SENSOR AND ACTUATOR DIAGNOSTIC PROCEDURES

INSPECTION

The basic diagnostic procedure recommended for most sensor and actuator circuits is to disconnect the harness at the connector and inspect for corrosion, bent pins, spread pins or any condition that could cause a loose or intermittent connection. **Figure 3.4–1.**

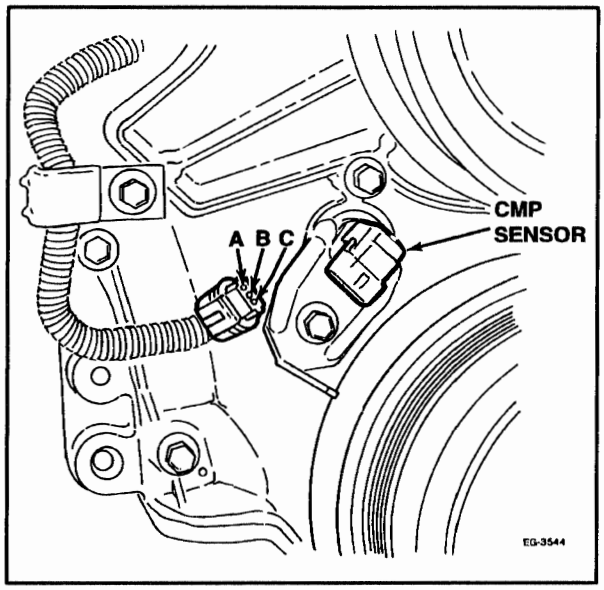

Figure 3.4–1. Removing Connector For Inspection

CONNECTOR CHECKS TO GROUND (B–)

The second step is to measure the resistance of all wiring harness connectors to ground (preferably the negative battery cable) to determine if a short to ground condition is present. **It is important that during this test all accessories including the dome light be turned off, current flow in the system will affect resistance readings. If the reading is fluctuating greatly, disconnect the battery and measure to the negative battery cable.**

- Signal ground (marked "A" on all engine sensor harness connectors should measure less than 5 ohms. (Signal ground on vehicle sensor connectors vary). **Figure 3.4–2.**

- The V Ref and signal lines, with the processor connected, will normally measure greater than 1000 ohms.

NOTE: THE SYMBOLS < & > ARE USED ON EACH DIAGNOSTIC CIRCUIT PAGE. THEY ARE DEFINED AS FOLLOWS:

(<) INDICATES A VALUE LESS THAN

(>) INDICATES A VALUE GREATER THAN

EXAMPLE: < 5 OHMS = LESS THAN 5 OHMS

EXAMPLE: > 5 OHMS = MORE THAN 5 OHMS

- Power ground on an actuator circuit should measure less than 5 ohms. The control side of an actuator circuit will normally measure greater than 1000 ohms.

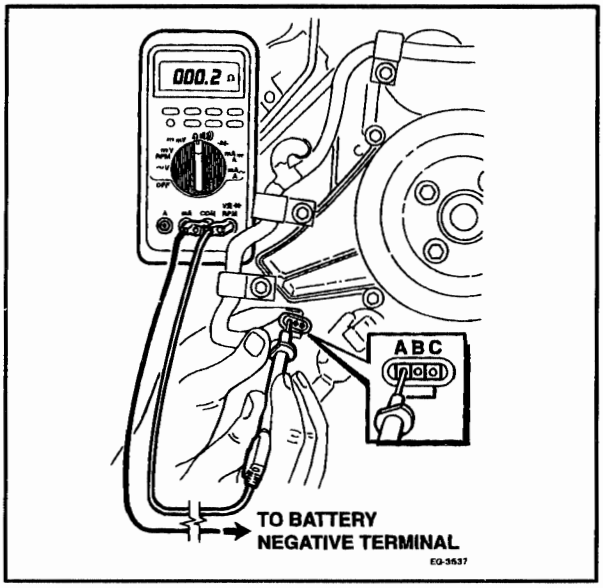

Figure 3.4–2. Measuring Resistance to Ground

CONNECTOR VOLTAGE CHECKS

Turn the ignition key to the 'ON' position and measure if the expected voltages are present at the connector. On circuits with expected voltages, this test will verify the integrity of that circuit. On circuits without an expected voltage, this test will determine if that circuit is shorted or miswired to a voltage source.

- Signal ground (marked "A" on all engine sensor harness connectors should measure less than .25 volts.)

- V Ref should measure 5.00 volts ± .50 volts. If this is higher or lower than expected, disconnect sensors one at a time to determine if a sensor is biasing the circuit and refer to V Ref procedures. **Figure 3.4–3.**

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SENSOR AND ACTUATOR DIAGNOSTIC PROCEDURES (Continued)

CONNECTOR VOLTAGE CHECKS (Continued)

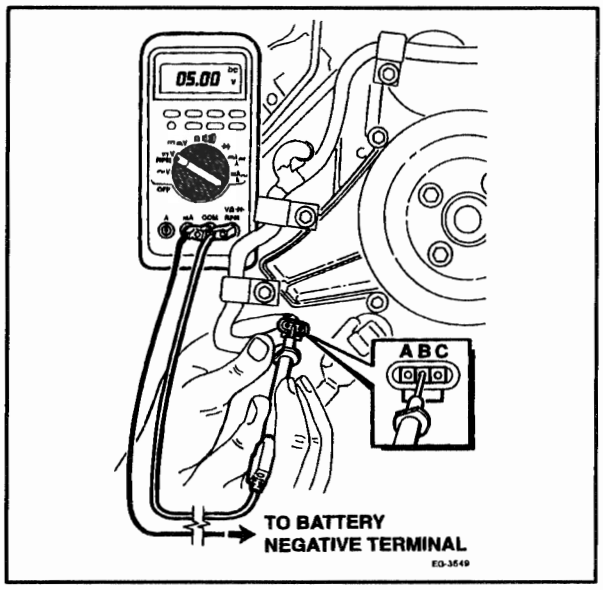

Figure 3.4–3. Measuring V Ref Voltage

- Sensor signal lines will measure 0 to .25 volts if the circuit is designed to "pull down" when disconnected, or a higher voltage (normally 4.6 to 5, or 12 volts) if it is designed as a "pull up circuit". A "pull up" signal circuit that measures the expected value normally indicates a good circuit.
- Actuator circuits may be either on/off type circuits (normally 12 volts) or pulse width modulated circuits (12 volts controlled by a % duty cycle).
- Communication circuits between the Electronic Control Module (ECM) and the Injector Driver Module (IDM) are designed to either "pull up" or "pull down". That means that one end of the communication circuit is normally at a high or 12 volt level and the signal is created by the low side toggling or switching the high side to ground. Communication lines are best diagnosed with the breakout box installed and measuring the expected voltage with the key in the "ON" position and the engine off.

HARNESS RESISTANCE TESTS

Harness resistance tests are performed when a circuit is suspected of having high resistance or being open. These tests are performed with the breakout box connected and by measuring resistance from the sensor connector end to the processor connector. If an open circuit or high resistance is encountered, the problem is most easily isolated by separating the circuit at the interim connectors (normally the Deutsch connector on the valve cover or the cowl) and measuring resistance through both halves of the circuit.

OPERATIONAL SIGNAL CHECKS

These checks are made with the breakout box installed and are normally measuring a signal voltage or frequency. They are useful for determining an in range type fault or an intermittent connection.

In the case of an intermittent fault, monitoring a suspected circuit and recreating the environmental or physical conditions that caused the complaint will help verify if a problem is in a particular circuit.

It is critical when measuring the signal level of a circuit to understand it's function and whether it is a analog voltage, digital frequency, sine wave or digital communication signal. A standard Digital Volt Ohm meter (DVOM) has certain limitations in measuring any circuit that has a frequency.

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