PART 13-42 Integral Power Steering Gear-Saginaw

Applies Only to Bronco

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DESCRIPTION

STEERING GEAR

The Rotary Valve Safety power steering gear displaces fluid to provide hydraulic fluid pressure assists when turning. All internal components of the gear are immersed in fluid making periodic lubrication unnecessary. In addition, the fluid acts as a cushion to absorb road shocks that may be transmitted to the driver. All fluid passages are internal except the pressure and return hoses between the gear and pump.

The rotary valve provides a smooth transmission through the driving range of steering wheel effort. A torsion bar transmits the road feel to the driver.

The rack-piston nut is one piece and is geared to the sector shaft. An adjusting screw on the end of the shaft gear maintains lash between the sector shaft and rack-piston nut (Fig. 1).

2. Slide the control valve spool (Fig. 6) off the actuator.
3. Install the valve spool slowly and evenly with a slight turning motion into the flanged end of valve housing, with the valve identification groove between the valve spool lands facing outward. Checking the valve for freedom of movement in the housing. The valve spool should enter the housing bore freely and fall by its own weight.
4. If the valve spool is not free, check for burrs at the outward edges of the working lands in the housing and remove with a hard stone.
5. Check the valve for burrs and remove as described in Step 4. Stone the valve in a **radial direction only.** Recheck the valve for freedom of movement.
6. Remove the valve spool from the housing.
7. Slide the spool onto the actuator making sure that the groove in the spool annulus is toward the worm.
8. Install the actuator spring and snap ring with the convex side actuator spring (color coded) toward the snap ring. Be sure the beveled ID of the snap ring is away from the spool.

PISTON AND BALL NUT

Disassembly and Assembly

1. Remove the Teflon ring and O-ring (Fig. 6) from the piston and ball nut. Discard both rings.
2. Dip a **new** O-ring in gear lubricant and install it on the piston and ball nut.
3. Install a **new** Teflon ring on the piston and ball nut being careful not to stretch it any more than necessary.

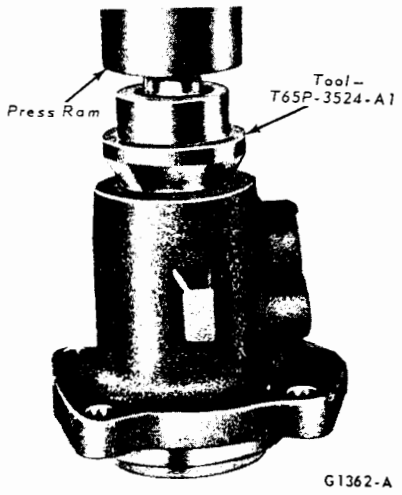


FIG. 15 Installing Oil Seal in Valve Housing

SPECIFICATIONS

FORD INTEGRAL POWER STEERING GEAR SPECIFICATIONS

Description	
Type	Recirc. Ball Torsion Bar
Ratio	17:1
Turns of Steering Wheel (Lock to Lock–Linkage Disconnected)	4
Fluid Capacity (Included in Pump Reservoir Fill)	1.6 Pints (Approx.)
Fluid Specification	D2AZ-19582-A
Worm Bearing Preload	2-8 In-Lb
Total Meshload Over Mechanical Center	17 In-Lb (Max.)
Total Meshload Over Worm Bearing Preload	9-13 In-Lb

FORD INTEGRAL POWER STEERING GEAR TORQUE LIMITS (FT-LBS)

Description	Torque
Sector Shaft Cover Bolts	55-70
Mesh Load Adjusting Screw Lock Nut	35-45
Ball Return Guide Clamp Screw	42-70 In-Lb
Valve Housing to Gear Housing Screw	35-45
Race Retaining Nut	①
Set Screw-Race Nut	20-25 In-Lb
Piston End Cap	70-110
Pressure Hose to Gear	16-25
Return Hose to Gear	25-34
Hose Clamps	1-2

① Specified Torque - Because the length of the tool required to torque the nut will affect the observed torque reading on the torque wrench, the torque reading should be computed using the length of the torque wrench and the nominal specified torque as follows:

Torque (using tool T66P-3553-B) = Length of Torque Wrench x 60 Ft-Lb / Length of Torque Wrench + 5.5 Inches

Example: With 13 inch torque wrench

$$\frac{13 \text{ In.} \times 60 \text{ Ft-Lb}}{13 \text{ In.} + 5.5 \text{ In.}} = \frac{13 \times 60 \text{ Ft-Lb}}{18.5} = 0.703 \times 60 = 42 \text{ Ft-Lb}$$

SPECIAL SERVICE TOOLS

Tool No.	Description	Tool No.	Description
T56L-33610-D	Pressure Testing Gauge Assembly	T59L-100-B	Slide Hammer-Short
T64P-3590-F	Steering Pitman Arm Remover	T58L-101-A	Puller Attachment
T57L-500-A	Bench Mounted Holding Fixture	T65P-3524-A1, A2, A3	Bearing Remover and Installer
T66P-3553-C	Spacer	T65P-3576-B	Sector Shaft Seal Installer
T66P-3553-B	Spanner Wrench		

CG1843-C

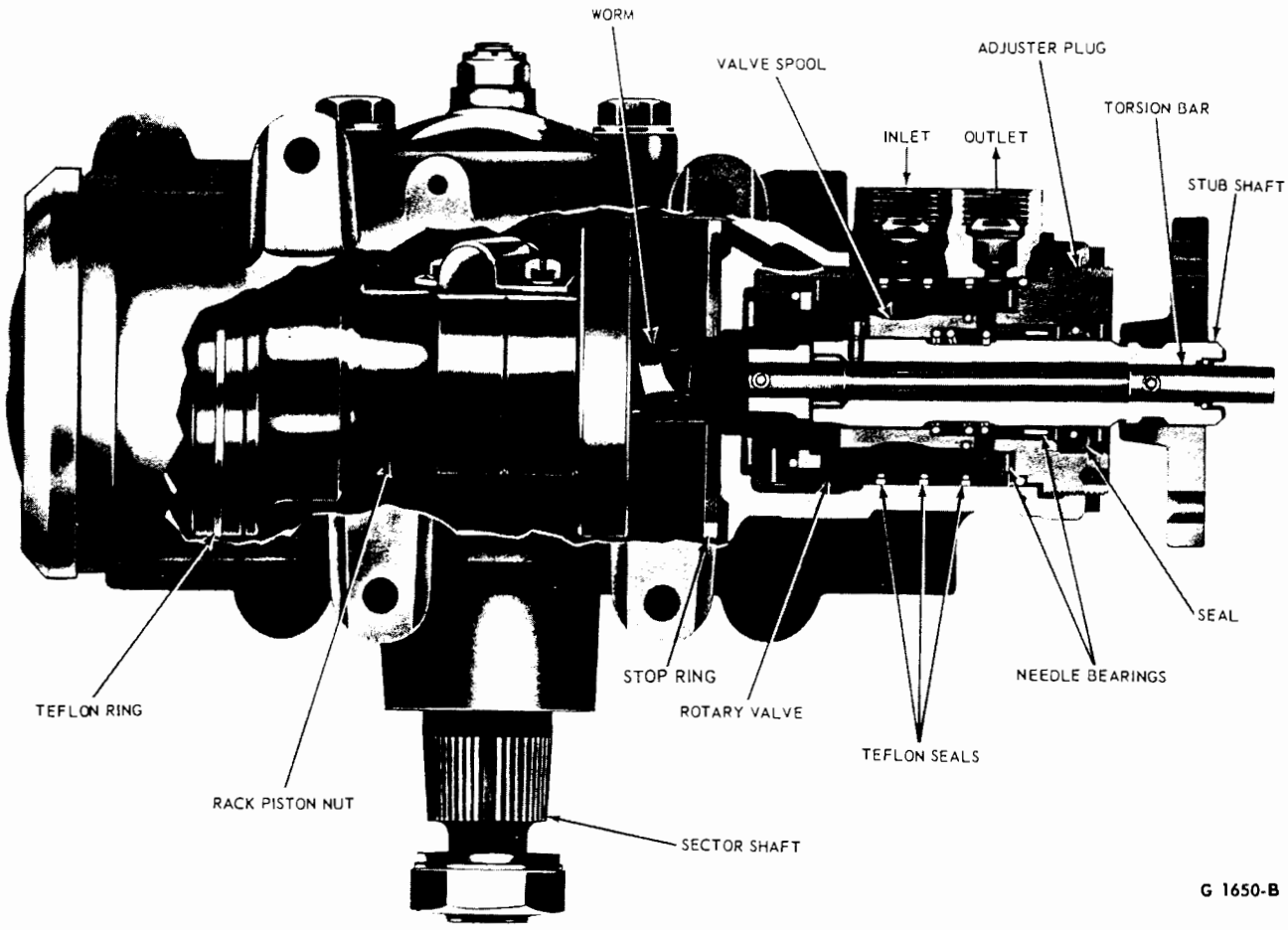


FIG. 1 Power Steering Gear—Sectional View

ADJUSTMENTS

During the breaking in period of the vehicle, some of the factory adjustments may change. These changes in adjustment will not necessarily affect the operation of the steering gear assembly and need not be adjusted unless there is excessive lash or other malfunctioning. The only adjustment that need be performed is the total over center position load (mesh load) to eliminate excessive lash between the sector shaft and rack teeth.

MESH LOAD

1. Disconnect the Pitman arm from the sector shaft and remove the steering wheel hub.
2. Disconnect the fluid return line at the reservoir and cap the reservoir return line pipe.
3. Place the end of the return line in a clean container and turn the steering wheel from left to right several times to discharge the fluid from the gear.
4. Turn the gear one-half turn off center in either direction. Using a 24 in-lb torque wrench on the steering wheel nut, determine the torque required to rotate the shaft slowly through a 20 degree arc.
5. Turn the gear back to center and repeating Step 4, above, loosen the adjuster lock nut and turn the screw inward using a 7/32 inch Allen wrench until the reading is 6 in-lb **greater** than that taken in Step 4. Hold the screw in place and tighten the lock nut.
6. Recheck the readings and replace the Pitman arm and steering wheel hub.
7. Connect the fluid return line to the reservoir and fill to specification (Part 13-01).

REMOVAL AND INSTALLATION

STEERING GEAR

Removal

When servicing the steering gear, label hoses before disconnecting them so they can be easily identified for reassembly.

Service the steering gear as follows:

1. Position a drain pan under the steering gear. Disconnect the pressure and the return lines from the steering gear and plug the lines and ports in the gear to prevent entry of dirt.
2. Raise the vehicle on a hoist and remove the Pitman arm attaching nut and lock washer.
3. Remove the Pitman arm from the sector shaft using Tool T64P-3590-F.
4. Remove the bolts and nuts that attach the steering gear to the frame side rail. Lower the vehicle.
5. Remove the pinch bolt from the flange and insulator assembly.
6. Loosen the nut holding the horn and turn the horn outward.
7. Remove the steering gear attaching bolts and remove the steering gear, shaft, and joint assemblies **as a unit.**
8. Remove the pinch bolt and nut from the shaft and joint assembly (Fig. 2).
9. Remove the shaft and joint assembly from the steering gear.

Installation

1. Before installing the gear in the vehicle, attach the shaft and joint assembly to the steering gear. Install the pinch bolt and torque the nut to 45 to 60 ft-lb.
2. Raise the vehicle on a hoist. Place the steering gear on the frame side rail and loosely attach the forward attaching bolt and nut.
3. Center the steering gear input shaft.
4. Insert the shaft end of the shaft and joint assembly into the flange and insulator assembly while supporting the rear of the steering gear.
5. Install the remaining steering gear attaching bolts through the steering gear flange, through the frame side rail.
6. Install the remaining steering gear attaching nuts and torque all three attaching nuts to 52 to 90 ft-lb.
7. Make sure the wheels are in the straight ahead position and install the Pitman arm, lock washer and nut. Torque the nut to 170-230 ft-lb. Lower the vehicle.
8. Install the pinch bolt in the flange and insulator assembly, and torque to 28 to 35 ft-lb.
9. Remove the plugs from the pressure and return lines and ports of the steering gear. Connect the lines to gear and torque to 16 to 25 ft-lb.
10. Turn the horn inward and tighten the retaining nut. Disconnect the coil wire. Fill the power steering pump reservoir to specification (Part 13-01). Turn on the ignition and turn the steering wheel to distribute the fluid. Check the fluid level and add fluid, if necessary. Connect the coil wire, start the engine and turn the steering wheel from side to side. Check for fluid leaks.

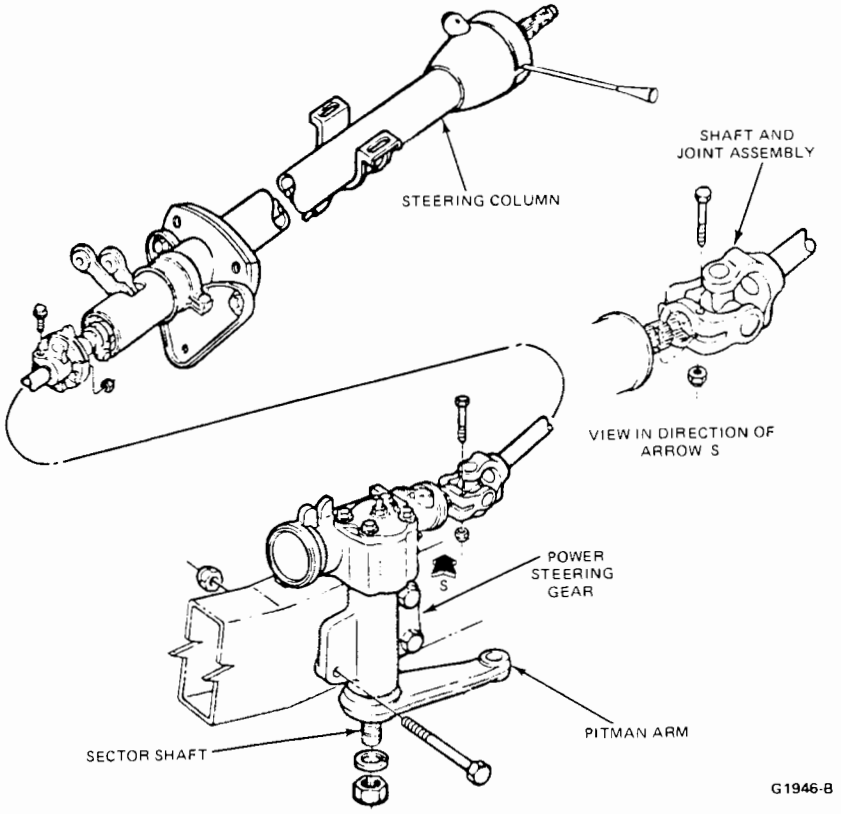


FIG. 2 Power Steering Gear Installation—Bronco

DISASSEMBLY AND ASSEMBLY

Take the following precautions when servicing the steering gear:

1. Use a clean workbench and tools.
2. Thoroughly clean the exterior of the gear with solvent and drain off excess hydraulic fluid, if necessary.
3. **Do not use solvent on seals.**

STEERING GEAR

Disassembly

1. Mount the steering gear in a vise (Fig. 3).
2. Rotate the end plug retaining ring until one end of the ring is opposite the hole in the housing.
3. Working through the hole in the housing (Fig. 4), unseat the retaining ring and work it out of the groove with a screwdriver.
4. Rotate the input shaft ~~counter~~clockwise, using a 3/4 inch, 12-point socket wrench to force the end plug out of the housing. Do not rotate the shaft any more than necessary to remove the plug. Further rotation will allow the balls to fall from their circuit and allow the rack-piston to become disengaged from the sector shaft. Remove the O-ring from the housing and discard it.
5. Rotate the input shaft clockwise one-half turn to draw the piston inward.
6. Turn the end plug (Fig. 5) counterclockwise out of the piston using a 1/2-inch drive extension.
7. Remove the lock nut from the sector

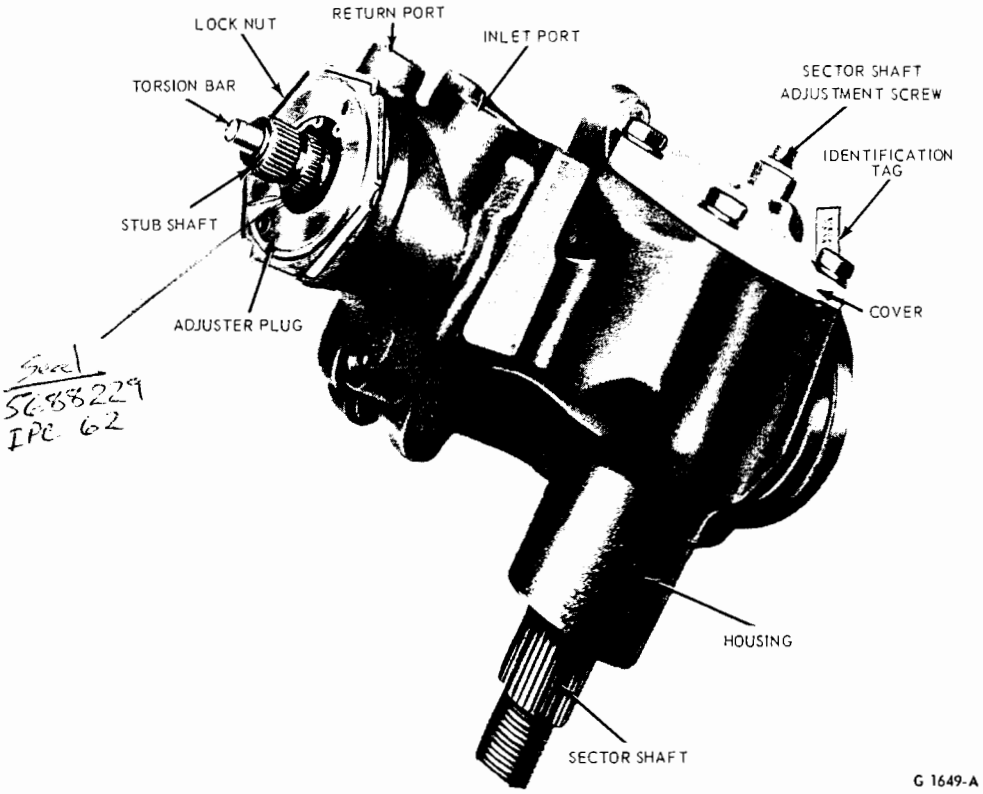


FIG. 3 Steering Gear—Exterior View

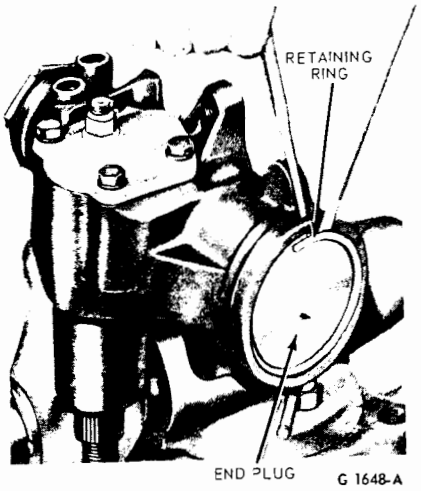


FIG. 4 Removing End Plug Retaining Ring

shaft adjustment screw. Discard the nut.

8. Remove the cover attaching screws. Rotate the sector shaft adjustment screw with an Allen wrench until the cover is free of the housing. Remove the cover and the O-ring. Discard the O-ring.
9. Turn the input shaft to center sector shaft teeth in the housing.
10. Tap the end of the sector shaft with a soft-faced hammer to free it from the housing.
11. Remove the adjuster plug lock nut.
12. Remove the adjuster plug using spanner wrench T65P-3A537-A (Fig. 6).
13. Insert Tool T65P-3D517-A (Fig. 7) into the end of the rack-piston until it contacts the worm shaft. Rotate the stub shaft counterclockwise until the worm is free of the rack-piston. Withdraw the rack-piston from the housing holding the tool all the way in the piston to avoid dropping the balls. Do not disassemble the rack-piston at this time.
14. Pull the stub shaft and valve assembly from the housing.
15. Lift the worm, lower thrust bearing and races out of the housing.

Assembly

1. Secure the steering gear housing in a vise.
2. Lubricate the worm shaft, lower thrust bearing, and races with steering gear fluid and install the thrust bearing and races on the worm.

   Align the valve body drive pin on the worm, with the narrow pin slot in the valve body. Install the O-ring seal between the valve body and the worm head. Lubricate the Teflon ring and lower cap O-ring with petrolatum.
3. Place the valve assembly and worm shaft in the housing **as a unit** (Fig. 8). Do not push against the stub shaft as this could cause the stub shaft and cap to pull out of the valve body, allowing the spool seal to slip into valve body fluid grooves. Install the valve assembly by pushing on the outer diameter of the valve body housing with the finger tips. Be sure that the Teflon rings do not bind inside the housing. The valve assembly is correctly seated when the fluid return hole in the gear housing is fully visible.
4. Place the Tool T65P-3A537-B over the end of the stub shaft (Fig. 9).