1973-74 FORD (SAGINAW) ROTARY VALVE POWER STEERING

Bronco (1973-74)

DESCRIPTION

Gear is variable ratio, recirculating ball type. Steel balls work as a rolling thread between steering gear worm shaft and rack-piston nut. Worm shaft thrust is supported by a thrust bearing and two conical thrust races at lower end, and by a bearing in adjuster plug at upper end. This design provides continual spring loaded pressure on worm shaft to prevent loss of thrust bearing preload for life of gear. Adjuster plug provides initial preload adjustment and service adjustment when servicing gear. As worm shaft is turned right, rack-piston moves upward in gear; turning worm shaft left moves rack-piston downward in gear. Rack-piston teeth mesh with sector, which is forged as part of the sector shaft. Turning worm shaft turns sector shaft, which turns wheels through mechanical linkage.

LUBRICATION

Check fluid level in pump reservoir every 6,000 miles. Steering gear and fluid must be at normal operating temperature. If necessary, add Power Steering Fluid to bring level to proper mark on dipstick.

ADJUSTMENT

GEAR MESH LOAD

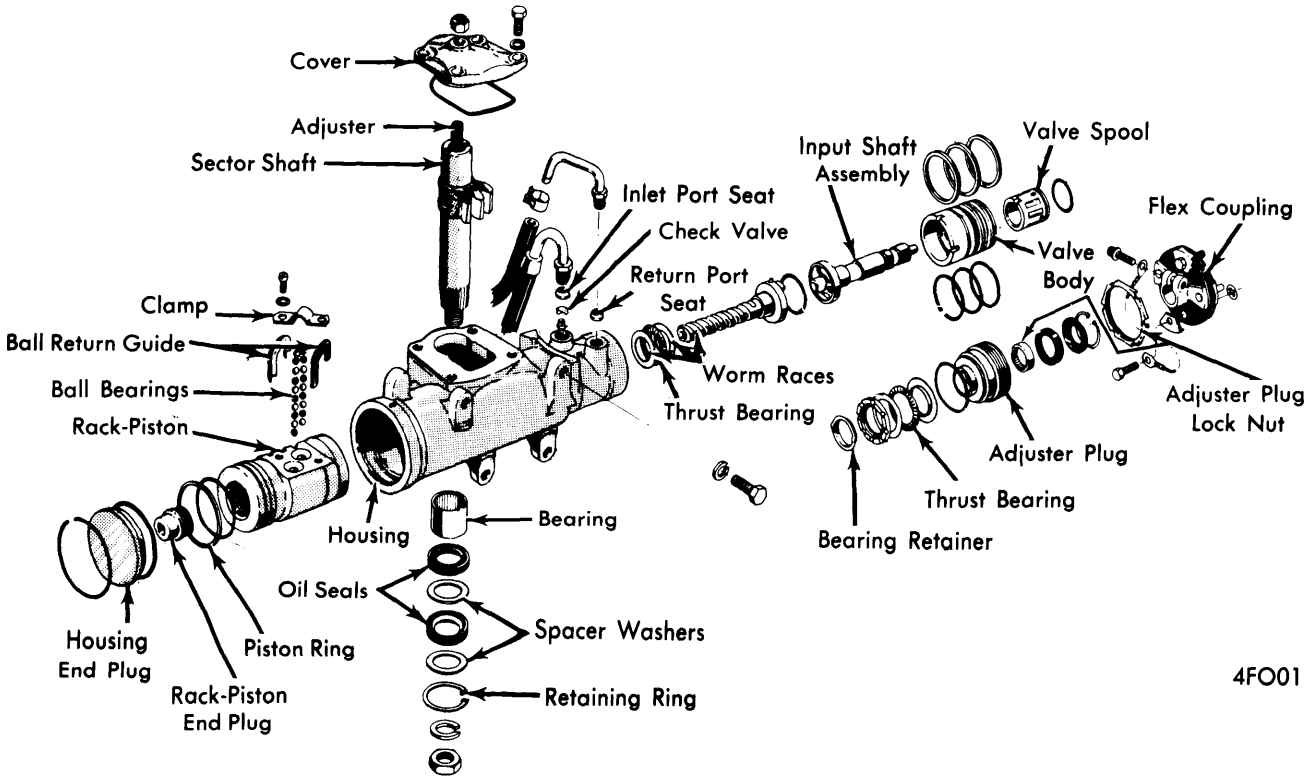
1) Disconnect pitman arm from sector shaft, then remove horn button from steering wheel. Disconnect fluid return line at pump reservoir, cap reservoir fitting, and place end of return line in a clean container. Rotate steering wheel in both directions several times to discharge fluid from steering gear.

2) Attach an INCH lb. torque wrench to steering wheel attaching nut, and turn steering shaft ½ turn off center in either direction. Note torque required to turn steering shaft through a 20° arc from this position.

3) Turn gear back to center position, and measure torque required to rotate steering shaft through a 20° arc from this position. Loosen sector shaft adjuster lock nut, and turn adjuster until reading at center position is 6 INCH lbs. greater than reading noted at position ½ turn off center. Tighten lock nut while holding adjuster in place. Recheck readings, then replace pitman arm and horn button. Connect fluid return line, refill pump reservoir, and bleed system. *See POWER STEERING PUMPS in this Section.*

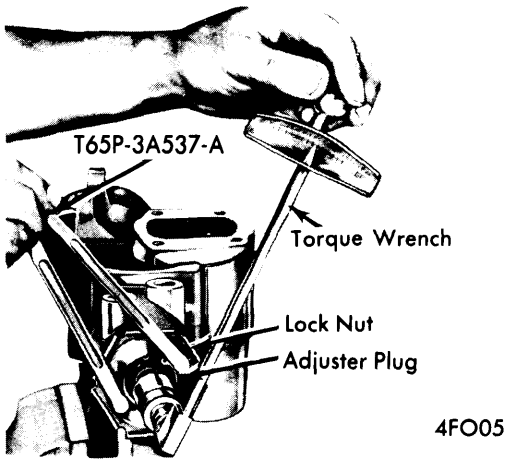
THRUST BEARING PRELOAD

With steering gear removed from vehicle, loosen adjuster plug lock nut. While rotating input shaft, tighten adjuster plug until a slight drag is felt. Loosen adjuster plug ⅛ turn. Using an INCH lb. torque wrench, measure input shaft rotational drag. Tighten adjuster plug until drag is increased by 1-3 INCH lbs. Tighten adjuster plug lock nut, and recheck preload. Total preload must not exceed 8 INCH lbs.



STEERING GEAR ASSEMBLY

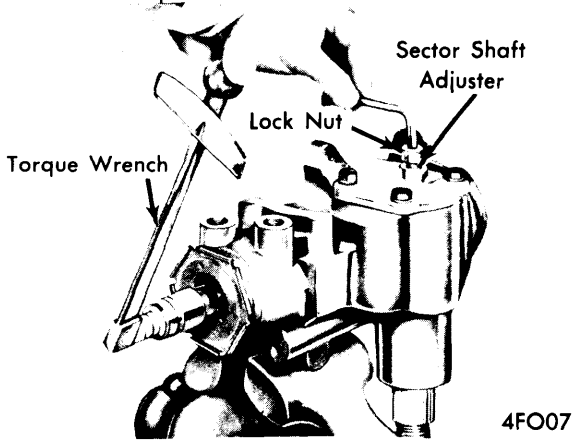
1973-74 FORD (SAGINAW) ROTARY VALVE POWER STEERING (Cont.)



THRUST BEARING PRELOAD ADJUSTMENT

OVERCENTER POSITION

With steering gear removed from vehicle, turn input shaft to full left or full right position, then turn back approximately 1 ¾ turns to center. With gear on center and sector shaft adjuster loose, rotate input shaft, using an INCH lb. torque wrench. Note torque required to rotate input shaft. Center gear and adjust sector shaft adjuster until rotational torque, measured at input shaft, is 4-8 INCH lbs. greater than total preload and drag measured at completion of thrust bearing preload adjustment. *NOTE — Do not rotate gear through more than a 20° arc from center.* Tighten adjuster lock nut and recheck final total preload.



OVERCENTER POSITION ADJUSTMENT

TESTING

PUMP PRESSURE

With fluid at proper level in pump reservoir, belt tension properly adjusted, and power steering fluid at normal operating temperature, install suitable gauge and valve assembly between power steering pump and high pressure hose. With engine idling at 600-800 RPM, and gauge valve open, note pressure reading while turning wheels from stop to stop. If maximum pressure reading is below 620 psi, temporarily close gauge valve and note reading obtained. *CAUTION — Do not leave gauge valve closed for more than five seconds.* If reading with gauge valve closed is below 620 psi, pump is faulty. If reading is above 620 psi, power steering gear is faulty.

REMOVAL & INSTALLATION

STEERING GEAR

Removal & Installation — Disconnect hydraulic lines at power steering gear and cap openings. Remove bolts securing flex coupling to steering gear input shaft, and to steering column. Raise vehicle, and remove pitman arm-to-sector shaft lock nut. Using suitable tool, remove pitman arm from sector shaft, using care not to damage seals. If vehicle equipped with standard transmission, remove clutch fork return spring to provide clearance for steering gearbox removal. Support gearbox and remove attaching bolts. Work gear free of flex coupling, and remove gearbox assembly from vehicle. To install, reverse removal procedure and bleed system. *See POWER STEERING PUMPS in this Section.*

OVERHAUL

STEERING GEAR

NOTE — If complete gearbox assembly is not to be overhauled, remove unit to be serviced and proceed to disassembly and reassembly of that unit.

Disassembly — Rotate end plug retainer ring until one end of ring is over hole in housing. Force end of ring from its groove in housing, and remove ring. Rotate input shaft counterclockwise to force end plug from housing. *CAUTION — Do not rotate shaft more than necessary to remove plug, or ball bearings will fall out of rack-piston and worm assembly.* Rotate input shaft clockwise ½ turn to draw piston inward. Remove end plug from piston. Remove lock nut from adjuster, and remove sector shaft cover. Remove and discard cover "O" ring. Turn input shaft to center sector shaft teeth in housing. Tap end of sector shaft with soft-faced hammer to free shaft from housing. Remove adjuster plug lock nut. Using suitable spanner wrench (T65P-3A537-A), remove adjuster plug. Insert suitable tool (T65P-3D517-A) into end of rack-piston until tool contacts worm shaft. Rotate input shaft counter-clockwise until worm is free of rack-piston. Remove rack-piston from housing, being sure to keep tool fully inserted in order to prevent ball bearings from falling out. Remove input shaft and control valve assembly from housing. Lift worm, lower thrust bearing, and races from housing.

Reassembly — Lubricate all parts with clean power steering fluid. Install thrust bearing and races on worm. Align valve body drive pin on worm with narrow pin slot in valve body, and install "O" ring between valve body and worm head. Install valve body and worm assembly in housing, making sure fluid return hole in gear housing is fully visible. Position suitable alignment tool (T65P-3A537-B) over input shaft, install new adjuster plug "O" ring, and install adjuster plug over alignment tool. Remove alignment tool from housing. Install adjuster plug lock nut and adjust thrust bearing preload. *See Thrust Bearing Preload Adjustment.* Insert suitable tool (T65P-3D517-A) into rack-piston, and install rack-piston assembly into housing, being sure to keep tool in contact with worm shaft. Force rack-piston inward until it contacts worm shaft. Turn input shaft clockwise until middle rack groove in rack-piston is aligned with sector shaft roller bearing. Remove tool. Install new sector shaft cover "O" ring, then thread sector shaft cover onto adjuster screw until bottomed. Back off 1 ½ turns. Install sector shaft so that center gear tooth meshes with center groove in rack-piston, and install cover attaching bolts. Install adjuster lock nut, and install piston end plug in rack-piston. Install housing end plug, and end plug retainer ring. Adjust steering gear overcenter position. *See Overcenter Position Adjustment.*

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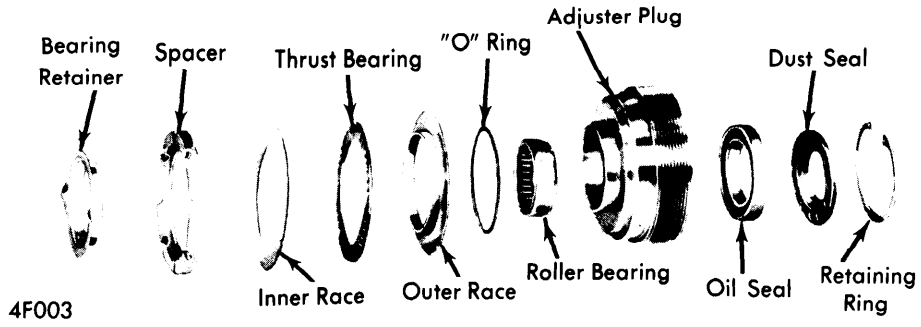


ADJUSTER PLUG

ADJUSTER PLUG

Disassembly – Remove thrust bearing retainer with screwdriver, being careful not to score needle bearing bore. Discard retainer. Remove thrust bearing spacer, thrust bearing, and races. Remove and discard adjuster plug "O" ring, then remove input shaft seal retainer. Remove and discard dust seal, then pry input shaft seal from adjuster plug. Inspect needle bearing in adjuster plug, and remove if damaged by pressing out from spacer end. Discard bearing.

Inspection – Inspect thrust bearing spacer for cracks, then inspect thrust bearing rollers for water, pitting, scoring, or cracking. If any of these conditions exist, replace both thrust bearing races and check thrust bearing spacer. Inspect thrust bearing races for wear, pitting, scoring, or cracking.

Reassembly – Press needle bearing into adjuster plug with identification end down, until bearing bottomed on input shaft seal bore. Install input shaft seal with spring in seal facing adjuster plug. Install dust seal, with lip facing upward, into adjuster plug, then install retainer ring. Install adjuster plug "O" ring. Assemble thrust bearing, thrust bearing races, and thrust bearing spacer on adjuster plug. Using a brass or wooden dowel, press bearing retainer into needle bearing bore.

ROTARY VALVE

NOTE – The complete valve assembly is hydraulically balanced during manufacture. If replacement of any part other than rings, seals, or valve spool centering spring is necessary, replace complete rotary valve assembly.

Disassembly – Invert valve, and tap torsion bar end on work bench lightly until torsion bar cap separates from valve body. Remove and discard cap-to-body "O" ring. Push input shaft down through valve body until drive pin hole is visible. Tilt input shaft to disengage drive pin from valve spool, and remove input shaft from valve body. Slide valve spool out of top of valve body.

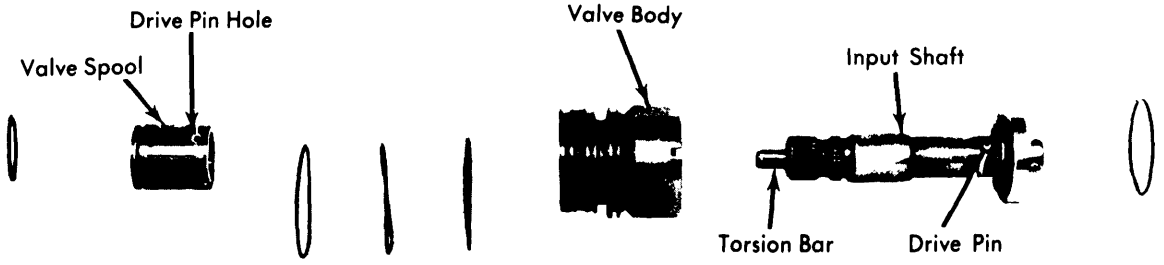
Reassembly – Lubricate dampener "O" ring with power steering fluid and install on spool. Insert spool into valve body, using a turning motion, until spool is even with valve body bottom, and drive pin hole is directly opposite deep notch in valve body. Install input shaft into valve spool, making sure drive pin holes are aligned. Insert drive pin into hole in valve spool, and pull assembly into valve body, keeping cap slot and body pin aligned. *NOTE – Cap is seated correctly when top surface of cap is at least 3/32" below deep notch in valve body.* Install cap-to-body "O" ring.

RACK-PISTON & WORM

Disassembly – Remove piston ring and back-up "O" ring from rack-piston nut. Remove ball return guide clamp, ball return guide, ball retaining tool, and all ball bearings.

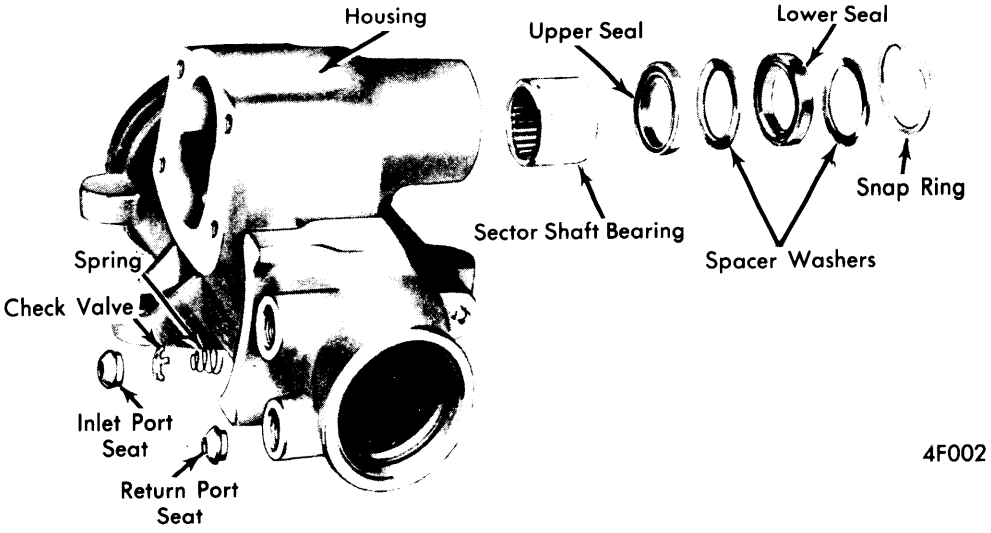
Inspection – Clean and dry all parts. Inspect worm and rack-piston grooves and all balls for scoring. *NOTE – If either rack-piston or worm are damaged, both must be replaced as a matched set.* Make sure ends of ball return guides, where ball bearings enter and leave, are not damaged. Replace lower thrust bearing races if worn, pitted, scored, or cracked.

Reassembly – 1) Install "O" ring and piston ring on rack-piston, using care not to twist "O" ring. Install worm into rack-piston, until worm is against piston shoulder. Install 16 balls into rack-piston while slowly rotating worm counterclockwise. *NOTE – Install plain and black ball bearings alternately.* Install remaining ball bearings into ball return guide, making sure balls in guide alternate in color with last ball installed in rack-piston. Install guide into rack-piston, install guide clamp, and tighten clamp attaching screws.



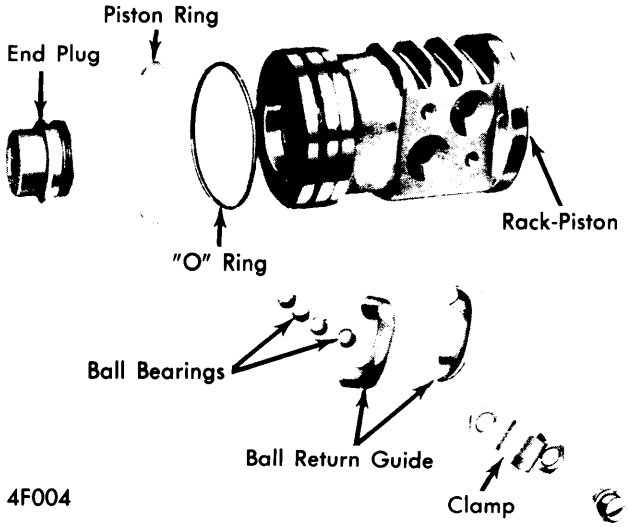
ROTARY VALVE ASSEMBLY

1973-74 FORD (SAGINAW) ROTARY VALVE POWER STEERING (Cont.)



STEERING GEAR HOUSING

2) Clamp rack-piston in a vise with worm shaft up and install rotary valve assembly on worm, such that it engages worm drive pin. Rotate worm so it is 1¼" from rack-piston to thrust bearing face. Install an INCH lb. torque wrench on input shaft, and note torque required to rotate shaft through an arc of 60° in each direction. Torque with worm rotating should be 1-4 INCH lbs. If torque too high or too low, a new set of ball bearings should be installed.



RACK-PISTON ASSEMBLY

3) Determine correct ball bearing size as follows; Note ball size stamped on rack-piston. To increase preload, install next larger size ball. To decrease preload, install next smaller size ball. If no number is stamped on rack-piston, original ball size was No. 7. *CAUTION — A change of one ball size will change preload approximately 1 INCH lb.* Final preload on replacement balls should be 2-3 INCH lbs.

Replacement Ball Bearings

Ball Number Size	Diameter Range
6	.28112-.28122"
7	.28120-.28130"
8	.28128-.28138"
9	.28136-.28146"
10	.28144-.28154"
11	.28152-.28162"

4) Remove valve assembly from worm. Remove rack-piston from vise. Insert suitable tool (T65P-3D517-A) into plug end of rack-piston until it contacts worm shaft. Apply pressure to tool while rotating worm shaft out of rack-piston. Leave tool in place until piston is installed in housing.

STEERING GEAR HOUSING

Disassembly — Remove sector shaft seal retaining ring, and remove lower spacer washer. Remove lower seal, spacer washer, and upper seal from housing. Press sector shaft bearing out of housing from lower end. To remove port seat, tap out seat, using a 5/16-18 tap. Thread a bolt, with nut and flat washer into seat. Hold bolt from turning while tightening nut to extract seat from housing.

Reassembly — Working from upper end, press new bearing into housing until seated .030" below edge of bore. Lubricate new seal in power steering fluid, then install single lip seal, spacer washer, double lip seal and second spacer washer. Install sector shaft seal retaining ring. If port seat removed, position new port seat over opening in housing, and using suitable tool (T65P-3548-A), drive seat into place.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Sector Shaft Cover Bolts	30-35
Sector Shaft Adjuster Lock Nut	30-35
Ball Return Guide Clamp Screw	3-6
Adjuster Plug Lock Nut	50-110
Piston End Plug	50-110