1969-74 FORD (THOMPSON) INTEGRAL POWER STEERING

Ford (1969-74)

NOTE – Some models use other units. See Ford (Bendix) Integral Power Steering and Ford (Saginaw) Rotary Valve Power Steering in this Section.

DESCRIPTION

Torsion bar type power steering unit consists of a worm and one-piece rack-piston, which is meshed to gear teeth on sector shaft. Hydraulic control valve, valve actuator, input shaft, and torsion bar assembly are mounted to end of worm shaft and operated by twisting action of torsion bar. One-piece rack-piston, worm and sector shaft are mounted in one housing, while valve spool is mounted in an attached housing. This allows internal passage of fluid between valve and cylinder, thus eliminating need for all external lines and hoses, except pressure and return hoses between pump and gearbox assembly.

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.

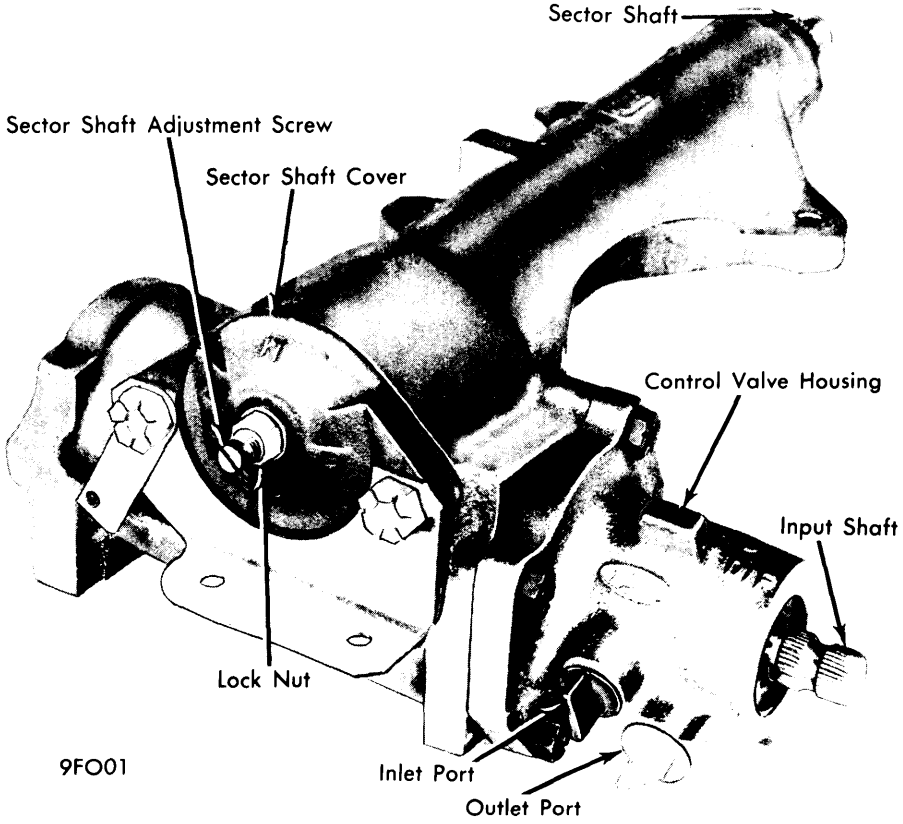
ADJUSTMENT

VALVE SPOOL CENTERING

Install a suitable 0-2000 psi pressure gauge and valve assembly between power steering pump and high pressure line. Open gauge valve completely, and remove horn button from steering wheel. Attach an INCH-lb. torque wrench to steering wheel attaching nut. With power steering fluid at normal operating temperature and correct level, steering wheel in centered position, and engine at normal operating temperature, set engine idle to 1000 RPM. Using torque wrench, rotate steering shaft to either side of center to obtain gauge reading of 250 psi in each direction. Torque reading should be same in both directions when 250 psi is reached. If difference between readings exceeds 4 INCH lbs., steering gear must be removed and valve centering shim replaced. If steering effort is greater toward left side, increase shim thickness. If steering effort is greater toward right side, decrease shim thickness.

OVERCENTER POSITION

Disconnect pitman arm from sector shaft. Disconnect fluid return line at pump reservoir, and cap reservoir return line pipe. Place end of return line in clean container and cycle steering wheel in both directions several times to discharge all fluid from steering gearbox. Remove horn button from steering wheel, and turn steering wheel until positioned 45° from left steering stop. Using an INCH-lb. torque wrench on steering wheel attaching nut, measure force required to turn steering shaft ⅛ turn from 45° position. Turn steering wheel back to center position, and measure force required to move steering shaft back and forth across center position. Loosen lock nut and turn adjusting screw until reading across center position is 11-12 INCH lbs. greater than reading across 45° position. Tighten lock nut while holding adjusting screw in place.



FORD (THOMPSON) STEERING GEARBOX

1969-74 FORD (THOMPSON) INTEGRAL POWER STEERING (Cont.)

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 pressure 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 lines. Plug ports in steering gear to prevent entry of foreign matter. 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, being sure not to damage seals. If vehicle is equipped with standard transmission, remove clutch fork return spring to provide clearance for steering gearbox removal. Support gearbox, and remove gearbox attaching bolts. Work gear free of flex coupling, and remove gearbox assembly from vehicle. Remove flex coupling from input shaft (if necessary). 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 overhauled and proceed to disassembly and reassembly of that unit.

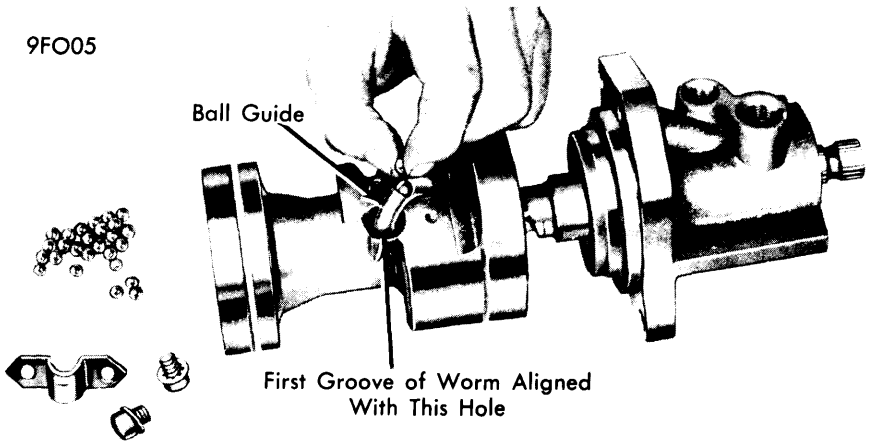
Disassembly — 1) Drain steering gear completely, and mount it in a soft-jawed vise. Remove lock nut and washer from adjusting screw. Turn input shaft to either stop, then turn shaft back 1¾ turns to center gear. Remove sector shaft cover attaching screws. Tap lower end of sector shaft with a soft-faced hammer to loosen shaft in bore, then lift shaft and cover assembly from housing. Discard cover "O" ring.

2) Turn sector shaft cover counterclockwise to remove it from adjusting screw. Remove valve housing attaching bolts. Lift valve housing from steering gear housing, while holding piston to prevent it from rotating off worm shaft. Remove valve housing and lube passage "O" rings and discard them. Stand valve body and piston assembly on end, with piston end down. Rotate input shaft counterclockwise out of piston, allowing ball bearings to drop into piston. Place cloth over piston, invert piston, and remove ball bearings.

3) Remove ball guide clamp attaching screws, then remove clamp and guides. Install valve body in suitable holding fixture, loosen Allen head race nut screw, and remove worm bearing race nut. Carefully slide input shaft, worm, and valve assembly out of valve housing. *CAUTION — Due to close clearance, cocking of spool may cause it to jam in housing.* Remove shim from valve housing bore.

Reassembly — 1) Mount valve assembly in suitable holding fixture, flanged end up. Place required thickness valve spool centering shim in housing, and carefully install worm assembly in housing. Install and tighten race nut, then install and tighten Allen head race nut setscrew through housing.

2) Place piston on bench with ball guide holes facing up. Insert worm shaft so that first groove in shaft is aligned with hole nearest to center of piston. Position ball guide in piston. Place ball bearings into ball guide, while turning worm in clockwise direction. If all balls have not been fed into guide upon reaching right stop, rotate input shaft back and forth while installing remaining balls. After balls have been installed, DO NOT rotate input shaft or piston more than 3½ turns off right stop. This will prevent balls from falling out of circuit.



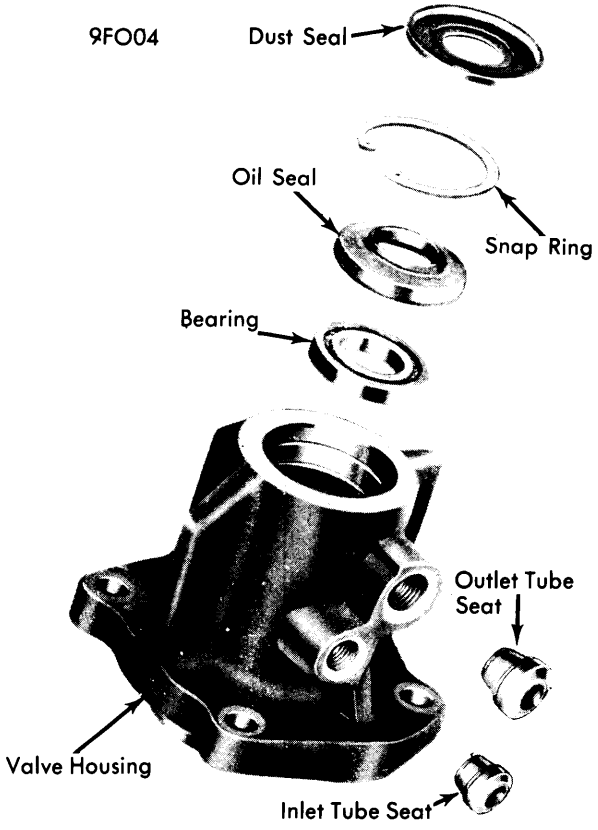
1969-74 FORD (THOMPSON) INTEGRAL POWER STEERING (Cont.)

3) Secure guides in ball nut with guide clamp. Position new lube passage "O" ring in counterbore of gear housing. Apply vaseline to Teflon seal on piston, and place new "O" ring on valve housing. Slide piston and valve into gear housing, using care not to damage Teflon seal. Align lube passage in valve housing with passage in gear housing. Loosely install housing attaching bolts. Rotate ball nut until teeth are in same plane as sector shaft teeth. Tighten valve housing attaching bolts.

4) Position sector shaft cover "O" ring in steering gear housing. Turn input shaft as required to center piston. Apply vaseline to sector shaft journal, position sector shaft and cover assembly in gear housing, and install and tighten cover attaching bolts. Adjust steering overcenter position. See *Overcenter Position Adjustment.*

CONTROL VALVE HOUSING

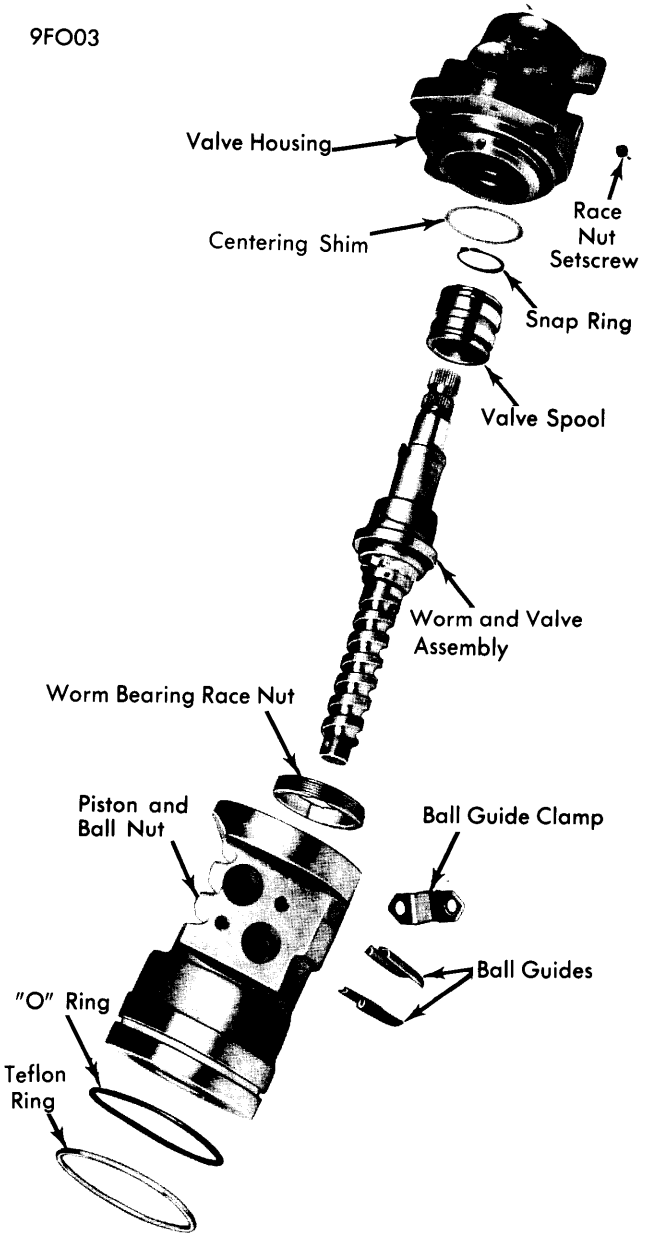
Disassembly & Reassembly – Remove dust seal and snap ring, and discard seal. Invert housing, and drive out bearing and seal, using care not to damage valve bore. Using an E-Z out, remove inlet and outlet tube seats (if necessary). Position new seats in ports, and install hydraulic line nuts to press seats into position. Coat bearing and seal surface of housing with vaseline, then press bearing into position in housing. Dip new oil seal in power steering fluid and place seal in housing with metal side out. Drive seal into housing until outer edge of seal does not quite clear snap ring groove. Position snap ring in housing, and drive on ring until ring seats in groove. This will properly seat seal. Place dust seal in housing with dished side facing out.



CONTROL VALVE HOUSING

VALVE & ACTUATOR

Disassembly & Reassembly – Remove snap ring from end of actuator, and slide control valve spool off actuator. Install valve spool evenly and slowly, with a slight oscillating motion, into flanged end of valve housing. Valve identification groove must be pointing outward. Valve must move freely in housing, and valve spool should enter housing bore freely and fall by its own weight. If valve spool is not free, check for burrs at outward edges of working lands in housing and remove with a hard stone. *NOTE – Stone valve in radial direction only.* Remove spool from housing and slide into actuator, making sure groove in spool annulus is toward worm. Install spool retaining ring, with beveled edge of snap ring toward spool. Check clearance between spool and snap ring. Clearance should be .0005-.035". If not within limits, select a snap ring which will allow .002" clearance.

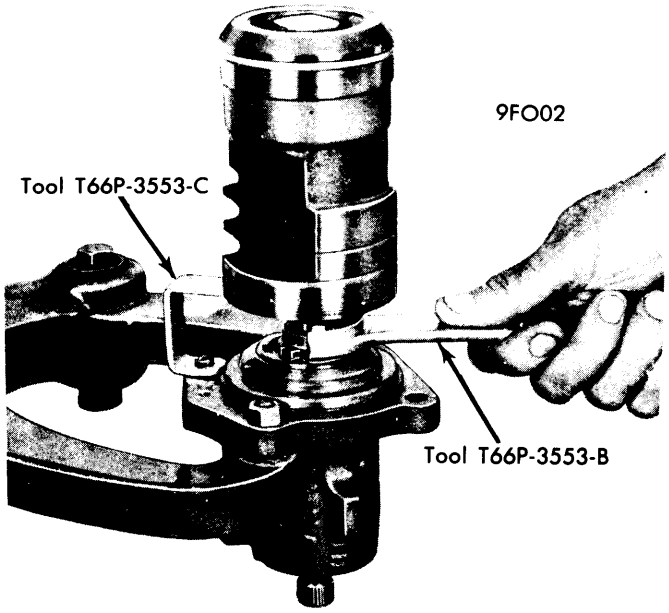


CONTROL VALVE ASSEMBLY

1969-74 FORD (THOMPSON) INTEGRAL POWER STEERING (Cont.)

WORM & PISTON

Disassembly & Reassembly – 1) Place control valve housing in a suitable holding fixture, with piston facing up. Rotate piston outward 3½ turns. Insert suitable tool (T66P-3553-C), with arm facing away from piston, into a bolt hole in valve housing. Rotate arm into position under piston, loosen Allen head race nut setscrew from valve housing, then using suitable tool (T66P-3553-B), loosen worm bearing race nut. Lift piston and worm assembly from housing. *CAUTION – Hold piston to prevent it from spinning off shaft during removal.*



REMOVING WORM BEARING RACE UNIT

2) Determine correct valve centering shim thickness as follows: Shim thickness is determined by rotational torque difference between left and right turns. *See Valve Spool Centering.* There are five different thickness shims available. Notches identify shim thickness. Shim with no notches is .006". Shim thickness increases .002" for each additional notch. More than one shim may be used, providing their combined thickness does not exceed .030". Rotational torque is changed approximately 2 INCH lbs. in each direction with each shim size change.

For example: If steering rotational torque is 17 INCH lbs. to the left and 10 INCH lbs. to the right, rotational torque difference is 7 INCH lbs. Changing to a shim two sizes larger (2 INCH lb. change with each size change), would give a change of 4 INCH lbs. in each direction. Therefore, new rotational torque readings should be 13 INCH lbs. to the left, and 14 INCH lbs. to the right. *NOTE – If there is to be a slight difference, it is preferable that larger torque be to the right.*

3) Reassemble remaining parts in reverse order of disassembly, and tighten all nuts and bolts.

PISTON & BALL NUT

Disassembly & Reassembly – Remove Teflon ring and "O" ring from piston and ball nut assembly. Dip new "O" ring in power steering fluid and install it on piston and ball nut. Install new Teflon ring on piston and ball nut, using care not to stretch ring more than necessary.

STEERING GEAR HOUSING

Disassembly & Reassembly – Remove snap ring and spacer washer from lower end of housing. Using a suitable puller, remove lower seal, spacer washer, and upper seal from housing. Lubricate seals and sector shaft bore with power steering fluid, and position sector shaft seal in housing with lip of seal facing inward. Press seal into place. Place a .090" spacer washer on top of seal, and press outer seal into place with lip facing inward. Place .090" spacer washer on top of outer seal, and install snap ring in groove.

TIGHTENING SPECIFICATIONS

Application	Inch Lbs.
Ball Return Guide Clamp Screw	42-70
Allen Head Race Nut Setscrew	20-25

Application	Ft. Lbs.
Sector Shaft Cover Bolts	55-70
Sector Shaft Adjusting Screw Lock Nut	35-45
Valve Housing-to-Gear Housing Bolts	35-45
Piston End Cap	70-110
Race Retaining Nut	①

① – Tool used with torque wrench will affect observed reading of torque wrench. To obtain required torque wrench reading, multiply length of torque wrench by desired torque (60 ft. lbs.), and divide this product by sum of torque wrench length plus length of tool (5.5").