STEERING

CONTENTS

POWER STEERING

INDEX

DESCRIPTION AND OPERATION

STEERING SYSTEM

This vehicle has manual steering or optional power steering. The power steering system has a hydraulic pump. The pump is a constant flow rate and displacement vane-type pump. The pump reservoir on the 4.0L engine is mounted to the pump body (Fig. 1). The 2.5L engine has a remote pump reservoir mounted to the fan shroud (Fig. 2).

The steering gear used 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 power steering system consists of:

- Hydraulic pump
- Recirculating ball steering gear
- Steering column
- Steering linkage

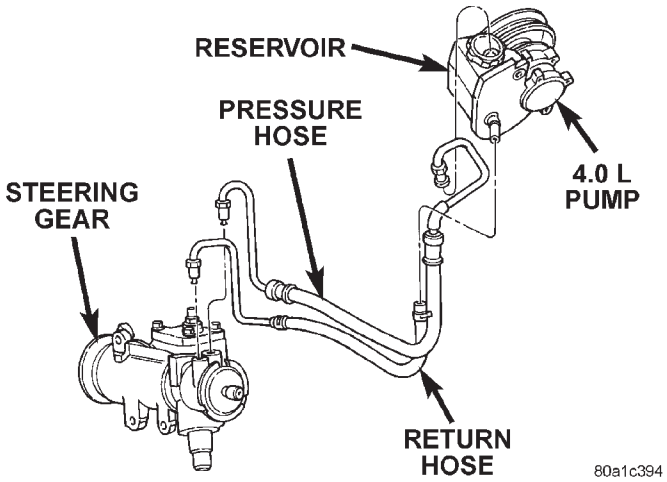


Fig. 1 Power Steering Gear & Pump – 4.0L

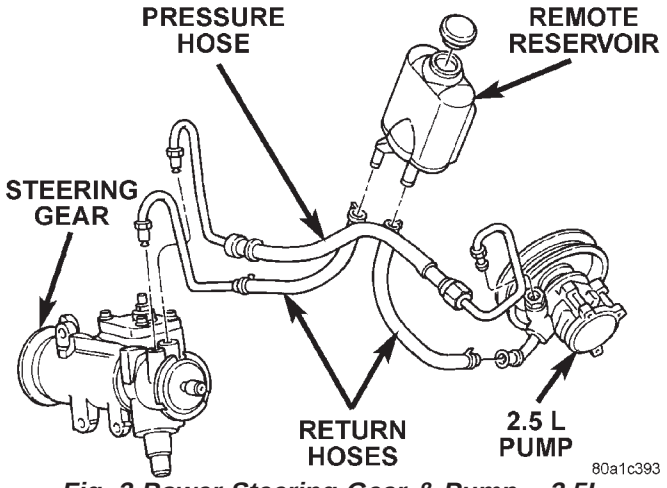


Fig. 2 Power Steering Gear & Pump – 2.5L

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. Steering intermediate shaft 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.

DIAGNOSIS AND TESTING (Continued)

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level.	1. Fill to proper level.
	2. Tire pressure.	2. Adjust tire pressure.
	3. Steering component.	3. Inspect and lube.
	4. Loose belt.	4. Adjust or replace.
	5. Low pump pressure.	5. Pressure test and replace if necessary.
	6. Column shaft coupler binding.	6. Replace coupler.
	7. Steering gear worn or out of adjustment.	7. Repair or replace gear.
	8. Ball joints binding.	8. Inspect and repair as necessary.

INSUFFICIENT ASST. OR POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Lack of lubrication.	4. Inspect and lubricate steering and suspension compnents.
	5. Low pump pressure.	5. Pressure test and repair as necessary.
	6. Internal gear leak.	6. Pressure and flow test, and repair as necessary.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate steering and suspension compnents.
	4. High friction in steering gear.	4. Test and adjust as necessary.
	5. Ball joints binding.	5. Inspect 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.	1. Repair as necessary.
	2. Worn or loose wheel bearings.	2. Repair as necessary.
	3. Steering gear mounting.	3. Tighten gear mounting bolts to specification.
	4. Gear out of adjustment.	4. Adjust gear to specification.
	5. Worn or loose steering coupler.	5. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
VEHICLE PULLS OR LEADS TO ONE SIDE	1. Tire Pressure.	1. Adjust tire pressure.
	2. Radial tire lead.	2. Cross front tires.
	3. Brakes dragging.	3. Repair as necessary.
	4. Wheel alignment.	4. Align vehicle.
	5. Weak or broken spring.	5. Replace spring.
	6. Loose or worn steering or suspension components.	6. Repair as necessary.

POWER STEERING FLOW AND PRESSURE

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the gallons per minute (GPM) or 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 Power Steering Analyzer Tool 6815 (Fig. 3) and Adapter kit 6893.

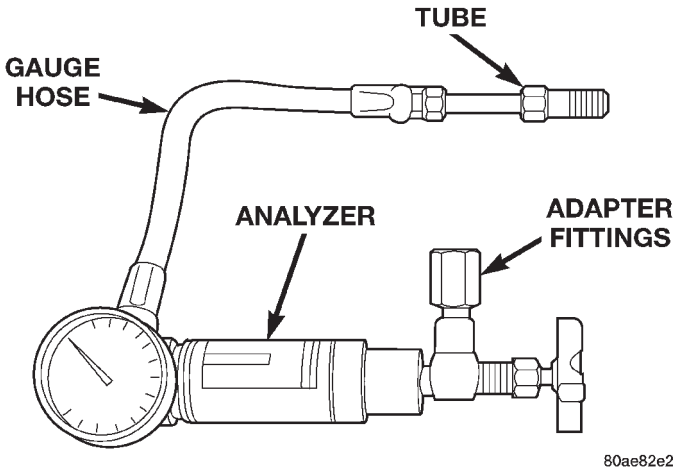


Fig. 3 Power Steering Analyzer

FLOW AND PRESSURE TEST

(1) Check the power steering belt to ensure it is in good condition and adjusted properly.

(2) Connect pressure gauge hose from the Power Steering Analyzer to Tube 6865.

(3) Connect Adapter 6826 to Power Steering Analyzer test valve end.

(4) Disconnect the high pressure hose from the power steering pump.

(5) Connect Tube 6865 to the pump hose fitting.

(6) Connect the power steering hose from the steering gear to Adapter 6826.

(7) Open the test valve completely.

(8) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge.

(9) Shut off the engine and check the fluid level, add fluid as necessary. Start engine again and let idle.

(10) 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).

(11) Increase the engine speed to 1500 RPM and read the flow meter. The reading should be 2.4 - 2.8 GPM, if the reading is below this specification the pump should be replaced.

CAUTION: This next step involves testing maximum pump pressure output and flow control valve operation. Do not leave test valve closed for more than three seconds as the pump could be damaged.

(12) Close valve fully three times for three seconds and record highest pressure indicated each time. **All three readings must be above pump relief pressure 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.

(13) Open the test valve and turn the steering wheel to the extreme left and right positions against the stops. Record the highest pressure reading at each position. Compare readings to pump specifications chart. If pressure readings are not within 50 psi. of each other, the gear is leaking internally and must be repaired.

DIAGNOSIS AND TESTING (Continued)

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.

PUMP SPECIFICATIONS

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM)
2.5L	9653 kPa (1400 psi)	1500 RPM 2.4 - 2.8 GPM
4.0L	9653 kPa (1400 psi)	

POWER STEERING PUMP

INDEX

DESCRIPTION AND OPERATION

POWER STEERING PUMP

Hydraulic pressure for the power steering system is provided by a belt driven power steering pump (Fig. 1). The pump shaft has a pressed-on drive pulley that is belt driven by the crankshaft pulley. The power steering pump is a constant flow rate and displacement, vane-type pump. The pump internal parts 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 on the 4.0L engine. A remote pump reservoir is used on the 2.5L engine mounted to the fan shroud. The power steering pump is connected to the steering gear by the pressure and return hoses.

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

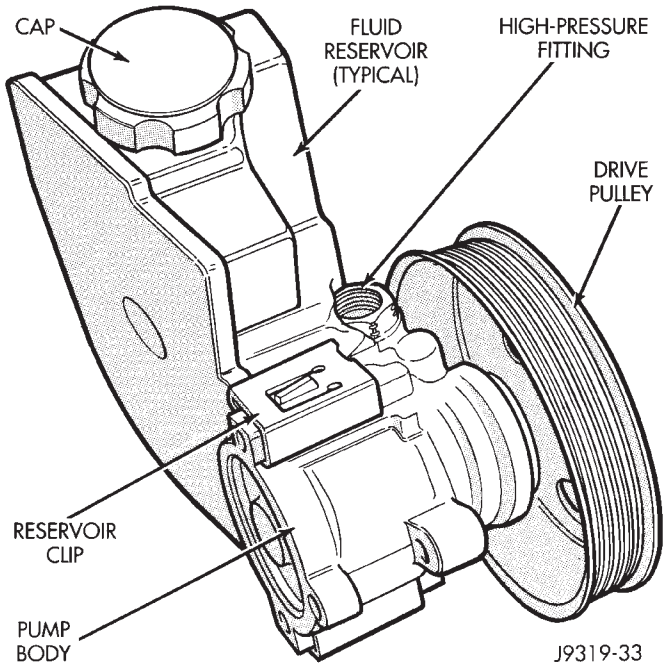
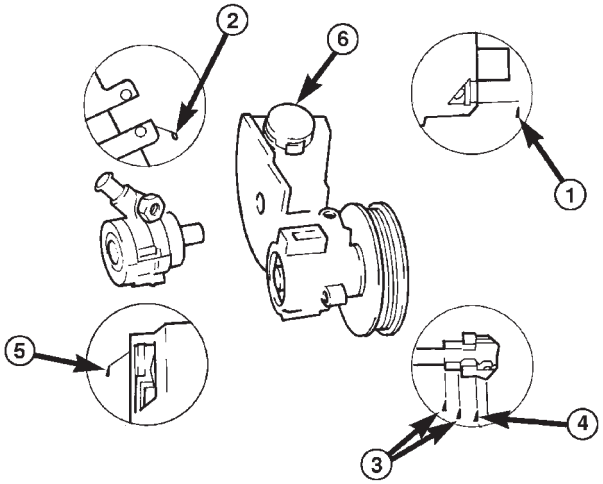


Fig. 1 Pump With Integral Reservoir

DIAGNOSIS AND TESTING

PUMP LEAKAGE DIAGNOSIS



1. BUSHING (BEARING) WORN, SEAL WORN. REPLACE PUMP.
2. REPLACE RESERVOIR O-RING SEAL.
3. TORQUE HOSE FITTING NUT TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
4. TORQUE FITTING TO SPECIFICATIONS. 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

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

CAUTION: 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 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.

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

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

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

REMOVAL AND INSTALLATION

POWER STEERING PUMP

REMOVAL

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

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

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

(4) Loosen the 3 pump bracket bolts (Fig. 2).

(5) Tilt pump downward and remove from engine.

(6) Remove pulley from pump.

INSTALLATION

(1) Install pulley on pump.

(2) Install pump on the engine mounting bracket.

(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 line on the pump and tighten to 28 N·m (21 ft. lbs.).

(6) Install return hoses on pump.

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

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

PUMP REMOTE RESERVOIR – 2.5L

REMOVAL

(1) Remove the pump return hoses from the reservoir and drain the reservoir.

(2) Remove the push-in fastener from the reservoir (Fig. 3).

(3) Slide the reservoir up out of the fan shroud mount.

INSTALLATION

(1) Slide reservoir down onto the fan shroud mount until it clicks in place.

(2) Install the push-in fastener.

(3) Install the hoses.

REMOVAL AND INSTALLATION (Continued)

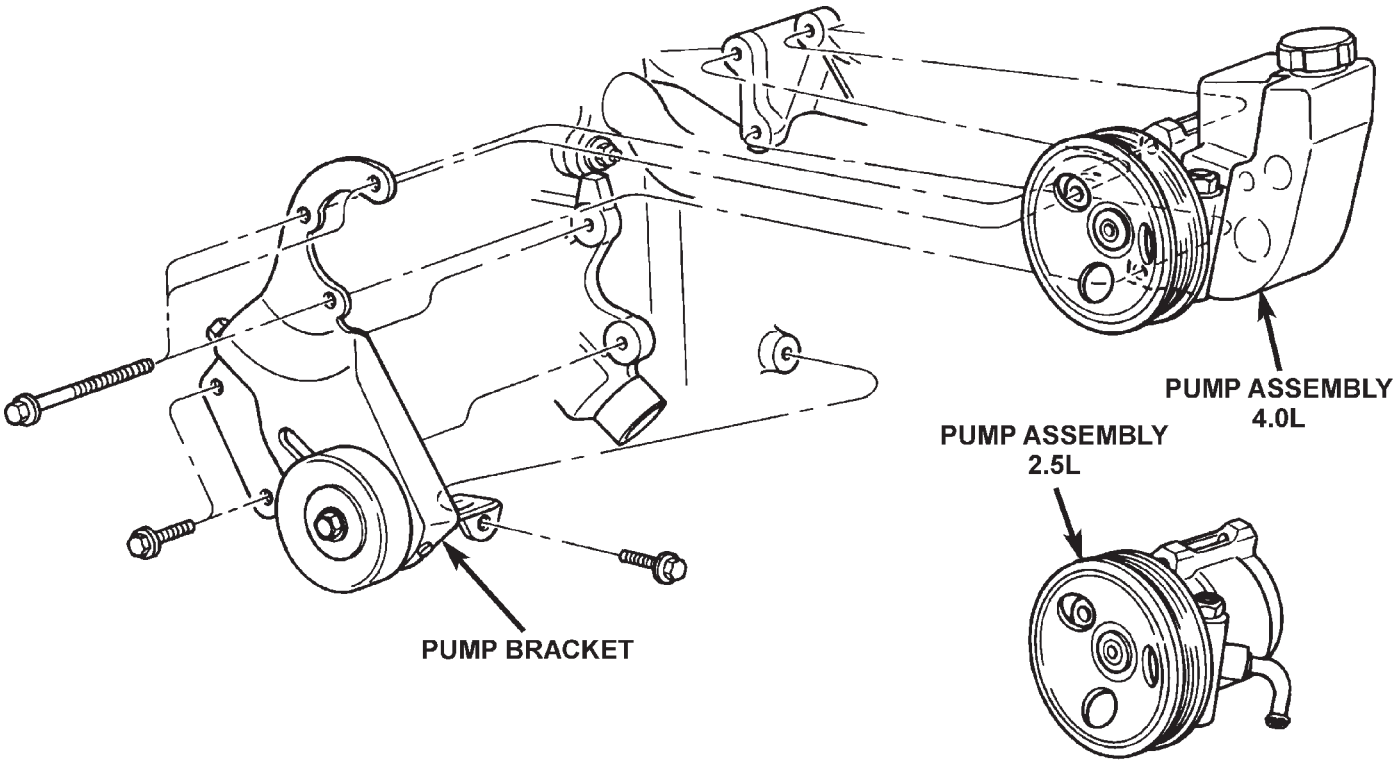


Fig. 2 Pump Mounting

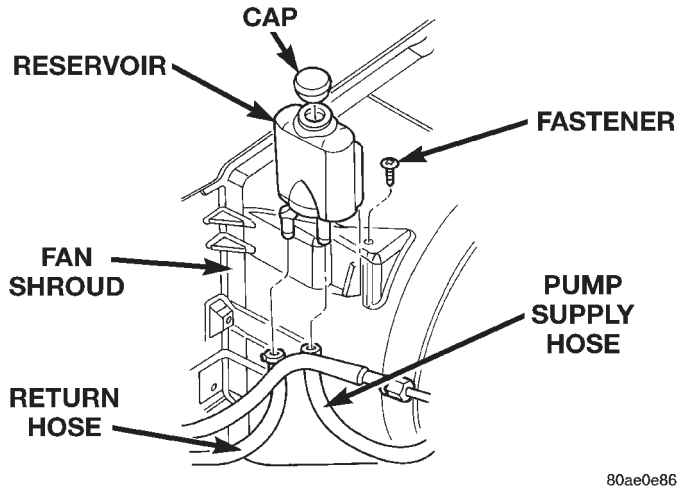


Fig. 3 Pump Reservoir – 2.5L

(4) Fill reservoir to proper level, refer to Power Steering Pump Initial Operation.

DISASSEMBLY AND ASSEMBLY

PUMP PULLEY

DISASSEMBLY

(1) Remove pump assembly.

(2) Remove pulley from pump with Puller C-4333 (Fig. 4).

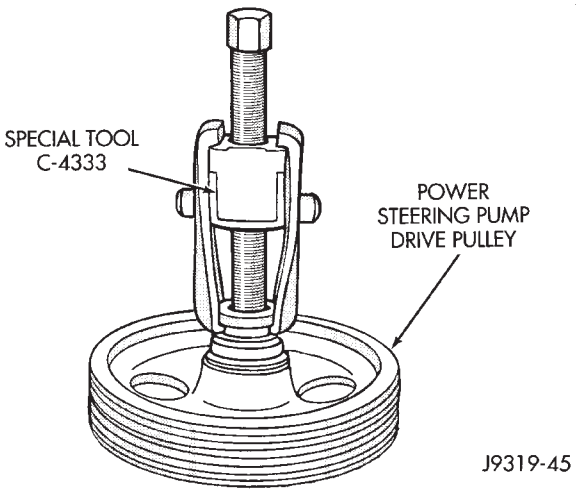


Fig. 4 Pulley Removal

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

(1) Replace pulley if bent, cracked, or loose.

(2) Install pulley on pump with Installer C-4063-B (Fig. 5) flush with the end of the shaft. Ensure the tool and pulley remain aligned with the pump shaft.

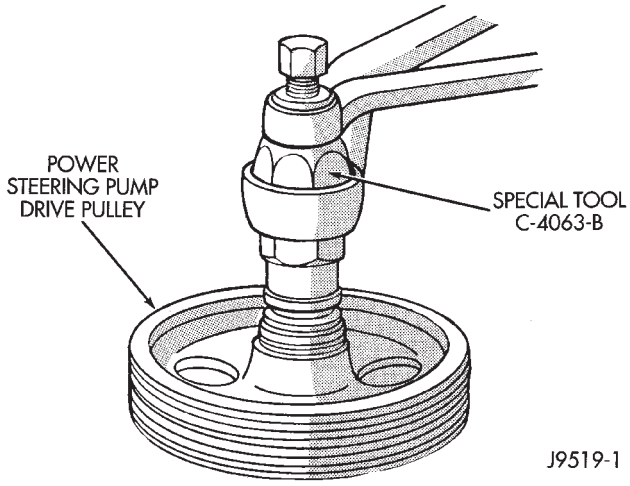


Fig. 5 Pulley Installation

(3) Install pump assembly.

(4) With Serpentine Belt, 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.**

PUMP RESERVOIR

DISASSEMBLY

(1) Remove power steering pump.

(2) Clean exterior of pump.

(3) Clamp the pump body in a soft jaw vice.

(4) Pry up tab and slide the retaining clips off (Fig. 6).

NOTE: Use new retaining clips for installtion.

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

ASSEMBLY

(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 **new** reservoir retainer clips until tab locks to housing.

(5) Install power steering pump.

(6) Add power steering fluid, refer to Pump Initial Operation.

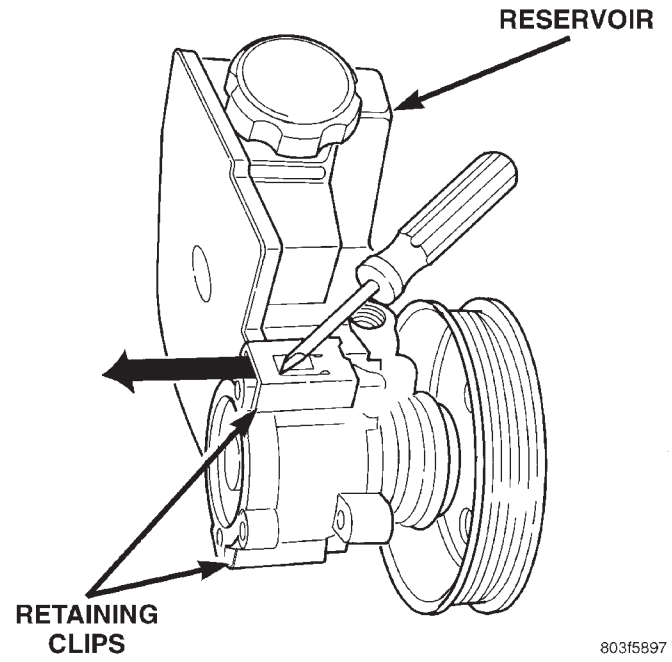


Fig. 6 Pump Reservoir Clips

FLOW CONTROL VALVE

DISASSEMBLY

(1) Clean area around fitting to prevent dirt from entering pump. Remove pressure hose from pump fitting.

(2) Remove fitting from pump housing (Fig. 7). **Prevent flow control valve and spring from sliding out of housing bore.**

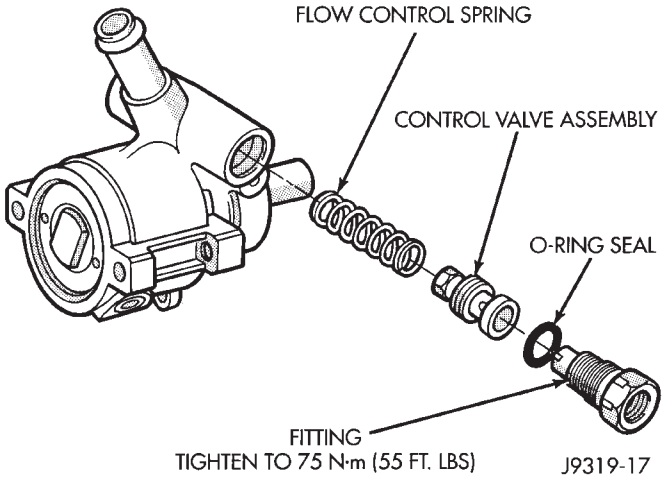


Fig. 7 Flow Control Valve

(3) Remove and discard O-ring seal.

ASSEMBLY

(1) Install spring and flow control valve into pump housing bore. **Be sure the hex nut end of the valve is facing in toward pump.**

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install O-ring seal onto fitting.
(3) Install flow control valve in pump housing and tighten to 75 N·m (55 ft. lbs.).
(4) Install pressure hose to valve.

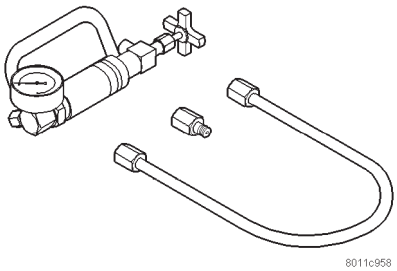
SPECIFICATIONS

TORQUE CHART

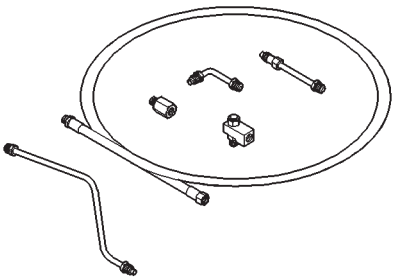
DESCRIPTION	TORQUE
Power Steering Pump	
Bracket to Pump	28 N·m (21 ft. lbs.)
Bracket to Engine	47 N·m (35 ft. lbs.)
Flow Control Valve	75 N·m (55 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)

SPECIAL TOOLS

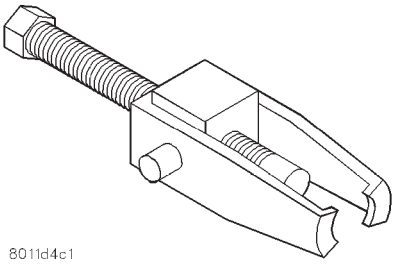
POWER STEERING PUMP



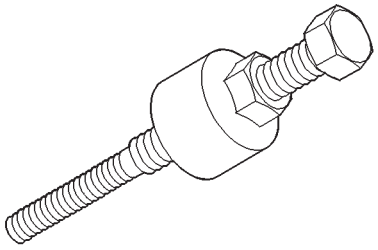
Analyzer Set, Power Steering Flow/Pressure 6815



Adapters, Power Steering Flow/Pressure Tester 6893



Puller C-4333



Installer, Power Steering Pulley C-4063–B

POWER STEERING GEAR

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DESCRIPTION AND OPERATION

POWER STEERING GEAR

The power steering gear is a variable ratio recirculating ball type gear (Fig. 1). The ratio is 15:1 on center, reducing to 13:1 at the end of travel. 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.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

DESCRIPTION AND OPERATION (Continued)

KEY NO.	PART NAME
1	RING, RETAINING
2	PLUG
3	SEAL, O-RING
5	RING, TEFLON
6	SEAL, O-RING
7	COVER, SIDE
8	NUT, ADJUSTER LOCK
10	BOLT
11	GASKET
12	SHAFT, PITMAN
13	SHAFT, WORM
15	RACE, FLAT
16	BEARING, THRUST
17	RACE, FLAT
18	VALVE, CHECK
20	HOUSING
21	SCREW
22	CLAMP
23	GUIDE, BALL
25	BALLS
26	PISTON, RACK
27	PLUG
28	BEARING, NEEDLE
31	WASHER, BACKUP
35	RING, RETAINING
36	WASHER, LOCK
37	NUT
38	SEAL
40	SHAFT, STUB
41	SPOOL, VALVE
42	SEAL
43	BODY, VALVE
45	SEAL, O-RING VALVE BODY
46	RING
48	NUT, COUPLING SHIELD RETAINER AND LOCK
49	THRUST SUPPORT ASSEMBLY
56	SEAL, O-RING
63	SEAL, PITMAN SHAFT
64	SEAL, DUST
65	ADJUSTER NUT ASSEMBLY

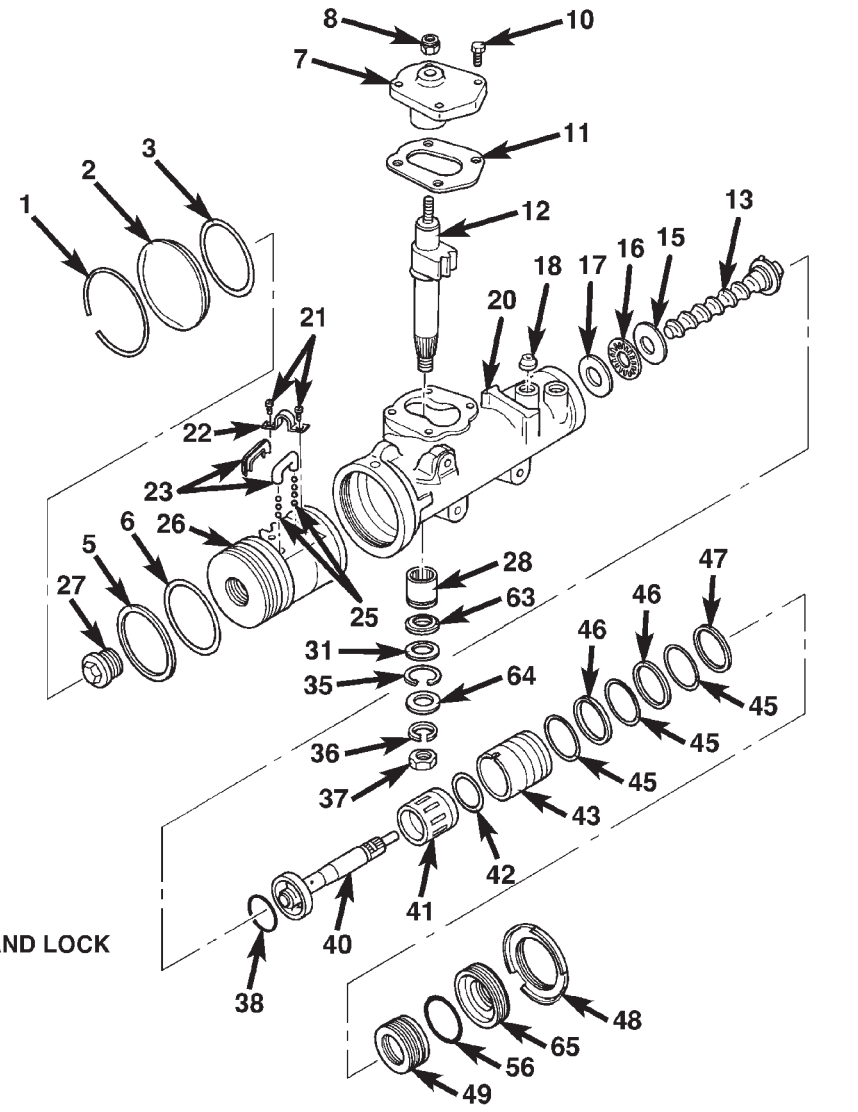
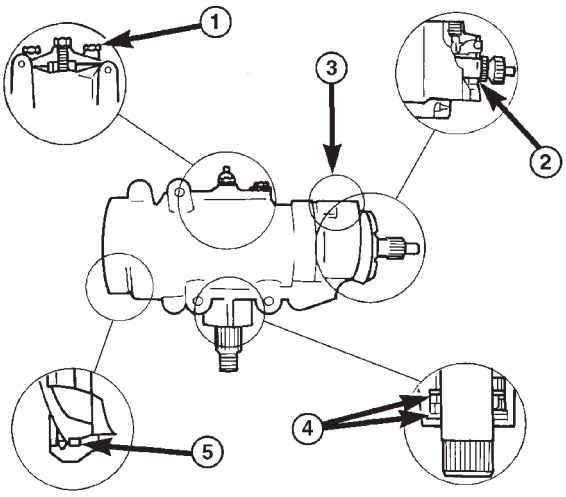


Fig. 1 Recirculating Ball Type Gear

DIAGNOSIS AND TESTING

POWER STEERING GEAR LEAKAGE DIAGNOSIS



1. SIDE COVER LEAK - TORQUE SIDE COVER BOLTS TO SPECIFICATION. REPLACE THE SIDE COVER SEAL IF THE LEAKAGE PERSISTS.
2. ADJUSTER PLUG SEAL - REPLACE THE ADJUSTER PLUG SEALS.
3. PRESSURE LINE FITTING - TORQUE THE HOSE FITTING NUT TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE THE SEAL.
4. PITMAN SHAFT SEALS - REPLACE THE SEALS.
5. TOP COVER SEAL - REPLACE THE SEAL.

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REMOVAL AND INSTALLATION

POWER STEERING GEAR

REMOVAL

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

(2) Disconnect and cap the fluid hoses/tubes from power steering pump.

(3) Remove the column coupler shaft from the gear.

(4) Remove pitman arm from gear.

(5) Remove the steering gear retaining bolts and remove the gear (Fig. 2).

(6) Remove power steering hoses/tubes from steering gear.

INSTALLATION

(1) Install power steering hoses/tubes to steering gear and tighten to 28 N·m (21 ft. lbs.).

(2) Install steering gear on the frame rail and tighten bolts to 95 N·m (70 ft. lbs.)

(3) Align the column coupler shaft to steering gear and tighten coupler bolt.

(4) Align and install the pitman arm and tighten nut to 251 N·m (185 ft. lbs.).

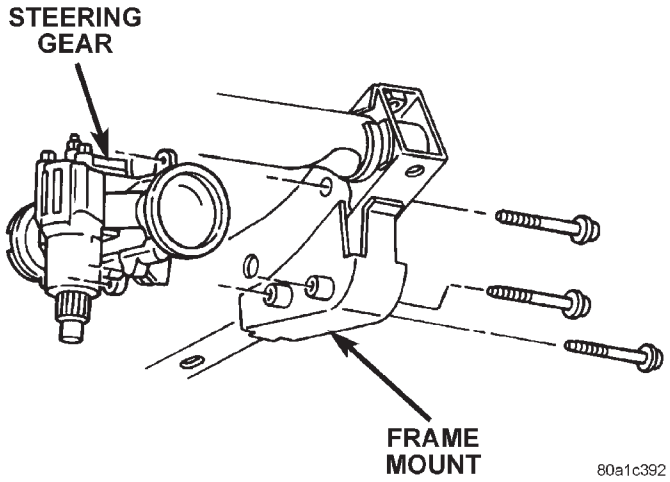


Fig. 2 Steering Gear Mounting

(5) Install power steering hoses/tubes to power steering pump.

(6) Fill power steering system to proper level, refer to Steering Pump Initial Operation.

DISASSEMBLY AND ASSEMBLY

HOUSING END PLUG

DISASSEMBLY

(1) Unseat and remove retaining ring from groove with a punch through the hole in the end of the housing (Fig. 3).

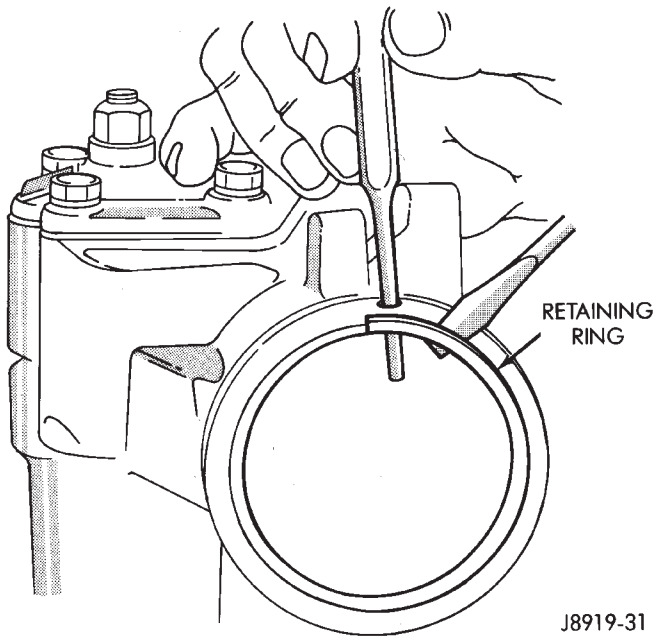


Fig. 3 End Plug Retaining Ring

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Slowly rotate stub shaft with 12 point socket COUNTER-CLOCKWISE to force the end plug out from housing.

CAUTION: Do not turn stub shaft any further than necessary. The rack piston balls will drop out of the rack piston circuit if the stub shaft is turned too far.

(3) Remove O-ring from the housing (Fig. 4).

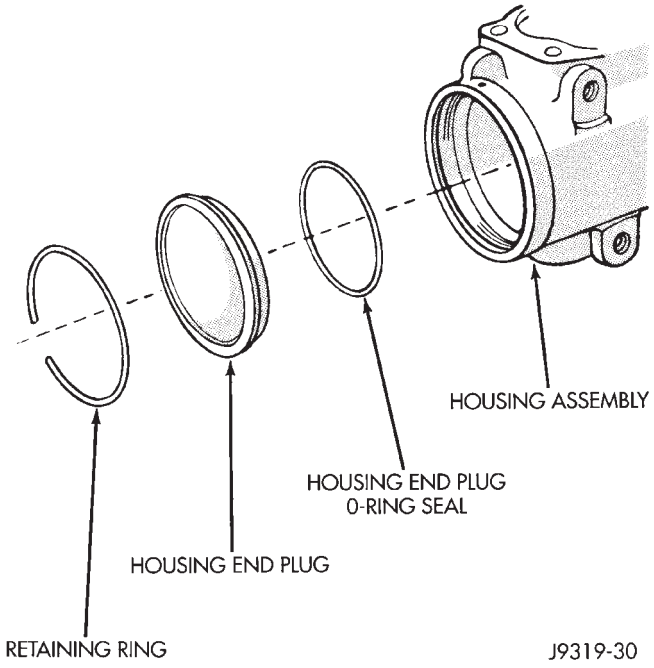


Fig. 4 End Plug Components

ASSEMBLY

(1) Lubricate O-ring with power steering fluid and install into the housing.

(2) Install end plug by tapping the plug lightly with a plastic mallet into the housing.

(3) Install retaining ring so one end of the ring covers the housing access hole (Fig. 5).

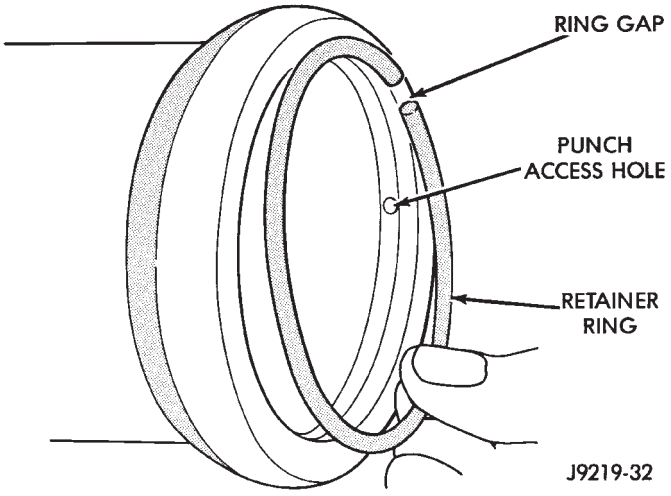


Fig. 5 Installing The Retaining Ring

PITMAN SHAFT/SEALS/BEARING

DISASSEMBLY

(1) Clean exposed end of pitman shaft and housing with a wire brush.

(2) Remove preload adjuster nut (Fig. 6).

(3) Rotate the stub shaft with a 12 point socket from stop to stop and count the number of turns.

(4) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

(5) Remove side cover bolts and remove side cover, gasket and pitman shaft as an assembly (Fig. 6).

NOTE: The pitman shaft will not clear the housing if it is not centered.

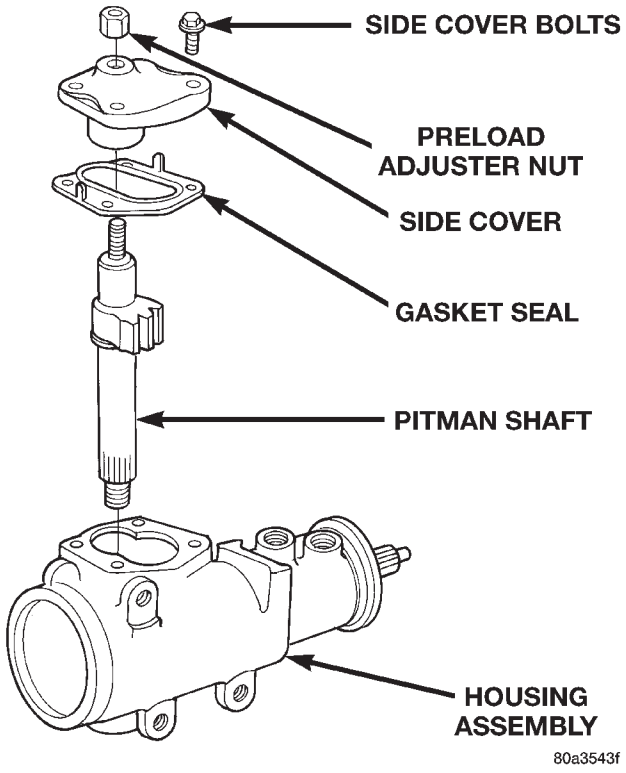


Fig. 6 Side Cover and Pitman Shaft

(6) Remove pitman shaft from the side cover.

(7) Remove dust seal from the housing with a seal pick (Fig. 7).

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

(8) Remove retaining ring with snap ring pliers.

(9) Remove washer from the housing.

(10) Remove oil seal from the housing with a seal pick.

(11) Remove pitman shaft bearing from housing with a bearing driver and handle (Fig. 8).

DISASSEMBLY AND ASSEMBLY (Continued)

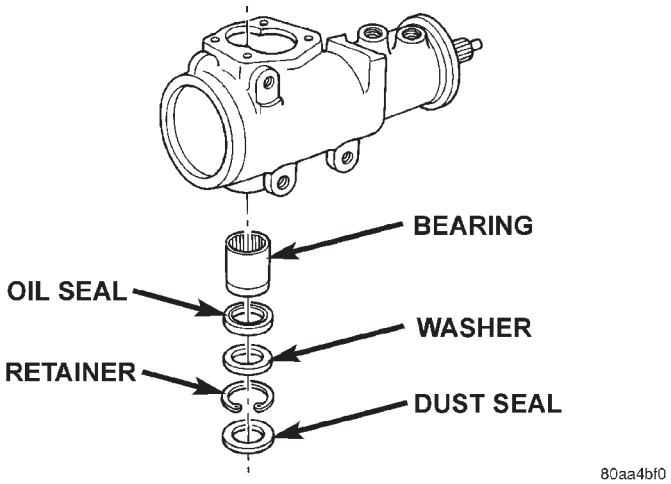


Fig. 7 Pitman Shaft Seals & Bearing

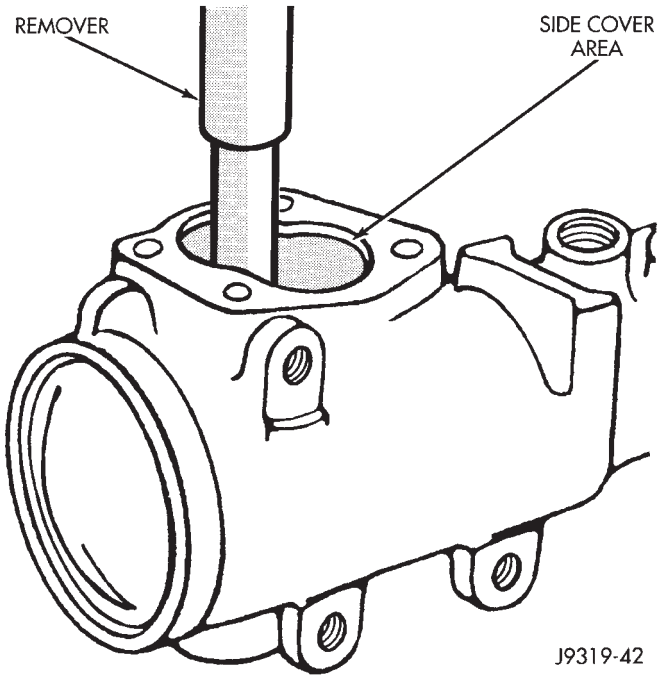


Fig. 8 Needle Bearing Removal

ASSEMBLY

(1) Install pitman shaft bearing into housing with a bearing driver and handle.

(2) Coat the oil seal and washer with **special grease** supplied with the new seal.

(3) Install the oil seal with a driver and handle.

(4) Install backup washer.

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

(6) Coat the dust seal with **special grease** supplied with the new seal.

(7) Install dust seal with a driver and handle.

(8) Install pitman shaft to side cover by screwing shaft in until it fully seats to side cover.

(9) Install preload adjuster nut. **Do not tighten nut until after Over-Center Rotation Torque adjustment has been made.**

(10) Install gasket to side cover and bend tabs around edges of side cover (Fig. 6).

(11) Install pitman shaft assembly and side cover to housing.

(12) Install side cover bolts and tighten to 60 N·m (44 ft. lbs.).

(13) Perform over-center rotation torque adjustment.

SPOOL VALVE

DISASSEMBLY

(1) Remove lock nut (Fig. 9).

(2) Remove adjuster nut with Spanner Wrench C-4381.

(3) Remove thrust support assembly out of the housing (Fig. 10).

(4) Pull stub shaft and valve assembly from the housing (Fig. 11).

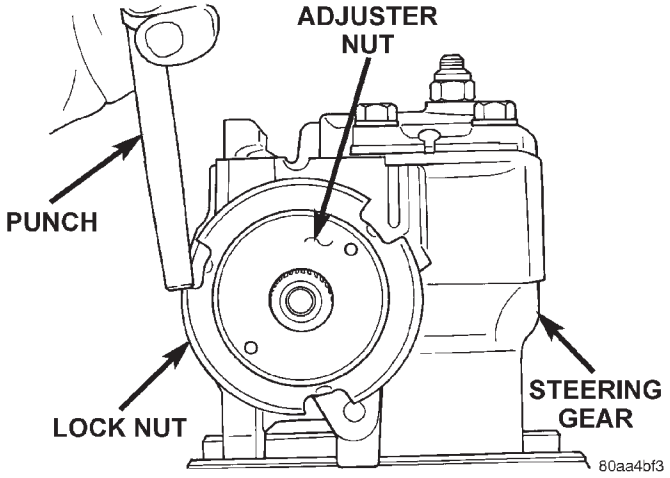


Fig. 9 Lock Nut and Adjuster Nut

(5) Remove stub shaft from valve assembly by lightly tapping shaft on a block of wood to loosen shaft. Then disengage stub shaft pin from hole in spool valve and separate the valve assembly from stub shaft (Fig. 12).

(6) Remove spool valve from valve body by pulling and rotating the spool valve from the valve body (Fig. 13).

(7) Remove spool valve O-ring and valve body teflon rings and O-rings underneath the teflon rings (Fig. 14).

(8) Remove the O-ring between the worm shaft and the stub shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

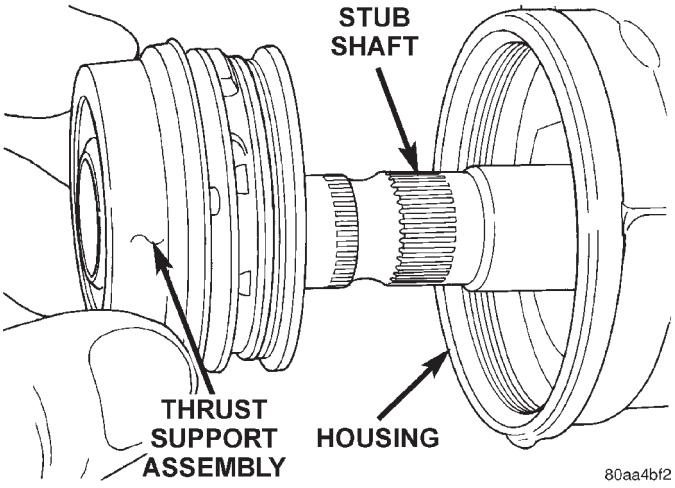


Fig. 10 Thrust Support Assembly

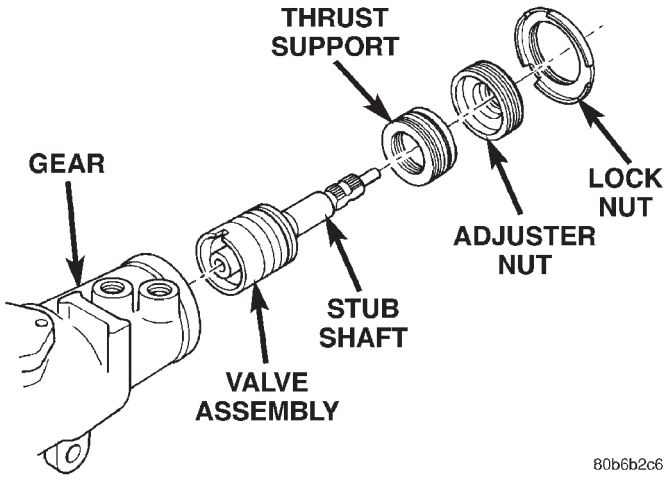


Fig. 11 Valve Assembly With Stub Shaft

ASSEMBLY

NOTE: Clean and dry all components, then lubricate with power steering fluid.

(1) Install spool valve spool O-ring.

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

(3) Install stub shaft in valve spool and engage locating pin on stub shaft into spool valve hole (Fig. 15).

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

(4) Install O-rings and teflon rings over the O-rings on valve body.

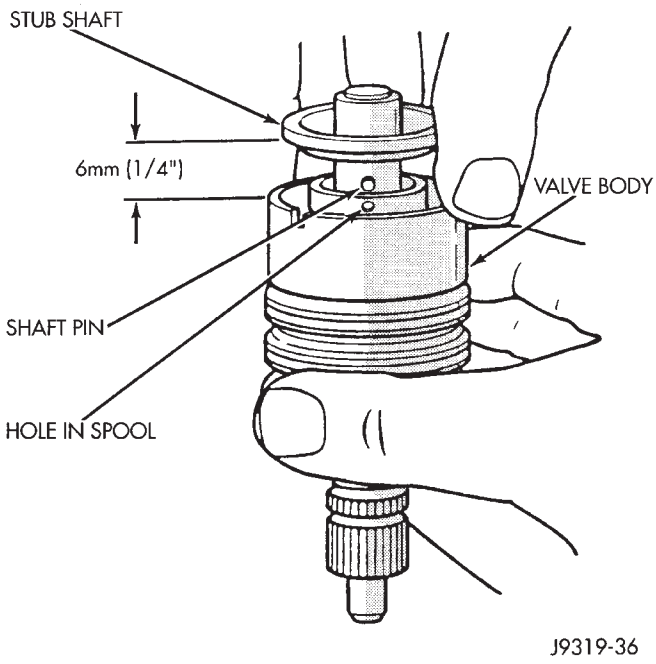


Fig. 12 Stub Shaft

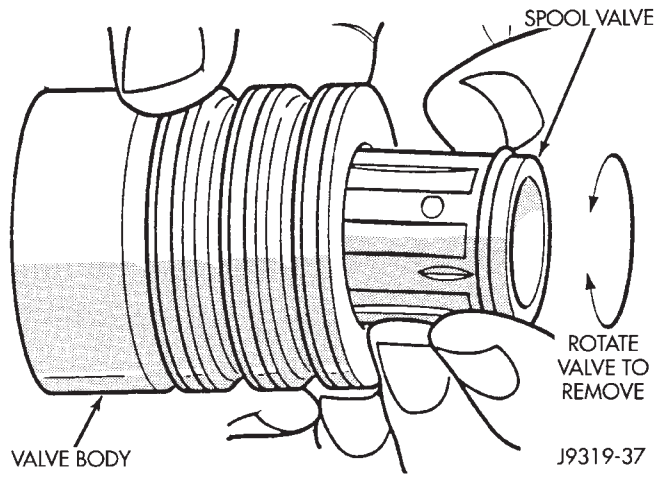


Fig. 13 Spool Valve

(5) Install O-ring into the back of the stub shaft cap (Fig. 16).

(6) Install stub shaft and valve assembly in the housing. Line up worm shaft to slots in the valve assembly.

(7) Install thrust support assembly.

NOTE: The thrust support is serviced as an assembly. If any component of the thrust support is damaged the assembly must be replaced.

(8) Install adjuster nut and lock nut.

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

DISASSEMBLY AND ASSEMBLY (Continued)

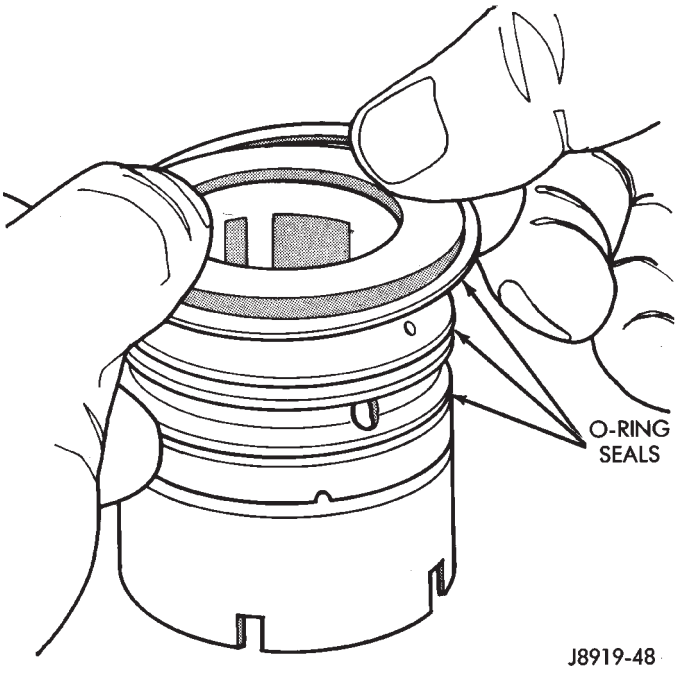


Fig. 14 Valve Seals

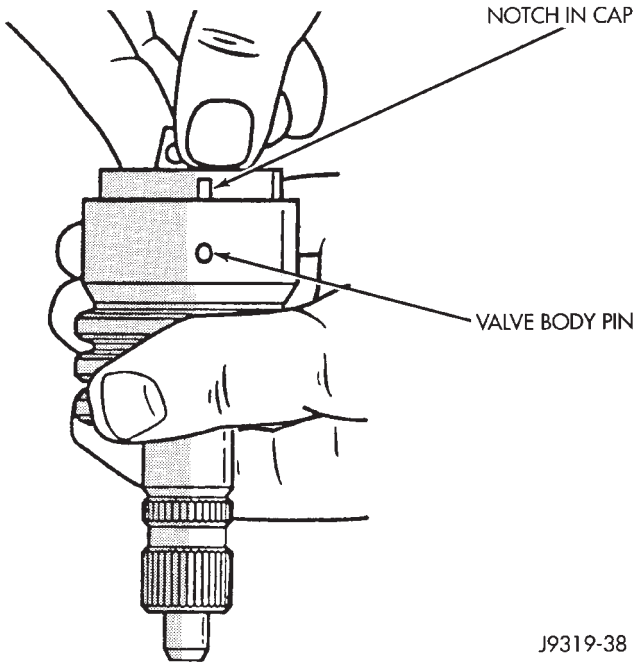


Fig. 15 Stub Shaft Installation

RACK PISTON AND WORM SHAFT

DISASSEMBLY

(1) Remove housing end plug.

(2) Remove rack piston plug (Fig. 17).

(3) Remove side cover and pitman shaft.

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

(5) Insert Arbor C-4175 into bore of rack piston (Fig. 18) and hold tool tightly against worm shaft.

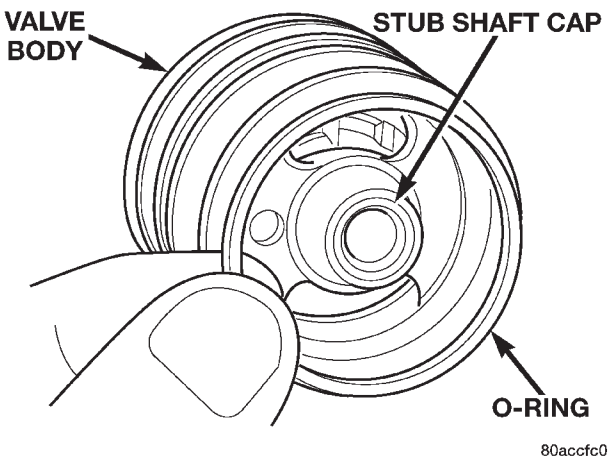


Fig. 16 Stub Shaft Cap O-Ring

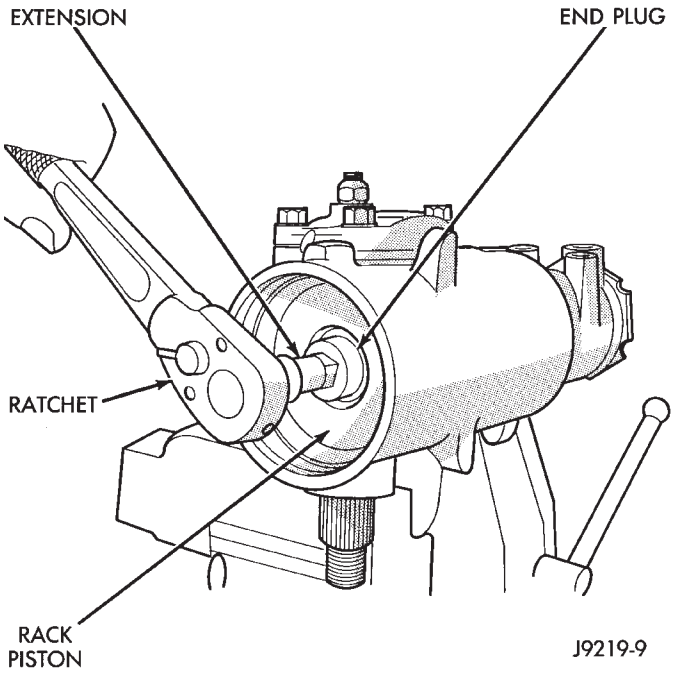


Fig. 17 Rack Piston End Plug

(6) Turn the stub shaft with a 12 point socket COUNTERCLOCKWISE, this will force the rack piston onto the tool and hold the rack piston balls in place.

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

(8) Remove tool from rack piston.

(9) Remove rack piston balls.

(10) Remove clamp bolts, clamp and ball guide (Fig. 19).

(11) Remove teflon ring and O-ring from the rack piston (Fig. 20).

(12) Remove the adjuster lock nut and adjuster nut from the stub shaft.

(13) Pull the stub shaft with the spool valve and thrust support assembly out of the housing.

DISASSEMBLY AND ASSEMBLY (Continued)

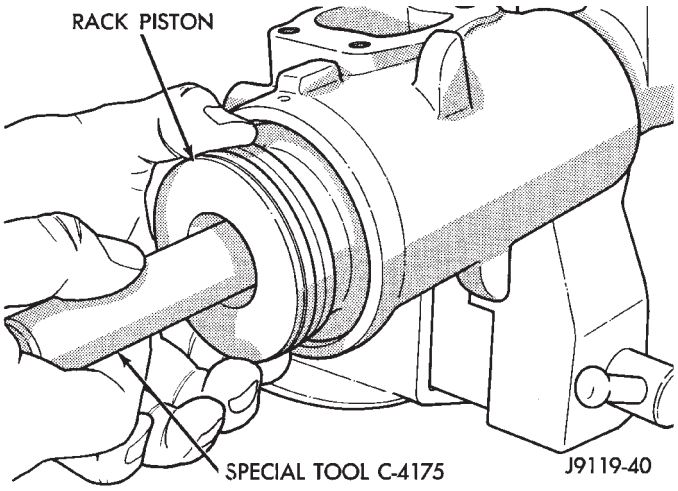


Fig. 18 Rack Piston with Arbor

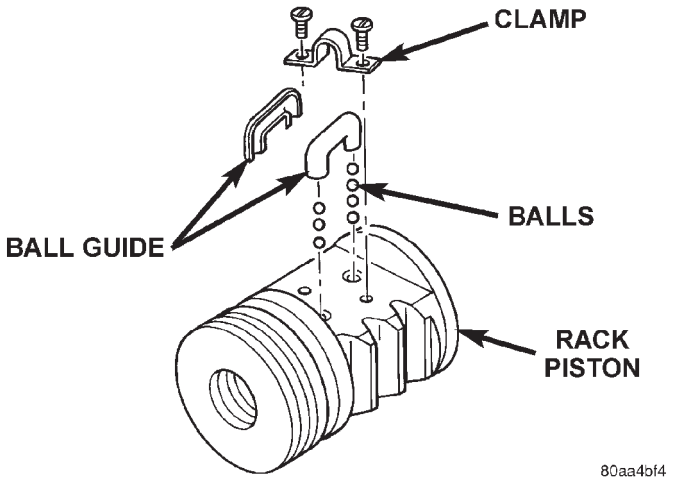


Fig. 19 Rack Piston

(14) Remove the worm shaft from the housing (Fig. 21).

ASSEMBLY

NOTE: Clean and dry all components and lubricate with power steering fluid.

(1) Check for scores, nicks or burrs on the rack piston finished surface. Slight wear is normal on the worm gear surfaces.

(2) Install O-ring and teflon ring on the rack piston.

(3) Install worm shaft in the rack piston and align worm shaft spiral groove with rack piston ball guide hole (Fig. 22).

CAUTION: The rack piston balls must be installed alternately into the rack piston and ball guide. This maintains worm shaft preload. There are 12 black balls and 12 silver (Chrome) balls. The black balls are smaller than the silver balls.

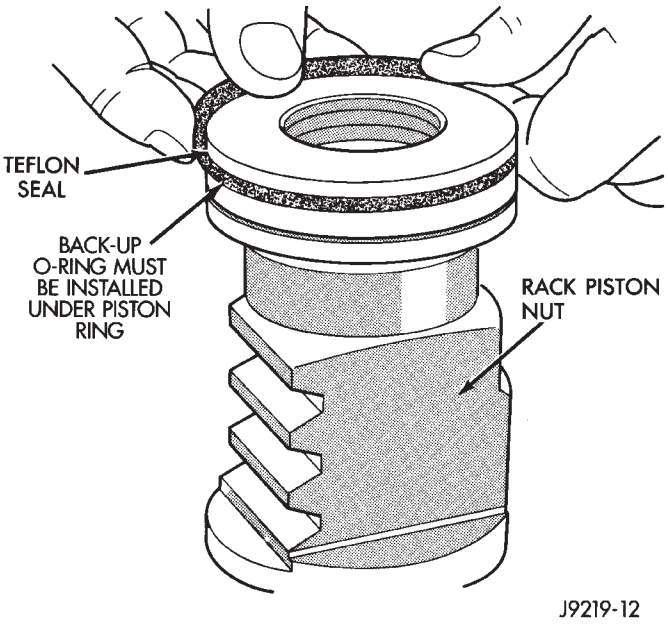


Fig. 20 Rack Piston Teflon Ring and O-Ring

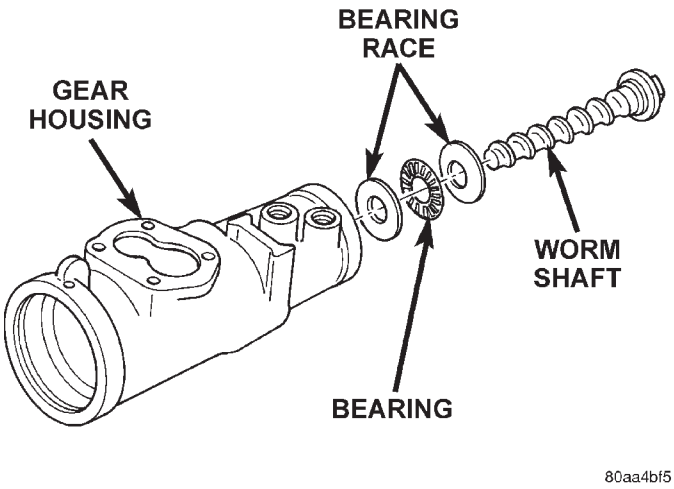


Fig. 21 Worm Shaft

(4) Lubricate and install rack piston balls through return guide hole while turning worm shaft COUNTERCLOCKWISE (Fig. 22).

(5) Install remaining balls in guide using grease to hold the balls in place (Fig. 23).

(6) Install the guide onto rack piston and install clamp and clamp bolts. Tighten bolts to 4.8 N·m (43 in. lbs.).

(7) Insert Arbor C-4175 into bore of rack piston and hold tool tightly against worm shaft.

(8) Turn the worm shaft COUNTERCLOCKWISE while pushing on the arbor. This will force the rack piston onto the arbor and hold the rack piston balls in place.

(9) Install the races and thrust bearing on the worm shaft and install shaft in the housing (Fig. 21).

DISASSEMBLY AND ASSEMBLY (Continued)

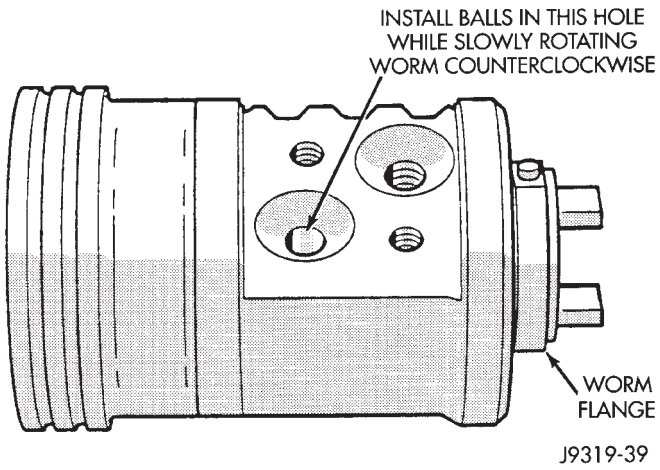


Fig. 22 Installing Balls in Rack Piston

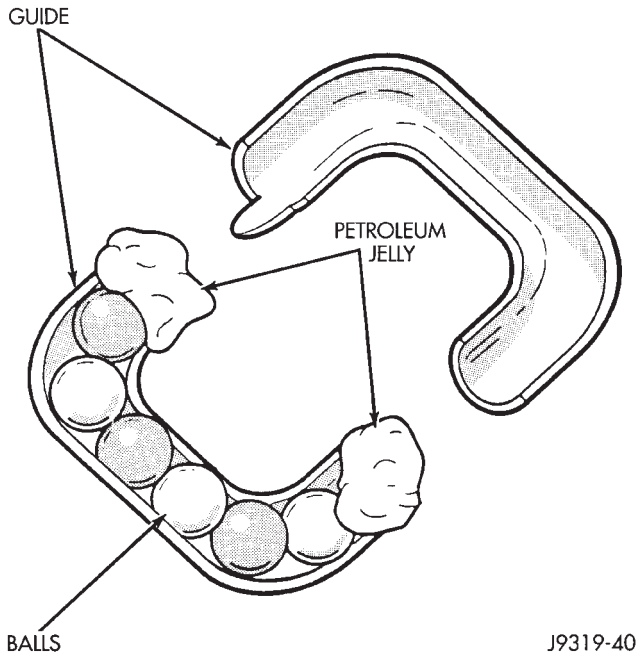


Fig. 23 Balls in the Return Guide

(10) Install the stub shaft with spool valve, thrust support assembly and adjuster nut in the housing.

(11) Install the rack piston and arbor tool into the housing.

(12) Hold arbor tightly against worm shaft and turn stub shaft CLOCKWISE until rack piston is seated on worm shaft.

(13) Install pitman shaft and side cover in the housing.

(14) Install rack piston plug and tighten to 150 N·m (111 ft. lbs.).

(15) Install housing end plug.

(16) Adjust worm shaft thrust bearing preload and over-center rotating torque.

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) Mount the gear carefully into a vise.

CAUTION: Do not overtighten the vise on the gear case. This may affect the adjustment

(2) Remove adjuster plug locknut (Fig. 24).

(3) Rotate the stub shaft back and forth with a 12 point socket to drain the remaining fluid.

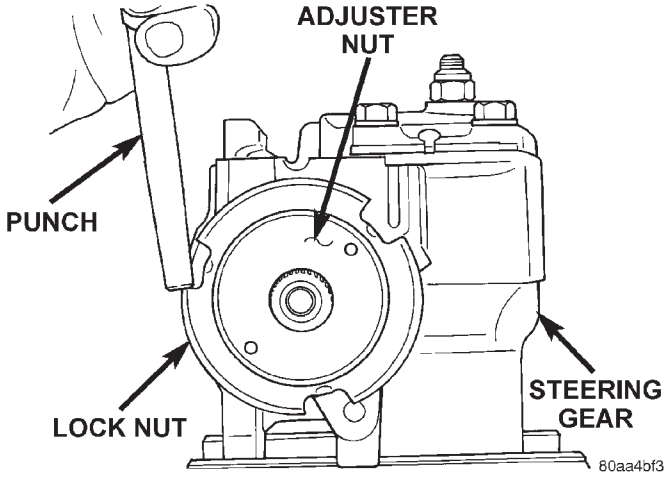


Fig. 24 Adjuster Lock Nut

(4) Turn the adjuster in with Spanner Wrench C-4381. Tighten the plug and thrust bearing in the housing until firmly bottomed in the housing about 34 N·m (25 ft. lbs.).

(5) Place an index mark on the housing even with one of the holes in adjuster plug (Fig. 25).

(6) Measure back (counterclockwise) 5.08 mm (0.20 in) and mark housing (Fig. 26).

(7) Rotate adjustment cap back (counterclockwise) with spanner wrench until hole is aligned with the second mark (Fig. 27).

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

ADJUSTMENTS (Continued)

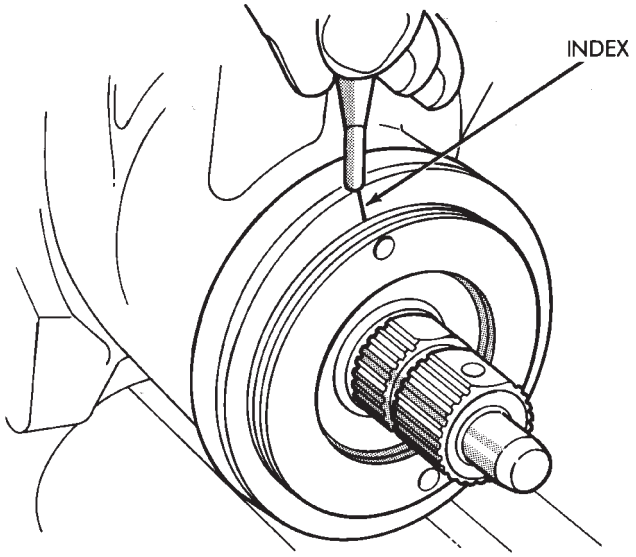


Fig. 25 Alignment Marking On Housing

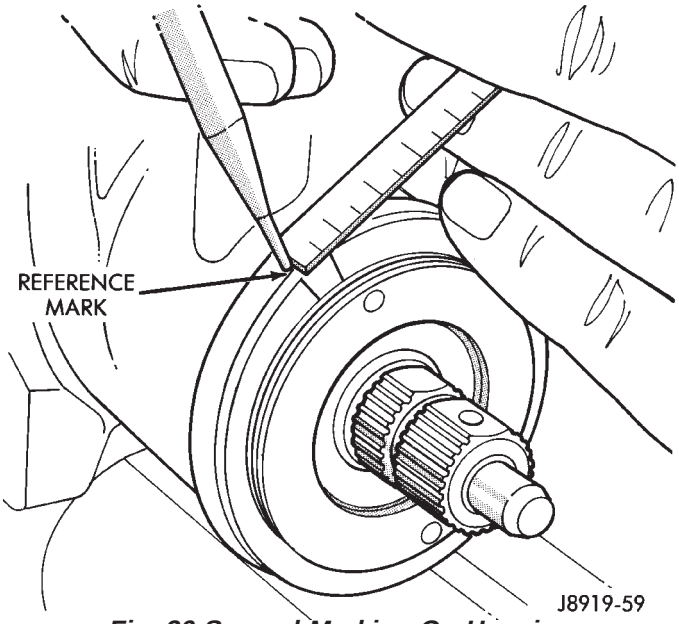


Fig. 26 Second Marking On Housing

OVER-CENTER

NOTE: Before performing this procedure, the worm bearing preload adjustment must be performed.

(1) Rotate the stub shaft with a 12 point socket from stop to stop and count the number of turns.

(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. 28).

(3) 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 in this range (Fig. 29). This is the Over-Center Rotating Torque.

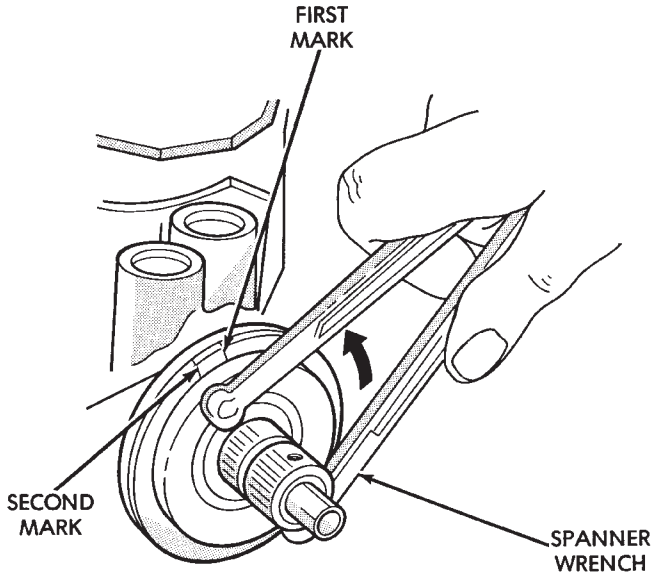


Fig. 27 Aligning To The Second Mark

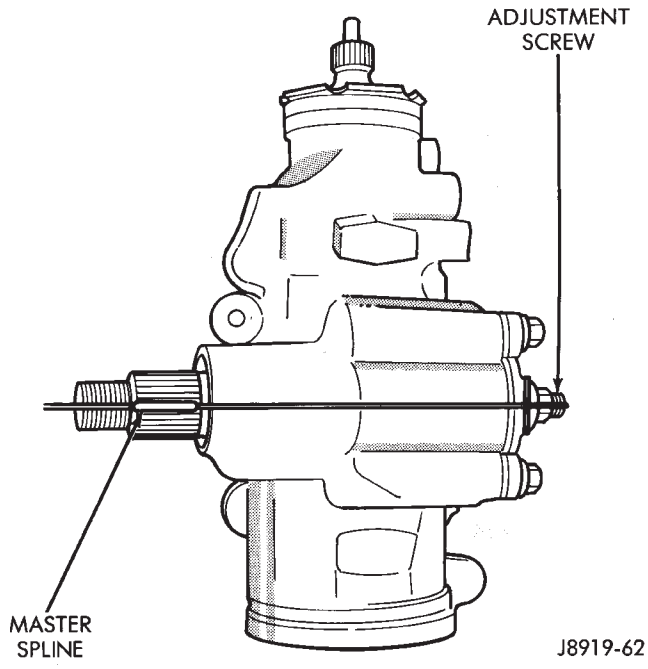


Fig. 28 Steering Gear Centered

NOTE: The stub shaft must rotate smoothly without sticking or binding.

(4) Rotate the stud shaft between 90° and 180° to the left of center and record the left off-center preload. Repeat this to the right of center and record the right off-center preload. The average of these two recorded readings is the Preload Rotating Torque.

(5) The Over-Center Rotating Torque should be 0.40-0.70 N·m (3-7 in. lbs.) **higher** than the Preload Rotating Torque.

ADJUSTMENTS (Continued)

(6) If an adjustment to the Over-Center Rotating Torque is necessary, first loosen the adjuster lock nut. Then turn the pitman shaft adjuster screw back (COUNTERCLOCKWISE) until fully extended, then turn back in (CLOCKWISE) one full turn.

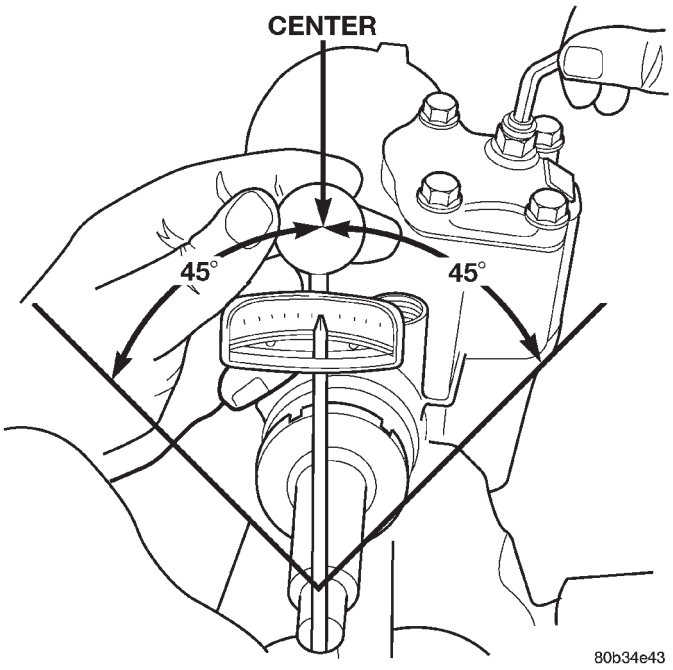


Fig. 29 Checking Over-center Rotation Torque

(7) Remeasure Over-Center Rotating Torque. If necessary turn the adjuster screw and repeat measurement until correct Over-Center Rotating Torque is reached.

NOTE: To increase the Over-Center Rotating Torque turn the screw CLOCKWISE.

(8) Prevent the adjuster screw from turning while tightening adjuster lock nut. Tighten the adjuster lock nut to 49 N·m (36 ft. lbs.).

SPECIFICATIONS

POWER STEERING GEAR

Steering Gear

Type . . . . . Recirculating Ball
Gear Ratio . . . . . 15 to 13:1

Worm Shaft Bearing

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

Pitman Shaft Over-Center Drag

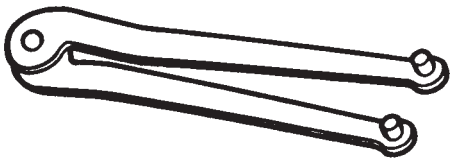
New Gear (under 400 miles) . . . . . 0.45–0.90 N·m (4–8 in. lbs.) + Worm Shaft Preload
Used Gear (over 400 miles) . . . . . 0.5–0.6 N·m (4–5 in. lbs.) + Worm Shaft Preload

TORQUE CHART

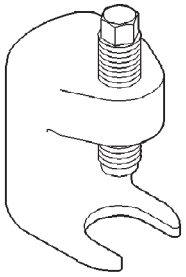
DESCRIPTION	TORQUE
Power Steering Gear	
Adjustment Cap Locknut	108 N·m (80 ft. lbs.)
Adjustment Screw Locknut	49 N·m (36 ft. lbs.)
Gear to Frame Bolts	95 N·m (70 ft. lbs.)
Pitman Shaft Nut	251 N·m (185 ft. lbs.)
Rack Piston Plug	102 N·m (75 ft. lbs.)
Side Cover Bolts	60 N·m (44 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)
Return Line	28 N·m (21 ft. lbs.)

SPECIAL TOOLS

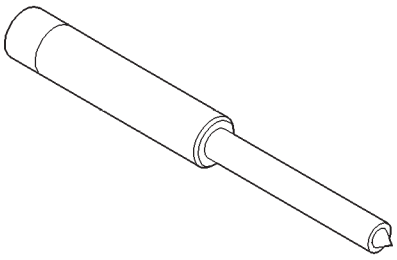
POWER STEERING GEAR



Remover/Installer, Steering Plug C-4381



Remover, Pitman Arm C-4150A



Remover/Installer Steering Rack Piston C-4175

STEERING LINKAGE

INDEX

DESCRIPTION AND OPERATION

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.

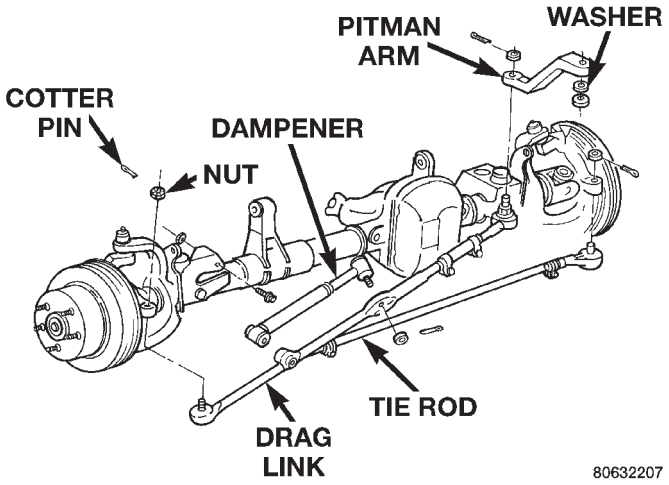


Fig. 1 Steering Linkage

SERVICE PROCEDURES

LUBRICATION

Periodic lubrication of the steering system components is required. Refer to Group 0, Lubrication And Maintenance for the recommended maintenance schedule.

The following components must be lubricated:

- Tie rod ends
- Drag link

STEERING LINKAGE

The tie rod end and ball stud seals should be inspected during all oil changes. If a seal is damaged, it should be replaced. Before installing a new seal, inspect 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.

CAUTION: If any steering components are replaced or serviced an alignment must be performed, to ensure the vehicle meets all alignment specifications.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

REMOVAL AND INSTALLATION

TIE ROD

REMOVAL

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

(2) Remove the ball studs with puller tool.

(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. 2) and tighten to 27 N·m (20 ft. lbs.).

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

(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.

REMOVAL AND INSTALLATION (Continued)

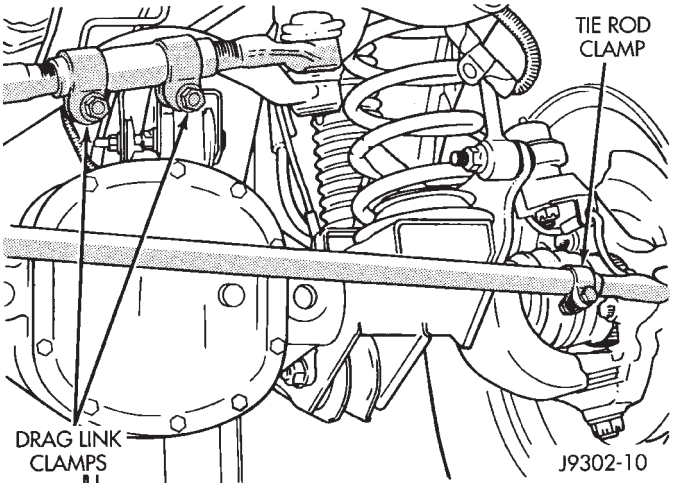


Fig. 2 Tie Rod/Drag Link Clamp Bolt

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. 3).

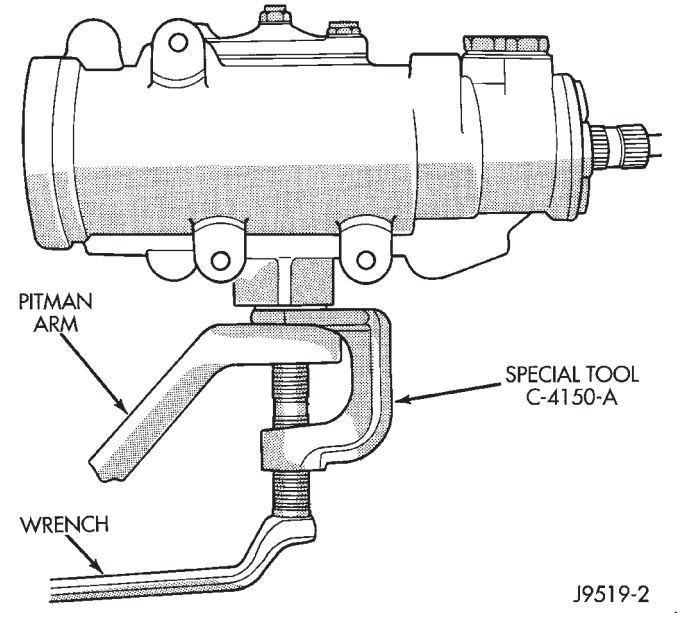


Fig. 3 Pitman Arm Removal

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.

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).

(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.

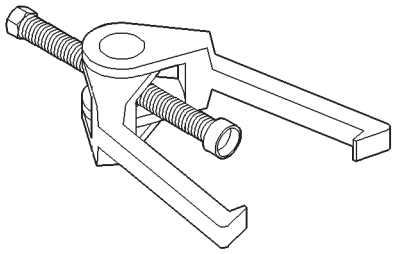
SPECIFICATIONS

TORQUE CHART

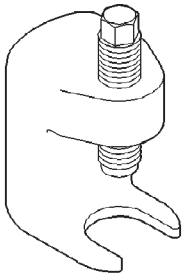
DESCRIPTION	TORQUE
Pitman Arm	
Shaft	251 N·m (185 ft. lbs.)
Drag Link	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	49 N·m (36 ft. lbs.)
Tie Rod Ends	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	27 N·m (20 ft. lbs.)
Tie Rod	
Ball Stud	88 N·m (65 ft. lbs.)
Steering Damper	
Frame	74 N·m (55 ft. lbs.)
Drag Link	74 N·m (55 ft. lbs.)

SPECIAL TOOLS

STEERING LINKAGE



Puller C-3894–A



Remover Pitman C-4150A

STEERING COLUMN

INDEX

DESCRIPTION AND OPERATION

STEERING COLUMN

The standard non-tilt and tilt steering column has been designed to be serviced as an assembly. The key cylinder, switches, clock spring, trim shrouds and steering wheel are serviced separately. On the non-tilt column the upper mounting bracket is also serviced separately.

The column is connected to the steering gear with an upper and lower shaft. The lower shaft has a support bearing mounted to a bracket. The bracket mounts to the frame rail with two bolts. These shafts and bearing are serviceable.

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 8M 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. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. 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.

REMOVAL AND INSTALLATION

STEERING COLUMN

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO GROUP 8M RESTRAINT SYSTEMS FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

CAUTION: Keep clock spring from turning during removal and installation. Failure to do so may damage the clock spring.

REMOVAL

(1) Position front wheels **straight ahead.**

(2) Remove and isolate the negative ground cable from the battery.

(3) Remove the airbag, refer to Group 8M Restraint Systems for service procedures.

NOTE: If equipped with cruise control, disconnect clock spring harness from the cruise switch harness on the steering wheel.

(4) Remove the steering wheel with an appropriate puller (Fig. 1).

CAUTION: Ensure the puller bolts are fully engaged into the steering wheel before attempting to remove the wheel. Failure to do so may damage the steering wheel.

(5) Turn ignition cylinder to the on position and remove cylinder by pressing release through lower shroud access hole (Fig. 2).

(6) Remove knee blocker cover and knee blocker, refer to Group 8E Instrument Panel Systems.

(7) Remove screws from the lower column shroud (Fig. 3) and remove the shroud.

REMOVAL AND INSTALLATION (Continued)

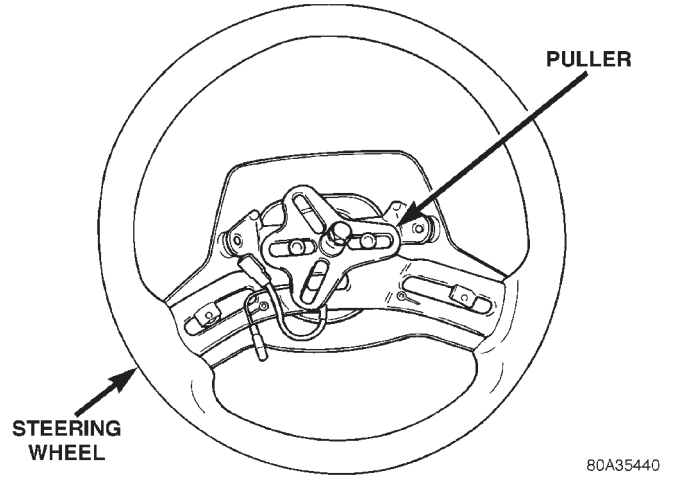


Fig. 1 Steering Wheel

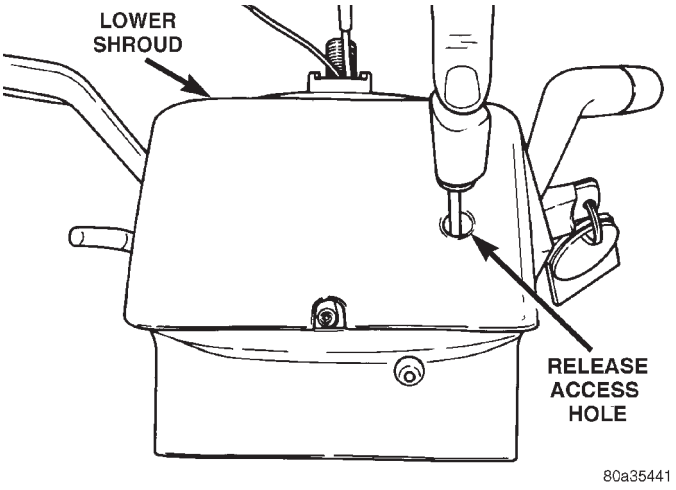


Fig. 2 Key Cylinder Release Access Hole

(8) Remove the steering coupler bolt and column mounting nuts (Fig. 4) then lower column off the mounting studs.

(9) Remove upper column shroud (Fig. 3).

(10) Disconnect and remove the wiring harness from the column (Fig. 5).

NOTE: If vehicle is equipped with automatic transmission, remove shifter interlock cable. Refer to Group 21 Transmission and Transfer Case for procedure.

(11) Remove column.

(12) Remove nut and bolt from the upper column mounting bracket on non-tilt column (Fig. 6). Remove the bracket from the column and **note the mounting location and orientation of the bracket.**

(13) Remove clock spring (Fig. 7), switches, (SKIM if equipped) and ignition key cylinder, refer to Group 8 Electrical for service procedures.

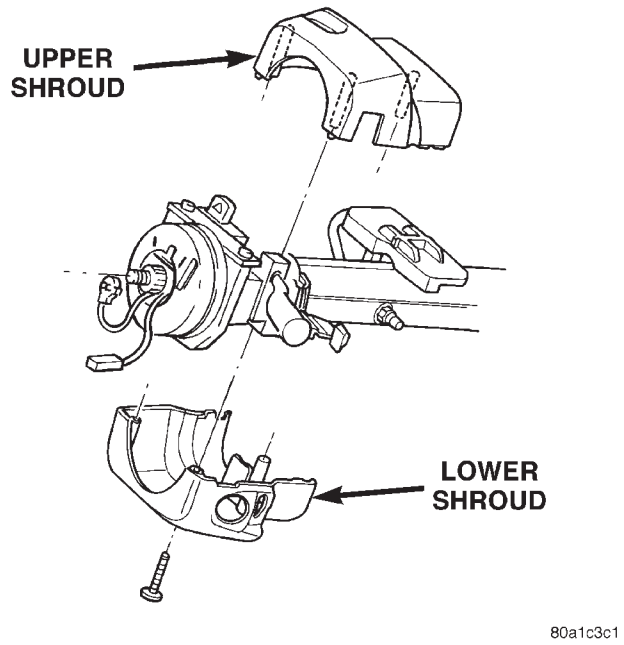


Fig. 3 Column Shrouds

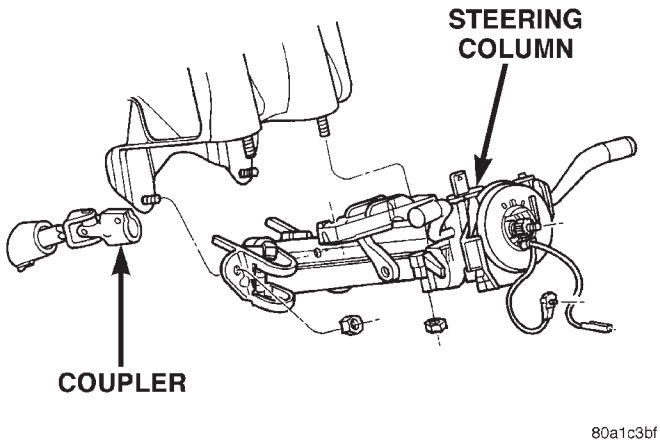


Fig. 4 Steering Column Mounting

INSTALLATION

(1) Install upper column mounting bracket on non-tilt column. Install the mounting bolt and tighten the nut to 17 N·m (150 in. lbs.).

(2) Install switches, refer to Group 8 Electrical for service procedures.

(3) Align and install column into the steering coupler.

(4) Install column harness and connect harness to switches.

NOTE: If vehicle is equipped with automatic transmission, install shifter interlock cable. Refer to Group 21 Transmission and Transfer Case for procedure.

REMOVAL AND INSTALLATION (Continued)

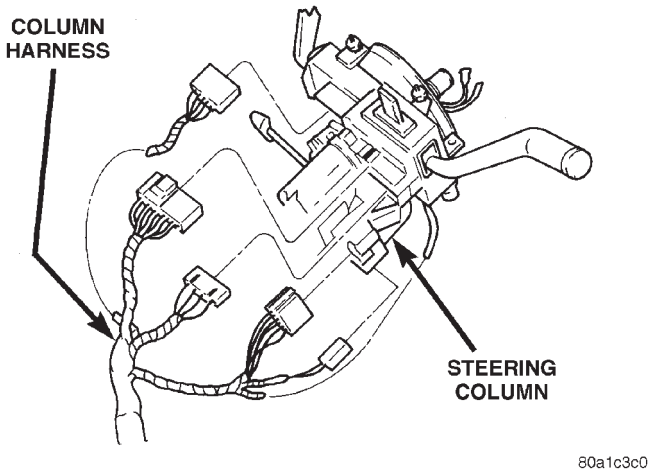


Fig. 5 Steering Column Harness

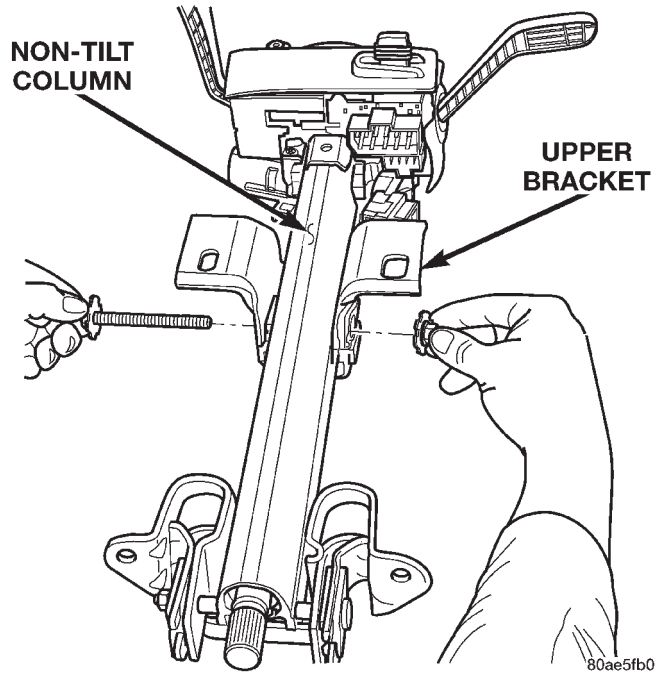


Fig. 6 Non-Tilt Column

(5) Install upper column shrouds.

(6) Install column onto the mounting studs.

(7) Install mounting nuts and tighten to 23 N·m (17 ft. lbs.).

(8) Install steering column coupler bolt and tighten to 49 N·m (36 ft. lbs.).

(9) Center the clock spring (if necessary) and install it on the column, refer to Group 8 Electrical for service procedures.

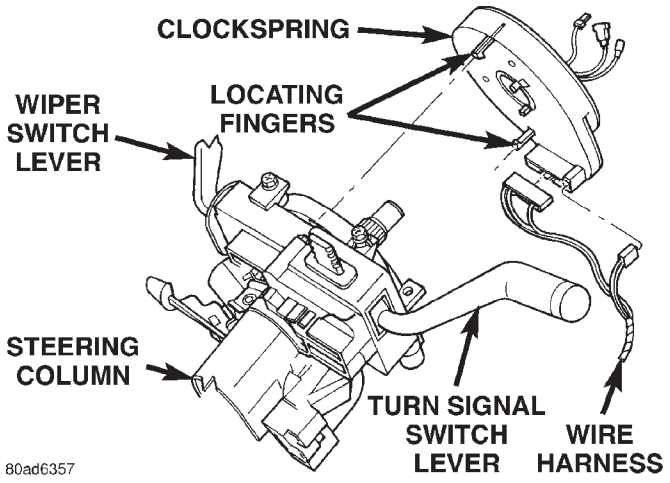


Fig. 7 Clock Spring

(10) Install lower column shrouds and install mounting screws.

(11) Install ignition cylinder.

(12) Install knee blocker and knee blocker cover, refer to Group 8E Instrument Panel Systems.

(13) Install steering wheel and tighten nut to 54 N·m (40 ft. lbs.).

NOTE: If equipped with cruise control, connect clock spring harness to cruise switch harness on the steering wheel.

(14) Install airbag, refer to Group 8M Restraint Systems for service procedures.

(15) Install negative battery terminal.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Tilt Steering Column	
Steering Wheel Nut	54 N·m (40 ft. lbs.)
Mounting Nuts	23 N·m (17 ft. lbs.)
Coupler Bolt	49 N·m (36 ft. lbs.)
Non-Tilt Steering Column	
Steering Wheel Nut	54 N·m (40 ft. lbs.)
Mounting Nuts	23 N·m (17 ft. lbs.)
Coupler Bolt	49 N·m (36 ft. lbs.)
Upper Bracket Nut	17 N·m (150 in. lbs.)