

## GEMMER/ROSS WORM & ROLLER

Ford Motor Co.  
Bronco & "F" Model 4-WD  
International Harvester  
Scout II, Terra & Traveler  
Jeep  
Right Hand Drive Vehicles

### DESCRIPTION

The worm and roller type manual steering gear consists of a worm gear, a sector shaft assembly and steering linkage. The worm gear, which is part of the input shaft, rotates on ball bearings. The roller, which rides on the worm gear, is mounted to the sector shaft. The sector shaft and roller assembly rotates as a unit in bushings mounted in the lower part of the housing. Rotation of the worm gear is transmitted to the sector shaft through the roller assembly and is then relayed to the steering linkage through the pitman arm.

### ADJUSTMENT

#### WORM BEARING PRELOAD

**NOTE** — Adjustment of Ford Bronco steering gear requires removal of gear from vehicle. For worm bearing preload adjustment, attach INCH lb. torque wrench to worm shaft instead of steering wheel.

**Ford "F" 4-WD Models & Bronco** — 1) Disconnect pitman arm from sector shaft. Disconnect battery ground cable and remove horn pad. Attach an INCH lb. torque wrench to steering wheel nut. Turn steering wheel completely to one side. Using torque wrench, measure INCH lbs. required to turn steering wheel at a constant rate  $\frac{1}{4}$  to  $\frac{1}{2}$  turn.

2) If preload is not within specifications, remove or add enough shims between worm shaft end cover and steering gear housing. Install cover and tighten attaching bolts. Recheck preload with torque wrench to make sure preload did not vary when bolts were tightened.

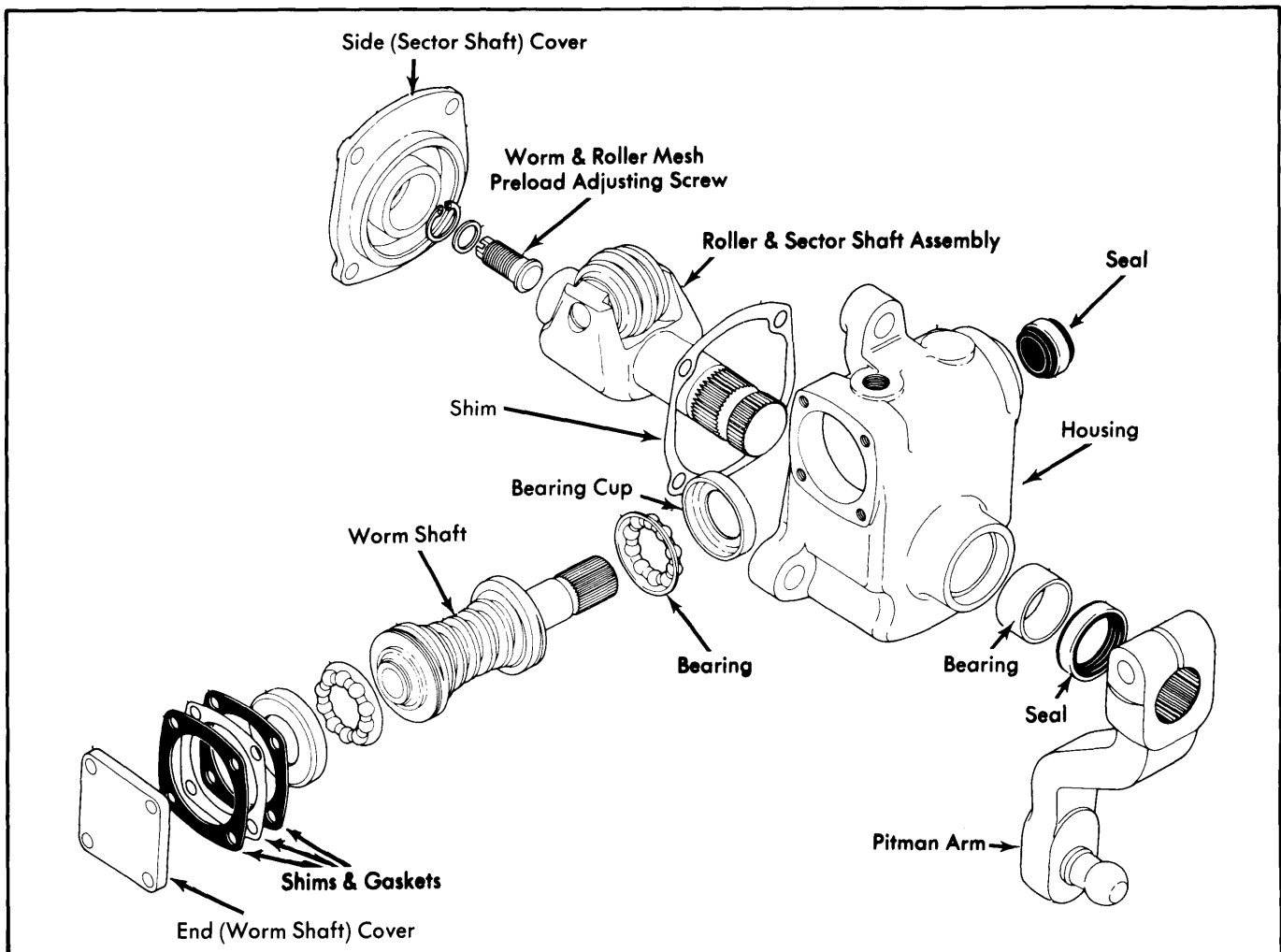


Fig. 1 Disassembled Gemmer/Ross Worm & Roller Steering Gear

# Manual Steering Gears

## GEMMER/ROSS WORM & ROLLER (Cont.)

**International Harvester** — 1) Disconnect steering linkage from pitman arm. Loosen worm and roller mesh preload screw lock nut and turn screw counterclockwise one turn. Turn steering wheel to center of travel. Attach an INCH lb. torque wrench to steering wheel nut. Rotate steering wheel 1/2 turn and check torque required to turn.

2) If preload is not within specifications, remove or add enough shims between worm shaft end cover and steering gear housing. Tighten cover bolts. Recheck preload and adjust as necessary. Adjust worm and roller mesh preload. See *Worm & Roller Mesh Preload adjustment in this article*. Install steering linkage and check lubricant level in steering gear.

**Jeep** — 1) Install a socket and an INCH lb. torque wrench on splined end of worm shaft. Rotate worm shaft left and right, without contacting stops. Tighten adjuster until specified torque to turn worm shaft is obtained. Tighten adjuster lock nut to 90 ft. lbs.

2) Attach an INCH lb. torque wrench to splined end of worm shaft. Turn worm gear with torque wrench and measure torque required to turn shaft. If not to specification, add or remove shims between worm end shaft cover and steering gear. Recheck preload after adjustment.

### Worm Bearing Preload

Application	INCH Lbs.
Ford Motor Co. ....	5-10
International Harvester	
Scout II, Terra & Traveler .....	2-8
Jeep .....	2-5

### WORM & ROLLER MESH PRELOAD

**NOTE** — Worm Bearing Preload must be adjusted before Worm and Roller Mesh Preload is adjusted.

**All Models** — 1) **NOTE** — On Ford models it will be necessary to remove steering gear from vehicle. Center sector shaft by rotating worm shaft through full travel while counting number of turns. Rotate worm shaft back half way.

2) Turn adjusting screw clockwise until all lash is removed between worm shaft and sector shaft. Using an INCH lb. torque wrench, measure torque required to rotate worm shaft across center position. If torque is not within specifications, use adjusting screw to change worm and roller mesh until specified torque is reached. Tighten adjusting screw lock nut.

### Worm & Roller Mesh Preload

Application	INCH Lbs.
Ford Motor Co. ....	12-21
International Harvester	
Scout II, Terra & Traveler .....	9-16
Jeep .....	7-12

## REMOVAL & INSTALLATION

### STEERING GEAR

**Ford Bronco & "F" 4-WD Models** — 1) Raise vehicle. Remove pitman arm nut. Pull pitman arm off shaft using a puller. Remove bolts and nuts that secure steering gear to frame rail. Lower vehicle.

2) Remove flex coupling bolt and nut from coupling clamp. Loosen clamp from coupling at end of steering column. Separate coupling from steering shaft by pushing steering shaft toward steering column.

3) Discard clamp, bolt and nut. Remove and discard flex coupling clamp from steering shaft. Remove steering gear from vehicle. To install steering gear, reverse removal procedure. Install a new steering shaft clamp at end of steering column.

**International Harvester** — **NOTE** — Information was not available from vehicle manufacturer at time of publication.

**Jeep** — Disconnect steering shaft-to-worm shaft coupling. Disconnect steering linkage from pitman arm. Remove the three bolts that attach steering gear to frame. Remove gear by sliding it slightly forward and to the right, then lifting it out of engine compartment. To install, reverse removal procedure.

## OVERHAUL

### DISASSEMBLY

1) Drain lubricant and remove pitman arm from sector shaft. Remove side cover attaching screws. Remove side cover with sector shaft from housing. Remove adjusting screw lock nut and turn adjusting screw clockwise until it is completely unthreaded from side cover which will release sector shaft from side cover.

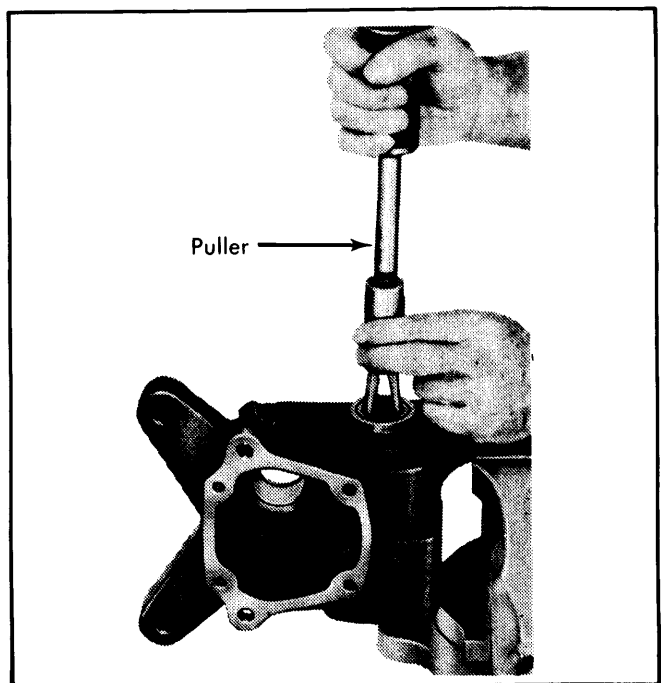


Fig. 2 Removing Upper Seal

## GEMMER/ROSS WORM & ROLLER (Cont.)

2) Remove top cover attaching bolts, top cover and shims.

**NOTE** — Do not discard shims. Remove worm gear assembly from housing. Remove bearing cups and ball bearings from worm gear assembly. Remove oil seals and discard.

### INSPECTION

Use cleaning solvent to clean parts and dry with compressed air, taking care not to spin bearings. Inspect worm gear for chipping, scoring or binelling and condition of splines and threads. Check all bearings and bearing surfaces for wear. Check sector shaft for burrs on splines, twisted splines and wear on bearing surfaces. Check housing for strain at mounting flanges.

### REASSEMBLY

1) Install new oil seals with the longer lip of each seal facing into the housing. Install ball bearings and cups on worm gear assembly and lubricate the assembly. Install worm gear assembly into housing. Install shims and top cover. Check worm bearing preload. See *Adjustments*.

2) Thread sector shaft with adjusting screw into side cover until end of shaft just touches inner face of side cover. Install lock nut loosely on adjusting screw and lubricate sector shaft assembly. Install sector shaft assembly with side cover and new gasket in housing. Adjust worm and roller mesh preload. See *Adjustments*. Install pitman arm on sector shaft.

### TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Sector Shaft Adj. Screw Lock Nut	
Ford Motor Co. ....	20-35
International Harvester .....	16-20
Jeep .....	16-20
Sector Shaft Cover Bolts	
Ford Motor Co. ....	16-20
International Harvester .....	30-35
Jeep .....	18-25
Worm Cover Bolts	
Ford Motor Co. ....	18-22
International Harvester .....	18-22
Jeep .....	18-25
Pitman Arm Retaining Nut	
Ford Motor Co. ....	170-230
International Harvester .....	160-180
Jeep .....	160-210
Steering Gear Attaching Bolt	
Ford Motor Co. ....	60-85
International Harvester .....	①45-50
Jeep .....	60-80

① — 1/2" Gear-to-Frame given. 1/2" Gear-to-Bracket is 60-80. 7/16" Gear-to-Frame is 35-40