



LOWER UNIT

Section 6B – Left Hand Non-Ratcheting

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**6
B**

Gear Housing Specifications (Counter Rotation)

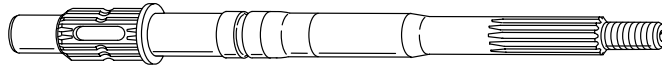
Ratio	Pinion Depth	Forward Gear Backlash	Reverse Gear Backlash
1.75:1 1.87:1	0.025 in. (0.635 mm) With Tool 91-12349A2 using Disc #2 and Flat #4	0.017 in. to 0.028 in. (0.431 mm to 0.711 mm) Pointer on line mark #1	0.040 in. to 0.060 in. (1.01 mm to 1.52 mm)
Gearcase Lubricant Capacity			
All Ratios		27.0 fl. oz. (798.0 ml)	
Gearcase Pressure Check			
Gearcase without Oil		Gearcase should hold 15 psi for 5 minutes without leakage	

Gear Ratio	Pinion Gear Teeth	Forward and Reverse Gear Teeth
1.75:1	12	21
1.87:1	15	28

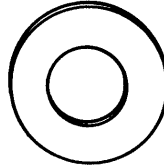


Special Tools

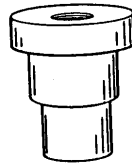
1. Propeller Shaft 44-93003 and Load Washer 12-37429



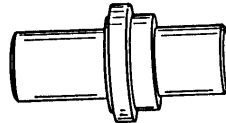
2. Bellville Washer 12-54048



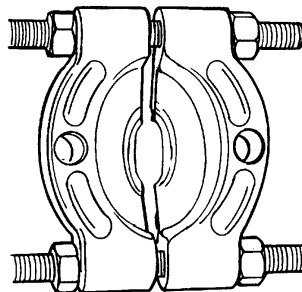
3. Needle Bearing Driver 91-15755



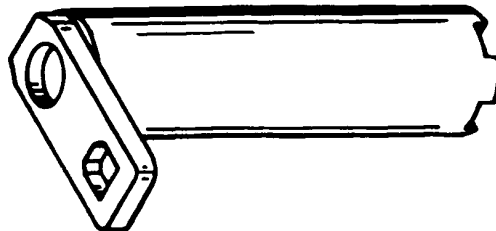
4. Oil Seal Driver 91-31108



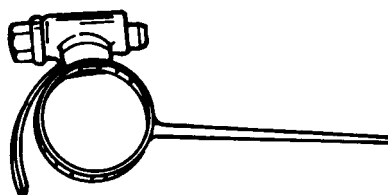
5. Universal Puller Plate 91-37241



6. Bearing Retainer Tool 91-43506

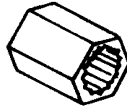


7. Backlash Indicator Rod 91-53459

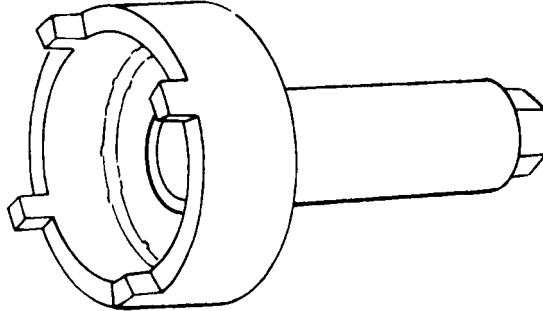




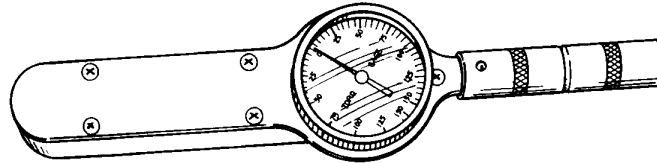
8. Drive Shaft Nut Wrench 91-56775



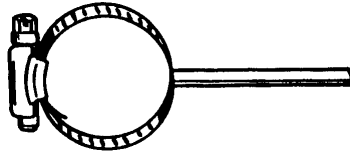
9. Bearing Carrier Retainer Wrench 91-61069



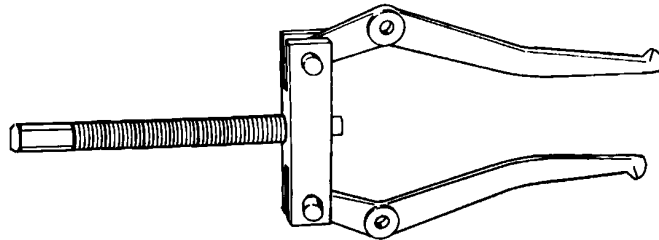
10. Torque Wrench (lb. in.) 91-66274



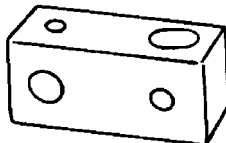
11. Backlash Indicator Rod 91-78473



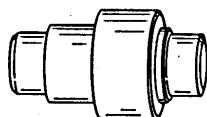
12. Puller Bolt 91-85716 and Puller Jaws 91-46086A1



13. Dial Indicator Holding Tool 91-89897

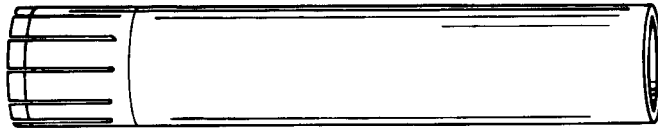


14. Forward Gear Bearing Tool 91-86943

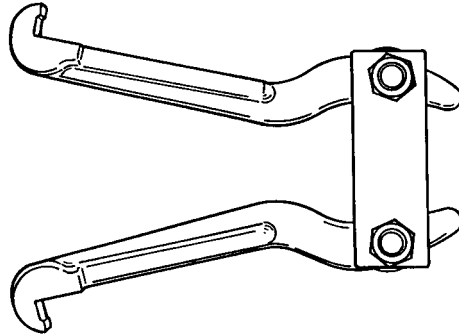




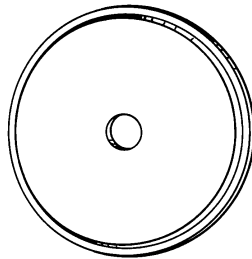
15. Forward Gear Installation Tool 91-815850



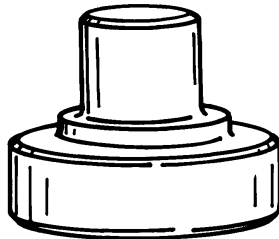
16. Puller Jaws 91-816242



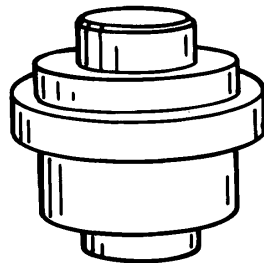
17. Guide Plate 91-816243



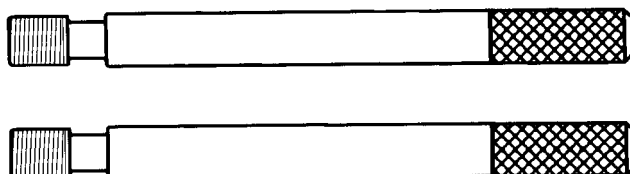
18. Bearing Driver 91-816244



19. Oil Seal Driver 91-817569

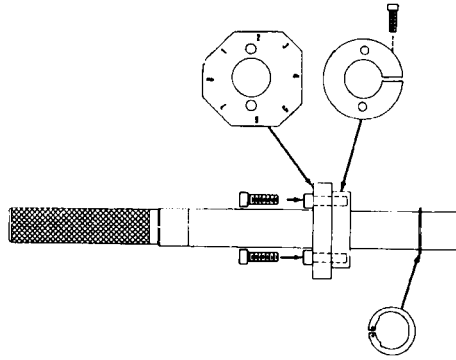


20. Water Pump Alignment Pins 91-821571A1

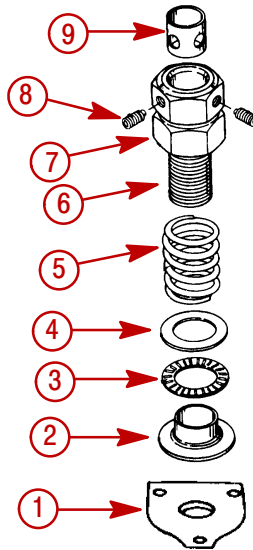




21. Pinion Gear Shimming Tool 91-12349A2



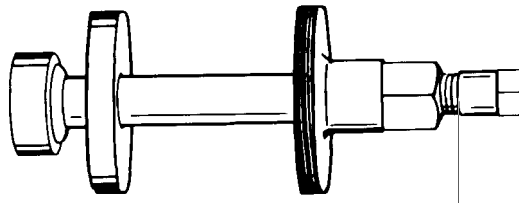
22. Bearing Preload Tool 91-14311A2



- 1 - Plate (44307)
- 2 - Adaptor (N.S.S.)
- 3 - Bearing (N.S.S.)
- 4 - Washer (N.S.S.)
- 5 - Spring (24-14111)

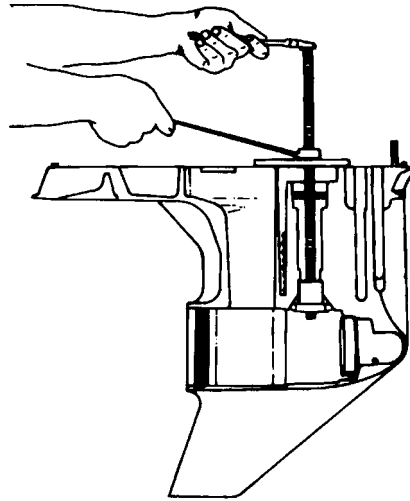
- 6 - Bolt (10-12580)
- 7 - Nut (11-13953)
- 8 - Set Screw (10-12575)
- 9 - Sleeve (23-13946)

23. Bearing Adaptor Installation Tool 91-18605A2





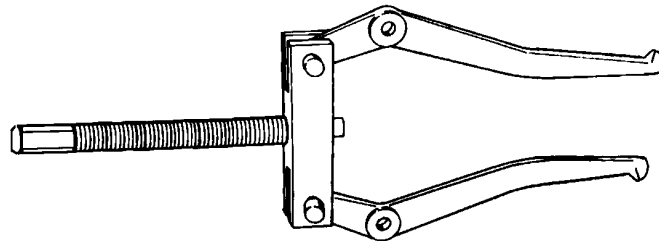
24. Bearing Removal and Installation Tool 91-31229A7 – Includes Driver Head 91-36569; Driver Head Rod 91-37323; Nut 11-24156; Pilot Washer 91-36571; Pilot Plate 91-29310; Puller/Driver Head 91-38628; Mandrel 91-30366; Plate 91-29310; Driver Head 91-32325; Puller Shaft 91-31229; Washer 91-34961.



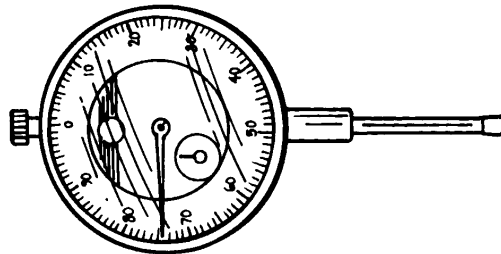
25. Slide Hammer Puller 91-34569A1



26. Puller Bolt 91-85716 and Puller Jaws 91-46086A1

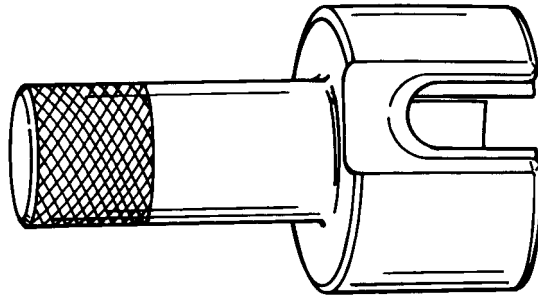


27. Dial Indicator 91-58222A1

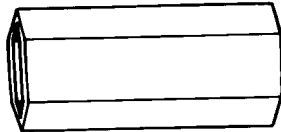




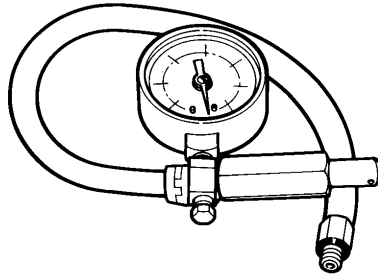
28. Pinion Nut Adaptor 91-61067A3



29. Drive Shaft Adaptor 91-61077



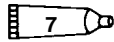
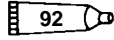
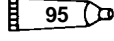
30. Leakage Tester FT8950

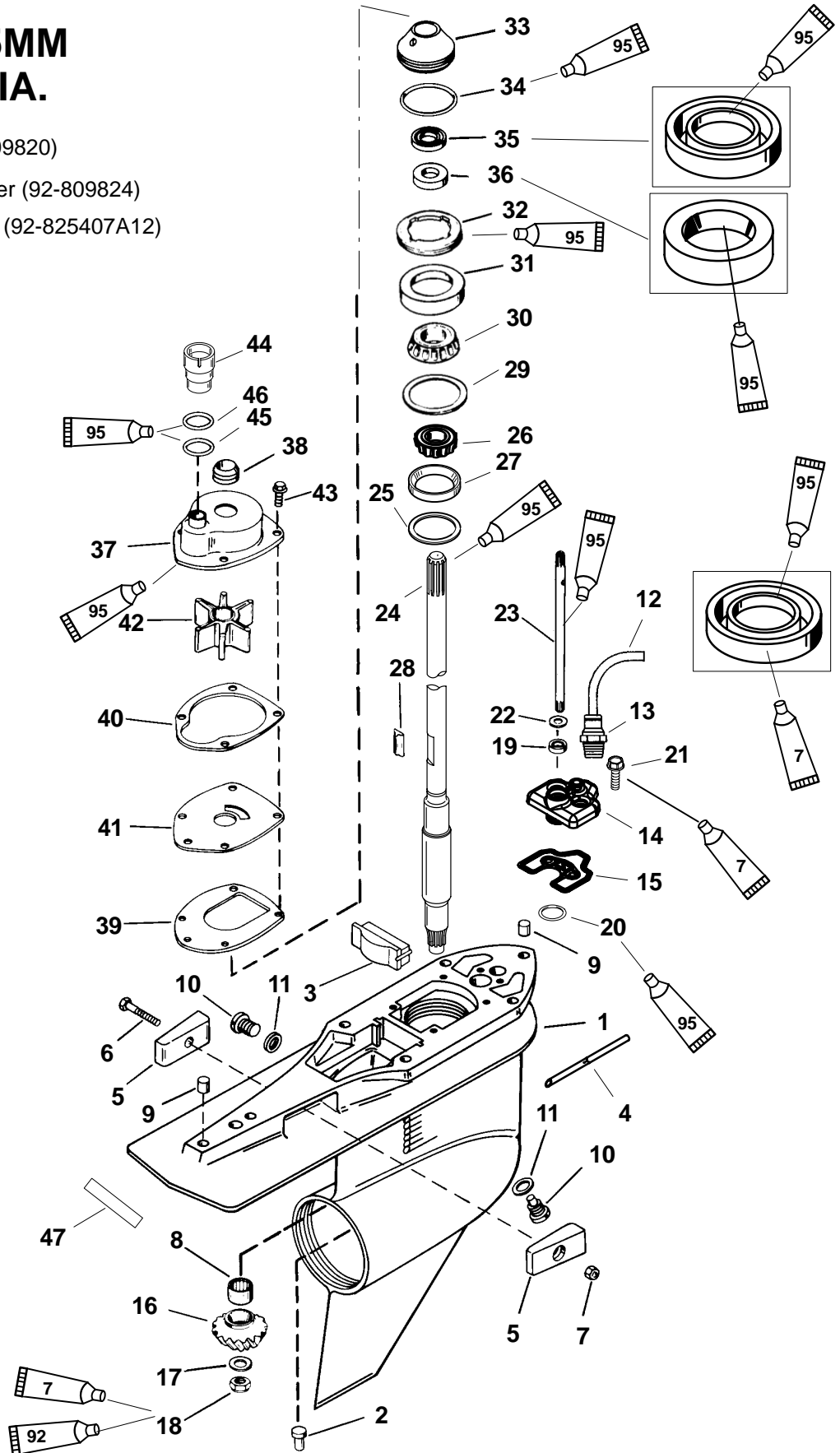




Gear Housing (Drive Shaft)(Counter Rotation)

4.75 IN/120.65MM TORPEDO DIA.

-  Loctite 271 (92-809820)
-  Loctite 7649 Primer (92-809824)
-  2-4-C With Teflon (92-825407A12)





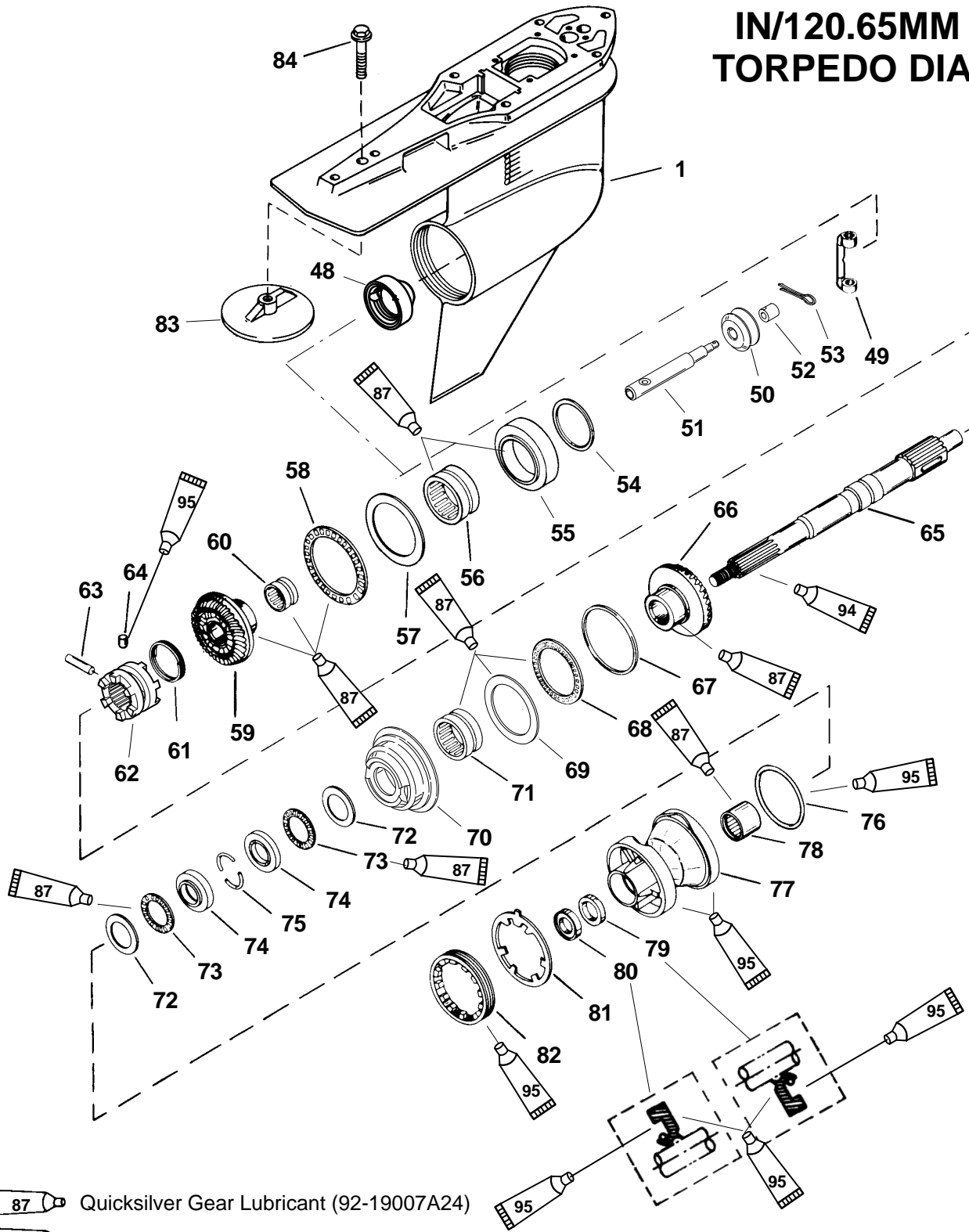
Gear Housing (Drive Shaft)(Counter Rotation)

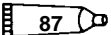
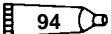
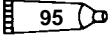
REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	GEAR HOUSING			
2	1	PIN			
3	1	FILLER BLOCK			
4	1	PITOT TUBE			
5	2	ANODE			
6	1	SCREW	60		7
7	1	NUT			
8	1	ROLLER BEARING			
9	2	DOWEL PIN			
10	2	SCREW ASSEMBLY	60		7
11	2	SEALING WASHER			
12	1	CONNECTOR (X-LONG - 12 IN.)			
	1	CONNECTOR (XX-LONG - 17 IN)			
13	1	CONNECTOR			
14	1	COVER			
15	1	GASKET			
16	1	PINION GEAR (1.75:1 - 12/21) (PART OF 43-828695A1)			
17	1	WASHER			
18	1	NUT		70	95
19	1	OIL SEAL			
20	1	O RING			
21	2	SCREW (M6 x 16)	60		7
22	1	RUBBER WASHER			
23	1	SHIFT SHAFT (LOWER)			
24	1	DRIVE SHAFT (X-LONG)			
	1	DRIVE SHAFT (XX-LONG)			
25	AR	SHIM SET			
26	1	TAPERED ROLLER BEARING			
27	1	CUP			
28	1	KEY			
29	AR	SHIM			
30	1	TAPERED ROLLER BEARING			
31	1	CUP			
32	1	RETAINER		100	135
33	1	CARRIER ASSEMBLY			
34	1	O RING			
35	1	OIL SEAL			
36	1	OIL SEAL			
37	1	WATER PUMP ASSEMBLY			
38	1	SEAL			
39	1	GASKET			
40	1	GASKET			
41	1	FACE PLATE			
42	1	IMPELLER			
43	4	SCREW (M6 x 16)	60		7
44	1	COUPLING ASSEMBLY			
45	1	O RING			
46	1	O RING			
47	1	DECAL-Counter Rotation			



Gear Housing (Prop Shaft)(Counter Rotation)

4.75 IN/120.65MM TORPEDO DIA.



-  Quicksilver Gear Lubricant (92-19007A24)
-  Anti-Corrosion Grease (92-78376A6)
-  2-4-C With Teflon (92-825407A12)



Gear Housing (Prop Shaft)(Counter Rotation)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	GEAR HOUSING			
48	1	PLUG			
49	1	SHIFT CRANK			
50	1	SHIFT SPOOL			
51	1	SPOOL			
52	1	SLEEVE			
53	1	COTTER PIN			
54	AR	SHIM SET			
55	1	BEARING ADAPTOR ASSEMBLY			
56	1	ROLLER BEARING			
57	1	THRUST WASHER			
58	1	THRUST BEARING			
59	1	REVERSE GEAR (1.75:1 - 12/21)			
60	1	ROLLER BEARING			
61	1	SPRING			
62	1	SLIDING CLUTCH			
63	1	CROSS PIN			
64	1	DETENT PIN			
65	1	PROPELLER SHAFT			
66	1	FORWARD GEAR (1.75:1 - 12/21)			
67	AR	SPACER SHIM .206 IN.			
	AR	SPACER SHIM .208 IN.			
	AR	SPACER SHIM .210 IN.			
	AR	SPACER SHIM .212 IN.			
	AR	SPACER SHIM .214 IN.			
	AR	SPACER SHIM .216 IN.			
	AR	SPACER SHIM .218 IN.			
	AR	SPACER SHIM .220 IN.			
	AR	SPACER SHIM .222 IN.			
	AR	SPACER SHIM .224 IN.			
	AR	SPACER SHIM .226 IN.			
AR	SPACER SHIM .228 IN.				
AR	SPACER SHIM .230 IN.				
68	1	ROLLER BEARING			
69	1	THRUST RING			
70	1	BEARING ADAPTOR ASSEMBLY			
71	1	ROLLER BEARING			
72	2	THRUST WASHER			
73	2	THRUST BEARING			
74	2	THRUST RACE			
75	2	KEEPER			
76	1	O RING			
77	1	BEARING CARRIER ASSEMBLY			
78	1	ROLLER BEARING			
79	1	OIL SEAL (INSIDE)			
80	1	OIL SEAL (OUTSIDE)			
81	1	TAB WASHER			
82	1	COVER		210	285
83	1	ANODIC PLATE			
84	1	SCREW		40	54.0



General Service Recommendations

There may be more than one way to “disassemble” or “reassemble” a particular part(s), therefore, it is recommended that the entire procedure be read prior to repair.

IMPORTANT: Read the following before attempting any repairs.

In many cases, disassembly of a sub-assembly may not be necessary until cleaning and inspection reveals that disassembly is required for replacement of one or more components.

Service procedure order in this section is a normal disassembly-reassembly sequence. It is suggested that the sequence be followed without deviation to assure proper repairs. When performing partial repairs, follow the instructions to the point where the desired component can be replaced, then proceed to “reassembly and installation” of that component in the reassembly part of this section. Use the “Index” (on back of section divider) to find correct page number.

Threaded parts are right hand (RH), unless otherwise indicated.

When holding, pressing or driving is required, use soft metal vise jaw protectors or wood for protection of parts. Use a suitable mandrel (one that will contact only the bearing race) when pressing or driving bearings.

Whenever compressed air is used to dry a part, verify that no water is present in air line.

BEARINGS

Upon disassembly of gear housing, all bearings must be cleaned and inspected. Clean bearings with solvent and dry with compressed air. Air should be directed at the bearing so that it passes thru the bearing. DO NOT spin bearing with compressed air, as this may cause bearing to score from lack of lubrication. After cleaning, lubricate bearings with Quicksilver Gear Lubricant. DO NOT lubricate tapered bearing cups until after inspection.

Inspect all bearings for roughness, catches and bearing race side wear. Work inner bearing race in-and-out, while holding outer race, to check for side wear. When inspecting tapered bearings, determine condition of rollers and inner bearing race by inspecting bearing cup for pitting, scoring, grooves, uneven wear, imbedded particles and/or discoloration from over-heating. Always replace tapered bearing and race as a set.

Roller bearing condition is determined by inspecting the bearing surface of the shaft that the roller bearing supports. Check shaft surface for pitting, scoring, grooving, imbedded particles, uneven wear and/or discoloration from overheating. The shaft and bearing must be replaced, if the conditions described are found.

SHIMS

Keep a record of all shim amounts and location during disassembly to aid in reassembly. Be sure to follow shimming instructions during reassembly, as gears must be installed to correct depth and have the correct amount of backlash to avoid noisy operation and premature gear failure.

SEALS

As a normal procedure, all O-rings and oil seals SHOULD BE REPLACED without regard to appearance. To prevent leakage around oil seals, apply Loctite 271 to outer diameter of all metal case oil seals. When using Loctite on seals or threads, surfaces must be clean and dry. To ease installation, apply 2-4-C w/Teflon Marine Lubricant on all O-rings. To prevent wear, apply 2-4-C w/Teflon Marine Lubricant on I.D. of oil seals. To prevent corrosion damage after reassembly, apply Quicksilver 2-4-C w/Teflon to external surfaces of bearing carrier and cover nut threads prior to installation.



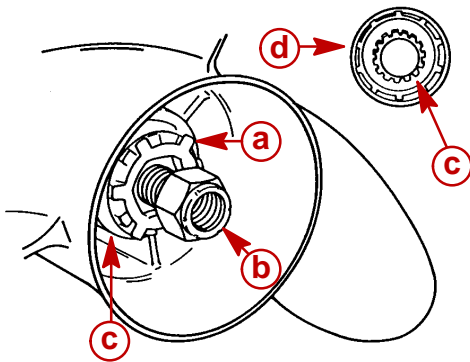
Removal, Disassembly, Cleaning and Inspection of Counter Rotation (Left Hand) Gear Housing

REMOVAL

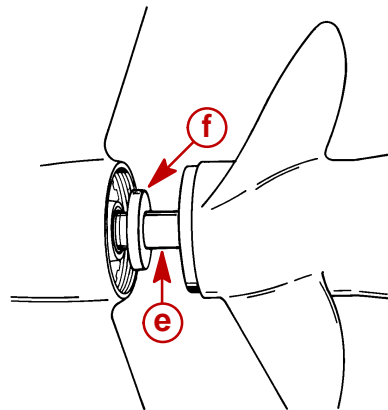
⚠ WARNING

Disconnect high tension leads from spark plugs and remove spark plugs from engine before removing gear housing from driveshaft housing.

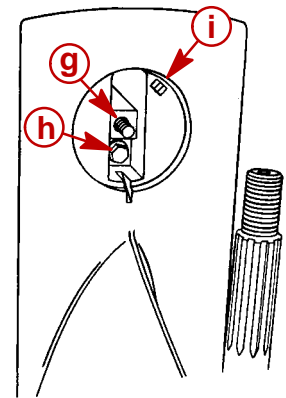
1. Disconnect high tension leads from spark plugs and remove spark plugs from engine.
2. Shift engine into NEUTRAL position.
3. Tilt engine to full up position and engage tilt lock lever.
4. Bend tabs of propeller tab washer away from thrust hub (rear), then remove propeller locknut, tab washer, thrust hub (rear), propeller and thrust hub (forward) from propeller shaft.
5. Mark gear housing and trim tab so that trim tab can be reinstalled in the same position. Remove plastic cap at rear edge of driveshaft housing. Remove bolt that secures trim tab and remove tab from gear housing.
6. Once trim tab is removed, remove bolt from inside of trim tab cavity.



51916



51912

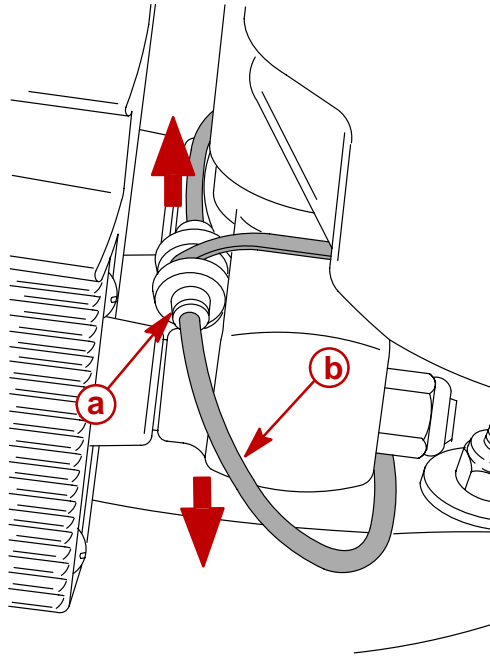


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- a - Tab Washer
- b - Propeller Nut
- c - Rear Thrust Hub
- d - Continuity Washer (if equipped)
- e - Propeller Shaft
- f - Thrust Hub (forward)
- g - Bolt (secures trim tab)
- h - Bolt (inside trim tab cavity)
- i - Ribs – Align Carefully with Trim Tab while Securing Tab



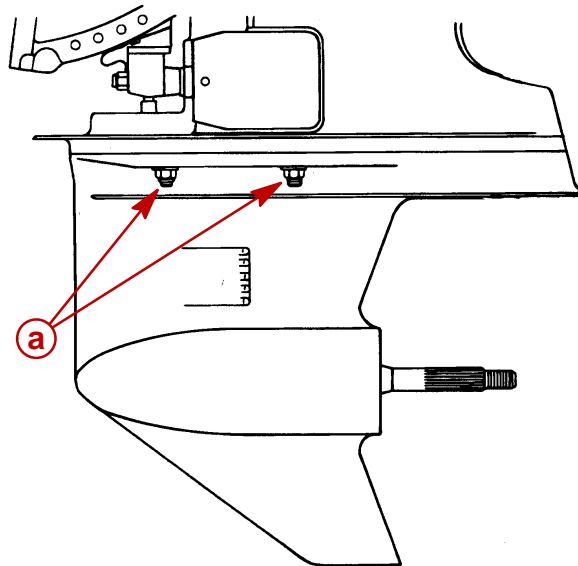
7. While pressing in on speedometer hose junction, pull out on hose to disconnect.



57735

- a** - Press in on Junction
- b** - Pull out on Hose

8. Loosen the side mounting locknuts. (DO NOT attempt to remove one nut before opposite side is loosened sufficiently, or gear housing could be damaged.)



- a** - Side Mounting Locknuts

9. Pull gear housing away from drive shaft housing as far as the loosened nuts (in Step 8) will allow, then remove loosened nuts. (DO NOT allow gear housing to fall, as it now is free.)
10. Pull gear housing from drive shaft housing.

DRAINING AND INSPECTING GEAR HOUSING LUBRICANT

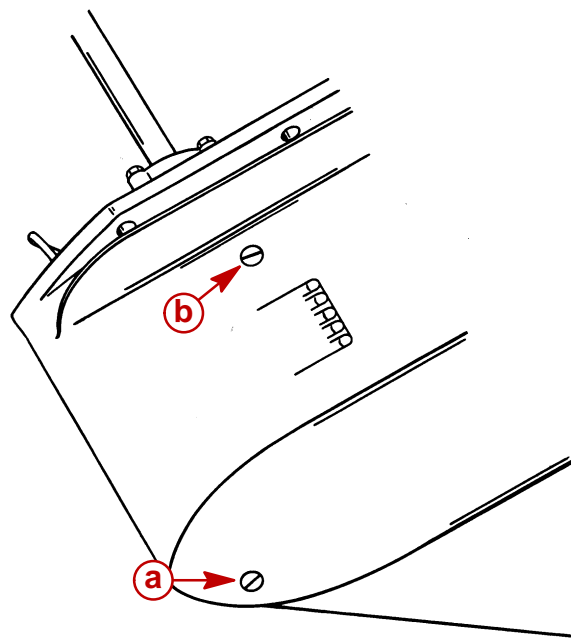
1. Place gear housing in a suitable holding fixture or vise with the driveshaft in a vertical position, as shown.



NOTE: Drain and Fill screws may be located on the starboard side of gearcase on later models.

2. Position a clean drain pan under gear housing and remove "Fill" and "Vent" screws from gear housing.
3. Inspect gear lubricant for metal particles. Presence of a small amount of fine metal particles (resembling powder) indicates normal wear. Presence of larger particles (or a large quantity of fine particles) indicates need for gear housing disassembly, and component inspection.
4. Note the color of gear lubricant. White or cream color indicates presence of water in lubricant. Check drain pan for water separation from lubricant. Presence of water in gear lubricant indicates the need for disassembly, and inspection of oil seals, seal surfaces, O-rings and gear housing components.

IMPORTANT: Gear lubricant drained from a recently run gear case will be a light chocolate brown in color due to agitation/aeration. Oil which is stabilized will be a clear yellow brown in color.



- a** - Fill Screw
b - Vent Screw

52377

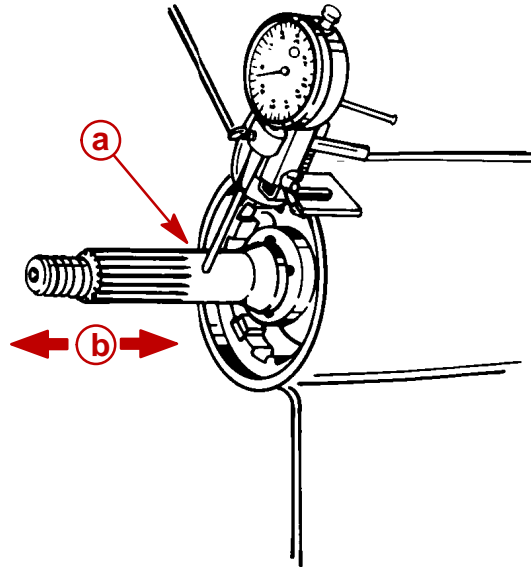


Pre-Disassembly Inspection

Propeller Shaft

INSPECTION

1. Check for a bent propeller shaft as follows:
 - a. Rotate the propeller shaft while observing the dial indicator. If the deflection is more than 0.009 in. (0.23 mm), a bent propeller shaft is indicated.
2. Measure propeller shaft endplay. If it is in excess of 0.093 in. (2.36mm), disassemble gear case and check condition of the reverse shoulder of the propeller shaft, reverse gear and thrust washer. Replace components as required.



- a** - Prop Shaft Runout
b - Prop Shaft Endplay

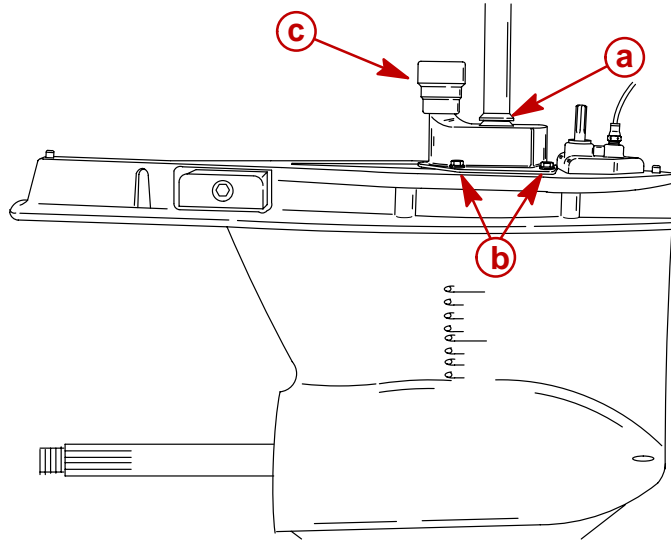
22086



Water Pump

REMOVAL AND DISASSEMBLY

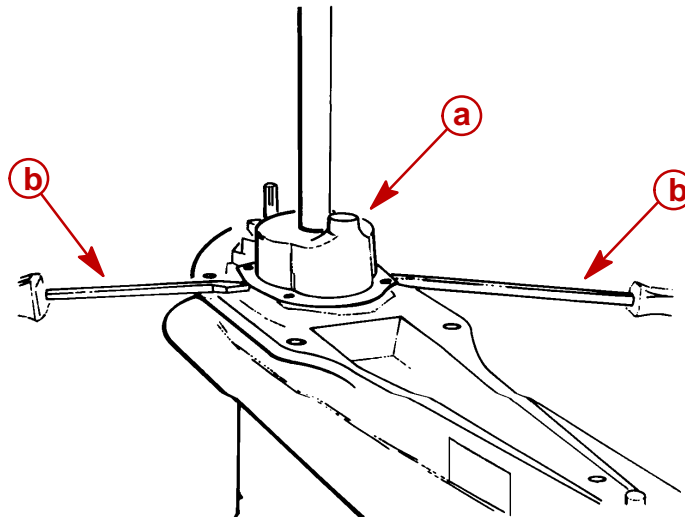
1. Remove the water seal, water tube coupling assembly, and the water pump screws.



57944

- a** - Water Seal
- b** - Water Tube Coupling
- c** - Water Pump Screws (4)

2. Carefully slide the water pump straight up off of the drive shaft. It may be necessary to encourage the water pump up by gently prying up on its mounting flanges with a couple of screwdrivers.

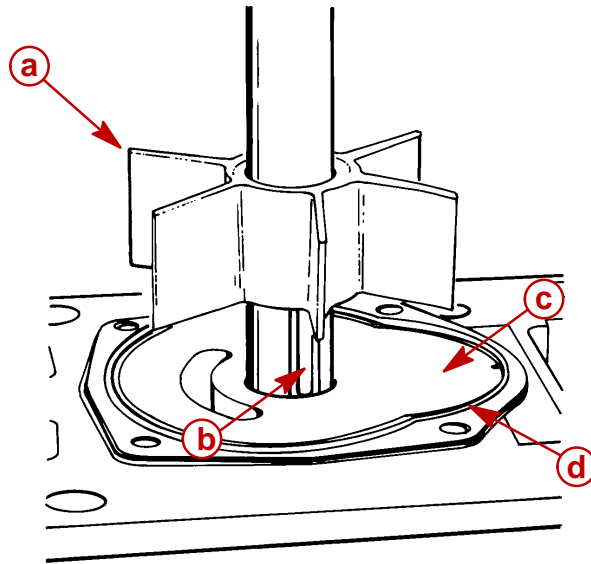


70487

- a** - Water Pump Body
- b** - Screwdrivers



3. Remove the impeller, impeller key, the face plate and gaskets, (discard the gaskets).

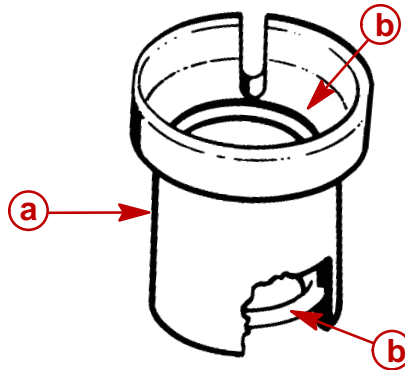


70605

- a** - Impeller
- b** - Impeller Key
- c** - Water Pump Face Plate
- d** - Gasket (1 each side of face plate)

CLEANING AND INSPECTION

1. Inspect the water tube coupling assembly for wear or damage. If necessary replace the worn or damaged components especially the two O-rings on the inside, one at the top and one at the bottom.



70613

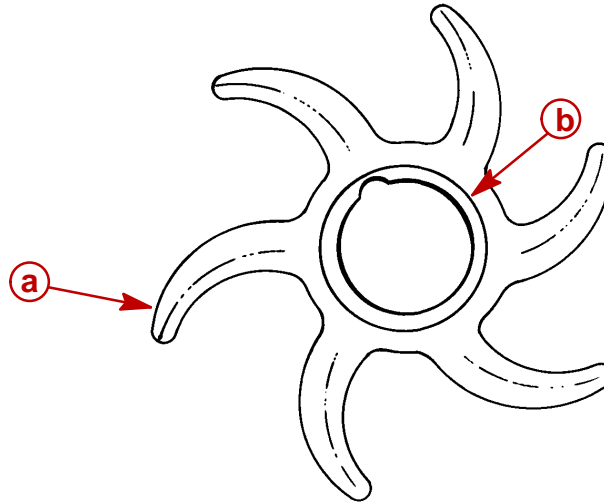
- a** - Water Tube Adaptor
- b** - O-rings (2)

IMPORTANT: The circular groove formed by the impeller sealing bead should be disregarded when inspecting cover and plate. The depth of the groove will not affect water pump output.

2. Inspect face plate and water pump cover for grooves and/or rough surfaces.
3. Replace cover and /or face plate if grooves (other than sealing grooves) are more than 0.030 in. (0.762 mm) deep.



4. Inspect impeller side seal surfaces and ends of impeller blades for cracks, tears and wear. Replace impeller if any of these conditions are found.
5. Inspect impeller bonding to impeller hub.
6. Inspect impeller for glazed or melted appearance (caused by operation without sufficient water supply). Replace impeller if any of these conditions exist.



70500

- a** - Impeller
b - Hub

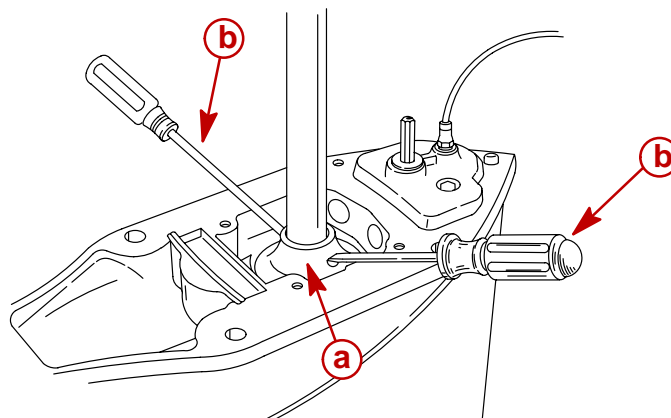
IMPORTANT: When completing gear housing repairs, that require removal of water pump impeller, it is recommended that the impeller be replaced. If it is necessary, however, to re-use impeller, DO NOT install in reverse to original rotation, or premature impeller failure will occur.

IMPORTANT: It is recommended that all seals and gaskets be replaced (as a normal repair procedure) to assure effective repair.

Oil Seal Carrier Assembly

REMOVAL

1. Remove the oil seal carrier from the gear housing. It may be necessary to gently pry up on it with two screwdrivers.



57940

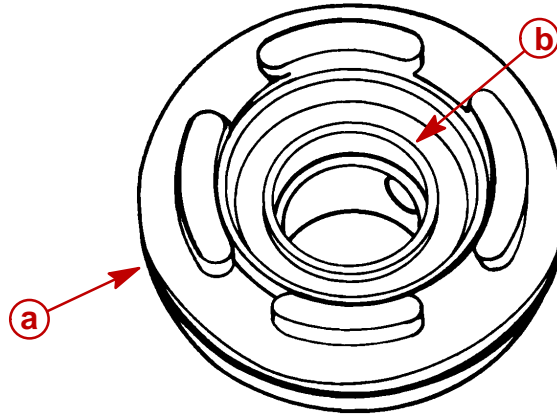
- a** - Oil Seal Carrier
b - Screwdrivers



OIL SEAL CARRIER ASSEMBLY - COMPONENT DISASSEMBLY

NOTE: Complete the instructions in this section only if the assembly components have been found to be defective and are in need of repair or replacement.

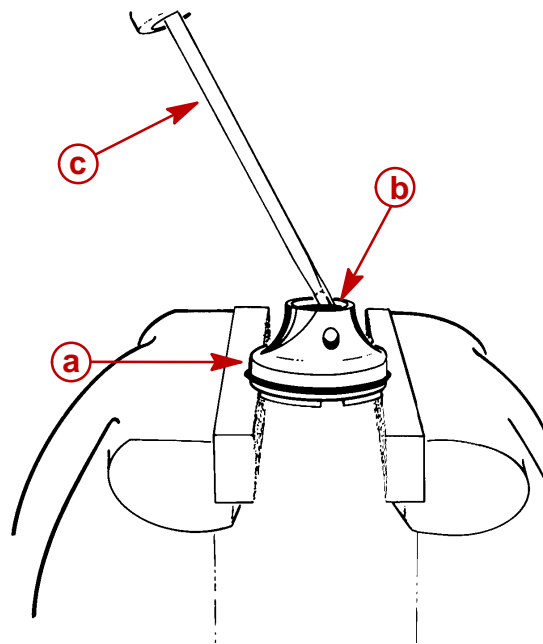
1. Remove the o-ring.



70501

- a** - O-ring
- b** - Oil Seals (2)

2. Remove oil seals.



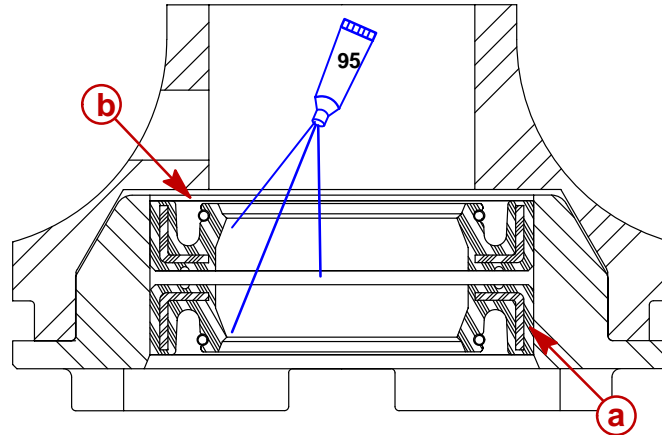
70610

- a** - Oil Seal Carrier
- b** - Oil Seals
- c** - Screwdriver



OIL SEAL CARRIER ASSEMBLY – COMPONENT REASSEMBLY

The oil seals in the carrier assembly are the same diameter. The bottom (first) seal lip faces down; the top (second) seal lip faces up. Apply 2-4-C w/Teflon Marine Lubricant to seal lips and between seals. Press seal into carrier with suitable mandrel. Second seal should be pressed in flush with carrier surface.

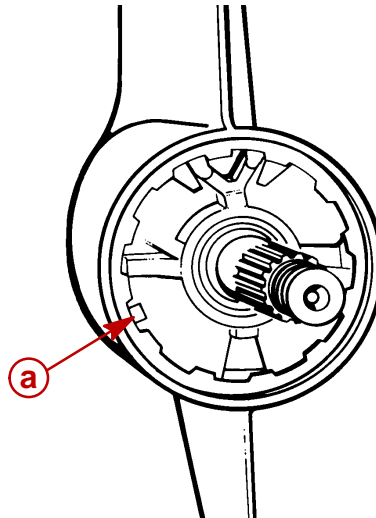


 2-4-C With Teflon (92-825407A12)

- a** - Bottom Seal (lip faces down)
- b** - Top Seal (lip faces up)

Bearing Carrier and Propeller Shaft Removal

1. Straighten the tab on the tab washer.



- a** - Tab on Tab Washer

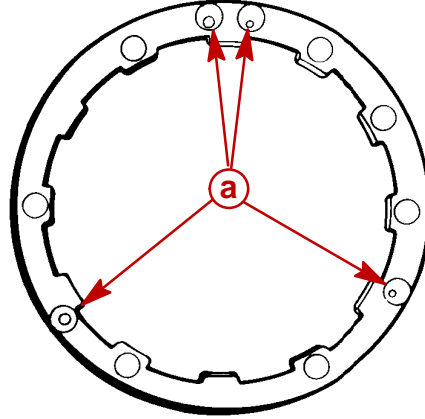
70490



2. Remove the bearing carrier retainer following step a or b as follows:

CAUTION
DO NOT drill into the gear housing retainer threads when using the following procedure for removing the retainer

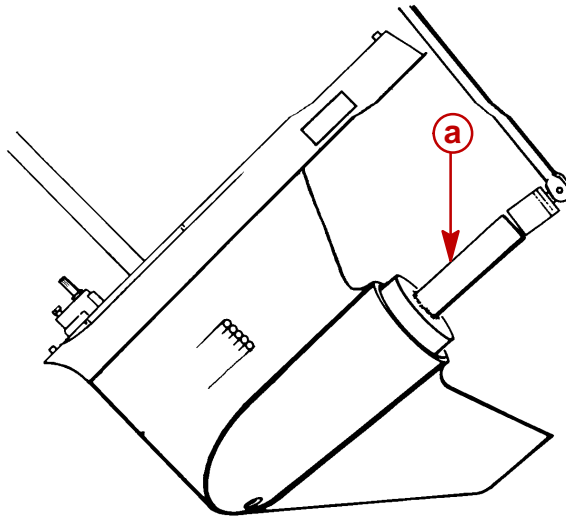
- a. If the retainer is corroded in place, drill 4 holes in the retainer and fracture the retainer with a chisel. Pry the remaining segments out.



23356

a - Drilled Holes

- b. Remove the bearing carrier retainer using the Bearing Carrier Retainer Wrench (91-61069).



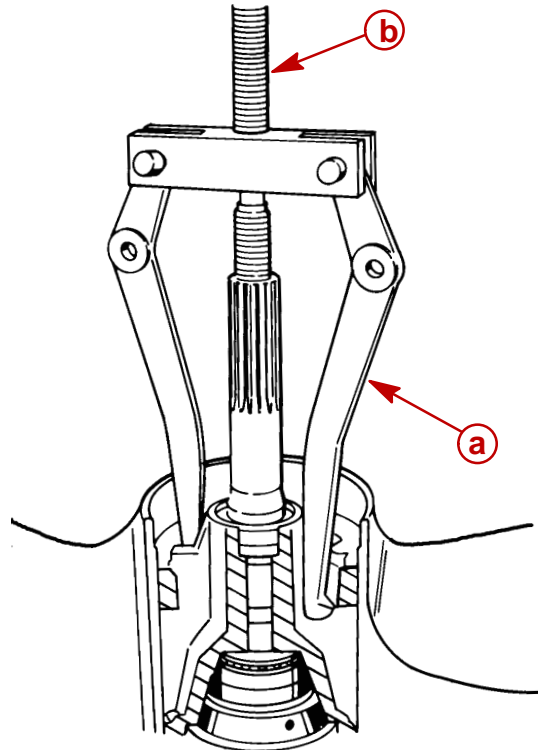
70491

a - Bearing Carrier Retainer Wrench



3. Pull the bearing carrier from the gear housing by pulling on the outer ring of the bearing carrier. POSITION PULLER JAWS CLOSE TO BOSSES IN CARRIER.

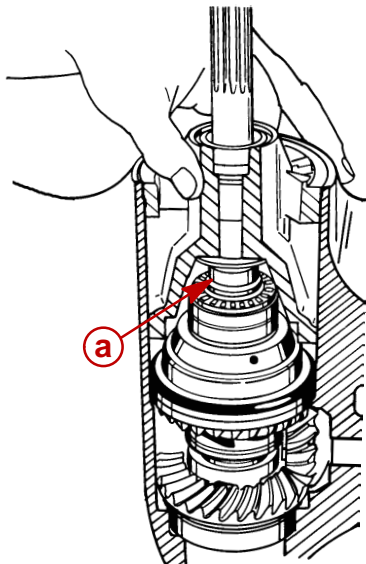
NOTE: If the bearing carrier is seized in the gear housing, it may be necessary to use heat to loosen the carrier.



50786

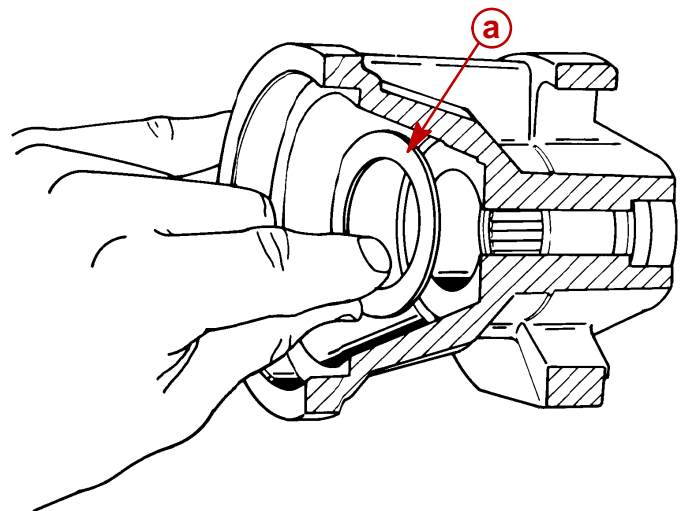
- a - Puller Jaws (91-46086A1)
- b - Puller Bolt (91-85716)

4. Lift the bearing carrier out of the gear housing. Locate and retain the thrust washer that may be stuck to the inside surface of the bearing carrier.



50826

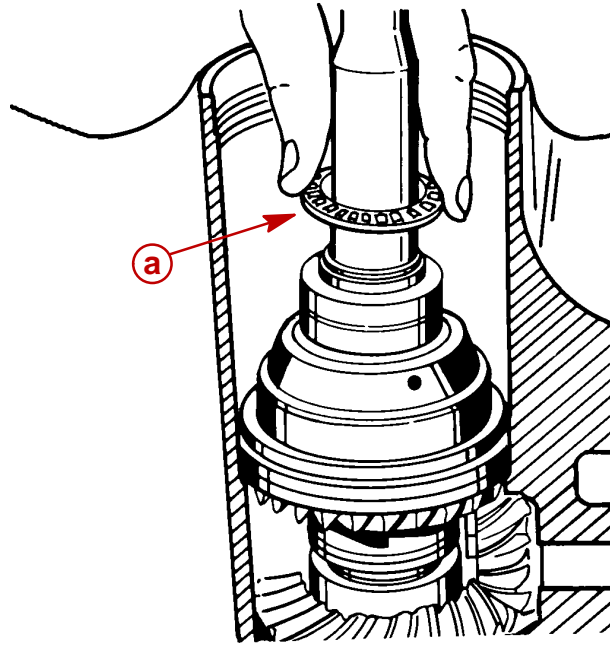
- a - Thrust Washer



50779



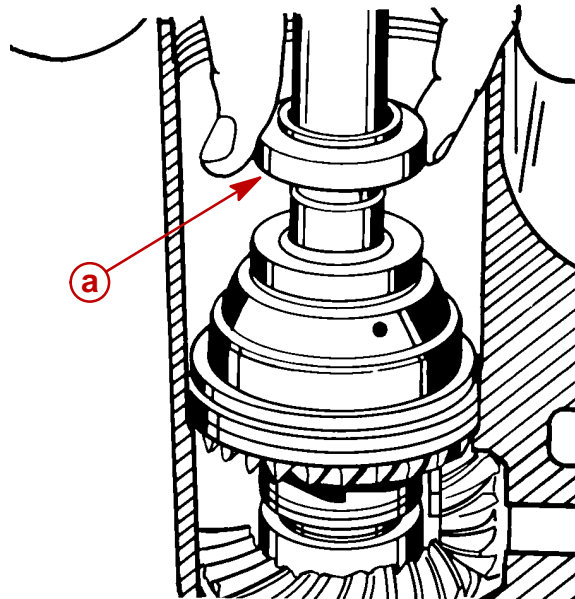
5. Remove the aft thrust bearing.



a - Thrust Bearing

50786

6. Remove the aft thrust collar.

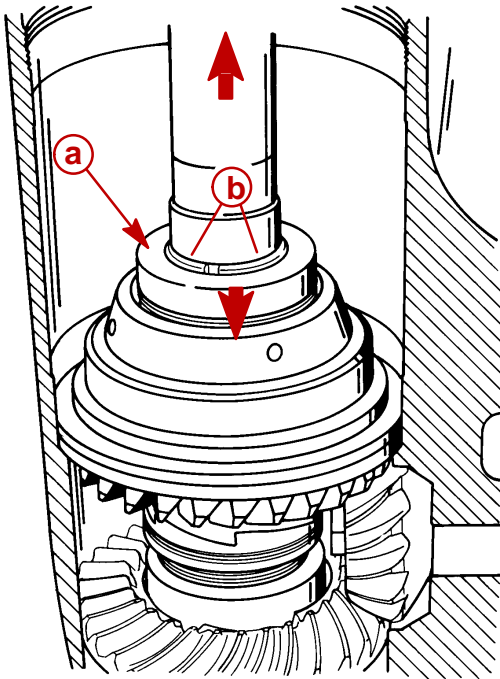


a - Thrust Collar

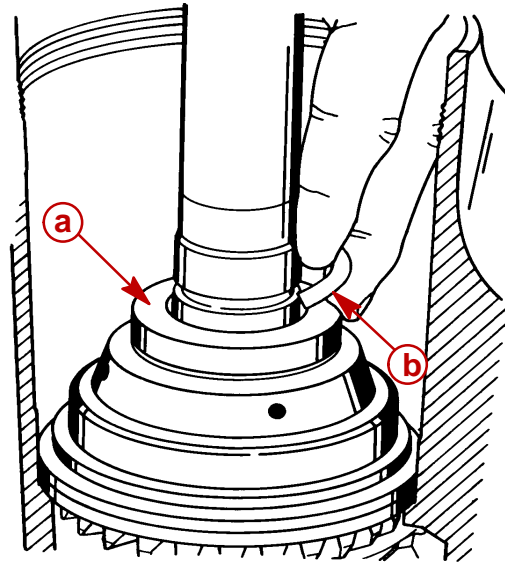
50787



7. Lift up on the propeller shaft and push down on the forward thrust collar to remove the two keepers.



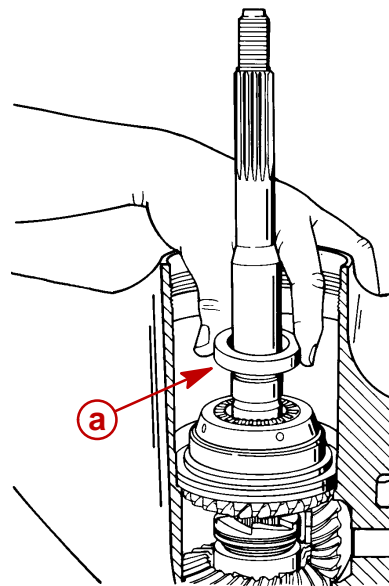
50778



50826

- a - Thrust Collar
- b - Keepers (2)

8. Remove the forward thrust collar.

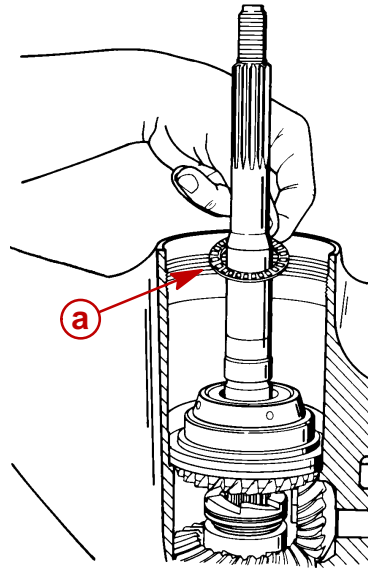


5084

- a - Thrust Collar



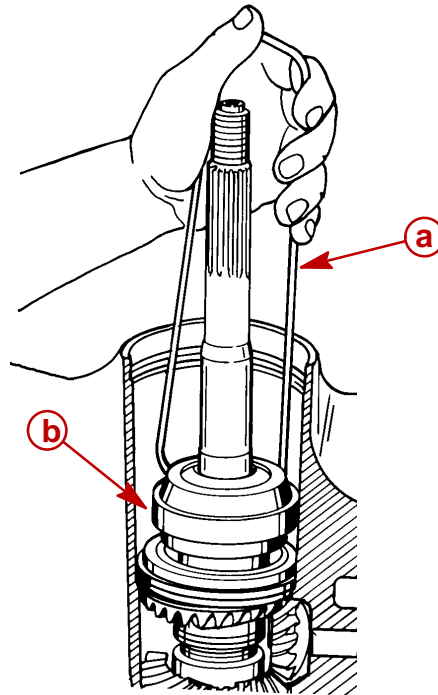
9. Remove the forward thrust bearing.



a - Thrust Bearing

50783

10. Form a tool using a 1/8 in. (3 mm) wire as shown in the following figure and remove the forward gear bearing adaptor.



a - Wire Tool
b - Forward Gear Bearing Adaptor

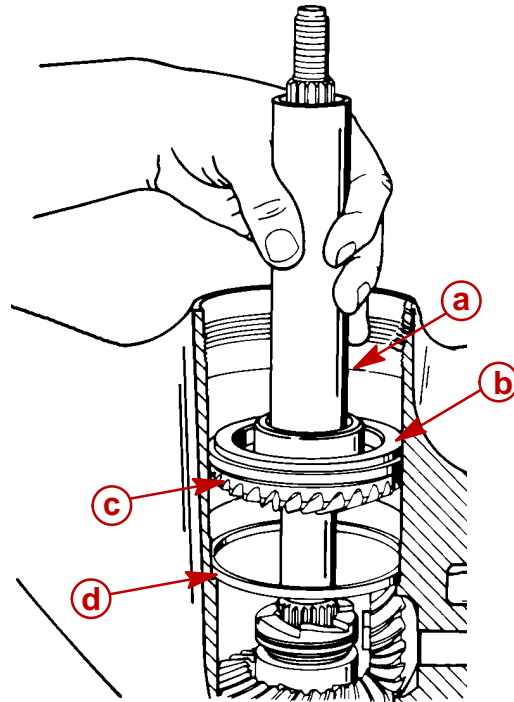
50786

11. Shift gear case into forward gear.

NOTE: The thrust race has a tight fit in the gear housing bore. Use the Forward Gear Installation Tool (91-815850) to remove the thrust race and the forward gear together. If this attempt fails, form a small hook on the end of a stiff piece of wire and while applying heat to the outside of gear case, pull the thrust race up and out of the gear housing.



12. Remove the O-ring from inside the gear housing.
13. Remove the forward gear, thrust race, and the thrust bearing (between the gear and the race).
14. Remove the forward gear shim.



- a** - Forward Gear Installation Tool (91-815850)
- b** - Thrust Race
- c** - Forward Gear
- d** - Shim

50783

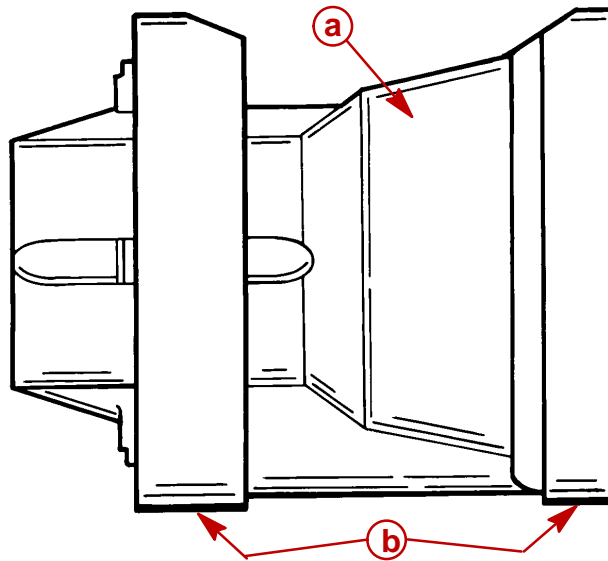


BEARING CARRIER ASSEMBLY - INSPECTION

1. Clean the assembly and all components with a suitable solvent and dry the parts thoroughly using compressed air.

NOTE: If any of the following items are found to be defective complete the appropriate instruction(s) in "Bearing Carrier Assembly", 'Component Disassembly and Inspection' section.

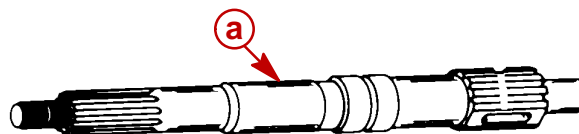
2. Inspect the bearing carrier for signs of excessive corrosion especially in the area where the bearing carrier touches the gear housing. If excessive corrosion is evident replace the carrier.



50818

- a** - Bearing Carrier
- b** - Mating Surfaces

3. The condition of the bearing surface on the propeller shaft in the area that the needle bearing (in the bearing carrier) rides is an indication of the condition of the needle bearing in the bearing carrier. Replace the bearing if the surface of the shaft is pitted, grooved, scored, worn unevenly, discolored from overheating or has embedded metal particles.

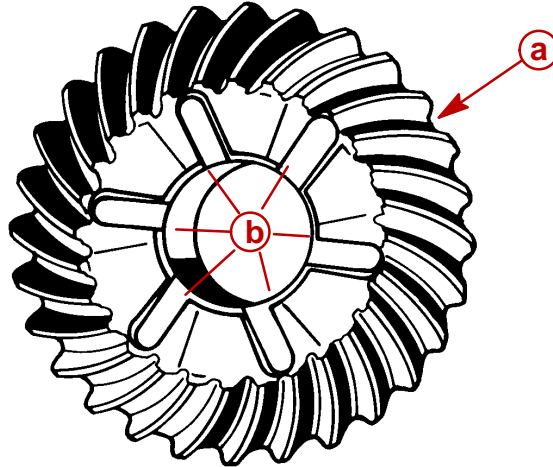


50698

- a** - Propeller Shaft Bearing Contact Area



4. Inspect the forward gear for pitted, chipped, broken teeth, hairline fractures, and excessive or uneven wear. Replace the forward gear and the pinion gear if any defects are found.
5. Inspect the outer hub of the forward gear for excessive wear or damage. Replace the forward and the pinion gear if either of these conditions exist.
6. Inspect the clutch jaws of the gear for damage. Surfaces must not be chipped or rounded off. Replace the forward and the pinion gear if any are found.



23355

- a** - Reverse Gear Teeth
- b** - Clutch Jaws

7. Inspect the thrust bearings, collars and forward gear bearing adaptor for excessive wear in the areas where the thrust bearings come into contact with them. Replace the appropriate components if they are found to be defective.
8. Inspect the bearing carrier retainer for cracks and/or broken or corroded threads. Replace it if any are found.
9. Inspect the large O-ring for damage and/or deterioration. Replace it if either condition is found.

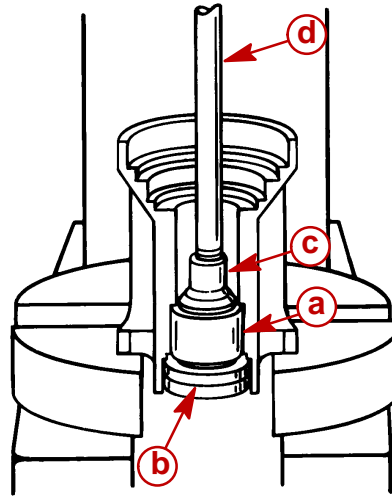


BEARING CARRIER ASSEMBLY - COMPONENT DISASSEMBLY AND INSPECTION

NOTE: Complete the instructions in this section only if the assembly components have been found to be defective.

NOTE: Inspection of the bearing surfaces on the propeller shaft where the needles of the bearing carrier needle bearing rolls, gives an indication of the condition of the needle bearing inside the bearing carrier. Replace needle bearing in the bearing carrier if the prop shaft is pitted, grooved, scored, worn unevenly, discolored from overheating, or has embedded particles.

1. Perform the following step a. or b. as necessary.
 - a. **If Replacing the Needle Bearing and Seals:** Remove the needle bearing and seals with the tools as shown.

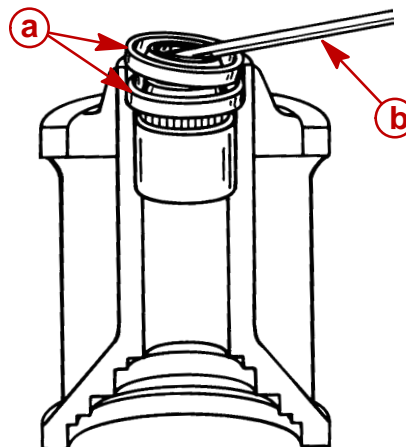


23140

- a** - Needle Bearing
- b** - Oil Seals
- c** - Driver Head (91-36569)
- d** - Bearing Driver Rod (91-37323)

(1.) **Discard the needle bearing and both seals.**

- b. **If Replacing the Seal Only:** Remove the oil seals with a suitable pry bar, being careful not to damage the bore of the bearing carrier.



23140

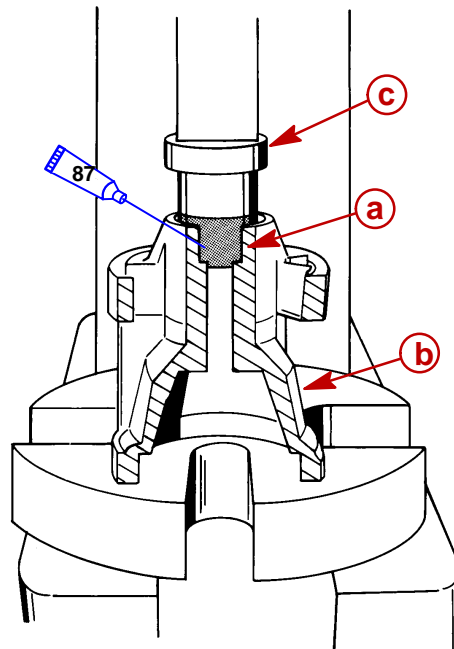
- a** - Oil Seals
- b** - Pry Bar

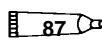
(1.) **Discard both of the seals.**

**BEARING CARRIER ASSEMBLY - COMPONENT REASSEMBLY**

NOTE: Complete the instructions in this section only if the assembly components have been disassembled and repaired or replaced.

1. Clean all of the components with a suitable solvent and dry the parts thoroughly using compressed air. Be careful not to spin the bearing.
2. Lubricate the bore that the needle bearing is pressed into with Quicksilver Gear Lubricant (92-13783A24).
3. Assemble the needle bearing (with the numbered end of the bearing towards the driver shoulder), onto the driver.
4. Press the needle bearing into the bearing carrier until the driver bottoms out on the bearing carrier. Ensure that the numbered side of the needle bearing faces the seal end (aft end) of the carrier.



 87 Quicksilver Gear Lubricant (92-19007A24)

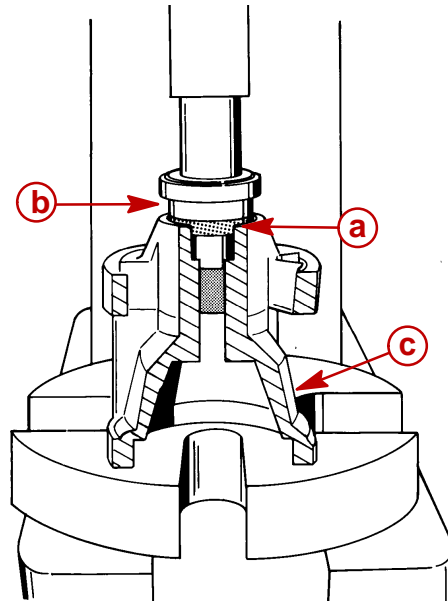
50788

- a** - Needle Bearing
- b** - Bearing Carrier
- c** - Needle Bearing Driver (91-15755)

5. **Thoroughly clean** the bore to which the first seal is to be pressed.
6. Assemble the first seal (with the lips of the seal facing away from the driver shoulder) onto the long end of the oil seal driver.



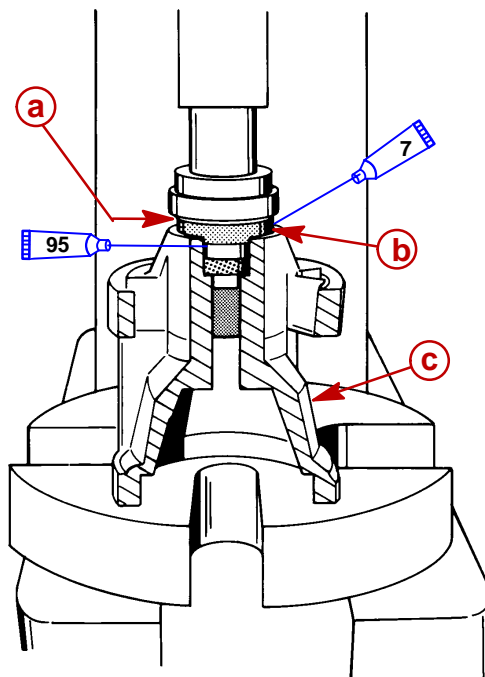
- Press on the oil seal driver until the driver bottoms onto the aft face of the bearing carrier.

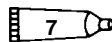
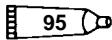


50788

- a** - Oil Seal
- b** - Oil Seal Driver (91-31108) (long end)
- c** - Bearing Carrier

- Apply a thin film of Loctite 271 (92-809820) to the outer diameter of the second seal.
- Assemble the second seal (with the lips seal facing the driver shoulder) onto the short end of the driver.
- Press the oil seal with the driver until the driver bottoms out on the bearing carrier.



-  Loctite 271 (92-809820)
-  2-4-C With Teflon (92-825407A12)

50788

- a** - Driver
- b** - Oil Seal (lips toward driver shoulder)
- c** - Bearing Carrier



11. Wipe up all of the excess Loctite. Do not allow any of the excess Loctite to spread to other parts of the assembly.
12. Lubricate the seal lips and fill the area between the seals with 2-4-C w/Teflon (92-825407A12).

Forward Gear Bearing Adaptor Assembly

INSPECTION

1. Thoroughly clean the forward gear bearing adaptor with a suitable solvent and dry it using compressed air.

NOTE: *The condition of the bearing surfaces on the forward gear in the areas that the bearings of the bearing adaptor and the thrust bearing rides, is an indication of the condition of the respective bearings. Replace the bearing(s) if the surface of the gear and/or the thrust washer is pitted, grooved, scored, worn unevenly, discolored from overheating or has embedded metal particles.*

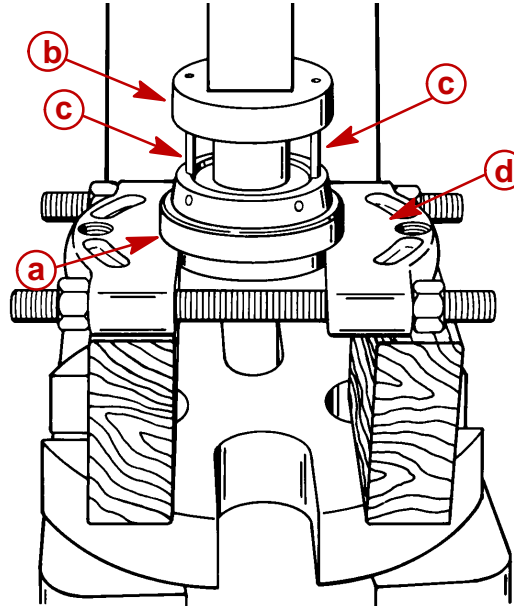
2. Assemble the forward gear to the bearing adaptor. Inspect them for excessive movement or roughness by rotating the gear in the adaptor. Replace the bearing in the adaptor if either of these conditions exist.
3. Inspect the adaptor for other signs of excessive wear or damage. Replace the adaptor if any are found.



FORWARD GEAR BEARING ADAPTOR ASSEMBLY - COMPONENT DISASSEMBLY AND REASSEMBLY

NOTE: Complete the instructions in this section only if the needle bearing in the bearing adaptor is defective and the adaptor is to be reused.

1. Disassemble the adaptor as follows:
 - a. Remove the bearing from the adaptor using the bearing removal tool. Align the pins of the tool with the holes of the adaptor and apply pressure to the center of the tool so that the pressure is equal on both of the pins. **Discard the bearing.**



50874

- a** - Forward Gear Bearing Adaptor
- b** - Bearing Removal Tool (91-816245)
- c** - Pins
- d** - Universal Puller Plate

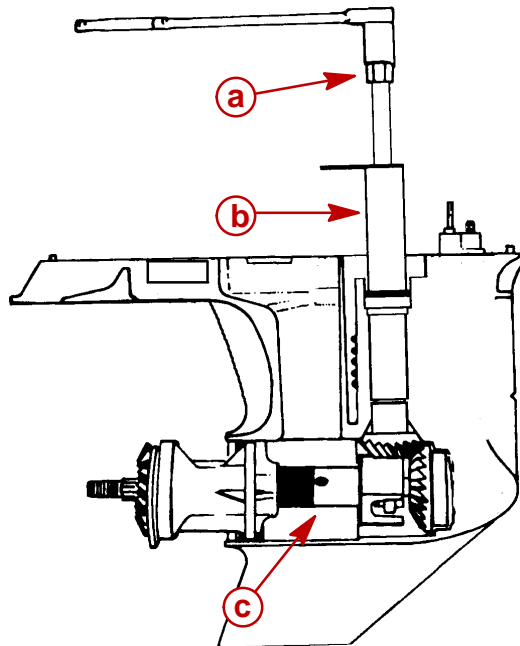
2. Assemble the adaptor as follows:
 - a. Lubricate the bore that the needle bearing is pressed into with 2-4-C w/Teflon (92-825407A12).
 - b. Assemble the needle bearing to the adaptor with the numbered end of the bearing facing the driver shoulder.
 - c. Press the needle bearing into the bearing adaptor using a suitable mandrel until the bearing bottoms in the adaptor.



Drive Shaft Assembly

REMOVAL

1. Remove the drive shaft pinion nut as follows:
 - a. Place the drive shaft bearing retainer wrench onto the drive shaft. Do not loosen the retainer at this time.
 - b. Insert the pinion nut adapter, with the MR slot facing the pinion gear, into the gear housing. It may be necessary to slightly lift and rotate the drive shaft to align the pinion gear nut into the pinion nut adapter slot.
 - c. Install the bearing carrier into the gear housing backwards to support the prop shaft and to keep the pinion nut adapter aligned.
 - d. Place the drive shaft nut wrench over the drive shaft splines and **loosen**, (but do not fully unscrew), the pinion nut by rotating the drive shaft counterclockwise.



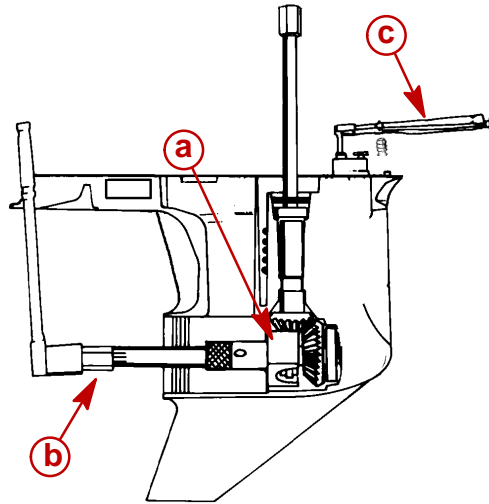
70887

- a** - Drive Shaft Nut Wrench (91-56775)
- b** - Drive Shaft Bearing Retainer Wrench (91-43506)
- c** - Pinion Nut adapter (MR Slot) (91-61067A2)



- e. **If the drive shaft is broken**, place propeller shaft nut wrench onto the propeller shaft splines, hold shift shaft in forward gear and **loosen**, (but do not fully unscrew), the pinion nut by rotating prop shaft counterclockwise to turn gears, thus loosening the pinion nut.

NOTE: The propeller shaft nut wrench is included with the pinion nut adapter kit.



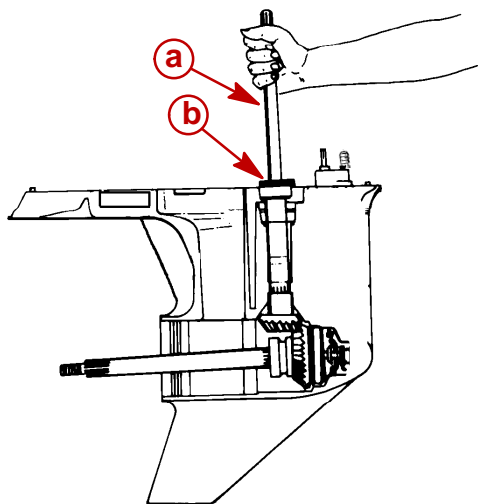
70607

- a** - Pinion Nut Adaptor (MR slot) (91-61067A2)
- b** - Propeller Shaft Nut Wrench (91-61067)
- c** - Shift Shaft (Turn Clockwise) (Protect shaft splines with soft material)

- f. Completely unscrew the drive shaft bearing retainer.
- g. Completely unscrew the pinion nut by rotating the drive shaft (or the propeller shaft) in a counterclockwise direction.
- h. Remove all tools.

IMPORTANT: The pinion bearing rollers are free to fall out of the pinion bearing once the drive shaft is removed. Be careful not to loose the (18) rollers.

2. Remove the drive shaft and all components by pulling the drive shaft straight out of the gear housing as shown.



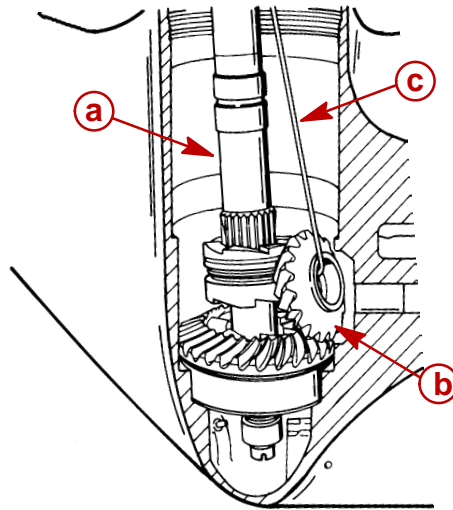
70608

- a** - Drive Shaft
- b** - Drive Shaft Retainer, Bearing Cup, Bearing, and Shims

3. With propeller shaft facing straight up, rotate shift lever into forward. Pull propeller shaft up and over towards port side of gear case.



4. Form a small hook on a stiff piece of wire and attempt to hook onto the top side of the gear and pull it out. It may be necessary to slightly move the propeller shaft from side-to-side to dislodge the pinion gear.



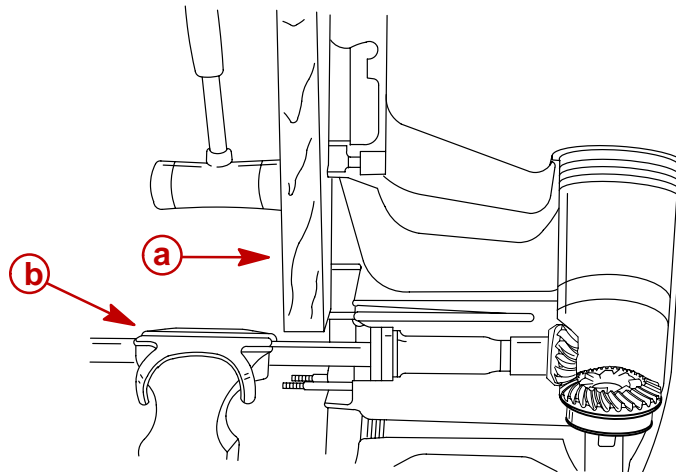
50884

- a - Propeller Shaft
- b - Pinion Gear
- c - Wire Tool

NOTE: If pinion gear is seized onto the driveshaft, place gearcase in vise using soft jaw vise covers. Place a block of wood on gear housing mating surface. Use a mallet and carefully tap gear housing away from drive shaft.

CAUTION

Do not strike gear housing hard with mallet or allow gear housing to fall.

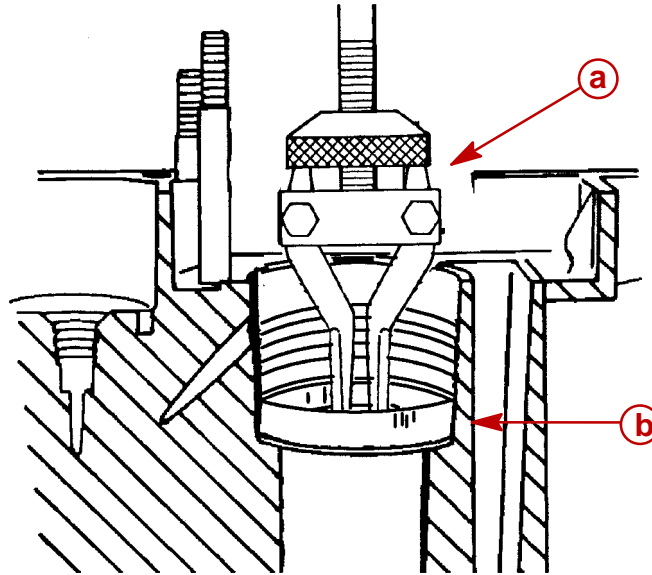


57951

- a - Wood Block
- b - Drive Shaft in Soft Jaw Vise



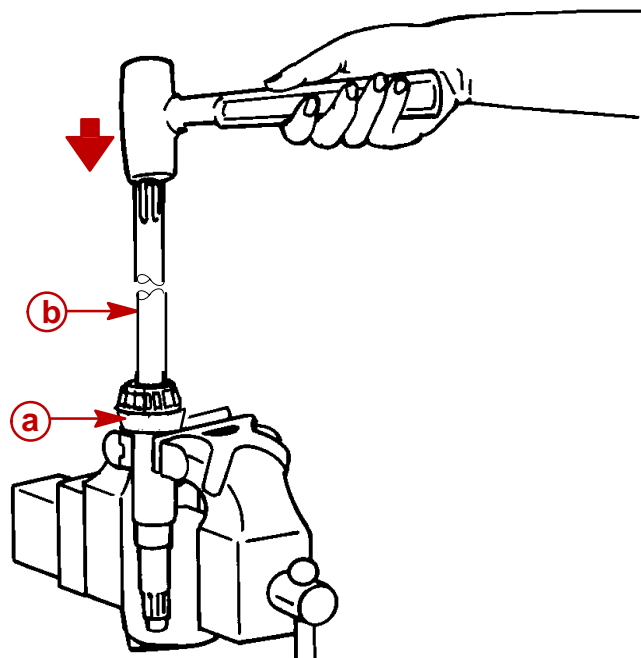
5. Remove lower drive shaft bearing cup and shims using slide hammer puller (34569A1) (retain shims for re-installation).



- a - Slide Hammer Puller (91-34569A1)
- b - Lower Drive Shaft Bearing Cup

DISASSEMBLY

1. Both upper and lower tapered roller bearings can be removed from the drive shaft in one operation. Using the bottom bearing cup removed from the gearcase, place the cup on top of a vise leaving the vise jaws open enough to allow the drive shaft to slide through.
2. Place the driveshaft through the cup and vise until the bottom bearing is resting in the cup. While holding the driveshaft, tap on the top of the shaft with a lead hammer until the bearings are free. **Do not drop the shaft when performing this operation.**



- a - Lower Bearing Cup Removed from Gear Case
- b - Drive Shaft With Both Upper and Lower Bearings

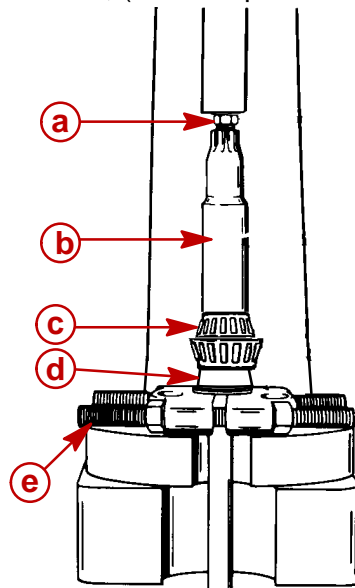


DRIVE SHAFT ASSEMBLY - INSPECTION

1. Clean all parts with a suitable solvent and dry the parts using compressed air. **DO NOT** spin the bearings.
2. The condition of the drive shaft bearing cup is an indication of the condition of the tapered roller bearing on the drive shaft. Replace the bearing and bearing cup if the cup is pitted, grooved, scored, worn unevenly, discolored from overheating, or has embedded particles.
3. Inspect the bearing surface on the drive shaft where the needles of the lower pinion bearing roll. Replace the drive shaft if it is pitted, grooved, scored, worn unevenly, discolored from overheating, or has embedded particles.
4. Inspect the splines at both ends of the drive shaft for a worn or twisted condition. Replace the drive shaft if either condition exists.
5. Inspect the gear for pitting, chipped or broken teeth, hairline fractures, and excessive or uneven wear. **Replace the pinion gear and the forward gear** if any defects are found.
6. Inspect driveshaft for groove(s) where water pump base oil seals contact shaft. Replace driveshaft if groove(s) are found.

REASSEMBLY

1. Apply a light coat of Quicksilver Heavy Duty Gear Lubricant on I.D. of drive shaft tapered bearing. Apply High Pressure Grease (such as Chicago Manufacturing and Distributing Lube #3) to the O.D. of both bearings.
2. Assemble a new tapered roller bearing to the drive shaft with the large O.D. of the bearing facing the pinion gear end of the drive shaft.
3. Thread a used pinion nut onto end of drive shaft. Leave approximately 1/16" (2mm) of nut threads exposed. Drive shaft threads **MUST NOT** extend beyond nut or thread damage could result while pressing.
4. Press the tapered roller bearing onto the drive shaft using the universal puller plate and a suitable mandrel, (an old tapered roller bearing inner race).



- a - Used Pinion Nut
- b - Drive Shaft
- c - Tapered Bearing(s)
- d - Old Bearing Inner Race
- e - Universal Puller Plate



Propeller Shaft Assembly

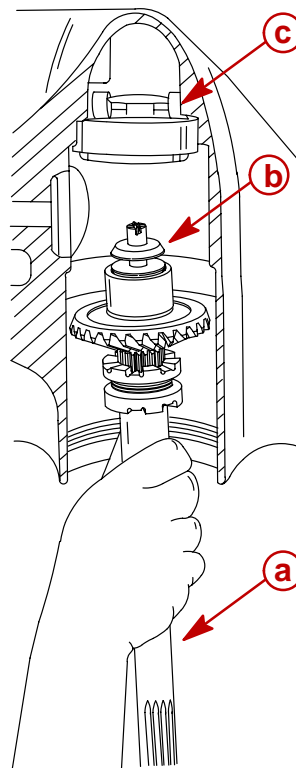
REMOVAL

⚠ CAUTION

Hold onto the propeller shaft assembly in the following step to avoid personal injury and/or dropping components when turning the gear housing over.

1. While holding onto the propeller shaft, turn the gear housing over so that the bore opening is facing down.
2. While moving the propeller shaft to the left (port) side of the gear housing, to allow the shift spool to disengage from the shift crank, lower the propeller shaft out of the gear housing.

NOTE: The rollers of the reverse gear bearing adaptor may become dislodged while removing the propeller shaft assembly. If this occurs, inspect the bearing cage to see if it has been damaged. If it has not been damaged simply snap the rollers back into position. If it has been damaged it will be necessary to remove and replace the bearing as outlined in the "Reverse Gear Bearing Adaptor Assembly", 'Component Disassembly and Reassembly' section.

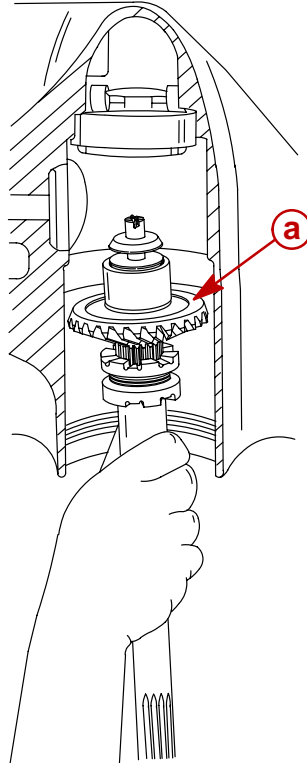


- a** - Propeller Shaft Assembly
- b** - Shift Spool
- c** - Shift Crank

58014



3. Locate and retain the thrust race and thrust bearing which could be on top of the reverse gear (if not, they may be stuck to the reverse gear bearing adaptor).



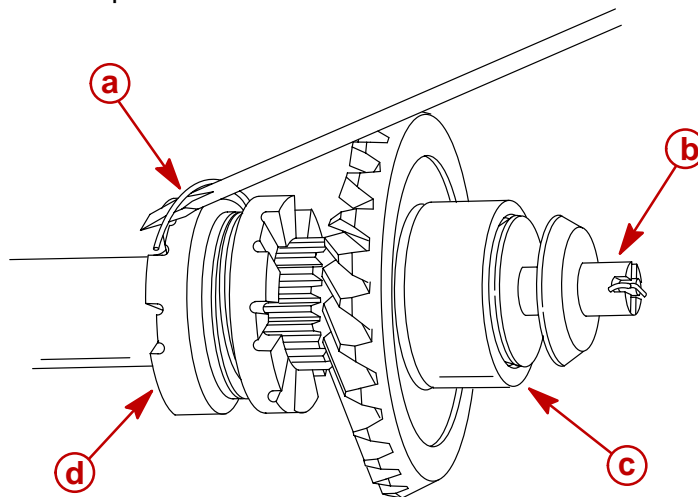
a - Thrust Bearing and Race

58014

PROPELLER SHAFT ASSEMBLY - COMPONENT DISASSEMBLY

IMPORTANT: When accomplishing the next step, all of the parts are free to come apart. Work closely over a work bench to ensure that the parts are not dropped or damaged, and to avoid personal injury.

1. Remove the spring around the clutch being careful not to overstretch it during removal. If the spring does not coil back to its normal position once it has been removed, it must be replaced.

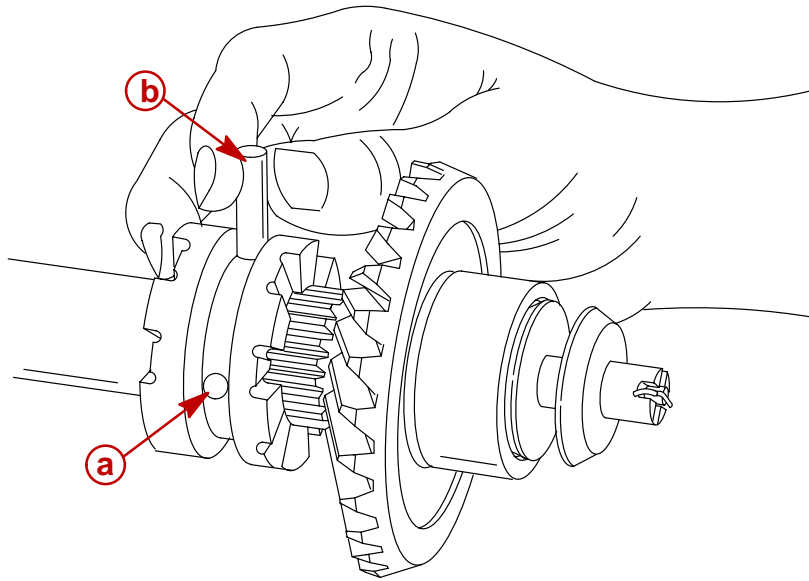


a - Spring
b - Shift Spool Assembly
c - Reverse Gear Assembly
d - Sliding Clutch

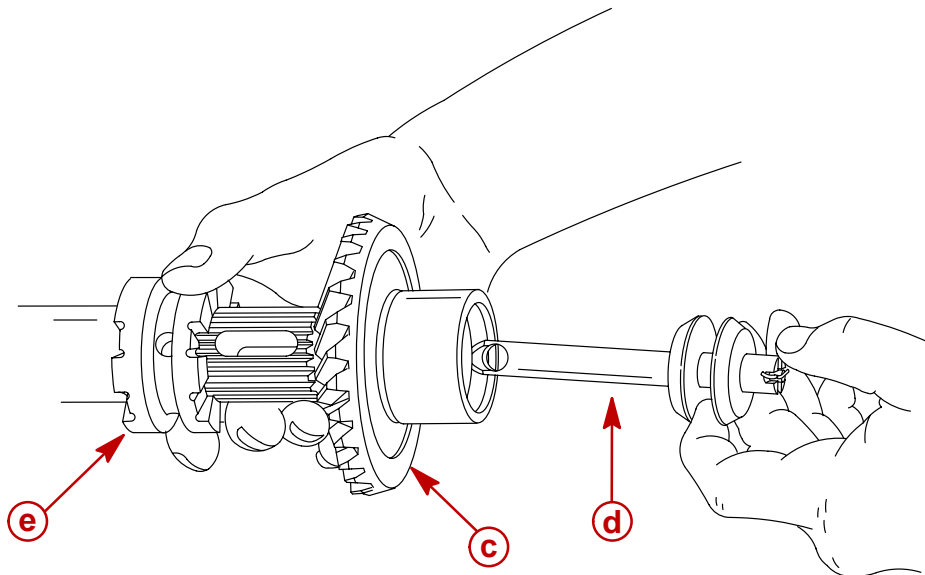
58015



2. Remove detent pin.
3. Remove the cross pin that goes through the clutch dog. Remove the reverse gear and slide the clutch off of the propeller shaft.



58012

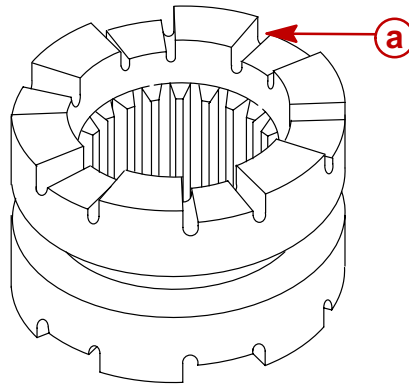


58018

- a** - Detent Pin
- b** - Cross Pin
- c** - Reverse Gear Assembly
- d** - Spool
- e** - Clutch

**PROPELLER SHAFT ASSEMBLY - COMPONENT INSPECTION**

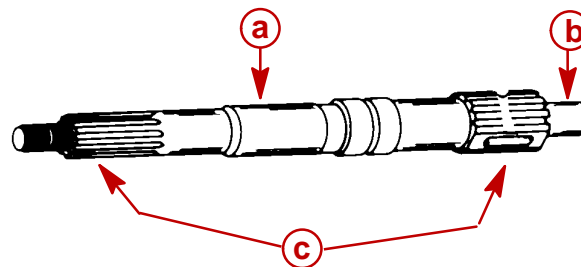
1. Clean all the parts with a suitable solvent and dry the parts thoroughly using compressed air, being careful not to spin bearings.
2. Inspect the sliding clutch jaws for damage. Jaws must not be chipped or rounded off. Replace the clutch if they are.



58013

a - Jaws

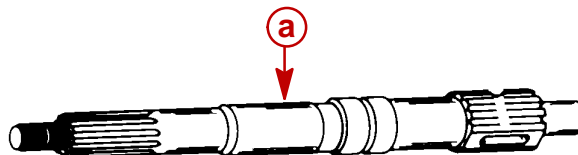
3. Inspect the bearing surfaces on the propeller shaft where the needles of the bearing carrier needle bearing and the needles of the forward gear needle bearing roll. Replace the propeller shaft if it is pitted, grooved, scored, worn unevenly, discolored from overheating, or has embedded particles.



50698

a - Bearing Carrier Needle Bearing Contact Area
b - Reverse Gear Needle Bearing Contact Area
c - Splines

4. Inspect the propeller shaft splines at both ends for a broken, worn, or twisted condition. Replace the propeller shaft if any of these conditions exists.
5. Inspect the surface of the propeller shaft where the bearing carrier seal lips contact the shaft. If the oil seals have made grooves, replace propeller shaft and seals.

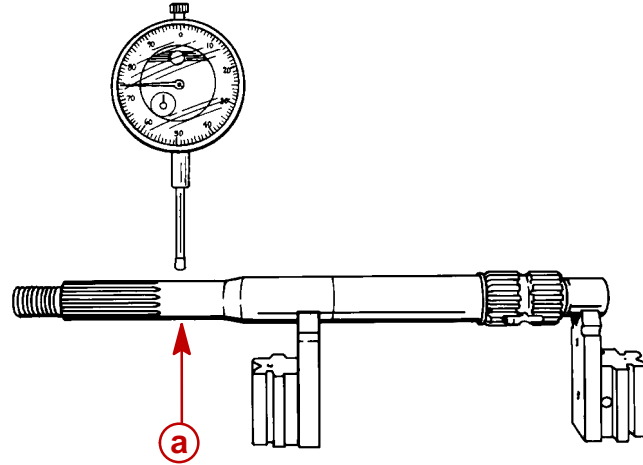


50698

a - Bearing Carrier Seal Contact Area



6. Inspect the propeller shaft for a bent condition.
 - a. **V-Blocks and Dial Indicator**
 - (1.) Position the propeller shaft bearing surfaces on V-blocks.
 - (2.) Adjust the height of V-blocks to level the propeller shaft.
 - (3.) Position the dial indicator tip just forward of the propeller shaft splines.



52727

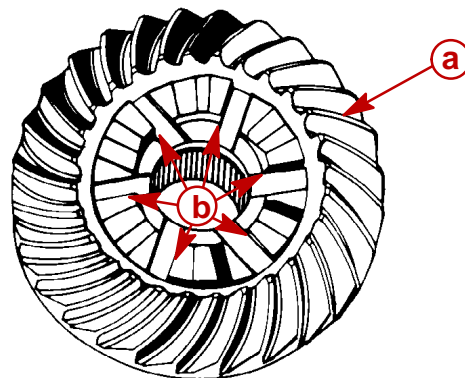
a - Check Movement with Dial Indicator (91-58222A1) Here

7. Rotate the propeller shaft and observe the dial indicator movement. If the indicator in the dial moves more than 0.009 in. (0.23mm), replace the propeller shaft.

Reverse Gear Assembly

COMPONENT INSPECTION

1. Clean the reverse gear assembly with a suitable solvent and dry thoroughly with compressed air. Be careful not to spin the bearings.
2. Inspect the gear for pitting, chipped or broken teeth, hairline fractures, and excessive or uneven wear. **Replace the reverse gear** if any defects are found.
3. Inspect the clutch jaws of the gear for damage. The surfaces must not be chipped or rounded off. **Replace the reverse gear** if any of these conditions exist.



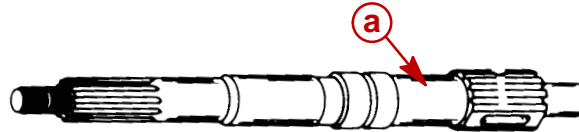
23351

a - Reverse Gear Teeth
b - Clutch Jaws



NOTE: The needle bearing in the reverse gear should not be removed unless damage has been found. Inspect to ensure that all of the needles are present and in position. The needles may have become dislodged while removing the gear from the propeller shaft (and/or while removing the propeller shaft assembly from the gear housing). They may be snapped back into place as long as no damage has occurred to the bearing cage.

4. Inspect the needle bearings on the inside of the reverse gear and the bearing surface on the propeller shaft. If either the needle bearings, or the bearing surface of the propeller shaft is pitted, grooved, scored, worn unevenly, discolored from overheating, or has embedded particles, replace the propeller shaft and remove and replace the needle bearing in the reverse gear as outlined in the next section.



50698

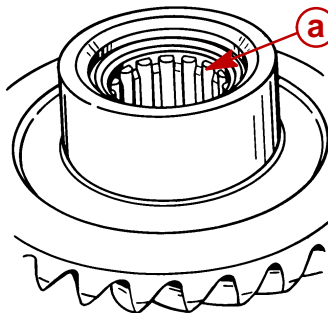
a - Forward Gear Needle Bearing Contact Area

REVERSE GEAR ASSEMBLY - COMPONENT DISASSEMBLY

NOTE: Reverse gear can only be removed from gear housing after drive shaft and pinion gear have been removed.

NOTE: Complete the instructions in this section only if the needle bearing in the gear has been found to be defective and the reverse gear is to be reused. Bearings that have become dislodged may be snapped back into position. If this is the only problem that exists it is not necessary to replace the needle bearing.

1. Replace bearing if it is rusted or does not roll freely.
2. Press the reverse gear needle bearing out using a suitable mandrel.



50778

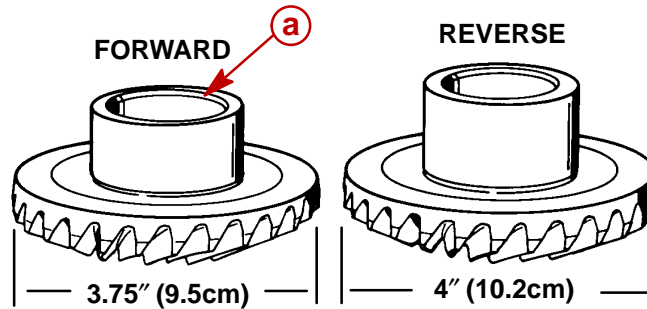
a - Reverse Gear Needle Bearing



REVERSE GEAR ASSEMBLY - COMPONENT REASSEMBLY

NOTE: Complete the instructions in this section only if the assembly components have been disassembled and repaired or replaced.

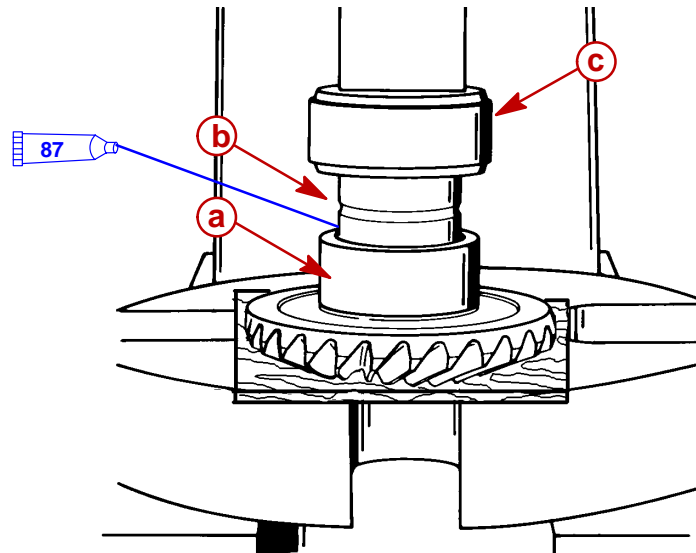
IMPORTANT: The appearance of the forward and reverse gear is almost identical. The forward gear has a shorter hub and is slightly smaller in diameter.



50885

a - Shorter Hub

1. Apply Quicksilver gear lubricant to I.D. of forward gear. Press the needle bearing into the reverse gear until tool contacts gear.



 87 Super Duty Gear Lubricant (92-850737A1)

50789

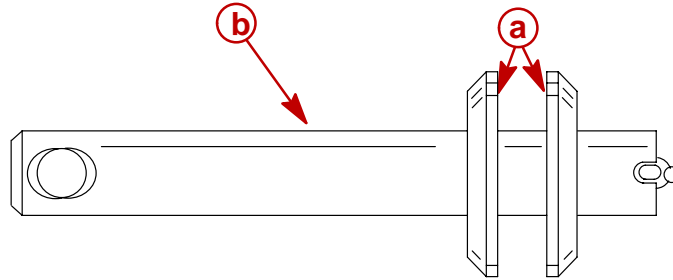
- a** - Reverse Gear
- b** - Needle Bearing
- c** - Bearing Driver (91-86943)



Shift Spool Assembly

INSPECTION

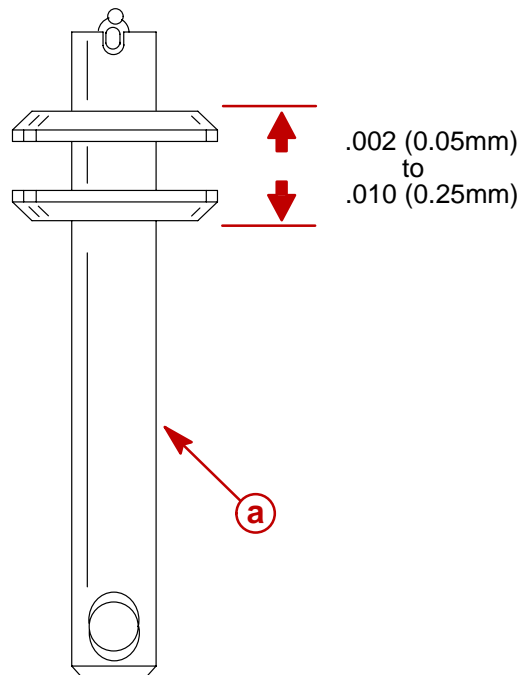
1. Clean the assembly with a suitable solvent and dry the parts using compressed air.
2. Inspect the shift spool assembly for damage. Small nicks and burrs may be smoothed. If any parts are damaged or worn beyond repair it will be necessary to replace the complete shift spool assembly. Individual parts are not available for the assembly.
3. Inspect the shift spool for wear in the area where the shift crank comes into contact.



23356

a - Contact Area
b - Shift Spool

4. Inspect to insure that the spool spins freely (it may be helpful to lightly tap the forward [castle nut] end of the shift spool shaft against a firm surface to align the internal parts).
5. Inspect to insure that the spool has no more than 0.002-0.010 (0.05-0.25 mm) end play.



55694

a - Spool



SHIFT SPOOL ASSEMBLY - COMPONENT DISASSEMBLY

NOTE: Disassembly of the shift spool is for cleaning and inspection of the internal parts of the assembly due to an improperly functioning shift spool assembly or debris in the gear housing and/or shift spool assembly. Individual components for the shift spool are not available as replacement parts. If the shift spool does not function properly (see the preceding "Shift Spool Assembly - Inspection" section) and the following cleaning and adjustment procedures do not produce the desired results, it will be necessary to order a new shift spool assembly.

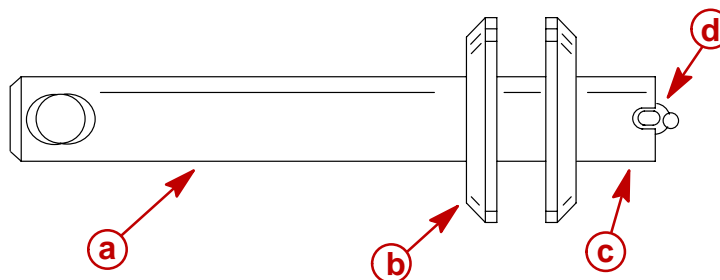
1. Disassemble the shift spool assembly as follows:
 - a. Remove and discard the cotter pin.
 - b. Remove the castle nut and the spool.

SHIFT SPOOL ASSEMBLY - COMPONENT INSPECTION

1. Clean all components with a suitable solvent and dry them with compressed air.
2. Inspect each component for wear or damage. If any components are worn beyond repair, damaged, or broken it will be necessary to replace the complete shift spool assembly. Small nicks or burrs may be smoothed and the parts reused.

SHIFT SPOOL ASSEMBLY - COMPONENT REASSEMBLY

1. Assemble the shift spool and shift spool shaft as follows:
 - a. Place the shift spool onto the shift spool shaft.
 - b. Assemble the castle nut and screw it down until it touches the washer and a slight resistance is felt.
 - c. Loosen the castle nut until the cotter pin slot of the castle nut is aligned with the hole in the shaft. If, when the castle nut is screwed down, the cotter pin slot is already aligned at the hole in the shaft, back the castle nut off until the next available slot in the nut is aligned with the hole in the shaft.
 - d. Insert a new cotter pin and bend ends of the cotter pin in opposite directions.



- a** - Shift Spool Shaft
- b** - Shift Spool
- c** - Castle Nut
- d** - Cotter Pin

55694



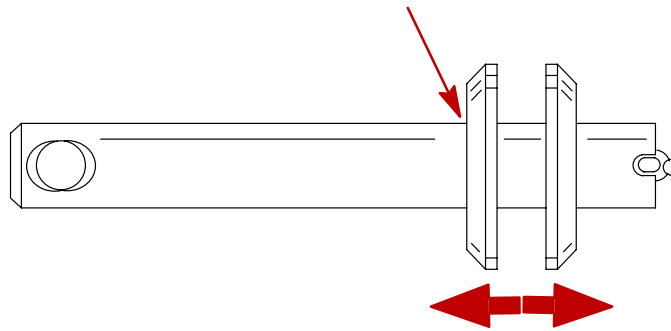
SHIFT SPOOL ASSEMBLY - ADJUSTMENT

NOTE: If the shift spool assembly has been disassembled and reassembled (as in the previous two sections) skip the following instructions, (1 through 4).

NOTE: If the shift spool assembly has not been disassembled and reassembled, do all of the following steps.

1. Remove and discard the cotter pin.
2. Screw the castle nut down until it touches the washer and a slight resistance is felt.
3. Loosen the castle nut until the cotter pin slot of the castle nut is aligned with the hole in the shaft. If, when the castle nut is screwed down, the cotter pin slot is not aligned at the hole in the shaft, back off the castle nut until the next available slot in the nut is aligned with the hole in the shaft.
4. Insert a new cotter pin and bend ends in opposite directions.
5. Inspect to insure that the spool spins freely (it may be helpful to lightly tap the forward [castle nut] end of the shift spool shaft against a firm surface to align the internal parts).
6. Inspect to insure that the spool has no more than 0.002-0.010 (0.05-0.25 mm) end play, if it does adjust the castle nut once again as outlined previously.

0.002 - 0.010 in. (0.05 - 0.25 mm)



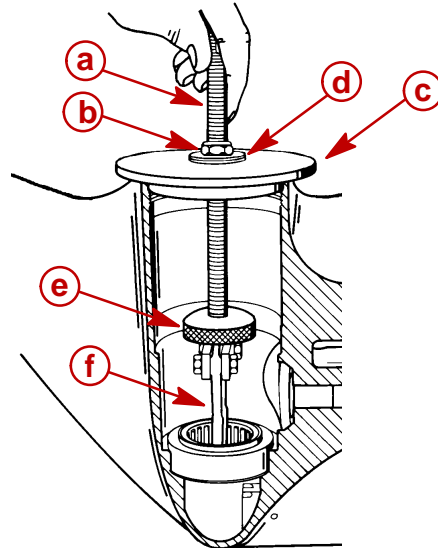
7. If this adjustment did not produce the desired results it will be necessary to disassemble, clean, and reassemble the shift spool assembly. If the spool assembly has already been disassembled and cleaned it will be necessary to replace the shift spool assembly.



Reverse Gear Bearing Adaptor Assembly

REMOVAL

1. Remove the reverse gear bearing adaptor using the tools as shown in the next figure. Remove, measure and make note of the shim thickness. If the shims are not damaged, they may be reused.



50780

- a - Bolt (91-31229)
- b - Nut (11-24156)
- c - Guide Plate (91-816243)
- d - Washer (91-34961)
- e - Puller Head (from Slide Hammer Puller Kit 90-34569A1)
- f - Jaws (91-816242)

REVERSE GEAR BEARING ADAPTOR ASSEMBLY - INSPECTION

1. Thoroughly clean the reverse gear bearing adaptor with a suitable solvent and dry it using compressed air.

NOTE: The condition of the bearing surfaces on the reverse gear in the areas that the bearings of the bearing adaptor and the thrust bearing rides, is an indication of the condition of the respective bearings. Replace the bearing(s) if the surface of the gear and/or the thrust washer is pitted, grooved, scored, worn unevenly, discolored from overheating or has embedded metal particles.

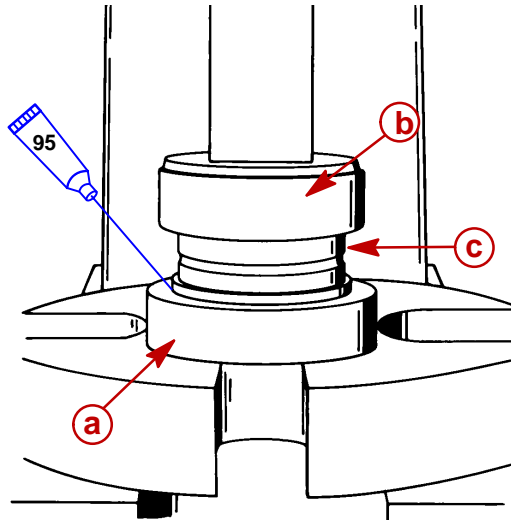
2. Assemble the reverse gear, the thrust bearing, and the thrust race, to the bearing adaptor. Inspect them for excessive movement or roughness by rotating the gear in the adaptor. Replace the bearing in the adaptor and/or the thrust bearing if either of these conditions exist.
3. Inspect the adaptor for other signs of excessive wear or damage. Replace the adaptor if any are found.



REVERSE GEAR BEARING ADAPTOR ASSEMBLY - COMPONENT DISASSEMBLY AND REASSEMBLY

NOTE: Complete the instructions in this section only if the needle bearing in the bearing adaptor is defective and the adaptor is to be reused.

1. Disassemble the adaptor as follows:
 - a. Remove the bearing from the adaptor using a suitable mandrel.
 - b. **Discard the bearing.**
2. Assemble the adaptor as follows:
 - a. Lubricate the bore that the needle bearing is to be pressed into with 2-4-C w/Teflon (92-825407A12).
 - b. Position the needle bearing on the adaptor with the numbered end of the bearing facing the driver shoulder.
 - c. Press the needle bearing into the bearing adaptor using a suitable mandrel until the bearing is flush with the face of the adaptor.



 95 2-4-C With Teflon (92-825407A12)

50790

- a** - Reverse Gear Bearing Adaptor
- b** - Suitable Mandrel
- c** - Bearing

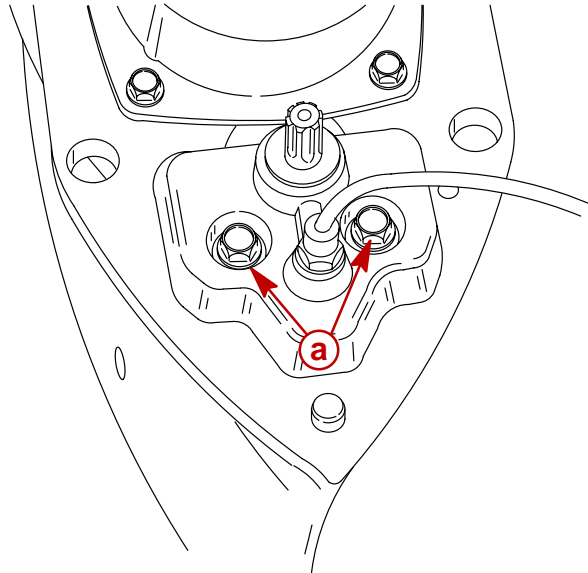


Shift Shaft Assembly

REMOVAL

NOTE: It is possible to remove and service the shift shaft assembly (but not the shift crank inside the gear case) without removing any of the internal components of the gear housing.

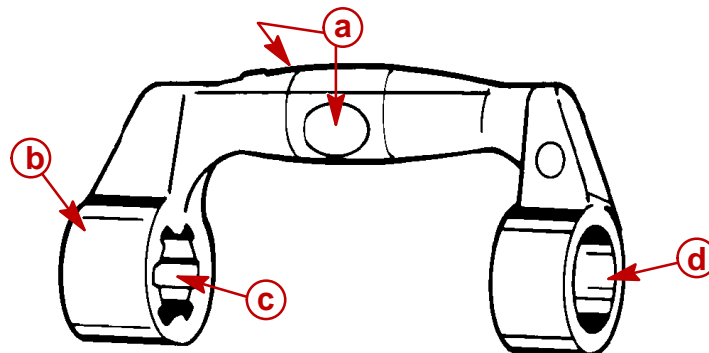
1. Remove the shift shaft bushing screws, and remove the shift shaft and bushing by pulling them straight out of gear housing.



57934

a - Shift Shaft Bushing Screws

2. Remove the shift crank from the inside of the gear housing. Clean it with a suitable solvent and dry it thoroughly. Inspect it for wear in the areas that contact the shift spool and inspect the splines and the diameter that goes over the locating pin for damage or wear.

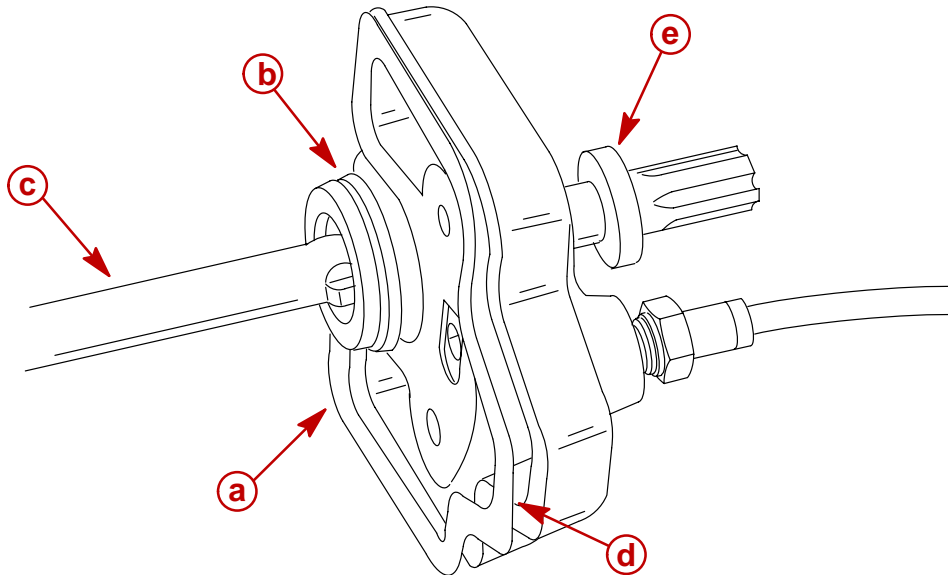


23350

- a** - Contact Area
- b** - Shift Crank
- c** - Splines
- d** - Diameter for Locating Pin

**SHIFT SHAFT ASSEMBLY - Component Disassembly and Inspection**

1. Slide the bushing assembly off the shift shaft. Remove the coupler from the shaft.

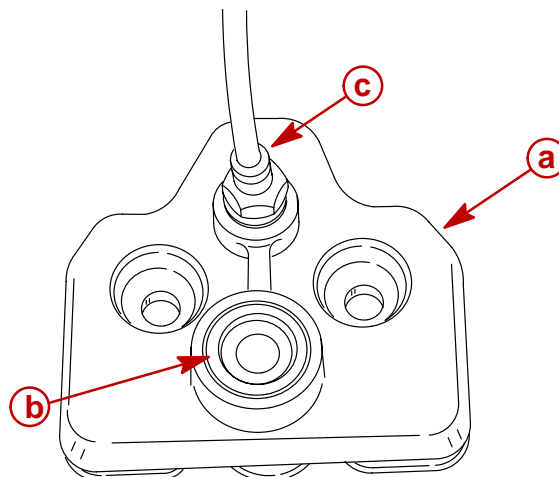


57954

- a** - Shift Shaft Bushing Assembly
- b** - O-ring
- c** - Shift Shaft
- d** - Gasket
- e** - Rubber Washer

2. Clean all components with a suitable solvent and dry thoroughly with compressed air.
 - a. Inspect the shift shaft bushing for cracking, damage, or excessive wear.
 - b. Inspect the oil seal inside the bushing, the sleeve, and the O-rings on the outside of the bushing for damage or excessive wear.
 - c. Inspect the speedometer connector for damage or blockage.

If any of these conditions exist, replace the appropriate components.

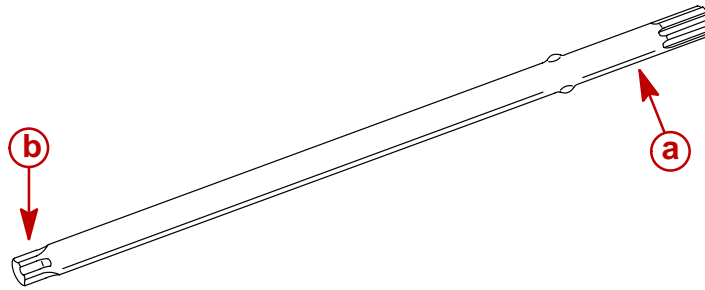


57932

- a** - Shift Shaft Bushing
- b** - Oil Seal (Oil Seal is Replaceable)
- c** - Speedometer Tube Connector



3. Inspect the shift shaft splines and oil seal surface for corrosion and/or excessive wear. Replace the shift shaft if either if these conditions are found.

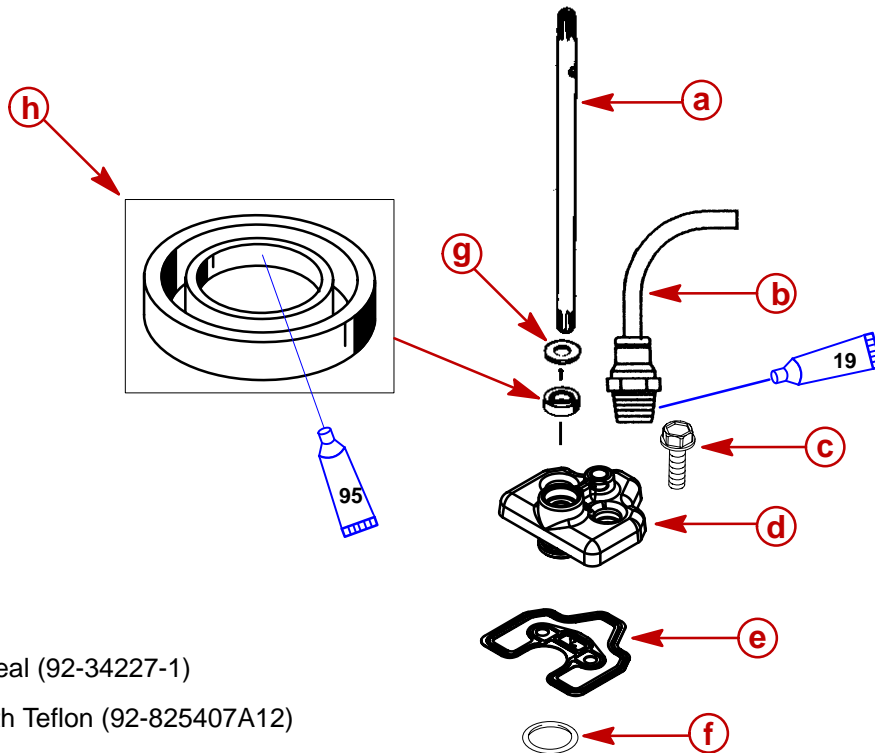


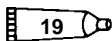
- a - Oil Seal Surface
- b - Spline

57948

SHIFT SHAFT ASSEMBLY - Component Reassembly

1. Lightly lubricate the seat of the O-ring diameter on the bushing and the lip of the oil seal with 2-4-C w/Teflon (92-825407A12).
2. If the speedometer connector was removed and/or replaced, lightly coat the **threads of the connector** with Quicksilver Perfect Seal (91-34277-1). Assemble the speedometer connector to the bushing and torque the connector to 4.5 lb. in. (0.5 Nm).
3. Assemble all components as shown below.



 Perfect Seal (92-34227-1)

 2-4-C With Teflon (92-825407A12)

- a - Shift Shaft
- b - Speedometer Pressure Hose
- c - Bolt (2) [Torque to 60 lb. in. (7 Nm)]
- d - Bushing
- e - Gasket
- f - O-ring
- g - Rubber Washer
- h - Seal (Lip Faces Up)



Pinion Bearing

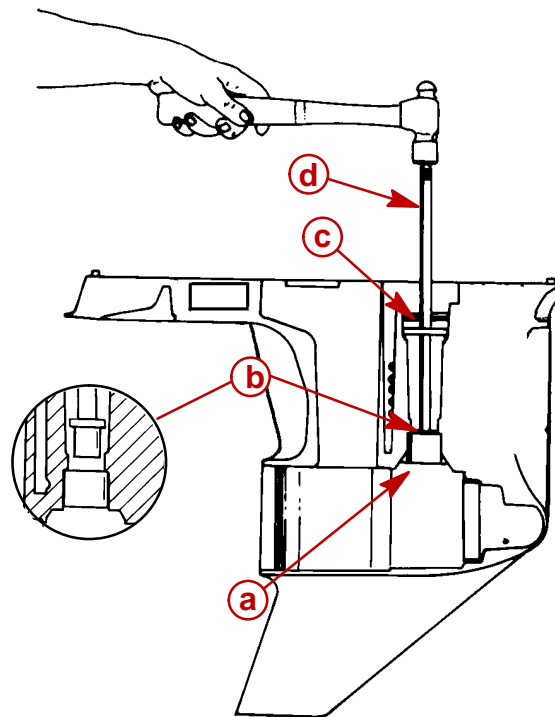
REMOVAL

NOTE: *Inspect the bearing surface on the drive shaft where the needles of the lower pinion bearing roll. The condition of the drive shaft at this location gives an indication of the condition of the needle bearing. Replace lower pinion bearing (needles and race as a set) if the drive shaft is pitted, grooved scored, worn unevenly, discolored from overheating, or has embedded particles.*

IMPORTANT: All the needle bearings (18) **MUST BE** in place inside bearing race while driving the pinion bearing from the gear housing.

IMPORTANT: Do not reuse the bearing (race or rollers) once it has been removed.

1. Remove and discard the pinion bearing (race and rollers) using tools as shown.



70614

- a** - Pinion Bearing
- b** - Bearing Driver (91-36569)
- c** - Pilot Washer (91-36571)
- d** - Driver Rod (91-37323)



Gear Housing Reassembly

Gear Housing Inspection

1. Clean the gear housing thoroughly with a suitable solvent and a hard bristle brush. Dry the gear housing thoroughly using compressed air. Insure that all sealants, locking agents and debris are removed.
2. Verify the 2 oil circulation holes in the drive shaft bore and the shift shaft hole are clear and free of debris.
3. Inspect the gear housing for excessive corrosion, impact or any other damage. Excessive damage and/or corrosion requires replacement of the gear housing.
4. Inspect the bearing carrier retainer threads in the gear housing for corrosion and/or stripped threads. Damage or corrosion to the threads requires replacement of the gear housing.
5. Inspect bearing race/cup contact areas for evidence of bearing cup spinning. Check that bearing cups are not loose in bearing bores. Any one bearing bore in which the race/cup is loose will require replacement of the gear housing.
6. Inspect for blockage in water inlet holes and the speedometer hole, clean as necessary. Be careful not to enlarge the speedometer hole as this could cause erroneous speedometer readings.
7. Verify that the locating pins are in place in the gear housing and that the corresponding holes in the drive shaft housing are not elongated. The drive shaft may break if the housings are not aligned properly due to missing locating pins or elongated holes.

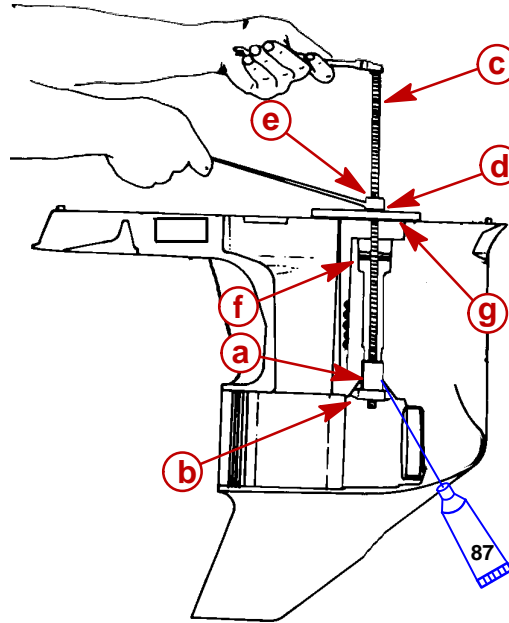


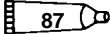
Pinion Bearing

INSTALLATION

IMPORTANT: Install only a new pinion bearing. Do not reinstall a pinion bearing that has been previously removed from a gear housing.

1. Lubricate the bore into which the pinion bearing is to be installed with Quicksilver Gear Lubricant (92-19007A24).
2. Position the new pinion bearing (with the cardboard shipping sleeve in place) onto the driver head, with the lettered and numbered side of the bearing oriented upward.
3. Insert the driver with the bearing assembly, into position (by way of the propeller shaft bore) at the drive shaft bore as shown.



 Quicksilver Gear Lubricant (92-19007A24)

70615

- a** - Drive Shaft Pinion Bearing (With Cardboard Shipping Sleeve)
- b** - Driver Head (91-38628)
- c** - Puller Shaft (91-31229)
- d** - Washer (12-34961)
- e** - Nut (11-24156)
- f** - Pilot Washer (91-36571)
- g** - Puller Plate (91-29310)

4. Install the bearing by screwing down the nut until the bearing is fully seated against the bore shoulder.

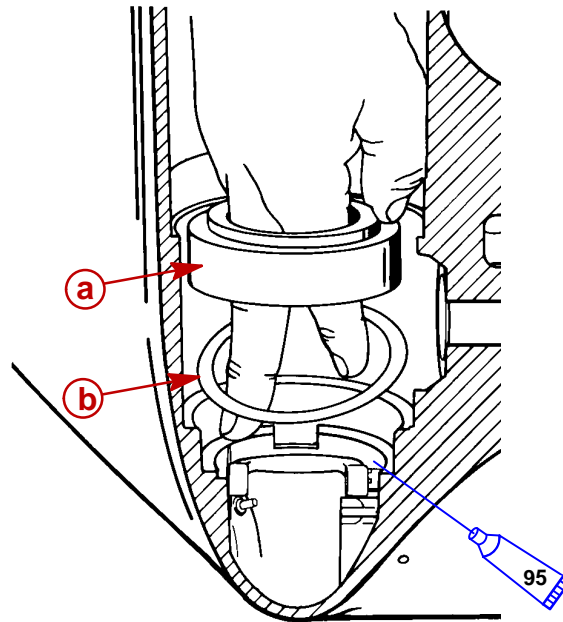


Reverse Gear Bearing Adaptor Assembly

INSTALLATION

NOTE: If the reverse gear, reverse gear adaptor, large thrust bearing, or bearing race in the gear housing were not replaced, install the same shim(s) (or the same thickness of shim(s) that were taken out when adaptor was removed. If the reverse gear, reverse gear adaptor, large thrust bearing, bearing race, or gear housing were replaced, install 0.008 in. (0.51 mm) of shims.

1. Lubricate the bore into which the reverse gear bearing adaptor is to be installed with 2-4-C w/Teflon (92-825407A12).
2. Place the shim(s) into reverse bore of gear housing.
3. Position the bearing adaptor in the gear housing.

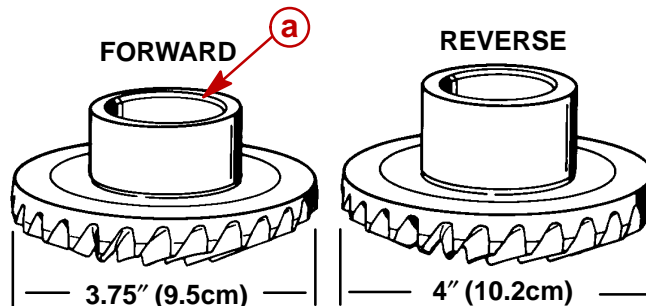


 95 2-4-C With Teflon (92-825407A12)

50781

- a** - Bearing Adaptor
- b** - Shims

IMPORTANT: The appearance of the forward and reverse gear is almost identical. The forward gear has a shorter hub and is slightly smaller in diameter.

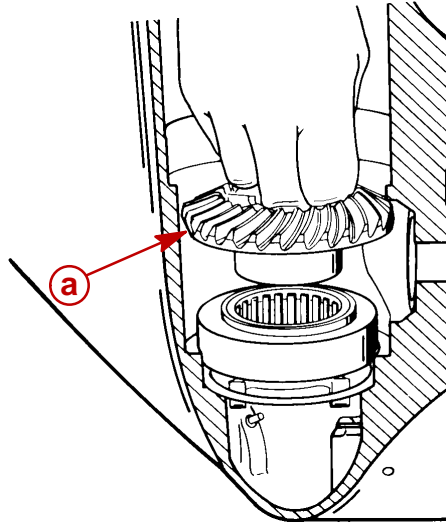


50885

- a** - Shorter Hub



4. Position the reverse gear (without the thrust race or thrust bearing) into the gear housing and into the adaptor.



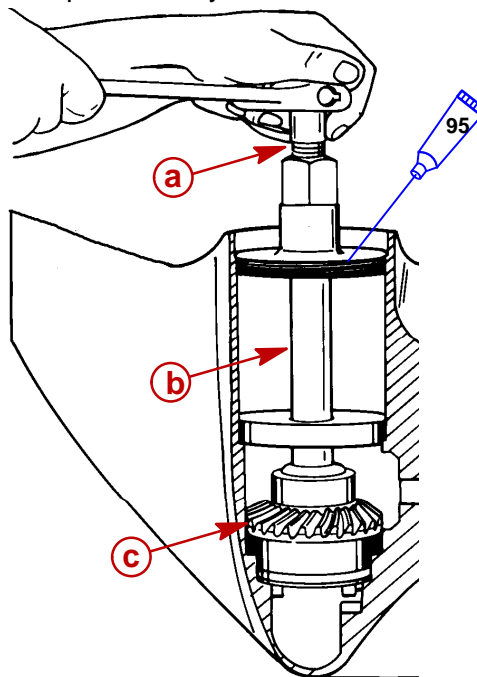
50781

a - Reverse Gear

5. Press the bearing adaptor into the gear housing using the installation tool as follows:

IMPORTANT: Be sure that the bearing adaptor is positioned as straight as possible to avoid cocking it in the bore while pressing it in.

- a. Lubricate the threads of the installation tool with 2-4-C w/Teflon (92-825407A12).
- b. Turn the hex-head screw of the installation tool until the bearing adaptor bottoms out on the gear housing shoulder. DO NOT continue to turn the tool once the screw resistance goes up noticeably.



 95 2-4-C With Teflon (92-825407A12)

50791

- a** - Hex-Head Screw
- b** - Bearing Adaptor Installation Tool (91-18605A1)
- c** - Reverse Gear

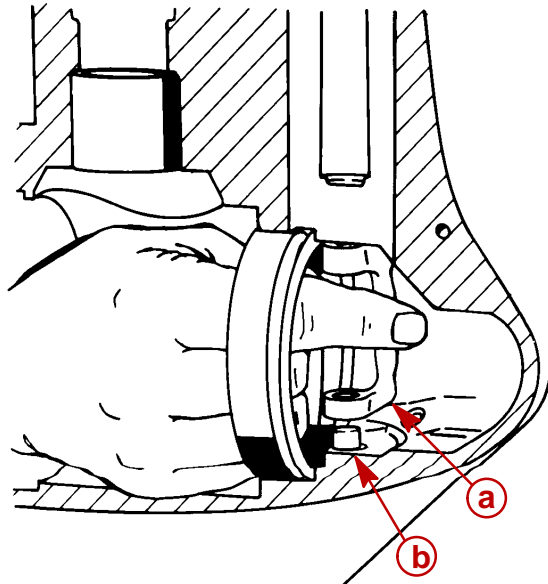
- c. Remove the installation tool **and the reverse gear**.



Shift Shaft Assembly

INSTALLATION

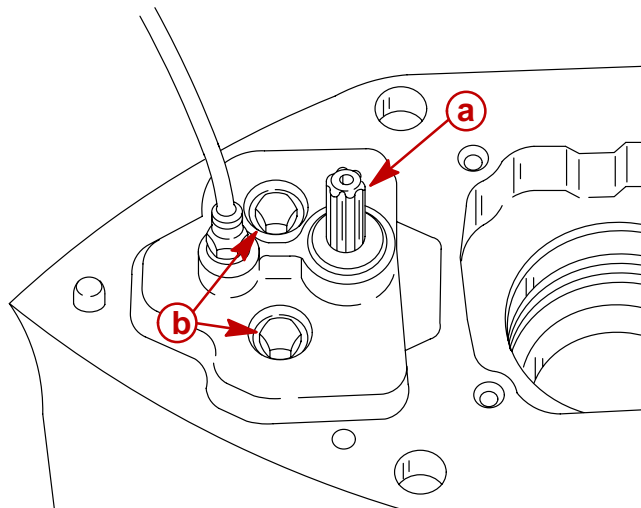
1. Place the shift crank onto the locating pin in the forward section of the gear housing. Ensure that the shift crank faces towards the left (port) side of the gear housing.



50314

- a** - Shift Crank
- b** - Locating Pin

2. Install the shift shaft assembly into the gear housing as shown. Engage the splined end of the shift shaft with the shift crank. Verify O-ring is positioned properly and lubricated with 2-4-C w/Teflon. Secure shift shaft bushing with 2 screws. Torque screws to 60 lb. in. (7 Nm).

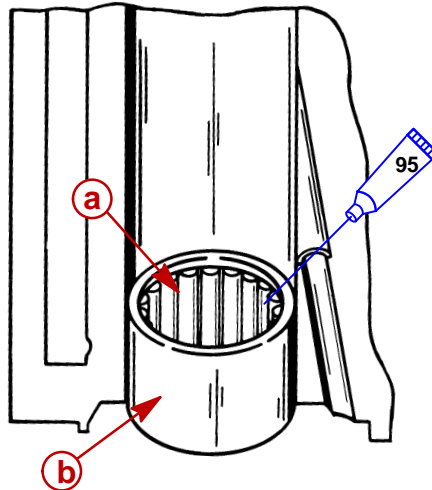


57933

- a** - Shift Shaft Assembly
- b** - Screws [Torque to 60 lb. in. (7 Nm)]



NOTE: If the pinion bearing needle bearings have fallen out, install 18 needles into needle bearing outer race. Use 2-4-C w/Teflon (92-825407A12), to help hold needles in place.



 95 2-4-C With Teflon (92-825407A12)

23142

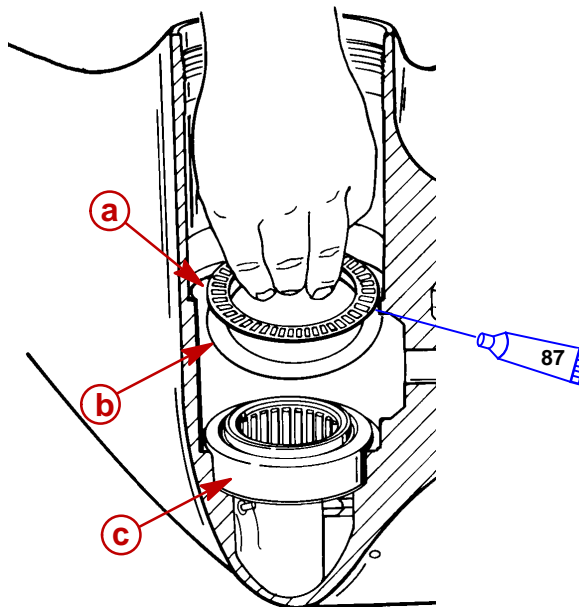
- a** - Rollers (18)
- b** - Roller Bearing Outer Race

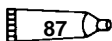
Gear Location/Backlashes Checking and Adjustment

Reverse Gear

INSTALLATION (FOR CHECKING BACKLASH ONLY)

1. Lubricate the large reverse gear thrust bearing with Quicksilver Gear Lubricant (92-13783A24) and position first the thrust race, then the bearing into the gear housing and onto the reverse gear bearing adaptor.



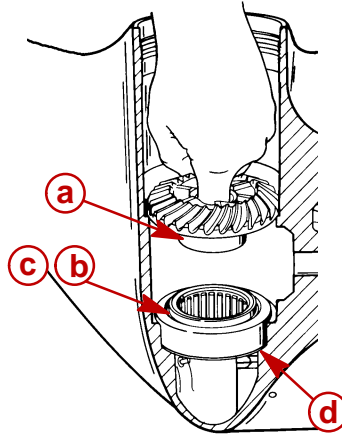
 87 Quicksilver Gear Lubricant (92-19007A24)

50882

- a** - Thrust Bearing
- b** - Thrust Race
- c** - Reverse Gear Bearing Adaptor



2. Install the reverse gear into the gear housing and into the reverse gear bearing adaptor.



50884

- a** - Reverse Gear
- b** - Thrust Bearing
- c** - Thrust Race (under Bearing)
- d** - Reverse Gear Bearing Adaptor

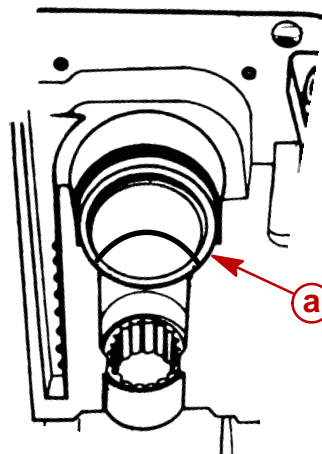
Drive Shaft and Pinion Gear

INSTALLATION

NOTE: If the original shims were not retained or if pinion gear, drive shaft, drive shaft upper tapered roller bearing and cup, or gear housing were replaced, start off by installing a 0.038 in. (0.96 mm) shim(s), for the upper tapered roller bearing.

NOTE: If the original shims were retained (or measurement known) and none of the above listed parts were replaced, reinstall the same shims or same amount of shims.

1. Place the upper tapered bearing shim(s) into the drive shaft housing bore.



70620

- a** - Shim(s)

NOTE: For ease of installation, glue the washer to the pinion gear, using 3M Adhesive (92-25234), or Quicksilver Bellows Adhesive (92-86166), or equivalent.

NOTE: If the backlash may have to be changed, it is recommended that Loctite 271 NOT be applied to the pinion nut UNTIL the backlash setting is finalized. DO NOT reuse the old pinion nut. Install a NEW pinion nut after backlash is finalized.

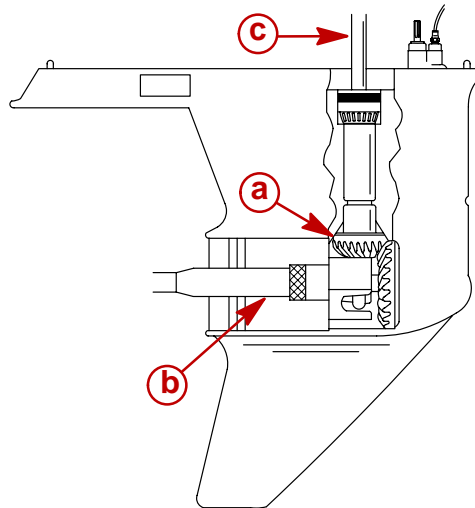
NOTE: Do not install the lower tapered bearing cup or shim(s) at this time.



2. Apply Loctite 271 (92-809820) to the threads of the pinion gear nut and place the pinion gear nut into the MR slot of the pinion nut adapter.

NOTE: Install the pinion gear nut with the flat side of the nut away from the pinion gear.

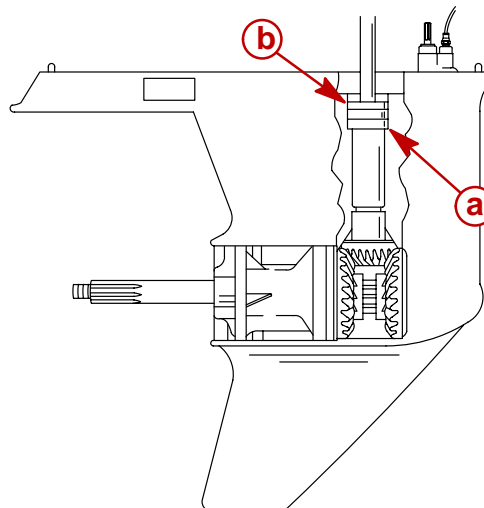
3. Place the pinion gear (with the washer glued to it) into the gear housing.
4. Insert the drive shaft into the gear housing drive shaft bore. It may be necessary to rotate the drive shaft to engage the drive shaft splines into the pinion gear splines.
5. Temporarily install the propeller shaft (without the sliding clutch installed) into reverse gear.
6. Insert the pinion nut adaptor (with the nut) into the gear housing. It may be necessary to raise the drive shaft slightly to clear the tool.
7. Start the pinion nut onto the drive shaft threads by rotating the drive shaft until the nut is snug.



57952

- a** - Pinion Gear (with the washer glued to it)
- b** - Pinion Nut Adaptor (91-61067A2)
- c** - Drive Shaft

8. Install the upper drive shaft tapered roller bearing cup. Apply 2-4-C w/Teflon to the retainer threads and install the retainer.

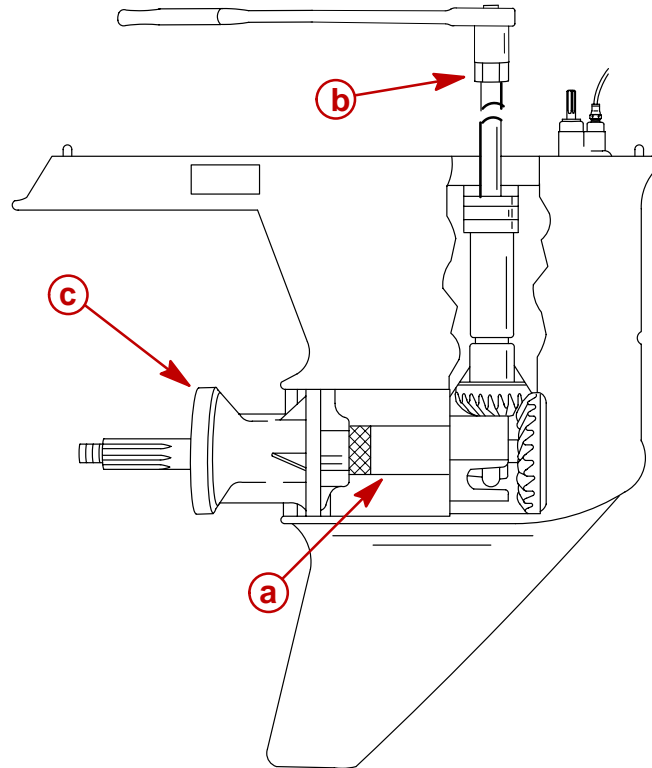


57953

- a** - Upper Tapered Roller Bearing Cup
- b** - Drive Shaft Retainer



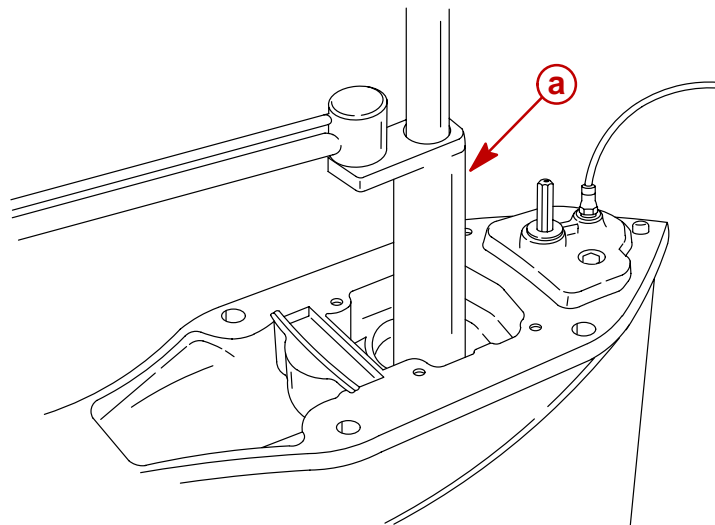
9. Install the bearing carrier into the gear housing backwards to hold the propeller shaft and the pinion nut adaptor in position.
10. Torque the pinion nut to 70 lb. ft. (95 Nm) by turning the drive shaft using the drive shaft nut wrench and torque wrench.



57950

- a** - Pinion Nut Adapter (91-61067A2)
- b** - Drive Shaft Nut Wrench (91-56775)
- c** - Bearing Carrier (installed backwards)

11. Remove the bearing carrier, pinion nut adapter and drive shaft nut wrench.
12. Torque the retainer to 100 lb. ft. (135 N·m).



57935

- a** - Drive Shaft Bearing Retainer Wrench (91-43506)

13. Remove retainer wrench.

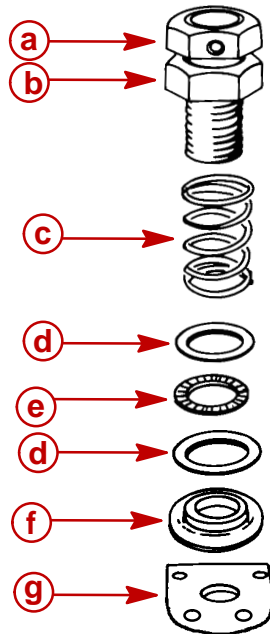


Gear Location/Backlashes/Checking and Adjustment

Drive Shaft - Bearing Preload Tool

INSTALLATION

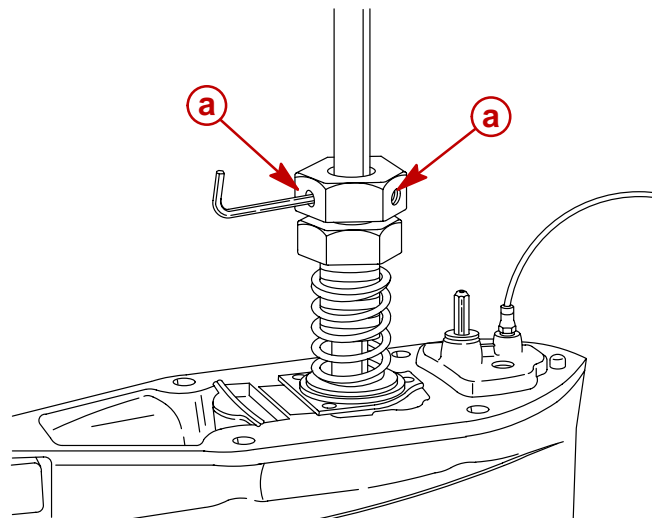
1. Install the components from the Bearing Preload Tool Kit (91-14311A1), over the drive shaft in the order shown.



- a** - Top Nut with Threaded Pipe
- b** - Nut
- c** - Spring
- d** - Thrust Washer (2 Required) (12-18448)
- e** - Thrust Bearing
- f** - Thrust Washer
- g** - Water Pump Face Plate (from your gear housing)

70496

2. Pull up on the drive shaft and tighten the two (2) allen screws in the top nut of the bearing preload tool.

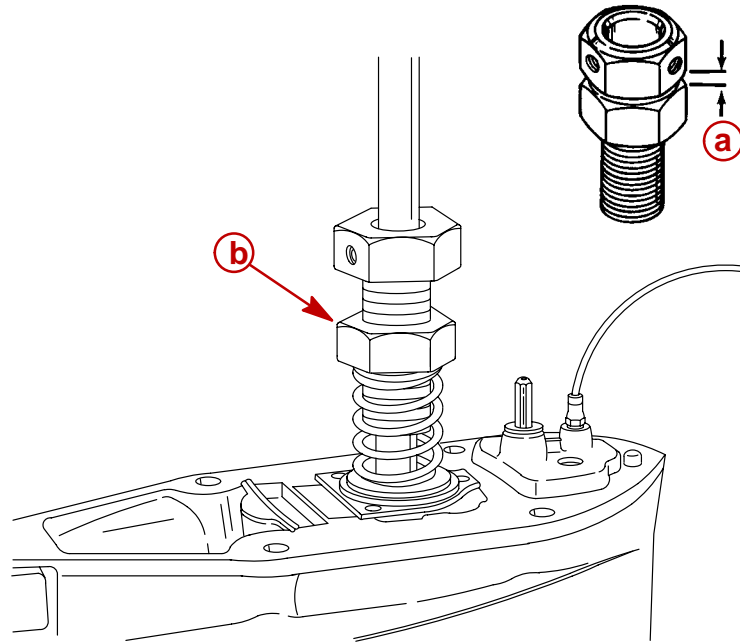


- a** - Allen Screws

57936



3. Measure distance (a) and increase that distance by 1 in. (25.4mm) by turning bottom nut away from top nut.



57937

- a - Distance 1 in. (25.4mm)
- b - Bottom nut [screwed down approximately 1 in. (25.4mm)]

Pinion Gear Location

CHECKING AND ADJUSTING

Pinion Depth – 0.025 in. (0.64mm)

NOTE: If the bearing preload tool has not already been set up, refer to “Drive Shaft - Bearing Preload Tool”, ‘Installation’ section first.

NOTE: The prop shaft and reverse gear can be installed when checking pinion height IF Pinion Height Tool 91-56048 is used.

1. Place the pinion gear shimming tool into the gear housing.

NOTE: Take the following measurements at 3 locations, rotating the drive shaft 120 degrees between each reading (always rotate the drive shaft in a clockwise direction).

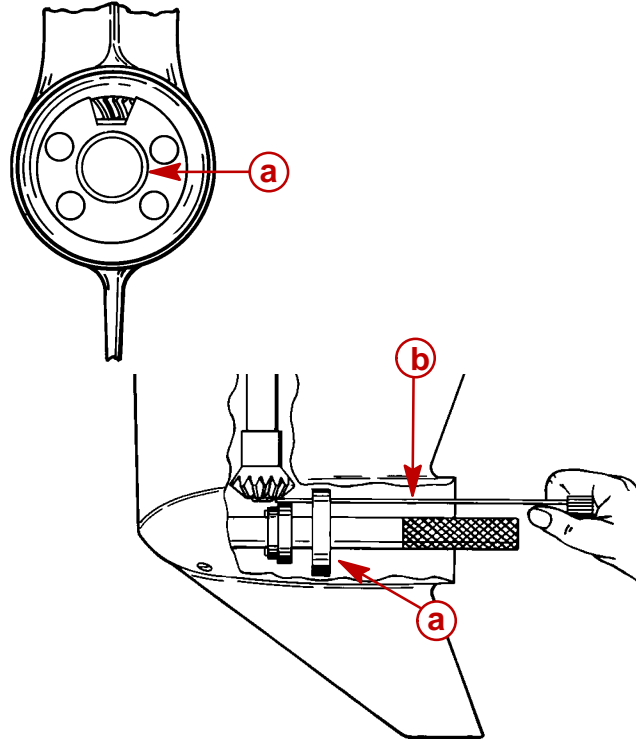
2. Insert the thickest feeler gauge that fits snugly between one tooth of the pinion gear and high point of the shimming tool.
3. Rotate the drive shaft 120 degrees in a clockwise direction and take another reading.
4. Repeat this process until 3 readings have been taken.
5. Add the three readings together and divide the sum by 3 to get the average pinion gear height. Make note of this average measurement.

The average pinion gear height should be 0.025 in. (0.64mm).

6. **A.** If the (average) pinion gear location does not meet the specification of 0.025 in. (0.64 mm) continue with the instructions on the following section.
B. If the (average) pinion gear location meets specification, skip the following section and go on to the “Reverse Gear Backlash”, ‘Checking’ section.



7. If the average pinion gear height is not correct, remove the bearing preload tool, the drive shaft retainer and the drive shaft tapered roller bearing cup. (The cup can be removed by wiggling the drive shaft back and forth or by turning gear housing and shaking it.) Add or subtract shims beneath the cup to obtain the proper average pinion gear height. Reinstall the cup and retainer. Retorque retainer to 100 lb. ft. (135 Nm). Reinstall the bearing preload tool and rotate the drive shaft at least 3 full turns in a clockwise direction. Recheck the pinion gear height as in step 5 above. Repeat this process until the average pinion gear height is within specification.



24643

- a** - Pinion Gear Shimming Tool (91-12349A2) Using Disc #2 and Flat #4
- b** - 0.025 in. (0.64mm) Feeler Gauge



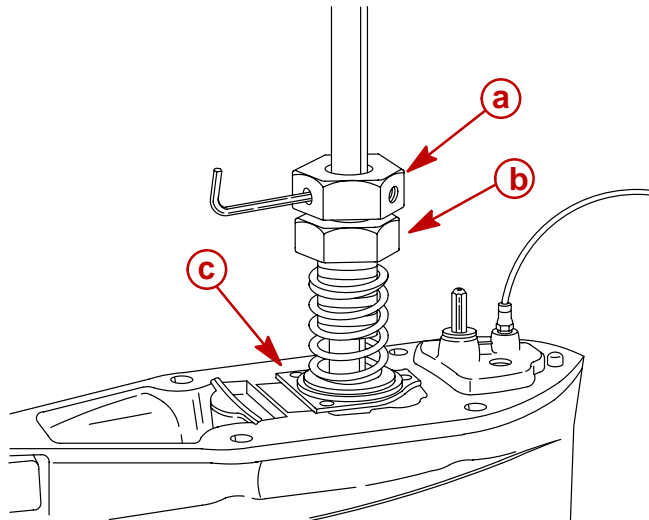
Drive Shaft - Bearing Preload Tool

REMOVAL

CAUTION

Before loosening the top nut allen screws of the bearing preload tool, screw the bottom nut up as close as possible to the top nut.

1. Remove the dial indicator and its supporting tooling.
2. Screw the bottom nut of the bearing preload tool until it is as close as possible to top nut.
3. Loosen the allen screws in the top nut.
4. Remove all components.



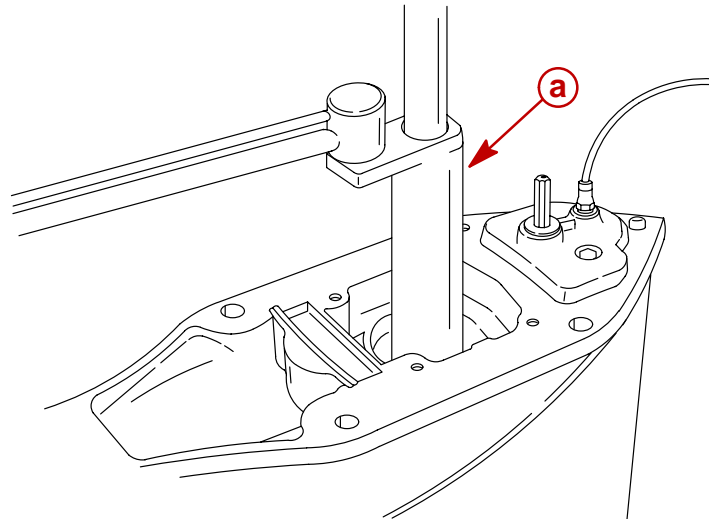
- a** - Top Nut (with allen screws)
- b** - Bottom Nut
- c** - Plate

57936



UPPER DRIVESHAFT BEARING CLEARANCE

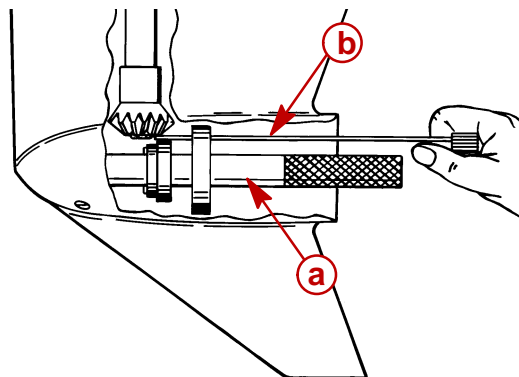
1. When the correct pinion gear height is achieved, remove pinion nut, upper retainer and driveshaft.
2. Apply Quicksilver gear lubricant to O.D. of the driveshaft lower bearing cup and install cup into the gear case.
3. Reinstall driveshaft and pinion gear into gear case.
4. Install the upper drive shaft bearing cup and install and torque the upper bearing retainer to 100 lb. ft. (135 Nm).
5. Torque pinion nut to 70 lb. ft. (95 Nm).



57935

a - Bearing Retainer Tool (91-43506)

6. Push down on drive shaft and check clearance between pinion gear and pinion gear shimming tool shoulder. Clearance should be 0.020 in - 0.024 in. (0.51 mm - 0.61 mm).



a - Pinion Gear Shimming Tool (91-12349A2) Using Disc #2 and Flat #4

b - Feeler Gauge

NOTE: Do not change shims under upper bearing cup or pinion height will be changed.

7. Maintain the shims as previously set under the upper drive shaft bearing cup.
8. If clearance is not within specifications, remove the upper bearing cup retainer with tool 91-43506 and remove cup. Leave upper cup shim(s) in place.

NOTE: A 0.001 in. (25.4 mm) change of shims under the lower bearing cup will result in a 0.001 in. (25.4 mm) change in drive shaft end play.



9. With new shim(s) under lower bearing cup, reinstall upper bearing cup and torque cup retainer to 100 lb. ft. (135.5 Nm). Recheck drive shaft clearance.

NOTE: Install a NEW pinion nut with Loctite 271 AFTER all clearances are correct.

10. If clearance is correct, clean drive shaft threads and apply Loctite 271 and install a new pinion nut. Torque nut to 70 lb. ft. (95 Nm).

Reverse Gear Backlash

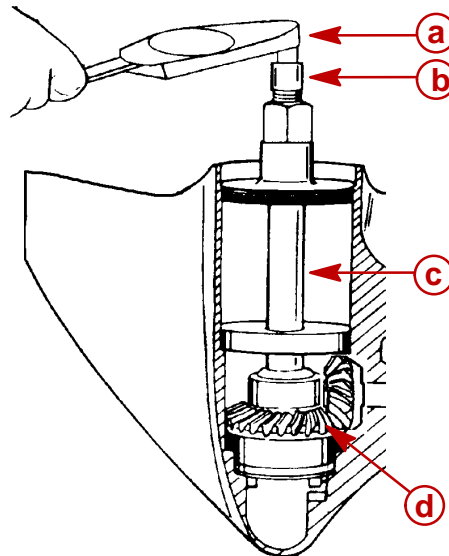
CHECKING

Reverse Gear Backlash Specification: 0.040-0.060 in. (1.01mm-1.5 mm).

NOTE: If the bearing preload tool has not already been set up see “Drive Shaft - Bearing Preload Tool”, ‘Installation’ section first.

NOTE: The reverse gear bearing adaptor installation tool is used to apply a light preload to the reverse gear in the following steps.

1. Install the reverse gear bearing adaptor installation tool into the gear housing to hold the reverse gear against the thrust bearing as follows:
 - a. Assemble the reverse gear bearing adaptor installation tool into the gear housing and tighten it by hand until a slight resistance is felt.
 - b. Torque the adaptor’s driver bolt to 45 lb. in. (5 Nm).

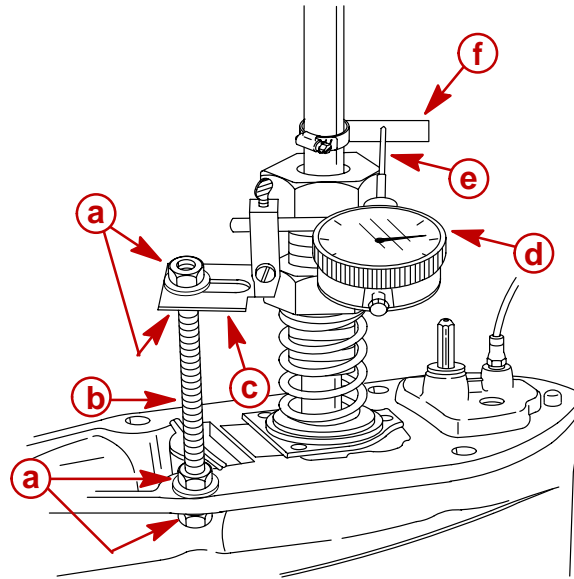


70973

- a** - Torque Wrench (91-66274)
- b** - Driver Bolt
- c** - Bearing Adaptor Installation Tool (91-18605A1)
- d** - Reverse Gear



2. Install a dial indicator and align the dial indicator pointer so that it is perpendicular to and touching the "I" mark on the dial indicator tool. Tighten the indicator tool onto the drive shaft and rotate the drive shaft so that the needle in the dial makes at least one full revolution and comes to "0" on the dial indicator scale.



57939

- a** - Nuts (4) (Obtain Locally)
- b** - Threaded Rod [3/8 in. (9.5mm) obtain locally]
- c** - Dial Indicator Holding Tool (91-83155)
- d** - Dial Indicator (91-58222A1)
- e** - Indicator Pointer
- f** - Backlash Indicator Rod (91-53459) (for 1.75:1 ratio)
Backlash Indicator Rod (91-78473) (for 1.87:1 ratio)

3. Take the backlash readings by lightly turning the drive shaft back and forth, so as to feel the backlash between the gears, (no movement should be noticed at the propeller shaft).
 - a. Observe the dial indicator and record the reading.
 - b. Loosen the indicator tool and rotate the drive shaft 90 degrees in a clockwise direction.
 - c. Repeat step 2 above and take and record another reading. Repeat step 3 until a total of 4 backlash readings have been taken.
4. Add the four readings together and divide the sum by four. This is your average backlash and it should be 0.040 in. - 0.060 in. (1.0 mm - 1.5 mm) (for 1.75:1 and 1.87:1 ratios).



NOTE: If backlash needs to be adjusted, (see Checking Reverse Gear Backlash), adding 0.001 in. (0.03 mm) shims will **reduce** the gear backlash by approximately 0.001 in. (0.03mm). Subtracting 0.001 in. (0.03mm) shims will **increase** backlash by approximately the same amount.

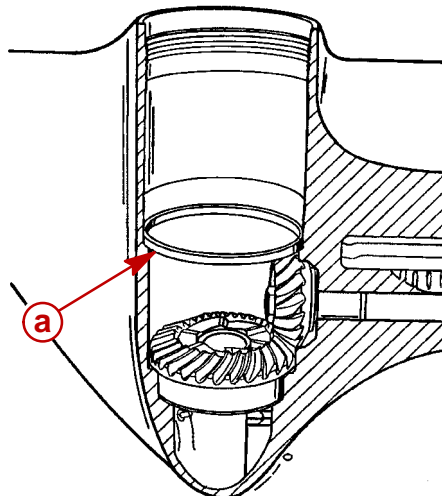
Example 1 (if backlash is too high)		
Backlash checks:	.070 in.	(1.79 mm)
(subtract) middle of specification:	.050 in.	(1.27 mm)
You get:	.020 in.	(0.50 mm)
add this quantity of shims		
Example 2 (if backlash is too low)		
middle of specification:	.050 in.	(1.27 mm)
Backlash checks:	.020 in.	(0.50 mm)
(subtract) You get:	.030 in.	(0.76 mm)
subtract this quantity of shims		

- Loosen the backlash indicator tool and remove the propeller nut, washer and pinion nut adaptor. Remove the dial indicator and all its mounting components. **Do not remove the bearing preload tool. The following instructions give specific instructions for its removal.**

Forward Gear/Bearing Carrier Assembly

CHECKING FORWARD GEAR BACKLASH

- Install the appropriate spacer shim into the gear housing.

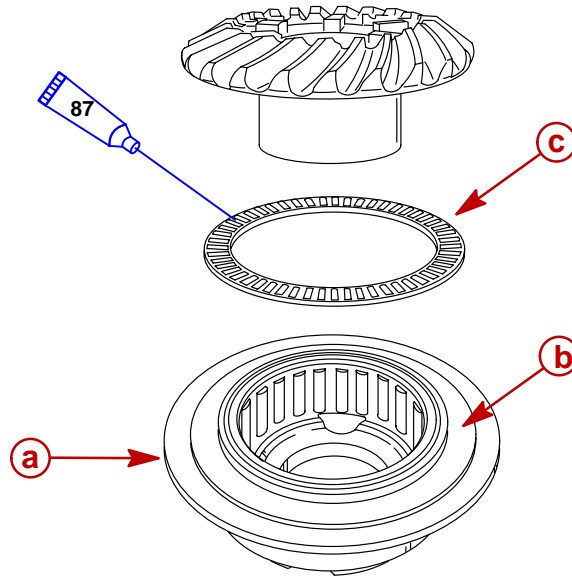


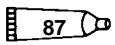
a - Shim

55428



2. Apply Quicksilver Gear Lubricant to thrust bearing and install thrust bearing and thrust race onto forward gear bearing adaptor.

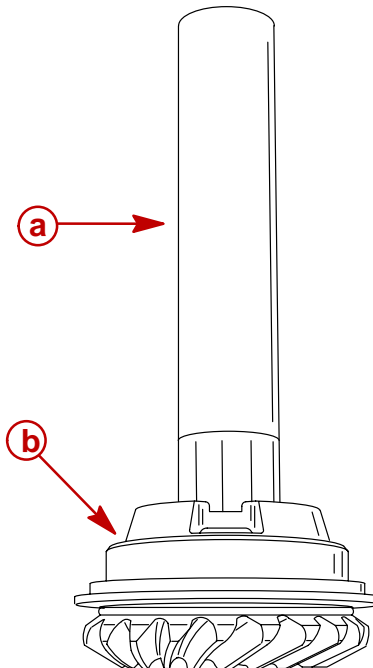


 Quicksilver Gear Lubricant (92-19007A24)

55220

- a** - Bearing Adaptor
- b** - Thrust Washer
- c** - Thrust Bearing

3. Insert Forward Gear Installation Tool (91-815850) into forward gear/bearing adaptor assembly.



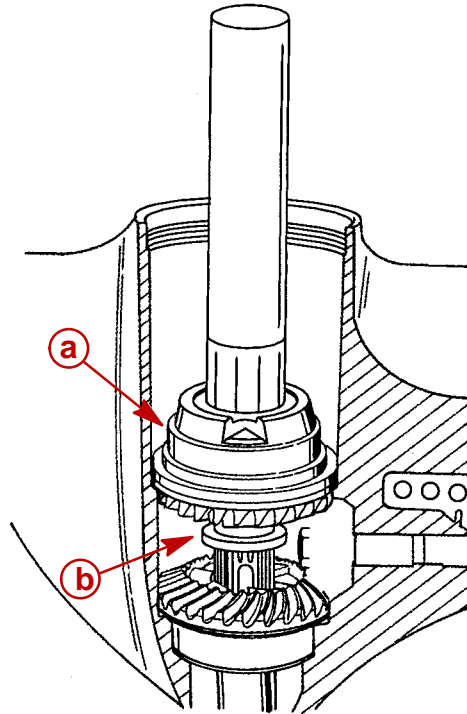
55221

- a** - Forward Gear Installation Tool (91-815850)
- b** - Forward Gear/Bearing Adaptor Assembly



NOTE: Verify load washer is installed on propeller shaft prior to installing forward gear assembly

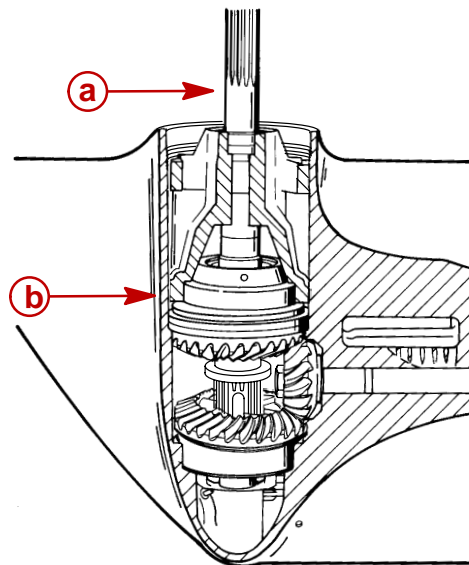
4. Install tool with adaptor assembly over propeller shaft and into gear housing. Applying downward pressure to bearing adaptor, remove installation tool from assembly.



55431

- a** - Forward Gear Bearing Adaptor
- b** - Load Washer

5. Install the bearing carrier over the propeller shaft pushing bearing carrier down until it is fully seated.

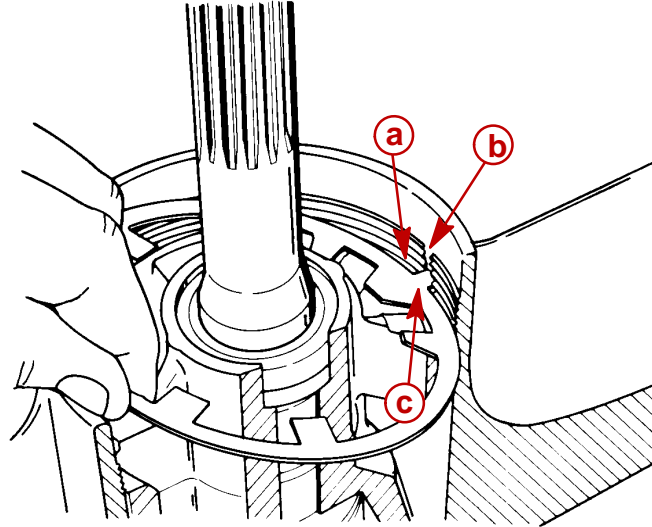


55429

- a** - Propeller Shaft
- b** - Bearing Carrier



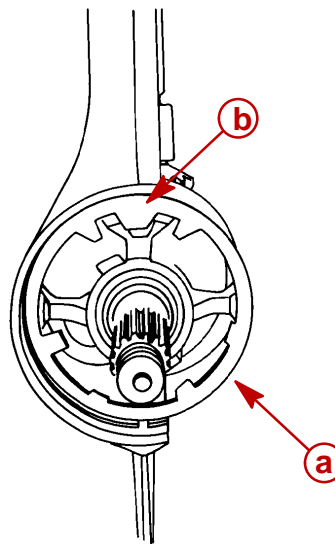
- Align the bearing carrier "V" shaped notch with the alignment hole in the gear housing. Install the tab washer with the external tab inserted into the hole in the gear housing.



50779

- a** - Gear Housing Tab Washer Alignment Hole (not seen)
- b** - "V" Shaped Notch in Bearing Carrier
- c** - Alignment Tab of Tab Washer

- Insure that the "V" shaped tab aligns with the "V" notch in bearing carrier.

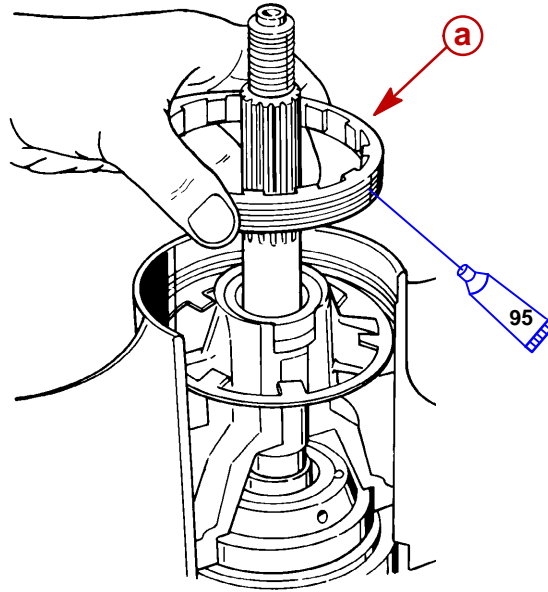


70714

- a** - Tab Washer
- b** - "V" Tab



- Lubricate the bearing carrier retainer threads with 2-4-C w/Teflon (92-825407A12). Start the retainer into the gear housing threads and screw it down fully by hand.

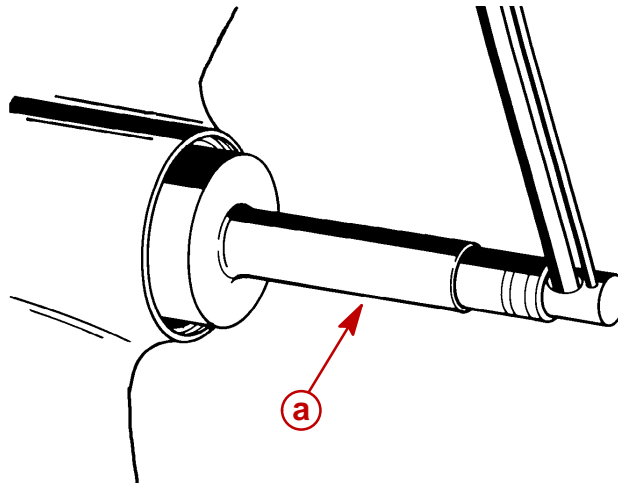


 2-4-C With Teflon (92-825407A12)

50881

a - Bearing Carrier Retainer

- Torque the bearing carrier retainer to 210 lb. ft. (285 Nm) to seat forward gear assembly in gear case.



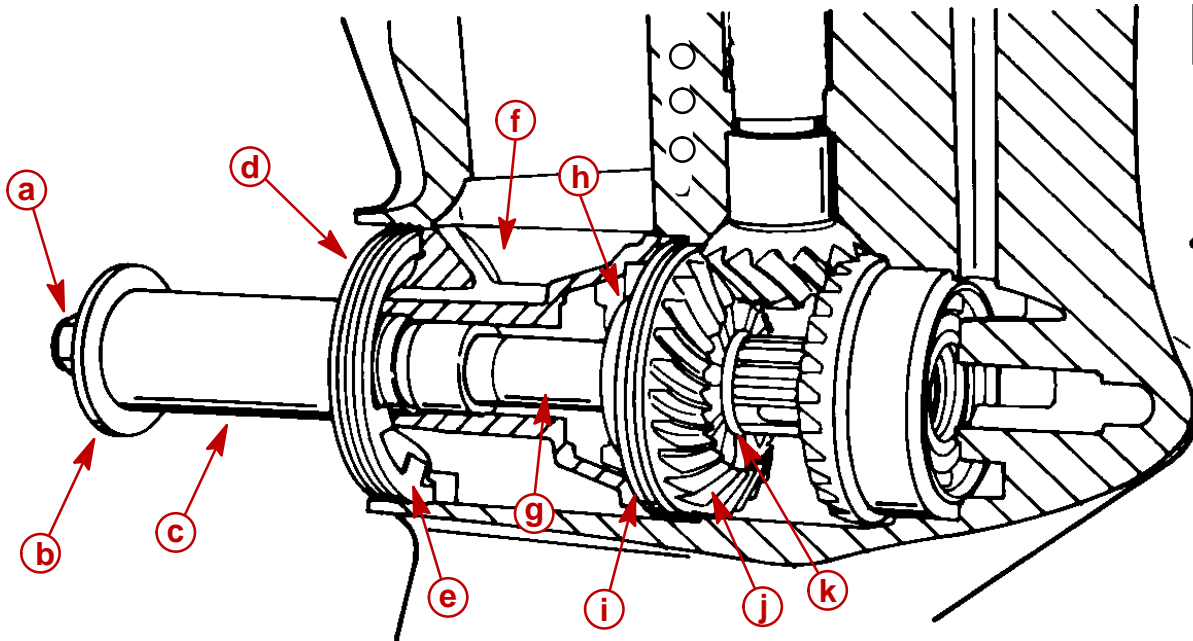
23355

a - Bearing Carrier Retainer Wrench (91-61069)



NOTE: Drill a 3/8" (22.2mm) diameter hole through the side (PROPELLER NUT END) of a 5" x 2" (127mm x 50.8mm) long piece of PVC pipe. A screwdriver may be inserted thru pipe into propeller shaft splines to prevent PVC pipe from turning while tightening retaining nut.

10. Install a 5" x 2" (127mm x 50.8mm) long piece of PVC pipe (obtain locally) over propeller shaft and secure it against the bearing carrier with a flat washer and nut.



51882

- a - Prop Nut
- b - Flat Washer
- c - PVC Pipe [5" x 2" (127mm x 50.8mm)]
- d - Retainer
- e - Tab Washer
- f - Bearing Carrier
- g - Prop Shaft
- h - Bearing Adaptor
- i - Shim
- j - Forward Gear
- k - Load Washer

11. Tighten nut to 45 lb. in. (5 Nm). This will seat the forward gear against the forward thrust bearing and tends to hold the propeller shaft from moving when measuring backlash.

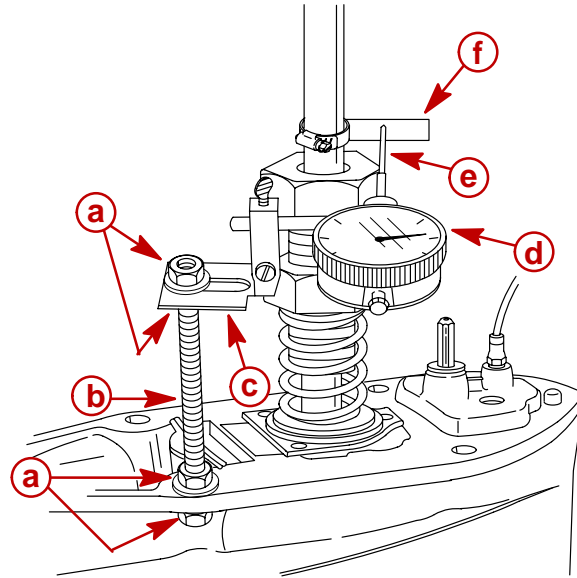


Forward Gear Backlash

CHECKING

NOTE: If the bearing preload tool has not already been set up, see “Drive Shaft - Bearing Preload Tool”, ‘Installation’ section first.

1. Install a dial indicator as shown in the following figure.



57939

- a** - Nuts (4) (Obtain Locally)
- b** - Threaded Rod [3/8 in. (9.5mm) obtain locally]
- c** - Dial Indicator Holding Tool (91-83155)
- d** - Dial Indicator (91-58222A1)
- e** - Indicator Pointer
- f** - Backlash Indicator Rod (91-53459) (for 1.75:1)
Backlash Indicator Rod (91-78473) (for 1.87:1 ratio)

2. Align the dial indicator pointer so that it is perpendicular to and touching the “I” mark on the dial indicator tool. Tighten the indicator tool onto the drive shaft and rotate the drive shaft so that the needle in the dial makes at least one full revolution and comes to “0” on the dial indicator scale.
3. Take the backlash readings by lightly turning the drive shaft back and forth.
 - a. Observe the dial indicator and record the reading.
 - b. Loosen the indicator tool and rotate the drive shaft 90 degrees in a clockwise direction.
 - c. Repeat step 4 above and take and record another reading. Repeat step 4 until a total of 4 backlash readings have been taken.
4. Add the four readings together and divide the sum by 4. This is your average backlash, which should be 0.017 in. - 0.028 in. (0.431mm - 0.711mm) (for 1.75:1 and 1.87:1 ratios).
5. If backlash is MORE than the specified MAXIMUM, REMOVE shim(s) from in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 to threads of nut.
6. If backlash is LESS than the specified MINIMUM, add shim(s) in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 to threads of nut.



NOTE: By adding or subtracting 0.001 in. (0.03mm) shim, the backlash will change approximately 0.001 in. (0.03mm).

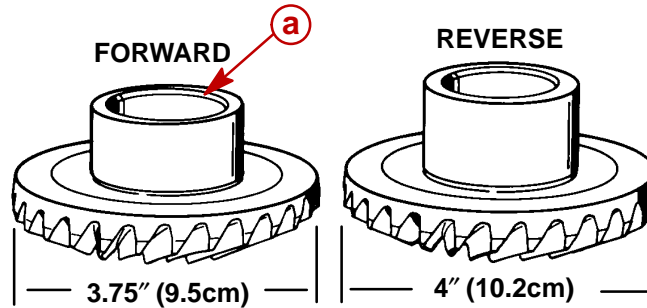
7. Remove the propeller nut, washer, and the pinion nut adaptor.
 - a. **If the Backlash is to Specification**, skip the next step (7b), and go on to step 8 following.
 - b. **If the Backlash is not to Specification**, complete the following instructions to install a different size spacer shim under the forward gear thrust race.
 - (1.) Remove the bearing carrier retainer, tab washer, and the bearing carrier.
 - (2.) Using the hook tool, remove the forward gear bearing adaptor.
 - (3.) Insert the forward gear installation tool into the forward gear and remove the forward gear, thrust bearing and thrust race.
 - (4.) Remove the spacer shim.
 - (5.) Complete the instruction found in section “Forward Gear/Bearing Carrier Assembly”, ‘Installation - (For Checking Forward Gear Backlash)’ section.
 - (6.) Recheck backlash as outlined in the “Forward Gear Backlash”, ‘Checking’ section.
8. Remove the following items as outlined below:
 - a. Remove the bearing carrier retainer, tab washer, and the bearing carrier.
 - b. Using the hook tool remove the forward gear bearing adaptor.
 - c. Insert the forward gear installation tool into the forward gear and remove the forward gear, thrust bearing and thrust race.
 - d. Remove the propeller shaft.
 - e. Remove the spacer shim.
 - f. “Drive Shaft - Bearing Preload Tool”, ‘Removal’ section.
 - g. “Drive Shaft Assembly”, ‘Removal’ section.
 - h. Remove the reverse gear.



Propeller Shaft Assembly

Component Reassembly

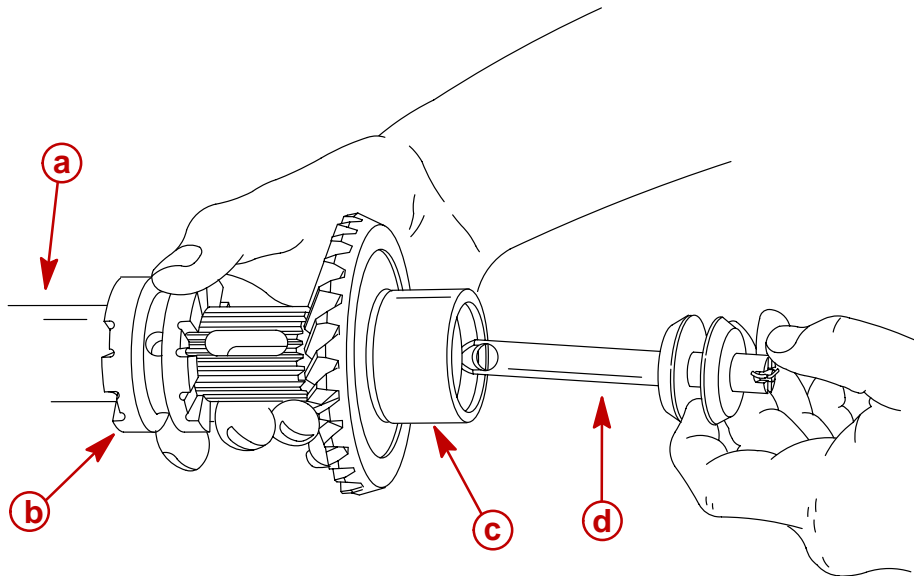
IMPORTANT: The appearance of the forward and reverse gear is almost identical. The forward gear has a shorter hub and is slightly smaller in diameter.



50885

a - Shorter Hub

1. Assemble the sliding clutch on the propeller shaft, being sure to align cross pin holes in the clutch with the slot in the propeller shaft. Make sure that the sliding clutch is placed on the propeller shaft with the grooved end of the clutch facing the propeller end of the shaft.
2. Assemble the reverse gear onto the propeller shaft.
3. Assemble the shift spool assembly to the propeller shaft being sure to align the cross pin hole of the shift spool shaft with the clutch slot.

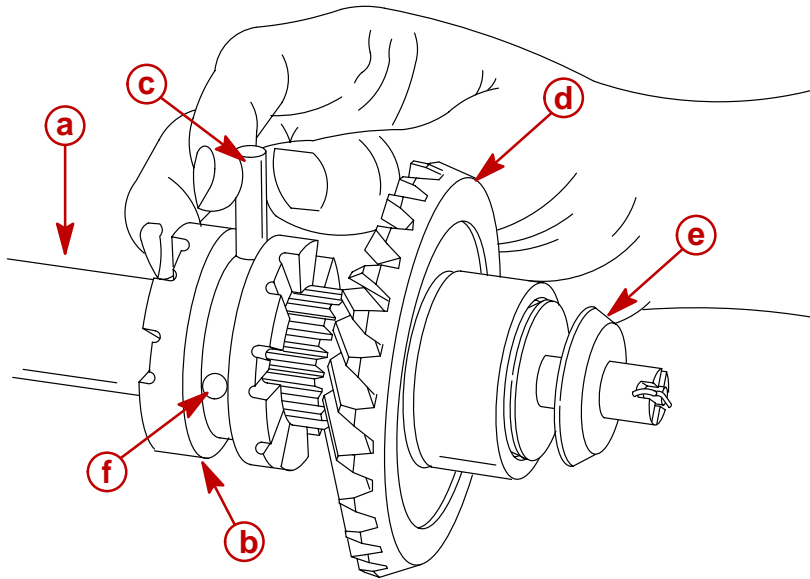


58018

- a** - Propeller Shaft
b - Sliding Clutch
c - Reverse Gear
d - Shift Spool Assembly



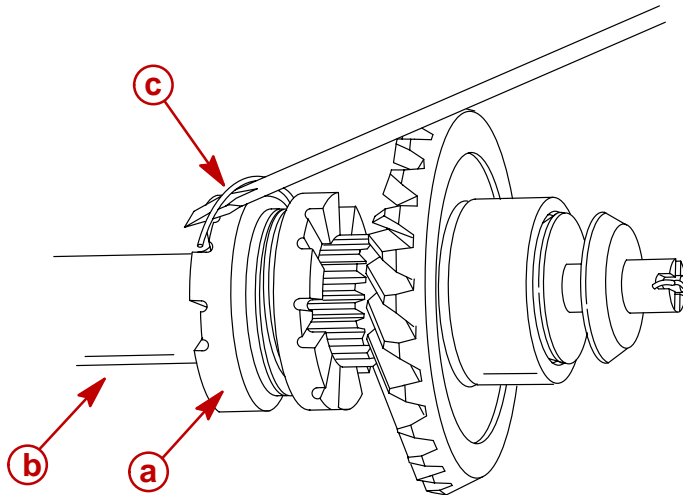
4. Assemble the cross pin through the sliding clutch, through the propeller shaft and through the shift spool shaft hole.
5. Install detent pin in third hole in clutch.



58012

- a - Propeller Shaft
- b - Sliding Clutch
- c - Cross Pin
- d - Reverse Gear
- e - Shift Spool Assembly
- f - Detent Pin

6. Assemble the cross pin retaining spring over the propeller shaft and wind it around the clutch over the cross pin hole. Be careful not to distort the spring while assembling it. **Make sure that the spring is wound on so that it does not cross over on itself and that it lies flat against the clutch once it is assembled. If it does not lie flat against the clutch a new spring must be installed.**



58015

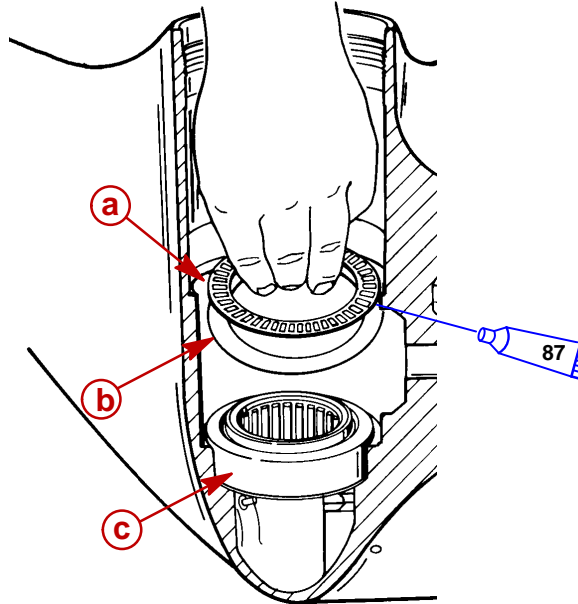
- a - Sliding Clutch
- b - Propeller Shaft
- c - Cross Pin Retaining Spring

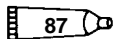


Propeller Shaft Assembly

Installation

1. Lubricate the large thrust bearing with Quicksilver Gear Lubricant (92-13783A24) and position first the thrust race then the bearing into the gear housing onto the reverse gear bearing adaptor.

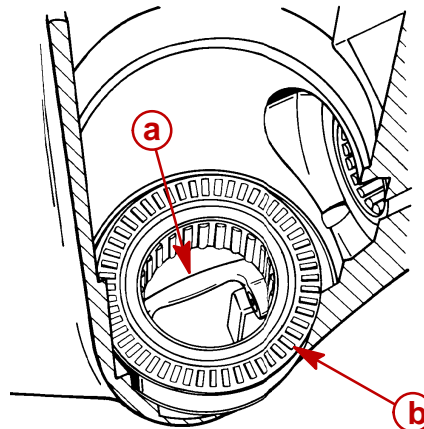


 Quicksilver Gear Lubricant (92-19007A24)

50882

- a** - Thrust Bearing
- b** - Thrust Race
- c** - Reverse Gear Bearing Adaptor

2. Rotate the shift crank toward the aft end of the gear housing until it touches against the bearing adaptor and hold it in this position.



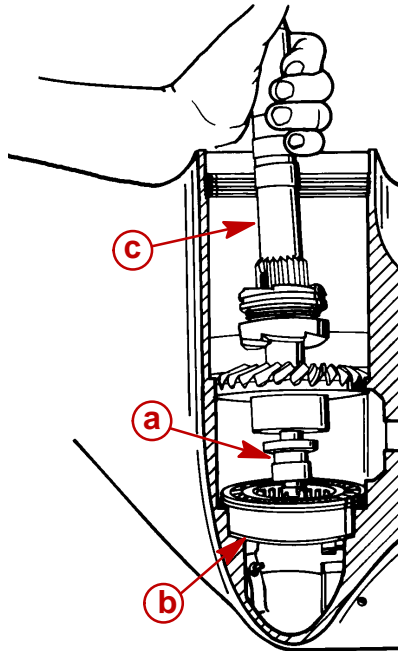
50885

- a** - Shift Crank
- b** - Bearing Adaptor

IMPORTANT: Be careful when inserting the propeller shaft assembly into the gear housing as the needle bearings in the reverse gear bearing adaptor can become dislodged. If it is suspected that a needle has become dislodged, remove the propeller shaft assembly and inspect the needle bearing cages for damage. If the cages have not been damaged and a needle bearing is mispositioned, it can be snapped back into place.



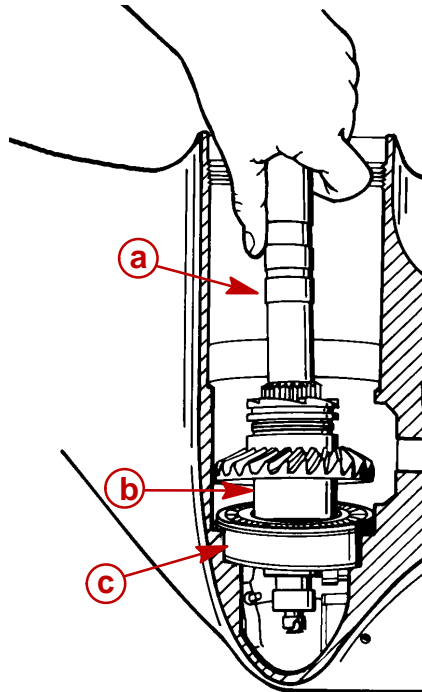
3. To allow for the engagement of the shift spool with the shift crank, tilt the propeller end of the propeller shaft assembly to the left (port) side of gear housing and begin to lower it into the gear housing.



50888

- a** - Shift Actuating Spool
- b** - Shift Crank
- c** - Propeller Shaft Assembly

4. With the propeller shaft assembly tilted to the port side of the gear housing, continue to lower the assembly until the reverse gear hub comes into contact with the reverse gear bearing adaptor and the propeller shaft is fully inserted into the reverse gear.

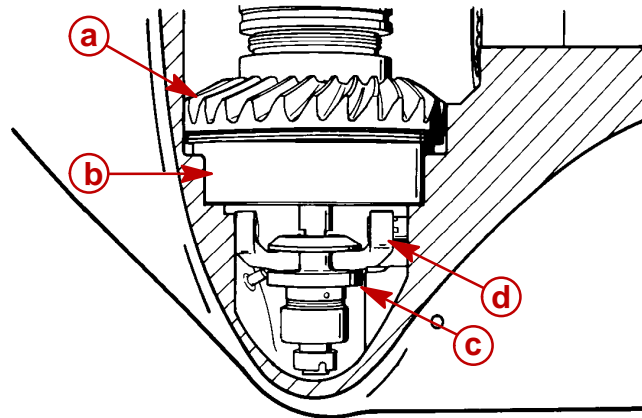


50888

- a** - Propeller Shaft
- b** - Reverse Gear Hub
- c** - Bearing Adaptor



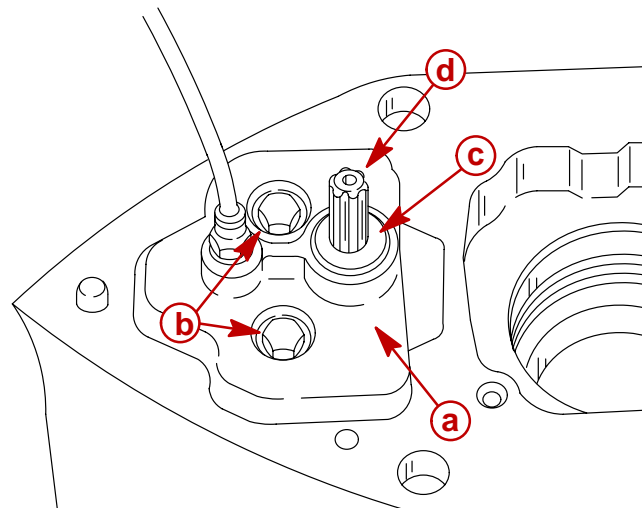
5. Slowly move the propeller shaft to the center of the housing and lower the reverse gear into the bearing adaptor. The shift spool should engage with the shift crank as the propeller shaft centers itself.



50885

- a** - Reverse Gear
- b** - Bearing Adaptor
- c** - Shift Spool
- d** - Shift Crank

6. Operate the shift shaft to ensure that it has been properly installed. The sliding clutch should move forward when the shift shaft is turned clockwise, and should move aft when the shift shaft is turned counterclockwise.
7. Make sure that the O-rings are present and positioned correctly. Install the screws that secure the shift shaft bushing and torque them to 60 lb. in. (7 Nm).
8. Slide the rubber sleeve at top end of shift shaft down so that it just touches the oil seal in the bushing.



57933

- a** - Screws [Torque to 60 lb. in. (7 Nm)]
- b** - Shift Shaft Bushing
- c** - Rubber Sleeve
- d** - Shift Shaft

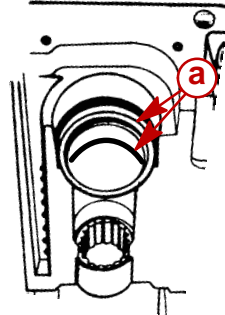


Drive Shaft and Pinion Gear

Final Installation

NOTE: Verify upper and lower driveshaft bearing shims are installed

1. Place the shim(s) into the drive shaft housing bore at the location shown.



a - Shims

70620

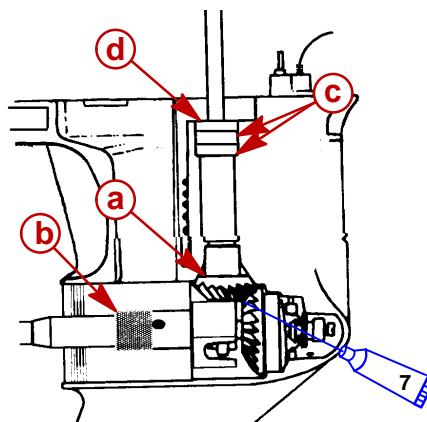
2. Install lower tapered bearing cup.


NOTE: For ease of installation, glue the washer to the pinion gear, using 3M Adhesive (92-25234), or Quicksilver Bellows Adhesive (92-86166), or equivalent.

3. Apply Loctite Type 271 (92-809820) to the threads of the **NEW** pinion gear **NUT** and assemble the pinion gear nut into the MR slot of the pinion nut adaptor.

NOTE: Install the pinion gear nut with the flat side of the nut away from the pinion gear.

4. Place the pinion gear (with the washer glued to it) into the gear housing.
5. Insert the drive shaft into the gear housing drive shaft bore. It may be necessary to rotate the drive shaft to engage the drive shaft splines into the pinion gear splines.
6. Install upper tapered bearing cup and the retainer
7. Insert the pinion nut adaptor (with the nut assembled to it) into the gear housing. It may be necessary to raise the drive shaft slightly to clear the tool.
8. Start the pinion nut onto the drive shaft threads by rotating the drive shaft until the nut is snug.

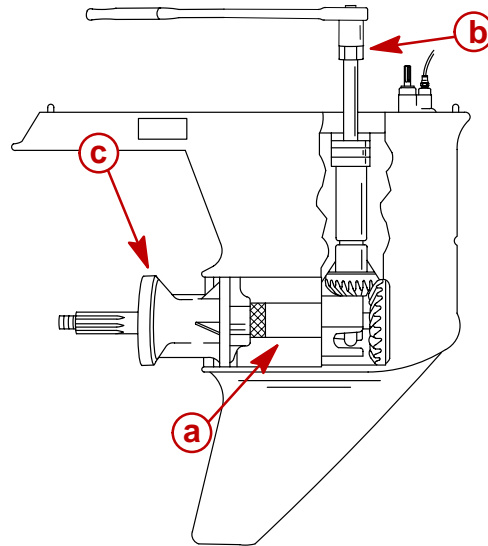


 Loctite 271 (92-809820)

- a** - Pinion Gear (with the washer glued to it)
- b** - Pinion Nut Adaptor (91-61067A3)
- c** - Tapered Roller Bearing Cups
- d** - Retainer



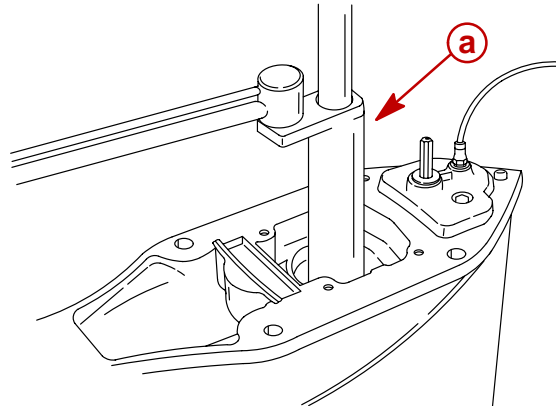
9. Install the bearing carrier into the gear housing backwards to hold the propeller shaft and the pinion nut adaptor in position.
10. Torque the pinion nut by turning the drive shaft using the drive shaft nut wrench and torque wrench with the appropriate socket to 70 lb. ft. (95 Nm).



57950

- a** - Pinion Nut Adaptor (91-61067A2)
- b** - Drive Shaft Nut Wrench (91-56775)
- c** - Bearing Carrier (installed backwards)

11. Remove the bearing carrier, pinion nut adaptor and drive shaft nut wrench.
12. Torque the retainer to 100 lb. ft. (135 Nm).



57935

- a** - Drive Shaft Bearing Retainer Wrench (91-43506)

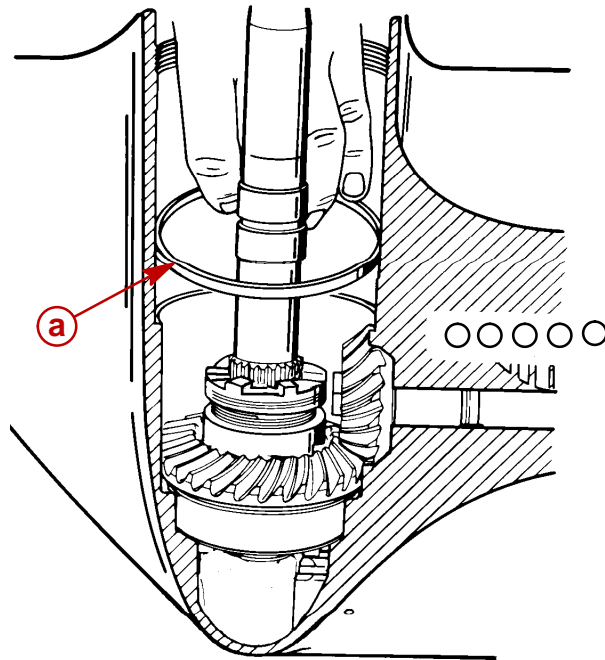
13. Remove the retainer wrench.



Bearing Carrier Assembly

Final Installation

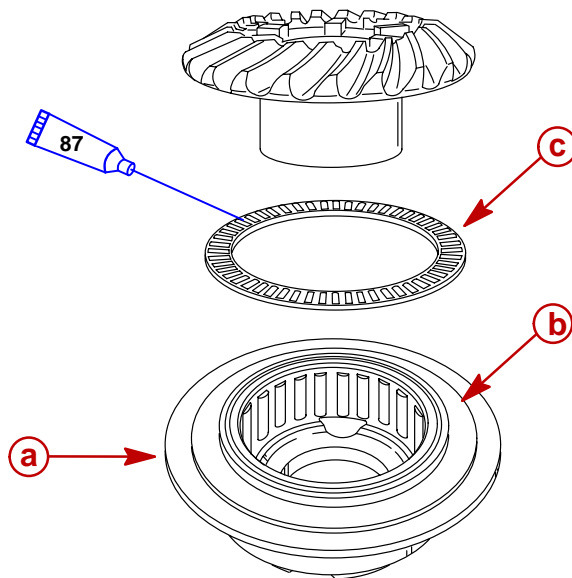
1. Install appropriate spacer shim into the gear housing.

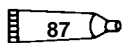


50782

a - Shim

2. Apply Quicksilver Gear Lubricant to thrust bearing and install thrust bearing and thrust race onto forward gear bearing adaptor.



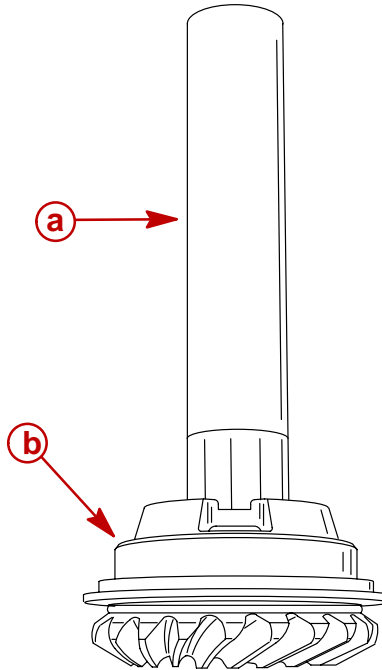
 87 Quicksilver Gear Lubricant (92-19007A24)

55220

a - Bearing Adaptor
b - Thrust Washer
c - Thrust Bearing



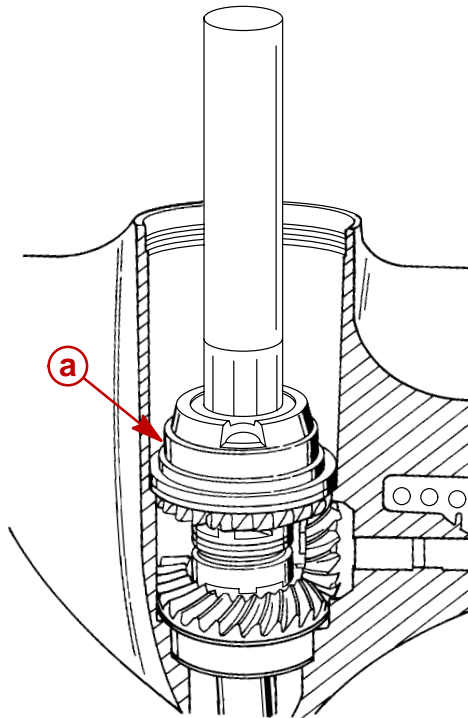
3. Insert Forward Gear Installation Tool (91-815850) into forward gear/bearing adaptor assembly.



55221

- a** - Forward Gear Installation Tool (91-815850)
- b** - Forward Gear/Bearing Adaptor Assembly

4. Install tool with adaptor assembly over propeller shaft and into gear housing. Applying downward pressure to bearing adaptor, remove installation tool from assembly.

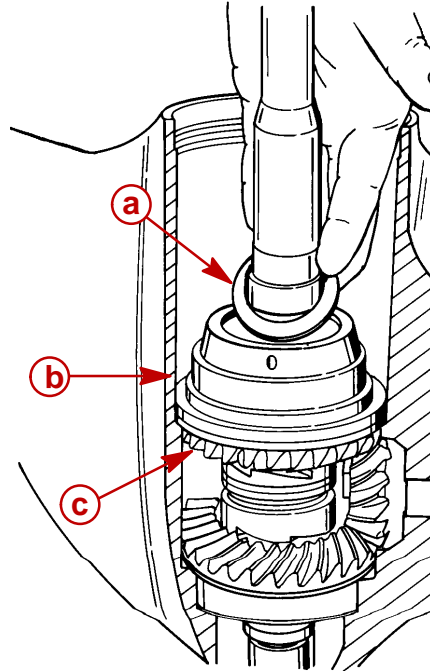


55202

- a** - Forward Gear Bearing Adaptor



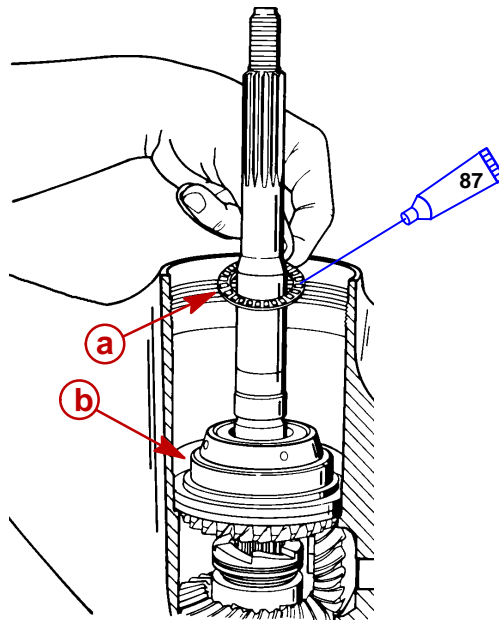
5. Ensure that the top of the bearing adaptor is clean and install the small thrust race on top of the bearing adaptor.

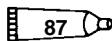


50880

- a** - Thrust Race
- b** - Forward Gear Bearing Adaptor
- c** - Forward Gear

6. Lubricate the small thrust bearing with Quicksilver Gear Lubricant (92-13783A24) and install it on top of the thrust race.



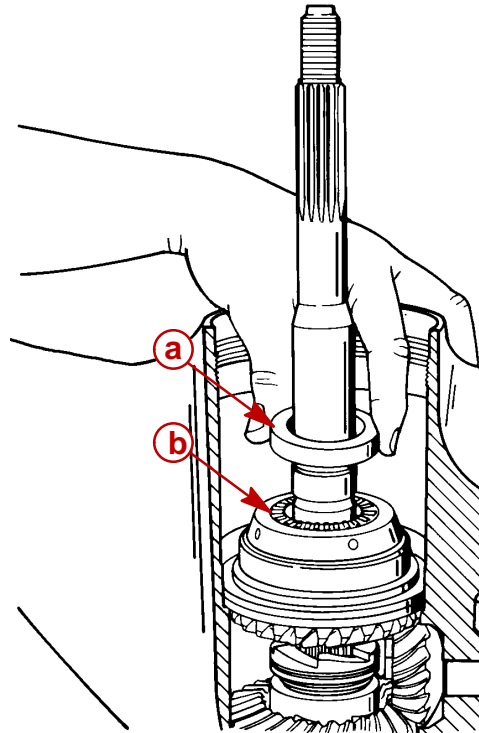
 Quicksilver Gear Lubricant (92-19007A24)

50783

- a** - Small Thrust Bearing
- b** - Forward Gear Bearing Adaptor



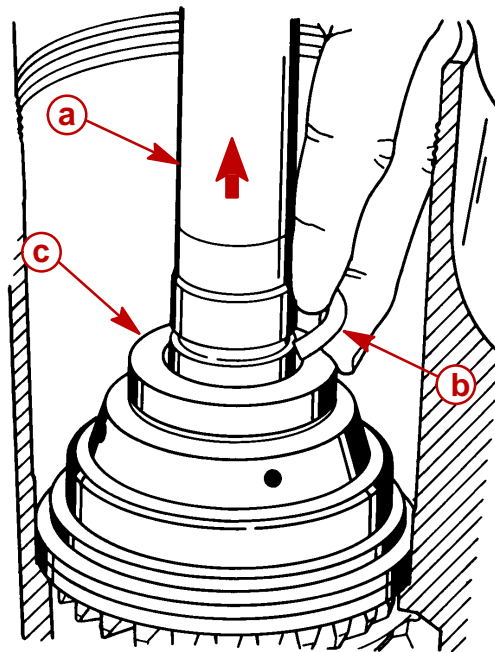
7. Assemble the thrust collar with its STEPPED SIDE DOWN toward the small thrust bearing.



50784

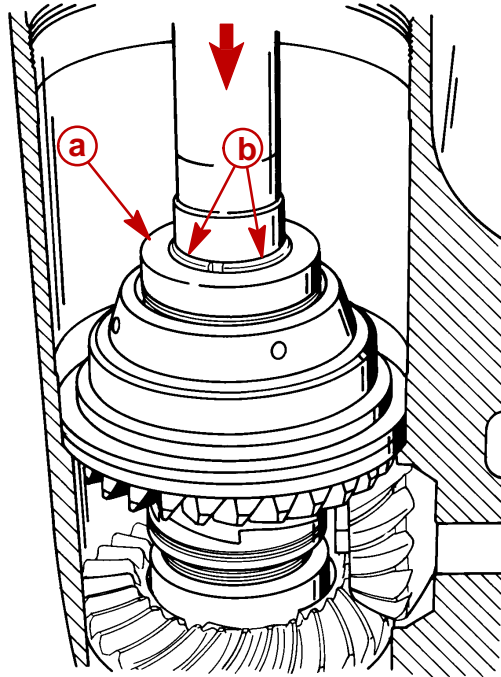
- a** - Thrust Collar
- b** - Small Thrust Bearing

8. Pull up slightly on the propeller shaft to gain access to the groove on the shaft for the keepers. Assemble the two keepers into the groove and lower the propeller shaft.



50826

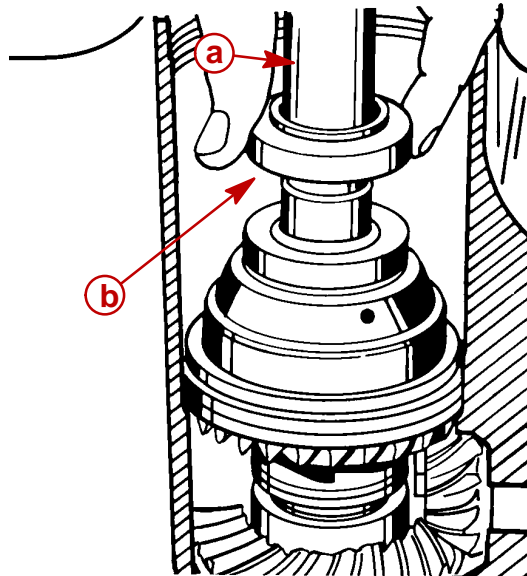
- a** - Propeller Shaft (slightly lifted)
- b** - Keepers (2)
- c** - Thrust Collar



50778

- a** - Thrust Collar
- b** - Keepers

9. Install the second thrust collar with its STEPPED SIDE UP.

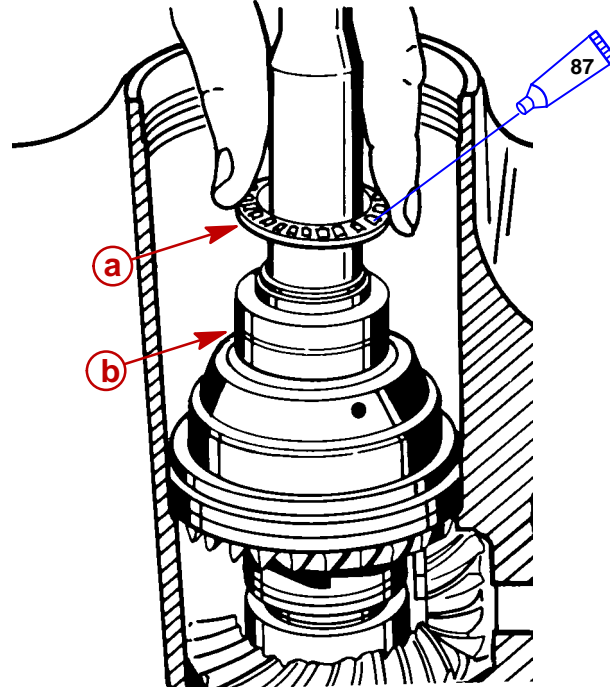


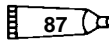
50787

- a** - Propeller Shaft
- b** - Thrust Collar



10. Lubricate the second thrust bearing with Quicksilver Gear Lubricant (92-13783A24) and install it to the top of the thrust collar.

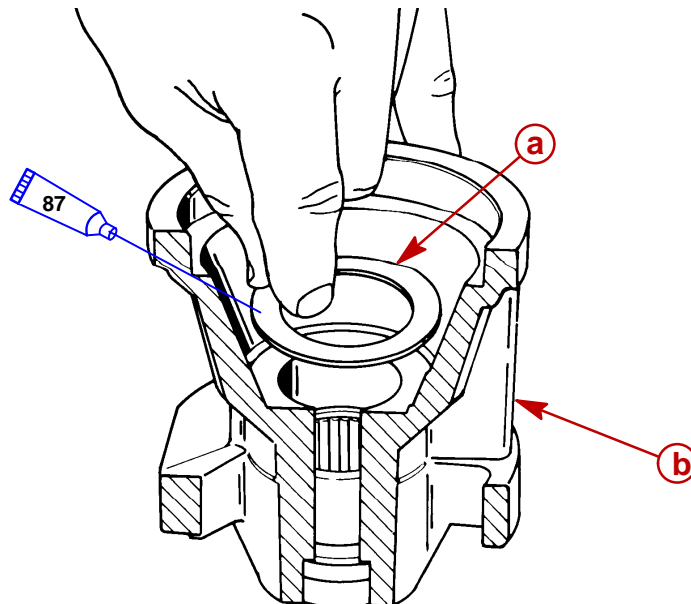


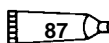
 Quicksilver Gear Lubricant (92-19007A24)

50786

- a** - Thrust Bearing
- b** - Thrust Collar

11. Lubricate the second small thrust bearing race with Quicksilver Gear Lubricant (92-13783A24). Assemble it to the surface inside of the bearing carrier as shown.



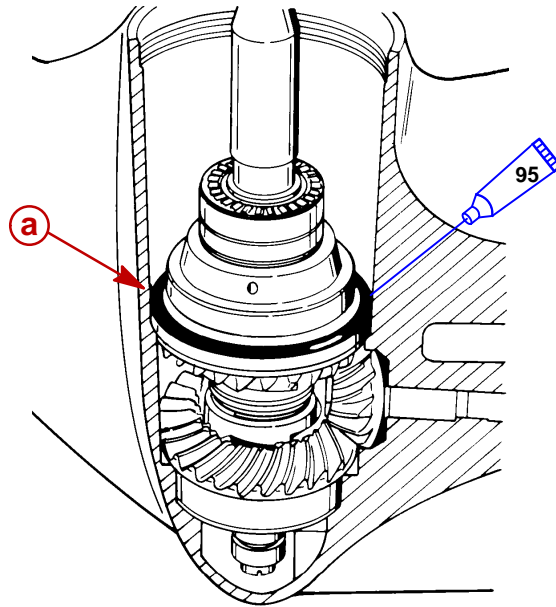
 Quicksilver Gear Lubricant (92-19007A24)

50779

- a** - Thrust Race
- b** - Bearing Carrier



12. Lubricate the large O-ring with 2-4-C w/Teflon (92-825407A12) and assemble into the gear housing as shown following.



 2-4-C With Teflon (92-825407A12)

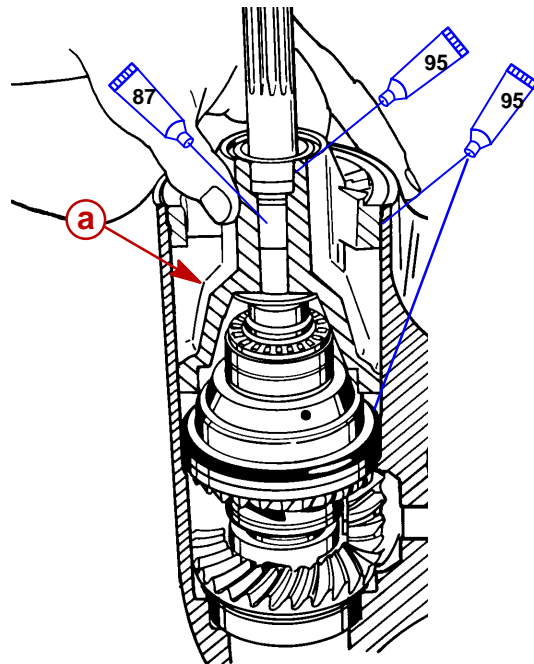
50886

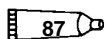
a - O-ring

13. Prepare the bearing carrier for installation as follows:

- Lubricate the outer diameter of the bearing carrier with 2-4-C w/Teflon (92-825407A12).
- Fill the space between the carrier oil seals with 2-4-C w/Teflon.
- Lubricate the needle bearing with Quicksilver Gear Lubricant (92-13783A24).

14. Install the bearing carrier assembly into the gear housing.



 Quicksilver Gear Lubricant (92-19007A24)

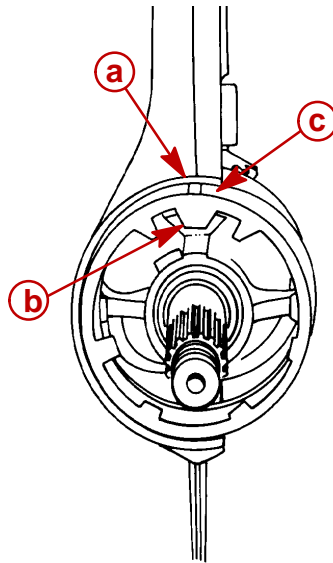
 2-4-C With Teflon (92-825407A12)

50826

a - Bearing Carrier Assembly



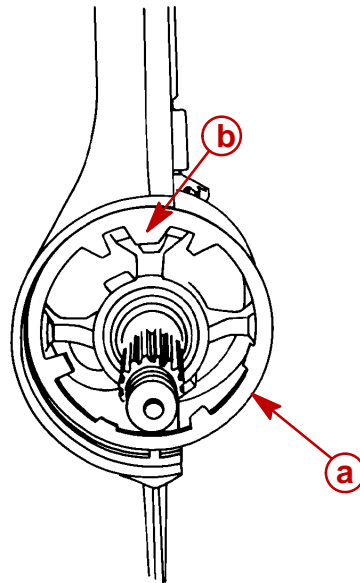
15. Align the bearing carrier “V” shaped notch with the alignment hole in the gear housing and then install the tab washer with the external tab inserted into the hole in the gear housing.



70713

- a** - Gear Case Alignment Hole
- b** - “V” Shaped Notch in Bearing Carrier
- c** - Alignment Tab of Tab Washer

16. Insure that the “V” shaped tab aligns with the “V” notch in bearing carrier.

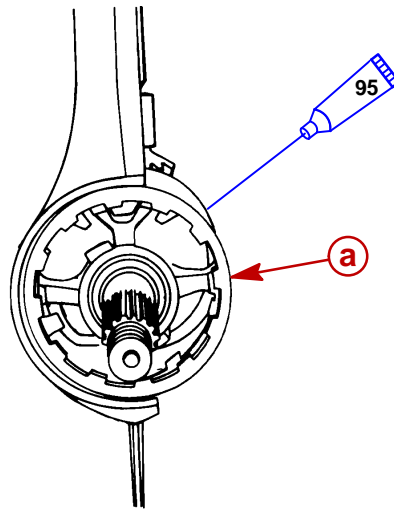


70714

- a** - Tab Washer
- b** - “V” Tab



17. Fill the bearing carrier retainer nut threads and corresponding gear housing threads (360°) with 2-4-C w/Teflon (92-825407A12). Start the retainer into the gear housing threads and screw it down fully by hand.



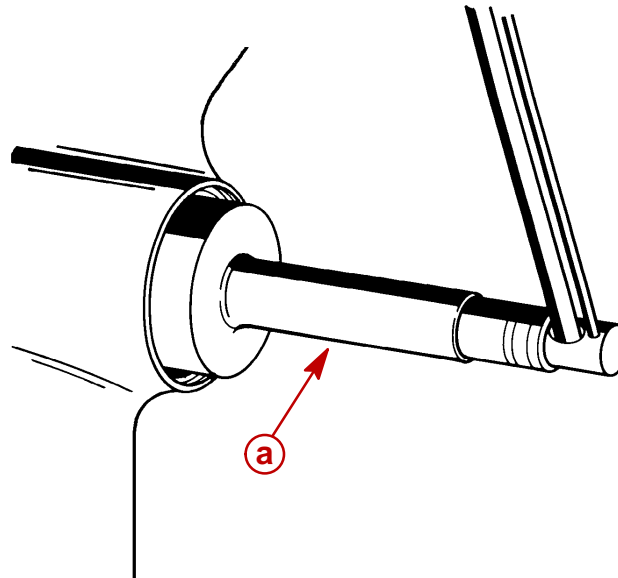
 2-4-C With Teflon (92-825407A12)

70715

a - Bearing Carrier Retainer

IMPORTANT: Before torquing bearing carrier retainer, gear case must be bolted to drive shaft housing or securely fastened in a gear case holding fixture to avoid possible damage to gear housing.

18. Torque the bearing carrier retainer to 210 lb. ft. (284.7 N·m). If one tab does not align up in space between two of the notches, continue to tighten retainer until alignment is achieved. DO NOT loosen retainer to achieve alignment.

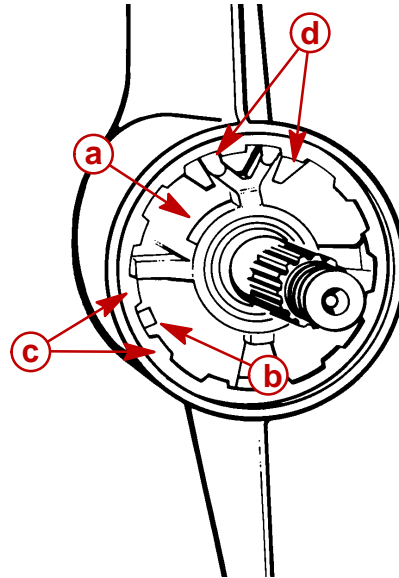


23355

a - Bearing Carrier Retainer Wrench (91-61069)



19. Bend one tab aft (outward) into a space between two of the notches of the retainer. Bend all the remaining tabs forward (inward).



70490

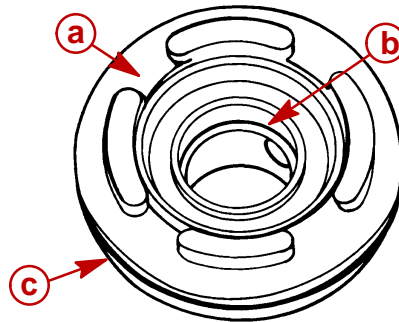
- a** - Bearing Carrier
- b** - Tab
- c** - Retainer Notches
- d** - Alignment Tabs (Bend Inward)

Oil Seal Carrier Assembly

Installation

NOTE: Apply hand pressure only to install the oil seal carrier into position. Do not hammer it into position.

1. Lubricate the oil seal carrier, oil seal lips, space between seals and O-ring with 2-4-C w/Teflon and install the oil seal carrier over the drive shaft and into the gear case.



70501

- a** - Oil Seal Carrier
- b** - Oil Seal Lips
- c** - O-ring

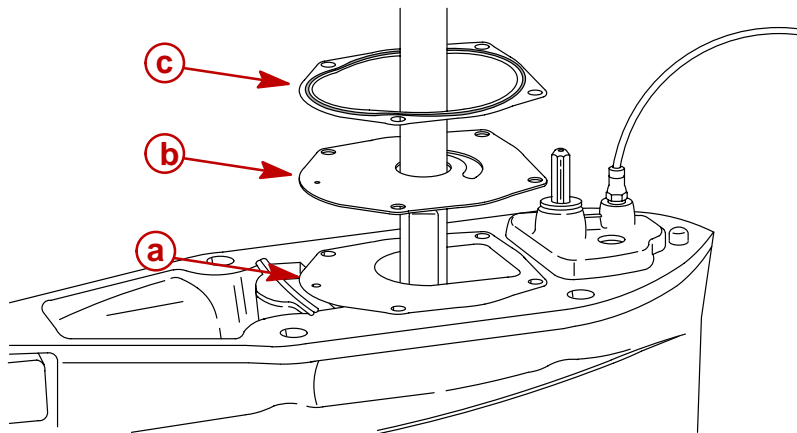


Water Pump Assembly

Installation

NOTE: The gaskets/face plate hole pattern is not symmetrical. If the holes of the gaskets/face plate do not align with the screw holes of the gear case and/or each other, one or more of the parts is upside down. Determine which part(s) is (are) upside down and turn the appropriate part(s) over.

1. Install the small hole gasket then the face plate followed by the large hole gasket onto the gear case.



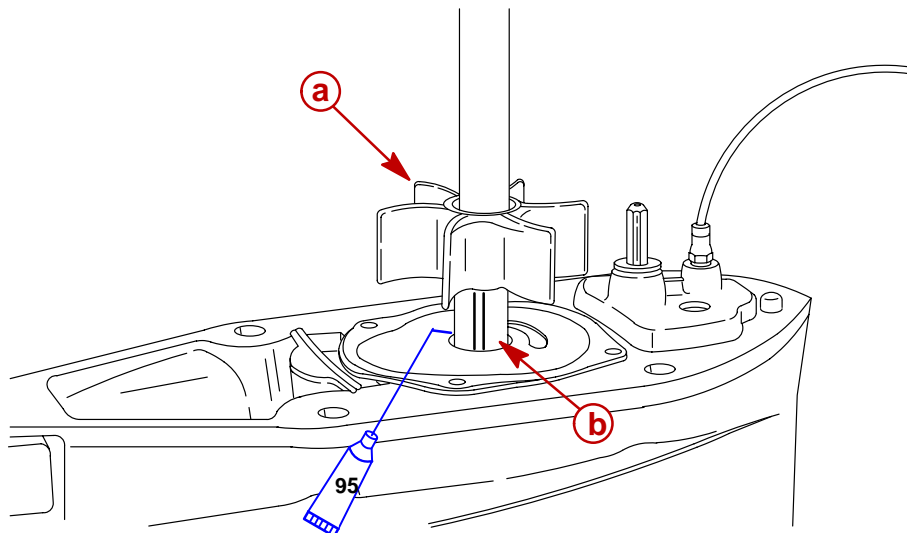
58011

- a** - Small Hole gasket
- b** - Face Plate
- c** - Large Hole Gasket (GRAY sealing ring faces up)

2. Place a small amount of 2-4-C w/Teflon on the flat surface of the impeller key and install the key onto the drive shaft keyway.

IMPORTANT: When using an impeller whose blades have taken a set, face the curl of the blades in a counterclockwise direction. Do not install the impeller with its blades oriented in a reversed direction from original rotation, or premature impeller failure will occur.

3. Assemble the water pump impeller onto the drive shaft and down over the key.



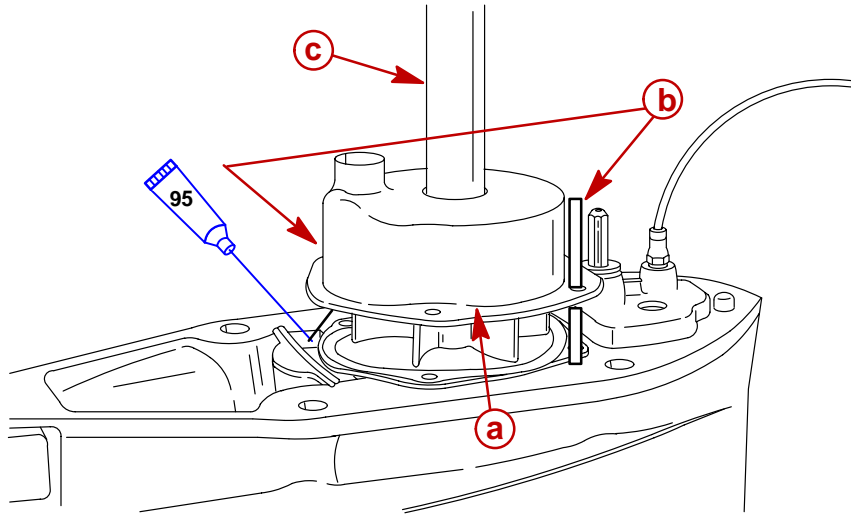
 95 2-4-C With Teflon (92-825407A12)

57938

- a** - Water Pump Impeller
- b** - Water Pump Impeller Key



4. Install the 2 water pump locating pins through the gaskets and face plate.
5. Apply a light coat of 2-4-C w/Teflon to the inside of the pump cover. Position the water pump body over the drive shaft and water pump locating pins. Rotate the drive shaft in a clockwise direction, while pushing down on the water pump body to ease the water pump over the impeller blades.



 95 2-4-C With Teflon (92-825407A12)

57942

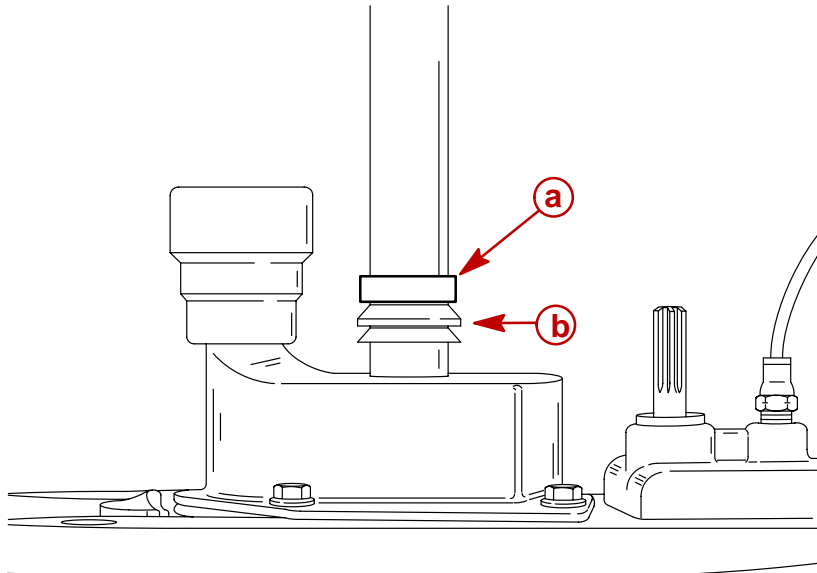
- a** - Water Pump Body
- b** - Water Pump Alignment Pins (91-821571A1)
- c** - Drive Shaft (turn clockwise while installing water pump body)

6. Hand start two (2) fasteners into the water pump assembly and remove the water pump locating pins. Install the remaining 2 fasteners. Run all fasteners down and torque to 60 lb. in. (7 Nm).
7. Lightly lubricate the O-rings in the water tube coupling with 2-4-C w/Teflon (92-825407A12).
8. Install the water tube coupling assembly to the water pump ensuring that the O-rings are not damaged during assembly.

IMPORTANT: If seal installed above pump housing is not at the proper height, air will be drawn into the pump resulting in overheating of the engine.



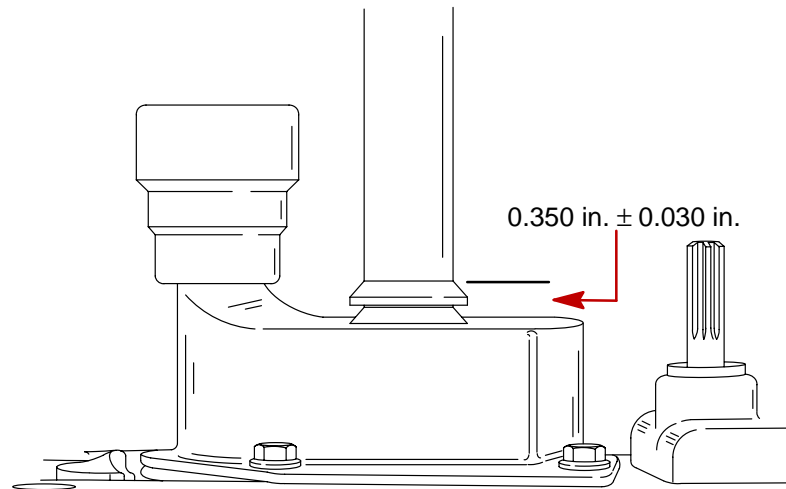
9. Using tool (a) provided in seal kit (26-816575A2) or water pump kit (817275A3), press seal (b) down over drive shaft (DO NOT GREASE DRIVE SHAFT) until tool seats against pump housing.



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- a** - Tool
b - Seal

If tool is not available, lightly press seal against housing until a height of 0.350 in. \pm 0.030 in. (8.9mm \pm 0.76mm) is obtained.



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Gear Lubricant Filling Instructions

1. Inspect “Fill” and “Vent” sealing washers for cuts or abrasions. Replace washers if necessary.
2. Clean any metal debris from magnet on “Fill” plug.

IMPORTANT: Never apply lubricant to gear housing without first removing Vent screw, or gear housing cannot be filled because of trapped air. Fill gear housing ONLY when housing is in a vertical position.

3. Slowly fill housing thru Fill hole with Quicksilver Super Duty Lower Unit Lubricant until lubricant flows out of “Vent” hole and no air bubbles are visible.
4. Install Vent screw into Vent hole.

IMPORTANT: DO NOT lose more than one fluid ounce (30cc) of gear lubricant while reinstalling Fill screw.

5. Remove grease tube (or hose) from Fill hole and quickly install Fill screw into Fill hole.

Installing Gear Housing to Driveshaft Housing

⚠ WARNING

Disconnect high tension leads from spark plugs and remove spark plugs from engine before installing gear housing onto driveshaft housing.

1. Tilt engine to full up position and engage the tilt lock lever.
2. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant onto driveshaft splines.

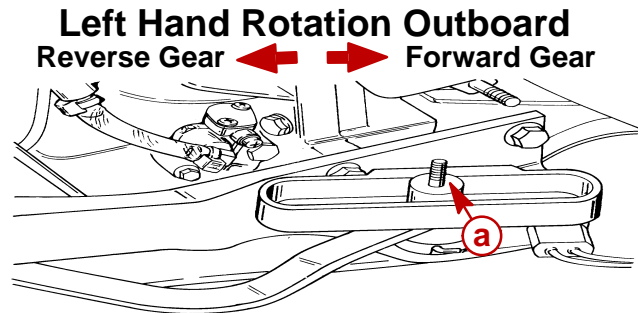
⚠ CAUTION

DO NOT allow lubricant on top of driveshaft. Excess lubricant, that is trapped in clearance space, will not allow driveshaft to fully engage with crankshaft. Subsequently, tightening the gear housing nuts (while excess lubricant is on top of driveshaft) will load the driveshaft/crankshaft and damage either or both the powerhead and gear housing. Top of driveshaft is to be wiped free of lubricant.

3. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant onto shift shaft splines. (DO NOT allow lubricant on top of shift shaft.)
4. Apply a thin bead of G.E. Silicone Sealer (92-91600-1) against the top of divider block.
5. Insert trim tab bolt into hole in rear of gear housing to driveshaft housing machined surface.



- Shift gear housing into NEUTRAL and place guide block anchor pin into NEUTRAL position



a - Guide Block Anchor Pin

- Position gear housing so that the driveshaft is protruding into driveshaft housing.
NOTE: If, while performing Step 8, the driveshaft splines will not align with crankshaft splines, place a propeller onto propeller shaft. Shift gearcase into FORWARD and turn propeller counterclockwise as the gear housing is being pushed toward driveshaft housing.
- Move gear housing up toward driveshaft housing while aligning shift shaft splines and water tube with water tube guide (in water pump cover).
- Place flat washers onto studs (located on either side of driveshaft housing). Start a nut on these studs and tighten finger-tight.
- Start bolt at rear of gear housing inside trim tab recess. DO NOT tighten bolt at this time.
- Recheck shift shaft spline engagement and correct if necessary.
NOTE: Guide block anchor pin should be in FORWARD when gearcase is in FORWARD.
IMPORTANT: Do not force gear case up into place with attaching nuts.
- Evenly tighten 2 nuts which were started in Step 9. Torque to 55 lb. ft. (75 Nm).
- After 2 nuts (located on either side of driveshaft housing) are tightened, check shift operation as follows:
 - Place guide block anchor pin into forward gear position while turning prop shaft. Rotate flywheel clockwise (viewed from top); propeller shaft should rotate counterclockwise.
 - Place guide block anchor pin into NEUTRAL position. Propeller shaft should rotate freely clockwise/counterclockwise.
 - Place guide block anchor pin into REVERSE gear position. Rotate flywheel clockwise (viewed from top); propeller shaft should rotate clockwise.**IMPORTANT: If shifting operation is not as described, preceding, the gear housing must be removed and the cause corrected.**
- Install remaining washers and nuts onto drive shaft studs. Torque to 55 lb. ft. (75 Nm).
- Torque bolt (started in Step 10) to 45 lb. ft. (61 Nm).
- Position trim tab or anodic plate in gear housing. Align grooves of trim tab with ribs in trim tab pocket. Adjust to position in which it had previously been installed, and while holding trim tab, torque bolt to 40 lb. ft. (54 Nm)
- Install plastic cap into trim tab bolt opening at rear edge of driveshaft housing.

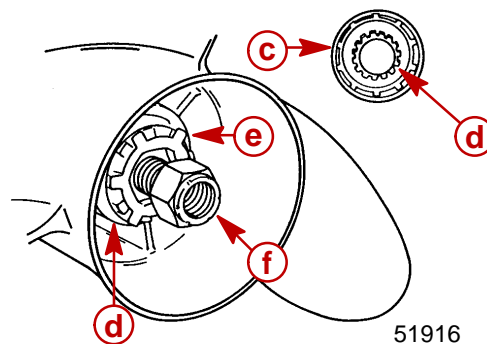
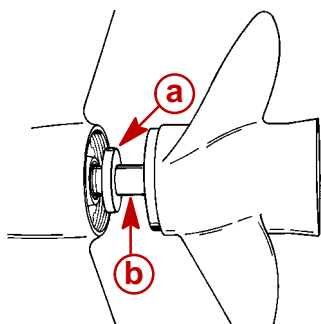


Propeller Installation

⚠ WARNING

When installing or removing propeller, because of the engine's ease in starting, **VERIFY** that the remote control is in **NEUTRAL** position and that the key switch is "OFF." Place a block of wood between the anti-cavitation plate and propeller to prevent accidental starting and to protect hands from propeller blades while removing or installing nut.

- To aid in future removal of the propeller, liberally coat the propeller shaft splines with one of the following Quicksilver products:
 - Anti-Corrosion Grease (92-78376A6)
 - Special Lubricant 101 (92-13872A1)
 - 2-4-C Marine Lubricant (92-90018A12)
 - Perfect Seal (92-34227--1)
- Place forward thrust hub over propeller shaft with shoulder side toward propeller.
- Place propeller on propeller shaft and slide it up against thrust hub.
- Place continuity washer (if equipped) onto shoulder of rear thrust hub.
- Place rear thrust hub, tab washer and propeller nut on propeller shaft.
- Thread propeller nut onto propeller shaft until nut is recessed into tab washer.
- After propeller nut is recessed into tab washer, tighten nut securely [minimum of 55 lb. ft. (74.5 Nm) torque].
- Bend 3 of the tabs of tab washer down in grooves of rear thrust hub to secure propeller nut. (If tab washer tabs do not align with slots, continue to tighten propeller nut to obtain alignment. **DO NOT** loosen nut to align tabs.)



- a** - Forward Thrust Hub
- b** - Propeller Shaft
- c** - Continuity Washer (If Equipped)
- d** - Rear Thrust Hub
- e** - Tab Washer
- f** - Propeller Nut

⚠ CAUTION

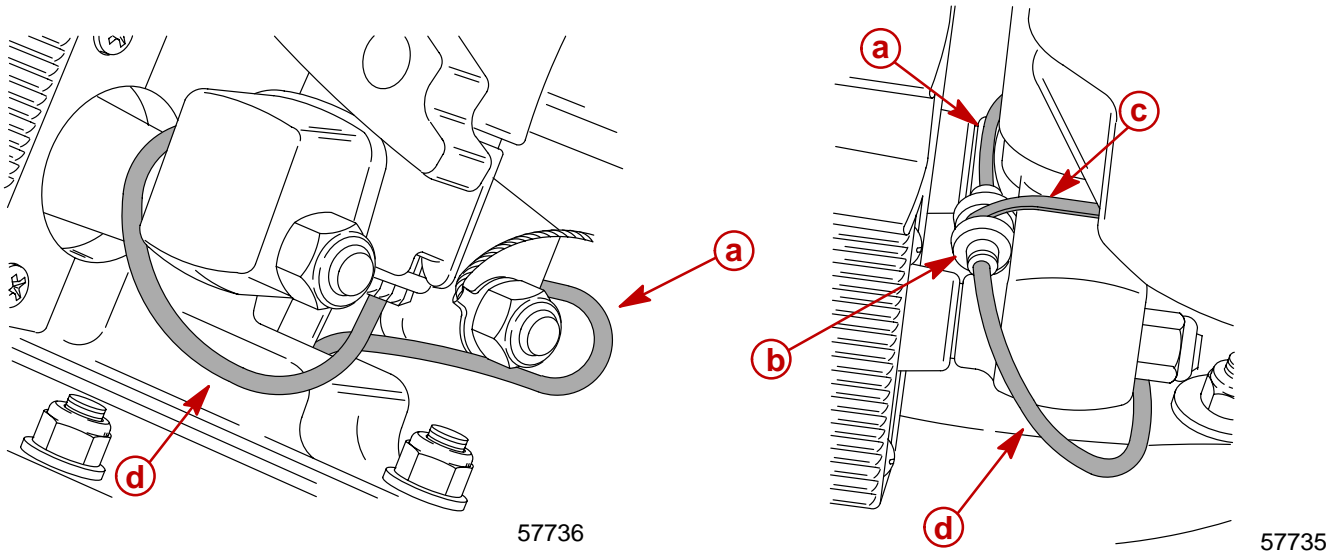
DO NOT misinterpret propeller shaft movement with propeller movement. If propeller and propeller shaft together move forward-and-aft, this is normal; however, propeller should not move forward-and-aft on propeller shaft.

- After first use, retighten propeller nut and again secure with tab washer (Steps 7 and 8, preceding). Propeller should be checked periodically for tightness, particularly if a stainless steel propeller is used.



Speedometer Tube Installation

1. Route speedometer tube from gearcase around lower yoke and push into junction. Junction should be secured to yoke with sta-strap.
2. Route speedometer tube from swivel tube around lower yoke and push into junction. After insertion of speedometer tubes into junction, pull on each tube to verify that they are locked into junction. If tube pulls out, reinsert into junction.



- a** - Speedometer Tube from Gearcase
- b** - Junction
- c** - Sta-strap
- d** - Speedometer Tube from Swivel Tube