

2010 ELECTRICAL

Charging - Service Information - Liberty

DESCRIPTION

DESCRIPTION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch
- Battery (refer to **BATTERY SYSTEM** for information)
- Battery temperature sensor
- Generator Lamp (if equipped)
- Check Gauges Lamp (if equipped)
- Wiring harness and connections (refer to appropriate SYSTEM WIRING DIAGRAMS for information)

OPERATION

OPERATION

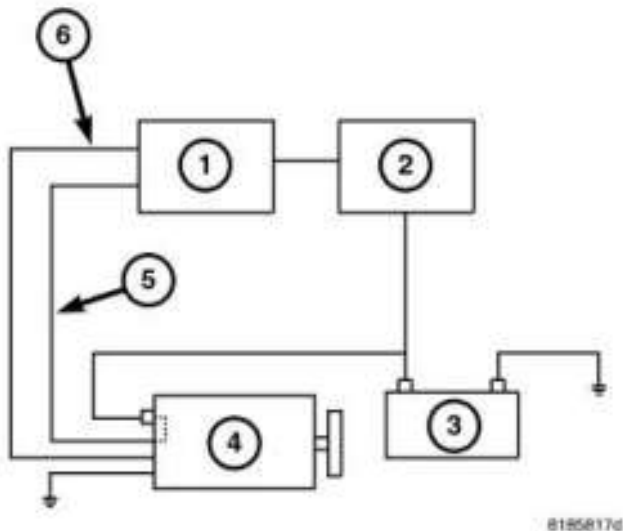


Fig. 1: CHARGING SYSTEM
Courtesy of CHRYSLER LLC

- 1 - PCM
- 2 - TIPM
- 3 - Battery
- 4 - Generator
- 5 - Feed Back Circuit B+

6 - Control Circuit

7 - Battery Sense

On gasoline powered engines, the charging system is turned on and off with the PCM (Powertrain Control Module) and ignition switch with engine running. On diesel powered engines, the charging system is turned on and off with the ECM (Engine Control Module) and ignition switch with engine running. The field circuit will not be energized until engine is running and ignition switch on. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source B+) at the back of the generator. The generator is internally grounded. The generator regulates the field using pin-1 of the field connector (high side driver).

The generator is driven by the engine through a serpentine belt and pulley, or a decoupler pulley arrangement.

The PCM, or ECM receives a voltage input from the generator (5) and also a battery voltage input (7) from the TIPM (Totally Integrated Power Module), it then compares the voltages to the desired voltage programmed in the EVR (Electronic Voltage Regulator) software, and, if there is a difference it sends a signal to the generator EVR circuit to increase or decrease output. It uses a Pulse Width Modulation (PWM) to send signals to the generator circuitry to control the amount of output from the generator. The amount of DC current produced by the generator is controlled by the EVR circuitry contained within the generator.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR 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 certain failures it detects.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage**, engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The lamp is located on the instrument panel. Refer to **Electrical/Instrument Cluster/INDICATORS, Instrument Cluster - Operation** for additional information.

Voltage is monitored at the B+ terminal stud to insure it is connected. If the B+ cable is loose, the PCM will shut down generator field. Because of this new feature, pin-2 of the field connector is internally connected to the B+ terminal.

The generator used with diesel engines is internally regulated. The generator and ECM communicate for diagnostics, etc. If the generator regulator becomes disconnected from the ECM, it will still operate, but in a default mode.

DIAGNOSIS AND TESTING

CHARGING SYSTEM

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp (if equipped) is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to **IGNITION-OFF DRAW TEST** for more information.

INSPECTION

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 On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

To perform a complete test of the charging system, use a diagnostic scan tool. Perform the following inspections before attaching the scan tool.

1. Inspect the battery condition. Refer to **BATTERY SYSTEM** for procedures.
2. Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.
3. Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.
4. Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to **TORQUE - GENERATOR** for torque specifications.
5. Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to **COOLING**.
6. Inspect automatic belt tensioner (if equipped). Refer to **COOLING** for information.
7. Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

SPECIFICATIONS

TORQUE - GENERATOR

TORQUE - GENERATOR

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Generator Horizontal Mounting Bolts - 3.7L	57	42	-
Generator Vertical Mounting Bolt - 3.7L	40	29	-
Generator Mounting Bolts - 2.8L Diesel	54	40	-
Rear Generator Support Bracket Bolts (to engine) - 2.8L Diesel	28	-	250
B+ Cable Terminal Nut	13	10	115
Generator Decoupler	110	81	-

GENERATOR RATINGS

TYPE	RATED SAE AMPS	ENGINES
DENSO	136	3.7L
DENSO	160	3.7L
DENSO	180	2.8L Diesel

SPECIAL TOOLS

SPECIAL TOOLS

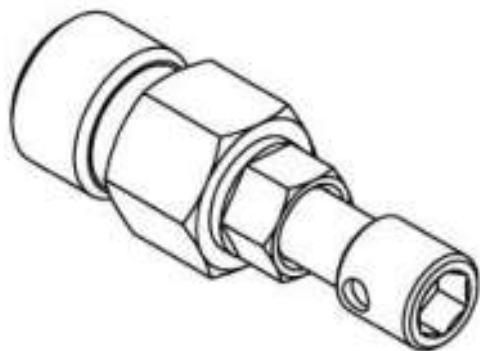
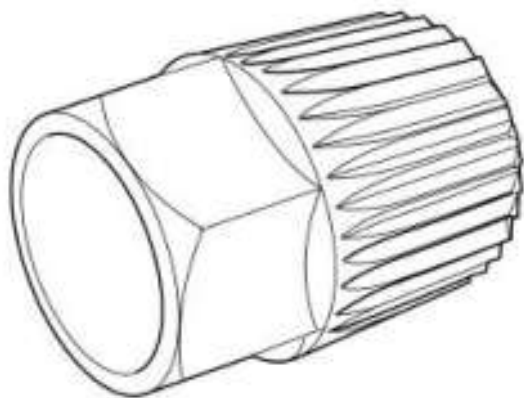


Fig. 2: GENERATOR DECOUPLER TOOL #8433
 Courtesy of CHRYSLER LLC



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Fig. 3: GENERATOR DECOUPLER TOOL #8823
 Courtesy of CHRYSLER LLC

DECOUPLER, GENERATOR

DESCRIPTION

DESCRIPTION

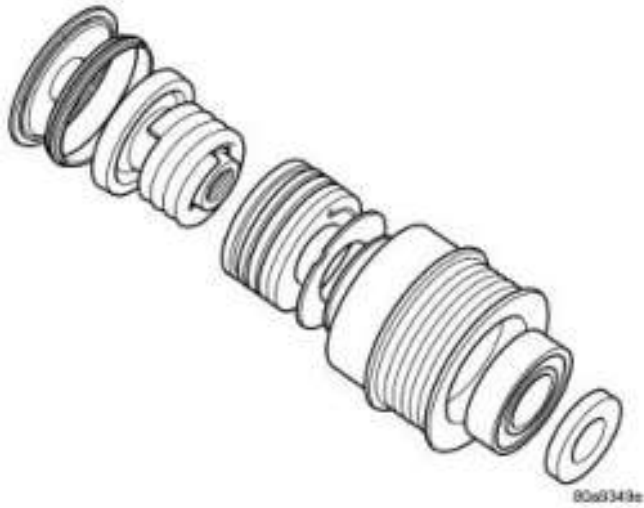


Fig. 4: GENERATOR DECOUPLER PULLEY

Courtesy of CHRYSLER LLC

The generator decoupler is used only with certain engines. The decoupler is used in place of the standard generator drive pulley.

OPERATION

OPERATION

The generator decoupler is used only with certain engines. The decoupler is a one-way clutch designed to help reduce belt tension fluctuation, vibration, reduce fatigue loads, improve belt life, reduce hubloads on components, and reduce noise. Dry operation is used (no grease or lubricants). The decoupler is not temperature sensitive and also has a low sensitivity to electrical load. The decoupler is a non-serviceable item and is to be replaced as an assembly.

DIAGNOSIS AND TESTING

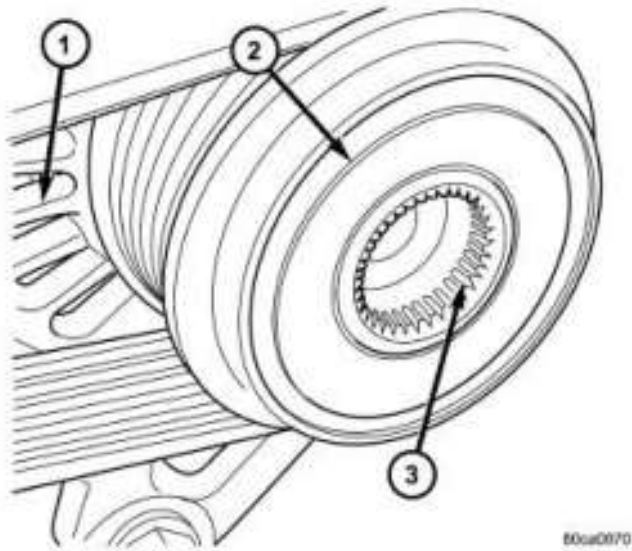
GENERATOR DECOUPLER

CONDITION	POSSIBLE CAUSES	CORRECTION
Does not drive generator (generator not charging)	Internal failure -	Replace decoupler -
Noise coming from decoupler	Internal failure	Replace decoupler

REMOVAL

REMOVAL

The generator decoupler is used only with certain engines.

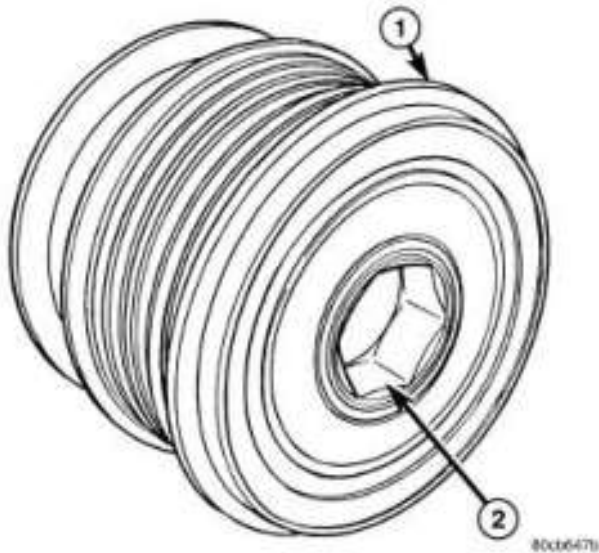


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Fig. 5: GENERATOR DECOUPLER PULLEY (INA)
 Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - GENERATOR
2 - DECOUPLER (INA)
3 - MACHINED SPLINES |
|--|

Two different type generator decoupler pulleys are used. One can be identified by the machined splines (3) .



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Fig. 6: GENERATOR DECOUPLER PULLEY (LITENS)
 Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - DECOUPLER (LITENS)
2 - HEX OPENING |
|---|

The other decoupler is equipped with a hex opening (2) and will not use splines.

Different special tools are required to service each different decoupler. Refer to following procedure.

INA Decoupler

1. Disconnect the negative battery cable.
2. Remove the generator and accessory drive belt. See Electrical/Charging/GENERATOR - Removal.

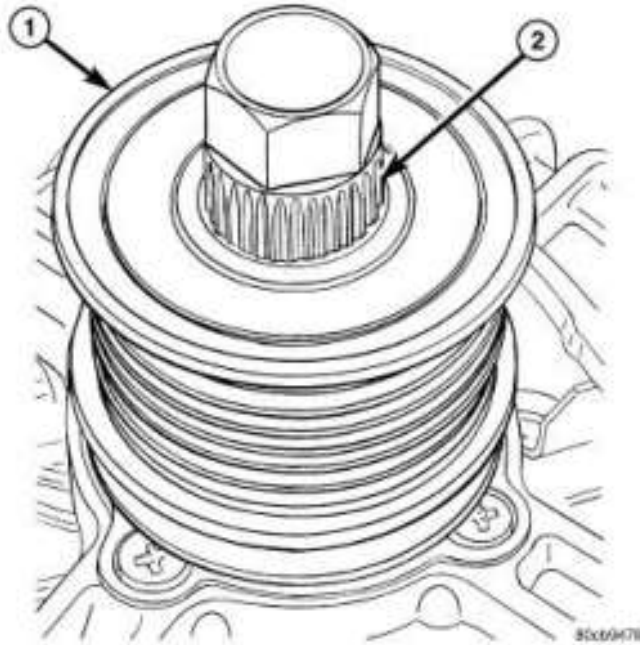


Fig. 7: 8823 TOOL AND INA DECOUPLER
Courtesy of CHRYSLER LLC

1 - INA DECOUPLER 2 - TOOL 8823 (VM.1048)
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3. Position the Special Tool 8823 (VM.1048) (2) into the decoupler (1) .

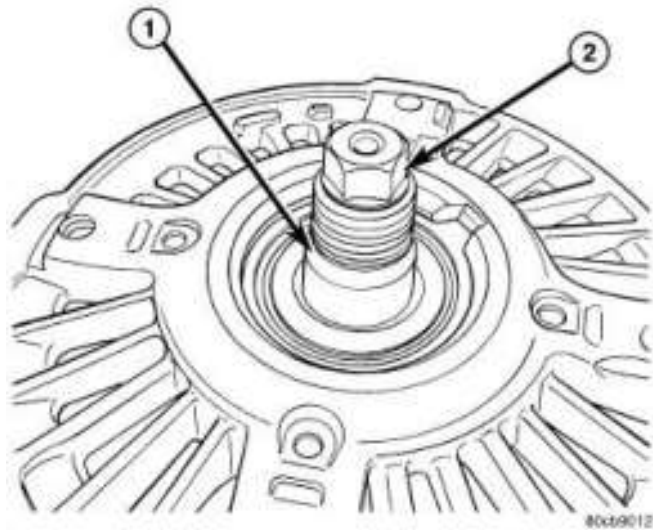


Fig. 8: END OF GENERATOR SHAFT (HEX)
Courtesy of CHRYSLER LLC

1 - GENERATOR SHAFT 2 - HEX

4. Determine if the end of generator shaft is hex shaped (2) .

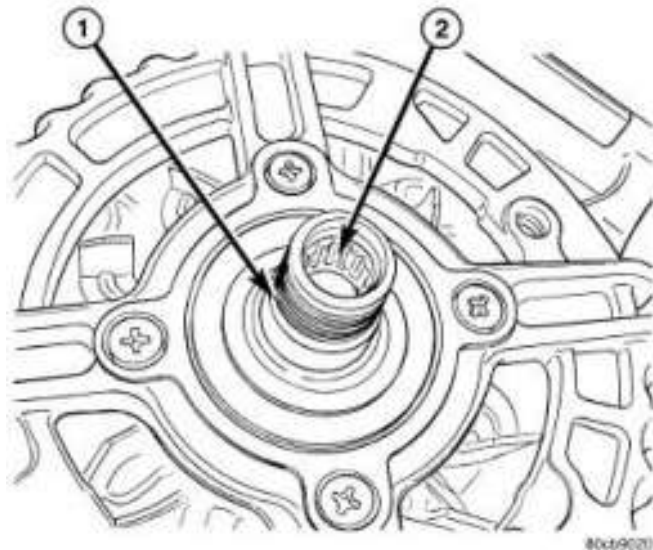


Fig. 9: END OF GENERATOR SHAFT (SPLINED)
Courtesy of CHRYSLER LLC

1 - GENERATOR SHAFT 2 - SPLINES

5. .or is splined (2) .

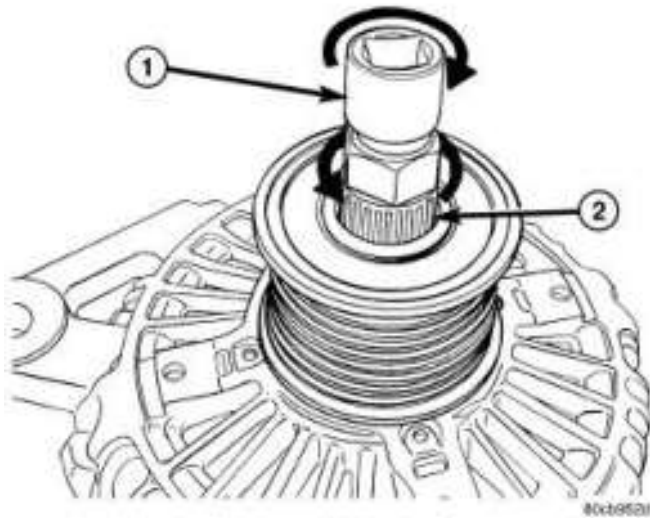


Fig. 10: DECOUPLER REMOVAL (INA-HEX)
Courtesy of CHRYSLER LLC

1 - DEEP 10 MM SOCKET 2 - TOOL 8823 (VM.1048)
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6. If the hex is used, insert a 10MM deep socket (1) into tool 8823 (VM.1048) .

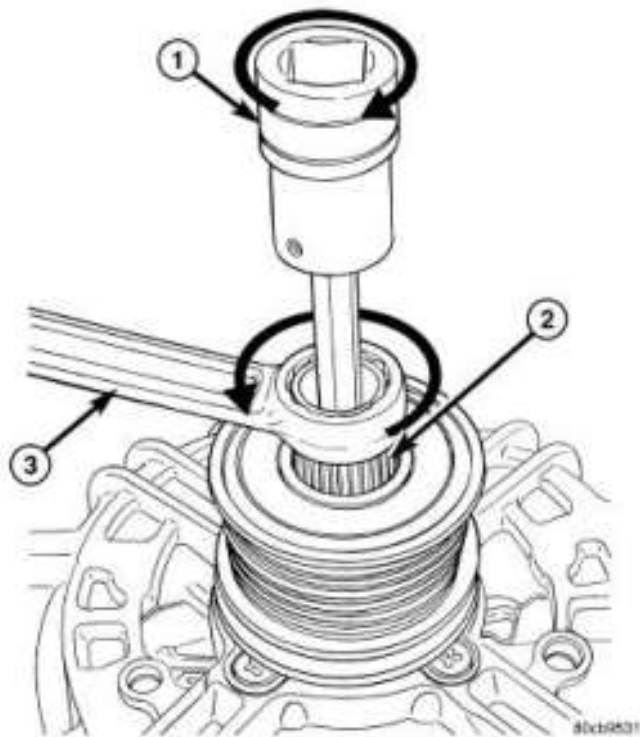


Fig. 11: DECOUPLER REMOVAL (INA-SPLINED)
Courtesy of CHRYSLER LLC

- | |
|---|
| 1 - DRIVER
2 - TOOL 8823 (VM.1048)
3 - 17 MM WRENCH |
|---|

7. If splined, insert a 5/16" 6-point hex driver (1), or a 10MM 12-point triple square driver into tool 8823 (VM.1048) .

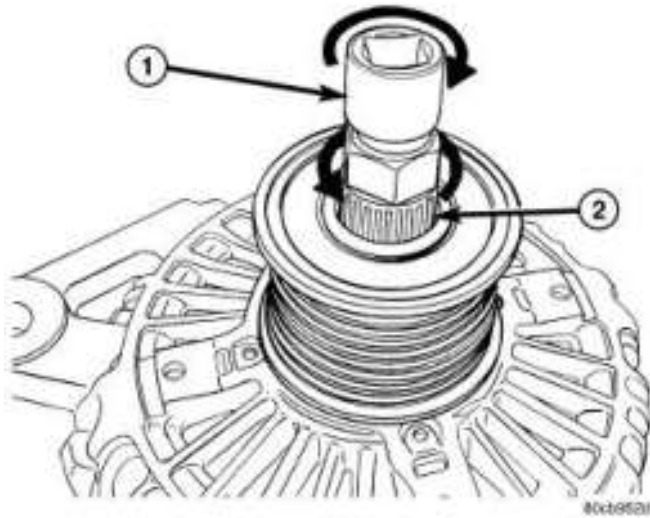


Fig. 12: DECOUPLER REMOVAL (INA-HEX)
Courtesy of CHRYSLER LLC

- | |
|--|
| 1 - DEEP 10 MM SOCKET
2 - TOOL 8823 (VM.1048) |
|--|

8. The generator shaft uses conventional right-hand threads to attach the decoupler. To break the decoupler loose from generator threads, rotate the end of tool (1) clockwise or.,

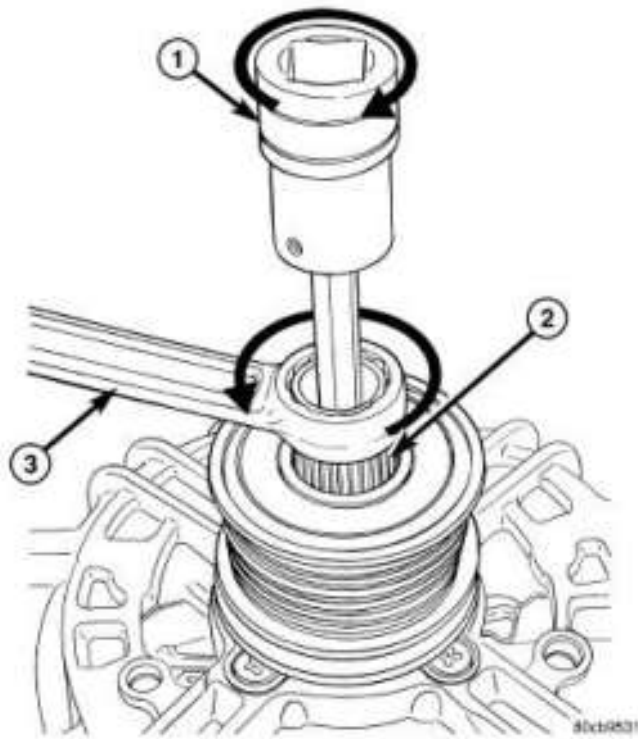


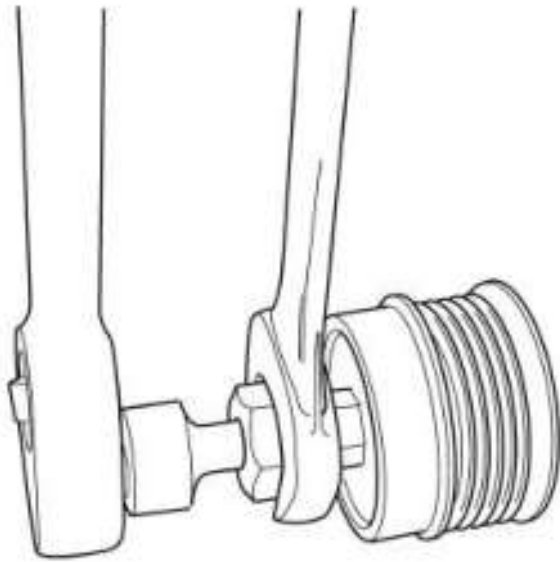
Fig. 13: DECOUPLER REMOVAL (INA-SPLINED)
Courtesy of CHRYSLER LLC

1 - DRIVER 2 - TOOL 8823 (VM.1048) 3 - 17 MM WRENCH

9. Rotate the end of tool (1) clockwise .
10. After breaking it loose with the tool, unthread decoupler by hand from the generator.

Litens Decoupler

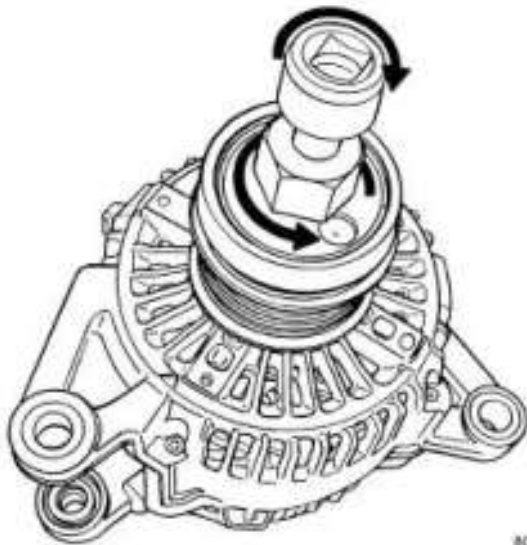
1. Disconnect the negative battery cable.
2. Remove the generator and accessory drive belt. See **Electrical/Charging/GENERATOR - Removal.**



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Fig. 14: 8433A TOOL AND LITENS DECOUPLER
Courtesy of CHRYSLER LLC

3. Position the Special Tool 8433A into the decoupler. Align to the hex end of the generator shaft.



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Fig. 15: DECOUPLER REMOVAL (LITENS)
Courtesy of CHRYSLER LLC

4. The generator shaft uses conventional right-hand threads to attach the decoupler. To break the decoupler loose from generator threads, rotate the end of tool clockwise .
5. After breaking loose the decoupler with the tool, unthread the decoupler by hand from the generator.

INSTALLATION

INSTALLATION

INA Decoupler

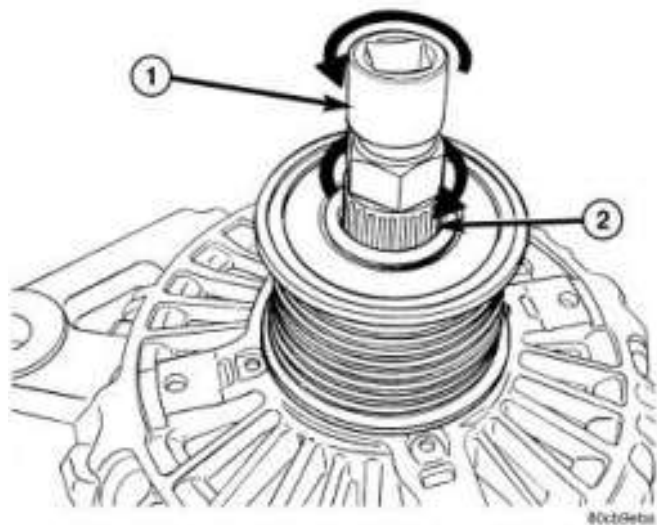


Fig. 16: DECOUPLER INSTALLATION (INA-HEX)

Courtesy of CHRYSLER LLC

1 - 10MM DEEP SOCKET

2 - TOOL 8823 (VM.1048)

1. Thread the decoupler pulley onto the generator shaft by hand (right-hand threads).
2. Position the Special Tool 8823 (VM.1048) into the decoupler.
3. Determine if the end of generator shaft is hex shaped or is splined. If hex is used, insert a 10MM deep socket (1) into the tool 8823 (VM.1048) or.

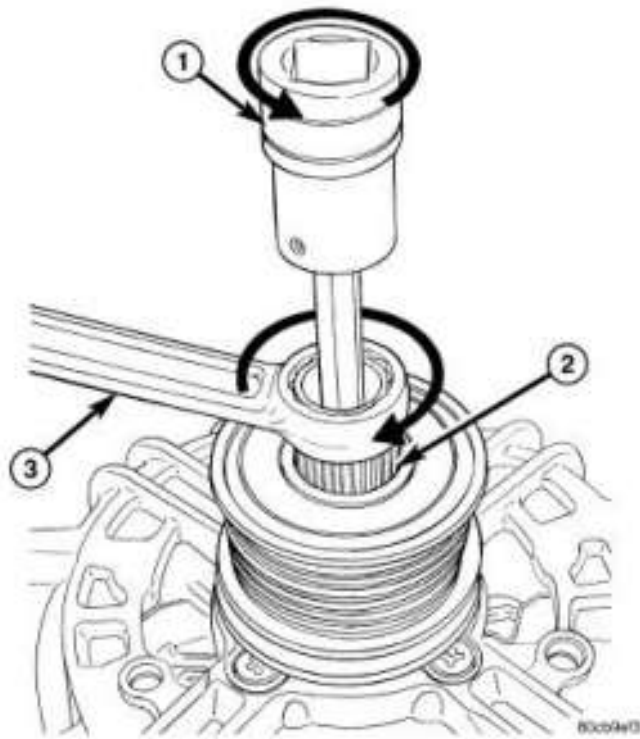


Fig. 17: DECOUPLER INSTALLATION (INA SPLINED)
Courtesy of CHRYSLER LLC

1 - DRIVER 2 - TOOL 8823 (VM.1048) 3 - BACKUP WRENCH
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4. .if splined, insert a 5/16" 6-point hex driver (1), or a 10MM 12-point triple square driver into tool 8823 (VM.1048) .
5. **Do not use an adjustable, ratcheting "click type" torque wrench. Most "click type" wrenches will only allow torque to be applied in a clockwise rotation. Use a dial-type or beam-type wrench.** Tighten in the counterclockwise rotation and tighten to 110 N.m (81 ft. lbs.).
6. Install the accessory drive belt and generator. See [Electrical/Charging/GENERATOR - Installation](#).
7. Connect the negative battery cable.

Litens Decoupler



Fig. 18: DECOUPLER INSTALLATION (Litens)
 Courtesy of CHRYSLER LLC

1. Thread the decoupler pulley onto the generator shaft by hand (right-hand threads).
2. Position the Special Tool 8433A into decoupler. Align the tool to hex end of the generator shaft.
3. **Do not use an adjustable, ratcheting "click type" torque wrench. Most "click type" wrenches will only allow torque to be applied in a clockwise rotation. Use a dial-type or beam-type wrench.** Tighten in the counterclockwise rotation and tighten to 110 N.m (81 ft. lbs.).
4. Install the accessory drive belt, and generator. See **Electrical/Charging/GENERATOR - Installation.**
5. Connect the negative battery cable.

GENERATOR

DESCRIPTION

DESCRIPTION

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

OPERATION

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 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 vehicle electrical system through the generator battery terminal.

Although the generators appear the same externally, different generators with different output ratings are used on this vehicle. Be certain that the replacement generator has the same output rating and part number as the original unit. Refer to **Specifications** and see Generator Ratings for amperage ratings and part numbers.

Noise emitting from the generator may be caused by: worn, loose or defective bearings; a loose or defective drive pulley; incorrect, worn, damaged or misadjusted fan drive belt; loose mounting bolts; a misaligned drive pulley or a defective stator or diode.

REMOVAL

3.7L

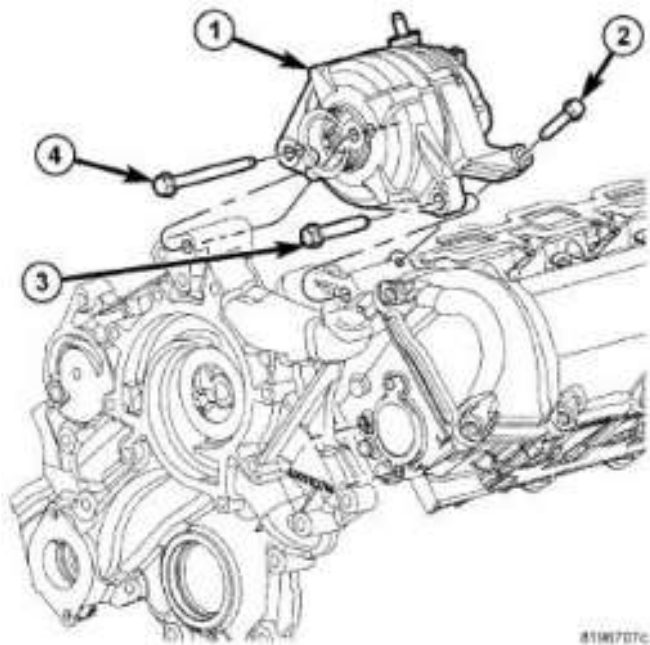


Fig. 19: GENERATOR - 3.7L
Courtesy of CHRYSLER LLC

CAUTION: Disconnect the negative battery cable before removing the battery output wire from generator. Failure to do so can result in injury or damage to electrical system.

1. Disconnect and isolate negative battery cable at battery.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to **COOLING** .

2. Remove generator drive belt. Refer to COOLING .
3. Unsnap plastic protective cover from B+ mounting stud.
4. Remove B+ terminal mounting nut at top of generator.
5. Disconnect field wire electrical connector at rear of generator by pushing on connector tab.
6. Remove one vertical generator mounting bolt (2) and two horizontal mounting bolts (3) and (4).
7. Remove generator (1) from vehicle.

2.8L DIESEL

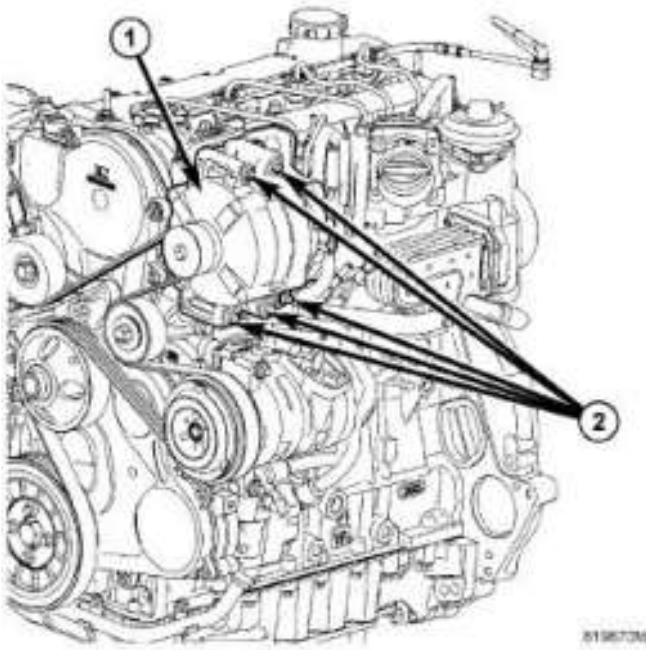


Fig. 20: GENERATOR - 2.8L DIESEL
Courtesy of CHRYSLER LLC

CAUTION: Disconnect the negative battery cable before removing the battery output wire from generator. Failure to do so can result in injury or damage to electrical system.

1. Disconnect and isolate negative battery cable at battery.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to COOLING .

2. Remove generator drive belt. Refer to COOLING .

3. Unsnap plastic protective cover from B+ mounting stud.
4. Remove B+ terminal mounting nut at top of generator.
5. Disconnect field wire electrical connector at rear of generator by pushing on connector tab.
6. Remove four generator mounting bolts (2).
7. Remove generator (1) from vehicle.

INSTALLATION

3.7L

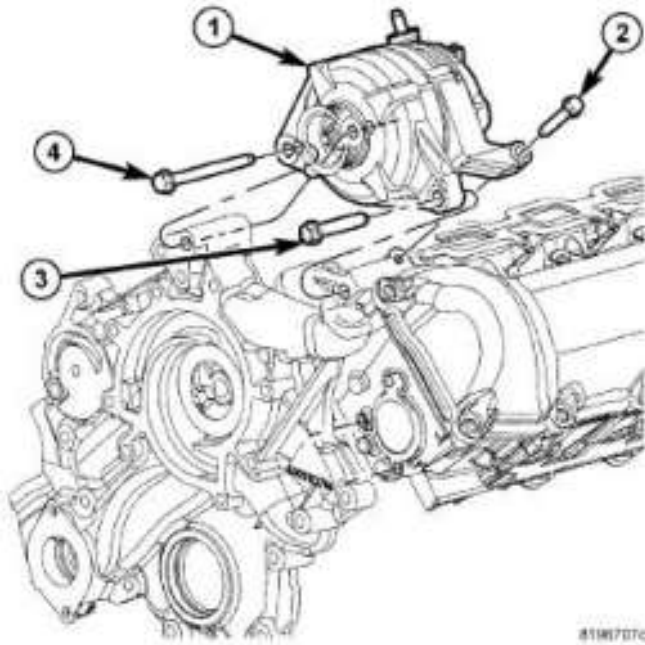


Fig. 21: GENERATOR - 3.7L
 Courtesy of CHRYSLER LLC

1. Position generator (1) to engine and install three mounting bolts (2), (3) and (4). Tighten two horizontal mounting bolts (3) and (4) to 57 N.m (42 ft. lbs.). Tighten vertical mounting bolt (2) to 40 N.m (29 ft. lbs.)
2. Snap field wire connector into rear of generator.
3. Install B+ terminal and nut to generator mounting stud. Tighten nut to 13 N.m (115 in. lbs.)
4. Snap plastic protective cover to B+ terminal.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to COOLING .

5. Install drive belt. Refer to **COOLING** for belt routing, belt adjustment and bolt tightening procedures.
6. Install negative battery cable to battery.

2.8L DIESEL

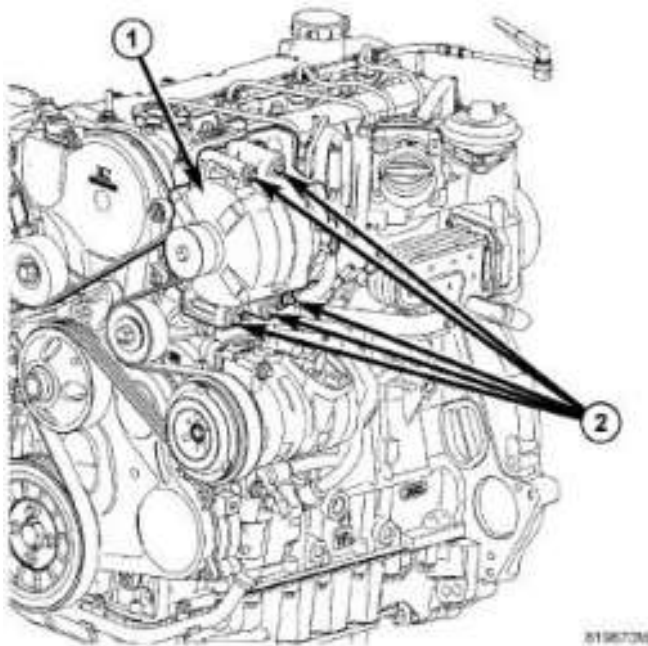


Fig. 22: GENERATOR - 2.8L DIESEL
Courtesy of CHRYSLER LLC

1. Position generator (1) to engine and install four mounting bolts (2). Tighten all four bolts to 54 N.m (40 ft. lbs.).
2. Snap field wire connector into rear of generator.
3. Install B+ terminal and nut to generator mounting stud. Tighten nut to 13 N.m (115 in. lbs.)
4. Snap plastic protective cover to B+ terminal.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to **COOLING** .**

5. Install drive belt. Refer to **COOLING** for belt routing, belt adjustment and bolt tightening procedures.
6. Install negative battery cable to battery.

REGULATOR, VOLTAGE

DESCRIPTION

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

OPERATION

The amount of DC current produced by the generator is controlled by EVR circuitry contained within the Powertrain Control Module (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 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 Operation for additional information.