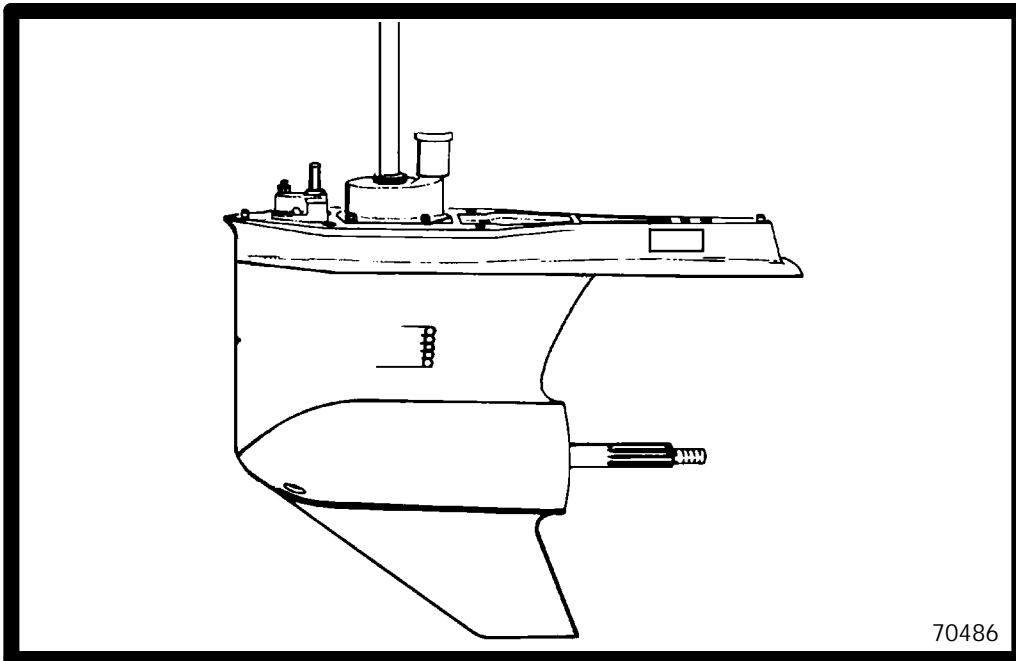




LOWER UNIT



6
A

**GEAR HOUSING
RIGHT HAND OPERATION
(STANDARD ROTATION)
(RATCHETING AND NON-RATCHETING)**



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General Service Recommendations

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

IMPORTANT: Read the following before attempting any repairs.

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 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 “Table of Contents” (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, be sure 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 overheating. 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 Quicksilver 2-4-C w/Teflon on all O-rings. To prevent wear, apply 2-4-C w/Teflon on I.D. of oil seals.

To prevent corrosion damage after reassembly, apply Quicksilver Perfect Seal or 2-4-C w/Teflon to external surfaces of bearing carrier and retainer nut threads prior to installation. DO NOT allow Perfect Seal to enter bearings or O-ring area.

NOTE: Before filling gear case, apply 10-15 psi (68.5 - 102.7kPa) of air pressure at the VENT hole. Pressure should not drop for 15 seconds while alternately applying a 2-3 pound force to the top of the shift shaft in the fore and aft direction.



Gear Housing Specifications (Standard Rotation)

Forward/Reverse Gear Backlash and Pinion Depth (Ratcheting and Non-Ratcheting)

Pinion Depth	
All Models	0.025 in. (0.64mm) with Tool 91-12349A2 Using Disc #2 and Flat #4
Forward Gear Backlash	
1.64:1 and 1.75:1 Gear Ratios 1.62:1 Gear Ratio Service Replacement	0.017 in. to 0.028 in. (0.431mm to 0.711mm) Pointer on line mark #1 with Backlash Indicator Rod 91-53549
Reverse Gear Backlash	
1.64:1 and 1.75:1 Gear Ratios 1.62:1 Gear Ratio Service Replacement	0.030 in. to 0.050 in. (0.76mm to 1.27mm)
Lubricant Capacity	28 fl. oz. (0.828 liter)
Forward Gear Backlash	
1.87:1 Gear Ratio (High Altitude)	0.017 in. to 0.028 in. (0.431mm to 0.711mm) Pointer on line mark #1 with Backlash Indicator Rod 91-78473
Reverse Gear Backlash	
1.87:1 Gear Ratio (High Altitude)	0.030 in. to 0.050 in. (0.76mm to 1.27mm)
Lubricant Capacity	28 fl. oz. (0.828 liter)

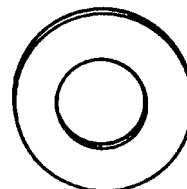
Gear Ratio	Teeth in Pinion Gear	Teeth in Forward and Reverse Gear
1.62:1	13	21
1.64:1	17	28
1.75:1	12	21
1.87:1	15	28

Water Pressure	
Idle	1-1/2 - 4-1/2 psi (10.3 - 30.8kPa)
Poppet Valve Opening	6 - 7 psi (41.1 - 47.9kPa)

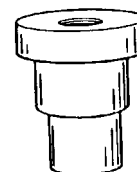
W.O.T.	8-10 psi 54.9 - 68.5kPa)
Test Propeller for Static Test	
12 Dia. x 15 Pitch	48-78116A40

Special Tools (Ratcheting and Non-Ratcheting)

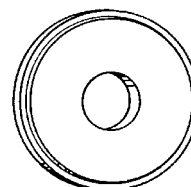
Bellville Washer 12-54048



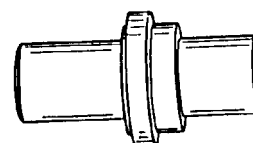
Needle Bearing Driver 91-15755



Bearing Driver Cup 91-31106



Oil Seal Driver 91-31108

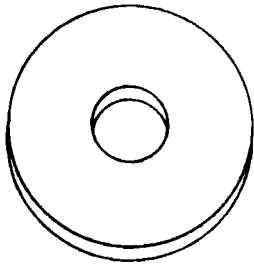


Needle Bearing Driver 91-33491

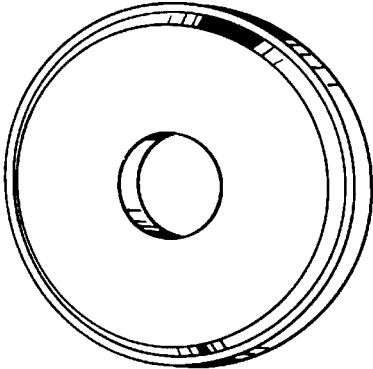




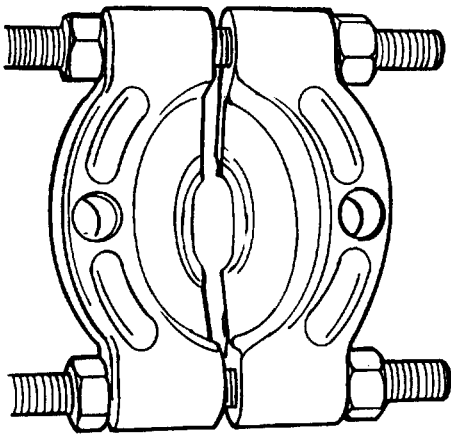
Pilot Washer 91-36571



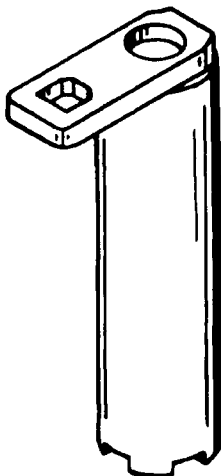
Driver Cup 91-36577



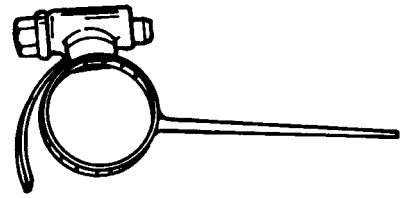
Universal Puller Plate 91-37241



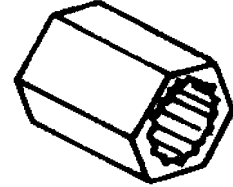
Bearing Retainer Tool 91-43506



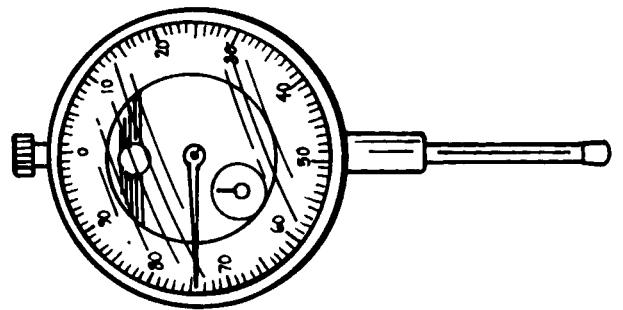
Backlash Indicator Rod 91-53459



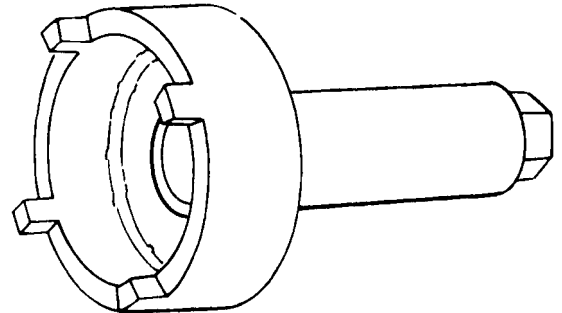
Drive Shaft Nut Wrench 91-56775



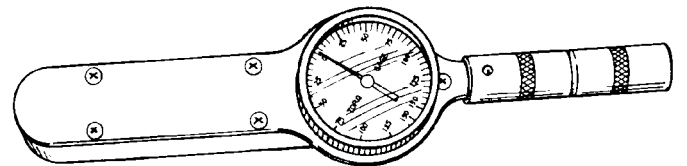
Dial Indicator 91-58222A1



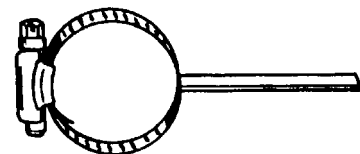
Bearing Carrier Retainer Wrench 91-61069



Torque Wrench (lb. in.) 91-66274

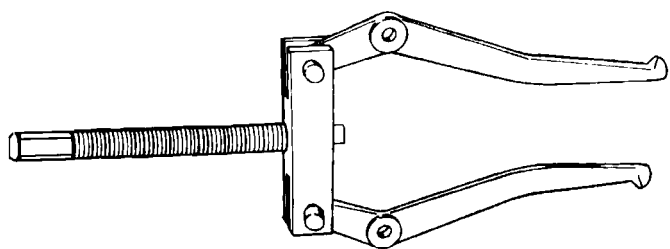


Backlash Indicator Rod 91-78473

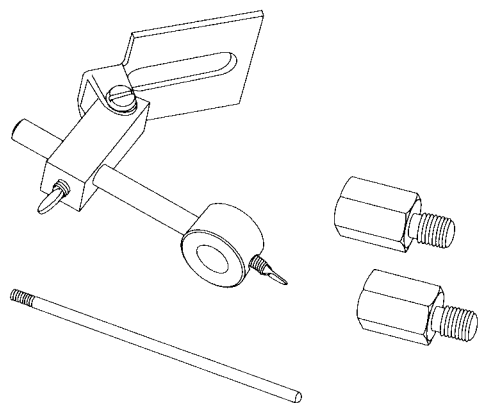




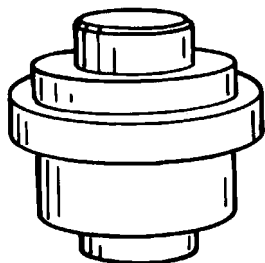
Puller Bolt 91-85716 and Puller Jaws 91-46086A1



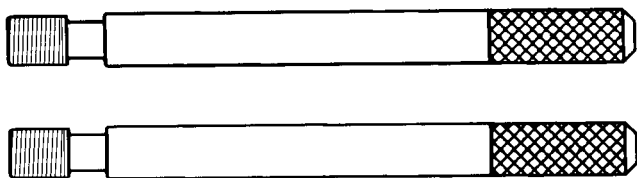
Dial Indicator Holding Tool 91-83155



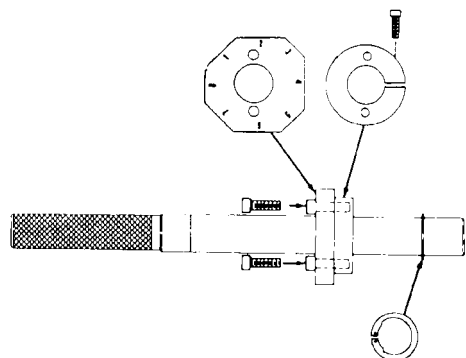
Oil Seal Driver 91-817569



Water Pump Alignment Pins 91-82157A1



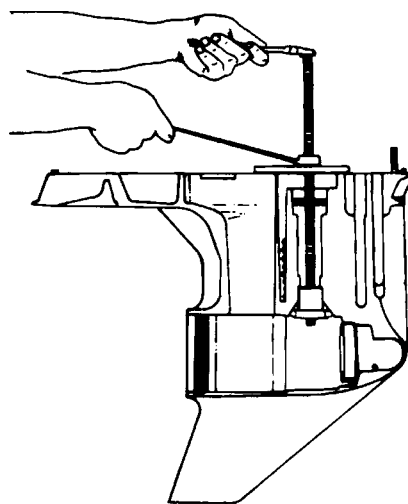
Pinion Gear Shimming Tool 91-12349A2



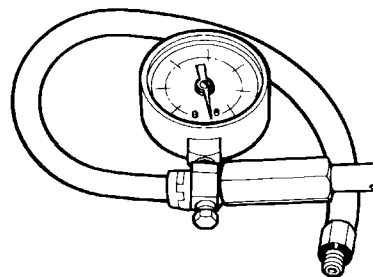
Bearing Preload Tool 91-14311A2



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 91-29610; Puller/Driver Head 91-38628; Mandrel 91-30366; Plate 91-29310; Driver Head 91-32325; Puller Shaft 91-31229; Washer 91-34961.



Leakage Tester FT8950



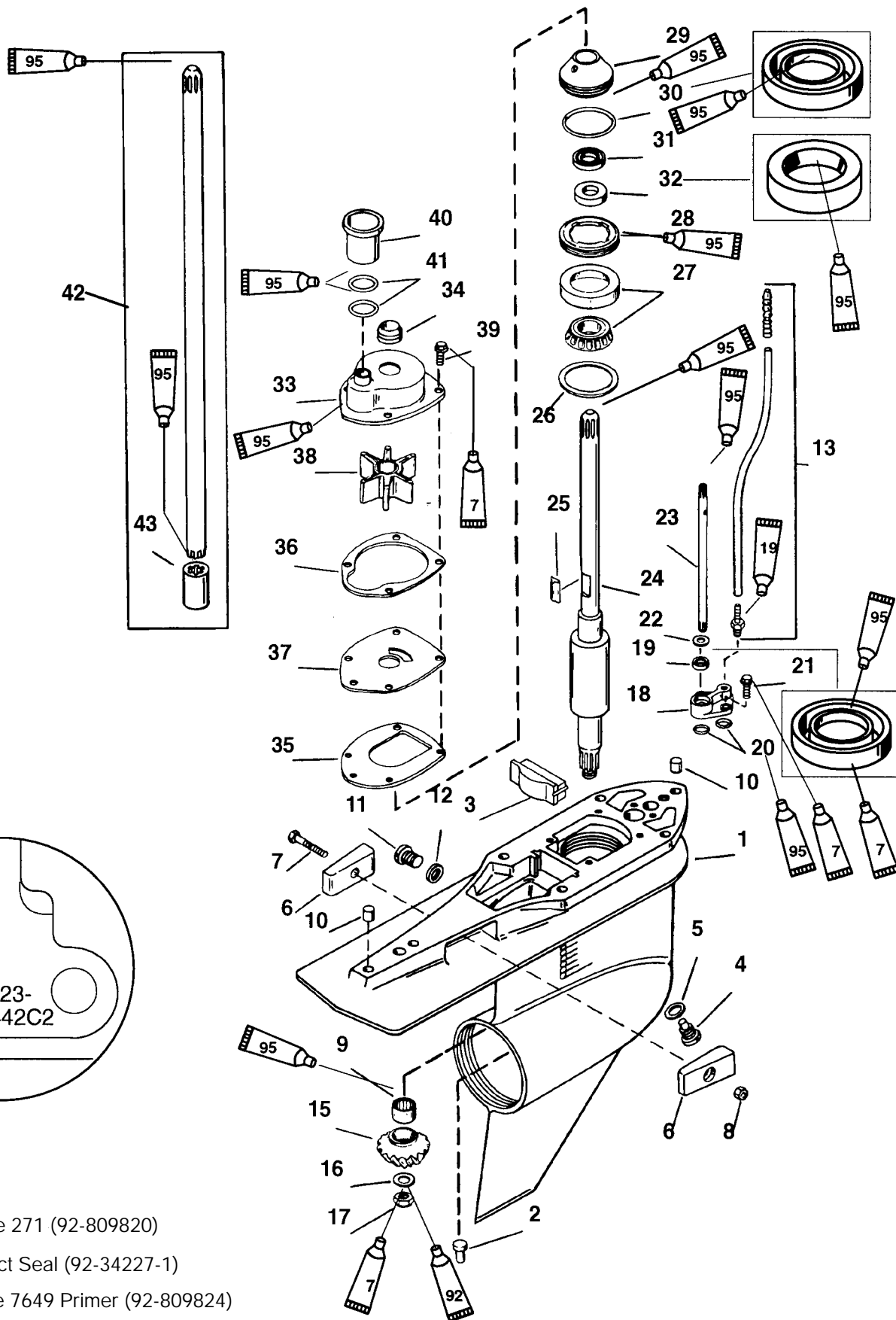
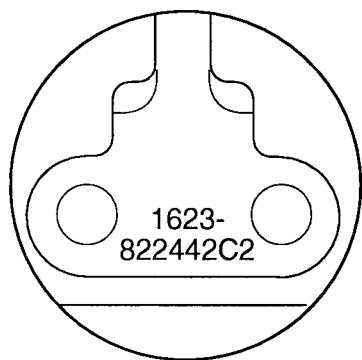


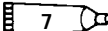
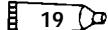
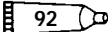
Notes:





Gear Housing (Drive Shaft) (Standard Rotation)(Ratcheting) (S/N-0G437999 & BELOW)(CASTING #1623-822442C2)



-  Loctite 271 (92-809820)
-  Perfect Seal (92-34227-1)
-  Loctite 7649 Primer (92-809824)
-  2-4-C With Teflon (92-825407A12)



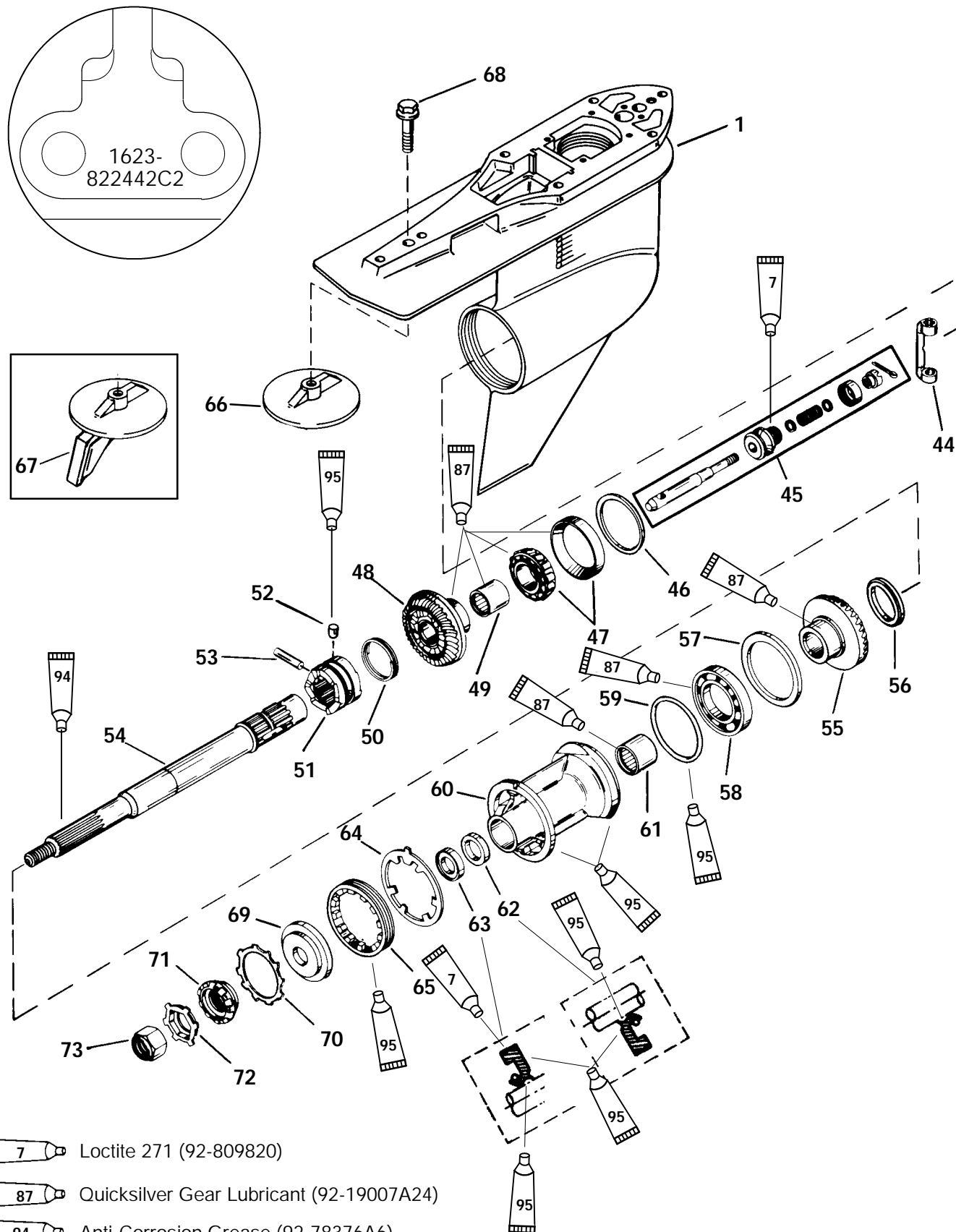
Gear Housing (Drive Shaft) (Standard Rotation)(Ratcheting) (S/N-0G437999 & BELOW)(CASTING #1623-822442C2)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	GEAR HOUSING			
2	1	PIN			
3	1	FILLER BLOCK			
4	1	MAGNETIC SCREW	60		6.8
5	1	SEALING WASHER			
6	2	ANODE			
7	1	SCREW			
8	1	NUT	60		6.8
9	1	ROLLER BEARING			
10	2	DOWEL PIN			
11	1	SCREW	60		6.8
12	1	SEALING WASHER			
13	1	CONNECTOR (LONG/X-LONG)			
14	1	CONNECTOR (XX-LONG)			
15	1	PINION GEAR (Part of 43-826181A2 - 1.75:1 or 43-828072A2 - 1.62:1)			
16	1	WASHER			
17	1	NUT		75	101
18	1	BUSHING ASSEMBLY			
19	1	OIL SEAL			
20	2	O RING			
21	2	SCREW	60		6.8
22	1	RUBBER WASHER			
23	1	SHIFT SHAFT (LOWER)			
24	1	DRIVE SHAFT (LOWER)			
25	1	KEY			
26	AR	SHIM			
27	1	TAPERED ROLLER BEARING			
28	1	RETAINER		100	135
29	1	CARRIER ASSEMBLY			
30	1	O RING			
31	1	OIL SEAL			
32	1	OIL SEAL			
33	1	WATER PUMP ASSEMBLY			
34	1	SEAL			
35	1	GASKET			
36	1	GASKET			
37	1	FACE PLATE			
38	1	IMPELLER			
39	4	SCREW	60		6.8
40	1	COUPLING ASSEMBLY			
41	2	O RING			
42	1	DRIVESHAFT KIT (LONG-20 IN.)	SEE NOTE		
	1	DRIVESHAFT KIT (X-LONG-25 IN.)	13 SPLINES		
	1	DRIVESHAFT KIT (XX-LONG-30 IN.)			
	1	DRIVESHAFT KIT (LONG-20 IN.)	SEE NOTE		
	1	DRIVESHAFT KIT (X-LONG-25 IN.)	8 SPLINES		
43	1	COUPLING			

NOTE: Service replacement of the one (1) piece driveshaft is not being offered. Determine the length of the driveshaft and ORDER REF. #'s 24 & 42.



Gear Housing (Prop Shaft) (Standard Rotation)(Ratcheting) (S/N-0G437999 & BELOW)(CASTING #1623-822442C2)



7 Loctite 271 (92-809820)

87 Quicksilver Gear Lubricant (92-19007A24)

94 Anti-Corrosion Grease (92-78376A6)

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

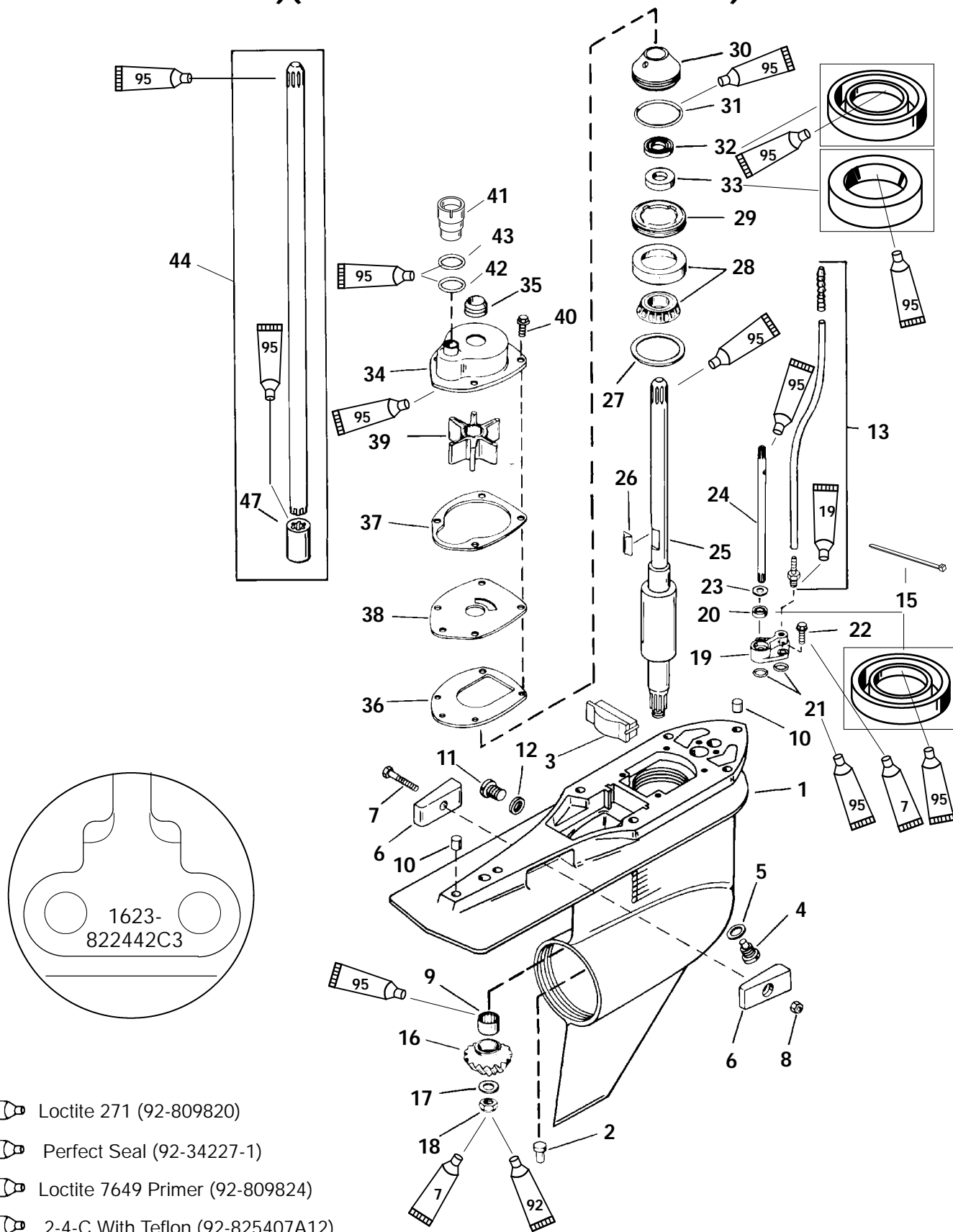


Gear Housing (Prop Shaft) (Standard Rotation)(Ratcheting) (S/N-0G437999 & BELOW)(CASTING #1623-822442C2)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	GEAR HOUSING			
44	1	SHIFT CRANK			
45	1	SHIFT SPOOL KIT			
46	AR	SHIM			
47	1	TAPERED ROLLER BEARING (USE WITH 1623-822442C2 CASTING)			
	1	TAPERED ROLLER BEARING (USE WITH 1623-822442C3 CASTING)			
48	1	FORWARD GEAR SET (Includes Pinion Gear) (1.75:1 GEAR RATIO)			
	1	FORWARD GEAR (NOTE: THIS COMPLETE GEAR SET IS A 1.62:1 GEAR RATIO REPLACING A 1.64:1 GEAR RATIO)			
49	1	ROLLER BEARING			
50	1	SPRING			
51	1	SLIDING CLUTCH			
52	1	DETENT PIN			
53	1	CROSS PIN			
54	1	PROPELLER SHAFT			
55	1	REVERSE GEAR (1.75:1 GEAR RATIO)			
	1	REVERSE GEAR (1.64:1 GEAR RATIO)			
	1	REVERSE GEAR (1.62:1 GEAR RATIO)(PART OF 43-828072A2)			
56	1	THRUST SPACER			
57	1	THRUST RING			
58	1	BALL BEARING			
59	1	O RING			
60	1	BEARING CARRIER			
61	1	ROLLER BEARING			
62	1	OIL SEAL (INSIDE)			
63	1	OIL SEAL (OUTSIDE)			
64	1	TAB WASHER			
65	1	RETAINER		210	285
67	1	ANODIC PLATE			
	1	TRIM TAB (BLACK ALUMINUM)			
68	1	TRIM TAB (ANODIC) THESE REPLACEMENT PARTS ARE NOT INCLUDED WITH COMPLETE GEAR HOUSING REPLACEMENT			
	1	SCREW		40	54.0
69	1	THRUST HUB			
70	1	LOCKWASHER			
71	1	WASHER			
72	1	TAB WASHER			
73	1	PROPELLER NUT		55	75.0



Gear Housing (Drive Shaft)(Standard Rotation)(Non-Ratcheting) (S/N-0G438000 & UP)(CASTING #1623-822442C3)



-  Loctite 271 (92-809820)
-  Perfect Seal (92-34227-1)
-  Loctite 7649 Primer (92-809824)
-  2-4-C With Teflon (92-825407A12)



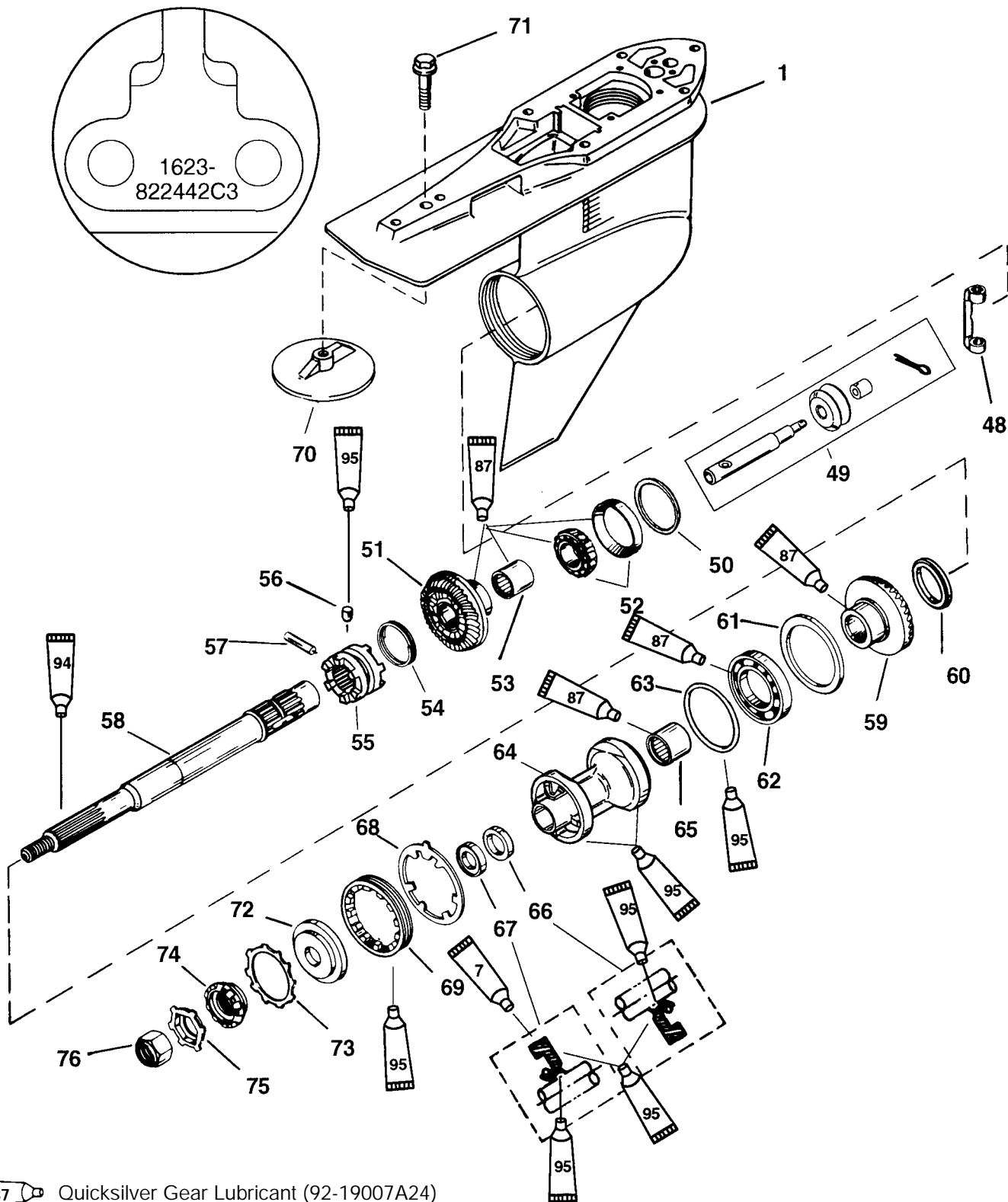
Gear Housing (Drive Shaft)(Standard Rotation)(Non-Ratcheting) (S/N-OG438000 & UP)(CASTING #1623-822442C3)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	GEAR HOUSING			
2	1	PIN			
3	1	FILLER BLOCK			
4	1	MAGNETIC SCREW	60		6.8
5	1	SEALING WASHER			
6	2	ANODE			
7	1	SCREW	60		6.8
8	1	NUT			
9	1	ROLLER BEARING			
10	2	DOWEL PIN			
11	1	SCREW ASSEMBLY	60		6.8
12	1	SEALING WASHER			
13	1	CONNECTOR (L/XL)			
14	1	CONNECTOR (XXL)			
15	1	CABLE TIE			
16	1	PINION GEAR (Part of 43-828168A2)			
17	1	WASHER			
18	1	NUT		75	101
19	1	BUSHING ASSEMBLY			
20	1	OIL SEAL			
21	2	O RING			
22	2	SCREW	60		6.8
23	1	RUBBER WASHER			
24	1	SHIFT SHAFT (LOWER)			
25	1	DRIVE SHAFT (LOWER)			
26	1	KEY			
27	AR	SHIM			
28	1	TAPERED ROLLER BEARING			
29	1	RETAINER		100	135
30	1	CARRIER ASSEMBLY			
31	1	O RING			
32	1	OIL SEAL			
33	1	OIL SEAL			
34	1	WATER PUMP ASSEMBLY			
35	1	SEAL			
36	1	GASKET			
37	1	GASKET			
38	1	FACE PLATE			
39	1	IMPELLER			
40	4	SCREW	60		6.8
41	1	COUPLING ASSEMBLY			
42	1	O RING			
43	1	O RING			
44	1	DRIVESHAFT KIT (LONG-20 IN.)			
45	1	DRIVESHAFT KIT (X-LONG-25 IN.)			SEE NOTE
46	1	DRIVESHAFT KIT (XX-LONG-30 IN.)			
47	1	COUPLING			

NOTE: Service replacement of the one (1) piece driveshaft is not being offered. Determine the length of the driveshaft and ORDER REF. #'s 25 & 44/45/46.



Gear Housing (Prop Shaft)(Standard Rotation)(Non-Ratcheting) (S/N-0G438000 & UP)(CASTING #1623-822442C3)



 Quicksilver Gear Lubricant (92-19007A24)

 Anti-Corrosion Grease (92-78376A6)

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



Gear Housing (Prop Shaft)(Standard Rotation)(Non-Ratcheting) (S/N-OG438000 & UP)(CASTING #1623-822442C3)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	GEAR HOUSING			
48	1	SHIFT CRANK			
49	1	SHIFT SPOOL KIT			
50	AR	SHIM			
51	1	FORWARD GEAR SET (Includes Pinion Gear)			
52	1	TAPERED ROLLER BEARING			
53	1	ROLLER BEARING			
54	1	SPRING			
55	1	SLIDING CLUTCH			
56	1	DETENT PIN			
57	1	CROSS PIN			
58	1	PROPELLER SHAFT			
59	1	REVERSE GEAR			
60	1	THRUST SPACER			
61	1	THRUST RING			
62	1	BALL BEARING			
63	1	O RING			
64	1	BEARING CARRIER			
65	1	ROLLER BEARING			
66	1	OIL SEAL (INSIDE)			
67	1	OIL SEAL (OUTSIDE)			
68	1	TAB WASHER			
69	1	RETAINER		210	285
70	1	ANODIC PLATE			
71	1	SCREW		40	54.0
72	1	THRUST HUB			
73	1	LOCKWASHER			
74	1	WASHER			
75	1	TAB WASHER			
76	1	PROPELLER NUT		55	75.0

**THESE
PARTS ARE NOT
INCLUDED WITH
COMPLETE GEAR
HOUSING REPLACEMENT**



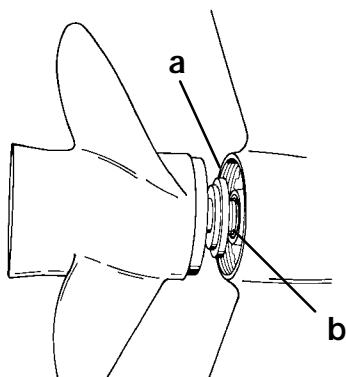
Removal, Disassembly, Cleaning and Inspection - Standard Rotation (Ratcheting and Non-Ratcheting)

REMOVAL

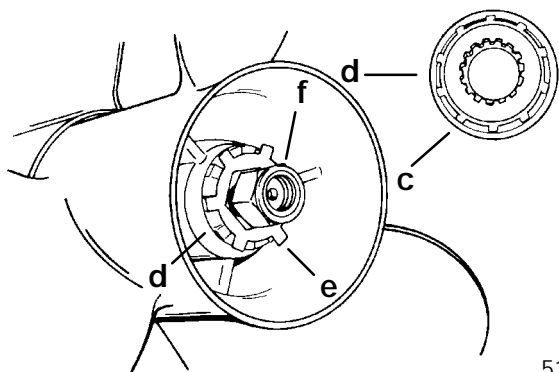
⚠ WARNING

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



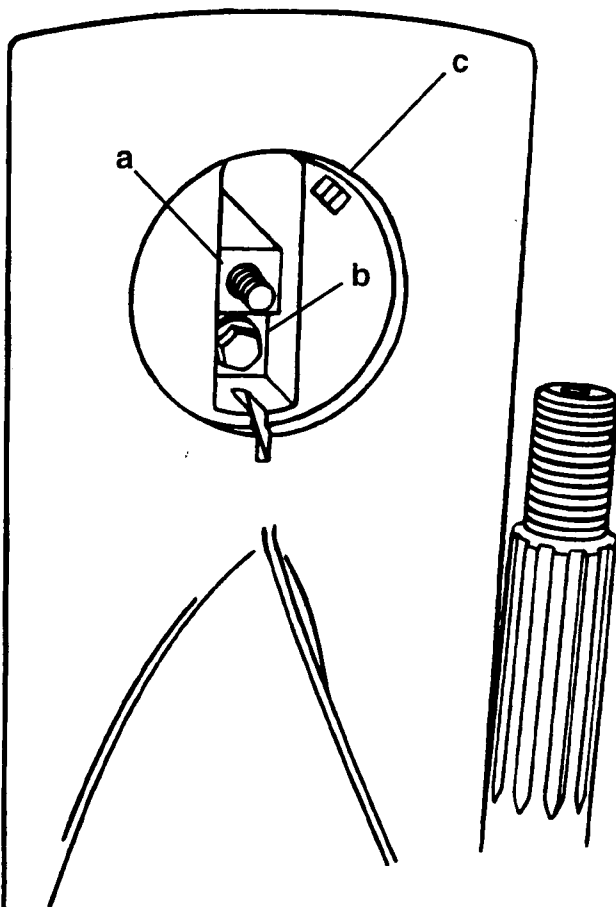
51866



51871

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

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 drive shaft housing. While holding trim tab securely, unthread bolt that secures trim tab and remove trim tab from gear housing.
6. Once trim tab is removed, remove bolt from inside of trim tab cavity.

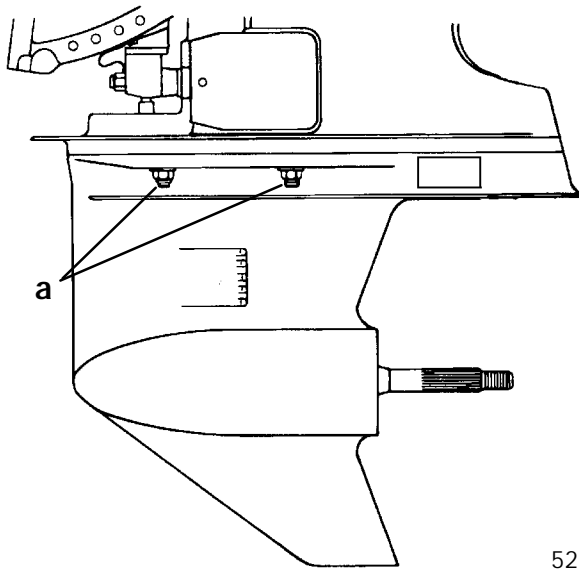


52375

- a - Bolt (Secures Trim Tab)
 - b - Bolt (Inside Trim Tab Cavity)
 - c - Ribs - Align Carefully with Trim Tab while Securing Tab
7. Loosen the side mounting locknuts. (DO NOT attempt to remove one nut before opposite side is loosened sufficiently, or drive shaft housing could be damaged.)
 8. Pull gear housing away from drive shaft housing as far as the loosened nuts (in Step 9) will allow, then remove loosened nuts. (DO NOT allow gear housing to fall, as it now is free.)



9. Pull gear housing from drive shaft housing.

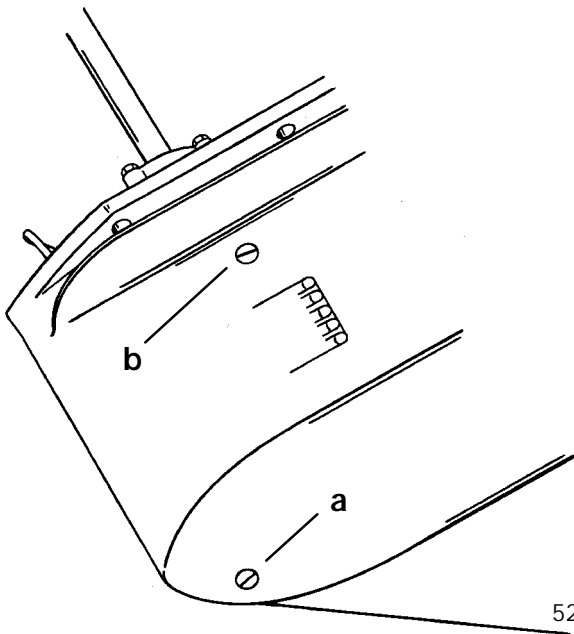


52374

a - Side Mounting Locknut (2 Each Side)

DRAINING AND INSPECTING GEAR HOUSING LUBRICANT

1. Place gear housing in a suitable holding fixture or vise with the drive shaft in a vertical position.
2. Position a clean drain pan under gear housing and remove "Fill" and "Vent" screws from gear housing. Do not loose sealing washers on Fill and Vent screws.



52377

a - "Fill" Screw
b - "Vent" Screw

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.

NOTE: 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.

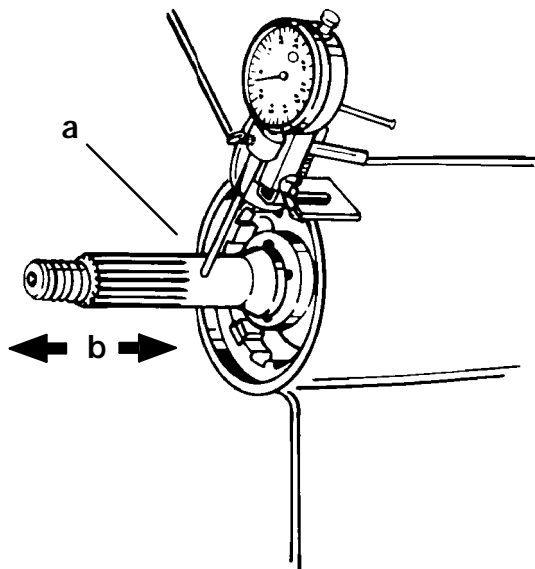


Pre-Disassembly Inspection

Propeller Shaft

INSPECTION

1. Inspect the propeller shaft for side to side movement, as follows:
 - a. Position the dial indicator on the propeller shaft.
 - b. Push the propeller shaft to one side and zero the dial indicator.
 - c. Move the propeller shaft to the opposite side while observing the dial indicator. Without rotating the propeller shaft, reposition the dial indicator and check the up and down deflection. A shaft deflection of more than 0.003 in. (0.08 mm) indicates a worn propeller shaft bearing.
2. Check for a bent propeller shaft as follows:
 - a. Rotate the propeller shaft while observing the dial indicator. If the deflection is more than 0.010 in. (0.25mm), a bent propeller shaft is indicated.
3. Measure propeller shaft end play. If it is in excess of 0.045 in. (1.14mm), disassemble gear case and check condition of the reverse shoulder of the propeller shaft, reverse gear and thrust washer. Replace components as required.



22086

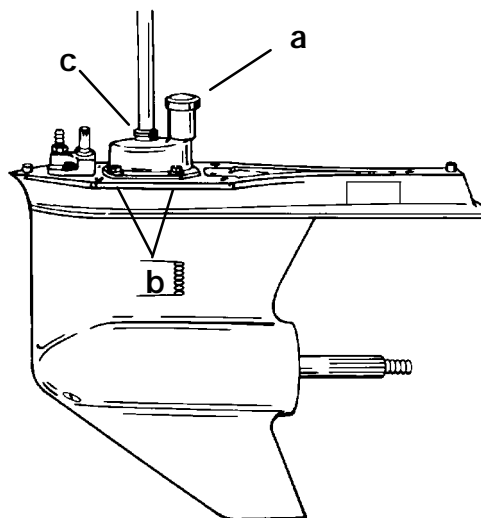
- a - Prop Shaft Runout
- b - Prop Shaft End play

Gear Housing and Component Disassembly

Water Pump Assembly

REMOVAL

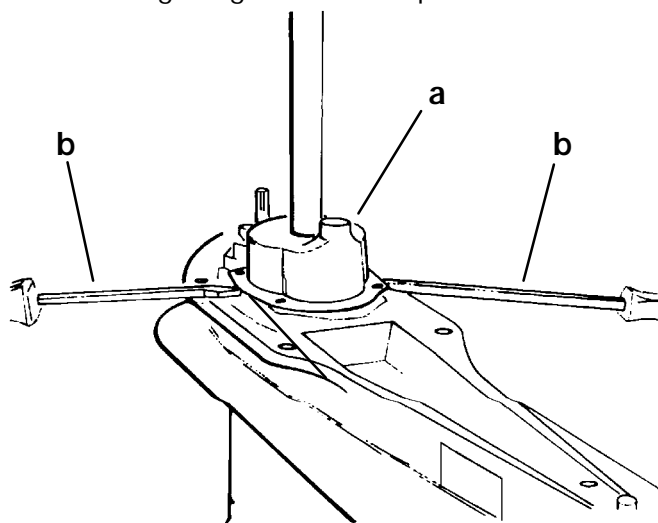
1. Remove the water seal, water tube coupling assembly, and the water pump screws.



52749

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

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.

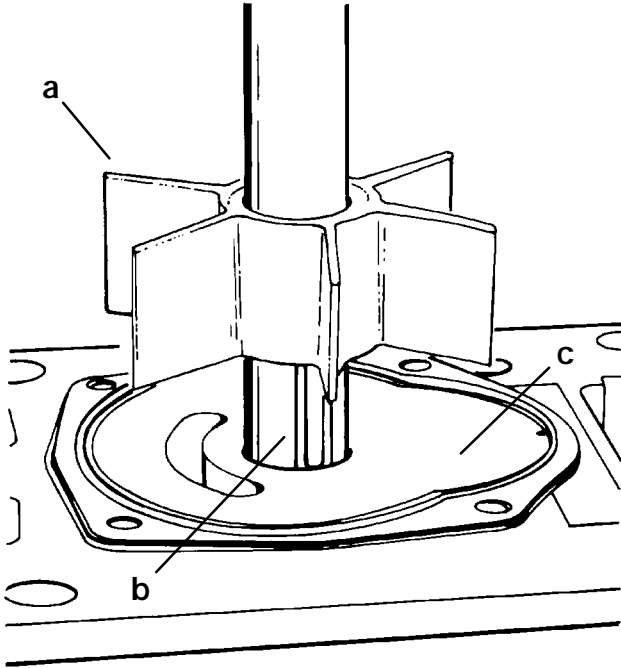


70487

- a - Water Pump Body
- b - Screw Drivers



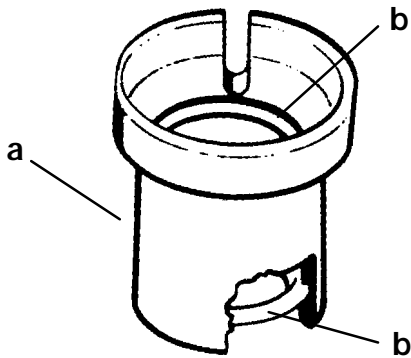
3. Remove the impeller, impeller key, the face plate and gaskets, (discard the gaskets).



- a - Impeller
- b - Impeller Key
- c - Water Pump Face Plate and Gaskets
(One on each side of the face plate)

WATER PUMP ASSEMBLY - Component Inspection

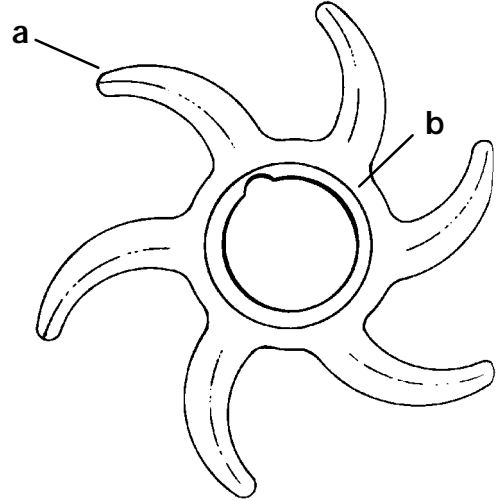
1. Inspect the water tube coupling assembly for wear or damage. If necessary replace the worn or damaged components especially the two O-rings on the inside, one at the top and one at the bottom.



- a - Water Tube adapter
- b - O-rings (2)

2. Inspect the water pump impeller for wear on the end, top and bottom of the impeller blades. Replace the impeller if this condition is found.

3. Inspect for proper bonding between the hub and the impeller. Replace the impeller if improper bonding is found.



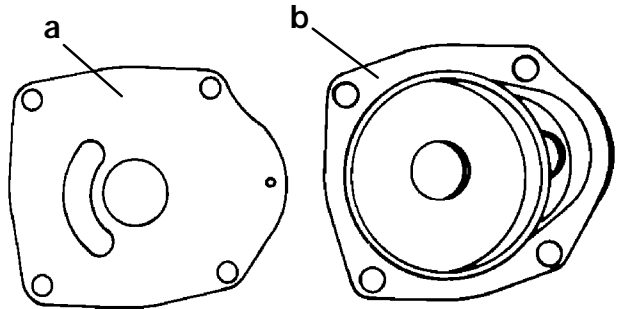
70500

- a - Impeller
- b - Hub

4. Inspect the impeller blades to see if they are cracked, burnt, hard or deformed. Replace the impeller if the blades are in this condition.

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.

5. Replace cover if thickness of steel at the discharge slot is 0.060 in. (1.5mm) or less or if grooves (other than impeller sealing bead groove) in cover roof are more than 0.030 in. (0.76mm) deep.



70609

- a - Water Pump Face Plate
- b - Water Pump Cover

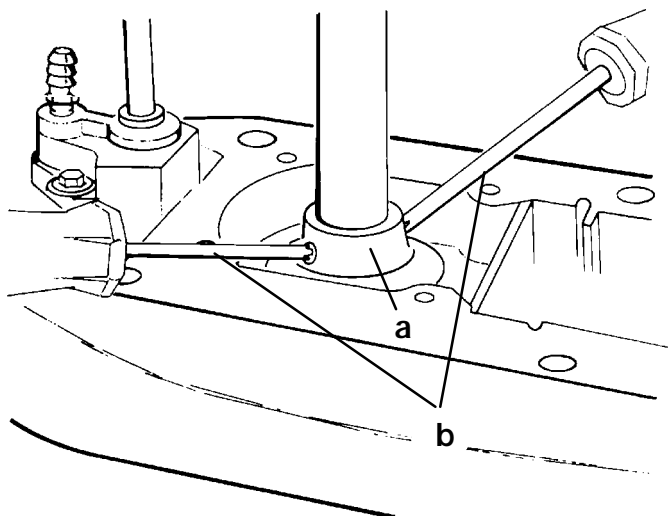
6. Inspect the water pump face plate and the water pump interior for roughness and/or grooves. Replace the appropriate components if any are found.



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.



70489

- a - Oil Seal Carrier
- b - Screwdrivers

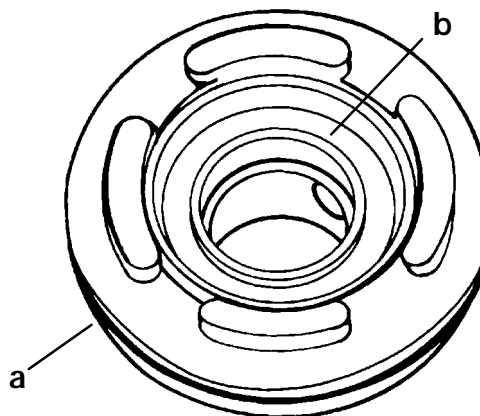
OIL SEAL CARRIER ASSEMBLY - Inspection

1. Inspect the oil seal carrier, O-ring, and seals for wear and/or damage. If necessary replace defective parts as outlined following.

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.

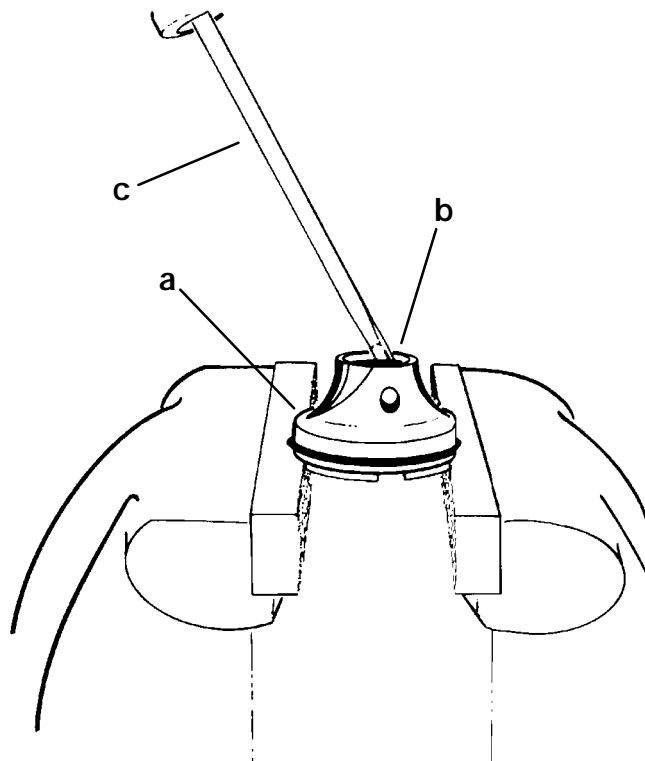
1. Remove the O-ring.



70501

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

2. Remove the oil seals.



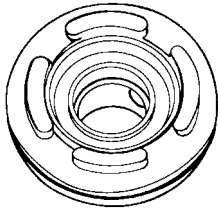
70610

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



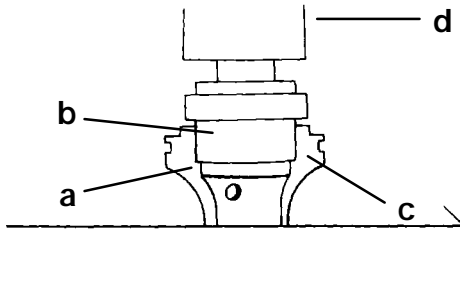
OIL SEAL CARRIER ASSEMBLY - Component Reassembly (1994/1995 MODELS)

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



70501

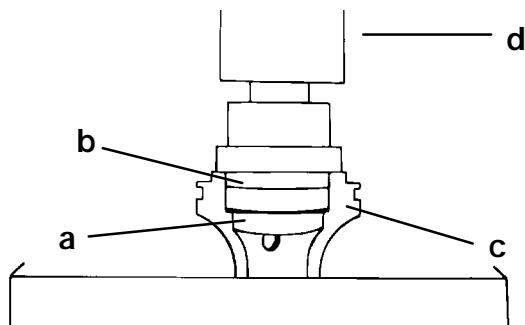
1. Assemble the small oil seal (with the lips of the oil seal facing away from the driver shoulder) onto the long end of the oil seal driver.
2. Press on the oil seal driver until the driver bottoms against the carrier. Do not press so hard as to damage the oil seal carrier while driving the oil seal.



70611

- a - Oil Seal
- b - Oil Seal Driver (91-817569) use long end
- c - Oil Seal Carrier
- d - Press

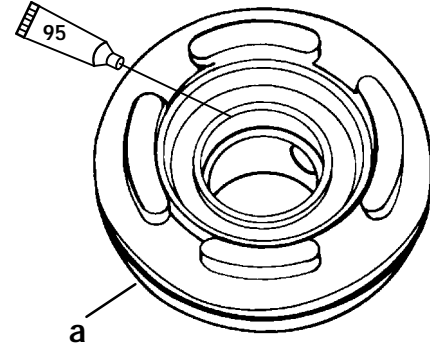
3. Assemble the large oil seal (with the lips of the oil seal facing the driver shoulder) onto the short end of the oil seal driver.
4. Press on the oil seal driver until the driver bottoms against the carrier. Do not press so hard as to damage the oil seal carrier while driving the the oil seal.



70612

- a - Oil Seal
- b - Oil Seal Driver (91-817569) use short end
- c - Oil Seal Carrier
- d - Press

5. Fill the area between the seal lips with 2-4-C w/Teflon. Apply 2-4-C w/Teflon to the O-ring.
6. Install the O-ring onto the oil seal carrier.



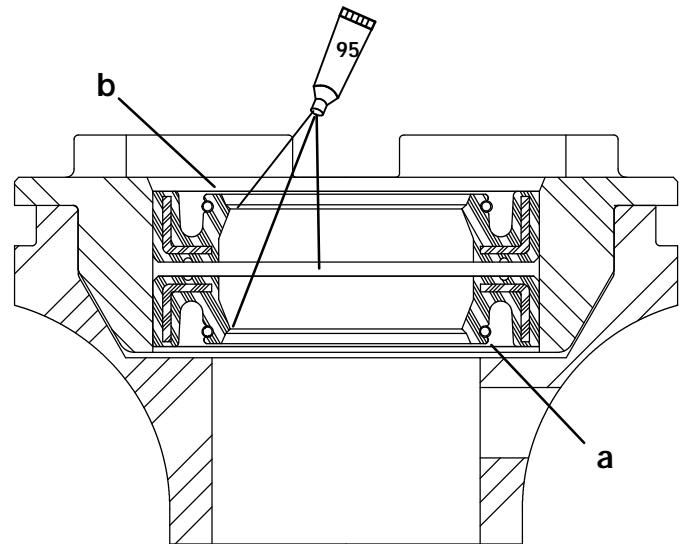
70501

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

a - O-ring

OIL SEAL CARRIER ASSEMBLY - Component Reassembly (96/97/98 MODELS)

The oil seals in 1996/1997 carrier assemblies are the same diameter. The bottom (first) seal lip faces down; the top (second) seal lip faces up. Apply 2-4-C 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.



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

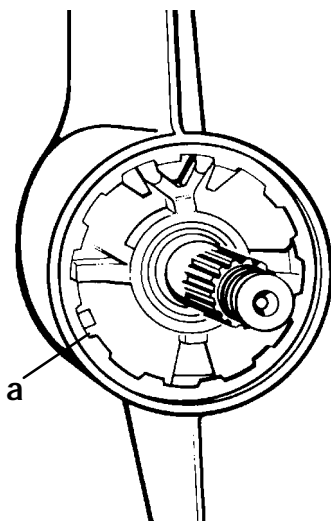
- a - Bottom Seal (Lip Faces Down)
- b - Top Seal (Lip Faces Up)



Bearing Carrier Assembly

REMOVAL

1. Straighten the tab on the tab washer.



70490

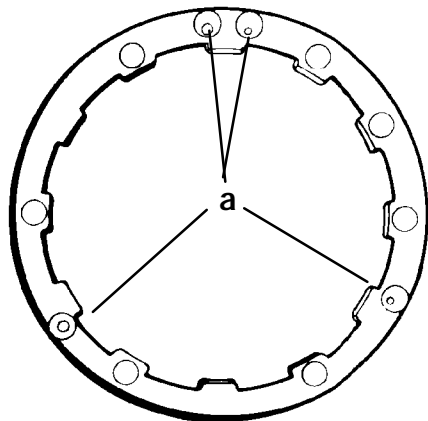
a - Tab on Tab Washer

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.

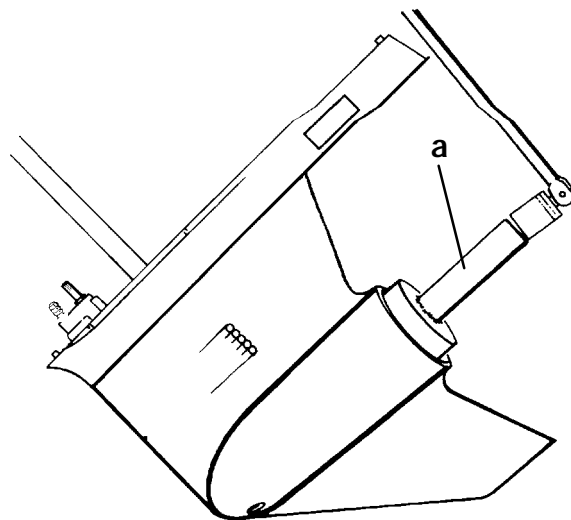
- a. If the retainer is corroded in place, drill 4 holes in the retainer and fracture the retainer with a chisel. Pry the remaining segments out.



23356

a - Drilled Holes

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

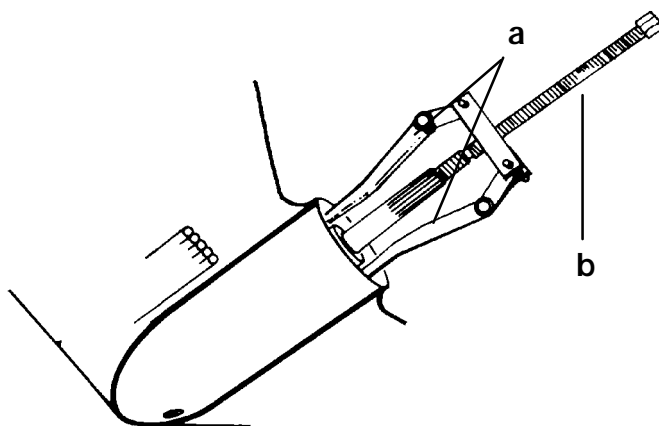


491

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.



10772

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

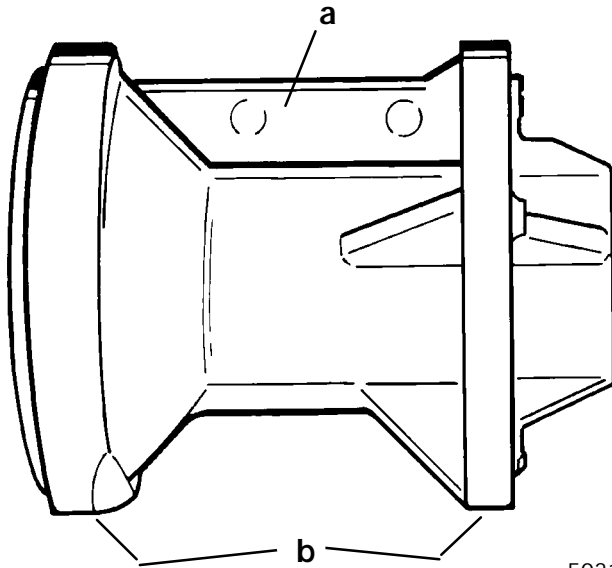


BEARING CARRIER ASSEMBLY - Inspection

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

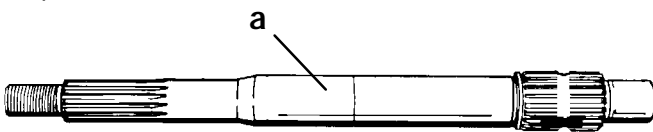
NOTE: If any of the following items are found to be defective complete the appropriate instruction(s) in "Bearing Carrier Assembly", 'Component Disassembly and Inspection' section found on page 6A-22.

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.



- 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.

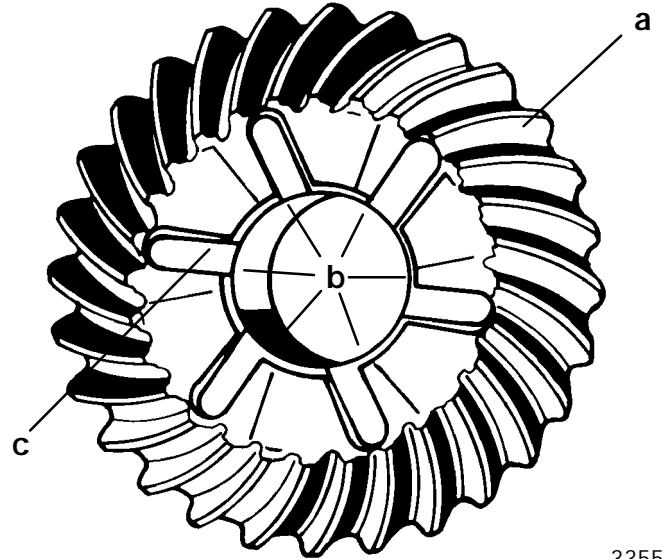


- a - Propeller Shaft Bearing Contact Area

4. Inspect the reverse gear for pitted, chipped, broken teeth, hairline fractures, and excessive or uneven wear. Replace the gear if any defects are found.

NOTE: If outboard jumps out of gear, inspect not only clutch dog teeth on reverse gear but also thrust washer surface on reverse gear for excessive wear. Replace gear if wear is evident.

5. Inspect the clutch jaws of the gear for damage. Surfaces must not be chipped or rounded off. Replace the gear if any are found.

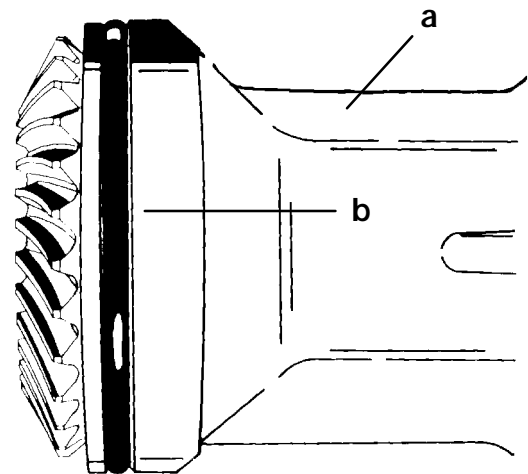


- a - Reverse Gear Teeth
- b - Thrust Washer Surface
- c - Clutch Jaws

6. Inspect the reverse gear bearing for excessive movement or roughness by rotating gear. Replace the bearing if either of these conditions exists.

7. Inspect the bearing carrier retainer for cracks and/or broken or corroded threads. Replace carrier if any are found.

8. Remove the O-ring from the bearing carrier assembly.



- a - Bearing Carrier
- b - O-ring

- a. Inspect the O-ring for damage and or deterioration. Replace it if necessary.



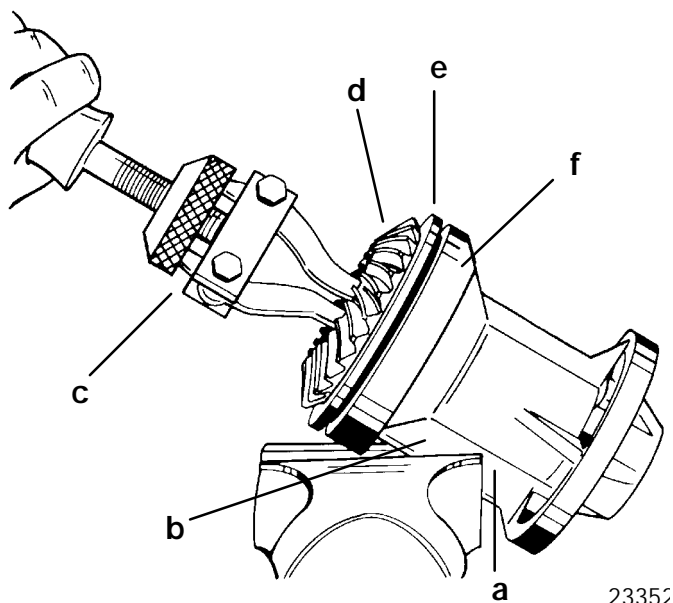
BEARING CARRIER ASSEMBLY - Component Disassembly and Inspection

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

⚠ CAUTION

Clamp onto the reinforcing rib of the bearing carrier **ONLY**, or damage to the carrier may result.

1. Place the bearing carrier in a vise, clamping on the reinforcing rib.
2. Remove the reverse gear, thrust ring, and bearing as an assembly, using a slide hammer puller.

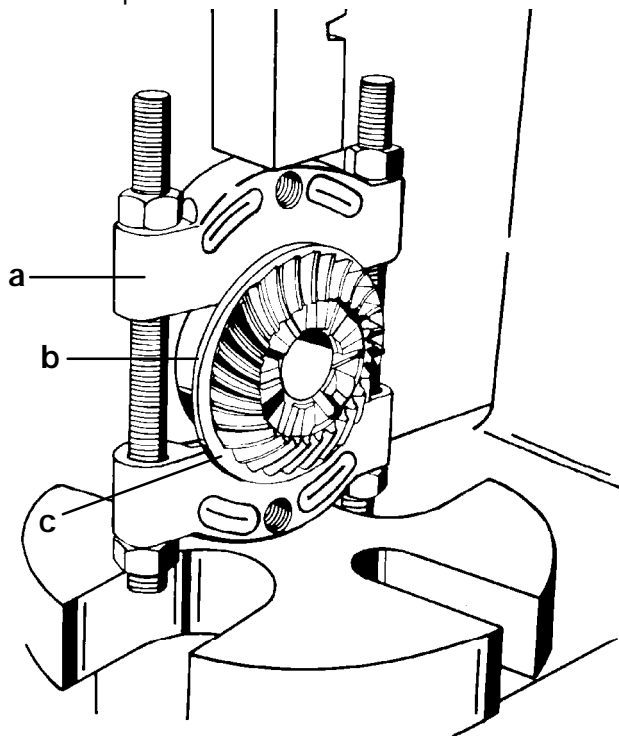


- a - Bearing Carrier Reinforcing Rib
- b - Bearing Carrier
- c - Slide Hammer Puller (91-34569A1)
- d - Reverse Gear
- e - Thrust Hub
- f - Bearing (not seen) - Located in the Carrier

3. Clean all components thoroughly with a suitable solvent and inspect them for damage and/or excessive wear. Replace any parts that are found to be defective.

IMPORTANT: The bearing **MUST BE** replaced if removed from gear.

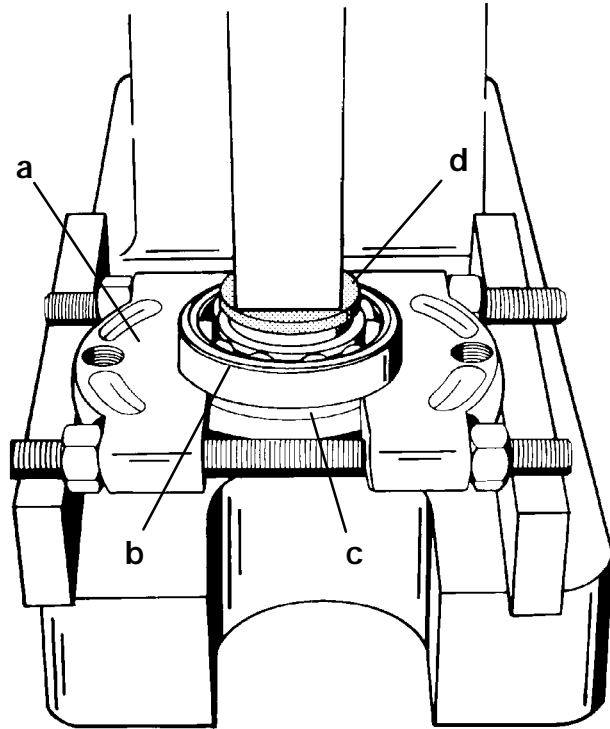
4. Place the universal puller plate between the thrust washer and bearing as shown and press on the plate until it bottoms.



- a - Universal Puller Plate (91-37241)
- b - Thrust Washer
- c - Bearing



5. Using a suitable mandrel and the universal puller plate to support the bearing, press the bearing from the reverse gear as shown.



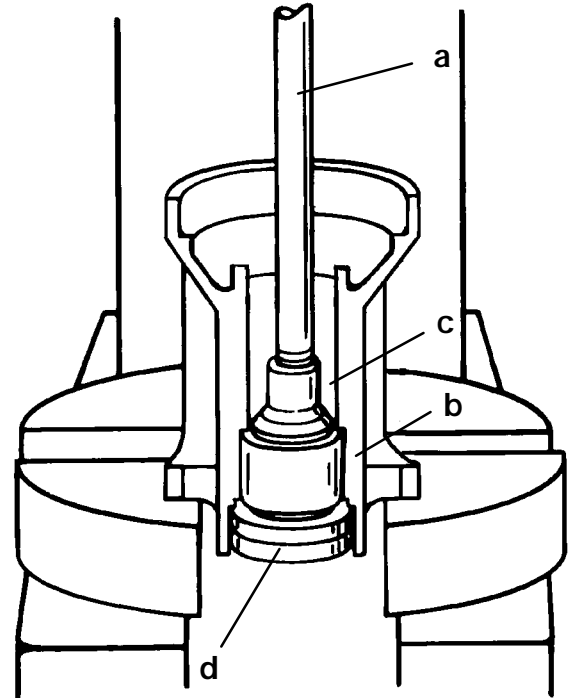
23351

- a - Universal Puller Plate (91-37241)
- b - Bearing
- c - Gear
- d - Suitable Mandrel

- a. **Discard the bearing.**
- b. Inspect the gear, and thrust washer for excessive wear, cracks, or damage. Replace the appropriate components if any of these conditions are found.

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.

6. 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.



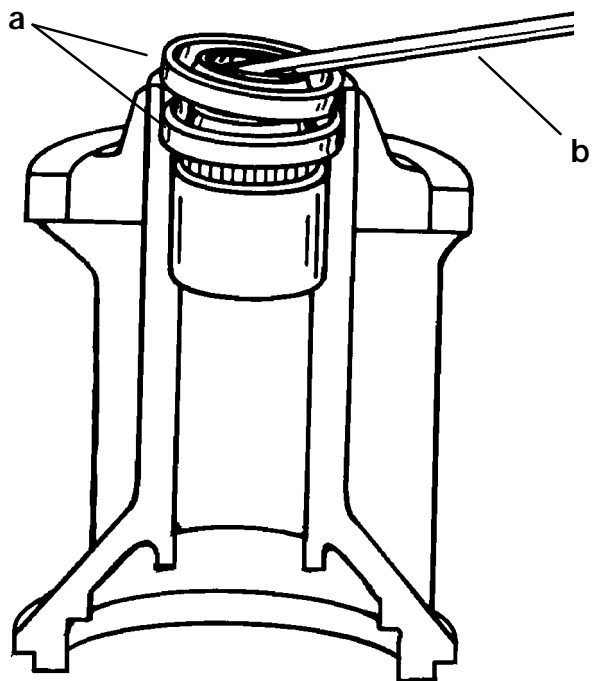
--140

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

- (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

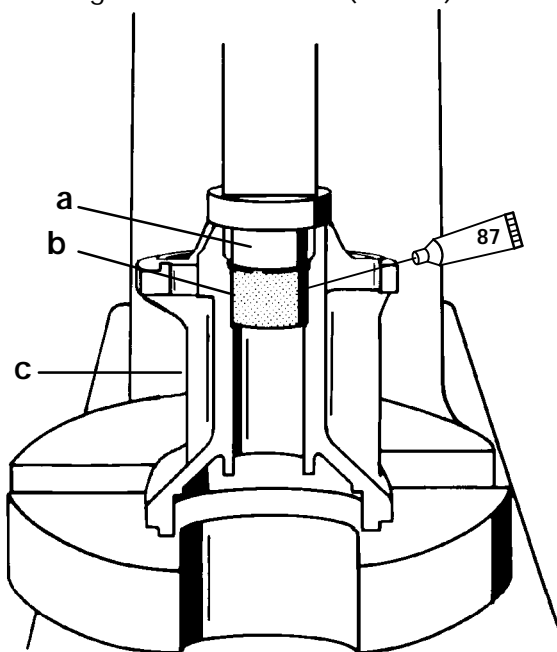
- a - Oil Seals
b - Pry Bar

(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.



50315

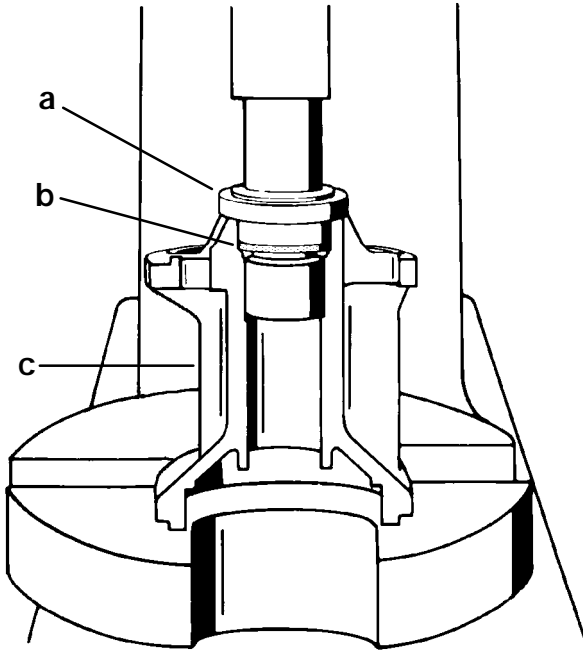
 Quicksilver Gear Lubricant (92-19007A24)

- a - Needle Bearing Driver (P/N 91-15755)
b - Needle Bearing
c - Bearing Carrier

5. **Thoroughly clean** the bore in 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.



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

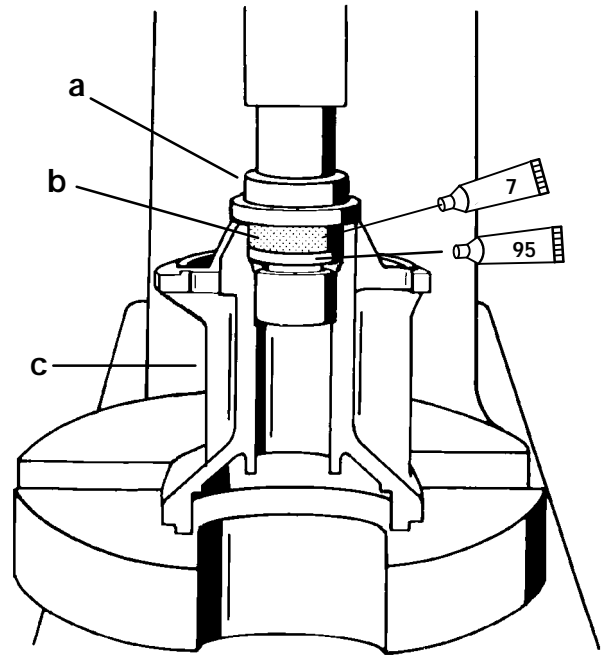


50315

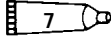
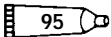
- a - Oil Seal Driver (91-31108)
- b - Oil Seal
- c - Bearing Carrier

8. Apply a thin film of Loctite 271 (92-809820) to the outer diameter of the second seal.
9. Assemble the second seal (with the lips of the seal facing the driver shoulder) onto the short end of the driver.

10. Press the oil seal with the driver until the driver bottoms out on the bearing carrier.



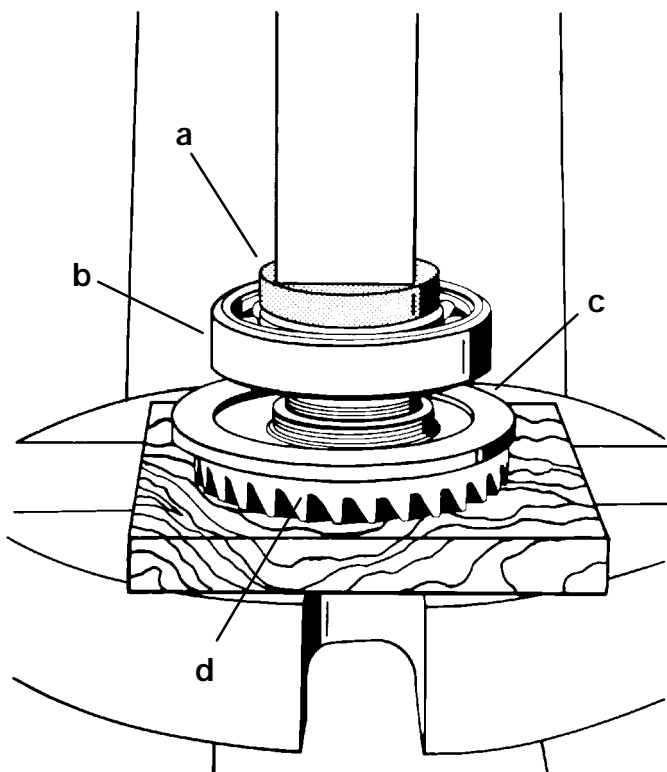
50315

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

- a - Driver (short end)
 - 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).



13. Install the thrust washer and **a new ball bearing** onto the reverse gear. Press on the inner race of the ball bearing using the pilot washer until the bearing bottoms out on the gear.

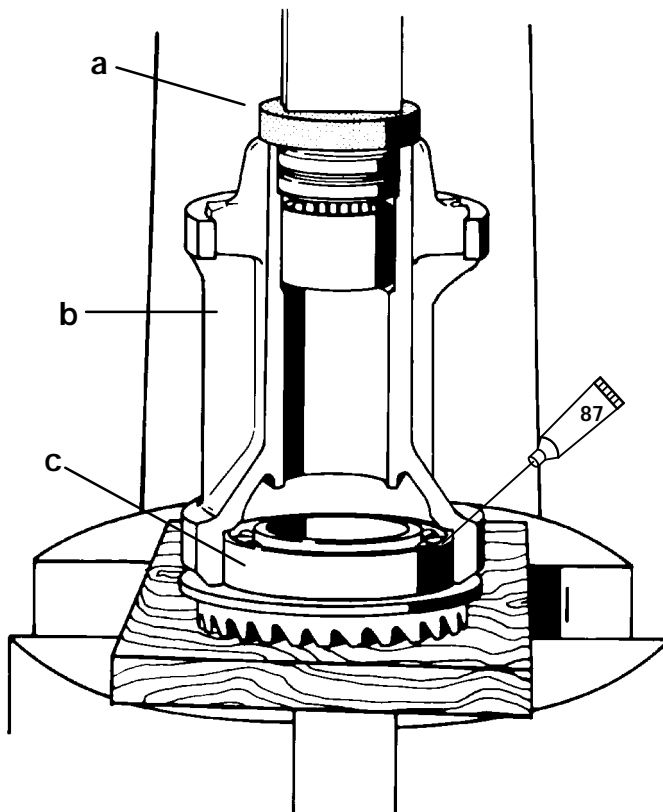


23346

- a - Pilot Washer (P/N 91-36571)
- b - Ball Bearing
- c - Thrust Hub
- d - Reverse Gear

14. Lubricate the bore that the bearing is pressed into with Quicksilver Gear Lubricant (92-13783A24).

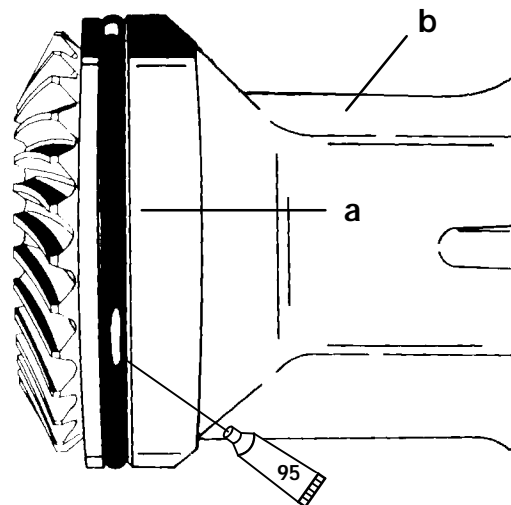
15. Press the bearing carrier onto the reverse gear and bearing until the bearing bottoms out in bearing carrier, using the pilot washer to press against the carrier.



Quicksilver Gear Lubricant (92-19007A24)

- a - Pilot Washer (91-36571)
- b - Bearing Carrier
- c - Reverse Gear and Bearing Assembly

16. Lubricate the O-ring with 2-4-C w/Teflon and install the O-ring onto the bearing carrier.



23354

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

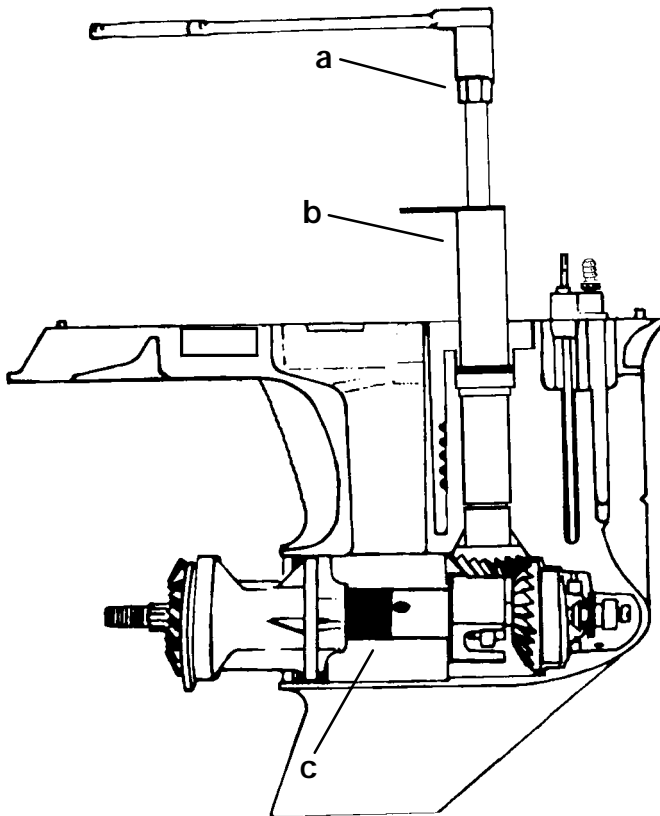
- a - O-ring
- b - Bearing Carrier



Drive Shaft Assembly

REMOVAL

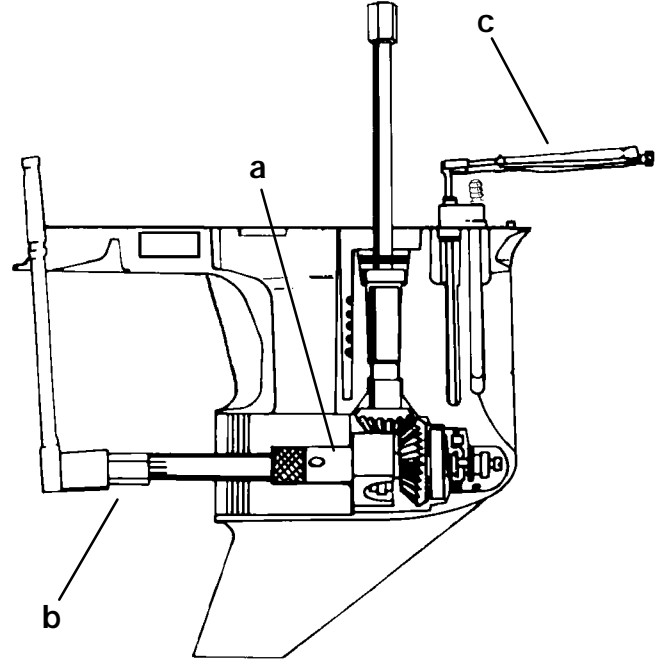
1. Remove the drive shaft pinion nut as follows:
 - a. Place the drive shaft nut wrench onto the drive shaft. Do not loosen the retainer at this time.
 - b. Insert the pinion nut adapter with the MR slot facing the pinion gear into the gear housing. It may be necessary to slightly lift and rotate the 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.



- 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.

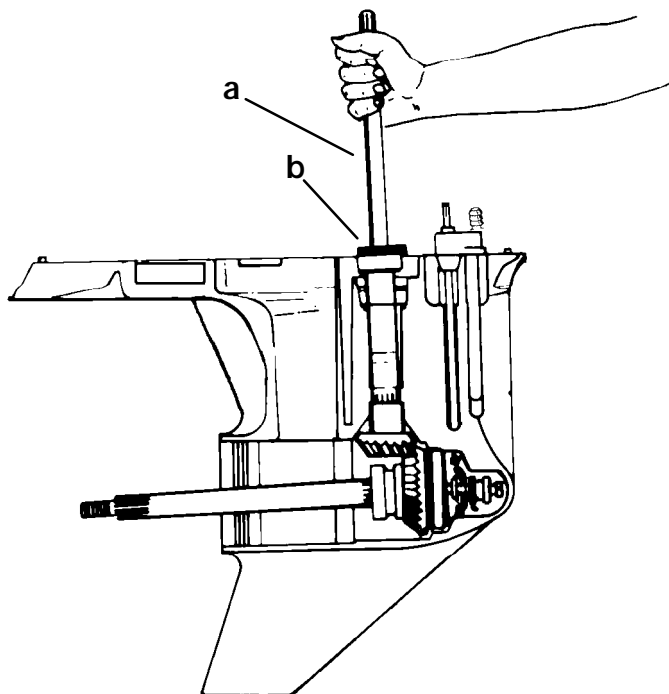


- a - Pinion Nut adapter (91-61067A2)
 - b - Propeller Shaft Nut Wrench (91-61077)
 - c - Shift Shaft (Turn Clockwise) (Protect shaft splines w/soft material)
- f. Completely unscrew the drive shaft bearing retainer.
 - g. Completely unscrew the pinion nut by rotating the drive shaft (or the propeller 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.



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

3. Move the prop shaft downward and to the PORT side of the gear case.
4. Retrieve the pinion gear, the washer and the nut from the inside of the gear housing.

DRIVE SHAFT ASSEMBLY - Inspection

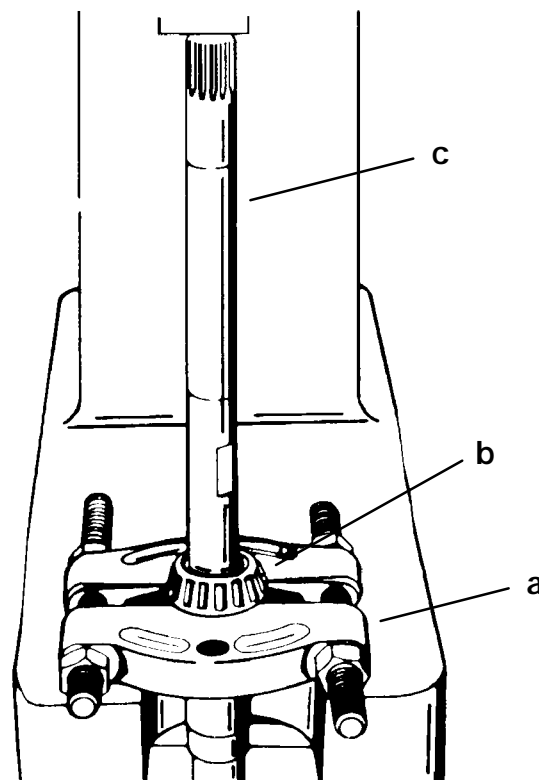
1. Clean all parts with a suitable solvent and dry the parts thoroughly using compressed air, being careful not to spin the bearings.
2. The condition of the drive shaft bearing cup is an indication of the condition of the tapered roller bearing on the drive shaft. Replace the bearing and bearing cup if the cup is pitted, grooved, scored, worn unevenly, discolored from over-heating, 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 over-heating, 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 as a set** if any defects are found.

DRIVE SHAFT 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. Press the tapered roller bearing from the drive shaft using the universal puller plate to support the **inner race** of the bearing while removing it.



70699

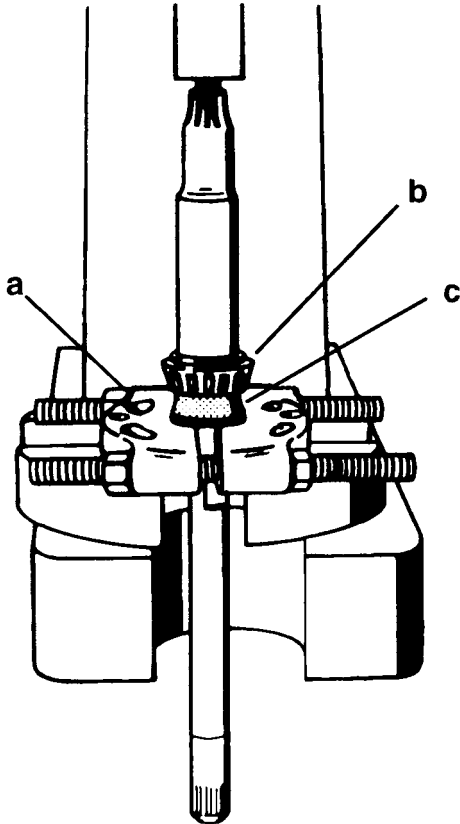
- a - Universal Puller Plate (91-37241)
- b - Tapered Roller Bearing
- c - Drive Shaft



DRIVE SHAFT ASSEMBLY - Component Reassembly

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

1. 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.
2. 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).



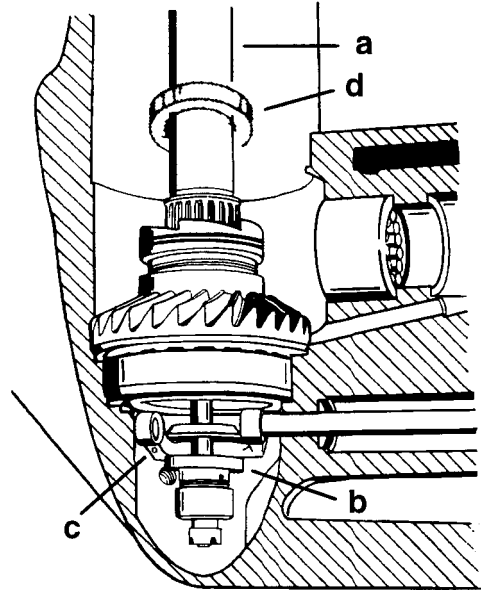
70700

- a - Universal Puller Plate (91-37241)
- b - Tapered Roller Bearing
- c - Suitable Mandrel (Inner Race of Old Bearing)

Propeller Shaft Assembly and Forward Gear Bearing Cup

REMOVAL

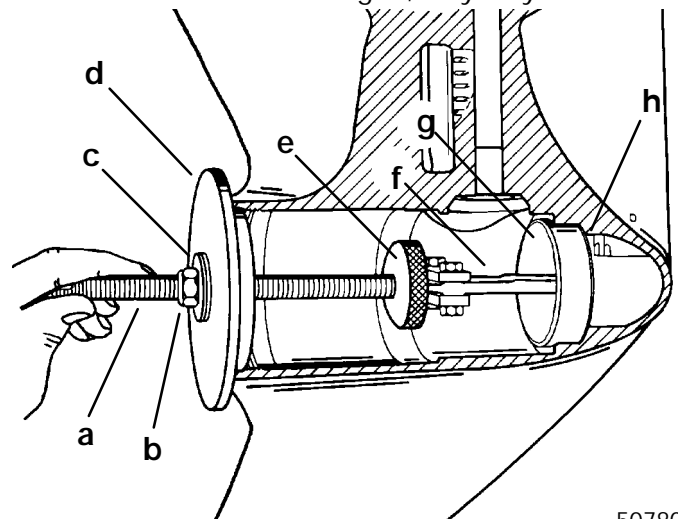
1. Tilt the propeller shaft to the port side of the gear housing and remove the shaft by pulling it straight up and out.



23348

- a - Propeller Shaft Assembly
- b - Shift Spool
- c - Shift Crank
- d - Thrust Washer (Reverse Gear)

2. Remove the forward gear bearing cup and shims. Measure and make note of the shim thickness. If the shims are not damaged, they may be reused.



5078C

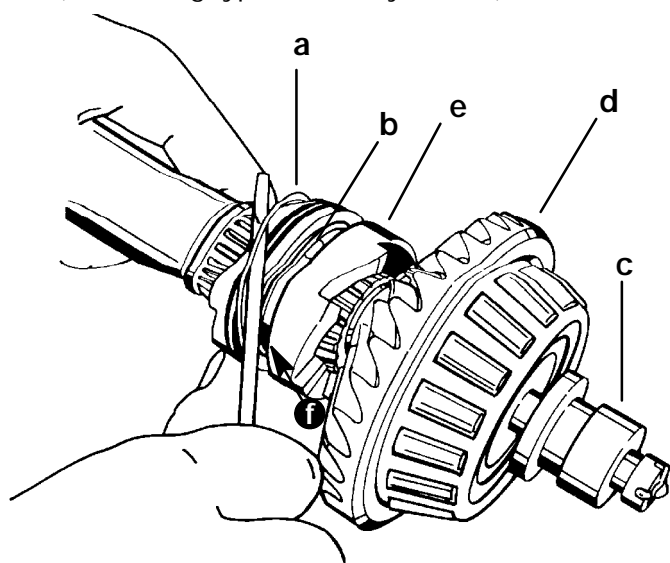
- a - Puller Shaft (91-31229)
- b - Nut (11-24156)
- c - Washer (91-34961)
- d - Guide Plate (91-816243)
- e - Puller Head (from Slide Hammer Puller Kit 91-34569A1)
- f - Jaws (from Slide Hammer Puller Kit)
- g - Bearing Cup
- h - Shims



PROPELLER SHAFT ASSEMBLY - Component Disassembly

NOTE: 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 over-stretch it during removal. If the spring does not coil back to its normal position once it has been removed, it must be replaced.
2. Remove detent pin.
3. Remove the cross pin that goes through the clutch.
4. Remove the remainder of the components (Ratcheting type assembly shown).

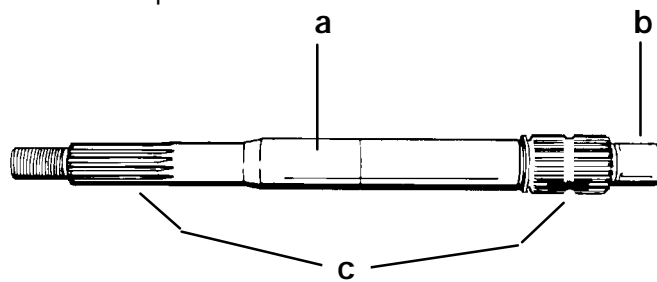


23350

- a - Spring
- b - Cross Pin
- c - Shift Spool Assembly
- d - Forward Gear Assembly
- e - Sliding Clutch
- f - Detent Pin

PROPELLER SHAFT ASSEMBLY - Component Inspection

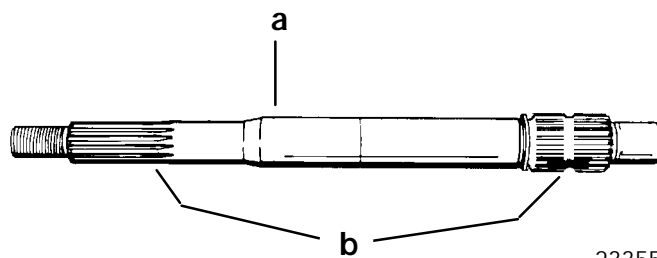
1. Clean all the parts with a suitable solvent and dry the parts thoroughly using compressed air, being careful not to spin bearings.
2. Inspect the sliding clutch jaws for damage. Jaws must not be chipped or rounded off. Replace the clutch if they are.
3. Inspect the bearing surfaces on the propeller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



23355

- a - Bearing Carrier Needle Bearing Contact Area
- b - Forward 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 the propeller shaft and oil seals.

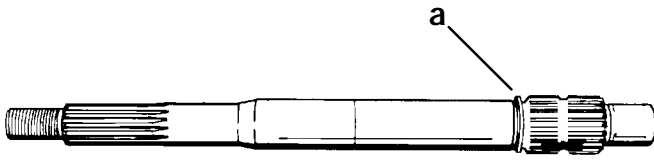


23355

- a - Bearing Carrier Seal Contact Area
- b - Splines



6. Inspect reverse gear thrust washer surface for wear or taper. If surface is worn or tapered, propeller shaft must be replaced.



23355

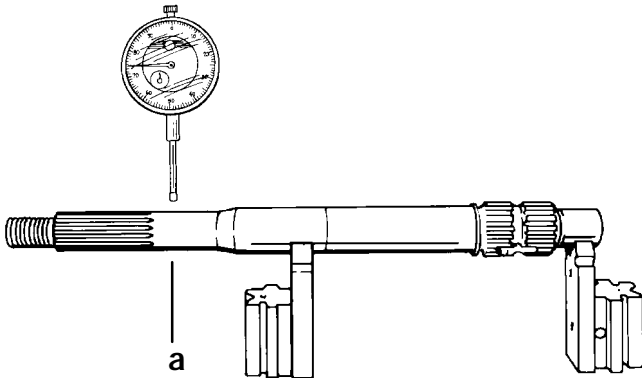
a - Thrust Washer Surface

7. 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.

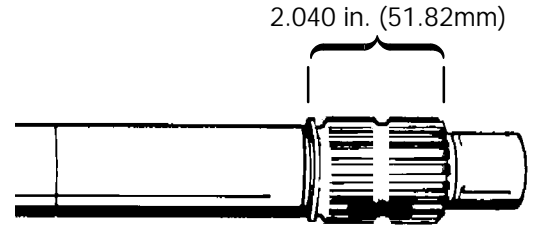
8. Rotate the propeller shaft and observe the dial indicator movement, If the indicator in the dial moves more than 0.010 in. (0.25mm), replace the propeller shaft.



52727

a - Check Movement with Dial Indicator (P/N 91-58222A1) Here.

9. Measure propeller shaft FORWARD to REVERSE shoulder length. If measurement is under 2.040 in. (51.82mm), replace propeller shaft.



23355

10. Inspect REVERSE thrust washer for wear or taper. Measure thickness of washer. If thickness is LESS than 0.240 in. (6.1mm), replace washer.

0.240 in. (6.096mm)

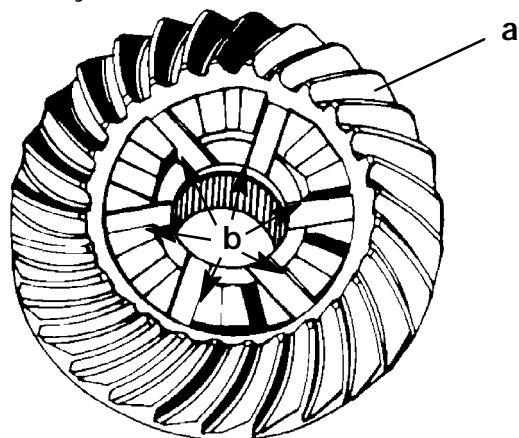




Forward Gear Assembly

COMPONENT INSPECTION

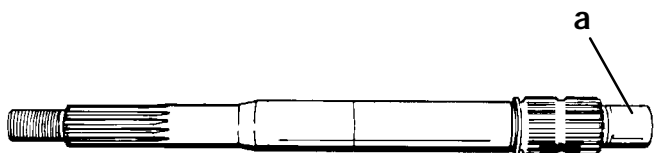
1. Clean the forward gear assembly and the forward gear bearing cup with a suitable solvent and dry with compressed air. Be careful not to spin the bearings.
2. Inspect the gear for pitting, chipped or broken teeth, hairline fractures, and excessive or uneven wear. **Replace the forward gear and the pinion gear as a set** 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 both the forward and pinion gear as a set** if any of these conditions exist.



23351

- a - Forward Gear Teeth
- b - Clutch Jaws

4. Inspect the needle bearings on the inside of the forward gear and the bearing surface on the propeller shaft. If either the needle bearing 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 forward gear as outlined in the next section.



23355

- a - Forward Gear Needle Bearing Contact Area

5. Inspect the tapered roller bearings on the forward gear and the bearing surface on the forward gear bearing cup. If either the roller bearings or the bearing surface of the forward gear bearing cup is pitted, grooved, scored, worn unevenly, discol-

ored from overheating, or has embedded particles, replace the forward gear bearing cup and remove and replace the tapered roller bearings as outlined in the next section.

FORWARD GEAR ASSEMBLY - Component Disassembly

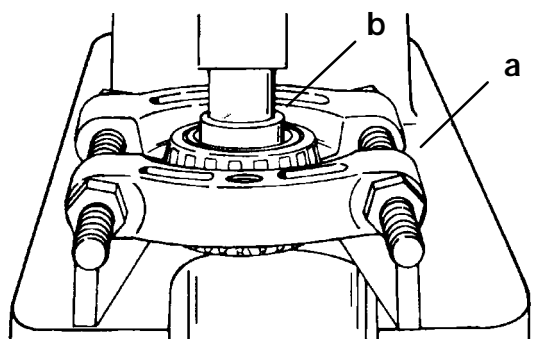
NOTE: Forward gear can only be removed from gear housing after drive shaft and pinion gear have been removed.

1. Reach into gear housing and lift out forward gear.

IMPORTANT: DO NOT remove tapered bearing or needle bearings from forward gear unless replacement of bearings is required. (Bearings cannot be reused after they have been removed.)

2. If inspection determines that replacement of forward gear tapered bearing is required, separate gear from bearing as follows:
 - a. Install Universal Puller Plate (91-37241) between forward gear and tapered bearing.
 - b. Place assembly on press and press gear out of bearing with suitable mandrel.

NOTE: Tapered bearing and race **MUST BE** replaced as a set.



51870

- a - Universal Puller Plate (91-37241)
- b - Mandrel

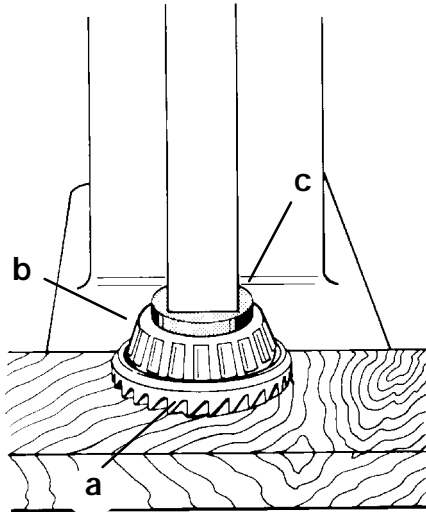
3. If inspection determines that replacement of propeller shaft needle bearings is required, remove bearing as follows:
 - a. Clamp forward gear in a soft jaw vise securely.
 - b. From toothed-side of gear, drive propeller shaft needle bearings out of gear with a punch and hammer.



FORWARD GEAR ASSEMBLY - Component Reassembly

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

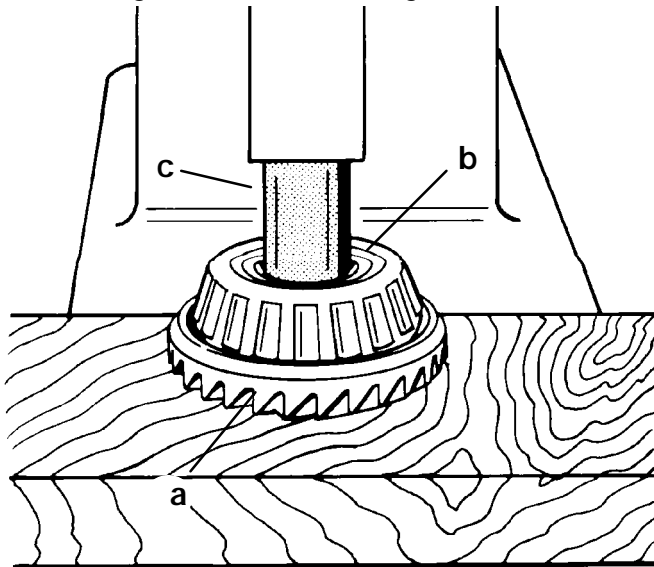
- Using a suitable mandrel, press the tapered roller bearing onto the forward gear by pressing on the inner bearing race, until the bearing bottoms out on the gear mounting shoulder.



23353

- a - Forward Gear
- b - Tapered Roller Bearing
- c - Suitable Mandrel (or Inner Race from old Bearing)

- Using the needle bearing driver, press the needle bearing, with the lettered side facing away from the gear teeth, into the forward gear until the bearing bottoms inside the gear.



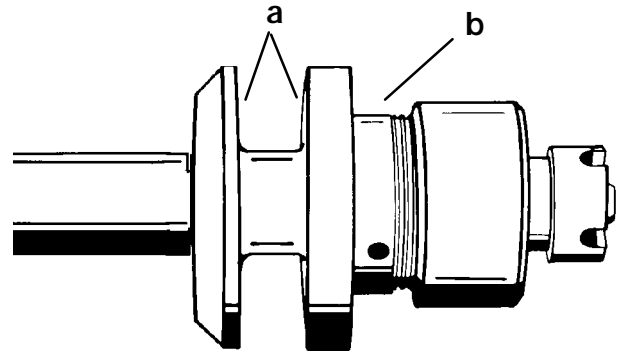
23350

- a - Forward Gear
- b - Needle Bearing (not seen)
- c - Needle Bearing Driver (91-33491)

Shift Spool Assembly

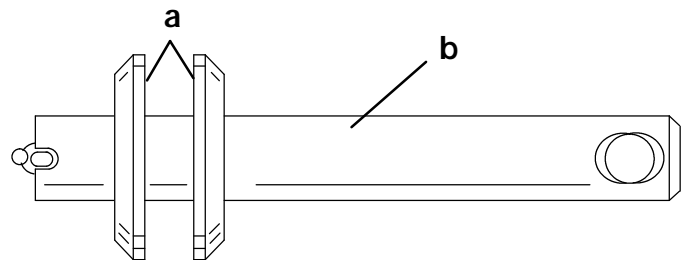
INSPECTION

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



23356

- a - Contact Area
- b - Ratcheting Shift Spool

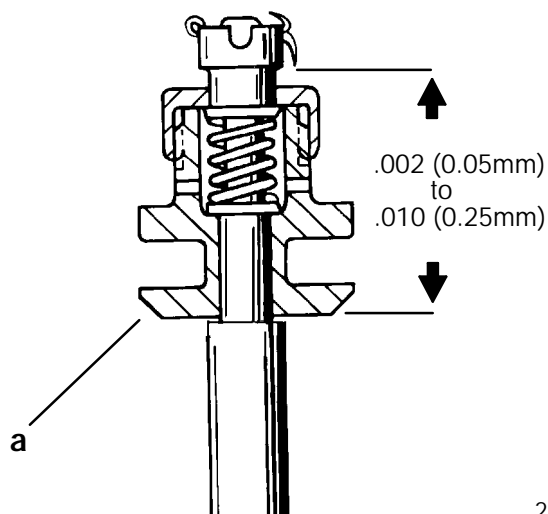


55694

- a - Contact Area
- b - Non-Ratcheting Shift Spool

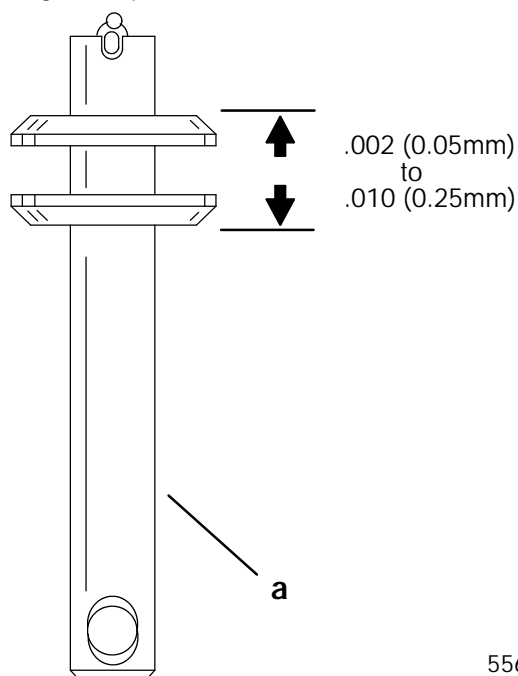


4. Inspect to insure that the spool spins freely (it may be helpful to lightly tap the forward [castle nut] end of the shift shaft against a firm surface to align the internal parts).
5. Inspect to insure that both ratcheting and non-ratcheting spools have 0.002-0.010 in. (0.05-0.25 mm) end play. This end play may be achieved by turning the castle nut (clockwise) down on either spool until it is snug and then backing off the nut (counterclockwise) to the first cotter pin slot.



23142

a - Ratcheting Shift Spool



55694

a - Non-Ratcheting Shift Spool

NOTE: Non-Ratcheting shift spools do not contain a spring under the castle nut.

NOTE: If the spool meets the above two criteria skip the disassembly and reassembly section following.

NOTE: If the spool does not meet the above criteria proceed with the disassembly and reassembly section following.

SHIFT SPOOL ASSEMBLY - Component Disassembly

NOTE: Disassembly of the shift spool is for cleaning and inspection of the internal parts 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 spool.
 - c. Clamp the spool in a vice being careful not to damage the spool.
 - d. Remove the retainer by unscrewing it with a pair of pliers.
 - e. Remove the two washers and the spring.

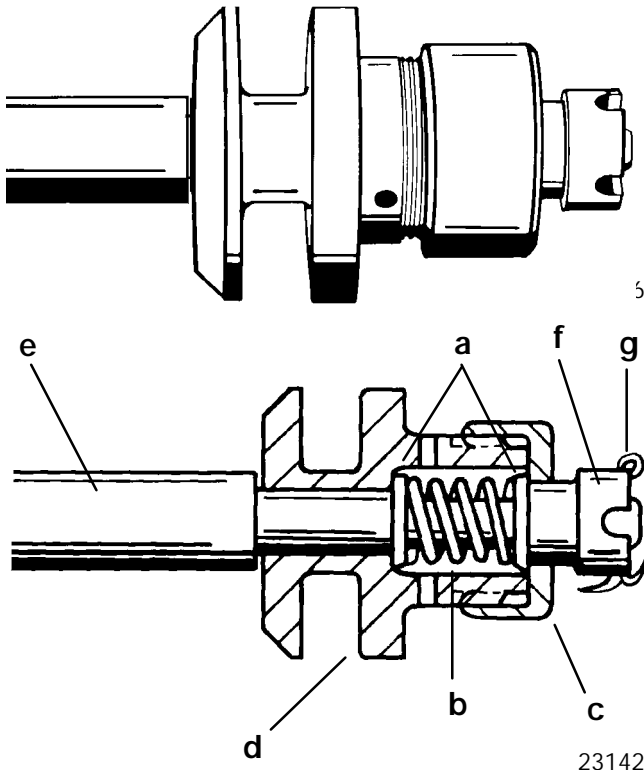
SHIFT SPOOL ASSEMBLY - Component Inspection

1. Clean all components with a suitable solvent and dry them thoroughly with compressed air.
2. Inspect each component for wear or damage. If any components are worn excessively, 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 (RATCHETING) - 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 first washer, then the spring, then the second washer into the shift spool.
 - c. Apply Loctite 271 (92-809820) to the first 3 threads of the spool. Thread the retainer onto the spool and tighten the retainer securely with a pair of pliers.
 - d. Assemble the castle nut and screw it down until it touches the washer and a slight resistance is felt.
 - e. 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.
 - f. Insert a new cotter pin and bend ends of the cotter pin in opposite directions.



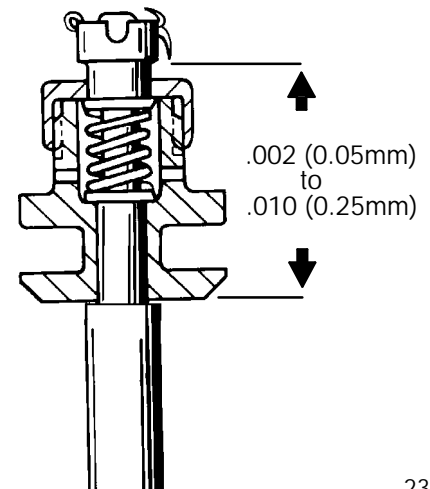
- a - Washers (2)
- b - Spring
- c - Retainer
- d - Spool
- e - Shift Shaft
- f - Castle Nut
- g - Cotter Pin

SHIFT SPOOL ASSEMBLY (RATCHETING) - 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 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 0.002 - 0.010 in. (0.05 - 0.25mm) end play, if it doesn't, adjust the castle nut once again as outlined previously.



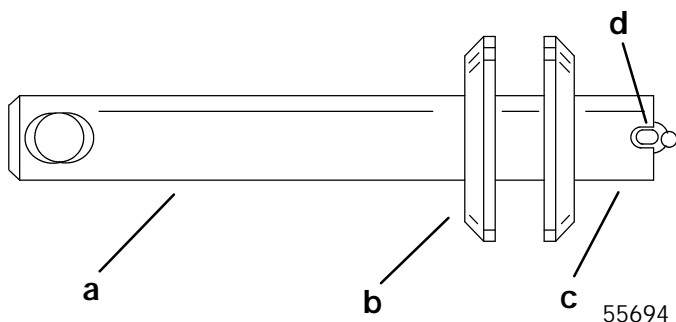
23142

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.



SHIFT SPOOL ASSEMBLY (NON-RATCHETING) - Component Reassembly and Adjustment

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.
 - e. Inspect to insure that the spool has 0.002 - 0.010 in. (0.05 - 0.25mm) end play, if it doesn't, adjust the castle nut once again as outlined previously.



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

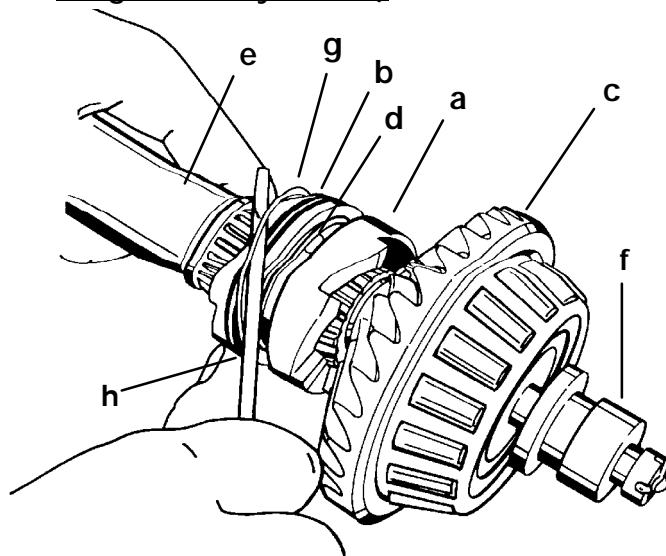
- f. If this adjustment did not produce the desired results it will be necessary to disassemble, clean, and reassemble the shift spool assembly. If the spool assembly has already been disassembled and cleaned it will be necessary to replace the shift spool assembly.

Propeller Shaft Assembly

COMPONENT REASSEMBLY

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

1. Install the sliding clutch on the propeller shaft. Align cross pin holes in the clutch with the slot in the propeller shaft. The grooved end of the clutch should be facing the propeller end of the shaft.
2. Assemble the forward gear assembly to 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.
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 3rd hole in clutch.
6. Assemble the cross pin retaining spring over the propeller end of 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. (Ratcheting Assembly Shown)**



- a - Sliding Clutch
- b - Grooves in Clutch
- c - Forward Gear Assembly
- d - Cross Pin
- e - Propeller Shaft
- f - Spool and Actuating Shaft Assembly
- g - Cross Pin Retaining Spring
- h - Detent Pin

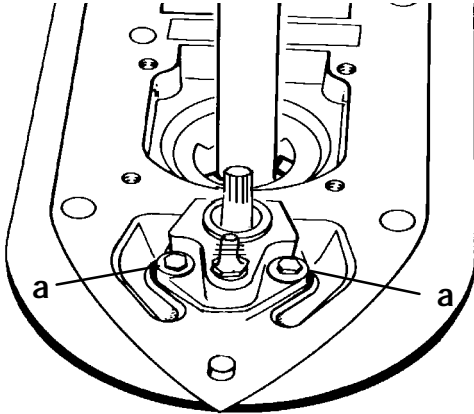


Shift Shaft Assembly

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.

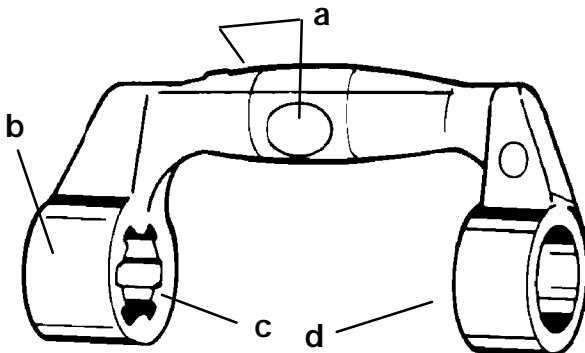
1. Remove the shift shaft bushing screws, and remove the shift shaft and bushing by pulling both straight out of gear housing.



70494

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.

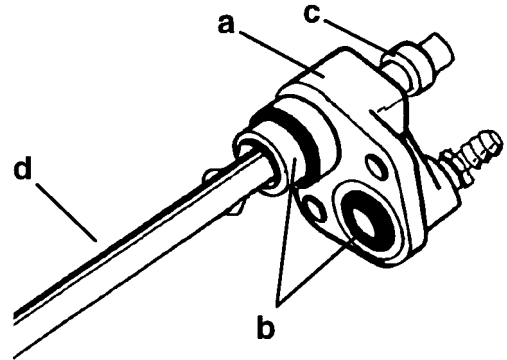


23350

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.

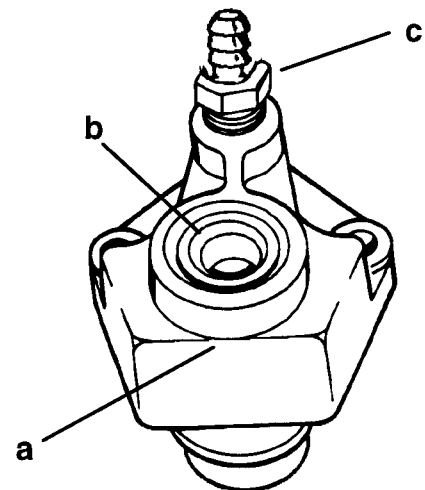


70616

a - Shift Shaft Bushing
 b - O-rings (2)
 c - Coupler
 d - Shift Shaft

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.

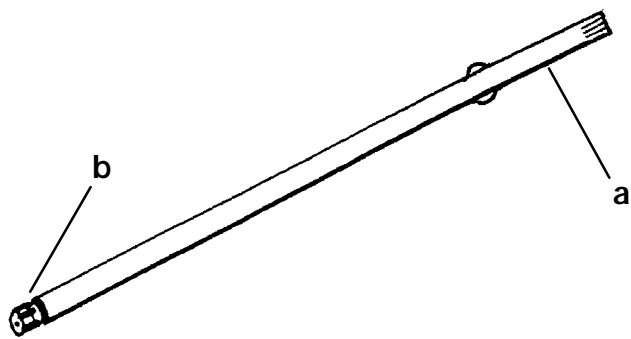


70617

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.

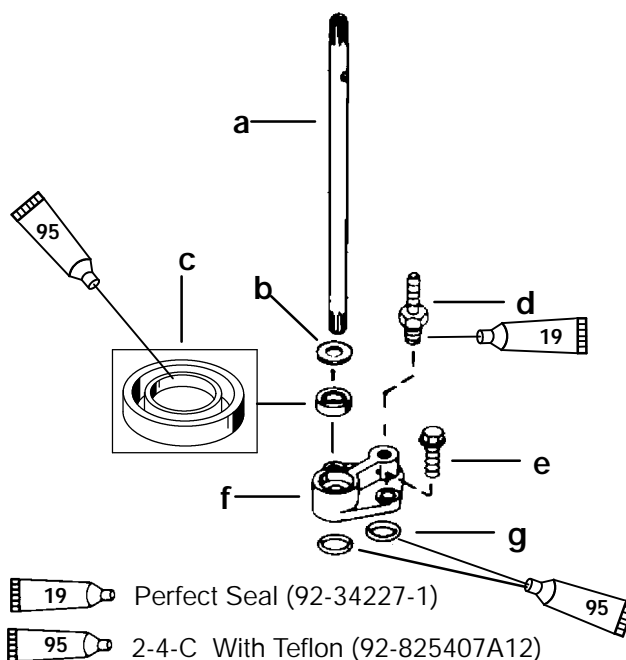


a - Oil Seal Surface
b - Spline

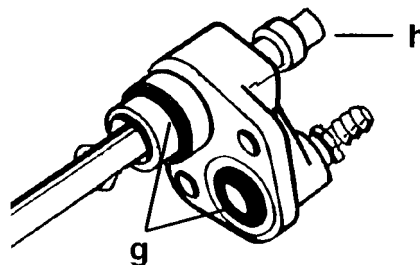
SHIFT SHAFT ASSEMBLY - Component Reassembly

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

1. Lightly lubricate the seats of the O-ring diameters 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. (0.51 N·m).
3. Assemble all components as shown below.



19 Perfect Seal (92-34227-1)
95 2-4-C With Teflon (92-825407A12)



7061€

- a - Shift Shaft
- b - Rubber Washer
- c - Seal (Lip Faces Up)
- d - Speedometer Connector
- e - Bolt (2 ea.) [Torque to 60 lb. in. (6.8 N·m)]
- f - Bushing
- g - O-Rings (2 ea.)
- h - Coupler

NOTE: For reinstalling the shift shaft when none of the other components of the gear housing were disassembled see the "Shift Shaft Assembly", "Installation".



Pinion Bearing

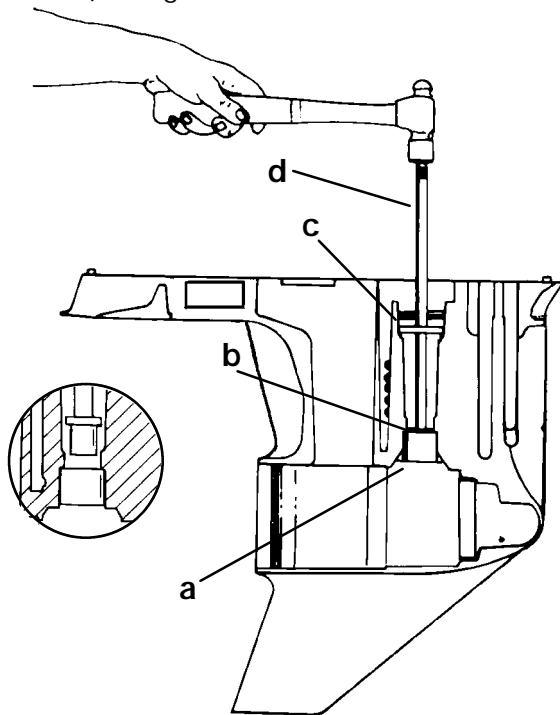
REMOVAL

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.



.0614

- 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. Make sure 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.

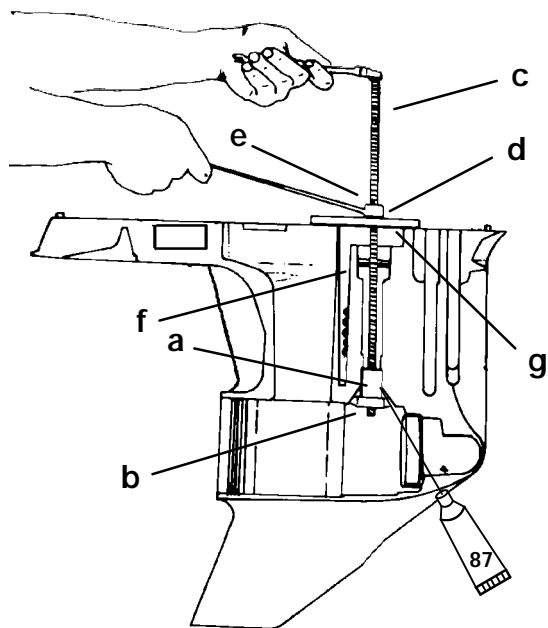


Pinion Bearing

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 Lube (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.



70615

 Quicksilver Gear Lubricant (92-19007A24)

- 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.

Forward Gear Bearing Cup

INSTALLATION

Forward Gear Backlash - .017 in. to .028 in. (0.43mm to 0.71mm)

NOTE: If the forward gear, forward gear bearing and cup, or gear housing were not replaced, install the same quantity of shims that were taken out when cup was removed. If the forward gear, forward gear bearing/cup, or gear housing were replaced, install 0.020 in. (0.51mm) of shims.

NOTE: If backlash has already been checked and it has determined that it needs to be adjusted, (see *Checking Forward Gear Backlash*), adding or subtracting 0.001 in. (0.03mm) shims will **change** the gear backlash by the same amount.

Example 1 (if backlash is too high)

If Forward Backlash Checks:	.040 in.	(1.02mm)
(Subtract):	.018 in.	(0.46mm)
Add This Quantity of Shims:	.022 in.	(0.56mm)
Provides Backlash of 0.018		(0.46mm)

Example 2 (if backlash is too low)

Backlash Checks:	.010 in.	(0.25mm)
Subtract this Quantity of Shims:	.008 in.	(0.30mm)
Provides Backlash of 0.018		(0.46mm)

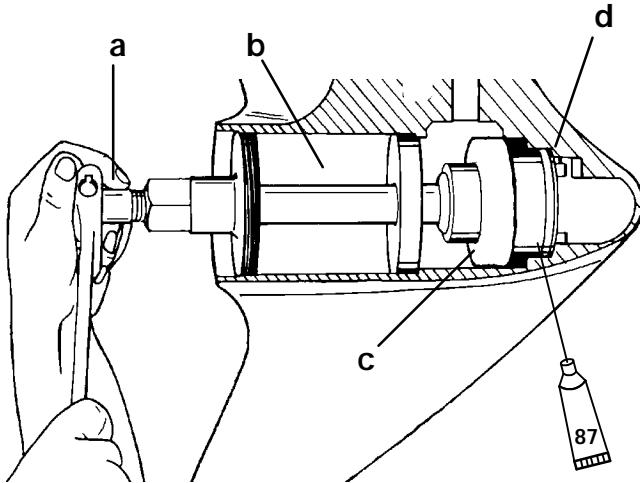
1. Lubricate the bore into which the forward gear bearing cup is to be installed with Quicksilver Gear Lube (92-19007A24).
2. Place the shim(s) into forward bore of gear housing.



- Press the bearing cup into the gear housing using the installation tool as follows:

NOTE: Ratcheting type gear cases use bearing cup driver 91-36577. Non-ratcheting gear cases use bearing cup driver 91-31106.

IMPORTANT: Verify that the bearing cup is position as straight as possible to avoid cocking it in the bore while pressing it in.



50791

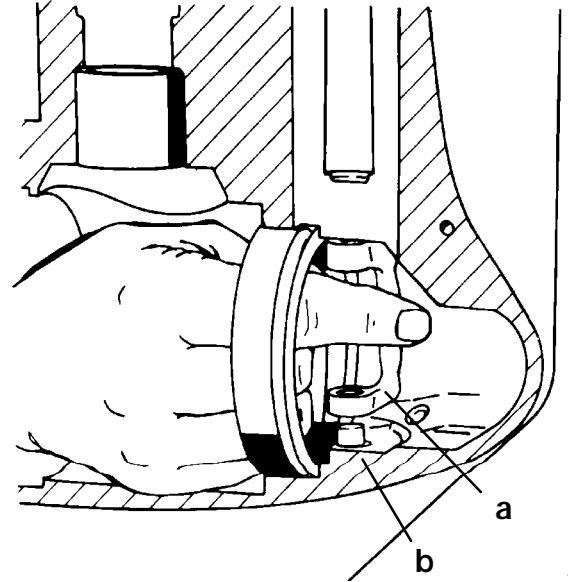
Quicksilver Gear Lubricant (92-19007A24)

- a - Hex-Head Screw
- b - Bearing Cup Installation Tool (91-18605A1)
- c - Driver Cup (91-36577) for ratcheting type gear cases.
Driver Cup (91-31106) for non-ratcheting type gear cases.
- d - Shims

Shift Shaft Assembly

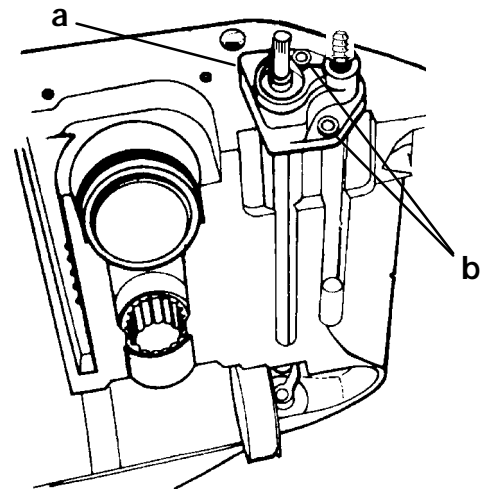
INSTALLATION

- 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.



- a - Shift Crank
- b - Locating Pin

- 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-rings are positioned properly and lubricated with 2-4-C w/Te-flon. Secure shift shaft bushing with 2 screws. Torque screws to 60 lb. in. (6.8 N.m).

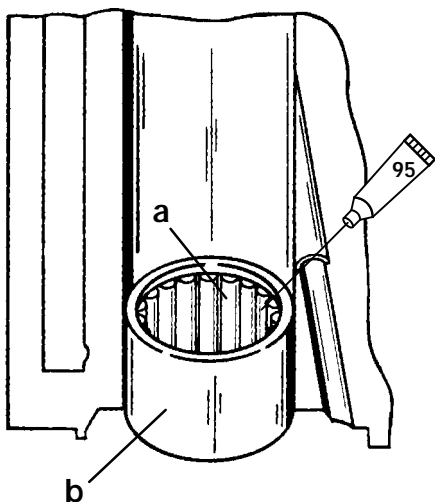


70620

- a - Shift Shaft Assembly
- b - Screws [Torque to 60 lb. in. (6.8 N-m)]



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.



23142

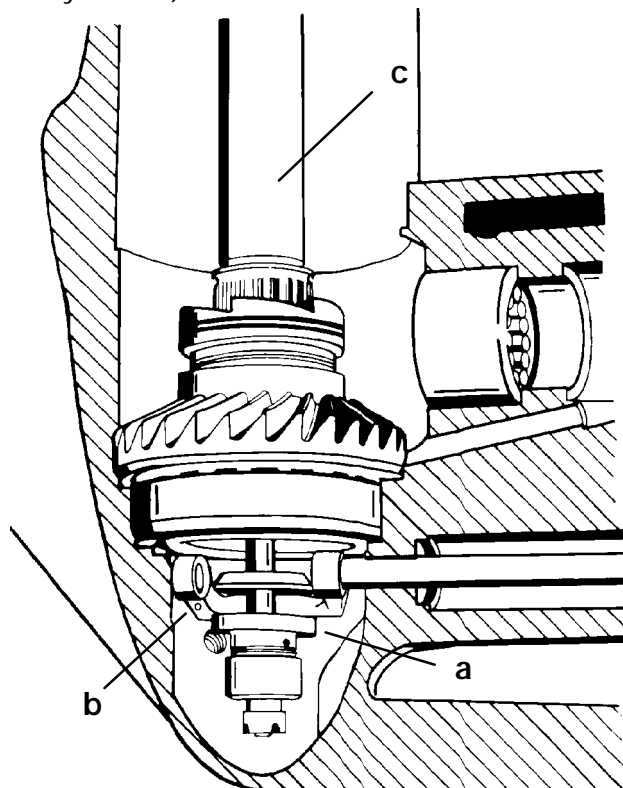
 95 2-4-C With Teflon (92-825407A12)

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

Propeller Shaft Assembly

INSTALLATION

1. 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 rotate the shift shaft from reverse to neutral while installing shaft (ratcheting assembly shown).



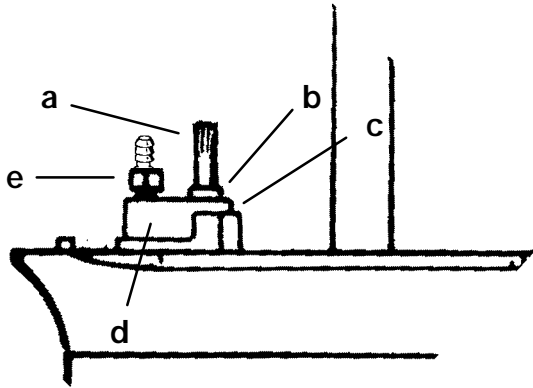
23343

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

2. 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.



- Slide the rubber sleeve at top end of shift shaft down so that it just touches the oil seal in the bushing.



- a - Shift Shaft
- b - Rubber Sleeve
- c - Oil Seal
- d - Shift Shaft Bushing
- e - Speedometer Connector

NOTE: Secure the speedometer tube to the speedometer connector with a sta-strap.

2

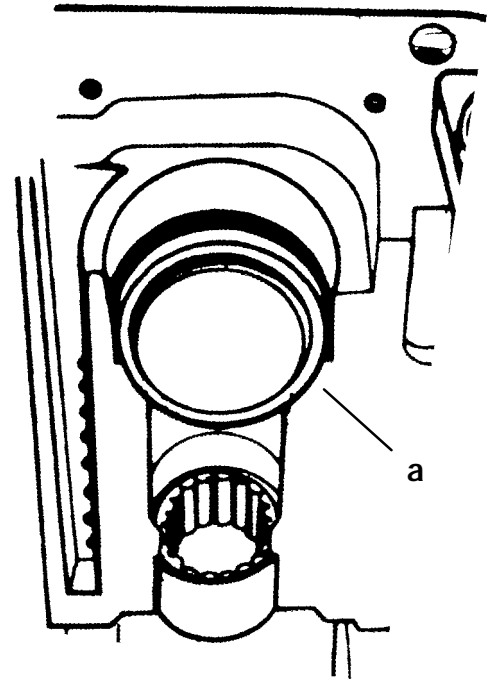
Drive Shaft and Pinion Gear

INSTALLATION

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

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.

- Place the shim(s) into the drive shaft housing bore.



/U620

- 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.

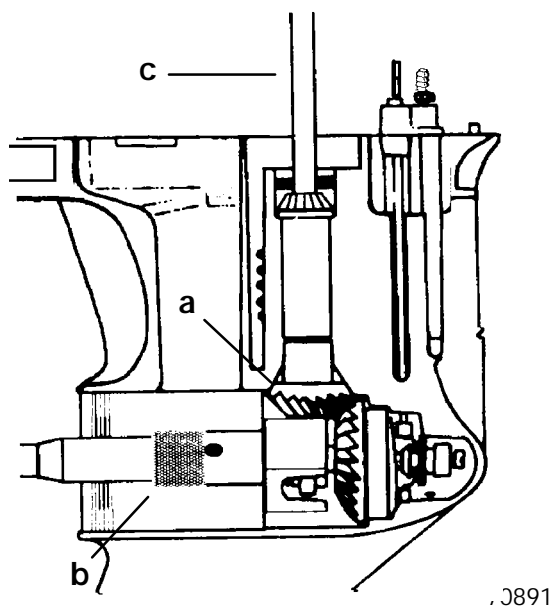
NOTE: If the backlash may have to be changed, it is recommended that Loctite 271 NOT be applied to the pinion nut UNTIL the backlash setting is finalized. DO NOT reuse the old pinion nut. Install a NEW pinion nut after backlash is finalized.

- 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.

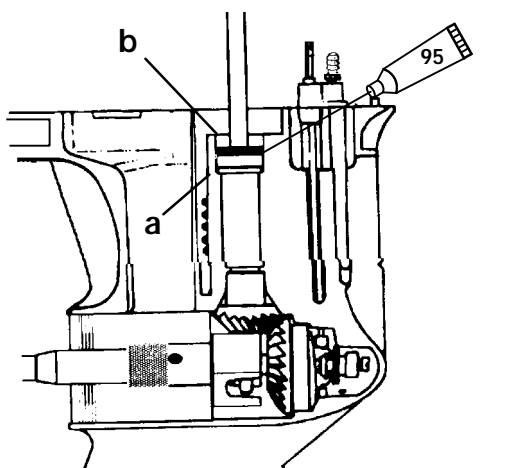


3. Place the pinion gear and washer into the gear housing.
4. Insert the pinion nut adaptor (with the nut) into the gear housing.
5. Insert the drive shaft into the gear housing drive shaft bore. It may be necessary to rotate the drive shaft to engage the drive shaft splines into the pinion gear splines.
6. Start the pinion nut onto the drive shaft threads by rotating the drive shaft until the nut is snug.



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

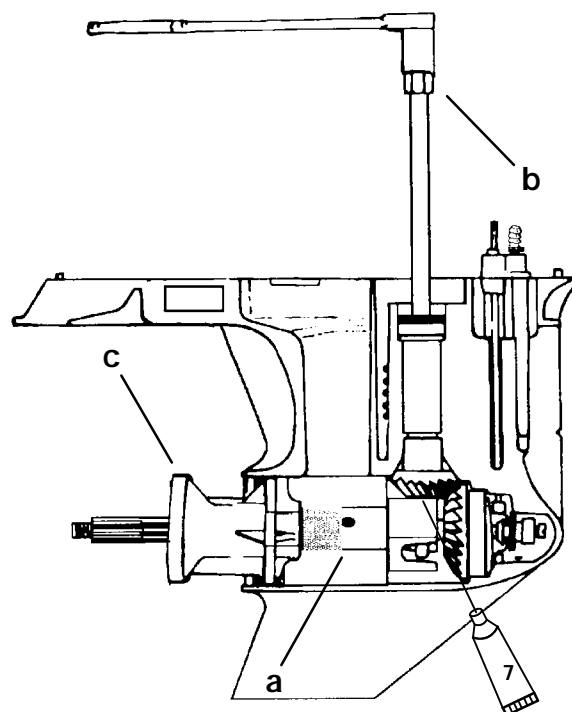
7. Install the drive shaft tapered roller bearing cup. Apply 2-4-C w/Teflon to the retainer threads and install the retainer.



 2-4-C With Teflon (92-825407A12) 70890

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

8. Install the bearing carrier into the gear housing backwards to hold the propeller shaft and the pinion nut adaptor in position.
9. Torque the pinion nut to 75 lb. ft. (101.7 N·m) by turning the drive shaft using the drive shaft nut wrench and torque wrench.

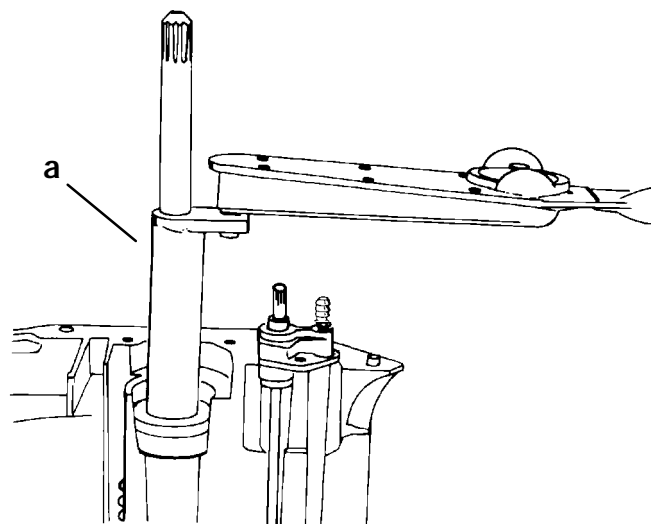


 Loctite 271 (92-809820)

70892

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

10. Torque the retainer to 100 lb. ft. (136.0 N·m).



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

11. Remove the bearing carrier, pinion nut adaptor and drive shaft nut wrench.

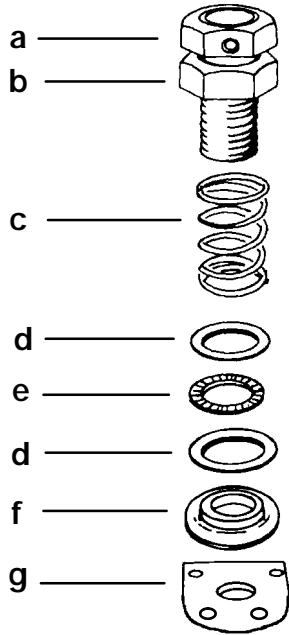


Gear Location/Backlashes Checking and Adjustment

Drive Shaft - Bearing Preload Tool

INSTALLATION

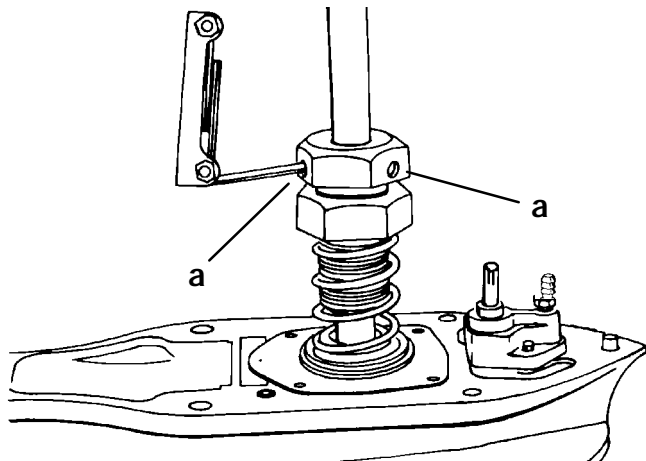
1. Install the components from the Bearing Preload Tool Kit (91-14311A1), over the drive shaft in the order shown.



70496

- 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)

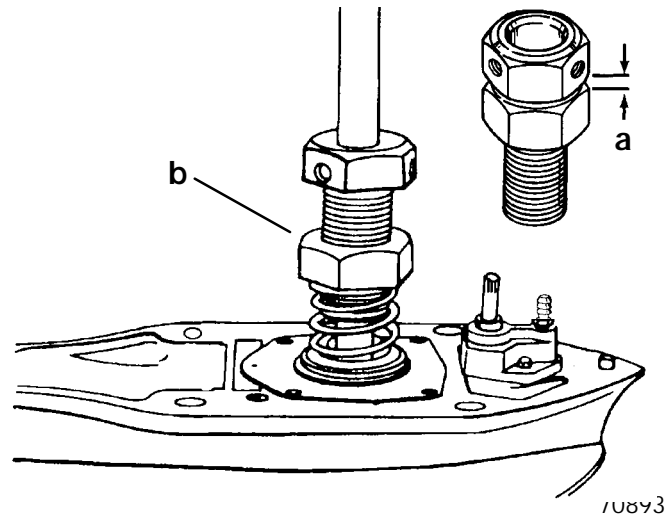
2. Pull up on the drive shaft and tighten the two (2) allen screws in the top nut of the bearing preload tool.



70716

- a - Allen Screws

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



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

4. Rotate the drive shaft at least three full turns in a clockwise direction.

Pinion Gear Location

CHECKING AND ADJUSTING

Pinion Depth - .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 forward 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.

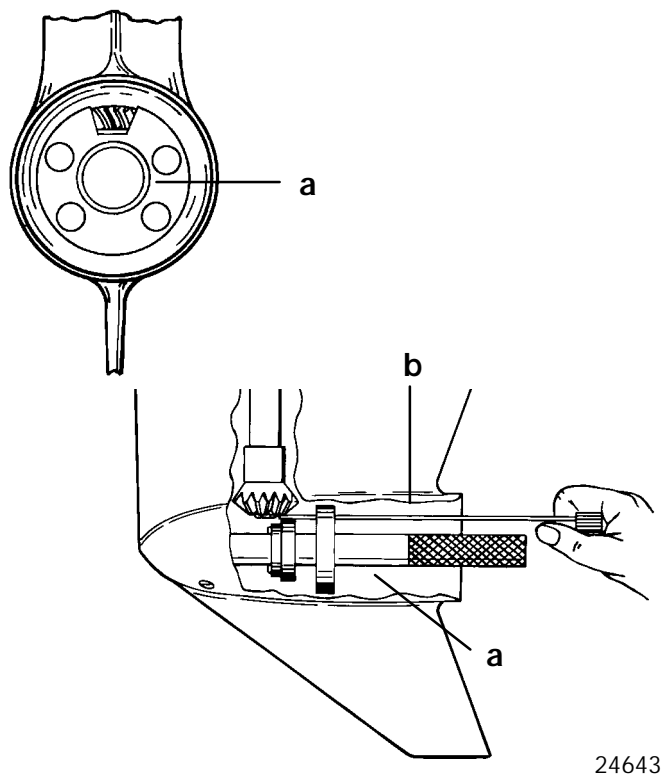
NOTE: Take the following measurements at 3 locations, rotating the drive shaft 120 degrees between each reading (always rotate the drive shaft in a clockwise direction).

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).

- 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. (135.6 N·m). 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

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

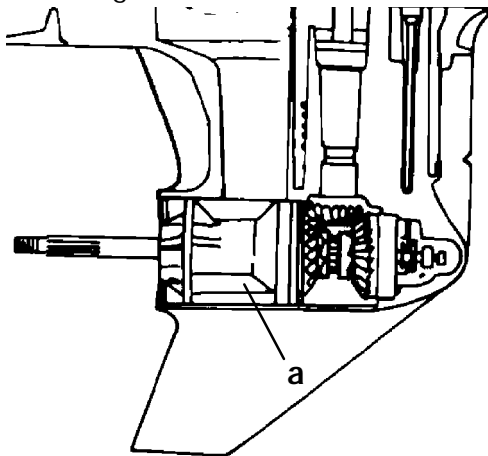
- When the correct pinion gear height is achieved, remove pinion nut and apply Loctite 271 to nut threads IF FORWARD GEAR and PROP SHAFT ARE INSTALLED. Reinstall pinion nut and torque to 75 lb. ft. (101.7 N·m).

Bearing Carrier Assembly

INSTALLATION - (FOR CHECKING BACKLASHES)

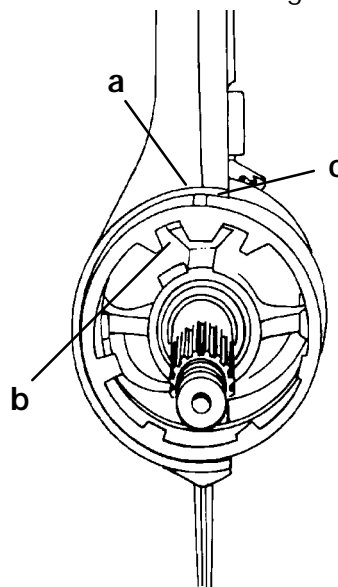
NOTE: If backlashes have already been checked and they are to specification proceed with "Bearing Carrier Assembly", 'Final Installation' section found on page 6A-50.

- Place the bearing carrier assembly into the gear housing. It may be necessary to turn the drive shaft to align the teeth of the pinion and the reverse gears.



70712

- a - Bearing Carrier Assembly
- 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.

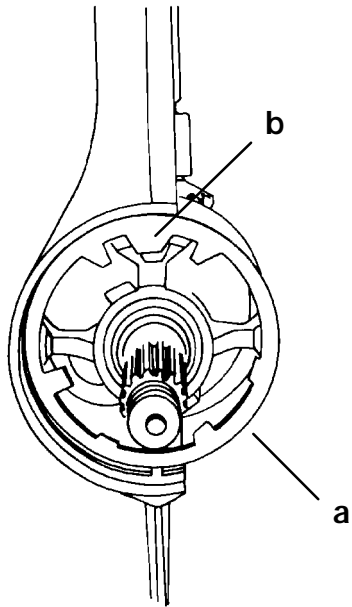


70713

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



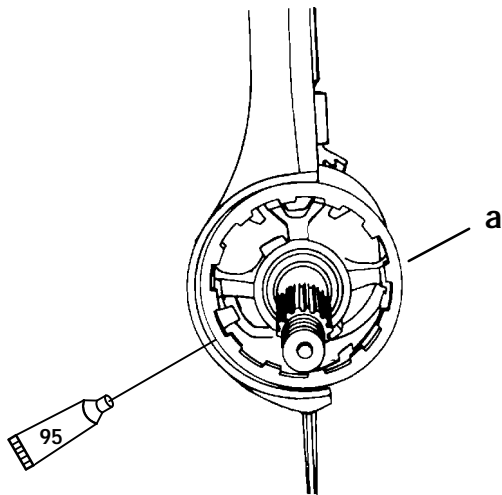
3. Verify that the "V" shaped tab aligns with the "V" notch in bearing carrier.



70714

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

4. 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.



70715

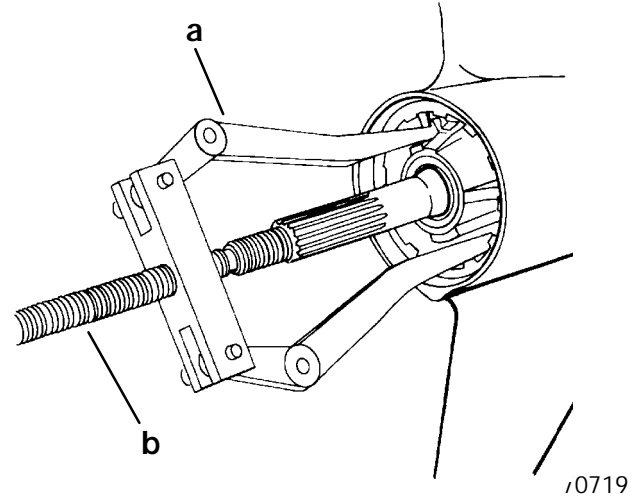
 95 2-4-C With Teflon (92-825407A12)

- a - Bearing Carrier Retainer

Forward Gear Backlash

CHECKING

1. Apply forward pressure to propeller shaft as follows:
 - a. Attach puller jaws and puller bolt onto bearing carrier bosses and propeller shaft.



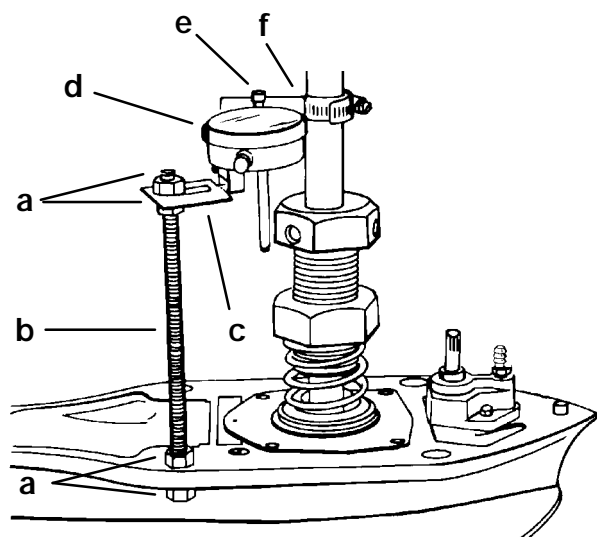
- a - Puller Jaws (91-46086A1)
- b - Puller Bolt (91-85716)

- b. Torque the puller bolt to 45 lb. in. (5.1 N·m). Rotate drive shaft three full turns clockwise and retorque the bolt to 45 lb. in. (5.1 N·m).

NOTE: If the bearing preload tool has not already been set up, see "Drive Shaft - Bearing Preload Tool", 'Installation' section found on page 6A-45 first.



2. Install a dial indicator and align the dial indicator pointer so that it is perpendicular to and touching the "1" 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.



70717

- 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 1.64:1 or 1.75:1)
Backlash Indicator Rod (91-78473) (for 1.87:1 ratio)

3. Take the backlash readings by lightly turning the drive shaft back and forth, (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, which should be 0.017 in. - 0.028 in. (0.431mm - 0.711mm) (for 1.64:1; 1.75:1 and 1.87 ratios).

5. If backlash is LESS than the specified minimum, REMOVE shim(s) from in front of forward gear bearing race to obtain correct backlash. When re-installing pinion nut, apply Loctite 271 to threads of nut.
6. If backlash is MORE than the specified MAXIMUM, add shim(s) in front of forward gear bearing race to obtain correct backlash. When re-installing 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).

Reverse Gear Backlash

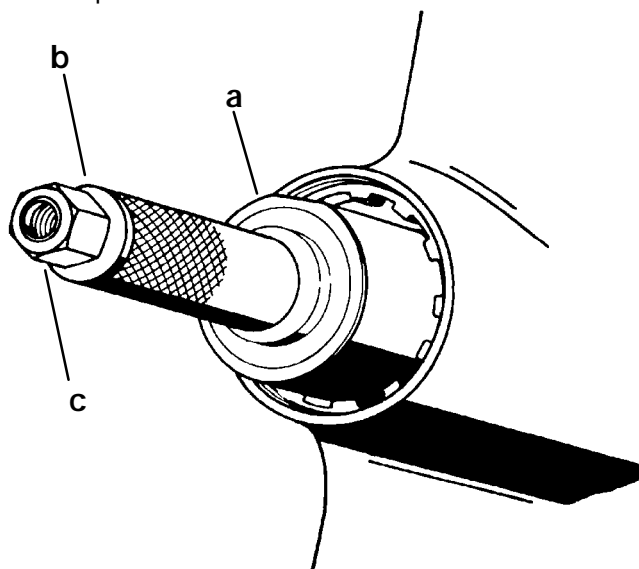
CHECKING

Reverse Gear Backlash - 0.030 in. to 0.050 in. (0.76mm to 1.27mm)

Although reverse gear backlash is not adjustable, it may be checked as follows:

NOTE: Torque cover nut to 210 lb. ft. (284.7 N·m).

1. Apply backward pressure on the propeller shaft as follows:
 - a. Install the pinion nut adaptor, washer and propeller nut as shown.

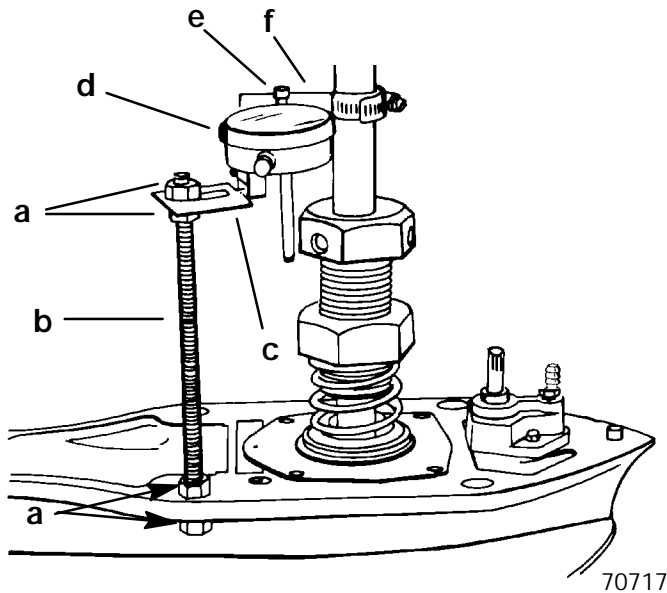


- a - Pinion Nut Adaptor (91-61067A2)
- b - Washer (12-54048)
- c - Prop Nut

55



- b. Torque the propeller nut to 45 lb. in. (5.1 N·m). Rotate the drive shaft 3 full turns in a clockwise direction and retorque the propeller nut to 45 lb. in. (5.1 N·m).
2. Install a dial indicator and align the dial indicator pointer so that it is perpendicular to and touching the "1" 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.



- a - Nuts (4) (obtain locally)
- b - Threaded Rod [3/8 in. (9.5 mm) obtain locally]
- c - Dial Indicator Holding Tool (91-83155)
- d - Dial Indicator (91-58222A1)
- e - Indicator Pointer
- f - Backlash Indicator Rod (91-53459) (for 1.64:1 or 1.75:1)
- g - 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 0.030 in. - 0.050 in. (0.76mm - 1.27mm) (for 1.64:1; 1.75:1 and 1.87:1 ratios).

If backlash is not as indicated, gear case is not properly assembled or parts are excessively worn and must be replaced before returning gear case to service.

5. 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.**

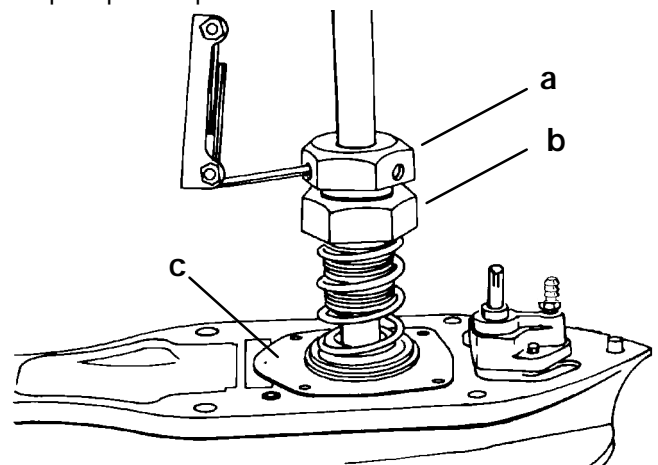
Drive Shaft - Bearing Preload Tool

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 including the water pump face plate.



70716

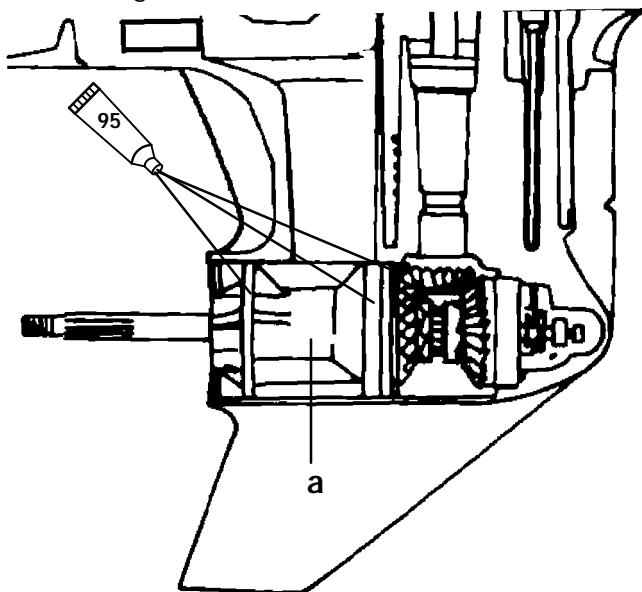
- a - Top Nut (with allen screws)
- b - Bottom Nut
- c - Water Pump Face Plate



Bearing Carrier Assembly

Final Installation

1. Remove the Bearing Carrier and lubricate the following as specified:
 - a. Lubricate the carrier O-ring with 2-4-C w/Teflon (92-825407A12).
 - b. Lubricate both the forward and aft outer diameters of the bearing carrier and gear case area where carrier will seat with 2-4-C w/Teflon.
 - c. Fill the space between the carrier oil seals with 2-4-C w/Teflon.
2. Place the bearing carrier assembly into the gear housing. It may be necessary to turn the drive shaft to align the teeth of the pinion and the reverse gears.

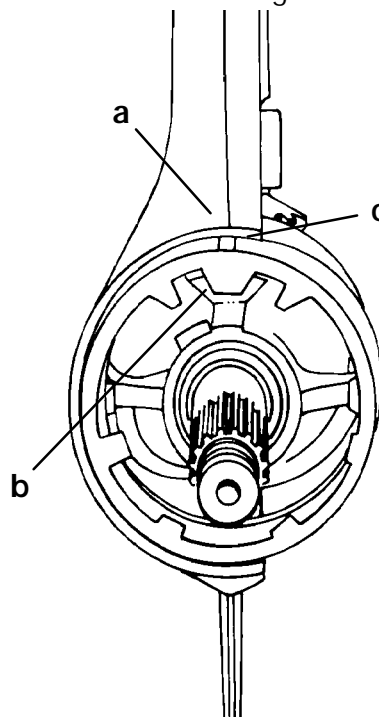


70712

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

a - Bearing Carrier Assembly

3. 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.

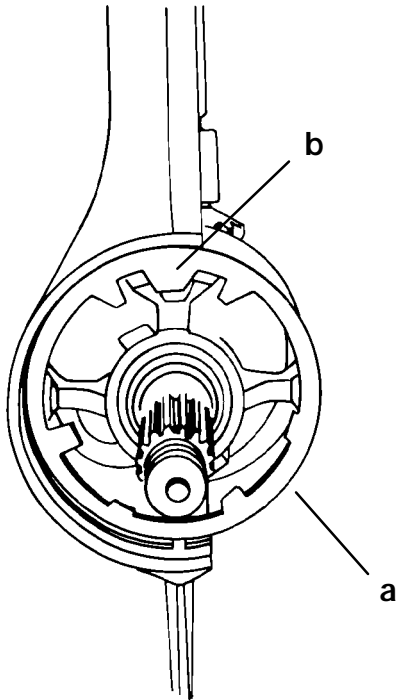


70713

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



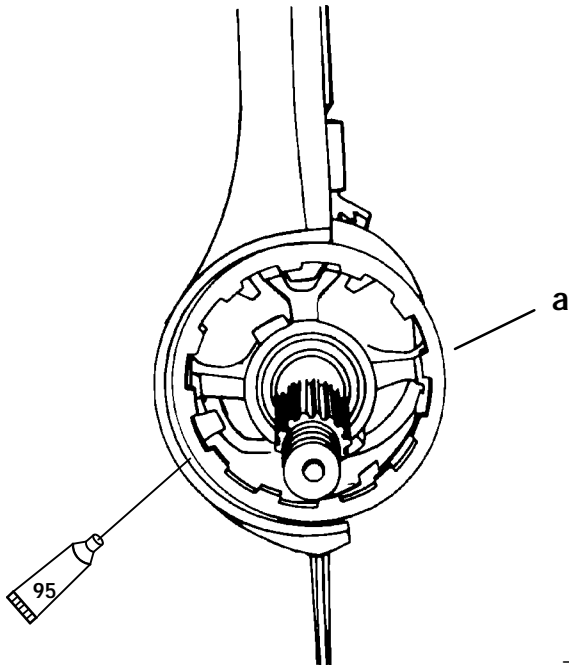
- Verify the "V" shaped tab aligns with the "V" notch in bearing carrier.



70714

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

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



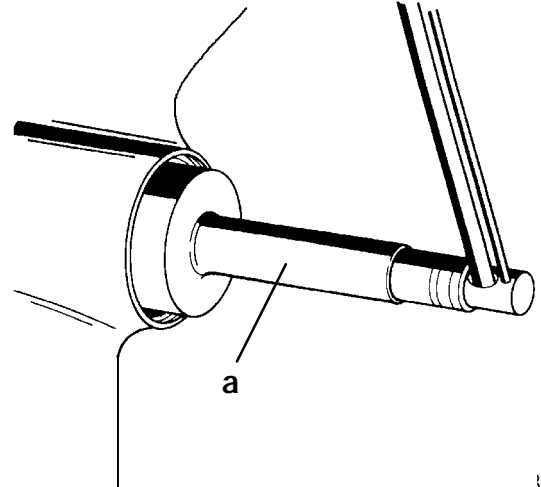
70715

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

- 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.

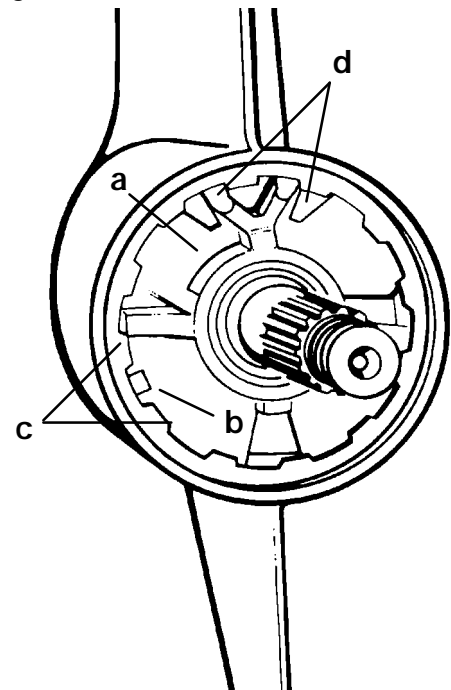
- Torque the bearing carrier retainer to 210 lb. ft. (284.7 N·m). If one tab does not align up in space between two of the notches, continue to tighten retainer until alignment is achieved. **DO NOT** loosen retainer to achieve alignment.



2J355

- a - Bearing Carrier Retainer Wrench (91-61069)

- 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)

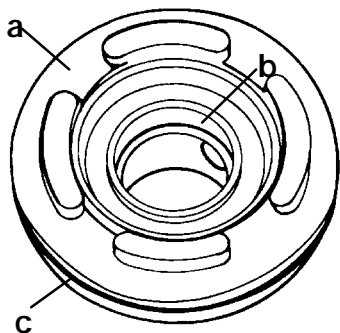


Oil Seal Carrier Assembly

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

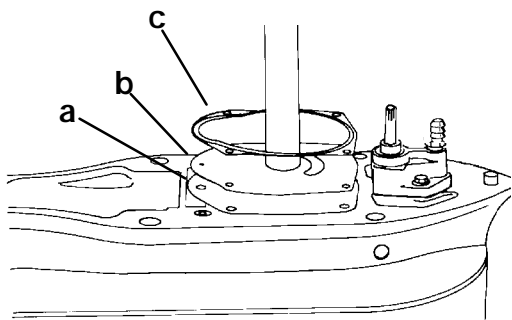
- a - Oil Seal Carrier
- b - Oil Seal Lips
- c - O-ring

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.



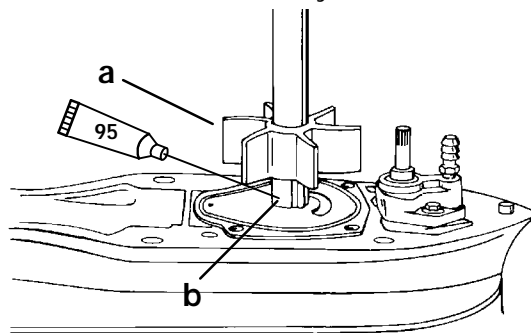
70720

- a - Small Hole gasket
- b - Face Plate
- c - Large Hole Gasket

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.

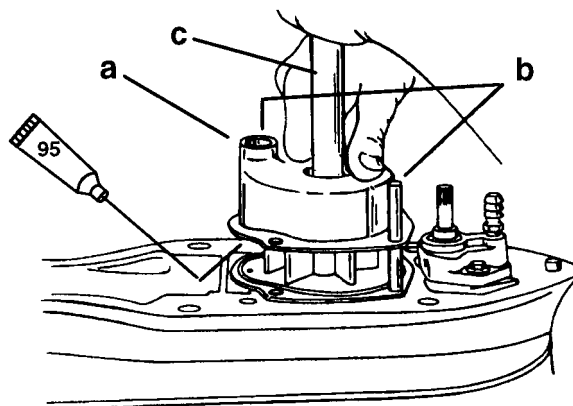


52725

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

- 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.



52751

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

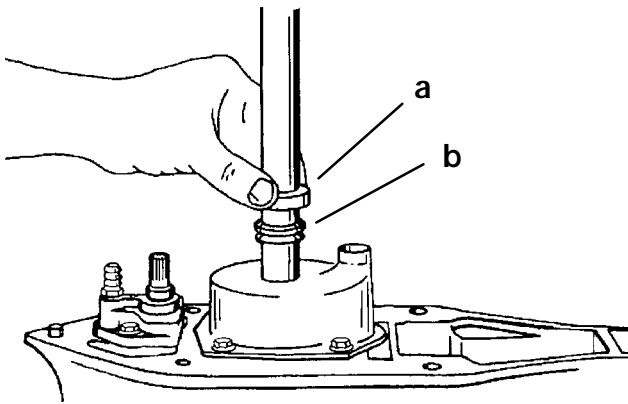
- a - Water Pump Body
- b - Water Pump Alignment Pins (91-821571A1)
- c - Drive Shaft (turn clockwise while installing water pump body)



- 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. (6.8 N·m).
- Lightly lubricate the O-rings in the water tube coupling with 2-4-C w/Teflon (92-825407A12).
- Install the water tube coupling assembly to the water pump ensuring that the O-rings are not damaged during assembly.

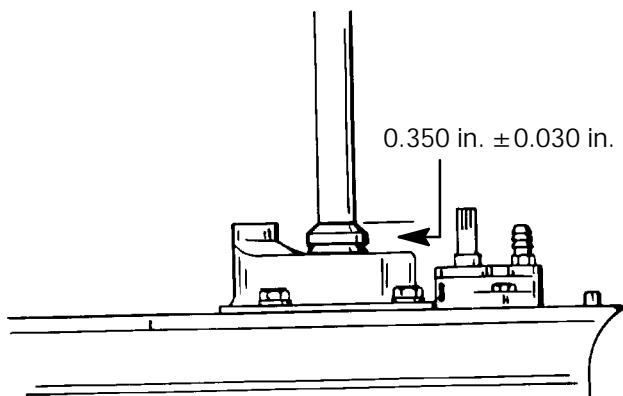
IMPORTANT: If seal installed above pump housing is not at the proper height, air will be drawn into the pump resulting in overheating of the engine.

- 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.



52724

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.



52726

NOTE: Secure speedometer tube to speedometer connector with a sta-strap.

Gear Lubricant Filling Instructions

- Inspect "Fill" and "Vent" sealing washers for cuts or abrasions. Replace O-rings if necessary.
- Clean any metal debris from magnet on "Fill" plug.

IMPORTANT: Never add 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.

- 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.
- Install "Vent" screw into "Vent" hole.

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

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

Installing Gear Housing to Drive Shaft Housing

⚠ WARNING

Disconnect high tension leads from spark plugs and remove spark plugs from engine before installing gear housing into drive shaft housing.

- Tilt engine to full up position and engage the tilt lock lever.
- Apply a light coat of 2-4-C w/Teflon onto drive shaft splines.

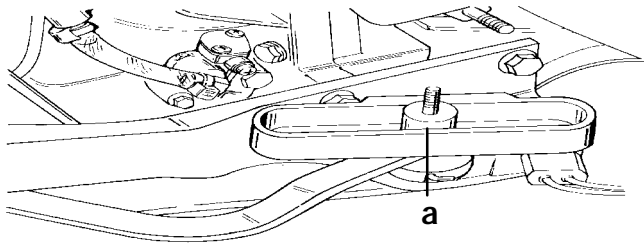
⚠ CAUTION

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

- Apply a light coat of 2-4-C w/Teflon onto shift shaft splines. (DO NOT allow lubricant on top of shift shaft.)



4. Insert a NEW trim tab bolt (with patch) into hole in rear of gear housing to drive shaft housing machined surface.
5. Shift gear housing into NEUTRAL and place guide block anchor pin into NEUTRAL position.



52189

a - Guide Block Anchor Pin

6. Position gear housing so that the drive shaft is protruding into drive shaft housing.
7. Feed speedometer tube through opening in drive shaft housing.

NOTE: If, while performing Step 8, the drive shaft splines will not align with crankshaft splines, have helper rotate flywheel slightly to align drive shaft splines with crankshaft.

8. Move gear housing up toward drive shaft housing while aligning shift shaft splines and water tube.
9. Place flat washers onto studs (located on either side of drive shaft housing). Start a nut on these studs and tighten finger-tight.
10. Start bolt at rear of gear housing inside trim tab recess. DO NOT tighten bolt at this time.
11. Recheck shift shaft spline engagement and correct if necessary.

IMPORTANT: Do not force gear case up into place with attaching nuts.

12. Evenly tighten 2 nuts which were started in Step 9. Torque to 55 lb. ft. (74.6 N·m).
13. After 2 nuts (located on either side of drive shaft housing) are tightened, check shift operation as follows:
 - a. Place guide block anchor pin into forward gear position. Rotate flywheel clockwise (viewed from top); propeller shaft should rotate clockwise.
 - b. Place guide block anchor pin into NEUTRAL position. Propeller shaft should rotate freely clockwise/counterclockwise.
 - c. Place guide block anchor pin into REVERSE gear position. Rotate flywheel clockwise (viewed from top); propeller shaft should rotate counterclockwise.

IMPORTANT: If shifting operation is not as described, preceding, the gear housing must be removed and the cause corrected.

14. Install remaining washers and nuts onto drive shaft studs. Torque to 55 lb. ft. (74.6 N·m).
15. Torque bolt (started in Step 10) to 45 lb. ft. (61.0 N·m).
16. Position trim tab in gear housing aligning 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. (54.2 N·m)
17. Install plastic cap into trim tab bolt opening at rear edge of drive shaft housing.