

Chapter Sixteen

Drive Shaft Housing

Engine torque passes through a drive shaft/universal joint to a pinion and drive gear in the drive shaft housing where the horizontal power flow from the engine is changed into a vertical flow down into the lower unit or gear housing. When a sliding clutch engages a forward or reverse gear in the gear housing, it creates a direct coupling that changes the power flow back to horizontal movement to the propeller shaft.

To service the drive shaft housing, the entire stern drive unit must be removed from the boat. This chapter covers removal, overhaul and installation of the Model I (includes Models I-R and I-MR), Model II, Model II-TR and Model II-TRS drive shaft housing. Other MerCruiser drives are manufactured for heavy-duty use including racing. Mercury Marine does not recommend service by amateur mechanics on such models. **Tables 1-5** are at the end of the chapter.

CAUTION

Elastic stop nuts should never be used more than twice. It is a good idea to replace such nuts with new ones each time they are removed. Never use worn-out stop nuts or non-locking nuts.

SERVICE PRECAUTIONS

Whenever you work on a stern drive unit, there are several precautions to keep in mind that will make your work easier, faster and more accurate.

1. Use special tools where noted. In some cases, it may be possible to perform the procedure with makeshift tools, but this procedure is not recommended. The use of makeshift tools can damage the components and may cause serious personal injury.
2. Use a vise with protective jaws to hold housings or parts. If protective jaws are not available, insert blocks of wood on either side of the part(s) before clamping them in the vise.
3. Remove and install pressed-on parts with an appropriate mandrel, support and hydraulic press. Do not try to pry, hammer or otherwise force them on or off.
4. Refer to the appropriate table at the end of the chapter for torque values, if not given in the text. Proper torque is vital to assure long life and service from stern drive components.
5. Apply Perfect Seal (part No. C-92-34227) to the outer surfaces of all bearing carrier, retainer and

housing mating surfaces during reassembly. *Do* not allow Perfect Seal to touch O-rings or enter the bearings or gears.

6. Apply Multipurpose Lubricant (part No. C-92-63250) to all O-rings and seal lips.

7. Apply Loctite Type A (part No. C-92-32609-1) on the outside diameter of all metal case oil seals.

8. Keep a record of all shims and where they came from. As soon as the shims are removed, inspect them for damage and write down their thickness and location. Wire the shims together for reassembly and place them in a safe place. Follow shimming instructions closely. If gear backlash is not properly set, the unit will be noisy and suffer premature gear failure. Incorrect bearing preload will result in premature bearing failure.

9. Work in an area where there is good lighting and sufficient space for components to be stored. Keep an ample number of containers available for storing small parts. Cover parts with clean shop cloths when you are not working with them.

MODEL I DRIVE

Figure 1 is an exploded view of the Model I drive shaft housing. **Figure 2** is a cross-section of the Model I Drive to provide component relationships inside the drive shaft housing.

Troubleshooting

Water Shutter Clatter

Owners of MCM **898R/228R/260R** models may encounter a clattering noise at idle rpm. The noise can be eliminated by installing a new water shutter kit (part No. **99370A2**) at the top of each exhaust collector pipe. The modification can be made without removing the engine from the boat.

Universal Joint Bellows Chafing

Excessive exhaust gas backpressure with MCM **898R/228R/260R/200R/230MR/260MR** models may cause the exhaust bellows to balloon. When this happens, the exhaust bellows pushes the universal joint bellows against the moving U-joints and results in excessive chafing and premature failure. The problem can be eliminated by replacing the exhaust bellows with exhaust tube part No. **78458A1**. Models manufactured after July 1985 have this exhaust tube installed at the factory.

Universal Joint Bellows Lubrication (TR/TRS Models)

The service life of a universal joint bellows can be extended considerably on **TR/TRS** models used in applications where continuous steering cycling is required. Lubricate the outer surface of the bellows with Quicksilver 2-4-C Multi-Lube (part No. **92-90018A12**) every 50 hours of operation or 30 days.

Universal Joint Knocking (Model I, TR or TRS Drive)

Excessive side-to-side play in the U-joint cross and bearing assemblies can cause a knock or vibration during turning or trimming maneuvers.

If the original cross and bearing assembly has not been replaced, the problem can be eliminated by installing C-ring kit part No. **53-12067A1**. The C-rings are curved at the ends and must be installed as shown in **Figure 3** with the curve facing the yoke or center socket.

If the original assembly has been replaced, the C-ring kit cannot be installed. The bearing cap grooves in service replacement **Spicer** assemblies are too narrow to accept the new C-rings.

Drive Shaft Housing Removal

1. Remove the lower unit or gear housing. See Chapter Fifteen.
2. Loosen the forward mounting nuts on each trim cylinder.

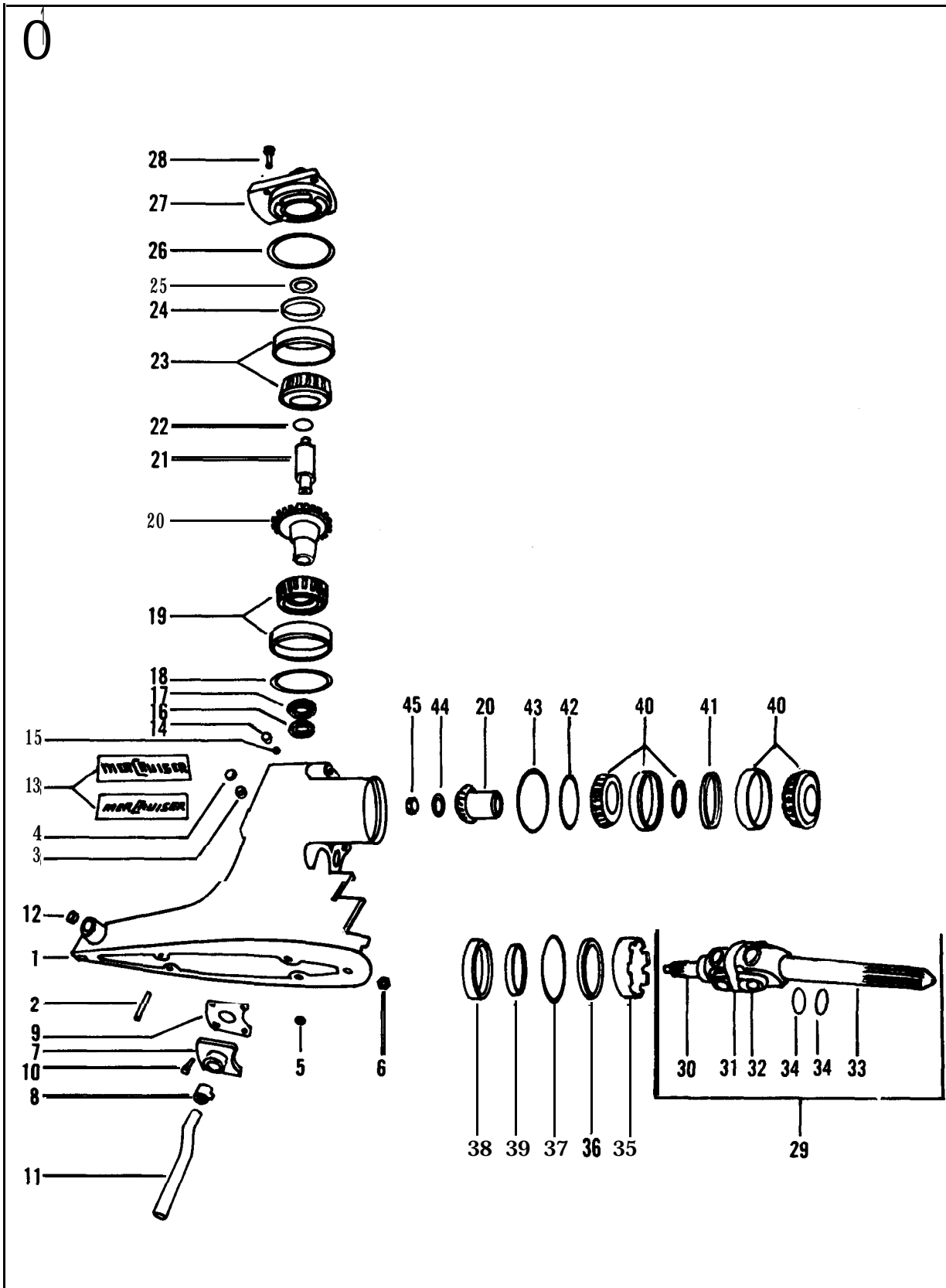
NOTE

If the anchor pin rotates in the housing during Step 3, remove one nut, hold the pin with Vise Grips and then remove the other nut.

3. Remove the nuts and washer at the aft end of each trim cylinder (**Figure 4**).
4. Disconnect and remove the continuity springs, if so equipped. See **Figure 5**.
5. Remove each trim cylinder from the drive shaft housing anchor pin.

NOTE

If equipped with Dyna-Shocks, remove shock-to-housing bolt on each side and move reverse lock hook release lever to RELEASE position.

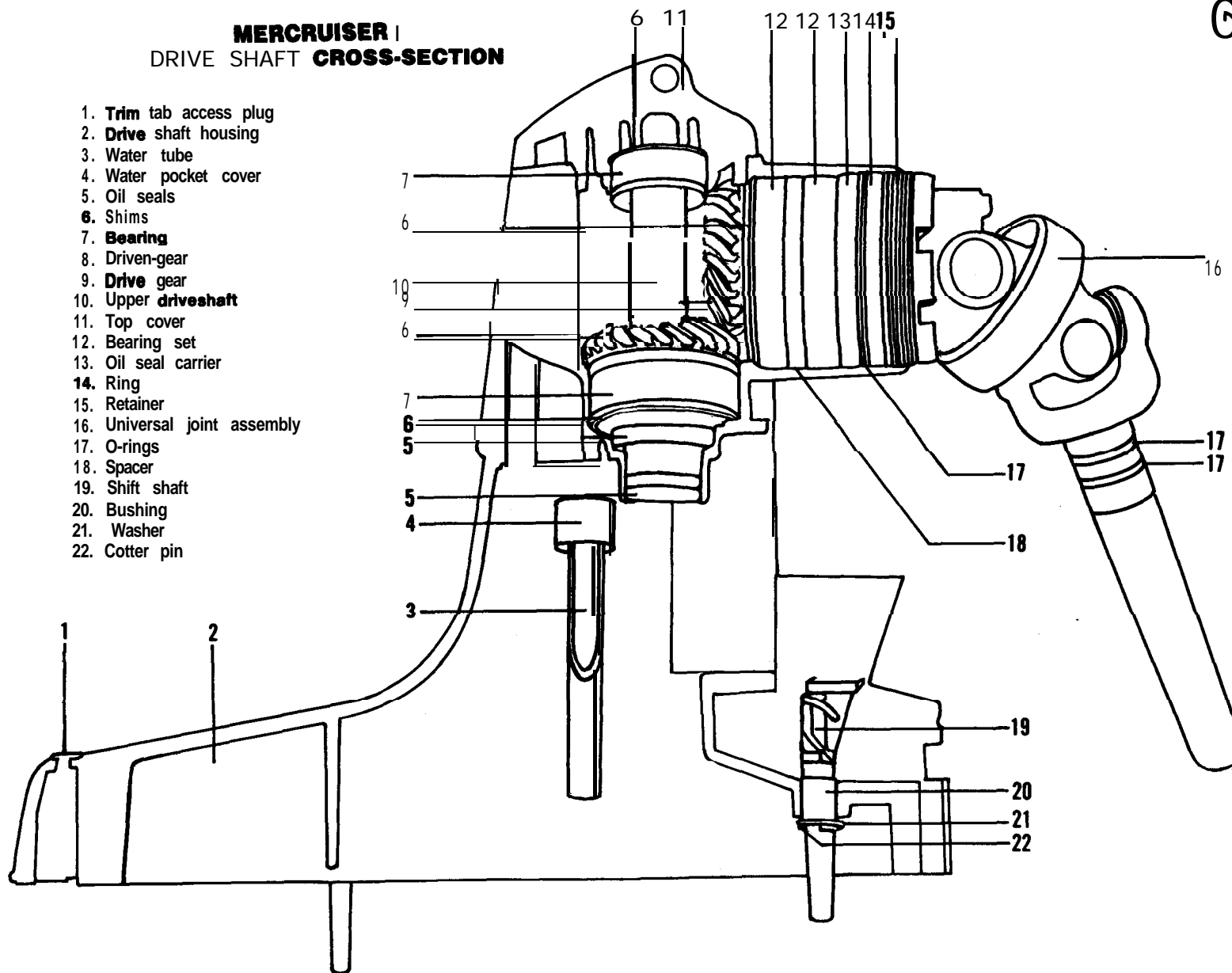


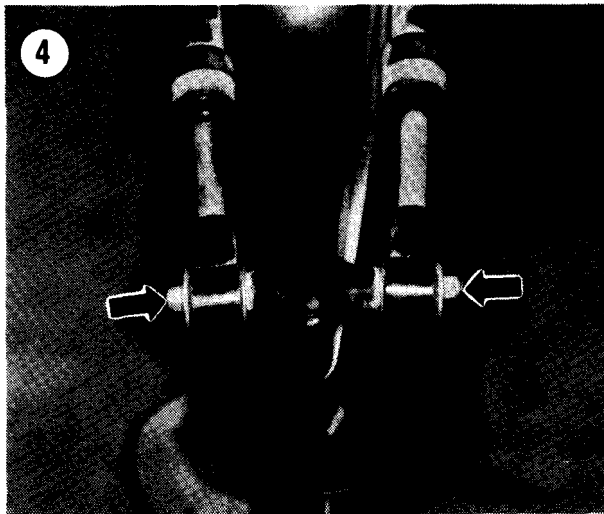
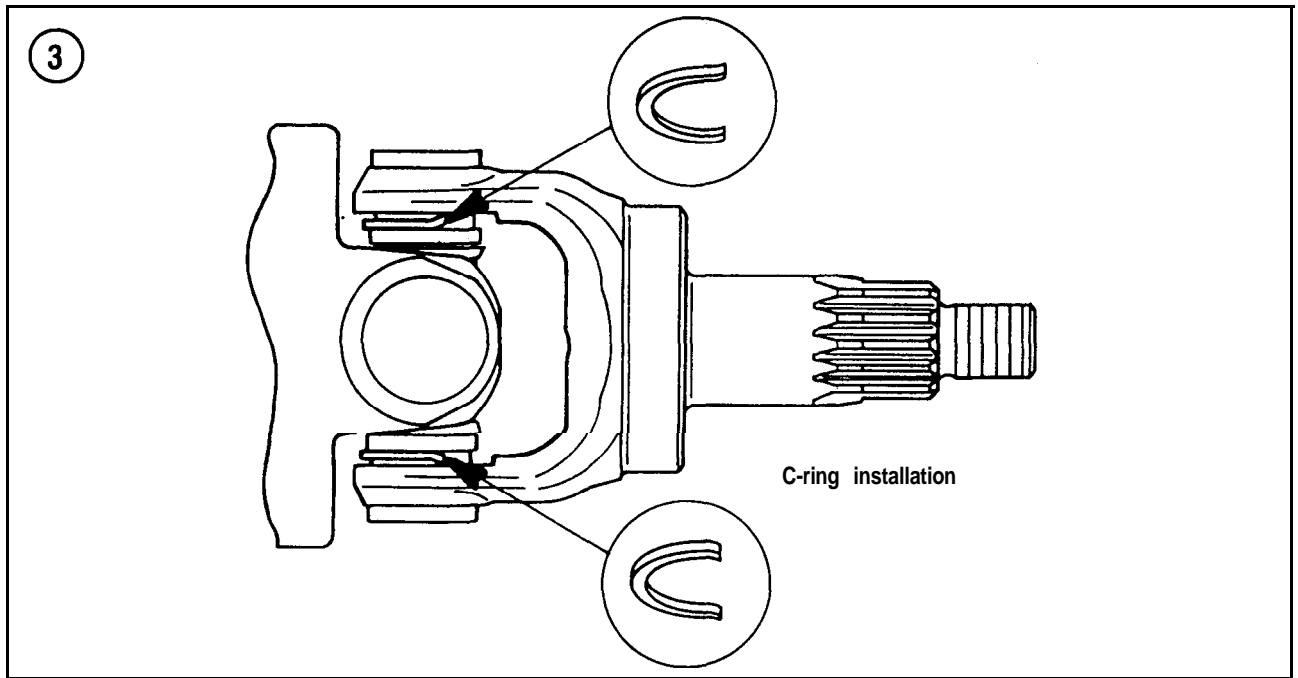
MERCUISER I DRIVE SHAFT **HOUSING**
(TYPICAL)

- | | |
|----------------------------|-----------------------------------|
| 1. Drive shaft housing | 24. Spacer |
| 2. Stud | 25. Spring |
| 3. Pipe plug | 26. O-ring |
| 4. Welch plug | 27. Cover assembly |
| 5. Bushing | 28. screw |
| 6. Nut | 29. Universal joint assembly |
| 7. Cover assembly | 30. Yoke |
| 8. Rubber seal | 31. Socket |
| 9. Gasket | 32. Spider |
| 10. Screw | 33. Yoke assembly |
| 11. Watertube | 34. O-ring |
| 12. Plug | 35. Retainer |
| 13. Decal set | 36. Ring |
| 14. Screw | 37. O-ring |
| 15. Washer | 38. Carrier assembly |
| 16. Oil seal | 39. oil seal |
| 17. Oil seal | 40. Tapered roller bearing |
| 18. Shim | 41. Spacer |
| 19. Tapered roller bearing | 42. Shim |
| 20. Gear assembly | 43. Shim |
| 21. Drive shaft | 44. Washer |
| 22. O-ring | 45. Nut |
| 23. Sealing assembly | |

MERCUISER I DRIVE SHAFT CROSS-SECTION

1. Trim tab access plug
2. Drive shaft housing
3. Water tube
4. Water pocket cover
5. Oil seals
6. Shims
7. Bearing
8. Driven-gear
9. Drive gear
10. Upper driveshaft
11. Top cover
12. Bearing set
13. Oil seal carrier
14. Ring
15. Retainer
16. Universal joint assembly
17. O-rings
18. Spacer
19. Shift shaft
20. Bushing
21. Washer
22. Cotter pin





6. Wire the cylinders up and out of the way to prevent damage.

NOTE

Spiral springs are used to electrically ground the trim cylinders. On 1975-1978 models, nylon-coated cylinders were used instead of springs. This coating should be removed and spiral springs installed.

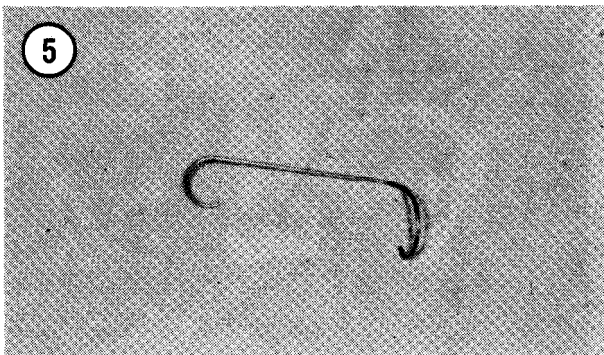
7. Place rubber bushings, washers, and spiral springs (Figure 6) in a safe place for reassembly.

8. Remove 6 elastic stop nuts and washers holding drive housing to bell housing.

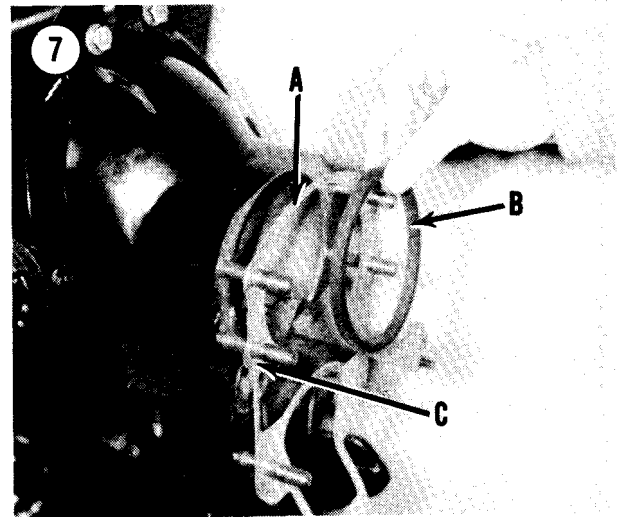
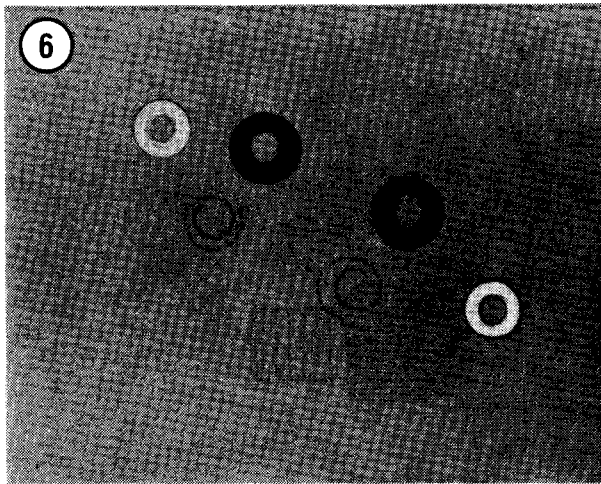
9. Shift drive unit into forward gear to allow shift shafts to separate.

NOTE

If drive shaft housing refuses to move in Step 9, the drive shaft splines may be frozen in the engine coupler or the drive shaft may be frozen to the gimbal bearing. To remove the unit in such cases, you must either disconnect the engine and move it forward or remove the drive shaft housing top cover and drive the U-joint nut off with a hammer and punch, leaving the frozen drive shaft in the bell housing.



10. Pull drive shaft housing straight back from bell housing, then mount assembly in a suitable holding fixture.



11. Remove and discard the bell housing gasket (A), rubber gasket (B) and O-ring (C) from bell housing assembly. See Figure 7.

12. If equipped with a reverse lock mechanism (Figure 8), remove stop screw, spring and washer. Remove lock pivoting screw. Remove cotter pin and washer from upper shift shaft. Remove shift shaft and reverse lock assembly.

Drive Shaft Housing Installation

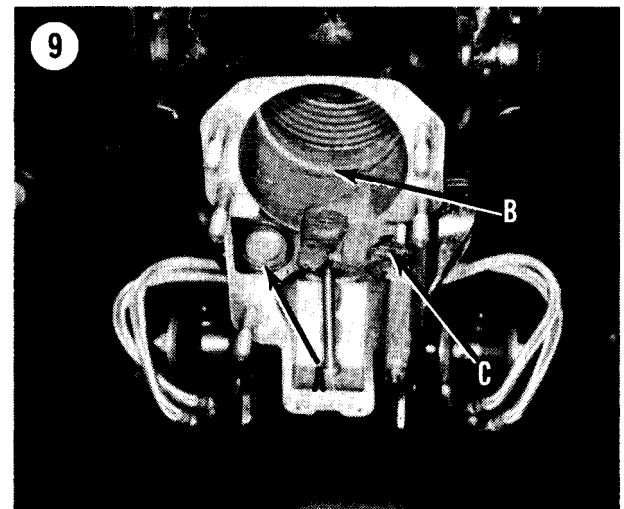
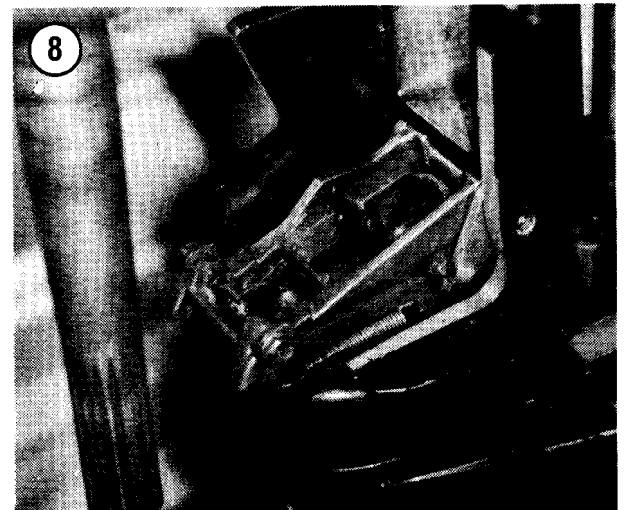
Engine alignment should be checked with engine coupler alignment shaft (part No. C-91-48247 or part No. C-91-57797A3) before reinstalling drive shaft housing.

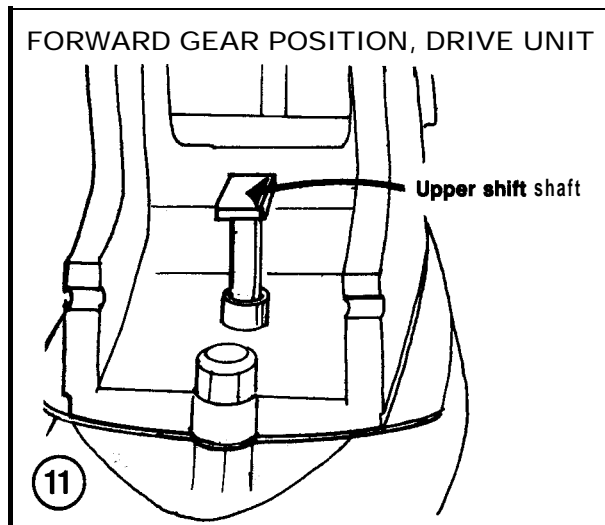
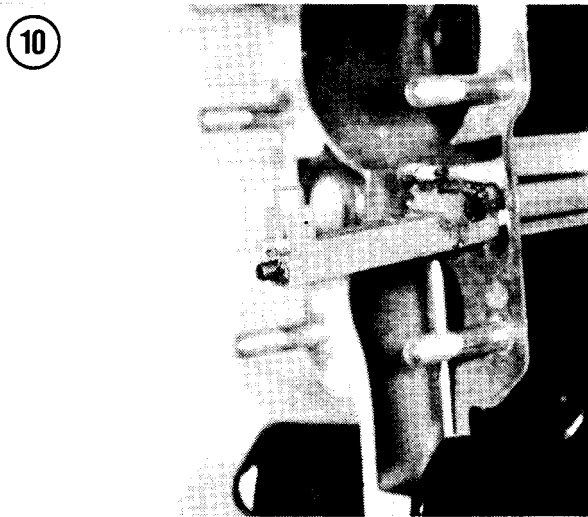
CAUTION

Engine alignment is a critical operation which requires good judgment and experience in addition to use of the special alignment tool. It is best to have your MerCruiser dealer perform any alignment procedures required to prevent premature failure of the drive shaft unit.

Check engine alignment to make sure there is no resistance to alignment tool entering the engine. If there is, the engine must be aligned. This requires raising or lowering the front of the engine until the alignment tool meets no resistance when installed.

1. Install reverse lock assembly, if so equipped.
2. Install a new O-ring in the water passage. See A, Figure 9.
3. Install a new rubber gasket in the bell housing (B, Figure 9).
4. Lubricate the shift slide assembly (C, Figure 9) with Universal Joint Lubricant.



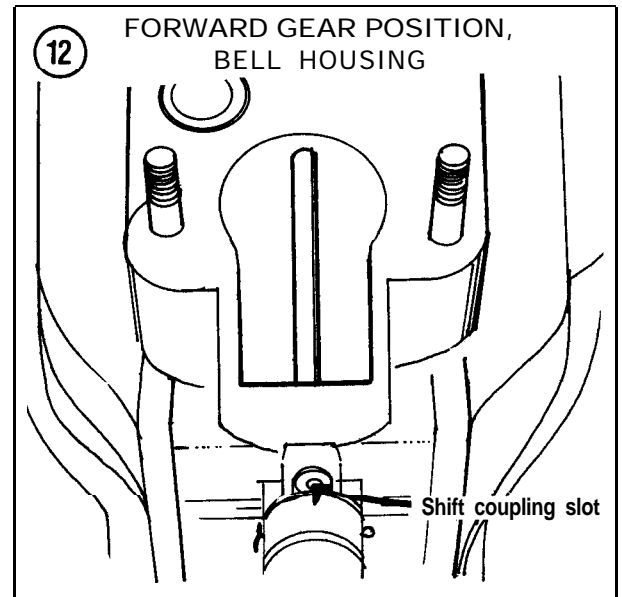
**NOTE**

Make sure slide is located in upright position (Figure 10) to allow slide assembly to freely rotate on core wire.

5. Install a new bell housing gasket.
6. Position upper shift shaft as shown in Figure 11 to put drive unit in forward gear.
7. Position bell housing shift mechanism as shown in Figure 12.
8. Lubricate universal joint splines and O-rings with Universal Joint Lubricant.

NOTE

If shaft and coupling splines do not properly align in Step 9, rotate propeller shaft counterclockwise slightly until they do.



9. Guide universal joint shaft through gimbal housing bearing and into engine drive coupling. At the same time, guide shift slide into opening in drive shaft housing.

10. Lubricate bell housing stud threads with Universal Joint Lubricant. Install flat washer and new elastic stop nut on each stud. Tighten nuts to specifications (Table 1).

CAUTION

If spiral grounding springs and continuity springs are not properly installed in Step 11 and Step 12, the piston rod/end assemblies will not be grounded and can be damaged by galvanic corrosion.

11. Make sure aft anchor pin is centered in drive shaft housing. Install large ID flat washer, rubber bushing (small diameter outward) and spiral ground spring on each end of pin. Swing each tilt cylinder up and locate pivot end on anchor pin.

12. Install continuity spring with long end located on anchor pin between flat washer and bushing. Clamp other end over tilt cylinder piston rod.

13. Install rubber bushing (small end inward) and small ID flat washer on each anchor pin. Wipe pin threads with Universal Joint Lubricant and install new elastic stop nuts.

14. Tighten forward and aft anchor pin nuts until about 2 threads on pin are exposed beyond nut.

15. Install lower gear housing. See Chapter Fifteen.

Top Cover/Water Pocket Cover Removal

1. Reach inside the drive shaft housing from underneath the unit and remove the copper water tube, if still in water pocket cover. See **Figure 13**.
2. Remove screws holding water pocket cover in housing. Remove cover and gasket. Discard gasket.
3. Remove 4 screws holding top cover on drive shaft housing (**Figure 14**).
4. Insert screwdriver blades in each of the 2 pry slots provided in the top cover and pry cover free of drive shaft housing.
5. Remove the cover.

Top Cover/Water Pocket Cover Cleaning and Inspection

Figure 15 and **Figure 16** show the inside of 2 typical top cover assemblies.

1. Clean all parts in solvent. Blow dry with compressed air.
2. Check upper drive shaft top bearing cup inside cover (A, **Figure 15** and A, **Figure 16**) for pitting, grooving, scoring, heat discoloration or embedded metallic particles. Replace bearing and bearing cup if any of these defects are noted.
3. Check shim(s) for damage that may have occurred during removal. Replace with same thickness shim(s) if damaged.

Top Cover/Water Pocket Cover Disassembly/Assembly

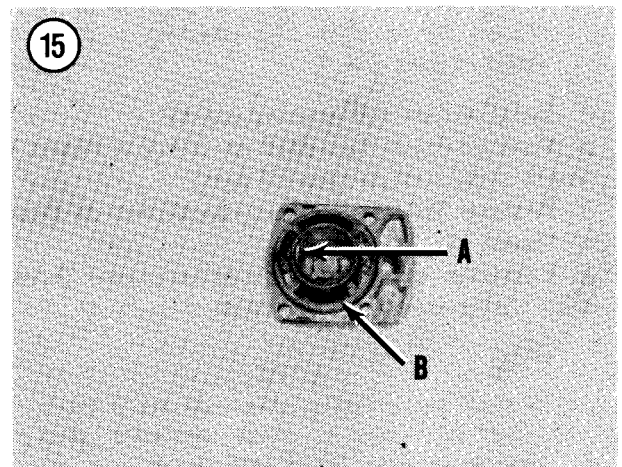
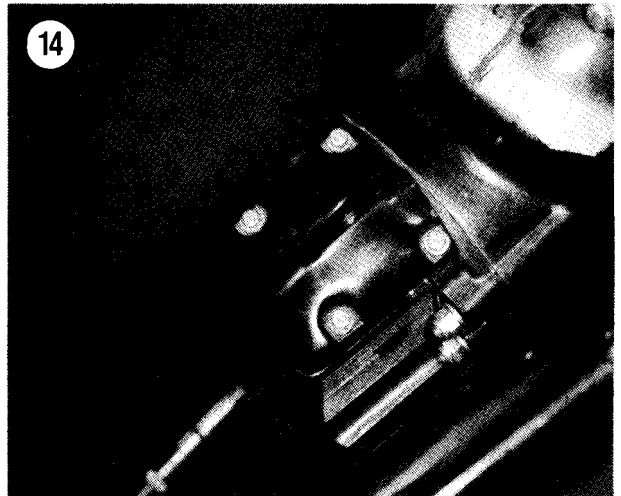
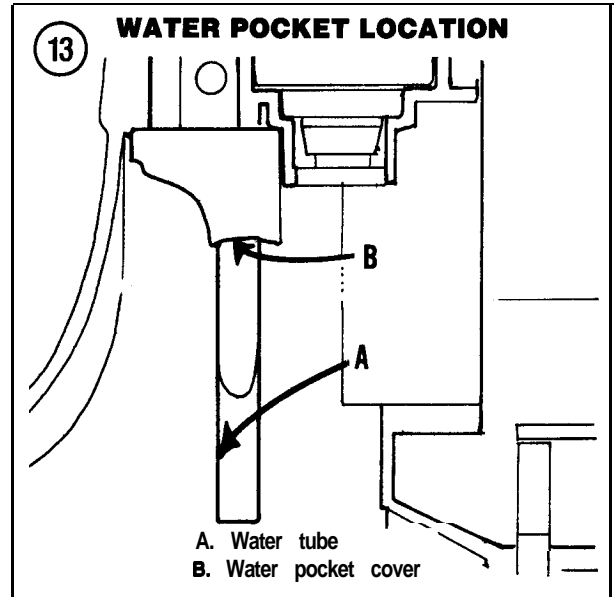
It is not necessary to remove the top cover bearing cup unless cup and bearing assembly requires replacement.

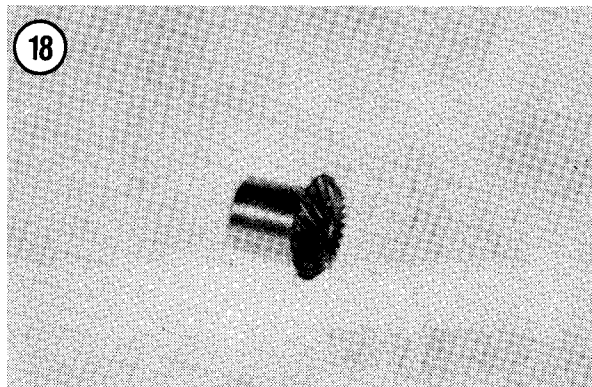
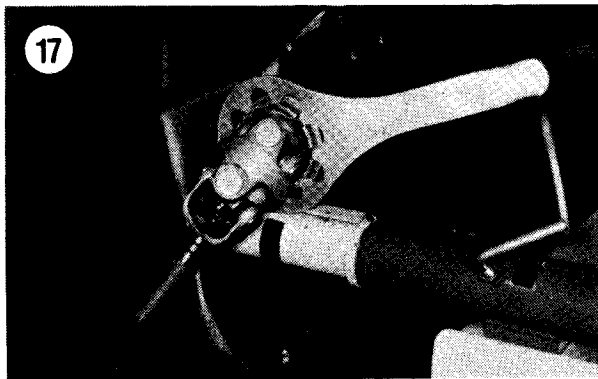
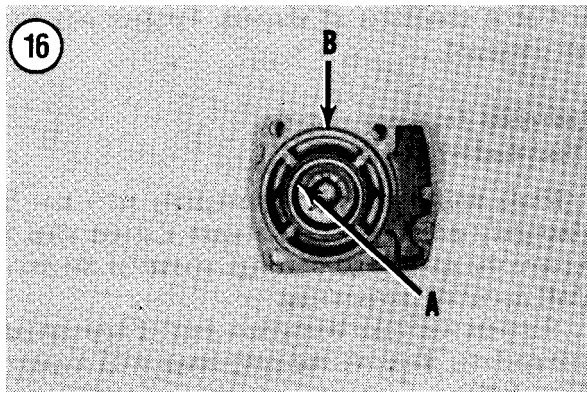
1. Remove bearing cup from top cover (A, **Figure 15** and A, **Figure 16**) with a suitable puller and slide hammer.

NOTE

Some units may have a free-load spring and spacer under the bearing cup instead of the shim(s).

2. Retrieve shim(s) under bearing cup and tag for reassembly reference.
3. Remove rubber O-ring (B, **Figure 15** and B, **Figure 16**) from top cover.
4. Remove rubber seal from water pocket cover.
5. To assemble, wipe a new water pocket cover seal with Universal Joint Lubricant and fit into





19



cover, aligning seal retaining embossment with pocket cover hole.

6. Install shim(s) in top cover bearing cup bore.
7. Install bearing cup with a suitable driver.
8. Install a new top cover O-ring.

Top Cover/Water Pocket Cover Installation

If the unit has been disassembled beyond top cover removal, it should not be reinstalled until the universal joint and drive gear/bearing assembly have been installed and drive gear clearance has been checked. See **Drive Gear Clearance** in this chapter.

1. Install water pocket cover in drive shaft housing with a new gasket. Tighten screws to specifications (Table 1).
2. Install water tube to water pocket cover.
3. Install top cover and tighten screws to specifications (Table 1).

Universal Joint, Drive Gear and Bearing Assembly Removal/Disassembly

1. Install bearing retainer wrench (part No. C-91-36235) and rotate counterclockwise to remove cover nut (Figure 17). It may be necessary to tap wrench with a hammer to break nut loose.
2. Pull universal joint with drive gear and bearing assembly from drive shaft housing.
3. Remove any shims and/or spacers which may remain inside the housing. Wire shims/spacer together and set aside for reassembly reference.
4. Clamp an appropriate length of steel rod in a vise and tighten securely. Fit universal joint yoke over steel rod to hold assembly and remove the drive gear nut with an appropriate socket and flex handle.
5. Remove drive gear (Figure 18) from universal joint shaft.

CAUTION

Mark bearing location in Step 6 for reassembly reference. Bearings must be installed on the gear in the same order as removed. If replacement is necessary, replace both bearings, bearing cups, preload spacers and outer spacers as an assembly.

6. Remove bearing/cup assemblies with small preload spacer and large outer spacer (Figure 19).

7. Remove oil seal carrier, O-ring and retainer ring (**Figure 20**). Remove inner oil seal from carrier.
8. Remove 2 O-rings from end of universal shaft coupling (**Figure 21**).

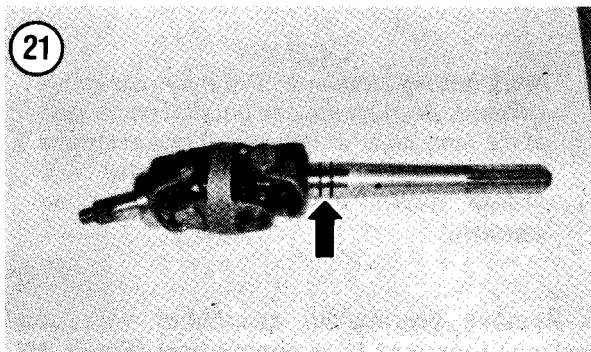
Universal Joint, Drive Gear and Bearing Cleaning and Inspection

1. Clean all parts in fresh solvent. Blow dry with compressed air.

NOTE

If wear or corrosion is found in Step 2 or Step 3, also check engine coupling splines for the same defect.

2. Inspect coupling and gear end of U-joint for spline wear.
3. Clean all corrosion from the coupling. Replace coupling yoke if splines are partially corroded away.
4. Check drive gear for pitting, excessive wear and chipped or broken teeth. See **Figure 18**. Replace gear if any of these defects are noted.
5. Inspect bearing cups for pitting, scoring, grooving, heat discoloration or embedded metallic particles. Replace bearing and cup if any defect is noted.

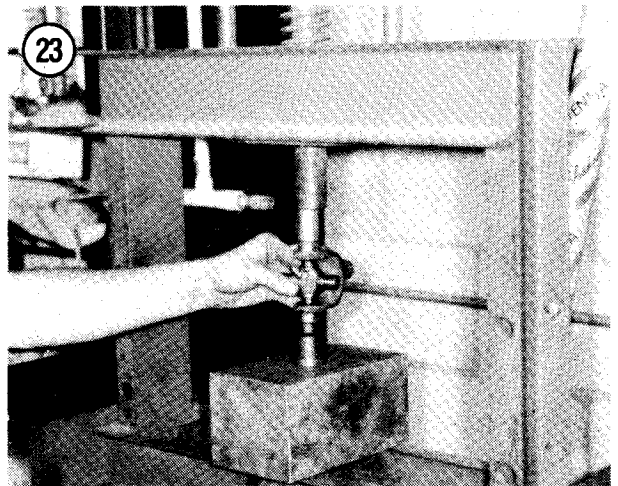
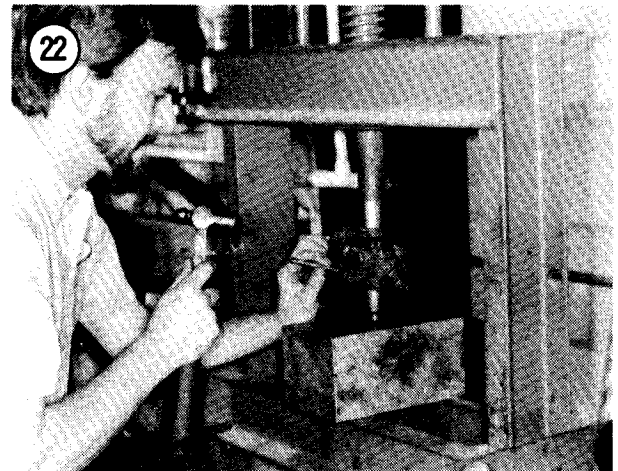


6. Check condition of shim(s). Replace any that are damaged.

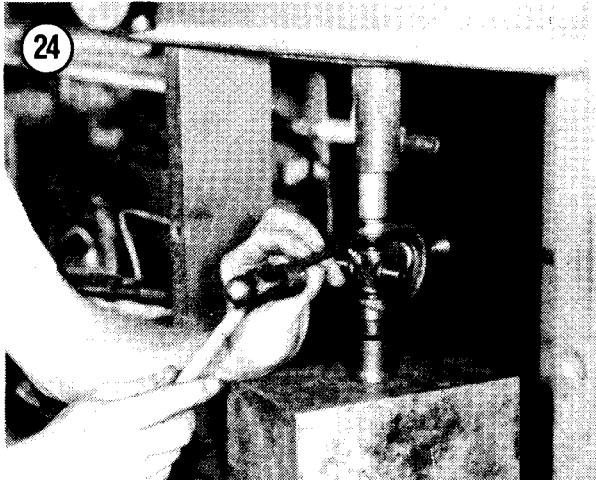
Universal Joint Disassembly/Assembly

While universal joint disassembly may not be absolutely necessary, it is always a good idea to replace the spider and bearings whenever the drive shaft is out of the housing.

1. Support the yoke between a pair of appropriate size sockets. Remove the snap rings with a punch (**Figure 22**).
2. Press on one bearing until the opposite bearing is pressed into the socket, then remove the one free bearing.
3. Turn the universal joint assembly 180° and press on bearing crossmember to remove opposite bearing.



4. Repeat Steps 1-3 to remove the remaining bearings. Remove the spider.
5. Repeat Steps 1-4 to remove the second spider/yoke assembly.
6. Place the new bearing cups in the yoke cavities and position the spider inside the yoke with the grease fitting pointing toward the longer shaft. See Figure 23.
7. Press the bearings through the yoke and onto the spider. Install new bearing snap rings. See Figure 24.
8. Repeat Step 6 and Step 7 to install the remaining bearings.
9. Repeat Steps 6-8 to install the second spider/yoke assembly.



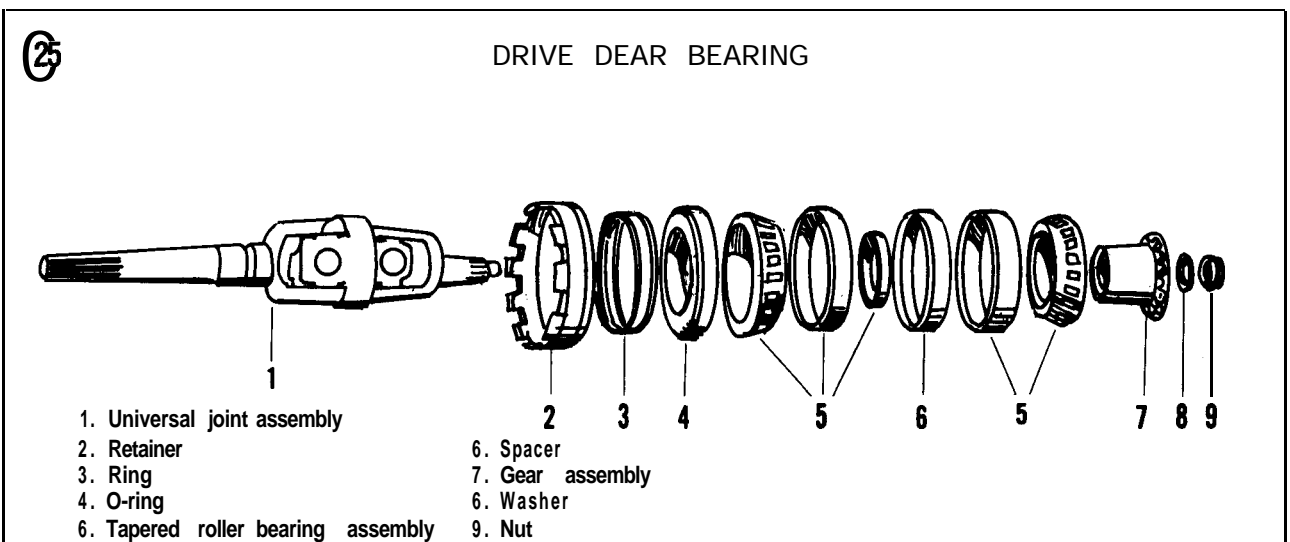
Universal Joint, Drive Gear and Bearing Assembly

1. If oil seal in carrier was removed, position a new seal (lip side facing concave side of carrier) and press into place until flush with carrier.
2. Wipe lip of seal with Universal Joint Lubricant.
3. Clamp an appropriate length of steel rod in a vise and tighten securely. Fit universal joint yoke over steel rod to hold assembly.
4. Starting with the threaded cover nut, install drive gear bearing assembly components on the drive shaft gear in the order shown in **Figure 25**. Make sure original bearings are reinstalled in the same order in which they were removed.
5. Install drive gear washer with its concave side facing the gear. Install the nut.
6. Fit an automotive type piston ring compressor over the bearing assembly. This holds the preload spacer in position while torquing the drive gear nut and assists in aligning the components for easy installation of the assembly in the drive shaft housing.

CAUTION

Correct torque in Step 7 is important, as it applies preload on the drive gear assembly. Too little torque may result in damage to the drive and driven gears, while excessive torque can damage the shaft.

7. Torque the self-locking drive gear nut to specifications.
8. Remove the piston ring compressor tool.



Universal Joint, Drive Gear and Bearing Installation

1. Remove the top cover as described in this chapter.
2. Install bearing cup-to-gear housing shim(s) and spacer in drive shaft housing.

CAUTION

MerCruiser drive units with a 1.65:1 ratio have the same number of teeth on drive and driven gears in the drive shaft housing. These gears have marks that must be aligned as shown in Figure 26.

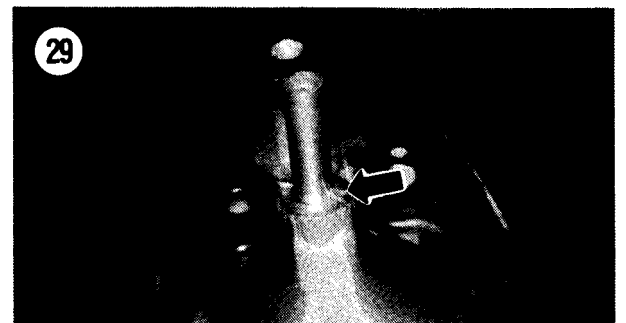
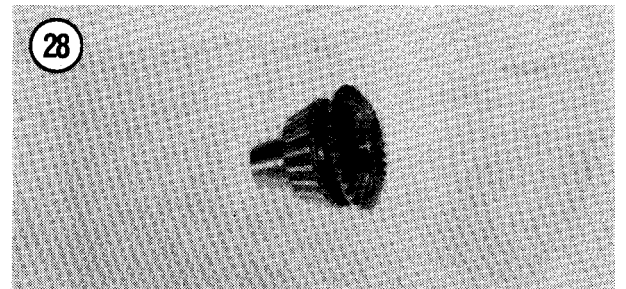
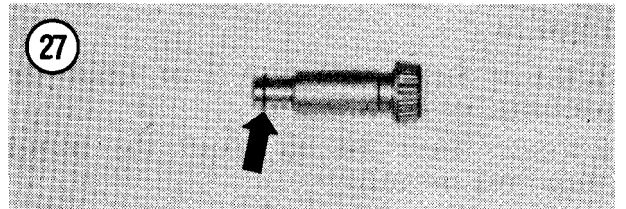
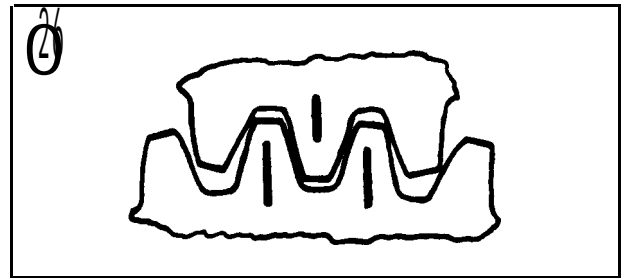
3. Align gear marks, if necessary, and install universal joint/drive gear assembly into drive shaft housing.
4. Install bearing retainer wrench (part No. C-91-36235) (**Figure 17**) and tighten cover nut to specifications (**Table 1**).
5. Check drive-to-driven gear clearance as described under **Drive Gear Clearance** in this chapter.
6. When clearance is correct, install top cover and tighten to specifications (**Table 1**).

Upper Drive Shaft/Driven Gear Assembly Removal

1. Remove top cover/water pocket cover as described in this chapter.
2. Remove universal joint, drive gear and bearing assembly as described in this chapter.
3. Reach into drive shaft housing and remove the upper drive **shaft** and driven gear/bearing assembly.
4. Press the upper drive shaft (**Figure 27**) from the driven gear/bearing (**Figure 28**).

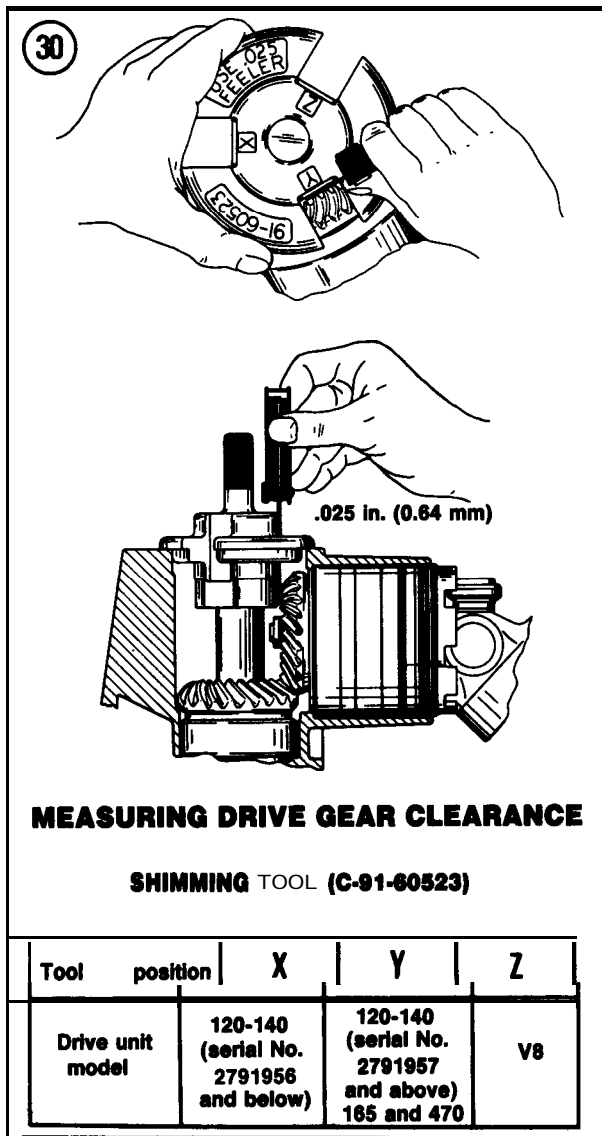
Upper Drive Shaft/Driven Gear Assembly Cleaning and Inspection

1. Check driven gear for signs of pitting, worn, chipped or broken teeth. Replace as required.
2. Check tapered roller bearing cup for signs of scoring, pitting, grooving, heat discoloration or embedded metallic particles. Replace bearing and **cup** if any of these defects are noted.
3. Check driven gear shaft surface where oil seal lip rides. Replace gear/shaft assembly if area shows any signs of grooving.
4. Replace O-ring on lower end of upper drive shaft (arrow, **Figure 27**).



Upper Drive Shaft/Driven Gear Assembly Installation

1. Wipe ID of driven gear with Universal Joint Lubricant, then press upper drive shaft into driven gear.
2. Wipe ID of driven gear tapered roller bearing (if removed) and press into place until it seats on shoulder of driven gear.
3. Install upper drive shaft and driven gear assembly into drive shaft housing.



4. Establish upper drive shaft bearing preload as described in this chapter.
5. Check driven gear clearance as described in this chapter.
6. Install universal joint, drive gear and bearing assembly as described in this chapter.
7. Install top cover/water pocket cover as described in this chapter.

Intermediate Shift Shaft/Seal Removal/Installation

1. Remove the drive shaft housing as described in this chapter.
2. Invert the housing and install in a suitable holding fixture.

3. Remove the intermediate shift shaft cotter pin (arrow, **Figure 29**). Remove the washer and shift shaft.
4. Drive the shift shaft bushing out with an appropriate size socket and hammer.
5. Installation is the reverse of removal.

Drive Shaft Housing Bearing Cups

Whenever the drive shaft housing is completely disassembled, wash the entire assembly in solvent and blow dry with compressed air. If one or more bearing cups and/or oil seals must be replaced, they can be removed with a standard 2-jaw puller and slide hammer (bearing cups) or screwdriver (oil seals) and installed with appropriate size sockets or drivers. Be sure to retrieve any shims located under the bearing cup.

Wipe the OD of all oil seals with Loctite Type A before installation. Install the upper and lower drive shaft oil seals with their lip facing the driven gear. After installation, lubricate seal lip with Universal Joint Lubricant.

Drive Gear Clearance

Whenever the universal joint, drive gear and bearing assembly is removed, drive gear clearance must be checked and corrected as the unit is reassembled. This procedure requires the use of the following shimming tool according to model:

- a. MerCruiser 60, 80, 90-part No. C-91-36763.
- b. MerCruiser I-part No. C-91-33487.
- c. MerCruiser IA, IB, IC-part No. C-9136385.
- d. MerCruiser 120, 140, 160, 165 (early)-part No. C-91-45877.
- e. MerCruiser 120, 140, 165, 888 (late) and I-MR-part No. C-91-60523.

1. Refer to **Figure 30**, which shows the special shimming tool required and how it is used. Select the proper face of the shimming tool to be used according to your drive unit (**Figure 30**). Align that face with 2-3 teeth of the driven gear.
2. Insert an 0.025 in. flat feeler gauge between one outer tooth of the aligned gear teeth and the shimming tool.
3. Rotate shimming tool to provide slight drag on feeler gauge. Hold shimming tool in position and move feeler gauge between the other outer tooth of the aligned gear teeth and the tool.
4. If clearance is greater or smaller than 0.025 in., repeat Step 2 and Step 3 with feeler gauges of

varying thickness until the same clearance is felt between both outer teeth and the tool!

5. If clearance is less than 0.025 in., subtract your reading from 0.025 in. The difference is the shim thickness to be **added** between the drive shaft housing and the universal joint bearing cup.

6. If clearance is greater than 0.02 in., subtract 0.025 in. from your reading. The difference is the shim thickness to be **removed** from between the drive shaft housing and the universal joint bearing cup.

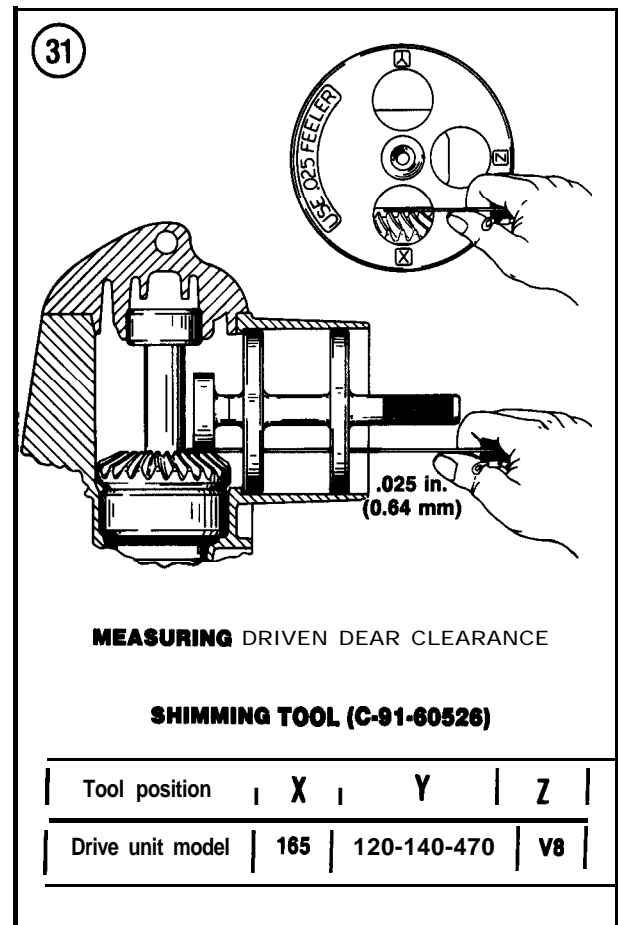
7. After making the necessary calculations and changing shims as required, repeat this procedure to make sure drive gear clearance is now correct. When it is, you may continue unit reassembly.

Driven Gear Clearance

This procedure requires the use of the following shimming tool according to model:

- a. MerCruiser 60, **80, 90**—part No. C-91-38764.
- b. MerCruiser I—part No. C-91-33488.
- c. **MerCruiser IA, IB, IC**—part No. C-91-36384.
- d. **MerCruiser 120, 140, 160, 165** (early)—part No. C-91-45878.
- e. **MerCruiser 120, 140, 165, 888** (late) and **I-MR**—part No. C-91-60526.

1. Check the upper drive **shaft** bearing preload as described in this chapter.
2. Check that top cover is properly torqued in position.
3. Select the proper face of the shimming tool to be used according to your drive unit (**Figure 31**). Align that face with 3 teeth of the driven gear.
4. Insert an 0.025 in. flat feeler gauge as shown in **Figure 31** between one outer tooth of the aligned gear teeth and the shimming tool.
5. Rotate shimming tool to provide slight drag on feeler gauge. Hold shimming tool in position and move feeler gauge between another outer tooth of the aligned gear teeth and the tool.
6. If clearance is greater or smaller than 0.025 in., repeat Step 4 and Step 5 with feeler gauges of varying thickness until the same clearance is felt between both outer teeth and the tool.
7. If clearance is less than 0.025 in., subtract your reading from 0.025 in. The difference is the shim thickness that must be **removed** from under the driven gear tapered roller bearing cup. The same amount of shimming must be **added** under the upper drive shaft bearing cup in the top cover to maintain upper drive shaft preload.

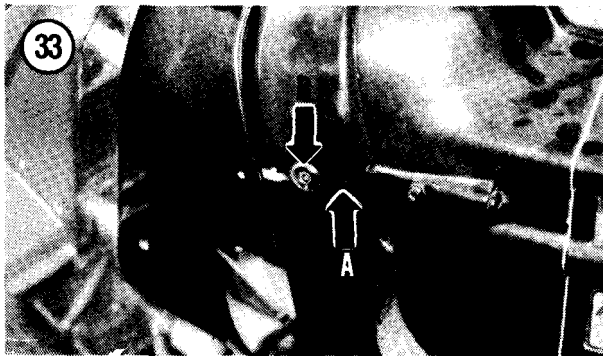


8. If clearance is greater than 0.025 in., subtract 0.025 in. from your reading. The difference is the shim thickness that must be **added** under the driven gear tapered roller bearing cup. The same amount of shimming must be **removed** from under the upper drive shaft bearing cup in the top cover to maintain upper drive shaft preload.

Upper Drive Shaft Bearing Preload

The lower gear housing must be removed from the drive shaft housing for this check.

1. Mount gear housing in a suitable holding fixture.
2. Lubricate all bearings and gears involved with a few drops of Quicksilver Super-Duty Gear Lubricant (part No. C-92-686 17) to prevent erratic results from dry bearings and gears.
3. Rotate drive shaft several times in one direction to set the bearings.
4. Install an inch-pound torque wrench to the end of the drive shaft and slowly rotate the **shaft** in the



same direction as in Step 3. Maintain a smooth rotational motion and note torque reading. It should be between 6- 10 in.-lb. for new bearings and 2 1/2-4 in.-lb. for used bearings.

NOTE

If top cover bearing cup shimming is changed, the cover must be retorqued and drive shaft clearance rechecked.

5. If torque reading is greater than specified, remove shims from under the top cover bearing cup. If less than specified, add shims under the top cover bearing cup.

MODEL II

Figure 32 is an exploded view of the Model II drive shaft housing components.

**Drive Shaft Housing
Removal/Installation**

1. Remove the lower gear housing. See Chapter Fifteen.
2. Disconnect the shift cable.
3. Loosen 2 square head setscrews. Pull guide away from cable.
4. Loosen hex head **jamnut** on end of cable. Screw insert out and remove.
5. Loosen universal joint and shift cable bellows hose clamps at gimbal housing. Carefully slide bellows away from gimbal housing.
- 6A. 1.33:1 drive-Remove shock absorber anchor bolt and rotate unit to vertical position.
- 6B. 1.78:1 drive-Remove trim cylinders.

NOTE

In Step 7, some models use cotter pins instead of retaining pins.

7. Drive out retaining pin on each side (A, Figure 33) with a long punch to expose hinge pins.

NOTE

Some early models may have grease fittings installed in the hinge pins. Fittings should be removed before attempting to remove hinge pins in Step 8.

8. Remove hinge pin on each side (B, Figure 33) with adaptor (part No. C-91-36060) and a slide hammer.
9. Lift up on the drive shaft housing and pull it away from the gimbal ring and housing.
10. Place drive shaft housing in a suitable holding fixture.
11. Installation is the reverse of removal. Align universal joint shaft with gimbal housing bearing and install just far enough to fasten end of bellows with hose clamp. Insert anti-galling washers between drive shaft housing and gimbal ring before installing hinge pins.

**Universal Joint, Pinion
Gear and Bearing Removal**

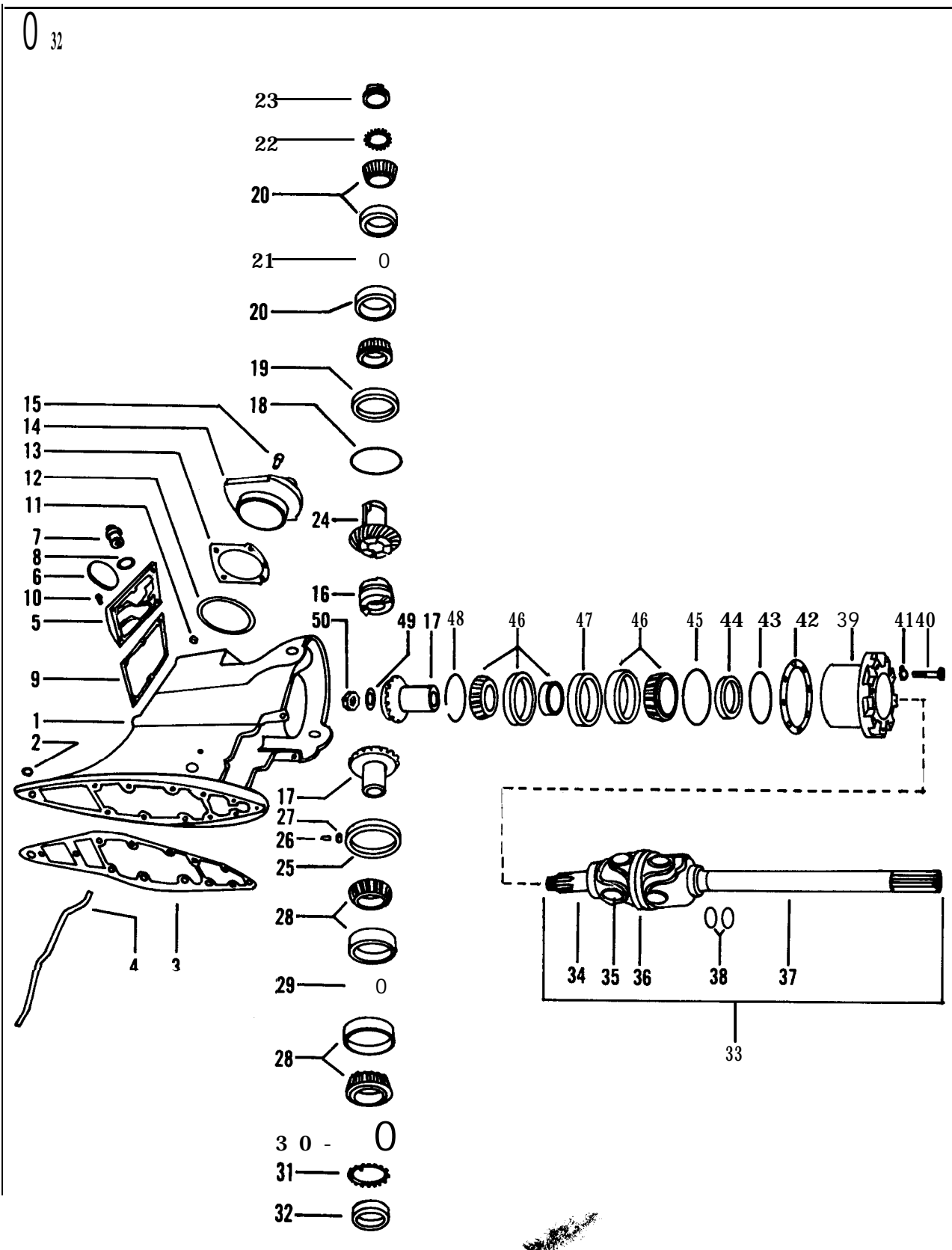
1. Remove rear cover and gasket from drive shaft housing.
2. Straighten washer tabs on hex head capscrews holding pinion bearing retainer to drive shaft housing. Remove capscrews and tab washers.
3. Hold a punch against the center of the pinion shaft and tap lightly with a hammer until the universal joint and bearing retainer can be removed.
4. Withdraw the universal joint with bearing retainer from the housing. Remove the shim and O-ring. Discard the O-ring.

**Universal Joint, Pinion Gear
and Bearing Disassembly/Reassembly**

If shaft requires disassembly, take it to a **MerCruiser** dealer or qualified marine shop. All bearings, bearings cups and spacers must be replaced as a unit. In addition, forward and pinion gears are a matched set on 1.33: 1 drives. If either is damaged, both must be replaced. Disassembly, shimming and reassembly are best done by a qualified specialist.

**Universal Joint, Pinion Gear
and Bearing Installation**

If lower gear and bearing assembly were removed, they must be reinstalled and properly shimmed before performing this procedure.



MERCUISER MODEL II
DRIVE SHAFT HOUSING

- | | |
|-------------------------------------|-------------------------------------|
| 1. Drive shaft housing | 26. Setscrew |
| 2. Trim tab plug hole | 27. Jamnut |
| 3. Gasket | 26. Tapered roller bearing assembly |
| 4. Oil tube | 29. Spacer |
| 5. Cover assembly | 30. Shim |
| 6. Emblem assembly | 31. Tab washer |
| 7. Oil filler plug | 32. Nut |
| 6. Oil filler plug ring | 33. Universal joint assembly |
| 9. Shift fork cover gasket | 34. Universal joint yoke |
| 10. Screw | 35. Center socket |
| 11. Oil channel pipe plug | 36. yoke |
| 12. O-ring | 37. Shaft |
| 13. Shim | 36. O-ring |
| 14. Iop cover | 39. Retainer |
| 15. Screw | 40. Screw |
| 16. Sliding clutch shift fork | 41. Iab washer |
| 17. Complete gear assembly | 42. Shim |
| 16. Shim | 43. O-ring |
| 19. Washer | 44. Oil seal |
| 20. Tapered roller bearing assembly | 45. Shim |
| 21. Spacer | 46. Tapered roller bearing assembly |
| 22. Iab washer | 47. Spacer |
| 23. Nut | 46. Retaining ring |
| 24. Reverse gear | 49. Washer |
| 25. Retainer | 50. Nut |

There is a mark on the lower gear on 1.33: 1 drives with left-hand rotation and 20 degree spiral angle gear teeth and on all units with 35 degree spiral angle gear teeth. On such units, the marked tooth on the lower gear must mesh between the 2 marked pinion gear teeth.

1. Install pinion gear and universal joint assembly with shim and a new O-ring into drive shaft housing.
2. Align holes in bearing retainer, shim and housing. Install capscrews with tab washers. Tighten capscrews to specifications (Table 1) and bend one tab up on each washer.
3. Install rear cover with new gasket. Tighten screws to specifications (Table 1).

Upper Gear and Bearing Removal

1. Remove top cover plate screws. Tap lightly on the underside of the cover with a plastic mallet to break the seal. Remove the cover, shim(s) and O-ring. Discard the O-ring.
2. Remove the upper gear and bearing assembly.

Upper Gear and Bearing Disassembly/Reassembly

If shaft requires disassembly, take it to a MerCruiser dealer or qualified marine shop. All bearings, bearings cups and spacers must be replaced as a unit. Disassembly, shimming and reassembly are best done by a qualified specialist.

Upper Gear and Bearing Installation

1. Perform **Upper Gear Bearing Assembly Drive Shaft Housing Clearance** as described in this chapter.
2. After correct shim thickness has been determined, measure gap between top cover and drive shaft housing with a flat feeler gauge.
3. Remove cover from housing and install shims that are 0.002 in. **thinner** than the feeler gauge reading obtained in Step 2.

NOTE

Models with serial No. 1602186 and above use oil passages in the drive shaft housing and top cover assembly, Check to make sure these passages are clean before installing cover in Step 4.

4. Reinstall cover with shim(s) and new O-ring. Tighten fasteners to specifications (Table 1).

Lower Gear and Bearing Assembly Removal

This procedure requires the use of many special tools. Bearings are matched and a complete set of bearings, cups and spacers must be installed if existing bearing set is damaged. For this reason, it is probably best that you have this procedure performed by a MerCruiser dealer or other qualified specialist.

1. Place an old sliding clutch on top of the lower gear. Make sure clutch lugs engage gear lugs.
2. Install splined end of wrench adaptor (part No. C-91-32332A1) into center of sliding clutch. Install bolt and washer from bottom of drive shaft housing and tighten into adaptor. Make sure washer is centered on gear and does not touch locknut when tightening bolt.
3. Install top cover holding fixture (part No. C-91-32333A1) over adaptor and fasten to drive shaft housing.

NOTE

On early units, a large screwdriver blade can be jammed in one of the locknut cutouts and used to hold the assembly from turning.

4. Install gear locknut wrench (part No. C-91-32329) with flex handle and 6 in. extension from underneath unit until it engages and holds locknut at bottom of lower gear/bearing assembly.
5. Turn wrench adaptor counterclockwise to break locknut free. Remove retaining bolt and washer, then finish removing locknut.
6. Remove pilot plate, wrench adaptor and sliding clutch.
7. Remove the gear, one tapered roller bearing and spacer from drive shaft housing.
8. Remove **jamnuts** and setscrews holding bearing cup retainer in place.
9. Install lugs of retainer driver (part No. C-91-35545) into retainer notches.
10. Install drive end of wrench adaptor tool into driver with spacer furnished.
11. Place holding fixture (part No. C-91-32333A) over the adaptor. Secure it to drive shaft housing, then rotate adaptor counterclockwise until retainer can be removed.
12. Remove bearing, cups and shims from housing with a bearing puller (part No. C-91-3 1229A4).

Installation

1. Perform **Upper Gear/Bearing Assembly Drive Housing Clearance** procedure.
2. Install bearing assemblies on lower gear as follows: large diameter of tapered roller bearing toward gear, bearing cup on roller bearing, spacers, bearing cup with large diameter facing upward and roller bearing in cup.
3. Install gear locknut finger-tight.
4. Install shim(s) in drive shaft housing.
5. Press gear and bearing assembly into drive shaft housing until it bottoms.
6. Remove locknut from gear. Lift gear, tapered roller bearing and spacers from drive shaft housing.
7. Install bearing retainer with retainer driver (part No. C-91-35545), wrench adaptor (part No. C-91-32332A1) and holding fixture (part No. C-91-32333A1).
8. Position tapered roller bearing and spacer(s) on lower gear, then install assembly in bearing cup inside the drive shaft housing.
9. Install locknut on underside of gear/bearing assembly with chamfer facing up.
10. Install an old sliding clutch on the gear with the clutch teeth engaging the gear teeth.
11. Install retaining bolt and washer through gear and tighten into wrench adaptor. Make sure washer is centered on gear and does not touch locknut when tightening the bolt.
12. Install gear locknut wrench (part No. C-91-32329) from bottom of unit to hold gear locknut. Turn wrench adaptor clockwise to tighten nut to 150 ft.-lb.
13. If new gears and/or bearing assemblies were installed, perform **Lower Gear/Bearing Assembly Clearance** procedure in this chapter.
14. Swage locknut in place with tool part No. C-91-53122.

Upper Gear/Bearing Assembly Drive Housing Clearance

This procedure must be performed before the lower gear and bearing assembly is reinstalled in the drive shaft housing.

1. Install shimming tool (part No. C-91-52001) in drive shaft housing through pinion retainer opening. **Flat** surface must clear upper gear.
2. Reinstall shims in drive shaft housing.
3. Install top cover without O-ring or cover shims. Tighten cover snugly; do not torque.

4. Rotate shimming tool until you can measure the gap between the rounded tool surface and the flat surface on a tooth with a feeler gauge:
 - a. **Early 1.33:1** drives with 35° spiral angle gears should have a clearance of 0.032 in.
 - b. **Late 1.33:1** and all **1.78:1** drives with 20° spiral angle gears should have a clearance of 0.025 in.
5. If clearance between tool and tooth gear is excessive, remove sufficient shimming from drive shaft cover to bring it into specifications.
6. If clearance is too small, add shimming to drive shaft cover to bring it into specifications.
7. Proceed with **Lower Gear and Bearing Assembly/Installation** as described in this chapter.

Lower Gear/Bearing Assembly Clearance

This procedure must be performed whenever a new lower gear or bearing assemblies are installed.

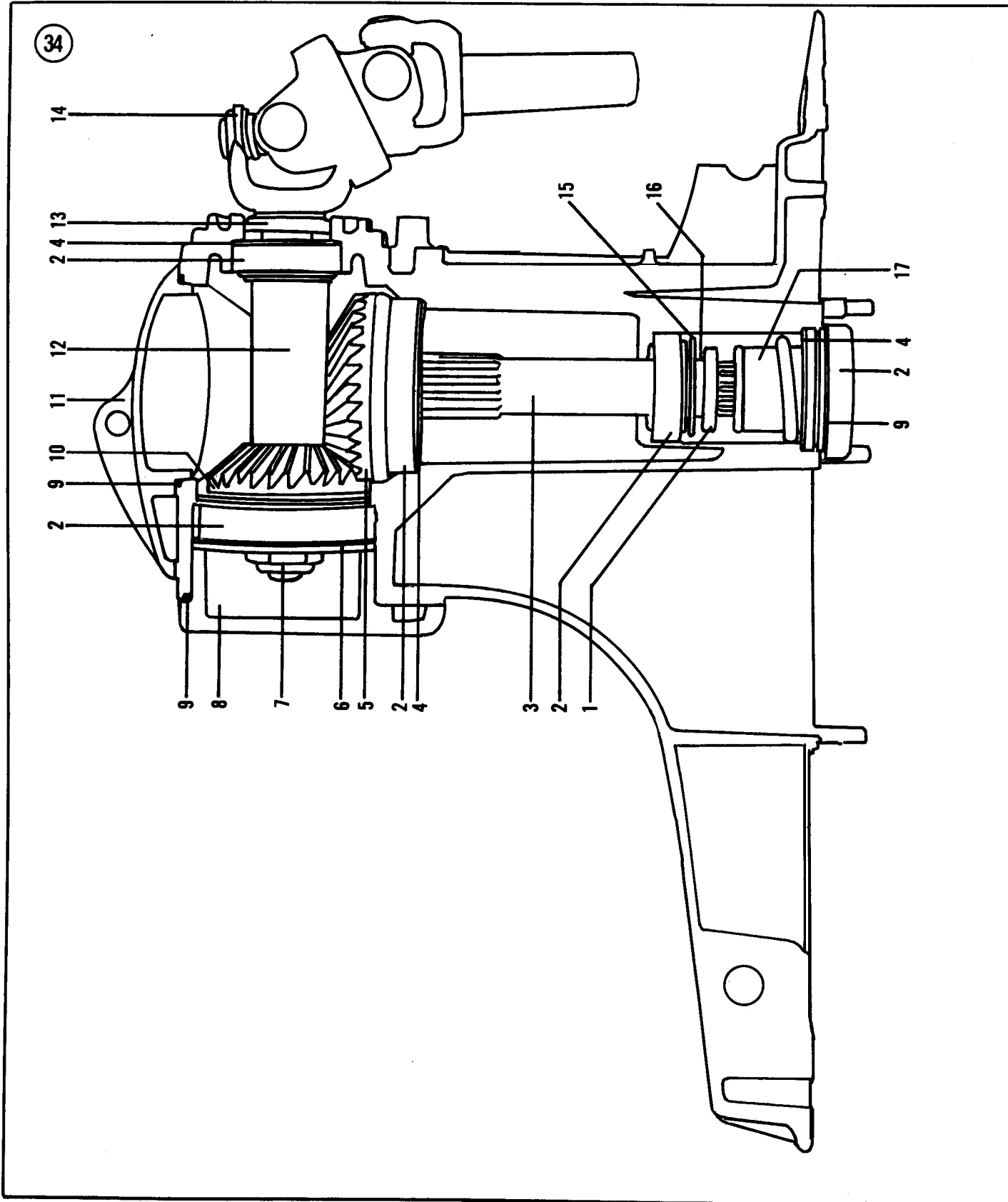
1. Install shimming tool (part No. C-91-52001) in drive shaft housing through pinion retainer opening. **Flat** surface must clear lower gear.
2. Rotate shimming tool until you can measure the gap between the rounded tool surface and the flat surface on a tooth with a feeler gauge:
 - a. **Early 1.33:1** drives with 35° spiral angle gears should have a clearance of 0.032 in.
 - b. **Late 1.33:1** and all **1.78:1** drives with 20° spiral angle gears should have a clearance of 0.025 in.
3. If clearance between tool and tooth gear is excessive, add sufficient shimming under the bottom bearing cup to bring it into specifications.
4. If clearance is too small, remove shimming from under bottom bearing cup to bring it into specifications.

MODEL II-TR AND II-TRS DRIVE

Figure 34 is a cross-section of the Model **II-TR/II-TRS** drive to show component relationships within the drive shaft housing.

Drive Shaft Housing Removal/Installation

The II-TR and II-TRS drive shaft housing can be removed following the procedure given in this chapter for the Model I.



**MERCUISER II-TR AND II-TRS
DRIVE SHAFT CROSS-SECTION**

1. Searing nut
2. Bearing
3. Upper **driveshaft**
4. Shim
5. Driven gear
6. Shim/tab washer
7. Nut
8. Rear cover
9. O-ring
10. Drive gear
11. Iop cover
12. Spacer
13. Oil seal
14. Universal joint assembly
15. Flat tab washer
16. Tab lockwasher
17. Coupling

Top and Rear Covers Removal/Installation

1. Remove 4 top cover capscrews (Figure 35). Remove top cover and O-ring.
2. Remove 4 rear cover capscrews. Remove cover and O-ring (Figure 36).
3. Remove universal joint shaft guide spring.
4. Installation is the reverse of removal.

Top and Rear Covers Cleaning and Inspection

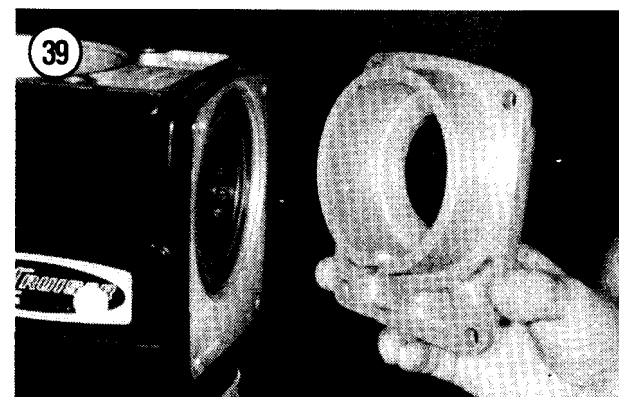
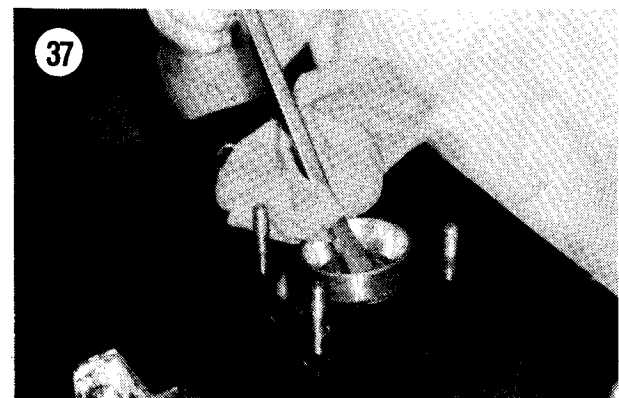
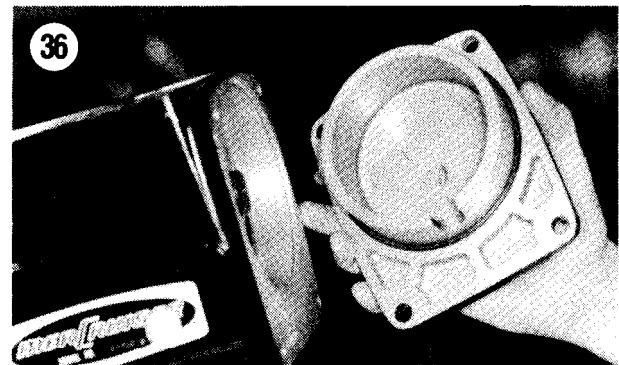
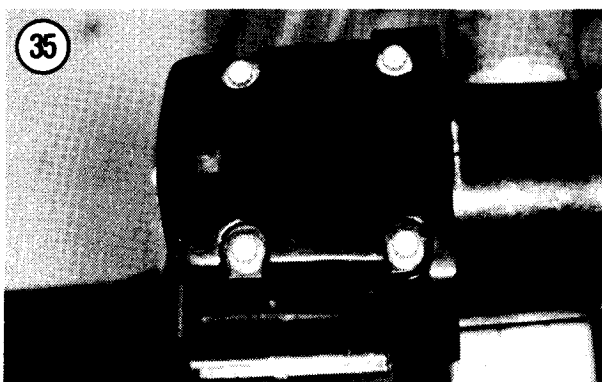
1. Clean covers in fresh solvent. Blow dry with compressed air.
2. Check O-rings for serviceability. Replace if O-ring shows signs of hardening, cracking or is cut or nicked.

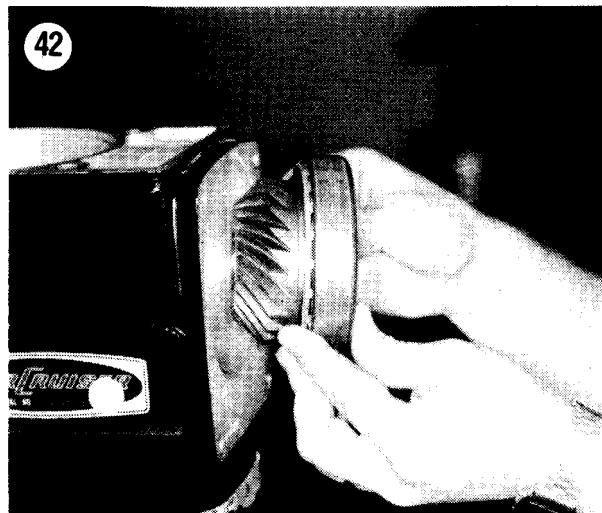
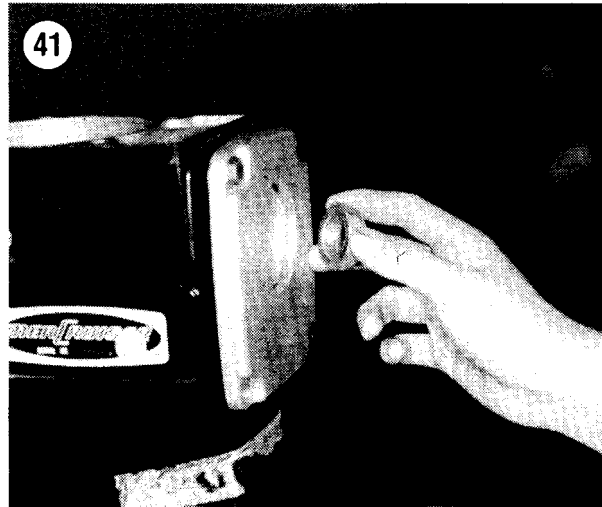
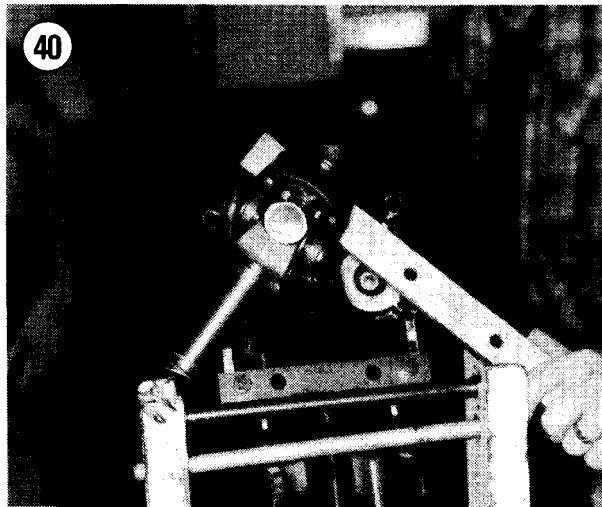
Lower Drive Shaft Bearing Cup, Spacer and Coupling Removal

1. Invert drive shaft housing in holding fixture.
2. Carefully pry lower bearing cup from housing as shown in Figure 37.
3. Remove shims, spacer and drive shaft coupling from housing. See Figure 38.

Lower Drive Shaft Bearing Cup, Spacer and Coupling Cleaning and Inspection

1. Clean all parts in fresh solvent. Blow dry with compressed air.
2. Check bearing cup for signs of pitting, scoring, grooving, heat discoloration or embedded metallic particles. Replace bearing and cup if any defects are found.





3. Check shims for damage. Replace any that are not serviceable with new shims of the same thickness.
4. Inspect coupling splines for signs of excessive wear, rust or pitting.

Lower Drive Shaft Bearing Cup, Spacer and Coupling Installation

1. With drive shaft housing inverted, install drive shaft coupler, spacer and shims (Figure 38).
2. Install bearing cup in drive shaft housing with a soft mallet.

Universal Joint and Drive Gear Removal

1. Remove rear cover as described in this chapter.
2. Install bearing holder tool (part No. C-91-63625) in place of rear cover (Figure 39). Tighten capscrews snugly.
3. Insert a metal bar through the universal joint yoke as shown in Figure 40 to prevent yoke from turning.
4. Loosen universal joint shaft nut through bearing holder tool and remove nut (Figure 41). Remove the universal joint assembly.
5. Remove the bearing holder tool.
6. Remove the washer, shims and tab washer from the drive shaft housing.
7. Remove the drive gear/bearing assembly (Figure 42). Reach inside the housing and remove the spacer tube and front tapered roller bearing.
8. Remove universal joint front bearing cup with slide hammer puller (part No. C-9 1-34569A1). Remove shim(s) under bearing cup.
9. Note position of universal joint shaft oil seal and repeat Step 8 to remove it. Remove O-ring from drive shaft housing pilot.

Universal Joint and Drive Gear Cleaning and Inspection

1. Clean all parts in fresh solvent. Blow dry with compressed air.
2. Check coupling and universal joint gear end splines for excessive wear.
3. Clean all corrosion from coupling splines. If splines are partially corroded, replace coupling end yoke. See *Universal Joint Disassembly/Assembly* for Model I in this chapter.
4. Check drive gear for chipped, broken, pitted or excessively worn teeth. Replace as required.

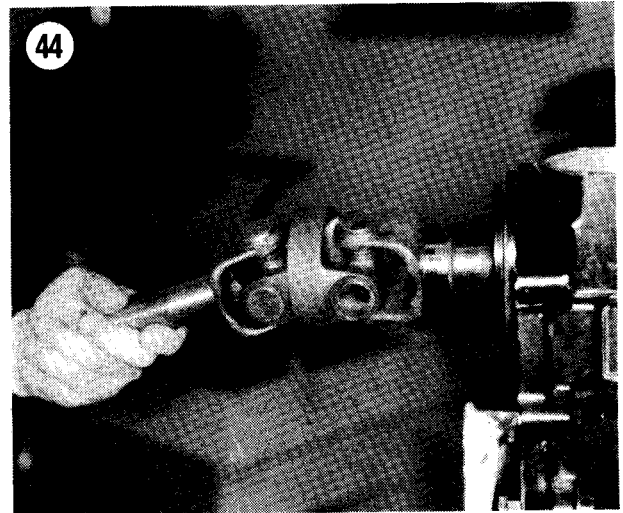
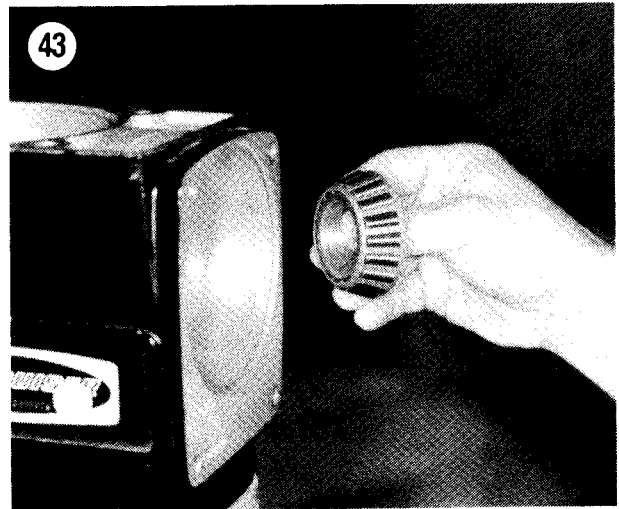
5. Check bearing cups for signs of pitting, scoring, grooving, heat discoloration or embedded metallic particles. Replace bearing and cup if any of these defects are noted.
6. Check O-ring for serviceability. Replace if cut, nicked, cracked or hardened.
7. Check oil seal for signs of wear, damage, roughness or improper spring position. Replace as required.

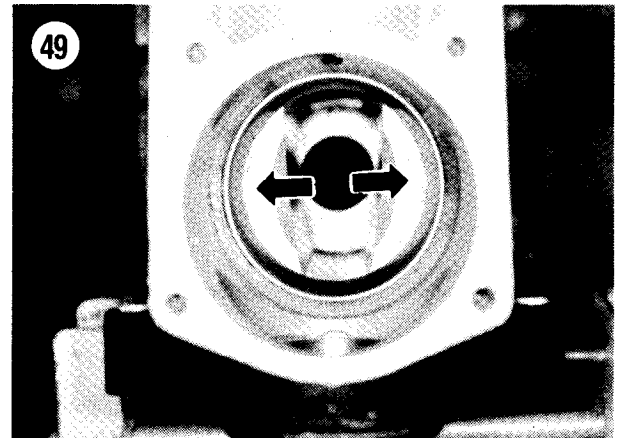
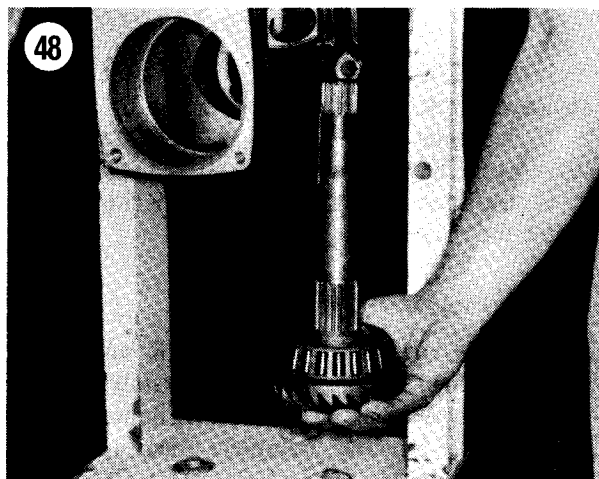
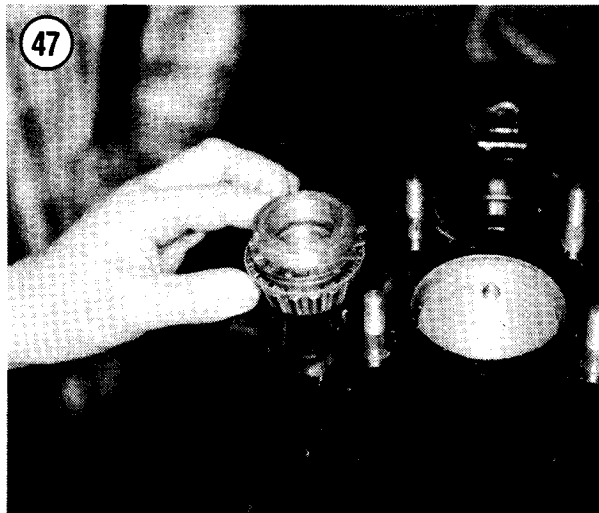
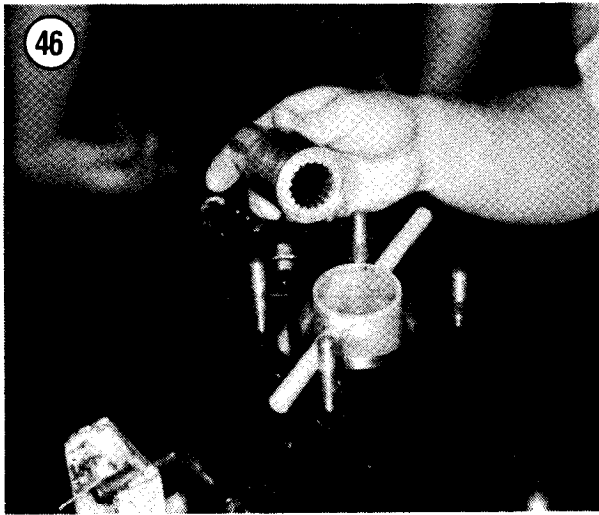
Universal Joint and Drive Gear Installation

1. Install oil seal with tool part No. C-91-63619. If seal was flush with housing when removed, use side No. 1 of tool to install seal 1/16 in. into housing bore. If seal was not flush, use side No. 2 of tool and install seal 1/8 in. into bore. If a new universal joint shaft is being installed, install seal flush with housing.
2. Install shim(s) in drive shaft housing. Position flat side of tool part No. C-91-63619 toward gear and install tapered roller bearing cup.
3. Install tapered roller bearing (**Figure 43**) and spacer tube in drive shaft housing.
4. Install drive gear/bearing assembly in drive shaft housing. See **Figure 42**.
5. Install tab washer in drive shaft housing. Tab must engage oil hole in bearing cup.
6. Install shim(s) and flat washer.
7. Install universal joint shaft through front bearing, spacer and drive gear. See **Figure 44**. Install and finger-tighten shaft nut.
8. Install bearing holder tool (part No. C-91-63635) and tighten universal joint shaft nut to specifications (**Table 1**).
9. Remove bearing holder tool and reinstall rear cover (**Figure 36**) with new O-ring. Tighten capscrews to specifications (**Table 1**).
10. Check drive shaft overall bearing preload at upper drive shaft with a torque wrench. Bearing preload should be 5-11 ft.-lb. greater than that measured in *Drive Shaft and Driven Gear Assembly Installation* during this chapter.

Drive Shaft and Driven Gear Assembly Removal

1. With drive shaft housing inverted in a suitable holding fixture, bend tab washer back from upper drive shaft bearing nut.





2. Install bearing nut wrench (part No. C-91-63620) (Figure 45) over drive shaft bearing nut.
3. Install drive shaft socket (part No. C-91-63621) into bearing nut wrench and turn drive shaft clockwise to loosen nut.
4. Remove drive shaft socket with nut (Figure 46). Remove bearing nut wrench.
5. Remove tabbed washers and bearing from bottom of drive shaft housing. Figure 47 shows correct assembly of bearing, washers and nut.
6. Press driven gear and upper drive shaft assembly from drive shaft housing (Figure 48).
7. Remove driven gear bearing cup (Figure 49) with slide hammer puller (part No. C-91-34569A1). Remove shim(s) under the cup.
8. Repeat Step 7 to remove bottom bearing cup.

Drive Shaft and Driven Gear Assembly Cleaning and Inspection

CAUTION

Do not separate bearing from driven gear unless it must be replaced. Pressing the driven gear from the bearing destroys the bearing.

1. Clean all parts in solvent. Blow dry with compressed air.
2. Check for pitted, chipped, broken or excessively worn driven gear teeth. Replace as required.
3. Check bearing cups for signs of scoring, grooving, pitting, heat discoloration or embedded metallic particles. Replace bearing and cup assembly if any of these defects are noted.
4. Check drive shaft **splines** for excessive wear.

Drive Shaft and Driven Gear Assembly Installation

1. Install driven gear bearing shim(s). Install bearing cup with driver part No. C-91-63626.
2. Install upper drive shaft bearing cup with driver part No. C-91-63619.

NOTE

Washer tabs must align with drive shaft slot in Step 3. Chamfered side of nut should face bearing.

3. Install upper drive shaft through top of housing. Install tapered roller bearing, flat tabbed washer, new tab washer and bearing nut through bottom of drive shaft housing.

NOTE

Tighten bearing nut in stages in Step 4, checking preload torque on the upper drive shaft with a drive shaft socket and inch-pound torque wrench. If too much torque is provided, resulting in too much preload, remove nut and start again. Do not back off nut to adjust torque/preload.

4. Install drive shaft socket/wrench (part No. C-91-63620A1) and rotate drive shaft counterclockwise to tighten nut sufficiently to obtain the proper preload on upper drive shaft bearings.
5. Align bearing nut slot with washer tab. Bend tab into slot.

Drive Gear Clearance

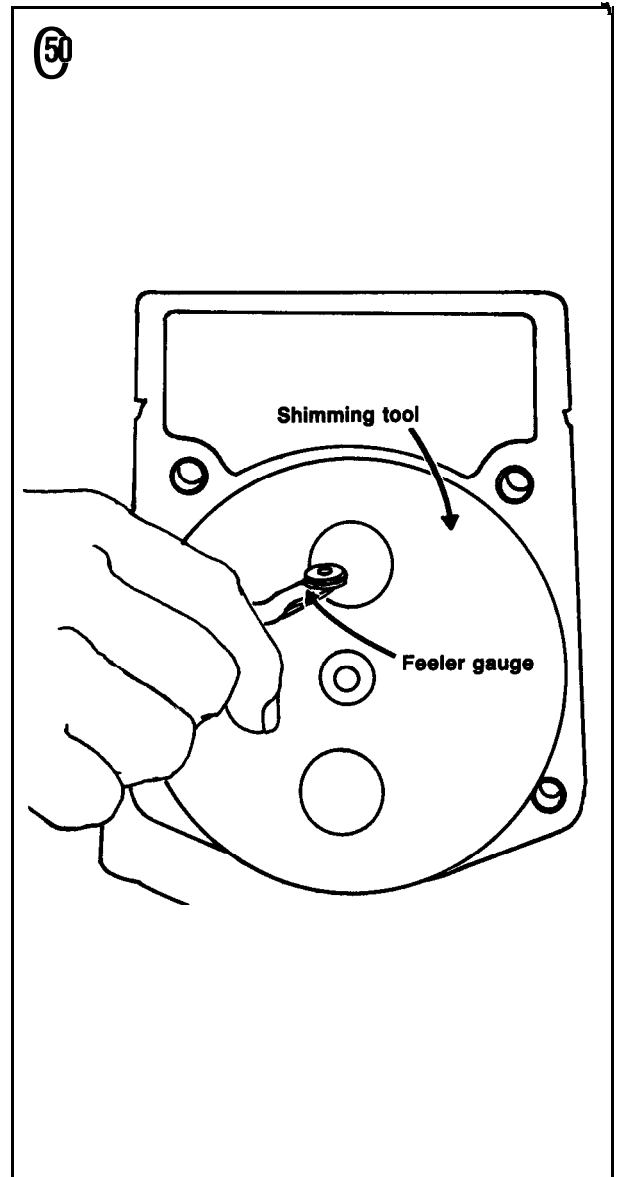
Refer to Figure 50 for this procedure.

1. Install shimming tool (part No. C-91-63624) into drive shaft housing.
2. Insert 0.025 in. feeler gauge and measure clearance between drive gear and shimming tool.
3. If clearance is too great, remove shim(s) from under the universal joint shaft front bearing cup and add the same amount of shimming under the rear cover.
4. If clearance is insufficient, add shim(s) under the front bearing cup and remove the same amount from under the rear cover.

Driven Gear Clearance

Refer to Figure 51 for this procedure.

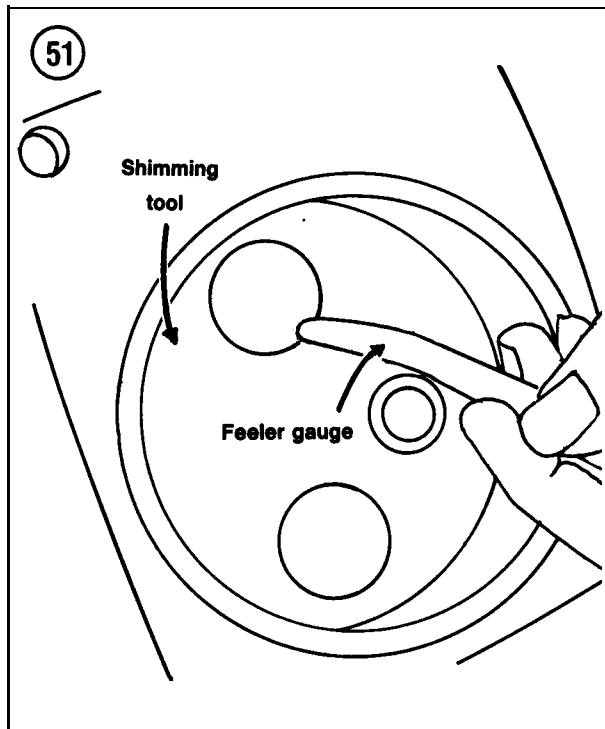
- I. Install shimming tool (part No. C-91-63623) into drive shaft housing. Hole marked "MCIITR" must face driven gear.



2. Insert 0.025 in. feeler gauge and measure clearance between driven gear and shimming tool.
3. If clearance is too great, add shim(s) under the driven gear bearing cup.
4. If clearance is insufficient, remove shim(s) from under the driven gear bearing cup.

Bearing Preload

During assembly of Model II-TR and II-TRS gear housings, bearing preload is established and set for each shaft as described in Chapter 15. The drive shaft housing complete bearing preload consists of:



a. The upper drive shaft preload.

b. The universal joint shaft preload.

This complete preload is measured at the upper drive shaft.

Table 2 contains bearing preload torque specifications for **MerCruiser II-TR, 255II-TRS, 280-TRS** and **330-TRS** models. **Tables 3-5** provide bearing preload charts for the same models. Refer to appropriate preload torque chart to determine drive shaft housing overall bearing preload torque (top line). Locate prop shaft bearing preload torque along **left** side of chart. The 2 figures in the intersecting block of the preload chart are the upper/lower limits of the drive unit's overall bearing preload torque, as measured at the prop shaft.

If the preload as measured is not within the specified range, rotate the propeller **shaft** several times to seat the bearings and recheck. If the measured preload for the total unit still does not agree with the chart value, separate the housings. Recheck individual preload settings against the values specified in **Table 2** and correct as necessary.

Table 1 DRIVE SHAFT HOUSING TIGHTENING TORQUES

	in.-lb.	ft.-lb.
MODELS 60, 80, 90		
Bell housing to drive shaft housing stud nut		40
Drive shaft housing		
To gear housing stud nut		40
Top cover screw		20
Universal joint shaft pinion nut		50
Universal joint retainer cover		150
Upper drive shaft preload	26-44	
Upper drive shaft impeller shaft		40
Water pocket cover screw		12
Water pump body screw		5-8
MODEL I		
Bell housing to drive shaft housing stud nut		50
Drive shaft housing		
Top cover screw		20
To gear housing stud nut		35
Trim tab bolt	180	
Universal joint		
Cover retainer		200
Pinion nut		85
Upper drive shaft preload	2-6	
Water pocket cover screw	30-40	
MODEL II		
Drive shaft housing to gear housing stud nut		40
Rear cover screw		12
Top cover screw		30
Universal shaft joint pinion nut		200
Drive shaft pinion nut		150
Drive shaft housing assembly nut		250
Drive shaft bearing retainer		20
Rack guide to drive shaft housing screw		12
Trim tab bolt	180	
MODELS II-TR, II-TRS		
Bell housing to drive shaft housing stud nut		75-85
Drive shaft housing		
Top cover screw		20
Rear cover screw		20
To gear housing stud nut		35
Trim tab bolt	180	
Universal joint pinion nut		200
Valve guide to drive shaft housing screw	30	
(continued)		

Table 1 DRIVE SHAFT **HOUSING TIGHTENING** TORQUES (continued)

	in.-lb.	ft.-lb.
MODEL III-390		
Bell housing to drive shatt housing stud nut		100
Drive shatt housing		
To gear housing stud nut		60
Rear cover		20
Front cover screw		30
Front cover stud nut		20
Bearing retainer stud nut		30
Preload		20-30
Threaded retainer		200
Bearing cone retainer nut		250
Universal joint shaft pinion nut		200
Trim tab bolt	180	

Table 2 BEARING PRELOAD TORQUES

MODEL II-TR	
Upper drive shatt housing only (located in drive shaft housing)	5-15 in.-lb.
Drive shatt housing complete (upper drive shaft and U-joint measured @ upper drive shaft)	Upper drive shatt torque + 5-11 in.-lb.
Propeller shaft	8-15 in.-lb.
Drive unit overall preiod (recorded @ prop shaft)	Drive shatt housing complete X 1.5 + prop shaft preiod + 5-15 in.-lb.
MODEL 255 II-TRS	
Upper drive shaft housing only (located in drive shatt housing)	5-15 in.-lb.
Drive shaft housing complete (upper drive shatt and U-joint measured @ upper drive shaft)	Upper drive shatt torque + 5-11 in.-lb.
Propeller shatt	8-15 in.-lb.
Drive unit overall preiod (recorded @ prop shaft)	Drive shatt housing complete + prop shaft preiod + 2-6 in.-lb.
MODELS 280-TRS, 330-TRS	
Upper drive shatt housing only (located in drive shatt housing)	5-15 in.-lb.
Drive shaft housing complete (upper drive shatt and U-joint measured @ upper drive shaft)	Upper drive shaft torque + 5-11 in.-lb.
Propeller shatt	8-15 in.-lb.
Drive unit overall preiod (recorded @ prop shaft)	Drive shatt housing complete X 1.125 + prop shaft preiod + 2-6 in.-lb.

Table 3 BEARING PRELOAD CHART—MERCUISER II-TR DRIVE UNIT
 DRIVE SHAFT HOUSING (COMPLETE) TORQUES (IN.-LB.)

PROPELLER SHAFT TORQUES (IN.-LB.)

	10	11	12	13	14	15	16	17	16	19	20	21	22	23	24	26	26
6	28 to 36	29 to 39	31 to 41	32 to 42	34 to 44	35 to 45	37 to 47	38 to 46	40 to 50	41 to 51	43 to 53	44 to 54	46 to 56	47 to 57	49 to 59	50 to 60	52 to 62
9	29 to 39	30 to 40	32 to 42	33 to 43	35 to 45	36 to 46	38 to 46	39 to 49	41 to 51	42 to 52	44 to 54	45 to 55	47 to 57	48 to 56	50 to 60	51 to 61	53 to 63
10	30 to 40	31 to 41	33 to 43	34 to 44	38 to 46	37 to 47	39 to 49	40 to 50	42 to 52	43 to 53	45 to 55	46 to 56	48 to 56	49 to 59	51 to 61	52 to 62	54 to 64
11	31 to 41	32 to 42	34 to 44	35 to 45	37 to 47	38 to 48	40 to 50	41 to 51	43 to 53	44 to 54	46 to 56	47 to 57	49 to 59	50 to 60	52 to 62	53 to 63	55 to 65
12	32 to 42	33 to 43	35 to 45	36 to 46	38 to 48	39 to 49	41 to 51	42 to 52	44 to 54	45 to 55	47 to 57	48 to 58	50 to 60	51 to 61	53 to 63	54 to 64	56 to 66
13	33 to 43	34 to 44	36 to 46	37 to 47	39 to 49	40 to 50	42 to 52	43 to 53	45 to 55	46 to 56	48 to 58	49 to 59	51 to 61	52 to 62	54 to 64	55 to 65	57 to 67
14	34 to 44	35 to 45	37 to 47	38 to 48	40 to 50	41 to 51	43 to 53	44 to 54	46 to 56	47 to 57	49 to 59	50 to 60	52 to 62	53 to 63	55 to 65	56 to 66	58 to 68
15	35 to 45	36 to 46	38 to 48	39 to 49	41 to 51	42 to 52	44 to 54	45 to 55	47 to 57	48 to 58	50 to 60	51 to 61	53 to 63	54 to 64	56 to 66	57 to 67	59 to 69

Table 4 BEARING **PRELOAD CHART—MERCUISER 255II-TRS** DRIVE UNIT
 DRIVE SHAFT HOUSING (COMPLETE) TORQUES **(IN.-LB.)**

PROPELLER SHAFT TORQUES (IN.-LB.)

	10	11	12	13	14	15	16	17	16	19	20	21	22	23	24	25	26
6	20 to 24	21 to 25	22 to 26	23 to 27	24 to 26	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40
9	21 to 25	22 to 26	23 to 27	24 to 26	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41
10	22 to 26	23 to 27	24 to 26	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	38 to 42
11	23 to 27	24 to 26	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	38 to 42	39 to 43
12	24 to 26	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	38 to 42	39 to 43	40 to 44
13	25 to 29	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	36 to 42	39 to 43	40 to 44	41 to 45
14	26 to 30	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	36 to 42	39 to 43	40 to 44	41 to 45	42 to 46
15	27 to 31	26 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 36	35 to 39	36 to 40	37 to 41	36 to 42	39 to 43	40 to 44	41 to 45	42 to 46	43 to 47

Table 5 BEARING PRELOAD **CHART—MERCUISER 280-TRS AND 330-TRS**
 DRIVE SHAFT HOUSING (COMPLETE) TORQUES (IN.-LB.)

PROPELLER SHAFT TORQUES (IN.-LB.)

	10	11	12	13	14	15	16	17	16	19	20	21	22	23	24	25	26
8	21 to 25	22 to 26	24 to 28	25 to 29	26 to 30	27 to 31	28 to 32	29 to 33	30 to 34	31 to 35	33 to 37	34 to 38	35 to 39	36 to 40	37 to 41	38 to 42	39 to 43
9	22 to 26	23 to 27	25 to 29	28 to 30	27 to 31	28 to 32	29 to 33	30 to 34	31 to 35	32 to 36	34 to 38	35 to 39	38 to 40	37 to 41	38 to 42	39 to 43	40 to 44
10	23 to 27	24 to 28	28 to 30	27 to 31	28 to 32	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	35 to 39	38 to 40	37 to 41	38 to 42	39 to 43	40 to 44	41 to 45
11	24 to 28	25 to 29	27 to 31	28 to 32	29 to 33	30 to 34	31 to 35	32 to 38	33 to 37	34 to 38	38 to 40	37 to 41	38 to 42	39 to 43	40 to 44	41 to 45	42 to 48
12	25 to 29	28 to 30	28 to 32	29 to 33	30 to 34	31 to 35	32 to 38	33 to 37	34 to 38	35 to 39	37 to 41	38 to 42	39 to 43	40 to 44	41 to 45	42 to 48	43 to 47
13	26 to 30	27 to 31	29 to 33	30 to 34	31 to 35	32 to 36	33 to 37	34 to 38	35 to 39	36 to 40	38 to 42	39 to 43	40 to 44	41 to 45	42 to 46	43 to 47	44 to 48
14	27 to 31	28 to 32	30 to 34	31 to 35	32 to 38	33 to 37	34 to 38	35 to 39	36 to 40	37 to 41	39 to 43	40 to 44	41 to 45	42 to 48	43 to 47	44 to 48	45 to 49
15	28 to 32	29 to 33	31 to 35	32 to 38	33 to 37	34 to 38	35 to 39	38 to 40	37 to 41	38 to 42	40 to 44	41 to 45	42 to 48	43 to 47	44 to 48	45 to 49	48 to 50