

2-10 ENGINE ELECTRICAL

STARTING SYSTEM

Starter

TESTING

Voltage Drop Test

➔ **The battery must be in good condition and fully charged prior to performing this test.**

1. Disable the ignition system by unplugging the coil pack. Verify that the vehicle will not start.
2. Connect a voltmeter between the positive terminal of the battery and the starter **B+** circuit.
3. Turn the ignition key to the **START** position and note the voltage on the meter.
4. If voltage reads 0.5 volts or more, there is high resistance in the starter cables or the cable ground, repair as necessary. If the voltage reading is ok proceed to the next step.
5. Connect a voltmeter between the positive terminal of the battery and the starter **M** circuit.
6. Turn the ignition key to the **START** position and note the voltage on the meter.
7. If voltage reads 0.5 volts or more, there is high resistance in the starter. Repair or replace the starter as necessary.

➔ **Many automotive parts stores have starter bench testers available for use by customers. A starter bench test is the most definitive way to determine the condition of your starter.**

REMOVAL & INSTALLATION

♦ See Figure 45

1. Disconnect the negative battery cable.

2. Raise the vehicle and support it safely.
3. Disconnect the starter cable from the starter. If equipped with starter mounted solenoid, disconnect the push-on connector from the solenoid.

➔ **To disconnect the hard-shell connector from the solenoid S terminal, grasp the plastic shell and pull off; do not pull on the wire. Pull straight off to prevent damage to the connector and S terminal.**

4. Remove the starter bolts and the starter.

➔ **Some 3.8L applications have a starter-mounting stud that is used for engine ground.**

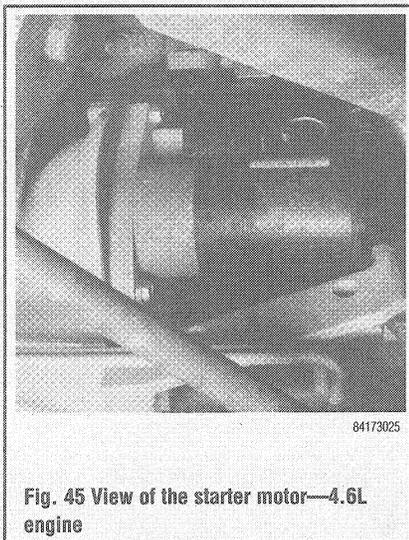


Fig. 45 View of the starter motor—4.6L engine

Ensure this connection is tight when replacing a starter.

To install:

5. Position the starter to the engine and tighten the mounting bolts to 15–20 ft. lbs. (20–27 Nm).
6. Reconnect the electrical leads. Connect the negative battery cable.

SOLENOID/RELAY REPLACEMENT

Starter Mounted Solenoid

1. Disconnect the negative battery cable.
2. Remove the starter.
3. Remove the positive brush connector from the solenoid **M** terminal.
4. Remove the solenoid retaining screws and remove the solenoid.
5. Attach the solenoid plunger rod to the slot in the lever and tighten the solenoid retaining screws to 45–54 inch lbs. (5–6 Nm).
6. Attach the positive brush connector to the solenoid **M** terminal and tighten the retaining nut to 80–120 inch lbs. (9–14 Nm).
7. Install the starter and connect the negative battery terminal.

Relay

1. Disconnect the negative battery cable.
2. Label and disconnect the wires from the relay.
3. Remove the relay retaining bolts and remove the relay.
4. Installation is the reverse of the removal procedure.

SENDING UNITS AND SENSORS

This section describes the operating principles of sending units, warning lights and gauges. Sensors, which provide information to the Powertrain Control Module (PCM), are covered in Section 4 of this manual.

Sending Units and Sensors

Instrument panels contain a number of indicating devices (gauges and warning lights). These devices are composed of two separate components. One is the sending unit, mounted on the engine or other remote part of the vehicle, and the other is the actual gauge or light in the instrument panel.

Several types of sending units exist, however most can be characterized as being either a pressure type or a resistance type. Pressure type sending units convert liquid pressure into an electrical signal that is sent to the gauge. Resistance type sending units are most often used to measure temperature and use variable resistance to control the current flow back to the indicating device. Both types of sending units are connected in series by a wire to the battery (through the ignition switch). When the ignition is turned **ON**, current flows from the battery through the indicating device and on to the sending unit.

Coolant Temperature Sensor

TESTING

*** CAUTION

Never open, service, or drain the radiator or cooling system when hot; serious burns can occur from the steam and hot coolant. In addition, when draining engine coolant, keep in mind that cats and dogs are attracted to ethylene glycol antifreeze and could drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantities. Always drain coolant into a sealable container. Coolant should be reused unless it is contaminated or is several years old.

The sending unit is located in a water jacket or coolant passage near the thermostat.

1. Check the appropriate fuse before attempting any other diagnostics.
2. Make sure the cooling system is full and free of any trapped air.

3. Tape a mechanic's thermometer to the radiator return hose (upper hose) securely.
4. Disconnect the sending unit electrical harness.
5. Using an ohmmeter, check the resistance between the sending unit terminals.
6. Resistance should be high (58K ohms) with engine coolant cold 50°F (10°C) and low (2.8K ohms) with engine coolant hot 194°F (90°C).

➔ **It is best to check resistance with the engine cool, then start the engine, and watch the resistance change as the engine warms.**

7. If resistance does not drop as engine temperature rises, the sending unit is faulty.

REMOVAL & INSTALLATION

♦ See Figure 46

1. Disconnect the negative battery cable.
2. Drain the cooling system into a suitable container.
3. Disconnect the electrical connector at the temperature sender/switch.
4. Remove the temperature sender/switch.