



Gear Housing Removal

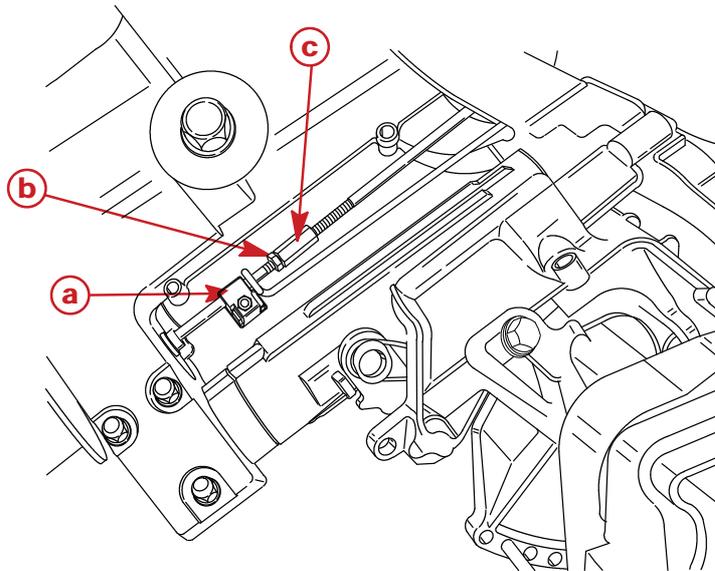
⚠ WARNING

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

1. Tilt outboard to full "UP" position.

9.9/15 Bigfoot (4 Stroke)

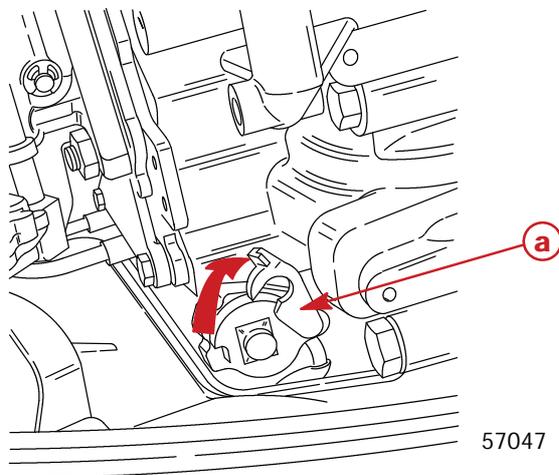
2. Remove reverse hook guide assembly from lower shift shaft.
3. Loosen jam nut and disconnect coupler. Remove jam nut to allow removal of gearcase.



- a-Reverse Hook Guide
- b-Jam Nut
- c-Coupler

20/25 (2 Stroke)

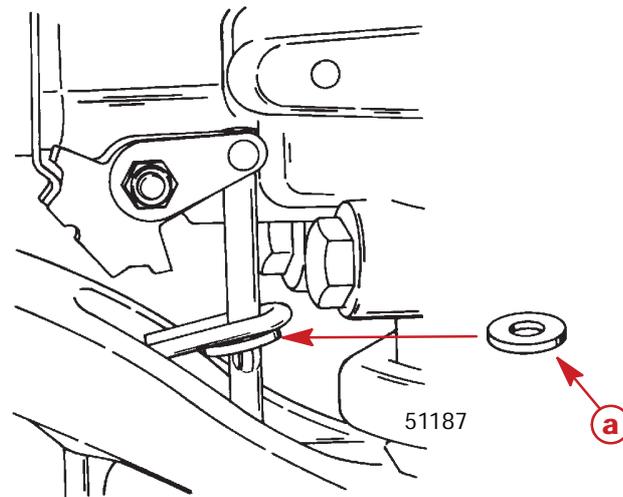
4. Unlatch and remove retainer to free shift shaft for removal of gearcase.



- a-Retainer

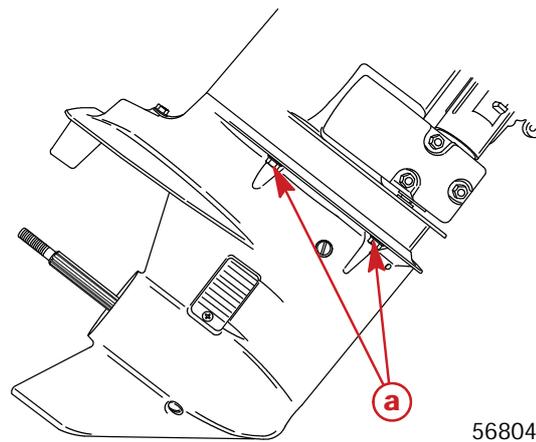


NOTE: A flat washer is located on the shift shaft near the top of the shaft. This washer may slide off shift shaft when gear case is removed. Do not lose washer as washer is necessary for reassembly.



a-Flat Washer

5. Remove four screws and remove gear housing.



a-Screws (4)

NOTE: If water tube should pull out of driveshaft housing, remove tube from water pump and insert tube back into driveshaft housing to aid in reassembly.

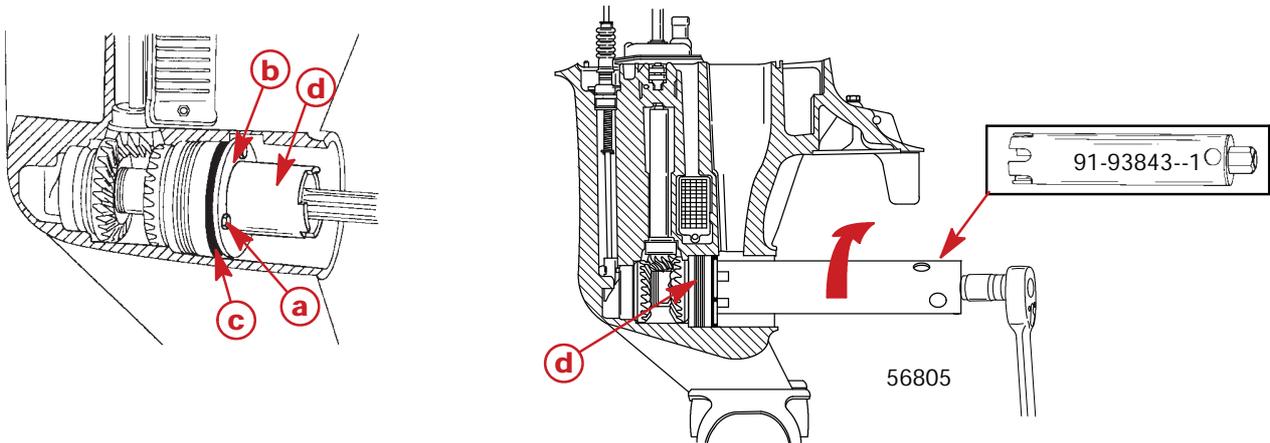


Disassembly

IMPORTANT: It is recommended that, during complete disassembly of gear housing, all O-rings and oil seals be replaced, regardless of their appearance.

Bearing Carrier

1. Remove 3 screws which secure the O-ring retainer plate and O-ring to the bearing carrier. Remove the O-ring retainer plate and O-ring from gear housing.
2. Remove bearing carrier using Special Tool 91-93843--1 (LEFT HAND THREAD).

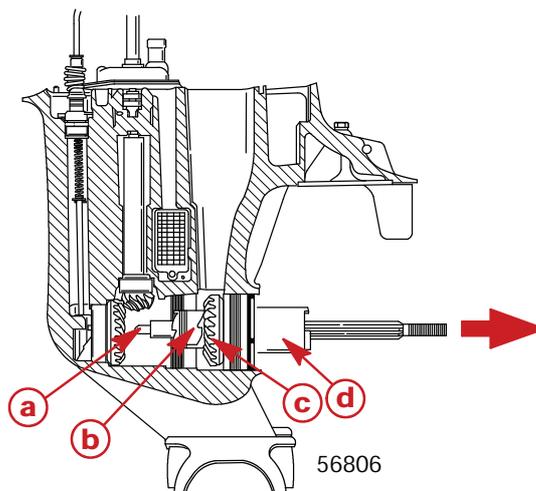


- a-Screws (3)
- b-O-Ring Retainer Plate
- c-O-Ring
- d-Bearing Carrier

3. While holding onto propeller shaft and bearing carrier, pull propeller shaft from propeller shaft cavity, as shown.

NOTE: Cam follower is free to slide out of propeller shaft.

4. Remove reverse gear and bearing carrier from propeller shaft.
5. Separate reverse gear from bearing carrier.

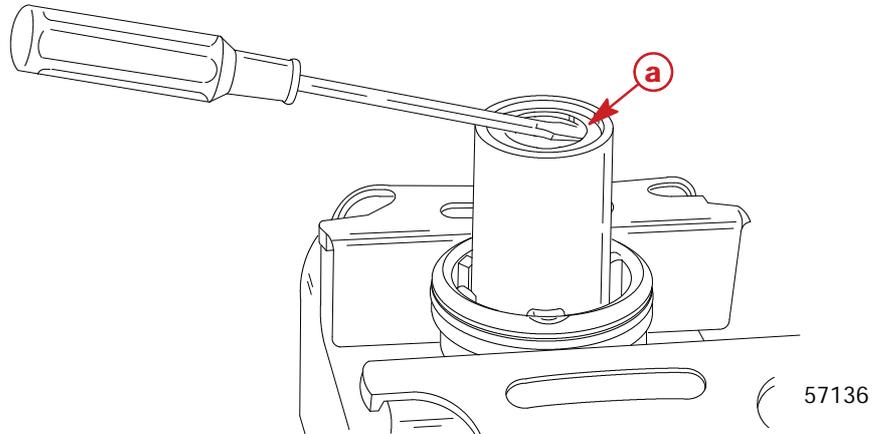


- a-Cam Follower
- b-Propeller Shaft Assembly
- c-Reverse Gear
- d-Bearing Carrier



NOTE: When using a screwdriver to remove carrier seals, be careful not to scar carrier seal surface. If carrier seal surface is damaged, replace carrier.

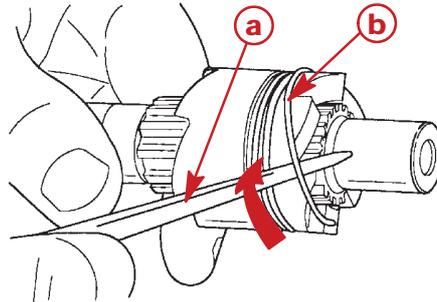
6. Secure bearing carrier in a vise. Using a screwdriver, pry out both seals from bearing carrier.



a-Oil Seals

Propeller Shaft

1. Insert a thin blade screwdriver or awl under first coil (from front) of cross-pin retainer spring.
2. Rotate propeller shaft to unwind spring from sliding clutch.



a-Awl

b-Cross Pin Retaining Ring

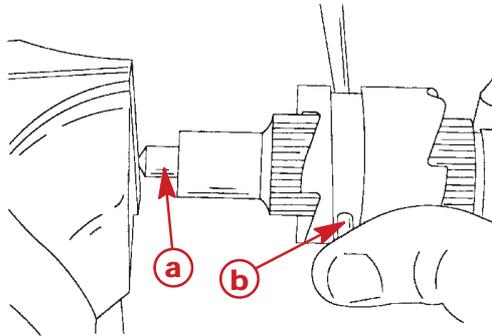
3. Insert flat end of cam follower into front end of propeller shaft.
4. Position cam follower against a solid surface.



⚠ WARNING

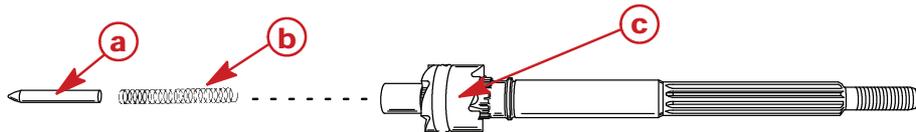
Use caution when removing cam follower. As the cross-pin is removed the cam follower can shoot out of the propeller shaft as a high speed projectile.

5. Push against cam follower. Use a punch or awl to push cross-pin out of sliding clutch.
6. Release pressure against cam follower.



a-Cam Follower
b-Cross Pin

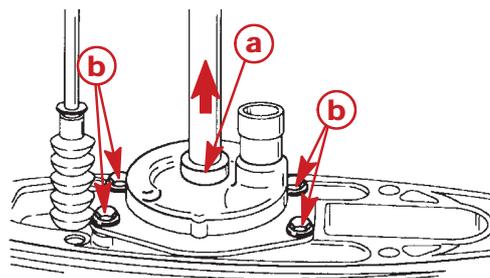
7. Remove cam follower, spring and sliding clutch from propeller shaft.



a-Cam Follower
b-Spring
c-Clutch

Water Pump

1. Slide centrifugal slinger off drive shaft.
2. Remove four (4) screws securing water pump to gear housing as shown in illustration.



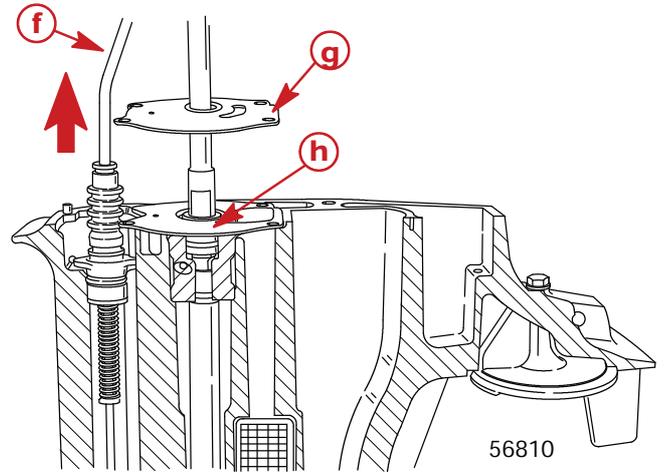
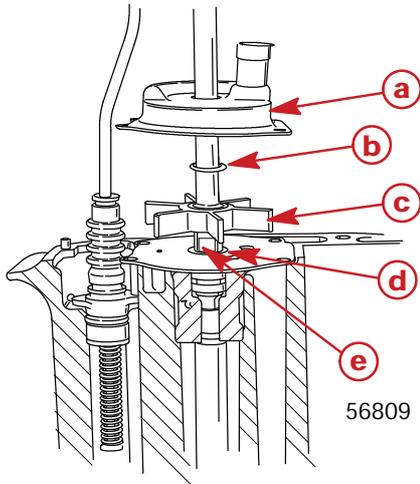
a-Centrifugal Slinger
b-Water Pump Mounting Screws

3. Remove cover, nylon washers (above and below impeller), impeller and drive key from drive shaft.
4. It is recommended that impeller be replaced whenever gear case is being serviced.

NOTE: If impeller is not going to be replaced, **DO NOT** install impeller in reverse rotation to its original state as vanes have taken a set. Vanes will crack and break shortly after out-board is returned to service.



5. Remove face plate and base gasket.
6. Remove shift shaft from housing.



- a**-Cover
- b**-Nylon Washer
- c**-Impeller
- d**-Nylon Washer
- e**-Key
- f**-Shift Shaft
- g**-Face Plate
- h**-Base Gasket

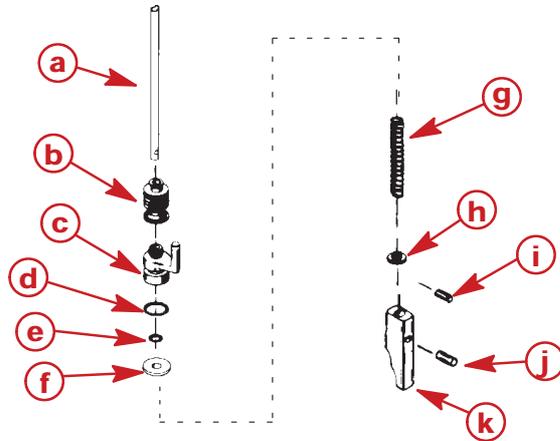
NOTE: Replace impeller if:

- Impeller blades are cracked, torn or worn.
- Impeller is glazed or melted.
- Rubber portion of impeller is not bonded to impeller hub.



Shift Shaft

1. Pull shift shaft assembly from gear housing.
2. Remove and replace outer O-ring from shift shaft retainer.



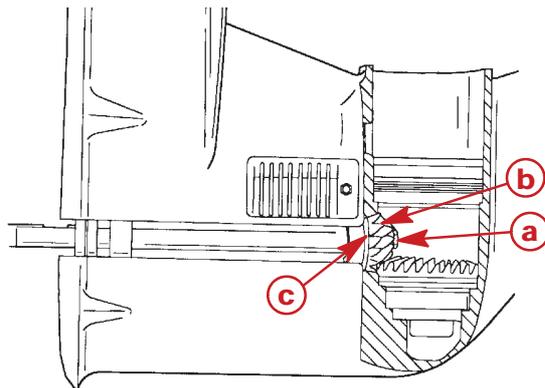
- a**-Shift Shaft
- b**-Boot
- c**-Retainer
- d**-O-ring (outer)
- e**-O-ring (inner)
- f**-Washer

- g**-Spring
- h**-Washer
- i**-Roll Pin
- j**-Driver Pin
- k**-Shift Cam

Drive Shaft and Pinion Gear

1. Clamp driveshaft in a soft jaw vise and remove pinion nut or bolt that secures pinion to driveshaft. Pull driveshaft out of gear housing. Remove pinion and tapered roller bearing.

NOTE: 9.9/15 Bigfoot (4 Stroke) uses nut to secure pinion gear. 20/25 (2 Stroke) uses bolt to secure pinion gear.

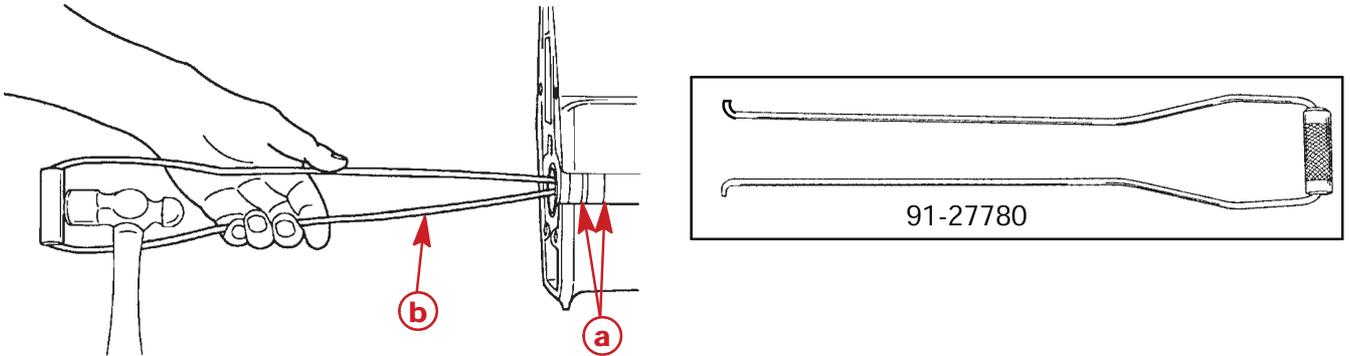


- a**-Pinion Nut/Bolt
- b**-Pinion
- c**-Tapered Roller Bearing



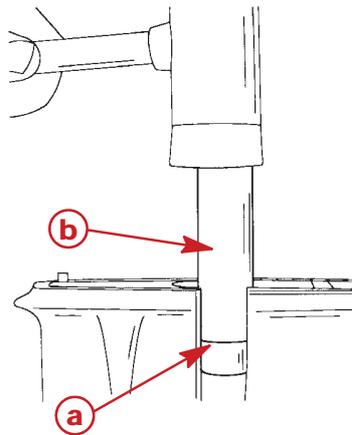
Upper Drive Shaft and Bearing/Seals

1. Using Water Pump Cartridge Puller (91-27780), as shown, remove the driveshaft oil seals from gear housing.



- a**-Oil Seals
- b**-Water Pump Cartridge Puller

2. Using suitable mandrel drive upper drive shaft bearing through gearcase sleeve to the bottom of gearcase.
3. Do not remove gearcase sleeve (not shown).

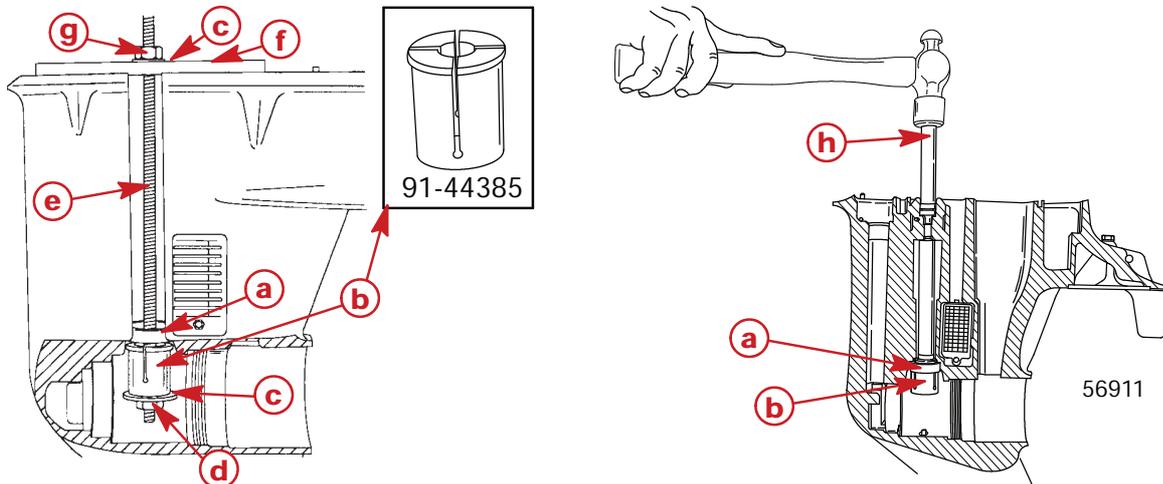


- a**-Upper Driveshaft Bearing
- b**-Mandrel



Lower Drive Shaft Bearing/Cup

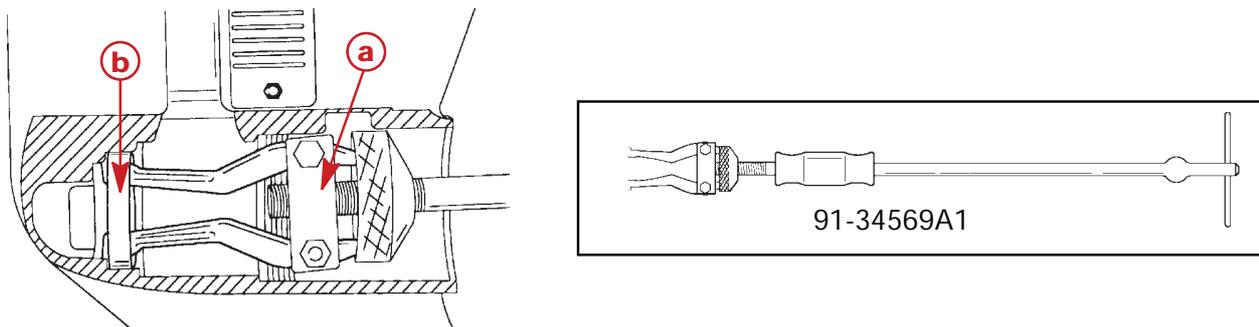
1. Fasten bearing cup puller on a threaded rod as shown.
2. Tighten hex nut and draw the bearing cup puller up into bearing cup until lip on tool snaps over the top side of bearing cage. Remove threaded rod assembly.
3. Insert tapered end of rod (91-44385) into bearing cup puller and tap bearing cup out of driveshaft bore.



- a**-Bearing Cup
- b**-Bearing Cup Puller (91-44385)
- c**-Flat Washers 2 (12-34961)
- d**-Hex Nut 0.625x18 (11-24156)
- e**-Threaded Rod 0.625x18-16 Long (91-31229)
- f**-Plate (91-29310)
- g**-Hex Nut 0.625x18 (11-24156)
- h**-Tapered Rod (91-44385)

Forward Gear Race

1. Use slide hammer to remove forward gear tapered bearing race as shown.



- a**-Slide Hammer
- b**-Tapered Bearing Race



Cleaning and Inspection

Gear Housing/Bearing Carrier Castings

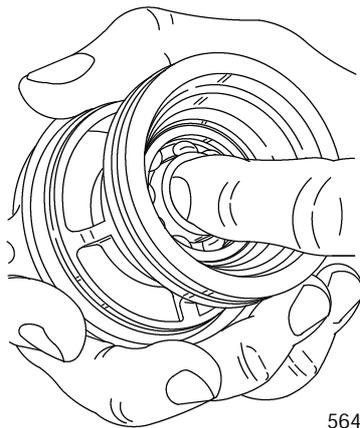
1. Thoroughly clean gear housing/bearing carrier castings. Be sure all old gasket material is removed from mating surfaces and that carbon deposits have been removed from exhaust passages.
2. Inspect castings for cracks or fractures.
3. Check sealing surfaces for nicks, deep grooves and distortion which could cause leaks.
4. Check water passages for obstructions.

Ball Bearings

CAUTION

DO NOT spin-dry ball bearings with compressed air.

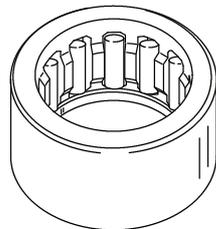
1. Clean bearing in solvent and dry with compressed air.
2. Bearing should be free of rust stains.
3. Attempt to work inner bearing race in-and-out. There should not be excessive play.
4. Lubricate ball bearing with Quicksilver Gear Lube. Rotate inner bearing race. Bearing should have smooth action. If ball bearing sounds or feels rough or has catches, remove and discard bearing. Refer to "Bearing Carrier" following.



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Needle Bearing

1. Clean needle bearings in solvent and dry with compressed air.
2. Replace bearing if needles are rusted, fractured, worn, galled badly, discolored, or if area of shaft that bearing contacts is worn or pitted. Refer to "Drive Shaft" following.

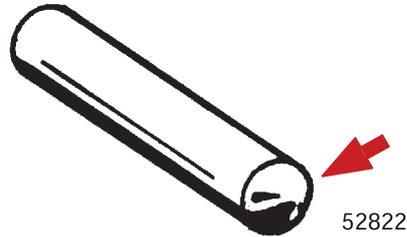


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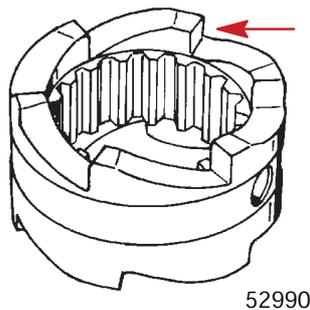
Cam Follower

1. Inspect cam follower for wear or galling. If wear is present, inspect corresponding shift cam for wear. Replace if worn.



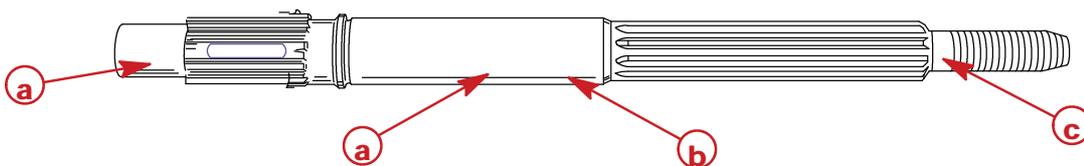
Clutch

1. Replace clutch if jaws are rounded or chipped. Rounded jaws may be caused by the following:
 - Improper shift cable adjustment or linkage.
 - Engine idle speed too high while shifting.
 - Shifting too slowly from NEUTRAL into FORWARD or REVERSE.



Propeller shaft

1. Check propeller shaft for straightness.
2. Inspect bushing/bearing surfaces of propeller shaft for pitting or wear. Replace shaft and corresponding bushing/bearing if wear or pitting is observed.
3. Replace propeller shaft if any of the following exist:
 - Splines are twisted or worn.
 - Oil seal surface is grooved.
 - Shaft has a noticeable "wobble" or is bent more than 0.006 in. (0.15 mm).



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a-Bushing/Bearing Surfaces

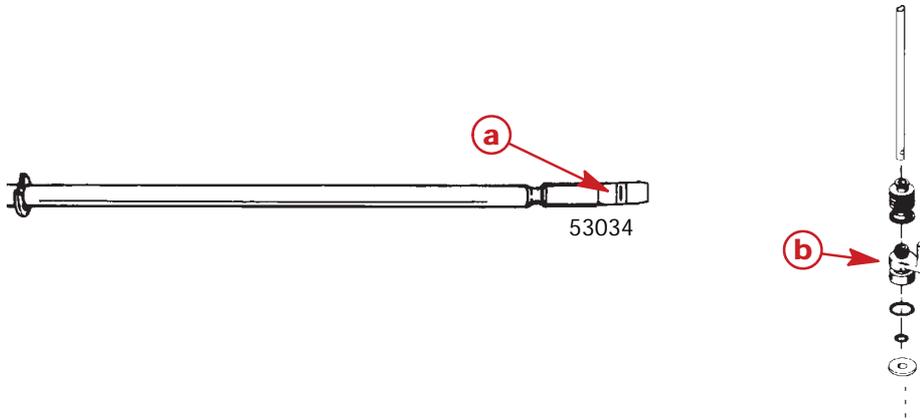
b-Oil Seal Surface

c-Measure Here for "Wobble" (When measuring shaft for wobble, use v-blocks and support at bushing surface)



Shift Shaft

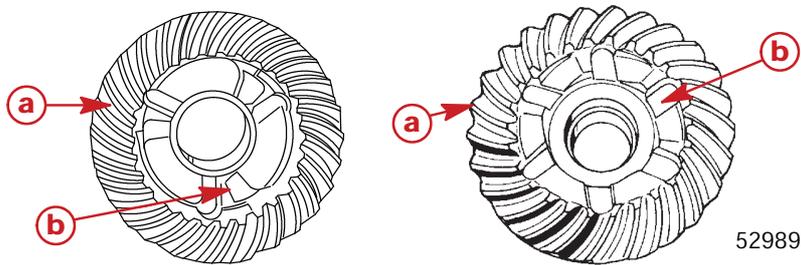
1. Inspect shift shaft retainer for cracks and replace if necessary.
2. Inspect shift cam face for wear. Replace if worn.



- a**-Shift Cam
- b**-Shift Shaft Retainer

Reverse And Forward Gear

1. Inspect gear teeth for pitting, uneven wear, scoring, etc. Replace gear if any damage is found.
2. Inspect gear clutch jaws. Replace gear if jaws are rounded or chipped.



- a**-Gear Teeth
- b**-Clutch Teeth

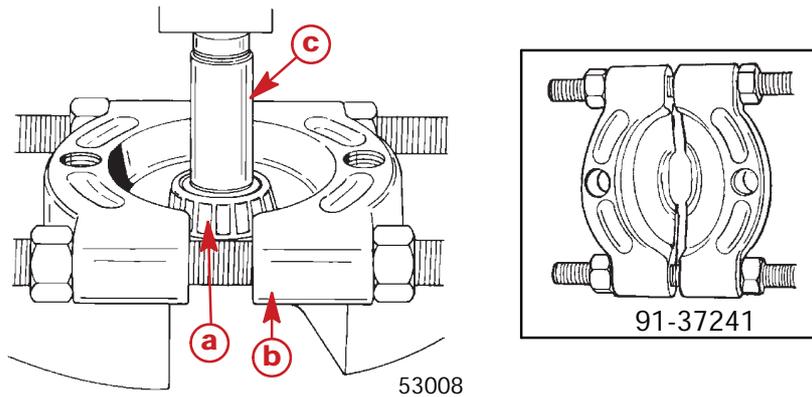


3. Inspect FORWARD gear tapered bearing and race for rust, roughness, pitting, spalling or excessive wear (looseness).

NOTE: DO NOT remove tapered bearing from FORWARD gear unless replacement is necessary as removal process will damage bearing.

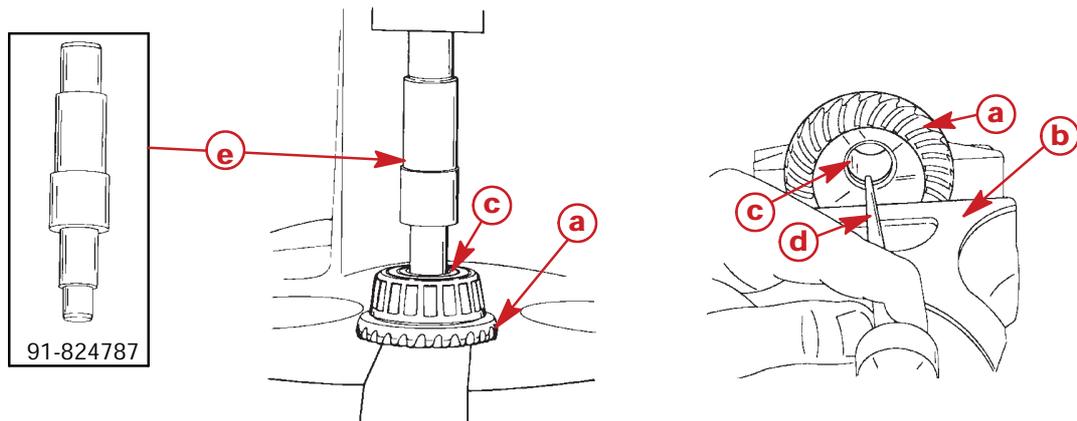
4. If bearing must be replaced, remove bearing from gear using Universal Puller Plate (91-37241) and a suitable mandrel (5/8 in. socket).

IMPORTANT: If FORWARD gear tapered bearing or race requires replacement, replace bearing and race as a set.



- a-Bearing
- b-Universal Puller Plate (91-37241)
- c-Mandrel (5/8 in. Socket)

5. If inspection determines that replacement of forward gear bushing is required, remove bushing from forward gear using one of two ways.
6. **Using a Punch:** Secure forward gear in a vise. Be sure to use a soft jaw vise and do not clamp onto tapered bearing. Use a punch and hammer, remove bushing from the clutch jaw (teeth) side of gear.
7. **Using a Press:** Press bushing from gear using Bushing Removal Tool 91-824787.

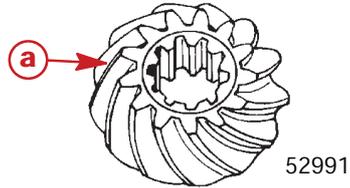


- a-Forward Gear
- b-Vise Protector
- c-Bushing
- d-Punch
- e-Bushing Removal Tool (91-824787)



Pinion Gear

1. Inspect pinion gear teeth for breakage, rust, chipping or excessive wear.
2. If pinion gear teeth are damaged, inspect FORWARD and REVERSE gear for damage.
3. Replace gears as required.

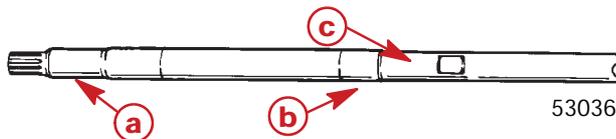


a-Pinion Gear

Driveshaft

IMPORTANT: If upper drive shaft bushing or lower drive shaft needle bearing race appear to be spinning in their respective bores, the gear housing should be replaced.

1. Replace drive shaft if the following exist:
 - Splines are twisted or worn.
 - Oil seal surface is grooved.
 - Bearing/Bushing journal surfaces are pitted or worn. Replace corresponding bearing as well.

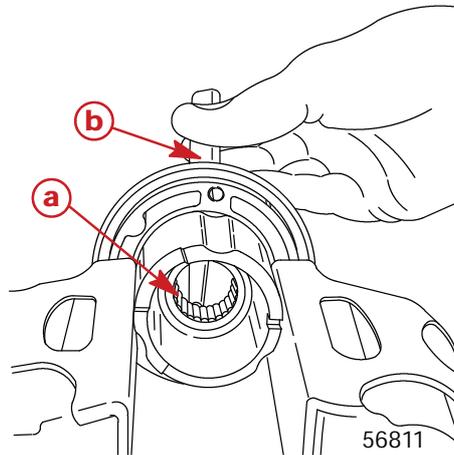


a-Bearing/Bushing Surface
b-Bearing/Bushing Surface
c-Seal Surface



Bearing Carrier

1. If inspection of bearing area on propeller shaft determines that replacement of bearing inside of bearing carrier is required, remove bearing from bearing carrier.
2. Secure bearing carrier in a vise, DO NOT clamp onto threaded portion of bearing carrier.
3. Remove bearing from bearing carrier with a punch or suitable mandrel/socket and hammer.

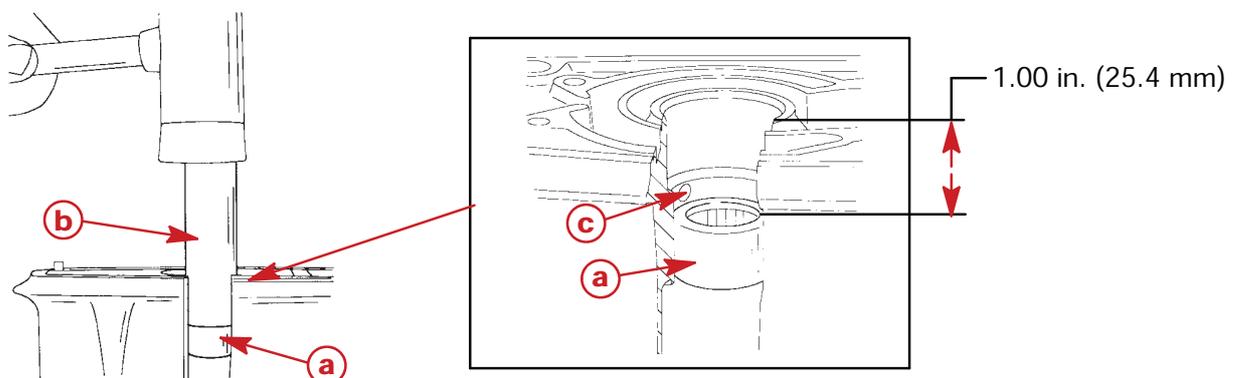


- a**-Bearing
b-Punch

Reassembly

Drive Shaft Bearing and Seals

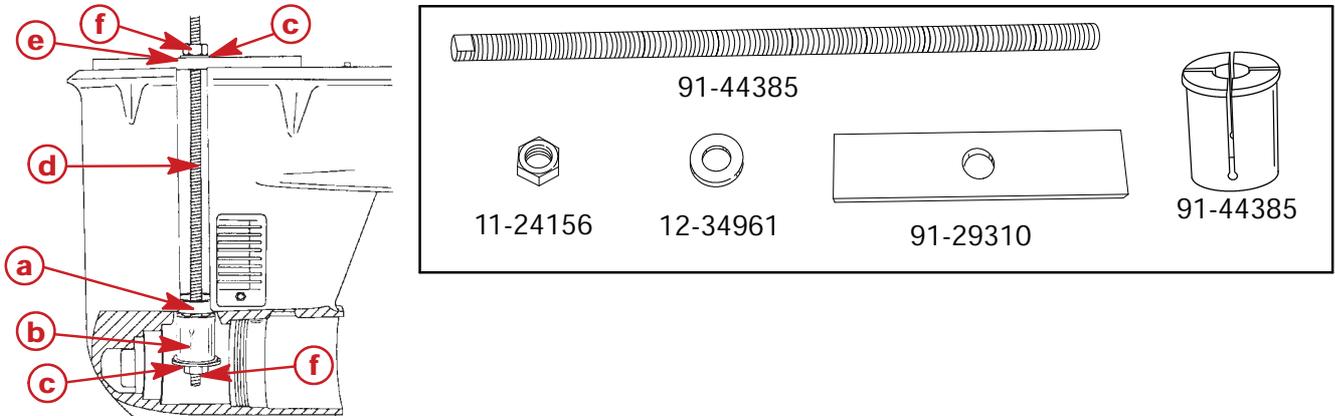
1. Install upper driveshaft bearing into driveshaft bore of gear housing sleeve. Apply a light coat of 2-4-C w/Teflon to upper driveshaft bearing retainer bore as follows:
 - Place upper driveshaft bearing over bearing retainer bearing bore with lettered side of bearing face up.
 - Using a suitable mandrel, press bearing into gear housing sleeve until the bearing is just below the oil hole to a depth of 1.00 in. (25.4 mm) as shown.



- a**-Upper Driveshaft Bearing
b-Mandrel
c-Oil Hole

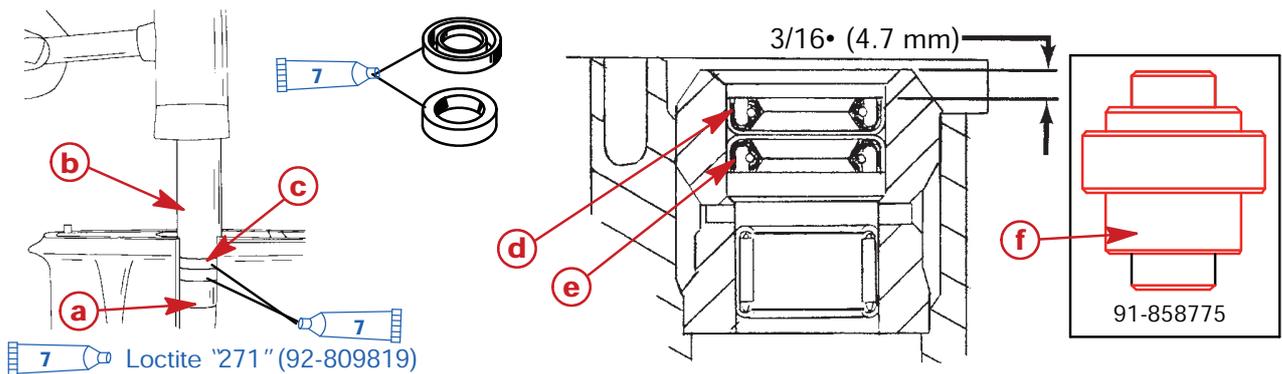


- Install lower driveshaft bearing cup into driveshaft bore of gear housing as follows:
 - Assemble bearing cup as shown.
 - Draw bearing cup up to shoulder of gearcase housing using cup puller (91-44385) as shown



- a**-Bearing Cup
- b**-Bearing Cup Puller (91-44385)
- c**-Flat Washers 2 (12-34961)
- d**-Threaded Rod 0.625x18-16 in. long (91-31229)
- e**-Plate (91-29310)
- f**-Hex Nut 0.625x18 (2) (11-24156)

- Install new driveshaft oil seals into driveshaft bore of gear housing as follows:
 - Apply Loctite "271" to outer diameter of driveshaft oil seals.
 - With lip of seal facing down, press the first oil seal into driveshaft bore until seal is just below the top of driveshaft bore.
 - With lip of seal facing up, and using Installation tool 91-858775, press the second oil seal into driveshaft bore until seal is 3/16" (4.7 mm) below top of driveshaft bore.
 - Wipe off excess Loctite.

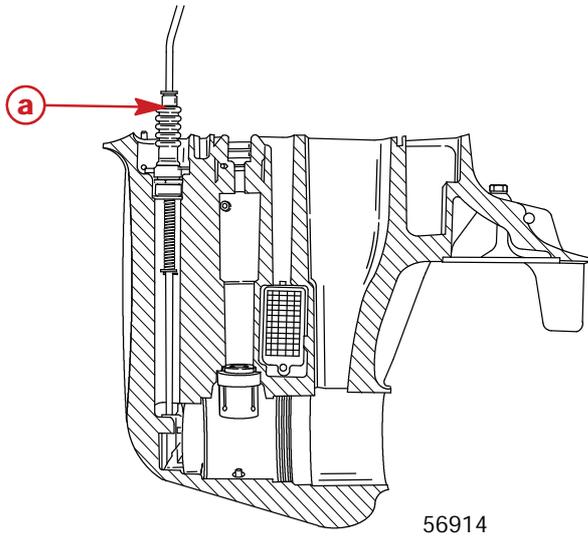


- a**-Upper Driveshaft Bearing
- b**-Mandrel
- c**-Seals (2)
- d**-Oil Seal with Lip of Seal Facing Up
- e**-Oil Seal with Lip of Seal Facing Down
- f**-Installation Tool (91-858775)

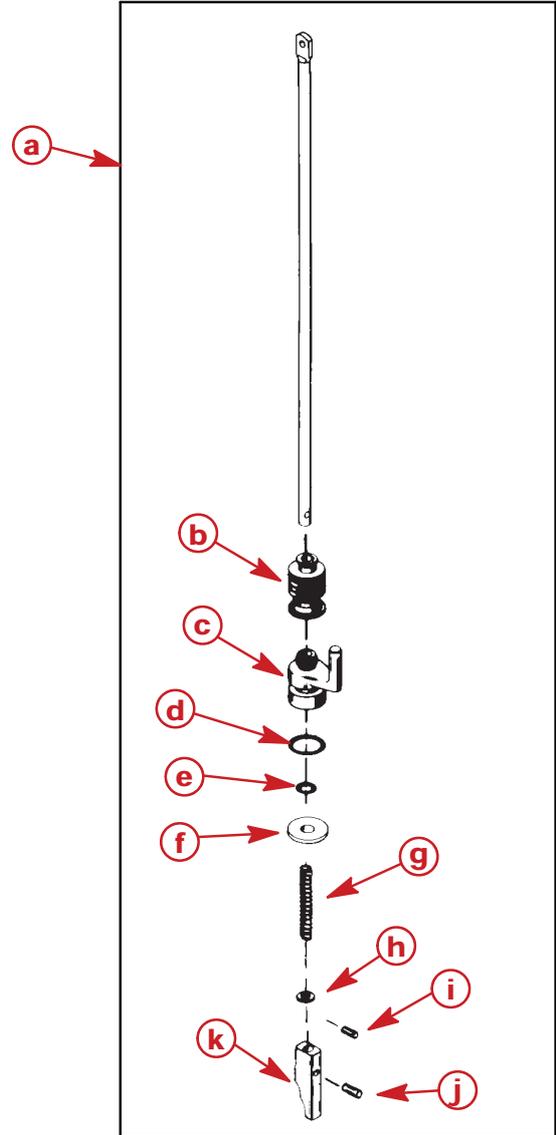


Shift Shaft

1. Install shift shaft assembly into gear housing assembly.



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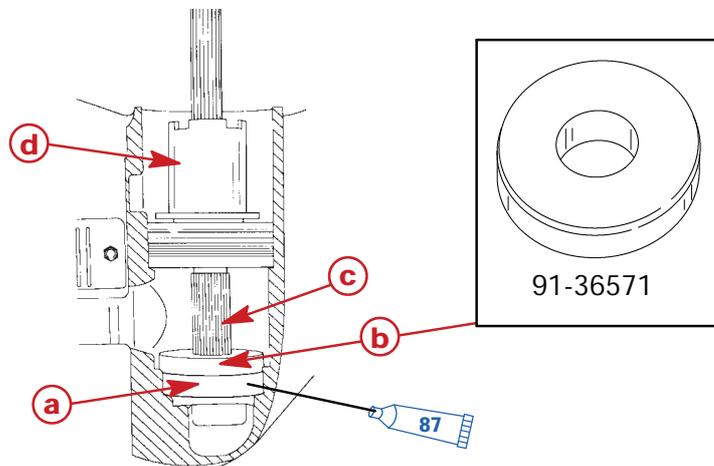


- a**-Shift Shaft Assembly
- b**-Boot
- c**-Retainer
- d**-O-ring (outer)
- e**-O-ring (inner)
- f**-Washer
- g**-Spring
- h**-Washer
- i**-Roll Pin
- j**-Driver Pin
- k**-Shift Cam



Forward Gear Installation

1. Install forward gear bearing race into gear housing.
2. Apply a light coat of Super Duty Gear Lubricant to forward gear bearing race bore in propeller shaft cavity.
3. Position tapered bearing race squarely over bearing bore in front portion of propeller shaft cavity.
4. Place mandrel (91-36571) from Bearing Installation Kit (91-31229A7) over tapered bearing race.
5. Place propeller shaft into hole in center of mandrel.
6. Install bearing carrier assembly over propeller shaft and thread it in 4 or 5 turns.
7. Thread a suitable nut onto propeller shaft to protect propeller shaft threads. (DO NOT use propeller nut.)
8. Use a mallet to drive propeller shaft against mandrel until tapered bearing race is firmly seated in bearing race bore.

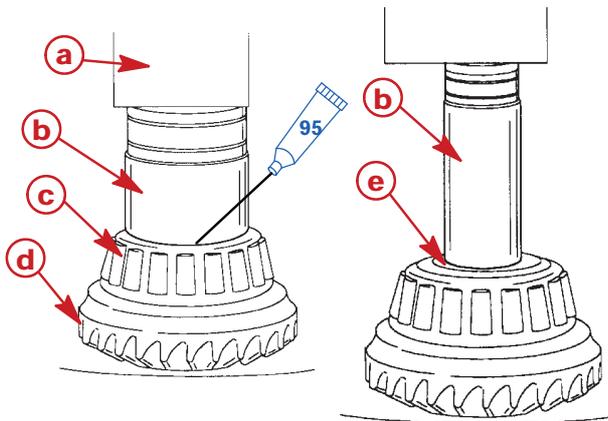


 Super Duty Gear Lubricant (92-850737A1)

- a**-Forward Gear Bearing Race
- b**-Mandrel (91-36571)
- c**-Propeller Shaft
- d**-Bearing Carrier



9. Remove nut from propeller shaft, then remove bearing carrier, propeller shaft and mandrel from propeller shaft cavity.
10. Apply a light coat of oil on tapered bearing race.
11. Place forward gear on a press with gear teeth down.
12. Apply a light coat of oil to I.D. of forward gear tapered bearing.
13. Position forward gear tapered bearing over gear.
14. Press on inner race of bearing until bearing is firmly seated against forward gear.
15. Apply a light coat of Gear Lube to bore in center of forward gear.
16. Using a suitable mandrel, press forward gear bushing into forward gear until bushing is flush with the back of gear.



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

- a**-Press
- b**-Mandrel
- c**-Bearing
- d**-Forward Gear
- e**-Bushing

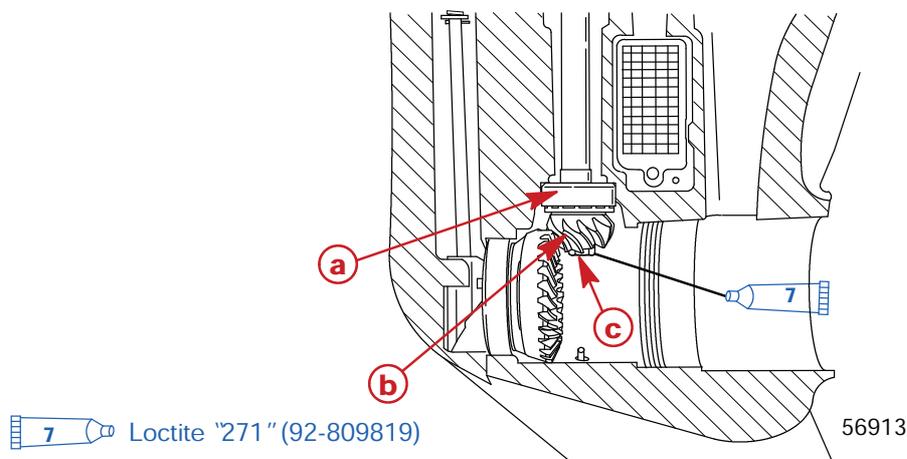
17. Apply a light coat of oil on forward gear tapered bearing, then position forward gear assembly in gear housing.



Pinion and Driveshaft

1. Place lower drive shaft tapered roller bearing into bearing cup.
2. Place pinion gear into gear housing with teeth of pinion meshed with teeth of forward gear.
3. Insert driveshaft into gear housing while holding pinion in place with other hand. Rotate driveshaft back and forth to align splines on driveshaft with splines in pinion gear.
4. Secure pinion gear to driveshaft. Apply Loctite "271" to pinion nut or bolt. Refer to table for "Fastener Type" and "Torque".

Model	Fastener Type	Torque
9.9/15 Bigfoot (4-Stroke)	Pinion Nut	15 lb-ft (20.3 Nm)
20/25 (2-Stroke)	Pinion Bolt	13.3 lb-ft (18.0 Nm)

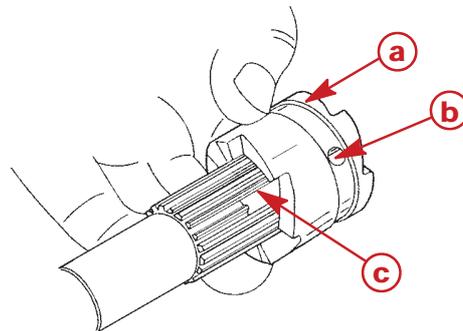


 Loctite "271" (92-809819)

- a**-Tapered Roller Bearing
- b**-Pinion Gear
- c**-Fastener

Propeller Shaft

1. Position sliding clutch over propeller shaft spline with cross-pin holes aligned with slots in propeller shaft.

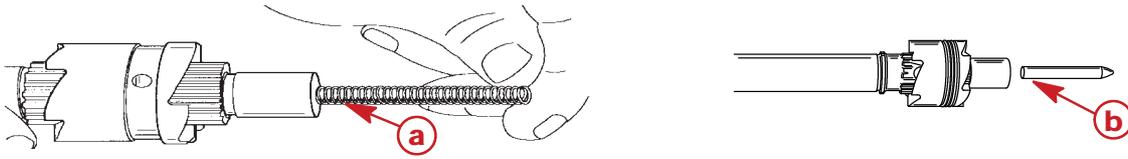


- a**-Short End
- b**-Cross Pin Hole
- c**-Slot

2. Apply a small amount of light oil onto sliding clutch spring and insert spring into propeller shaft.

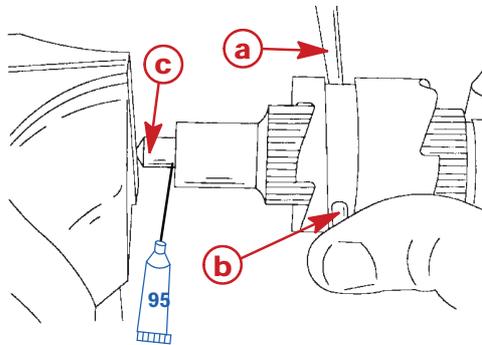


3. Insert flat end of cam follower into propeller shaft.



- a**-Spring
- b**-Flat End of Cam Follower

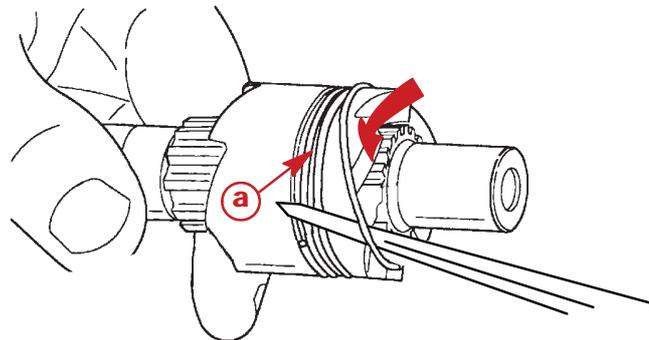
4. Place cam follower against a solid object and push against cam follower to compress spring.
5. Insert a punch thru the cross-pin holes in sliding clutch (between cam follower and spring).
6. Apply a light coat of oil on cross-pin and install cross-pin into sliding clutch by pushing punch out of clutch with cross-pin, as shown. (Release pressure on cam follower and remove follower from propeller shaft.)



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

- a**-Punch
- b**-Cross Pin
- c**-Cam Follower

7. Install cross-pin retainer spring.



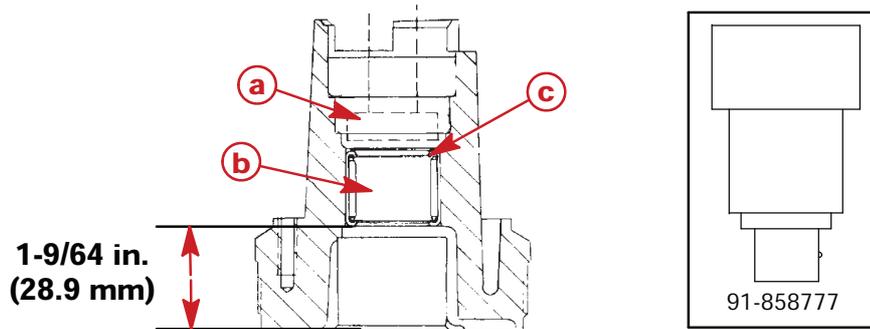
- a**-Cross Pin Retainer Spring

8. Place a dab of 2-4-C w/Teflon into end of propeller shaft and install cam follower (flat end first).



Bearing Carrier

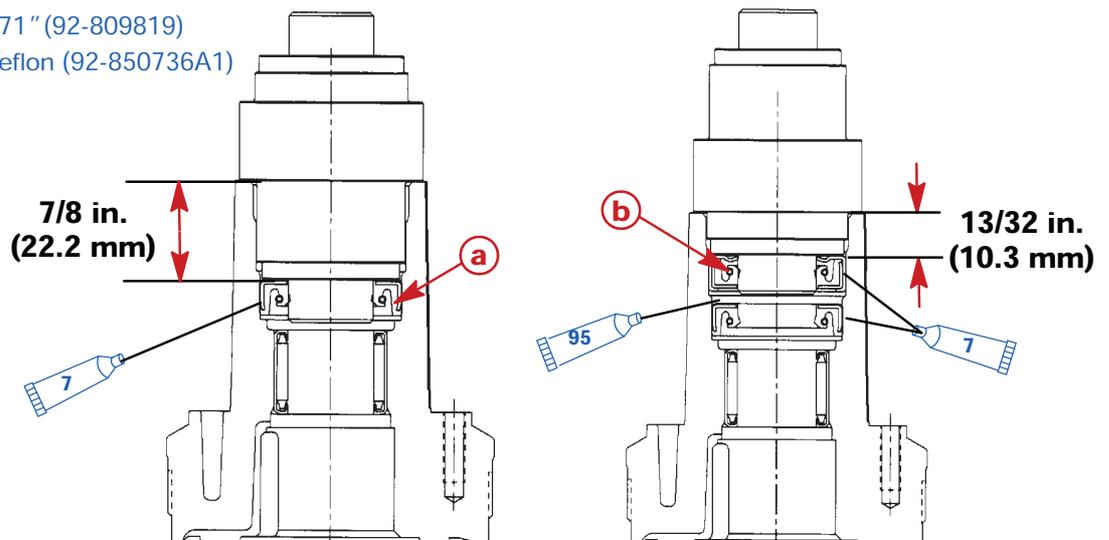
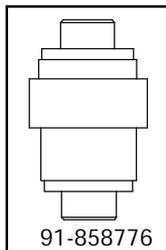
1. Apply a small amount of oil into bearing bore in bearing carrier.
2. Position bearing carrier on a press (with the threaded side down).
3. Place propeller shaft bearing into aft end of bearing carrier with lettered end of bearing up.
4. Use installation tool (91-858777) to press bearing into bearing carrier until the installation tool bottoms out, or using a suitable mandrel press bearing to depth of $1\text{-}9/64$ in. (28.9 mm) from end of bearing carrier housing.



- a**-Suitable Mandrel
- b**-Propeller Shaft Bearing
- c**-Lettered end of Bearing

5. Apply Loctite Type "271" to outer diameter of inner propeller shaft seal. Use installation tool (91-858776) to press inner seal into bearing carrier (lip of seal is facing inward) to a depth of $7/8$ in. (22.2 mm) from end of bearing carrier housing.
6. Apply 2-4-C w/Teflon between seals.
7. Apply Loctite Type "271" to outside diameter of the outer propeller shaft seal. Rotate installation tool and press outer seal into bearing carrier (lip of seal is facing outward) to a depth of $13/32$ in. (10.3 mm) from end of bearing carrier housing.

- 7** Loctite "271" (92-809819)
- 95** 2-4-C w/Teflon (92-850736A1)

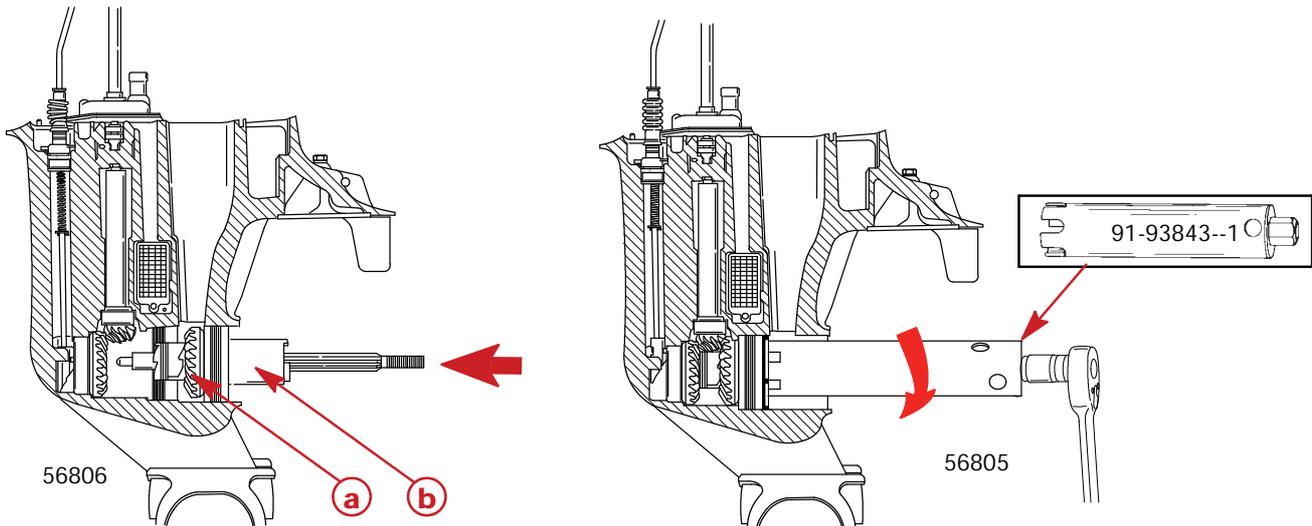


- a**-Inner Propeller Shaft Seal
- b**-Outer Propeller Shaft Seal



Bearing Carrier/Propeller Shaft Installation

1. Apply a small amount of 2-4-C w/Teflon between lips of propeller shaft oil seals. Apply 2-4-C w/Teflon to threads, O-ring groove and pilot diameter.
2. Slide reverse gear into bearing carrier assembly. Slide bearing carrier assembly over propeller shaft and thread it into propeller shaft cavity as-far-as possible by hand (LEFT HAND THREAD).
3. Torque bearing carrier using Special Tool 91-93843--1. Torque to 80 lb-ft (108.5 Nm).

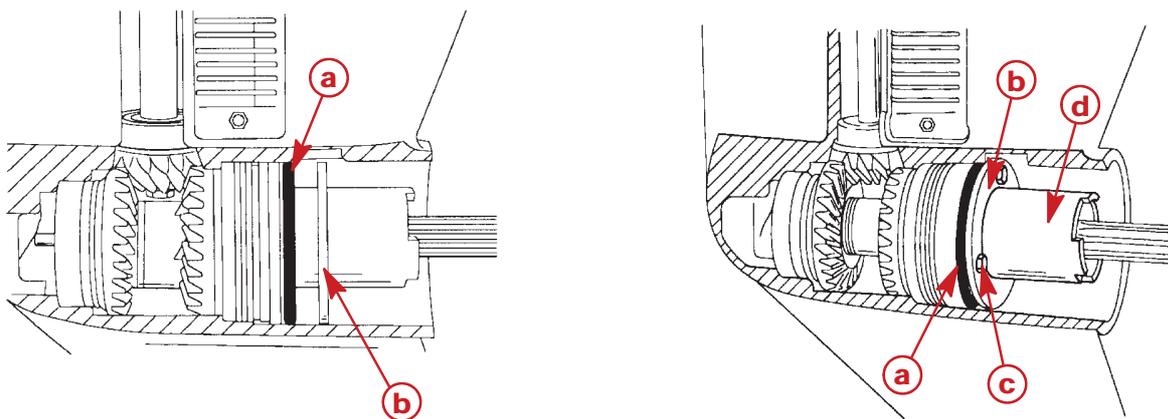


- a**-Reverse Gear
b-Bearing Carrier Assembly

4. Install O-ring and O-ring retainer plate on bearing carrier.
5. Secure O-ring retainer plate to bearing carrier with 3 screws.

NOTE: Orientate O-ring to prevent "pinching it".

6. Torque screws to 65 lb-in. (7.2 Nm).

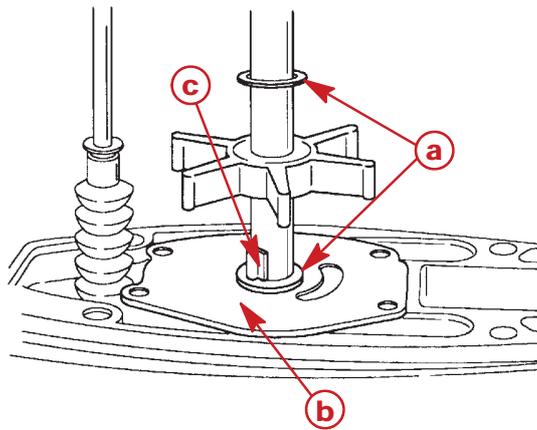


- a**-O-Ring
b-O-Ring Retainer Plate
c-Screws (3) Torque to 65 lb-in. (7.2 Nm)
d-Bearing Carrier



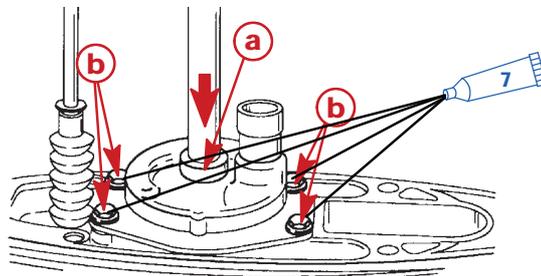
Water Pump

1. Slide a new face plate gasket and face plate over driveshaft and position them on gear housing.
2. Install nylon washer over driveshaft and set it flat against face plate.
3. Place impeller drive key on flat of driveshaft.
4. Slide new impeller over driveshaft. Align impeller keyway with drive key, then push impeller over drive key and against face plate. If reusing impeller (not recommended) note orientation of vane set.
5. Install nylon washer and set it flat against impeller.
6. Install new O-ring in water pump cover. Install cover assembly over driveshaft and down against impeller.



- a**-Nylon Washer
- b**-Face Plate
- c**-Drive Key

7. While pushing down on water pump cover assembly, rotate driveshaft clockwise to install impeller cover and seat cover against face plate.
8. Align mounting holes in gasket, face plate and water pump cover with mounting holes in gear housing. Install four (4) screws applying Loctite "271" and torque to 60 lb-in. (6.8 Nm).
9. Slide centrifugal slinger down drive shaft.



 **7** Loctite "271" (92-809819)

- a**-Centrifugal Slinger
- b**-Screws (4) Torque to 60 lb-in. (6.8 Nm).