSEMBLY
M1
M2
LO
HI
*BLOWER SWITCH
BI-LEVEL
HEATER
VENT
HEAT/DEF
SELECTOR SWITCH
OFF
DEF
3 RED 202
A C D B E C1 B C2
1 YEL 60
1 TAN 63
1 ORN 52
2 LT GRN 66
B A
1.85 Ω
THERMAL LIMITERS (NOT REPLACEABLE)
.61 Ω
1 LT BLU 72
D
.31 Ω TOTAL
BLOWER RESISTOR
C
A1
A2 B2
HIGH BLOWER RELAY
86
87
87A
85
30
C2
C1
3 DK BLU 101
.35 BLK 650
3 PPL 65
S217
B
BLOWER MOTOR
M
3 BLK 650
SEE GROUND DISTRIBUTION PAGES 8A-14-7, 8, 9
S216
SEE GROUND DISTRIBUTION PAGE 8A-14-10
A
3 BLK 650
3 BLK 850
G200
G201

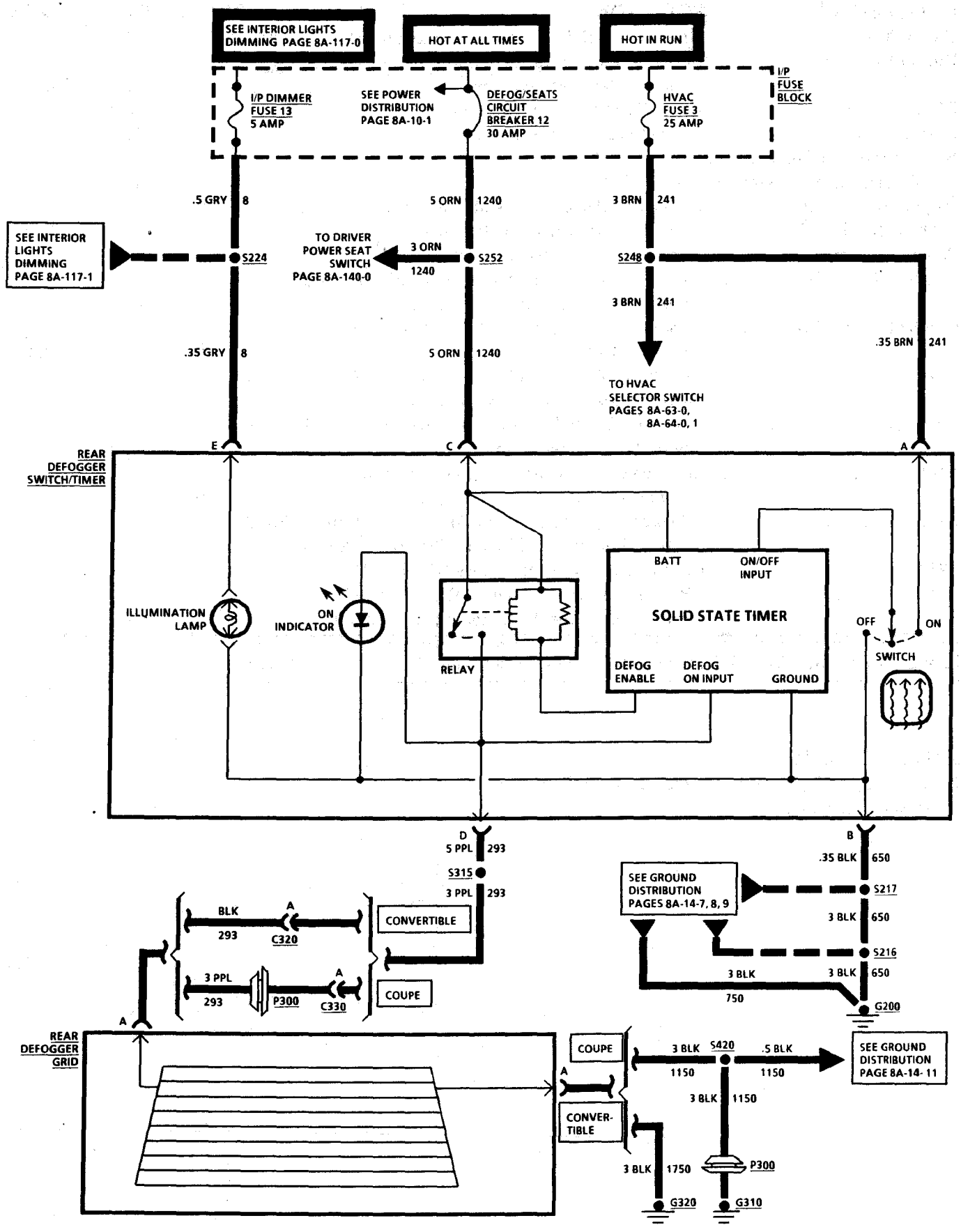
COMPONENT	LOCATION	201-PG	FIG.	CONN
Blower Motor	Under lower RH side of I/P, mounted in HVAC Module	20	37	
Blower Resistor	In HVAC Module, forward and left of Temperature Control Cable Attachment			202-20
Blower Switch	Part of HVAC Control Assembly	21	39	
Fusible Links	Above RH Shock Tower	10	19	
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
High Blower Relay	Under I/P, above left side of floor tunnel	42	77	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Selector Switch	Part of HVAC Control Assembly	21	39	
C200B (18 cavities)	Part of Forward Lamp 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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S248	I/P Harn, approx 4 cm before RR Defog Switch (Chevy) or from Instrument Cluster (Pont) breakouts			

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

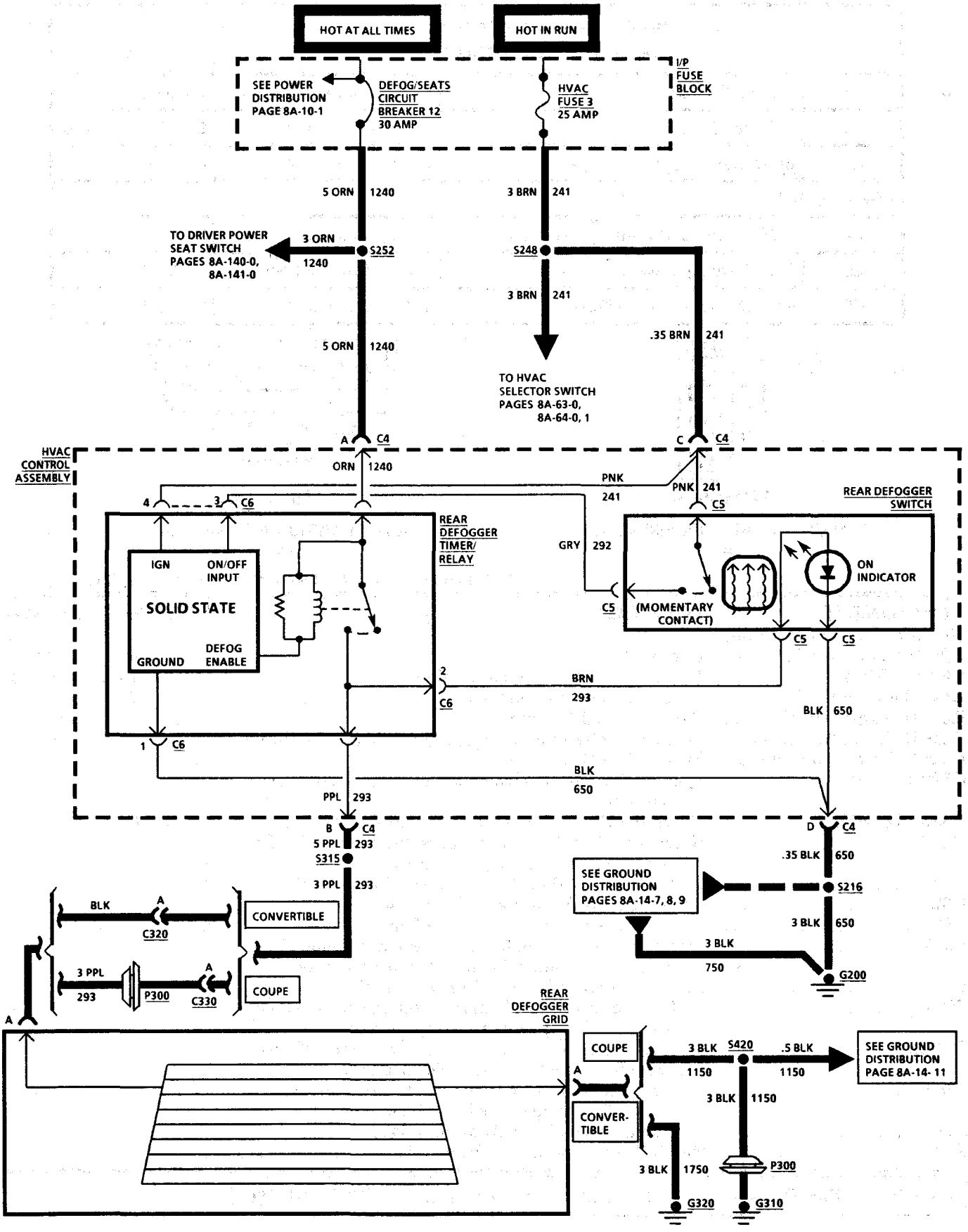
SYSTEM DIAGNOSIS

- For Diagnosis, refer to "HVAC Blower Controls (C60)," page 8A-63-0.

DEFOGGER (CHEVY)



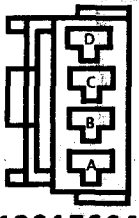
DEFOGGER (PONTIAC)



DEFOGGER

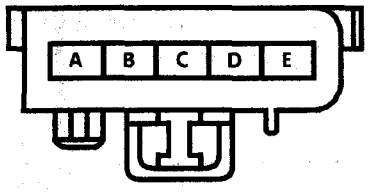
HVAC CONTROL ASSEMBLY CONNECTOR DESCRIPTIONS			PAGE
C1	Blower Switch	5-Way Connector	8A-63-0
C2	Selector Switch	3-Way Connector	8A-63-0, 8A-64-0
C3	Illumination Lamps Jumper	2-Way Connector	8A-117-1
PONTIAC ONLY			
C4	HVAC Control Assembly to I/P Harness	4-Way Connector	8A-61-1
C5	Rear Defogger Switch	Four 1-Way Connectors	8A-61-1
C6	Rear Defogger Timer/Relay	4-Way Connector	8A-61-1

C4



12015664

4-WAY F METRI-PACK 630 SERIES
BLK



12059296

5-WAY F METRI-PACK 480 SERIES
RED

REAR DEFOGGER SWITCH/TIMER CONNECTOR (CHEVY)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Rear Defogger Grid	Mounted on rear windshield	4	7	
Rear Defogger Switch	Part of HVAC Assembly	21	39	
Rear Defogger Switch/Timer	Mounted on I/P knee bolster, right of Steering Column	37	66	202-27
Rear Defogger Timer/Relay	Part of HVAC Assembly	21	39	
C320 (1 cavity)	Under left Interior Garnish Molding above left rear wheelhouse			
C330 (3 cavities)	Hatch to I/P Harn, center of roof near Dome Lamp	4	6	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G310	Bolted to roof, left of Dome Lamp (1 ring, 1 wire)	4	6	
G320	Bolted to body frame above RH rear wheelhouse			
P300	In rear center of roof, near Dome Lamp	4	7	
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S248	I/P Harn, approx 4 cm before RR Defog Switch (Chevy) or from Instrument Cluster (Pont) breakouts			
S252	I/P Harn, approx 17 cm back from HVAC Controls (Pont) or RR Defogger Switch/Timer (Chevy)			
S315	I/P Harn, approx 19 cm from conn C410			
S420	Hatch Harn, approx 7 cm from P300	4	7	

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check Fuse 3. If open, refer to Chart #2.
2. Check Rear Defogger Grid for opens, refer to SECTION 10-2.
3. Check that grounds G200, G310 and G320 are clean and tight.

- 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 procedure(s).

SYSTEM CHECK (CHEVY)

ACTION	NORMAL RESULTS
[1] • Engine running. • Turn Rear Defogger Control Switch to "ON" and release.	Switch returns to "REST" position. Rear Defogger Indicator is "ON" and Rear Defogger Grid becomes warm. Defogger Grid(s) and Indicator turn "OFF" in approximately 10 minutes.
[2] • After first 10 minute time period, with Engine still running, turn Rear Defogger Control Switch to "ON" and release.	Switch returns to "REST" position. Indicator and Defogger Grid(s) remain "ON" for approximately 5 minutes and then turn "OFF."

SYSTEM CHECK (PONTIAC)

ACTION	NORMAL RESULTS
[1] • Engine running. • Press Rear Defogger Switch once and release.	Switch returns to "REST" position. Rear Defogger Indicator is "ON" and Rear Defogger Grid becomes warm. Indicator and Rear Defogger Grid turn "OFF" in approximately 10 minutes.
[2] • Press Rear Defogger Switch once and release.	Switch returns to "REST" position. Indicator and Rear Defogger Grid remain "ON" for 5 minutes and then turn "OFF."
[3] • Press Rear Defogger Switch once and release. • Press Rear Defogger Switch a second time and release.	Indicator and Rear Defogger Grid remain "ON" until the Rear Defogger Switch is pressed a second time.

DEFOGGER

SYMPTOM TABLE (CHEVY)

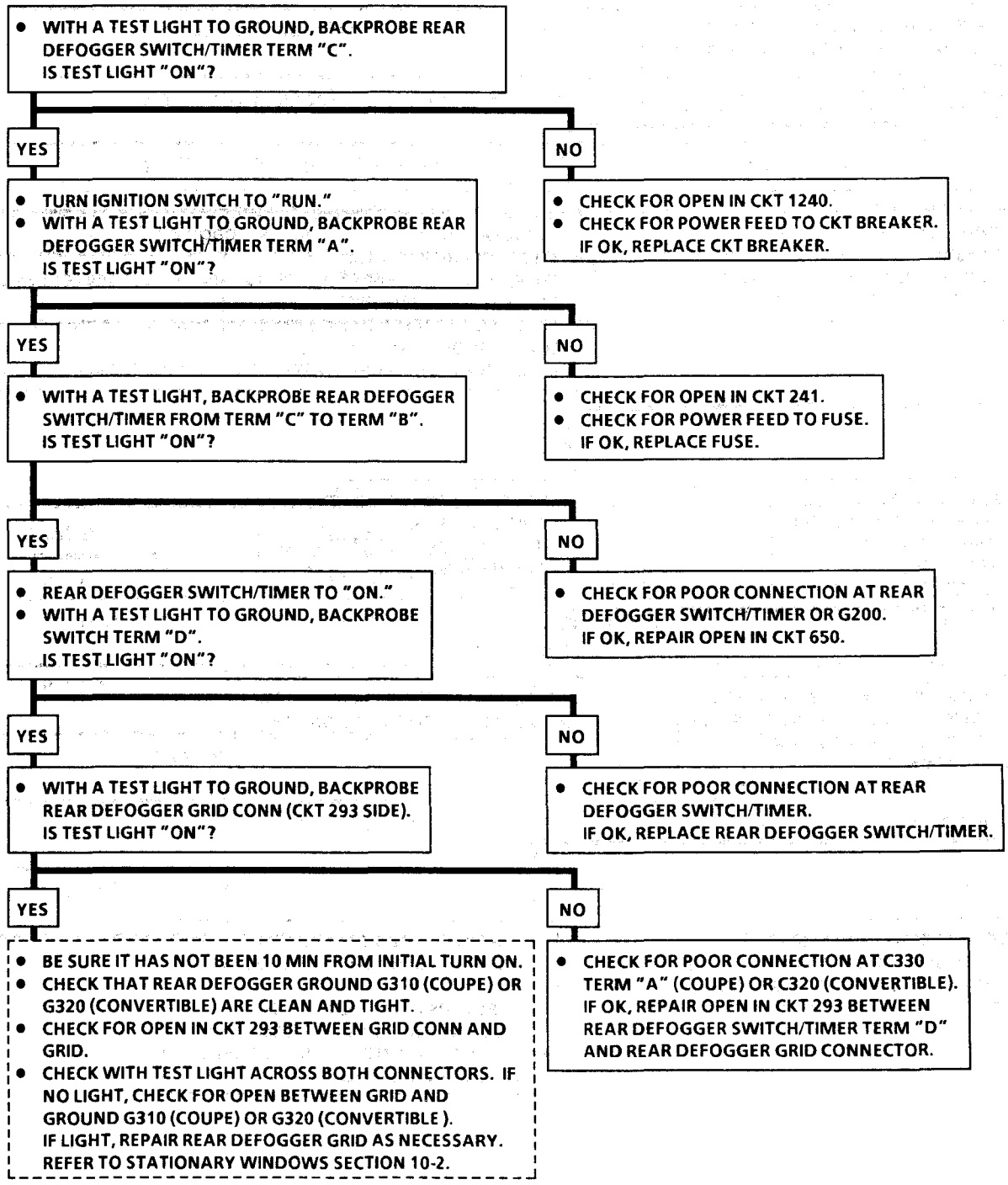
SYMPTOM	PROCEDURE	PAGE NUMBER
Rear Defogger Grid inoperative, Indicator may or may not light.	Chart #1	8A-61-5
Indicator inoperative, but Rear Defogger Grid operates normally.	Replace Rear Defogger Switch/Timer.	
Rear Defogger Grid and Indicator will not cycle "ON/OFF" for 10 minutes or 5 minutes.	Replace Rear Defogger Switch/Timer.	
Rear Defogger Control Switch does not return to "REST" position.	Replace Rear Defogger Switch/Timer.	
Illumination Lamp inoperative.	Refer to "Interior Lights," page 8A-117-0.	
Fuse #3 blows when attempting to operate rear defogger.	Chart #5	8A-61-8

SYMPTOM TABLE (PONTIAC)

SYMPTOM	PROCEDURE	PAGE NUMBER
Rear Defogger Grid and Indicator inoperative.	Chart #2	8A-61-6
Rear Defogger Grid inoperative but Indicator operates normally.	Chart #3	8A-61-7
Indicator inoperative but Rear Defogger Grid operates normally.	Chart #4	8A-61-8
Rear Defogger Grid and Indicator operative, but will not cycle "ON/OFF" for 10 minutes or 5 minutes.	Replace Rear Defogger Timer/Relay.	
Rear Defogger Switch does not return to "REST" position.	Replace Rear Defogger Switch.	
Fuse #3 blows when attempting to operate rear defogger.	Chart #5	8A-61-8

CHART #1

REAR DEFOGGER GRID INOPERATIVE. INDICATOR MAY OR MAY NOT LIGHT.



DEFOGGER

CHART #2
REAR DEFOGGER GRID AND INDICATOR INOPERATIVE

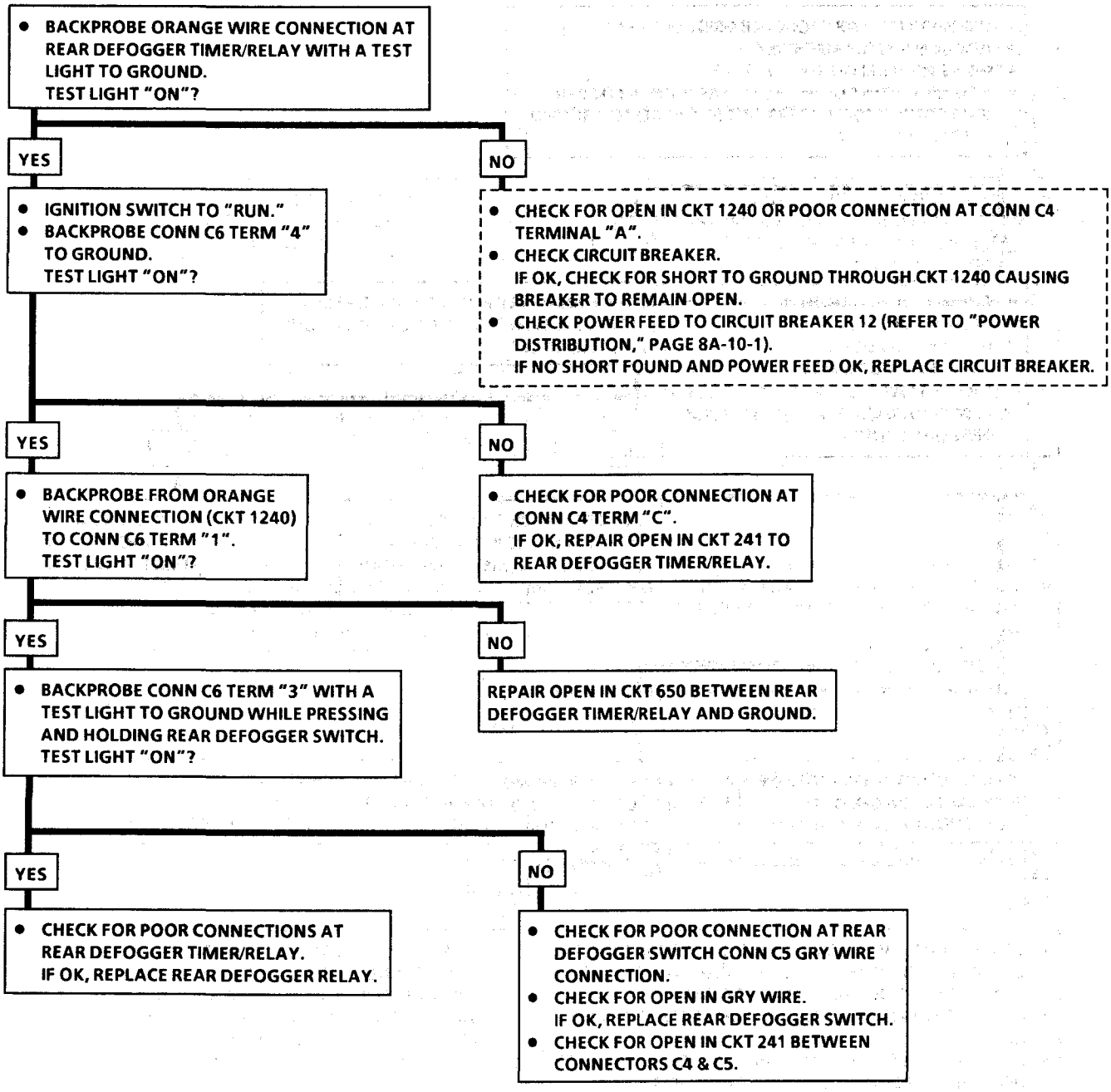
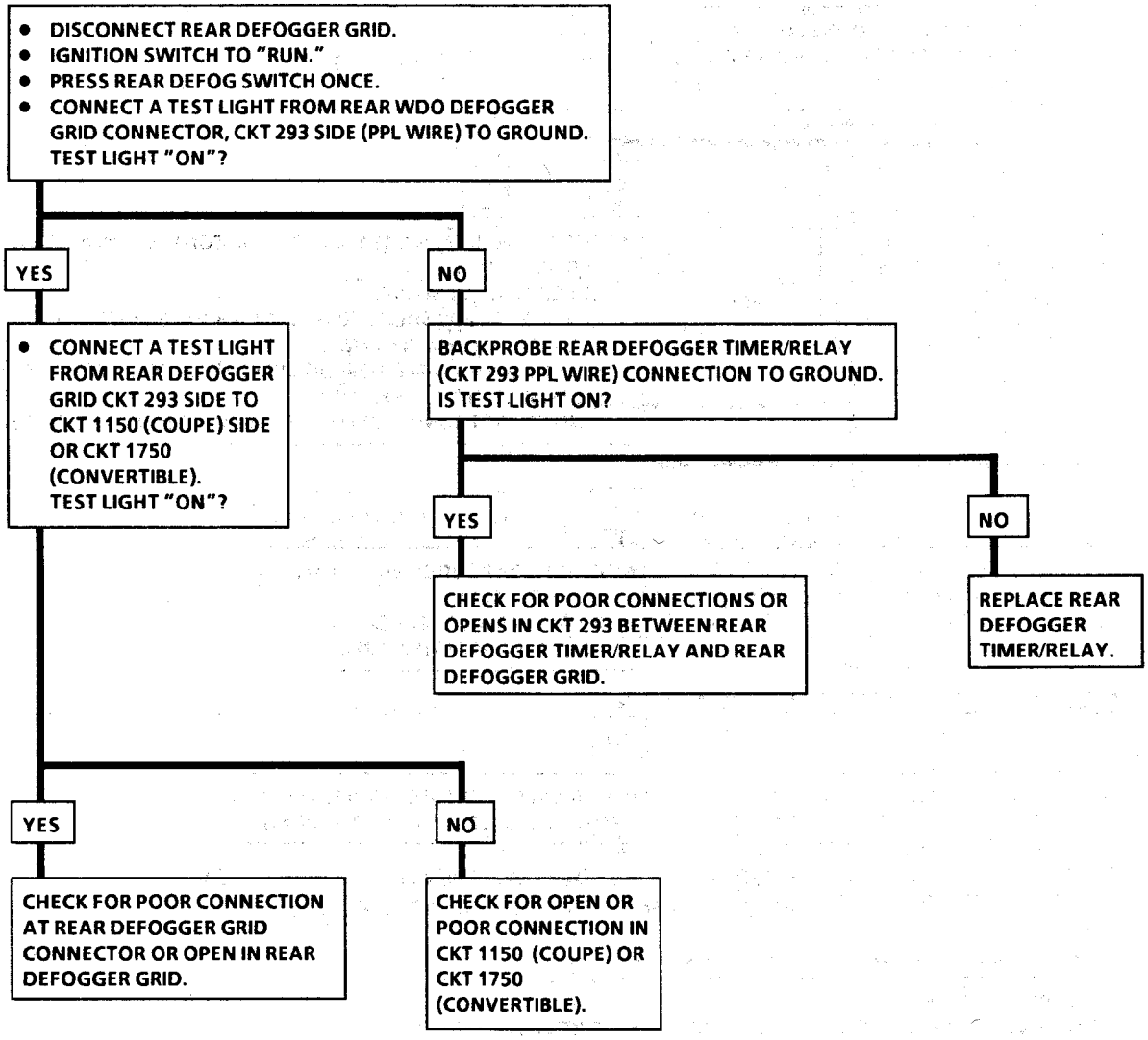


CHART #3
REAR DEFOGGER GRID INOPERATIVE BUT INDICATOR OPERATES NORMALLY



DEFOGGER

CHART #4
INDICATOR INOPERATIVE BUT REAR DEFOGGER GRID OPERATES NORMALLY

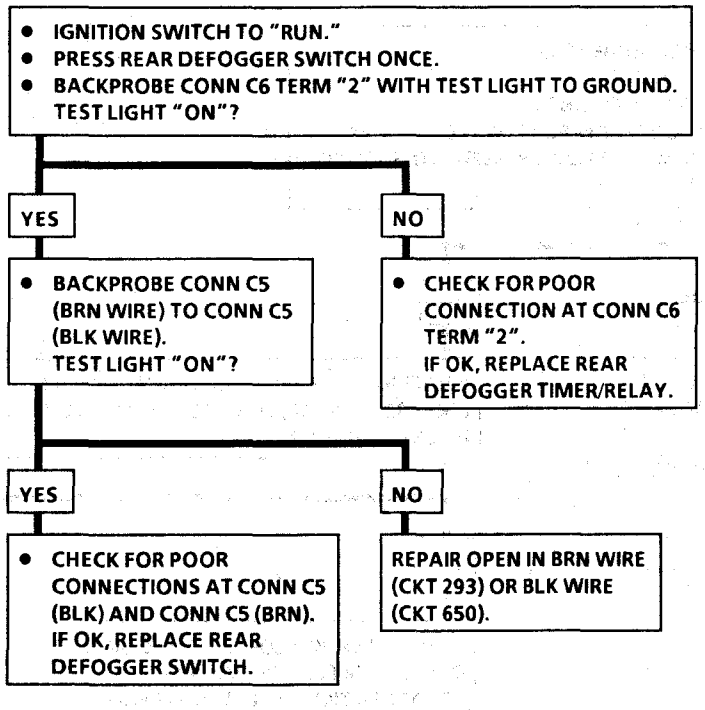
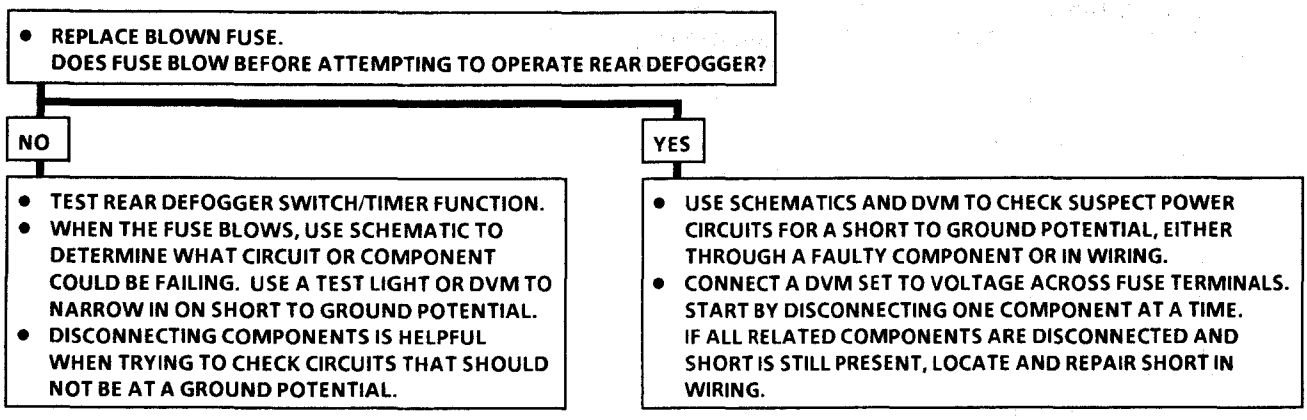


CHART #5
HVAC FUSE 3 REPEATEDLY BLOWS WHENEVER IGNITION IS "ON" OR WHEN ATTEMPTING TO USE REAR DEFOGGER



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."

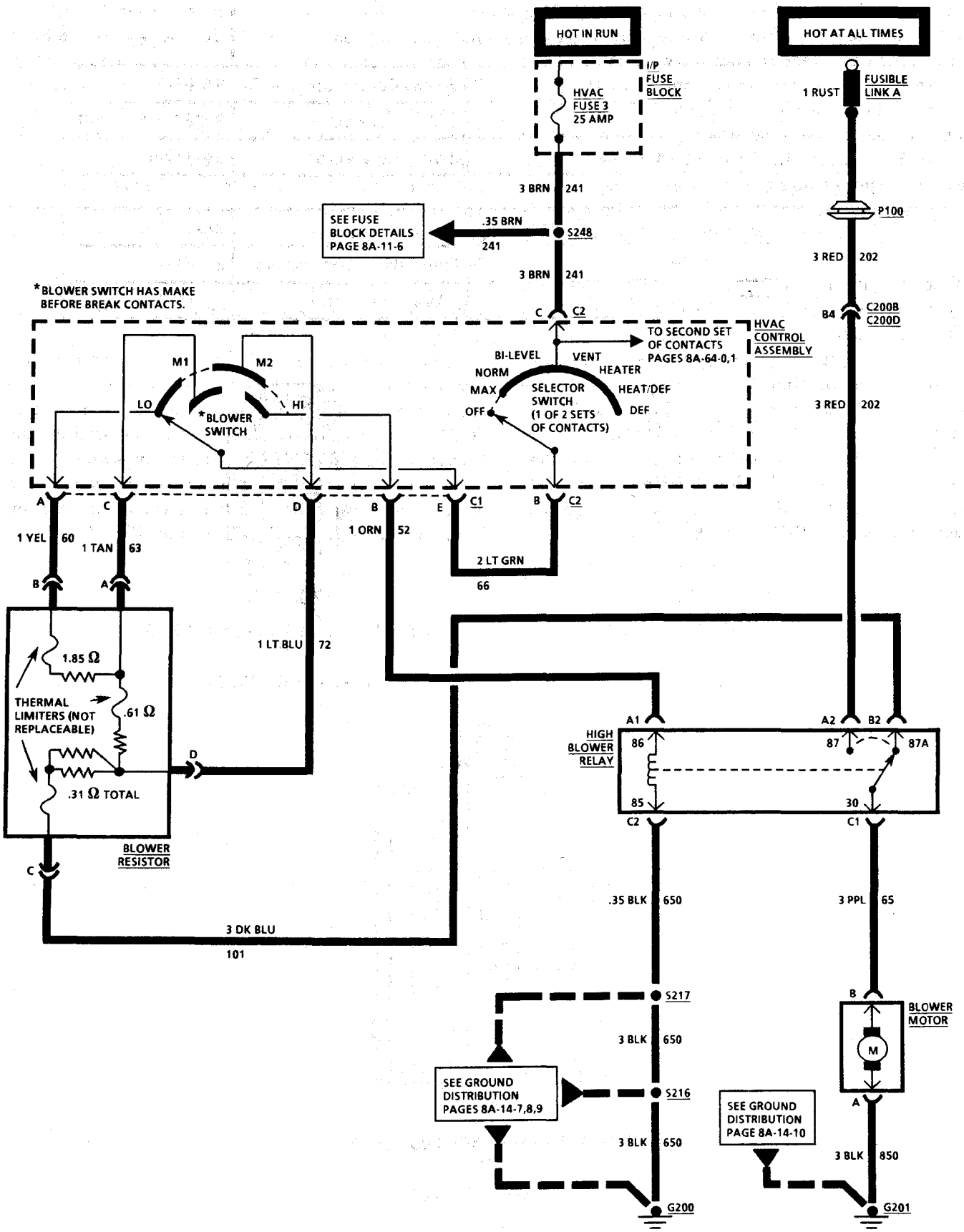
CIRCUIT OPERATION (PONTIAC)

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.

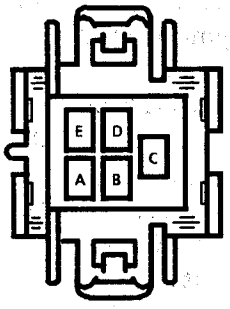
The Rear Defogger Timer/Relay contains an internal timer to control the time the internal contacts are closed. When the Ignition Switch is turned to "RUN" and the Rear Defogger Switch pressed for the first time, the defog cycle lasts 10 minutes and further operation will result in 5 minutes defog cycles.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

HVAC BLOWER CONTROL (C60)



HVAC CONTROL ASSEMBLY CONNECTOR DESCRIPTIONS			PAGE
C1	Blower Switch	5-Way Connector	8A-63-0
C2	Selector Switch	3-Way Connector	8A-63-0, 8A-64-0
C3	Illumination Lamps Jumper	2-Way Connector	8A-117-1
PONTIAC ONLY			
C4	HVAC Control Assembly to I/P Harness	4-Way Connector	8A-61-1
C5	Rear Defogger Switch	Four 1-Way Connectors	8A-61-1
C6	Rear Defogger Timer/Relay	4-Way Connector	8A-61-1

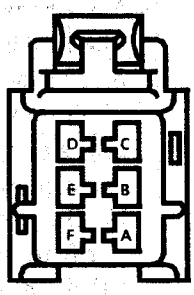
C1



12020813

5-WAY F METRI-PACK 630 SERIES
BLK

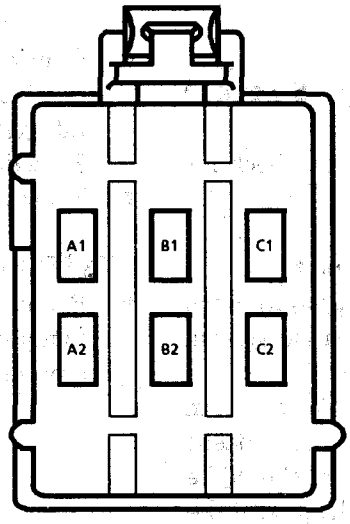
HVAC BLOWER SWITCH (C1)



12064752

6-WAY F METRI-PACK 280 SERIES
BLK

BLOWER RESISTOR



12110541

6-WAY F METRI-PACK 280 FLX LK
BLK

HIGH BLOWER RELAY

HVAC BLOWER CONTROL (C60)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Blower Motor	Under lower RH side of I/P, mounted in HVAC Module	20	37	
Blower Resistor	In HVAC Module, forward and left of Temperature Control Cable Attachment			202-20
Blower Switch	Part of HVAC Control Assembly	21	39	
Fusible Links	Above RH Shock Tower	10	19	
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
High Blower Relay	Under I/P, above left side of floor tunnel	42	77	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Selector Switch	Part of HVAC Control Assembly	21	39	
C200B (18 cavities)	Part of Forward Lamp 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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S248	I/P Harn, approx 4 cm before RR Defog Switch (Chevy) or from Instrument Cluster (Pont) breakouts			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check HVAC Fuse 3 for open. If open, check for short to ground through CKT 241.
2. Check Fusible Link A.
3. Check that G201 and G200 are clean and tight.

- 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.

SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Ignition Switch in "RUN." • Blower Switch in "LO." • Selector Switch in "VENT."	Blower Motor runs at low speed.
[2] • Blower Switch in "M1".	Blower Motor runs faster than in low speed.
[3] • Blower Switch in "M2".	Blower Motor runs faster than "M1" speed.
[4] • Blower Switch in "HI."	Blower Motor runs at high speed.
[5] • Put Selector Switch in "VENT," "BI-LEV," "HEAT," "DEFOG" and "DEF."	Blower continues to run at high speed.
[6] • Put Selector Switch in "OFF."	Blower Motor stops.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Blower Motor does not operate in "HI," but does operate in "LO," "M1" or "M2".	Chart #1	8A-63-4
Blower Motor does not operate at all.	Chart #2	8A-63-5
Blower Motor will only operate in "HI."	Chart #3	8A-63-6
One Blower speed inoperative, other than "HI."	Chart #4	8A-63-6
Blower Motor operates in "HI" continuously with Ignition Switch "OFF."	• Disconnect High Blower Relay. • If Blower Motor stops, replace High Blower Relay. • If Blower Motor continues to run, repair short to B + in CKT 101.	

HVAC BLOWER CONTROL (C60)

CHART #1
BLOWER MOTOR DOES NOT OPERATE IN "HI," BUT DOES OPERATE IN "LO," "M1" OR "M2"

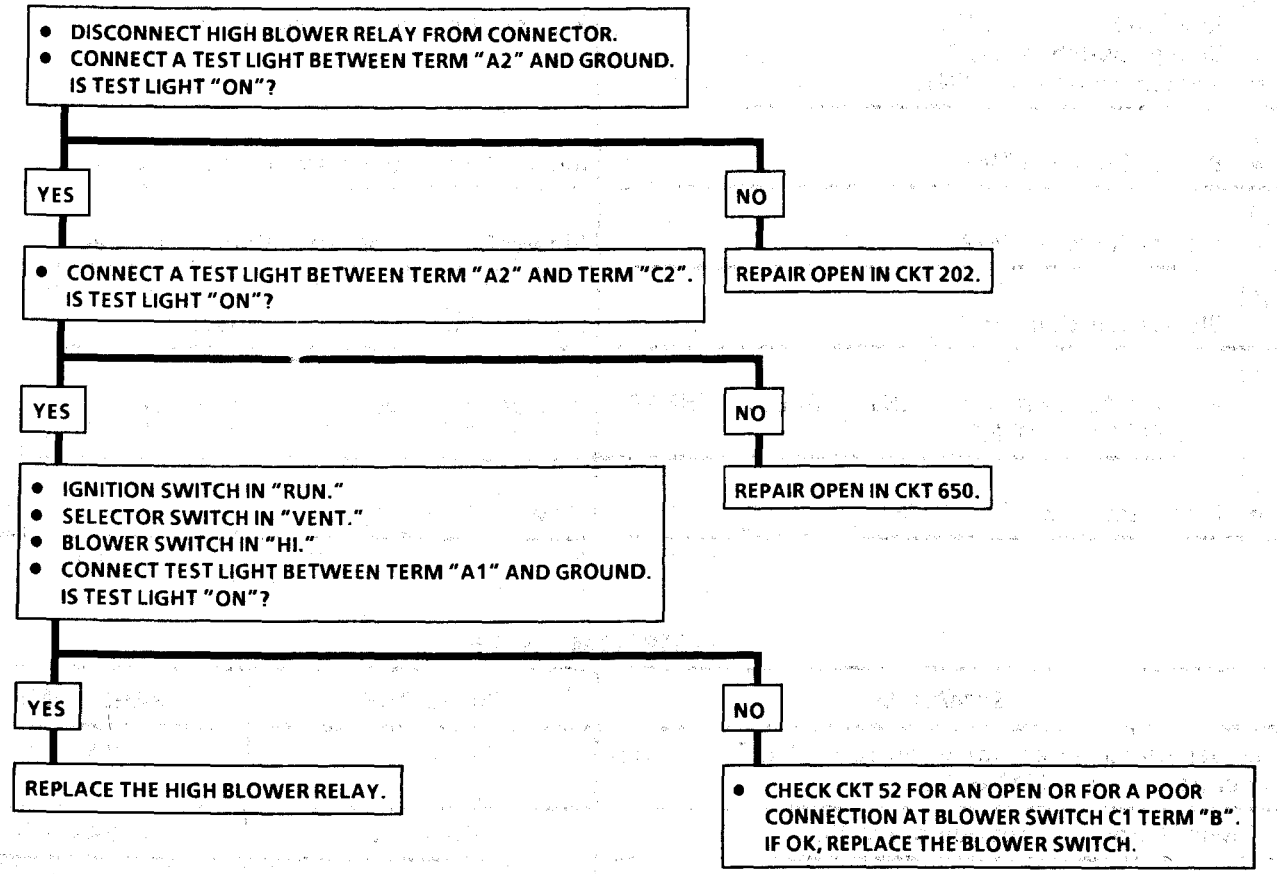
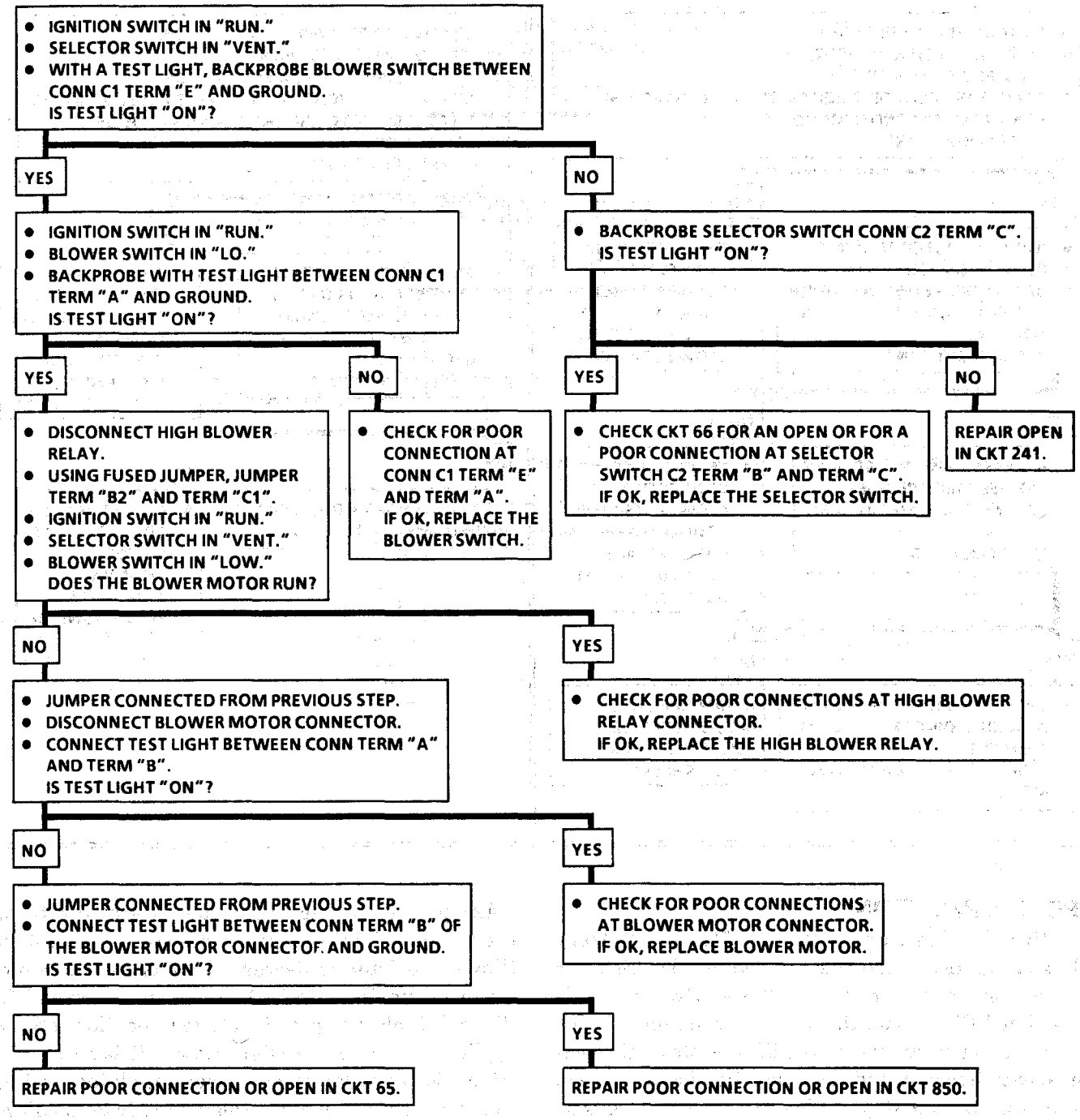


CHART #2
BLOWER MOTOR DOES NOT OPERATE AT ALL



HVAC BLOWER CONTROL (C60)

CHART #3
BLOWER MOTOR WILL ONLY OPERATE IN "HI"

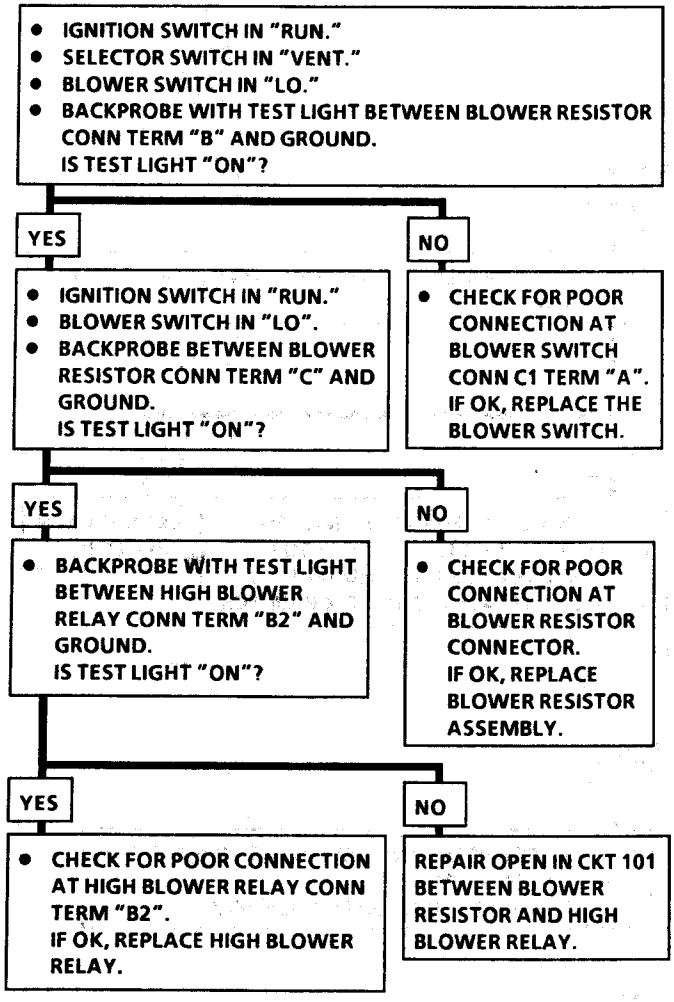
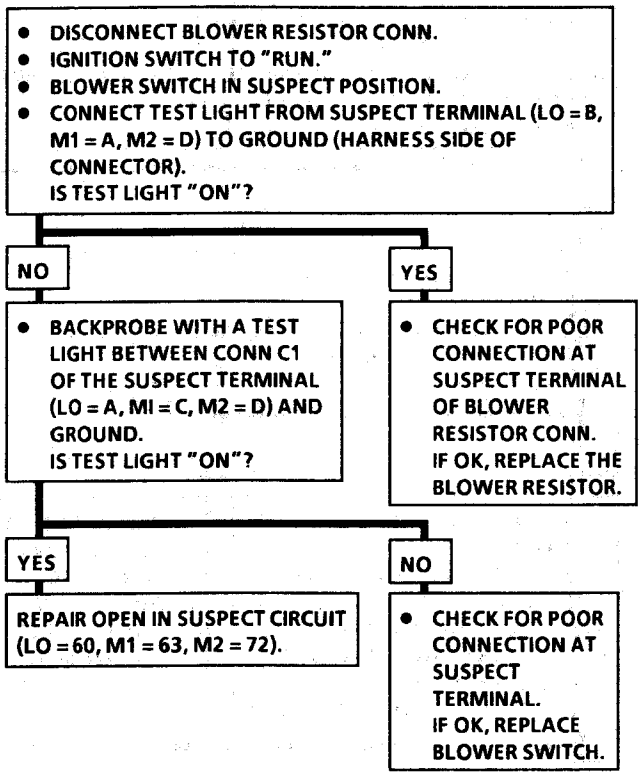


CHART #4
ONE BLOWER SPEED INOPERATIVE, OTHER THAN "HI"

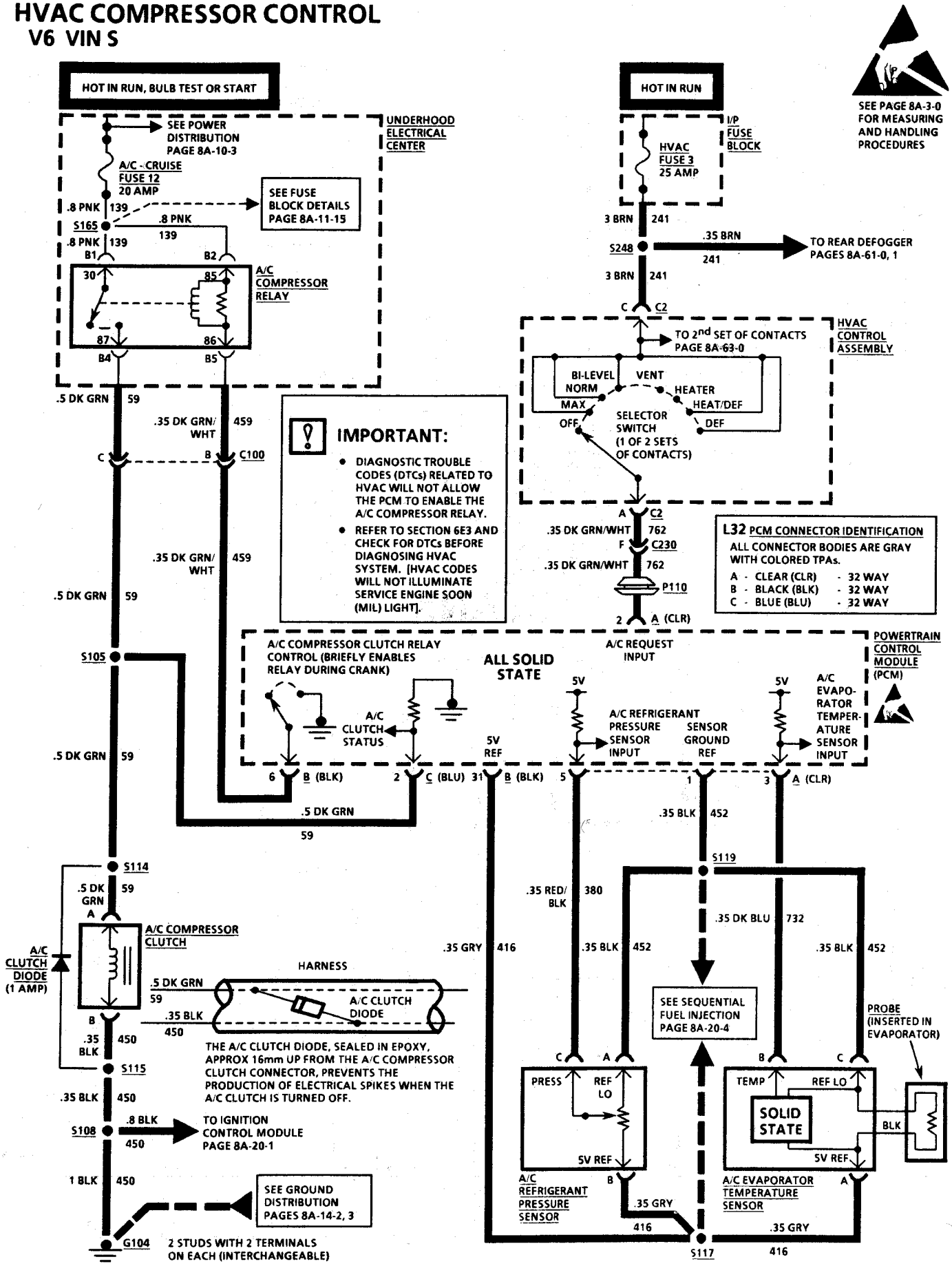


CIRCUIT OPERATION

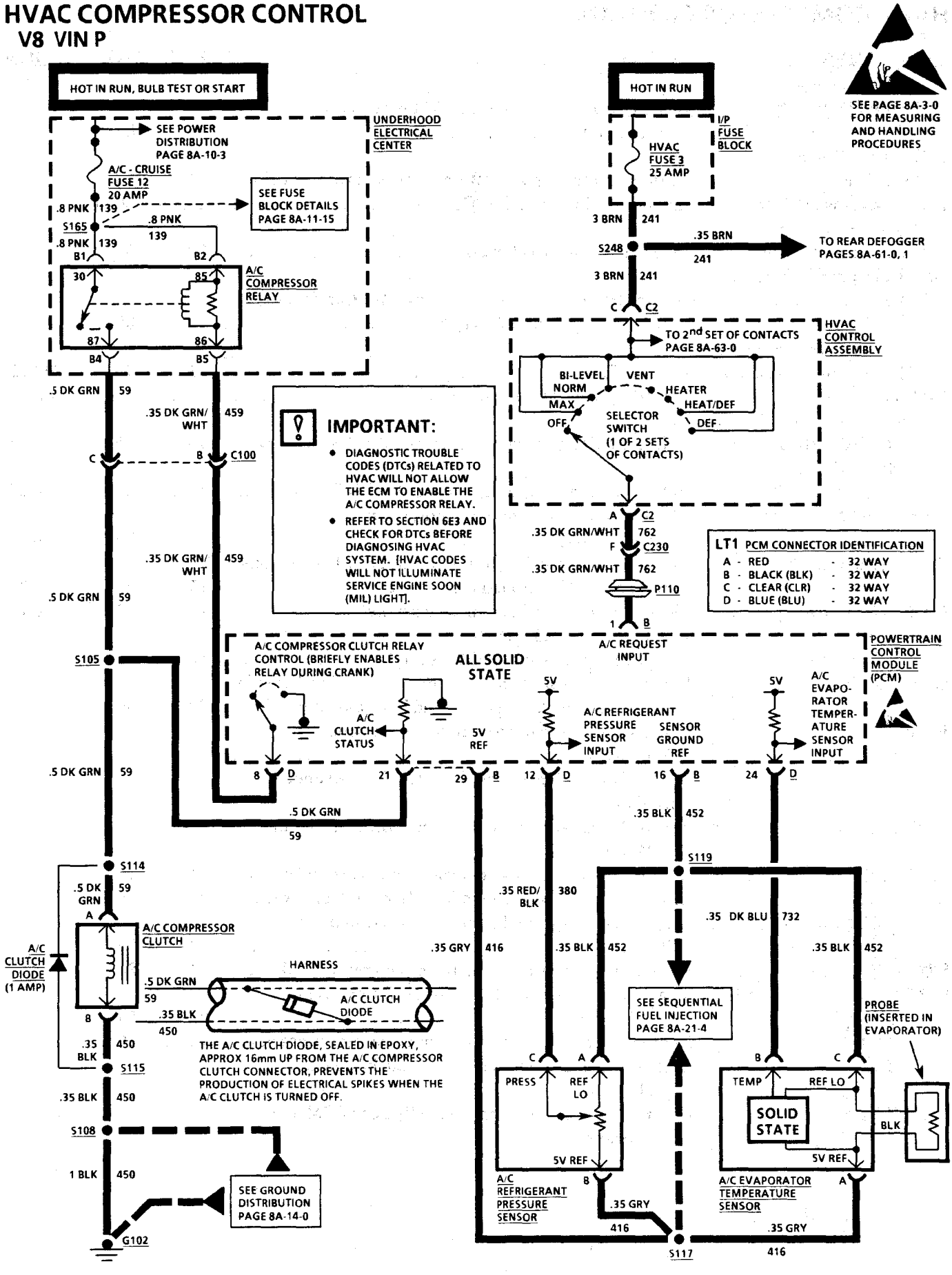
With the Ignition Switch in "RUN," battery voltage is applied to the Selector Switch. The Selector Switch applies power to the Blower Switch in all modes but "OFF." With the Blower Switch set to "LO," battery voltage is applied to the Blower Motor through the Blower Resistor and the normally closed contacts of the High Blower Relay. The Blower Motor runs at low speed. When the Blower Switch is in the "M1" or "M2" positions, the operation is similar to the operation in "LO" except the resistance through the Blower Resistor is decreased, causing the Blower Motor to run faster in "M1" and even faster in "M2". When "HI" blower speed is selected, the Blower Switch applies voltage to the High Blower Relay coil. The High Blower Relay is energized, applying voltage from CKT 202 through the relay directly to the Blower Motor. The Blower Motor then runs at high speed.

BLANK

HVAC COMPRESSOR CONTROL
V6 VIN S



HVAC COMPRESSOR CONTROL
V8 VIN P



HVAC COMPRESSOR CONTROL

COMPONENT	LOCATION	201-PG	FIG.	CONN
A/C Clutch Diode (V6 VIN S)	Sealed in Harn, 10 cm from A/C Compressor Clutch Conn	28	54	
A/C Clutch Diode (V8 VIN P)	Sealed in Harn, approx 12 cm from Generator breakout	14	26	
A/C Compressor Clutch	RH side of Engine, below Generator	14, 28	26, 54	
A/C Evaporator Temperature Sensor	Mounted in Evaporator Core	20	37	
A/C Refrigerant Pressure Sensor	Above RH Shock Tower, forward of A/C Compressor Low Pressure Cut-off Switch	19	35	
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C100 (10 cavities)	Engine to Forward Lamp Harn, behind LH wheelhouse, attached to PCM bracket	15	28	202-0
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
G102 (LT1)	Front of LH cylinder head (3 rings, 3 wires and braided strap)	16	29	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S105 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S105 (LT1)	Engine Harn, approx 11 cm from main branch and PCM breakout			
S108 (L32)	Engine Harn, approx 4 cm from braided ground strap	11	20	
S108 (LT1)	Engine Harn, approx 17 cm from Injector 3 breakout	24	44	
S114 (L32)	Engine Harn, approx 10 cm from A/C Compressor Clutch Conn	28	54	
S114 (LT1)	Engine Harn, approx 12 cm from Generator breakout	14	26	
S115 (L32)	Engine Harn, approx 10 cm from A/C Compressor Clutch Conn	28	54	
S115 (LT1)	Engine Harn, approx 12 cm from Generator breakout	14	26	
S117 (L32)	Engine Harn, approx 5 cm from main branch and PCM breakout			
S117 (LT1)	Engine Harn, approx 5 cm from clip near PCM and main branch			

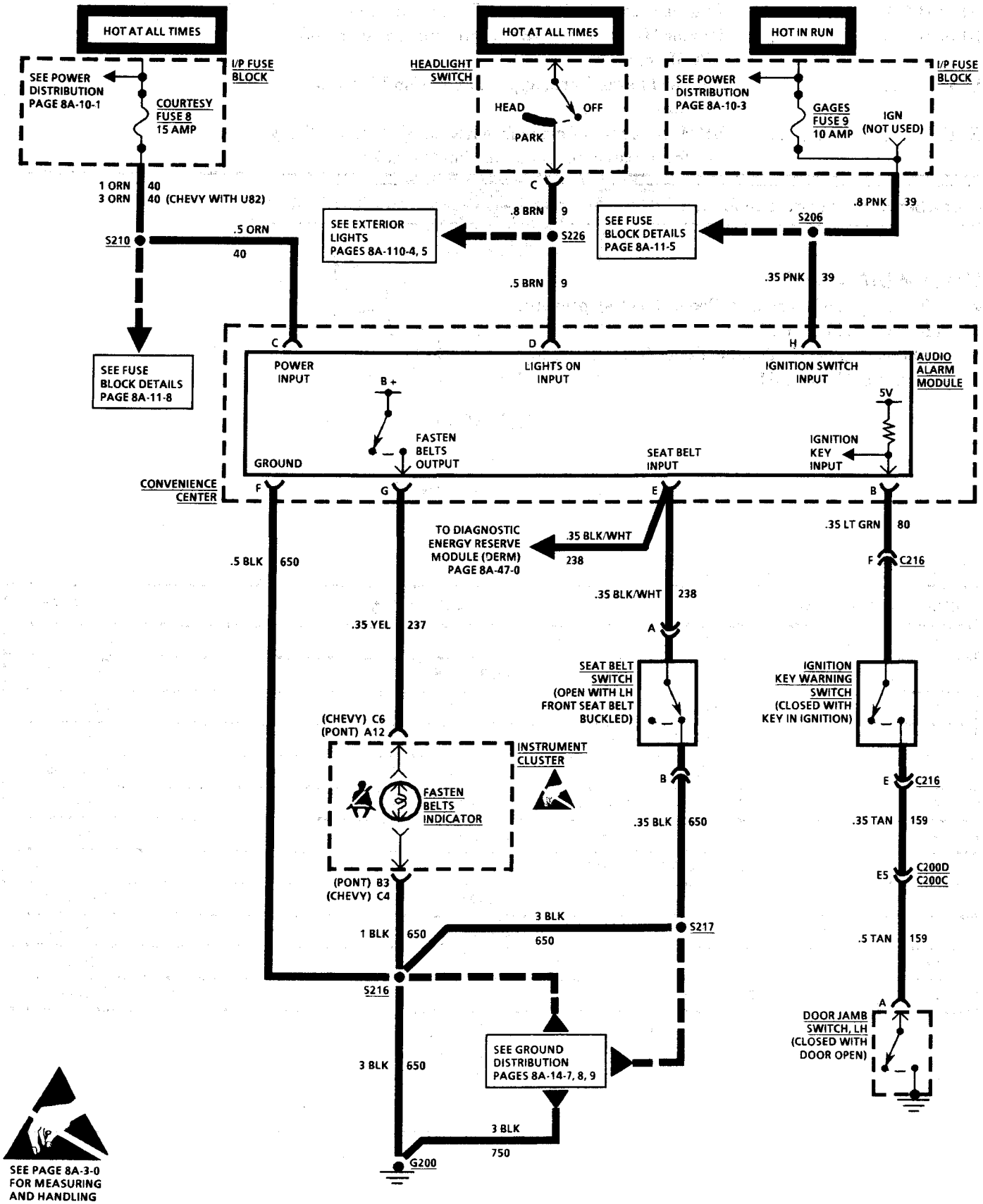
COMPONENT	LOCATION	201-PG	FIG.	CONN
S119 (L32)	Engine Harn, at RH Oxygen Sensor breakout	12	23	
S119 (LT1)	Engine Harn, approx 18 cm from main branch and PCM breakout			
S165	Forward Lamp Harn, approx 7 cm from Electrical Center breakout			
S248	I/P Harn, approx 4 cm before RR Defog Switch (Chevy) or from Instrument Cluster (Pont) breakouts			

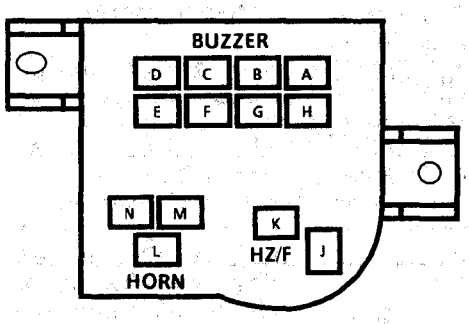
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

- With Diagnostic Trouble Codes (DTCs) present, refer to SECTION 6E3.
- Without Diagnostic Trouble Codes (DTCs) present, refer to SECTION 1B1.

AUDIBLE WARNINGS: TONE





12015999

BLK

CONVENIENCE CENTER

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
B	LT GRN	80	KEY-IN-IGNITION SIGNAL	8A-76-0
C	ORN	40	POWER FEED FROM COURTESY FUSE #8	8A-11-8
D	BRN	9	PARK LIGHT ON FEED	8A-76-0
E	BLK/WHT	238	SEAT BELT SWITCH SIGNAL	8A-76-0
F	BLK	650	GROUND	8A-14-8
G	YEL	237	SEAT BELT INDICATOR LAMP CONTROL	8A-76-0
H	PNK	39	POWER FEED FROM GAGES FUSE #9	8A-11-5
J	BRN	27	HAZARD FLASHER OUTPUT	8A-110-4
K	ORN	140	POWER FEED FROM STOP/HAZARD FUSE #6	8A-11-7
L	ORN	540	POWER FEED FROM CIGAR/HORN FUSE #7	8A-11-8
M	BLK	28	HORN RELAY CONTROL	8A-40-0
N	DK GRN	29	HORN FEED	8A-40-0

AUDIBLE WARNINGS: TONE

COMPONENT	LOCATION	201-PG	FIG.	CONN
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Door Jamb Switch, LH	Near base of LH "A" pillar	45	84	
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Key Warning Switch	Part of Steering Column	3	5	
Instrument Cluster	LH side of I/P			202-23
Seat Belt Switch	Part of Driver's Seat Buckle Assembly	43	81	
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
C216 (11 cavities)	Attached to base of Steering Column	34	63	202-5
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S210	I/P Harn, approx 44 cm from Convenience Center (Pont) or 12 cm from RR Defog Switch (Chevy) breakouts			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- Check that G200 is clean and tight.
- If Ignition Key warning is inoperative check the LH Door Jamb Switch or for open in CKT 159.
- If all warning chimes are inoperative, check Courtesy Fuse 8 for open.
- 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 procedure(s).

SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] LIGHTS "ON" WARNING • Remove Ignition Key from Ignition Switch. • Headlamp Switch to "PARK" or "HEAD." • Headlamp Switch to "OFF."	Lights "ON" Warning sounds as long as the Headlight Switch is in "HEAD" or in "PARK."
[2] IGNITION KEY WARNING • Ignition Key in Ignition Switch. • Ignition Switch to "OFF." • Open LH door. • Close LH door.	Ignition Key Warning Tone sounds as long as the LH door is open.

(CONTINUED ON NEXT PAGE)

(CONTINUED FROM PREVIOUS PAGE)

SYSTEM CHECK

ACTION	NORMAL RESULTS
[3] IGNITION KEY WARNING • Driver's seat belt latched. • Ignition Switch to "RUN." • Open LH door. • Close LH door.	No tone sounds.
[4] SEAT BELT WARNING • Ignition Switch to "OFF." • Close LH door. • Driver's seat belt unlatched. • Ignition Switch to "RUN."	Seat Belt Warning Tone sounds for 5 to 8 seconds. Fasten Belts Indicator stays "ON."
[5] SEAT BELT WARNING • Close LH door. • Latch driver's seat belt. • Ignition Switch to "OFF" and back to "RUN."	Seat Belt Warning Tone does not sound and does not illuminate.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
All warnings inoperative.	Chart #1	8A-76-4
Ignition Key Warning inoperative.	Chart #2	8A-76-4
Seat Belt Warning inoperative.	Chart #3	8A-76-5
Fasten Belts Indicator "ON" continuously.	Chart #4	8A-76-5
Fasten Belts Indicator inoperative.	Chart #5	8A-76-5
Lights "ON" Warning inoperative.	Check for poor connection at Convenience Center terminal "D" or open in CKT 9 to the Audio Alarm Module. If OK, replace Audio Alarm Module.	
Lights "ON" Warning sounds continuously with Ignition Switch in "RUN."	Check for poor connection at Convenience Center terminal "H" or open in CKT 39 to the Audio Alarm Module. If OK, replace Audio Alarm Module.	
Ignition Key Warning sounds when LH front door is open and key is not in Ignition Switch.	Check for short to ground in CKT 80. If OK, replace Ignition Key Warning Switch.	
Ignition Key Warning continues to sound when LH front door is closed and Ignition Switch is in "RUN."	Check for poor connection at Convenience Center terminal "H" or open in CKT 39 to the Audio Alarm Module.	
Seat Belt Warning sounds continuously.	Check for short to ground in CKT 238 or for Seat Belt Switch stuck closed. If OK, replace Audio Alarm Module.	

AUDIBLE WARNINGS: TONE

CHART #1
ALL WARNINGS INOPERATIVE

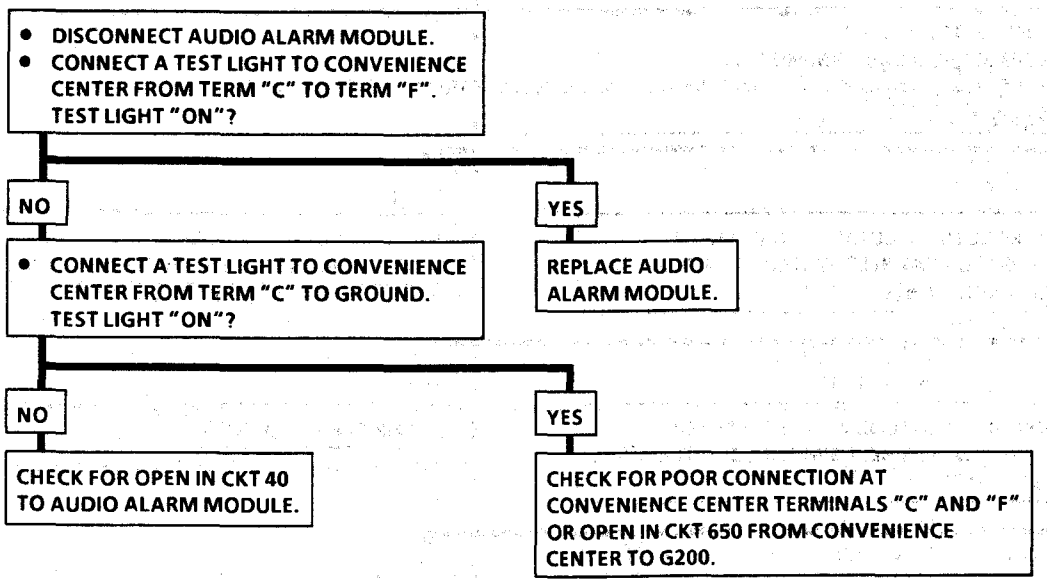


CHART #2
IGNITION KEY WARNING INOPERATIVE

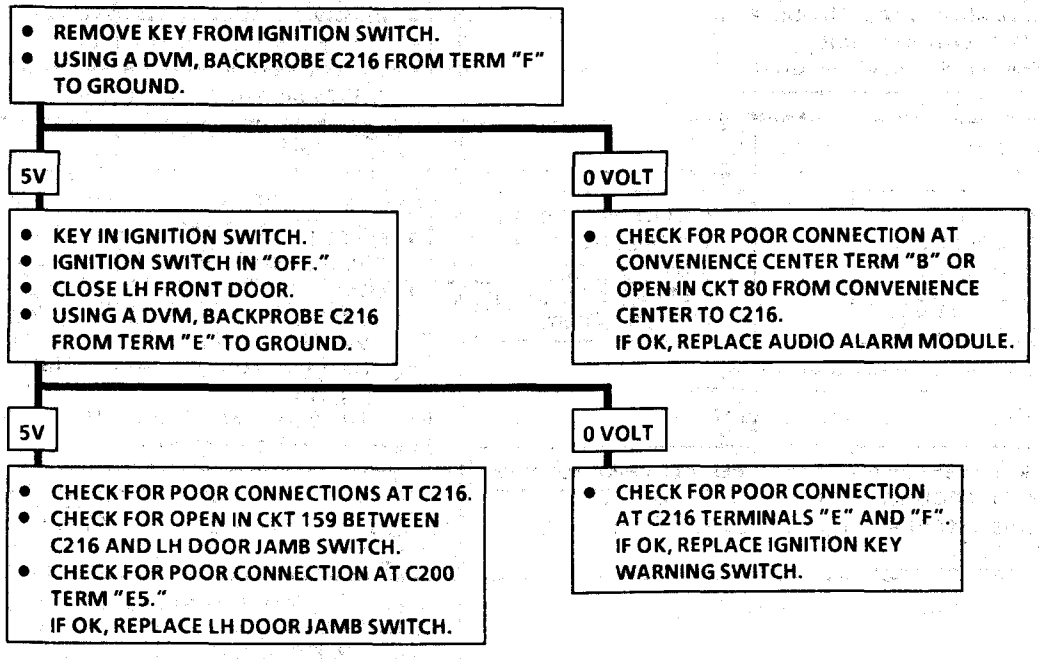


CHART #3
SEAT BELT WARNING INOPERATIVE

- SEAT BELT NOT BUCKLED.
- DISCONNECT AUDIO ALARM MODULE.
- WITH TEST LIGHT, BACKPROBE CONVENIENCE CENTER FROM TERM "C" TO TERM "E". IS TEST LIGHT "ON"?

NO
- BACKPROBE FROM CONVENIENCE CENTER TERM "G" TO SEAT BELT SWITCH CONN TERM "A". IS TEST LIGHT "ON"?

YES
- CHECK FOR POOR CONNECTION AT TERM "E". IF OK, REPLACE AUDIO ALARM MODULE.

NO
- BACKPROBE FROM CONVENIENCE CENTER TERM "G" TO SEAT BELT SWITCH CONN TERM "B". IS TEST LIGHT "ON"?

YES
REPAIR OPEN IN CKT 238.

NO
REPAIR OPEN IN CKT 650.

YES
- CHECK SEAT BELT SWITCH CONNECTION. IF OK, REPLACE SEAT BELT SWITCH.

CHART #4
FASTEN BELTS INDICATOR "ON" CONTINUOUSLY

- REMOVE AUDIO ALARM MODULE.
- IGNITION SWITCH TO "RUN." FASTEN BELTS INDICATOR "ON"?

NO
- PROBE WITH A TEST LIGHT BETWEEN SEAT BELT SWITCH CONN TERM "A" AND B+. IS TEST LIGHT "ON"?

YES
- CHECK FOR SHORT TO VOLTAGE TO CKT 237. IF OK, REPLACE INSTRUMENT CLUSTER PRINTED CIRCUIT.

YES
- CHECK CKT 238 FOR A SHORT TO GROUND. IF OK, REPLACE SEAT BELT SWITCH.

NO
REPLACE CHIME MODULE.

CHART #5
FASTEN BELTS INDICATOR INOPERATIVE

- REMOVE AUDIO ALARM MODULE.
- CONNECT A FUSED JUMPER FROM B+ TO THE CONVENIENCE CENTER TERM "G". FASTEN BELTS INDICATOR "ON"?

NO
- FUSED JUMPER STILL CONNECTED.
- CONNECT A TEST LIGHT TO INSTRUMENT CLUSTER CONN FROM TERM "A12" (PONT) OR "C6" (CHEVY). TO GROUND. TEST LIGHT "ON"?

YES
- CHECK FOR POOR CONNECTION AT AUDIO ALARM MODULE. IF OK, REPLACE AUDIO ALARM MODULE.

NO
REPAIR OPEN IN CKT 237 BETWEEN CONVENIENCE CENTER AND INSTRUMENT CLUSTER.

YES
- CHECK FOR POOR CONNECTION AT INSTRUMENT CLUSTER CONNECTOR.
- CHECK FASTEN BELTS INDICATOR LAMP. IF OK, REPLACE INSTRUMENT CLUSTER PRINTED CIRCUIT.

AUDIBLE WARNINGS: TONE

CIRCUIT OPERATION

The Audio Alarm Module generates a single tone for: Lights "ON" Warning, Ignition Key Warning and Fasten Belts Warning.

LIGHTS "ON" WARNING

When the Headlamp Switch is in "PARK" or "HEAD," voltage is applied to the Lights "ON" Input of the Audio Alarm Module. When the Ignition Switch is turned out of the "RUN" position, voltage is removed from the Ignition Switch Input of the Audio Alarm Module. When voltage is present at the Lights "ON" Input and no voltage applied to the Ignition Switch Input, the Audio Alarm Module will sound the Lights "ON" Warning.

IGNITION KEY WARNING

The Audio Alarm Module applies voltage at all times to the Ignition Key Warning Switch. When the Ignition Key is placed into the Ignition Switch, the Ignition Key Warning Switch is closed. When the LH front door is open, the LH Front Door Jamb Switch closes the circuit to ground. The Audio Alarm Module senses a voltage drop at the Ignition Key Input and will sound the Ignition Key Warning.

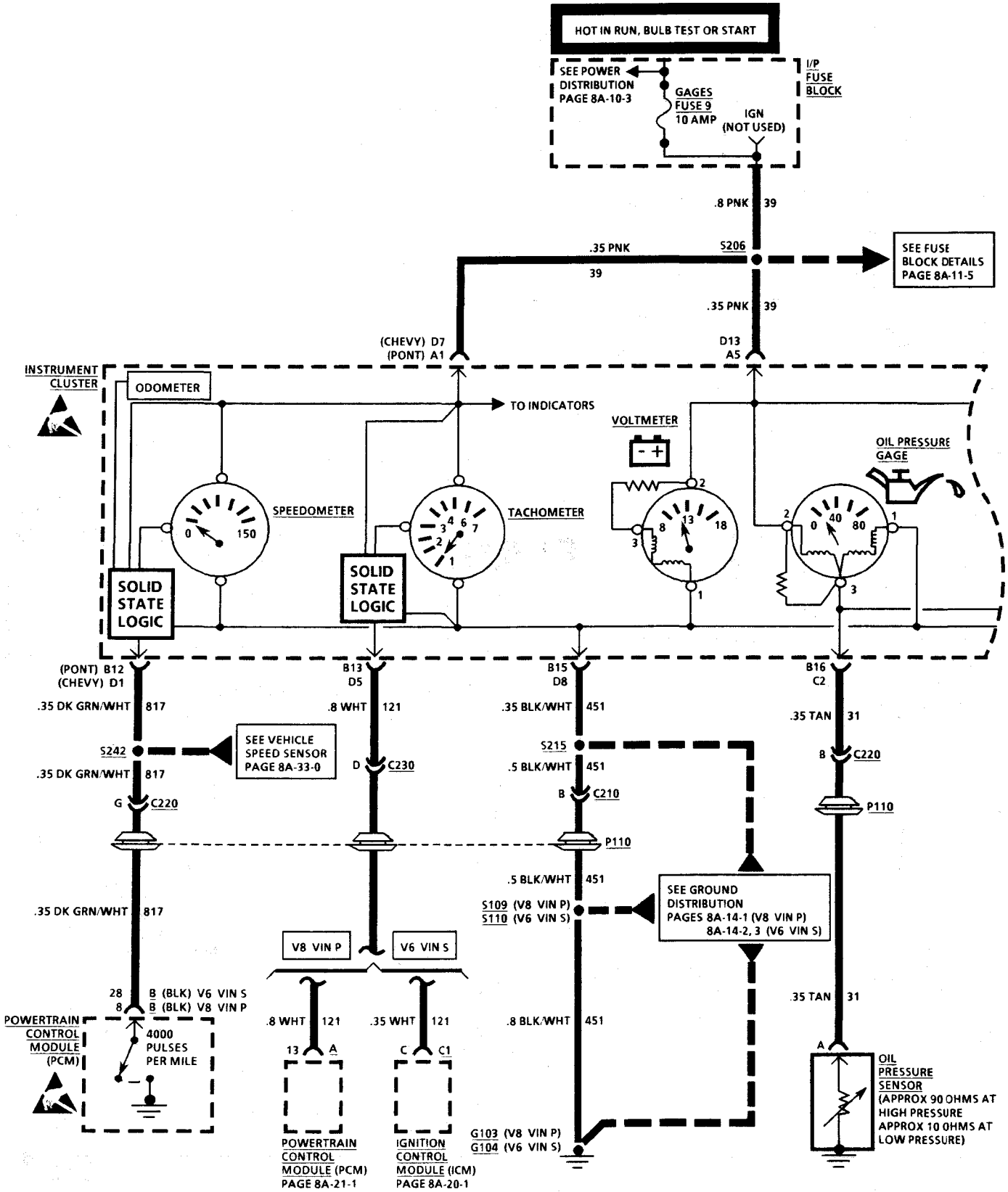
FASTEN BELTS WARNING

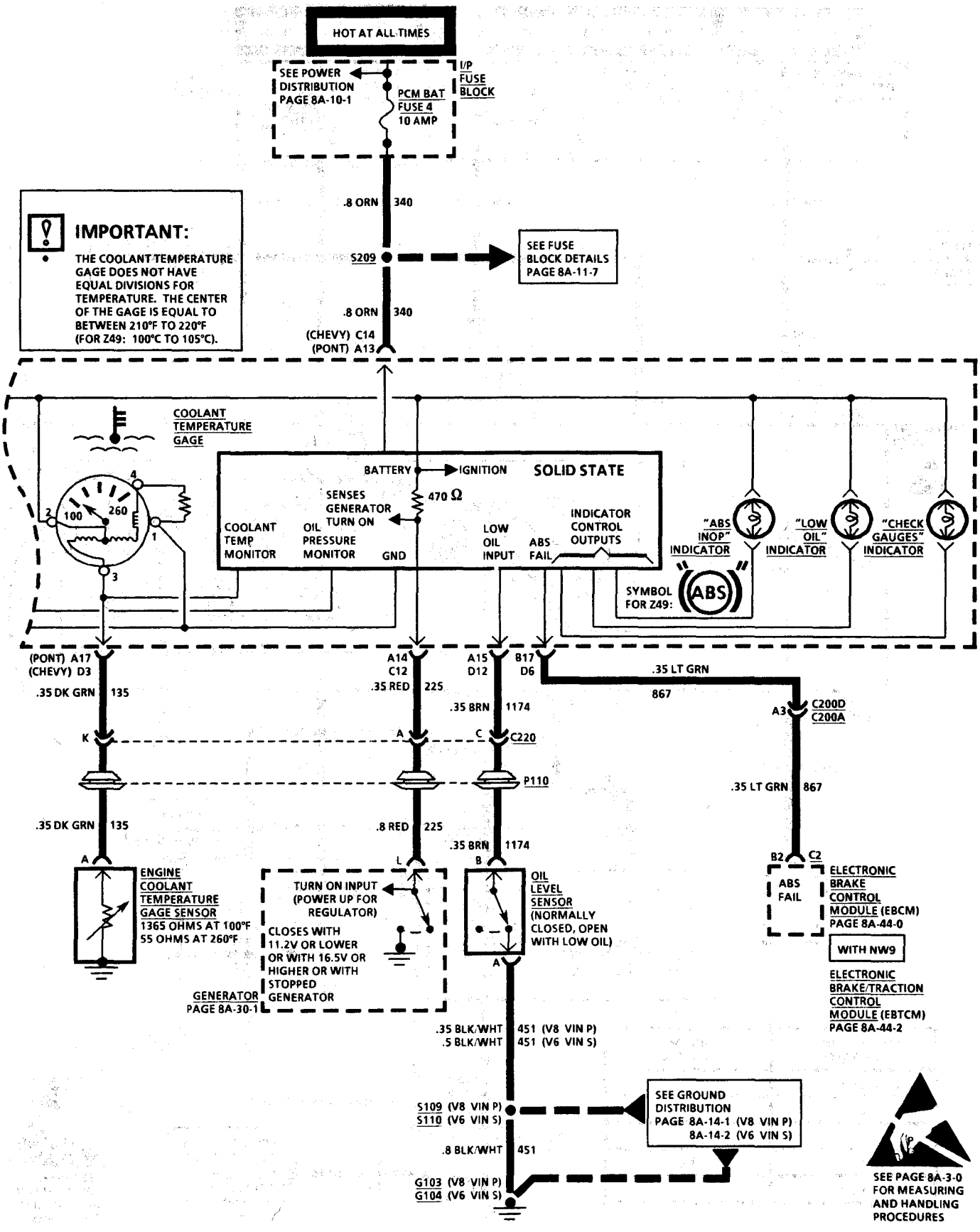
The Audio Alarm Module applies voltage to the Seat Belt Switch at all times. The Audio Alarm Module senses a voltage drop at the Seat Belt Input through the closed contacts of the Seat Belt Switch when the driver's seat belt is unlatched. When the driver's seat belt is latched, the Seat Belt Switch is opened and the Audio Alarm Module senses voltage at the Seat Belt Input. When the Ignition Switch is turned to "RUN," voltage is applied to the Audio Alarm Module Ignition Switch Input. When voltage is present at the Ignition Switch Input and zero volt at the Seat Belt Input, the Audio Alarm Module will sound the Fasten Belts Warning for 5 to 8 seconds. If voltage is present at the Ignition Switch Input and the Seat Belt Input, the Audio Alarm Module will disable the Fasten Belts Warning.

When the Ignition Switch is turned to "RUN," the Audio Alarm Module senses voltage at the Ignition Switch Input. When voltage is applied to the Ignition Switch Input, the Audio Alarm Module applies voltage to the Fasten Belts Indicator for 5 to 8 seconds independent of the Seat Belt Switch and Fasten Belts Warning.

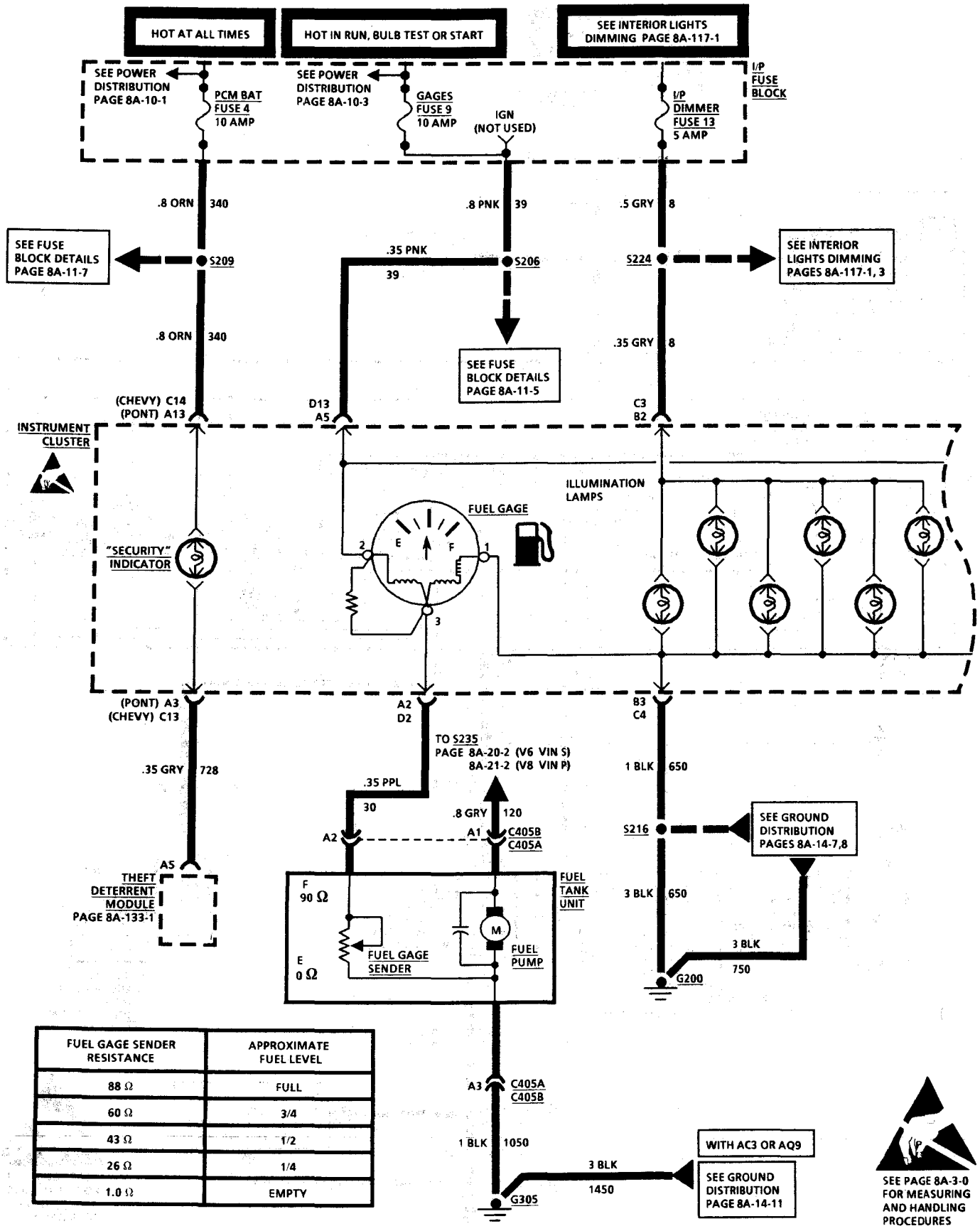
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INSTRUMENT CLUSTER: WITH GAGES

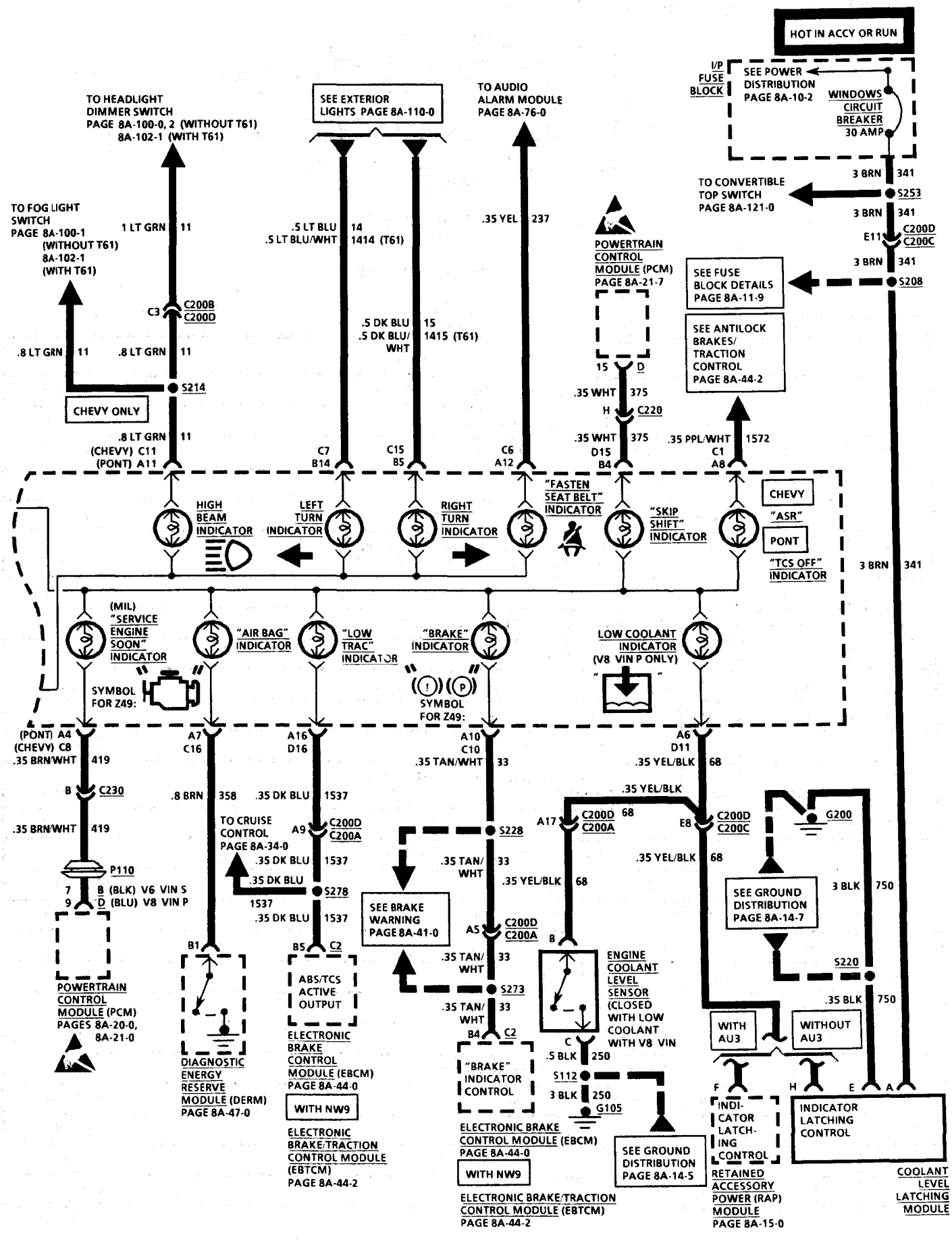



HOT AT ALL TIMES
SEE POWER DISTRIBUTION PAGE 8A-10-1
PCM BAT FUSE 4 10 AMP
I/P FUSE BLOCK
.8 ORN 340
S209
SEE FUSE BLOCK DETAILS PAGE 8A-11-7
.8 ORN 340
(CHEVY) C14
(PONT) A13
IMPORTANT:
THE COOLANT TEMPERATURE GAGE DOES NOT HAVE EQUAL DIVISIONS FOR TEMPERATURE. THE CENTER OF THE GAGE IS EQUAL TO BETWEEN 210°F TO 220°F (FOR Z49: 100°C TO 105°C).
COOLANT TEMPERATURE GAGE
100
260
BATTERY
IGNITION
SOLID STATE
SENSES GENERATOR TURN ON
470 Ω
COOLANT TEMP MONITOR
OIL PRESSURE MONITOR
GND
LOW OIL INPUT
ABS FAIL
INDICATOR CONTROL OUTPUTS
"ABS INOP" INDICATOR
"LOW OIL" INDICATOR
"CHECK GAUGES" INDICATOR
SYMBOL FOR Z49:
ABS
(PONT) A17
(CHEVY) D3
.35 DK GRN 135
A14
C12
.35 RED 225
A15
D12
.35 BRN 1174
B17
D6
.35 LT GRN
867
A3
C200D
C200A
K
A
C
C220
P110
.35 DK GRN 135
.8 RED 225
.35 BRN 1174
.35 LT GRN 867
A
L
B
B2
C2
ENGINE COOLANT TEMPERATURE GAGE SENSOR
1365 OHMS AT 100°F
55 OHMS AT 260°F
TURN ON INPUT (POWER UP FOR REGULATOR)
CLOSES WITH 11.2V OR LOWER OR WITH 16.5V OR HIGHER OR WITH STOPPED GENERATOR
GENERATOR PAGE 8A-30-1
OIL LEVEL SENSOR (NORMALLY CLOSED, OPEN WITH LOW OIL)
ABS FAIL
ELECTRONIC BRAKE CONTROL MODULE (EBCM) PAGE 8A-44-0
WITH NW9
ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM) PAGE 8A-44-2
.35 BLK/WHT 451 (V8 VIN P)
.5 BLK/WHT 451 (V6 VIN S)
S109 (V8 VIN P)
S110 (V6 VIN S)
SEE GROUND DISTRIBUTION PAGE 8A-14-1 (V8 VIN P) 8A-14-2 (V6 VIN S)
.8 BLK/WHT 451
G103 (V8 VIN P)
G104 (V6 VIN S)
SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

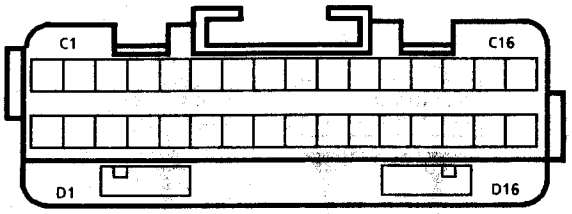
INSTRUMENT CLUSTER: WITH GAGES



FUEL GAGE SENDER RESISTANCE	APPROXIMATE FUEL LEVEL
88 Ω	FULL
60 Ω	3/4
43 Ω	1/2
26 Ω	1/4
1.0 Ω	EMPTY


HOT IN ACCY OR RUN
I/P FUSE BLOCK
SEE POWER DISTRIBUTION PAGE 8A-10-2
WINDOWS CIRCUIT BREAKER 30 AMP
TO CONVERTIBLE TOP SWITCH PAGE 8A-121-0
3 BRN 341
S253
E11
C200D
C200C
S208
SEE FUSE BLOCK DETAILS PAGE 8A-11-9
SEE ANTILOCK BRAKES/ TRACTION CONTROL PAGE 8A-44-2
TO HEADLIGHT DIMMER SWITCH PAGE 8A-100-0, 2 (WITHOUT T61) 8A-102-1 (WITH T61)
SEE EXTERIOR LIGHTS PAGE 8A-110-0
TO AUDIO ALARM MODULE PAGE 8A-76-0
TO FOG LIGHT SWITCH PAGE 8A-100-1 (WITHOUT T61) 8A-102-1 (WITH T61)
1 LT GRN 11
.5 LT BLU 14
.5 LT BLU/WHT 1414 (T61)
.35 YEL 237
.5 DK BLU 15
.5 DK BLU/ WHT 1415 (T61)
POWERTRAIN CONTROL MODULE (PCM) PAGE 8A-21-7
C3
C200B
C200D
.8 LT GRN 11
.8 LT GRN 11
S214
CHEVY ONLY
15 D
.35 WHT 375
H
C220
.8 LT GRN 11
(CHEVY) C11
(PONT) A11
C7
B14
C15
B5
C6
A12
.35 WHT 375
D15
B4
.35 PPL/WHT 1572
C1
A8
HIGH BEAM INDICATOR
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
"FASTEN SEAT BELT" INDICATOR
"SKIP SHIFT" INDICATOR
CHEVY
"ASR"
PONT
"TCS OFF" INDICATOR
3 BRN 341
(MIL) "SERVICE ENGINE SOON" INDICATOR
"AIR BAG" INDICATOR
"LOW TRAC" INDICATOR
"BRAKE" INDICATOR
LOW COOLANT INDICATOR (V8 VIN P ONLY)
SYMBOL FOR Z49:
SYMBOL FOR Z49:
(PONT) A4
(CHEVY) C8
.35 BRN/WHT 419
A7
C16
A16
D16
A10
C10
.35 TAN/WHT 33
A6
D11
.35 YEL/BLK 68
B
C230
.8 BRN 358
.35 DK BLU 1537
.35 YEL/BLK
A17
C200D
C200A
68
E8
C200D
C200C
G200
TO CRUISE CONTROL PAGE 8A-34-0
A9
C200D
C200A
S228
.35 TAN/ WHT 33
.35 YEL/BLK 68
.35 BRN/WHT 419
.35 DK BLU 1537
.35 DK BLU
1537
.35 DK BLU 1537
S278
SEE BRAKE WARNING PAGE 8A-41-0
SEE GROUND DISTRIBUTION PAGE 8A-14-7
3 BLK 750
P110
7
9
B (BLK) V6 VIN S
D (BLU) V8 VIN P
B1
B5
C2
A5
C200D
C200A
B
S220
.35 TAN/ WHT 33
ENGINE COOLANT LEVEL SENSOR (CLOSED WITH LOW COOLANT WITH V8 VIN
.35 BLK 750
POWERTRAIN CONTROL MODULE (PCM) PAGES 8A-20-0, 8A-21-0
ABS/TCS ACTIVE OUTPUT
S273
.35 TAN/ WHT 33
WITH AU3
WITHOUT AU3
B4
C2
C
.5 BLK 250
S112
3 BLK 250
G105
F
H
E
A
DIAGNOSTIC ENERGY RESERVE MODULE (DERM) PAGE 8A-47-0
ELECTRONIC BRAKE CONTROL MODULE (EBCM) PAGE 8A-44-0
WITH NW9
ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM) PAGE 8A-44-2
"BRAKE" INDICATOR CONTROL
ELECTRONIC BRAKE CONTROL MODULE (EBCM) PAGE 8A-44-0
WITH NW9
ELECTRONIC BRAKE/TRACTION CONTROL MODULE (EBTCM) PAGE 8A-44-2
SEE GROUND DISTRIBUTION PAGE 8A-14-5
INDI-CATOR LATCH-ING CONTROL
INDICATOR LATCHING CONTROL
RETAINED ACCESSORY POWER (RAP) MODULE PAGE 8A-15-0
COOLANT LEVEL LATCHING MODULE

INSTRUMENT CLUSTER: WITH GAGES



12045575

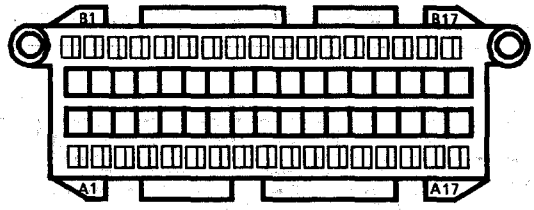
32-WAY F MICRO-PACK 100 SERIES
BLK

INSTRUMENT CLUSTER

(CHEVY)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1	PPL/WHT	1572	"ASR" INDICATOR LAMP CONTROL (WITH NW9)	8A-81-3
C2	TAN	31	OIL PRESSURE INDICATOR CONTROL	8A-81-0
C3	GRY	8	I/P ILLUMINATION LAMPS FEED	8A-81-2
C4	BLK	650	GROUND	8A-14-8
C6	YEL	237	SEAT BELT INDICATOR LAMP CONTROL	8A-81-3
C7 C7	LT BLU LT BLU/WHT	14 1414	(DOMESTIC) LEFT TURN SIGNAL SWITCH OUTPUT (WITH T61) LEFT TURN SIGNAL SWITCH OUTPUT	8A-81-3 8A-81-3
C8	BRN/WHT	419	SERVICE ENGINE SOON INDICATOR LAMP CONTROL	8A-81-3
C10	TAN/WHT	33	BRAKE WARNING INDICATOR LAMP CONTROL	8A-81-3
C11	LT GRN	11	HIGH BEAM HEADLIGHTS ON	8A-81-3
C12	RED	225	GENERATOR OUTPUT - INDICATOR CONTROL	8A-81-1
C13	GRY	728	SECURITY INDICATOR LAMP CONTROL	8A-81-2
C14	ORN	340	POWER FEED FROM PCM BAT FUSE 4	8A-11-7
C15 C15	DK BLU DK BLU/WHT	15 1415	(DOMESTIC) RIGHT TURN SIGNAL SWITCH OUTPUT (WITH T61) RIGHT TURN SIGNAL SWITCH OUTPUT	8A-81-3 8A-81-3
C16	BRN	358	AIR BAG INDICATOR CONTROL	8A-81-3
D1	DK GRN/WHT	817	VEHICLE SPEED SIGNAL - 4000 PULSES PER MILE	8A-81-0
D2	PPL	30	FUEL GAGE SIGNAL	8A-81-2
D3	DK GRN	135	COOLANT TEMPERATURE SENSOR SIGNAL	8A-81-1
D5	WHT	121	TACHOMETER SIGNAL	8A-81-0
D6	LT GRN	867	ABS FAIL SIGNAL	8A-81-1
D7	PNK	39	POWER FEED FROM GAGES FUSE 9	8A-11-5
D8	BLK/WHT	451	GROUND	8A-14-1, 2, 3
D11	YEL/BLK	68	LOW COOLANT LEVEL INDICATOR CONTROL	8A-81-3
D12	BRN	1174	OIL LEVEL SENSOR SIGNAL	8A-81-1
D13	PNK	39	POWER FEED FROM GAGES FUSE 9	8A-11-5
D15	WHT	375	"SKIP SHIFT" INDICATOR LAMP CONTROL	8A-81-3
D16	DK BLU	1537	ABS ACTIVE OUTPUT	8A-81-3



12065803

34-WAY F MICRO-PACK 100 SERIES
BLK
INSTRUMENT CLUSTER

(PONTIAC)

**CAVITIES NOT LISTED ARE NOT USED

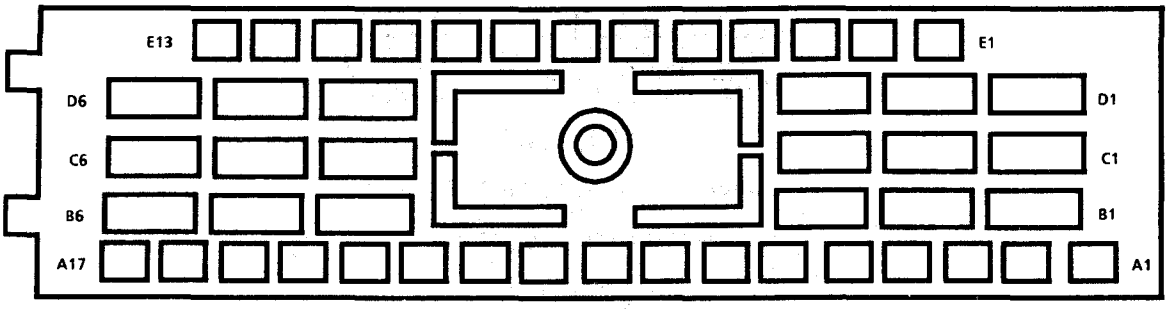
CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	PNK	39	POWER FEED FROM GAGES FUSE 9	8A-11-5
A2	PPL	30	FUEL GAGE SIGNAL	8A-81-2
A3	GRY	728	SECURITY INDICATOR LAMP CONTROL	8A-81-2
A4	BRN/WHT	419	SERVICE ENGINE SOON INDICATOR LAMP CONTROL	8A-81-3
A5	PNK	39	POWER FEED FROM GAGES FUSE 9	8A-11-5
A6	YEL/BLK	68	LOW COOLANT LEVEL INDICATOR CONTROL	8A-81-3
A7	BRN	358	AIR BAG INDICATOR CONTROL	8A-81-3
A8	PPL/WHT	1572	"TCS OFF" INDICATOR LAMP CONTROL (WITH NW9)	8A-81-3
A10	TAN/WHT	33	BRAKE WARNING INDICATOR LAMP CONTROL	8A-81-3
A11	LT GRN	11	HIGH BEAM HEADLIGHTS ON	8A-81-3
A12	YEL	237	SEAT BELT INDICATOR LAMP CONTROL	8A-81-3
A13	ORN	340	POWER FEED FROM PCM BAT FUSE 4	8A-11-7
A14	RED	225	GENERATOR OUTPUT INDICATOR CONTROL	8A-81-1
A15	BRN	1174	OIL LEVEL SENSOR SIGNAL	8A-81-1
A16	DK BLU	1537	"LOW TRAC" INDICATOR LAMP CONTROL	8A-81-3
A17	DK GRN	135	COOLANT TEMPERATURE SENSOR SIGNAL	8A-81-1
B2	GRY	8	I/P ILLUMINATION LAMPS FEED	8A-81-2
B3	BLK	650	GROUND	8A-14-8
B4	WHT	375	"SKIP SHIFT" INDICATOR LAMP CONTROL	8A-81-3
B5 B5	DK BLU DK BLU/WHT	15 1415	(DOMESTIC) RIGHT TURN SIGNAL SWITCH OUTPUT (WITH T61) RIGHT TURN SIGNAL SWITCH OUTPUT	8A-81-3 8A-81-3
B12	DK GRN/WHT	817	VEHICLE SPEED SIGNAL - 4000 PULSES PER MILE	8A-81-0
B13	WHT	121	TACHOMETER SIGNAL	8A-81-0
B14 B14	LT BLU LT BLU/WHT	14 1414	(DOMESTIC) LEFT TURN SIGNAL SWITCH OUTPUT (WITH T61) LEFT TURN SIGNAL SWITCH OUTPUT	8A-81-3 8A-81-3
B15	BLK/WHT	451	GROUND	8A-14-1, 2, 3
B16	TAN	31	OIL PRESSURE INDICATOR CONTROL	8A-81-0
B17	LT GRN	867	ABS FAIL SIGNAL	8A-81-1

INSTRUMENT CLUSTER: WITH GAGES

FOR CONNECTOR CHART, SEE SECTION 8A-202.

I/P HARNESS TO FORWARD LAMP/CROSS CAR HARNESS

C200D



12077822

M - CONNECTOR
F - TERMINAL

48-WAY M METRI-PACK MIXED SERIES
BLK

C200A

FORWARD LAMP HARNESS TO I/P HARNESS

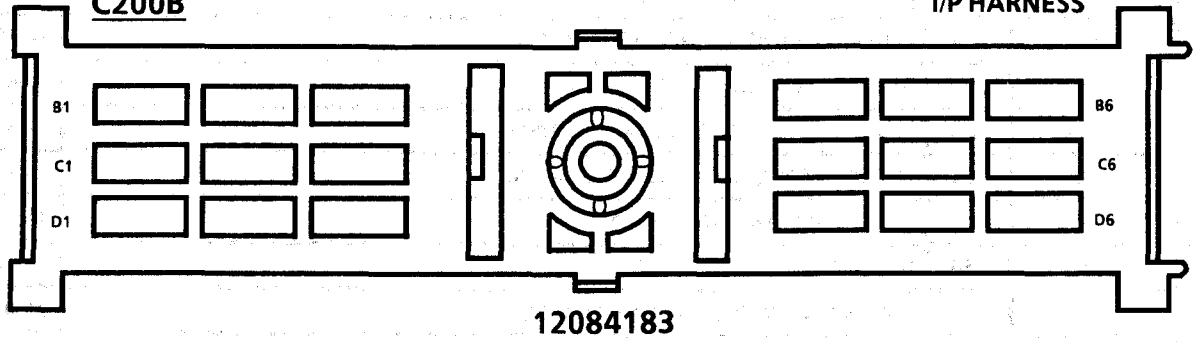


12047842

17-WAY F METRI-PACK 150 SERIES
BLK

C200B

FORWARD LAMP HARNESS TO I/P HARNESS



12084183

18-WAY F METRI-PACK MIXED SERIES
BLK

C200C

CROSS CAR HARNESS TO I/P HARNESS

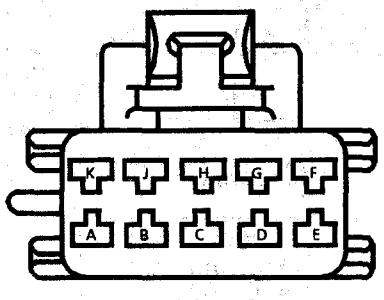


12047840

13-WAY F METRI-PACK 280 SERIES
GRY

FOR CONNECTOR CHART, SEE SECTION 8A-202.

C220



ENGINE HARNESS TO I/P HARNESS

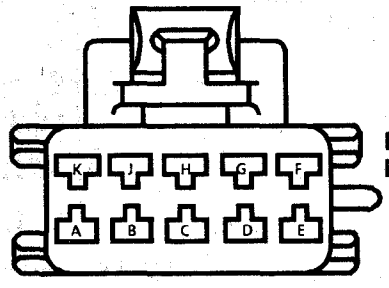
12064769

10-WAY F METRI-PACK 150 SERIES

WHT

FOR CONNECTOR CHART, SEE SECTION 8A-202.

C230



ENGINE HARNESS TO I/P HARNESS

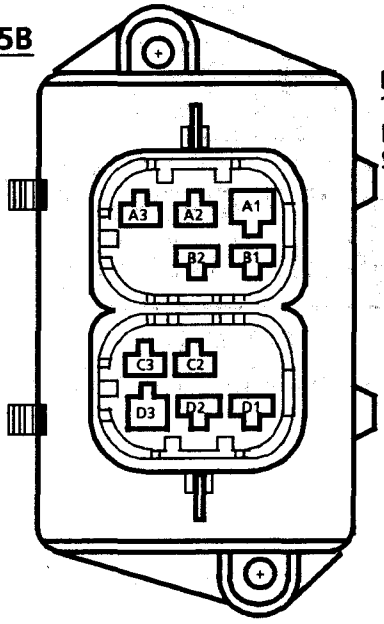
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10-WAY F METRI-PACK 150 SERIES

BLU

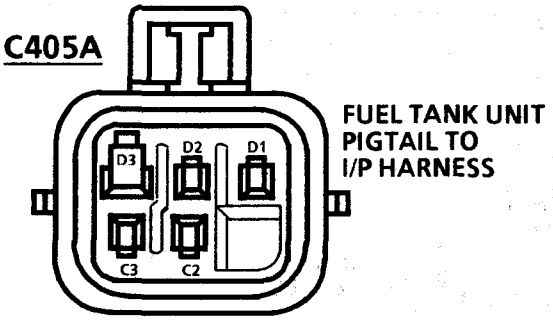
INSTRUMENT CLUSTER: WITH GAGES

FOR CONNECTOR CHART, SEE SECTION 8A-202.



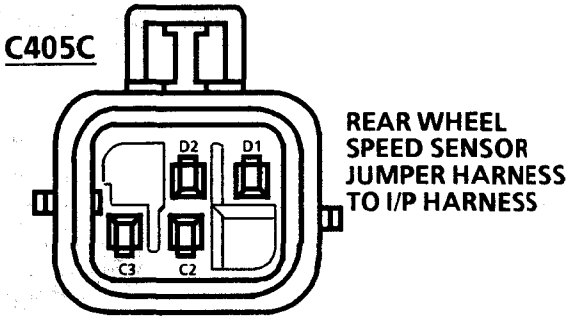
12092789

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



12110481

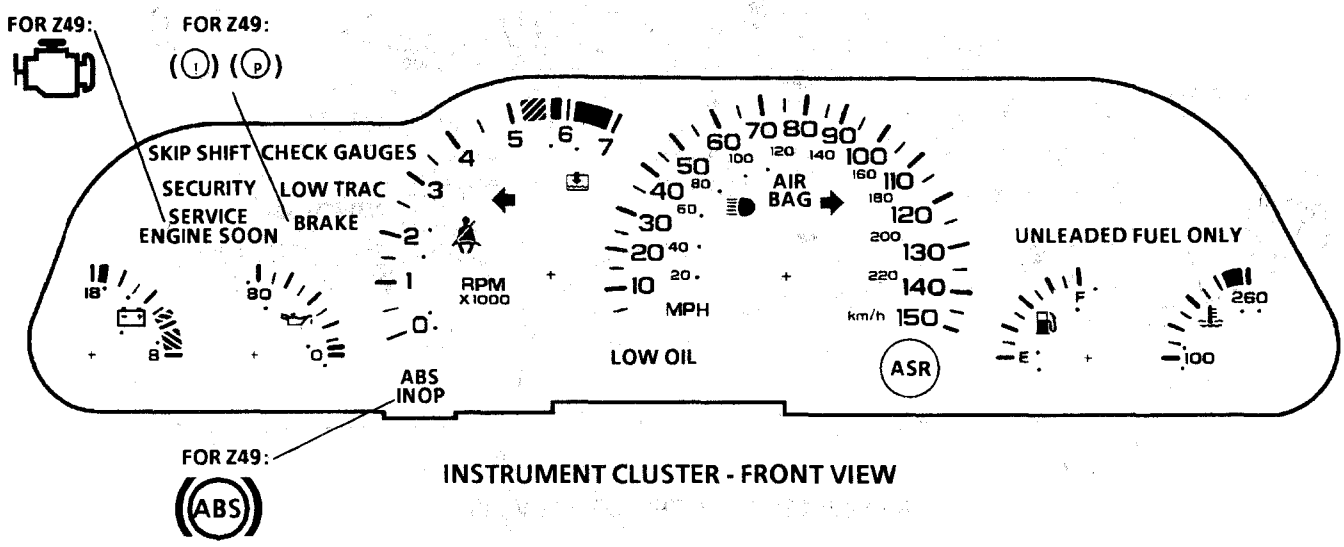
5-WAY F METRI-PACK 150, 280 SERIES
RED



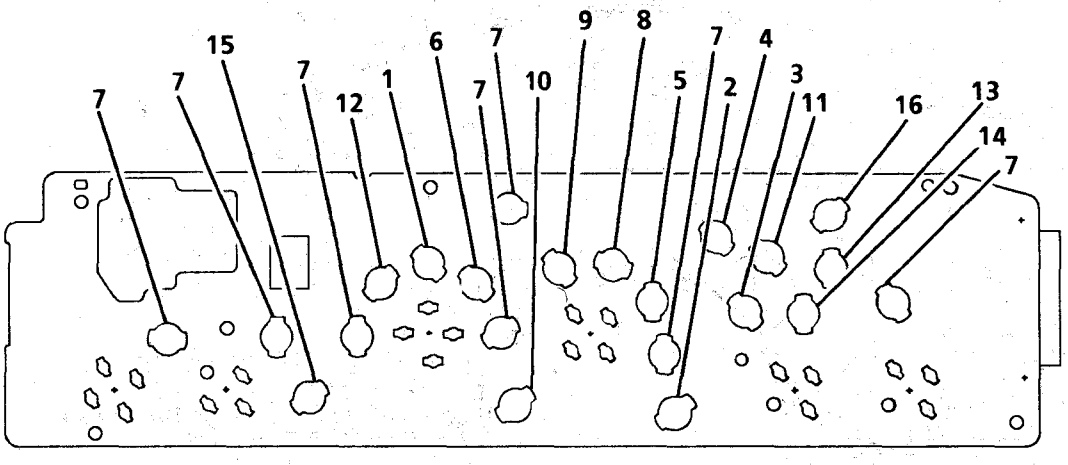
12092800

4-WAY F METRI-PACK MIXED SERIES
BLK

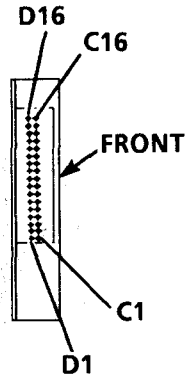
INSTRUMENT CLUSTER: WITH GAGES (CHEVY)



INSTRUMENT CLUSTER - FRONT VIEW



INSTRUMENT CLUSTER - REAR VIEW

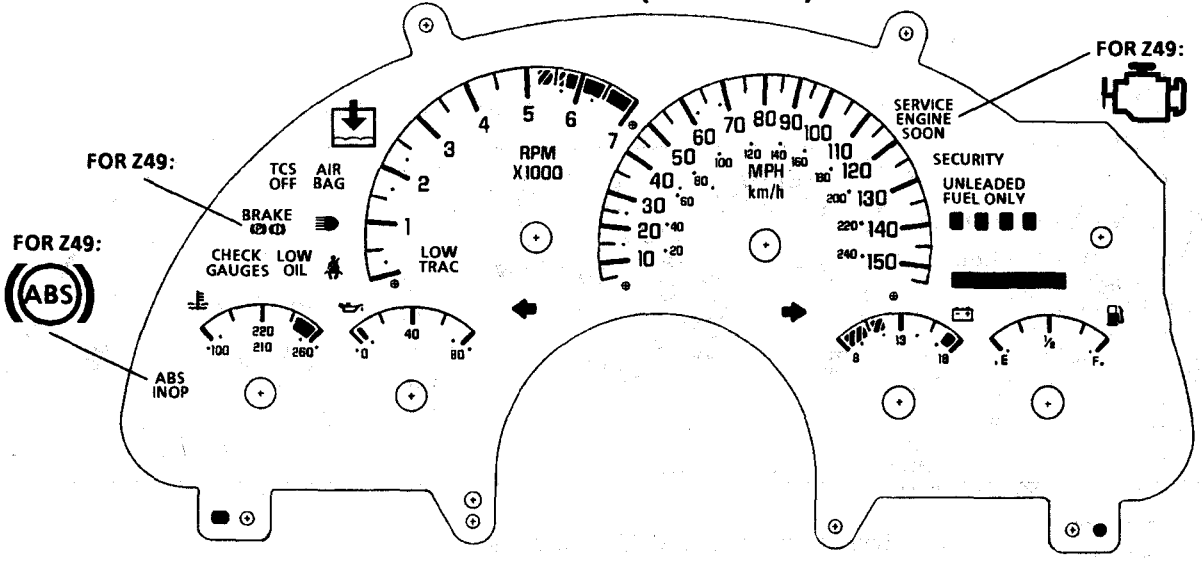


INSTRUMENT CLUSTER - SIDE VIEW

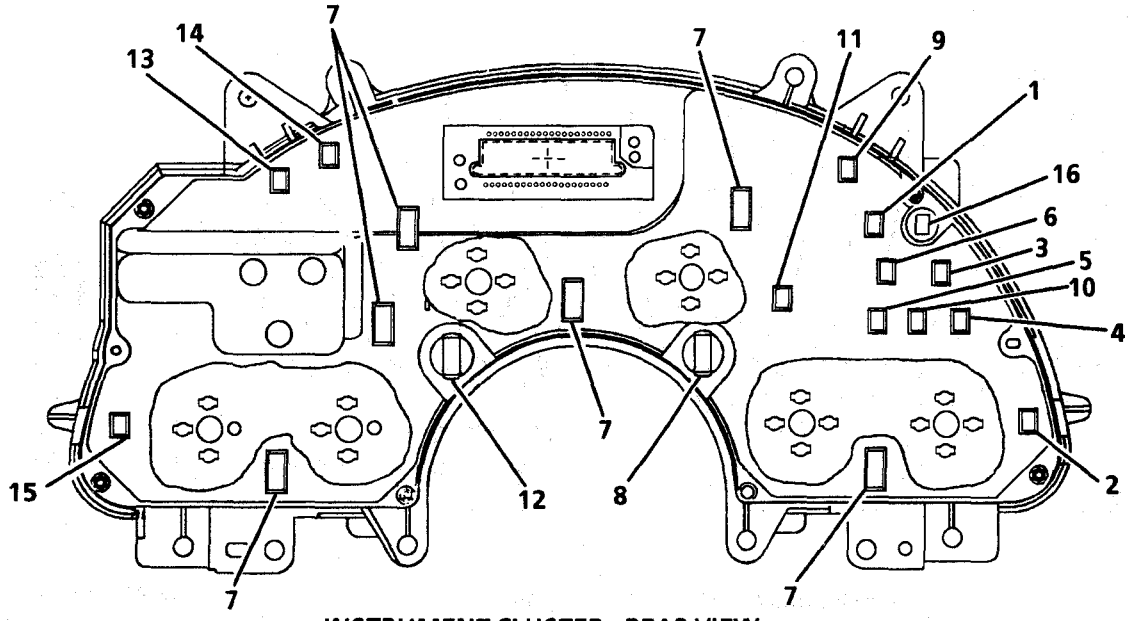
LAMP LOCATION LEGEND

1	"AIR BAG" Indicator Lamp	9	Low Coolant Indicator Lamp (V8 only)
2	"ABS INOP" Indicator Lamp	10	"LOW OIL" Indicator Lamp
3	"BRAKE" Indicator Lamp	11	"LOW TRAC" Indicator Lamp
4	"CHECK GAUGES" Indicator Lamp	12	Right Turn Indicator Lamp
5	Fasten Seat Belt Indicator Lamp	13	"SECURITY" Indicator Lamp
6	High Beam Indicator Lamp	14	"SERVICE ENGINE SOON" Indicator Lamp
7	Illumination Lamp	15	"ASR" Indicator Lamp
8	Left Turn Indicator Lamp	16	"SKIP SHIFT" Indicator Lamp

INSTRUMENT CLUSTER: WITH GAGES (PONTIAC)



INSTRUMENT CLUSTER - FRONT VIEW



INSTRUMENT CLUSTER - REAR VIEW

LAMP LOCATION LEGEND

1	"AIR BAG" Indicator Lamp	9	Low Coolant Indicator Lamp (V8 only)
2	"ABS INOP" Indicator Lamp	10	"LOW OIL" Indicator Lamp
3	"BRAKE" Indicator Lamp	11	"LOW TRAC" Indicator Lamp
4	"CHECK GAUGES" Indicator Lamp	12	Right Turn Indicator Lamp
5	Fasten Seat Belt Indicator Lamp	13	"SECURITY" Indicator Lamp
6	High Beam Indicator Lamp	14	"SERVICE ENGINE SOON" Indicator Lamp
7	Illumination Lamp	15	"SKIP SHIFT" Indicator Lamp
8	Left Turn Indicator Lamp	16	"TCS OFF" Indicator Lamp

COMPONENT	LOCATION	201-PG	FIG.	CONN
Coolant Level Latching Module	In molded pocket of dash mat, center above floor tunnel	45	84	202-20
Diagnostic Energy Reserve Module (DERM)	Snapped in bracket, behind RH side of I/P Compartment	8	15	202-12
Electronic Brake Control Module (EBCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Electronic Brake/Traction Control Module (EBTCM)	Under I/P, next to LH hinge pillar, just above Pass Thru Grommet	8	14	202-13
Engine Coolant Level Sensor (V8 VIN P)	Mounted on upper right side of radiator	19	35	
Engine Coolant Temperature Gage Sensor (V6 VIN S)	Left front of Engine, mounted in Head	27	52	
Engine Coolant Temperature Gage Sensor (V8 VIN P)	Mounted in LH Head, between 1 and 3 Cylinders	16	29	
Fuel Tank Unit	Under rear of vehicle			
Generator	RH front of Engine	14, 29	26, 56	202-21
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Control Module (ICM) (V6 VIN S)	Left front of Engine	27	52	202-22
Instrument Cluster	LH side of I/P			202-23
Oil Level Sensor	Lower left side of Engine, in oil pan	11, 24	20, 44	
Oil Pressure Sensor (V6 VIN S)	Lower left side of Engine, above oil filter	11	20	
Oil Pressure Sensor (V8 VIN P)	Mounted to top center of Engine block, rear of manifold	26	50	202-23
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Retained Accessory Power (RAP) Module	In molded pocket of dash mat, center above floor tunnel	9	17	202-27
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
C200A (17 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
C200B (18 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C220 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-6
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C405A (4 cavities)	Part of Pass Thru Conn, forward of rear axle, to Fuel Tank Unit	5	9	202-8
C405B (10 cavities)	Part of Pass Thru Conn, forward of rear axle, to Pass Thru Panel	5	9	202-8
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	

(CONTINUED ON NEXT PAGE)

INSTRUMENT CLUSTER: WITH GAGES

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S208	Cross Car Harn, approx 5 cm from Express Down Module breakout	45	84	
S209	I/P Harn, approx 24 cm from Convenience Center breakout			
S214	I/P Harn, approx 7 cm from G200 breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S228	I/P Harn, approx 15 cm before DLC breakout			
S242	I/P Harn, approx 26 cm from Instrument Cluster Conn			
S253	I/P Harn, approx 35 cm from Convenience Center breakout			
S273	Forward Lamp Harn, approx 25 cm from breakout inboard of P100	8	14	
S278	Forward Lamp Harn, approx 9 cm from EBCM breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

For Instrument Cluster removal and replacement, refer to SECTION 8C.

1. It is possible to have an open circuit to an indicator within the Cluster, though unlikely. Check circuits from suspect socket to connector terminals before replacing Cluster for an indicator problem.
2. If more than one gage or indicator are inoperative, check the appropriate fuse and ground before continuing.

- 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.

SYSTEM CHECK (for Indicators)

ACTION	NORMAL RESULTS
[1] • Turn Ignition Switch from "OFF" to "RUN."	– "AIR BAG" Indicator will flash 7 to 9 times, then go out. – "ABS INOP" Indicator is "ON" for approximately 3 seconds. – "TCS OFF" (Pont) or "ASR" (Chevy) Indicator "ON" approximately 3 seconds. – "BRAKE" Indicator "ON" approximately 3 seconds. – "CHECK GAUGES" Indicator is "ON" continuously. – "LOW OIL" Indicator is "ON" for approximately 1 second. – "LOW COOLANT" Indicator "ON" approximately 1 second. – "LOW TRAC" Indicator "ON" approximately 3 seconds. – "SECURITY" Indicator is "ON" for approximately 5 seconds. – Fasten Seat Belt Indicator "ON" if not buckled.
[2] • Turn Ignition Switch slowly through "BULB TEST" to "START."	– (MIL) "SERVICE ENGINE SOON" Indicator "ON" momentarily at "START" then goes "OFF."

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Instrument Cluster Illumination Lamps are inoperative or do not dim properly.	See "Interior Lights Dimming," SECTION 8A-117.	
GAGES		
Coolant Temperature Gage always indicates Cold.	Chart #1	8A-81-15
Coolant Temperature Gage always indicates Hot.	Chart #2	8A-81-15
Coolant Temperature Gage appears inaccurate.	Chart #3	8A-81-15
Fuel Gage always indicates Empty.	Chart #4	8A-81-16
Fuel Gage always indicates Full.	Chart #5	8A-81-16
Fuel Gage appears inaccurate.	Chart #6	8A-81-17
Oil Pressure Gage always indicates High Pressure.	Chart #7	8A-81-18
Oil Pressure Gage always indicates Low Pressure.	Chart #8	8A-81-18
Oil Pressure Gage appears inaccurate.	Chart #9	8A-81-18
Speedometer inoperative or inaccurate.	See "Vehicle Speed Sensor," SECTION 8A-33.	
Tachometer inoperative or inaccurate.	Chart #10	8A-81-19
Voltmeter inoperative or inaccurate.	Chart #11	8A-81-19
INDICATORS		
"ABS INOP" Indicator problem.	See SECTION 5E1.	

(CONTINUED ON NEXT PAGE)

INSTRUMENT CLUSTER: WITH GAGES

(CONTINUED FROM PREVIOUS PAGE)

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
"AIR BAG" Indicator problem.	See SECTION 9JA.	
"BRAKE" Indicator problem.	See "Brake Warning," SECTION 8A-41.	
"CHECK GAUGES" Indicator always "ON."	Chart #12	8A-81-20
"CHECK GAUGES" Indicator does not turn "ON."	Chart #13	8A-81-20
Fasten Seat Belt Indicator problem.	See "Audible Warnings," SECTION 8A-76.	
High Beam Indicator problem.	See "Headlights and Fog Lights," SECTION 8A-100 (without DRL), SECTION 8A-102 (with DRL).	
Low Coolant Indicator does not turn "ON."	Chart #14	8A-81-21
Low Coolant Indicator always "ON" (coolant level OK).	Chart #15	8A-81-22
Low Coolant Indicator turns "ON" and "OFF" intermittently while driving.	Check for an open or poor connection in CKT 68 between C200C and Retained Accessory Power Module (with AU3) or Coolant Level Latching Module (without AU3). Also check power and ground to the Coolant Level Latching Module. If circuits and connections are good, replace the respective module. **NOTICE:** The module should keep the indicator "ON" (latched) for entire Ignition cycle after the Engine Coolant Level Sensor detects a low.	
"LOW OIL" Indicator does not turn "ON" when oil level is low.	Chart #16	8A-81-23
"LOW OIL" Indicator stays "ON" when oil level is OK.	Chart #17	8A-81-23
"LOW TRAC" Indicator problem.	See SECTION 5E1.	
"SECURITY" Indicator problem.	See SECTION 9D.	
"TCS OFF" (Pont) or "ASR" (Chevy) Indicator problem.	See SECTION 5E2.	
"SKIP SHIFT" Indicator problem.	See SECTION 6E3.	
Low Coolant Indicator turns "ON" with bulb check but does not turn "ON" when coolant level is low.	Replace Low Coolant Level Sensor.	
(MIL) "SERVICE ENGINE SOON" Indicator problem.	See SECTION 6E3.	
Turn Indicator problem, Left or Right.	See "Exterior Lights," SECTION 8A-110.	
POWER AND GROUNDS		
More than 1 gage or indicator inoperative.	Disconnect Instrument Cluster and connect a Test Light across the appropriate power and ground terminals. Test Light "ON"? - Check connector for poor connection to Cluster. If OK, replace Instrument Cluster. Test Light "OFF"? - Repair open in power or ground circuit to Cluster.	

CHART #1
COOLANT TEMPERATURE GAGE ALWAYS INDICATES COLD

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT ENGINE COOLANT TEMPERATURE GAGE SENSOR CONNECTOR.
- CONNECT A JUMPER BETWEEN TERM "A" OF CONNECTOR AND GROUND.
- COOLANT TEMP GAGE SHOULD MOVE ALL THE WAY TO THE RIGHT (HOT).
  DOES IT?

YES

- CHECK FOR POOR CONNECTION.
  IF OK, REPLACE THE ENGINE COOLANT TEMPERATURE GAGE SENSOR.

NO

- CHECK CKT 135 FOR A POOR CONNECTION OR AN OPEN.
  IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

CHART #2
COOLANT TEMPERATURE GAGE ALWAYS INDICATES HOT

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT ENGINE COOLANT TEMPERATURE GAGE SENSOR CONNECTOR.
  DOES THE GAGE MOVE BACK TO THE LEFT (COLD)?

YES

REPLACE THE ENGINE COOLANT TEMPERATURE GAGE SENSOR.

NO

- CHECK FOR A SHORT TO GROUND IN CKT 135.
  IF OK, REPAIR/REPLACE THE INSTRUMENT CLUSTER.

CHART #3
COOLANT TEMPERATURE GAGE APPEARS INACCURATE

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT ENGINE COOLANT TEMPERATURE GAGE SENSOR CONNECTOR.
- USING I/P TESTER J 33431 OR EQUIVALENT, CONNECT ONE RED CLIP LEAD FROM THE TESTER TO THE SENSOR CONNECTOR TERM "A". CONNECT THE OTHER RED CLIP LEAD TO GROUND.
- ADJUST THE RESISTANCE DIALS OF THE TESTER TO 1400 OHMS AND THEN 55 OHMS.
- THE COOLANT TEMP GAGE SHOULD REGISTER COLD AND THEN HOT.
  DOES IT?

YES

REPLACE THE ENGINE COOLANT TEMPERATURE GAGE SENSOR.

NO

- CHECK FOR A POOR CONNECTION OR HIGH RESISTANCE IN CKT 135.
  IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

INSTRUMENT CLUSTER: WITH GAGES

CHART #4
FUEL GAGE ALWAYS INDICATES EMPTY

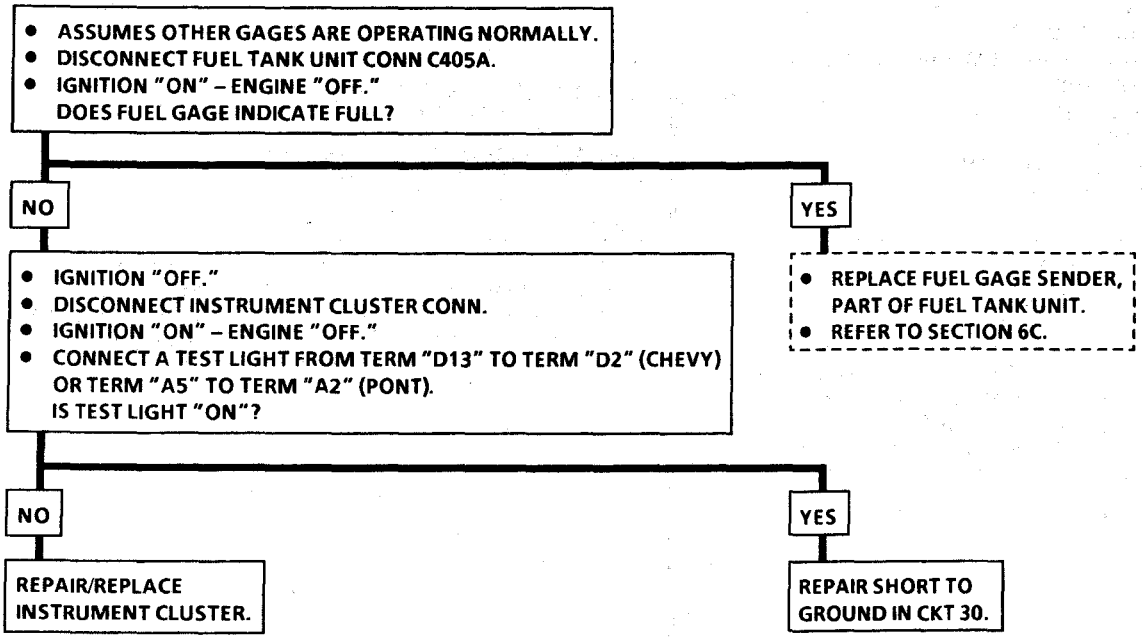


CHART #5
FUEL GAGE ALWAYS INDICATES FULL
(VERIFY THAT FUEL TANK IS NOT ACTUALLY FULL)

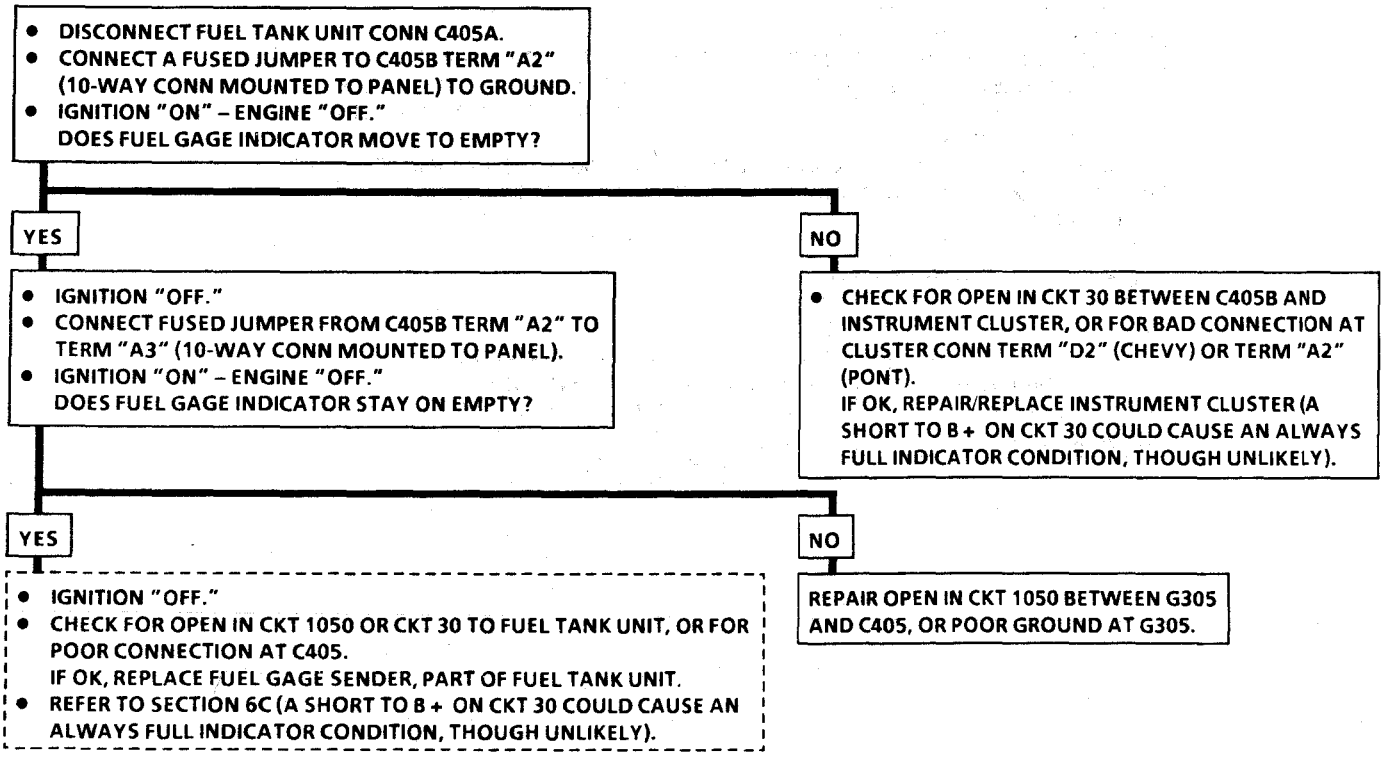


CHART #6
FUEL GAGE APPEARS INACCURATE

- DISCONNECT FUEL TANK UNIT CONN C405A.
- USING I/P TESTER J 33431, CONNECT ONE RED CLIP LEAD FROM THE TESTER TO C405B TERM "A2" (10-WAY CONN MOUNTED TO PANEL). CONNECT THE OTHER RED CLIP LEAD TO GROUND.
- SET TESTER TO "0" OHMS.
- IGNITION "ON" – ENGINE "OFF."

DOES FUEL GAGE INDICATE EMPTY?

IMPORTANT:

- IF A J 33431 IS UNAVAILABLE, RESISTORS OF EQUAL VALUE MAY BE USED.

YES

- SET RESISTANCE TO "90" OHMS FOR 1 MINUTE OR UNTIL GAGE READS FULL, THEN SLOWLY REDUCE RESISTANCE TO "0" OHMS OVER 1 MINUTE'S TIME.

AS RESISTANCE VALUES CHANGE, DOES GAGE INDICATOR CHANGE VALUES EQUAL TO THE TABLE BELOW?

YES

- CHECK FOR INTERMITTENT OPEN IN CKT 1050 OR FOR POOR GROUND CONNECTION.
- CHECK FUEL TANK UNIT WIRES FOR DAMAGE.
- CHECK FOR MECHANICAL CLEARANCE BETWEEN FLOAT AND TANK INTERIOR.
- IF THE CONNECTIONS ARE LOOSE OR CORRODED, OR WIRES SHORTED, REPAIR AS REQUIRED.

IF OK, REPLACE FUEL GAGE SENDER (REFER TO SECTION 6C).

NO

- CHECK CKT 30 AND CONNECTORS TO CLUSTER AND FUEL TANK UNIT FOR A RESISTIVE OPEN OR POOR CONNECTION. (A TOTALLY OPEN CKT 30 WOULD CAUSE GAGE TO READ FULL, A SHORT TO GROUND WOULD READ EMPTY.)

IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

NO

- CHECK CKT 30 AND CONNECTORS TO CLUSTER AND FUEL TANK UNIT FOR A RESISTIVE OPEN OR POOR CONNECTION. (A TOTALLY OPEN CKT 30 WOULD CAUSE GAGE TO READ FULL, A SHORT TO GROUND WOULD READ EMPTY.)

IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

FUEL GAGE SENDER RESISTANCE	APPROXIMATE FUEL LEVEL
88 Ω	FULL
60 Ω	3/4
43 Ω	1/2
26 Ω	1/4
1.0 Ω	EMPTY

INSTRUMENT CLUSTER: WITH GAGES

CHART #7
OIL PRESSURE GAGE ALWAYS INDICATES HIGH PRESSURE

IMPORTANT:

- CHECK FOR PROPER OIL LEVEL, THEN CHECK OIL PRESSURE WITH A MECHANICAL GAGE BEFORE PROCEEDING. IF NOT OK, REFER TO SECTION 6A.

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT OIL PRESSURE SENSOR CONNECTOR.
- CONNECT A JUMPER BETWEEN TERM "A" OF CONNECTOR AND GROUND.
  DOES GAGE MOVE BACK TO THE LEFT (LO PRESSURE)?

YES

- CHECK FOR POOR CONNECTION.
  IF OK, REPLACE OIL PRESSURE SENSOR.

NO

- CHECK FOR A POOR CONNECTION OR OPEN IN CKT 31.
  IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

CHART #8
OIL PRESSURE GAGE ALWAYS INDICATES LOW PRESSURE

IMPORTANT:

- CHECK FOR PROPER OIL LEVEL, THEN CHECK OIL PRESSURE WITH A MECHANICAL GAGE BEFORE PROCEEDING. IF NOT OK, REFER TO SECTION 6A.

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT OIL PRESSURE SENSOR CONNECTOR.
  DOES OIL PRESSURE GAGE MOVE ALL THE WAY TO THE RIGHT (HIGH PRESSURE)?

YES

REPLACE OIL PRESSURE SENSOR.

NO

- CHECK FOR SHORT TO GROUND IN CKT 31.
  IF OK, REPAIR/REPLACE THE INSTRUMENT CLUSTER.

CHART #9
OIL PRESSURE GAGE APPEARS INACCURATE

IMPORTANT:

- CHECK FOR PROPER OIL LEVEL, THEN CHECK OIL PRESSURE WITH A MECHANICAL GAGE BEFORE PROCEEDING. IF NOT OK, REFER TO SECTION 6A.

- IGNITION "ON" – ENGINE "OFF."
- DISCONNECT OIL PRESSURE SENSOR CONNECTOR.
- USING I/P TESTER J 33431 OR EQUIVALENT, CONNECT ONE RED CLIP LEAD TO THE SENSOR CONNECTOR TERM "A" AND CONNECT THE OTHER RED CONNECTOR TO GROUND.
- SET THE RESISTANCE DIALS ON THE TESTER TO 0 OHMS, 40 OHMS AND 100 OHMS.
- THE OIL PRESSURE GAGE SHOULD GO FROM LO PRESSURE TO APPROXIMATELY 30 psi, AND THEN TO HIGH PRESSURE.
  DOES IT?

YES

REPLACE OIL PRESSURE SENSOR.

NO

- CHECK CKT 31 FOR POOR OR CORRODED CONNECTIONS.
  IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

CHART #10
TACHOMETER INOPERATIVE OR INACCURATE
(ASSUMES ENGINE RUNS NORMALLY)

- (V6 VIN S) DISCONNECT IGNITION CONTROL MODULE CONN C1 (6-WAY).
  (V8 VIN P) DISCONNECT THE POWERTRAIN CONTROL MODULE CONN A.
- USE I/P TESTER J 33431 WITH J 33431-10 HARNESS OR EQUIVALENT.
  (V6 VIN S) CONNECT THE TESTER TO CONN C1 TERM "C" AND GROUND.
  (V8 VIN P) CONNECT THE TESTER TO CONN A TERM "13" OF THE POWERTRAIN CONTROL MODULE
- SET THE TESTER TO 54 mph (60 Hz).
- IGNITION "ON" – ENGINE "OFF."
  DOES THE TACHOMETER INDICATE APPROXIMATELY 1200 rpm FOR (V6 VIN S) OR 900 rpm FOR (V8 VIN P)?

YES

- (V6 VIN S) CHECK FOR POOR CONNECTION AT IGNITION CONTROL MODULE CONN C1.
  IF OK, REPLACE IGNITION CONTROL MODULE.
- (V8 VIN P) CHECK FOR POOR CONNECTION AT POWERTRAIN CONTROL MODULE CONN A TERM "13".
  IF OK, REPLACE POWERTRAIN CONTROL MODULE.

NO

- CHECK FOR AN OPEN, SHORT TO GROUND OR B + IN CKT 121.
  IF OK, REPAIR/REPLACE INSTRUMENT CLUSTER.

CHART #11
VOLTMETER INOPERATIVE OR INACCURATE

- IGNITION "ON" – ENGINE "OFF."
- CONNECT A DVM SET TO DC SCALE TO THE POSITIVE AND NEGATIVE TERMINALS OF THE BATTERY.
  DOES THE VOLTMETER AT THE INSTRUMENT CLUSTER CLOSELY MATCH THE VOLTAGE READING ON THE DVM?

YES

- START ENGINE AND AGAIN MEASURE THE VOLTAGE ACROSS THE BATTERY TERMINALS.
  DOES THE VOLTMETER IN THE INSTRUMENT CLUSTER STILL CLOSELY MATCH THE DVM?

YES

NO TROUBLE FOUND.

NO

REPAIR/REPLACE INSTRUMENT CLUSTER.

NO

REPAIR/REPLACE INSTRUMENT CLUSTER.

INSTRUMENT CLUSTER: WITH GAGES

CHART #12
"CHECK GAUGES" INDICATOR ALWAYS "ON"

- ENGINE RUNNING AT IDLE.
- MEASURE SYSTEM VOLTAGE ACROSS BATTERY. IS VOLTAGE MORE THAN 16.5 VOLTS OR LESS THAN 11.2 VOLTS?

NO

- CHECK FOR PCM DIAGNOSTIC TROUBLE CODES RELATIVE TO CHARGING SYSTEM, OIL PRESSURE OR TEMPERATURE.
- REFER TO SECTION 6E.
- VERIFY COOLANT TEMPERATURE IS BELOW APPROXIMATELY 252°F FOR V6 VIN S OR BELOW 244°F FOR V8 VIN P.
- VERIFY OIL PRESSURE IS ABOVE 8.3 psi (MINIMUM FOR PUMP). ANYTHING BELOW 3 TO 5 psi SHOULD CAUSE CHECK GAGES LIGHT TO TURN "ON." ARE ALL OK?

NO

- FOR THE SPECIFIC SYSTEM INDICATING A PROBLEM CONDITION, REPAIR MECHANICAL OR ELECTRICAL FAILURE.
- SEE GAGES CHARTS IN THIS SECTION.

YES

- CHECK FOR OPEN OR POOR CONNECTION IN CKT 225. (IF CIRCUIT IS OPEN, GENERATOR WILL NOT GENERATE VOLTAGE AND VEHICLE MAY BE RUNNING ONLY ON BATTERY POWER.) IF OK, REPLACE INSTRUMENT CLUSTER.

YES

- REPAIR CHARGING SYSTEM.
- REFER TO SECTION 6D3.

CHART #13
"CHECK GAUGES" INDICATOR DOES NOT TURN "ON"

- START ENGINE WHILE MONITORING "CHECK GAUGES" INDICATOR (SEE VIEW OF CLUSTER FOR LOCATION). DID "CHECK GAUGES" INDICATOR TURN "ON" FOR APPROXIMATELY 1 SECOND? ("CHECK GAUGES" INDICATOR WILL STAY ON CONTINUOUSLY IF ENGINE IS NOT STARTED.)

YES

- IS THERE AN INDICATION OF A PROBLEM WITH ONE OF THE FOLLOWING SYSTEMS?
  - CHARGING SYSTEM
  - COOLANT TEMPERATURE
  - OIL PRESSURE

YES

- FOR GAGE FAILURE INDICATIONS, SEE SYMPTOM TABLE TO REFERENCE SPECIFIC CHARTS.
- FOR SYSTEM FAILURES:
  - CHARGING SYSTEM, REFER TO SECTION 6D3
  - COOLANT TEMPERATURE, REFER TO SECTION 6B
  - OIL PRESSURE, REFER TO SECTION 6A2A (V6 VIN S) SECTION 6A3A (V8 VIN P).

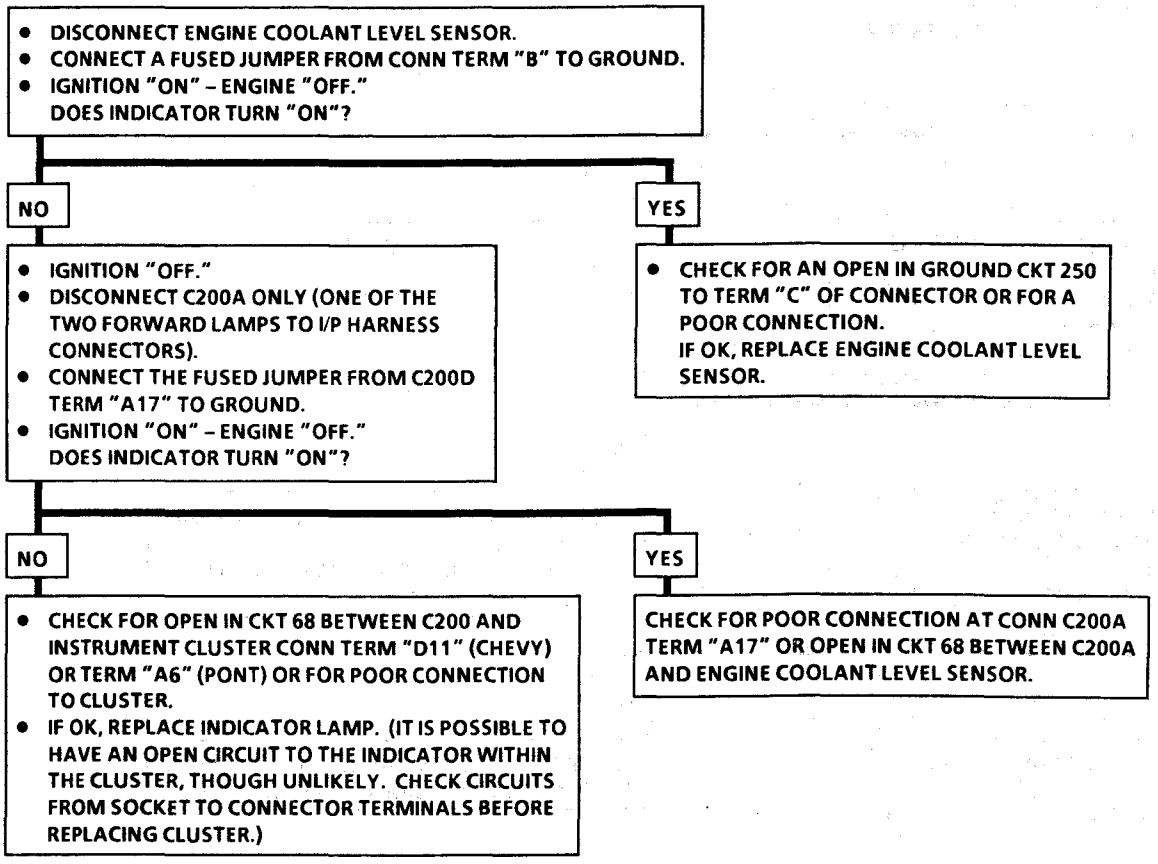
NO

- REPLACE "CHECK GAUGES" INDICATOR LAMP.
- CYCLE IGNITION FROM "OFF" TO "ON" AGAIN. IF INDICATOR DOES NOT TURN ON, REPAIR/REPLACE INSTRUMENT CLUSTER.

NO

SYSTEM OPERATING NORMALLY. NO TROUBLE FOUND.

CHART #14
"LOW COOLANT" INDICATOR DOES NOT TURN "ON"
(ASSUMES OTHER INDICATORS OPERATE NORMALLY)



INSTRUMENT CLUSTER: WITH GAGES

CHART #15
"LOW COOLANT" INDICATOR ALWAYS "ON"
(COOLANT LEVEL OK)

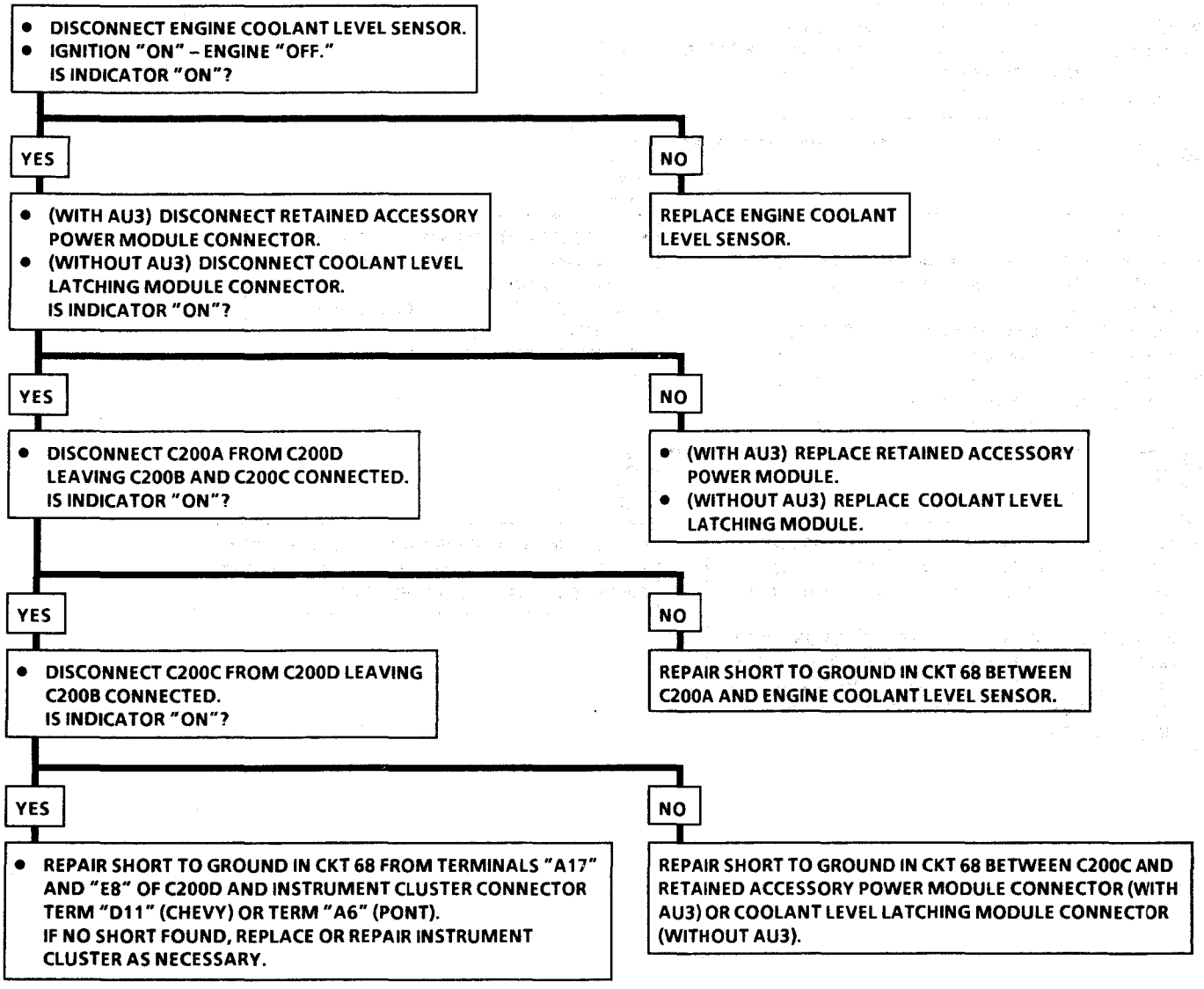


CHART #16
"LOW OIL" INDICATOR DOES NOT TURN "ON" WHEN OIL LEVEL IS LOW

IMPORTANT:

- DUE TO THE PROGRAMMING OF THE CLUSTER, THE "LOW OIL" INDICATOR WILL NOT TURN "ON" IF A LOW OIL CONDITION HAS OCCURRED WHILE ENGINE IS RUNNING. LET ENGINE COOL APPROXIMATELY 45 MINUTES THEN KEY "ON" BEFORE PERFORMING DIAGNOSTICS.

- TURN IGNITION FROM "OFF" TO "ON" WHILE MONITORING "LOW OIL" INDICATOR (SEE VIEW OF CLUSTER FOR LOCATION). DID "LOW OIL" INDICATOR TURN "ON" FOR APPROXIMATELY 1 SECOND?

YES

- IGNITION "OFF," WAIT A MINIMUM OF 35 MINUTES FOR CLUSTER'S COLD OIL DRAINBACK CALCULATION TO CLEAR.
- DISCONNECT OIL LEVEL SENSOR CONNECTOR.
- IGNITION "ON" – ENGINE "OFF." DOES "LOW OIL" INDICATOR COME "ON" AND STAY "ON"?

YES

- VERIFY THERE IS A LOW OIL CONDITION.
- IF LOW OIL, REPLACE OIL LEVEL SENSOR.

NO

- CHECK FOR A SHORT TO GROUND IN CKT 1174. IF OK, REPLACE INSTRUMENT CLUSTER.

NO

- REPLACE "LOW OIL" INDICATOR LAMP.
- CYCLING IGNITION FROM "OFF" TO "ON" AGAIN. IF INDICATOR DOES NOT TURN ON, REPAIR/REPLACE INSTRUMENT CLUSTER.

CHART #17
"LOW OIL" INDICATOR STAYS "ON" WHEN OIL LEVEL IS OK

- IGNITION "OFF," WAIT A MINIMUM OF 35 MINUTES FOR CLUSTER'S COLD OIL DRAINBACK CALCULATION TO CLEAR.
- DISCONNECT OIL LEVEL SENSOR CONNECTOR.
- JUMPER THE HARNESS CONNECTOR FROM TERM "A" TO TERM "B".
- IGNITION "ON" – ENGINE "OFF." DOES INDICATOR TURN "ON" FOR APPROXIMATELY 1 SECOND THEN GO "OFF"?

NO

- IGNITION "OFF."
- JUMPER STILL CONNECTED AT SENSOR CONN.
- DISCONNECT INSTRUMENT CLUSTER.
- CONNECT A TEST LIGHT FROM TERM "D12" (CHEVY) OR TERM "A15" (PONT) TO B+. IS TEST LIGHT "ON"?

NO

REPAIR OPEN IN GROUND CKT 451 OR CKT 1174.

YES

- CHECK FOR POOR CONNECTION TO CLUSTER AT TERM "D12" (CHEVY) OR TERM "A15" (PONT). IF OK, REPLACE INSTRUMENT CLUSTER.

YES

- VERIFY OIL LEVEL TO BE CORRECT.
- IF OIL LEVEL IS OK, CHECK FOR POOR CONNECTION AT OIL LEVEL SENSOR CONNECTOR. IF OK, REPLACE OIL LEVEL SENSOR.

INSTRUMENT CLUSTER: WITH GAGES

CIRCUIT OPERATION

The Instrument Cluster contains Analog Gages and Indicators. Some Gages and Indicators are controlled by solid state controls within the Cluster; some are controlled by direct circuits into the Cluster from other components. These operations are described here briefly.

"ABS INOP" INDICATOR, FOR Z49: 

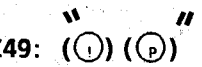
See SECTION 5E1.

"AIR BAG" INDICATOR

See SECTION 9J.

"ASR" INDICATOR (CHEVY)

See SECTION 5E2.

"BRAKE" INDICATOR, FOR Z49: 

See "Brake Warning," page 8A-41-5.

"CHECK GAUGES" INDICATOR

The Instrument Cluster's internal circuitry monitors three inputs for determining when to illuminate the "CHECK GAUGES" Indicator.

The "CHECK GAUGES" Indicator is provided a ground for illumination when:

1. The Coolant Temperature Sensor indicates above normal temperature (252°F for V6 VIN S or 244°F for V8 VIN P).
2. The Instrument Cluster senses the Generator turn on input is at ground potential. The Generator pulls CKT 225 low with system voltage at or below 11.2v or with 16.5v or higher, also pulled low if Generator is stopped.
3. The Oil Pressure Sensor indicates below normal pressure. The minimum rating for the pump is 8.3 psi, though the sensor will be approximately 3 to 5 psi at 10 ohms which will cause the "CHECK GAUGES" Indicator to illuminate (maximum pressure should be about 90 ohms at the sensor).
4. The Instrument Cluster performs a bulb check function for approximately one second after Ignition "ON."

COOLANT TEMPERATURE GAGE

The Coolant Temperature Gage contains internal coils that create magnetic fields when current flows though them. The current through the coils varies depending on the Coolant Temperature Sensor resistance (approximately 55 ohms at 260°F (hot) and approximately 1365 ohms at 100°F). The varying sensor resistance causes the current through the coils to fluctuate. The magnetic fields of the coils move the pointer.

"FASTEN SEAT BELT" INDICATOR

See "Audible Warnings," page 8A-76-0.

FUEL GAGE

The Fuel Gage contains internal coils that create magnetic fields when current flows through them. The current through the coils varies depending on the Fuel Gage Sender resistance (see Fuel Level/Resistance Chart). The varying sender resistance causes the current through the coils to fluctuate. The magnetic fields of the coils move the pointer.

HIGH BEAM INDICATOR

The High Beam Indicator has system voltage applied to it whenever the Headlights are "ON" and the Headlight Dimmer Switch is on "HIGH." The Indicator has a constant ground and will illuminate whenever system voltage is applied.

"LOW COOLANT" INDICATOR (V8 VIN P)

The "LOW COOLANT" Indicator has system voltage applied in "RUN," "BULB TEST" or "START." The Indicator requires a ground for illumination. There are two ways the Indicator receives a ground:

1. During bulb check through the Engine Coolant Level Sensor.
2. Whenever the Engine Coolant Level Sensor detects a low coolant condition.

The Engine Coolant Level Sensor performs a bulb check by grounding the circuit to the indicator for approximately one second after Ignition "ON." When a low coolant condition occurs, a ground path is supplied through the Engine Coolant Level Sensor to the Indicator. At the same time, ground is supplied through the Engine Coolant Level Sensor to the Retained Accessory Power Module (with AU3) or Coolant Level Latching Module (without AU3). The module is designed to provide a continuous ground path to the Indicator for the remainder of the Ignition cycle in which a momentary low coolant condition occurred. (The module provides its own ground to the Indicator until the Ignition is turned "OFF." This is called latching.)

"LOW OIL" INDICATOR

The Instrument Cluster's internal circuitry will only check the Oil Level Sensor at Ignition "ON" if Drainback Times are met (35 minutes after Ignition "OFF" if the Engine was still cold, or 4 minutes after Ignition "OFF" if the Engine was hot. Hot is defined as running for at least 17 minutes). Drainback Timer sets at Ignition "OFF." The sensor has normally closed contacts that are open under a low oil condition. After determining a low oil condition exists, the "LOW OIL" Indicator is provided a ground for illumination. The Indicator also receives a ground for approximately one second during the Cluster's bulb check function right after Ignition "ON."

"LOW TRAC" INDICATOR

See SECTION 5E1.

OIL PRESSURE GAGE

The Oil Pressure Gage contains internal coils that create magnetic fields when current flows through them. The current through the coils varies depending on the Oil Pressure Sensor resistance. (Low pressure resistance is approximately 10 ohms, high pressure resistance is approximately 90 ohms.) The varying sensor resistance causes the current through the coils to fluctuate. The magnetic fields of the coils move the pointer.

"SECURITY" INDICATOR

See SECTION 9D.

"SKIP SHIFT" INDICATOR

See SECTION 6E3.

(MIL) "SERVICE ENGINE SOON" INDICATOR, FOR Z49:



See SECTION 6E3.

SPEEDOMETER

See "Vehicle Speed Sensor," page 8A-33-0.

TACHOMETER

The Tachometer displays Engine speed in Revolutions Per Minute (RPM). Voltage pulses from the Ignition Control Module (V6 VIN S) or the Powertrain Control Module (V8 VIN P) are interpreted by solid state logic circuits within the Cluster. The solid state circuits process the pulses and put out a signal that drives the pointer of the meter. The pointer is moved with magnetic fields created from coils within the Tachometer.

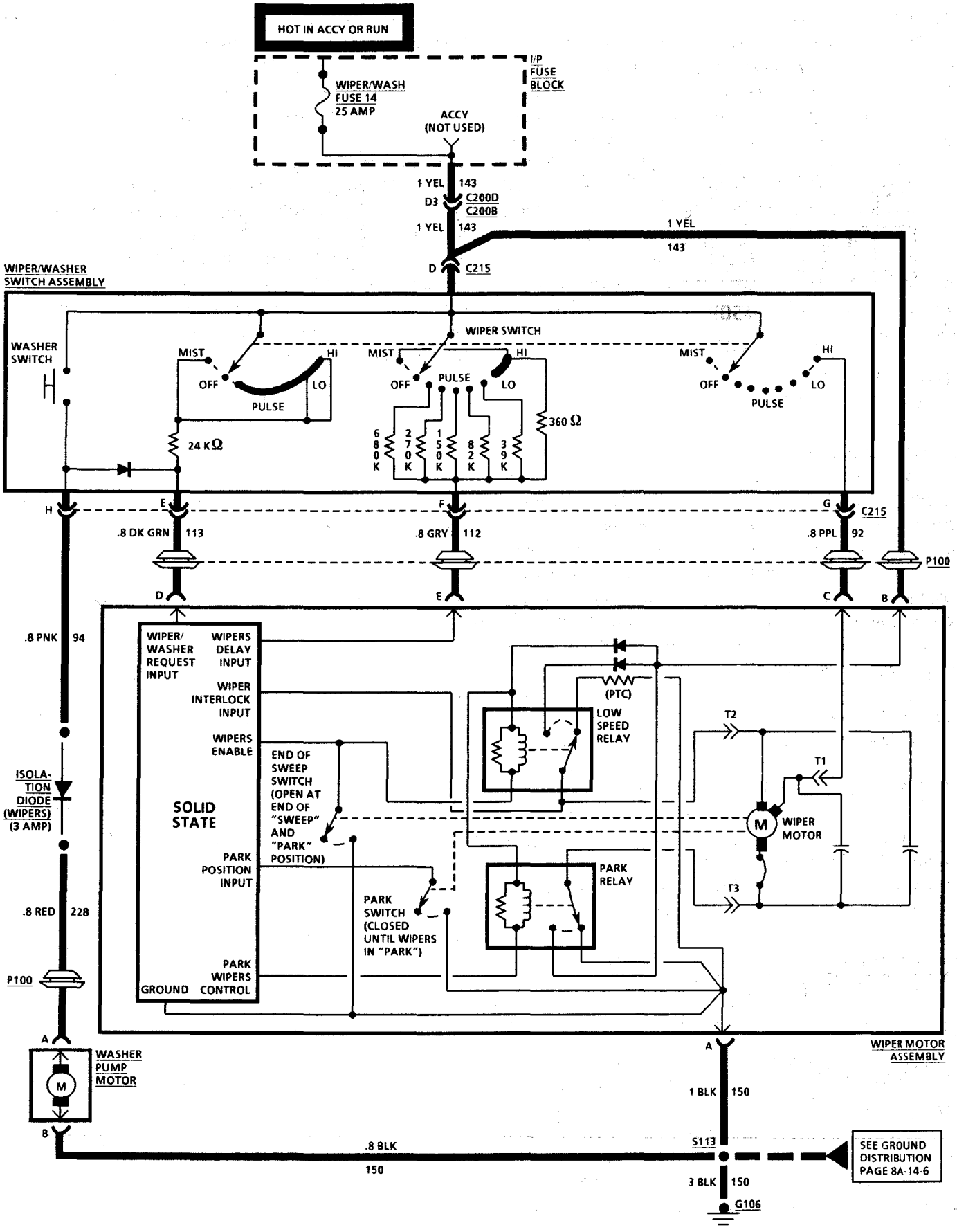
"TCS OFF" INDICATOR (PONT)

See SECTION 5E2.

VOLTMETER

The Voltmeter measures the vehicle's electrical system voltage during run or stopped conditions. The Voltmeter has two coils internally that create magnetic fields. These coils are made of a different amount of windings and are in series with a calibrated resistance. Any voltage between 8 to 18 volts will create a magnetic field that will move the pointer to the appropriate voltage indication.

WIPER/WASHER: PULSE

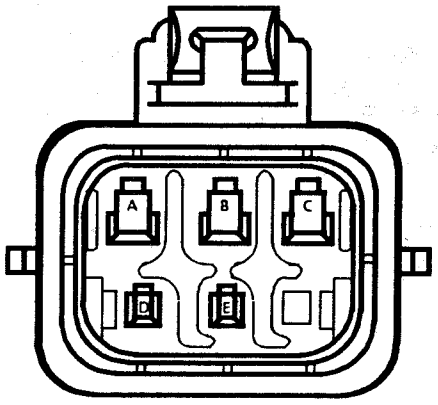


C215 FORWARD LAMP HARNESS TO STEERING COLUMN HARNESS



06294509

11-WAY F PACK-CON I
BLK



12129126

5-WAY F METRI-PACK MIXED SERIES
BLK

WIPER MOTOR ASSEMBLY

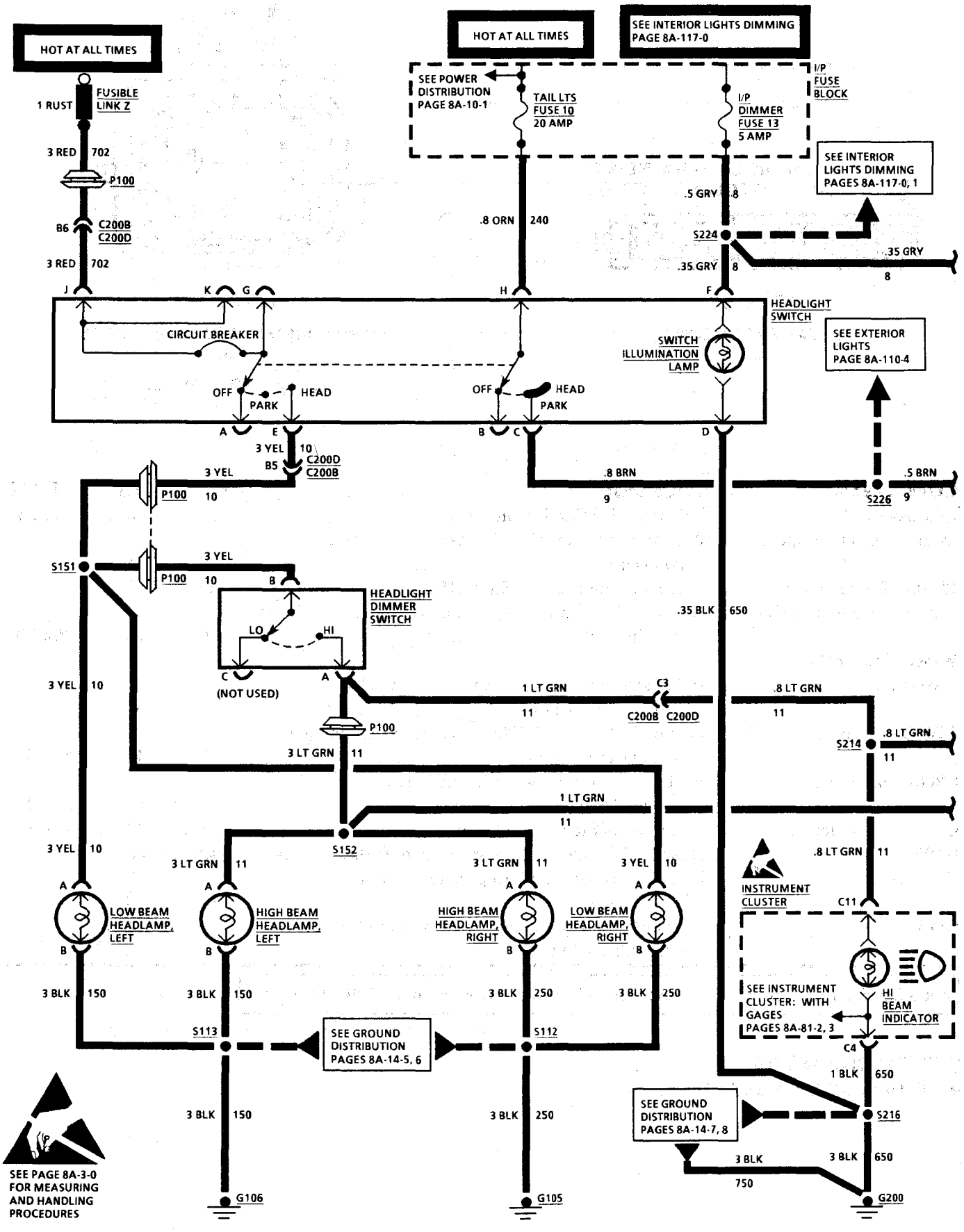
COMPONENT	LOCATION	201-PG	FIG.	CONN
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Isolation Diode (Wipers)	Approx 10 cm from C215 breakout, in Forward Lamp Harn	35	64	
Washer Pump Motor	Front of vehicle, below Engine Hood Latch	25	46	
Wiper Motor Assembly	Rear of LH Shock Tower, mounted to dash panel below LH Wiper Mount	10	18	202-28
Wiper/Washer Switch Assembly	In left side of Steering Column, actuated by Multi-Function Lever	3	5	
C200B (18 cavities)	Part of Forward Lamp 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
C215 (11 cavities)	Near base of Steering Column	35	64	202-4
G106	Near top LH side of radiator, in top of T-Bar	19	35	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			

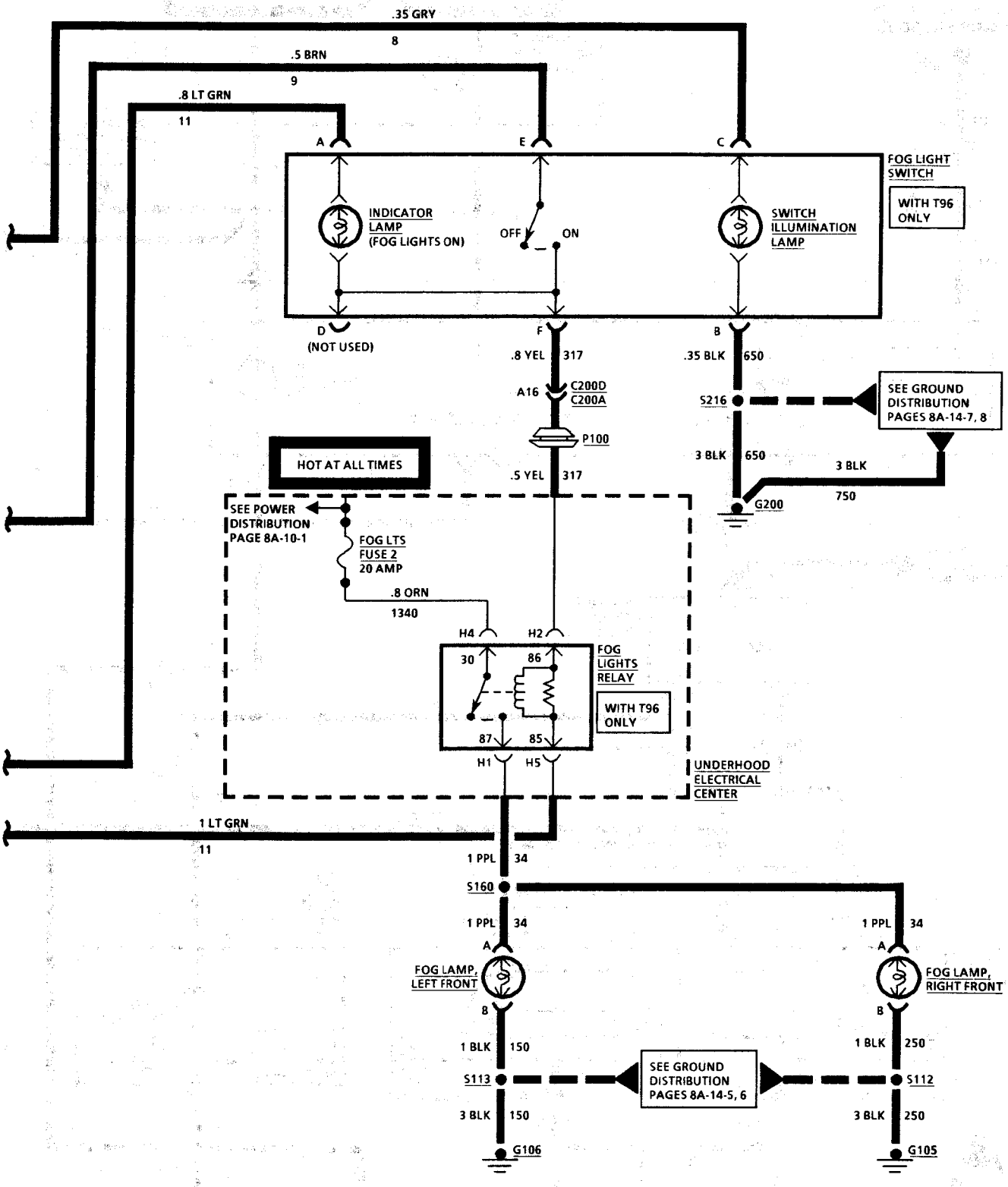
For a Service Part Cross Reference List and Information, refer to SECTION 8A-200.

SYSTEM DIAGNOSIS

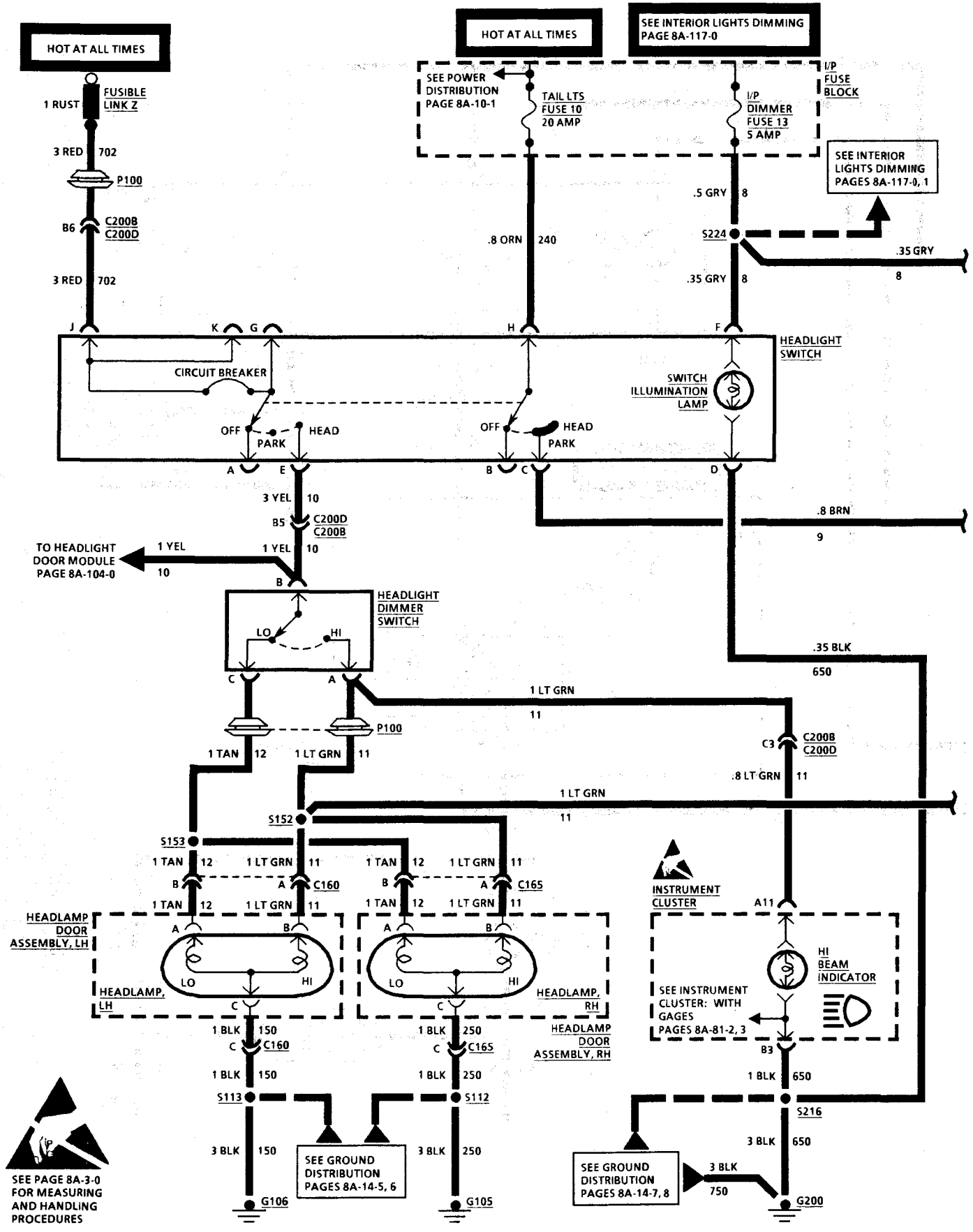
- Refer to SECTION 8E for Diagnosis.

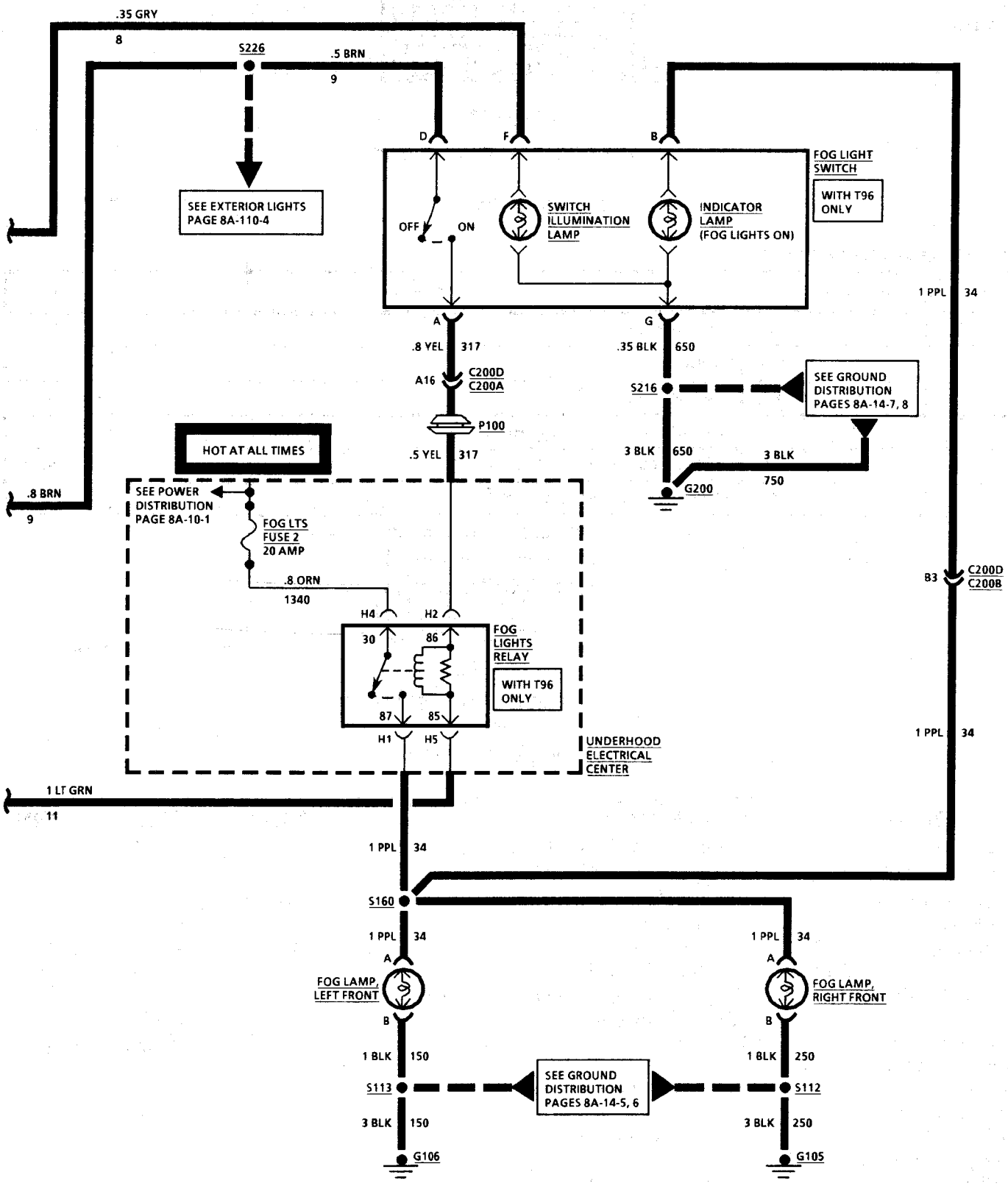
HEADLIGHTS AND FOG LIGHTS (CHEVY)
WITHOUT DRL (T61)



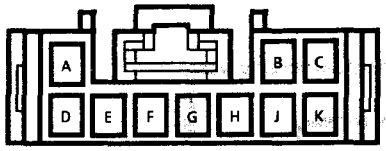

.35 GRY
8
.5 BRN
9
.8 LT GRN
11
A
E
C
FOG LIGHT SWITCH
WITH T96 ONLY
INDICATOR LAMP (FOG LIGHTS ON)
OFF
ON
SWITCH ILLUMINATION LAMP
D
(NOT USED)
F
B
.8 YEL 317
.35 BLK 650
A16
C200D
C200A
S216
SEE GROUND DISTRIBUTION PAGES 8A-14-7, 8
P100
3 BLK 650
3 BLK 750
HOT AT ALL TIMES
.5 YEL 317
G200
SEE POWER DISTRIBUTION PAGE 8A-10-1
FOG LTS FUSE 2 20 AMP
.8 ORN 1340
H4
H2
30
86
FOG LIGHTS RELAY
WITH T96 ONLY
87
85
H1
H5
UNDERHOOD ELECTRICAL CENTER
1 LT GRN
11
1 PPL 34
S160
1 PPL 34
A
FOG LAMP, LEFT FRONT
B
1 BLK 150
S113
SEE GROUND DISTRIBUTION PAGES 8A-14-5, 6
3 BLK 150
G106
1 PPL 34
A
FOG LAMP, RIGHT FRONT
B
1 BLK 250
S112
3 BLK 250
G105

HEADLIGHTS AND FOG LIGHTS (PONTIAC)
WITHOUT DRL (T61)




.35 GRY
8
S226
.5 BRN
9
SEE EXTERIOR LIGHTS PAGE 8A-110-4
D
F
B
FOG LIGHT SWITCH
WITH T96 ONLY
OFF
ON
SWITCH ILLUMINATION LAMP
INDICATOR LAMP (FOG LIGHTS ON)
1 PPL 34
A
G
.8 YEL 317
.35 BLK 650
A16
C200D C200A
S216
SEE GROUND DISTRIBUTION PAGES 8A-14-7, 8
P100
HOT AT ALL TIMES
.5 YEL 317
3 BLK 650
3 BLK 750
G200
.8 BRN
9
SEE POWER DISTRIBUTION PAGE 8A-10-1
FOG LTS FUSE 2 20 AMP
.8 ORN 1340
B3
C200D C200B
H4
H2
30
86
FOG LIGHTS RELAY
WITH T96 ONLY
87
85
H1
H5
UNDERHOOD ELECTRICAL CENTER
1 PPL 34
1 LT GRN
11
1 PPL 34
S160
1 PPL 34
1 PPL 34
A
A
FOG LAMP, LEFT FRONT
FOG LAMP, RIGHT FRONT
B
B
1 BLK 150
1 BLK 250
S113
SEE GROUND DISTRIBUTION PAGES 8A-14-5, 6
S112
3 BLK 150
3 BLK 250
G106
G105

HEADLIGHTS AND FOG LIGHTS
WITHOUT DRL (T61)



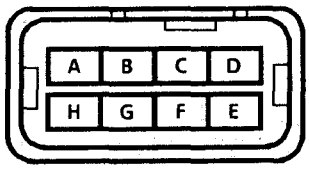
12129077

10-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT SWITCH

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C	BRN	9	PARK LAMP FEED	8A-100-0, 2
D	BLK	650	GROUND	8A-14-8
E	YEL	10	HEADLIGHTS ON	8A-100-0, 2
F	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-100-0, 2
H	ORN	240	POWER FEED FROM TAIL LTS FUSE #10	8A-100-0, 2
J	RED	702	POWER FEED FROM FUSIBLE LINK Z	8A-100-0, 2



12045688

8-WAY M METRI-PACK 150 SERIES
BLK

FOG LIGHT SWITCH

COMPONENT	LOCATION	201-PG	FIG.	CONN
Fog Lamp, Left Front	Lower LH side of front Fascia			
Fog Lamp, Right Front	Lower RH side of front Fascia			
Fog Light Switch	Lower LH side of I/P	37, 38	66, 67	202-21
Fusible Links	Above RH Shock Tower	10	19	
Headlamp, Left (Pont)	LH front of vehicle	23	43	
Headlamp, Right (Pont)	RH front of vehicle			
Headlight Dimmer Switch	Part of Steering Column, activated by Multi-Function Lever	3, 35	5, 52	
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
High Beam Headlamp, Left (Chevy)	Exterior, left front			
High Beam Headlamp, Right (Chevy)	Exterior, right front			
Low Beam Headlamp, Left (Chevy)	Exterior, left front			
Low Beam Headlamp, Right (Chevy)	Exterior, right front			

COMPONENT	LOCATION	201-PG	FIG.	CONN
Instrument Cluster	LH side of I/P			202-23
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C160 (3 cavities)	LH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C165 (3 cavities)	RH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C200A (17 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
C200B (18 cavities)	Part of Forward Lamp 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
G105	Near top RH side of radiator, in top of T-Bar	19	36	
G106	Near top LH side of radiator, in top of T-Bar	19	35	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S112	Forward Lamp Harn, approx 10 cm from G105 breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S151	Forward Lamp Harn, at Electrical Center breakout			
S152	Forward Lamp Harn, approx 8 cm from Electrical Center breakout			
S153	Forward Lamp Harn, at Air Pump breakout			
S160	Forward Lamp Harn, approx 4 cm from Coolant Fan breakout			
S214	I/P Harn, approx 7 cm from G200 breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Always suspect an open lamp filament before proceeding with diagnostics.
2. Make sure Lamp Connectors are free from corrosion.
3. Check that grounds G200, G106 and G105 are clean and tight.
4. Check Fusible Link Z for open.
5. Check TAIL LTS Fuse 10 and I/P Dimmer Fuse 13 for open. If fuse(s) are open, refer to Chart #15 in this section.
6. On Pontiac Models if Headlamp door(s) do not open and Headlamps do not illuminate, repair Headlamp door(s) failure first. See "Headlight Doors," page 8A-104-0.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedures.

HEADLIGHTS AND FOG LIGHTS
WITHOUT DRL (T61)

SYMPTOM TABLE (CHEVY)

SYMPTOM	PROCEDURE	PAGE NUMBER
LO Beam and HI Beam Headlights are inoperative.	Chart #1	8A-100-8
LO Beam Headlights inoperative, HI Beam Headlights operate normally.	Chart #3	8A-100-9
HI Beam Headlights inoperative, LO Beam Headlights operate normally.	Chart #4	8A-100-9
HI Beam Indicator inoperative, HI Beam Headlights operate normally.	Chart #5	8A-100-9
One LO Beam or one HI Beam Headlamp inoperative.	Chart #8	8A-100-10
LO beams or HI beams do not turn "OFF."	Chart #9	8A-100-10
HI Beam Headlights and LO Beam Headlights "ON" at the same time.	Check for short to B + in CKTs 11 and 12. If OK, replace Headlamp Dimmer Switch.	
Fog Lights do not turn "ON" but Park Lights operate normally.	Chart #12	8A-100-12
Fog Lights do not turn "OFF."	Chart #13	8A-100-13
One Fog Lamp inoperative.	Chart #14	8A-100-13
Fog Lights "ON" Indicator Lamp on; Fog Light Switch inoperative but Fog Lights operate normally.	Check for: • Poor connection at C200 terminal "B3". • Open in CKT 34 between S160 and Fog Light Switch. • Open in CKT 650 to ground. • Poor connections at Fog Light Switch. If OK, replace Fog Light Switch.	
Fuse(s) blows when replaced or when attempting to use lighting system.	Chart #15	8A-100-14

SYMPTOM TABLE (PONTIAC)

SYMPTOM	PROCEDURE	PAGE NUMBER
LO Beam and HI Beam Headlights are inoperative.	Chart #2	8A-100-8
LO Beam Headlights inoperative, HI Beam Headlights operate normally.	Chart #6	8A-100-10
HI Beam Headlights inoperative, LO Beam Headlights operate normally.	Chart #7	8A-100-10
HI Beam Indicator inoperative, HI Beam Headlights operate normally.	Chart #5	8A-100-9
One LO Beam or one HI Beam Headlamp inoperative.	Chart #10	8A-100-11
LO Beams or HI Beams do not turn "OFF."	Chart #11	8A-100-11
HI Beam Headlights and LO Beam Headlights "ON" at the same time.	Check for short to B + in CKTs 11 and 12. If OK, replace Headlamp Dimmer Switch.	
Fog Lights do not turn "ON" but Park Lights operate normally.	Chart #12	8A-100-12
Fog Lights do not turn "OFF."	Chart #13	8A-100-13
One Fog Lamp inoperative.	Chart #14	8A-100-13
Fog Lights "ON" Indicator Lamp on; Fog Light Switch inoperative but Fog Lights operate normally.	Check for: • Poor connection at C200 terminal "B3". • Open in CKT 34 between S160 and Fog Light Switch. • Open in CKT 650 to ground. • Poor connections at Fog Light Switch. If OK, replace Fog Light Switch.	
Fuse(s) blows when replaced or when attempting to use lighting system.	Chart #15	8A-100-14

HEADLIGHT AND FOG LIGHTS
WITHOUT DRL (T61)

CHART #1 (CHEVY ONLY)
LO BEAM AND HI BEAM HEADLIGHTS ARE INOPERATIVE

- WITH A TEST LIGHT, BACKPROBE HEADLIGHT SWITCH CONN TERM "J" TO GROUND. IS TEST LIGHT "ON"?

YES

- HEADLIGHT SWITCH TO "HEAD."
- CONNECT A TEST LIGHT FROM HEADLIGHT SWITCH CONN TERM "E" TO GROUND. IS TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT HEADLIGHT SWITCH. IF OK, REPLACE HEADLIGHT SWITCH.

NO

- CHECK FOR POOR CONNECTION AT C200 TERM "B6".
- CHECK FUSIBLE LINK Z FOR OPEN. IF OK, REPAIR OPEN IN CKT 702 BETWEEN HEADLIGHT SWITCH AND FUSIBLE LINK Z.

YES

- CHECK FOR POOR CONNECTION AT C200 TERM "B5". IF OK, REPAIR OPEN IN CKT 10 BETWEEN HEADLIGHT SWITCH AND S151.

CHART #2 (PONTIAC ONLY)
LO BEAM AND HI BEAM HEADLIGHTS ARE INOPERATIVE

- HEADLIGHT SWITCH TO "HEAD."
- CONNECT A TEST LIGHT FROM HEADLIGHT DIMMER SWITCH CONN TERM "B" TO GROUND. IS TEST LIGHT "ON"?

YES

- CONNECT A TEST LIGHT FROM HEADLIGHT SWITCH CONN TERM "E" TO GROUND. IS TEST LIGHT "ON"?

YES

- CHECK FOR AN OPEN IN CKT 702, AN OPEN IN FUSIBLE LINK Z OR A POOR CONNECTION AT C200.
- CHECK FOR POOR CONNECTION AT HEADLIGHT SWITCH. IF OK, REPLACE HEADLIGHT SWITCH.

YES

- CHECK FOR POOR CONNECTION AT HEADLIGHT DIMMER SWITCH. IF OK, REPLACE HEADLIGHT DIMMER SWITCH.

YES

- CHECK FOR POOR CONNECTION AT C200 TERM "B5". IF OK, REPAIR OPEN IN CKT 10 BETWEEN HEADLIGHT SWITCH AND HEADLIGHT DIMMER SWITCH.

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

- HEADLIGHT SWITCH TO "HEAD."
- DISCONNECT A LO BEAM HEADLAMP CONNECTOR.
- WITH A TEST LIGHT TO GROUND, PROBE TERM "A" OF HEADLAMP CONN. IS TEST LIGHT ON?

YES

- CHECK FOR POOR CONNECTIONS AT HEADLIGHT CONNECTORS. IF OK, CHECK FOR MULTIPLE HEADLAMP FAILURE.

NO

CHECK S151 FOR OPEN IN CKT 10 TO LO BEAM HEADLIGHTS.

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

- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH TO "HI". IS HI BEAM INDICATOR "ON"?

NO

- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH TO "HI."
- WITH A TEST LIGHT TO GROUND, BACKPROBE HEADLIGHT DIMMER SWITCH CONN TERM "B". IS TEST LIGHT "ON"?

NO

REPAIR OPEN IN CKT 10 BETWEEN HEADLAMP DIMMER SWITCH AND S151.

YES

- CHECK FOR POOR CONNECTION AT HEADLIGHT DIMMER SWITCH. IF OK, REPLACE HEADLIGHT DIMMER SWITCH.

YES

CHECK FOR OPEN IN CKT 11 BETWEEN HEADLIGHT DIMMER SWITCH TERM "A" AND S152.

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

- REMOVE INSTRUMENT CLUSTER.
- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH TO "HI."
- PROBE INSTRUMENT CLUSTER CONN TERM "A11" WITH A DIGITAL MULTIMETER TO GROUND.
- MEASURE VOLTAGE.

0 VOLTS

CHECK FOR POOR CONNECTION AT C200 OR OPEN IN CKT 11 BETWEEN HEADLIGHT DIMMER SWITCH CONN AND INSTRUMENT CLUSTER CONN.

B+

- CHECK FOR POOR CONNECTION AT INSTRUMENT CLUSTER CONNECTOR TERM "A11".
- CHECK FOR MISSING OR DAMAGED HI BEAM INDICATOR LAMP OR POOR CONNECTION AT THE INSTRUMENT CLUSTER PRINTED CIRCUIT.
- CHECK PRINTED CIRCUIT FOR DAMAGE OR FLAWS.

REPLACE OR REPAIR AS NECESSARY.

HEADLIGHTS AND FOG LIGHTS
WITHOUT DRL (T61)

CHART #6 (PONT ONLY)
LO BEAM HEADLIGHTS INOPERATIVE, HI BEAM HEADLIGHTS OPERATE NORMALLY

- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH "LO."
- BACKPROBE HEADLIGHT DIMMER SWITCH CONN TERM "C" WITH A TEST LIGHT TO GROUND.

IS TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT HEADLIGHT DIMMER SWITCH. IF OK, REPLACE HEADLIGHT DIMMER SWITCH.

YES

CHECK FOR OPEN IN CKT 12 BETWEEN THE HEADLIGHT DIMMER SWITCH TERM "C" AND S153.

CHART #7 (PONT ONLY)
HI BEAM HEADLIGHTS INOPERATIVE, LO BEAM HEADLIGHTS OPERATE NORMALLY

- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH TO "HI".

IS HI BEAM INDICATOR "ON"?

NO

- CHECK FOR POOR CONNECTION AT HEADLIGHT DIMMER SWITCH. IF OK, REPLACE HEADLIGHT DIMMER SWITCH.

YES

CHECK FOR OPEN IN CKT 11 BETWEEN HEADLIGHT DIMMER SWITCH TERM "A" AND S152.

CHART #8 (CHEVY ONLY)
ONE LO BEAM OR ONE HI BEAM HEADLAMP INOPERATIVE

- DISCONNECT INOPERATIVE HEADLAMP CONN.
- HEADLIGHT SWITCH TO "HEAD."
- HEADLIGHT DIMMER SWITCH TO "HI" IF HI BEAM IS INOPERATIVE.
- CONNECT A TEST LIGHT FROM HEADLAMP CONN TERM "A" (LO BEAM) OR TERM "A" (HI BEAM) TO GROUND.

IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTION AT HEADLAMP CONN.
- (LH) CHECK FOR OPEN IN GROUND CKT 150.
- (RH) CHECK FOR OPEN IN GROUND CKT 250. IF OK, REPLACE HEADLAMP.

NO

- (HI BEAM) REPAIR OPEN IN CKT 11 BETWEEN S152 AND INOPERATIVE HEADLAMP CONN.
- (LO BEAM) REPAIR OPEN IN CKT 10 BETWEEN S151 AND INOPERATIVE HEADLAMP CONN.

CHART #9 (CHEVY ONLY)
LO BEAMS OR HI BEAMS DO NOT TURN "OFF"

- (LO BEAMS) DISCONNECT HEADLIGHT SWITCH CONN FROM HEADLIGHT SWITCH.
- (HI BEAMS) DISCONNECT CONNECTOR FROM HEADLIGHT DIMMER SWITCH.

DO HEADLIGHTS TURN "OFF"?

YES

- (LO BEAMS) REPLACE HEADLIGHT SWITCH.
- (HI BEAMS) REPLACE HEADLIGHT SWITCH.

NO

- (LO BEAMS) REPAIR SHORT TO B + IN CKT 10.
- (HI BEAMS) REPAIR SHORT TO B + IN CKT 11.

CHART #10 (PONT ONLY)
ONE LO BEAM OR ONE HI BEAM HEADLAMP INOPERATIVE

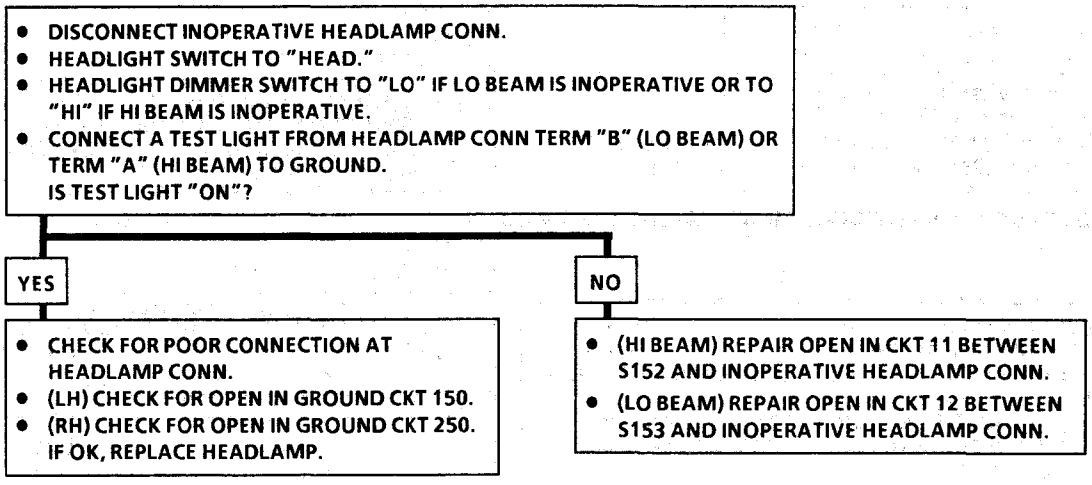
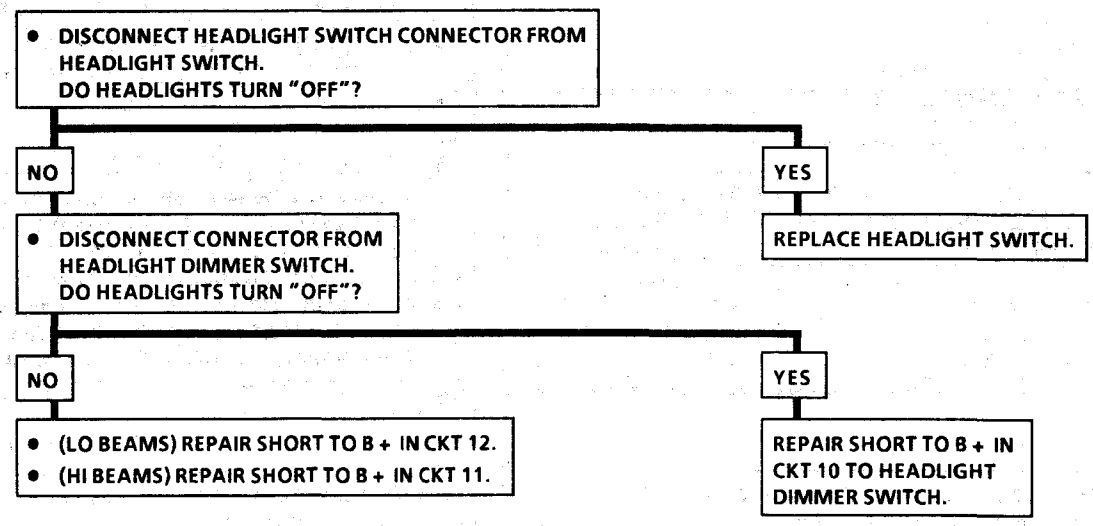


CHART #11 (PONT ONLY)
LO BEAMS OR HI BEAMS DO NOT TURN "OFF"



HEADLIGHTS AND FOG LIGHTS
WITHOUT DRL (T61)

CHART #12
FOG LIGHTS DO NOT TURN "ON" BUT PARK LIGHTS OPERATE NORMALLY

- HEADLIGHT SWITCH TO "PARK."
- WITH A TEST LIGHT TO GROUND, BACKPROBE FOG LIGHT SWITCH CONN TERM "E" (CHEVY) OR TERM "D" (PONT). IS TEST LIGHT "ON"?

YES

- HEADLIGHT SWITCH TO "PARK."
- FOG LIGHT SWITCH TO "ON."
- WITH A TEST LIGHT TO GROUND, BACKPROBE FOG LIGHT SWITCH CONN TERM "F" (CHEVY) OR TERM "A" (PONT). IS TEST LIGHT "ON"?

YES

- HEADLIGHT SWITCH TO "PARK."
- FOG LIGHT SWITCH TO "ON."
- REMOVE FOG LIGHTS RELAY FROM UNDERHOOD ELECTRICAL CENTER.
- WITH A TEST LIGHT TO GROUND, PROBE FOG LIGHTS RELAY CAVITY "H2" IN THE UNDERHOOD ELECTRICAL CENTER. IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, PROBE FOG LIGHTS RELAY CAVITY "H4" IN THE UNDERHOOD ELECTRICAL CENTER. IS TEST LIGHT "ON"?

YES

- CONNECT A FUSED JUMPER FROM FOG LIGHTS RELAY CAVITIES "H4" TO "H1" IN UNDERHOOD ELECTRICAL CENTER. DO FOG LIGHTS TURN "ON"?

YES

- WITH A TEST LIGHT TO B+, PROBE FOG LIGHTS RELAY CAVITY "H5" IN UNDERHOOD ELECTRICAL CENTER. IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTIONS AT FOG LIGHTS RELAY. IF OK, REPLACE FOG LIGHTS RELAY.

NO

- CHECK FOR POOR CONNECTION AT FOG LIGHT SWITCH CONN TERM "E" (CHEVY) OR TERM "D" (PONT). IF OK, REPAIR OPEN IN CKT 9 BETWEEN FOG LIGHT SWITCH AND S226.

NO

- CHECK FOR POOR CONNECTIONS AT FOG LIGHT SWITCH CONN TERM "F" AND TERM "E" (CHEVY) OR TERM "A" AND TERM "D" (PONT). IF OK, REPLACE FOG LIGHT SWITCH.

NO

- CHECK FOR POOR CONNECTION AT C200 TERM "A16."
- IF OK, REPAIR OPEN IN CKT 317 BETWEEN FOG LIGHT SWITCH AND FOG LIGHTS RELAY LOCATED IN UNDERHOOD ELECTRICAL CENTER.

NO

- CHECK FOG LIGHTS FUSE 2 LOCATED IN UNDERHOOD ELECTRICAL CENTER FOR OPEN.
- IF OPEN, CHECK FOR OPEN OR SHORT TO GROUND THROUGH CKTS 1340 AND 34 INCLUDING FAULTY RELAY. IF FUSE CONTINUES TO BLOW, REFER TO CHART #15 IN THIS SECTION.

NO

- IF FOG LIGHT SWITCH "ON" INDICATOR LIGHT ILLUMINATES WITH FUSED JUMPER INSTALLED, CHECK FOR POOR CONNECTIONS AT FOG LAMP BULBS.
- IF OK, CHECK FOR MULTIPLE BULB FAILURE.
- IF FOG LIGHT SWITCH "ON" INDICATOR LIGHT DOES NOT ILLUMINATE WITH FUSED JUMPER INSTALLED, CHECK FOR OPEN IN CKT 34 BETWEEN FOG LIGHTS RELAY AND S160.

NO

REPAIR OPEN IN CKT 11 BETWEEN FOG LIGHTS RELAY AND S152.

CHART #13
FOG LIGHTS DO NOT TURN "OFF"

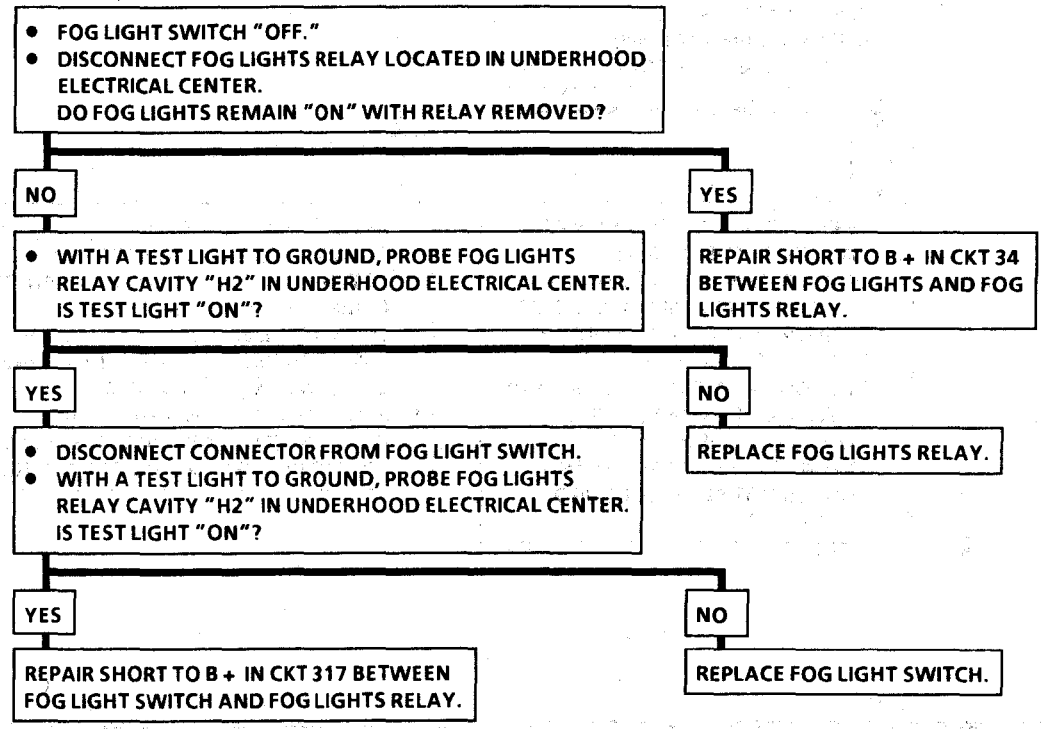
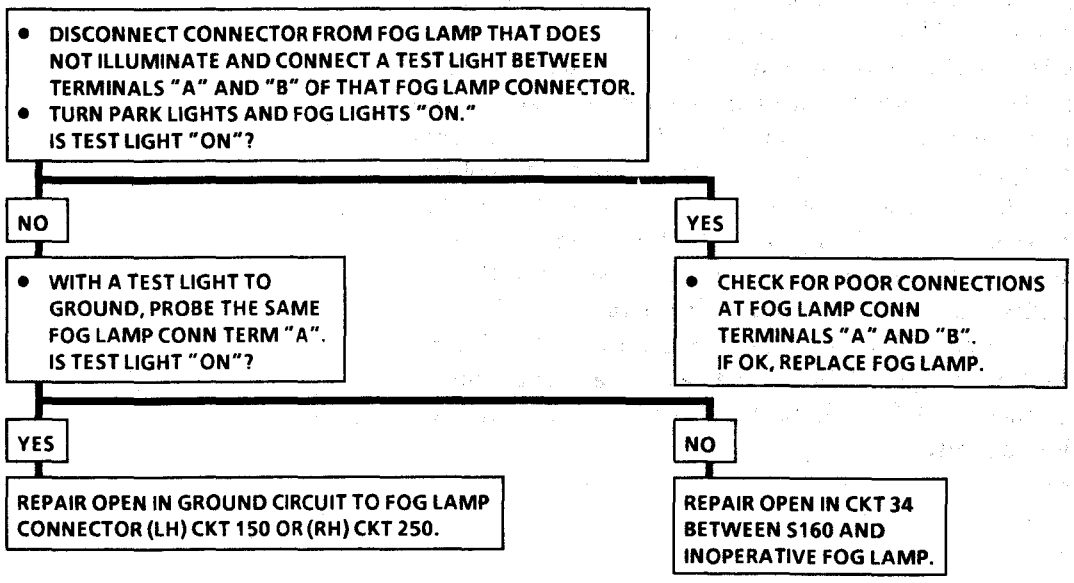
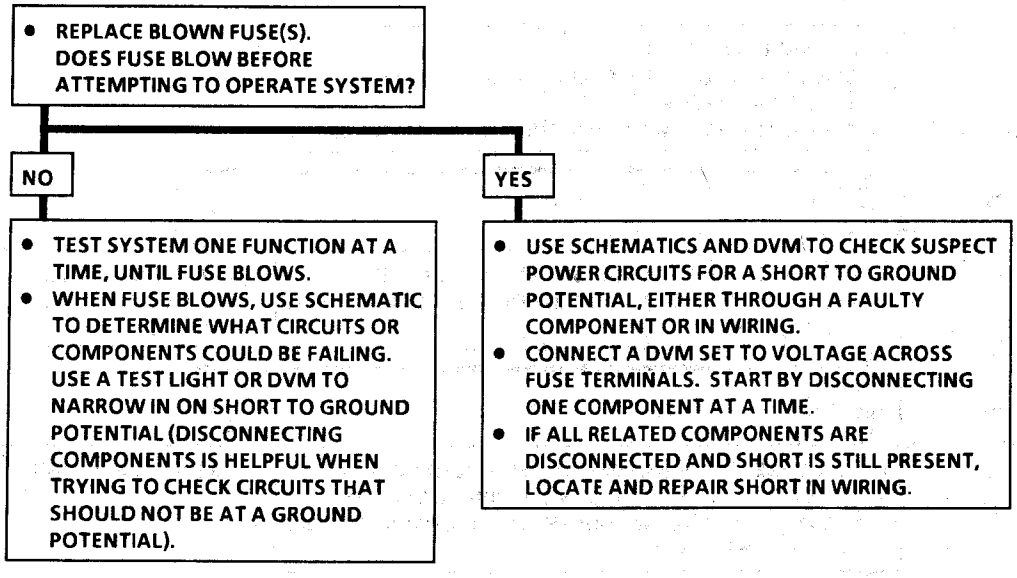


CHART #14
ONE FOG LAMP INOPERATIVE



HEADLIGHTS AND FOG LIGHTS
WITHOUT DRL (T61)

CHART #15
FUSE(S) BLOWS WHEN REPLACED OR WHEN ATTEMPTING TO USE LIGHTING SYSTEM



CIRCUIT OPERATION (CHEVY)
HEADLIGHTS

Voltage is applied to the Headlight Switch at all times from Fusible Link Z. When the Headlight Switch is in "HEAD," voltage is applied directly from the Headlight Switch through CKT 10 to the LO Beam Headlamps. Voltage is also applied through CKT 10 to the Headlight Dimmer Switch. When the Headlight Dimmer Switch is placed in "HI," voltage is applied through the closed contacts of the Dimmer Switch to the HI Beam Headlamps and the HI Beam Indicator. When HI Beams are selected both the LO Beam Headlamps and HI Beam Headlamps will be illuminated. The LO Beam Headlamps, HI Beam Headlamps, and HI Beam Indicator are permanently grounded so that when battery voltage is applied, the lamps operate.

CIRCUIT OPERATION (PONTIAC)

HEADLIGHTS

Voltage is applied to the Headlight Switch at all times from Fusible Link Z. When the Headlight Switch is in "HEAD," voltage is applied to the HI and LO Beam Circuits through the Headlight Dimmer Switch.

At the same time, this voltage is applied to the Headlamp Door Motor Assemblies, which allows the doors to open.

When the Headlight Switch is moved to "HEAD" and the Headlight Dimmer Switch is placed in "LO," voltage is applied through the closed contacts of the Headlight Dimmer Switch to the LO Beam Circuit of the Headlights. When the Headlight Dimmer Switch is placed in "HI," battery voltage is applied to the HI Beam circuit of the Headlights, and the HI Beam Indicator. The LH Headlamp, RH Headlamp, and the HI Beam Indicator are permanently grounded so that when battery voltage is applied, the lamps operate.

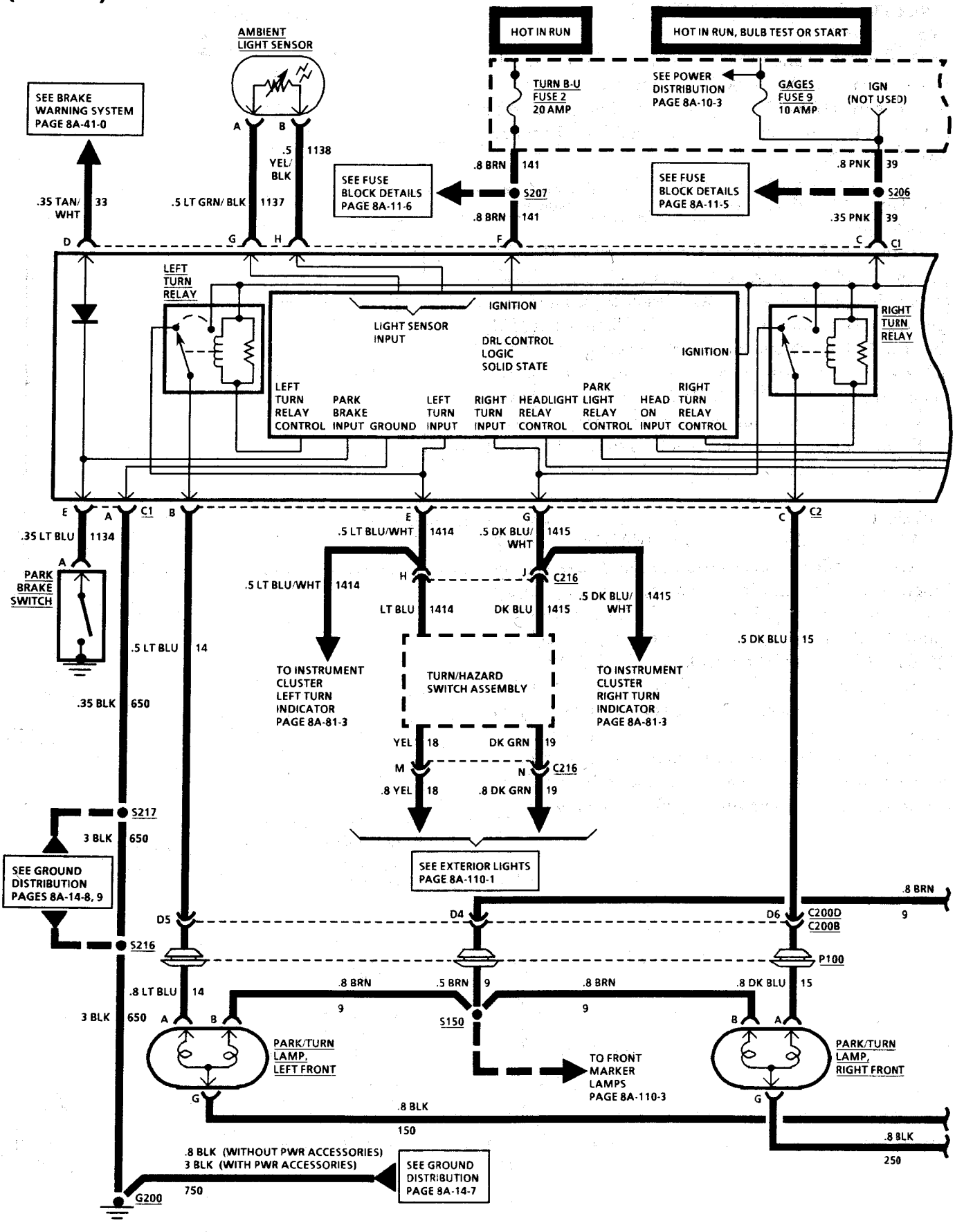
FOG LIGHTS

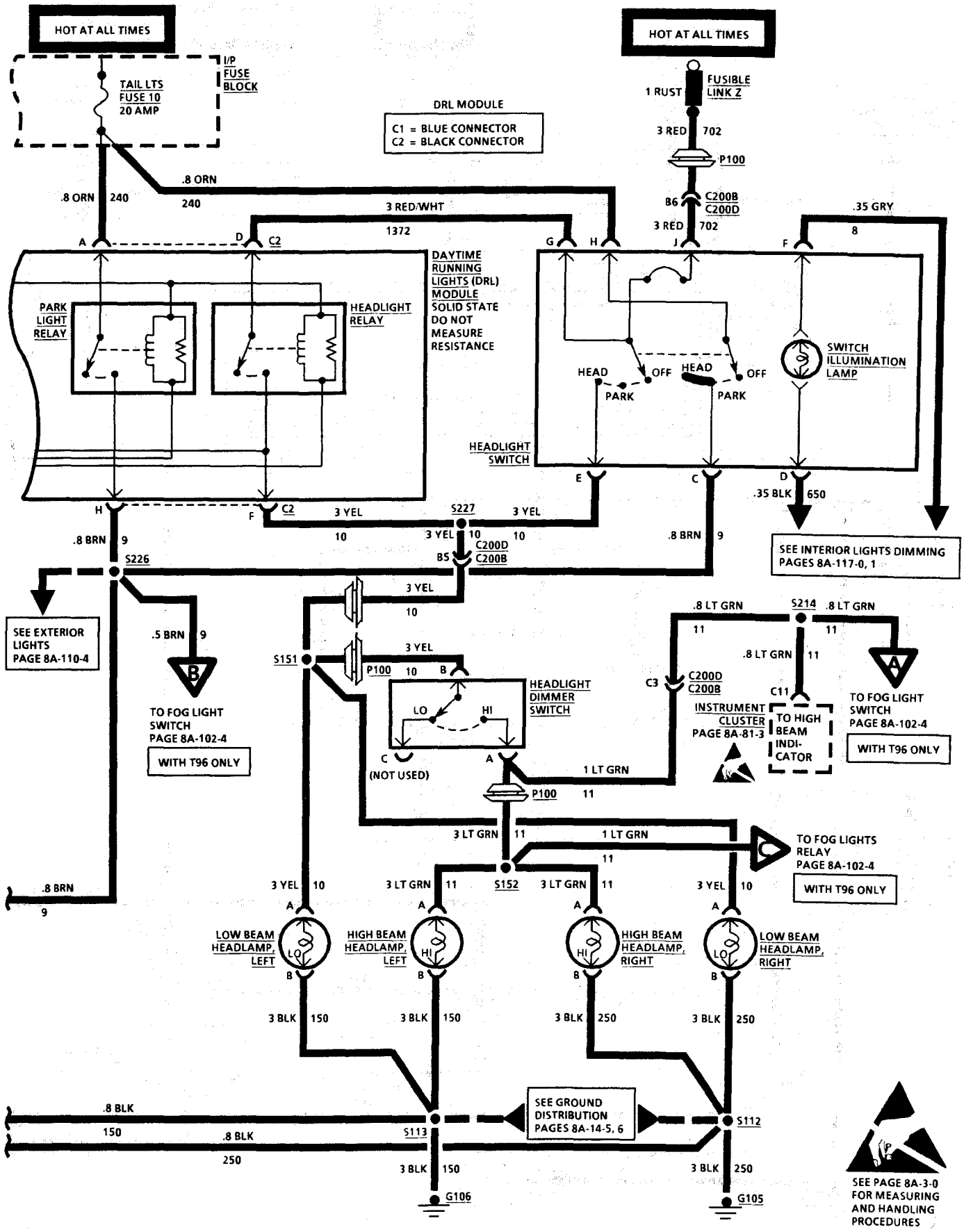
With the Headlight Switch in "HEAD" or "PARK," voltage is applied to one side of the Fog Light Switch. When the Fog Light Switch is closed, voltage is applied to one side of the Fog Lights Relay Coil, energizing the relay (the other side of the coil is grounded through the HI Beam Filament of the Headlamps).

When energized, the normally open contacts of the Fog Lights Relay close, allowing voltage to be applied to the Fog Lights.

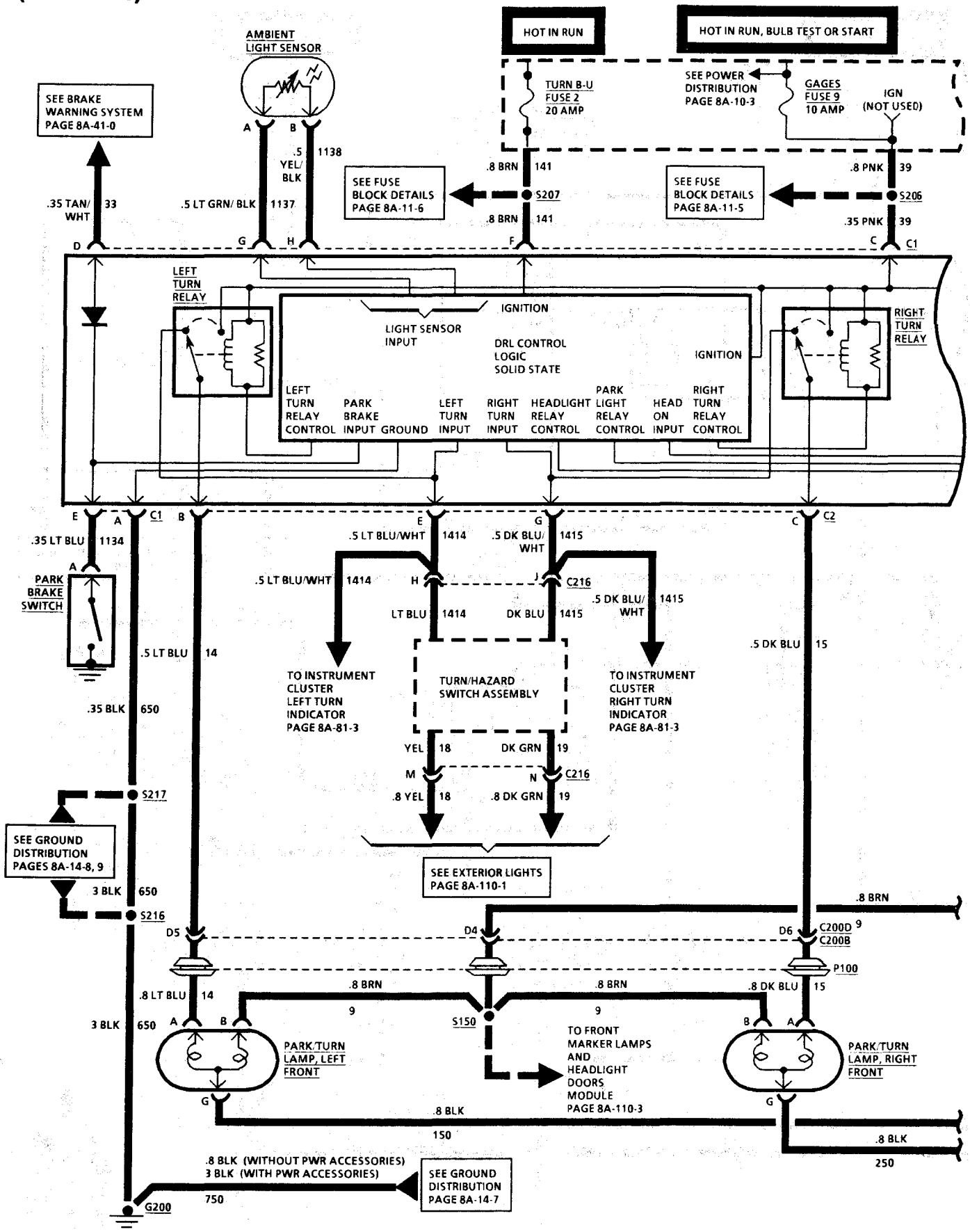
When the HI Beams are activated, ground is removed to one side of the Fog Lights Relay Coil, de-energizing the relay and turning off the Fog Lights.

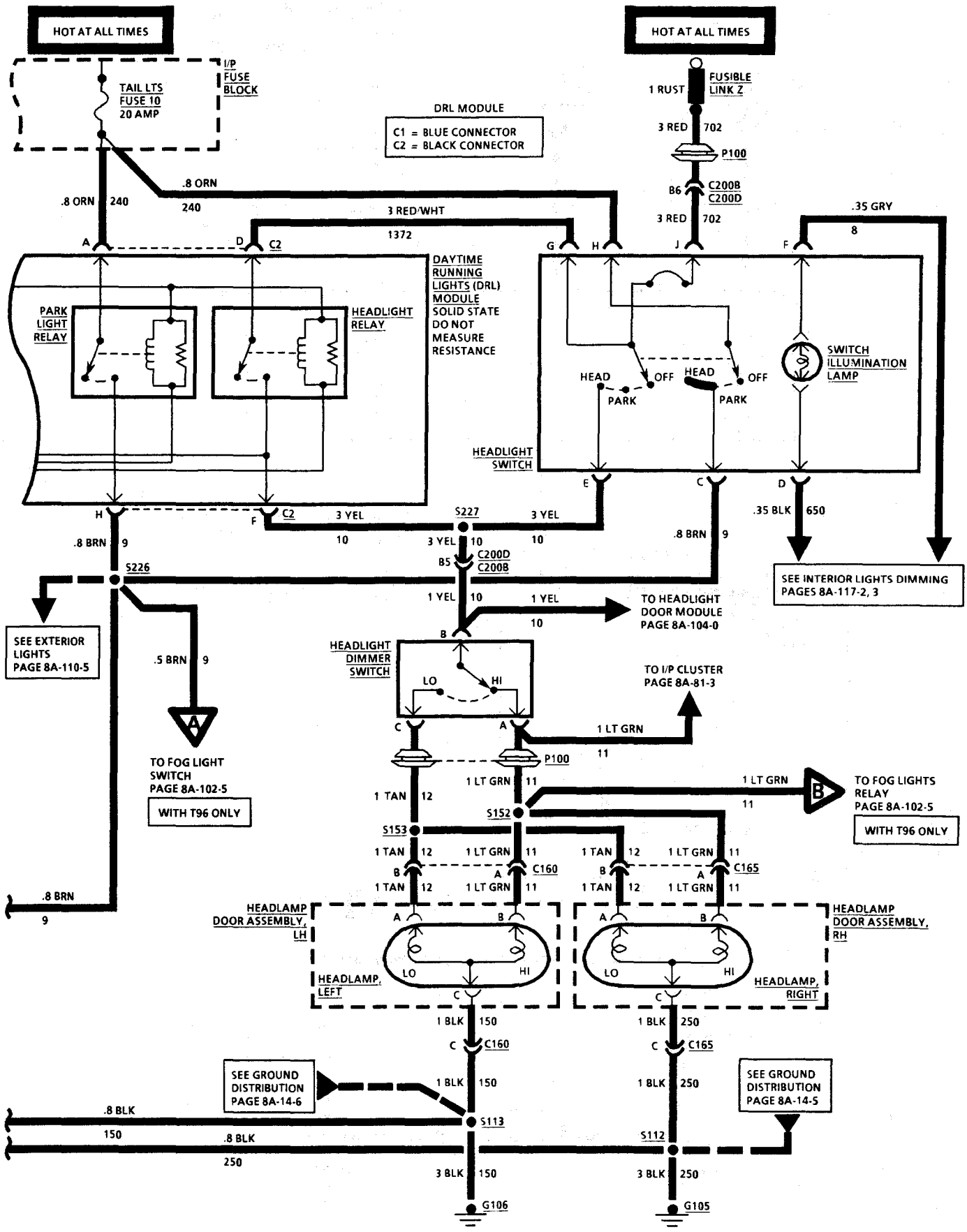
HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61) (CHEVY)



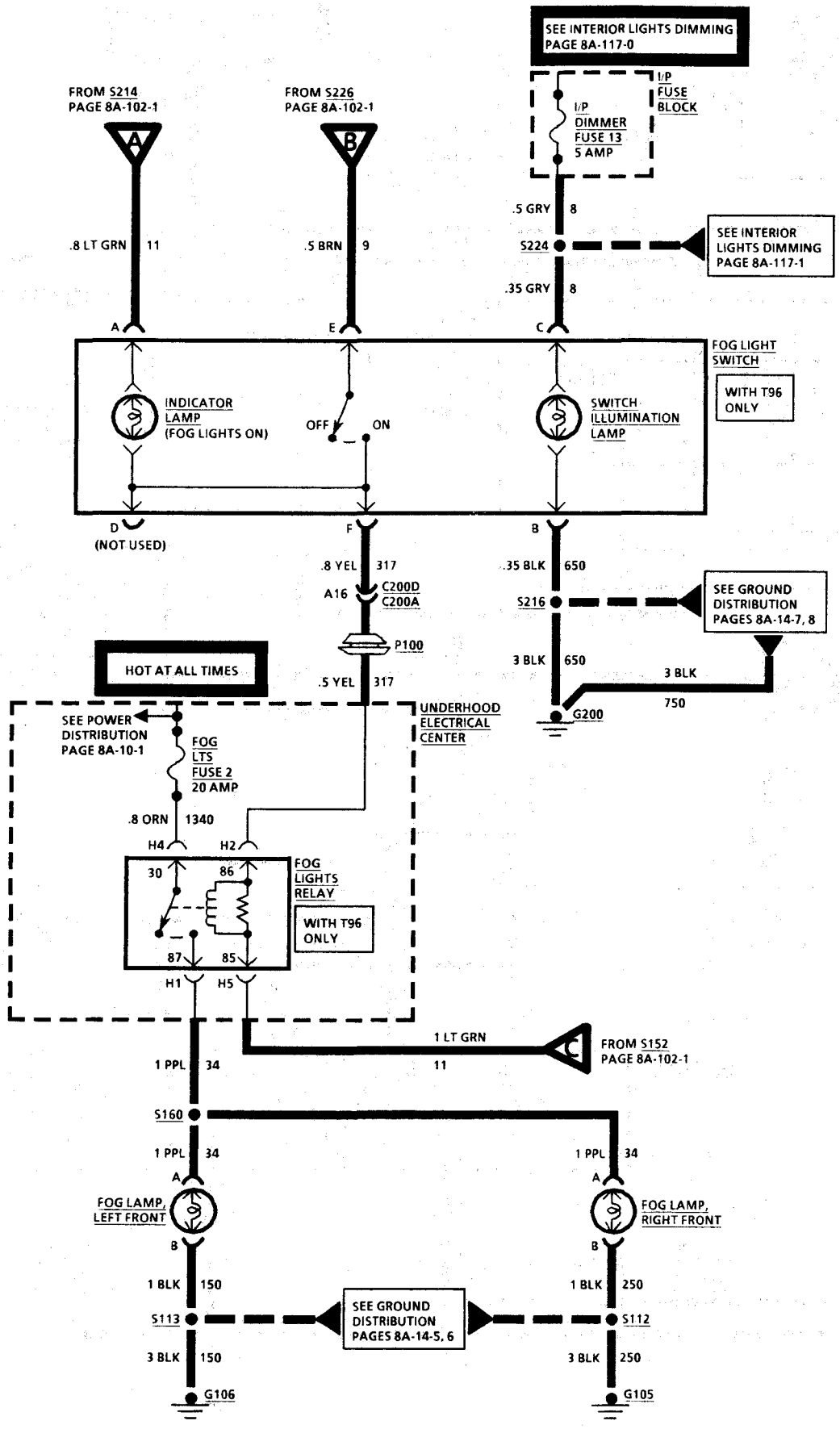

HOT AT ALL TIMES
I/P FUSE BLOCK
TAIL LTS FUSE 10 20 AMP
HOT AT ALL TIMES
1 RUST
FUSIBLE LINK Z
3 RED 702
P100
B6 C200B C200D
3 RED 702
DRL MODULE
C1 = BLUE CONNECTOR
C2 = BLACK CONNECTOR
.8 ORN 240
.8 ORN 240
3 RED/WHT 1372
.35 GRY 8
A
D C2
G H
J
F
DAYTIME RUNNING LIGHTS (DRL) MODULE SOLID STATE DO NOT MEASURE RESISTANCE
PARK LIGHT RELAY
HEADLIGHT RELAY
HEAD OFF PARK
HEAD OFF PARK
SWITCH ILLUMINATION LAMP
HEADLIGHT SWITCH
E C D
.35 BLK 650
SEE INTERIOR LIGHTS DIMMING PAGES 8A-117-0, 1
H F C2 3 YEL 10
S227
3 YEL 10 10
3 YEL 10
C200D C200B B5
.8 BRN 9
S226
.8 BRN 9
SEE EXTERIOR LIGHTS PAGE 8A-110-4
.5 BRN 9
B
TO FOG LIGHT SWITCH PAGE 8A-102-4
WITH T96 ONLY
3 YEL 10
S151
3 YEL P100 10 B
HEADLIGHT DIMMER SWITCH
LO HI
C (NOT USED)
A
1 LT GRN
P100 11
.8 LT GRN 11
S214
.8 LT GRN 11
.8 LT GRN 11
C3 C200D C200B
C11
INSTRUMENT CLUSTER PAGE 8A-81-3
TO HIGH BEAM INDICATOR
A
TO FOG LIGHT SWITCH PAGE 8A-102-4
WITH T96 ONLY
3 LT GRN 11
1 LT GRN 11
TO FOG LIGHTS RELAY PAGE 8A-102-4
WITH T96 ONLY
.8 BRN 9
3 YEL 10
3 LT GRN 11
S152
3 LT GRN 11
3 YEL 10
A
LOW BEAM HEADLAMP, LEFT
HIGH BEAM HEADLAMP, LEFT
HIGH BEAM HEADLAMP, RIGHT
LOW BEAM HEADLAMP, RIGHT
B
3 BLK 150
3 BLK 150
3 BLK 250
3 BLK 250
.8 BLK 150
.8 BLK 250
S113
SEE GROUND DISTRIBUTION PAGES 8A-14-5, 6
S112
3 BLK 150
3 BLK 250
G106
G105
SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61) (PONTIAC)

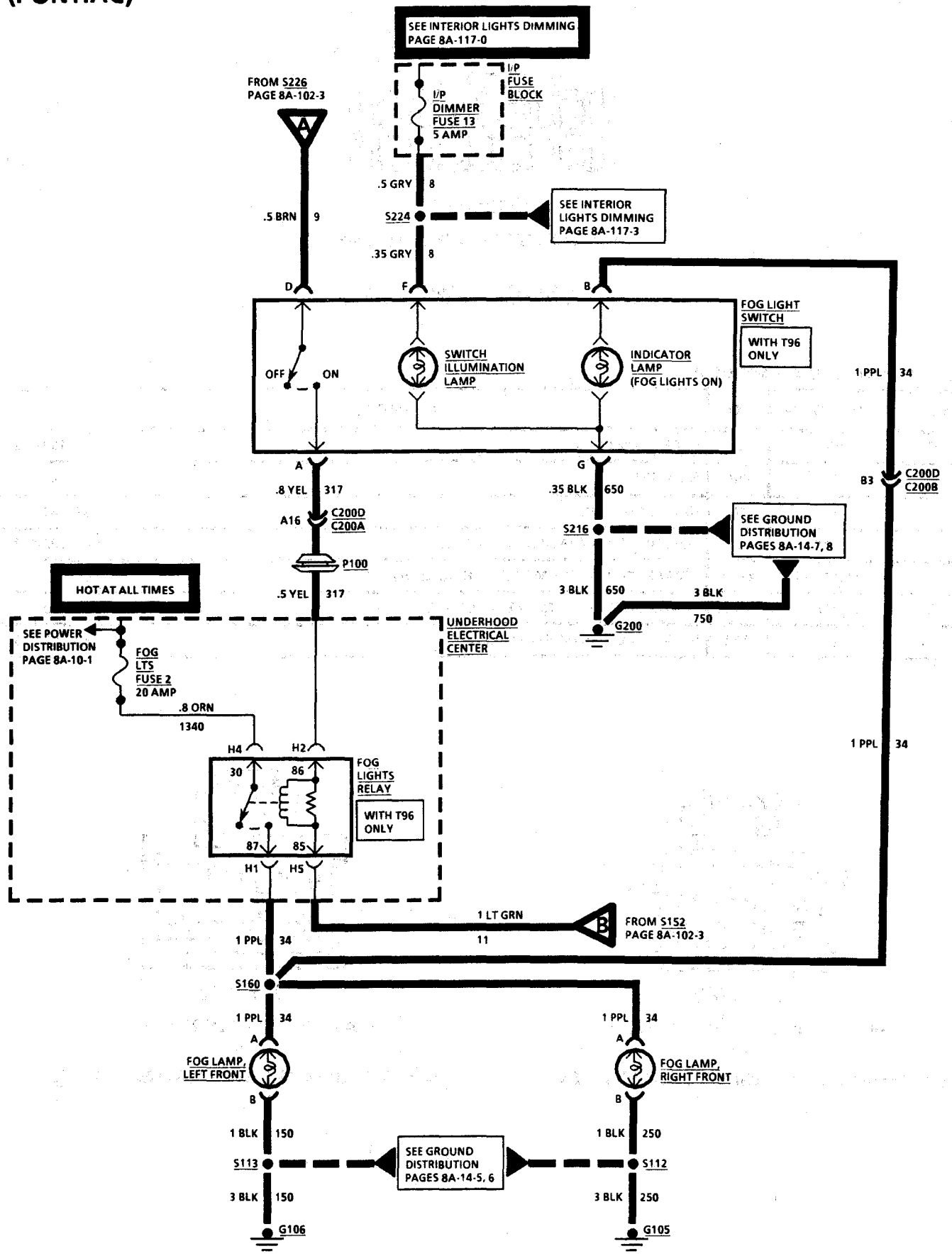



HOT AT ALL TIMES
I/P FUSE BLOCK
TAIL LTS FUSE 10 20 AMP
.8 ORN 240
.8 ORN 240
DRL MODULE
C1 = BLUE CONNECTOR
C2 = BLACK CONNECTOR
HOT AT ALL TIMES
1 RUST FUSIBLE LINK Z
3 RED 702
P100
B6 C200B C200D
3 RED 702
3 RED/WHT 1372
.35 GRY 8
A D C2
G H J F
DAYTIME RUNNING LIGHTS (DRL) MODULE SOLID STATE DO NOT MEASURE RESISTANCE
PARK LIGHT RELAY
HEADLIGHT RELAY
HEAD OFF PARK
HEAD OFF PARK
SWITCH ILLUMINATION LAMP
HEADLIGHT SWITCH
E C D
H F C2 3 YEL 10
S227
3 YEL 10
3 YEL 10
.8 BRN 9
.35 BLK 650
.8 BRN 9
S226
B5 C200D C200B
SEE INTERIOR LIGHTS DIMMING PAGES 8A-117-2, 3
1 YEL 10
1 YEL 10
TO HEADLIGHT DOOR MODULE PAGE 8A-104-0
B
SEE EXTERIOR LIGHTS PAGE 8A-110-5
.5 BRN 9
HEADLIGHT DIMMER SWITCH
LO HI
TO I/P CLUSTER PAGE 8A-81-3
C A
1 LT GRN 11
P100
1 LT GRN 11
1 LT GRN 11
TO FOG LIGHTS RELAY PAGE 8A-102-5
WITH T96 ONLY
1 TAN 12
S152
S153
1 TAN 12
1 LT GRN 11
1 TAN 12
1 LT GRN 11
B A C160
1 TAN 12
1 LT GRN 11
B A C165
1 TAN 12
1 LT GRN 11
TO FOG LIGHT SWITCH PAGE 8A-102-5
WITH T96 ONLY
.8 BRN 9
HEADLAMP DOOR ASSEMBLY, LH
HEADLAMP DOOR ASSEMBLY, RH
A B
LO HI
HEADLAMP, LEFT
HEADLAMP, RIGHT
C
1 BLK 150
1 BLK 250
C C160
C C165
SEE GROUND DISTRIBUTION PAGE 8A-14-6
1 BLK 150
1 BLK 250
SEE GROUND DISTRIBUTION PAGE 8A-14-5
.8 BLK 150
S113
S112
.8 BLK 250
3 BLK 150
3 BLK 250
G106
G105

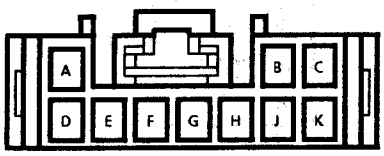
HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61) (CHEVY)



HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61) (PONTIAC)



HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61)



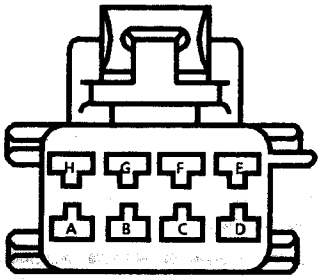
12129077

10-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT SWITCH

**CAVITIES NOT LISTED ARE NOT USED

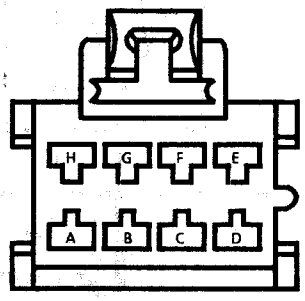
CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C	BRN	9	PARK LAMP FEED	8A-102-1, 3
D	BLK	650	GROUND	8A-14-8
E	YEL	10	HEADLIGHTS ON	8A-102-1, 3
F	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-102-1, 3
G	RED/WHT	1372	POWER FEED TO DRL MODULE - HEADLIGHT RELAY	8A-102-1, 3
H	ORN	240	POWER FEED FROM TAIL LTS FUSE #10	8A-102-1, 3
J	RED	702	POWER FEED FROM FUSIBLE LINK Z	8A-102-1, 3



12064766

8-WAY F METRI-PACK 150 SERIES
BLU

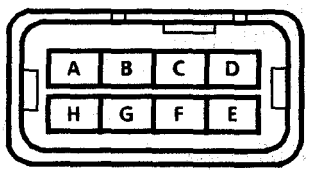
DAYTIME RUNNING LIGHTS (DRL) MODULE C1



12064998

8-WAY F METRI-PACK 280 SERIES
BLK

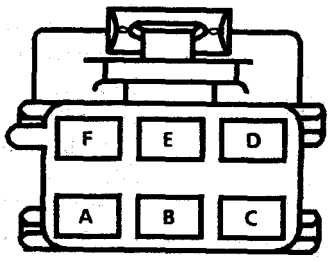
DAYTIME RUNNING LIGHTS (DRL) MODULE C2



12045688

8-WAY M METRI-PACK 150 SERIES
BLK

FOG LIGHT SWITCH (PONT)



12064762

6-WAY F METRI-PACK 150 SERIES
GRY

FOG LIGHT SWITCH (CHEVY)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Ambient Light Sensor	Mounted in top of I/P, near Defrost Grill	22	41	
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Fog Lamp, Left Front	Lower LH side of front Fascia			
Fog Lamp, Right Front	Lower RH side of front Fascia			
Fog Light Switch	Lower LH side of I/P	37, 38	66, 67	202-21
Fusible Links	Above RH Shock Tower	10	19	
Headlamp, Left (Pont)	LH front of vehicle	23	43	
Headlamp, Right (Pont)	RH front of vehicle			
Headlight Dimmer Switch	Part of Steering Column, activated by Multi-Function Lever	3, 35	5, 64	
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
High Beam Headlamp, Left (Chevy)	Exterior, left front			
High Beam Headlamp, Right (Chevy)	Exterior, right front			
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Instrument Cluster	LH side of I/P			202-23
Low Beam Headlamp, Left (Chevy)	Exterior, left front			
Low Beam Headlamp, Right (Chevy)	Exterior, right front			
Park Brake Switch	In console, at base of Park Brake Lever	43	81	
Park/Turn Lamp, Left Front	Exterior, left front	17	32	
Park/Turn Lamp, Right Front	Exterior, right front	17	32	
Turn/Hazard Switch Assembly	Part of Steering Column	3	5	
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C160 (3 cavities)	LH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C165 (3 cavities)	RH Headlight to Forward Lamp Harn Jumper, behind Headlight Door Bracket	23	43	
C200A (17 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
C200B (18 cavities)	Part of Forward Lamp 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

(CONTINUED ON NEXT PAGE)

HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61)

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
C216 (11 cavities)	Attached to base of Steering Column	34	63	202-5
G105	Near top RH side of radiator, in top of T-Bar	19	36	
G106	Near top LH side of radiator, in top of T-Bar	19	35	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S112	Forward Lamp Harn, approx 10 cm from G105 breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S150	Forward Lamp Harn, approx 22 cm forward of Electrical Center breakout, on lighting branch			
S151	Forward Lamp Harn, at Electrical Center breakout			
S152	Forward Lamp Harn, approx 8 cm from Electrical Center breakout			
S153	Forward Lamp Harn, at Air Pump breakout			
S160	Forward Lamp Harn, approx 4 cm from Coolant Fan breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S207	I/P Harn, approx 4 cm before DLC breakout			
S214	I/P Harn, approx 7 cm from G200 breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			
S227	I/P Harn, approx 10 cm from Convenience Center breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Make sure Headlights and Park Lights operate normally when using the Light Switch before proceeding with Daytime Running Lamp (DRL) diagnosis.
2. Make sure the Brake Warning System is functioning properly. DRL will not turn "ON" if Park Brake is "ON."
3. Check Fusible Link Z for open.
4. Check Turn B-U Fuse 2, Gages Fuse 9 and TAIL LTS Fuse 10 for open. If fuse(s) are blown, replace fuse(s). If fuse(s) re-blows, check for short to ground through the suspected circuit(s).

- 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 systemdisconnected. 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.

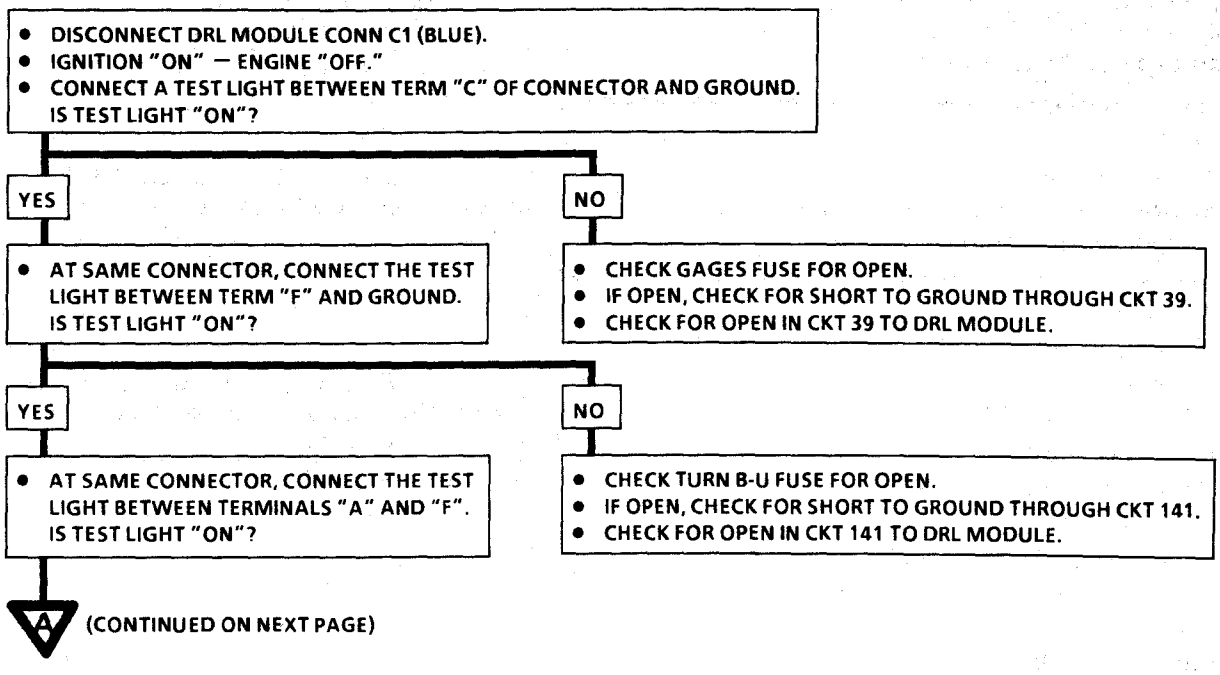
SYSTEM DIAGNOSIS

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
DRL will not turn "ON."	Chart #1	8A-102-9
DRL operates normally in daytime, but Park Lights and Headlights will not turn "ON" automatically at dark.	Chart #2	8A-102-11
Park Lights will not turn "ON" automatically at dark (Headlights turn "ON" OK).	Chart #3	8A-102-11
Headlights will not turn "ON" automatically at dark (Park Lights turn "ON" OK).	Chart #4	8A-102-11
Park Lights always stay "ON" during daylight hours (Headlights remain "OFF").	Chart #5	8A-102-12
Headlights always stay "ON" during daylight hours (Park Lights remain "OFF").	Chart #6	8A-102-12
Park Lights and Headlights remain "ON" during daylight hours.	Chart #5 Chart #6	8A-102-12 8A-102-12
LH Front Turn Signal inoperative.	Chart #7	8A-102-12
RH Front Turn Signal inoperative.	Chart #8	8A-102-13
Fog Lights entire system inoperative or individual lamp inoperative.	For diagnosis, refer to "Headlights," SECTION 8A-100.	

CHART #1
DRL WILL NOT TURN "ON"



HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61)

CHART #1 (continued)
DRL WILL NOT TURN "ON"

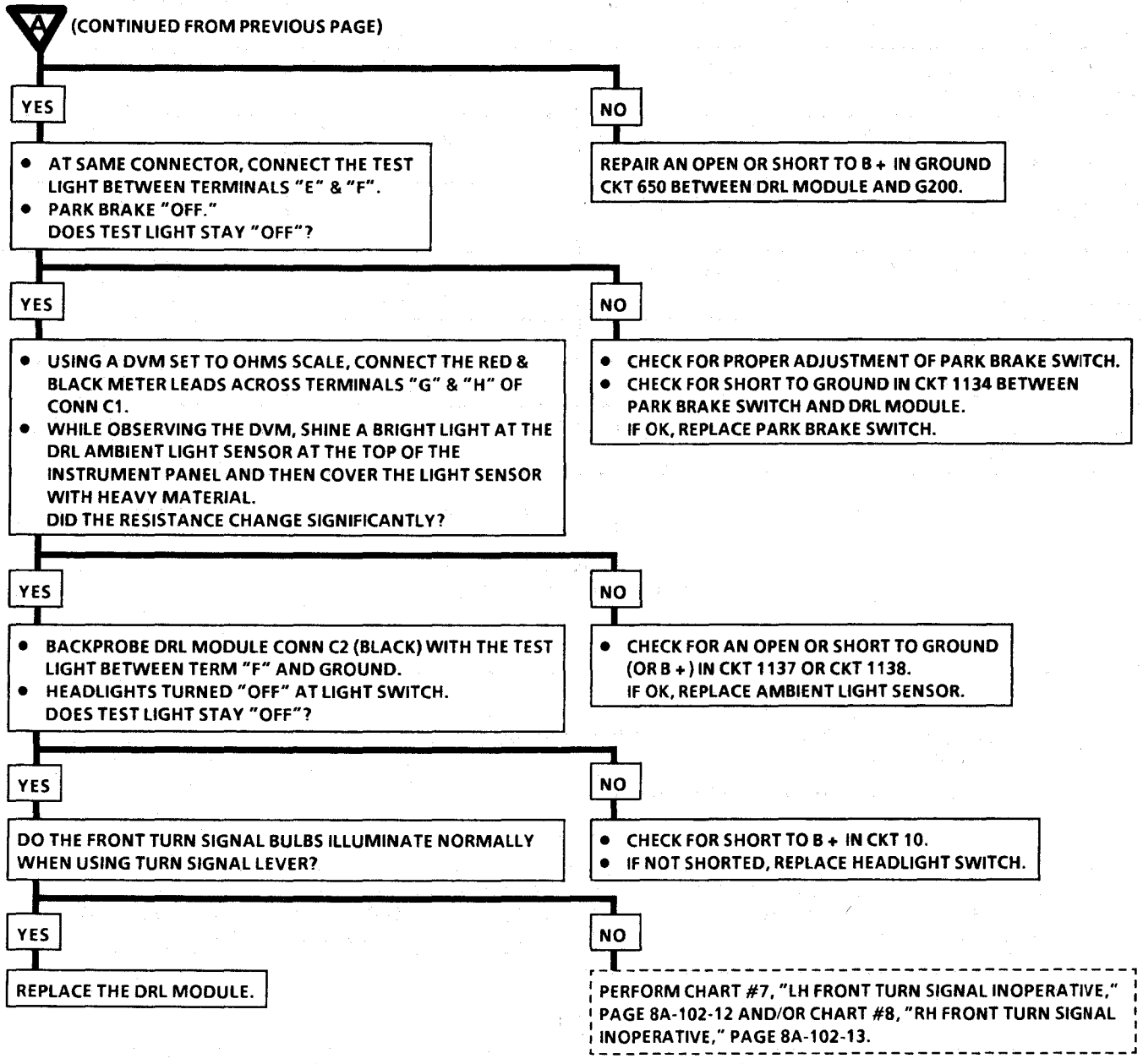


CHART #2

DRL OPERATES NORMALLY IN DAYTIME, BUT PARK LIGHTS AND HEADLIGHTS DO NOT TURN "ON" AUTOMATICALLY AT DARK

IMPORTANT:

- MAKE SURE PARK LIGHTS AND HEADLIGHTS OPERATE PROPERLY FROM HEADLIGHT SWITCH BEFORE PROCEEDING. IF NOT, REFER TO "EXTERIOR LIGHTS," SECTION 8A-110 FOR PARK LIGHT DIAGNOSIS AND/OR "HEADLIGHTS," SECTION 8A-100 FOR HEADLIGHT DIAGNOSIS.

- DISCONNECT DRL MODULE CONN C1 (BLUE).
- USING A DVM SET TO THE OHMS SCALE, CONNECT THE RED & BLACK METER LEADS ACROSS TERMINALS "G" & "H" OF C1.
- WHILE OBSERVING THE RESISTANCE ON THE DVM, SHINE A BRIGHT LIGHT INTO THE DRL AMBIENT LIGHT SENSOR (AT THE TOP OF THE INSTRUMENT PANEL), THEN COVER THE LIGHT SENSOR WITH A PIECE OF HEAVY MATERIAL.
  DID THE RESISTANCE MEASUREMENTS CHANGE SIGNIFICANTLY?

YES

- CHECK FOR POOR CONNECTION AT THE DRL MODULE. IF OK, REPLACE THE DRL MODULE.

NO

- CHECK FOR AN OPEN, SHORT TO GROUND, OR SHORT TO B+ IN CKT 1137 OR CKT 1138. IF OK, REPLACE DRL AMBIENT LIGHT SENSOR.

CHART #3

PARK LIGHTS WILL NOT TURN "ON" AUTOMATICALLY AT DARK (HEADLIGHTS TURN "ON" OK)

IMPORTANT:

- MAKE SURE PARK LIGHTS OPERATE NORMALLY FROM HEADLIGHT SWITCH BEFORE PROCEEDING. IF NOT OPERATING NORMALLY, REFER TO "EXTERIOR LIGHTS," SECTION 8A-110 FOR DIAGNOSIS.

- DISCONNECT DRL MODULE CONN C2 (BLACK).
- IGNITION "ON" – ENGINE "OFF."
- CONNECT A TEST LIGHT BETWEEN TERM "A" OF CONNECTOR AND GROUND.
  IS TEST LIGHT "ON"?

YES

- RECONNECT CONN C2.
- COVER DRL AMBIENT LIGHT SENSOR WITH HEAVY MATERIAL.
- BACKPROBE CONN C2 WITH THE TEST LIGHT BETWEEN TERM "H" AND GROUND.
  IS TEST LIGHT "ON"?

YES

REPAIR OPEN IN CKT 9 BETWEEN DRL MODULE AND S226.

NO

- CHECK FOR POOR CONNECTION AT DRL MODULE CONN C2 TERM "H". IF OK, REPLACE DRL MODULE.

NO

- CHECK FOR OPEN TAIL LTS FUSE.
- IF OPEN, CHECK FOR SHORT TO GROUND THROUGH CKT 240.
- CHECK FOR OPEN IN CKT 240 BETWEEN I/P FUSE BLOCK AND DRL MODULE.

CHART #4

HEADLIGHTS WILL NOT TURN "ON" AUTOMATICALLY AT DARK (PARK LIGHTS TURN "ON" OK)

IMPORTANT:

- MAKE SURE HEADLIGHTS OPERATE NORMALLY FROM HEADLIGHT SWITCH BEFORE PROCEEDING. IF NOT, REFER TO "HEADLIGHTS," SECTION 8A-100 FOR DIAGNOSIS.

- DISCONNECT DRL MODULE CONN C2 (BLACK).
- CONNECT A TEST LIGHT BETWEEN TERM "D" OF CONNECTOR AND GROUND.
  IS TEST LIGHT "ON"?

YES

- CONNECT A FUSED JUMPER BETWEEN TERM "F" AND TERM "D" OF DRL MODULE CONN C2.
  DO HEADLIGHTS TURN "ON"?

YES

- CHECK FOR POOR CONNECTIONS AT DRL MODULE CONN C2. IF OK, REPLACE DRL MODULE.

NO

REPAIR OPEN IN CKT 10 BETWEEN DRL MODULE AND S227.

NO

- CHECK FOR AN OPEN IN CKT 1372 BETWEEN HEADLIGHT SWITCH AND DRL MODULE. IF OK, REPLACE LIGHT SWITCH.

HEADLIGHTS AND FOG LIGHTS: DAYTIME RUNNING LIGHTS (T61)

CHART #5
PARK LIGHTS ALWAYS STAY "ON" DURING DAYLIGHT HOURS (HEADLIGHTS REMAIN "OFF")

- DISCONNECT DRL MODULE CONN C2 (BLACK). DO PARK LIGHTS TURN "OFF"?

YES
- REPLACE DRL MODULE.

NO
- REPAIR SHORT TO B + IN CKT 9.
- FOR A COMPLETE CIRCUIT SCHEMATIC REFER TO "EXTERIOR LIGHTS," SECTION 8A-110.

CHART #6
HEADLIGHTS ALWAYS STAY "ON" DURING DAYLIGHT HOURS (PARK LIGHTS REMAIN "OFF")

- DISCONNECT DRL CONN C2 (BLACK). DO HEADLIGHTS TURN "OFF"?

YES
- REPLACE DRL MODULE.

NO
- CHECK FOR SHORT TO B + IN CKT 10.
- REFER TO "HEADLIGHTS," SECTION 8A-100 FOR FURTHER DIAGNOSIS.

CHART #7
LH FRONT TURN SIGNAL INOPERATIVE

IMPORTANT:
- MAKE SURE THE DRL SYSTEM OPERATES NORMALLY (FRONT TURN SIGNAL BULBS ILLUMINATE DURING DAYLIGHT HOURS) BEFORE PROCEEDING. IF NOT OPERATING CORRECTLY, PERFORM CHART #1, "DRL WILL NOT TURN 'ON.'"

- IGNITION "ON" — ENGINE "OFF."
- WITH A TEST LIGHT TO GROUND, BACKPROBE DRL MODULE CONN C2 TERM "E". DOES TEST LIGHT ILLUMINATE (OR FLASH ON & OFF) WHEN TURN SIGNAL LEVER IS MOVED TO THE "LEFT TURN" POSITION?

YES
- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERM "B" AND GROUND. DOES TEST LIGHT ILLUMINATE WHEN THE TURN SIGNAL LEVER IS MOVED TO THE "LEFT TURN" POSITION?

NO
- CHECK FOR POOR CONNECTION AT DRL MODULE.
- CHECK FOR AN OPEN IN CKT 1414 BETWEEN TURN/HAZARD SWITCH ASSEMBLY AND DRL MODULE.
- IF OK, REFER TO "EXTERIOR LIGHTS," SECTION 8A-110 FOR FURTHER DIAGNOSIS.

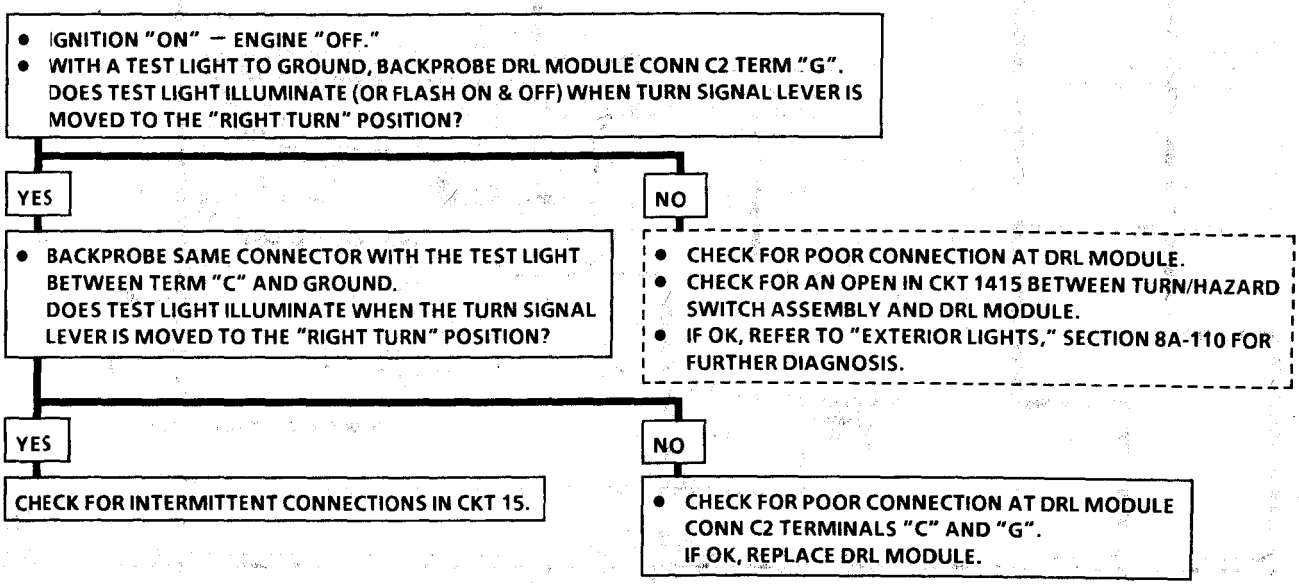
YES
- CHECK FOR INTERMITTENT CONNECTIONS IN CKT 14.

NO
- CHECK FOR POOR CONNECTIONS AT DRL MODULE CONN C2 TERMINALS "E" AND "B". IF OK, REPLACE DRL MODULE.

CHART #8
RH FRONT TURN SIGNAL INOPERATIVE

IMPORTANT:

- MAKE SURE THE DRL SYSTEM OPERATES NORMALLY (FRONT TURN SIGNAL BULBS ILLUMINATE DURING DAYLIGHT HOURS) BEFORE PROCEEDING.
  IF NOT OPERATING CORRECTLY, PERFORM CHART #1, "DRL WILL NOT TURN 'ON.'"



CIRCUIT OPERATION

The Daytime Running Lamp (DRL) system consists of a Control Module and an Ambient Light Sensor.

During daylight hours, the DRL Module turns "ON" the Front Turn Signal Lights if 1.) Ignition is "ON," 2.) The Headlights are "OFF" and 3.) If the Park Brake is "OFF." As darkness approaches, the DRL Module will turn "OFF" the Front Turn Signal Lights and turn "ON" the Park Lights and Headlights.

The DRL Module determines daylight or nighttime hours by receiving voltage from the Ambient Light Sensor. As darkness approaches the Ambient Light Sensor will change resistance and thus change the voltage received by the DRL Module.

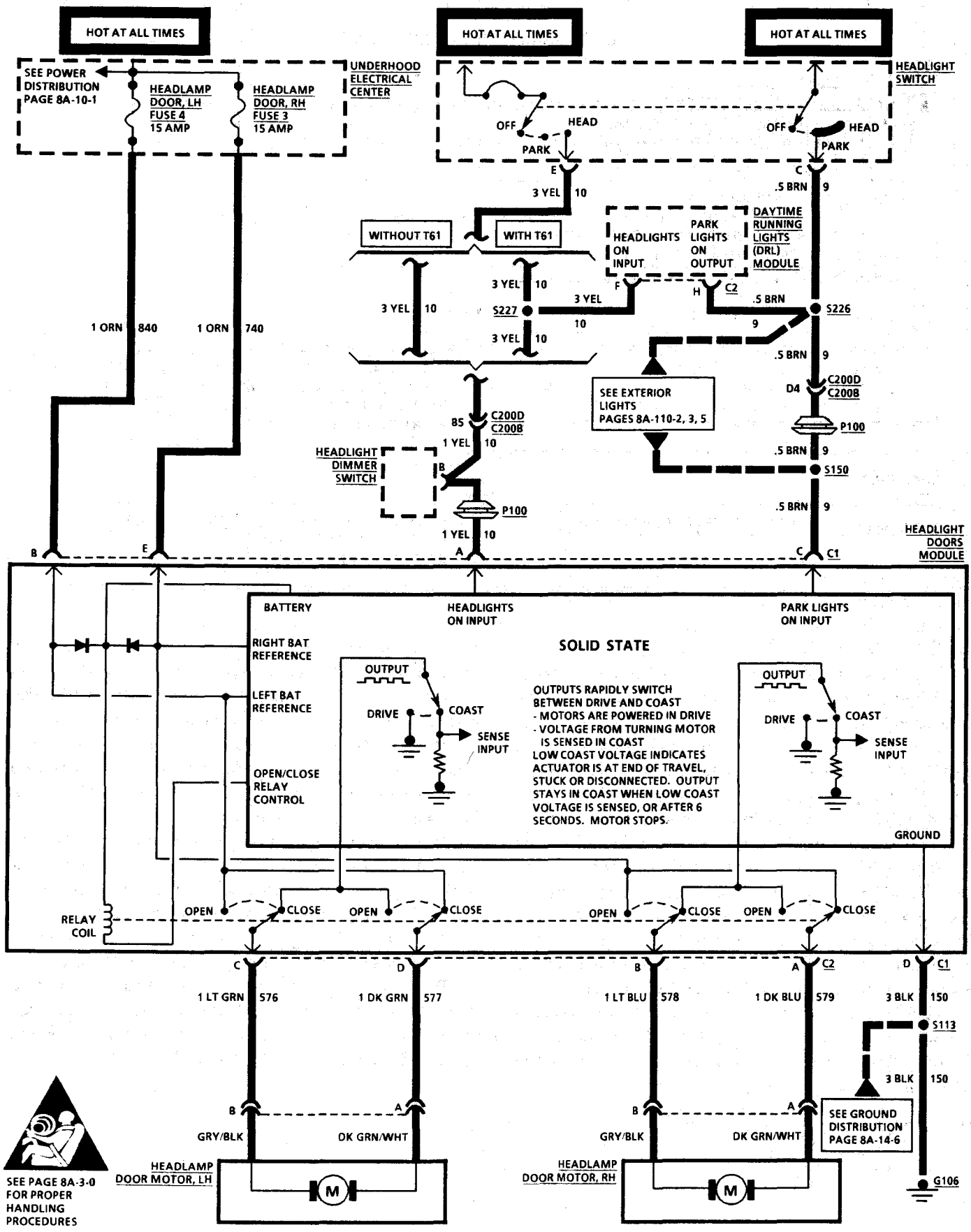
The Control Logic within the DRL Module receives its voltage from the Turn B-U Fuse 2 and the Gages Fuse 9. The Gages Fuse also supplies voltage to the relays within the DRL Module and supplies voltage to the Front Turn Signal bulbs during DRL operation through the Left and Right DRL Relays within the DRL Module. The Headlight Switch supplies voltage for the Headlights, through the Headlight Relay contacts within the DRL Module, during nighttime hours. The Tail Fuse supplies voltage to the Park Lights during nighttime hours.

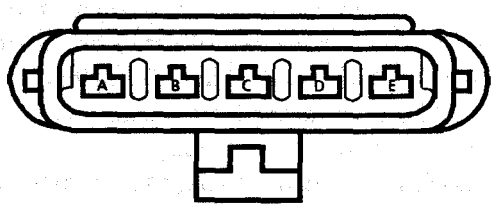
During DRL operation, the Turn Signals and Hazard Flasher will operate normally. The Park Lights and/or the Headlights may be operated manually at any time by using the Light Switch.

The DRL Module will not operate if the system voltage is less than 9 volts or greater than 18 volts.

When the Park Lights/Headlights are turned "OFF," and the Ambient Light Sensor indicates a night condition, the Park Lights will illuminate when Ignition Switch is moved to "CRANK" position.

HEADLIGHT DOORS

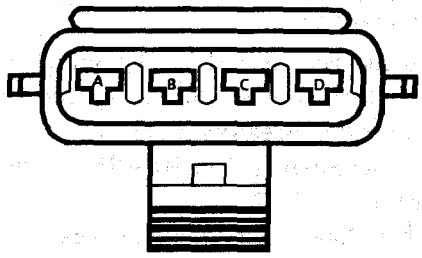




15300030

5-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT DOORS MODULE (C1)



15300029

4-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT DOORS MODULE (C2)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Headlamp Door Motor, LH	LH front of vehicle			
Headlamp Door Motor, RH	RH front of vehicle	23	43	
Headlight Dimmer Switch	Part of Steering Column, activated by Multi-Function Lever	3, 35	5, 64	
Headlight Doors Module	Forward of LH front wheelhouse, mounted to Air Intake	19	36	202-21
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
Underhood Electrical Center	LH side of Engine Compartment, forward of wheelhouse	19	36	202-28
C200B (18 cavities)	Part of Forward Lamp 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
G106	Near top LH side of radiator, in top of T-Bar	19	35	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S150	Forward Lamp Harn, approx 22 cm forward of Electrical Center breakout, on lighting branch			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			
S227	I/P Harn, approx 10 cm from Convenience Center breakout			

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

HEADLIGHT DOORS

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Before doing Electrical Diagnosis, check the mechanical linkages attached to the Headlamp Doors for binding, breakage, etc.
2. Check for corrosion at the Headlamp Door Motor connector terminals.
3. If Headlamp Doors open slowly, check that G106 is clean and tight and also that the battery is good and fully charged.
4. If Headlamp Doors open only partially and no problems were found with mechanical linkages on Headlamp Doors, perform Chart #1.
5. If Headlamp Doors pop up without requesting Headlights, check for bulletins to determine if a correction is necessary.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Both Headlamp Doors remain open or closed.	Chart #1	8A-104-3
LH Headlamp Door stays open or closed.	Chart #2	8A-104-3
RH Headlamp Door stays open or closed.	Chart #3	8A-104-4

CHART #1
BOTH HEADLAMP DOORS REMAIN OPEN OR CLOSED

IMPORTANT:

- IF HEADLIGHTS STAY ON ALL THE TIME OR DO NOT TURN ON AT ALL, REFER TO "HEADLIGHTS," PAGE 8A-100-0.

- DISCONNECT CONN C1 AT HEADLIGHT DOORS MODULE.
- CONNECT A TEST LIGHT BETWEEN TERMINALS "D" & "E" OF CONNECTOR AND THEN BETWEEN TERMINALS "D" & "B". TEST LIGHT SHOULD ILLUMINATE BOTH TIMES. DOES IT?

YES

- CONNECT THE TEST LIGHT BETWEEN TERMINALS "A" & "D" OF C1. DOES THE TEST LIGHT ILLUMINATE WHEN HEADLIGHTS ARE TURNED "ON"?

YES

- CHECK FOR POOR CONNECTION AT HEADLIGHT DOORS MODULE. IF OK, REFER TO CHARTS 2 & 3 FOR INDIVIDUAL HEADLAMP DOOR DIAGNOSIS. IF OK, REPLACE HEADLIGHT DOORS MODULE.

NO

REPAIR OPEN IN CKT 10 BETWEEN HEADLIGHT DIMMER SWITCH AND HEADLIGHT DOORS MODULE.

NO

- CHECK FOR OPEN IN GROUND CKT 150 FROM HEADLIGHTS DOOR MODULE TO G106.
- CHECK LH AND RH HEADLAMP DOOR FUSES FOR OPEN ALSO CHECK FOR OPEN IN CKT 740 AND CKT 840.
- IF FUSE(S) ARE BLOWN CHECK FOR SHORT TO GROUND THROUGH CKT 740 AND/OR CKT 840.

CHART #2
LH HEADLAMP DOOR STAYS OPEN OR CLOSED

- DISCONNECT LH HEADLAMP DOOR MOTOR 2-WAY CONNECTOR.
- CONNECT A FUSED JUMPER FROM THE BATTERY POSITIVE TERMINAL TO TERM "A" OF DOOR MOTOR 2-WAY CONNECTOR.
- CONNECT A JUMPER FROM TERM "B" OF CONNECTOR TO GROUND.
- IF DOOR WAS OPEN, IT SHOULD NOW CLOSE. DOES IT?

YES

- REVERSE THE WIRES TO TERMINALS "A" & "B" (GROUND TO TERM "A").
- IF DOOR WAS CLOSED, IT SHOULD NOW OPEN. DOES IT?

YES

- CHECK FOR A SHORT TO GROUND, SHORT TO B + OR AN OPEN IN THE TWO WIRES FROM THE HEADLIGHT DOORS MODULE TO THE HEADLAMP DOOR MOTOR CONNECTOR (CKTS 576 & 577).
- IF WIRES ARE OK, REPLACE THE HEADLIGHT DOORS MODULE.

NO

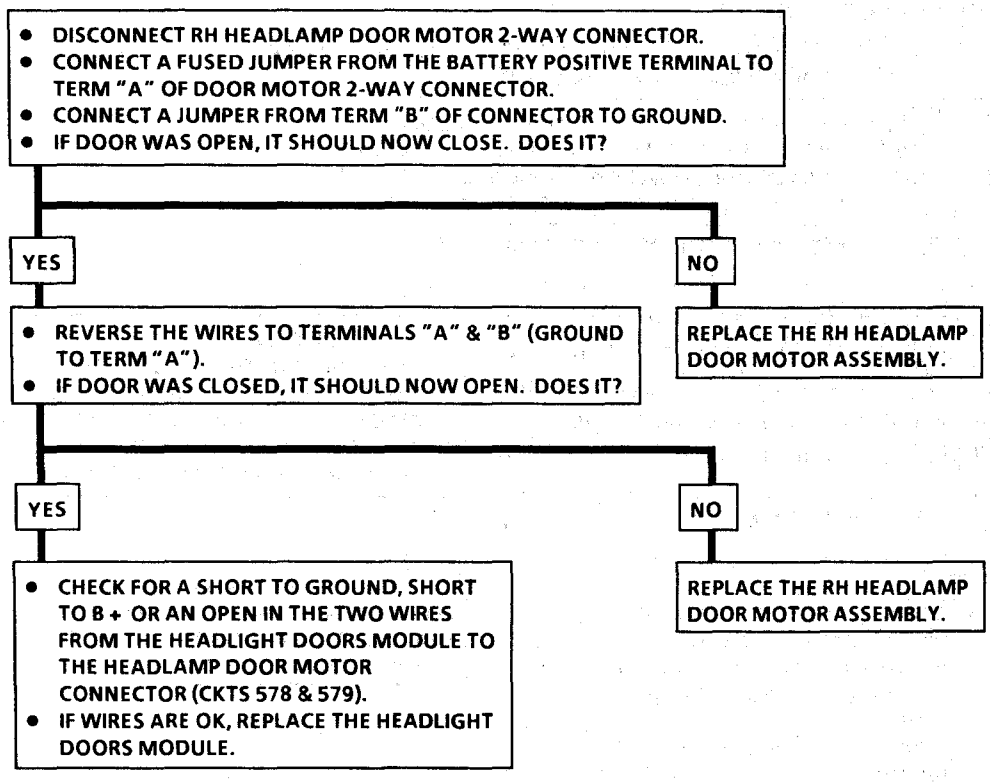
REPLACE THE LH HEADLAMP DOOR MOTOR ASSEMBLY.

NO

REPLACE THE LH HEADLAMP DOOR MOTOR ASSEMBLY.

HEADLIGHT DOORS

CHART #3
RH HEADLAMP DOOR STAYS OPEN OR CLOSED



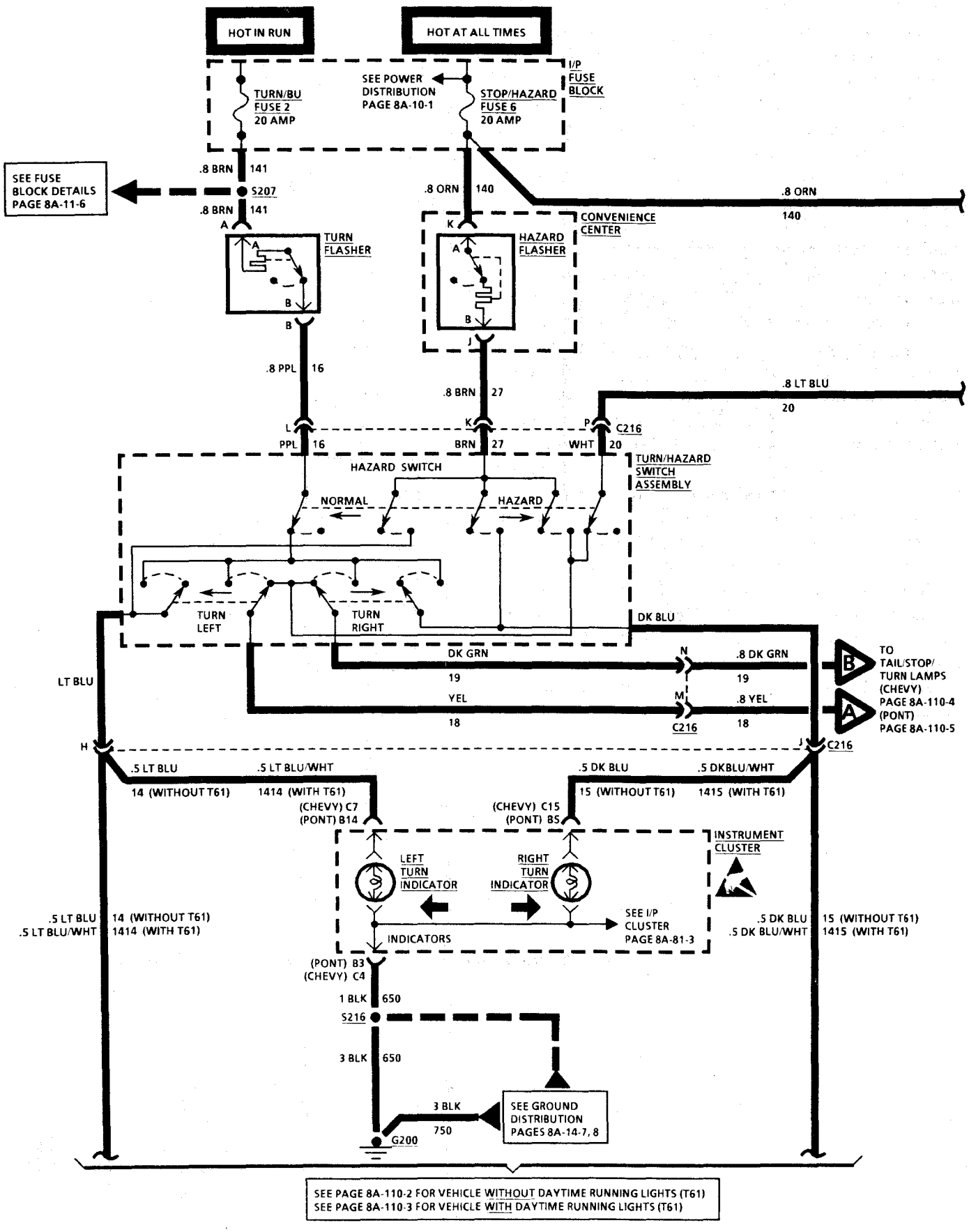
CIRCUIT OPERATION

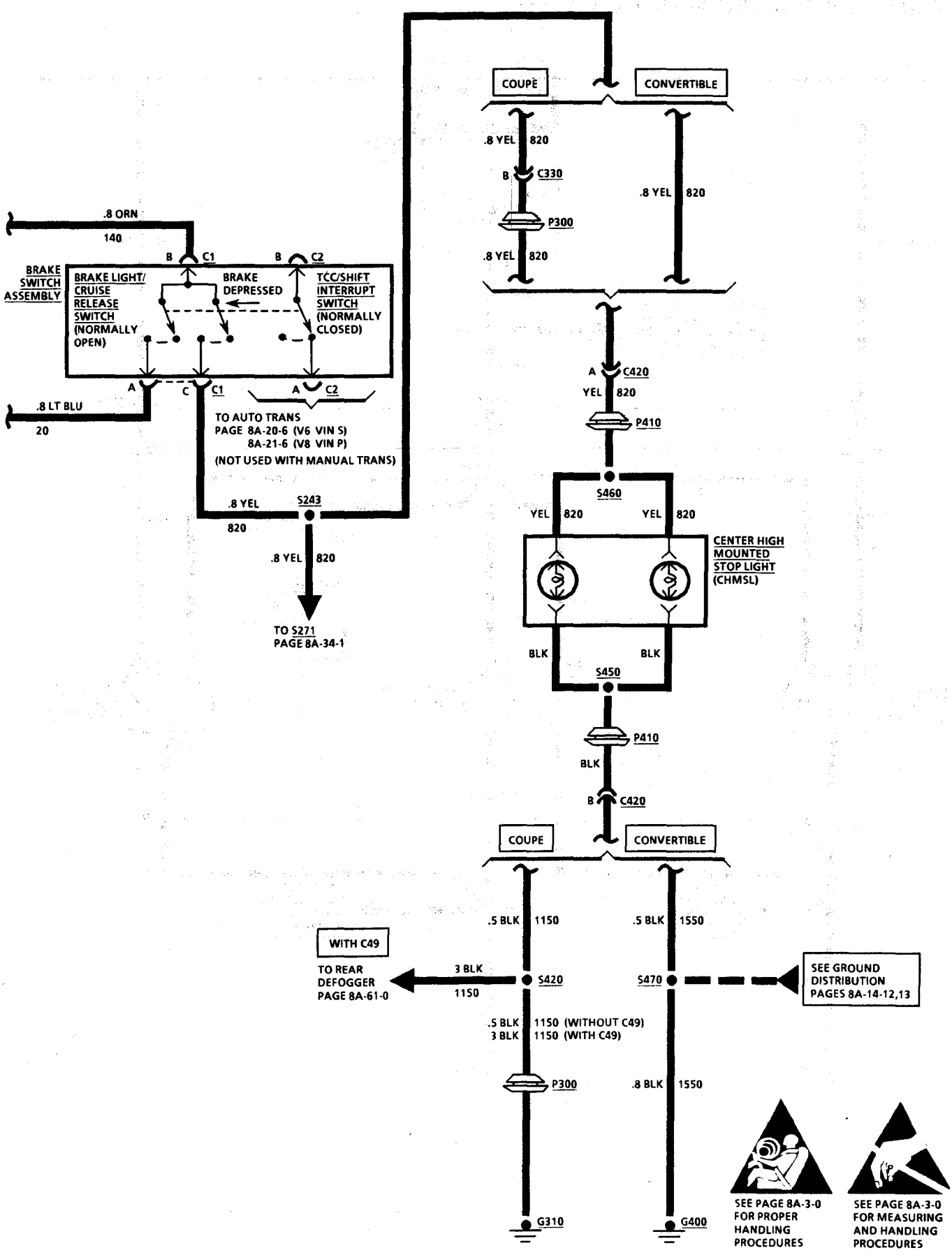
Voltage to open the Headlamp Doors and to power the solid state circuitry is applied to the Headlight Doors Module at all times at terminals "B" and "E" of C1. When the Headlights are turned "ON", voltage is applied to terminal "A" of C1 as a request for the Headlamp Doors to open.

When the Headlights are turned "ON", ground is applied to the relay coil within the Headlight Doors Module. The relay contacts close and voltage is applied to the Headlamp Door Motor Assemblies. Ground is provided for the motors through the solid state circuitry until the Headlamp Doors are open. The ground circuit for each Headlamp Door Motor is rapidly switched within the Headlight Doors Module between a ground potential and a high impedance sense input. This input monitors for a fully open Headlamp Door and will allow ground to be provided until open or up to 6 seconds. A difficult to open or obstructed door will be sensed as fully open and ground will be removed by the module.

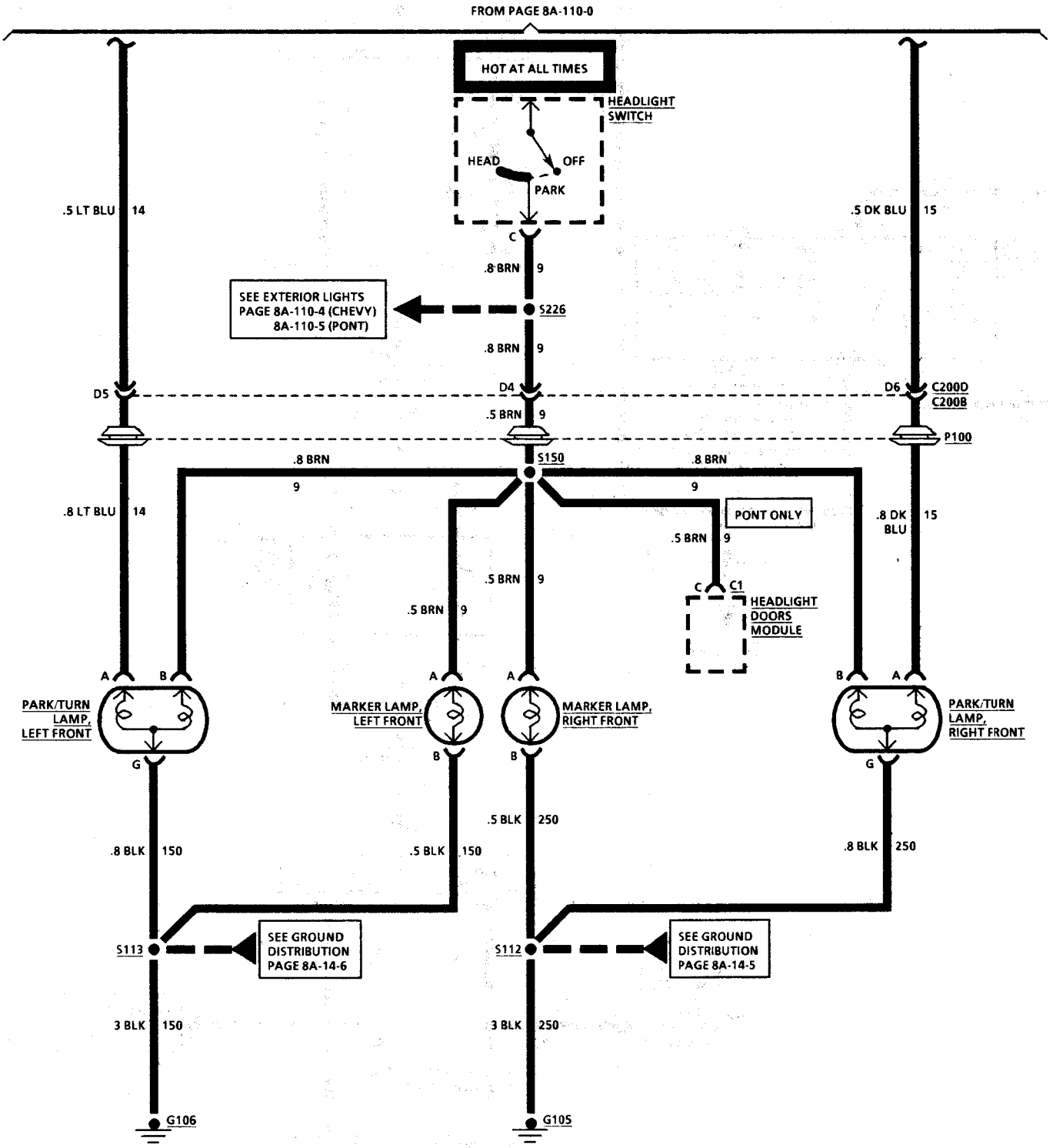
When the Headlights are turned "OFF", the ground to the relay coil within the module is removed. The contacts then return to the normally closed position which switches power and ground to the Headlamp Door Motors. The Headlamp Door Motors run in the opposite direction to close the Headlamp Doors. The ground circuit operation within the module is the same during the closing sequence as during the opening sequence.

EXTERIOR LIGHTS
TURN/HAZARD/STOP

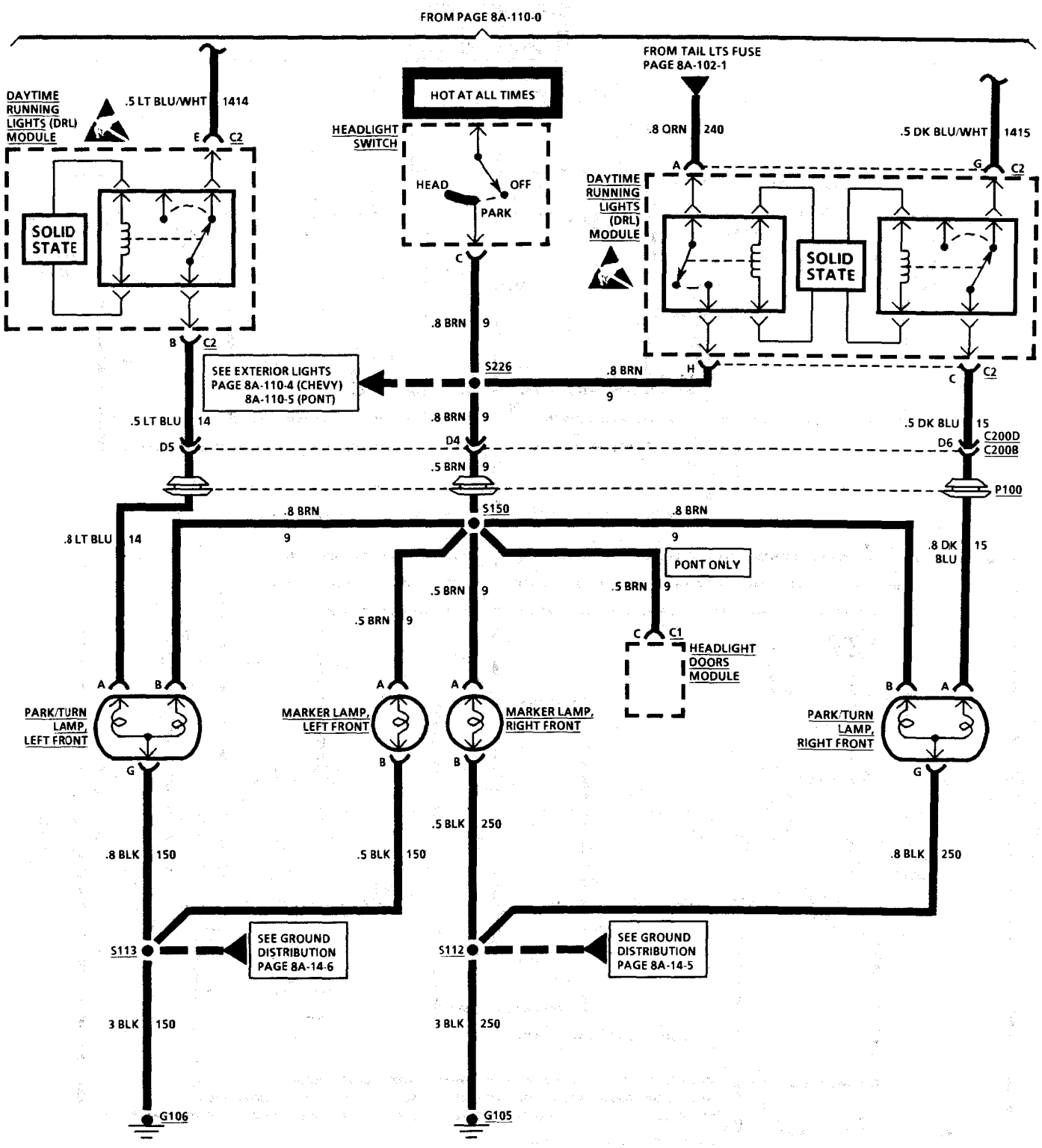



.8 ORN
140
B C1
B C2
BRAKE SWITCH ASSEMBLY
BRAKE LIGHT/ CRUISE RELEASE SWITCH (NORMALLY OPEN)
BRAKE DEPRESSED
TCC/SHIFT INTERRUPT SWITCH (NORMALLY CLOSED)
A C C1
A C2
.8 LT BLU
20
TO AUTO TRANS
PAGE 8A-20-6 (V6 VIN S)
8A-21-6 (V8 VIN P)
(NOT USED WITH MANUAL TRANS)
.8 YEL S243
820
.8 YEL 820
TO S271
PAGE 8A-34-1
COUPE
CONVERTIBLE
.8 YEL 820
B C330
P300
.8 YEL 820
.8 YEL 820
A C420
YEL 820
P410
S460
YEL 820
YEL 820
CENTER HIGH MOUNTED STOP LIGHT (CHMSL)
BLK
BLK
S450
P410
BLK
B C420
COUPE
CONVERTIBLE
.5 BLK 1150
.5 BLK 1550
WITH C49
TO REAR DEFOGGER PAGE 8A-61-0
3 BLK
1150
S420
S470
SEE GROUND DISTRIBUTION PAGES 8A-14-12,13
.5 BLK 1150 (WITHOUT C49)
3 BLK 1150 (WITH C49)
P300
.8 BLK 1550
G310
G400
SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES
SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

EXTERIOR LIGHTS
WITHOUT DAYTIME RUNNING LIGHTS (T61)



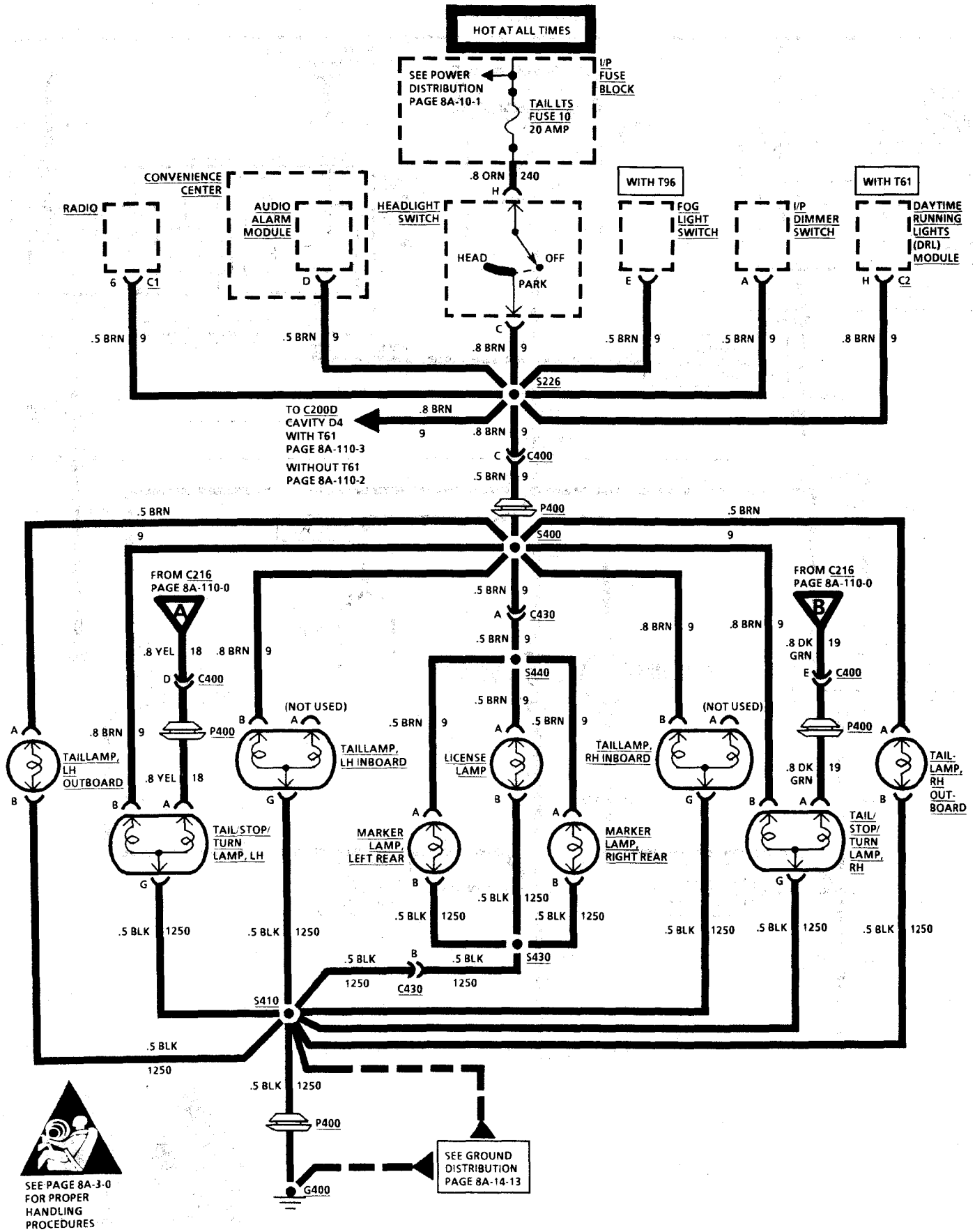
EXTERIOR LIGHTS
WITH DAYTIME RUNNING LIGHTS (T61)



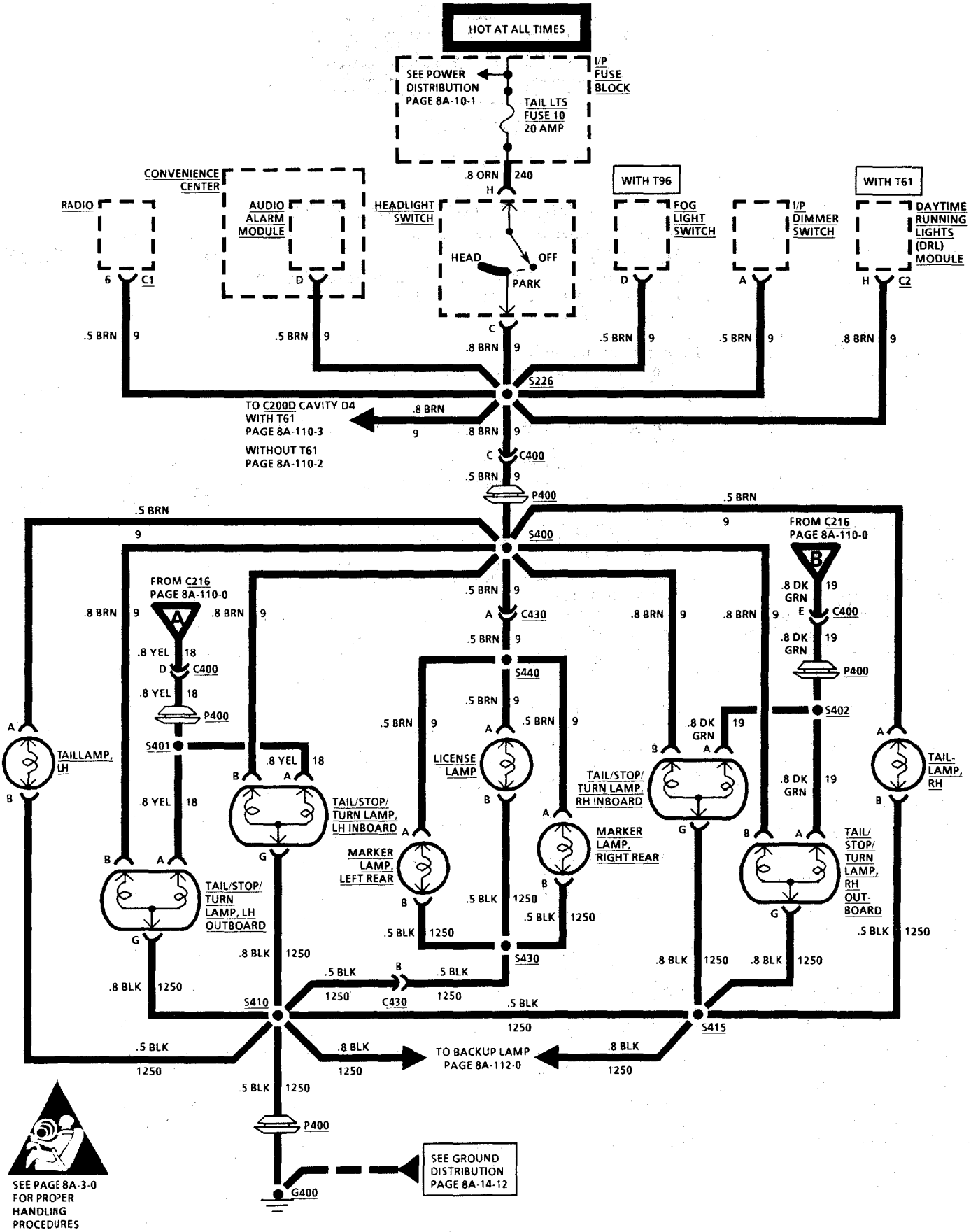
SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

SEE PAGE 8A-3-0 FOR MEASURING AND HANDLING PROCEDURES

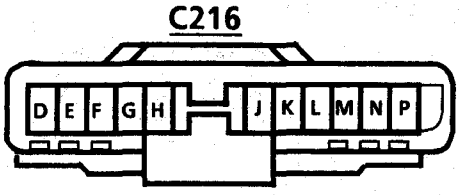
EXTERIOR LIGHTS (CHEVY)
REAR MARKER/LICENSE/TAIL/STOP/TURN



EXTERIOR LIGHTS (PONTIAC)
REAR MARKER/LICENSE/TAIL/STOP/TURN



EXTERIOR LIGHTS



12004147

11-WAY F PACK-CON I
BLK

I/P HARNESS TO STEERING COLUMN HARNESS

COMPONENT	LOCATION	201-PG	FIG.	CONN
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Center High Mounted Stop Light (CHMSL)	Rear center of Spoiler			
Convenience Center	Left of Steering Column, mounted to bottom of I/P Carrier	8	15	202-20
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Fog Light Switch	Lower LH side of I/P	37, 38	66, 67	202-21
Headlight Doors Module	Forward of LH front wheelhouse, mounted to Air Intake	19	36	202-21
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
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
Instrument Cluster	LH side of I/P			202-23
License Lamp	Center of rear Fascia, above license plate	31	59	
Marker Lamp, Left Front	Exterior, left front	17	32	
Marker Lamp, Left Rear	Exterior, left rear	31	59	
Marker Lamp, Right Front	Exterior, right front	17	32	
Marker Lamp, Right Rear	Exterior, right rear	31	59	
Park/Turn Lamp, Left Front	Exterior, left front	17	32	
Park/Turn Lamp, Right Front	Exterior, right front	17	32	
Radio	Center of I/P Carrier	36	65	202-16
Taillamp, LH (Pont)	Exterior, left rear	33	62	
Taillamp, LH Inboard (Chevy)	Exterior, left rear	32	61	
Taillamp, LH Outboard (Chevy)	Exterior, left rear	32	61	
Taillamp, RH Inboard (Chevy)	Exterior, right rear	32	61	
Taillamp, RH Outboard (Chevy)	Exterior, right rear	32	61	
Taillamp, RH (Pont)	Exterior, right rear	33	62	
Tail/Stop/Turn Lamp, LH (Chevy)	Exterior, left rear	32	61	
Tail/Stop/Turn Lamp, LH Inboard (Pont)	Exterior, left rear	33	62	
Tail/Stop/Turn Lamp, LH Outboard (Pont)	Exterior, left rear	33	62	
Tail/Stop/Turn Lamp, RH (Chevy)	Exterior, right rear	32	61	
Tail/Stop/Turn Lamp, RH Inboard (Pont)	Exterior, right rear	33	62	
Tail/Stop/Turn Lamp, RH Outboard (Pont)	Exterior, right rear	33	62	

COMPONENT	LOCATION	201-PG	FIG.	CONN
Turn Flasher	Mounted to bracket, right of Steering Column, above Data Link Conn	8	15	
Turn/Hazard Switch Assembly	Part of Steering Column	3	5	
C200B (18 cavities)	Part of Forward Lamp 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
C216 (11 cavities)	Attached to base of Steering Column	34	63	202-5
C330 (3 cavities)	Hatch to I/P Harn, center of roof near Dome Lamp	4	6	
C400 (6 cavities)	LH Rear Cargo Compartment, between rear end panel and carpet	30	57	202-19
C420 (2 cavities)	LH side of Hatch, between Hatch Frame and plastic panel	4	7	
C430 (2 cavities)	Between Rear Fascia and rear end panel, on LH side	32, 33	61, 62	
G105	Near top RH side of radiator, in top of T-Bar	19	36	
G106	Near top LH side of radiator, in top of T-Bar	19	35	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G310	Bolted to roof, left of Dome Lamp (1 ring, 1 wire)	4	6	
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
P100	Left side in dash panel, Engine to Passenger Compartment	19	36	
P300	In rear center of roof, near Dome Lamp	4	7	
P400	Left rear in end gate panel	30	57	
P410	In left side spoiler			
S112	Forward Lamp Harn, approx 10 cm from G105 breakout			
S113	Forward Lamp Harn, approx 13 cm from Electrical Center breakout			
S150	Forward Lamp Harn, approx 22 cm forward of Electrical Center breakout, on lighting branch			
S207	I/P Harn, approx 4 cm before DLC breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			
S243	I/P Harn, approx 14 cm from Fuel Pump Relay breakout	7	13	
S400	Rear Body Harn, approx 13 cm from Left Backup Lamp (Pont) or 20 cm from P400 branch (Chevy) breakouts	32	61	
S401	Rear Body Harn, approx 19 cm forward of P400	30	57	
S402	Rear Body Harn, approx 16 cm forward of P400	30	57	
S410	Rear Body Harn, approx 7 cm from Left Backup Lamp breakout	33	62	
S415	Rear Body Harn, approx 20 cm from Left Backup Lamp breakout	33	62	
S420	Hatch Harn, approx 7 cm from P300	4	7	
S430	Rear Fascia Harn, approx 11 cm from License Lamp breakout	31	59	
S440	Rear Fascia Harn, approx 5 cm from License Lamp breakout	31	59	
S450	CHMSL Jumper Harn, approx 15 cm from bulbs			
S460	CHMSL Jumper Harn, approx 15 cm from bulbs			
S470	I/P Harn, approx 24 cm from Hatch Release Actuator			

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

EXTERIOR LIGHTS

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- 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).
- Make sure all lamps are operational before replacing flashers.
- Refer to System Diagnosis.

SYSTEM DIAGNOSIS

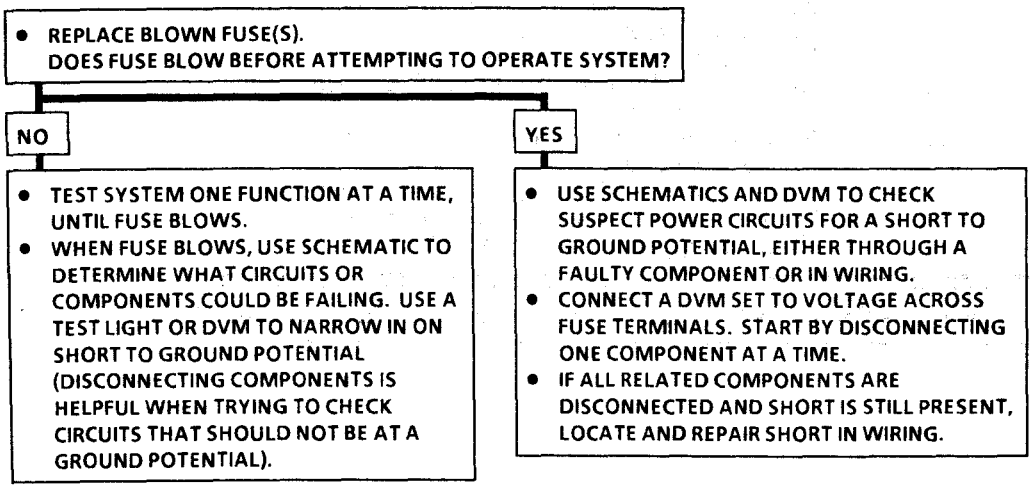
- Refer to the Symptom Table for the appropriate diagnostic procedures.
- For Daytime Running Lights (DRL) related failures, refer to "Headlights and Fog Lights: Daytime Running Lights (T61)," page 8A-102-0.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Fuse(s) blows when replaced or when attempting to use lighting system.	Chart #1	8A-110-8
Entire lighting system inoperative.	Use schematics and DVM or test light to check suspect power circuits and ground circuits for opens or poor connections.	
Individual lamp inoperative.	• Determine if lamp is defective. • Check for corrosion or poor connection at socket. If OK, use schematic and DVM or test light to check suspect circuits.	

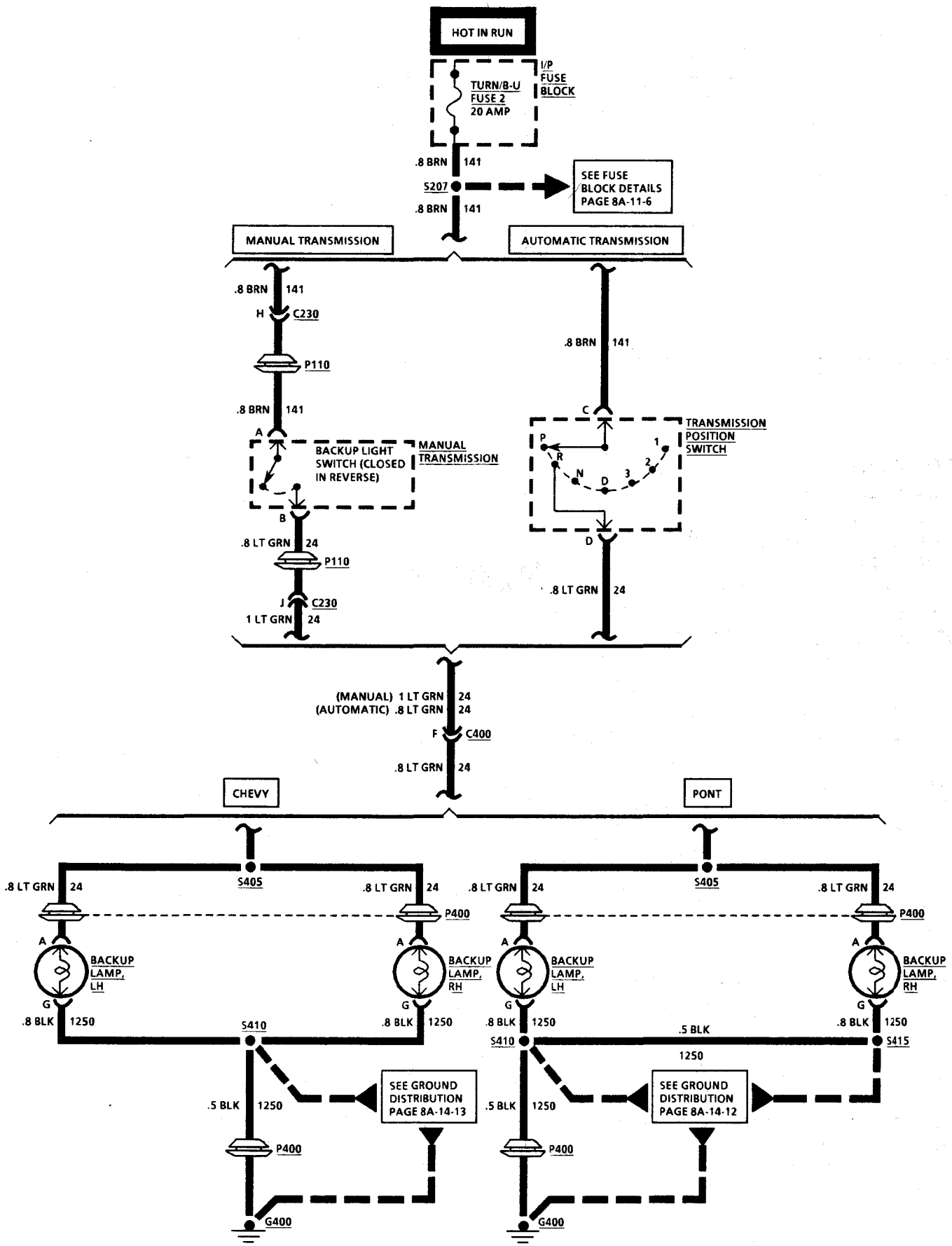
CHART #1

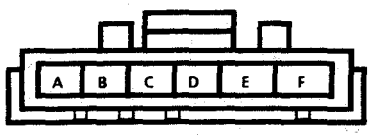
FUSE(S) BLOWS WHEN REPLACED OR WHEN ATTEMPTING TO USE LIGHTING SYSTEM



BLANK

BACKUP LIGHTS





12015307

6-WAY F METRI-PACK MIXED SERIES
BLK

TRANSMISSION POSITION SWITCH

COMPONENT	LOCATION	201-PG	FIG.	CONN
Backup Lamp, LH	Mounted in Taillamp Assembly	32, 33	61, 62	
Backup Lamp, RH	Mounted in Taillamp Assembly	32, 33	61, 62	
Backup Light Switch (M49) (V6 VIN S)	Middle of Transmission, left side	16	30	
Backup Light Switch (MM6) (V8 VIN P)	Middle of Transmission, right side	26	51	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
C400 (6 cavities)	LH Rear Cargo Compartment, between rear end panel and carpet	30	57	202-19
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
P400	Left rear in end gate panel	30	57	
S207	I/P Harn, approx 4 cm before DLC breakout			
S405	Rear Body Harn, approx 12 cm forward of P400	30	57	
S410	Rear Body Harn, approx 7 cm from Left Backup Lamp breakout	33	62	
S410 (Chevy)	Rear Body Harn, approx 27 cm from P400 branch breakout	32	61	
S415	Rear Body Harn, approx 20 cm from Left Backup Lamp breakout	33	62	

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

BACKUP LIGHTS

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- 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.

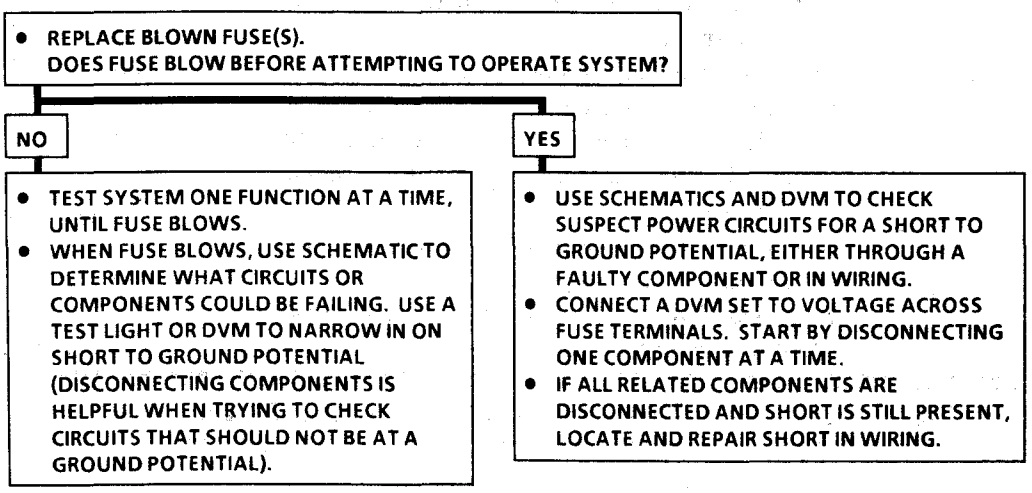
SYSTEM DIAGNOSIS

- Refer to the Symptom Table for the appropriate diagnostic procedures.

SYMPTOM TABLE

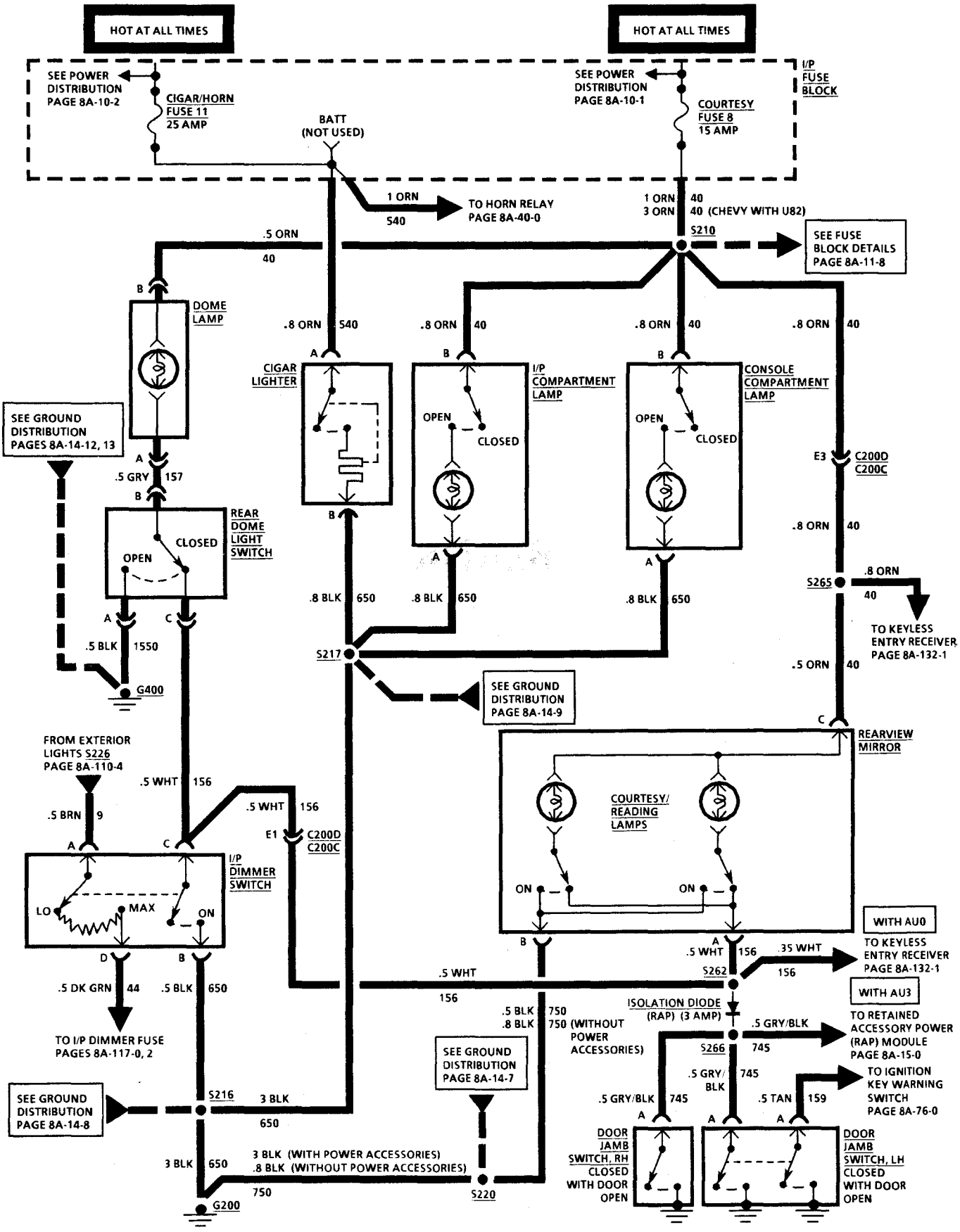
SYMPTOM	PROCEDURE	PAGE NUMBER
Fuse(s) blows when replaced or when attempting to use lighting system.	Chart #1	8A-112-2
Both lights inoperative.	Use schematics and DVM or test light to check suspect power circuits and ground circuits for opens or poor connections. Repair or replace as necessary.	
Individual lamp inoperative.	• Determine if lamp is defective. • Check for corrosion or poor connection at socket. If OK, use schematic and DVM or test light to check suspect circuits.	

CHART #1
FUSE(S) BLOWS WHEN REPLACED OR WHEN ATTEMPTING TO USE LIGHTING SYSTEM

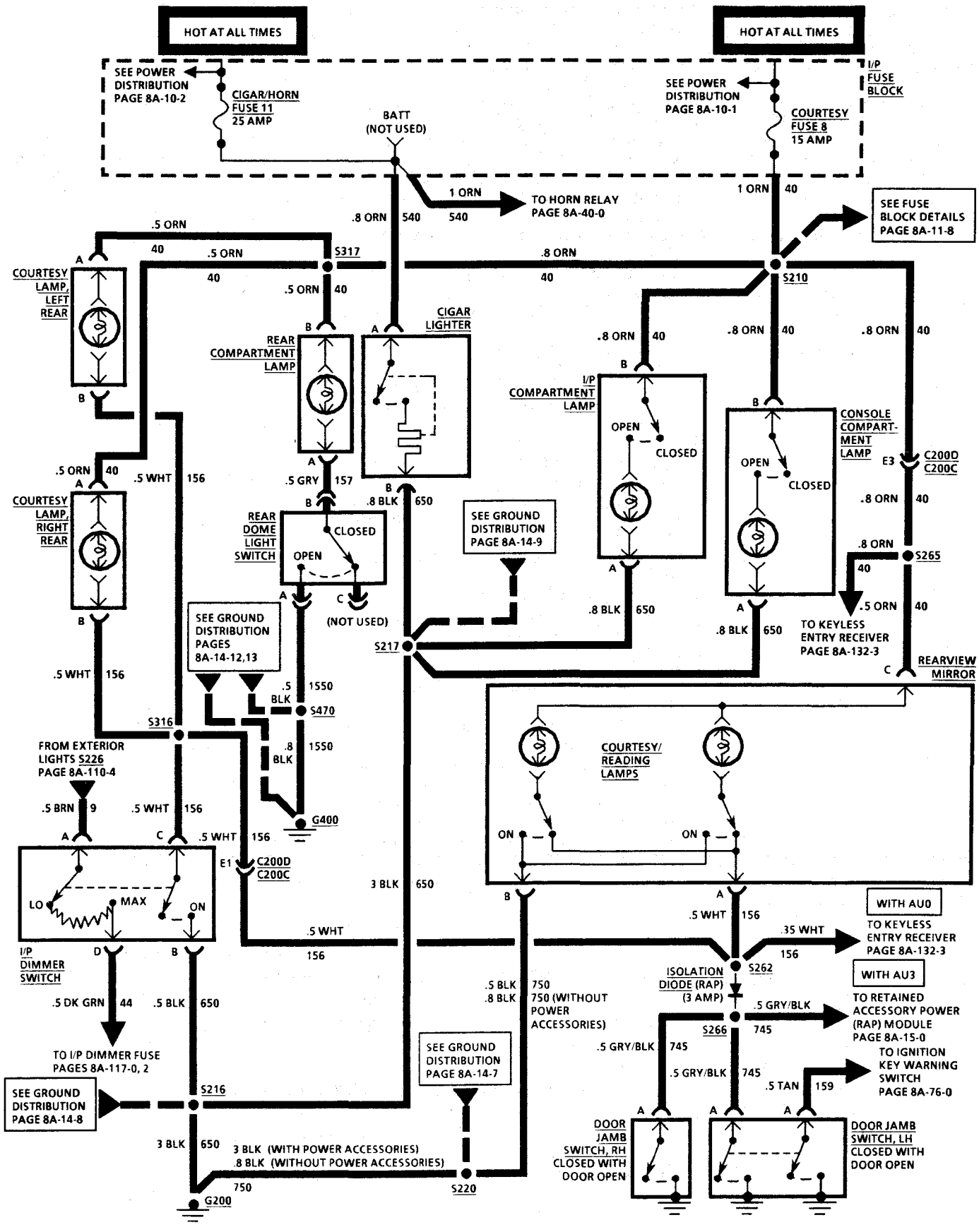


BLANK

INTERIOR LIGHTS
COUPE



INTERIOR LIGHTS
CONVERTIBLE



INTERIOR LIGHTS

COMPONENT	LOCATION	201-PG	FIG.	CONN
Cigar Lighter	Mounted on front of console	43	81	
Console Compartment Lamp	Under Console Compartment Door	43	81	
Courtesy Lamp, Left Rear	Mounted in left sail panel			
Courtesy Lamp, Right Rear	Mounted in right sail panel			
Dome Lamp	On roof, near hatch	4	6	
Door Jamb Switch, LH	Near base of LH "A" pillar	45	84	
Door Jamb Switch, RH	Near base of RH "A" pillar	32	49	
I/P Compartment Lamp	Inside top center of compartment	22	41	
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
Isolation Diode (RAP)	Sealed in Harn, approx 9 cm right of Rearview Mirror breakout	45	84	
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	
Rearview Mirror	Top center of windshield			202-27
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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
S210	I/P Harn, approx 44 cm from Convenience Center Pont or 12 cm from RR Defog Switch (Chevy) breakouts			
S216	I/P Harn, approx 5 cm from Convenience Center breakout			
S217	I/P Harn, approx 23 cm before DLC breakout			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S262	Cross Car Harn, approx 9 cm from Rearview Mirror breakout	45	84	
S265	Cross Car Harn, approx 20 cm from Rearview Mirror breakout	45	84	
S266	Cross Car Harn, approx 9 cm from Rearview Mirror breakout	45	84	
S316	I/P Harn, approx at rear edge of door below left sail panel			
S317	I/P Harn, approx at rear edge of door below left sail panel			
S470	I/P Harn, approx 24 cm from Hatch Release Actuator			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- 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

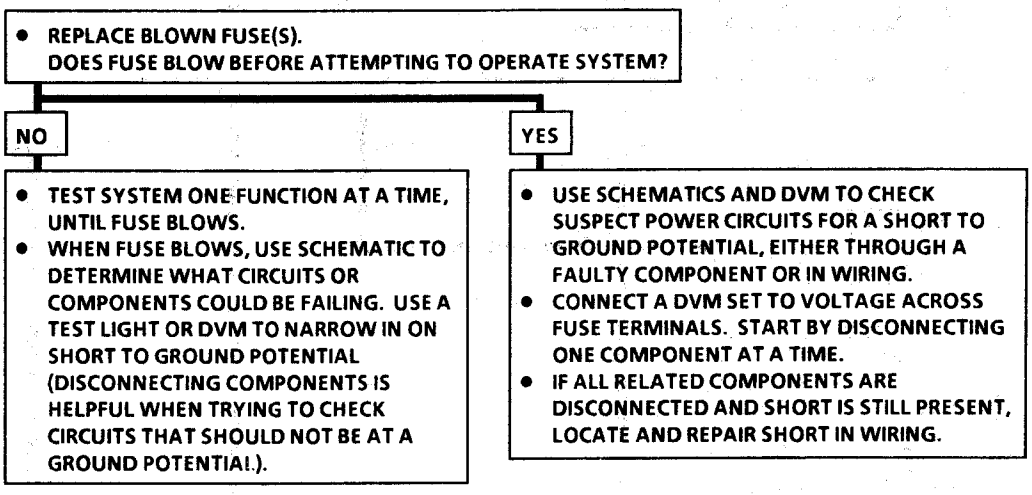
- Refer to the Symptom Table for the appropriate diagnostic procedures.

SYMPTOM TABLE

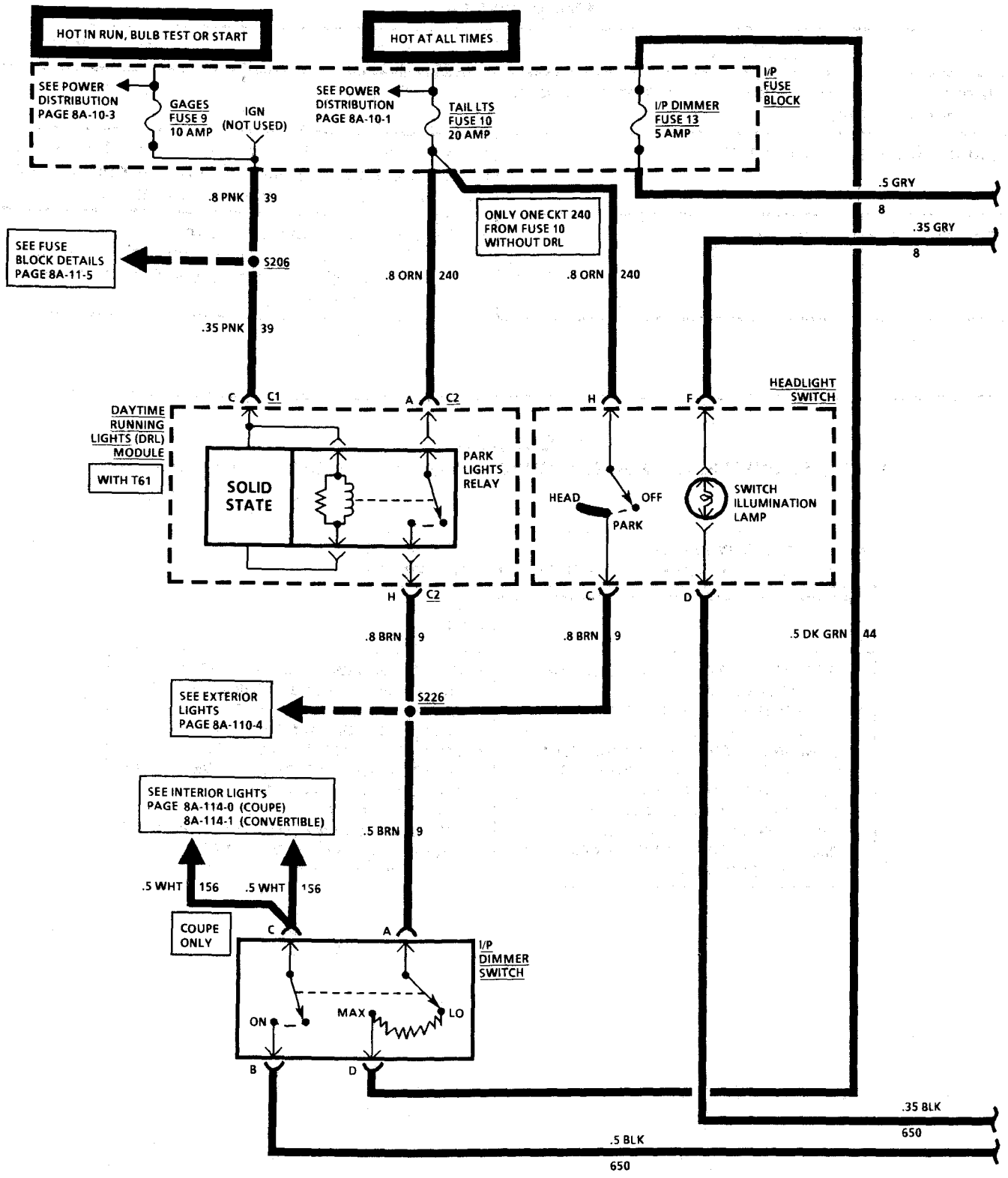
SYMPTOM	PROCEDURE	PAGE NUMBER
Fuse(s) blows when replaced or when attempting to use lighting system.	Chart #1	8A-114-3
Entire lighting system inoperative.	Use schematics and DVM or test light to check suspect power circuits and ground circuits for opens or poor connections. Repair or replace as necessary.	
Individual lamp inoperative.	• Determine if lamp is defective. • Check for corrosion or poor connection at socket. If OK, use schematic and DVM or test light to check suspect circuits.	

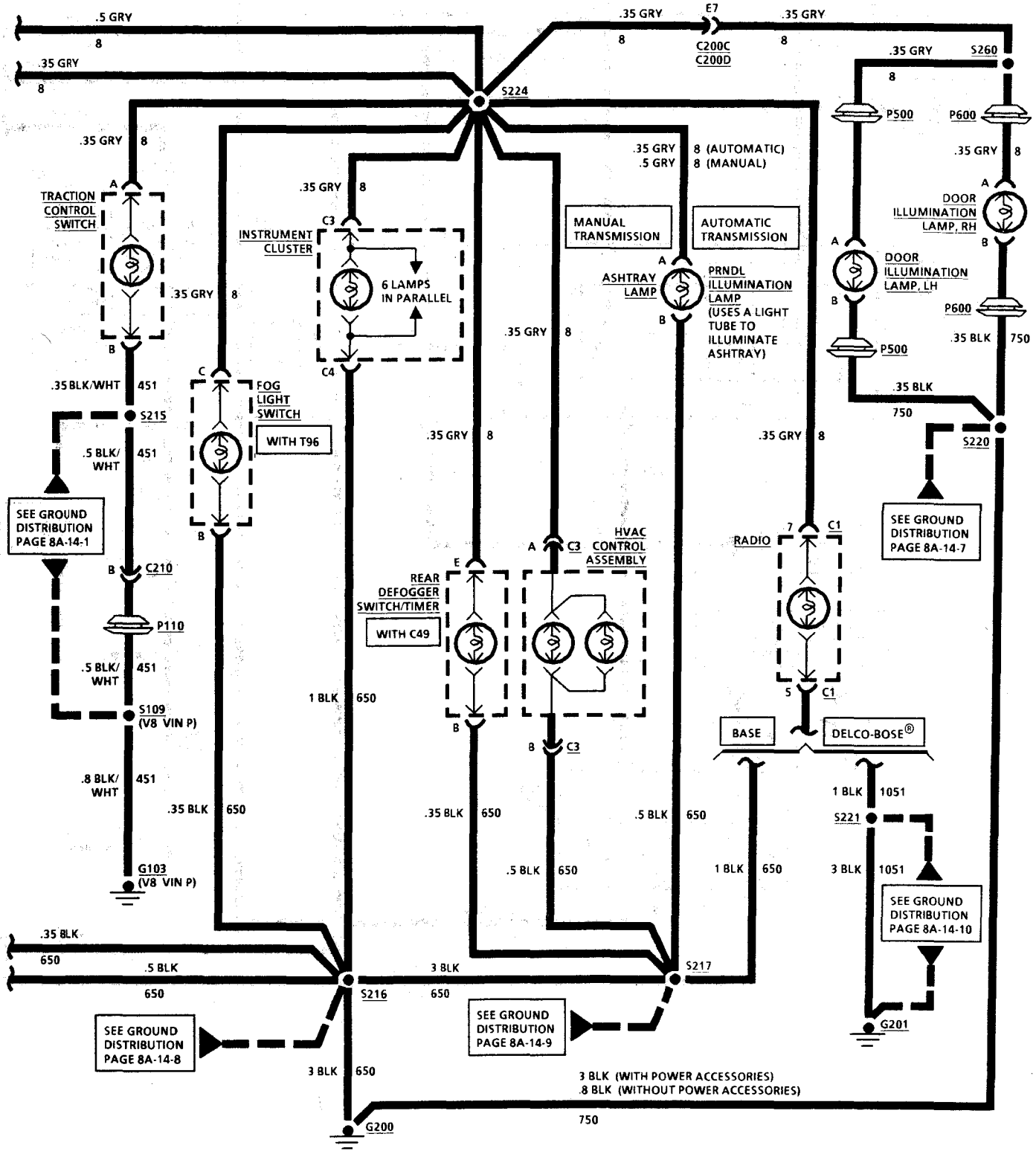
CHART #1

FUSE(S) BLOWS WHEN REPLACED OR WHEN ATTEMPTING TO USE LIGHTING SYSTEM

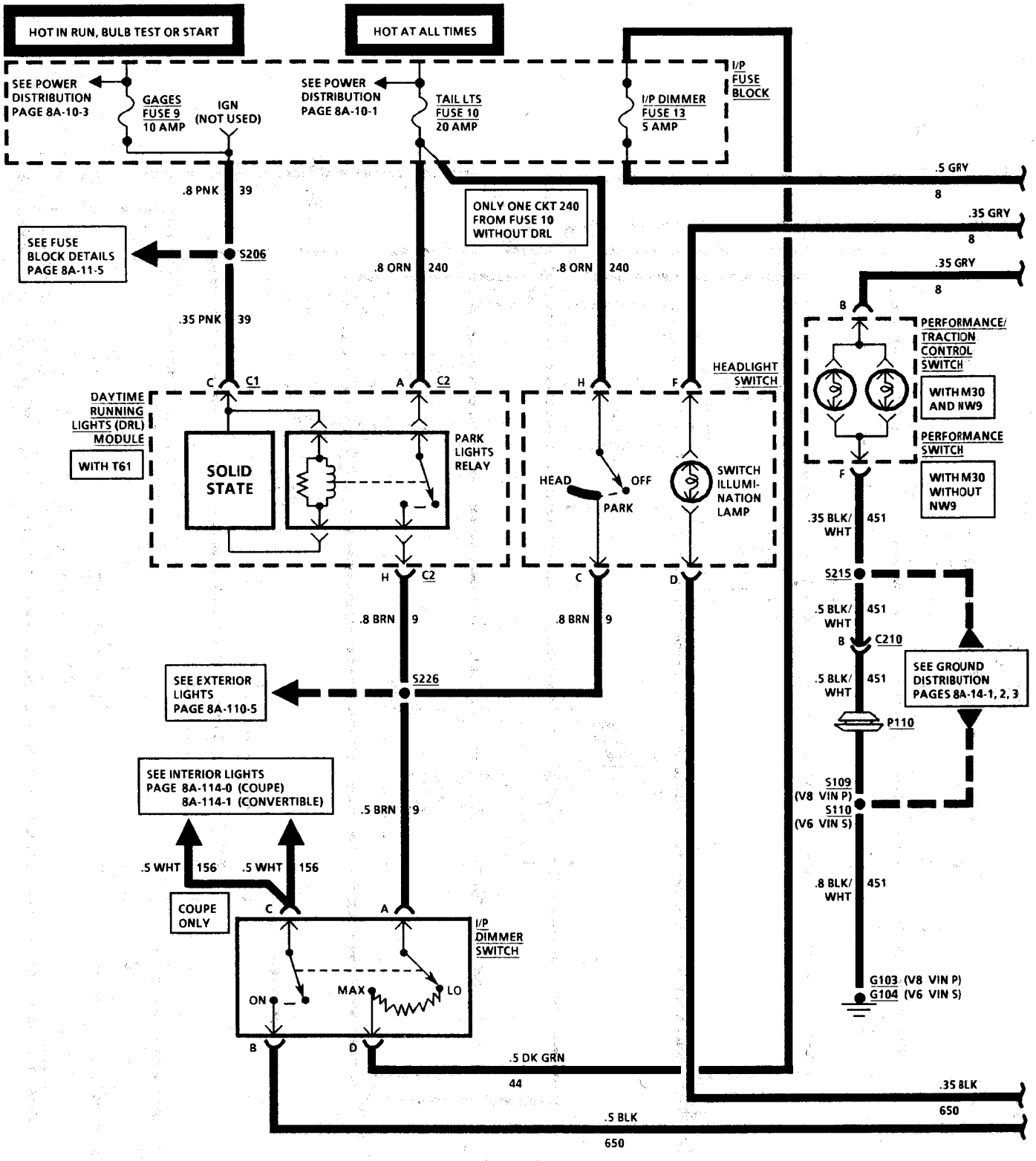


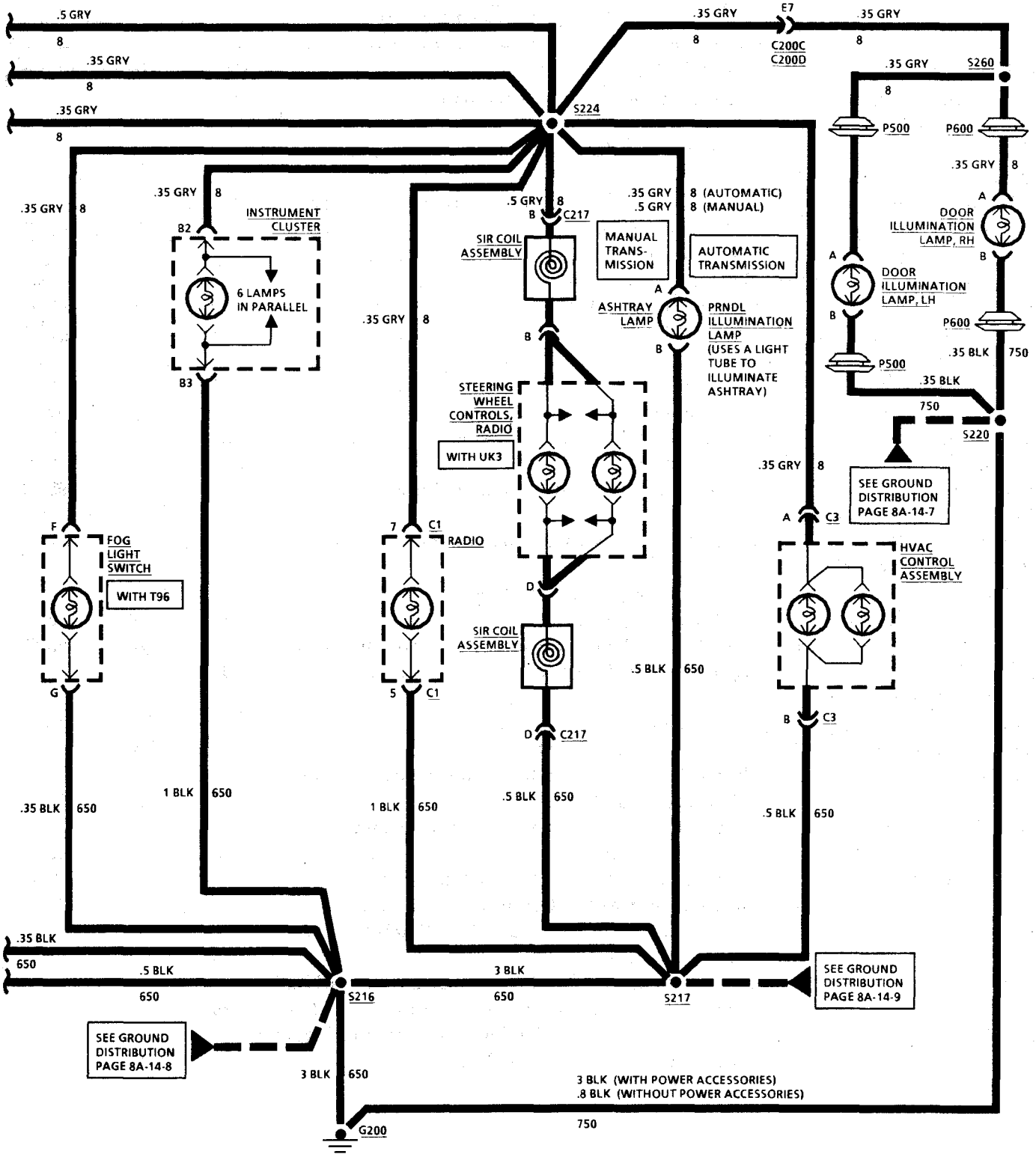
INTERIOR LIGHTS DIMMING (CHEVY)




.5 GRY
8
.35 GRY
8
.35 GRY
8
E7
C200C
C200D
.35 GRY
8
.35 GRY
S260
8
S224
P500
P600
.35 GRY
8
.35 GRY
8
A
TRACTION CONTROL SWITCH
B
.35 GRY
8
.35 GRY
8
C3
INSTRUMENT CLUSTER
6 LAMPS IN PARALLEL
C4
.35 GRY
8 (AUTOMATIC)
.5 GRY
8 (MANUAL)
MANUAL TRANSMISSION
AUTOMATIC TRANSMISSION
A
ASHTRAY LAMP
B
PRNDL ILLUMINATION LAMP (USES A LIGHT TUBE TO ILLUMINATE ASHTRAY)
A
DOOR ILLUMINATION LAMP, RH
B
A
DOOR ILLUMINATION LAMP, LH
B
P600
.35 BLK
750
P500
.35 BLK
750
S220
.35 BLK/WHT
451
S215
.5 BLK/ WHT
451
C
FOG LIGHT SWITCH
WITH T96
B
.35 GRY
8
.35 GRY
8
SEE GROUND DISTRIBUTION PAGE 8A-14-1
SEE GROUND DISTRIBUTION PAGE 8A-14-7
B
C210
P110
.5 BLK/ WHT
451
S109
(V8 VIN P)
E
REAR DEFOGGER SWITCH/TIMER
WITH C49
B
A
C3
HVAC CONTROL ASSEMBLY
B
C3
RADIO
7
C1
5
C1
BASE
DELCO-BOSE®
1 BLK
650
.8 BLK/ WHT
451
.35 BLK
650
.35 BLK
650
.5 BLK
650
1 BLK
1051
S221
.5 BLK
650
1 BLK
650
3 BLK
1051
G103
(V8 VIN P)
SEE GROUND DISTRIBUTION PAGE 8A-14-10
.35 BLK
650
.5 BLK
650
S216
3 BLK
650
S217
SEE GROUND DISTRIBUTION PAGE 8A-14-8
SEE GROUND DISTRIBUTION PAGE 8A-14-9
G201
3 BLK
650
3 BLK (WITH POWER ACCESSORIES)
.8 BLK (WITHOUT POWER ACCESSORIES)
750
G200

INTERIOR LIGHTS DIMMING (PONTIAC)




.5 GRY
8
.35 GRY
8
.35 GRY
8
.35 GRY
8
E7
C200C
C200D
.35 GRY
8
.35 GRY
S260
8
S224
P500
P600
.35 GRY
8
.35 GRY
8
.35 GRY
8
INSTRUMENT CLUSTER
B2
6 LAMPS IN PARALLEL
B3
.5 GRY
8
B
C217
SIR COIL ASSEMBLY
B
.35 GRY
.5 GRY
8 (AUTOMATIC)
8 (MANUAL)
MANUAL TRANS-MISSION
AUTOMATIC TRANSMISSION
A
ASHTRAY LAMP
PRNDL ILLUMINATION LAMP (USES A LIGHT TUBE TO ILLUMINATE ASHTRAY)
B
DOOR ILLUMINATION LAMP, RH
A
B
DOOR ILLUMINATION LAMP, LH
P600
P500
.35 BLK
750
.35 BLK
750
S220
STEERING WHEEL CONTROLS, RADIO
WITH UK3
.35 GRY
8
SEE GROUND DISTRIBUTION PAGE 8A-14-7
F
FOG LIGHT SWITCH
WITH T96
G
7
C1
RADIO
5
C1
D
SIR COIL ASSEMBLY
D
C217
A
C3
HVAC CONTROL ASSEMBLY
B
C3
.5 BLK
650
.35 BLK
650
1 BLK
650
1 BLK
650
.5 BLK
650
.5 BLK
650
.35 BLK
650
.5 BLK
650
3 BLK
650
S216
S217
SEE GROUND DISTRIBUTION PAGE 8A-14-9
SEE GROUND DISTRIBUTION PAGE 8A-14-8
3 BLK
650
3 BLK (WITH POWER ACCESSORIES)
.8 BLK (WITHOUT POWER ACCESSORIES)
750
G200

INTERIOR LIGHTS DIMMING



12034060

4-WAY F METRI-PACK 480 SERIES
NAT (WHT)

I/P DIMMER SWITCH

COMPONENT	LOCATION	201-PG	FIG.	CONN
Ashtray Lamp (Auto Trans)	Lighting Tube from PRNDL Lamp			
Ashtray Lamp (Manual Trans)	Rearward of shifter, in ashtray	43	82	
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
Door Illumination Lamp, LH	Behind door trim panel	17	31	
Door Illumination Lamp, RH	Behind door trim panel	17	31	
Fog Light Switch	Lower LH side of I/P	37, 38	66, 67	202-21
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Center of I/P	21	40	202-22
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
Instrument Cluster	LH side of I/P			202-23
Performance Switch	Mounted in center console behind shifter			202-24
Performance/Traction Control Switch	Mounted in center console behind shifter	42	79	202-24
PRNDL Illumination Lamp (Auto Trans)	Under console, left of Shifter	43	81	
Radio	Center of I/P Carrier	36	65	202-16
Rear Defogger Switch/Timer	Mounted on I/P knee bolster, right of Steering Column	37	66	202-27
SIR Coil Assembly	Top of Steering Column	3, 34	5, 51	
Steering Wheel Controls, Radio (UK3)	On Steering Wheel	2	3	202-27
Traction Control Switch	Left side of upper console	42	78	
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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C217 (4 cavities)	Near base of Steering Column	34	63	202-19
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	

COMPONENT	LOCATION	201-PG	FIG.	CONN
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S221	I/P Harn, approx 7 cm from DERM breakout			
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			
S260	Cross Car Harn, approx 13 cm from Rearview Mirror breakout	45	84	

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

- 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.
- With DRL suspect failures, for a better understanding of the DRL System, refer to the Circuit Operation and Circuit Mechanization in SECTION 8A-102.

SYSTEM DIAGNOSIS

- Refer to the Symptom Table for the appropriate diagnostic procedures.

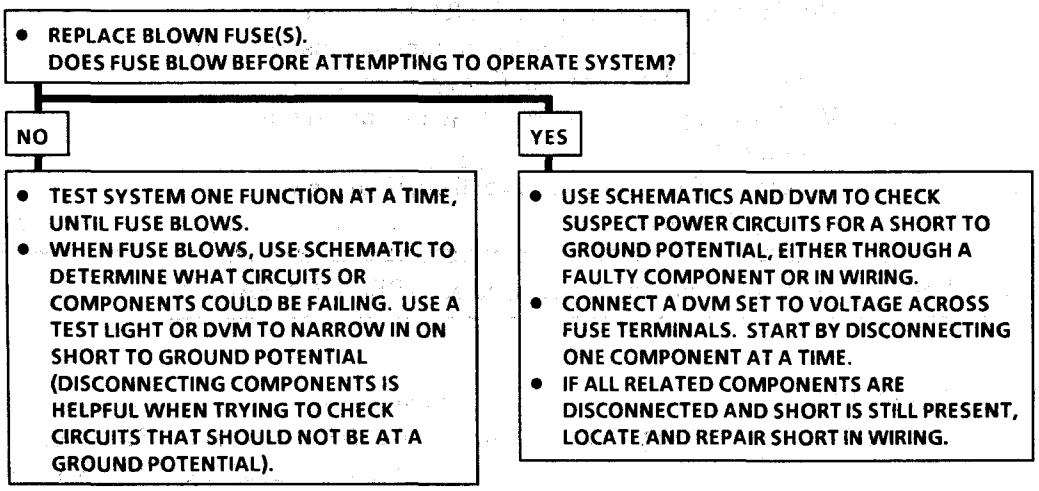
INTERIOR LIGHTS DIMMING

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Fuse blows when replaced or when attempting to use lighting system.	Chart #1	8A-117-6
Entire lighting system inoperative.	Use schematics and DVM or test light to check suspect power circuits and ground circuits for opens or poor connections. Repair or replace as necessary.	
Individual lamp inoperative.	• Determine if lamp is defective. • Check for corrosion or poor connection at socket. If OK, use schematic and DVM or test light to check suspect circuits.	

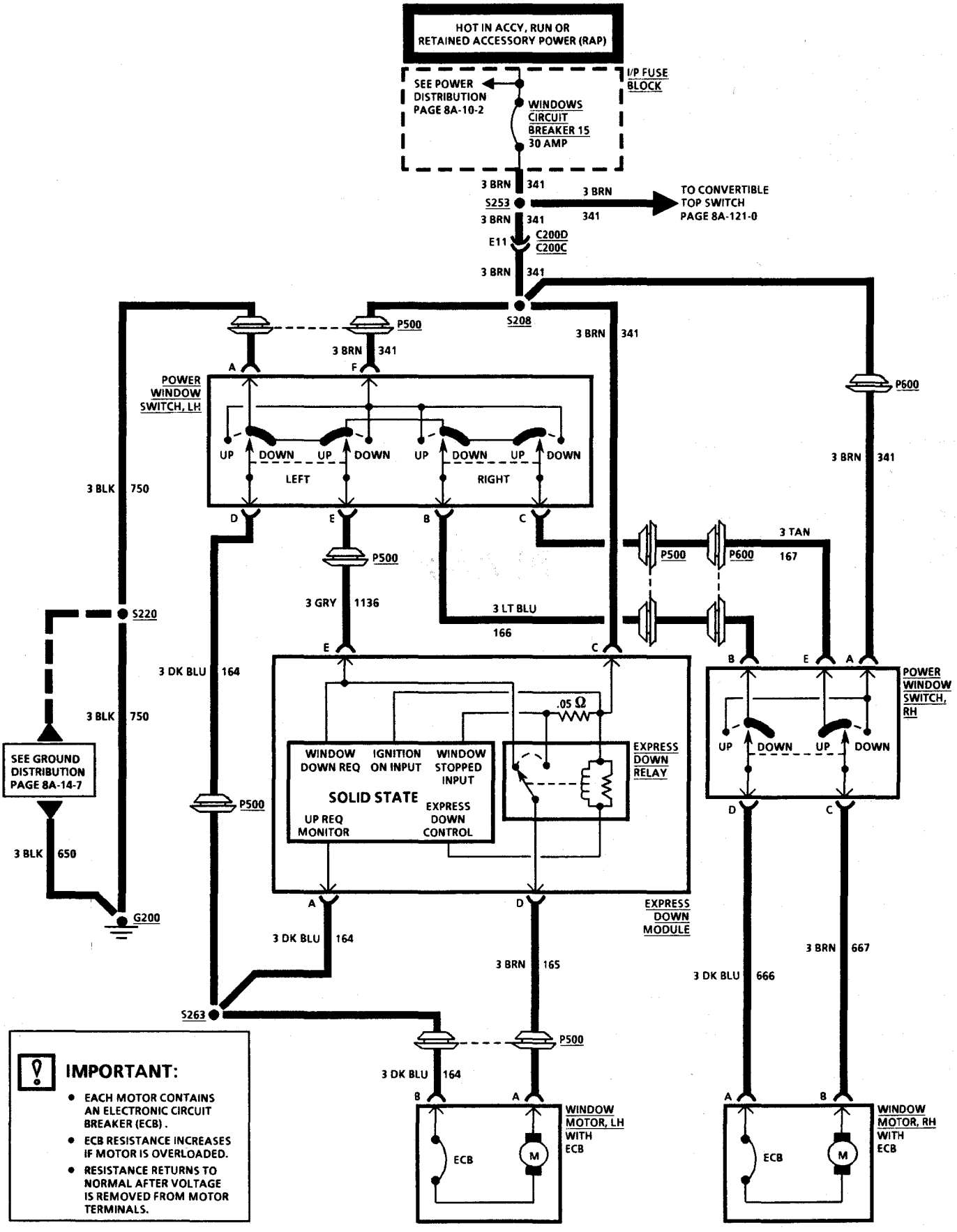
CHART #1

FUSE BLOWS WHEN REPLACED OR WHEN ATTEMPTING TO USE LIGHTING SYSTEM



BLANK

POWER WINDOWS (A31)



COMPONENT	LOCATION	201-PG	FIG.	CONN
Express Down Module	Mounted to center of dash mat, above floor tunnel	9	17	202-21
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Power Window Switch, LH	Mounted in left door armrest	18	33	202-27
Power Window Switch, RH	Mounted in right door armrest	18	33	202-27
Window Motor, LH	Inside LH door	17	31	
Window Motor, RH	Inside RH door	17	31	
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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S208	Cross Car Harn, approx 5 cm from Express Down Module breakout	45	84	
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S253	I/P Harn, approx 35 cm from Convenience Center breakout			
S263	Cross Car Harn, approx 16 cm from C200 breakout	45	84	

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. If both windows are inoperative, check windows Circuit Breaker 15 for open. If open, check for short to ground through CKT 341.
- Check for poor connection at C200 terminal "E11".
2. If windows move slowly, check that:
   - Windows free of mechanical binding and pivot joints and tracks are properly lubed.
   - Battery is fully charged.
   - Ground G200 is clean and tight.
3. If the Express Down Feature does not work, but window moves down with each switch depression, check for poor connection at Express Down Module terminal "A" or open in CKT 164 from Express Down Module to S263.
- 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 procedure(s).

SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Operate each window "UP" and "DOWN" from the Master Power Window Switch Assembly.	Each window operates quietly and smoothly, with no sticking. LH Front Window rolls down all the way without the switch being held (Express Down Feature).
[2] • Operate each window from its individual Window Switch.	Each window operates quietly and smoothly, with no sticking.

POWER WINDOWS (A31)

IMPORTANT:

- FOR A BETTER UNDERSTANDING OF THE RETAINED ACCESSORY POWER (RAP) OPERATION, REFER TO CIRCUIT OPERATION AT THE END OF THIS SECTION.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Both Power Windows inoperative from both switches.	Chart #1	8A-120-2
Power Windows inoperative from the LH Switch, RH Switch operates RH Window normally.	Chart #2	8A-120-3
RH Window inoperative from both switches, LH Window operates normally.	Chart #3	8A-120-4
RH Power Window inoperative from LH Power Window Switch with normal operation from RH Power Window Switch.	Check for poor connection at LH Power Window Switch. If OK, replace LH Power Window Switch.	
Express Down Feature inoperative. Window does operate up and down while switch is held in the desired position. **Important:** • Express Down Feature is for the LH Window only.	Check for poor connections at Express Down Module terminal "A" and terminal "C". Check for open in CKT 164 from S263 to terminal "A" of Express Down Module and in CKT 341 from S208 to terminal "C" of Express Down Module. If OK, replace Express Down Module.	
RH Power Window Switch inoperative, LH Power Window Switch operates normally.	Check for poor connection or open in CKT 341 from RH Power Window Switch terminal "A" to S208.	

CHART #1

BOTH POWER WINDOWS INOPERATIVE FROM BOTH SWITCHES

IMPORTANT:

- IF BOTH WINDOWS ARE INOPERATIVE, CHECK WINDOWS CIRCUIT BREAKER 15 FOR OPEN. IF OPEN, CHECK FOR SHORT TO GROUND THROUGH CKT 341.

- IGNITION SWITCH IN THE "RUN" POSITION.
- WITH A TEST LIGHT, BACKPROBE LH POWER WINDOW SWITCH ASSEMBLY FROM TERM "F" TO GROUND. IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT, BACKPROBE THE LH POWER WINDOW SWITCH ASSEMBLY BETWEEN TERM "F" AND TERM "A". IS TEST LIGHT "ON"?

YES

- CHECK LH POWER WINDOW SWITCH ASSEMBLY CONNECTOR FOR POOR CONNECTION. IF OK, REPLACE SWITCH.

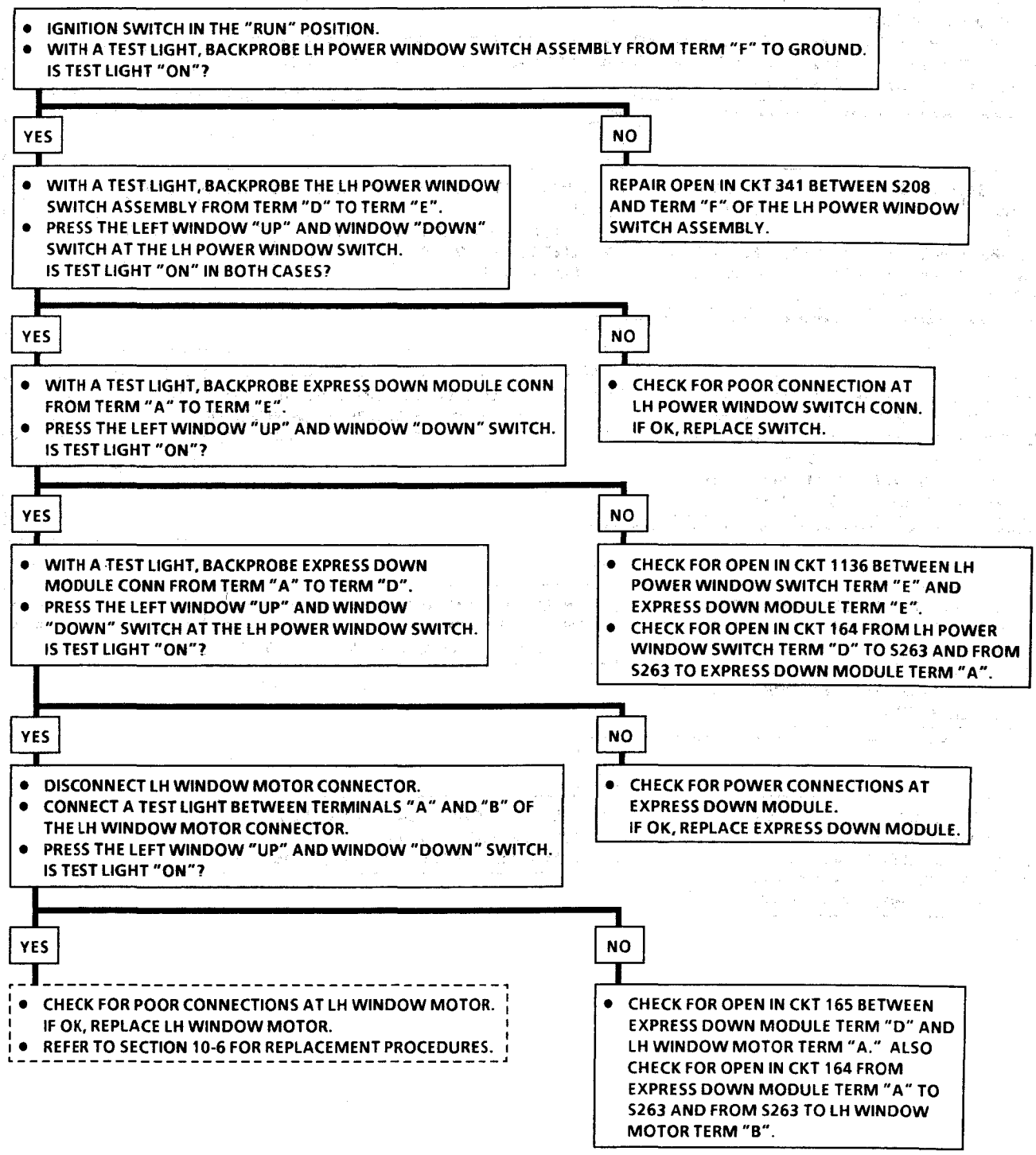
NO

- CHECK FOR POOR CONNECTION AT G200. IF OK, REPAIR OPEN IN CKT 750 BETWEEN LH POWER WINDOW SWITCH ASSEMBLY CONN TERM "A" AND G200.

NO

- CHECK FOR POOR CONNECTION AT C200 TERM "E11". IF OK, REPAIR OPEN IN CKT 341 BETWEEN WINDOWS CIRCUIT BREAKER 15 AND LH POWER WINDOW SWITCH ASSEMBLY CONN TERM "F".

CHART #2
POWER WINDOWS INOPERATIVE FROM THE LH SWITCH, RH SWITCH OPERATES RH WINDOW NORMALLY



POWER WINDOWS (A31)

CHART #3

RH WINDOW INOPERATIVE FROM BOTH SWITCHES, LH WINDOW OPERATES NORMALLY

- IGNITION SWITCH IN "RUN."
- WITH A TEST LIGHT, BACKPROBE THE RH POWER WINDOW MOTOR CONN FROM TERM "A" TO TERM "B".
- WHILE OBSERVING THE TEST LIGHT, PRESS THE RH WINDOW "UP" AND WINDOW "DOWN" SWITCH. IS THE TEST LIGHT "ON" IN BOTH CASES?

NO

- WITH A TEST LIGHT, BACKPROBE THE RH POWER WINDOW SWITCH FROM CONN TERM "D" TO TERM "C".
- WHILE OBSERVING THE TEST LIGHT, PRESS THE RH WINDOW "UP" AND WINDOW "DOWN" SWITCH. IS TEST LIGHT "ON" IN BOTH CASES?

NO

- WITH A TEST LIGHT, BACKPROBE RH POWER WINDOW SWITCH CONN TERM "B" TO TERM "E".
- WHILE OBSERVING THE TEST LIGHT AND USING THE LH WINDOW SWITCH, PRESS THE RH WINDOW "UP" AND WINDOW "DOWN" SWITCH. IS THE TEST LIGHT "ON" IN BOTH CASES?

NO

- WITH A TEST LIGHT, BACKPROBE LH POWER WINDOW SWITCH CONN TERM "B" TO TERM "C".
- WHILE OBSERVING THE TEST LIGHT AND USING THE LH WINDOW SWITCH, PRESS THE RH WINDOW "UP" AND WINDOW "DOWN" SWITCH. IS THE TEST LIGHT "ON" IN BOTH CASES?

YES

- CHECK FOR POOR CONNECTIONS AT LH POWER WINDOW SWITCH.
  IF OK, CHECK FOR OPEN IN CKT 166 AND CKT 167 BETWEEN LH POWER WINDOW SWITCH AND RH POWER WINDOW SWITCH.

NO

- CHECK FOR POOR CONNECTIONS AT LH POWER WINDOW SWITCH.
  IF OK, REPLACE LH POWER WINDOW SWITCH.

YES

- CHECK FOR POOR CONNECTIONS AT RH POWER WINDOW SWITCH CONN.
  IF OK, REPLACE RH POWER WINDOW SWITCH.

YES

CHECK FOR OPEN IN CKT 666 OR CKT 667 BETWEEN RH POWER WINDOW SWITCH AND RH WINDOW MOTOR.

YES

- CHECK POWER WINDOW MOTOR CONNECTOR FOR POOR CONNECTION.
  IF OK, REPLACE INOPERATIVE POWER WINDOW MOTOR.
- REFER TO SECTION 10-6 FOR REPLACEMENT PROCEDURES.

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.

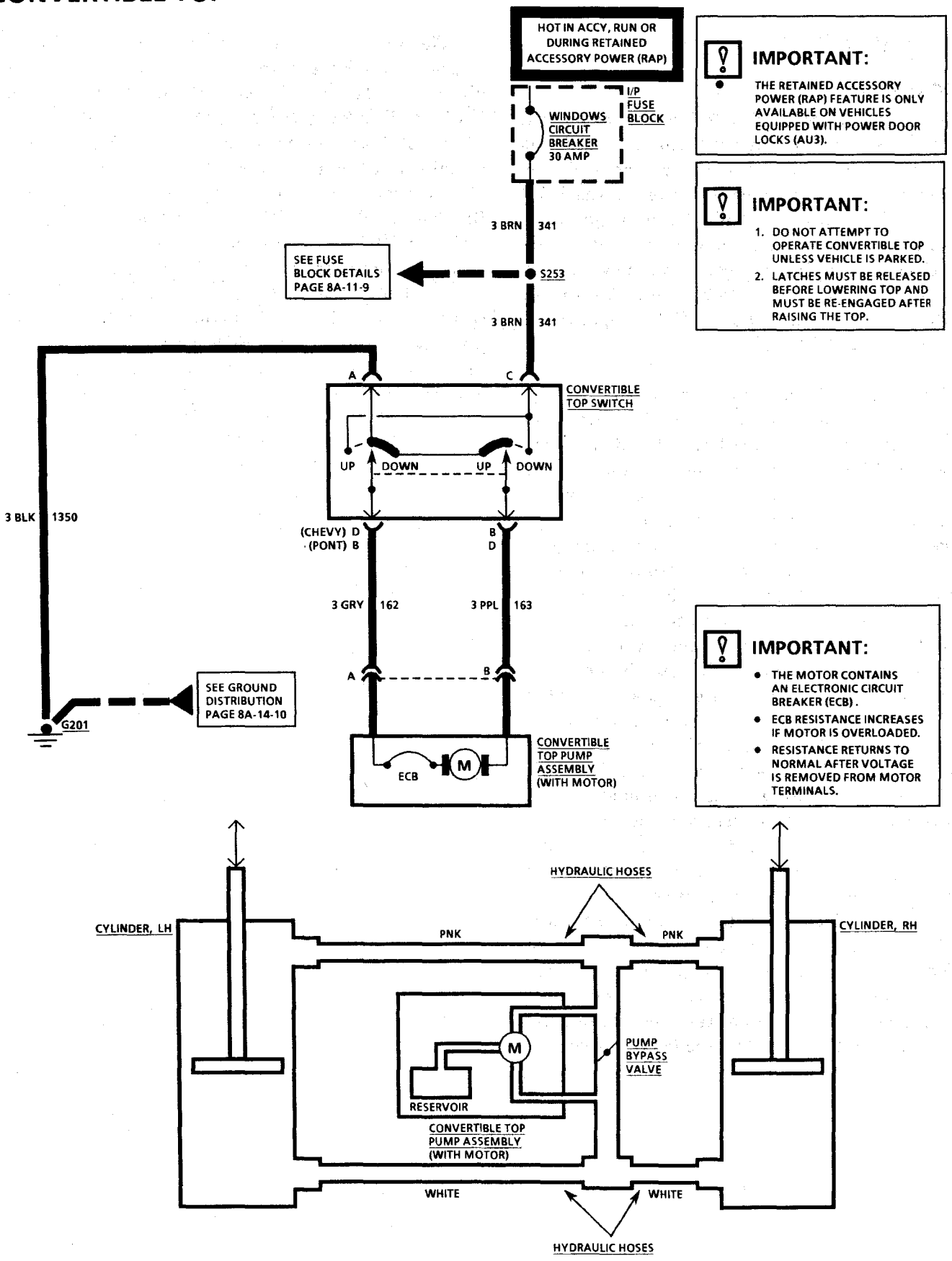
The Power Windows are driven by reversible, permanent magnet motors. Each motor is controlled by a set of two switches, which are normally closed to ground. When any Window Switch is moved to the "UP" position, the "UP" switch will provide battery voltage to the Window Motor through the DK BLU wire. 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.

CONVERTIBLE TOP



COMPONENT	LOCATION	201-PG	FIG.	CONN
Convertible Top Pump Assembly	LH side rear compartment behind carpeting	30	58	
Convertible Top Switch	Left side of upper console (Chevy) or lower console (Pont)	42	78, 80	202-20
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
S253	I/P Harn, approx 35 cm from Convenience Center breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

Important:

- To avoid misdiagnosis, check linkage for mechanical binding which would prevent correct system operation.
- If a hydraulic problem is suspected, refer to SECTION 10-9 for hydraulic diagnosis.

1. Check Windows Circuit breaker 15 for an open. If open, check for a short to ground through CKTs 341, 162 and 163.
2. Check that G201 is clean and tight.

- 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 instructions on how to manually lower and raise the Convertible Top, refer to SECTION 10-9.

CONVERTIBLE TOP

SYSTEM CHECK

ACTION	NORMAL RESULTS
[1] • Remove all items that could obstruct the Convertible Top. • Lower both sun visors. • Release the two latches (one latch above each sun visor). • Turn the Ignition Switch to "RUN" and lower all side windows. • Move the Convertible Top Switch to the DOWN position.	Convertible Top lowers quietly and smoothly with no binding.
[2] • Move Convertible Top Switch to the UP position.	Convertible Top raises quietly and smoothly with no binding.

IMPORTANT:

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

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Convertible Top inoperative.	Chart #1	8A-121-3
Convertible Top lowers but does not raise when using Convertible Top Switch.	Replace Convertible Top Switch.	
Convertible Top raises but does not lower when using Convertible Top Switch (can be lowered manually).	Replace Convertible Top Switch.	

CHART #1
CONVERTIBLE TOP INOPERATIVE

IMPORTANT:

- IF A HYDRAULIC PROBLEM IS SUSPECTED, REFER TO SECTION 10-9 FOR HYDRAULIC DIAGNOSIS. CHECK WINDOWS CIRCUIT BREAKER 15 FOR OPEN. IF OPEN, CHECK FOR SHORT TO GROUND THROUGH CKTS 341, 162 AND 163.

- IGNITION SWITCH TO "RUN."
- WITH A TEST LIGHT TO GROUND, BACKPROBE CONVERTIBLE TOP SWITCH CONN TERM "C".
  IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT, BACKPROBE CONVERTIBLE TOP SWITCH CONN FROM TERM "C" TO TERM "A".
  IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT, BACKPROBE CONVERTIBLE TOP SWITCH CONN FROM TERM "B" TO TERM "D".
- WHILE OBSERVING TEST LIGHT, PRESS THE CONVERTIBLE TOP SWITCH TO THE "UP" POSITION AND THEN TO THE "DOWN" POSITION.
  DOES THE TEST LIGHT ILLUMINATE IN BOTH POSITIONS?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE PUMP ASSEMBLY CONN TERM "B" (I/P HARNESS SIDE OF CONNECTOR).
- WHILE OBSERVING THE TEST LIGHT, PRESS THE CONVERTIBLE TOP SWITCH TO THE "DOWN" POSITION.
  IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE PUMP ASSEMBLY CONN TERM "A" (I/P HARNESS SIDE OF CONNECTOR).
- WHILE OBSERVING TEST LIGHT, PRESS THE CONVERTIBLE TOP SWITCH TO THE "UP" POSITION.
  IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTION AT CONVERTIBLE TOP PUMP ASSEMBLY CONN.
  IF OK, REPLACE CONVERTIBLE TOP PUMP ASSEMBLY.

NO

- REPAIR OPEN IN CKT 162 BETWEEN CONVERTIBLE TOP SWITCH AND CONVERTIBLE TOP PUMP ASSEMBLY CONN.

NO

- REPAIR OPEN IN CKT 163 BETWEEN CONVERTIBLE TOP SWITCH AND CONVERTIBLE TOP PUMP ASSEMBLY CONN.

NO

- CHECK FOR POOR CONNECTIONS AT CONVERTIBLE TOP SWITCH CONN.
  IF OK, REPLACE CONVERTIBLE TOP SWITCH.

NO

- CHECK FOR POOR CONNECTION AT G201.
  IF OK, REPAIR OPEN IN CKT 1350 BETWEEN CONVERTIBLE TOP SWITCH CONN TERM "A" AND G201.

NO

- REPAIR OPEN IN CKT 341 BETWEEN WINDOWS CIRCUIT BREAKER 15 AND CONVERTIBLE TOP SWITCH CONN TERM "C".

CONVERTIBLE TOP

CIRCUIT OPERATION

Important:

- The Convertible Top Pump Assembly 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 Convertible Top Switch through CKT 341. The Convertible Top Pump Assembly receives ground through the Convertible Top Switch Assembly, which is grounded at G201.

The Convertible Top Pump is driven by a reversible permanent magnet motor. The motor is controlled by the Convertible Top Switch, which is normally closed to ground. When the Convertible Top Switch is moved to the "UP" position, battery voltage is provided to the Convertible Top Pump Assembly through the GRY wire. The Convertible Top Pump Assembly will receive ground through the PPL wire, the Convertible Top Switch, and drive the Convertible Top up. When the switch is released, the switch contacts will return to their normal grounded position.

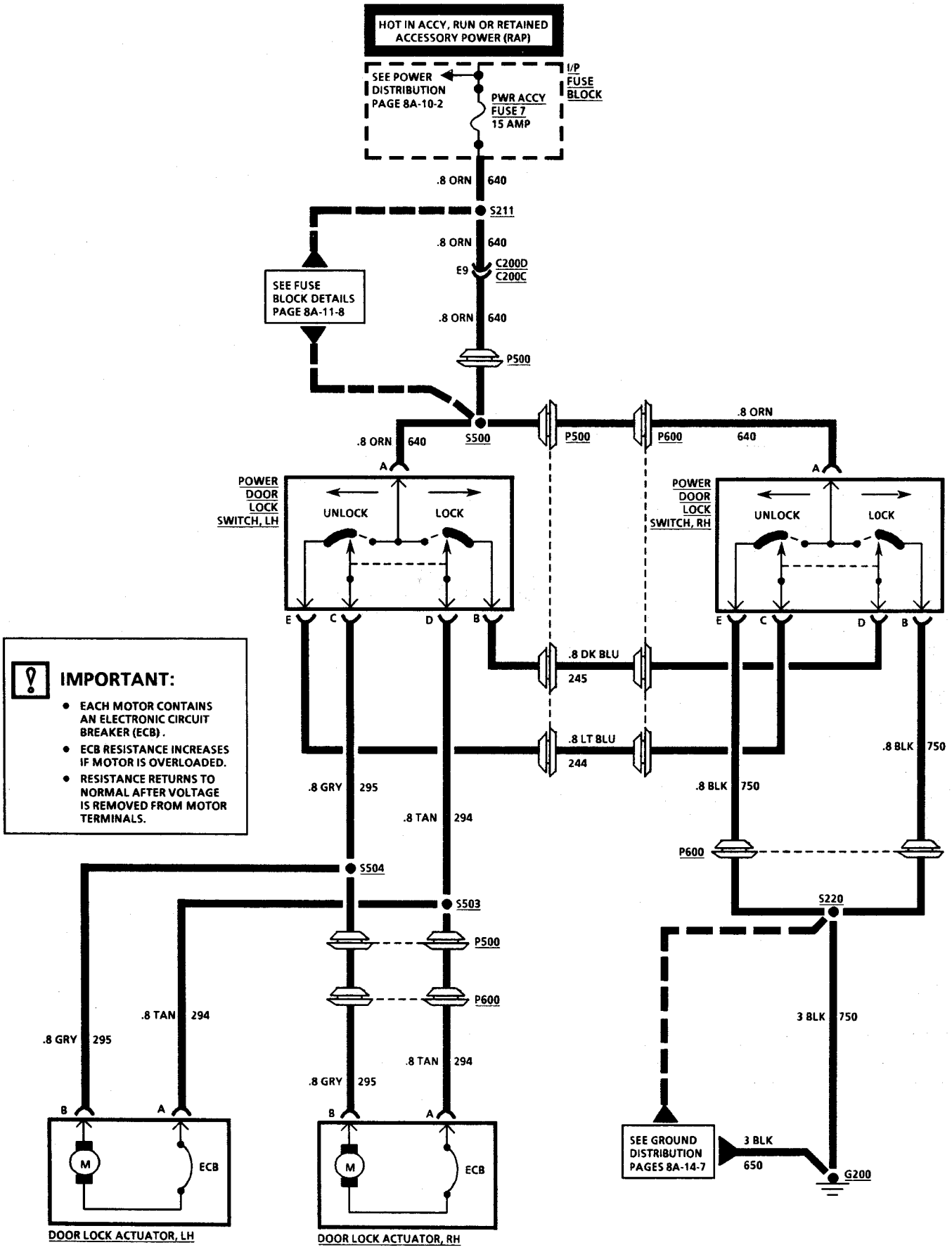
To lower the Convertible Top, the Convertible Top Switch will connect the PPL wire to battery voltage. Ground will be provided to the GRY wire through the Convertible Top Switch. The polarity across the motor will be reversed, causing the motor to rotate in the opposite direction and lower the Convertible Top.

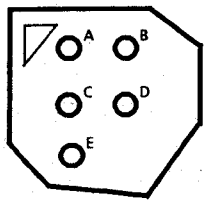
The Convertible Top Pump Assembly has two hydraulic hoses that go to the right hand cylinder and two hydraulic hose that to go the left hand cylinder that evenly control the up and down movement of both cylinder simultaneously.

The motor within the Convertible Top Pump Assembly is protected against an overload condition internally by an Electronic Circuit Breaker (ECB). If the motor in the Convertible Top Pump Assembly becomes overloaded, the ECB will increase its resistance. By increasing its resistance, the ECB will prevent the motor from overloading. The ECB will reset to normal resistance when voltage to the motor is interrupted.

BLANK

POWER DOOR LOCKS (AU3)





12004680

5-WAY F PIN GRIP SERIES
BLK/WHT

POWER DOOR LOCK SWITCH, LH AND RH

COMPONENT	LOCATION	201-PG	FIG.	CONN
Door Lock Actuator, LH	Inside rear of left door	17	31	
Door Lock Actuator, RH	Inside rear of right door	17	31	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	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
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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S211	I/P Harn, approx 4 cm from antenna cable (Chevy) or Convenience Center (Pont) breakouts			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S500	Cross Car Harn, approx 6 cm from Speaker breakout	17	31	
S503	Cross Car Harn, approx 3 cm from LH Power Door Lock Switch breakout	17	31	
S504	Cross Car Harn, approx 11 cm from Power Mirror breakout	17	31	

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

POWER DOOR LOCKS (AU3)

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check PWR ACCY Fuse 7 in I/P Fuse Block. If open, refer to Diagnostic Chart #4.
2. Check for poor connection at G200.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

Important:

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

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Power Door Locks will not operate from both Power Door Switches.	Chart #1 Chart #2 Chart #3	8A-130-3 8A-130-4 8A-130-5
RH Door Lock Switch operates normally. LH Door Lock Switch does not "LOCK" or "UNLOCK."	Check for B+ at terminal "A" of LH Door Lock Connector. – If not present, repair open in CKT 640. – If present, replace LH Door Lock Switch.	
LH Door Lock Switch operates normally. RH Door Lock Switch does not.	Chart #1	8A-130-3
One Door Lock Switch "UNLOCKS" but does not "LOCK." Other switch OK.	Check for poor connection at suspect Door Lock Switch. If OK, replace suspect Door Lock Switch.	
One Door Lock Switch "LOCKS" but does not "UNLOCK." Other switch OK.	Check for poor connection at suspect Door Lock Switch. If OK, replace suspect Door Lock Switch.	
Power Door Locks either "LOCK" only or "UNLOCK" only from both Door Lock Switches.	Chart #1 Chart #2	8A-130-3 8A-130-4
One door does not "LOCK" or "UNLOCK."	Chart #3	8A-130-5
PWR ACCY Fuse 7 repeatedly blows whenever Ignition is "ON" or when attempting to use Power Door Locks.	Chart #4	8A-130-5
• Power Door Locks do not operate when one or both doors are opened. • Power Door Locks only operate with Ignition "ON," or for 10 minutes after Ignition is turned "OFF" and exiting the vehicle and closing the door(s).	Refer to "Retained Accessory Power (RAP)," page 8A-15-0.	

CHART #1
RH DOOR LOCK SWITCH TEST

IMPORTANT:

- IF PWR ACCY FUSE CONTINUALLY BLOWS, REFER TO CHART #4.

- BACKPROBE RH DOOR LOCK SWITCH CONNECTOR WITH A TEST LIGHT BETWEEN TERM "A" AND GROUND. IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "A" & "C". IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "A" & "D". IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "C" & "E".
- MOVE THE RH DOOR LOCK SWITCH TO THE "LOCK" POSITION WHILE OBSERVING THE TEST LIGHT. IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "D" & "E".
- MOVE THE RH DOOR LOCK SWITCH TO THE "UNLOCK" POSITION WHILE OBSERVING THE TEST LIGHT. IS TEST LIGHT "ON"?

YES

- CHECK CONTINUITY FROM TERM "C" OF RH DOOR LOCK SWITCH CONNECTOR TO TERM "E" OF LH DOOR LOCK SWITCH CONNECTOR. IS THERE CONTINUITY (NEARLY 0 OHMS)?

YES

- CHECK CONTINUITY FROM TERM "D" OF RH DOOR LOCK SWITCH CONNECTOR TO TERM "B" OF LH DOOR LOCK SWITCH CONNECTOR. IS THERE CONTINUITY (NEARLY 0 OHMS)?

YES

- NO TROUBLE FOUND WITH THE RH DOOR LOCK SWITCH.
- IF LH DOOR LOCK SWITCH IS INOPERATIVE, REFER TO CHART #2, "LH DOOR LOCK SWITCH TEST," PAGE 8A-130-4.

NO

- CHECK FOR OPEN IN CKT 640 BETWEEN RH DOOR LOCK SWITCH AND PWR ACCY FUSE. IF OK, REPAIR POWER FEED TO PWR ACCY FUSE.

NO

- CHECK FOR OPEN IN GROUND CKT 750 (G200) TO TERM "E" OF CONNECTOR OR POOR CONNECTION TO SWITCH. IF OK, REPLACE RH DOOR LOCK SWITCH.

NO

- CHECK FOR OPEN IN GROUND CKT 750 (G200) TO RH DOOR LOCK SWITCH CONNECTOR TERM "B" OR POOR CONNECTION TO SWITCH. IF OK, REPLACE RH DOOR LOCK SWITCH.

NO

- CHECK FOR POOR CONNECTION AT SWITCH. IF OK, REPLACE RH DOOR LOCK SWITCH.

NO

- CHECK FOR POOR CONNECTION AT SWITCH. IF OK, REPLACE RH DOOR LOCK SWITCH.

NO

REPAIR OPEN IN CKT 244.

NO

REPAIR OPEN IN CKT 245.

POWER DOOR LOCKS (AU3)

CHART #2
LH DOOR LOCK SWITCH TEST

IMPORTANT:

- CHART #1, "RH DOOR LOCK SWITCH TEST," PAGE 8A-130-3 MUST BE PERFORMED BEFORE PROCEEDING.

- BACKPROBE LH DOOR LOCK SWITCH CONNECTOR WITH A TEST LIGHT BETWEEN TERM "A" AND GROUND. IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "A" & "C". IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "A" & "D". IS TEST LIGHT "ON"?

YES

- BACKPROBE THE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "C" & "E".
- MOVE LH DOOR LOCK SWITCH TO "LOCK" POSITION WHILE OBSERVING TEST LIGHT. IS TEST LIGHT "ON"?

YES

- BACKPROBE SAME CONNECTOR WITH THE TEST LIGHT BETWEEN TERMINALS "D" & "E".
- MOVE LH DOOR LOCK SWITCH TO THE "UNLOCK" POSITION WHILE OBSERVING TEST LIGHT. IS TEST LIGHT "ON"?

YES

- NO TROUBLE FOUND WITH LH DOOR LOCK SWITCH.
- REFER TO CHART #3, "DOOR LOCK ACTUATOR TEST," PAGE 8A-130-5.

NO

- CHECK FOR POOR CONNECTION AT LH SWITCH. IF OK, REPLACE LH DOOR LOCK SWITCH.

NO

- CHECK FOR POOR CONNECTION AT LH SWITCH. IF OK, REPLACE LH DOOR LOCK SWITCH.

NO

- CHECK FOR OPEN IN CKT 245.
- CHECK FOR POOR CONNECTION AT LH SWITCH. IF OK, REPLACE LH DOOR LOCK SWITCH.

NO

- CHECK FOR POOR CONNECTION AT LH SWITCH. IF OK, REPLACE LH DOOR LOCK SWITCH.

NO

- CHECK FOR POOR CONNECTION AT LH SWITCH. IF OK, REPLACE LH DOOR LOCK SWITCH.

NO

REPAIR OPEN IN CKT 640 BETWEEN S500 AND LH POWER DOOR LOCK SWITCH AT TERM "A".

CHART #3
DOOR LOCK ACTUATORS TEST

IMPORTANT:

- IF BOTH DOOR LOCK ACTUATORS DO NOT OPERATE, PERFORM CHART #1, "RH DOOR LOCK SWITCH TEST," PAGE 8A-130-3 AND CHART #2, "LH DOOR LOCK SWITCH TEST," PAGE 8A-130-4 BEFORE PROCEEDING.

- DISCONNECT SUSPECT DOOR LOCK ACTUATOR CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN TERM "B" OF CONNECTOR AND B+.
  IS TEST LIGHT "ON"?

YES

- CONNECT THE TEST LIGHT BETWEEN TERM "A" OF SUSPECT DOOR LOCK MOTOR CONNECTOR AND B+.
  IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTION AT DOOR LOCK ACTUATOR.
  IF OK, REPLACE DOOR LOCK ACTUATOR.

NO

REPAIR OPEN IN CKT 294 (TAN WIRE).

NO

REPAIR OPEN IN CKT 295 (GRY WIRE).

CHART #4
PWR ACCY FUSE 7 REPEATEDLY BLOWS WHENEVER IGNITION IS "ON" OR WHEN ATTEMPTING TO OPERATE POWER DOOR LOCKS

- REPLACE BLOWN FUSE.
  DOES FUSE BLOW BEFORE ATTEMPTING TO OPERATE POWER DOOR LOCKS?

NO

- TEST POWER DOOR LOCK SWITCH ONE FUNCTION AT A TIME UNTIL FUSE BLOWS.
- WHEN THE FUSE BLOWS, USE SCHEMATICS TO DETERMINE WHAT CIRCUITS OR COMPONENTS COULD BE FAILING. USE A TEST LIGHT OR DVM TO NARROW IN ON SHORT TO GROUND POTENTIAL.
- DISCONNECTING COMPONENTS IS HELPFUL WHEN TRYING TO CHECK CIRCUITS THAT SHOULD NOT BE AT A GROUND POTENTIAL.

YES

- USE SCHEMATICS AND DVM TO CHECK SUSPECT POWER CIRCUITS FOR A SHORT TO GROUND POTENTIAL, EITHER THROUGH A FAULTY COMPONENT OR IN WIRING.
- CONNECT A DVM SET TO VOLTAGE ACROSS FUSE TERMINALS. START BY DISCONNECTING ONE COMPONENT AT A TIME.
  IF ALL RELATED COMPONENTS ARE DISCONNECTED AND SHORT IS STILL PRESENT, LOCATE AND REPAIR SHORT IN WIRING.

POWER DOOR LOCKS (AU3)

CIRCUIT OPERATION

Important:

- The Power Door Lock System 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 Ignition is turned off or for 35 seconds after exiting the vehicle and closing the doors. Voltage is also applied whenever a door is open. For a complete understanding of Retained Accessory Power (RAP) operation, refer to "Retained Accessory Power (RAP): with AU3," page 8A-15-0.

When a Door Lock Switch is activated in the Power Door Lock system, both doors will lock or unlock in unison. Each lock can also be operated manually. The locks are operated by reversible Actuators. The Door Lock Switches operate the Actuators by applying a voltage to one of the terminals and a ground to the other terminal.

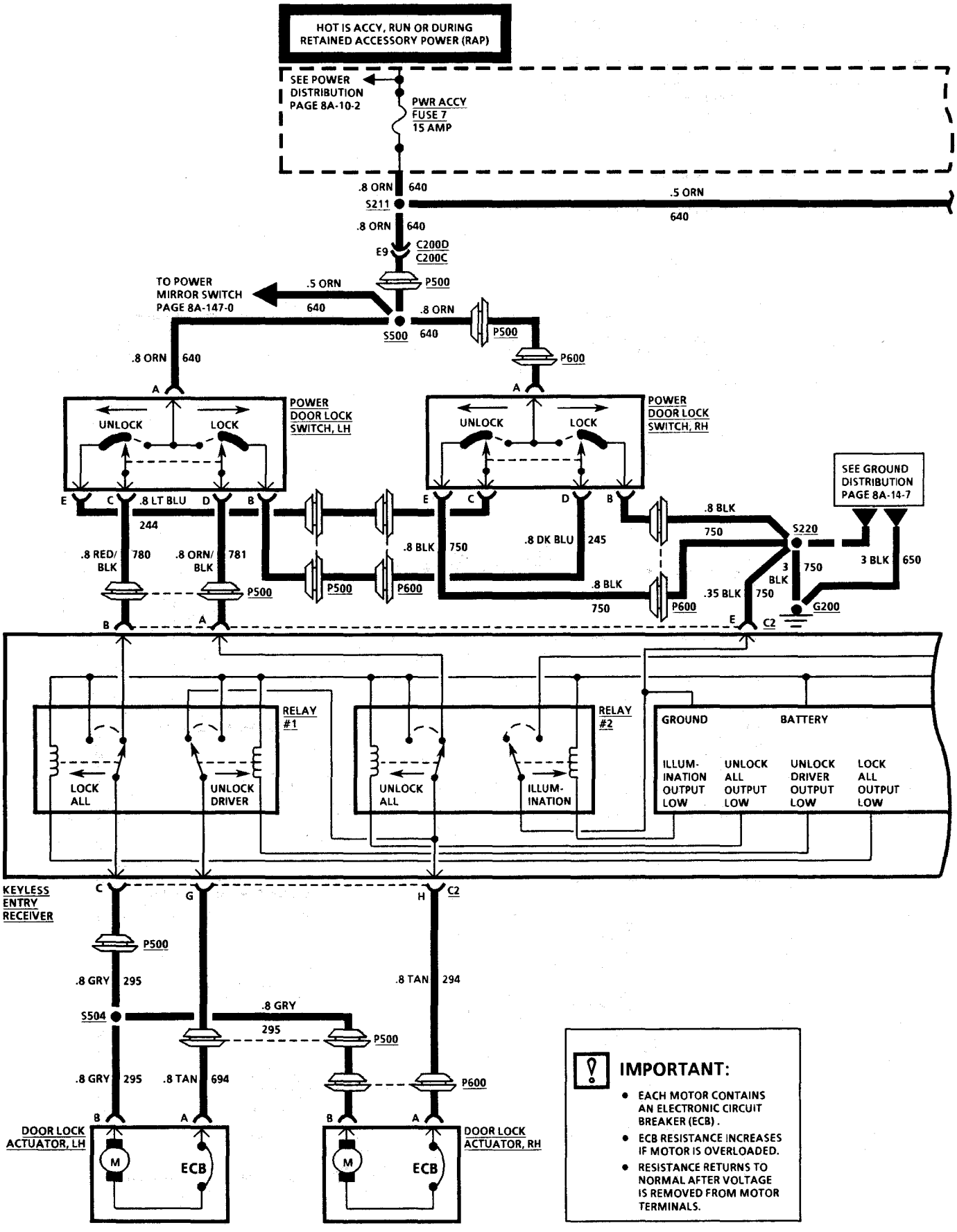
Battery voltage is applied to both Door Lock Switches at terminal "A". When the LH Door Lock Switch is moved to "LOCK," battery voltage is applied to both Door Lock Actuators from the GRY (295) wires. Both Actuators are grounded through the TAN (294) wires, the contacts of the LH Door Lock Switch, the DK BLU (245) wire, the contacts of the RH Door Lock Switch and the BLK (750) wires to ground G200.

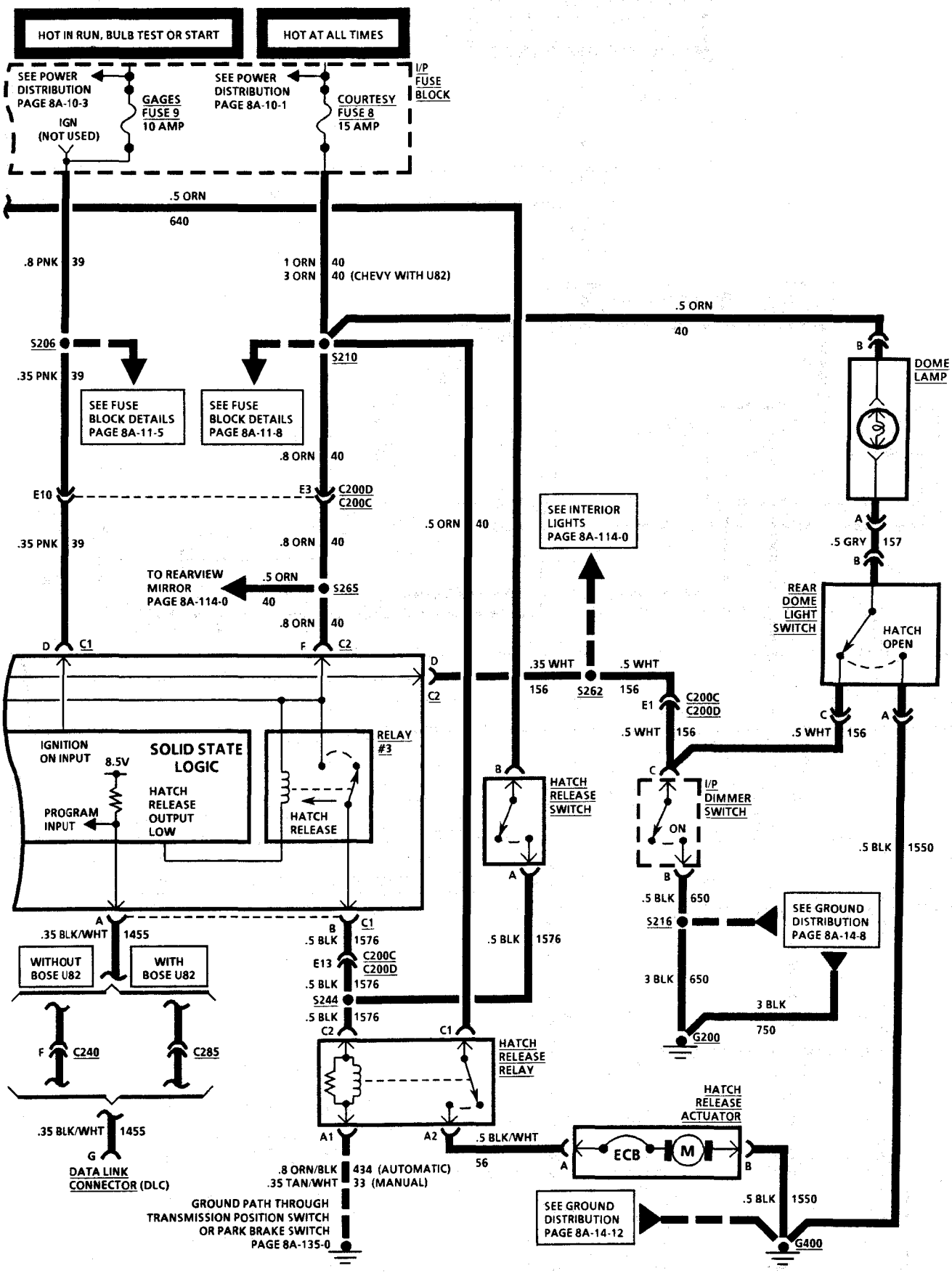
When the LH Door Lock Switch is moved to "UNLOCK," battery voltage is applied to both Door Lock Actuators in the opposite direction from the TAN (294) wires. Both Actuators are grounded through the GRY (295) wires, the contacts of the LH Door Lock Switch, the LT BLU (244) wire, the contacts of the RH Door Lock Switch and the BLK (750) wires to ground G200.

When the RH Door Lock Switch is moved to "LOCK," battery voltage is applied from the LT BLU (244) wires, the contacts of the LH Door Lock Switch and the GRY (295) wires to both Door Lock Actuators. When the RH Door Lock Switch is moved to "UNLOCK," battery voltage is applied from the DK BLU (245) wire, the contacts of the LH Door Lock Switch, and the TAN (294) wires to both Door Lock Actuators in the opposite direction. During RH Door Lock Switch operation, the Door Lock Actuators are grounded similarly to the way they are grounded during LH Door Lock Switch operation.

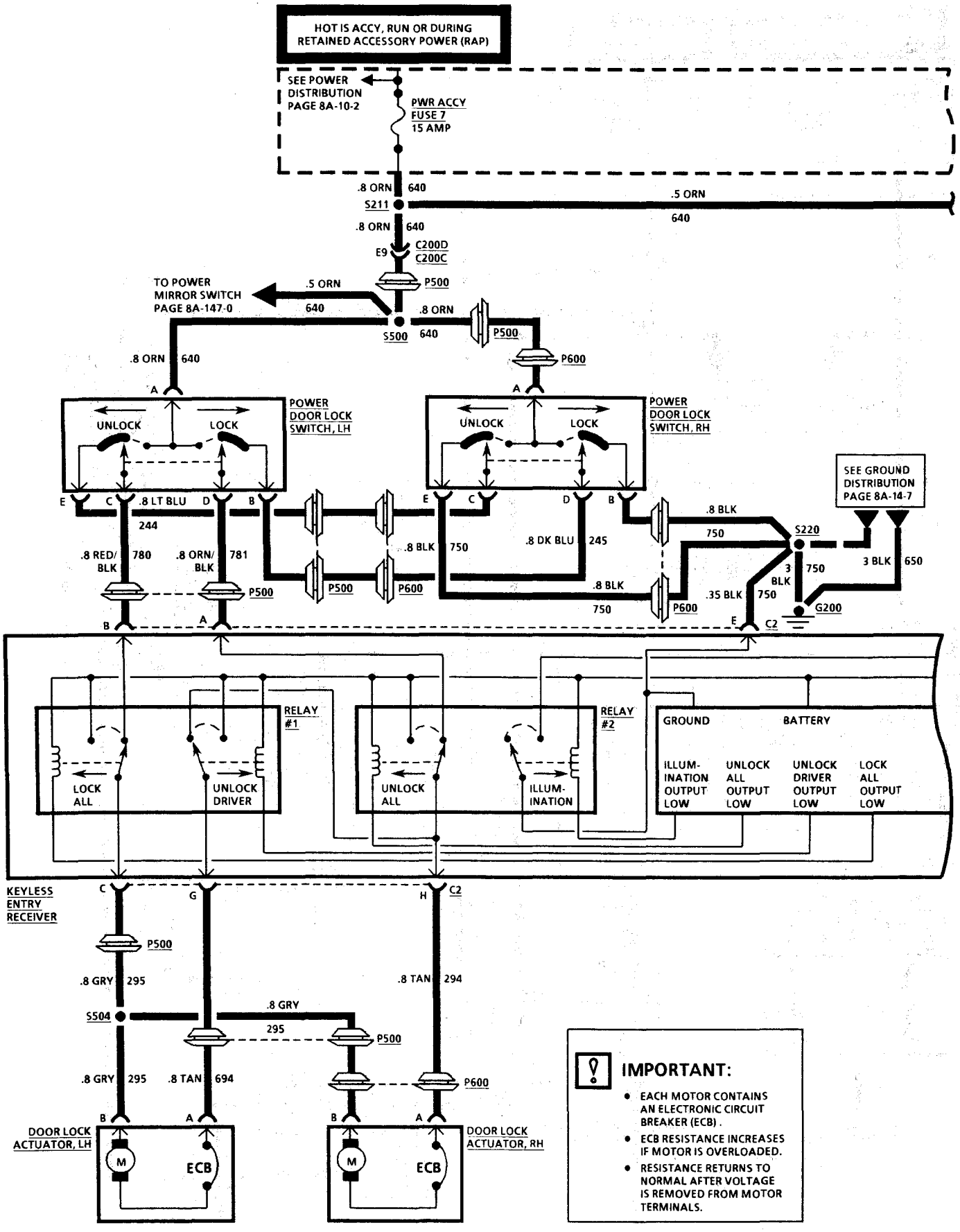
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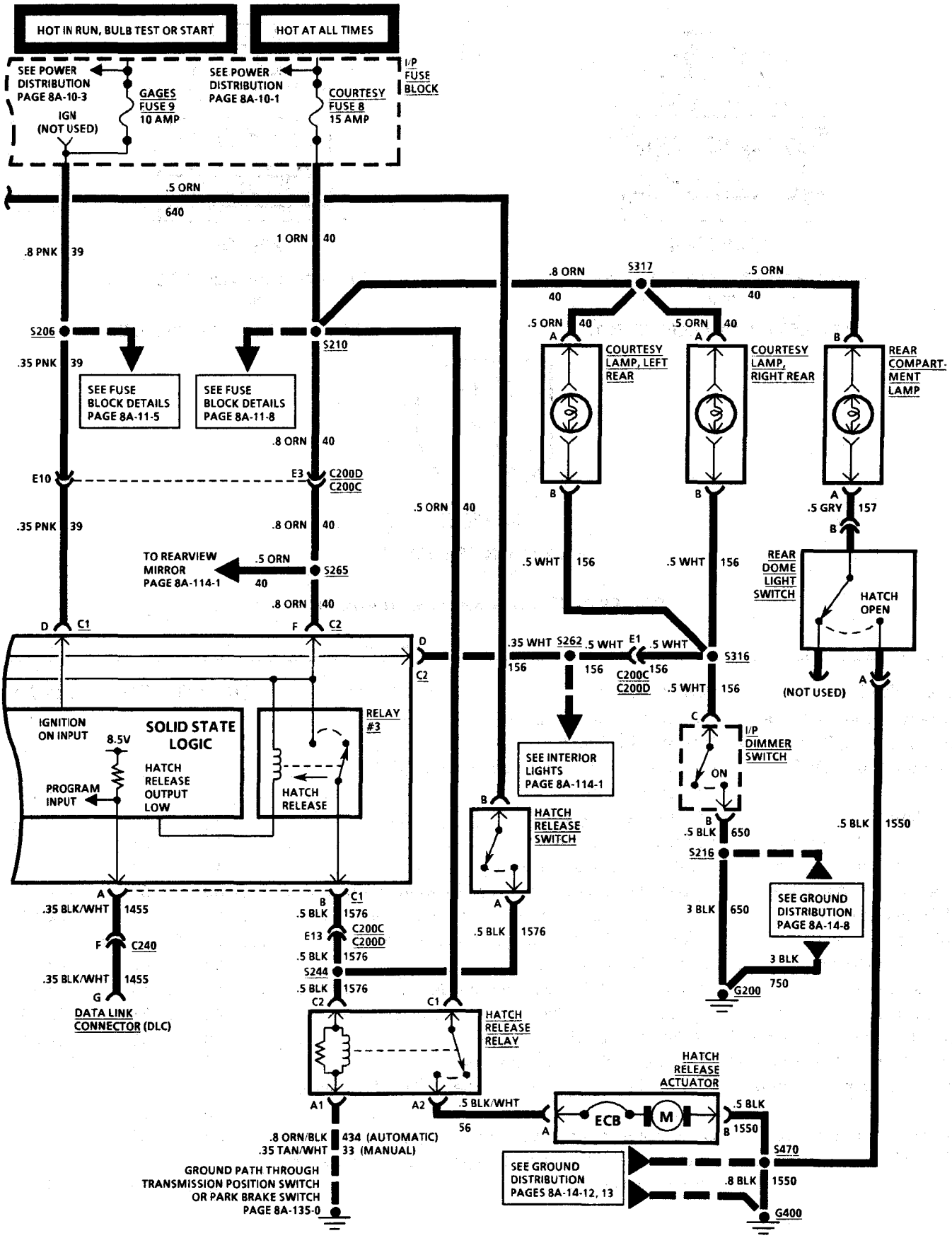
KEYLESS ENTRY: AU0
(COUPE)



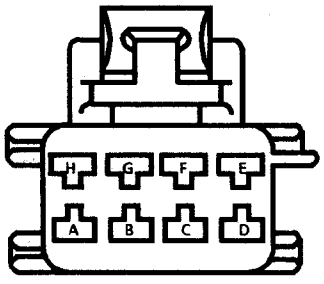

HOT IN RUN, BULB TEST OR START
HOT AT ALL TIMES
I/P FUSE BLOCK
SEE POWER DISTRIBUTION PAGE 8A-10-3
IGN (NOT USED)
GAGES FUSE 9 10 AMP
SEE POWER DISTRIBUTION PAGE 8A-10-1
COURTESY FUSE 8 15 AMP
.5 ORN 640
.8 PNK 39
1 ORN 40
3 ORN 40 (CHEVY WITH U82)
.5 ORN 40
S206
S210
.35 PNK 39
SEE FUSE BLOCK DETAILS PAGE 8A-11-5
SEE FUSE BLOCK DETAILS PAGE 8A-11-8
.8 ORN 40
E10
E3
C200D C200C
.35 PNK 39
.8 ORN 40
.5 ORN 40
TO REARVIEW MIRROR PAGE 8A-114-0
.5 ORN 40
S265
.8 ORN 40
D C1
F C2
SEE INTERIOR LIGHTS PAGE 8A-114-0
DOME LAMP
.5 GRY 157
REAR DOME LIGHT SWITCH
HATCH OPEN
.35 WHT 156
S262
.5 WHT 156
C200C C200D
.5 WHT 156
.5 WHT 156
IGNITION ON INPUT
8.5V
SOLID STATE LOGIC
HATCH RELEASE OUTPUT LOW
PROGRAM INPUT
HATCH RELEASE
RELAY #3
HATCH RELEASE SWITCH
I/P DIMMER SWITCH
ON
.5 BLK 1550
.5 BLK 650
S216
SEE GROUND DISTRIBUTION PAGE 8A-14-8
.35 BLK/WHT 1455
.5 BLK 1576
.5 BLK 1576
3 BLK 650
3 BLK 750
G200
WITHOUT BOSE U82
WITH BOSE U82
E13
C200C C200D
.5 BLK 1576
S244
.5 BLK 1576
F C240
C285
HATCH RELEASE RELAY
HATCH RELEASE ACTUATOR
.35 BLK/WHT 1455
A1
A2
.5 BLK/WHT 56
ECB
M
G
DATA LINK CONNECTOR (DLC)
.8 ORN/BLK 434 (AUTOMATIC)
.35 TAN/WHT 33 (MANUAL)
GROUND PATH THROUGH TRANSMISSION POSITION SWITCH OR PARK BRAKE SWITCH PAGE 8A-135-0
SEE GROUND DISTRIBUTION PAGE 8A-14-12
.5 BLK 1550
G400

KEYLESS ENTRY: AU0
(CONVERTIBLE)




HOT IN RUN, BULB TEST OR START
HOT AT ALL TIMES
SEE POWER DISTRIBUTION PAGE 8A-10-3
IGN (NOT USED)
GAGES FUSE 9 10 AMP
SEE POWER DISTRIBUTION PAGE 8A-10-1
COURTESY FUSE 8 15 AMP
I/P FUSE BLOCK
.5 ORN
640
.8 PNK 39
1 ORN 40
.8 ORN 40
S317
.5 ORN 40
S206
.35 PNK 39
S210
SEE FUSE BLOCK DETAILS PAGE 8A-11-5
SEE FUSE BLOCK DETAILS PAGE 8A-11-8
COURTESY LAMP, LEFT REAR
COURTESY LAMP, RIGHT REAR
REAR COMPART-MENT LAMP
E10
E3
C200D
C200C
.5 GRY 157
TO REARVIEW MIRROR PAGE 8A-114-1
S265
.5 WHT 156
REAR DOME LIGHT SWITCH
HATCH OPEN
(NOT USED)
D C1
F C2
.35 WHT S262 .5 WHT E1 .5 WHT
S316
C200C C200D
I/P DIMMER SWITCH
ON
SEE INTERIOR LIGHTS PAGE 8A-114-1
IGNITION ON INPUT
8.5V
SOLID STATE LOGIC
PROGRAM INPUT
HATCH RELEASE OUTPUT LOW
RELAY #3
HATCH RELEASE
HATCH RELEASE SWITCH
.5 BLK 650
S216
.5 BLK 1550
3 BLK 650
SEE GROUND DISTRIBUTION PAGE 8A-14-8
3 BLK 750
G200
.35 BLK/WHT 1455
C240
DATA LINK CONNECTOR (DLC)
.5 BLK 1576
E13
S244
HATCH RELEASE RELAY
HATCH RELEASE ACTUATOR
A1
A2
.5 BLK/WHT 56
ECB
M
.5 BLK 1550
S470
.8 BLK 1550
G400
.8 ORN/BLK 434 (AUTOMATIC)
.35 TAN/WHT 33 (MANUAL)
GROUND PATH THROUGH TRANSMISSION POSITION SWITCH OR PARK BRAKE SWITCH PAGE 8A-135-0
SEE GROUND DISTRIBUTION PAGES 8A-14-12, 13

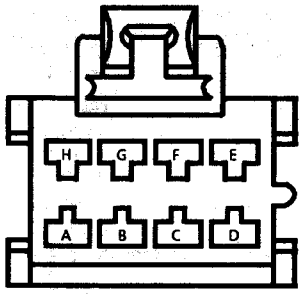
KEYLESS ENTRY: AU0



12064766

8-WAY F METRI-PACK 150 SERIES
BLU

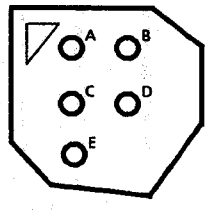
KEYLESS ENTRY RECEIVER (C1)



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	201-PG	FIG.	CONN
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

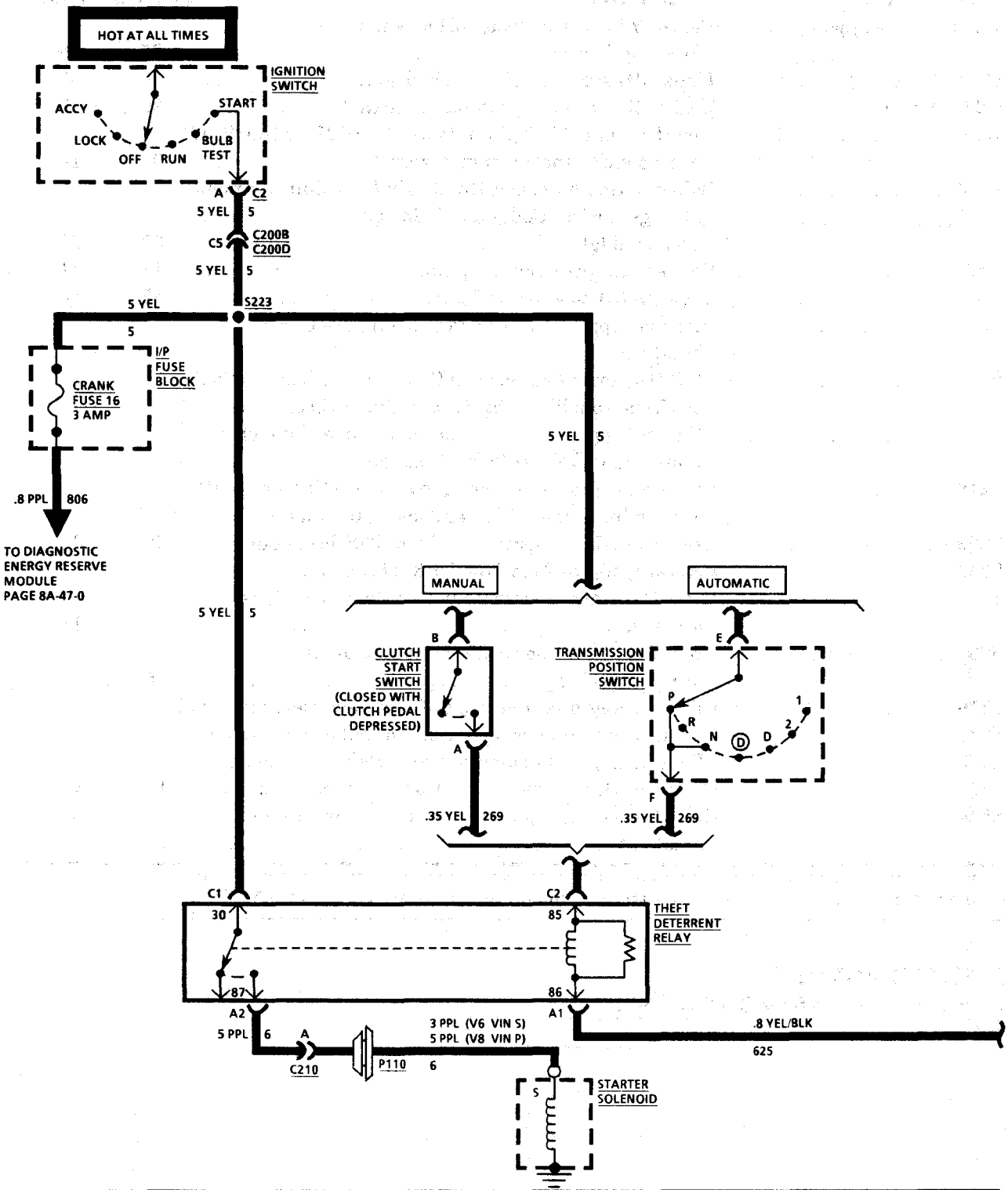
COMPONENT	LOCATION	201-PG	FIG.	CONN
C200D (48 cavities)	Part of I/P Harn, between LH kick panel and Steering Column	25	49	202-2
C240 (6 cavities)	Under RH side of I/P, behind kick panel	20	37	202-19
C285 (1 cavity)	Under RH side of I/P, behind kick panel	20	37	
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S210	I/P Harn, approx 44 cm from Convenience Center (Pont) or 12 cm from RR Defog Switch (Chevy) breakouts			
S211	I/P Harn, approx 4 cm from antenna cable (Chevy) or Convenience Center (Pont) breakouts			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S244	I/P Harn, approx 7 cm from DERM breakout			
S262	Cross Car Harn, approx 9 cm from Rearview Mirror breakout	45	84	
S265	Cross Car Harn, approx 20 cm from Rearview Mirror breakout	45	84	
S316	I/P Harn, approx at rear edge of door below left sail panel			
S317	I/P Harn, approx at rear edge of door below left sail panel			
S470	I/P Harn, approx 24 cm from Hatch Release Actuator			
S500	Cross Car Harn, approx 6 cm from Speaker breakout	17	31	
S504	Cross Car Harn, approx 11 cm from Power Mirror breakout	17	31	

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

SYSTEM DIAGNOSIS

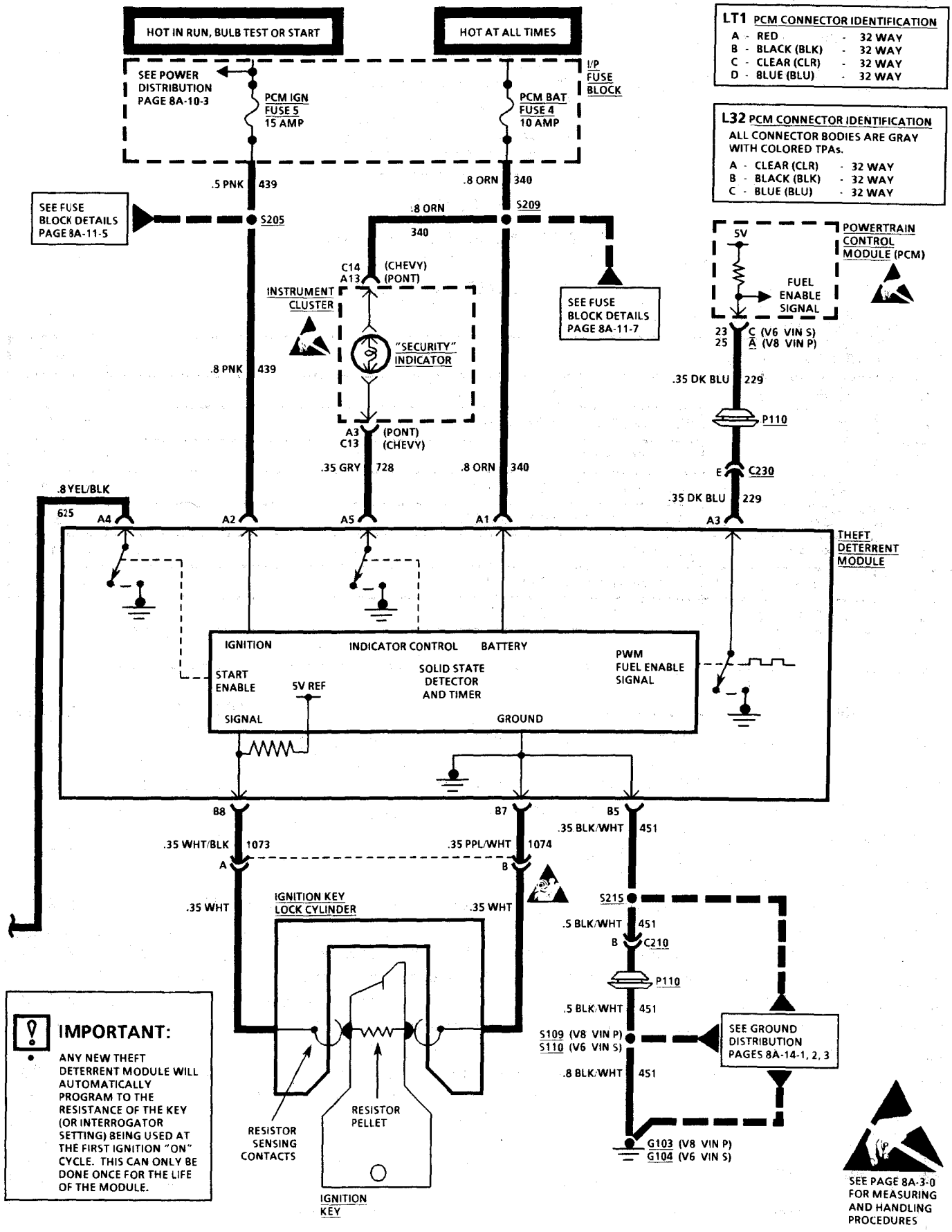
- For Diagnosis, refer to SECTION 9K.

THEFT DETERRENT SYSTEM: PASS-Key®II
(PERSONALIZED AUTOMOTIVE SECURITY SYSTEM)



SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

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.



LT1 PCM CONNECTOR IDENTIFICATION

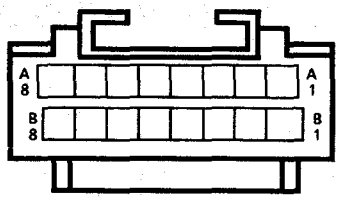
A - RED	-	32 WAY
B - BLACK (BLK)	-	32 WAY
C - CLEAR (CLR)	-	32 WAY
D - BLUE (BLU)	-	32 WAY

L32 PCM CONNECTOR IDENTIFICATION

ALL CONNECTOR BODIES ARE GRAY WITH COLORED TPAs.

A - CLEAR (CLR)	-	32 WAY
B - BLACK (BLK)	-	32 WAY
C - BLUE (BLU)	-	32 WAY

THEFT DETERRENT SYSTEM: PASS-Key®II
(PERSONALIZED AUTOMOTIVE SECURITY SYSTEM)



12110259

16-WAY F MICRO-PACK 100 SERIES
GRN

THEFT DETERRENT MODULE

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	ORN	340	POWER FEED FROM PCM BAT FUSE #4	8A-11-7
A2	PNK	439	POWER FEED FROM PCM IGN FUSE #5	8A-11-5
A3	DK BLU	229	FUEL ENABLE SIGNAL	8A-133-1
A4	YEL/BLK	625	THEFT DETERRENT RELAY CONTROL	8A-133-0, 1
A5	GRY	728	"SECURITY" INDICATOR LAMP CONTROL	8A-133-1
B5	BLK/WHT	451	GROUND	8A-14-1, 2, 3
B7	PPL/WHT	1074	IGNITION KEY RESISTOR RETURN	8A-133-1
B8	WHT/BLK	1073	IGNITION KEY RESISTOR FEED	8A-133-1

COMPONENT	LOCATION	201-PG	FIG.	CONN
Clutch Start Switch	Mounted to clutch pedal bracket, behind Convenience Center	0	1	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Ignition Key Lock Cylinder	Top RH side of Steering Column	3, 34	5, 63	
Ignition Switch	Part of Steering Column	34	63	202-23
Instrument Cluster	LH side of I/P			202-23
Powertrain Control Module (PCM) (V6 VIN S)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-25
Powertrain Control Module (PCM) (V8 VIN P)	In Engine Compartment, rearward of RH Shock Tower	19	35	202-26
Starter Solenoid	Bottom of RH side of Engine, above Starter Motor	28, 40	54, 72	
Theft Deterrent Module	In I/P, just right of Radio, attached to Air Bag Bracket	8	15	202-18
Theft Deterrent Relay	Mounted to right side of SIR Bracket, behind I/P	22	41	202-27
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28

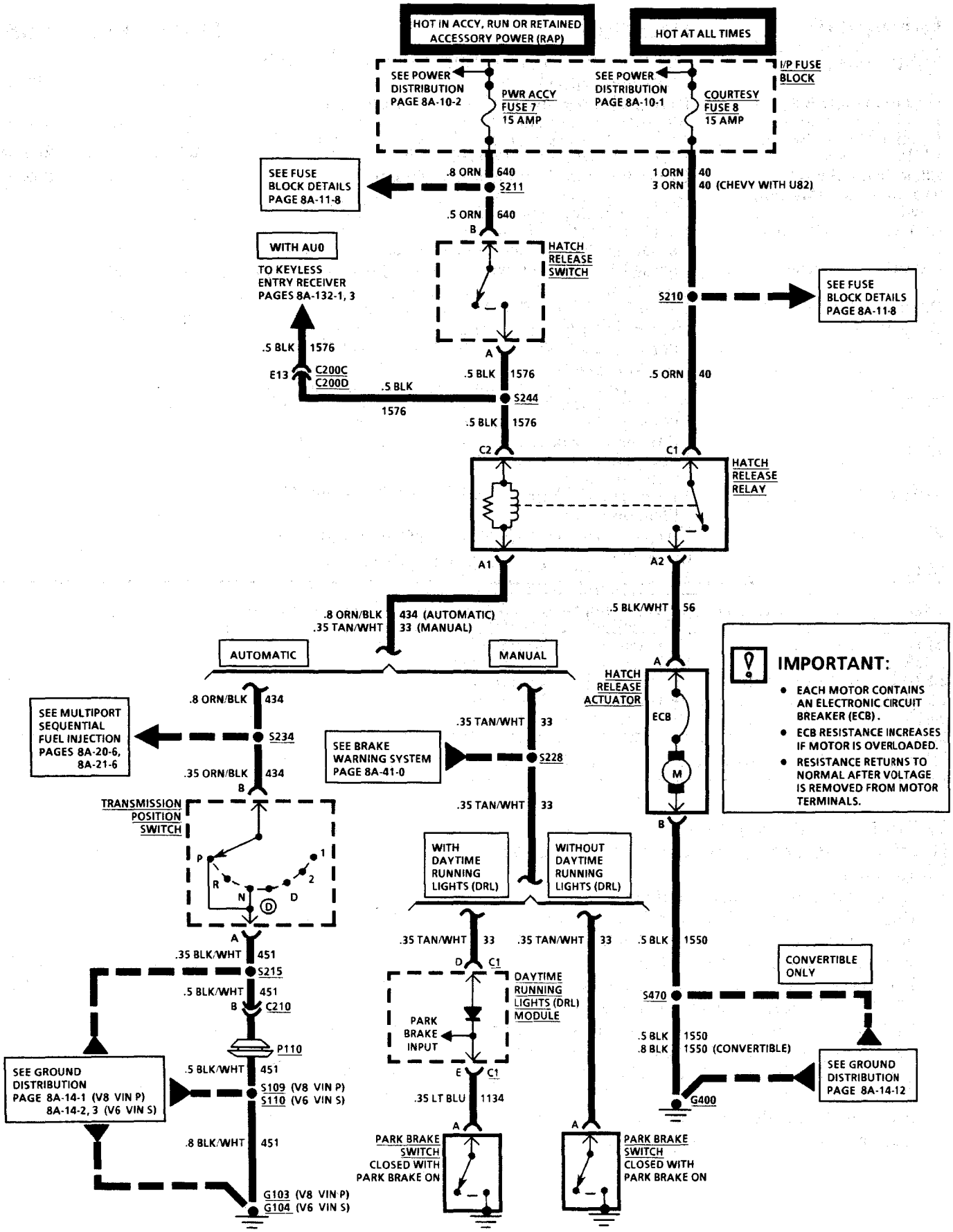
COMPONENT	LOCATION	201-PG	FIG.	CONN
C200B (18 cavities)	Part of Forward Lamp Harn, between LH kick panel and Steering Column	25	49	202-2
C200D (48 cavities)	Part of I/P Harn, between LH kick panel and Steering Column	25	49	202-2
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
C230 (10 cavities)	Under RH side of I/P, behind kick panel	20	37	202-7
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor 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 11 cm before DLC breakout			

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

SYSTEM DIAGNOSIS

- For Diagnosis refer to SECTION 9D.

HATCH RELEASE (A90)



COMPONENT	LOCATION	201-PG	FIG.	CONN
Daytime Running Lights (DRL) Module	Mounted behind Radio and HVAC Controls, left of I/P Compartment	7	12	202-20
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 Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Park Brake Switch	In console, at base of Park Brake Lever	43	81	
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
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
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
G103 (LT1)	RH side of Engine Block, just above Starter (2 rings, 2 wires)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
G400	Bolted to Hatch Release Bracket in Rear Compartment (2 rings, 3 wires Coupe) or (2 rings, 2 wires Convertible)	30	57	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S210	I/P Harn, approx 44 cm from Convenience Center (Pont) or 12 cm from RR Defog Switch (Chevy) breakouts			
S211	I/P Harn, approx 4 cm from antenna cable (Chevy) or Convenience Center (Pont) breakouts			
S215	I/P Harn, approx 30 cm before DLC breakout			
S228	I/P Harn, approx 15 cm before DLC breakout			
S234 (Automatic)	I/P Harn, approx 4 cm from G201 breakout			
S244	I/P Harn, approx 7 cm from DERM breakout			
S470	I/P Harn, approx 24 cm from Hatch Release Actuator			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check that G400 is clean and tight.
2. Check PWR ACCY Fuse and Courtesy Fuse for open. If either fuse is open, check for short to ground through CKTs 640 and/or 40.
3. For vehicles with Manual Transmissions, the "BRAKE" Indicator receives a ground through the Park Brake Switch. Applying the Park Brake and observing the "BRAKE" Indicator can be used as a quick check of the ground CKT below S228.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

HATCH RELEASE (A90)

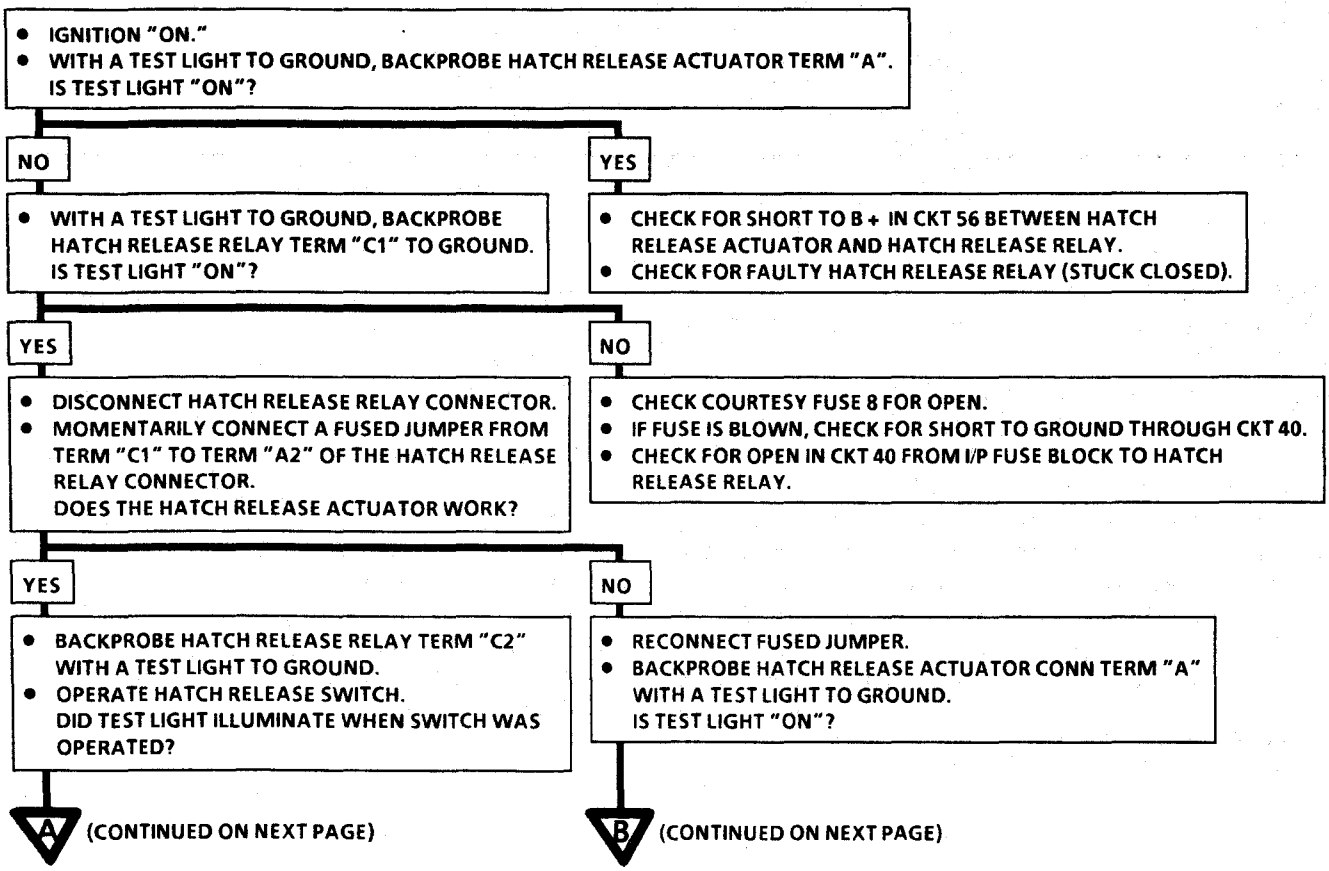
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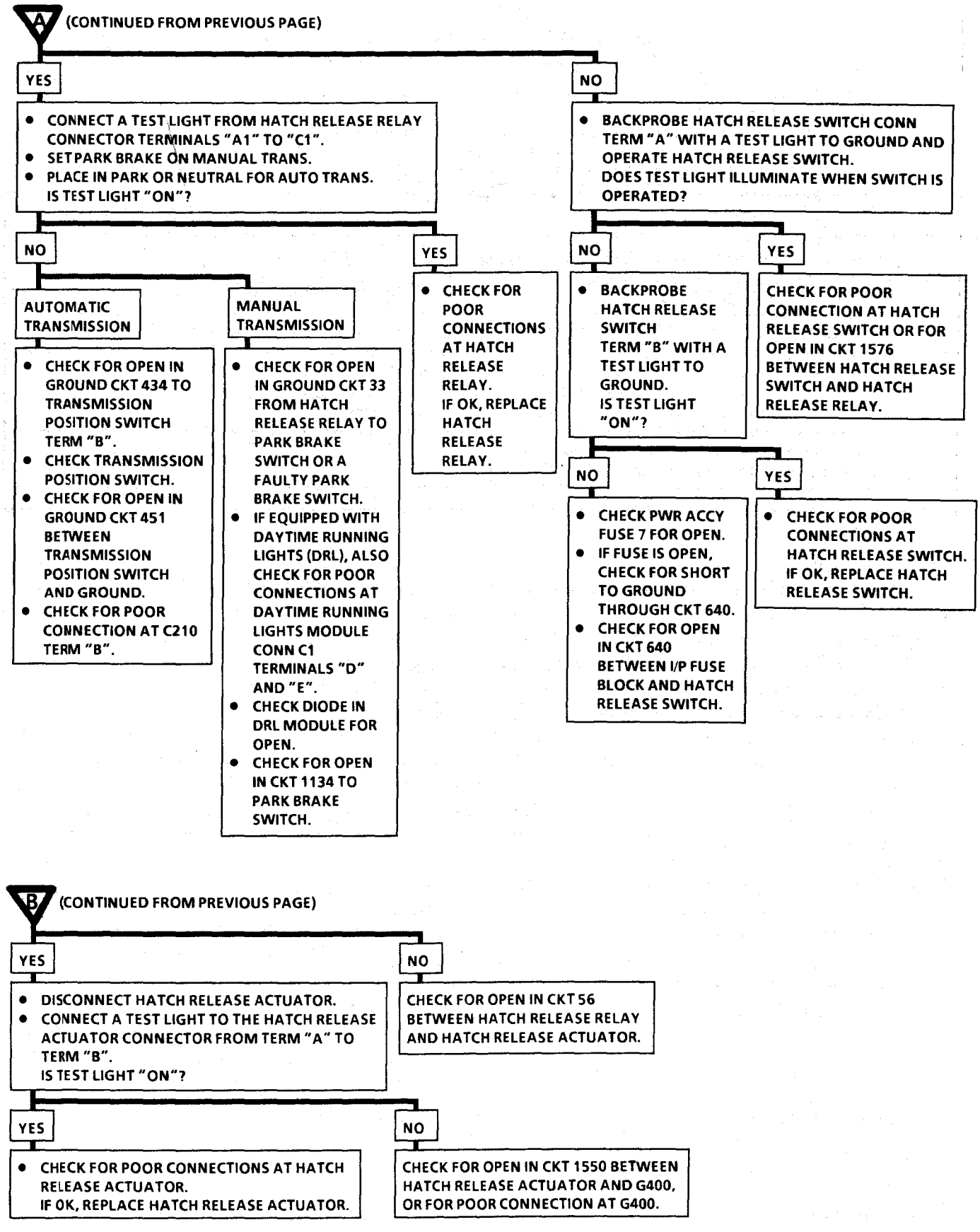
- For a better understanding of the Retained Accessory Power (RAP) operation, refer to Circuit Operation at the end of this section.

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Hatch does not release when operating the Hatch Release Switch.	Chart #1	8A-135-2
Hatch releases immediately at Ignition "ON" (in Park or Neutral for Automatic Transmission or with Park Brake "ON" for Manual Transmission).	• Check for short to B + on CKT 1576 between Hatch Release Switch and Hatch Release Relay. • Check for faulty Hatch Release Switch (stuck closed). • If equipped with Keyless Entry, also refer to SECTION 8A-132.	
Hatch Release operates from Keyless Entry and does not operate from Hatch Release Switch.	Chart #2	8A-135-4

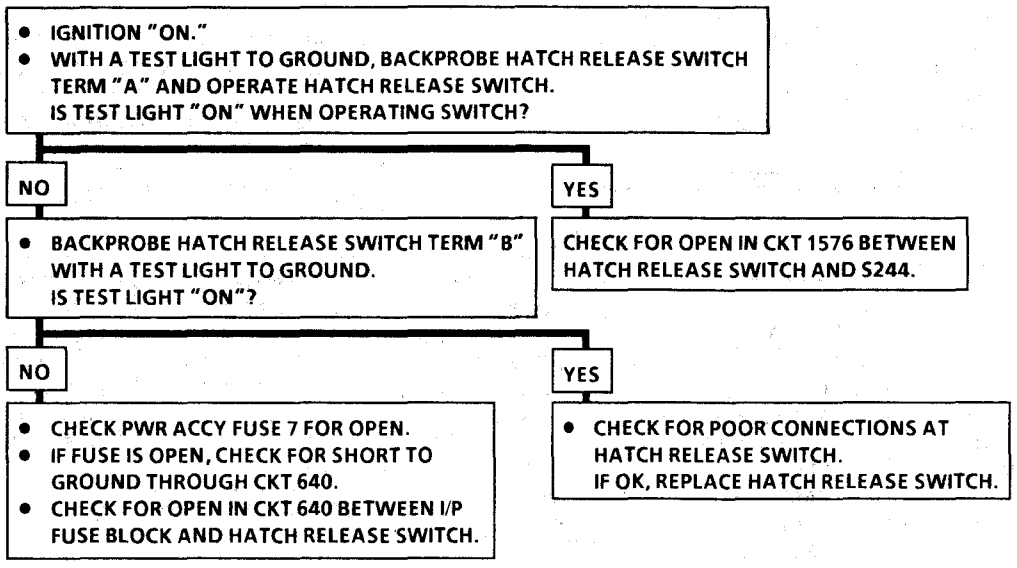
CHART #1
HATCH DOES NOT RELEASE WHEN OPERATING THE HATCH RELEASE SWITCH




A
(CONTINUED FROM PREVIOUS PAGE)
YES
NO
• CONNECT A TEST LIGHT FROM HATCH RELEASE RELAY CONNECTOR TERMINALS "A1" TO "C1".
• SET PARK BRAKE ON MANUAL TRANS.
• PLACE IN PARK OR NEUTRAL FOR AUTO TRANS.
IS TEST LIGHT "ON"?
• BACKPROBE HATCH RELEASE SWITCH CONN TERM "A" WITH A TEST LIGHT TO GROUND AND OPERATE HATCH RELEASE SWITCH.
DOES TEST LIGHT ILLUMINATE WHEN SWITCH IS OPERATED?
NO
YES
NO
YES
AUTOMATIC TRANSMISSION
MANUAL TRANSMISSION
• CHECK FOR POOR CONNECTIONS AT HATCH RELEASE RELAY.
IF OK, REPLACE HATCH RELEASE RELAY.
• BACKPROBE HATCH RELEASE SWITCH TERM "B" WITH A TEST LIGHT TO GROUND.
IS TEST LIGHT "ON"?
CHECK FOR POOR CONNECTION AT HATCH RELEASE SWITCH OR FOR OPEN IN CKT 1576 BETWEEN HATCH RELEASE SWITCH AND HATCH RELEASE RELAY.
• CHECK FOR OPEN IN GROUND CKT 434 TO TRANSMISSION POSITION SWITCH TERM "B".
• CHECK TRANSMISSION POSITION SWITCH.
• CHECK FOR OPEN IN GROUND CKT 451 BETWEEN TRANSMISSION POSITION SWITCH AND GROUND.
• CHECK FOR POOR CONNECTION AT C210 TERM "B".
• CHECK FOR OPEN IN GROUND CKT 33 FROM HATCH RELEASE RELAY TO PARK BRAKE SWITCH OR A FAULTY PARK BRAKE SWITCH.
• IF EQUIPPED WITH DAYTIME RUNNING LIGHTS (DRL), ALSO CHECK FOR POOR CONNECTIONS AT DAYTIME RUNNING LIGHTS MODULE CONN C1 TERMINALS "D" AND "E".
• CHECK DIODE IN DRL MODULE FOR OPEN.
• CHECK FOR OPEN IN CKT 1134 TO PARK BRAKE SWITCH.
NO
YES
• CHECK PWR ACCY FUSE 7 FOR OPEN.
• IF FUSE IS OPEN, CHECK FOR SHORT TO GROUND THROUGH CKT 640.
• CHECK FOR OPEN IN CKT 640 BETWEEN I/P FUSE BLOCK AND HATCH RELEASE SWITCH.
• CHECK FOR POOR CONNECTIONS AT HATCH RELEASE SWITCH.
IF OK, REPLACE HATCH RELEASE SWITCH.
B
(CONTINUED FROM PREVIOUS PAGE)
YES
NO
• DISCONNECT HATCH RELEASE ACTUATOR.
• CONNECT A TEST LIGHT TO THE HATCH RELEASE ACTUATOR CONNECTOR FROM TERM "A" TO TERM "B".
IS TEST LIGHT "ON"?
CHECK FOR OPEN IN CKT 56 BETWEEN HATCH RELEASE RELAY AND HATCH RELEASE ACTUATOR.
YES
NO
• CHECK FOR POOR CONNECTIONS AT HATCH RELEASE ACTUATOR.
IF OK, REPLACE HATCH RELEASE ACTUATOR.
CHECK FOR OPEN IN CKT 1550 BETWEEN HATCH RELEASE ACTUATOR AND G400, OR FOR POOR CONNECTION AT G400.

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.

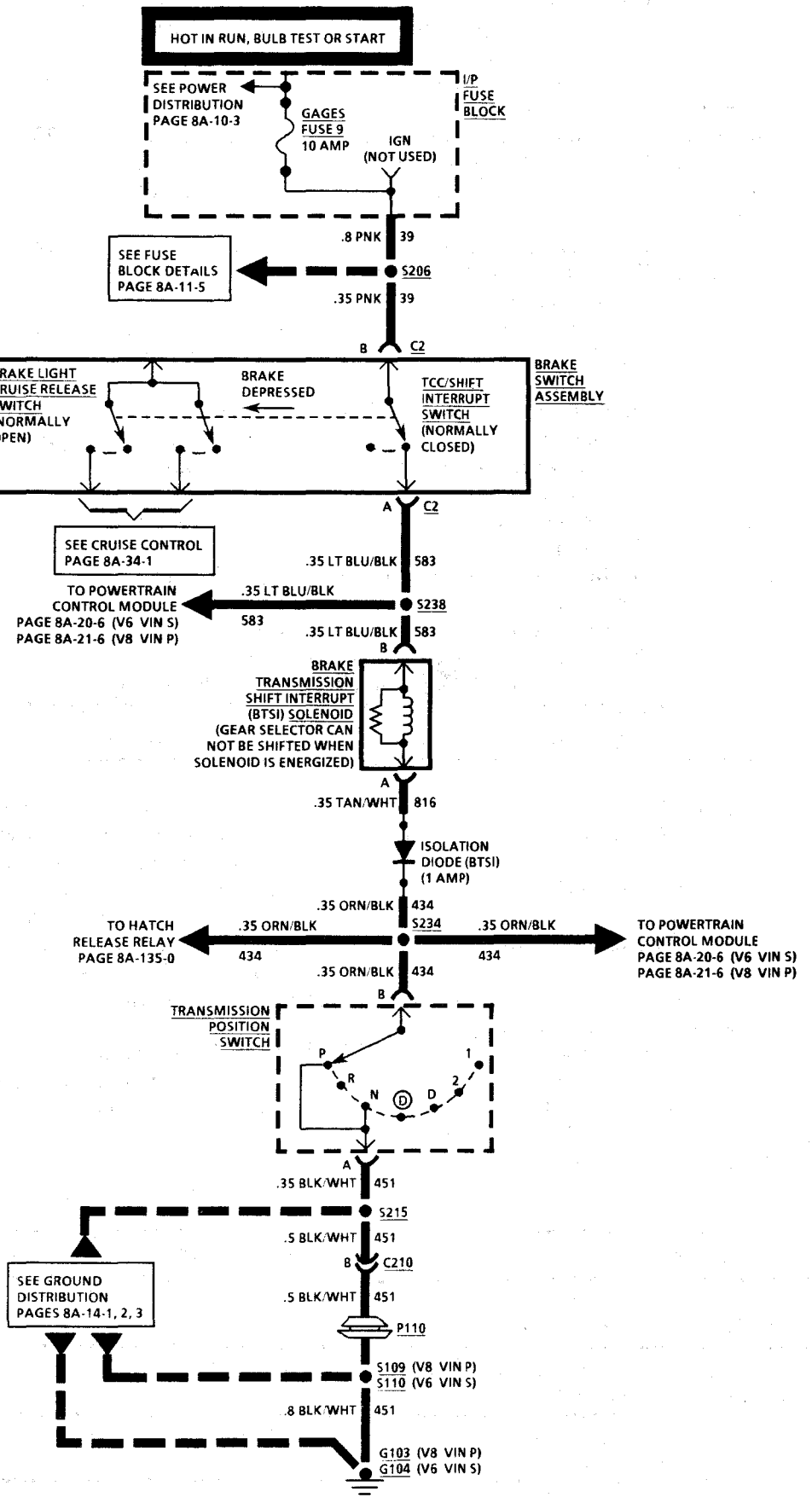
Battery voltage is applied at all times to the normally open contacts of the Hatch Release Relay from Courtesy Fuse 8.

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.

BLANK

BRAKE TRANSMISSION SHIFT INTERLOCK (AUTOMATIC TRANSMISSION)



COMPONENT	LOCATION	201-PG	FIG.	CONN
Brake Switch Assembly	Mounted in lower hole of brake pedal bracket (2 conn with Automatic), (1 conn with Manual) same switch for both	0	1	
Brake Transmission Shift Interrupt (BTSI) Solenoid	In console, under PRNDL Display	22	42	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Isolation Diode (BTSI)	Sealed in Harn, approx 6 cm from DERM breakout			
Transmission Position Switch	Under console, on base of shift control lever	22	42	202-28
C210 (4 cavities)	Under RH side of I/P, behind RH kick panel	20	37	202-19
G103 (LT1)	RH side of Engine Block, just above Starter (1 ring, 1 wire)	40	72	
G104 (L32)	2 studs, 2 rings on each, interchangeable. Top RH side of Engine, 1 stud in head, 1 stud in Intake Manifold	29	56	
P110	Right side in dash panel, Engine to Passenger Compartment	19	35	
S109 (LT1)	Engine Harn, approx 4 cm from main branch and PCM breakout			
S110 (L32)	Engine Harn, approx 7 cm from RH Oxygen Sensor breakout			
S206	I/P Harn, approx 18 cm from Convenience Center breakout			
S215	I/P Harn, approx 30 cm before DLC breakout			
S234 (Automatic)	I/P Harn, approx 4 cm from G201 breakout			
S238 (Automatic)	I/P Harn, approx 7 cm from Center Console breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. If Gages Fuse #9 is open, refer to Chart #3 in this section.
2. Check Brake Switch Assembly for proper adjustment.
3. If Transmission Shifter does not shift out of "PARK," check linkage and cable for binding.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedures.

SYMPTOM	PROCEDURE	PAGE NUMBER
Transmission does not shift out of "PARK" with brake pedal depressed and Ignition Switch in "RUN."	Chart #1	8A-138-2
Transmission shifts out of "PARK" with Ignition Switch in "RUN" and brake pedal not depressed.	Chart #2	8A-138-2
Gages Fuse #9 repeatedly blows whenever Ignition is "ON" or when attempting to depress the brake pedal.	Chart #3	8A-138-3

BRAKE TRANSMISSION SHIFT INTERLOCK (AUTOMATIC TRANSMISSION)

CHART #1

TRANSMISSION DOES NOT SHIFT OUT OF "PARK" WITH BRAKE PEDAL DEPRESSED AND IGNITION SWITCH IN "RUN"

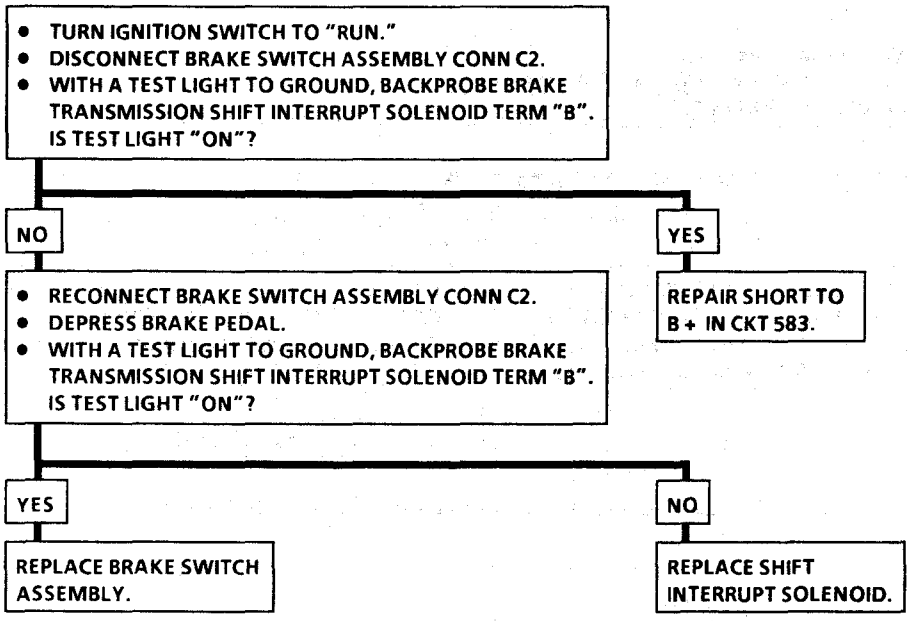


CHART #2

TRANSMISSION SHIFTS OUT OF "PARK" WITH IGNITION SWITCH IN "RUN" AND BRAKE PEDAL NOT DEPRESSED

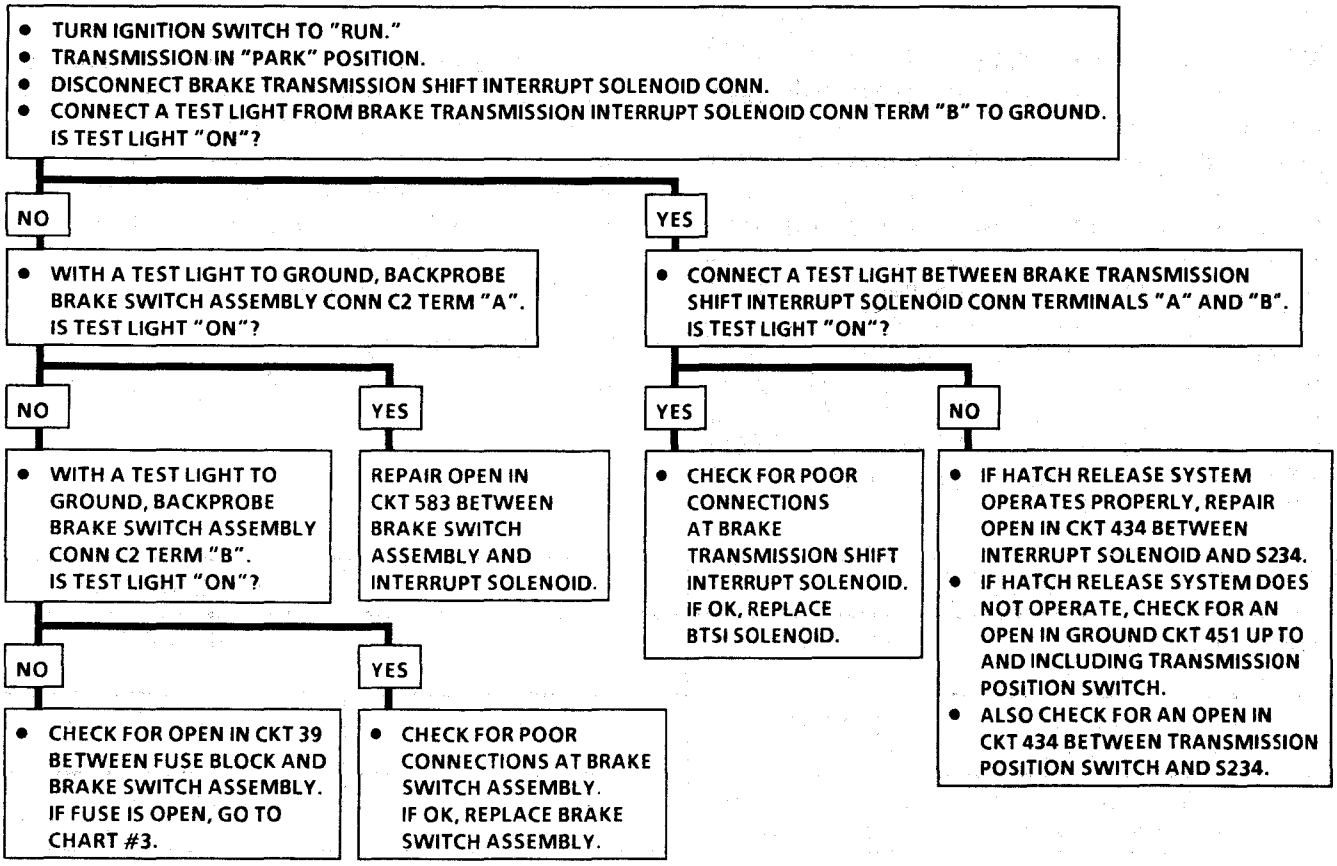
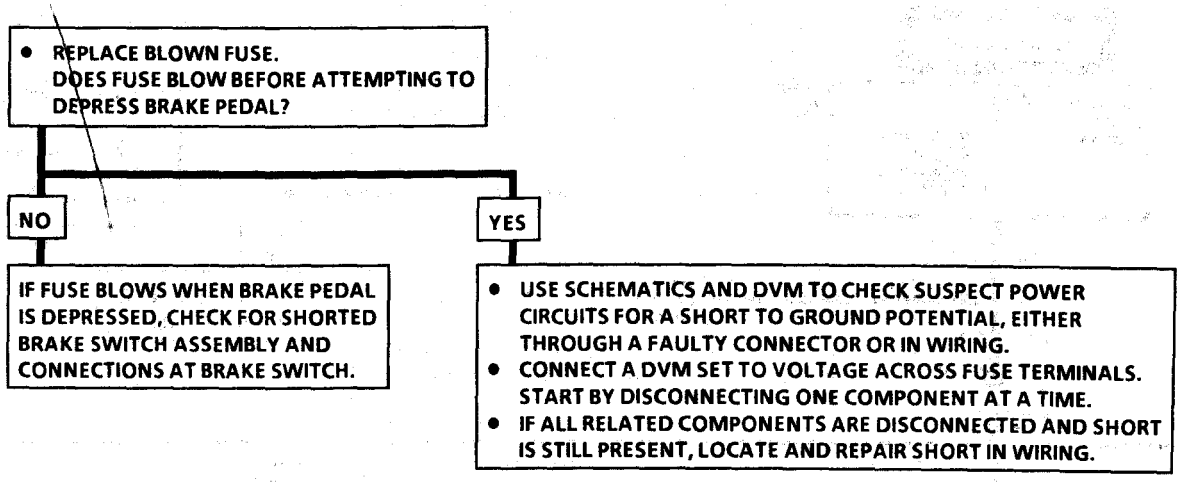


CHART #3
GAGES FUSE #9 REPEATEDLY BLOWS WHENEVER IGNITION IS "ON" OR WHEN ATTEMPTING TO DEPRESS THE BRAKE PEDAL



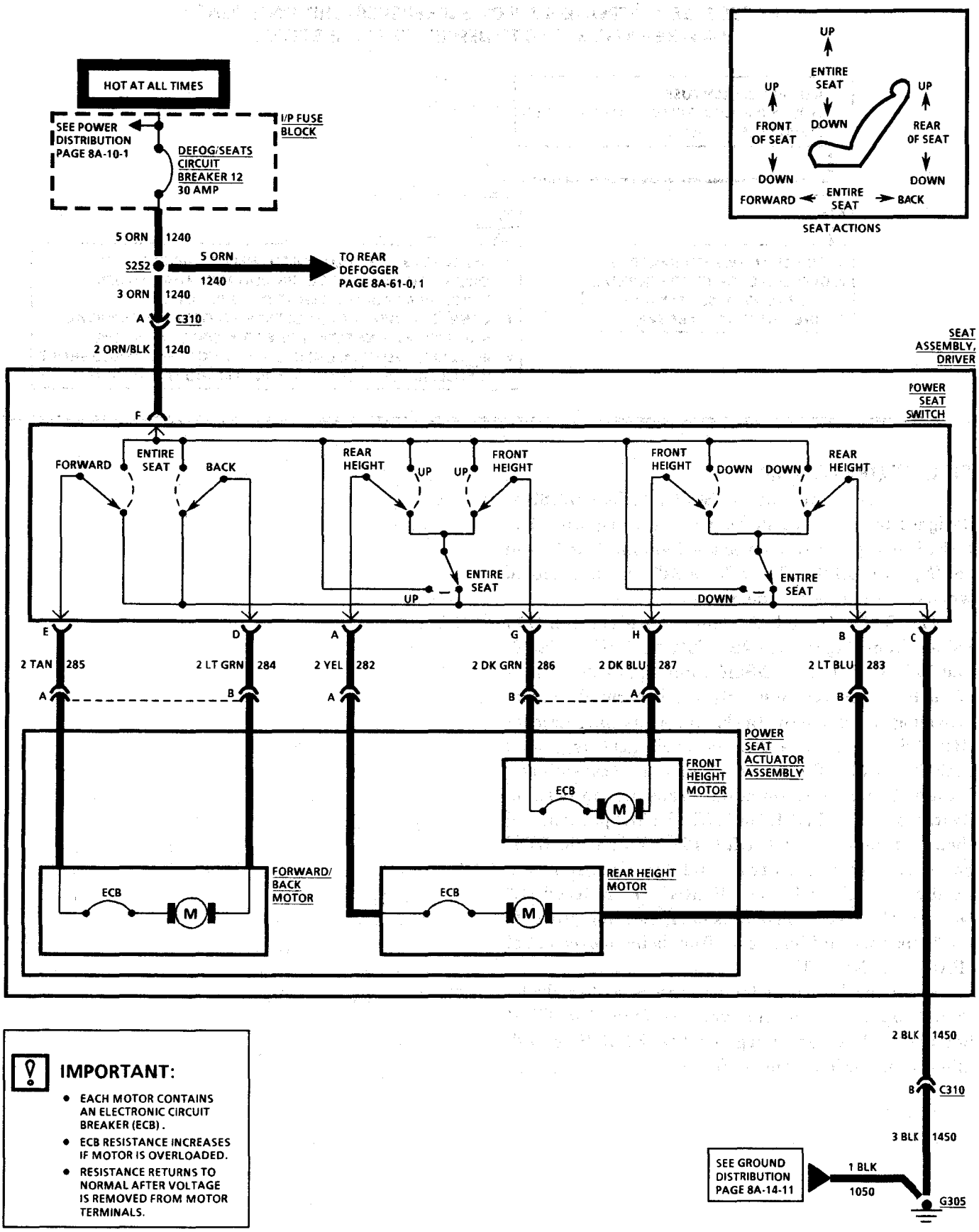
CIRCUIT OPERATION

The Brake Transmission Shift Interlock (BTSI) is designed to interrupt shifting when energized. The BTSI is energized whenever the Ignition Switch is in "RUN," "BULB TEST" or "START" and is disabled when the brake pedal is depressed.

The Brake Switch Assembly receives Ignition voltage from Gages Fuse #9 in "RUN," "BULB TEST" and "START." The TCC/Shift Interrupt Switch is part of the Brake Switch Assembly and is normally closed, providing voltage to the Brake Transmission Interrupt (BTSI) Solenoid. The BTSI Solenoid gets its ground path through CKT 434 then through the Transmission Position Switch only when the Transmission Position Switch is in the "PARK" or "NEUTRAL" position and then to ground through CKT 451. When the BTSI Solenoid receives voltage and the Transmission Position Switch is in the "PARK" or "NEUTRAL" position, the BTSI Solenoid is energized and prevents the Transmission Shift Lever from being moved out of "PARK" or "NEUTRAL."

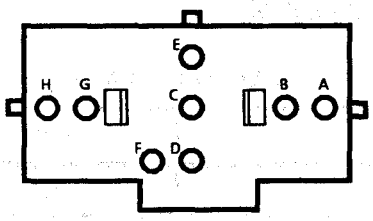
When the brake pedal is depressed, the Brake Switch opens, removing voltage from the BTSI Solenoid. This de-energizes the BTSI Solenoid, allowing operation of the Shift Lever.

POWER SEAT: DRIVER 6-WAY (AC3)



IMPORTANT:

- EACH MOTOR CONTAINS AN ELECTRONIC CIRCUIT BREAKER (ECB).
- ECB RESISTANCE INCREASES IF MOTOR IS OVERLOADED.
- RESISTANCE RETURNS TO NORMAL AFTER VOLTAGE IS REMOVED FROM MOTOR TERMINALS.



12085013

8-WAY F PIN GRIP SERIES
BLK

POWER SEAT SWITCH (AC3)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Forward/Back Motor	Under Driver's Seat	41	76	
Front Height Motor	Under Driver's Seat	41	76	
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Power Seat Actuator Assembly	Under Driver's Seat	41	76	
Power Seat Switch	On left side of Driver's Seat	41	76	202-24
Rear Height Motor	Under Driver's Seat	41	76	
C310 (2 cavities)	Between rear mounting bolt of Driver Seat near #3 Rail	6	11	
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
S252	I/P Harn, approx 17 cm back from HVAC Controls (Pont) or RR Defogger Switch/Timer (Chevy)			

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

TROUBLESHOOTING HINTS
(Perform before beginning System Diagnosis)

1. Check Defog/Seats Circuit Breaker #12 by operating the Rear Defogger.
2. Check that ground G305 is clean and tight.
3. Check for poor connections at Power Seat Switch Connector or Motor Assembly connections.
4. If Defog/Seats Circuit Breaker opens whenever the Power Seat Switch is operated, check for short to ground through CKTs 282, 283, 284, 285, 286 and 287. Disconnecting motors one at a time can be helpful.

- 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

- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

POWER SEAT: DRIVER 6-WAY (AC3)

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
All Power Seat functions inoperative.	Chart #1	8A-140-2
Entire seat will not go "FORWARD" or "BACK," "UP" or "DOWN" functions operate normally.	Chart #2	8A-140-3
Front Height will not go "UP" or "DOWN," "FORWARD" or "BACK" functions operate normally.	Chart #3	8A-140-4
Rear Height will not go "UP" or "DOWN," "FORWARD" or "BACK" functions operate normally.	Chart #4	8A-140-5
Entire seat will not go "UP" or "DOWN," "FORWARD" or "BACK" functions operate normally.	Chart #5	8A-140-6

CHART #1
ALL POWER SEAT FUNCTIONS INOPERATIVE

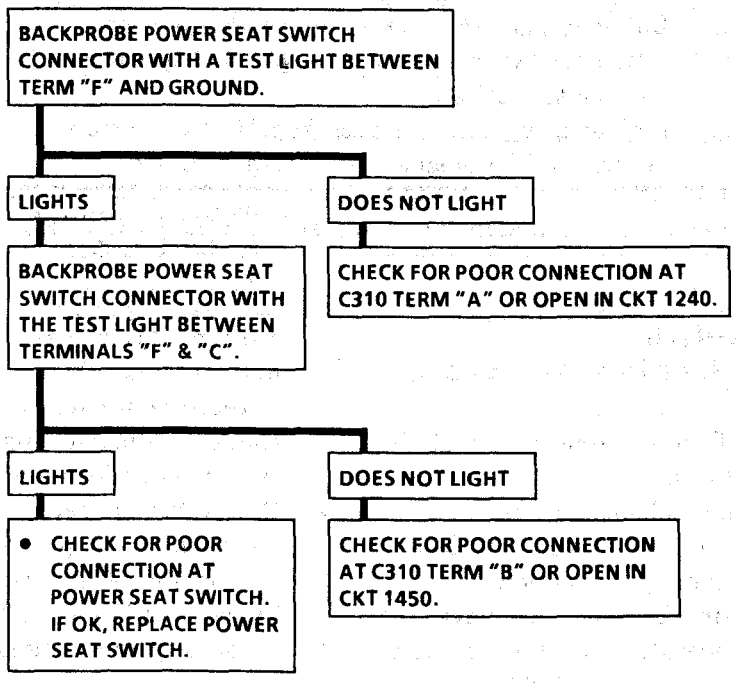
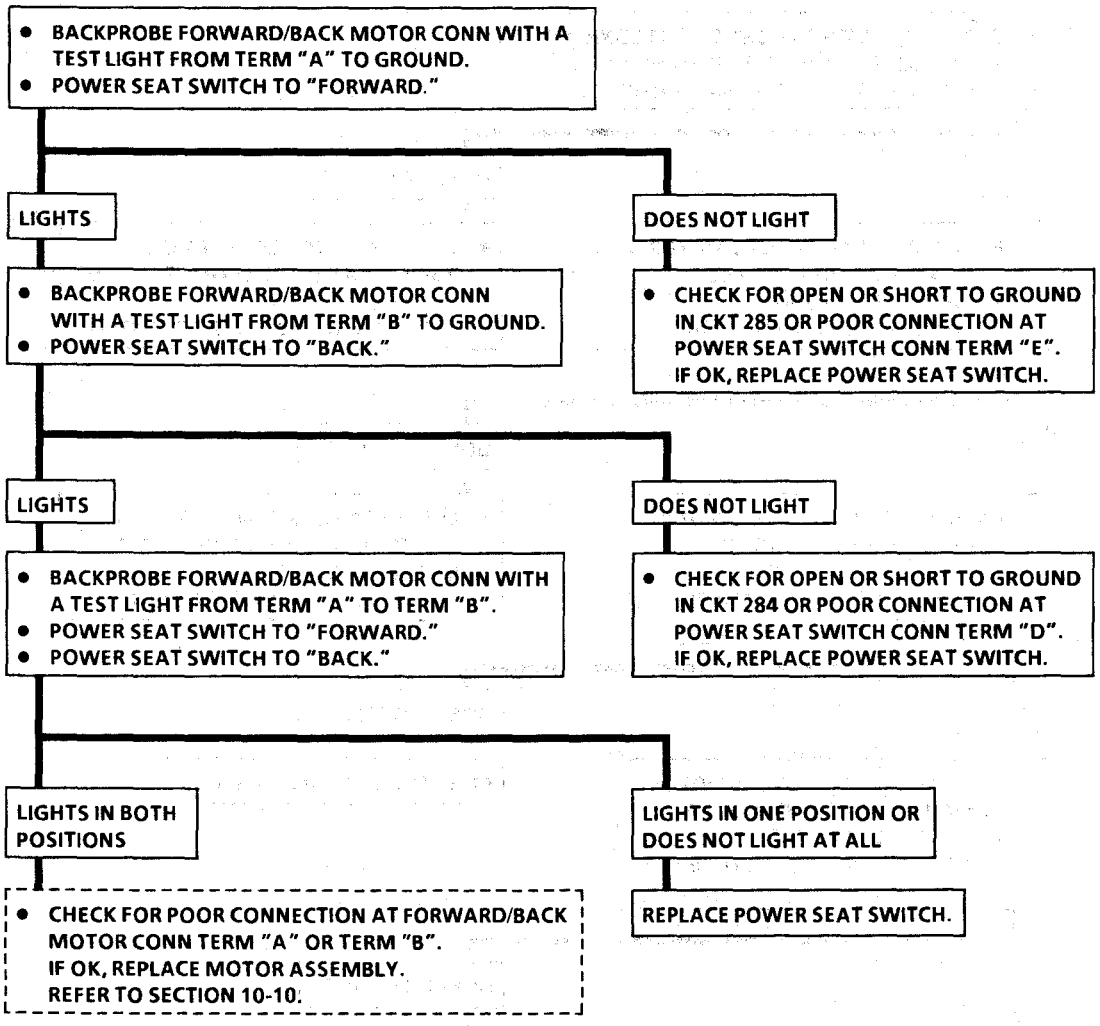


CHART #2
ENTIRE SEAT WILL NOT GO "FORWARD" OR "BACK," "UP" OR "DOWN" FUNCTIONS OPERATE NORMALLY



POWER SEAT: DRIVER 6-WAY (AC3)

CHART #3
FRONT HEIGHT WILL NOT GO "UP" OR "DOWN," "FORWARD" OR "BACK" FUNCTIONS OPERATE NORMALLY

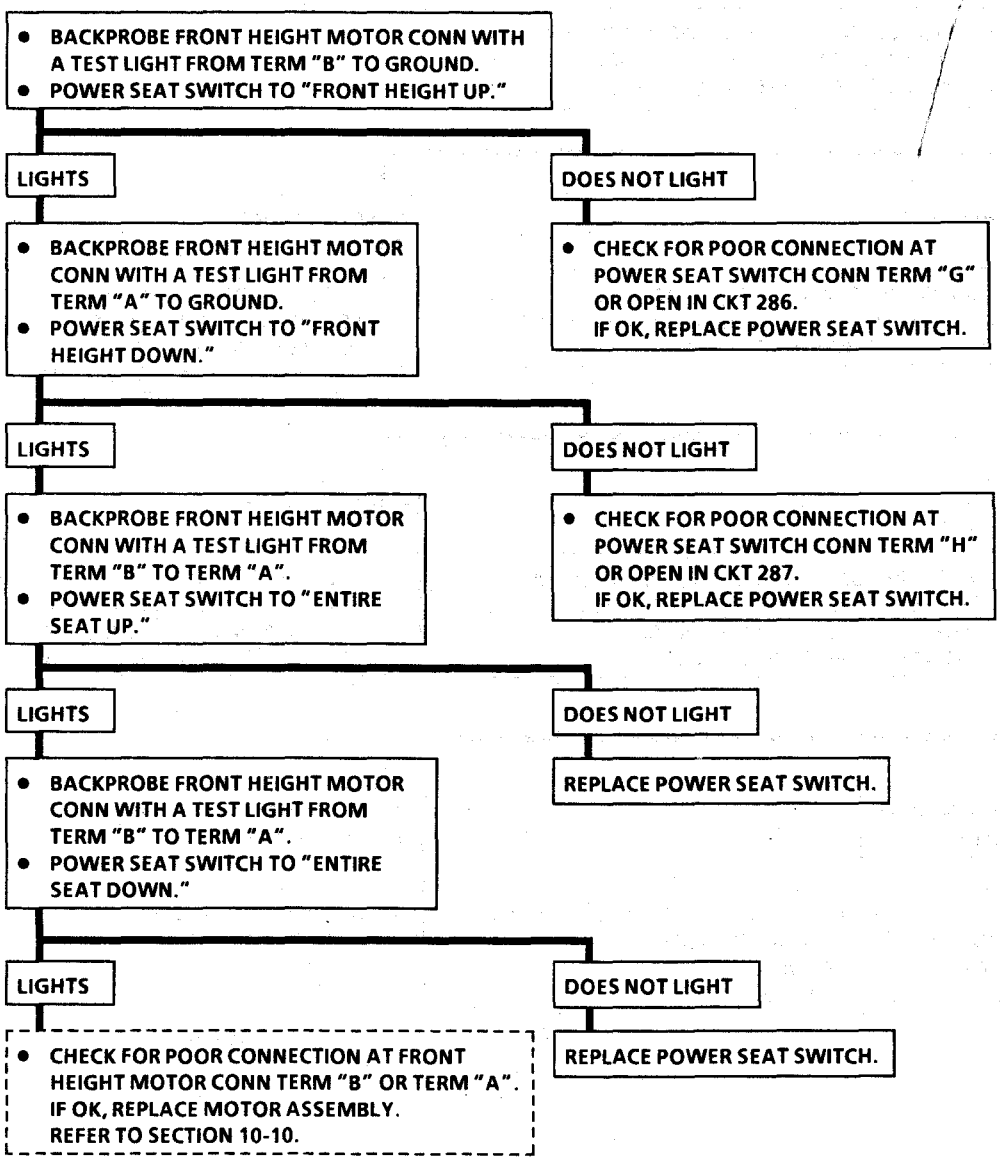
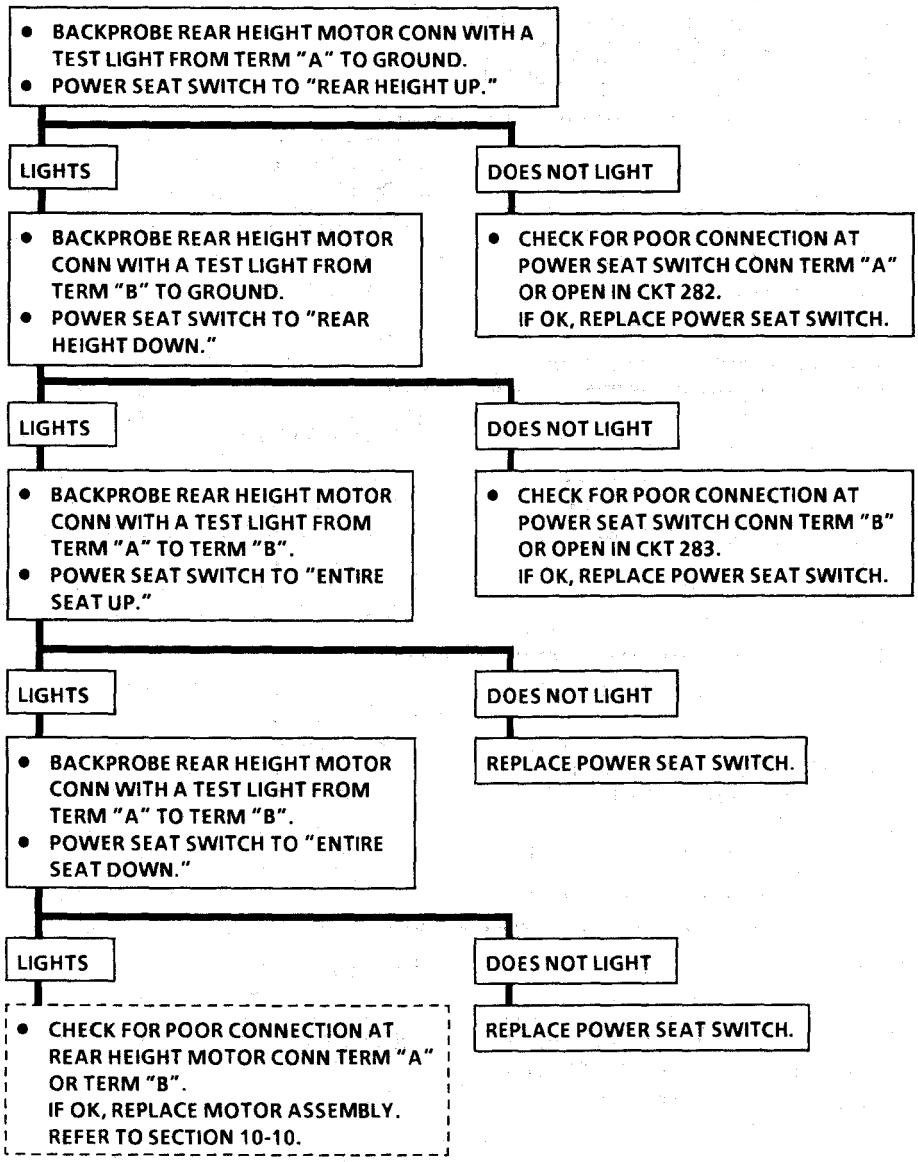
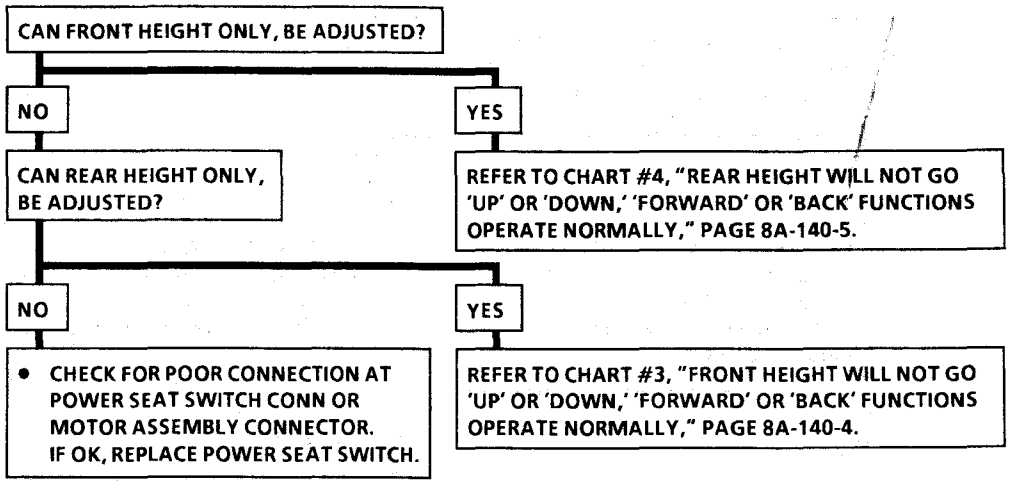


CHART #4
REAR HEIGHT WILL NOT GO "UP" OR "DOWN," "FORWARD" OR "BACK" FUNCTIONS OPERATE NORMALLY



POWER SEAT: DRIVER 6-WAY (AC3)

CHART #5
ENTIRE SEAT WILL NOT GO "UP" OR "DOWN," "FORWARD" OR "BACK" FUNCTIONS OPERATE NORMALLY



CIRCUIT OPERATION

There are three reversible motors that operate the Power Seats. The front and back height of the seat are operated by different motors. They can be raised or lowered independently of each other. When the Entire Seat Switch is pushed to the "UP" or "DOWN" position, both motors run to move the front and back of the seat at the same time.

The Forward/Back Motor is operated by the Entire Seat Switch. When it is held in the "FORWARD" position, battery voltage is applied through the switch contacts and CKT 285 to the Forward/Back Motor. The motor is grounded through CKT 284 and the contact of the Entire Seat Switch to ground G305. The motor runs to drive the seat forward until the switch is released.

In the "BACK" position, CKT 284 receives battery voltage and CKT 285 is grounded. This reversed polarity causes the motor to run in the opposite direction and drive the seat backward.

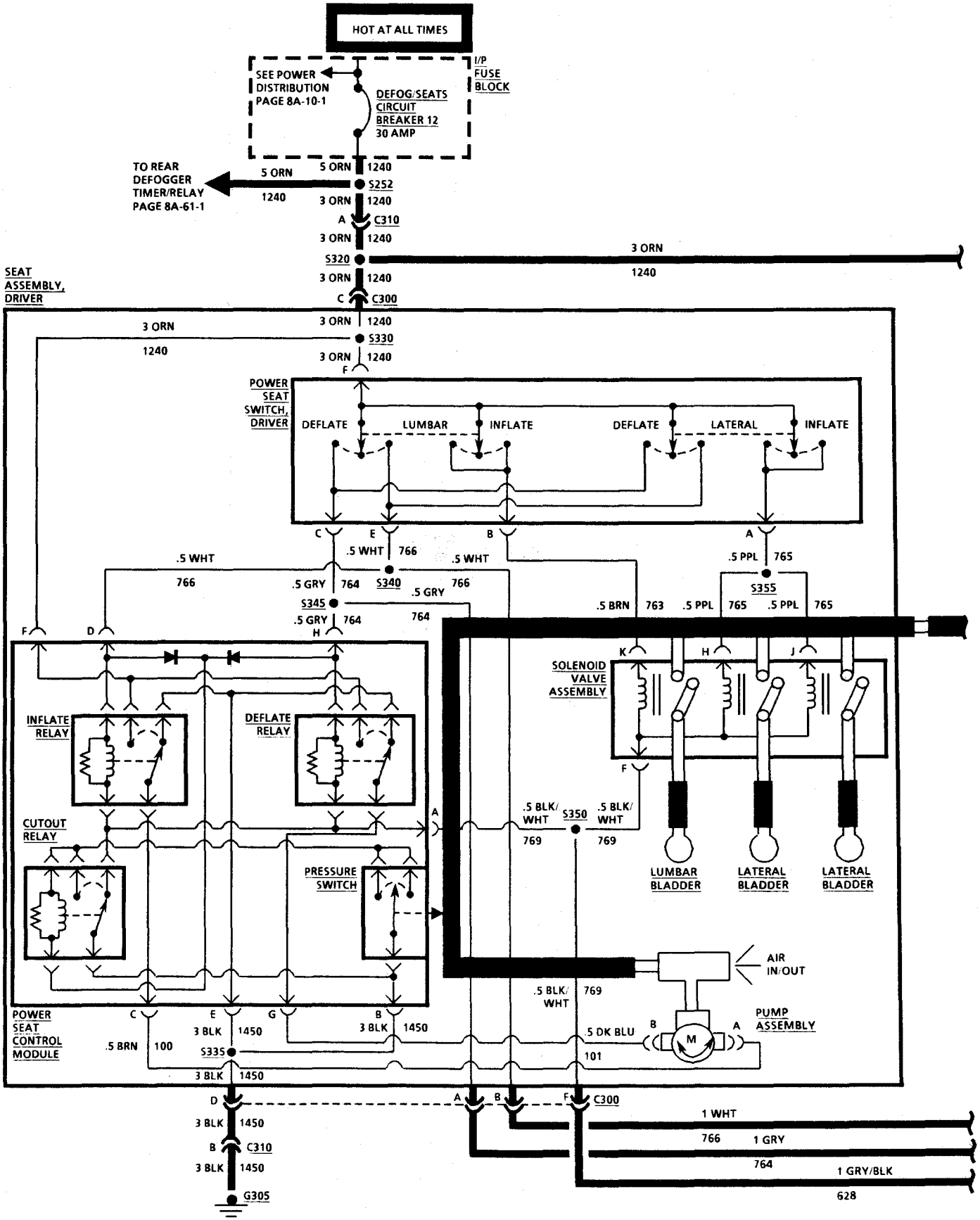
The Front and Rear Motors work in a similar way when the Front or Rear Height Switch is operated.

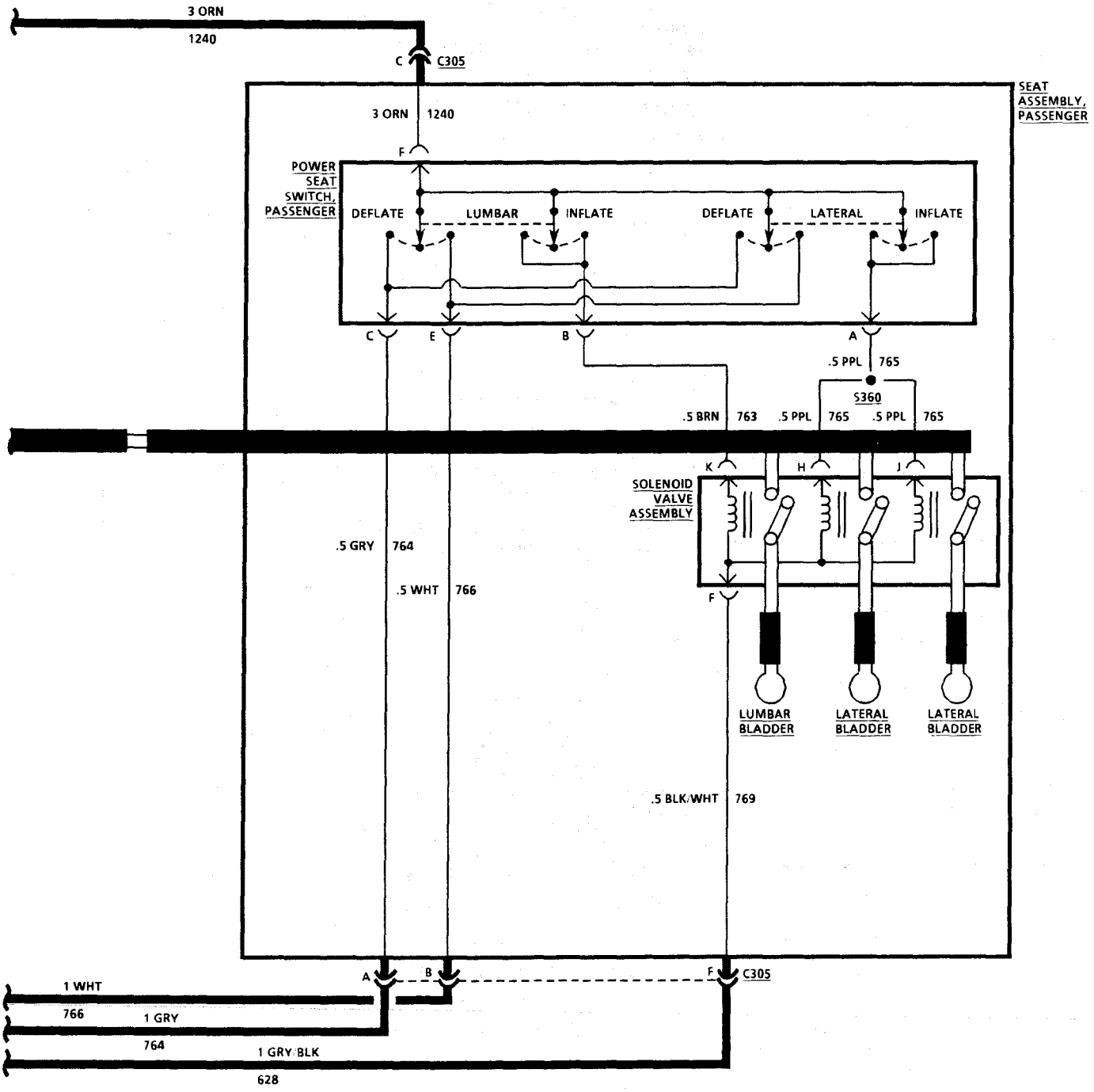
To raise the entire seat, the Entire Seat Switch is held in the "UP" position. This applies battery voltage through CKT 282 and CKT 286 to the Rear Seat and Front Seat Motors. The motors are grounded through CKT 283 and CKT 287 and the Power Seat Switch to G305. Both motors run to drive the entire seat up. A similar action occurs to move the entire seat down.

Each Motor contains an Electronic Circuit Breaker (ECB). ECB resistance increases if motor is overloaded. Resistance returns to normal after voltage is removed from motor terminals.

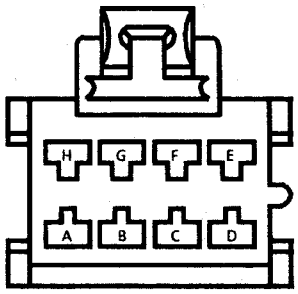
BLANK

POWER SEATS: ULTIMA (AQ9)




3 ORN
1240
C
C305
SEAT ASSEMBLY, PASSENGER
3 ORN
1240
F
POWER SEAT SWITCH, PASSENGER
DEFLATE
LUMBAR
INFLATE
DEFLATE
LATERAL
INFLATE
C
E
B
A
.5 PPL
765
S360
.5 BRN
763
.5 PPL
765
.5 PPL
765
K
H
J
SOLENOID VALVE ASSEMBLY
.5 GRY
764
.5 WHT
766
F
LUMBAR BLADDER
LATERAL BLADDER
LATERAL BLADDER
.5 BLK/WHT
769
A
B
F
C305
1 WHT
766
1 GRY
764
1 GRY/BLK
628

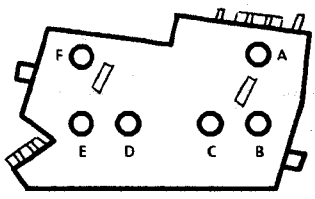
POWER SEATS: ULTIMA (AQ9)



12064998

8-WAY F METRI-PACK 280 SERIES
BLK

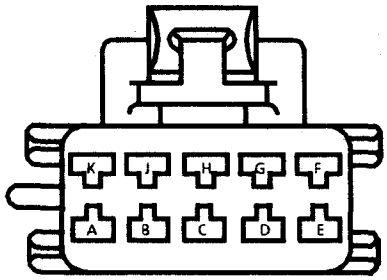
POWER SEAT CONTROL MODULE



12033944

6-WAY F PIN GRIP SERIES
BLK

POWER SEAT SWITCH, DRIVER
POWER SEAT SWITCH, PASSENGER



12064769

10-WAY F METRI-PACK 150 SERIES
NAT

SOLENOID VALVE ASSEMBLY

COMPONENT	LOCATION	201-PG	FIG.	CONN
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Power Seat Control Module	Under Driver's Seat	47	86	202-24
Power Seat Switch, Driver	On left side of Driver's Seat	47	86	202-24
Power Seat Switch, Passenger	On right side of Passenger Seat	47	86	202-24
Pump Assembly	Under Driver's Seat	47	86	
Solenoid Valve Assembly	Under Driver's Seat	46, 47	85, 86	202-27
C300 (6 cavities)	Under Driver Seat Assembly	47	86	202-19
C305 (6 cavities)	Under Passenger Seat Assembly	46	85	202-19
C310 (2 cavities)	Between rear mounting bolt of Driver Seat near #3 Rail	6	11	
G305	Bolted to Floor Pan Bar #2, under Driver's Seat (2 rings, 2 wires, with AC3/AQ9), (1 ring, 1 wire without AC3/AQ9)	6	11	
S252	I/P Harn, approx 17 cm back from HVAC Controls (Pont) or RR Defogger Switch/Timer (Chevy)			
S320	Seat Jumper Harn, near rosebud under Driver Seat			
S330	Driver Seat Harn, approx 22 cm from Power Seat Switch Conn			
S335	Driver Seat Harn, approx 12 cm from Power Seat Control Module Conn			
S340	Driver Seat Harn, approx 19 cm from Power Seat Control Module Conn			
S345	Driver Seat Harn, approx 18 cm from C300			
S350	Driver Seat Harn, approx 11 cm from C300			
S355	Driver Seat Harn, approx 20 cm from Solenoid Valve Assembly Conn			
S360	Passenger Seat Harn, approx 22 cm from Power Seat Switch Conn			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. If both Passenger and Driver Seat Functions (Lumbar and Lateral) are inoperative, check DEFOG/SEATS Circuit Breaker 12 for open.
   - Check that G305 is clean and tight.
   - Check for poor connections at C300.
   - Check for poor connections at C310 terminals "A" and "B".
2. If Passenger Seat is inoperative and Driver's Seat operates normally, check for poor connections at C300 and C305, and for open in Seat Jumper Harness.

- 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

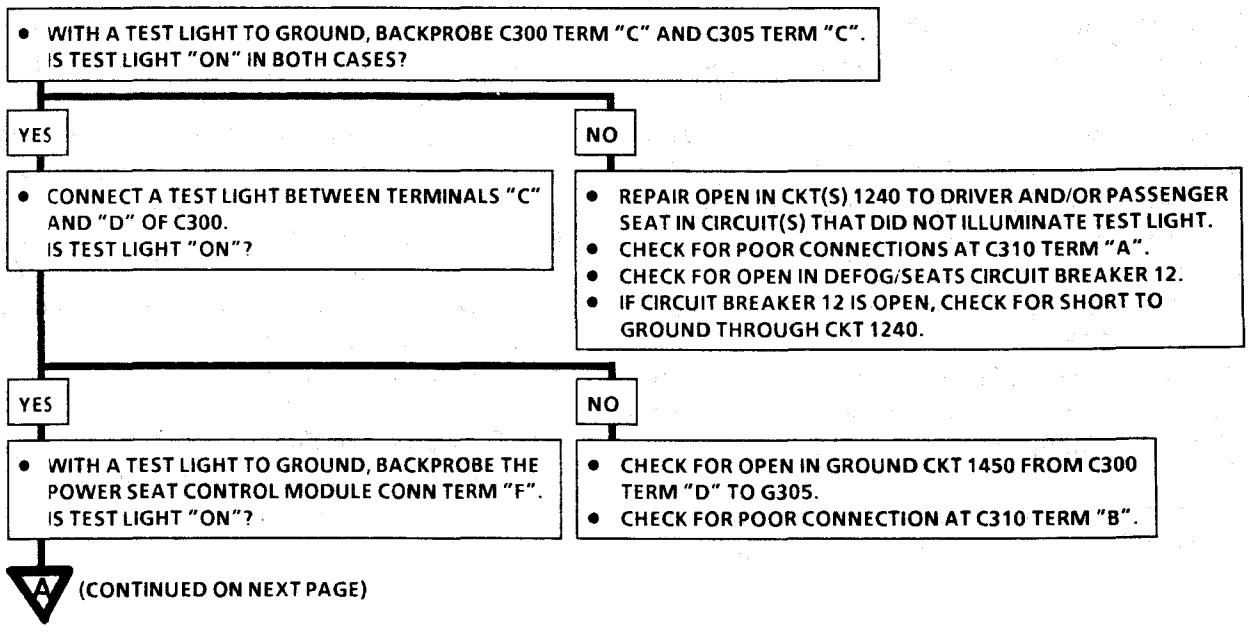
- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

POWER SEATS: ULTIMA (AQ9)

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Important: • Charts #1 through #5 to be used for diagnosis of both Driver and/or Passenger Seat(s).		
Both seats inoperative and pump does not run.	Chart #1	8A-141-4
Lumbar bladder inoperative, but lateral bladders operate normally within the same seat.	Chart #2	8A-141-6
Lateral bladders inoperative, but lumbar bladder operates normally within the same seat.	Chart #3	8A-141-7
Bladder(s) inflate but do not deflate.	Chart #4	8A-141-7
Pump Assembly operates, but bladder(s) do not inflate.	Chart #5	8A-141-8
Passenger Power Seat inoperative, Driver Power Seat operates normally.	Chart #6	8A-141-9
Driver Power Seat inoperative, Passenger Power Seat operates normally.	Chart #7	8A-141-10
One lateral bladder inoperative, and one lateral bladder operates normally within the same seat.	Check for: – Pinched or punctured bladder tubing. – Punctured bladder. – Stuck Solenoid Valve within Solenoid Valve Assembly. – Open in CKT 765 from S355 or S360 to Solenoid Valve Assembly terminal "H" or terminal "J".	

CHART #1
BOTH SEATS INOPERATIVE AND PUMP DOES NOT RUN



A (CONTINUED FROM PREVIOUS PAGE)

YES

- DISCONNECT THE POWER SEAT CONTROL MODULE CONNECTOR.
- CONNECT A TEST LIGHT FROM TERM "F" TO TERM "E" AT THE POWER SEAT CONTROL MODULE CONNECTOR.

IS TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT C300 TERM "C".

IF OK, REPAIR OPEN IN CKT 1240 BETWEEN C300 TERM "C" AND POWER SEAT CONTROL MODULE TERM "F".

YES

- CONNECT A TEST LIGHT FROM TERM "F" TO TERM "B" AT THE POWER SEAT CONTROL MODULE CONNECTOR.

IS TEST LIGHT "ON"?

NO

REPAIR OPEN IN GROUND CKT 1450 BETWEEN POWER SEAT CONTROL MODULE CONN TERM "E" AND C300 TERM "D".

YES

- CHECK THE TERMINALS IN THE POWER SEAT CONTROL MODULE CONNECTOR FOR POOR CONNECTIONS.

WAS THERE ANY TERMINAL(S) CAUSING A POOR CONNECTION?

NO

REPAIR OPEN IN GROUND CKT 1450 BETWEEN POWER SEAT CONTROL MODULE CONN TERM "B" AND C300 TERM "D".

NO

- RECONNECT POWER SEAT CONTROL MODULE.
- DISCONNECT PUMP ASSEMBLY CONNECTOR UNDER DRIVER SEAT.
- CONNECT A TEST LIGHT BETWEEN TERMINALS "A" AND "B" OF THE PUMP ASSEMBLY CONNECTOR.
- WHILE OBSERVING TEST LIGHT, OPERATE THE DRIVER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO THE "INFLATE" POSITION.

DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

REPAIR OR REPLACE TERMINALS AS NECESSARY TO ASSURE GOOD TERMINAL CONTACT.

NO

- RECONNECT PUMP ASSEMBLY CONNECTOR.
- WITH AT EST LIGHT, BACKPROBE TERMINALS "C" AND "G" OF THE POWER SEAT CONTROL MODULE CONNECTOR.
- WHILE OBSERVING TEST LIGHT, OPERATE DRIVER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO THE "INFLATE" AND "DEFLATE" POSITIONS.

DOES TEST LIGHT ILLUMINATE IN BOTH "INFLATE" AND "DEFLATE" POSITIONS WHEN OPERATING SWITCH?

YES

- CHECK FOR POOR CONNECTIONS AT PUMP ASSEMBLY CONNECTOR.

IF OK, REPLACE PUMP.

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT CONTROL MODULE CONNECTOR TERM "D".
- WHILE OBSERVING TEST LIGHT, OPERATE DRIVER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO THE "INFLATE" POSITION.

DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- CHECK FOR OPEN IN CKT 100, OR FOR OPEN IN CKT 101 FROM POWER SEAT CONTROL MODULE TO PUMP ASSEMBLY.

B (CONTINUED ON NEXT PAGE)

POWER SEATS: ULTIMA (AQ9)

CHART #1 (continued)
BOTH SEATS INOPERATIVE AND PUMP DOES NOT RUN

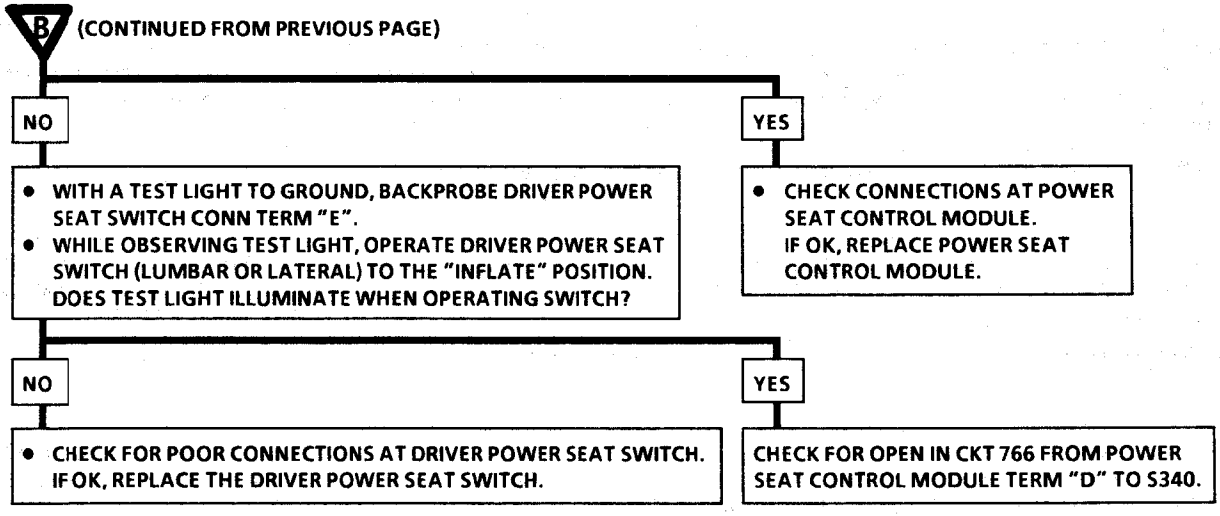


CHART #2
LUMBAR BLADDER INOPERATIVE, BUT LATERAL BLADDERS OPERATE NORMALLY WITHIN THE SAME SEAT

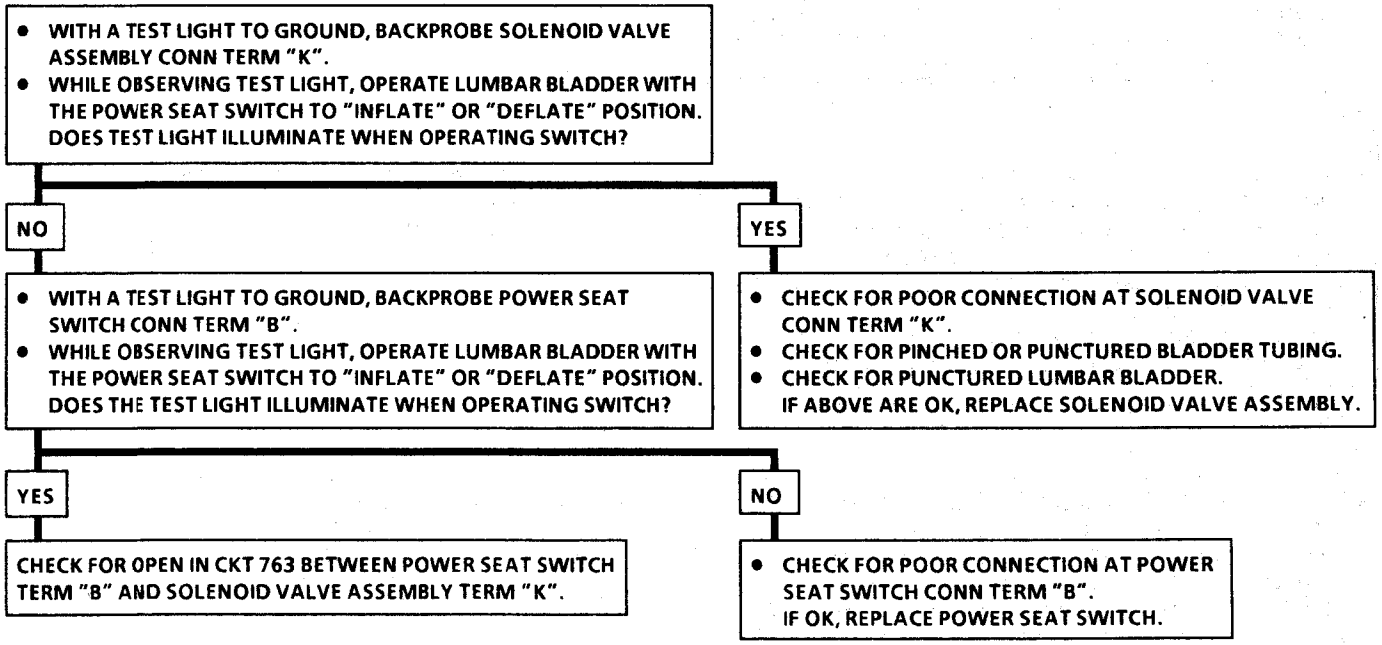


CHART #3
LATERAL BLADDERS INOPERATIVE, BUT LUMBAR BLADDER OPERATES NORMALLY WITHIN THE SAME SEAT

- WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT SWITCH CONN TERM "A".
- WHILE OBSERVING TEST LIGHT, OPERATE LATERAL BLADDER USING THE POWER SEAT SWITCH TO THE "INFLATE" OR "DEFLATE" POSITION.
  DOES THE TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE SOLENOID VALVE CONN TERM "H".
- WHILE OBSERVING TEST LIGHT, OPERATE LATERAL BLADDER USING THE POWER SEAT SWITCH TO THE "INFLATE" OR "DEFLATE" POSITION.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- CHECK FOR POOR CONNECTION AT SOLENOID VALVE CONN TERMINALS "H" AND "J".
- CHECK FOR PINCHED OR PUNCTURED BLADDER TUBING.
  IF ABOVE ARE OK, REPLACE SOLENOID VALVE.

NO

- CHECK FOR OPEN IN CKT 765 BETWEEN POWER SEAT SWITCH CONN TERM "A" AND SOLENOID VALVE CONN TERMINALS "H" AND "J".

NO

- CHECK FOR POOR CONNECTION AT POWER SEAT SWITCH CONN TERM "A".
  IF OK, REPLACE POWER SEAT SWITCH.

CHART #4
BLADDER(S) INFLATE BUT DO NOT DEFLATE

- WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT SWITCH CONN TERM "C".
- WHILE OBSERVING TEST LIGHT, OPERATE POWER SEAT SWITCH TO THE "DEFLATE" POSITION.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT CONTROL MODULE CONN TERM "H".
- WHILE OBSERVING TEST LIGHT, OPERATE POWER SEAT SWITCH TO THE "DEFLATE" POSITION.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- CHECK FOR POOR CONNECTION AT POWER SEAT CONTROL MODULE TERM "H".
  IF OK, REPLACE POWER SEAT CONTROL MODULE.

NO

(DRIVER SEAT):
- REPAIR OPEN IN CKT 764 BETWEEN DRIVER POWER SEAT SWITCH TERM "C" AND POWER SEAT CONTROL MODULE TERM "H".

(PASSENGER SEAT):
- CHECK FOR OPEN IN CKT 764 FROM PASSENGER POWER SEAT SWITCH TO C305 TERM "A".
- CHECK FOR OPEN IN CKT 764 IN SEAT JUMPER HARNESS FROM C305 TERM "A" TO C300 TERM "A".
- CHECK FOR OPEN IN CKT 764 FROM C300 TERM "A" TO S345 TO POWER SEAT CONTROL MODULE TERM "H".

NO

- CHECK FOR POOR CONNECTION AT POWER SEAT SWITCH TERM "C".
  IF OK, REPLACE POWER SEAT SWITCH.

POWER SEATS: ULTIMA (AQ9)

CHART #5
PUMP ASSEMBLY OPERATES, BUT BLADDER(S) DO NOT INFLATE

- (LATERAL BLADDERS): WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT SWITCH CONN TERM "A".
  (LUMBAR BLADDER): WITH A TEST LIGHT TO GROUND, BACKPROBE POWER SEAT SWITCH CONN TERM "B".
- PRESS POWER SEAT SWITCH TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- (LATERAL BLADDERS): WITH A TEST LIGHT TO GROUND, BACKPROBE SOLENOID VALVE CONN TERM "H" AND TERM "J".
  (LUMBAR BLADDER): WITH A TEST LIGHT TO GROUND, BACKPROBE SOLENOID VALVE CONN TERM "K".
- PRESS POWER SEAT SWITCH TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT.
  DOES TEST LIGHT ILLUMINATE ON ALL CIRCUITS WHEN OPERATING SWITCH?

YES

- (LATERAL BLADDERS): WITH A TEST LIGHT TO GROUND, BACKPROBE SOLENOID VALVE CONN TERM "F".
  (LUMBAR BLADDER): WITH A TEST LIGHT TO GROUND, BACKPROBE SOLENOID VALVE CONN TERM "F".
- PRESS POWER SEAT SWITCH TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- DISCONNECT POWER SEAT CONTROL MODULE.
- USING A TEST LIGHT, PROBE POWER SEAT CONTROL MODULE CONN TERM "A" TO GROUND.
- PRESS POWER SEAT SWITCH TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- RECONNECT POWER SEAT CONTROL MODULE.
- DISCONNECT SOLENOID VALVE ASSEMBLY CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN SOLENOID VALVE CONNECTOR TERMINALS "K" AND "F".
- USING LUMBAR CONTROL, PRESS POWER SEAT SWITCH TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT.
  DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

- CHECK FOR POOR CONNECTIONS AT SOLENOID VALVE.
- CHECK FOR PINCHED OR PUNCTURED BLADDER TUBING WITHIN INDIVIDUAL SEATS; ALSO CHECK BLADDER TUBING IN SEAT JUMPER HARNESS.
- CHECK FOR PUNCTURED BLADDER.
- IF ABOVE CHECKS ARE OK, THE SOLENOID VALVE ASSEMBLY MAY BE STUCK OR FAULTY. REPLACE SOLENOID VALVE ASSEMBLY.

NO

- CHECK FOR POOR CONNECTIONS AT POWER SEAT CONTROL MODULE CONN TERM "A".
  IF OK, REPLACE POWER SEAT CONTROL MODULE.

NO

- (DRIVER SEAT): REPAIR OPEN IN CKT 769 BETWEEN SOLENOID VALVE AND POWER SEAT CONTROL MODULE.
  (PASSENGER SEAT): CHECK FOR OPEN IN CKT 769 FROM SOLENOID VALVE TO C305 TERM "F".
- CHECK FOR OPEN IN CKT 628 FROM C305 TERM "F" TO C300 TERM "F".
- CHECK FOR OPEN IN CKT 769 BETWEEN C300 TERM "F" AND POWER SEAT CONTROL MODULE TERM "A", INCLUDING S350.

NO

- CHECK FOR POOR CONNECTIONS AT SOLENOID VALVE ASSEMBLY.
  IF OK, REPLACE SOLENOID VALVE ASSEMBLY.

NO

CHECK FOR OPEN BETWEEN POWER SEAT SWITCH AND SOLENOID VALVE ASSEMBLY IN CKTS 763 AND/OR 765.

NO

- CHECK FOR POOR CONNECTIONS AT POWER SEAT SWITCH.
  IF OK, REPLACE POWER SEAT SWITCH.

CHART #6
PASSENGER POWER SEAT INOPERATIVE, DRIVER POWER SEAT OPERATES NORMALLY

- WITH A TEST LIGHT TO GROUND, BACKPROBE C305 TERM "C". IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE PASSENGER POWER SEAT SWITCH CONN TERM "F". IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE C300 TERM "B".
- PRESS PASSENGER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT. DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE C305 TERM "B".
- PRESS PASSENGER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT. DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

NO

- WITH A TEST LIGHT TO GROUND, BACKPROBE PASSENGER POWER SEAT SWITCH CONN TERM "E".
- PRESS THE PASSENGER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT. DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

NO

- CHECK FOR POOR CONNECTIONS AT PASSENGER POWER SEAT SWITCH CONN TERM "E". IF OK, REPLACE PASSENGER POWER SEAT SWITCH.

YES

- CHECK FOR POOR CONNECTION AT C305 TERM "B". IF OK, REPAIR OPEN IN CKT 766 BETWEEN C305 AND PASSENGER POWER SEAT SWITCH.

YES

CHECK FOR OPEN IN SEAT JUMPER HARNESS CKT 766 BETWEEN C305 AND C300.

YES

- CHECK FOR POOR CONNECTION AT C300 TERM "B". IF OK, REPAIR OPEN IN CKT 766 BETWEEN C300 AND S340.

NO

- CHECK FOR POOR CONNECTION AT C305 TERM "C". IF OK, REPAIR OPEN IN CKT 1240 BETWEEN C305 AND PASSENGER POWER SEAT SWITCH.

NO

REPAIR OPEN IN CKT 1240 IN SEAT JUMPER HARNESS FROM C305 TERM "C" TO S320.

POWER SEATS: ULTIMA (AQ9)

CHART #7
DRIVER POWER SEAT INOPERATIVE, PASSENGER POWER SEAT OPERATES NORMALLY

- WITH A TEST LIGHT TO GROUND, BACKPROBE DRIVER POWER SEAT SWITCH CONN TERM "F". IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT TO GROUND, BACKPROBE DRIVER POWER SEAT SWITCH CONN TERM "E".
- PRESS DRIVER POWER SEAT SWITCH (LUMBAR OR LATERAL) TO "INFLATE" POSITION WHILE OBSERVING TEST LIGHT. DOES TEST LIGHT ILLUMINATE WHEN OPERATING SWITCH?

YES

REPAIR OPEN IN CKT 766 BETWEEN DRIVER POWER SEAT SWITCH TERM "E" AND S340.

NO

- CHECK FOR POOR CONNECTIONS AT DRIVER POWER SEAT SWITCH CONN TERMINALS "F" AND "E". IF OK, REPLACE DRIVER POWER SEAT SWITCH.

NO

CHECK FOR OPEN IN CKT 1240 BETWEEN DRIVER POWER SEAT SWITCH TERM "F" AND S330.

CIRCUIT OPERATION

Each seat incorporates a power inflate/power deflate pneumatic system used for altering the contour of the seat. This is accomplished by inflating and deflating air bladders within each seat.

Both Power Seats utilize the same Power Seat Control Module and Pump Assembly for operation. The Power Seat Control Module and Pump Assembly are mounted under the Driver Seat. A Seat Jumper Harness from the Driver Seat connects the circuitry and bladder tubing to the Passenger Seat.

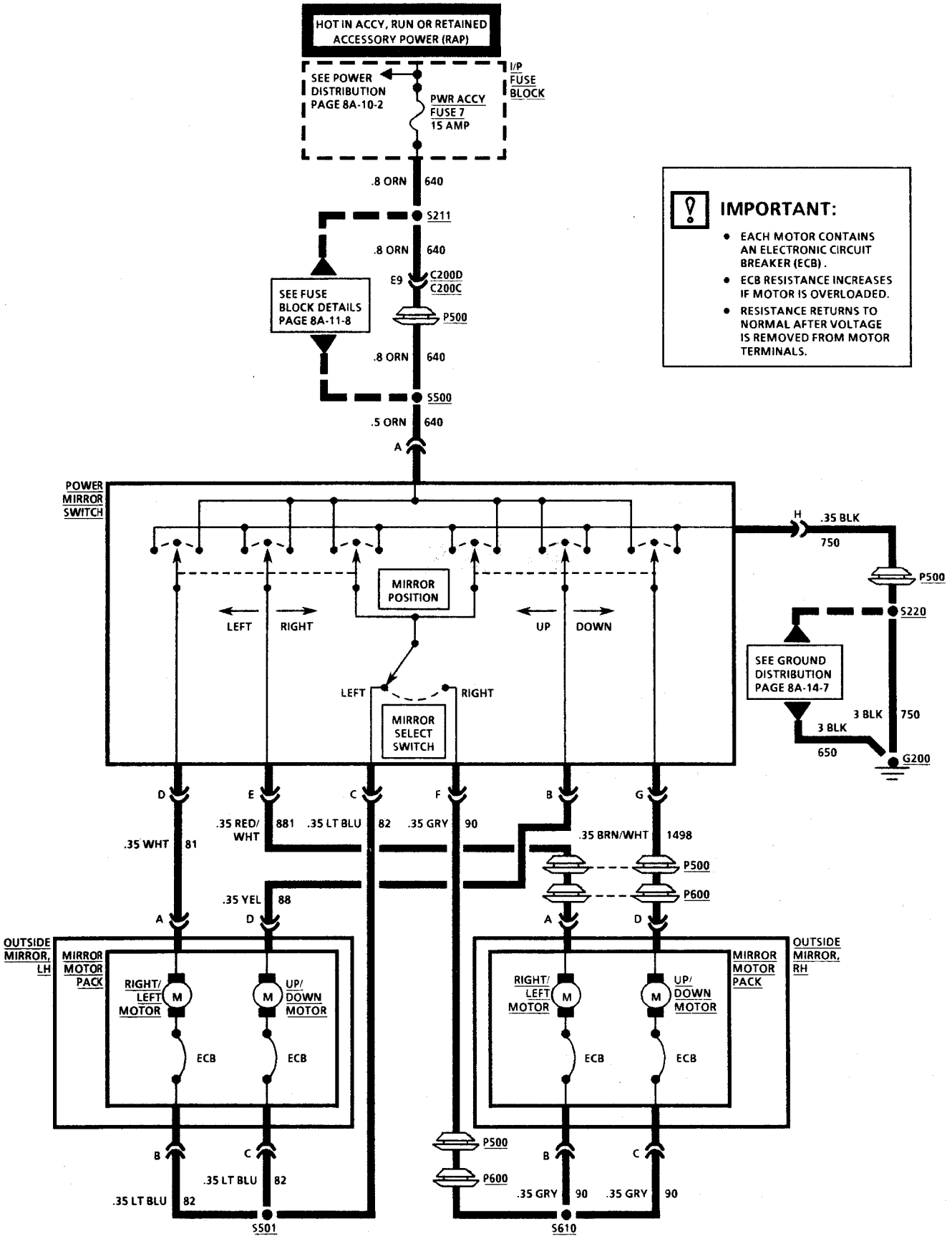
Voltage is supplied at all times to both Power Seat Switches through CKT 1240 from the DEFOG/SEATS Circuit Breaker 12. When lateral/lumbar support is requested, the Power Seat Switch applies voltage to the selected solenoid at the Solenoid Valve Assembly.

The Solenoid Valve Assembly is grounded through the Power Seat Control Module. At the same time, the Power Seat Switch applies battery voltage to the selected inflate or deflate relay within the Power Seat Control Module. The Power Seat Control Module applies power to the Pump Assembly in either the forward direction (inflate) or the reverse direction (deflate).

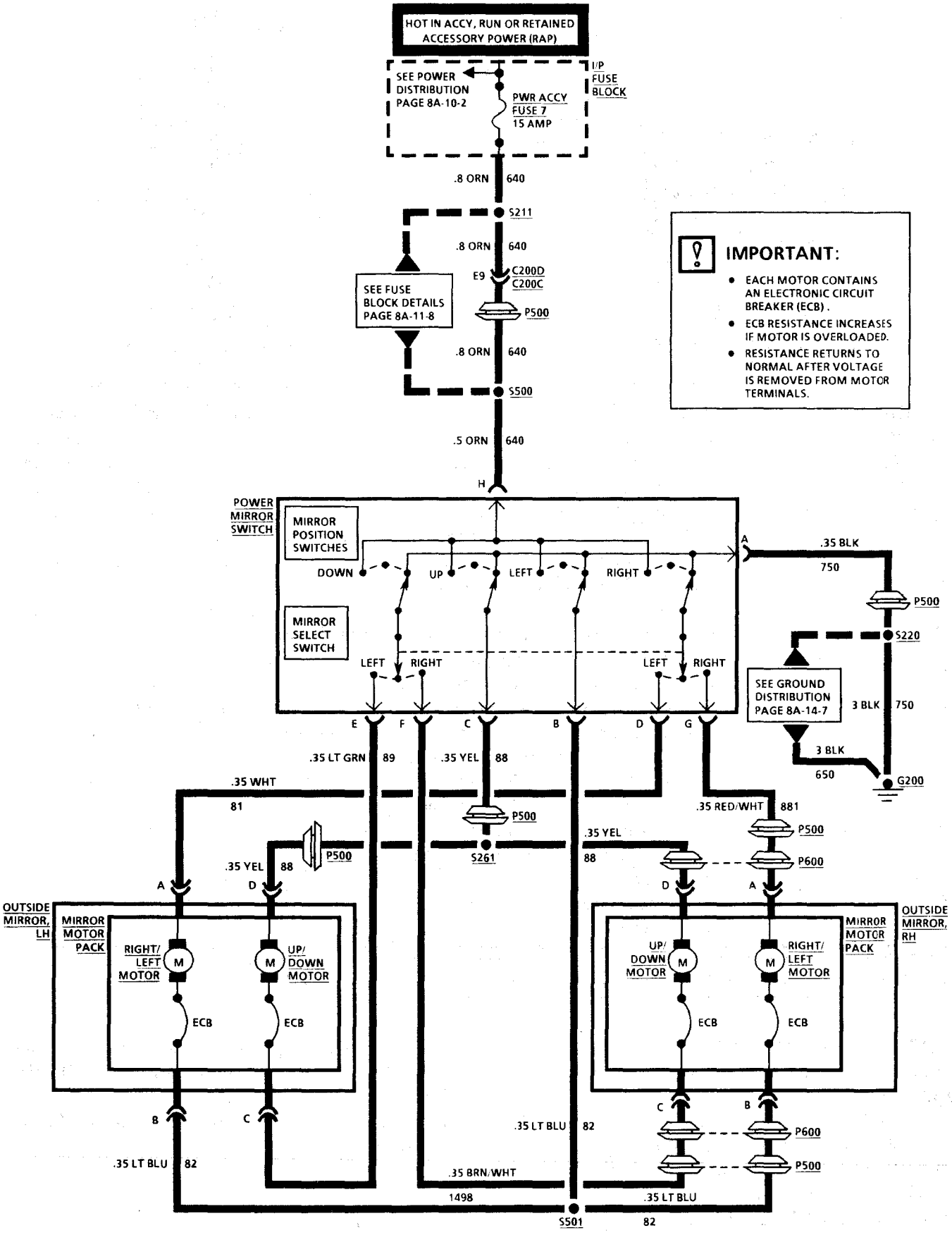
The ground to the Solenoid Valve is electrically opened when a pressure switch inside the Power Seat Control Module senses a bladder full/empty condition. In response to these conditions the Power Seat Control Module shuts off the pump by opening the ground to the Inflate or Deflate Relay until the Power Seat Switch is released.

BLANK

POWER MIRRORS (DG7) (CHEVY)

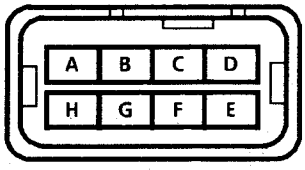


POWER MIRRORS (DG7) (PONTIAC)



POWER MIRRORS (DG7)

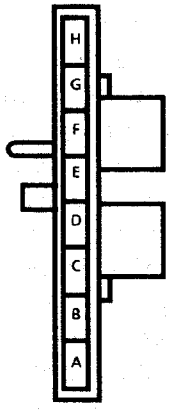
(CHEVY)



12045688

8-WAY M METRI-PACK 150 SERIES
BLK

(PONT)



12064862

8-WAY F METRI-PACK 150 SERIES
BLK

COMPONENT	LOCATION	201-PG	FIG.	CONN
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Outside Mirror, LH	LH front door	17	31	202-24
Outside Mirror, RH	RH front door	17	31	202-24
Power Mirror Switch	Mounted in left door armrest	18	33	202-24
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
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S211	I/P Harn, approx 4 cm from antenna cable (Chevy) or Convenience Center (Pont) breakouts			
S220	Cross Car Harn, approx 9 cm from C200 breakout	45	84	
S261	Cross Car Harn, approx 14 cm inboard of P600	45	84	
S500	Cross Car Harn, approx 6 cm from Speaker breakout	17	31	
S501	Cross Car Harn, approx 4 cm from Power Mirror breakout	17	31	
S610	Cross Car Harn, approx 7 cm from Outside Mirror breakout			

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

1. Check PWR ACCY Fuse 7 in I/P Fuse Block. If open, refer to Diagnostic Chart #5.
2. If both mirrors are inoperative, check for poor connections at the Power Mirror Switch.
3. Check that G200 is clean and tight.
4. If only one mirror operates properly, check for poor connections at LH Outside Mirror or RH Outside Mirror.

- Refer to SECTION 10-6 for Outside Mirror replacement.

- 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

POWER MIRRORS (DG7)

CHART #1
BOTH MIRRORS DO NOT OPERATE IN EITHER ("UP/DOWN" OR "LEFT/RIGHT") MODE

- WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "A" (CHEVY) OR TERM "H" (PONT) TO GROUND. IS TEST LIGHT "ON"?

YES

- WITH A TEST LIGHT, BACKPROBE BETWEEN POWER MIRROR SWITCH CONN TERM "A" AND TERM "H". IS THE TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTION AT POWER MIRROR SWITCH CONN. IF OK, REPLACE SWITCH.

NO

- CHECK FOR POOR CONNECTION AT G200.
- CHECK FOR POOR CONNECTION AT POWER MIRROR CONN TERM "H" (CHEVY) OR TERM "A" (PONT). IF OK, REPAIR OPEN IN CKT 750 FROM G200 TO POWER MIRROR SWITCH CONN TERM "H" (CHEVY) OR TERM "A" (PONT).

NO

- CHECK FOR POOR CONNECTION AT C200 TERM "E9" OR AT POWER MIRROR SWITCH CONN. IF OK, REPAIR OPEN IN CKT 640 FROM FUSE BLOCK TO POWER MIRROR SWITCH CONN.

CHART #2
ONE MIRROR DOES NOT OPERATE IN THE "UP/DOWN" MODE ("LEFT/RIGHT" MODE OPERATES NORMALLY)

- (LH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "B" TO TERM "C" (CHEVY) OR TERM "C" TO TERM "E" (PONT).
  (RH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "G" TO TERM "F" (CHEVY) OR TERM "C" TO TERM "F" (PONT).
- PRESS MIRROR POSITION SWITCH TO "UP" WHILE OBSERVING THE TEST LIGHT. IS THE TEST LIGHT "ON"?

YES

- (LH): WITH A TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "D" TO TERM "C".
  (RH): WITH A TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "D" TO TERM "C".
- PRESS MIRROR POSITION SWITCH TO "UP" WHILE OBSERVING THE TEST LIGHT. IS THE TEST LIGHT "ON"?

YES

CHEVY

- (LH): CHECK FOR OPEN IN CKT 88 BETWEEN POWER MIRROR SWITCH TERM "B" AND OUTSIDE MIRROR CONN TERM "D". IF OK, CHECK FOR OPEN IN CKT 82 BETWEEN S501 AND OUTSIDE MIRROR CONN TERM "C".
- (RH): CHECK FOR OPEN IN CKT 1498 BETWEEN POWER MIRROR SWITCH TERM "G" AND OUTSIDE MIRROR CONN TERM "D". IF OK, CHECK FOR OPEN IN CKT 90 BETWEEN S610 AND OUTSIDE MIRROR CONN TERM "C".

PONT

- (LH): CHECK FOR OPEN IN CKT 88 BETWEEN OUTSIDE MIRROR CONN TERM "D" AND S261. IF OK, CHECK FOR OPEN IN CKT 89 BETWEEN OUTSIDE MIRROR CONN TERM "C" AND POWER MIRROR SWITCH TERM "E".
- (RH): CHECK FOR OPEN IN CKT 88 BETWEEN OUTSIDE MIRROR CONN TERM "D" AND S261. IF OK, CHECK FOR OPEN IN CKT 1498 BETWEEN OUTSIDE MIRROR CONN TERM "C" AND POWER MIRROR SWITCH CONN TERM "F".

NO

- (LH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONNECTOR. IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.
- (RH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONNECTOR. IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.

NO

- CHECK FOR POOR CONNECTION AT POWER MIRROR SWITCH CONN. IF OK, REPLACE POWER MIRROR SWITCH.

CHART #3
ONE MIRROR WILL NOT OPERATE IN THE "LEFT/RIGHT" MODE ("UP/DOWN" MODE OPERATES NORMALLY)

- (LH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "D" TO TERM "C" (CHEVY) OR TERM "D" TO TERM "B" (PONT).
  (RH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "E" TO TERM "F" (CHEVY) OR TERM "G" TO TERM "B" (PONT).
- PRESS MIRROR POSITION SWITCH TO "LEFT" WHILE OBSERVING THE TEST LIGHT. IS THE TEST LIGHT "ON"?

YES

- (LH): WITH THE TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "B" TO TERM "A".
  (RH): WITH THE TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "B" TO TERM "A".
- PRESS MIRROR POSITION SWITCH TO "LEFT" WHILE OBSERVING THE TEST LIGHT. IS THE TEST LIGHT "ON"?

NO

- CHECK FOR POOR CONNECTION AT POWER MIRROR SWITCH CONN. IF OK, REPLACE POWER MIRROR SWITCH.

NO

CHEVY

- (LH): CHECK FOR OPEN IN CKT 81 BETWEEN POWER MIRROR SWITCH CONN TERM "D" AND OUTSIDE MIRROR CONN TERM "A". IF OK, CHECK FOR OPEN IN CKT 82 BETWEEN S501 AND OUTSIDE MIRROR CONN TERM "B".
- (RH): CHECK FOR OPEN IN CKT 881 BETWEEN POWER MIRROR SWITCH CONN TERM "E" AND OUTSIDE MIRROR CONN TERM "A". IF OK, CHECK FOR OPEN IN CKT 90 BETWEEN S610 AND OUTSIDE MIRROR CONN TERM "B".

PONT

- (LH): CHECK FOR OPEN IN CKT 81 BETWEEN POWER MIRROR SWITCH CONN TERM "D" AND OUTSIDE MIRROR CONN TERM "A". IF OK, CHECK FOR OPEN IN CKT 82 BETWEEN S501 AND OUTSIDE MIRROR CONN TERM "B".
- (RH): CHECK FOR OPEN IN CKT 881 BETWEEN POWER MIRROR SWITCH CONN TERM "G" AND OUTSIDE MIRROR CONN TERM "A". IF OK, CHECK FOR OPEN IN CKT 82 BETWEEN OUTSIDE MIRROR CONN TERM "B" AND S501.

YES

- (LH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONNECTOR. IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.
- (RH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONNECTOR. IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.

POWER MIRRORS (DG7)

CHART #4
ONE MIRROR WILL NOT OPERATE IN EITHER ("UP/DOWN" OR "LEFT/RIGHT") MODE

- (LH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "B" TO TERM "C" (CHEVY) OR TERM "C" TO TERM "E" (PONT).
  (RH): WITH A TEST LIGHT BACKPROBE FROM POWER MIRROR SWITCH CONN TERM "G" TO TERM "F" (CHEVY) OR TERM "C" TO TERM "F" (PONT).
- PRESS MIRROR POSITION SWITCH TO "UP" WHILE OBSERVING THE TEST LIGHT.
  IS THE TEST LIGHT "ON"?

YES

- (LH): WITH THE TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "D" TO TERM "C".
  (RH): WITH THE TEST LIGHT BACKPROBE FROM OUTSIDE MIRROR CONN TERM "D" TO TERM "C".
- PRESS THE MIRROR POSITION SWITCH TO "UP" WHILE OBSERVING THE TEST LIGHT.
  IS THE TEST LIGHT "ON"?

NO

CHEVY

(LH): REPAIR OPEN IN CKT 82 BETWEEN POWER MIRROR SWITCH CONN TERM "C" AND S501.
(RH): REPAIR OPEN IN CKT 90 BETWEEN POWER MIRROR SWITCH CONN TERM "F" AND S610.

PONT

- CHECK FOR OPEN IN CKT 88 BETWEEN OUTSIDE MIRROR SWITCH CONN TERM "C" AND S261.
- (LH): CHECK FOR OPEN IN CKT 89 BETWEEN OUTSIDE MIRROR SWITCH CONN TERM "E" AND OUTSIDE MIRROR CONN TERM "C".
- (RH): CHECK FOR OPEN IN CKT 1498 BETWEEN POWER MIRROR SWITCH TERM "F" AND OUTSIDE MIRROR CONN TERM "C".

YES

- (LH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONN.
  IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.
- (RH): CHECK FOR POOR CONNECTION AT OUTSIDE MIRROR CONN.
  IF OK, REPLACE THE MIRROR MOTOR PACK WITHIN THE POWER MIRROR.

NO

- CHECK FOR POOR CONNECTION AT POWER MIRROR SWITCH.
  IF OK, REPLACE POWER MIRROR SWITCH.

CHART #5
PWR ACCY FUSE 7 REPEATEDLY BLOWS WHENEVER IGNITION IS "ON" OR WHEN ATTEMPTING TO OPERATE POWER MIRRORS

- REPLACE BLOWN FUSE.
  DOES FUSE BLOW BEFORE ATTEMPTING TO OPERATE POWER MIRRORS?

NO

- TEST POWER MIRROR SWITCH ONE FUNCTION AT A TIME UNTIL FUSE BLOWS.
- WHEN THE FUSE BLOWS, USE SCHEMATICS TO DETERMINE WHAT CIRCUITS OR COMPONENTS COULD BE FAILING. USE A TEST LIGHT OR DVM TO NARROW IN ON SHORT TO GROUND POTENTIAL.
- DISCONNECTING COMPONENTS IS HELPFUL WHEN TRYING TO CHECK CIRCUITS THAT SHOULD NOT BE AT A GROUND POTENTIAL.

YES

- USE SCHEMATICS AND DVM TO CHECK SUSPECT POWER CIRCUITS FOR A SHORT TO GROUND POTENTIAL, EITHER THROUGH A FAULTY COMPONENT OR IN WIRING.
- CONNECT A DVM SET TO VOLTAGE ACROSS FUSE TERMINALS. START BY DISCONNECTING ONE COMPONENT AT A TIME.
  IF ALL RELATED COMPONENTS ARE DISCONNECTED AND SHORT IS STILL PRESENT, LOCATE AND REPAIR SHORT IN WIRING.

CIRCUIT OPERATION

The Power Mirror System 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 Ignition is turned "OFF" or for 35 seconds after exiting the vehicle and closing the doors. Voltage is also applied whenever a door is open. For a complete understanding of Retained Accessory Power (RAP) operation, refer to "Retained Accessory Power (RAP): with AU3," page 8A-15-0.

Each Outside Mirror has two reversible motors. One adjusts the mirror up and down, and the other adjusts the mirror right and left. These motors are controlled by the Power Mirror Switch. The Power Mirror Switch contains a Mirror Position Switch. The Mirror Position Switch controls the polarity of the voltage to the motors. The Power Mirror Switch also contains a Mirror Select Switch, which directs the voltage to either the RH or LH Outside Mirror. The Power Mirror Switch receives battery voltage from the PWR ACCY Fuse through CKT 640 and is permanently grounded at G200.

When the LH Outside Mirror is selected, the Mirror Position Switch will control the motors of the LH Outside Mirror. When the Mirror Position Switch UP position is selected, voltage is applied to the Up/Down Motor of the LH Outside Mirror through CKT 88. Ground will be provided to the Up/Down Motor by the Outside Mirror Switch through CKT 82 (Chevy) or CKT 89 (Pont). The Up/Down Motor in the LH Outside Mirror will run and turn the LH Outside Mirror up.

When the Mirror Position Switch DOWN position is selected, voltage is applied to the Up/Down Motor of the LH Outside Mirror through CKT 82 (Chevy) or CKT 89 (Pont), and ground is provided through CKT 88. This will cause the Up/Down Motor to rotate in the opposite direction and turn the LH Outside Mirror down.

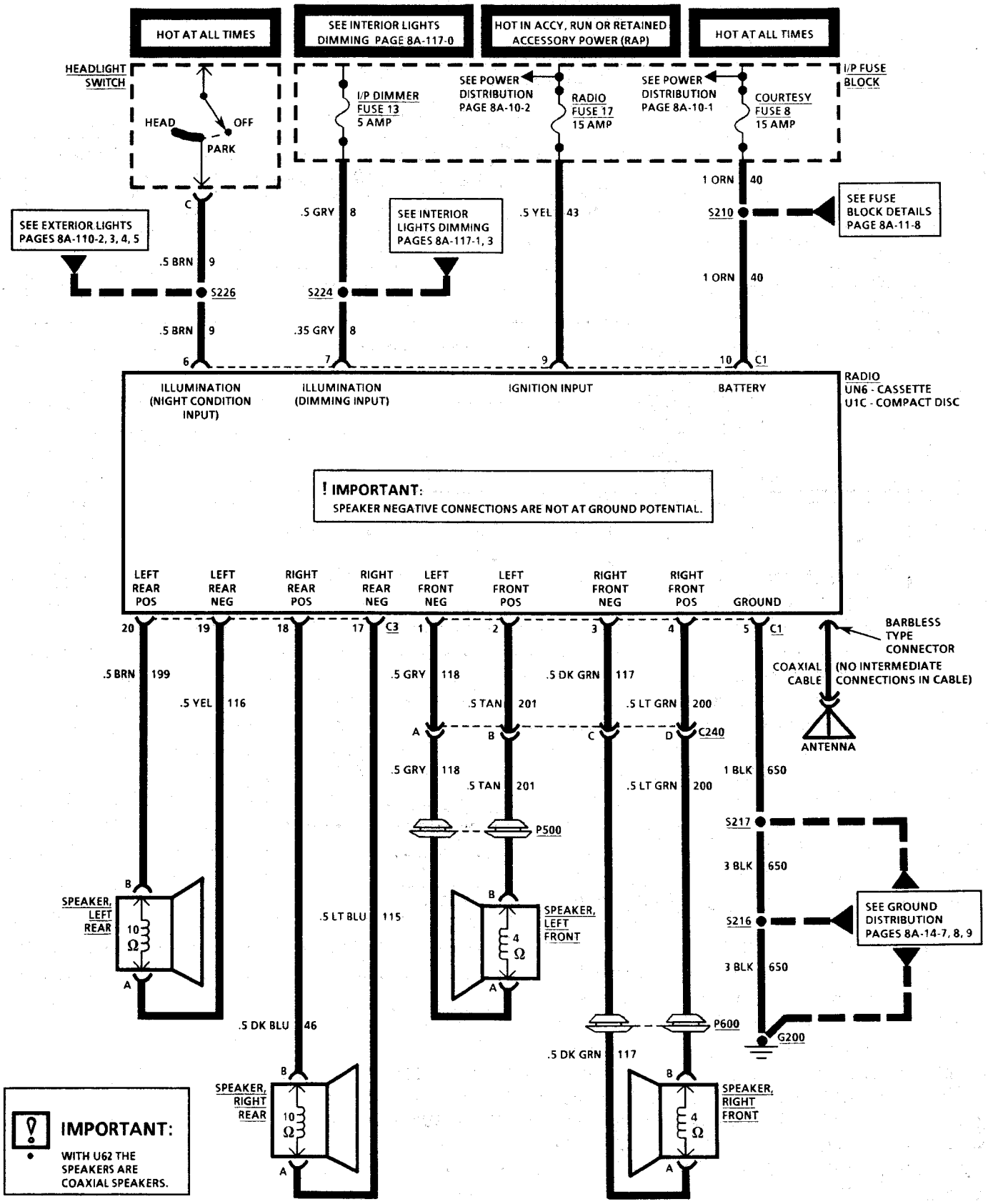
The Left/Right Motor of the LH Outside Mirror operates in a similar manner. When the Mirror Position Switch LEFT position is selected, voltage is applied to the Left/Right Motor of the LH Outside Mirror through the CKT 81. Ground will be provided to the Left/Right Motor by the Outside Mirror Switch through CKT 82. The Left/Right Motor will run and turn the LH Outside Mirror to the left.

When the Mirror Position Switch RIGHT position is selected, voltage is applied to the Left/Right Motor of the LH Outside Mirror through the CKT 82 and ground is provided through CKT 81. This will cause the Left/Right Motor to rotate in the opposite direction and turn the LH Outside Mirror to the right.

The RH Outside Mirror is adjusted in the same way when the Mirror Select Switch is moved to the RH position, and the appropriate position switch is operated.

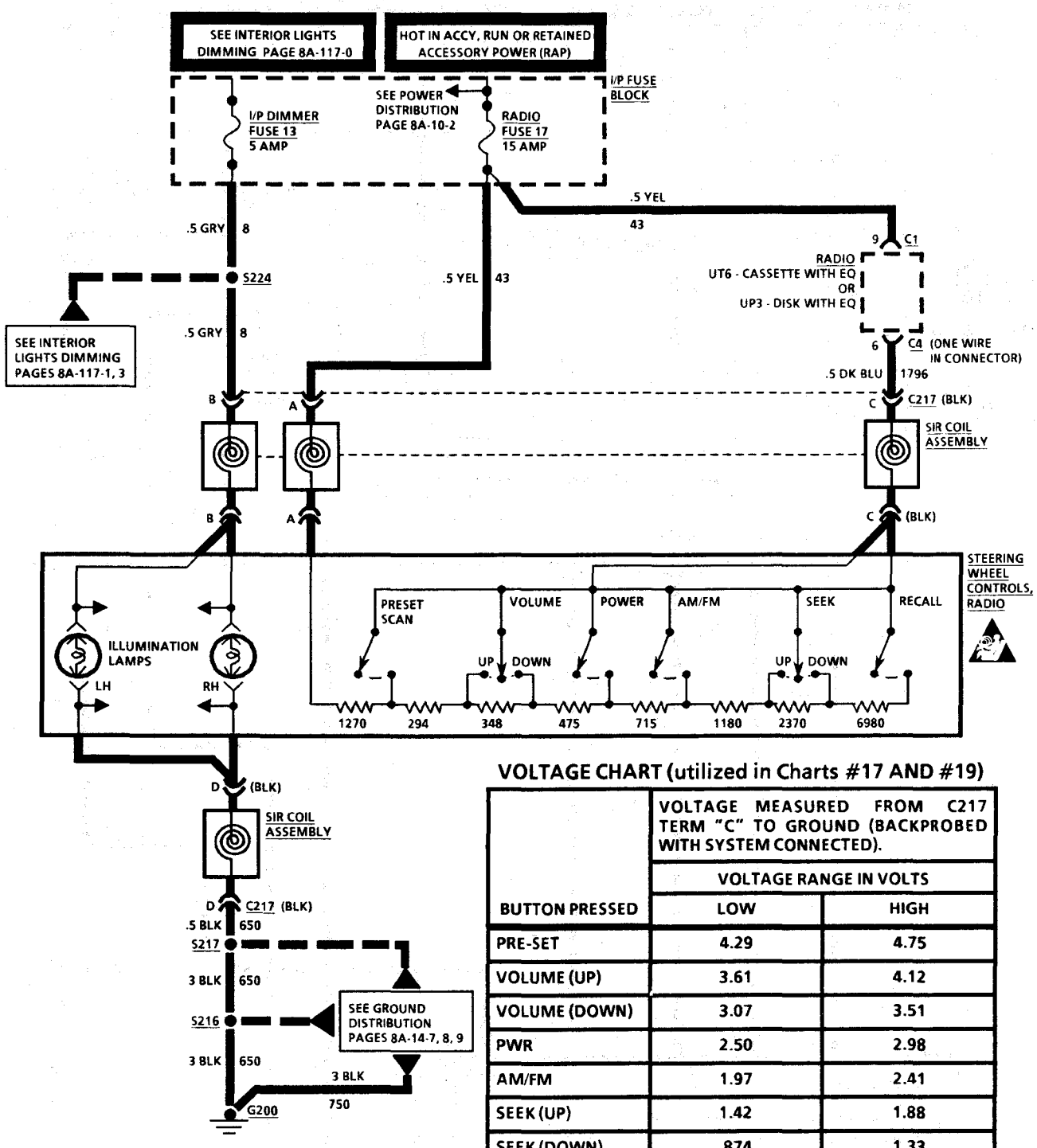
RADIO

UN6 OR U1C RADIO WITH UQ0 (COUPE) OR U62 (CONVERTIBLE)



RADIO

STEERING WHEEL RADIO CONTROLS: UK3 (INCLUDED WITH UT6 OR UP3 RADIO ONLY)



VOLTAGE CHART (utilized in Charts #17 AND #19)

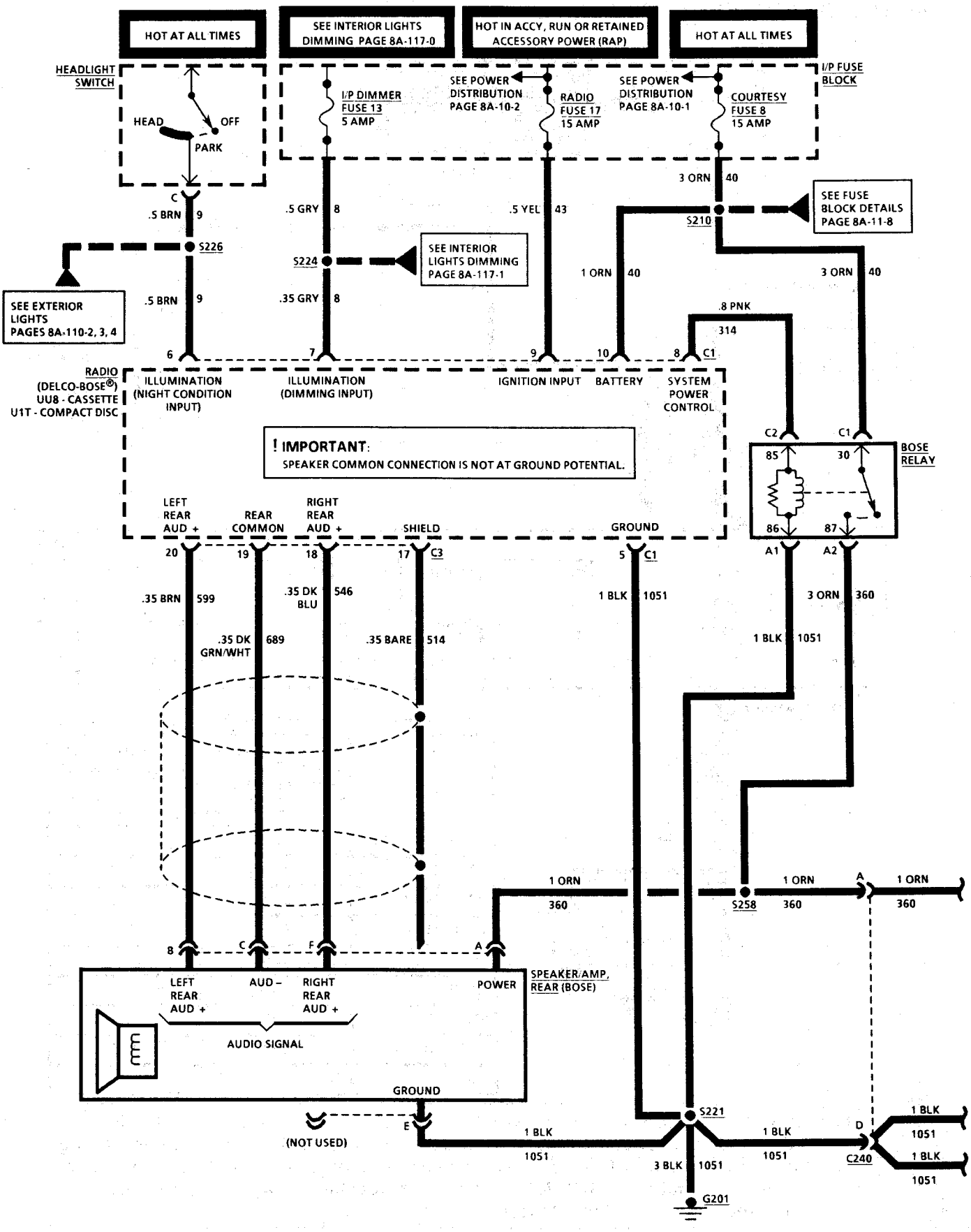
BUTTON PRESSED	VOLTAGE MEASURED FROM C217 TERM "C" TO GROUND (BACKPROBED WITH SYSTEM CONNECTED). VOLTAGE RANGE IN VOLTS	
	LOW	HIGH
PRE-SET	4.29	4.75
VOLUME (UP)	3.61	4.12
VOLUME (DOWN)	3.07	3.51
PWR	2.50	2.98
AM/FM	1.97	2.41
SEEK (UP)	1.42	1.88
SEEK (DOWN)	.874	1.33
RCL	.285	.779

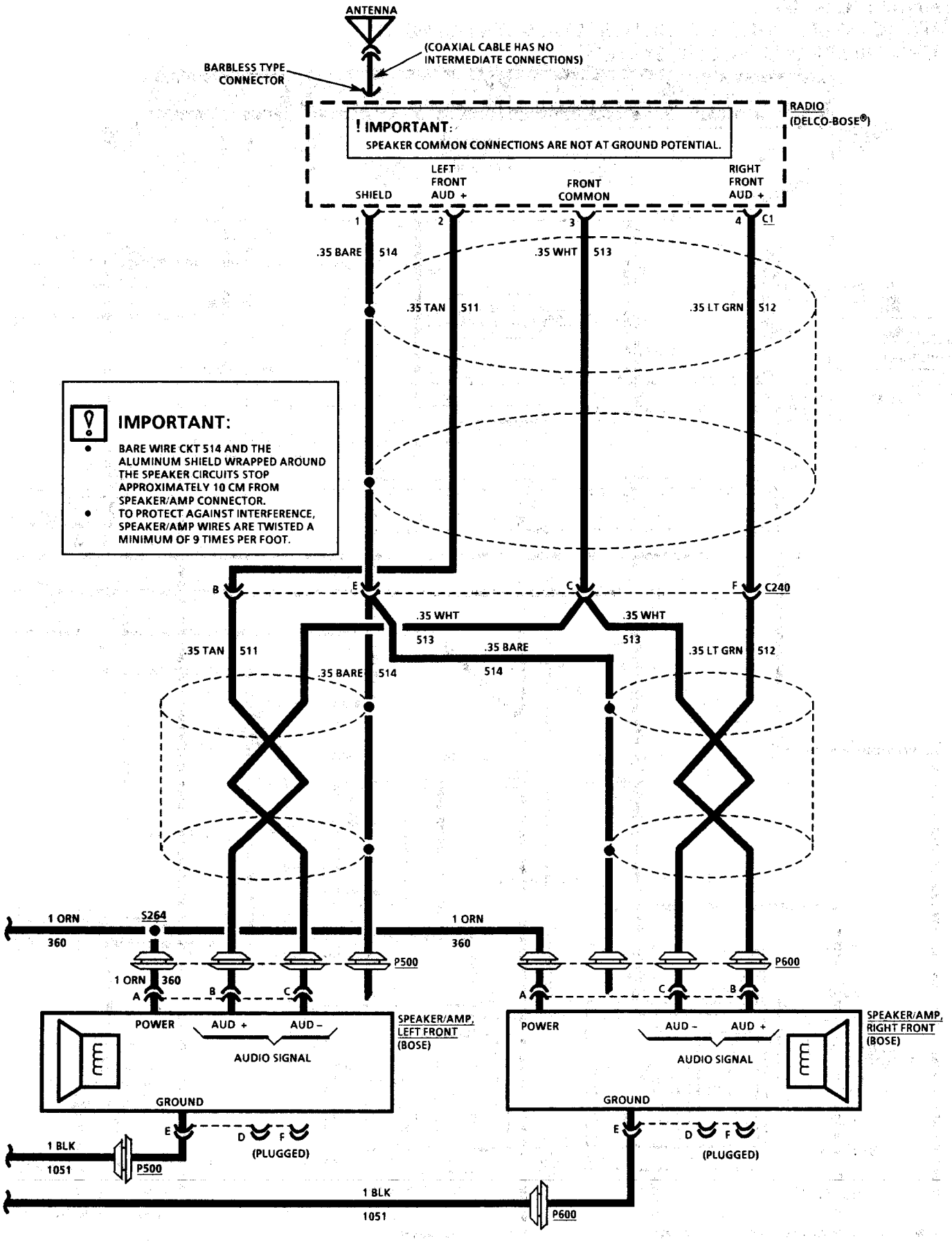
SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

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.

RADIO (CHEVY)

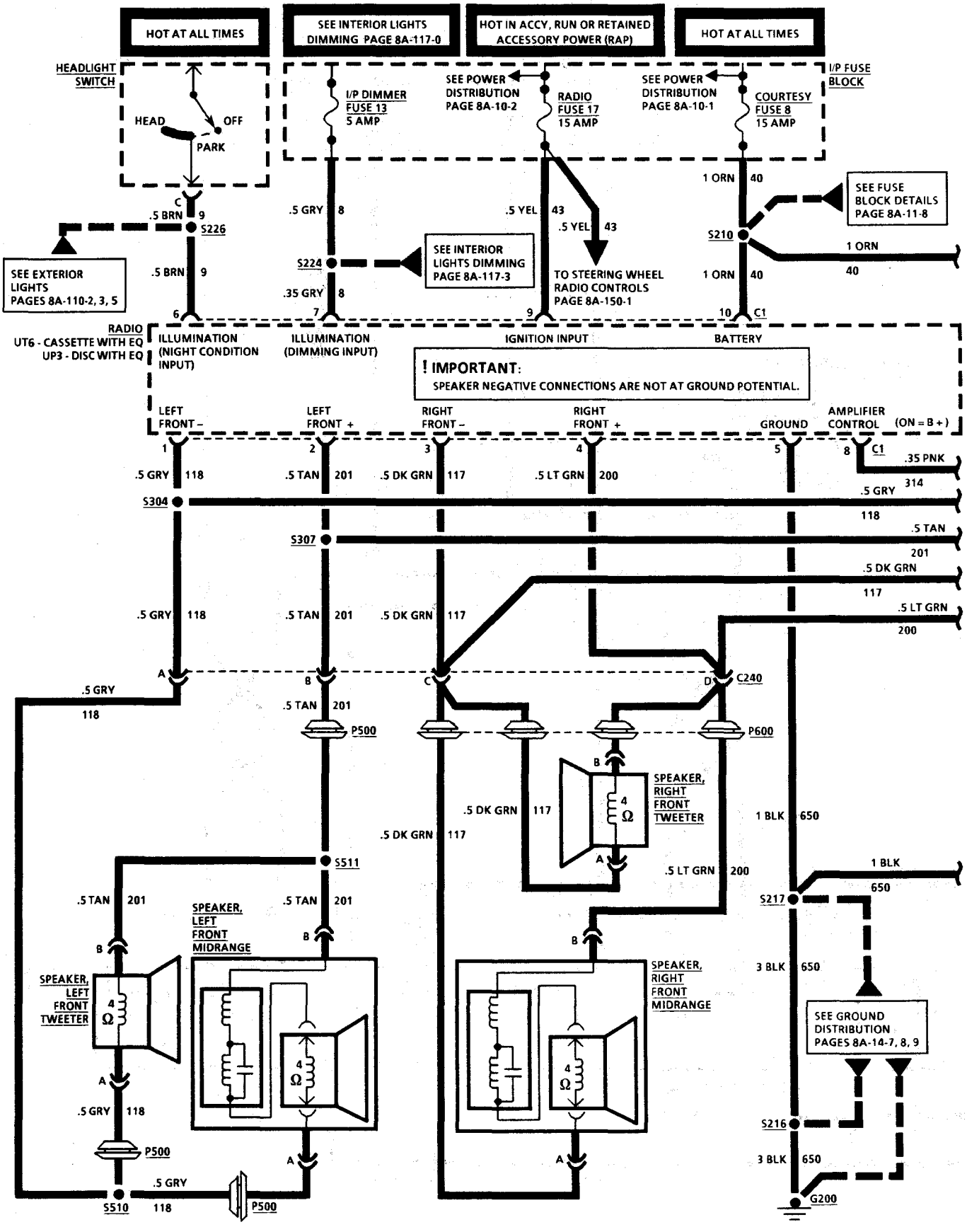
DELCO-BOSE®: (UU8 CASSETTE RADIO OR U1T DISC RADIO) WITH U82 SPEAKERS

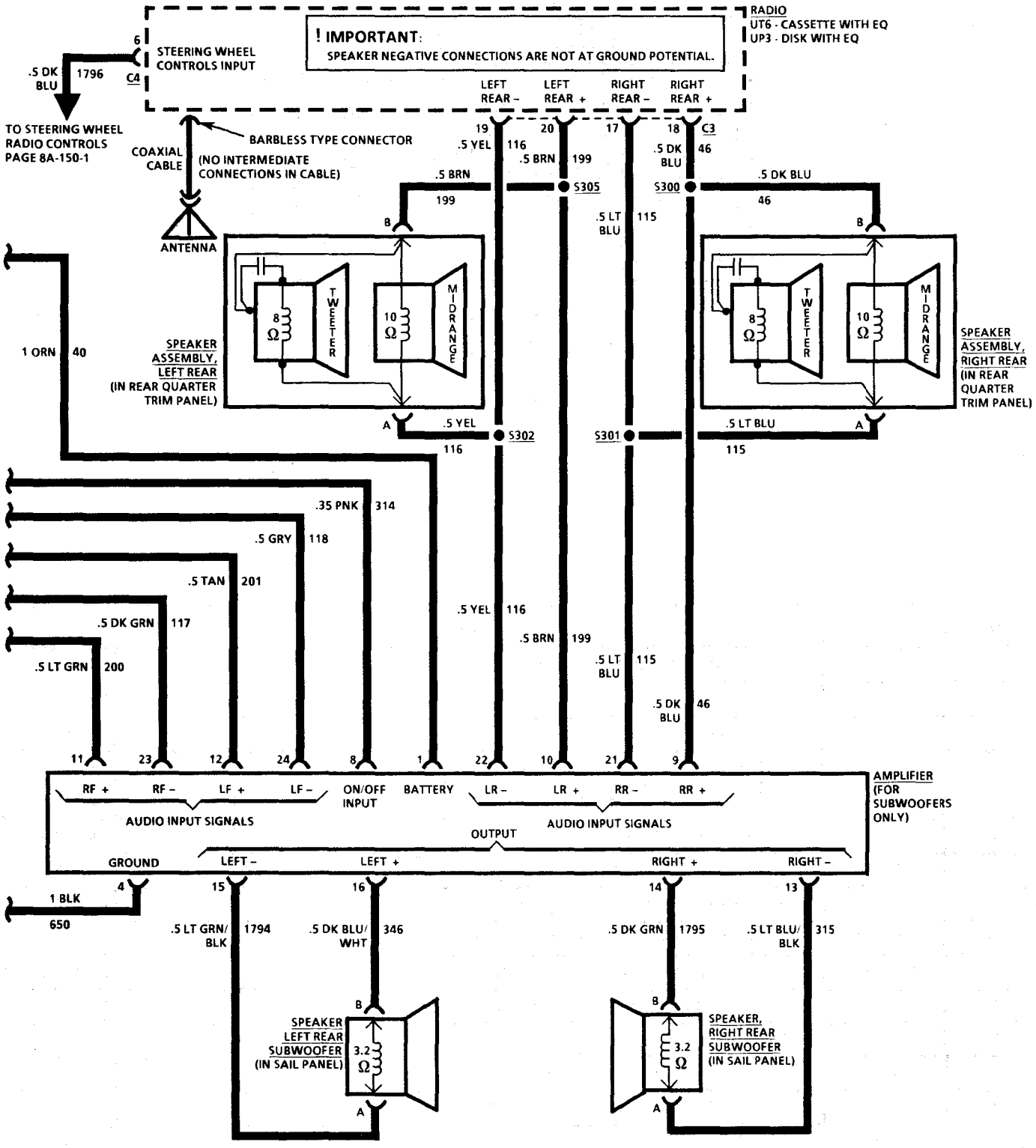



ANTENNA
(COAXIAL CABLE HAS NO INTERMEDIATE CONNECTIONS)
BARBLESS TYPE CONNECTOR
RADIO (DELCO-BOSE®)
! IMPORTANT:
SPEAKER COMMON CONNECTIONS ARE NOT AT GROUND POTENTIAL.
SHIELD
LEFT FRONT AUD +
FRONT COMMON
RIGHT FRONT AUD +
1
2
3
4
C1
.35 BARE 514
.35 WHT 513
.35 TAN 511
.35 LT GRN 512
IMPORTANT:
BARE WIRE CKT 514 AND THE ALUMINUM SHIELD WRAPPED AROUND THE SPEAKER CIRCUITS STOP APPROXIMATELY 10 CM FROM SPEAKER/AMP CONNECTOR.
TO PROTECT AGAINST INTERFERENCE, SPEAKER/AMP WIRES ARE TWISTED A MINIMUM OF 9 TIMES PER FOOT.
B
E
C
F
C240
.35 WHT 513
.35 WHT 513
.35 TAN 511
.35 BARE 514
.35 BARE 514
.35 LT GRN 512
1 ORN 360
S264
1 ORN 360
1 ORN 360
P500
P600
A
B
C
A
C
B
POWER
AUD +
AUD –
AUDIO SIGNAL
SPEAKER/AMP, LEFT FRONT (BOSE)
POWER
AUD –
AUD +
AUDIO SIGNAL
SPEAKER/AMP, RIGHT FRONT (BOSE)
GROUND
GROUND
E
D
F
(PLUGGED)
E
D
F
(PLUGGED)
1 BLK 1051
P500
1 BLK 1051
P600

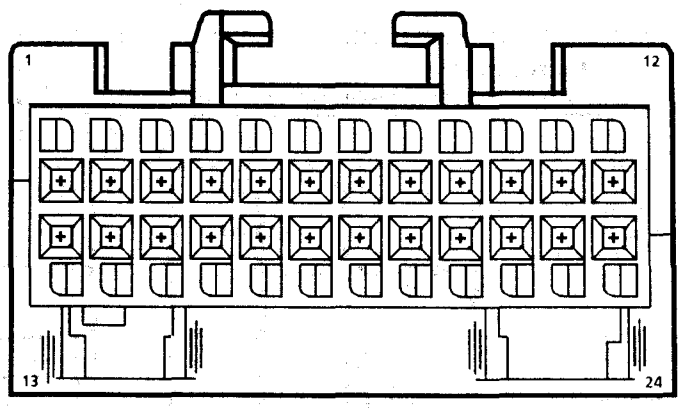
RADIO (PONTIAC)

UT6 (CASSETTE WITH EQ) OR UP3 (DISC WITH EQ) WITH UW2 (10 SPEAKER SOUND SYSTEM)




RADIO
UT6 - CASSETTE WITH EQ
UP3 - DISK WITH EQ
! IMPORTANT:
SPEAKER NEGATIVE CONNECTIONS ARE NOT AT GROUND POTENTIAL.
6
STEERING WHEEL CONTROLS INPUT
.5 DK BLU
1796
C4
TO STEERING WHEEL RADIO CONTROLS PAGE 8A-150-1
COAXIAL CABLE
BARBLESS TYPE CONNECTOR
(NO INTERMEDIATE CONNECTIONS IN CABLE)
ANTENNA
LEFT REAR –
LEFT REAR +
RIGHT REAR –
RIGHT REAR +
19
20
17
18
C3
.5 YEL
116
.5 BRN
199
.5 DK BLU
46
S305
S300
S302
S301
.5 LT BLU
115
1 ORN
40
SPEAKER ASSEMBLY, LEFT REAR (IN REAR QUARTER TRIM PANEL)
SPEAKER ASSEMBLY, RIGHT REAR (IN REAR QUARTER TRIM PANEL)
8 Ω
10 Ω
TWEETER
MIDRANGE
.35 PNK
314
.5 GRY
118
.5 TAN
201
.5 DK GRN
117
.5 LT GRN
200
11
23
12
24
8
1
22
10
21
9
AMPLIFIER (FOR SUBWOOFERS ONLY)
RF +
RF –
LF +
LF –
ON/OFF INPUT
BATTERY
LR –
LR +
RR –
RR +
AUDIO INPUT SIGNALS
OUTPUT
GROUND
LEFT –
LEFT +
RIGHT +
RIGHT –
4
15
16
14
13
1 BLK
650
.5 LT GRN/ BLK
1794
.5 DK BLU/ WHT
346
.5 DK GRN
1795
.5 LT BLU/ BLK
315
SPEAKER LEFT REAR SUBWOOFER (IN SAIL PANEL)
SPEAKER, RIGHT REAR SUBWOOFER (IN SAIL PANEL)
3.2 Ω

RADIO

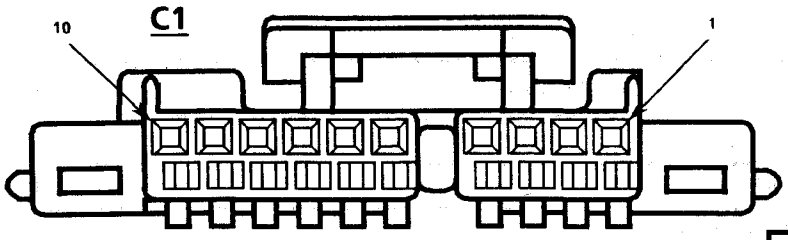


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24-WAY F MICRO-PACK 100 SERIES
LT GRY

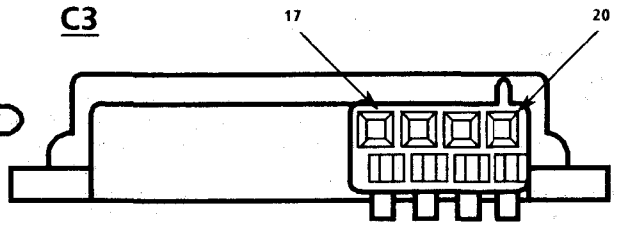
AMPLIFIER

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
1	ORN	40	POWER FEED FROM COURTESY FUSE 8	8A-11-8
4	BLK	650	GROUND	8A-14-9
8	PNK	314	RADIO SIGNAL - ON	8A-150-5
9	DK BLU	46	RIGHT REAR SPEAKER FEED (POS)	8A-150-5
10	BRN	199	LEFT REAR SPEAKER FEED (POS)	8A-150-5
11	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-4, 5
12	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-4, 5
13	LT BLU/BLK	315	RIGHT SUBWOOFER SPEAKER RETURN (NEG)	8A-150-5
14	DK GRN	1795	RIGHT SUBWOOFER SPEAKER FEED (POS)	8A-150-5
15	LT GRN/BLK	1794	LEFT SUBWOOFER SPEAKER RETURN (NEG)	8A-150-5
16	DK BLU/WHT	346	LEFT SUBWOOFER SPEAKER FEED (POS)	8A-150-5
21	LT BLU	115	RIGHT REAR SPEAKER RETURN (NEG)	8A-150-5
22	YEL	116	LEFT REAR SPEAKER RETURN (NEG)	8A-150-5
23	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-4, 5
24	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-4, 5



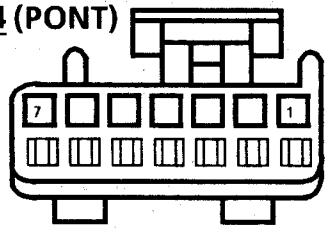
12047531

10-WAY F MICRO-PACK
BLK



12047530

4-WAY F MICRO-PACK
BLU



12065873

7-WAY F MICRO-PACK 100 SERIES
BLK

RADIO

(PONTIAC)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1				
1	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-0, 4
2	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-0, 4
3	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-0, 4
4	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-0, 4
5	BLK	650	GROUND	8A-14-7, 8, 9
6	BRN	9	PARK LAMP FEED	8A-150-0, 4
7	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-150-0, 4
8	PNK	314	(WITH UW2) RADIO SIGNAL - ON	8A-150-4, 5
9	YEL	43	POWER FEED FROM RADIO FUSE #17	8A-150-0, 1, 4
10	ORN	40	POWER FEED FROM COURTESY FUSE #8	8A-11-8
C3				
17	LT BLU	115	RIGHT REAR SPEAKER RETURN	8A-150-0, 5
18	DK BLU	46	RIGHT REAR SPEAKER FEED	8A-150-0, 5
19	YEL	116	LEFT REAR SPEAKER RETURN	8A-150-0, 5
20	BRN	199	LEFT REAR SPEAKER FEED	8A-150-0, 5
C4 (WITH UK3)				
6	DK BLU	1796	STEERING WHEEL RADIO CONTROL SIGNAL	8A-150-1, 5

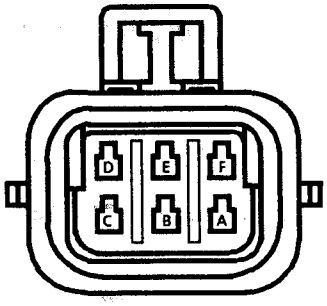
RADIO

**CAVITIES NOT LISTED ARE NOT USED

(CHEVY)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1 (BASE)				
1	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-0
2	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-0
3	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-0
4	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-0
5	BLK	650	GROUND	8A-14-7, 8, 9
C1 (DELCO-BOSE®)				
1	BARE	514	DRAIN WIRE	8A-150-3
2	TAN	511	SPEAKER SIGNAL LEFT FRONT	8A-150-3
3	WHT	513	SPEAKER RETURN LEFT AND RIGHT	8A-150-3
4	LT GRN	512	SPEAKER SIGNAL RIGHT FRONT	8A-150-3
5	BLK	1051	GROUND	8A-14-10
C1 (ALL RADIOS)				
6	BRN	9	PARK LAMP FEED	8A-150-0, 2
7	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-150-0, 2
8	PNK	314	(WITH U82 ONLY) RADIO SIGNAL - ON	8A-150-2
9	YEL	43	POWER FEED FROM RADIO FUSE #17	8A-150-0, 2
10	ORN	40	POWER FEED FROM COURTESY FUSE #8	8A-11-8
C3 (BASE)				
17	LT BLU	115	RIGHT REAR SPEAKER RETURN	8A-150-0
18	DK BLU	46	RIGHT REAR SPEAKER FEED	8A-150-0
19	YEL	116	LEFT REAR SPEAKER RETURN	8A-150-0
20	BRN	199	LEFT REAR SPEAKER FEED	8A-150-0
C3 (DELCO-BOSE®)				
17	BARE	514	DRAIN WIRE	8A-150-2
18	DK BLU	546	REAR PRE AMP FEED (RIGHT SIGNAL)	8A-150-2
19	DK GRN/WHT	689	REAR PRE AMP RETURN	8A-150-2
20	BRN	599	REAR PRE AMP FEED (LEFT SIGNAL)	8A-150-2

SPEAKER AMP/ASSEMBLIES

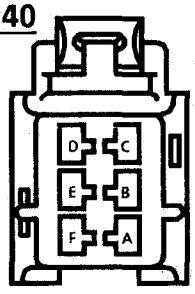


12052848

6-WAY F METRI-PACK 280 SERIES
BLK

SPEAKER/AMP,
LEFT AND RIGHT FRONT (BOSE)

C240



12064752

6-WAY F METRI-PACK 280 SERIES
BLK

CROSS CAR HARNESS TO I/P HARNESS
BLOWER RESISTOR
SPEAKER/AMP, REAR (BOSE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Amplifier (part of UW2 Speaker Option)	Mounted behind Right Rear Armrest, on Rail	44	83	202-9
Antenna	Right rear quarter panel	22, 25	41, 48	
Bose Relay	Below center A/C Duct, mounted to SIR Bracket	22	41	202-21
Headlight Switch	LH side of I/P	37, 38	66, 67	202-15
I/P Fuse Block	LH side of I/P Carrier, on the side	8	15	202-23
Radio	Center of I/P Carrier	36	65	202-16
SIR Coil Assembly	Top of Steering Column	3, 34	5, 51	
Speaker/Amp, Left Front (Bose)	Mounted in left door	17	31	202-27
Speaker/Amp, Rear (Bose)	Mounted in left rear Cargo Compartment trim	5	8	202-27
Speaker/Amp, Right Front (Bose)	Mounted in right door	17	31	202-27
Speaker Assembly, Left Rear (with UW2 Speakers)	Mounted in left Cargo Compartment trim	5	8	
Speaker Assembly, Right Rear (with UW2 Speakers)	Mounted in right Cargo Compartment trim	44	83	
Speaker, Left Front (Base - UQ0)	Mounted in left door	17	31	
Speaker, Left Front Midrange (with UW2 Speakers)	Mounted in left door	17	31	
Speaker, Left Front Tweeter (with UW2 Speakers)	Mounted in left door	17	31	
Speaker, Left Rear (Base - UQ0)	Mounted in left sail panel	5	8	
Speaker, Left Rear Subwoofer (with UW2 Speakers)	Mounted in left sail panel	5	8	
Speaker, Right Front (Base - UQ0)	Mounted in right door	17	31	
Speaker, Right Front Midrange (with UW2 Speakers)	Mounted in right door	17	31	

(CONTINUED ON NEXT PAGE)

RADIO

(CONTINUED FROM PREVIOUS PAGE)

COMPONENT	LOCATION	201-PG	FIG.	CONN
Speaker, Right Front Tweeter (with UW2 Speakers)	Mounted in right door	17	31	
Speaker, Right Rear (Base - UQ0)	Mounted in right sail panel	44	83	
Speaker, Right Rear Subwoofer (with UW2 Speakers)	Mounted in right sail panel	44	83	
Steering Wheel Controls, Radio (UK3)	On Steering Wheel	2	3	202-27
C217 (4 cavities)	Near base of Steering Column	34	63	202-19
C240 (6 cavities)	Under RH side of I/P, behind kick panel	20	37	202-19
G200	Near base of LH "A" pillar, bolted to I/P Mounting Stud behind kick panel (2 rings, 2 wires)	9	16	
G201	Near base of RH "A" pillar, bolted to I/P Mounting Stud behind kick panel (1 ring, 1 wire)	9	16	
P500	Between LH door and "A" pillar	17	31	
P600	Between RH door and "A" pillar	45	84	
S210	I/P Harn, approx 44 cm from Convenience Center (Pont) or 12 cm from RR Defog Switch (Chevy) breakouts			
S216	I/P Harn, approx 5 cm from Convenience Center (Pont) or from Instrument Cluster (Chevy) breakouts			
S217	I/P Harn, approx 23 cm before DLC breakout			
S221	I/P Harn, approx 7 cm from DERM breakout			
S224	I/P Harn, approx 4 cm from Instrument Cluster (Pont) or from RR Defog Switch (Chevy) breakouts			
S226	I/P Harn, approx 10 cm from Instrument Cluster breakout			
S258	I/P Harn, approx 4 cm from antenna cable breakout			
S264	Cross Car Harn, approx 20 cm from P600	45	84	
S300	I/P Harn, approx 15 cm from last rosebud on RH rocker panel	6	10	
S301	I/P Harn, approx 21 cm from last rosebud on RH rocker panel	6	10	
S302	I/P Harn, approx 8 cm from last rosebud on RH rocker panel	6	10	
S304	I/P Harn, approx 34 cm from last rosebud on RH rocker panel	6	10	
S305	I/P Harn, approx 2 cm from last rosebud on RH rocker panel	6	10	
S307	I/P Harn, approx 28 cm from last rosebud on RH rocker panel	6	10	
S510	Cross Car Harn, approx 7 cm from Rearview Mirror breakout	45	84	
S511	Cross Car Harn, approx 7 cm from Power Mirror breakout	17	31	

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

TROUBLESHOOTING HINTS (Perform before beginning System Diagnosis)

Radio Inoperative:

1. For checking a speaker, use a "C" or "D" cell Battery and momentarily connect and disconnect it across the circuits to that speaker while listening for a slight popping sound or watching for the cone of the speaker to move in and out. If either happens, the speaker and circuitry are usually OK.
2. Check Fuse 8. If open, check for a short to ground through CKT 40.
3. Check Fuse 17. If open, check for a short to ground through CKT 43.
4. Make sure ground G200 is clean and tight.

Radio Noise:

A noise "sniffer" may be used to aid in troubleshooting Radio noise, see details on page 8A-150-30. (For definitions of the different types of Radio noise, refer to "Noise Entry," page 8A-150-33.)

1. Test the Radio outside with the hood down.
2. Ignition noise on FM indicates a possible defective High Energy Ignition (HEI) System. Refer to SECTION 6D4.
3. Check antenna coax connectors for corrosion or bad connections.
4. If a test antenna is used, ground the base of the antenna to the vehicle body.
5. When shielding components, use aluminum foil tape (nickel tape works best for magnetic interference) and ground both ends of the shield.
6. Most noise can be found on weak AM Stations near low end of Radio band.
7. Coated screws or bolts can act as poor grounds.
8. Most hoses are conductive unless they have a white stripe.
9. Before removing a speaker, check all accessible wiring and connectors to that speaker.

General:

- 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

- Determine type of audio complaint.
- Try to duplicate condition (listen to AM or FM, start vehicle, put in a good CD or cassette, test switches, etc.).
- Refer to the Symptom Table for the appropriate diagnostic procedure(s).

RADIO

The purpose of the System Performance Check is to distinguish between noise or poor reception. Some noises induced into the system may not be audible but can cause poor reception.

SYSTEM PERFORMANCE CHECK

ACTION	NORMAL RESULTS
[1] • Ignition in "ACCESSORY" mode, Radio "ON."	
[2] • Seek up (88-108 FM) (550-1600 AM). • Count number of valid Radio Stations tuner stops at. • Listen for various noise problems.	– A certain number of Radio stations will be received. – Sometimes Radio will stop at dead spots on the display where there is no audible information. These dead spots should not be counted as valid stations.
[3] • Ignition "ON," Engine off. Repeat step 2.	– Same number of stations are received as above.
[4] • Ignition "ON," Engine running. Repeat step 2.	– Same number of stations are received as above.

NOTICE TO TECHNICIANS: Electromagnetic interference (EMI) can cause a fewer number of stations to be received in one of the three modes. The EMI can be caused by various vehicle components. This may be the cause of the differences in reception. Check for components powered up in the three various key positions. This may eliminate Engine running components, Ignition on components, etc. For example, if the same number of stations are received with the Engine running as when the Engine was off, the components active with the Engine running are not causing the interference.

DEVELOPMENT QUESTIONS

* If an equal number of stations are counted in all key positions vehicle related, interference is not indicated. Some vehicle systems may interfere in all key positions.

* If noise is determined not to be causing interference, refer to "Poor Reception."

Important:

- For a better understanding of Retained Accessory Power (RAP) operation, refer to "Retained Accessory Power (RAP): AU3", page 8A-15-0.

SYMPTOM TABLE

PERFORMANCE COMPLAINTS
(Noise or Reception Symptoms)

To distinguish between noise or poor reception, perform the System Performance Check on the previous page.

CHEVY AND PONTIAC

SYMPTOM	PROCEDURE	PAGE NUMBER
Radio noise.	Chart #10	8A-150-20
Poor reception.	Chart #4	8A-150-17
Switch pop or Accessory Noise.	Chart #16	8A-150-26

CHEVY

Noise in one or more Bose Speaker/Amps, caused by the use of power options.	Suppress noise using Capacitor (P/N 1227894) across suspect component: motor, switch or solenoid.
Noise from Delco-Bose® Speaker/Amps with Radio "OFF."	Check for a stuck Bose Relay or for short to B+ in CKT 360 or CKT 314.

PONTIAC

Noise caused by the use of power options in Subwoofer Speakers only (UW2).	Suppress noise using Capacitor (P/N 1227894) across suspect component: motor, switch or solenoid.

HARDWARE RELATED FAILURES
(No Audio, Display Problems, Inoperative Functions, etc.)

CHEVY AND PONTIAC

SYMPTOM	PROCEDURE	PAGE NUMBER
No sound from any speaker, blank digital display.	Chart #1	8A-150-15
No sound from any speaker, digital display operates normally, seek/scan and presets appear to operate normally (UQ0 or U62).	Check for disconnected connector C3 with major wiring damage to front speakers or with balance to rear only. If OK, service Radio.	
Display does not dim when Park Lamps or Headlamps are turned "ON."	Check for open in CKT 9 to the Radio or poor connection at Radio Connector C1 terminal "6". If OK, service Radio.	
Display dimming does not vary when using the I/P Dimmer Switch (assumes I/P Dimmer Switch Circuit is operating normally elsewhere).	Check for open in CKT 8 to Radio or poor connection at connector C1 terminal "7", refer to "Interior Lights Dimming," page 8A-117-0. If OK, service Radio. Refer to SECTION 9A.	
Cassette Tape Player inoperative.	Chart #5	8A-150-17

(CONTINUED ON NEXT PAGE)

RADIO

(CONTINUED FROM PREVIOUS PAGE)

SYMPTOM TABLE

SYMPTOM	PROCEDURE	PAGE NUMBER
Cassette Tape Player weak.	Inspect and clean moving parts. Use a known good cassette tape to retest. If Cassette Tape Player is still weak, service Radio. Refer to SECTION 9A.	
Compact Disk Player inoperative or skips.	Skipping over hard bumps may occur. Make sure disk being used is not smudged or scratched. Smudges or a scratch that is in a circular direction can cause the laser to track improperly, causing skipping. If excessive skipping occurs, service Radio. Refer to SECTION 9A.	
No sound from one speaker (UQ0 or U62).	Chart #6	8A-150-18
Some Radio functions are operational, others are not operational.	Service Radio, refer to SECTION 9A.	
Loss of memory.	Check CKT 40 and connector C1 terminal "10" for an open or poor connection. If OK, service Radio.	
CHEVY		
SYMPTOM	**PROCEDURE**	**PAGE NUMBER**
No sound from any speaker, digital display operates normally, seek/scan and presets appear to operate normally (Delco-Bose®).	Chart #2	8A-150-15
No sound from one speaker (Delco-Bose®).	Chart #7	8A-150-18
PONTIAC		
Digital Display illuminated, with all Radio functions inoperative.	Check for a short to B + in CKT 1796 (UT6 or UP3 only). If OK, service Radio. Refer to SECTION 9A. **Important:** • An open in CKT 1796 between DVM measuring point and Radio will cause a reading of B + with any button pressed, though there will not be a short to B + in the circuit.	
All lights in Steering Wheel Control Buttons inoperative (some lights are operational).	Chart #3	8A-150-16
One or more lights in Steering Wheel Control Buttons inoperative (some lights are operational).	Replace Steering Wheel Radio Controls.	
Compact Disk Radio displays "ERR" for 5 seconds and stays in Radio mode when a disk is inserted.	The Optical Sensor is impaired by moisture or the disk is in upside down.	
No sound from one speaker (UW2).	Chart #8	8A-150-19
Both Subwoofer Speakers inoperative (UW2).	Chart #9	8A-150-19
All Steering Wheel Radio Controls inoperative (or operate erratically).	Chart #17	8A-150-27
One or more Steering Wheel Radio Controls inoperative (some controls are operational).	Chart #19	8A-150-31

CHART #1
NO SOUND FROM ANY SPEAKER, BLANK DIGITAL DISPLAY

- REMOVE RADIO.
- DISCONNECT RADIO CONN C1.
- IGNITION "ON."
- WITH A TEST LIGHT TO GROUND, PROBE RADIO CONN C1 TERM "9". IS TEST LIGHT "ON"?

YES

- CONNECT TEST LIGHT FROM RADIO CONN C1 TERM "10" TO GROUND. IS TEST LIGHT "ON"?

YES

- CONNECT A TEST LIGHT BETWEEN RADIO CONN C1 TERM "5" AND TERM "9". IS TEST LIGHT "ON"?

YES

- CHECK FOR POOR CONNECTIONS AT RADIO.
- IF OK, SERVICE RADIO. REFER TO SECTION 9A.

NO

- CHECK FOR OPEN IN CKT 43, OR FOR SHORT TO GROUND THROUGH CKT 43 CAUSING FUSE 17 TO BLOW.

NO

CHECK FOR OPEN IN CKT 40, OR FOR SHORT TO GROUND THROUGH CKT 40 CAUSING FUSE 8 TO BLOW.

NO

REPAIR OPEN IN CKT 650 TO GROUND.

CHART #2 (CHEVY)
NO SOUND FROM ANY SPEAKER, DIGITAL DISPLAY OPERATES NORMALLY, SEEK/SCAN AND PRESETS APPEAR TO OPERATE NORMALLY (DELCO-BOSE®)

- DISCONNECT BOSE RELAY.
- CONNECT TEST LIGHT FROM RELAY CONN TERM "C1" TO GROUND. IS TEST LIGHT "ON"?

YES

- CONNECT THE TEST LIGHT FROM RELAY CONN TERM "C1" TO TERM "A1". IS TEST LIGHT "ON"?

YES

- CONNECT THE TEST LIGHT FROM RELAY CONN TERM "C2" TO TERM "A1".
- IGNITION SWITCH TO "ACCY". IS TEST LIGHT "ON"?

YES

- IGNITION STILL "ON."
- RADIO ON WITH VOLUME AT A NORMAL LEVEL.
- CONNECT A FUSED JUMPER, WITH A 15 AMP FUSE, FROM BOSE RELAY CONN TERM "C1" TO TERM "A2". IS RADIO NOW WORKING WITH SOUND EMITTING FROM SPEAKERS?

YES

- CHECK FOR FOR POOR CONNECTIONS AT BOSE RELAY. IF OK, REPLACE RELAY.

NO

REPAIR OPEN IN CKT 40 BETWEEN S210 AND RELAY.

NO

REPAIR OPEN IN CKT 1051 BETWEEN S221 AND RELAY.

NO

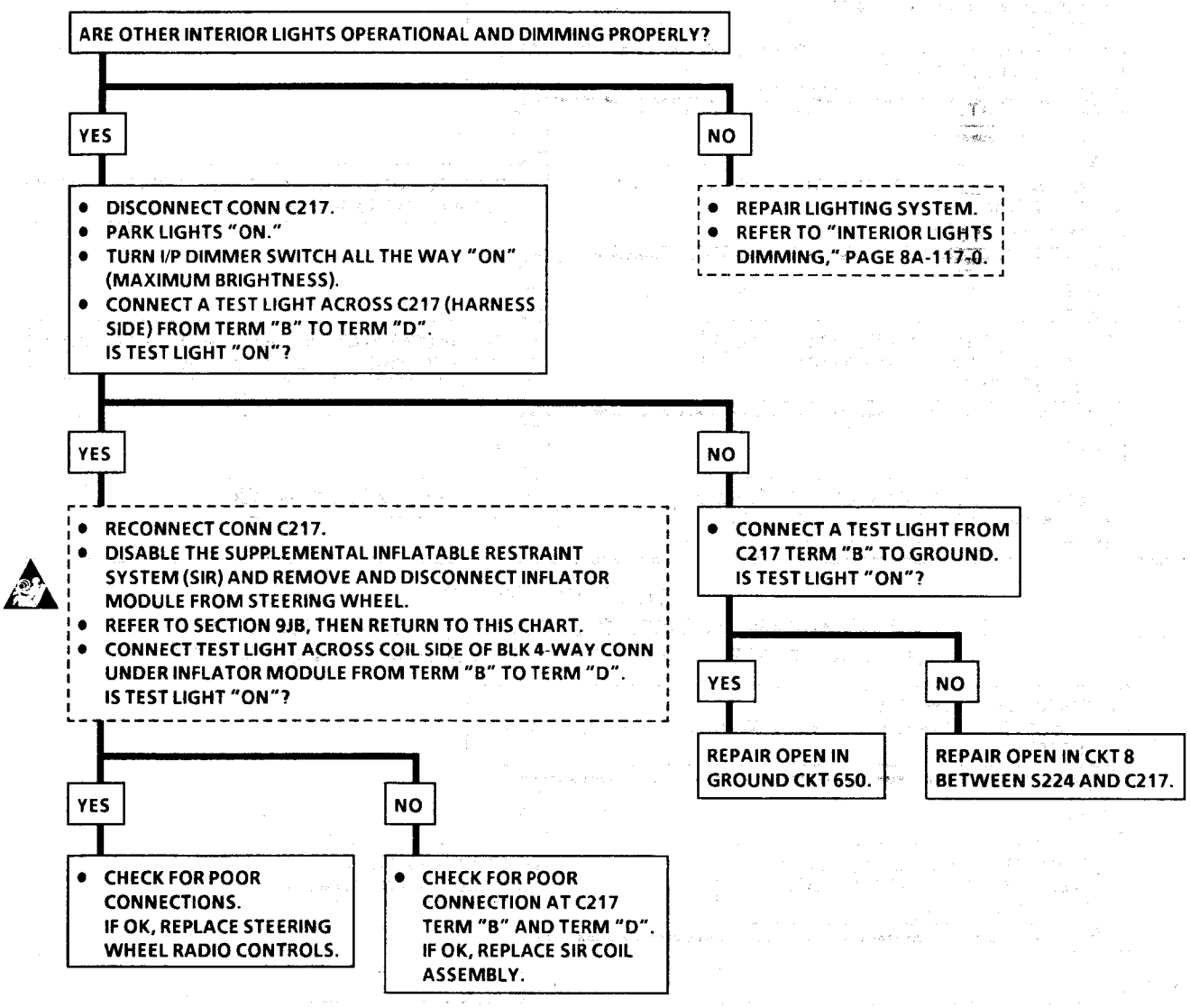
REPAIR OPEN IN CKT 314 OR POOR CONNECTION TO RADIO AT CONN C1 TERM "8".

NO

- CHECK FOR OPEN IN CKT 360 BETWEEN S308 AND RELAY.
- IF OK, CHECK FOR POOR GROUND SPLICE AT S221. IF ALL ARE OK, SERVICE RADIO.

RADIO

CHART #3 (PONTIAC)
ALL LIGHTS IN STEERING WHEEL CONTROL BUTTONS INOPERATIVE





SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

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.

CHART #4
POOR RECEPTION

IMPORTANT:
- THE SYSTEM PERFORMANCE CHECK SHOULD BE PERFORMED BEFORE CONTINUING WITH THIS CHART.
- IF SUBSTITUTING AN ANTENNA OR CABLE, BE SURE TO USE A BARBLESS TYPE CONNECTOR. INCORRECT CONNECTORS MAY CAUSE POOR RECEPTION OR DAMAGE TO CONNECTORS.

IS THERE A NOISE THAT ACCOMPANIES THE POOR RECEPTION COMPLAINT?

NO

- FM ONLY WEAK?
  AM AND FM OR AM ONLY WEAK?

AM AND FM OR AM ONLY WEAK

- SUBSTITUTE A KNOWN GOOD ANTENNA.
- KEY IN "ACCESSORY" POSITION.
- GROUND THE BASE OF THE ANTENNA TO THE VEHICLE BODY OR CHASSIS.
  RECEPTION STILL WEAK?

YES

- SUSPECT A VEHICLE COMPONENT IS CAUSING THE POOR RECEPTION.
- TRY AND ISOLATE A GROUP OF CIRCUITS, REMOVE FUSES, CIRCUIT BREAKERS OR FUSIBLE LINKS UNTIL THE RECEPTION IMPROVES.
  DID THE RECEPTION IMPROVE?

YES

TRY THE FOLLOWING FIXES:
- REINSTALL ALL FUSES, CIRCUIT BREAKERS OR FUSIBLE LINKS. DISCONNECT COMPONENTS ON THE SUSPECT CIRCUIT UNTIL THE RECEPTION IMPROVES.
- CHECK THE INTEGRITY OF THE COMPONENT WIRING, INCLUDING ANY COMPONENT GROUND WIRES. REROUTE ANY COMPONENT WIRING THAT IS ROUTED WITH THE AUDIO WIRING OR THE ANTENNA COAX.
- CHECK FOR SERVICE BULLETINS.
- SERVICE RADIO, REFER TO SECTION 9A.

NO

- SERVICE RADIO.
- REFER TO SECTION 9A.

NO

- REFER TO "CHECKING RADIO MAST ANTENNAS," PAGE 8A-150-29.
- REPAIR ANTENNA SYSTEM AS NECESSARY.

YES

REFER TO "RADIO NOISE," CHART #10 BEFORE CONTINUING WITH THIS CHART.

FM ONLY WEAK

- COMPARE FM RECEPTION TO ANOTHER VEHICLE WITH SIMILAR EQUIPMENT.
- TUNE TO A WEAK STATION.
  BOTH RADIOS RECEPTION SIMILAR?

YES

- WEAK FM RECEPTION MAY HAVE BEEN DUE TO SIGNAL STRENGTH, TERRAIN OF THE AREA, ELECTRICAL INTERFERENCE OR ATMOSPHERIC CONDITIONS.
- EXPLAIN TO THE CUSTOMER THAT THE RADIO RECEPTION IS NORMAL. REFER TO CUSTOMER TIPS TO HELP EXPLAIN NORMAL RECEPTION OR HOW TO ACHIEVE BETTER RECEPTION. IF POOR RECEPTION IS STILL PERCEIVED, CONTACT TECHNICAL ASSISTANCE.

NO

- CHECK FOR SERVICE BULLETINS.
- SERVICE RADIO.
- REFER TO SECTION 9A.

CHART #5
CASSETTE TAPE PLAYER INOPERATIVE

CHECK PLAYER FOR OBSTRUCTIONS.

NO OBSTRUCTION FOUND

- SUBSTITUTE A KNOWN GOOD CASSETTE TAPE.
  DOES CASSETTE PLAYER WORK?

YES

FAULT WAS WITH CASSETTE TAPE.

NO

- SERVICE RADIO.
- REFER TO SECTION 9A.

OBSTRUCTION FOUND

- REMOVE OBSTRUCTION.
- REFER TO SECTION 9A.

NOTICE: IMPROPER REMOVAL MAY DAMAGE CASSETTE TAPE PLAYER.

RADIO

CHART #6
NO SOUND FROM ONE SPEAKER (UQ0 OR U62)

- DISCONNECT SPEAKER.
- MEASURE AND NOTE RESISTANCE OF SPEAKER. IS RESISTANCE APPROXIMATELY 4 Ω (FRONT) OR 10 Ω (REAR)?

YES

- DISCONNECT THE COMBINED RADIO CONNECTORS C1 AND C3.
- CHECK THE SUSPECT CIRCUITS FOR A SHORT TO B + OR GROUND. ARE CIRCUITS OK?

YES

- RECONNECT SPEAKER CONNECTOR.
- MEASURE THE RESISTANCE AT THE RADIO CONNECTOR THROUGH THE SUSPECT CIRCUITS AND SPEAKER. IS THE RESISTANCE APPROXIMATELY THE SAME AS WHEN MEASURED RIGHT AT THE SPEAKER?

YES

- CHECK FOR POOR CONNECTION AT RADIO CONNECTOR. IF OK, SERVICE RADIO (IF AVAILABLE, TRY REPLACING SPEAKER WITH A KNOWN GOOD SPEAKER BEFORE SERVICING RADIO).

NO

REPAIR OPEN OR HIGH RESISTANCE IN SUSPECT CIRCUITS.

NO

REPAIR AS NECESSARY.

NO

REPLACE SPEAKER.

CHART #7 (CHEVY)
NO SOUND FROM ONE SPEAKER (DELCO-BOSE®)

- IGNITION "ON."
- RADIO "ON."
- CONNECT TEST LIGHT ACROSS SPEAKER/AMP CONNECTOR TERM "A" TO TERM "E" (BACKPROBE CONNECTOR FROM SPEAKER/AMP SIDE OF CONNECTOR). IS TEST LIGHT "ON"?

YES

- RADIO OFF.
- REMOVE AND DISCONNECT SPEAKER FROM SPEAKER/AMP HOUSING.
- MEASURE RESISTANCE OF SPEAKER. RESISTANCE BETWEEN .8 Ω AND 2 Ω?

YES

- CHECK AUDIO SIGNAL CIRCUITS FOR OPENS, POOR CONNECTIONS, OR SHORTS TO GROUND OR TO SHIELD. ARE THEY OK?

YES

REPLACE SPEAKER/AMP (FOR REAR SPEAKER/AMP IF STILL NOT OPERATIONAL AFTER REPLACEMENT, SERVICE RADIO).

NO

REPAIR OPEN OR POOR CONNECTION IN CKT 360 OR CKT 1051.

NO

REPLACE SPEAKER.

NO

REPAIR AS NECESSARY.

CHART #8 (PONTIAC)
NO SOUND FROM ONE SPEAKER (UW2)

- DISCONNECT SPEAKER.
- MEASURE AND NOTE RESISTANCE OF SPEAKER. IS RESISTANCE APPROXIMATELY EQUAL TO RESISTANCE SHOWN ON THE SCHEMATIC (3-10 Ω) FOR THAT SPEAKER? (FOR THE REAR QUARTER TWEETER AND MIDRANGE SPEAKERS WIRED TOGETHER AS PART OF THE UW2 SPEAKER PACKAGE, MEASURE ACROSS EACH SPEAKER COIL SEPARATELY.)

YES

- DISCONNECT THE COMBINED RADIO CONNECTORS C1 AND C3, OR THE AMPLIFIER CONNECTOR FOR THE SUBWOOFERS.
- CHECK THE SUSPECT CIRCUITS FOR A SHORT TO B + OR GROUND. ARE CIRCUITS OK?

YES

- RECONNECT SPEAKER CONNECTOR.
- MEASURE THE RESISTANCE AT THE RADIO CONNECTOR OR AMPLIFIER CONNECTOR THROUGH THE SUSPECT CIRCUITS AND SPEAKER. IS THE RESISTANCE APPROXIMATELY THE SAME AS WHEN MEASURED RIGHT AT THE SPEAKER?

YES

- CHECK FOR POOR CONNECTION AT RADIO OR AMPLIFIER CONNECTOR. IF OK, SERVICE RADIO OR AMPLIFIER (IF AVAILABLE, TRY REPLACING SPEAKER WITH A KNOWN GOOD SPEAKER BEFORE REPLACING RADIO OR AMPLIFIER).

NO

- CHECK FOR POOR CONNECTION AT SPEAKER. IF OK, REPAIR OPEN OR HIGH RESISTANCE IN SUSPECT CIRCUITS.

NO

REPAIR AS NECESSARY.

NO

REPLACE SPEAKER.

CHART #9 (PONTIAC)
BOTH SUBWOOFER SPEAKERS INOPERATIVE (UW2)

- DISCONNECT AMPLIFIER CONN.
- CONNECT A TEST LIGHT FROM CONN TERM "1" TO TERM "4". IS TEST LIGHT "ON"?

YES

- IGNITION "ON."
- RADIO "ON."
- USE A DVM TO CHECK VOLTAGE AT AMPLIFIER CONN TERM "8". IS VOLTAGE APPROX B + ?

YES

- IGNITION "OFF."
- RADIO "OFF."
- DISCONNECT RADIO CONNECTORS C1 AND C3.
- CHECK AUDIO SIGNAL CIRCUITS FOR OPENS BETWEEN AMPLIFIER AND RADIO OR FOR MAJOR WIRING DAMAGE.
- CHECK FOR POOR CONNECTION TO AMPLIFIER. IF OK, SERVICE AMPLIFIER.

NO

- REMOVE RADIO WHILE LEAVING CONNECTED.
- RADIO STILL "ON."
- DVM STILL SET ON VOLTAGE, BACKPROBE RADIO CONN C1 TERM "8". IS VOLTAGE APPROX B + ?

YES

REPAIR OPEN IN CKT 314.

NO

- CHECK FOR POOR CONNECTION AT C1 TERM "8" OR FOR SHORT TO GROUND IN CKT 314. IF OK, SERVICE RADIO.

NO

- CONNECT A TEST LIGHT FROM TERM "1" TO GROUND. IS TEST LIGHT "ON"?

YES

REPAIR OPEN IN GROUND CKT 650.

NO

REPAIR OPEN IN B + CKT 40.

RADIO

CHART #10
RADIO NOISE

IMPORTANT:

- IF THERE ARE AFTERMARKET COMPONENTS INSTALLED OR IN USE IN VEHICLE THAT MAY BE CAUSING COMPLAINT, REFER TO CHART #11 THEN RETURN TO THIS CHART.
- IF NOISE IS IN CONJUNCTION WITH POOR RECEPTION, GO TO CHART #4, "POOR RECEPTION."
- TO DISTINGUISH BETWEEN NOISE OR POOR RECEPTION, PERFORM THE SYSTEM PERFORMANCE CHECK ON PAGE 8A-150-12
- IF NOISE IS ONLY PRESENT WHEN A SWITCH IS ACTIVATED, REFER TO CHART #16, "SWITCH POP OR ACCESSORY NOISE," BEFORE PROCEEDING.
- CHECK FOR ANY TECHNICAL SERVICE BULLETINS ON RADIO NOISE.

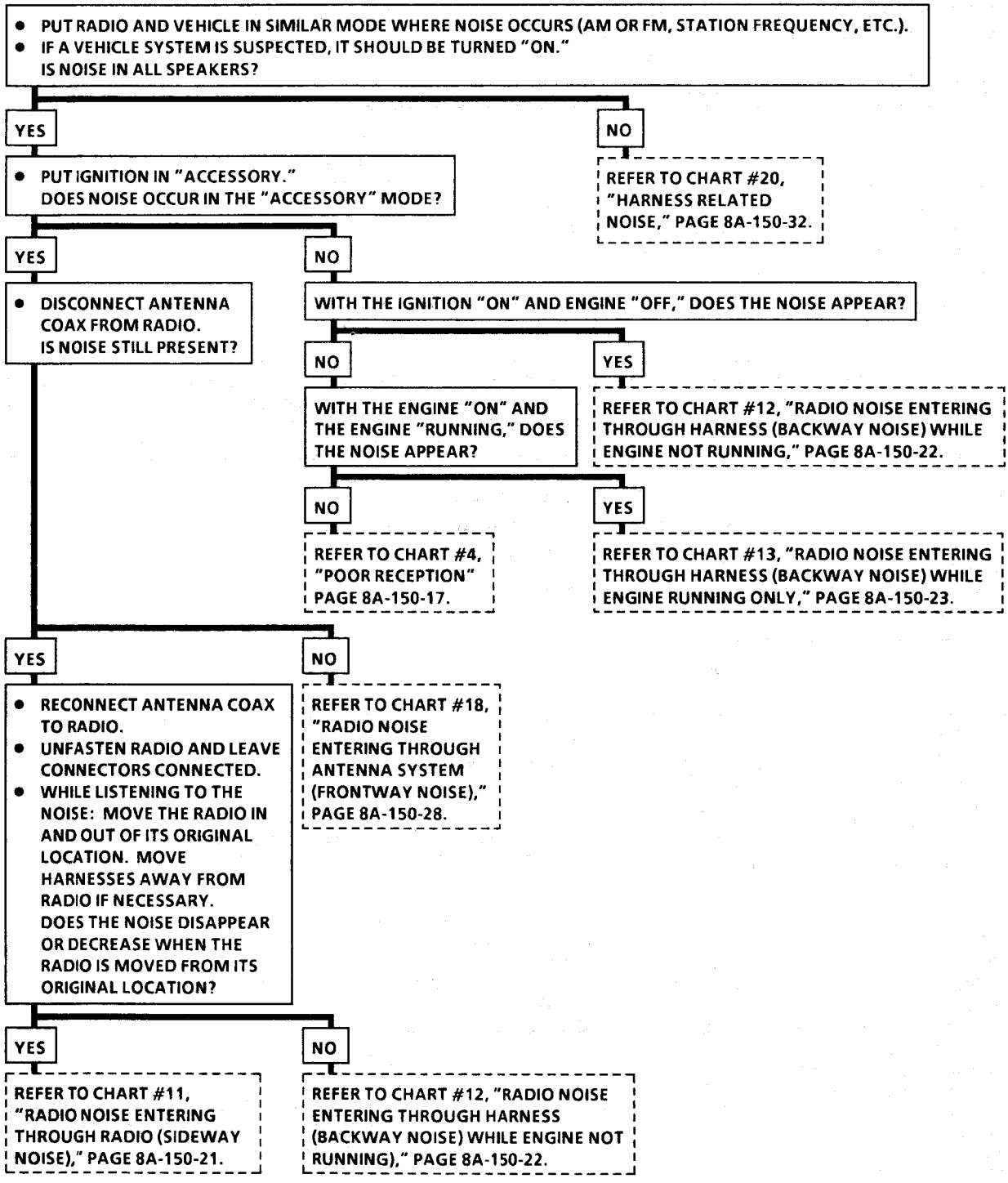
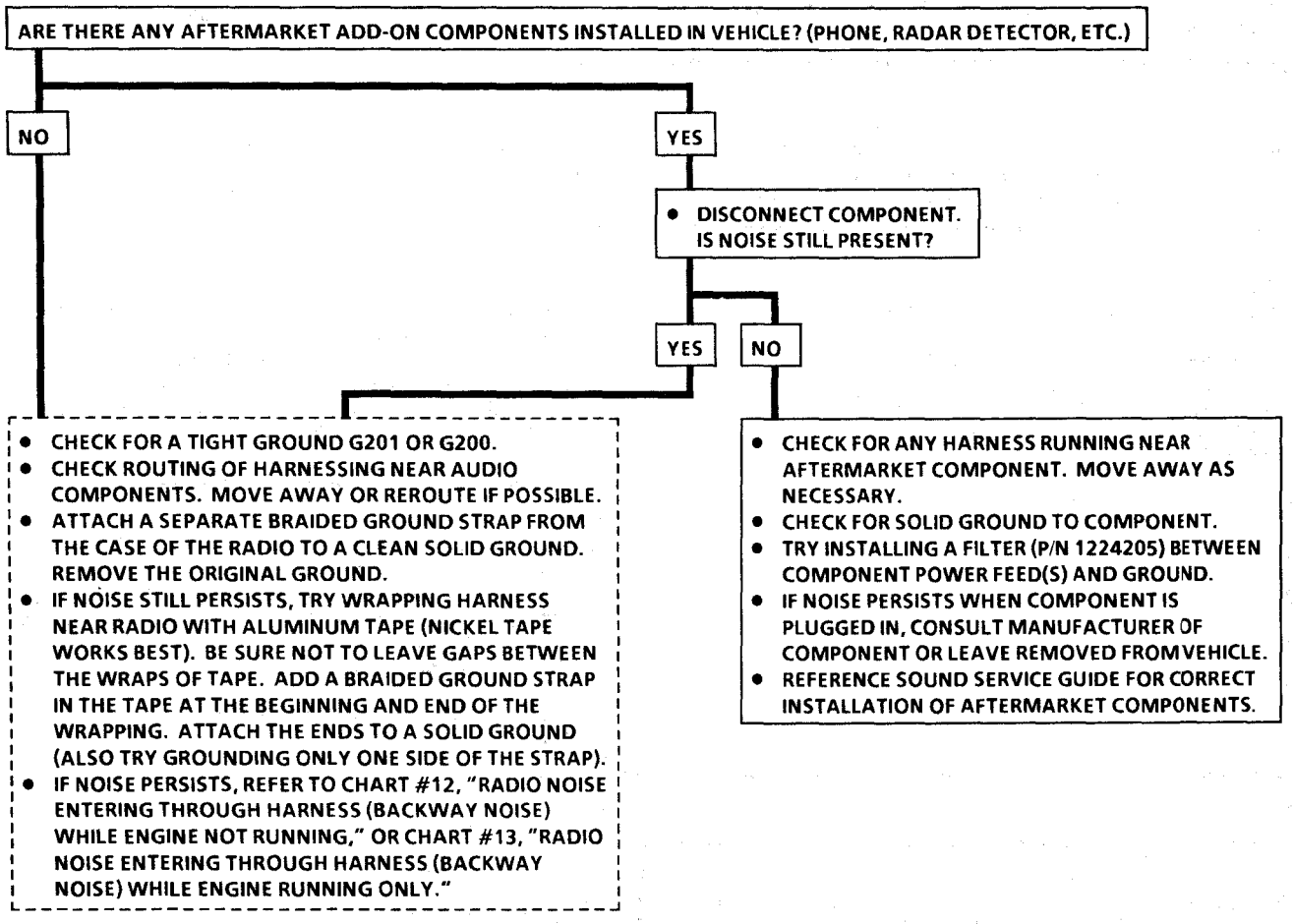


CHART #11
RADIO NOISE ENTERING THROUGH RADIO (SIDEWAY NOISE)

IMPORTANT:

- ONLY PERFORM THIS CHART IF SENT HERE FROM CHART #10, " RADIO NOISE."
- CHECK FOR TECHNICAL SERVICE BULLETINS RELATING TO RADIO NOISE BEFORE PROCEEDING.



RADIO

CHART #12

RADIO NOISE ENTERING THROUGH HARNESS (BACKWAY NOISE) WHILE ENGINE NOT RUNNING

IMPORTANT:

- BEFORE PROCEEDING:
  - CHECK FOR ANY TECHNICAL SERVICE BULLETINS ON RADIO NOISE.

- IGNITION IN POSITION WHERE COMPLAINT OCCURS.
- RADIO SET TO SIMILAR MODE WHERE COMPLAINT OCCURS.

IS NOISE STILL PRESENT?

YES

- REMOVE ONE FUSE AT A TIME FROM THE FUSE BLOCKS (DO NOT REMOVE THE "COURTESY" OR "RADIO" FUSES).

IS NOISE ELIMINATED WHEN A PARTICULAR FUSE IS REMOVED?

YES

- REINSTALL ALL FUSES, CIRCUIT BREAKERS, OR FUSIBLE LINKS.
- ONCE THE "NOISY" CIRCUIT HAS BEEN ISOLATED, IDENTIFY THE "NOISY" COMPONENT BY DISCONNECTING EACH COMPONENT ON THAT CIRCUIT UNTIL THE NOISE STOPS.

CAN NOISE BE STOPPED?

NO

TRY THE FOLLOWING FIXES:

- REMOVE THE RADIO GROUND WIRE AND ATTACH A BRAIDED GROUND STRAP TO THE RADIO CASE. CONNECT THE OTHER END TO A GOOD CHASSIS GROUND.
- REROUTE RADIO SYSTEM HARNESSES AWAY FROM OTHER VEHICLE WIRING AND ELECTRICAL COMPONENTS. REMOVE RADIO SYSTEM WIRING FROM HARNESSES WHEN BUNDLED WITH OTHER VEHICLE WIRING.
- ESTABLISH A NEW COMPONENT GROUND IF CURRENTLY SHARED WITH THE AUDIO SYSTEM. IF ROUTED TOGETHER WITH AUDIO SYSTEM WIRING, SEPARATE AND SHIELD THE COMPONENT WIRING. THE WIRING CAN BE SHIELDED BY WRAPPING IT WITH NICKEL TAPE. BE SURE NOT TO LEAVE GAPS BETWEEN THE WRAPS OF THE TAPE. GROUND EACH END OF THE SHIELD BY TAPING A BRAIDED GROUND STRAP TO IT AND ATTACHING THE STRAPS TO A GOOD CHASSIS GROUND.
- INSTALL A FILTER PACKAGE, 1224205, ONLY ON THE POWER FEEDS TO THE "NOISY" COMPONENT. INSTALL THE FILTER WITH THE BLACK LEAD AWAY FROM THE COMPONENT. ALSO TEST FOR BEST RESULTS WITH THE BLACK LEAD GROUNDED AND UNGROUNDED.
- FOR CDM RADIO'S, USE .47 CAPACITOR ON IGNITION LINE.
- REMOVE ANY RADIO INPUT LINE, SUCH AS: DATA LINE, DIM LINE, POWER ANTENNA LINE, STEERING WHEEL CONTROL LINE, AND CHECK IF NOISE DISAPPEARS. IF NOISE STILL PRESENT, CONTACT TECHNICAL ASSISTANCE.

NO

NOISE MAY HAVE BEEN DUE TO A POOR RECEPTION AREA.

NO

- INSTALL A FILTER (P/N 1224205) BETWEEN RADIO CONN C1 TERM "10" AND GROUND.
- IF NOISE IS STILL PRESENT, THEN ATTACH A BRAIDED GROUND STRAP FROM THE RADIO CHASSIS TO NEAREST GROUND POINT. REMOVE ORIGINAL RADIO GROUND FROM RADIO CONN C1 TERM "5".

IS NOISE ELIMINATED?

NO

- IF DELCO-BOSE® SYSTEM, REMOVE THE BOSE RELAY AND JUMPER BETWEEN TERMINALS "C1" AND "A2" OF RELAY CONNECTOR.
- IF NOISE IS ELIMINATED, REPLACE RELAY.
- IF NOISE IS NOT ELIMINATED, SUSPECT THE RADIO.

YES

NO FURTHER DIAGNOSIS IS NECESSARY.

YES

IS COMPONENT OPERATING NORMALLY?

YES

- IF COMPONENT CAN BE NOISE FILTERED, REFER TO NOISE SUPPRESSION COMPONENTS LIST AND SUPPRESS AS NECESSARY.

IS NOISE ELIMINATED?

NO

- CHECK WIRING AND GROUND TO THE COMPONENT. IF OK, REPLACE COMPONENT.

NO

YES

NO FURTHER ACTION REQUIRED.

CHART #13
RADIO NOISE ENTERING THROUGH HARNESS (BACKWAY NOISE) WHILE ENGINE RUNNING ONLY

IMPORTANT:

- BEFORE PROCEEDING:
  - SERVICE ANY KNOWN DRIVEABILITY PROBLEMS.
  - CHECK FOR ANY TECHNICAL SERVICE BULLETINS ON THIS TYPE OF RADIO NOISE.

- SET RADIO TO MODES WHERE NOISE OCCURS.
- DISCONNECT GENERATOR 4-WAY CONNECTOR.
- START ENGINE.

IS NOISE STILL PRESENT?

YES

- STOP ENGINE AND REINSTALL GENERATOR CONNECTOR.
- PERFORM CHART #14, "IGNITION NOISE."

NO

- STOP ENGINE.
- INSTALL A GENERATOR CAPACITOR (P/N 1227895) TO GENERATOR. CAPACITOR SHOULD BE INSTALLED IN PARALLEL BETWEEN THE WIRE ATTACHED ON OUTPUT STUD IN BACK OF THE GENERATOR AND NEAREST GOOD GROUND.
- REINSTALL 4-WAY CONNECTOR AND RESTART ENGINE. IF NOISE PERSISTS, PERFORM CHART #15, "GENERATOR WHINE (VARIES WITH ENGINE SPEED)."

RADIO

CHART #14
IGNITION NOISE

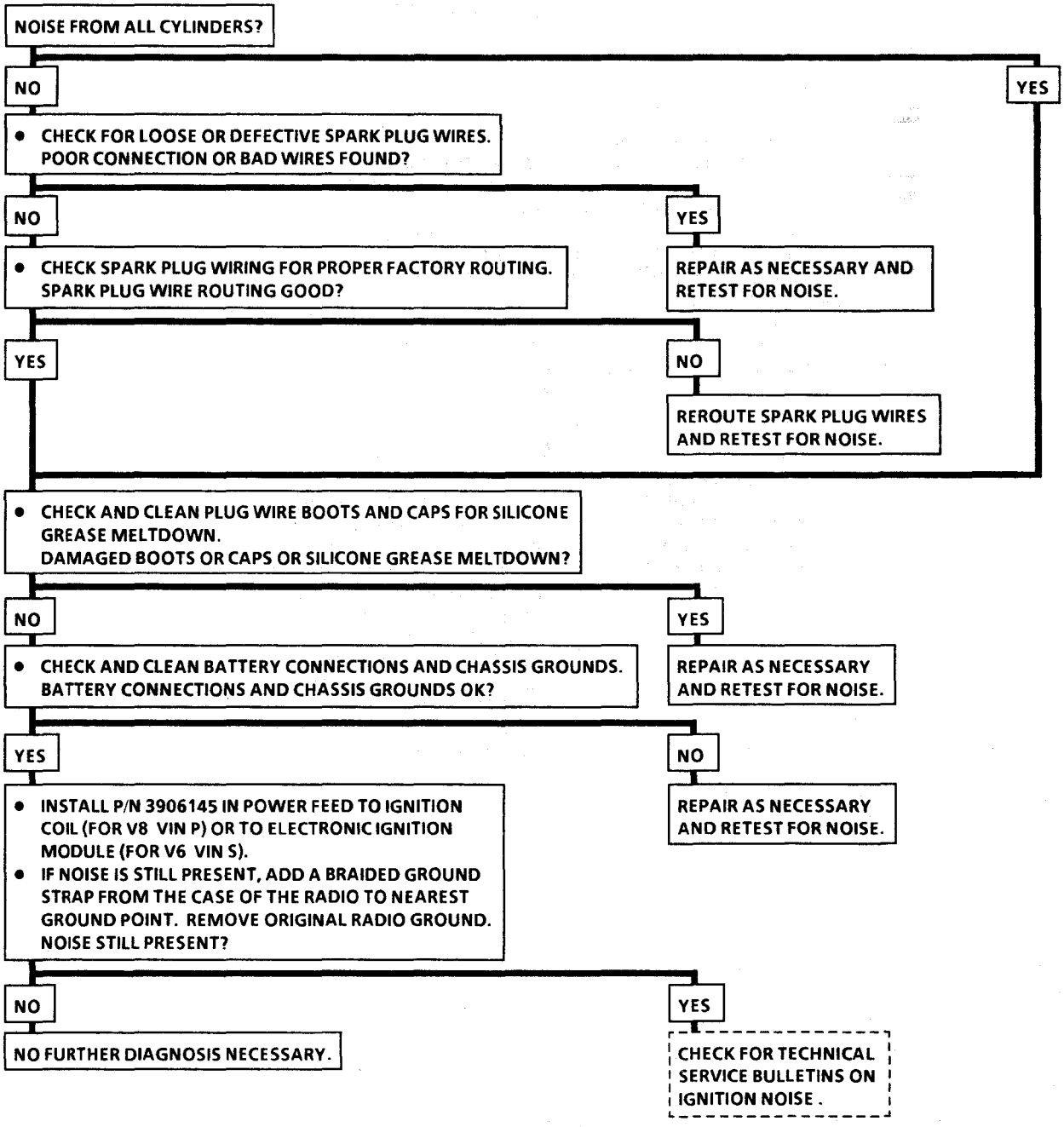


CHART #15
GENERATOR WHINE
(VARIES WITH ENGINE SPEED)

- IGNITION "OFF."
- DISCONNECT GENERATOR COMPLETELY.
- START ENGINE.
  NOISE STILL PRESENT?

NO

- RECONNECT GENERATOR.
- START ENGINE.
  NOISE PRESENT?

YES

- ALL ACCESSORIES TO "OFF."
- IGNITION SWITCH TO "OFF."
- USING DIGITAL MULTIMETER J 39200, MEASURE VOLTAGE FROM NEGATIVE BATTERY TERMINAL TO GENERATOR CASE.

GREATER THAN 0.1V DC

- CHECK GROUND TERM ON BATTERY.
- CHECK FOR COATED MOUNTING BOLTS ON GENERATOR BRACKET.
- RUN A TEMPORARY SEPARATE BRAIDED GROUND STRAP FROM GENERATOR BODY TO A SOLID GROUND POINT.
  NOISE STILL PRESENT?

YES

- INSTALL BRAIDED GROUND STRAP FROM RADIO RECEIVER CASE TO NEAREST GROUND POINT, REMOVE ORIGINAL RADIO GROUND.
  NOISE STILL PRESENT?

YES

- TRY THE FOLLOWING FIXES:
- INSTALL A FILTER (P/N 1224205) IN THE BATTERY FEED TO THE RADIO AT CONN C1 TERM "10".
- TRY INSTALLING THE FILTER WITH THE FOLLOWING VARIATIONS IF NOISE IS NOT ELIMINATED.
  - INSTALL THE FILTER WITH THE SINGLE WIRE SIDE TOWARD THE RADIO AND THE GROUND WIRE ATTACHED TO A GOOD GROUND.
  - REMOVE GROUND TO THE FILTER.
  - REVERSE FILTER TO HAVE TWO WIRE SIDE TOWARD RADIO WITH GROUND WIRE ATTACHED.
  - REMOVE GROUND TO THE FILTER.
- IF NOISE IS STILL PRESENT, INSTALL ANOTHER FILTER (P/N 1224205) IN THE IGNITION FEED TO THE RADIO AT CONN C1 TERM "9". INSTALL USING THE SAME VARIATIONS AS THE FIRST FILTER. IF THE INSTALLATION OF THIS FILTER CAUSES TURN "ON" OR TURN "OFF" DELAYS OR OTHER NOTICEABLE PERFORMANCE PROBLEMS, REMOVE IT AND INSTALL A .47 μ_f CAP TO GROUND IN ITS PLACE.
- IF NOISE IS STILL PRESENT, CHECK THE CHARGING SYSTEM. REFER TO SECTION 6D3.
- IF THE CHARGING SYSTEM IS FUNCTIONING NORMALLY, CHECK FOR TECHNICAL SERVICE BULLETINS ON GENERATOR WHINE.
- CALL TECHNICAL ASSISTANCE.
- REMOVE ANY UNNEEDED FILTERS AFTER REPAIR, BEFORE REASSEMBLING VEHICLE.

NO

- IF ANY OTHER ELECTRICAL ACCESSORIES CAUSE RADIO NOISE, REMOVE THE BRAIDED GROUND STRAP AND ATTACH THE ORIGINAL RADIO GROUND TO THE STEERING COLUMN OR NEAREST GROUND POINT.
- RETEST FOR NOISE.

YES

REFER TO CHART #10, "RADIO NOISE," PAGE 8A-150-20.

NO

- CHECK FOR FAULTY MOUNTING OF GENERATOR TO ENGINE.
- MAKE SURE ALL GROUND STRAPS BETWEEN ENGINE AND FRAME ARE CLEAN AND TIGHT.

LESS THAN 0.1V DC

RADIO

CHART #16
SWITCH POP OR ACCESSORY NOISE

(FOR NOISE RELATED TO THE ACTIVATION OR OPERATION OF A SWITCH OR ACCESSORY. FOR EXAMPLE, A POP WHEN THE BRAKES ARE APPLIED OR A HUM WHEN THE A/C IS USED.)

DOES NOISE OCCUR ONLY WHEN TURNING A SWITCH ON OR OFF?

NO

- DETERMINE WHICH ACCESSORY IS CAUSING THE NOISE. IS A MOTOR NOISE SUSPECTED?

NO

TRY THESE REPAIRS:
- CHECK THE GROUND CIRCUIT FOR THE SUSPECT MODULE OR COMPONENT.
- REROUTE ANY AUDIO HARNESSES OR THE ANTENNA COAX AWAY FROM THE MODULE OR COMPONENT.
- INSTALL A FILTER PACKAGE 1224205 ONLY IN THE POWER FEED TO THE MODULE OR COMPONENT. INSTALL THE FILTER WITH THE BLACK LEAD AWAY FROM THE MODULE OR COMPONENT. ALSO, TEST FOR THE BEST RESULTS WITH THE BLACK LEAD GROUNDED AND UNGROUNDED.
- INSTALL A .47 µf CAPACITOR IN THE B + AND IGNITION FEEDS TO THE RADIO.
- IF NOISE IS STILL PRESENT TRY A KNOWN GOOD MODULE OR COMPONENT.
- IF NOISE STILL PERSISTS, REFER TO "BACKWAY/ELECTRICAL NOISE" CHARTS, THEN IF NECESSARY CALL TECHNICAL ASSISTANCE.

YES

TRY THESE REPAIRS:
- CHECK FOR A GOOD GROUND TO THE MOTOR.
- INSTALL A CAPACITOR (P/N 3906145) AT THE POWER FEED TO THE MOTOR TO A KNOWN GOOD GROUND.

IMPORTANT:

FOR A BLOWER MOTOR NOISE INSTALL A "FEED THROUGH" CAPACITOR (P/N 3906187) IN THE POWER FEED TO THE BLOWER MOTOR.

- TRY INSTALLING A .47 µf CAPACITOR (IN PARALLEL TO GROUND) AT THE B + AND IGNITION FEEDS TO THE RADIO.
- IF NOISE IS STILL PRESENT, TRY A KNOWN GOOD MOTOR.
- IF NOISE STILL PERSISTS, REFER TO "BACKWAY/ELECTRICAL NOISE" CHARTS, THEN IF NECESSARY CALL TECHNICAL ASSISTANCE.

YES

- DETERMINE WHICH SWITCH IS CAUSING A POP WHEN ACTIVATED.
- DETERMINE SWITCH CONFIGURATION, SEE FIGURE 1 OR FIGURE 2.
- INSTALL CAPACITOR (P/N 1227894) AT LOCATION ①. POP STILL PRESENT?

YES

- INSTALL CAPACITOR (P/N 1227894) AT LOCATION ②. POP STILL PRESENT?

YES

- INSTALL CAPACITOR (P/N 1227894) AT LOCATION ③. POP STILL PRESENT?

YES

CHECK FOR TECHNICAL SERVICE BULLETINS ON SWITCH POP.

NO

RETEST FOR NOISE.

NO

NO

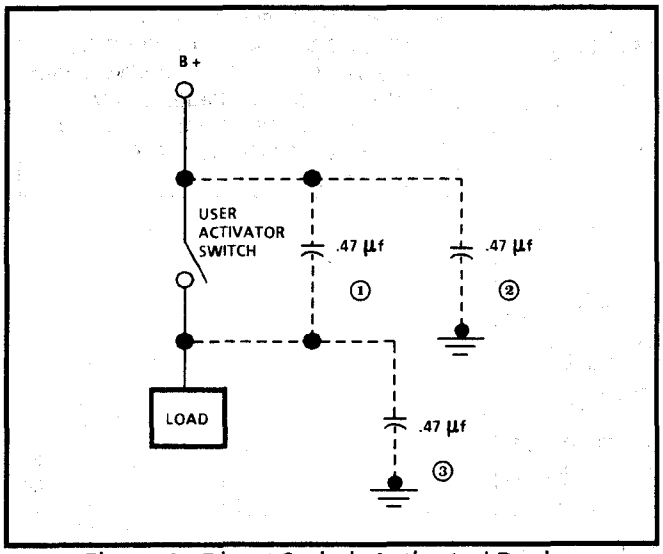


Figure 1 - Direct Switch Activated Device

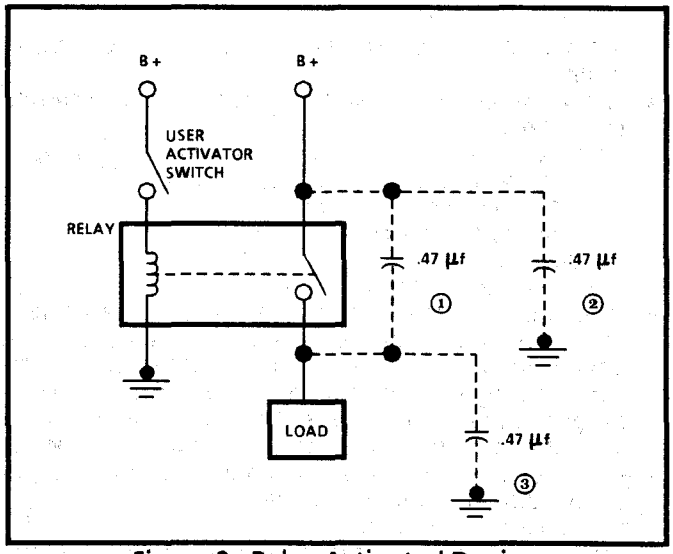


Figure 2 - Relay Activated Device

CHART #17
ALL STEERING WHEEL RADIO CONTROLS INOPERATIVE (OR OPERATE ERRATICALLY)

IMPORTANT:

- AN ADDITIONAL RADIO INPUT TEST CAN BE FOUND ON PAGE 8A-150-31.

ARE ALL RADIO FUNCTIONS OPERATING NORMALLY AT RADIO?

YES

- IGNITION "ON."
- RADIO "ON."
- BACKPROBE FROM CONN C217 TERM "C" TO GROUND USING J 39200 DVM SET TO VOLTAGE.
- MEASURE AND NOTE THE VOLTAGE WHILE PRESSING EACH OF THE STEERING WHEEL RADIO CONTROL BUTTONS.
- COMPARE THE VOLTAGES TO THE CHART ON PAGE 8A-150-1.
  DO THE VOLTAGES CHECK OUT OK?

NO

WAS VOLTAGE B + WHEN ANY BUTTON WAS PRESSED?

NO

- DISCONNECT RADIO CONN C4.
- DISCONNECT CONN C217.
- CHECK CKT 1796 FOR SHORT TO GROUND.
  IS CIRCUIT OK?

YES

- CONNECT TEST LIGHT FROM C217 TERM "A" (HARNESS SIDE) TO GROUND.
  IS TEST LIGHT "ON"?

YES

- DISABLE THE SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) SYSTEM AND REMOVE AND DISCONNECT INFLATOR MODULE FROM STEERING WHEEL (REFER TO SECTION 9JB, THEN RETURN TO THIS CHART).
- CHECK CKTS 43 AND 1796 OF THE SIR COIL ASSEMBLY FOR OPENS OR SHORTS TO GROUND.
  IF OK, REPLACE STEERING WHEEL CONTROLS.
- IF STILL INOPERATIVE, SERVICE RADIO.
- REFER TO SECTION 9A.

NO

- CHECK FOR OPEN IN CKT 43 TO C217 TERM "A", OR FOR OPEN FUSE 17.
- IF FUSE 17 IS OPEN, CHECK FOR SHORT TO GROUND THROUGH CKT 43.

NO

REPAIR AS NECESSARY.

YES

- SERVICE RADIO.
- REFER TO SECTION 9A.

NO

- CHECK FOR DIRECT SHORT TO B + IN CKT 1796 OR IN STEERING WHEEL RADIO CONTROLS.
- REPAIR AS NECESSARY.

YES

- CHECK FOR OPEN IN CKT 1796 BETWEEN C217 AND RADIO, OR FOR POOR CONNECTION AT RADIO.
  IF OK, SERVICE RADIO.

NO

- SERVICE RADIO.
- REFER TO SECTION 9A.

DISCONNECT RADIO CONN C4 ONLY.
RADIO "ON."
ARE ALL RADIO FUNCTIONS OPERATIONAL AT RADIO?

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.

SEE PAGE 8A-3-0 FOR PROPER HANDLING PROCEDURES

RADIO

CHART #18
RADIO NOISE ENTERING THROUGH ANTENNA SYSTEM (FRONTWAY NOISE)

IMPORTANT:

- IF SUBSTITUTING AN ANTENNA OR CABLE, BE SURE TO USE A BARBLESS TYPE CONNECTOR. INCORRECT CONNECTORS MAY CAUSE POOR RECEPTION OR DAMAGE TO CONNECTORS.

- SUBSTITUTE A KNOWN GOOD ANTENNA WHILE USING ORIGINAL CABLE.
- GROUND BASE OF ANTENNA TO VEHICLE BODY OR CHASSIS.
  IS NOISE STILL PRESENT?

YES

- SUBSTITUTE A KNOWN GOOD CABLE.
  IS NOISE STILL PRESENT?

IMPORTANT:

- LEAD-IN CABLE MUST HAVE A BARBLESS TYPE CONNECTION AT RADIO.

NO

- CHECK ALL COAX CONNECTORS FOR CORROSION AND TIGHTNESS.
- ORIGINAL ANTENNA CABLE WAS DEFECTIVE OR MAY HAVE BEEN ROUTED THROUGH AN AREA THAT WAS PICKING UP NOISE. TRY MOVING THE COAX AWAY FROM OTHER ELECTRICAL COMPONENTS AND THEIR WIRING.
- IF NOISE COMES BACK WHEN NEW CABLE IS INSTALLED, NARROW IN ON NOISY AREA AND SHIELD CABLE WITH ALUMINUM TAPE. A NOISE SNIFFER SHOWN ON PAGE 8A-150-30 IS HELPFUL (SEE "CHECKING LEAD-IN CABLES" BEFORE REPLACING CABLE).
- ALSO TRY: REMOVING THE RECEIVER HARNESS GROUND WIRE AND ATTACHING A BRAIDED GROUND STRAP TO THE RADIO CASE. CONNECT THE OTHER END OF THE STRAP TO A GOOD CHASSIS GROUND.
- IF NOISE PERSISTS, REFER TO CHART #12, "RADIO NOISE ENTERING THROUGH HARNESS (BACKWAY NOISE) WHILE ENGINE NOT RUNNING."

YES

- RETEST FOR A DIFFERENT CAUSE OF NOISE, SEE CHART #10, "RADIO NOISE," PAGE 8A-150-20. IF NO OTHER NOISE IS FOUND, SERVICE RADIO.

NO

- MAKE SURE ANTENNA WAS PROPERLY MOUNTED AND GROUNDED AND ALL MOUNTING SCREWS ARE CLEAN AND TIGHT. IF OK, REPLACE ANTENNA.

CHECKING RADIO MAST ANTENNAS

Unplug antenna lead-in at back of Radio and plug a test antenna into Radio. Make sure test antenna base is grounded to the vehicle chassis. Do not touch the mast. Check Radio reception in an area away from tall buildings, metal structures, power lines, fluorescent lighting and power tools. Tune to high and low ends of the dial on both AM and FM, checking weak and strong station reception. See "System Performance Check," page 8A-150-12. If reception is OK, the problem exists with antenna and/or its lead-in cable. If reception is still poor with test antenna, check for aftermarket equipment that may be causing complaint. If OK, service Radio.

CHECKING LEAD-IN CABLES

In case of continued reception or noise complaints, always check the lead-in with a digital multimeter, see Figure 3 and Table 1. If long jumper leads are not available, check center conductor continuity by jumping the antenna mast to ground and checking for continuity from the center conductor at Radio to ground.

When checking resistance, cautiously wiggle the lead-in tip and cable. Consistent readings from Table 1 should always be obtained. If not, some portion of the lead-in is intermittent and lead-in should be replaced. Also try:

1. Running a braided ground strap to the antenna lead-in.
2. Changing the antenna lead-in.
3. Disconnecting the lead-in to check resistance.

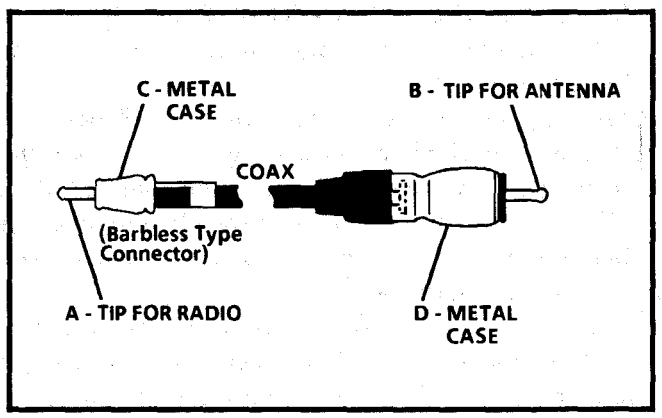


Figure 3 - Checking Lead-in Cables

Table 1 - Lead-in Cable Resistance Values

Digital Multimeter probes at points:	Resistance measured in ohms
A and B	less than 3.5
C and D	less than 0.2
A and D	infinite
C and B	infinite
A and C	infinite
B and D	infinite

RADIO

USE AND CONSTRUCTION OF A NOISE "SNIFFER"

The antenna sniffer can be used along with the vehicle's Radio to locate "hot spots" which are generating Radio noise interference. These "hot spots" can be found in the harnesses, in the upper part of the dash or even between the hood and windshield.

The sniffer can be made from an old piece of antenna lead-in from a mast or power antenna. The longer the lead-in the better.

Make the antenna sniffer as shown in Figure 4. The 2" section with the black coating and braided shield stripped back becomes the antenna when the sniffer is plugged into the Radio's antenna socket. It can then be used to probe and search out "hot spots."

To use the noise sniffer:

1. While listening to the complaint noise, disconnect the antenna and plug the sniffer into the antenna socket.
2. Turn the Radio volume up.
3. Search for the noise source, keeping fingers off the 2" probe.

When checking for noise on a wire, the best results will be achieved when the sniffer is placed parallel to the wire, see Figure 5.

USE AND CONSTRUCTION OF A HAND HELD NOISE "SNIFFER"

A noise sniffer can be built from a personal AM/FM stereo cassette player.

EQUIPMENT

- Personal AM/FM stereo cassette tape player with headphones
- Four feet of 75 ohm antenna coax
- One-half inch heat shrink tube the same diameter as the coax
- A drill and bit the same diameter as the coax
- Book of matches or hair dryer
- Soldering iron and solder

INSTRUCTION FOR THE PERSONAL TYPE RADIO

1. Strip 1/4" off both ends of the coax.
2. Place the heat shrink over one end of the bare wire. Fasten the heat shrink to the wire by heating it (a match or a hair dryer).
3. Disassemble the Radio and locate the antenna.
4. Disconnect the antenna and fasten the bare end of the coax to the antenna mount. A soldering iron may be needed.
5. Feed the coax to the exterior of the Radio. Drill a feed hole if necessary.
6. Reassemble the Radio.

To use the Radio sniffer, turn the Radio on AM and select an appropriate station.

INSTRUCTION FOR THE PERSONAL TYPE CASSETTE

1. Strip 1/4" off each end of coax.
2. Disassemble the cassette deck and locate the tape head.
3. Remove the head and mount one end of the coax to this point. A soldering iron may be needed.
4. Feed the coax to the exterior of the cassette deck. Drill a feed hole if necessary.
5. Reassemble the cassette deck.
6. Feed the heat shrink tube through the other end of the coax. DO NOT FASTEN THE HEAT SHRINK.
7. Fasten the head to the open end of the coax. Use a soldering iron.
8. Cover the exposed wires between the head and the wire by positioning the heat shrink tube and heating it.

To use the cassette sniffer, push "play." It will work on the same idea as a metal detector.

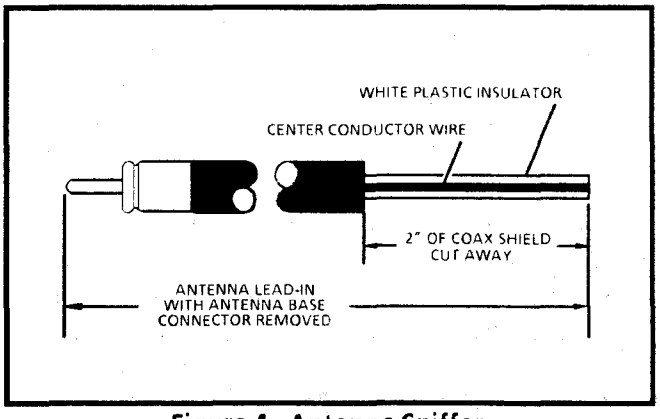


Figure 4 - Antenna Sniffer

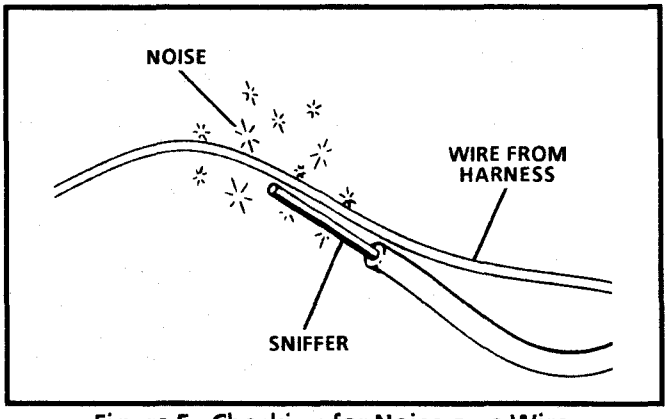


Figure 5 - Checking for Noise on a Wire

CHART #19
ONE OR MORE STEERING WHEEL RADIO CONTROLS INOPERATIVE (SOME CONTROLS ARE OPERATIONAL)

IMPORTANT:

- ASSUME ALL FUNCTIONS OPERATE NORMALLY AT RADIO. IF THEY DO NOT OPERATE NORMALLY, SERVICE RADIO. REFER TO SECTION 9A.

- IGNITION "ON."
- RADIO "ON."
- BACKPROBE FROM CONN C217 TERM "C" TO GROUND USING J 39200 DVM SET TO VOLTAGE.
- MEASURE AND NOTE THE VOLTAGE WHILE PRESSING EACH OF THE STEERING WHEEL RADIO CONTROL BUTTONS.
- COMPARE THE VOLTAGES TO THE CHART ON PAGE 8A-150-1. DO THE VOLTAGES CHECK OUT OK?

YES

- SERVICE RADIO.
- REFER TO SECTION 9A.

NO

REPLACE STEERING WHEEL CONTROLS.

RADIO INPUT TEST

1. DISCONNECT CONN C217.
2. IGNITION "ON."
3. RADIO "ON."
4. USING SIGNAL GENERATOR I/P TESTER J 33431-B, SIMULATE THE RESISTANCES EQUAL TO THE VALUES IN THE STEERING WHEEL RADIO CONTROLS THAT DO NOT OPERATE (SEE RESISTANCE CHART).
5. MOMENTARILY CONNECT THE SIMULATED RESISTANCES FROM B + TO C217 TERM "C" (RADIO SIDE).

RESISTANCE CHART

SIMULATED BUTTON	RESISTANCE FROM TERM "A" TO TERM "C" IN OHMS.
PRE-SET	1270
VOLUME (UP)	1564
VOLUME (DOWN)	1912
PWR	2387
AM/FM	3102
SEEK (UP)	4282
SEEK (DOWN)	6652
RCL	13632

RADIO

CHART #20
HARNESS RELATED NOISE

- WITH THE RADIO OFF, INTERCHANGE THE AUDIO LEADS OF A NON-COMPLAINT SPEAKER WITH THE AUDIO LEADS OF A COMPLAINT SPEAKER AT THE RECEIVER. TURN THE RADIO ON. DOES THE ORIGINAL COMPLAINT SPEAKER NOW PERFORM NORMALLY?

NO

- INSTALL TEMPORARY AUDIO LEADS BETWEEN THE RECEIVER AND THE COMPLAINT SPEAKER(S). DOES THIS ELIMINATE THE NOISE?

NO

- INSURE THAT THE AUDIO LEADS ARE MAKING GOOD CONTACT WITH THE SPEAKER.
- ALSO, VERIFY THAT THE NOISE IS NOT A SPEAKER NOISE BY INTERCHANGING A COMPLAINT SPEAKER WITH A NON-COMPLAINT SPEAKER.
- IF THE SPEAKER IS GOOD, CALL TECHNICAL ASSISTANCE.

YES

- INSTALL NEW AUDIO LEADS.
- TRY TO ROUTE THE NEW LEADS BY THEMSELVES SO THAT NO INTERFERENCE CAN BE COUPLED ON TO THEM.

YES

- VERIFY THAT THE AUDIO LEADS WERE MAKING GOOD CONTACT WITH THE RECEIVER, REPAIR IF NECESSARY.
- IF NOISE IS RELATED TO THE ACTIVATION OR OPERATION OF A SWITCH OR ACCESSORY, REFER TO CHART #16, "SWITCH POP OR ACCESSORY NOISE," PAGE 8A-150-26.
  IF NOT, SERVICE RADIO.

NOISE ENTRY

FRONTWAY NOISE

Any noise which is brought into the Radio system through the antenna. (Noise can be eliminated by unplugging the antenna from the back of the Radio.)

Some Causes:

- Poor grounding or missing grounds of: the antenna base; the receiver; some electrical components; body parts.
- Defective or marginal components: relays, solenoid, switches and electric motors.
- Something near the antenna coax or corrosion at antenna coax connections.

Solutions:

- Always verify grounding first. If more than one component interferes, a poor ground probably exists.
- Pinpoint the source: suppress, shield or replace.
- Reroute noisy wires if necessary.

SIDEWAY NOISE

Any noise that enters the audio component by a radiated field through the component case. (Noise is reduced or eliminated when slowly removing the audio component from its fastened location.)

Some Causes:

Noisy wires or hoses behind or on top of the Radio or antenna coax lead-in.

Solutions:

- Suppress or shield the noisy wire or hose or reroute it.
- Shield the Radio case.
- Use aluminum or nickel tape and ground the tape whenever shielding. (Nickel tape will also stop magnetic interference, aluminum will not.)

BACKWAY NOISE

Noise that enters the audio component through its wiring harness, most commonly detected in the power and ground circuits. (Noise that can be heard at minimum volume and not frontway or sideway noise.)

Some Causes:

- Poor grounding of the Radio or of unsuppressed electrical components.
- Poorly routed wires or
- Defective suppression of electrical components.

Solutions:

- Suppression (capacitors, etc.) preferably can be installed at the noise source, then at the Radio or both.
- Switch pops are backway noise and best suppressed using capacitors.
- Squeals and buzzes are best suppressed using filter or generator whine packages.

HARNESS RELATED NOISE

Noise induced into speaker wires or any low level audio signal wire used as an interconnect between the various audio components.

Some Causes:

- Broken, pinched or shorted audio wires.
- Screw through wire harness.
- Faulty shield wires.

Solutions:

- Localize problem to left, right side, front or back speaker location. Preferably done by using the fade and balance controls; if not, try reversing the speaker leads at the Radio connector.
- Check wiring for defects, breaks, pinches or shorts.
- Check wiring near known noisy components.

RADIO

CUSTOMER'S TIPS

HOW TO ENJOY FM STEREO

A. Select Stations Within Range – The best FM fidelity will be obtained from stations within a 10-40 mile range. Beyond that "noise" or "flutter" may begin to appear due to the "line of sight" range limitations of FM signals.

SOLUTION: Reduce treble response by moving the treble control down (or to the left) in fringe areas. On EQ Radios, slowly slide the 10K control down.

B. Realize Tall Structures Can Interfere – Tall buildings or hills may cause "shadows" or cancellation of FM signals (this is similar to the "ghost" or "flutter" effect seen on television sometimes when airplanes are flying in the vicinity). It will sound like a "pop" or momentary "hiss."

SOLUTION: Reduce the treble or 10K setting to a lower volume.

C. Interference From Another Station – Although the circuits in Delco receivers are the most advanced available, there are rare instances where a station being listened to will be interfered with by another station. This only happens when the stations are on almost the same frequency and certain geographical criteria are present.

SOLUTION: Select another station or switch to tape.

HOW TO ENJOY AM

Reception Characteristics

AM stereo does not have the flutter characteristics of FM (caused by tall buildings, hills, etc.). However, it is subject to interference from power lines, neon signs, atmospheric conditions, and unwanted stations. The stereo light will only come on when tuned to a clear, noise-free station broadcasting C-QUAM AM Stereo.

Finding Stereo Stations

1. Depress AM Stereo-Mono button to inward position.
2. Consult directory, or use Seek or Scan.
3. Watch for stereo light to come on, indicating you are tuned to stereo.

Important:

- After tuning to a stereo station, there is a one or two second delay before the stereo light comes on.

WAYS TO REDUCE NOISE

1. Press AM Stereo button to switch to mono.
2. Move treble control down.
3. Tune to a stronger station.

AM STEREO

The AM Stereo-Mono button has no effect on FM reception.

Most AM Stereo stations broadcast in C-Quam, but some do not. Check with your local station to determine compatibility in your area. **C-Quam** is a registered trademark of Motorola Inc.

CIRCUIT OPERATION

Important:

- For Delco-Loc II Anti-theft Feature (available only on Chevy U1T Disk Radio option) or for Radio Features and Controls Operation, refer to SECTION 9A.
- For Theft-Loc Anti-theft Feature (available on all Pontiac Radio Options UT6, UP3 and UN6) or Radio Features and Controls Operation, refer to SECTION 9A.

The Radio receives battery voltage at all times on CKT 40 from Fuse 8 to keep clock and preset station memory alive when the Ignition is "OFF." With the Ignition Switch in "ACCY", "RUN" or "RETAINED ACCESSORY POWER (RAP)," voltage is applied to CKT 43 from Fuse 17 to enable Radio operation.

When the Park Lights or Headlights are turned "ON," voltage is applied to the Radio on CKT 9 from the Headlight Switch. When voltage is applied to CKT 9 at the Radio, the Radio will illuminate the display. With the Headlights or Park Lights "ON," the Radio display may be dimmed manually using the I/P Dimmer Switch. The I/P Dimmer Switch varies the voltage on CKT 8 to the Radio to control display dimming.

SPEAKERS: BASE (UQ0 OR U62)

With the Base Speaker System, the audio signals are amplified within the Radio, and the outputs go directly to the speakers.

SPEAKERS: DELCO-BOSE®

The Delco-Bose® Music System uses a relay to control Battery voltage to three speaker/amps within the Passenger Compartment. A shielded cable carries the audio signals from the Radio to the speaker/amps where the signals are then amplified to drive speakers.

SPEAKERS: UW2 (10 SPEAKER SOUND SYSTEM)

For eight of the systems ten speakers, the audio signals are amplified within the Radio and the outputs go directly to the speakers.

The Amplifier is used to drive two subwoofers. The Amplifier receives all the amplified signals coming from the Radio. These signals are used to determine the Amplifier's output to the subwoofers. The Amplifier has separate power and ground inputs and is turned "ON" and "OFF" from the control output of the Radio on CKT 314.

SERVICE PARTS INFORMATION

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
A/C Clutch Diode	GMSPO #12112421	2.510
A/C Compressor Clutch	Not serviceable separately - Compressor, A/C	9.17
A/C Compressor Relay	Relay, FWD LMP WRG HARN	2.485
A/C Evaporator Temperature Sensor	Switch, A/C MDL THERM CYCL	9.275
A/C Refrigerant Pressure Sensor	Sensor, A/C REFRIG PRESS	9.275
ABS Brake Pressure Valve Solenoid, LF	Valve Kit, BRK M/CYL SOL	4.73
ABS Brake Pressure Valve Solenoid, RF	Valve Kit, BRK M/CYL SOL	4.73
ABS Motor Pack	Motor Kit, BRK M/CYL	4.647
ABS Relay	Relay, ELEK BRK CONT	4.72
Adjuster Assembly	Adjuster ASM, ACCEL CONT + CR CONT SERVO CABLE	3.454
Air Pump Relay	Relay, FWD LMP WRG HARN	2.485
Ambient Light Sensor	Sensor, Daytime Running LP AMB LGT	2.485
Amplifier (Part of UW2 Speaker Option)	Amplifier, Low FREQ Audio	9.65
Antenna	Antenna, RDO	9.647
Arming Sensor, Dual Pole	Sensor, INFL RST Arming	14.865
Ashtray Lamp (Auto Trans)	Light Pipe from PRNDL Lamp (part of trim plate)	
Ashtray Lamp (Manual Trans)	Standard Part	
ASR/TCS Relay	Relay, ELEK BRK CONT	4.72
Audio Alarm Module	Alarm, ST Belt, IGN Key and LPS	9.765
Backup Lamp, LH	Standard Part	
Backup Lamp, RH	Standard Part	
Backup Light Switch (V6 VIN S Manual)	Switch, B/U LP	2.698
Backup Light Switch (V8 VIN P Manual)	Switch, B/U LP	2.698
Battery	Battery, STOR	2.33
Battery Junction Block	Block, Main WRG JUNC and Fuse	2.483
Blower Motor	Motor, Blower Fan	1.015
Blower Resistor	Connector, BLO RES	9.275
Blower Switch (C41)	Switch, HTR CONT BLO	8.852
Blower Switch (C60)	Switch, HTR and A/C CONT BLO	9.275
Bose Relay	Relay, RDO RR SPKR WRG	9.656
Brake Combo Valve (ABS)	Valve, BRK COMB	4.69
Brake Switch Assembly (All vehicles, use 1 conn on Manual)	Switch, S/LP and TRANS CONV CLU	4.115
Brake Transmission Shift Interrupt (BTSI) Solenoid	Solenoid, A/TRNS SHFT LK CONT	4.054
Camshaft Position Sensor (V6 VIN S)	Sensor, CM/SHF Position	2.383
Center High Mounted Stop Light (CHMSL)	Lamp, High MT Stop	2.679
Cigar Lighter	Lighter, CIG	9.709
Clutch Anticipate/Cruise Release Switch (All V6 Manual)	Switch, Clutch PED POSN	4.054
Clutch Start Switch	Switch, M/TRNS CLU Start	4.054
Console Compartment Lamp	Socket, FRT Console LP	10.275
Convenience Center	Not serviceable - Packard Part	
Convertible Top Pump Assembly	Pump ASM, F/TOP	14.481
Convertible Top Switch	Switch, F/TOP	14.483
Coolant Fan, Left	Motor Kit, ENG COOL Fan (ELEC)	1.055
Coolant Fan, Primary	Motor Kit, ENG COOL Fan (ELEC)	1.055
Coolant Fan Relay #1	Relay, FWD LP WRG HARN	2.485

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
Coolant Fan Relay #2	Relay, FWD LP WRG HARN	2.485
Coolant Fan Relay #3	Relay, FWD LP WRG HARN	2.485
Coolant Fan Relay, Primary	Relay, FWD LP WRG HARN	1.055
Coolant Fan Relay, Secondary	Relay, FWD LP WRG HARN	1.055
Coolant Fan, Right	Motor Kit, ENG COOL Fan (ELEC)	1.055
Coolant Fan, Secondary	Motor Kit, ENG COOL Fan (ELEC)	1.055
Coolant Level Latching Module	Module, ENG COOL LVL IND	1.203
Courtesy Lamp, LR	Standard Part	
Courtesy Lamp, RR	Standard Part	
Crankshaft Position Sensor, HI Resolution (V6 VIN S)	Sensor, CR/SHF POSN	2.383
Crankshaft Position Sensor, LOW Resolution (V6 VIN S)	Sensor, CR/SHF POSN	2.383
Cruise Control Module	Module, CRCONT	3.887
Cruise Release Brake Switch (All with K34)	Switch, CRCONT REL	3.887
Cruise Release Clutch Switch (V8 Manual with K34, 2 pin)	Switch, CRCONT REL CLU SW	3.887
Data Link Connector (DLC)	Connector, ECM Data Link	2.53
Daytime Running Lights (DRL) Module	Module, HDLP Auto CONT	2.485
Diagnostic Energy Reserve Module (DERM)	Module, INFL RST RESV ENGY	14.865
Discriminating Sensor, Forward	Sensor, INFL RST F/END SH MET	14.856
Discriminating Sensor, Passenger Compartment	Sensor, INFL RST PASS COMPT	14.865
Distributor	Distributor	2.361
Dome Lamp	Bulb, LP DM	8.991
Door Illumination Lamp, LH	Standard Part	
Door Illumination Lamp, RH	Standard Part	
Door Jamb Switch, LH	Switch, DR Jamb (Double Pole)	11.95
Door Jamb Switch, RH	Switch, DR Jamb (Single Pole)	11.95
Door Lock Actuator, LH	Actuator, FRT S/D LK	10.485
Door Lock Actuator, RH	Actuator, FRT S/D LK	10.485
Electronic Brake Control Module (EBCM)	Module, Electronic BRK CONT	4.72
Electronic Brake/Traction Control Module (EBTCM)	Module, ELEK BRAKE CONT	4.720
Engine Coolant Heater	Engine Coolant Heater	1.152
Engine Coolant Heater Cord	Engine Coolant Heater Cord	1.152
Engine Coolant Level Sensor (V8 VIN P)	Module, ENG COOL LVL IND	1.203
Engine Coolant Temperature (ECT) Sensor	Sensor, Coolant TEMP (ENG Unit)	1.15
Engine Coolant Temperature Gage Sensor	Sensor, ENG COOL TEMP	3.682
Evaporative Emission (EVAP) Canister Purge Solenoid Valve	Valve, EVAP EMIS CNSTR Purge SOL VLV	3.13
Exhaust Gas Recirculation (EGR) Vacuum Control Signal Solenoid Valve	Valve, EGR	3.67
Express Down Module	Module, P/W CONT	10.783
Fog Lamp, Left Front	Bulb, w/Socket, Fog LP	8.991
Fog Lamp, Right Front	Bulb, w/Socket, Fog LP	8.991
Fog Light Relay	Relay, FWD LP WRG HARN	2.485
Fog Light Switch	Switch, Fog LP	2.485

(CONTINUED ON NEXT PAGE)

SERVICE PARTS INFORMATION

(CONTINUED FROM PREVIOUS PAGE)

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
Forward/Back Motor (AC3 Power Seat)	Motor, D/Seat ADJR (w/GROM and INS)	11.556
Front Height Motor (AC3 Power Seat)	Motor, D/Seat ADJR (w/GROM and INS)	11.556
Fuel Gage Sender	Sender, Fuel	3.107
Fuel Injectors	Injector, Fuel Injection	3.3
Fuel Pump	Pump, Fuel	3.9
Fuel Pump Prime Connector	Connector, Fuel Pump	3.9
Fuel Pump Relay	Relay, F/PMP	3.9
Fuel Tank Unit	See: Fuel Pump or Fuel Sender	
Fusible Links	Fusible Link Wire	8.965
Generator	Generator	2.275
Hatch Release Actuator	Actuator, Deck Lid REL	12.942
Hatch Release Relay	Relay, R/CMPT Lid REL	12.243
Hatch Release Switch	Switch, R/CMPT Lid REL	12.243
Hazard Flasher	Flasher, Hazard LP	2.575
Headlamp Door Motor, LH	Actuator, HDLP	2.76
Headlamp Door Motor, RH	Actuator, HDLP	2.76
Headlamp, Left	Sealbeam, HDLP	2.727
Headlamp, Right	Sealbeam, HDLP	2.727
Headlight Dimmer Switch	Switch, DIMR	2.459
Headlight Doors Module	Module, HDLP OPG DR ACTR CONT	2.755
Headlight Switch	Switch, Headlamp/Fog Lamp	2.485
Heated Oxygen Sensor, Bank #1	Sensor, HTR OXY	3.682
Heated Oxygen Sensor, Bank #2	Sensor, HTR OXY	3.682
Heater/Vent/Air Conditioning (HVAC) Control Assembly	Control, Heater and A/C	9.273
High Beam Headlamp, Left	Sealbeam, HDLP (High Beam)	2.727
High Beam Headlamp, Right	Sealbeam, HDLP (High Beam)	2.727
High Blower Relay	Relay, BLOWER	
Horn Relay	Relay, Horn	2.815
Horn Switch	Switch, STRG WHL Horn	2.819
Horn #1 (A note)	Horn, High Note	2.81
Horn #2 (F note)	Horn, Low Note	2.81
Hydraulic Modulator Assembly	Valve ASM, BRK PRESS MOD (Components Serviceable)	4.73
I/P Compartment Lamp	Bulb, Glove Box LP	8.991
I/P Dimmer Switch	Switch, I/P LP DIMR	2.49
I/P Fuse Block	Block, Main WRG JUNC and Fuse	2.483
Idle Air Control (IAC) Valve	Valve Kit, TBI Idle Air CONT	3.82
Ignition Coil Module (V8 VIN P)	Module, Ignition Coil	2.383
Ignition Coil (V8 VIN P)	Coil, Ignition	2.17
Ignition Control Module (ICM) (V6 VIN S)	Module, IGN Coil	2.17
Ignition Key Lock Cylinder	Cylinder, STRG COL LK and IGN SW	2.188
Ignition Key Warning Switch	Switch, IGN Key Alarm	2.195
Ignition Switch	Switch, IGN	2.188
Inflator Module, Driver	Module, INFL RST STRG WHL (Inflator)	14.865
Inflator Module, Passenger	Module, INFL RST I/P (Inflator)	14.865
Instrument Cluster	Cluster, INST	9.735
Intake Air Temperature (IAT) Sensor	Sensor, A/CL Air TEMP	3.682
Isolation Diode (BTSI)	GMSPO #12112421	2.510

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
Isolation Diode (RAP)	GMSPO #12112422	2.510
Isolation Diode (Wipers)	GMSPO #12112422	2.510
Keyless Entry Receiver	Receiver, R/CON DR LK	10.485
Knock Sensor	Sensor, Knock	2.383
License Lamp	Standard Part	
Low Beam Headlamp, Left	Sealbeam, HDLP (Low Beam)	2.727
Low Beam Headlamp, Right	Sealbeam, HDLP (Low Beam)	2.727
Manifold Absolute Pressure (MAP) Sensor	Sensor, MAP	3.682
Marker Lamp, Left Front	Standard Part	
Marker Lamp, Left Rear	Standard Part	
Marker Lamp, Right Front	Standard Part	
Marker Lamp, Right Rear	Standard Part	
Mass Air Flow (MAF) Sensor	Sensor, Mass Air Flow	3.682
Mirror Motor Pack	Motor, O/S RR View MIR	10.185
Multi-Function Lever	Lever, T/SIG, HDLP D/SW, CRCONT ACTR, WSW and WSWA	2.897
Oil Level Sensor	Sensor, ENG Oil LVL	1.516
Oil Pressure Sensor	Sensor, Oil Pressure	1.8
Outside Mirror, LH	Mirror, O/S RR View	10.185
Outside Mirror, RH	Mirror, O/S RR View	10.185
Oxygen Sensor, LH	Sensor, OXY	3.682
Oxygen Sensor, RH	Sensor, OXY	3.682
Park Brake Switch	Switch, Parking BRK Alarm	4.589
Park/Turn Lamp, Left Front	Standard Part	
Park/Turn Lamp, Right Front	Standard Part	
Performance Switch	Switch, A/TRANS SHFT PRGM	4.056
Performance/Traction Control Switch	Switch, ELEK TRACT CONT	4.710
Power Door Lock Switch, LH	Switch, DR LK	10.485
Power Door Lock Switch, RH	Switch, DR LK	10.485
Power Mirror Switch	Switch, O/S R/CON RR View MIR SEL	10.186
Power Seat Actuator Assembly (AC3)	Actuator, D/Seat ADJR (w/MOT and SUPT)	11.556
Power Seat Control Module (AQ9 Power Seat)	Module, P/Seat PNEU CONT	11.378
Power Seat Motor (AC3)	Motor, D/Seat ADJR	11.556
Power Seat Switch (AC3)	Switch, D/Seat ADJR	11.558
Power Seat Switch, Driver (AQ9)	Switch, D/Seat PNEU Pump and VLV	11.378
Power Seat Switch, Passenger (AQ9)	Switch, P/Seat PNEU Pump and VLV	11.378
Powertrain Control Module (PCM)	Controller, PCM	3.67
Power Window Switch, LH	Switch, SI WDO	10.777
Power Window Switch, RH	Switch, SI WDO	10.777
PRNDL Illumination Lamp (Auto Trans)	Lamp, Instrument PNL	2.515
Pump Assembly (AQ9 Power Seat)	Pump, ST INFL D/Seat PNEU	11.378
Radio	Radio, Radio	9.65
Rear Compartment Lamp	Standard Part	
Rear Defogger Grid	Part of Rear Glass	
Rear Defogger Switch	Switch, R/WDO DEFG	9.778
Rear Defogger Switch/Timer	Switch, R/WDO DEFG	9.778
Rear Defogger Timer/Relay	Timer, R/WDO DEFG	9.744

(CONTINUED ON NEXT PAGE)

SERVICE PARTS INFORMATION

(CONTINUED FROM PREVIOUS PAGE)

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
Rear Dome Light Switch	Switch, R/CMPT Lid Lock	12.243
Rear Height Motor (AC3 Power Seat)	Motor, D/Seat ADJR (w/GROM and INS)	11.556
Rearview Mirror	Mirror, I/S RR View	10.185
Retained Accessory Power (RAP) Module	Module, Retained Accessory Power	10.485
Reverse Lockout Solenoid (V8 VIN P Manual)	Part of Transmission Exchange Program	
Seat Belt Switch	Part of Driver's Seat Belt Buckle	14.875
Secondary Air Injection Pump Assembly	Pump, SECD Air INJN	3.66
Selector Switch (C41)	Switch, HTR CONT SEL	8.850
Selector Switch (C60)	Switch, HTR & A/C CONT SEL	9.275
SIR Coil Assembly	Coil Kit, INFL RST STRG WHL MDL	14.865
Solenoid Valve Assembly (AQ9 Power Seat)	Valve, D/Seat Pneumatic 3 SOL	11.378
Speaker/Amp, Left Front (BOSE)	Amplifier, RDO FRT SPKR	9.65
Speaker/Amp, Rear (BOSE)	Amplifier, RDO RR SPKR	9.65
Speaker/Amp, Right Front (BOSE)	Amplifier RDO FRT SPKR	9.65
Speaker Assembly, Left Rear (With UW2 Speakers)	Speaker, RDO R/Q TR PNL	9.665
Speaker Assembly, Right Rear (With UW2 Speakers)	Speaker, RDO R/Q TR PNL	9.665
Speaker, Left Front Midrange (With UW2 Speakers)	Speaker, RDO FRT S/D	9.665
Speaker, Left Front Tweeter (With UW2 Speakers)	Speaker, RDO FRT S/D (Tweeter)	9.665
Speaker, Left Front (Base - UQ0)	Speaker, RDO FRT S/D	9.65
Speaker, Left Rear Subwoofer (With UW2 Speakers)	Speaker, RDO QTR	9.665
Speaker, Left Rear (Base - UQ0)	Speaker, RDO RR	9.665
Speaker, Right Front Midrange (With UW2 Speakers)	Speaker, RDO FRT S/D	9.665
Speaker, Right Front Tweeter (With UW2 Speakers)	Speaker, RDO FRT S/D (Tweeter)	9.665
Speaker, Right Front (Base - UQ0)	Speaker, RDO FRT S/D	9.65
Speaker, Right Rear Subwoofer (With UW2 Speakers)	Speaker, RDO QTR	9.65
Speaker, Right Rear (Base - UQ0)	Speaker, RDO RR	9.665
Starter Motor	Motor, STRTR	2.041
Starter Solenoid	Switch, STRTR SOL	2.1
Steering Wheel Controls, Radio (UK3)	Switch, RDO CONT	9.649
Taillamp, LH	Standard Part	
Taillamp, RH	Standard Part	
Taillamp, LH Inboard	Standard Part	
Taillamp, LH Outboard	Standard Part	
Taillamp, RH Inboard	Standard Part	
Taillamp, RH Outboard	Standard Part	
Tail/Stop/Turn Lamp, LH	Standard Part	
Tail/Stop/Turn Lamp, RH	Standard Part	
Tail/Stop/Turn Lamp, LH Inboard	Standard Part	
Tail/Stop/Turn Lamp, LH Outboard	Standard Part	
Tail/Stop/Turn Lamp, RH Inboard	Standard Part	

Component Name Used In Section 8A	Service Parts Catalog	
	Reference Name	Group
Tail/Stop/Turn Lamp, RH Outboard	Standard Part	
Theft Deterrent Module	Module, Theft DTRNT	2.195
Theft Deterrent Relay	Relay, Theft DTRNT	2.195
Throttle Position (TP) Sensor	Sensor, Throttle Position (EFI)	3.764
Traction Control Motor Pack	Motor Kit, ELEK TRACT CONT	4.730
Traction Control Switch	Switch, ELEK TRACT CONT	4.710
Transmission Position Switch	Switch, Park/NEU POSN	4.054
Turn Flasher	Flasher, T/SIG LP	2.892
Turn/Hazard Switch Assembly	Switch, T/SIG	2.895
Underhood Electrical Center	Part of Harness, U/Hood LP WRG	8.89
Vehicle Speed Sensor	Sensor, VEH SPD	3.682
Washer Pump Motor	Pump, WSWA	10.153
Wheel Speed Sensor, Left Front	Sensor, WHL SPD	4.71
Wheel Speed Sensor, Left Rear	Sensor, WHL SPD	4.710
Wheel Speed Sensor, Rear	Wheel, RR WHL SPD SEN Reluctor	
Wheel Speed Sensor, Right Rear	Sensor, WHL SPD	4.710
Wheel Speed Sensor, Right Front	Sensor, WHL SPD	4.71
Window Motor, LH	Motor, FRT S/D WDO REG	10.783
Window Motor, RH	Motor, FRT S/D WDO REG	10.783
Wiper Motor Assembly	Motor, WSW	10.150
Wiper/Washer Switch Assembly	Switch, WSW and WSWA	10.163

COMPONENT LOCATION VIEWS

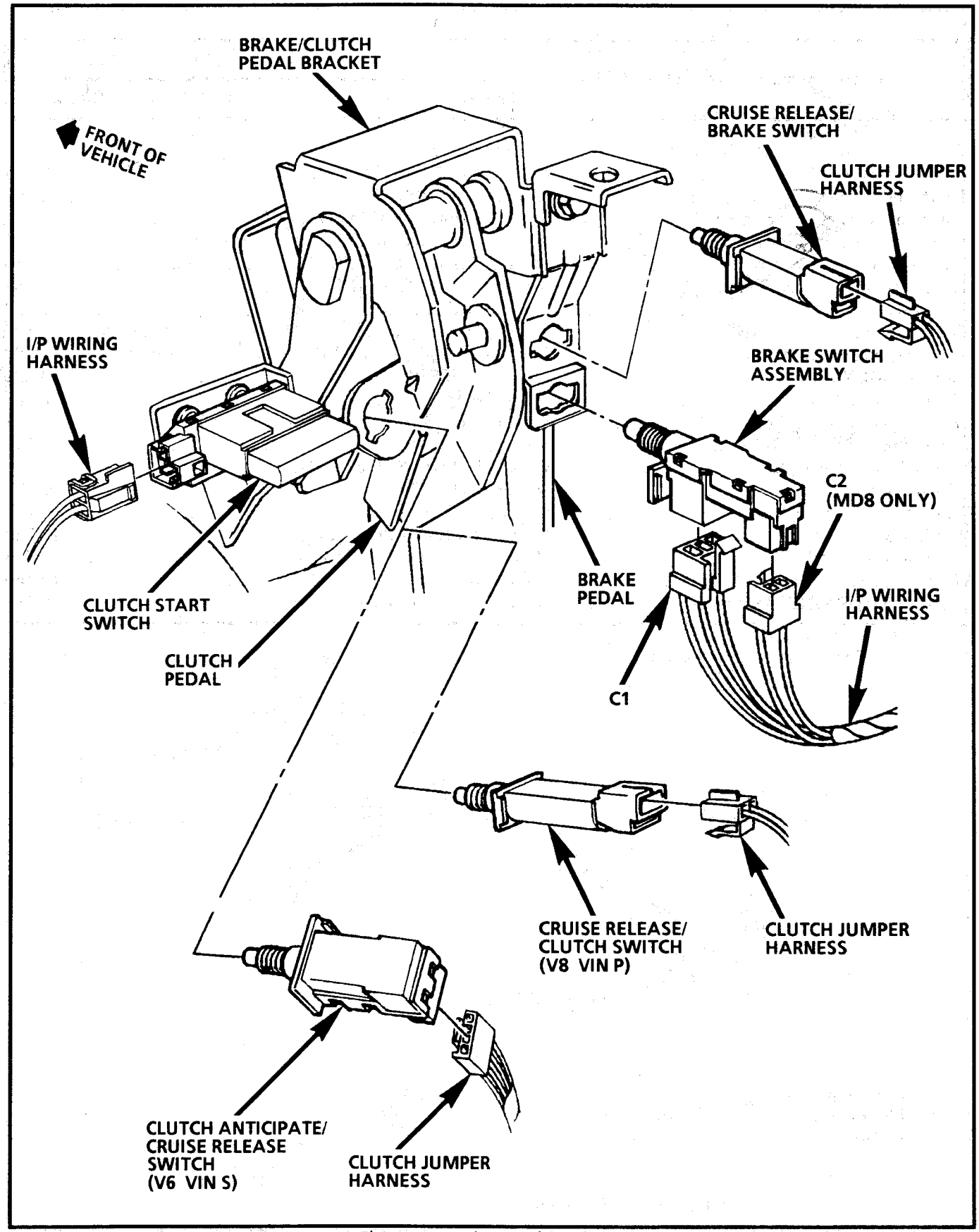
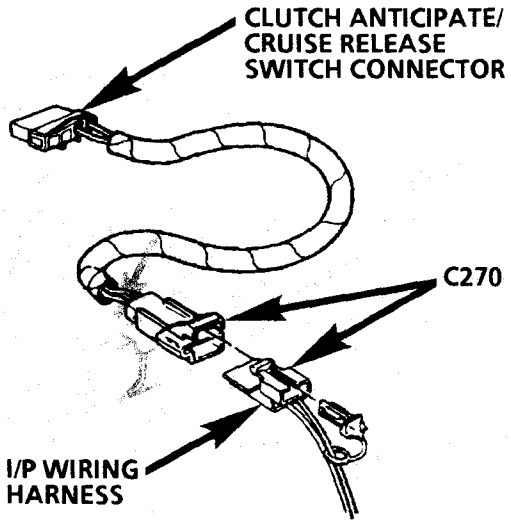
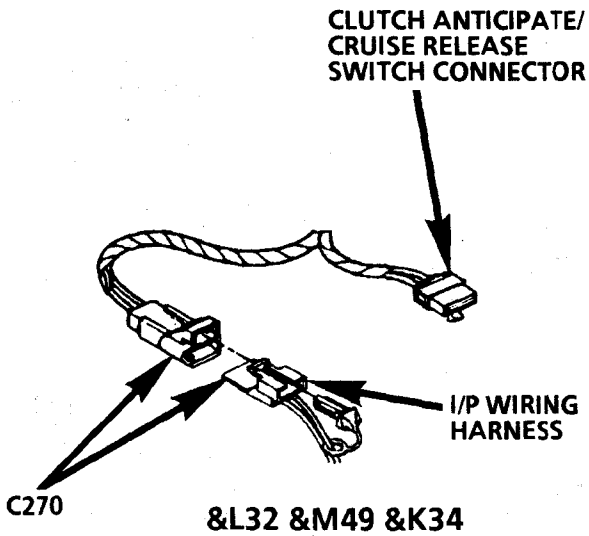


Figure 1 - Under LH Side of I/P



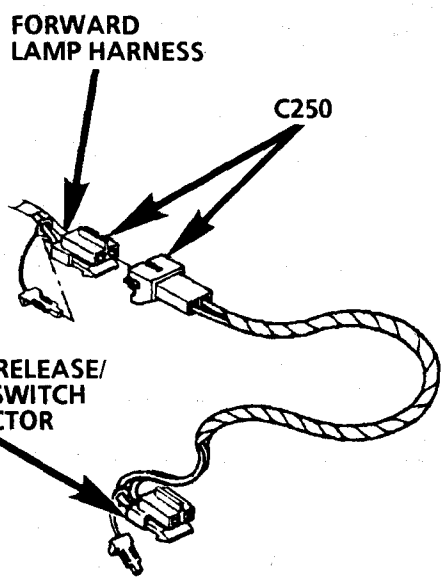
&L32 &M49 EXC K34



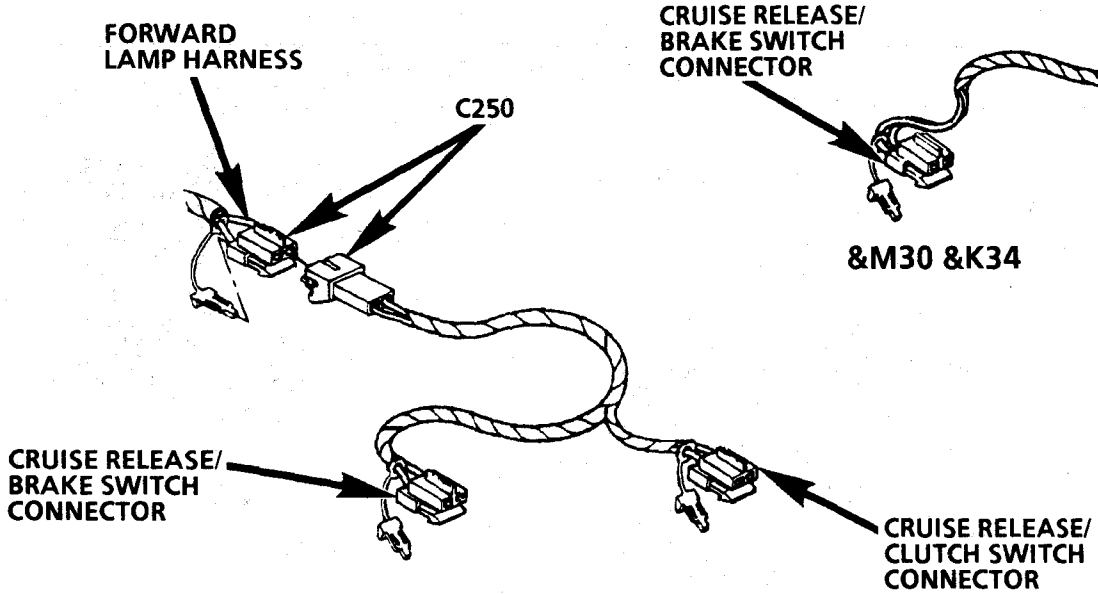
&L32 &M49 &K34

IMPORTANT:

- LT1 &MM6 WITHOUT K34, DOES NOT HAVE A CLUTCH JUMPER HARNESS.



&M30 &K34



&LT1 &MM6 &K34

Figure 2 - Clutch Jumper Harness Combinations - Manual (M49 or MN6)

COMPONENT LOCATION VIEWS

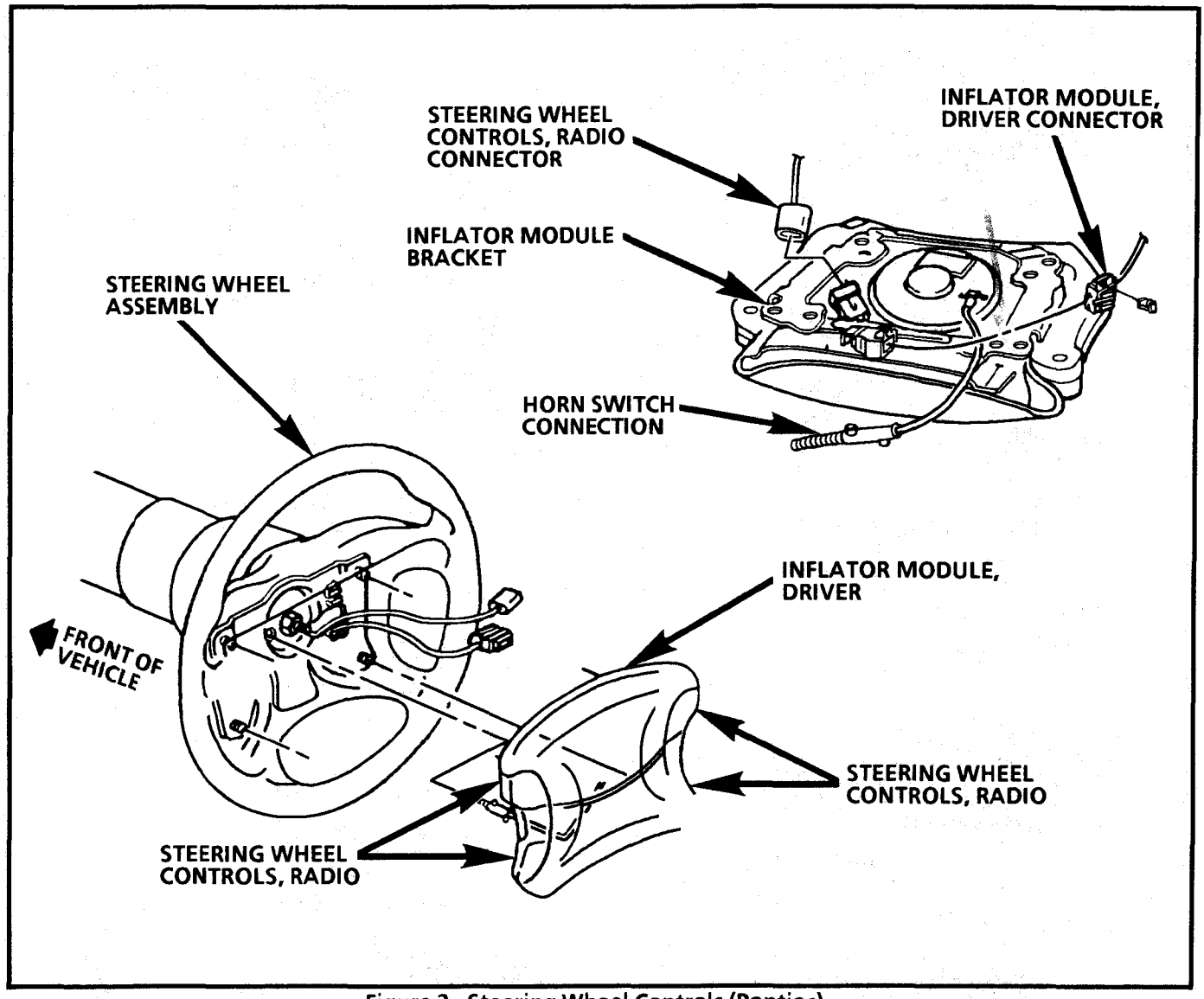


Figure 3 - Steering Wheel Controls (Pontiac)

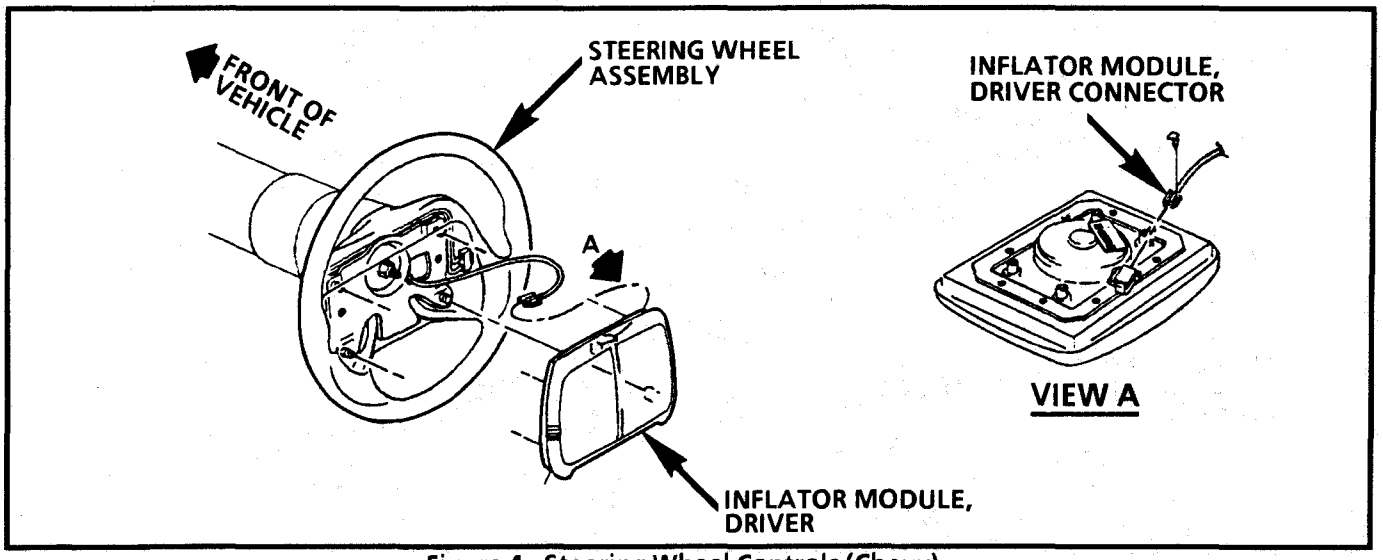


Figure 4 - Steering Wheel Controls (Chevy)

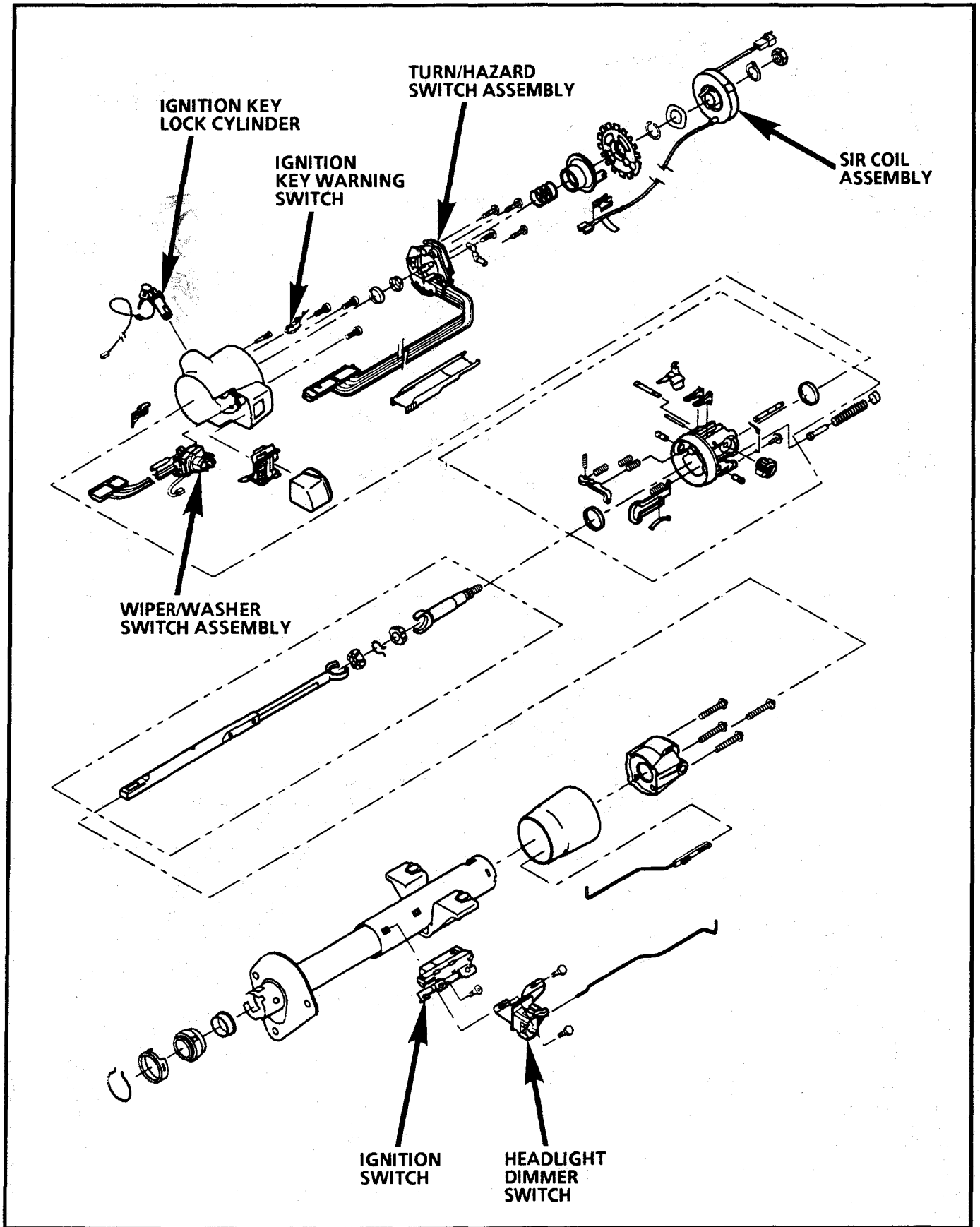


Figure 5 - Steering Column Internals

COMPONENT LOCATION VIEWS

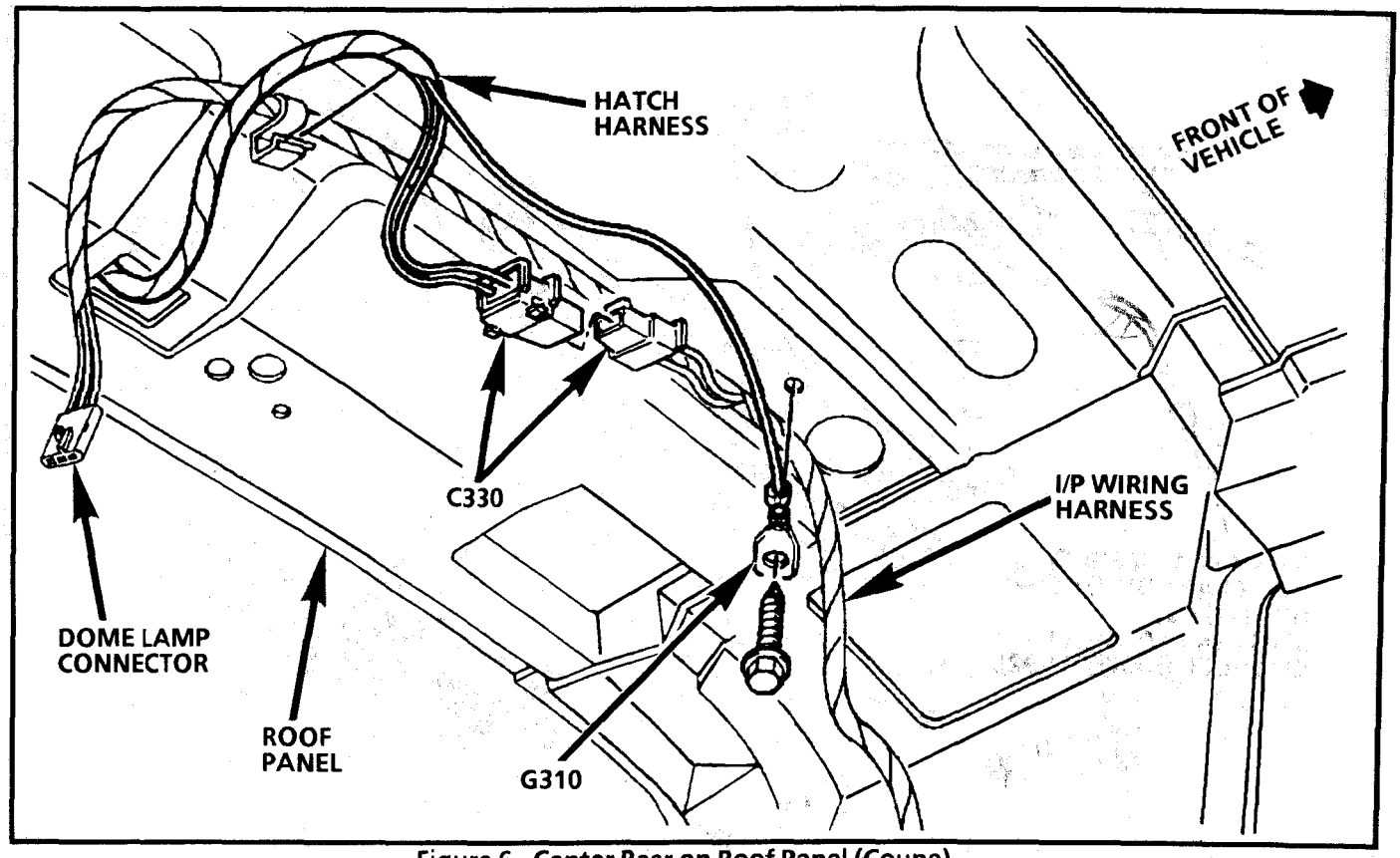


Figure 6 - Center Rear on Roof Panel (Coupe)

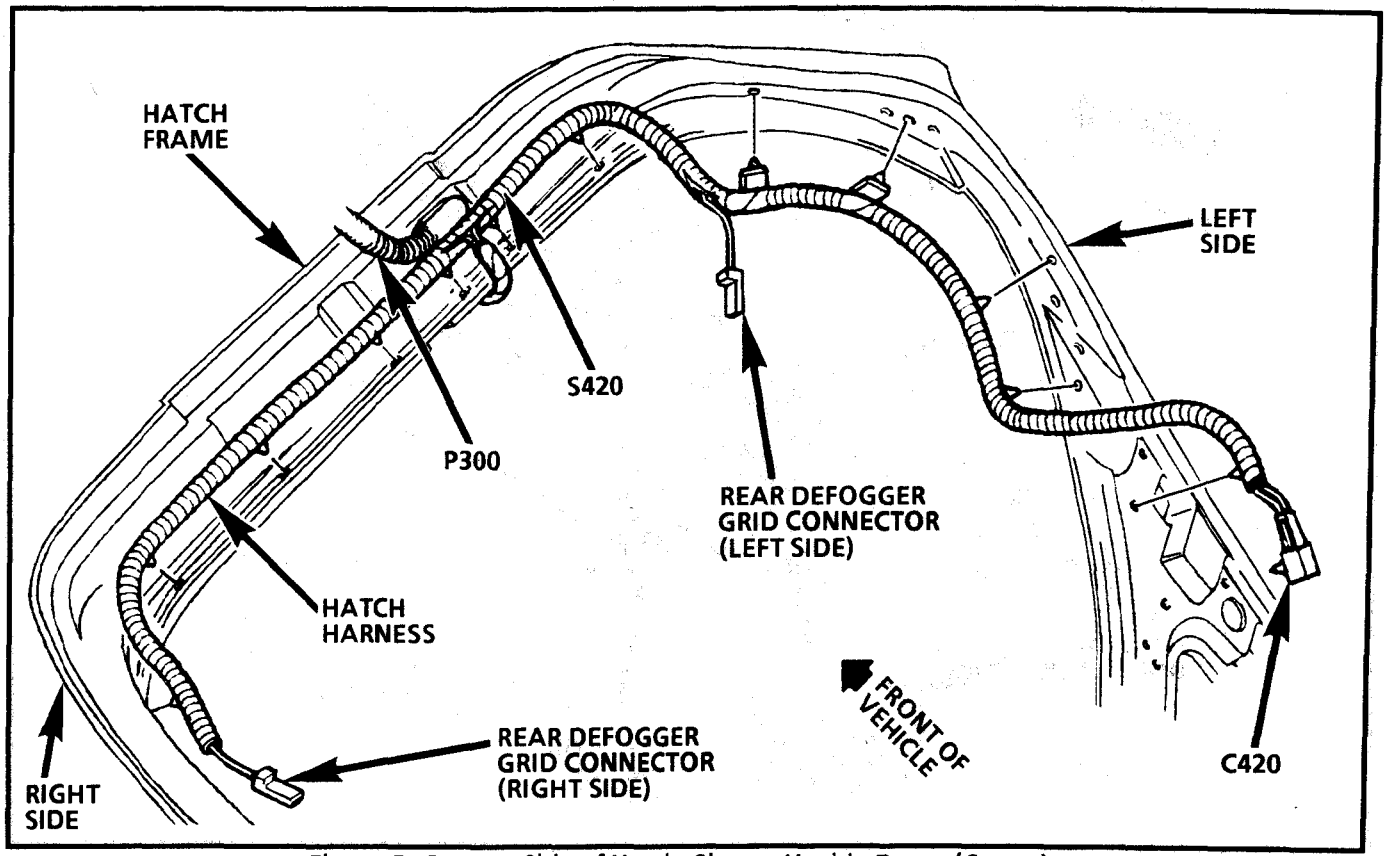


Figure 7 - Bottom Side of Hatch, Shown Upside Down (Coupe)

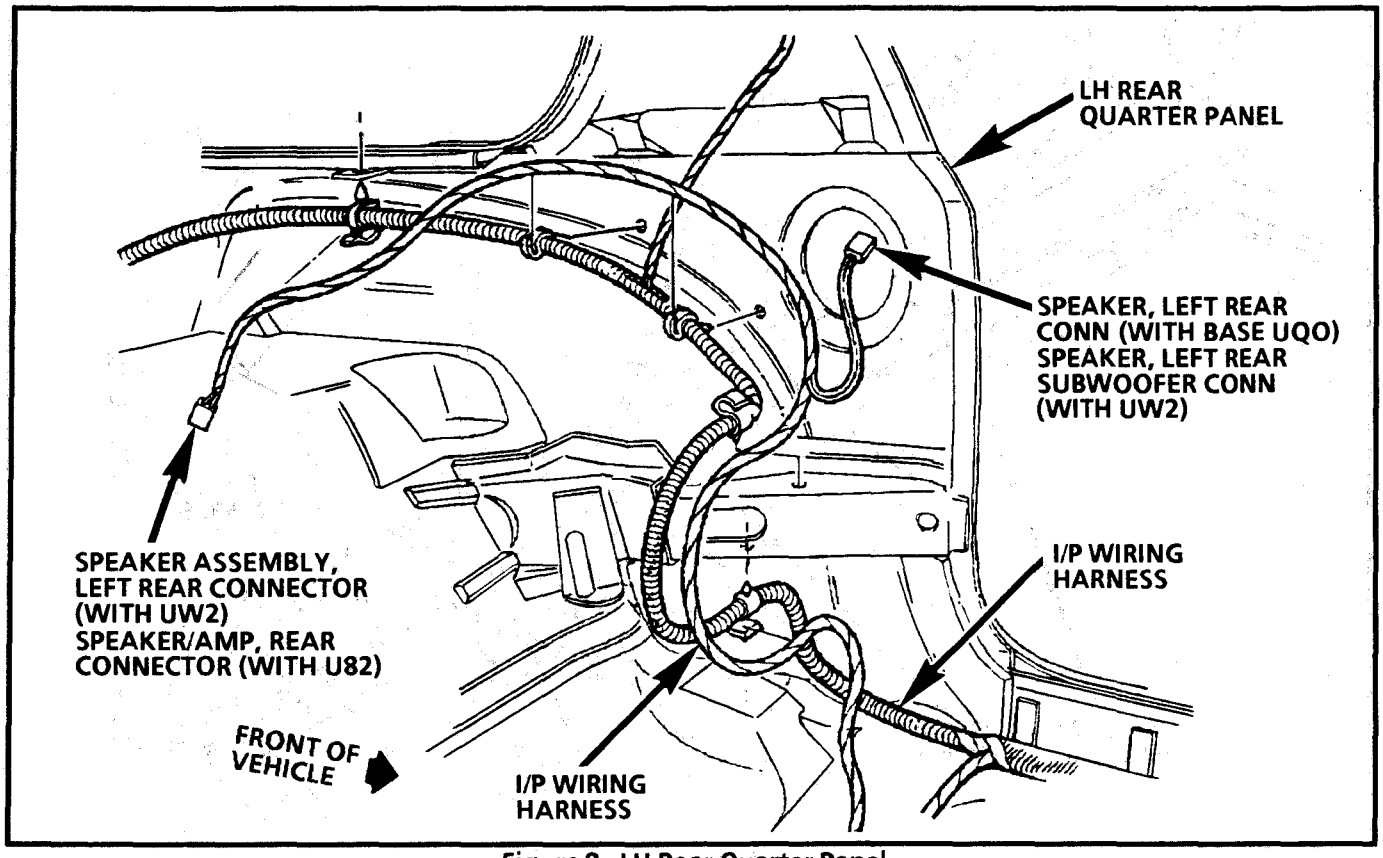


Figure 8 - LH Rear Quarter Panel

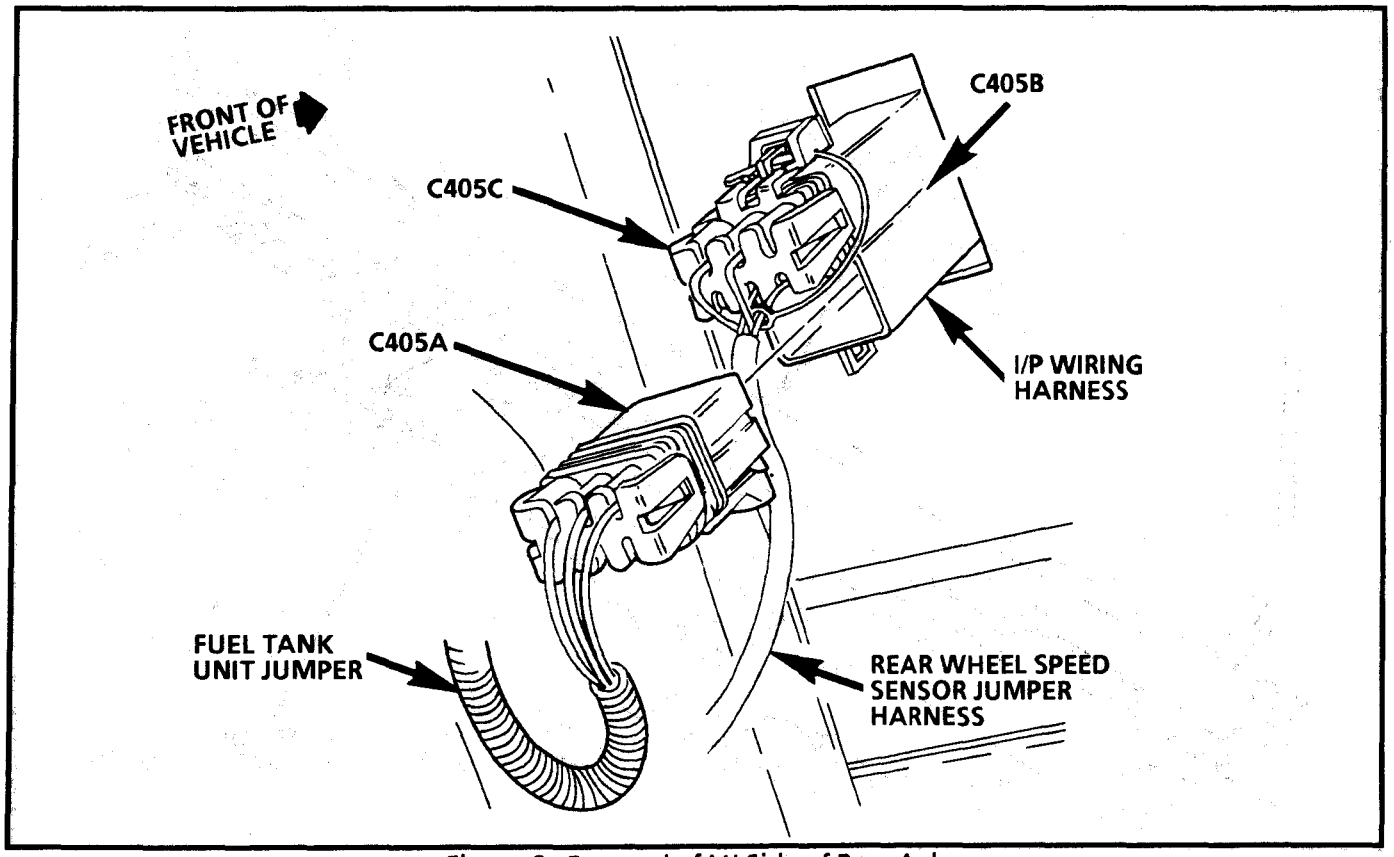


Figure 9 - Forward of LH Side of Rear Axle

COMPONENT LOCATION VIEWS

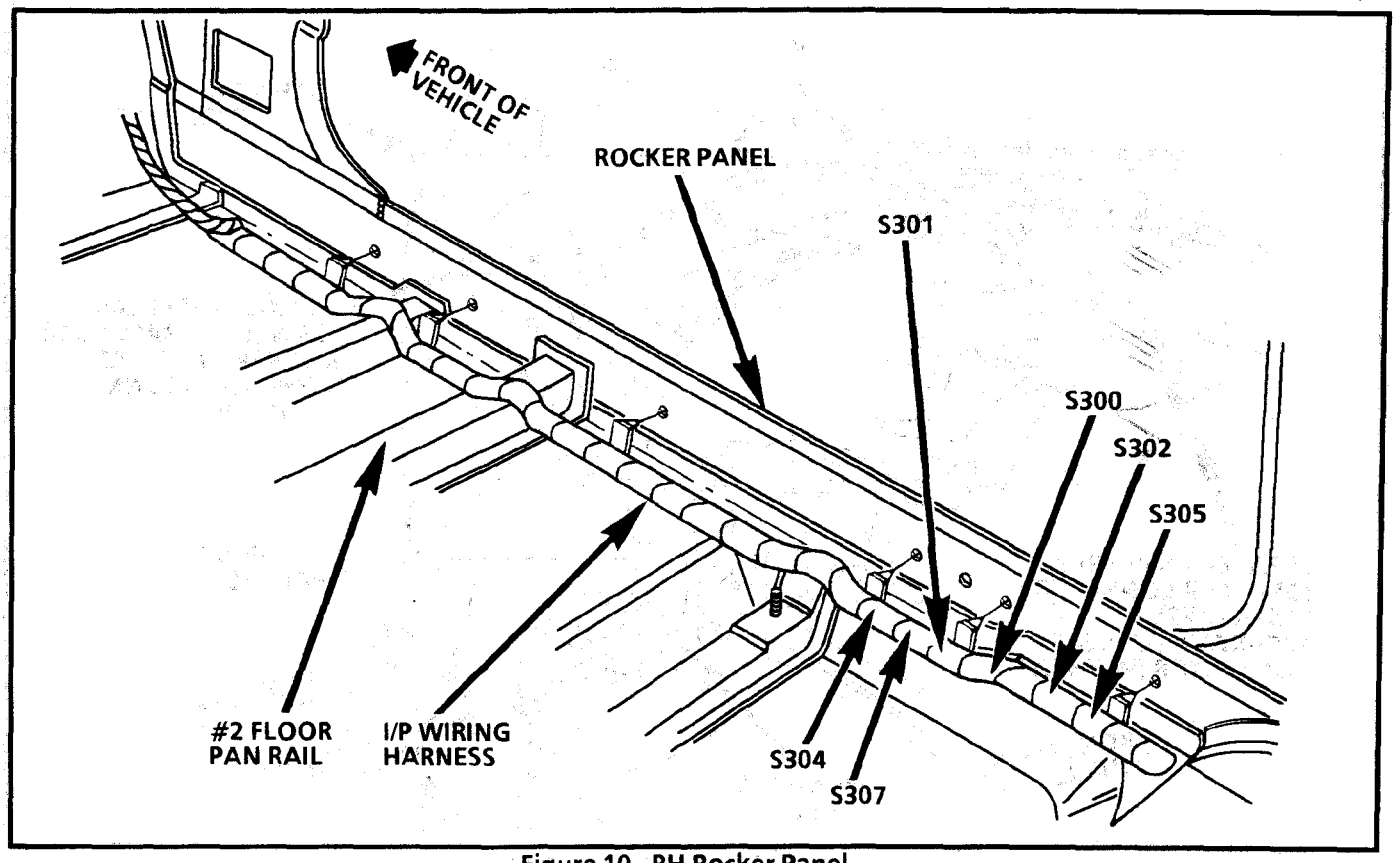


Figure 10 - RH Rocker Panel

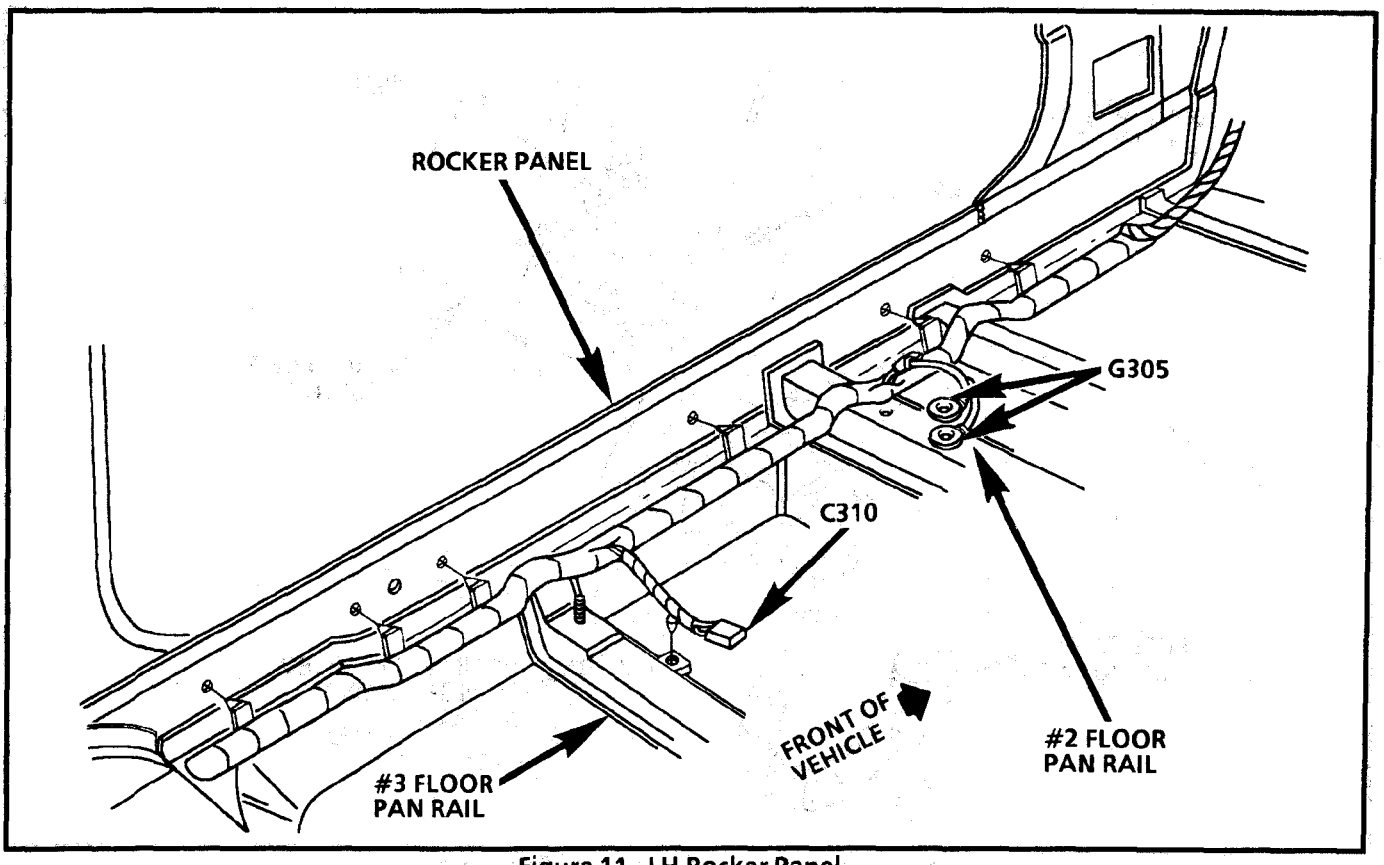


Figure 11 - LH Rocker Panel

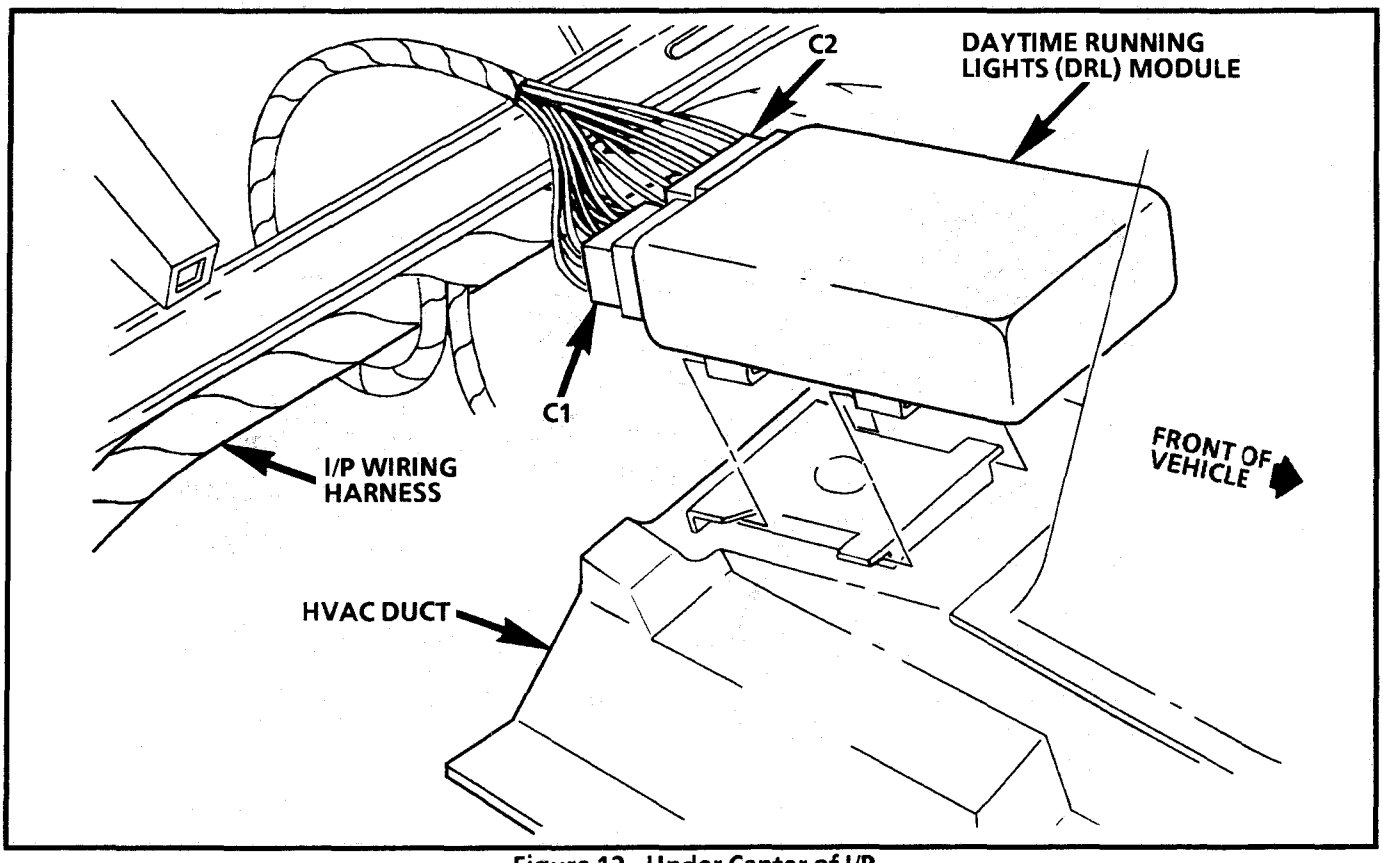


Figure 12 - Under Center of I/P

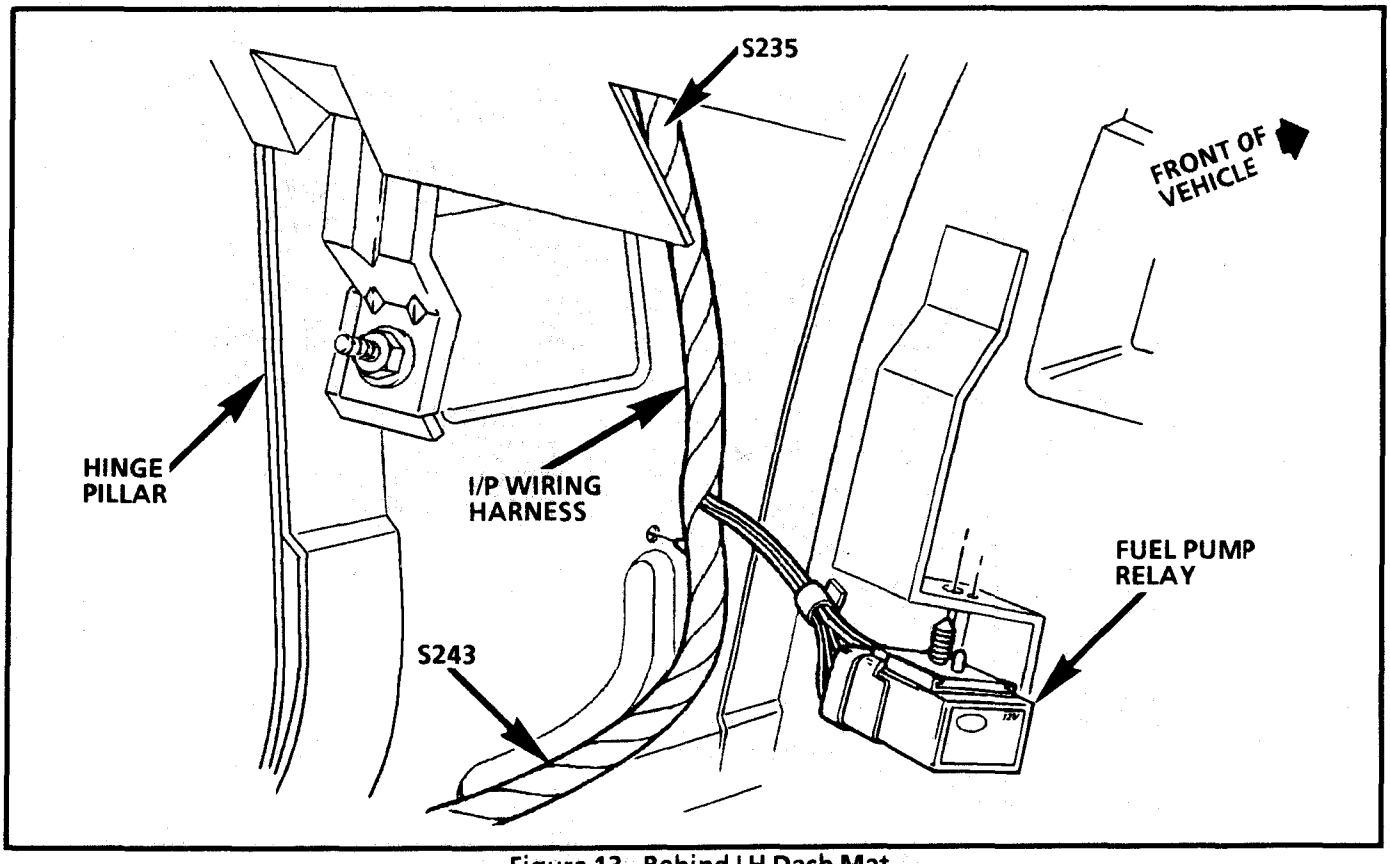


Figure 13 - Behind LH Dash Mat

COMPONENT LOCATION VIEWS

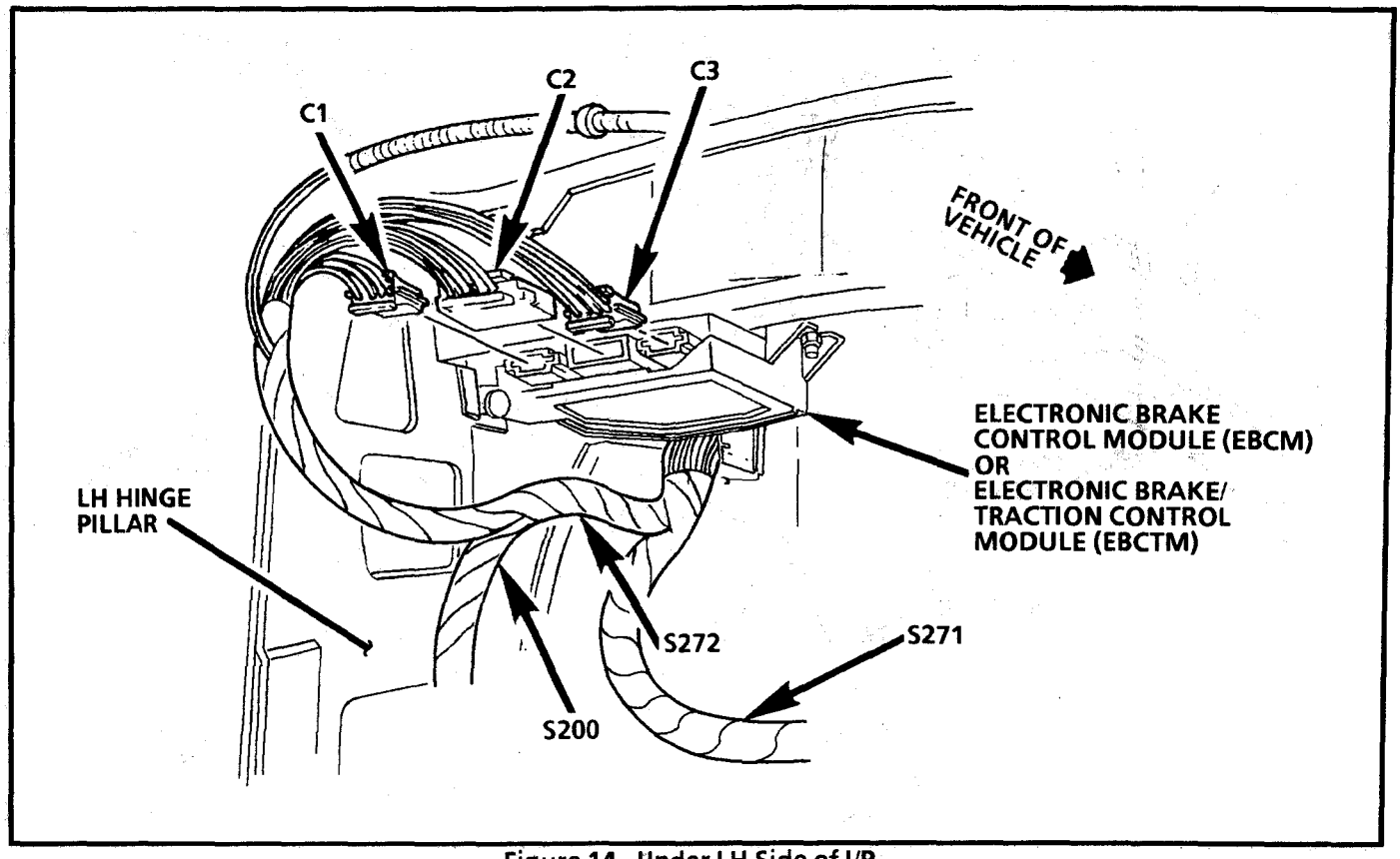


Figure 14 - Under LH Side of I/P

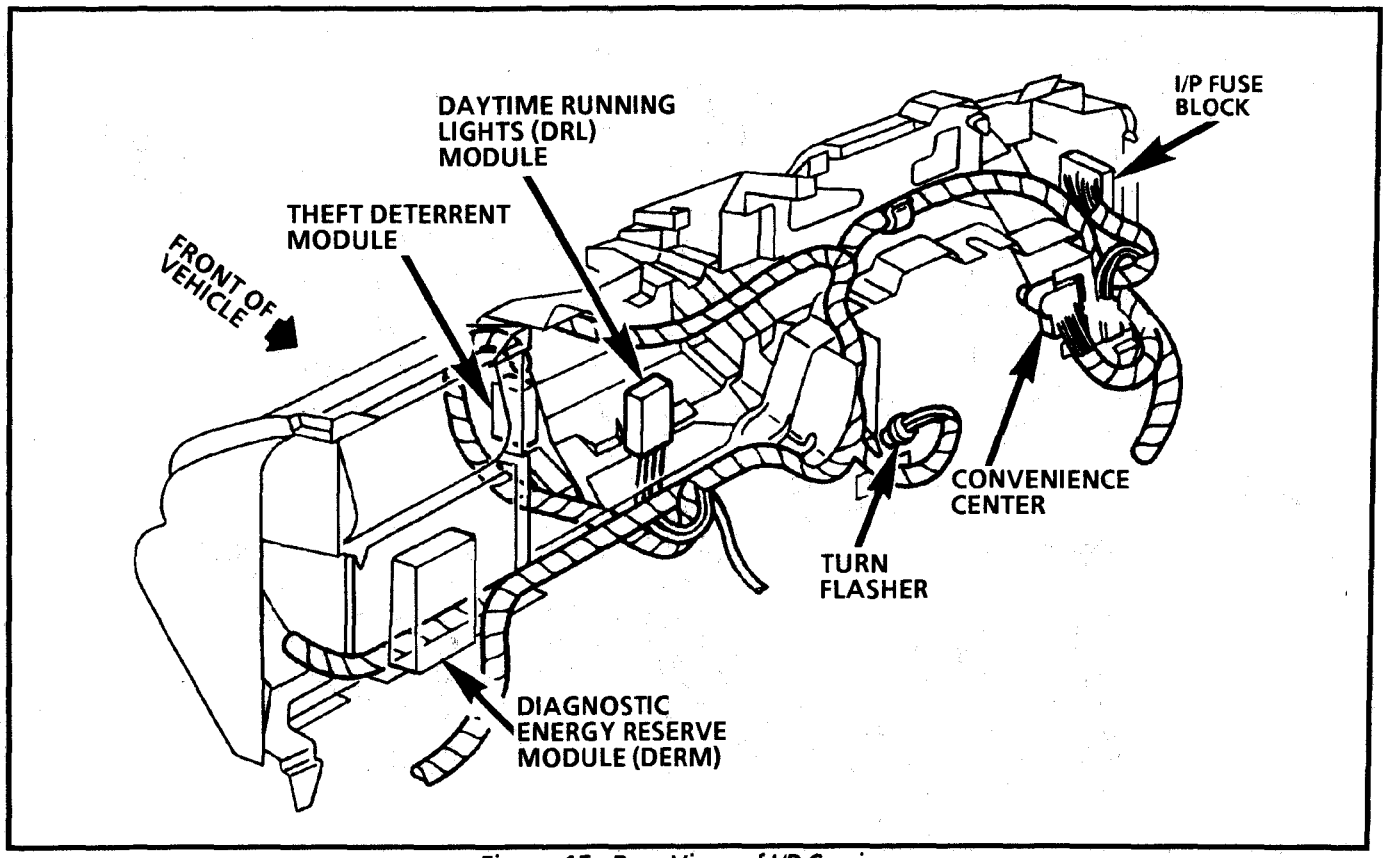


Figure 15 - Rear View of I/P Carrier

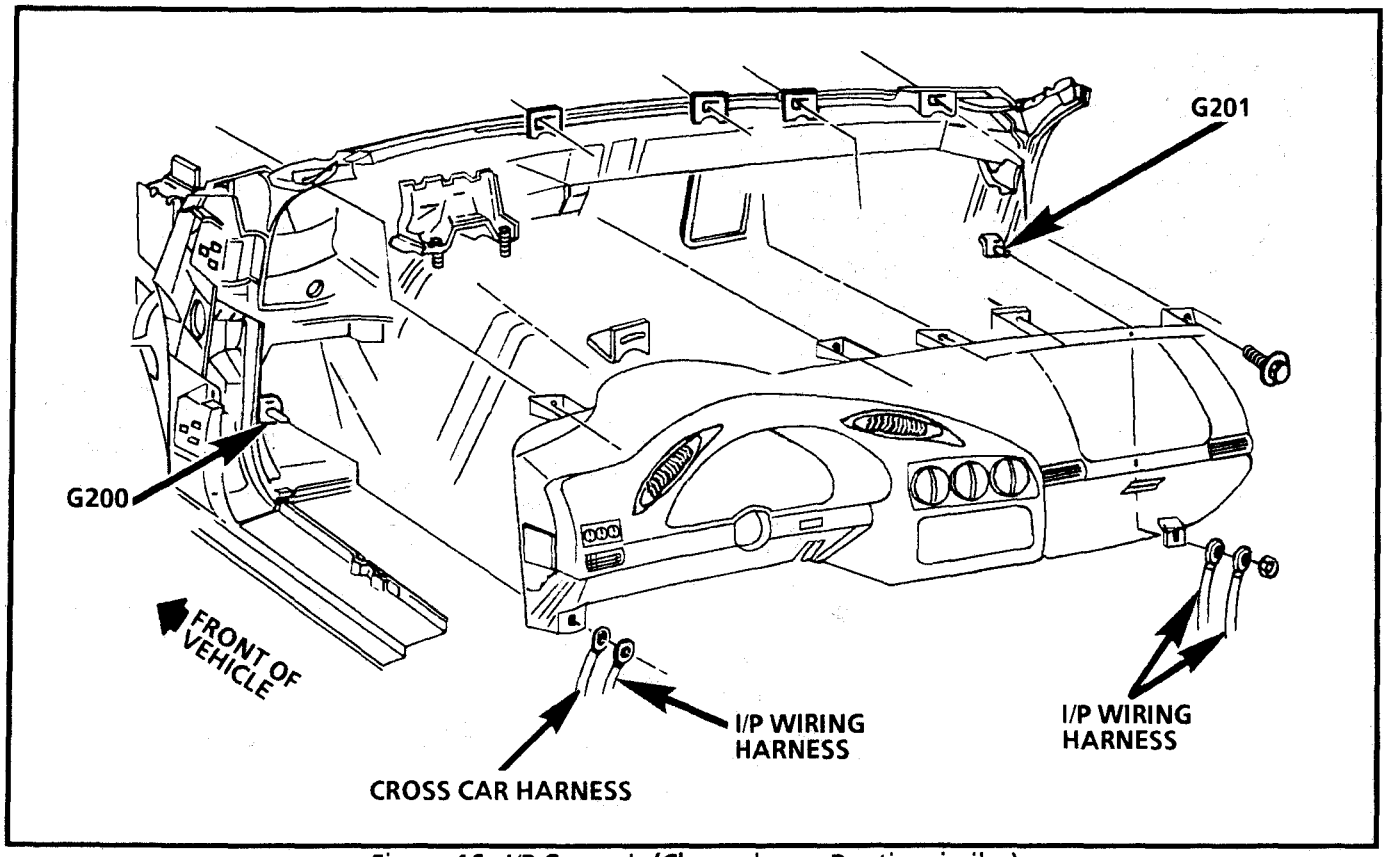


Figure 16 - I/P Grounds (Chevy shown Pontiac similar)

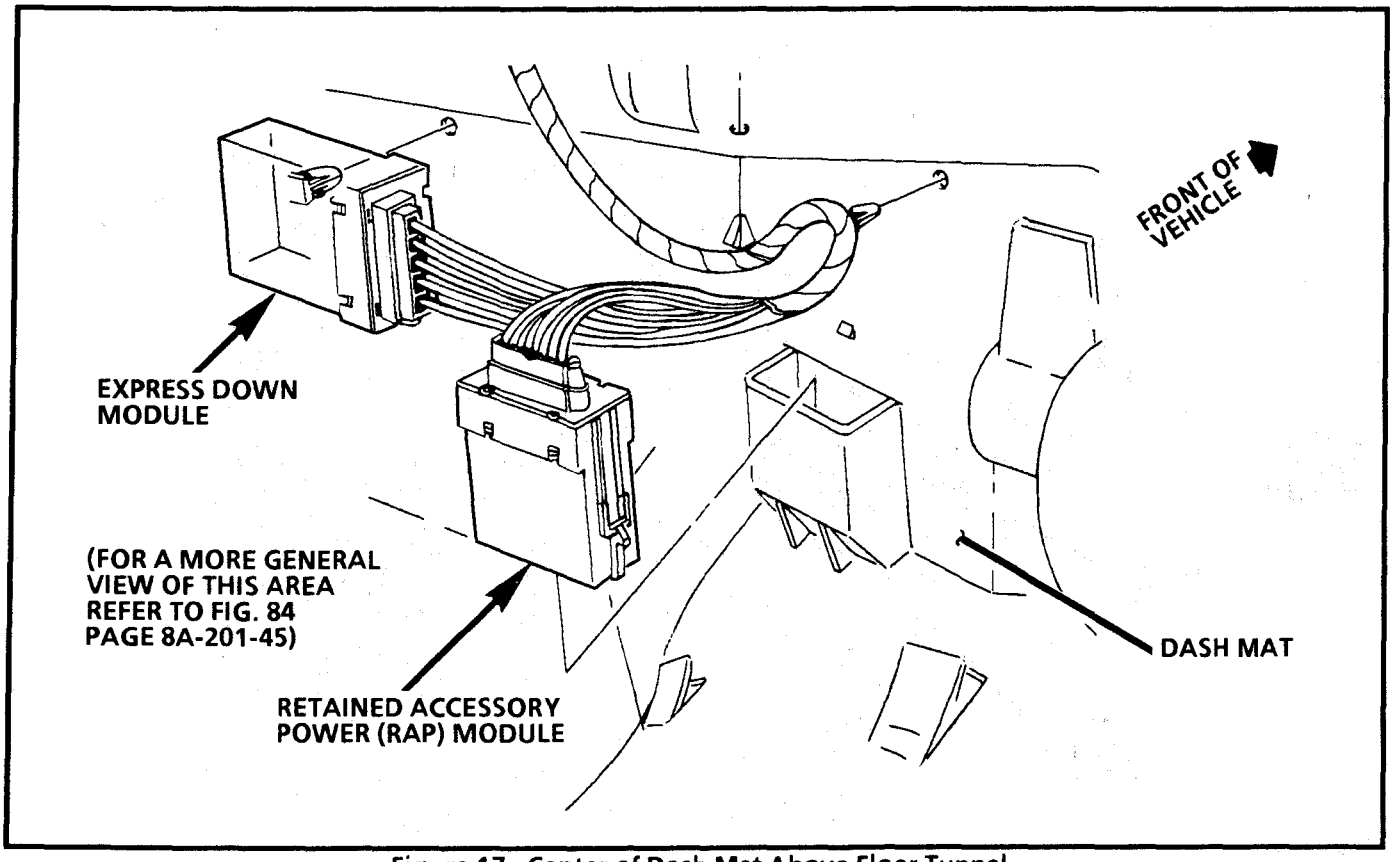


Figure 17 - Center of Dash Mat Above Floor Tunnel

COMPONENT LOCATION VIEWS

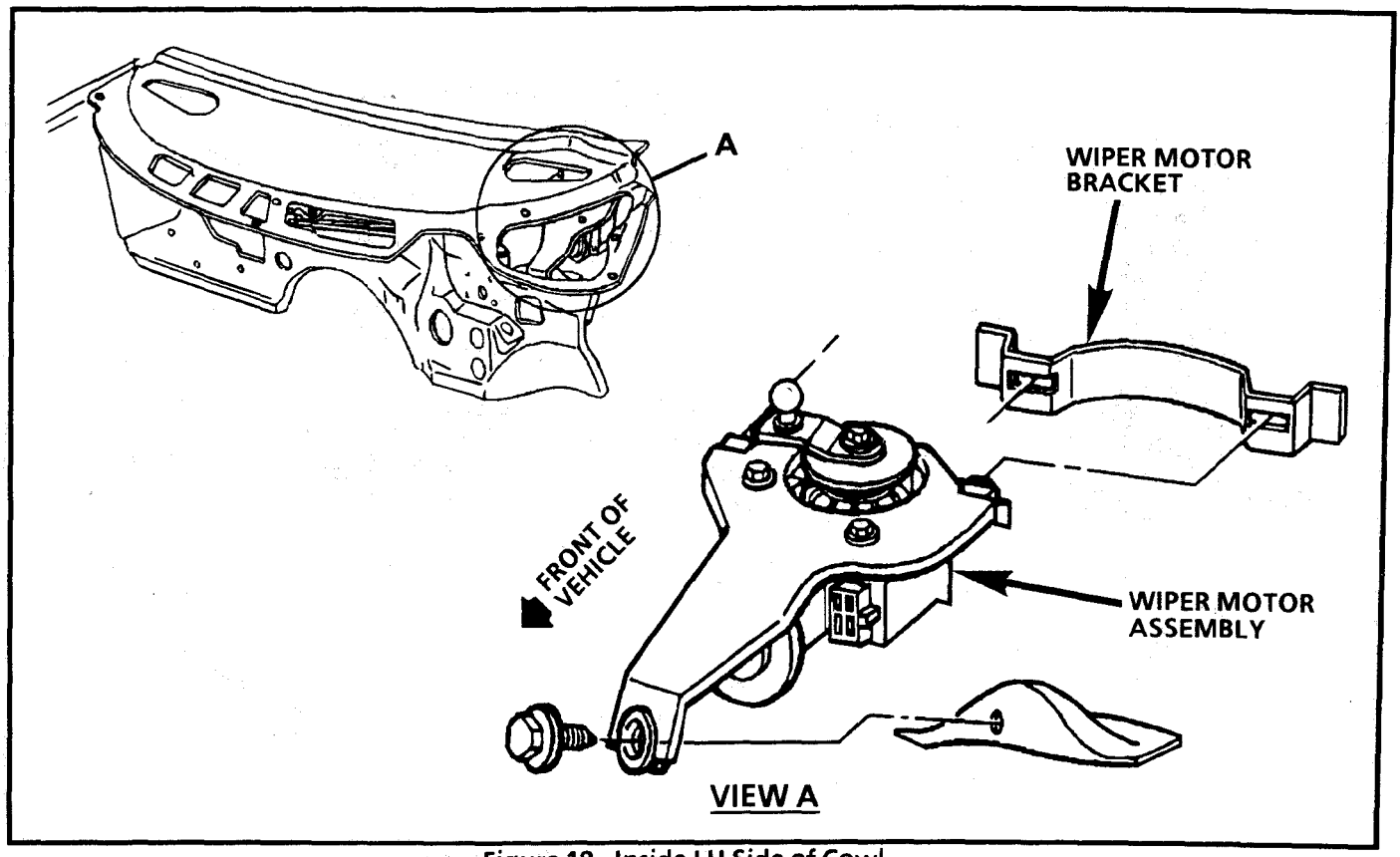


Figure 18 - Inside LH Side of Cowl

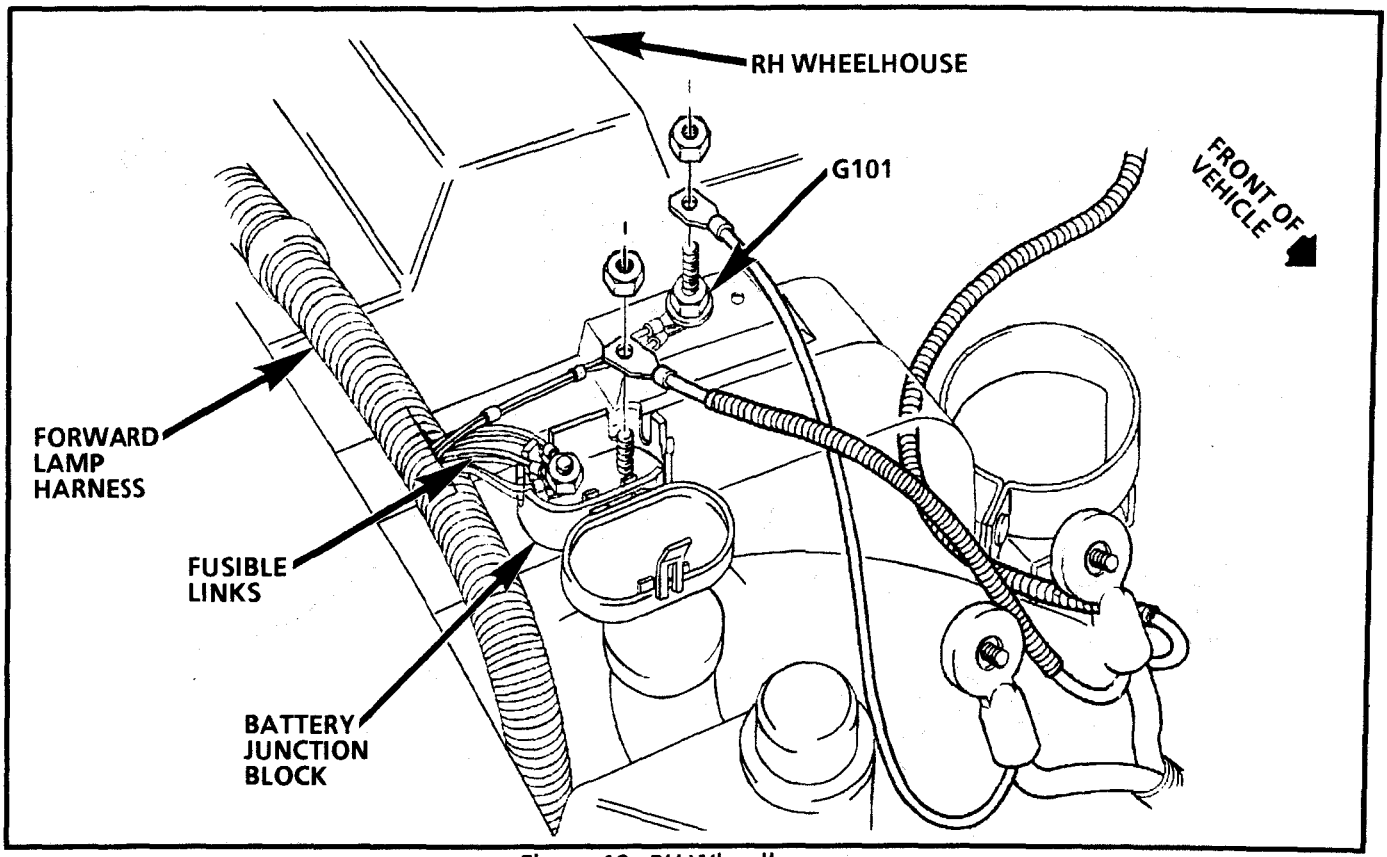


Figure 19 - RH Wheelhouse

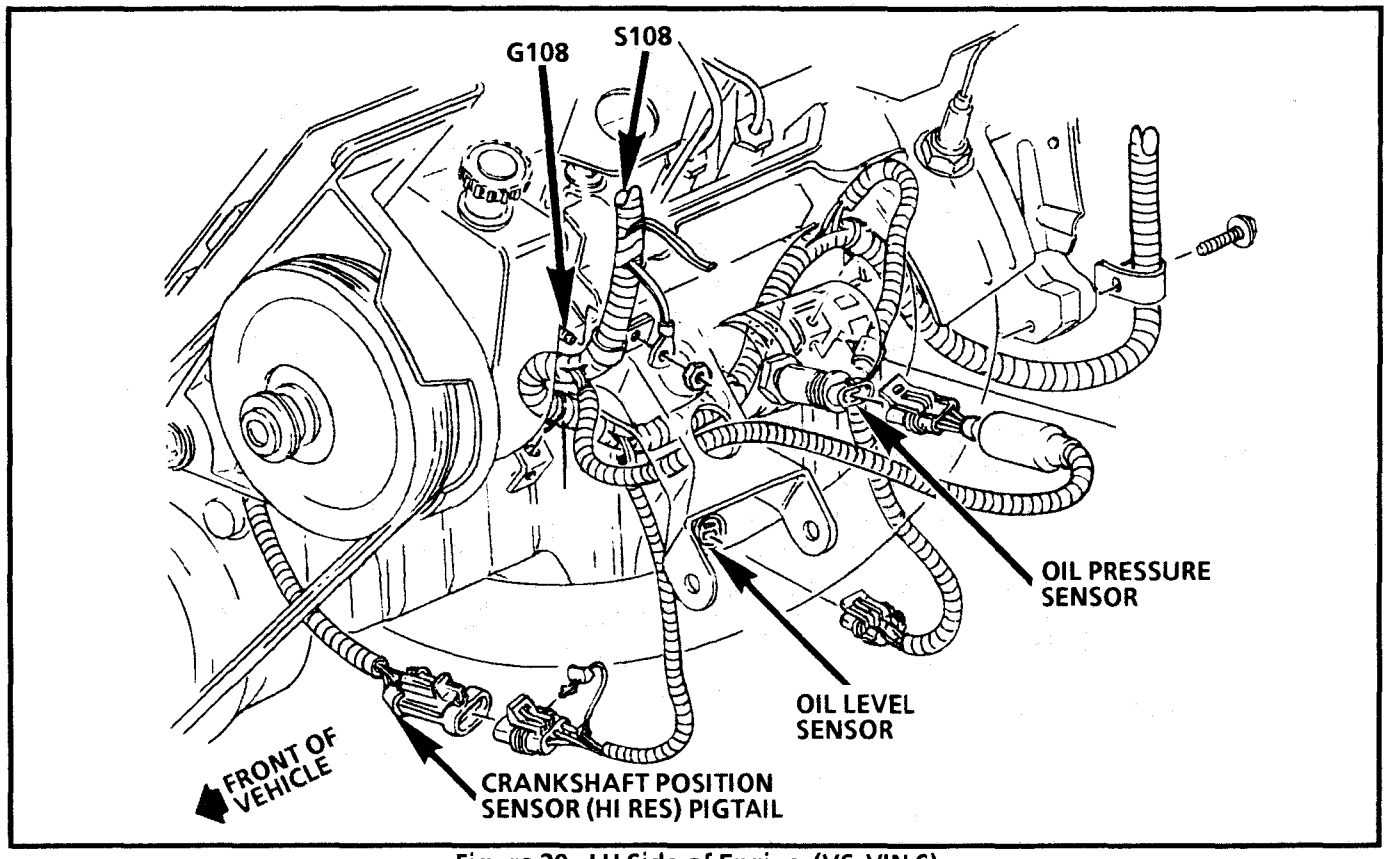


Figure 20 - LH Side of Engine (V6 VIN S)

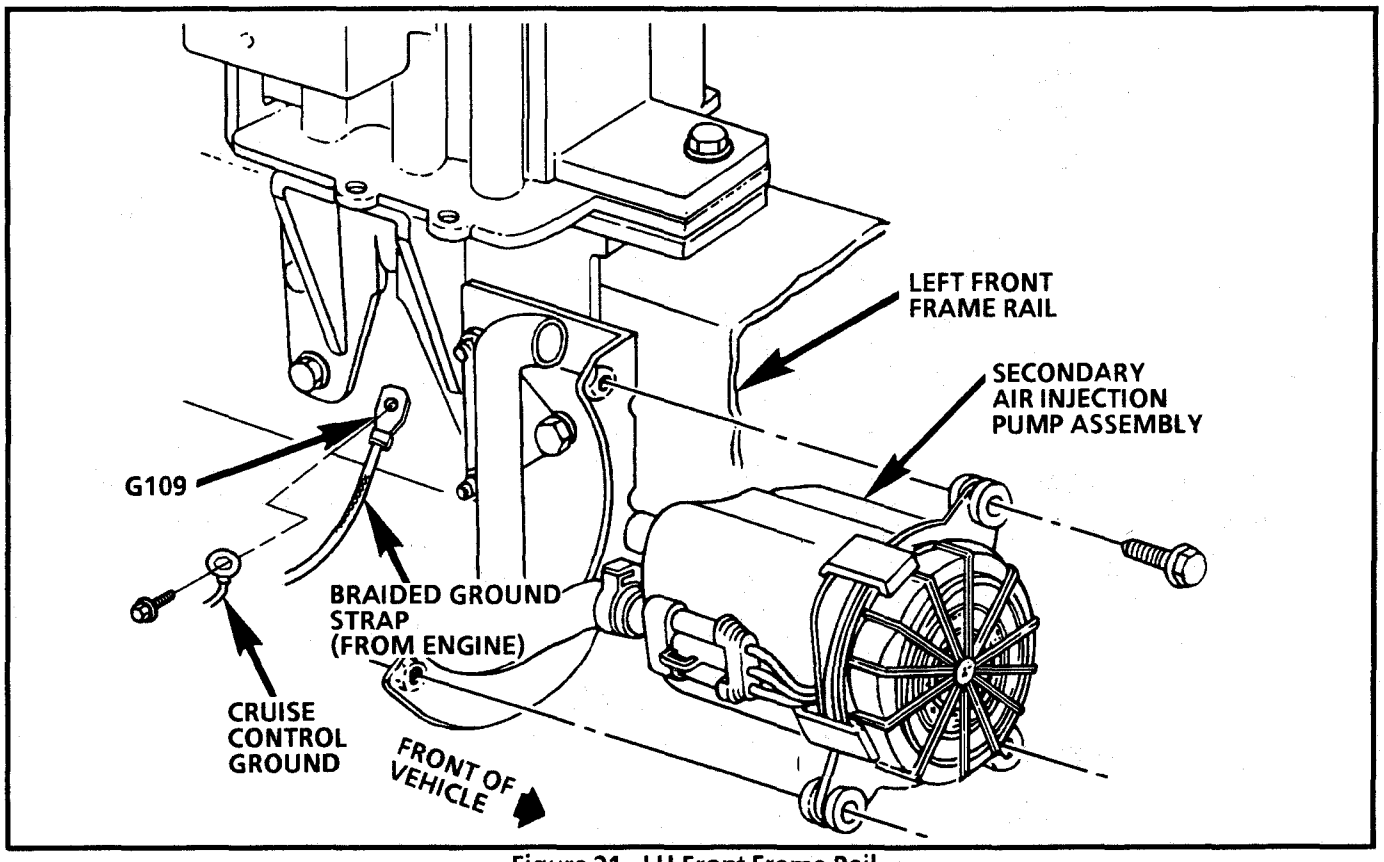


Figure 21 - LH Front Frame Rail

COMPONENT LOCATION VIEWS

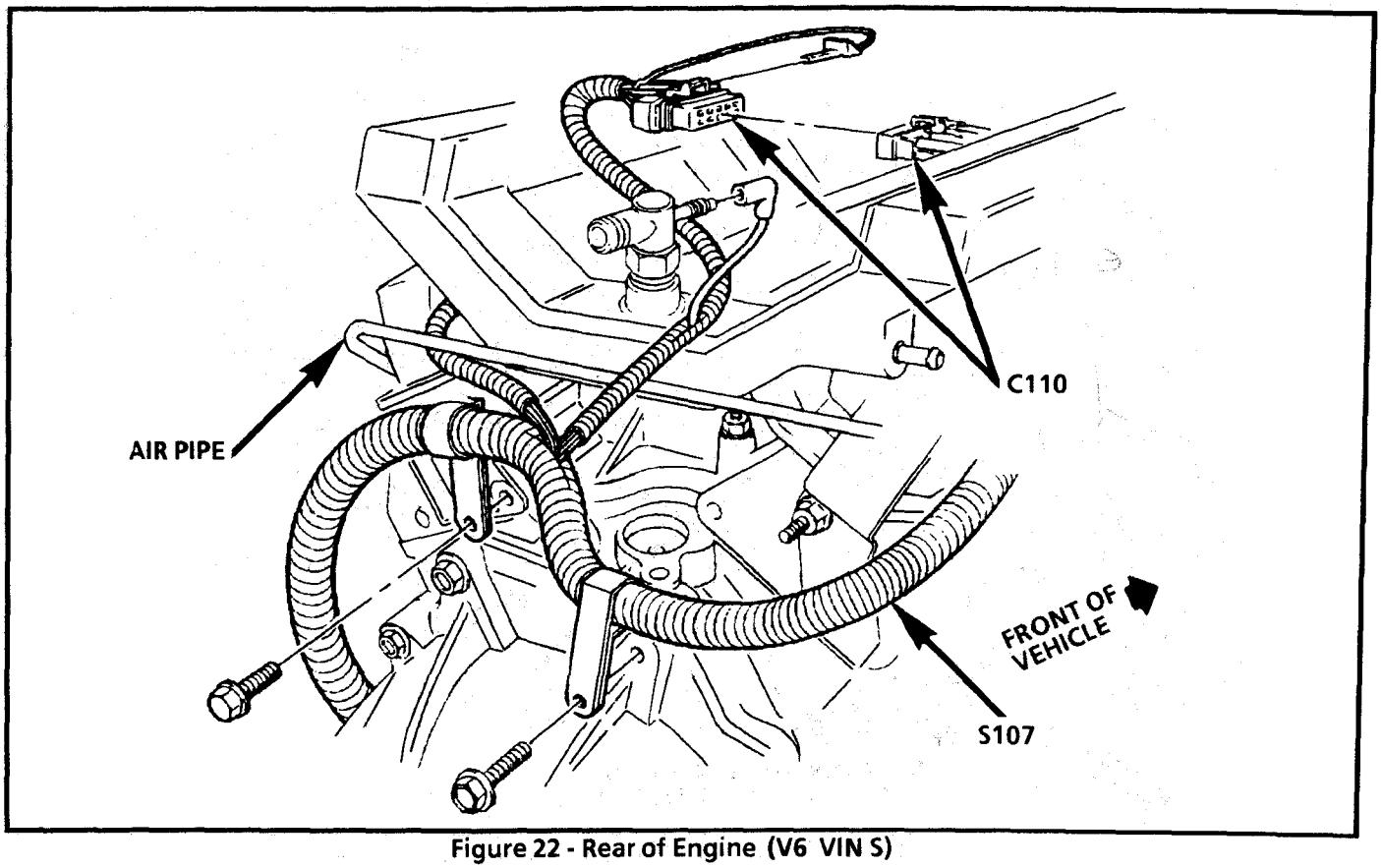


Figure 22 - Rear of Engine (V6 VIN S)

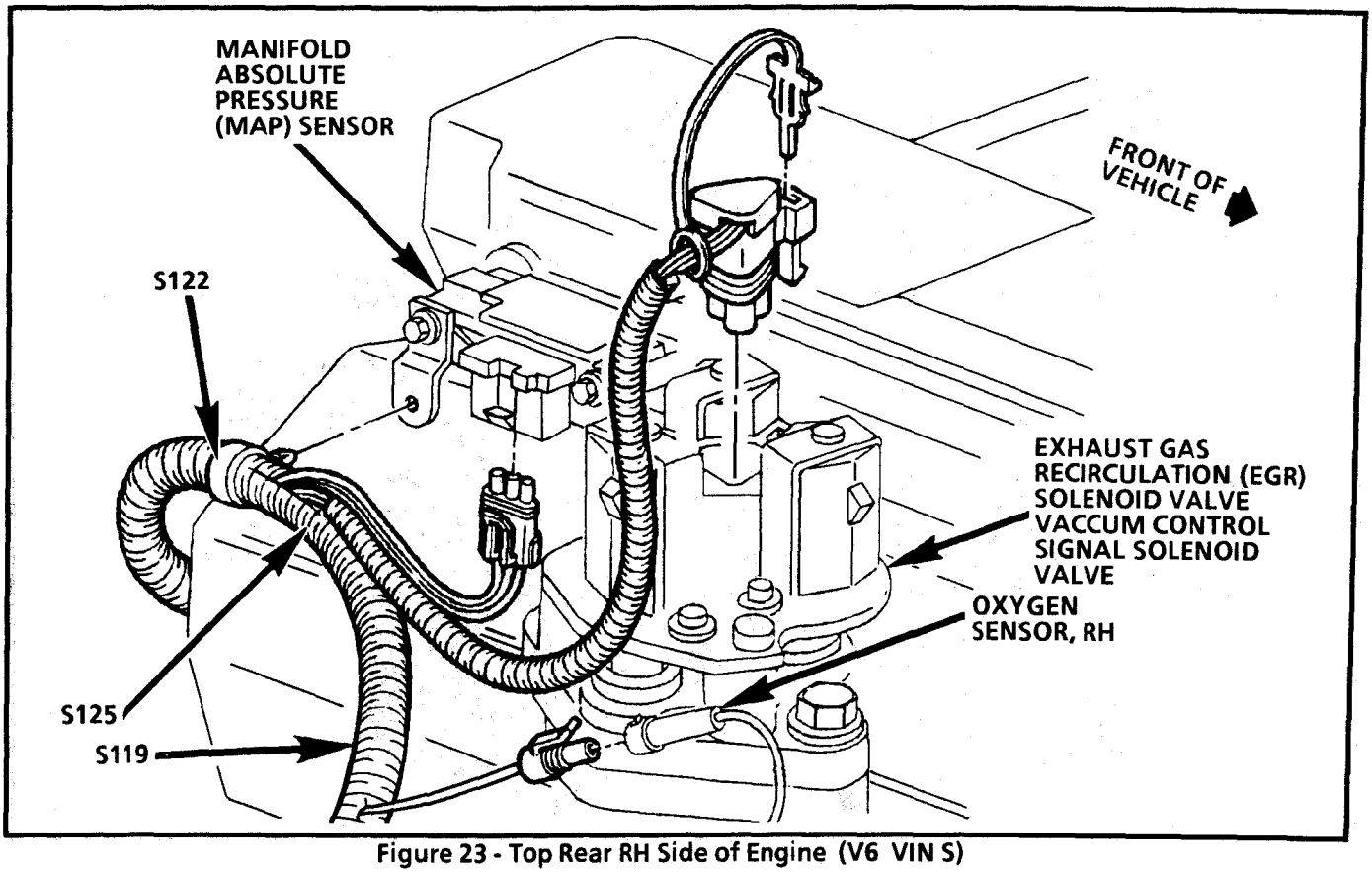


Figure 23 - Top Rear RH Side of Engine (V6 VIN S)

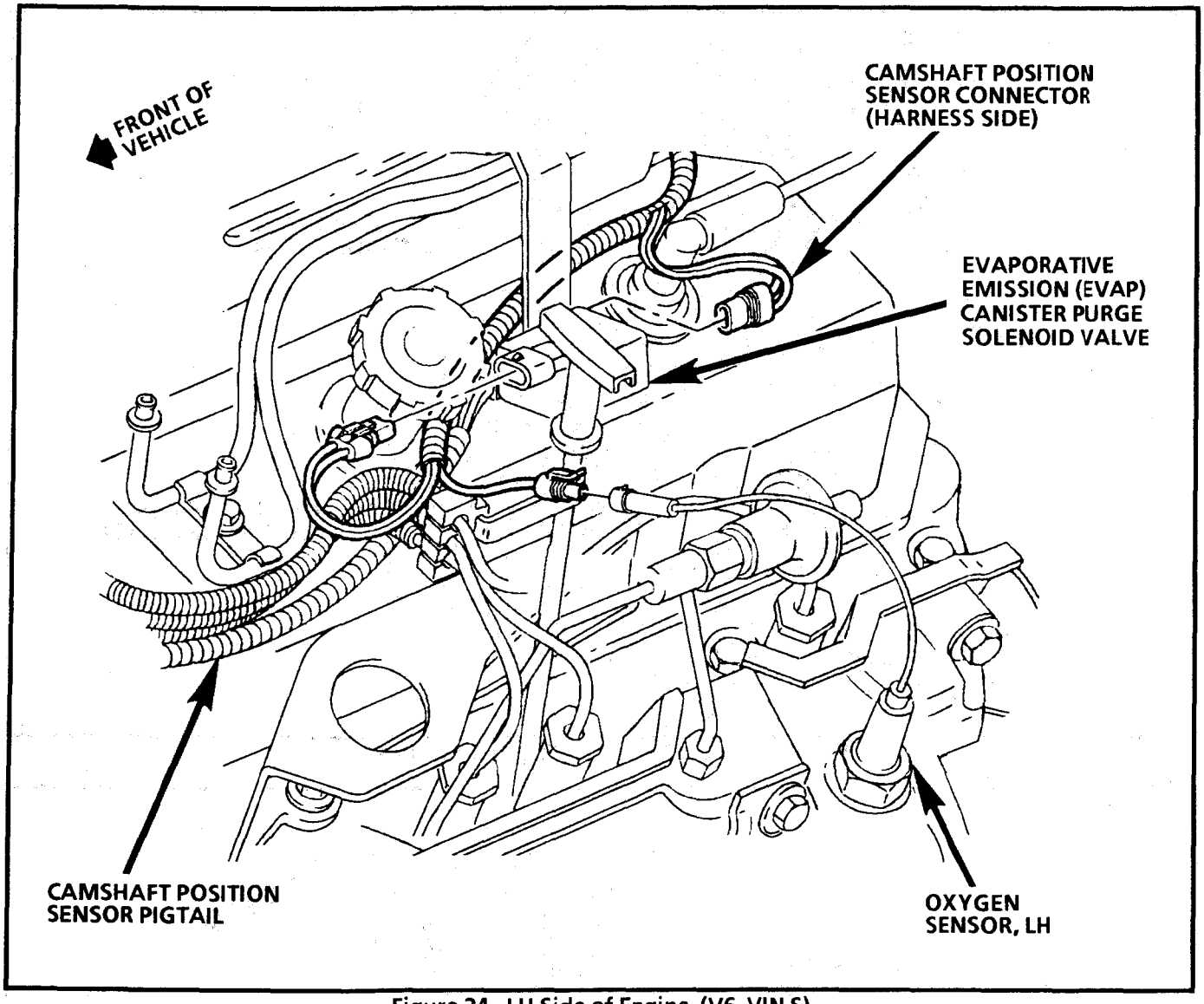


Figure 24 - LH Side of Engine (V6 VIN S)

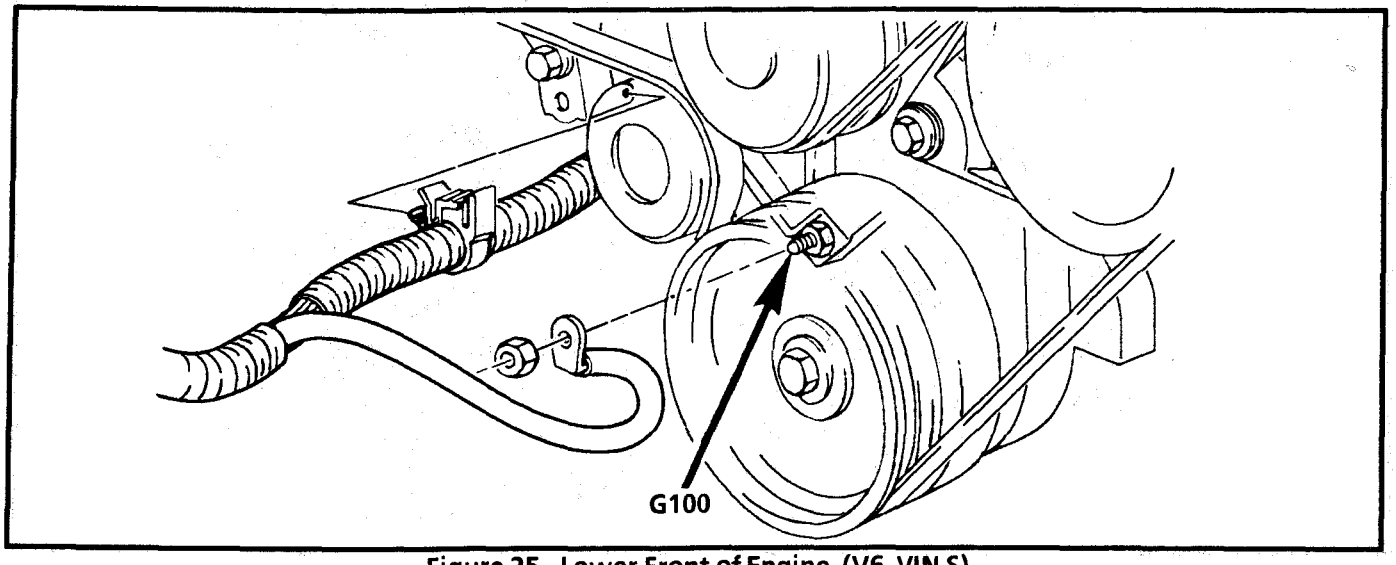


Figure 25 - Lower Front of Engine (V6 VIN S)

COMPONENT LOCATION VIEWS

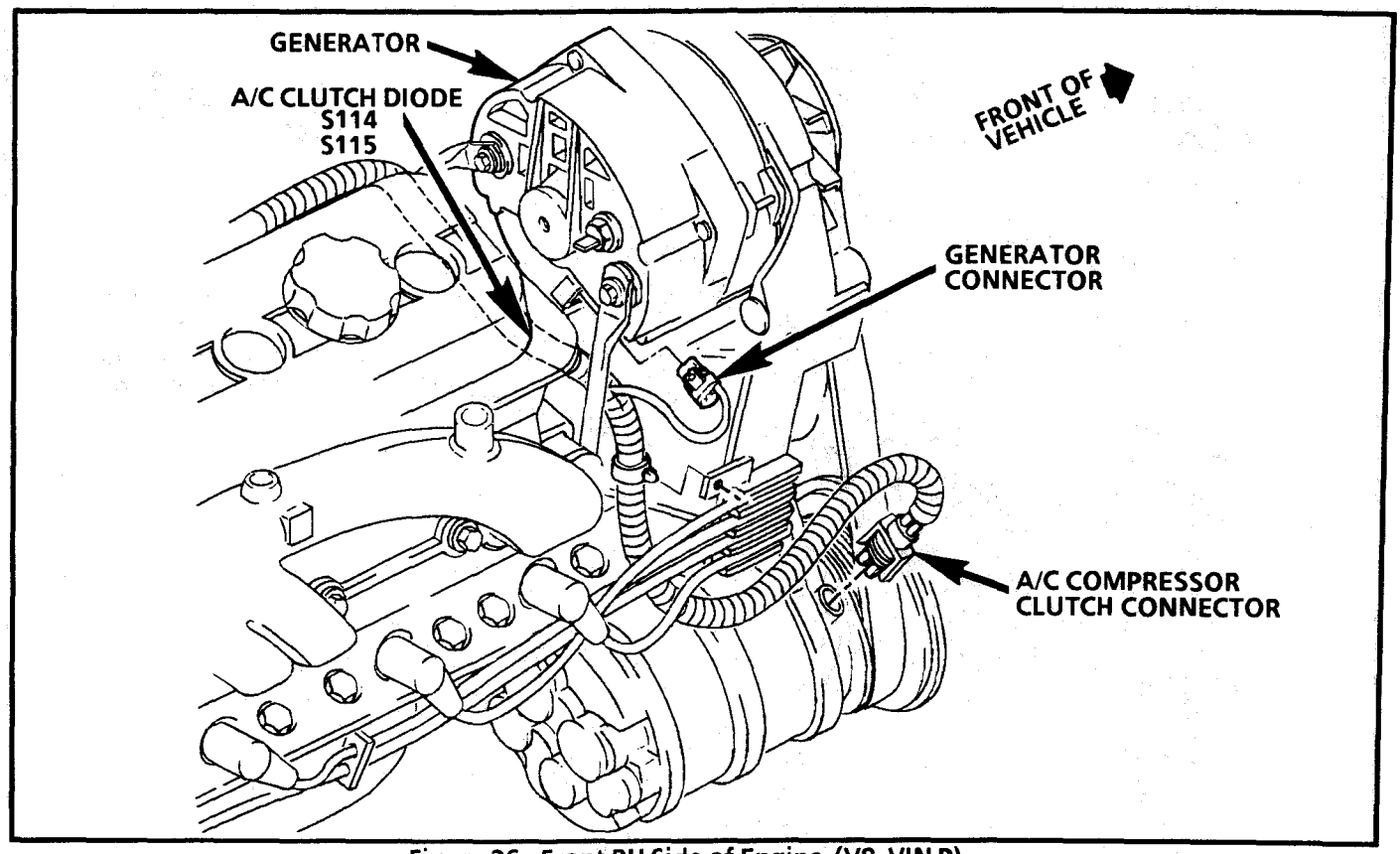


Figure 26 - Front RH Side of Engine (V8 VIN P)

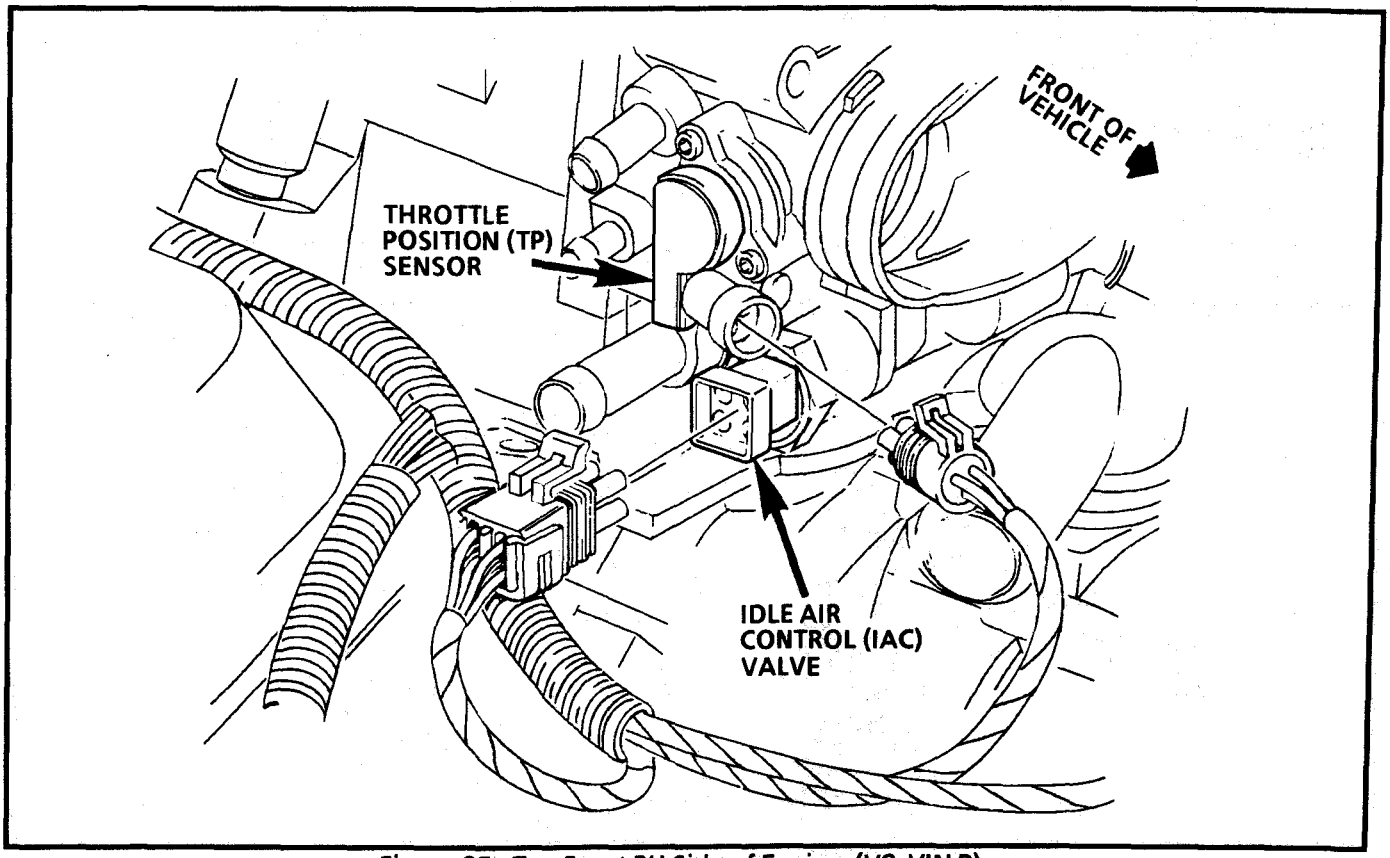


Figure 27 - Top Front RH Side of Engine (V8 VIN P)

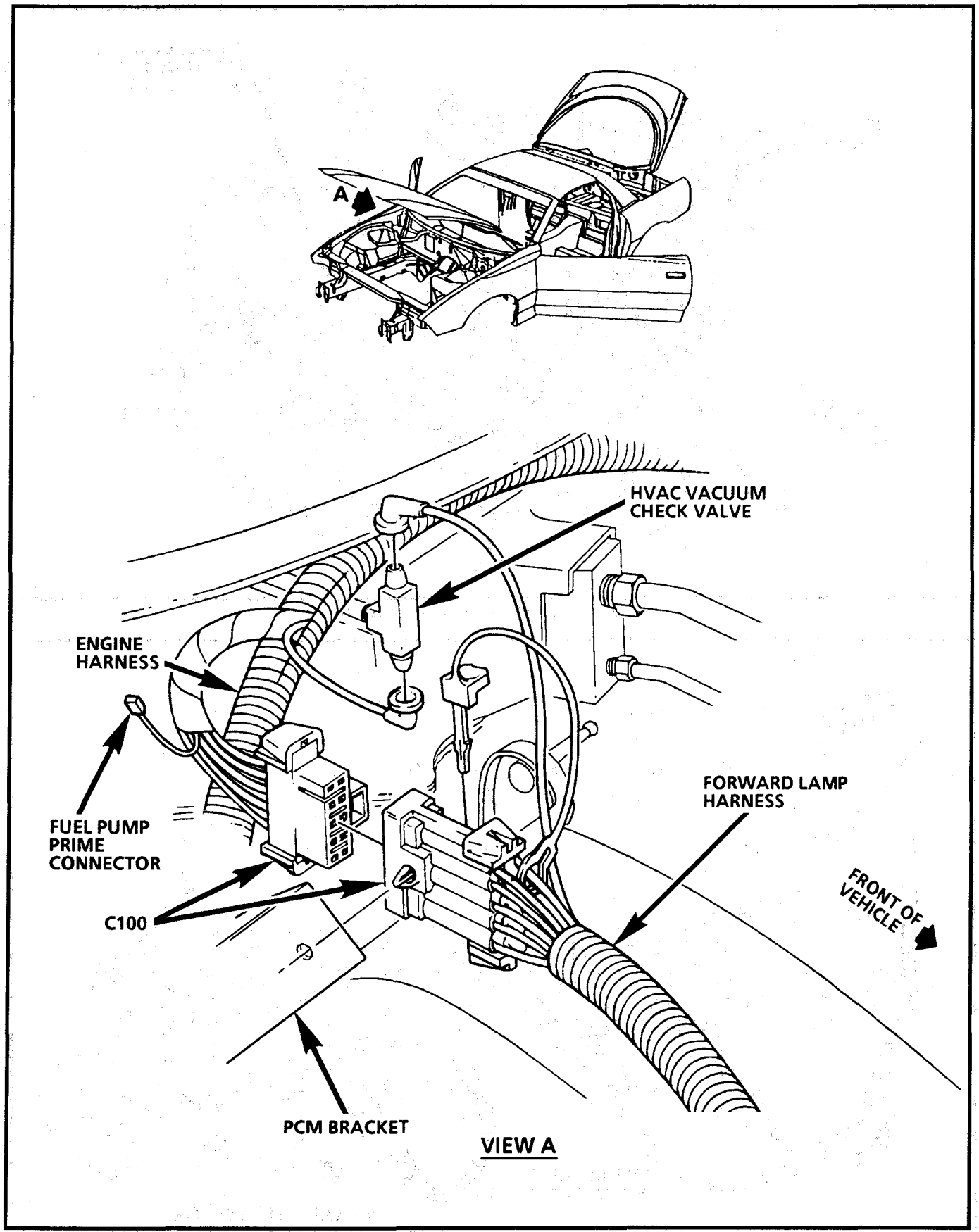


Figure 28 - Right Rear of Engine Compartment

COMPONENT LOCATION VIEWS

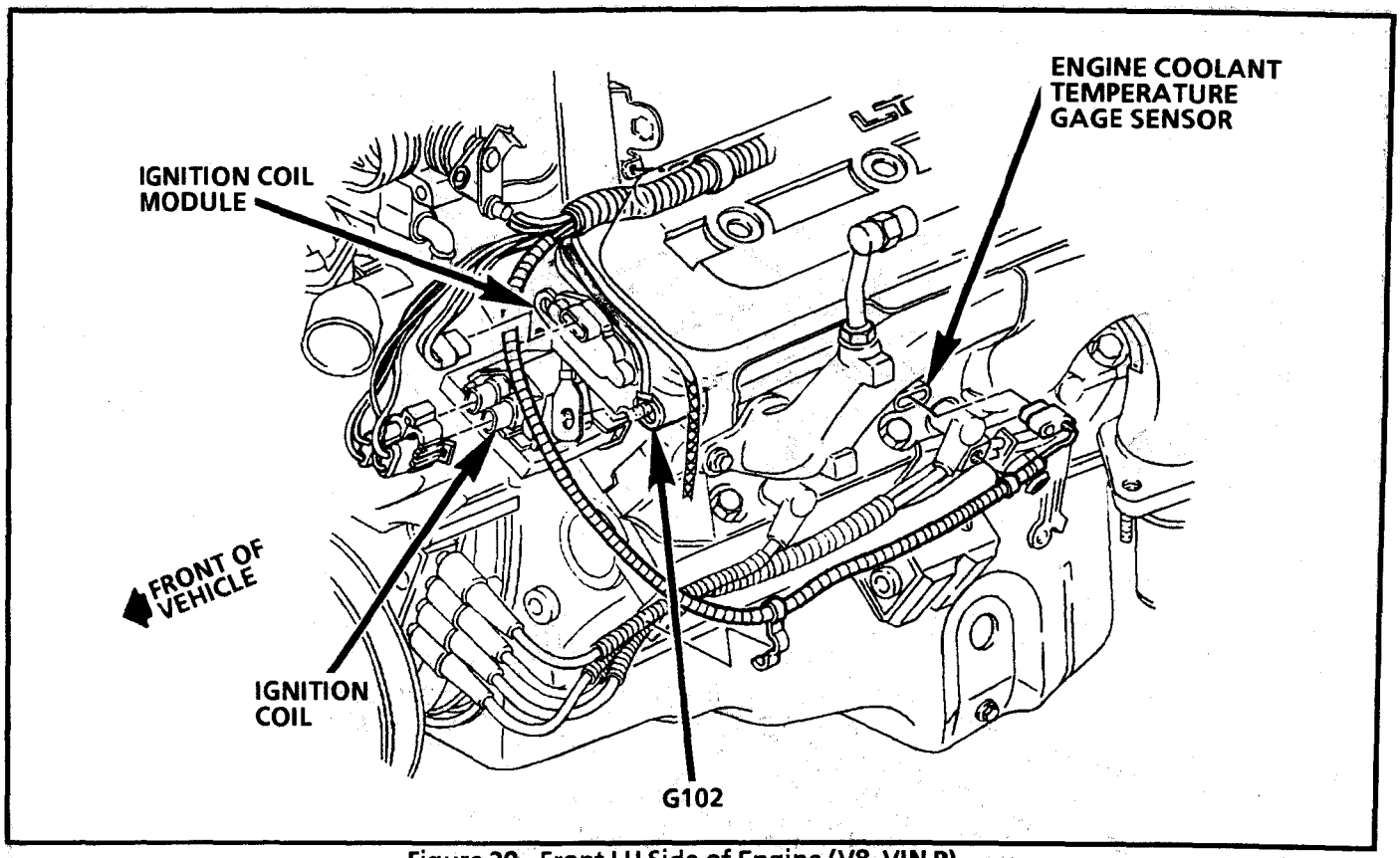


Figure 29 - Front LH Side of Engine (V8 VIN P)

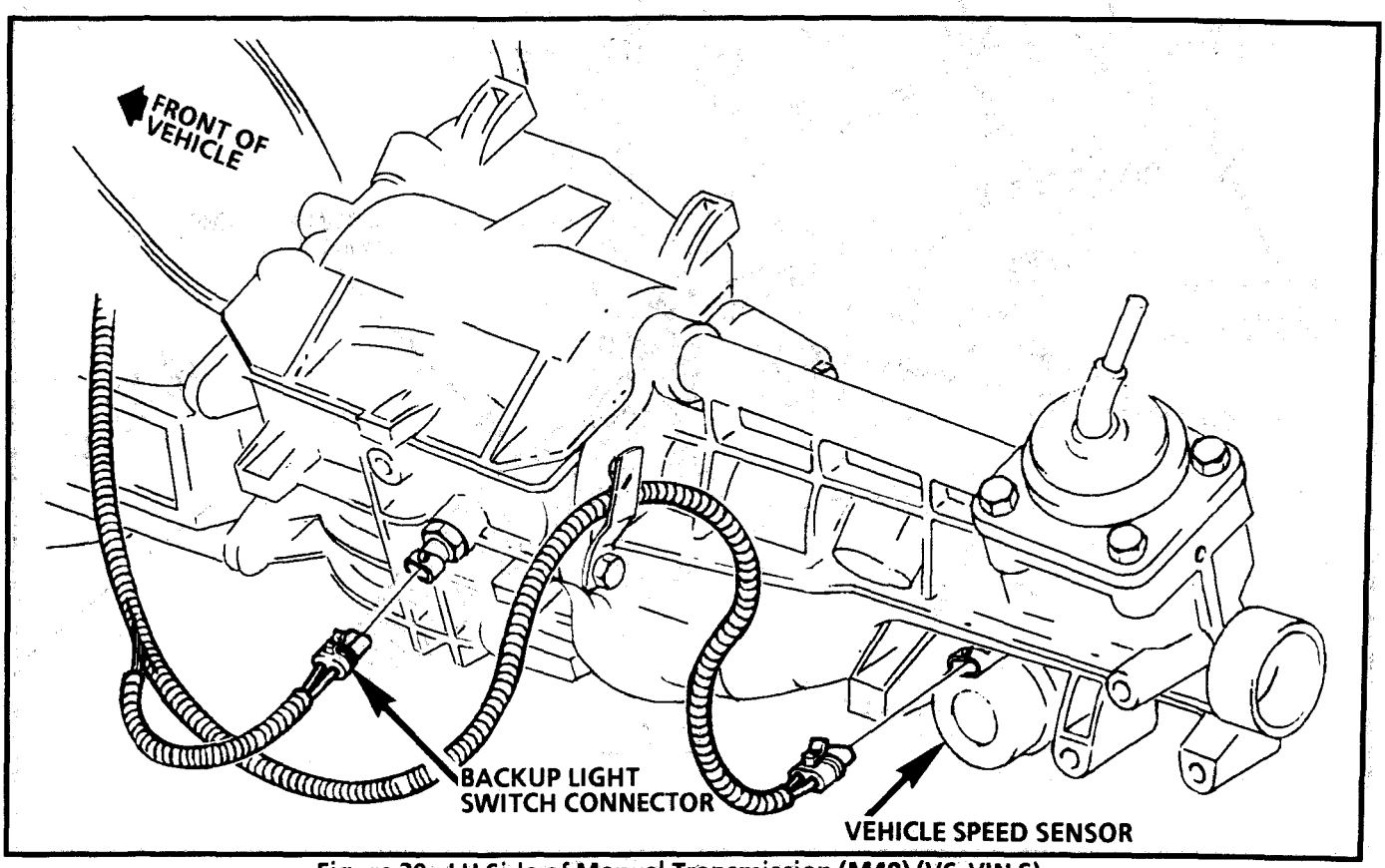


Figure 30 - LH Side of Manual Transmission (M49) (V6 VIN S)

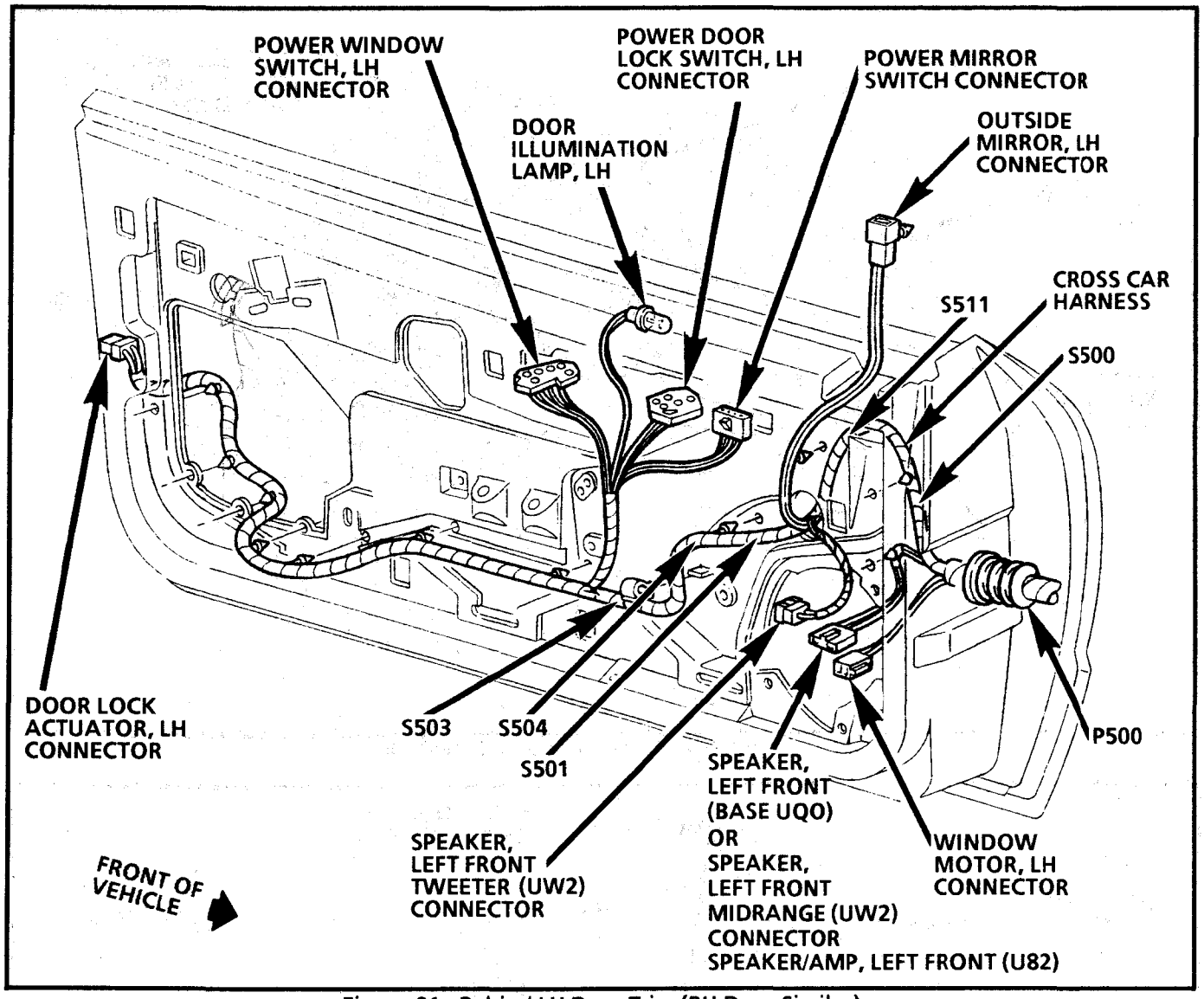


Figure 31 - Behind LH Door Trim (RH Door Similar)

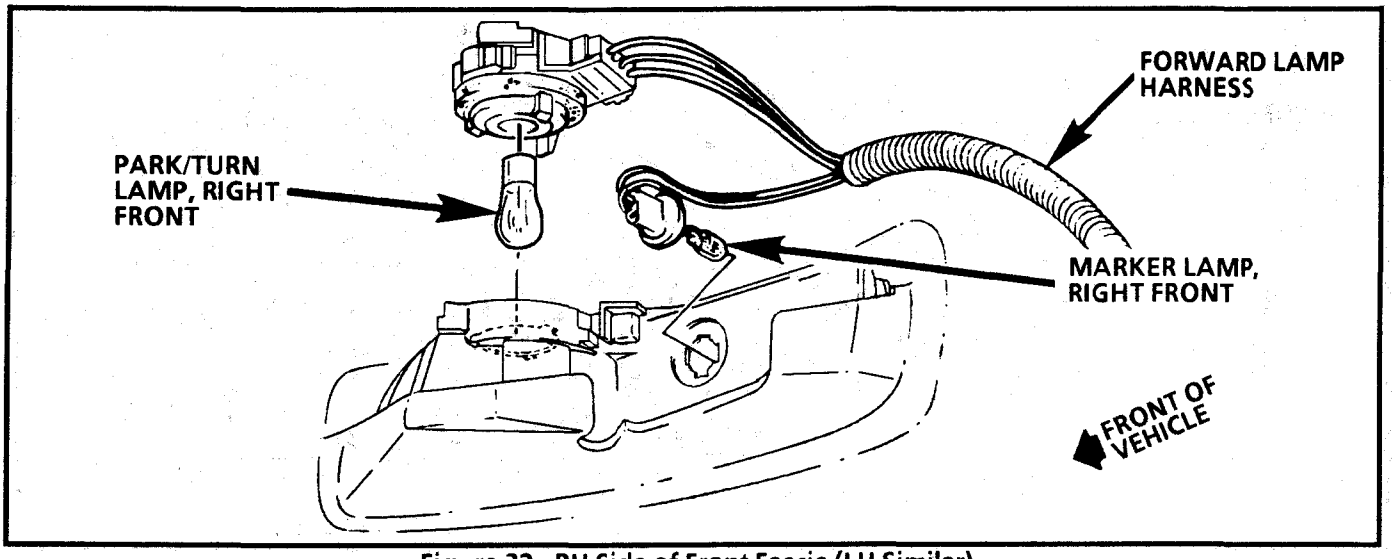


Figure 32 - RH Side of Front Fascia (LH Similar)

COMPONENT LOCATION VIEWS

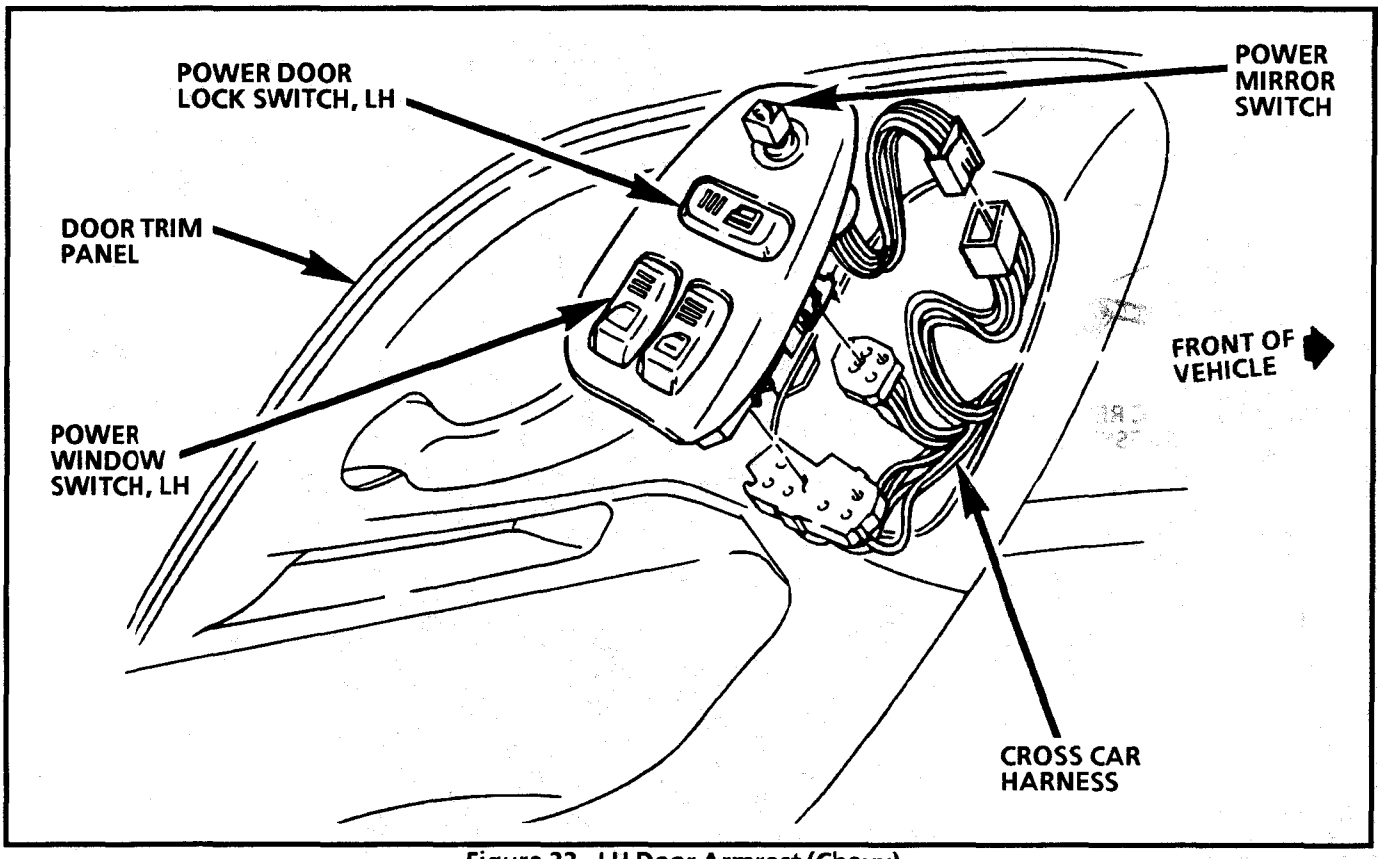


Figure 33 - LH Door Armrest (Chevy)

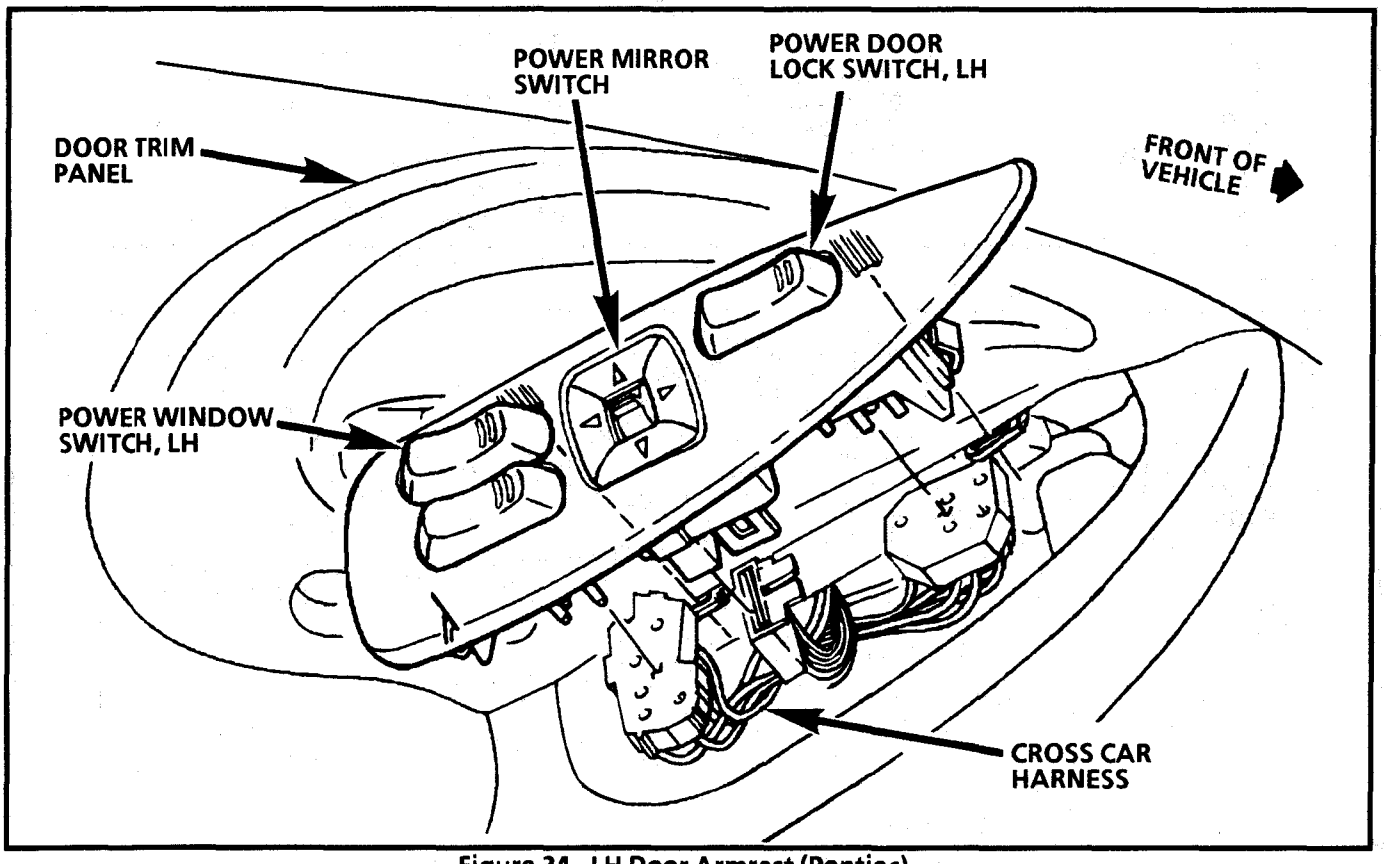


Figure 34 - LH Door Armrest (Pontiac)

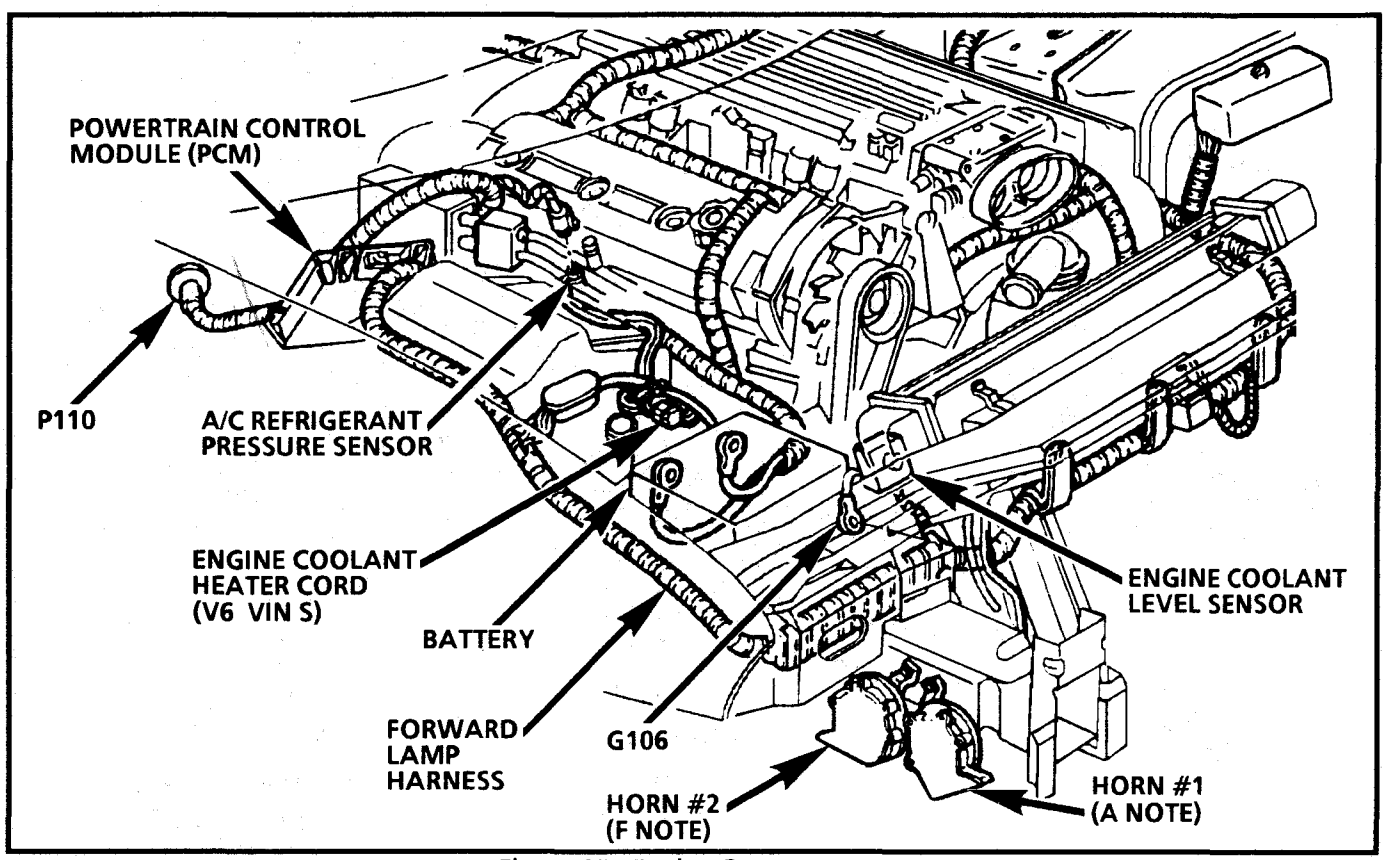


Figure 35 - Engine Compartment

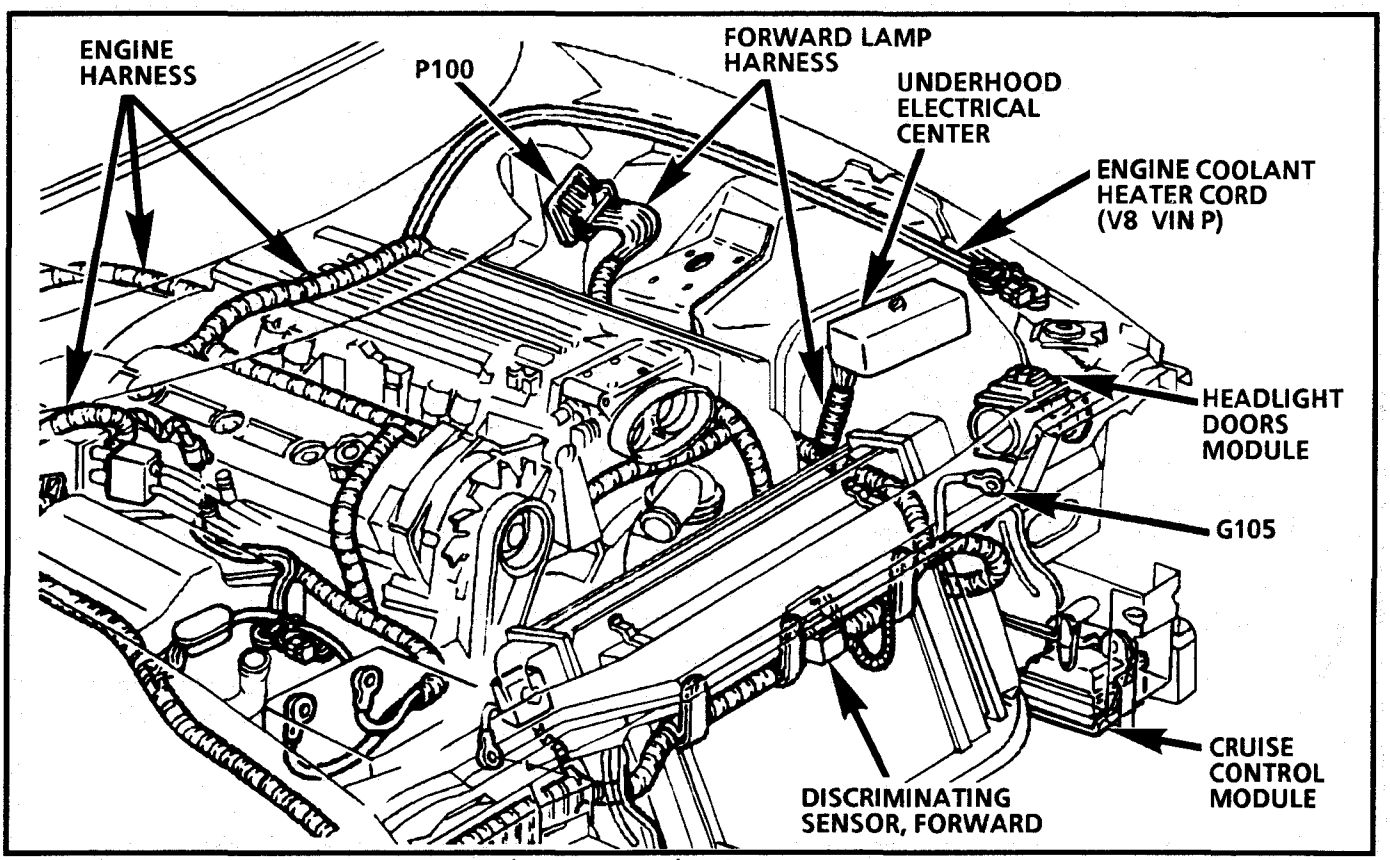


Figure 36 - Engine Compartment

COMPONENT LOCATION VIEWS

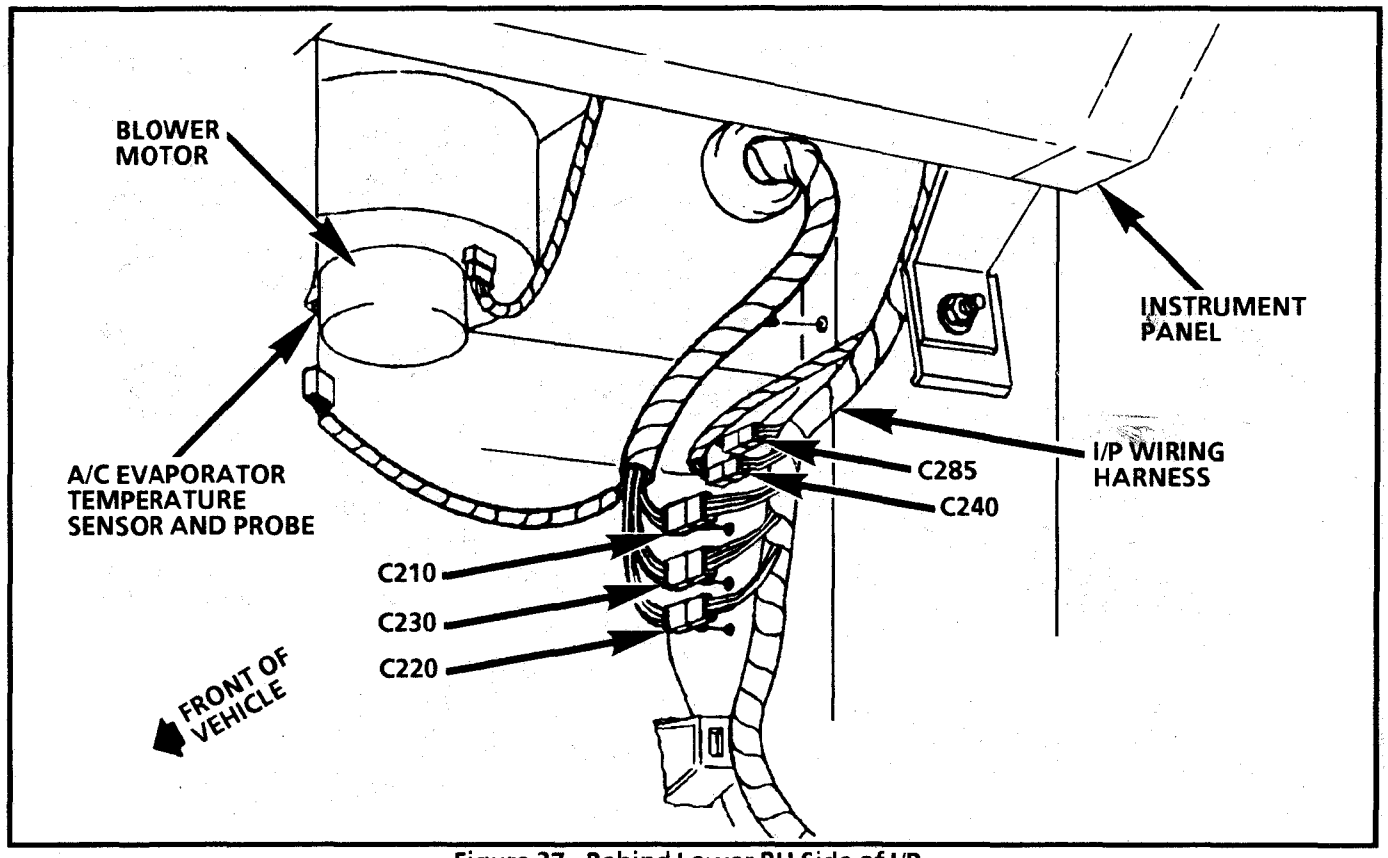


Figure 37 - Behind Lower RH Side of I/P

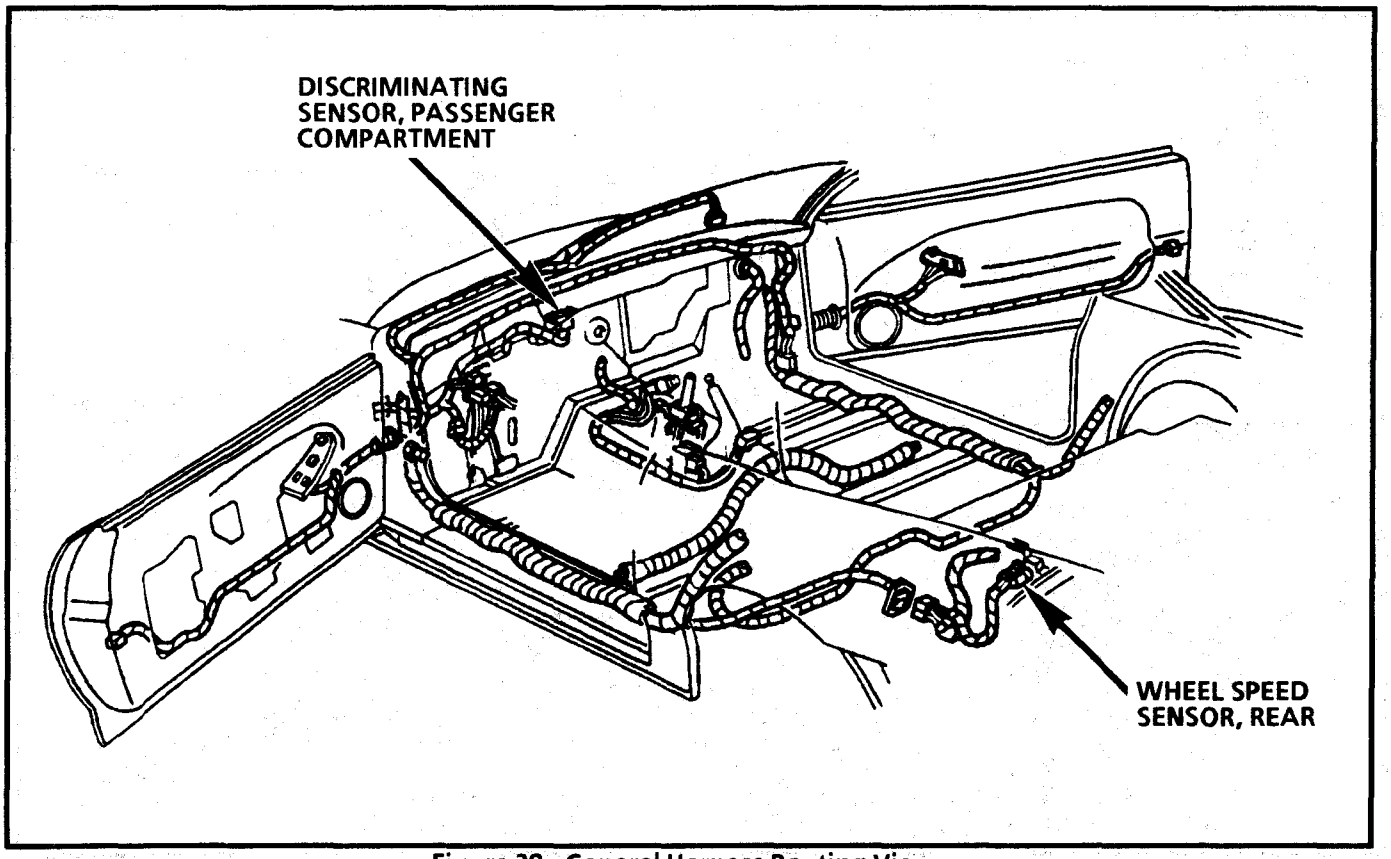


Figure 38 - General Harness Routing View

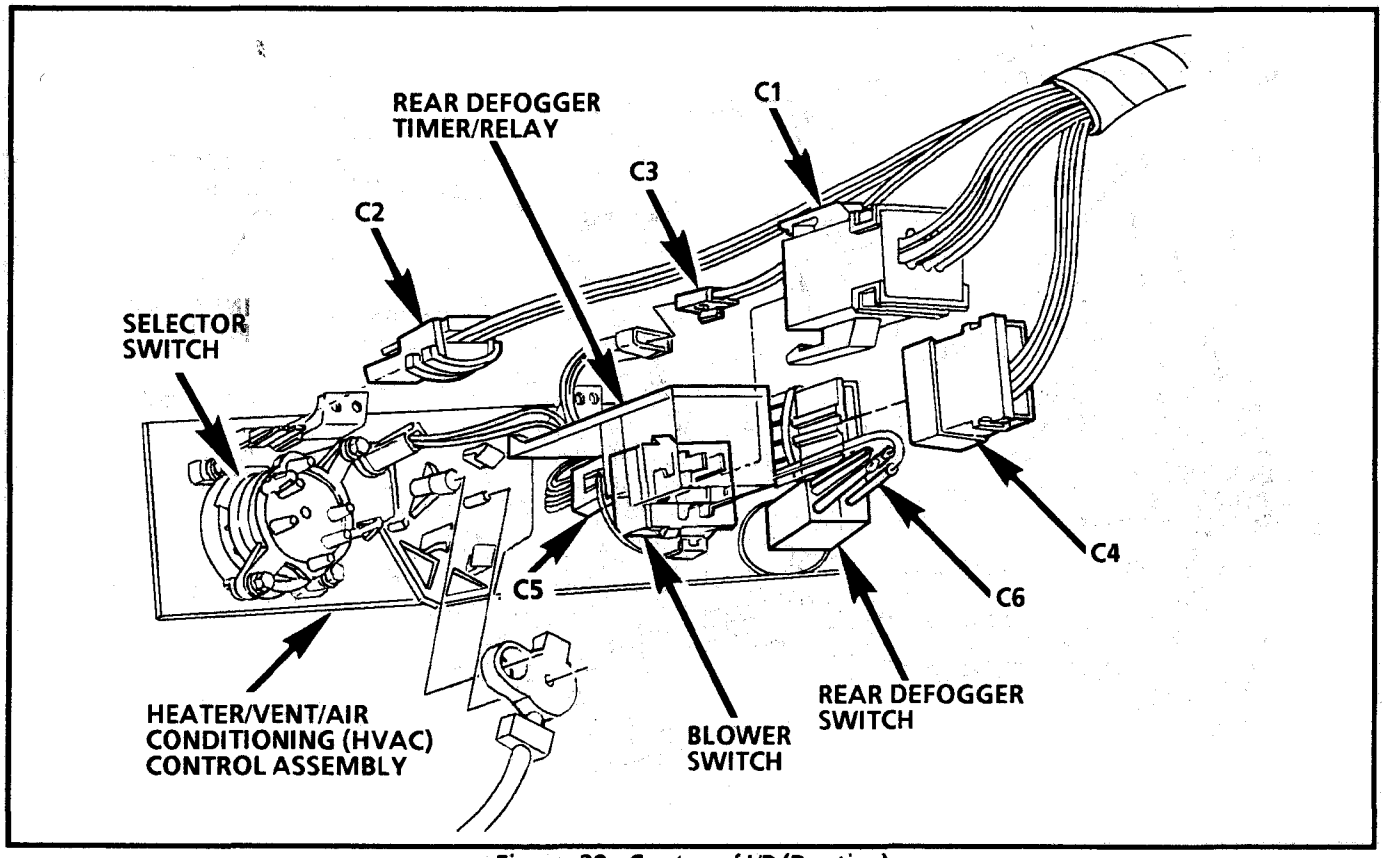


Figure 39 - Center of I/P (Pontiac)

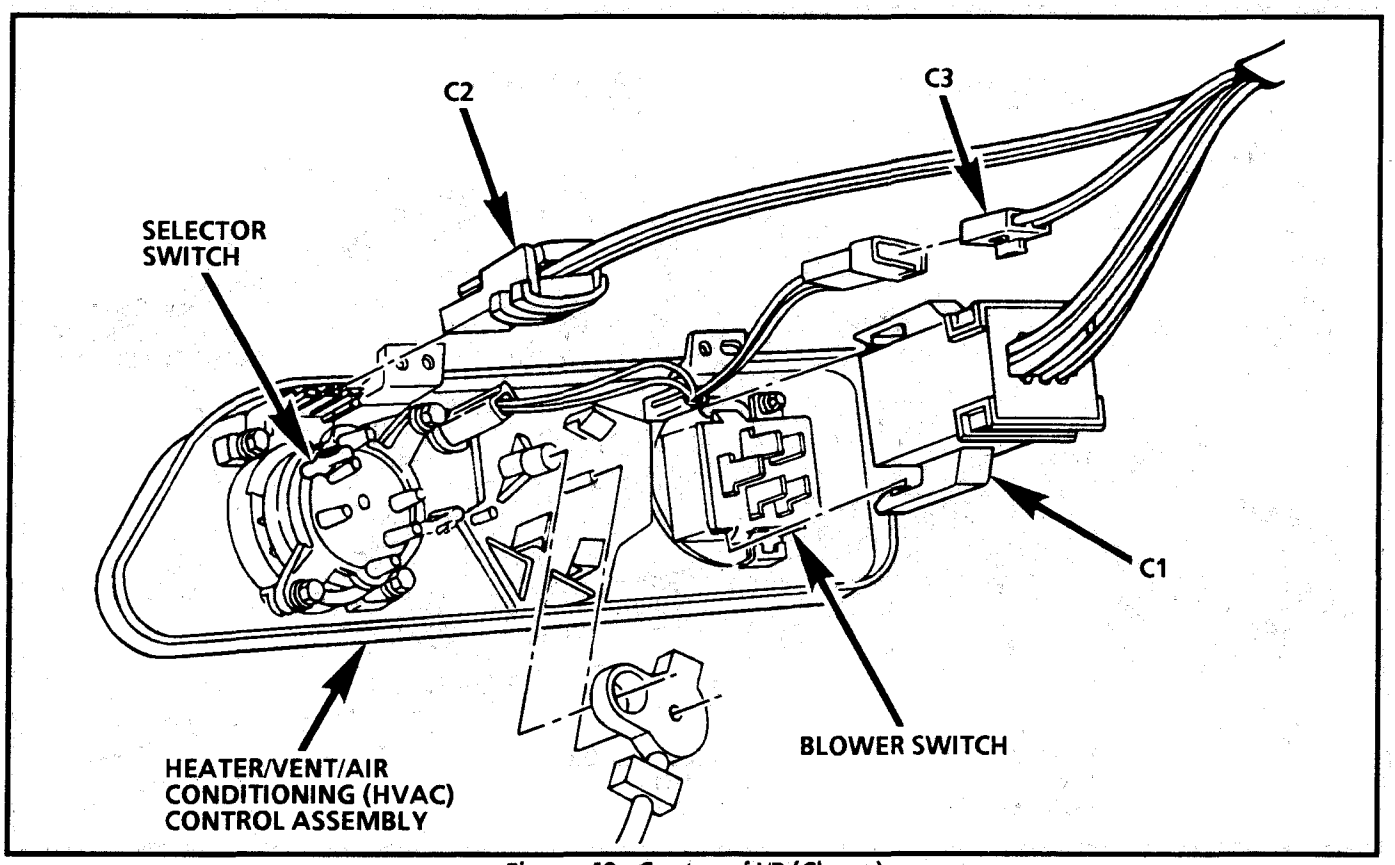


Figure 40 - Center of I/P (Chevy)

COMPONENT LOCATION VIEWS

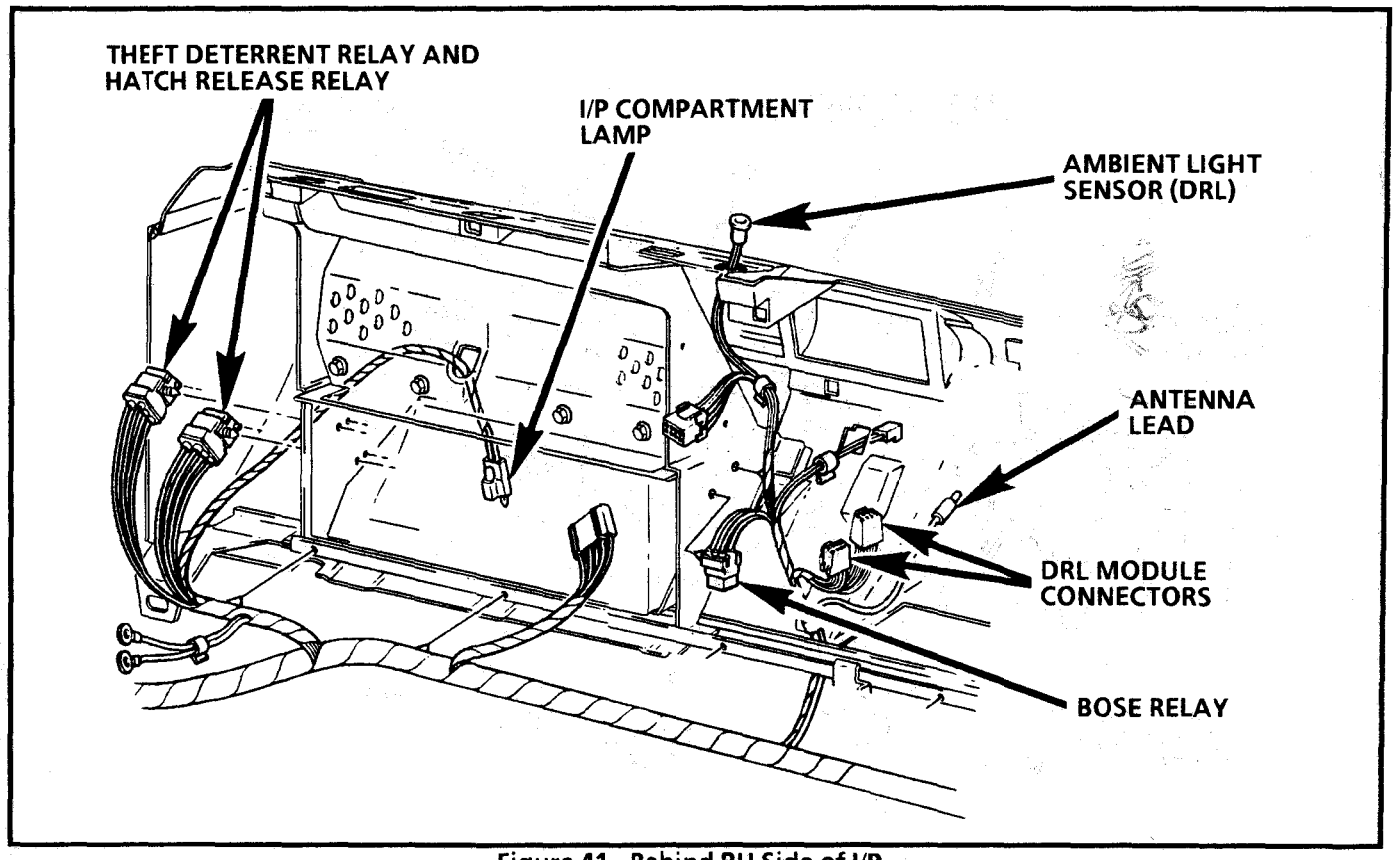


Figure 41 - Behind RH Side of I/P

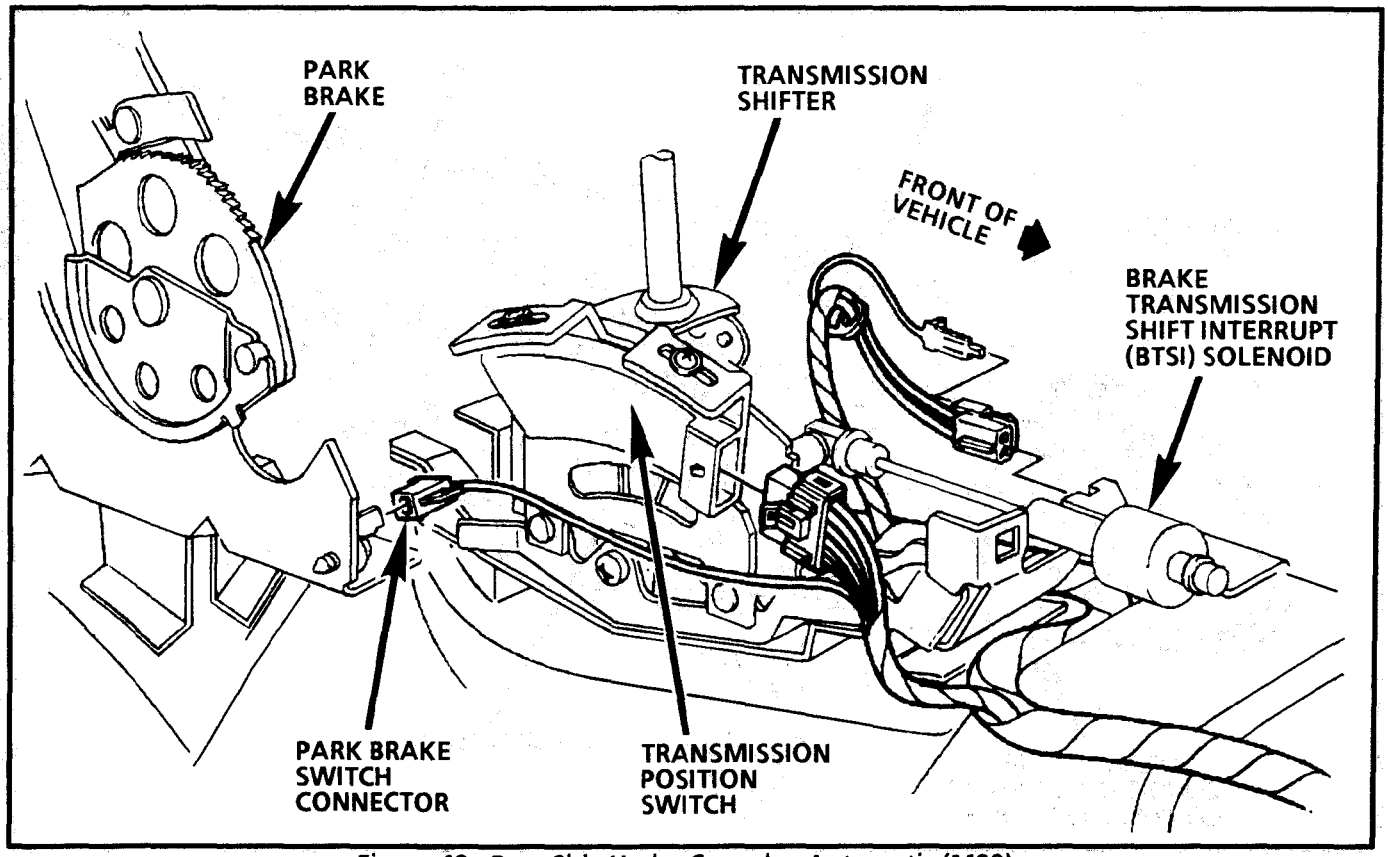


Figure 42 - Rear Side Under Console - Automatic (M30)

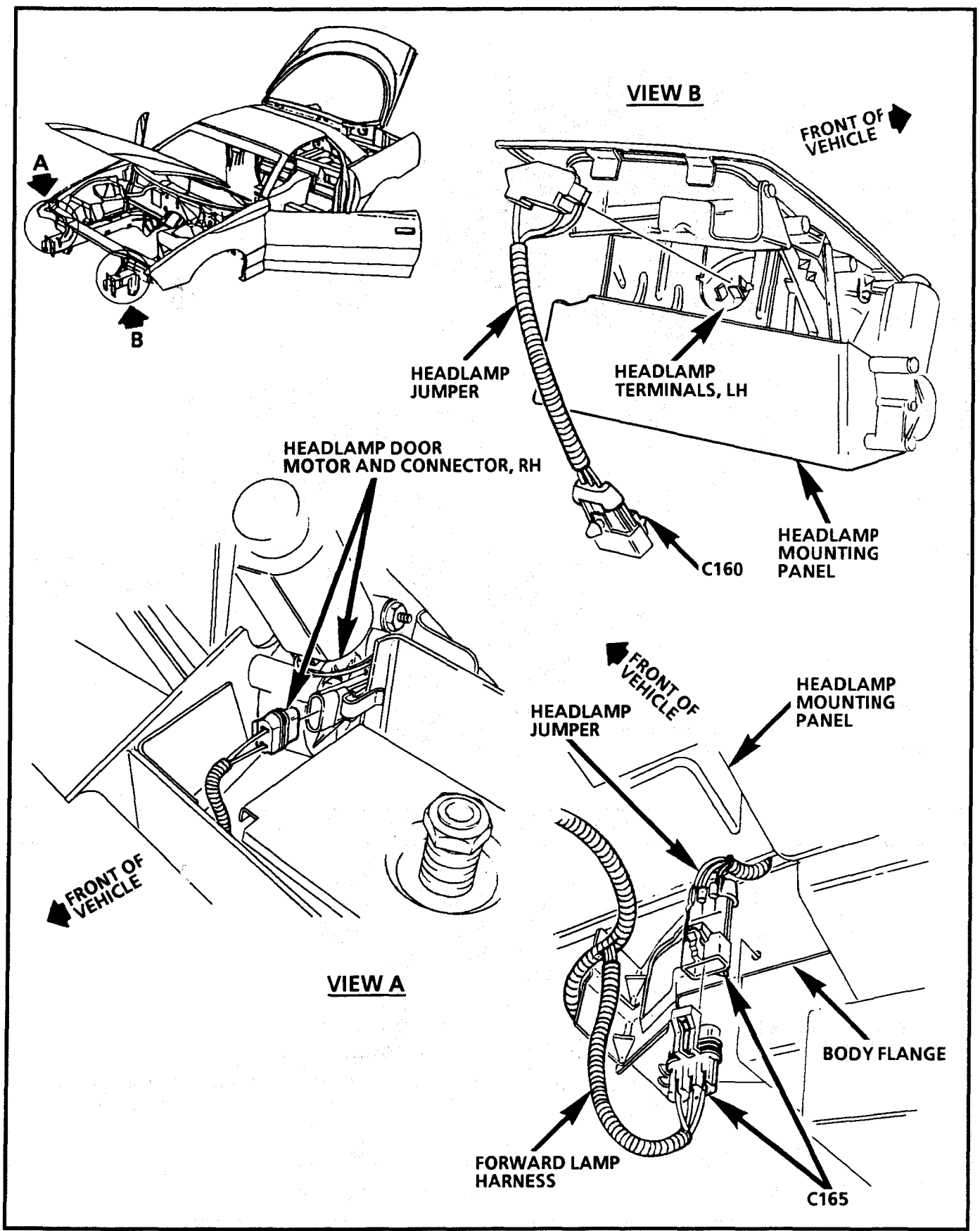


Figure 43 - Headlamp Area (Pontiac)

COMPONENT LOCATION VIEWS

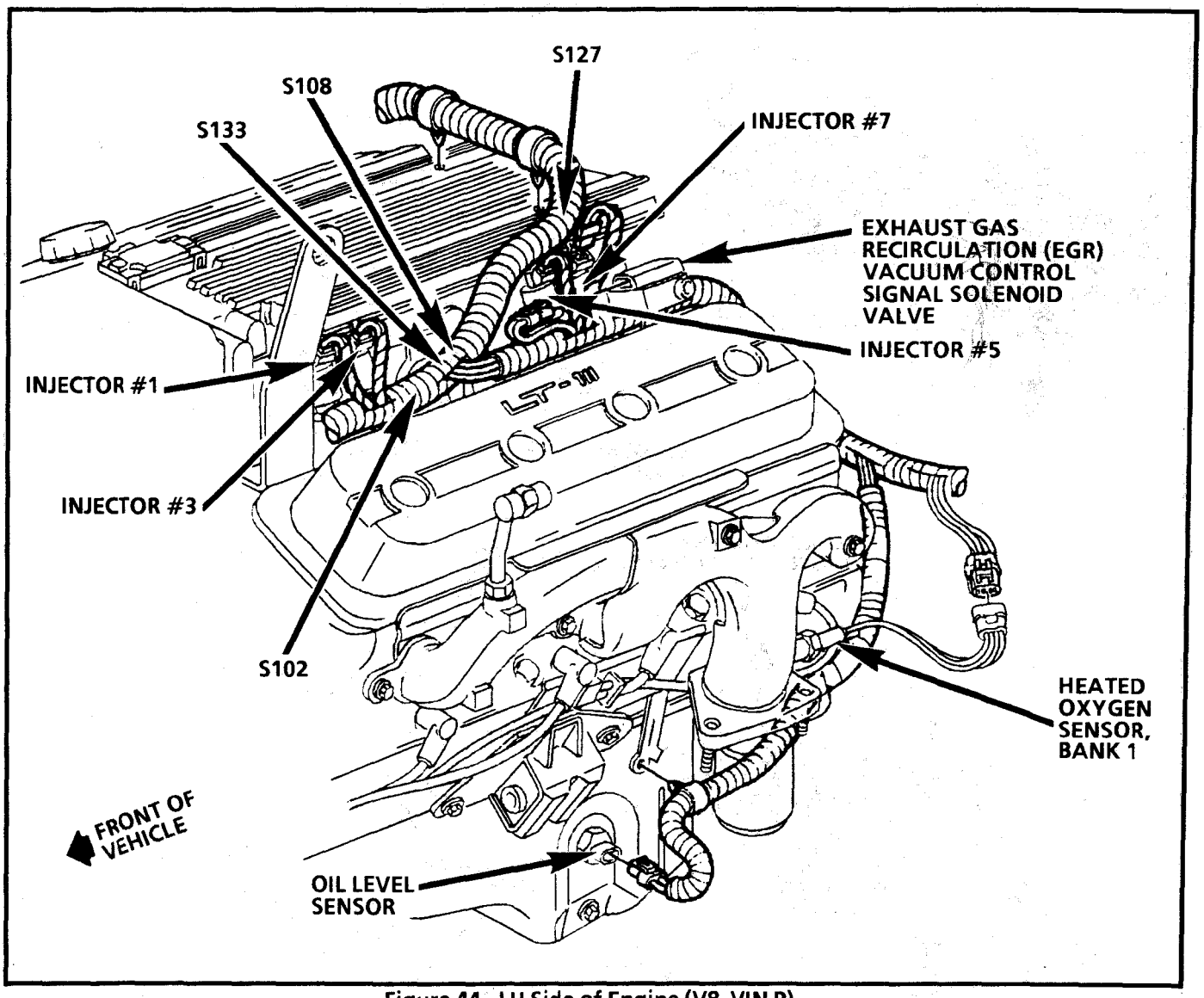


Figure 44 - LH Side of Engine (V8 VIN P)

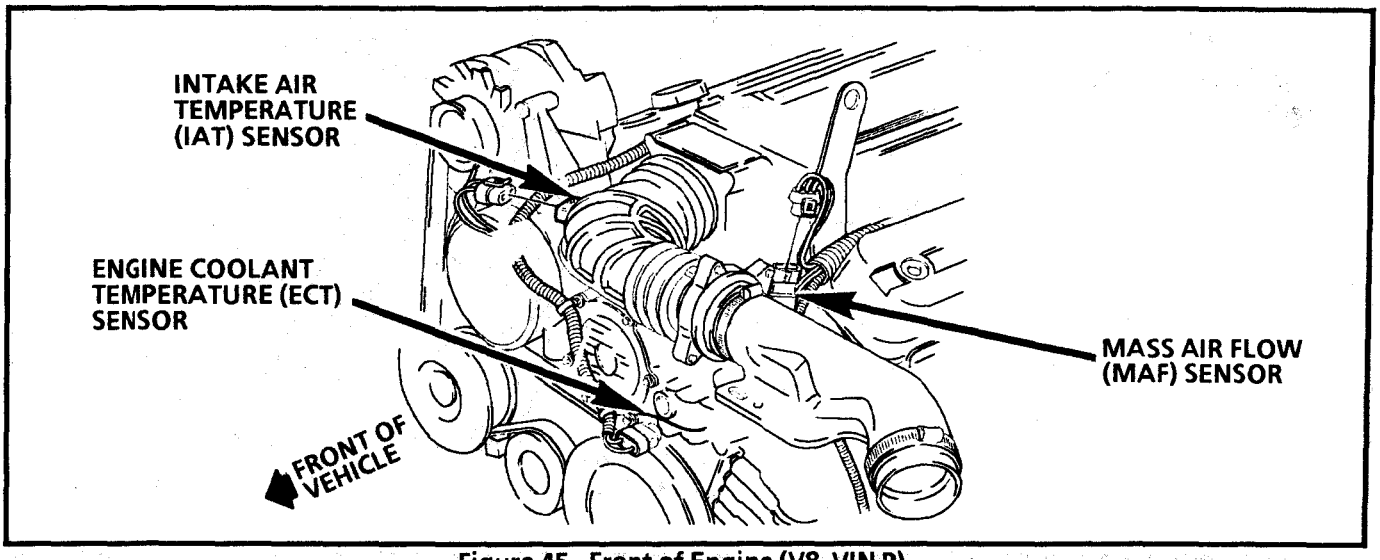


Figure 45 - Front of Engine (V8 VIN P)

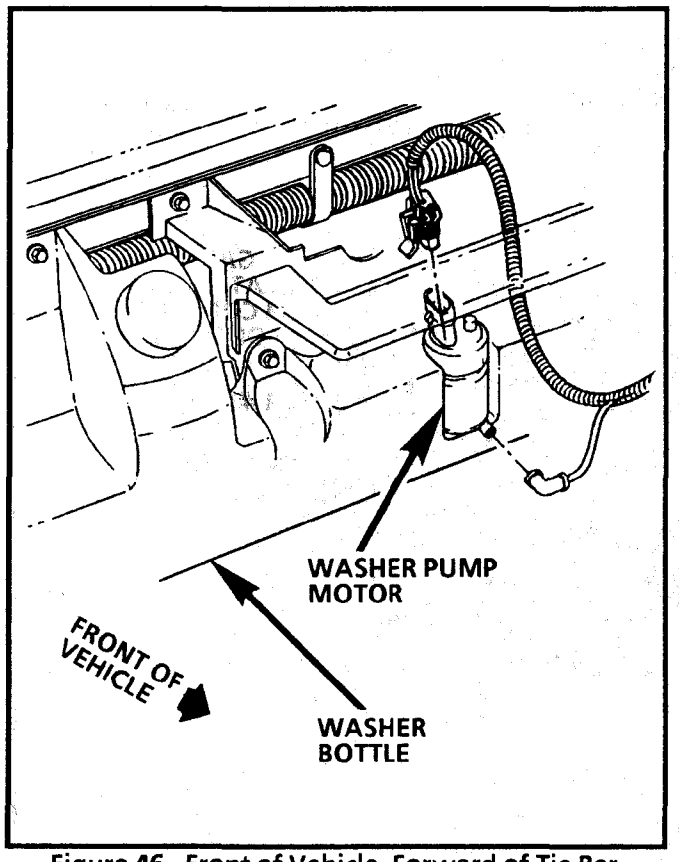


Figure 46 - Front of Vehicle, Forward of Tie Bar

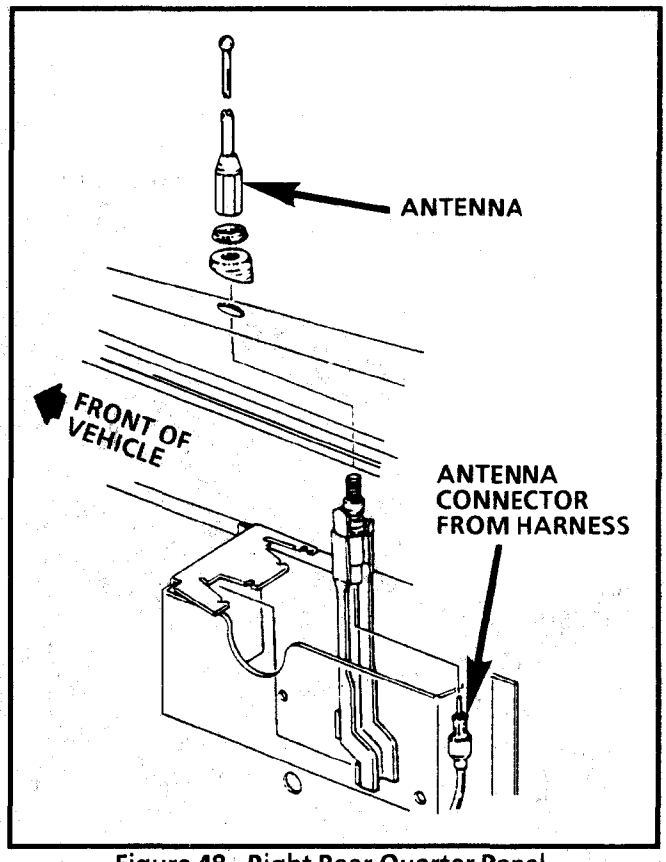


Figure 48 - Right Rear Quarter Panel

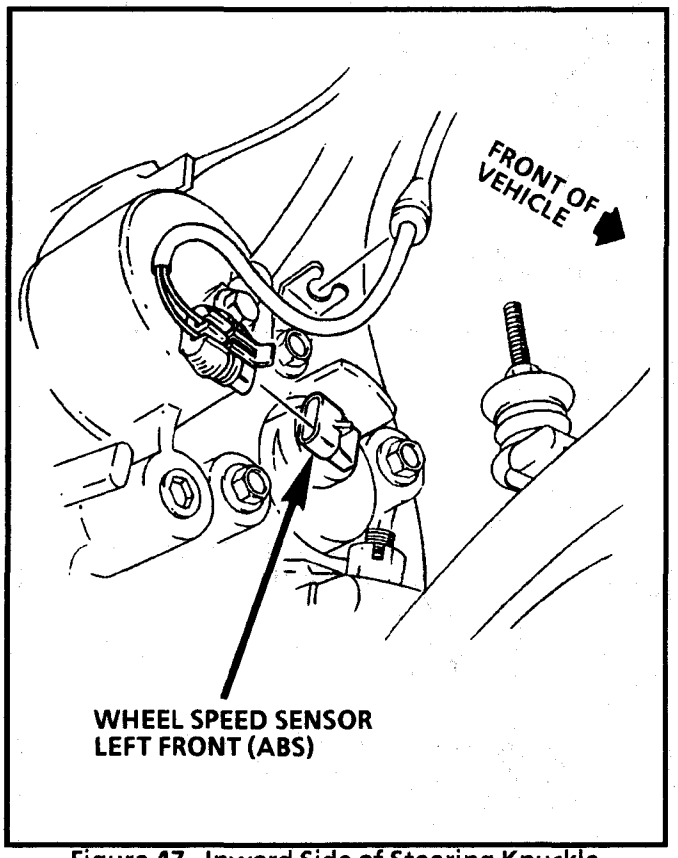


Figure 47 - Inward Side of Steering Knuckle (Right Side Similar)

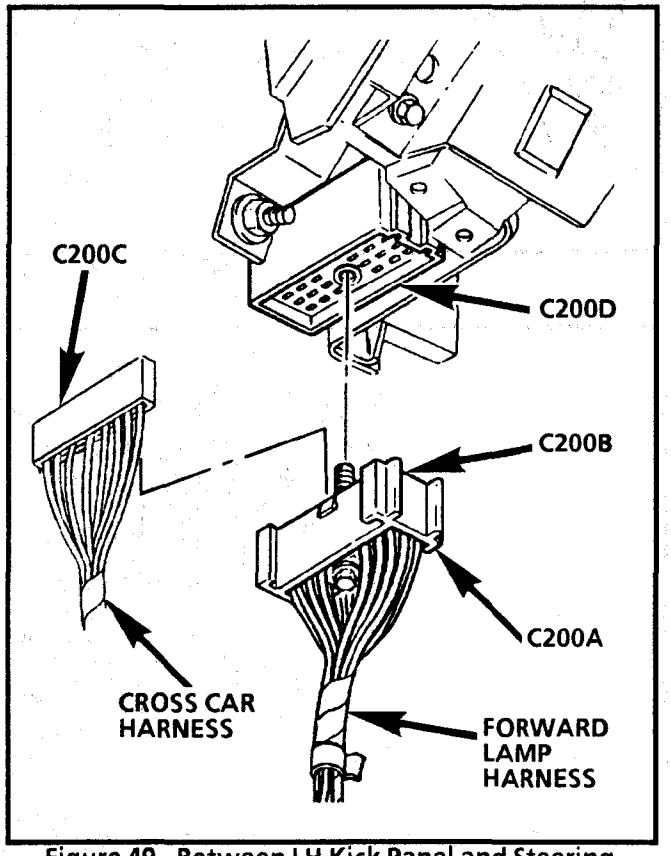


Figure 49 - Between LH Kick Panel and Steering Column

COMPONENT LOCATION VIEWS

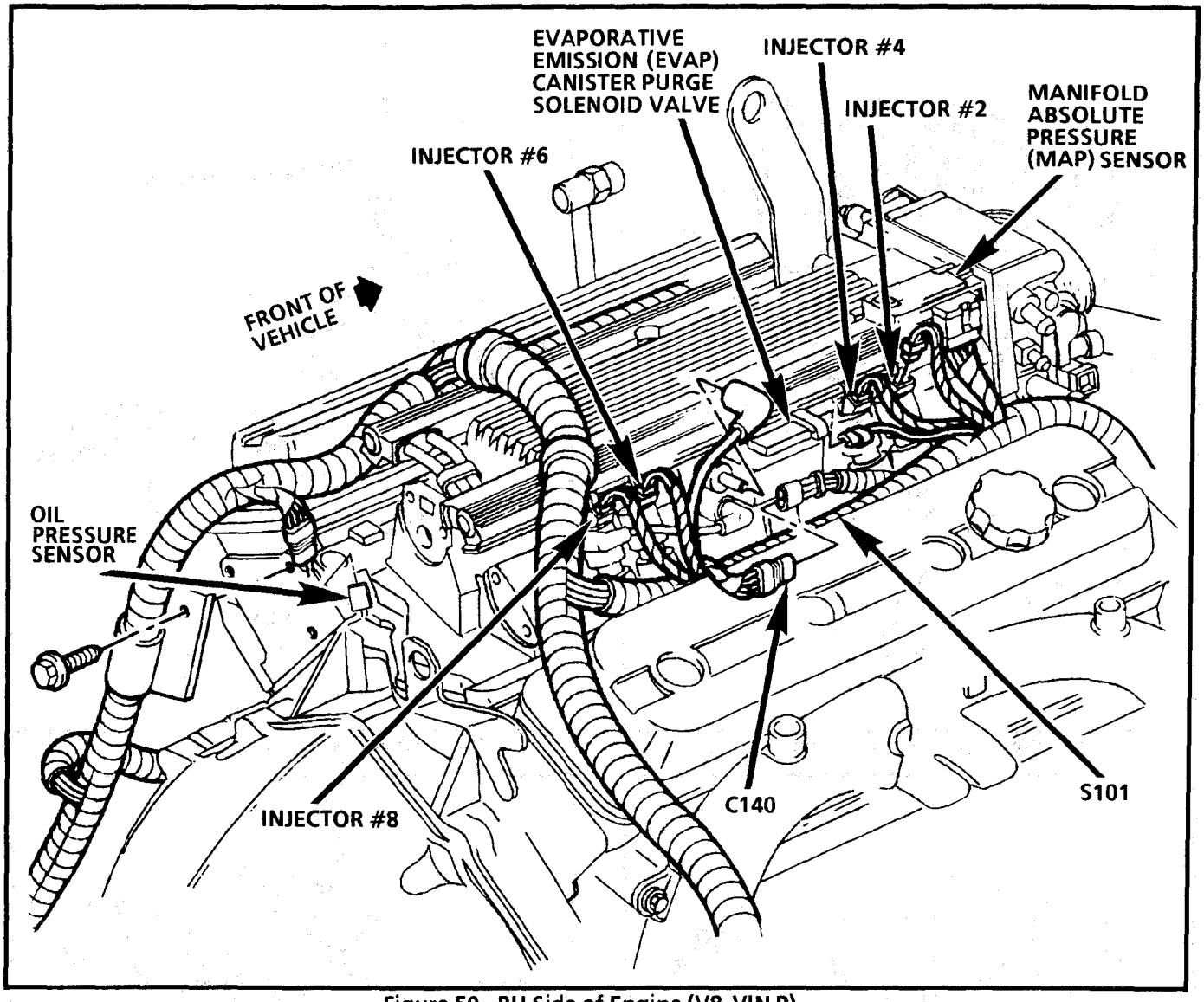


Figure 50 - RH Side of Engine (V8 VIN P)

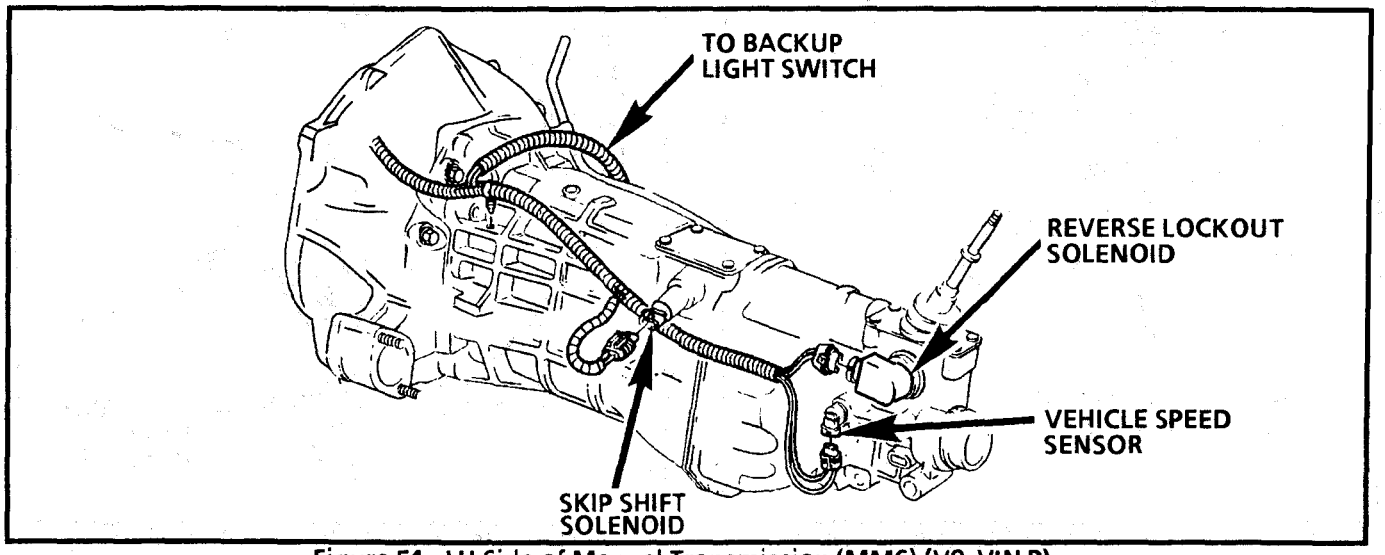


Figure 51 - LH Side of Manual Transmission (MM6) (V8 VIN P)

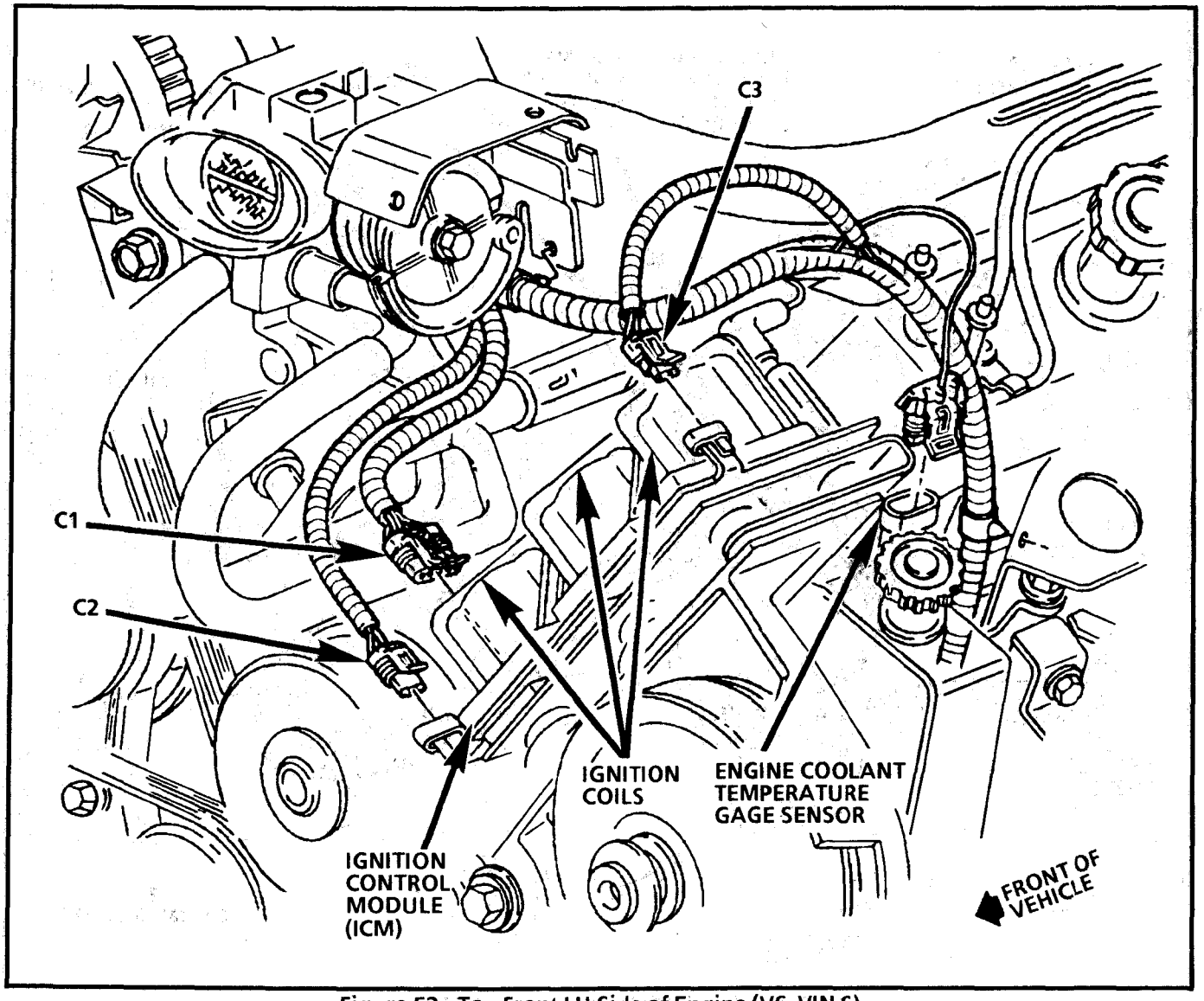


Figure 52 - Top Front LH Side of Engine (V6 VIN S)

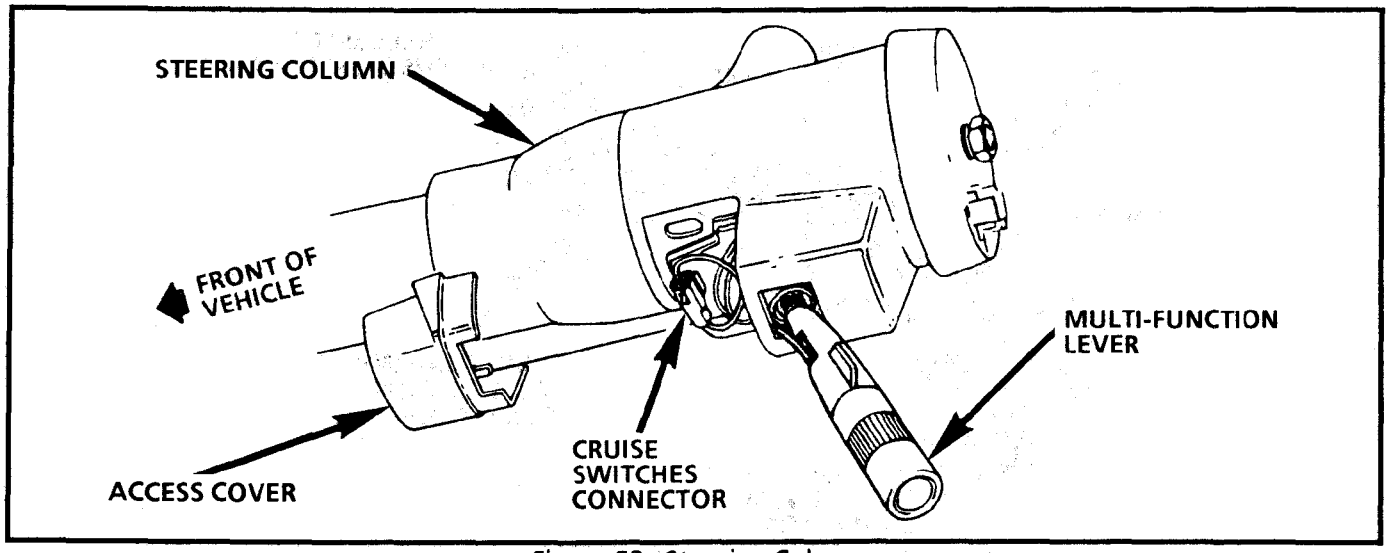


Figure 53 - Steering Column

COMPONENT LOCATION VIEWS

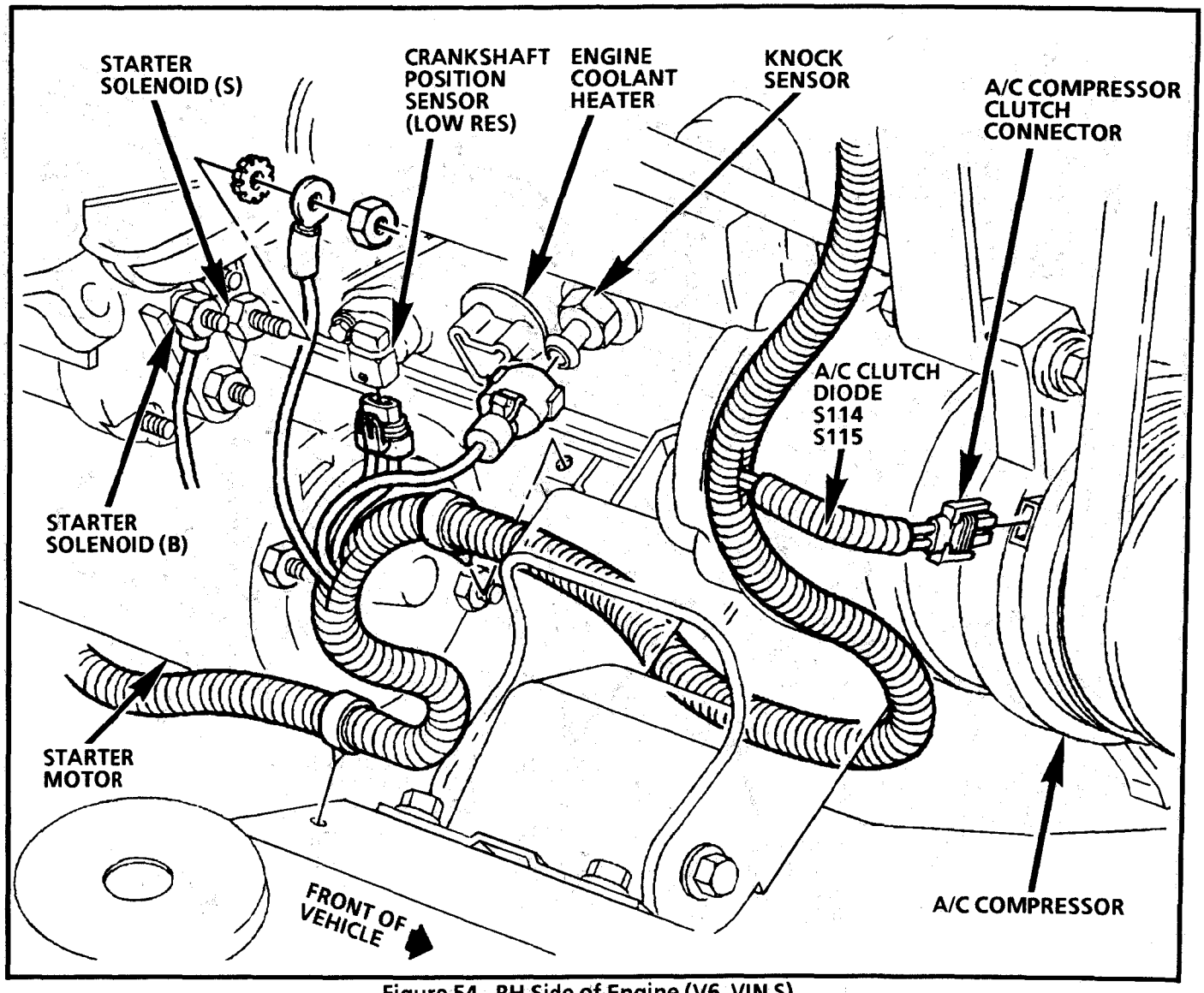


Figure 54 - RH Side of Engine (V6 VIN S)

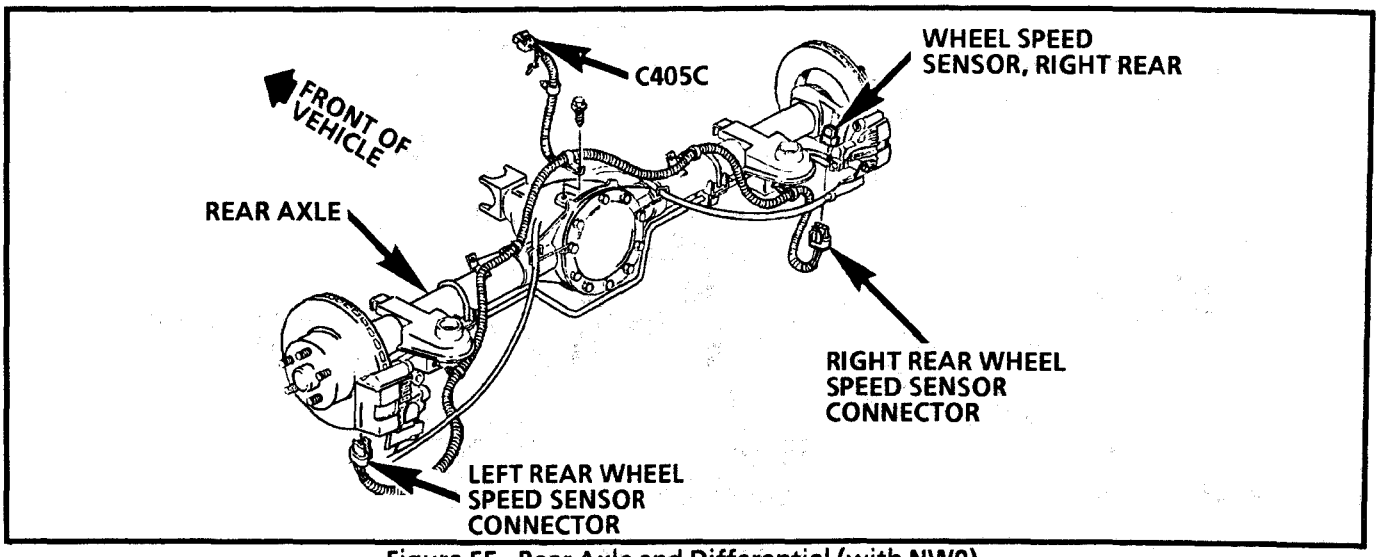


Figure 55 - Rear Axle and Differential (with NW9)

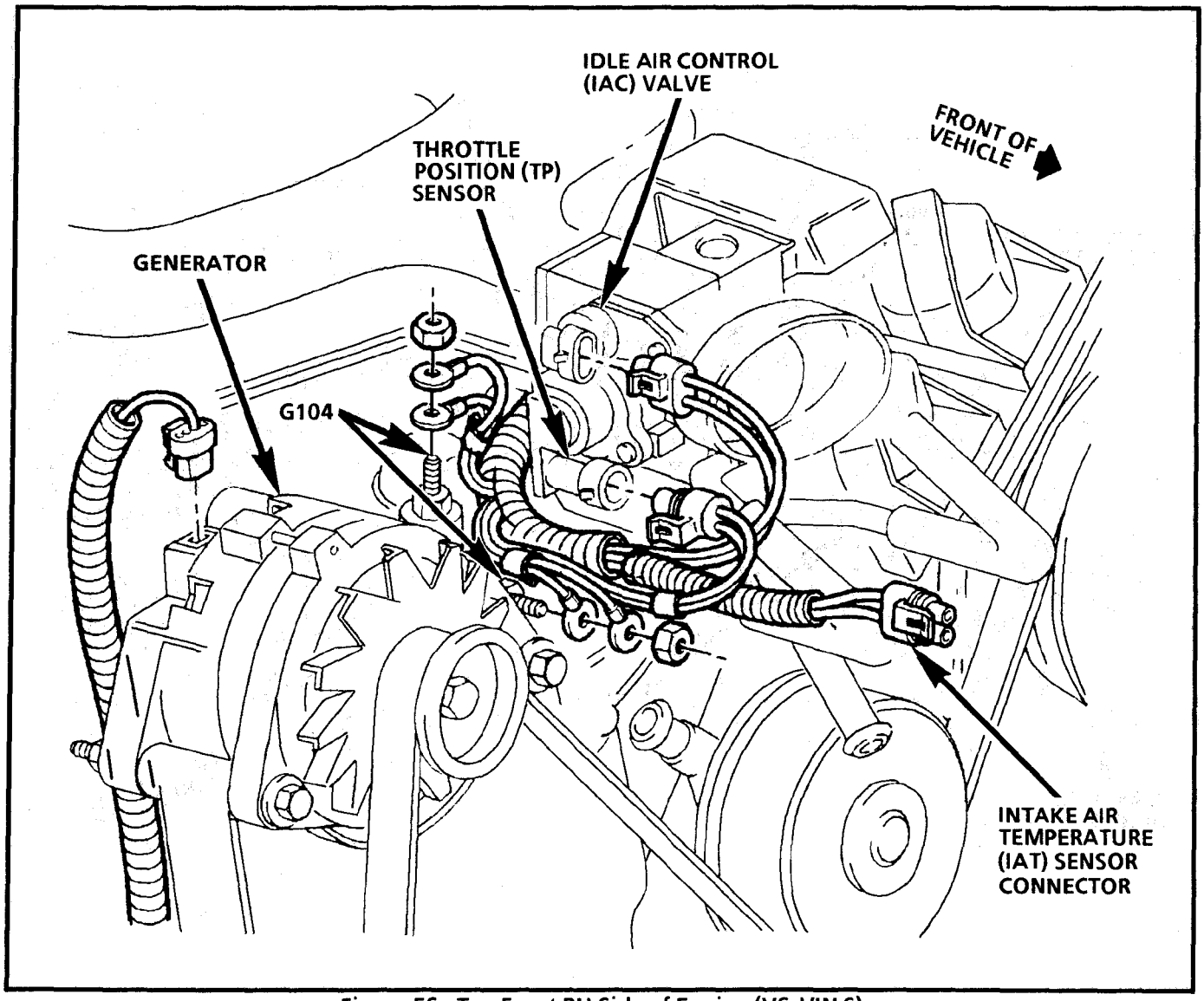


Figure 56 - Top Front RH Side of Engine (V6 VIN S)

COMPONENT LOCATION VIEWS

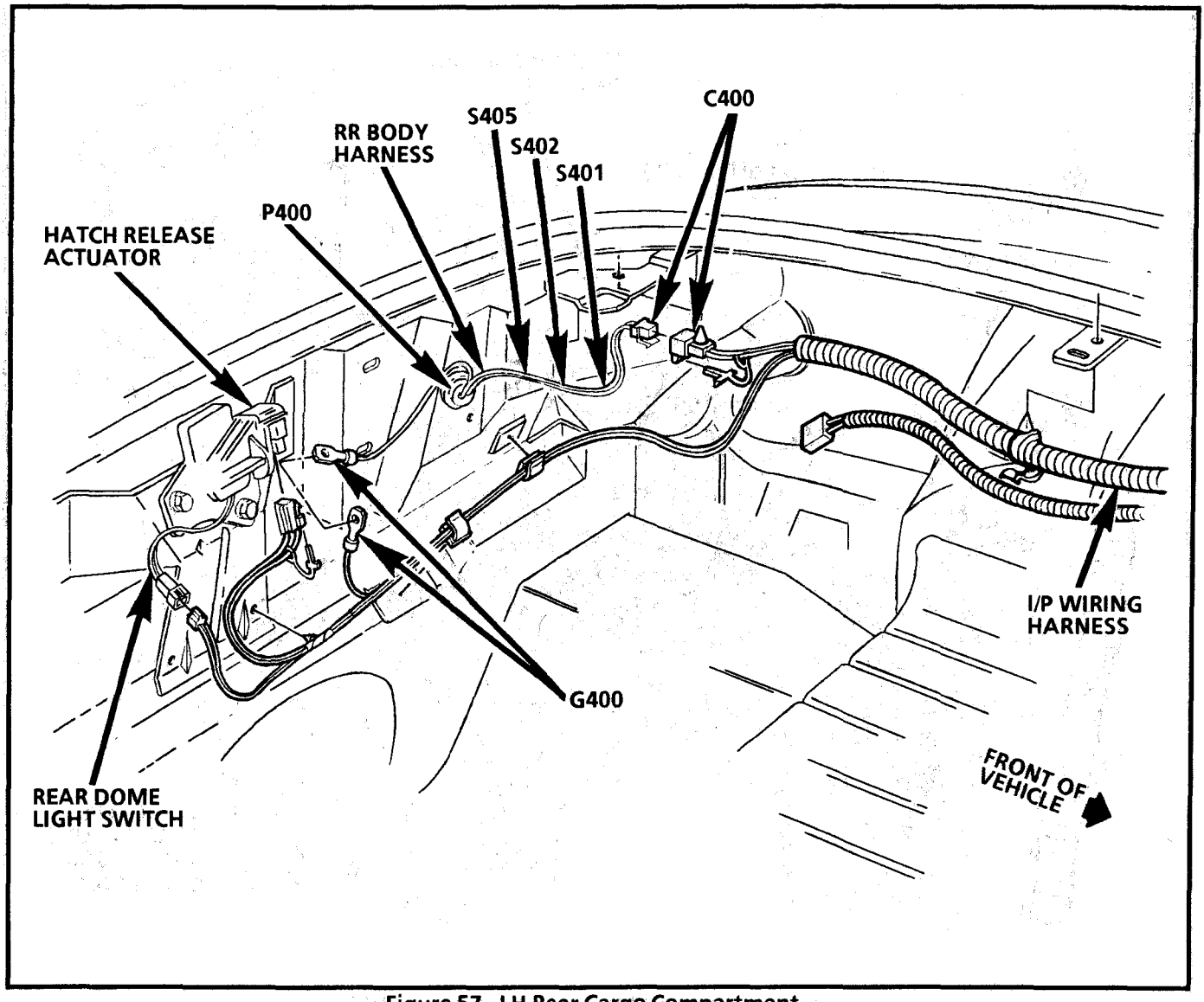


Figure 57 - LH Rear Cargo Compartment

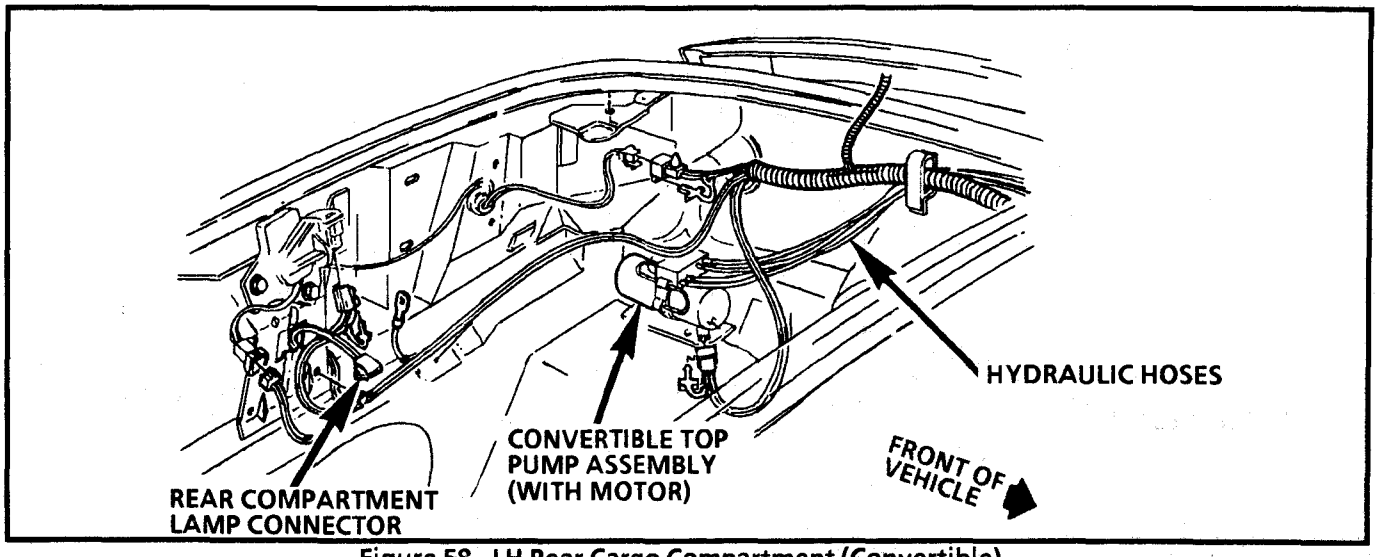


Figure 58 - LH Rear Cargo Compartment (Convertible)

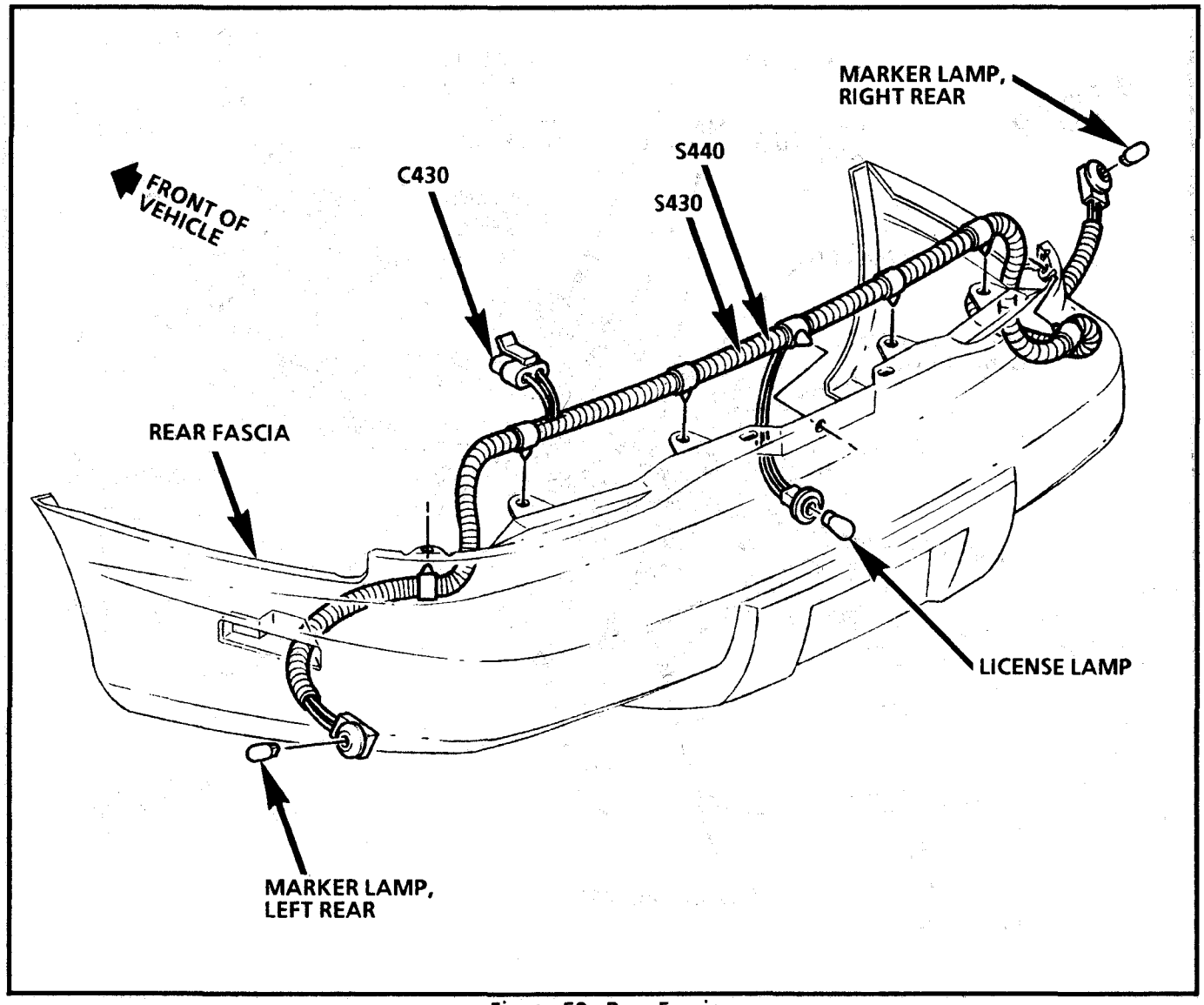


Figure 59 - Rear Fascia

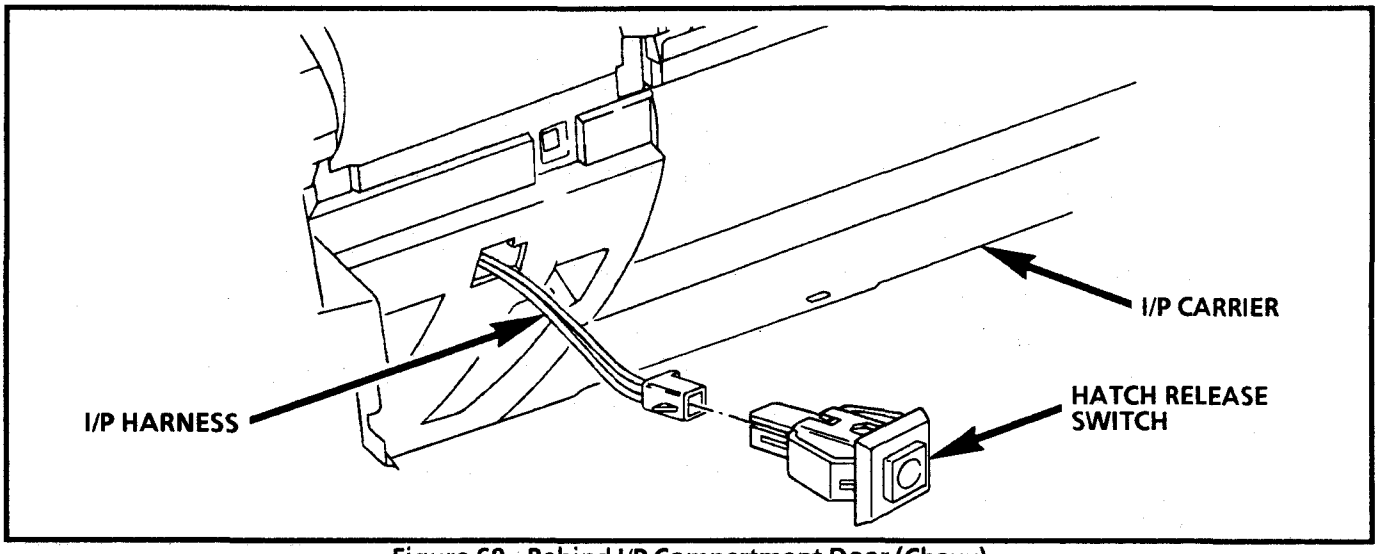


Figure 60 - Behind I/P Compartment Door (Chevy)

COMPONENT LOCATION VIEWS

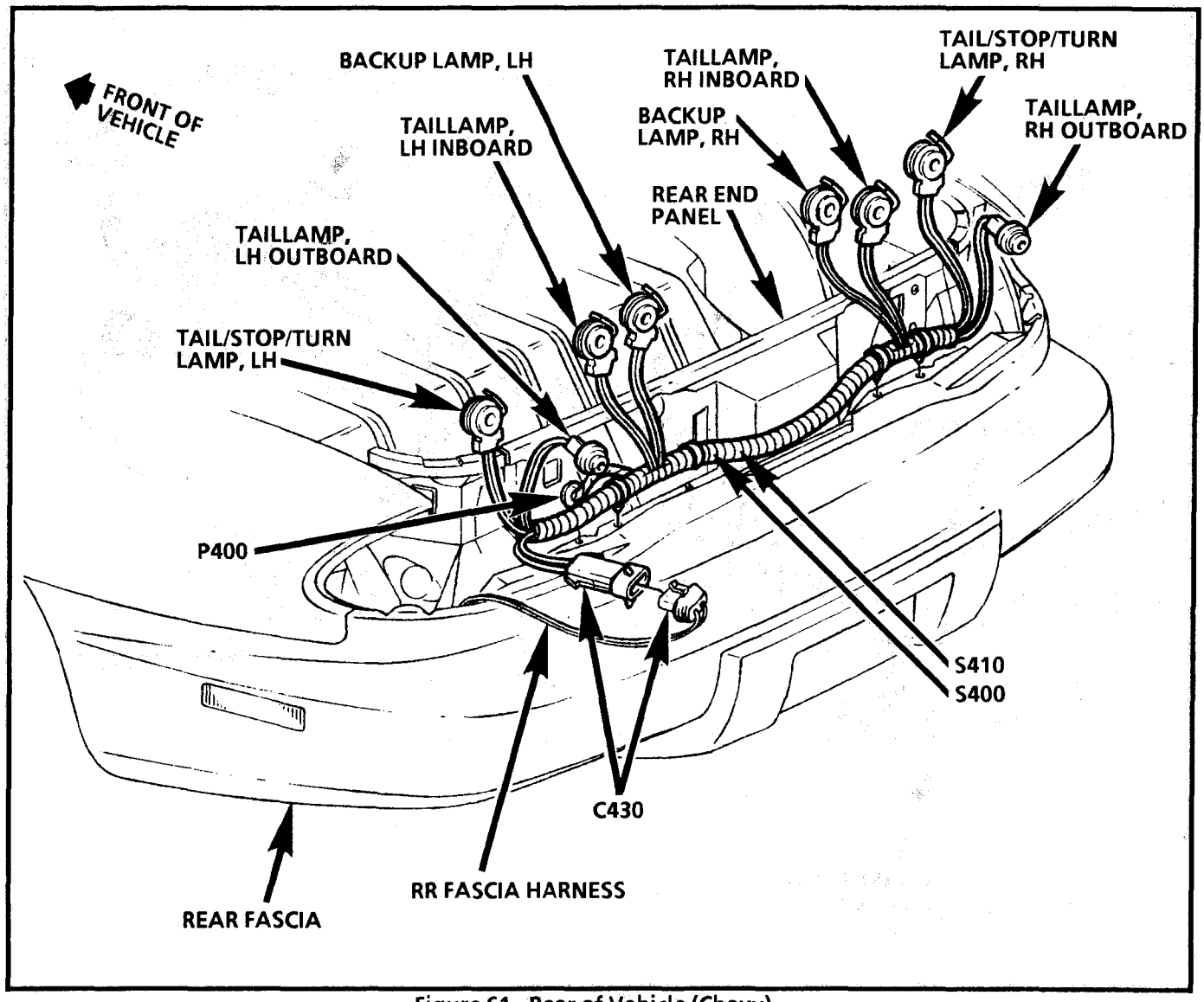


Figure 61 - Rear of Vehicle (Chevy)

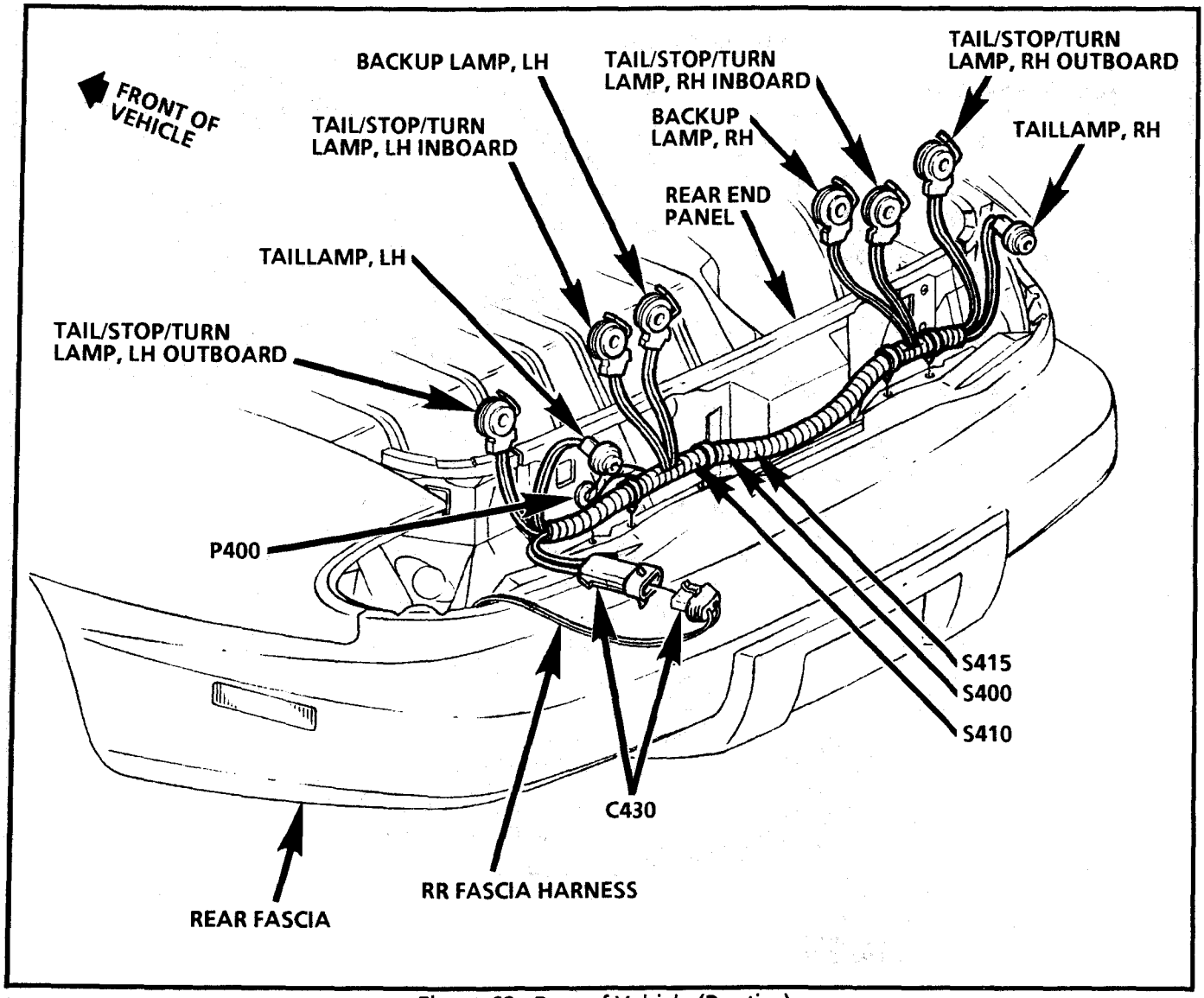


Figure 62 - Rear of Vehicle (Pontiac)

COMPONENT LOCATION VIEWS

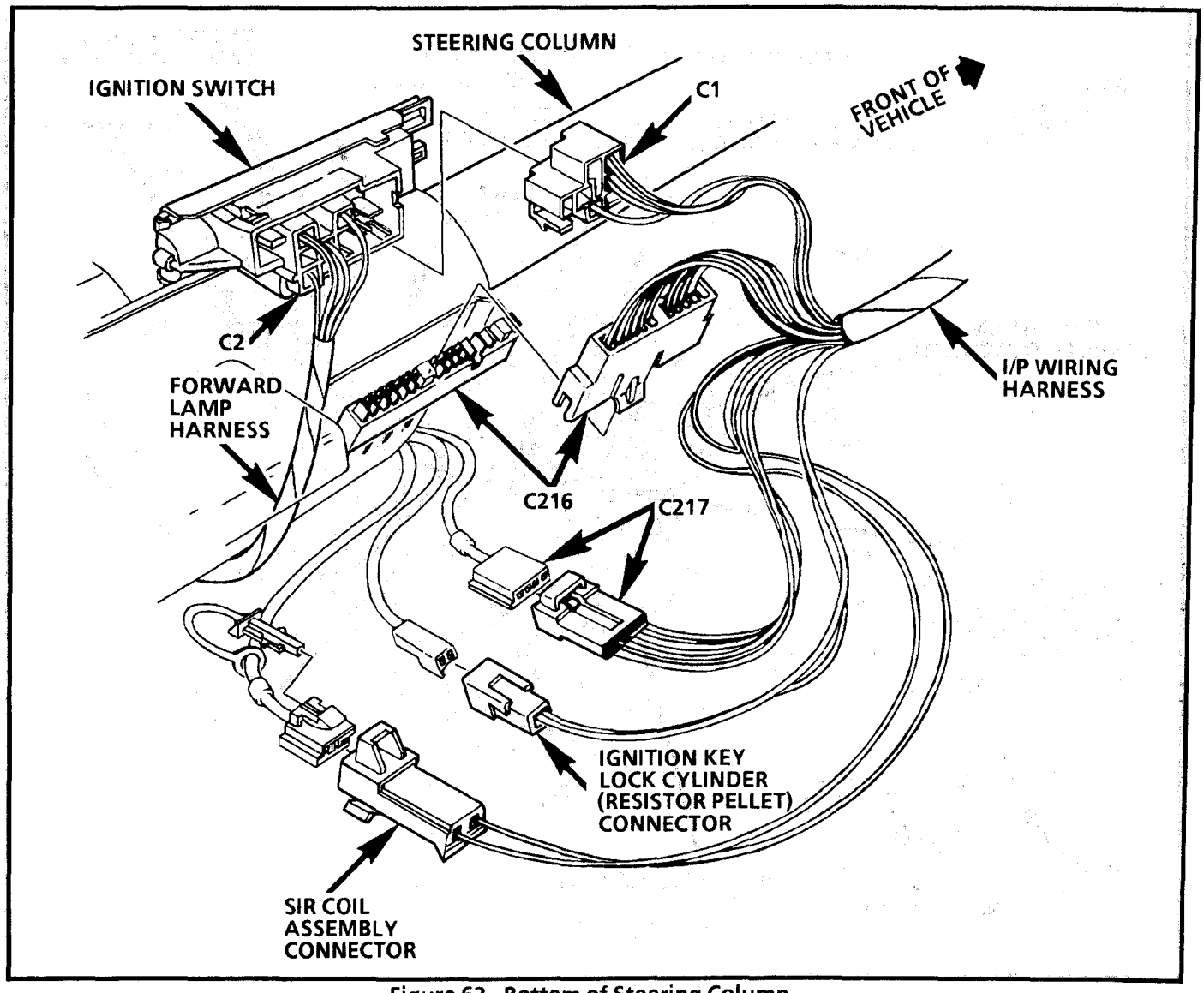


Figure 63 - Bottom of Steering Column

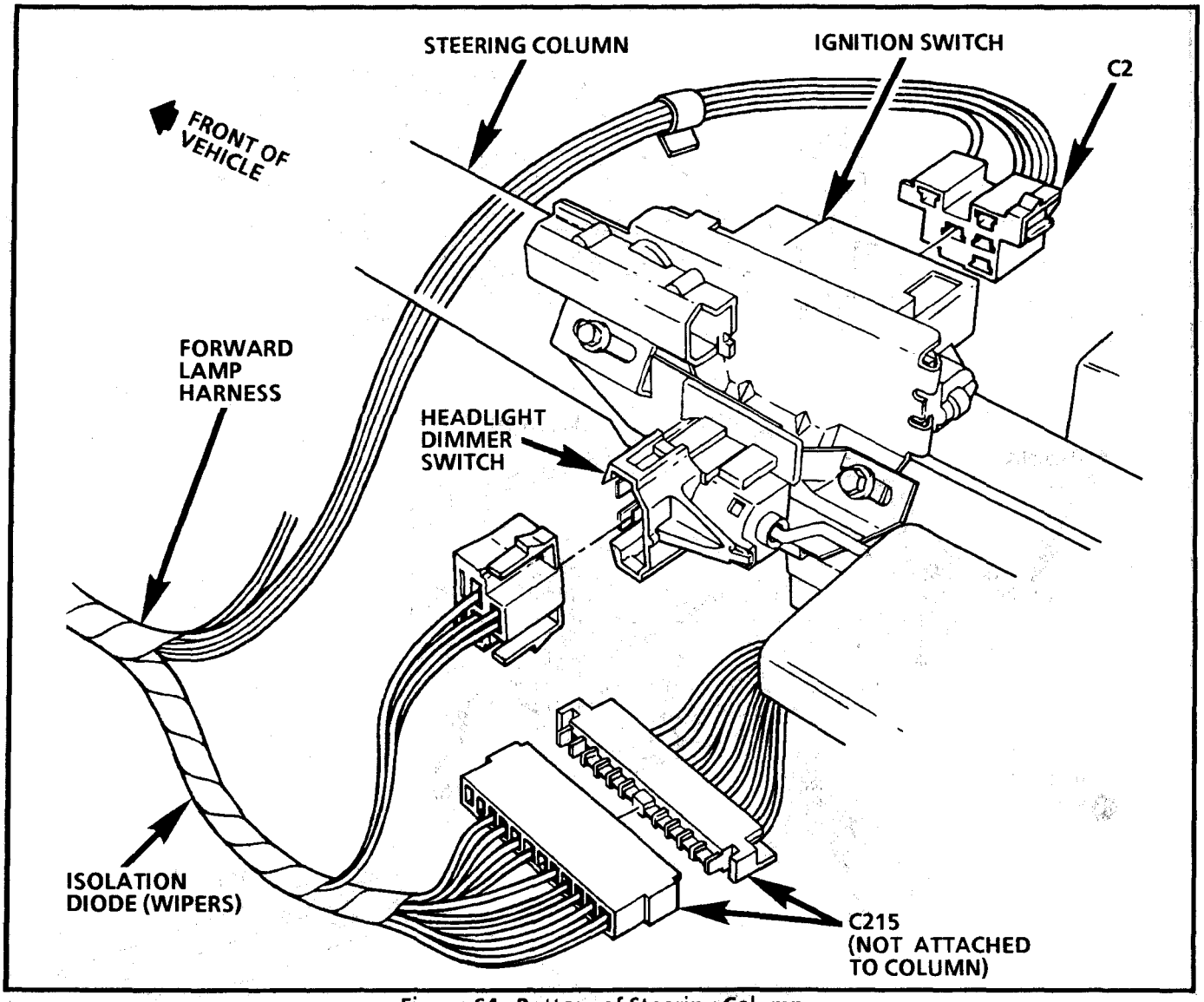


Figure 64 - Bottom of Steering Column

COMPONENT LOCATION VIEWS

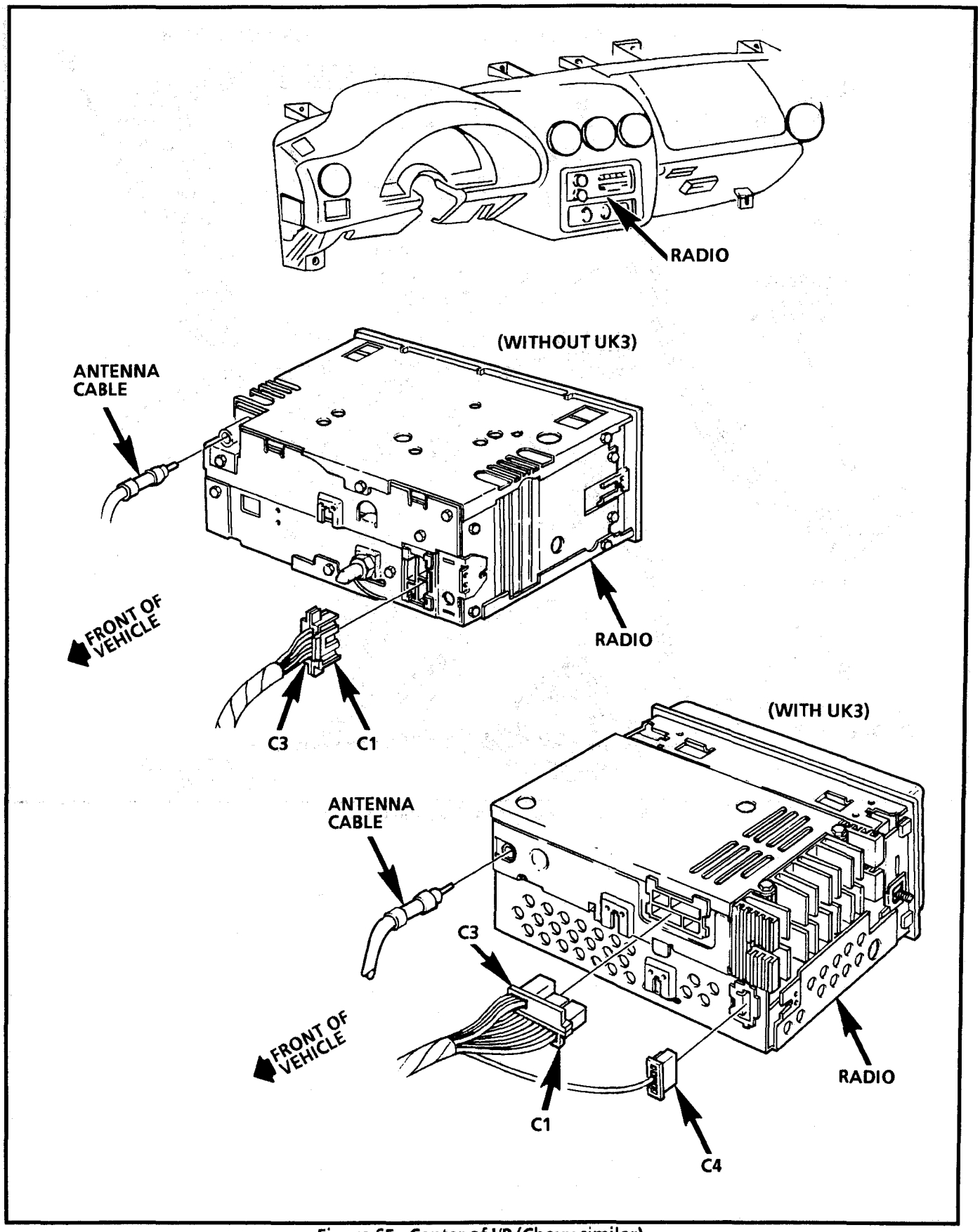


Figure 65 - Center of I/P (Chevy similar)

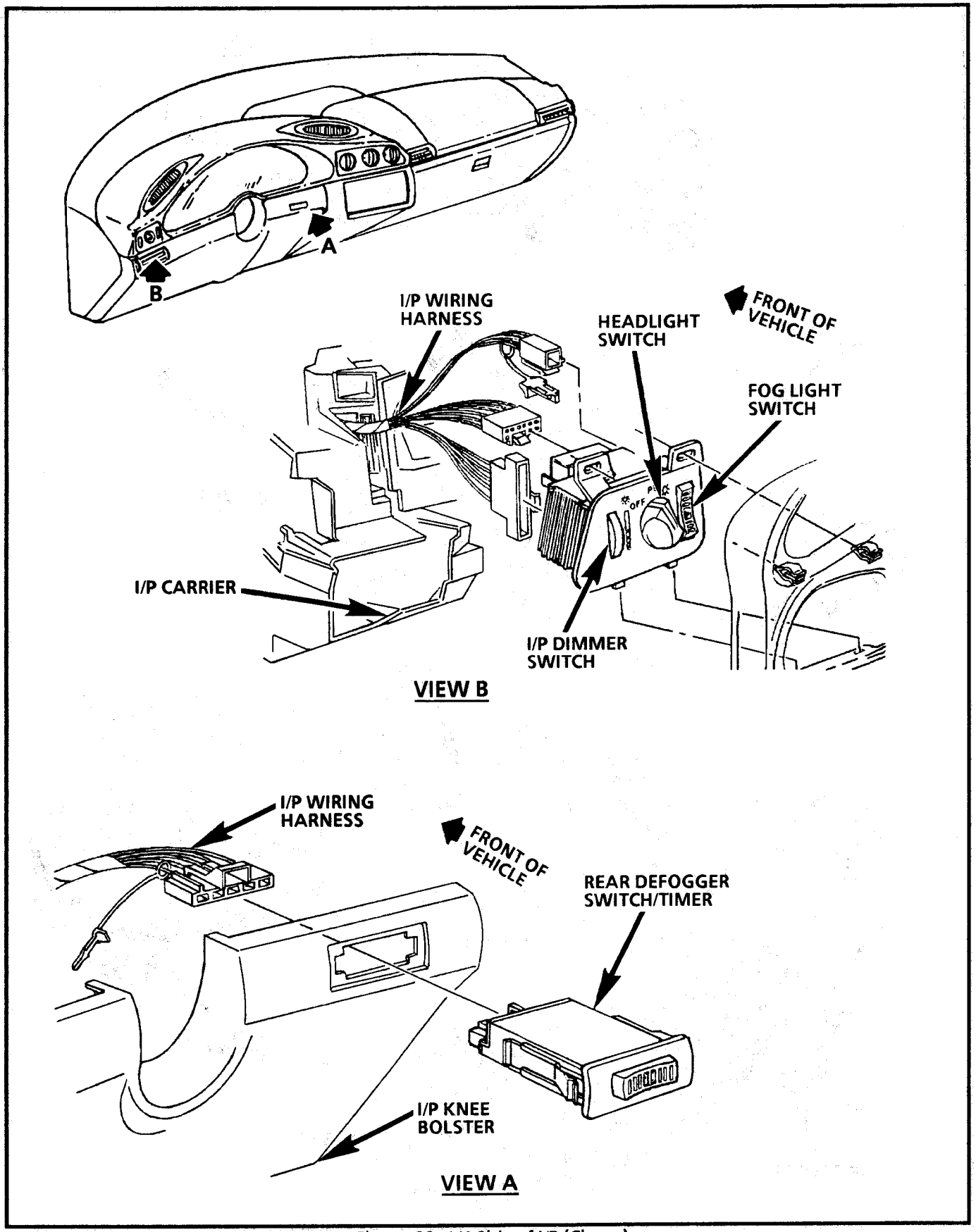


Figure 66 - LH Side of I/P (Chevy)

COMPONENT LOCATION VIEWS

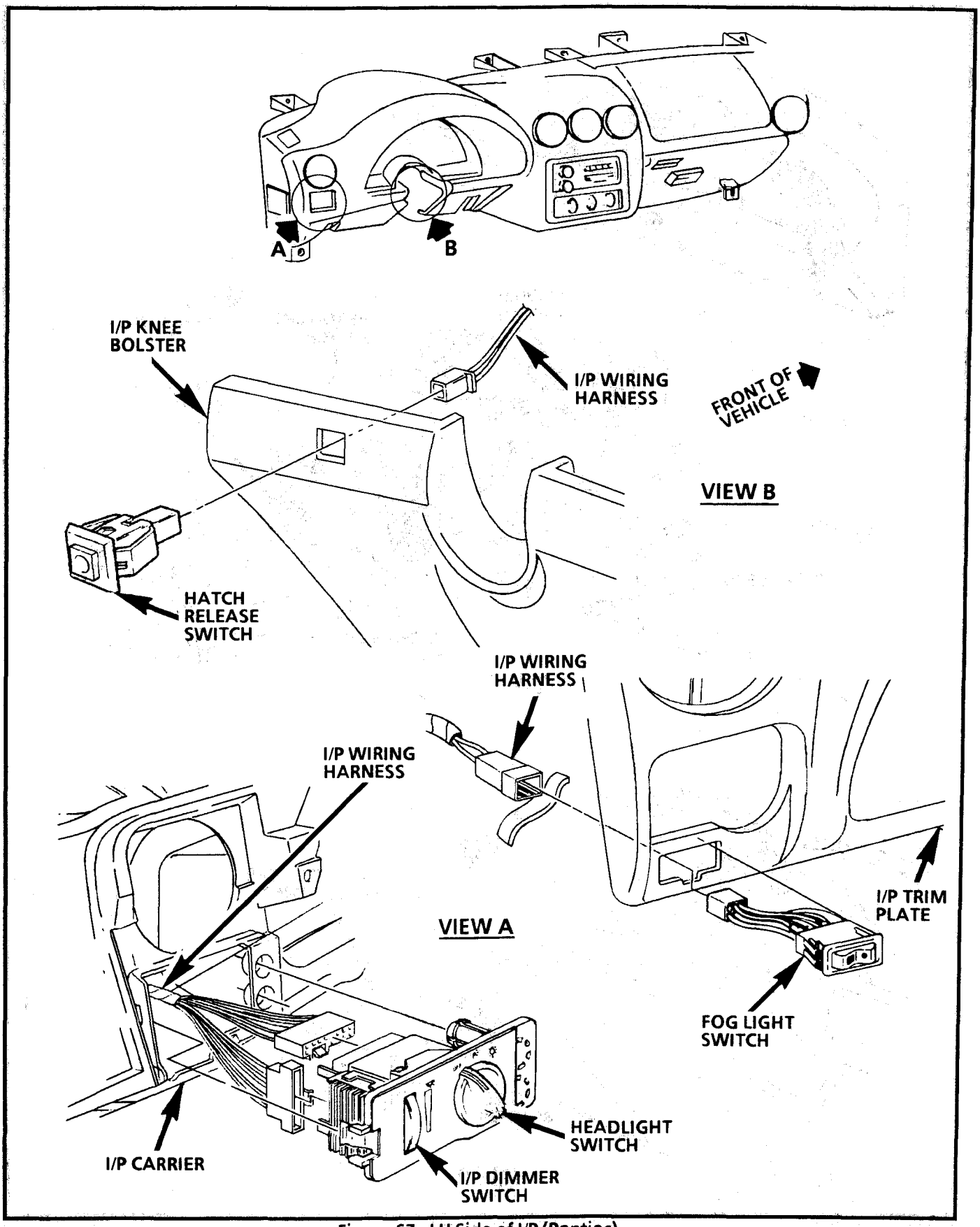


Figure 67 - LH Side of I/P (Pontiac)

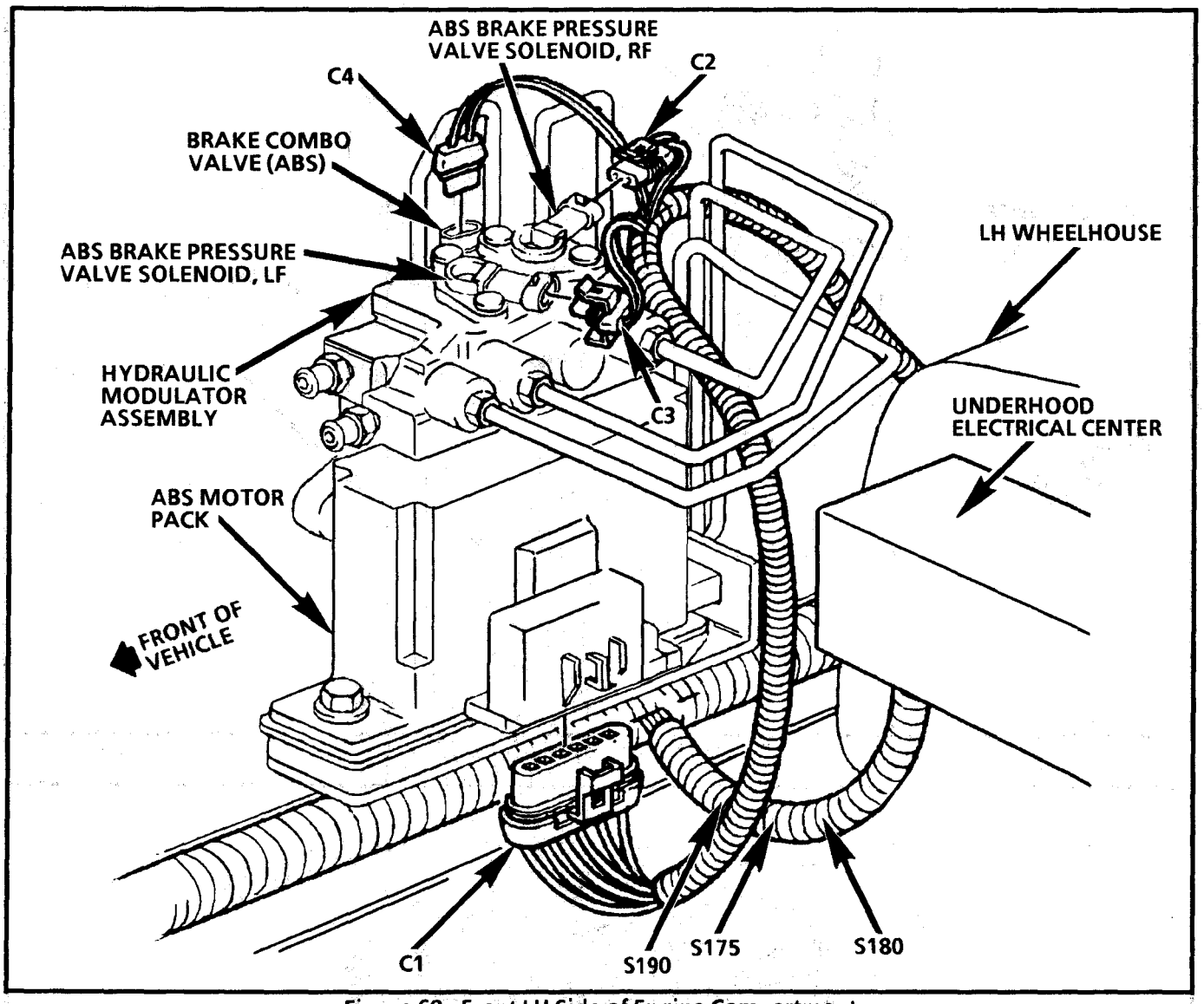


Figure 68 - Front LH Side of Engine Compartment

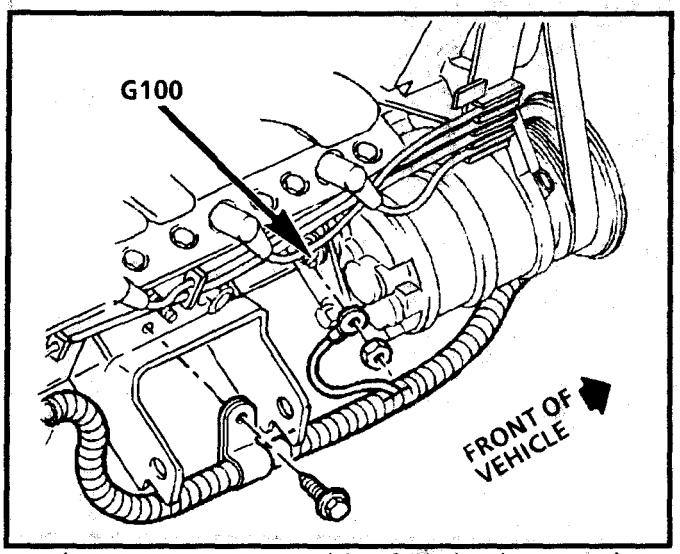


Figure 69 - Lower RH Side of Engine (V8 VIN P)

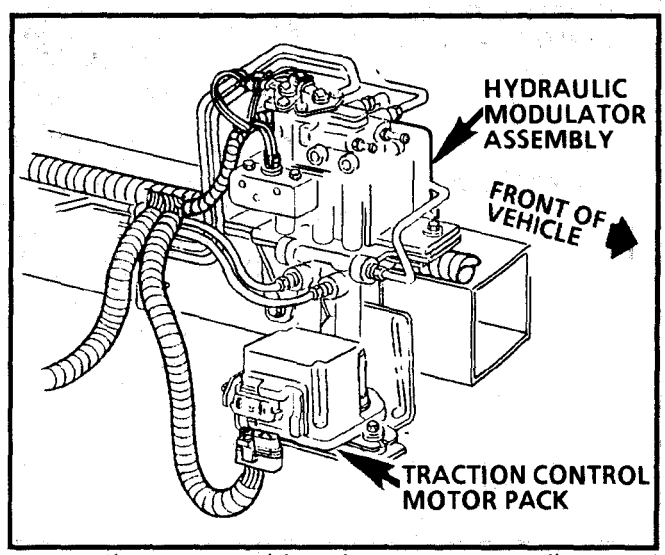


Figure 70 - Inside Left Front Frame Rail

COMPONENT LOCATION VIEWS

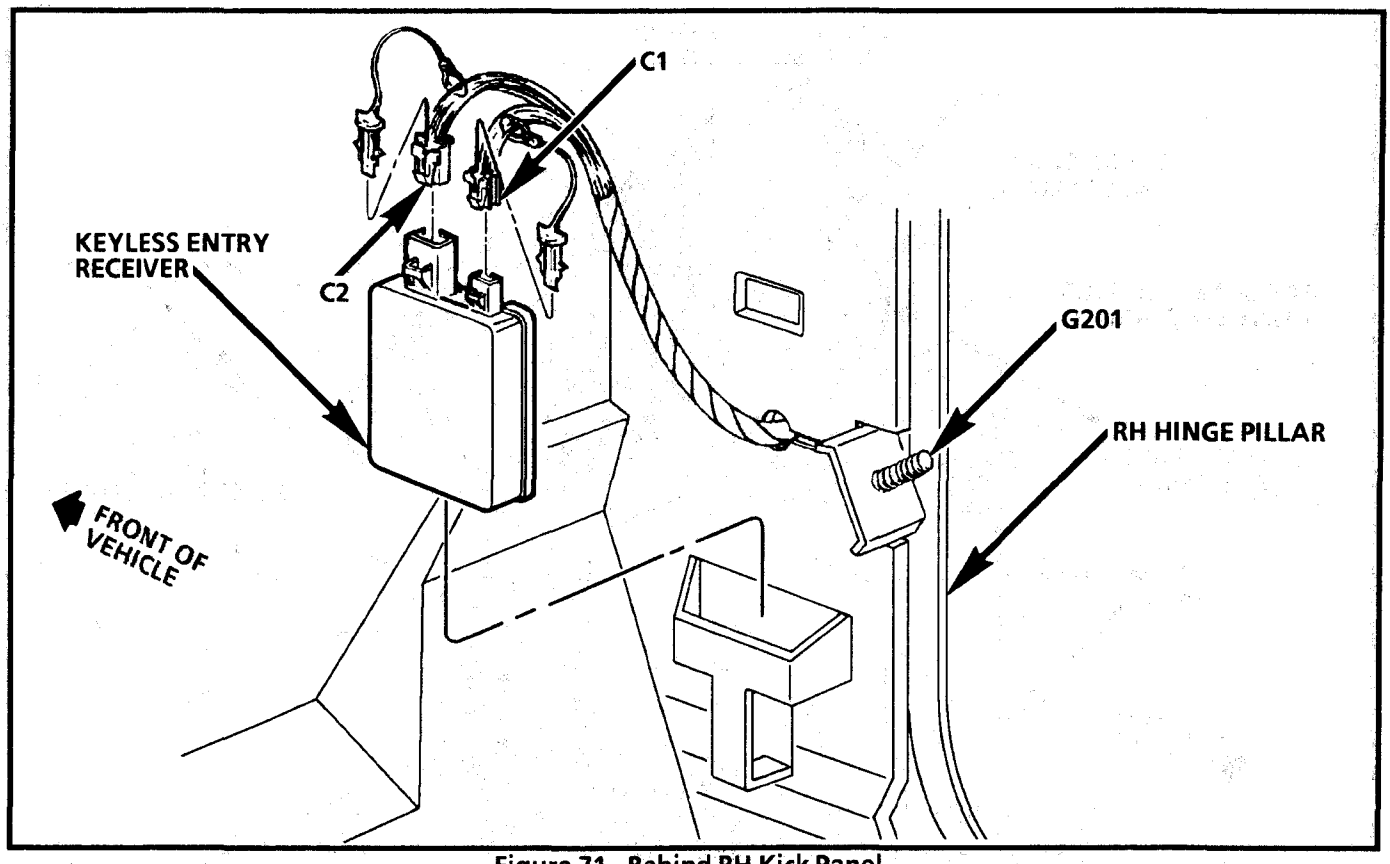


Figure 71 - Behind RH Kick Panel

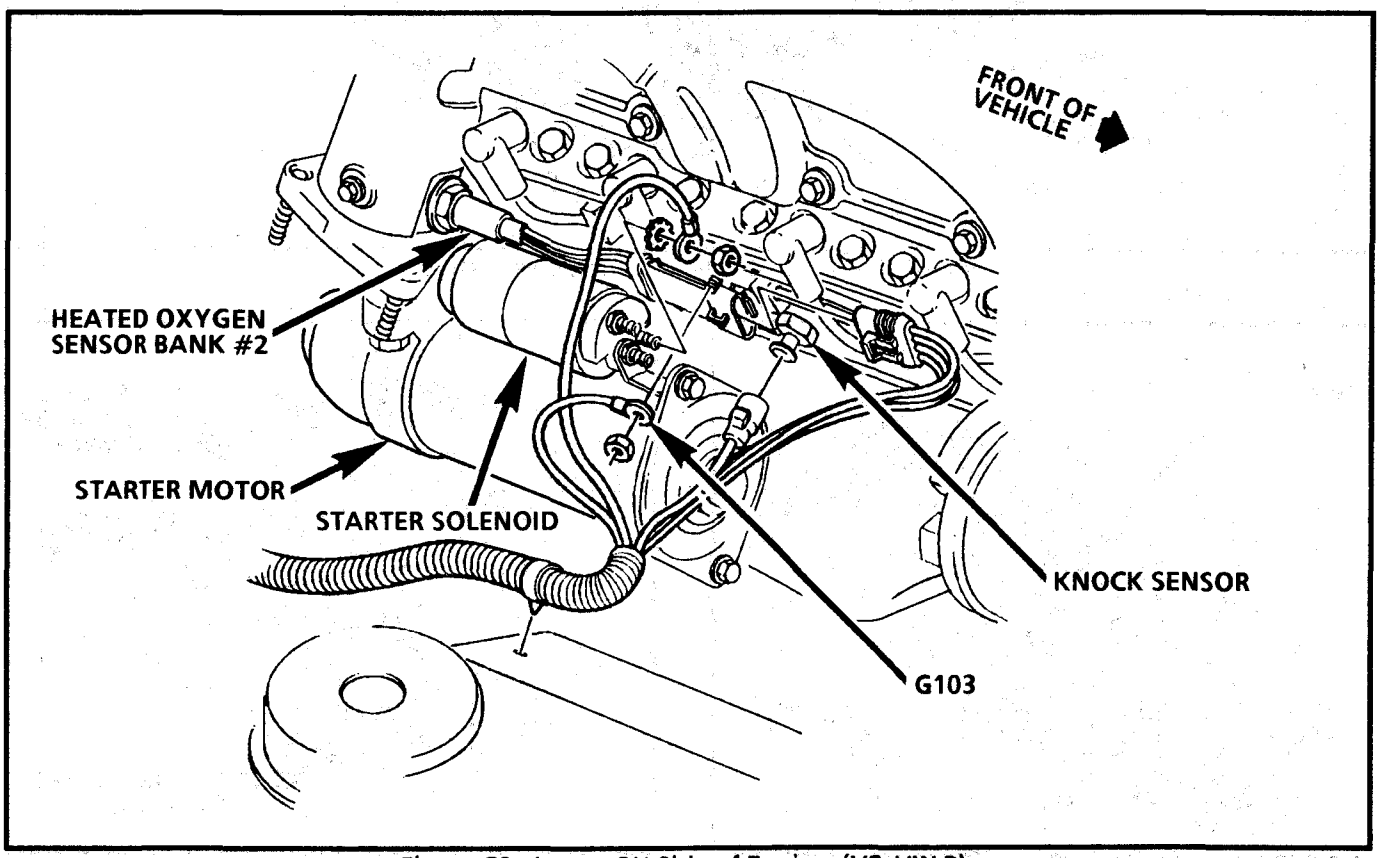


Figure 72 - Lower RH Side of Engine (V8 VIN P)

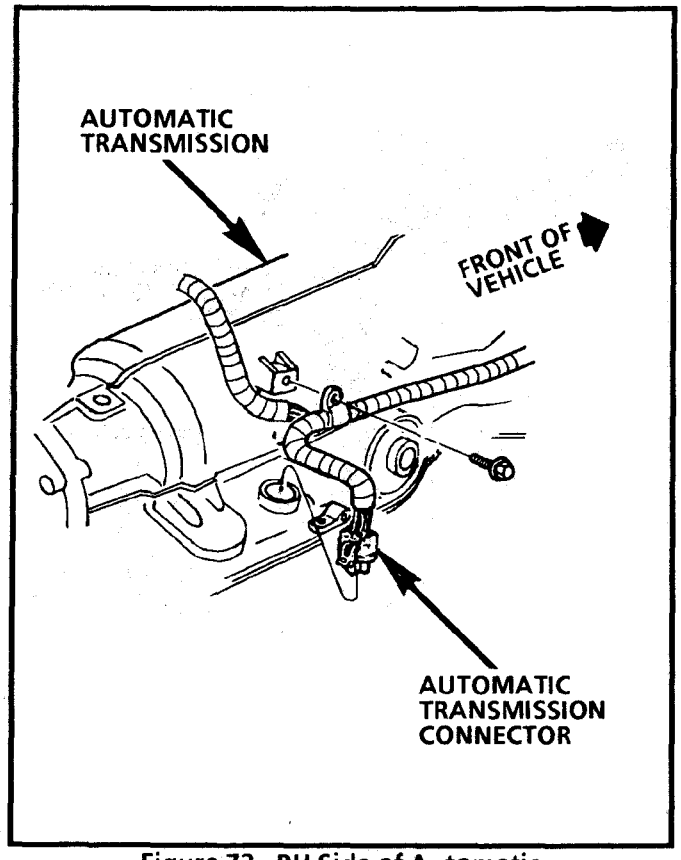


Figure 73 - RH Side of Automatic Transmission (M30)

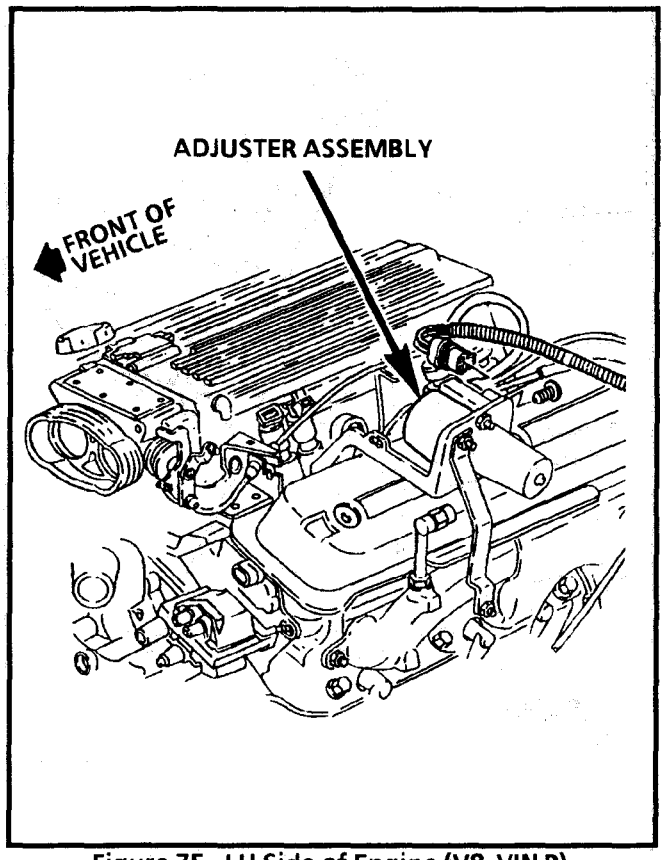


Figure 75 - LH Side of Engine (V8 VIN P)

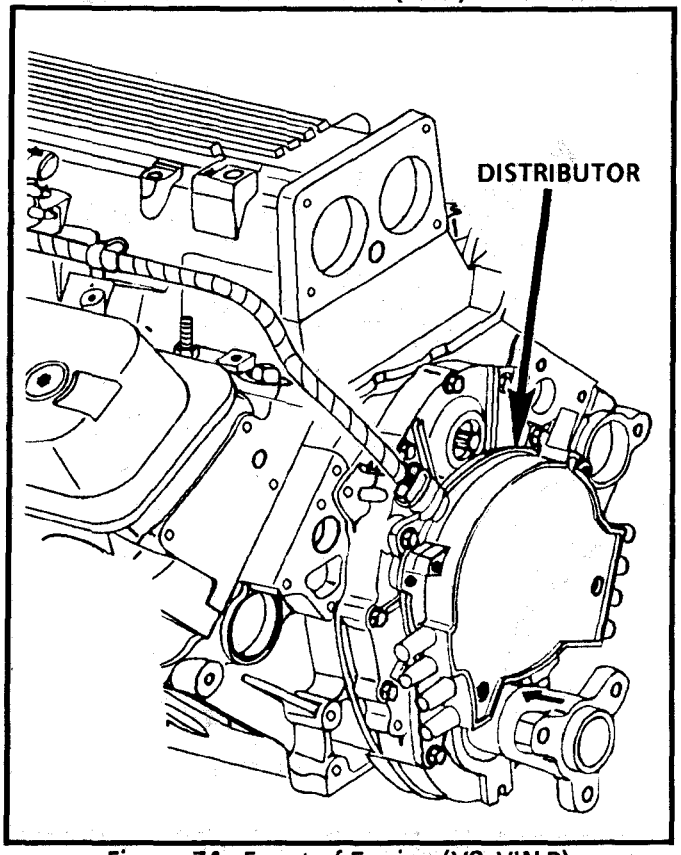


Figure 74 - Front of Engine (V8 VIN P)

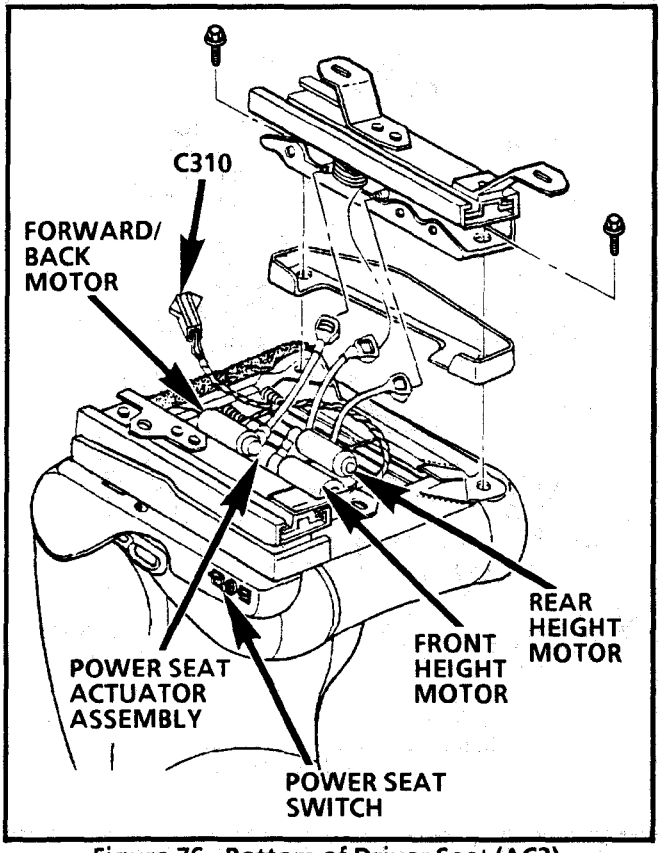


Figure 76 - Bottom of Driver Seat (AC3)

COMPONENT LOCATION VIEWS

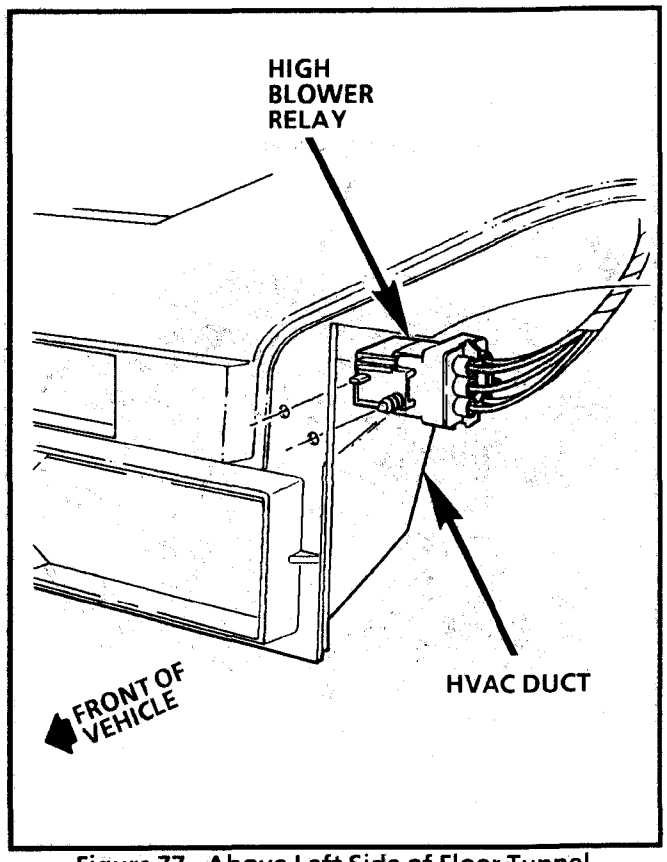


Figure 77 - Above Left Side of Floor Tunnel

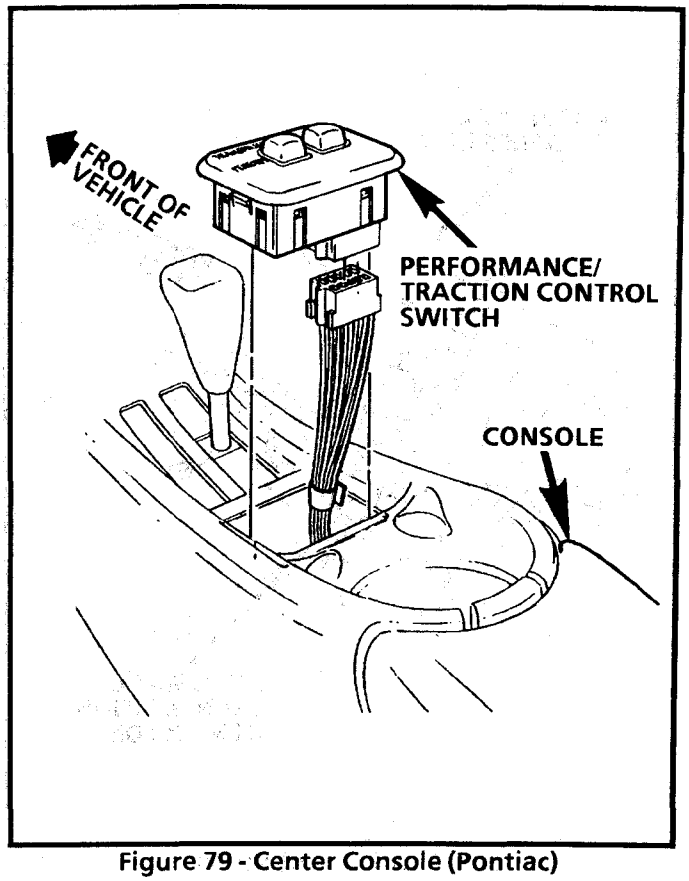


Figure 79 - Center Console (Pontiac)

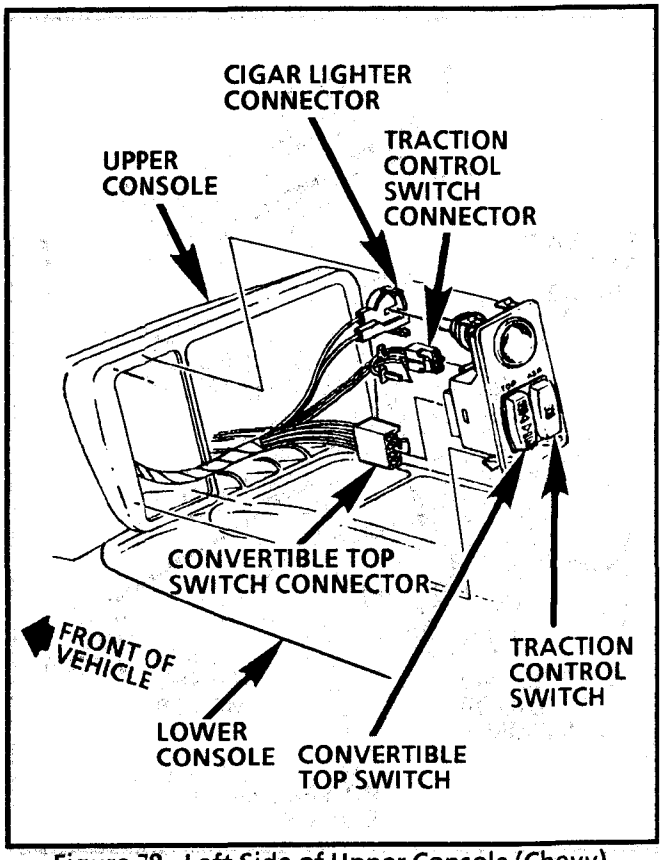


Figure 78 - Left Side of Upper Console (Chevy)

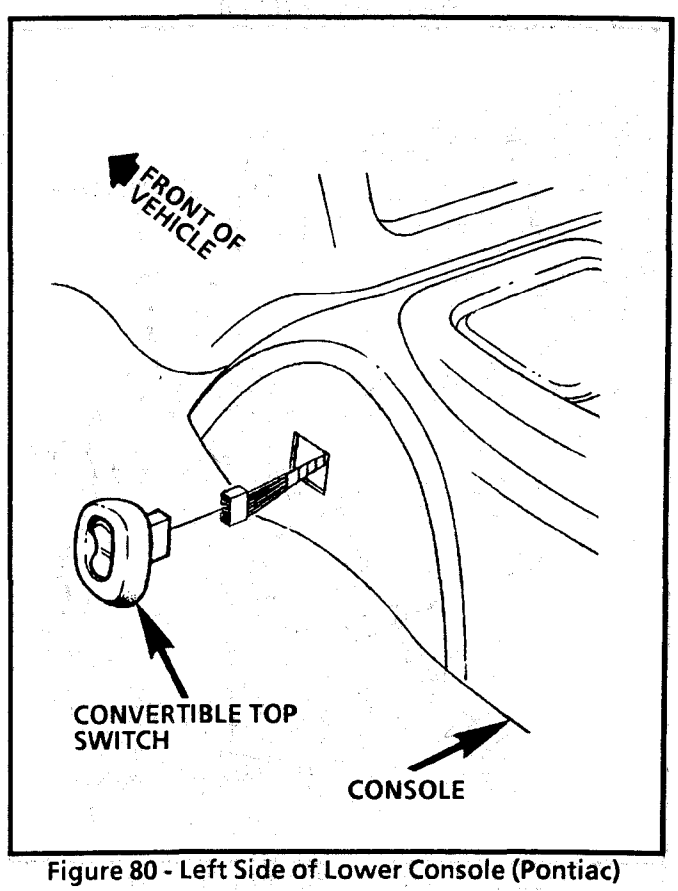


Figure 80 - Left Side of Lower Console (Pontiac)

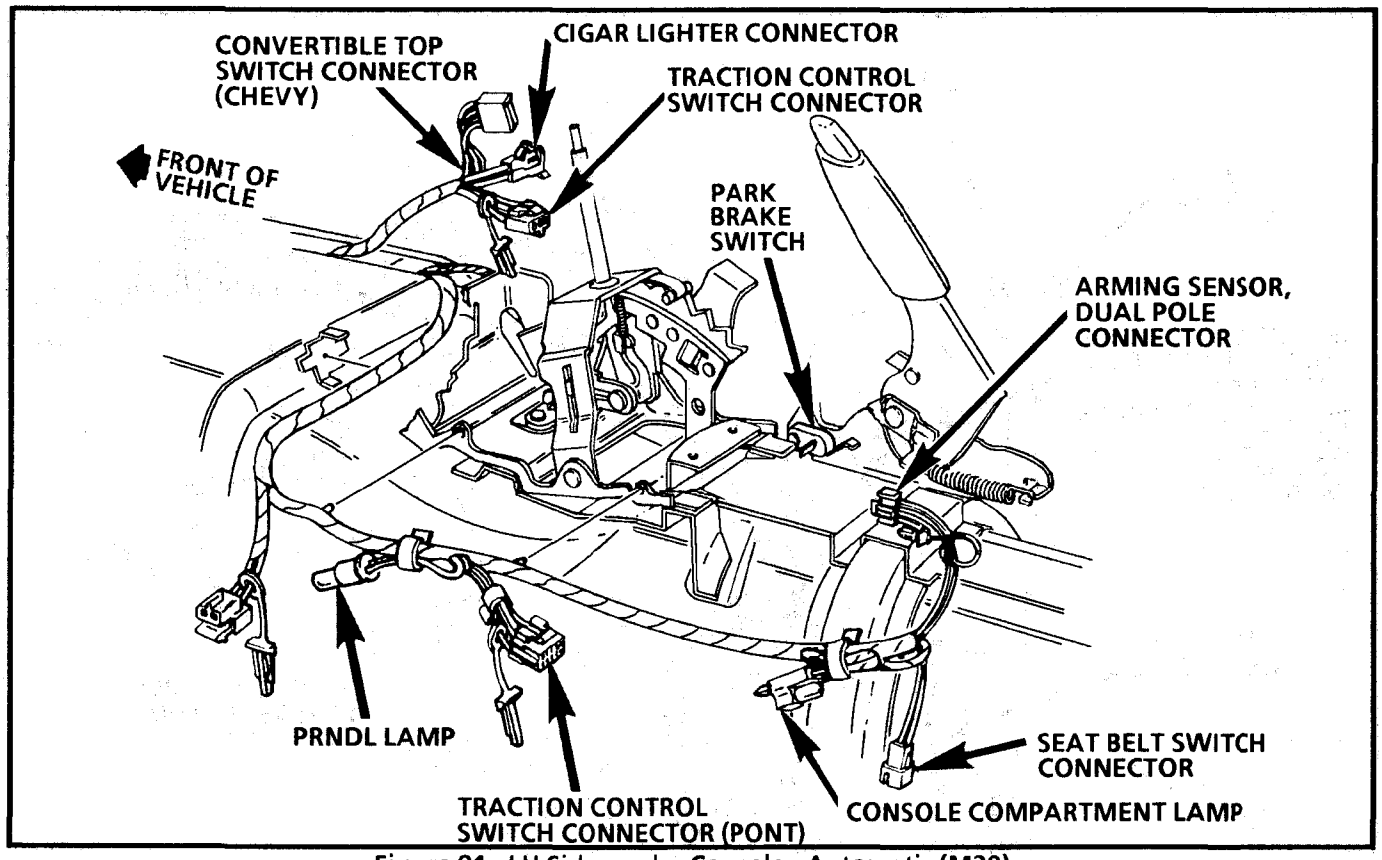


Figure 81 - LH Side, under Console - Automatic (M30)

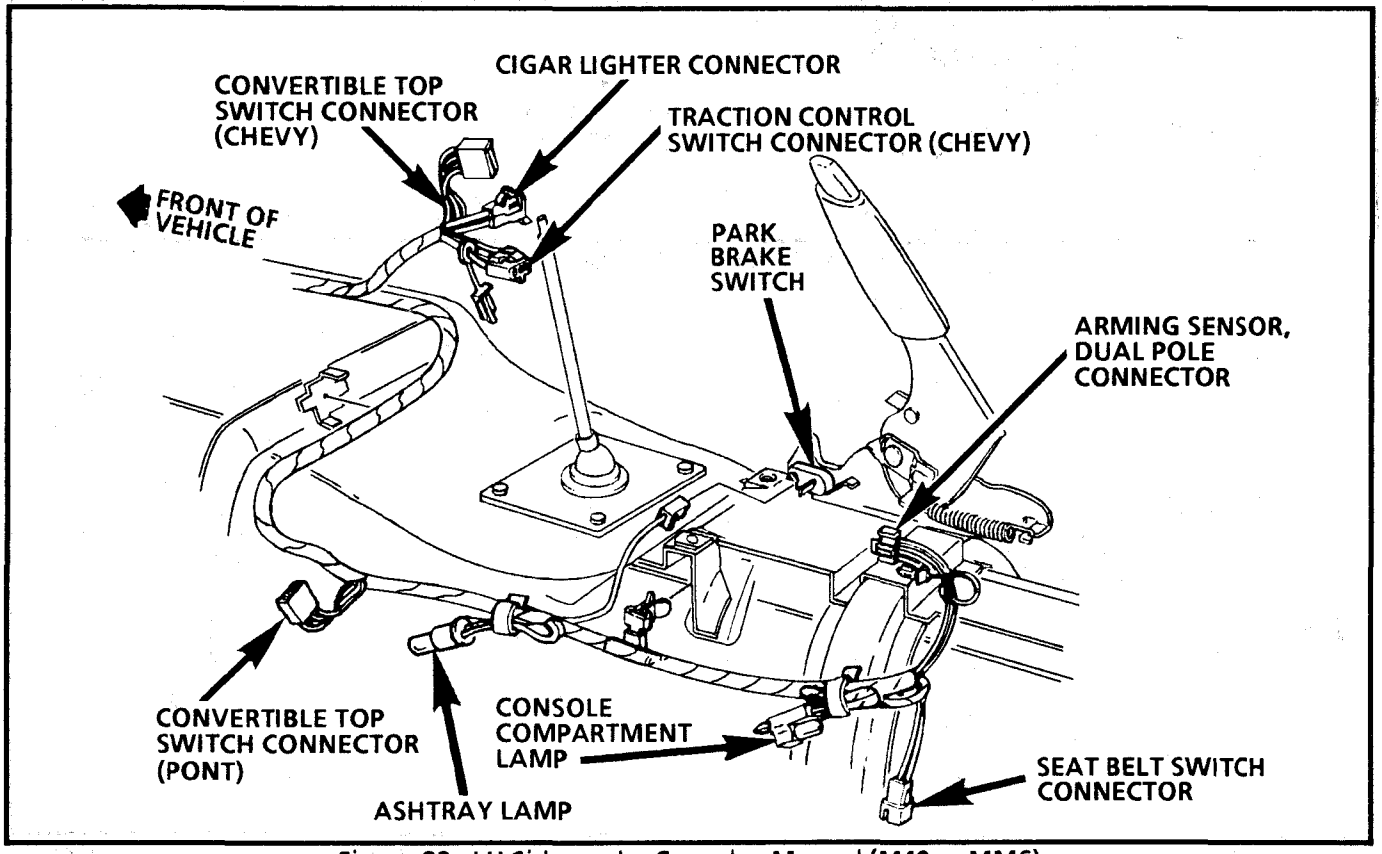


Figure 82 - LH Side, under Console - Manual (M49 or MM6)

COMPONENT LOCATION VIEWS

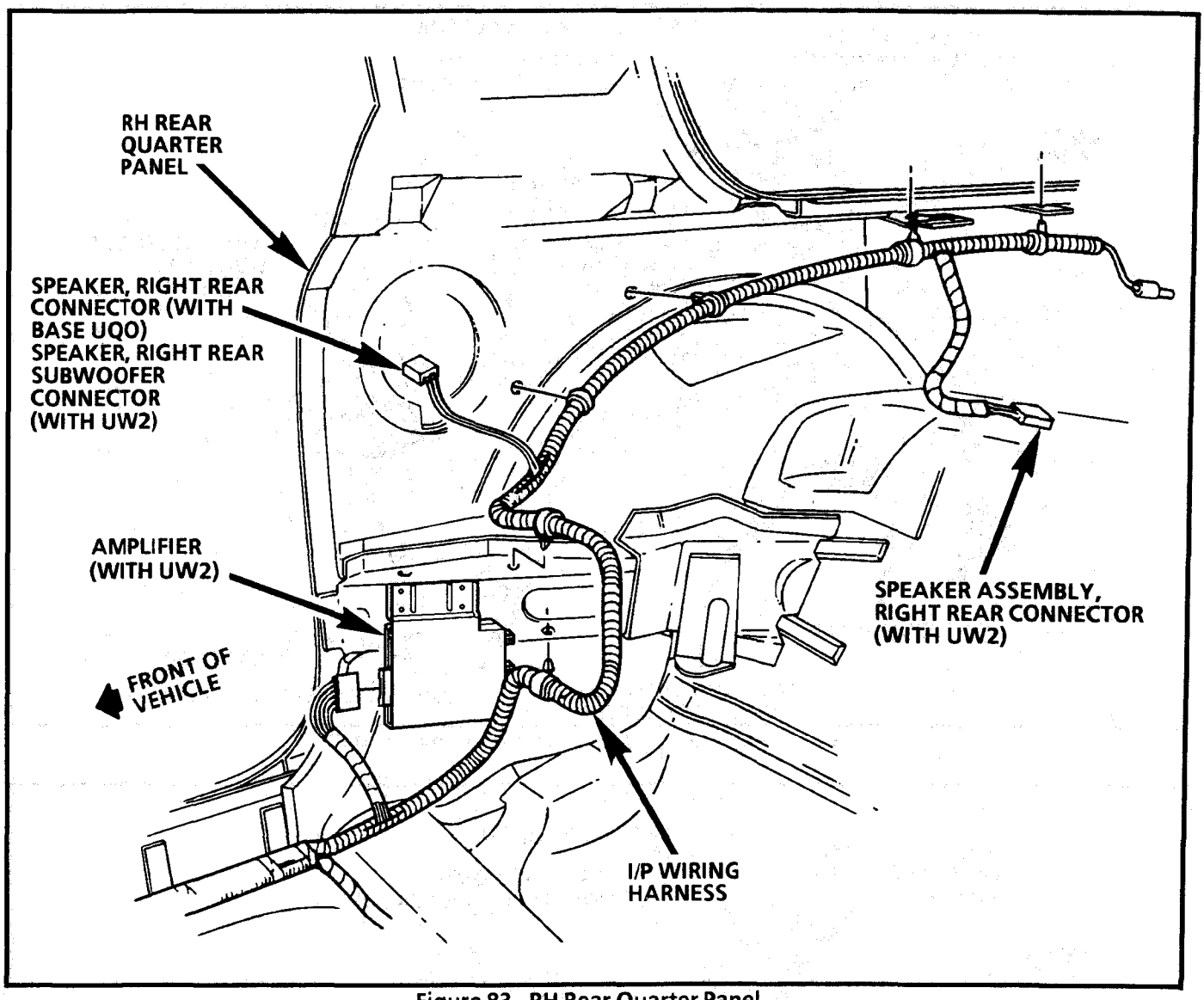


Figure 83 - RH Rear Quarter Panel

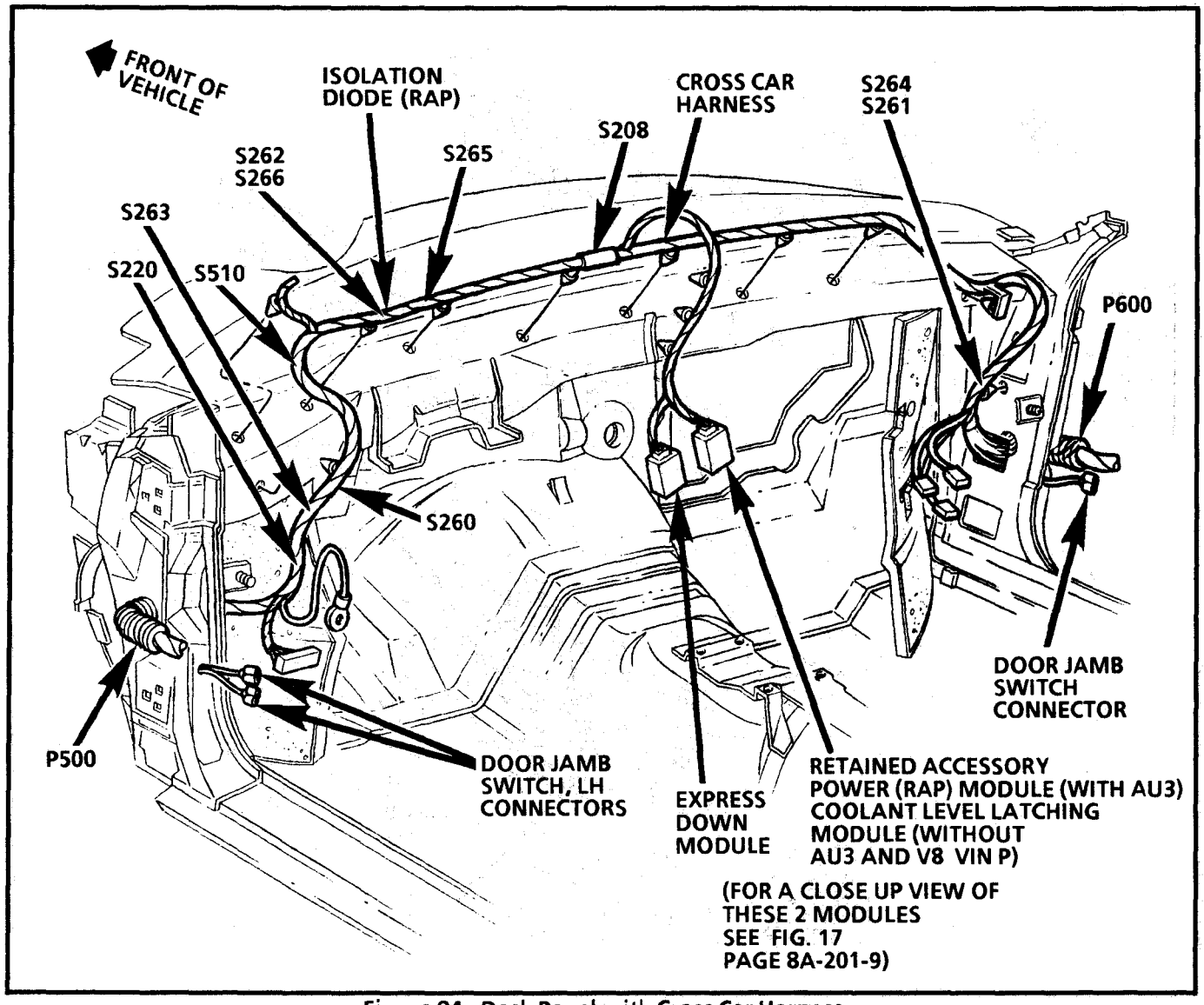


Figure 84 - Dash Panel with Cross Car Harness

COMPONENT LOCATION VIEWS

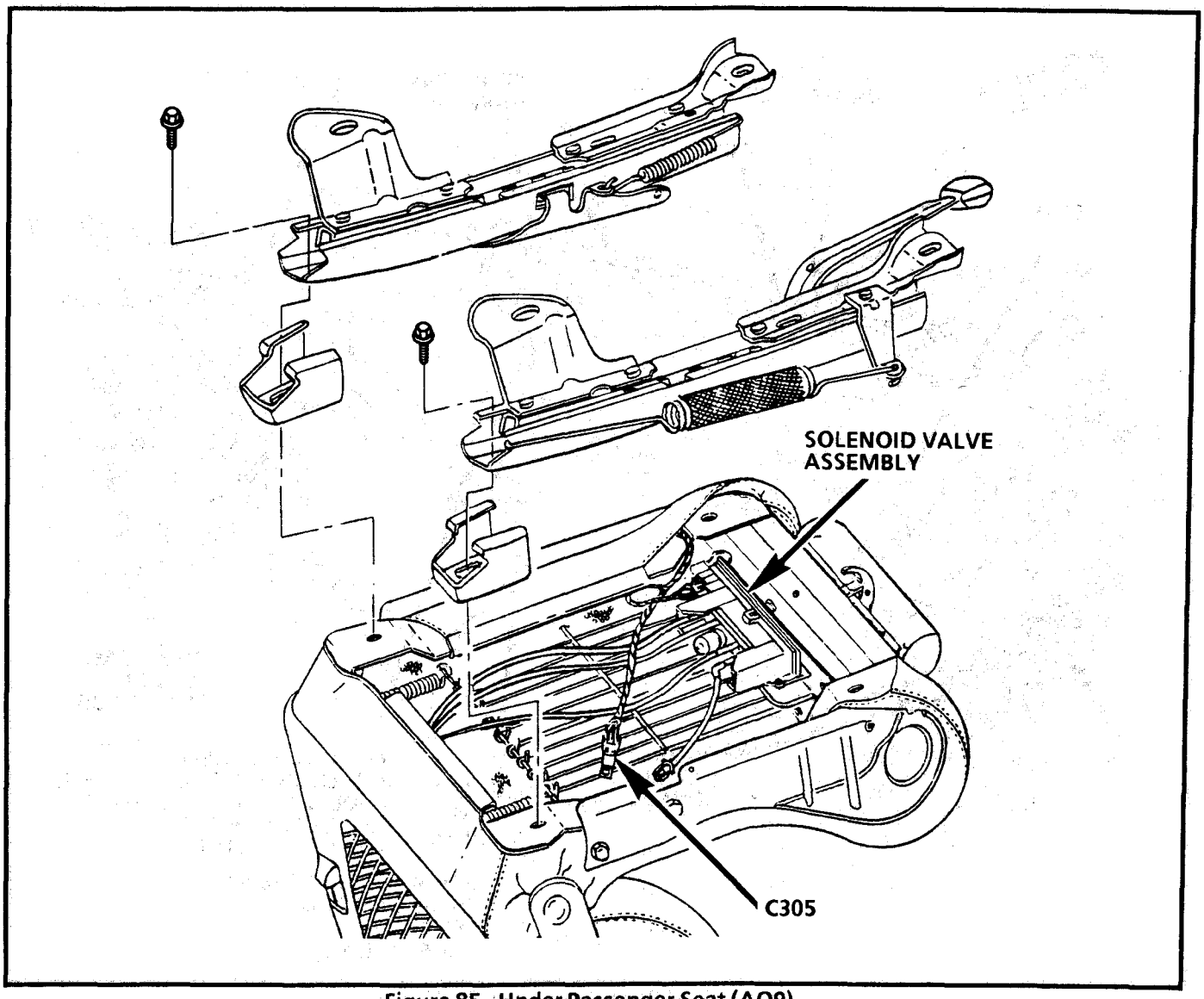


Figure 85 - Under Passenger Seat (AQ9)

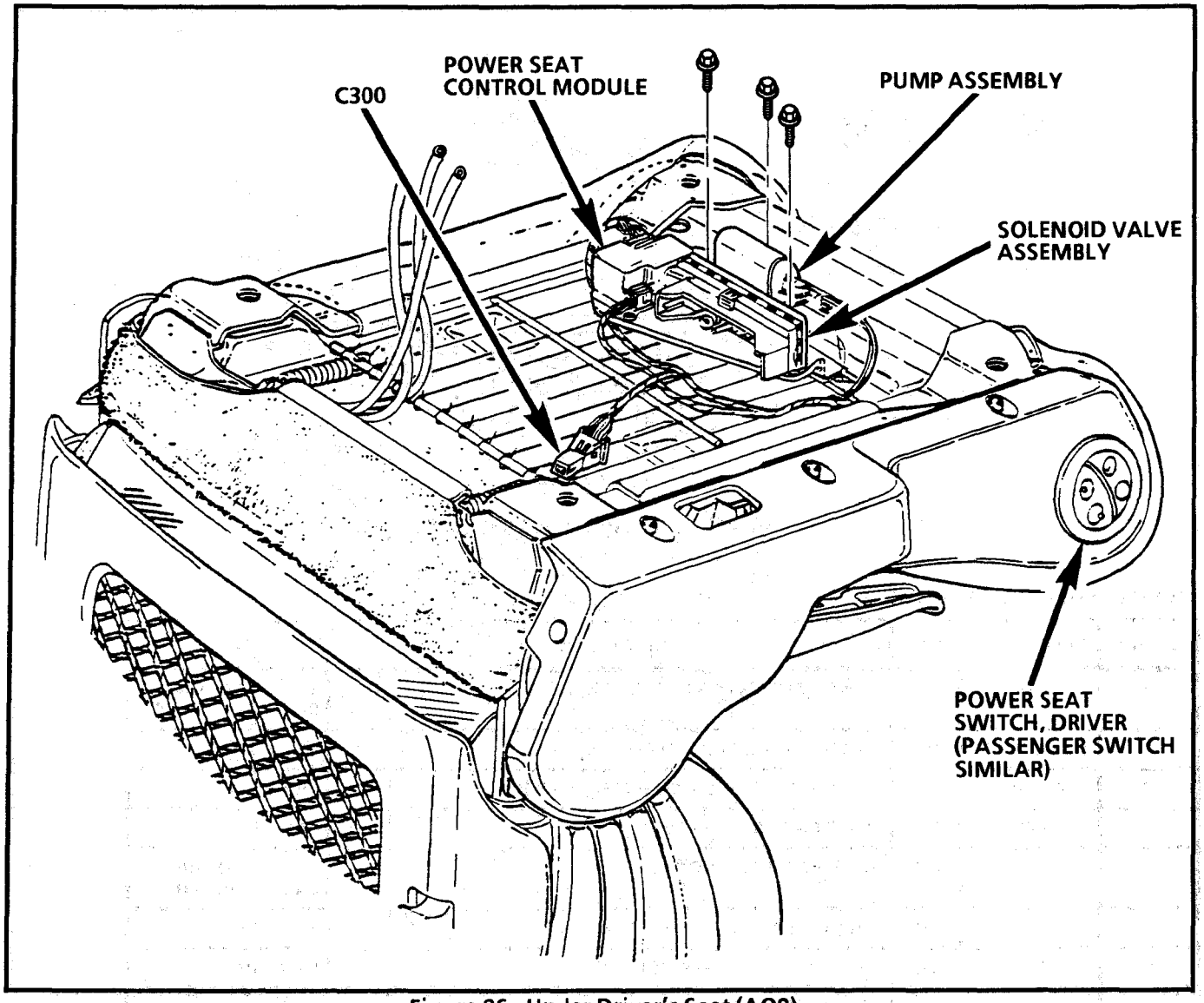
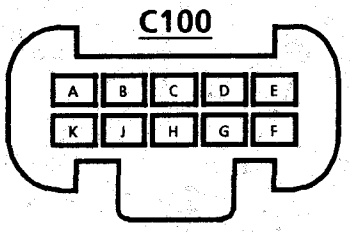


Figure 86 - Under Driver's Seat (AQ9)

HARNESS CONNECTOR FACES



ENGINE HARNESS TO FORWARD LAMP HARNESS

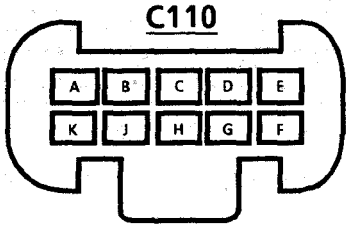
12065425

10-WAY F METRI-PACK 150 SERIES

BLK

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	PNK	639	POWER FEED FROM INJECTOR FUSE 9	8A-20-3 (V6 VIN S), 8A-21-3 (V8 VIN P)
B	DK GRN/WHT	459	A/C COMPRESSOR RELAY CONTROL	8A-64-0, 1
C	DK GRN	59	A/C COMPRESSOR CLUTCH SOLENOID FEED	8A-64-0, 1
D	LT BLU	832	TRACTION CONTROL ACTIVE	8A-44-3
E	BRN	436	AIR PUMP RELAY CONTROL	8A-20-5 (V6 VIN S), 8A-21-3 (V8 VIN P)
F	BRN	541	POWER FEED FROM FANS/ACTR FUSE 6	8A-11-12
G	PNK	239	POWER FEED FROM IGNITION FUSE 11	8A-11-15
H	DK BLU	473	COOLANT FAN RELAY CONTROL	8A-31-1, 2
J	DK GRN	335	COOLANT FAN RELAY CONTROL	8A-31-0, 1, 2
K	PNK	839	POWER FEED FROM INJECTOR FUSE 10	8A-20-3 (V6 VIN S), 8A-21-3 (V8 VIN P)



ENGINE HARNESS (V6 VIN S)
TO INJECTOR JUMPER
HARNESS

12065425

10-WAY F METRI-PACK 150 SERIES
BLK

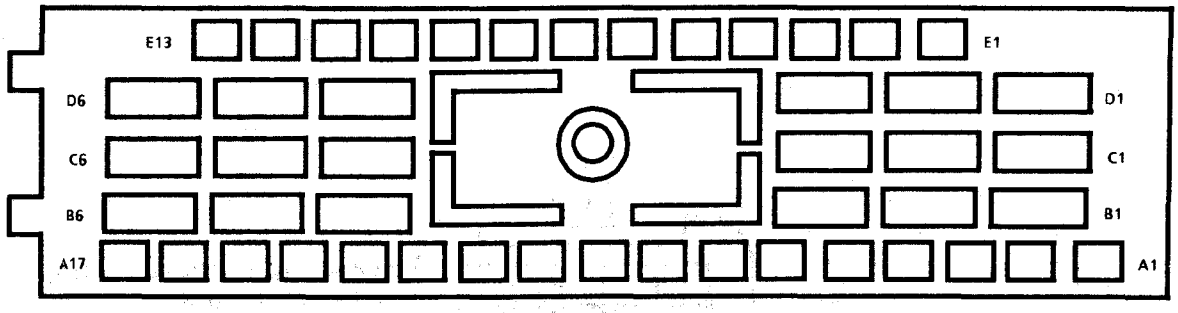
**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	BLK	1744	FUEL INJECTOR #1 OUTPUT	8A-20-3
B	LT GRN/BLK	1745	FUEL INJECTOR #2 OUTPUT	8A-20-3
C	PNK/BLK	1746	FUEL INJECTOR #3 OUTPUT	8A-20-3
D	LT BLU/BLK	844	FUEL INJECTOR #4 OUTPUT	8A-20-3
E	BLK/WHT	845	FUEL INJECTOR #5 OUTPUT	8A-20-3
F	YEL/BLK	846	FUEL INJECTOR #6 OUTPUT	8A-20-3
G	PNK	639	POWER FEED FROM INJECTOR FUSE 9	8A-20-3
H	PNK	839	POWER FEED FROM INJECTOR FUSE 10	8A-20-3
J	BLK	470	SENSOR REFERENCE GROUND	8A-20-4
K	YEL	410	COOLANT TEMPERATURE SENSOR SIGNAL	8A-20-4

HARNESS CONNECTOR FACES

I/P HARNESS TO FORWARD LAMP/CROSS CAR HARNESS

C200D



12077822

M - CONNECTOR
F - TERMINAL

48-WAY M METRI-PACK MIXED SERIES
BLK

FORWARD LAMP HARNESS TO I/P HARNESS

C200A

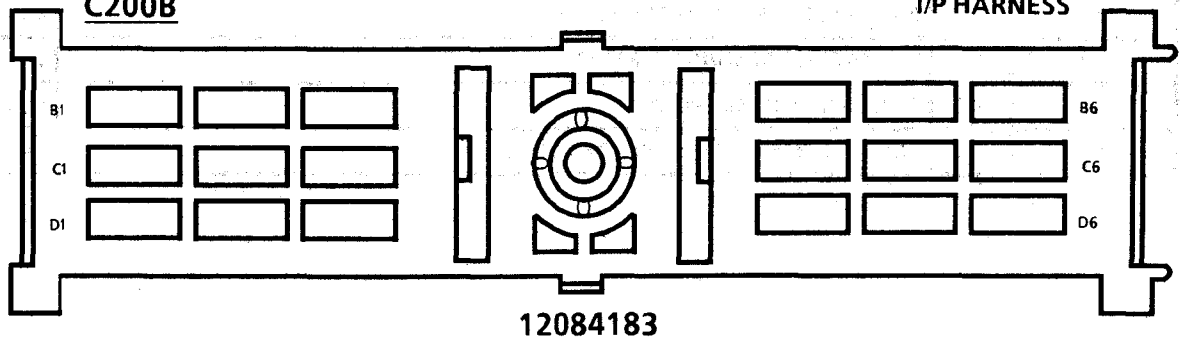


12047842

17-WAY F METRI-PACK 150 SERIES
BLK

FORWARD LAMP HARNESS TO I/P HARNESS

C200B



12084183

18-WAY F METRI-PACK MIXED SERIES
BLK

CROSS CAR HARNESS TO I/P HARNESS

C200C



12047840

13-WAY F METRI-PACK 280 SERIES
GRY

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	DK GRN/WHT	817	VEHICLE SPEED SIGNAL TO CRUISE CONTROL MODULE	8A-33-0
A2	ORN/BLK	463	TRACTION CONTROL SYSTEM SPARK RETARD	8A-44-3
A3	LT GRN	867	ABS FAILURE FEED TO I/P SOLID STATE	8A-81-1
A4	YEL	820	CENTER HIGH MOUNTED STOPLAMP FEED	8A-34-1
A5	TAN/WHT	33	BRAKE INDICATOR WARNING SIGNAL	8A-44-0
A7	DK GRN	29	HORN FEED	8A-40-0
A8	TAN/BLK	464	TRACTION CONTROL SYSTEM THROTTLE POSITION	8A-44-3
A9	DK BLU	1537	"LOW TRAC" INDICATOR CONTROL	8A-81-3
A10	BLK	884	LEFT REAR, WHEEL SPEED SENSOR SIGNAL	8A-44-4
A11	RED	885	LEFT REAR, WHEEL SPEED SENSOR RETURN	8A-44-4
A12	TAN	800	SERIAL DATA SIGNAL	8A-50-0
A13	BRN/WHT	1571	TRACTION CONTROL SYSTEM SWITCH SIGNAL	8A-44-4
A14	WHT	883	REAR WHEEL SPEED SENSOR RETURN (WITH NW9) RIGHT REAR WHEEL SPEED SENSOR RETURN	8A-44-1 8A-44-4
A15	BRN	882	REAR WHEEL SPEED SENSOR SIGNAL (WITH NW9) RIGHT REAR WHEEL SPEED SENSOR SIGNAL	8A-44-1 8A-44-4
A16	YEL	317	FOG LIGHTS ON RELAY FEED	8A-100-1, 3
A17	YEL/BLK	68	LOW COOLANT INDICATOR - LATCHED GROUND	8A-81-3
B1	PNK	3	IGNITION SWITCH OUTPUT - HOT IN RUN AND CRANK	8A-10-3
B2	ORN	300	IGNITION SWITCH OUTPUT - HOT IN RUN	8A-10-3
B3	PPL	34	FOG LIGHTS ON INDICATOR FEED (PONT)	8A-100-3
B4	RED	202	BATTERY FEED FROM FUSIBLE LINK A	8A-63-0
B5	YEL	10	HEADLIGHTS ON OUTPUT	8A-100-0, 2
B6	RED	702	BATTERY FEED FROM FUSIBLE LINK Z	8A-10-1
C1	RED	102	BATTERY FEED FROM FUSIBLE LINK E (DOUBLE WIRE)	8A-10-2
C2	RED	1002	BATTERY FEED FROM FUSIBLE LINK F (DOUBLE WIRE)	8A-10-1
C3	LT GRN	11	HI BEAM HEADLAMP POWER FEED	8A-100-0, 2
C4	PPL/WHT	1572	"ASR" (CHEVY) OR "TCS OFF" (PONT) INDICATOR CONTROL (DOUBLE WIRE ON PONT)	8A-44-2
C5	YEL	5	IGNITION SWITCH OUTPUT - CRANK	8A-10-3
C6	BRN	4	IGNITION SWITCH OUTPUT - ACCESSORY (DOUBLE WIRE)	8A-10-2
D1	BLK/WHT	1751	SUPPLEMENTAL INFLATABLE RESTRAINTS GROUND (DOUBLE WIRE)	8A-47-1
D2	DK GRN	348	SUPPLEMENTAL INFLATABLE RESTRAINTS INFLATOR OUTPUT (DOUBLE WIRE)	8A-47-1
D3	YEL	143	WIPER/WASH FUSE 14 OUTPUT	8A-11-9
D4	BRN	9	PARK LAMPS FEED	8A-110-2, 3
D5	LT BLU	14	LEFT FRONT TURN SIGNAL LAMP FEED	8A-110-2, 3
D6	DK BLU	15	RIGHT FRONT TURN SIGNAL LAMP FEED	8A-110-2, 3
E1	WHT	156	COURTESY LAMP OUTPUT (SWITCHED GROUND)	8A-114-0, 1

(CONTINUED ON NEXT PAGE)

HARNESS CONNECTOR FACES

(CONTINUED FROM PREVIOUS PAGE)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
E2	BRN	4	IGNITION SWITCH OUTPUT - ACCESSORY AND RUN	8A-10-2
E3	ORN	40	COURTESY FUSE 8 OUTPUT	8A-11-8
E4	RED	102	BATTERY FEED FROM FUSIBLE LINK E	8A-10-2
E5	TAN	159	KEY-IN-IGNITION SWITCH OUTPUT	8A-76-0
E6	DK BLU	75	RETAINED ACCESSORY POWER RELAY OUTPUT COMMON CONTACT ACCESSORY	8A-15-0
E7	GRY	8	I/P DIMMER FUSE 13 OUTPUT TO LH AND RH DOOR ILLUMINATION LAMPS	8A-117-1
E8	YEL/BLK	68	LOW COOLANT INDICATOR CONTROL (DOUBLE WIRE)	8A-81-3
E9	ORN	640	POWER ACCESSORY FUSE 7 OUTPUT	8A-11-8
E10	PNK	39	GAGES FUSE 9 OUTPUT FOR KEYLESS ENTRY MODULE	8A-11-5
E11	BRN	341	WINDOWS CIRCUIT BREAKER OUTPUT	8A-120-0
E12	PNK	70	RETAINED ACCESSORY POWER COMMON CONTACT IGN 3	8A-15-0
E13	BLK	1576	HATCH RELEASE FEED TO KEYLESS ENTRY MODULE	8A-132-1, 3

C215



FORWARD LAMP HARNESS TO STEERING COLUMN HARNESS

06294509

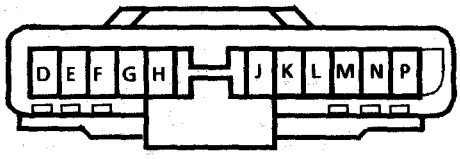
11-WAY F PACK-CON I

BLK

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
D	YEL	143 A/B	POWER FROM WIPER/WASH FUSE 14/POWER TO WINDSHIELD WIPER MOTOR MODULE (DOUBLE WIRE)	8A-91-0
E	DK GRN	113	WINDSHIELD WIPER SWITCH SIGNAL - ON	8A-91-0
F	GRY	112	WINDSHIELD WIPER SWITCH SIGNAL - LOW/PULSE/MIST	8A-91-0
G	PPL	92	WINDSHIELD WIPER SWITCH SIGNAL - HIGH	8A-91-0
H	PNK	94	WINDSHIELD WASHER SWITCH SIGNAL	8A-91-0
J	GRY/BLK	87	CRUISE CONTROL SWITCH SIGNAL - RESUME/ACCEL	8A-34-0
K	DK BLU	84	CRUISE CONTROL SWITCH SIGNAL - SET/COAST	8A-34-0
L	GRY	397	CRUISE CONTROL SWITCH SIGNAL - ON	8A-34-0
M	PNK	139 E/F	POWER FROM A/C COMPRESSOR RELAY/POWER TO CRUISE RELEASE SWITCHES (DOUBLE WIRE), (SINGLE WIRE WITH NW9 AND K34)	8A-34-0

C216



I/P HARNESS TO STEERING COLUMN HARNESS

12004147

11-WAY F PACK-CON I

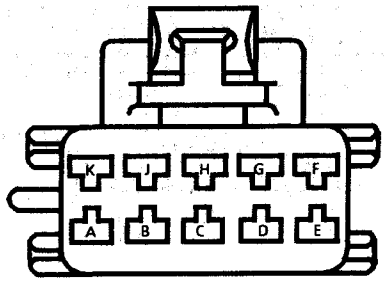
BLK

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
E	TAN	159	KEY-IN-IGNITION SWITCH OUTPUT	8A-76-0
F	LT GRN	80	KEY-IN-IGNITION SWITCH TO AUDIO ALARM MODULE	8A-76-0
G	BLK	28	HORN RELAY FEED (SWITCHED GROUND)	8A-40-0
H H	LT BLU LT BLU/WHT	14 1414	LEFT FRONT TURN SIGNAL TO I/P INDICATOR AND TURN LAMP (DOUBLE WIRE) (WITH T61) LEFT FRONT TURN SIGNAL TO I/P INDICATOR AND TURN LAMP (DOUBLE WIRE)	8A-110-0 8A-110-0
J J	DK BLU DK BLU/WHT	15 1415	RIGHT FRONT TURN SIGNAL TO I/P INDICATOR AND TURN LAMP (DOUBLE WIRE) (WITH T61) RIGHT FRONT TURN SIGNAL TO I/P INDICATOR AND TURN LAMP (DOUBLE WIRE)	8A-110-0 8A-110-0
K	BRN	27	HAZARD FLASHER OUTPUT	8A-110-0
L	PPL	16	TURN SIGNAL FLASHER OUTPUT	8A-110-0
M	YEL	18	LEFT REAR TURN SIGNAL	8A-110-1
N	DK GRN	19	RIGHT REAR TURN SIGNAL	8A-110-1
P	LT BLU	20	STOPLAMP FEED	8A-110-0

HARNESS CONNECTOR FACES

C220



ENGINE HARNESS
TO I/P HARNESS

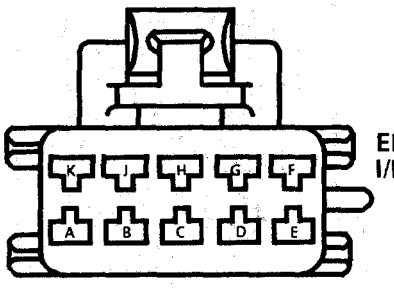
12064769

10-WAY F METRI-PACK 150 SERIES
WHT

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	RED	225	GENERATOR FEED TO INSTRUMENT CLUSTER	8A-30-1
B	TAN	31	OIL PRESSURE FEED TO INSTRUMENT CLUSTER	8A-81-0
C	BRN	1174	OIL LEVEL FEED TO INSTRUMENT CLUSTER	8A-81-1
D	ORN/BLK	463	SPARK RETARD REQUEST	8A-44-4
E	TAN/BLK	464	THROTTLE POSITION SENSOR SIGNAL (EBTCM)	8A-44-4
F	TAN	800	SERIAL DATA SIGNAL	8A-50-0
G	DK GRN/WHT	817	VEHICLE SPEED SIGNAL	8A-33-0
H	DK BLU/WHT	1493 375	(AUTOMATIC) PERFORMANCE SWITCH SIGNAL (MANUAL) SKIP SHIFT INDICATOR CONTROL (V8 VIN P ONLY)	8A-39-0 8A-81-3
J	DK GRN/WHT	465	FUEL PUMP RELAY CONTROL	8A-20-2 (V6 VIN S), 8A-21-2 (V8 VIN P)
K	DK GRN	135	COOLANT TEMPERATURE FEED TO INSTRUMENT CLUSTER	8A-81-1

C230



ENGINE HARNESS TO I/P HARNESS

12064871

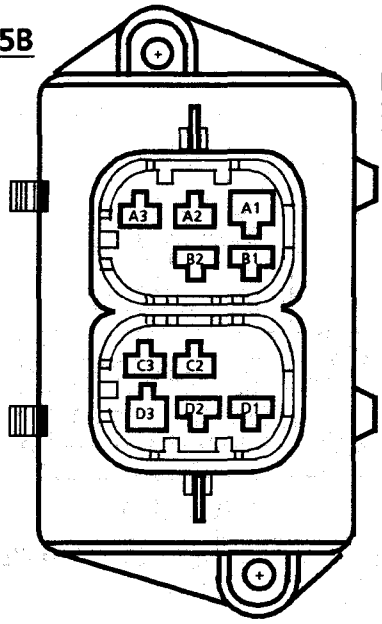
10-WAY F METRI-PACK 150 SERIES
BLU

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	LT BLU	553 48	(AUTOMATIC) PERFORMANCE SWITCH INDICATOR CONTROL (MANUAL) CLUTCH ANTICIPATE SIGNAL (V6 VIN S ONLY)	8A-20-7, 8A-39-0
B	BRN/WHT	419	SERVICE ENGINE SOON INDICATOR FEED	8A-81-3
C	WHT/BLK	448	DIAGNOSTIC REQUEST SIGNAL	8A-50-0
D	WHT	121	TACHOMETER SIGNAL TO INSTRUMENT CLUSTER	8A-81-0
E	DK BLU	229	THEFT DETERRENT - FUEL ENABLE FEED	8A-133-1
F	DK GRN/WHT	762	A/C REQUEST SIGNAL	8A-64-0, 1
G	PNK	439	POWER FEED FROM PCM IGN FUSE #5	8A-11-5
H	LT BLU/BLK	583	(AUTOMATIC) TCC SWITCHED POWER FEED	8A-20-6 (V6 VIN S), 8A-21-6 (V8 VIN P)
H	BRN	141	(MANUAL) POWER FROM TURN B/U FUSE #2 TO BACKUP SWITCH	8A-112-0
J	ORN/BLK	434	(AUTOMATIC) PARK/NEUTRAL FEED FROM TRANSMISSION POSITION SWITCH (V8 VIN P ONLY)	8A-20-6 (V6 VIN S), 8A-21-6 (V8 VIN P)
J	LT GRN	24	(MANUAL) BACKUP LAMP FEED	8A-112-0
K	TAN/BLK	422	(AUTOMATIC) TORQUE CONVERTER CLUTCH CONTROL	8A-20-6 (V6 VIN S), 8A-21-6 (V8 VIN P)

HARNESS CONNECTOR FACES

C405B

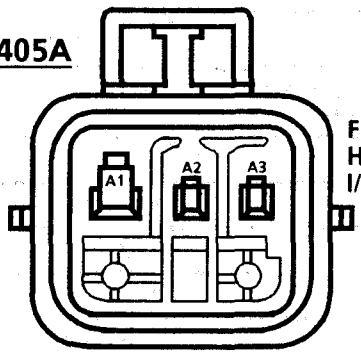


I/P HARNESS TO FUEL SENDER/REAR WHEEL SPEED SENSOR HARNESS

12092789

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

C405A

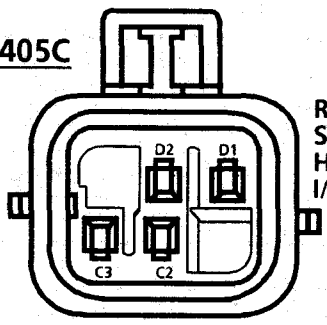


FUEL TANK UNIT HARNESS TO I/P HARNESS

12092859

4-WAY F METRI-PACK MIXED SERIES
WHT

C405C



REAR WHEEL SPEED SENSOR HARNESS TO I/P HARNESS

12092800

4-WAY F METRI-PACK MIXED SERIES
BLK

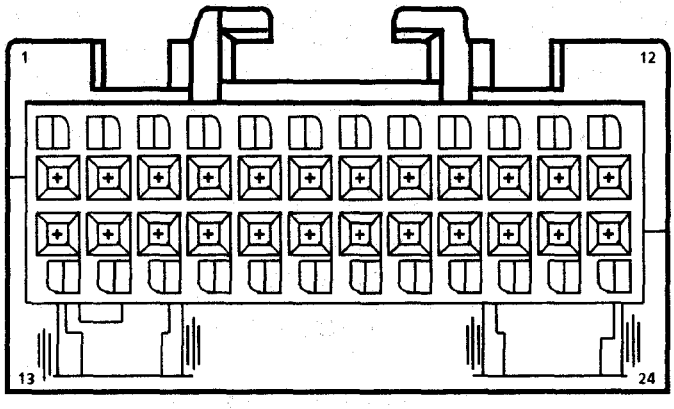
**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	GRY	120	FUEL PUMP MOTOR FEED	8A-20-2 (V6 VIN S), 8A-21-2 (V8 VIN P)
A2	PPL	30	FUEL GAGE SENSOR SIGNAL	8A-20-2 (V6 VIN S), 8A-21-2 (V8 VIN P)
A3	BLK	1050	GROUND	8A-20-2 (V6 VIN S), 8A-21-2 (V8 VIN P)

(CONTINUED ON NEXT PAGE)

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CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C2	WHT	883	WHEEL SPEED SENSOR RETURN (WITH NW9) RIGHT REAR WHEEL SPEED SENSOR RETURN	8A-44-1 8A-44-4
C3	BRN	882	WHEEL SPEED SENSOR SIGNAL (WITH NW9) RIGHT REAR WHEEL SPEED SENSOR SIGNAL	8A-44-1 8A-44-4
D1	RED	885	(WITH NW9) LEFT REAR WHEEL SPEED SENSOR RETURN	8A-44-4
D2	BLK	884	(WITH NW9) LEFT REAR WHEEL SPEED SENSOR SIGNAL	8A-44-4



12110088

24-WAY F MICRO-PACK 100 SERIES

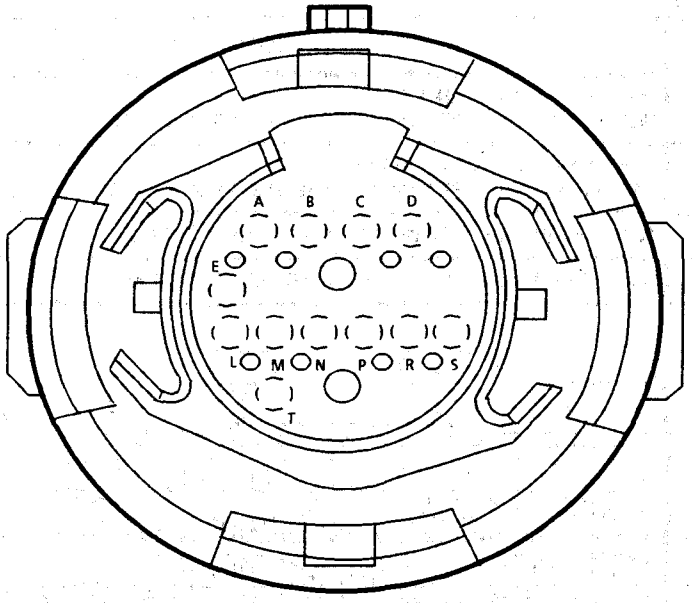
LT GRY

AMPLIFIER (PONT)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
1	ORN	40	POWER FEED FROM COURTESY FUSE 8	8A-11-8
4	BLK	650	GROUND	8A-14-9
8	PNK	314	RADIO SIGNAL - ON	8A-150-5
9	DK BLU	46	RIGHT REAR SPEAKER FEED (POS)	8A-150-5
10	BRN	199	LEFT REAR SPEAKER FEED (POS)	8A-150-5
11	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-5
12	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-5
13	LT BLU/BLK	315	RIGHT SUBWOOFER SPEAKER RETURN (NEG)	8A-150-5
14	DK GRN	1795	RIGHT SUBWOOFER SPEAKER FEED (POS)	8A-150-5
15	LT GRN/BLK	1794	LEFT SUBWOOFER SPEAKER RETURN (NEG)	8A-150-5
16	DK BLU/WHT	346	LEFT SUBWOOFER SPEAKER FEED (POS)	8A-150-5
21	LT BLU	115	RIGHT REAR SPEAKER RETURN (NEG)	8A-150-5
22	YEL	116	LEFT REAR SPEAKER RETURN (NEG)	8A-150-5
23	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-5
24	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-5

HARNESS CONNECTOR FACES



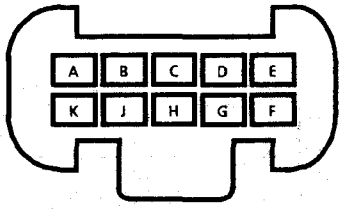
12129829

12-WAY F MICRO-PACK 100 W
GRY

AUTOMATIC TRANSMISSION

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	LT GRN	1222	1-2 SHIFT SOLENOID CONTROL	8A-39-0
B	YEL/BLK	1223	2-3 SHIFT SOLENOID CONTROL	8A-39-0
C	RED/BLK	1228	PRESSURE CONTROL SOLENOID FEED	8A-39-0
D	LT BLU/WHT	1229	PRESSURE CONTROL SOLENOID RETURN	8A-39-0
E	PNK	239	POWER FEED FROM IGNITION FUSE 11	8A-11-15
L	YEL/BLK	1227	TRANSMISSION TEMPERATURE SENSOR SIGNAL	8A-39-0
M	BLK	470	SENSOR RETURN - PCM	8A-39-0
N	PNK	1224	TRANSMISSION PRESSURE SWITCH SIGNAL - RANGE A	8A-39-0
P	RED	1226	TRANSMISSION PRESSURE SWITCH SIGNAL - RANGE C	8A-39-0
R	DK BLU	1225	TRANSMISSION PRESSURE SWITCH SIGNAL - RANGE B	8A-39-0
S	WHT	687	3-2 SHIFT SOLENOID CONTROL	8A-39-0
T	TAN/BLK	422	TORQUE CONVERTER CLUTCH SOLENOID CONTROL	8A-39-0



12065425

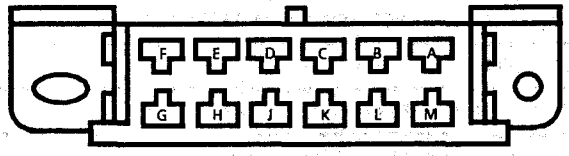
10-WAY F METRI-PACK 150 SERIES

BLK

CRUISE CONTROL MODULE

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	GRY	397	CRUISE CONTROL SWITCH - ON	8A-34-0
B	DK BLU	84	CRUISE CONTROL SWITCH - SET/COAST	8A-34-0
C	GRY/BLK	87	CRUISE CONTROL SWITCH - RESUME/ACCEL	8A-34-0
D	BRN	86	CRUISE RELEASE/BRAKE SWITCH OUTPUT	8A-34-0
E	BLK	1650	GROUND	8A-14-0, 2
F	PNK	139	POWER FEED FROM A/C-CRUISE FUSE #12	8A-34-0
G	YEL	820	BRAKE DEPRESSED INPUT	8A-34-1
K	DK GRN/WHT	817	VEHICLE SPEED SIGNAL	8A-34-1



12020043

12-WAY F METRI-PACK 280 SERIES

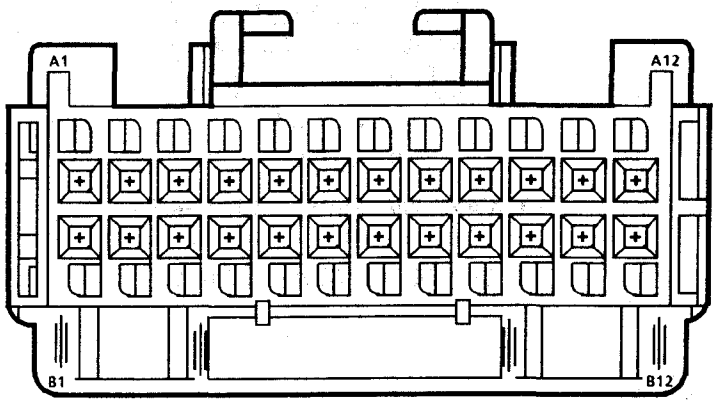
BLK

DATA LINK CONNECTOR (DLC)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A	BLK/WHT	451	GROUND	8A-14-1, 2, 3
B	WHT/BLK	448	DIAGNOSTIC REQUEST, PCM	8A-20-0, 8A-21-0
G	BLK/WHT	1455	PROGRAM INPUT, KEYLESS ENTRY MODULE	8A-132-1
M	TAN	800	SERIAL DATA LINE, DIAGNOSTIC ENERGY RESERVE MODULE (DERM), ELECTRONIC BRAKE CONTROL MODULE (EBCM) AND PCM	8A-50-0

HARNESS CONNECTOR FACES



12092689

24-WAY F MICRO-PACK 100 SERIES

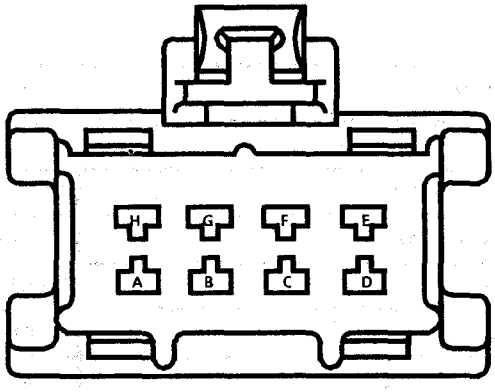
YEL

DIAGNOSTIC ENERGY RESERVE MODULE (DERM)

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	BLK/WHT	1751	GROUND	8A-14-4
A2	BLK	650	GROUND	8A-14-8, 9
A3	PNK	1401	DUAL ARMING SENSOR FEED - PASSENGER - 36 VOLT	8A-47-1
A4	YEL/BLK	236	DUAL ARMING SENSOR FEED - DRIVER - 36 VOLT	8A-47-1
A5	LT GRN	1400	DUAL ARMING SENSOR SIGNAL - DRIVER	8A-47-1
A6	LT GRN/WHT	1837	DUAL ARMING SENSOR SIGNAL - PASSENGER	8A-47-1
A7	WHT/BLK	1403	INFLATOR FEED - PASSENGER	8A-47-1
A9	YEL	1139	POWER FEED FROM AIR BAG FUSE #1	8A-47-0, 1
A10	YEL	1139	POWER FEED FROM AIR BAG FUSE #1	8A-47-0, 1
A12	BLK/WHT	1751	GROUND	8A-14-4
B1	BRN	358	AIR BAG INDICATOR LAMP FEED	8A-47-0
B2	PNK	39	POWER FEED FROM GAGES FUSE #9	8A-11-5
B5	BLK/WHT	238	SEAT BELT SWITCH SIGNAL	8A-47-0
B7	DK GRN	348	SIR INFLATOR OUTPUT	8A-47-1
B8	DK GRN	348	SIR INFLATOR OUTPUT	8A-47-1
B9	WHT	347	INFLATOR FEED - DRIVER	8A-47-1
B10	PPL	806	POWER FEED FROM CRANK FUSE #16	8A-11-9
B11	TAN	800	SERIAL DATA SIGNAL	8A-50-0

C1

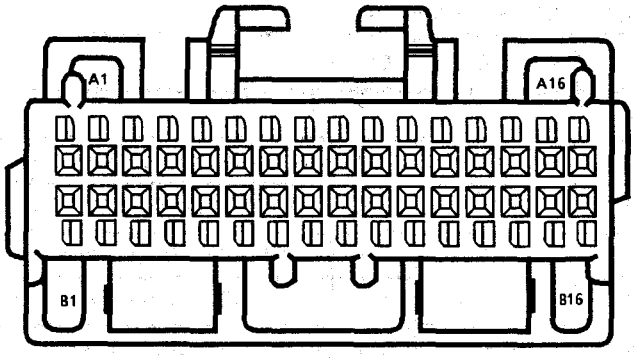


12110626

8-WAY F METRI-PACK 280 FLX LK
LT GRY

ELECTRONIC BRAKE CONTROL MODULE (EBCM)
OR
ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

C2

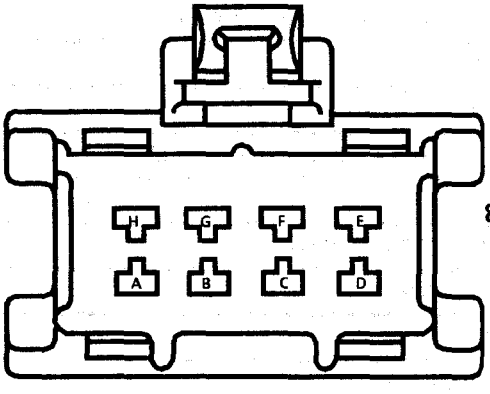


12110113

32-WAY F MICRO-PACK 100 SERIES
DK RED

ELECTRONIC BRAKE CONTROL MODULE (EBCM)
OR
ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

C3 (WITH NW9)



12129088

8-WAY F METRI-PACK 280 SERIES FLX LK
BLK

ELECTRONIC BRAKE/TRACTION
CONTROL MODULE (EBTCM)

**CAVITIES NOT LISTED ARE NOT USED

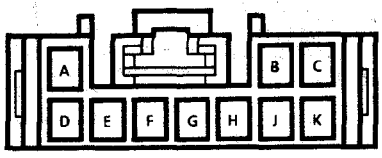
CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1				
A	BLK	1280	LEFT FRONT ABS MOTOR FEED	8A-44-1, 2
B	PNK	1281	LEFT FRONT ABS MOTOR RETURN	8A-44-1, 2
C	DK GRN	1284	REAR ABS MOTOR FEED	8A-44-1, 2
D	RED	1633	ABS RELAY OUTPUT - SWITCHED TO BATTERY	8A-44-1, 3
E	BLK/WHT	651	GROUND	8A-44-0, 2
F	ORN	1285	REAR ABS MOTOR RETURN	8A-44-1, 2
G	PPL	1282	RIGHT FRONT ABS MOTOR FEED	8A-44-1, 2
H	BLK	1283	RIGHT FRONT ABS MOTOR RETURN	8A-44-1, 2

(CONTINUED ON NEXT PAGE)

HARNESS CONNECTOR FACES

(CONTINUED FROM PREVIOUS PAGE)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C2				
A1	BLK	884	LEFT REAR WHEEL SPEED SENSOR SIGNAL (WITH NW9)	8A-44-4
A2	RED	885	LEFT REAR WHEEL SPEED SENSOR RETURN (WITH NW9)	8A-44-4
A3	TAN	833	RIGHT FRONT WHEEL SPEED SENSOR RETURN	8A-44-1, 4
A4	DK GRN	872	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL	8A-44-1, 4
A5 A5	WHT WHT	883 883	REAR WHEEL SPEED SENSOR RETURN RIGHT REAR WHEEL SPEED SENSOR RETURN (WITH NW9)	8A-44-1 8A-44-4
A6 A6	BRN BRN	882 882	REAR WHEEL SPEED SENSOR SIGNAL RIGHT REAR WHEEL SPEED SENSOR SIGNAL (WITH NW9)	8A-44-1 8A-44-4
A7	YEL	873	LEFT FRONT WHEEL SPEED SENSOR RETURN	8A-44-1, 4
A8	LT BLU	830	LEFT FRONT WHEEL SPEED SENSOR SIGNAL	8A-44-1,4
A9	LT BLU	1289	RIGHT FRONT SOLENOID FEED	8A-44-0, 2
A11	TAN	800	SERIAL DATA SIGNAL	8A-50-0
A14	TAN/BLK	464	THROTTLE POSITION SENSOR SIGNAL (WITH NW9)	8A-44-3
A15	BRN/WHT	1571	TRACTION CONTROL SYSTEM SWITCH SIGNAL (WITH NW9)	8A-44-4
A16	LT BLU	832	TRACTION CONTROL ACTIVE (WITH NW9)	8A-44-3
B1	DK GRN	1288	LEFT FRONT SOLENOID FEED	8A-44-0, 2
B2	LT GRN	867	ABS FAILURE INPUT TO INSTRUMENT CLUSTER (SOLID STATE)	8A-44-0, 2
B3	PNK	1632	ABS ENABLE FEED TO RELAY	8A-44-1, 3
B4	TAN/WHT	33	"BRAKE" INDICATOR LAMP (SWITCHED GROUND)	8A-44-0, 2
B5	DK BLU	1537	"LOW TRAC" INDICATOR LAMP CONTROL	8A-44-0, 2
B10	ORN	440	POWER FEED FROM ABS BAT FUSE #1	8A-44-1, 3
B11	BRN	641	POWER FEED FROM ABS IGN FUSE #5	8A-44-1, 3
B12	YEL	820	BRAKE DEPRESSED INPUT	8A-44-0, 2
B14	ORN/BLK	463	SPARK RETARD REQUEST (WITH NW9)	8A-44-3
B15	PPL/WHT	1572	"ASR" (CHEVY) OR "TCS OFF" (PONT) INDICATOR CONTROL (WITH NW9)	8A-44-2, 4
C3 (WITH NW9)				
A	LT GRN	566	RIGHT REAR TCS MOTOR FEED	8A-44-3
B	PPL	562	TCS ENABLE FEED TO RELAY	8A-44-3
C	RED/BLK	563	TCS RELAY OUTPUT - SWITCHED TO BATTERY	8A-44-3
D	GRY	561	THROTTLE RELAXER MOTOR RETURN	8A-44-3
E	WHT	560	THROTTLE RELAXER MOTOR FEED	8A-44-3
F	LT BLU	564	LEFT REAR TCS MOTOR FEED	8A-44-3
G	DK BLU	565	LEFT REAR TCS MOTOR RETURN	8A-44-3
H	DK GRN	567	RIGHT REAR TCS MOTOR RETURN	8A-44-3



12129077

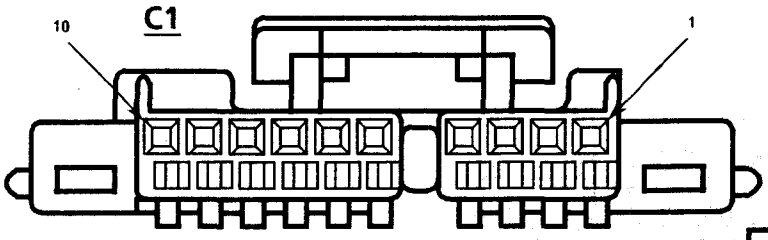
10-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT SWITCH

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C	BRN	9	PARK LAMP FEED	8A-100-0
D	BLK	650	GROUND	8A-14-8
E	YEL	10	HEADLIGHTS ON	8A-100-0
F	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-100-0
H	ORN	240	POWER FEED FROM TAIL LTS FUSE #10	8A-100-0
J	RED	702	POWER FEED FROM FUSIBLE LINK Z	8A-100-0

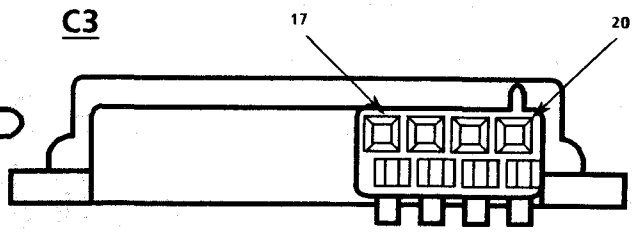
HARNESS CONNECTOR FACES



12047531

10-WAY F MICRO-PACK

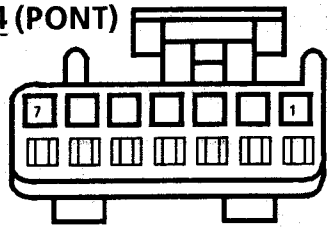
BLK



12047530

4-WAY F MICRO-PACK

BLU



12065873

7-WAY F MICRO-PACK 100 SERIES

BLK

RADIO

(PONTIAC)

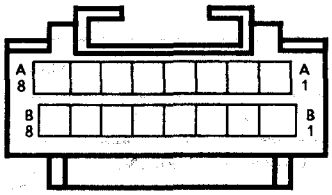
**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1				
1	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-0, 4
2	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-0, 4
3	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-0, 4
4	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-0, 4
5	BLK	650	GROUND	8A-14-7, 8, 9
6	BRN	9	PARK LAMP FEED	8A-150-0, 4
7	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-150-0, 4
8	PNK	314	(WITH UW2) RADIO SIGNAL - ON	8A-150-4
9	YEL	43	POWER FEED FROM RADIO FUSE #17	8A-150-0, 4
10	ORN	40	POWER FEED FROM COURTESY FUSE #8	8A-11-8
C3				
17	LT BLU	115	RIGHT REAR SPEAKER RETURN	8A-150-0, 5
18	DK BLU	46	RIGHT REAR SPEAKER FEED	8A-150-0, 5
19	YEL	116	LEFT REAR SPEAKER RETURN	8A-150-0, 5
20	BRN	199	LEFT REAR SPEAKER FEED	8A-150-0, 5
C4 (WITH UK3)				
6	DK BLU	1796	STEERING WHEEL RADIO CONTROL SIGNAL	8A-150-1, 5

**CAVITIES NOT LISTED ARE NOT USED (CHEVY)

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
C1 (BASE)				
1	GRY	118	LEFT FRONT SPEAKER RETURN (NEG)	8A-150-0
2	TAN	201	LEFT FRONT SPEAKER FEED (POS)	8A-150-0
3	DK GRN	117	RIGHT FRONT SPEAKER RETURN (NEG)	8A-150-0
4	LT GRN	200	RIGHT FRONT SPEAKER FEED (POS)	8A-150-0
5	BLK	650	GROUND	8A-14-7, 8, 9
C1 (DELCO-BOSE®)				
1	BARE	514	DRAIN WIRE	8A-150-3
2	TAN	511	SPEAKER SIGNAL LEFT FRONT	8A-150-3
3	WHT	513	SPEAKER RETURN LEFT AND RIGHT	8A-150-3
4	LT GRN	512	SPEAKER SIGNAL RIGHT FRONT	8A-150-3
5	BLK	1051	GROUND	8A-14-10
C1 (ALL RADIOS)				
6	BRN	9	PARK LAMP FEED	8A-150-0, 2
7	GRY	8	POWER FEED FROM I/P DIMMER FUSE #13	8A-150-0, 2
8	PNK	314	(WITH U82 ONLY) RADIO SIGNAL - ON	8A-150-2
9	YEL	43	POWER FEED FROM RADIO FUSE #17	8A-150-0, 2
10	ORN	40	POWER FEED FROM COURTESY FUSE #8	8A-11-8
C3 (BASE)				
17	LT BLU	115	RIGHT REAR SPEAKER RETURN	8A-150-0
18	DK BLU	46	RIGHT REAR SPEAKER FEED	8A-150-0
19	YEL	116	LEFT REAR SPEAKER RETURN	8A-150-0
20	BRN	199	LEFT REAR SPEAKER FEED	8A-150-0
C3 (DELCO-BOSE®)				
17	BARE	514	DRAIN WIRE	8A-150-2
18	DK BLU	546	REAR PRE AMP FEED (RIGHT SIGNAL)	8A-150-2
19	DK GRN/WHT	689	REAR PRE AMP RETURN	8A-150-2
20	BRN	599	REAR PRE AMP FEED (LEFT SIGNAL)	8A-150-2

HARNESS CONNECTOR FACES



12110259

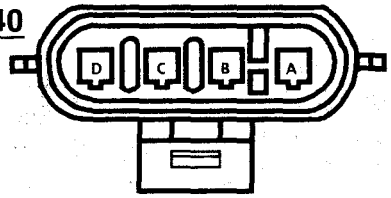
16-WAY F MICRO-PACK 100 SERIES
GRN

THEFT DETERRENT MODULE

**CAVITIES NOT LISTED ARE NOT USED

CAVITY	WIRE COLOR	CKT	DESCRIPTION	PAGE
A1	ORN	340	POWER FEED FROM PCM BAT FUSE #4	8A-11-7
A2	PNK	439	POWER FEED FROM PCM IGN FUSE #5	8A-11-5
A3	DK BLU	229	FUEL ENABLE SIGNAL	8A-133-1
A4	YEL/BLK	625	THEFT DETERRENT RELAY CONTROL	8A-133-0, 1
A5	GRY	728	"SECURITY" INDICATOR LAMP CONTROL	8A-133-1
B5	BLK/WHT	451	GROUND	8A-14-1, 2, 3
B7	PPL/WHT	1074	IGNITION KEY RESISTOR RETURN	8A-133-1
B8	WHT/BLK	1073	IGNITION KEY RESISTOR FEED	8A-133-1

C140

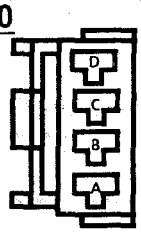


12047950

4-WAY F METRI-PACK 150 SERIES
BLK

ENGINE HARNESS TO
DISTRIBUTOR JUMPER (V8 VIN P)

C210

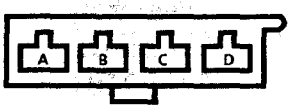


12015664

4-WAY F METRI-PACK 630 SERIES
BLK

ENGINE HARNESS TO I/P HARNESS

C217

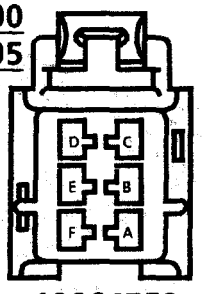


12092162

4-WAY F METRI-PACK 150 SERIES
BLK

SIR COIL ASSEMBLY HARNESS TO I/P HARNESS
STEERING WHEEL CONTROLS, RADIO

C240
C300
C305

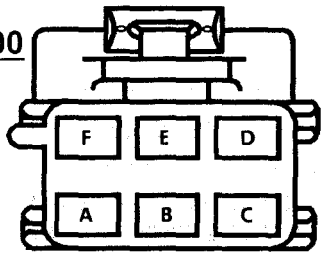


12064752

6-WAY F METRI-PACK 280 SERIES
BLK

CROSS CAR HARNESS TO I/P HARNESS
SEAT JUMPER HARNESS TO DRIVER SEAT HARNESS
SEAT JUMPER HARNESS TO PASSENGER SEAT HARNESS
BLOWER RESISTOR
SPEAKER/AMP, REAR (CHEVY BOSE)

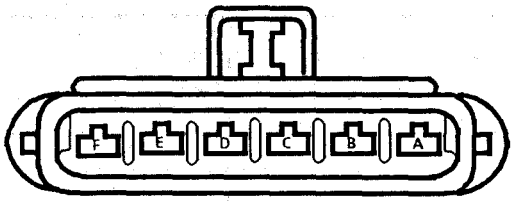
C400



12064762

6-WAY F METRI-PACK 150 SERIES
GRY

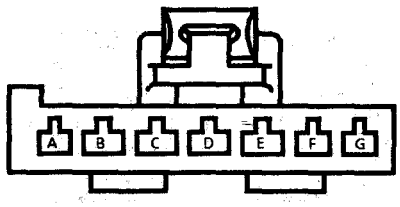
REAR BODY HARNESS TO I/P HARNESS



12110295

6-WAY F METRI-PACK 280 SERIES
GRY

ABS MOTOR PACK



12092761

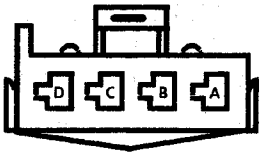
7-WAY F METRI-PACK 280 SERIES
YEL

ARMING SENSOR, DUAL POLE

HARNESS CONNECTOR FACES

BLOWER RESISTOR
SEE C240

BOSE RELAY (CHEVY)
SEE FUEL PUMP RELAY

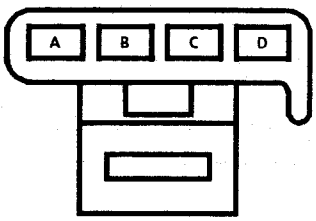


12033704

4-WAY F METRI-PACK 280 SERIES
BLK

CLUTCH ANTICIPATE/CRUISE RELEASE SWITCH
(V6 WITH MANUAL)

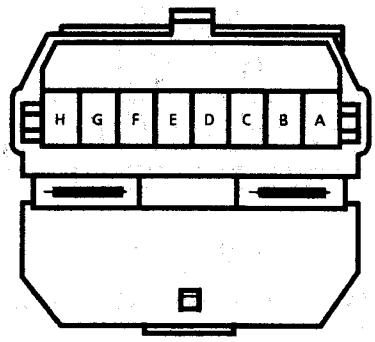
CONVENIENCE CENTER
REFER TO PAGE 8A-76-1



12052856

4-WAY F METRI-PACK 280 SERIES
BLK

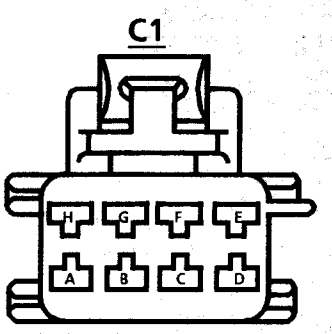
CONVERTIBLE TOP SWITCH (CHEVY OR PONT)



12015308

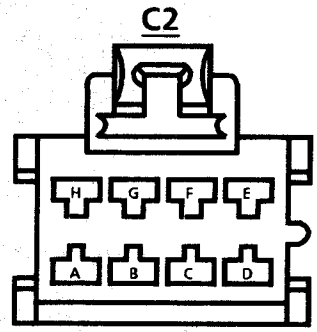
8-WAY PC EDGEBOARD - STD
BLK

COOLANT LEVEL LATCHING MODULE



12064766

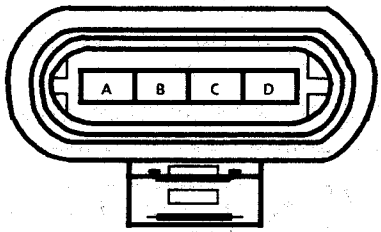
8-WAY F METRI-PACK
150 SERIES
BLU



12064998

8-WAY F METRI-PACK
280 SERIES
BLK

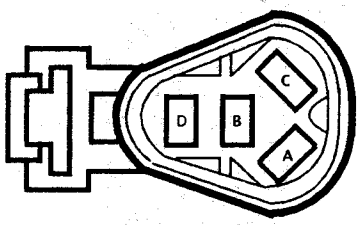
DAYTIME RUNNING LIGHTS (DRL) MODULE



12059401

4-WAY F METRI-PACK 150.1 SERIES
PULL-TO-SEAT
GRY

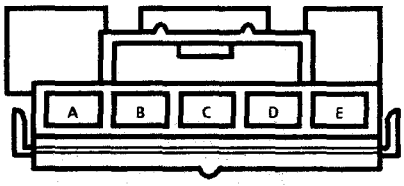
DISTRIBUTOR (V8 VIN P)



12065292

4-WAY F METRI-PACK 150 PULL-TO-SEAT
BLK

EXHAUST GAS RECIRCULATION (EGR) VACUUM
CONTROL SIGNAL SOLENOID VALVE (V6 VIN S)

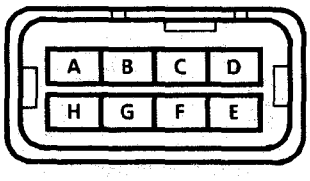


12015356

5-WAY F METRI-PACK 150 480 SERIES
BLK

EXPRESS DOWN MODULE

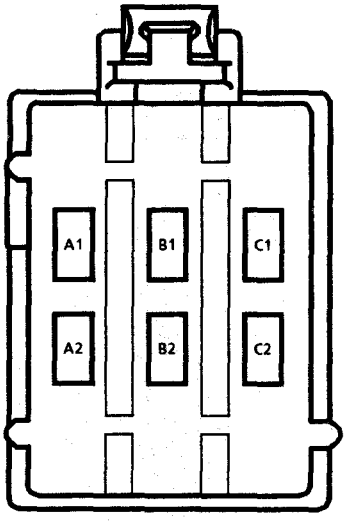
FOG LIGHT SWITCH (CHEVY)
SEE C400



12045688

8-WAY M METRI-PACK 150 SERIES
BLK

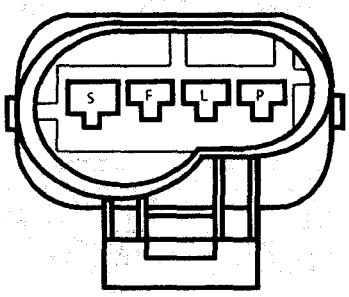
FOG LIGHT SWITCH (PONT)



12110541

6-WAY F METRI-PACK 280 FLX LK
BLK

FUEL PUMP RELAY
HATCH RELEASE RELAY
THEFT DETERRENT RELAY
HIGH BLOWER RELAY
BOSE RELAY (CHEVY)



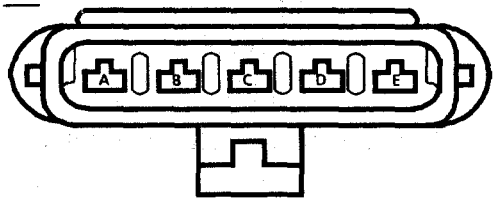
12129068

4-WAY F METRI-PACK MIXED SERIES
BLK

GENERATOR

HATCH RELEASE RELAY
SEE FUEL PUMP RELAY

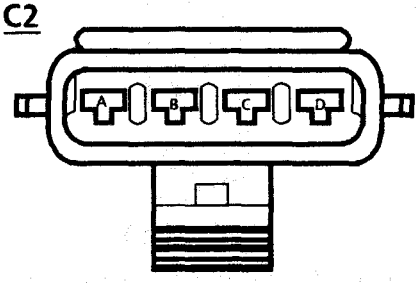
C1



15300030

5-WAY F METRI-PACK 280 SERIES
BLK

C2

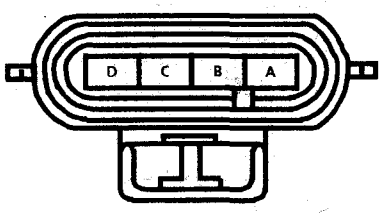


15300029

4-WAY F METRI-PACK 280 SERIES
BLK

HEADLIGHT DOORS MODULE (PONT ONLY)

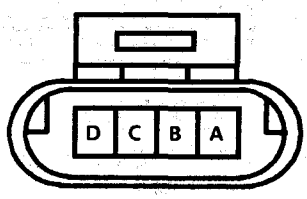
HARNESS CONNECTOR FACES



12059870

4-WAY F METRI-PACK 150 SERIES
BLK

HEATED OXYGEN SENSOR - BANK #1 AND BANK #2

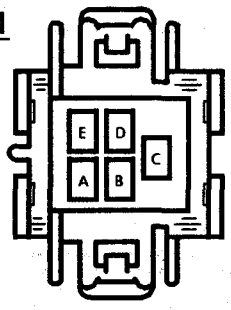


12110188

4-WAY F METRI-PACK 150 SERIES
PULL-TO-SEAT
BLK

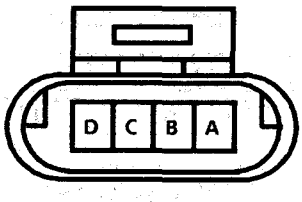
IDLE AIR CONTROL (IAC) VALVE (V8 VIN P AND V6 VIN S)

C1



12020813

5-WAY F METRI-PACK 630 SERIES
BLK

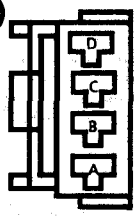


12040754

4-WAY F METRI-PACK 150 SERIES
PULL-TO-SEAT
BLK

IGNITION COIL MODULE (V8 VIN P)

C4 (PONT)

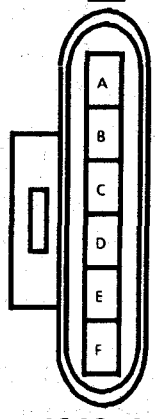


12015664

4-WAY F METRI-PACK 630 SERIES
BLK

HEATER/VENT/AIR CONDITIONING (HVAC) CONTROL ASSEMBLY

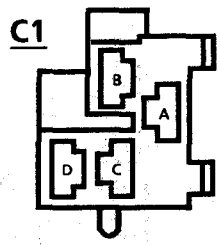
C1



12124045

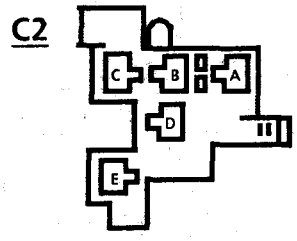
6-WAY F METRI-PACK 150 SERIES
BLK

IGNITION CONTROL MODULE (V6 VIN S)



06294641

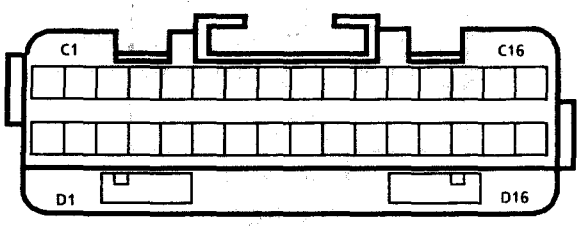
4-WAY F MIXED SERIES
BLK



12010966

5-WAY F 56 SERIES
BLU

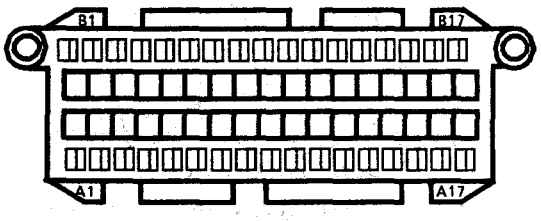
IGNITION SWITCH



12045575

32-WAY F MICRO-PACK 100 SERIES
BLK

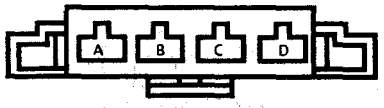
INSTRUMENT CLUSTER (CHEVY)



12065803

34-WAY F MICRO-PACK 100 SERIES
BLK

INSTRUMENT CLUSTER (PONT)

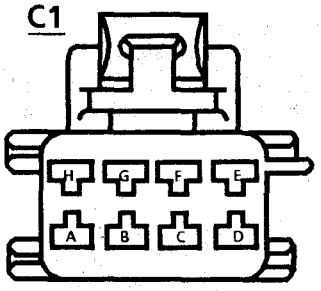


12034060

4-WAY F METRI-PACK 480 SERIES
NAT (WHT)

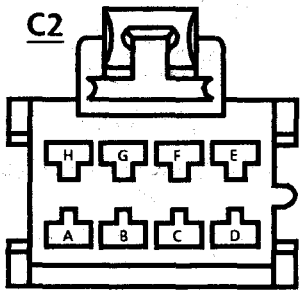
I/P DIMMER SWITCH

I/P FUSE BLOCK
REFER TO PAGE 8A-11-0 (CHEVY)
8A-11-1 (PONT)



12064766

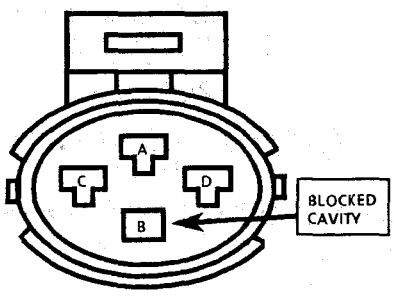
8-WAY F METRI-PACK 150 SERIES
BLU



12064998

8-WAY F METRI-PACK 280 SERIES
BLK

KEYLESS ENTRY RECEIVER
POWER SEAT CONTROL MODULE (AQ9)

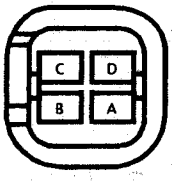


12065401

3-WAY F METRI-PACK 150 SERIES
GRY

OIL PRESSURE SENSOR

HARNESS CONNECTOR FACES

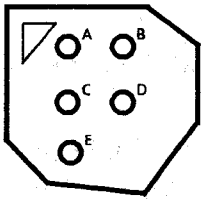


12066498

4-WAY M METRI-PACK 150 SERIES
BLK

OUTSIDE MIRROR
LH AND RH

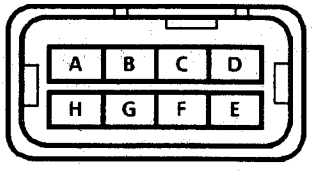
PERFORMANC SWITCH
PERFORMANCE/TRACTION CONTROL SWITCH
SEE SOLENOID VAVLE ASSEMBLY (AQ9)



12004680

5-WAY F PIN GRIP SERIES
NAT

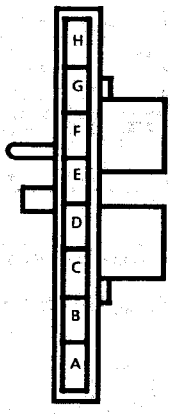
POWER DOOR LOCK SWITCH
LH AND RH



12045688

8-WAY M METRI-PACK 150 SERIES
BLK

POWER MIRROR SWITCH (CHEVY)

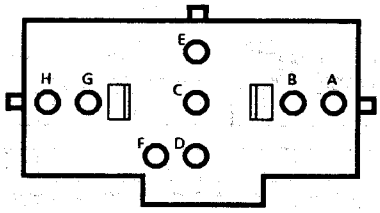


12064862

8-WAY F METRI-PACK 150 SERIES
BLK

POWER MIRROR SWITCH (PONT)

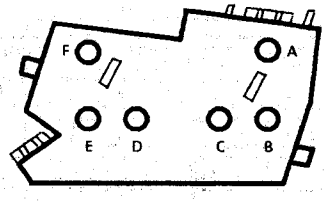
POWER SEAT CONTROL MODULE
(AQ9 POWER SEAT)
SEE KEYLESS ENTRY RECEIVER (C2)



12085013

8-WAY F PIN GRIP SERIES
BLK

POWER SEAT SWITCH (AC3)

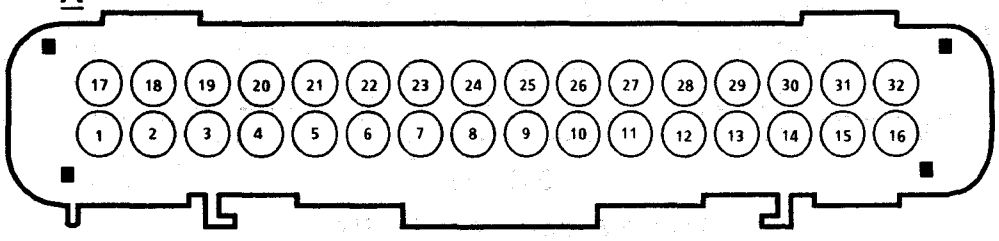


12033944

6-WAY F PIN GRIP SERIES
BLK

POWER SEAT SWITCH (AQ9)
DRIVER AND PASSENGER

A

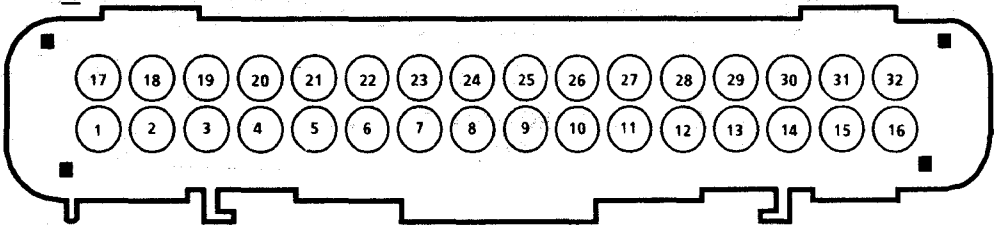


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129022 (CLR)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

B

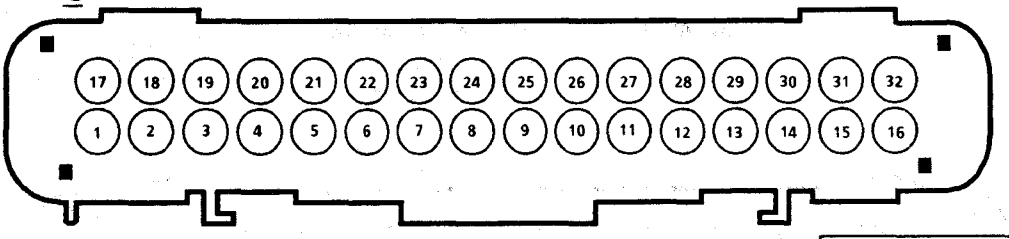


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

C



12129025

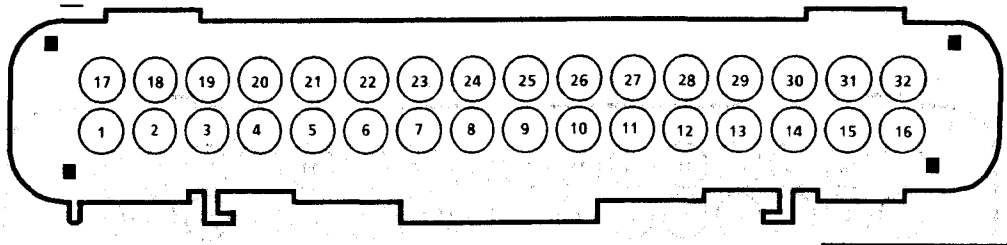
32-WAY F MICRO-PACK 100 SERIES
NAT

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

POWERTRAIN CONTROL MODULE (PCM) (V6 VIN S)

HARNESS CONNECTOR FACES

A

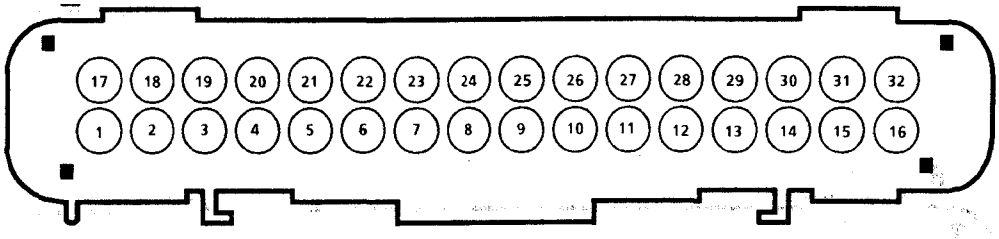


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129024 (RED)
SEAL	- 12146093
STRAIN RELIEF	- 12129028
CONNECTOR	- 12129025

B

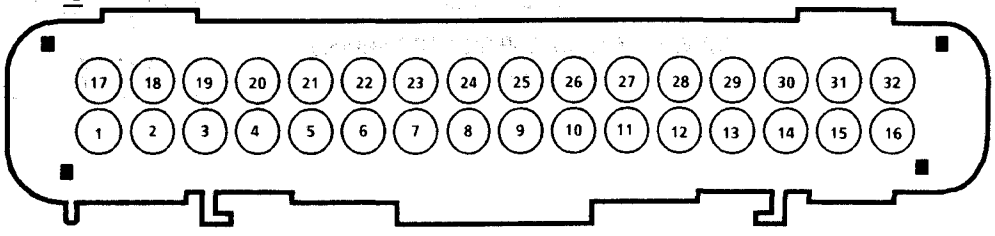


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129021 (BLK)
SEAL	- 12146093
STRAIN RELIEF	- 12129028
CONNECTOR	- 12129025

C

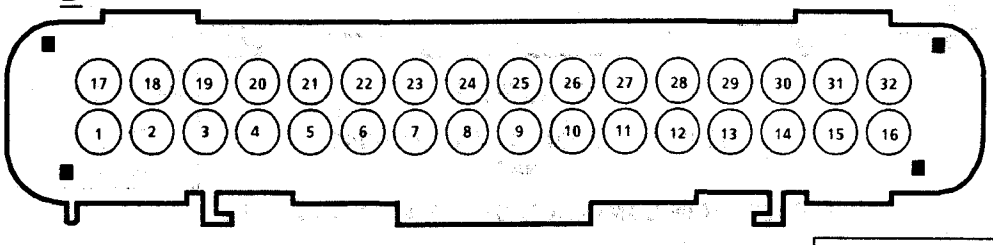


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129022 (CLR)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

D

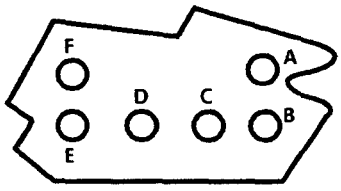


12129025

32-WAY F MICRO-PACK 100 SERIES
NAT

CONNECTOR ASSEMBLY BREAKDOWN	
TPA	- 12129023 (BLU)
SEAL	- 12146093
STRAIN RELIEF	- 12129030
CONNECTOR	- 12129025

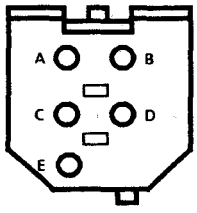
POWERTRAIN CONTROL MODULE (PCM) (V8 VIN P)



12048027

6-WAY F PIN GRIP SERIES
GRY

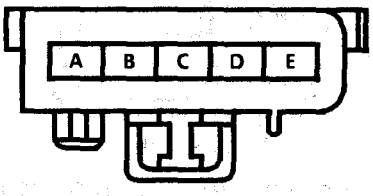
POWER WINDOW SWITCH, LH



12033945

5-WAY F PIN GRIP SERIES
BLK

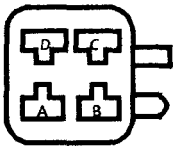
POWER WINDOW SWITCH, RH



12059296

5-WAY F METRI-PACK 480 SERIES
RED

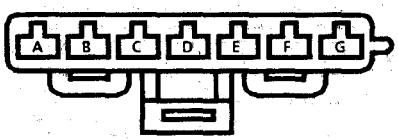
REAR DEFOGGER SWITCH/TIMER (CHEVY)



12047785

4-WAY F METRI-PACK 150 SERIES
BLK

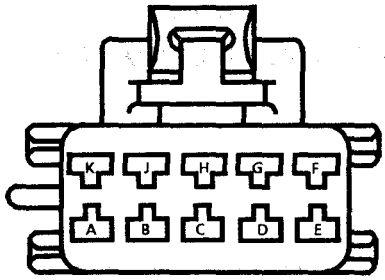
REARVIEW MIRROR



12052854

7-WAY F METRI-PACK 280 SERIES
BLK

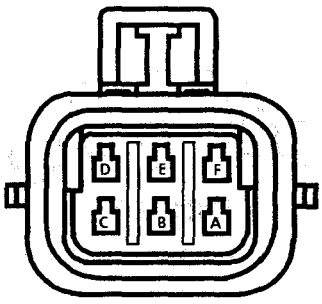
RETAINED ACCESSORY POWER (RAP) MODULE



12064769

10-WAY F METRI-PACK 150 SERIES
NAT

SOLENOID VALVE ASSEMBLY (AQ9)
PERFORMANCE SWITCH
PERFORMANCE/TRACTION CONTROL SWITCH



12052848

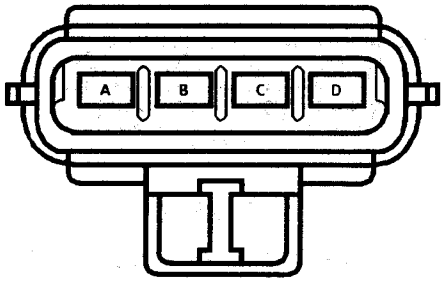
6-WAY F METRI-PACK 150 SERIES
BLK

SPEAKER/AMP, LEFT AND
RIGHT FRONT (CHEVY BOSE)
SPEAKER/AMP, REAR (CHEVY BOSE)
SEE C240

STEERING WHEEL CONTROLS, RADIO
SEE C217

THEFT DETERRENT RELAY
SEE FUEL PUMP RELAY

HARNESS CONNECTOR FACES

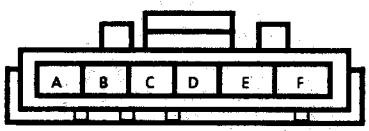


12129565

4-WAY F METRI-PACK 280 SERIES
GRY

TRACTION CONTROL MOTOR PACK

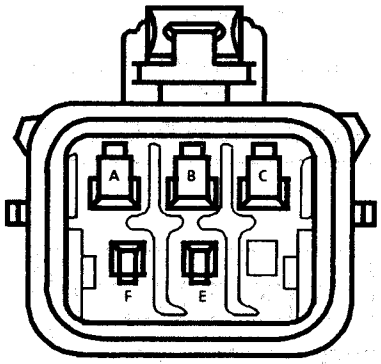
UNDERHOOD ELECTRICAL CENTER
REFER TO PAGE 8A-11-3



12015307

6-WAY F METRI-PACK MIXED SERIES
BLK

TRANSMISSION POSITION SWITCH



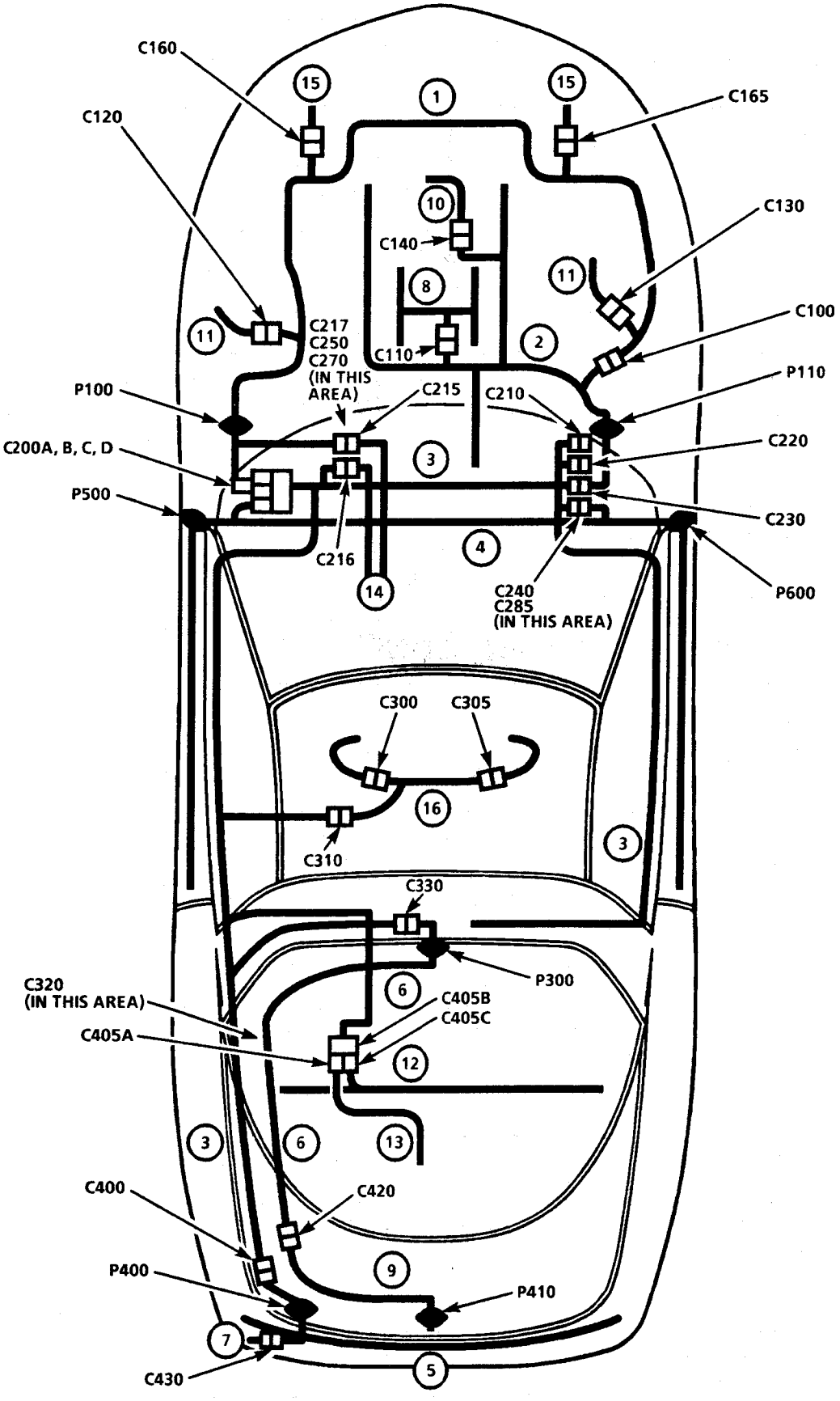
12129126

5-WAY F METRI-PACK MIXED SERIES
BLK

WIPER MOTOR ASSEMBLY

BLANK

HARNESS ROUTING VIEWS



HARNESS LEGEND			
1	Forward Lamp Harness	9	CHMSL Jumper Harness
2	Engine Harness	10	Distributor Jumper Harness (V8 VIN P)
3	I/P Harness	11	Wheel Speed Sensor Jumper Harness
4	Cross Car Harness	12	RR Wheel Speed Sensor Jumper Harness
5	Rear Body Harness	13	Fuel Tank Unit Pigtail
6	Hatch Harness	14	Steering Column Harness
7	RR Fascia Harness	15	Headlamp Jumper Harness (Pontiac only)
8	Injector Harness (V6 VIN S)	16	Seat Jumper Harness (with AQ9) or Driver Seat Harness (with AC3)

CONNECTOR LEGEND		PAGE	FIGURE	CONNECTOR
C100 (10 cavities)	Engine Harn to Forward Lamp Harn, behind LH wheelhouse attached to PCM Bracket	201-15	28	202-0
C110 (10 cavities) (V6 VIN S)	Engine Harn to Injector Harn, top center of Intake Manifold	201-12	22	202-1
C120 (2 cavities)	Forward Lamp Harn to Wheel Speed Sensor Jumper Harn, mounted to LH Frame Rail			
C130 (2 cavities)	Forward Lamp Harn to Wheel Speed Sensor Jumper Harn, mounted to RH Frame Rail			
C140 (4 cavities) (V8 VIN P)	Engine Harn to Distributor Jumper Harn, right side of Intake Plenum, attached to EVAP Solenoid Valve	201-26	50	202-19
C160 (3 cavities) (Pontiac)	Forward Lamp Harn to Headlamp Jumper Harn, behind LH Headlamp Door Bracket	201-23	43	
C165 (3 cavities) (Pontiac)	Forward Lamp Harn to Headlamp Jumper Harn, behind RH Headlamp Door Bracket	201-23	43	
C200A (17 cavities)	Forward Lamp Harn to I/P Harn, between LH kick panel and Steering Column	201-25	49	202-2
C200B (18 cavities)	Forward Lamp Harn to I/P Harn, between LH kick panel and Steering Column	201-25	49	202-2
C200C (13 cavities)	Cross Car Harn to I/P Harn, between LH kick panel and Steering Column	201-25	49	202-2
C200D (48 cavities)	I/P Harn side, between LH kick panel and Steering Column	201-25	49	202-2
C210 (4 cavities)	I/P Harn to Engine Harn, under RH side of I/P behind RH kick panel	201-20	37	202-19
C215 (11 cavities)	Forward Lamp Harn to Steering Column Harn, near base of Steering Column	201-35	64	202-4

(CONTINUED ON NEXT PAGE)

HARNESS ROUTING VIEWS

(CONTINUED FROM PREVIOUS PAGE)

CONNECTOR LEGEND		PAGE	FIGURE	CONNECTOR
C216 (11 cavities)	I/P Harn to Steering Column Harn, attached to base of Steering Column	201-34	63	202-5
C217 (4 cavities) (Pontiac)	I/P Harn to SIR Coil Assembly Harn, near base of Steering Column	201-34	63	202-19
C220 (10 cavities)	I/P Harn to Engine Harn, under RH side of I/P behind kick panel	201-20	37	202-6
C230 (10 cavities)	I/P Harn to Engine Harn, under RH side of I/P behind kick panel	201-20	37	202-7
C240 (6 cavities)	Cross Car Harn to I/P Harn, under RH side of I/P behind kick panel	201-20	37	202-19
C250 (2 cavities)	Forward Lamp Harn to Clutch Jumper Harn, near Brake/Clutch Pedal Bracket	201-1	2	
C270 (2 cavities)	I/P Harn to Clutch Jumper Harn, near Brake/Clutch Pedal Bracket	201-1	2	
C285 (1 cavity) (Chevy AU0 and U82)	Cross Car Harn to I/P Harn, under RH side of I/P behind kick panel	201-20	37	
C300 (6 cavities) (Pontiac AQ9)	Seat Jumper Harn to Driver Seat Harn, under Driver Seat Assembly	201-47	86	202-19
C305 (6 cavities) (Pontiac AQ9)	Seat Jumper Harn to Passenger Seat Harn, under Passenger Seat Assembly	201-46	85	202-19
C310 (2 cavities) (with AC3 or AQ9)	I/P Harn to Driver Seat Harn (with AC3) or Seat Jumper Harn (with AQ9), between rear mounting bolts of driver seat	201-6	11	
C320 (1 cavity) (Convertible)	I/P Harness to Convertible Rear Defogger Jumper, under left Interior Garnish Molding above left rear wheelhouse			
C330 (3 cavities)	I/P Harn to Hatch Harn, center of roof near Dome Lamp (Coupe only)	201-4	6	
C400 (6 cavities)	I/P Harn to Rear Body Harn, LH rear Cargo Compartment	201-30	57	202-19
C405A (4 cavities)	Fuel Tank Unit Pigtail to I/P Harn, part of Pass Thru Connector forward of rear axle	201-5	9	202-8
C405B (10 cavities)	I/P Harn side, part of Pass Thru Connector forward of rear axle	201-5	9	202-8
C405C (4 cavities)	Rear Wheel Speed Sensor Jumper Harn to I/P Harn, part of Pass Thru Connector forward of rear axle	201-5	9	202-8
C420 (2 cavities)	Hatch Harn to CHMSL Jumper Harn, LH side of hatch between hatch frame and plastic panel (Coupe) or I/P Harn to CHMSL Jumper Harn, located on LH underside of Deck Lid (Convertible).	201-4	7	
C430 (2 cavities)	Rear Body Harn to Rear Fascia Harn, between rear fascia and rear end panel on LH side	201-32, 201-33	61, 62	

BLANK

A

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