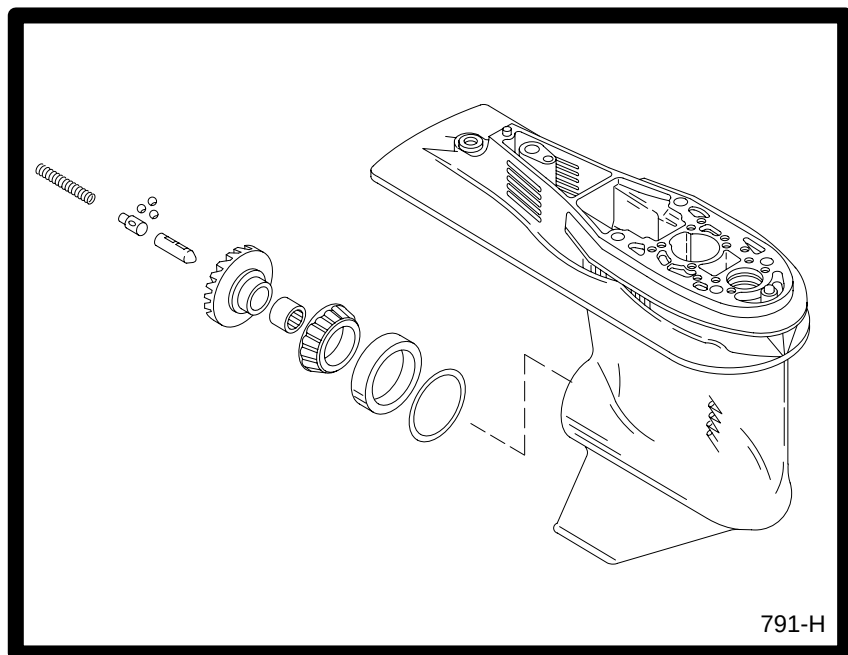




LOWER UNIT



5

A

GEAR HOUSING



Table of Contents

	Page		Page
Notes	5A-1	Bearing Carrier Reassembly	5A-20
Drive Shaft and Water Pump Components ...	5A-2	Forward Gear Reassembly	5A-22
Propeller Shaft Components	5A-6	Propeller Shaft Reassembly	5A-23
Special Tools	5A-8	Drive Shaft Wear Sleeve Installation	5A-23
Removal	5A-8	Lower Drive Shaft Bearing Race	
Disassembly	5A-8	Installation	5A-24
Propeller Removal	5A-8	Oil Sleeve Installation	5A-25
Draining and Inspecting Gear Housing		Upper Drive Shaft Bearing Installation ...	5A-25
Lubricant	5A-9	Forward Gear, Lower Drive Shaft Bearing,	
Water Pump (Design 1)	5A-10	Pinion Gear, and Drive Shaft	
Water Pump (Design 2)	5A-11	Installation	5A-26
Bearing Carrier and Propeller Shaft	5A-12	Pinion Gear Depth and Forward Gear	
Pinion Gear, Drive Shaft, and Forward		Backlash	5A-26
Gear	5A-15	Determining Pinion Gear Depth	5A-26
Upper Drive Shaft Bearing	5A-16	Determining Forward Gear Backlash .	5A-28
Oil Sleeve	5A-17	Bearing Carrier and Propeller Shaft	
Lower Drive Shaft Bearing Race	5A-17	Installation	5A-29
Shift Shaft	5A-18	Water Pump Reassembly and	
Forward Gear Bearing Race	5A-19	Installation	5A-30
Trim Tab Adjustment and Replacement ..	5A-19	Gear Housing Pressure Test	5A-32
Reassembly	5A-19	Filling Gear Housing With Lubricant	5A-32
Forward Gear Bearing Race	5A-19	Propeller Installation	5A-33
Shift Shaft	5A-19	Installation	5A-33

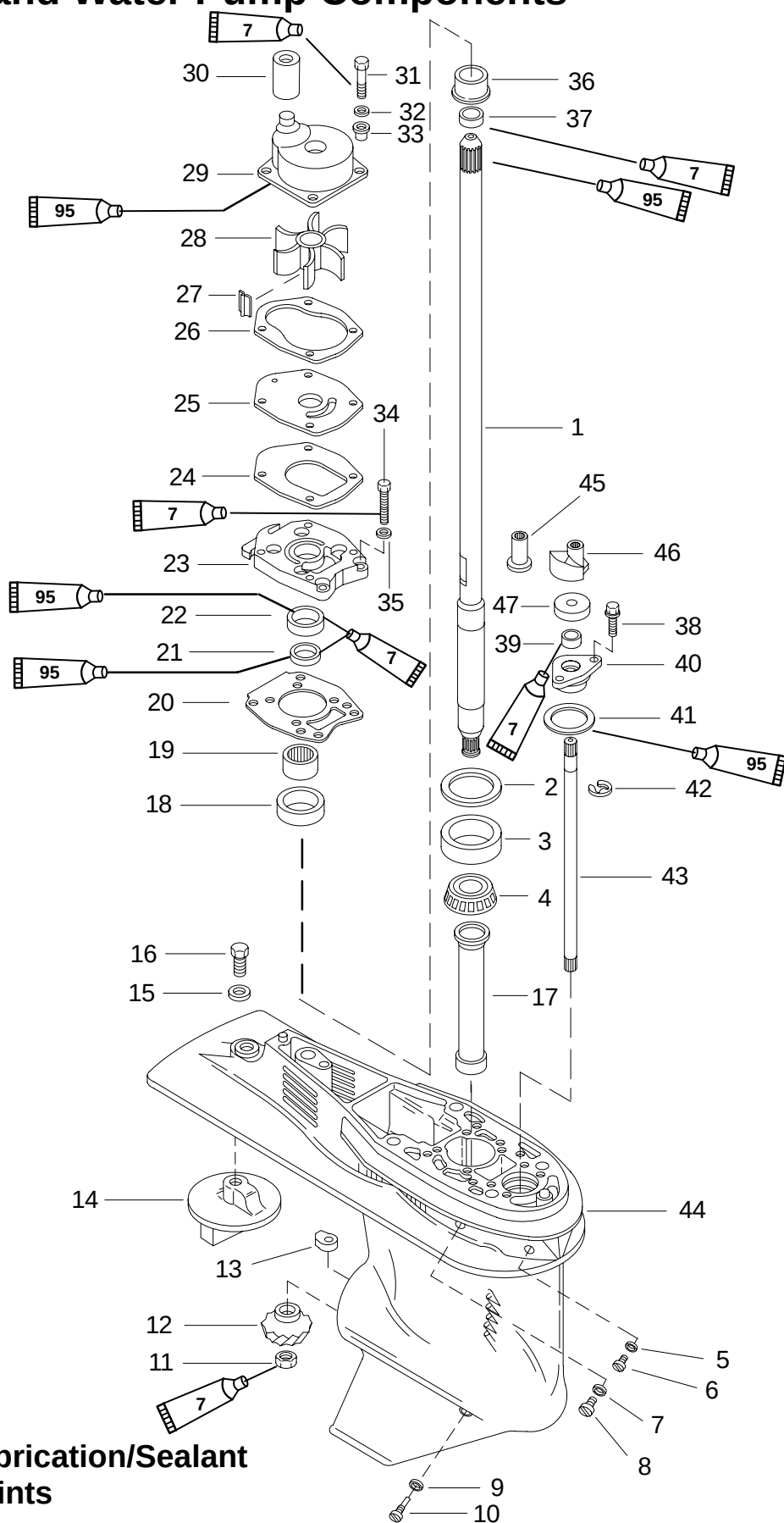


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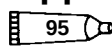


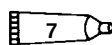


Drive Shaft and Water Pump Components



Quicksilver Lubrication/Sealant Application Points

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

 Loctite 271 (Obtain Locally)

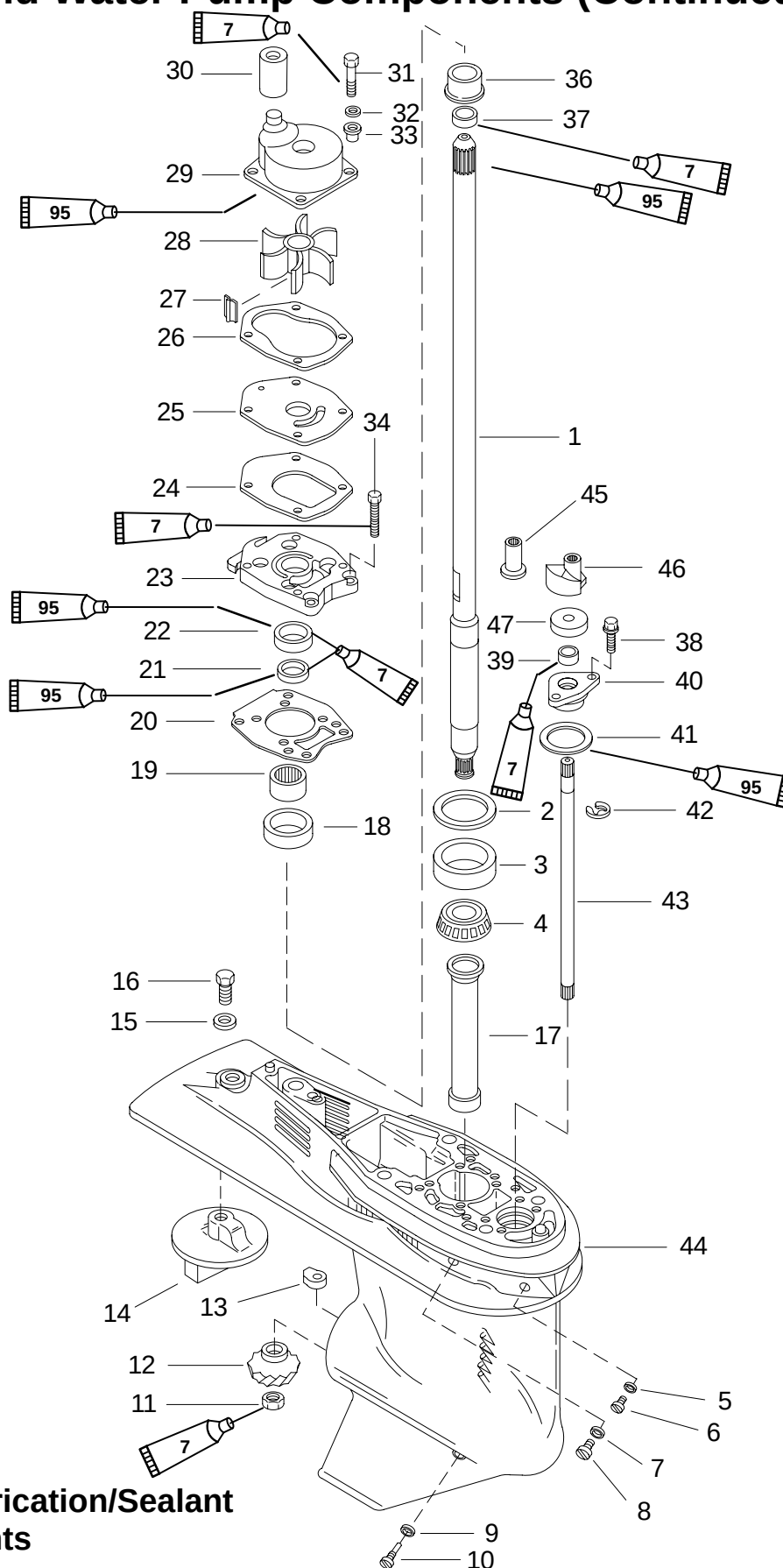


Drive Shaft and Water Pump Components (Continued)

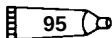
REF. NO.	QUAN.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	Drive Shaft (Long)			
		Drive Shaft (X-Long)			
2	1	Shim			
3	1	Bearing Race			
4	1	Tapered Bearing			
5	1	Washer			
6	1	Screw	60		6.8
7	1	Washer			
8	1	Screw	60		6.8
9	1	Washer			
10	1	Screw (Magnetic)	60		6.8
11	1	Pinion Nut		70	94.9
12	1	Pinion Gear			
13	1	Shift Cam (Letters Face Up)			
14	1	Trim Tab			
15	1	Washer			
16	1	Trim Tab Bolt		22	29.8
17	1	Oiler Tube			
18	1	Carrier			
19	1	Needle Bearing (Numbers Face Up)			
20	1	Gasket (Not used with nylon cover assy.)			
21	1	Oil Seal (Lip Up)			
22	1	Oil Seal (Lip Down)			
23	1	Cover Assembly			
24	1	Gasket			
25	1	Face Plate			
26	1	Gasket			

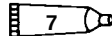


Drive Shaft and Water Pump Components (Continued)



Quicksilver Lubrication/Sealant Application Points

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

 Loctite 271 (Obtain Locally)

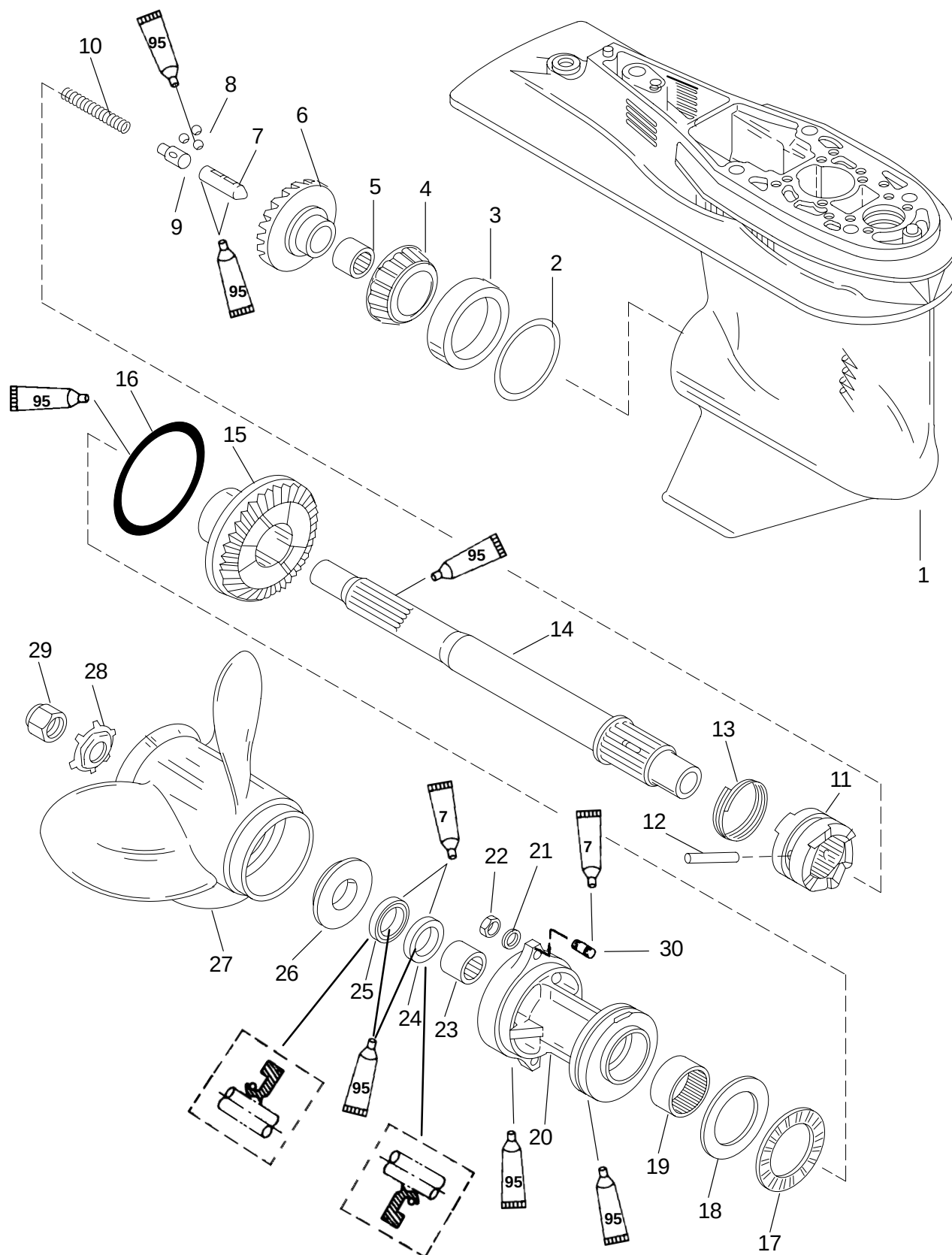


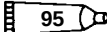
Drive Shaft and Water Pump Components (Continued)

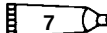
REF. NO.	QUAN.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
27	1	Impeller Drive Key			
28	1	Impeller			
29	1	Water Pump Assembly			
30	1	Water Tube Seal			
31	4	Water Pump Bolt	60		6.8
32		Delete			
33		Delete			
34	6	Cover Screw	60		6.8
35		Delete			
36	1	Wear Sleeve			
37	1	Seal Ring			
38	2	Bushing Screw	35		3.9
39	1	Oil Seal (Lip Up)			
40	1	Shift Shaft Bushing			
41	1	O-Ring			
42	1	Shift Shaft "E" Ring			
43	1	Shift Shaft (Long)			
	1	Shift Shaft (X-Long)			
44	1	Gear Housing			
45	1	Shift Shaft Adapter			
46	1	Reverse Lock Cam			
47	1	Washer			



Propeller Shaft Components



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

 7 Loctite 271 (Obtain Locally)



Propeller Shaft Components (Continued)

REF. NO.	QUAN.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	Gear Case			
2	1	Shim			
3	1	Bearing Race			
4	1	Tapered Roller Bearing			
5	1	Roller Bearing			
6	1	Forward Gear			
7	1	Cam Follower			
8	3	Ball Bearing			
9	1	Slide Cross Pin			
10	1	Spring			
11	1	Clutch			
12	1	Clutch Cross Pin			
13	1	Retainer Spring			
14	1	Propeller Shaft			
15	1	Reverse Gear			
16	1	O-Ring			
17	1	Thrust Bearing			
18	1	Thrust Washer			
19	1	Roller Bearing			
20	1	Bearing Carrier			
21	1	Washer			
22	1	Nut (Design 2) or Bolt (Design 1)	260	21.7	29.4
23	1	Roller Bearing			
24	1	Oil Seal (Lip In)			
25	1	Oil Seal (Lip Out)			
26	1	Thrust Washer			
27	1	Propeller			
28	1	Tab Washer			
29	1	Propeller Nut		55	75
30	2	Stud			



Special Tools

Part No.	Description
91-46086A1	Puller Jaws
91-85716	Puller Bolt
91-34569A1	Slide Hammer
91-36569	Mandrel*
91-37263	Mandrel*
91-37323	Driver Rod*
91-56775	Drive Shaft Holding Tool
91-37241	Universal Puller Plate
91-83165M	Bearing Puller Assembly
91-31106	Mandrel
91-31108	Oil Seal Driver
91-37350	Mandrel
91-31229	Threaded Rod*
11-24156	Nut*
91-78473	Backlash Indicator Tool (3 Cyl)
91-58222A1	Dial Indicator
91-83155	Dial Indicator Adaptor Kit
91-12349A2	Pinion Gear Locating Tool
91-14308A1	Bearing Race Tool
91-14309A1	Bearing Installation Tool
91-14310A1	Wear Sleeve Installation Tool
91-14311A1	Bearing Preload Tool
91-13945	Bearing Installation Tool
91-13949	Oil Seal Driver
91-19660	Backlash Indicator Tool (4 Cyl)

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

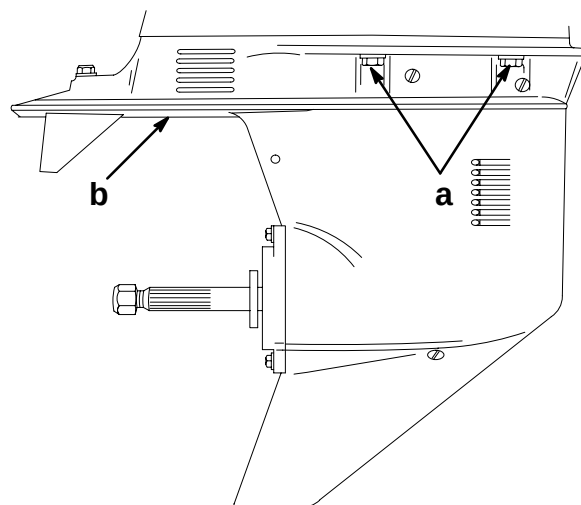
Removal

⚠ 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 (or locknuts on 1995 Models) and washers (two each side).
5. Remove locknut and washer.

6. Remove gear housing.



51552

- a - Bolts (or Locknuts) and Washers
b - Locknut and Washer

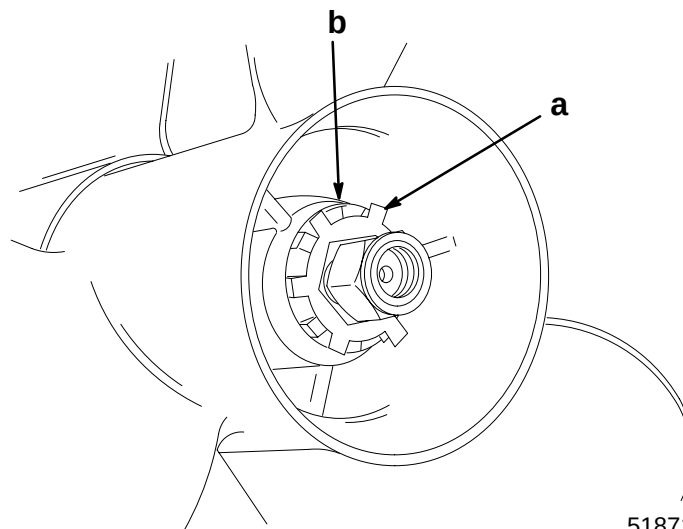
Disassembly

Propeller Removal

⚠ WARNING

If gear housing is not removed from drive shaft housing, before attempting to remove or install the propeller, remove (and isolate) spark plug leads from spark plugs to prevent engine from starting accidentally.

1. Bend tabs of tab washer away from hub.

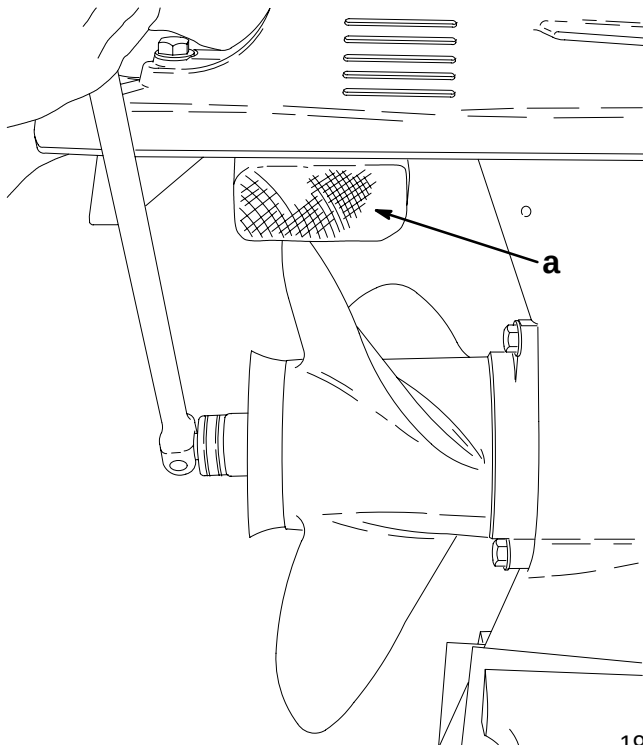


51871

- a - Tab Washer
b - Hub



2. Place a block of wood, as shown, to prevent propeller from rotating and to protect hands during removal of nut.
3. Remove nut and pull components from shaft.



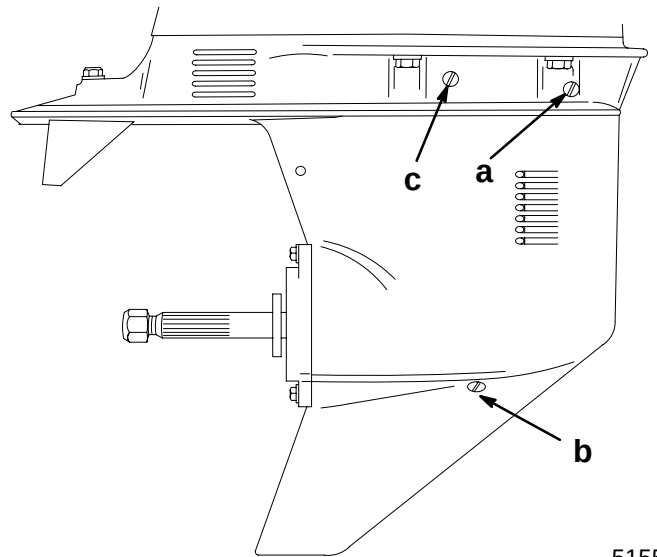
a - Block of Wood

Draining and Inspecting Gear Housing 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).



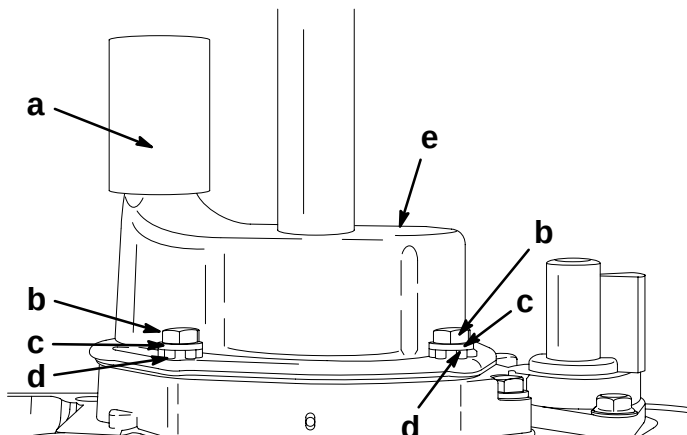
- a - Oil Level Screw
b - Fill/Drain Screw
c - Vent Screw

2. Inspect gear lubricant for metal particles (lubricant will have a “metal flake” appearance). Presence of fine metal particles (resembling powder) on the drain plug bar magnet indicates normal wear. The presence of metal chips on the drain plug bar magnet 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 to 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 as well as gear housing components for damage. If gearcase is rebuilt, gearcase should be pressure checked before filling with lubricant.



Water Pump (Design 1)

1. 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.
2. Replace water tube seal, if damaged.
3. Remove 4 bolts, washers, and isolators.
4. Remove cover.



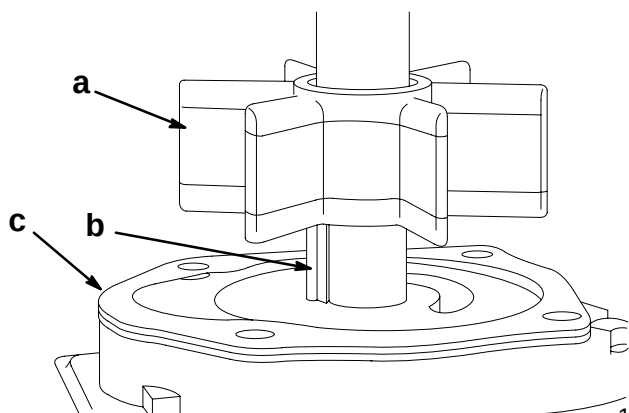
19212

a - Water Tube Seal
b - Bolts (4 each)
c - Washers (4 each)

d - Isolators (4 each)
e - Cover

IMPORTANT: The circular groove formed by the impeller sealing bead should be disregarded when inspecting cover (Step 5) and plate (Step 9), as the depth of the groove will not affect water pump output.

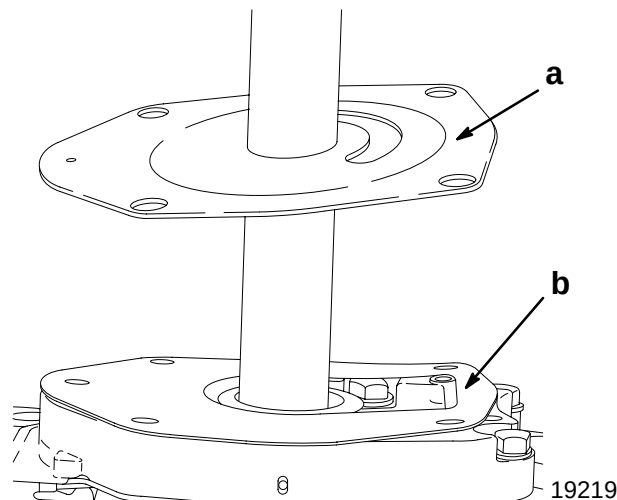
5. Replace cover if thickness of steel at the discharge slots is 0.060" or less, or if groove(s) (other than impeller sealing bead groove) in cover roof are more than 0.030" (0.762mm) deep.
6. Lift impeller, drive key, and gasket from drive shaft.



19220

a - Impeller
b - Drive Key
c - Gasket

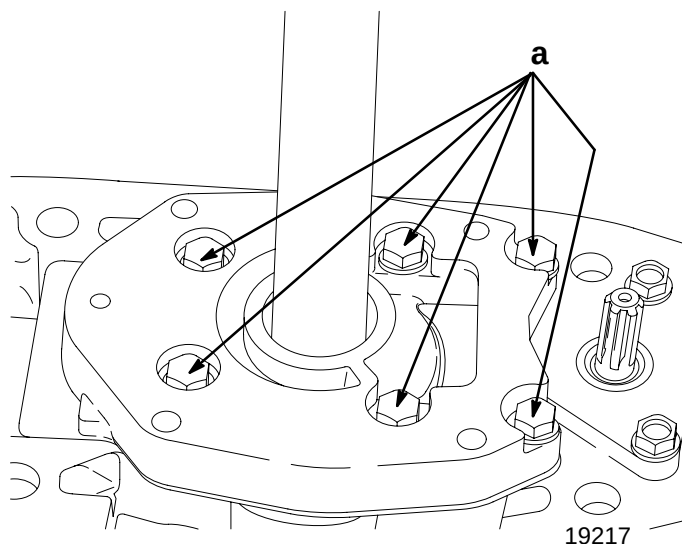
7. Inspect impeller. Replace impeller if any of the following conditions exist:
 - Impeller blade(s) are cracked, torn, or worn.
 - Impeller is glazed or melted (caused by operation without sufficient water supply).
 - Rubber portion of impeller is not bonded to impeller hub.
8. Remove plate and gasket.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



19219

a - Plate
b - Gasket

10. Remove bolts and washers.

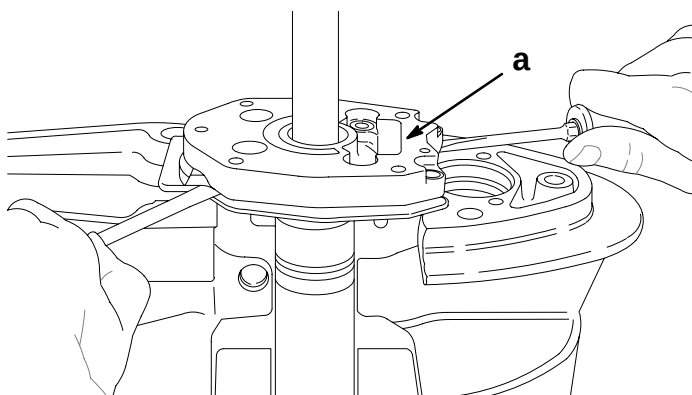


19217

a - Bolts and Washers (6 each)



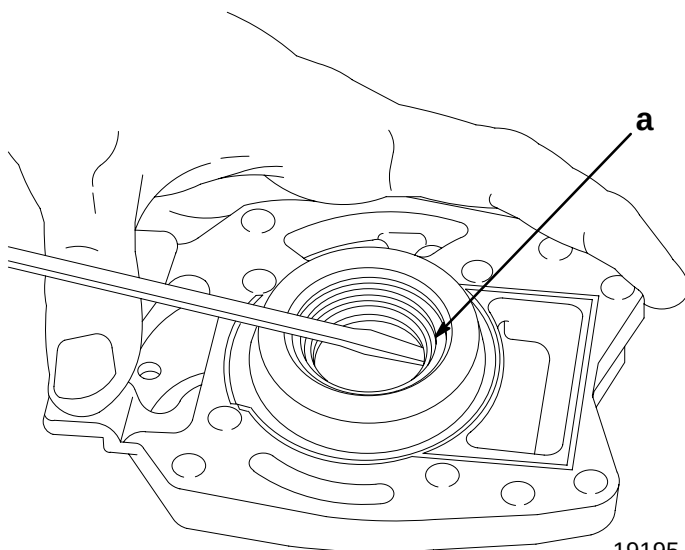
11. Remove water pump base.



19226

a - Water Pump Base

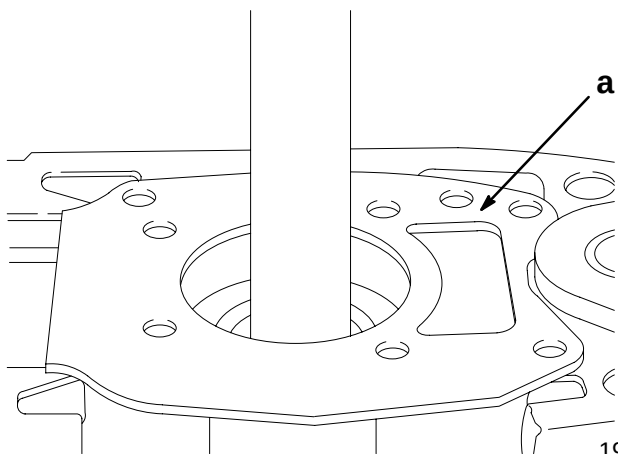
12. Remove (and discard) seals.



19195

a - Seals

13. Remove gasket.



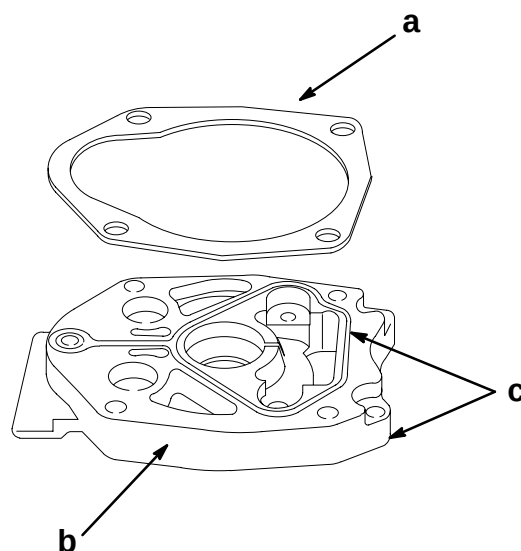
19218

a - Gasket

Water Pump (Design 2)

NOTE: Disassembly procedure for DESIGN 2 model water pump is the same as for DESIGN 1 model water pump, previous.

IMPORTANT: Gear housing on 3 CYLINDER MODELS 70, 75, 80, 90 and 4 CYLINDER MODELS 100 and 115 have been modified to accept a new style plastic water pump base (P/N 19282A1). This new base does not require gaskets as it has a silicone impregnated seal on the top and bottom. As long as this silicone seal is not damaged – i.e., cuts or abrasions – it will retain its sealing capabilities. This new water pump base **CANNOT BE USED** on older gear housings. The aluminum water pump base (P/N 43055A2) is still available for use with the older gear housings.



26263

a - Water Pump Cover Gasket

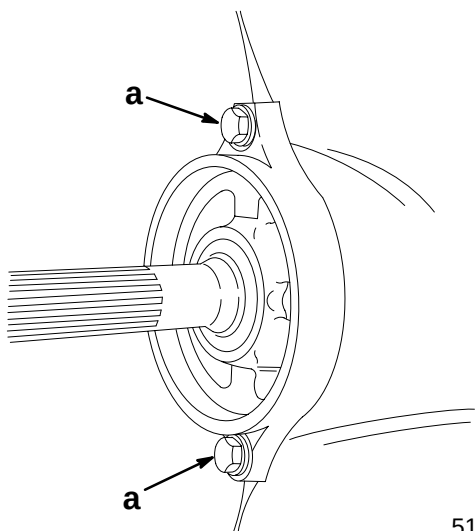
b - Plastic Pump Base

c - Silicone Seal (Both Sides)



Bearing Carrier and Propeller Shaft

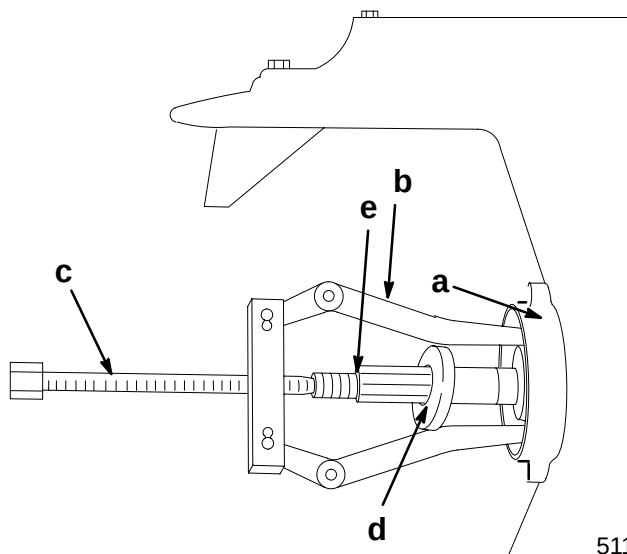
1. Drain lubricant from gear housing; refer to "Draining and Inspecting Gear Housing Lubricant."
2. Remove bolts and washers or self locking nuts if applicable.



51117

a - Bolt and Washers or Locknuts

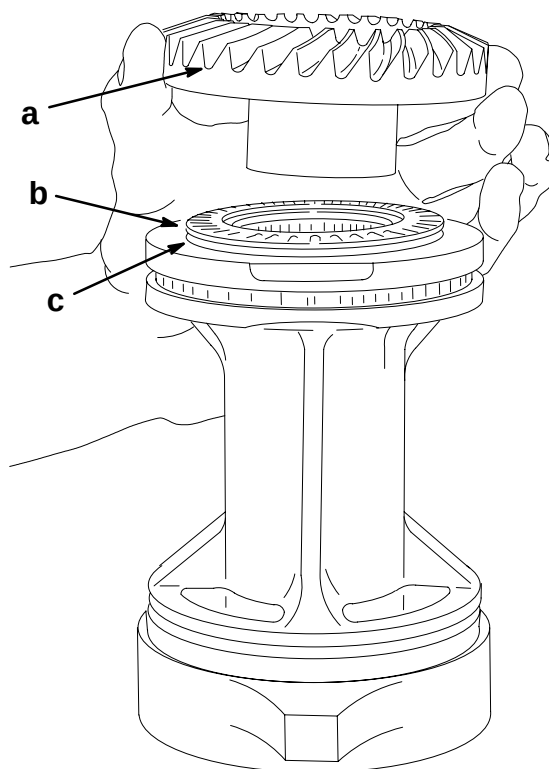
3. With propeller shaft horizontal, pull carrier to break seal with gear housing. Remove bearing carrier/propeller shaft components as an assembly, taking care not to lose cam follower or 3 metal balls in end of propeller shaft.
4. Remove propeller shaft from bearing carrier.



51116

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

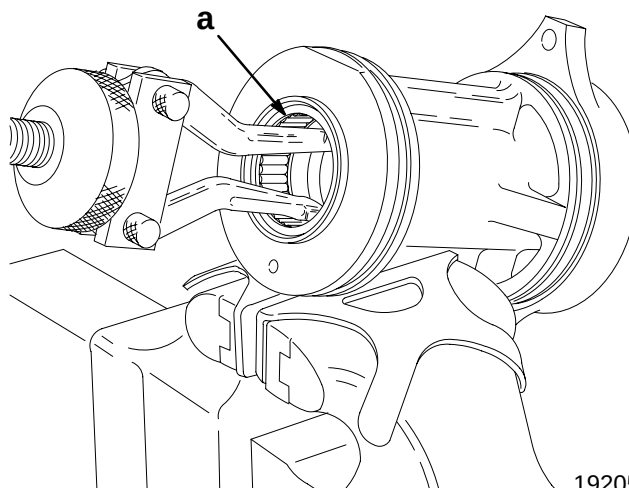
5. Lift reverse gear, thrust bearing and thrust washer from bearing carrier.
6. Replace reverse gear if gear teeth or clutch teeth on reverse gear are chipped or worn. If reverse gear must be replaced, pinion gear and sliding clutch should be inspected for damage.
7. Replace thrust bearing and thrust washer if rusted, pitted or damaged.



19202

a - Reverse Gear
b - Thrust Bearing
c - Thrust Washer

8. If bearing is rusted or does not roll freely, replace bearing. Remove bearing using Slide Hammer (91-34569A1).



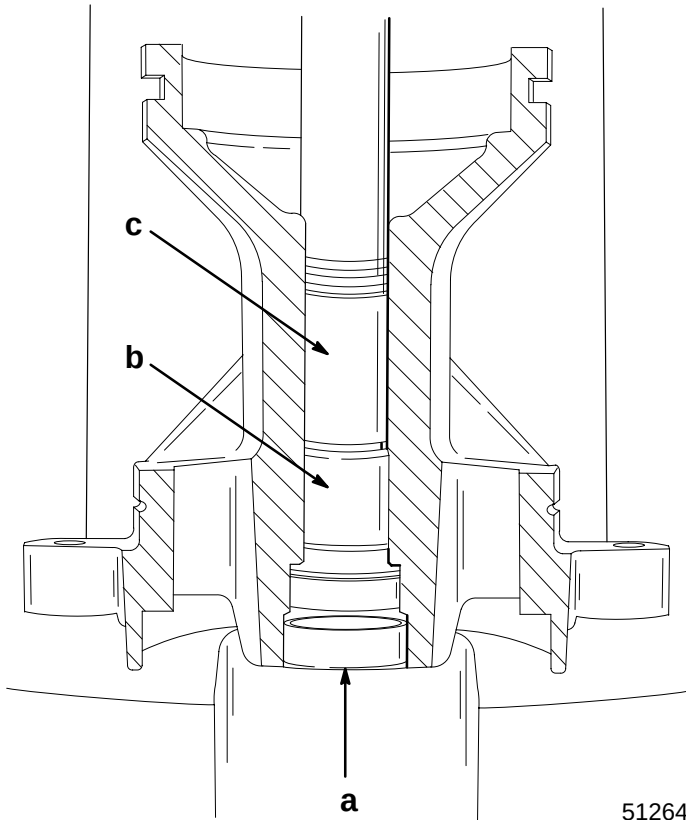
19205

a - Bearing



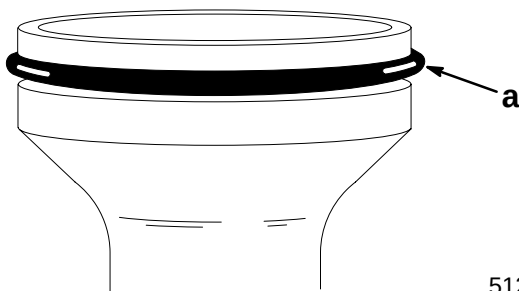
9. If bearing is rusted or does not roll freely, replace bearing. Remove bearing and oil seals using Mandrel* (91-36569) and Driver Rod* (91-37323). Discard oil seals.

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



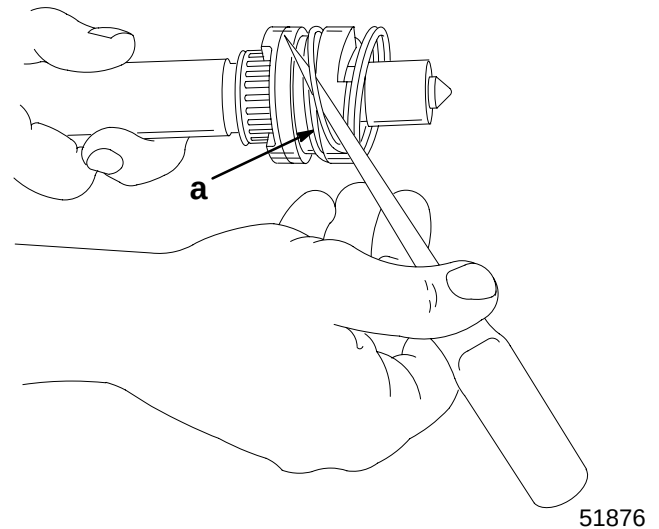
- a - Bearing
b - Mandrel (91-26569)
c - Driver Rod (91-37323)

10. Remove (if not removed with bearing in Step 9) propeller shaft seals and O-ring.



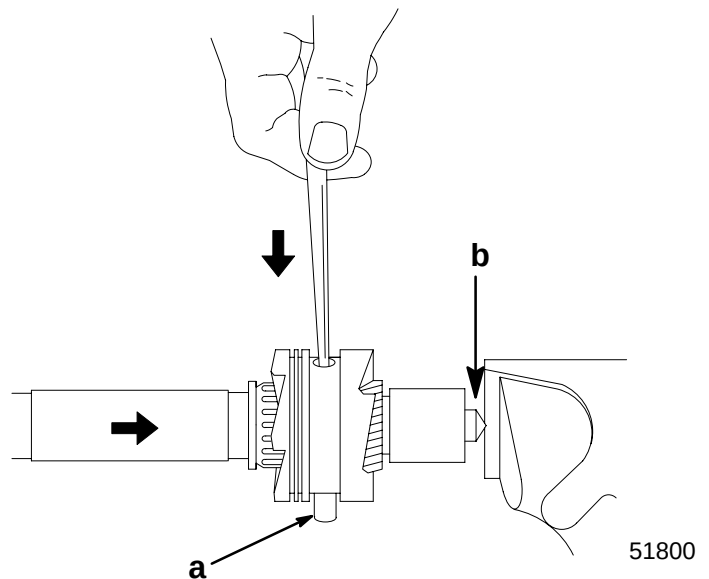
- a - O-ring

11. Remove spring.



- a - Spring

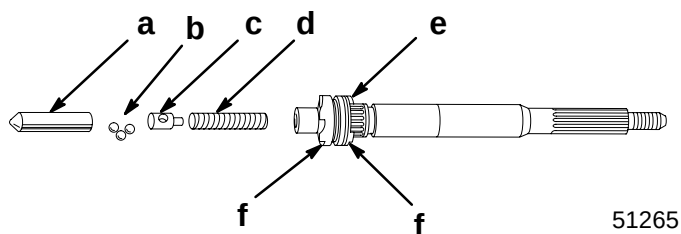
12. Apply constant pressure to cam follower to prevent cam follower assembly from ejecting from propeller shaft while pushing cross pin out of clutch dog.



- a - Cross Pin
b - Cam Follower



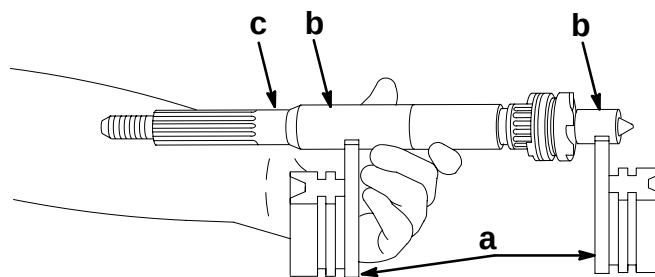
13. Remove components from propeller shaft.
14. Replace cam follower if worn or pitted.
15. Replace sliding clutch if jaws are rounded or chipped. Rounded jaws indicate one or more of the following:
 - a. Improper shift cable adjustment.
 - b. Engine idle speed too high while shifting.
 - c. Shifting from neutral to reverse (or forward) too slowly.



- a - Cam Follower
b - 3 Metal Balls
c - Guide Block
d - Spring
e - Sliding Clutch
f - Jaws

51265

16. Check bearing surfaces of propeller shaft for pitting or wear. If shaft is worn or pitted, replace shaft and corresponding bearing.
17. Replace propeller shaft if any of the following exist:
 - a. Splines are twisted or worn.
 - b. Oil seal surface is grooved.
 - c. Shaft has a noticeable "wobble" or is bent more than 0.009 in. (0.228mm). Prop shaft trueness should be measured with a dial indicator with prop shaft on V-blocks.



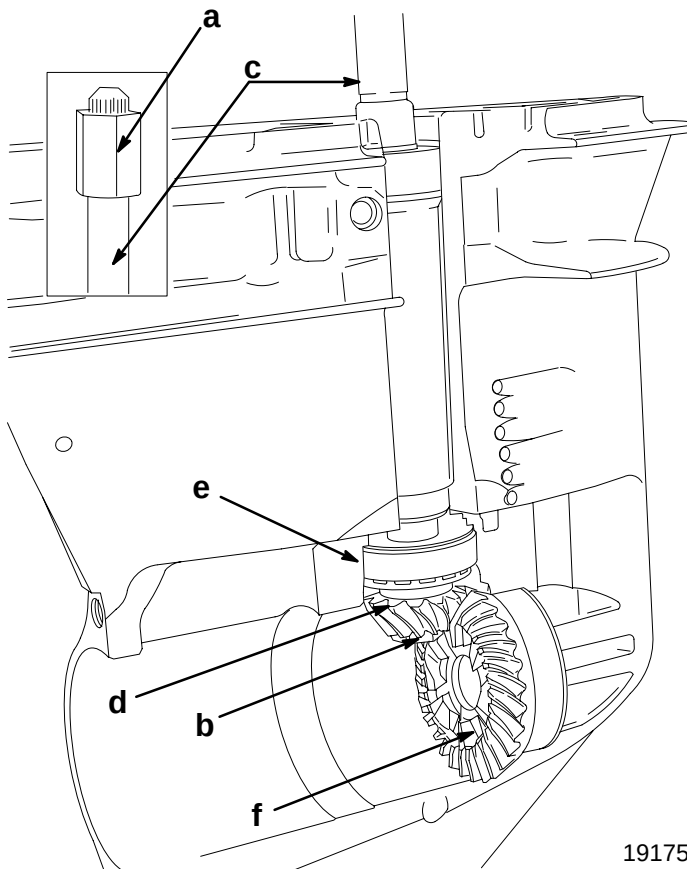
51877

- a - V-Blocks
b - Bearing Surfaces
c - Measure with Dial Indicator at this Point.



Pinion Gear, Drive Shaft, and Forward Gear

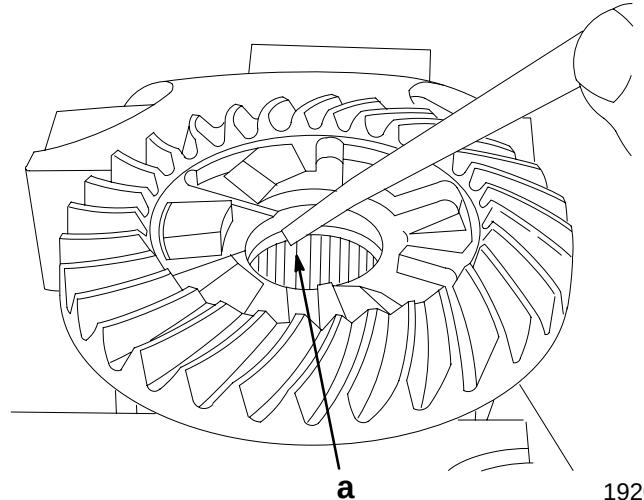
1. Hold drive shaft using Drive Shaft Holding Tool (91-56775); remove (and discard) pinion nut.
2. Remove drive shaft, pinion gear, bearing and forward gear .
3. Replace pinion gear if it is chipped or worn.
4. Replace bearing and race if either are rusted or damaged; or if bearing does not roll freely. To remove race, refer to "Lower Drive Shaft Bearing Race," following.
5. Replace forward gear if gear teeth or clutch teeth are chipped or worn.



19175

- a - Drive Shaft Holding Tool (91-56775)
b - Pinion Nut
c - Drive Shaft
d - Pinion Gear
e - Bearing
f - Forward Gear

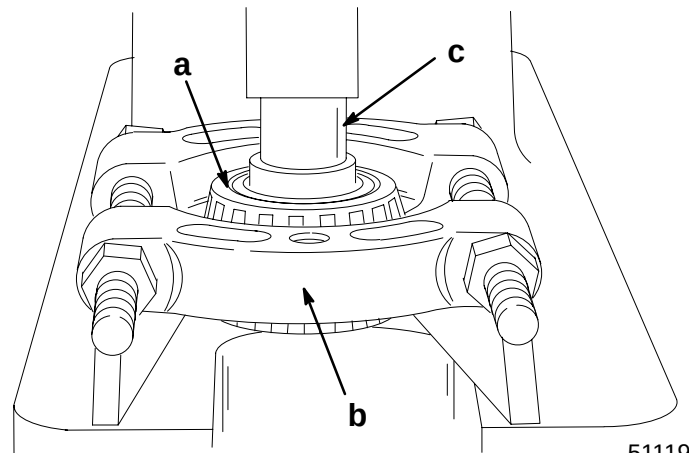
6. Replace bearing if it is rusted or does not roll freely; use a punch and hammer to remove bearing.



19203

- a - Bearing

7. Replace forward gear bearing and race if either are rusted or damaged; or if bearing does not roll freely. Remove bearing from gear using Universal Puller Plate (91-37241) and mandrel. To remove race, refer to "Forward Gear Bearing Race," following.



51119

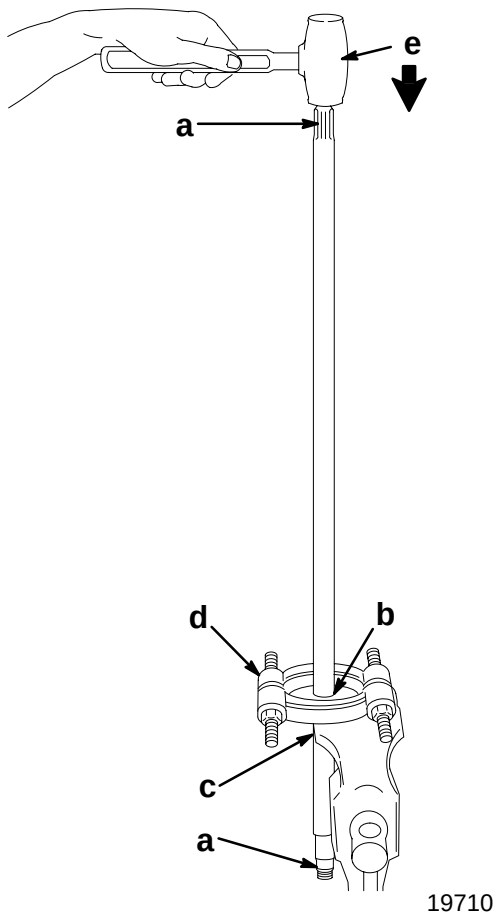
- a - Forward Gear Bearing
b - Universal Puller Plate (91-37241)
c - Mandrel



8. Replace drive shaft if splines are worn or twisted.
9. If bearing surface is damaged, replace drive shaft and corresponding bearing.

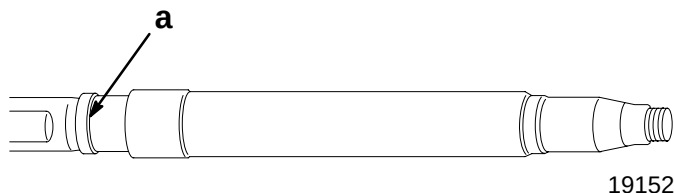
IMPORTANT: Do not tighten vise against drive shaft.

10. If wear sleeve is deeply grooved allowing water to enter gear case, remove (and discard) sleeve using Universal Puller Plate (91-37241) and lead hammer.



- a - Splines
- b - Bearing Surface
- c - Wear Sleeve
- d - Universal Puller Plate (91-37241)
- e - Lead Hammer

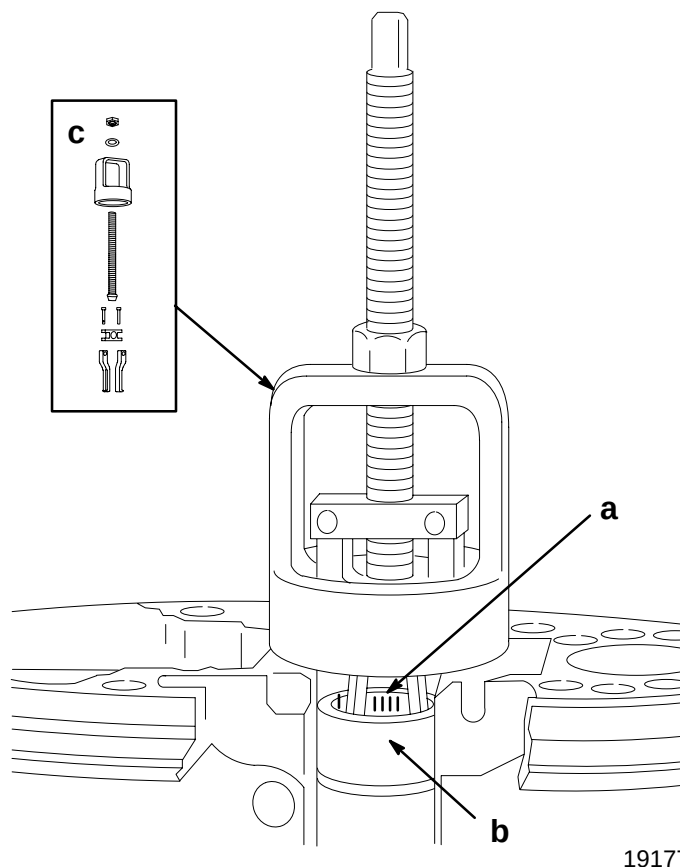
11. Remove (and discard) rubber ring.



- a - Rubber Ring

Upper Drive Shaft Bearing

1. Replace upper drive shaft bearing and sleeve if either are rust stained, or if bearing will not roll freely. Remove bearing and then sleeve using Puller Assembly (91-83165M) with suitable jaws.



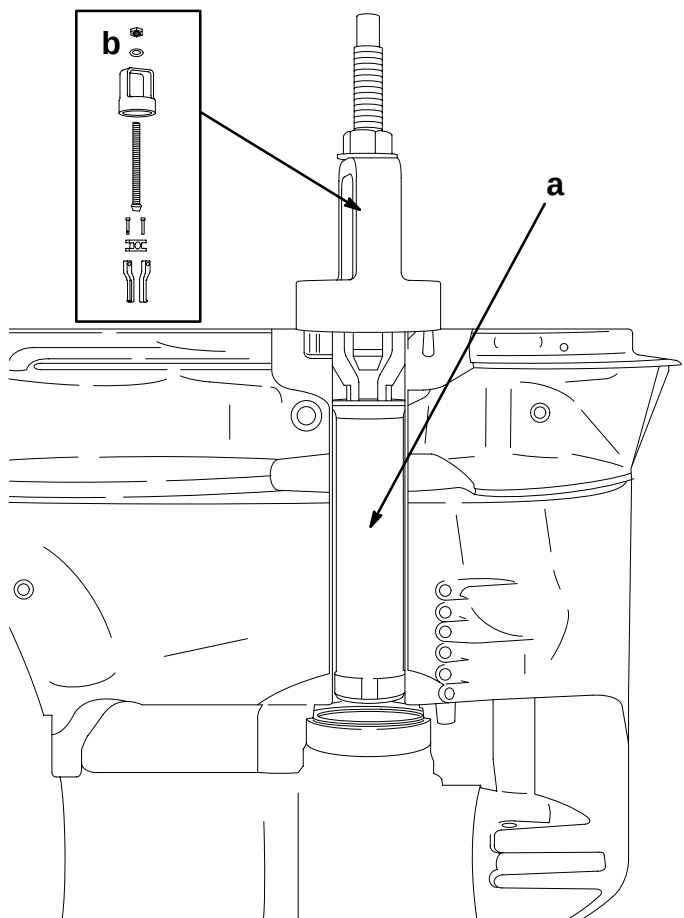
- a - Upper Drive Shaft Bearing
- b - Sleeve
- c - Puller Assembly (91-83165M)



IMPORTANT: Upper drive shaft bearing/sleeve must be removed prior to oil sleeve removal. Refer to “Upper Drive Shaft Bearing,” preceding.

Oil Sleeve

1. Remove oil sleeve (if necessary) using Puller Assembly (91-83165M) with suitable jaws.



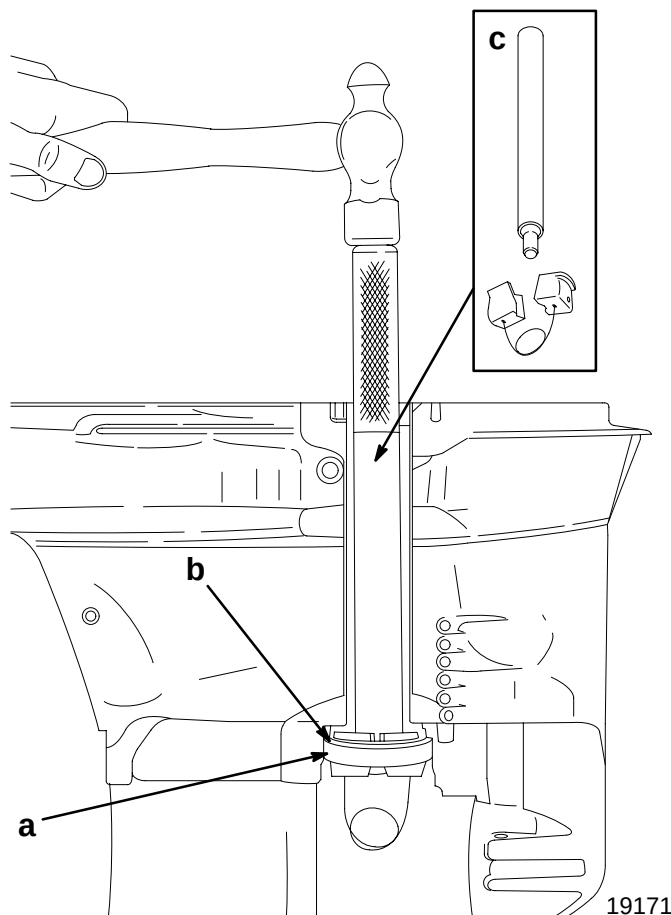
a - Oil Sleeve
b - Puller Assembly (91-83165M)

IMPORTANT: Upper drive shaft bearing/sleeve and oil sleeve do not have to be removed for lower drive shaft bearing race removal.

Lower Drive Shaft Bearing Race

IMPORTANT: Retain shim(s) for reassembly.

1. Remove race and shim(s) using bearing race tool (91-14308A1).

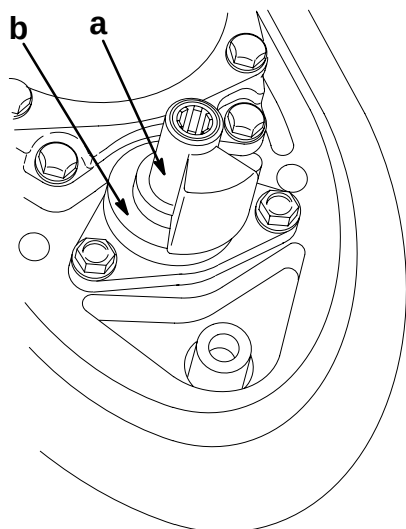


a - Race
b - Shim(s)
c - Bearing Race Tool (91-14308A1)



Shift Shaft

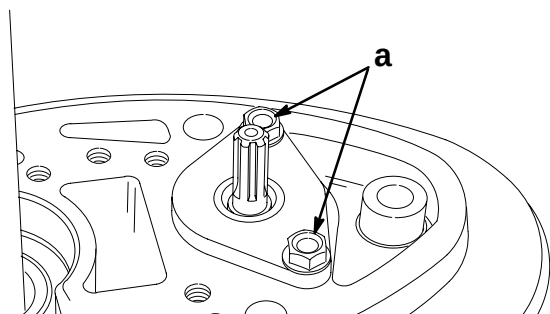
1. Remove shift shaft coupler and nylon spacer.



19221

- a - Shift Shaft Coupler
- b - Spacer

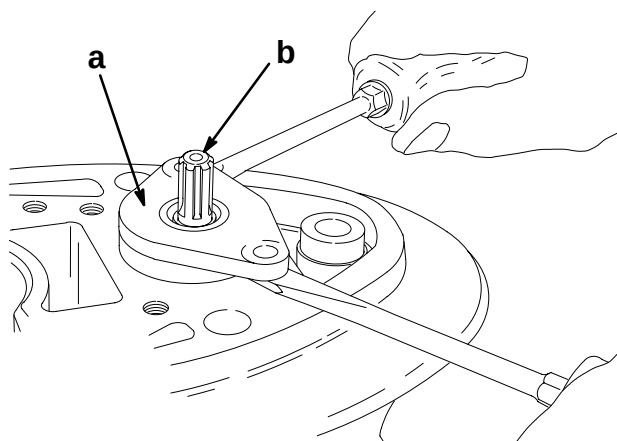
2. Remove bolts.



19216

- a - Bolts

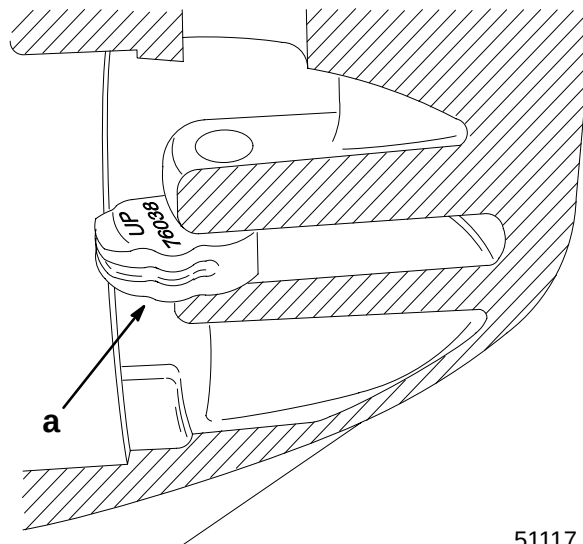
3. Remove shift shaft bushing and shift shaft.



19225

- a - Bushing
- b - Shift Shaft

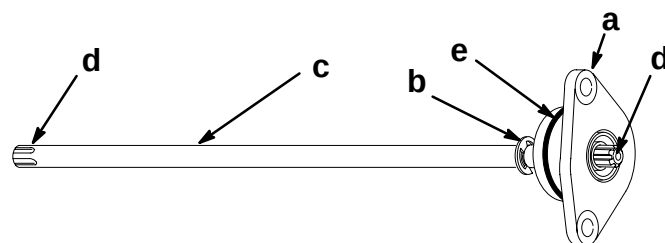
4. Remove shift cam from housing.
5. Replace shift cam if worn.



51117

- a - Shift Cam

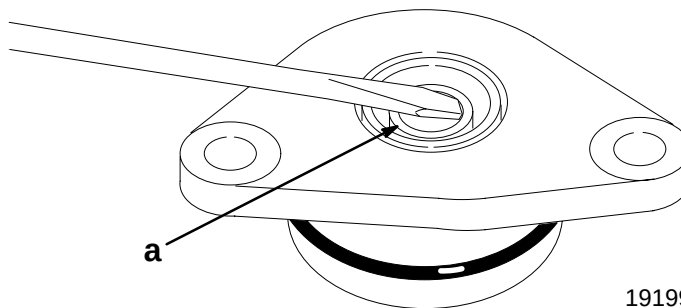
6. Remove shift shaft bushing and clip from shift shaft.
7. Replace shift shaft if splines are worn or shaft is twisted.
8. Remove (and discard) O-ring.



19200

- a - Bushing
- b - Clip
- c - Shift Shaft
- d - Splines
- e - O-ring

9. Remove (and discard) seal.



19199

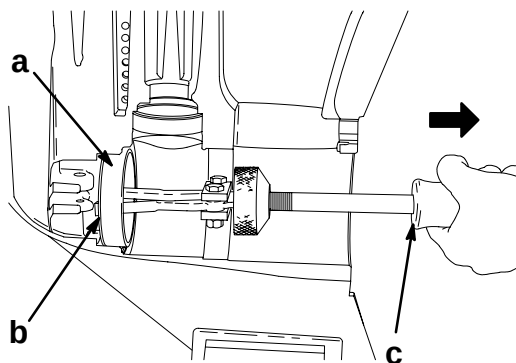
- a - Seal



Forward Gear Bearing Race

IMPORTANT: Retain shim(s) for reassembly.

1. Remove race and shim(s) using Slide Hammer (91-34569A1).



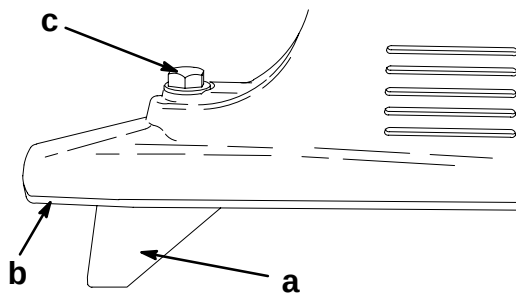
27653

- a - Race
- b - Shim(s)
- c - Slide Hammer (91-34569A1)

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) consumed. Mark location of old trim tab on anti-ventilation plate before removal; install new trim tab in same location.
2. The trim tab provides a means to offset (balance) some of the "steering load" that is caused by "propeller torque" at higher operating speeds. If at higher speeds the boat turns more easily to the left, loosen bolt, move the trim tab (trailing edge) to the left (when viewed from behind); retighten bolt. Turn trim tab (trailing edge) to the right if the boat turns more easily to the right.



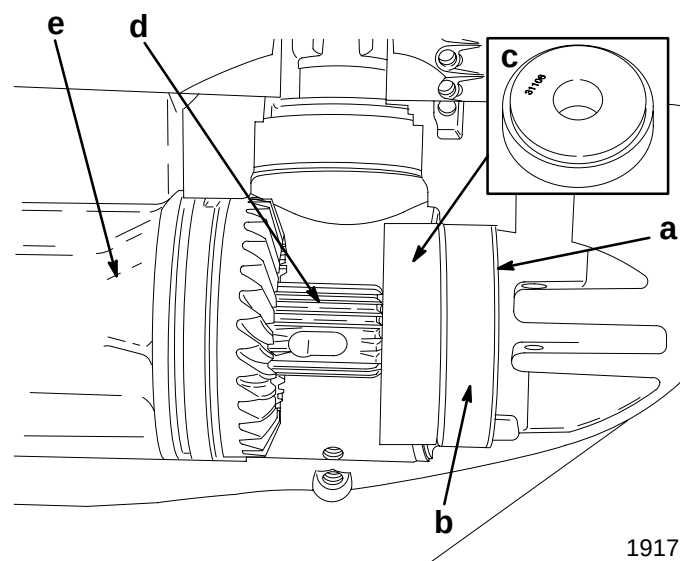
19172

- a - Trim Tab
- b - Anti-Ventilation Plate
- c - Retaining Bolt and Washer; Torque Bolt to 22 lbs. ft. (29.8 N-m)

Reassembly

Forward Gear Bearing Race

1. Place shim(s) (retained from disassembly) into housing. If shim(s) were lost, or a new gear housing is being assembled, start with 0.010" (0.254mm) shim(s).
2. Assemble components as shown; drive race into housing by striking propeller shaft end with lead hammer.

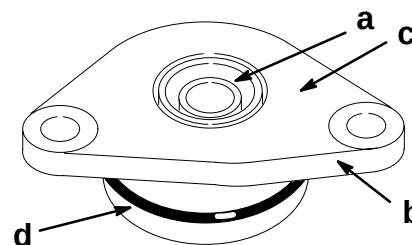


19179

- a - Shim(s)
- b - Race, Apply Quicksilver Needle Bearing Assembly Lubricant on O.D.
- c - Mandrel (91-31106)
- d - Disassembled Propeller Shaft
- e - Assembled Bearing Carrier

Shift Shaft

1. Apply Loctite 271 on O.D. of new seal.
2. Press seal into shift shaft bushing until seal is flush with surface.
3. Install new O-ring.
4. Apply 2-4-C with Teflon on O-ring and I.D. of seal.

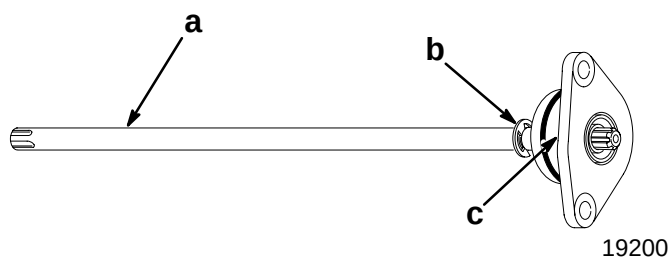


19199

- a - Seal
- b - Bushing
- c - Surface
- d - O-ring



5. Assemble components as shown.

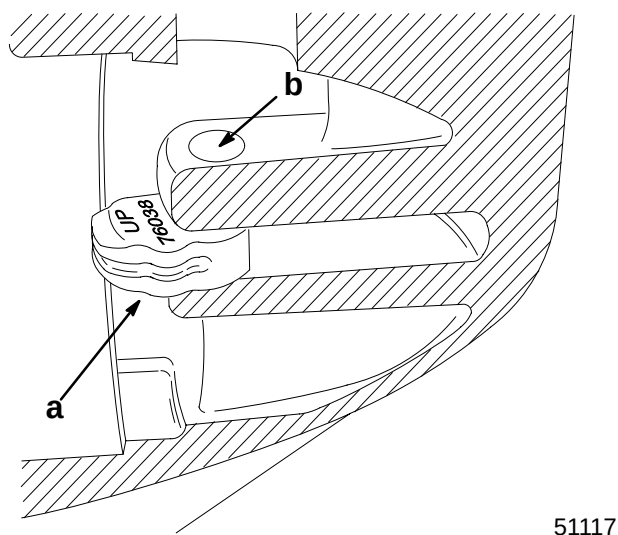


a - Shift Shaft

b - "E" Clip

c - Shift Shaft Bushing

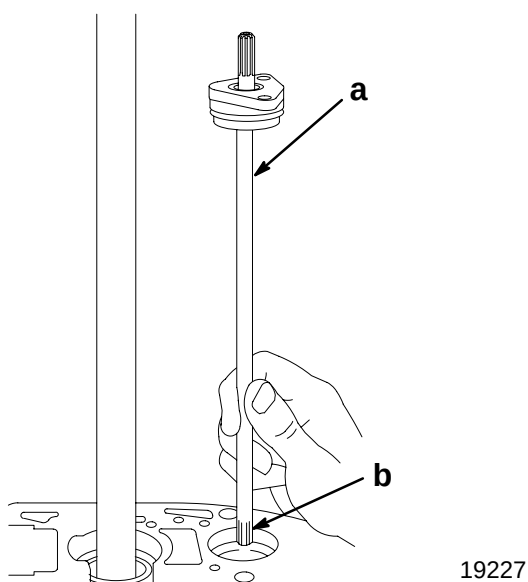
6. Install shift cam (numbers toward top of gear housing); align hole in shift cam with hole.



a - Shift Cam (Numbers UP)

b - Hole

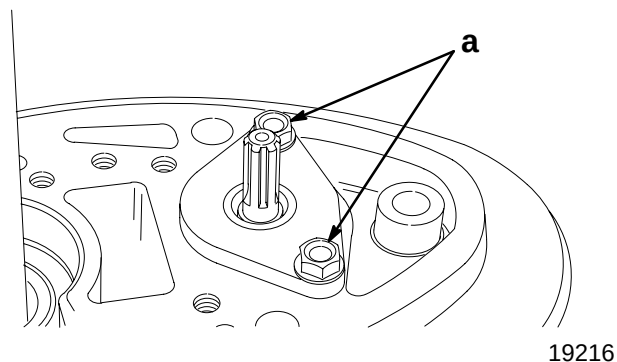
7. Install shift shaft assembly; insert splines into shift cam.



a - Shift Shaft Assembly

b - Splines

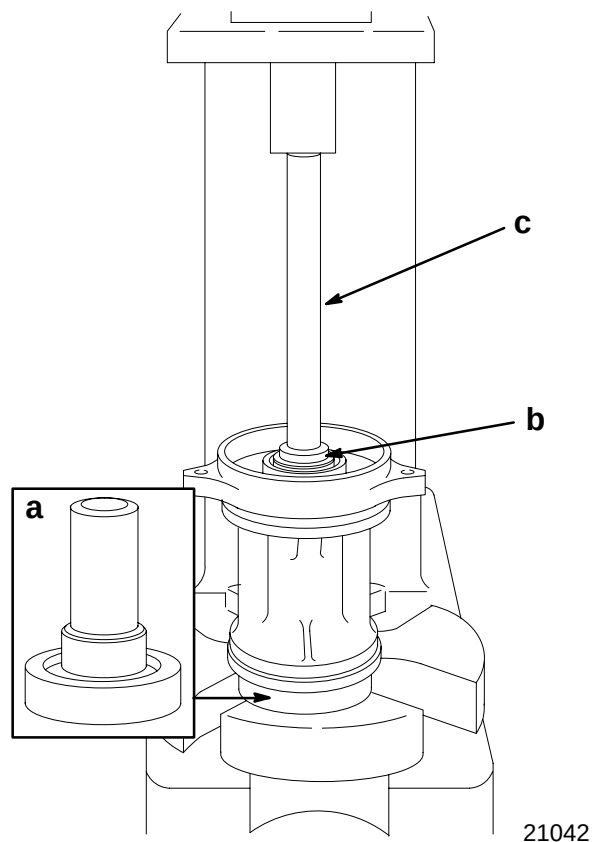
8. Apply Loctite 271 on bottom 1/2 of threads of bolts; install bolts and torque to 60 lb. in. (6.8 N·m).



a - Bolts [Torque to 60 lb. in. (6.8 N·m)]

Bearing Carrier Reassembly

1. Lubricate O.D. of bearing and bearing carrier bore with Quicksilver 2-4-C w/Teflon.
2. Protect lip on forward side of bearing carrier, using bearing installation tool (91-13945).
3. Press propeller shaft needle bearing (number side toward mandrel) into carrier, until bearing bottoms out.



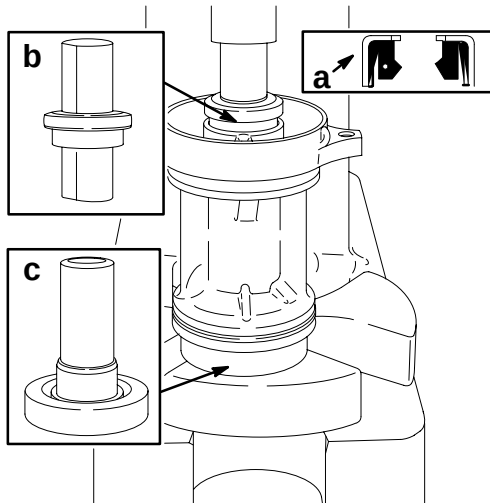
a - Bearing Installation Tool (91-13945)

b - Mandrel (91-37263)

c - Suitable Driver Rod



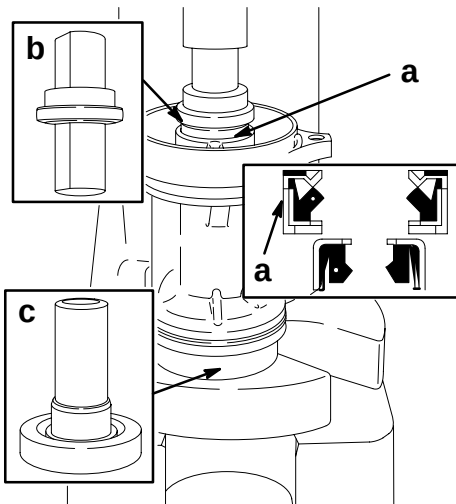
4. Place smaller diameter seal on longer shoulder of Oil Seal Driver (91-31108) with seal lip away from shoulder.
5. Protect lip on front side of bearing carrier using Bearing Installation Tool (91-13945). Apply Loctite 271 on O.D. of seal. Press seal into carrier until tool bottoms.



21040

- a - Seal
b - Oil Seal Driver (91-31108)
c - Bearing Installation Tool (91-13945)

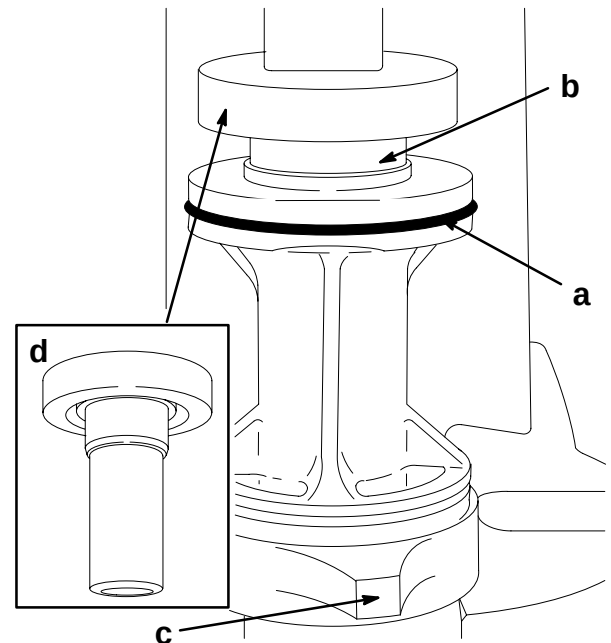
6. Place larger diameter seal on shorter shoulder of Oil Seal Driver (91-31108) with seal lip toward shoulder.
7. Protect lip on front side of bearing carrier using Bearing Installation Tool (91-13945). Apply Loctite 271 on O.D. of new seal. Press seal into carrier until tool bottoms.



21041

- a - Seal
b - Oil Seal Driver (91-31108)
c - Bearing Installation Tool (91-13945)

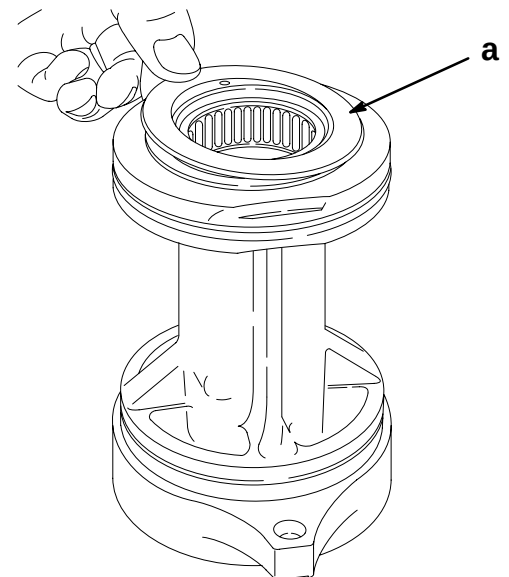
8. Install O-ring.
9. Lubricate O-ring with 2-4-C w/Teflon. Lubricate seal lips with 2-4-C w/Teflon (92-825407A12). Lubricate outside diameter of bearing with a light coating of 2-4-C w/Teflon.
10. Press bearing into carrier until tool bottoms.



19163

- a - O-ring
b - Bearing, Numbered Side Toward Tool
c - Seal Lips
d - Bearing Installation Tool (91-13945)

11. Install thrust washer. Coat thrust washer with Quicksilver Gear Lubricant (92-13783A24).

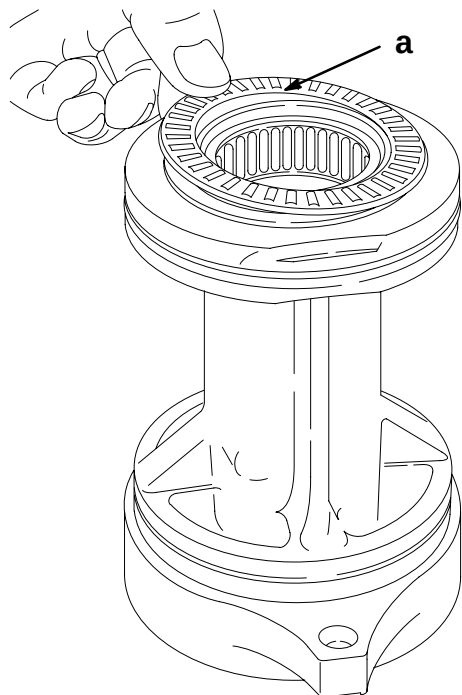


19167

- a - Thrust Washer



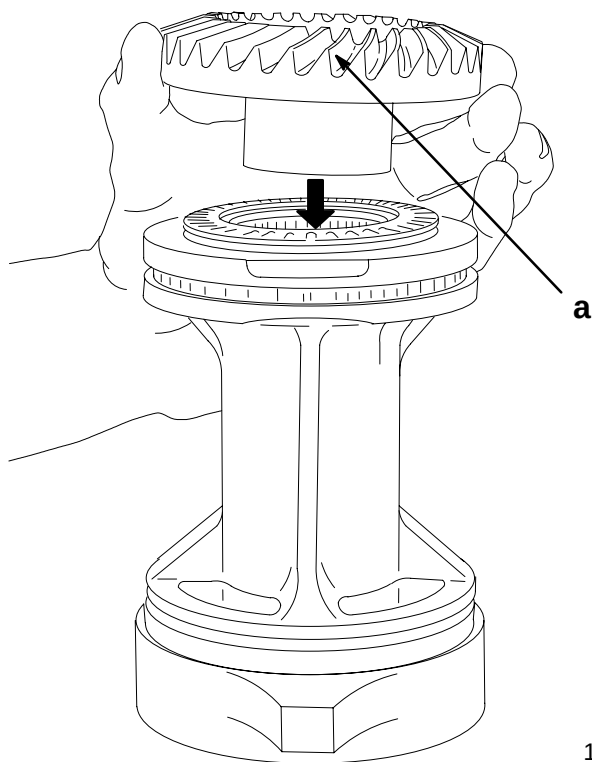
12. Install thrust bearing . Coat thrust bearing with Quicksilver Gear Lubricant (92-13783A24).



19168

a - Thrust Bearing

13. Install reverse gear.

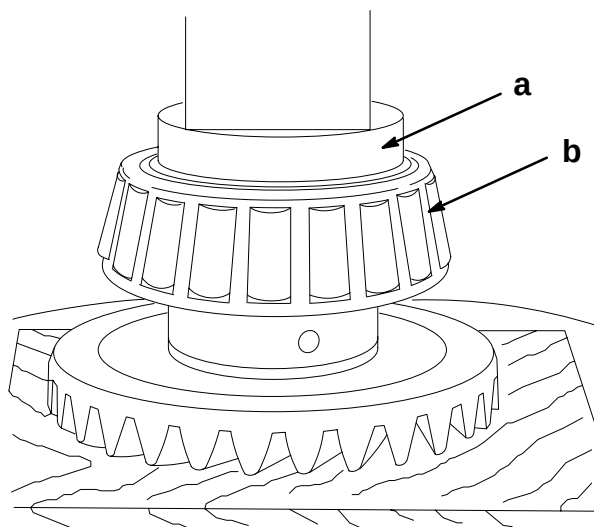


19202

a - Reverse Gear

Forward Gear Reassembly

1. Press bearing onto gear (press only on inner race of bearing).



51869

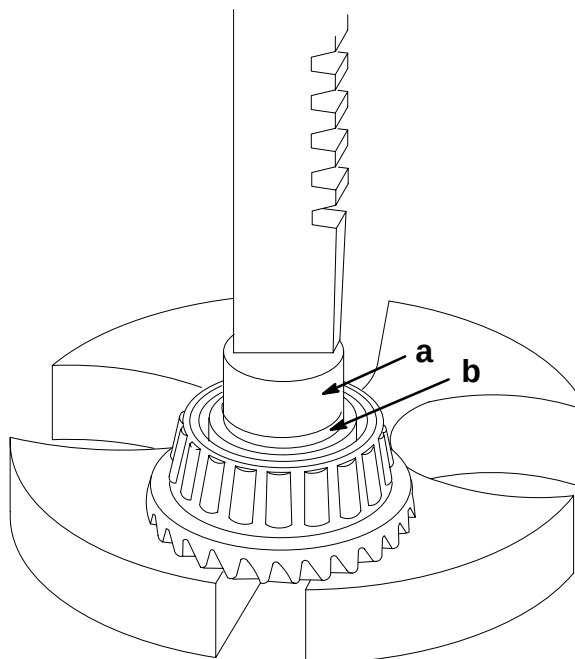
a - Mandrel (91-37350)

b - Bearing; Lubricate I.D. with Quicksilver 2-4-C w/Teflon

2. Apply 2-4-Cw/Teflon to bore in center of gear.

3. Press bearing into gear until bearing bottoms out.

NOTE: Do not apply pressing force AFTER bearing bottoms out as bearing damage could result.



28062

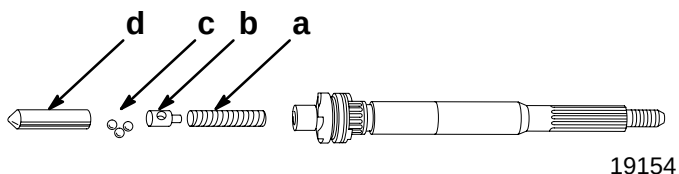
a - Mandrel

b - Bearing, Numbered Side Toward Mandrel



Propeller Shaft Reassembly

1. Install components into propeller shaft in sequence shown.



a - Spring

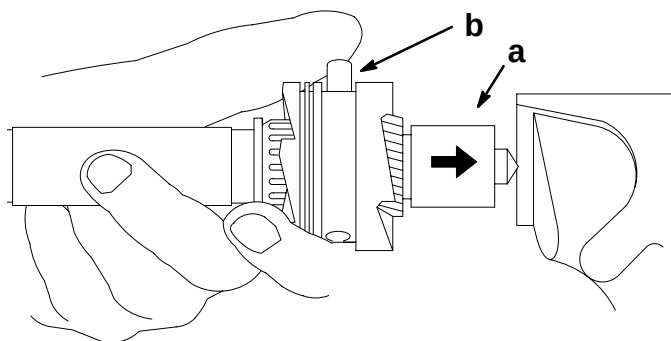
b - Guide Block

c - 3 Metal Balls*

d - Cam Follower*

*Hold in Place With Quicksilver 2-4-C w/Teflon

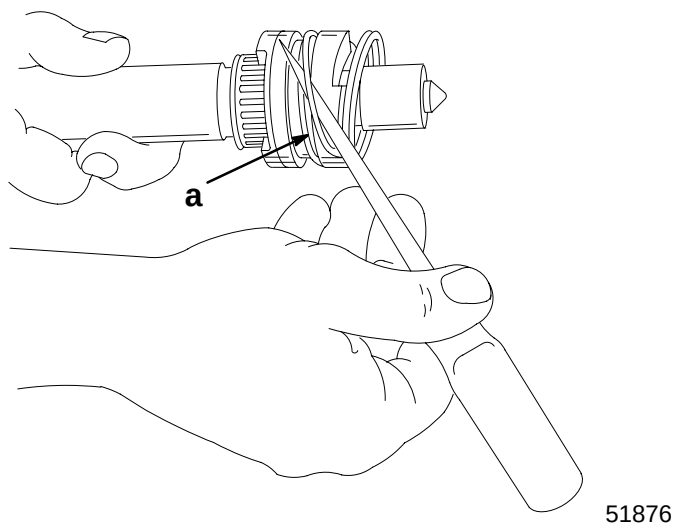
2. Install cross pin.



a - Apply Pressure in This Direction

b - Cross Pin

3. Install spring. DO NOT overlap springs.



a - Spring

Drive Shaft Wear Sleeve Installation

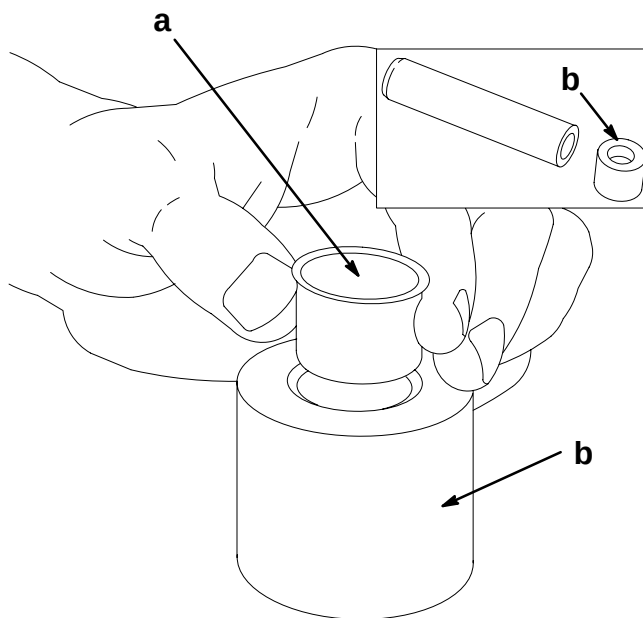
1. Install new rubber ring.
2. Apply a light coat of Loctite 271 on outside diameter of rubber ring.



a - Ring

3. Insert sleeve into holder*.

*Component of Wear Sleeve Installation Tool (91-14310A1).

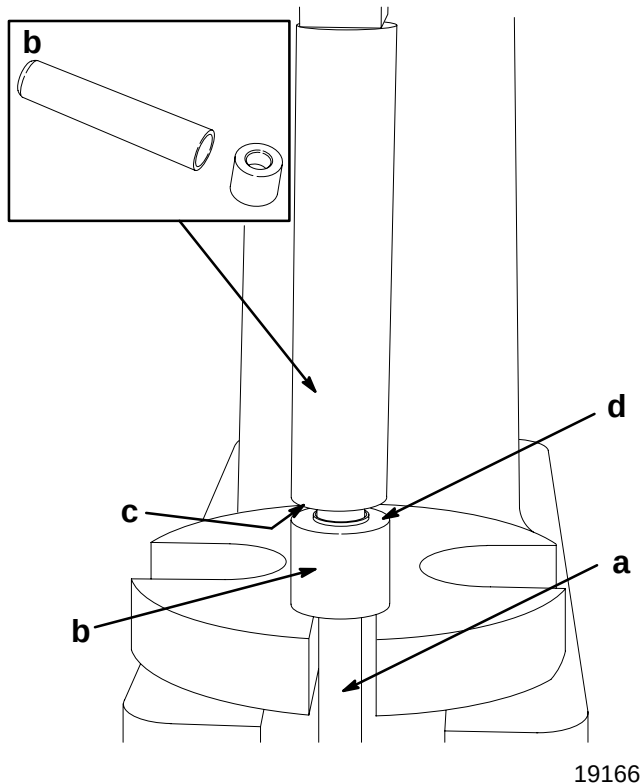


a - Sleeve

b - Holder



4. Press sleeve onto drive shaft using Wear Sleeve Installation Tool (91-14310A1); continue pressing until surface contacts surface.



- a - Drive Shaft
- b - Wear Sleeve Installation Tool
- c - Surface
- d - Surface

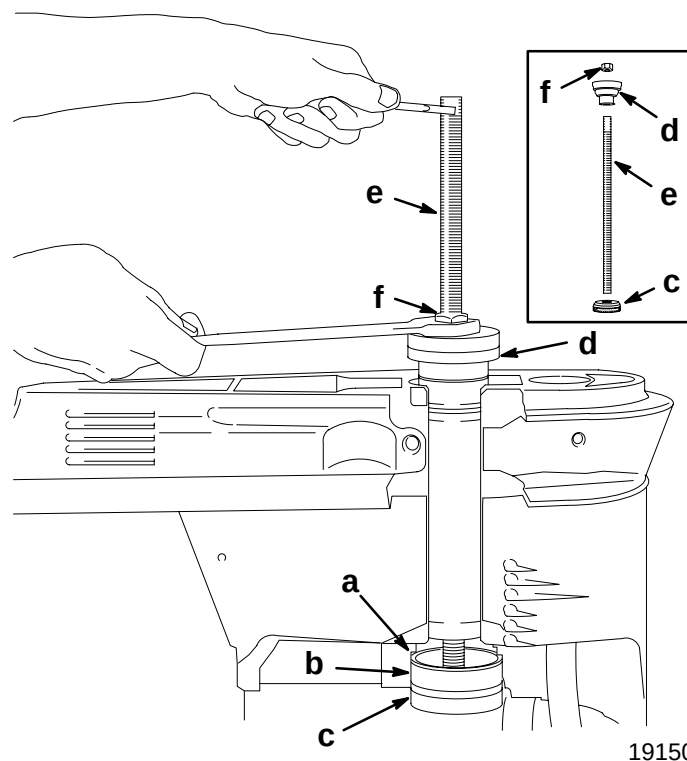
5. Remove excess Loctite from assembled shaft.

Lower Drive Shaft Bearing Race Installation

IMPORTANT: Lower drive shaft bearing cup can be installed with or without upper drive shaft bearing/sleeve and oil sleeve installed.

1. Lubricate O.D. of bearing race with Quicksilver 2-4-C w/Teflon.
2. Install shim(s) and bearing race into housing.

NOTE: Verify shim(s) are not cocked when drawing up race.



- a - Shim(s); Retained From Disassembly. If Shim(s) Were Lost or a New Gear Housing is Being Assembled, Start With 0.025" (0.635mm) Shim(s)
- b - Bearing Race
- c - Mandrel*
- d - Mandrel*
- e - Threaded Rod** (91-31229)
- f - Nut** (11-24156)

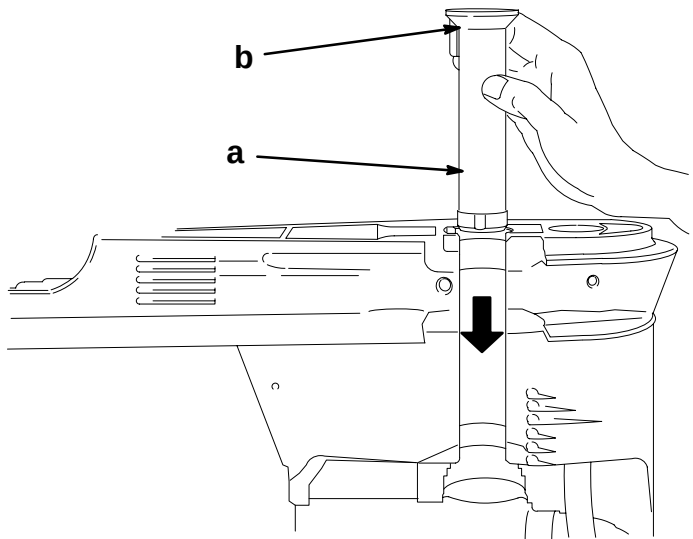
*From Bearing Installation Tool (91-14309A1)

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



Oil Sleeve Installation

1. Install oil sleeve with tab positioned as shown.

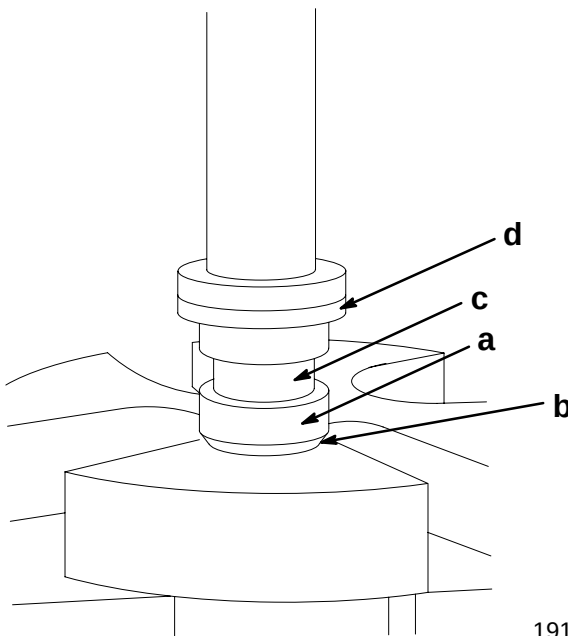


19173

- a - Oil Sleeve
- b - Tab

Upper Drive Shaft Bearing Installation

1. Lubricate I.D. of bearing holder and O.D. of bearing with 2-4-C w/ Teflon.
2. Press bearing into sleeve.



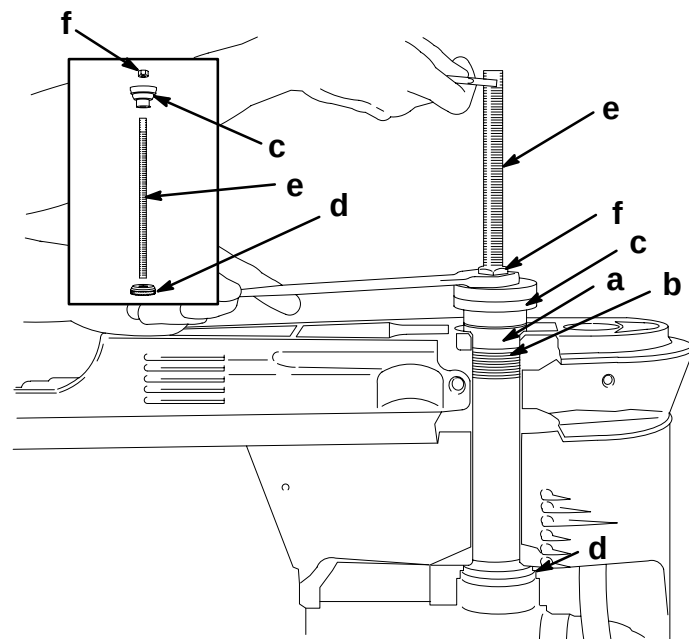
19164

- a - Bearing Sleeve
- b - Tapered End
- c - Bearing; Numbered Side Toward Mandrel
- d - Mandrel; From Bearing Installation Tool (91-14309A1)

IMPORTANT: Oil sleeve must be installed prior to upper drive bearing installation.

IMPORTANT: Upper drive shaft bearing/sleeve can be installed with or without lower drive shaft bearing cup installed.

3. Install bearing/sleeve into housing.



19151

- a - Bearing/Sleeve
- b - Tapered End
- c - Mandrel*
- d - Mandrel*
- e - Threaded Rod** (91-31229)
- f - Nut** (11-24156)

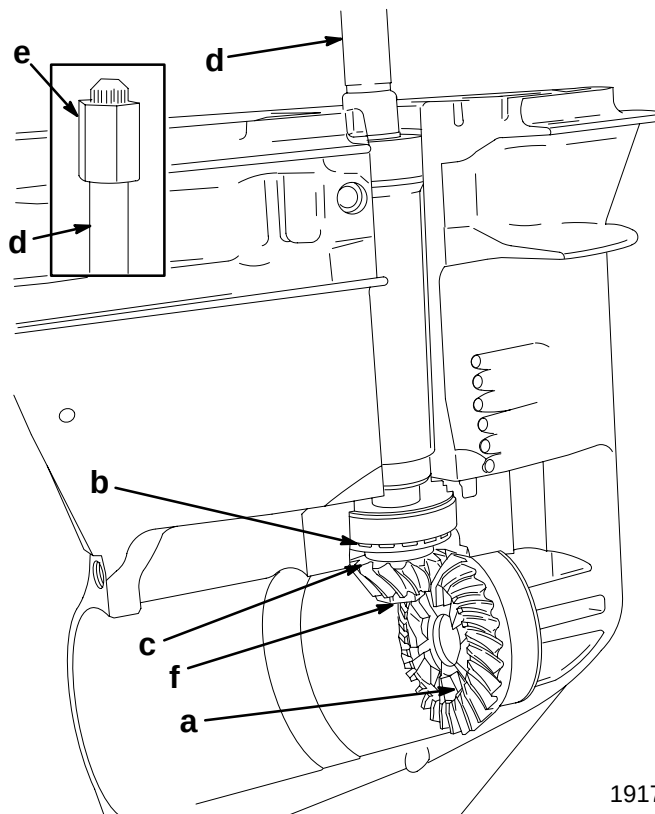
*From Bearing Installation Tool (91-14309A1)

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



Forward Gear, Lower Drive Shaft Bearing, Pinion Gear, and Drive Shaft Installation

1. Install components in sequence shown.



- a - Forward Gear/Bearing: Work Quicksilver gear lube into bearing rollers.
- b - Lower Drive Shaft Tapered Roller Bearing: Work Quicksilver gear lube into bearing rollers.
- c - Pinion Gear
- d - Drive Shaft
- e - Drive Shaft Holding Tool (91-56775)
- f - Pinion Nut (New): Apply Loctite 271 to threads during final assembly (after pinion gear depth and forward gear backlash have been set), torque to 70 lb. ft. (95 N·m).

Pinion Gear Depth and Forward Gear Backlash

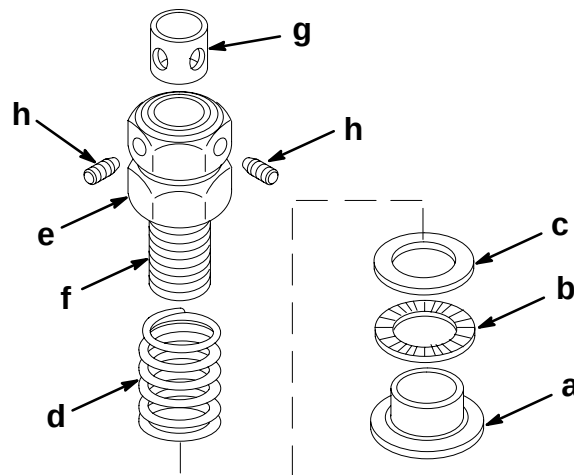
DETERMINING PINION GEAR DEPTH

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

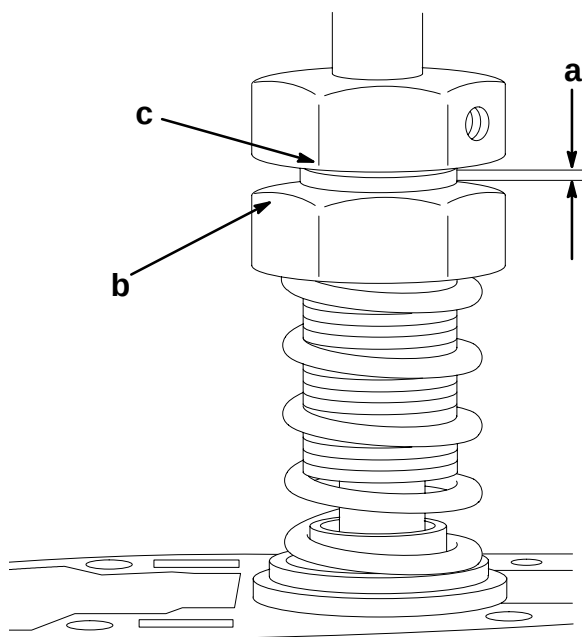
IMPORTANT: Forward gear assembly must be installed in gear housing when checking pinion gear depth or an inaccurate measurement will be obtained.

1. Clean the gear housing bearing carrier shoulder and diameter.

2. With gear housing positioned up right (drive shaft vertical), install Bearing Preload Tool (91-14311A1) over drive shaft in sequence shown.

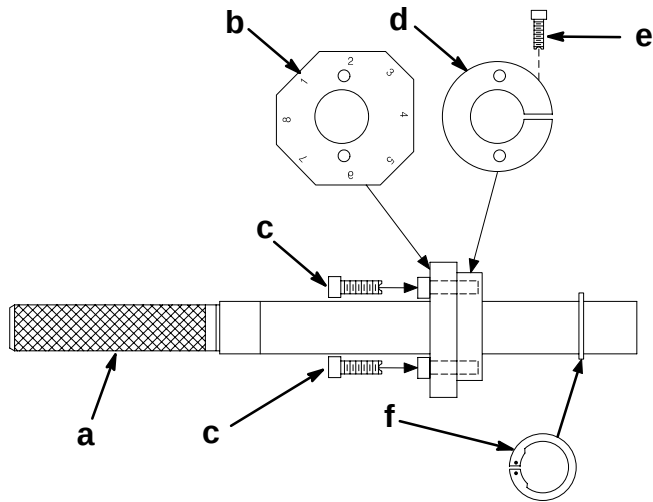


- a - Adaptor: Bearing surfaces clean and free of nicks
 - b - Thrust Bearing: Oiled and able to move freely
 - c - Thrust Washer: Clean and free of nicks and bends
 - d - Spring
 - e - Nut: Threaded all-the-way onto bolt
 - f - Bolt: Held snug against spring
 - g - Sleeve: Holes in sleeve must align with set screws
 - h - Set Screw (2): Tightened against drive shaft, bolt should not slide on drive shaft.
3. Measure distance (a) between top of nut (b) and bottom of bolt head (c).
 4. Increase distance (a) by 1" (25.4mm).
 5. Rotate drive shaft 5 to 10 revolutions. This should properly seat upper drive shaft tapered roller bearing.



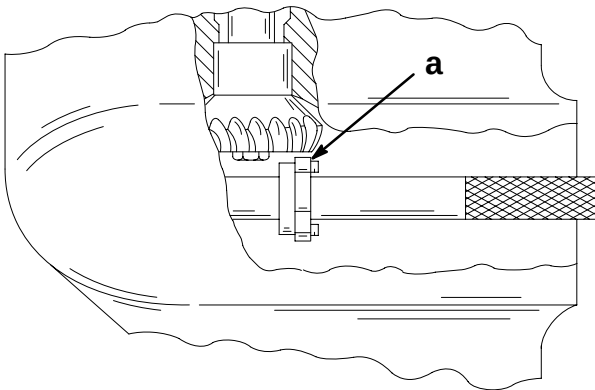


6. Assembly Pinion Gear Locating Tool (91-12349A2) as shown; do not tighten collar retaining bolt at this time.



- a - Arbor
b - Gauging Block; Install With Numbers Away From Split Collar
c - Bolt; Gauging Block Retaining
d - Split Collar
e - Bolt; Collar Retaining
f - Snap Ring

7. Insert tool into forward gear assembly; position gauging block under pinion gear as shown.



22067

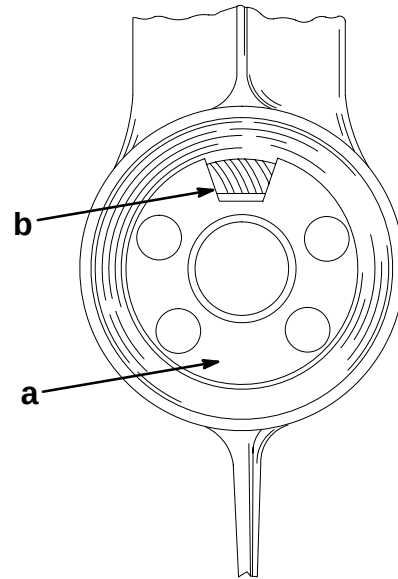
- a - Gauging Block

8. Remove tool, taking care not to change gauging block position, and tighten collar retaining bolt.
9. Insert tool into forward gear assembly; position proper numbered flat (from chart) of gauging block – under pinion gear.

MODEL	GEAR RATIO (PINION GEAR TEETH/ REVERSE GEAR TEETH)	USE FLAT NO.
75-thru-90 (3 Cylinder)	13/30	8
100/115/125 (4 Cylinder)	14/29	2

10. Install the number “3” locating disc against bearing carrier shoulder in gear housing.

11. Position access hole as shown.



24643

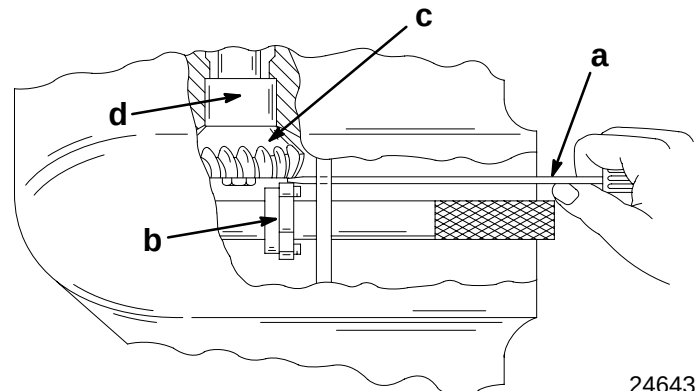
- a - Locating Disc
b - Access Hole

12. Determine pinion gear depth by inserting a feeler gauge thru access hole in locating disc.

13. The correct clearance between gauging block and pinion gear is 0.025" (0.64mm).

14. If clearance is correct, leave Bearing Preload Tool on drive shaft and proceed to “Determining Forward Gear Backlash,” following.

15. If clearance is incorrect, add (or subtract) shims from above bearing race to lower (or raise) pinion gear. When reinstalling pinion nut, apply Loctite 271 on threads of nut.



24643

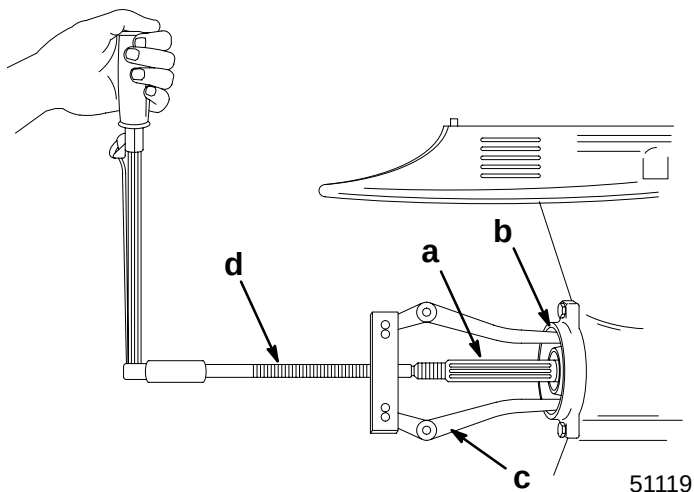
- a - Feeler Gauge
b - Gauging Block
c - Pinion Gear
d - Bearing Race



DETERMINING FORWARD GEAR BACKLASH

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

1. Obtain correct pinion gear depth; refer to "Determining Pinion Gear Depth," preceding.
2. Install Bearing Preload Tool (91-14311A1) on drive shaft; refer to "Determining Pinion Gear Depth," preceding.
3. Install components as shown.

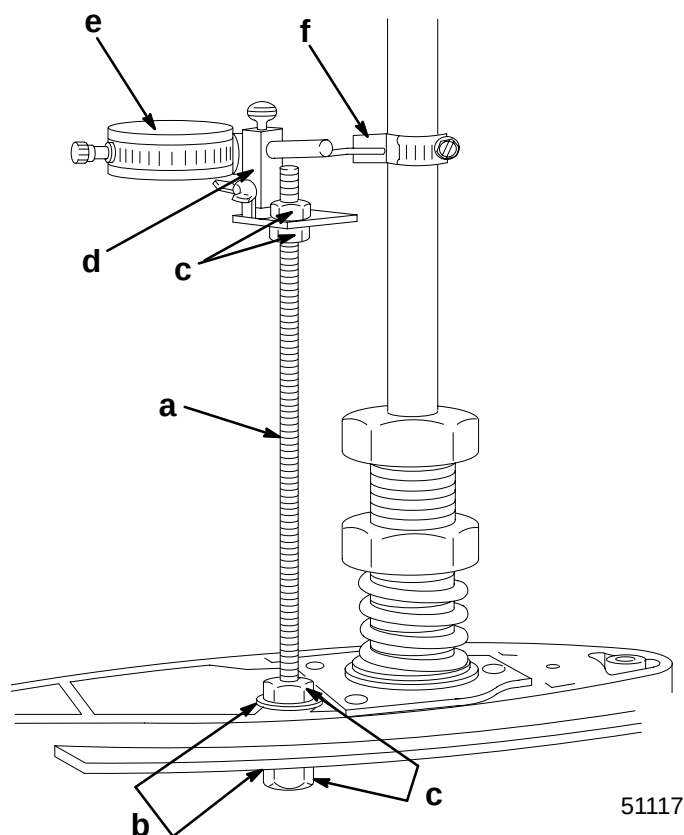


- a - Propeller Shaft*
- b - Bearing Carrier* (Assembled)
- c - Puller Jaws (91-46086A1)
- d - Puller Bolt (91-85716); Torque to 45 lbs. in. (5.1 N·m)

*Refer to "Bearing Carrier and Propeller Shaft Installation," following.

4. Rotate drive shaft 5 to 10 revolutions. This should properly seat forward gear tapered roller bearing.

5. Install components as shown.



- 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

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

MODEL	ALIGN POINTER OF DIAL INDICATOR WITH MARK
75-thru-90 (3 Cylinder) Backlash Indicator Tool (91-78473)	4
100/115/125 (4 Cylinder) Backlash Indicator Tool (91-19660)	1



7. Lightly turn drive shaft back-and-forth (no movement should be noticed at propeller shaft).
8. Dial Indicator registers amount of backlash, which must be between specification shown in chart.

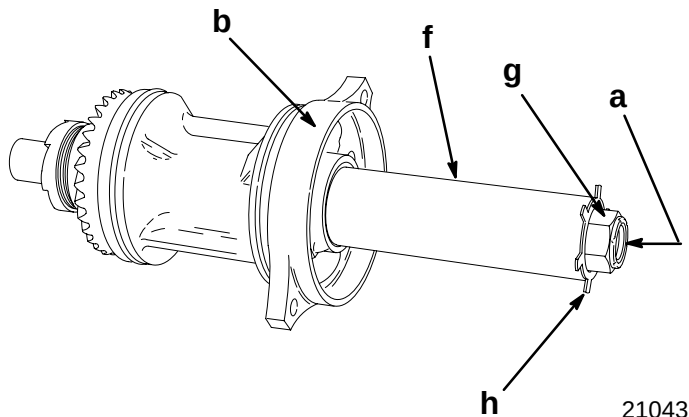
MODEL	DIAL INDICATOR MINIMUM	READING MAXIMUM
75-thru-90 (3 Cylinder)	0.012 in. (0.30mm)	0.019 in. (.48mm)
100/115/125 (4 Cylinder)	0.015 in. (0.38mm)	0.022 in. (0.55mm)

9. If backlash is less than the minimum specification, remove shim(s)* from in front of forward gear bearing race to obtain correct backlash. When re-installing pinion nut, apply Loctite 271 on threads of nut.
10. If backlash is more than the maximum specification, add shim(s)* in front of forward gear bearing race to obtain correct backlash. When re-installing pinion nut, apply Loctite 271 on threads of nut.

* By adding or subtracting 0.001" (0.025mm) shim, the backlash will change approximately 0.001" (.025mm).

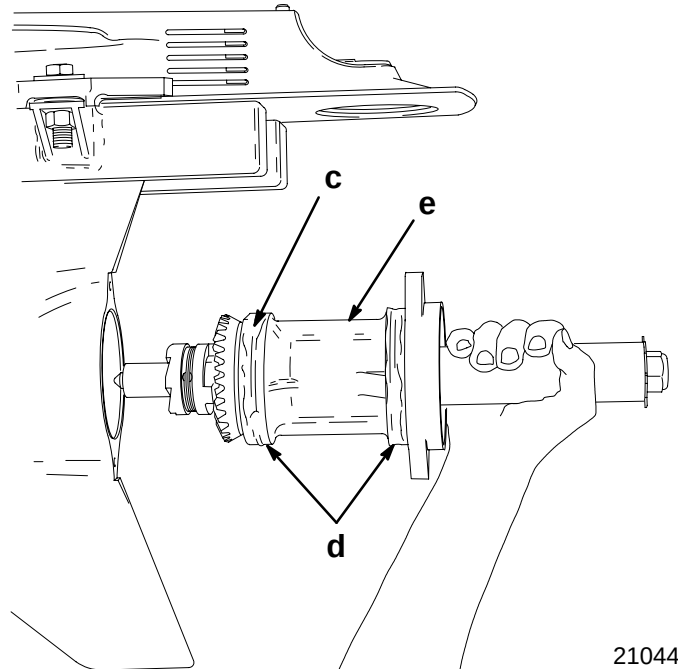
Bearing Carrier and Propeller Shaft Installation

1. Insert propeller shaft assembly into bearing carrier.
2. Before installing bearing carrier assembly into gear housing, obtain locally a 6" (152.4mm) long by 1-1/4" – 1-1/2" (31.7 – 38.1mm) diameter piece of PVC pipe. Install the PVC pipe (f) over the prop shaft (a) and secure the pipe against the bearing carrier assembly (b) with the propeller nut (g) and tab washer (h). This will allow the reverse gear to apply pressure to the reverse gear thrust bearing to prevent the thrust bearing from being inadvertently dislodged as the bearing carrier assembly is installed in the gear housing.



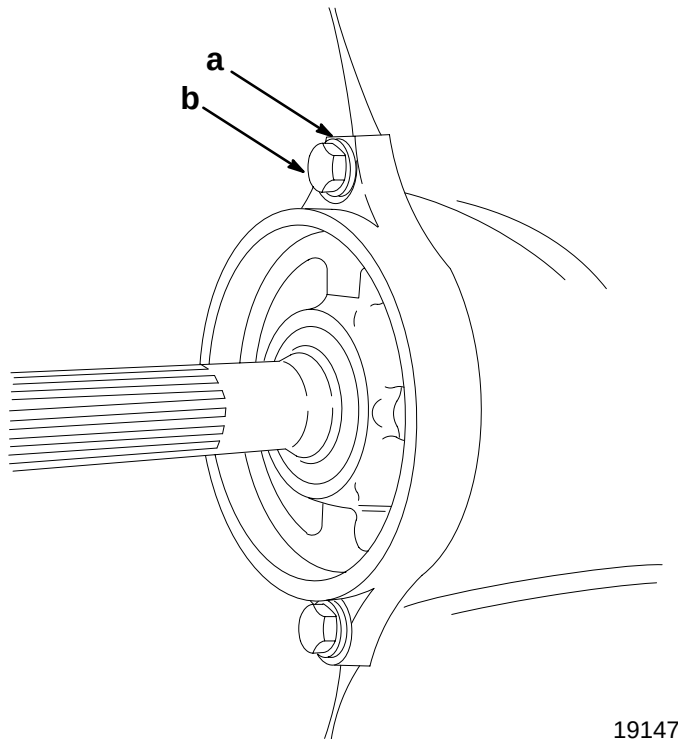
21043

3. Lubricate o-ring (c) and areas (d) with 2-4-C w/ Teflon (92-825407A12).
4. Install bearing carrier and propeller shaft into housing with the word "TOP" located on flange (e) toward top of housing.



21044

5. Install components as shown.



19147

a - Washers

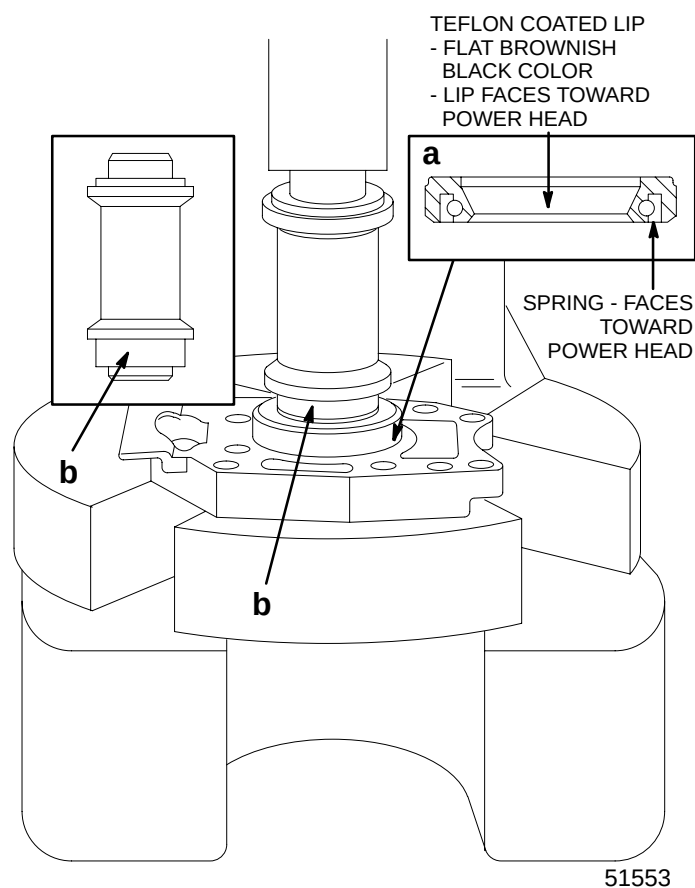
b - Bolts; Apply Loctite 271 on Threads and Torque to 21.7 lb. ft. (29.4 N·m)

NOTE: If nuts are used in place of bolts (b), torque nuts to 21.7 lb. ft. (29.4 N·m).



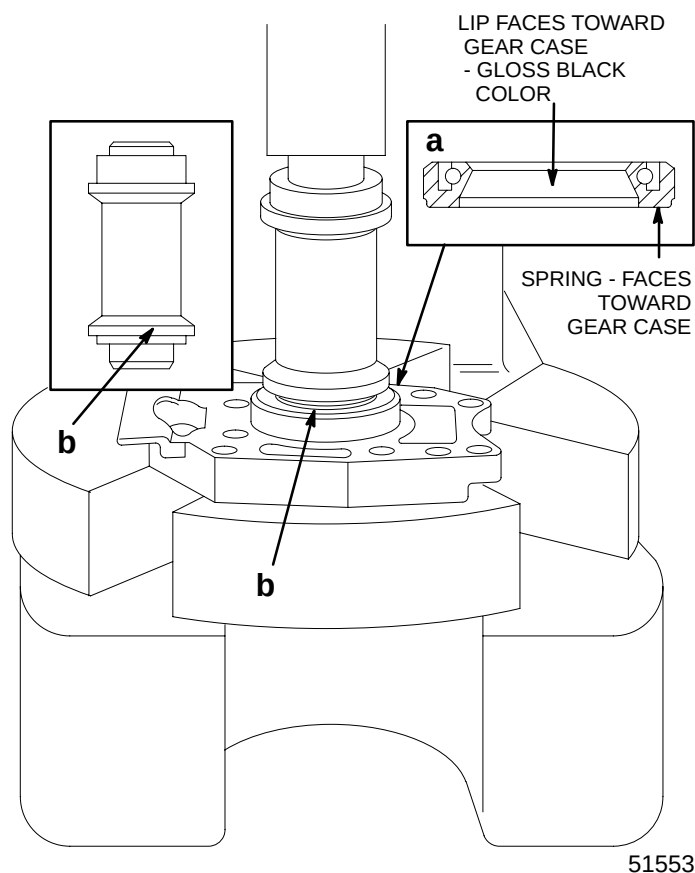
Water Pump Reassembly and Installation

6. Place seal on longer shoulder side of Oil Seal Driver (91-13949) with seal lip away from shoulder.
7. Apply Loctite 271 on O.D. of seal; press seal into water pump base until tool bottoms.



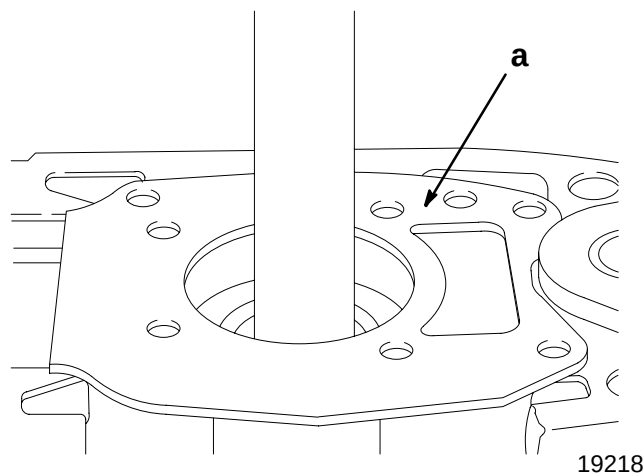
- a - Seal
b - Oil Seal Driver (91-13949)

8. Place seal on shorter shoulder side of Oil Seal Driver (91-13949) with seal lip toward shoulder.
9. Apply Loctite 271 on O.D. of seal; press seal into water pump base until tool bottoms.
10. Lubricate lip of each seal with Quicksilver 2-4-C w/ Teflon (92-825407A12).



- a - Seal
b - Oil Seal Driver (91-13949)

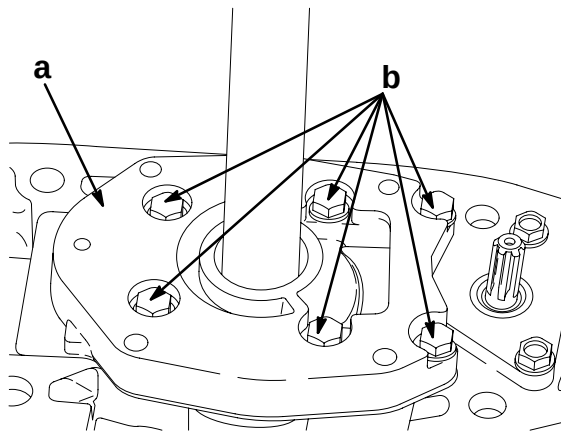
11. Install gasket.



- a - Gasket



12. Install components as shown.

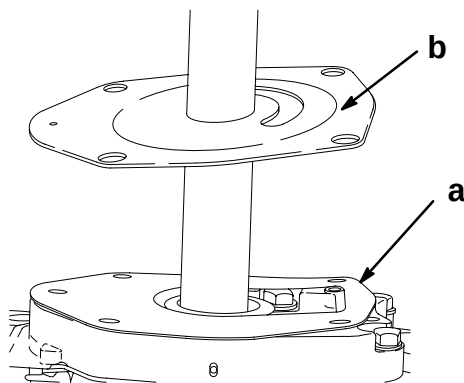


19217

a - Water Pump Base

b - Bolts and Washers; Apply Loctite 271 on Threads and Torque to 60 lb. in. (6.8 N·m).

13. Install gasket and plate.



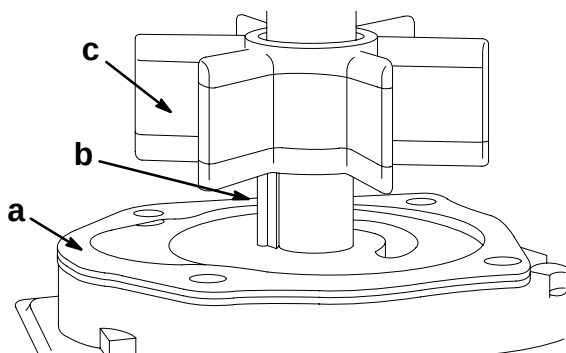
19219

a - Gasket

b - Plate

IMPORTANT: If the old impeller will be re-used, impeller must be installed in original (clockwise) direction of rotation.

14. Install gasket, drive key and impeller.



19220

a - Gasket

b - Drive Key

c - Impeller

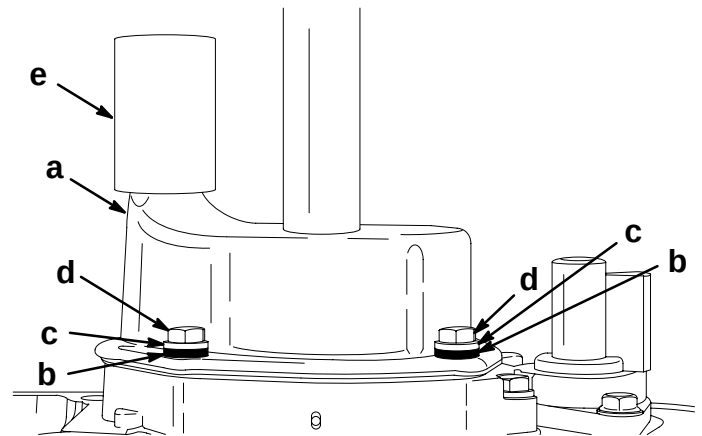
15. Lubricate I.D. of cover with Quicksilver 2-4-C w/ Teflon (92-825407A12).

16. Rotate drive shaft clockwise and push cover down over impeller.

17. Install cover.

18. 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.

19. Lubricate I.D. of water tube seal with Quicksilver 2-4-C w/Teflon (92-825407A12) and install as shown.



19212

a - Cover

b - Isolators (4) – If Equipped

c - Washers (4)

d - Bolts (4); Apply Loctite 271 on Threads and Torque to 60 lb. in. (6.8 N·m).

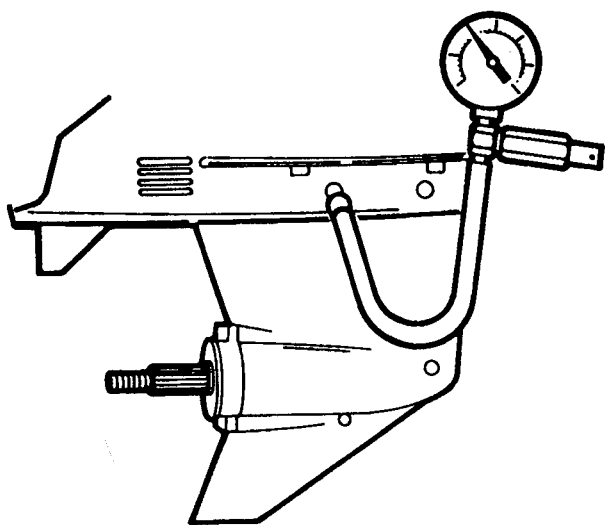
e - Water Tube Seal

NOTE: It is recommended that the gearcase be pressure tested for leaks after reassembly and BEFORE gear lube is added. Gearcase should hold 10 to 12 psi for 5 minutes.

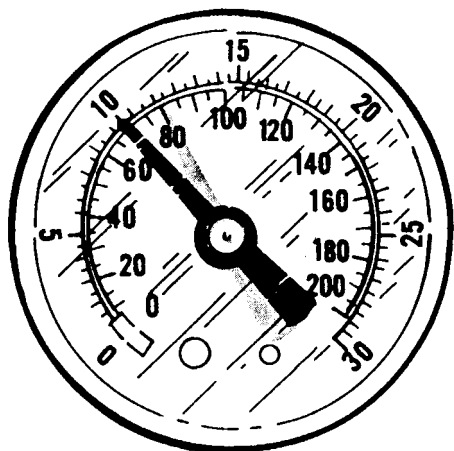


Gear Housing Pressure Test

1. Remove vent plug and install pressure test gauge



2. Pressurized housing to 10 to 12 psi and observe gauge for 5 minutes.
3. Rotate drive shaft, prop shaft and move shift shaft while housing is pressurized to check for leaks.



4. If pressure drop is noted, immerse housing in water.
5. Re-pressurize to 10 to 12 psi and check for air bubbles.
6. Replace leaking seals as necessary. Retest housing.

Note: Gearcase should hold 10 to 12 psi for 5 minutes.

7. Remove tester from housing and install vent plug.

Filling Gear Housing With Lubricant

NOTE: Gear housing lubricant capacity is 22.5 fl. oz. (665.2ml).

⚠ 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.

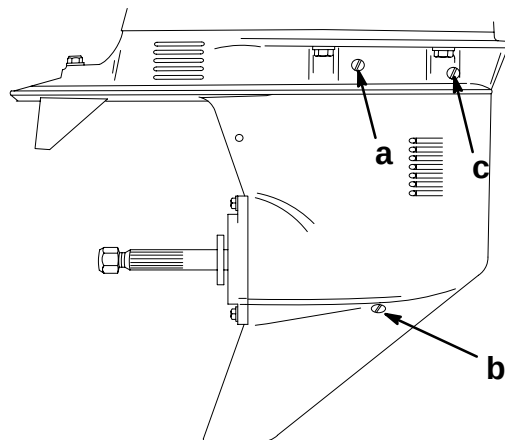
⚠ CAUTION

Do not use automotive grease in the gear housing. Use only Quicksilver Gear Lube or Quicksilver Super-Duty Lower Unit Lubricant.

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" screws or gear housing cannot be filled because of trapped air. Fill gear housing only when housing is in a vertical position.

3. Remove lubricant "Fill" screw and gasket from gear housing.
4. Insert lubricant tube into "Fill" hole, then remove "Vent" screws and gaskets.
5. Fill gear housing with lubricant until excess starts to flow out of one (first) "Vent" screw hole.
6. Replace this lubricant "Vent" screw and gasket only and continue filling until excess starts to flow out of second lubricant "Vent" screw hole.



51552

- a - Vent Screw
- b - Fill/Drain Screw
- c - Oil Level Vent Screw



7. Replace second lubricant "Vent" screw and gasket.

IMPORTANT: Do not lose more than one fluid ounce (30cc) of gear lubricant while reinstalling "FILL" screw.

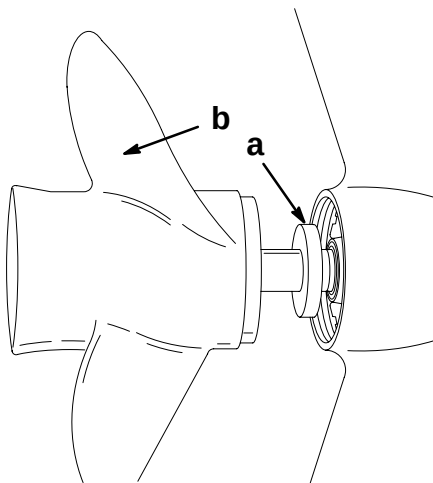
8. Remove lubricant tube from "Fill" hole; install "Fill" screw and gasket.

Propeller Installation

⚠ WARNING

If gear housing is not removed from drive shaft housing, before attempting to remove or install the propeller, remove (and isolate) spark plug leads from spark plugs to prevent engine from starting accidentally.

1. Apply a liberal coat of one of the following Quick-silver products on propeller shaft splines:
 - Special Lubricant 101 (P/N 92-13872A1)
 - 2-4-C w/Teflon (92-825407A12)
 - Anti-Corrosion Grease (92-19007A24)
2. Install components as shown.



51801

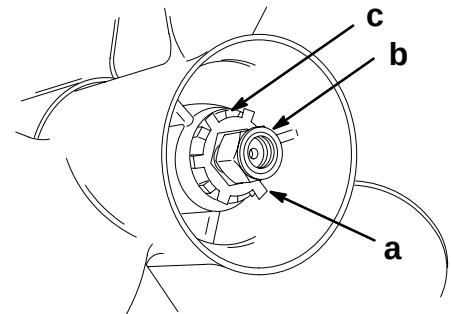
- a - Thrust Hub; Flat Surface Toward Propeller
b - Propeller

3. Install tab washer and locknut.
4. Thread locknut onto propeller shaft until locknut is recessed into tab washer.
5. Torque locknut to 55 lbs. ft. (75 N·m).
6. Bend 3 tabs of tab washer down into grooves to secure locknut. If tab washer tabs do not align with slots, continue to tighten locknut to obtain alignment.

⚠ 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.

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



51871

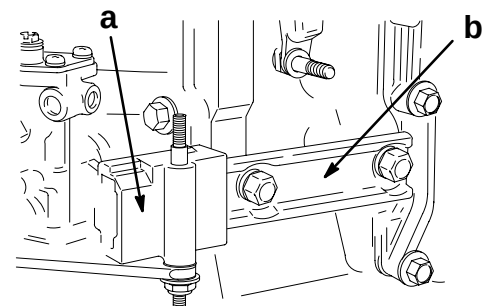
- a - Tab Washer
b - Locknut
c - Grooves

Installation

⚠ WARNING

Disconnect (and isolate) spark plug leads from spark plugs before installing gear housing onto drive shaft housing. Failure to follow this warning could result in accidental engine starting and possible injury.

1. Position shift block in forward gear position, as shown.



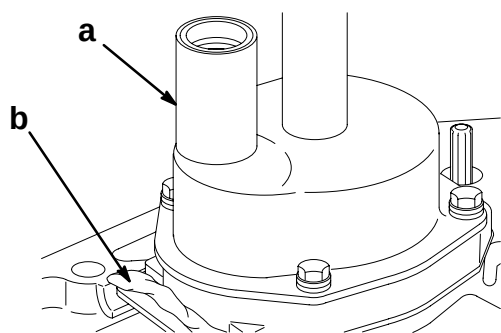
19879

- a - Shift Block; Front of Block MUST Extend 1/8" (3.2mm) Past Front of Rail.
b - Rail

2. Tilt engine to full up position and engage tilt lock lever.
3. Shift gear housing into neutral position. Propeller shaft will rotate freely in either direction.



4. Install water tube seal; lube I.D. of seal with Quicksilver 2-4-C w/Teflon (92-825407A12).
5. Apply a bead of RTV Sealer as shown.



19215

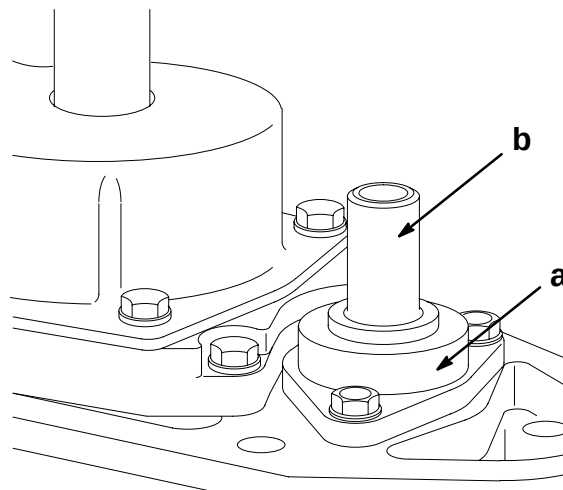
- a - Water Tube Seal
b - RTV Sealer

⚠ CAUTION

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

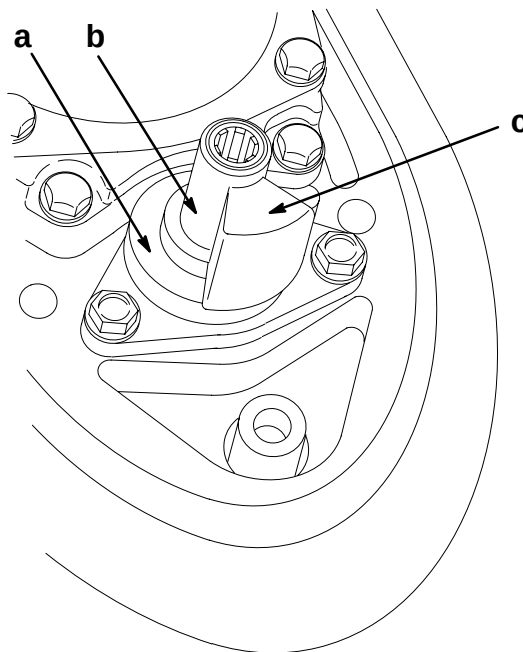
6. Apply a light coat of Quicksilver 2-4-C w/Teflon onto drive shaft splines.
7. Apply a light coat of Quicksilver 2-4-C w/Teflon on gear case shift shaft splines and upper shift shaft splines. Do not use lubricant on ends of shift shafts.

8. Install components as shown in appropriate photo.



19883

- a - Nylon Spacer
b - Shift Shaft Coupler; Used on Models Equipped with Power Trim



19221

- a - Nylon Spacer
b - Shift Shaft Coupler; Used on Models NOT Equipped with Power Trim
c - Flat; MUST BE Positioned Toward Front of Gear Housing.

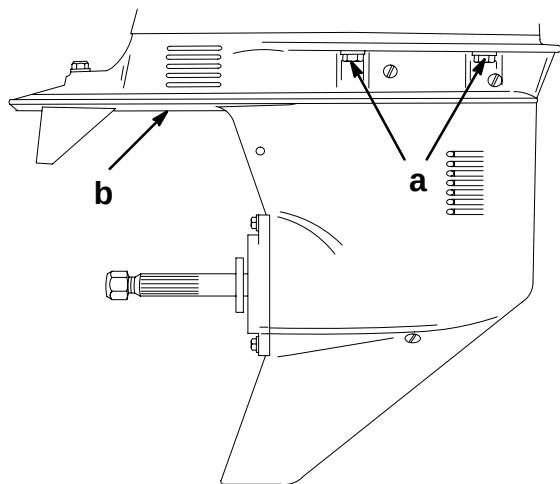
9. Shift gear housing into forward gear position. In forward gear the gear housing will ratchet when propeller shaft is turned clockwise and resistance will be felt when propeller shaft is rotated counter-clockwise.
10. Apply Loctite Grade 271 on threads of gear housing retaining bolts.



NOTE: If, while performing Step 11, the drive shaft splines will not align with the crankshaft splines, place a propeller onto propeller shaft and turn it counterclockwise as the gear housing is being pushed toward drive shaft housing.

NOTE: During installation of gear housing, it may be necessary to move the shift block (located under cowl) slightly to align upper shift shaft splines with shift shaft coupler splines.

11. Position gear housing so that the driveshaft is protruding into drive shaft housing.
12. Move gear housing up toward drive shaft housing, while aligning upper shift shaft splines with shift shaft coupler splines, water tube with water tube seal, and crank shaft splines with drive shaft splines.
13. Install 4 bolts and washers (two each side).
14. Install locknut and washer.
15. Torque bolts and locknut (or nuts only if applicable) to 40 lbs. ft. (54 N·m).



51552

a - Bolts and Washers (4)

b - Locknut and Washer

16. Check shift operation as follows:

- a. Place shift lever in forward gear. Gear housing should ratchet when propeller shaft is turned clockwise and resistance should be felt when propeller shaft is turned counterclockwise.
- b. Place shift lever in neutral. Propeller shaft should rotate freely in either direction.
- c. While rotating propeller shaft, place shift lever in reverse gear. Resistance should be felt when propeller shaft is rotated in either direction.

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