BATTERY/STARTER MOTOR/GENERATOR SERVICE

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BATTERY SERVICE PROCEDURES

GENERAL INFORMATION

This section covers Battery rermoval and installation procedures only. For diagnostic procedures. refer to Group 8A - Battery/Starting/Charging Systems Diagnostics.

The Low Maintenance Battery (Fig. 1) has removable battery cell caps. Water can be added to this battery. The battery is not sealed and also has small vent holes in the top. The chemical composition inside of the battery produces an extremely small amount of gases at normal charging voltages. The battery is equipped with a test indicator (Fig. 1) that displays a colored ball to indicate battery state-of-charge.

Green Indicator = Full charge
Black Indicator = Discharged
Yellow Indicator = Battery replacement required

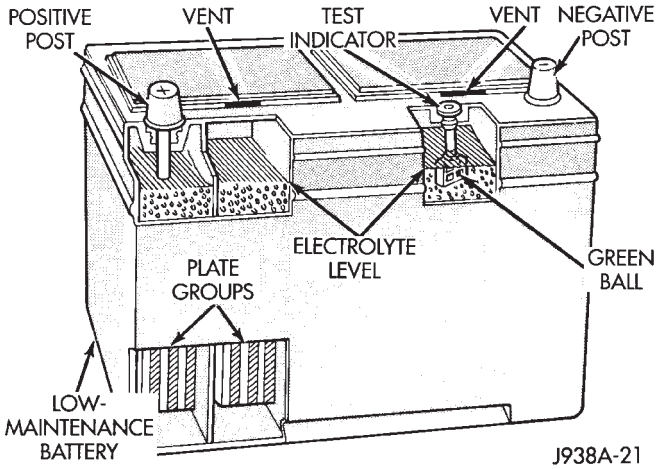


Fig. 1 Low Maintenance Battery

BATTERY MAINTENANCE

(1) Inspect the cable terminal for corrosion and damage. Remove the corrosion using a wire brush, or post and terminal cleaner, and a sodium bicarbonate/water solution. Replace cables that have damaged or deformed terminals.

Be sure vents are installed when washing battery to prevent solution from entering battery.

(2) Clean the outside of the battery case if the original battery is to be installed. Clean the top cover with diluted ammonia or a sodium bicarbonate/water solution to remove the acid film (Fig. 2). Flush with clean water. Ensure that the cleaning solution does not enter the cells.

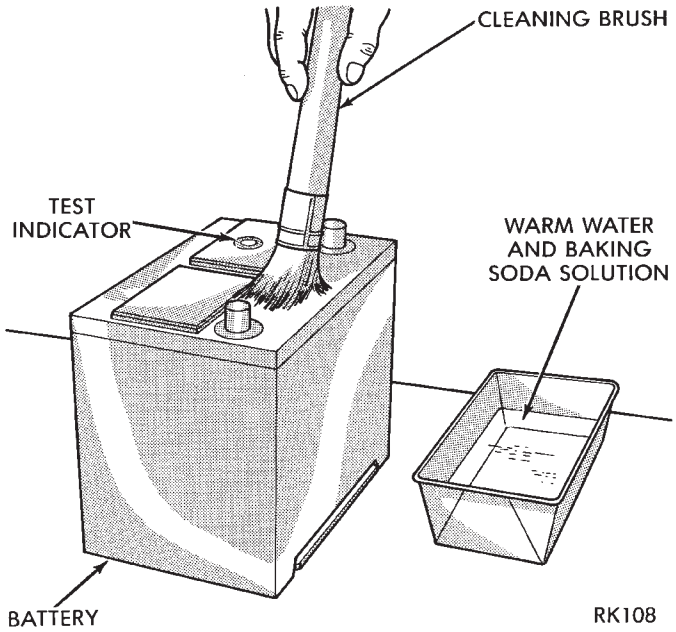


Fig. 2 Cleaning Battery

(3) Remove corrosion from the terminals with a wire brush or post and terminal cleaner (Figs. 3 and 4). Inspect the case for cracks or other damage that would result in leakage of electrolyte.

Check electrolyte level in the battery. Use a putty knife or other suitable wide tool to pry filler caps off low maintenance battery (Fig. 5). Do not use a screwdriver. Add distilled water to each cell until the liquid reaches the bottom of the vent well. DO NOT OVERFILL.

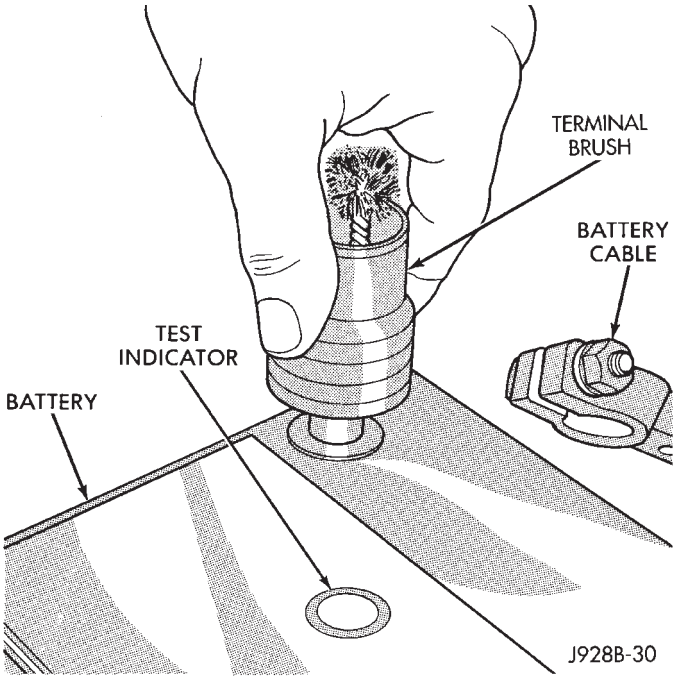


Fig. 3 Cleaning Battery Post

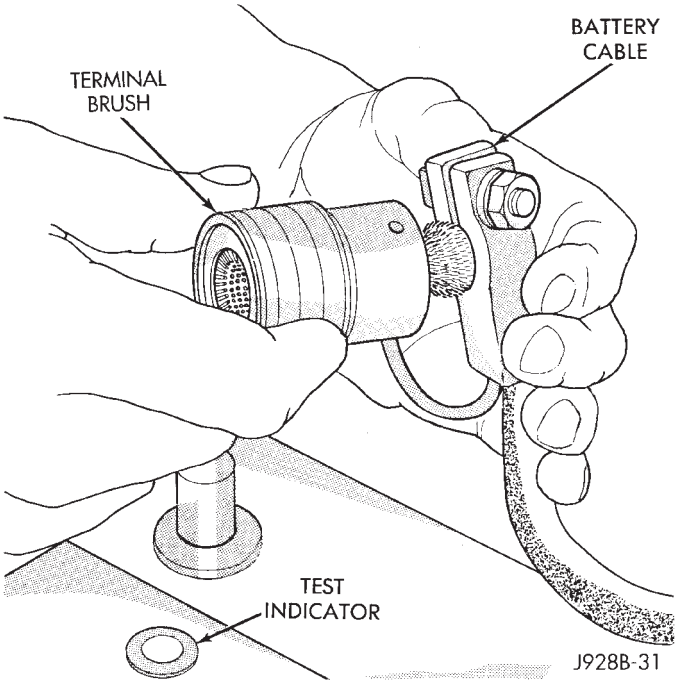


Fig. 4 Cleaning Battery Terminals

Operate the engine immediately after adding water (particularly in cold weather) to assure proper mixing of the water and acid.

BATTERY REPLACEMENT

REMOVAL

(1) Make sure ignition switch is in OFF position and all electrical accessories are OFF.

(2) Loosen the cable terminal clamps.

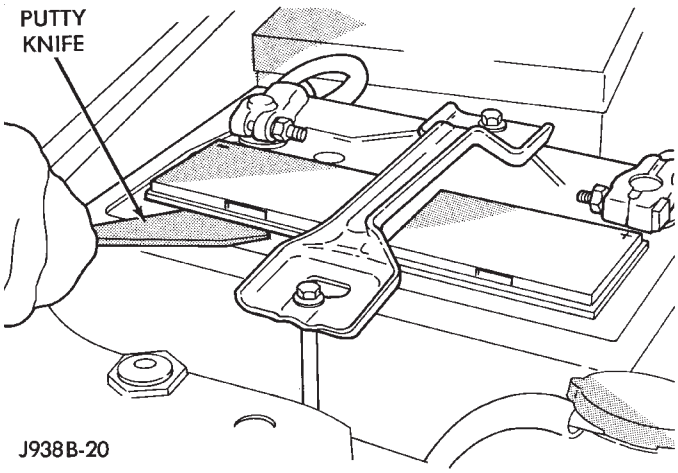


Fig. 5 Removing Filler Cap

(3) If necessary, use a puller to remove the cable terminal clamps, and remove the negative cable terminal clamp first.

WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. IF THE BATTERY IS CRACKED OR LEAKING THE ELECTROLYTE CAN BURN THE SKIN.

(4) Remove battery holddowns and remove battery from vehicle (Fig. 6).

(5) Inspect the battery tray and holddowns for corrosion. Remove corrosion using a wire brush and a sodium bicarbonate/water solution. Paint any exposed bare metal. Replace damaged components (Fig. 6).

If the battery tray needs to be replaced, disconnect the hoses from the vacuum reservoir to remove the tray. Remove the vacuum reservoir from the bottom to the battery tray.

INSTALLATION

(1) Refer to Specifications to determine if the battery has the correct classification and rating for the vehicle.

(2) Use a hydrometer to test the battery electrolyte. Charge the battery if necessary.

(3) Position the battery in the tray. Ensure that the positive and negative terminals (posts) are correctly located. The cables must reach their respective terminals (posts) without stretching (Fig. 7).

(4) Ensure that the tang at the battery base is positioned in the tray properly before tightening the holddown.

CAUTION: It is imperative that the cables are connected to the battery positive-to-positive and negative-to-negative. Reverse polarity will damage the generator diodes and radio(s).

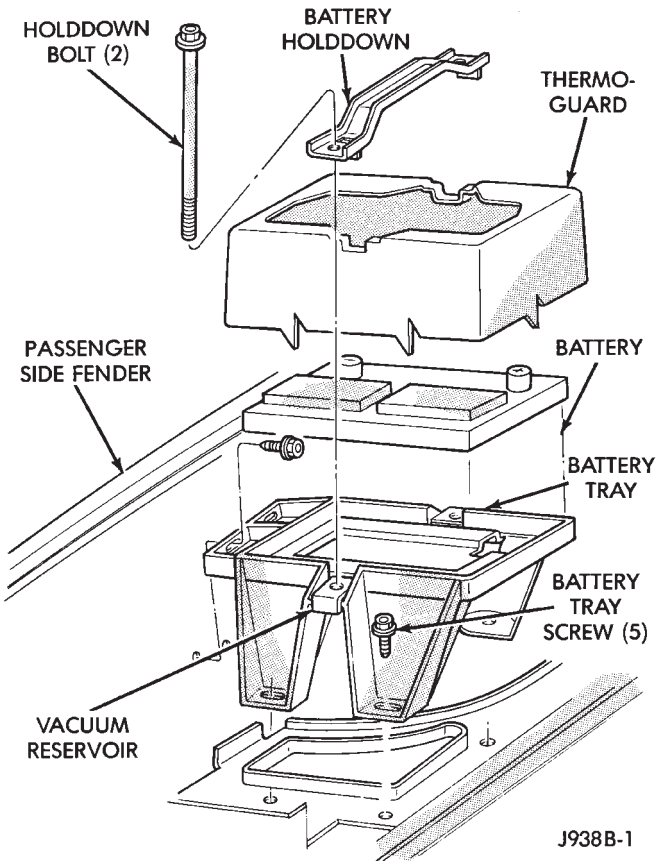


Fig. 6 Battery Tray and Holddown

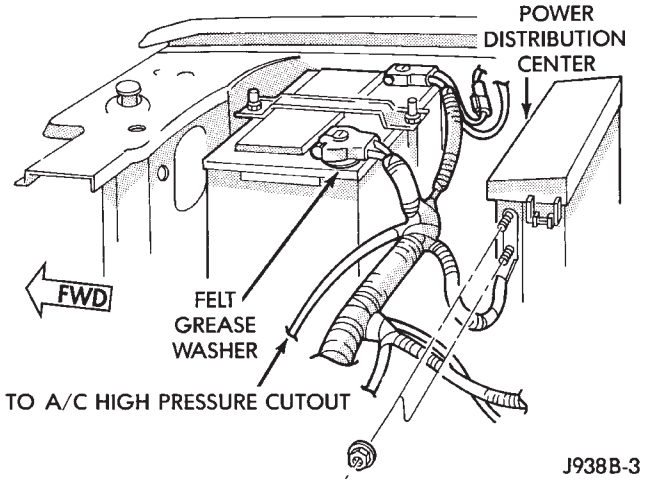


Fig. 7 Battery Cable Connections

(5) Place the felt washer on the positive battery terminal.

(6) Connect the positive cable first. Then connect the negative cable. Tighten both cable terminal bolts to 8.5 N•m (75 in. lbs.).

(7) Apply a thin coating of petroleum jelly or chassis grease to the cable terminals and the battery posts.

(8) Inspect the negative cable connections on the engine and the vehicle body for condition, security and electrical continuity.

ENGINE STARTER MOTOR SERVICE PROCEDURES

GENERAL INFORMATION

This section will cover the Starting System component service procedures only. For diagnostic procedures, refer to Group 8A - Battery/Starting/Charging Systems Diagnostics.

The starter system circuits consist of:

- a battery
- starter motor and solenoid
- starter relay
- ignition switch
- park/neutral positon switch (automatic transmission)
- connecting wires and battery cables.

STARTER RELAY REPLACEMENT

The starter relay is located in the Power Distribution Center (Fig. 1). Refer to the underside of the Power Distribution Cover for relay location.

(1) Disconnect negative cable from battery.
(2) Replace the relay.
(3) Connect battery cable.
(4) Test relay operation.

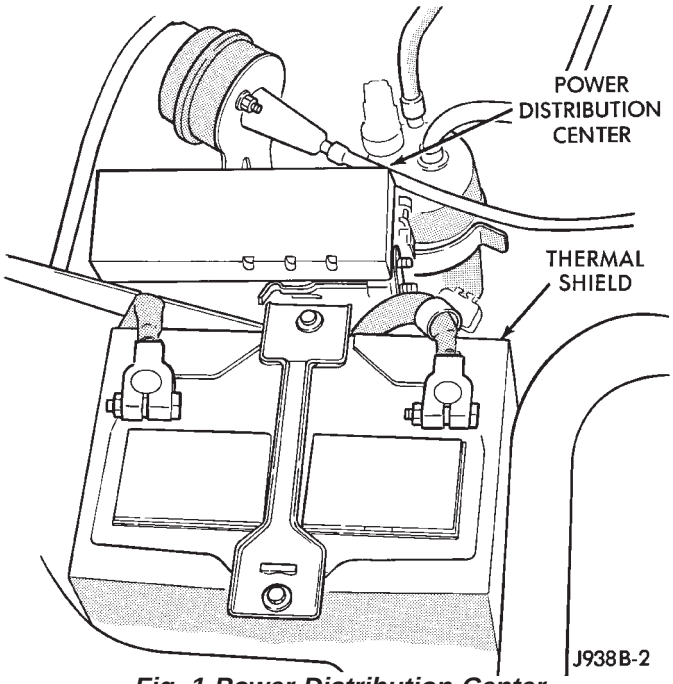


Fig. 1 Power Distribution Center

STARTER MOTOR GENERAL INFORMATION—4.0L

The Mitsubishi starter motor is a light-weight unit featuring a planetary gear drive and permanent magnets for current induction.

The planetary gear drive is splined to both the armature shaft and overrunning clutch. Starter torque is transmitted to the overrunning clutch pinion through the planetary gears which provide higher rotational speeds.

The starter magnetic field is produced by six permanent magnets. The magnets are mounted in the armature frame and positioned according to polarity. They are permanently attached to the frame and are not removable.

The starter motor is activated by a solenoid mounted on the overrunning clutch housing.

This unit is highly sensitive to hammering, shocks, and external pressure.

CAUTION: The starter motor MUST NOT BE CLAMPED in a vise by the stator frame. Doing so may damage the magnets. It may be clamped by the mounting flange ONLY.

CAUTION: Do not connect the starter motor incorrectly when electrical tests are being performed. The magnets may be damaged and rendered unserviceable.

- Ensure cleanliness when performing repairs.
- Metal chips are attracted by the magnets and may not be completely removed from the stator frame. Chips in the ring gear can lead to failure of the starter.

STARTER MOTOR REMOVAL/INSTALLATION—4.0L

(1) Disconnect negative cable from battery.
(2) Raise and support vehicle.
(3) Disconnect the battery wire and solenoid feed

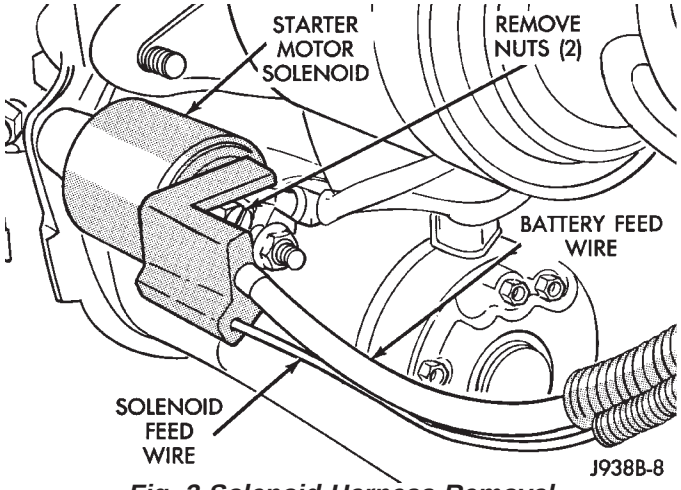


Fig. 2 Solenoid Harness Removal

wire connector (Fig. 2).

(4) Remove starter front mounting bolt (Fig. 3).

(5) Remove starter rear mounting bolt and remove starter.

(6) To install the starter motor, reverse the removal procedures and torque the mounting hardware as follows:

- Tighten starter mounting bolts to 45 N•m (33 ft. lbs.).

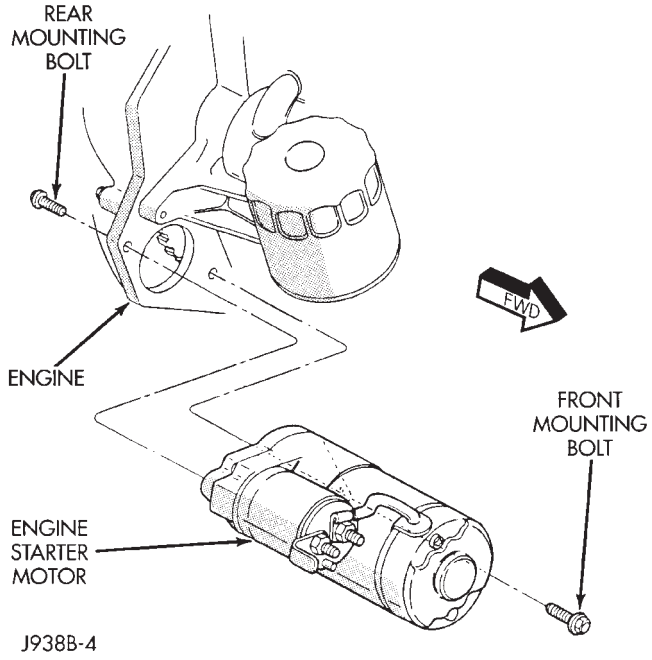


Fig. 3 Starter Motor Removal/Installation—Typical

• Tighten the terminal adapter solenoid nut to 6 N●m (55 in. lbs.).
• Tighten the terminal adapter battery cable nut to 10 N●m (90 in. lbs.).
(7) Remove vehicle support and lower vehicle.
(8) Install negative cable to battery.

STARTER MOTOR GENERAL INFORMATION—5.2L

A Nippondenso reduction gear field coil starter motor is used on the 5.2L engine. This starter motor features compact design and is lightweight as compared with those having the same output. Structure is different from that of direct drive and permanent magnet type, but electrical wiring is common for all engines. The reduction gear sets and solenoid shift devices are enclosed in an aluminum die cast housing which is part of starter assembly.

STARTER MOTOR REMOVAL/INSTALLATION—5.2L

(1) Disconnect negative cable from battery.
(2) Raise and support vehicle.
(3) Disconnect the battery wire and solenoid feed wire connector (Fig. 4).
(4) Remove lower mounting nut (Fig. 5).
(5) Remove transmission line clip from stud.
(6) Remove upper mounting bolt.
(7) Pull starter forward and remove from vehicle.
(8) To install the starter motor, reverse the removal procedures and torque the mounting hardware as follows:

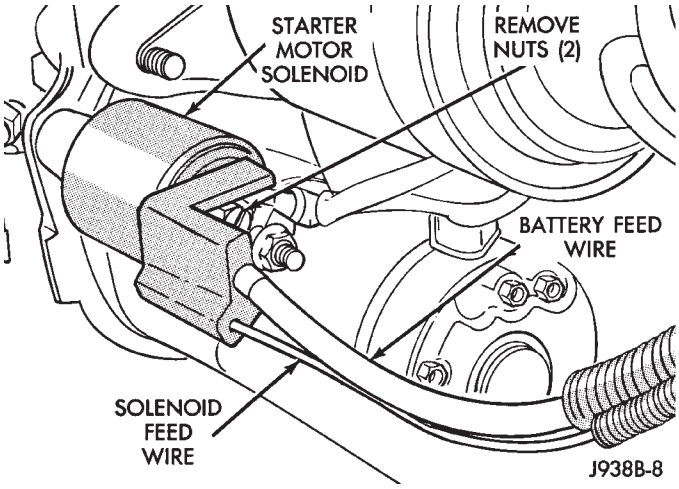


Fig. 4 Solenoid Harness Removal—Typical

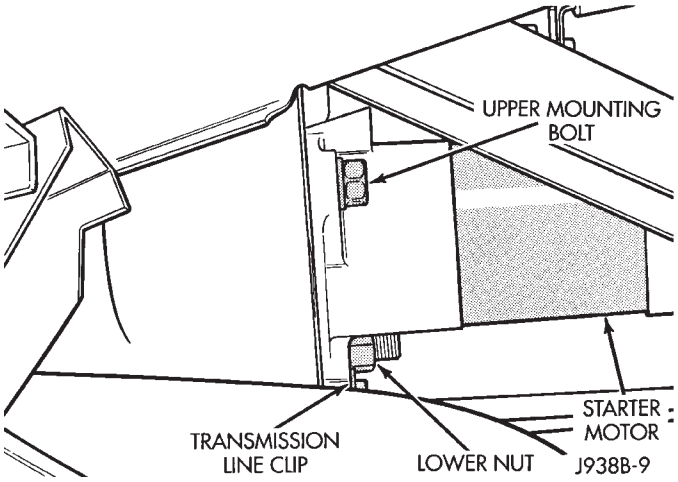


Fig. 5 Starter Motor Removal/Installation (Typical)

• Tighten starter upper mounting bolt and stud nut to 68 N●m (50 ft. lbs.).
• Tighten the terminal adapter solenoid nut to 6 N●m (55 in. lbs.).
• Tighten the terminal adapter battery cable nut to 10 N●m (90 in. lbs.).
(9) Remove vehicle support and lower vehicle.
(10) Install negative cable to battery.

PARK/NEUTRAL POSITION SWITCH

Refer to Group 21 for diagnostic, removal and installation procedures.

Check linkage adjustment before replacing the switch.

GENERATOR SERVICE PROCEDURES

GENERAL

The generator is belt-driven by the engine. This section will cover generator removal and installation. The generator is not serviceable. Information covering on-vehicle testing can be found in Group 8A - Battery/Starting/Charging Systems Diagnostics.

GENERATOR REMOVAL AND INSTALLATION—4.0L

WARNING: FAILURE TO DISCONNECT THE NEGATIVE CABLE FROM THE BATTERY BEFORE DISCONNECTING THE RED (OUTPUT) WIRE CONNECTOR FROM THE GENERATOR CAN RESULT IN INJURY.

Belt tension is adjusted at the power steering pump.

(1) Disconnect negative cable from battery.

(2) Loosen rear mounting bolts (Fig. 1).

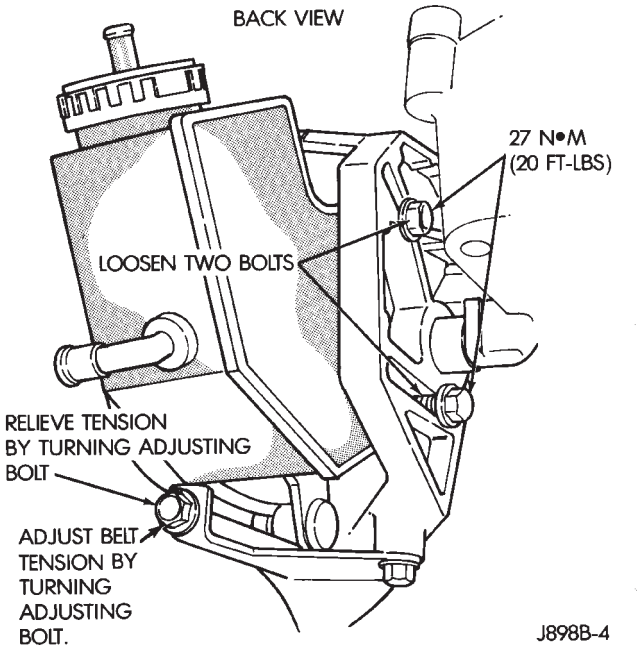


Fig. 1 P.S Pump Rear Mounting Bolts

(3) Loosen power steering pump pivot bolt and lock nut (Fig. 2).

(4) Loosen adjusting bolt to remove belt.

(5) Raise and support vehicle.

(6) Remove B+ terminal nut, 2 field terminal nuts, ground and harness hold down nuts (Fig. 3). Remove wire connector assembly.

(7) Remove 2 generator mounting bolts and remove generator from vehicle.

(8) Install generator with two mounting bolts. Torque bolts to 55 N●m (41 ft. lbs.).

(9) Attach generator wires.

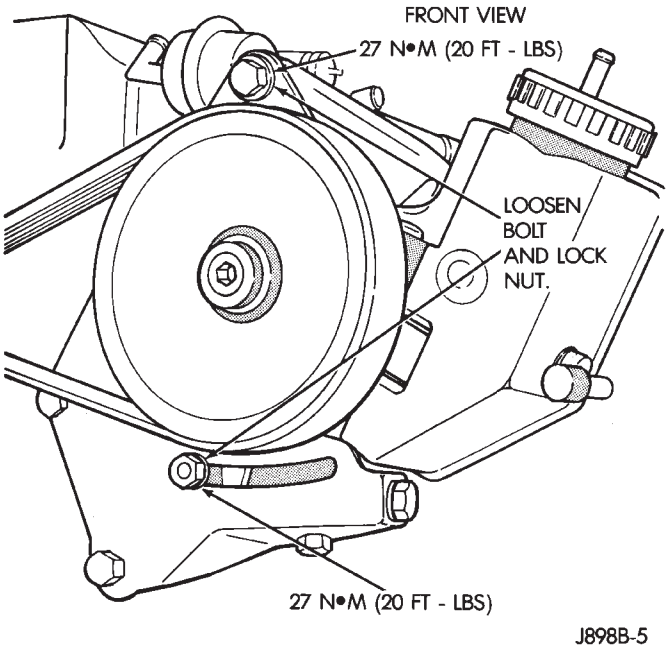


Fig. 2 P.S Pump Front Mounting Bolts

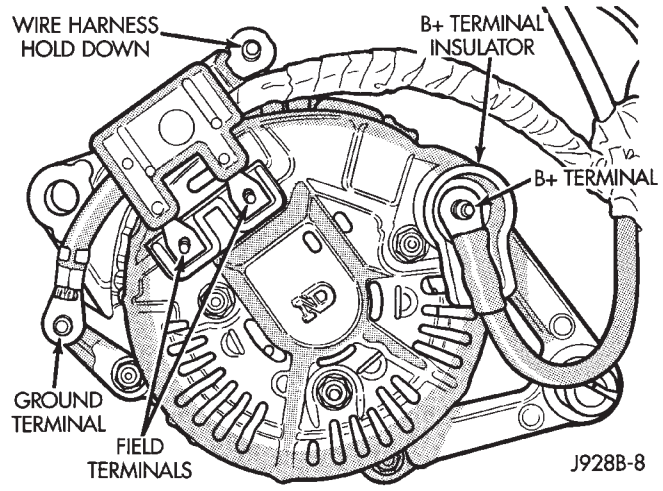


Fig. 3 Remove or Install Connector Assembly

CAUTION: Never force a belt over a pulley rim using a screwdriver as the synthetic fiber may be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The engine may overheat because the water pump will be rotating in the wrong direction if the belt is installed incorrectly. Refer to the appropriate accessory drive belt schematic for the correct belt routing (Group 7).

(10) Place serpentine belt over pulley.

(11) The 2 rear mounting bolts and the power steering pump pivot bolt should be finger tight.

(12) Turn adjusting bolt until the belt has the correct tension as given in Specifications.

(13) Tighten rear mounting bolts, pivot bolt, and lock nut to 27 N•m (20 ft. lbs.) torque.

(14) Remove support and lower vehicle.

(15) Attach negative cable to the battery.

GENERATOR REMOVAL AND INSTALLATION—5.2L ENGINE

WARNING: FAILURE TO DISCONNECT THE NEGATIVE CABLE FROM THE BATTERY BEFORE DISCONNECTING THE RED (OUTPUT) WIRE CONNECTOR FROM THE GENERATOR CAN RESULT IN INJURY.

REMOVAL

Drive belts on the 5.2L engine are equipped with a spring loaded automatic belt tensioner (Fig. 4). This belt tensioner is used on all belt configurations. For more information, refer to Group 7 - Cooling, Automatic Belt Tensioner—5.2L Engines.

(1) Disconnect negative cable from battery.

(2) Attach a socket/wrench to the pulley mounting bolt of the automatic tensioner (Fig. 4).

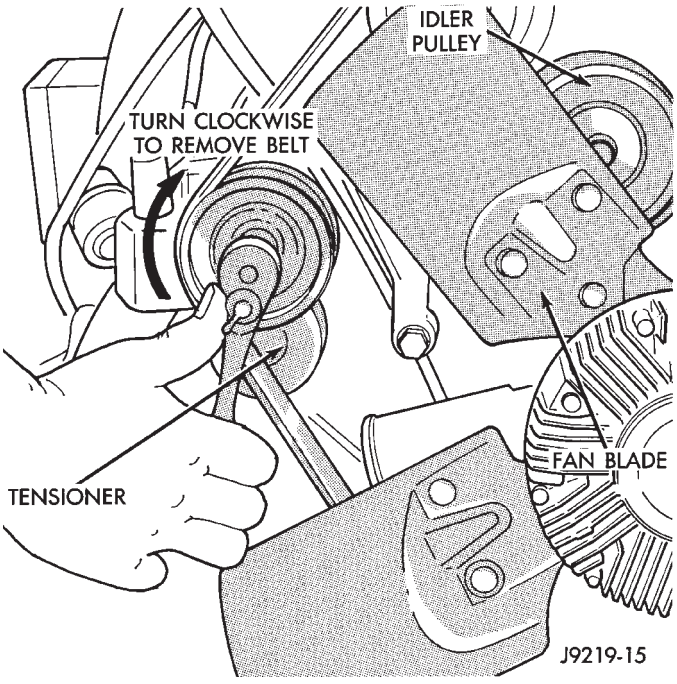


Fig. 4 Automatic Belt Tensioner—Belt Removal/ Installation

(3) Rotate the tensioner assembly clockwise (as viewed from front) until tension has been relieved from belt.

(4) Remove belt from vehicle.

(5) Remove lower generator mounting bolt and nut (Fig. 5).

(6) Remove upper generator mounting bolt and remove generator from bracket.

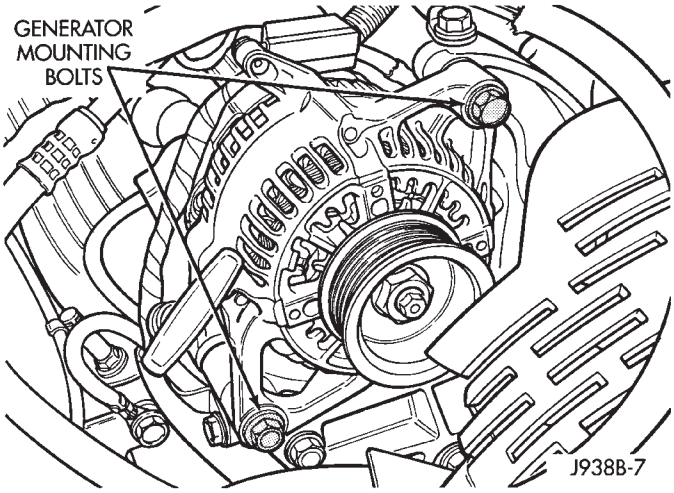


Fig. 5 Generator Mounting Bolts

(7) Remove the B+ terminal nut, 2 field terminal nuts, ground, and harness hold down nuts (Fig. 6). Remove wire connectors.

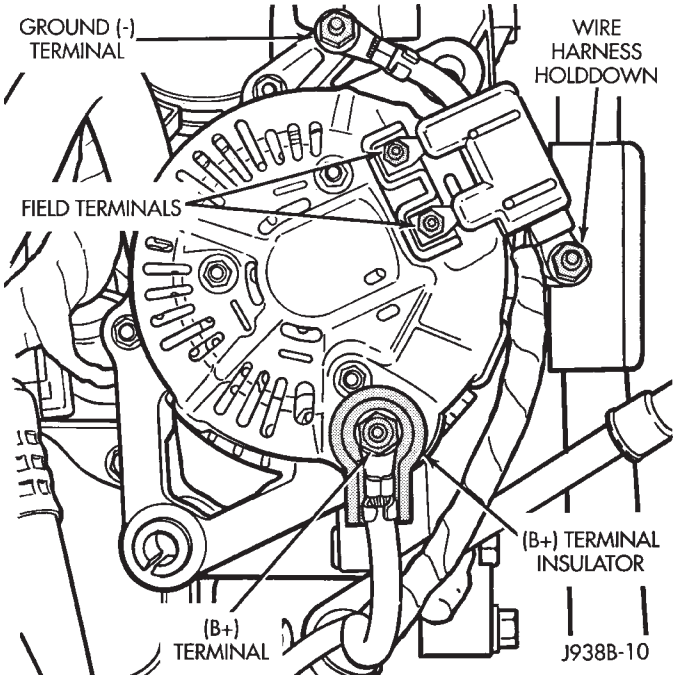
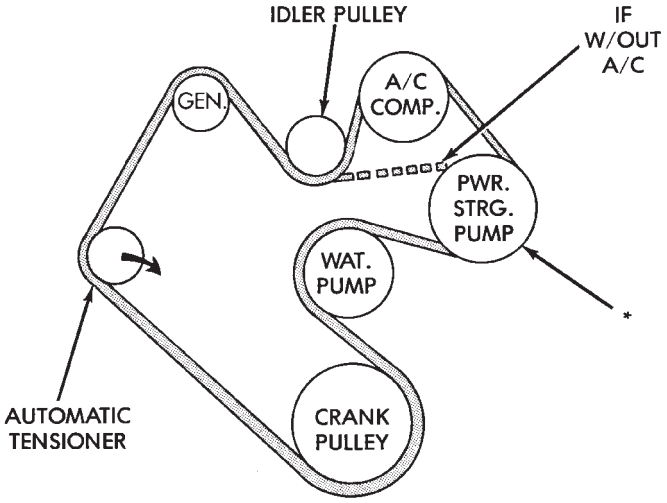


Fig. 6 Remove or Install Wire Connector Assembly

INSTALLATION

(1) Install generator. Tighten both bolts to 41 N•m (30 ft. lbs.).

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 7) for correct 5.2L engine belt routing. The correct belt with the correct length must be used



*IF VEHICLE IS NOT EQUIPPED WITH POWER STEERING, THIS WILL BE AN IDLER PULLEY. J9307-26

Fig. 7 Belt Routing—5.2L Engine

(2) Position the drive belt over all pulleys **except** the idler pulley. This pulley is located between the generator and A/C compressor.

(3) Attach a socket/wrench to the pulley mounting bolt of the automatic tensioner (Fig. 4).

(4) Rotate the socket/wrench clockwise. Place the belt over the idler pulley. Let tensioner rotate back into place. Remove wrench. Be sure belt is properly seated on all pulleys.

(5) Check belt indexing marks. Refer to Group 7 - Cooling, Automatic Belt Tensioner—5.2L Engine for more belt information.

SPECIFICATIONS

BATTERY CLASSIFICATIONS AND RATINGS

Group Size	Cold Crank AMPS	Reserve Capacity (Min.)	Engine
34	600	120	ALL

J938A-11

GENERATOR OUTPUT VOLTAGE SPECIFICATIONS

Ambient Temperature °C (°F)	Acceptable Voltage Range
−40 to −6.7 (−40 to 20)	14.5 to 15.0
−6.7 to 26.7 (20 to 80)	13.87 to 15.0
26.7 to 60 (80 to 140)	13.25 to 14.37
60 to 71.1 (140 to 160)	13.25 to 13.75

J918C-13

Type	Part Number	Engine	Rating
Nippondenso	56005685	4.0L,5.2L	90 Amps

J938B-17

4.0L ENGINE

TORQUE SPECIFICATIONS

COMPONENT	TORQUE	
Generator Mounting Bolts	38 N•m (28 ft. lbs.)	
Power Steering Pump (or Idler Pulley) Mounting Bolts	27 N•m (30 ft. lbs.)	
Belt Tension	New Belt 800-900	N (lbs-f) (180-200)
	Used Belt 623-712	N (lbs-f) (140-160)

J938B-11

TORQUE SPECIFICATIONS

Description	Torque
Battery Strap Screw	10 N•m (90 in. lbs.)
Battery Tray Screw	10 N•m (90 in. lbs.)

J938A-14

ENGINE STARTER MOTOR AND SOLENOID TESTING SPECIFICATIONS

Description	Specifications @ 20 °C (68 °F)
No Load Test With 11.2 volts Max. Amps Min. RPM	 90 2500
Solenoid Hold-in Winding Voltage	3.5 Min.
Pull-in Winding Voltage	7.8 Max.

J928B-25

ENGINE STARTER MOTOR COLD CRANKING SPECIFICATIONS

Battery Test Voltage	12.5 Volts
Cold Cranking Voltage (Minimum)	9.6 Volts
Cold Cranking Amps	130 Amps

J918B-17

5.2L ENGINE

REDUCTION GEAR STARTER

Manufacturer	Nippondenso
Engine Application	5.2L
Part Number and Power Rating	56004934 1.4 Kw
Voltage	12
No. of Fields	4
No. of Poles	4
Brushes	4
Drive	Reduction Gear Train
Free Running Test Voltage Amperage Draw Minimum Speed RPM	 11 73 Amps 3601 RPM
Solenoid Closing Voltage	7.5 Volts
Cranking Amperage Draw Test	125-200 Amps*

*Engine should be up to operating temperature. Extremely heavy oil or tight engine will increase starter amperage draw.

J938B-21