

## Troubleshooting Instructions

## Troubleshooting Instructions (1)

GI-8

## TROUBLESHOOTING INSTRUCTIONS

## TROUBLESHOOTING PROCEDURES

The following five-step troubleshooting procedure is recommended.

**1. Verify the customer's complaints**

Turn on all the components in the problem circuit to check the accuracy of the customer's complaints. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the probable causes.

**2. Read and analyze the schematic diagram**

Locate the schematic for the problem circuit. Determine how the circuit is supposed to work by tracing the current paths from the power source through the system components to ground. If you do not understand how the circuit should work, read the circuit operation text. Also check other circuits that share with the problem circuit. The name of circuits that share the same fuse, ground, or switch, for example, are referred to on each diagram. Try to operate any shared circuits you did not check in step 1. If the shared circuit works, the shared wiring is okay, and the cause must be within the wiring used only by the problem circuit. If several circuits fail at the same time, the fuse or ground is a likely cause.

**3. Inspect the circuit/ component with the problem isolated**

Make a circuit test to check the diagnosis you made in step 2. Remember that a logical, simple procedure is the key to efficient troubleshooting. Narrow down the probable causes using the troubleshooting hints and system diagnosis charts. Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.

**4. Repair the problem**

Once the problem is found, make the necessary repairs.

**5. Make sure the circuit works**

Repeat the system check to be sure you have repaired the problem. If the problem was a blown fuse, be sure to test all of the circuits on that fuse.

## TROUBLESHOOTING EQUIPMENT

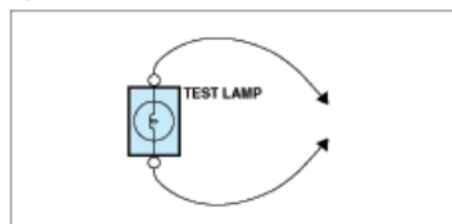
**VOLTMETER AND TEST LAMP**

Use a test lamp or a voltmeter on circuits without solidstate units and use a test lamp to check for voltage. A test lamp is made up of a 12-volt light bulb with a pair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. When the bulb goes on, there is voltage at the point being tested.

**CAUTION**

A number of circuits include solid-state modules, such as the Engine Control Module(ECM), used with computer command control injection. Voltage in these circuits should be tested only with a 10-megaohm or higher impedance digital multimeter. Never use a test lamp on circuits that contain solid state modules. Damage to the modules may result.

A voltmeter can be used in place of a test lamp. While a test lamp shows whether the voltage is present or not, a voltmeter indicates how much voltage is present.

**SELF-POWERED TEST LAMP AND OHMMETER**

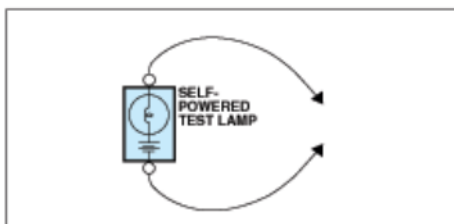
Use a self-powered test lamp or an ohmmeter to check for continuity. The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

### CAUTION

Never use a self-powered test lamp on circuits that contain solid state modules. Damage to these modules may result.

An ohmmeter can be used in place of a self-powered test lamp. The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

Circuits which include any solid-state devices should be tested only with a 10-megaohm or higher impedance digital multimeter. When measuring resistance with a digital multimeter, the battery negative terminal should be disconnected. Otherwise, there may be incorrect readings. Diodes and solid-state devices in a circuit can make an ohmmeter give a false reading. To find out if a component is affecting a measurement, take one reading, reverse the leads and take a second reading. If different the solid-state device is affecting the measurement.



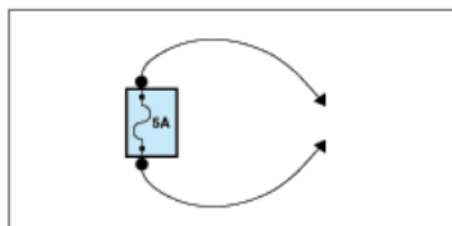
### JUMPER WIRE WITH FUSE

Use a jumper wire with a fuse to by-pass an open circuit.

A jumper wire is made up of an in-line fuse holder connected to a set of test leads. This tool is available with small clamp connectors providing adaption to most connectors without damage.

### CAUTION

Do not use a fuse with a higher rating than the specified fuse that protects the circuit being tested. Do not use this tool in any situation to substitute an input or output at the solid-state control module, such as ECM, TCM, etc.



### SHORT FINDER

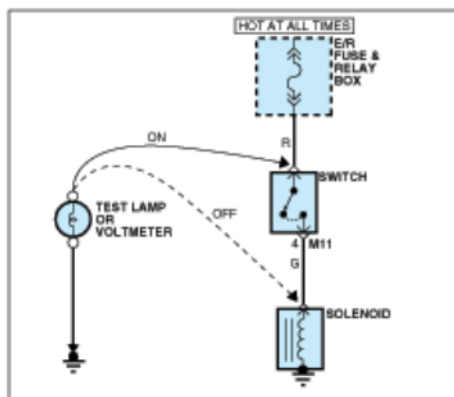
A short finder is available to locate a short to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

### TROUBLESHOOTING TEST

#### 1. TESTING FOR VOLTAGE

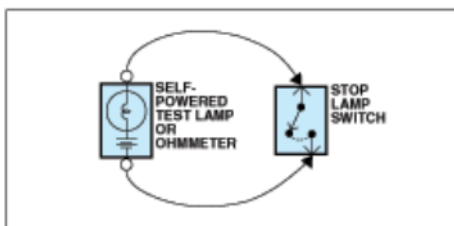
This test measures voltage in a circuit. When testing for voltage at a connector, you do not have to separate the two halves of the connector. Instead, probe the connector from the back(backprobe). Always check both sides of the connector because dirt and corrosion between its contact surfaces can cause electrical problems.

- Connect one lead of a test lamp or voltmeter to a ground. If you are using a voltmeter, be sure it is the voltmeter's negative test lead you have connected to ground.
- Connect the other lead of the test lamp or voltmeter to a selected test point(connector or terminal).
- If the test lamp glows, there is voltage present. If you are using a voltmeter, note the voltage reading. A loss of more than 1 volt from specification indicates a problem.



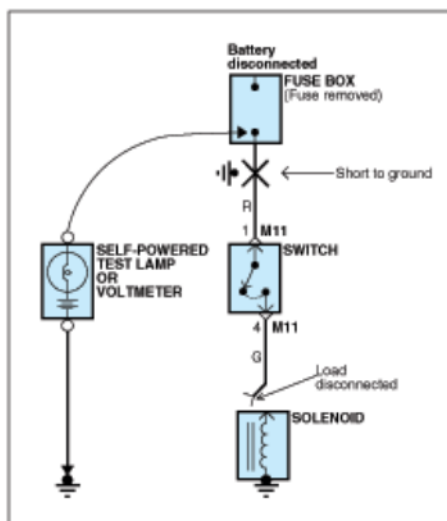
#### 2. TESTING FOR CONTINUITY

- Disconnect the battery negative terminal.
- Connect one lead of a self-powered test lamp or ohmmeter to one end of the part of the circuit you wish to test. If you are using an ohmmeter, hold the leads together and adjust the ohmmeter to read zero ohms.
- Connect the other lead to the other end.
- If the self-power test lamp glows, there is continuity. If you are using an ohmmeter, low or zero resistance means good continuity.



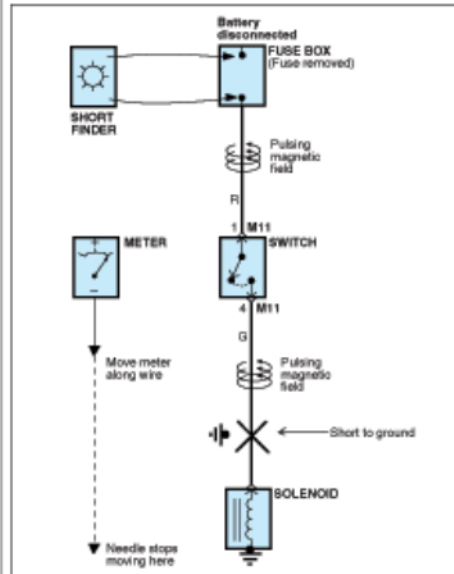
#### 3. TESTING FOR SHORT TO GROUND

- Disconnect the battery negative terminal.
- Connect one lead of a self-powered test lamp or an ohmmeter to the fuse terminal on the load side.
- Connect the other lead to a ground.
- Beginning near the fuse block move the harness from side to side. Continue this procedure(about six inches apart) while watching the self-powered test lamp or ohmmeter.
- When the self-powered test lamp glows, or ohmmeter registers, there is a short to a ground in the wiring near that point.



#### 4. TESTING FOR A SHORT WITH A SHORT FINDER

- Remove the blown fuse. Leave the battery connected.
- Connect the short finder across the fuse terminals.
- Close all switches in series in the circuit that is being testing.
- Turn on the short circuit locator. It sends pulses of current to the short. This creates a pulsing magnetic field around the wiring between the fuse box and the short.
- Beginning at the fuse box, slowly move the short finder along the circuit wiring. The meter will show current pulses through sheet metal and body trim. As long as the meter is between the fuse and the short, the needle will move with each current pulse. Once the meter is moved past the point of the short, the needle will stop moving. Check around this area to locate the cause of the short circuit.



#### 5. TESTING FOR VOLTAGE DROP

This test checks for voltage drop along a wire, or through a connection or switch.

- Connect the positive lead of a voltmeter to the end of the wire (or to the side of the connector or switch) closest to the battery.
- Connect the negative lead to the other end of the wire. (or the other side of the connector or switch)
- Operate the circuit.
- The voltmeter will show the difference in voltage between the two points. A difference, or drop of more than 0.1 volts (50mV in 5V circuits), may indicate a problem. Check the circuit for loose or dirty connections.

