

# BATTERY/STARTER/GENERATOR SERVICE

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### GENERAL INFORMATION

Group 8B covers battery, starter and generator service procedures. For diagnosis of these components and their related systems, refer to Group 8A - Bat-

tery/Starting/Charging Systems Diagnostics. Refer to Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

## BATTERY

### GENERAL INFORMATION

This section covers battery service procedures only. For battery maintenance procedures, refer to Group 0 - Lubrication and Maintenance. While battery charging can be considered a service or maintenance procedure, this information is located in Group 8A - Battery/Starting/Charging Systems Diagnostics. This was done because the battery must be fully charged before any diagnosis is performed.

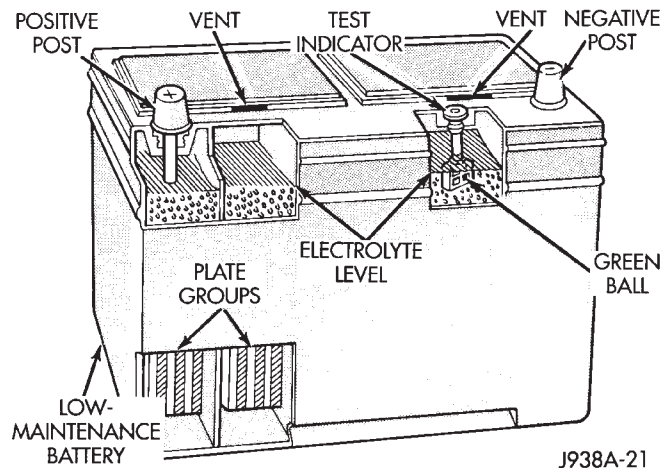
It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal discharge, over-charging, or premature failure of the battery must be diagnosed and corrected before a battery is replaced or returned to service. Refer to Group 8A - Battery/Starting/Charging Systems Diagnostics.

The factory installed low-maintenance battery (Fig. 1) has removable battery cell caps. Water can be added to this battery. The battery is not sealed and has vent holes in the cell caps. The chemical composition within the low-maintenance battery reduces battery gassing and water loss at normal charge and discharge rates. Therefore, the battery should not require additional water in normal service.

However, low electrolyte can be caused by an over-charging condition. Be certain to diagnose charging system before returning vehicle to service. Refer to Group 8A - Battery/Starting/Charging Systems Diagnostics for more information.

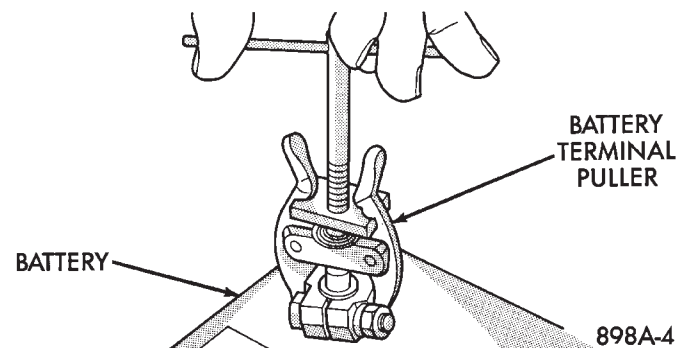
### BATTERY REMOVE/INSTALL

(1) Turn ignition switch to OFF position. Make sure all electrical accessories are off.



**Fig. 1 Low-Maintenance Battery**

(2) Loosen the cable terminal clamps and remove both battery cables, negative cable first. If necessary, use a puller to remove terminal clamps from battery posts (Fig. 2).



**Fig. 2 Remove Battery Terminal Clamp**

(3) Inspect the cable terminals for corrosion and damage. Remove corrosion using a wire brush or post

and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 3). Replace cables that have damaged or deformed terminals.

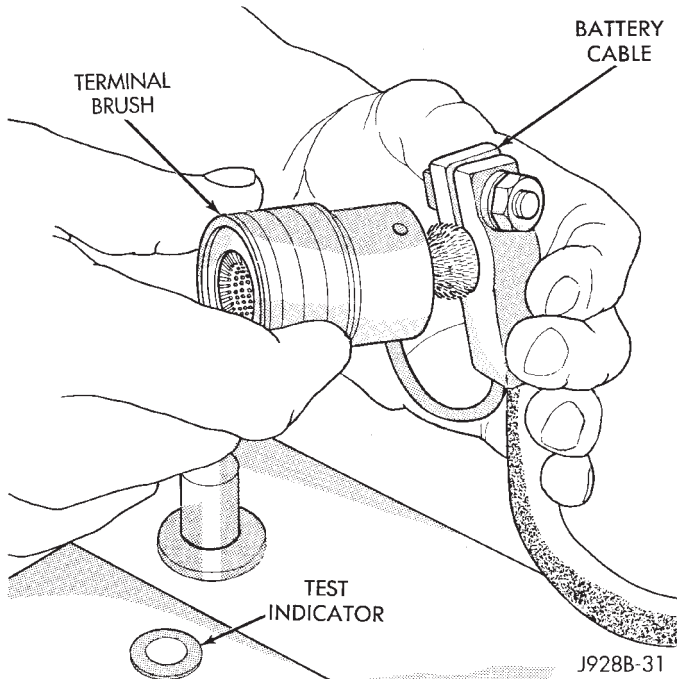


Fig. 3 Clean Battery Cable Terminal

**WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES SHOULD ALSO BE WORN. IF THE BATTERY IS CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.**

(4) Remove battery holddowns (Fig. 4 or 5) and remove battery from vehicle.

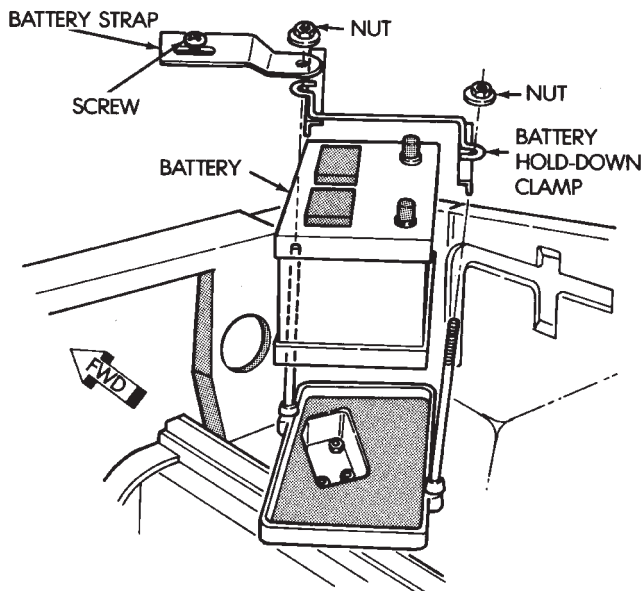


Fig. 4 Battery Holddown—XJ

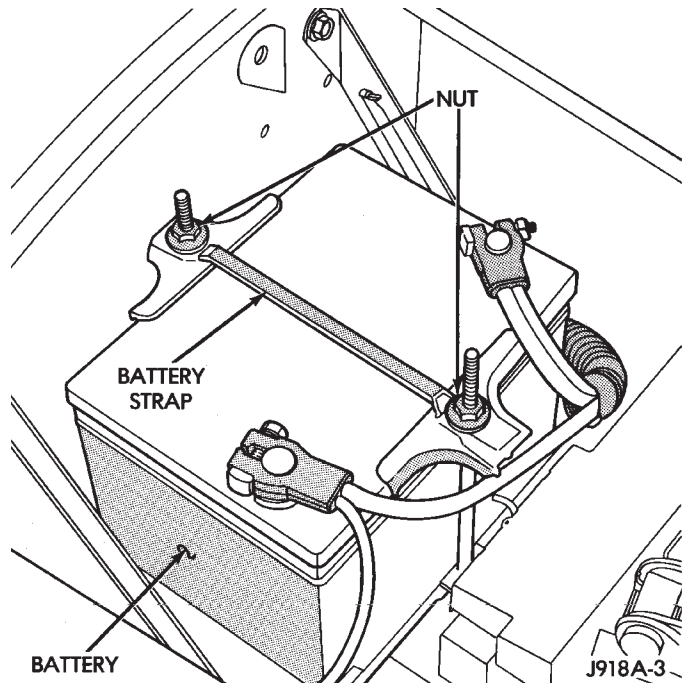


Fig. 5 Battery Holddown—YJ

(5) Inspect battery tray (Fig. 6 or 7) and hold-downs for corrosion or damage. Remove corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal and replace any damaged parts.

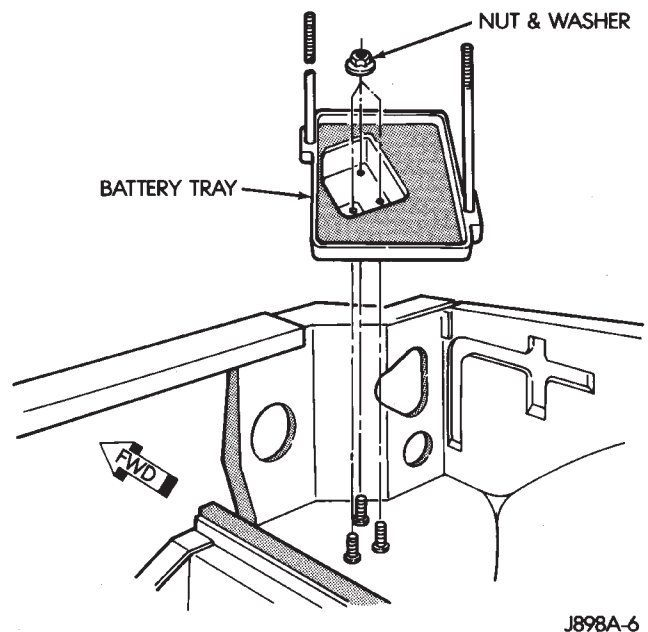
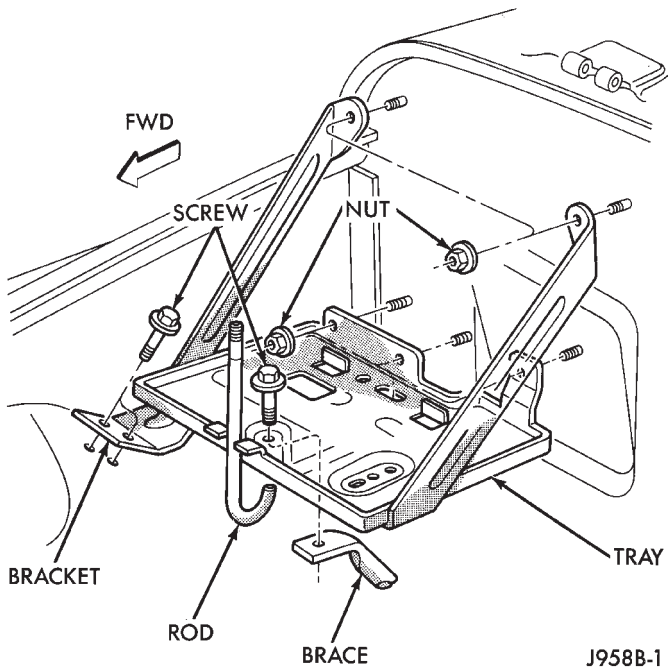


Fig. 6 Battery Tray—XJ

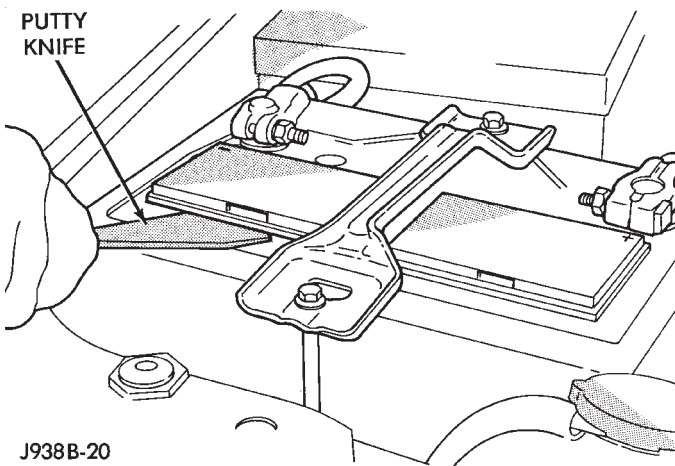
(6) Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also check battery terminal posts for looseness. Batteries with damaged cases or loose posts must be replaced.

(7) Check electrolyte level in the battery. Use a putty knife or other suitable wide-bladed flat tool to



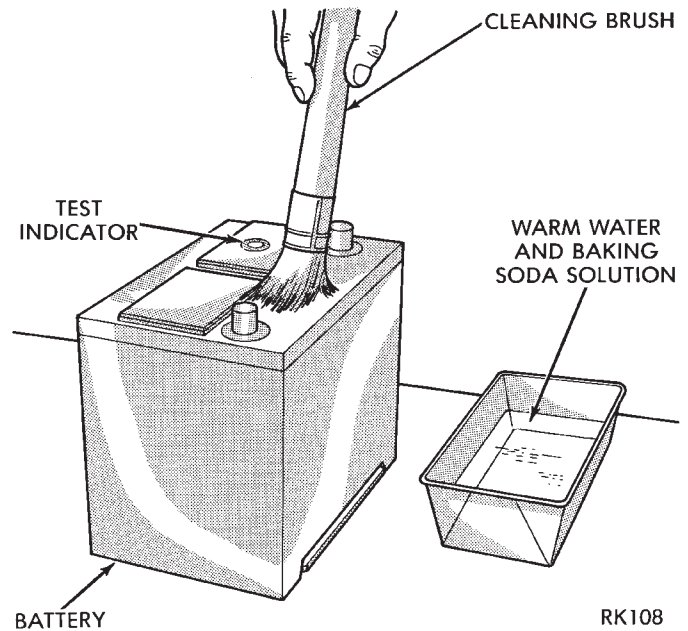
**Fig. 7 Battery Tray—YJ**

pry cell caps off (Fig. 8). Do not use a screwdriver. Add distilled water to each cell until the liquid reaches the bottom of the vent well. **DO NOT OVER-FILL.** If battery is discharged, charge as required. Refer to Group 8A - Battery/Starting/Charging Systems Diagnosis for more information.



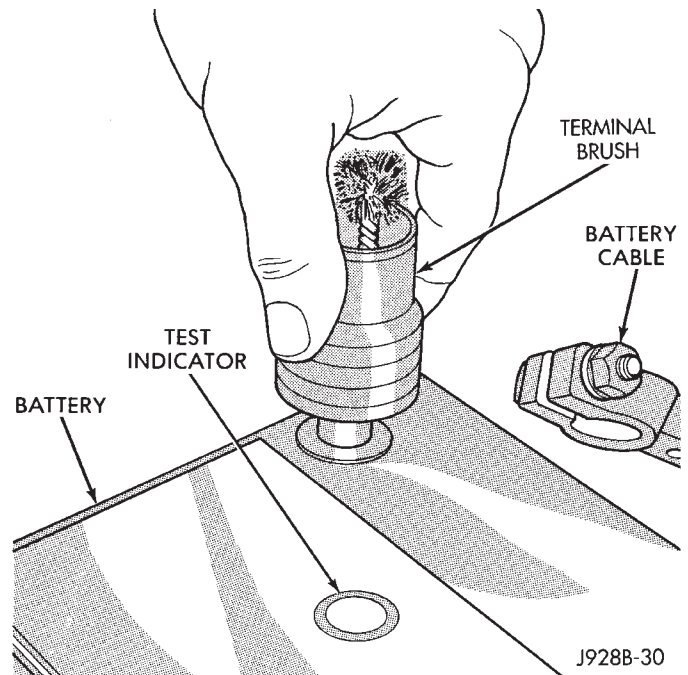
**Fig. 8 Removing Cell Cap**

(8) If the battery is to be reinstalled, clean outside of battery case and top cover with sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 9) to remove acid film. Flush with clean water. Ensure that cleaning solution does not enter cells through the vent holes. If the battery is being replaced, refer to Specifications in Group 8A - Battery/Starting/Charging Systems Diagnostics to confirm replacement has correct classification and ratings for the vehicle.



**Fig. 9 Clean Battery**

(9) Clean corrosion from battery posts (Fig. 10) with a wire brush or post and terminal cleaner, and sodium bicarbonate (baking soda) and warm water cleaning solution.



**Fig. 10 Clean Battery Post**

(10) Position battery in tray. Ensure that positive and negative posts are correctly positioned. The cable terminals must reach the correct battery post without stretching.

(11) Loosely install battery holddown hardware. Ensure that battery base is correctly positioned in tray, then tighten holddowns to 2.2 N·m (20 in. lbs.) torque.

**CAUTION:** Be certain that battery cables are connected to the correct battery terminals. Reverse polarity can damage electrical components.

(12) Place oiled felt washer on battery positive terminal post.

(13) Install and tighten battery positive cable terminal clamp. Then install and tighten negative cable

terminal clamp. Both cable clamp bolts require torque of 8.5 N·m (75 in. lbs.).

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

## STARTER AND STARTER RELAY

### GENERAL INFORMATION

This section covers starter and starter relay service procedures only. For diagnostic procedures, refer to Group 8A - Battery/Starting/Charging Systems Diagnostics. Service procedures for other starting system components can be found as follows:

- battery - see Battery, in this group
- ignition switch - refer to Group 8D - Ignition Systems
- park/neutral position switch (automatic transmission) - refer to Group 21 - Transmission and Transfer Case
- wiring harness and connectors - refer to Group 8W - Wiring Diagrams.

### STARTER

The starter motor incorporates several features to create a reliable, efficient, compact and lightweight unit. A planetary gear system (intermediate transmission) is used between the electric motor and pinion gear. This feature makes it possible to reduce the dimensions of the starter. At the same time, it allows higher armature rotational speed and delivers increased torque through the pinion gear to the fly-wheel or drive plate ring gear.

The use of a permanent magnet field also reduces starter size and weight. This field consists of six high-strength permanent magnets. The magnets are aligned according to their polarity and are permanently fixed in the starter field frame.

The starter motors for all engines are activated by a solenoid mounted to the overrunning clutch housing. However, the starter motor/solenoid are serviced only as a complete assembly. If either component fails, the entire assembly must be replaced.

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

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

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

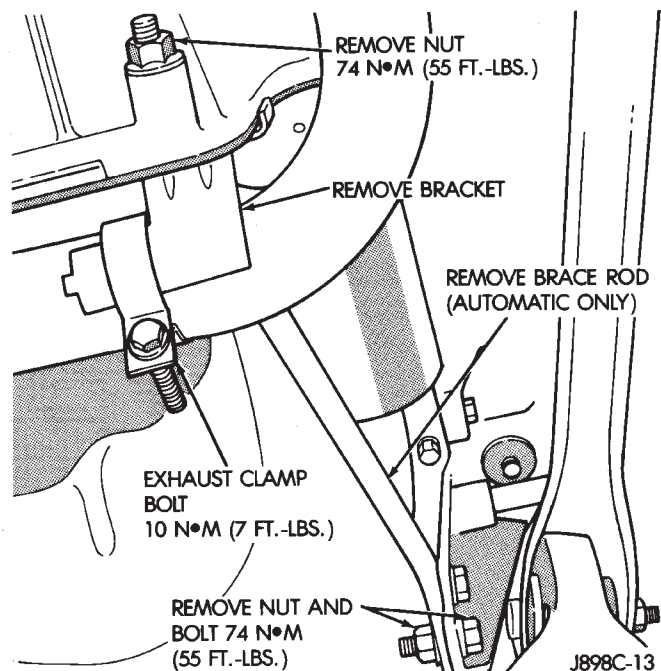
### STARTER RELAY

The starter relay is an International Standards Organization (ISO) type relay, and is located in the Power Distribution Center (PDC). Refer to underside of PDC cover for relay location.

### STARTER REMOVE/INSTALL—2.5L

#### XJ MODELS

- (1) Disconnect battery negative cable.
- (2) Remove exhaust clamp from bracket (Fig. 11).



**Fig. 11 Exhaust Clamp and Brace Remove (XJ—2.5L)**

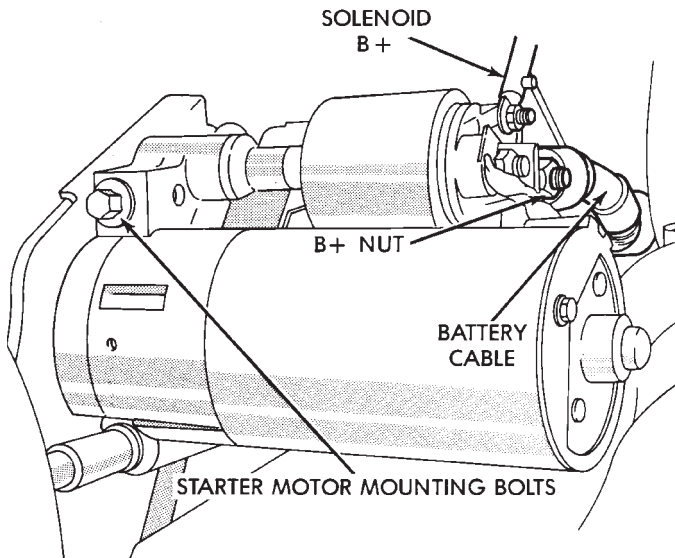
- (3) Remove nut and bolt from forward end of brace rod (automatic transmission only).

(4) Remove nut from lower end of brace rod (automatic transmission only).

(5) Remove brace rod and bracket (automatic transmission only).

(6) Remove nut, bolt and bracket from bell housing (manual transmission only).

(7) Disconnect battery cable and solenoid feed wire from solenoid (Fig. 12).



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**Fig. 12 Starter Remove/Install (XJ—2.5L)**

(8) Remove starter mounting bolts, starter motor and shims.

**Shim thickness available is 0.381 mm (0.015 in.). Refer to 2.5L Starter Noise Diagnosis in Group 8A - Battery/Starting/Charging Systems Diagnostics for proper shim selection.**

(9) Reverse removal procedures to install and torque mounting hardware as shown in Specifications.

#### YJ MODELS

(1) Disconnect battery negative cable.

(2) Disconnect battery cable from solenoid battery terminal (Fig. 13).

(3) Disconnect solenoid feed wire.

(4) Remove starter mounting bolts.

(5) Remove starter motor and shims.

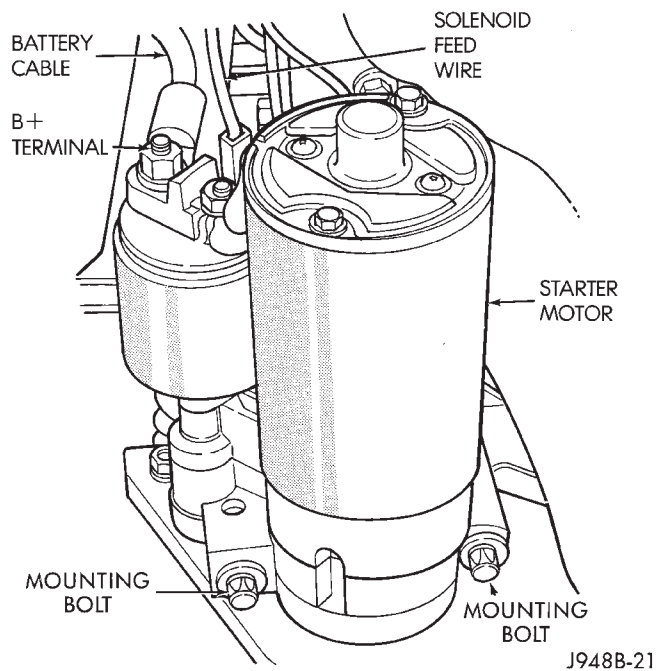
**Shim thickness available is 0.381 mm (0.015 in.). Refer to 2.5L Starter Noise Diagnosis in Group 8A - Battery/Starting/Charging Systems Diagnosis for proper shim selection.**

(6) Reverse removal procedures to install and torque mounting hardware as shown in Specifications.

#### STARTER REMOVE/INSTALL—4.0L

(1) Disconnect battery negative cable.

(2) Raise and support vehicle.

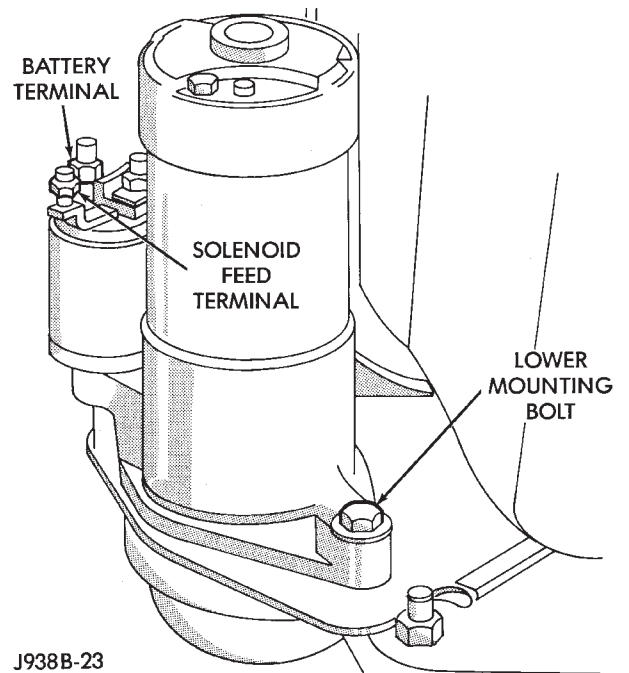


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**Fig. 13 Starter Remove/Install (YJ—2.5L)**

(3) Disconnect battery cable and solenoid feed wire from solenoid.

(4) Remove starter lower mounting bolt (Fig. 14).

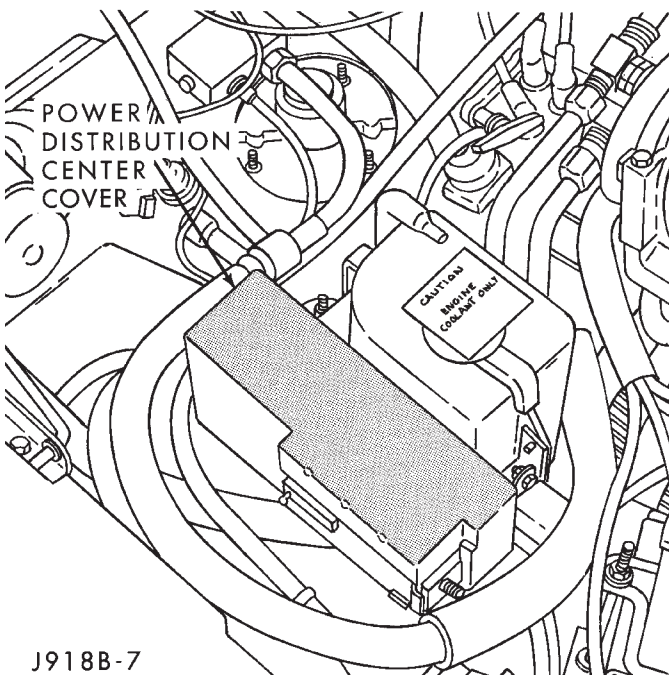


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**Fig. 14 Starter Remove/Install—4.0L**

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

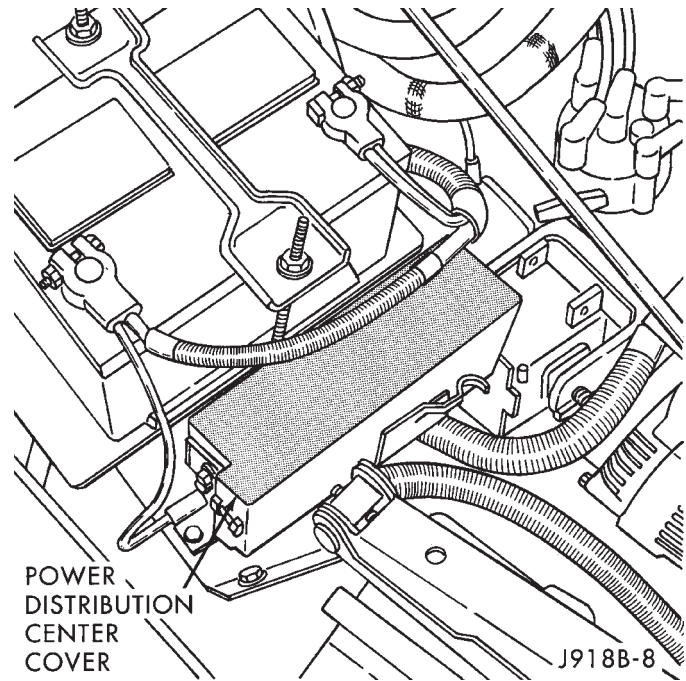
(6) Reverse removal procedures to install and torque mounting hardware as shown in Specifications.



**Fig. 15 Power Distribution Center—XJ**

#### STARTER RELAY REMOVE/INSTALL

- (1) Disconnect battery negative cable.
- (2) Remove starter relay by unplugging unit from PDC (Fig. 15 or 16).



**Fig. 16 Power Distribution Center—YJ**

- (3) Install starter relay by aligning relay terminals with cavities in PDC and plugging relay in.
- (4) Connect negative cable to battery.
- (5) Test relay operation.

## GENERATOR

### GENERAL INFORMATION

This section covers generator service procedures only. For generator or charging system diagnosis, refer to Group 8A - Battery/Starting/Charging Systems Diagnostics.

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

Two generator output ratings are available, depending upon optional equipment. Be certain that the replacement generator has the same output rating as the original unit. Refer to Group 8A - Battery/Starting/Charging Systems Diagnostics and see Specifications.

The generator field control (voltage regulator) circuitry is internal to the Powertrain Control Module (PCM). If faulty, the entire PCM must be replaced. Refer to Group 14 - Fuel System for PCM service procedure.

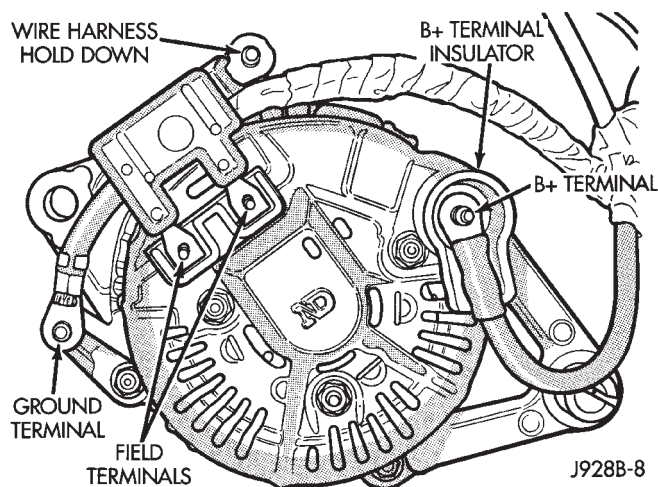
### GENERATOR REMOVE/INSTALL—LEFT-HAND DRIVE

**WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY.**

*ALL WITH 2.5L AND YJ WITH 4.0L*

- (1) Disconnect battery negative cable.
- (2) Remove generator drive belt. Refer to Group 7 - Cooling System for procedure.
- (3) Remove generator battery output terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 17). Remove wire connector assembly.
- (4) Remove 2 generator mounting bolts and remove generator from vehicle.
- (5) Reverse removal procedure to install. Torque generator hardware as shown in Specifications.

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



**Fig. 17 Remove/Install Generator Connector**

**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 the belt routing label in engine compartment, or refer to Belt Schematics in Group 7 - Cooling System.

**XJ WITH 4.0L**

- (1) Disconnect battery negative cable.
- (2) Remove generator drive belt. Refer to Group 7 - Cooling System for procedure.
- (3) Raise and support vehicle.
- (4) Remove generator battery output terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 17). Remove wire connector assembly.
- (5) Remove 2 generator mounting bolts and remove generator from vehicle.
- (6) Reverse removal procedure to install. Torque generator hardware as shown in Specifications.

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

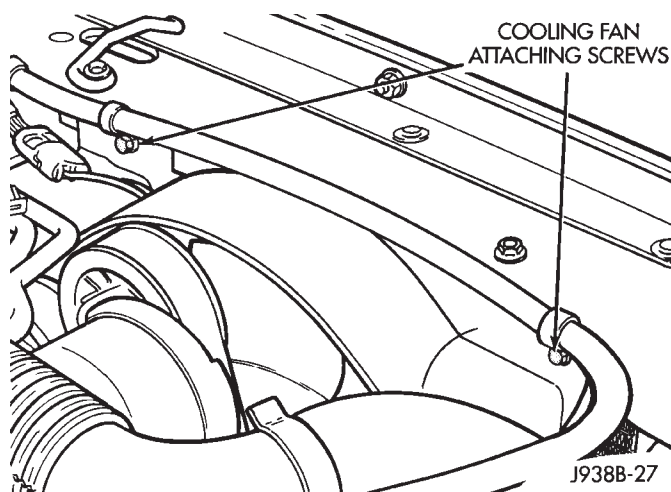
**CAUTION:** When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump will be rotating in the wrong direction if

the belt is installed incorrectly, causing the engine to overheat. Refer to the belt routing label in engine compartment, or refer to Belt Schematics in Group 7 - Cooling System.

**GENERATOR REMOVE/INSTALL—RIGHT-HAND DRIVE**

**WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY.**

- (1) Disconnect battery negative cable.
- (2) Remove 2 screws holding electric cooling fan (Fig. 18).



**Fig. 18 Electric Cooling Fan Remove/Install**

- (3) Unplug electric cooling fan wiring connector and pull fan unit up and out of vehicle.
- (4) Remove generator drive belt. Refer to Group 7 - Cooling System for procedure.
- (5) Remove generator mounting bolts.
- (6) Position generator to gain access to all of the wire connectors. Remove generator battery output terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 17). Remove wire connector assembly.
- (7) Remove generator from vehicle.
- (8) Reverse removal procedure to install. Torque generator hardware as shown in Specifications.

## SPECIFICATIONS

## BATTERY SPECIFICATIONS

## TORQUE

Description	Torque
Battery Strap Screw	2 N•m (20 in. lbs.)
Battery Tray Nut	2 N•m (20 in. lbs.)
Battery Clamp Nut	2 N•m (20 in. lbs.)

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## STARTER SPECIFICATIONS

## TORQUE—2.5L

COMPONENTS	TORQUE
Starter Motor Mounting Bolts	45 N•m (33 ft. lbs.)
Starter Solenoid Battery Cable Nut	10 N•m (90 in. lbs.)
Starter Solenoid B + Nut	6 N•m (55 in. lbs.)

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## TORQUE—4.0L

COMPONENTS	TORQUE
Starter Motor Mounting Bolts	Upper 55 N•m (40 ft. lbs.)
	Lower 41 N•m (30 ft. lbs.)
Starter Solenoid Battery Cable Nut	10 N•m (90 in. lbs.)
Starter Solenoid B + Nut	6 N•m (55 in. lbs.)

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## GENERATOR SPECIFICATIONS

## TORQUE

COMPONENT	TORQUE
Generator Mounting Bolts	55 N•m (41 ft. lbs.)
Power Steering Pump (or Idler Pulley) Mounting Bolts	27 N•m (20 ft. lbs.)

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