

MANUAL STEERING GEARS

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OVERHAUL OPERATIONS

Disassembly (Figs. 3B-1 through 3B-4)

As with any ball bearing unit the steering gear parts must be kept free of dirt. Clean paper or rags should be spread on the workbench before starting disassembly of the steering gear.

1. Place the steering gear in a vise, clamping onto one of the mounting tabs. The wormshaft should be in a horizontal position.

2. Rotate the wormshaft from stop to stop, counting the total number of turns. Then turn back exactly half way, placing the gear on center (the wormshaft flat should be at

the 12 o'clock position). Loosen locknut.

3. Place a pan under the assembly to catch the lubricant and remove the three self locking bolts attaching the side cover to the housing.

4. Tap lightly on the end of the pitman shaft with a plastic hammer and lift the side cover and pitman shaft assembly from the gear housing (fig. 3B-5).

NOTE: If the pitman shaft sector does not clear the opening in the housing easily, turn the wormshaft by hand until the sector will pass through the opening in the housing.

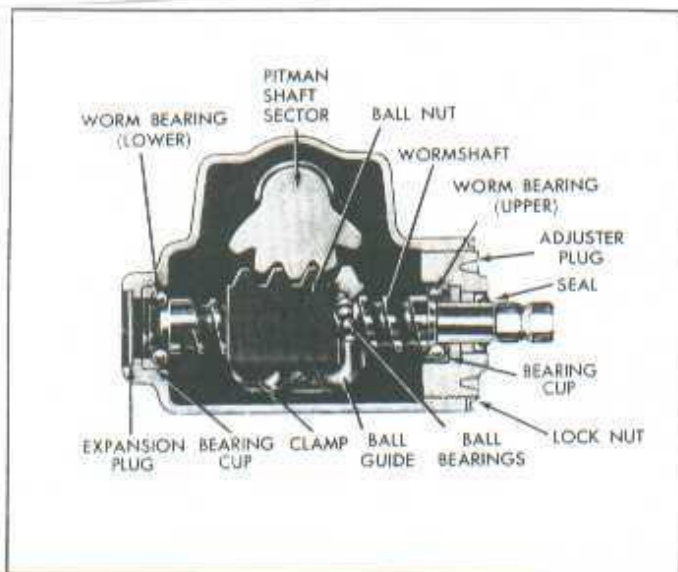


Fig. 3B-3--Steering Gear--Corvette

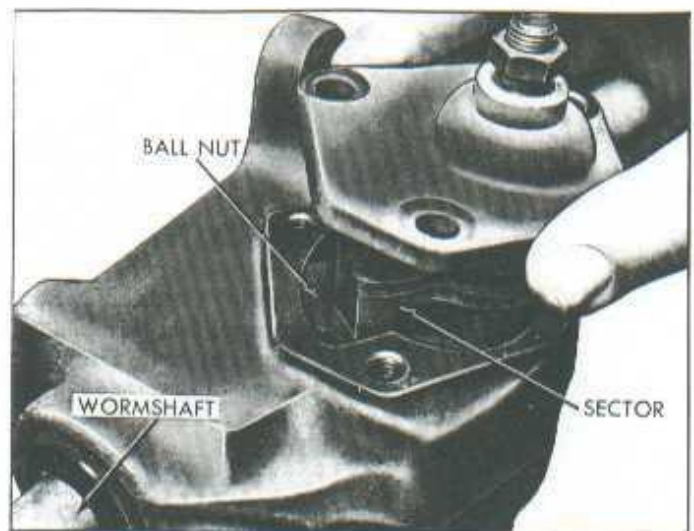


Fig. 3B-5--Removing Pitman Shaft Assembly--Typical

5. Remove the adjuster plug and locknut assembly (incorporates the lower wormshaft bearing and race on all except Corvette - upper wormshaft bearing race on Corvette).

6. Draw the wormshaft and ball nut assembly from the housing (fig. 3B-6).

CAUTION: Use care that the ball nut does not run down to either end of the worm. Damage will be done to the ends of the ball guides if the nut is allowed to rotate until stopped at the end of the worm.

All Except Corvette-- Remove the upper bearing from the wormshaft.

Corvette-- Remove lower bearing from inside the gear housing.

All Except Corvette-- Using a suitable size screw driver, push the lower bearing race down the adjuster plug and remove the plug (fig. 3B-7).

9. Remove the locknut from the lash adjuster screw in

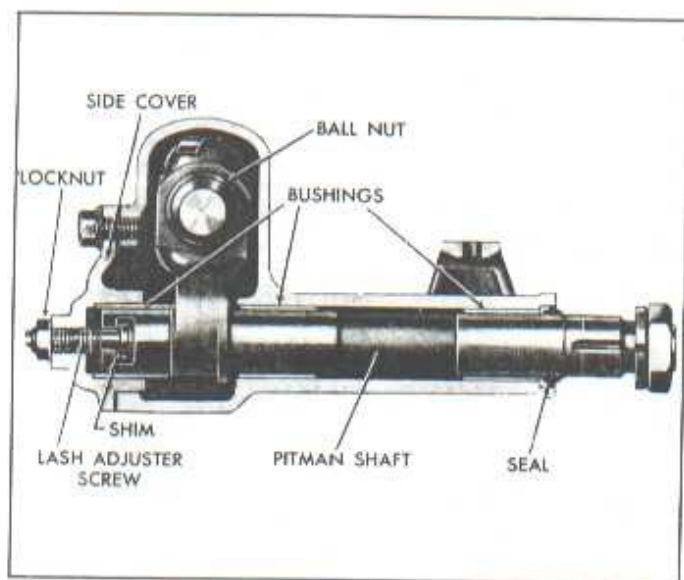


Fig. 3B-4--Steering Gear (Corvette and G10-30 Series Trucks)

the side cover. Remove the lash adjuster screw from the side cover by turning the screw clockwise. Slide the adjuster screw and shim out of the slot in the end of the pitman shaft.

10. Pry out and discard both the pitman shaft and wormshaft seals.

Inspection

With the steering gear completely disassembled, wash all parts in cleaning solvent. Dry them thoroughly with air. With a magnifying glass inspect the bearings and bearing races for signs of indentation. Also check for any signs of chipping or breakdown of the surface. Any parts that show signs of damage should be replaced.

Inspect all seals. Any seal that is worn or has been removed should be replaced.

Inspect the fit of the pitman shaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed.

Check steering gear wormshaft assembly for being bent or damaged in any way. Never attempt to salvage steering parts by welding or straightening.



Fig. 3B-6--Removing the Wormshaft and Ball Nut--Typical



Fig. 3B-7—Removing Lower Bearing Retainer—Except Corvette

Repairs

Pitman Shaft and/or Wormshaft Seal Replacement

The double lipped pitman shaft and wormshaft seals should be replaced each time a defective seal is indicated or the steering gear is disassembled.

1. If the seals were not removed at disassembly, pry out the old seals using a suitable size screw driver.

CAUTION: Before installing new seals, check the condition of the pitman shaft bushing(s) and the upper wormshaft bearing race.

2. A suitable size socket, pressing on the outer diameter of the seal, may be used to install new seals.

CAUTION: Care should be taken to insure that the new seals are not assembled in a cocked position.

Pitman Shaft Bushing Replacement

1. Support the steering gear housing in an arbor press and press the pitman shaft bushing (2 bushings on Corvette and G10-30 Series Trucks) from the housing using Tool J-1614, inserted from the lower end of the housing (fig. 3B-8).

2. Press the new bushing(s) into position using Tool J-1614. Position the Corvette and G10-30 Series Truck bushings as shown in Figure 3B-4.

NOTE: Service bushings are diamond bored to size and require no further reaming.

Side Cover Bushing Replacement

The entire side cover assembly, including bushing, is serviced as a unit and should be replaced when it is desired to replace the bushing.

Wormshaft Bearing Race Replacement ADJUSTER PLUG RACES

All Except Corvette: Remove the wormshaft bearing race using Tool J-5755. (See Fig. 3B-9).

Corvette: Using a hammer and punch, drive the bearing race out of the adjuster plug.

2. Press the new bearing race into position using Tool J-5755.

HOUSING RACES

1. **Corvette only:** Using a drift or punch (inserted into the housing from the adjuster plug end) drive the sheet metal

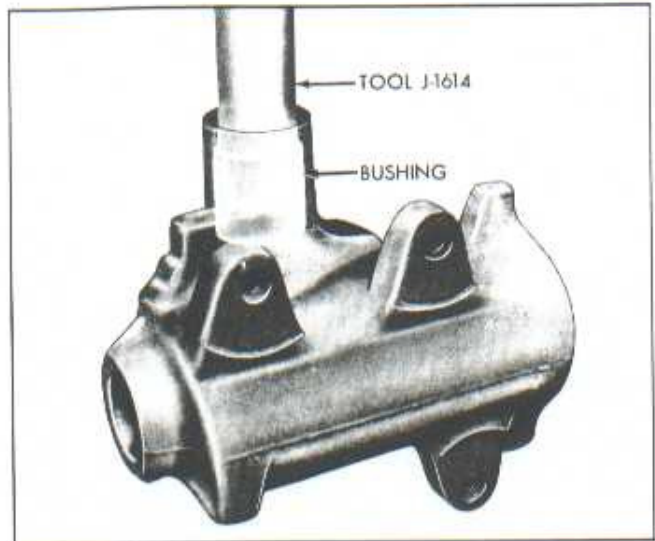


Fig. 3B-8—Removing Pitman Shaft Bushing—Typical

expansion plug out of the lower end of the housing.

2. All Series - Using a drift or punch, drive the bearing race out of the housing.

3. Press the new bearing race into position using Tool J-5755 (fig. 3B-10).

4. **Corvette only:** Install a new expansion plug into the lower end of the housing. Press on the center of the plug to deform it inward and secure it in the housing. Make sure the plug is tight or lubricant leakage could result.

Ball Nut Servicing

As a rule, disassembly of the ball bearing nut will not be necessary if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

1. Remove screws and clamp retaining the ball guides in nut. Draw guides out of nut.

2. Turn the nut upside down and rotate the wormshaft back and forth until all the balls have dropped out of the nut into a clean pan. With the balls removed, the nut can be pulled endwise off the worm.

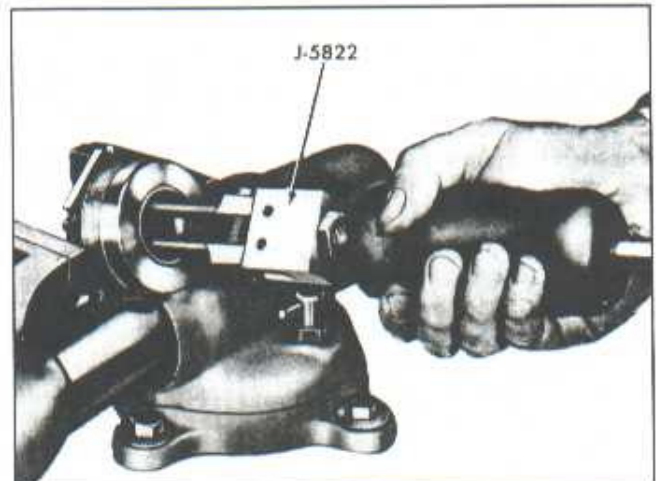


Fig. 3B-9—Removing Adjuster Plug Bearing Race

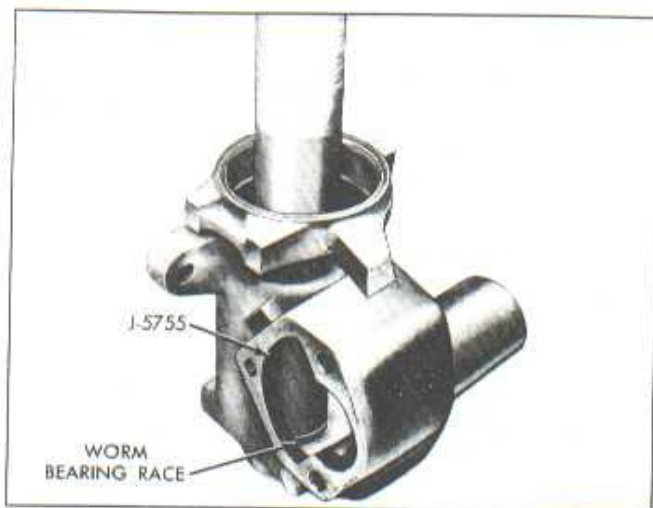


Fig. 3B-10--Installing Wormshaft Bearing Race-Typical

3. Wash all parts in cleaning solvent and dry them thoroughly with air. Using a magnifying glass inspect the worm and nut grooves and the surface of all balls for signs of indentation. Check ball guides for damage at ends where they deflect or pick up the balls from the helical path. Any parts that show signs of damage should be replaced.

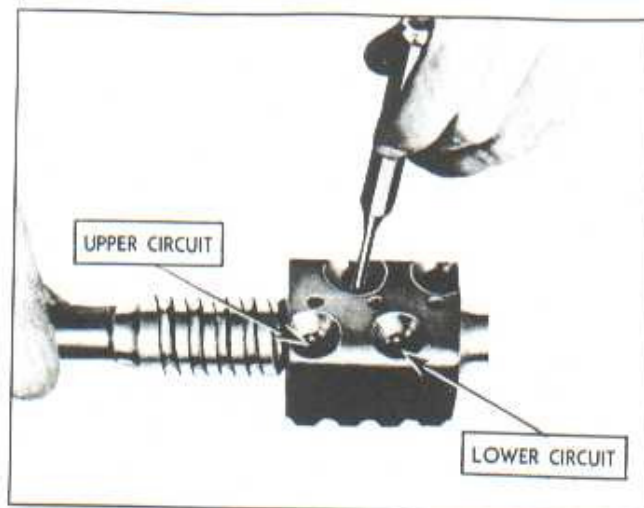


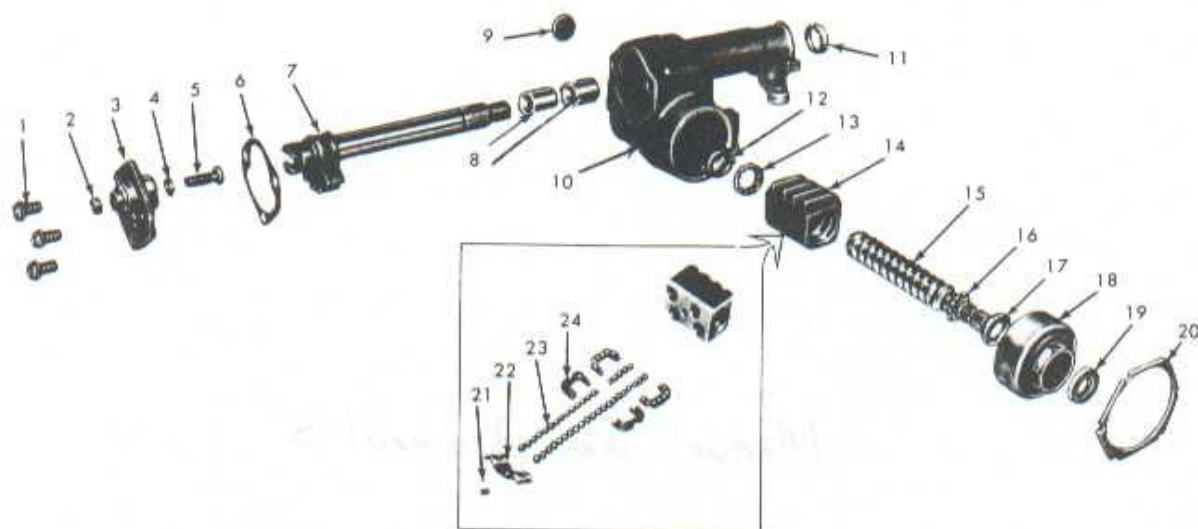
Fig. 3B-12--Filling Ball Circuits--Corvette

5. Corvette only (figs. 3B-12 and 3B-13):

- a. Place the wormshaft flat on the bench and slip the nut over the worm with the ball guide holes up and the shallow end of the rack teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.
- b. Count 27 balls into a suitable container. This is the proper number of balls for half the circuit. Place these balls into one of the guide holes while turning the worm gradually away from that hole.
- c. Lay one-half of the ball guide, groove up, on the bench and place the remaining balls from the count container in it.
- d. Close this half of guide with the other half. Hold the two halves together and plug each open end with petroleum jelly so that balls will not drop out while installing the guide.
- e. Push the guide into the guide holes of the nut. This completes one circuit of balls. If the guide does not push all the way down easily, tap it lightly into place with the wooden handle of a screw driver.
- f. Fill the second ball circuit in the same manner. Continue until the ball circuit is full from the bottom of one



Fig. 3B-13--Filling Ball Guides--Corvette



- | | | |
|---------------------------|-----------------------------|-----------------------------|
| 1. Side Cover Screws | 9. Expansion Plug | 17. Worm Bearing Race—Upper |
| 2. Lash Adjuster Locknut | 10. Steering Gear Housing | 18. Adjuster Plug |
| 3. Side Cover and Bushing | 11. Pitman Shaft Seal | 19. Wormshaft Seal |
| 4. Lash Adjuster Shim | 12. Worm Bearing Race—Lower | 20. Adjuster Plug Locknut |
| 5. Lash Adjuster Screw | 13. Worm Bearing—Lower | 21. Clamp Screw |
| 6. Side Cover Gasket | 14. Ball Nut | 22. Ball Guide Clamp |
| 7. Pitman Shaft | 15. Wormshaft | 23. Balls |
| 8. Pitman Shaft Bushings | 16. Worm Bearing—Upper | 24. Ball Guides |

Fig. 3B-15—Steering Gear—Corvette

guide hole to the bottom of the other or until stopped by reaching the end of the worm.

NOTE: In cases where the balls are stopped by the end of the worm, hold down those balls already dropped into the nut with the blunt end of a clean rod or punch (fig. 3B-12) and turn the worm in the reverse direction a few turns. The filling of the circuit can then be continued. It may be necessary to work the worm back and forth, holding the balls down first in one hole and then the other, to close up the spaces between the balls and fill the circuit completely and solidly.

6. Assemble the ball guide clamp to the ball nut and tighten the screws to specified torque.

Check the assembly by rotating the nut on the worm to see that it moves freely. Do not rotate the nut to the end of the worm threads as this may damage the ball guides. If there is any "stickiness" in the motion of the nut, some slight damage to the ends of the ball guides or to other gear components may have been overlooked.

Assembly (Fig. 3B-14 and 3B-15)

After a major service overhaul, steering gear lubricant meeting GM Standard GM 4673M (or equivalent) should be

applied to the pitman shaft and bearings, wormshaft and bearings and the ball nut teeth.

1. Place the steering gear housing in a vise with the wormshaft bore horizontal and the side cover opening up.

2. With the pitman shaft and wormshaft seals, pitman shaft bushings and wormshaft bearing races installed, and the ball nut installed on the wormshaft, proceed to Step 3 or 4.

3. **Corvette—**
a. Place the worm bearing race in the housing race. Slide the other bearing and the adjuster plug assembly over the upper end of the wormshaft.

b. Place the worm bearing in the housing race. Slide the other bearing and the adjuster plug assembly over the upper end of the wormshaft.

c. Place the worm bearing in the housing race. Slide the other bearing and the adjuster plug assembly over the upper end of the wormshaft.

4. **Corvette—**

a. Place a wormshaft bearing in the housing race. Slide the other bearing and the adjuster plug assembly over the upper end of the wormshaft.

b. Insert the wormshaft, nut and adjuster assembly into the housing, guiding the lower end of the wormshaft into the housing bearing.

c. Thread the adjuster into the housing until nearly all end play is removed from the wormshaft.

5. Position the lash adjuster (with shim) in the slotted end of the pitman shaft. Check the end clearance, which should not be greater than .002" (fig. 3B-16). If clearance is greater than .002", a steering gear lash adjuster shim unit is available. It contains four shims—.063", .065", .067" and .069" thick.

6. Lubricate the steering gear with 11 oz. of lubricant meeting GM Specification GM 4673 (or equivalent). Rotate the wormshaft until the ball nut is at the end of its travel and then pack as much new lubricant into the housing as possible without losing it out the pitman shaft opening. Rotate the wormshaft until the ball nut is at the other end of its travel and pack as much lubricant into the opposite end as possible.

7. Rotate the wormshaft until the ball nut is about in the center of travel. This is to make sure that the pitman shaft sector and ball nut will engage properly, with the center tooth of the sector entering the center tooth space in the ball nut.

8. Insert the pitman shaft assembly (with lash adjuster

screw and shim but without side cover) into the housing so that the center tooth of the pitman shaft sector enters the



Fig. 3B-16—Checking Lash Adjuster End Clearance

center tooth space of the ball nut.

9. Pack the remaining portion of lubricant into the housing.

10. Place the side cover gasket on the housing.

11. Install the side cover onto the pitman shaft by reaching through the side cover with a screwdriver and turning the lash adjuster screw counterclockwise until the screw bottoms; back the screw off one-half turn. Loosely install a new locknut onto the adjuster screw.

12. Install and tighten the side cover bolts to specifications.

CAUTION: If new side cover bolts are used at installation, be sure to use specified bolts which are self locking.

Adjustment on Bench

1. Tighten the adjuster plug until all end play has been removed and then loosen one-quarter turn.

2. Using an 11/16" 12-point socket and an in. lb. torque wrench, carefully turn the wormshaft all the way to the right

turn stop and then turn back about one-half turn.

3. Tighten the adjuster plug until the proper thrust bearing preload is obtained; (See the Specifications at the rear of this Manual). Tighten the adjuster plug locknut to specifications.

4. Turn the wormshaft from one stop all the way to the other, counting the number of turns. Then turn the shaft back exactly half the number of turns to the center position.

5. Turn the lash adjuster screw clockwise to remove all lash between the ball nut and sector teeth. Tighten the locknut.

6. Again using the 11/16" 12-point socket and an in. lb. torque wrench, observe the highest reading while the gear is turned through center position. See the Specifications Section for proper over-center adjustment.

7. If necessary, readjust lash adjuster screw to obtain proper torque. Tighten the locknut to 23 ft. lb. torque and again check torque reading through center of travel.

ADJUSTMENT SPECIFICATIONS — STANDARD STEERING

Adjustment	Manual Steering	
	Gear Torque To Turn Worm Shaft	
Worm Bearing Preload	5-8	Lb. In.
Sector Lash Adjustment	4-10	Lb. In.
	in excess of above	
Total Steering Gear Preload	16	Lb. In. Maximum

Recommended Torque Specifications

Manual Steering Gear	Ft. Lb.
Gear to Frame Bolts	70
Pitman Shaft Nut	180
Side Cover Bolts	30
Pitman Shaft Adjusting Screw Locknut	25
Bearing Pre-Load Adjuster Locknut	85
Coupling Flange Nuts	20
Coupling Flange Bolt	30

SPECIAL TOOLS

Pitman Shaft Bushing Remover	J-1614
Worm Shaft Race Bearing Puller	J-5822
Slide Hammer	J-2619
Worm Shaft Bearing Race Installer	J-5755
0-25 in-lb. Torque Wrench	J-7754