

STEERING

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POWER STEERING

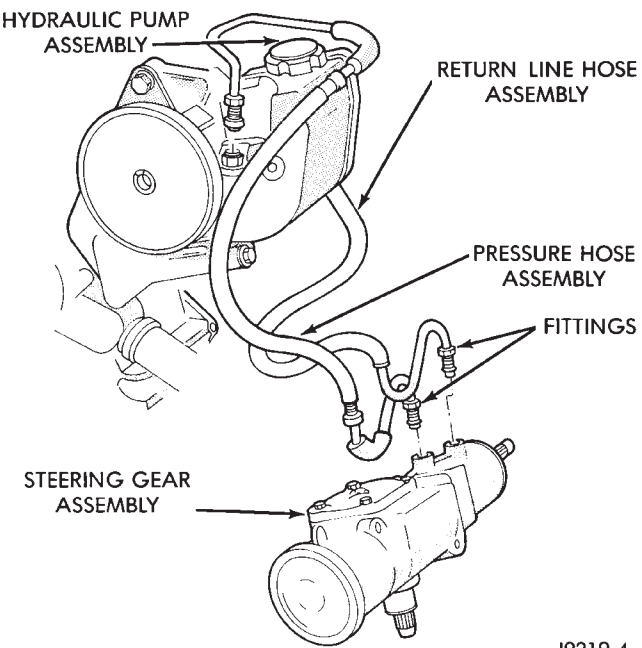
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GENERAL INFORMATION

STEERING SYSTEM

- The power steering system consists of;
- Hydraulic pump
 - Recirculating ball steering gear
 - Steering column
 - Steering linkage



Power Steering Gear & Pump

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DIAGNOSIS AND TESTING

POWER STEERING SYSTEM DIAGNOSIS CHARTS

STEERING NOISE

There is some noise in all power steering systems. One of the most common is a hissing sound evident

at a standstill parking. Or when the steering wheel is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Damaged steering coupler to dash panel seal. 2. Noisy valve in power steering gear.	1. Check and repair seal at dash panel. 2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose. 2. Loose or damaged suspension components. 3. Loose or damaged steering linkage. 4. Internal gear noise. 5. Pressure hose in contact with other components.	1. Tighten bolts to specification. 2. Inspect and repair suspension. 3. Inspect and repair steering linkage. 4. Replace gear. 5. Reposition hose.
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
WHINE OR GROWL	1. Low fluid level. 2. Pressure hose in contact with other components. 3. Internal pump noise.	1. Fill to proper level. 2. Reposition hose. 3. Replace pump.
SUCKING AIR SOUND	1. Loose return line clamp. 2. O-ring missing or damaged on hose fitting. 3. Low fluid level. 4. Air leak between pump and reservoir.	1. Replace clamp. 2. Replace o-ring. 3. Fill to proper level. 4. Repair as necessary.
SCRUBBING OR KNOCKING	1. Wrong tire size. 2. Wrong gear.	1. Verify tire size. 2. Verify gear.

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level. 2. Tire pressure. 3. Steering components. 4. Loose belt. 5. Pump flow control valve. 6. Column coupler binding. 7. Steering gear worn or out of adjustment.	1. Fill to proper level. 2. Adjust tire pressure. 3. Inspect and lube. 4. Adjust or replace. 5. Test and replace if necessary. 6. Replace coupler. 7. Repair or replace gear.

DIAGNOSIS AND TESTING (Continued)**INSUFFICIENT ASST. OR POOR RETURN TO CENTER**

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure. 2. Low fluid level. 3. Loose belt. 4. Lack of lubrication. 5. Low pump pressure. 6. Internal gear leak.	1. Adjust tire pressure. 2. Fill to proper level. 3. Adjust or replace. 4. Inspect and lubricate steering and suspension compnents. 5. Test and repair as necessary. 6. Test and repair as necessary.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure. 2. Wheel alignment. 3. Lack of lubrication. 4. High friction in steering gear.	1. Adjust tire pressure. 2. Align front end. 3. Inspect and lubricate steering and suspension compnents. 4. Test and repair as necessary.

LOOSE STEERING AND VEHICLE LEAD

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components. 2. Worn or loose wheel bearings. 3. Steering gear mounting. 4. Gear out of adjustment. 5. Worn or loose steering coupler.	1. Inspect and repair as necessary. 2. Inspect and repair or adjust bearings. 3. Tighten gear to specification. 4. Adjust gear to specification. 5. Inspect and replace as necessary.
VEHICLE PULLS OR LEADS TO ONE SIDE.	1. Radial tire lead. 2. Brakes dragging. 3. Wheel alignment.	1. Rotate tires. 2. Repair as necessary. 3. Align front end.

POWER STEERING PUMP

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DESCRIPTION AND OPERATION

POWER STEERING PUMP

Hydraulic pressure is provided for operation of the power steering gear by a belt driven power steering pump. The power steering pump is a constant flow rate and displacement, vane-type pump. The internal parts in the housing operate submerged in fluid. The flow control orifice is part of the high pressure line fitting. The pressure relief valve inside the flow control valve limits the pump pressure. The reservoir is attached to the pump body with spring clips.

The power steering pump is connected to the steering gear by the pressure and return hoses. The pump shaft has a pressed-on drive pulley that is belt driven by the crankshaft pulley (Fig. 1).

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

DIAGNOSIS AND TESTING

POWER STEERING PUMP

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Pressure/Flow tester, Special Tool 6815 (Fig. 2).

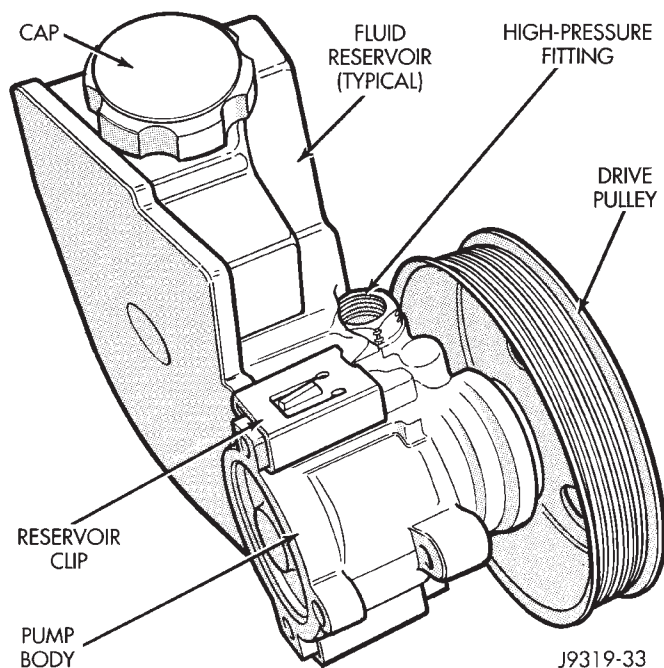


Fig. 1 TC Series Pump With Integral Reservoir

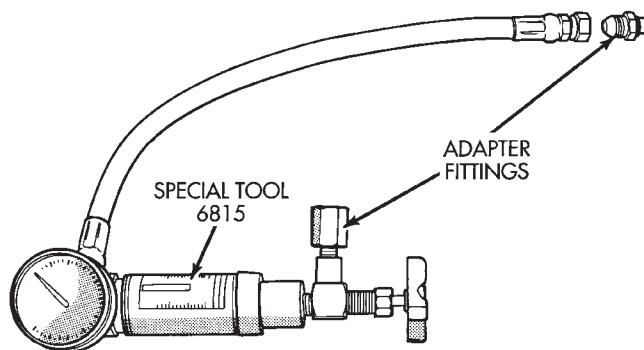


Fig. 2 Pressure Test Gauge

DIAGNOSIS AND TESTING (Continued)

POWER STEERING PUMP PRESSURE TEST

- (1) Check belt tension and adjust as necessary.
- (2) Disconnect high pressure hose at gear or pump. Use a container for dripping fluid.
- (3) Connect pressure gauge from Power Steering Analyzer Tool kit 6815 to both hoses using appropriate adapter. Connect spare pressure hose to gear or pump.
- (4) Open the test valve completely.
- (5) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge and to get air out of the fluid. Then shut off engine.
- (6) Check fluid level, add fluid as necessary. Start engine again and let idle.
- (7) Gauge should read below 862 kPa (125 psi), if above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi).

CAUTION: The following test procedure involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than five seconds as the pump could be damaged.

- (8) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

- Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
- Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.

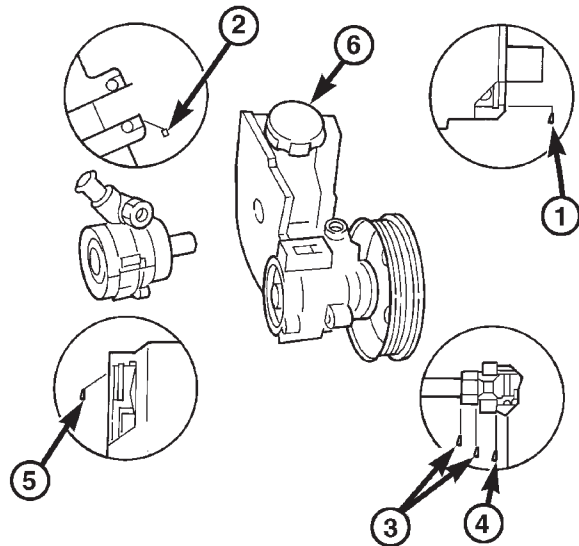
NOTE: Refer to pump relief pressure chart.

CAUTION: Do not force the pump to operate against the stops for more than 2 to 4 seconds at a time because, pump damage will result.

- (9) Open the test valve, turn steering wheel extreme left and right positions against the stops. Record the highest indicated pressure at each position. Compare readings to specifications. If highest output pressures are not the same against either stop, the gear is leaking internally and must be repaired.

ENGINE	RELIEF PRESSURE $\pm$ 50
4.0L	9653 kPa (1400 psi)
5.2L	9653 kPa (1400 psi)

PUMP LEAKAGE DIAGNOSIS



1. BUSHING (BEARING) WORN, SEAL WORN. REPLACE PUMP.
2. REPLACE RESERVOIR O-RING SEAL.
3. TORQUE HOSE FITTING NUT TO 35 N·m (25 ft. lbs.). IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
4. TORQUE FITTING TO 75 N·m (55 ft. lbs.). IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
5. REPLACE PUMP.
6. CHECK OIL LEVEL; IF LEAKAGE PERSISTS WITH THE LEVEL CORRECT AND CAP TIGHT, REPLACE THE CAP.

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SERVICE PROCEDURES

POWER STEERING PUMP—INITIAL OPERATION

CAUTION: The fluid level should be checked with engine off to prevent injury from moving components. Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal temperature.

- (1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two (2) minutes.
- (2) Start the engine and let run for a few seconds then turn engine off.
- (3) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.
- (4) Raise the front wheels off the ground.
- (5) Slowly turn the steering wheel right and left, lightly contacting the wheel stops at least 20 times.
- (6) Check the fluid level add if necessary.
- (7) Lower the vehicle, start the engine and turn the steering wheel slowly from lock to lock.

SERVICE PROCEDURES (Continued)

(8) Stop the engine and check the fluid level and refill as required.

(9) If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the procedure.

REMOVAL AND INSTALLATION

POWER STEERING PUMP — 4.0L**REMOVAL**

(1) Remove serpentine drive belt, refer to Group 7 Cooling.

(2) Vehicles equipped with Speed Proportional Steering, disconnect actuator harness.

(3) Remove pressure and return hoses from pump and drain pump.

(4) Remove 3 pump mounting bolts through pulley access holes.

(5) Loosen the 3 pump bracket bolts (Fig. 3).

(6) Tilt pump downward and remove from engine.

(7) Remove pulley from pump.

INSTALLATION

(1) Install pulley on pump.

(2) Install pump on engine.

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

(4) Install 3 pump mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(5) Install the pressure and return hoses to pump.

(6) Vehicles equipped with Speed Pro Steering, connect actuator harness.

(7) Install drive belt, refer to Group 7 Cooling.

(8) Add power steering fluid. Refer to Power Steering Pump Initial Operation in this section.

POWER STEERING PUMP — 5.2L**REMOVAL**

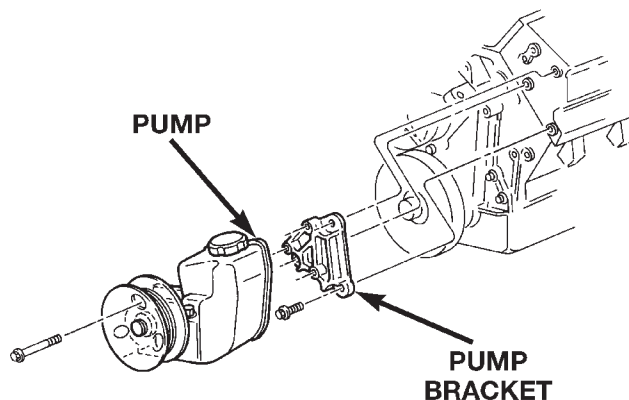
(1) Remove the serpentine drive belt. Refer to Group 7 Cooling.

(2) Remove the pressure and return hoses from pump and drain pump.

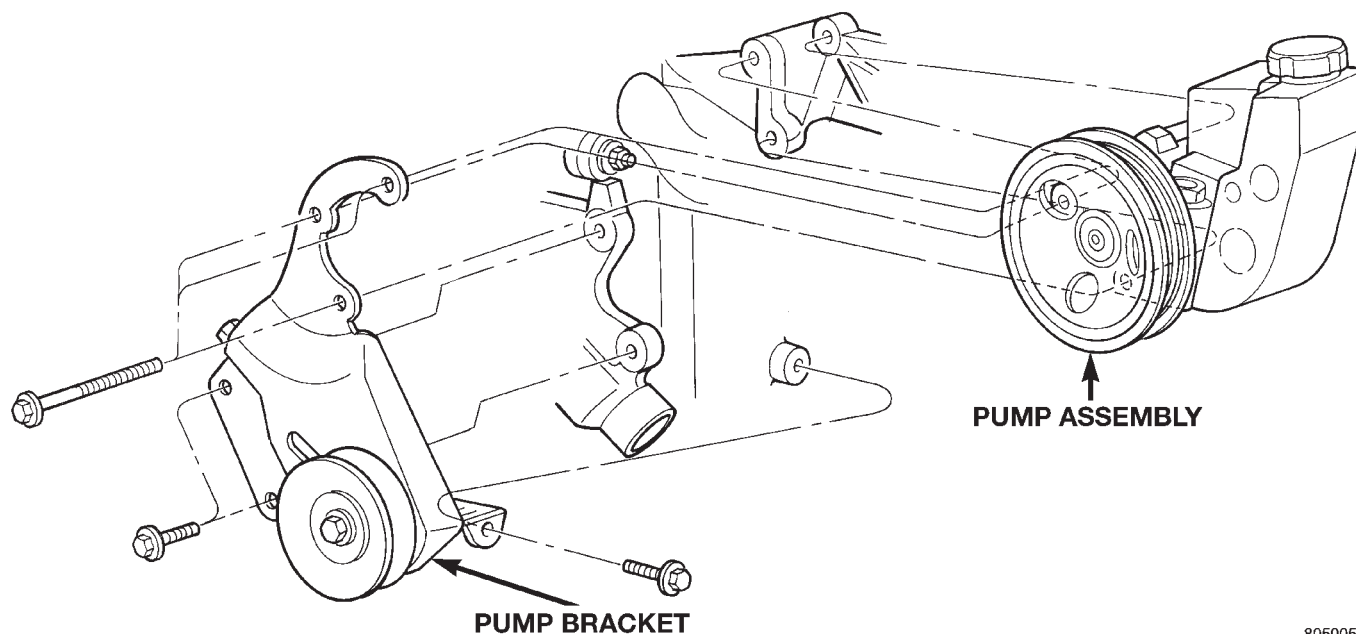
(3) Vehicles equipped with Speed Proportional Steering, disconnect actuator harness.

(4) Remove pump mounting bolts and remove the pump (Fig. 4).

(5) Remove pulley from pump.



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Fig. 4 Power Steering Pump — 5.2L

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Fig. 3 Pump Mounting

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

- (1) Install pulley on pump.
- (2) Mount pump on bracket and install bolts. Tighten bolts to 27 N·m (20 ft. lbs.).
- (3) Install the pressure and return hoses to pump.
- (4) Vehicles equipped with Speed Pro Steering, connect actuator harness.
- (5) Install drive belt, refer to Group 7 Cooling.
- (6) Add power steering fluid. Refer to Power Steering Pump Initial Operation in this section.

DISASSEMBLY AND ASSEMBLY

PUMP PULLEY

REMOVAL

- (1) Remove pump assembly.
- (2) Remove pulley from pump with Puller C-4333 (Fig. 5).

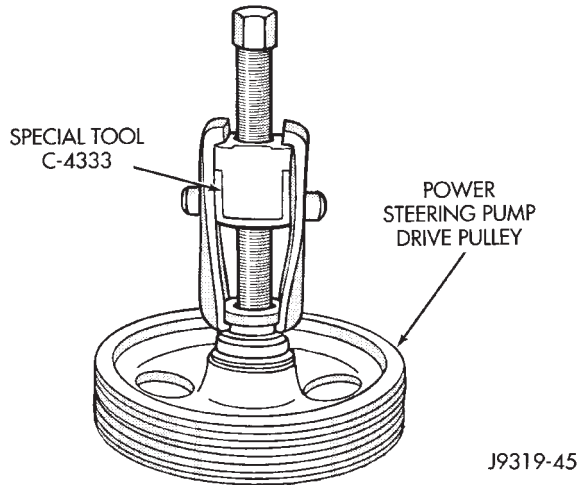


Fig. 5 Pulley Removal

INSTALLATION

- (1) Replace pulley if bent, cracked, or loose.
- (2) Install pulley on pump with Installer C-4063-B (Fig. 6) flush with the end of the shaft. Ensure the tool and pulley remain aligned with the pump shaft.
- (3) Install pump assembly.
- (4) With Serpentine Belts; Run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**

TC-SERIES PUMP RESERVOIR

REMOVAL

- (1) Remove power steering pump.
- (2) Clean exterior of pump with solvent.
- (3) Clamp the pump body in a soft jaw vice.

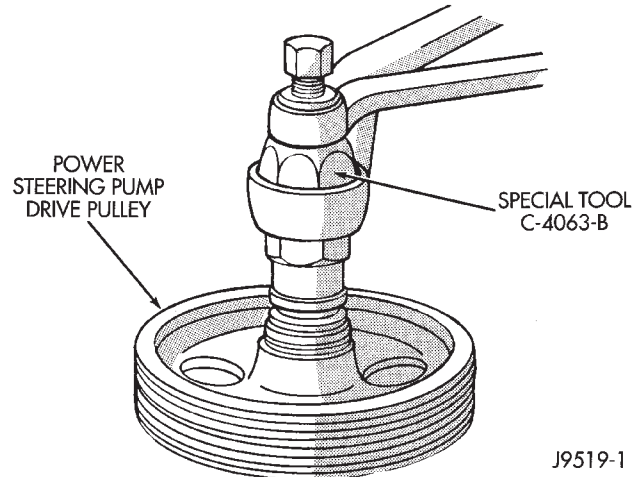


Fig. 6 Pulley Installation

- (4) Pry up tab and slide the retaining clips off (Fig. 7).

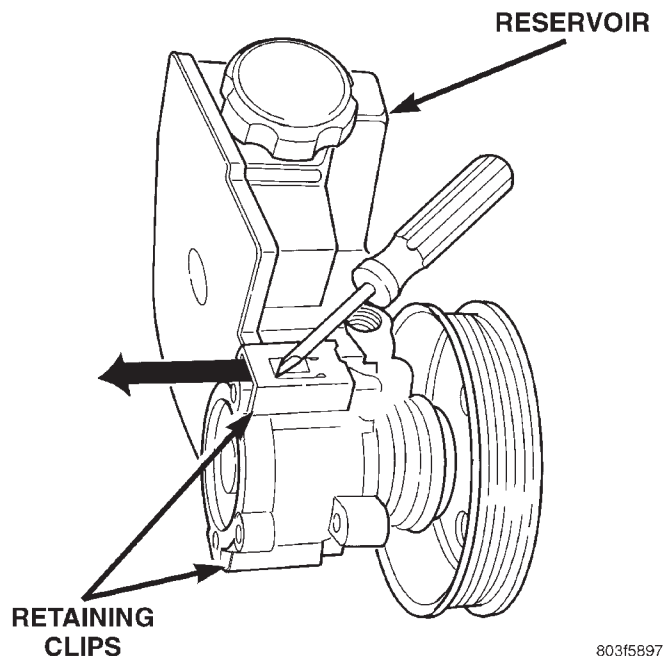


Fig. 7 Pump Reservoir Clips

- (5) Remove fluid reservoir from pump body. Remove and discard O-ring seal.

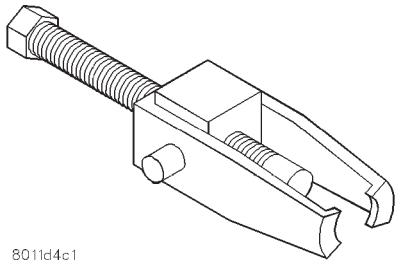
INSTALLATION

- (1) Lubricate new O-ring Seal with Mopar Power Steering Fluid or equivalent.
- (2) Install O-ring seal in housing.
- (3) Install reservoir onto housing.
- (4) Slide and tap in reservoir retainer clips until tab locks to housing.
- (5) Install power steering pump. Refer to Pump Replacement in this section.

SPECIFICATIONS

TORQUE CHART

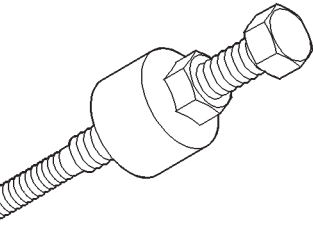
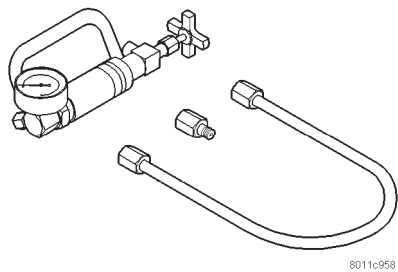
DESCRIPTION	TORQUE
Power Steering Pump	
Bracket Bolts.	.41 N·m (30 ft. lbs.)
Pump Bolts	.27 N·m (20 ft. lbs.)
Flow Control Valve	.75 N·m (55 ft. lbs.)
Pressure Line	.28 N·m (21 ft. lbs.)



Puller C-4333

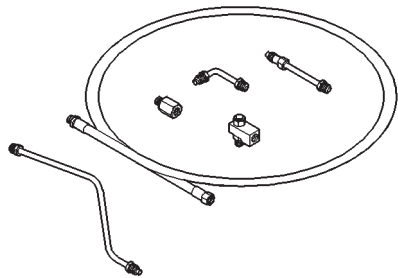
SPECIAL TOOLS

POWER STEERING PUMP



Installer, Power Steering Pulley C-4063-B

Analyzer Set, Power Steering Flow/Pressure 6815



Adapters, Power Steering Flow/Pressure Tester
6893

POWER STEERING GEAR

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DESCRIPTION AND OPERATION

POWER STEERING GEAR

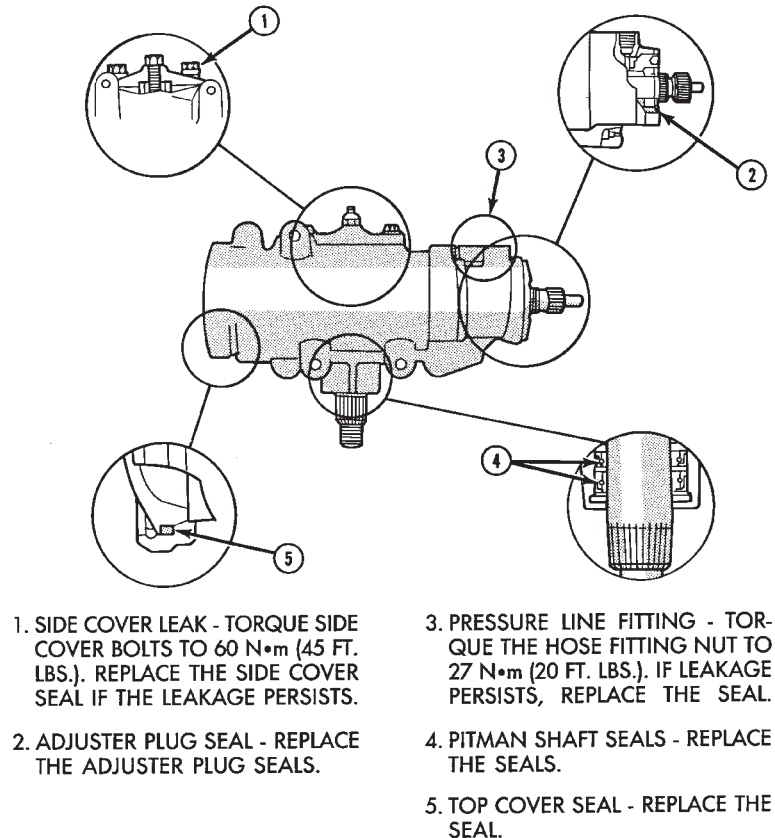
The power steering gear is a recirculating ball type gear. The gear acts as a rolling thread between the worm shaft and rack piston. The worm shaft is supported by a thrust bearing at the lower end and a bearing assembly

at the upper end. When the worm shaft is turned the rack piston moves. The rack piston teeth mesh with the pitman shaft. Turning the worm shaft turns the pitman shaft, which turns the steering linkage.

The steering gear can be adjusted and internally serviced.

DIAGNOSIS AND TESTING

POWER STEERING GEAR LEAKAGE DIAGNOSIS



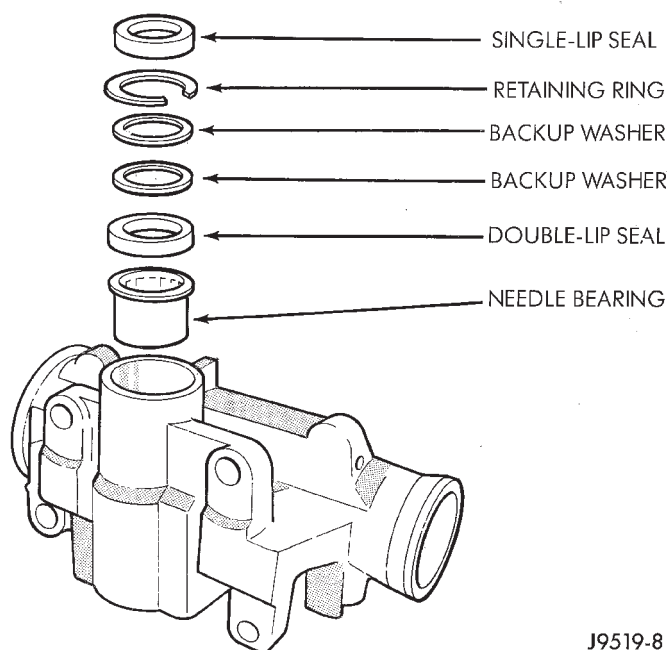
REMOVAL AND INSTALLATION

PITMAN SHAFT SEALS (IN VEHICLE)

REMOVAL

CAUTION: Use care not to score the housing bore when prying out seals and washers.

- (1) Remove pitman arm from gear.
- (2) Clean exposed end of pitman shaft and housing. Use a wire brush to clean the shaft splines.
- (3) Remove single lip dust seal.
- (4) Remove retaining ring with snap ring pliers (Fig. 1).



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Fig. 1 Pitman Shaft Seal

- (5) Remove backup washers with screwdriver.
- (6) Start the engine and turn steering wheel fully to the LEFT. Hydraulic pressure will force the double lip oil seal out.
- (7) Turn off engine and remove double lip seal with screwdriver.
- (8) Inspect the housing for burrs and remove if necessary. Inspect the pitman shaft seal surface for roughness and pitting. If shaft is damaged it will have to be replaced.

INSTALLATION

- (1) Coat the seals and washers with grease.
- (2) Install double lip oil seal with a suitable size deep socket.
- (3) Install nylon backup washer.
- (4) Install steel backup washer.
- (5) Install the retainer ring with snap ring pliers.

- (6) Install single lip dust seal with a suitable size deep socket.

- (7) Center the steering gear and install pitman arm.

- (8) Add power steering fluid, refer to Power Steering Initial Operation.

STEERING GEAR

REMOVAL

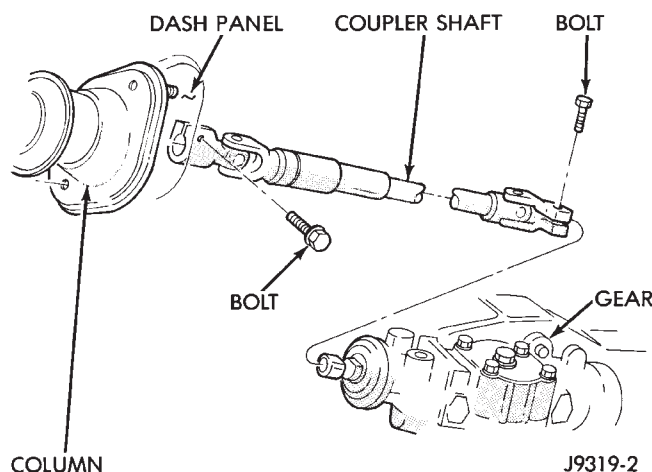
- (1) Place the front wheels in the straight ahead position with the steering wheel centered.

- (2) Remove and cap the pressure and return hoses from the steering gear.

- (3) Remove the column coupler shaft from the gear (Fig. 2).

- (4) Remove pitman arm from gear with Puller C-4150A (Fig. 3).

- (5) Remove the steering gear retaining bolts and nuts. Remove the steering gear from the vehicle (Fig. 4).



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Fig. 2 Coupling Shaft

INSTALLATION

- (1) Position the steering gear on the frame rail and install the bolts. Tighten the bolts to 88 N·m (65 ft. lbs.) torque.

- (2) Install the column coupler shaft.

- (3) Install the pitman arm and tighten nut to 251 N·m (185 ft. lbs.).

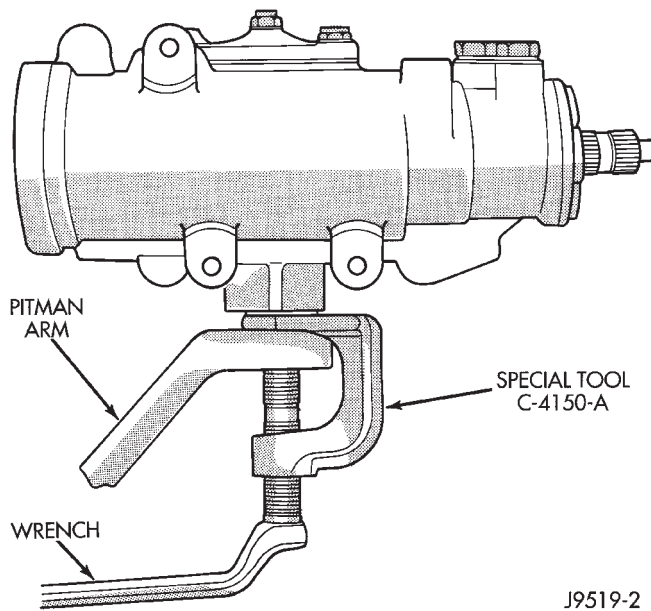
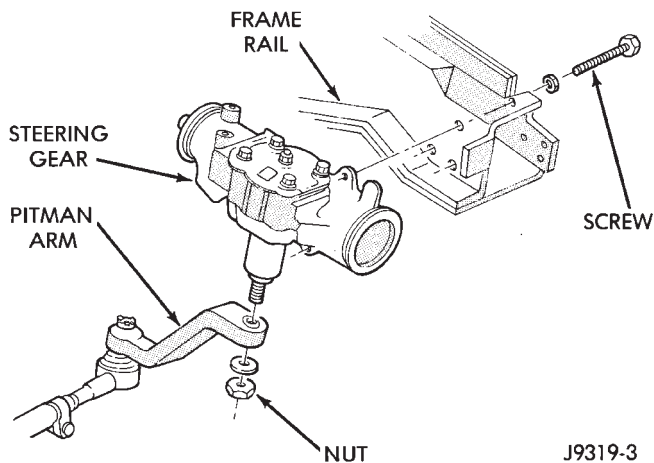
- (4) Connect pressure and return hoses to steering gear and tighten to 28 N·m (21 ft. lbs.).

DISASSEMBLY AND ASSEMBLY

PITMAN SHAFT

Steering gear must be removed from the vehicle for this procedure.

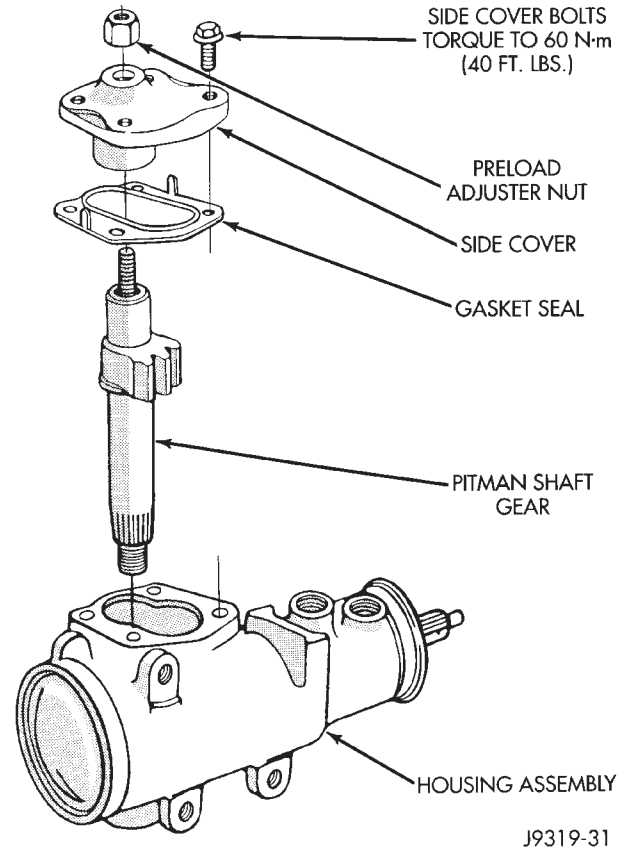
DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 3 Pitman Arm Removal****Fig. 4 Steering Gear Mounting****REMOVAL**

- (1) Clean exposed end of pitman shaft and housing with a wire brush.
- (2) Remove preload adjuster nut.
- (3) Rotate stub shaft with socket to center gear.
- (4) Remove side cover bolts and remove side cover, gasket and pitman shaft as an assembly.
- (5) Remove pitman shaft from the side cover (Fig. 5).

INSTALLATION

- (1) Install pitman shaft to side cover by screwing shaft in until it fully seats to side cover.
- (2) Install preload adjuster nut. **Do not tighten nut until after pitman shaft adjustment has been made.**

**Fig. 5 Side Cover and Pitman Shaft**

- (3) Install gasket to side cover and bend tabs around edges of side cover.
- (4) Install pitman shaft assembly and side cover to housing.
- (5) Install side cover bolts and tighten to 60 N·m (44 ft. lbs.).
- (6) Adjust pitman shaft, refer to Over-Center Adjustment.

HOUSING END PLUG

Steering gear must be removed from the vehicle for this procedure.

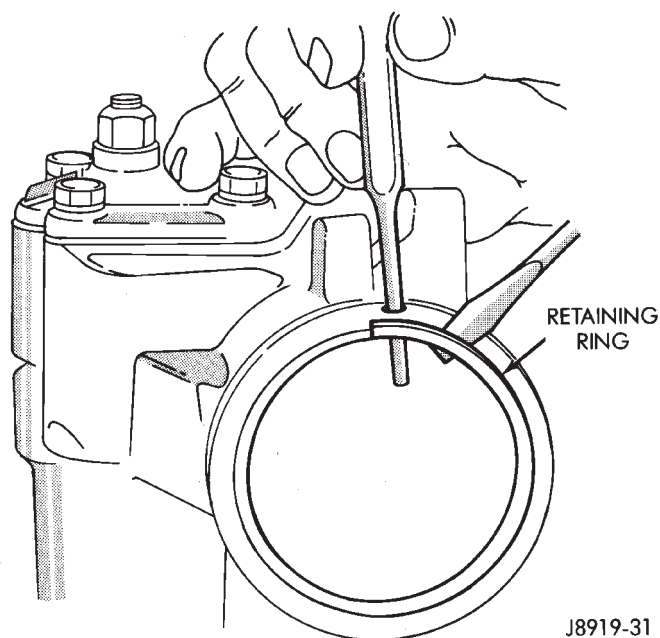
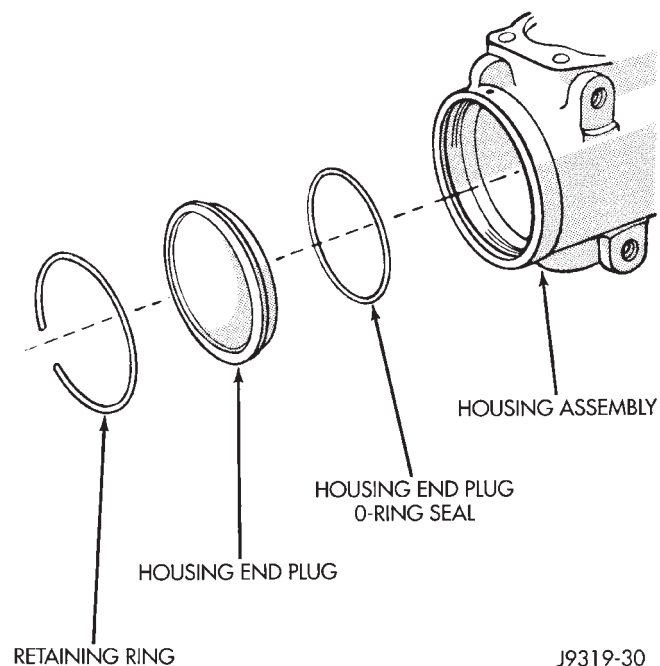
REMOVAL

- (1) Rotate retaining ring until one end is under the hole in the housing. Unseat and force ring from groove (Fig. 6).
- (2) Rotate stub shaft slowly COUNTER-CLOCK-WISE to remove end plug out from housing.

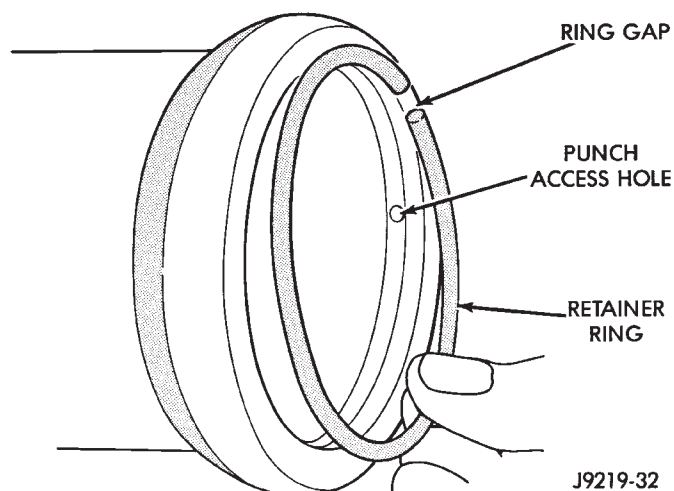
CAUTION: Do not turn stub shaft any further than necessary. The recirculating balls will drop out of the rack piston circuit and fall inside the rack piston chamber.

- (3) Remove O-ring seal (Fig. 7).

DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 6 End Plug Retaining Ring****Fig. 7 End Plug Components****INSTALLATION**

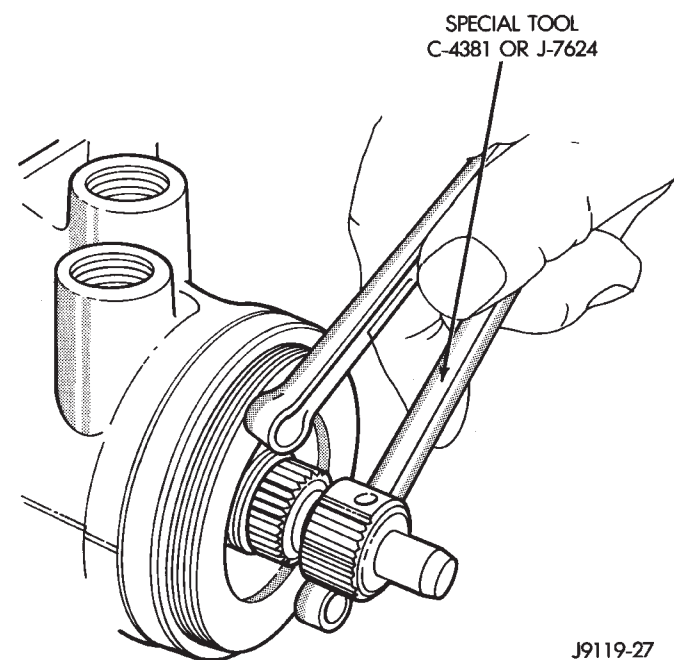
- (1) Lubricate O-ring seal with power steering fluid.
- (2) Install O-ring into housing.
- (3) Install plug, tap lightly with a plastic mallet to seat it.
- (4) Install retaining ring with open end 25 mm (1 inch) from access hole (Fig. 8).
- (5) Adjust pitman arm shaft, refer to Over-Center Adjustment.

**Fig. 8 Installing The Retaining Ring****ADJUSTER PLUG ASSEMBLY**

Steering gear must be removed from the vehicle for this procedure.

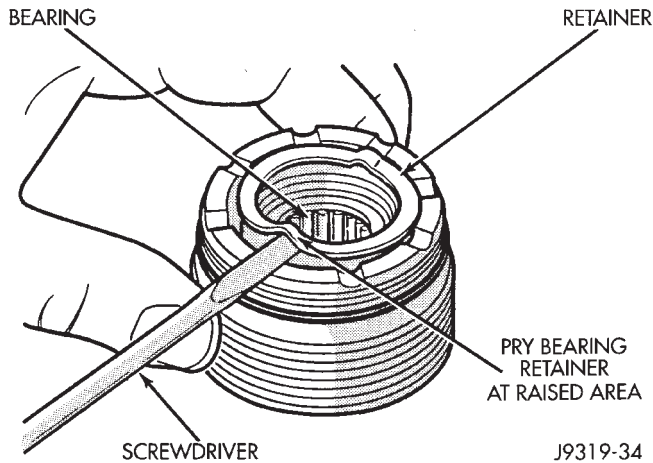
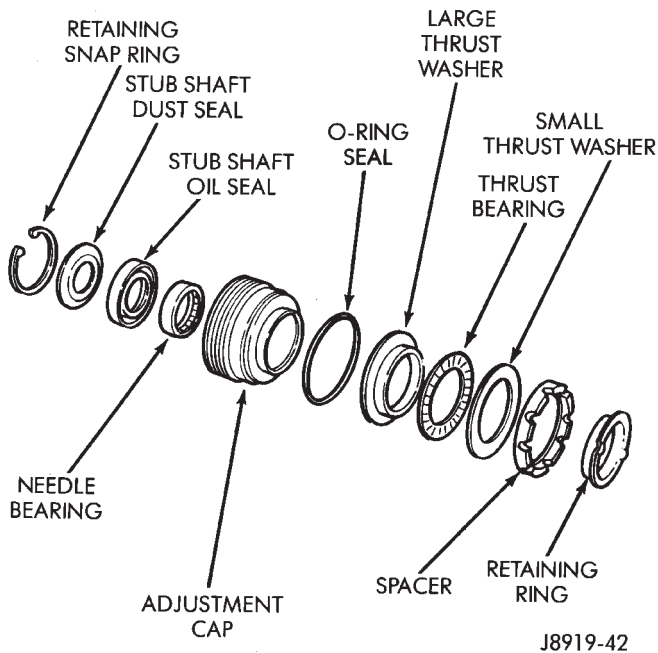
REMOVAL

- (1) Remove adjuster plug lock nut from housing.
- (2) Remove adjuster plug from housing with Spanner Wrench C-4381 (Fig. 9).

**Fig. 9 Adjustment Plug**

- (3) Remove thrust washer bearing retainer from adjuster plug with screwdriver (Fig. 10).
- (4) Remove bearing spacer, races and thrust bearing (Fig. 11).
- (5) Remove O-ring seal and retaining snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 10 Bearing Retainer****Fig. 11 Adjustment Plug Components**

(6) Remove needle bearing, dust seal and oil seal with remover/installer C-4177 and handle C-4171 (Fig. 12).

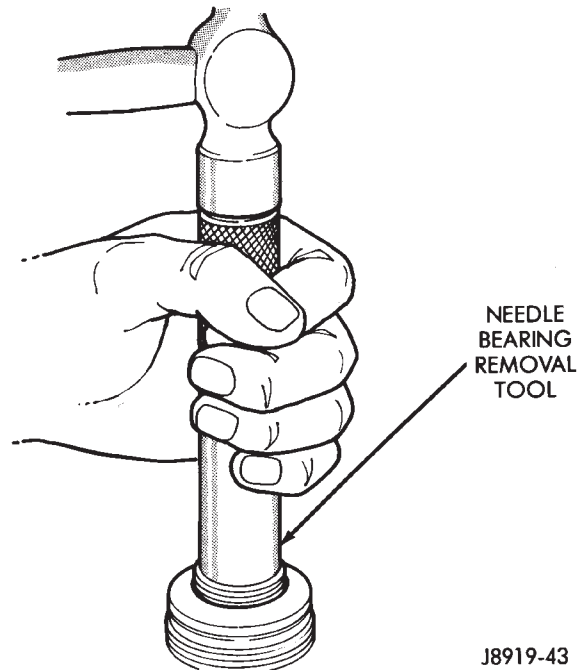
INSTALLATION

CAUTION: Needle bearing must be installed with identification on bearing facing tool to prevent damage to bearing.

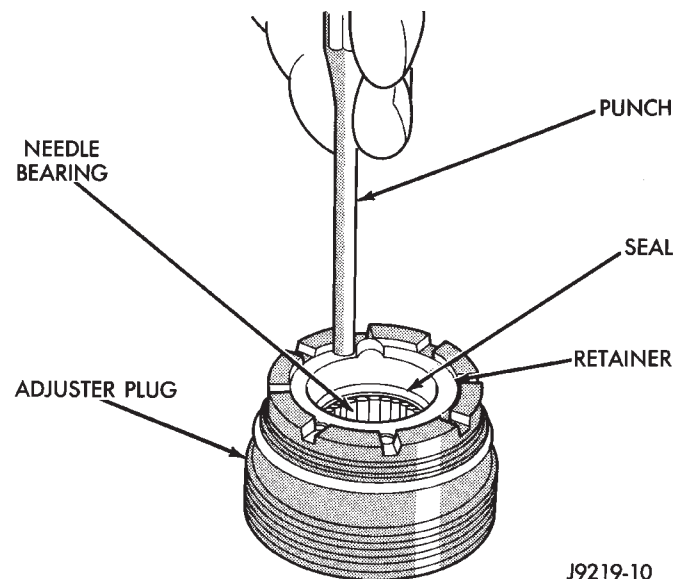
(1) Install needle bearing into adjuster plug with remover/installer C-4177 and handle C-4171.

(2) Apply white petroleum grease on oil seal. Install oil seal into adjuster plug with remover/installer C-4177 and handle C-4171.

(3) Apply white petroleum grease to dust seal cavity and install dust seal into adjuster plug with remover/installer C-4177 and handle C-4171.

**Fig. 12 Needle Bearing Removal**

- (4) Install retainer snap ring.
- (5) Install O-ring seal to adjuster plug.
- (6) Install large bearing race, thrust bearing, small bearing race and bearing spacer to adjuster plug.
- (7) Install thrust washer bearing retainer to adjuster plug (Fig. 13).

**Fig. 13 Install Retainer**

CAUTION: When installing adjuster plug, care should be taken not to cut the seals.

(8) Install adjuster plug into housing with Spanner Wrench C-4381.

(9) Adjust bearing preload, refer to Thrust Bearing Preload Adjustment.

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Install adjuster plug lock nut, and using a punch (drift) in a notch, tighten securely (Fig. 14). **Hold adjuster plug to maintain alignment of the marks.**

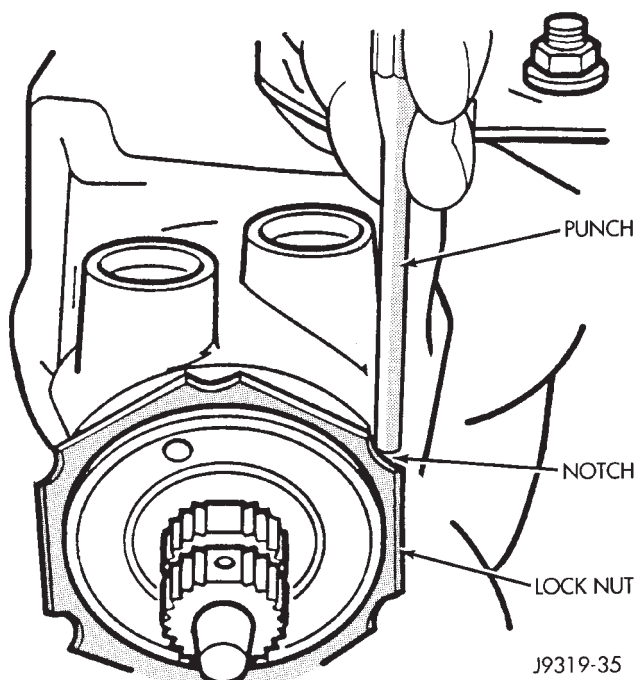


Fig. 14 Tighten Lock Nut

(11) Adjust pitman shaft, refer to Over-Center Adjustment.

SPOOL VALVE

Steering gear must be removed from the vehicle for this procedure.

REMOVAL

(1) Remove adjuster plug, refer to Adjuster Plug Assembly Replacement.

(2) Remove stub shaft and valve assembly (Fig. 15).

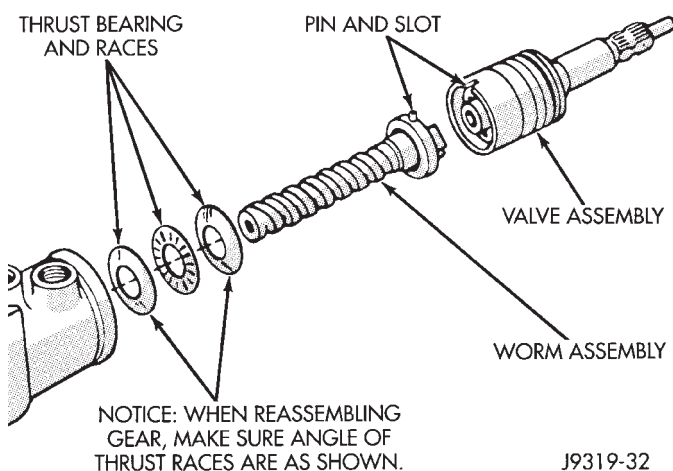


Fig. 15 Bearing, Worm and Valve Assembly

(3) Remove stub shaft from valve assembly by lightly tapping on a block of wood to loosen shaft cap.

Then pull cap and valve body and disengage stub shaft pin from hole in valve body (Fig. 16).

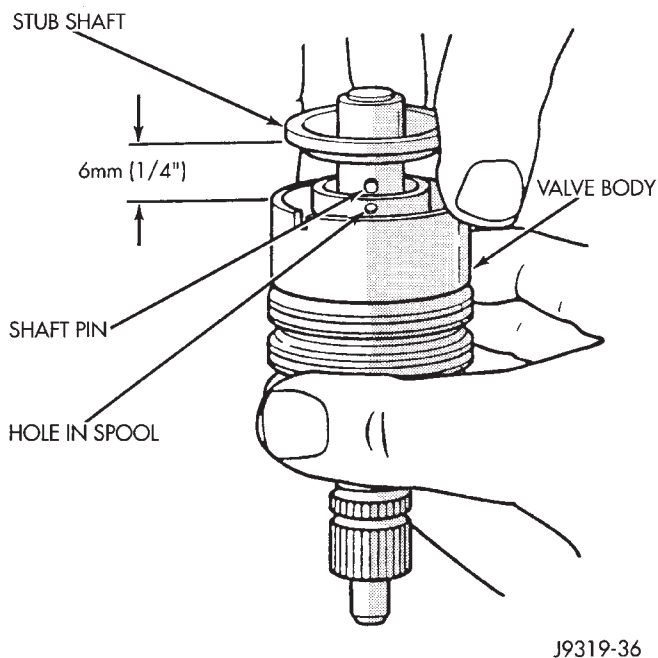


Fig. 16 Stub Shaft

(4) Remove valve spool by pulling and rotating from valve body (Fig. 17).

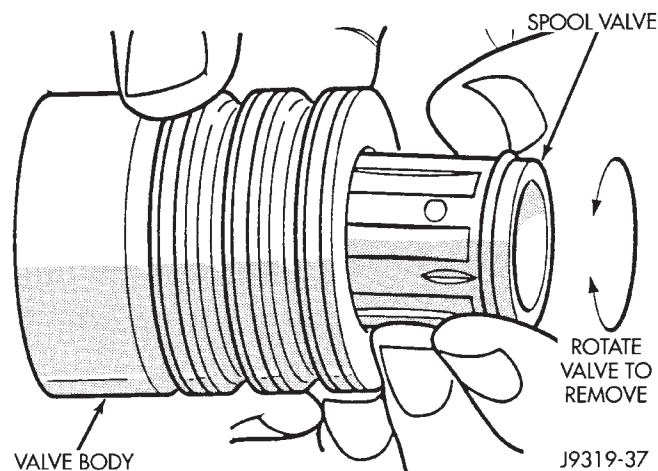


Fig. 17 Spool Valve

(5) Remove valve spool O-ring seal and valve body teflon rings and O-ring seals (Fig. 18).

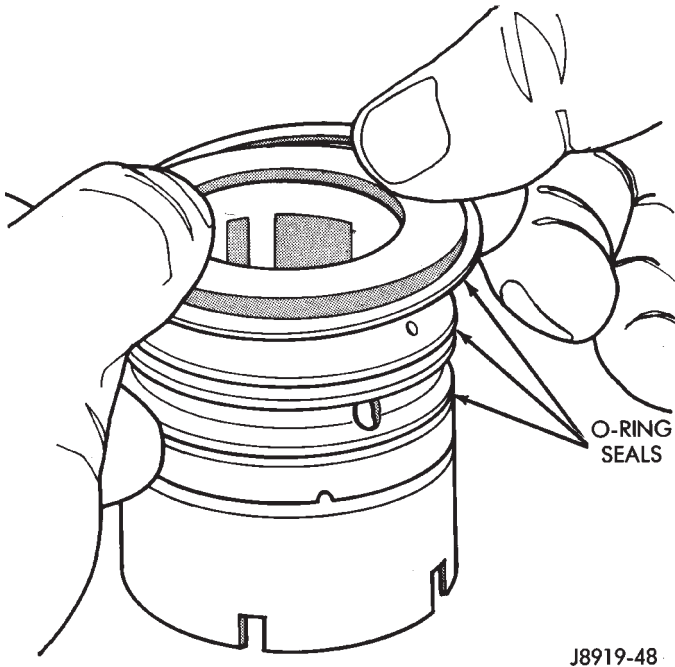
INSTALLATION

CAUTION: Speed Proportional Steering has a different spool valve. Do not interchange valves. Steering response will be affected if wrong valve is installed.

(1) Install valve spool O-ring seal to valve spool.

(2) Lubricate valve spool and O-ring seal with power steering fluid.

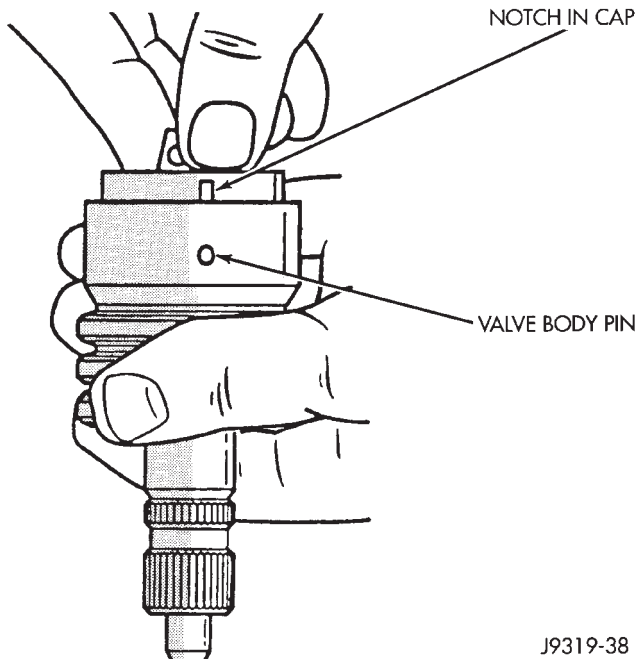
DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 18 Valve Seals**

(3) Install valve spool to valve body by pushing and rotating. Hole in valve spool for stub pin must be accessible from opposite end of valve body.

(4) Assemble stub shaft to valve spool, if necessary and insert pin (Fig. 19).

NOTE: Notch in stub shaft cap must fully engage valve body pin and seat against valve body shoulder.

**Fig. 19 Stub Shaft Installation**

(5) Install O-ring seals and teflon rings to valve body.

(6) Lubricate O-ring seals and teflon rings with power steering fluid.

(7) Install stub shaft and valve assembly to worm shaft. Line up worm shaft to slot in the valve assembly.

(8) Install adjuster plug.

(9) Adjust Thrust Bearing Preload Adjustment and Over-Center Adjustment.

RACK PISTON AND WORM SHAFT

Steering gear must be removed from the vehicle for this procedure.

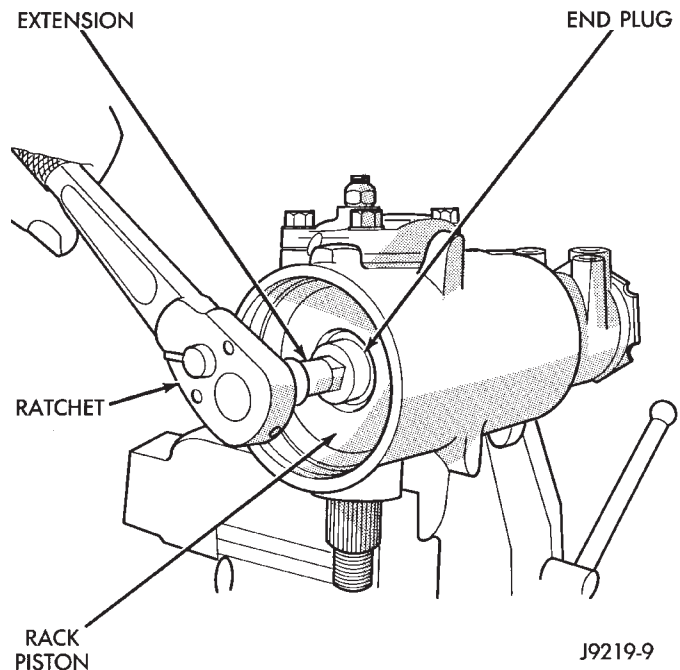
REMOVAL

(1) Remove pitman shaft and side cover.

(2) Remove housing end plug.

(3) Turn stub shaft **COUNTERCLOCKWISE** until the rack piston begins to come out of the housing.

(4) Remove rack piston plug (Fig. 20).

**Fig. 20 Rack Piston End Plug**

(5) Insert Arbor C-4175 into bore of rack piston (Fig. 21). Hold tool tightly against worm shaft while turning the stub shaft **COUNTERCLOCKWISE**.

(6) The rack piston will be forced onto the tool and hold the rack piston balls in place.

(7) Remove the rack piston, rack balls, and tool together from housing.

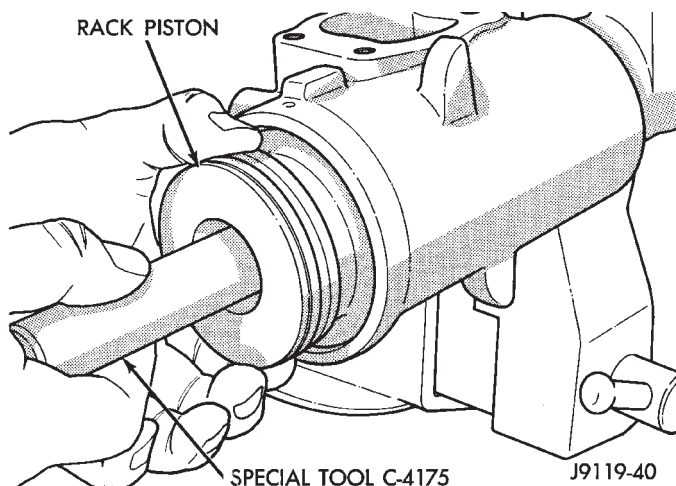
(8) Remove valve, worm shaft and thrust bearing and races.

(9) Remove tool from rack piston.

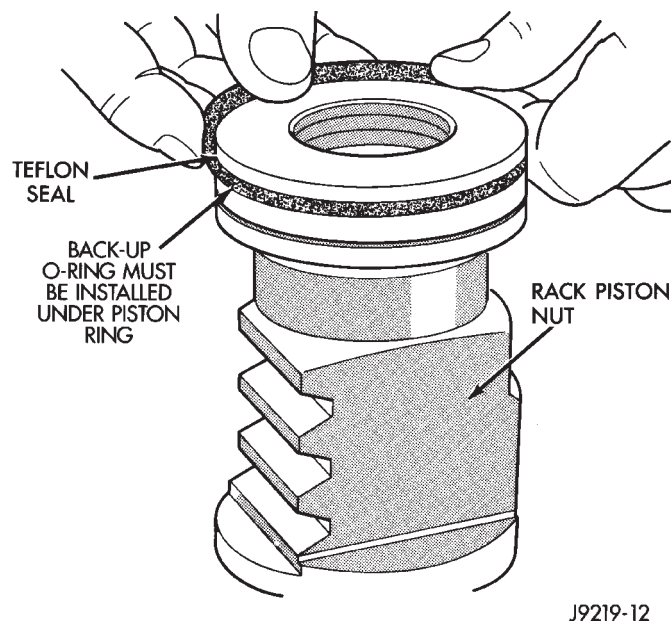
(10) Remove rack piston balls.

(11) Remove screws, clamp and ball guide.

DISASSEMBLY AND ASSEMBLY (Continued)

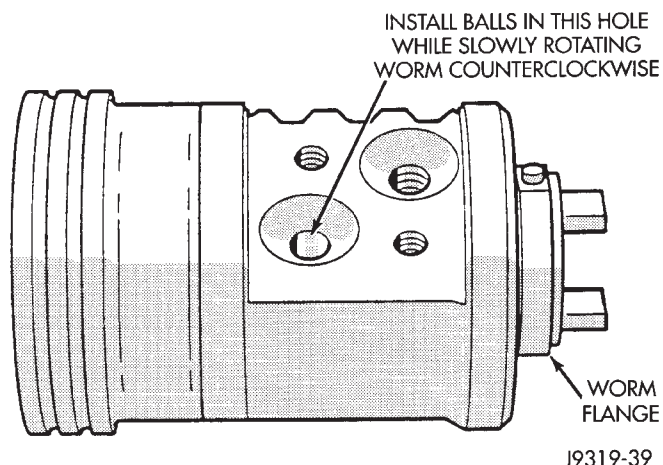
**Fig. 21 Rack Piston**

(12) Remove teflon ring and O-ring seal (Fig. 22).

**Fig. 22 Rack Piston Teflon Ring and O-Ring****INSTALLATION**

- (1) Clean all components in solvent and dry with compressed air.
- (2) Check for scores, nicks or burrs on the rack piston finished surface. Slight wear is normal on the worm gear surfaces.
- (3) Install O-ring seal and teflon ring and lubricate with power steering fluid.
- (4) Install worm shaft to rack piston outside of housing. Fully seat worm shaft to rack piston. Align worm shaft spiral groove with rack piston ball guide hole (Fig. 23).

NOTE: There are 12 black and 12 silver (Chrome) balls in the rack piston circuit. The black balls are smaller than the silver balls. The balls must be

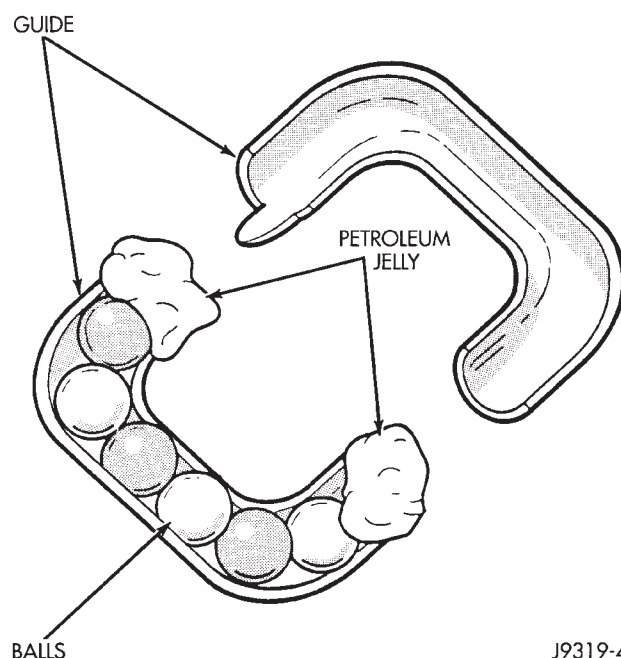
**Fig. 23 Installing Balls in Rack Piston**

installed alternately into the rack piston and ball guide. This procedure will maintain worm shaft preload.

(5) Lubricate and install rack piston balls through return guide hole while turning worm shaft COUNTERCLOCKWISE.

WARNING: MAKE SURE ALL RACK PISTON BALLS ARE INSTALLED PROPERLY. IMPROPER INSTALLATION MAY RESULT IN PERSONAL INJURY.

(6) Install remaining balls to guide using grease or petroleum jelly at each end to hold in place (Fig. 24).

**Fig. 24 Balls in the Return Guide**

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Install guide onto rack piston and return with clamp and screws. Tighten screws to 58 N·m (43 ft. lbs.).

(8) Insert Arbor C-4175 into bore of rack piston. Hold tool tightly against worm shaft while turning the stub shaft **COUNTERCLOCKWISE**.

(9) The rack piston will be forced onto the tool and hold the rack piston balls in place.

(10) Install the races and thrust bearing to worm shaft (Fig. 25).

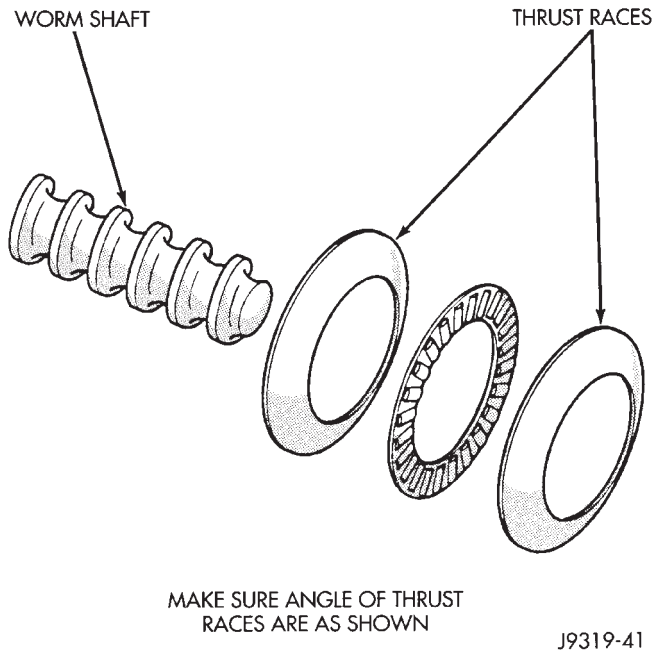


Fig. 25 Worm Shaft and Bearing

- (11) Install worm shaft to housing.
- (12) Install valve
- (13) Install rack piston to worm shaft from tool, compress seals.
- (14) Hold Arbor tightly against worm shaft and turn stub shaft **CLOCKWISE** until rack piston is seated on worm shaft.
- (15) Install rack piston plug and tighten to 150 N·m (111 ft. lbs.).
- (16) Install housing end plug.
- (17) Install pitman shaft and side cover.
- (18) Adjust steering gear.

PITMAN SHAFT SEALS AND BEARING

REMOVAL

- (1) Remove pitman arm from gear.
- (2) Clean exposed end of pitman shaft and housing with a wire brush.
- (3) Remove single lip dust seal.
- (4) Remove retaining ring with snap ring pliers (Fig. 26).
- (5) Remove backup washers with screwdriver.

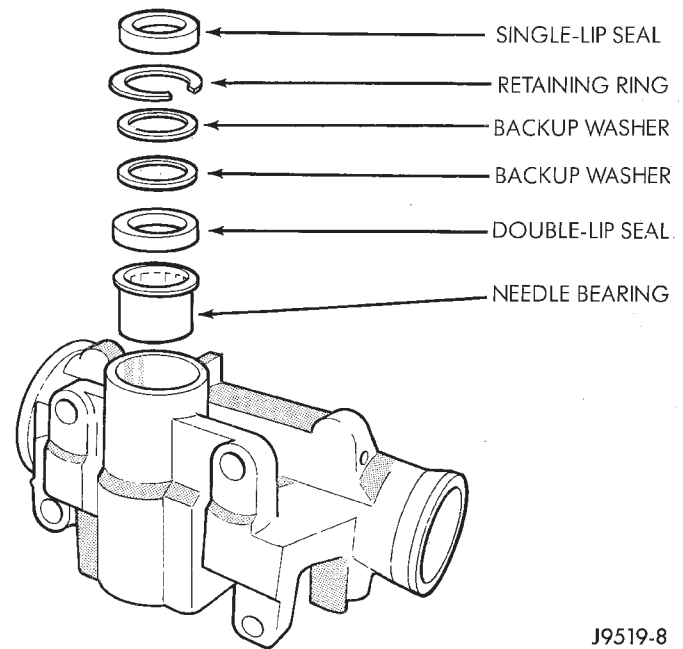


Fig. 26 Pitman Shaft Seals & Bearing

CAUTION: Use care not to score the housing bore when prying out seals and washers.

- (6) Remove double lip oil seal with screwdriver.
- (7) Inspect the housing for burrs and remove if necessary.
- (8) Remove needle bearing from housing (Fig. 27).

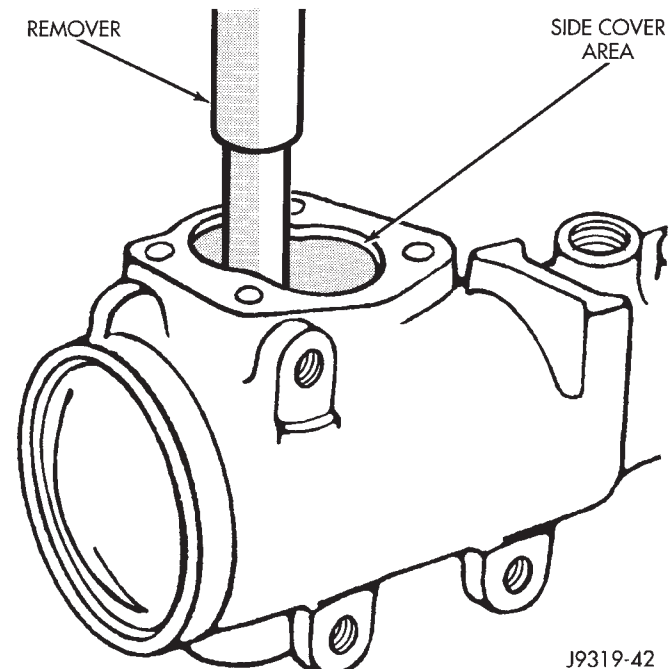


Fig. 27 Needle Bearing Removal

INSTALLATION

- (1) Install needle bearing into housing (Fig. 26).

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Coat the double lip seal and washers with grease.

(3) Install the double lip oil seal with a suitable size deep socket.

(4) Install nylon backup washer.

(5) Install steel backup washer.

(6) Install the retainer ring with snap ring pliers.

(7) Install single lip dust seal with a suitable size deep socket.

ADJUSTMENTS

STEERING GEAR

CAUTION: Steering gear must be adjusted in the proper order. If adjustments are not performed in order, gear damage and improper steering response may result.

NOTE: Adjusting the steering gear in the vehicle is not recommended. Remove gear from the vehicle and drain the fluid. Then mount gear in a vise to perform adjustments.

WORM THRUST BEARING PRELOAD

(1) Remove adjuster plug locknut (Fig. 28).

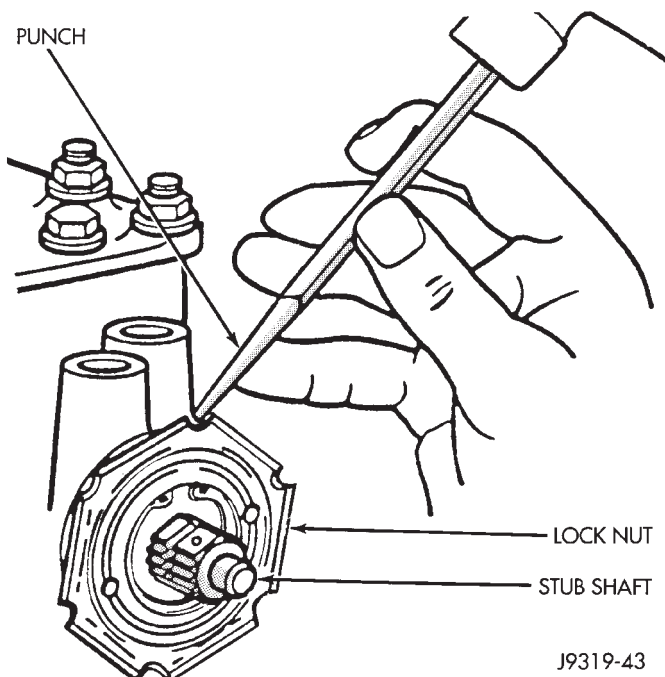


Fig. 28 Loosening the Adjuster Plug

(2) Turn the adjuster in with Spanner Wrench C-4381. Tighten the plug and thrust bearing in the housing until firmly bottomed in housing.

(3) Place an index mark on the housing even with one of the holes in adjuster plug (Fig. 29).

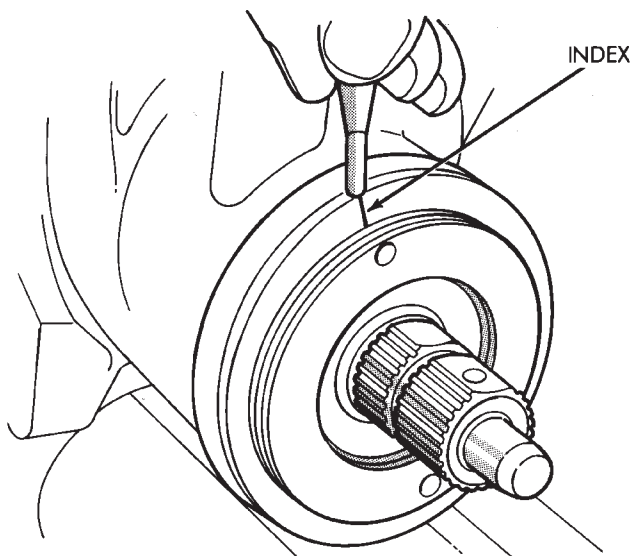


Fig. 29 Alignment Marking On Housing

(4) Measure back (counterclockwise) 13 mm (0.50 in) and mark housing (Fig. 30).

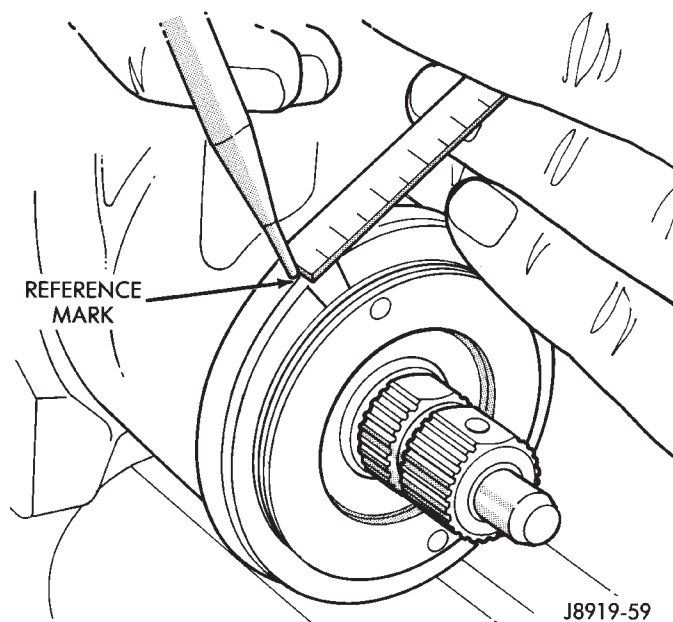


Fig. 30 Remarking The Housing

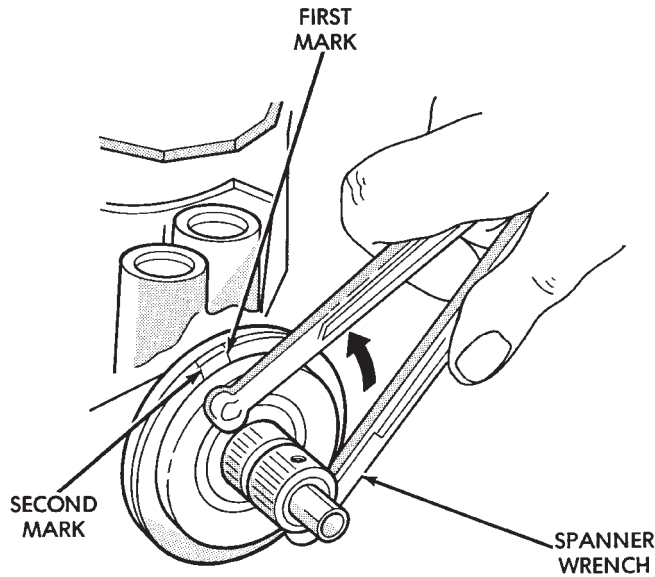
(5) Rotate adjustment cap back (counterclockwise) with spanner wrench until hole is aligned with the second mark (Fig. 31).

(6) Install and tighten locknut to 108 N·m (80 ft. lbs.). Be sure adjustment cap does not turn while tightening the locknut.

OVER-CENTER

(1) Rotate the stub shaft from stop to stop and count the number of turns.

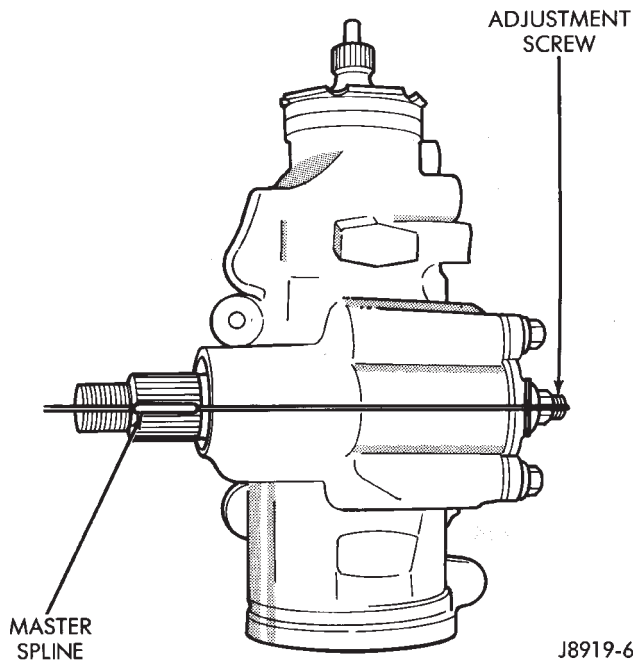
ADJUSTMENTS (Continued)



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Fig. 31 Aligning To The Second Mark

(2) Starting at either stop turn the stub shaft back 1/2 the total number of turns. This is the center of the gear travel (Fig. 32).

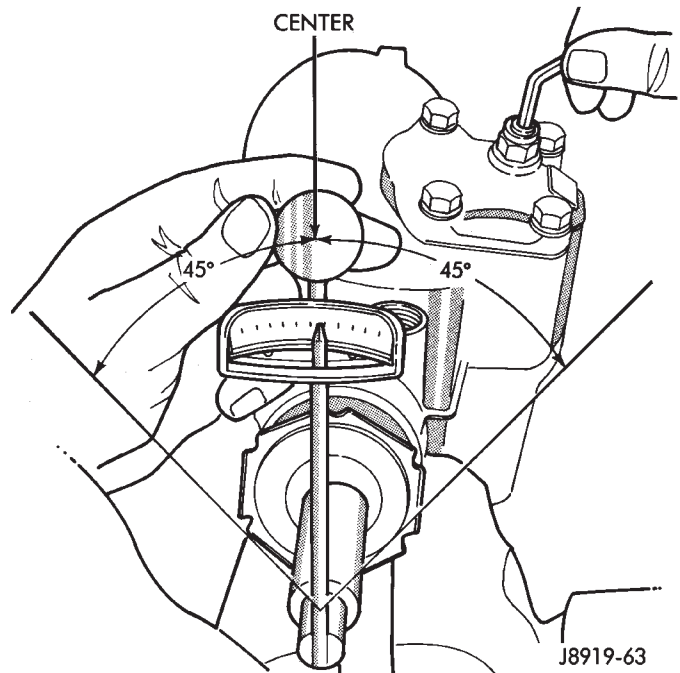


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Fig. 32 Steering Gear Centered

(3) Turn the pitman shaft adjuster screw back (COUNTERCLOCKWISE) until extended, then turn back in (CLOCKWISE) one full turn.

(4) Place the torque wrench in the vertical position on the stub shaft. Rotate the wrench 45 degrees each side of the center and record the highest rotational torque on center (Fig. 33).



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Fig. 33 Checking Over-center Rotation Torque

(5) Turn the adjuster in until torque to turn stub shaft is 0.6 to 1.2 N·m (6.0 to 10.0 in. lbs.) more than previous reading recorded.

(6) Prevent the adjuster screw from turning while tightening adjuster lock nut. Tighten the adjuster lock nut to 27 N·m (20 ft. lbs.).

SPECIFICATIONS

POWER STEERING GEAR

Steering Gear

Type Recirculating Ball

Gear Code and Ratio

BH, NZ 14:1

BF, XS 13-16:1

AL 12.7:1

Worm Shaft Bearing

Preload. 0.45–1.13 N·m (4–10 in. lbs.)

Pitman Shaft Overcenter Drag

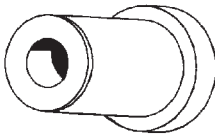
New Gear (under 400 miles). 0.45–0.90 N·m
(4–8 in. lbs.) + Worm Shaft Preload

Used Gear (over 400 miles). 0.5–0.6 N·m
(4–5 in. lbs.) + Worm Shaft Preload

SPECIFICATIONS (Continued)

TORQUE CHART

DESCRIPTION	TORQUE
Power Steering Gear	
Adjustment Cap Locknut	108 N·m (80 ft. lbs.)
Adjustment Screw Locknut	49 N·m (36 ft. lbs.)
Gear to Frame Bolts	88 N·m (65 ft. lbs.)
Pitman Shaft Nut	251 N·m (185 ft. lbs.)
Rack Piston Plug	150 N·m (111 ft. lbs.)
Side Cover Bolts	60 N·m (44 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)
Return Line	28 N·m (21 ft. lbs.)
Return Guide Clamp Bolt	58 N·m (43 ft. lbs.)



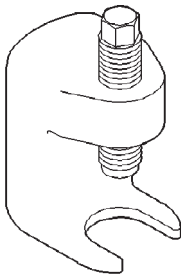
Remover, Pitman Shaft Bearing C-4177

SPECIAL TOOLS

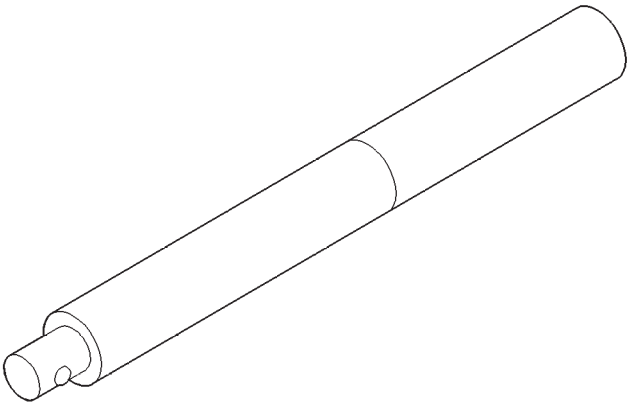
POWER STEERING GEAR



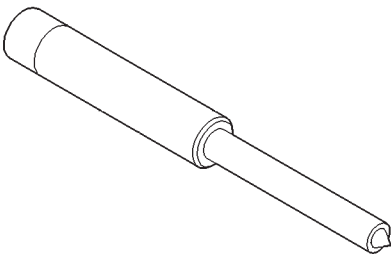
Remover/Installer, Steering Plug C-4381



Remover, Pitman Arm C-4150A



Handle C-4171



Remover/Installer Steering Rack Piston C-4175

STEERING COLUMN

INDEX

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DIAGNOSIS AND TESTING		SPECIFICATIONS	
IGNITION SWITCH	22	TORQUE CHART	24

GENERAL INFORMATION

STEERING COLUMN

The tilt and standard column (Fig. 1) has been designed to be serviced as an assembly; less wiring, switches, shrouds, steering wheel, etc. Most steering column components can be serviced without removing the steering column from the vehicle.

SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

To service the steering wheel, switches or airbag, refer to Group 8 M and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST

FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

CAUTION: Do not attempt to remove the pivot pins to disassemble the tilting mechanism. Do not remove ignition locking link, shaft lock plate or plate retainer. This will damage the column (Fig. 2) and (Fig. 3).

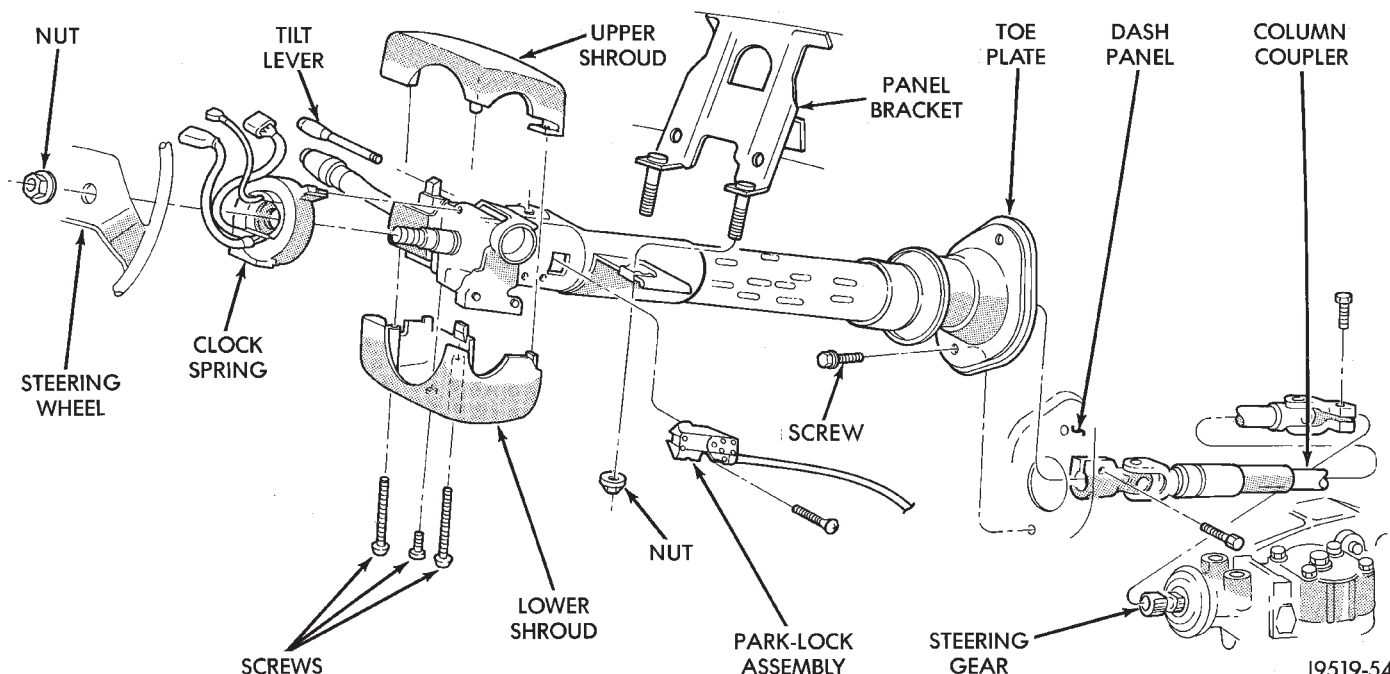
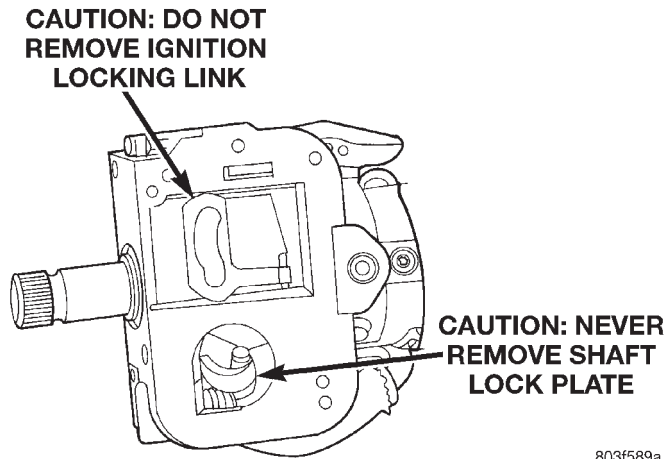
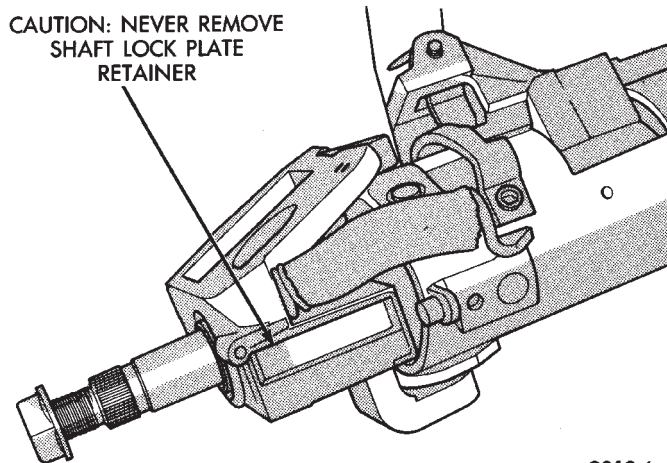


Fig. 1 Steering Column

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Fig. 2 Observe Cautions

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Fig. 3 Observe Cautions

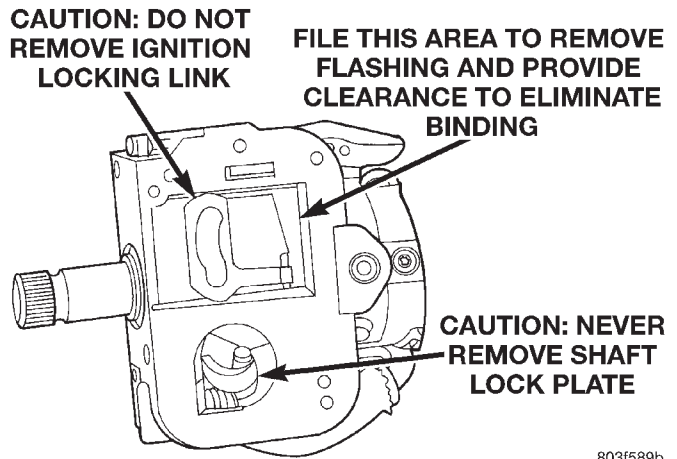
DIAGNOSIS AND TESTING

IGNITION SWITCH

TEST AND REPAIR

If the ignition switch effort is excessive, remove the ignition switch from the steering column. Refer to Group 8D Ignition System. Using a key cylinder, check the turning effort of the switch. If the ignition switch binds look for the following conditions.

- (1) Look for rough areas or flash in the casting and if found remove with a file (Fig. 4).
- (2) Remove the link and slider and check the link to see if it is bent. If so replace with a new part.
- (3) Put the slider in its slot in the sleeve and verify a loose fit over the length of the slot. If the slider binds in the slot at any point lightly file the slider until clearance is achieved.
- (4) If no binding is found, lightly file the ramp on the ignition switch, (The ramp fits into the casting) until binding no longer occurs.



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Fig. 4 Steering Column Flash Removal And Non-Serviceable Components

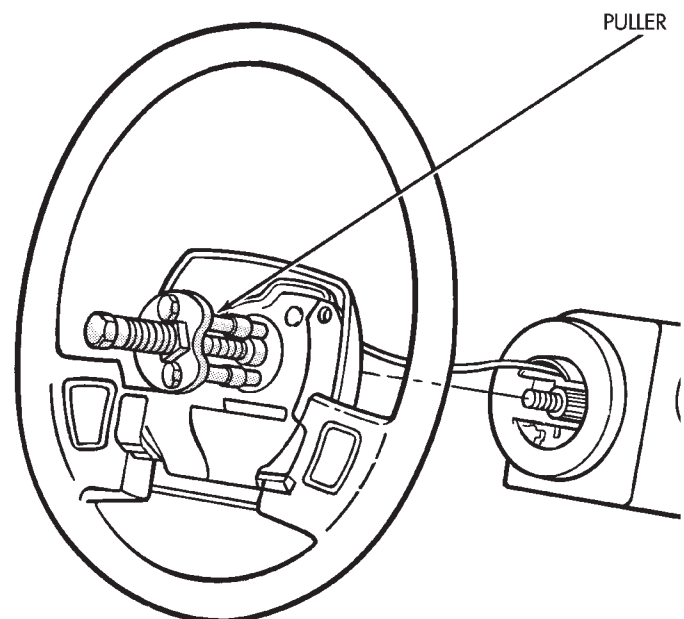
REMOVAL AND INSTALLATION

STEERING COLUMN

CAUTION: Bumping, jolting and hammering on the steering column shaft and gear shift tube must be avoided during all service procedures.

REMOVAL

- (1) Position front wheels straight ahead.
- (2) Disconnect the negative (ground) cable from the battery.
- (3) Remove airbag, refer to Group 8M Electrical for procedure.
- (4) Remove steering wheel with appropriate puller (Fig. 5).



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Fig. 5 Steering Wheel Removal

REMOVAL AND INSTALLATION (Continued)

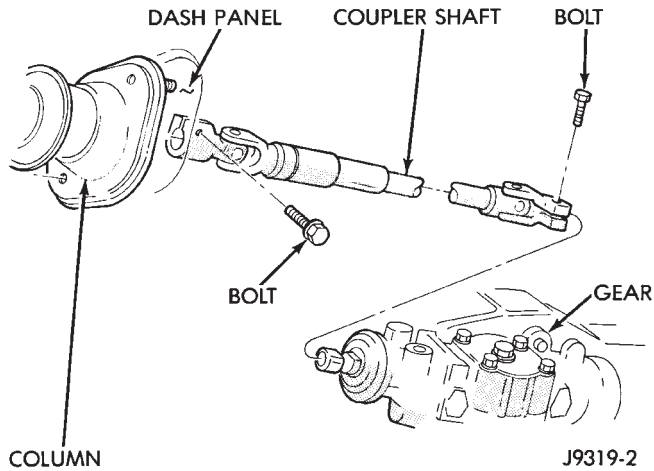


Fig. 6 Column Coupler Shaft

- (5) Remove column coupler upper pinch bolt (Fig. 6).
- (6) Remove the trim panel column cover and support plate (Fig. 7).
- (7) Remove tilt lever (if equipped) from column.
- (8) Remove the upper and lower lock housing shrouds.
- (9) Remove the heater cross over tube from under the column.
- (10) Loosen the panel bracket nuts/studs to allow the column to drop.
- (11) Remove the wiring harness from steering column (Fig. 8).
- (12) Remove the Interlock cable from the steering column. Refer to Group 3 Differential and Driveline.

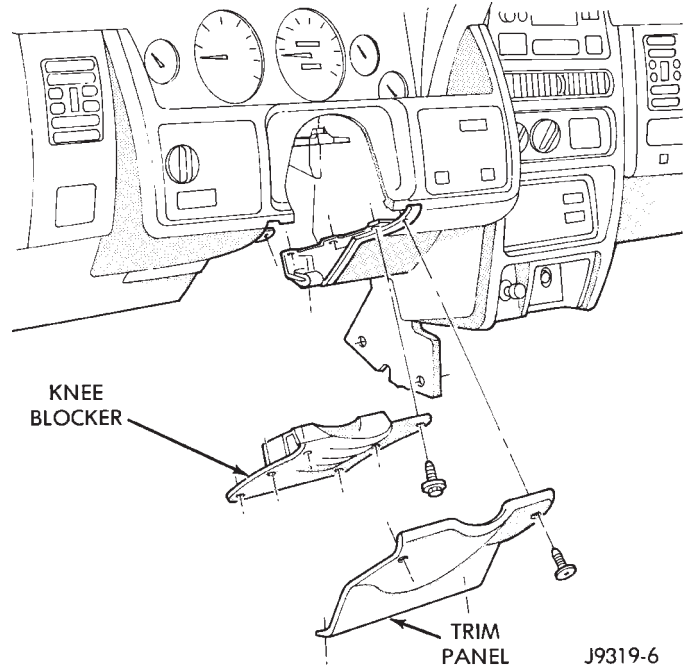


Fig. 7 Trim Panel Column Cover

- (13) Remove the toe plate to dash panel nuts.
- (14) Remove the panel bracket nuts/studs and remove the column.

INSTALLATION

CAUTION: If vehicle is equipped with Speed Proportional Steering do not transfer Wheel Speed Sensor to replacement column. Install new sensor only on column.

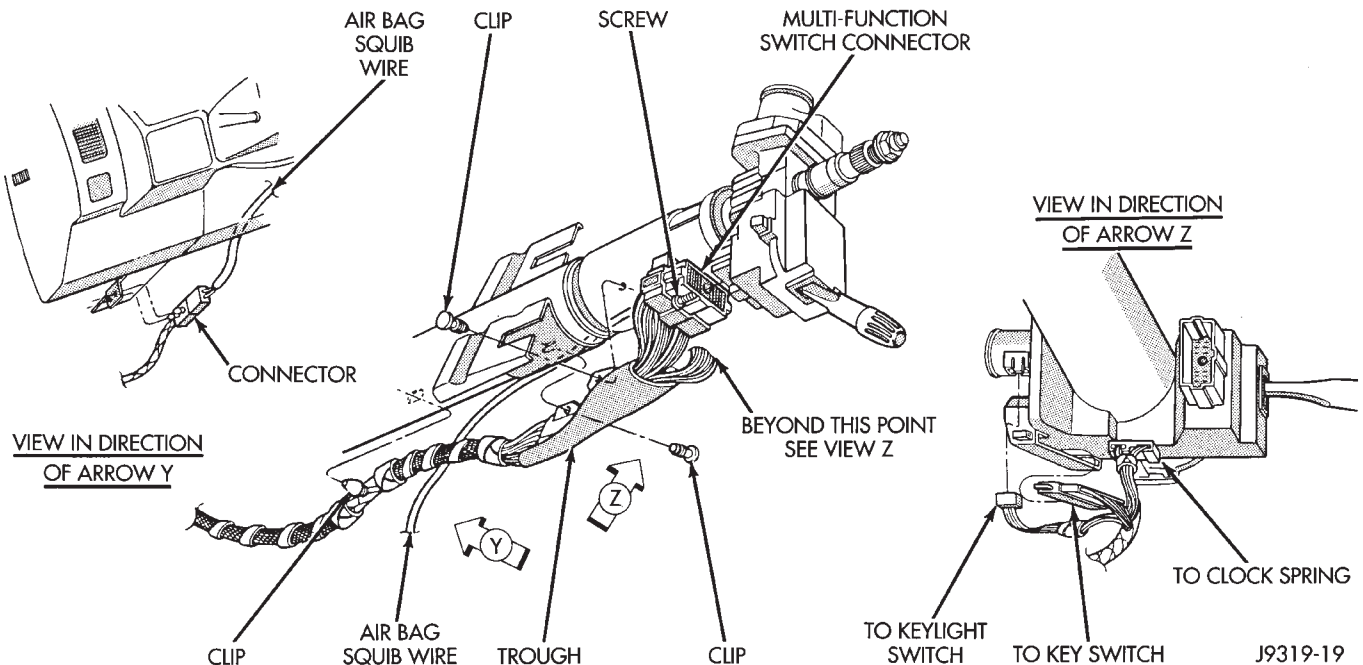
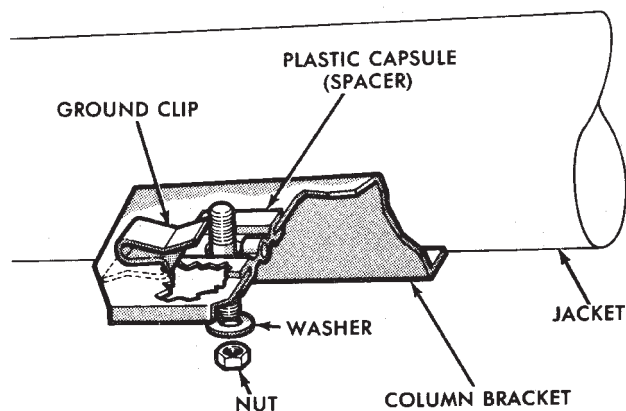


Fig. 8 Steering Column Wiring Harness

REMOVAL AND INSTALLATION (Continued)

(1) With the front wheels in the straight ahead position. Align and install the column to coupler. **Do not apply force at the top of the steering column shaft.**

(2) Ensure the ground clip is on the left spacer slot (Fig. 9).



RN832

Fig. 9 Ground Clip & Spacer

(3) Install the Interlock cable from the steering column. Refer to Group 3 Differential and Driveline..

(4) Install wiring harness connections to steering column. **Ensure the wiring is not pinched and all connections are correctly locked in place.**

(5) Install shaft coupler pinch bolt loose, load column up to panel bracket.

(6) Be sure both spacers are fully seated in the column support bracket. Tighten the column panel bracket support nuts/studs to 12 N·m (105 in. lbs.). **Ensure the nut is installed on the SHORT threaded side of the stud.**

(7) Tighten the toe plate attaching nuts to 12 N·m (105 in. lbs.).

(8) Tighten the coupler pinch bolt to 49 N·m (36 ft. lbs.).

(9) Install the heater cross over tube under the column.

(10) Install the upper and lower shrouds. Install the tilt lever (if equipped).

(11) Install the trim panel column cover and support plate.

(12) Install the steering wheel and airbag, refer to Group 8M Electrical for procedure.

(13) Remove the column shaft shipping lock pin (installed in service column).

(14) Connect the battery ground (negative) cable.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION

TORQUE

Steering Column

Steering Wheel Nut	.61 N·m (45 ft. lbs.)
Column Bracket Nuts	.12 N·m (105 in. lbs.)
Shaft Coupler Bolts	.49 N·m (36 ft. lbs.)
Toe Plate Bolts	.12 N·m (105 in. lbs.)

SPEED PROPORTIONAL STEERING

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SPEED PROPORTIONAL STEERING		SPEED PROPORTIONAL STEERING CONTROL	
SOLENOID	25	MODULE	27
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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 reduce. This reduces the power assist, providing the driver with a better feel for the road and improved directional stability.

When a quick steering maneuver is made while the system is operating at reduced power assist, full assist is provided for the maneuver.

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.

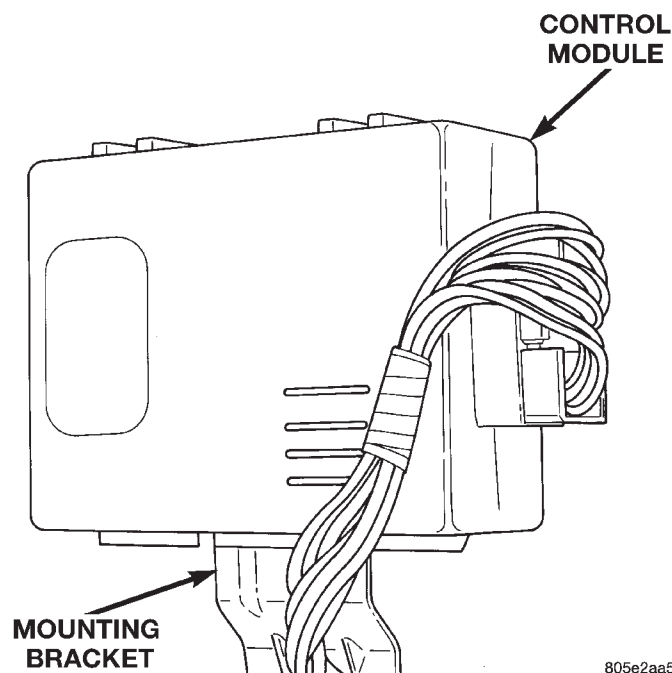


Fig. 1 Speed Proportional Steering Control Module

STEERING WHEEL SPEED SENSOR

The Steering Wheel Speed Sensor is mounted on the steering column shaft below the clock spring (Fig. 2).

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.

DESCRIPTION AND OPERATION (Continued)

1996 Grand Cherokee
Publication No. 81-370-6147
TSB 26-10-95 December, 1995

DIAGNOSIS AND TESTING

SPEED PROPORTIONAL STEERING

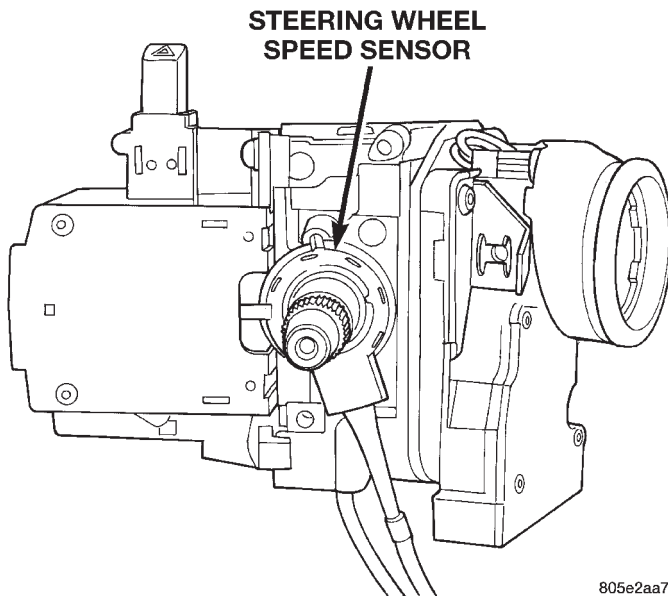
For diagnosis and testing procedures refer to the Chassis Diagnostic Manual.

REMOVAL AND INSTALLATION

STEERING WHEEL SPEED SENSOR

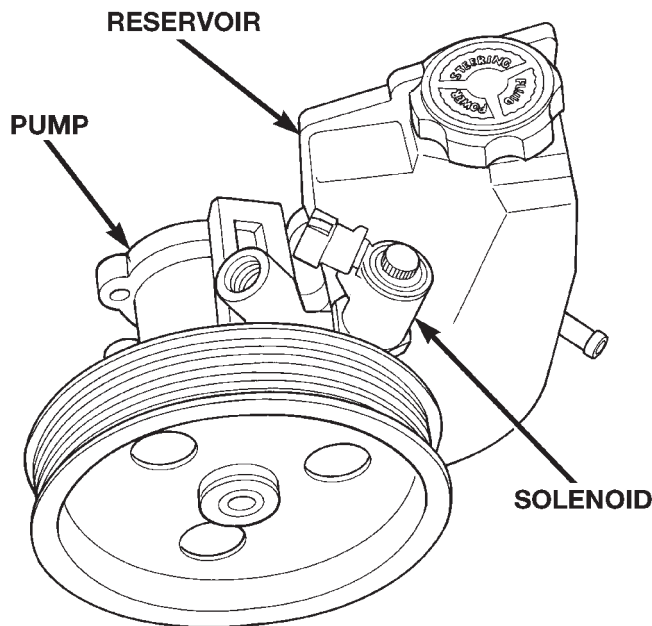
REMOVAL

- (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 (Fig. 4).
- (4) Remove clock spring, refer to Group 8M Electrical for procedure.
- (5) Pry sensor retaining ring tabs up and remove sensor (Fig. 5).



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Fig. 2 Steering Wheel Speed Sensor

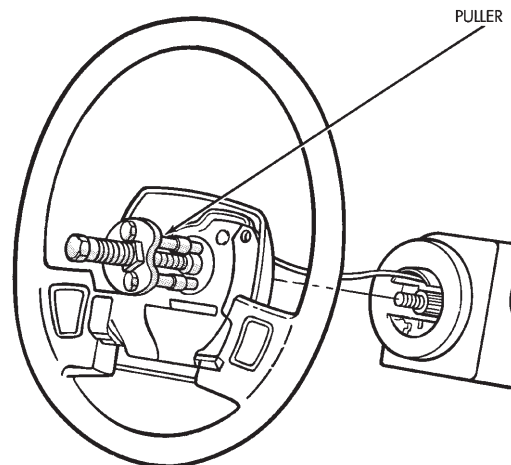


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Fig. 3 Speed Proportional Steering Solenoid
POWER STEERING GEAR

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.



J9319-10

Fig. 4 Steering Wheel Removal

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 canceler off to one side and ensure locating tab is in the proper position and push the sensor down on the shaft.

CAUTION: The conduit 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.

REMOVAL AND INSTALLATION (Continued)

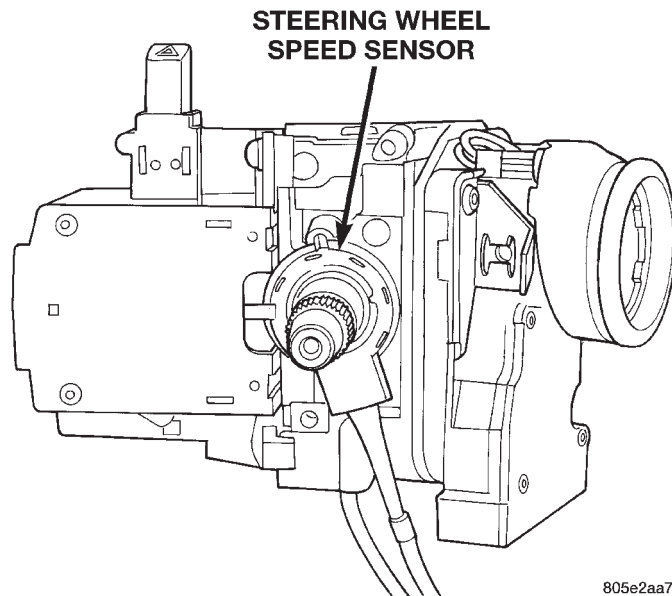


Fig. 5 Steering Wheel Speed Sensor

- (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. 6).

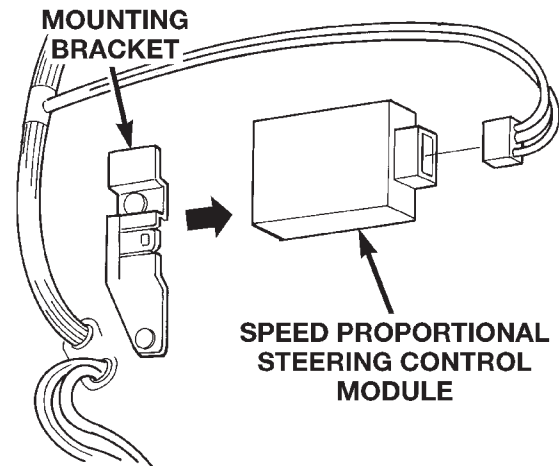


Fig. 6 Speed Proportional Steering Control Module

INSTALLATION

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

STEERING LINKAGE

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GENERAL INFORMATION

STEERING LINKAGE

The steering linkage consists of a pitman arm, drag link, tie rod, and steering dampener (Fig. 1). Adjustment sleeves are used on the tie rod and drag link for toe and steering wheel alignment.

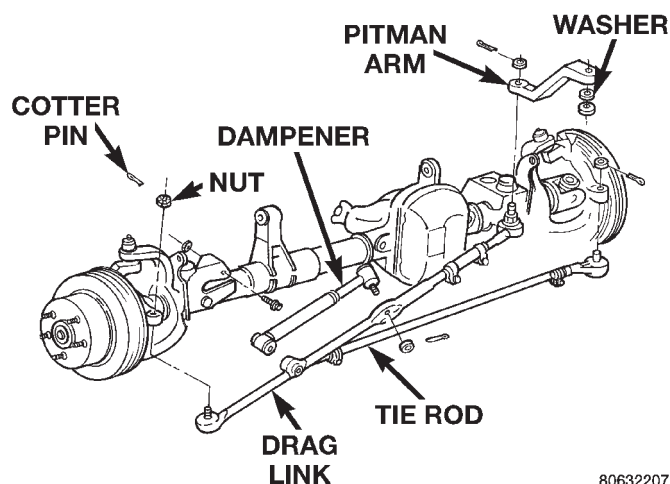


Fig. 1 Steering Linkage

NOTE: Refer to Group 2, Suspension for additional information.

The tie rod end ball stud seals should be inspected during all oil changes.

A damaged ball stud seal requires removal of the seal. Inspect the tie rod end ball stud at the throat opening. Check for lubricant loss, contamination, ball stud wear or corrosion. If these conditions exist, replace the tie rod. A replacement seal can be installed if lubricant is in good condition. Otherwise, a complete replacement ball stud end should be installed. Lubricate the tie rod end with MOPAR® Multi-Mileage Lubricant, or equivalent product.

NOTE: Use a Puller tool C-3894-A for tie rod removal. Failure to use this tool could damage the ball stud and seal (Fig. 2).

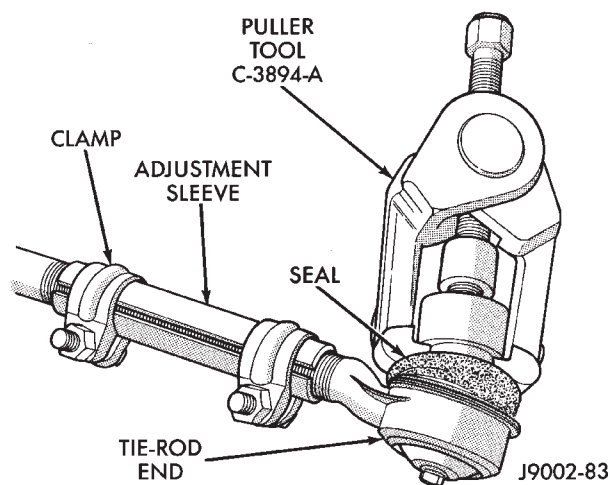


Fig. 2 Ball Stud Removal

SERVICE PROCEDURES

STEERING LINKAGE

Before removing any steering component, the boot seals should be closely inspected for damage. If a seal is damaged, it should be replaced. Before installing a new seal, inspect ball stud. Replace ball stud if worn and lubricate the ball studs with MOPAR Multi-Mileage Lubricant, or an equivalent.

REMOVAL AND INSTALLATION

TIE ROD

REMOVAL

(1) Remove the cotter pins and nuts at the steering knuckle and drag link (Fig. 1).

(2) Loosen the ball studs with a puller tool to remove the tie rod.

REMOVAL AND INSTALLATION (Continued)

(3) If necessary, loosen the end clamp bolts and remove the tie rod ends from the tube.

INSTALLATION

(1) If necessary, install the tie rod ends in the tube. Position the tie rod clamp (Fig. 3) and tighten to;

- 4.0L Engine: 27 N·m (20 ft. lbs.)
- 5.2L Engine: 49 N·m (36 ft. lbs.)

(2) Install the tie rod on the drag link and steering knuckle. Install the retaining nuts.

(3) Tighten the ball stud nut on the steering knuckle to 47 N·m (35 ft. lbs.). Tighten the ball stud nut to drag link to 47 N·m (35 ft. lbs.) torque. Install new cotter pins and bend end 60°.

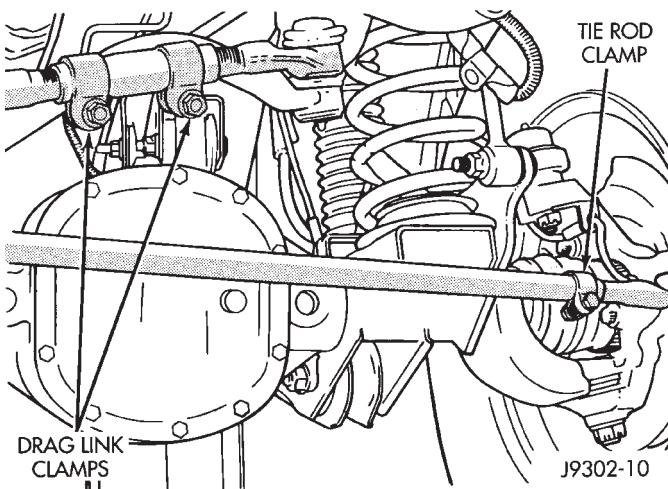


Fig. 3 Tie Rod/Drag Link Clamp Bolt

PITMAN ARM

REMOVAL

- (1) Remove the cotter pin and nut from the drag link at the pitman arm.
- (2) Remove the drag link ball stud from the pitman arm with a puller.
- (3) Remove the nut and washer from the steering gear shaft. Mark the pitman shaft and pitman arm for installation reference. Remove the pitman arm from steering gear with Puller C-4150A (Fig. 4).

INSTALLATION

- (1) Align and install the pitman arm on steering gear shaft.
- (2) Install the washer and nut on the shaft and tighten the nut to 251 N·m (185 ft. lbs.).
- (3) Install drag link ball stud to pitman arm. Install nut and tighten to 81 N·m (60 ft. lbs.). Install a new cotter pin.

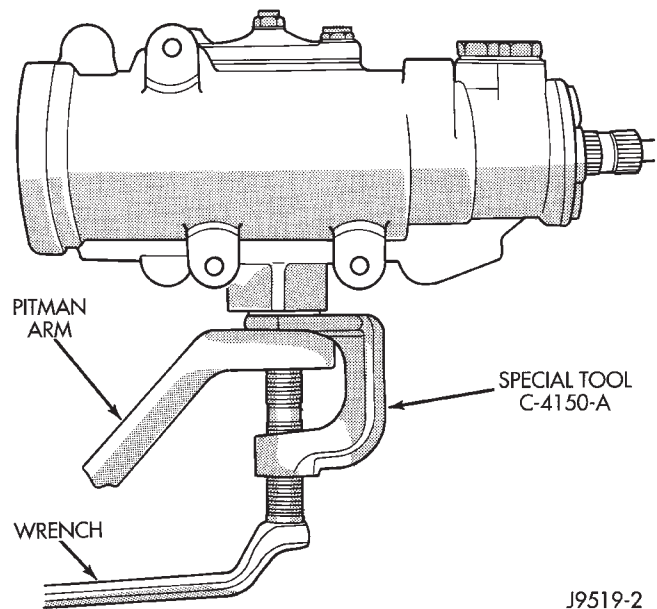


Fig. 4 Pitman Arm Removal

DRAG LINK

REMOVAL

- (1) Remove the cotter pins and nuts at the steering knuckle and drag link (Fig. 1).
- (2) Remove the steering dampener ball stud from the drag link with a puller tool.
- (3) Remove the drag link from the steering knuckle with a puller tool. Remove the same for tie rod and pitman arm.
- (4) If necessary, loosen the end clamp bolts and remove the tie rod end from the link.

INSTALLATION

- (1) Install the drag link adjustment sleeve and tie rod end. Position clamp bolts (Fig. 2).
- (2) Position the drag link at the steering linkage. Install the drag link to the steering knuckle nut. Do the same for the tie rod and pitman arm.
- (3) Tighten the nut at the steering knuckle to 47 N·m (35 ft. lbs.). Tighten the pitman nut to 81 N·m (60 ft. lbs.) and tie rod ball stud nut to 47 N·m (35 ft. lbs.). Install new cotter pins and bend end 60°.
- (4) Install the steering dampener onto the drag link and tighten the nut to 74 N·m (55 ft. lbs.). Install a new cotter pin and bend end 60°.

STEERING DAMPENER

REMOVAL

- (1) Place the front wheels in a straight ahead position.
- (2) Remove the steering dampener retaining nut and bolt from the axle bracket (Fig. 1).

REMOVAL AND INSTALLATION (Continued)

- (3) Remove the cotter pin and nut from the ball stud at the drag link.
- (4) Remove the steering dampener ball stud from the drag link using C-3894-A puller.

INSTALLATION

- (1) Install the steering dampener to the axle bracket and drag link.
- (2) Install the steering dampener bolt in the axle bracket and tighten nut to 74 N·m (55 ft. lbs.).
- (3) Install the ball stud nut at the drag link and tighten nut to 74 N·m (55 ft. lbs.). Install a new cotter pin.

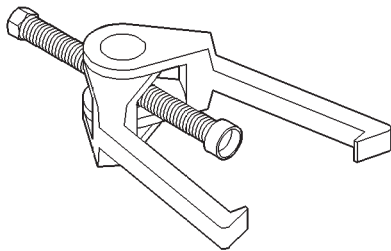
SPECIFICATIONS

TORQUE CHART

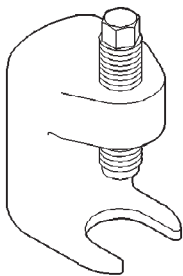
DESCRIPTION	TORQUE
Pitman Arm	
Shaft Nut	251 N·m (185 ft. lbs.)
Drag Link	
Pitman Arm Nut	81 N·m (60 ft. lbs.)
Knuckle Nut	47 N·m (35 ft. lbs.)
4.0L Clamp Bolts	27 N·m (20 ft. lbs.)
5.2L Clamp Bolts	49 N·m (36 ft. lbs.)
Tie Rod Ends	
Ball Stud Nut	47 N·m (35 ft. lbs.)
4.0L Clamp Bolts	27 N·m (20 ft. lbs.)
5.2L Clamp Bolts	49 N·m (36 ft. lbs.)
Tie Rod	
Ball Stud Nut	47 N·m (35 ft. lbs.)
Steering Damper	
Frame Bolt	74 N·m (55 ft. lbs.)
Drag Link Nut	74 N·m (55 ft. lbs.)

SPECIAL TOOLS

STEERING LINKAGE



Puller C-3894-A



Remover Pitman C-4150A