LOWER UNIT

Section 6A – Right Hand Non-Ratcheting

Table of Contents

6 A

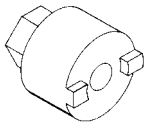
Gear Housing Specifications (Standard Rotation)

Ratio	Pinion Depth	Forward Gear Backlash	Reverse Gear Backlash
1.87:1	0.025 in. (0.635 mm) With Tool 91-12349A2 using Disc #2 and Flat #7	0.018 in. to 0.027 in. (0.460 mm to 0.686 mm) Pointer on line mark #1	0.030 in. to 0.050 in. (0.762 mm to 1.27 mm)
2.00:1	0.025 in. (0.635 mm)With Tool 91-12349A2 using Disc #2 and Flat #7	0.015 in. to 0.022 in. (0.38 mm to 0.56 mm) Pointer on line mark #2	0.030 in. to 0.050 in. (0.762 mm to 1.27 mm)
2.30:1	0.025 in. (0.635 mm)With Tool 91-12349A2 using Disc #2 and Flat #7	0.018 in. to 0.023 in. (0.46 mm to 0.58 mm) Pointer on line mark #4	0.030 in. to 0.050 in. (0.762 mm to 1.27 mm)
Gearcase Lubricant Capacity			
All Ratios		22.5 fl. oz. (665.4 ml)	

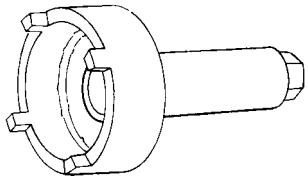
Gear Ratio	Teeth on Pinion Gear	Teeth on Forward and Reverse Gear
1.87:1	15	28
2.00:1	12	24
2.30:1	13	30

Special Tools

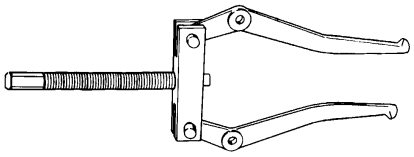
1. Shift Shaft Bushing Tool 91-31107



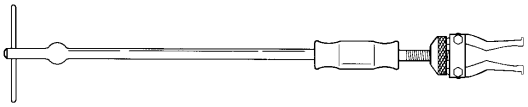
2. Gear Housing Cover Nut Tool 91-61069



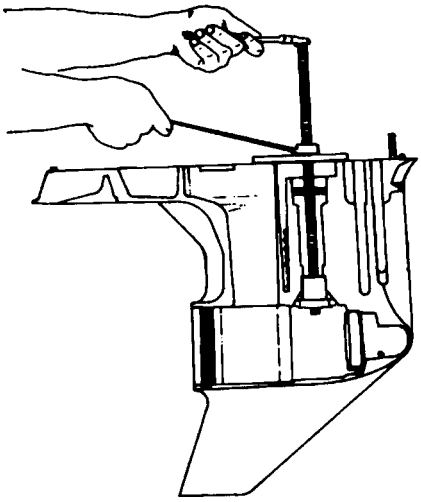
3. Bearing Carrier Removal Tool 91-46086A1 and Puller Bolt 91-85716



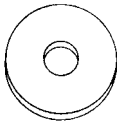
4. Slide Hammer Puller 91-34569A1



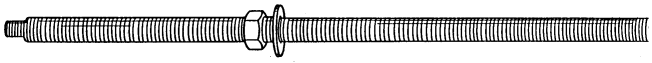
5. Bearing Removal and Installation Kit 91-31229A5. This kit contains the following tools: Pilot 91-36571; Puller Rod 91-31229; Nut 11-24156; Puller Plate 91-29310; Mandrel 91-38628; and Driver Rod 91-37323.



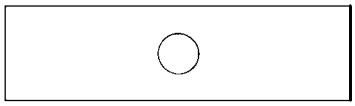
6. Pilot 91-36571



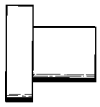
7. Puller Rod 91-31229 and Nut 91-24156



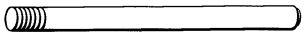
8. Puller Plate 91-29310



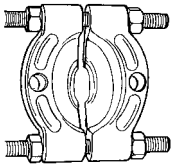
9. Mandrel 91-38628



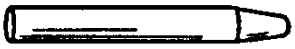
10. Driver Rod 91-37323



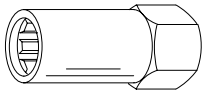
11. Universal Puller Plate 91-37241



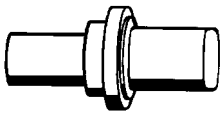
12. Cross Pin Tool 91-86642



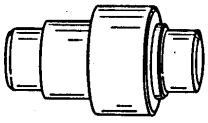
13. Driveshaft Holding Tool 91-34377A1or 91-90094



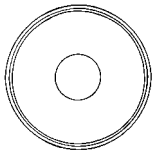
14. Oil Seal Driver 91-31108



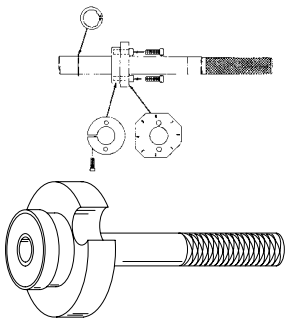
15. Forward Gear Bearing Tool 91-86943



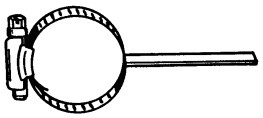
16. Bearing Driver Cup 91-31106



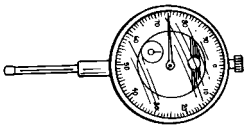
17. Pinion Locating Gear Tool 91-12349A2 or 91-74776



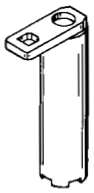
18. Backlash Indicator Rod 91-78473



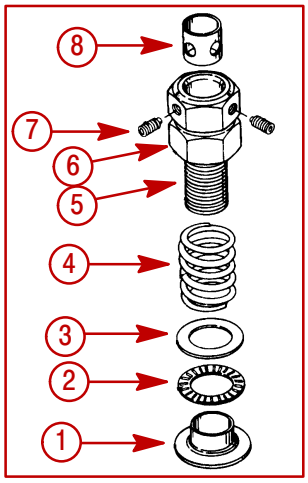
19. Dial Indicator 91-58222A1



20. Bearing Retainer Tool 91-43506



21. Bearing Preload Tool 91-14311A1



1 - Adaptor (N.S.S.)
2 - Bearing (N.S.S.)
3 - Washer (N.S.S.)
4 - Spring (24-14111)
5 - Bolt (10-12580)
6 - Nut (11-13953)
7 - Set Screw (10-12575)
8 - Sleeve (23-13946)

22. Mandrel 91-92788

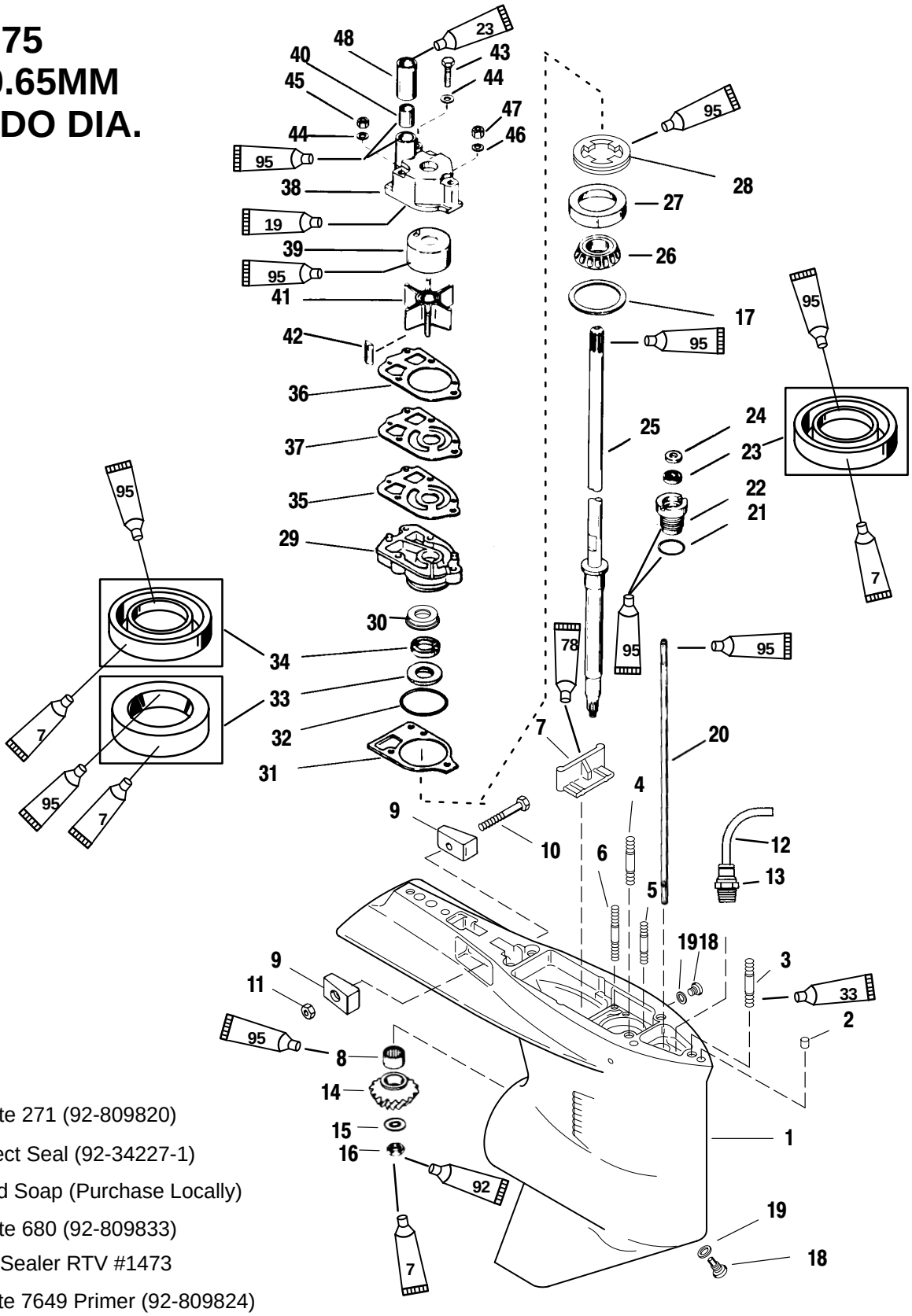
23. Mandrel 91-15755

24. Dial Indicator Holder 91-89897

Notes:

Gear Housing (Drive Shaft)(Standard Rotation)

4.75 IN/120.65MM TORPEDO DIA.

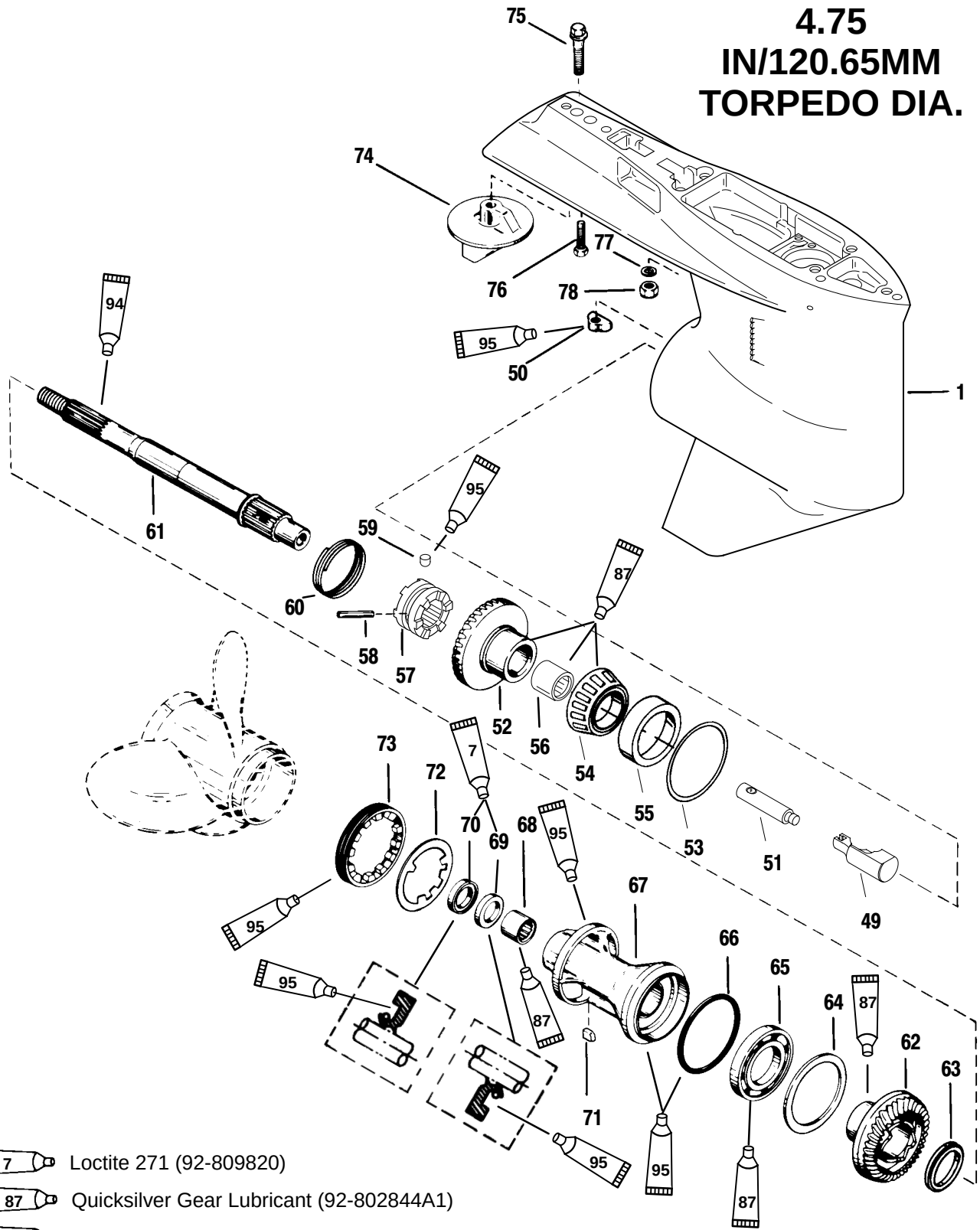


- 7 Loctite 271 (92-809820)
- 19 Perfect Seal (92-34227-1)
- 23 Liquid Soap (Purchase Locally)
- 33 Loctite 680 (92-809833)
- 78 G.E. Sealer RTV #1473
- 92 Loctite 7649 Primer (92-809824)
- 95 2-4-C With Teflon (92-825407A12)

Gear Housing (Drive Shaft)(Standard Rotation)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm
1	1	GEAR HOUSING **(BLACK)(BASIC)**			
2	2	DOWEL PIN			
3	1	STUD (3-1/8 IN.) **(LONG)**			
	1	STUD (3-11/16 IN.) **(X-LONG)**			
4	2	STUD (2-1/16 IN.)			
5	1	STUD (3-3/8 IN.)			
6	2	STUD (3-1/8 IN.)			
7	1	FILLER BLOCK			
8	1	ROLLER BEARING			
9	2	ANODE			
10	1	SCREW (M6 x 40)			
11	1	NUT	60		7
12	1	HOSE **(10 IN. - LONG)**			
	1	HOSE **(12 IN. - X-LONG)**			
13	1	FITTING			
14	1	PINION GEAR **(1.87:1- 15 TEETH)(150)**			
	1	PINION GEAR **(2:1 - 14 TEETH)(115/135)**			
15	1	WASHER			
16	1	NUT		75	101
17	AR	SHIM (006 thru 048)			
18	2	SCREW–drain	60		7
19	2	WASHER			
20	1	SHIFT SHAFT			
21	1	O-RING			
22	1	BUSHING ASSEMBLY		50	68
23	1	OIL SEAL			
24	1	WASHER–rubber			
25	1	DRIVE SHAFT **(LONG)**			
	1	DRIVE SHAFT **(X-LONG)**			
26	1	ROLLER BEARING			
27	1	CUP			
28	1	RETAINER		100	135
29	1	WATER PUMP BASE			
30	1	RETAINER			
31	1	GASKET			
32	1	O-RING			
33	1	OIL SEAL			
34	1	OIL SEAL			
35	1	GASKET–lower			
36	1	GASKET–upper			
37	1	FACE PLATE			
38	1	WATER PUMP BODY ASSEMBLY			
39	1	INSERT			
40	1	SEAL–rubber			
41	1	IMPELLER			
42	1	KEY			
43	1	SCREW (#14-8 x 2-1/4 IN.)	35		4
44	2	WASHER			
45	2	NUT	50		5.5
46	1	WASHER			
47	1	NUT	50		5.5
48	1	SLEEVE			

Gear Housing (Prop Shaft)(Standard Rotation)



7 Loctite 271 (92-809820)

87 Quicksilver Gear Lubricant (92-802844A1)

94 Anti-Corrosion Grease (92-78376A6)

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

Gear Housing (Prop Shaft)(Standard Rotation)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm
1	1	GEAR HOUSING**(BASIC)**			
49	1	CAM FOLLOWER			
50	1	SHIFT CAM			
51	1	ROD			
52	1	FORWARD GEAR **(1.87:1 – 15/28)(150)**			
	1	FORWARD GEAR **(2:1 – 14/28)(115/135)**			
53	AR	SHIM (.006 thru 050)			
54	1	TAPERED ROLLER BEARING			
55	1	CUP			
56	1	NEEDLE BEARING			
57	1	CLUTCH			
58	1	CROSS PIN			
59	1	DETENT PIN			
60	1	SPRING			
61	1	PROPELLER SHAFT			
62	1	REVERSE GEAR **(1.87:1 – 15/28)(150)**			
	1	REVERSE GEAR **(2:1 – 14/28)(115/135)**			
63	1	THRUST SPACER			
64	1	THRUST RING			
65	1	BALL BEARING			
66	1	O-RING			
67	1	BEARING CARRIER ASSEMBLY			
68	1	ROLLER BEARING			
69	1	OIL SEAL **(INSIDE)**			
70	1	OIL SEAL **(OUTSIDE)**			
71	1	KEY			
72	1	TAB WASHER			
73	1	COVER		210	285
74	1	TRIM TAB			
	1	ANODIC PLATE **(TRACKER/150 LONG)**			
75	1	SCREW (1-3/4 IN.)		25	34
76	1	SCREW (3/8-16 x 1 IN.)		30	41
77	2	WASHER			
78	2	NUT		50	68

General Service Recommendations

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

IMPORTANT: Read the following before attempting any repairs.

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

Service procedure order in this section is a normal disassembly-reassembly sequence. It is suggested that the sequence be followed without deviation to assure proper repairs. When performing partial repairs, follow the instructions to the point where the desired component can be replaced, then proceed to “reassembly and installation” of that component in the reassembly part of this section. Use the “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 Marine Lubricant on all O-rings. To prevent wear, apply Quicksilver 2-4-C w/Teflon Marine Lubricant on I.D. of oil seals.

To prevent corrosion damage after reassembly, apply Quicksilver 2-4-C w/Teflon Marine Lubricant to external surfaces of bearing carrier and cover nut threads prior to installation.

Removal, Disassembly, Cleaning and Inspection – Standard Rotation

Removal

⚠ WARNING

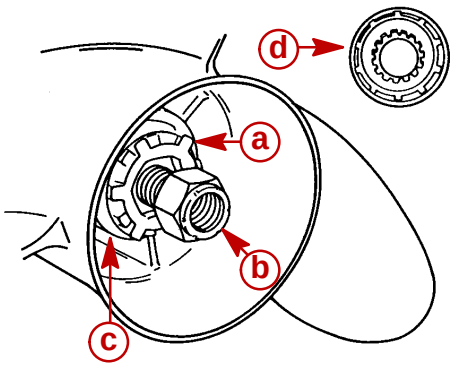
Disconnect high tension leads from spark plugs and remove spark plugs from engine before removing gear housing from driveshaft housing.

1. Disconnect high tension leads from spark plugs and remove spark plugs from engine.

⚠ CAUTION

Gear housing MUST BE in NEUTRAL position and shift shaft MUST BE removed from gear housing BEFORE propeller shaft can be removed from gear housing.

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



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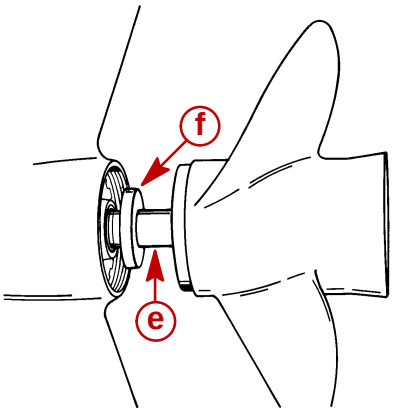

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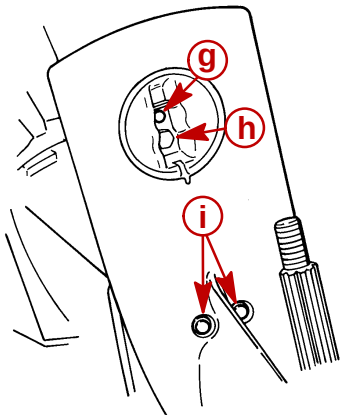

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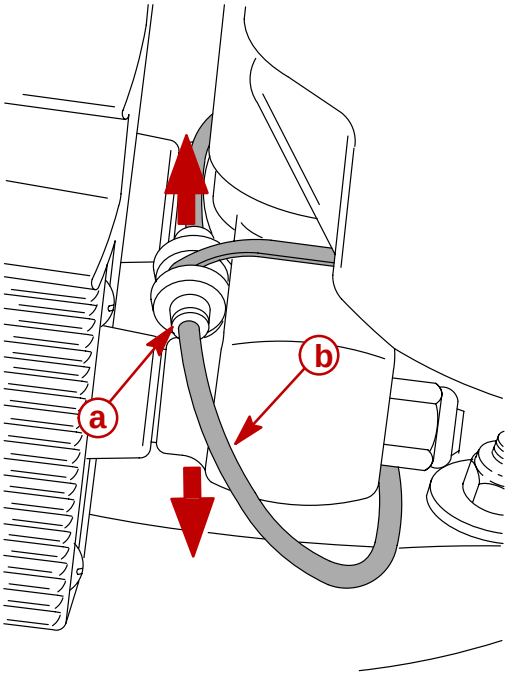
a - Tab Washer
b - Propeller Nut
c - Rear Thrust Hub
d - Continuity Washer (if equipped)
e - Propeller Shaft
f - Thrust Hub (forward)
g - Bolt (secures trim tab)
h - Bolt (inside trim tab cavity)
i - Locknuts and Washers

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



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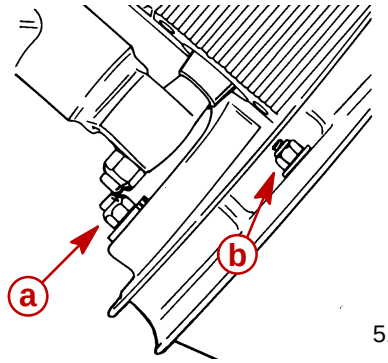
a - Press in on Junction
b - Pull out on Hose

9. Remove locknut from the front gear housing mounting stud.
10. Loosen the side mounting locknuts. (DO NOT attempt to remove one nut before opposite side is loosened sufficiently, or driveshaft housing could be damaged.)



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a - Front Mounting Locknut
b - Side Mounting Locknut (One Each Side)

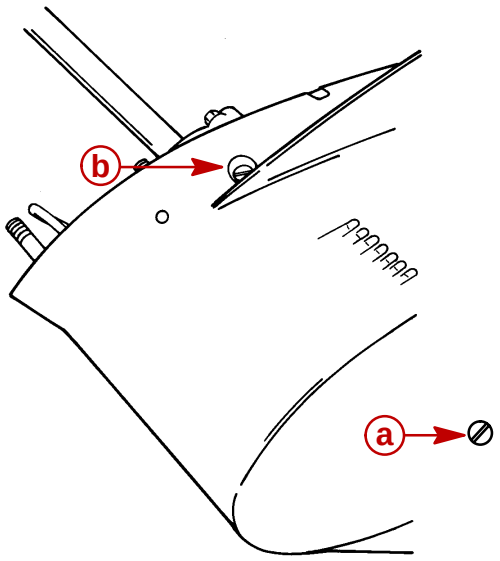
11. Pull gear housing away from driveshaft housing as far as the loosened nuts (in Step 9) will allow, then remove loosened nuts. (DO NOT allow gear housing to fall, as it now is free.)
12. Pull gear housing from driveshaft housing.

Draining and Inspecting Gear Housing Lubricant

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

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

2. Position a clean drain pan under gear housing and remove “Fill” and “Vent” screws from gear housing.



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.*

Water Pump

CLEANING AND INSPECTION

1. Clean all water pump parts with solvent and dry with compressed air.
2. Inspect water pump cover and base for cracks and distortion (from overheating).
3. Inspect face plate and water pump insert for grooves and/or rough surfaces.

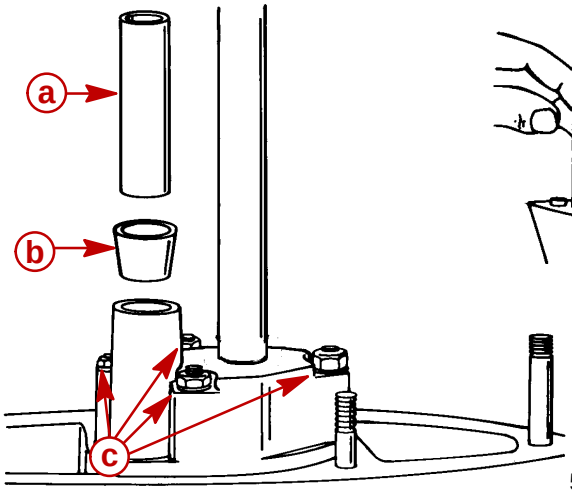
IMPORTANT: When completing gear housing repairs, that require removal of water pump impeller, it is recommended that the impeller be replaced. If it is necessary, however, to re-use impeller, DO NOT install in reverse to original rotation, or premature impeller failure will occur.

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

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

REMOVAL AND DISASSEMBLY

1. Slide rubber centrifugal slinger up and off driveshaft.
2. Remove water tube guide and seal from water pump cover. (Retain guide for reassembly and discard seal.)
3. Remove (and retain) 3 nuts, one bolt and all washers which secure water pump cover to gear housing.
4. Using 2 pry bars, lift water pump cover up and off driveshaft.



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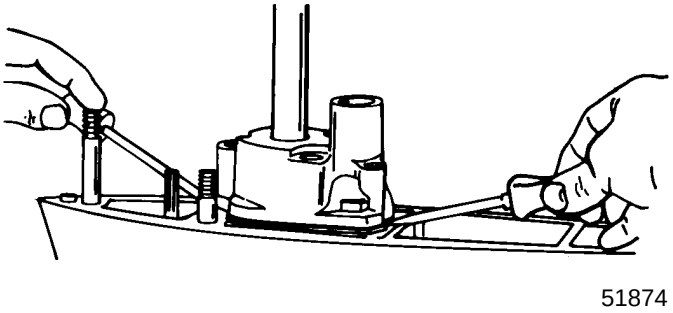


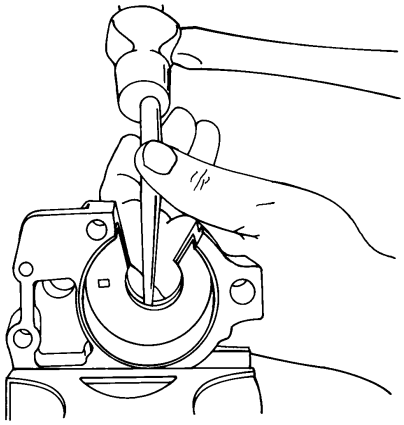
51874

a - Water Tube Guide
b - Water Tube Seal
c - Nuts, Bolt and Washers To Be Removed

5. Inspect water pump cover and insert, as outlined in **"Cleaning and Inspection,"** previous.
6. If inspection of water pump insert determines that replacement is required, follow Step "a" or "b" (immediately following) to remove insert from water pump cover.

NOTE: *Try Step "a" first. If insert cannot be removed with Step "a," use Step "b".*

a. Drive water pump insert out of water pump cover with a punch and hammer.



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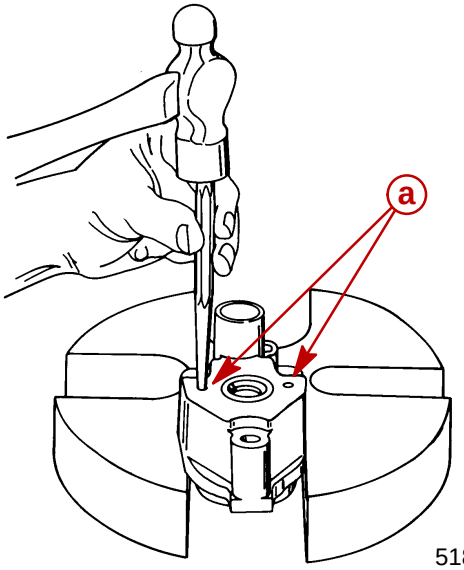
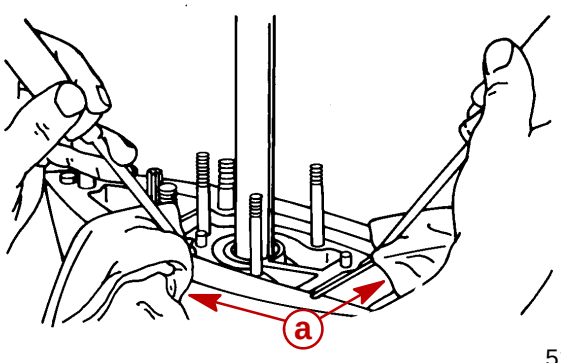
b. Drill two 3/16 in. (4.8mm) diameter holes thru the top of water pump cover (but not thru insert). Drive insert out of cover with a punch and hammer.



51873

a - Drill Two Holes at These Locations

7. Remove impeller from driveshaft. (It may be necessary to use a punch and hammer to drive impeller upward on driveshaft. In extreme cases, it may be necessary to split hub of impeller with a hammer and chisel.)
8. Once impeller is removed, remove impeller drive key from driveshaft.
9. Remove water pump face plate and both gaskets (one above and below face plate) from water pump base.
10. Using 2 pry bars, positioned and padded as shown, lift water pump base up and off driveshaft.



51874

a - Pads

11. Remove (and discard) O-ring from O-ring groove on water pump base.
12. Using a screwdriver, pry oil seals out of water pump base from gear housing side of base.

Bearing Carrier and Propeller Shaft Removal

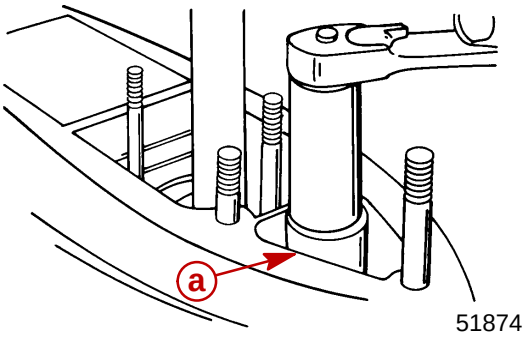
⚠ CAUTION

Gear housing MUST BE in NEUTRAL position, and shift shaft MUST BE removed from gear housing before propeller shaft can be removed from gear housing.

1. Place gear housing in a suitable holding fixture with propeller shaft in a horizontal position.
2. Use Shift Shaft Bushing Tool (91-31107) to unthread shift shaft bushing. (DO NOT remove bushing from shift shaft at this time.)

IMPORTANT: Prior to removal of shift shaft from gear housing, recheck that gear housing is in NEUTRAL position.

3. Bend cover nut lock tab out of cover nut recess.



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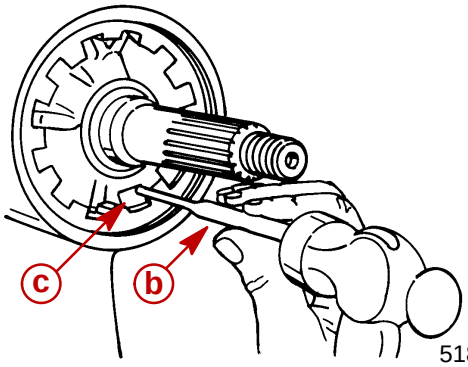
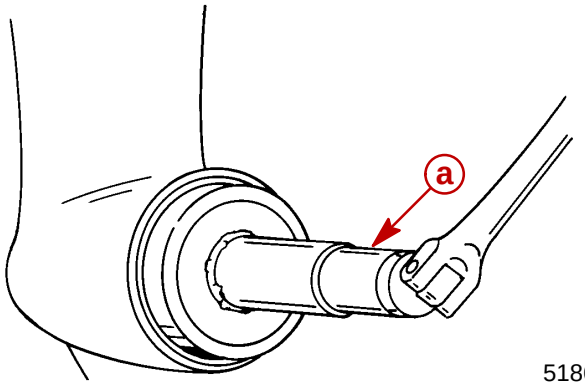


51865

a - Shift Shaft Bushing Tool (91-31107)
b - Punch
c - Tab of Tab Washer

4. Remove gear housing cover nut with Cover Nut Tool (91-61069).



51866

a - Cover Nut Tool (91-61069)

5. After cover nut has been removed, remove lock tab washer from gear housing.

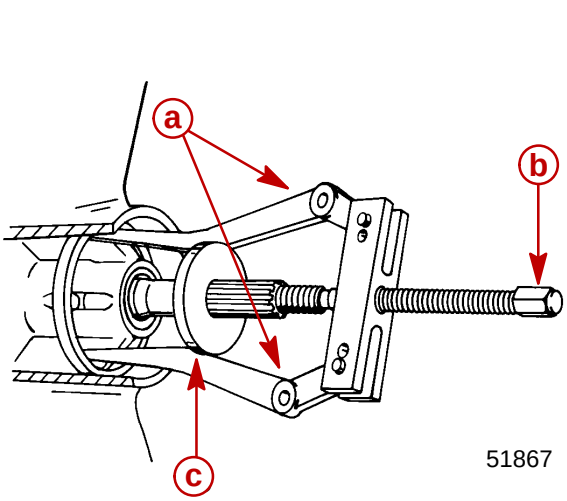
⚠ CAUTION

Once bearing carrier is removed from gear housing, extreme care MUST BE taken not to apply any side force on propeller shaft. Side force on propeller shaft may break the neck of the clutch actuator rod.

6. Use long Puller Jaws (91-46086A1) and Puller Bolt (91-85716) to remove bearing carrier. (Use propeller thrust hub to maintain outward pressure on puller jaws.)

NOTE: *When bearing carrier is removed from gear housing, the bearing carrier alignment key will come out with it.*

7. With gear housing in NEUTRAL, pull shift shaft out of gear housing. If necessary, use a pliers to pull shift shaft out of gear housing. If pliers are used to pull shift shaft out, wrap a strip of soft metal (aluminum) around splines before clamping pliers. DO NOT turn shaft (clockwise OR counterclockwise) while pulling shaft out. (For further information on shift shaft, see “Shift Shaft Cleaning/Inspection and Disassembly.”)



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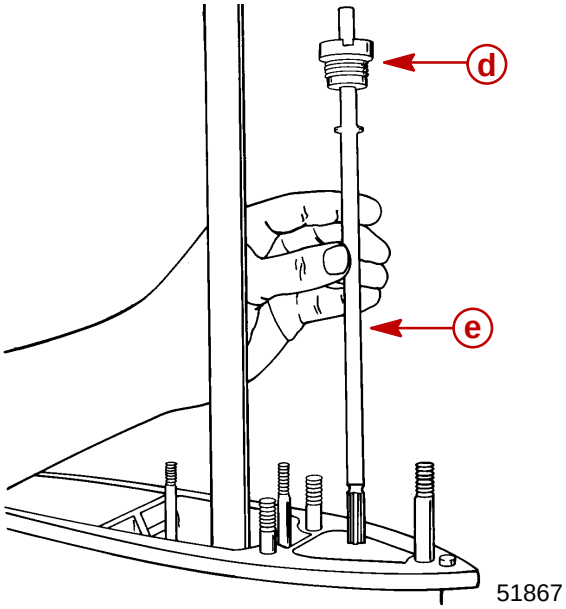


51867

a - Long Puller Jaws (91-46086A1)
b - Puller Bolt (91-85716)
c - Thrust Hub
d - Shift Shaft Bushing
e - Shift Shaft

⚠ CAUTION

Propeller shaft, cam follower and shift cam, in most cases, will come out of gear housing by simply pulling outward on propeller shaft. DO NOT FORCE shaft sideways or ATTEMPT TO PULL with a slide hammer or any mechanical puller.

8. Remove propeller shaft, cam follower and shift cam by pulling shaft straight out of gear housing. (DO NOT JERK propeller shaft.) If propeller shaft will not come out, proceed with Step “a” or “b”, following:

   a. Push propeller shaft back into place against the forward gear. Visually inspect location of shift cam by looking down shift shaft hole (illuminated with a flashlight). If splined hole in shift cam is visible, reinstall shift shaft and rotate shift shaft to neutral position. Remove shift shaft, then remove propeller shaft as instructed in Step 8, immediately preceding.

   b. Push propeller shaft back into place against forward gear. Slide bearing carrier back into gear housing (to support propeller shaft). Place gear housing on its left side (viewed from rear) and strike upper leading end of gear housing with a rubber mallet. This will dislodge the shift cam from cam follower into a clearance pocket in left side of gear housing. Remove bearing carrier and pull propeller shaft out of gear housing.

NOTE: *If Step 8-b was used to remove propeller shaft, the shift cam can be retrieved after removal of forward gear.*

Shift Shaft

CLEANING AND INSPECTION

1. Clean shift shaft and bushing with solvent and dry with compressed air.
2. Check shift shaft splines on both ends for wear and/or corrosion damage.
3. Inspect shift shaft for groove(s) at shift shaft bushing seal surface.
4. Inspect shift shaft bushing for corrosion damage.
5. Inspect shift shaft bushing oil seal for wear and/or cuts.

NOTE: *Oil seal in shift shaft bushing should be replaced as a normal repair procedure.*

DISASSEMBLY

1. Remove (and discard) shift shaft bushing oil seal by prying it out or driving it out with a punch and hammer.

CLEANING/INSPECTION - BEARING CARRIER

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

1. Clean bearing carrier with solvent and dry with compressed air.

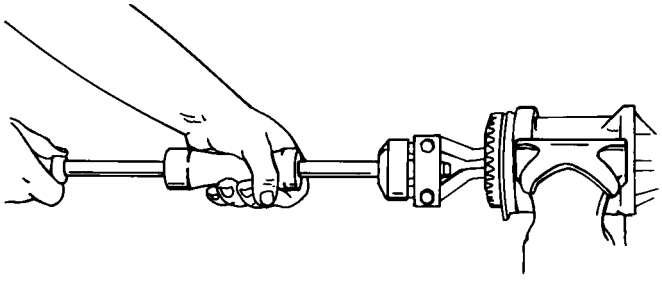
⚠ CAUTION

DO NOT spin bearings dry with compressed air, as this could cause bearing to score.

2. Bearing carrier propeller shaft needle bearing condition is determined by propeller shaft bearing surface condition. (See “Propeller Shaft Inspection.”)
3. Inspect reverse gear to pinion gear wear pattern (should be even and smooth). If not, replace reverse gear and pinion gear.
4. Check clutch jaws on reverse gear for damage. Replace reverse gear, if damage is found on clutch jaws.
5. Apply light oil to reverse gear bearing. Rotate reverse gear bearing while checking bearing for rough spots and/or catches. Push in and pull out on reverse gear to check for bearing side wear. Replace bearing if any of the listed conditions exist.

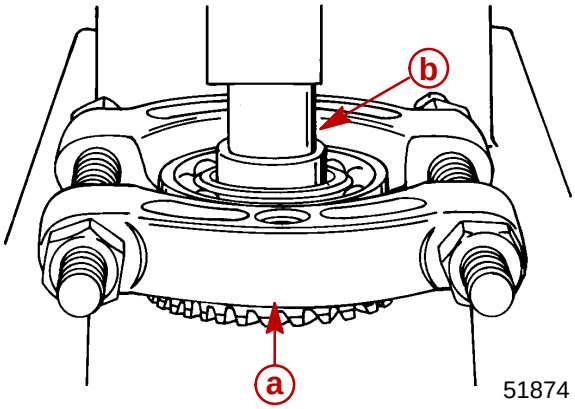
DISASSEMBLY - BEARING CARRIER

1. Remove and discard O-ring from between bearing carrier and thrust washer.
2. If inspection of reverse gear or reverse gear bearing determines that replacement of gear or bearing is required, remove gear and bearing as follows:
   a. Position bearing carrier in a soft jaw vise.
   b. Use Slide Hammer (91-34569A1) and remove reverse gear.



51868

c. If reverse gear bearing remains attached to reverse gear, install Universal Puller Plate (91-37241) and position puller plate, gear and bearing on a press with gear side down. Use a suitable mandrel and press gear out of bearing.



51874

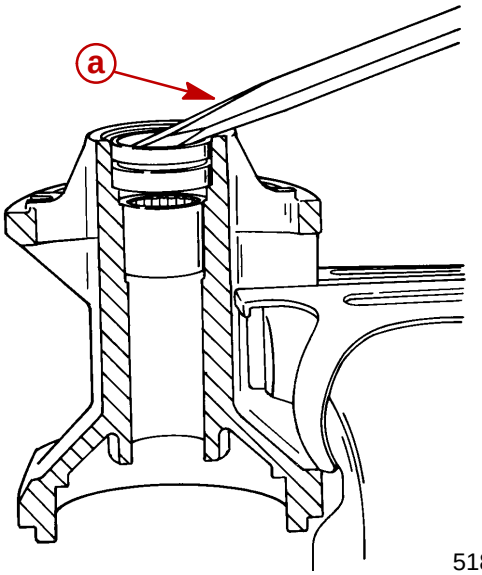
a - Universal Puller Plate
b - Mandrel

d. If reverse gear bearing has remained in bearing carrier, use slide hammer to remove bearing in the same methods as was used to remove reverse gear (Step “b”).

3. Propeller shaft oil seals can be removed by (a) using a pry bar, or (b) pressing seals out when propeller shaft needle bearing is pressed out of bearing carrier.

4. If inspection of propeller shaft needle bearing determines that replacement of bearing is required, use Universal Bearing Removal and Installation Tool (91-31229A1) to press bearing and seals out of bearing carrier.

NOTE: *Reverse gear must be removed from bearing carrier before propeller shaft needle bearing can be removed.*



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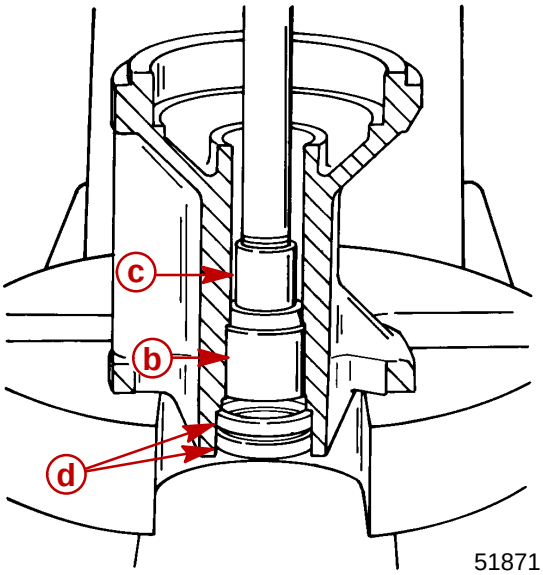


51871

a - Pry Bar
b - Propeller Shaft Needle Bearing
c - Mandrel
d - Oil Seals

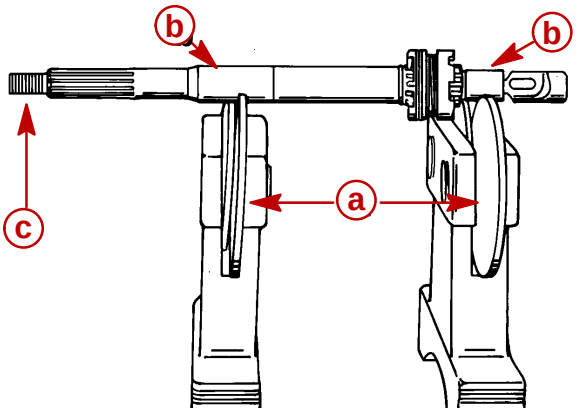
Propeller Shaft

INSPECTION

1. Clean propeller shaft assembly with solvent and dry with compressed air.
2. Inspect bearing carrier oil seal surfaces for grooves. Run fingernail across seal surface to check for groove. Replace shaft if groove is found.
3. Visually check bearing surfaces of propeller shaft for pitting, grooves, scoring, uneven wear or discoloration (bluish color) from overheating. Replace shaft and corresponding needle bearing if any of the above conditions are found. (Bearing carrier needle bearing contacts propeller shaft just in front of oil seal surface. Forward gear bearing contacts propeller shaft in front of sliding clutch splines.)
4. Inspect propeller shaft splines for wear and/or corrosion damage.
5. Check propeller shaft for straightness. Use either method, following:

BALANCE WHEELS

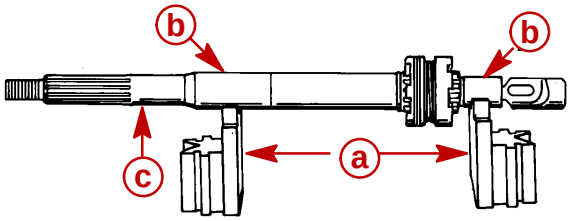
Place propeller shaft on balance wheels. Rotate propeller shaft and observe propeller end of shaft for “wobble.” Replace shaft if any “wobble” is observed.



51872

a - Balance Wheels
b - Bearing Surfaces
c - Watch for Wobble

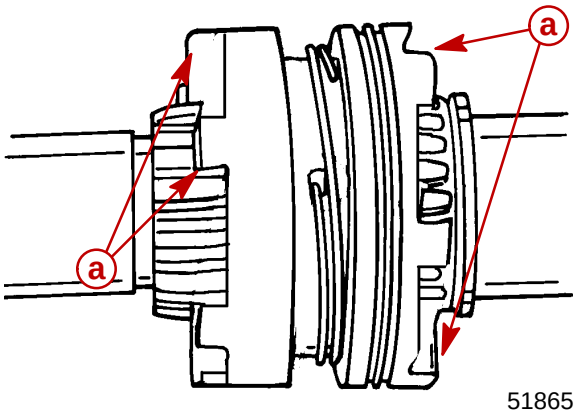
Position propeller shaft roller bearing surfaces on “vee” blocks. Mount a dial indicator at front edge of propeller splines. Rotate propeller shaft. Dial indicator movement of more than 0.006 in. (0.152 mm) (or noticeable “wobble”) is reason for replacement.



51872

a - “Vee” Blocks
b - Bearing Surfaces
c - Measure with Dial Indicator at this Point

6. Inspect sliding clutch. Check reverse gear and forward gear clutch jaws. Rounded jaws indicate one or more of the following:
   a. Improper shift cable adjustment.
   b. Improper shift habits of operator(s) (shift from NEUTRAL to REVERSE gear too slowly).
   c. Engine idle speed too high (while shifting).



51865

a - Clutch Jaws

7. Check condition of cam follower. If it shows wear (pitting, scoring or rough surface), replace cam follower and shift cam.

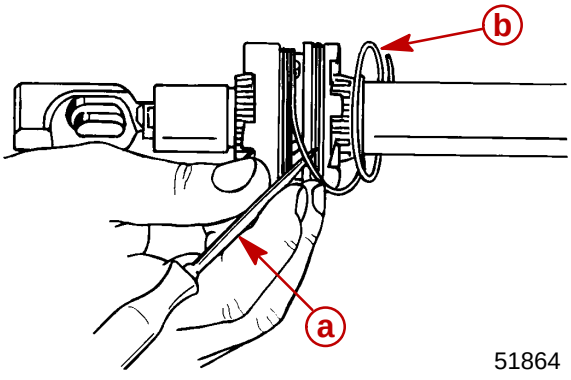
DISASSEMBLY

1. Remove shift cam from cam follower.
2. Insert a thin blade screwdriver or awl under first coil of cross pin retainer spring and rotate propeller shaft to unwind spring from sliding clutch. DO NOT over-stretch spring.

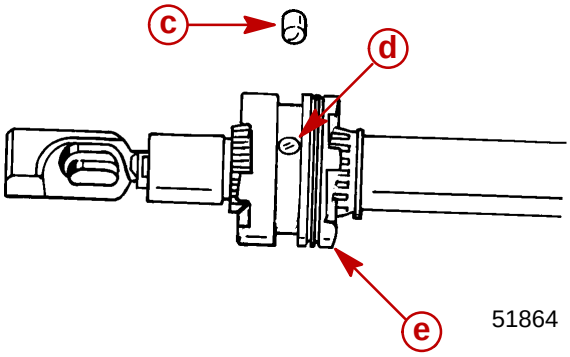
⚠ CAUTION

Detent pin is free and can fall out of sliding clutch. Care MUST BE taken not to lose pin.

3. Detent pin is free and can be removed from sliding clutch at this time.



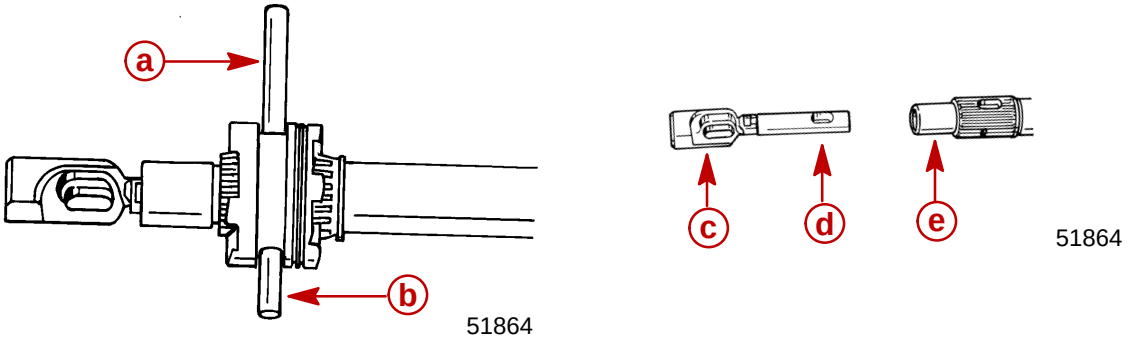
51864



51864

a - Awl
b - Cross Pin Retainer Spring
c - Detent Pin
d - Cross Pin
e - Sliding Clutch

4. Push cross pin out of sliding clutch and propeller shaft with Cross Pin Tool (91-86642).
5. Pull sliding clutch off propeller shaft.
6. Pull cam follower and clutch actuator rod out of propeller shaft. DO NOT force cam follower up-or-down or side-to-side when pulling from propeller shaft.



51864

a - Cross Pin Tool (91-86642)
b - Cross Pin
c - Cam Follower
d - Clutch Actuator Rod
e - Propeller Shaft

7. Once cam follower and clutch actuator rod are removed from propeller shaft, lift rod out of cam follower.

Clutch Actuator Rod

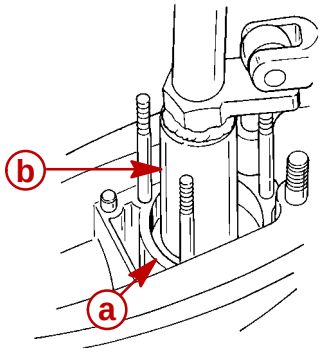
CLEANING AND INSPECTION

1. Clean clutch actuator rod in solvent and dry with compressed air.
2. Inspect actuator components for wear or damage. Replace components as required.

Pinion Gear and Driveshaft

REMOVAL

1. Remove bearing retainer using Bearing Retainer Tool (91-43506).



51865

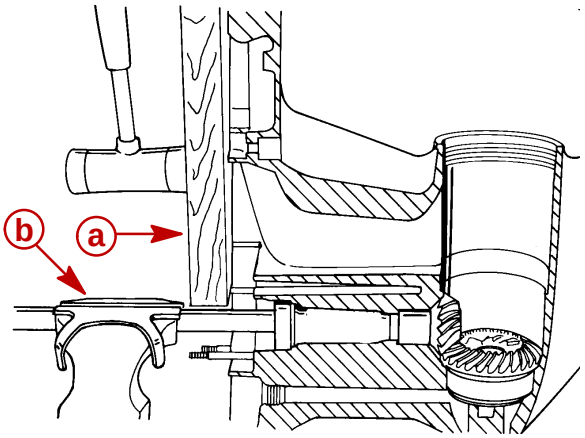
a - Bearing Retainer
b - Bearing Retainer Tool (91-43506)

2. Place Driveshaft Holding Tool (91-34377A1) over driveshaft splines.
3. Use a socket and flex handle to hold pinion nut. (Pad area of gear housing where flex handle will make contact to prevent damage to gear housing.)
4. Use a socket and flex handle on Driveshaft Holding Tool to loosen pinion nut. Remove pinion nut and Driveshaft Holding Tool.

5. Remove gear housing from vise and re-position it as shown. Be sure to use soft jaw vise covers and clamp as close as possible to water pump studs.
6. Place a block of wood on gear housing mating surface. Use a mallet and carefully tap gear housing away from driveshaft.

⚠ CAUTION

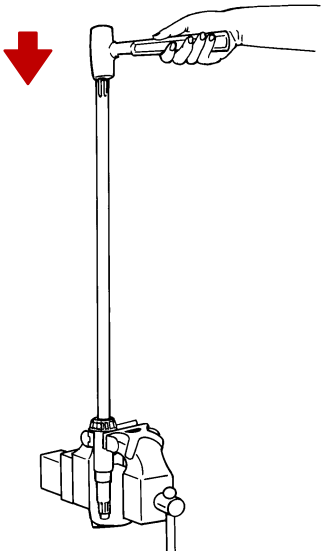
DO NOT strike gear housing hard with the mallet or allow gear housing to fall.



51870

a - Wooden Block
b - Soft Jaw Vise Covers

7. Reach into gear housing and remove pinion gear and forward gear assembly.
8. After driveshaft is removed from gear case, remove and retain shim(s) that were located under upper tapered driveshaft bearing.
9. If inspection determines that replacement of driveshaft tapered bearing is required, remove bearing from driveshaft as follows:
   a. Position driveshaft in a vise; DO NOT tighten vise jaws against shaft.
   b. Strike shaft with a lead hammer; take care not to drop shaft.

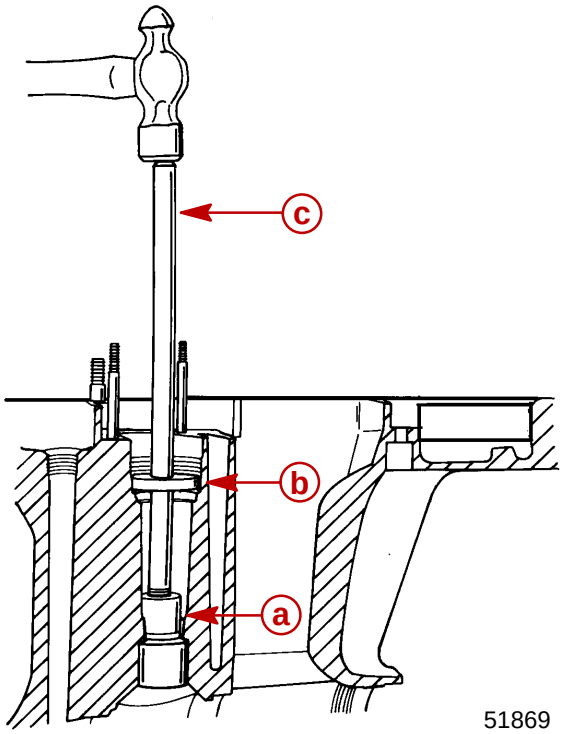


51866

10. Remove 18 loose needles from outer race of driveshaft needle bearing.
11. If inspection of driveshaft needle bearing surface determines that replacement of needle bearing is required, the 18 loose needle bearings previously removed must be reinstalled in bearing race to provide surface for mandrel to drive against.

NOTE: *FORWARD gear must be removed first BEFORE removing driveshaft needle bearing.*

IMPORTANT: Discard driveshaft needle bearing after removal. (Bearing cannot be reused.)



a - Mandrel (91-37263)
b - Pilot* (91-36571)
c - Driver Rod* (91-37323)
*From Bearing Removal and Installation Kit (91-31229A5)

CLEANING AND INSPECTION

1. Clean driveshaft, tapered bearing and race, and pinion gear with solvent. Dry with compressed air. DO NOT allow driveshaft bearing to spin while drying.
2. Inspect pinion gear for pitting, grooves, scoring, uneven wear and/or discoloration from overheating. Replace pinion gear, if any of the above conditions are found.
3. Inspect driveshaft needle bearing surface (area just above pinion gear splines) for pitting, grooves, scoring, uneven wear and/or discoloration from overheating. Replace driveshaft and driveshaft needle bearing, if any of the preceding conditions are found.
4. Inspect driveshaft to crankshaft splines for wear. Replace driveshaft if wear is excessive.
5. Inspect tapered bearing race for pitting, grooves, scoring, uneven wear and discoloration from overheating. Replace tapered bearing and race as a set, if any of the preceding conditions are found.
6. Inspect driveshaft for groove(s) where water pump base oil seals contact shaft. Replace driveshaft if groove(s) are found.

Forward Gear

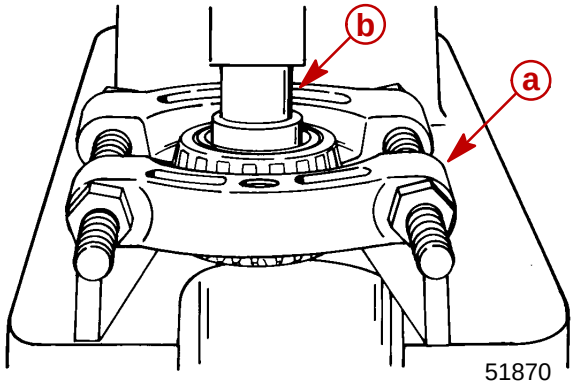
REMOVAL AND DISASSEMBLY

NOTE: *Forward gear can only be removed from gear housing after driveshaft 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, remove bearing from gear and bearing race from gear housing (tapered bearing and race MUST BE replaced as a set), as follows:
   a. Install Universal Puller Plate (91-37241) between forward gear and tapered bearing.
   b. Place forward gear, bearing and puller plate on a press and press gear out of bearing with a suitable mandrel.
   c. Use Slide Hammer (91-34569A1) to remove forward gear tapered bearing race.



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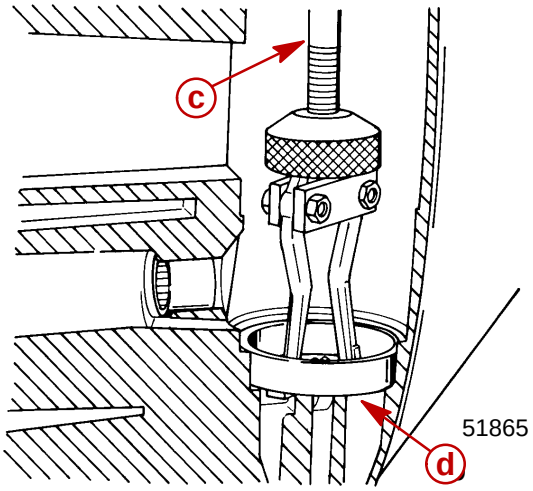


51865

a - Universal Puller Plate
b - Mandrel
c - Slide Hammer
d - Tapered Bearing Race

   d. After forward gear tapered bearing race is removed from gear housing, lift out and retain shims which were behind bearing race.

3. If inspection determines that replacement of propeller shaft needle bearings in forward gear is required, remove bearing from gear 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.

CLEANING AND INSPECTION

⚠ CAUTION

DO NOT spin bearings dry with compressed air, as this could cause bearing to score.

1. Clean forward gear and bearings with solvent and dry with compressed air.
2. Inspect gear teeth for pitting, grooves, scoring, uneven wear and for discoloration (from overheating). Replace gear if any of these conditions are found.
3. Check clutch jaws on forward gear for damage. Replace forward gear if damage is found.
4. Inspect tapered bearing race for pitting, grooves, scoring, uneven wear and discoloration (from overheating). Replace tapered bearing (on forward gear) and race if any of these conditions are found. (Always replace tapered bearing and race as a set.)
5. To determine condition of propeller shaft needle bearings (in forward gear), inspect propeller shaft forward gear needle bearing surface as outlined in “Propeller Shaft Inspection.”

Gear Housing

CLEANING AND INSPECTION

1. Clean gear housing with solvent and dry with compressed air.
2. Check gear housing carefully for impact damage.
3. Check for loose fitting bearing cups and needle bearings.
4. Inspect bearing carrier cover nut retainer threads in gear housing for corrosion damage and/or stripped threads.

Reassembly and Installation Standard Rotation

Driveshaft Needle Bearing

REASSEMBLY/INSTALLATION

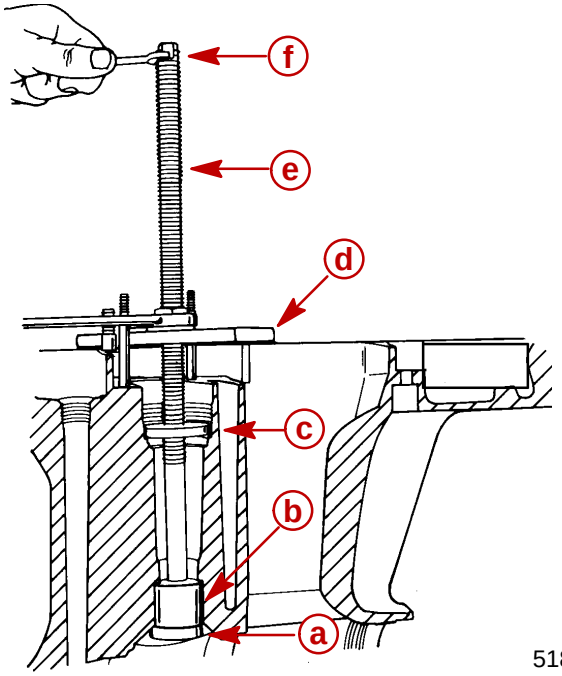
⚠ CAUTION

If driveshaft needle bearing failure has occurred, and original bearing race has turned in the gear housing, gear housing MUST be replaced. Loose fitting needle bearing will move out of position and cause repeated failures.

1. Apply a thin coat of Quicksilver 2-4-Cw/Teflon Lubricant to driveshaft needle bearing bore in gear housing.
2. By way of propeller shaft cavity, place needle bearing in driveshaft bore with numbered side of bearing facing up driveshaft bore.

3. Install and seat needle bearing with the following tools: Puller Rod* (91-31229), Nut* (11-24156), Pilot* (91-36571), Plate* (91-29310) and Mandrel (91-92788). Pull bearing up into bore until it bottoms on gear housing shoulder. (DO NOT use excessive force.)

*From Bearing Removal and Installation Kit (91-31229A5)



51869

a - Mandrel
b - Bearing
c - Pilot
d - Plate
e - Puller Rod
f - Hold

Bearing Carrier

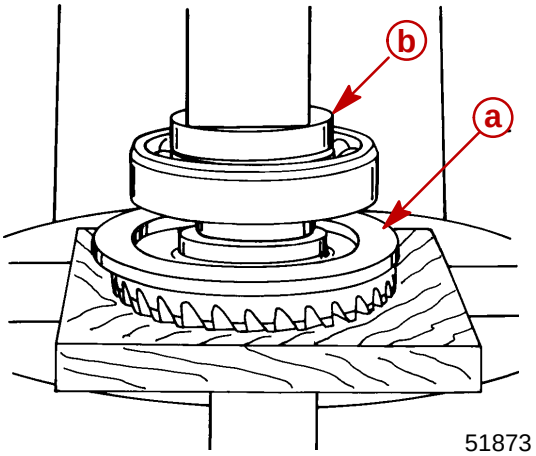
REASSEMBLY

1. Place reverse gear on a press with gear teeth facing down.

IMPORTANT: The reverse gear thrust washer has a tapered outside diameter so that one side is larger than the other. The larger outside diameter of washer must be toward reverse gear.

2. Place thrust washer over gear with the larger outside diameter down toward gear.
3. Apply a light coat of Quicksilver Super Duty Gear Lubricant onto inside diameter of reverse gear ball bearing.
4. Position ball bearing over gear (with numbered side of bearing up).

5. Press ball bearing onto gear with a suitable mandrel until firmly seated. (Be sure to press only on inner race of bearing and that bearing is firm against gear.)
6. Apply a light coat of Quicksilver Super Duty Gear Lubricant onto outside diameter of propeller shaft needle bearing.
7. Place propeller shaft needle bearing into aft end of bearing carrier with numbered side toward aft end.
8. Use Mandrel 91-15755 and press needle bearing into bearing carrier.



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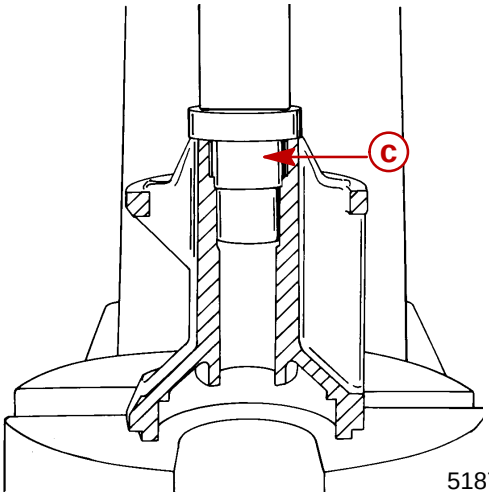
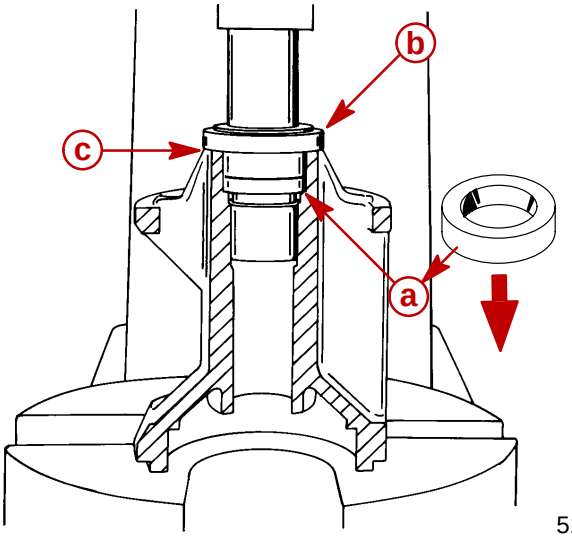


51872

a - Thrust Washer
b - Mandrel
c - Mandrel (91-15755)

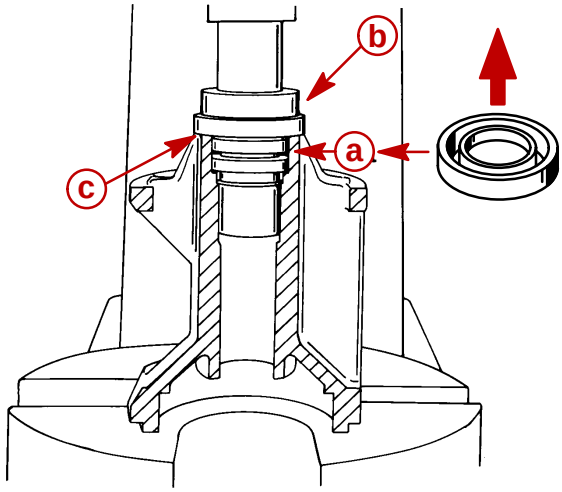
9. Apply Loctite 271 to outer diameter of propeller shaft oil seals.
10. Place one seal on longer shoulder side of Oil Seal Driver (91-31108) with lip of seal away from shoulder. Press seal into bearing carrier until seal driver bottoms against bearing carrier.



51872

a - Oil Seal (Lip of Seal Down)
b - Oil Seal Driver
c - Seated

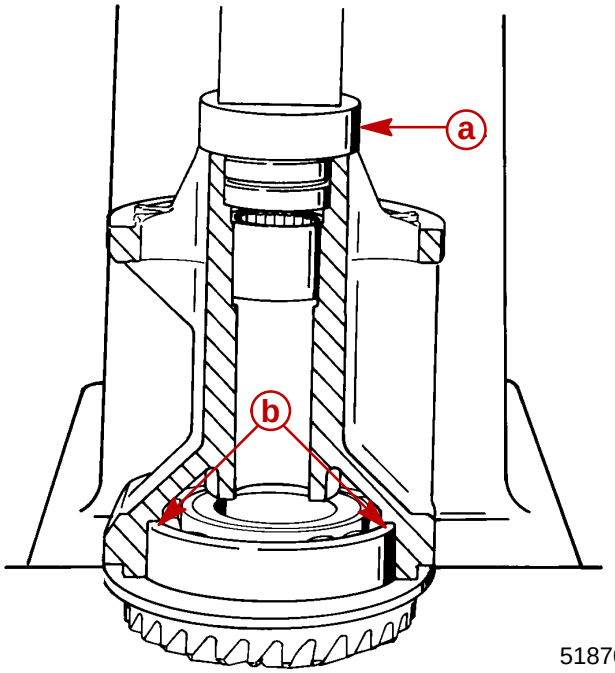
11. Place second seal on short shoulder side of seal driver with lip of seal toward shoulder. Press seal into bearing carrier until seal driver bottoms against bearing carrier.



51872

a - Oil Seal (Lip of Seal Up)
b - Oil Seal Driver
c - Seated

12. Wipe off excess Loctite.
13. Apply a light coat of Quicksilver Super Duty Gear Lubricant onto the outside diameter of reverse gear ball bearing.
14. Place bearing carrier over reverse gear and bearing assembly. Press bearing carrier onto bearing.



51870

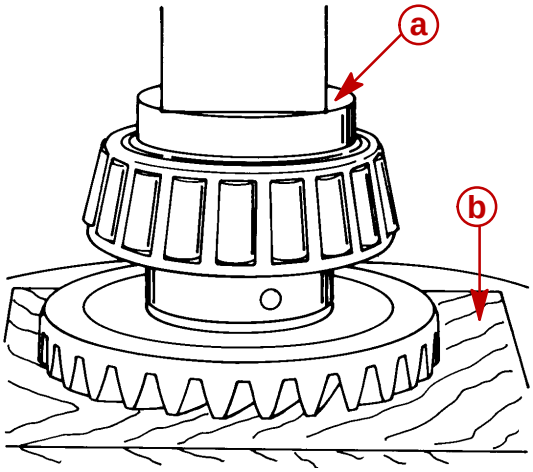
a - Mandrel
b - Seated

15. Place O-ring over bearing carrier and position it between bearing carrier and thrust washer.
16. Lubricate oil seals and O-ring with Quicksilver 2-4-C w/Teflon Marine Lubricant.

Forward Gear

REASSEMBLY

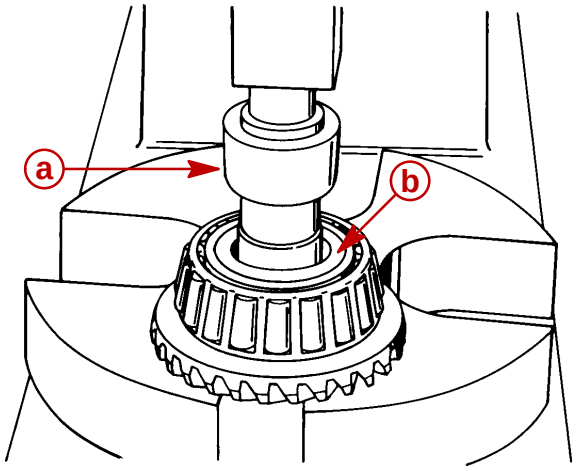
1. Place forward gear on a press with gear teeth down.
2. Apply a light coat of Quicksilver Super Duty Gear Lubricant onto the inside diameter of forward gear tapered bearing.
3. Position forward gear tapered bearing over gear.
4. Press bearing onto gear until firmly seated. (Be sure to press only on inner race of bearing and that bearing is firm against the gear.)



51869

a - Mandrel
b - Wooden Block

5. Apply a light coat of Quicksilver Super Duty Gear Lubricant to bore in center of forward gear.
6. Place one forward gear needle bearing on longer shoulder side of Forward Gear Bearing Tool (91-86943) with numbered side of bearing toward shoulder. Press bearing into forward gear until bearing tool bottoms against gear.



51873

a - Forward Gear Bearing Tool (91-86943)
b - Numbered Side of Needle Bearing

7. Place second needle bearing on short shoulder side of bearing tool with numbered side of bearing toward shoulder. Press bearing into forward gear until bearing tool bottoms against gear.

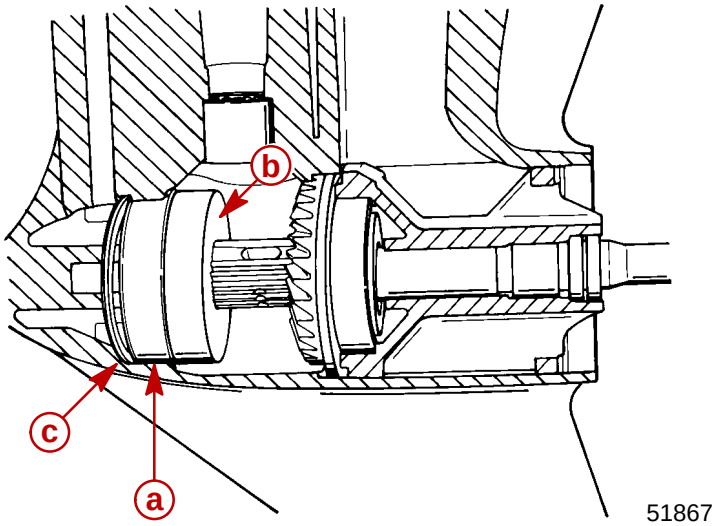
Forward Gear Bearing Race

INSTALLATION

1. Place shim(s) (retained from disassembly) into gear housing. If shim(s) were lost or a new gear housing is being used, start with approximately 0.010 in. (0.254 mm).
2. Apply a light coat of Quicksilver Super Duty Gear Lubricant to forward gear bearing race bore in gear housing.
3. Position tapered bearing race squarely over bearing bore in front portion of gear housing.
4. Place Bearing Driver Cup (91-87120) over tapered bearing race.

NOTE: *A used propeller shaft is recommended for use in Step 5. If it is necessary, however, to use the propeller shaft that will be installed in gear housing, the propeller shaft must be disassembled. (Refer to "Propeller Shaft Disassembly," preceding.)*

5. Place propeller shaft into hole in center of bearing driver cup.
6. Install bearing carrier assembly over propeller shaft and lower it into gear housing. Bearing carrier acts as a pilot to assure proper bearing race alignment.
7. Thread a nut onto propeller shaft to protect propeller shaft threads.
8. Use a mallet to drive propeller shaft against bearing driver cup until tapered bearing race is seated against shim(s).



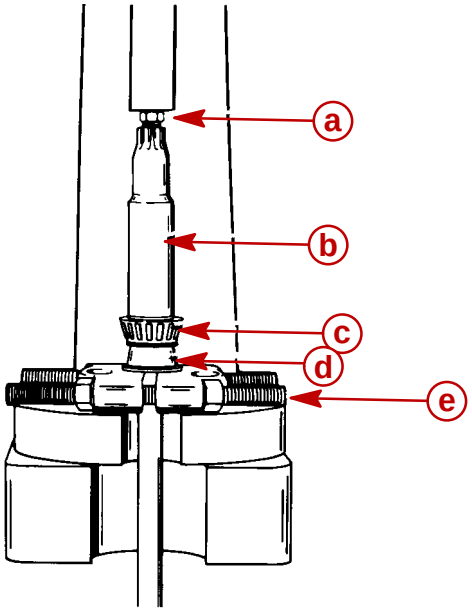
a - Tapered Bearing Race
b - Bearing Driver Cup (91-31106)
c - Shim(s)

9. Remove nut from propeller shaft, then remove bearing carrier and propeller shaft from gear housing. Lift bearing driver cup out of gear housing.
10. Apply a light coat of oil on tapered bearing race, then place forward gear assembly into forward bearing race.

Driveshaft and Pinion Gear

REASSEMBLY/INSTALLATION

1. Apply a light coat of Quicksilver Super Duty Gear Lubricant on I.D. of driveshaft tapered bearing.
2. Thread a used pinion nut onto end of driveshaft. Leave approximately 1/16 in. (1.6 mm) of nut threads exposed. Driveshaft threads MUST NOT extend beyond nut or thread damage could result while pressing.
3. Place bearing over driveshaft.
4. Using an old driveshaft bearing inner race or other suitable mandrel (which applies pressing force on center bearing race only), press bearing onto shaft until seated.



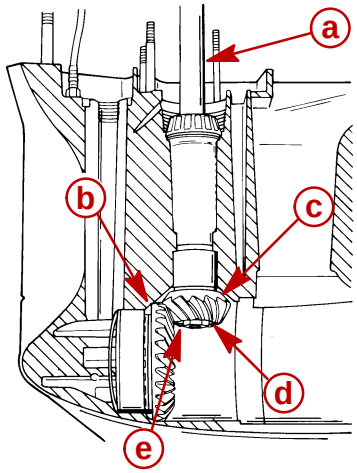
a - Used Pinion Nut
b - Driveshaft
c - Tapered Bearing
d - Old Bearing Inner Race
e - Universal Puller Plate

5. Position pinion gear in gear housing below driveshaft bore with teeth of pinion gear meshed with teeth of reverse gear.
6. Insert driveshaft into driveshaft bore while holding pinion gear. Rotate driveshaft to align and engage driveshaft splines with pinion gear splines. Continue to insert driveshaft into gear housing until driveshaft tapered bearing is against bearing race.

NOTE: *It is recommended that after final pinion depth is obtained, a new pinion nut be installed. Clean pinion nut threads with Loctite 7649 Primer (92-809824) before applying Loctite 271.*

7. Place a small amount of Loctite 271 onto threads of pinion gear nut and install flat washer and nut on driveshaft with flat side of nut away from pinion gear. Hand tighten pinion nut.
8. Place shim(s) (retained from disassembly) into gear housing. If shim(s) were lost or are not reusable (damaged), start with approximately 0.010 in. (0.254 mm).

9. Install bearing race and bearing retainer.



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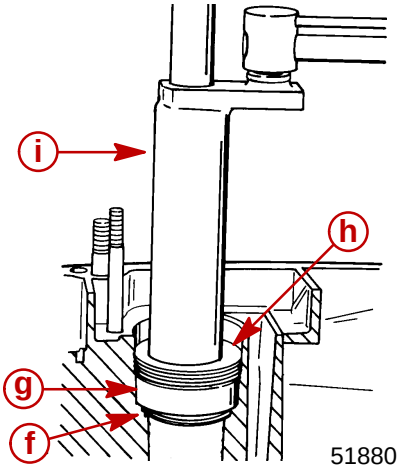
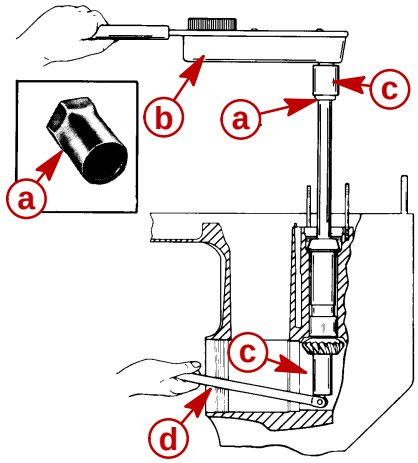


51880

a - Driveshaft (rotate to engage splines with pinion gear)
b - Forward Gear Assembly
c - Pinion Gear
d - Washer (located above pinion nut)
e - Pinion Nut [apply Loctite 271 on threads and install with flat side away from pinion gear.]
f - Shim(s)
g - Bearing Race
h - Bearing Retainer (Word “OFF” must be visible) Torque to 100 lb. ft. (135.5 Nm)
i - Bearing Retainer Tool (91-43506)

10. Use a socket and flex handle to hold pinion nut (pad area where flex handle will contact gear housing while torquing nut).

11. Place Driveshaft Holding Tool (91-34377A1) or (91-90094) over crankshaft end of driveshaft. Torque pinion nut to 75 lb. ft. (101.5 Nm).



a - Driveshaft Holding Tool (91-34377A1)
b - Torque Wrench; Torque Nut to 75 lb. ft. (101.5 Nm)
c - Socket
d - Breaker Bar

IMPORTANT: Wipe any excess Loctite from pinion nut and pinion gear.

Pinion Gear Depth/Forward Gear Backlash/Reverse Gear Backlash

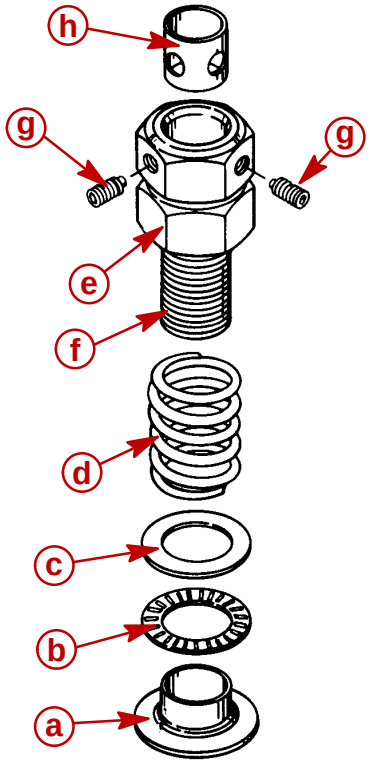
DETERMINING PINION GEAR DEPTH

NOTE: *Read entire procedure before attempting any change in shim thickness.*

IMPORTANT: Forward gear assembly must be installed in gear housing when checking pinion gear depth or an inaccurate measurement will be obtained.

1. Clean the gear housing bearing carrier shoulder.
2. Install Bearing Preload Tool (91-14311A1) over driveshaft in sequence shown.

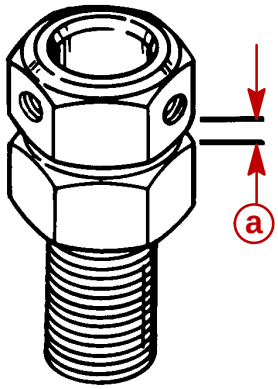
NOTE: *Bearing Preload Tool (91-44307A1) may also be used. Follow instructions provided with tool for proper installation.*

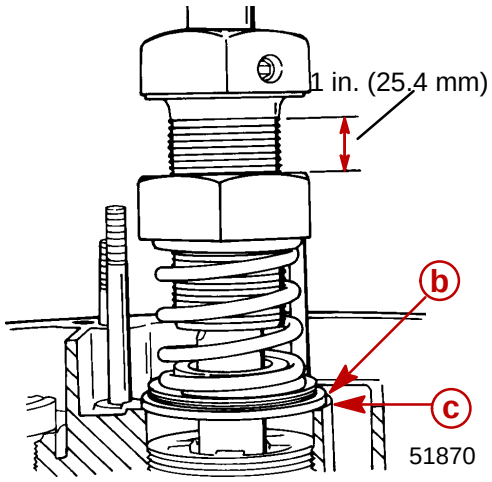


a - Adaptor
b - Bearing
c - Washer
d - Spring
e - Nut; thread nut all the way onto bolt
f - Bolt
g - Set Screw
h - Sleeve; Holes in sleeve must align with set screw

3. Align adaptor on driveshaft bearing pocket ledge.
4. With tool installed over driveshaft, tighten both set screws securely, making certain to align sleeve holes to allow set screws to pass thru.

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



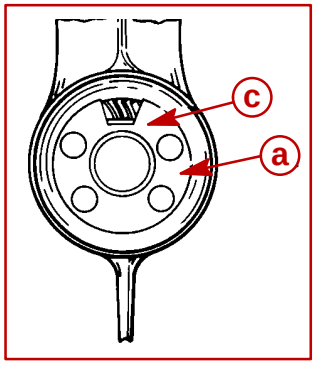


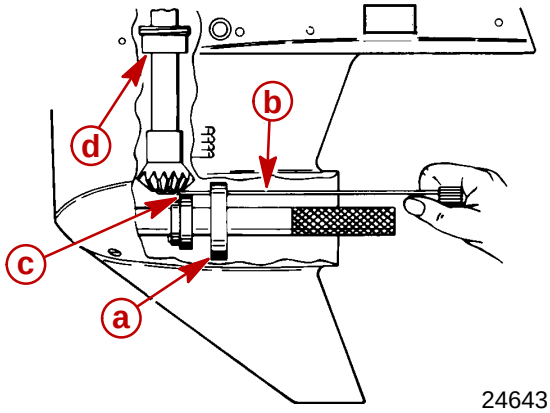
a - Distance
b - Adaptor
c - Ledge

6. Turn driveshaft clockwise 2 or more turns to seat driveshaft bearings.
7. Insert Pinion Gear Locating Tool* (91-74776) into gear housing until it bottoms out on bearing carrier shoulder.

*Pinion Gear Locating Tool (91-12349A2) can be used. Use flat #7 and disc #2. Follow instructions supplied with tool.

8. Determine pinion gear depth by inserting a feeler gauge thru access slot in pinion gear shimming tool.
9. Clearance between shimming tool and pinion gear should be 0.025 in. (0.64 mm).
10. If clearance is correct, leave Bearing Preload Tool on driveshaft for “Determining Forward Gear Backlash,” following.
11. If clearance is not correct, add (or subtract) shims at location shown to raise (or lower) pinion gear. When reinstalling pinion nut, apply Loctite 271 on threads of nut and retorque pinion nut.





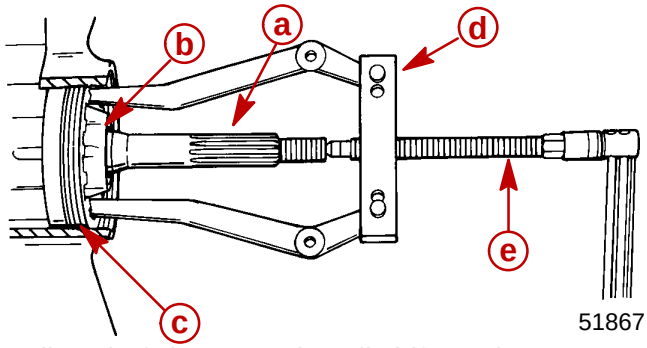
a - Pinion Gear Tool (91-74776 or 91-12349A2)
b - Feeler Gauge
c - Obtain 0.025 in. (0.64 mm) Clearance between Shimming Tool and Pinion Gear
d - Add or Subtract Shim(s) Here

NOTE: *Bearing Preload Tool (91-14311A1) should remain installed on driveshaft after setting pinion gear depth as it is required to properly check forward gear and reverse gear backlash.*

DETERMINING FORWARD GEAR BACKLASH

IMPORTANT: Bearing carrier must be assembled to provide a pilot for propeller shaft.

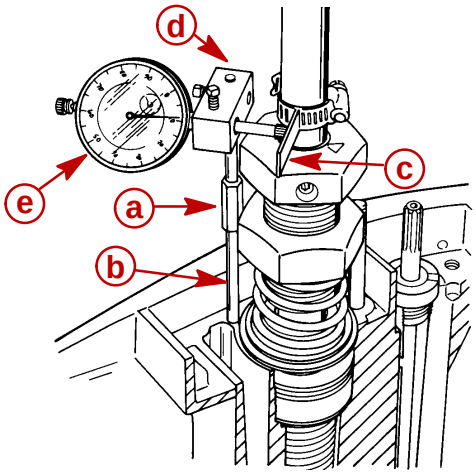
1. Insert propeller shaft into position in gear housing. (DO NOT place shift cam on propeller shaft.)
2. Place bearing carrier into gear housing and thread cover nut tightly against bearing carrier. (It is not necessary to torque cover nut against bearing carrier.)
3. Attach Bearing Carrier Removal Tool (91-46086A1) and Puller Bolt (91-85716) onto gear housing.
4. Torque puller bolt against propeller shaft to 45 lb. in. (5 Nm). Turn driveshaft 10 revolutions with the load applied to propeller shaft. This will seat forward gear bearing.



a - Propeller Shaft (DO NOT install shift cam)
b - Bearing Carrier (assembled)
c - Cover Nut (Tighten; DO NOT torque)
d - Bearing Carrier Removal Tool (91-46086A1)
e - Puller Bolt (91-85716); Torque to 45 lb. in. (5 Nm)

5. Fasten dial indicator to gear housing and Backlash Indicator Tool (91-78473) to driveshaft.
6. Recheck torque on puller bolt [45 lb. in. (5 Nm)].

7. Position dial indicator pointer on line marked “1” on Backlash Indicator Tool, if gear ratio is 1.87:1 (15 teeth on pinion gear), or on line marked “2” on Backlash Indicator Tool, if gear ratio is 2:1 (14 teeth on pinion gear) or on line marked “4” if gear ratio is 2.3:1 (13 teeth on pinion gear).



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a - Thread Stud Adaptor (from 91-14311A1)
b - Stud
c - Backlash Indicator Tool (91-78473)
d - Dial Indicator Holder (91-89897)
e - Dial Indicator (91-58222A1)

8. Lightly turn driveshaft back-and-forth (no movement should be noticed at propeller shaft).
9. Dial indicator registers amount of backlash which must be 0.018 in. to 0.027 in. (0.46 mm to 0.69 mm) for the 1.87:1 gear ratio, 0.015 in. to 0.022 in. (0.38 mm to 0.56 mm) for the 2:1 gear ratio and 0.018 in. to 0.023 in. (0.46 mm to 0.58 mm) for the 2.3:1 gear ratio.
10. If backlash is LESS than the specified minimum, REMOVE shim(s) from in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 on threads of nut.
11. If backlash is MORE than the specified MAXIMUM, add shim(s) in front of forward gear bearing race to obtain correct backlash. When reinstalling pinion nut, apply Loctite 271 on threads of nut.

NOTE: *By adding or subtracting 0.001 in. (0.025 mm) shim, the backlash will change approximately 0.001 in. (0.025 mm).*

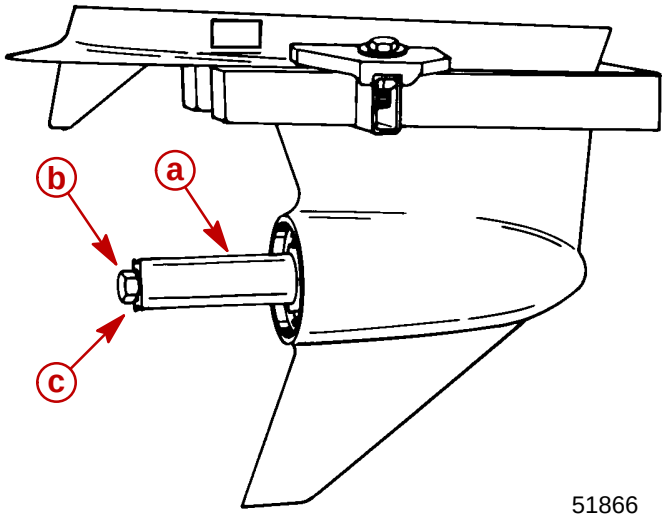
REVERSE GEAR

Determining Reverse Gear Backlash

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

1. Propeller shaft and bearing carrier must be completely assembled and installed in gearcase.
2. Install shift shaft in gearcase.
3. Shift gearcase into reverse.
4. Slide 5-1/2 in. x 1.5 in. I.D. (139.7 mm x 38.0 mm) piece of PVC pipe over propeller shaft and position pipe against bearing carrier.

5. Secure pipe against carrier with propeller nut and tab washer.



a - Pipe [5-1/2 in. x 1.5 in. (139.7 mm x 38.0 mm)]
b - Propeller Nut
c - Tab Washer

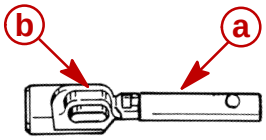
6. Torque propeller nut to 45 lb. in. (5 Nm).
7. Gently rock driveshaft. Dial indicator should show backlash of 0.030 in. – 0.050 in. (0.762 mm – 1.27 mm).

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.

Clutch Actuator Rod

REASSEMBLY

1. Place a small amount of Quicksilver 2-4-C w/Teflon Lubricant on actuator rod and install cam follower.



a - Actuator Rod
b - Cam Follower

Shift Shaft Bushing

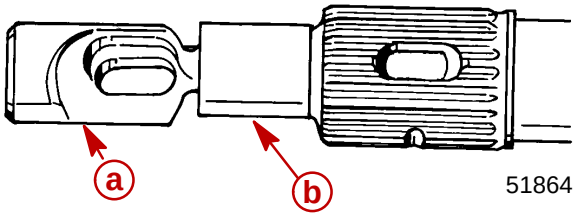
REASSEMBLY

1. Position shift shaft bushing on a press with threaded side down.
2. Apply Loctite 271 to outside diameter of oil seal.
3. Press oil seal into shift shaft bushing with lip of seal up.
4. Wipe any excess Loctite from oil seal and bushing.
5. Place rubber washer against oil seal.
6. Install O-ring over threads and up against shoulder of bushing.
7. Lubricate O-ring and oil seal with Quicksilver 2-4-C w/Teflon Marine Lubricant.

Propeller Shaft

REASSEMBLY/INSTALLATION

1. Insert clutch actuator rod assembly into end of propeller shaft. Align cross pin slot in actuator rod with cross pin slot in propeller shaft.
2. On PRODUCTION MODEL GEAR CASES, position sliding clutch onto propeller shaft with GROOVED RINGS (ON SLIDING CLUTCH) TOWARD PROPELLER END OF PROPELLER SHAFT. Cross pin hole and detent holes (in sliding clutch) must line up with cross pin slot and detent notches on propeller shaft.



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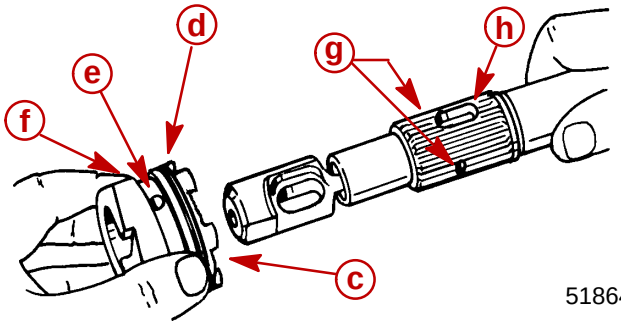
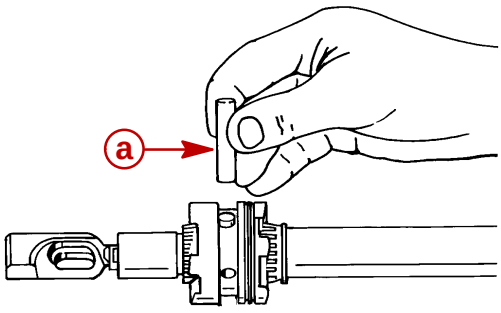


51864

a - Cam Follower
b - Propeller Shaft
c - Sliding Clutch
d - Grooved Rings
e - Cross Pin Hole
f - Detent Hole (Behind Finger and Thumb)
g - Detent Notch (One on Each Side)
h - Cross Pin Slot

3. Insert cross pin thru sliding clutch, propeller shaft and actuator rod, forcing cross pin tool out.
4. Apply a small amount of 2-4-C w/Teflon Marine Lubricant on detent pin. Position a detent pin in detent pin hole of sliding clutch with rounded end of pin toward propeller shaft.



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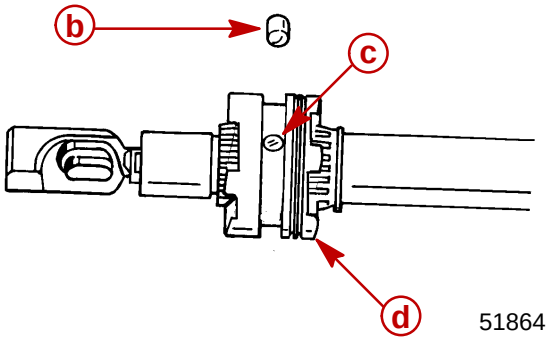

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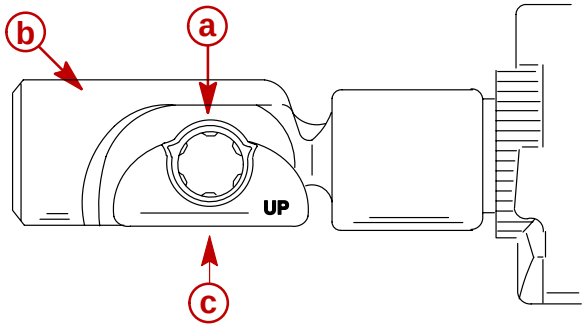
a - Cross Pin
b - Detent Pin
c - Cross Pin
d - Sliding Clutch

5. Install cross pin retaining spring onto sliding clutch as follows:

IMPORTANT: DO NOT over-stretch retaining spring when installing onto sliding clutch.

6. Spirally wrap spring into groove on sliding clutch.
7. Place gear housing in a soft jaw vise with the driveshaft in a vertical position.
8. Coat cam pocket of cam follower with 2-4-C w/Teflon Marine Lubricant.
9. Place shift cam into cam pocket of cam follower with numbered side of cam facing up.
10. With shift cam positioned as shown, insert propeller shaft thru forward gear until shaft bottoms out.



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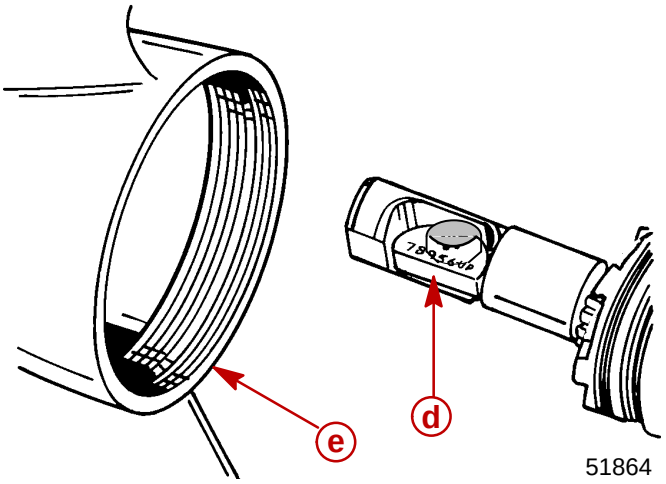


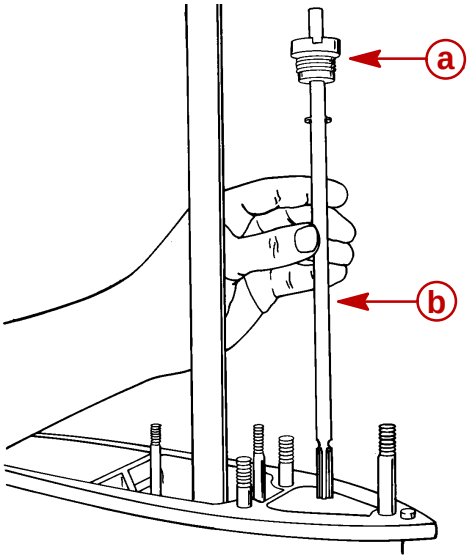
51864

a - Cam Pocket
b - Cam Follower
c - Shift Cam
d - Shift Cam (Position as Shown)
e - Gear Housing

⚠ CAUTION

Until bearing carrier is installed into gear housing, extreme care MUST BE taken not to apply any side force on propeller shaft. Side force on propeller shaft may break the neck of the clutch actuator rod.

11. Insert shift shaft down shift shaft hole (of gear housing) and thru shift cam and cam follower. (It may be necessary to rotate shift shaft back-and-forth slightly for it to enter shift cam.)
12. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant to threads of shift shaft bushing. (Thread bushing into position, but do not tighten down at this time)



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a - Shift Shaft Bushing
b - Shift Shaft

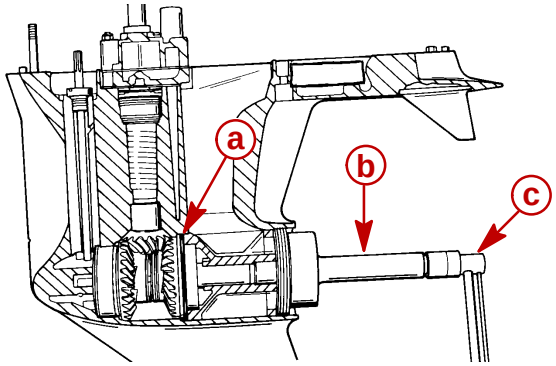
13. Lubricate O-ring on bearing carrier with Quicksilver 2-4-C w/Teflon Marine Lubricant.
14. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant to outside diameter of bearing carrier (where carrier contacts gear housing).

NOTE: *When performing Step 15, rotate driveshaft clockwise (viewed from top) to mesh pinion gear with reverse gear.*

15. Position bearing carrier over propeller shaft and slide it into gear housing. (Be sure to align bearing carrier keyway with gear housing keyway.)
16. Push bearing carrier in as far as possible by hand, then install bearing carrier key.
17. Place tab washer against bearing carrier.
18. Apply Quicksilver 2-4-C w/Teflon Marine Lubricant to threads of cover nut and install cover nut in gear housing (verify that the word “OFF” and arrow are visible).

NOTE: *Before torquing bearing carrier cover nut, gear case should either be mounted in a stand specifically designed for holding gear cases or bolted to a driveshaft housing to avoid possible damage to the gear case.*

19. Start cover nut a few turns by hand, then using Cover Nut Tool (91-61069) and torque wrench, torque cover nut to 210 lb. ft. (285 Nm).



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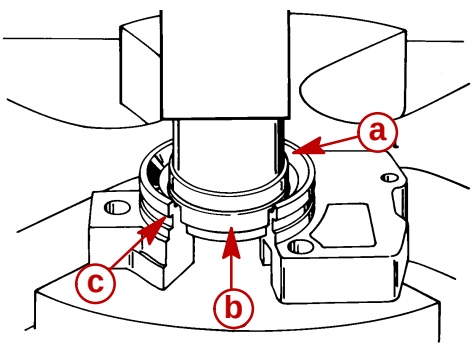
a - O-ring
b - Cover Nut Tool
c - Torque Wrench

20. Bend one lock tab of tab washer into cover nut (only one will align).
21. Bend remaining tabs of tab washer toward front of gear housing.
22. Use Shift Shaft Bushing Tool (91-31107) and torque shift shaft bushing to 30 lb. ft. (41 Nm).

Water Pump

REASSEMBLY/INSTALLATION

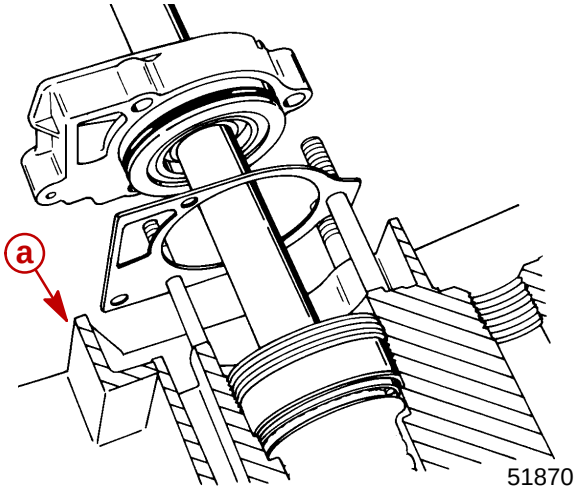
1. Install oil seals into water pump base, as follows:
   a. Place water pump base on a press.
   b. Just before installing each seal apply Loctite 271 on outside diameter of oil seal.
   c. With a suitable mandrel, press the smaller diameter oil seal into pump base with lip of oil seal toward impeller side of base.
   d. With a suitable mandrel, press the larger diameter oil seal into pump base with lip of oil seal toward gear housing side of base.
   e. Wipe any excess Loctite from oil seals and water pump base.
2. Install O-ring into O-ring groove of water pump base. Lubricate O-ring and oil seals with 2-4-C w/Teflon Marine Lubricant (92-90018A12).



51869

a - Mandrel
b - Oil Seal (Smaller OD)
c - O-ring Groove

3. Install divider block if removed. Use RTV Sealer to seal seams between divider block and gear housing.
4. Install a new water pump base gasket and install water pump base.



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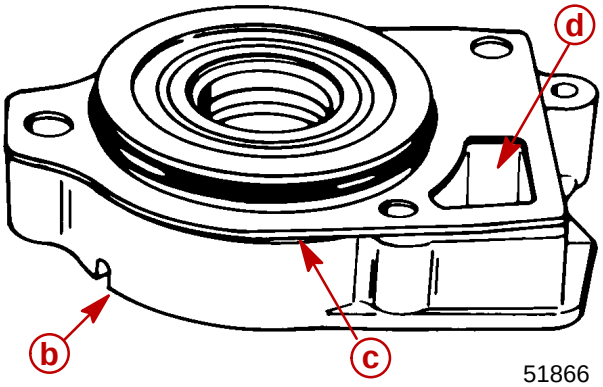

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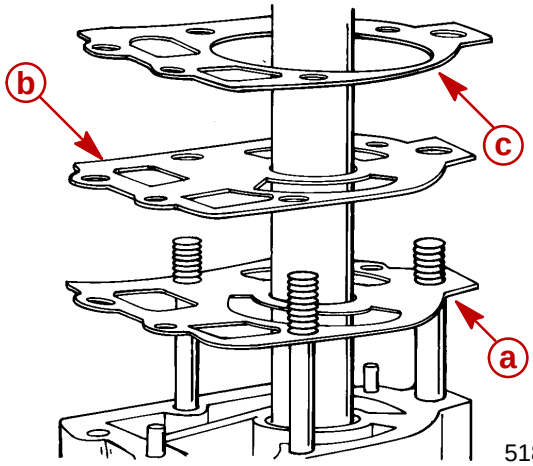
a - Divider Block
b - Water Pump Base
c - Gasket
d - Hole (MUST be positioned as shown)

5. Install the following in order: Pump base to face plate gasket, face plate gasket and face plate to pump cover gasket. Gaskets and face plate are indexed by dowel pin location and must be installed correctly.



51868

a - Gasket (Water Pump Base to Face Plate)
b - Face Plate
c - Gasket (Face Plate to Water Pump Cover)

6. Place impeller drive key on flat of driveshaft. Hold key on driveshaft with a small amount of Quicksilver 2-4-C w/Teflon Marine Lubricant.

IMPORTANT: When completing gear housing repair, that requires removal of water pump impeller, it is recommended that the impeller be replaced. If it is necessary, however, to reuse the impeller, DO NOT install in reverse to original rotation, or pre-mature impeller failure will occur. Original rotation is clockwise.

⚠ CAUTION

A visual inspection of impeller drive key MUST BE made to determine that drive key is on flat of driveshaft after impeller is installed. If key has moved off flat of driveshaft, repeat Steps 6 and 7.

7. Slide impeller down driveshaft to impeller drive key. Align drive key with keyway in the center hub of impeller, and slide impeller over drive key.
8. If removed, install new water pump insert into pump cover as follows:
   a. Apply Perfect Seal to water pump insert area of pump cover.
   b. Install water pump insert into pump cover. Verify that tab on insert enters recess in pump cover.
   c. Wipe any excess Perfect Seal from insert and cover.

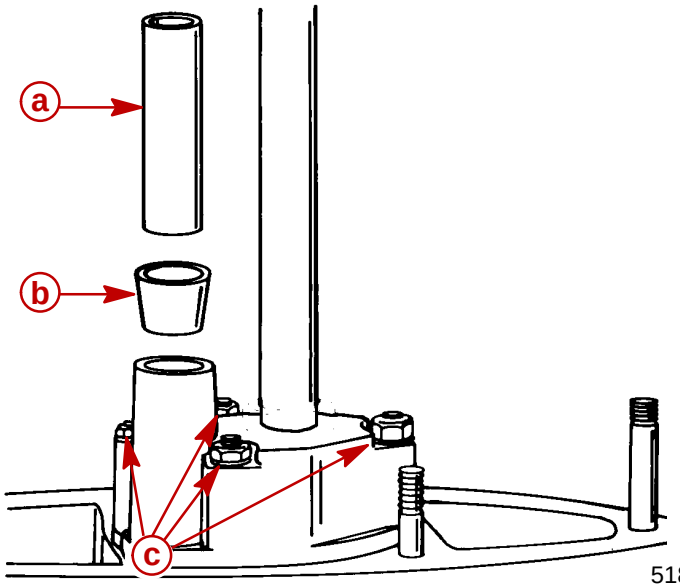
NOTE: *If 2 holes were drilled in top of water pump cover to aid in removal of insert, fill holes with RTV Sealer or equivalent. Allow to cure, 24 hours prior to operating engine.*

9. Install water tube seal into pump cover, being sure that plastic side of seal goes into cover first.
10. Reinstall water tube guide into water pump cover.
11. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant inside of water pump insert.
12. Position assembled water pump cover over driveshaft and lower over water pump studs. Rotate driveshaft in a clockwise direction (viewed from top), while pushing down on pump cover to ease impeller entry into cover.
13. Install water pump cover retainer washers, nuts and bolt.

⚠ CAUTION

DO NOT over-torque nuts and bolt, as this could cause cover to crack during operation.

14. Torque water pump nuts to 50 lb. in. (5.5 Nm), and water pump bolt to 35 lb. in. (4 Nm).
15. Install centrifugal slinger over driveshaft and down against pump cover.



51874

a - Water Tube Guide
b - Water Tube Seal
c - Nuts, Bolts and Washers

Gear Lubricant Filling Instructions

1. Remove any gasket material from “Fill” and “Vent” screws and gear housing.
2. Install new gaskets on Fill and Vent screws.

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

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

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

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

Installing Gear Housing to Driveshaft Housing

⚠ WARNING

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

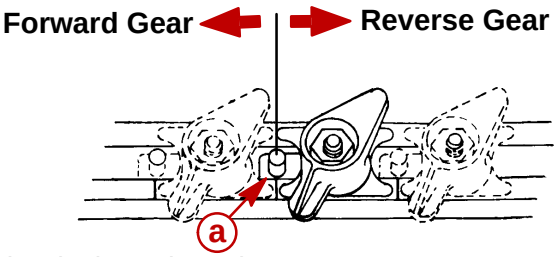
1. Tilt engine to full up position and engage the tilt lock lever.
2. Apply a light coat of Quicksilver 2-4-C w/Teflon Marine Lubricant onto driveshaft splines.

⚠ CAUTION

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

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

Right Hand Rotation Outboard



a - Guide Block Anchor Pin

7. Position gear housing so that the driveshaft is protruding into driveshaft housing.

NOTE: *If, while performing Step 8, the driveshaft splines will not align with crankshaft splines, place a propeller onto propeller shaft and turn it counterclockwise as the gear housing is being pushed toward driveshaft housing.*

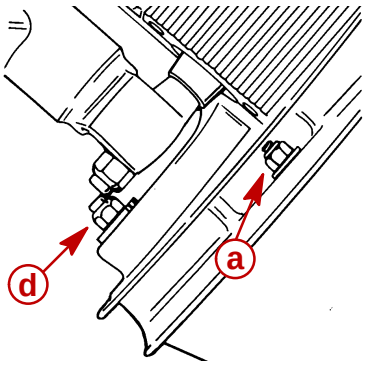
8. Move gear housing up toward driveshaft housing while aligning shift shaft splines and water tube with water tube guide (in water pump cover).
9. Place flat washers onto studs (located on either side of driveshaft housing). Start a nut (a) on these studs and tighten finger-tight.
10. Start bolt (b) 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 (a) which were started in Step 9. Torque to listing in **"Torque Specifications,"** preceding.
13. After 2 nuts (located on either side of driveshaft housing) are tightened, check shift operation as follows:
    a. Place guide block anchor pin into forward gear position while turning prop shaft. 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 washers and nuts (c) onto studs (located on bottom center of anti-cavitation plate). Torque to listing in **"Torque Specifications,"** preceding.



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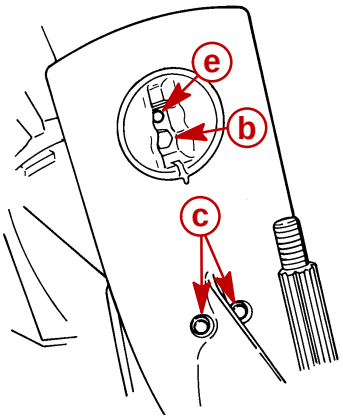

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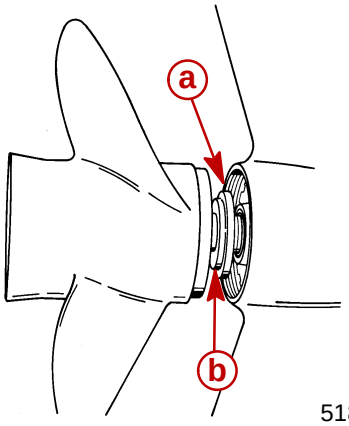
15. Install special flat washer and nut (d) on stud at leading edge of driveshaft housing. Torque to listing in **"Torque Specifications,"** preceding.
16. Torque bolt (started in Step 10) to listing in **"Torque Specifications,"** preceding.
17. Install trim tab, adjust to position in which it had previously been installed, and tighten bolt (e) securely.
18. Install plastic cap into trim tab bolt opening at rear edge of driveshaft housing.

Propeller Installation

⚠ WARNING

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

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



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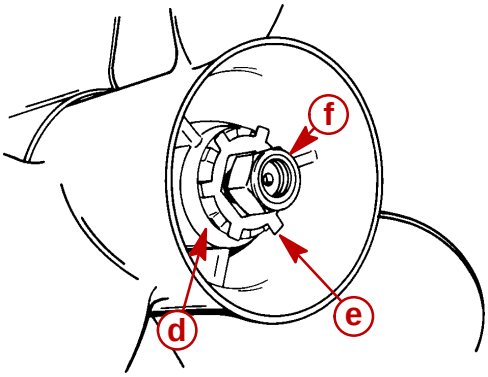

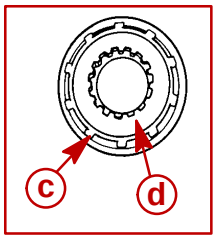

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a - Forward Thrust Hub
b - Propeller Shaft
c - Continuity Washer (if Equipped)
d - Rear Thrust Hub
e - Tab Washer
f - Propeller Nut

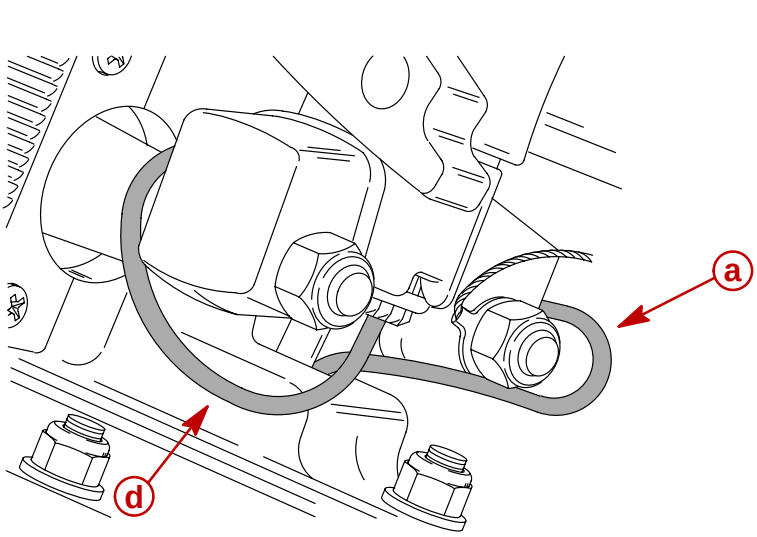
⚠ CAUTION

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

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

Speedometer Tube Installation

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



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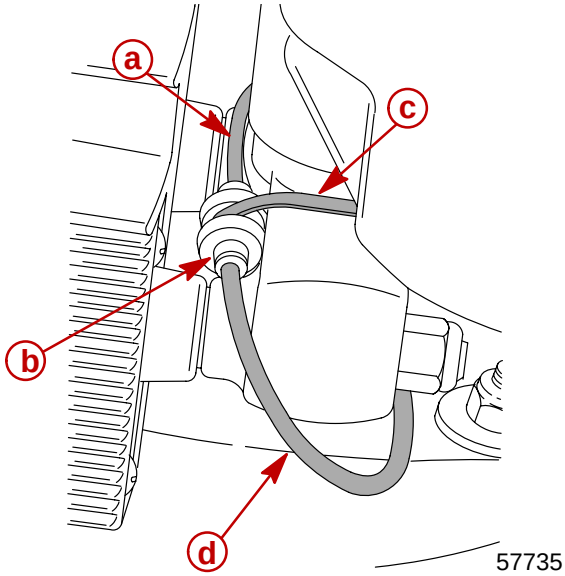

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a - Speedometer Tube from Gearcase
b - Junction
c - Sta-strap
d - Speedometer Tube from Swivel Tube