

CHARGING SYSTEM

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DESCRIPTION AND OPERATION

CHARGING SYSTEM

DESCRIPTION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to the Ignition System for information)
- Battery (refer to the Battery for information)
- Battery temperature sensor
- Wiring harness and connections (refer to the Wiring for information)

OPERATION

The charging system is turned on and off with the ignition switch. When the ignition switch is turned to the ON position, battery voltage is applied to the generator rotor through one of the two field terminals to produce a magnetic field. The generator is driven by the engine through a serpentine belt and pulley arrangement.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry, contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

Temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly and to maintain the proper voltage depending on battery temperature.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including the EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnos-

tic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects.

GENERATOR

DESCRIPTION

The generator is belt-driven by the engine. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The Y type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicles electrical system through the generator, battery, and ground terminals.

Noise emitting from the generator may be caused by:

- Worn, loose or defective bearings
- Loose or defective drive pulley
- Incorrect, worn, damaged or misadjusted drive belt
- Loose mounting bolts
- Misaligned drive pulley
- Defective stator or diode
- Damaged internal fins

DIAGNOSIS AND TESTING

CURRENT OUTPUT TEST

The current output test will determine if the charging system can deliver its minimum test current (amperage) output. Refer to the Specifications section at the end of this group for minimum test current (amperage) requirements.

DIAGNOSIS AND TESTING (Continued)

The first part of this test will determine the combined amperage output of both the generator and the Electronic Voltage Regulator (EVR) circuitry.

PREPARATION

(1) Determine if any Diagnostic Trouble Codes (DTC) exist. For repair, refer to the appropriate Powertrain Diagnostic Procedures manual.

(2) Before starting test, make sure battery is in good condition and is fully-charged. See the Battery section for more information.

(3) Check condition of battery cables at battery. Clean if necessary.

(4) Be sure the generator drive belt is properly tensioned. Refer to the Cooling System for information.

(5) A volt/amp tester equipped with both a battery load control (carbon pile rheostat) and an inductive-type pickup clamp (ammeter probe) will be used for this test. Refer to operating instructions supplied with tester. When using a tester equipped with an inductive-type clamp, removal of wiring at the generator will not be necessary.

(6) Start the engine and allow it to reach operating temperature.

(7) Shut engine off.

(8) Turn off all electrical accessories and all vehicle lighting.

(9) Connect the volt/amp tester leads to the battery post or jump start posts. Be sure the carbon pile rheostat control is in the OPEN or OFF position before connecting leads. See Load Test in the Battery section for more information. Also refer to the operating instructions supplied with test equipment.

(10) Connect the inductive clamp (ammeter probe). Refer to the operating instructions supplied with test equipment.

(11) If volt/amp tester is not equipped with an engine tachometer, connect a separate tachometer to the engine.

TEST

(1) Perform the previous test Preparation.

(2) Fully engage the parking brake.

(3) Start engine.

(4) Bring engine speed to 2500 rpm.

(5) With engine speed held at 2500 rpm, slowly adjust the rheostat control (load) on the tester to obtain the highest amperage reading. Do not allow voltage to drop below 12 volts. Record the reading.

This load test must be performed within 15 seconds to prevent damage to test equipment. On certain brands of test equipment, this load will be applied automatically. Refer to the operating manual supplied with test equipment.

(6) The ammeter reading must meet the Minimum Test Amps specifications as displayed in the Generator Ratings chart. This can be found in the Specifications section. A label stating a part reference number is attached to the generator case. On some engines this label may be located on the bottom of the case. Compare this reference number to the Generator Ratings chart.

(7) Rotate the load control to the OFF position.

(8) Continue holding engine speed at 2500. If EVR circuitry is OK, amperage should drop below 15–20 amps. With all electrical accessories and vehicle lighting off, this could take several minutes of engine operation. If amperage did not drop, refer to the appropriate Powertrain Diagnostic Procedures manual for testing.

(9) Remove volt/amp tester.

If minimum amperage could not be met, refer to the appropriate Powertrain Diagnostic Procedures manual for testing.

REMOVAL AND INSTALLATION

2.0L Generator

REMOVAL

(1) Disconnect the negative battery cable at the remote terminal, located on the left strut tower.

(2) Remove the generator pivot bolt. Located directly below the generator.

(3) Remove the generator lock nut (Fig. 1).

(4) Loosen the (2) generator support bracket retaining bolts (Fig. 1).

(5) Loosen the accessory drive belt tension bolt (Fig. 1).

(6) Remove the accessory drive belt from the generator pulley.

(7) Disconnect the (2) generator electrical connectors

(8) Remove the generator pivot bolt.

(9) Remove the generator from the vehicle.

INSTALLATION

(1) Install the generator in the vehicle.

(2) Install the generator pivot bolt and leave loose at this time

(3) Install the accessory drive belt. Making sure the belt is properly seated on all the accessory drive pulleys

(4) Install the generator lock nut and leave loose at this time (Fig. 2).

(5) Tighten the accessory drive belt tension bolt to set the proper belt tension (Fig. 2).

(6) Torque the generator pivot bolt to 54 N·m (40 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

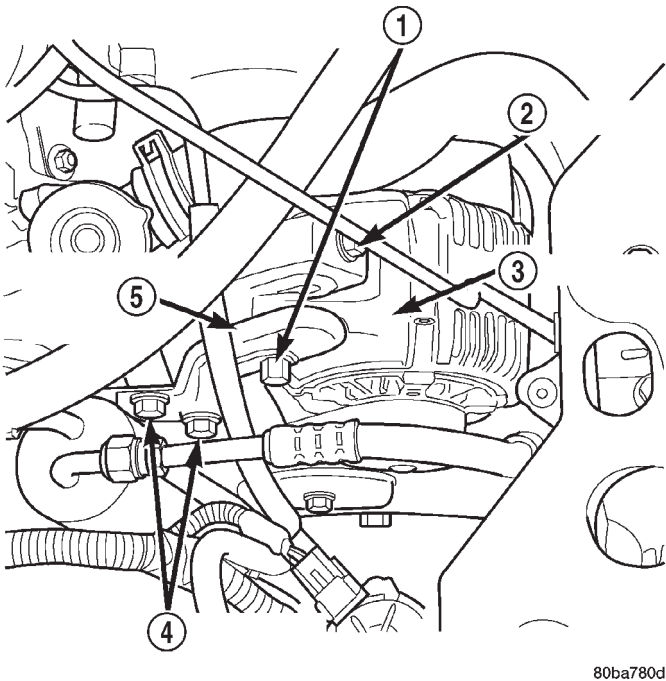


Fig. 1 Generator Position & Orientation — Front
1 – GENERATOR LOCK NUT
2 – BELT TENSION BOLT
3 – GENERATOR
4 – GENERATOR SUPPORT BRACKET BOLTS
5 – GENERATOR SUPPORT BRACKET

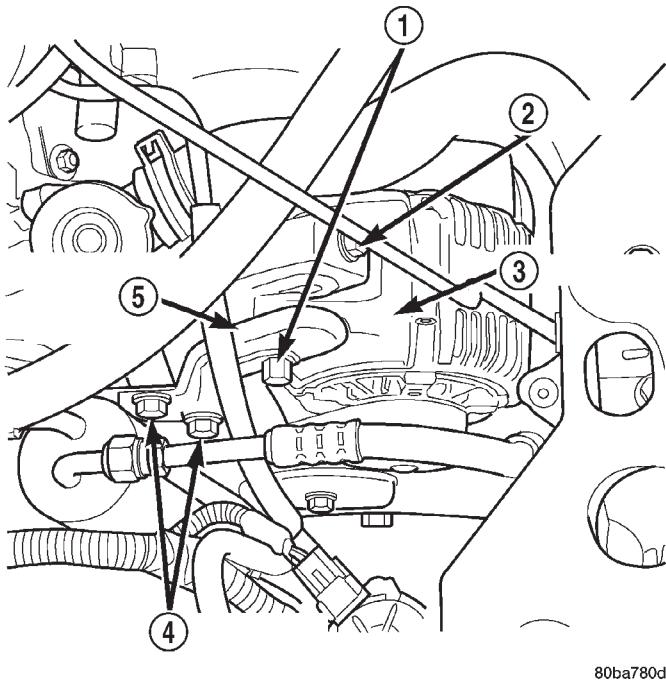


Fig. 2 Generator Position & Orientation — Front
1 – GENERATOR LOCK NUT
2 – BELT TENSION BOLT
3 – GENERATOR
4 – GENERATOR SUPPORT BRACKET BOLTS
5 – GENERATOR SUPPORT BRACKET

- (7) Torque the generator lock nut to 54 N·m (40 ft. lbs.).
- (8) Connect the generator electrical connectors. Torque the B+ terminal to 9 N·m (75 in. lbs.).

- (9) Connect the negative battery cable.

SPECIFICATIONS

GENERATOR RATINGS

TYPE	ENGINES	MINIMUM TEST AMPS
DENSO	2.0L	100 amps
DENSO	2.5L	100 amps
The Test Specifications are: 1. 2500 ±20 RPMS 2. Voltage Output 12V ±.3V 3. Field Current 6amps ±.1amp		

SPECIFICATIONS (Continued)

TORQUE

DESCRIPTION	TORQUE
Battery Terminal Nut	10 N·m (90 in. lbs.)
Battery Hold Down Clamp Bolt	10 N·m (90 in. lbs.)
Battery Negative Cable Nut at Shock Tower	10 N·m (90 in. lbs.)
Generator B+ Terminal	9 N·m (75 in. lbs.)
Generator Mounting Bolt	54 N·m (40 ft. lbs.)
Generator Pivot Bolt	54 N·m (40 ft. lbs.)