# SECTION 6E
# DRIVEABILITY AND EMISSIONS GENERAL INFORMATION

**CAUTION: This vehicle is equipped with a 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 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 values must be used when installing fasteners that require them. If the above procedures are not followed, parts or system damage could result.

**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.**

## CONTENTS



## DRIVEABILITY AND EMISSIONS CONTROL

The computer command control system, which is controlled by the Engine Control Module (ECM), is designed to maintain exhaust emission levels at federal standards while providing good driveability and fuel efficiency. The functions of the system are based on data gathered by sensors and switches located throughout the vehicle.

The ECM maintains control over fuel delivery, ignition, idle air flow, the fuel pump and other system components, while monitoring the system for faulty operation with its diagnostic capabilities (Figure 1).

It is important to review the component sections and wiring diagrams in SECTION 6E2 to determine which systems are controlled by the ECM.

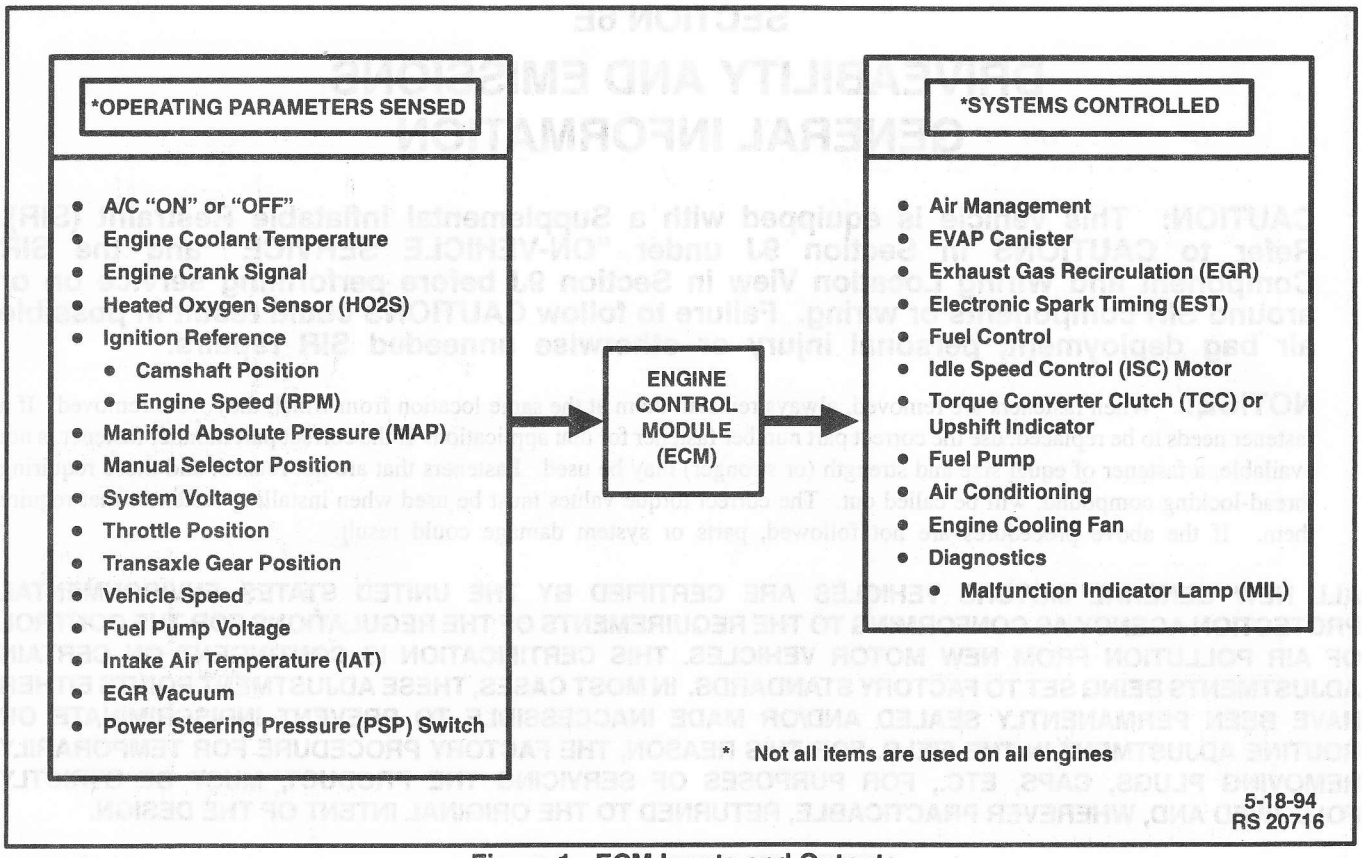



**Figure 1 - ECM Inputs and Outputs**

## EMISSIONS CONTROL INFORMATION LABEL

The underhood "Vehicle Emission 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 component 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 Organization (GMSPO).

## MAINTENANCE SCHEDULE

Refer to SECTION 0B for the maintenance service that should be performed to retain emission control performance.

## BLOCKING DRIVE WHEELS

The vehicle drive wheels always should be blocked and parking brake firmly set while checking the electronic engine control system, unless specified otherwise.

## WHAT THIS SECTION CONTAINS

SECTION 6E has been developed to describe the function and operation of the electronic engine control system that controls the driveability and emissions of the vehicle. Emphasis is placed on the diagnosis and repair of malfunctions related to the system.

This section also provides general diagnostic procedures, Tech 1 scan tool diagnostic computer use, wiring and terminal repair procedures and descriptions of special tools. It then leads into SECTION 6E2, which deals with engine control systems using throttle body injection for fuel delivery.

SECTION 6E2 is divided into three major subsections dealing with diagnosis and repair. They can be summarized as follows:

### SECTION A: ENGINE COMPONENTS/WIRING DIAGRAMS/DIAGNOSTIC CHARTS

- Component Locations
- Wiring Diagrams
- ECM Terminal End View and Terminal Definitions
- On-Board Diagnostic (OBD) System Check This must be the first step of any diagnostic procedure.
- Typical Tech 1 Data and Definitions

**VEHICLE EMISSION CONTROL INFORMATION**
**SUZUKI MOTOR CORPORATION**

| | |
|---|---|
| ENGINE FAMILY: | PSK1.0V5FFC4 |
| ENGINE DISPLACEMENT: | 1.0 LITER |
| EVAPORATIVE FAMILY: | EVV-A |
| EXHAUST EMISSION CONTROL SYSTEM: | TBI+TWC+O2S |

ENGINE TUNE UP SPECIFICATIONS AND ADJUSTMENTS:
*AT NORMAL OPERATING TEMPERATURE
*LIGHTS, HEATER BLOWER AND AIR CONDITIONER OFF
*TRANSMISSION IN NEUTRAL

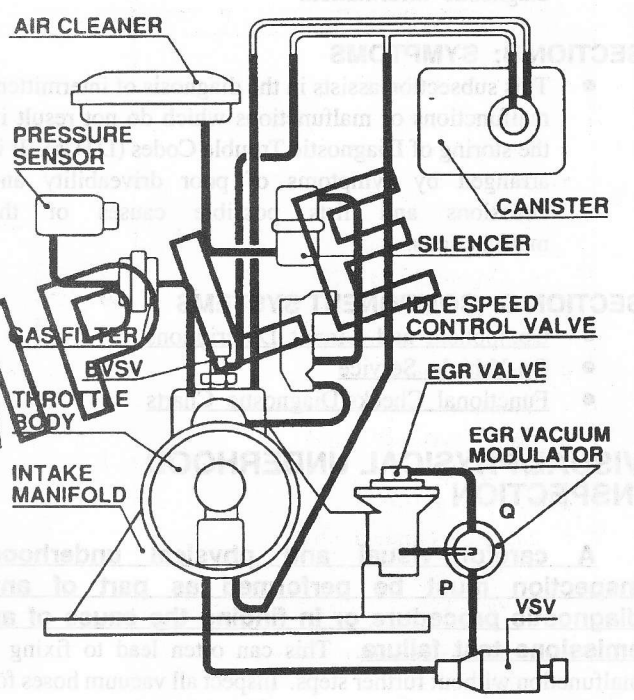
| | |
|---|---|
| IDLE SPEED | 850 RPM(N) |
| IGNITION TIMING | 5° BTDC WITH THE CHECK CONNECTOR SHORT CIRCUITED AT DLC |
| IDLE MIXTURE SETTING | IDLE MIXTURE SCREWS PRESET AND SEALED AT FACTORY. ADJUSTMENT DURING TUNE-UP IS NOT RECOMMENDED. |
| SPARK PLUG GAP | 0.039 IN. |

THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO 1995 MODEL YEAR NEW PASSENGER CARS. HOWEVER, IF THIS VEHICLE IS BUILT FOR USE IN CANADA, IT DOES NOT COMPLY WITH U.S. EPA FUEL LABELING REGULATIONS.

**CATALYST**

11955-67E20






VACUUM HOSE ROUTING

10V5FFCA

**ENGINE FAMILY**

S SK 1.0 V 5 FF C 4

- S = CERT YEAR S = 1995
- SK = DIVISION SK = SUZUKI
- 1.0 = DISPLACEMENT 1.0L
- V = VEHICLE CLASS AND STANDARDS: V = Gasoline Vehicle; W = Calif. Std. Gasoline Vehicle; T = Gasoline Truck; X = Calif. Std. Gasoline Truck; K = Diesel Truck
- 5 = FUEL METERING: 3 = PFI and TBI; 4 = 4 bbl; 5 = TBI; 7 = MFI; 8 = PFI; 9 = PFI Turbo
- FF = CATALYST DESIGNATOR
- C = ENGINE FAMILY SUFFIX CODE (Describes Emission System)
- 4 = CHECK SUM DIGIT

5-12-94
RS 20717

Figure 2 - Vehicle Emission Control Information Label

- Diagnostic Trouble Code Charts These charts are designed with facing pages containing circuit diagrams, circuit operation information, and helpful diagnostic information.

**SECTION B: SYMPTOMS**

- This subsection assists in the diagnosis of intermittent malfunctions or malfunctions which do not result in the storing of Diagnostic Trouble Codes (DTCs). It is arranged by symptoms of poor driveability and emissions and lists possible causes of the malfunctions.

**SECTION C: COMPONENT SYSTEMS**

- Component and Circuit Descriptions
- On-Vehicle Service
- Functional Checks/Diagnostic Charts

## 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 malfunction 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 this manual most effectively, a general understanding of basic electrical circuits and circuit testing tools is required. The technician 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 tachometer, test light, high-impedance (at least 10 megohms) digital multimeter, vacuum gage and jumper wires are also required. Please become acquainted with the tools and their uses before attempting to diagnose a driveability malfunction. Special tools which are required for system service and the ones described above are illustrated at the end of this section.

## Electrostatic Discharge Damage

Electronic components used in control systems are often designed to carry very low voltage, and are very susceptible to damage caused by electrostatic discharge. It is possible for less than 100 volts of static electricity to cause damage to some electronic components. By comparison, it takes as much as 4,000 volts for a person to even feel the zap of a static discharge.

There are several ways for a person to become statically charged. The most common methods of charging are by friction and by induction. An example of charging by friction is a person sliding across a car seat, in which a charge of as much as 25,000 volts can build up. Charging by induction occurs when a person with well insulated shoes stands near a highly charged object and momentarily touches ground. Charges of the same polarity are drained off, leaving the person highly charged with the opposite polarity. Static charges of either type can cause damage; therefore, it is important to use care when handling and testing electronic components.

**NOTICE:** To prevent possible electrostatic discharge damage:

- Always touch a known good ground before handling an Engine Control Module (ECM).
- Do Not touch the ECM connector pins or soldered components on the ECM circuit board.

## DIAGNOSTIC INFORMATION

The diagnostic charts and functional checks in this manual 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.

The Engine Control Module (ECM) performs a continual self-diagnosis on certain control functions. This diagnostic capability is complemented by the diagnostic procedures contained in this manual. The ECM's language for communicating the source of a malfunction is a system of Diagnostic Trouble Codes (DTCs). The DTCs are two digit numbers that range from 12 to 51. When a malfunction is detected by the ECM, a DTC is set and the Malfunction Indicator Lamp (MIL) is illuminated.

## Malfunction Indicator Lamp (MIL)

This indicator is in the instrument panel cluster assembly and has the following functions:

- It informs the driver that a malfunction has occurred and that the vehicle should be taken for service as soon as reasonably possible.
- It displays Diagnostic Trouble Codes (DTCs) stored by the Engine Control Module (ECM) which help the technician diagnose system malfunctions.

As a bulb and system check, the Malfunction Indicator Lamp (MIL) should be lit with the ignition switch in the "ON" position (engine not running). When the engine is started, the MIL will go out. If the MIL remains lit, the self-diagnostic system has detected a malfunction. If the malfunction goes away, the MIL will go out immediately but a corresponding DTC will be stored in the memory of the ECM. DTC 41 (Ignition Signal Circuit), however, is an exception to this statement and is not stored in ECM memory. Any memory of DTC 41 is erased as soon as the ignition switch is turned to the "LOCK" position. In order to detect an active DTC 41, the engine must be cranked for 3 seconds and the Tech 1 scan tool diagnostic computer connected with the ignition switch left in "ON." If the ignition switch is turned to "LOCK" at any time during this procedure, a present DTC 41 will be lost. For further DTC retrieval information, refer to "Reading Diagnostic Trouble Codes (DTCs)" later in this section.

When the MIL remains lit while the engine is running, or when a malfunction is suspected due to a driveability or emissions malfunction, the **"On-Board Diagnostic (OBD) System Check" must be performed.** The procedure for this check is given in "Engine Components/Wiring Diagrams/Diagnostic Charts" in SECTION 6E2-A1 1.0L (VIN 6) or 6E2-A2 1.3L (VIN 9). This check will expose malfunctions which may not be detected if other diagnostics are performed prematurely.

## Intermittent Malfunction Indicator Lamp (MIL)

In the case of an "intermittent" malfunction, the Malfunction Indicator Lamp (MIL) will remain lit as long as the trouble exists and will go out when the system returns to normal, **except in the case of Exhaust Gas Recirculation (EGR) intermittents.** EGR intermittents will cause the MIL to remain lit until the ignition switch is turned to "LOCK."

Even though the MIL goes out, the corresponding Diagnostic Trouble Code (DTC) will be stored in the memory of the Engine Control Module (ECM) unless system voltage is removed for 60 seconds or longer. DTC 41 (Ignition Signal Circuit), however, is an exception to this statement and is not stored in the memory of the ECM. For retrieval of an active DTC 41, refer to "Malfunction Indicator Lamp (MIL)" earlier in this section.

When unexpected DTCs appear during the DTC reading process, the assumption can be made that these DTCs were set by an intermittent malfunction and could be helpful in diagnosing the system.

An intermittent DTC may or may not reset. If it is an intermittent malfunction, a Diagnostic Trouble Code Chart is not used. Consult the "Diagnostic Aids" on the page facing the diagnostic chart corresponding to the intermittent DTC. The topic of "Intermittents" is also covered in "Symptoms" in SECTION 6E2-B. A physical inspection of the applicable subsystem most often will resolve the malfunction.

## Reading Diagnostic Trouble Codes (DTCs)

The provisions for communicating with the Engine Control Module (ECM) are the Data Link Connector (DLC), the DIAG SW connector in the junction block and the diagnostic request terminal in the Duty Check DLC (Figures 3 and 4). The DLC is located under the instrument panel to the left of the steering column and is initially used at the assembly plant for determining powerplant system integrity prior to vehicle shipment. The junction block is also located under the instrument panel to the left of the steering column. The Duty Check DLC is located in the left rear engine compartment near the strut tower. Diagnostic Trouble Codes (DTCs) stored in ECM memory can be read either through the Tech 1 scan tool diagnostic computer (a hand-held diagnostic scanner) plugged into the DLC or by counting the flashes of the Malfunction Indicator Lamp (MIL) (or a test light) after grounding either the DIAG SW connector in the junction block or the diagnostic request terminal in the Duty Check DLC. When either terminal is grounded, the ECM enters its diagnostic mode and outputs DTCs to either the MIL or, if a test light is used, to the diagnostic output terminal of the Duty Check DLC.

To ground the DIAG SW connector in the junction block, simply remove the spare fuse from the junction block and insert it into the DIAG SW connector. Then, turn the ignition switch to "ON" and observe the MIL. To ground the diagnostic request terminal in the Duty Check DLC, connect a jumper between Duty Check DLC cavities "2" and "4". At this point, the MIL should flash DTC 12 continuously. This would be the following flash sequence: "flash, pause, flash-flash, long pause, flash, pause, flash-flash, long pause, flash, pause, flash-flash," etc. DTC 12 indicates that the ECM's diagnostic system is operating. If DTC 12 is not indicated, a malfunction is present within the diagnostic system itself, which should be addressed by consulting "Engine Components/Wiring Diagrams/Diagnostic Charts" in SECTION 6E2-A1 1.0L (VIN 6) or 6E2-A2 1.3L (VIN 9).

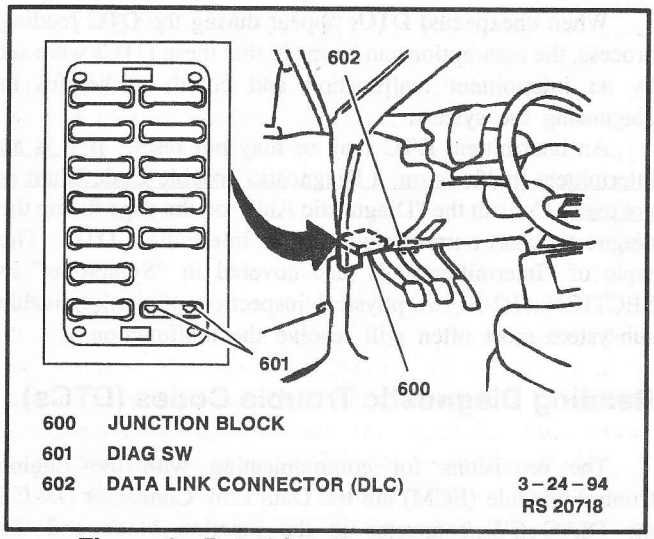



**Figure 3 - Data Link Connector (DLC) and Junction Block**

If any DTCs exist indicating a malfunction (DTCs other than DTC 12), those DTCs will flash instead of a DTC 12. If more than one DTC is stored in the ECM's memory, the DTCs will be repeatedly output from the lowest to the highest, with each DTC being displayed three times.

## Clearing Diagnostic Trouble Codes (DTCs)

To clear the Diagnostic Trouble Codes (DTCs) from the memory of the Engine Control Module (ECM), either to determine if the malfunction will occur again or because repair has been completed, the ECM power feed must be disconnected for at least 60 seconds. To remove power from the ECM, remove the 15A TAIL fuse located in the junction block. If working under the hood, the 40A LAMP fuse in the fuse box on the left front fender apron can be removed to disconnect power to the ECM. Removal of the 40A LAMP fuse will erase memory in the clock and/or radio, so use of the 15A TAIL fuse for this purpose is preferred.

**NOTICE:** To prevent ECM damage, the ignition switch must be in the "LOCK" position when disconnecting or reconnecting ECM power. When using a Tech 1 scan tool to retrieve diagnostic data, clearing the DTCs can be done through the Tech 1 scan tool without removing power to the ECM.

## Diagnostic Mode

When the diagnostic terminal in either the Duty Check Data Link Connector (DLC) or in the junction block is grounded with the ignition switch in the "ON" position (engine not running), the system enters what is called the diagnostic mode. In this mode, the Engine Control Module (ECM) will perform the following functions:

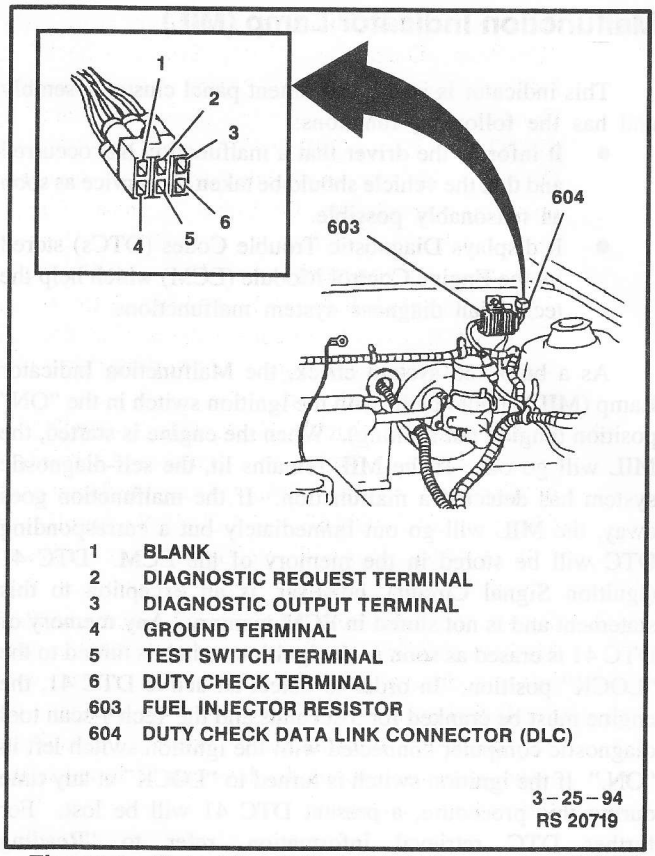



**Figure 4 - Duty Check Data Link Connector (DLC)**

1. Display Diagnostic Trouble Code (DTC) 12 by flashing the Malfunction Indicator Lamp (MIL) (indicating the system is operating correctly).
2. Display any stored DTCs by flashing the MIL. If DTCs other than DTC 12 are stored, DTC 12 will not be flashed.
3. Output idle speed control duty through the duty check terminal of the Duty Check DLC.

## Field Service Mode

If the test switch terminal is grounded, the Engine Control Module (ECM) sets ignition timing to its initial (non-corrected) setting. The test switch terminal is located in the Duty Check Data Link Connector (DLC).

If both the diagnostic terminal in either the junction block or Duty Check DLC and the test switch terminal are grounded simultaneously, the ECM outputs the air/fuel duty through the duty check terminal of the Duty Check DLC.

## ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

The correct method for diagnosing malfunctions is to follow these three basic steps:

1. Are the on-vehicle diagnostics working? This is determined by performing the "On-Board Diagnostic (OBD) System Check." Since this is the starting point for diagnostic procedures or for finding the cause of

an emissions test failure, always begin here. The "On-Board Diagnostic (OBD) System Check" is located at the beginning of "Engine Components/Wiring Diagrams/ Diagnosis Charts" in SECTION 6E2-A1 1.0L (VIN 6) or 6E2-A2 1.3L (VIN 9). If the on-vehicle diagnostics are not operating properly, the "On-Board Diagnostic (OBD) System Check" will lead to a diagnostic chart in "Engine Components/Wiring Diagrams/Diagnosis Charts" in SECTION 6E2-A1 1.0L (VIN 6) or 6E2-A2 1.3L (VIN 9) to correct the malfunction. If the on-vehicle diagnostics are working properly, proceed to the next step.

2. Is a Diagnostic Trouble Code (DTC) stored? If a DTC is stored, go directly to the numbered DTC chart in "Engine Components/Wiring Diagrams/Diagnostic Charts" in SECTION 6E2-A1 1.0L(VIN 6) or 6E2-A2 1.3L (VIN 9). This will determine if the fault is still present. If no DTC is stored, proceed to the next step.
3. Scan serial data transmitted by the Engine Control Module (ECM). This involves reading the information available on the serial data stream with the Tech 1 scan tool or one of the tools available for that purpose. Information on these tools and the meaning of the various displays can be found in the succeeding paragraphs.

## DATA LINK CONNECTOR (DLC) SCAN TOOLS

The Engine Control Module (ECM) can communicate a variety of information through the Data Link Connector (DLC). This data is transmitted at a high frequency which requires a Tech 1 diagnostic computer or 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 a 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 charts unnecessary, nor can they indicate exactly where a malfunction is in a particular circuit. Diagnostic charts incorporate procedures using a Tech 1 when it is applicable.

**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.**

## SCAN TOOL USE WITH INTERMITTENTS

In some scan tool applications, the data update rate makes the tool less effective than a digital multimeter - such as when trying to detect an intermittent malfunction which lasts a very short time. However, the Tech 1 does allow manipulation of wiring harnesses under the hood (engine not running) while observing readouts.

The Tech 1 or scan tool can also be plugged in and observed while driving the vehicle under the condition when the Malfunction Indicator Lamp (MIL) comes on momentarily or when engine driveability is momentarily poor. If the malfunction 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 malfunction 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 (DTC). Comparing the sensor's readings with those of a known good one may uncover the malfunction.

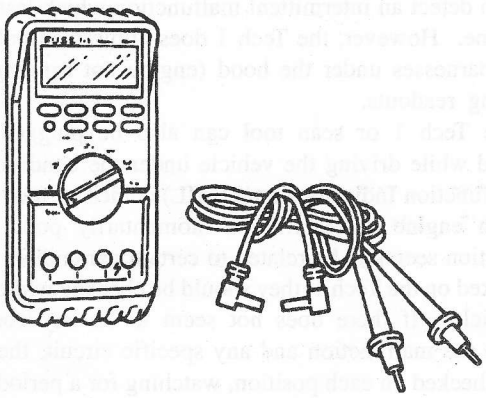
The Tech 1 has the ability to save time in diagnosis and prevent the replacement of good parts. The key to using the Tech 1 successfully in diagnosis lies in the technician's ability to understand the system he is trying to diagnose as well as an understanding of the Tech 1 operation and limitations.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

## WIRING HARNESS SERVICE

Wiring harnesses should be replaced with proper part number harnesses. Use J 38125-A Terminal Repair Kit when making repairs to a wire or connectors. When signal wires are spliced into a harness, use wire with high temperature insulation only. Refer to SECTION 8A-5 for wiring harness and connector repair instruction.

## TOOLS NEEDED TO SERVICE THE SYSTEM

For thorough diagnosis, the system requires a Tech 1 diagnostic computer or equivalent scan tool, a tachometer, a test light, a high-impedance digital multimeter (J 39200 or equivalent), a vacuum gage and some fused jumper wires. A test light or digital multimeter must be used when specified in the diagnosis procedures. For more information on the tools necessary for diagnostics, refer to "Special Tools" later in this section and to the individual tool manufacturer's instructions.



J 39200

**DIGITAL MULTIMETER**

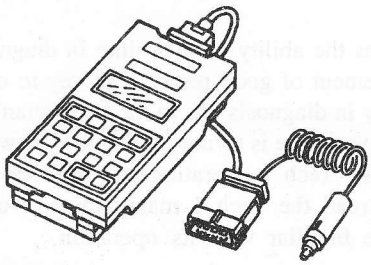
**Voltmeter** - Voltage position measures magnitude of voltage when connected in parallel to an existing circuit. A digital voltmeter with a 10 megohm input impedance is used because this type of meter will not load down the circuit and result in faulty readings. Some circuits require accurate low voltage readings because they have a very high resistance. Refer to meter instructions for more information.

**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.

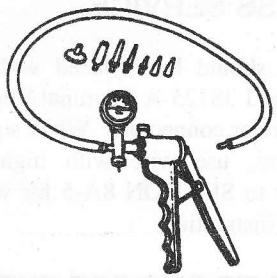
- Selector must be set to proper range. Refer to meter instructions for more information.



TK00000

**TECH 1 DIAGNOSTIC COMPUTER**

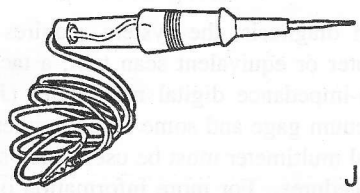
A hand-held scan tool used to analyze and diagnose fuel and emission system. Also can be used to analyze other systems.



J 23738-A

**PLASTIC MITY-VAC® HAND VACUUM PUMP**

Use the gage to monitor manifold engine vacuum and use the hand pump to check vacuum sensors, solenoids and valves.



J 34142-B

**UNPOWERED TEST LIGHT**

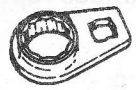
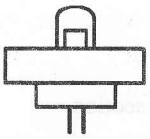
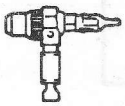
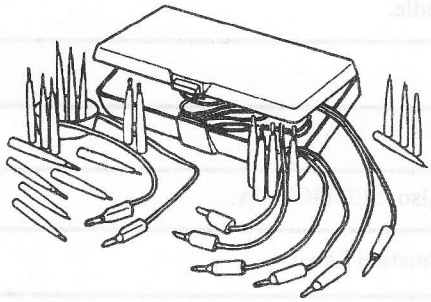
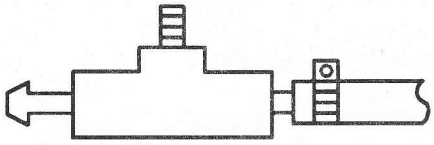
Used for checking wiring for complete circuit, short to ground or voltage.

**TACHOMETER**

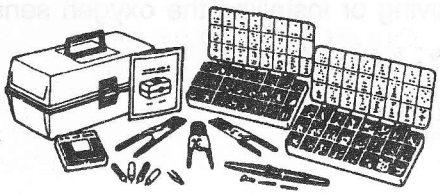
Must have inductive trigger signal pickup.

5-11-94
RS 20720

Special Tools 1

| | |
|---|---|
|  J 29533-A | **OXYGEN SENSOR WRENCH**<br>Used for removing or installing the oxygen sensor (O2S). |
|  J 34730-2B | **INJECTOR TEST LIGHT**<br>Used for checking the electrical circuit to a TBI fuel injector.<br>Part of Diagnostic Kit/J 34730-B |
|  J 26792 | **H. E. I. SPARK TESTER**<br>Used for checking the secondary ignition coil voltage. |
|  J 35616 | **CONNECTOR TEST ADAPTER KIT**<br>Used for making electrical test connections in current Weather Pack, Metri-Pack and Micro-Pack style terminals. |
|  J 34730-1 | **FUEL PRESSURE GAGE**<br>Used to check and monitor fuel pressure.<br>Part of Diagnostic Kit/J 34730-B |
|  J 34730-75 | **FUEL RAIL ADAPTER**<br>Used to adapt J 34730-1 fuel pressure gage to Metro TBI fuel system.<br>5-3-94<br>RS 20721 |

Special Tools 2



J 38125-A

**TERMINAL REPAIR KIT**
Used for making wiring harness repairs.

5-6-94
RS 20722

**Special Tools 3**

## GENERAL SPECIFICATIONS

Listed on the chart below are locations of specifications used in this section.

| SPECIFICATION | LOCATION OF INFORMATION |
|---|---|
| Engine Timing | Vehicle Emission Control Information Label. |
| Idle Speed, ECM Controlled | Not adjustable. ECM controls idle. |
| Spark Plug Type | SECTION 0B. |
| Spark Plug Gap | SECTION 0B. |
| Engine Code | Eighth digit of VIN number. Also SECTION 0A. |
| Engine Family | Vehicle Emission Control Information Label. |
| Filter Part Numbers | SECTION 0B. |
| Part Numbers of Major Components | GMSPO Parts Book. |
| Replacement of Vehicle Emission Control Information Label | GMSPO Parts Book. |

# SECTION 6E2

# DRIVEABILITY AND EMISSIONS FUEL INJECTION (TBI)

## THIS SECTION APPLIES TO:

## 1.0L (VIN 6) & 1.3L (VIN 9) "M" CARLINE (TBI)

**CAUTION: This vehicle is equipped with a 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 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 values must be used when installing fasteners that require them. If the above procedures are not followed, parts or system damage could result.

# CONTENTS

## 1.0L (VIN 6) & 1.3L (VIN 9)

**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 engines which have a fuel injector mounted above a throttle body assembly. The entire assembly is mounted to the intake manifold and is referred to as "Throttle Body Fuel Injection (TBI)" unit.

The 1995 Metro utilizes two types of engines; a 1.0L (VIN 6) three cylinder and a 1.3L (VIN 9) four cylinder. These engines are divided into two sections: 6E2-A1 is for the 1.0L (VIN 6) three cylinder and 6E2-A2 is for the 1.3L (VIN 9) four cylinder. Both of these systems are similar and much of the information in these sections are the same.

These engines have controls to reduce exhaust emissions, while maintaining good driveability and fuel economy.

An Engine Control Module (ECM) 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 SECTION 6E2-C.

The ECM has the ability to do some diagnosis of itself, and of other parts of the system. When it finds a problem, it lights a Malfunction Indicator Lamp (MIL) in the instrument panel cluster and a Diagnostic Trouble Code (DTC) will be stored in the ECM memory. This does not mean that the engine should be stopped right away, but that the cause of the MIL 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 diagnosing 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 diagnosis procedures using a Data Link Connector (DLC) scan 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 the scan tool 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 scan tool's limitations. See SECTION 6E for more information.**

## SECTION A1

# ENGINE COMPONENTS/WIRING DIAGRAMS/ DIAGNOSTIC CHARTS 1.0L (VIN 6)

## BASIC PROCEDURE

If the basic information on using the diagnostic procedures contained in this section has not been reviewed, refer to the "Introduction" of this section.

## ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

The "On-Board Diagnostic (OBD) System Check" verifies that the engine control system is functioning correctly. Special considerations to observe while performing the "On-Board Diagnostic (OBD) System Check" are:

### Blocking Drive Wheels

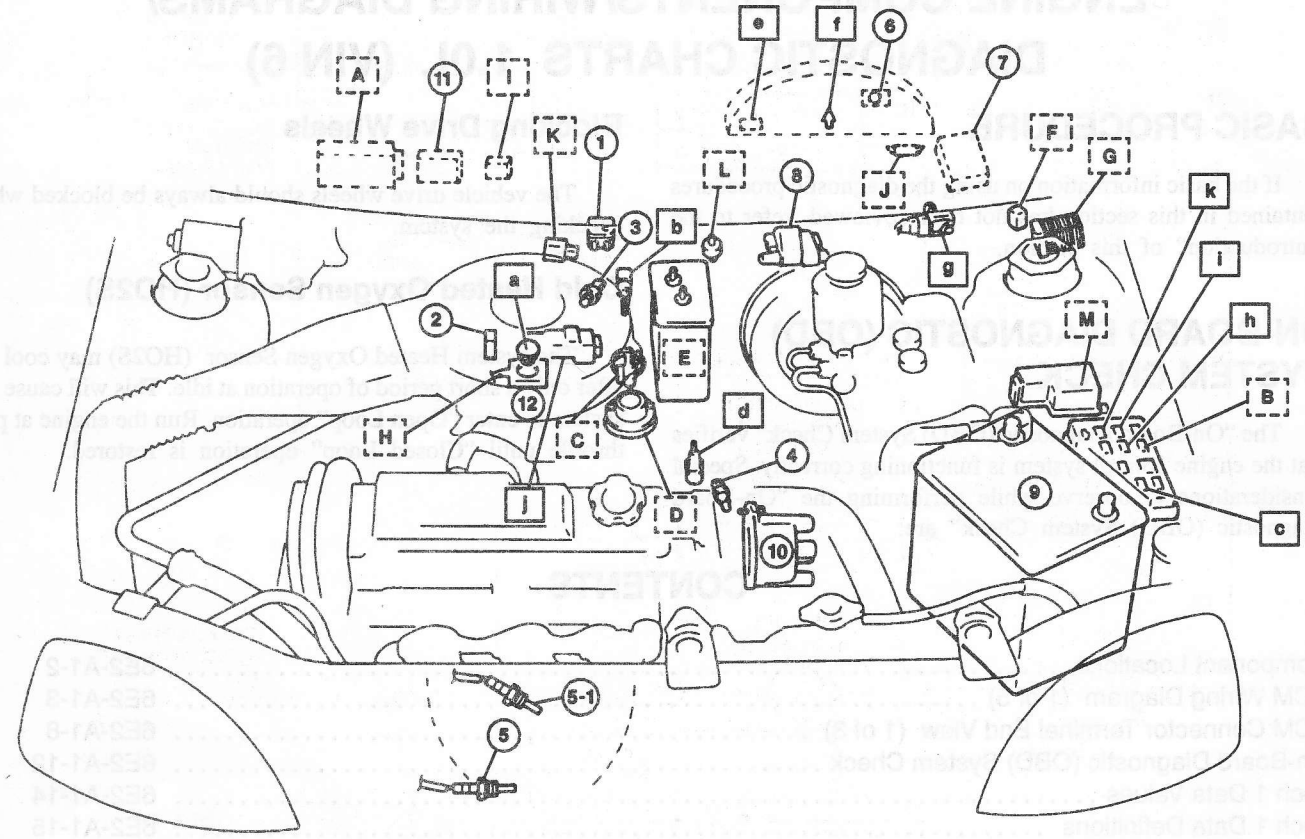
The vehicle drive wheels should always be blocked while checking the system.

### Cold Heated Oxygen Sensor (HO2S)

The system Heated Oxygen Sensor (HO2S) may cool off after only a short period of operation at idle. This will cause the system to enter "Open Loop" operation. Run the engine at part throttle until "Closed Loop" operation is restored.

## CONTENTS

## 1.0L (VIN 6) "M" CARLINE




### ○ INFORMATION SENSORS

1 Manifold Absolute Pressure (MAP) sensor
2 Throttle Position (TP) sensor
3 Intake Air Temperature (IAT) sensor
4 Engine Coolant Temperature (ECT) sensor
5 Heated Oxygen Sensor (HO2S) (for vehicle without warm up three way converter) (WU-TWC)
5-1 Heated Oxygen Sensor (HO2S) (For vehicle with warm up three way converter) (WU-TWC)
6 Vehicle Speed Sensor (VSS)
7 Junction Block (diagnostic switch terminal)
8 Ignition coil
9 Battery
10 Distributor (CMP sensor)
11 A/C amplifier (If equipped)
12 Idle switch (In idle speed control motor)

### □ CONTROLLED DEVICES

a Fuel injector
b Evaporative Emission Canister Purge valve
c Fuel pump relay
d Exhaust Gas Recirculation Solenoid Vacuum (EGR SV) valve
e Malfunction Indicator Lamp (MIL)
f Upshift Indicator (manual)
g Igniter
h Positive Temperature Coefficient (PTC) heater relay
i Idle Speed Control (ISC) motor relay
j Idle Speed Control (ISC) motor
k Radiator fan control relay

### ⬚ RELATED COMPONENTS

A Engine Control Module (ECM)
B Main relay
C Exhaust Gas Recirculation (EGR) valve
D Exhaust Gas Recirculation (EGR) pressure transducer
E Evaporative Emission (EVAP) canister
F Duty Check Data Link Connector (DLC)
G Fuel injector resistor
H Early Fuel Evaporation (EFE) heater
I Electric load diode
J Data Link Connector (DLC)
K Noise suppressor filter
L Tank pressure control valve
M Fuse box

11-23-94
RS 20731

Figure A1-1 - Component Locations 1.0L (VIN 6)

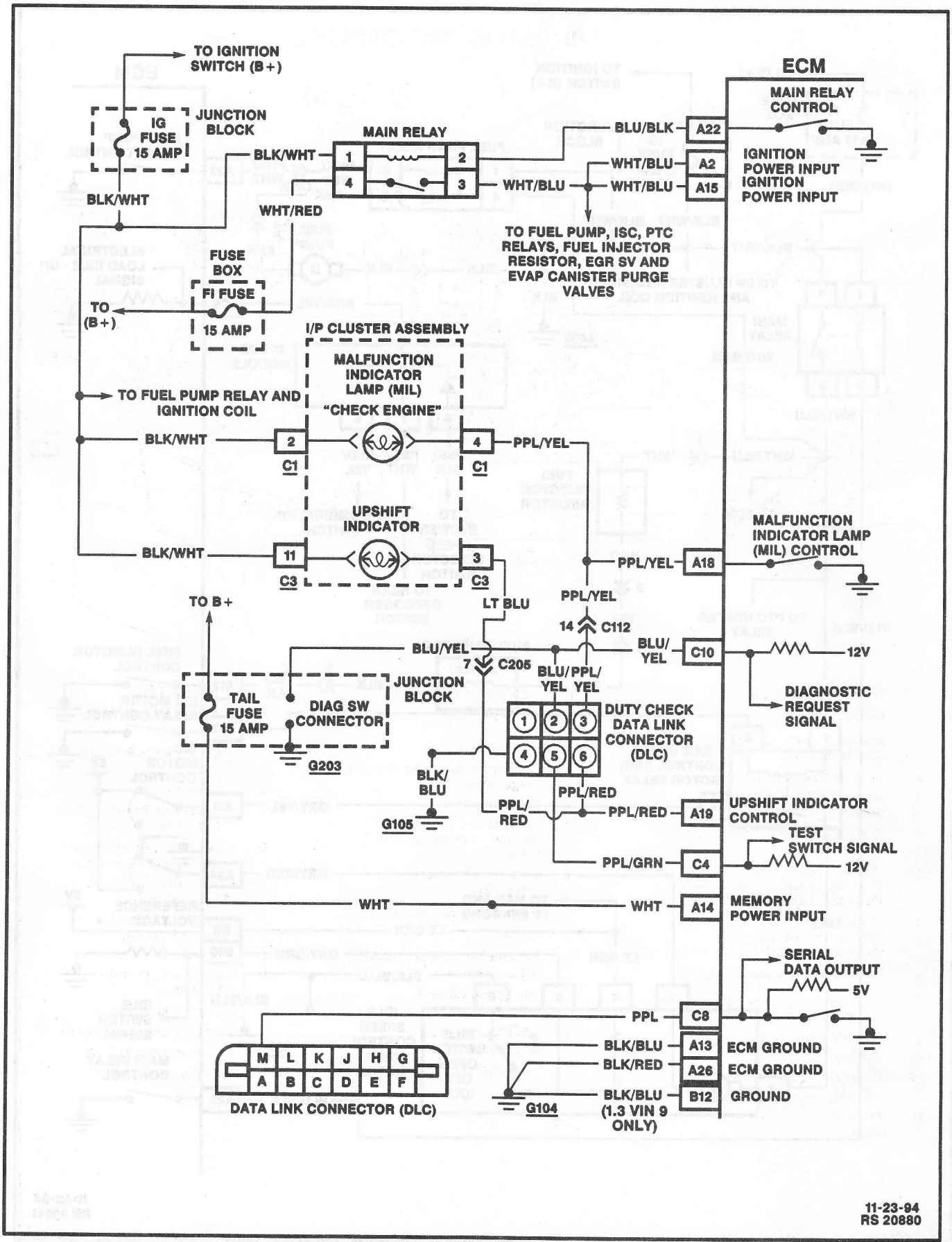



Figure A1-2 - ECM Wiring Diagram 1.0L (VIN 6) (1 of 5)

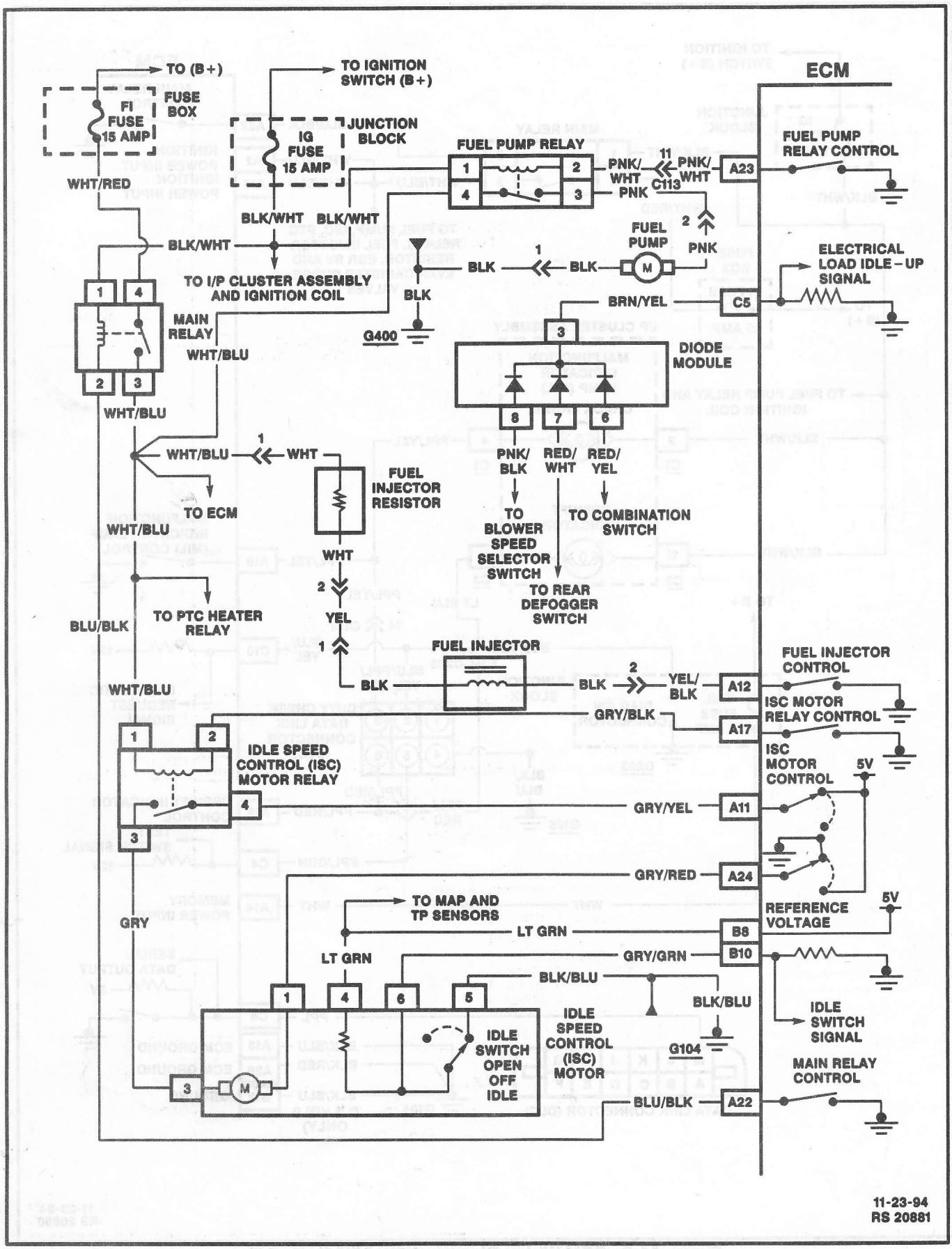



Figure A1-3 - ECM Wiring Diagram 1.0L (VIN 6) (2 of 5)

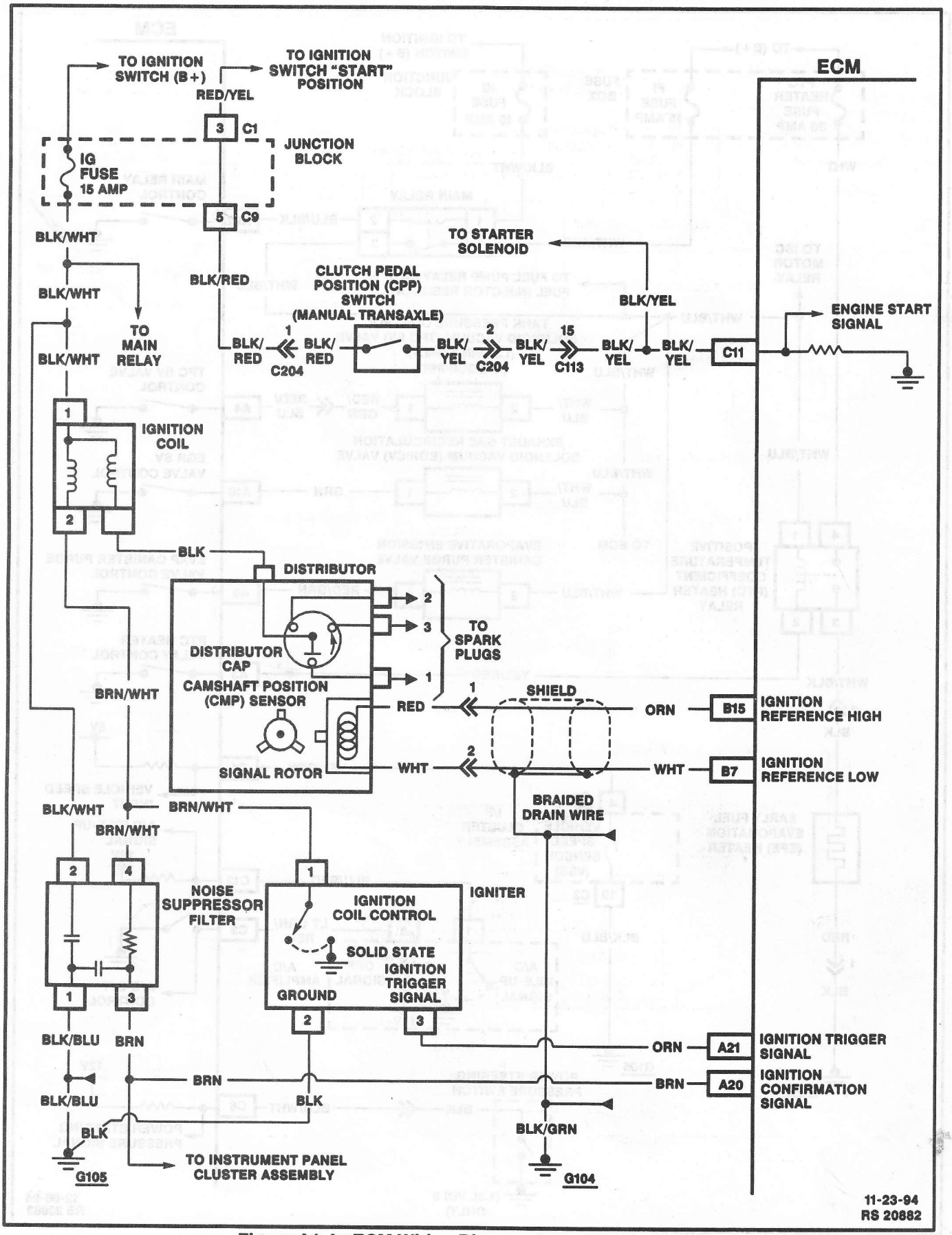



Figure A1-4 - ECM Wiring Diagram 1.0L (VIN 6) (3 of 5)

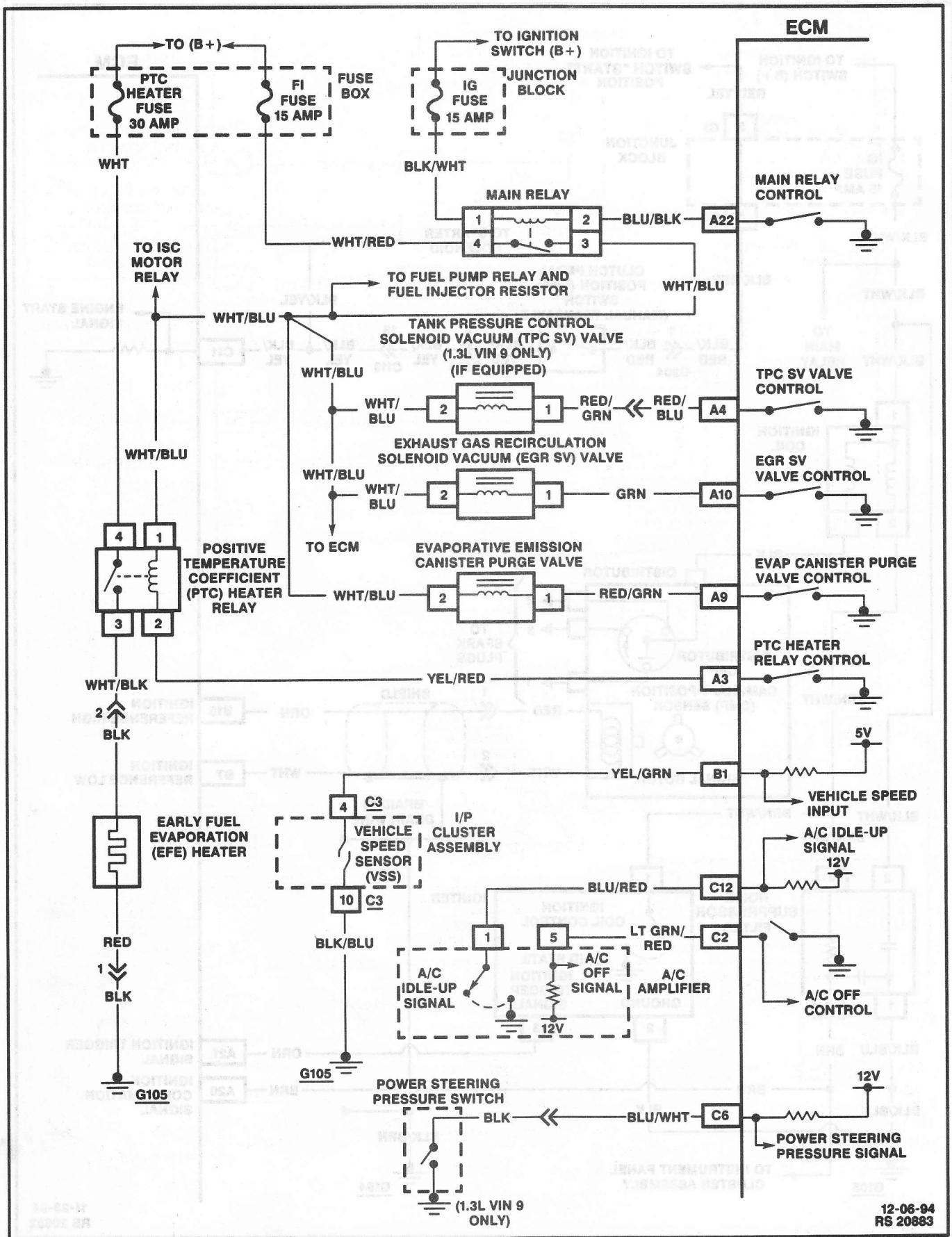



Figure A1-5 - ECM Wiring Diagram 1.0L (VIN 6) (4 of 5)

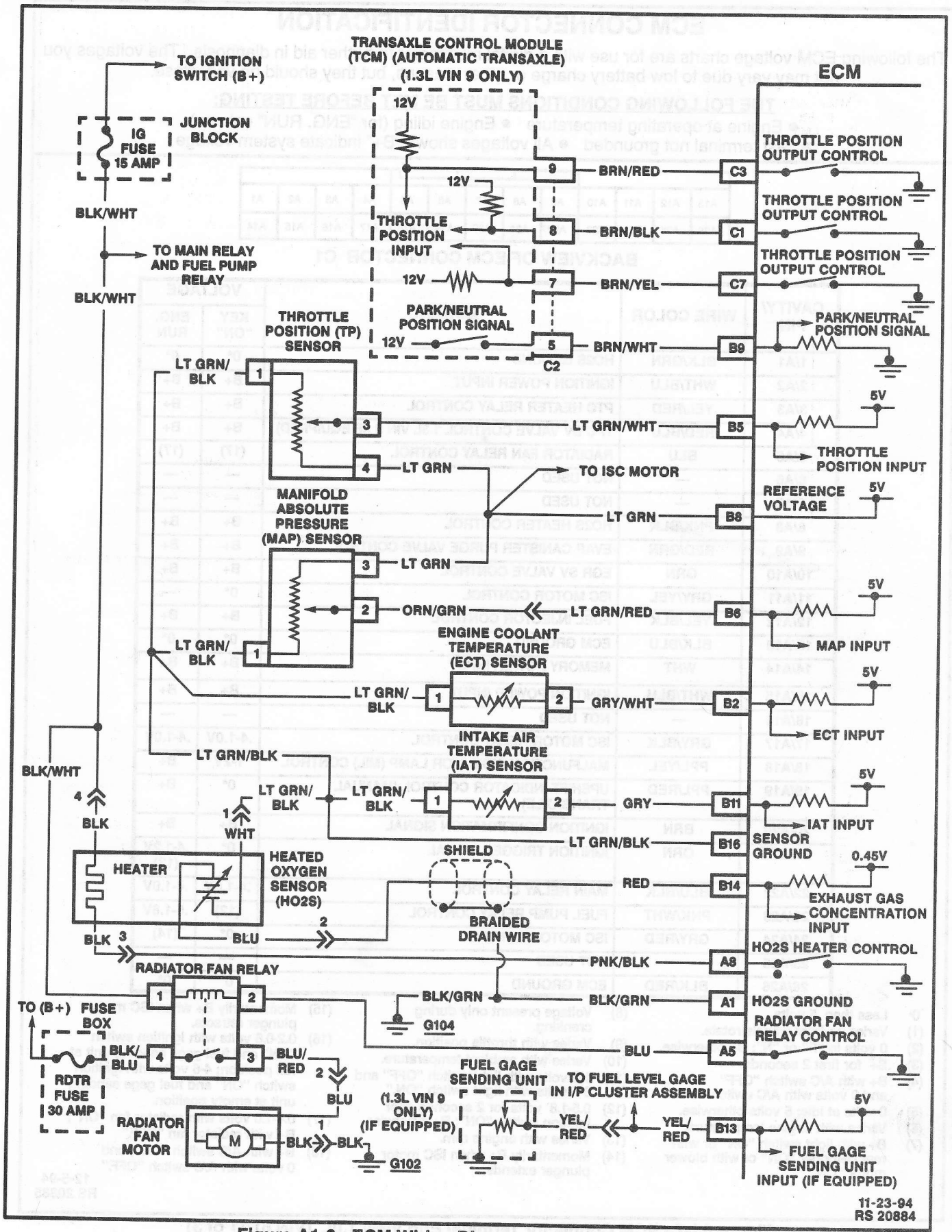



Figure A1-6 - ECM Wiring Diagram 1.0L (VIN 6) (5 of 5)

# ECM CONNECTOR IDENTIFICATION

The following ECM voltage charts are for use with a digital multimeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

**THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:**

- Engine at operating temperature
- Engine idling (for "ENG. RUN" column)
- Test terminal not grounded
- All voltages shown "B+" indicate system voltage

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A13 | A12 | A11 | A10 | A9 | A8 | A7 | A6 | A5 | A4 | A3 | A2 | A1 |
| A26 | A25 | A24 | A23 | A22 | A21 | A20 | A19 | A18 | A17 | A16 | A15 | A14 |

**BACKVIEW OF ECM CONNECTOR C1**

| CAVITY/ PIN | WIRE COLOR | CIRCUIT | VOLTAGE | |
|---|---|---|---|---|
| | | | KEY "ON" | ENG. RUN |
| 1/A1 | BLK/GRN | HO2S GROUND | 0* | 0* |
| 2/A2 | WHT/BLU | IGNITION POWER INPUT | B+ | B+ |
| 3/A3 | YEL/RED | PTC HEATER RELAY CONTROL | B+ | B+ |
| 4/A4 | RED/BLU | TPC SV VALVE CONTROL 1.3L VIN 9 (IF EQUIPPED) | B+ | B+ |
| 5/A5 | BLU | RADIATOR FAN RELAY CONTROL | (17) | (17) |
| 6/A6 | — | NOT USED | — | — |
| 7/A7 | — | NOT USED | — | — |
| 8/A8 | PNK/BLK | HO2S HEATER CONTROL | B+ | B+ |
| 9/A9 | RED/GRN | EVAP CANISTER PURGE VALVE CONTROL | B+ | B+ |
| 10/A10 | GRN | EGR SV VALVE CONTROL | B+ | B+ |
| 11/A11 | GRY/YEL | ISC MOTOR CONTROL | 0* | — |
| 12/A12 | YEL/BLK | FUEL INJECTOR CONTROL | B+ | B+ |
| 13/A13 | BLK/BLU | ECM GROUND | 0* | 0* |
| 14/A14 | WHT | MEMORY POWER INPUT | B+ | B+ |
| 15/A15 | WHT/BLU | IGNITION POWER INPUT | B+ | B+ |
| 16/A16 | — | NOT USED | — | — |
| 17/A17 | GRY/BLK | ISC MOTOR RELAY CONTROL | .4-1.0V | .4-1.0V |
| 18/A18 | PPL/YEL | MALFUNCTION INDICATOR LAMP (MIL) CONTROL | 1-2V | B+ |
| 19/A19 | PPL/RED | UPSHIFT INDICATOR CONTROL (MANUAL TRANSAXLE) | 0* | B+ |
| 20/A20 | BRN | IGNITION CONFIRMATION SIGNAL | B+ | B+ |
| 21/A21 | ORN | IGNITION TRIGGER SIGNAL | 0* | .4-1.2V (13) |
| 22/A22 | BLU/BLK | MAIN RELAY CONTROL | .4-1.0V | .4-1.0V |
| 23/A23 | PNK/WHT | FUEL PUMP RELAY CONTROL | (12) | .5-1.8V |
| 24/A24 | GRY/RED | ISC MOTOR CONTROL | 0* | (14) |
| 25/A25 | — | NOT USED | — | — |
| 26/A26 | BLK/RED | ECM GROUND | 0* | 0* |

0* Less than .5 volts.
(1) Varies as front wheels rotate.
(2) 0 volts in "P" or "N"; B+ otherwise.
(3) B+ for first 2 seconds.
(4) B+ with A/C switch "OFF" and 0 volts with A/C switch "ON."
(5) 0 volts at idle; 5 volts otherwise.
(6) Varies with engine temperature.
(7) B+ with light switch "ON" or with rear defogger "ON" or with blower motor "ON."
(8) Voltage present only during cranking.
(9) Varies with throttle position.
(10) Varies with ambient temperature.
(11) 1-2 volts with light switch "OFF" and 3-5 volts with light switch "ON."
(12) 0.5-1.8 volts for 2 seconds after ignition switch "ON"; B+ otherwise.
(13) Varies with engine rpm.
(14) Momentarily B+ when ISC motor plunger extends.
(15) Momentarily B+ when ISC motor plunger retracts.
(16) 0.2-0.6 volts with ignition switch "ON" and fuel gage sending unit at full position; 4-6 volts with ignition switch "ON" and fuel gage sending unit at empty position.
(17) 0.4-1.0 volts with radiator fan "ON"; B+ with radiator fan "OFF."
(18) B+ with A/C switch "ON"; and 0 volts with A/C switch "OFF."

12-5-94
RS 20885

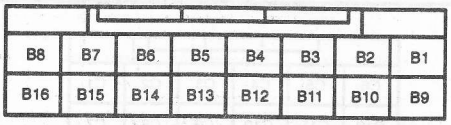
Figure A1-7 - ECM Connector Terminal End View 1.0L (VIN 6) (1 of 3)

# ECM CONNECTOR IDENTIFICATION

The following ECM voltage charts are for use with a digital multimeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

**THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:**

- Engine at operating temperature
- Engine idling (for "ENG. RUN" column)
- Test terminal not grounded
- All voltages shown "B+" indicate system voltage




BACKVIEW OF ECM CONNECTOR C2

| CAVITY/ PIN | WIRE COLOR | CIRCUIT | VOLTAGE | |
|---|---|---|---|---|
| | | | KEY "ON" | ENG. RUN |
| 1/B1 | YEL/GRN | VEHICLE SPEED INPUT | 0-5V (1) | 0-5V (1) |
| 2/B2 | GRY/WHT | ECT INPUT | .4-.8V (6) | .4-.8V (6) |
| 3/B3 | — | NOT USED | — | — |
| 4/B4 | — | NOT USED | — | — |
| 5/B5 | LT GRN/ WHT | THROTTLE POSITION INPUT | .2-1.0V (9) | .2-1.0V (9) |
| 6/B6 | LT GRN/ RED | MAP INPUT | 3-4V | 1-2V |
| 7/B7 | ORN | IGNITION REFERENCE HIGH | .4-.8V | .4-.8V |
| 8/B8 | LT GRN | REFERENCE VOLTAGE (5V) | 4-5V | 4-5V |
| 9/B9 | BRN/WHT | PARK/NEUTRAL POSITION SIGNAL (AUTOMATIC TRANSAXLE 1.3L VIN 9 ONLY) | 0-12V (2) | 0-12V (2) |
| 10/B10 | GRY/GRN | IDLE SWITCH SIGNAL | (5) | (5) |
| 11/B11 | GRY | IAT INPUT | 2-2.7V (10) | 2-2.7V (10) |
| 12/B12 | BLK/BLU | GROUND 1.3L VIN 9 | — | — |
| 13/B13 | YEL/RED | FUEL GAGE SENDING UNIT INPUT 1.3L VIN 9 (IF EQUIPPED) | (16) | (16) |
| 14/B14 | RED | EXHAUST OXYGEN CONCENTRATION INPUT | 0* | .1-.9V |
| 15/B15 | WHT | IGNITION REFERENCE LOW | .4-.8V | .4-.8V |
| 16/B16 | LT GRN/BLK | SENSOR GROUND | 0* | 0* |

0* Less than .5 volts.
(1) Varies as front wheels rotate.
(2) 0 volts in "P" or "N"; B+ otherwise.
(3) B+ for first 2 seconds.
(4) B+ with A/C switch "OFF" and 0 volts with A/C switch "ON."
(5) 0 volts at idle; 5 volts otherwise.
(6) Varies with engine temperature.
(7) B+ with light switch "ON" or with rear defogger "ON" or with blower motor "ON."
(8) Voltage present only during cranking.
(9) Varies with throttle position.
(10) Varies with ambient temperature.
(11) 1-2 volts with light switch "OFF" and 3-5 volts with light switch "ON."
(12) 0.5-1.8 volts for 2 seconds after ignition switch "ON"; B+ otherwise.
(13) Varies with engine rpm.
(14) Momentarily B+ when ISC motor plunger extends.
(15) Momentarily B+ when ISC motor plunger retracts.
(16) 0.2-0.6 volts with ignition switch "ON" and fuel gage sending unit full position; 4-6 volts with ignition switch "ON" and fuel gage sending unit at empty position.
(17) 0.4-1.0 volts with radiator fan "ON"; B+ with radiator fan "OFF."
(18) B+ with A/C switch "ON"; and 0 volts with A/C switch "OFF."

11-23-94
RS 20886

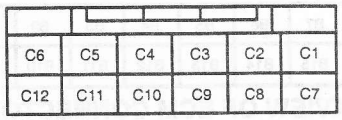
Figure A1-8 - ECM Connector Terminal End View 1.0L (VIN 6) (2 of 3)

# ECM CONNECTOR IDENTIFICATION

The following ECM voltage charts are for use with a digital multimeter to further aid in diagnosis. The voltages you get may vary due to low battery charge or other reasons, but they should be very close.

**THE FOLLOWING CONDITIONS MUST BE MET BEFORE TESTING:**

- Engine at operating temperature
- Engine idling (for "ENG. RUN" column)
- Test terminal not grounded
- All voltages shown "B+" indicate system voltage



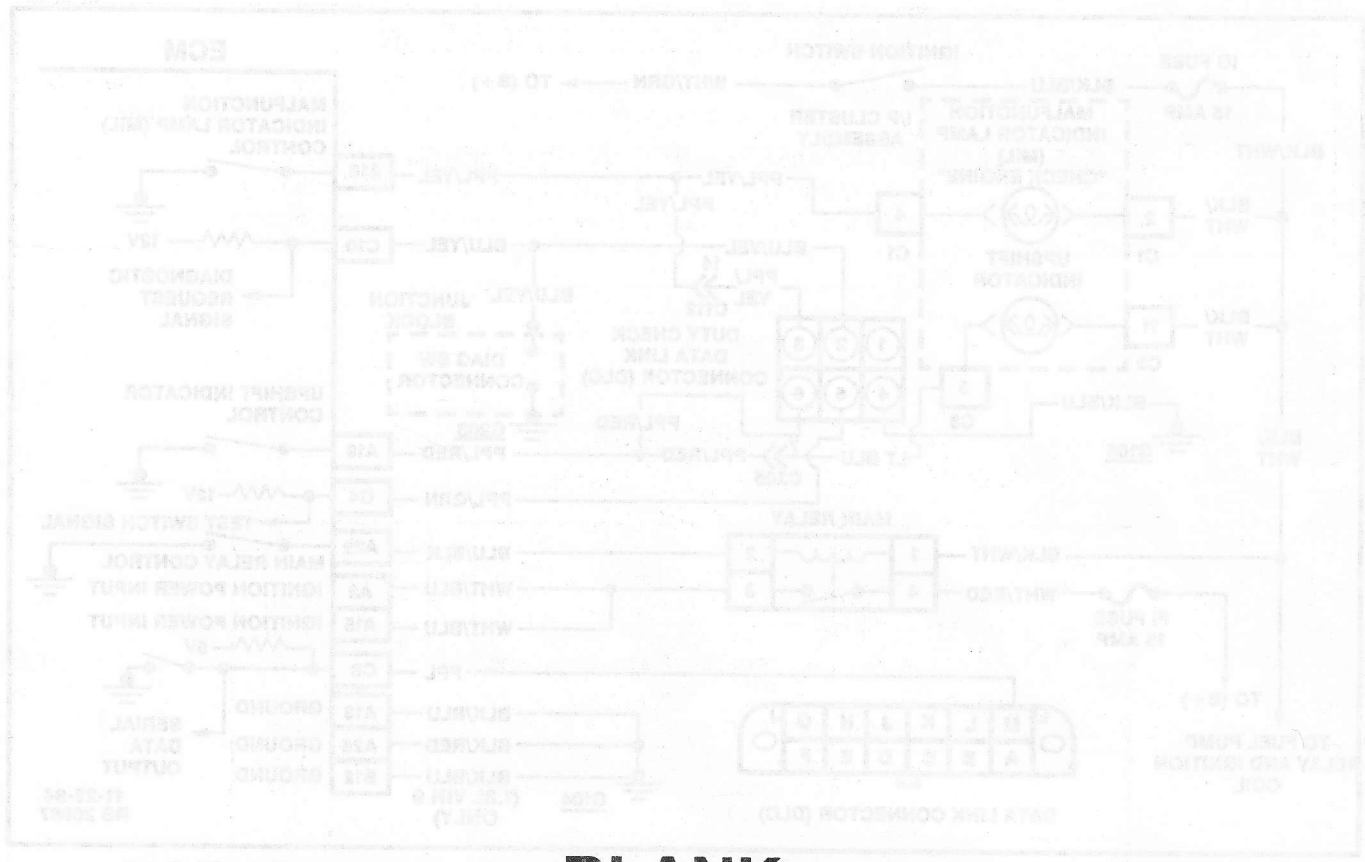

BACKVIEW OF ECM CONNECTOR C3

| CAVITY/ PIN | WIRE COLOR | CIRCUIT | VOLTAGE | |
|---|---|---|---|---|
| | | | KEY "ON" | ENG. RUN |
| 1/C1 | BRN/BLK | THROTTLE POSITION OUTPUT CONTROL (AUTOMATIC TRANSAXLE 1.3L VIN 9 ONLY) | 0-10V (9) | 0-10V (9) |
| 2/C2 | LT GRN/RED | A/C OFF CONTROL | (18) | (18) |
| 3/C3 | BRN/RED | THROTTLE POSITION OUTPUT CONTROL (AUTOMATIC TRANSAXLE 1.3L VIN 9 ONLY) | 0-10V (9) | 0-10V (9) |
| 4/C4 | PPL/GRN | TEST SWITCH SIGNAL | B+ | B+ |
| 5/C5 | BRN/YEL | ELECTRICAL LOAD IDLE-UP SIGNAL | (7) | (7) |
| 6/C6 | BLU/WHT | POWER STEERING PRESSURE SIGNAL | B+ | B+ |
| 7/C7 | BRN/YEL | THROTTLE POSITION OUTPUT CONTROL (AUTOMATIC TRANSAXLE 1.3L VIN 9 ONLY) | 0-10V (9) | 0-10V (9) |
| 8/C8 | PPL | SERIAL DATA OUTPUT | 4-5V | 4-5V |
| 9/C9 | — | NOT USED | — | — |
| 10/C10 | BLU/YEL | DIAGNOSTIC REQUEST SIGNAL | B+ | B+ |
| 11/C11 | BLK/YEL | ENGINE START SIGNAL | 0* (8) | 0* |
| 12/C12 | BLU/RED | A/C IDLE-UP SIGNAL | B+ | B+ (4) |

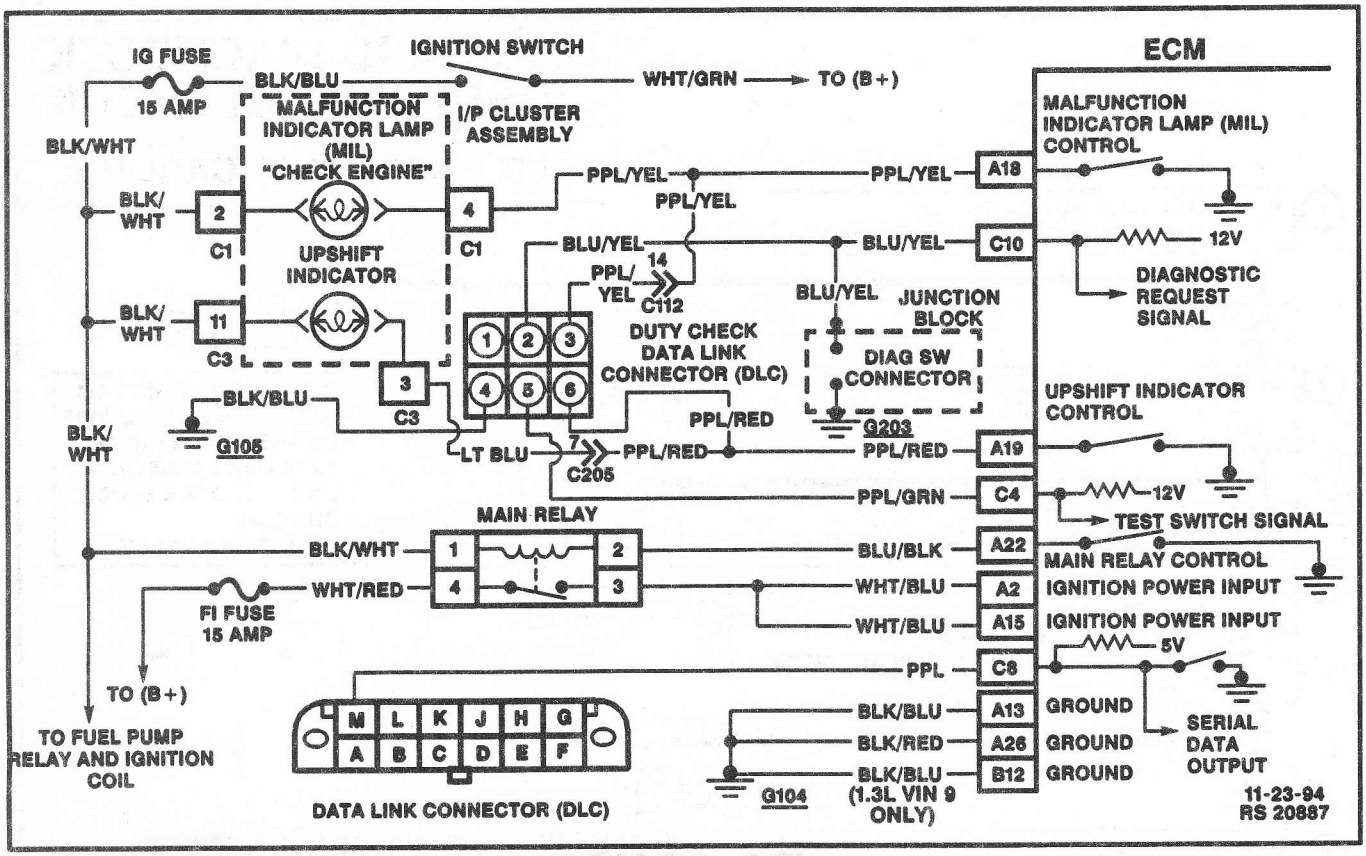
0* Less than .5 volts.
(1) Varies as front wheels rotate.
(2) 0 volts in "P" or "N"; B+ otherwise.
(3) B+ for first 2 seconds.
(4) B+ with A/C switch "OFF" and 0 volts with A/C switch "ON."
(5) 0 volts at idle; 5 volts otherwise.
(6) Varies with engine temperature.
(7) B+ with light switch "ON" or with rear defogger "ON" or with blower motor "ON."
(8) Voltage present only during cranking.
(9) Varies with throttle position.
(10) Varies with ambient temperature.
(11) 1-2 volts with light switch "OFF" and 3-5 volts with light switch "ON."
(12) 0.5-1.8 volts for 2 seconds after ignition switch "ON"; B+ otherwise.
(13) Varies with engine rpm.
(14) Momentarily B+ when ISC motor plunger extends.
(15) Momentarily B+ when ISC motor plunger retracts.
(16) 0.2-0.6 volts with ignition switch "ON" and fuel gage sending unit full position; 4-6 volts with ignition switch "ON" and fuel gage sending unit at empty position.
(17) 0.4-1.0 volts with radiator fan "ON"; B+ with radiator fan "OFF."
(18) B+ with A/C switch "ON"; and 0 volts with A/C switch "OFF."

11-23-94
RS 20825

Figure A1-9 - ECM Connector Terminal End View 1.0L (VIN 6) (3 of 3)



# BLANK




# ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The On-Board Diagnostic (OBD) System Check is an organized approach to identifying a malfunction 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.

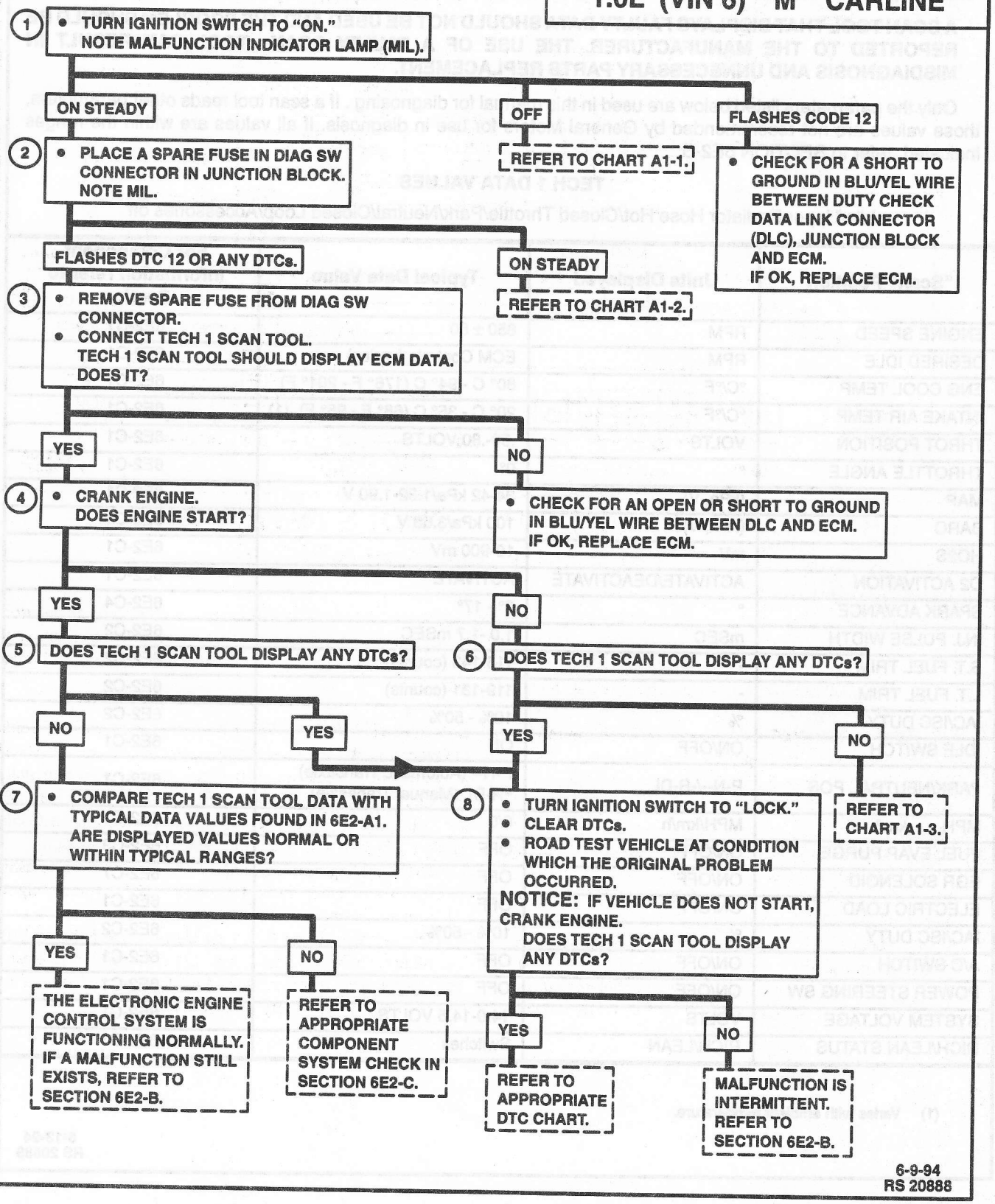
1. Checks the MIL operation.
2. Checks to see if the ECM's self-diagnostic mode is operating.
3. Checks to see if the ECM's serial data output is operating.
4. Checks to see if vehicle will start.
5. Checks for any Diagnostic Trouble Codes (DTCs) that are stored in the ECM's memory with the engine running.
6. Checks for any DTCs that are stored in the ECM's memory with the engine off.
7. Compares ECM's control data to typical data values.
8. Checks to see if DTCs are intermittent malfunctions.

**Diagnostic Aids:** When the diagnostic terminal in either the Duty Check Data Link Connector (DLC) or the DIAG SW in the junction block are grounded with the ignition switch in the "ON" position (engine not running), the system enters what is called the diagnostic mode. In this mode, the Engine Control Module (ECM) will perform the following functions:

1. Display Diagnostic Trouble Code (DTC) 12 by flashing the Malfunction Indicator Lamp (MIL) (indicating the system is operating correctly.)
2. Display any stored DTCs by flashing the MIL. If DTCs other than DTC 12 are stored, DTC 12 will not be flashed.
3. Output idle speed control duty through the duty check terminal of the Duty Check DLC.

# ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

## 1.0L (VIN 6) "M" CARLINE




6-9-94
RS 20888

If after completing the On-Board Diagnostic (OBD) System Check and finding the Tech 1 scan tool diagnostics functioning properly, and no diagnostic trouble codes (DTCs) stored in the ECM's memory, the "Typical Data Values" may be used for comparison with the values obtained on the vehicle being tested. The "Typical 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 diagnosing . If a scan tool reads other parameters, those values are not recommended by General Motors for use in diagnosis. If all values are within the ranges indicated, refer to SECTION 6E2-B.

**TECH 1 DATA VALUES**

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

| "Scan" Position | Units Displayed | Typical Data Value | For Component Information refer to Section |
|---|---|---|---|
| ENGINE SPEED | RPM | 850 ± 50 | 6E2-C1 |
| DESIRED IDLE | RPM | ECM Controls (varies) | 6E2-C1 |
| ENG COOL TEMP | °C/°F | 80° C - 94° C (176° F - 201° F) | 6E2-C1 |
| INTAKE AIR TEMP | °C/°F | 20° C - 35° C (68° F - 95° F) (1) | 6E2-C1 |
| THROT POSITION | VOLTS | .50-.80 VOLTS | 6E2-C1 |
| THROTTLE ANGLE | ° | 0° | 6E2-C1 |
| MAP | (kPa, V) | 34-42 kPa/1.32-1.90 V | 6E2-C1 |
| BARO | (kPa, V) | 100 kPa/3.68 V | 6E2-C1 |
| HO2S | mV | 10-900 mV | 6E2-C1 |
| O2 ACTIVATION | ACTIVATE/DEACTIVATE | ACTIVATE | 6E2-C1 |
| SPARK ADVANCE | ° | 8° - 17° | 6E2-C4 |
| INJ. PULSE WIDTH | mSEC | 1.0 -1.7 mSEC | 6E2-C2 |
| S.T. FUEL TRIM | - | 113-143 (counts) | 6E2-C2 |
| L.T. FUEL TRIM | - | 119-131 (counts) | 6E2-C2 |
| IAC/ISC DUTY | % | 10% - 50% | 6E2-C2 |
| IDLE SWITCH | ON/OFF | ON | 6E2-C1 |
| PARK/NEUTRAL POS | P-N--/-R-DL | P-N-- (Automatic Transaxle)<br>-R-DL (Manual Transaxle) | 6E2-C1 |
| MPH km/h | MPH/km/h | 0/0 | 6E2-C1 |
| FUEL EVAP PURGE | ON/OFF | OFF | 6E2-C3 |
| EGR SOLENOID | ON/OFF | OFF | 6E2-C7 |
| ELECTRIC LOAD | ON/OFF | OFF | 6E2-C1 |
| IAC/ISC DUTY | % | 10% - 50% | 6E2-C2 |
| A/C SWITCH | ON/OFF | OFF | 6E2-C1 |
| POWER STEERING SW | ON/OFF | OFF | 6E2-C1 |
| SYSTEM VOLTAGE | VOLTS | 14.0-14.5 VOLTS | 6E2-C1 |
| RICH/LEAN STATUS | RICH/LEAN | Switches | 6E2-C1 |

(1) **Varies with ambient temperature.**

# TECH 1 DATA DEFINITIONS

## ECM DATA DESCRIPTIONS

A list of explanations for each message displayed on the Tech 1 scan tool begins below. This information will assist in diagnosing driveability and emissions malfunctions, since the displays can be viewed while driving the vehicle.

**ENGINE SPEED - Range: 0 - 9999 RPM**
Engine speed is calculated by the Engine Control Module (ECM) from the ignition reference pulses it receives from the Camshaft Position (CMP) sensor. The ECM will keep this value close to the desired idle under various engine loads with the engine idling.

**DESIRED IDLE - Range: 0 - 2000 RPM**
The desired idle speed is an Engine Control Module (ECM) requested speed. The ECM determines what this speed should be from the information it receives from various sensors throughout the vehicle.

**ENG COOL TEMP - Range: -40°C - 120°C/-40°F - 250°F**
The Engine Coolant Temperature (ECT) sensor is a thermistor (a variable resistor that changes with temperature) in series with a fixed resistor in the Engine Control Module (ECM). The ECM provides a 5 volt reference voltage to the ECT sensor. The ECM reads the voltage across the ECT sensor and calculates this voltage reading into a temperature reading. A low voltage reading at the ECM indicates a hot engine and a high voltage reading at the ECM indicates a cold engine.

**INTAKE AIR TEMP - Range: -40°C - 120°C/-40°F - 250°F**
The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes with temperature) in a series with a fixed resistor in the Engine Control Module (ECM). The ECM provides a 5 volt reference voltage to the IAT sensor. The ECM reads the voltage across the IAT sensor and calculates this voltage reading into a temperature reading to control the air/fuel mixture and spark timing. A low voltage reading at the ECM indicates that the intake air is warm and a high voltage reading at the ECM indicates that the intake air is cold.

**THROT POSITION - Range: 0 - 5.10 VOLTS**
The Throttle Position (TP) sensor has a potentiometer whose resistance changes with the throttle valve position. The Engine Control Module (ECM) provides a 5 volt reference voltage to the TP sensor. The ECM reads the voltage across the TP sensor and converts it into throttle position. When the TP sensor resistance decreases (throttle valve opening increases), the voltage being monitored at the ECM increases. When the TP sensor resistance increases (throttle valve opening decreases), the voltage being monitored at the ECM decreases.

**THROTTLE ANGLE - Range: - 0 - 90°**
The throttle angle parameter displays the throttle position in degrees. The Tech 1 will display "0" when the throttle valve is fully closed, and will display about "80" when the throttle valve is fully opened.

**MAP - Range: 0 - 125 kPa/0 - 5.10 V**
The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure. This change in pressure, that results from engine load and RPM changes, is converted into a voltage reading that is monitored by the Engine Control Module (ECM). A low voltage reading at the ECM indicates low manifold pressure, and a high voltage reading at the ECM indicates high manifold pressure.

**BARO - Range: 0 - 125 kPa/0 - 5.10 V**
The BARO reading displayed is measured from the MAP sensor at ignition switch "ON," engine "OFF" and WOT conditions. The BARO reading displayed represents barometric pressure and is used to compensate for altitude.

**HO2S - Range: 0 - 2500 mV**
The Heated Oxygen Sensor (HO2S) is the primary input to the fuel delivery system. The Engine Control Module (ECM) monitors the HO2S voltage, when the system is in "Closed Loop" operation. When the voltage reading is high, the air/fuel mixture is rich, and when the voltage reading is low the air/fuel mixture is lean. Under normal operating conditions, the voltage reading should constantly fluctuate.

**HO2S ACTIVATION - Range: Tech 1 displays "ACTIVATE" or "DEACTIVATE"**
The Tech 1 displays "ACTIVATE" when the system enters "Closed Loop" operation. This indicates that the Heated Oxygen Sensor (HO2S) is hot enough for the Engine Control Module (ECM) to control fuel delivery. When the Tech 1 displays "DEACTIVATE" the system is in "Open Loop" operation. This indicates that the HO2S is cold and the ECM bases fuel delivery on throttle position and manifold absolute pressure.

**SPARK ADVANCE - Range: -10° - 60°**
This displays the Engine Control Module (ECM) controlled value that is being used to control the spark timing.

**INJ. PULSE WIDTH - Range: 0 -65 mSEC**
This value is the amount of time, in milliseconds, that the Engine Control Module (ECM) is commanding the fuel injector to stay on during combustion. A shorter on time yields a leaner air/fuel mixture, and a longer on time yields richer air/fuel mixture.

**S.T. FUEL TRIM - Range: 0 - 255**
This value represents the short term corrections to the air/fuel mixture computation. A value of 128 indicates that no correction is necessary. A value below 128 indicates an enleanment condition, and a value above 128 indicates an enrichment condition.

**L.T. FUEL TRIM - Range: 0 - 255**
This value represents the long term corrections to the air/fuel mixture computation. A value of 128 indicates that no correction is required. A value below 128 indicates an enleanment condition, and a value above 128 indicates an enrichment condition.

**IAC/ISC DUTY - Range: 0 - 100%**
The Idle Speed Control (ISC) motor opens and closes the throttle valve according to signals from the ECM. The ECM controls the time in which the ISC motor is activated to adjust the idle speed (open and close the throttle plate).

**IDLE SWITCH - Range: Tech 1 displays "ON" or "OFF"**
This parameter indicates the throttle valve position. The Tech 1 will display "ON" when the throttle valve is fully closed, and will display "OFF" when it is opened.

**PARK/NEUTRAL POS - Range: Tech 1 displays "P-N- -" or "-R-DL"**
This parameter displays the manual selector's position with vehicles equipped with an automatic transaxle. When the manual selector is in the "P" or "N" position, the Tech 1 will display "P-N- -." When the manual selector is in the "R," "D," "2" or "L" position, the Tech 1 will display "-R-DL." On vehicles equipped with a manual transaxle, the Tech 1 will always display "-R-DL."

**MPH km/h - Range: 0 - 200 km/h/0 - 125 MPH**
This parameter displays the vehicle speed. The Engine Control Module (ECM) receives reference pulses from the Vehicle Speed Sensor (VSS) and converts them into km/h and MPH for display.

**FUEL EVAP PURGE - Range: Tech 1 displays "ON" or "OFF"**
This represents the Evaporative Emissions Canister Purge valve. The ECM commands the EVAP Canister Purge valve "ON" under several conditions. The scan tool will display "ON"/"OFF." If the vehicle is at operating temperature, the EVAP Canister Purge valve should be "OFF" at idle.

**EGR SOLENOID - Range: Tech 1 displays "ON" or "OFF"**
This parameter displays the status of the Exhaust Gas Recirculation Solenoid Vacuum (EGR SV) valve. When the Tech 1 displays "ON," the EGR SV valve is energized, thus allowing exhaust gases to flow into the intake manifold. When the Tech 1 displays "OFF," the EGR SV valve is de-energized, forbidding any exhaust gasses to flow into the intake manifold.

**ELECTRIC LOAD - Range : Tech 1 displays "ON" or "OFF"**
This mode displays the status of the light switch, blower speed selector switch and the rear defogger switch. If one or more of the previously mentioned switches is "ON," a signal is sent to the Engine Control Module (ECM) to increase engine idle speed due to the increased electronic load.

**IAC/ISC DUTY - Range: 0 - 100%**
The Idle Speed Control (ISC) motor opens and closes the throttle valve according to signals from the ECM. The ECM controls the time in which the ISC motor is activated to adjust the idle speed (open and close the throttle plate).

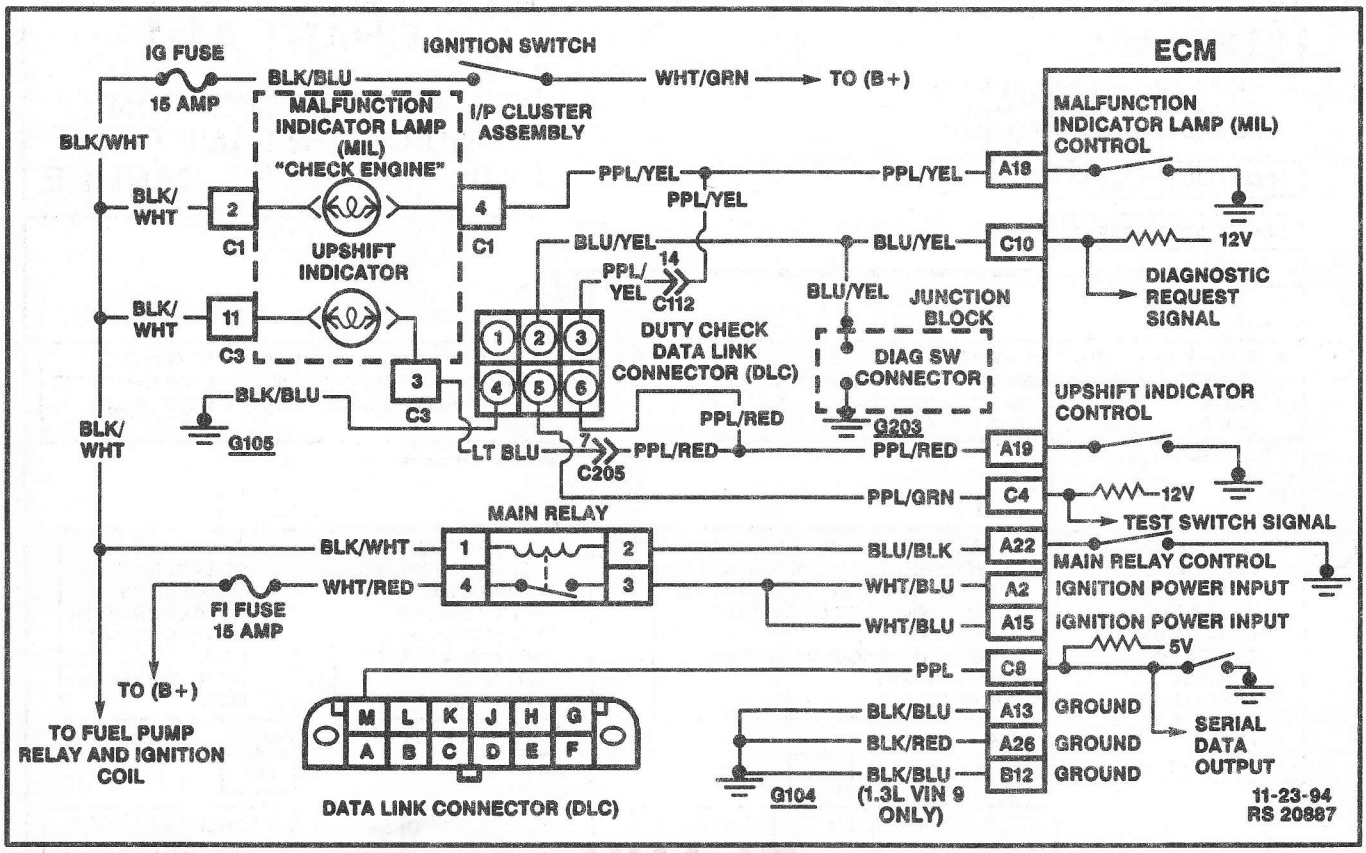
**A/C SWITCH - Range: Tech 1 displays "ON" or "OFF"**
This parameter displays the status of the A/C system. If the A/C has been requested (A/C switch "ON"), the Tech 1 will display "ON." If the A/C has not been requested (A/C switch "OFF"), the Tech 1 will display "OFF." The Engine Control Module (ECM) will use this information to increase engine idle speed, when required.

**POWER STEERNG SW - Range: Tech 1 displays "ON" or "OFF"**
This indicates whether the steering is being assisted by the power steering pump. The Tech 1 will display "ON" when the front wheels are turned all the way to the right or left. When the need for assisted steering no longer exists, the Tech 1 will display "OFF."

**SYSTEM VOLTAGE - Range: 0 - 18.75 VOLTS**
This value is the system voltage reading that is detected at the Engine Control Module (ECM).

**RICH/LEAN STATUS - Range: Tech 1 displays "RICH" or "LEAN"**
This parameter displays the status of the oxygen concentration in the air/fuel mixture. When the Heated Oxygen Sensor (HO2S) voltage is high, the Tech 1 will display "RICH," and when the HO2S voltage is low, the Tech 1 will display "LEAN."

# BLANK




# CHART A1-1

## NO MALFUNCTION INDICATOR LAMP (MIL)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

There should always be a steady Malfunction Indicator Lamp (MIL) when the ignition switch is in the "ON" position and the engine is not running. System voltage is applied to the indicator bulb. The Engine Control Module (ECM) will control the MIL and turn it "ON" by providing a ground path through the PPL/YEL wire.

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

1. Checks to see if ECM is receiving power.
2. Checks for an open in the PPL/YEL wire, or for a faulty ECM.
3. Checks for an open in WHT/BLU wire between MAIN relay and ECM.
4. Checks to see if ECM has a good ground.
5. Checks for an open in BLK/WHT wire to I/P or in PPL/YEL wire to ECM.
6. Checks to see if MAIN relay switch is receiving power.
7. Checks to see if MAIN relay coil is receiving power.
8. Checks to see if MAIN relay or ECM is faulty, or for an open in BLU/BLK wire between MAIN relay and ECM.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# CHART A1-1

## NO MALFUNCTION INDICATOR LAMP (MIL) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

DOES ENGINE START?

**NO**

1. TURN IGNITION SWITCH TO "ON."
   BACKPROBE ECM CONNECTOR C1 WITH A TEST LIGHT FROM CAVITIES "A2" AND "A15" TO GROUND.
   DOES TEST LIGHT LIGHT AT BOTH CAVITIES?

   **NO**

   3. BACKPROBE MAIN RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "3" TO GROUND.
      TEST LIGHT SHOULD LIGHT.
      DOES IT?

      **NO**

      6. BACKPROBE MAIN RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "4" TO GROUND.
         TEST LIGHT SHOULD LIGHT.
         DOES IT?

         **YES**

         7. BACKPROBE MAIN RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "1" TO GROUND.
            TEST LIGHT SHOULD LIGHT.
            DOES IT?

            **YES**

            8. REMOVE MAIN RELAY.
               CONNECT A DIGITAL MULTIMETER FROM MAIN RELAY CONNECTOR CAVITY "2" TO "1".
               MEASURE VOLTAGE.

               **LESS THAN 10.0 VOLTS**

               CHECK FOR AN OPEN IN BLU/BLK WIRE BETWEEN ECM AND MAIN RELAY.
               IF OK, REPLACE ECM.

               **MORE THAN 10.0 VOLTS**

               REPLACE MAIN RELAY.

            **NO**

            CHECK IG FUSE.
            CHECK BLK/WHT, BLK/BLU AND WHT/GRN WIRES FOR AN OPEN.
            IF OK, REPLACE IGNITION SWITCH.

         **NO**

         CHECK FI FUSE.
         IF OK, REPAIR OPEN IN RED OR WHT/RED WIRE TO FUSE.

      **YES**

      REPAIR OPEN IN WHT/BLU WIRE TO ECM.

   **YES**

   4. TURN IGNITION SWITCH TO "LOCK."
      DISCONNECT ECM CONNECTOR C1.
      WITH A TEST LIGHT TO B+, PROBE ECM CONNECTOR C1 CAVITIES "A13" AND "A26".
      TEST LIGHT SHOULD LIGHT AT BOTH CAVITIES.
      DOES IT?

      **YES**

      CHECK FOR POOR CONNECTION AT ECM.
      IF OK, REPLACE ECM.

      **NO**

      CHECK FOR CLEAN GROUND CONNECTION AT G104.
      CHECK FOR AN OPEN IN BLK/BLU OR BLK/RED WIRE TO ECM.

**YES**

2. CONNECT A JUMPER FROM DUTY CHECK DATA LINK CONNECTOR (DLC) CAVITY "3" TO CAVITY "4".
   IS THE MALFUNCTION INDICATOR LAMP (MIL) "ON"?

   **NO**

   5. BACKPROBE I/P CLUSTER ASSEMBLY CONNECTOR C1 WITH A JUMPER FROM TERMINAL "4" (PPL/YEL WIRE) TO GROUND.
      IS THE MIL "ON"?

      **NO**

      CHECK FOR OPEN INDICATOR BULB OR OPEN I/P PRINTED CIRCUIT.
      CHECK FOR POOR CONNECTION AT I/P.
      IF OK, REPAIR OPEN IN BLK/WHT WIRE TO I/P.

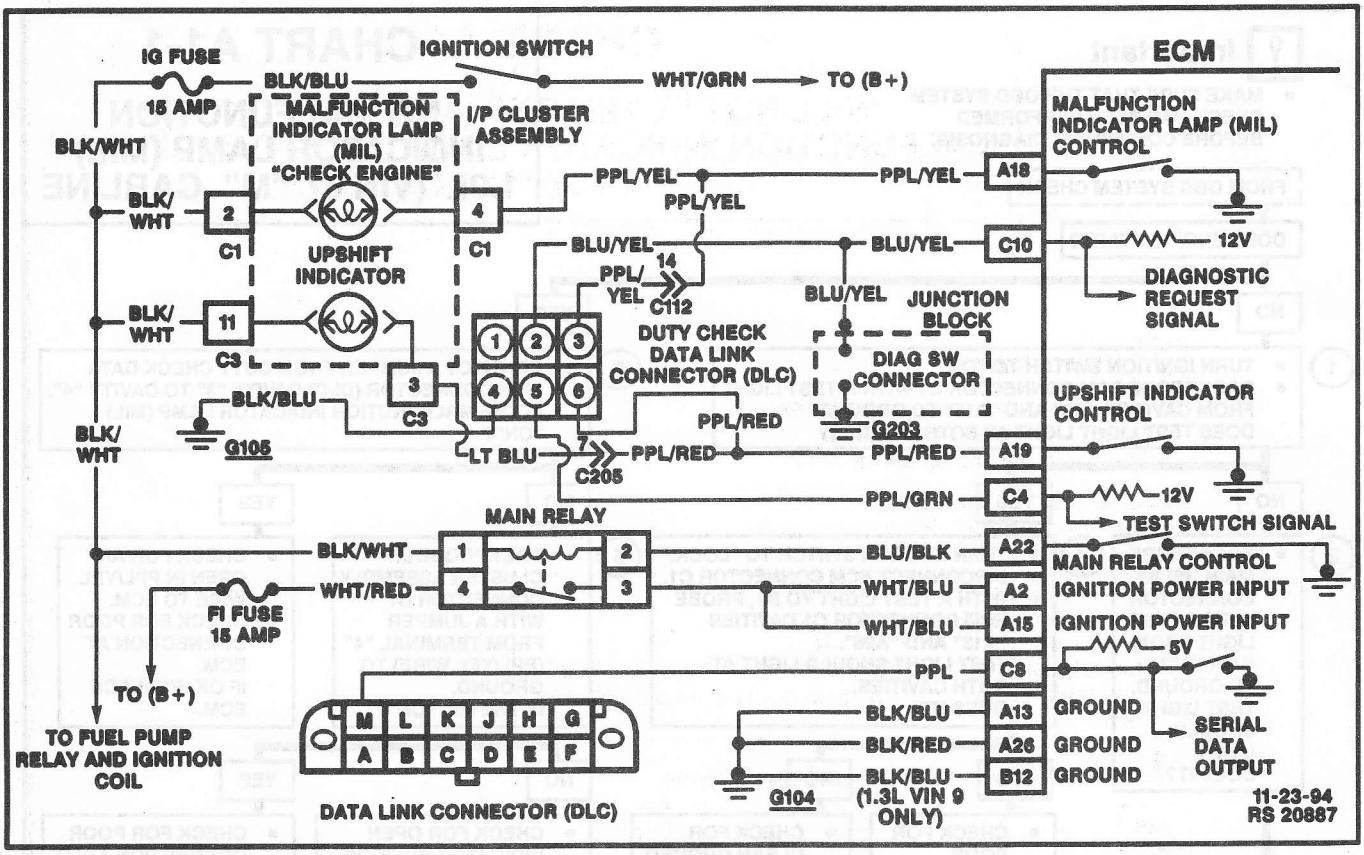
      **YES**

      CHECK FOR POOR CONNECTION AT I/P.
      IF OK, REPAIR OPEN IN PPL/YEL WIRE TO ECM OR PPL/YEL WIRE TO DLC.

   **YES**

   CHECK FOR AN OPEN IN PPL/YEL WIRE TO ECM.
   CHECK FOR POOR CONNECTION AT ECM.
   IF OK, REPLACE ECM.

11-1-94
RS 20890




# CHART A1-2

## WILL NOT FLASH DTC 12 OR ANY DTCs, MALFUNCTION INDICATOR LAMP (MIL) "ON" STEADY 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Malfunction Indicator Lamp (MIL) will flash Diagnostic Trouble Codes (DTCs) when either the diagnostic request terminal in the Duty Check Data Link Connector (DLC) or the DIAG SW connector in the junction block are grounded.

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

1. This will check for a grounded indicator circuit.
2. This will determine if it is an open diagnostic request terminal circuit, a poor ground connection or a faulty ECM.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# CHART A1-2

## WILL NOT FLASH DTC 12 OR ANY DTCs, MALFUNCTION INDICATOR LAMP (MIL) "ON" STEADY 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT ECM CONNECTOR C1.
   - TURN IGNITION SWITCH TO "ON."
   - REMOVE SPARE FUSE FROM DIAG SW IN JUNCTION BLOCK.
   - MALFUNCTION INDICATOR LAMP (MIL) SHOULD BE "OFF." IS IT?

YES

2. 
   - TURN IGNITION SWITCH TO "LOCK."
   - RECONNECT ECM CONNECTOR C1.
   - TURN IGNITION SWITCH TO "ON."
   - BACKPROBE ECM CONNECTOR C3 WITH A FUSED JUMPER FROM CAVITY "C10" TO GROUND.
   - MIL SHOULD FLASH DTC 12. DOES IT?

NO

- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

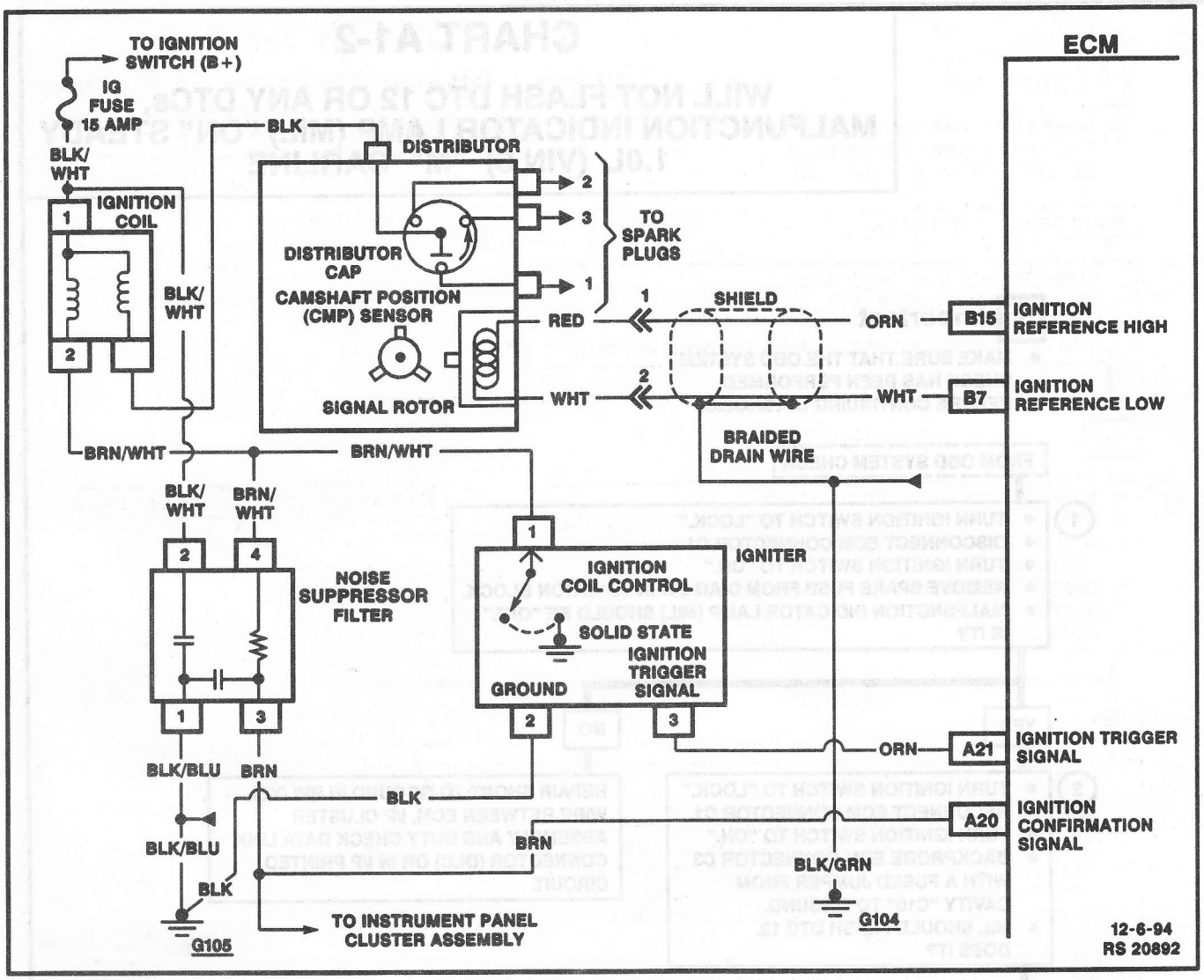
NO

REPAIR SHORT TO GROUND IN PPL/YEL WIRE BETWEEN ECM, I/P CLUSTER ASSEMBLY AND DUTY CHECK DATA LINK CONNECTOR (DLC) OR IN I/P PRINTED CIRCUIT.

YES

- CHECK FOR AN OPEN IN BLU/YEL WIRE TO DUTY CHECK DLC AND JUNCTION BLOCK.
- CHECK FOR AN OPEN IN BLK/BLU WIRE TO DUTY CHECK DLC.
- CHECK FOR A POOR GROUND CONNECTION AT G104.

11-1-94
RS 20891




# CHART A1-3

## ENGINE CRANKS BUT WILL NOT RUN
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

Before using this chart, battery condition, engine cranking speed and fuel quantity should be checked and verified as being OK.

When the ignition switch is turned to the "ON" or "START" positions, battery voltage is applied to the ignition coil. If the ignition coil's primary coil is being toggled to ground by the igniter, a high voltage is induced in the secondary windings of the ignition coil and is applied through the distributor to the spark plugs.

### Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if any Diagnostic Trouble Codes (DTCs) are stored in ECM's memory.
2. Checks for spark at ignition coil.
3. Checks for spark at distributor.
4. Checks for spark at spark plugs.

### Diagnostic Aids:

- Water or foreign material can cause a no start during freezing weather. The engine may start after 5 or 6 minutes in a heated shop. The problem may not recur until an overnight park in freezing temperatures.
- Fuel Pressure: Low fuel pressure can result in a very lean air/fuel ratio.
- Fouled or damaged spark plugs will cause a "Engine Cranks But Will Not Run" condition. Refer to SECTION 6D4 for spark plug inspection.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# CHART A1-3

## ENGINE CRANKS BUT WILL NOT RUN 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. TURN IGNITION SWITCH TO "LOCK."
   - CONNECT TECH 1 SCAN TOOL.
   - CRANK ENGINE.

   ARE ANY DIAGNOSTIC TROUBLE CODES (DTCs) PRESENT?

   - YES → REFER TO APPROPRIATE DTC CHART.
   - NO ↓

2. TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT SECONDARY COIL WIRE FROM IGNITION COIL.
   - CONNECT A J 26792 TO IGNITION COIL SECONDARY WIRE TERMINAL.
   - CHECK FOR SPARK WHILE CRANKING ENGINE.

   SHOULD HAVE SPARK.
   DOES IT?

   - NO → REPLACE IGNITION COIL.
   - YES ↓

3. TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT THE J 26792 FROM IGNITION COIL.
   - RECONNECT SECONDARY COIL WIRE TO IGNITION COIL.
   - DISCONNECT SPARK PLUG WIRES FROM DISTRIBUTOR.
   - CONNECT THE J 26792 TO DISTRIBUTOR SPARK PLUG SECONDARY WIRE TERMINALS.
   - CHECK FOR SPARK (AT EACH TERMINAL) WHILE CRANKING ENGINE.

   ALL SHOULD HAVE SPARK.
   DO THEY?

   - NO → CHECK SECONDARY COIL WIRE, DISTRIBUTOR CAP AND ROTOR FOR POOR CONNECTIONS OR OPENS. REFER TO SECTION 6D4.
   - YES ↓

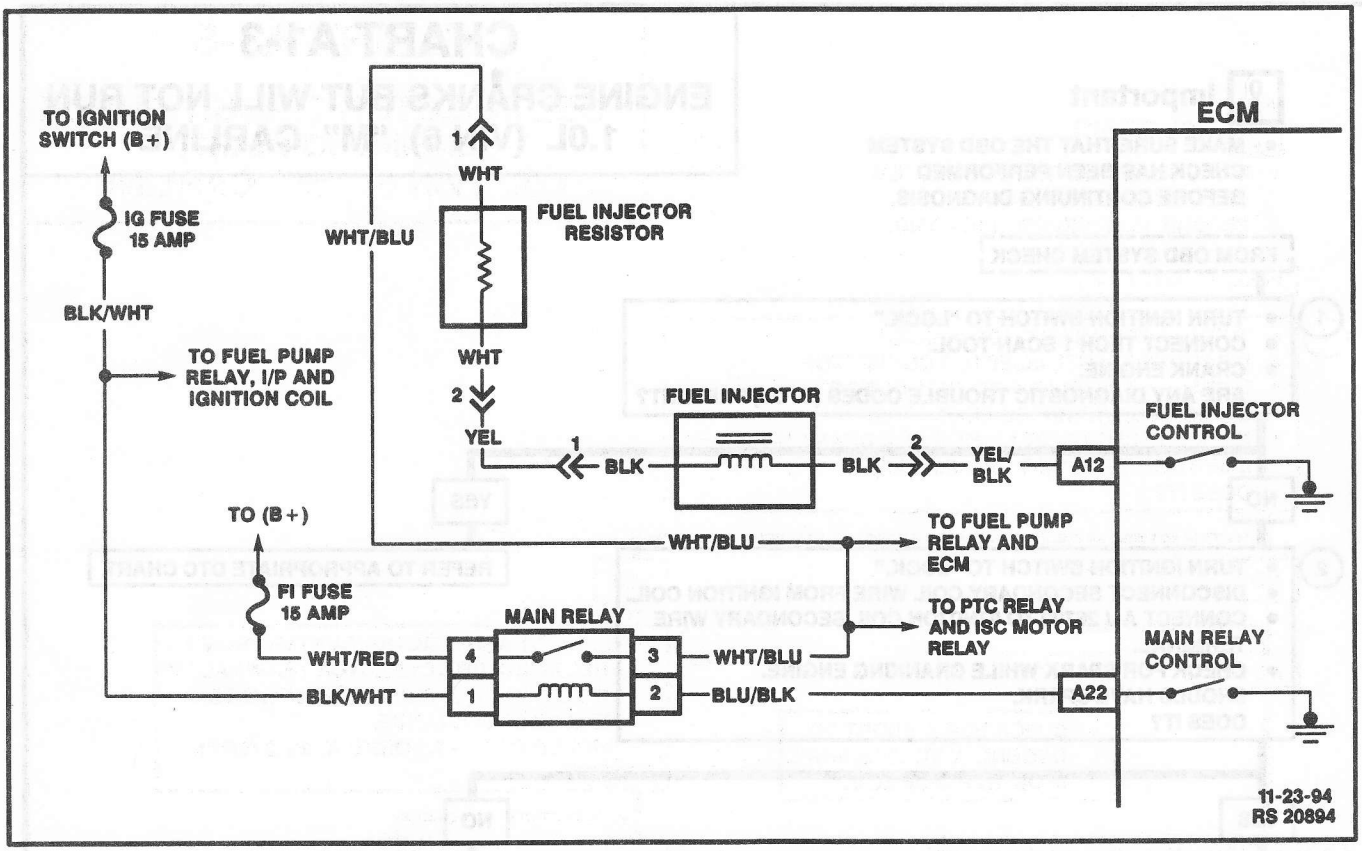
4. TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT THE J 26792 FROM DISTRIBUTOR.
   - RECONNECT SPARK PLUG WIRES TO DISTRIBUTOR.
   - DISCONNECT SPARK PLUG WIRES FROM SPARK PLUGS.
   - CONNECT THE J 26792 TO SPARK PLUG WIRES.
   - CHECK FOR SPARK (AT EACH WIRE) WHILE CRANKING ENGINE.

   ALL SHOULD HAVE SPARK.
   DO THEY?

   - NO → REPLACE FAULTY SPARK PLUG WIRE(S).
   - YES ↓

- DISCONNECT THE J 26792 FROM SPARK PLUG WIRE(S).
- SEE "DIAGNOSTIC AIDS."
- REFER TO CHART A1-5.

5-4-94
RS 20893




# CHART A1-5

## FUEL INJECTOR CIRCUIT CHECK

### (ENGINE NO-START)

### 1.0L (VIN 6) "M" CARLINE

**Circuit Description:**

When the solenoid coil of the fuel injector is energized by the Engine Control Module (ECM), it will activate the plunger and pressurized fuel will be injected into the Throttle Body Fuel Injection (TBI) unit. The fuel pump will operate as long as the engine is cranking, and the ECM is receiving ignition reference pulses. If the ECM does not receive any reference pulses, the fuel pump will stop after 2 seconds.

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

1. Checks to see if the ECM is controlling the fuel injector signals.
2. Checks the fuel injector for correct resistance.
3. Checks for voltage at fuel injector.
4. Checks for an open or short to ground in YEL/BLK wire, a faulty ECM or for a faulty fuel injector.
5. Checks for an open in YEL wire, an open in WHT/BLU wire or for a faulty fuel injector resistor.

**Diagnostic Aids:** There may be fuel spray at the fuel injector, but it may not be enough to start the engine. If both the fuel injector and the circuit are OK, the fuel injector nozzle may be partly blocked.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# CHART A1-5

## FUEL INJECTOR CIRCUIT CHECK
(ENGINE NO-START)
1.0L (VIN 6) "M" CARLINE

**Important**
- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM CHART A1-3

1. TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT FUEL INJECTOR CONNECTOR.
   - INSTALL A J 34730-2B INTO FUEL INJECTOR CONNECTOR (HARNESS SIDE).
   - NOTE INJECTOR TEST LIGHT WHILE CRANKING ENGINE. INJECTOR TEST LIGHT SHOULD FLASH. DOES IT?

**NO**

**NO LIGHT**

3. REMOVE J 34730-2B FROM FUEL INJECTOR CONNECTOR.
   - CONNECT A DIGITAL MULTIMETER FROM FUEL INJECTOR CONNECTOR CAVITY "1" TO GROUND (HARNESS SIDE).
   - TURN IGNITION SWITCH TO "ON."
   - MEASURE VOLTAGE. SHOULD BE B+. IS IT?

**YES**

4. CONNECT A TEST LIGHT FROM FUEL INJECTOR CONNECTOR CAVITY "2" (HARNESS SIDE) TO B+.
   - NOTE TEST LIGHT WHILE CRANKING ENGINE. TEST LIGHT SHOULD FLASH. DOES IT?

**NO**
- CHECK FOR A POOR CONNECTION AT ECM.
- CHECK FOR AN OPEN IN YEL/BLK WIRE. IF OK, REPLACE ECM.

**YES**

CHECK FOR A POOR CONNECTION AT FUEL INJECTOR. IF OK, REPLACE FUEL INJECTOR.

**STEADY LIGHT**

- CHECK FOR A SHORT TO GROUND IN YEL/BLK WIRE. IF OK, REPLACE ECM.

**YES**

2. CONNECT A DIGITAL MULTIMETER FROM FUEL INJECTOR CONNECTOR TERMINAL "1" TO TERMINAL "2" (FUEL INJECTOR SIDE).
   - MEASURE RESISTANCE. SHOULD BE 0.5 - 1.5 OHMS AT 20°C (68°F). IS IT?

**NO**

REPLACE FUEL INJECTOR.

**YES**
- THE FUEL INJECTOR MAY OR MAY NOT HAVE FUEL SPRAY.
- CHECK FOR RESTRICTIONS OR FOR A PARTLY BLOCKED FUEL INJECTOR NOZZLE. IF OK, REFER TO CHART A1-7A.

**NO**

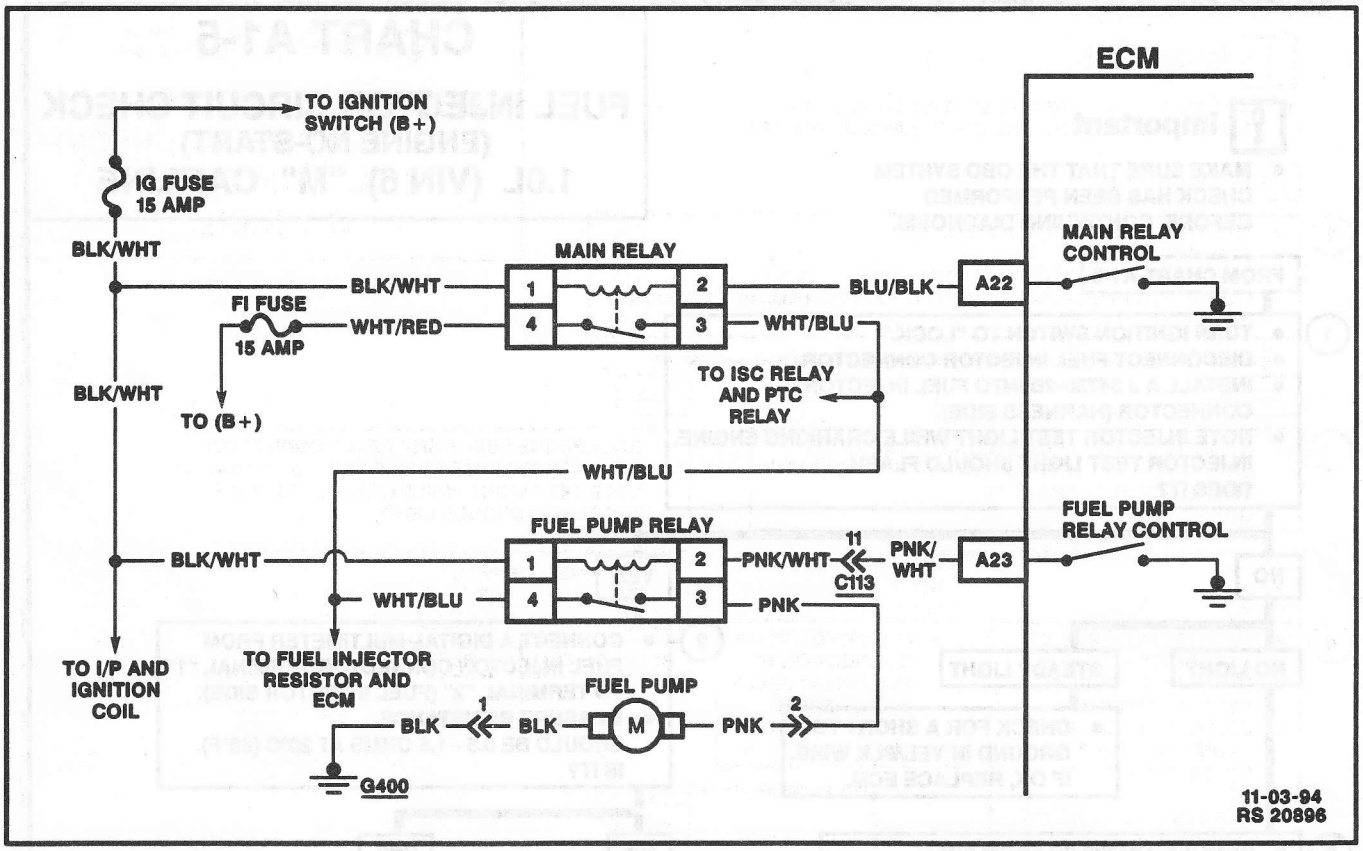
5. BACKPROBE FUEL INJECTOR RESISTOR CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "1" TO GROUND.
   - MEASURE VOLTAGE. SHOULD BE B+. IS IT?

**YES**
- CHECK FOR AN OPEN OR SHORT TO GROUND IN YEL WIRE.
- CHECK FOR A POOR CONNECTION AT FUEL INJECTOR RESISTOR. IF OK, REPLACE FUEL INJECTOR RESISTOR.

**NO**

REPAIR OPEN IN WHT/BLU WIRE.

6-9-94
RS 20895




# CHART A1-7A

## FUEL SYSTEM DIAGNOSIS
## (FUEL PUMP RELAY CHECK)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

When the ignition switch is turned to the "ON" position, the Engine Control Module (ECM) will energize the fuel pump relay for 2 seconds, allowing for fuel pump operation. When the fuel pump relay is de-energized, the fuel pump stops operating. If the engine is being cranked, or is running, the fuel pump will continue to operate, as long as the ECM is receiving ignition reference pulses. If the ignition reference pulses are not detected, the fuel pump will stop after 2 seconds.

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

1. Checks fuel pump operation with ignition switch in the "ON" position.
2. Checks fuel pump relay switch for power.
3. Checks for faulty ECM or improper fuel pressure.
4. Checks fuel pump circuit.
5. Checks for an open PNK wire.
6. Checks fuel pump relay coil for power.
7. Checks for faulty fuel pump, a poor ground connection or an open BLK wire.
8. Checks for faulty fuel pump relay.
9. Checks for faulty ECM or an open PNK/WHT wire.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# CHART A1-7A
## FUEL SYSTEM DIAGNOSIS (FUEL PUMP RELAY CHECK) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM CHART A1-5

**1**
- TURN IGNITION SWITCH TO "LOCK."
- REMOVE FUEL CAP.
- TURN IGNITION SWITCH TO "ON."
LISTEN FOR FUEL PUMP TO RUN FOR APPROXIMATELY 2 SECONDS.
DOES IT?

**NO**

**2**
- BACKPROBE FUEL PUMP RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "4" TO GROUND.
TEST LIGHT SHOULD LIGHT.
DOES IT?

**YES**

**4**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT FUEL PUMP RELAY CONNECTOR.
- CONNECT A JUMPER FROM FUEL PUMP RELAY CONNECTOR CAVITY "3" TO CAVITY "4".
- TURN IGNITION SWITCH TO "ON."
FUEL PUMP SHOULD RUN.
DOES IT?

**NO**

**5**
- LEAVE JUMPER CONNECTED.
- BACKPROBE FUEL PUMP CONNECTOR WITH A TEST LIGHT FROM CAVITY "2" TO GROUND.
TEST LIGHT SHOULD LIGHT.
DOES IT?

**YES**

**7**
- TURN IGNITION SWITCH TO "LOCK."
- REMOVE JUMPER.
- DISCONNECT FUEL PUMP CONNECTOR.
- CONNECT A TEST LIGHT FROM FUEL PUMP CONNECTOR CAVITY "1" (HARNESS SIDE) TO B+.
TEST LIGHT SHOULD LIGHT.
DOES IT?

**YES**
- CHECK FOR POOR CONNECTION AT FUEL PUMP.
IF OK, REPLACE FUEL PUMP.

**NO**
- CHECK FOR POOR GROUND CONNECTION AT G400.
IF OK, REPAIR OPEN IN BLK WIRE.

**NO**
- CHECK FOR POOR CONNECTION AT FUEL PUMP RELAY.
IF OK, REPAIR OPEN IN WHT/BLU WIRE.

**YES**

**3**
- BACKPROBE FUEL PUMP RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "2" TO B+.
- NOTE TEST LIGHT WHILE CRANKING ENGINE.
TEST LIGHT SHOULD LIGHT.
DOES IT?

**NO**
REPLACE ECM.

**YES**
REFER TO CHART A1-7B.

**YES**

**6**
- TURN IGNITION SWITCH TO "LOCK."
- REMOVE JUMPER FROM FUEL PUMP RELAY CONNECTOR.
- TURN IGNITION SWITCH TO "ON."
- BACKPROBE FUEL PUMP RELAY CONNECTOR WITH A TEST LIGHT FROM CAVITY "1" TO GROUND.
- TEST LIGHT SHOULD LIGHT.
DOES IT?

**YES**

**8**
- CONNECT A TEST LIGHT FROM FUEL PUMP RELAY CONNECTOR CAVITY "2" TO B+.
- NOTE TEST LIGHT WHILE CRANKING ENGINE.
TEST LIGHT SHOULD LIGHT.
DOES IT?

**NO**

**9**
- BACKPROBE ECM CONNECTOR C1 WITH A TEST LIGHT FROM CAVITY "A23" TO B+.
- NOTE TEST LIGHT WHILE CRANKING ENGINE.
TEST LIGHT SHOULD LIGHT.
DOES IT?

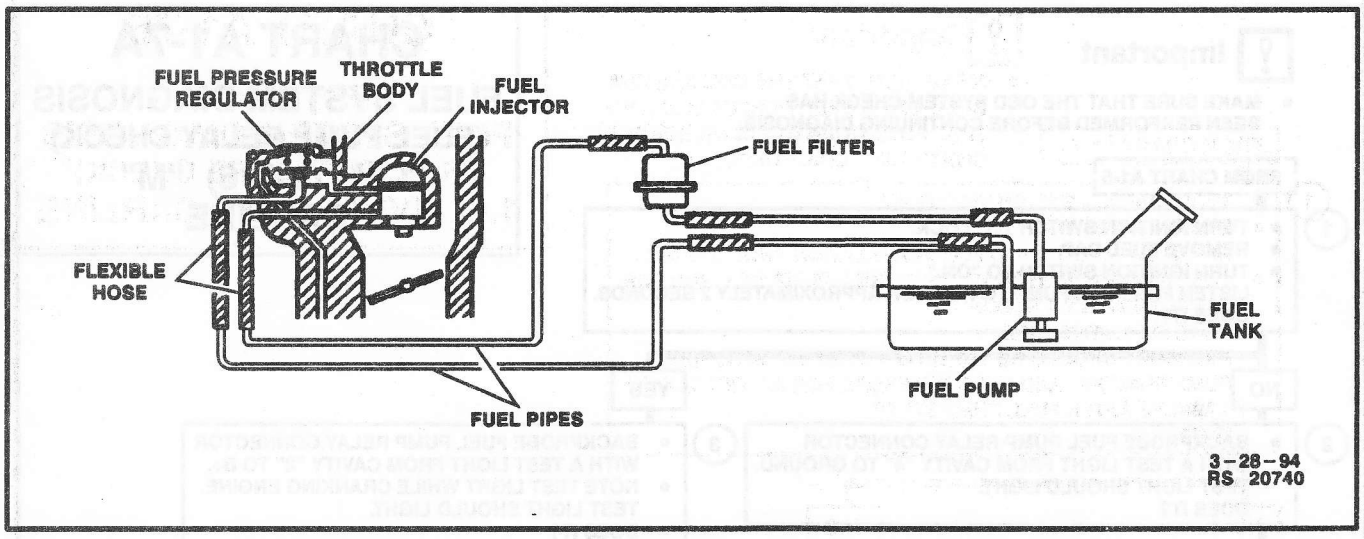
**NO**
- CHECK FOR POOR CONNECTION AT ECM.
IF OK, REPLACE ECM.

**YES**
REPAIR OPEN IN PNK/WHT WIRE BETWEEN FUEL PUMP RELAY AND ECM.

**NO**
- CHECK FOR POOR CONNECTION AT FUEL PUMP RELAY.
IF OK, REPAIR OPEN IN BLK/WHT WIRE.

**YES**
- CHECK FOR POOR CONNECTION AT FUEL PUMP RELAY.
IF OK, REPLACE FUEL PUMP RELAY.

11-1-94
RS 20897




# CHART A1-7B

## (Page 1 of 2)
## FUEL SYSTEM DIAGNOSIS
## (FUEL PRESSURE CHECK)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

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

The fuel pump will deliver fuel to the Throttle Body Fuel Injection (TBI) unit and fuel injector, then to the fuel pressure regulator, where the system pressure is controlled to about 160-210 kPa (23-31 psi) with the ignition switch "ON" and to about 90-140 kPa (13-20 psi) with the engine idling at normal operating temperature. Excess fuel is then returned to the fuel tank.

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

1. Checks to see if fuel system pressure is within specifications.
2. Checks fuel feed pipe and hose for leaks.
3. Checks for faulty fuel pump or a leaky fuel filter.
4. Checks for a leaky fuel injector, throttle body or for a faulty fuel pressure regulator.

**Diagnostic Aids:** Improper fuel system pressure can result in one of the following conditions:

- Cranks, but will not run.
- Cuts out, may feel like an ignition malfunction.
- Poor fuel economy, loss of power.
- Hard starts.

# CHART A1-7B

(Page 1 of 2)

## FUEL SYSTEM DIAGNOSIS (FUEL PRESSURE CHECK) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED AND THAT FUEL QUANTITY IS OK BEFORE CONTINUING DIAGNOSIS.

FROM CHART A1-7A

**1**
- TURN IGNITION SWITCH TO "LOCK."
- INSTALL A J 34730-1. REFER TO CHART A1-7C FOR INSTALLATION PROCEDURES.
- TURN IGNITION SWITCH TO "ON." FUEL PUMP WILL RUN FOR APPROXIMATELY 2 SECONDS.
- NOTE FUEL PRESSURE. PRESSURE SHOULD BE 160-210 kPa (23-31 psi) WITH FUEL PUMP RUNNING, AND HOLD PRESSURE FOR APPROXIMATELY 1 MINUTE AFTER FUEL PUMP STOPS. IS IT?

**NO**

- FUEL PRESSURE IS BETWEEN 160-210 kPa (23-31 psi) BUT DOES NOT HOLD.
- FUEL PRESSURE IS BELOW 160 kPa (23 psi) OR IS ABOVE 210 kPa (31 psi).
  - REFER TO CHART A1-7B (PAGE 2 OF 2).
- NO PRESSURE AT ALL.
  - CHECK FOR RESTRICTED FUEL FILTER, FUEL FEED PIPE OR HOSE. IF OK, REPLACE FUEL PUMP.

**YES**

- FUEL PRESSURE IS NORMAL. IF PROBLEM IS STILL "ENGINE CRANKS BUT WILL NOT RUN," REFER TO SECTION 6E2-B.

**2**
- CHECK FUEL FEED PIPE AND HOSE CONNECTION FOR LEAKS.

**NO LEAKS**

**3**
- TURN IGNITION SWITCH TO "LOCK."
- TURN IGNITION SWITCH TO "ON." FUEL PUMP WILL RUN FOR APPROXIMATELY 2 SECONDS.
- CHECK FUEL PRESSURE WHILE BLOCKING (PINCHING) FUEL FEED HOSE BEFORE PRESSURE GAGE. PRESSURE SHOULD HOLD AT ABOUT 160 kPa (23 psi). DOES IT?

**LEAKS**

- REPAIR LEAKAGE AS NECESSARY.

**NO**

**4**
- TURN IGNITION SWITCH TO "LOCK."
- TURN IGNITION SWITCH TO "ON." FUEL PUMP WILL RUN FOR APPROXIMATELY 2 SECONDS.
- CHECK FUEL PRESSURE WHILE BLOCKING (PINCHING) FUEL RETURN HOSE. PRESSURE SHOULD REMAIN AT OR ABOVE 160 kPa (23 psi). DOES IT?

**YES**

- CHECK FOR LEAKAGE AT FUEL FILTER. IF OK, REPLACE FUEL PUMP.

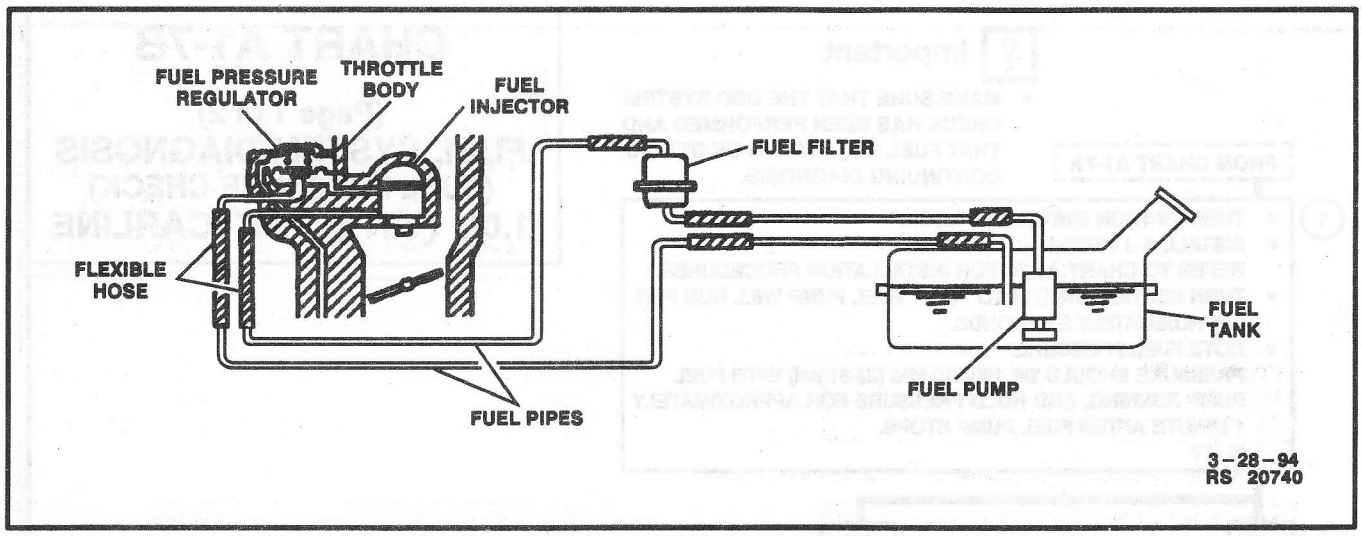
**YES**

- REPLACE FUEL PRESSURE REGULATOR.

**NO**

- CHECK FOR LEAKAGE AT FUEL INJECTOR OR BETWEEN FUEL INJECTOR AND THROTTLE BODY. IF OK, REPLACE FUEL PUMP.

6-13-94
RS 20898




# CHART A1-7B

## (Page 2 of 2)
## FUEL SYSTEM DIAGNOSIS
## (FUEL PRESSURE CHECK)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

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

The fuel pump will deliver fuel to the Throttle Body Fuel injection (TBI) unit and fuel injector, then to the fuel pressure regulator, where the system pressure is controlled to about 160-210 kPa (23-31 psi) with the ignition switch "ON" and to about 90-140 kPa (13-20 psi) with the engine idling at normal operating temperature. Excess fuel is then returned to the fuel tank.

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

5. Checks for a restricted fuel feed pipe or fuel filter or for a faulty fuel pressure regulator.
6. This determines if there is a restricted fuel return pipe or fuel pressure regulator.

**Diagnostic Aids:** Improper fuel system pressure can result in one of the following conditions:

- Cranks, but will not run.
- Cuts out, may feel like an ignition malfunction.
- Poor fuel economy, loss of power.
- Hard starts.

# CHART A1-7B

(Page 2 of 2)

## FUEL SYSTEM DIAGNOSIS
(FUEL PRESSURE CHECK)
1.0L (VIN 6) "M" CARLINE

FROM CHART A1-7B (Page 1 of 2)
FUEL PRESSURE IS BELOW 160 kPa (23 psi) OR IS ABOVE 210 kPa (31 psi).

FUEL PRESSURE IS BELOW 160 kPa (23 psi).

(5)
- TURN IGNITION SWITCH TO "LOCK."
- TURN IGNITION SWITCH TO "ON."
  CHECK FUEL PRESSURE WHILE BLOCKING (PINCHING) FUEL RETURN HOSE.
  PRESSURE SHOULD BE 160 kPa (23 psi) OR HIGHER.
  IS IT?

NO
- CHECK FOR LEAKS AT HOSE CONNECTION TO FUEL PUMP IN FUEL TANK.
- CHECK FOR A RESTRICTED FUEL FEED PIPE OR FUEL FILTER.
  IF OK, REPLACE FUEL PUMP.

YES
REPLACE FUEL PRESSURE REGULATOR.

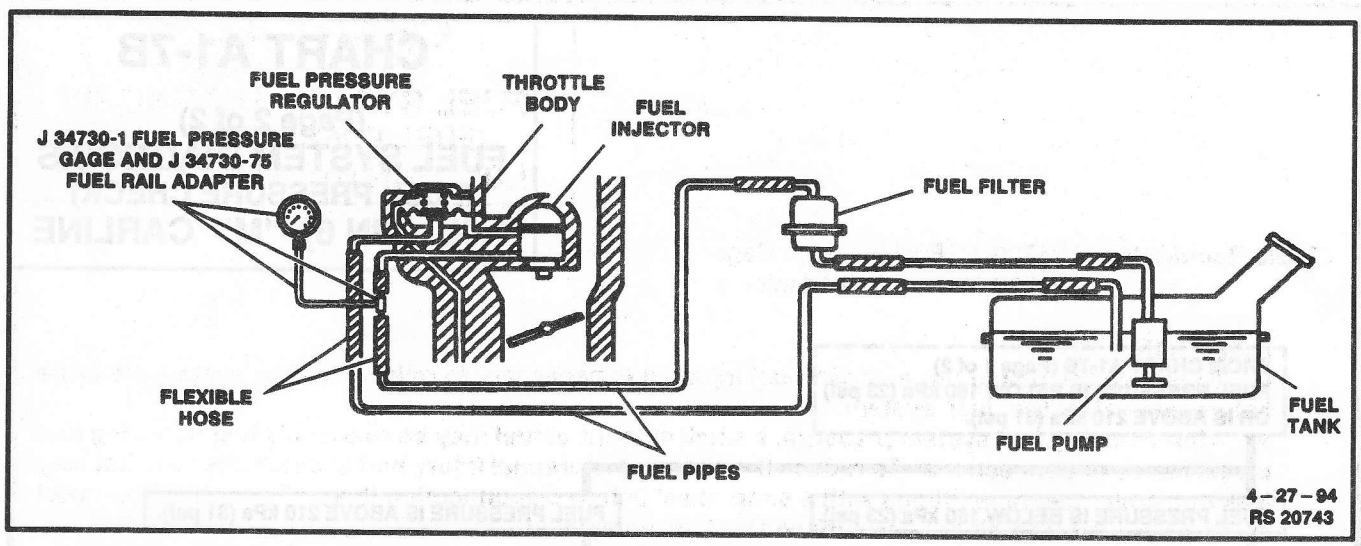
FUEL PRESSURE IS ABOVE 210 kPa (31 psi).

(6)
- TURN IGNITION SWITCH TO "LOCK."
- RELIEVE FUEL SYSTEM PRESSURE. REFER TO "FUEL PRESSURE GAGE REMOVAL" IN CHART A1-7C AND PERFORM STEPS 1 THROUGH 5 ONLY.
- DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR.
- CONNECT A NEW RETURN HOSE TO FUEL PRESSURE REGULATOR.
- INSERT THE OTHER END OF THE NEW HOSE INTO AN APPROVED GASOLINE CONTAINER.
- RECONNECT FUEL PUMP RELAY CONNECTOR.
- TURN IGNITION SWITCH TO "ON."
  PRESSURE SHOULD BE 160-210 kPa (23-31 psi).
  IS IT?

NO
REPLACE FUEL PRESSURE REGULATOR.

YES
- CHECK FOR RESTRICTED FUEL RETURN PIPE OR HOSE. REPLACE AS NECESSARY.

5-10-94
RS 20899




# CHART A1-7C

## FUEL SYSTEM DIAGNOSIS
## (FUEL PRESSURE GAGE)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The following procedure outlines the installation and removal of the fuel pressure gage. Make sure to observe all cautions while performing this procedure.

# CHART A1-7C

## FUEL SYSTEM DIAGNOSIS (FUEL PRESSURE GAGE) 1.0L (VIN 6) "M" CARLINE

**Tools Required:** J 34730-1 Fuel Pressure Gage
J 34730-75 Fuel Rail Adapter

**CAUTION:**

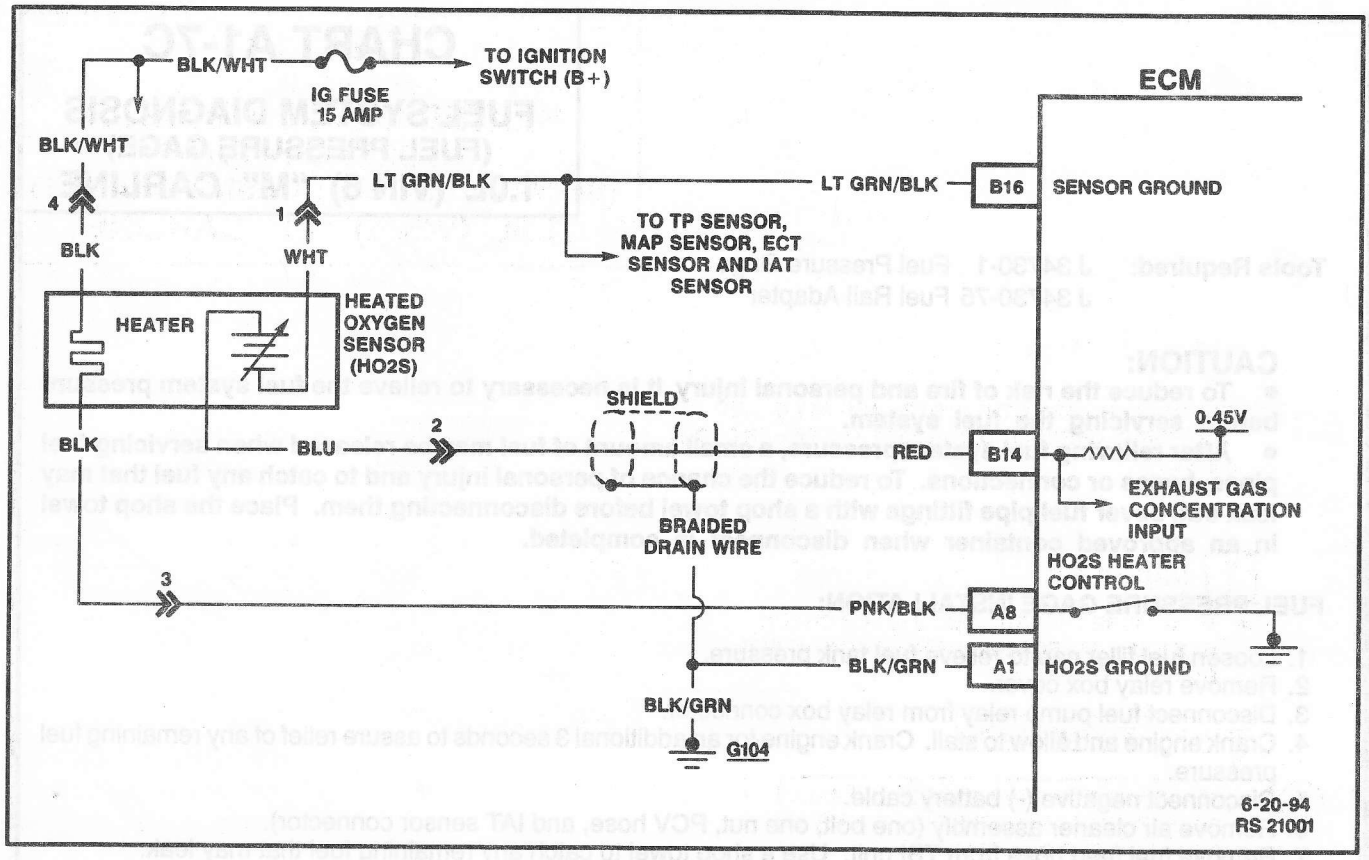
- **To reduce the risk of fire and personal injury, it is necessary to relieve the fuel system pressure before servicing the fuel system.**
- **After relieving fuel system pressure, a small amount of fuel may be released when servicing fuel pipes, hoses or connections. To reduce the chance of personal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

**FUEL PRESSURE GAGE INSTALLATION:**

1. Loosen fuel filler cap to relieve fuel tank pressure.
2. Remove relay box cover.
3. Disconnect fuel pump relay from relay box connector.
4. Crank engine and allow to stall. Crank engine for an additional 3 seconds to assure relief of any remaining fuel pressure.
5. Disconnect negative (-) battery cable.
6. Remove air cleaner assembly (one bolt, one nut, PCV hose, and IAT sensor connector).
7. Remove fuel feed hose from TBI unit. Use a shop towel to catch any remaining fuel that may leak.
8. Install J 34730-75 to TBI unit.
9. Install J 34730-1 to J 34730-75.
10. Install air cleaner assembly to TBI unit (one bolt, one nut, PCV hose, and IAT sensor connector).
11. Reconnect negative (-) battery cable. Tighten to 15 N·m (11 lb.ft.).
12. Install fuel pump relay into its connector.
13. Install relay box cover and tighten fuel filler cap.

**FUEL PRESSURE GAGE REMOVAL:**

1. Loosen fuel filler cap to relieve fuel tank pressure.
2. Remove relay box cover.
3. Disconnect fuel pump relay from relay box connector.
4. Crank engine and allow to stall. Crank engine for an additional 3 seconds to assure relief of any remaining fuel pressure.
5. Remove negative (-) battery cable.
6. Remove air cleaner assembly (one bolt, one nut, PCV hose, and IAT sensor connector).
7. Remove J 34730-1 and J 34730-75 from TBI unit. Use a shop towel to catch any remaining fuel that may leak.
8. Reconnect fuel feed hose to TBI unit.
9. Install air cleaner assembly to TBI unit (one bolt, one nut, PCV hose, and IAT sensor connector).
10. Reconnect negative (-) battery cable. Tighten to 15 N·m (11 lb.ft.).
11. Install fuel pump relay into its connector.
12. Install relay box cover and tighten fuel filler cap.
13. Turn ignition switch to "ON" and then to "LOCK." Check for any fuel leaks.




# DTC 13

## HEATED OXYGEN SENSOR (HO2S) CIRCUIT
## (SIGNAL VOLTAGE DOESN'T CHANGE)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Heated Oxygen Sensor (HO2S) produces a varying voltage after the sensor is hot, above 360°C (600°F). This voltage varies from 0 to 900 mV. The signal will vary, depending on the exhaust gas oxygen content. After the sensor is hot, if the voltage stays above 450 mV for more than 10 seconds, this indicates a rich condition. If voltage remains below 450 mV for more than 10 seconds, a lean condition is indicated.

The HO2S acts like an "open circuit" and produces no voltage when below 360°C (600°F). An open HO2S sensor circuit causes the fuel control system to operate in an "Open Loop" operation.

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

1. HO2S output voltage, at this step, should be fluctuating between 0-1 volt.
2. When the vacuum hose is removed from the MAP sensor, its output voltage will increase, and the ECM should interpret this as a high engine load. The ECM should increase the fuel injector pulse width, causing a rich air/fuel mixture. This should cause the HO2S to generate a high output voltage, usually more than 0.900 volt (900 mV).

**Diagnostic Aids:** Normal voltage varies between 0 mV and 900 mV.

A loose or intermittent Heated Oxygen Sensor (HO2S) ground circuit could cause DTC 13 to set. The grounding point at the engine is located on the rear of the intake manifold, on the lower right edge.

Refer to SECTION 6E2-C1 for additional HO2S specifications.

Refer to 8A-5 for HO2S wiring repairs.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 13

## HEATED OXYGEN SENSOR (HO2S) CIRCUIT (SIGNAL VOLTAGE DOESN'T CHANGE) 1.0L (VIN 6) "M" CARLINE

* IF DTC 13 AND ANY OTHER DTCs ARE SET IN MEMORY TOGETHER, CHECK AND CORRECT THE OTHER DTC(s) FIRST.

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

(1)
- START AND RUN ENGINE UNTIL NORMAL OPERATING TEMPERATURE IS REACHED.
- RUN ENGINE AT 2000 RPM.
- NOTE TECH 1 SCAN TOOL HO2S DISPLAY.

**0 mV**
- CHECK LT GRN/BLK AND RED WIRES BETWEEN HO2S AND ECM FOR OPENS OR SHORTS TO GROUND.
IF OK, REPLACE HO2S.

**REMAINS UNCHANGED BETWEEN 0 AND 450 mV.**

(2)
- MAINTAIN ENGINE SPEED AT 2000 RPM.
- DISCONNECT VACUUM HOSE FROM MAP SENSOR.
- NOTE TECH 1 SCAN TOOL HO2S DISPLAY.

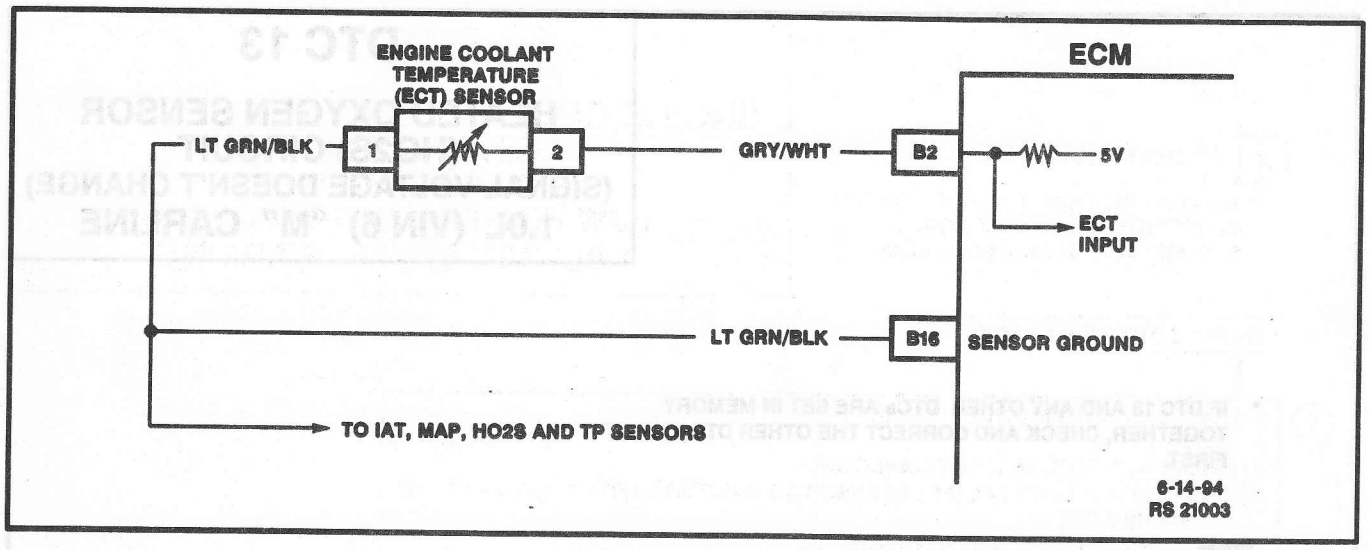
**LESS THAN 450 mV**
- REPLACE HO2S.

**450 mV OR MORE**
- CHECK MAP, ECT AND IAT SENSORS.
- CHECK FUEL PRESSURE AND FUEL INJECTOR.
IF OK, REPLACE ECM.

**REMAINS UNCHANGED ABOVE 450 mV.**
- CHECK FOR A SHORT TO VOLTAGE IN RED WIRE BETWEEN HO2S AND ECM.
- CHECK TP, ECT, IAT AND MAP SENSORS.
- CHECK FOR CLOGGED VACUUM HOSE TO MAP SENSOR.
- CHECK FUEL PRESSURE AND FUEL INJECTOR.
IF OK, REPLACE ECM.

"*AFTER REPAIRS*," CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 21002




# DTC 14

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (HIGH VOLTAGE INPUT - LOW TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Engine Coolant Temperature (ECT) sensor is a thermistor (a variable resistor that changes along with engine coolant temperature) in series with a fixed resistor in the Engine Control Module (ECM). The ECM applies 5 volts to the ECT sensor. The ECM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM will receive a high voltage input, and when the engine is warm the ECM will receive a low voltage input.

DTC 14 will set if the following condition is met for at least 1.6 seconds:

- Voltage input at the ECM indicates ECT below -48°C (-54°F).

### DTC Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test simulates DTC 15. If the ECM stores DTC 15, the ECM and its wiring are OK and the ECT sensor is faulty. If DTC 14 resets, the ECT sensor is OK and the wiring to the ECM or the ECM is faulty.
2. This test determines whether there is an open in the GRY/WHT or LT GRN/BLK wires, a short to voltage in the GRY/WHT wire or a faulty ECM.

### Diagnostic Aids:

After the engine is started the ECT should rise steadily to about 95°C (203°F) and stabilize when the thermostat opens.

DTCs 14, 23 and 32 stored at the same time could be the result of an open LT GRN/BLK sensor ground wire.

When replacing the ECT sensor the "Temperature to Resistance Value" scale on the diagnostic chart may be used to test the ECT 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 SECTION 6E2-C1 for additional ECT sensor specifications.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 14

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (HIGH VOLTAGE INPUT - LOW TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - TURN IGNITION SWITCH TO "LOCK."
   - CLEAR DTCs.
   - DISCONNECT ECT SENSOR CONNECTOR.
   - CONNECT A JUMPER FROM ECT SENSOR CONNECTOR CAVITY "1" TO CAVITY "2" (HARNESS SIDE).
   - START ENGINE AND RUN FOR 1 MINUTE.
   - DOES TECH 1 SCAN TOOL INDICATE DTC 14 OR DTC 15?

DTC 14

2. 
   - TURN IGNITION SWITCH TO "LOCK."
   - REMOVE JUMPER FROM ECT SENSOR CONNECTOR.
   - CONNECT A DIGITAL MULTIMETER FROM CONNECTOR CAVITY "2" TO GROUND.
   - TURN IGNITION SWITCH TO "ON."
   - MEASURE VOLTAGE.

DTC 15

- CHECK FOR POOR CONNECTION AT ECT SENSOR.
  IF OK, REPLACE ECT SENSOR.

4–6 VOLTS

- CHECK FOR AN OPEN IN LT GRN/BLK WIRE.
- CHECK FOR A POOR CONNECTION AT ECM.
  IF OK, REPLACE ECM.

0 VOLTS

- CHECK FOR AN OPEN IN GRY/WHT WIRE.
- CHECK FOR POOR CONNECTION AT ECM.
  IF OK, REPLACE ECM.

MORE THAN 6 VOLTS

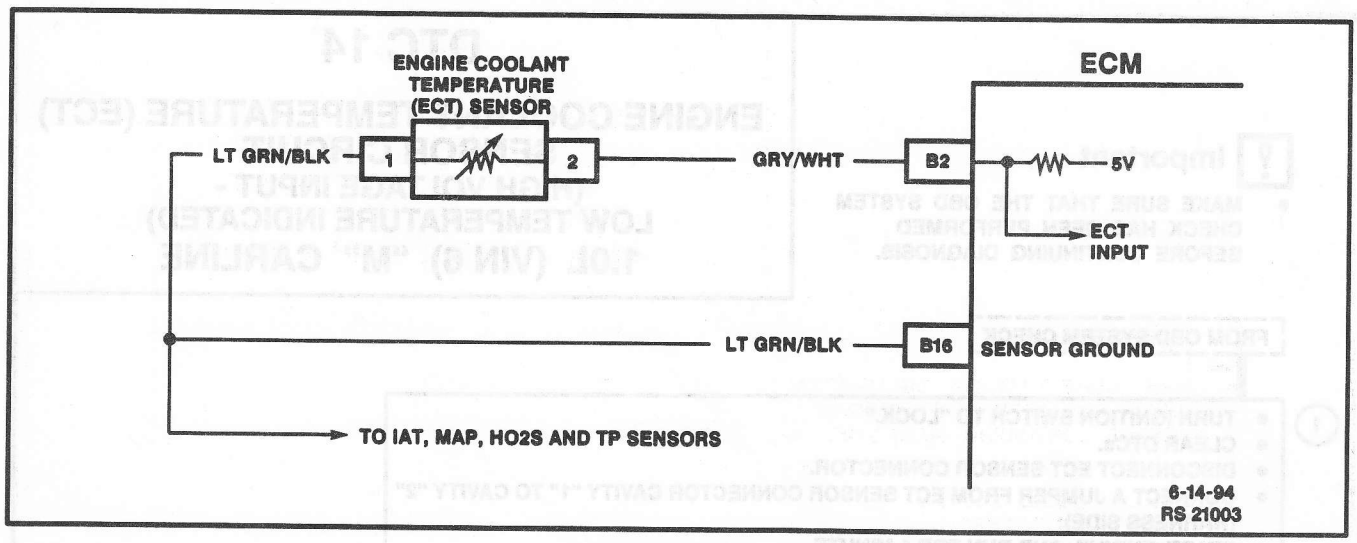
- CHECK FOR A SHORT TO VOLTAGE IN GRY/WHT WIRE.
  IF OK, REPLACE ECM.

### DIAGNOSTIC AID

| ECT SENSOR | | |
|---|---|---|
| TEMPERATURE TO RESISTANCE VALUES (APPROXIMATE) | | |
| °F | °C | OHMS |
| 210 | 99 | 190 |
| 160 | 71 | 400 |
| 100 | 38 | 1,250 |
| 70 | 21 | 2,350 |
| 40 | 4 | 4,780 |
| 20 | -7 | 8,100 |
| 0 | -18 | 14,650 |

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 20860




# DTC 15

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT
### (LOW VOLTAGE INPUT - HIGH TEMPERATURE INDICATED)
### 1.0L (VIN 6) "M" CARLINE

**Circuit Description:**

The Engine Coolant Temperature (ECT) sensor is a thermistor (a variable resistor that changes along with engine coolant temperature) in a series with a fixed resistor in the Engine Control Module (ECM). The ECM applies 5 volts to the sensor. The ECM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM will receive a high voltage input, and when the engine is warm the ECM will receive a low voltage input.

DTC 15 will set if the following condition is met for at least 1.6 seconds:

- Voltage input at the ECM indicates ECT above 136°C (276°F).

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

1. This test simulates DTC 14. If the ECM stores DTC 14, the ECM and its wiring are OK and the ECT sensor is faulty. If DTC 15 resets, the ECT sensor is OK and the wiring to the ECM or the ECM is faulty.

**Diagnostic Aids:** After the engine is started, the ECT should rise steadily to about 95°C (203°F) and stabilize when the thermostat opens.

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.).

When replacing the ECT sensor the "Temperature To Resistance Value" scale on diagnostic chart may be used to test the ECT 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 SECTION 6E2-C1 for additional ECT sensor specifications.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 15

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT (LOW VOLTAGE INPUT - HIGH TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

(1)
- TURN IGNITION SWITCH TO "LOCK."
- CLEAR DTCs.
- DISCONNECT ECT SENSOR CONNECTOR.
- START AND RUN ENGINE FOR 1 MINUTE.

DOES TECH 1 SCAN TOOL INDICATE DTC 14 OR DTC 15?

DTC 14

REPLACE ECT SENSOR.

DTC 15

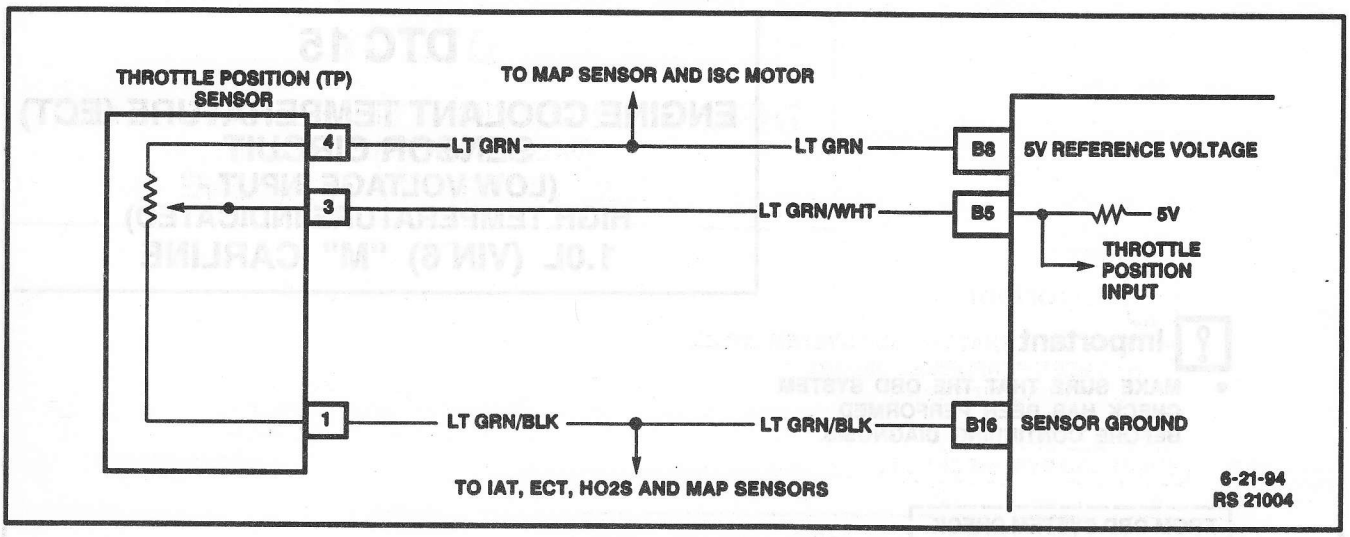
- CHECK FOR SHORT TO GROUND IN GRY/WHT WIRE. IF OK, REPLACE ECM.

### DIAGNOSTIC AID

| ECT SENSOR | | |
|---|---|---|
| TEMPERATURE TO RESISTANCE VALUES (APPROXIMATE) | | |
| °F | °C | OHMS |
| 210 | 99 | 190 |
| 160 | 71 | 400 |
| 100 | 38 | 1,250 |
| 70 | 21 | 2,350 |
| 40 | 4 | 4,780 |
| 20 | -7 | 8,100 |
| 0 | -18 | 14,650 |

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

5-4-94
RS 20861




# DTC 21

## THROTTLE POSITION (TP) SENSOR CIRCUIT
### (HIGH VOLTAGE INPUT)
### 1.0L (VIN 6) "M" CARLINE

## Circuit Description:

The Throttle Position (TP) sensor has a potentiometer whose resistance changes along with the throttle valve position. The Engine Control Module (ECM) provides a 5 volt reference voltage to the TP sensor. The ECM reads the voltage across the TP sensor and converts it into throttle position. When the TP sensor resistance decreases, the throttle valve opening is increasing to wide open throttle, and the voltage being monitored at the ECM increases. When the TP sensor resistance increases, the throttle valve opening is decreasing to idle, and the voltage being monitored at the ECM decreases.

DTC 21 will set if the following condition is met for at least 1.6 seconds:

- High voltage input at the ECM indicated with the engine running at idle.

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

1. Checks for an open or short to voltage in LT GRN/WHT wire or for a faulty ECM.
2. Checks for an open or short to voltage in LT GRN wire or for a faulty ECM.
3. Checks for an open LT GRN/BLK wire or for a faulty ECM or a misadjusted or faulty TP sensor.

**Diagnostic Aids:** Refer to SECTION 6E2-C1 for TP sensor adjustment and/or check.

DTC 21, DTC 46 and DTC 22 stored at the same time could be the result of an open LT GRN wire.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 21

## THROTTLE POSITION (TP) SENSOR CIRCUIT
### (HIGH VOLTAGE INPUT)
### 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

**1**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT TP SENSOR CONNECTOR.
- CONNECT A DIGITAL MULTIMETER FROM TP SENSOR CONNECTOR CAVITY "3" TO GROUND.
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE. SHOULD BE 4-5 VOLTS. IS IT?

YES

**2**
- CONNECT A DIGITAL MULTIMETER FROM TP SENSOR CONNECTOR CAVITY "4" TO GROUND.
- MEASURE VOLTAGE. SHOULD BE 4-6 VOLTS. IS IT?

YES

**3**
- CONNECT A TEST LIGHT FROM TP SENSOR CONNECTOR CAVITY "1" TO B+. TEST LIGHT SHOULD LIGHT. DOES IT?

YES
- CHECK FOR A POOR CONNECTION AT TP SENSOR. IF OK, ADJUST/REPLACE TP SENSOR.

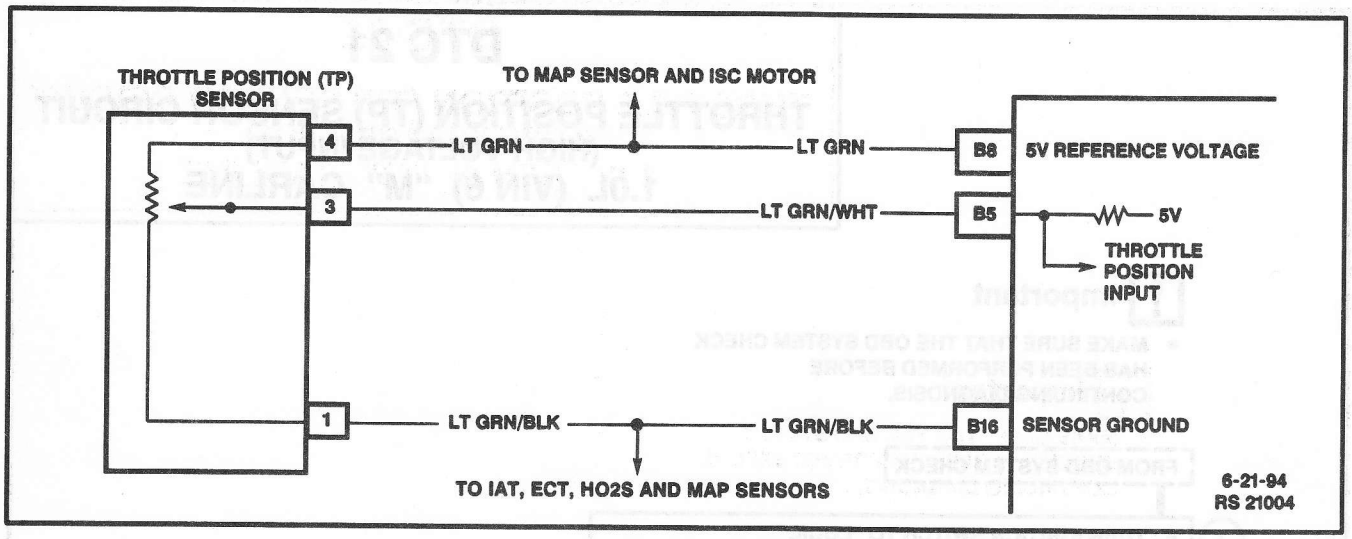
NO
- CHECK FOR AN OPEN IN LT GRN/BLK WIRE.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

NO
- CHECK FOR AN OPEN OR A SHORT TO VOLTAGE IN LT GRN WIRE.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

NO
- CHECK FOR AN OPEN OR SHORT TO VOLTAGE IN LT GRN/WHT WIRE.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 20863




# DTC 22

## THROTTLE POSITION (TP) SENSOR CIRCUIT (LOW VOLTAGE INPUT) 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Throttle Position (TP) sensor has a potentiometer whose resistance changes along with the throttle valve position. The Engine Control Module (ECM) provides a 5 volt reference voltage to the TP sensor. The ECM reads the voltage across the TP sensor and converts it into throttle position. When the TP sensor resistance decreases, the throttle valve opening is increasing to wide open throttle, and the voltage being monitored at the ECM increases. When the TP sensor resistance increases, the throttle valve opening is decreasing to idle, and the voltage being monitored at the ECM decreases.

DTC 22 will set if the following condition is met for at least 1.6 seconds:

- Low voltage input at the ECM indicated with the engine running off idle.

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

1. Measures TP sensor signal voltage at sensor and checks for short to ground in LT GRN/WHT wire.
2. Checks for reference voltage from the ECM or a faulty ECM, or a misadjusted or faulty TP sensor.

**Diagnostic Aids:** Refer to SECTION 6E2-C1 for TP sensor adjustment and/or check.

DTC 21, DTC 46 and DTC 22 stored at the same time could be the result of an open LT GRN wire.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 22

## THROTTLE POSITION (TP) SENSOR CIRCUIT
## (LOW VOLTAGE INPUT)
## 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT TP SENSOR CONNECTOR.
   - CONNECT A DIGITAL MULTIMETER FROM TP SENSOR CONNECTOR CAVITY "3" TO GROUND.
   - TURN IGNITION SWITCH TO "ON."
   - MEASURE VOLTAGE. SHOULD BE 4-5 VOLTS. IS IT?

NO
- CHECK FOR A SHORT TO GROUND IN LT GRN/WHT WIRE. IF OK, REPLACE ECM.

YES

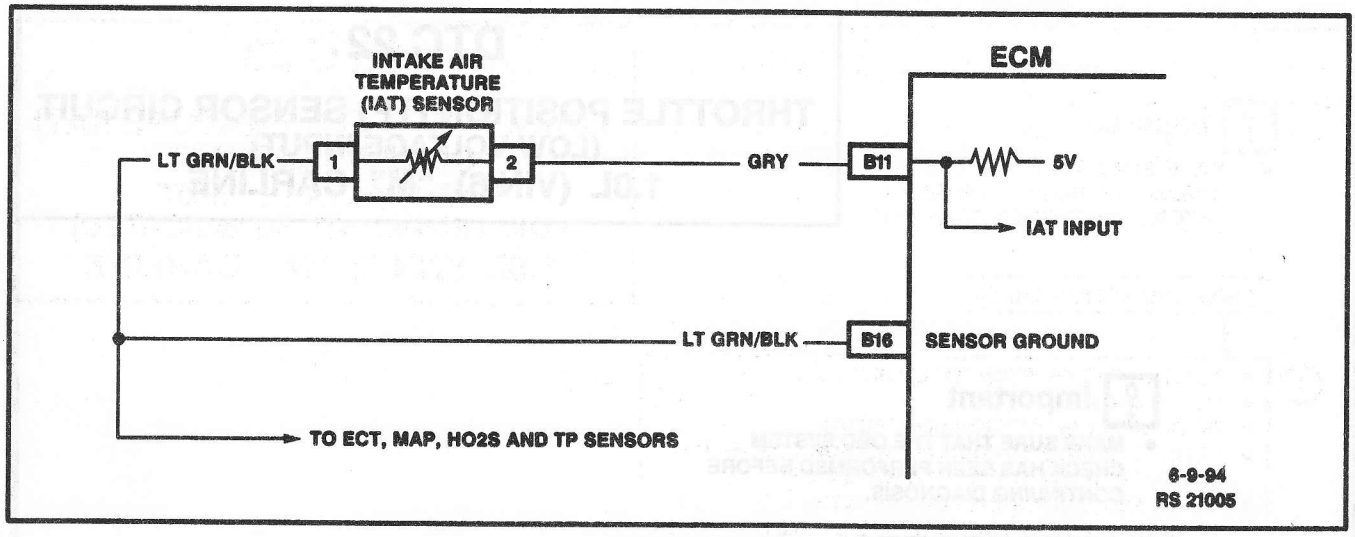
2. 
   - CONNECT A DIGITAL MULTIMETER FROM TP SENSOR CONNECTOR CAVITY "4" TO GROUND.
   - MEASURE VOLTAGE. SHOULD BE 4-6 VOLTS. IS IT?

NO
- CHECK FOR AN OPEN OR A SHORT TO GROUND IN LT GRN WIRE. IF OK, REPLACE ECM.

YES
- CHECK FOR A POOR CONNECTION AT TP SENSOR. IF OK, ADJUST/REPLACE TP SENSOR.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 20864




# DTC 23

## INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (HIGH VOLTAGE INPUT - LOW TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes along with outside air temperature) in series with a fixed resistor in the Engine Control Module (ECM). The ECM applies 5 volts to the sensor. The ECM monitors the voltage across the IAT sensor and converts it into a temperature reading. When the outside air temperature is cold the IAT sensor resistance is high, and when the outside air temperature is warm the IAT sensor resistance is low. Therefore, when the air temperature is cold the ECM will receive a high voltage input, and when the air temperature is warm the ECM will receive a low voltage input.

DTC 23 will set if the following condition is met for at least 1.6 seconds:

- Voltage input at the ECM indicates an air temperature below -48°C (-54°F).

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

1. This test simulates DTC 25. If the ECM stores DTC 25, the ECM and its wiring are OK and the IAT sensor is faulty. If DTC 23 resets, the IAT sensor is OK, and the wiring to the ECM or the ECM is faulty.
2. This test determines whether there is an open in the GRY or LT GRN/BLK wires, a short to voltage in the GRY wire or a faulty ECM.

**Diagnostic Aids:** When replacing the IAT sensor the "Temperature to Resistance Value" scale on the diagnostic chart may be used to test the 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 SECTION 6E2-C1 for additional IAT sensor specifications.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 23

## INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (HIGH VOLTAGE INPUT - LOW TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

(1)
- TURN IGNITION SWITCH TO "LOCK."
- CLEAR DTCs.
- DISCONNECT IAT SENSOR CONNECTOR.
- CONNECT A JUMPER FROM IAT SENSOR CONNECTOR CAVITY "1" TO CAVITY "2" (HARNESS SIDE).
- START AND RUN ENGINE FOR 1 MINUTE. DOES TECH 1 SCAN TOOL INDICATE DTC 23 OR DTC 25?

DTC 23

(2)
- TURN IGNITION SWITCH TO "LOCK."
- REMOVE JUMPER FROM IAT SENSOR CONNECTOR.
- CONNECT A DIGITAL MULTIMETER FROM IAT SENSOR CONNECTOR CAVITY "2" TO GROUND.
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE.

4–6 VOLTS
- CHECK FOR AN OPEN IN LT GRN/BLK WIRE.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

0 VOLTS
- CHECK FOR AN OPEN IN GRY WIRE.
- CHECK FOR POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

MORE THAN 6 VOLTS
- CHECK FOR A SHORT TO VOLTAGE IN GRY WIRE. IF OK, REPLACE ECM.

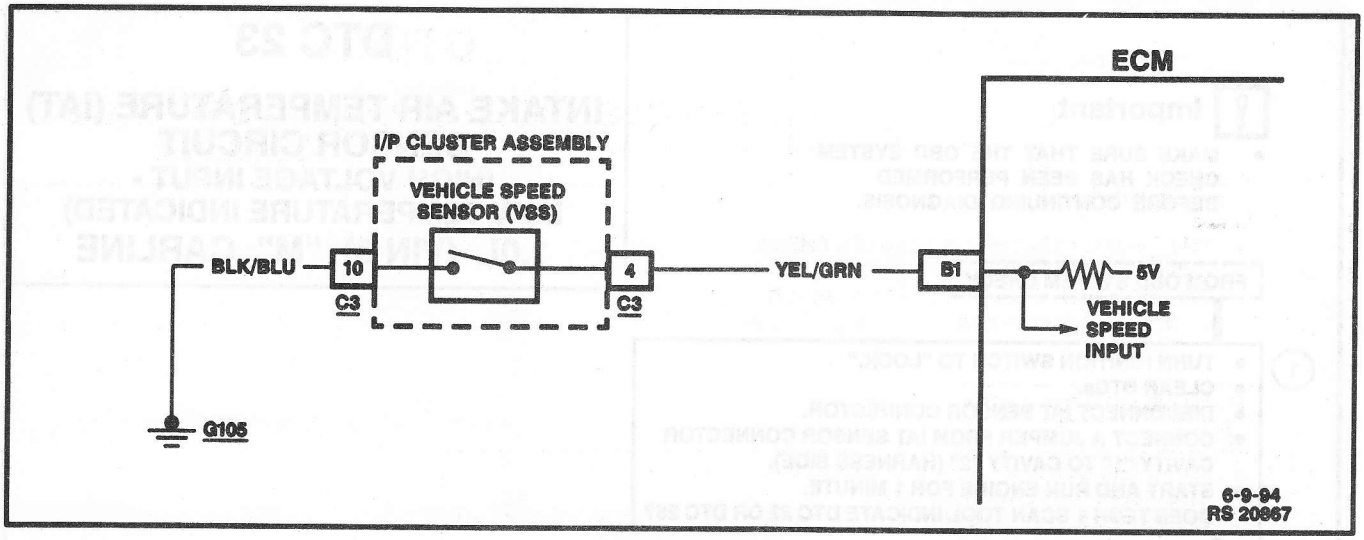
DTC 25
- CHECK FOR POOR CONNECTION AT IAT SENSOR. IF OK, REPLACE IAT SENSOR.

### DIAGNOSTIC AID

| IAT SENSOR | | |
|---|---|---|
| TEMPERATURE TO RESISTANCE VALUES (APPROXIMATE) | | |
| °F | °C | OHMS |
| 210 | 99 | 190 |
| 160 | 71 | 400 |
| 100 | 38 | 1,250 |
| 70 | 21 | 2,350 |
| 40 | 4 | 4,780 |
| 20 | -7 | 8,100 |
| 0 | -18 | 14,650 |

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 20866




# DTC 24

## VEHICLE SPEED SENSOR (VSS) CIRCUIT 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Engine Control Module (ECM) supplies 5 volts to the Vehicle Speed Sensor (VSS). While the vehicle is moving, the reed switch within the VSS will open and close four times per each revolution of the speedometer cable. Because the reed switch opens and closes, the voltage at the ECM is toggled high and low. The ECM then converts this toggled high/low voltage into a vehicle speed that is displayed in kph and MPH.

DTC 24 will set if the following condition is met for at least 4 seconds:

- A constant voltage signal (either high of low) detected at the ECM with the engine running and the vehicle moving.

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

1. Checks to see if malfunction is intermittent.
2. If the VSS is not receiving the 5 volts from the ECM, DTC 24 will set. This step checks for an open or short to ground in the YEL/GRN wire or for a faulty ECM.
3. Checks I/P cluster printed circuit for cracks or bad connections, an open in the BLK/BLU wire or for a faulty VSS.

**Diagnostic Aids:** If the speedometer cable is binding, DTC 24 can be set. Make sure that the speedometer cable is free from any restrictions and that it has a secure connection to the I/P cluster assembly.

Refer to "Intermittents" in SECTION 6E2-B.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 24

## VEHICLE SPEED SENSOR (VSS) CIRCUIT 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED AND CHECK THE SPEEDOMETER CABLE OPERATION BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. RAISE AND SUITABLY SUPPORT VEHICLE DRIVE AXLES.
   START AND RUN ENGINE IN GEAR.
   TECH 1 SCAN TOOL SHOULD DISPLAY VEHICLE SPEED ABOVE 0 kph/MPH.
   DOES IT?

NO

2. TURN IGNITION SWITCH TO "LOCK."
   LOWER VEHICLE.
   DISCONNECT I/P CLUSTER ASSEMBLY CONNECTOR C3.
   CONNECT A DIGITAL MULTIMETER FROM I/P CLUSTER ASSEMBLY CONNECTOR C3 TERMINAL "4" TO GROUND (HARNESS SIDE).
   TURN IGNITION SWITCH TO "ON."
   MEASURE VOLTAGE.
   SHOULD BE 4-5 VOLTS.
   IS IT?

YES

3. CONNECT A TEST LIGHT FROM I/P CLUSTER ASSEMBLY CONNECTOR C3 TERMINAL "10" (HARNESS SIDE) TO B+.
   TEST LIGHT SHOULD LIGHT.
   DOES IT?

YES

- CHECK I/P CLUSTER PRINTED CIRCUIT FOR CRACKS OR BAD CONNECTIONS.
  IF OK, REPLACE SPEEDOMETER ASSEMBLY.

NO

- CHECK FOR A CLEAN GROUND CONNECTION AT G105.
  IF OK, REPAIR OPEN IN BLK /BLU WIRE.

NO

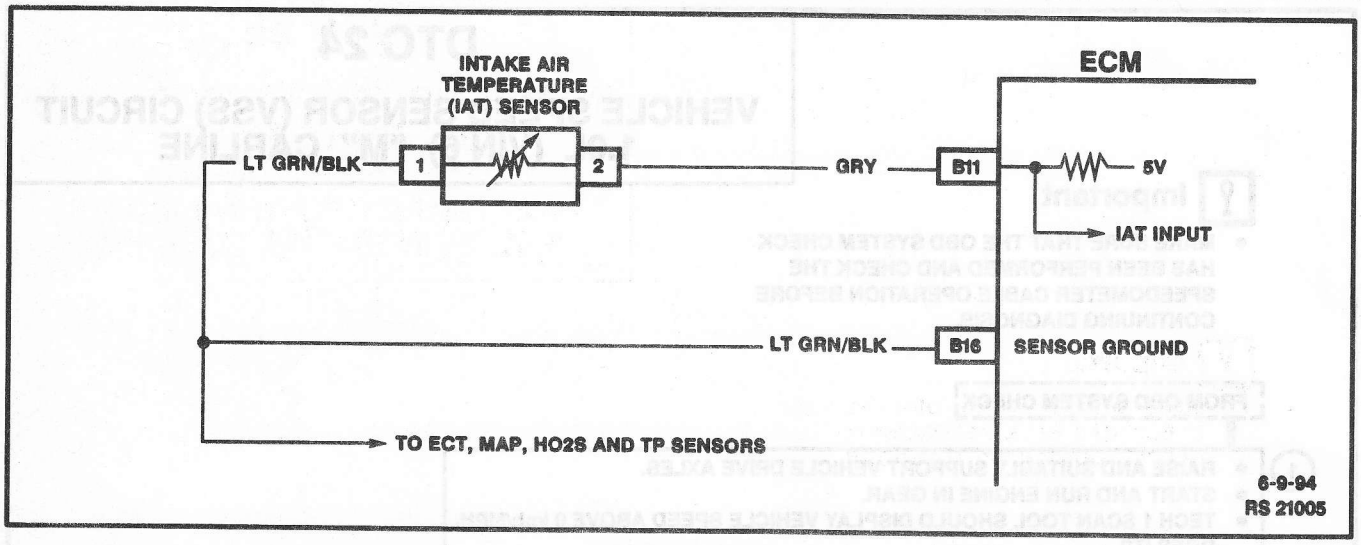
- CHECK FOR AN OPEN OR SHORT TO GROUND IN YEL/GRN WIRE.
- CHECK FOR POOR CONNECTION AT ECM.
  IF OK, REPLACE ECM.

YES

MALFUNCTION IS INTERMITTENT.
REFER TO "DIAGNOSTIC AIDS."

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-13-94
RS 20868




# DTC 25

## INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (LOW VOLTAGE INPUT - HIGH TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes along with outside air temperature) in series with a fixed resistor in the Engine Control Module (ECM). The ECM applies 5 volts to the sensor. The ECM monitors the voltage across the IAT sensor and converts it into a temperature reading. When the outside air temperature is cold the IAT sensor resistance is high, and when the outside air temperature is warm the IAT sensor resistance is low. Therefore, when the air temperature is cold the ECM will receive a high voltage input, and when the air temperature is warm the ECM will receive a low voltage input.

DTC 25 will set if the following condition is met for at least 1.6 seconds:

- Voltage input at the ECM indicates an air temperature above 136°C (276°F).

### DTC Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. This test simulates DTC 23. If the ECM stores DTC 23, the ECM and its wiring are OK and the IAT sensor is faulty. If DTC 25 resets, the IAT sensor is OK, and the wiring to the ECM or the ECM is faulty.

### Diagnostic Aids:

When replacing the IAT sensor the "Temperature to Resistance Value" scale on the diagnostic chart may be used to test the 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 SECTION 6E2-C1 for additional IAT sensor specifications.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 25

## INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT (LOW VOLTAGE INPUT - HIGH TEMPERATURE INDICATED) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - TURN IGNITION SWITCH TO "LOCK."
   - CLEAR DTCs.
   - DISCONNECT IAT SENSOR CONNECTOR.
   - START AND RUN ENGINE FOR 1 MINUTE.

   DOES TECH 1 SCAN TOOL INDICATE DTC 23 OR DTC 25?

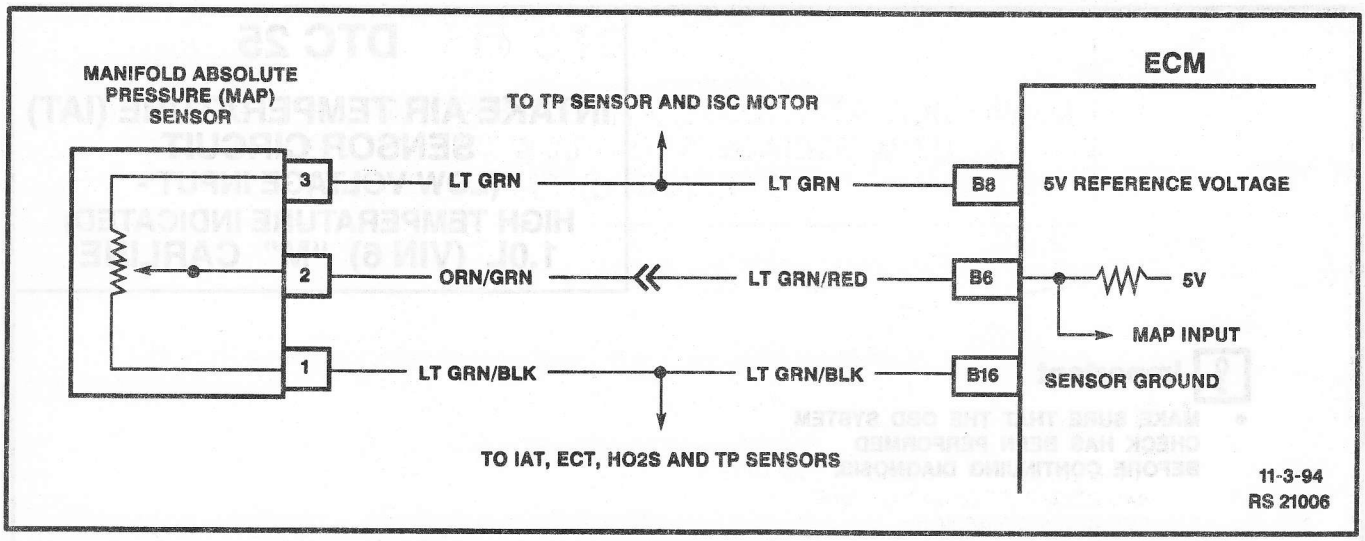
- DTC 23
  - REPLACE IAT SENSOR.
- DTC 25
  - CHECK FOR SHORT TO GROUND IN GRY WIRE. IF OK, REPLACE ECM.

### DIAGNOSTIC AID

| IAT SENSOR | | |
|---|---|---|
| TEMPERATURE TO RESISTANCE VALUES (APPROXIMATE) | | |
| °F | °C | OHMS |
| 210 | 99 | 190 |
| 160 | 71 | 400 |
| 100 | 38 | 1,250 |
| 70 | 21 | 2,350 |
| 40 | 4 | 4,780 |
| 20 | -7 | 8,100 |
| 0 | -18 | 14,650 |

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

5-11-94
RS 20869




# DTC 31

## MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
### (LOW VOLTAGE INPUT - LOW MANIFOLD PRESSURE)
### 1.0L (VIN 6) "M" CARLINE

**Circuit Description:**

The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure (vacuum). The Engine Control Module (ECM) provides a 5 volt reference voltage to the MAP sensor. The change in the pressure, that results from engine load and RPM changes, is converted into a voltage input that is monitored by the ECM. A low voltage reading at the ECM indicates low manifold pressure, and a high voltage reading at the ECM indicates high manifold pressure.

DTC 31 will set if the following condition is met for 0.5 seconds:

- Low voltage input at the ECM indicating intake manifold pressure below -27 mmHg.

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

1. This step checks that the ECM is providing a 5 volt reference.
2. This step checks for the bias voltage to the MAP sensor which has a value between 4.5 and 4.9 volts. This step checks that value.

**Diagnostic Aids:** Check for a clogged or pinched vacuum hose to MAP sensor.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 31

## MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
## (LOW VOLTAGE INPUT - LOW MANIFOLD PRESSURE)
## 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT MAP SENSOR CONNECTOR.
- CONNECT A DIGITAL MULTIMETER FROM MAP SENSOR CONNECTOR CAVITY "3" TO GROUND.
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE. SHOULD BE 4-5 VOLTS. IS IT?

YES

2
- CONNECT A DIGITAL MULTIMETER FROM MAP SENSOR CONNECTOR CAVITY "2" TO GROUND.
- MEASURE VOLTAGE. SHOULD BE 4.5-4.9 VOLTS. IS IT?

YES

REPLACE MAP SENSOR.

NO

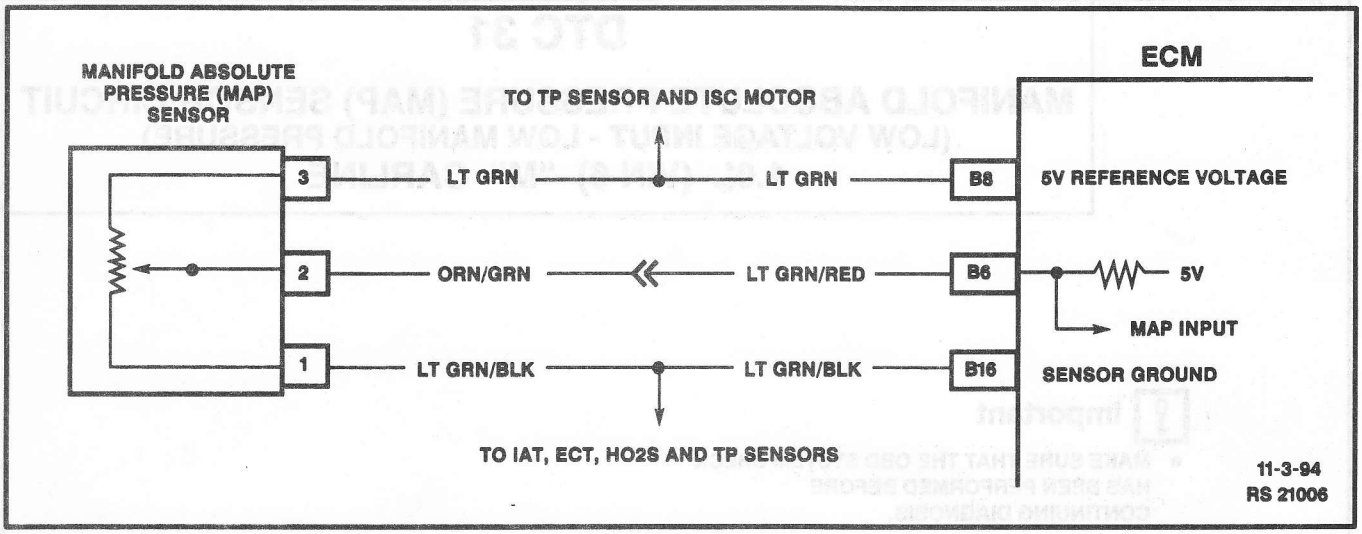
- CHECK FOR A SHORT TO GROUND IN THE MAP INPUT WIRE. IF OK, REPLACE ECM.

NO

- CHECK FOR AN OPEN OR A SHORT TO GROUND IN LT GRN WIRE. IF OK, REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

11-1-94
RS 21007




# DTC 32

## MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
## (HIGH VOLTAGE INPUT - HIGH MANIFOLD PRESSURE)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure (vacuum). The Engine Control Module (ECM) provides a 5 volt reference voltage to the MAP sensor. The change in the pressure, that results from engine load and RPM changes, is converted into a voltage input that is monitored by the ECM. A low voltage reading at the ECM indicates low manifold pressure, and a high voltage reading at the ECM indicates high manifold pressure.

DTC 32 will set if the following condition is met for 0.5 seconds:

- High voltage input at the ECM indicating intake manifold pressure above 974 mmHg.

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

1. This step checks the MAP input wire for an open or for a short to voltage or for a faulty ECM. Under normal conditions the MAP input wire should carry a little less than 5 volts. A short to 5 volts or B+ will cause DTC 32 to set.
2. This step checks for an open LT GRN/BLK wire, poor connection at the MAP sensor or ECM and for a faulty MAP sensor or ECM.

**Diagnostic Aids:** Check for a leaking vacuum hose to MAP sensor.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 32

## MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CIRCUIT
### (HIGH VOLTAGE INPUT - HIGH MANIFOLD PRESSURE)
### 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT MAP SENSOR CONNECTOR.
- TURN IGNITION SWITCH TO "ON."
- CONNECT A DIGITAL MULTIMETER FROM MAP SENSOR CONNECTOR CAVITY "2" (HARNESS SIDE) TO GROUND.
- MEASURE VOLTAGE.

4.5-4.9 VOLTS

2
- CONNECT A DIGITAL MULTIMETER FROM MAP SENSOR CONNECTOR CAVITY "1" TO CAVITY "2" (HARNESS SIDE).
- MEASURE VOLTAGE.

4-5 VOLTS
- CHECK FOR A POOR CONNECTION AT MAP SENSOR. IF OK, REPLACE MAP SENSOR.

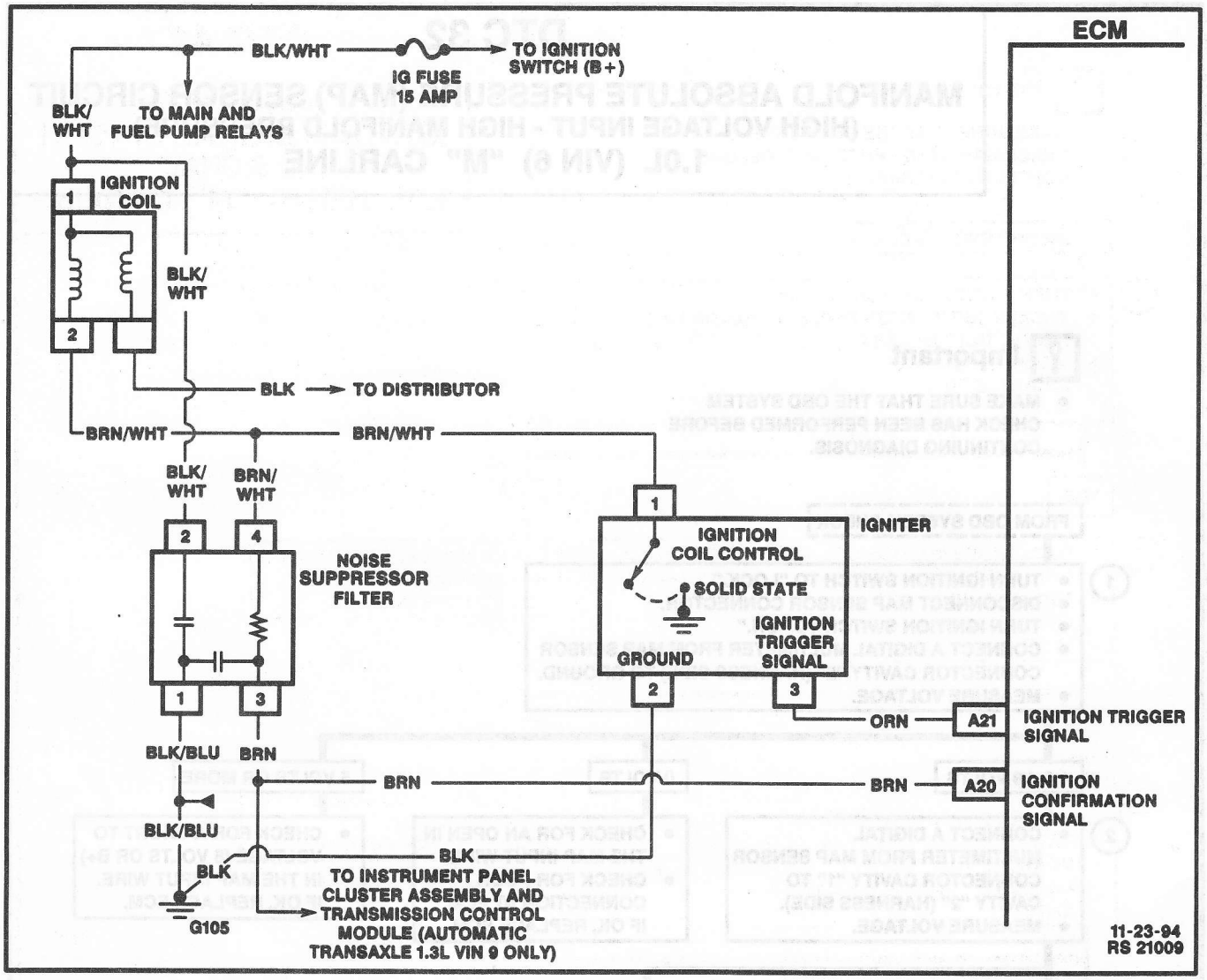
0 VOLTS
- CHECK FOR AN OPEN IN LT GRN/BLK WIRE.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

0 VOLTS
- CHECK FOR AN OPEN IN THE MAP INPUT WIRE.
- CHECK FOR POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

5 VOLTS OR MORE
- CHECK FOR A SHORT TO VOLTAGE (5 VOLTS OR B+) IN THE MAP INPUT WIRE. IF OK, REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

11-1-94
RS 21008




# DTC 41

## (Page 1 of 2)
## IGNITION SIGNAL CIRCUIT
## (NO SIGNAL)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Engine Control Module (ECM) receives an ignition fail safe signal when the ignition switch is turned to the "START" position. When the ECM receives this signal, it will toggle the igniter "ON" and "OFF." As the igniter is toggled "ON" and "OFF," so is the primary windings of the ignition coil, thus inducing a voltage into the secondary windings of the ignition coil. This induced voltage is then used to fire the spark plugs. DTC 41 will set if the following condition is met:

- Toggled ignition fail safe signal not present at the ECM within 3 seconds of cranking.

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

1. This checks for power to the ignition coil.
2. This checks for a poor connection at the ignition coil, or for a faulty ignition coil.
3. This checks for an open or short to ground in BRN/WHT or BLK/WHT wires.
4. This checks for an open BLK/BLU wire, a poor ground connection or for a faulty noise suppressor filter.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 41 will set in history only.

# DTC 41

(Page 1 of 2)

## IGNITION SIGNAL CIRCUIT (NO SIGNAL)

## 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK.

1. 
   - TURN IGNITION SWITCH TO "ON."
   - BACKPROBE IGNITION COIL CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "1" TO GROUND.
   - MEASURE VOLTAGE.

   SHOULD BE B+.
   IS IT?

   - YES
   - NO → REPAIR OPEN IN BLK/WHT WIRE BETWEEN JUNCTION BLOCK AND IGNITION COIL.

2. 
   - BACKPROBE IGNITION COIL CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "2" TO GROUND.
   - MEASURE VOLTAGE.

   SHOULD BE B+.
   IS IT?

   - YES
   - NO → CHECK FOR POOR CONNECTION AT IGNITION COIL. IF OK, REPLACE IGNITION COIL.

3. 
   - BACKPROBE NOISE SUPPRESSOR FILTER CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "2" THEN CAVITY "4" TO GROUND.
   - MEASURE VOLTAGE.

   SHOULD BE B+ ON BOTH CAVITIES.
   IS IT?

   - YES
   - NO → REPAIR OPEN OR SHORT TO GROUND IN BRN/WHT OR BLK/WHT WIRES.

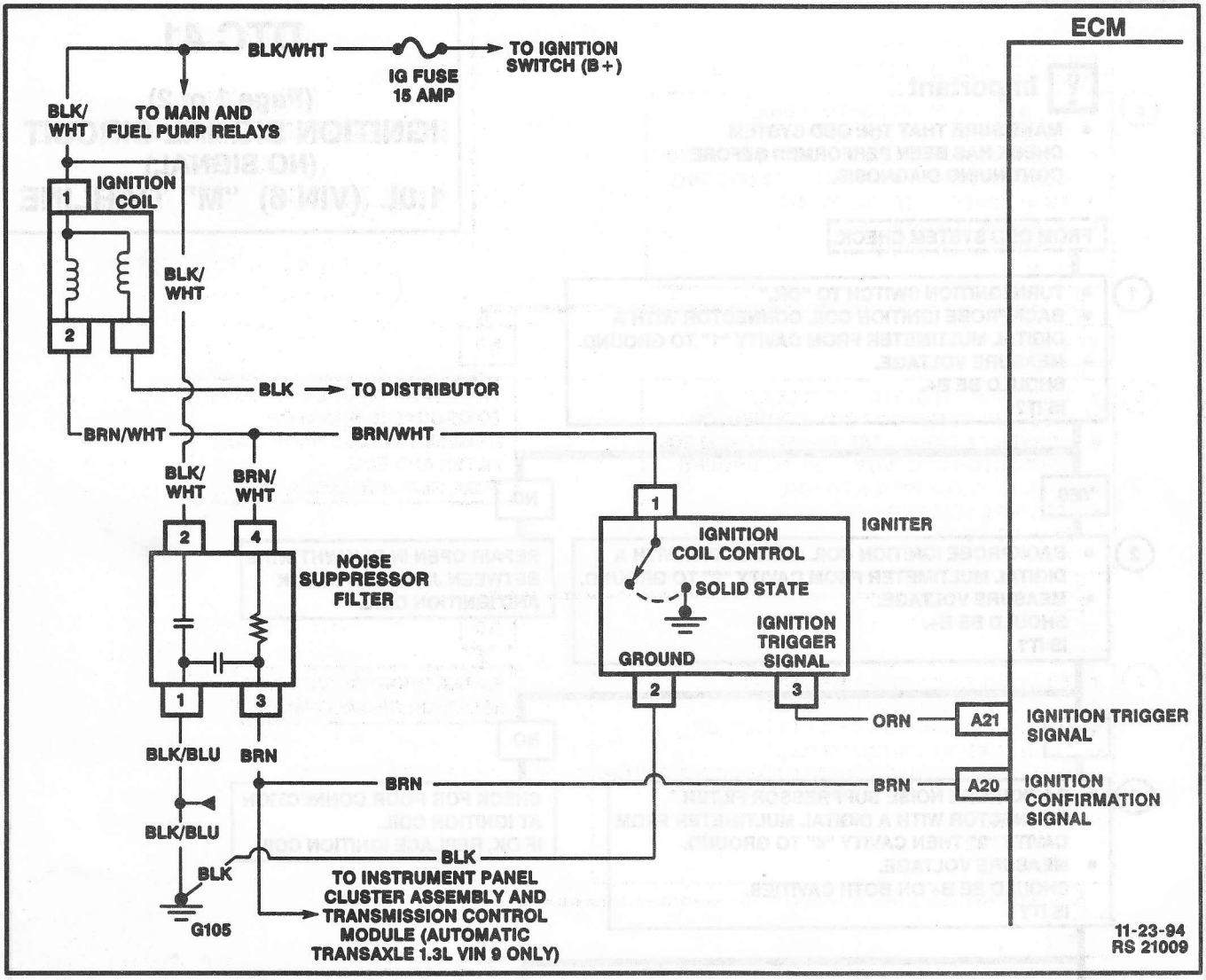
4. 
   - BACKPROBE NOISE SUPPRESSOR FILTER CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "3" TO GROUND.
   - MEASURE VOLTAGE.

   SHOULD BE 10V OR MORE.
   IS IT?

   - YES → REFER TO DTC 41 PAGE 2 OF 2.
   - NO →
     - CHECK FOR AN OPEN IN BLK/BLU WIRE BETWEEN NOISE SUPPRESSOR FILTER AND G105.
     - CHECK FOR A POOR GROUND CONNECTION AT G105.
     - CHECK FOR A POOR CONNECTION AT NOISE SUPPRESSOR FILTER.

     IF OK, REPLACE NOISE SUPPRESSOR FILTER.

6-13-94
RS 21010




# DTC 41

## (Page 2 of 2)

## IGNITION SIGNAL CIRCUIT

## (NO SIGNAL)

## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Engine Control Module (ECM) receives an ignition fail safe signal when the ignition switch is turned to the "START" position. When the ECM receives this signal, it will toggle the igniter "ON" and "OFF." As the igniter is toggled "ON" and "OFF," so is the primary windings of the ignition coil, thus inducing a voltage into the secondary windings of the ignition coil. This induced voltage is then used to fire the spark plugs. DTC 41 will set if the following condition is met:

- Toggled ignition fail safe signal not present at the ECM within 3 seconds of cranking.

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

5. This checks for an open or short to ground in the BRN wire, or for a faulty ECM.
6. This checks for a short to voltage in the BRN or BRN/WHT wire.
7. This checks for an open or short to ground in BRN/WHT wire.
8. This checks for an open in the BLK/BLU wire or a poor ground connection.
9. This checks to see if the ECM is toggling the ignition signal. Either an open, a short to ground, or a faulty ECM, or igniter is the fault.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 41 will set in history only.

# DTC 41

(Page 2 of 2)

## IGNITION SIGNAL CIRCUIT (NO SIGNAL)

## 1.0L (VIN 6) "M" CARLINE

FROM DTC 41 PAGE 1 OF 2.

**5**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT ECM CONNECTOR C1.
- CONNECT A DIGITAL MULTIMETER FROM ECM CONNECTOR C1 CAVITY "A20" TO GROUND.
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE.
  SHOULD BE 10V OR MORE.
  IS IT?

YES

**6**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT IGNITION COIL CONNECTOR.
- CONNECT A DIGITAL MULTIMETER FROM ECM CONNECTOR C1 CAVITY "A20" TO GROUND.
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE.
  SHOULD BE 0V.
  IS IT?

YES

**7**
- TURN IGNITION SWITCH TO "LOCK."
- RECONNECT ECM CONNECTOR C1.
- RECONNECT IGNITION COIL CONNECTOR.
- TURN IGNITION SWITCH TO "ON."
- BACKPROBE IGNITER CONNECTOR WITH A DIGITAL MULTIMETER FROM CAVITY "1" TO GROUND.
- MEASURE VOLTAGE.
  SHOULD BE B+.
  IS IT?

YES

**8**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT IGNITER CONNECTOR.
- CONNECT A DIGITAL MULTIMETER FROM IGNITER CONNECTOR CAVITY "1" TO CAVITY "2".
- TURN IGNITION SWITCH TO "ON."
- MEASURE VOLTAGE.
  SHOULD BE B+.
  IS IT?

YES

**9**
- CONNECT A TEST LIGHT FROM IGNITER CONNECTOR CAVITY "3" TO B+.
- NOTE TEST LIGHT WHILE CRANKING ENGINE.

FLASHES
- CHECK FOR A POOR CONNECTION AT IGNITER. IF OK, REPLACE IGNITER.

ON STEADY
- CHECK FOR A SHORT TO GROUND IN ORN WIRE BETWEEN IGNITER AND ECM. IF OK, REPLACE ECM.

OFF STEADY
- CHECK FOR AN OPEN IN ORN WIRE BETWEEN IGNITER AND ECM.
- CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

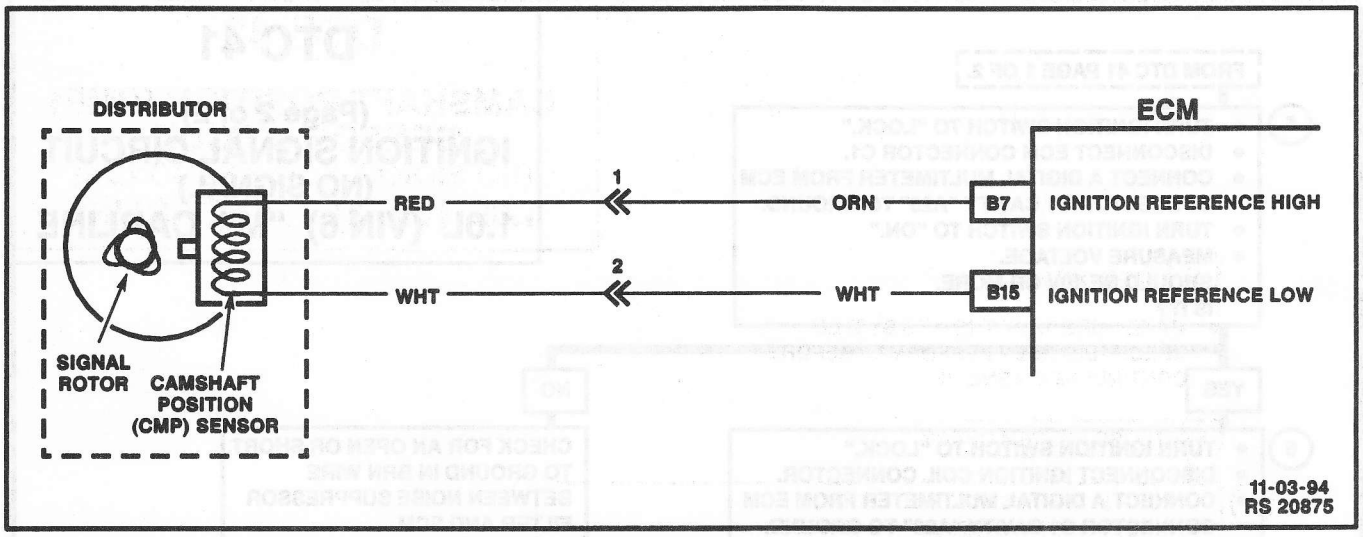
NO
- CHECK FOR A POOR GROUND CONNECTION. IF OK, REPAIR OPEN IN BLK/BLU WIRE BETWEEN G105 AND IGNITER.

NO
- REPAIR OPEN OR SHORT TO GROUND IN BRN/WHT WIRE BETWEEN IGNITER AND IGNITION COIL.

NO
- REPAIR SHORT TO VOLTAGE IN BRN OR BRN/WHT WIRE.

NO
- CHECK FOR AN OPEN OR SHORT TO GROUND IN BRN WIRE BETWEEN NOISE SUPPRESSOR FILTER AND ECM. IF OK, REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).




# DTC 42

## CAMSHAFT POSITION (CMP) SENSOR CIRCUIT
## (NO SIGNAL FOR 2 SECONDS)
## 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

When the distributor shaft rotates, a fluctuating magnetic field is generated due to changes in the air gap between the Camshaft Position (CMP) sensor and distributor shaft signal rotor. As a result, a small Alternating Current (AC) voltage is induced in the CMP sensor. This ignition reference signal is sent to the Engine Control Module (ECM) on terminals "B7" and "B15", the ECM monitors the AC voltage between these two terminals. The ECM uses this signal in determining when to fire the ignition coil and the fuel injector.

DTC 42 will set if the following condition is met for 2 seconds:

- No ignition reference signal at the ECM while the engine is cranking.

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

1. The CMP sensor's resistance check 205-255 at 20°C 68°F.
2. When the distributor shaft turns, the CMP sensor acts as an AC voltage signal generator. This checks for a proper AC signal voltage being produced.
3. After proving that the CMP sensor is capable of generating the proper AC signal voltage, this step checks to see if this voltage is getting through to the ECM.

**Diagnostic Aids:** A loose or damaged CMP sensor could cause an intermittent DTC.

A misaligned CMP sensor or improper air gap could result in DTC 42 or intermittent "Cranks But Won't Run." Refer to SECTION 6D4 for CMP sensor specifications.

Resistance of the CMP sensor will increase as engine temperatures increase.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 42 will set in history only.

# DTC 42

## CAMSHAFT POSITION (CMP) SENSOR CIRCUIT (NO SIGNAL FOR 2 SECONDS) 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT DISTRIBUTOR CONNECTOR.
   - CONNECT A DIGITAL MULTIMETER FROM DISTRIBUTOR CONNECTOR CAVITY "1" TO CAVITY "2" (DISTRIBUTOR SIDE).
   - MEASURE RESISTANCE. SHOULD BE 205-255 OHMS AT 20°C (68°F). IS IT?

   YES → 2

   NO → REPLACE CMP SENSOR.

2. 
   - LEAVE DIGITAL MULTIMETER CONNECTED TO DISTRIBUTOR.
   - MEASURE "AC" VOLTAGE WHILE CRANKING THE ENGINE. SHOULD BE 0.10-0.40 VOLTS. IS IT?

   YES → 3

   NO →
   - CHECK CMP SENSOR AIR GAP. REFER TO SECTION 6D4. IF OK, REPLACE CMP SENSOR.

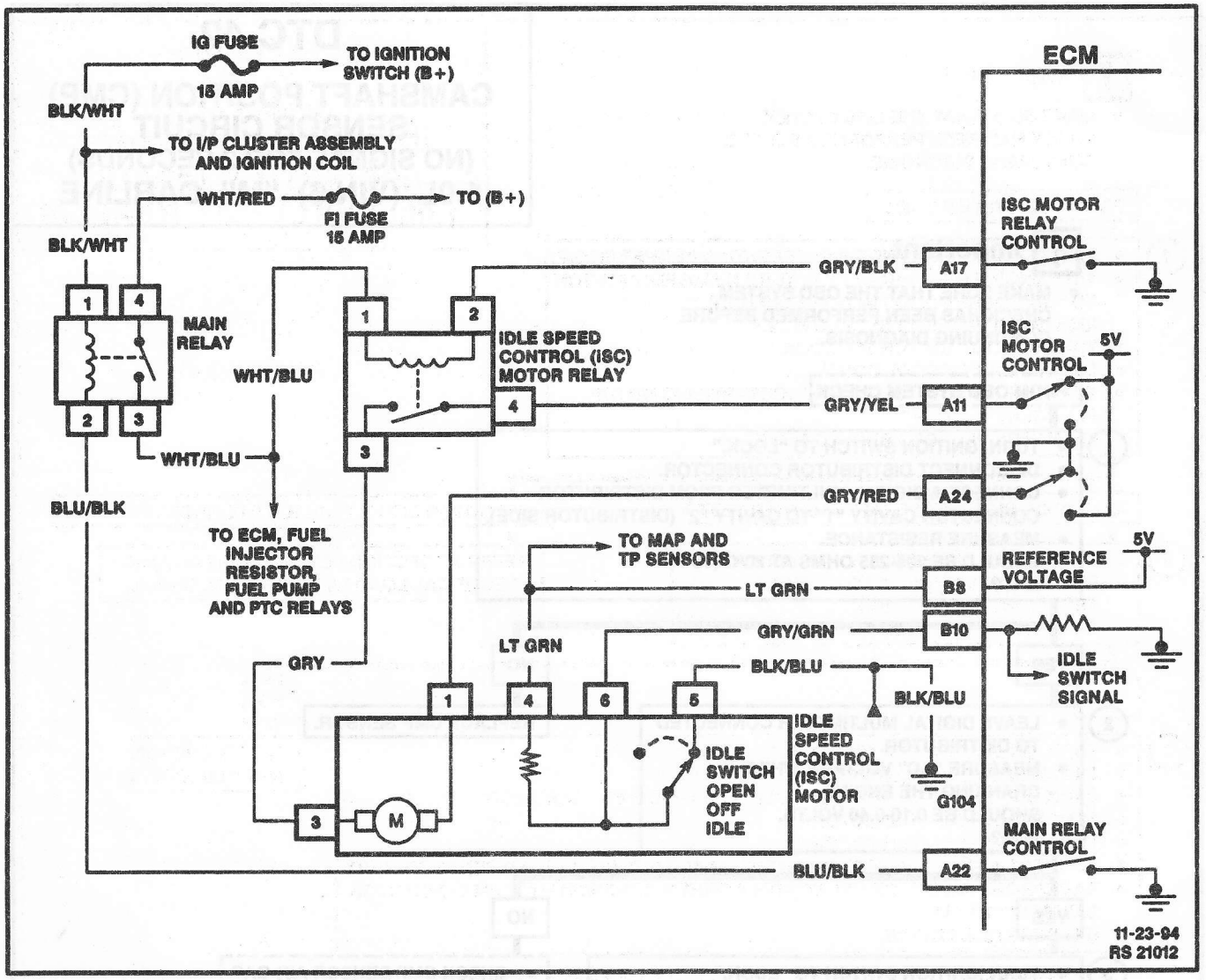
3. 
   - TURN IGNITION SWITCH TO "LOCK."
   - RECONNECT DISTRIBUTOR CONNECTOR.
   - DISCONNECT ECM CONNECTOR C2.
   - CONNECT A DIGITAL MULTIMETER FROM ECM CONNECTOR C2 CAVITY "B7" TO CAVITY "B15".
   - MEASURE "AC" VOLTAGE WHILE CRANKING THE ENGINE. SHOULD BE 0.10-0.40 VOLTS. IS IT?

   NO →
   - CHECK FOR A POOR CONNECTION AT DISTRIBUTOR. IF OK, REPAIR OPEN, SHORT TO GROUND OR SHORT TO VOLTAGE IN ORN OR WHT WIRES TO ECM.

   YES →
   - CHECK FOR A POOR CONNECTION AT ECM. IF OK, REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 20876




# DTC 46 (Page 1 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Idle Speed Control (ISC) motor opens and closes the throttle valve according to signals from the Engine Control Module (ECM). When a condition arises which demands a higher idle speed, the ECM will send a signal to the ISC motor which will extend the plunger of the ISC motor, thus opening the throttle plates to increase the idle speed. When the higher idle speed is no longer needed, the ECM will reverse the polarity to the ISC motor which will cause the throttle plates to close, thus decreasing the idle speed.

DTC 46 will set if the following conditions are met:

- If battery voltage is greater than 12 volts, the idle switch is closed and the change in throttle valve opening is less than 0.3 degrees after the ECM has energized the ISC motor for more than 8 milliseconds.
- If the throttle valve opening is sensed at less than 2.5 degrees.
- If the ISC motor drive voltage is sensed twice when the signal is not fed from the ECM.
- If the throttle valve opening is not within 3 degrees of the target throttle valve opening under any of the following conditions: (1) Battery voltage is greater than 12 volts. (2) The idle switch is closed. (3) 3 seconds since the engine was started. (4) During deceleration or fast idle. (5) Electrical load, A/C or transaxle "D" range idle-up signal not inputted to the ECM.

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

1. This checks the electrical load idle-up circuit.
2. This checks for an open in WHT/BLU wire.
3. This checks for an open in GRY/BLK wire or for a faulty ISC motor relay.
4. This checks for an open, a short to ground or a short to voltage in GRY/RED, GRY or GRY/YEL wires or for a faulty ISC motor.

**Diagnostic Aids:** An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 21, DTC 22 and DTC 46 stored at the same time could be the result of an open LT GRN wire.

# DTC 46

(Page 1 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

1. 
   - WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE.
   - WITH ENGINE RUNNING AT IDLE, TURN HEADLIGHT SWITCH TO "ON" (OBSERVE ISC MOTOR PLUNGER). ISC MOTOR PLUNGER SHOULD MOVE.
   - TURN IGNITION SWITCH TO "LOCK."
   - LET THE ENGINE COOL DOWN.
   - TURN IGNITION SWITCH TO "ON" (OBSERVE ISC MOTOR PLUNGER). ISC MOTOR PLUNGER SHOULD MOVE.

ISC MOTOR DID NOT OPERATE IN EITHER TEST

ISC MOTOR DID NOT OPERATE IN FIRST TEST ONLY

REFER TO SECTION 6E2-C1 (CHART C-1A) FOR ELECTRICAL LOAD IDLE-UP SIGNAL CHECK.

2. 
   - BACKPROBE ISC MOTOR RELAY WITH A TEST LIGHT FROM CAVITY "1" TO GROUND. TEST LIGHT SHOULD LIGHT. DOES IT?

YES

NO

REPAIR OPEN IN WHT/BLU WIRE.

3. 
   - TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT ECM CONNECTOR C1.
   - BACK OUT TERMINAL "A17" (GRY/BLK WIRE) FROM ECM CONNECTOR C1.
   - RECONNECT ECM CONNECTOR C1.
   - TURN IGNITION SWITCH TO "ON."
   - CONNECT A FUSED JUMPER FROM TERMINAL "A17" (HARNESS SIDE) TO GROUND.
   - BACKPROBE ISC MOTOR RELAY WITH A DIGITAL MULTIMETER FROM CONNECTOR CAVITY "3" TO "4".
   - MEASURE RESISTANCE.

LESS THAN 0.5 OHMS

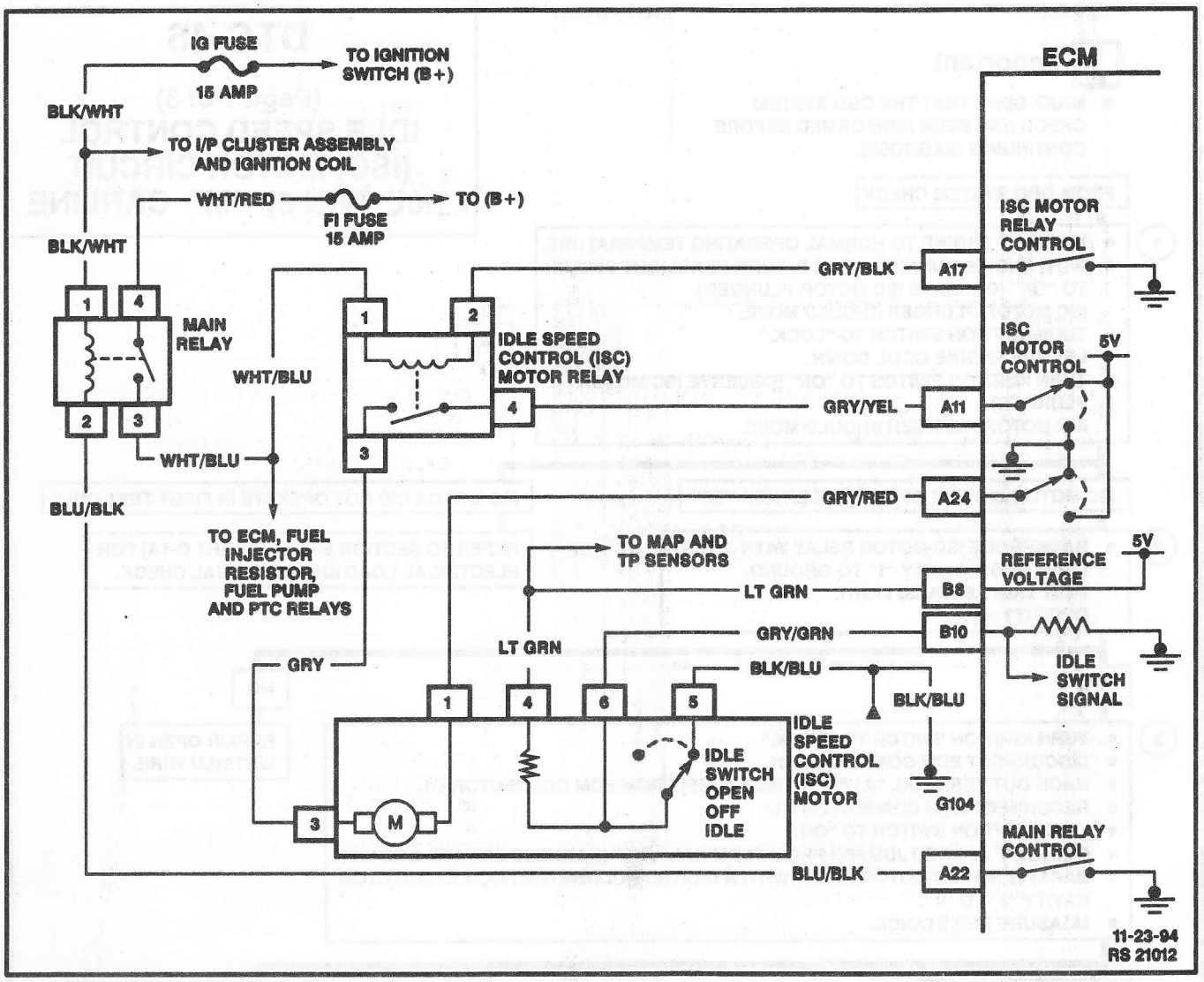
MORE THAN 0.5 OHMS

- CHECK FOR AN OPEN IN GRY/BLK WIRE. IF OK, REPLACE ISC MOTOR RELAY.

4. 
   - TURN IGNITION SWITCH TO "LOCK."
   - DISCONNECT ECM CONNECTOR C1.
   - BACK OUT TERMINAL "A24" (GRY/RED WIRE) AND "A11" (GRY/YEL WIRE) FROM ECM CONNECTOR C1.
   - RECONNECT ECM CONNECTOR C1.
   - LEAVE FUSED JUMPER FROM TERMINAL "A17" (HARNESS SIDE) TO GROUND CONNECTED.
   - TURN IGNITION SWITCH TO "ON."
   - KEEP THROTTLE LEVER APART FROM PLUNGER OF ISC MOTOR.
   - CONNECT THREE NEW 1.5 VOLT BATTERIES IN SERIES.
   - CONNECT TERMINAL "A11" (HARNESS SIDE) TO POSITIVE SIDE OF BATTERIES.
   - CONNECT TERMINAL "A24" (HARNESS SIDE) TO NEGATIVE SIDE OF BATTERIES. NOTE: VOLTAGE (4.5V) MUST NOT BE APPLIED FOR LONGER THAN 2 SECONDS, OR A FAULTY CONDITION MAY OCCUR. ISC MOTOR PLUNGER SHOULD EXTEND. DOES IT?

REFER TO DTC 46 PAGE 2 OF 3.

6-15-94
RS 21013




# DTC 46 (Page 2 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Idle Speed Control (ISC) motor opens and closes the throttle valve according to signals from the Engine Control Module (ECM). When a condition arises which demands a higher idle speed, the ECM will send a signal to the ISC motor which will extend the plunger of the ISC motor, thus opening the throttle plates to increase the idle speed. When the higher idle speed is no longer needed, the ECM will reverse the polarity to the ISC motor which will cause the throttle plates to close, thus decreasing the idle speed.

DTC 46 will set if the following conditions are met:

- If battery voltage is greater than 12 volts, the idle switch is closed and the change in throttle valve opening is less than 0.3 degrees after the ECM has energized the ISC motor for more than 8 milliseconds.
- If the throttle valve opening is sensed at less than 2.5 degrees.
- If the ISC motor drive voltage is sensed twice when the signal is not fed from the ECM.
- If the throttle valve opening is not within 3 degrees of the target throttle valve opening under any of the following conditions: (1) Battery voltage is greater than 12 volts. (2) The idle switch is closed. (3) 3 seconds since the engine was started. (4) During deceleration or fast idle. (5) Electrical load, A/C or transaxle "D" range idle-up signal not inputted to the ECM.

### DTC Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

5. This checks for an open, a short to ground or a short to voltage in GRY/RED, GRY or GRY/YEL wires or for a faulty ISC motor.
6. This checks for an open in BLK/BLU wire.
7. This checks for an open, a short to ground or a short to voltage in LT GRN wire or for a faulty ECM.

### Diagnostic Aids:

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 21, DTC 22 and DTC 46 stored at the same time could be the result of an open LT GRN wire.

# DTC 46

(Page 2 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

FROM DTC 46 PAGE 1 OF 3

**5**

- KEEP THROTTLE LEVER APART FROM PLUNGER OF ISC MOTOR.
- CONNECT TERMINAL "A11" (HARNESS SIDE) TO NEGATIVE SIDE OF BATTERIES.
- CONNECT TERMINAL "A24" (HARNESS SIDE) TO POSITIVE SIDE OF BATTERIES.

NOTE: VOLTAGE (4.5V) MUST NOT BE APPLIED FOR LONGER THAN 2 SECONDS, OR A FAULTY CONDITION MAY OCCUR.
ISC MOTOR PLUNGER SHOULD RETRACT.
DOES IT?

YES

NO

- CHECK FOR AN OPEN, A SHORT TO GROUND OR A SHORT TO VOLTAGE IN GRY/RED, GRY OR GRY/YEL WIRES. IF OK, REPLACE ISC MOTOR.

**6**

- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT THE THREE 1.5 VOLT BATTERIES AND REINSTALL ALL TERMINALS.
- TURN IGNITION SWITCH TO "ON."
- BACKPROBE ISC MOTOR CONNECTOR WITH A TEST LIGHT FROM CAVITY "5" TO B+.

TEST LIGHT SHOULD LIGHT.
DOES IT?

YES

NO

- CHECK FOR AN OPEN, A SHORT TO GROUND OR A SHORT TO VOLTAGE IN GRY/RED, GRY OR GRY/YEL WIRE. IF OK, REPLACE ISC MOTOR.

**7**

- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT ISC MOTOR CONNECTOR.
- TURN IGNITION SWITCH TO "ON."
- CONNECT A DIGITAL MULTIMETER FROM ISC MOTOR CONNECTOR CAVITY "4" TO GROUND.
- MEASURE VOLTAGE.

SHOULD BE 4-6 VOLTS.
IS IT?

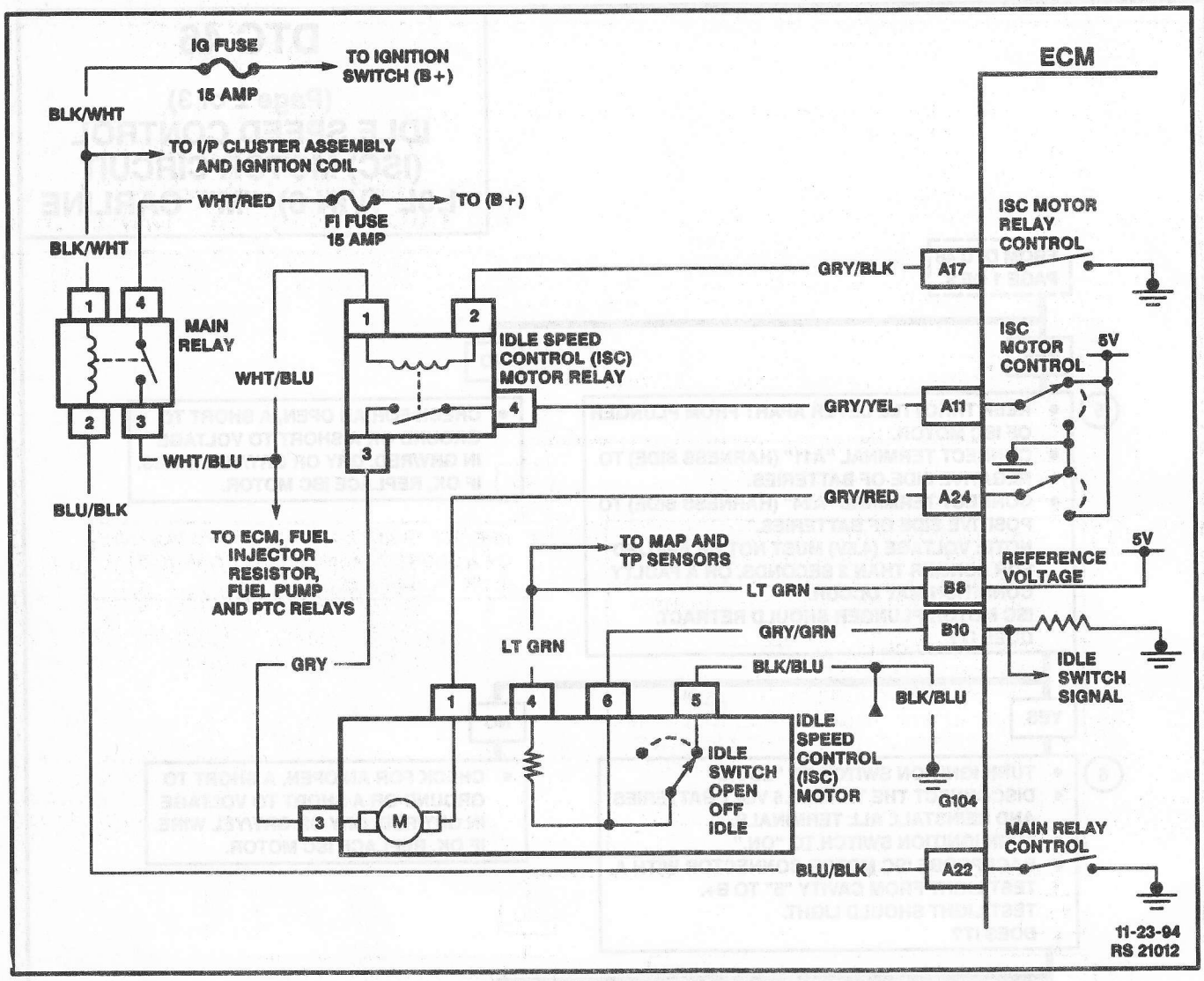
YES

NO

REPAIR OPEN IN BLK/BLU WIRE.

REFER TO DTC 46 PAGE 3 OF 3.

6-10-94
RS 21014




# DTC 46 (Page 3 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Idle Speed Control (ISC) motor opens and closes the throttle valve according to signals from the Engine Control Module (ECM). When a condition arises which demands a higher idle speed, the ECM will send a signal to the ISC motor which will extend the plunger of the ISC motor, thus opening the throttle plates to increase the idle speed. When the higher idle speed is no longer needed, the ECM will reverse the polarity to the ISC motor which will cause the throttle plates to close, thus decreasing the idle speed.

DTC 46 will set if the following conditions are met:

- If battery voltage is greater than 12 volts, the idle switch is closed and the change in throttle valve opening is less than 0.3 degrees after the ECM has energized the ISC motor for more than 8 milliseconds.
- If the throttle valve opening is sensed at less than 2.5 degrees.
- If the ISC motor drive voltage is sensed twice when the signal is not fed from the ECM.
- If the throttle valve opening is not within 3 degrees of the target throttle valve opening under any of the following conditions: (1) Battery voltage is greater than 12 volts. (2) The idle switch is closed. (3) 3 seconds since the engine was started. (4) During deceleration or fast idle. (5) Electrical load, A/C or transaxle "D" range idle-up signal not inputted to the ECM.

### DTC Chart Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

8. This checks for a short to voltage in GRY/GRN wire or for a faulty ISC motor.
9. This checks for an open, a short to ground or a short to voltage in GRY/GRN wire, a faulty ISC motor or for a faulty ECM.

### Diagnostic Aids:

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

DTC 21, DTC 22 and DTC 46 stored at the same time could be the result of an open LT GRN wire.

# DTC 46

(Page 3 of 3)

## IDLE SPEED CONTROL (ISC) MOTOR CIRCUIT 1.0L (VIN 6) "M" CARLINE

FROM DTC 46 PAGE 2 OF 3

YES

8

- TURN IGNITION SWITCH TO "LOCK."
- RECONNECT ISC MOTOR CONNECTOR.
- DISCONNECT ECM CONNECTOR C2.
- BACK OUT TERMINAL "B10" (GRY/GRN WIRE) FROM ECM CONNECTOR C2.
- RECONNECT ECM CONNECTOR C2.
- TURN IGNITION SWITCH TO "ON."
- CONNECT A DIGITAL MULTIMETER FROM TERMINAL "B10" (HARNESS SIDE) TO GROUND.
- MAKE SURE THAT THE ISC MOTOR PLUNGER IS IN CONTACT WITH THE THROTTLE LEVER.
- MEASURE VOLTAGE. SHOULD BE 0-1 VOLT. IS IT?

NO

- CHECK FOR AN OPEN, A SHORT TO VOLTAGE OR A SHORT TO GROUND IN LT GRN WIRE. IF OK, REPLACE ECM.

YES

9

- LEAVE DIGITAL MULTIMETER CONNECTED.
- MOVE THE THROTTLE LEVER OFF OF THE ISC MOTOR PLUNGER.
- MEASURE VOLTAGE. SHOULD BE 4-6 VOLTS. IS IT?

NO

- CHECK FOR A SHORT TO VOLTAGE IN GRY/GRN WIRE. IF OK, REPLACE ISC MOTOR.

NO

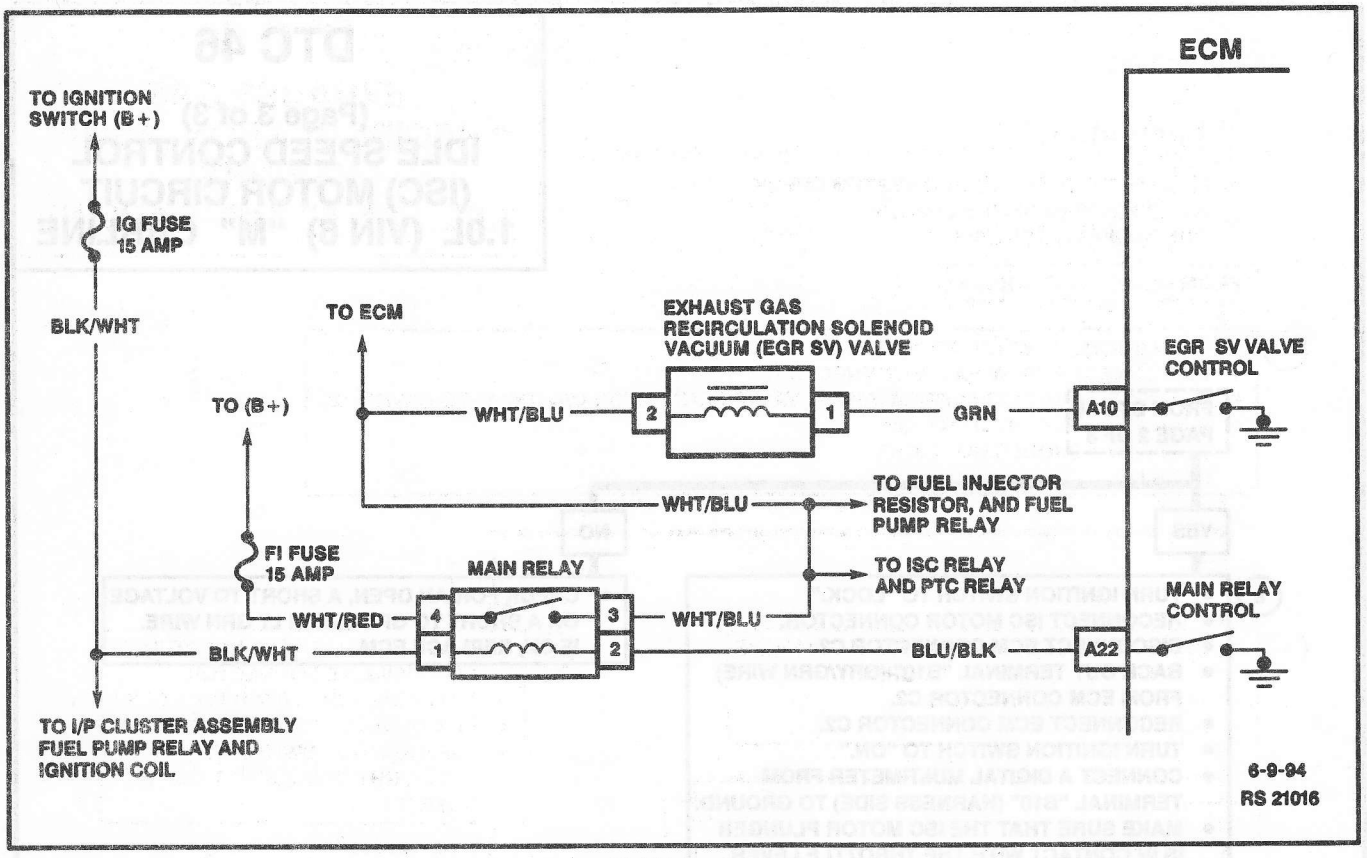
- CHECK FOR AN OPEN, A SHORT TO VOLTAGE OR A SHORT TO GROUND IN GRY/GRN WIRE. IF OK, REPLACE ISC MOTOR.

YES

REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-15-94
RS 21015




# DTC 51

## EXHAUST GAS RECIRCULATION (EGR) CIRCUIT 1.0L (VIN 6) "M" CARLINE

### Circuit Description:

The Exhaust Gas Recirculation Solenoid Vacuum (EGR SV) valve is Engine Control Module (ECM) controlled. System voltage is applied to the EGR SV valve from the MAIN relay. When the driver in the ECM closes, the EGR SV valve is activated.

DTC 51 will set if the following conditions are met:

- System is operating in "Closed Loop" operation.
- Difference of MAP sensor between EGR SV valve is "ON" and when "OFF" is less than a calibrated value.

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

1. This will check the EGR SV valve circuit for a short to ground.
2. Checks for voltage from MAIN relay.
3. Checks the EGR SV valve circuit for a short to ground or a faulty ECM.
4. Checks the EGR SV valve circuit for an open GRN wire.
5. Checks for proper resistance of the EGR SV valve.

**Diagnostic Aids:** Closely check all vacuum hoses to the Throttle Body Fuel Injection (TBI) unit and the EGR valve. Also check the MAP sensor vacuum hose for leaks or restrictions. In "Closed Loop" operation with EGR enabled, the ECM will periodically turn "OFF" the EGR SV valve. If the corresponding manifold pressure change is less than a calibrated value, the ECM determines that a fault exists in the EGR system and sets DTC 51. Refer to SECTION 6E2-C7 for EGR mechanical system diagnosis.

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Inspect harness connectors for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals and poor terminal-to-wire connections before component replacement.

# DTC 51
## EXHAUST GAS RECIRCULATION (EGR) CIRCUIT
## 1.0L (VIN 6) "M" CARLINE

**Important**

- MAKE SURE THAT THE OBD SYSTEM CHECK HAS BEEN PERFORMED BEFORE CONTINUING DIAGNOSIS.

FROM OBD SYSTEM CHECK

**1**
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT EGR SV VALVE CONNECTOR.
- CONNECT A TEST LIGHT FROM EGR SV VALVE CONNECTOR CAVITY "1" TO CAVITY "2".
- TURN IGNITION SWITCH TO "ON."

TEST LIGHT SHOULD NOT LIGHT.
DOES IT?

NO

**2**
- CONNECT A TEST LIGHT FROM EGR SV VALVE CONNECTOR CAVITY "2" TO GROUND.

TEST LIGHT SHOULD LIGHT.
DOES IT?

YES

**4**
- TURN IGNITION SWITCH TO "LOCK."
- CONNECT A JUMPER FROM EGR SV VALVE CONNECTOR CAVITY "1" TO CAVITY "2".
- BACKPROBE ECM CONNECTOR C1 WITH A TEST LIGHT FROM ECM CONNECTOR C1 CAVITY "A10" TO GROUND.
- TURN IGNITION SWITCH TO "ON."

TEST LIGHT SHOULD LIGHT.
DOES IT?

YES

**5**
- CONNECT A DIGITAL MULTIMETER FROM EGR SV VALVE TERMINAL "1" TO TERMINAL "2" (EGR SV VALVE SIDE).
- MEASURE RESISTANCE.

SHOULD BE 33-39 OHMS.
IS IT?

NO

REPLACE EGR SV VALVE.

YES

EGR ELECTRICAL SYSTEM IS FUNCTIONING NORMALLY.
REFER TO SECTION 6E2-C7 FOR EGR SYSTEM MECHANICAL CHECKS.

NO

REPAIR OPEN IN GRN WIRE.

NO

REPAIR OPEN IN WHT/BLU WIRE.

YES

**3**
- LEAVE TEST LIGHT CONNECTED TO EGR SV VALVE CONNECTOR.
- TURN IGNITION SWITCH TO "LOCK."
- DISCONNECT ECM CONNECTOR C1.
- TURN IGNITION SWITCH TO "ON."

TEST LIGHT SHOULD NOT LIGHT.
DOES IT?

YES

REPAIR SHORT TO GROUND IN GRN WIRE.

NO

REPLACE ECM.

*"AFTER REPAIRS,"* CONFIRM "CLOSED LOOP" OPERATION, NO DTCs AND NO MALFUNCTION INDICATOR LAMP (MIL).

6-9-94
RS 21017