

CHARGING SYSTEM

TABLE OF CONTENTS

	page		page
DESCRIPTION AND OPERATION		REMOVAL AND INSTALLATION	
CHARGING SYSTEM.....	1	GENERATOR—2.5L	3
GENERATOR.....	1	BATTERY TEMPERATURE SENSOR	3
BATTERY TEMPERATURE SENSOR	2	SPECIFICATIONS	
ELECTRONIC VOLTAGE REGULATOR.....	2	GENERATOR RATINGS.....	4
ON-BOARD DIAGNOSTIC SYSTEM	2	TORQUE	4

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 Diagnostic 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.

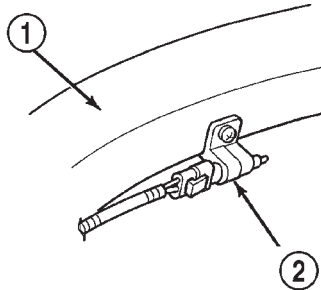
Noise emitting from the generator may be caused by:

- 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

DESCRIPTION AND OPERATION (Continued)

BATTERY TEMPERATURE SENSOR**DESCRIPTION**

The sensor is located on the rear side of the front bumper beam. (Fig. 1).



958A-20

Fig. 1 Battery Temperature Sensor

- 1 - BUMPER BEAM
2 - BATTERY TEMPERATURE SENSOR

OPERATION

The battery temperature sensor is used to determine the battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

The battery temperature sensor is also used for OBD II diagnostics. Certain faults and OBD II monitors are either enabled or disabled depending upon the battery temperature sensor input (example: disable purge and EGR, enable LDP). Most OBD II monitors are disabled below 20°F.

ELECTRONIC VOLTAGE REGULATOR**DESCRIPTION**

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

OPERATION

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

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage (B+) and battery temperature (refer to Battery Temperature Sensor for more information). It then determines a target charging voltage. If sensed battery voltage is 0.5 volts or lower than the target voltage, the PCM grounds the field winding until sensed battery voltage is 0.5 volts above target voltage. A circuit in the PCM cycles the ground side of the generator field up to 100 times per second (100Hz), but has the capability to ground the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 25% is used by the PCM in order to have some generator output. Also refer to Charging System Operation for additional information.

ON-BOARD DIAGNOSTIC SYSTEM**OPERATION****GENERAL INFORMATION**

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the OBD system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 50 engine starts if the problem does not occur again.

DIAGNOSTIC TROUBLE CODES

A DTC description can be read using the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

ERASING DIAGNOSTIC TROUBLE CODES

The DRB Scan Tool must be used to erase a DTC.

REMOVAL AND INSTALLATION

GENERATOR—2.5L

REMOVAL

- (1) Disconnect battery negative cable from remote negative terminal on shock tower.
- (2) Unplug field circuit from generator.
- (3) Remove the B+ terminal nut and wire (Fig. 2).

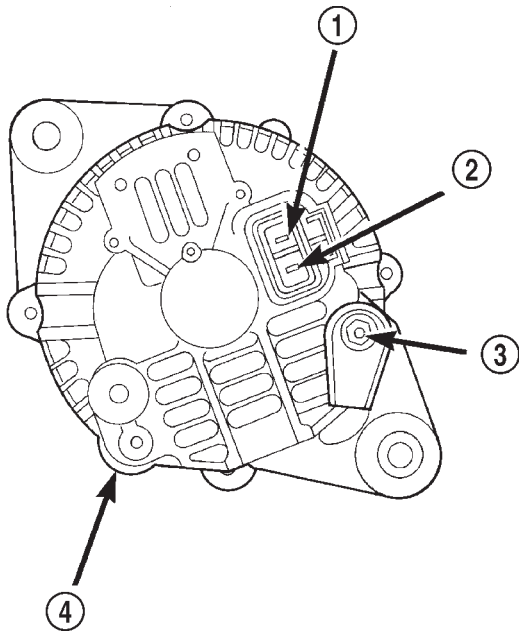


Fig. 2 Wiring Connections—2.5L

- 1 - FEED
- 2 - TO POWERTRAIN CONTROL MODULE
- 3 - B+ TERMINAL
- 4 - CASE GROUND

- (4) Loosen top mounting ear bolt.
- (5) Loosen pivot bolt, but do not remove. Be careful not to lose nut (Fig. 3).
- (6) Loosen adjusting bolt on idler to allow removal of the generator drive belt. Refer to the Cooling System.
- (7) Remove pivot bolt, do not drop spacer.
- (8) Remove top mounting ear bolt.
- (9) Remove upper generator bracket.
- (10) Remove generator.

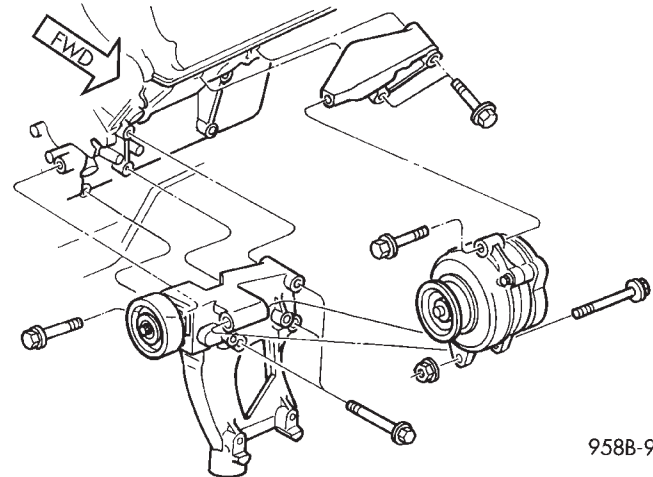


Fig. 3 Generator—2.5L Engine

INSTALLATION

- (1) Install generator.
- (2) Install upper generator bracket.
- (3) Install top mounting ear bolt.
- (4) Install pivot bolt, do not drop spacer.
- (5) Install field circuit to generator.
- (6) Install the B+ terminal nut and wire (Fig. 2).
- (7) Tighten adjusting bolt on idler for the generator drive belt. Refer to the Cooling System.
- (8) Tighten the top mounting ear bolt.
- (9) Tighten the pivot bolt (Fig. 3).
- (10) Connect battery negative cable to the remote negative terminal on shock tower.

BATTERY TEMPERATURE SENSOR

REMOVAL

- (1) Remove the negative battery cable.
- (2) Remove the front bumper fascia, refer to the Frame and Bumper section.
- (3) Raise vehicle on host.
- (4) Remove sensor.
- (5) Disconnect electrical connector from sensor.

INSTALLATION

- (1) Connect electrical connector to sensor.
- (2) Install sensor.
- (3) Lower vehicle.
- (4) Install the front bumper fascia, refer to the Frame and Bumper section.
- (5) Install the negative battery cable.

SPECIFICATIONS

GENERATOR RATINGS

TYPE	ENGINES	MINIMUM TEST AMPS
DENSO	2.5L	74 amps
The Test Specifications are: 1. 2500 ±20 RPMS 2. Voltage Output 14V ±.5V 3. Field Current 5amps ±.1amp		

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.)