

# STEERING

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## POWER STEERING PUMP

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#### REMOVAL AND INSTALLATION

##### POWER STEERING PUMP—2.5L DIESEL

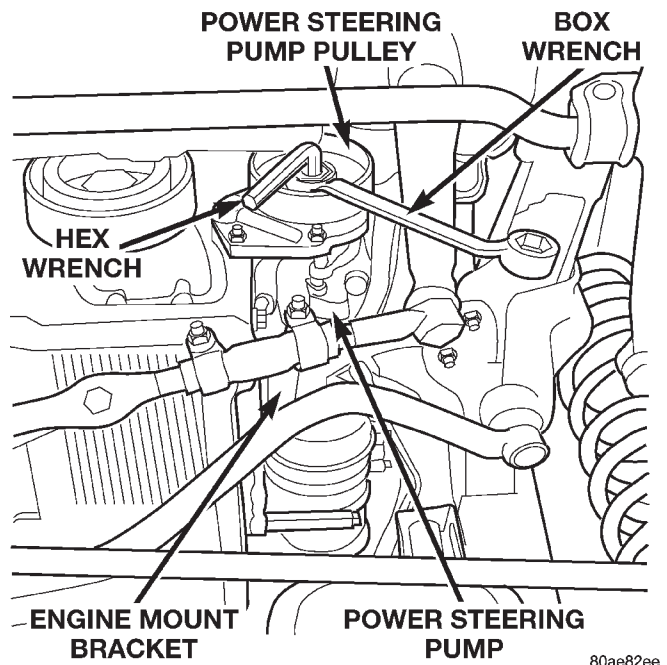
**NOTE:** The power steering pump is mounted below the fuel pump on the left side of the engine. The vehicle should be raised on a hoist to access the pump from below.

#### REMOVAL

- (1) Remove bolt securing A/C line retainer bracket to top of the valve cover.
- (2) Remove serpentine drive belt. Refer to Group 7, Cooling System, for procedure.
- (3) Remove power steering pump pulley. Use a hex wrench to secure the power steering shaft while removing the pulley bolt with a box wrench. (Fig. 1).

**CAUTION:** Do not use an impact wrench to remove the pump pulley – this can cause rear pump seal damage. Do not secure power steering shaft with a wrench on the 'H' coupling to the A/C compressor – this can cause rear pump seal damage.

- (4) Remove 'H' coupling power steering pump shaft pinch bolt.
- (5) Remove 'H' coupling bolts (2) from power steering pump side of coupling.



**Fig. 1 Power Steering Pump Pulley Removal**

- (6) Remove 'H' coupling bolts (2) from A/C compressor side of coupling.
- (7) Loosen A/C compressor bolts and separate compressor from bracket. Do not disconnect A/C hoses.
- (8) Remove left engine mount bracket bolts (4).

## REMOVAL AND INSTALLATION (Continued)

(9) Remove left motor mount frame bracket (Fig. 2). Refer to Group 9, Engine, for procedure.

**NOTE:** Some engine mounts are welded to the frame bracket, and cannot be separated from the bracket. In this case, it may be necessary to remove the steering shaft on LHD vehicles to be able to remove the bracket.

(10) Remove bolts (2) securing the power steering pump to the power steering bracket.

(11) Disconnect power steering pump supply hose at the pump and drain fluid.

(12) Disconnect power steering pressure hose at the steering gear assembly.

(13) Remove power steering pump.

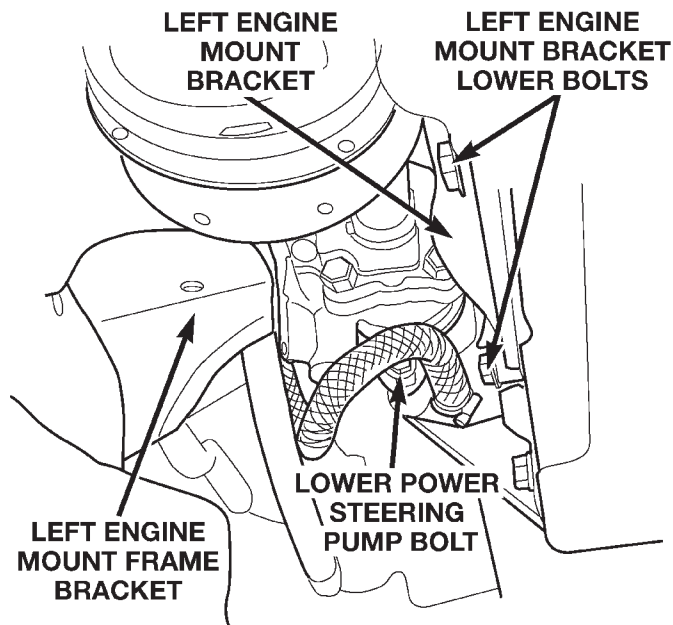
**INSTALLATION**

(1) Install pump on engine.

(2) Tighten pump bracket bolts to 47 N·m (35 ft. lbs.).

(3) Reverse the above procedures in steps 12 through 1 to complete installation.

(4) Add power steering fluid and perform Power Steering Pump Initial Operation.



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**Fig. 2 Left Side Motor Mount—VM Diesel**

## SPEED PROPORTIONAL STEERING

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### DESCRIPTION AND OPERATION

#### SPEED PROPORTIONAL STEERING

Speed Proportional Steering consist of;

- Speed Proportional Steering Control Module (SPSCM)
- Steering Wheel Speed Sensor (SWSS)
- Speed Proportional Steering Solenoid (SPSS)
- Speed Proportional Steering Gear (SPSG)

Speed Proportional Steering provides variable power assist based on inputs from the Vehicle Speed Sensor and Steering Wheel Speed Sensor. The sensors are monitored by the Speed Proportional Steering Control Module. The module controls the operation of the Speed Proportional Steering Solenoid which regulated power steering pump flow rate.

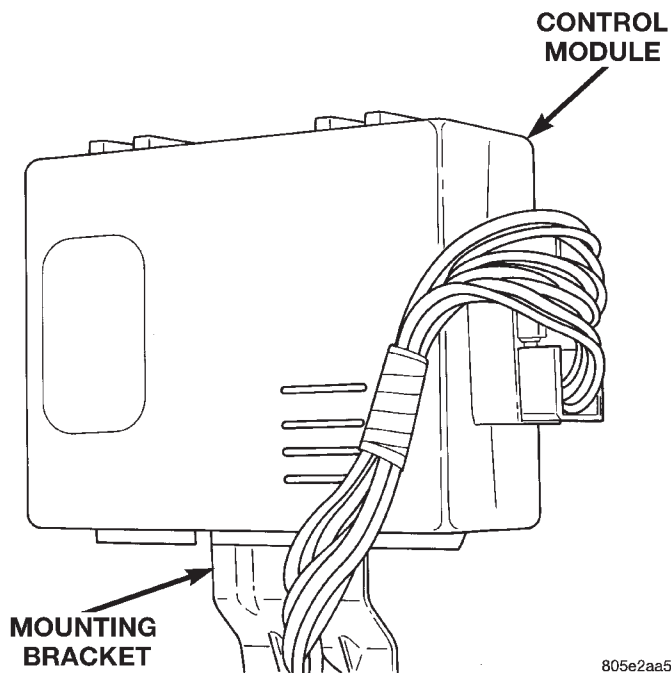
When parking or at low speeds, full power assist is provided. As the vehicle speed increases pump flow is reduced. This reduces the power assist, providing the driver with a better steering feel for the road and improved directional stability.

The SWSS continually monitors steering wheel assist. When a quick steering maneuver is made while the system is operating at reduced power assist, full assist is provided for the maneuver instantly.

#### SPEED PROPORTIONAL STEERING CONTROL MODULE

The control module is mounted to a bracket on the passenger side of the front cowl panel just left of the

steering column (Fig. 1). A 14-way connector is attached to the module. The module monitors steering wheel speed and vehicle speed to determine the amount of power steering assist needed. The module controls power steering assist by sending a 12-volt duty-cycle signal (pulsed on and off) to the Speed Proportional Steering Solenoid.



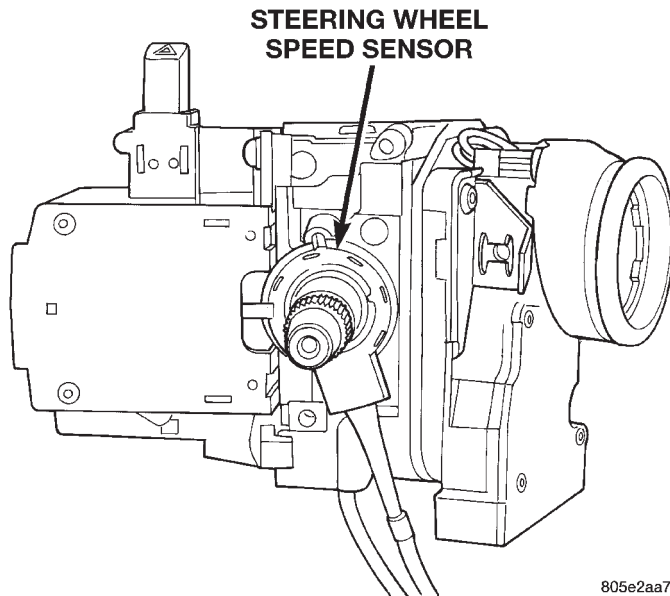
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**Fig. 1 Speed Proportional Steering Control Module**

## DESCRIPTION AND OPERATION (Continued)

**STEERING WHEEL SPEED SENSOR**

The Steering Wheel Speed Sensor is mounted on the steering column shaft below the clock spring (Fig. 2). The sensor is used to monitor steering wheel assist.



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**Fig. 2 Steering Wheel Speed Sensor**

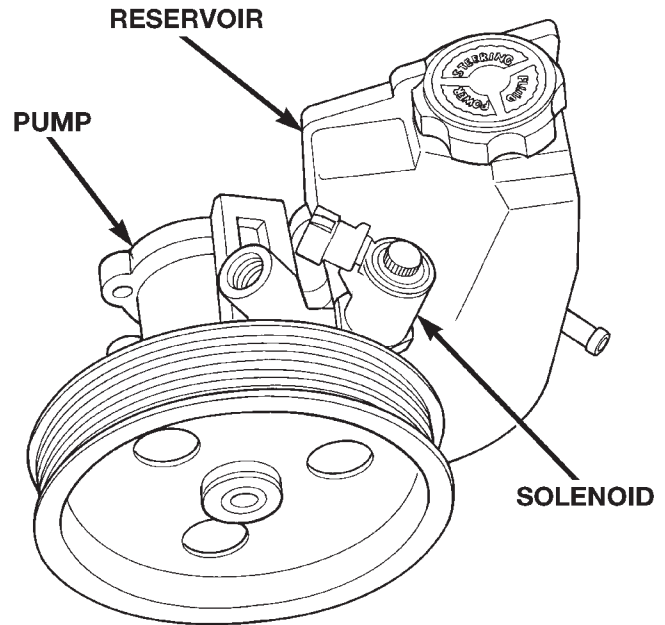
**SPEED PROPORTIONAL STEERING SOLENOID**

The solenoid is mounted to the power steering pump outlet port (Fig. 3). The solenoid controls pump output volume by moving a metering rod in and out of a fixed orifice. The SPSCM energizes and de-energizes the solenoid to move the metering rod up to 250 times per second. By varying the time energized versus de-energize steering pump output volume and steering assist is controlled.

**POWER STEERING GEAR**

The steering gear used with Speed Proportional Steering has a special spool valve. The valve provides improved response at lower flow rates. The gear is a serviceable component.

**CAUTION:** A Speed Proportional Steering gear should not be interchanged with any other steering gear.



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**Fig. 3 Speed Proportional Steering Solenoid**

**DIAGNOSIS AND TESTING****SPEED PROPORTIONAL STEERING**

For diagnosis and testing procedures refer to the Chassis Diagnostic Manual.

**REMOVAL AND INSTALLATION****STEERING WHEEL SPEED SENSOR****REMOVAL**

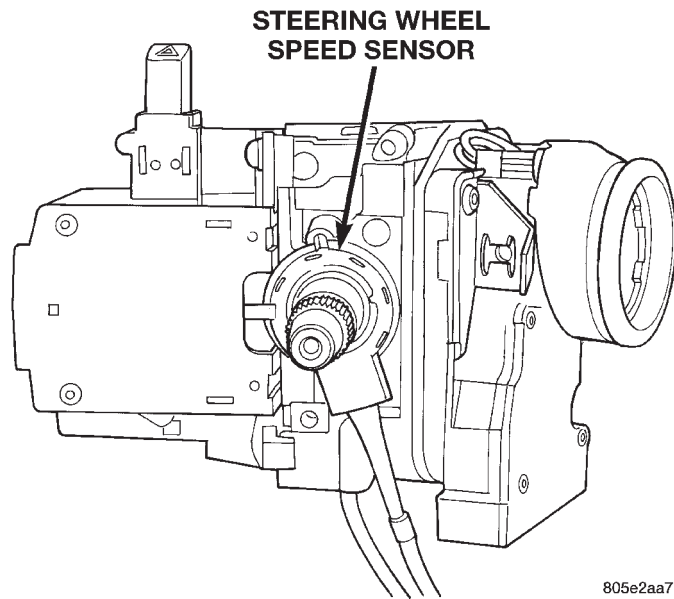
- (1) Disconnect the negative (ground) cable from the battery.
- (2) Remove airbag, refer to Group 8M Electrical for procedure.
- (3) Remove steering wheel with appropriate puller.
- (4) Remove clock spring, refer to Group 8M Electrical for procedure.
- (5) Pry sensor retaining ring tabs up and remove sensor (Fig. 4).

**INSTALLATION**

**CAUTION:** Never install a used sensor. Once the sensor has been removed it must be replaced with a new sensor.

- (1) Install new sensor on column shaft with a piece of thin wall conduit 3 inch long by 3/4 inch ID. Move turn signal canceller off to one side and insure locating tab is in the proper position and push the sensor down on the shaft.

## REMOVAL AND INSTALLATION (Continued)



**Fig. 4 Steering Wheel Speed Sensor**

**CAUTION:** The pipe installer must only touch the inner metal ring of the sensor and not the plastic housing or the sensor will be damaged.

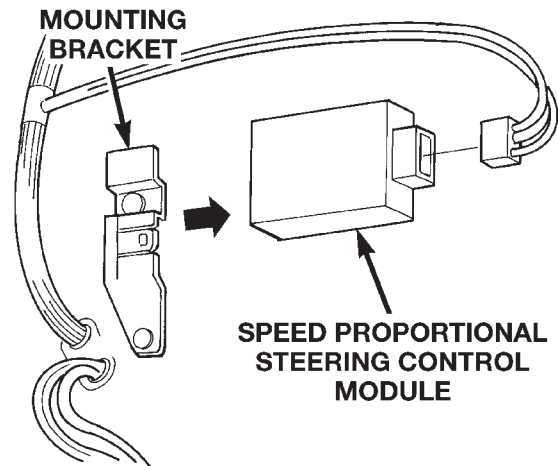
- (2) Install clock spring, refer to Group 8M Electrical for procedure.
- (3) Install steering wheel.
- (4) Install airbag, refer to Group 8M Electrical for procedure.

- (5) Connect negative (ground) cable to the battery.

## SPEED PROPORTIONAL STEERING CONTROL MODULE

### REMOVAL

- (1) Unplug harness from control module, located left of steering column on front cowl panel.
- (2) Slid the module off mounting bracket (Fig. 5).



**Fig. 5 Speed Proportional Steering Control Module**

### INSTALLATION

- (1) Slid module onto mounting bracket.
- (2) Plug harness into module.

