

BATTERY/STARTER/GENERATOR SERVICE

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BATTERY SERVICE PROCEDURES

GENERAL INFORMATION

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

BATTERY MAINTENANCE

(1) Inspect cable terminals 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 filler caps or vents are installed when washing battery to prevent solution from entering battery.

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

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

(4) Check electrolyte level in the battery. Use a putty knife or other suitable wide tool to pry filler caps off low maintenance battery (Fig. 1). Do not use a screwdriver. Add distilled water to each cell until the liquid reaches the bottom of the vent well. **DO NOT OVERFILL.**

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

BATTERY REPLACEMENT—LEFT HAND DRIVE

REMOVAL

- (1) Make sure ignition switch is in OFF position and all electrical accessories are OFF.
- (2) Loosen the cable terminal clamps.
- (3) If necessary, use a puller to remove cable terminal clamps. Remove negative cable terminal clamp first.

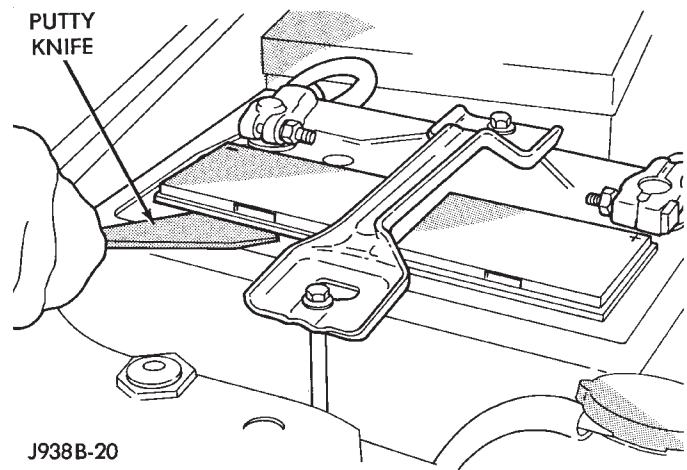


Fig. 1 Removing Filler Cap

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

(4) Remove battery holddown, and remove battery from vehicle (Figs. 2 and 3).

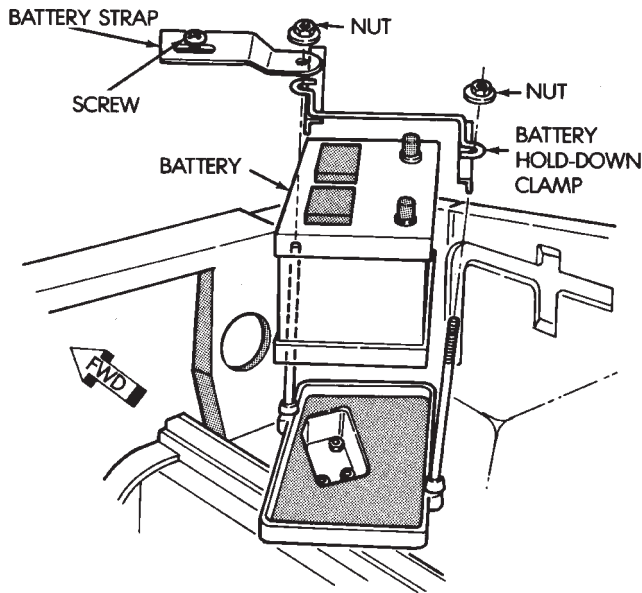
(5) Inspect battery tray and holddowns for corrosion. Remove corrosion using a wire brush and a sodium bicarbonate/water solution. Paint any exposed bare metal. Replace damaged components (Figs. 4 and 5).

INSTALLATION

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

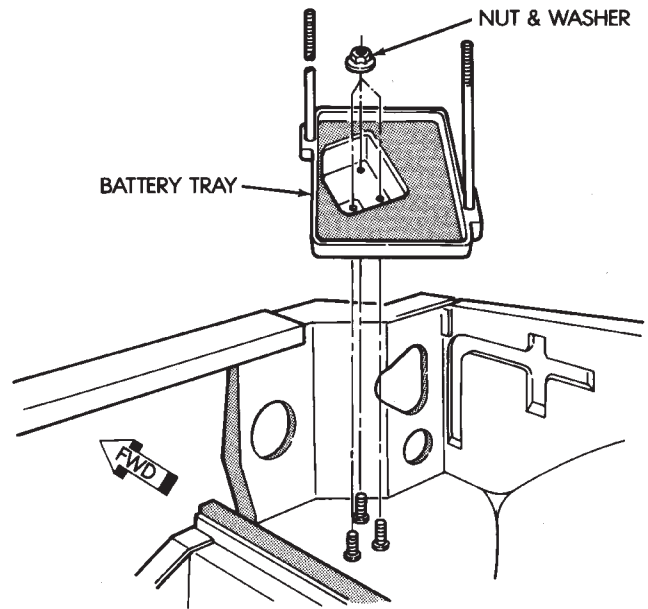
(2) Use a hydrometer to test the battery electrolyte. Charge battery if necessary.

(3) Position battery in tray. Ensure that positive and negative terminals (posts) are correctly located. The cables must reach their terminals (posts) without stretching (Figs. 2 and 3).



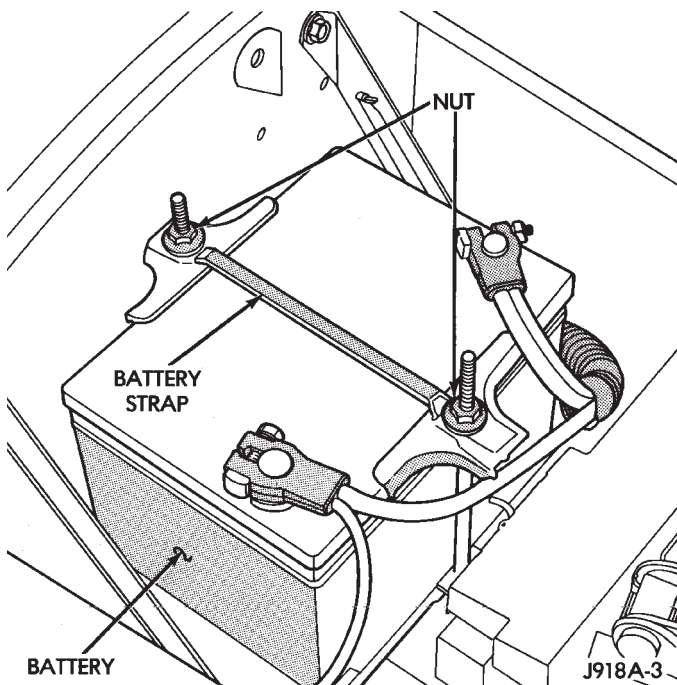
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Fig. 2 Battery Holddown—XJ



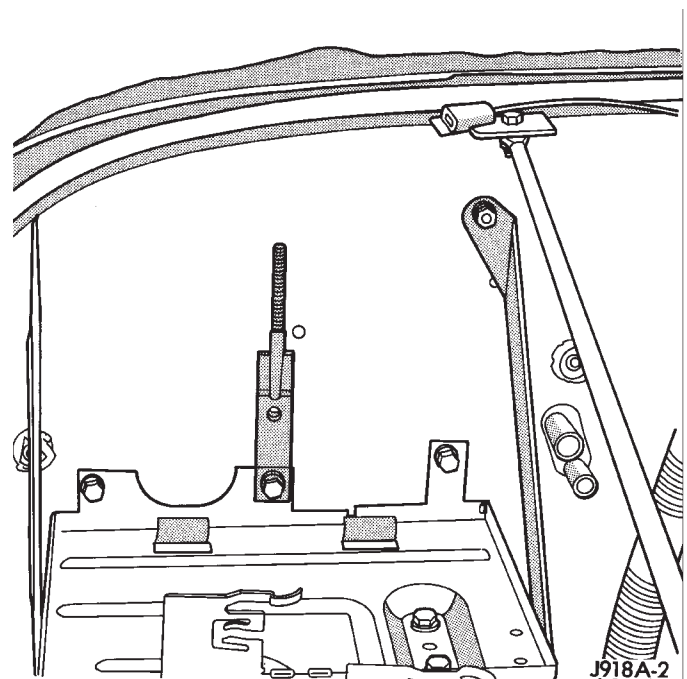
J898A-6

Fig. 4 Battery Tray—XJ



J918A-3

Fig. 3 Battery Holddown—YJ



J918A-2

Fig. 5 Battery Tray—YJ

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

- (5) Place felt washer on positive battery terminal.
- (6) Connect positive cable first. Then connect 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 cable terminals and battery posts.

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

BATTERY REPLACEMENT—RIGHT HAND DRIVE

REMOVAL

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

(2) Remove bolt and negative cable from battery (Fig. 6).

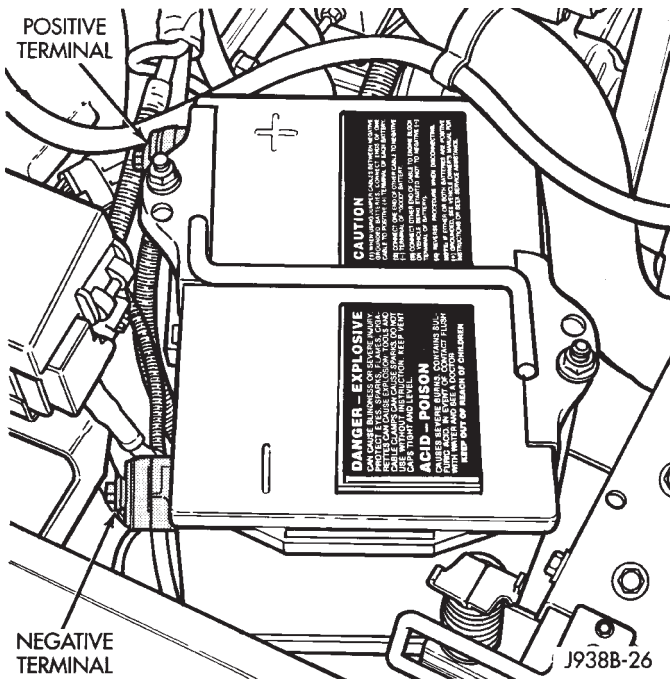


Fig. 6 Battery Cable Attachment

(3) Remove bolt and positive cable from battery.

WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES ALSO SHOULD BE WORN. IF THE BATTERY IS

CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.

(4) Remove battery holddown and battery from vehicle.

(5) Inspect 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.

INSTALLATION

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

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

(3) Position battery in tray. Ensure that positive and negative terminals are correctly located. The cables must reach their terminals without stretching (Fig. 6).

(4) Ensure that battery base is positioned in tray properly before tightening 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).

(5) Connect positive cable first. Then connect negative cable. Tighten both cable terminal bolts to 10-20 N·m (90-178 in. lbs.).

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

ENGINE STARTER MOTOR SERVICE PROCEDURES

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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.

Starting system components: battery, starter motor, starter relay, starter solenoid, ignition switch, connecting wires and battery cables. A park/neutral position switch is used with automatic transmissions.

STARTER RELAY REPLACEMENT

The starter relay is located in the Power Distribution Center (Figs. 1 and 2). Refer to underside of Power Distribution Center cover for relay location.

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

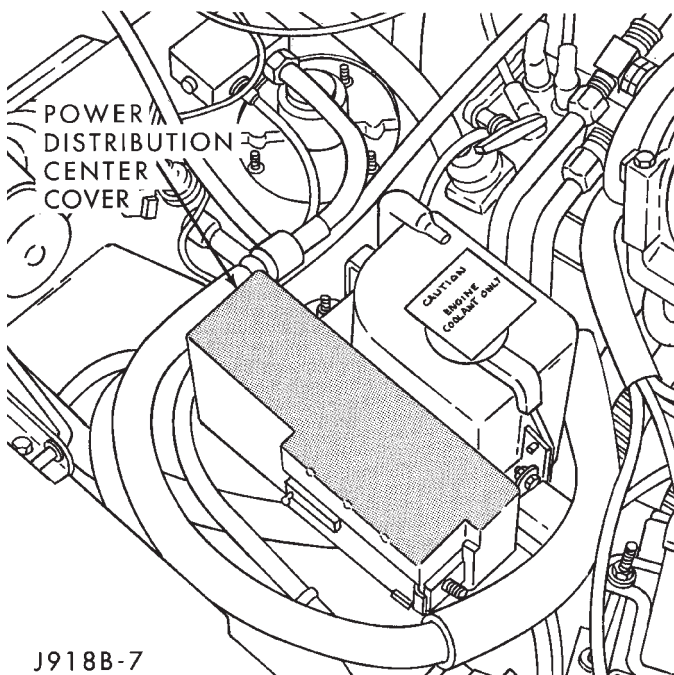


Fig. 1 Power Distribution Center—XJ

2.5L STARTER GENERAL INFORMATION

The 2.5L engine starter motor incorporates several features to create an efficient, lightweight unit.

A planetary gear system (intermediate transmission) between the electric motor and pinion shaft

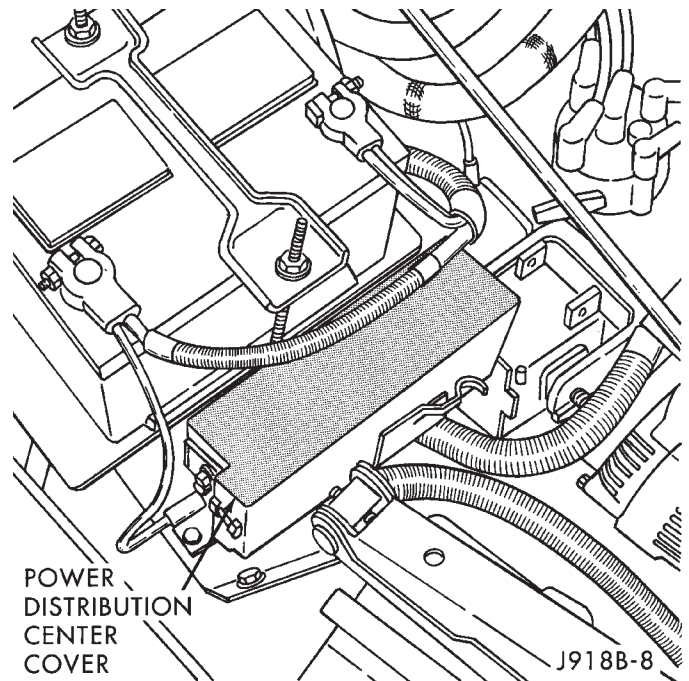


Fig. 2 Power Distribution Center—YJ

makes it possible to reduce the dimensions of the starter. This also makes it possible to obtain a higher rotational speed to produce the same torque at the pinion.

The permanent magnet field consists of six two-component high strength magnets. The magnets are aligned according to their polarity and are permanently fixed in the starter frame.

The brush holder plate consists of a plastic base-plate with four tubular brush holders.

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 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 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 starter frame. Chips in the ring gear can lead to failure of the starter.

2.5L STARTER MOTOR REMOVAL/INSTALLATION

XJ—2.5L ENGINE

- (1) Disconnect negative cable from battery.
- (2) Remove exhaust clamp from bracket (Fig. 3).
- (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).

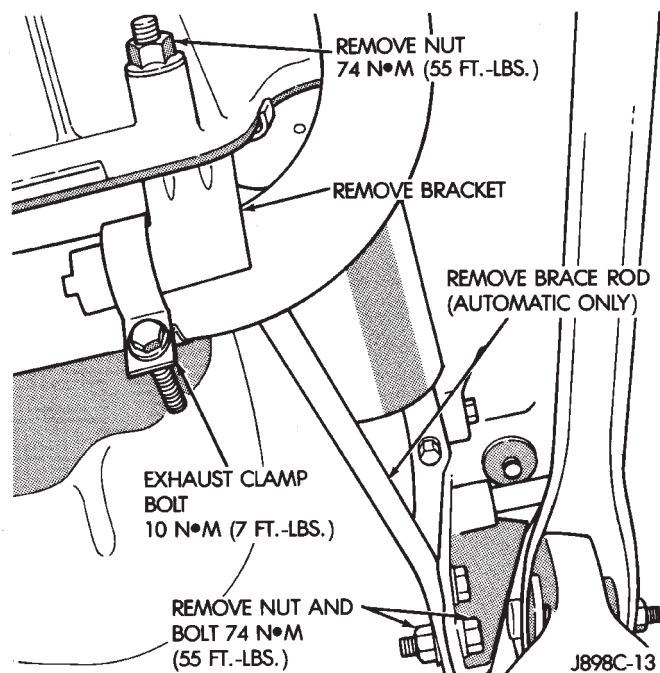


Fig. 3 Exhaust Clamp and Brace Removal—2.5L XJ

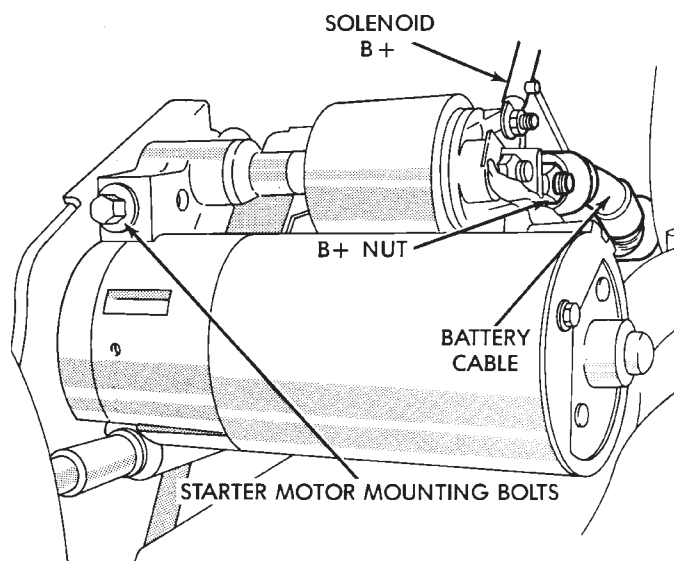
- (7) Disconnect battery cable and solenoid feed wire from solenoid (Fig. 4).
- (8) Remove starter motor mounting bolts, starter motor and shims.

Two shim thicknesses are available. One is 0.381 mm (0.015 in.) and the other is 1.143 mm (0.045 in.). Refer to Group 8A for proper shim selection.

- (9) To install starter motor, reverse the removal procedures and torque mounting hardware as shown.
- (10) Connect negative cable to battery.

YJ—2.5L ENGINE

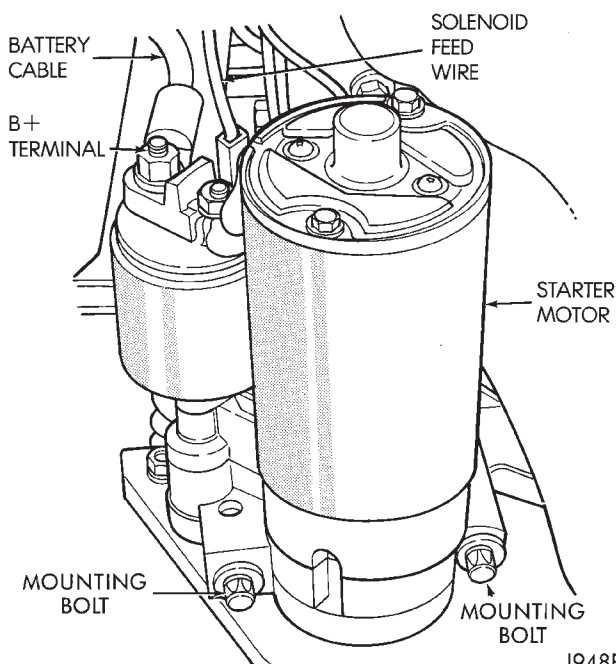
- (1) Disconnect negative cable from battery.
- (2) Disconnect battery cable from starter motor B+ terminal (Fig. 5).



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Fig. 4 Starter Motor Removal/Installation—2.5L XJ

- (3) Disconnect solenoid feed wire.
- (4) Remove starter motor mounting bolts.
- (5) Remove starter motor and shims.



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Fig. 5 Starter Motor Removal/Installation—2.5L YJ

Two shim thicknesses are available. One is 0.381 mm (0.015 in.) and the other is 1.143 mm (0.045 in.). Refer to Group 8A for proper shim selection.

- (6) To install starter motor, reverse removal procedures and torque mounting hardware as shown.
- (7) Connect negative cable to battery.

4.0L STARTER GENERAL INFORMATION

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 starter 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 starter 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 performing tests. 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 starter frame. Chips in the ring gear can lead to failure of the starter.

4.0L STARTER MOTOR REMOVAL/INSTALLATION

- (1) Disconnect negative cable from battery.
- (2) Raise and support vehicle.

- (3) Disconnect battery wire and solenoid feed wire.
- (4) Remove starter lower mounting bolt (Fig. 6).
- (5) Remove starter upper mounting bolt and remove starter.

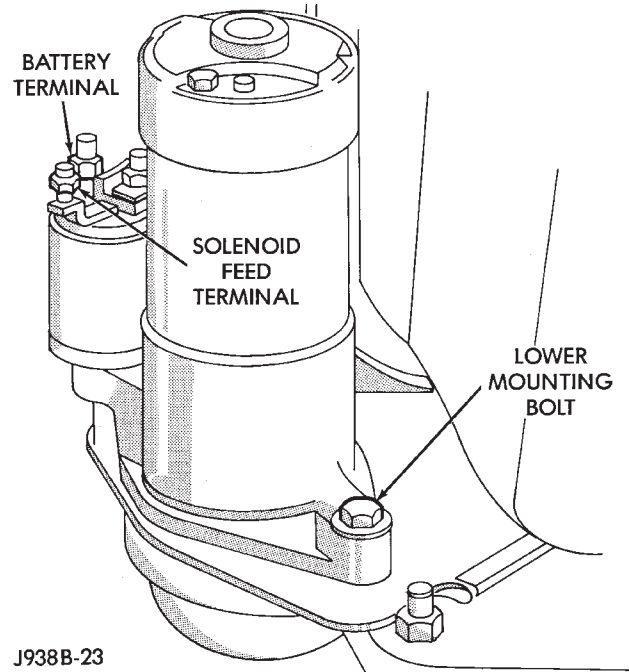


Fig. 6 Starter Motor Removal/Installation (Typical)

- (6) To install starter motor, reverse the removal procedures and torque mounting hardware as shown.
- (7) Remove vehicle support and lower vehicle.
- (8) 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. All engines use serpentine drive. 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 REPLACEMENT—LEFT HAND DRIVE

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

ALL YJ AND XJ WITH 2.5L ENGINE

Belt tension is adjusted at the power steering pump (or idler pulley if not equipped with power steering).

To replace generator:

- (1) Disconnect negative cable from battery.
- (2) Loosen rear mounting bolts (Fig. 1 or 2).

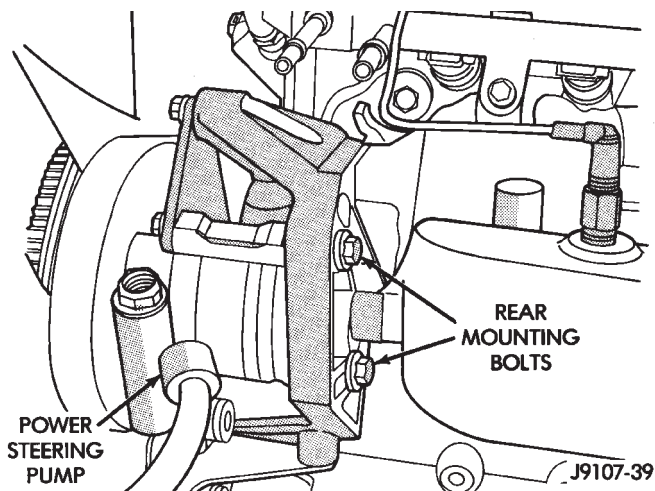


Fig. 1 Powering Steering Pump Rear Mounting Bolts—Except XJ With 4.0L

- (3) Loosen power steering pump/idler pulley pivot bolt and lock nut (Fig. 3 or 4).
- (4) Loosen adjusting bolt to remove belt.
- (5) Remove generator B+ terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 5). Remove wire connector assembly.
- (6) Remove 2 generator mounting bolts and remove generator from vehicle.
- (7) Install generator with 2 mounting bolts. Torque bolts to 55 N·m (41 ft. lbs.).
- (8) Attach generator wires.

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

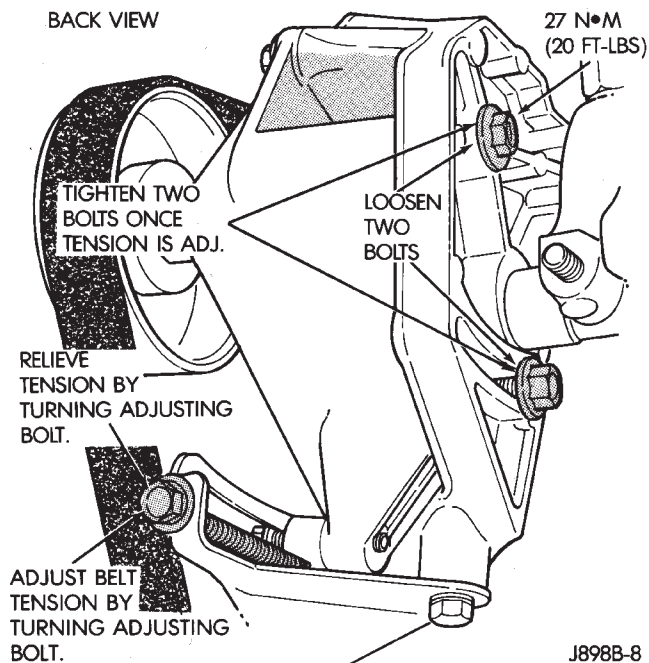


Fig. 2 Idler Pulley Rear Mounting Bolts—Except XJ With 4.0L

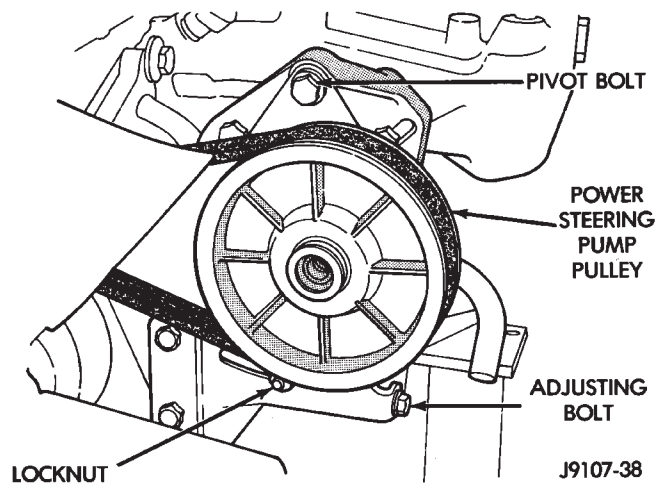
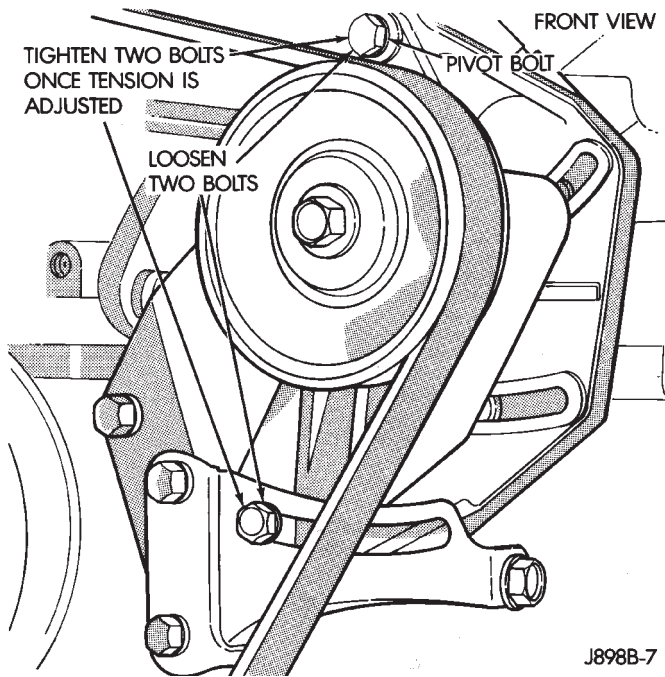


Fig. 3 Power Steering Pump Front Mounting Bolts—Except XJ With 4.0L

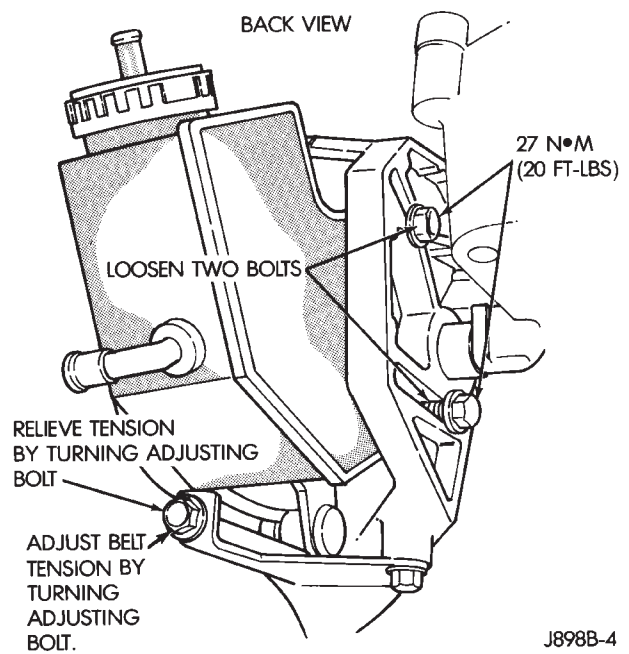
CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The engine may overheat because the water pump will be rotating in the wrong direction if the belt is installed incorrectly. Refer to the belt routing label in engine compartment, or see Group 7 - Belt Schematics.

- (9) Place serpentine belt over pulley.
- (10) Belt tension adjustment is made at power steering pump or idler pulley (Figs. 1 or 2).
- (11) Turn adjusting bolt until belt has correct tension. See Belt Tension in Specifications.



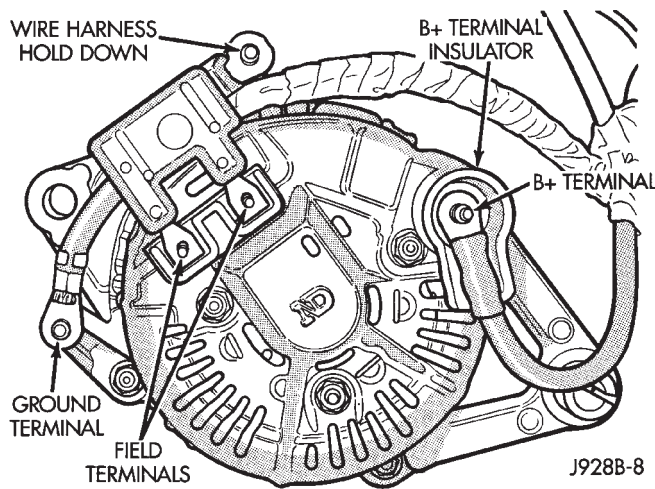
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Fig. 4 Idler Pulley Front Mounting Bolts—Except XJ With 4.0L



J898B-4

Fig. 6 Powering Steering Pump Rear Mounting Bolts—XJ With 4.0L



J928B-8

Fig. 5 Remove or Install Connector Assembly

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

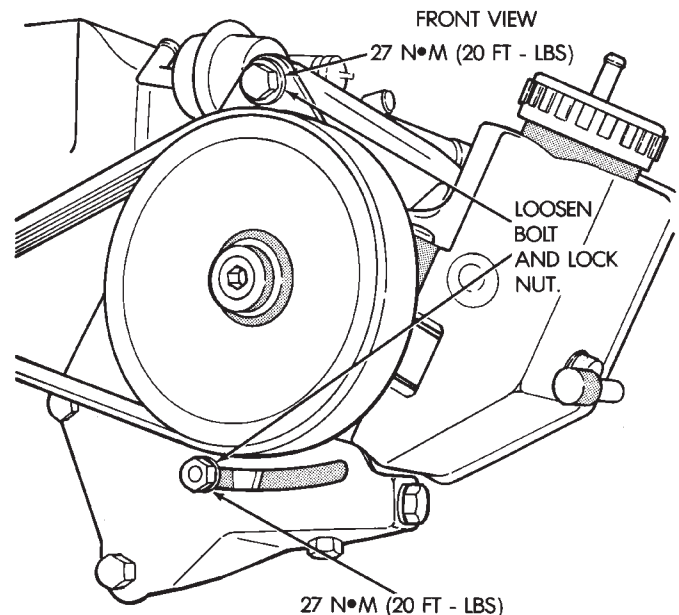
(13) Connect negative cable to battery.

XJ WITH 4.0L ENGINE

Belt tension is adjusted at the power steering pump.

To replace generator:

- (1) Disconnect negative cable from battery.
- (2) Loosen rear mounting bolts (Fig. 6).
- (3) Loosen power steering pump pivot bolt and lock nut (Fig. 7).
- (4) Loosen adjusting bolt to remove belt.
- (5) Raise and support vehicle.



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Fig. 7 Powering Steering Pump Front Mounting Bolts—XJ With 4.0L

(6) Remove generator B+ terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 5). 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.

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 belt routing label in engine compartment, or see Group 7 - Belt Schematics.

- (10) Place serpentine belt over pulley.
- (11) Belt tension adjustment is made at power steering pump (Fig. 6).
- (12) Turn adjusting bolt until belt has correct tension. See Belt Tension 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) Connect negative cable to battery.

GENERATOR REPLACEMENT—RIGHT HAND DRIVE

The generator used on the right hand drive is the same as used on left hand drive. However, the mounting and accessory drive belt installation are different.

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

- (1) Remove negative cable from battery.
- (2) Remove 2 screws holding electric cooling fan (Fig. 8).
- (3) Unplug electric cooling fan connector.
- (4) Pull fan up and out of vehicle.
- (5) Remove generator drive belt. See Group 7 - Cooling System, for instructions.
- (6) Remove generator mounting bolts.
- (7) Position generator to gain access to all of the wire connectors.

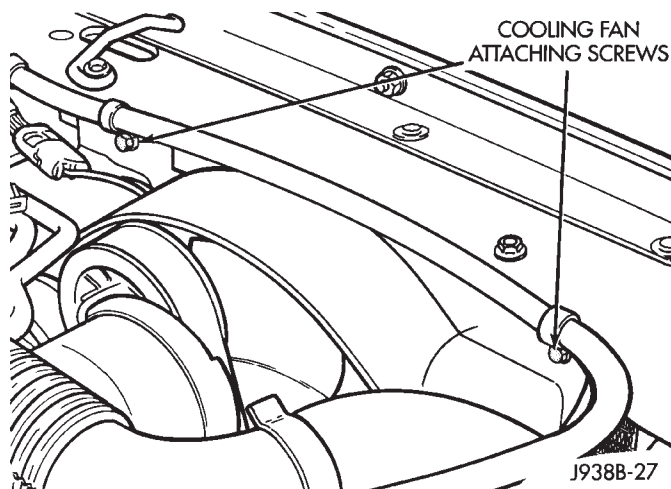


Fig. 8 Electric Cooling Fan Removal/Installation

- (8) Remove B+ terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 9). Remove wire connector assembly.

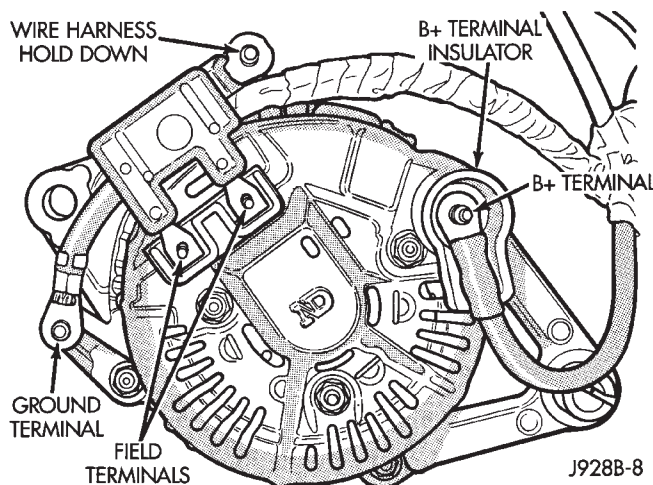


Fig. 9 Remove or Install Connector Assembly

- (9) Remove generator from vehicle.
- (10) To install generator, reverse the removal procedures. Refer to Group 7 for belt installation.
- (11) Tighten battery cable bolts to 10-20 N·m (90-178 in. lbs.).

SPECIFICATIONS

BATTERY CLASSIFICATIONS AND RATINGS—LEFT HAND DRIVE

| Group Size | Cold Crank AMPS | Reserve Capacity (Min.) | Engine | Vehicle Series |
|------------|-----------------|-------------------------|-------------|----------------|
| 58 | 430 | 80 | 2.5L & 4.0L | All |
| 58 | 500 | 85 | 2.5L, 4.0L | All |

J928A-1

BATTERY TORQUE SPECIFICATIONS

| 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.) |

J928A-7

BATTERY CLASSIFICATIONS AND RATINGS—RIGHT HAND DRIVE

| Group Size | Cold Crank AMPS | Reserve Capacity (Min.) | Engine | Vehicle Series |
|------------|-----------------|-------------------------|--------|----------------|
| 75 | 650 | 93 | 4.0L | Postal |

J938A-24

BELT TENSION

| Type of Belt | New Belt N (lbs-f) | Used Belt (lbs-f) |
|-----------------|--------------------|-------------------|
| Serpentine Belt | 800-900 (180-200) | 623-712 (140-160) |
| V-Belt | 533-711 (120-160) | 400-511 (90-115) |

J918C-17

4.0L ENGINES

4.0L STARTER MOTOR AND SOLENOID TESTING SPECIFICATIONS

| Description | Specifications @ 20 °C (68 °F) |
|---|---------------------------------------|
| No Load Test With 11.2 volts Max. Amps Min. RPM | 80 2500 |
| Solenoid Hold-in Winding Voltage Pull-in Winding Voltage | 3.5 Min. 7.8 Max. |

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STARTING SYSTEM COLD CRANKING SPECIFICATIONS

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

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STARTER MOTOR TORQUE SPECIFICATIONS

| 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.) |

J938B-22

2.5L ENGINES

2.5L STARTER MOTOR SPECIFICATIONS

| Description | Specifications @ 20 °C (68 °F) |
|---|---------------------------------------|
| No Load Test With 11.5 volts Max. Amps Min. RPM | 75 2900 |
| Solenoid Hold-in Winding Voltage | 2.6V-3.5V Max. |
| Solenoid Pull-in Winding Voltage | 6V-7.5V Max. |
| Starter Type | DW 1.4 |

J928B-24

STARTING SYSTEM COLD CRANKING SPECIFICATIONS

| | |
|------------------------------|------------|
| Battery Test Voltage | 12.5 Volts |
| Cold Cranking Voltage (Min.) | 9.6 Volts |
| Cold Cranking Amps | 160 Amps |

J918B-19

STARTER MOTOR TORQUE SPECIFICATIONS

| 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.) |

J928B-23

GENERATOR SPECIFICATIONS

TORQUE SPECIFICATIONS

| 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.) |

J948B-18

OUTPUT VOLTAGE SPECIFICATIONS

| PCM 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 |

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| Type | Part Number | Engine | Rating |
|-------------|-------------|-------------|--------|
| Nippondenso | 56005684 | 2.5L & 4.0L | 75 |
| Nippondenso | 56005685 | 2.5L & 4.0L | 90 |

J918C-11