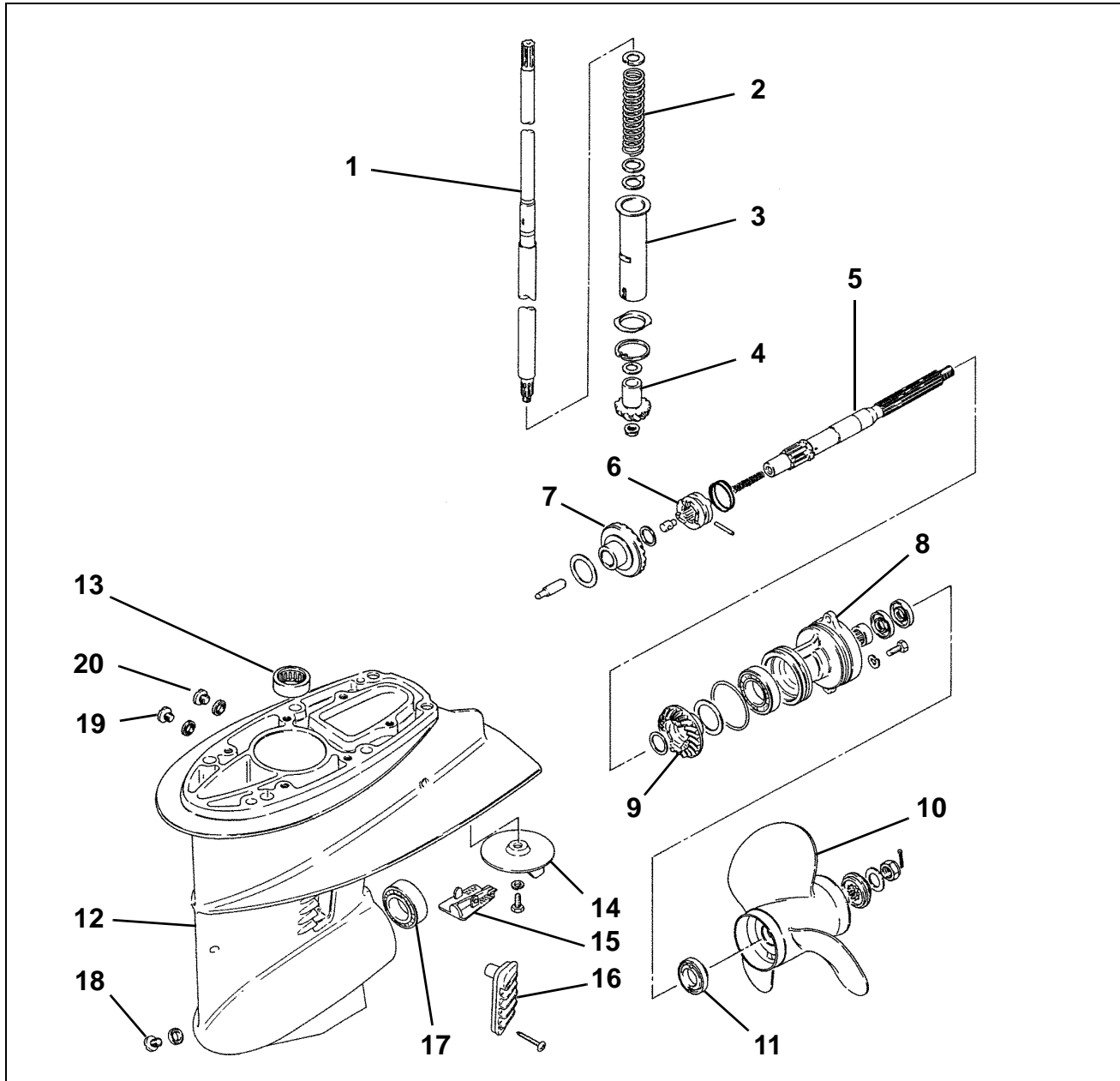


GEARCASE

TABLE OF CONTENTS

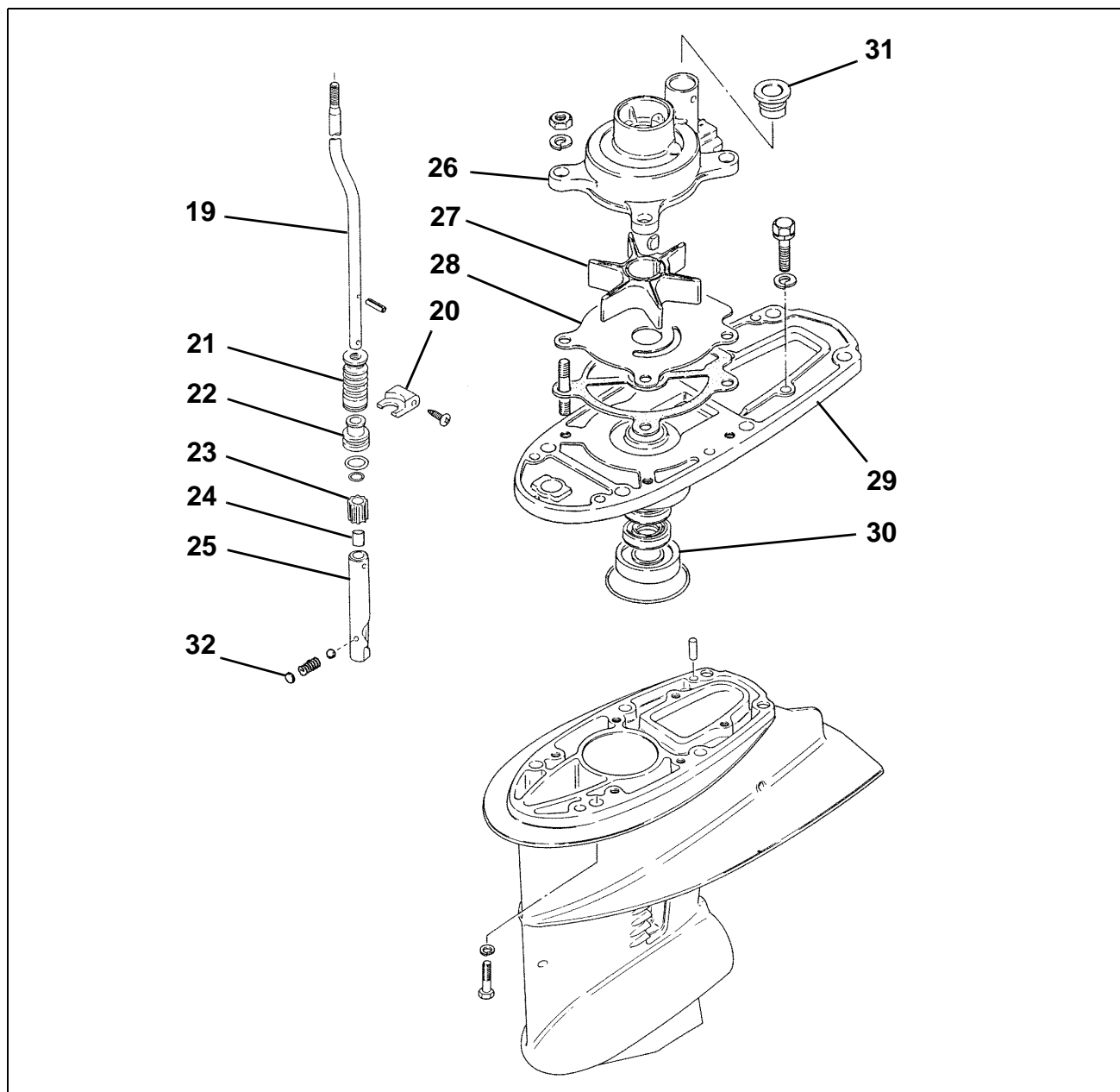
COMPONENTS	196
PROPELLER	198
REMOVAL	198
INSPECTION	198
INSTALLATION	198
TRIM TAB ADJUSTMENT	199
LUBRICANT	200
DRAINING	200
INSPECTION	200
FILLING	200
LEAK TEST	201
REMOVAL AND INSTALLATION	201
REMOVAL	201
INSTALLATION	202
WATER PUMP	204
DISASSEMBLY	204
INSPECTION	204
ASSEMBLY	205
DISASSEMBLY	205
PRE-DISASSEMBLY INSPECTION	205
PROPELLER SHAFT BEARING HOUSING REMOVAL	206
PROPELLER SHAFT DISASSEMBLY	206
PINION GEAR AND DRIVESHAFT REMOVAL	207
DRIVESHAFT DISASSEMBLY	209
SHIFT ROD REMOVAL	209
SHIFT ROD DISASSEMBLY	210
BEARING AND SEAL REMOVAL	210
BEARING AND SEAL INSTALLATION	212
ASSEMBLY	215
PRE-ASSEMBLY INSPECTION	215
SHIFT ROD ASSEMBLY	215
DRIVESHAFT ASSEMBLY	216
PINION GEAR AND DRIVESHAFT INSTALLATION	217
PROPELLER SHAFT ASSEMBLY	218
PROPELLER SHAFT BEARING HOUSING INSTALLATION	219
SHIMMING AND GEAR BACKLASH CHECKS	220
CHECKING THE FORWARD GEAR-TO-PINION GEAR BACKLASH	220
CHECKING THE TOOTH CONTACT PATTERN	221
CHECKING THE DRIVESHAFT THRUST PLAY	222
CHECKING THE PROPELLER SHAFT THRUST PLAY	223
NOTES	224

COMPONENTS



- | | |
|------------------------------------|---------------------------------|
| 1. Driveshaft | 11. Stopper |
| 2. Preload spring | 12. Gearcase |
| 3. Preload spring collar | 13. Pinion bearing |
| 4. Pinion gear | 14. Trim tab |
| 5. Propeller shaft | 15. Sub water filter |
| 6. Clutch dog shifter | 16. Water filter |
| 7. Forward gear | 17. Forward Gear Bearing |
| 8. Propeller shaft bearing housing | 18. Lubricant Drain plug |
| 9. Reverse gear | 19. Lubricant Level plug |
| 10. Propeller | 20. Cooling Water Flushing plug |

001868



- 21. Shift rod
- 22. Stopper
- 23. Boot
- 24. Shift rod guide
- 25. Magnet
- 26. Holder
- 27. Shift cam

- 28. Water pump case
- 29. Impeller
- 30. Under plate
- 31. Driveshaft bearing housing
- 32. Bearing
- 33. Grommet
- 34. Notch plate

001869

PROPELLER

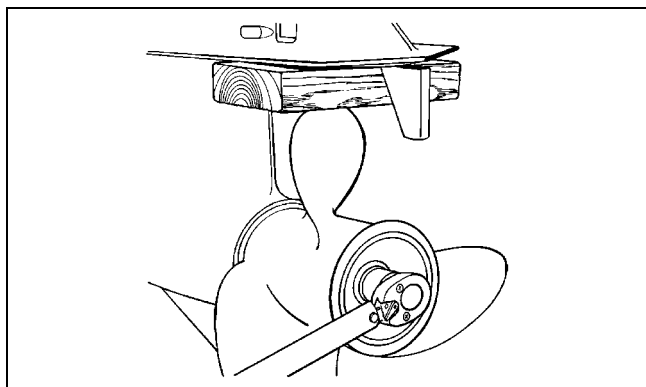
Removal

WARNING

To prevent accidental starting while servicing, remove the emergency stop lanyard and twist and remove all spark plug leads.

Place the shift lever in NEUTRAL.

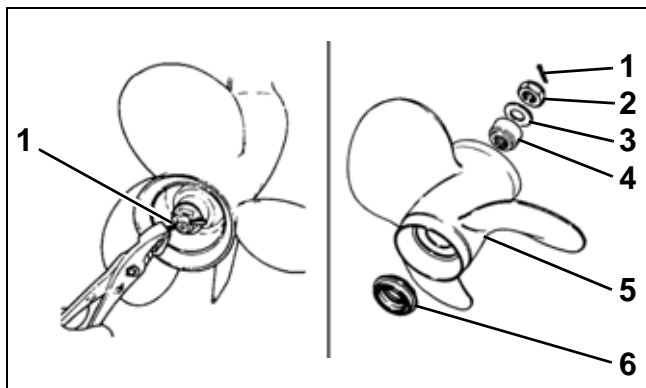
Wedge a block of wood between a propeller blade and the anti-cavitation plate to hold the propeller in place.



DRC3984

Remove the cotter pin from the propeller nut and remove propeller nut.

Remove the washer, the spacer, the propeller, and the thrust bushing from the propeller shaft.



001827

1. Cotter pin
2. Propeller nut
3. Washer
4. Spacer
5. Propeller
6. Thrust bushing

Inspection

Check for the following:

- Damaged blades and signs of propeller cavitation (burned paint, etc.)
- Spun or overheated inner hub
- Worn or twisted propeller bushing splines and inadequate lubricant
- Damage to outer hub area
- Worn, missing, or incorrect washer and spacer
- Correct size of propeller
- Bent or damaged propeller shaft and twisted splines

Installation

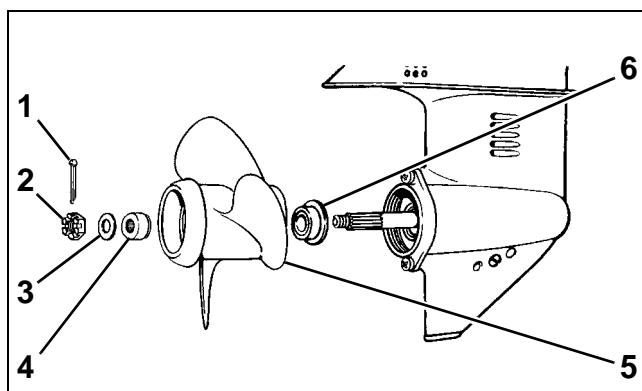
Place the shift lever in NEUTRAL.

Apply *Triple-Guard* grease to the entire propeller shaft before installing the propeller.

Install thrust bushing onto propeller shaft with shoulder of thrust bushing facing aft. Taper of bushing must match taper of propshaft.

Install propeller on propeller shaft by aligning splines and pushing until seated on the thrust bushing.

Install the spacer and the washer.



001828

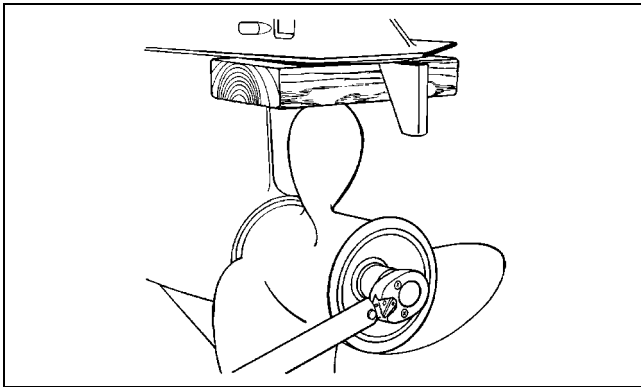
1. Cotter pin
2. Propeller nut
3. Washer
4. Spacer
5. Propeller
6. Thrust bushing

Wedge a block of wood between propeller blade and the anti-ventilation plate.

Install the propeller nut and torque to:

- 156 in. lbs. (18 N-m)

If cotter pin holes in the propeller nut and propeller shaft are not aligned, tighten the nut until they are in line. Do not loosen.



DRC3984

Insert a new cotter pin through the propeller nut and shaft. Bend its ends over the nut to secure the assembly.

IMPORTANT: After fastening propeller nut, make sure outboard is in NEUTRAL and carefully spin propeller. Propeller must turn freely and should not spin off center. If propeller appears to wobble, check for possible bent propeller shaft.

TRIM TAB ADJUSTMENT



CAUTION



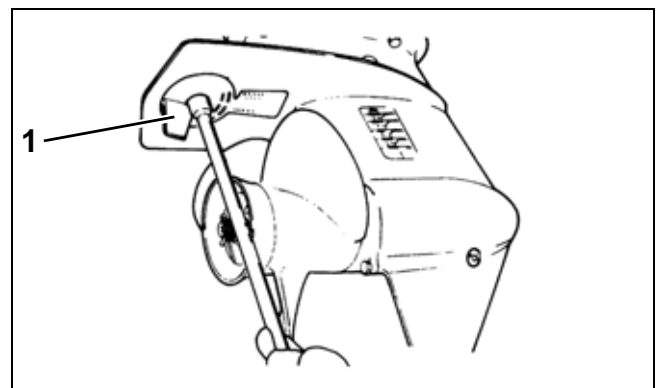
Improper trim tab adjustment can cause difficult steering and loss of control.

A propeller will generate steering torque when the propeller shaft is not running parallel to the water's surface. The trim tab is adjustable to compensate for this steering torque.

A single trim tab adjustment will relieve steering effort under only one set of speed, outboard angle, and load conditions. No single adjustment can relieve steering effort under all speed, outboard angle, and load conditions.

If the boat pulls to the left or right when its load is evenly distributed, adjust the trim tab as follows:

- **With the engine shut OFF**, loosen the trim tab bolt. If the boat pulled to starboard, move the rear of the trim tab slightly to the right. If the boat pulled to port, move the rear of the trim tab slightly to the left.
- Tighten the trim tab bolt.
- Test the boat and, if needed, repeat the procedure until steering effort is as equal as possible.



1. Trim tab

001826

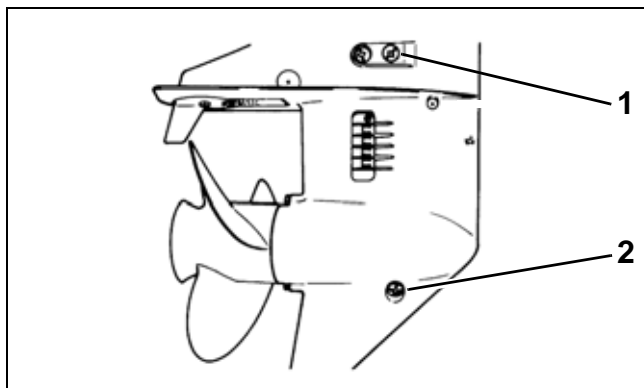
LUBRICANT

Draining

WARNING

Gearcase lubricant may be under pressure and/or hot if plug is removed from recently operated outboard. Take precaution to avoid injury.

Remove the lubricant level plug, then the lubricant drain/fill plug, and drain the lube from the gearcase into a container. Inspect the lube and the plugs for metal chips.



1. Lubricant level plug
2. Lubricant drain/fill plug

001825

The presence of metal **fuzz** can indicate normal wear of the gears, bearings, or shafts within the gearcase. Metal **chips** can indicate extensive internal damage.

Inspection

Inspect the lubricant for water contamination. Water can make the lubricant milky in appearance. However, normal aeration can also cause the same appearance.

To check for water contamination, drain lubricant into a suitable glass container. Allow the drained oil to settle for a minimum of one hour to determine if there is an abnormal amount of water in the oil. Some gearcase lubricants are designed to mix with a small amount of water from normal water vapor condensation within the gearcase.

Overheated lubricant will have a black color and burned odor.

Internal gearcase inspection is recommended when lubricant is contaminated or shows signs of failure.

Filling

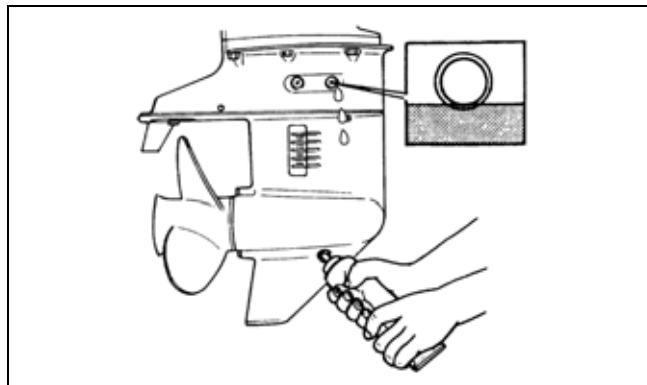
Secure the gearcase in a vertical position.

Remove the lubricant level plug and the lubricant drain/fill plug.

Slowly fill the gearcase with *HPF XR* gearcase lube through the drain/fill hole until it appears at the oil level hole. Filling the gearcase too quickly can cause air pockets and the gearcase may not fill completely.

If using pressurized lubricant tank, use fitting adapter, P/N 772269.

Clean plug seal area and install the lubricant level plug and **new** seal, then the lubricant drain/fill plug and **new** seal. Tighten them to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



001318

Refer to the **SERVICE SPECIFICATIONS AND SPECIAL TOOLS** section for gearcase lubricant capacities.

LEAK TEST

Drain lubricant before testing.

STEP 1

Install lubricant drain/fill plug and seal, thread pressure test gauge fitting and seal in lubricant level hole.

Pressurize 3 to 6 psi (21 to 42 kPa).

If pressure gauge indicates leakage, submerge the gearcase in water to determine source of leak.

If the gearcase pressure gauge does not indicate leakage, increase pressure to 14 psi (100 kPa). Check for leakage.

Make necessary repairs and repeat test.

STEP 2

Complete successful **STEP 1** before proceeding.

Install vacuum test gauge to the test fitting using adapter, P/N 772269. Connect an air pump to the test gauge and apply a vacuum of 3 to 5 in. Hg. (10 to 17 kPa).

If leakage occurs, apply oil around suspected seal. If leak then stops or oil is drawn in, that seal is defective.

Repeat test. Gearcase must hold minimum of 15 in. (381 mm) Hg.



1. Oil level hole

001889

REMOVAL AND INSTALLATION

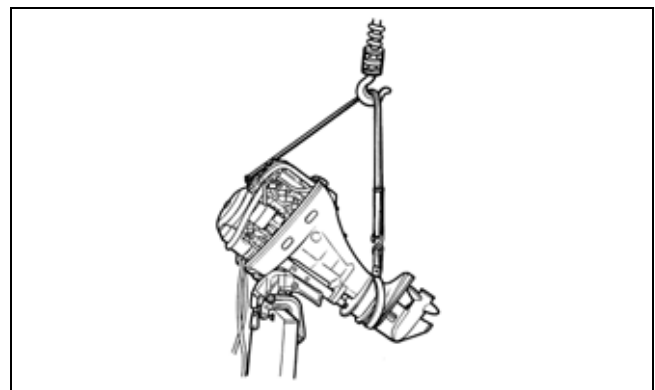
Removal



WARNING



During service, the outboard may drop unexpectedly. To avoid personal injury, always support the outboard's weight with a suitable hoist.

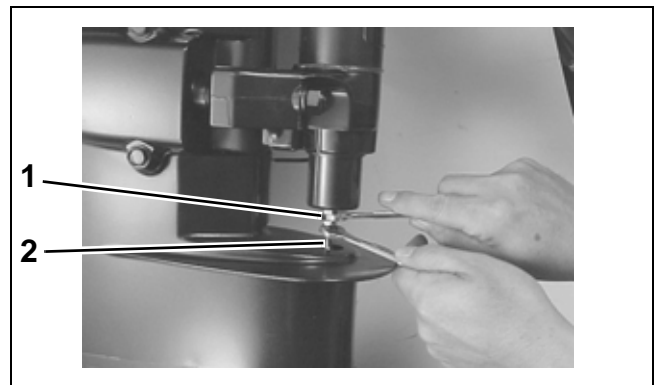


001731

Drain the lubricant from the gearcase. Refer to "LUBRICANT" on page 200.

Remove the propeller from the gearcase. Refer to "PROPELLER" on page 198.

Loosen the clutch rod locknut. Unscrew the turnbuckle to separate the clutch rod from the shift rod.

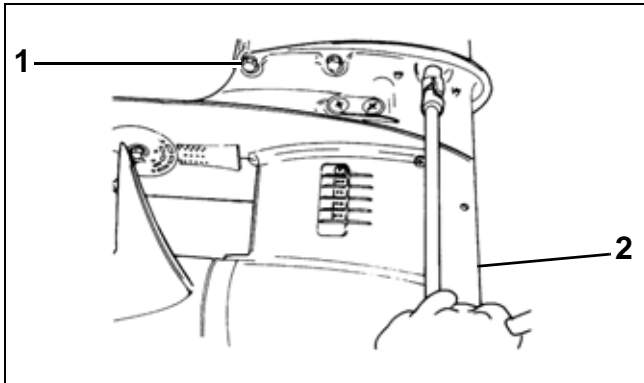


1. Locknut
2. Turnbuckle

001823

GEARCASE REMOVAL AND INSTALLATION

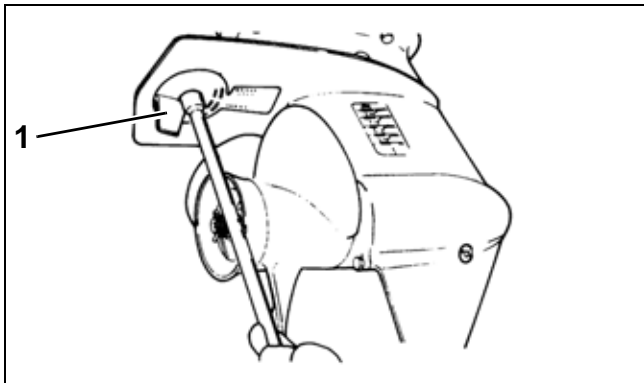
Remove six (6) bolts and separate the gearcase from the exhaust housing.



1. Bolts (6)
2. Gearcase

001824

If necessary, remove the trim tab.



1. Trim tab

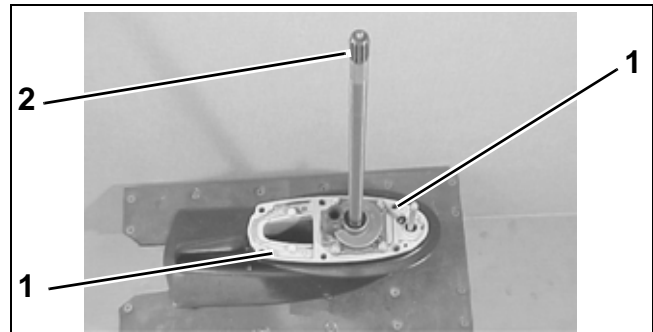
001826

Installation

If removed, insert two (2) dowel pins.

Coat the driveshaft splines with *Triple-Guard* grease.

Apply a light coat of *Gasket Sealing Compound* to the mating surfaces of the gearcase and the exhaust housing.

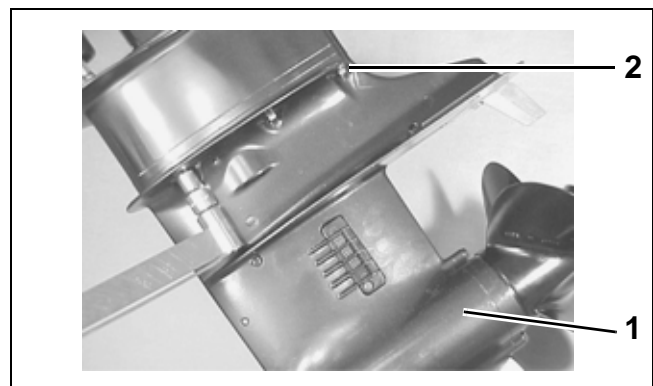


1. Dowel pins (2)
2. Driveshaft splines

001892

Slide the gearcase into place on the exhaust housing. Make sure that the top of the driveshaft engages properly with the crankshaft and the water tube locates in the water pump case outlet.

Apply *Gasket Sealing Compound* to the gearcase bolts. Install and tighten the bolts to a torque of 16.5 ft. lbs. (23 N·m).



1. Gearcase
2. Bolts (6)

001893

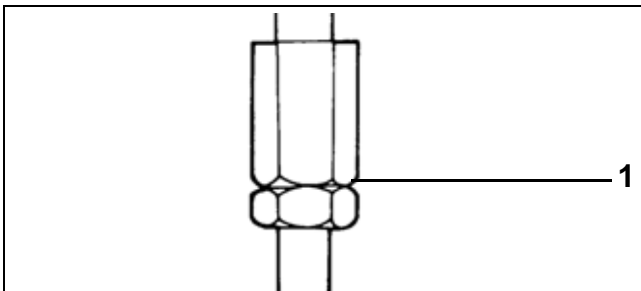
GEARCASE REMOVAL AND INSTALLATION

Fill the gearcase with the specified lubricant. Refer to "LUBRICANT" on page 200.

Connect the clutch rod to the shift rod. Make sure that the chamfered edge of the turnbuckle faces downward to seat against the locknut when tightened.



001898



1. Chamfered edge

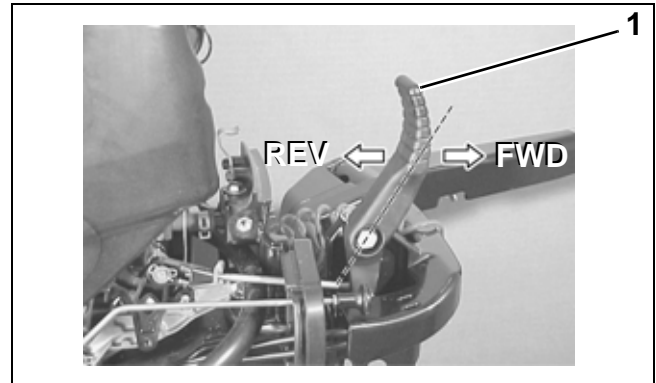
001895

Check the adjustment of the clutch lever. Refer to "Adjusting the Clutch Lever" on page 203.

Adjusting the Clutch Lever

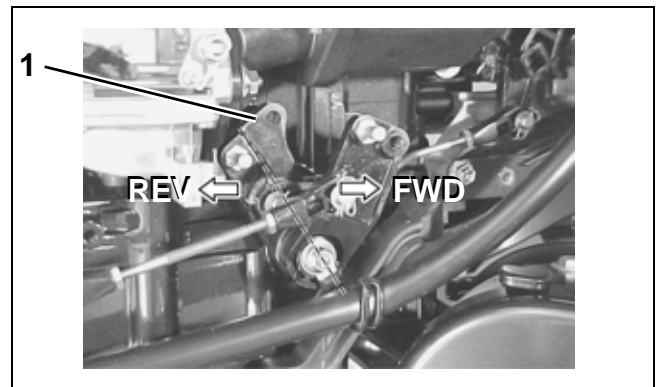
Shift the clutch lever from NEUTRAL through FORWARD and then from NEUTRAL through

REVERSE to check whether both gears engage at an equal angle from NEUTRAL.



1. Shift lever

001896



1. Clutch lever

001897

- If forward gear engages earlier (at a smaller angle) than reverse gear, rotate the turnbuckle **clockwise** until both gears engage with the same amount of clutch lever travel.
- If reverse gear engages earlier (at a smaller angle) than forward gear, rotate the turnbuckle **counterclockwise** until both gears engage with the same amount of clutch lever travel.

Tighten the locknut securely against the turnbuckle when the adjustment is correct.



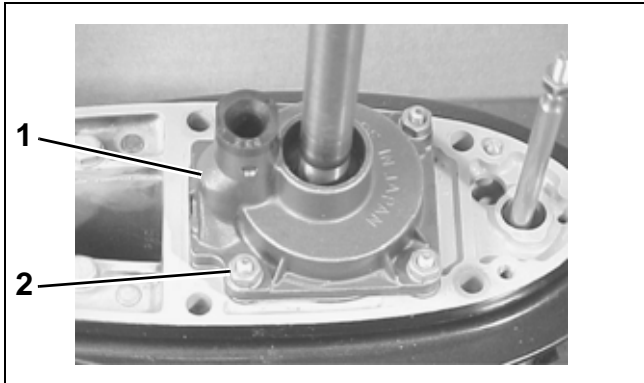
001899

WATER PUMP

Disassembly

Remove the gearcase from the exhaust housing. Refer to "REMOVAL AND INSTALLATION" on page 201.

Loosen four (4) nuts and the washers, then remove the impeller housing.



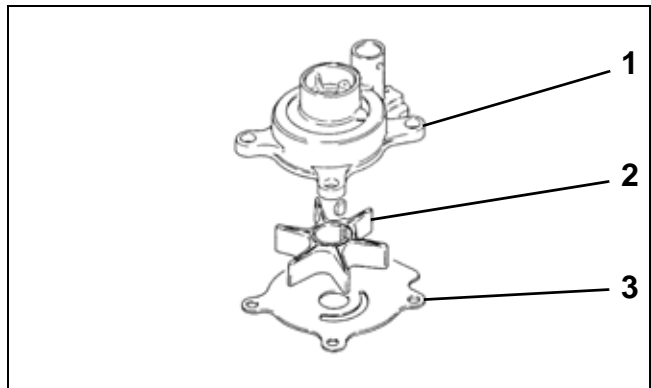
1. *Impeller housing*
2. *Nuts (4)* 001891

Inspection

Check the impeller for overheating, hub separation, and visible signs of wear or damage.

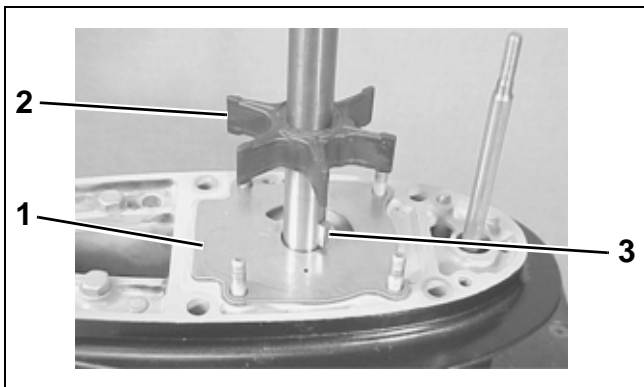
Check the plate and inside the housing for scoring, distortion, and impeller material transfer.

Check the housing for cracks or melting.



1. *Impeller housing*
2. *Impeller*
3. *Impeller housing plate* 001861

Remove the impeller, the impeller key, the impeller housing plate, and the gasket under the plate. Keep the key for reuse, but discard the gasket.

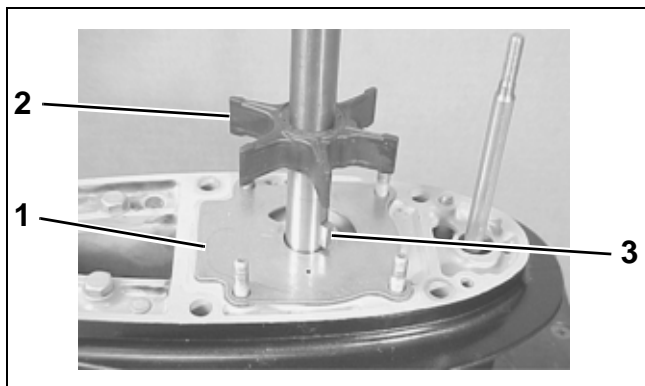


1. *Impeller housing plate*
2. *Impeller*
3. *Impeller key* 001890

Assembly

Install a **new** gasket and the plate on top of the gearcase.

Insert the impeller key in the driveshaft, then slide the impeller onto the driveshaft. Make sure that the key and keyway on the impeller are aligned.

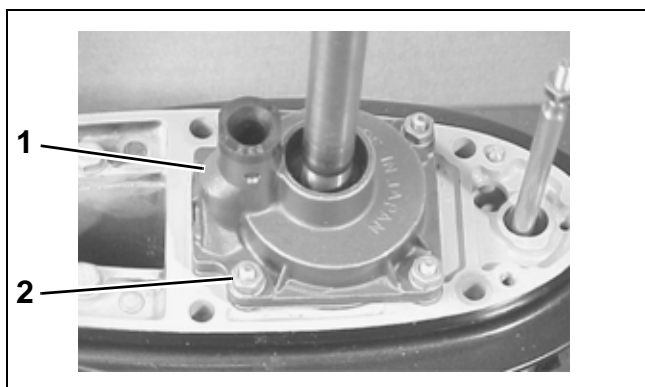


1. Impeller housing plate
2. Impeller
3. Impeller key

001890

Install the impeller housing while rotating the driveshaft clockwise to flex the impeller vanes in the correct direction.

Install and tighten four (4) nuts to a torque of 71 in. lbs. (8 N·m).



1. Impeller housing
2. Nuts (4)

001891

DISASSEMBLY

IMPORTANT: Clean and inspect all components during disassembly. Replace all damaged components, seals, O-rings, and gaskets upon assembly.

Pre-Disassembly Inspection

Before disassembling the gearcase, examine the following:

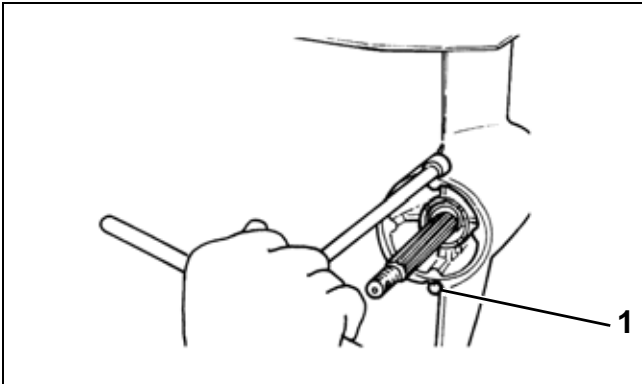
- **Gearcase housing** — All gasket surfaces must be free of gasket material. All threaded holes must be free of corrosion and sealer. Make sure that the inside of the gearcase is clean and free of debris.
- **Gearcase anode** — If the anode has been reduced to two-thirds of its original size, it must be replaced.
- **Driveshaft** — Check the splines for chips, wear, and cracks. Bearing and gear surfaces must not show signs of metal transfer, corrosion, or discoloration. Severe spline wear might indicate a exhaust housing or gearcase that has been distorted by impact damage.
- **Propeller Shaft** — Check for bent or damaged shaft. Check for twisted splines and damaged threads.
- **Shift Rod** — Check for misadjusted, bent, or binding rod. A misadjusted shift rod height can cause shift difficulty, loss of boat and outboard control, and gearcase damage.
- **Water intake screen** — The screen must be clear. If the screen cannot be adequately cleaned, replace it. Different screens are available and should not be mixed. Refer to the correct parts manual for listing and description.
- **Water pump** — Check impeller for wear, crumbling, and hub bonding. Check impeller cup and plate for scoring and distortion.

GEARCASE DISASSEMBLY

Propeller Shaft Bearing Housing Removal

Remove the water pump from the gearcase. Refer to "WATER PUMP" on page 204.

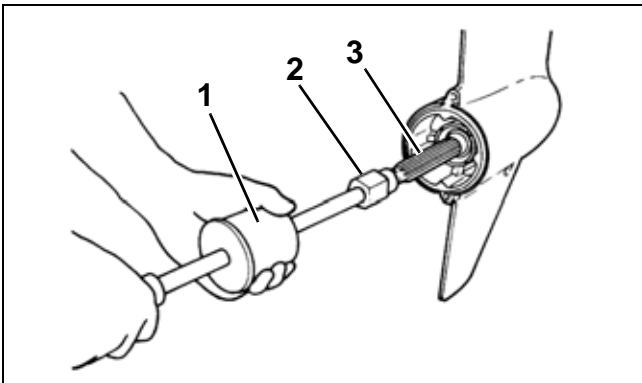
Remove two (2) bolts that secure the propeller shaft bearing housing to the gearcase.



1. Bolts (2)

001829

Use a sliding hammer and a propeller shaft removal tool to remove the propeller shaft and bearing housing assembly.



1. Sliding hammer, P/N 391008
2. Propeller shaft removal tool, P/N 5034762
3. Propeller shaft

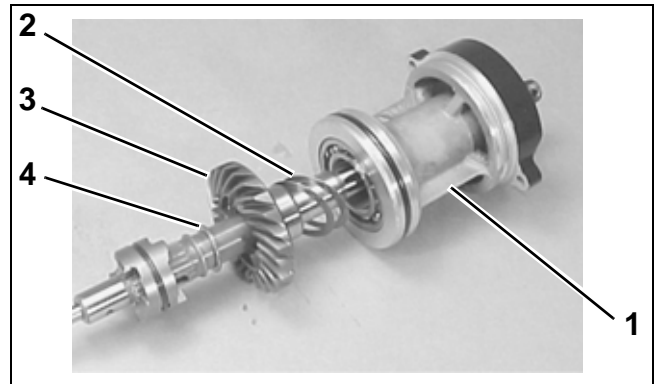
001830

Propeller Shaft Disassembly

IMPORTANT: Clean and inspect all components during disassembly. Replace all damaged components, seals, O-rings, and gaskets upon assembly.

Slide the propeller shaft out of the bearing housing assembly.

Remove the shim, the reverse gear, and the thrust washer from the shaft.

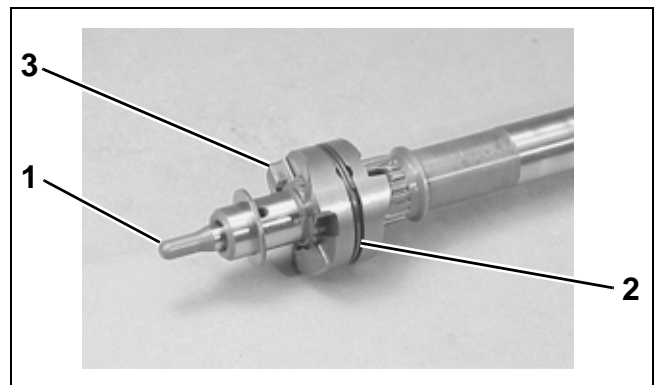


1. Bearing housing assembly
2. Shim
3. Reverse gear
4. Thrust washer

001842

Pull the push rod out of the end of the propeller shaft.

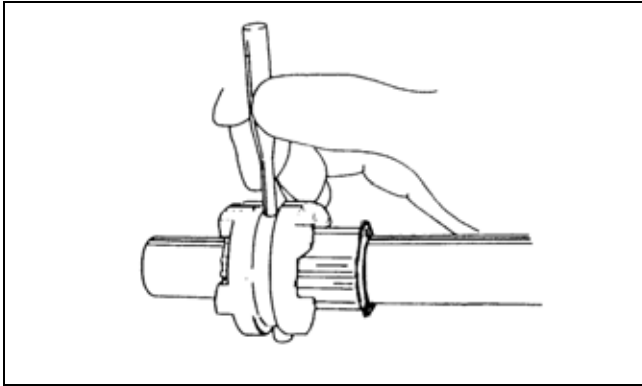
Remove the spring from the clutch dog shifter.



1. Push rod
2. Spring
3. Clutch dog shifter

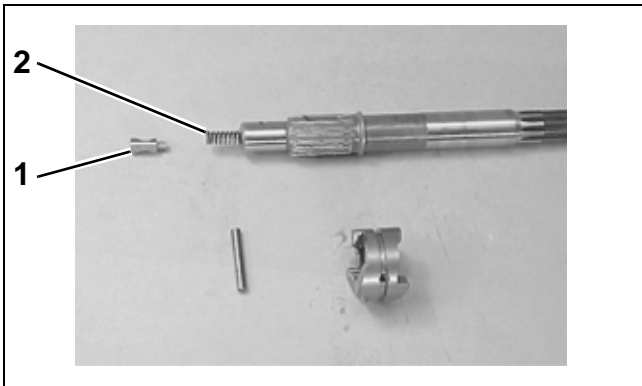
001843

Use appropriate tool to push pin out of the clutch dog shifter. Remove the clutch dog shifter from the shaft.



001844

Remove the push pin and the return spring from the end of the propeller shaft.



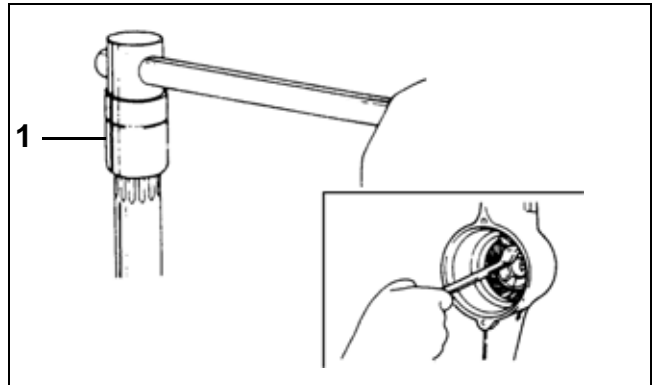
1. Push pin
2. Return spring

001845

Pinion Gear and Driveshaft Removal

Remove the propeller shaft bearing housing from the gearcase. Refer to "Propeller Shaft Bearing Housing Removal" on page 206.

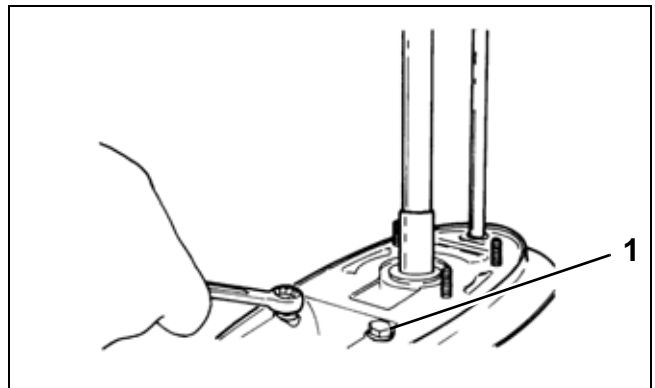
Hold the pinion nut securely with a wrench. Fit a driveshaft holder to the end of the driveshaft and loosen the pinion nut. Remove the pinion nut from the gearcase.



1. Driveshaft holder, P/N 345834

001833

Remove two (2) bolts that secure the driveshaft bearing housing to the gearcase.

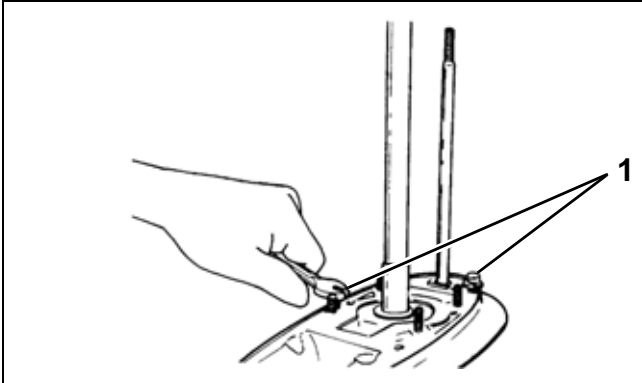


1. Bolts (2)

001834

GEARCASE DISASSEMBLY

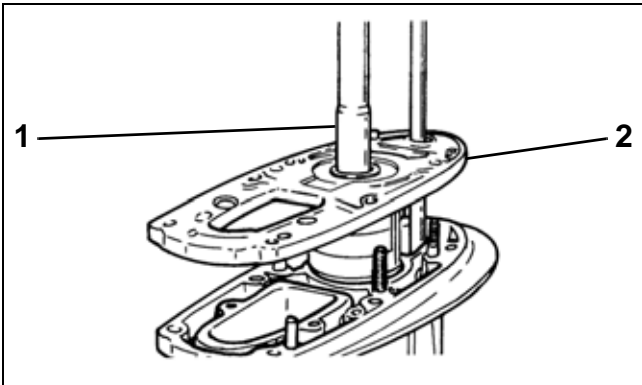
To remove the driveshaft bearing housing from the gearcase, use two 6mm bolts as screw jacks. Turn each bolt alternately and equally to keep the housing level as it separates from the gearcase.



1. 6mm bolts (2)

001835

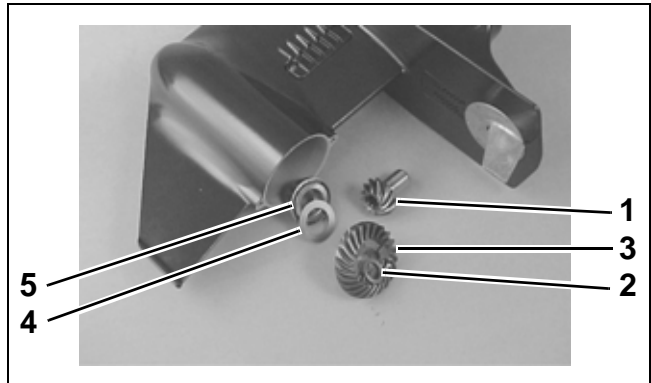
Lift the driveshaft and bearing housing assembly from the gearcase.



1. Driveshaft
2. Bearing housing assembly

001836

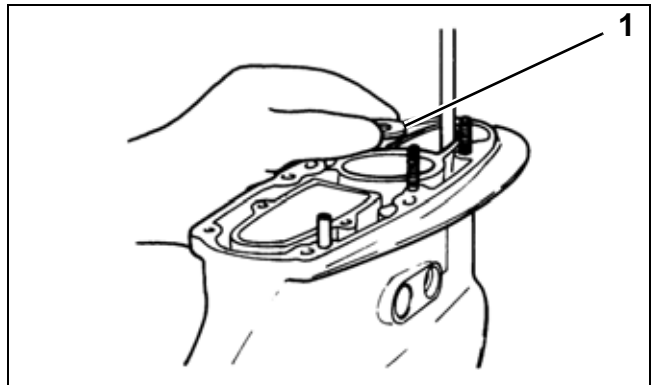
Remove the pinion gear, thrust washer, forward gear, shim, and bearing.



1. Pinion gear
2. Thrust washer
3. Forward gear
4. Shim
5. Bearing

001837

Remove pinion shim from the gearcase.



1. Pinion shim

001838

Driveshaft Disassembly

IMPORTANT: Clean and inspect all components during disassembly. Replace all seals, O-rings, gaskets, and damaged components.

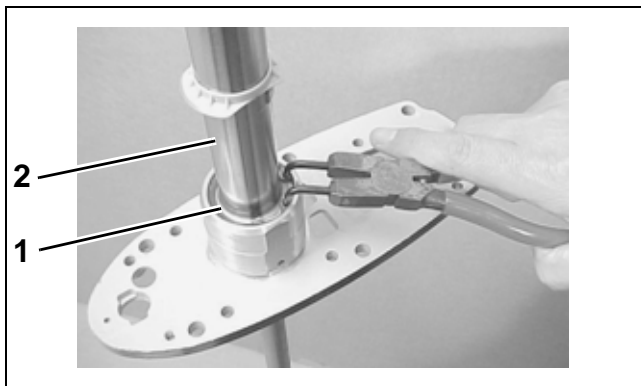


WARNING



When removing or installing any type of retaining rings, wear eye protection to avoid personal injury.

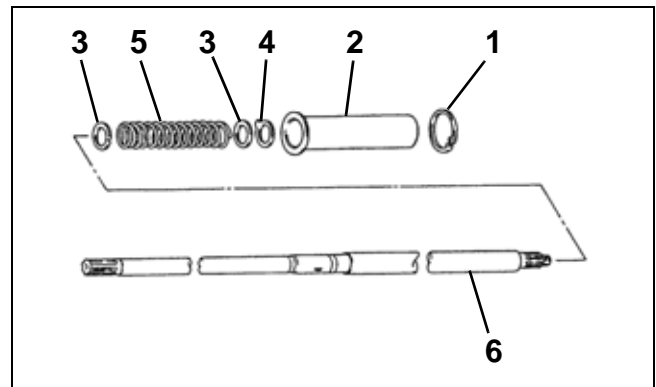
Remove the retaining ring, the driveshaft, and the preload spring collar from the bearing housing.



1. Retaining ring
2. Preload spring collar

001879

Remove the washer, the preload spring, the other washer, and the tab lock washer. Note the position of the tab lock washer before removal.

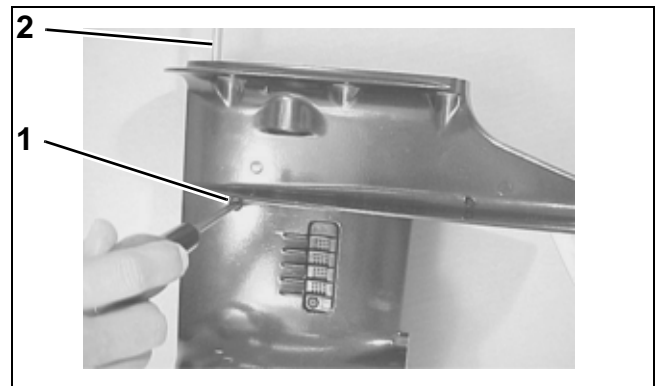


1. Retaining ring
2. Preload spring collar
3. Washer
4. Tab lock washer
5. Preload spring
6. Driveshaft

001841

Shift Rod Removal

Remove the screws that secure the shift rod guide stop. Remove the shift rod from the gearcase.



1. Screws (2)
2. Shift rod assembly

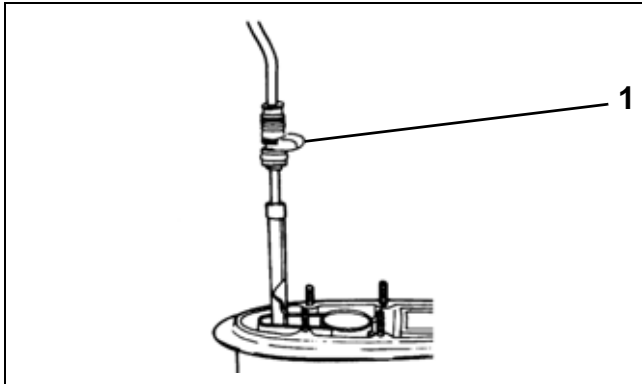
001838

GEARCASE

BEARING AND SEAL REMOVAL

Shift Rod Disassembly

Remove the stop from the shift rod guide.



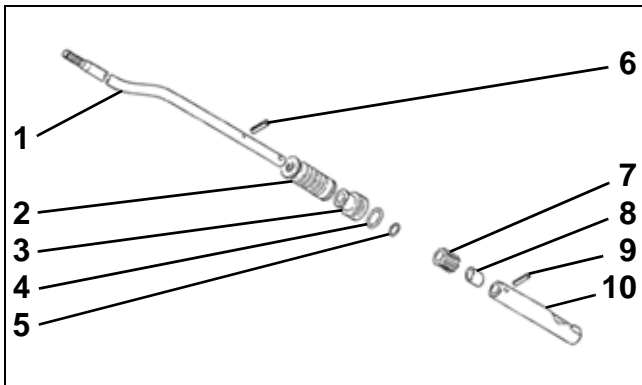
1. Shift rod guide stop

001860

Remove the cam pin and separate the shift rod cam from the shift rod.

Remove the spacer and the magnet from the shift rod.

Remove the shift rod pin, then remove the guide and the boot from the shift rod. Remove and discard the O-rings.



1. Shift rod
2. Boot
3. Shift rod guide
4. Guide O-ring (larger)
5. Shift rod O-ring (smaller)
6. Shift rod pin
7. Magnet
8. Spacer
9. Cam pin
10. Shift rod cam

001872

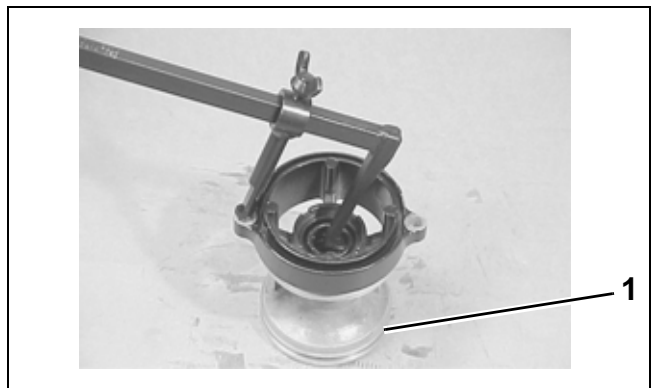
BEARING AND SEAL REMOVAL

IMPORTANT: Inspect bearings for damage while in place. If a bearing is removed for any reason, it must be replaced.

Propeller Shaft Bearing Housing Seals

Use an oil seal remover or 2-jaw puller and plate assembly, P/N 432131 to remove two (2) oil seals from the propeller shaft bearing housing.

Remove and discard the O-ring.



1. O-ring

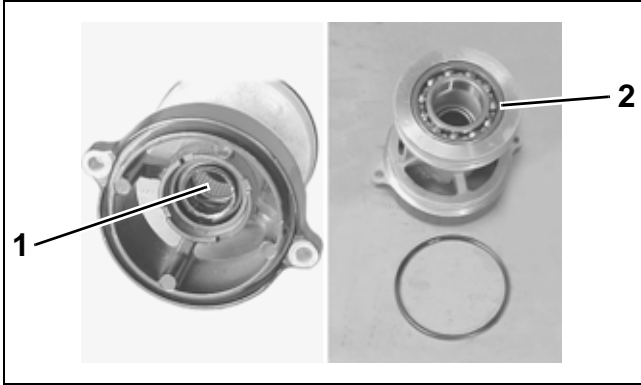
001858

Reverse Gear Bearing

Use 2-jaw puller and plate assembly, P/N 432129, to remove reverse gear bearing.

Propeller Shaft Bearings

Use bearing removal tool, P/N 5034764, to press bearing from housing.



1. Propshaft bearing
2. Reverse gear bearing

001857

Forward Bearing Race

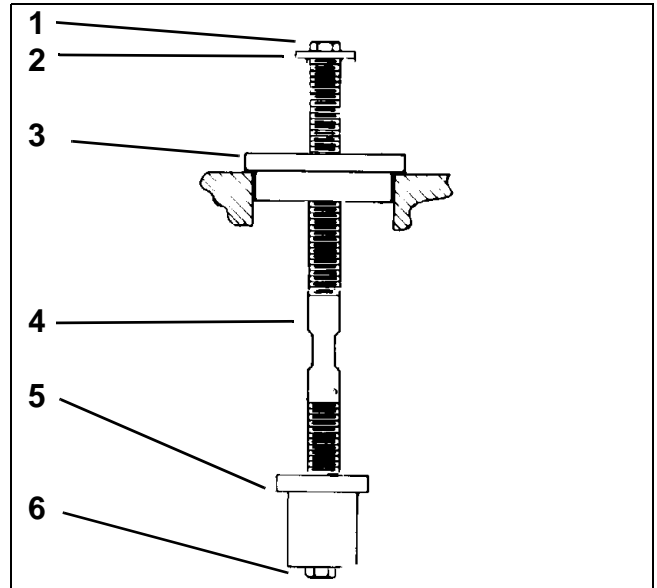
If forward gear bearing is replaced the race must be replaced. 2-jaw puller, P/N 432129, can be used with a plate obtained locally, to remove the bearing race from the gearcase housing.

Pinion Gear Bearing

Put a wood block under the pinion gear bearing.

To remove pinion bearing, assemble removal tool from Universal Pinion Bearing removal and installation Kit, P/N 391257, bearing removal/installation kit, P/N 5000009, and bearing removal/installation tool, P/N 5034763, as shown. Place removal tool inside the pinion gear bearing.

Drive out the bearing by striking the top of the shaft with heavy rawhide mallet. Be careful not to damage the gearcase.



1. 1/4 - 20 x 1/2 in. Hex head screw
2. 1 in. O.D. Flat Washer
3. Centering Guide from tool kit 5000009
4. Rod, P/N 326582
5. Pinion gear bearing removal/installation tool, P/N 5034763
6. 1/4 - 20 x 1 1/4 in. Hex head screw

824163

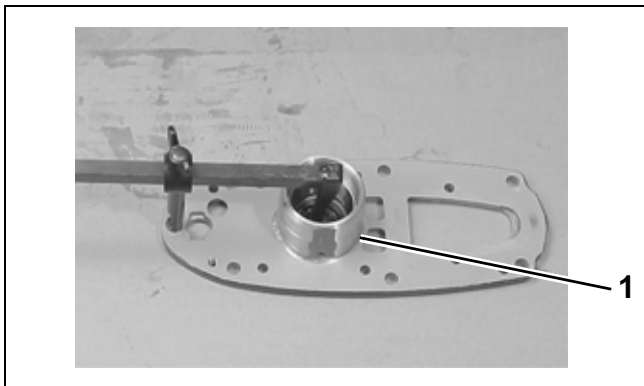
GEARCASE

BEARING AND SEAL INSTALLATION

Driveshaft Bearing Housing Seals

Use an oil seal remover or 2-jaw puller and plate assembly, P/N 432131, to draw two (2) oil seals out of the driveshaft bearing housing. Be careful not to damage driveshaft bearing race.

Remove the O-ring from the housing.



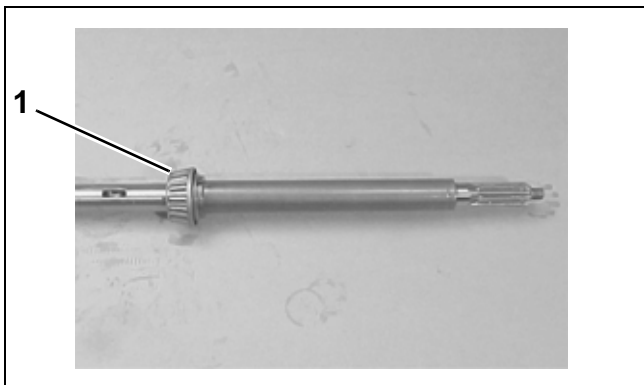
1. O-ring

001863

Driveshaft Bearing

If the driveshaft bearing is pitted, noisy or rough, press the bearing from the driveshaft and replace it. Seat new bearing to shaft carefully using press.

To remove driveshaft bearing race in driveshaft bearing housing, use 2-jaw puller and plate assembly, P/N 432131.



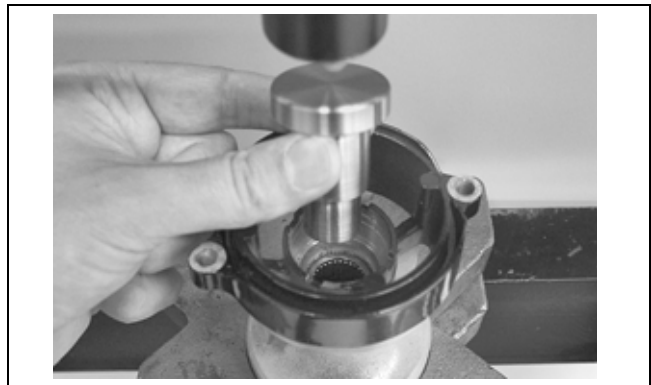
1. Driveshaft bearing

001865

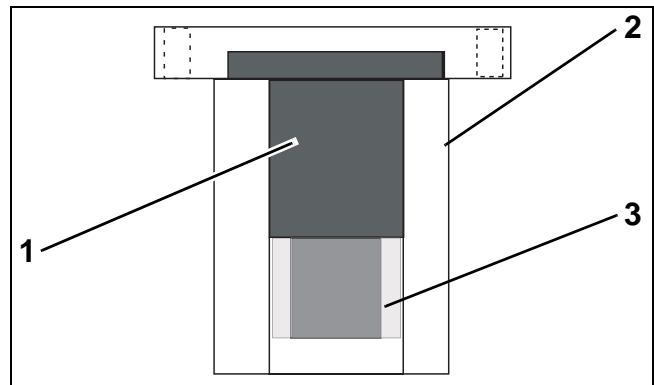
BEARING AND SEAL INSTALLATION

Propeller Shaft Bearing

Apply *HPF XR* gearcase lubricant to the bearing. Using bearing installation tool, P/N 5034774, with lettered side of bearing facing tool, carefully press bearing into housing. Bearing is properly installed when tool flange seats against housing.



002513



1. Bearing installation tool, P/N 5034774
2. Propeller shaft bearing housing
3. Propeller shaft bearing

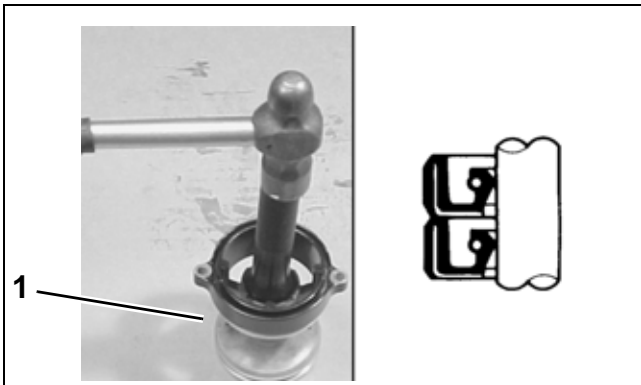
002512

Propeller Shaft Bearing Housing Seals

Apply *Triple-Guard* grease to the inner circumference of the housing.

Place the **new** seals in position (one at a time) with the lips facing toward the propeller. Use oil seal installation tool, P/N 326545, to seat seals into bearing housing. Apply *Triple-Guard* grease to the seal lips after installation.

Install a **new** O-ring on the housing.



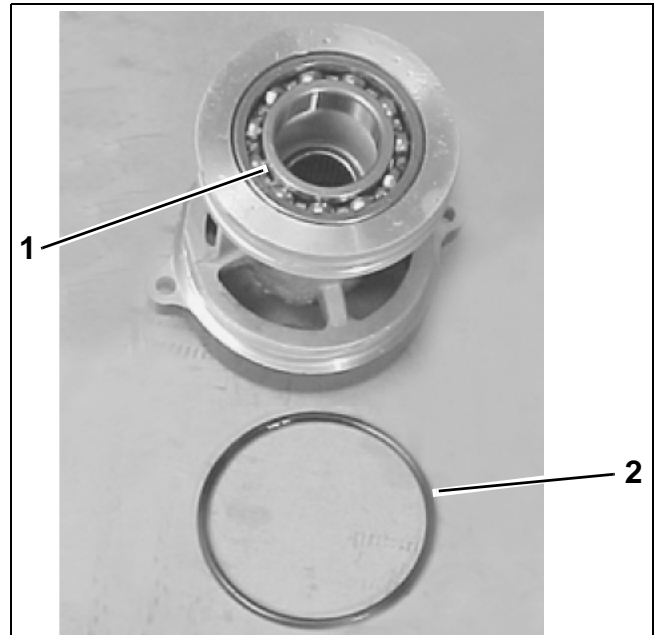
1. O-ring

001859

Reverse Gear Bearing

Apply *HPF XR* gearcase lubricant to the bearings.

Using suitable bearing installation tool obtained locally, press the bearing against outer race until fully seated in the housing.



1. Reverse Gear bearing
2. Propeller shaft bearing housing o-ring

001857

Pinion Gear Bearing

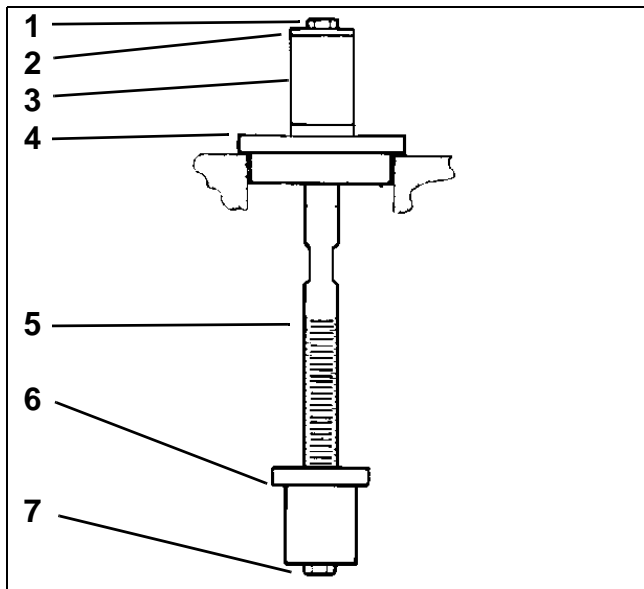
To install pinion bearing, assemble tools from Universal Pinion Bearing Removal and Installation Kit, P/N 391257, bearing removal/installation kit, P/N 5000009, bearing removal/installation tool, P/N 5034763, and spacer, P/N 350932, as shown.

Place bearing installation tool with lettered side of bearing facing tool. Use *Needle Bearing* grease to hold bearing on tool.

GEARCASE

BEARING AND SEAL INSTALLATION

Insert tool and bearing into gearcase. Using rawhide mallet, drive bearing into place until washer contacts spacer, P/N 350932.



1. 1/4 - 20 x 1/2 in. Hex head screw
2. 1 in. O.D. Flat Washer
3. Spacer 350932
4. Centering Guide from tool kit 5000009
5. Rod, P/N 326582
6. Pinion gear bearing removal/installation tool, P/N 5034763
7. 1/4 - 20 x 1 1/4 in. Hex head screw

824182

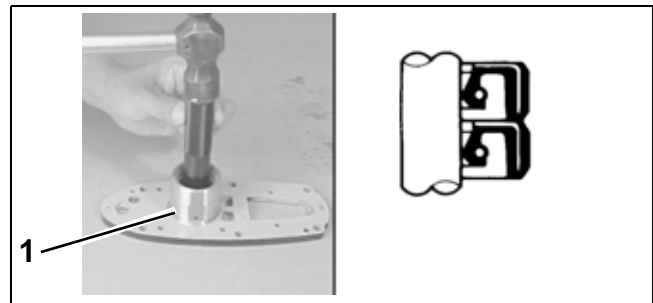
Driveshaft Bearing Housing Bearing Race and Seals

To install driveshaft bearing race, use bearing tool installation, P/N 342685, to press race until seated in housing

Apply *Triple-Guard* grease to the inner circumference of the housing and the lips of the **new** seals.

Place the seals in the housing (one at a time) with the lips facing away from the driveshaft bearing. Use oil seal installation obtained locally to seat seals into the bearing housing.

Install a **new** O-ring on the housing. Apply *Triple-Guard* grease to the O-ring after installation.



1. O-ring

001864

Forward Gear Bearing Race

Use bearing installation tool obtained locally to seat new bearing race fully into gearcase housing.

ASSEMBLY

Pre-Assembly Inspection

⚠	WARNING	⚠
<p>To avoid personal injury, wear eye protection and set compressed air pressure to less than 25 psi (172 kPa).</p>		

Clean all gearcase components in solvent and dry them with compressed air.

Visually inspect all internal components for signs of wear, distortion, chipping, metal transfer, pitting, galling, and discoloration due to improper lubrication. Replace any damaged components.

Before installation, coat all internal components with *HPF XR* gearcase lubricant to prevent rusting.

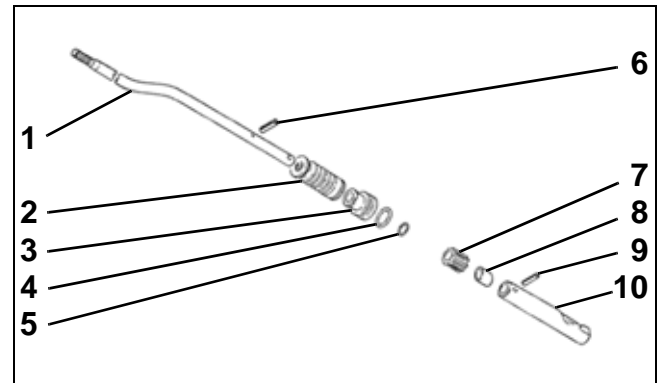
Shift Rod Assembly

Install **new** O-rings on the shift rod guide. Apply *Triple-Guard* grease to the shift rod guide O-ring and the inside of the dust boot.

Slide the dust boot and the shift rod guide onto the shift rod, then install the shift rod pin.

Install the magnet and the spacer on the shift rod.

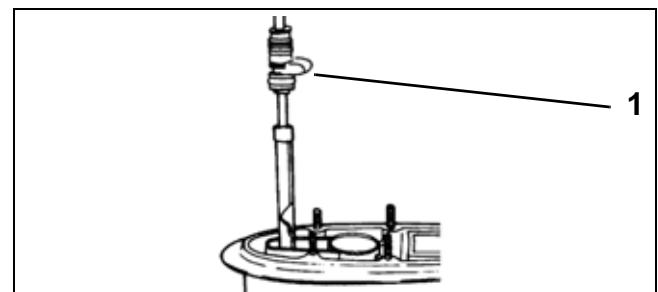
Install the shift rod cam on the shift rod, then insert the cam pin.



1. Shift rod
2. Boot
3. Shift rod guide
4. Guide O-ring (larger)
5. Shift rod O-ring (smaller)
6. Shift rod pin
7. Magnet
8. Spacer
9. Cam pin
10. Shift rod cam

001872

Install the stop on the shift rod guide.



1. Shift rod guide stop

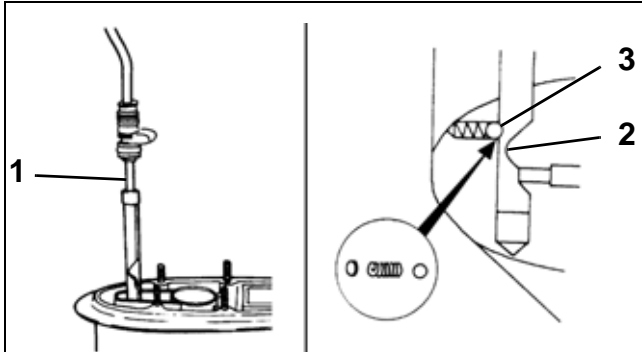
001860

Install the shift rod assembly in the gearcase.

IMPORTANT: Make sure that the stepped section of the shift rod cam faces toward the propeller shaft. Also make sure that the rear side of the shift

GEARCASE ASSEMBLY

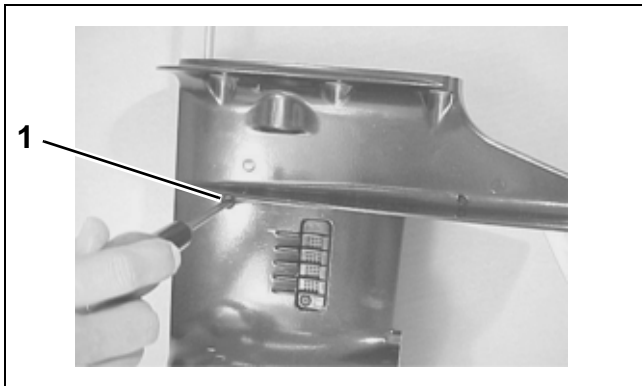
rod cam (with detent notch) is positioned over the detent ball in the gearcase.



1. Shift rod
2. Shift rod cam - stepped section
3. Detent ball

001873

Secure the stop to the gearcase with two (2) screws.

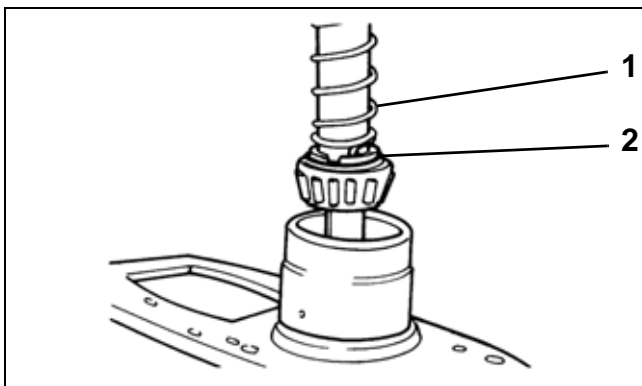


1. Screws (2)

001838

Driveshaft Assembly

Install the thrust washer and the preload spring on the driveshaft. Make sure that the end of the spring fits into the notch on the thrust washer.

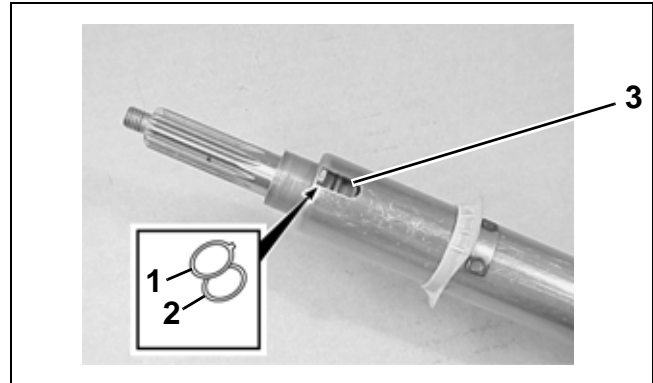


1. Preload spring
2. Thrust washer

001874

Place the tab lock washer and the other thrust washer in the preload spring collar. Make sure that the tab of the lock washer fits into the slot at the pinion gear end of the spring collar.

Slide the preload spring collar onto the driveshaft.



1. Tab lock washer
2. Thrust washer
3. Slot

001878

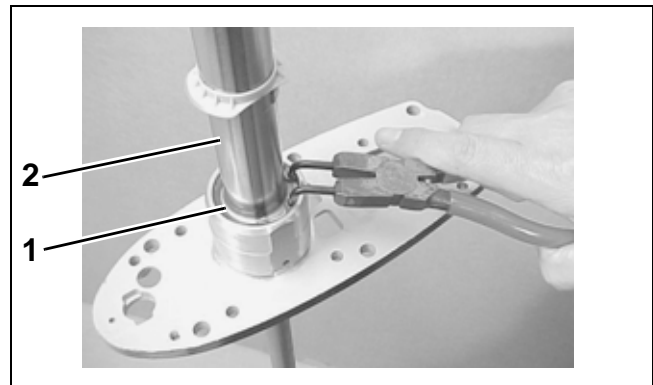


WARNING



When removing or installing any type of retaining rings, wear eye protection to avoid personal injury.

Install the driveshaft and the preload spring collar in the bearing housing. Firmly push down the collar and secure the collar to the housing with the retaining ring.

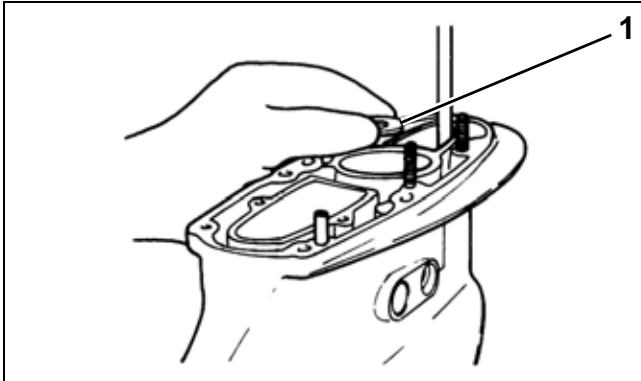


1. Retaining ring
2. Preload spring collar

001879

Pinion Gear and Driveshaft Installation

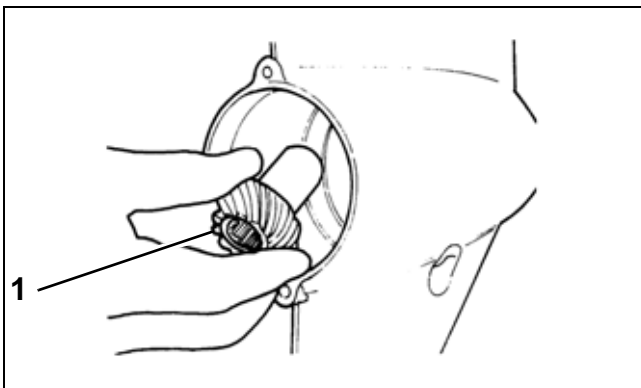
Install the pinion shim from the gearcase.



1. Pinion shim

001838

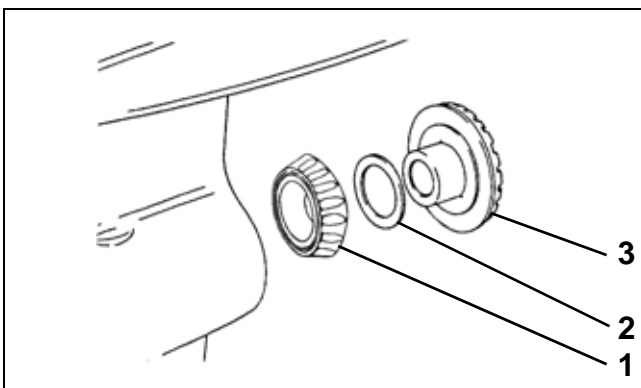
Install the pinion gear in the gearcase.



1. Pinion gear

001870

Install the forward gear bearing and the shim in the gearcase, then install the forward gear.

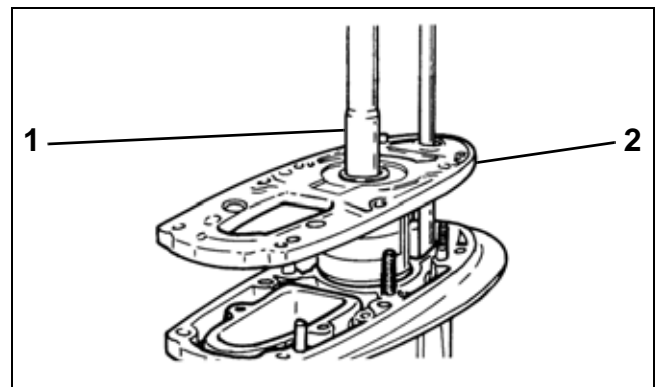


1. Forward gear bearing
2. Shim
3. Forward gear

001871

IMPORTANT: Before completing this installation procedure, check the forward gear to pinion gear backlash, the tooth contact pattern, and the initial driveshaft thrust play. Refer to “SHIMMING AND GEAR BACKLASH CHECKS” on page 220 for these procedures.

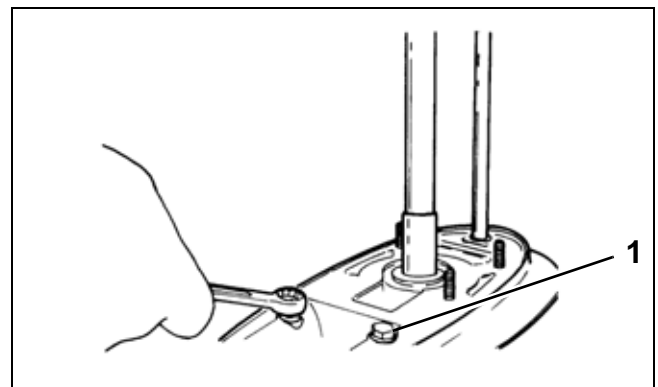
Apply *Gasket Sealing Compound* to the mating surfaces of the gearcase and the driveshaft bearing housing. Then install the complete driveshaft and bearing housing assembly to the gearcase.



1. Driveshaft
2. Bearing housing

001836

Install two (2) bolts that secure the driveshaft bearing housing to the gearcase.



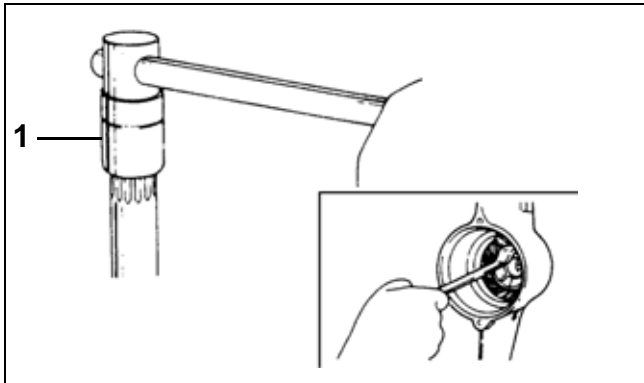
1. Bolts (2)

001834

Apply *Nut Lock* to the threads of the pinion nut. Fit a driveshaft holder to the top end of the driveshaft,

GEARCASE ASSEMBLY

then install the pinion nut on the other end. Tighten the nut to a torque of 13 ft. lbs. (18 N·m).



1. Driveshaft holder, P/N 345834

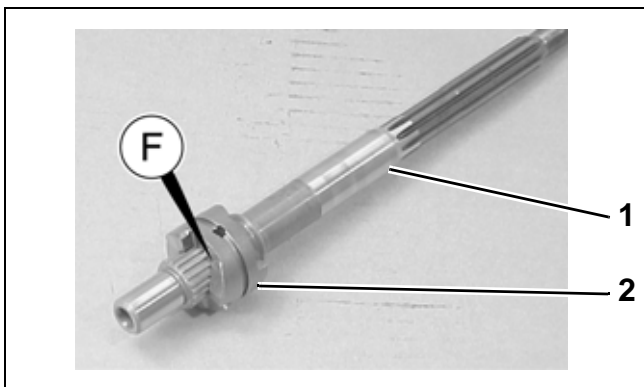
001833

Propeller Shaft Assembly

Check the return spring by measuring its free length. If free length is not within specifications, replace the return spring.

Return Spring Free Length	
Standard	2.30 in. (58.5 mm)
Service limit	2.22 in. (56.5 mm)

Slide the clutch dog shifter onto the propeller shaft. Make sure that the side that is marked with an "F" will face toward the forward gear.



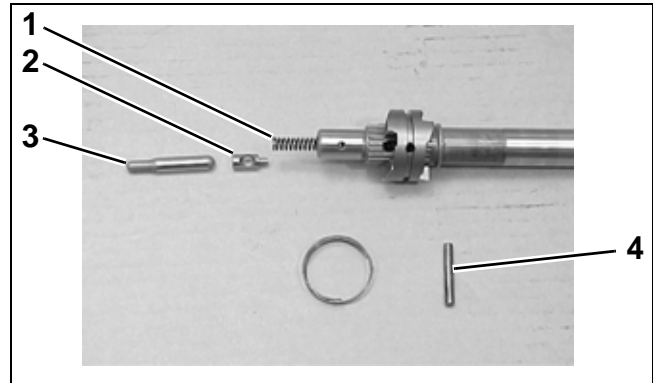
1. Propeller shaft
2. Clutch dog shifter

001881

Insert the return spring, the push pin, and the push rod into the propeller shaft.

Align the holes in the clutch dog shifter and the push pin. Depress the push rod and slide the

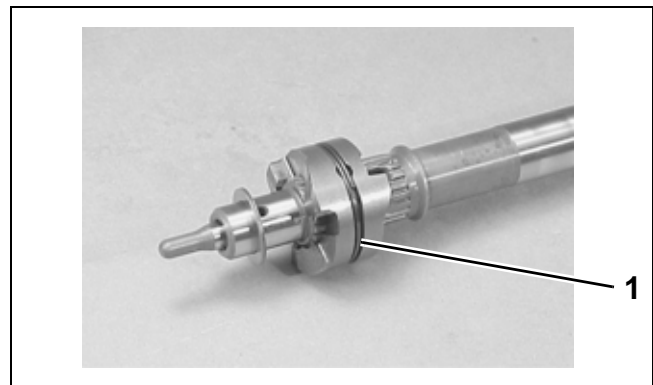
clutch dog shifter pin through the clutch dog shifter and the push pin.



1. Return spring
2. Push pin
3. Push rod
4. Dog pin

001882

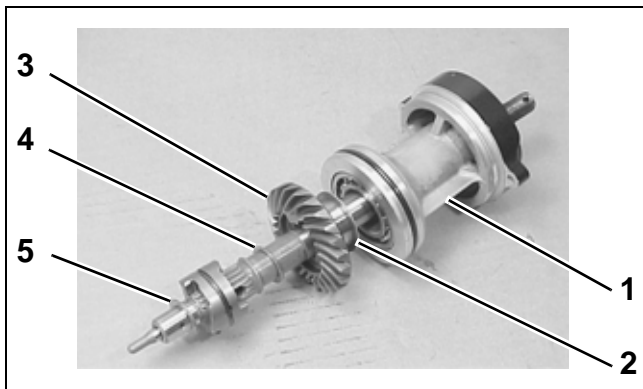
Install a **new** clutch dog shifter pin spring. Make sure that the spring fits snugly into the groove on the clutch dog shifter.



1. Clutch dog pin spring

001843

Install the forward gear thrust washer, the reverse gear thrust washer, the reverse gear, the shim, and the propeller shaft bearing housing.

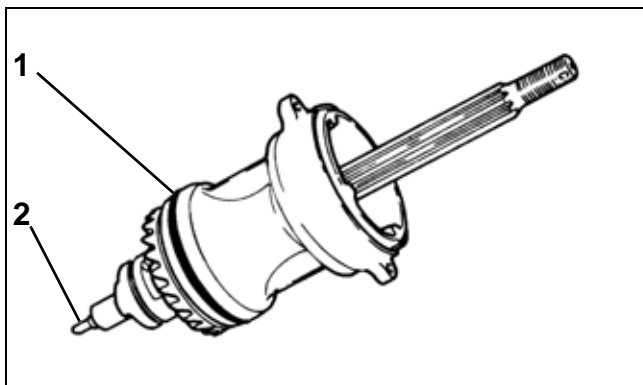


1. Propeller shaft bearing housing 001883
2. Shim
3. Reverse gear
4. Reverse gear thrust washer
5. Forward gear thrust washer

Propeller Shaft Bearing Housing Installation

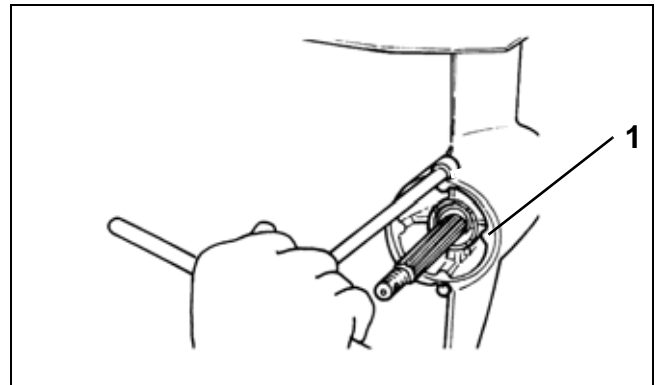
IMPORTANT: Before installing the propeller shaft and bearing housing assembly, move the shift cam to the forward position by moving the shift rod up or down.

Apply *Triple-Guard* grease to the O-ring and the push rod.



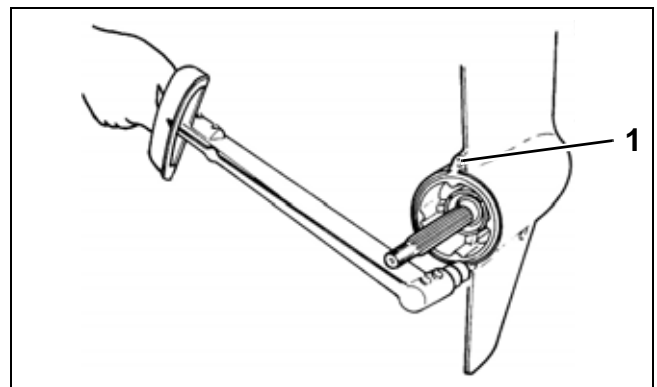
1. O-ring 001884
2. Push rod

Install propeller shaft bearing housing.



1. Propeller shaft bearing housing 001829

When the bearing housing is fully seated, install and tighten two (2) bolts to a torque of 71 in. lbs. (8 N·m).



1. Bolts (2) 001886

Check the driveshaft thrust play again. Refer to "Checking the Driveshaft Thrust Play" on page 222.

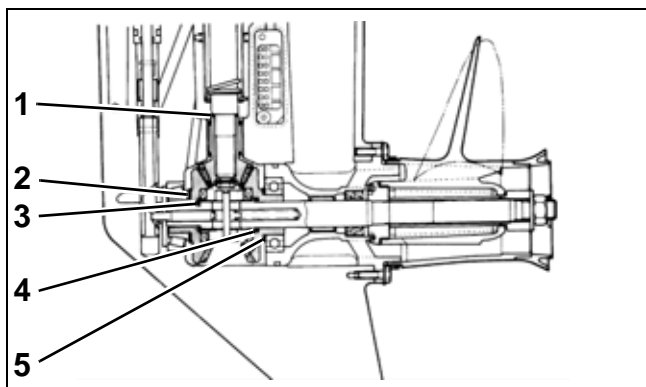
Check the propeller shaft thrust play. Refer to "Checking the Propeller Shaft Thrust Play" on page 223.

GEARCASE

SHIMMING AND GEAR BACKLASH CHECKS

SHIMMING AND GEAR BACKLASH CHECKS

If the gearcase has been rebuilt or any internal components have been replaced, the gears must be properly shimmed and adjusted to ensure smooth, reliable operation of the gears.



1. Pinion gear shim
2. Forward gear shim
3. Forward gear thrust washer
4. Reverse gear thrust washer
5. Reverse gear shim

001901

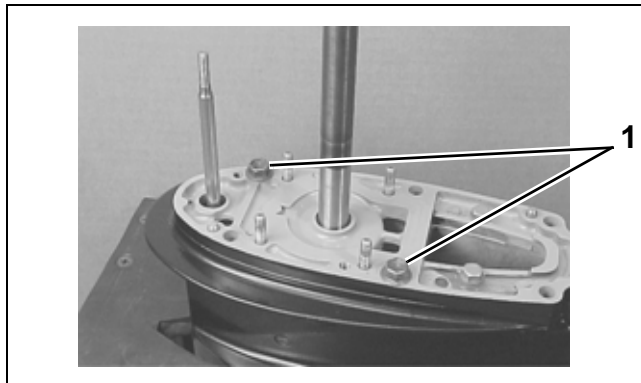
Item	Available thickness (mm)	Design spec thickness (mm)
Pinion gear shim	1.7, 1.8, 1.9, 2.0, 2.1, 2.2	2.0
Forward gear shim	0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5	1.2
Forward gear thrust washer	2.0	2.0
Reverse gear thrust washer	1.6, 1.8, 2.0, 2.2, 2.4, 2.6	2.0
Reverse gear shim	0.2, 0.5, 0.8, 1.0	1.5

Checking the Forward Gear-to-Pinion Gear Backlash

Install the driveshaft and bearing housing assembly **without** *Gasket Sealing Compound*.

Install and tighten the pinion nut **without** *Nut Lock* to a torque of 13 ft. lbs. (18 N·m).

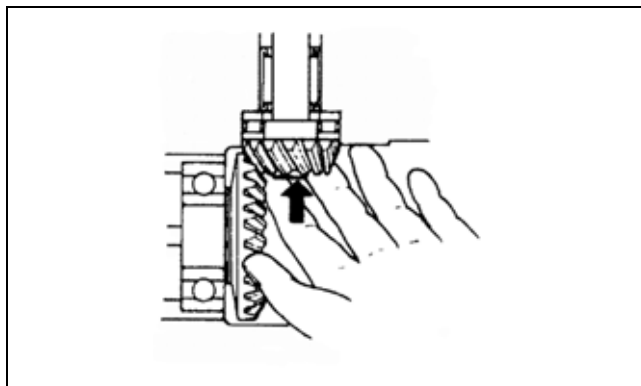
Temporarily fasten the driveshaft bearing housing to the gearcase using two (2) bolts and nuts placed through the two diagonally opposite gearcase mounting holes.



1. Bolts (2)

001888

Hold the pinion gear by hand, then gently rock the forward gear back and forth by hand.



001902

Forward Gear to Pinion Gear Backlash

0.004 – 0.008 in. (0.10 – 0.20 mm)

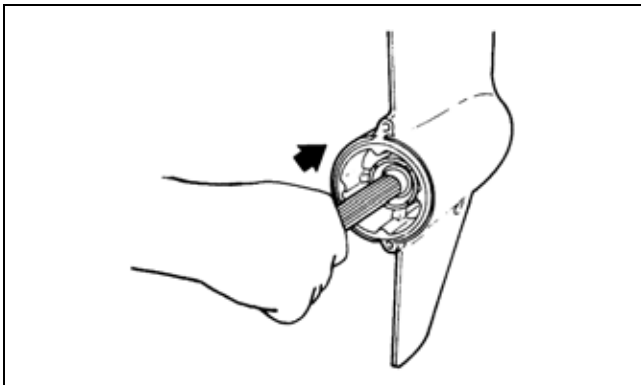
- If the backlash is greater than the specification, the thickness of the forward gear shim must be increased.
- If the backlash is less than the specification, the thickness of the forward gear shim must be decreased.

Checking the Tooth Contact Pattern

Apply a light coat of Gear Mark Compound, P/N 772666, on the convex surface of the forward gear.

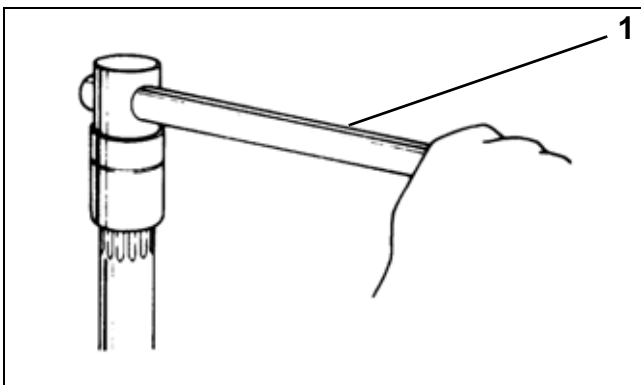
Install the propeller shaft and bearing housing assembly **without** the reverse gear and internal components.

Push the propeller shaft inward and hold it in position.



001905

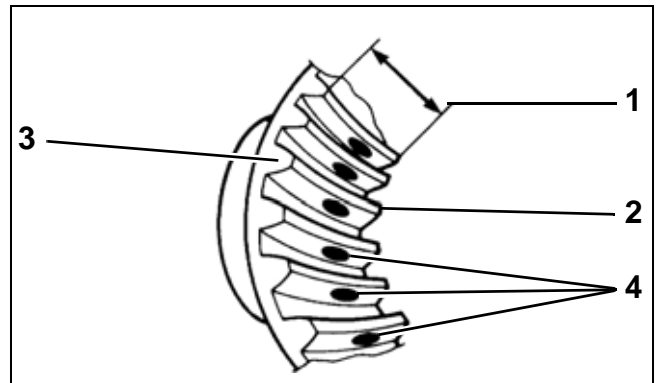
Use a driveshaft holder to rotate the driveshaft five or six times.



1. Driveshaft holder, P/N 345834

001904

Carefully pull out the propeller shaft and bearing housing to check the tooth contact pattern.



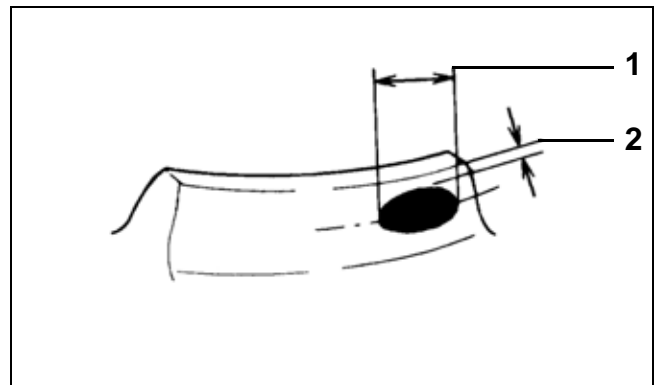
- 1. Tooth width
- 2. Toe
- 3. Heel
- 4. Tooth contact pattern

001906

Optimum Tooth Contact

A shim adjustment may be necessary to obtain this contact pattern. After adjusting the shim thickness, check the tooth contact pattern again.

Width of contact area	1/3 of total tooth width
Top of tooth to contact area	0.04 in. (1 mm)



- 1. Width of contact area
- 2. Top of tooth to contact area

001907

GEARCASE

SHIMMING AND GEAR BACKLASH CHECKS

Incorrect Top Side Toe Contact

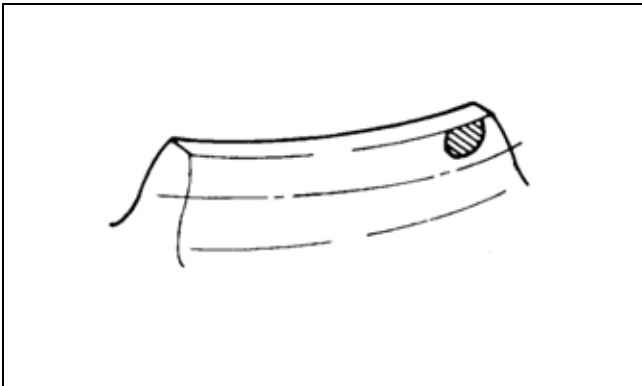


CAUTION



Do not set the tooth contact to this pattern. Damage to the gears may result.

To correct this tooth contact pattern, either decrease the thickness of the forward gear shim or slightly increase the thickness of the pinion gear shim.



001908

Incorrect Bottom Side Toe Contact

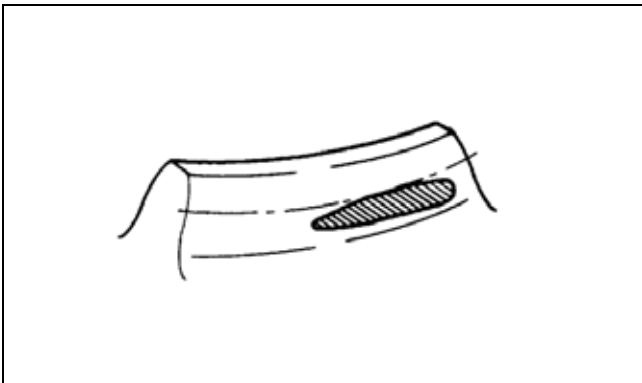


CAUTION



Do not set the tooth contact to this pattern. Damage to the gears may result.

To correct this tooth contact pattern, either increase the thickness of the forward gear shim or slightly decrease the thickness of the pinion gear shim.



001909

Checking the Driveshaft Thrust Play

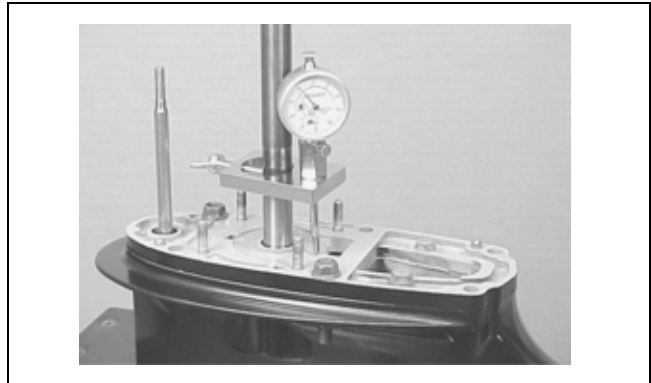
Initial Check

After obtaining the optimum tooth contact, measure the driveshaft thrust play.

Install a gear adjusting gauge to the driveshaft.

Slowly push the driveshaft downward. Record the maximum gauge reading. Designate this measurement as **A**.

The actual driveshaft thrust play should be 0.008 – 0.016 in. (0.20 – 0.40 mm).



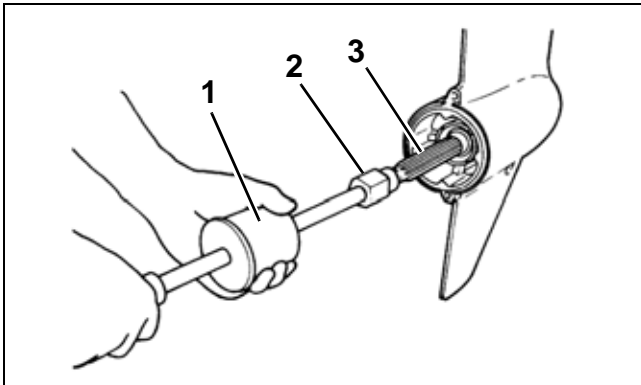
001880

Final Check

IMPORTANT: Measurement **A** from the initial check must be known to adjust the shim thickness for the reverse gear.

After adjusting the forward gear tooth contact pattern, assemble and install the propeller shaft and bearing housing assembly with the reverse gear and any related components.

Thread the sliding hammer onto the propeller shaft and strike a few gentle outward taps.

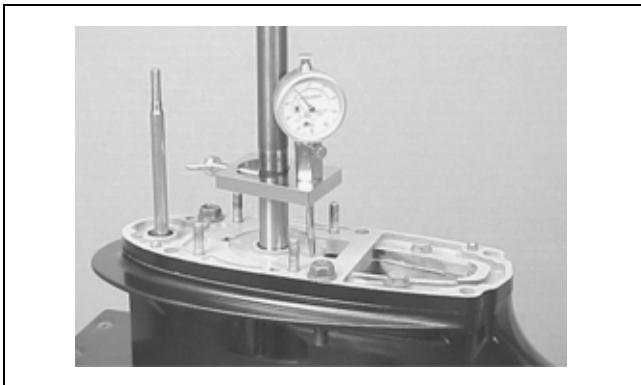


1. Sliding hammer, P/N 391008
2. Propeller shaft removal, P/N 5034762
3. Propeller shaft

001830

Install a gear adjusting gauge to the driveshaft.

Slowly push the driveshaft downward. Record the maximum gauge reading. Designate this measurement as **B**.



001880

Compare measurements **A** and **B**.

- If the measurements are equal, the shim thickness for the reverse gear is correct.
- If **B** is less than **A**, decrease the shim thickness for the reverse gear.

Checking the Propeller Shaft Thrust Play

After adjusting all gear positions, measure the propeller shaft thrust play.

IMPORTANT: Maintain the forward gear thrust washer at the standard thickness. Adjust only the reverse gear thrust washer.

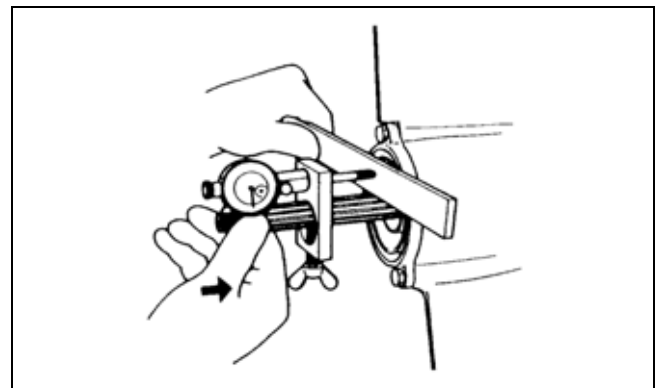
Install a gear adjusting gauge to the propeller shaft.

Push the propeller shaft inward. Hold the shaft in and set the dial gauge to zero.

Slowly pull the propeller shaft outward. Record the maximum gauge reading.

The actual propeller shaft thrust play should be 0.008 to 0.016 in. (0.20 to 0.40 mm).

- If the measurement is greater than the specification, increase the thickness of the reverse gear thrust washer.
- If the measurement is less than the specification, decrease the thickness of the reverse gear thrust washer.



001887

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	