



LOWER UNIT

Section 6A - Non-Bigfoot Gear Housing

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**6
A**

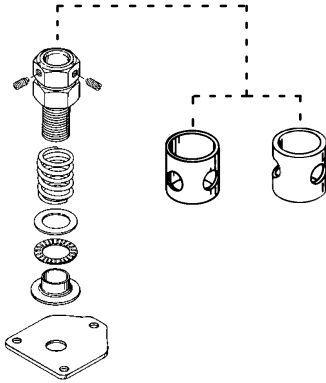
Specifications

GEAR HOUSING (1.83:1)	Gear Ratio	1.83:1
	Gearcase Capacity	11.5 fl oz (340 mL)
	Lubricant Type	Quicksilver Gear Lube-Premium Blend
	Forward Gear	
	Number of Teeth	22 Spiral/Bevel
	Pinion Gear	
	Number of Teeth	12 Spiral/Bevel
	Pinion Height	0.025 in. (0.64 mm)
	Forward Gear Backlash	Pinion Gear Locating Tool (91-817008A2) 0.011-0.017 in. (0.28-0.43 mm)
	Water Pressure (Warm Engine)	Backlash Indicator Tool (91-19660--1) MARK #4 or 0.366 in. (9.3 mm)
	@ 800 rpm	1-3 psi (7-21 kPa)
	@ 6000 rpm (WOT)	12-25 psi (83-172 kPa)
	Leak Test Pressure	10-12 psi (68-83 kPa) for 5 Minutes

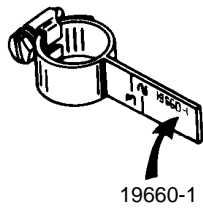


Special Tools

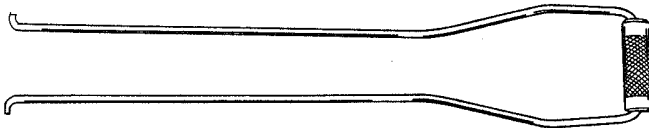
1. Bearing Preload Tool 91-14311A2



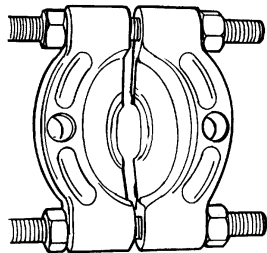
2. Backlash Indicator Tool 91-19660--1



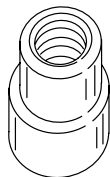
3. Puller 91-27780



4. Universal Puller Plate 91-37241



5. Driver Head 91-37312.

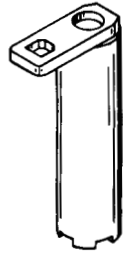


6. Driver Rod (91-37323)

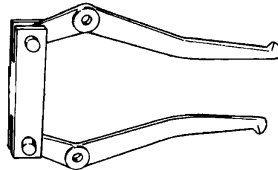




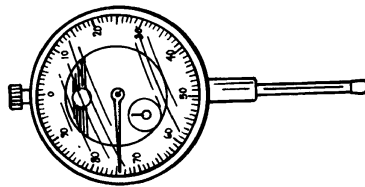
7. Bearing Retaining Tool 91-43506.



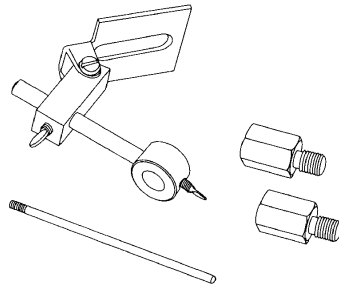
8. Puller Jaws (91-46086A1)



9. Dial Indicator (91-58222A1)



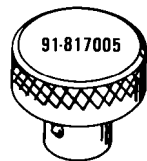
10. Dial Indicator Adaptor Kit (91-83155)



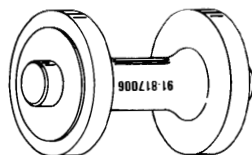
11. Puller Bolt (91-85716)



12. Forward Gear Bearing Installer 91-817005.

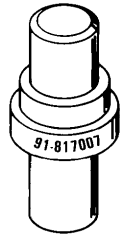


13. Water Pump Base Seal Installer 91-817006.

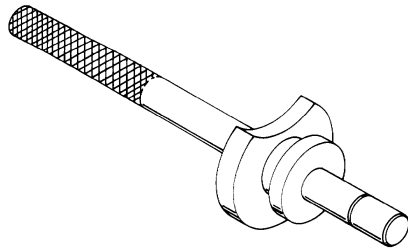




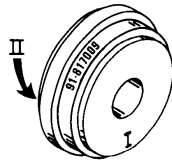
14. Bearing Carrier Seal Installer 91-817007.



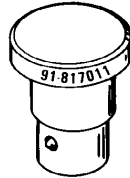
15. Pinion Gear Location Tool 91-817008A2.



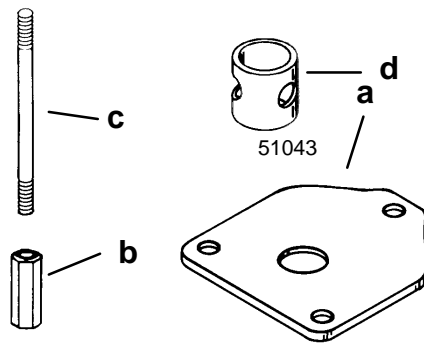
16. Forward Gear Bearing Race Driver Cup 91-817009.



17. Needle Bearing Installer 91-817011.



18. Backlash Indicator Tool 91-817057A1.

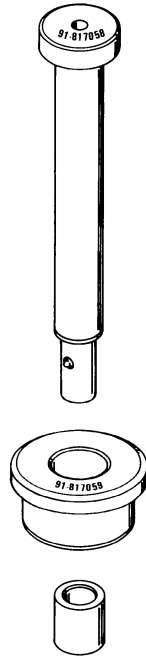


Ref.	Description	Qty.
a	Plate	1
b	Nut	1
c	Stud	1
d	Sleeve	1

91-817057A-1 Update Kit (Converts 91-14311A-1 Bearing Preload Kit Tool to a 91-14311A-2)



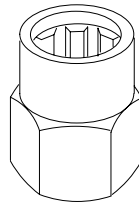
19. Lower Driveshaft Bearing Driver Assembly 91-817058A1.



20. Driveshaft Holding Tool 91-817070 55/60 (2-stroke).



21. Driveshaft Holding Tool 91-877840A1 50/60 (4-stroke).



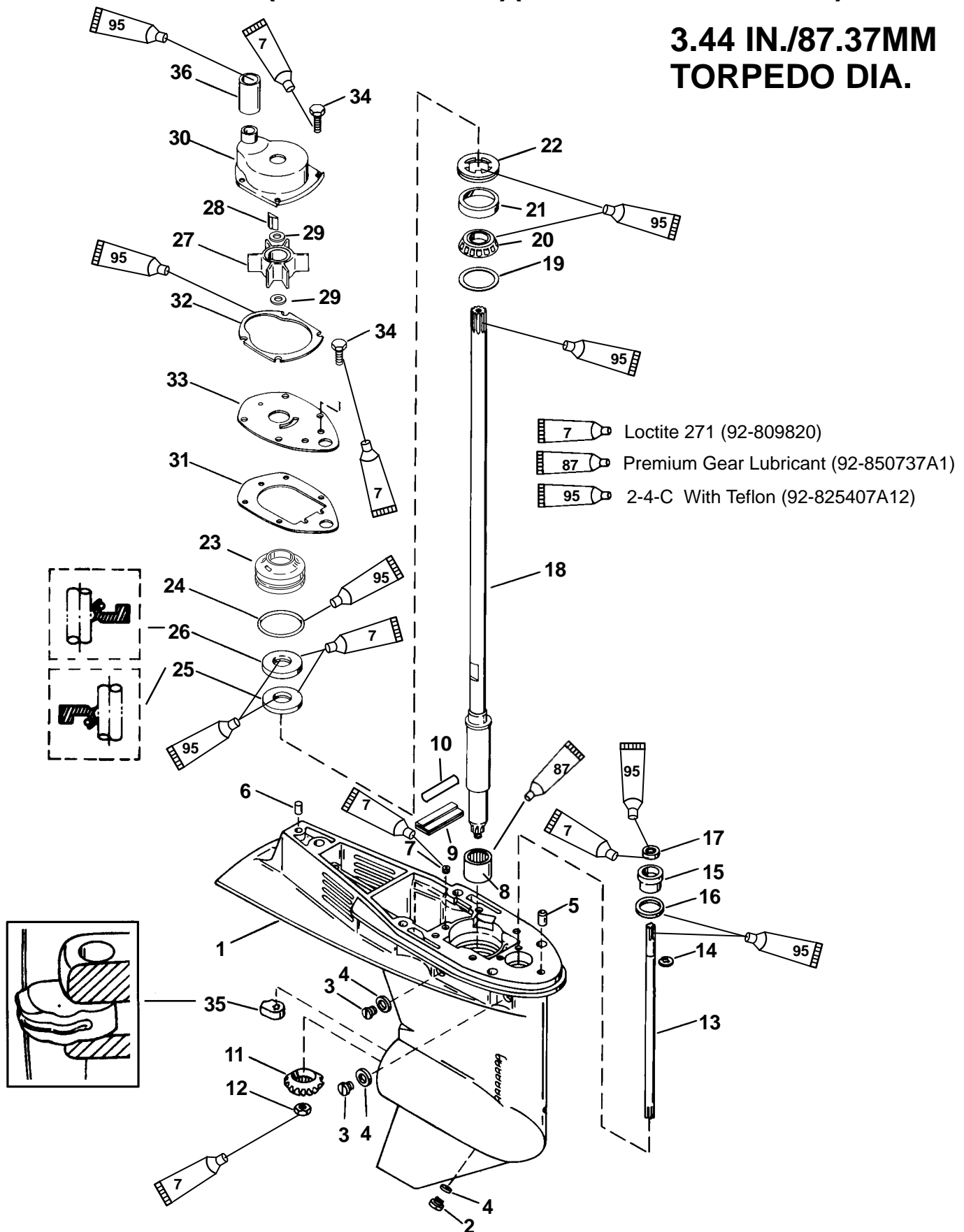
Quicksilver Lubricants and Service Aids

Part No.	Description
92-809820	Loctite "271"
92-90113--2	RTV Silicone Sealer
92-850737A1	Premium Blend Gear Lubricant
92-850735A1	Anti-Corrosion Grease
92-850736A1	2-4-C w/Teflon



GEAR HOUSING (DRIVE SHAFT)(1.83:1 GEAR RATIO)

3.44 IN./87.37MM TORPEDO DIA.



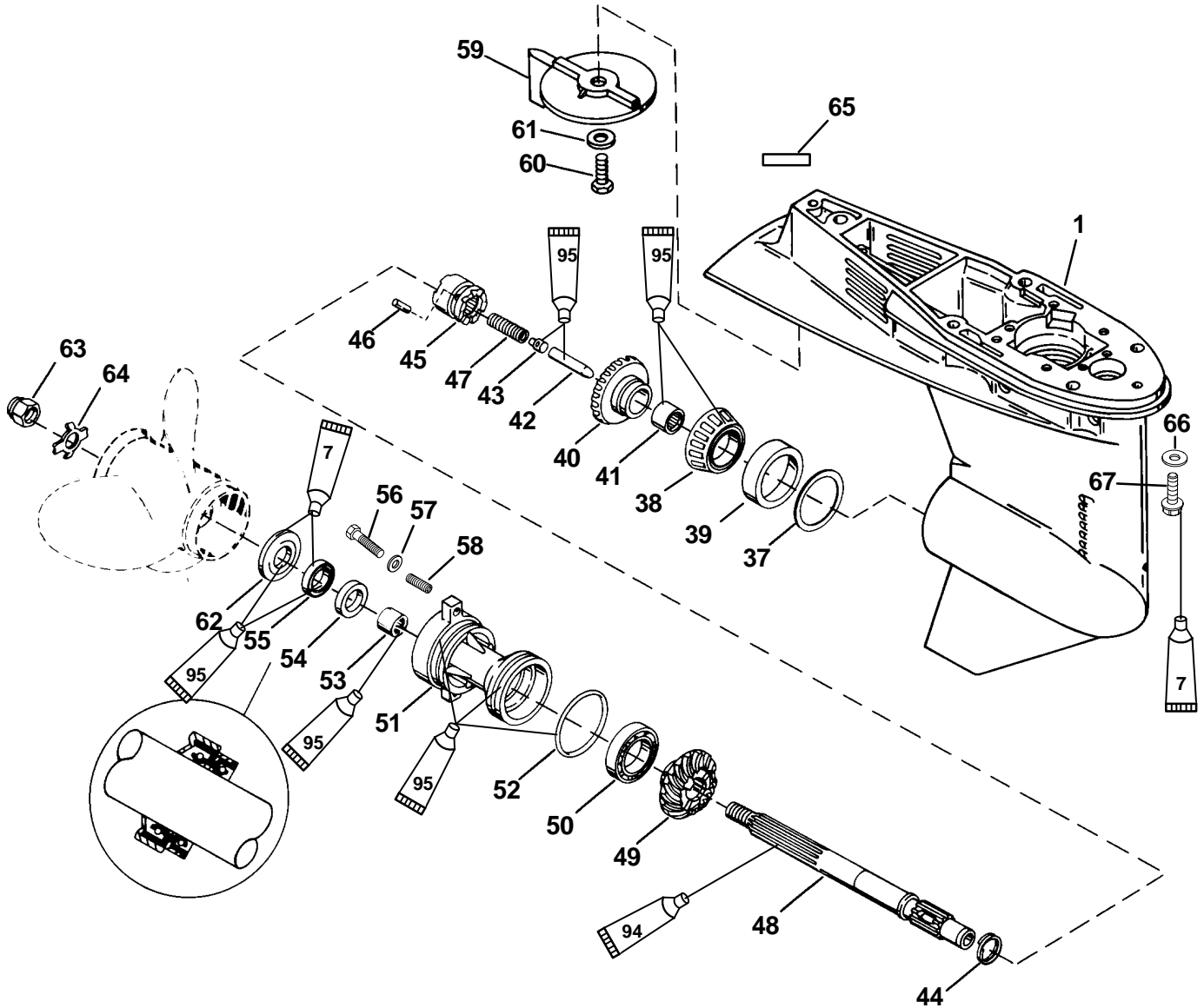
**GEAR HOUSING (DRIVE SHAFT)(1.83:1 GEAR RATIO)**

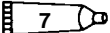
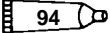
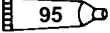
REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	GEAR HOUSING			
2	1	DRAIN SCREW	58		6.5
3	2	SCREW	58		6.5
4	3	WASHER-sealing			
5	1	DOWEL PIN			
6	1	DOWEL PIN			
7	1	PIPE PLUG			
8	1	ROLLER BEARING			
9	1	SEAL KIT			
10	1	FILLER PLATE			
11	1	PINION GEAR (14 TEETH)			
12	1	NUT		50	67.8
13	1	SHIFT SHAFT ASSEMBLY			
14	1	RETAINING RING			
15	1	BUSHING ASSEMBLY			
16	1	O-RING			
17	1	OIL SEAL			
18	1	DRIVE SHAFT			
19	AR	SHIM SET (SIZES 006 THRU 038)			
20	1	TAPERED ROLLER BEARING			
21	1	CUP			
22	1	NUT		75	101.7
23	1	WATER PUMP BASE			
24	1	O-RING			
25	1	OIL SEAL			
26	1	OIL SEAL			
27	1	IMPELLER			
28	1	KEY			
29	2	WASHER			
30	1	WATER PUMP			
31	1	GASKET (LOWER)			
32	1	GASKET (UPPER)			
33	1	FACE PLATE			
34	6	SCREW (M6x16)	60		6.8
35	1	SHIFT CAM			
36	1	COUPLER			



GEAR HOUSING (PROP SHAFT)(1.83:1 GEAR RATIO)

3.44 IN./87.37MM
TORPEDO DIA.



-  7 Loctite 271 (92-809820)
-  94 Anti-Corrosion Grease (92-78376A6)
-  95 2-4-C With Teflon (92-825407A12)

**GEAR HOUSING (PROP SHAFT)(1.83:1 GEAR RATIO)**

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb-in	lb-ft	Nm.
1	1	GEAR HOUSING			
37	AR	SHIM SET (SIZES 006 THRU 048)			
38	1	TAPERED ROLLER BEARING			
39	1	CUP			
40	1	FORWARD GEAR (23 TEETH)			
41	1	ROLLER BEARING			
42	1	CAM FOLLOWER			
43	1	SLIDE			
44	1	SPRING			
45	1	CLUTCH			
46	1	CROSS PIN			
47	1	SPRING			
48	1	PROPELLER SHAFT			
49	1	REVERSE GEAR (23 TEETH)			
50	1	BALL BEARING			
51	1	BEARING CARRIER ASSEMBLY			
52	1	O-RING			
53	1	ROLLER BEARING			
54	1	OIL SEAL			
55	1	OIL SEAL			
56	2	SCREW (M8x30)	225	18.8	25.5
57	2	WASHER			
58	2	THREADED INSERT			
59	1	TRIM TAB			
60	1	SCREW (M10 x 30)	186		21.0
61	1	WASHER			
62	1	THRUST HUB			
63	1	PROPELLER NUT		55	74.6
64	1	TAB WASHER			
65	1	DECAL- Gear Ratio			
66	4	WASHER			
67	4	SCREW (M10 x 45)		40	54



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.

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

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

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

Bearings

WARNING

To avoid personal injury, wear eye protection and regulate air pressure to not more than 25 p.s.i. (172 kPa) when drying bearings with compressed air. Do not spin bearings with compressed air as this may cause bearings to score from lack of lubrication.

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 through the bearing. Do not spin bearing with compressed air (see above warning). After cleaning, lubricate bearings with Quicksilver Gear Lubricant. DO NOT lubricate tapered bearing cups until after inspection.

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

Inspect gear housing for bearing races that have spun in their respective bores. If race(s) have spun, gear housing must be replaced.

Roller bearing condition is determined by inspecting the 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 such a condition exists.

Seals

As a normal procedure, all O-rings and oil seals should be replaced without regard to appearance. To prevent leakage around seals, apply Loctite 271 to outer diameter of all seals. When using Loctite on seals or threads, surfaces must be clean and dry. Apply 2-4-C w/Teflon on all O-rings and on I.D. of oil seals. Apply 2-4-C w/Teflon to external surfaces of bearing carrier.

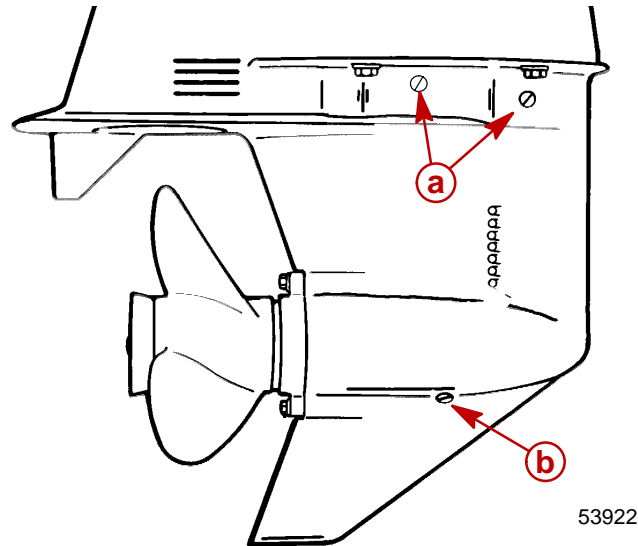


Draining and Inspecting Gear Lubricant

⚠ WARNING

If gear housing is installed on engine, to avoid accidental starting, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

1. With gear housing in normal running position, place a clean pan under housing and remove the two vent screws and one fill/drain screw (with gaskets).



- a** - Vent Plug
b - Fill/Drain Plug

2. Inspect gear lubricant for metal particles (lubricant will have a “metal flake” appearance). Presence of fine metal particles (resembling powder) in the drain pan indicates normal wear. The presence of metal chips in the drain pan indicates the need for gear housing disassembly and component inspection.
3. Note color of gear lubricant. White or cream color MAY indicate presence of water in lubricant. Gear lubricant which has been drained from a gear case recently in operation will have a yellowish color due to lubricant agitation/aeration. Gear lube which is mixed with assembly lubricant (Special Lube 101 or 2-4-C w/Teflon) will also be creamy white in color. This is normal and should not be confused with the presence of water. If water is suspected to be present in gearcase, a pressure check of gearcase should be made (with no lubricant in gearcase). Gearcase should hold 10-12 psi of pressure for 5 minutes without leaking down. Pouring a portion of the gear lubricant into a glass jar and allowing the lubricant to settle will allow any water in the lube to separate and settle to the bottom of the jar.
4. Presence of water in gear lubricant indicates the need for disassembly and inspection of oil seals, seal surfaces, O-rings, water pump gaskets, bearings and bearing surfaces, as well as gear housing components. If gearcase is rebuilt, gearcase should be pressure checked before filling with lubricant.

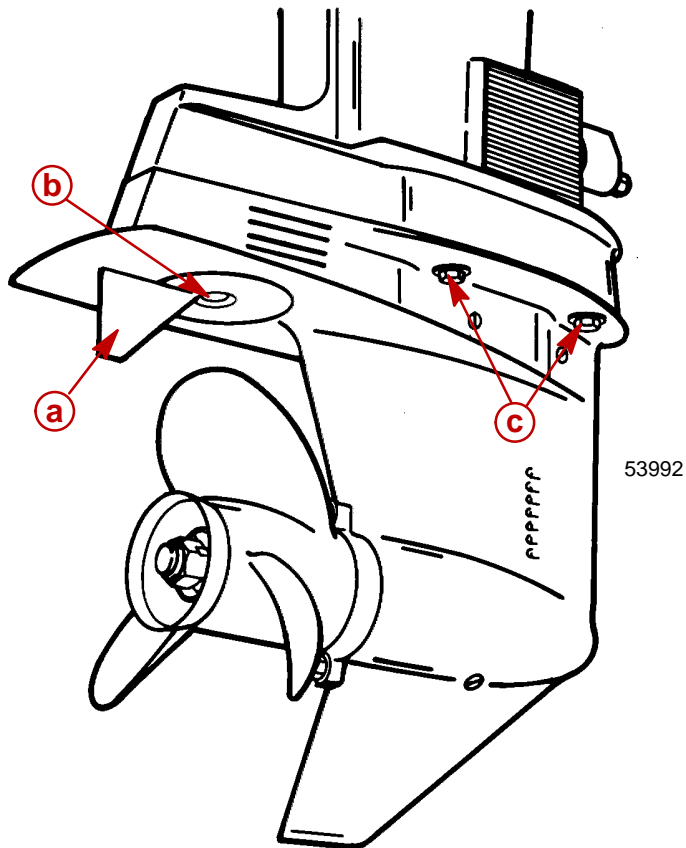


Removal

⚠ WARNING

To prevent accidental engine starting, remove (and isolate) spark plug leads from spark plugs before removing gear housing.

1. Remove (and isolate) spark plug leads from spark plugs.
2. Shift engine into forward gear.
3. Tilt engine to full "Up" position.
4. Remove 4 bolts and washers, two from each side.
5. Remove trim tab.
6. Remove locknut and washer in trim tab recess.
7. Remove gear housing.



- a** - Trim Tab
- b** - Locknut and Washer
- c** - Bolts(4) M10 x 45 and Washers(4)



Disassembly

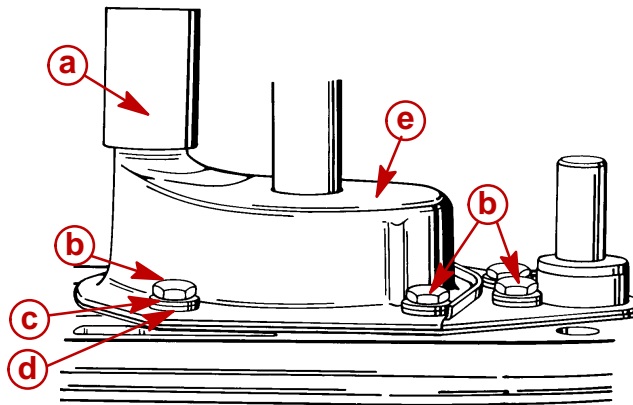
Water Pump

NOTE: If water tube seal stayed on water tube (inside of drive shaft housing) when gear housing was removed, pull water tube seal from water tube.

1. Replace water tube seal, if damaged.
2. Remove 6 screws, washers, and isolators (Design 1).
3. Remove cover.

NOTE: Isolators from forward 2 screws are shorter than the other isolators. Retain these for proper reassembly (Design 1).

NOTE: Design 1 included isolators on the water pump housing screws. Newer design versions did not use these isolators.

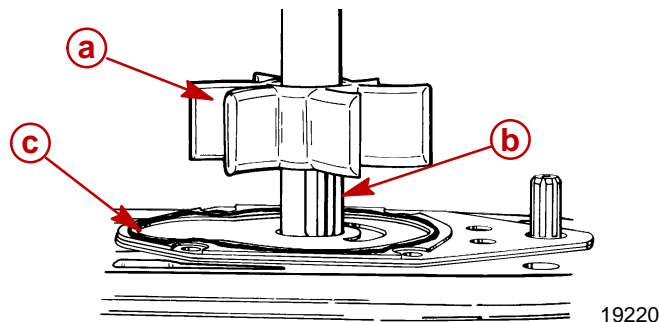


a - Water Tube Seal
b - Screw (6) M6x30
c - Washers (6)

d - Isolators (6) If so equipped
e - Cover

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

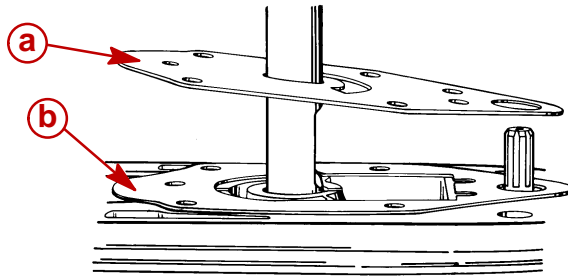
4. Replace cover if thickness of steel at the discharge slots is 0.060 in. (1.524 mm) or less, or if groove(s) (other than impeller sealing bead groove) in cover roof are more than 0.030 in. (0.762 mm) deep.
5. Lift impeller, drive key, and gasket from drive shaft.



a - Impeller
b - Drive Key
c - Gasket



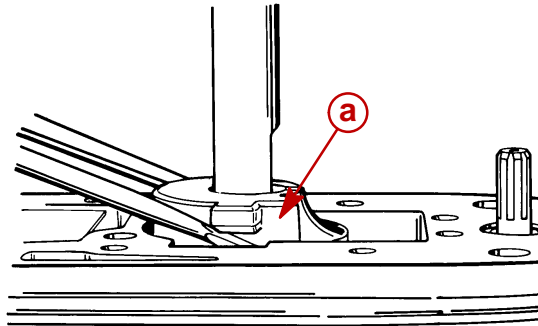
6. Inspect impeller. Replace impeller if any of the following conditions exist:
 - Impeller blade(s) are cracked, torn, or worn.
 - Impeller is glazed or melted (caused by operation without sufficient water supply).
 - Rubber portion of impeller is not bonded to impeller hub.
7. Remove plate and gasket.
8. Replace plate if groove(s) (other than impeller sealing bead groove) in plate are more than 0.030 in. (0.762 mm) deep.



- a** - Plate
- b** - Gasket

Old Style Base

9. Remove water pump base by lifting gently as shown. Inspect carefully for cracks.

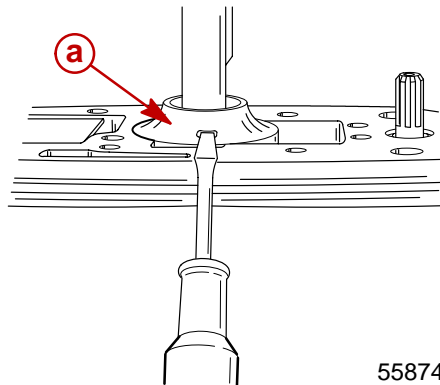


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- a** - Water Pump Base

New Style Base

10. Remove water pump base by lifting gently as shown. Inspect carefully for cracks.

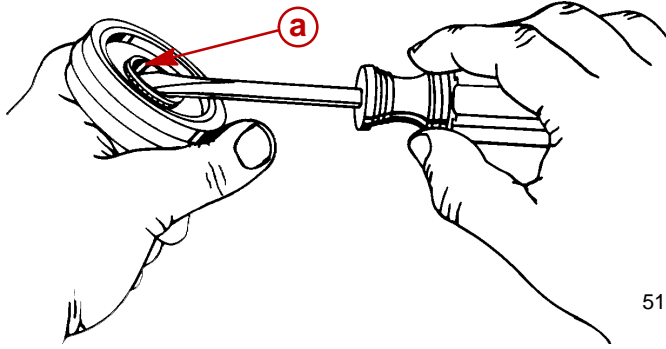


55874

- a** - Water Pump Base



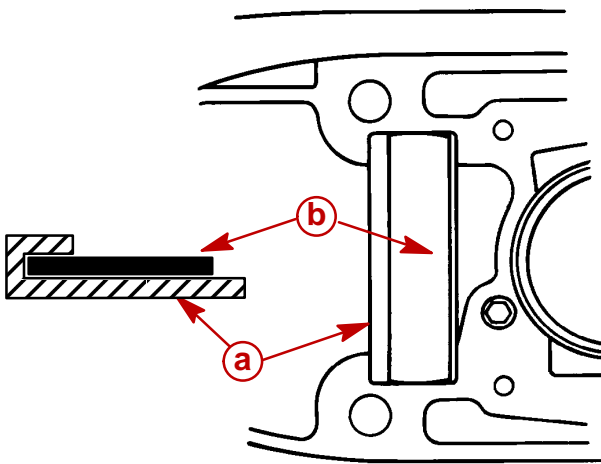
11. Remove (and discard) seals, if damaged. Secure the base to a bench top or **lightly** clamp base in vise when removing seals.



51205

a - Seals

12. Remove seal and plate if damaged or worn.



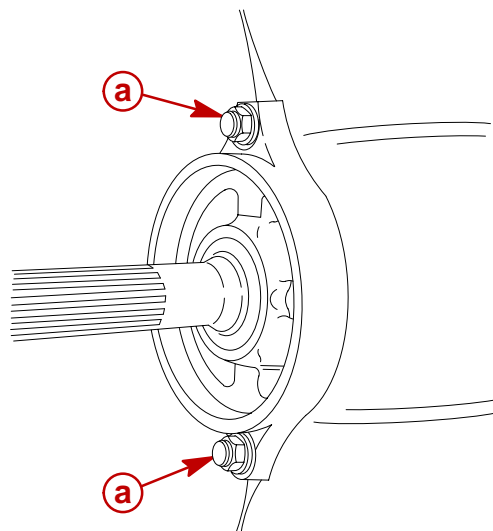
51268

a - Seal

b - Plate

Bearing Carrier and Propeller Shaft

1. Remove fasteners.

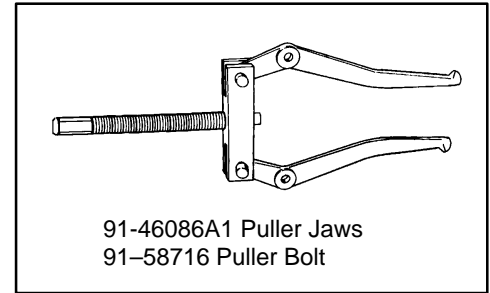
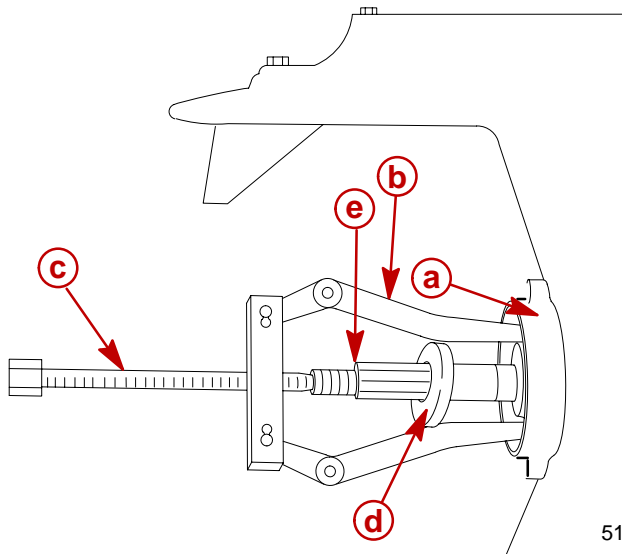


51117

a - Fasteners



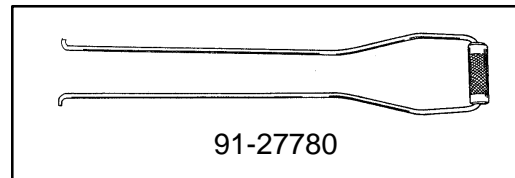
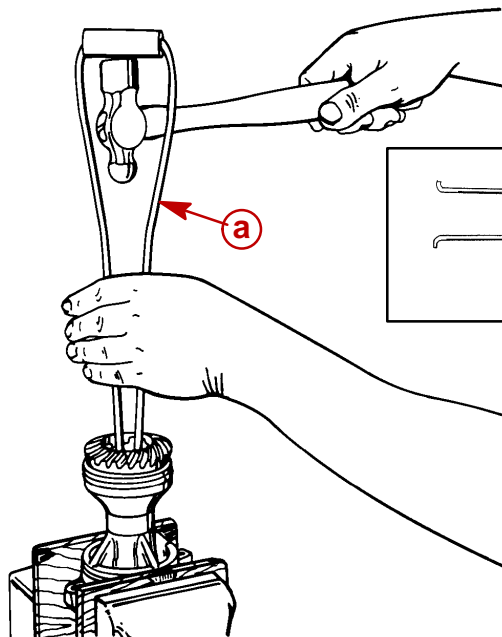
- With propeller shaft horizontal, use bearing puller to remove carrier from gear housing. Remove propeller shaft components as an assembly, taking care not to lose cam follower.



51116

- a** - Bearing Carrier
- b** - Puller Jaws (91-46086A1)
- c** - Puller Bolt (91-85716)
- d** - Thrust Hub
- e** - Propeller Shaft

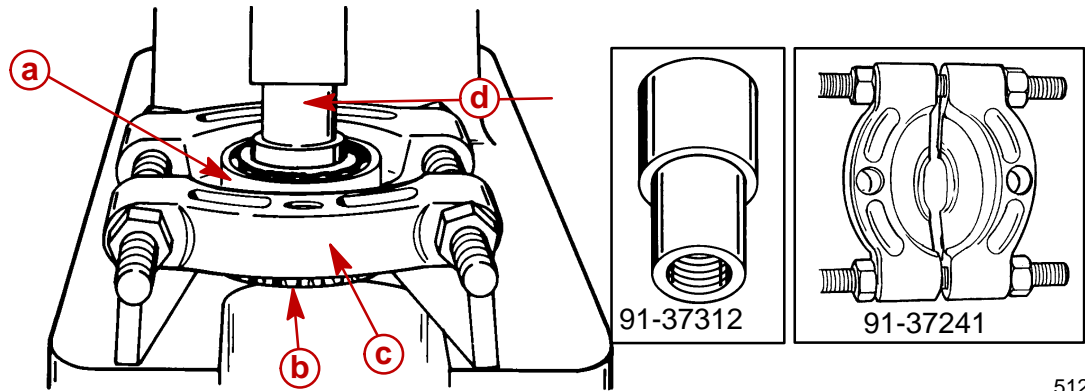
- Replace reverse gear if gear teeth or clutch teeth on reverse gear are chipped or worn. If reverse gear must be replaced, pinion and sliding clutch should also be inspected for damage.
- If reverse gear bearing is rusted or does not roll freely, replace bearing. Remove bearing and reverse gear using bearing puller.



- a** - Bearing Puller (91-27780)



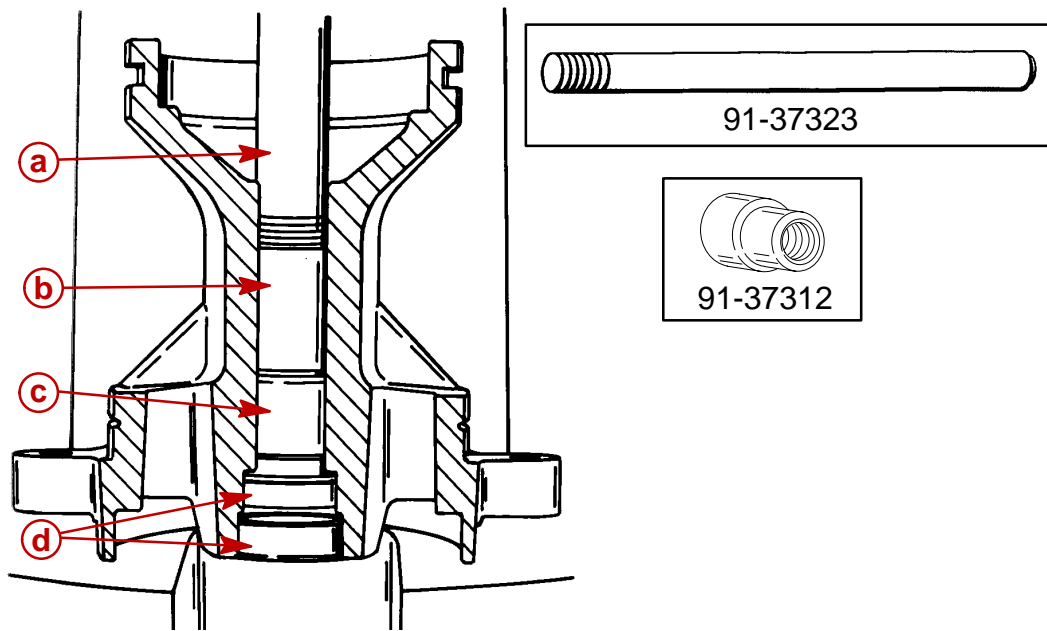
5. Remove ball bearing from reverse gear using Universal Puller Plate and mandrel.



51269

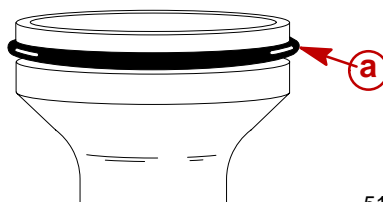
- a** - Ball Bearing
- b** - Reverse Gear
- c** - Universal Puller Plate (91-37241)
- d** - Driver Head (91-37312)

6. If bearing is rusted or does not roll freely, replace bearing. Remove bearing and oil seals. Discard oil seals.



- a** - Driver Rod (91-37323)
- b** - Driver Head (91-37312)
- c** - Propeller Shaft Needle Bearing
- d** - Oil Seals (2)

7. Remove propeller shaft seals and bearing carrier O-ring.



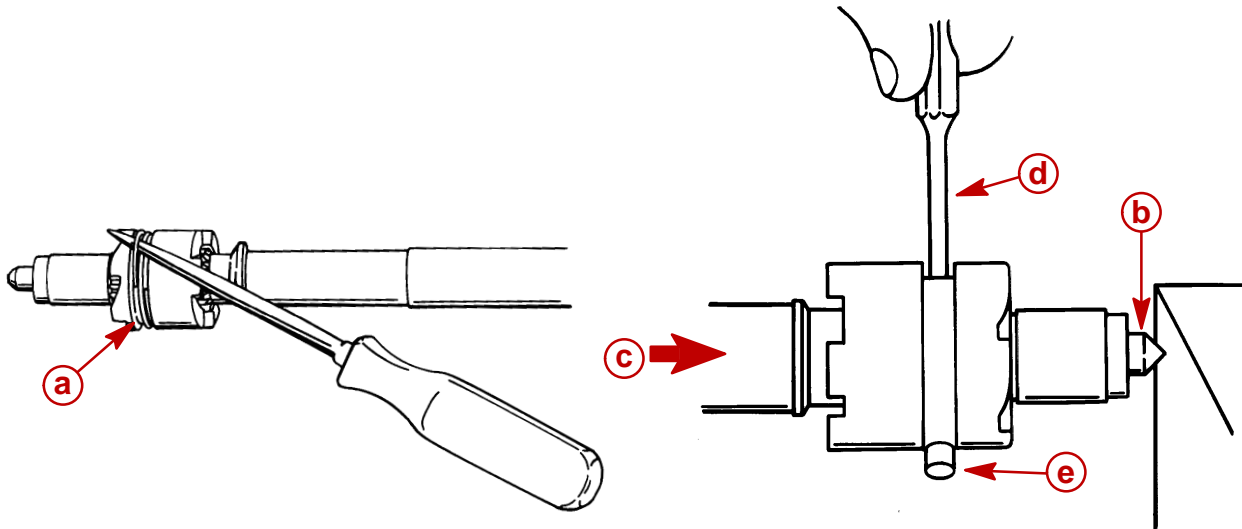
51263

- a** - O-ring



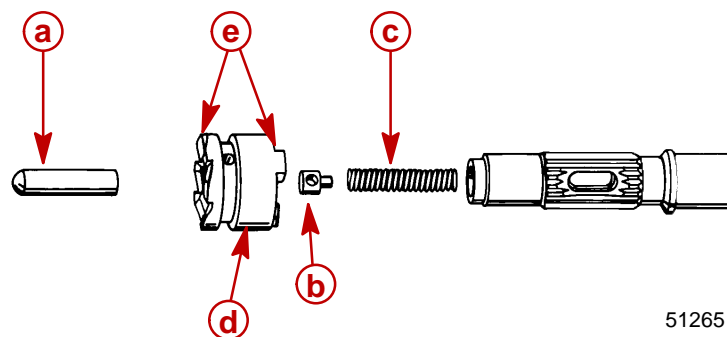
Propeller Shaft Disassembly

1. Remove spring. Push out cross pin.



- a** - Spring
- b** - Cam Follower
- c** - Apply Pressure as Shown
- d** - Punch
- e** - Cross Pin

2. Replace cam follower if worn or pitted on either end.
3. Replace sliding clutch if jaws are rounded or chipped. Rounded jaws indicate the following:
 - Improper shift cable adjustment.
 - Engine idle speed too high while shifting.
 - Shifting too slowly.

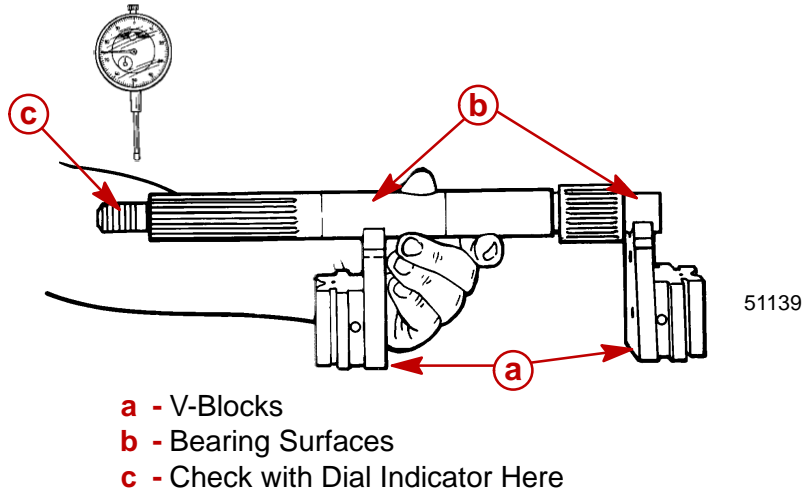


51265

- a** - Cam Follower
- b** - Guide Block
- c** - Spring
- d** - Sliding Clutch
- e** - Jaws



4. Check bearing surfaces of propeller shaft. If shaft is worn/pitted, replace shaft and corresponding bearing.
5. Replace propeller shaft if:
 - a. Splines are twisted or worn.
 - b. Bearing surfaces of propeller shaft are pitted or worn.
 - c. Oil seal surface is grooved in excess of 0.005 in. (0.12mm).
 - d. Shaft has a noticeable "wobble" or is bent more than 0.006 in. (.152 mm). Check with a dial indicator and V-blocks.



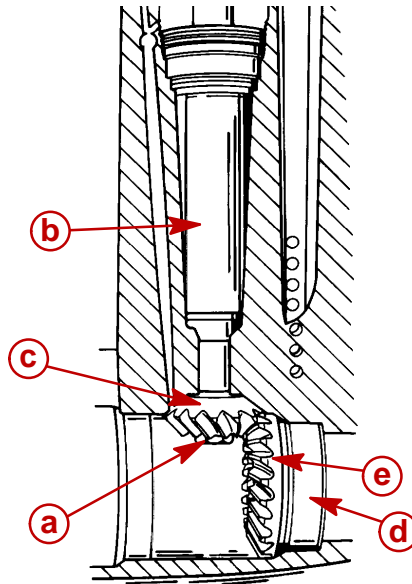


Pinion Gear, Driveshaft and Forward Gear

1. Hold driveshaft using Driveshaft Holding Tool. Remove (and discard) pinion nut.

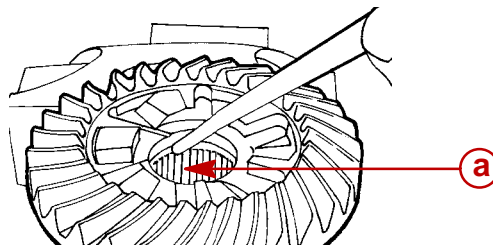
Model	Drive Shaft Holding Tool
40/50/60 (4-Stroke)	91-877840A1
55/60 Bigfoot (2-Stroke)	91-817070

2. Remove driveshaft, pinion gear, and forward gear.
3. Replace pinion gear if chipped or worn.
4. Replace lower driveshaft bearing if rusted or damaged; or does not roll freely. To remove, refer to "Lower Driveshaft Bearing", following.
5. Replace forward gear if gear teeth are chipped or worn.



- a** - Pinion Nut
- b** - Driveshaft
- c** - Pinion Gear
- d** - Bearing
- e** - Forward Gear

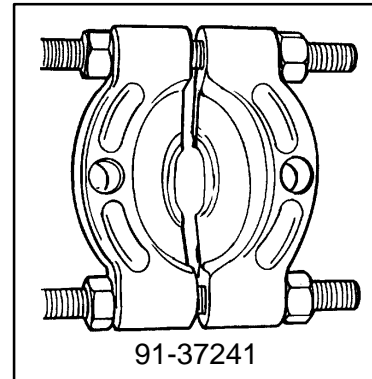
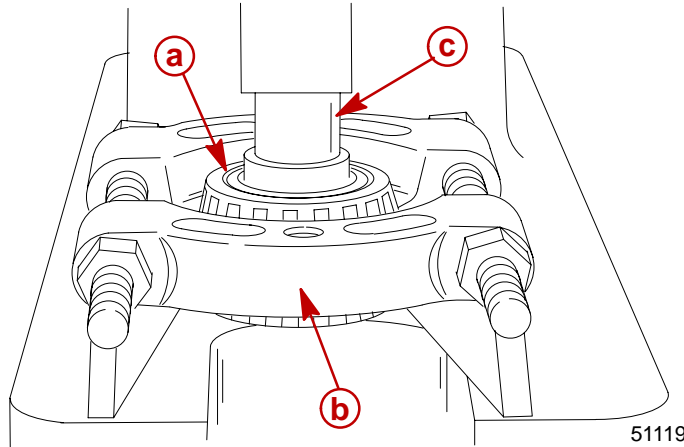
6. Replace forward gear needle bearing if rusted or does not roll freely after cleaning in solvent. Remove as shown.



- a** - Needle Bearing



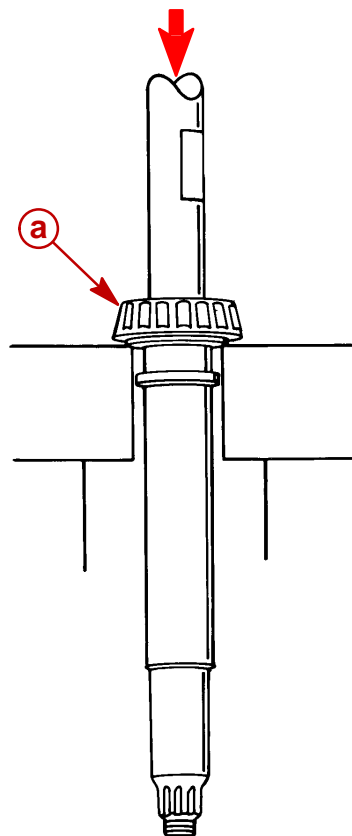
7. Replace forward gear tapered roller bearing and race if either bearing or race are rusted or damaged; or if bearing does not roll freely after cleaning in solvent. Remove bearing from gear using Universal Puller Plate and Mandrel. To remove race, refer to "Forward Gear Bearing Race", following.



- a - Bearing/Race
- b - Puller Plate (91-37241)
- c - Mandrel

Upper Driveshaft Bearing

1. Replace bearing and race if either bearing or race are rusted or damaged; or if bearing does not roll freely after cleaning in solvent.

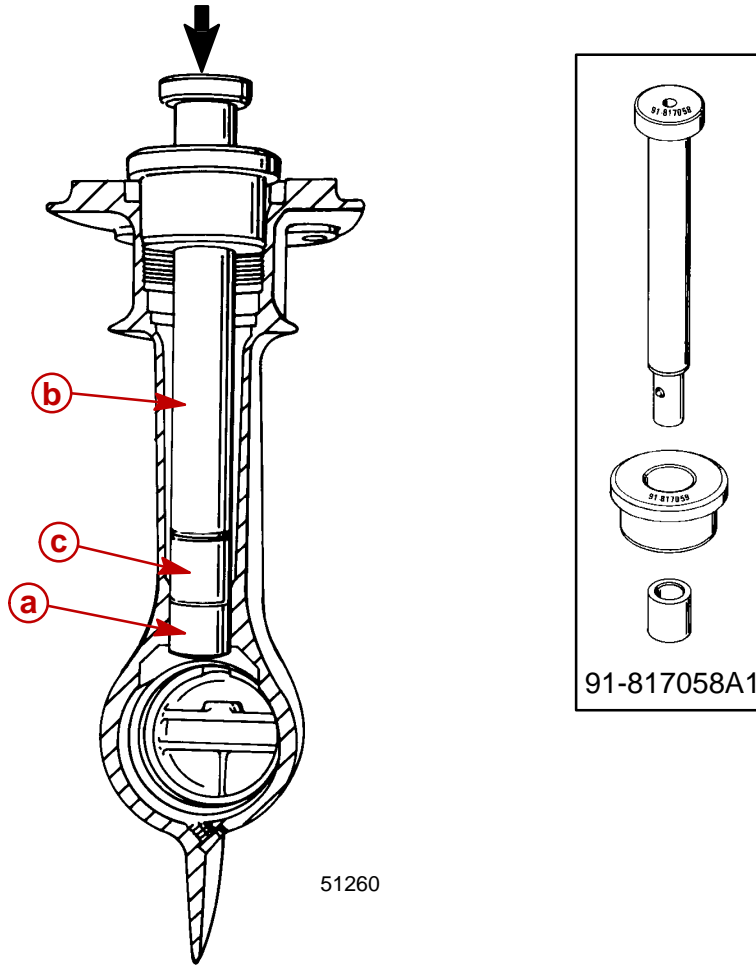


- a - Bearing



Lower Driveshaft Bearing

1. Remove lower driveshaft bearing using tool (91-817058A1) with bushing installed.



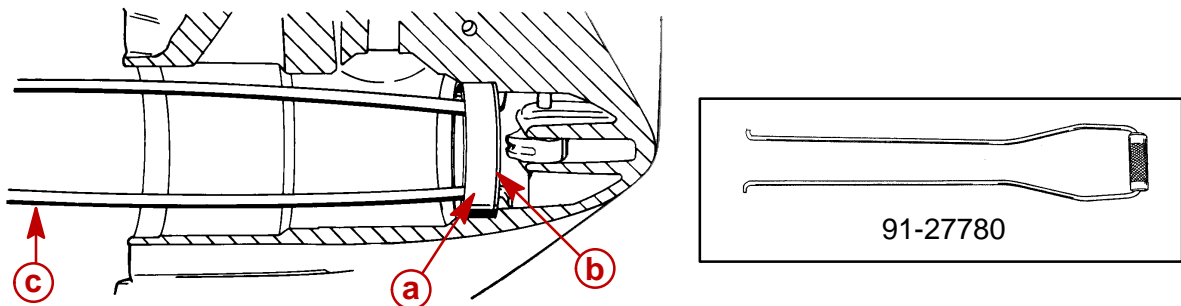
51260

- a** - Bearing
- b** - Removal Tool (91-817058A1)
- c** - Bushing

Forward Gear Bearing Race

IMPORTANT: Retain shim(s) for re-assembly.

1. Remove race and shim(s) using bearing puller.

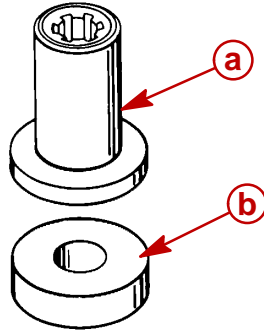


- a** - Race
- b** - Shim(s)
- c** - Bearing Puller (91-27780)



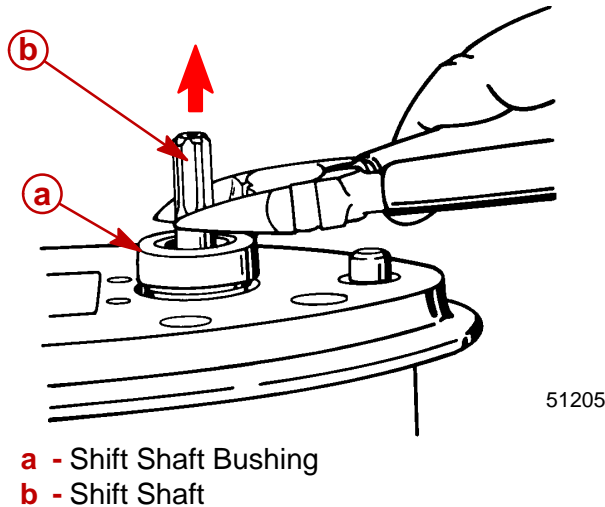
Shift Shaft

1. Remove shift shaft coupler and spacer.



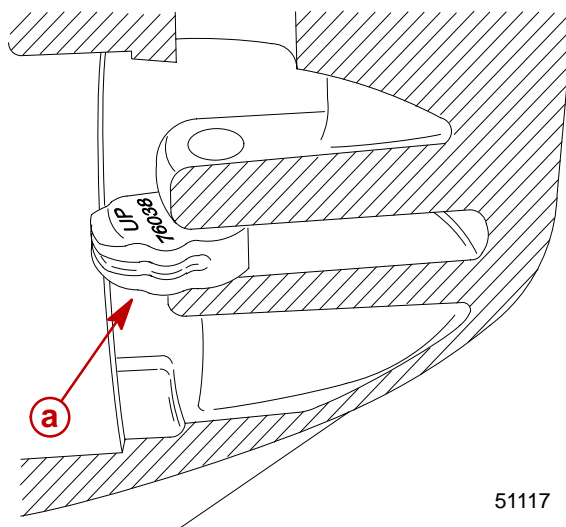
- a** - Coupler
- b** - Spacer

2. Remove shift shaft bushing and shift shaft. Protect shift shaft to prevent spline damage.



- a** - Shift Shaft Bushing
- b** - Shift Shaft

3. Remove shift shaft cam, replace if worn.

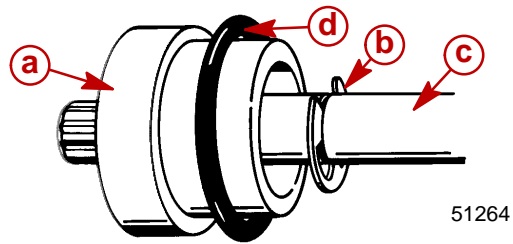


- a** - Shift Shaft Cam (55/60 2-Stroke shown)



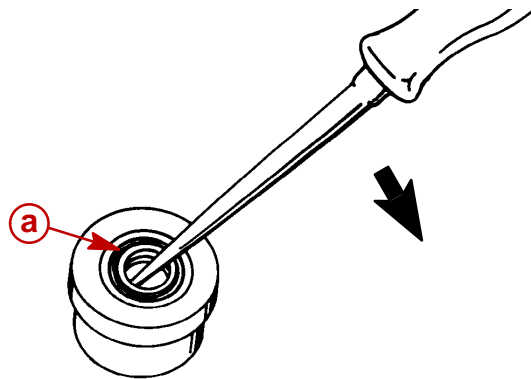
NOTE: Remove any burrs or sharp edges on the shift shaft splines before removing the shift shaft bushing.

4. Remove shift shaft bushing and “E” clip from shift shaft. Replace shift shaft if splines are twisted or damaged on either end of shaft. Remove (and discard) O-ring if damaged.



- a** - Shift Shaft Bushing
- b** - “E” Clip
- c** - Shift Shaft
- d** - O-ring

5. Remove (and discard) seal if damaged.



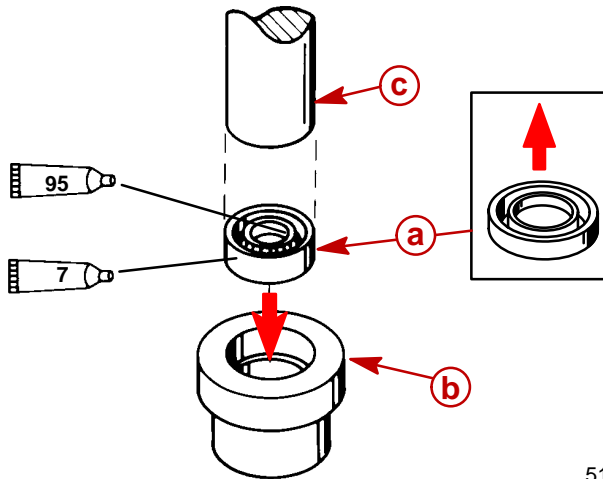
- a** - Seal




Gear Housing Reassembly

Shift Shaft

1. Apply Loctite 271 on O.D. of new seal. Install with seal lip up, as shown.
2. Press seal into shift shaft bushing until seal bottoms. Use a suitable tool.
3. Apply 2-4-C w/Teflon on O-ring and I.D. of seal.



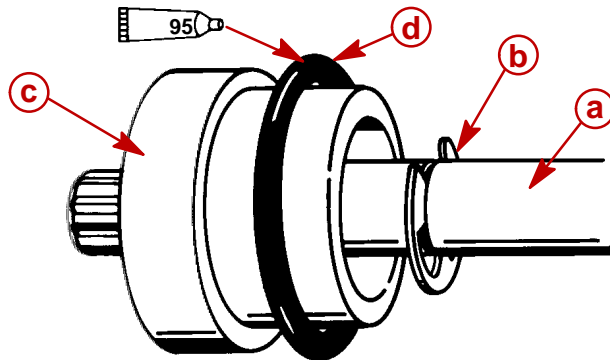
51270

 7 Loctite 271 (92-809820)

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

- a** - Seal Lips Facing Up
- b** - Shift Shaft Bushing
- c** - Tool

4. Assemble components.



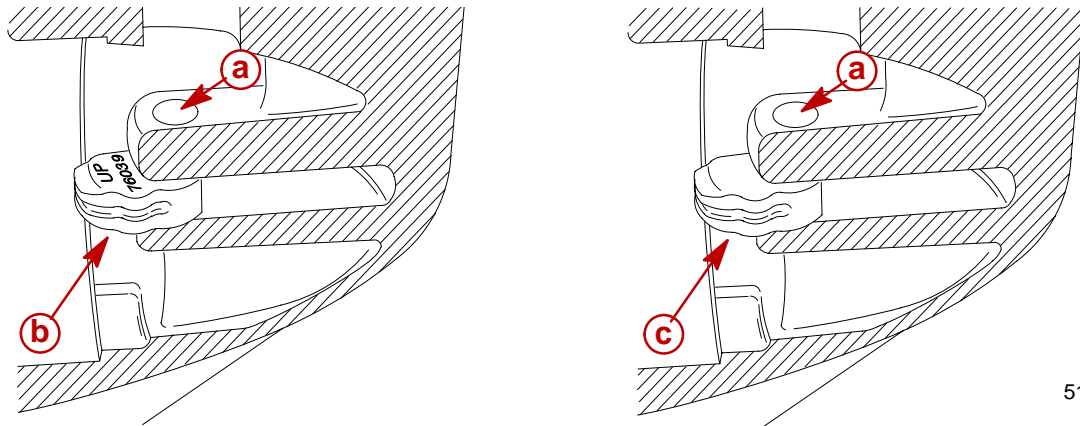
51264

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

- a** - Shift Shaft
- b** - "E" Clip
- c** - Bushing
- d** - O-ring



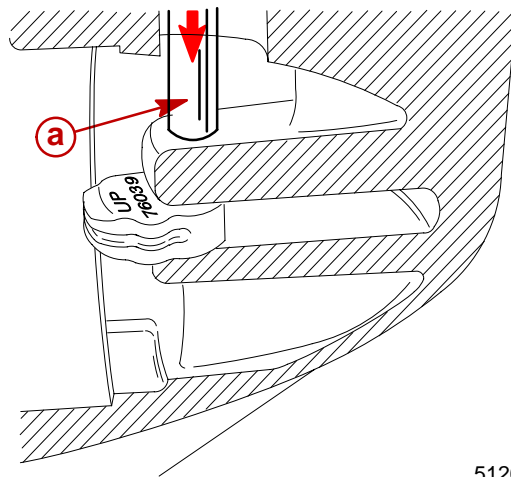
5. Install shift cam; align hole in shift cam with shift shaft pilot bore.



51117

- a** - Shift Shaft Pilot Bore
- b** - Shift Cam numbers up (2–Stroke)
- c** - Shift Shaft numbers down (4–Stroke)

6. Install shift shaft assembly; insert splines into shift cam.

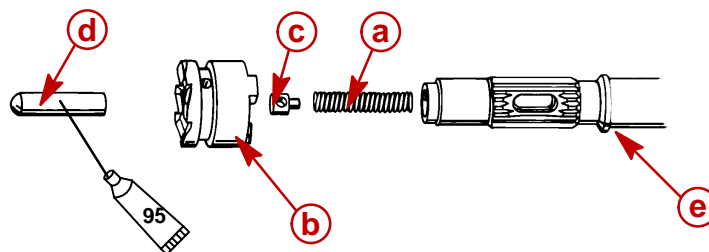


51268

- a** - Shift Shaft Assembly

Propeller Shaft

1. Install components. Clutch should be installed with long end (non-ratcheting) toward propshaft reverse shoulder.

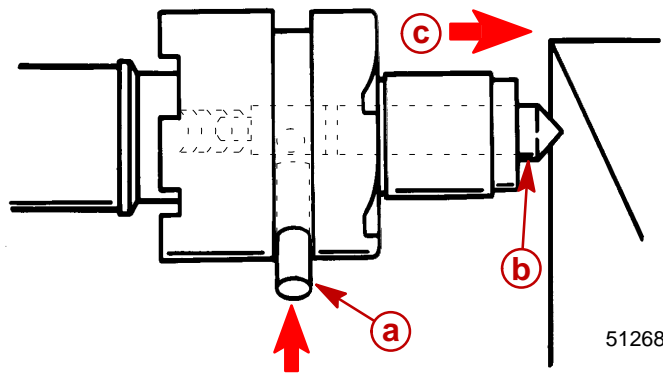


95 2-4-C w/Teflon (92-850736A1)

- a** - Spring
- b** - Clutch (Align Hole with Slot in Prop Shaft)
- c** - Guide Block
- d** - Cam Follower (Hold in Place with 2-4-C w/Teflon)
- e** - Propshaft Shoulder



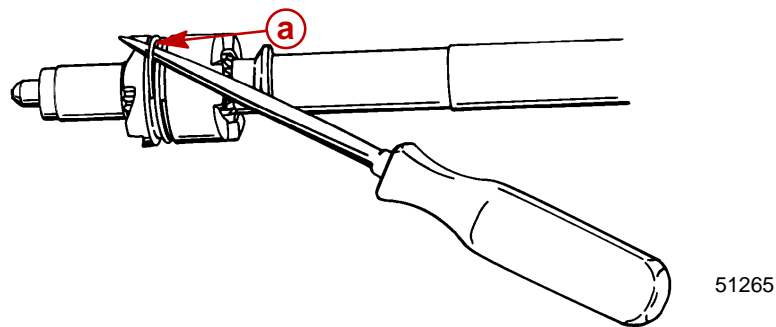
2. Install cross pin.



- a** - Cross Pin
- b** - Cam Follower
- c** - Apply Pressure in This Direction

3. Install spring.

NOTE: Spring windings must lay flat in clutch groove. DO NOT allow spring coils to overlap each other.

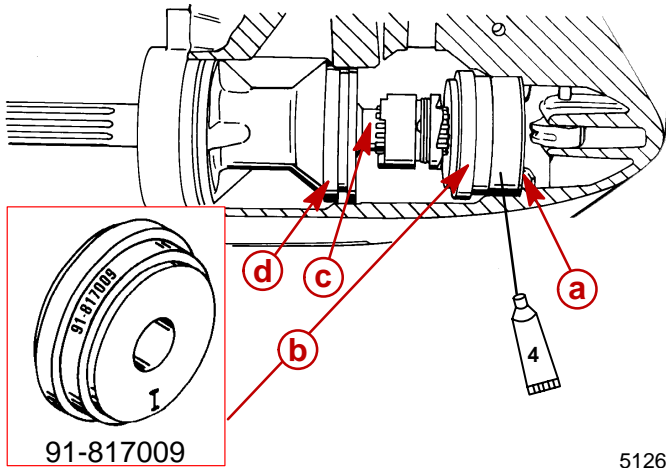


- a** - Spring



Forward Gear Bearing Race

1. Place shim(s), retained from disassembly, into housing. If shim(s) were lost or damaged, or a new gearcase is being assembled, start with a .010 in. (.254mm) shim.
2. Drive bearing race into housing. Use a lead hammer to avoid damage to propshaft.



51265

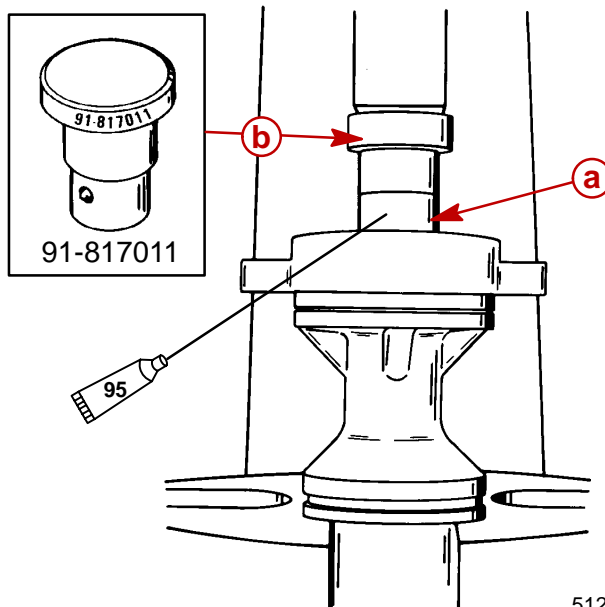
 Needle Bearing Assy. Lub. (92-825265A1)

- a** - Shim(s)
- b** - Driver Cup (91-817009)
- c** - Propeller Shaft
- d** - Assembled Bearing Carrier

Bearing Carrier

1. Lubricate O.D. of needle bearing with 2-4-C w/Teflon.
2. Install needle bearing.

Installation Note: Push against numbered end of bearing.



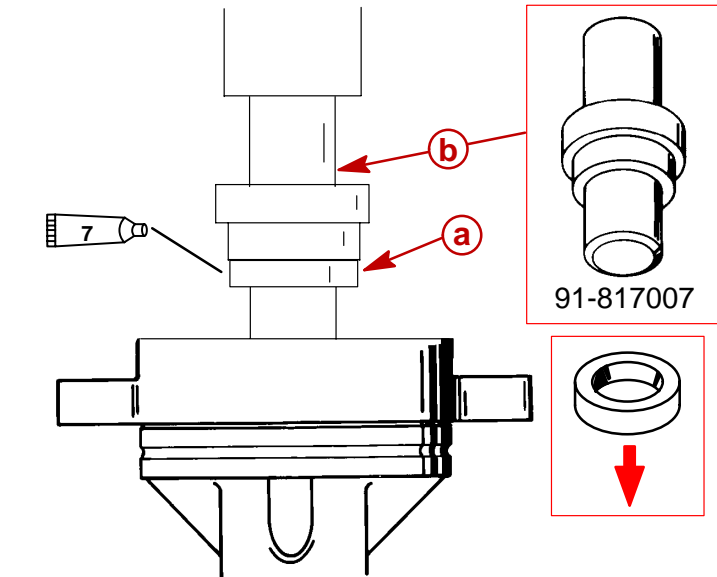
51269

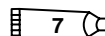
 2-4-C With Teflon (92-825407A12)

- a** - Needle Bearing
- b** - Installer (91-817011)



3. Apply Loctite 271 on O.D. of small diameter oil seal. Seal lip should face away from shoulder on Installation Tool. Press seal in until Installer Tool bottoms out.

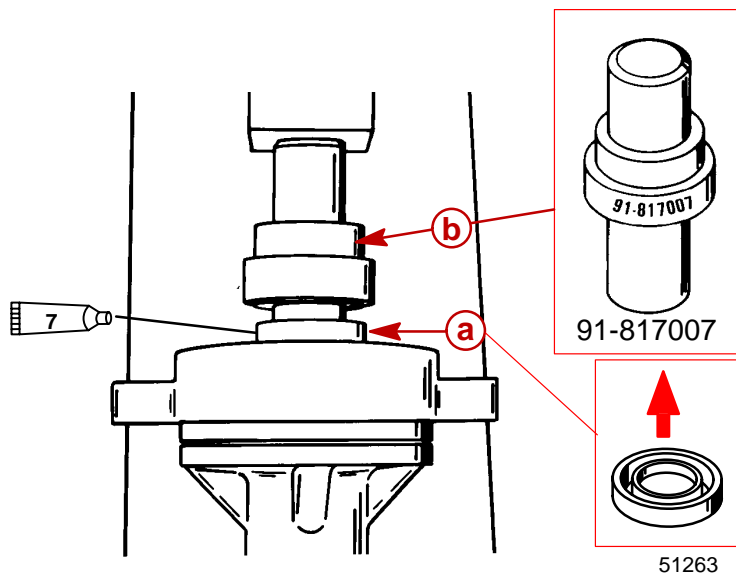


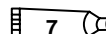
 Loctite "271" (92-809819)

- a** - Small Diameter Seal
- b** - Installer Tool (91-817007)

58209

4. Apply Loctite 271 on O.D. of larger diameter oil seal. Seal lip should face towards shoulder on installation tool. Press in until Installer tool bottoms out.



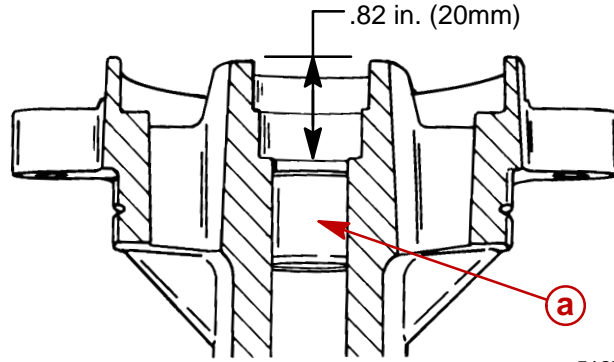
 Loctite "271" (92-809819)

- a** - Large Diameter Seal
- b** - Installer Tool (91-817007)

51263

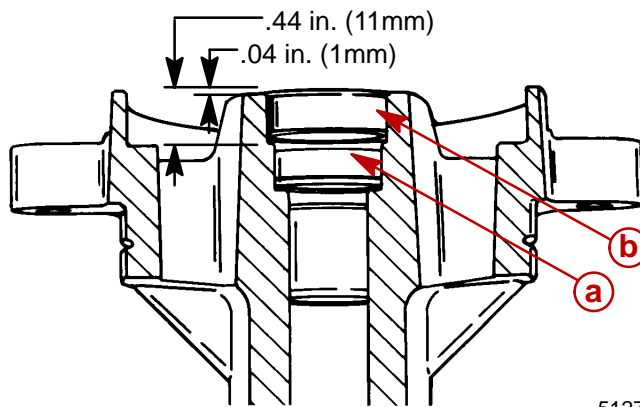


Installation Note: If service tools are not available, the following reference dimensions apply for installing bearing and seals to proper depths.



51275

a - Bearing



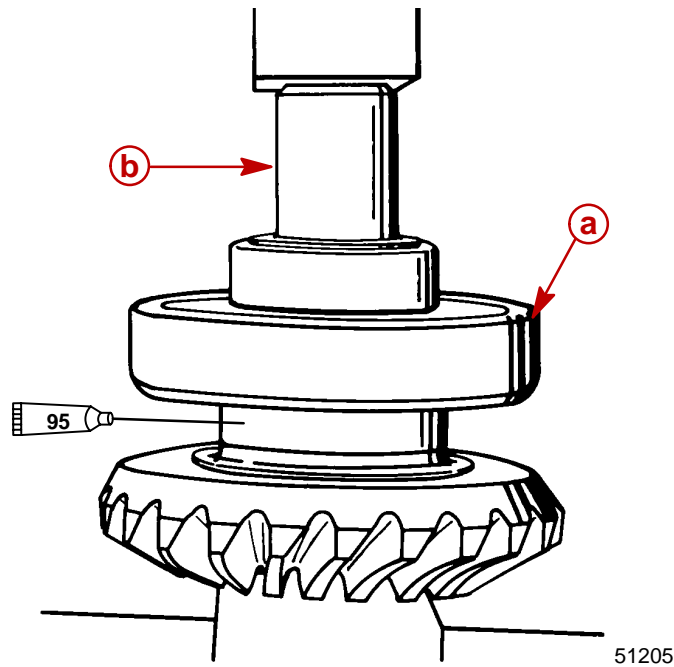
51275

- a** - Oil Seal (Install with Lip Down)
- b** - Oil Seal (Install With Lip Up)



Reverse Gear

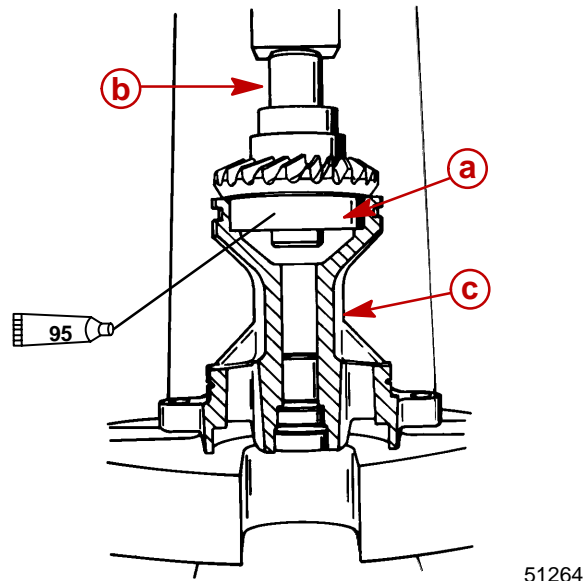
1. Lubricate I.D. of bearing with 2-4-C w/Teflon. Use suitable mandrel and press onto gear until bearing bottoms.



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

- a** - Bearing
- b** - Suitable Mandrel

2. Lubricate O.D. of bearing with 2-4-c w/Teflon. Use suitable mandrel and press reverse gear/bearing assembly into bearing carrier until bearing bottoms out.



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

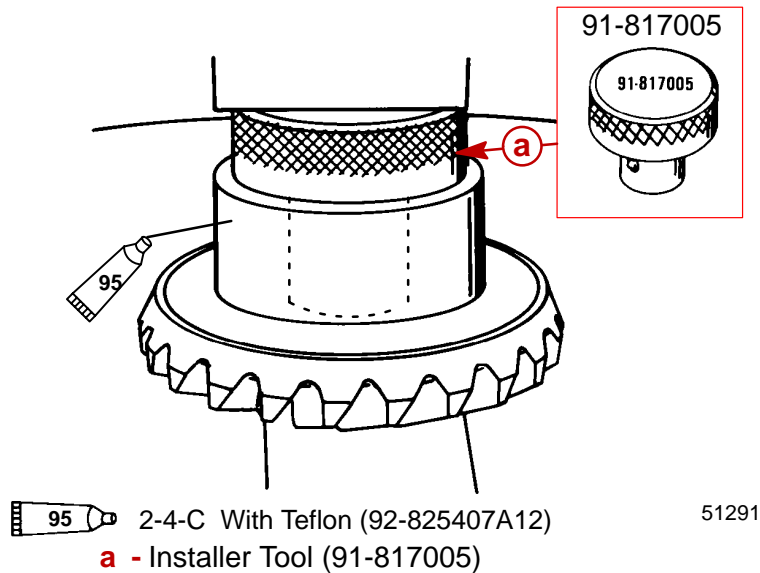
- a** - Reverse Gear and Bearing Assembly
- b** - Suitable Mandrel
- c** - Bearing Carrier



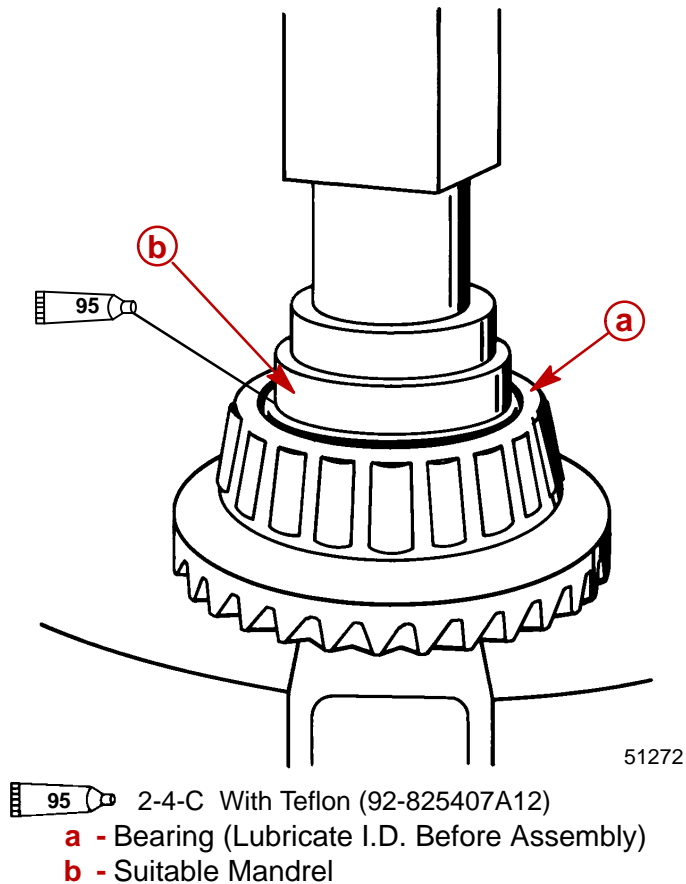
Forward Gear

1. Lubricate O.D. of bearing with 2-4-C w/Teflon. Press new propshaft bearing into gear until Installer Tool bottoms.

Installation Note: Push against numbered end of bearing.



2. Lubricate I.D. of bearing with 2-4-C w/Teflon. Use suitable mandrel and press tapered roller bearing onto gear until bearing bottoms on gear.

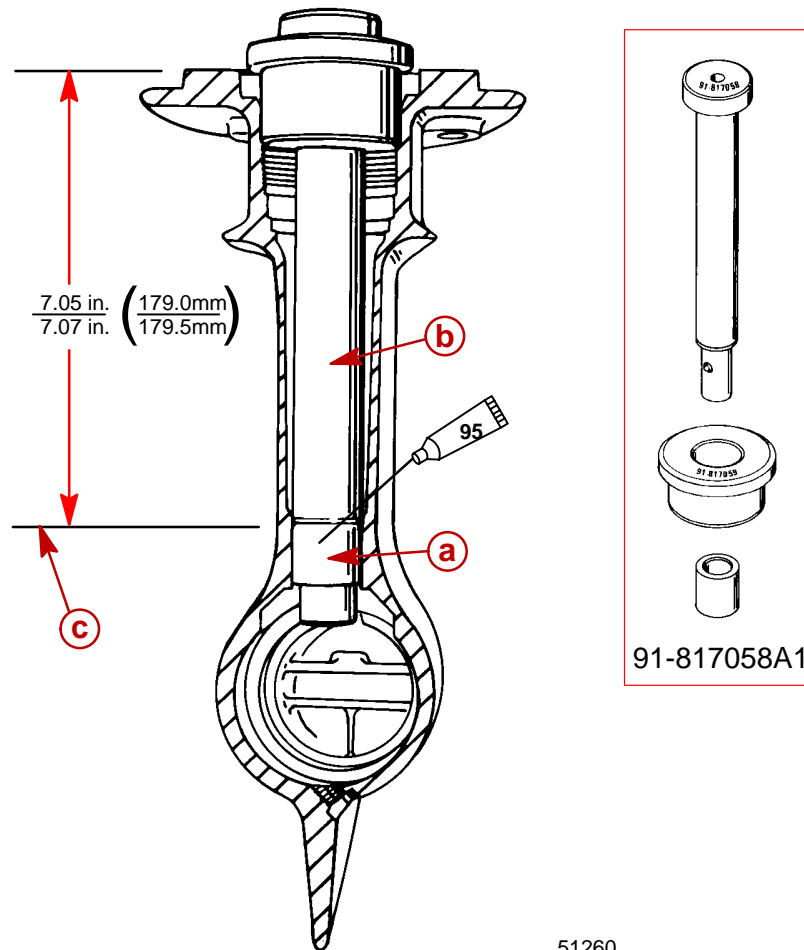




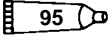
Lower Driveshaft Bearing Installation

1. Lubricate O.D. of bearing with 2-4-C w/Teflon.
2. Install bearing into housing. Press until Installer Tool bottoms out.

Installation Note: Push against numbered end of bearing.



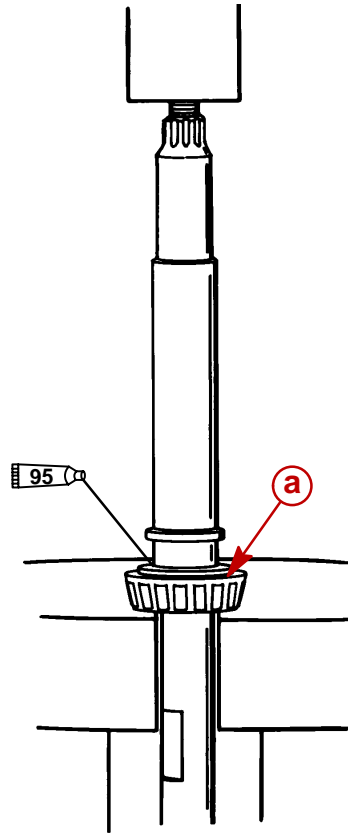
51260

-  2-4-C With Teflon (92-825407A12)
- a** - Needle Bearing (Lubricate O.D. Before Assembly)
 - b** - Bearing Installer Tool (91-817058A1)
 - c** - Reference (Bearing Depth)



Upper Driveshaft Bearing Installation

1. Lubricate I.D. of bearing with 2-4-C w/Teflon. Using suitable mandrel press upper driveshaft bearing onto driveshaft until bearing contacts driveshaft shoulder.



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

51268

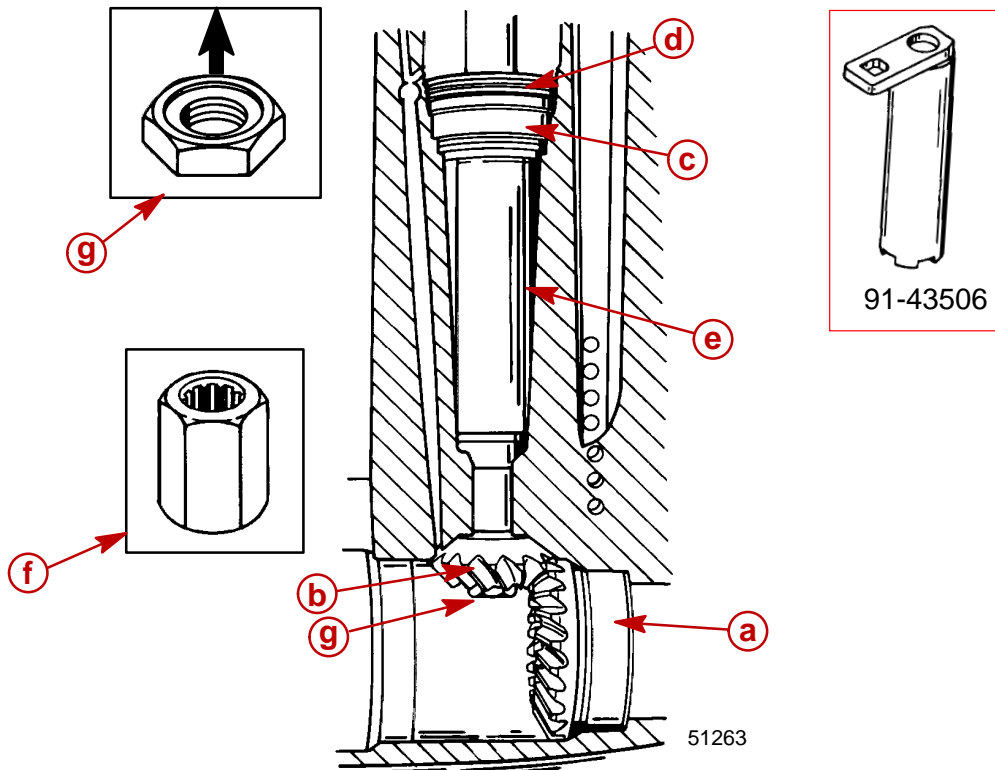
a - Upper Driveshaft Bearing (Lubricate I.D. Before Assembly)



Forward Gear, Pinion Gear, Upper Driveshaft Bearing Race, Retainer and Driveshaft Installation

NOTE: If shim(s) were lost or are not reusable (damaged), start with approximately .015 in. (0.361mm).

Install components in sequence shown.



ASSEMBLY SEQUENCE

- a** - Forward Gear/Bearing: Apply Premium Blend Gear Lube to Bearing Rollers Before Installation
- b** - Pinion Gear
- c** - Driveshaft
- d** - Upper Driveshaft Bearing Race and Shim(s)
- e** - Upper Driveshaft Bearing Retainer. Tighten to Specified Torque using Tool (91-43506)
- f** - Driveshaft Holding Tool
- g** - Pinion Nut (New) (See Note at "Pinion Gear Depth", Following.) Recess in Nut is Installed Toward Pinion Gear (See Inset).

Model	Drive Shaft Holding Tool
40/50/60 (4-Stroke)	91-877840A1
55/60 (2-Stroke)	91-817070

Upper Driveshaft Bearing Retainer Torque
75 lb-ft (101.7 Nm)



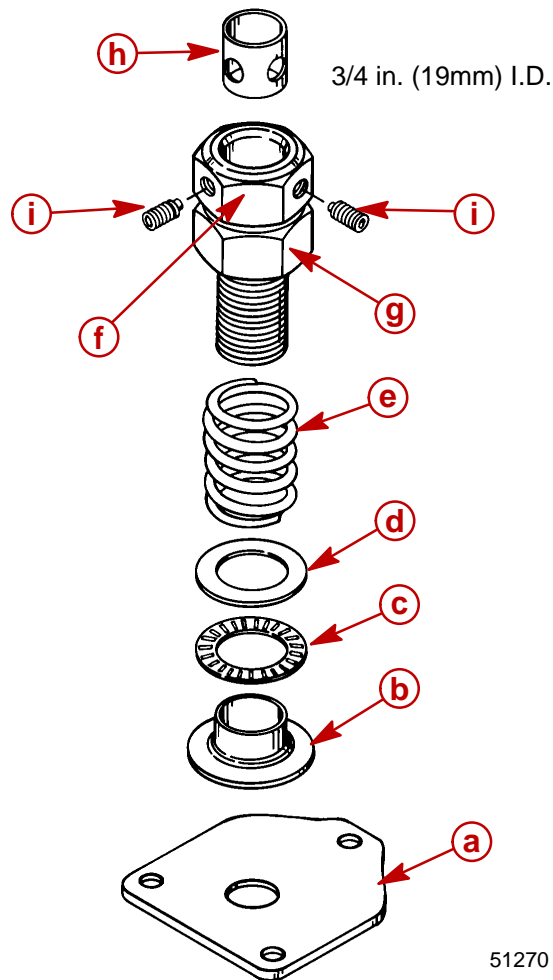
Pinion Gear Location and Forward Gear Backlash

DETERMINING PINION GEAR LOCATION

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

IMPORTANT: Forward gear assembly pilots the end of the pinion gage and must be installed in gear housing when checking pinion gear depth. Without it an inaccurate measurement will be obtained.

1. Clean the gear housing bearing carrier shoulder and diameter.
2. Position gear housing upright (driveshaft vertical). Install Bearing Preload Tool (91-14311A2) in sequence shown.

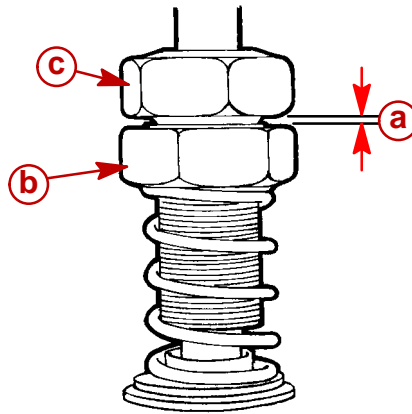


INSTALLATION SEQUENCE: Bearing Preload Tool (91-14311A2)

- a** - Plate
- b** - Adaptor: Bearing surfaces clean and free of nicks
- c** - Thrust Bearing: Oiled and able to move freely
- d** - Thrust Washer: Clean and free of nicks and bends
- e** - Spring
- f** - Nut: Threaded all the way onto bolt
- g** - Bolt: Held snug against spring
- h** - Sleeve: Holes in sleeve must align with set screws
- i** - Set Screw (2): Tighten against drive shaft, bolt should not slide on driveshaft



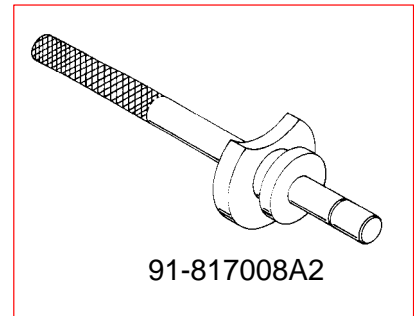
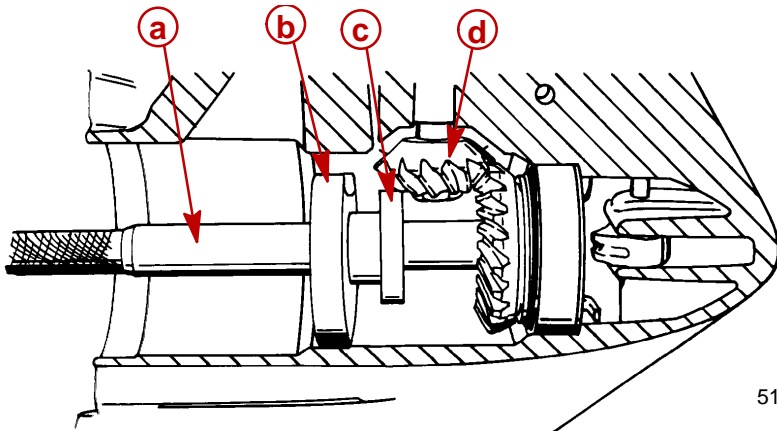
3. Measure distance between top of nut and bottom of bolt head.
4. Increase distance by 1 in. (25.4mm).
5. Rotate driveshaft 10 revolutions. This properly seats upper driveshaft tapered roller bearing.



19884

- a** - Distance, 1 in. (25.4 mm)
- b** - Nut
- c** - Bolt

6. Insert Pinion Location Tool. Position access hole as shown. Insert feeler gauge between gauging surface and pinion gear.



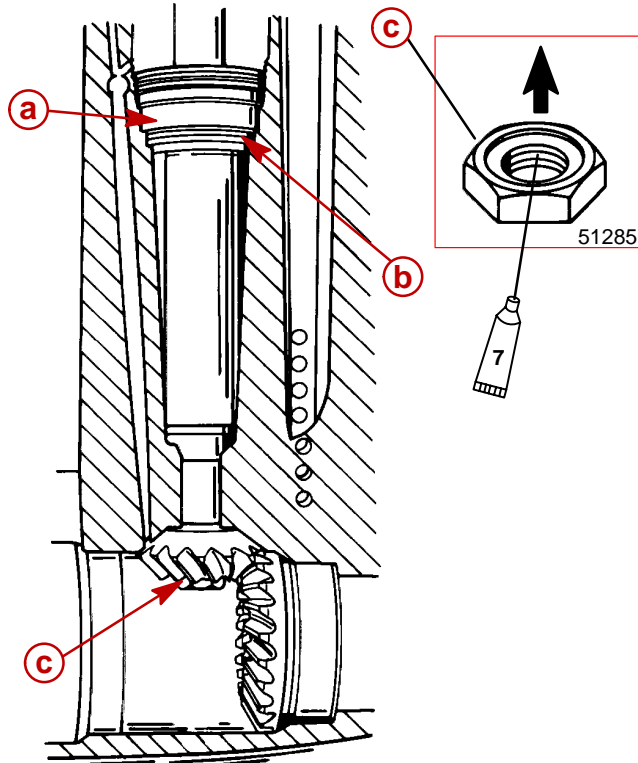
51265

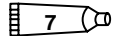
- a** - Pinion Location Tool (91-817008A2)
- b** - Access Hole
- c** - Gauging Surface
- d** - Pinion Gear



7. The correct clearance between the gauging surface and the pinion gear is .025 in. (0.64mm).
8. If clearance is more than .025 in. (0.64mm) remove shims from under the upper bearing cup. If clearance is less than 0.25 in., add shims under the upper bearing race.
9. After final adjustment to pinion height, **and forward gear backlash has been established,** apply Loctite 271 to threads and torque new pinion nut to specified torque.

NOTE: Clean driveshaft and pinion nut threads with Loctite Primer or suitable de-greaser before applying Loctite.



 Loctite "271" (92-809819)

51263

- a** - Bearing Race
- b** - Shim(s)
- c** - Pinion Nut (Recessed Side Toward Pinion)

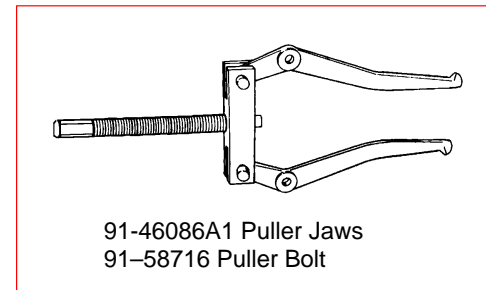
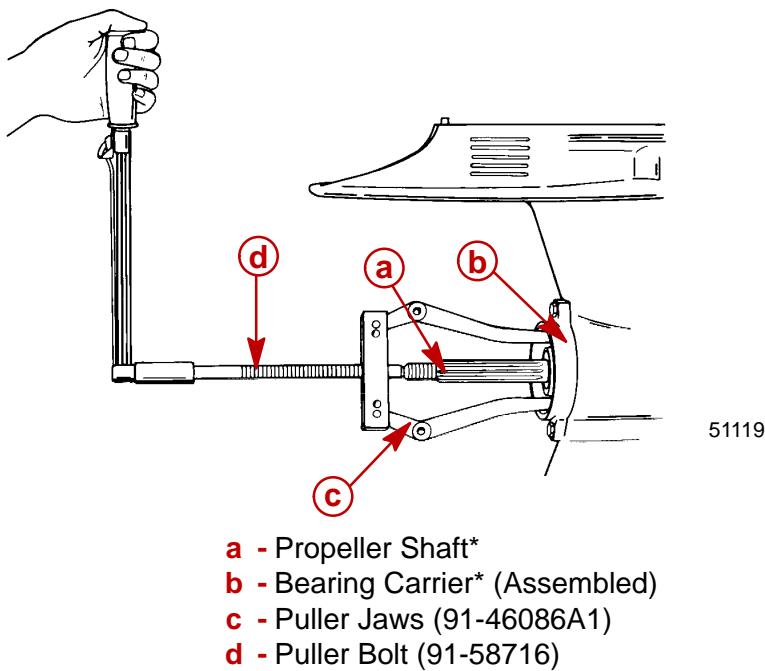
Pinion Nut Torque
50 lb-ft (67 Nm)



Determining Forward Gear Backlash

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

1. Obtain correct pinion gear location; refer to “Determining Pinion Gear Location”, preceding.
2. Install Bearing Preload Tool on driveshaft; refer to “Determining Pinion Gear Location”, preceding.
3. Install components as shown.
4. While holding the driveshaft, torque the puller bolt to 45 in-lb.
5. Rotate driveshaft 5-10 revolutions. This should properly seat the forward gear tapered roller bearing. **Repeat step 4.**

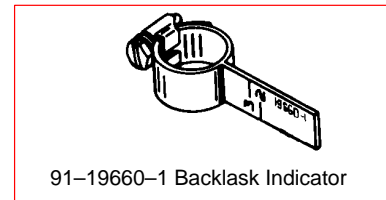
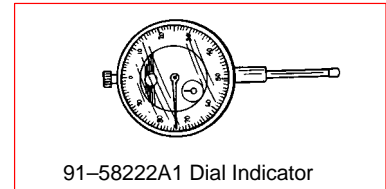
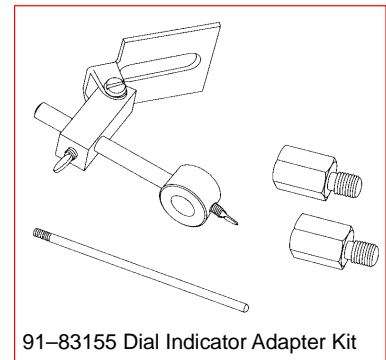
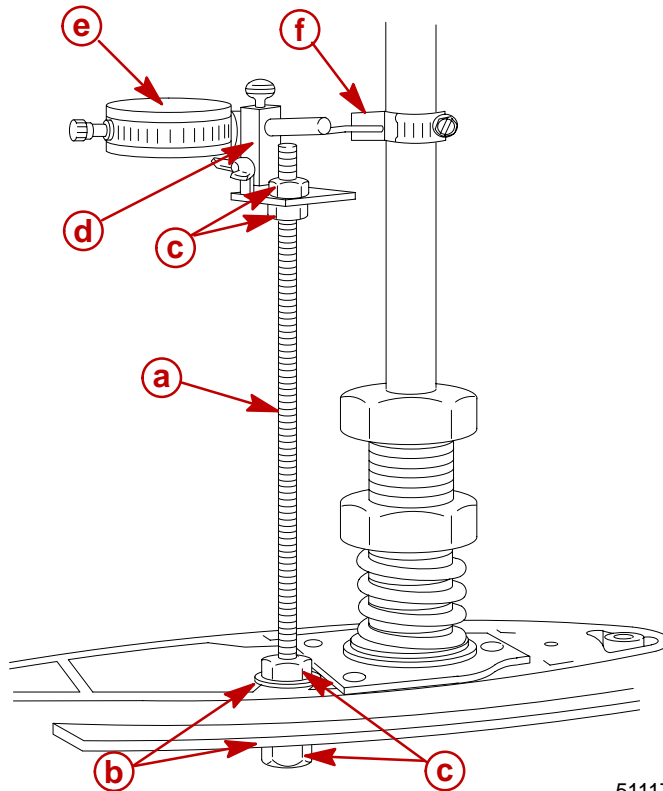


Puller Bolt Torque
45 lb-in. (5.1 Nm)

- *Refer to “Bearing Carrier and Propeller Shaft Installation”, following.



6. Install components as shown.



51117

- a - Threaded Rod (Obtain Locally)
- b - Washers
- c - Nuts
- d - Dial Indicator Adaptor Kit (91-83155)
- e - Dial Indicator (91-58222A1)
- f - Backlash Indicator Tool (91-19660-1)

7. Position Dial Indicator on appropriate line (from chart) marked on Backlash Indicator Tool.

MODEL	BACKLASH INDICATOR TOOL	ALIGN POINTER OF DIAL INDICATOR WITH MARK
40/50/60 (4-Stroke)	91-19660-1	4 OR 0.366 in. (9.3 mm)
55/60 (2-Stroke)	91-19660-1	3

8. Turn driveshaft back-and-forth (check for no rotation at the propeller shaft).
9. Dial Indicator registers amount of backlash, which must be between specifications shown in chart.

MODEL	DIAL INDICATOR MINIMUM	DIAL INDICATOR MAXIMUM
40/50/60 (4-Stroke)	0.011 in. (0.28 mm)	0.017 in. (.43 mm)
55/60 (2-Stroke)	0.013 in. (0.33 mm)	0.019 in. (.48 mm)

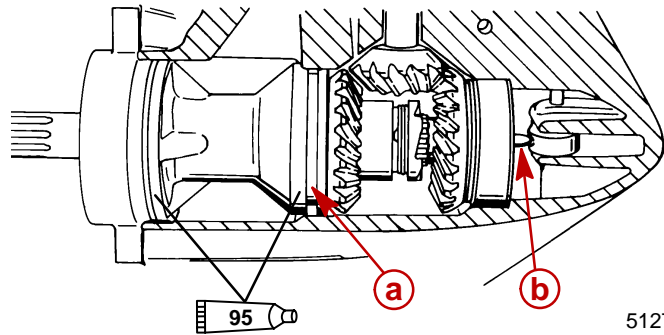
10. If backlash is less than the minimum reading, remove shim(s) from in front of the forward gear bearing race. If backlash is more than the maximum reading, add shim(s) in front of the forward gear bearing race. When final measurement has been made, apply Loctite 271 to threads of pinion nut.

NOTE: By adding or subtracting .001 in. (0.025mm) shim, the backlash will change 0.001 in. (0.032mm).



Bearing Carrier and Propeller Shaft Installation

1. Lubricate O-ring, bearing carrier and related gearcase housing bores, in areas shown, with Quicksilver 2-4-C w/Teflon.
2. Insert propeller shaft assembly into bearing carrier.
3. Install bearing carrier and propeller shaft assembly into gear housing. Use care not to displace cam follower.



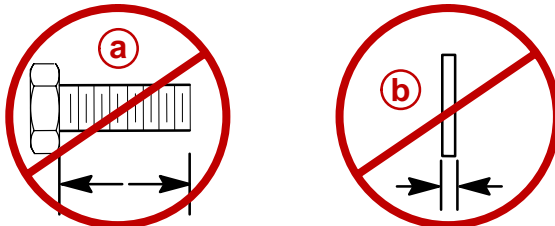
51271

 95 2-4-C w/Teflon (92-850736A1)

- a** - O-ring
- b** - Cam Follower

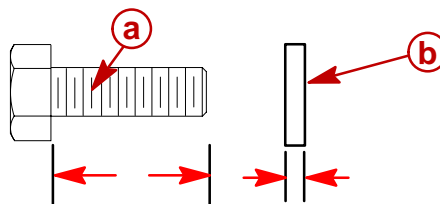
4. Discard the thin 0.063 in. (1.60 mm) flat washers and the 25 mm long bolts on models listed. Install thicker flat washers and longer bolts.

55/60 (3 Cylinder - 2 Stroke) Non Big Foot
USA 0G662097 and below
Belgium NA



- a** - Bolt 25 mm Long - Discard
- b** - Thin Flat Washer 0.063 in. (1.60 mm) thick - Discard

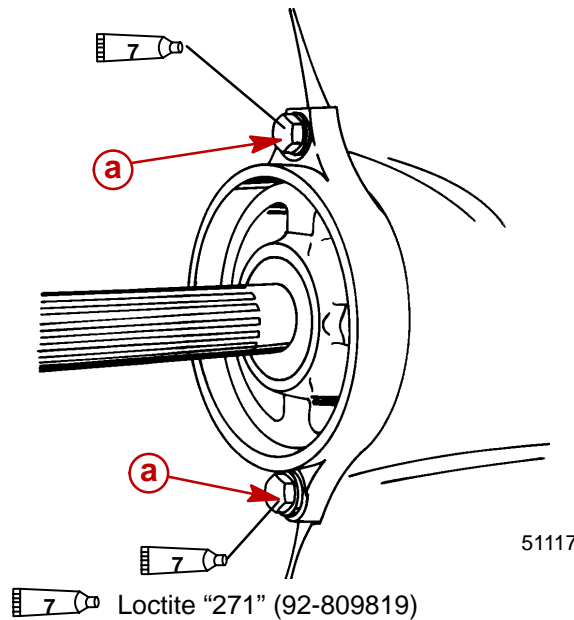
5. Install thicker flat washers and longer bolts.



- a** - Bolt (10-855940-30) 1.18 in. (30 mm) Long
- b** - Washer (12-855941) 0.090 in. (2.29 mm)



6. Torque bolts to specified torque.



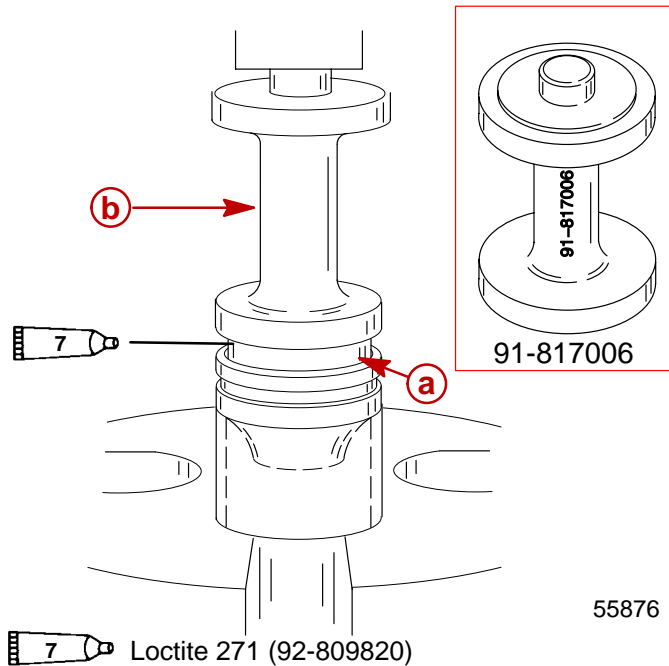
Loctite "271" (92-809819)

a - Bolts (2) M8x30

Bearing Carrier Bolt Torque
225 lb-in. / 18.8 lb-ft. (25.5 Nm)

Water Pump Re-Assembly and Installation

1. Place seal on longer shoulder side of tool. Seal spring should face the shoulder of the tool during installation. Apply Loctite 271 to O.D. of seal.
2. Press into water pump base until tool bottoms.

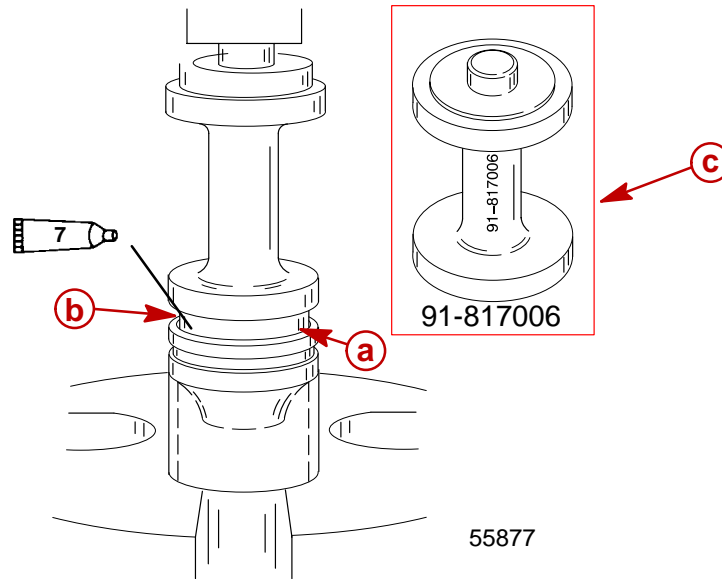


Loctite 271 (92-809820)

a - Seal
b - Seal Installation Tool (91-817006)



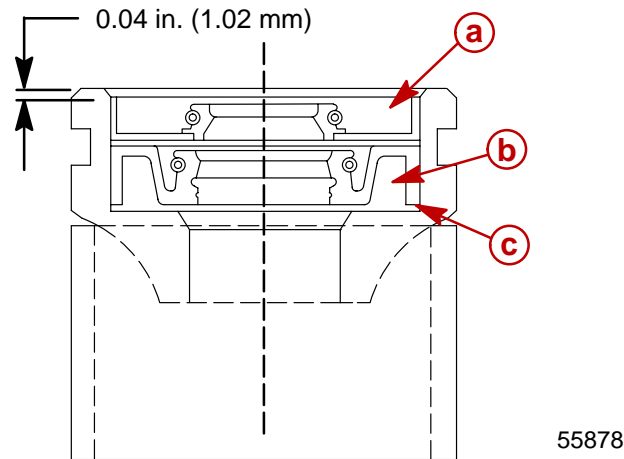
3. Place seal on shorter shoulder side of tool. Seal spring should face the shoulder of the tool during installation. Apply Loctite 271 to O.D. of seal.
4. Press into water pump base until tool bottoms.



 Loctite 271 (92-809820)

- a** - Seal
- b** - Shorter Side of Tool
- c** - Seal Installation Tool (91-817006)

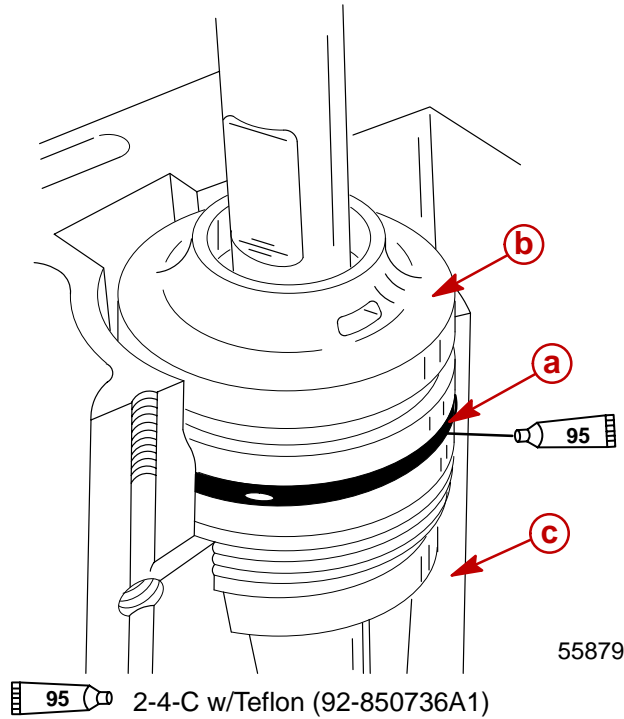
NOTE: If installation tool is not available, press seals in as shown to depths indicated.



- a** - Seal (Install with spring visible when installed.)
- b** - Seal (Install with spring visible when installed.)
- c** - Seal Bottom

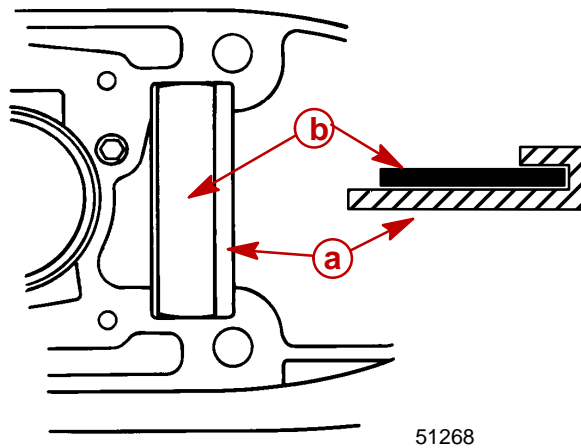


5. Install O-ring. Apply Quicksilver 2-4-C w/Teflon to o-ring, seal lips and gear housing bore.
6. Install water pump base into gear case.



- a - O-ring
- b - Water Pump Base
- c - Gear Case

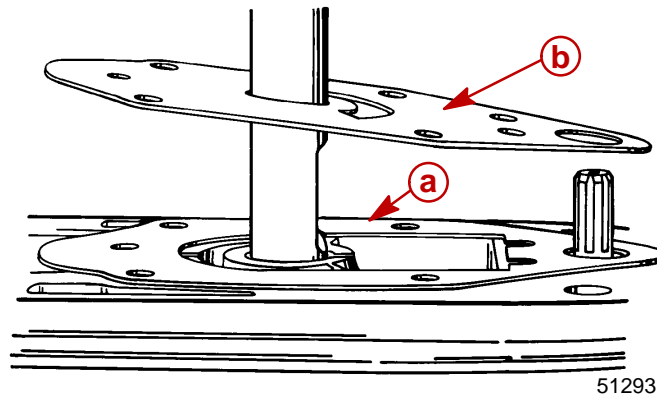
7. If removed previously, re-install seal and filler plate.



- a - Seal
- b - Filler Plate



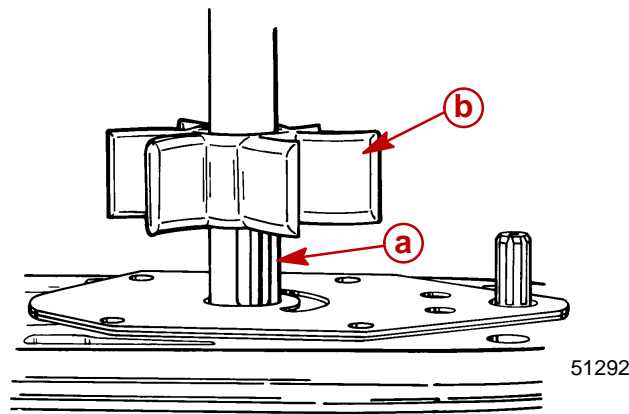
8. Install gasket and face plate.



- a - Gasket
- b - Face Plate

IMPORTANT: If the old impeller is re-used, install in the original (clockwise) direction of rotation.

9. Install drive key and impeller.



- a - Drive Key
- b - Impeller

10. Lubricate I.D. of cover with Quicksilver 2-4-C w/Teflon. Install gasket with bead facing up.



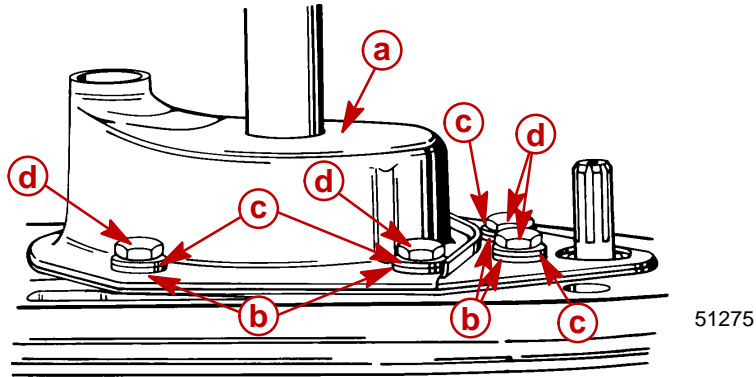
95 2-4-C With Teflon (92-825407A12)

- a - Gasket
- b - Bead Toward Cover



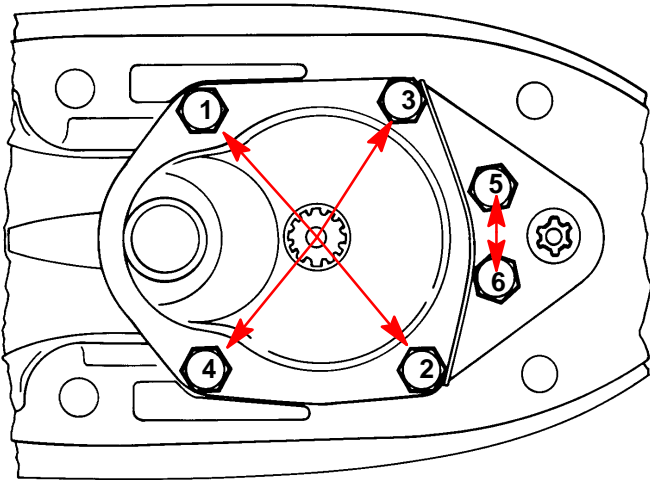
11. Rotate driveshaft clockwise and push water pump housing down.

12. Apply Loctite 271 on threads and tighten screws to specified torque (in sequence shown).



- a** - Water Pump Housing Assembly
- b** - Isolators, (**Design 1**) Note: 2 isolators for forward screws are different from remaining 4 isolators
- c** - Washers (6)
- d** - Screw (6) M6x16

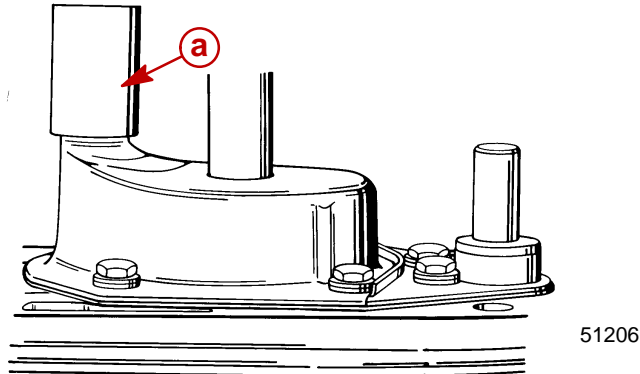
NOTE: Torque cover screws as shown.



Cover Screw Torque
60 lb-in. (6.8 Nm)



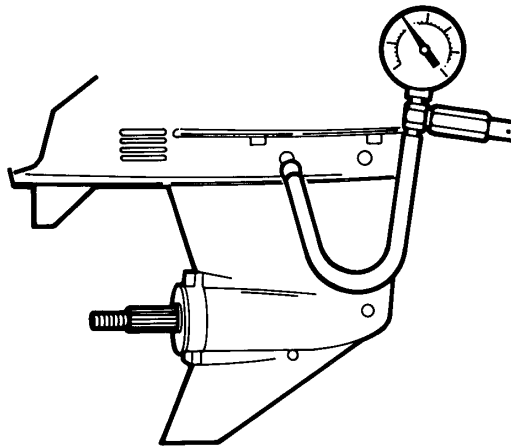
13. If water tube seal stayed on water tube (in driveshaft housing), pull seal from water tube.
14. Lubricate I.D. of water tube seal with Quicksilver 2-4-C w/Teflon and install.



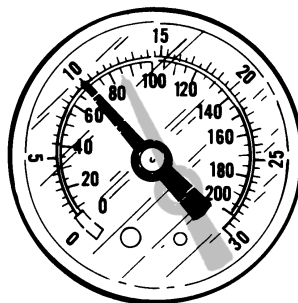
a - Water Tube Seal

Gear Housing Pressure Test

1. Remove vent plug and install pressure test gauge. Tighten securely.



2. Pressurize housing to 10-12 PSI (69-83 kPa) and observe gauge for 5 minutes.
3. Rotate driveshaft, prop shaft and move shift rod while housing is pressurized to check for leaks.



4. If pressure drop is noted, immerse housing in water.
 5. Re-pressurize to 10-12 PSI (69-83 kPa) and check for air bubbles.
 6. Replace leaking seals as necessary. Retest housing.
- NOTE:** Gearcase assembly should hold 10-12 PSI (69-83 kPa) for 5 minutes.
7. Remove tester from housing. Install vent plug and new sealing washers.



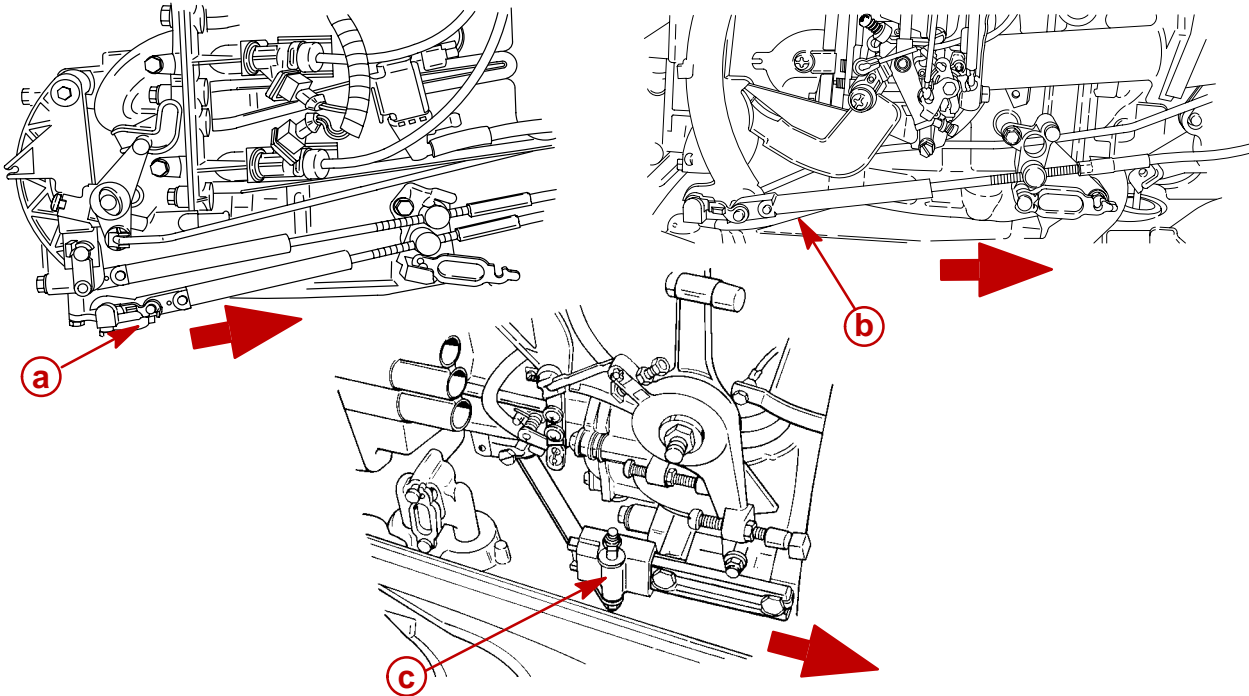
Gear Housing Installation

⚠ WARNING

Disconnect (and isolate) spark plug leads before installing gear housing onto drive-shaft housing.

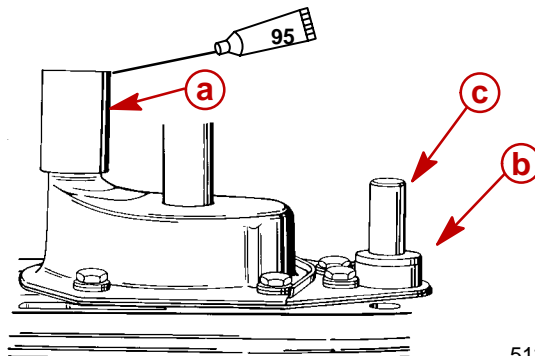
1. Position shift linkage into forward gear position.

Remote Control Model Shown



- a** - Shift Lever 40/50/60 EFI (4-Stroke)
- b** - Shift Lever 40/50/60 Carb (4-Stroke)
- c** - Shift Lever 60 Carb (2-Stroke)

2. Tilt engine to full "Up" position. Engage tilt lock lever.
3. Shift gear housing into neutral. Propeller shaft will rotate freely in either direction.
4. Install water tube seal, spacer and shift shaft coupler.



51206

95 2-4-C w/Teflon (92-850736A1)

- a** - Water Tube Seal
- b** - Spacer
- c** - Shift Shaft Coupler

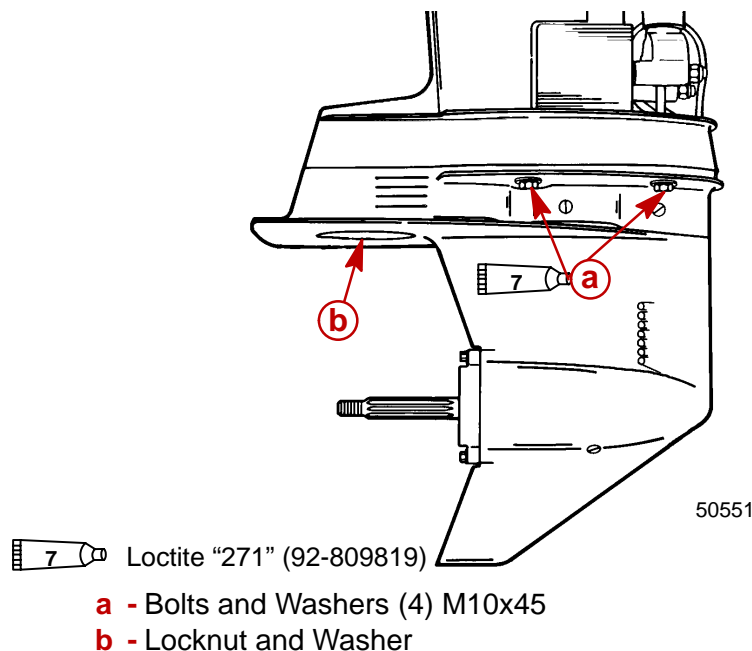
**⚠ CAUTION**

Do not lubricate top of driveshaft. Excess lubricant will not allow driveshaft to fully engage crankshaft. Tightening the gear housing fasteners (if excess lubricant is on top of driveshaft) will load the driveshaft/crankshaft and may damage either or both powerhead and gear housing. Wipe the top of driveshaft free of lubricant.

5. Lightly apply Quicksilver 2-4-C w/Teflon onto the driveshaft splines.
6. Shift gear housing into forward gear. Gear housing will not engage when propeller shaft is turned clockwise.
7. Position driveshaft into driveshaft housing. Move gear housing towards driveshaft housing while aligning shift shaft coupler, water tube seal and driveshaft splines.

NOTE: *If the driveshaft splines will not align with the crankshaft splines, install a propeller and turn the propeller shaft counterclockwise while pushing gear housing onto driveshaft housing. It may also be necessary to move the shift block (on the powerhead) to align the shift shaft splines for proper re-assembly.*

8. Install 4 bolts and washers, (two each side). Apply Loctite 271 on bottom half of bolt threads prior to installation.
9. Install locknut and washer.
10. Torque bolts and locknut to specified torque.

**Bolts and Locknut Torque**

40 lb-ft (54 Nm)

11. Check shift operation.
 - a. Propeller shaft will not rotate in counterclockwise direction when in forward gear. Clutch will ratchet (clicking noise) when rotated clockwise.
 - b. Propeller shaft will rotate freely in either direction when gearcase is in neutral.
 - c. Propeller shaft will not rotate in either direction when gearcase is in reverse.

IMPORTANT: *If shift operation is not as described, remove the gear housing and correct the shift operation.*



Filling Gear Housing with Lubricant

NOTE: Gear housing lubricant capacity is approximately 11.5 fl. oz. (340 ml).

⚠ WARNING

If gear housing is installed on outboard, disconnect (and isolate) spark plug leads from spark plugs before working near the propeller.

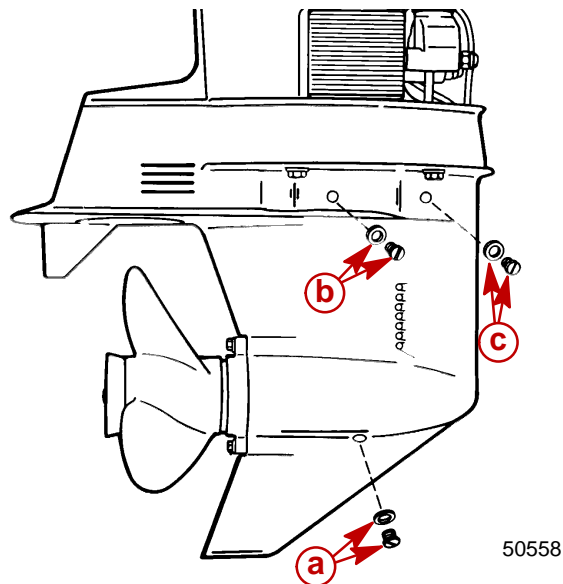
⚠ CAUTION

Do not use automotive grease in the gear housing. Use only Quicksilver Gear Lube.

1. Remove any gasket material from “Fill/Drain” and “Vent” plugs and gear housing. Install new sealing washers on “Fill/Drain” and “Vent” plugs.

IMPORTANT: Never add lubricant without removing “Vent” plugs. Gear housing cannot be filled because of trapped air. Fill gear housing when driveshaft is in a vertical position.

2. Remove “Fill/Drain” plug and sealing washer.
3. Insert lubricant tube in “Fill/Drain” hole, then remove “Vent” plugs and sealing washer.
4. Fill until excess lubricant flows out of left “Vent” hole.
5. Replace left “Vent” plug and sealing washer and continue to fill until lubricant flows from right “Vent” hole.
6. Replace right “Vent” plug and sealing washer.
7. Install “Fill/Drain” plug and sealing washer.
8. Torque screws to specified torque.



- a - “Fill/Drain” Plug
- b - “Vent” Plug
- c - “Vent” Plug

Screw Torque

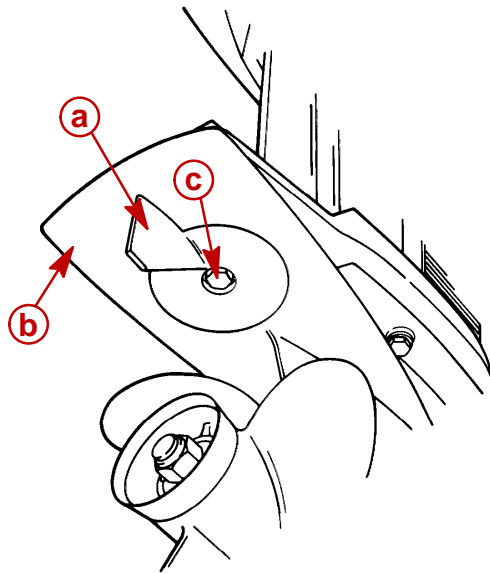
58 lb-in. (6.5 Nm)



Trim Tab Adjustment and Replacement

IMPORTANT: The trim tab is made of a special alloy to aid in protecting the drive shaft housing and gear housing from galvanic corrosion (corrosion and pitting of metal surfaces). Do not paint or place protective coating on the trim tab, or trim tab corrosion protection function will be lost.

1. Replace trim tab if 50% (or more) corroded. Mark location of old trim tab on anti-ventilation plate before removal; install new trim tab in same location.
2. The trim tab will offset (balance) some of the “steering load” that is caused by “propeller torque” at higher speeds. If at higher speeds the boat turns more easily to the left, loosen screw, move the trim tab (trailing edge) to the left (when viewed from behind); re-tighten screw. Turn trim tab (trailing edge) to the right if the boat turns more easily to the right.



50553

- a** - Trim Tab
- b** - Anti-Ventilation Plate
- c** - Retaining Screw (M10x30) and Washer

Retaining Screw Torque

22 lb-ft (29.8 Nm)
