

TOYOTA CORONA POWER-ASSISTED WORM AND SECTOR

Corona

DESCRIPTION

POWER STEERING PUMP

The power steering pump is a vane type composed of an engine driven eccentric rotor, a fixed ring (having six slotted grooves), and a flow control valve (to regulate maximum oil pressure and amount of oil flow). Slippers are fitted in each slotted groove and are pressed against rotor outside surface by pressure produced in adjoining slots and by spring tension. As rotor rotation increases or decreases, then space between the rotor and fixed ring changes accordingly, in order to control oil flow.

POWER STEERING GEAR

Power steering gear consists of a mechanism which converts steering wheel torque to cross shaft torque by means of worm and power piston nut, and of a mechanism which detects hydraulic pressure developed by vane pump and controls this pressure in proportion to the steering effort. The worm shaft is separated at the center and power is transmitted from the steering wheel to worm gear through a small diameter torsion bar.

LUBRICATION

Capacity - 1.7 pts. (800 c.c.)

Type - ATF type Dexron

ADJUSTMENTS

BELT TENSION ADJUSTMENT

With 22 lbs. (10 kg) pressure applied, belt deflection should be as shown in Fig. 1.

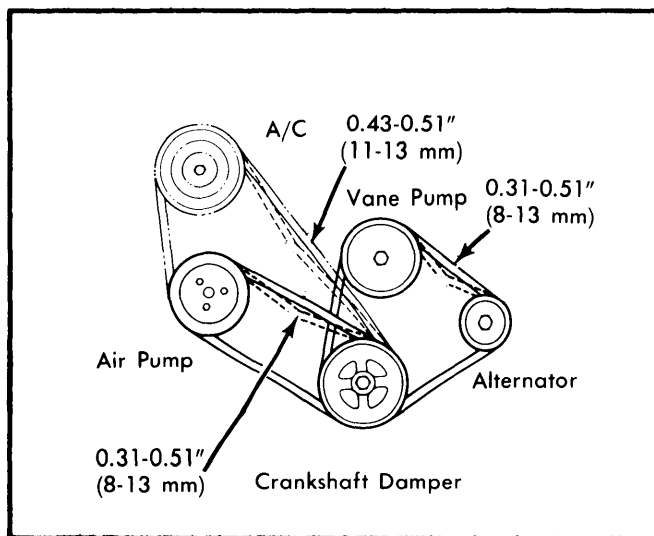


Fig. 1 Belt Deflection Measuring Points

STEERING GEAR AIR REMOVAL

1) Jack up front of vehicle and support with safety stands. Fill fluid to proper level in vane pump reservoir (turn wheels fully in both directions and recheck fluid level).

2) Turn steering wheel fully to one side and turn engine over while fluid level in reservoir is observed. **NOTE** - Do not start engine or run starter for prolonged periods. Repeat procedure with steering wheel turned to other side. Start engine, allow to idle, and turn wheels from side to side two or three times.

3) Remove safety stands and lower vehicle. Again allow engine to idle and turn wheels fully side to side two or three times. When steering wheel is brought to center position and engine stopped, fluid level should not show a rise. If fluid level does rise, there is air still in the system and Step 3 should be repeated.

FLUID REPLACEMENT

1) Raise and support front of vehicle. Disconnect return hose. **NOTE** - Have container on hand as fluid will drain from disconnected hose. Drain fluid from pump by turning engine over (do not start). Drain fluid from steering gear (turn wheel to both sides twice).

2) Refill reservoir with new fluid. Repeat draining procedure, then fill reservoir to specified level.

HYDRAULIC PRESSURE TESTING

1) Disconnect pressure line from steering gear case and mount a pressure gauge in line. Perform Steering Gear Air Removal, as previously described. After warming engine, set to idle speed. Open pressure gauge valve fully and record readings at the time steering wheel is turned completely left and completely right. Suitable pressure reading should be 1022 psi. **NOTE** - Do not hold steering in either extreme position for any length of time as damage may result to vane pump due to rising fluid temperatures. If pressure does not rise to specifications, pump, hoses, or steering gear is defective.

2) Gradually close pressure gauge valve and record pressure. If pressure fails to rise to same specifications as given above, pump is faulty. If less than minimum specification was recorded above during turning check, steering gear is defective. Also, if greater than maximum pressure was recorded during valve closing test, steering gear is faulty.

NOTE - Test pressure specification is determined with fluid temperature at 176° F (80° C).

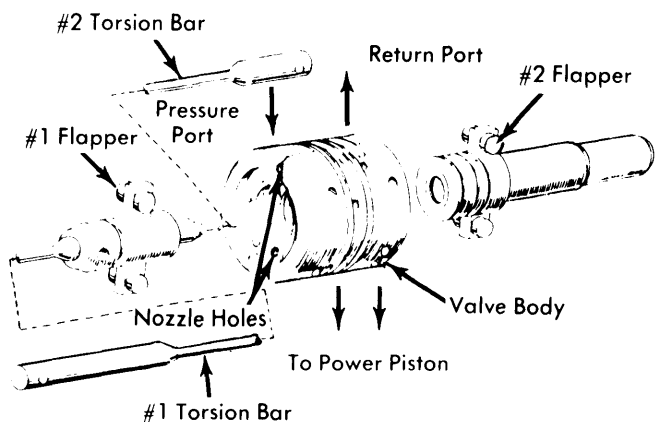


Fig. 2 Disassembled View of Valve Body and Flappers

TOYOTA CORONA POWER-ASSISTED WORM AND SECTOR (Cont.)

REMOVAL & INSTALLATION

POWER STEERING PUMP

Removal — Loosen pulley mounting nut before loosening drive belt. Disconnect pressure feed line from pump housing.

NOTE — Keep disconnected hose at high level to prevent fluid from draining out. Also plug pump housing hose fitting. Disconnect inlet fluid line. Remove pump assembly from mounting bracket and adjusting strap.

Installation — Install in reverse of removal procedures, noting the following: Adjust drive belt tension as previously described, then perform Air Removal procedure.

POWER STEERING GEAR

Removal — Disconnect pressure feed hose and inlet return line from steering gear housing. Remove bolt securing the intermediate shaft to flexible coupling. Unscrew nut from cross shaft. Remove pitman arm, using suitable puller (09610-20011). Unbolt steering gear from frame, then remove gear assembly from vehicle. **NOTE** — Do not lose shims from their mounting positions; they must be retained for replacement.

Installation — Reverse removal procedure, noting the following: Replace mounting shims in original positions. Perform Air Removal procedure, as previously described.

OVERHAUL

POWER STEERING PUMP

Disassembly — 1) **NOTE** — Pump disassembly will be made easier if a suitable holding tool is used (09629-22010). Clamp holding tool in vise and mount pump assembly to tool. Remove front reservoir attaching bolt, then remove both rear reservoir bolts. Detach reservoir by tapping at pump inlet with a plastic hammer.

2) Remove pressure hose union from pump and withdraw flow control valve and compression spring. Unscrew five bolts securing pump housing halves. Remove front housing by holding rotor shaft and fixed ring, then tap front housing off with plastic hammer. Remove nut from rotor shaft. **NOTE** — Bolt which retains front of reservoir is slightly longer than five pump housing bolts.

3) Tap rear housing from fixed ring. **CAUTION** — Do not tap flow control valve. Clamp rear housing and holder in a vise. Remove screw, washer, and snap ring from in front of flow control valve. Reinstall screw and grip with pliers to pull flow control spring seat from bore.

4) Remove relief pressure set bolt. **NOTE** — Do not disassemble relief bolt unless pump oil pressure stays low at all times.

5) Disassemble fixed ring and rotor shaft. Pull out slippers, springs, and spring seat. Extract rotor from fixed ring. Remove "O" ring from inner groove of rear housing, then remove rear side plate. Withdraw "O" ring and side plate from front housing.

Inspection — 1) Clean all disassembled parts in solvent and blow dry. Inspect oil seal lip and bushing sliding surface for wear or damage. Check rotor outer surface for wear or scoring. Inspect rotor-to-side plate contact surface.

2) Measure overall length of rotor (between end faces) and overall length of fixed ring. If overall length of rotor is more

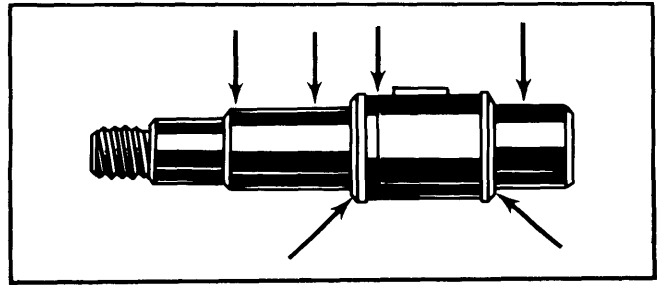


Fig. 3 Rotor Shaft Sub-Assembly Inspection Points

than .0024" (.06 mm) shorter than fixed ring overall length, replace with new rotor shaft sub-assembly.

3) Inspect slipper for wear: Measure length and thickness. If thickness is less than .0551" (1.4 mm) or if length is less than 1.571" (39.920 mm), replace entire set.

4) Inspect front and rear housing bushings. Bushing-to-rotor shaft clearance must not exceed .0012" (.03 mm). Inspect internal surface of fixed ring. If worn, scratched, or scored, replace ring. Check front and rear side plates at sliding surfaces. Bushings cannot be replaced separately. Replace entire housing.

5) Measure free length of slipper compression springs. If less than .51" (13 mm) replace individually. If free length varies more than .02" (0.5 mm) between springs, replace entire set.

6) If flow control valve is scratched or otherwise damaged, replace it with one having the same production number. Measure compression spring for flow control valve. If free length measures less than 1.85" (47 mm), replace spring. Inspect ball and relief spring.

7) Inspect reservoir for leakage. Inspect "S" type oil seal and replace if damaged: Remove with screwdriver. Apply a suitable lubricant to lip of new seal and install using special tool 09630-30041.

Reassembly — 1) **NOTE** — Replace all "O" rings. Unless otherwise noted, coat all sliding surfaces and "O" rings with power steering fluid. Install "O" ring into spring seat. Insert seat and snap ring into flow control bore. Install snap ring lock plate and screw. Lubricate and install flow control spring and valve. Check operation of valve by pushing into bore with finger. **NOTE** — Ensure number on flow control valve is the same as that stamped on rear housing (See Fig. 4).

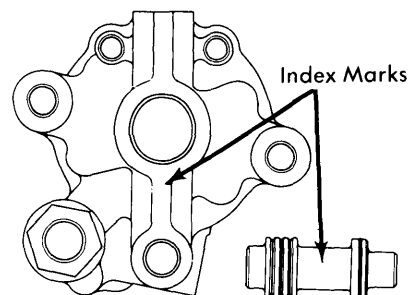


Fig. 4 Flow Control Valve and Rear Housing Index Marks

TOYOTA CORONA POWER-ASSISTED WORM AND SECTOR (Cont.)

2) Install two "O" rings on hose union and screw it into housing. Tighten to specification. Attach side plate to rear housing. Install "O" ring into groove in rear housing. Place fixed ring on rear housing. **NOTE** — It may be helpful to install two guide bolts. Tap fixed ring into rear housing. Remove guide bolts. **NOTE** — Fixed ring, if replaced, must have same stamp number as on rotor shaft.

3) Lubricate and install rotor into rear housing. Assemble the spring seat, springs, and slipper. Install slipper assembly with notched or open side facing in counterclockwise direction. **NOTE** — Ensure all slippers face rotor.

4) Install oil seal into front housing. Install lubricated side plate with chamfer facing front housing. Install "O" ring. Install front housing with long ear of housing facing right. Install two guide bolts and tap housing into position. Install "O" rings on five housing bolts and screw into position.

5) Place "O" ring on reservoir outlet and insert it into rear housing. Install "O" ring on long bracket bolt and insert and tighten. Tighten two rear reservoir bolts.

6) Assemble relief pressure set bolt as follows: Install relief spring with spring seat into relief valve bore, then install ball. Install two "O" rings on relief pressure set bolt. Position bolt into valve bore, with bolt extending .040" from rear housing. Do not lock bolt in place at this time.

7) Mount pulley on rotor shaft and measure shaft turning torque with pull scale. Torque should be less than 6.2 lbs. Ensure pulley turns smoothly.

NOTE — Install assembly and make proper adjustments. See Removal & Installation procedure in this article.

POWER STEERING GEAR

NOTE — It is recommended that Toyota tool kit part number 09630-22010 be used in disassembling and assembling power steering gear.

Disassembly — 1) To aid in overhaul procedure, bolt steering gear to holding tool and clamp gear assembly and holding tool in vise. Remove cross shaft end cover retaining bolts. Tighten end cover adjusting screw until end cover "O" ring is removed.

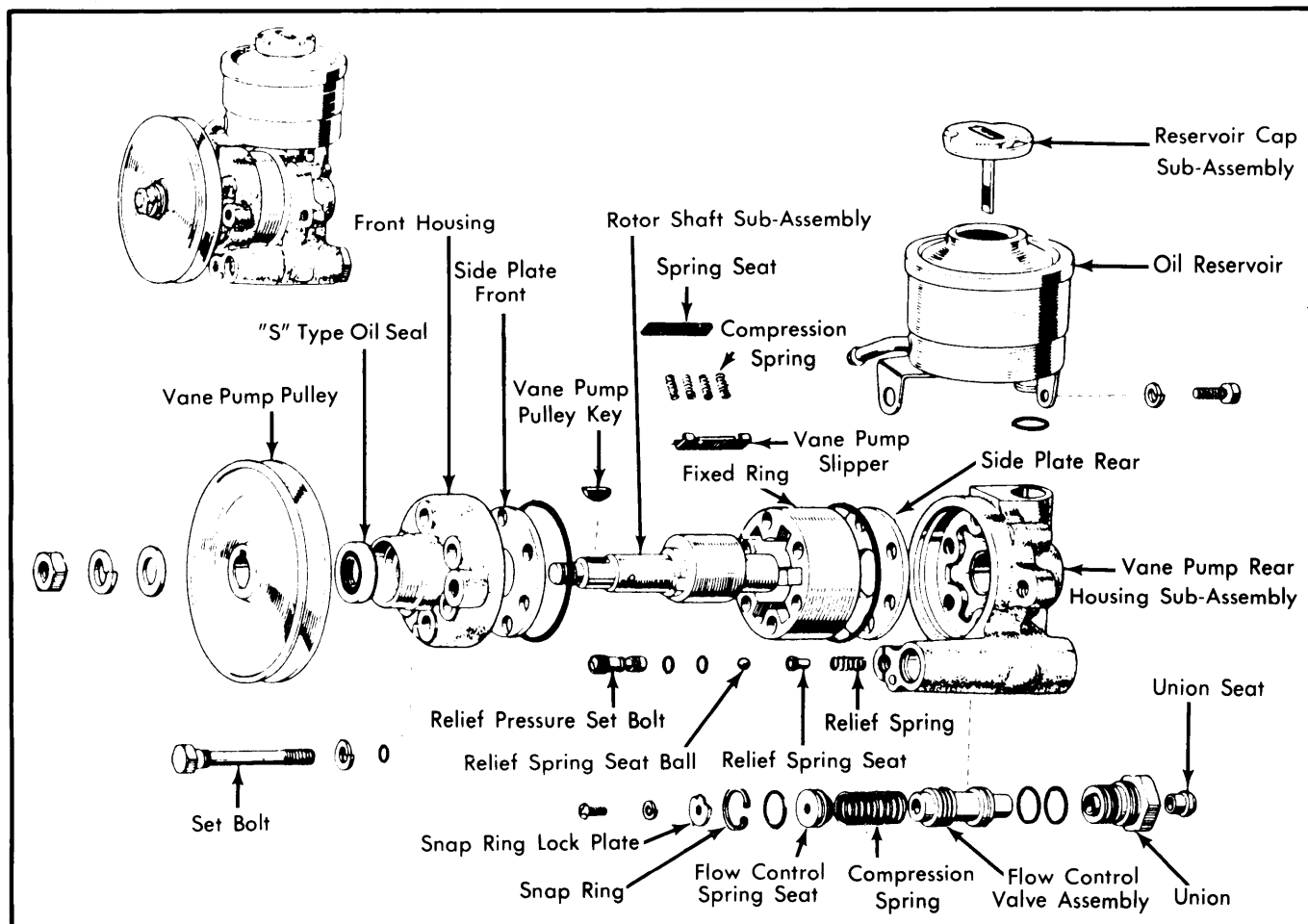


Fig. 5 Exploded View of Toyota Power Steering Pump Assembly

Power Steering

TOYOTA CORONA POWER-ASSISTED WORM AND SECTOR (Cont.)

2) Continue to tighten adjusting screw until end cover is released from cross shaft. Remove cross shaft by lightly tapping at bottom end with a hammer. Remove bolts attaching gear housing to valve housing.

3) Hold power piston nut with hand and turn worm shaft clockwise, then remove valve assembly and power piston.

CAUTION — Ensure that power piston nut does not come off worm shaft. Do not disassemble valve body or remove power piston from worm shaft.

4) Install valve assembly in vise. Using a dial indicator measure ball clearance. If clearance exceeds .006" (0.51 mm) replace valve assembly (See Fig. 6).

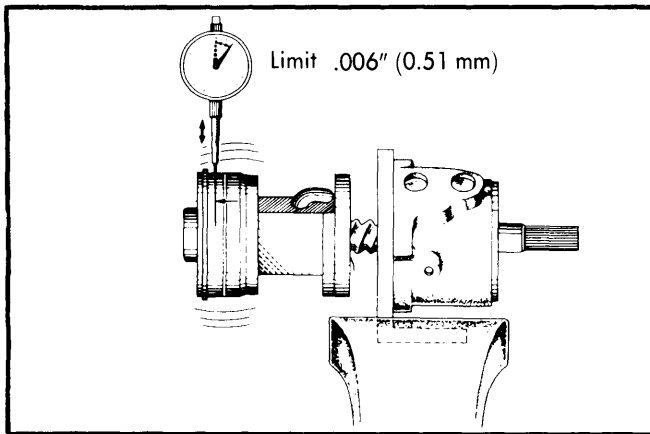


Fig. 6 Using Gauge to Check Ball Clearance

5) Install cross shaft in vise. Using dial indicator check cross shaft adjusting screw for thrust clearance .001-.002" (.03-.05 mm). To adjust thrust clearance, remove seal from shaft. Using lock nut tool, loosen lock nut and turn adjusting bolt to set clearance. Install seal on cross shaft.

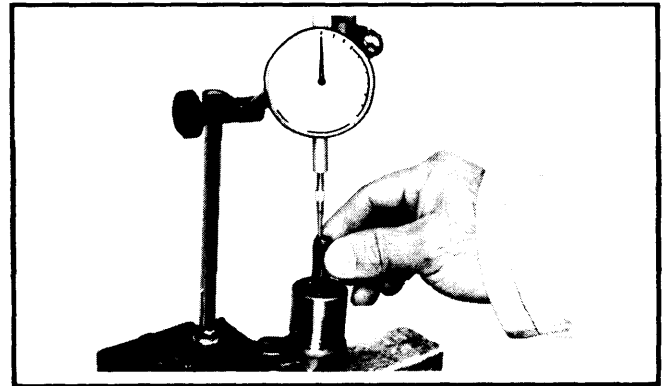


Fig. 7 Checking Thrust Clearance

6) Temporarily install valve assembly in gear housing and install mounting bolts. Using lock nut tool, remove lock nut and adjusting bolt from gear assembly. Remove and replace as needed, oil seal, "O" ring, and bearing assembly. Install lock nut and tighten. Remove valve assembly from gear housing.

Inspection — 1) Clean and dry all disassembled components. Unless otherwise mentioned, coat all sliding parts, "O" rings, and teflon rings with power steering fluid upon reassembly.

2) Inspect cross shaft for peeling or pitting at ball rolling surface. Check power piston nut mesh with cross shaft. Look for damaged tooth surfaces or ball rolling surfaces.

3) Gear housing bearings must be replaced if bearing rollers are pitted or peeled. Also replace housing bearings if it was noticed that cross shaft bearing surfaces had been scored or pitted.

Reassembly — 1) Install needle bearings with longer edge of outer race facing outwards and ensure bearing top end aligns with housing end surface. Install lower bearing so that it is

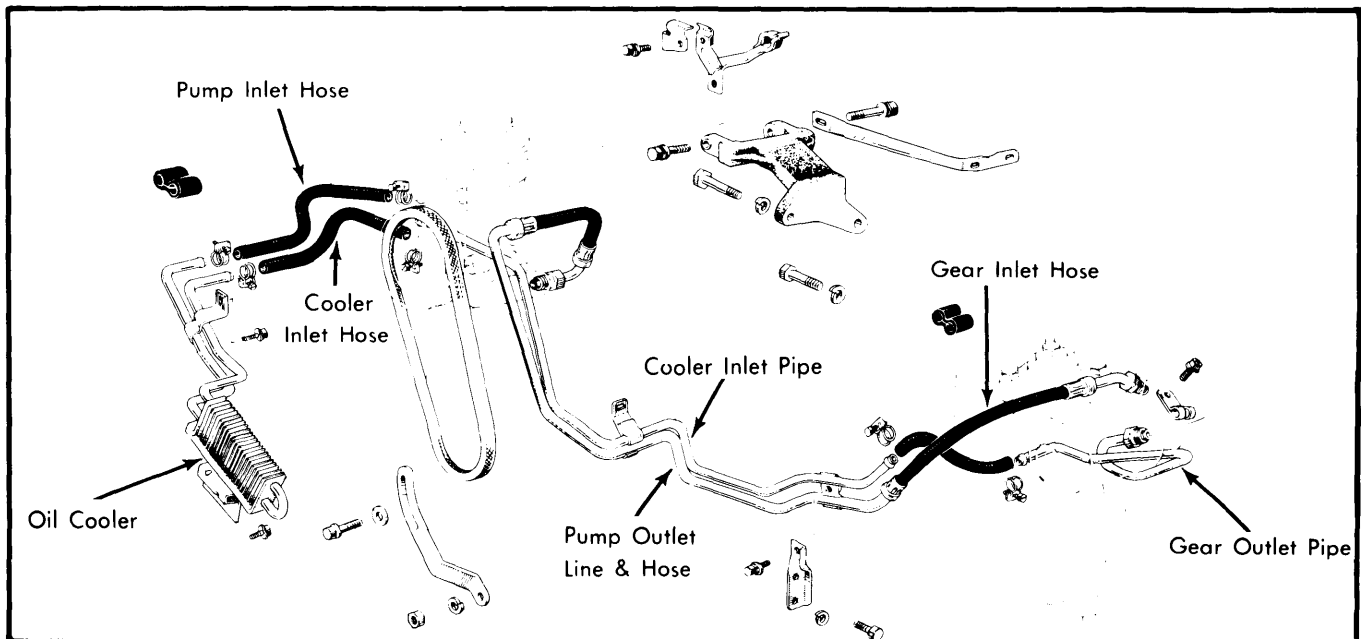


Fig. 8 Component View of Power Steering Line and Hose Placement

TOYOTA CORONA POWER-ASSISTED WORM AND SECTOR (Cont.)

positioned 0.764" (19.4 mm) away from housing inner end surface.

2) Install "O" ring, teflon ring and spacer in gear housing. Install "O" ring, valve housing, and mounting bolts. Tighten bolts to specifications. To adjust preload on worm shaft, loosen lock nut and install shaft tool and torque wrench on shaft. Preload should be 3.5-5.6 INCH lbs. (4-6.5 cmkg). Hold power piston nut to prevent it from turning.

3) Insert shaft holding tool inside of lock nut tool and tighten lock nut on worm shaft. Wrap a piece of vinyl tape around spline area of cross shaft. Align shaft gear with power piston nut gear and insert cross shaft in gear housing.

CAUTION — Do not turn cross shaft, because of possible damage to "O" ring.

4) Insert cross shaft (with cover attached) into housing and install mounting bolts. Tighten bolts to specifications. To adjust preload of cross shaft, set worm shaft to midpoint position. Determine total number of shaft turns and return from full lock by half that number.

5) Install shaft tool over shaft and attach a torque wrench. Using a screwdriver turn cross shaft adjusting bolt to specified

preload, 2.6-3.5 INCH lbs. (3-4 cmkg). Install seal and nut on adjusting bolt, tighten nut to specifications.

6) Recheck worm gear preload to see that both right and left rotations are identical. Stake worm gear lock nut at three points.

7 Remove teflon ring and "O" ring from gear housing. Using needle bearing removing tool, remove needle bearings.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Pump Housing & Bracket Bolts	18-25 (2.5-3.5)
Hose Union-to-Pump Housing	36-50 (5.0-6.9)
Rear Reservoir Bolts	3-5 (0.4-0.7)
Worm Bearing Adj. Screw	
Lock Nut	72-94 (10.0-13.0)
Cross Shaft End Cover	29-40 (4.0-5.5)
Valve Housing-to-Gear Housing	29-40 (4.0-5.5)
Gear Housing-to-Frame	36-51 (5.0-7.1)
Cross Shaft-to-Pitman Arm	80-101 (11.1-14.0)
Pulley-to-Pump	25-39 (3.5-5.4)

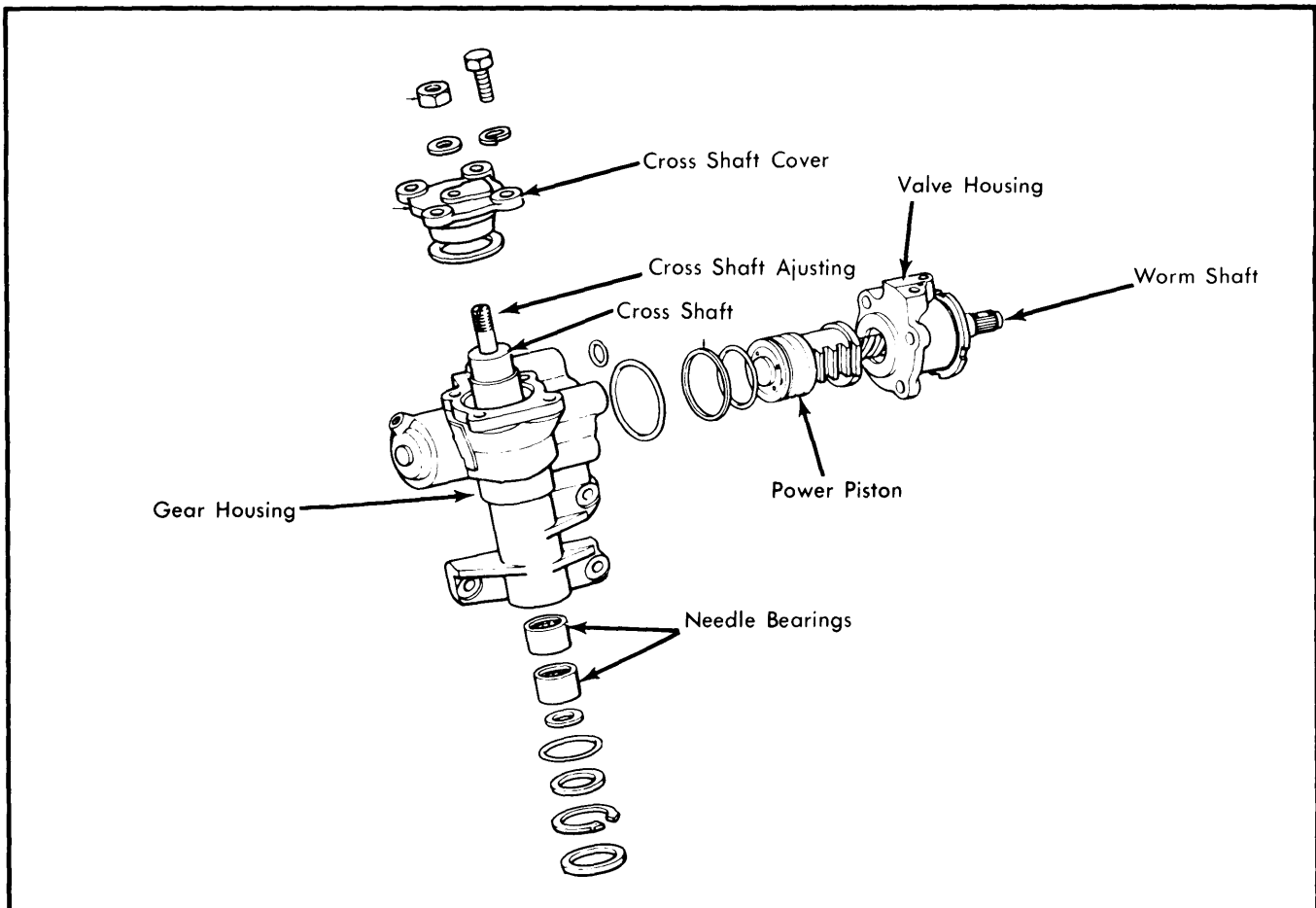


Fig. 9 Exploded View of Power Steering Gear