

Service Manual

Gearcases

EVINRUDE[®]
E-TEC[®]



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<i>Gel-Seal II</i> ™	

Original Instructions

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All special tools referenced in the manual can be found in the current **Special Tools Guide** included with the service manual set.

Gearcase General Service

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Safety Notice

Before working on any part of the outboard, read the **SAFETY** section at the end of this manual.

This publication is written for qualified, factory-trained technicians who are already familiar with the use of *Evinrude/Johnson* Special Tools. The included information is not a substitute for work experience. It is an organized guide for reference, repair, and/or maintenance.

The following symbols and/or signal words may be used in this document:

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

NOTICE

Indicates an instruction which, if not followed, could severely damage engine components or other property.

These safety alert signal words mean:

ATTENTION!

BECOME ALERT!

YOUR SAFETY IS INVOLVED!

IMPORTANT: Identifies information that controls correct assembly and operation of the product.

ENVIRONMENTAL NOTE

A note which provides tips and behaviors related to protecting the environment.

DO NOT perform any work until you have read and understood these instructions completely.

Torque wrench tightening specifications must strictly be adhered to.

Should removal of any locking fastener (lock tabs, locknuts, or patch screws) be required, always replace with a new one.

When replacement parts are required, use *Evinrude/Johnson Genuine Parts* or parts with equivalent characteristics, including type, strength and material. Use of substandard parts could result in injury or product malfunction.

Always wear EYE PROTECTION AND APPROPRIATE GLOVES when using power tools.

Unless otherwise specified, engine must be OFF when performing this work.

Always be aware of parts that can move, such as flywheels, propellers, etc.

Some components may be HOT. Always wait for engine to cool down before performing work.

If you use procedures or service tools that are not recommended in this manual, YOU ALONE must decide if your actions might injure people or damage the outboard.

This document may be translated into other languages. In the event of any discrepancy, the English version shall prevail.

⚠ DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

Abbreviations Used In This Manual

Units of Measurement

A	Amperes
amp-hr	Ampere hour
fl. oz.	fluid ounce
ft. lbs.	foot pounds
HP	horsepower
in.	inch
in. Hg	inches of mercury
in. lbs.	inch pounds
kPa	kilopascals
ml	milliliter
mm	millimeter
N·m	Newton meter
P/N	part number
psi	pounds per square inch
RPM	revolutions per minute
°C	degrees Celsius
°F	degrees Fahrenheit
ms	milliseconds
μs	microseconds
Ω	Ohms
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current

List of Abbreviations

ABYC	American Boat & Yacht Council
ATDC	after top dead center
AT	air temperature sensor
BPS	barometric pressure sensor
BTDC	before top dead center
CCA	cold cranking amps
CFR	Code of Federal Regulations
CPS	crankshaft position sensor
EMM	Engine Management Module
EPA	Environmental Protection Agency
ICOMIA	International Council of Marine Industry Associations
ID	Inside dimension
MCA	marine cranking amps
MWS	modular wiring system
NMEA	National Marine Electronics Assoc.
ROM	read only memory
S.A.F.E.	speed adjusting failsafe electronics
SAC	start assist circuit
SAE	Society of Automotive Engineers
SYNC	synchronization
TDC	top dead center
TPS	throttle position sensor
USCG	United States Coast Guard
WOT	wide open throttle
WTS	water temperature sensor

Standard Torque Specifications

Size	In. Lbs.	Ft. Lbs.	N·m
No. 6	7–10	0.58–0.83	0.8–1.1
No. 8	15–22	1.25–1.83	1.7–2.5
No. 10	24–36	2–3	2.7–4.0
No. 12	36–48	3–4	4.0–5.4
1/4 in.	60–84	5–7	7–9.5
5/16 in.	120–144	10–12	13.5–16.5
3/8 in.	216–240	18–20	24.5–27
7/16 in.	336–384	28–32	38–43.5
M3	15–22	1.25–1.83	1.7–2.5
M4	24–35	2–2.9	2.7–4.0
M5	35–60	2.9–5	4.0–6.8
M6	84–106	7–8.8	9.5–12
M8	177–204	14.7–17	20–23
M10	310–336	25.8–28	35–38

IMPORTANT: These values apply only when a specific torque for a specific fastener is not listed in the appropriate section. When tightening two or more screws on the same part, DO NOT tighten screws completely, one at a time.

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to. Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to turning must be felt when reusing a locking fastener.

If replacement is specified or required because the locking fastener has become weak, use only authorized *Evinrude Genuine Parts*.

Product Reference and Illustrations

BRP US Inc. reserves the right to make changes at any time, without notice, in specifications and models and also to discontinue models. The right is also reserved to change any specifications or parts, at any time, without incurring any obligation to equip same on models manufactured prior to date of such change. Specifications used are based on the latest product information available at the time of publication.

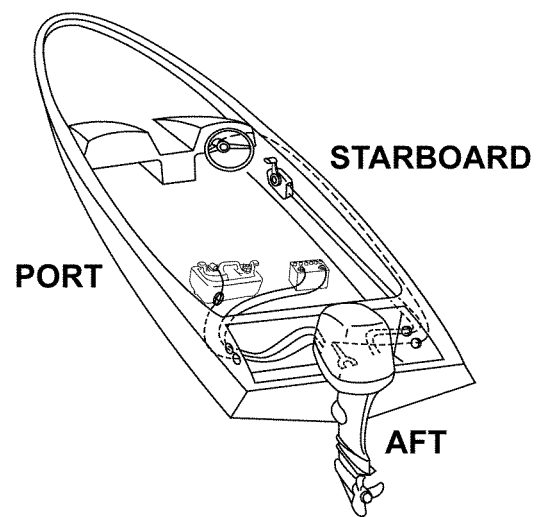
The continuing accuracy of this manual cannot be guaranteed.

All photographs and illustrations used in this manual may not depict actual models or equipment, but are intended as representative views for reference only.

Certain features or systems discussed in this manual might not be found on all models in all marketing areas.

All service technicians must be familiar with nautical orientation. This manual often identifies parts and procedures using these terms.

FORWARD

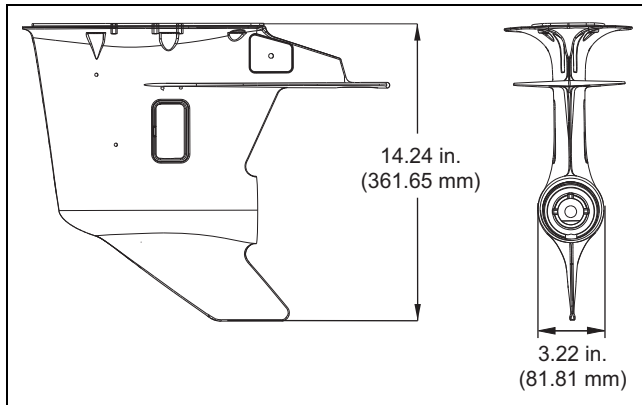


Gearcase Types

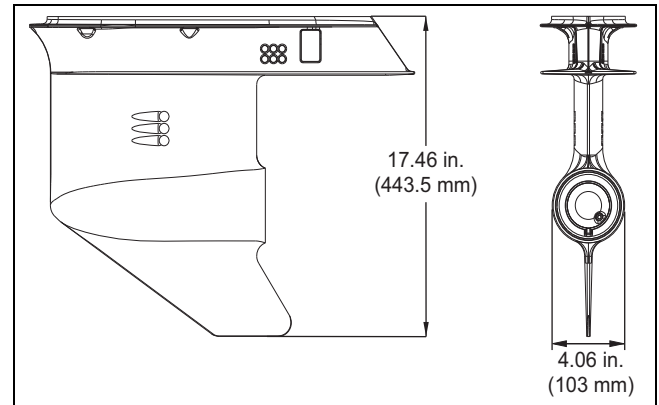
Outboard Model	Gearcase Type	Description of Features	Gear Ratio
2-Cylinder (15 – 30 HP)	H	•	2.15:1, 3:28, 0.465
2-Cylinder (40 – 60 HP)	F	•	2.90:1, 11:32, 0.34
3-Cylinder, L models with 20 in. shaft (75 HP)	S	• unique driveshaft with nutted pinion gear • 3-lug clutch dog and forward and reverse gears	2.0:1, 13:26, 0.50
3-Cylinder, L models with 20 in. shaft (60 H.O. & 90 HP)	S2	• unique driveshaft with bolted pinion gear • 6-lug clutch dog and forward and reverse gears	2.36:1, 11:26 0.42
V4, L models with 20 in. shaft (except Pontoon Series)			
3-Cylinder, X models with 25 in. shaft (60 H.O. & 90 HP)	O	• over-sized (V6) gearset • unique gear ratio • uses V6-style propeller	2.25:1, 12:27, 0.444
V4, L models with 20 in. shaft (Pontoon Series)			
V4, X models with 25 in. shaft			
V4, X models with 25 in. shaft (Counter Rotation)			
60° V6, L models with 20 in. shaft (non-H.O. models)		• standard gearset (V6)	1.86:1, 14:26, .538
60° V6, L models with 20 in. shaft (H.O. models only)	L2	• high speed profile • external water screens • pressed in propeller bearing housing • performance gearset	1.86:1, 14:26, .538
60° V6, X models with 25 in. shaft	M2	• front water inlets • straight leading edge • pressed in propeller shaft bearing housing with retaining flange • heavy duty standard gearset (V6)	1.85:1, 13:24 .542
60° V6, X models with 25 in. shaft (Counter Rotation)			
90° V6, all models with 20, 25 or 30 in. shaft			
90° V6, all models with 25 or 30 in. shaft (Counter Rotation)			

Housing Profiles

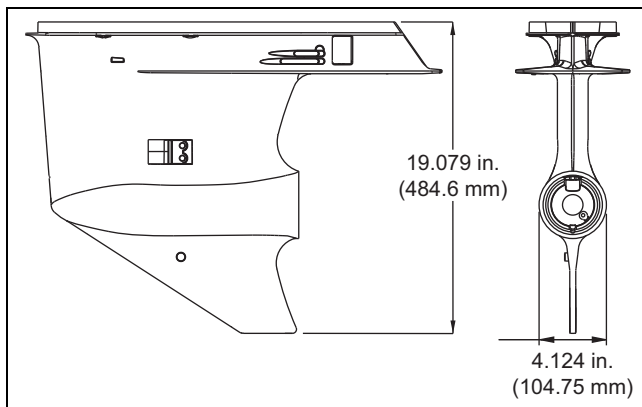
H-Type



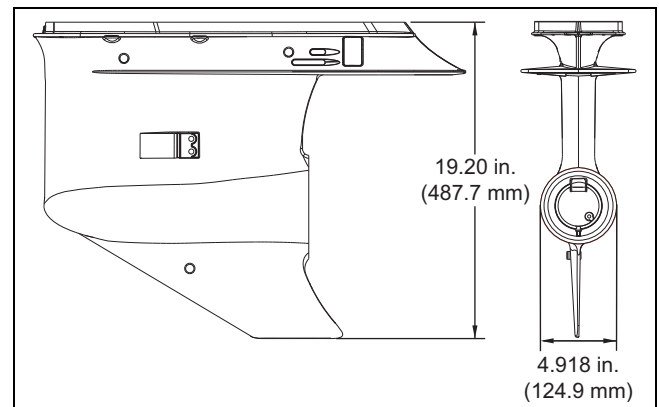
F-Type



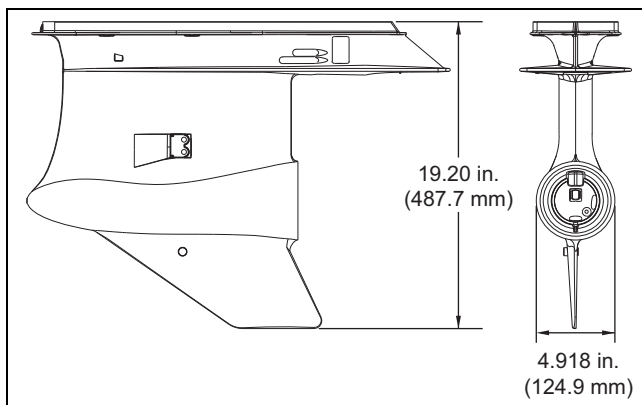
S-Type, S2-Type



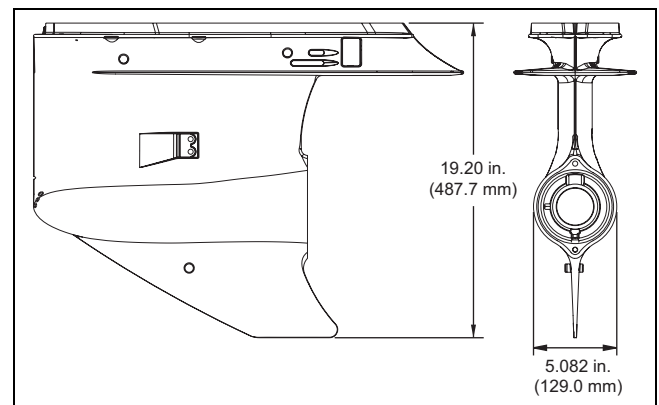
O-Type



L2-Type



M2-Type



Propeller Service

⚠ WARNING

When servicing the propeller, always shift the outboard to NEUTRAL, turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), so the outboard cannot be started accidentally.

Inspection

Carefully examine propeller and outboard for the following:

- Damaged blades and signs of propeller cavitation (burned paint, etc.)
- Spun or overheated inner hub
- Worn or twisted splines and inadequate lubricant
- Damaged or missing converging ring (if applicable)
- Damage to outer hub area
- Worn, missing, or incorrect thrust washer and spacer
- Correct size and style
- Check for bent or damaged propeller shaft and twisted splines.

Refer to **Propeller Hardware Installation** on p. 11.

Propeller Selection

NOTICE

Selection of the wrong propeller could reduce engine service life, affect boat performance, or cause serious damage to the powerhead.

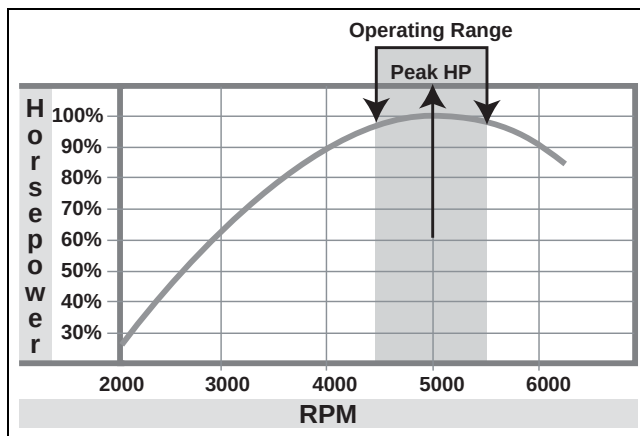
If the propeller blades have too much pitch, the engine will operate below its normal range at full throttle. Power will be lost, and powerhead damage could occur.

If the propeller blades have too little pitch, the engine will operate above its normal range and damage from overspeeding could occur.

Water testing with various propeller designs and sizes is the best method of propeller selection.

The correct propeller, under normal load conditions, will allow the engine to run near the mid-

point of the RPM operating range at full throttle. Refer to **Service Specifications** in the correct **Service Manual**.

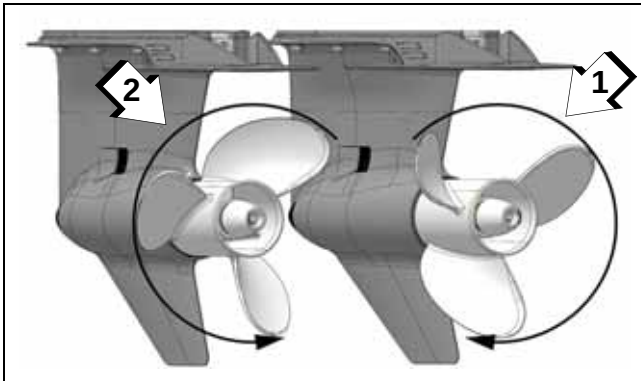


008329

When selecting a propeller, consider the following:

- Use an accurate tachometer to determine the engine's full-throttle RPM.
- The outboard should be trimmed for top speed.
- Select a propeller that suits the customer's application and allows the engine to run near the midpoint of the full-throttle operating range when the boat has a normal load.
- Occasionally, one propeller will not cover a wide range of boat applications — water skiing to high speed performance boating. In such cases, it might be necessary to have a propeller for each situation.
- Refer to the *Evinrude/Johnson Genuine Parts and Accessories Catalog* for propeller styles and sizes.
- Right-hand propellers are considered standard rotation propellers. When propelling a boat forward, the propeller rotates in a right-hand (clockwise) direction as viewed from the rear.
- Left-hand propellers are considered counter-rotation propellers. When propelling a boat for-

ward, the propeller rotates in a left-hand (counterclockwise) direction as viewed from the rear.



1. Right-hand rotation (clockwise)
2. Left-hand rotation (counterclockwise)

009079

⚠ WARNING

For dual-outboard installations, always check to be sure propellers are installed on the correct engines before aggressively operating the boat.

Propeller Hardware Installation

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

IMPORTANT: Depending on propeller style, different thrust bushings, spacers, and cotter pin keepers are used. See the *Evinrude/Johnson Genuine Parts and Accessories Catalog* for correct propeller hardware.

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

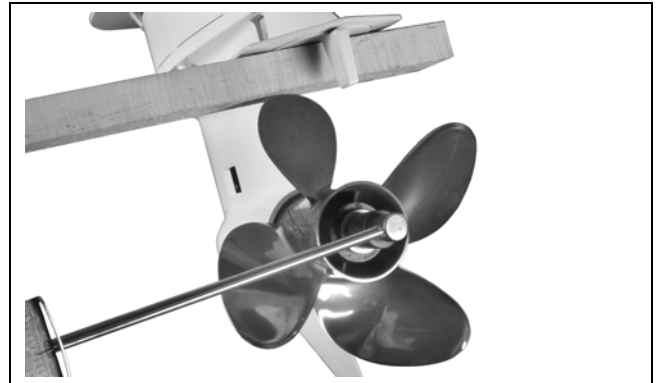
Install thrust bushing onto propeller shaft with taper of bushing matching taper of shaft.

If installing a propeller with an interchangeable hub, assemble the propeller following instructions provided with the propeller.

Align splines of propeller and shaft. Push propeller until seated on the thrust bushing.

Install the spacer over the propeller shaft splines.

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



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Install the propeller nut and tighten to a torque of:

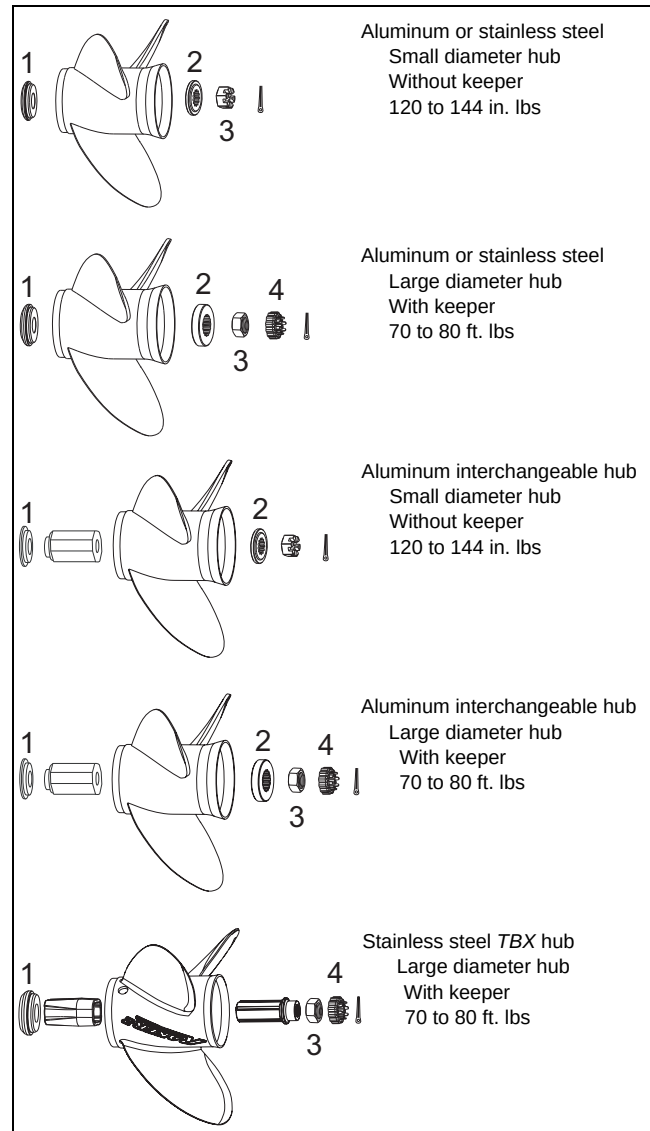
- With Keeper – 70 to 80 ft. lbs. (95 to 109 N·m)
- Without Keeper – 120 to 144 in. lbs. (13.6 to 16.3 N·m)

If cotter pin holes in the nut (without keeper) and shaft do not align, tighten further. Do not loosen.

Gearcase General Service

Gearcase Leak Test

Install keeper (if applicable). Install new cotter pin.



008057

IMPORTANT: After installation, make sure out-board 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.

Gearcase Leak Test

Drain lubricant before testing.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

Use Gearcase Pressure Tester, P/N 507977. 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 gauge does not indicate leakage, increase pressure to 16 to 18 psi (110 to 124 kPa). Check for leaks.

Make necessary repairs and repeat test.

Install Gearcase Vacuum Tester, P/N 507982. Apply 3 to 5 in. of vacuum (76 to 127 mm) Hg. with pump.

If vacuum gauge indicates leakage, apply oil around suspected seal. If leak stops or oil is drawn in, seal is defective.

Repeat test, gearcase must hold minimum of 15 in. vacuum (381 mm) Hg.



002388

Shift Rod Adjustment

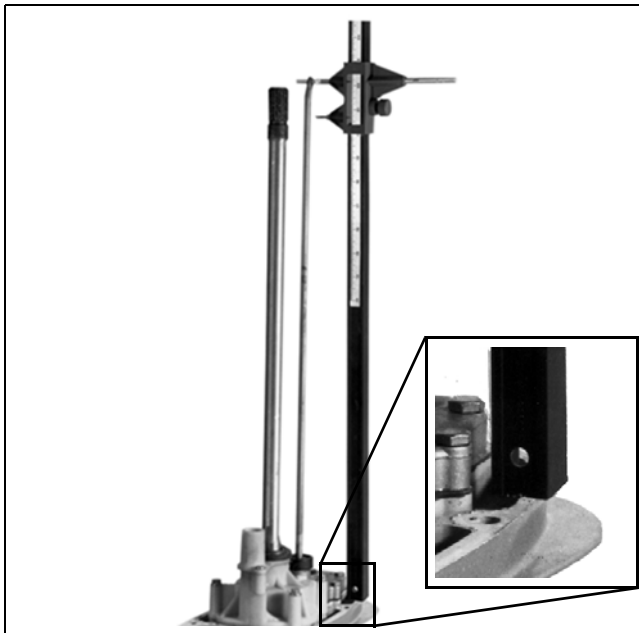
NOTICE

Before installing gearcase, shift rod adjustment MUST be checked. Refer to Shift Rod Adjustment on p. 324.

Note that the H-Type gearcase does NOT require Shift rod adjustment. Refer to **Shift Rod Installation** in the correct Service Manual.

Use the following procedure to adjust shift rod height for all other gearcase types.

Check the shift rod height from the shift rod hole to the surface of the gearcase using Universal Shift Rod Height Gauge, P/N 389997.



COA6166

With the gearcase in NEUTRAL, rotate the shift rod up or down as necessary for correct adjustment. Once correct height is achieved, rotate rod one half turn or less to direct offset to the rear.

IMPORTANT: The NEUTRAL detent is a two-step design. Make sure the NEUTRAL detent ball is in the center step before checking shift rod height.

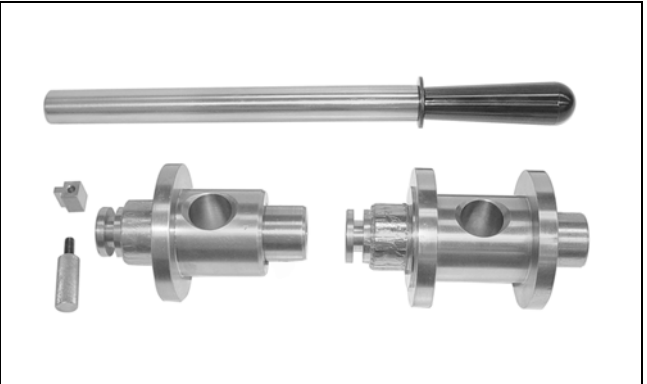
Shift Rod Height

Model	Type	Height All adjustments ± One-Half Turn
20 in. (L)	F	21 3/8 in. (21.38 in./ 543 mm)
3-Cylinder 20 in. (L)	S	21 1/4 in. (21.25 in./ 539.75 mm)
3-Cylinder 25 in. (X)	O	26 1/4 in. (26.25 in./ 666.75 mm)
60° V4 20 in. (L)	S2	20 15/16 in. (20.945 in./ 532 mm)
60° V4 25 in. (X)	O	25 15/16 in. (25.945 in./ 659 mm)
60° V6 20 in. (L)	O	20 15/16 in. (20.945 in./ 532 mm)
60° V6 20 in. (L)	"L2"	20 15/16 in. (20.945 in./ 532 mm)
60° V6 25 in. (X)	"M2"	25 15/16 in. (25.945 in./ 659 mm)
90° V6 20 in. (L)	"M2"	21 29/32 in. (21.906 in./ 556 mm)
90° V6 25 in. (X)	"M2"	26 29/32 in. (26.906 in./ 683 mm)
90° V6 30 in. (Z)	"M2"	31 29/32 in. (31.906 in./ 810 mm)

ICON Models: Use *Evinrude Diagnostics* software to calibrate shift actuator stroke. Refer to **Calibrate Actuator Stroke** in the correct **Service Manual**.

Gearcase Housing Inspection S, S2, L2, M2-Type

Thoroughly clean gearcase housing to remove all dirt and debris prior to inspection. Inspect pinion bearing and forward thrust surface of gearcase housing. Use Gearcase Alignment Gauge Kit, P/N 5006349 to check the condition of gearcase housing prior to reassembly. Refer to instructions provided with kit.

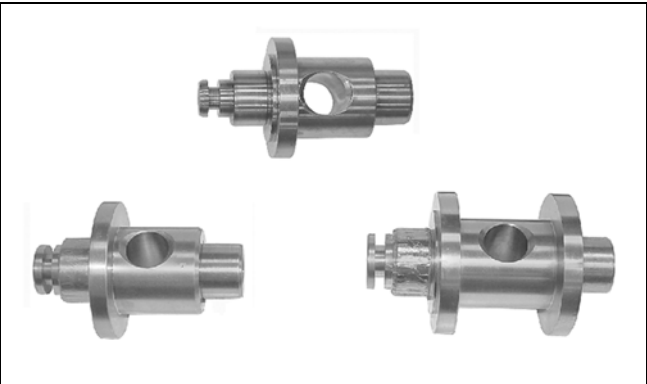


Gearcase Alignment Gauge Kit, P/N 5006349

004315

Use additional Gauging Head as follows:

Gearcase Type	Gauge Head P/N
S-Type	352879
S2-Type	352879
L2-Type	5007750
M2-Type	5007749



Additional Gauge Heads

006787

NOTICE

Use Alignment Gauge Puller, P/N 354718, to install and remove press fit propeller shaft bearing housing in L2 Type gearcase housings.

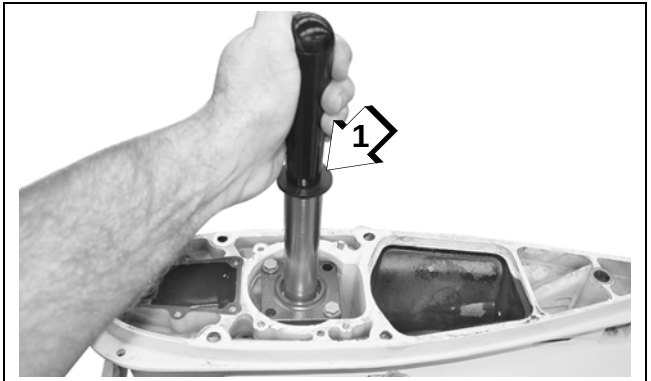
Failure to follow this procedure will result in inability to remove gauging head, forward thrust bearing and forward bearing housing from gearcase housing.



Alignment Gauge Puller, P/N 354718

354718

IMPORTANT: DO NOT force gauging shaft into alignment hole. Shaft **MUST** slide easily into hole of gauging head. If shaft does not slide into hole, gearcase housing is damaged and **must** be replaced.



1. Gauging shaft

004347

Driveshaft Shimming

NOTICE

If a new pinion gear is needed, replace gear set before shimming.

Pinion gear backlash is adjusted by using shims between the driveshaft bearing housing and the thrust washer. When installing a new thrust bearing or washer, bearing housing, pinion, or driveshaft, it is necessary to properly shim the assembly to restore the correct clearance.

Use Driveshaft Shimming Tool, P/N 5005925.

Shim gauge bars are precision made and should be handled carefully. The length of each bar is stamped near the part number. This dimension is 0.020 in. (0.508 mm) shorter than the actual shimmed length of the driveshaft.

IMPORTANT: Clean pinion and driveshaft before assembly. Replace any damaged parts.

Assemble the driveshaft bearing housing, thrust washer, thrust bearing, and pinion onto the driveshaft.

Use the chart below to select the correct special tools for the gearcase type being shimmed.

Gearcase Type			
	Driveshaft Seal Protector		
		Collar	
			Gauge Bar
F	312403	328363	359708
S	318674	341440	328367
S2	318674	341440	328367
O	318674	341440	328367
L2	318674	341440	328367
M2	318674	341440	349957

Use the correct Driveshaft Seal Protector, when installing or removing the bearing housing.

IMPORTANT: Clean pinion and driveshaft before assembly. Replace any damaged parts.

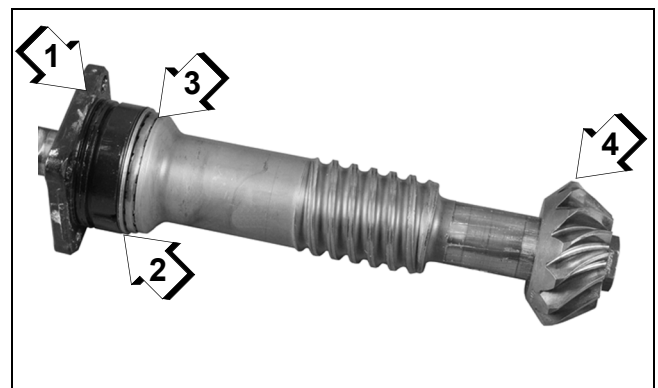
F, S, O, L2, M2-Type Gearcases

Assemble the driveshaft bearing housing, thrust washer, thrust bearing, and pinion onto the driveshaft. Use Driveshaft Seal Protector, P/N 318674, when installing or removing the bearing housing.

Lightly coat the threads of the pinion nut with out-board lubricant.

F-Type gearcase only: Tighten to a torque of 40 to 45 ft. lbs. (54 to 60 N·m).

All other gearcases: Tighten to a torque of 100 to 110 ft. lbs. (136 to 149 N·m).



1. Driveshaft bearing housing
2. Thrust washer
3. Thrust bearing
4. Pinion

010321

IMPORTANT: The original pinion nut may be used for shimming, but must **NOT** be used in final assembly.

S2 Type Gearcase Only

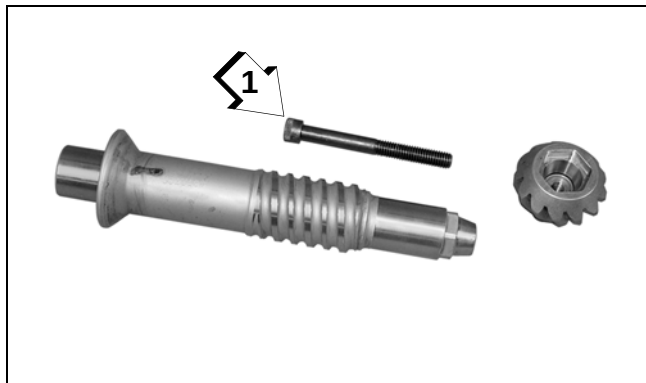
Assemble the driveshaft bearing housing, thrust washer, thrust bearing, and pinion onto the driveshaft. Install shimming screw, P/N 352878 and tighten to a torque of 47 to 51 ft. lbs. (64 to 69 N·m).

IMPORTANT: The original pinion screw is **NOT** used for shimming, but is used in final assembly.

Gearcase General Service

Driveshaft Shimming

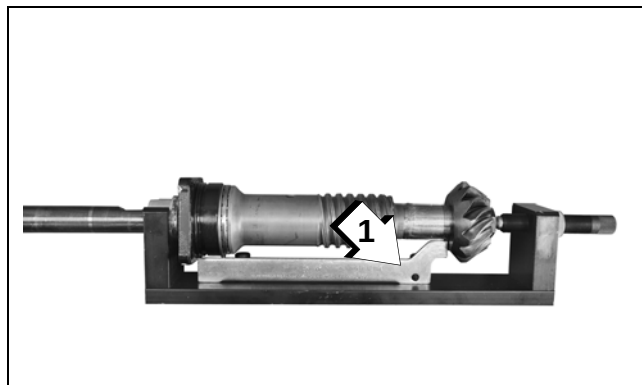
Use Shimming Screw, P/N 352878 (service tool) for shimming procedure.



1. Shimming screw

005414

Lay the tool base on its side. Position the shim gauge bar against guide pins of the tool base.



1. Shim gauge bar

006914

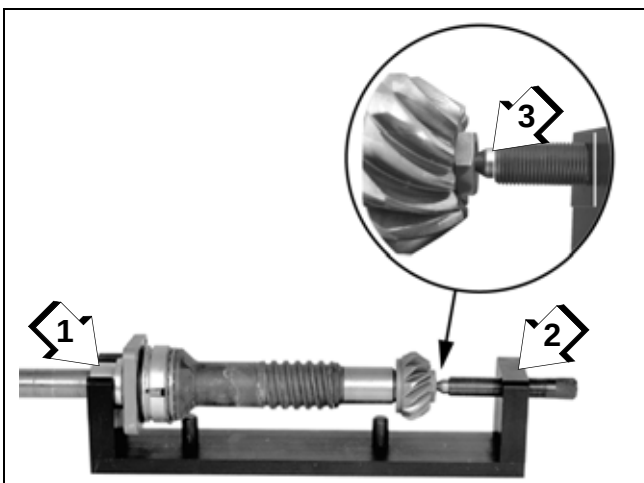
All Gearcases

Select correct collar and shim gauge bar:

- Collar: P/N 341440
- Shim gauge bar: P/N 328367

Slide the collar onto the driveshaft with large end in contact with the bearing housing.

Insert the assembled driveshaft into the tool base and tighten preload screw against the driveshaft until groove on the spring-loaded plunger is flush with end of threads. Tighten locking ring on preload screw.



1. Collar
2. Tool base
3. Groove

COA3566A

Check squareness of the bearing housing mounting surface by holding the shim gauge bar against the pinion while rotating **just the bearing housing**. Use a feeler gauge to measure clearance between the gauge bar and the bearing housing between each pair of screw holes. Replace the bearing housing and repeat check if variance is greater than 0.004 in. (0.101 mm).

Check squareness of the pinion to the driveshaft. Hold the shim gauge bar against the bearing housing (between the screw holes) while rotating **just the driveshaft and pinion assembly**. Measure clearance between the gauge bar and the pinion at several locations. If variance is greater than 0.002 in. (0.050 mm) replace the pinion or driveshaft, as necessary, and repeat check.

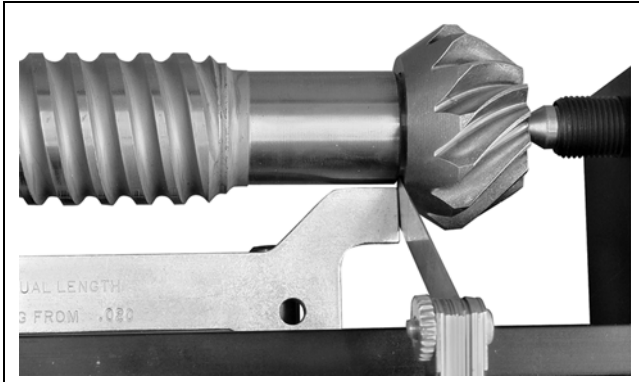
Subtract the average clearance measurement from 0.020 in. (0.508 mm) to determine the correct shim thickness required. Select the fewest number of shims to achieve the correct thickness.

Remove the driveshaft from the tool and add the required shims between the bearing housing and the thrust washer.

IMPORTANT: Use extreme care when removing bearing housing to avoid damaging the seals. Use Driveshaft Seal Protector, P/N 318674.

Rotate the driveshaft several revolutions to seat bearings.

Check clearance again. The measurement between the gauge bar and pinion should be 0.020 in. (0.508 mm).



005417

Remove the nut and pinion from the driveshaft. Discard the nut.

S2-Type Gearcase Only

Remove the Shimming Screw, P/N 352878, and pinion from the driveshaft.

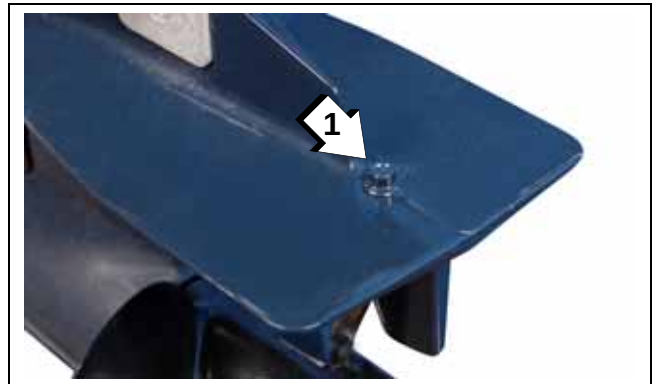
Trim Tab

Note where the index mark on the gearcase aligns with the index mark of the adjustable trim tab so the trim tab can be installed in the same position.

H-Type Gearcase

Removal

Remove the trim tab retaining screw and trim tab from the gearcase.



1. Trim tab retaining screw

007652

Installation

Apply *Gasket Sealing Compound* to threads of the trim tab screw. Install and align the trim tab with the index marks noted prior to disassembly. Tighten the trim tab screw to a torque of 60 to 84 ft. lbs. (7 to 9.5 N·m). For adjustment, refer to **Trim Tab Adjustment** on p. 18.

All Other Gearcases

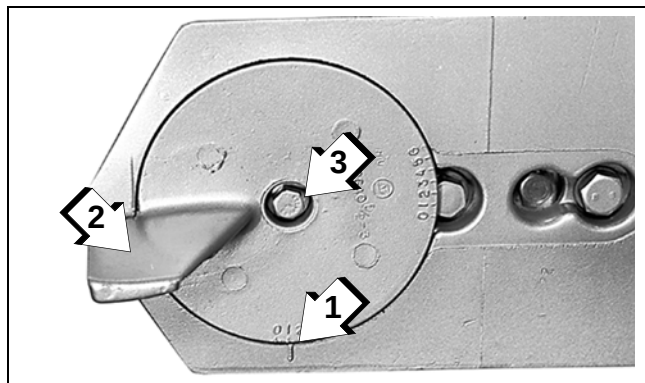
Removal

Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position.

Gearcase General Service

Trim Tab

Remove the trim tab retaining screw, gasket if equipped and trim tab from the gearcase.



1. Index mark
2. Trim tab
3. Trim tab retaining screw

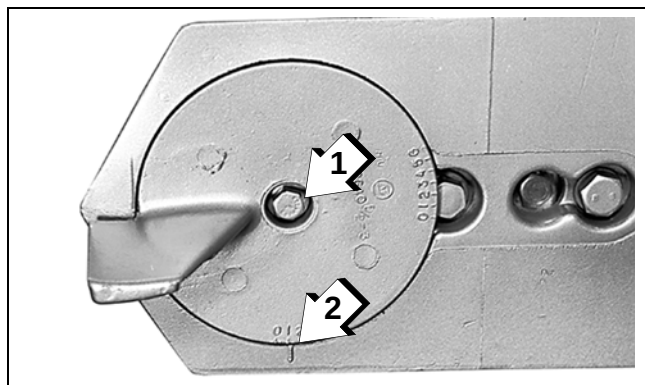
COA3663

Installation

Apply *Triple-Guard* grease to threads of the trim tab screw. If equipped, install gasket on gearcase.

Install and align the trim tab with the index marks noted prior to disassembly.

Tighten the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to **Trim Tab Adjustment** on p. 18.



1. Trim tab screw
2. Index mark

COA3663

NOTICE

Standard rotation and counter rotation trim tabs must not be interchanged. This would result in inadequate cooling water supply to the propeller hub.

Trim Tab Adjustment

⚠ WARNING

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.

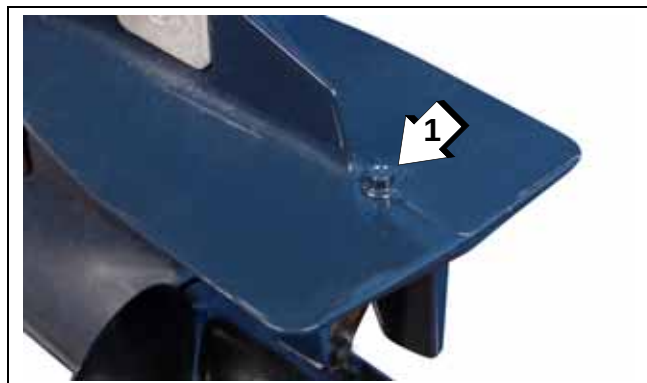
IMPORTANT: A single trim tab adjustment will relieve steering effort under only one set of speed, outboard angle and load conditions. No single adjustment can relieve steering effort under all conditions.

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

- With the remote control in NEUTRAL and the engine OFF, loosen the trim tab screw.
- If the boat pulled to the right, move rear of the trim tab slightly to the right.
- If the boat pulled to the left, move rear of the trim tab slightly to the left.

Tighten the trim tab screw as follows:

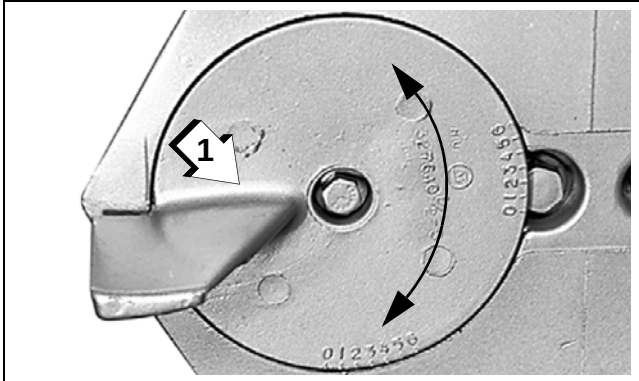
- **H-Type Gearcase:** 60 to 80 in. lbs. (7 to 9 N·m).



1. Trim tab screw

007044

- **F, S, S2-Type Gearcases:** 35 to 40 ft. lbs. (47 to 54 N·m).
- **O, L2, M2-Type Gearcases:** 35 to 40 ft. lbs. (47 to 54 N·m).



1. Trim tab screw

COA3663

Test the boat and, if needed, repeat the procedure until steering effort is as equal as possible.

Outboards with High Transom Heights

The trim tab may be above the surface of the water when the outboard is trimmed out. Steering effort might increase. Lower the trim setting to submerge the trim tab and to reduce steering effort.

Test the boat and, if needed, repeat the procedure until steering effort is as equal as possible.

Outboards with High Transom Heights

The trim tab may be above the surface of the water when the outboard is trimmed out. Steering effort might increase. Lower the trim setting to submerge the trim tab and to reduce steering effort.

Dual Standard Rotation Outboards

Move both trim tabs equally and in the same direction.

Dual Outboards, One Counter and One Standard Rotation

Set both trim tabs to the center position.

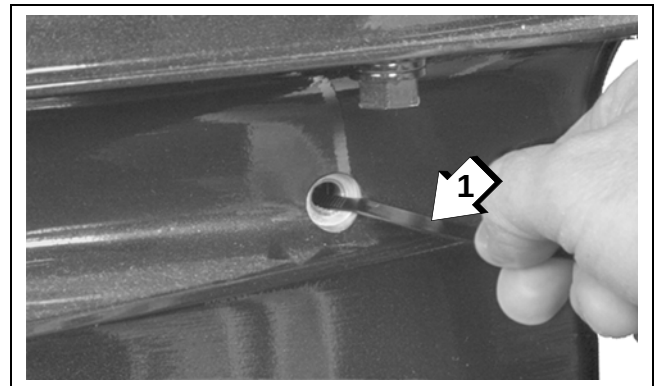
Gearcase Lubricant

Draining

⚠ WARNING

Gearcase lubricant may be under pressure and/or hot. If plug is removed from a recently operated outboard, take precautions to avoid injury.

IMPORTANT: Always check the fill level of the gearcase lubricant at the upper plug before removing the lower, drain/fill plug. A tie strap can be used to check lubricant level.

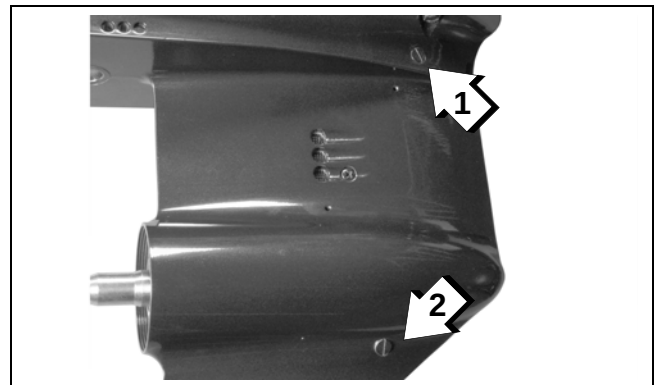


1. Tie strap

000072

If lubricant level is low, refer to **Gearcase Leak Test** on p. 12.

Remove the lubricant level plug, then the lubricant drain/fill plug, and drain the lube from the gearcase into a container.



1. Lubricant level plug

2. Lubricant drain/fill plug

001993

Gearcase General Service

Gearcase Lubricant

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

Inspection

Inspect the lubricant and the magnets on the plugs for metal chips. 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.

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, put lubricant into a glass container. Allow the oil to settle for a minimum of one hour to determine if there is an abnormal amount of water in the oil.

If water is present, refer to **Gearcase Leak Test** on p. 12.

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

Refer to the **Inspection and Maintenance Schedule** in the correct **Service Manual** for service frequency and recommended lubricants.

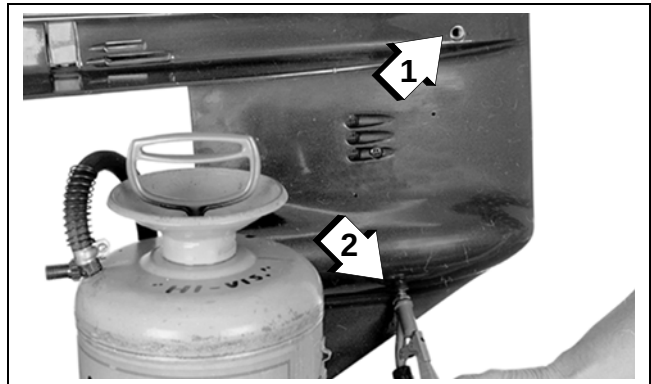
Secure the gearcase in a vertical position.

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

Use Gearcase Filler, P/N 501882, to slowly fill the gearcase with *HPF PRO* lubricant through the drain/fill hole until it appears at the oil level hole.

IMPORTANT: Filling the gearcase too quickly can cause air pockets and the gearcase may not fill completely.

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

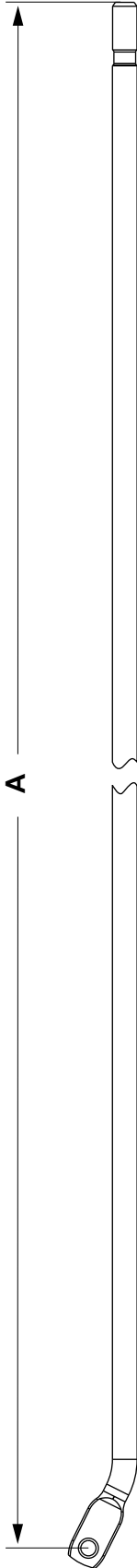
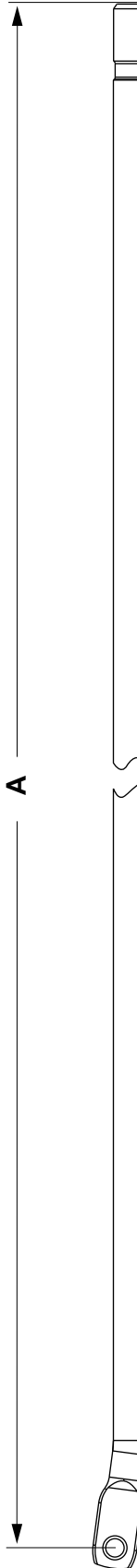
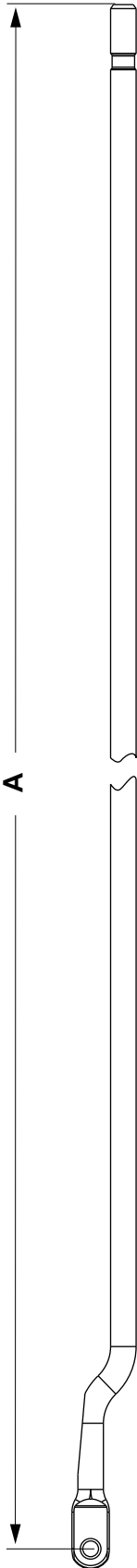


1. Lubricant level plug
2. Lubricant drain/fill plug

27023

The recommended gear lubricants are formulated for marine applications. Do not use automotive gear lubricants, engine oils, or any other oil or grease.

Shift Rod Application Chart

Model	Year	Shaft Length	Gearcase Type	Shift Rod P/N	Height Adjustment (±1/2 turn)	Shift Rod Dimension (A)	
3-Cylinder Inline	AA & newer	20	S, S2	351179	21 1/4 in (53.975 cm)	31.0 in (78.74 cm)	
		25	O	352886	26 1/4 in (66.675 cm)	35.85 in (91.05 cm)	
							
115 – 130 HP 60° V4	2007-2012	20	S2	350464	20 15/16 in (53.20 cm)	30.57 in (77.65 cm)	
	2007-2012	25	O	352957	25 15/16 in (65.90 cm)	35.55 in (90.29 cm)	
135 – 200 HP 60° V6	2007-2012	20	L2	350464	20 15/16 in (53.20 cm)	30.57 in (77.65 cm)	
	2007-2012	20	O	350464	20 15/16 in (53.20 cm)	30.57 in (77.65 cm)	
	2007-2012	25	M2	352808	25 15/16 in (65.90 cm)	35.32 in (89.71 cm)	
							
200 – 300 HP 90° V6	2005-2012	20	M2	347300	21 29/32 in (55.60 cm)	31.25 in (79.37 cm)	
	2005-2012	25	M2	347301	26 29/32 in (68.30 cm)	36.25 in (92.07 cm)	
	2005-2012	30	M2	347391	31 29/32 in (81.00 cm)	41.25 in (104.77 cm)	
							

External Water Screen Application Chart

This chart lists standard and available optional water screens. For applications which may require additional cooling water, select optional water screens based on the type of application.

S-Type and S2-Type Gearcases				
Individual Water Screens [†]	Port	Starboard	Height	Application
Standard	337778	337778	0.058	Aerated / Weedy
Optional	339247	339247	0.200	Severely aerated
Screws, P/N 340665				
† Note: Screens are symmetrical, use two per outboard.				
O-Type Gearcase				
Individual Water Screens ^{††}	Port	Starboard	Height	Application
Standard	337778	337778	0.023	General
Optional	339247	339247	0.055	Aerated
Screws, P/N 337061				
† Note: Screens are symmetrical, use two per outboard.				
M2-Type and L2-Type Gearcases				
Water Screen Kit ^{††}	Port	Starboard	Height	Application
High Performance, P/N 5005124 (L2 Standard)	348479	348480	Flush	High Speed (over 60 MPH)
High Flow, P/N 5005063	350264	350265	0.060	General
Ultra High Flow, P/N 5006337 (M2 Standard)	350946	350945	0.160	Aerated
Ultra High Flow +1/4, P/N 5007081	352790	352791	0.410	Severely aerated
Screws, P/N 337061				
†† Note: Kits include both screens, screws and instruction sheet.				

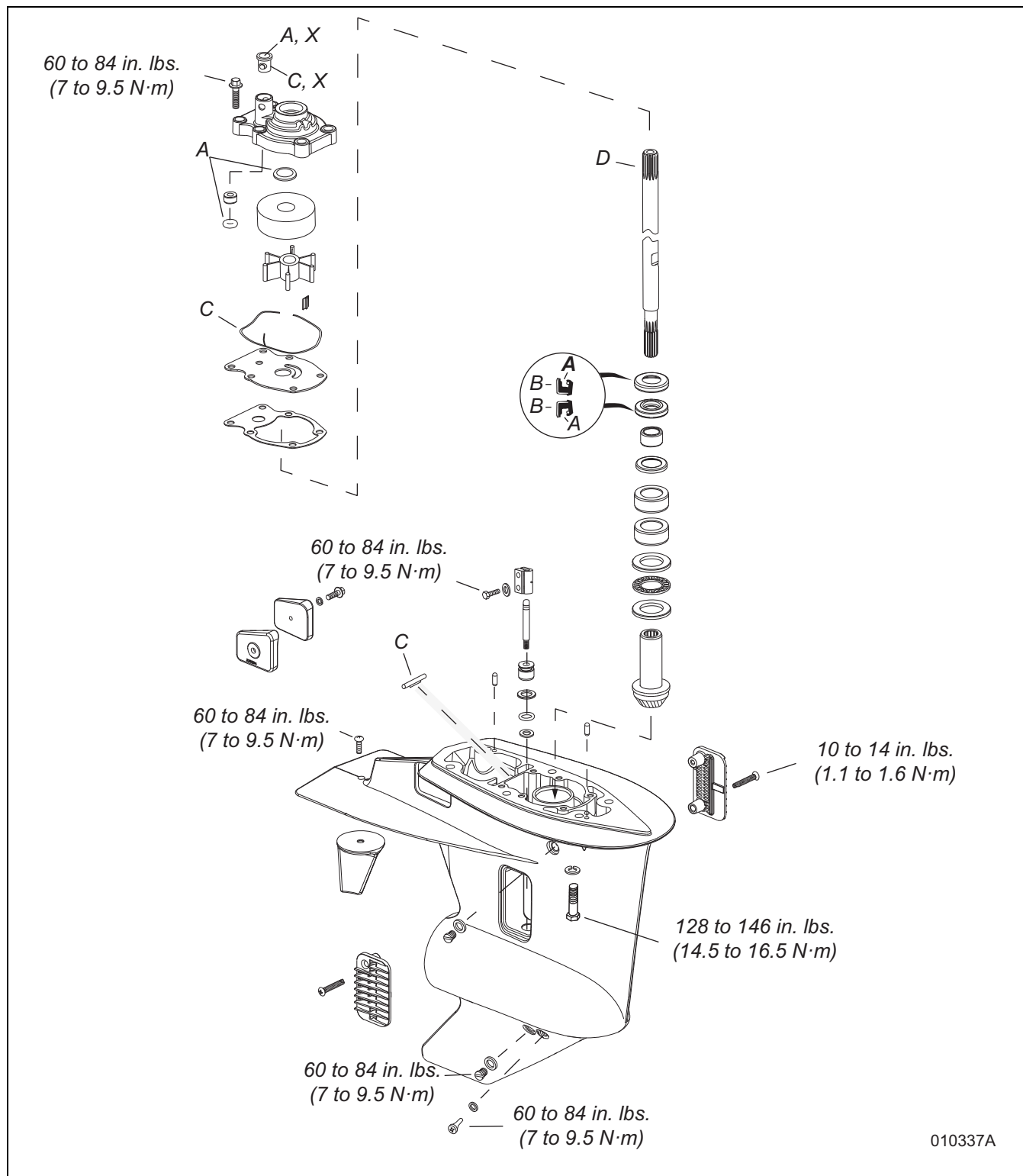
H-Type Gearcase

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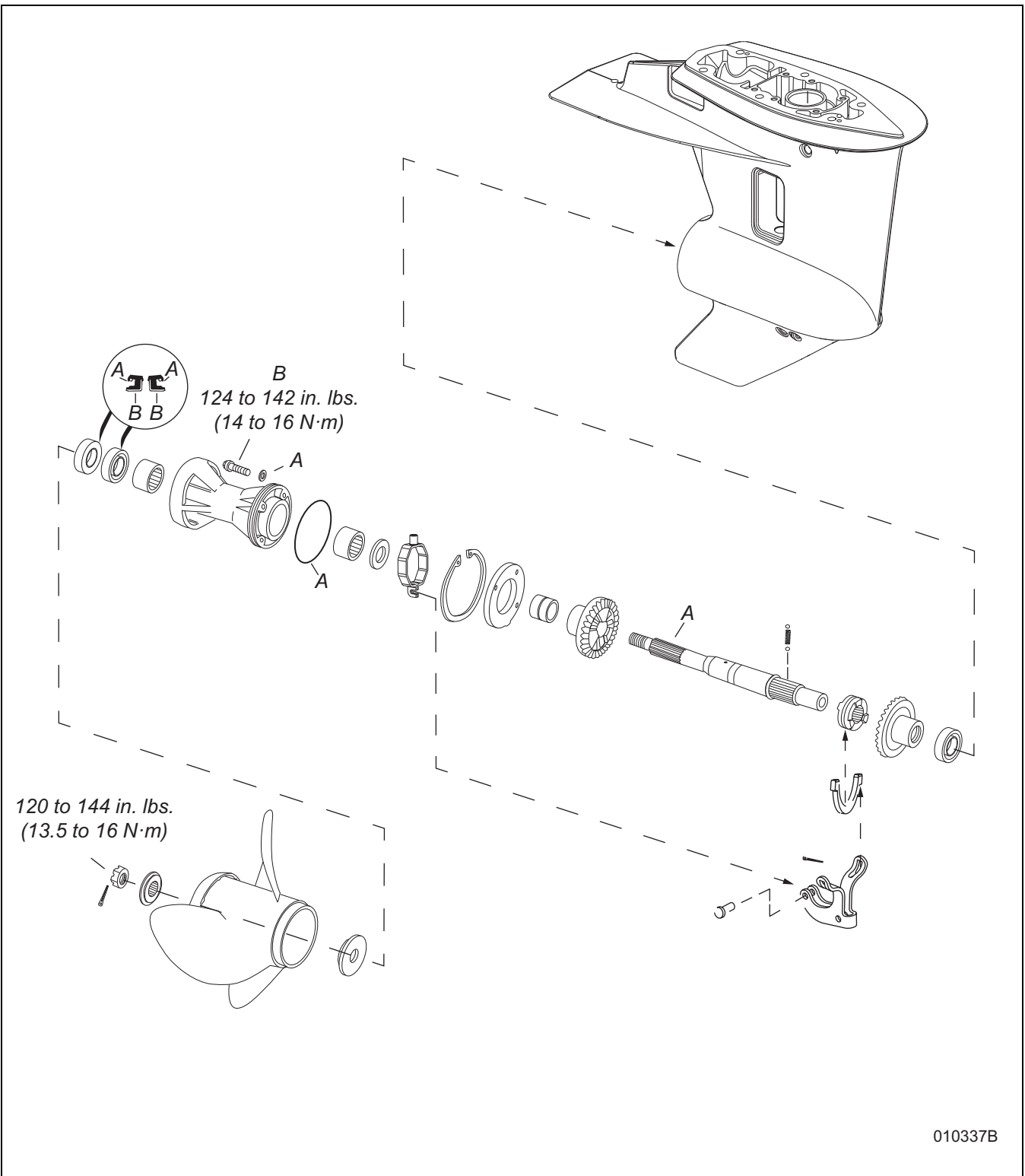
2

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Service Chart



A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	H Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual



A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	H Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

Gearcase Removal and Installation

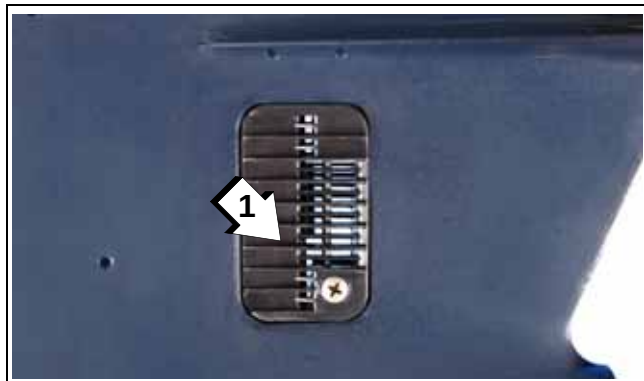
Gearcase Removal

⚠ WARNING

To prevent accidental starting while servicing, disconnect the Crankshaft Position Sensor (CPS).

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

Remove water intake screens.



1. Water intake screen

007649

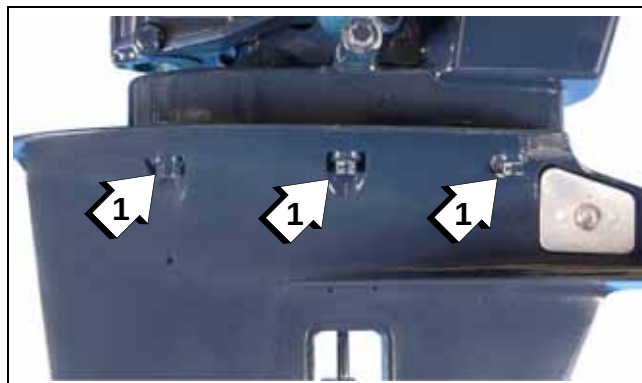
Remove the upper shift rod connector screw.



1. Shift rod connector screw

007650

Remove the six gearcase retaining screws or nuts (25 inch models).



1. Gearcase retaining screws

007653

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

H-Type Gearcase

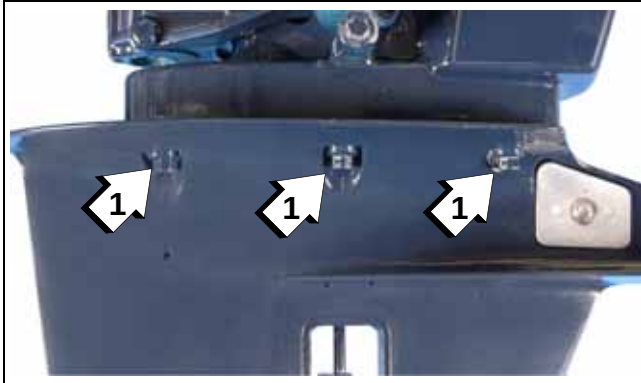
Gearcase Removal and Installation

2

Slide the gearcase into place, making sure that:

- Driveshaft engages the crankshaft
- Water tube enters grommet on water pump
- Upper shift rod enters the shift rod connector.

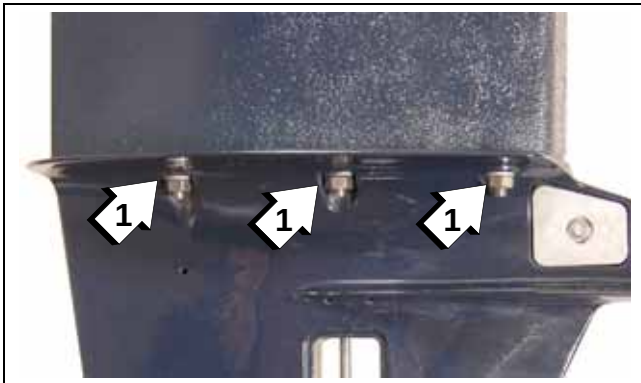
Apply *Gasket Sealing Compound* to threads of the gearcase retaining screws. Install and tighten the screws to a torque of 128 to 146 in. lbs. (14.5 to 16.5 N·m).



1. Gearcase retaining screws

007653

For 25 inch models, apply *Triple-Guard* grease to threads of the studs. Install washers and gearcase retaining nuts. Tighten nuts to a torque of 128 to 146 in. lbs. (14.5 to 16.5 N·m).

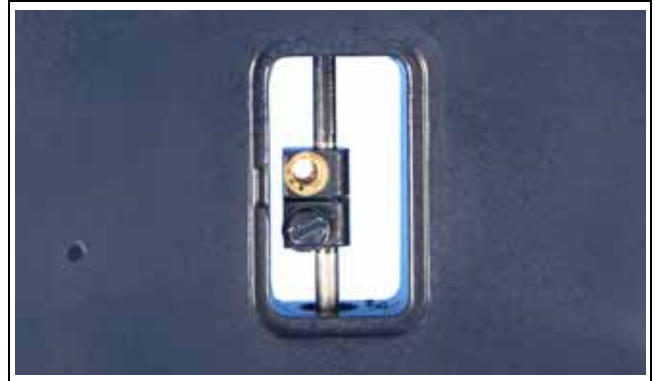


1. Gearcase retaining nuts

008371

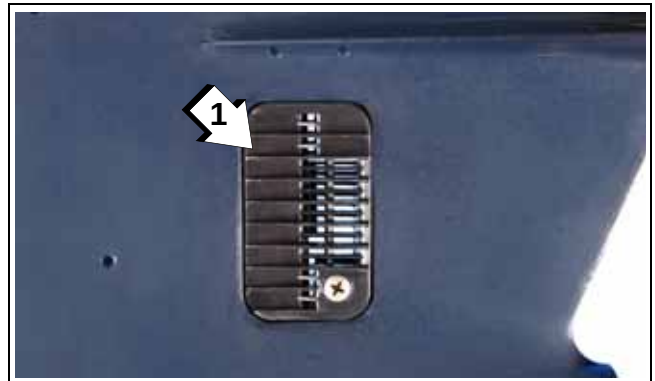
Align the groove in the upper shift rod with the screw hole in the connector. Apply *Gasket Sealing Compound* to threads of the shift rod connector

screw. Tighten screw, with washer, to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



007654

Install the port and starboard water intake screens with water intake holes positioned at the rear of gearcase. Tighten screws to a torque of 10 to 14 in. lbs. (1.1 to 1.6 N·m).



1. Water intake screen

007649

⚠ WARNING

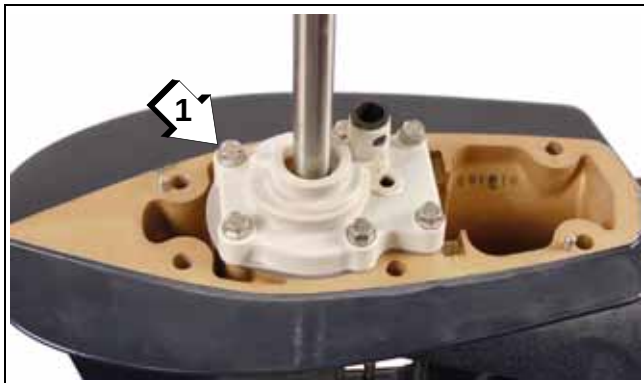
To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Water Pump Service

Disassembly

Remove the impeller housing screws.

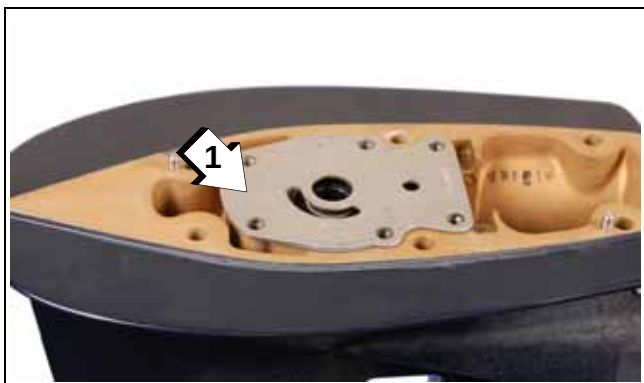


1. Screws

007655

Pull up on the driveshaft and remove the driveshaft with the water pump assembly from the gearcase. Remove the water pump assembly from the driveshaft.

Remove the impeller plate and gasket. Discard the gasket.



1. Impeller plate

007656

Remove the water pump grommet, all O-rings, and the shift rod bushing from the impeller housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

Check liner and wear plate for scoring, distortion, and impeller material transfer.

Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

Oil and install the shift rod bushing into the impeller housing.

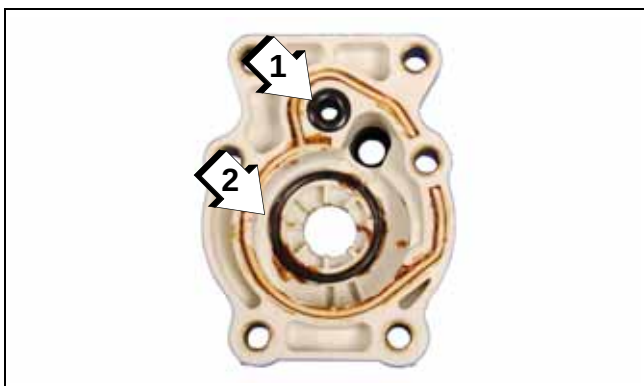


1. Shift rod bushing

007657

Apply *Triple-Guard* grease to the shift rod O-ring and install below bushing.

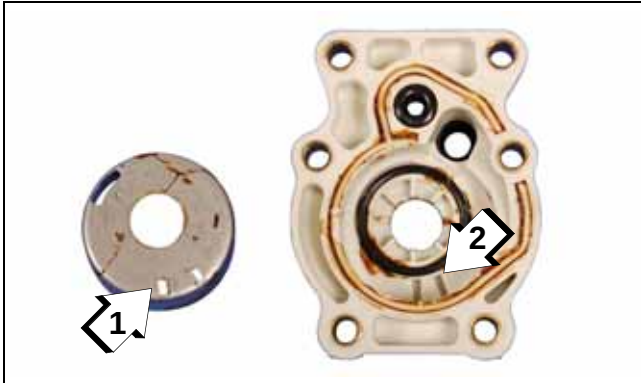
Apply a thin bead of *Adhesive 847* in the inner groove of the impeller housing and install a new impeller cup O-ring.



1. Shift rod O-ring
2. Impeller cup O-ring

007658

Lightly coat the exterior of the impeller cup with *Gasket Sealing Compound*. Align tabs of impeller cup with location holes of impeller housing and install the impeller cup into the impeller housing.

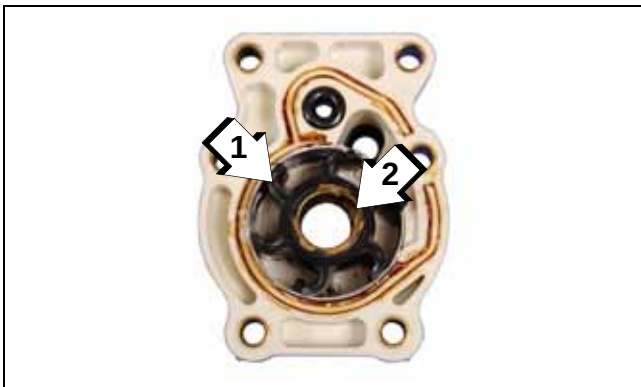


1. Tabs, impeller cup
2. Location holes

007659

Lightly coat the inside of the impeller cup with oil. With a counterclockwise rotation, install the impeller into the impeller cup.

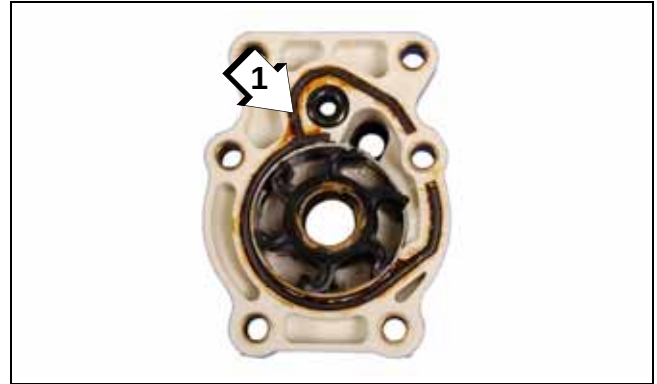
IMPORTANT: The sharp edge of key slot in the impeller is the leading edge during rotation.



1. Impeller
2. Sharp edge

007660

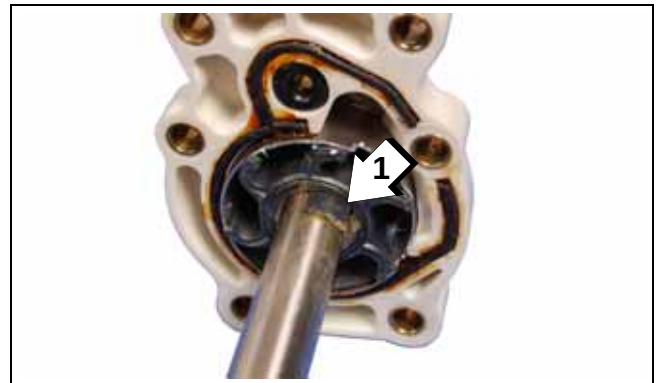
Apply *Adhesive 847* to the outer seal groove of the impeller housing. Install a new seal into the groove.



1. Seal

007661

Lightly oil pinion splines of the driveshaft. Slide the driveshaft through the impeller housing and impeller until drive key flat of the driveshaft is below the impeller. Align drive key flat with groove of the impeller. Install the impeller drive key.



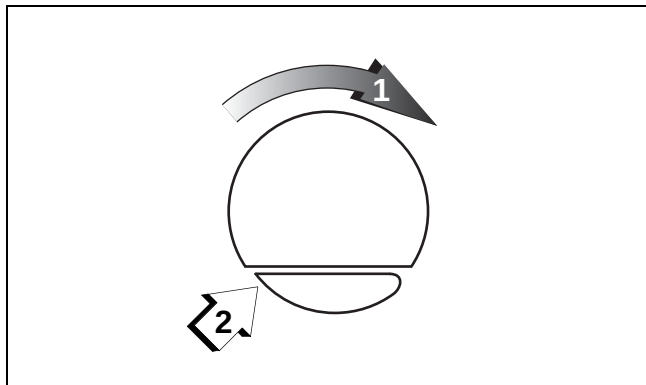
1. Drive key

007662

H-Type Gearcase

Water Pump Service

Sharp edge of the key is leading edge during driveshaft rotation. Slide the impeller housing down the driveshaft. Engage the impeller with the key.



1. Driveshaft rotation
2. Drive key

CO2995

Turn the driveshaft until holes of the impeller housing are aligned with holes of the gearcase. Apply *Gasket Sealing Compound* to threads of the impeller housing screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



007663

NOTICE

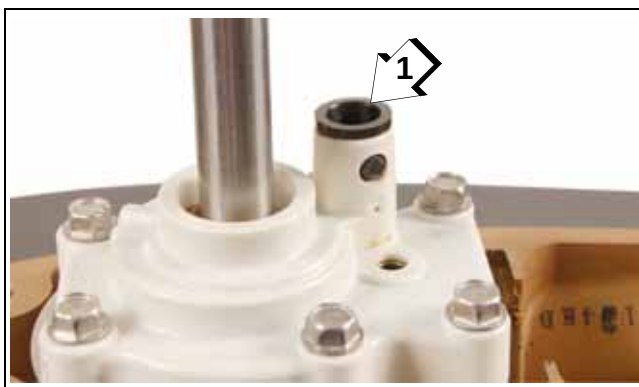
Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Lightly coat both sides of a new impeller plate gasket with *Gasket Sealing Compound*. Place gasket on the gearcase.

Place the impeller plate over the gasket.

Slide the driveshaft down into the gearcase and engage the pinion.

Apply *Adhesive 847* to outside of water tube grommet. Install grommet and locate grommet bosses into holes of impeller housing. Apply *Triple Guard* grease to the inside diameter of the grommet.



1. Grommet

007664

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

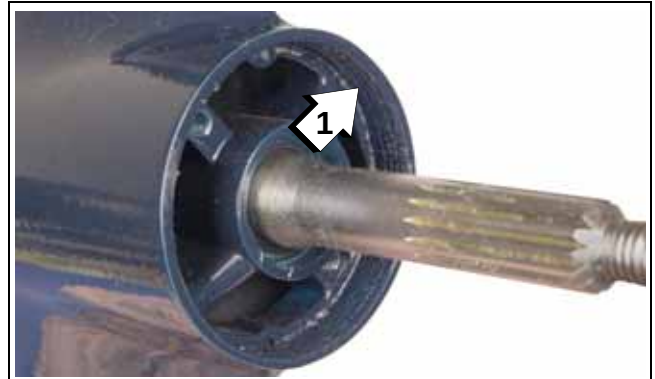
Remove gearcase. Refer to **Gearcase Removal and Installation** on p. 26.

Remove water pump. Refer to **Water Pump Service** on p. 28.

Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skag, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **Propeller Shaft** — Check for bent or damaged shaft. Check for twisted splines and damaged threads.
- **Shift Rod** — Check for bent, or binding rod.

- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

007665

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.

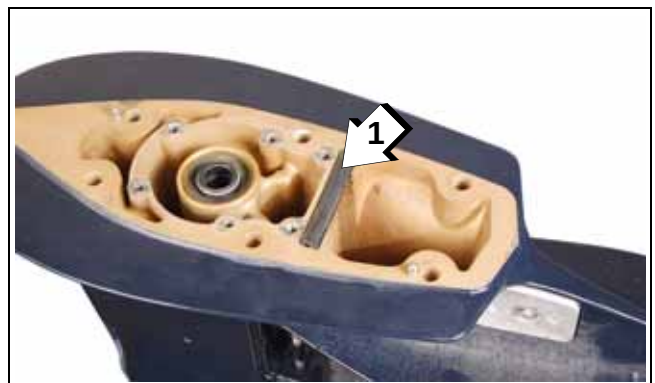


1. Gearcase anode

007666

- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.

Remove and discard exhaust seal assembly.



1. Seal assembly

007667

Propeller Shaft Bearing Housing Removal

Remove the two propeller shaft bearing housing screws.

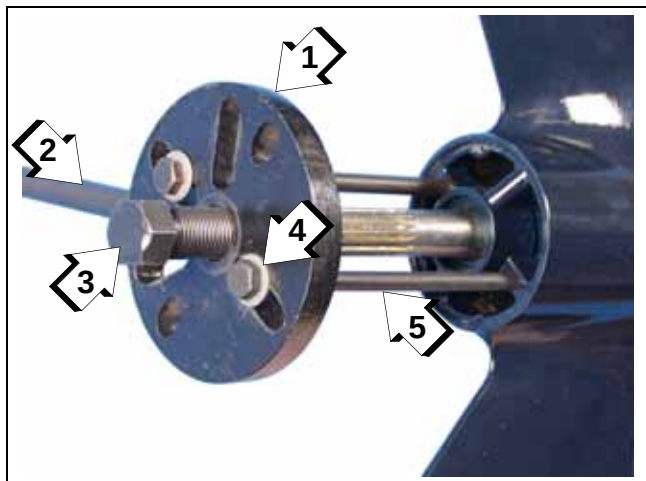


1. Screws

007668

Remove the propeller shaft bearing housing from the gearcase using the Universal Puller Set, P/N 378103:

- Puller body, P/N 307636
- Handle, P/N 307638
- Pressing screw, P/N 307637
- Two flat washers, P/N 307639
- Two 1/4-20 x 6 in. screws (obtain locally)



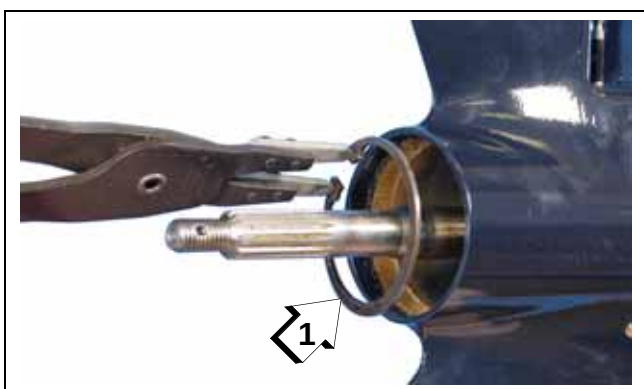
1. Body
2. Handle
3. Pressing screw
4. Washers
5. Screws (obtain locally)

007669

Remove the retaining ring using Retaining Ring Pliers, P/N 331045.

⚠ CAUTION

Retaining ring is under extreme pressure during removal and installation. To prevent personal injury, wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers. After the retaining ring is removed far enough from the gearcase to clear the housing, release the tension on the pliers while retaining ring is still around the propeller shaft.



1. Retaining ring

007670

Remove the retainer plate from the gearcase.



1. Retainer plate

007671

Shifter, Gear and Propeller Shaft Removal

Unscrew the lower shift rod from the shifter yoke and remove the shift rod from the gearcase.



1. Lower shift rod

007672

Use long-nose pliers to remove the shift yoke.



007673

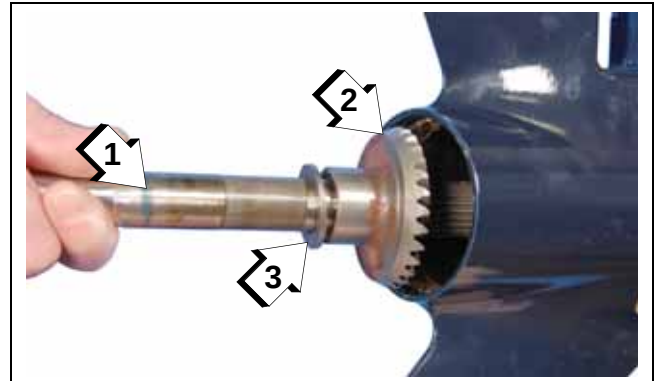
Remove the shifter lever pivot pin. Discard the pivot pin O-ring.



1. Shift lever pivot pin

007674

Remove the propeller shaft and reverse gear components from the gearcase.

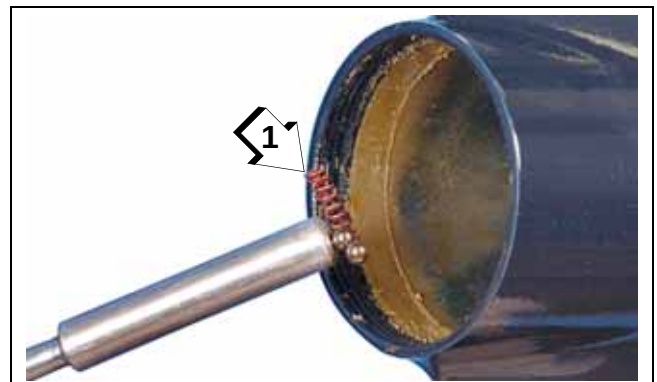


- 1. Propeller shaft
- 2. Reverse gear
- 3. Thrust washer

007675

IMPORTANT: Shifter detent balls and spring will pop out of the clutch when the propeller shaft is removed.

Use a magnet to locate and remove the two shifter detent balls and one detent spring from the gearcase.



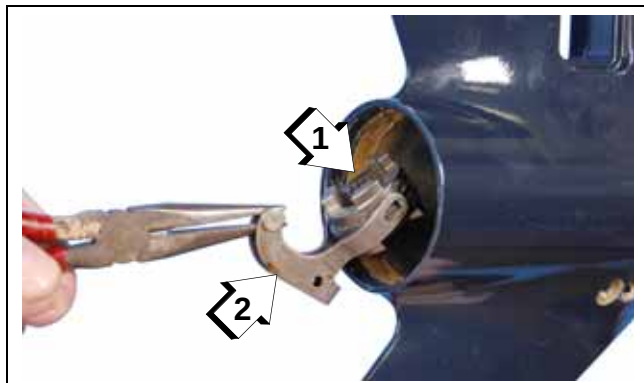
- 1. Spring and balls

007676

H-Type Gearcase

Bearing and Seal Removal

Use long-nose pliers to remove the clutch and shifter lever assembly. Use no force. Tilting the shifter lever slightly will allow you to remove it from the gearcase.



1. Clutch
2. Shifter lever assembly

007677

Remove the forward bearing, forward gear, pinion, pinion thrust bearing, and two pinion thrust washers.



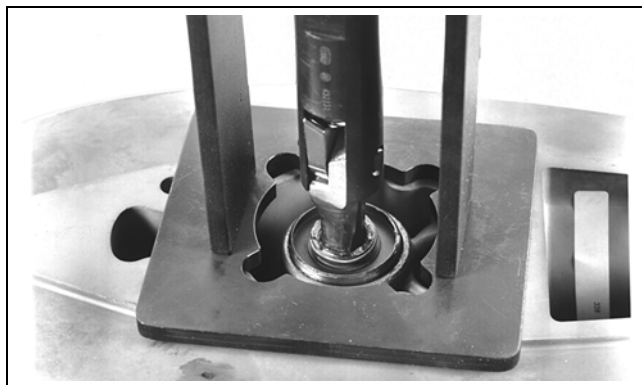
007678

Bearing and Seal Removal

IMPORTANT: Inspect bearings for damage while in place. If bearing is damaged, remove and discard. If the bearing is removed for any reason, it must be replaced.

Driveshaft Seals

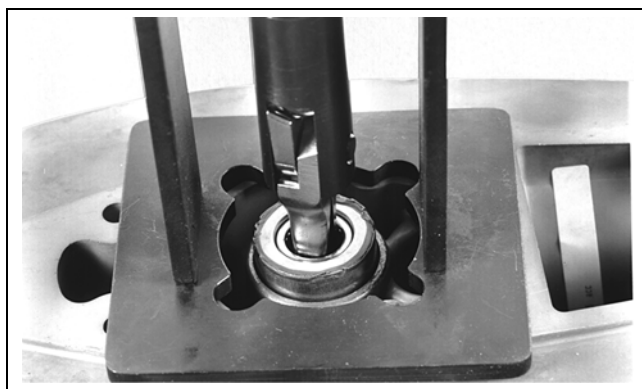
Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, to remove the two driveshaft seals. Discard the seals.



38633

Driveshaft Bearing

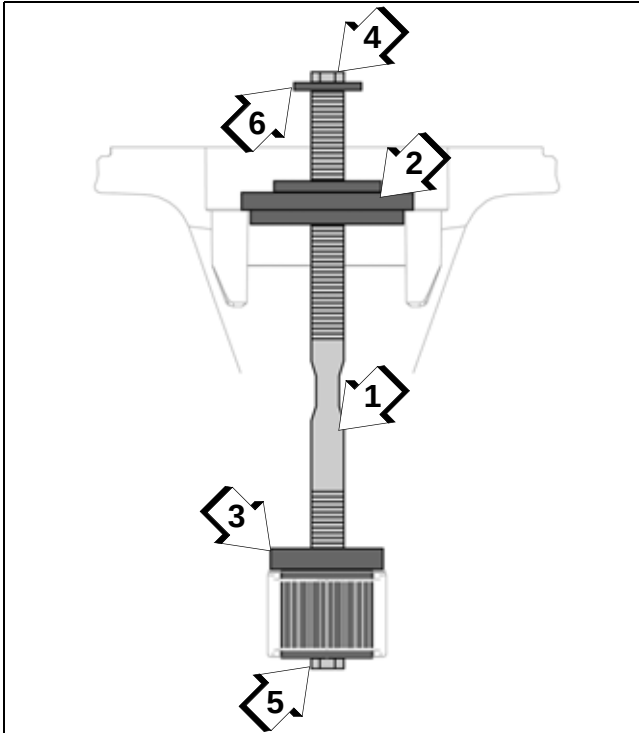
Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131 to remove the driveshaft bearing and sleeve from the gearcase. Discard the bearing.



38634

Pinion Bearings

Assemble the following components from Universal Pinion Bearing Remover and Installer, P/N 5005927.



1. Rod, P/N 326582
2. Pilot Plate, P/N 326583
3. Remover and Installer, P/N 326577
4. 1/4-20 x 1/2 in. hex head screw
5. 1/4-20 x 11/4 in. hex head screw
6. 1 in. O.D. flat washer

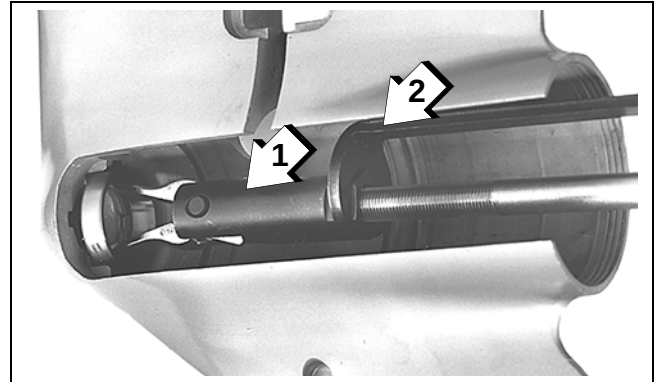
CO3125

Place the tool in gearcase. using a mallet, drive the pinion bearings into the gearcase propeller shaft cavity. Discard the bearings.

Forward Bearing

Use Slide Hammer, P/N 432128, and Bearing Puller, P/N 432130, to remove the forward bearing cup from the gearcase.

Secure the puller jaws into grooves behind the cup. Use Wrench, P/N 334359, to hold the puller while tightening the jaws.



1. Puller jaws, P/N 334359
2. Wrench

21789

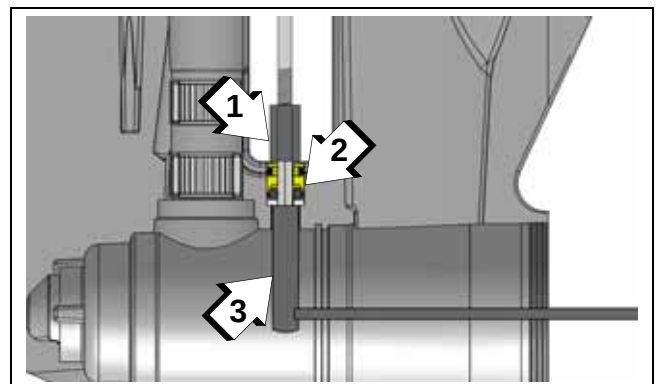
Shift Rod Bushing and O-ring

Position Shift Rod Bushing Remover, P/N 327693, under the shift rod bushing.

Thread the adapter of the Slide Hammer, P/N 391008, in the slide hammer. Place the adapter through the shift rod bushing and thread into the remover tool.

Remove the handle from the remover tool. Then remove the bushing from the gearcase.

Once the bushing has been removed from the gearcase, examine the bushing for damage. If damaged, replace the bushing on reassembly. Remove and discard the O-ring(s) and washer from the bushing.



1. Adapter
2. Shift rod bushing
3. Remover tool, P/N 327693

010484

H-Type Gearcase

Bearing and Seal Removal

Propeller Shaft Bearing Housing Seals and O-ring

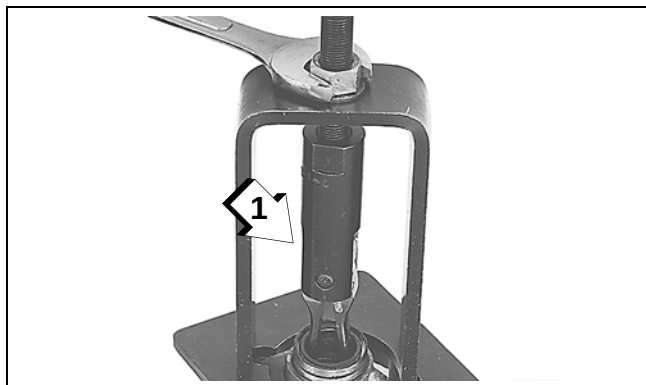
Remove and discard the propeller shaft bearing housing O-ring.



1. O-ring

007680

Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, to remove seals. Discard seals.

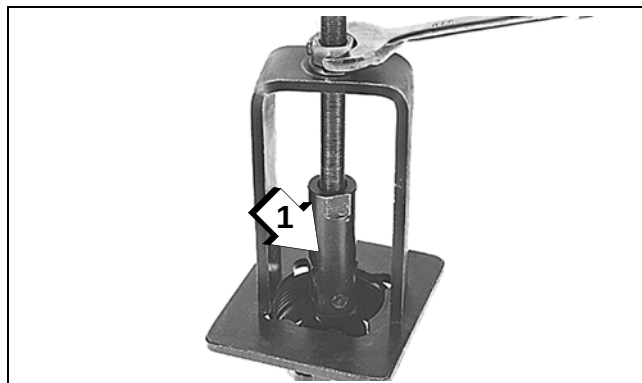


1. Small puller jaws

32555

Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, to remove both propellers

shaft bearings from the bearing housing. Discard both bearings.



1. Small puller

21795

Bearing and Seal Installation

IMPORTANT: Make no dry assemblies. Lubricate all bearings, shafts, and gears with gearcase lubricant.

Press the bearings into the housings until the tools are seated on the housing.

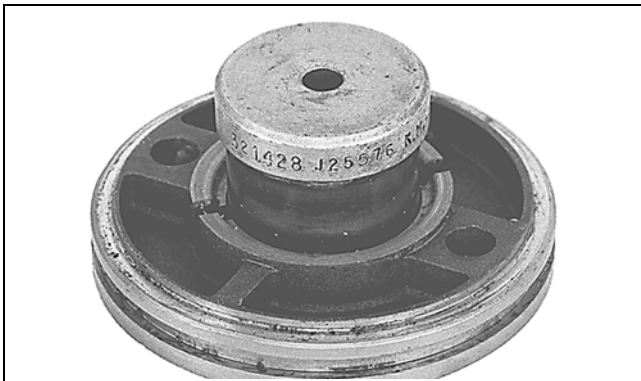
Propeller Shaft Bearing Housing Bearings

Use Bearing Installer, P/N 335820, to install a new bearing in the rear end of bearing housing. Position installer against the lettered side of bearing. Press the bearing into the housing until the tool is seated on the housing.



21793

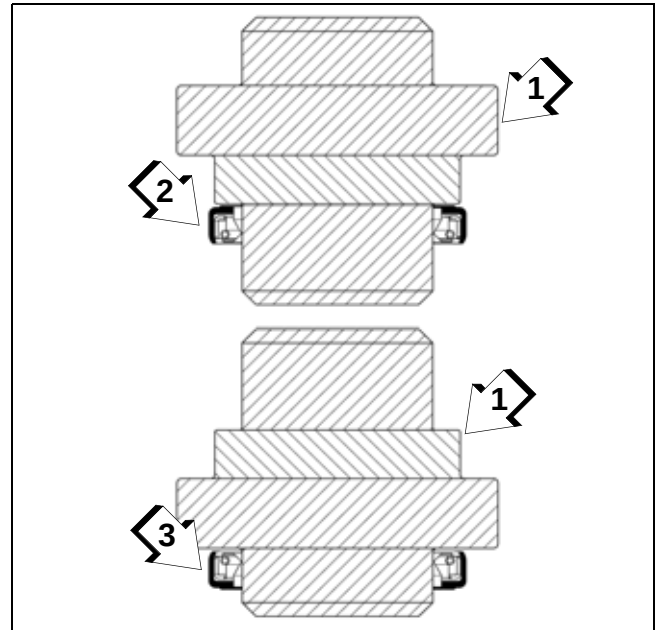
Use Bearing Installer, P/N 321428, to install a new bearing in the forward end of the bearing housing. Position installer against the lettered side of bearing.



21794

Propeller Shaft Bearing Housing Seals and O-ring

Install new seals back to back in aft end of the propeller shaft bearing housing using Seal Installer, P/N 335821. Apply *Gasket Sealing Compound* to the metal casing of the seals before installing. Install the inner seal with lip facing into the bearing housing and install the outer seal with lip facing away from the bearing housing. Apply *Triple-Guard* grease to seal lips after installing.



1. Seal installer
2. Inner seal
3. Outer seal

009513

Apply *Triple-Guard* grease to a new bearing housing O-ring. Place the O-ring in the bearing housing groove.



1. O-ring

007680

H-Type Gearcase

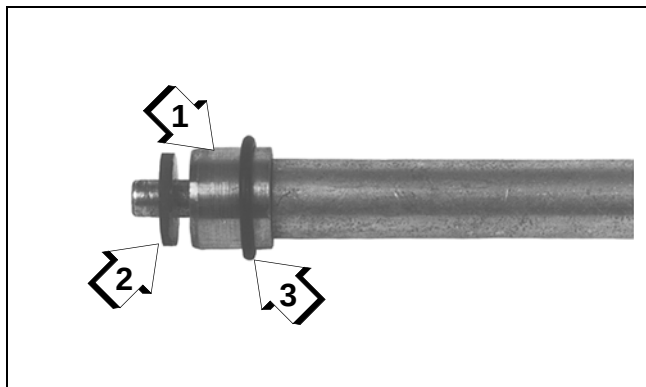
Bearing and Seal Installation

Shift Rod Bushing and O-ring

Coat the shift rod O-ring with *Triple-Guard* grease and install in shift rod bushing.

Place a new washer and bushing on Shift Rod Bushing Installer, P/N 304515. Apply *Gasket Sealing Compound* to the outside diameter of the shift rod bushing.

Install new bushing O-ring in outer groove of bushing.



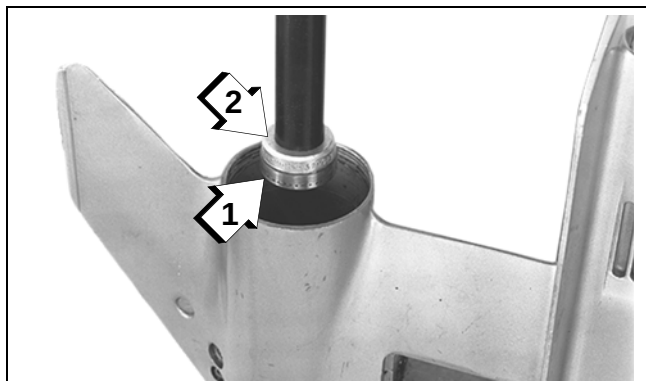
- 1. Bushing
- 2. Washer
- 3. O-ring, outer groove

COA3319

Use a mallet to drive the bushing into the gearcase housing.

Forward Bearing

Place the nose of the gearcase on a wooden block on the floor. Use Drive Handle, P/N 311880, Bearing Cup Installer, P/N 319929, and a mallet to drive the bearing cup into position in the gearcase housing. Oil the forward bearing cup and seat it firmly in the housing.

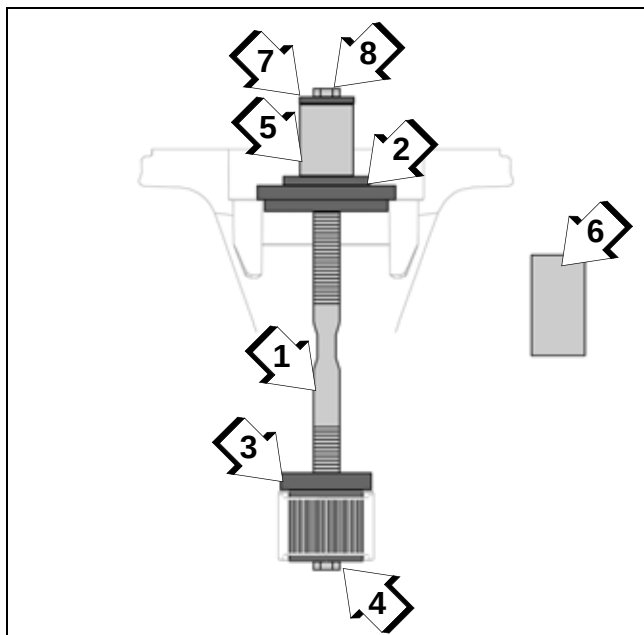


- 1. Forward bearing cup
- 2. Bearing cup installer

21791

Pinion Bearings

Install the pinion bearings using the following components of the Universal Pinion Bearing Remover and Installer, P/N 5005927, and two tool spacers.



drc4692R

- 1. Rod, P/N 326582
- 2. Plate, P/N 326583
- 3. Remover/Installer, P/N 326577
- 4. 1/4-20 x 1 1/4 in. screw
- 5. Spacer, Short, P/N 330067
- 6. Spacer, Long, P/N 330068
- 7. 1 in. flat washer
- 8. 1/4-20 x 1/2 in. screw

IMPORTANT: To ensure accurate bearing location, washer must be flat and screw must be tight.

Install **lower** pinion bearing. Assemble tool using **short** spacer, P/N 330067, and remover/installer, P/N 326577. Position installer against the lettered side of bearing. Drive bearing into gearcase housing until washer contacts spacer.

Install **upper** pinion bearing. Assemble tool using **long** spacer, P/N 330068.

Driveshaft Bearing

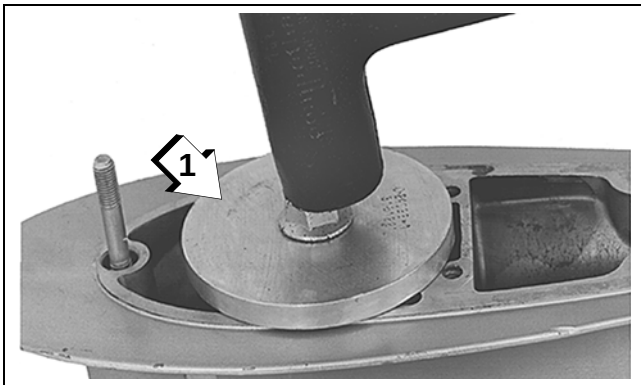
Oil and install a new driveshaft bearing in the bearing sleeve using Bearing Installer, P/N 322923. Press against the lettered side of the bearing until the tool is seated in the bearing sleeve.



1. Driveshaft bearing
2. Bearing sleeve
3. Bearing installer

21887

Use the same tool, attached to Plate, P/N 318122, to press the bearing sleeve assembly into the gearcase until the plate contacts the gearcase. Position the lettered side of the bearing against the tool.



1. Plate

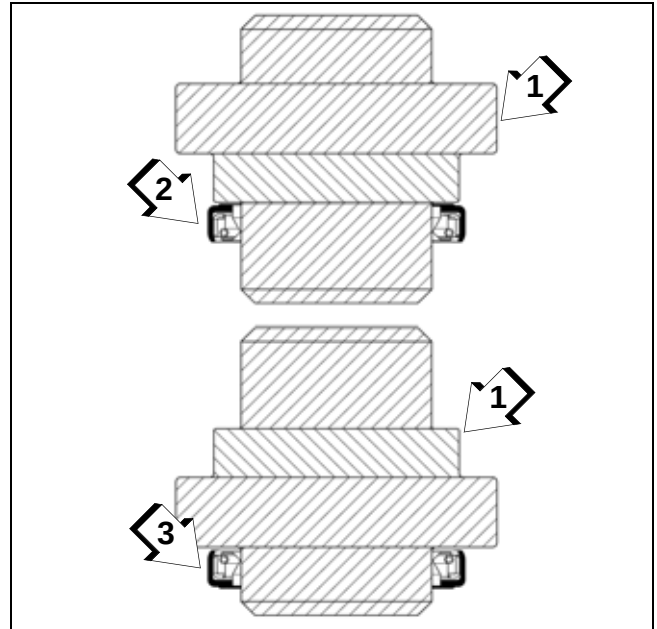
21813

Driveshaft Seals

Apply *Gasket Sealing Compound* to the metal casing of the seals before installing.

Use Seal Installer, P/N 326552, to install the inner seal with flush lip facing into the gearcase, then the outer seal with extended lip facing out of the gearcase.

Apply *Triple-Guard* grease to the seal lips after installing.



1. Seal Installer, P/N 326552
2. Inner seal
3. Outer seal

009513

Gearcase Assembly

Propeller Shaft, Gear and Shifter Installation

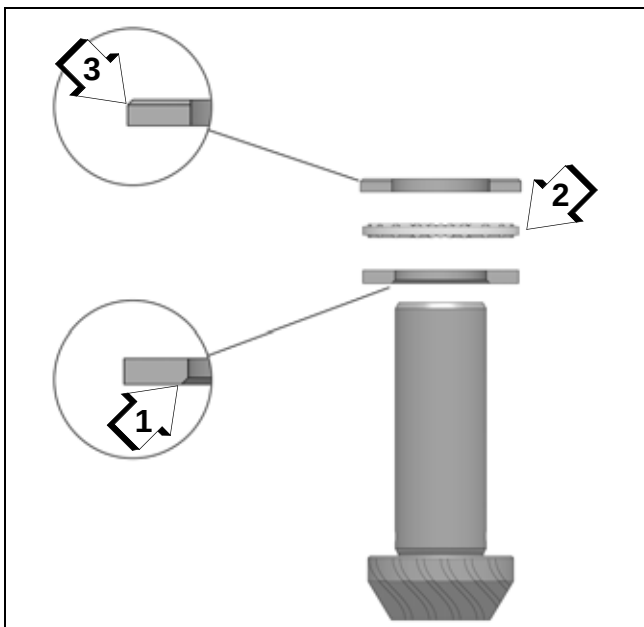
IMPORTANT: Make no dry assemblies. Lubricate all bearings, shafts, and gears with gearcase lubricant.

Oil and place the forward bearing cone and roller assembly in the forward bearing cup.



38635

Install the small thrust washer with the chamfered inside diameter facing the pinion gear. Oil and install the thrust bearing. Install the large thrust washer with chamfered outside edge facing up.



803051

1. Small thrust washer, chamfered inside diameter
2. Thrust bearing
3. Large thrust washer, chamfered outside edge

Use a right angled rod to install the pinion assembly in the gearcase.



COA3290

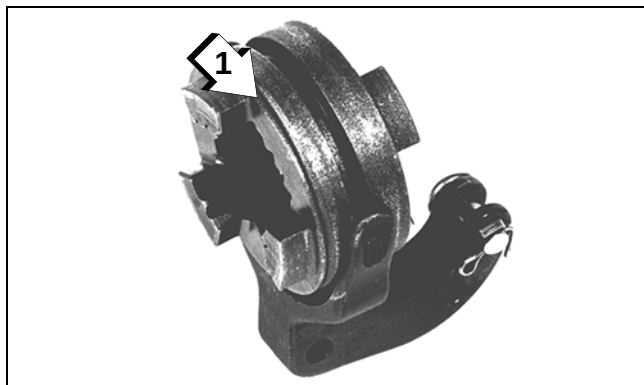
Place the forward gear into the gearcase.



1. Forward gear

COB3057

Install the shifter cradle on clutch dog. Grooved end of clutch dog must face forward gear end of the propeller shaft.

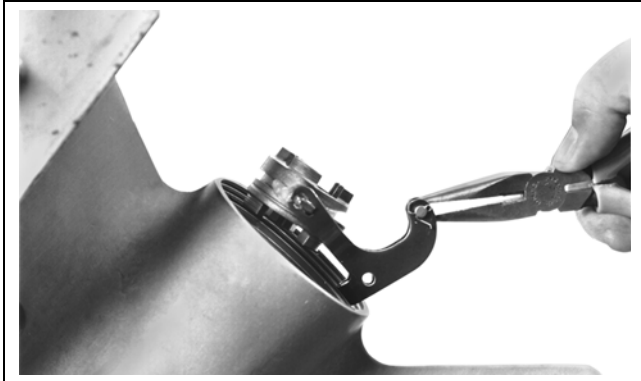


1. Grooved end

COB3065

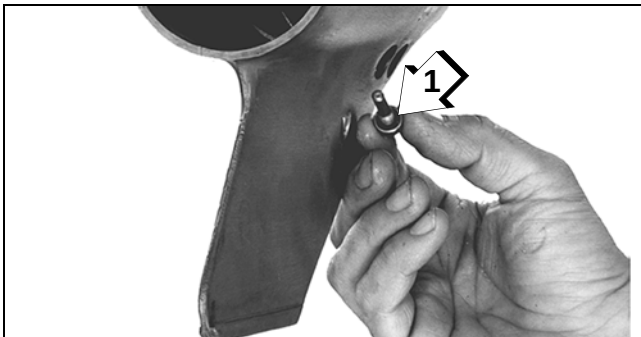
IMPORTANT: Apply *Needle Bearing* grease to clutch dog and shifter cradle to hold in place while assembling.

Install the shifter cradle and clutch dog in the gearcase using long-nose pliers.



38637

Apply *Triple-Guard* grease to a new pivot pin O-ring. Install O-ring on the pivot pin. Apply *Nut Lock* to threads of the pin. Align hole of shifter lever with hole in gearcase. Install and tighten pivot pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Pivot pin

COA3236

⚠ WARNING

Wear safety glasses for eye protection. Detent balls can pop out with great force.

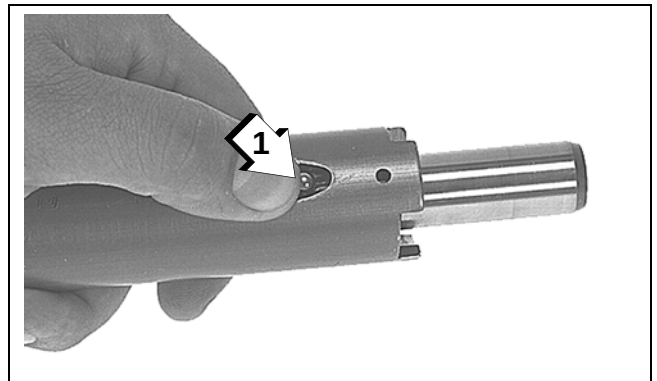
Slide the Shift Detent Sleeve, P/N 328081, over the propeller shaft. Align slot in the tool with hole in the propeller shaft.



1. Shift detent sleeve

26727

Insert one detent ball, then the spring, then the other detent ball. Push down on the ball and slide the tool back until you feel the ball slip into the detent.



1. Detent ball

26728

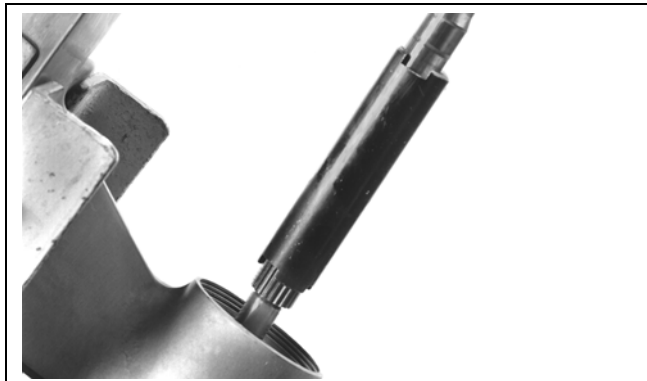
Install the propeller shaft and detent tool in gearcase. Make sure the following occurs:

- Propeller shaft must engage forward bearing.
- Tool ramps must engage clutch dog ramps.
- Hold tool firmly against clutch dog.

H-Type Gearcase

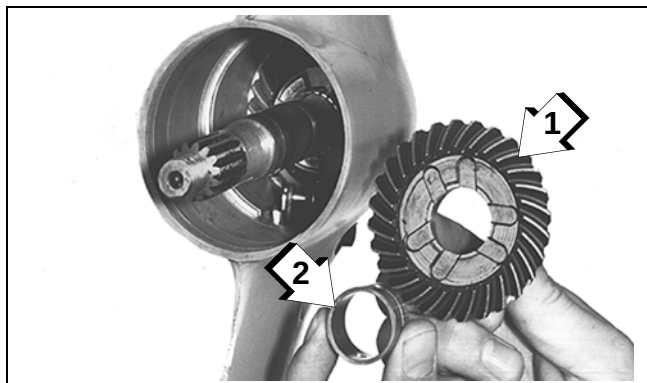
Gearcase Assembly

- Gently tap propeller shaft with a rawhide mallet to seat detent assembly.



38638

Remove detent tool. Slide the reverse gear down the propeller shaft and into the gearcase.

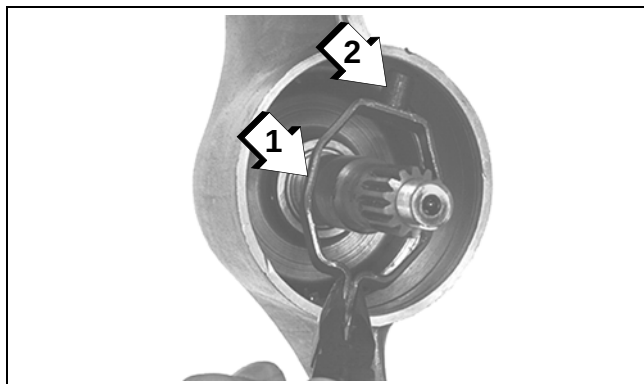


1. Reverse gear
2. Bushing

COB3051

Coat the reverse gear bushing with oil. Slide the bushing down the propeller shaft, seating the bushing into the reverse gear.

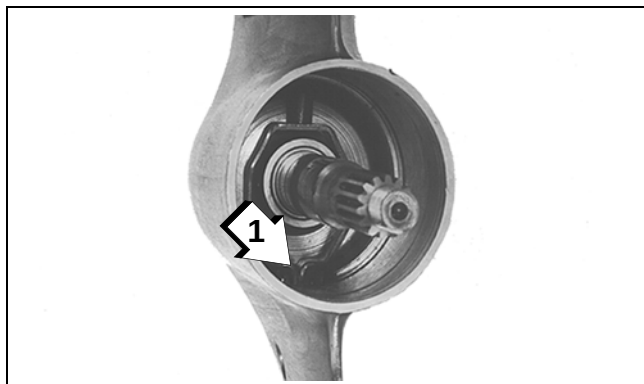
Holding the shifter yoke a with long-nose pliers, install the yoke at a tilted position, locating top of yoke into upper gearcase cavity.



1. Shifter yoke
2. Top of yoke

COA3229

Engage the shifter yoke hook onto the shifting lever clevis pin in bottom of the gearcase cavity.



1. Shifter yoke hook

COA3230

Shift Rod Installation

Apply *Triple-Guard* grease to threads of lower shift rod and install into gearcase through the water intake opening and engage the shifter yoke.

Thread the shift rod into the shifter yoke until the rod bottoms in the yoke.

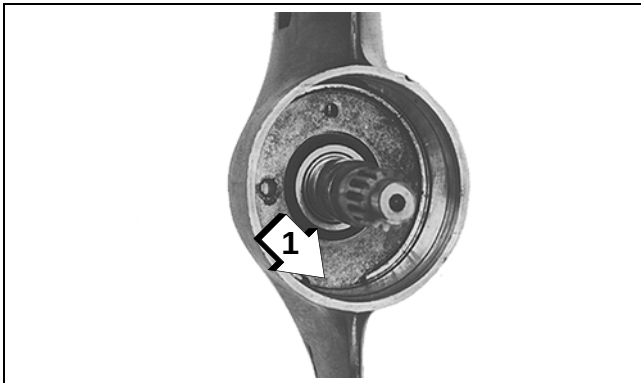


1. Lower shift rod

007672

Propeller Shaft Bearing Housing Installation

Slide the retainer plate down the propeller shaft and into the gearcase with tab facing down.



1. Tab, retainer plate

COA3238

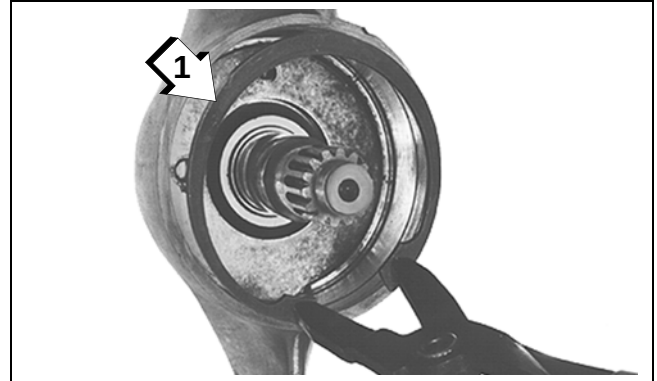
⚠ WARNING

Wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers.

Using Retaining Ring Pliers, P/N 331045, install the retaining ring into groove in gearcase with sharp outside edge facing aft.

NOTICE

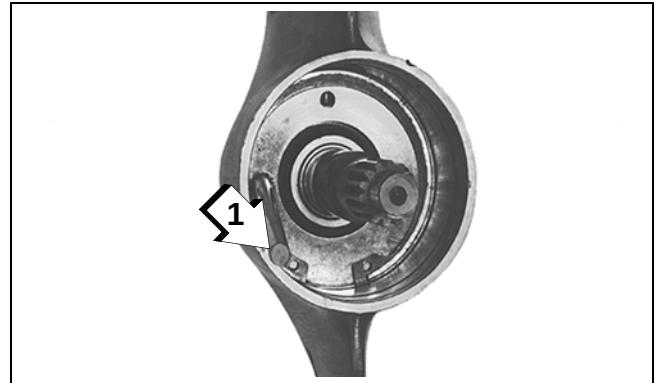
The retaining ring is under extreme pressure during installation. Make sure that the ring is seated in groove.



1. Retaining ring

COA3239

Thread one Guide Pin, P/N 383175, into the retainer plate.



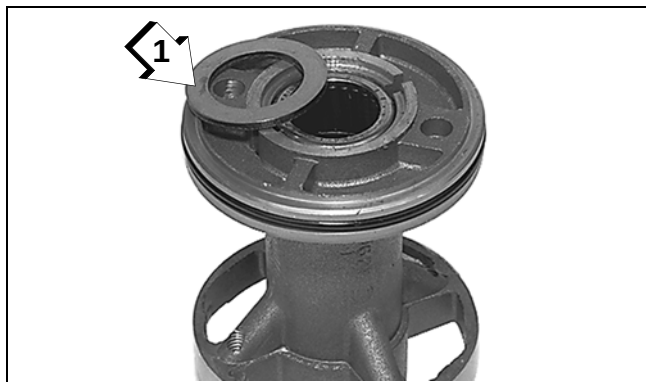
1. Guide pin

COA3240

H-Type Gearcase

Gearcase Assembly

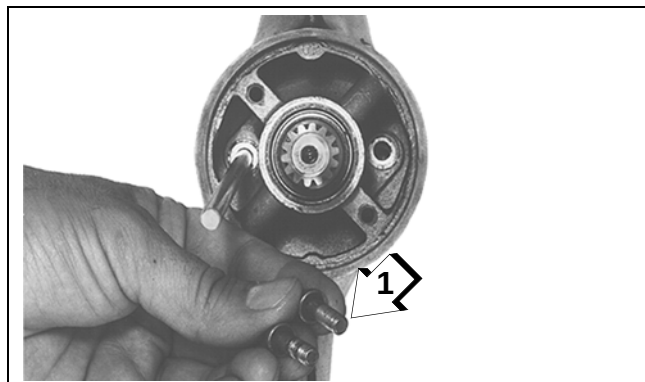
Use *Needle Bearing* grease to temporarily hold the reverse gear thrust washer on the back of the propeller shaft bearing housing.



1. Reverse gear thrust washer

COA3309

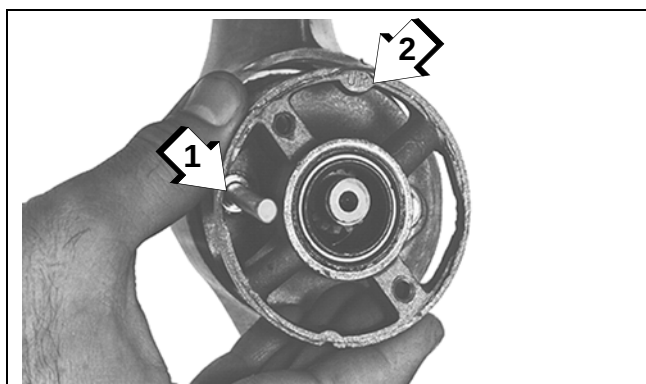
Place new O-rings on the bearing housing retaining screws. Apply *Gasket Sealing Compound* to the O-rings and threads of the screws.



1. Screws

COA3243

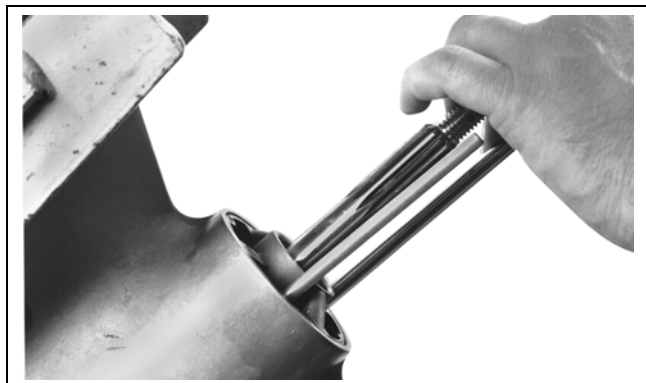
Lightly apply *Gasket Sealing Compound* to the aft support flange of the bearing housing. Align the propeller shaft bearing housing on the guide pin with the word "UP" toward the top.



1. Guide pin
2. "UP"

COA3241

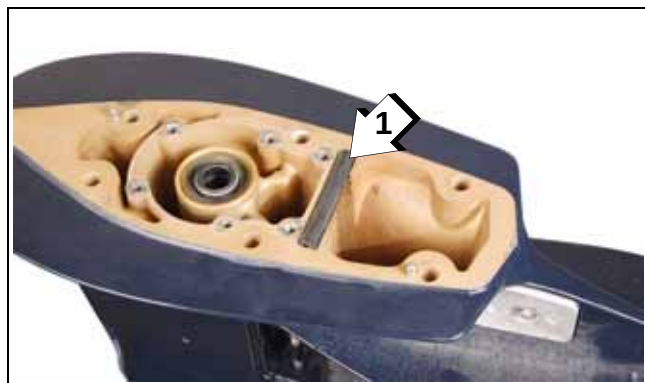
Using a brass punch and a mallet, seat the bearing housing in the gearcase.



38639

Install one screw in the bearing housing. Remove the guide pin and install the second screw. Tighten screws to a torque of 124 to 142 in. lbs. (14 to 16 N·m).

Apply *Adhesive 847* to the bottom of a new exhaust seal assembly and install it into the slot in the gearcase.



1. Seal assembly

007667

To complete gearcase assembly, refer to:

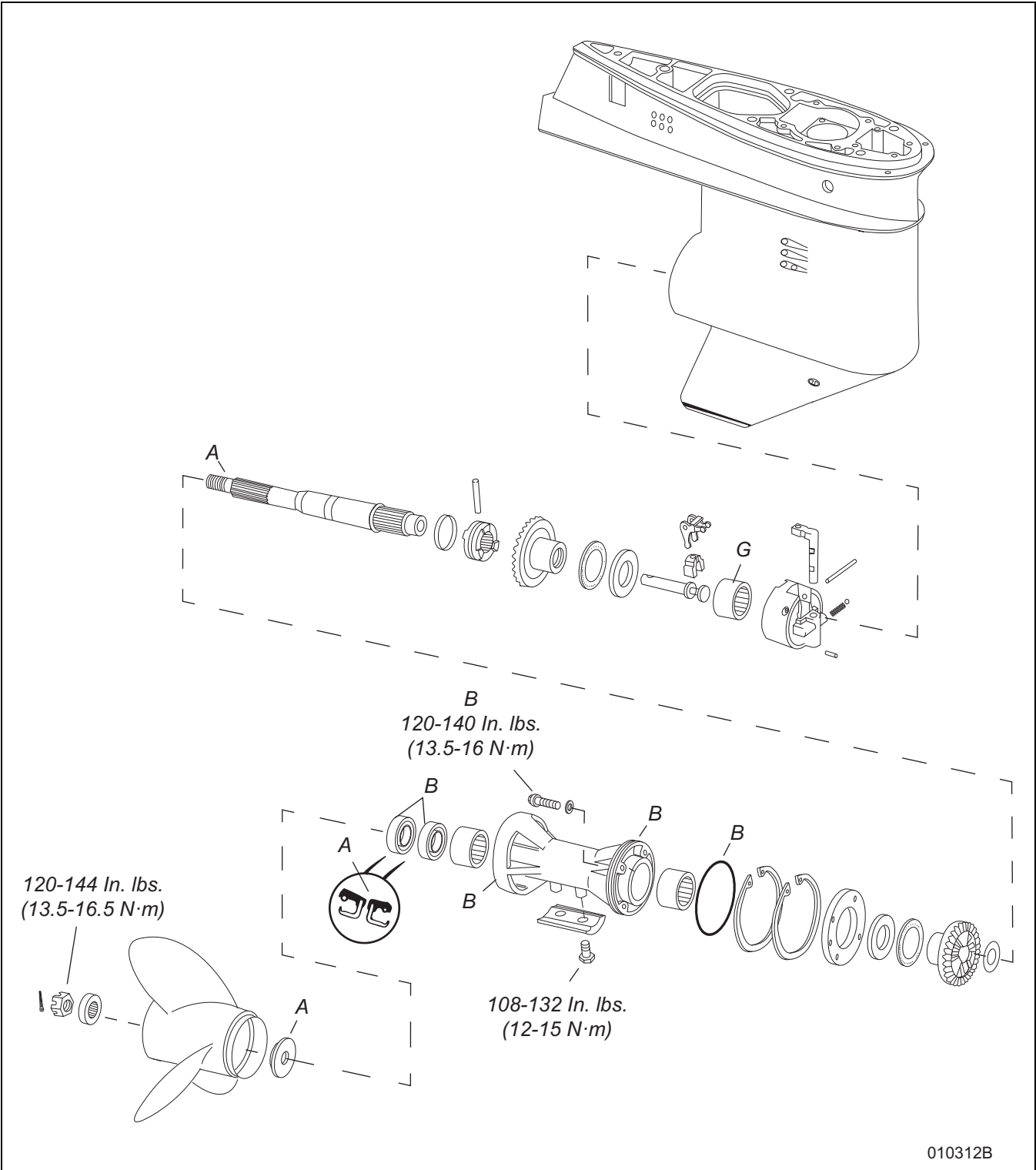
- **Water Pump Service** on p. 28
- **Gearcase Leak Test** on p. 12
- **Gearcase Removal and Installation** on p. 26
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

F-Type Gearcase

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A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	H Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

Gearcase Removal and Installation

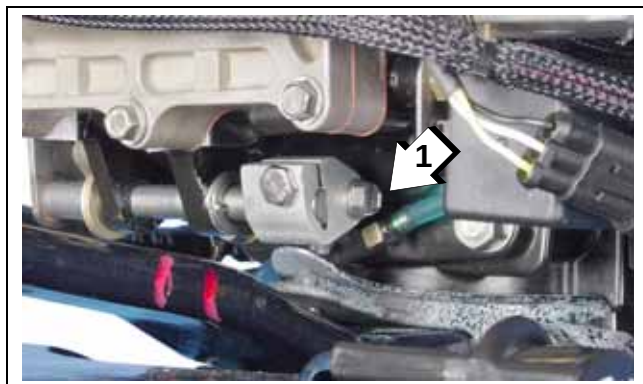
Gearcase Removal

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

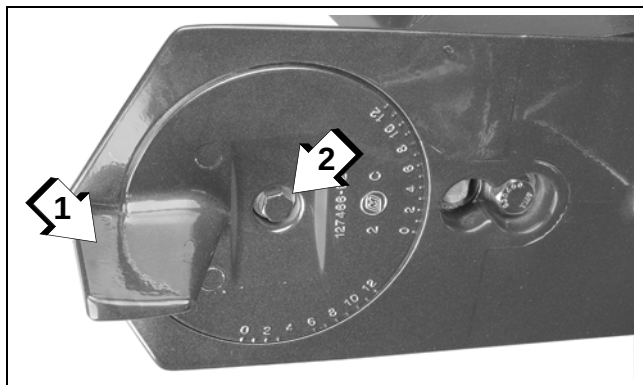
Remove pin and washer from shift rod lever to release the lower shift rod.



1. Shift rod screw

002171

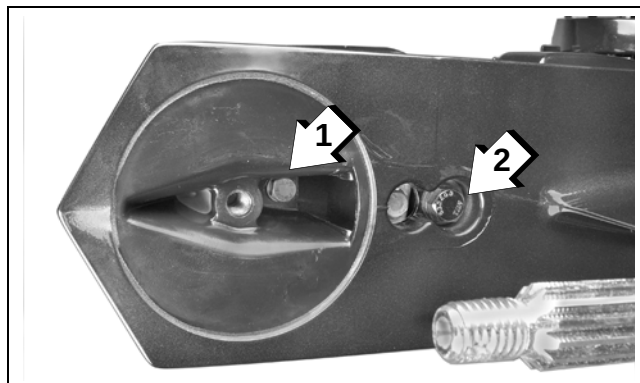
Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position. Remove the trim tab retaining screw and trim tab from the gearcase.



1. Trim tab
2. Trim tab retaining screw

001996

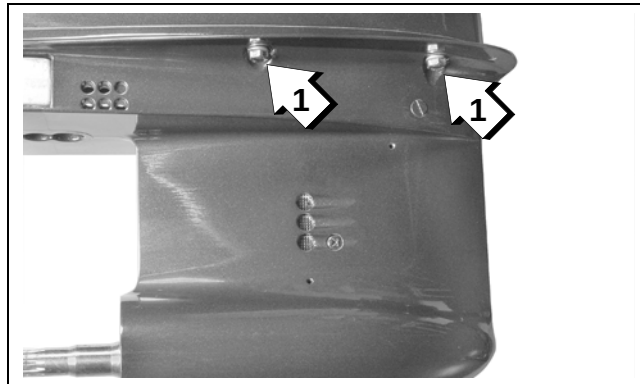
Remove the 5/16-18 x 1.25 in. screw and washer, and remove 7/16-14 x 3.5 in. screw and washer.



1. 5/16-18 x 1.25 in. screw
2. 7/16-14 x 3.5 in. screw

001995

Remove the four 3/8-16 x 1.5 in. gearcase retaining screws and washers.



1. Gearcase retaining screws

001994

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

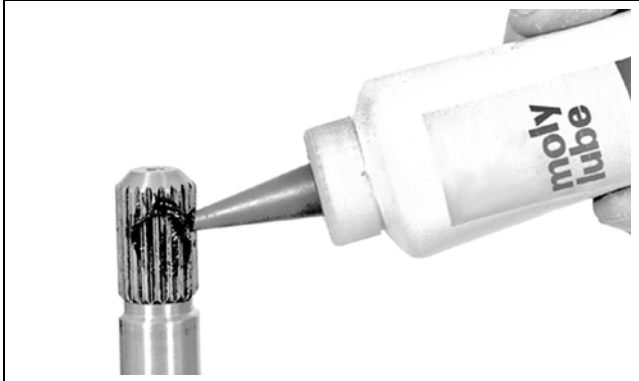
During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

NOTICE

Before installing gearcase, shift rod adjustment **MUST** be checked. Refer to Shift Rod Adjustment on p. 300.

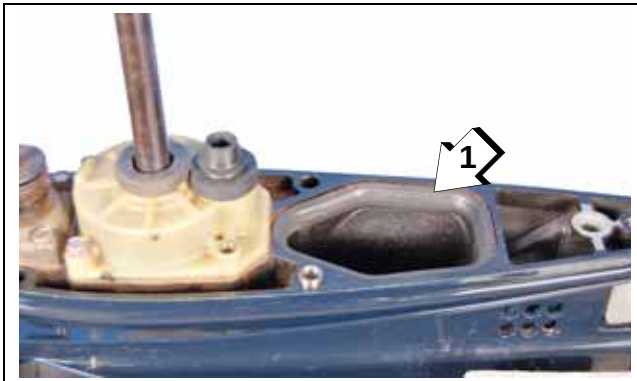
F-Type Gearcase Gearcase Removal and Installation

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

Apply *Adhesive 847* to the exhaust housing seal's outer surface. Place the seal in the gearcase exhaust cavity. Apply *Triple-Guard* grease to the seal's inner surfaces.



1. Exhaust housing seal

008354

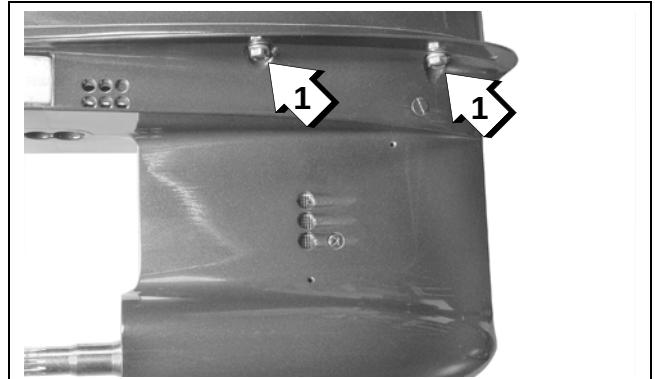
Slide the gearcase into place, making sure:

- Driveshaft engages the crankshaft.
- Inner exhaust housing installs correctly.
- Shift rod does not turn and is positioned properly in the shift rod lever below the crankcase.

Apply *Triple-Guard* grease to threads of the gearcase retaining screws. Tighten the screws to a torque of:

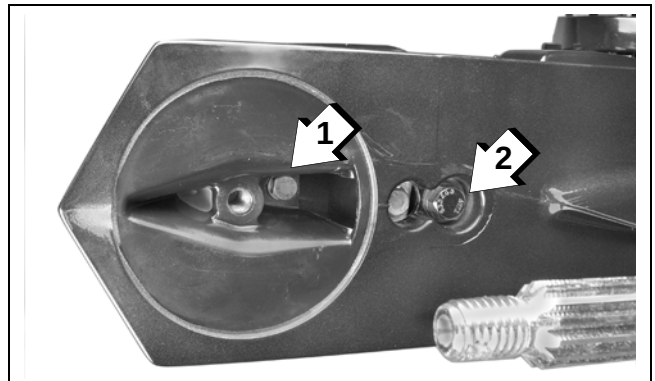
- **3/8 in.** screws – 18 to 20 ft. lbs. (24 to 27 N·m)
- **7/16 in.** screw – 28 to 30 ft. lbs. (38 to 40 N·m)

- **5/16 in.** screw – 10 to 12 ft. lbs. (13.5 to 16 N·m)



1. 3/8 in. screws

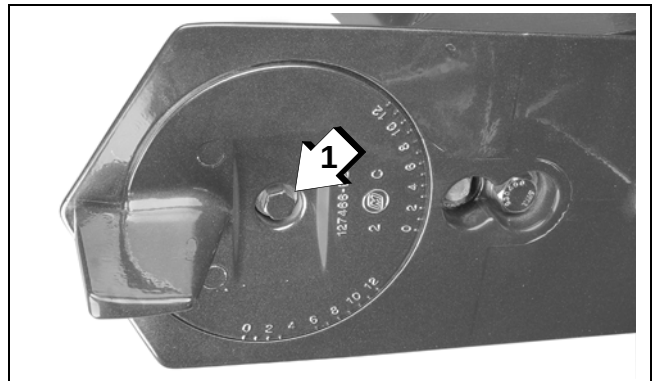
001994



1. 7/16 in. screw
2. 5/16 in screw

001995

Apply *Triple-Guard* grease to threads of the trim tab screw. Install and align the trim tab with the index marks noted prior to disassembly. Tighten the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to **Trim Tab Adjustment** on p. 18.



1. Trim tab screw

001996

F-Type Gearcase

Water Pump Service

Place the shift rod in the shift rod lever. Install the retaining pin and washer. Tighten pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Shift rod screw

002171

WARNING

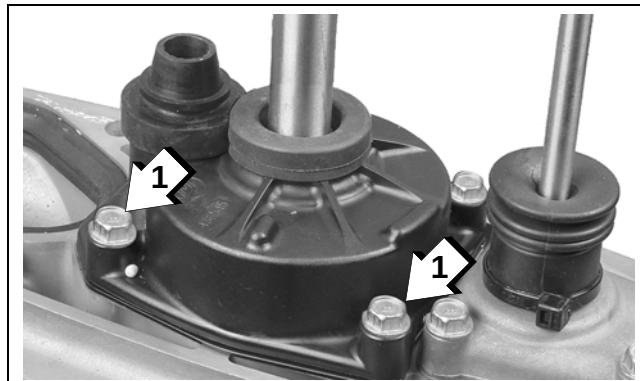
To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Water Pump Service

Disassembly

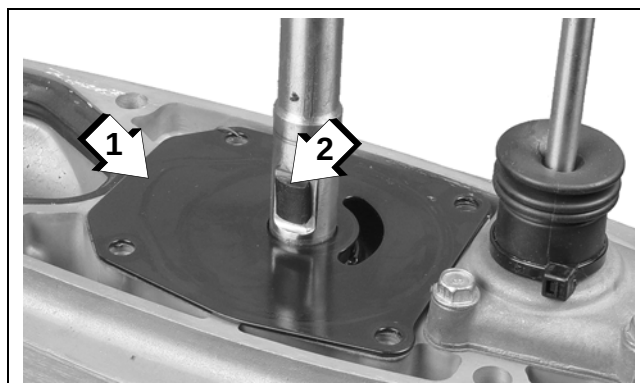
Remove the four impeller housing screws.



1. Impeller housing screws

001203

Slide the water pump off the driveshaft. Remove the impeller key, impeller plate, and gasket. Discard the gasket.



1. Impeller plate
2. Drive key

001214

Remove all the parts from the housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

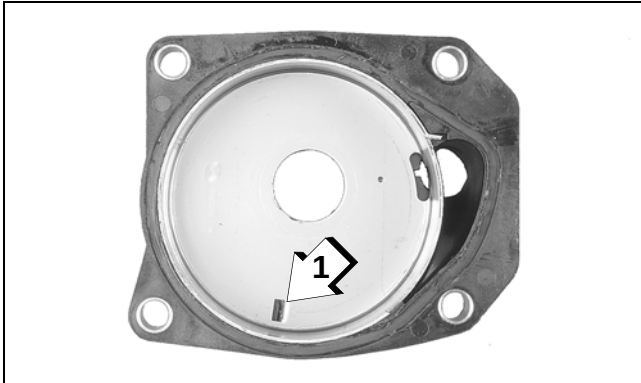
Check liner and wear plate for scoring, distortion, and impeller material transfer.

Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

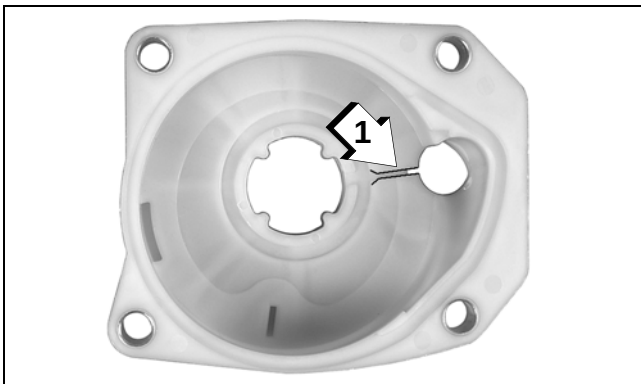
Lightly coat the exterior rim of the impeller cup with *Gasket Sealing Compound*. Install the cup in the impeller housing. The cup locks in place in the housing with a square index tab.



1. Index tab

001215

IMPORTANT: Do not allow any sealer to get into the air bleed groove in the impeller housing. If this groove is blocked by adhesive, the pump will lose its prime and will not pump water.

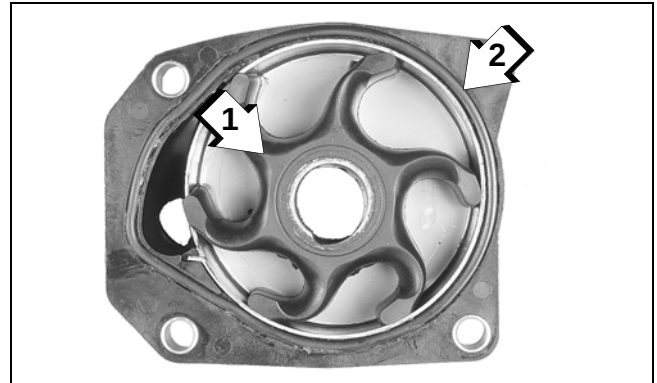


1. Air bleed groove

006415

Lightly coat the inside of the liner with *Triple-Guard* grease. With a counterclockwise rotation, install the impeller into the liner with the slot for the impeller key facing out.

Apply a thin bead of *Adhesive 847* in the seal groove, and install the special shaped O-ring seal.

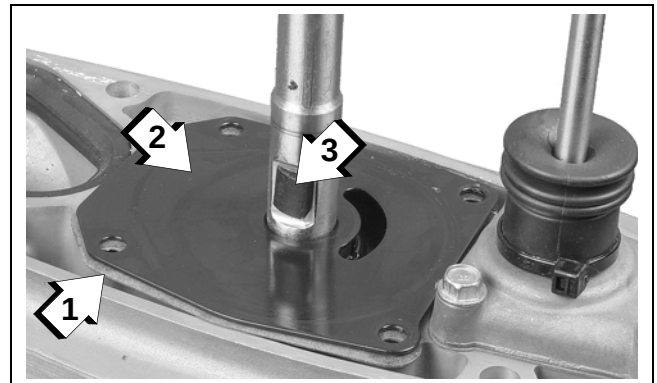


1. Impeller
2. O-ring seal

001216

Apply *Gasket Sealing Compound* to both sides of a new impeller plate gasket. Install the gasket and impeller plate.

Apply *Triple-Guard* grease to temporarily hold drive key in place.



1. Impeller plate gasket
2. Impeller plate
3. Drive key

001217

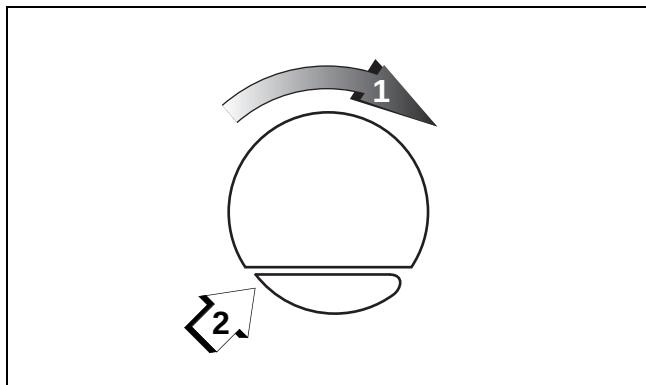
The sharp edge of the key is the leading edge in clockwise rotation.

Slide the water pump down the driveshaft. Align impeller slot with the impeller key. Rotate the driveshaft to engage the key with the impeller, and

F-Type Gearcase

Water Pump Service

slide water pump down over key. Be sure impeller key does not fall out of position.



1. Driveshaft rotation
2. Drive key

CO2995

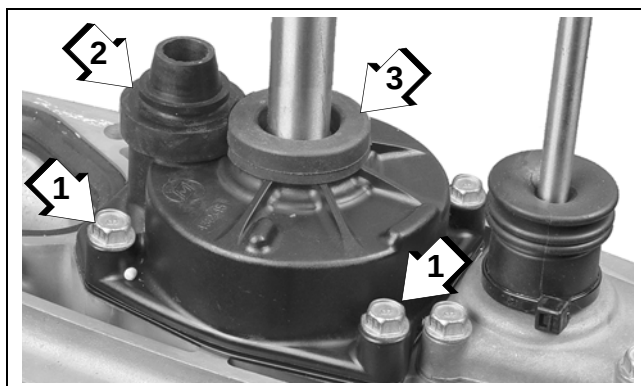
NOTICE

Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Align the impeller housing with the gearcase. Apply *Gasket Sealing Compound* to threads of the four impeller housing screws. Install the screws and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

Install the water tube grommet on the impeller housing.

Apply a thin bead of *Adhesive 847* to groove of the impeller housing grommet. Install the grommet on the impeller housing.



1. Housing screws
2. Water tube grommet
3. Impeller housing grommet

001203

NOTICE

Before installing gearcase, shift rod adjustment MUST be checked. Refer to Shift Rod Adjustment on p. 300.

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

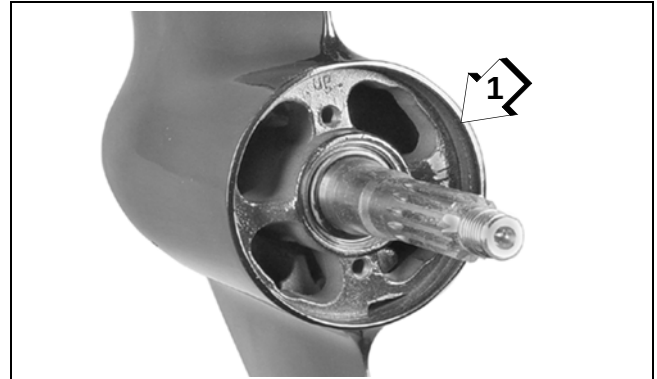
Remove gearcase. Refer to **Gearcase Removal and Installation** on p. 48.

Remove water pump. Refer to **Water Pump Service** on p. 50.

Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skag, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **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.

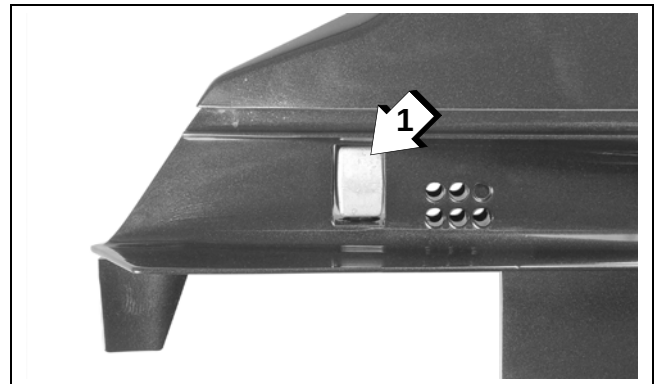
- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

002217

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.



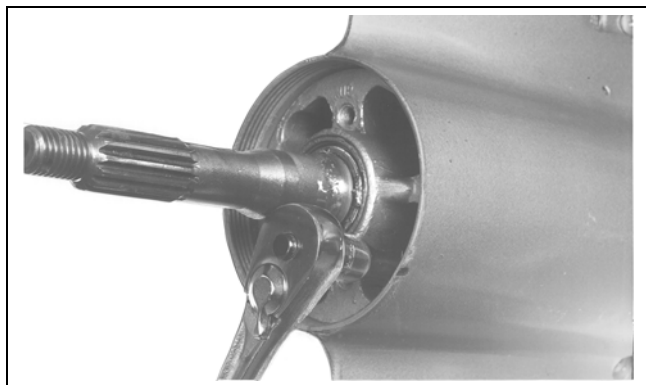
1. Gearcase anode

002014

- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.
- **Water Intake Screens** — Check for damage and blockage. If screens cannot be cleaned, they must be replaced. Different screens are available and should not be mixed. Refer to correct model parts manual for listing and description.

Propeller Shaft Bearing Housing Removal

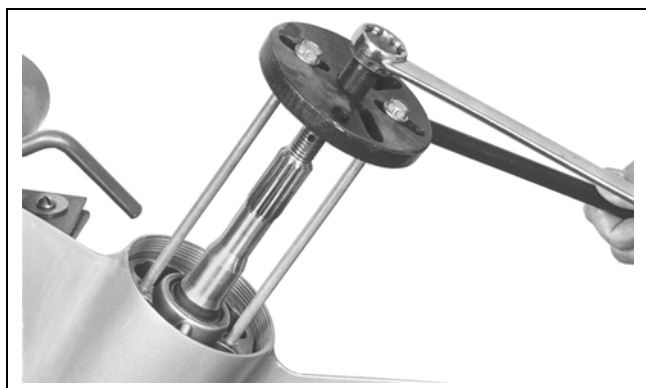
Use a 5/16 in. thin wall socket to remove the four screws with O-rings holding the propeller shaft bearing housing.



COA3571

Remove the propeller shaft bearing housing from the gearcase using the following:

- Puller body, screw, and handle from Universal Puller Set, P/N 378103.
- Two 5/16-18 x 8 in. screws, P/N 316982, from Universal Puller Set, P/N 378103.

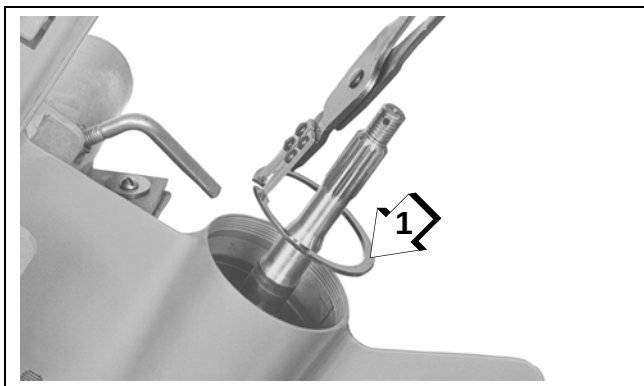


9437

Remove the two retaining rings using Retaining Ring Pliers, P/N 331045.

⚠ CAUTION

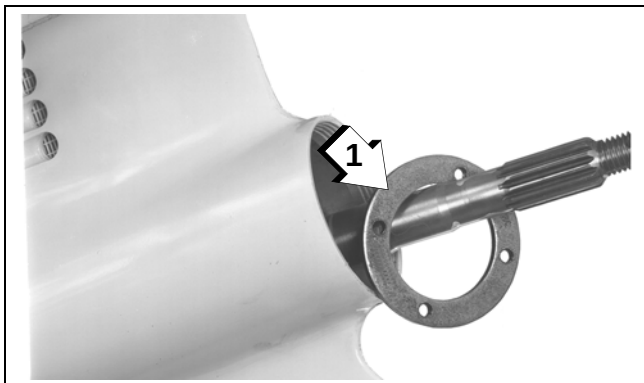
Retaining rings are under extreme pressure during removal and installation. To prevent personal injury, wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers. After the retaining rings are removed far enough from the gearcase to clear the housing, release the tension on the pliers while retaining ring is still around the propeller shaft.



1. Retaining ring

9438

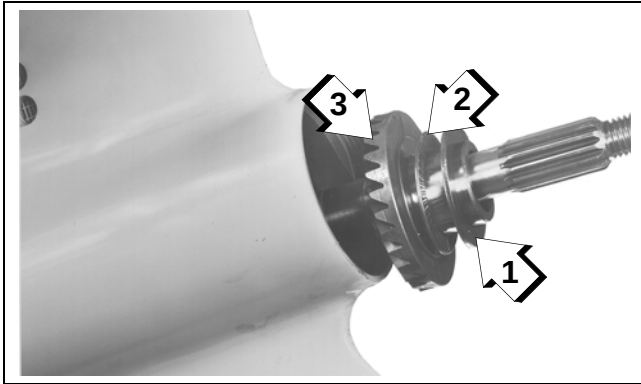
Remove the retainer plate from the gearcase.



1. Retainer plate

COA3513

Remove the larger thrust washer, thrust bearing, and reverse gear from the gearcase. Remove the smaller thrust washer located in front of the gear.



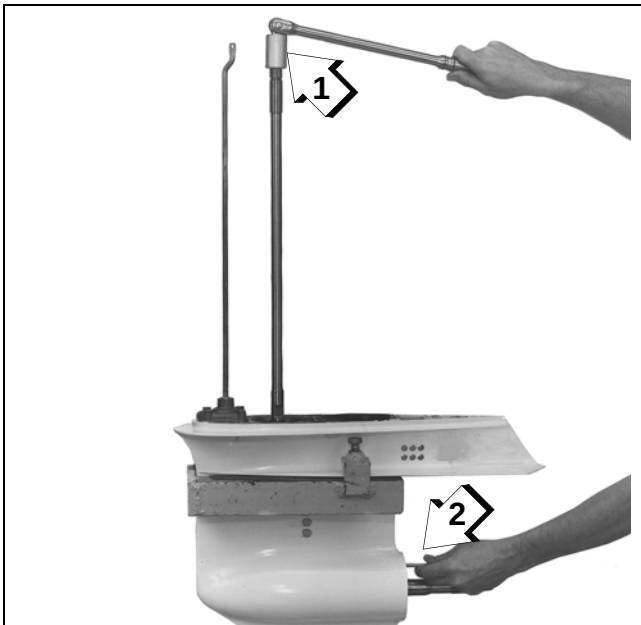
1. Larger thrust washer
2. Thrust bearing
3. Reverse gear

COA3514

Pinion Gear and Driveshaft Removal

Adjust the shift rod to move the clutch dog as far forward as possible. This will help ease removal of the pinion nut.

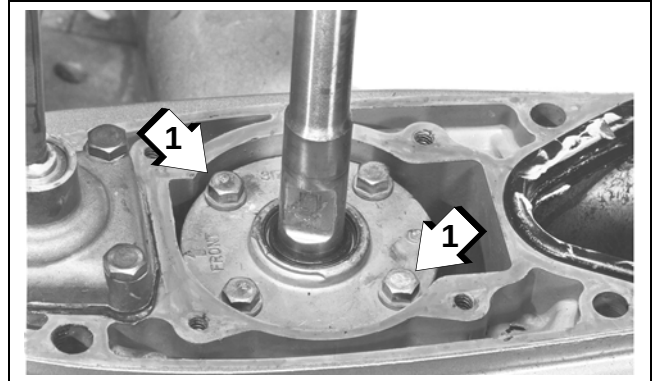
Use Driveshaft Holding Socket, P/N 334995, and an 11/16 in. open-end wrench to loosen and remove the pinion nut from the bottom of the driveshaft. Pad handle of the wrench to prevent damage to gearcase.



1. Holding socket
2. 11/16 Wrench

COA3573T

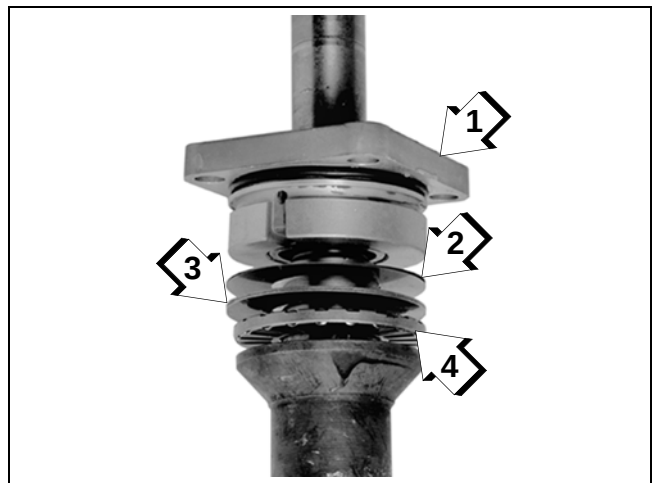
Remove the four driveshaft bearing housing screws.



1. Driveshaft bearing housing screws

COA3671

Remove the driveshaft from the gearcase. The bearing housing, shims, thrust washer, and thrust bearing will come out with the driveshaft.



1. Bearing housing
2. Shims
3. Thrust washer
4. Thrust bearing

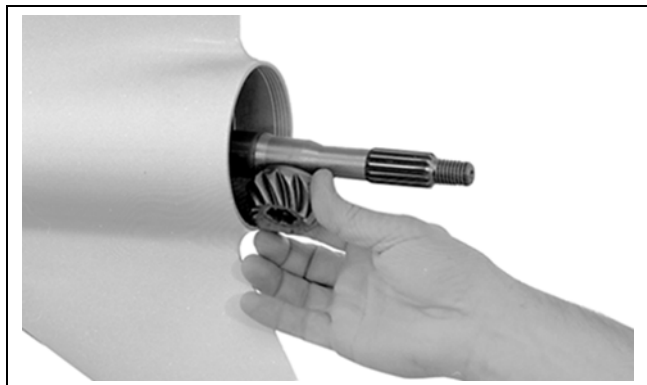
COA3558

If driveshaft cannot be removed, refer to **Locked Driveshaft Removal** on p. 56.

F-Type Gearcase

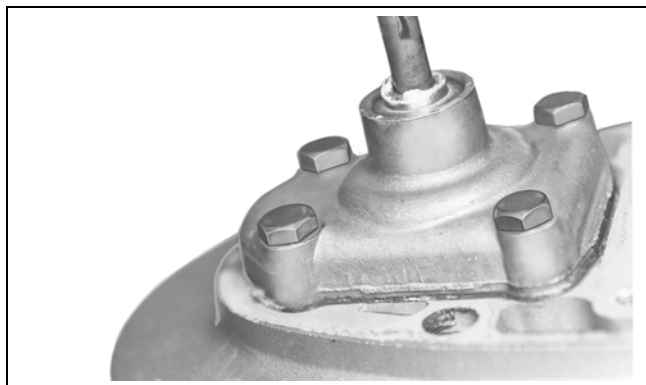
Gearcase Disassembly

Remove the pinion gear from the gearcase.



COA3159

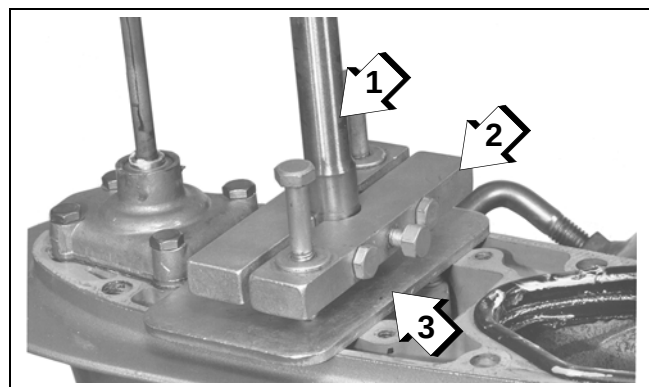
Discard the cover gasket. Remove and discard the shift rod O-ring from inside of cover.



COA3666

Locked Driveshaft Removal

The driveshaft to pinion taper is a locking taper. If necessary, use Puller, P/N 387206, and Backing Plate, P/N 325867, to break the lock. Install the tools as shown by clamping them around the driveshaft with the tool's setscrew aligned with the impeller drive key slot. Tighten the setscrew into the slot. Alternately tighten the two vertical screws against the backing plate inserted between the puller and the gearcase until the driveshaft pops loose from the pinion.

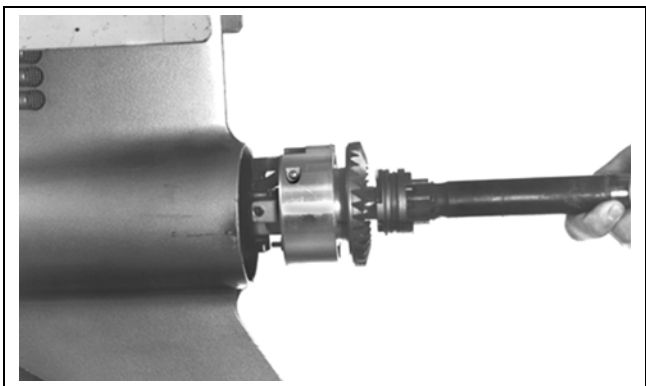


1. Drive shaft
2. Puller
3. Backing plate

COA3664

IMPORTANT: Make sure oil fill/drain plug is removed from gearcase.

Remove propeller shaft assembly from gearcase.



COA3575

Shift Housing, Gear and Propeller Shaft Removal

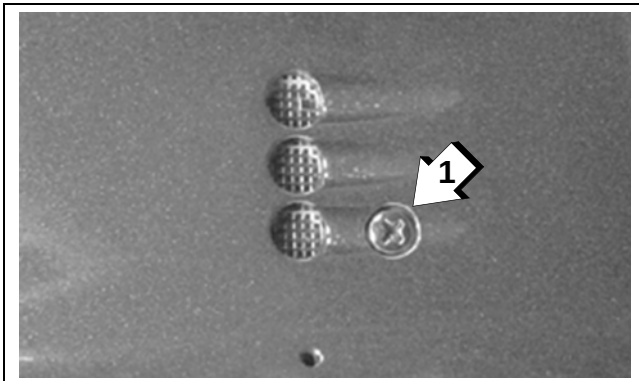
Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Shifter, Bearing and Seal Service

Pinion Bearing Removal

Inspect the pinion bearing for damage without removing it. If the bearing is removed for any reason, it must be replaced.

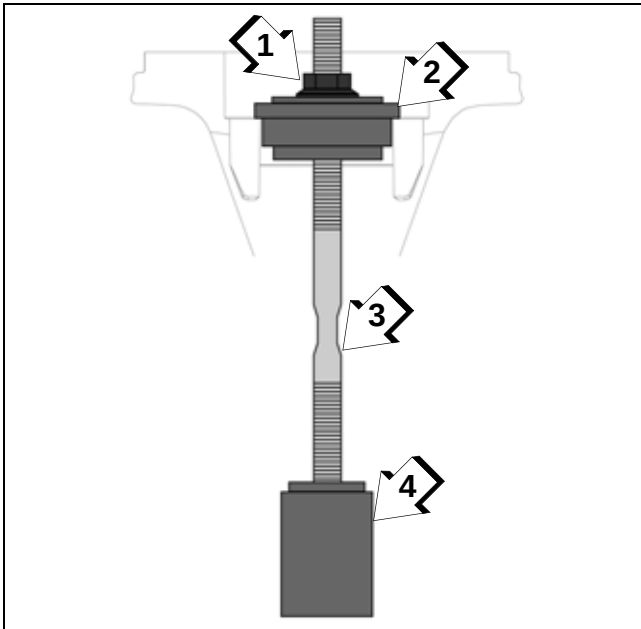
If the pinion bearing must be replaced, remove the bearing retaining screw from the gearcase. Discard the O-ring from the screw.



1. Bearing retaining screw

001997

Assemble Pinion Bearing Remover and Installer, P/N 5005927, in the gearcase as follows:



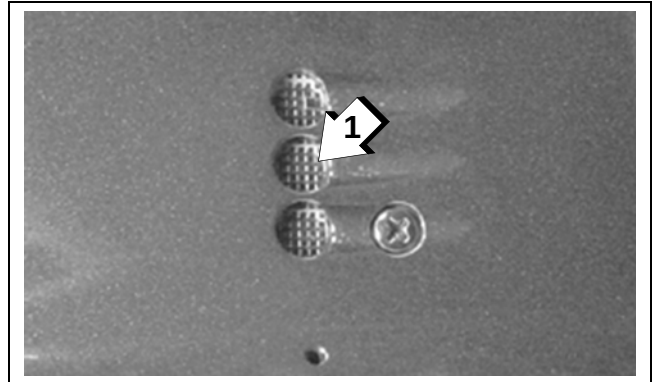
1. Flange Nut, P/N 326586
2. Plate, P/N 391260
3. Rod, P/N 326582
4. Remover, P/N 326580

010316

Use a 1 in. wrench to hold the remover in place. Use a 3/4 in. wrench to turn flange nut clockwise and draw the bearing up from the housing.

Water Intake Screen

Inspect the water intake screen for blockage and remove it by depressing the tabs on either side of the screen and pushing upward.



1. Water intake screen

001997

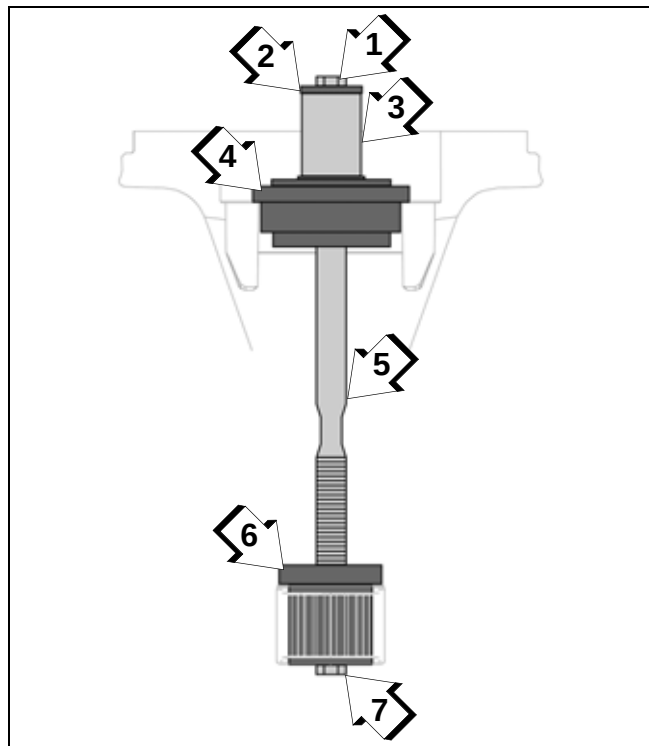
Pinion Bearing Installation

Install the water intake screen. Drop it into the water intake cavity and use a suitable tool to push it down as far as it will go.

F-Type Gearcase

Shifter, Bearing and Seal Service

Assemble Pinion Bearing Remover and Installer, P/N 5005927, as shown:



1. 1/4-20 X 1/2 in. Hex head screw
2. 1 in. O.D. Flat washer
3. Spacer, P/N 326584
4. Plate, P/N 391260
5. Rod, P/N 326582
6. Installer, P/N 326575
7. 1/4-20 X 1 1/4 in. Hex head screw

010317

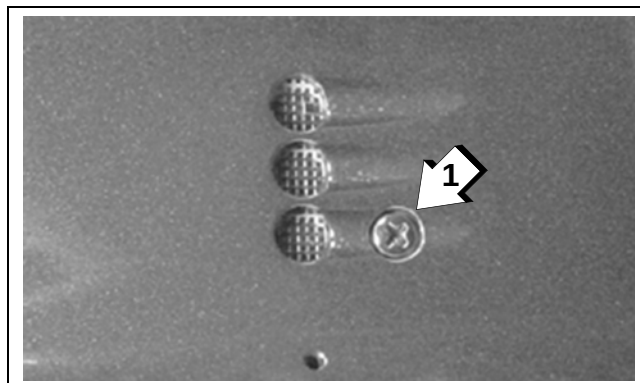
IMPORTANT: Spacers are different sizes and cannot be interchanged.

Place the bearing on the installer tool with the **lettered side of the bearing facing the top** of the gearcase. Use *Needle Bearing* grease to hold the bearing on the tool.

Insert the tool with the bearing into the gearcase. Drive the bearing into the gearcase until the washer on the tool contacts the spacer.

Place a new O-ring on the pinion bearing retaining screw. Apply *Gasket Sealing Compound* to O-ring and *Nut Lock* to screw threads. Install the screw

and tighten to a torque of 48 to 80 in. lbs. (5.5 to 9.0 N·m).



1. Bearing retaining screw

001997

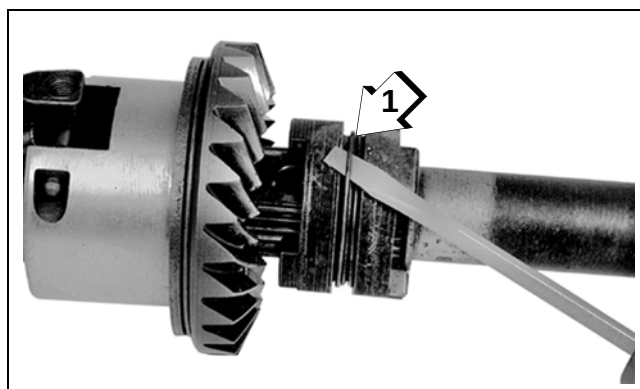
Shift Housing Disassembly

⚠ WARNING

Wear safety glasses to avoid injury.

IMPORTANT: The shift housing and forward gear bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

COA3560

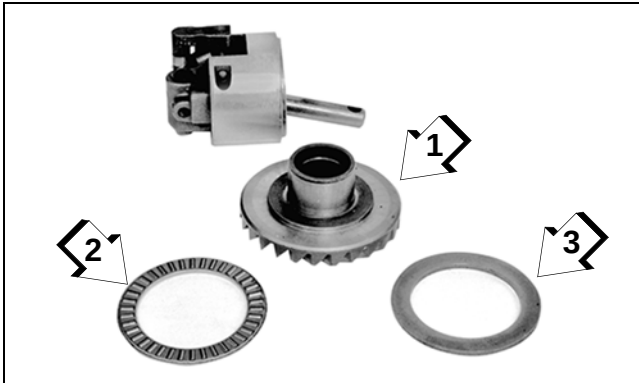
Push the pin out of the clutch dog. Remove all parts.



1. Pin

COA3561

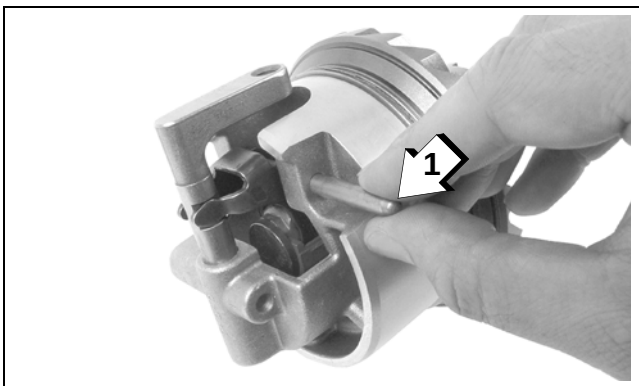
Remove the gear, thrust bearing, and thrust washer from the shift housing.



1. Gear
2. Thrust bearing
3. Thrust washer

COA3562

Remove the shift lever pin from the housing.

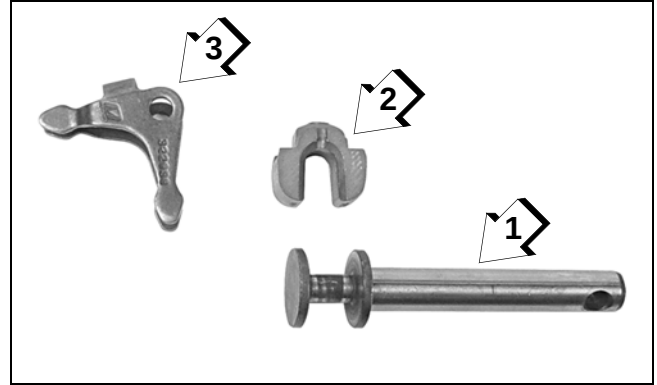


1. Shift lever pin
2. Shifter detent

DSC02449

Move the shifter detent as needed to help ease removal of the following parts:

- shift shaft
- cradle
- shift lever



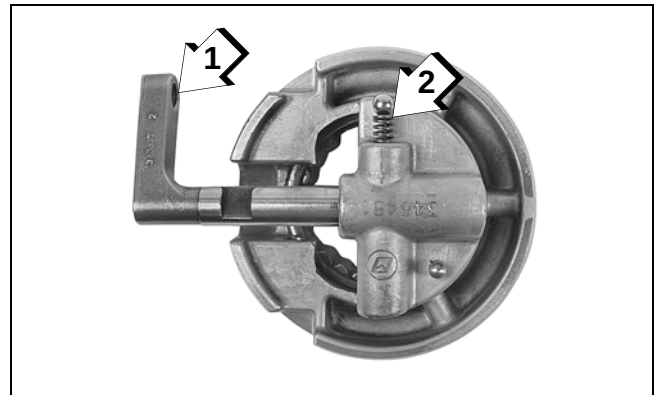
1. Shift shaft
2. Cradle
3. Shift lever

DSC02489

⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Rotate the shifter detent 90° in either direction, then pull the detent out of the housing.



1. Shifter detent
2. Ball and spring

DSC02518

Remove the detent ball and spring.

Shift Housing Assembly

IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

F-Type Gearcase

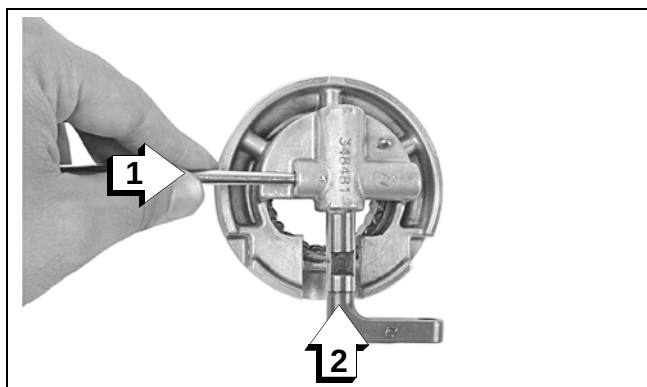
Shifter, Bearing and Seal Service

Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



010118

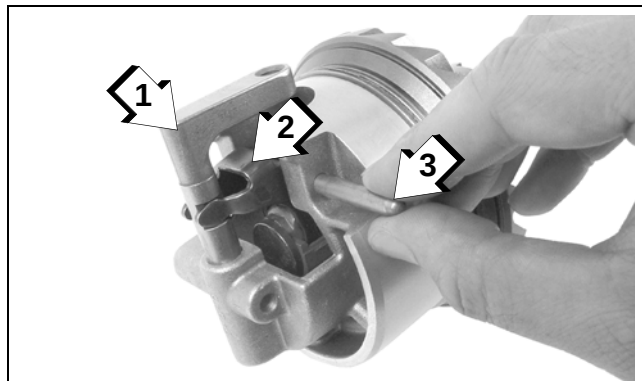
Insert shifter detent at 90° angle into the housing as shown. Use a suitable tool to depress the ball and spring into the housing. Hold the ball and spring in place and push the shifter detent to capture the ball and spring. Once the shifter detent is past the ball, remove the tool and position detent to engage NEUTRAL position.



1. Depress the ball and spring
2. Push the shifter detent

DSC02506

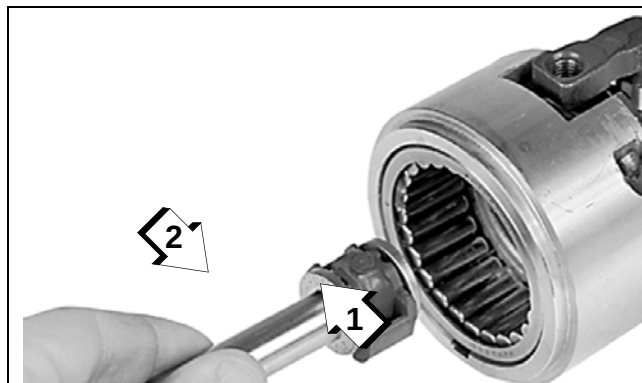
With shifter detent in NEUTRAL, install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Shifter detent
2. Shift lever
3. Pin, shift lever

DSC02449

Rest the cradle on the shift shaft.



1. Cradle
2. Shift shaft

4512

Place the shift lever arms into the recesses of the shift cradle. Pull shifter detent back up to NEUTRAL position to hold the cradle and shaft in position.

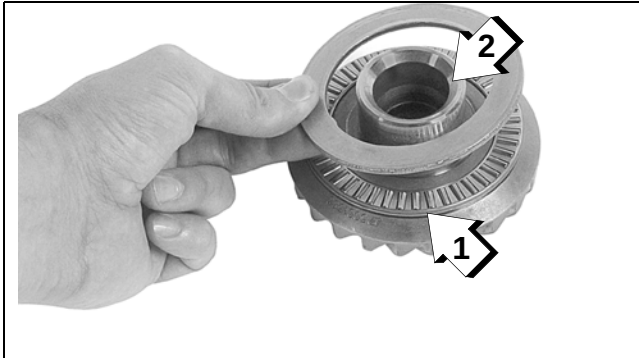


001219

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bearing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



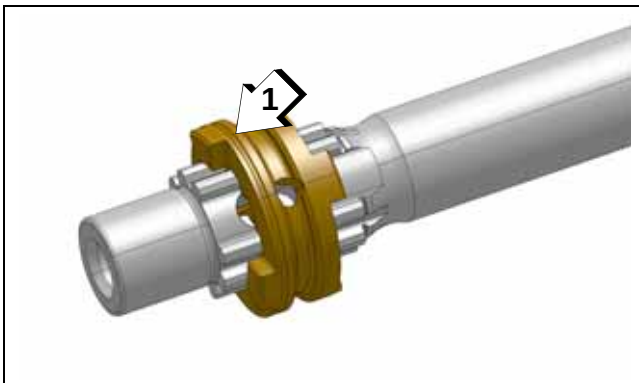
1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog with grooved end toward the forward end of the shaft.

NOTICE

The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.

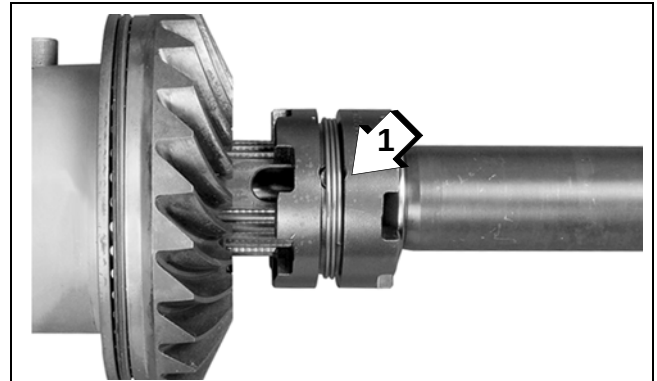


1. Grooved end

COA3591

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end

of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

006907

Driveshaft Bearing Housing Service

The driveshaft bearing is not serviceable. Replace the bearing housing assembly if the bearing is worn or damaged. Also, inspect the driveshaft bearing surface if the bearing is damaged.

Remove the driveshaft bearing housing seal using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Discard the seal.



010319

Remove and discard the O-ring from the bearing housing.

Clean the bearing housing in solvent to remove sealer from the seal bore and the O-ring groove.

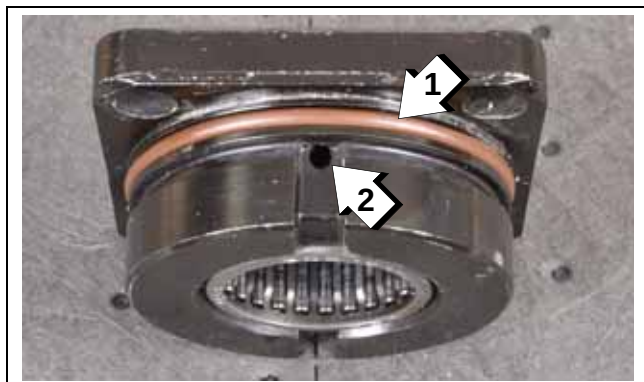
F-Type Gearcase

Shifter, Bearing and Seal Service

Lightly apply *Gasket Sealing Compound* to a new O-ring. Install the O-ring in top groove of the bearing housing. Do not allow sealant in oil passage.

NOTICE

Do not install the O-ring in the bearing housing's bottom groove. The bottom groove is an oil passage. Gearcase damage could result.

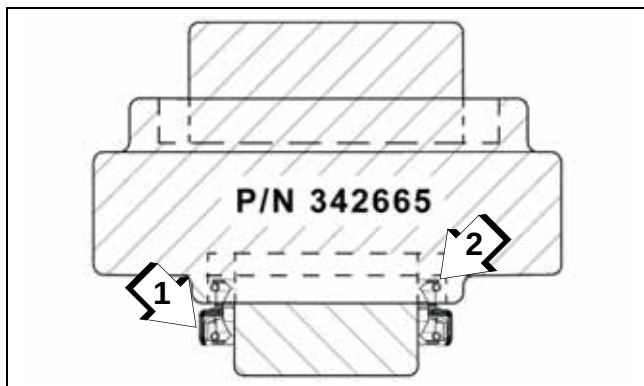


1. O-ring (top groove)
2. Oil passage

009526

Apply *Adhesive 847* to casing of new seal before installing.

Use Seal Installer, P/N 342665 to install seal in bearing housing with the exposed lip facing away from housing. Apply *Triple-Guard* grease to seal lips.



1. Seal
2. Exposed lip

010323

Propeller Shaft Bearing Housing Service

Rear Seal Removal

Remove seals using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Place the

plate on top of the housing to support the bridge, and tighten jaws securely behind the inner seal.



21047

Bearing Removal

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

Remove rear bearing using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Place the puller plate on top of the housing to support the bridge, and tighten jaws securely behind the bearing.



21045

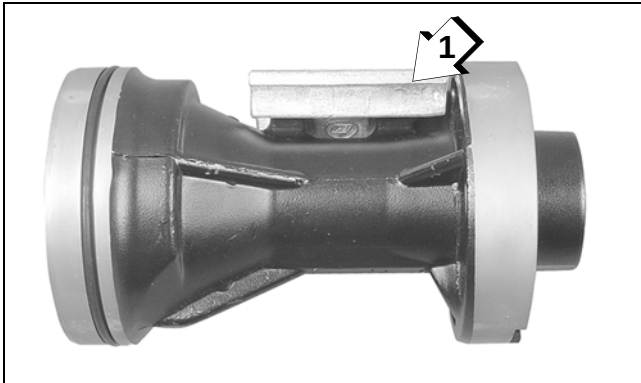
Remove front bearing using Puller Bridge, P/N 432127, and Bearing Puller, P/N 432130. Place the puller plate on top of the housing to sup-

port the bridge, and tighten jaws securely behind the bearing.



21067

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size. Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).

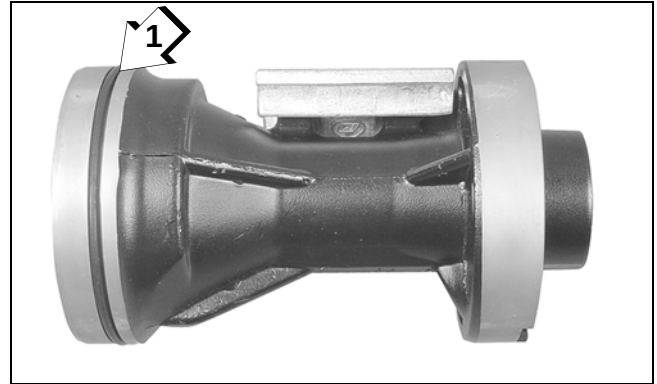


1. Anode

001220

Discard the bearing housing O-ring. Clean the housing and bearings in solvent and dry thoroughly. If bearings were not replaced, rotate the needles to check for freedom of movement.

Inspect O-ring groove. Sand off any sharp edges that might cut O-ring. Remove any nicks or burrs on front of bearing housing.



1. O-ring groove

DSC02291

Thoroughly clean the four bearing housing retaining screws in solvent. Discard the O-rings.

Bearing Installation

Oil, then install new bearings in bearing housing.

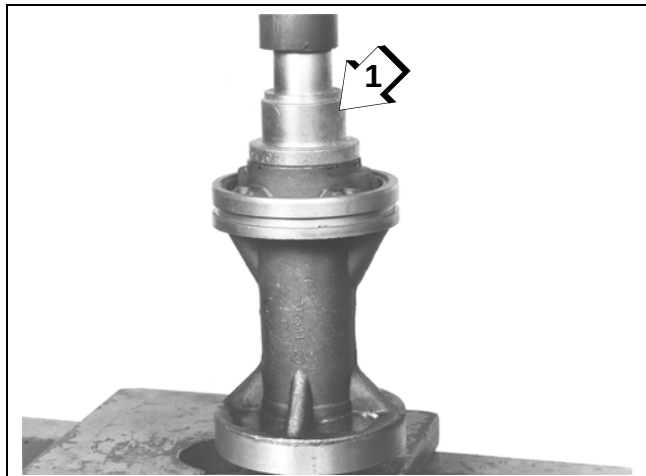
Place the **lettered end** of the bearing case on the bearing installer, then press the bearing into the housing until the tool seats. When installed, the lettered end of the bearing should be visible.

F-Type Gearcase

Shifter, Bearing and Seal Service

Bearing Installation Tool:

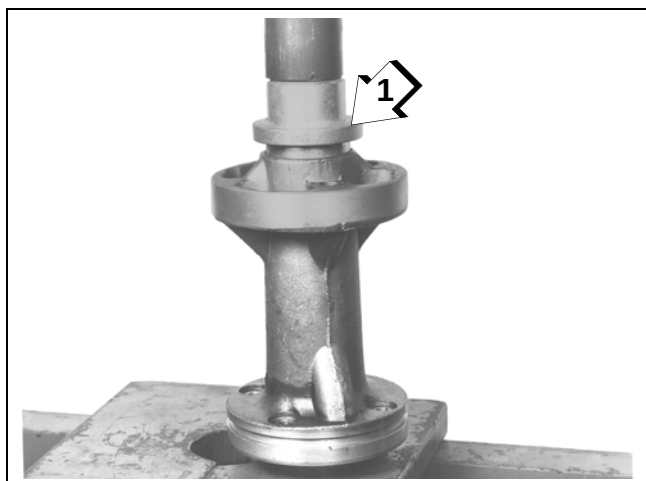
- P/N 326562



Forward Bearing

1. Bearing installation tool

COA3579

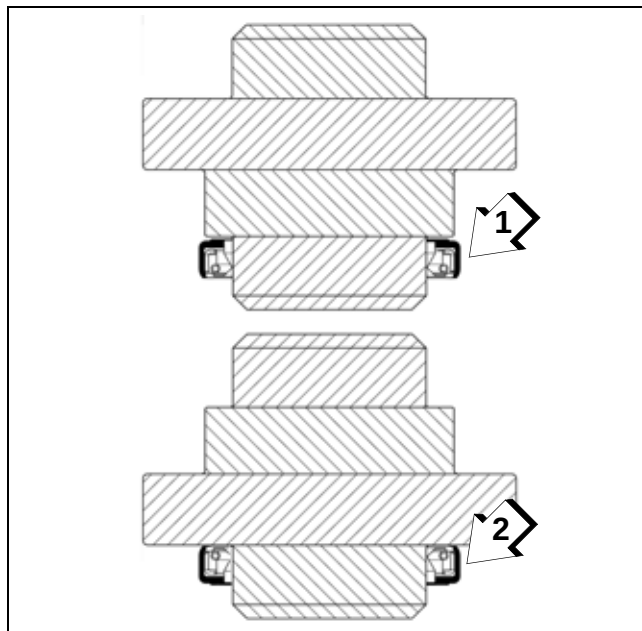


Rear Bearing

1. Bearing installation tool

COA3580

Install inner seal with lip facing toward the bearing housing, then outer seal with lip facing away from the bearing housing.



1. Inner seal
2. Outer seal

010320

Apply *Triple-Guard* grease to seal lips.S

Rear Seal Installation

Apply *Gasket Sealing Compound* to metal casings of the seals before installing.

Use Seal Installation Tool to install new seals back to back in bearing housing.

Seal Installation Tool:

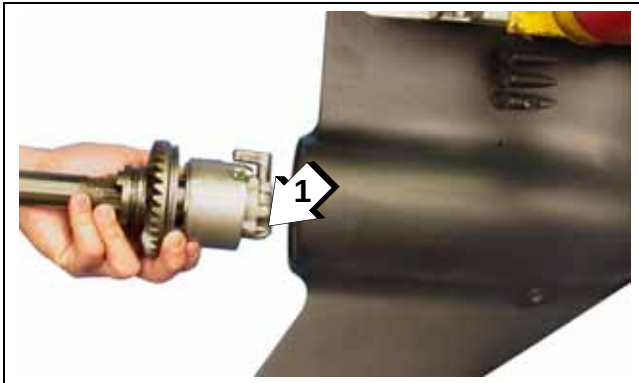
- P/N 326551

Gearcase Assembly

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift housing pin with hole in forward end of gearcase housing.



1. Pin

006648

Shift Rod Housing Installation

Lubricate a new shift rod cover O-ring with *Triple-Guard* grease. Install the O-ring into the shift rod cover.

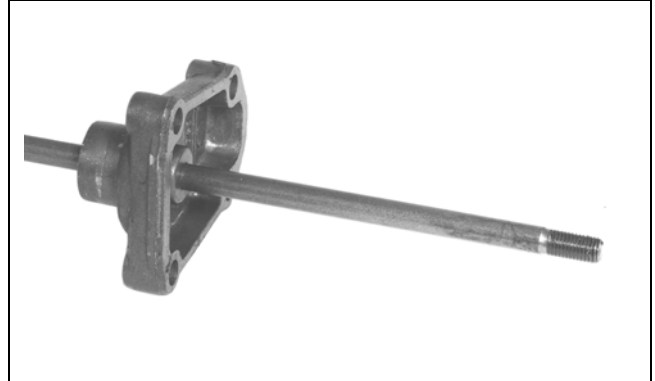
IMPORTANT: Make sure O-ring is fully seated in groove.



1. O-ring
2. Groove

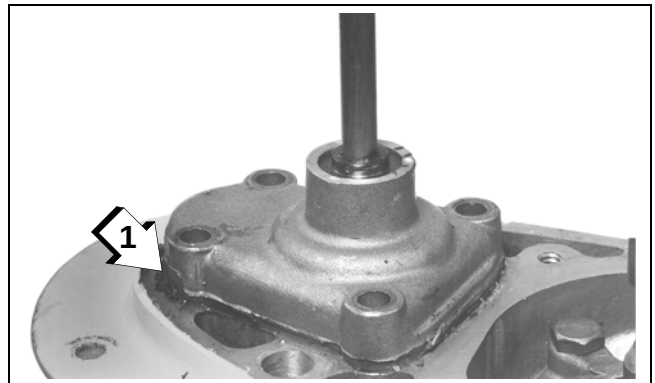
006649

Apply *Triple-Guard* grease to the threaded end of the shift rod and insert it through the cover. Turn the shift rod while pushing it through the cover to avoid damaging the O-ring.



COA3544

Apply *Gasket Sealing Compound* to both sides of a new shift rod cover gasket. Place the gasket on the gearcase. Thread the shift rod into the shifter detent about four turns.



1. Cover gasket

COA3545

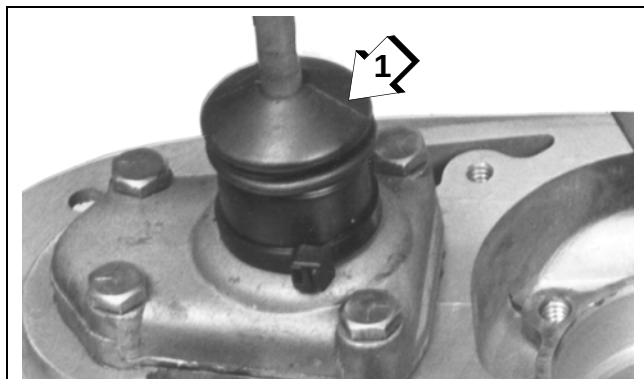
Move shift rod from side to side while pushing on the propeller shaft to ensure proper alignment of the bearing housing locator pin into the pin hole in the gearcase.

Apply *Gasket Sealing Compound* to the threads of the shift rod cover screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

F-Type Gearcase

Gearcase Assembly

Place the cover seal on the shift rod cover. Secure the cover seal with a new tie strap.



1. Cover seal

002514

the driveshaft bearing housing. Do not coat inside bearing housing bore surface of the gearcase.



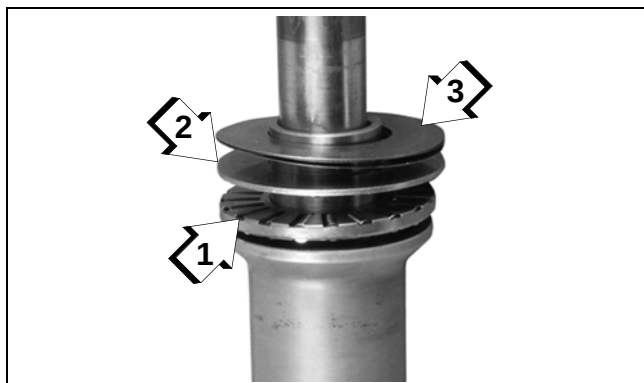
6207

Pinion Gear and Driveshaft Installation

Refer to **Driveshaft Shimming** on p. 15 before proceeding.

Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on p. 61.

Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

010322

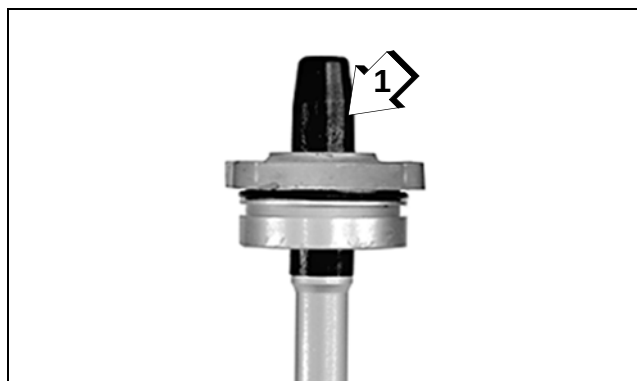
Lightly apply *Gasket Sealing Compound* to the gearcase area that contacts mounting flange of

Adjust shift rod to move clutch dog as far forward as possible. Be sure excess grease is removed from the pinion bearing.

IMPORTANT: The inside taper of the pinion gear and the driveshaft taper **MUST** be completely free of grease. Clean the tapers with *Cleaning Solvent*. Use a shop towel free of grease and lint.

Place the pinion gear into the gearcase. Insert the driveshaft into the gearcase and through the pinion gear.

Using Driveshaft Seal Protector, P/N 312403, slide the driveshaft bearing housing onto the driveshaft and into position in the gearcase. Align the embossed word "FRONT" toward the shift rod. Do not install screws at this time.

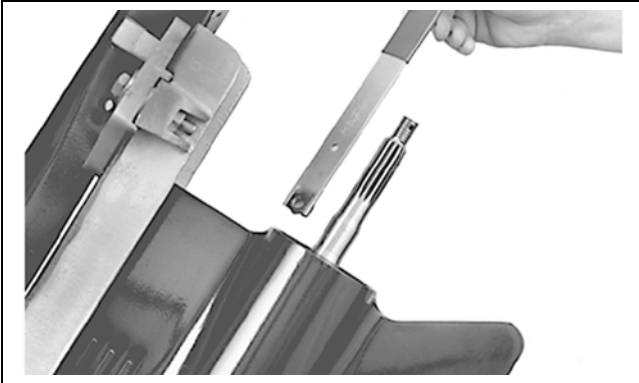


1. Seal protector

COA3130

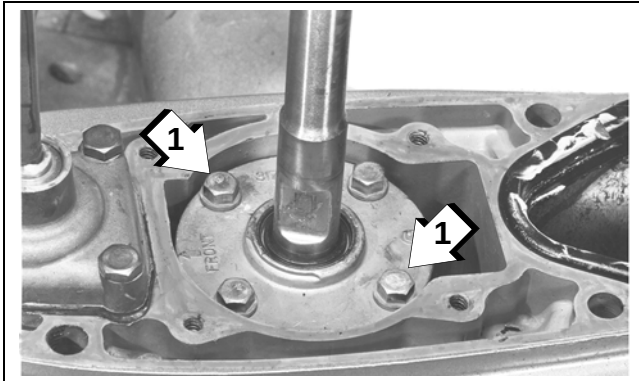
Lightly coat the threads of a **new** pinion nut with outboard lubricant. Use Pinion Nut Starting Tool, P/N 320675, to install nut on the driveshaft. Turn

the driveshaft by hand to thread the nut on to shaft.



33220

Apply *Gasket Sealing Compound* to the threads of the driveshaft bearing housing screws. Tighten screws **in stages** to a torque of 96 to 120 in. lbs. (11 to 14 N·m).

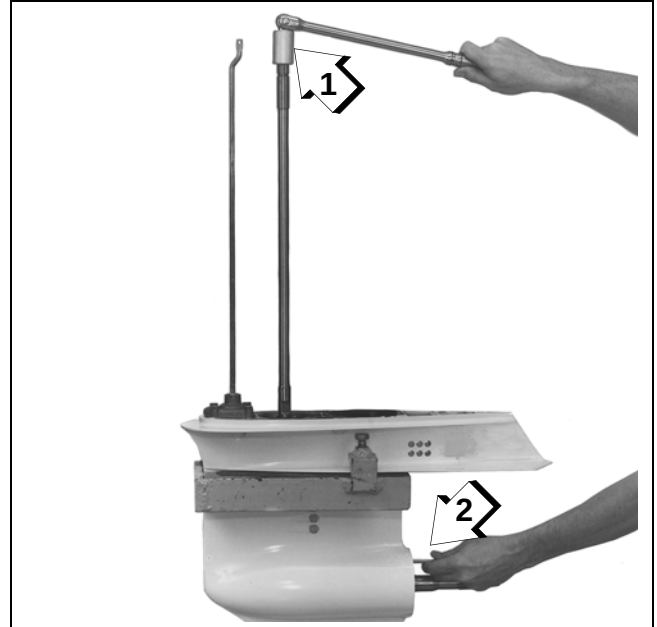


1. Driveshaft bearing housing screws

COA3671

Use Driveshaft Holding Socket, P/N 334995, and an 11/16 in. open-end wrench, to tighten the pinion nut to a torque of 40 to 45 ft. lbs. (54 to 60s

N·m). Pad handle of the wrench to prevent damage to gearcase.

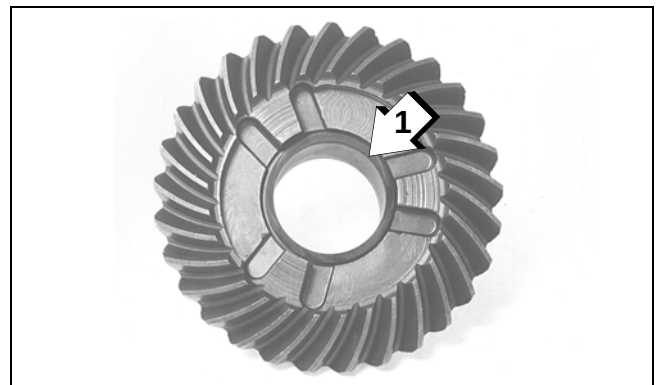


1. Holding socket
2. 11/16 Wrench

COA3573T

Propeller Shaft Bearing Housing and Gear Installation

Place the small thrust washer in recess of the reverse gear.



1. Small thrust washer

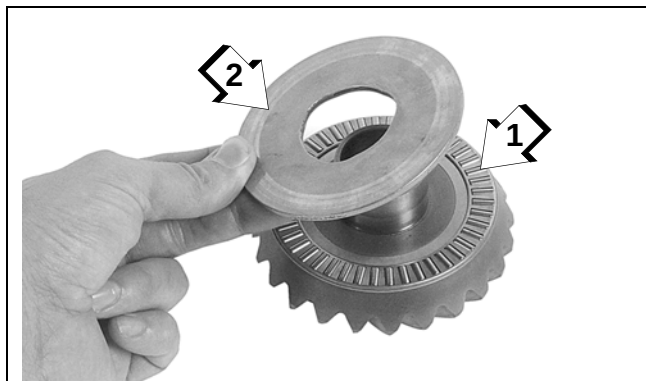
COA3597

Oil and install thrust bearing and larger thrust washer on hub of reverse gear. Slide the gear

F-Type Gearcase

Gearcase Assembly

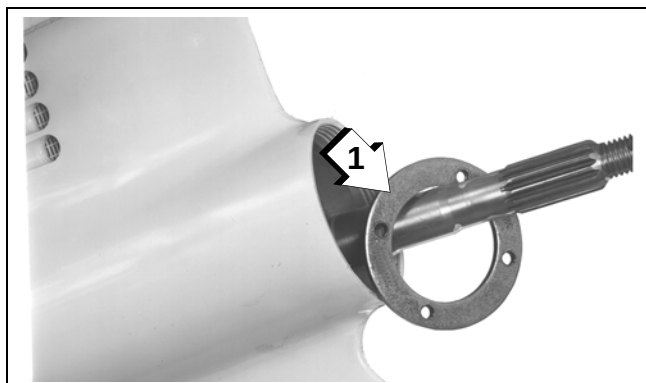
assembly onto the propeller shaft until it engages the pinion gear.



1. Thrust bearing
2. Thrust washer

DSC02295

Slide the bearing housing retainer plate into position over the propeller shaft.



1. Retaining ring

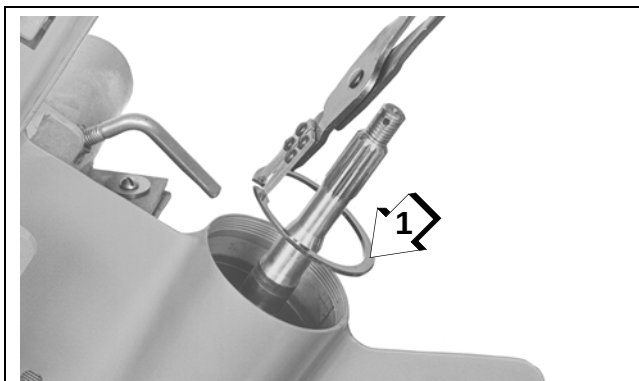
COA3513

Using Retaining Ring Pliers, P/N 331045, install the two retaining rings.

⚠ CAUTION

Retaining rings are under extreme pressure during installation. Wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers.

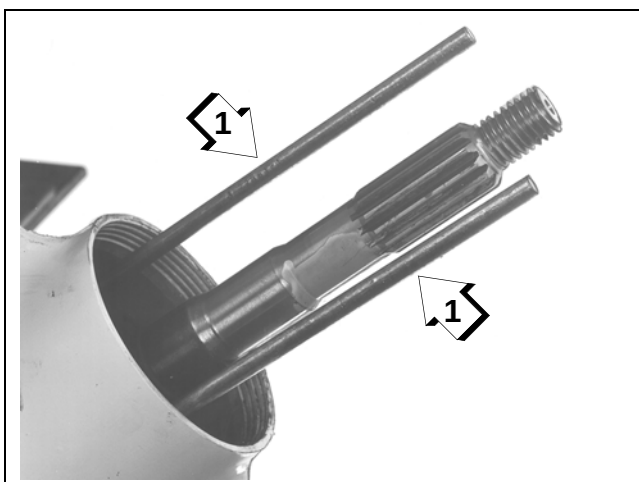
Make sure the retaining rings are seated in the grooves in the gearcase.



1. Retaining ring

9438

Thread two Guide Pins, P/N 383175, into the retainer plate to align holes in the plate with holes in the propeller shaft bearing housing. Do not thread guide pins more than two turns into the retainer plate.



1. Guide pins

COA3550

Install O-ring in groove in the bearing housing. Lightly apply *Gasket Sealing Compound* to the O-ring flange and aft support flange of the bearing housing. Do not allow sealer to contact either forward thrust surface or bearings in the housing.

Align the bearing housing on the guide pins with the word "UP" toward the top. Place the housing into gearcase and tap the housing with a soft face mallet to seat the O-ring.

Apply *Gasket Sealing Compound* to the threads and seals of the four propeller housing retaining screws. Install two of the screws into the bearing

housing finger tight. Remove the guide pins and install the remaining two screws. Tighten all four screws to a torque of 120 to 140 in. lbs. (14 to 16 N·m).

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 50
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 48
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Technician's Notes

[illegible]

Bulletins

Instruction Sheets

Other

S, S2-Type Gearcases

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Service Charts

"S"-Type Gearcase

24-36 In. lbs.
(3-4 N·m)

60-84 In. lbs.
(7-9.5 N·m)

120-144 In. lbs.
(13.5-16.5 N·m)

100-110 Ft. lbs.
(136-149 N·m)

18-20 Ft. lbs.
(24-27 N·m)

26-28 Ft. lbs.
(35-38 N·m)

35-40 Ft. lbs.
(47-54 N·m)

45-50 Ft. lbs.
(61-68 N·m)

60-84 In. lbs.
(7-9.5 N·m)

14-18 In. lbs.
(1.5-2 N·m)

60-84 In. lbs.
(7-9.5 N·m)

18-20 Ft. lbs.
(24-27 N·m)

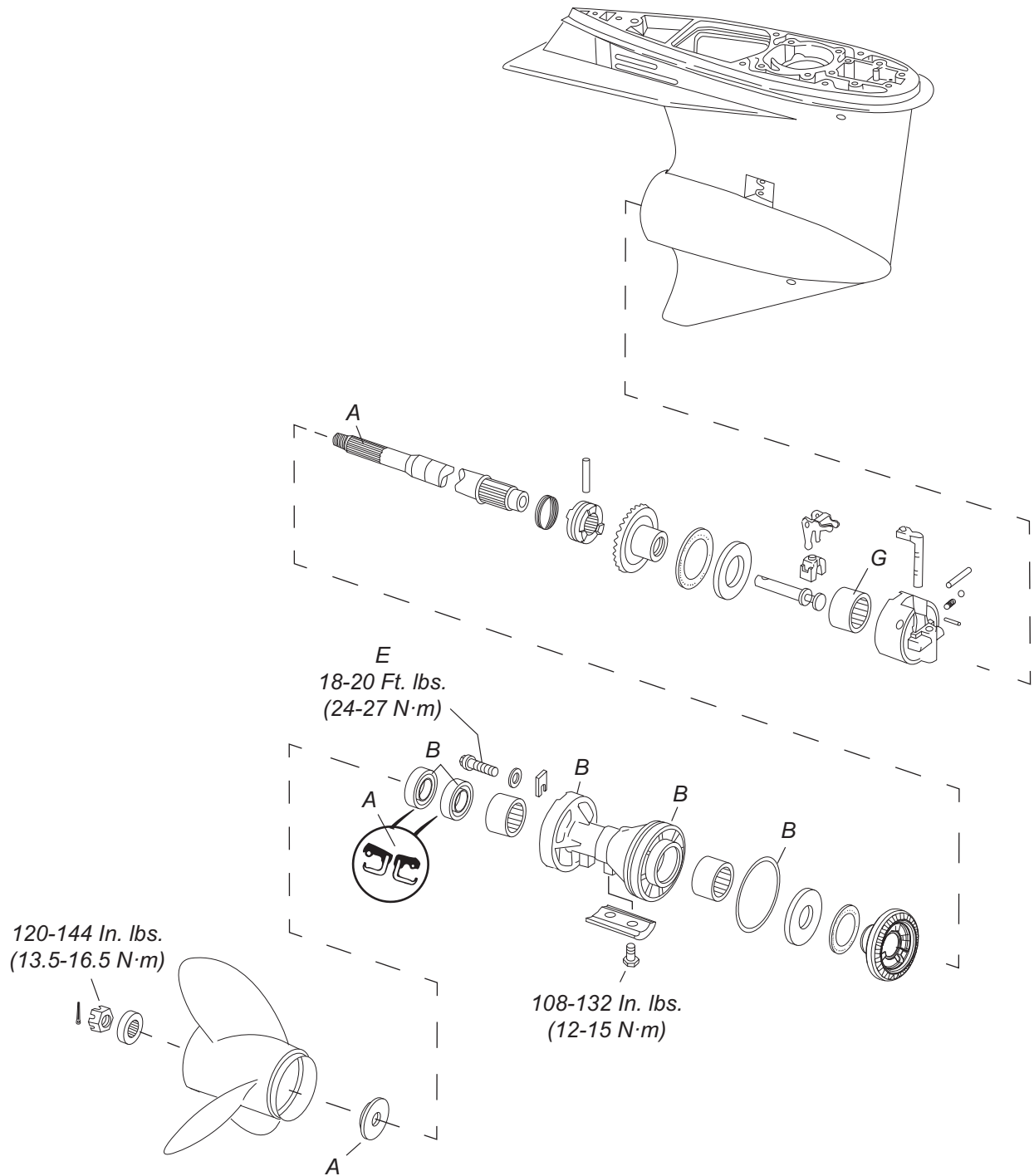
60-84 In. lbs.
(7-9.5 N·m)

26-28 Ft. lbs.
(35-38 N·m)

60-84 In. lbs.
(7-9.5 N·m)

010313A

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual



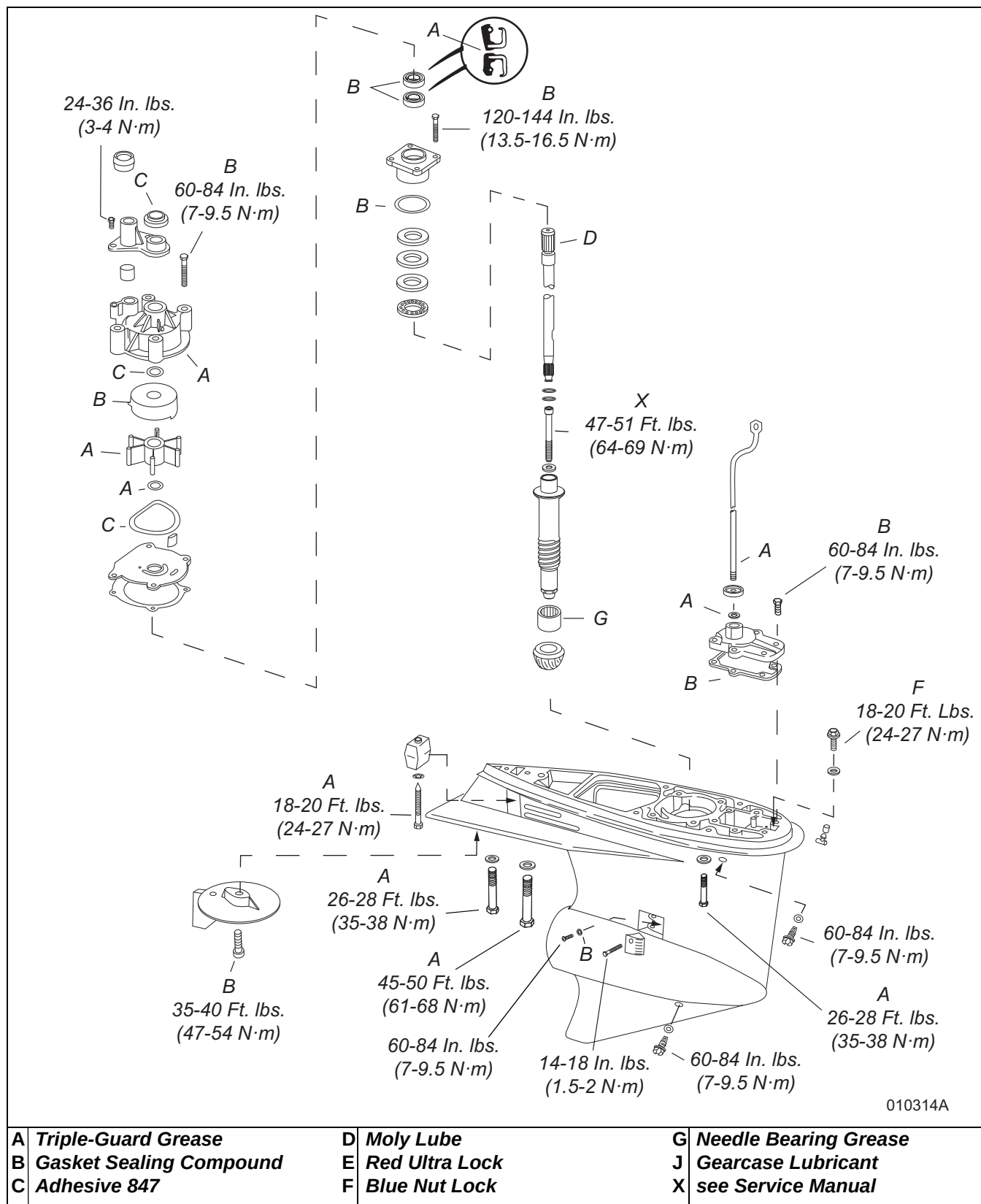
010313B

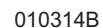
A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

S, S2-Type Gearcases

Service Charts

"S-2"-Type Gearcase



75

Gearcase Removal and Installation

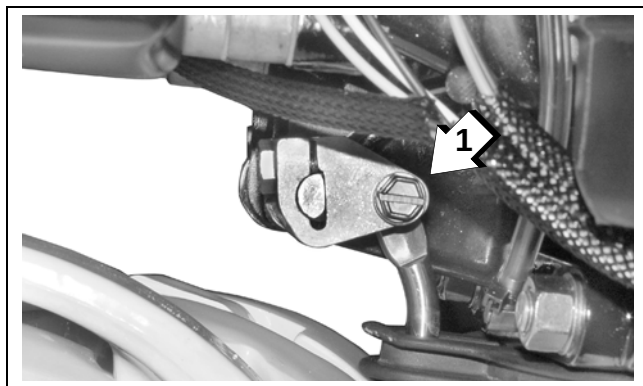
Gearcase Removal

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

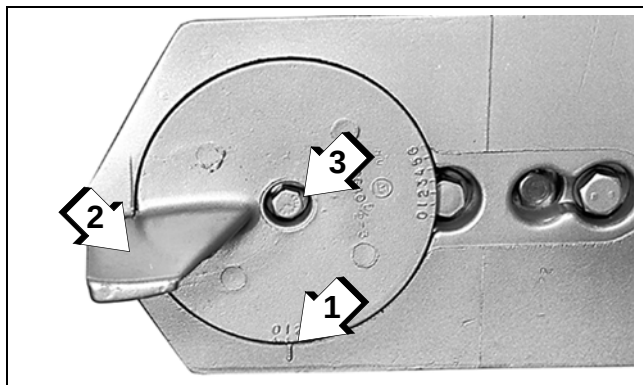
Remove pin and washer from shift rod lever to release the lower shift rod.



1. Shift rod screw

002013

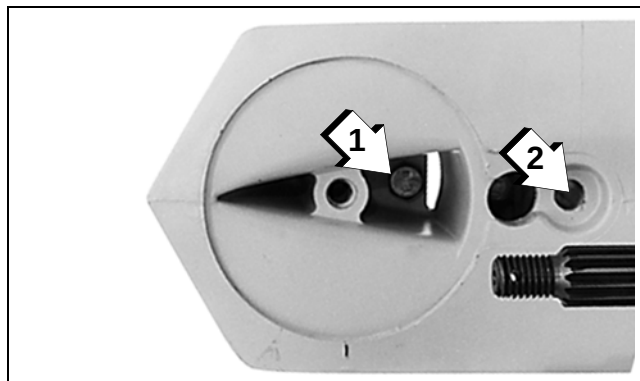
Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position. Remove the trim tab retaining screw and trim tab from the gearcase.



1. Index mark
2. Trim tab
3. Trim tab retaining screw

COA3663

Remove the 3/8-16 in. screw and washer, and remove 7/16-14 x 3.5 in. screw and washer.

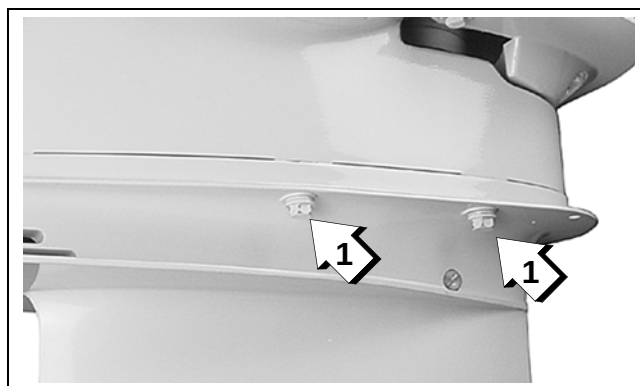


S Type Gearcases

1. 3/8-16 x 1.75 in. screw
2. 7/16-14 x 3.5 in. screw

COA3139

Remove the four 3/8-16 x 1.75 in. gearcase retaining screws and washers.



1. Gearcase retaining screws

001990

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

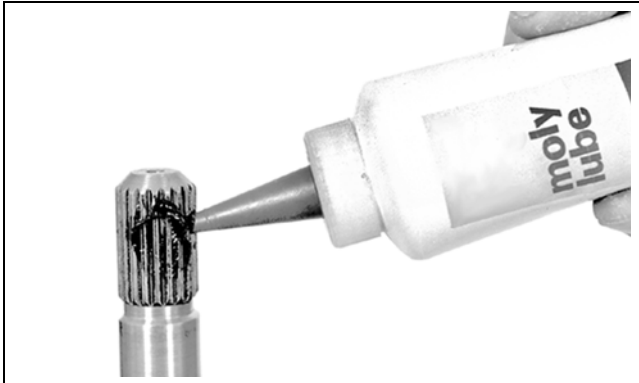
NOTICE

Before installing gearcase, shift rod adjustment **MUST** be checked. Refer to Shift Rod Adjustment on p. 324.

S, S2-Type Gearcases

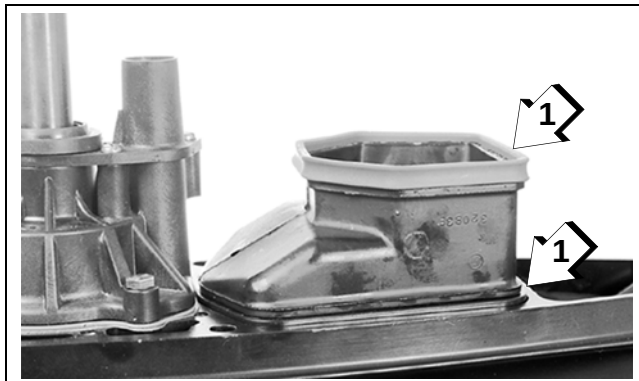
Gearcase Removal and Installation

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

Apply *Adhesive 847* to the lower exhaust housing seals' inner surfaces. Place two new seals on the housing. Apply *Triple-Guard* grease to the seals' outer surfaces and place the housing on the gearcase.



1. Lower exhaust seals

32002

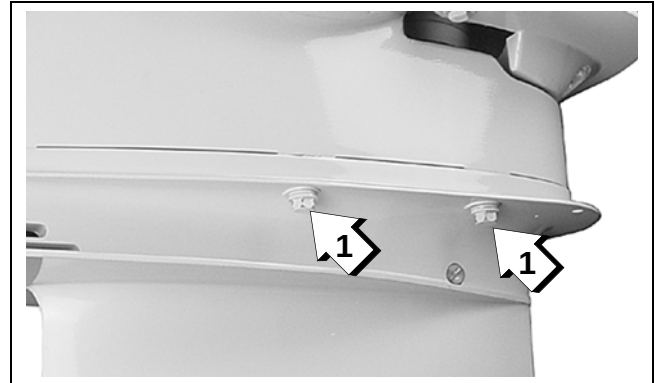
Slide the gearcase into place, making sure:

- Driveshaft engages the crankshaft.
- Water tube enters the water pump.
- Lower inner exhaust housing installs correctly.
- Shift rod does not turn and is positioned properly in the shift rod lever below the crankcase.

IMPORTANT: New gearcase screws are treated with a thread-locking material. Apply *Triple-Guard* grease to threads to ensure that the correct clamping force is achieved when tightening—If a previously installed screw is re-used, use a wire brush to remove any old thread-locking material or corrosion and lubricate threads with *Triple-Guard* grease.

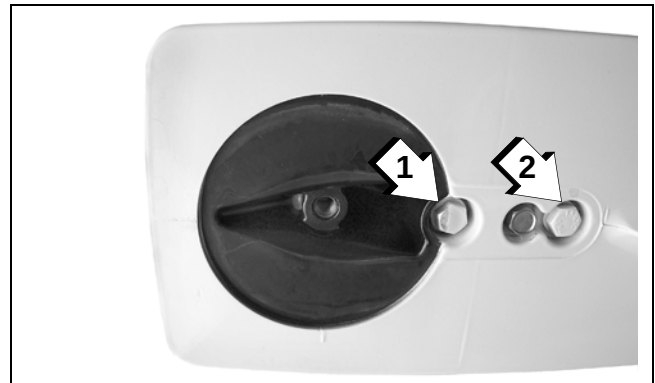
Install screws and washers and tighten to a torque of:

- **3/8 in.** screws – 26 to 28 ft. lbs. (35 to 38 N·m)
- **7/16 in.** screws – 45 to 50 ft. lbs. (61 to 68 N·m)



1. 3/8 in. screws

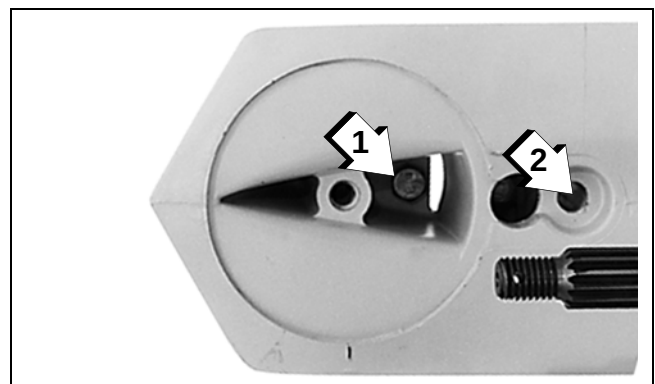
001990



O Type Gearcases

1. 3/8-16 x 3.5 in. screw
2. 7/16-14 x 3.5 in. screw

006869



S Type Gearcases

1. 3/8-16 x 1.75 in. screw
2. 7/16-14 x 3.5 in. screw

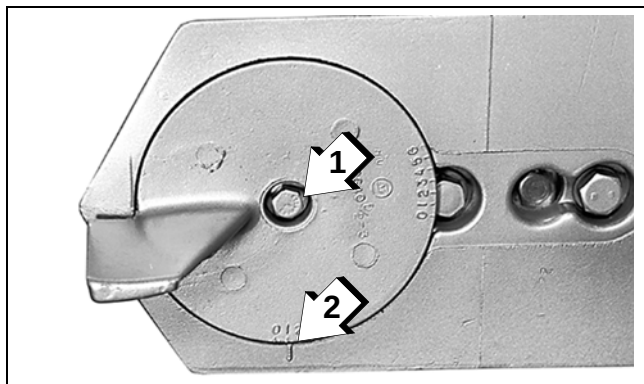
COA3139

Apply *Triple-Guard* grease to threads of the trim tab screw. Install and align the trim tab with the index marks noted prior to disassembly. Tighten

S, S2-Type Gearcases

Water Pump Service

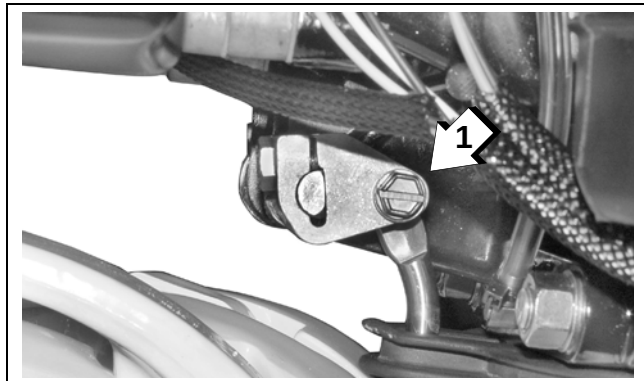
the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to **Trim Tab Adjustment** on p. 18.



1. Trim tab screw
2. Index mark

COA3663

Place the shift rod in the shift rod lever. Install the retaining pin and washer. Tighten pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Shift rod screw

002013

⚠ WARNING

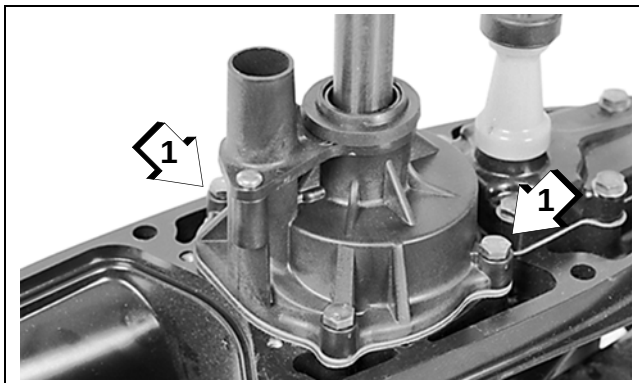
To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Water Pump Service

Disassembly

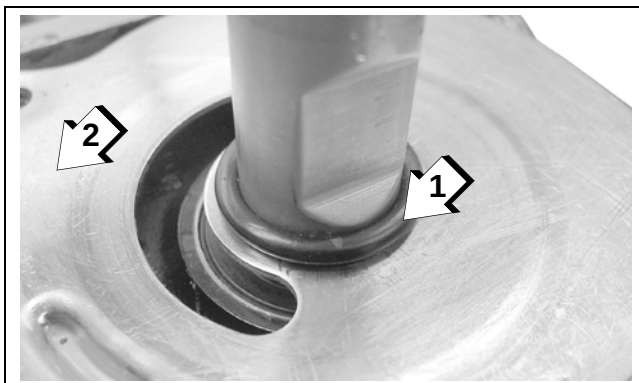
Rotate the driveshaft counterclockwise to unlock the impeller key. Remove the four impeller housing screws.



1. Screws

31998

Slide the water pump off the driveshaft. Remove the impeller key, O-ring, impeller plate, and gasket. Discard the gasket.



1. O-ring
2. Impeller plate

DSC02328

Remove all the parts from the housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

Check liner and wear plate for scoring, distortion, and impeller material transfer.

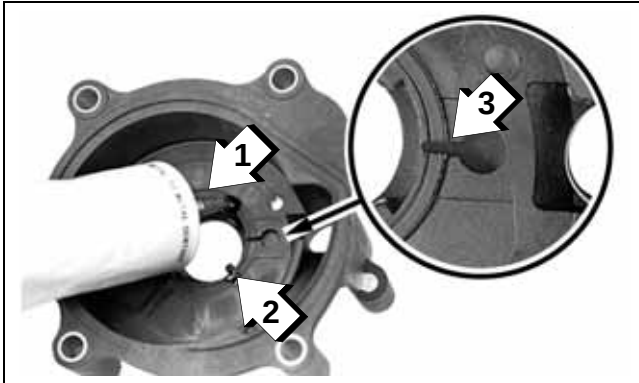
Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

Apply a drop of *Adhesive 847* in the seal ring groove at each of the four ribs.

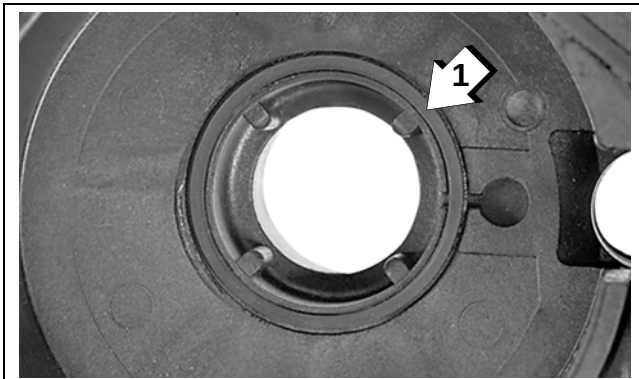
IMPORTANT: Do not allow any sealer to get into the air bleed groove in the impeller housing. If this groove is blocked by adhesive, the pump will lose its prime and will not pump water.



1. Seal ring groove
2. Ribs
3. Air bleed groove

2311

Install the O-ring in groove in the impeller housing.



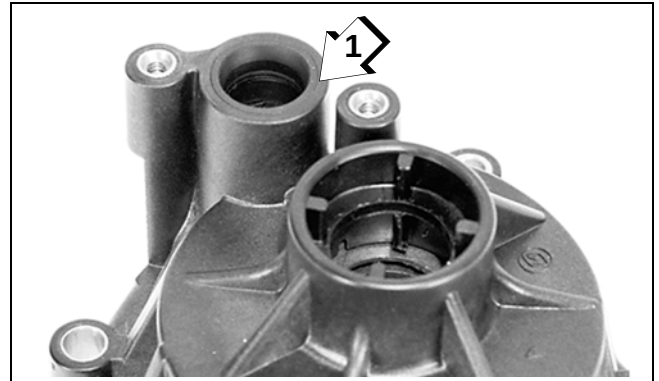
1. O-ring

34814

Lightly coat the exterior rim of the impeller cup with *Gasket Sealing Compound*. Install the cup in the impeller housing. The cup locks in place in the housing with a square index tab.

Make sure vent hole in impeller cup is open.

Install the water tube grommet with the inside taper facing up.

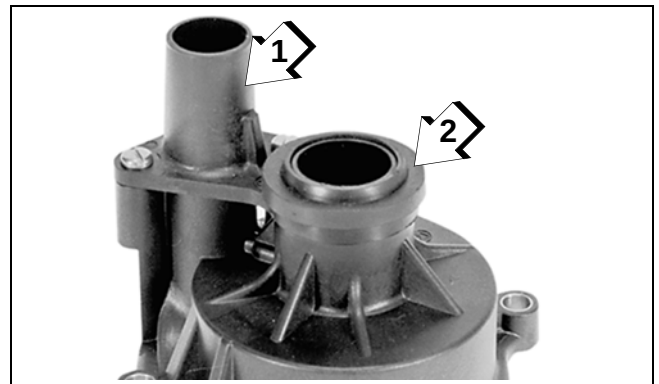


1. Water tube grommet

32000

Apply *Triple-Guard* grease to screw threads and install the impeller housing cover and tighten screws to a torque of 24 to 36 in. lbs. (3 to 4 N·m).

Apply *Adhesive 847* to flat side of the impeller housing grommet. Install the grommet, flat side down.



1. Impeller housing cover
2. Impeller housing grommet

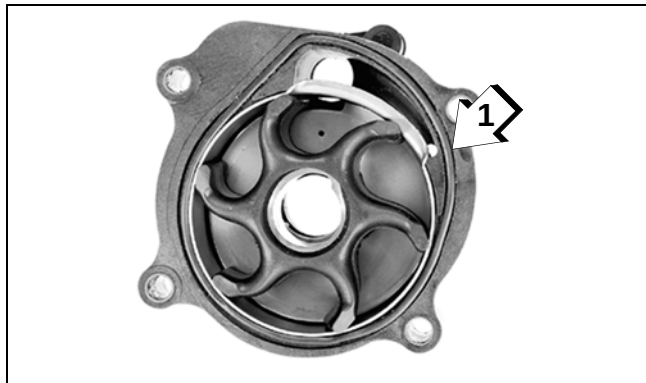
32001

Lightly coat the inside of the liner with *Triple-Guard* grease. With a counterclockwise rotation, install the impeller into the liner with the slot for the impeller key facing out.

S, S2-Type Gearcases

Water Pump Service

Apply a thin bead of *Adhesive 847* in the seal groove, and install the special shaped O-ring seal.

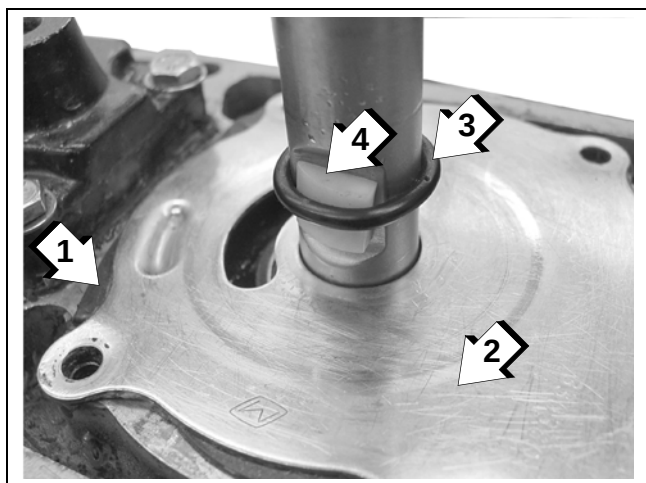


1. O-ring

34815

Apply *Gasket Sealing Compound* to both sides of a new impeller plate gasket. Install the gasket and impeller plate.

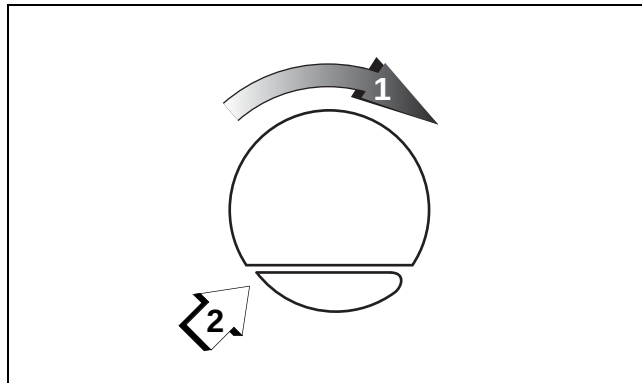
Apply *Triple-Guard* grease to a new impeller O-ring. Slide the O-ring down the driveshaft and half way over installed impeller key to temporarily hold key in place.



1. Impeller plate gasket
2. Impeller plate
3. O-ring
4. Drive key

DSC02326

slide water pump down over key. Be sure impeller key does not fall out of position.



1. Driveshaft rotation
2. Drive key

CO2995

NOTICE

Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Align the impeller housing with the gearcase. Apply *Gasket Sealing Compound* to threads of the four impeller housing screws. Install the screws and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

The sharp edge of the key is the leading edge in clockwise rotation.

Slide the water pump down the driveshaft. Align impeller slot with the impeller key. Rotate the driveshaft to engage the key with the impeller, and

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Remove gearcase. Refer to **Gearcase Removal and Installation** on p. 76.

Remove water pump. Refer to **Water Pump Service** on p. 78.

Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skag, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **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.

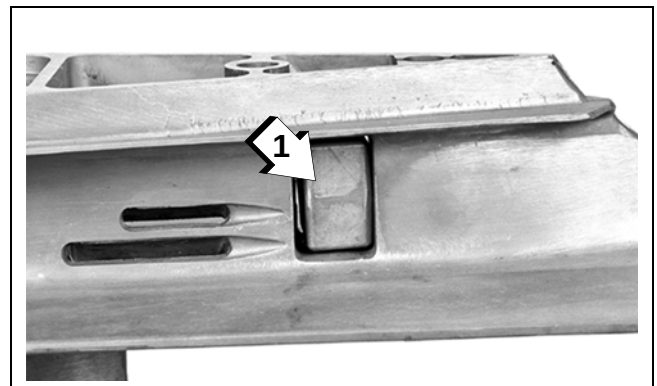
- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

4557

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.



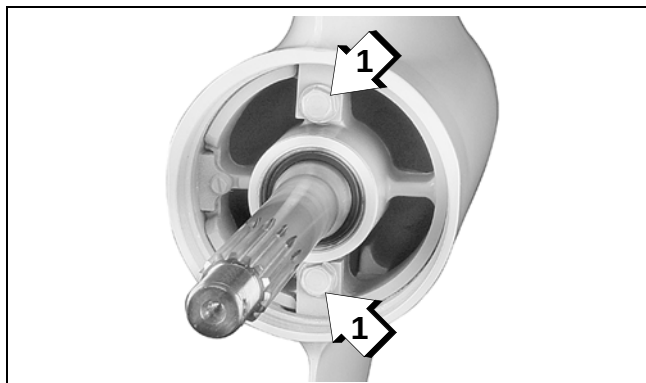
1. Gearcase anode

14161

- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.
- **Water Intake Screens** — Check for damage and blockage. If screens cannot be cleaned, they must be replaced. Different screens are available and should not be mixed. Refer to correct model parts manual for listing and description.

Propeller Shaft Bearing Housing Removal

Remove the two screws, washers, and retainers holding the propeller shaft bearing housing.



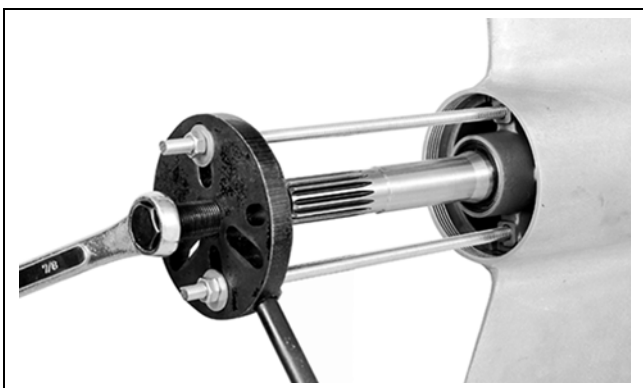
1. Retainer tab screws

001989

Remove the propeller shaft bearing housing from the gearcase using the following:

- Puller body, screw, and handle from Universal Puller Set, P/N 378103.
- Two 5/16-18 x 11 in. (279 mm) threaded rods, two large 5/16 in. I.D. flat washers, and two 5/16-18 nuts (obtain locally).

Assemble components and pull the bearing housing from the gearcase.



22775

Remove the thrust washer, thrust bearing, and reverse gear from gearcase.

Pinion Gear and Driveshaft Removal – S Type

Adjust the shift rod to move the clutch dog as far forward as possible. This will help ease removal of the pinion nut.

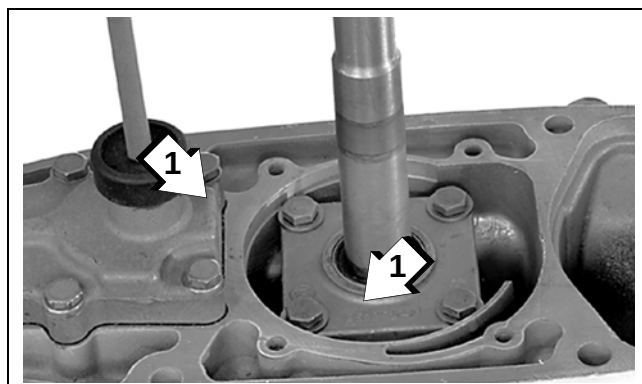
Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438 to loosen and remove the pinion nut from the bottom of the driveshaft. Pad handle of holder to prevent damage to gearcase.



1. Holding socket
2. Pinion nut wrench
3. Retainer

42229

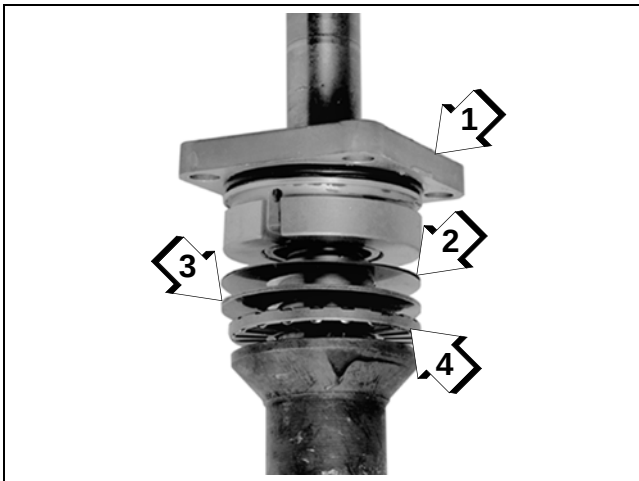
Remove the four driveshaft bearing housing screws.



1. Driveshaft bearing housing screws

COA3153

Remove the driveshaft from the gearcase. The bearing housing, shims, thrust bearing, and thrust washer will come out with the driveshaft.

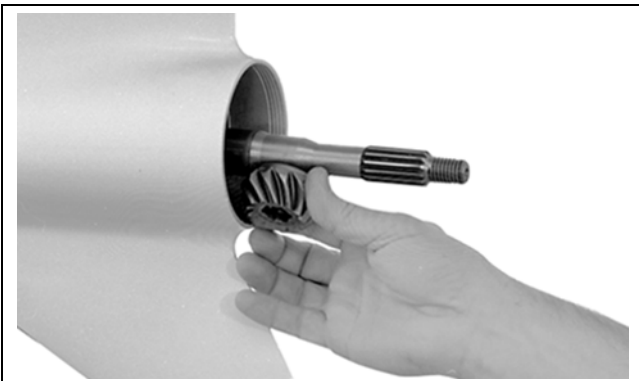


1. Bearing housing
2. Shims
3. Thrust bearing
4. Thrust washer

COA3558

If driveshaft cannot be removed, refer to **Locked Driveshaft Removal** on p. 83.

Remove the pinion gear from the gearcase.

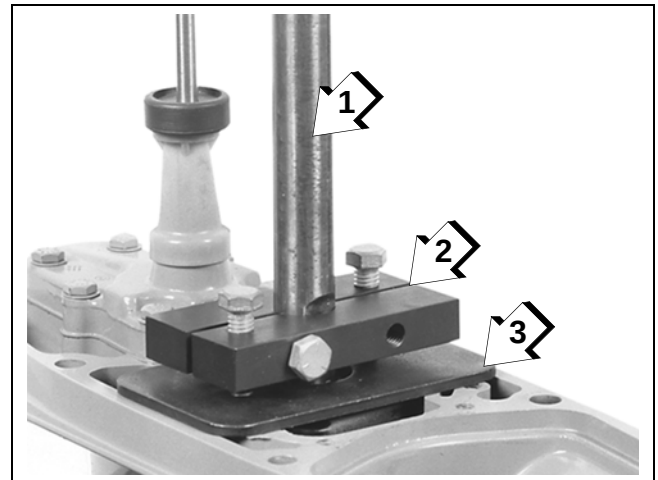


COA3159

Locked Driveshaft Removal

The driveshaft to pinion taper is a locking taper. If necessary, use Driveshaft Puller, P/N 390706, and Backing Plate, P/N 325867, to break the lock. Install the tools as shown by clamping them around the driveshaft. Alternately tighten the two vertical screws against the backing plate inserted

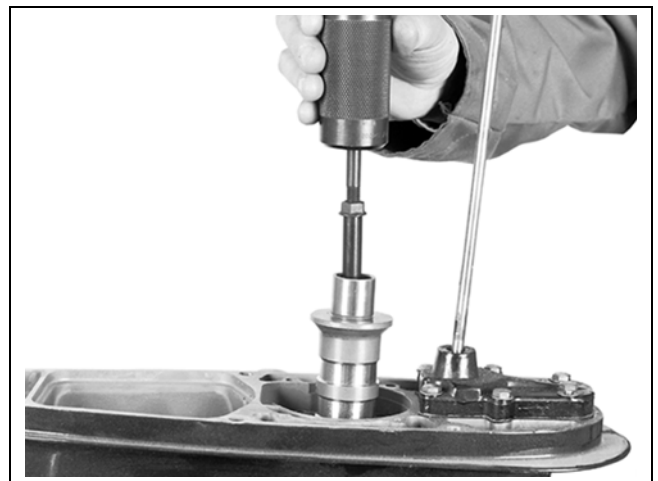
between the puller and the gearcase until the driveshaft pops loose from the pinion.



1. Drive shaft
2. Puller
3. Backing plate

41177

If upper driveshaft becomes separated from lower driveshaft, use Lower Driveshaft Puller, P/N 342681, to remove. Install puller into lower driveshaft and turn 90° to position hook under pin in driveshaft. Thread Slide Hammer, P/N 391008, into puller and remove driveshaft.



46905

S, S2-Type Gearcases

Gearcase Disassembly

Driveshaft Service

To separate the upper driveshaft (if needed) from the lower driveshaft, remove the roll pin. Replace the damaged component.



29337

To assemble the driveshaft, install **new** driveshaft retainer into the groove of the upper driveshaft.



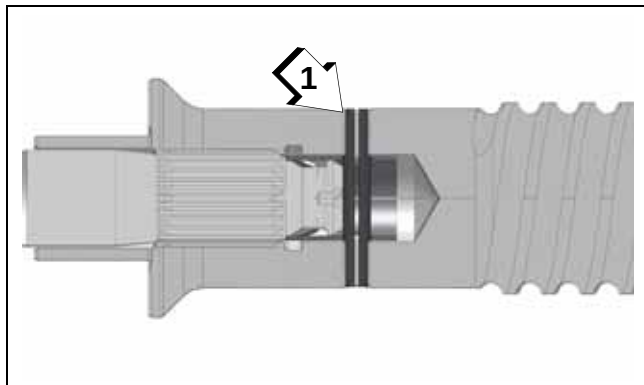
29338

Install the upper driveshaft into the lower driveshaft, aligning the holes in the driveshaft retainer and the lower driveshaft.



29330

Install the roll pin flush.



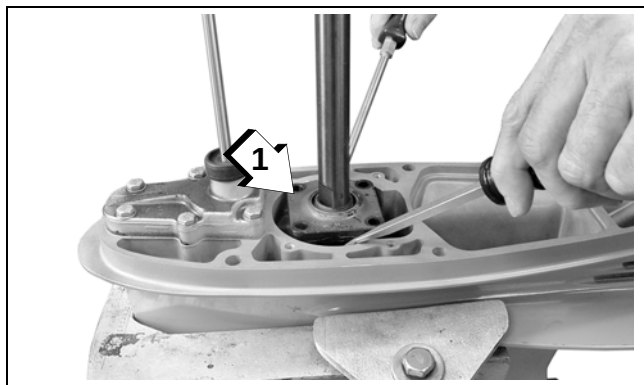
1. Roll pin

010492

Pinion Gear and Driveshaft Removal – S2 Type

IMPORTANT: To separate the upper driveshaft from the lower driveshaft, the upper retainer **must** be removed and upper driveshaft must slide down into lower driveshaft.

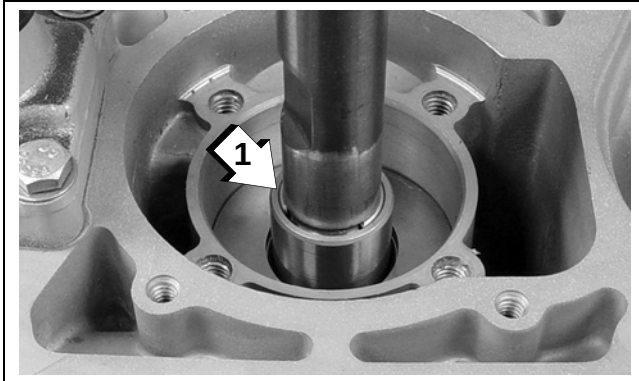
Remove the four driveshaft bearing housing screws and bearing housing.



1. Bearing housing

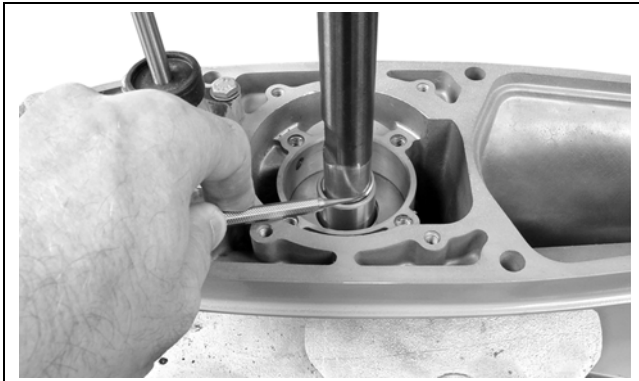
005422

Remove upper retainer.



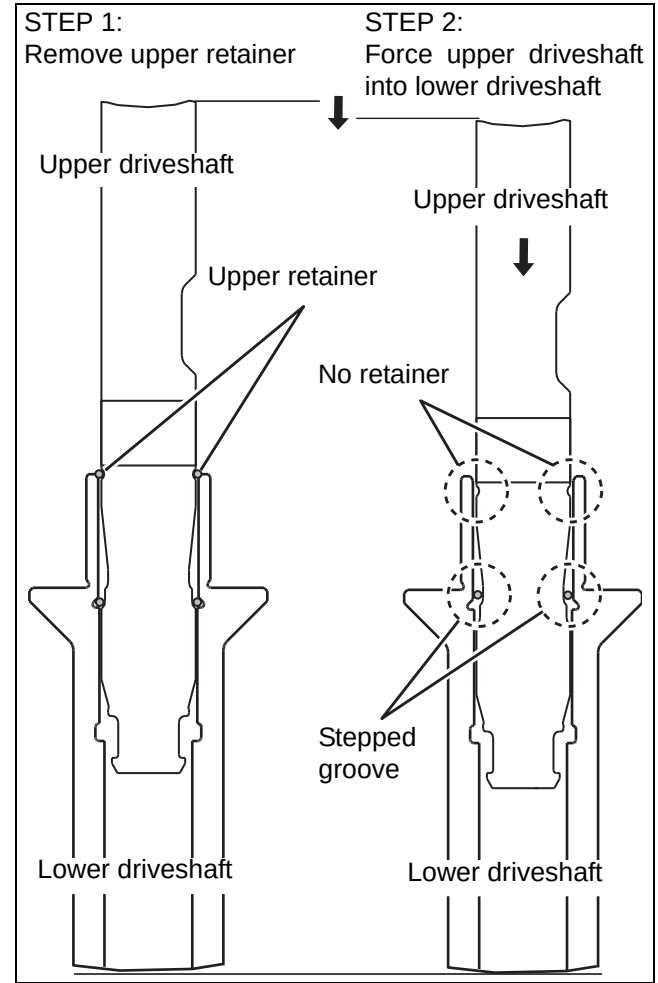
1. Retainer

005423



005424

Force upper driveshaft into lower driveshaft. This moves lower retainer on stepped groove of lower driveshaft. Refer to diagram below.



Upper Driveshaft Removal

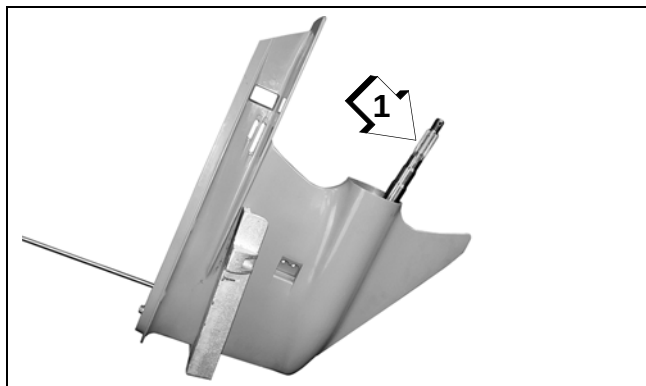
005411

S, S2-Type Gearcases

Gearcase Disassembly

Lift and remove upper driveshaft from lower drive-shaft.

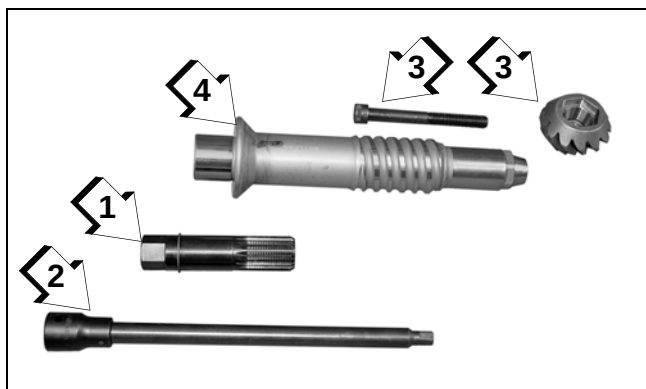
Push down on shift rod to move the clutch dog to reverse position. Pull propeller shaft aft to disengage from forward gear and shift housing. Allow shaft to drop against lower gearcase housing. This will assist in the removal of the pinion gear.



1. Propeller shaft

005405

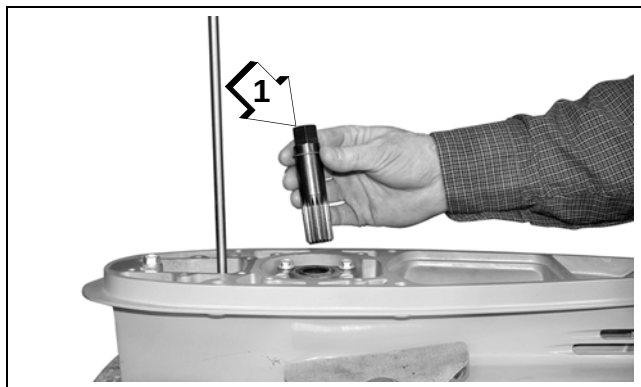
Use the required tools to remove the pinion screw and gear from the lower driveshaft.



1. Lower Driveshaft Spline Tool, P/N 5007052
2. Lower driveshaft Wrench, P/N 352877
3. Pinion gear and screw
4. Lower driveshaft

005406

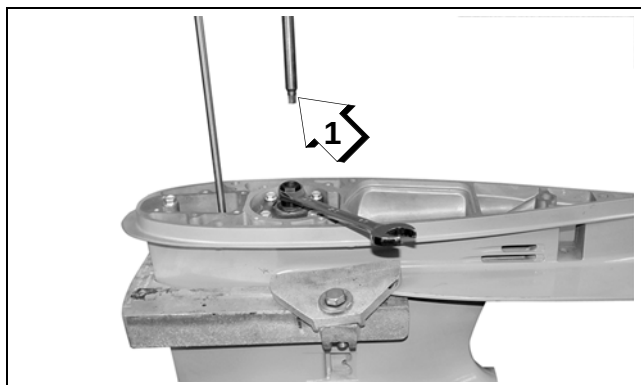
With driveshaft bearing housing and screws in place, insert Lower Driveshaft Spline Tool, P/N 5007052, into lower driveshaft.



1. Lower Driveshaft Spline Tool

005407

Insert Lower Driveshaft Wrench, P/N 352877, through Lower Driveshaft Spline Tool and lower driveshaft. Seat hex tip of wrench in head of pinion screw.



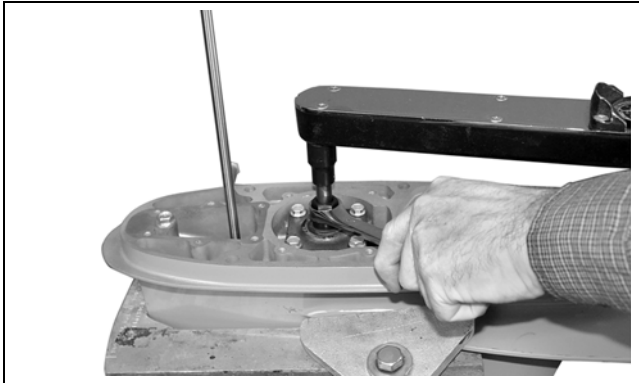
1. Wrench, hex tip

005408

IMPORTANT: Make sure Lower Driveshaft Wrench is fully seated in head of pinion screw.

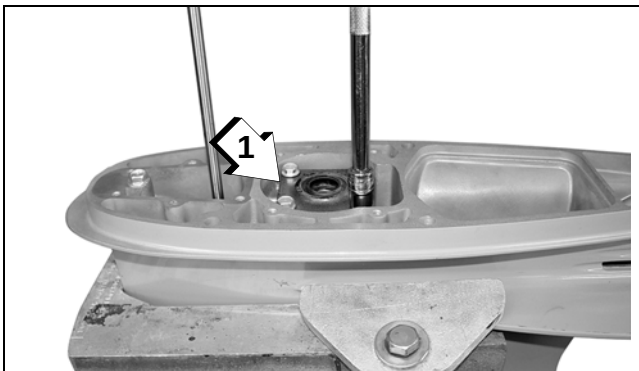
Use a long 3/4 in. combination wrench to hold lower Driveshaft Spline Tool and a 1/2" drive wrench to turn the Lower Driveshaft Wrench in a

counterclockwise direction. Loosen screw completely



005409

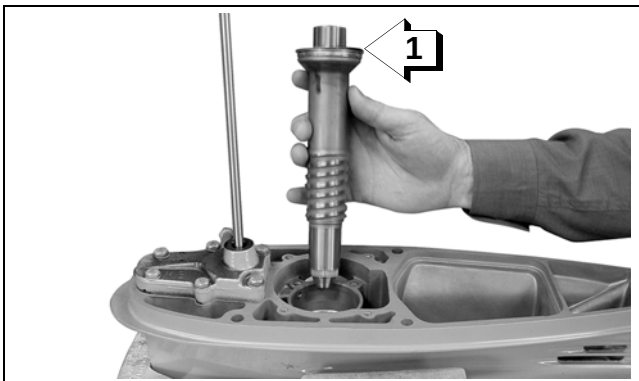
Remove the four driveshaft bearing housing screws and then the bearing housing.



1. Driveshaft bearing housing

005426

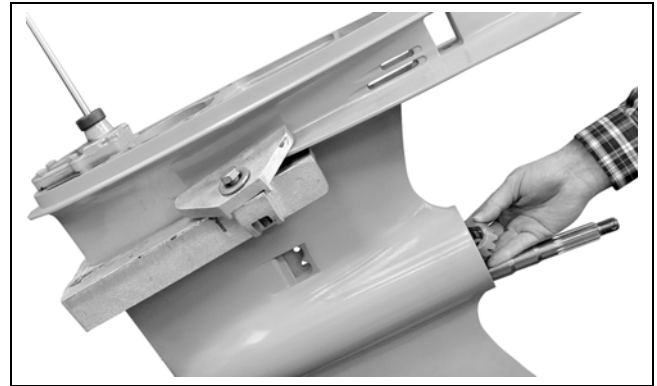
Remove shims, thrust washer, and thrust bearing with the lower driveshaft.



1. Shims, thrust bearing and thrust washer

005410

Remove pinion gear from gearcase housing.

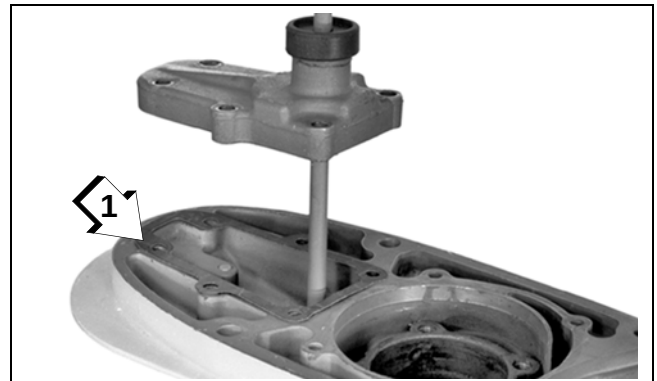


005420

Shift Housing, Gear and Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover gasket. Remove and discard the shift rod O-ring from inside of cover.



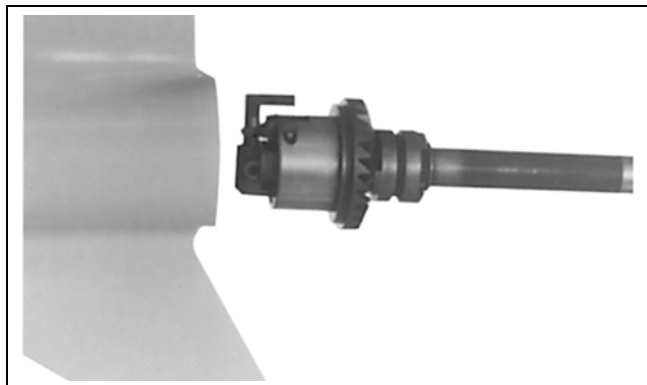
1. Cover gasket

COA3141

S, S2-Type Gearcases

Shifter, Bearing and Seal Service

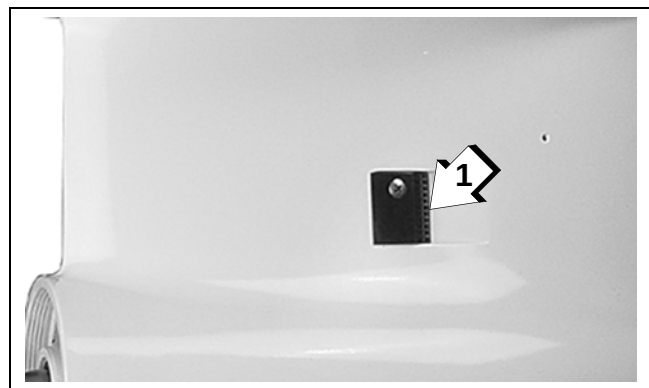
Remove propeller shaft assembly from gearcase.



COA3149

Water Intake Screens

Remove and clean water intake screens. Replace if damaged.



1. Water intake screen

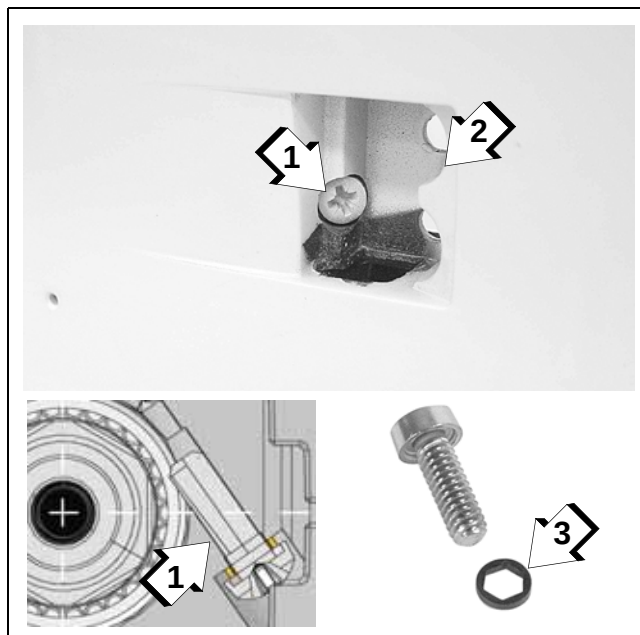
001991

IMPORTANT: Inspect gearcase housing, refer to **Gearcase Housing Inspection S, S2, L2, M2-Type** on p. 14.

Shifter, Bearing and Seal Service

Pinion Bearing Removal

Remove pinion bearing retaining screw.

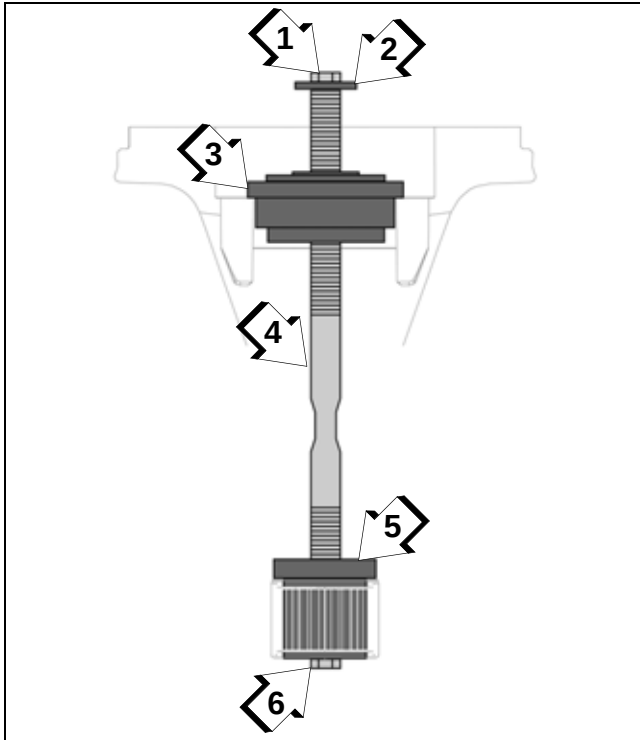


1. Pinion bearing retaining screw
2. Water screen pocket
3. Seal

DSC02370
DRC7416
DSC02313

Assemble Pinion Bearing Remover/Installer, P/N 5005927, in the gearcase as follows:

Use a mallet to drive the bearing from the housing.

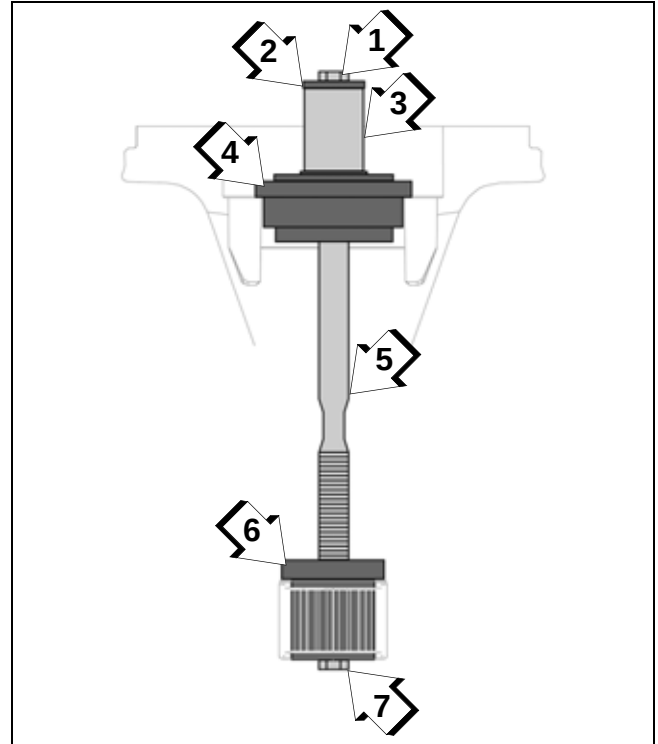


1. 1/4-20 x 1/2 in. Hex Head Screw
2. 1 in. O.D. Flat Washer
3. Plate, P/N 391260
4. Rod, P/N 326582
5. Installer/Remover, P/N 326574
6. 1/4-20 x 1 1/4 in. Hex Head Screw

010324

“Pinion Bearing Installation

Assemble the following components of Pinion Bearing Remover and Installer, P/N 5005927, as shown:



1. 1/4-20 X 1/2 in. Hex head screw
2. 1 in. O.D. Flat washer
3. Spacer, P/N 341437
4. Plate, P/N 391260
5. Rod, P/N 326582
6. Installer/Remover, P/N 326574
7. 1/4-20 X 1 1/4 in. Hex head screw

010317

IMPORTANT: Spacers are different sizes and cannot be interchanged.

Place the bearing on the installer tool with the **lettered side of the bearing facing the top** of the gearcase. Use *Needle Bearing* grease to hold the bearing on the tool.

IMPORTANT: The pinion bearing is tapered so that, when installed correctly, its shape compensates for stresses in the gearcase and allows full bearing contact. Whenever a gearcase is disassembled, the pinion bearing should be checked to ensure that it has been installed with the lettering facing up.

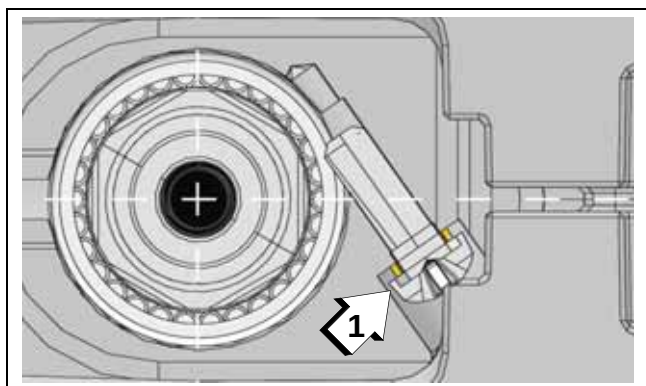
S, S2-Type Gearcases

Shifter, Bearing and Seal Service

Insert the tool with the bearing into the gearcase. Drive the bearing into the gearcase until the washer on the tool contacts the spacer.

Remove the tool.

Place a new O-ring on the pinion bearing retaining screw. Apply *Gasket Sealing Compound* to O-ring. Apply *Nut Lock* to screw threads. Install the screw and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. O-ring

drc7416R

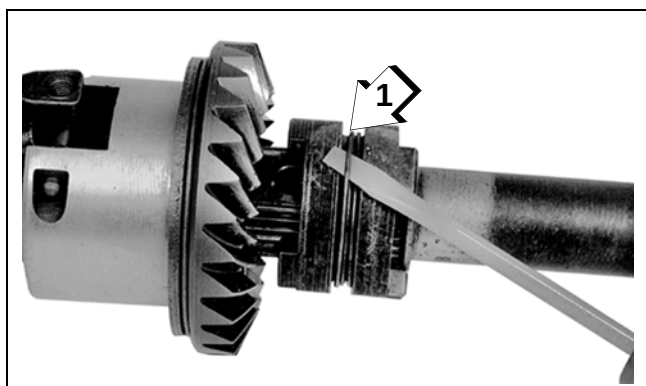
Shift Housing Disassembly

⚠ WARNING

Wear safety glasses to avoid injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

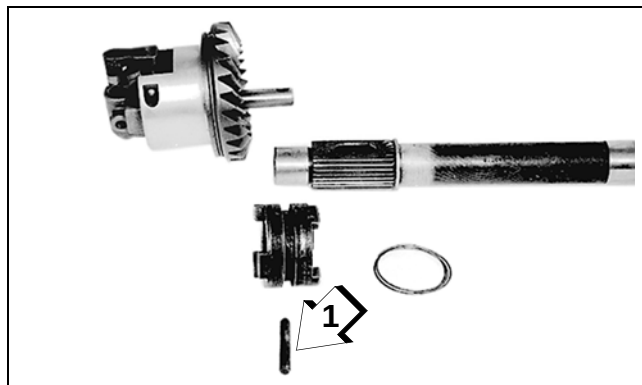
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

COA3560

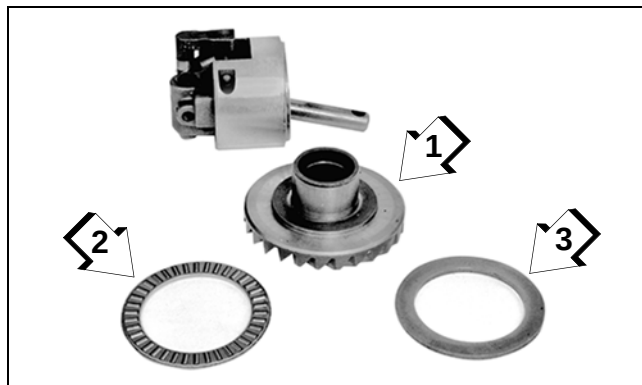
Push the pin out of the clutch dog. Remove all parts.



1. Pin

COA3561

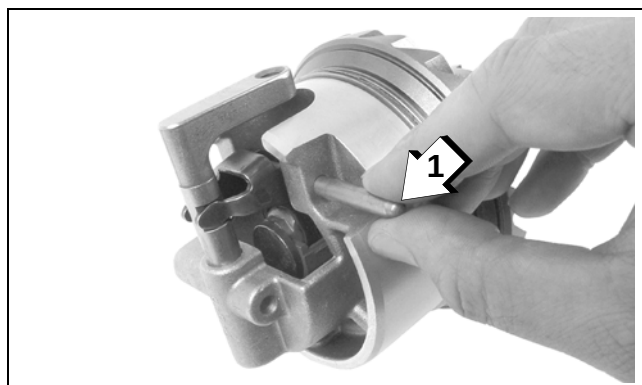
Remove the gear, thrust bearing, and thrust washer from the shift housing.



1. Gear
2. Thrust bearing
3. Thrust washer

COA3562

Remove the shift lever pin from the housing.

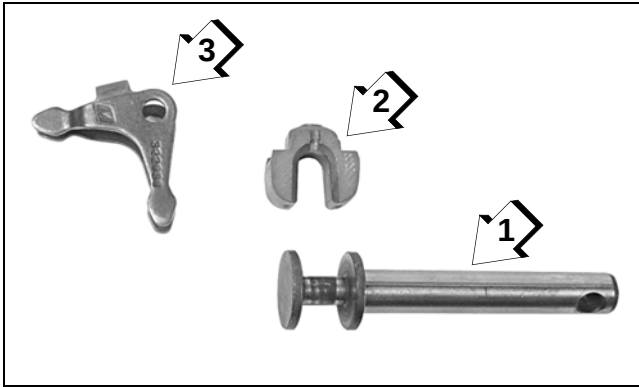


1. Shift lever pin
2. Shifter detent

DSC02449

Move the shifter detent as needed to help ease removal of the following parts:

- shift shaft
- cradle
- shift lever



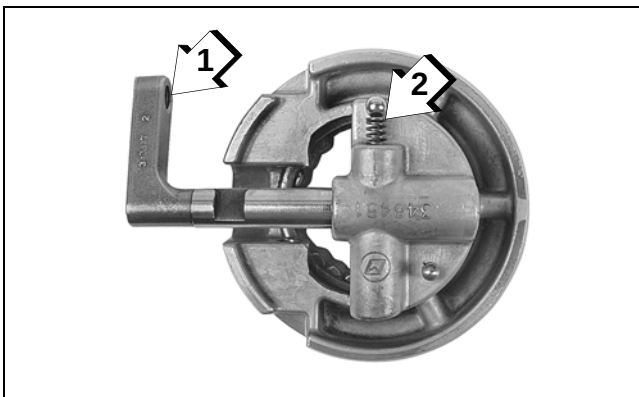
1. Shift shaft
2. Cradle
3. Shift lever

DSC02489

⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring and come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Rotate the shifter detent 90° in either direction, then pull the detent out of the housing.



1. Shifter detent
2. Ball and spring

DSC02518

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection.

Shift Housing Assembly

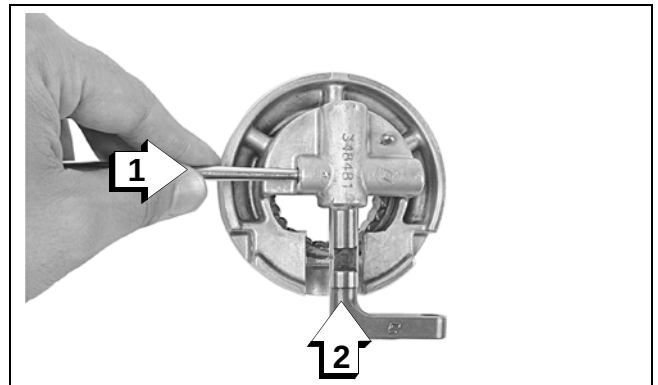
IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



010118

Insert shifter detent at 90° angle into the housing as shown, while depressing the ball and spring with a suitable tool. Once the shifter detent is past the ball, remove the tool and position detent to engage NEUTRAL position.



DSC02506

S, S2-Type Gearcases

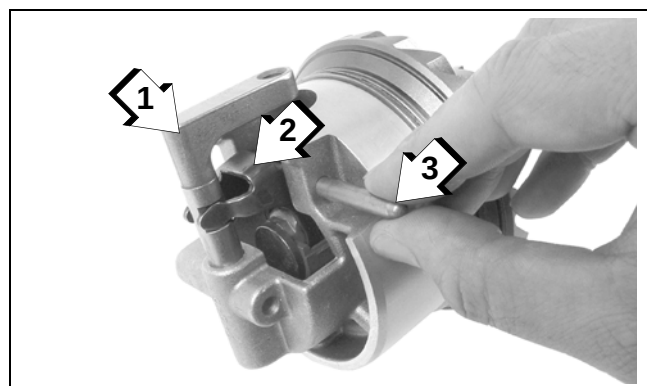
Shifter, Bearing and Seal Service

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case ("O" Type gearcases).



4520

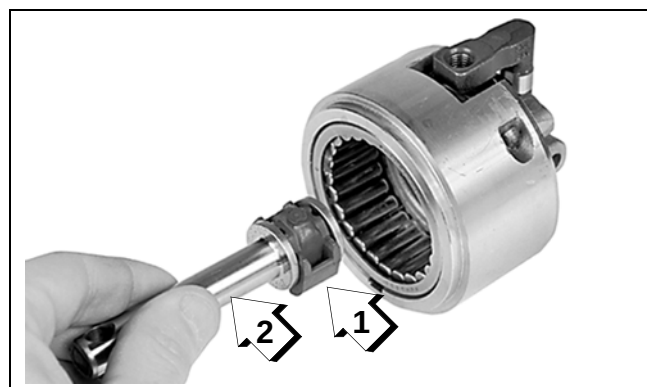
With shifter detent in NEUTRAL, install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Shifter detent
2. Shift lever
3. Pin, shift lever

DSC02449

Rest the cradle on the shift shaft.



- TYPICAL**
1. Cradle
 2. Shift shaft

4512

Place the shift lever arms into the recesses of the shift cradle. Pull shifter detent back up to NEUTRAL position to hold the cradle and shaft in place.

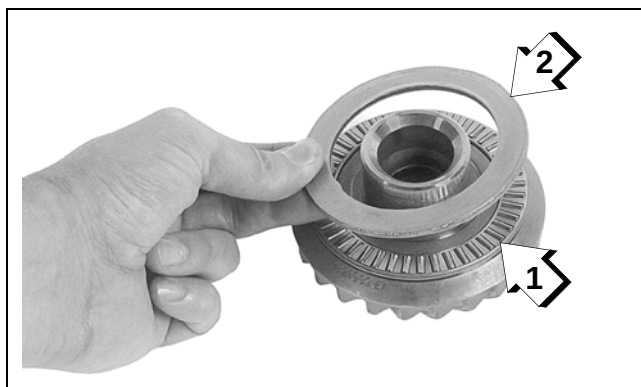


001219

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bearing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



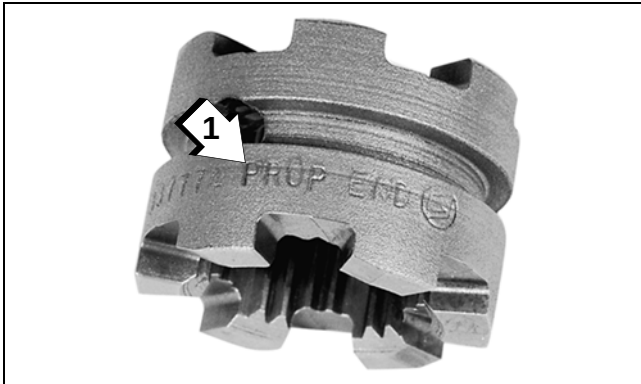
1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

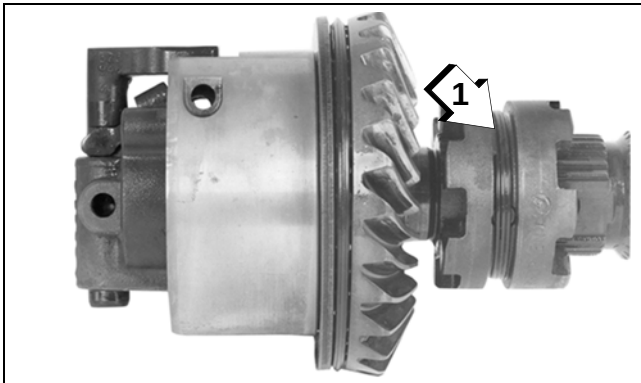
The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.



1. "PROP END"

COB7581

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

COB3101

Driveshaft Bearing Housing Service

The driveshaft bearing is not serviceable. Replace the bearing housing assembly if the bearing is worn or damaged. Also, inspect the driveshaft bearing surface if the bearing is damaged.

Seal Removal

Remove the driveshaft bearing housing seals using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Discard the seals.



14155

Remove and discard the O-ring from the bearing housing.

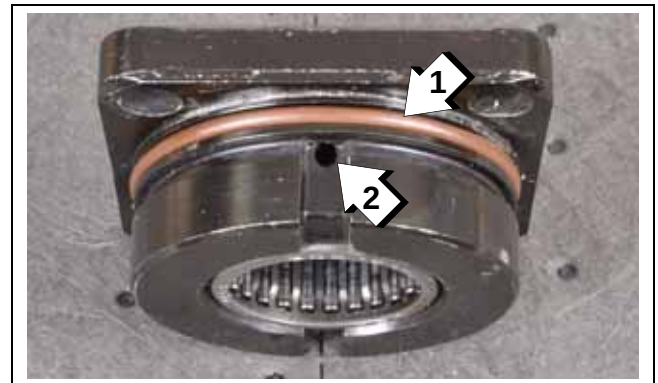
Clean the bearing housing in solvent to remove sealer from the seal bore and the O-ring groove.

Seal Installation

Lightly apply *Gasket Sealing Compound* to a new O-ring. Install the O-ring in top groove of the bearing housing. Do not allow sealant in oil passage.

NOTICE

Do not install the O-ring in the bearing housing's bottom groove. The bottom groove is an oil passage. Gearcase damage could result.



1. O-ring (top groove)
2. Oil passage

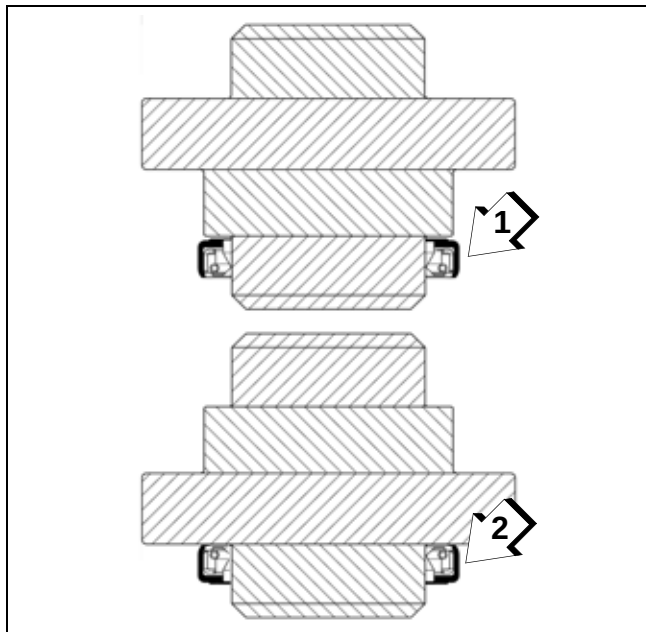
009526

S, S2-Type Gearcases

Shifter, Bearing and Seal Service

Apply *Gasket Sealing Compound* to casings of new seals before installing.

Use Seal Installation Tool, P/N 330268 to install new seals back to back in bearing housing. Install inner seal with lip facing toward bearing housing, then the outer seal with lip facing away from bearing housing. Apply *Triple-Guard* grease to seal lips.



1. Inner seal
2. Outer seal

010320

Propeller Shaft Bearing Housing Service

Rear Seal Removal

Remove seals using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131. Place the

plate on top of the housing to support the bridge, and tighten jaws securely behind the inner seal.



13520

Bearing Removal

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

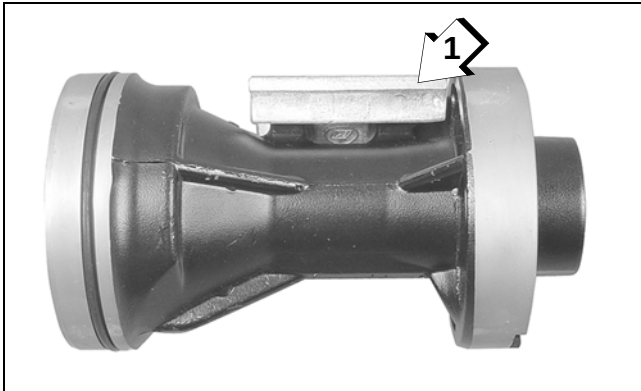
Remove either bearing using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Place the puller plate on top of the housing to support the bridge, and tighten jaws securely behind the bearing.



13522

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size.

Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).

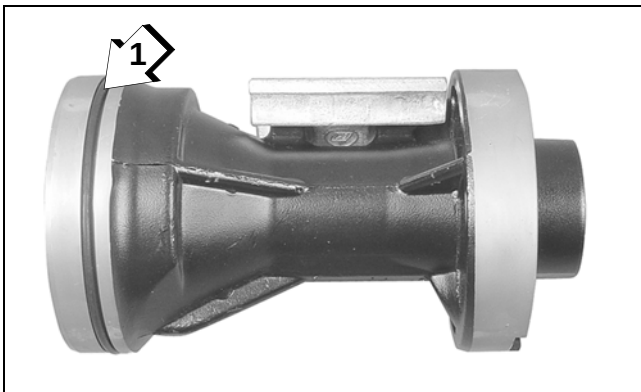


1. Anode

001220

Discard the bearing housing O-ring. Clean the housing and bearings in solvent and dry thoroughly. If bearings were not replaced, rotate the needles to check for freedom of movement.

Inspect O-ring groove. Sand off any sharp edges that might cut O-ring. Remove any nicks or burrs on front of bearing housing.



1. O-ring groove

DSC02291

Bearing Installation

Oil, then install new bearings in bearing housing.

Place the **lettered end** of the bearing case on the bearing installer, then press the bearing into the housing until the tool seats. When installed, the lettered end of the bearing should be visible.

Bearing installation tool:

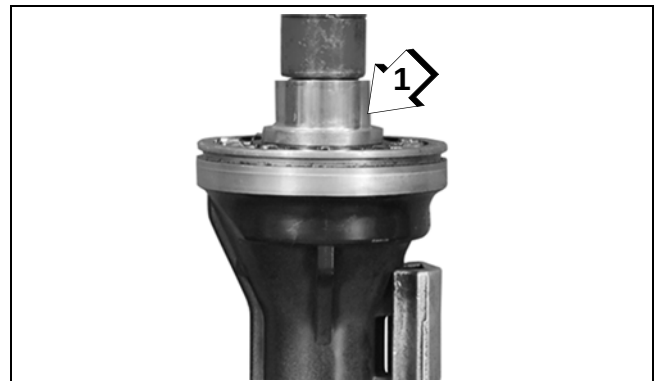
- P/N 326562 – “S” Type gearcases



Forward Bearing

1. Bearing installation tool

29967



Rear Bearing

1. Bearing installation tool

44237

Rear Seal Installation

Apply *Gasket Sealing Compound* to metal casings of the seals before installing.

Use Seal Installation Tool to install new seals back to back in bearing housing.

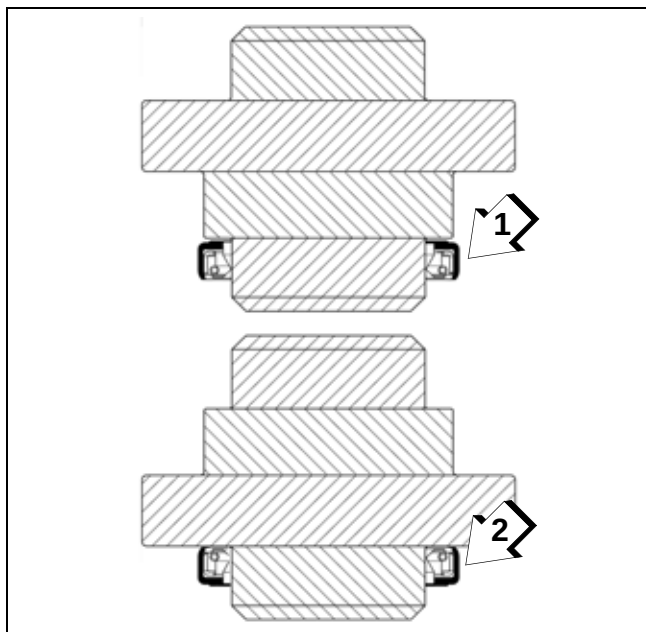
S, S2-Type Gearcases

Gearcase Assembly

Seal installation tool:

- P/N 326551 – “S” Type gearcases

Install inner seal with lip facing toward the bearing housing, then outer seal with lip facing away from the bearing housing.



1. Inner seal
2. Outer seal

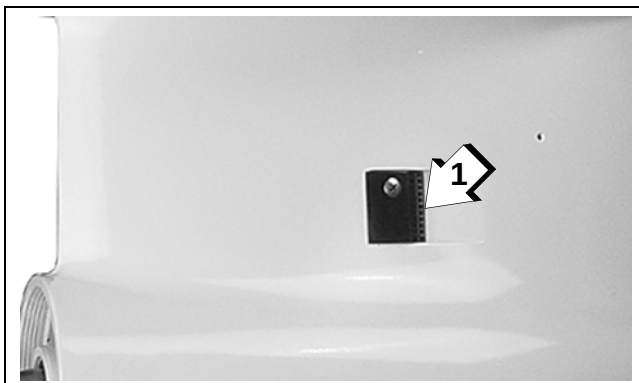
010320

Apply *Triple-Guard* grease to seal lips.

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



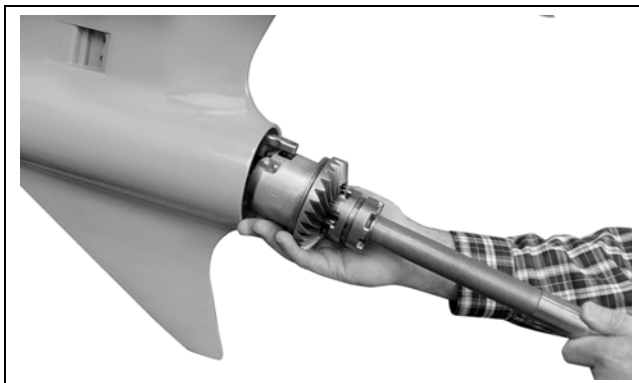
1. Water intake screen

001991

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift housing pin with hole in forward end of gearcase housing.

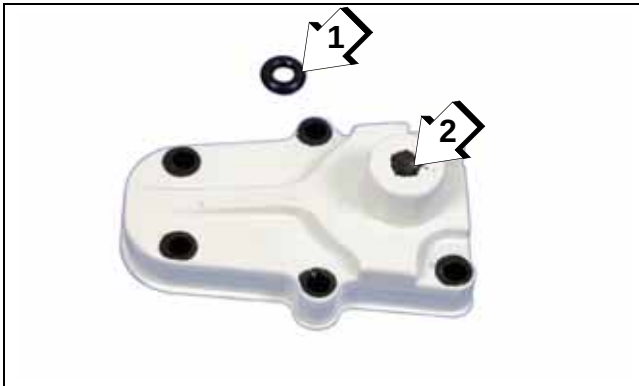


005427

Shift Rod Housing Installation

Lubricate a new shift rod cover O-ring with *Triple-Guard* grease. Install the O-ring into the shift rod cover.

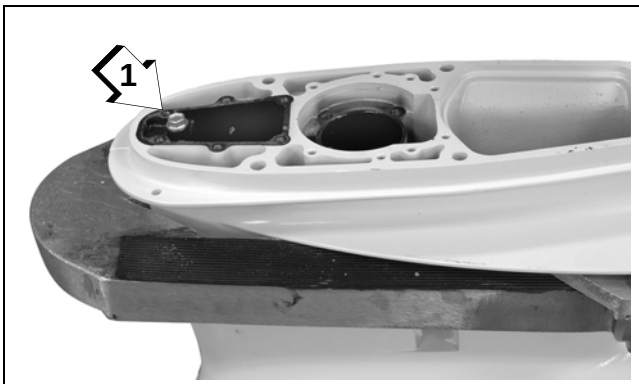
IMPORTANT: Make sure O-ring is fully seated in groove.



1. O-ring
2. Groove

006780

If removed, install pitot tube screw and seal in housing.

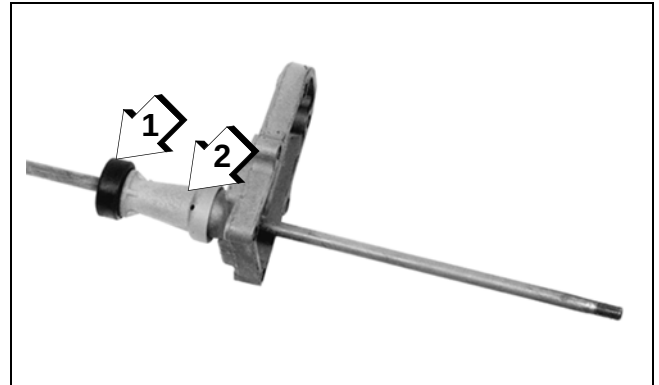


1. Screw and seal

006841

Place the shift rod grommet on the shift rod.

Install shift rod spacer under grommet on 25 in. models.



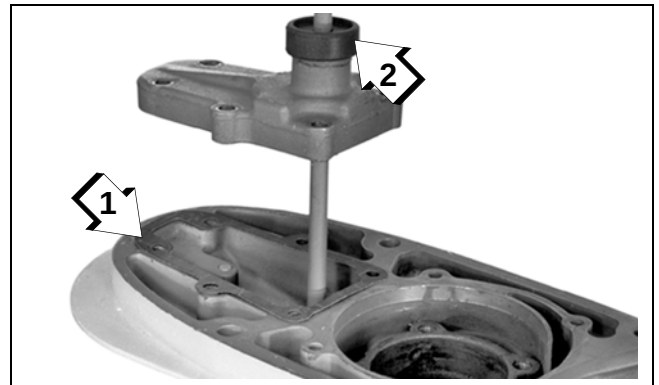
1. Grommet
2. Shift rod spacer

COA3568

Apply *Triple-Guard* grease to the threaded end of the shift rod and insert it through the cover. Turn the shift rod while pushing it through the cover to avoid damaging the O-ring.

Apply *Gasket Sealing Compound* to both sides of a new shift rod cover gasket. Place the gasket on the gearcase.

Thread the shift rod into the shifter detent about four turns.



1. Cover gasket
2. Grommet

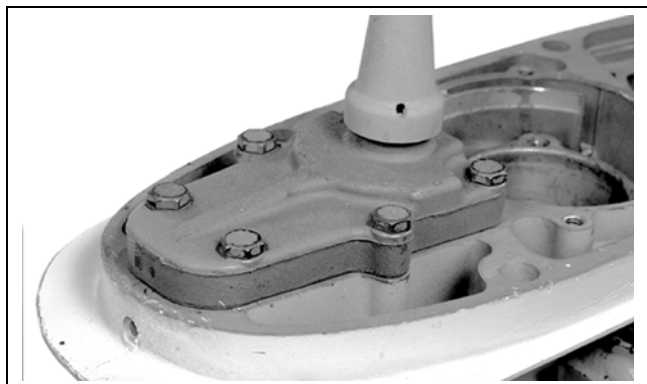
COA3141

Move shift rod from side to side while pushing on the propeller shaft to ensure proper alignment of the bearing housing locator pin into the pin hole in the gearcase.

S, S2-Type Gearcases

Gearcase Assembly

Apply *Gasket Sealing Compound* to the threads of the shift rod cover screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



COA3569

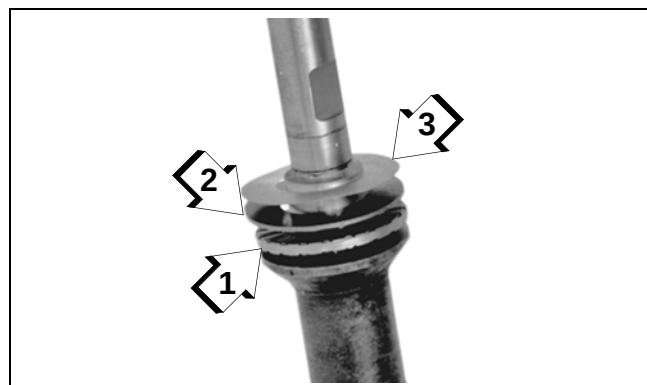
Refer to **Shift Rod Adjustment** on p. 13.

Pinion Gear and Driveshaft Installation – S Type

Refer to **Driveshaft Shimming** on p. 15 before proceeding.

Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on p. 93.

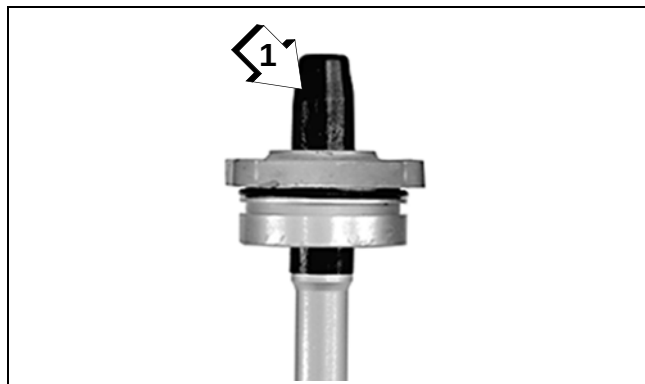
Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

COA3168

Using Driveshaft Seal Protector, P/N 318674, slide the driveshaft bearing housing onto the driveshaft and into position in the gearcase.



1. Seal protector

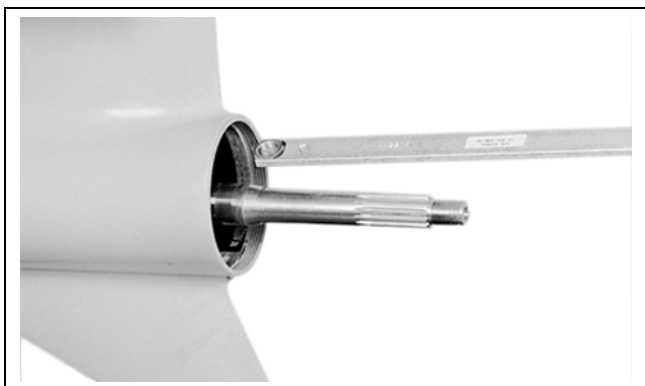
COA3130

Adjust shift rod to move clutch dog as far forward as possible. Be sure excess grease is removed from the pinion bearing.

IMPORTANT: The inside taper of the pinion gear and the driveshaft taper **MUST** be completely free of grease. Clean the tapers with *Cleaning Solvent*. Use a shop towel free of grease and lint.

Place the pinion gear into the gearcase. Insert the driveshaft into the gearcase and through the pinion gear.

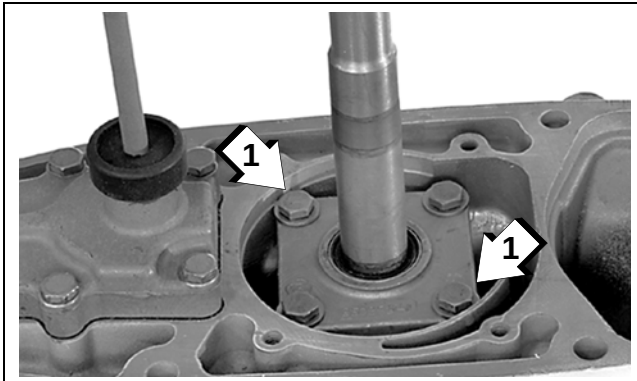
Lightly coat the threads of a **new** pinion nut with outboard lubricant. Use Pinion Nut Starting Tool, P/N 342216, to install nut on the driveshaft. Turn the driveshaft by hand to thread the nut on to shaft.



42230

Apply *Gasket Sealing Compound* to the threads of the driveshaft bearing housing screws. Tighten

screws **in stages** to a torque of 120 to 144 in. lbs. (13.5 to 16.5 N·m).



1. Driveshaft bearing housing screws

COA3153

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438, to tighten the pinion nut to a torque of 100 to 110 ft. lbs. (136 to 149 N·m). Pad handle of holder to prevent damage to gearcase.



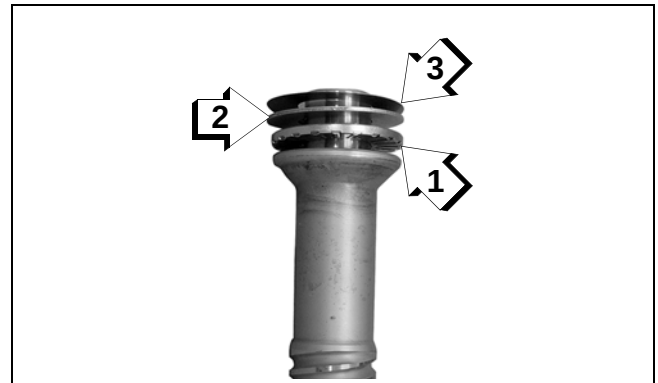
1. Holding socket
2. Pinion nut wrench
3. Retainer

42229

Pinion Gear and Driveshaft Installation – S2 Type

Refer to **Driveshaft Shimming** on p. 15.

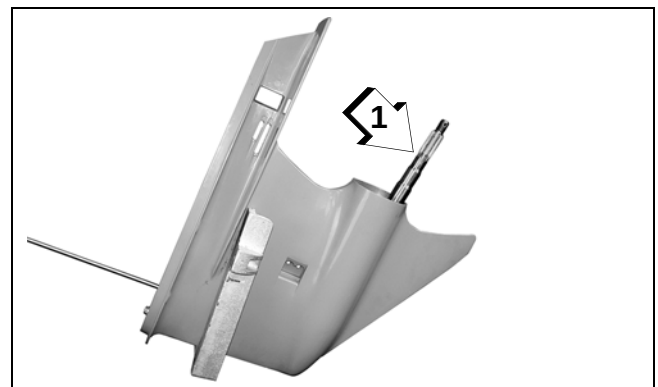
Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

005418

Push down on shift rod to move the clutch dog to reverse position. Pull propeller shaft aft to disengage from forward gear and shift housing. Allow shaft to drop against lower gearcase housing. This will allow the installation of the pinion gear.



1. Propeller shaft

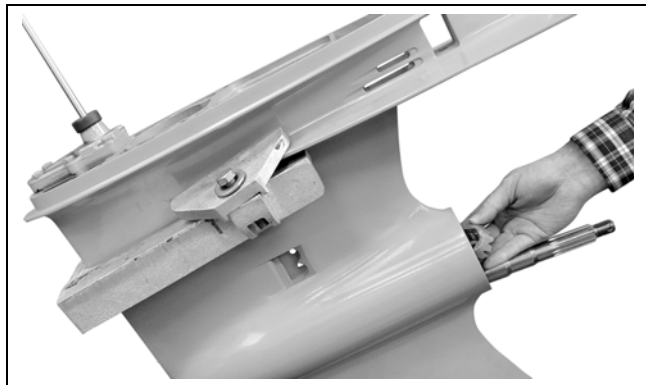
005405

IMPORTANT: Forward gear and thrust bearing and washer can become misaligned. Make sure forward thrust washer and thrust bearing and forward gear are properly aligned with shift housing before continuing gearcase assembly.

S, S2-Type Gearcases

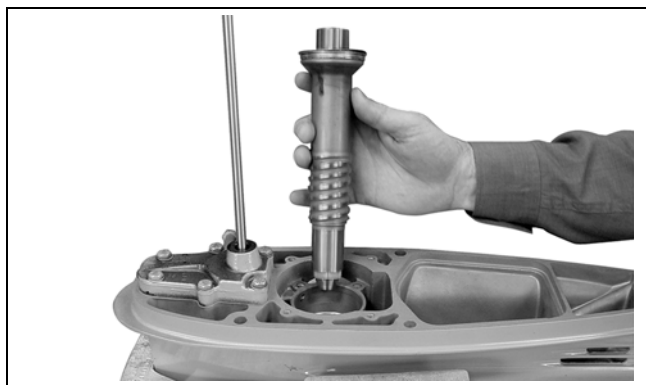
Gearcase Assembly

Install pinion gear in gearcase housing



005420

Install driveshaft with thrust bearing, thrust washer, and correct shim(s) in gearcase housing. Position pinion on lower driveshaft.



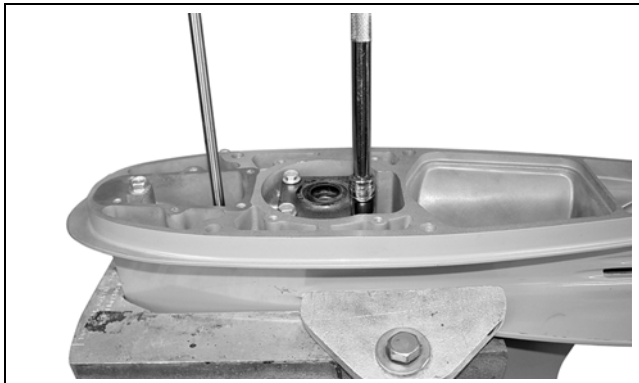
005410

Position pinion screw in lower driveshaft and thread into pinion.



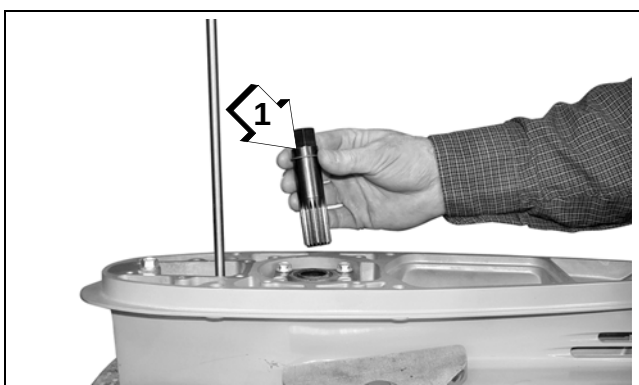
005421

IMPORTANT: Temporarily install bearing housing for support during pinion tightening procedure.



005426

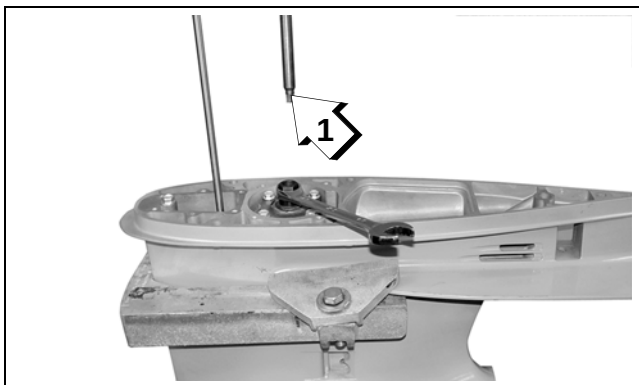
Insert Lower Driveshaft Spline Tool, P/N 5007052, into lower driveshaft.



1. Lower Driveshaft Spline Tool

005407

Insert Lower Driveshaft Wrench, P/N 352877, through Lower Driveshaft Spline Tool and lower driveshaft. Seat hex tip of wrench in head of pinion screw.

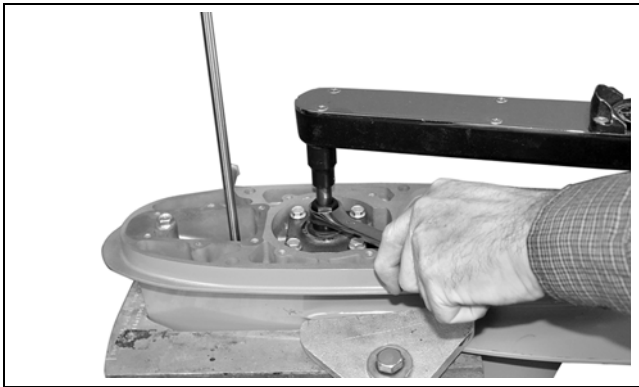


1. Wrench, hex tip

005408

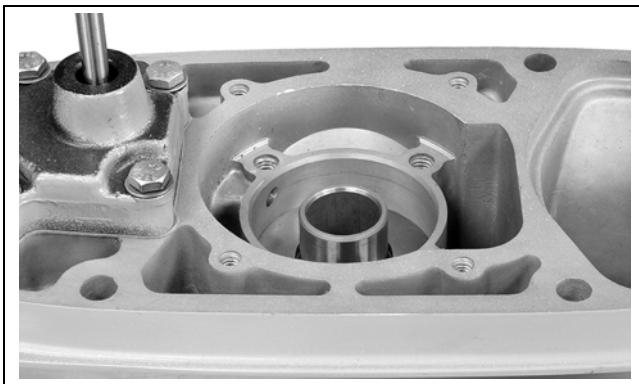
IMPORTANT: Make sure Lower Driveshaft Wrench is fully seated in head of pinion screw.

Use a long 3/4 in. combination wrench to hold Driveshaft Spline Tool and a 1/2" drive torque wrench to turn the Lower Driveshaft Wrench in a clockwise direction. Torque pinion screw to 47 to 51 ft. lbs. (64 to 69 N·m).



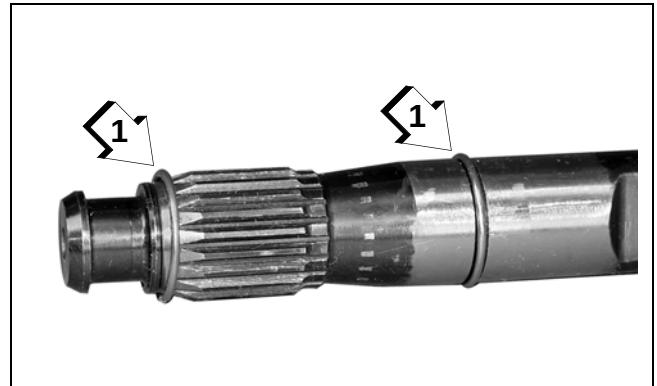
005409

Temporarily remove the four driveshaft bearing housing screws and bearing housing.



005421

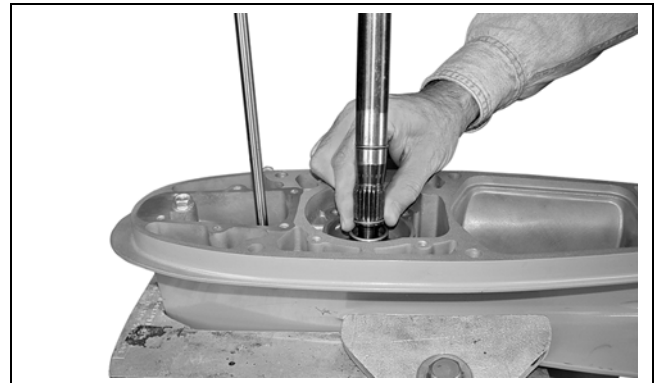
To install upper driveshaft into lower driveshaft, position **new** retainers (circlip type) on upper driveshaft as shown.



1. Retainer(s)

005412

Hold lower retainer and align upper driveshaft with lower driveshaft. Force upper driveshaft down until seated. Driveshaft should lock in place.



005413

S, S2-Type Gearcases

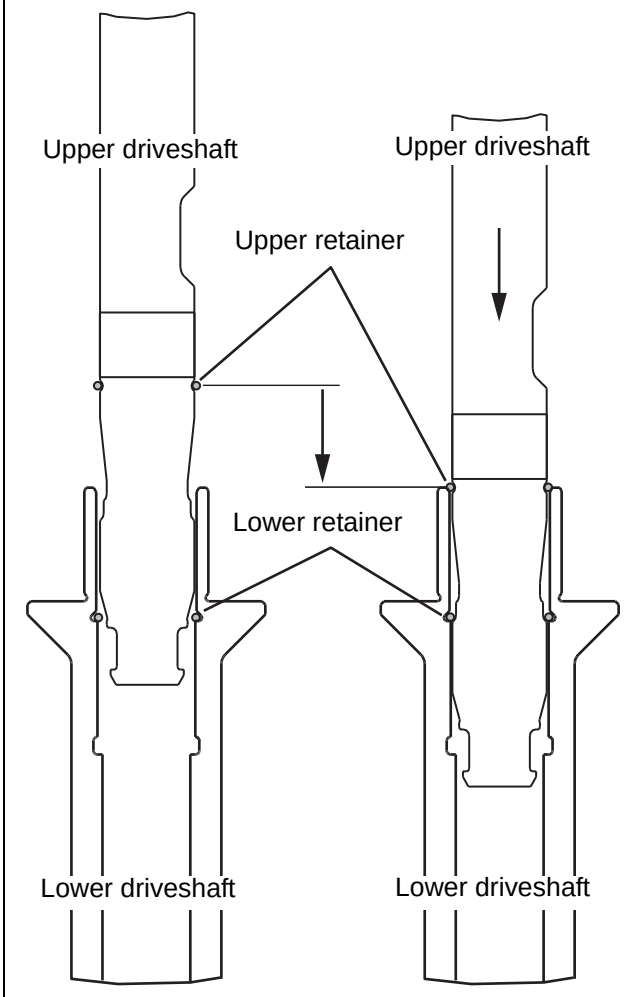
Gearcase Assembly

STEP 1:

Insert upper driveshaft into lower driveshaft.

STEP 2:

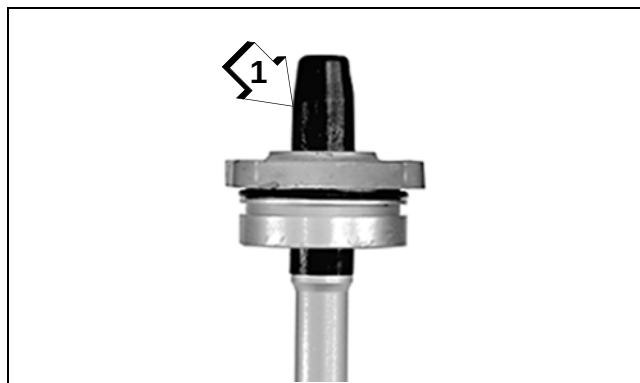
Push down to lock in place.



Upper Driveshaft Installation

005428

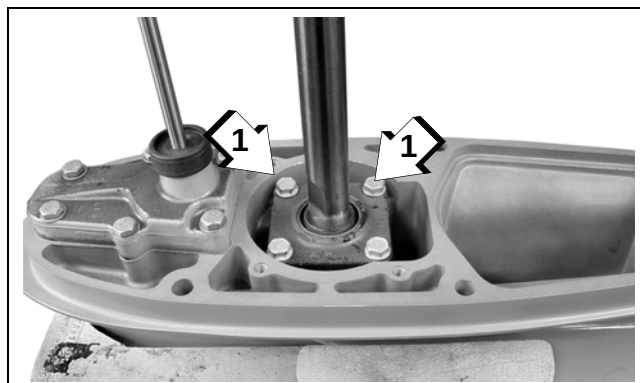
Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on p. 93. Using Driveshaft Seal Protector, P/N 318674, slide the driveshaft bearing housing onto the driveshaft.



1. Seal protector

COA3130

Apply *Gasket Sealing Compound* to the threads of the four driveshaft bearing housing screws. Tighten screws **in stages** to a torque of 120 to 144 in. lbs. (13.5 to 16.5 N·m).

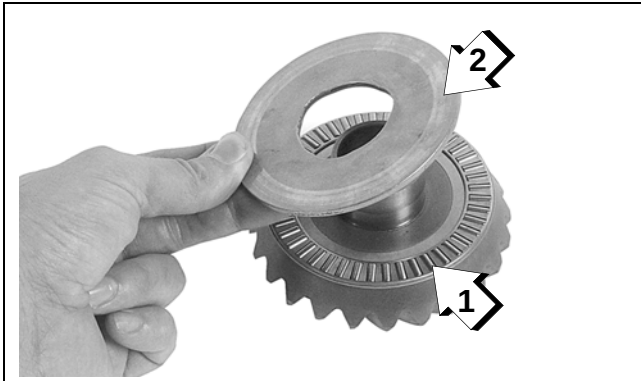


1. Driveshaft bearing housing screws

005425

Propeller Shaft Bearing Housing and Gear Installation

Oil and install thrust bearing and thrust washer on hub of reverse gear. Slide the gear assembly onto the propeller shaft until it engages the pinion gear.



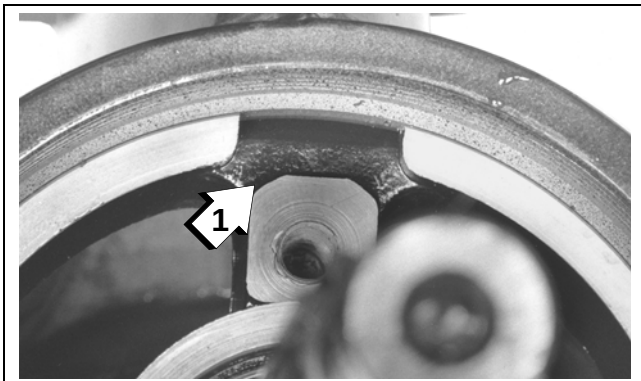
1. Thrust bearing
2. Thrust washer

DSC02295

Lightly apply *Gasket Sealing Compound* to a new bearing housing O-ring. Install O-ring in groove in the housing.

Install housing into gearcase. Align screw holes with retainer slots in gearcase.

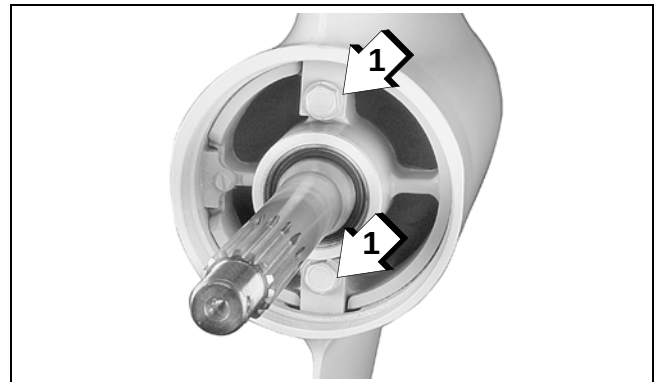
Housing must be completely seated to install retainer tabs.



1. Retainer tab notch

50106a

Install two retainers, washers and screws. Apply *Ultra Lock* to threads and tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).



1. Retainer tab screws

001989

Re-tighten two retainer screws to 18 to 20 ft. lbs. (24 to 27 N·m).

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 78
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 76
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Technician's Notes

[illegible][illegible]

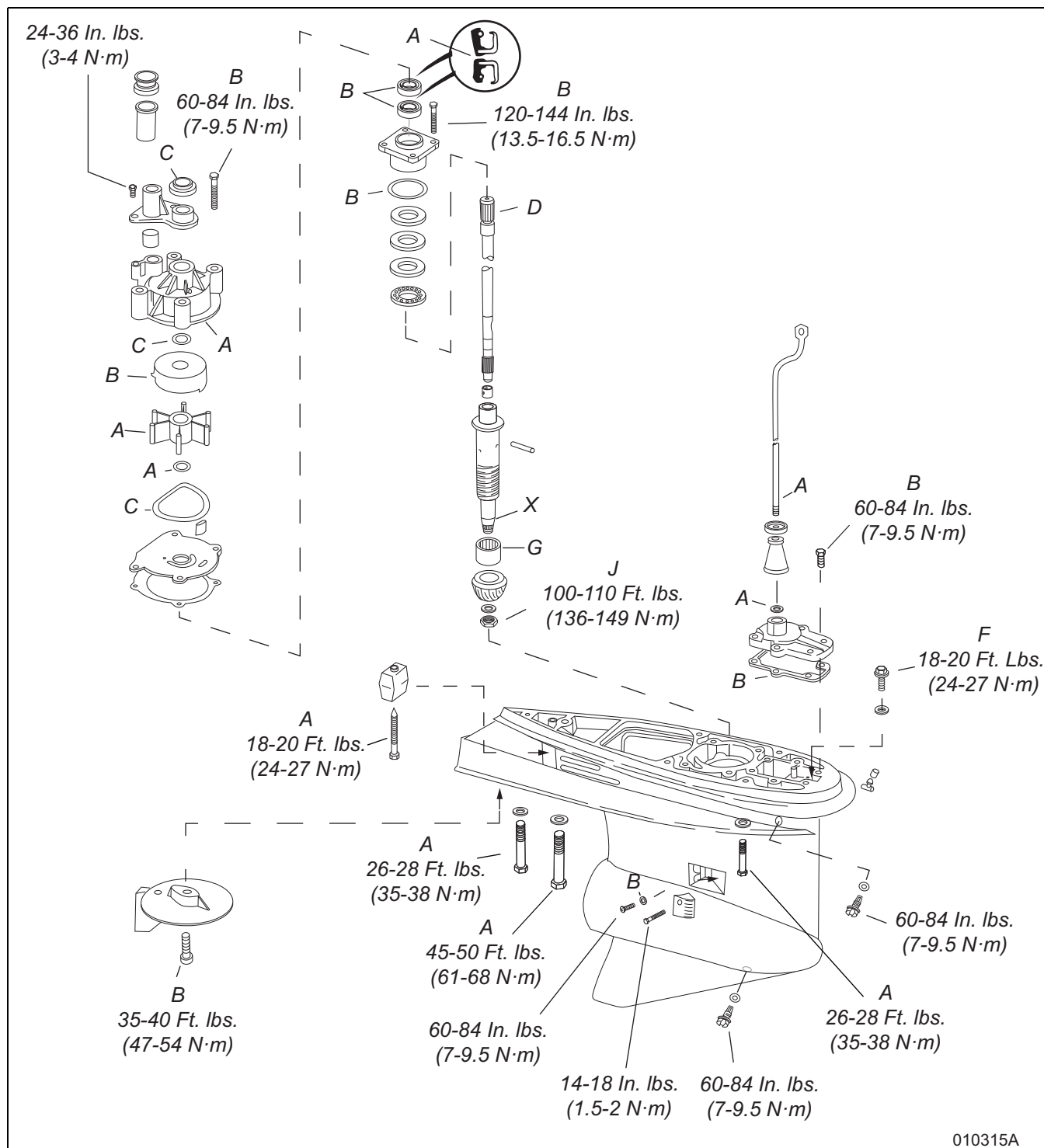
O-Type Gearcase

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Service Charts

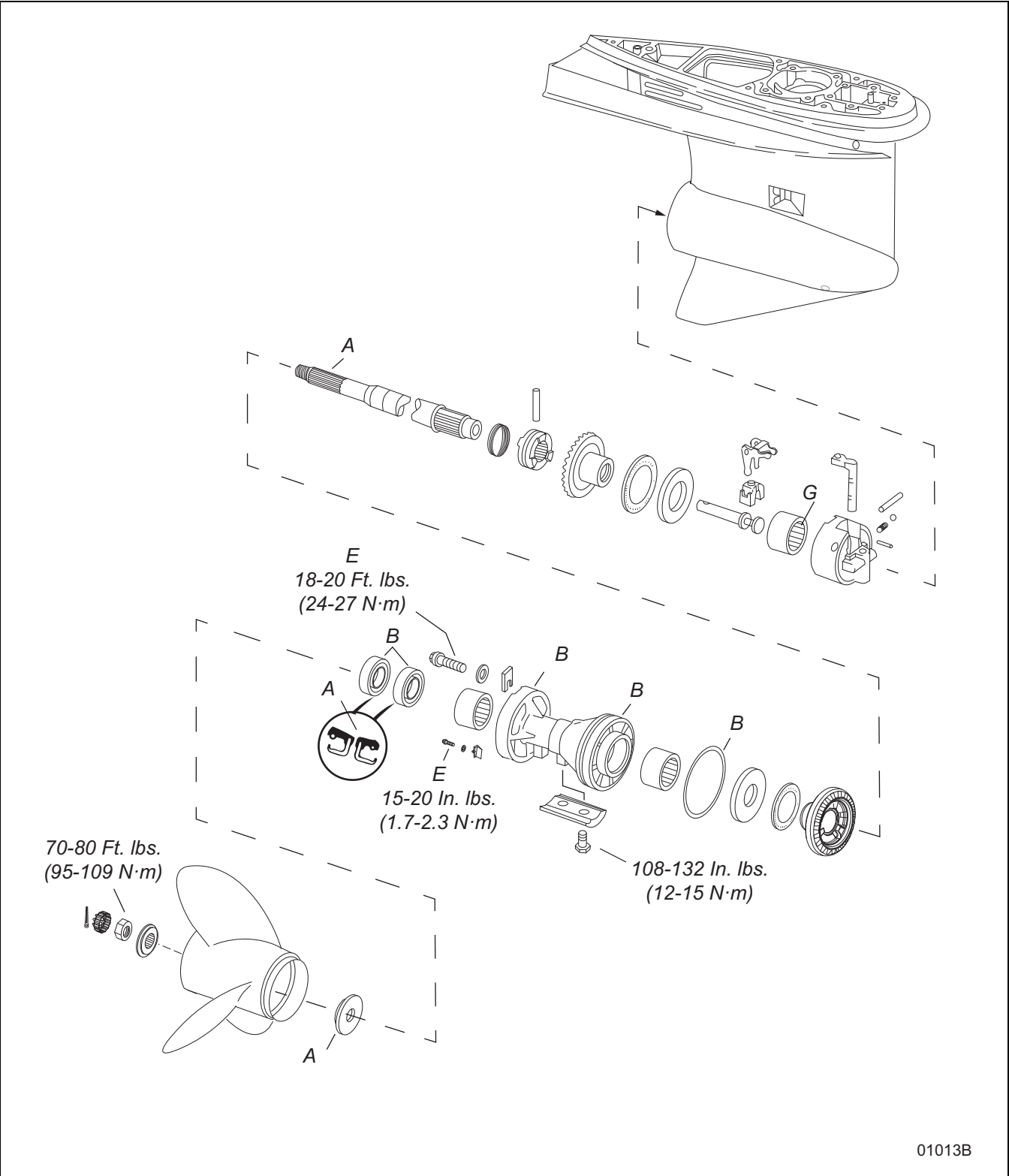
“O”-Type Gearcase – Water Pump, Driveshaft & Housing



010315A

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

“O”-Type Gearcase – Propeller Shaft – Standard Rotation

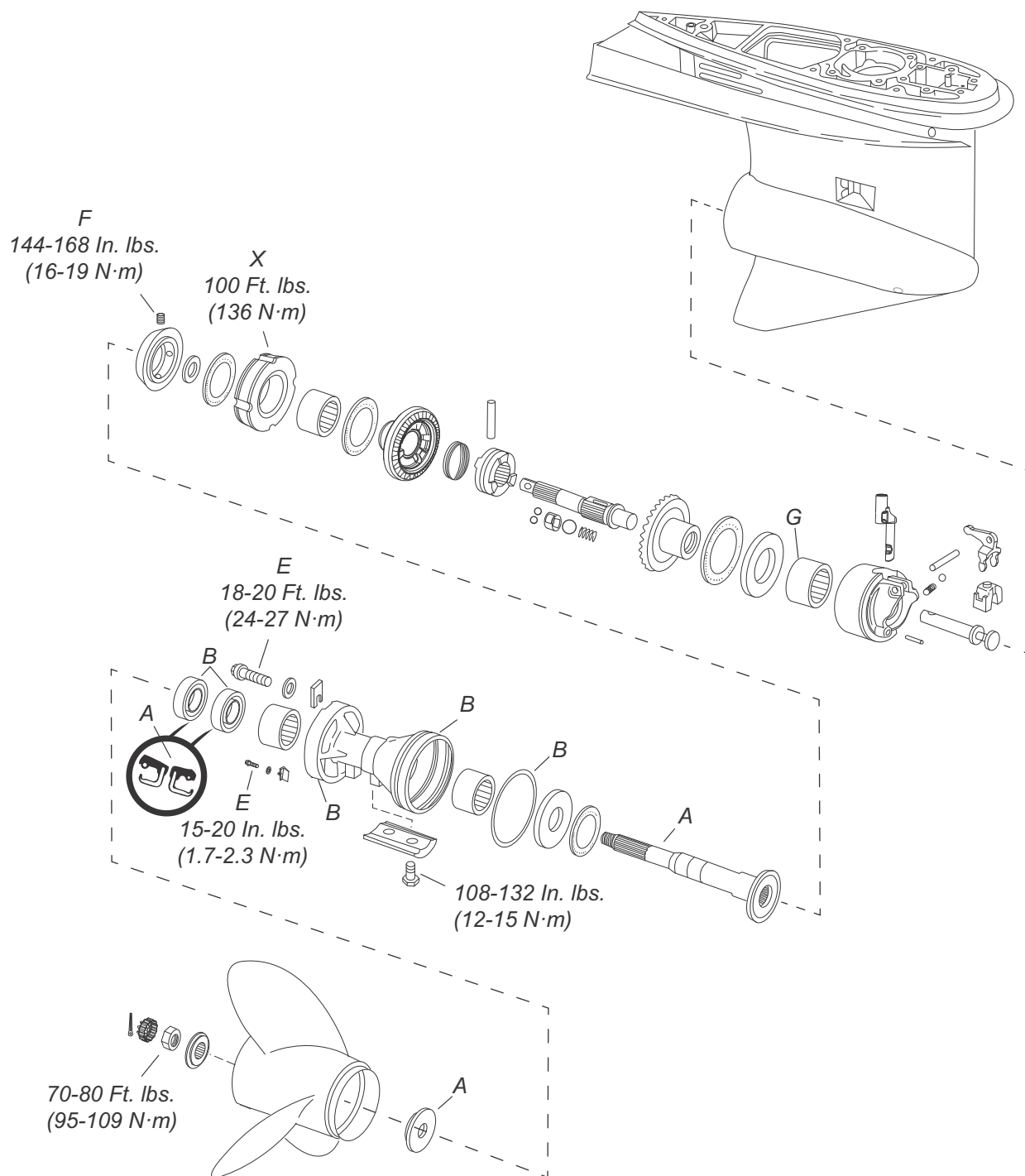


A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

O-Type Gearcase

Service Charts

"O"-Type Gearcase – Propeller Shaft – Counter Rotation



006593B

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

Gearcase Removal and Installation

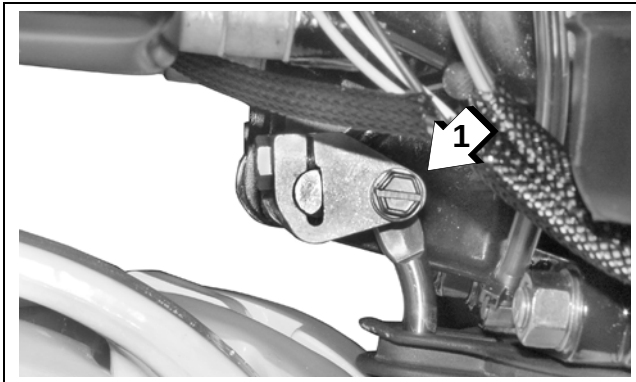
Gearcase Removal

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

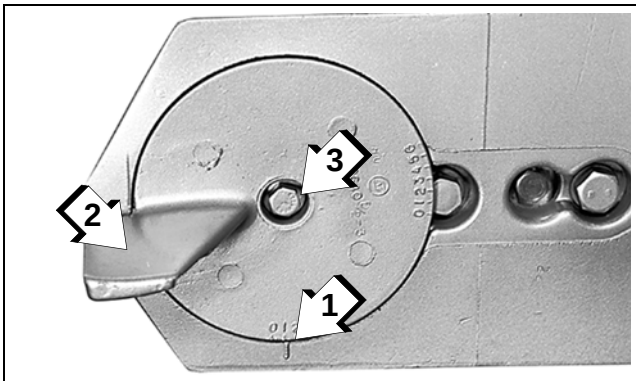
Remove pin and washer from shift rod lever to release the lower shift rod.



1. Shift rod screw

002013

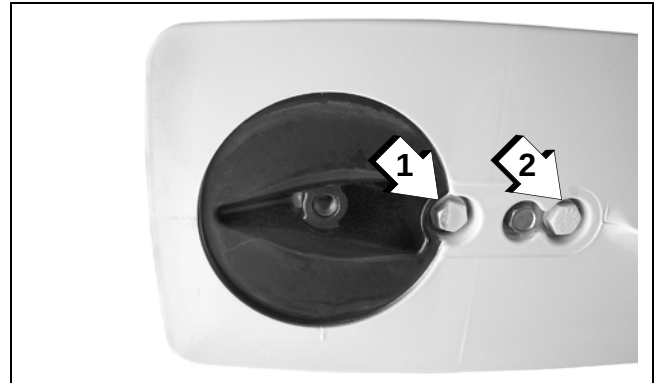
Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position. Remove the trim tab retaining screw and trim tab from the gearcase.



1. Index mark
2. Trim tab
3. Trim tab retaining screw

COA3663

Remove the 3/8-16 in. screw and washer, and remove 7/16-14 x 3.5 in. screw and washer.

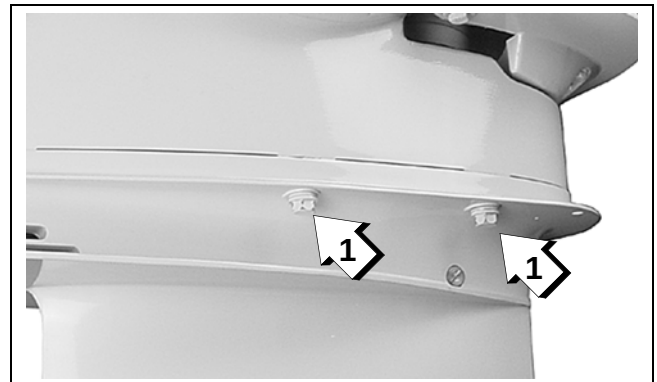


O Type Gearcases

1. 3/8-16 x 3.5 in. screw
2. 7/16-14 x 3.5 in. screw

006869

Remove the four 3/8-16 x 1.75 in. gearcase retaining screws and washers.



1. Gearcase retaining screws

001990

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

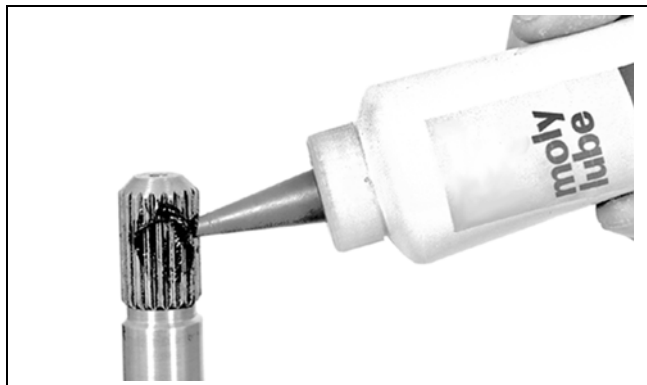
NOTICE

Before installing gearcase, shift rod adjustment **MUST** be checked. Refer to Shift Rod Adjustment on p. 324.

O-Type Gearcase

Gearcase Removal and Installation

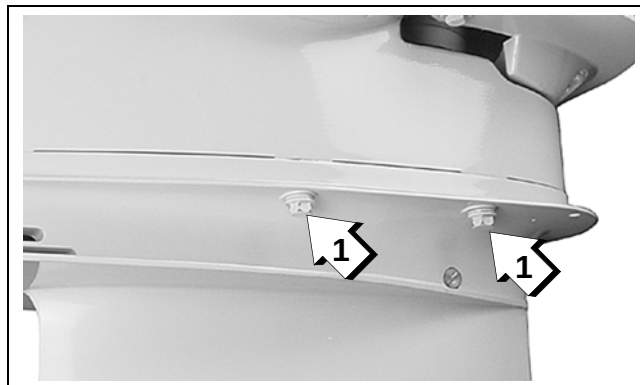
Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

Install screws and washers and tighten to a torque of:

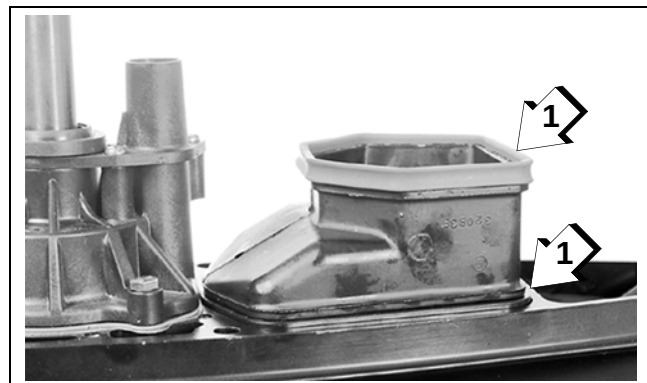
- **3/8 in.** screws – 26 to 28 ft. lbs. (35 to 38 N·m)
- **7/16 in.** screws – 45 to 50 ft. lbs. (61 to 68 N·m)



1. 3/8 in. screws

001990

Apply *Adhesive 847* to the lower exhaust housing seals' inner surfaces. Place two new seals on the housing. Apply *Triple-Guard* grease to the seals' outer surfaces and place the housing on the gearcase.



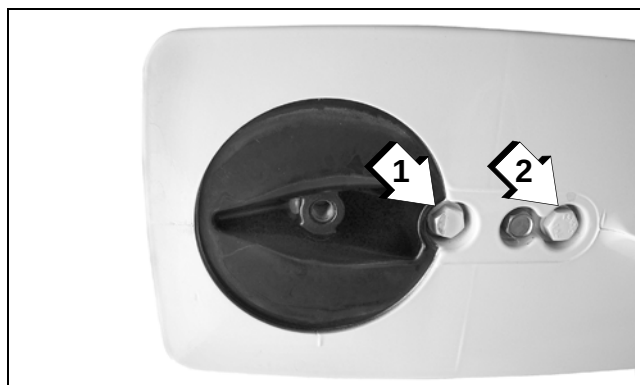
1. Lower exhaust seals

32002

Slide the gearcase into place, making sure:

- Driveshaft engages the crankshaft.
- Water tube enters the water pump.
- Lower inner exhaust housing installs correctly.
- Shift rod does not turn and is positioned properly in the shift rod lever below the crankcase.

IMPORTANT: New gearcase screws are treated with a thread-locking material. Apply *Triple-Guard* grease to threads to ensure that the correct clamping force is achieved when tightening—If a previously installed screw is re-used, use a wire brush to remove any old thread-locking material or corrosion and lubricate threads with *Triple-Guard* grease.



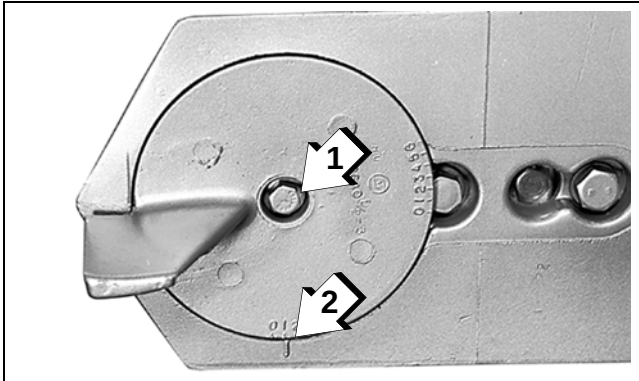
O Type Gearcases

1. 3/8-16 x 3.5 in. screw
2. 7/16-14 x 3.5 in. screw

006869

Apply *Triple-Guard* grease to threads of the trim tab screw. Install and align the trim tab with the index marks noted prior to disassembly. Tighten the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to **Trim Tab**

Adjustment on p. 18.



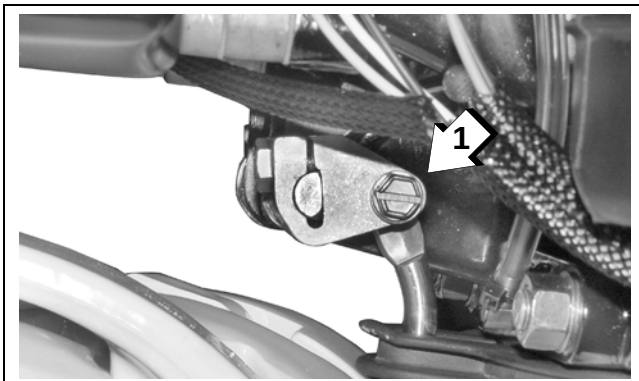
1. Trim tab screw
2. Index mark

COA3663

NOTICE

Standard rotation and counter rotation trim tabs must not be interchanged. This would result in inadequate cooling water supply to the propeller hub.

Place the shift rod in the shift rod lever. Install the retaining pin and washer. Tighten pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Shift rod screw

002013

⚠ WARNING

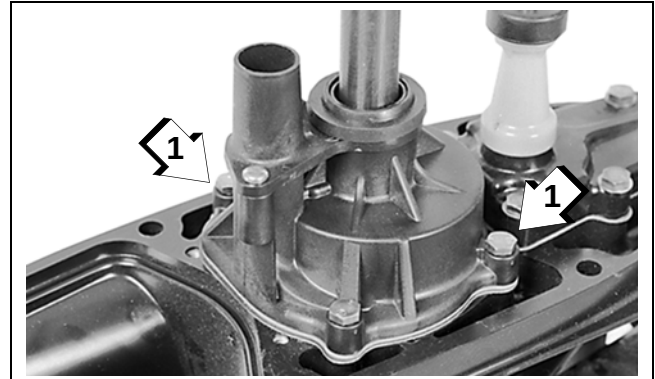
To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Water Pump Service

Disassembly

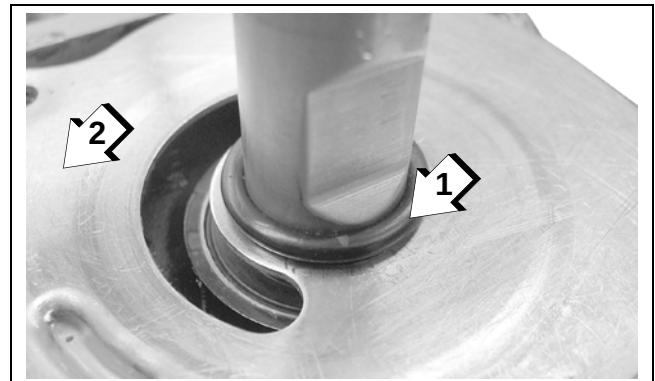
Rotate the driveshaft counterclockwise to unlock the impeller key. Remove the four impeller housing screws.



1. Screws

31998

Slide the water pump off the driveshaft. Remove the impeller key, O-ring, impeller plate, and gasket. Discard the gasket.



1. O-ring
2. Impeller plate

DSC02328

Remove all the parts from the housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

Check liner and wear plate for scoring, distortion, and impeller material transfer.

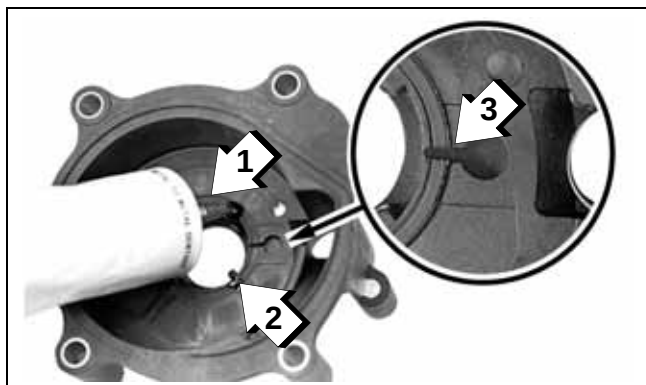
Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

Apply a drop of *Adhesive 847* in the seal ring groove at each of the four ribs.

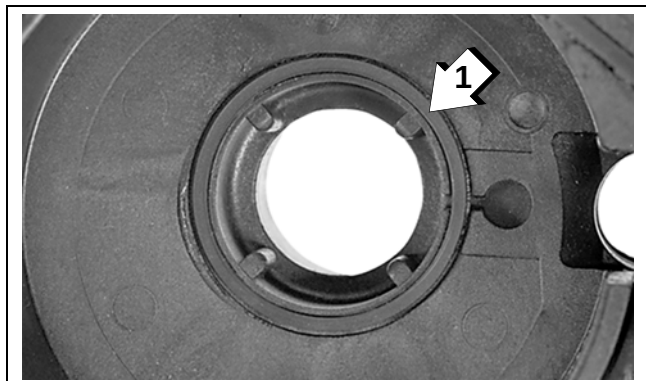
IMPORTANT: Do not allow any sealer to get into the air bleed groove in the impeller housing. If this groove is blocked by adhesive, the pump will lose its prime and will not pump water.



1. Seal ring groove
2. Ribs
3. Air bleed groove

2311

Install the O-ring in groove in the impeller housing.



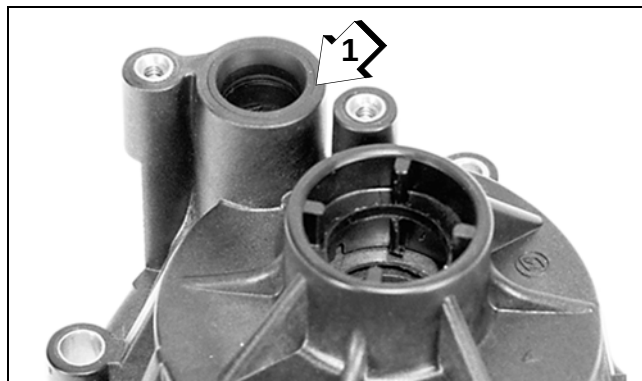
1. O-ring

34814

Lightly coat the exterior rim of the impeller cup with *Gasket Sealing Compound*. Install the cup in the impeller housing. The cup locks in place in the housing with a square index tab.

Make sure vent hole in impeller cup is open.

Install the water tube grommet with the inside taper facing up.

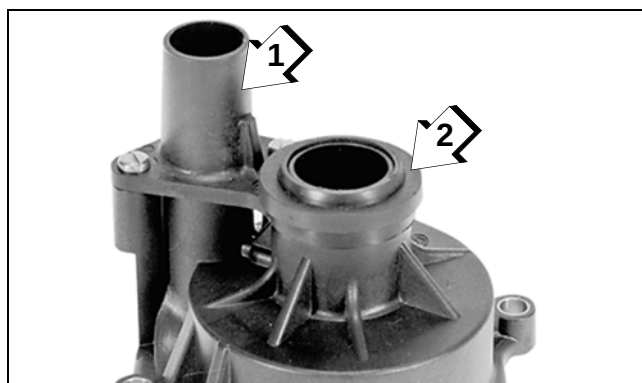


1. Water tube grommet

32000

Apply *Triple-Guard* grease to screw threads and install the impeller housing cover and tighten screws to a torque of 24 to 36 in. lbs. (3 to 4 N·m).

Apply *Adhesive 847* to flat side of the impeller housing grommet. Install the grommet, flat side down.

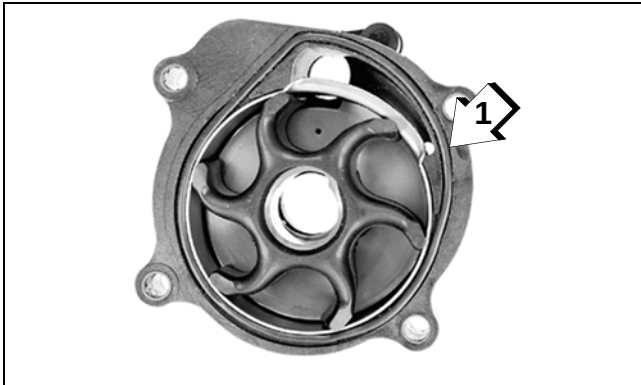


1. Impeller housing cover
2. Impeller housing grommet

32001

Lightly coat the inside of the liner with *Triple-Guard* grease. With a counterclockwise rotation, install the impeller into the liner with the slot for the impeller key facing out.

Apply a thin bead of *Adhesive 847* in the seal groove, and install the special shaped O-ring seal.

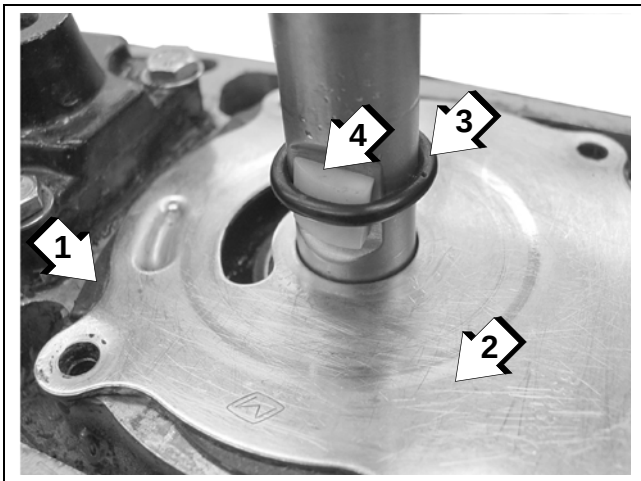


1. O-ring

34815

Apply *Gasket Sealing Compound* to both sides of a new impeller plate gasket. Install the gasket and impeller plate.

Apply *Triple-Guard* grease to a new impeller O-ring. Slide the O-ring down the driveshaft and half way over installed impeller key to temporarily hold key in place.



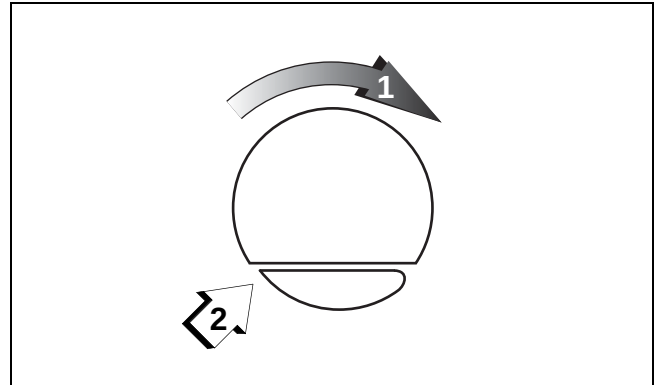
1. Impeller plate gasket
2. Impeller plate
3. O-ring
4. Drive key

DSC02326

The sharp edge of the key is the leading edge in clockwise rotation.

Slide the water pump down the driveshaft. Align impeller slot with the impeller key. Rotate the driveshaft to engage the key with the impeller, and

slide water pump down over key. Be sure impeller key does not fall out of position.



1. Driveshaft rotation
2. Drive key

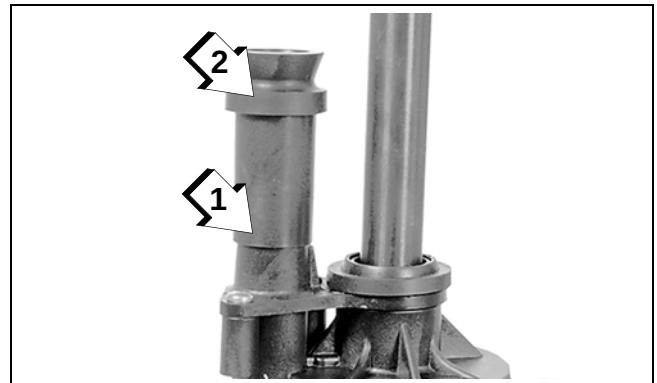
CO2995

NOTICE

Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Align the impeller housing with the gearcase. Apply *Gasket Sealing Compound* to threads of the four impeller housing screws. Install the screws and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

On 25 in. models, place water tube spacer and grommet on the impeller housing cover.



25 in. Model Water Tube Spacer

1. Spacer
2. Grommet

32728

Gearcase – Standard Rotation

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

Remove gearcase. Refer to **Gearcase Removal and Installation** on p. 109.

Remove water pump. Refer to **Water Pump Service** on p. 111.

Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skeg, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **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.

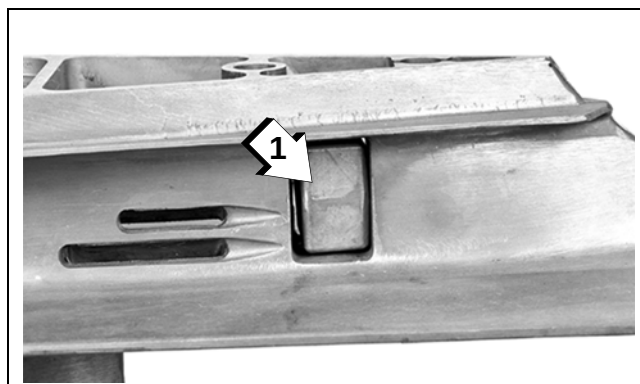
- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

4557

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.



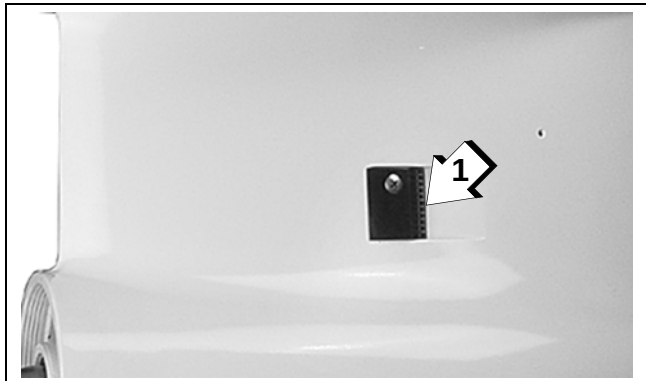
1. Gearcase anode

14161

- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.
- **Water Intake Screens** — Check for damage and blockage. If screens cannot be cleaned, they must be replaced. Different screens are available and should not be mixed. Refer to correct model parts manual for listing and description.

Water Intake Screens

GearcaseRemove and clean water intake screens. Replace if damaged.

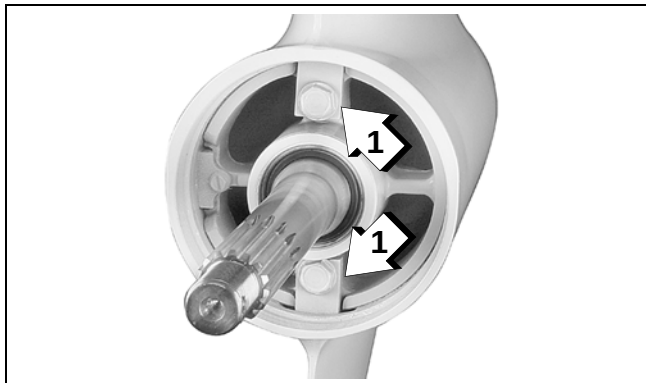


1. Water intake screen

001991

Propeller Shaft Bearing Housing Removal

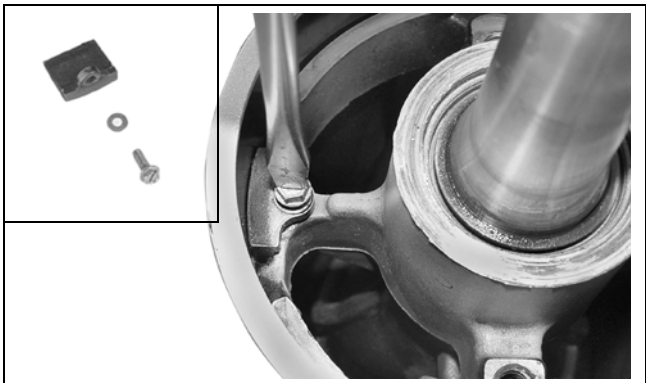
Remove the two screws, washers, and retainers holding the propeller shaft bearing housing.



1. Retainer tab screws

001989

Remove wedge, screw, and washer (“O” Type).

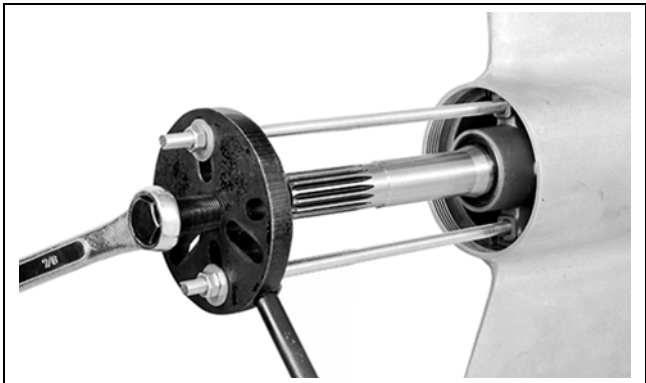


DSM02291
DSC02361

Remove the propeller shaft bearing housing from the gearcase using the following:

- Puller body, screw, and handle from Universal Puller Set, P/N 378103.
- Two 5/16-18 x 11 in. (279 mm) threaded rods, two large 5/16 in. I.D. flat washers, and two 5/16-18 nuts (obtain locally).

Assemble components and pull the bearing housing from the gearcase.



22775

Remove the thrust washer, thrust bearing, and reverse gear from gearcase.

Pinion Gear and Driveshaft Removal

Adjust the shift rod to move the clutch dog as far forward as possible. This will help ease removal of the pinion nut.

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438 to loosen and remove the

Gearcase – Standard Rotation

Gearcase Disassembly

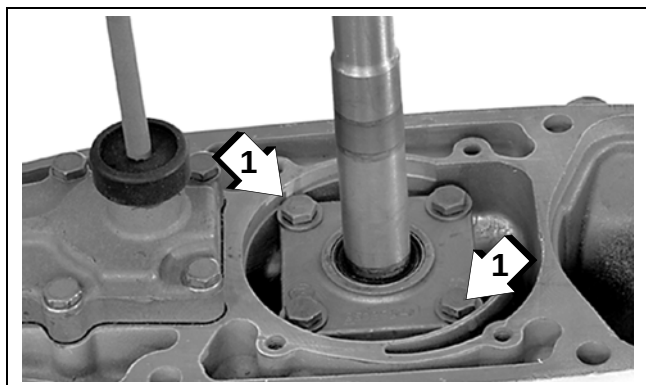
pinion nut from the bottom of the driveshaft. Pad handle of holder to prevent damage to gearcase.



1. Holding socket
2. Pinion nut wrench
3. Retainer

42229

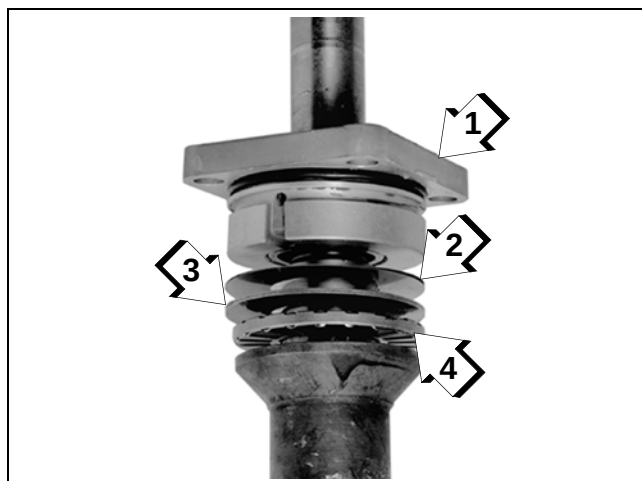
Remove the four driveshaft bearing housing screws.



1. Driveshaft bearing housing screws

COA3153

Remove the driveshaft from the gearcase. The bearing housing, shims, thrust bearing, and thrust washer will come out with the driveshaft.

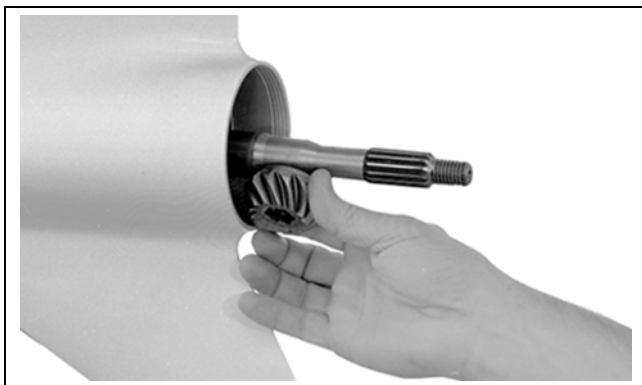


1. Bearing housing
2. Shims
3. Thrust bearing
4. Thrust washer

COA3558

If driveshaft cannot be removed, refer to **Locked Driveshaft Removal** on p. 116.

Remove the pinion gear from the gearcase.

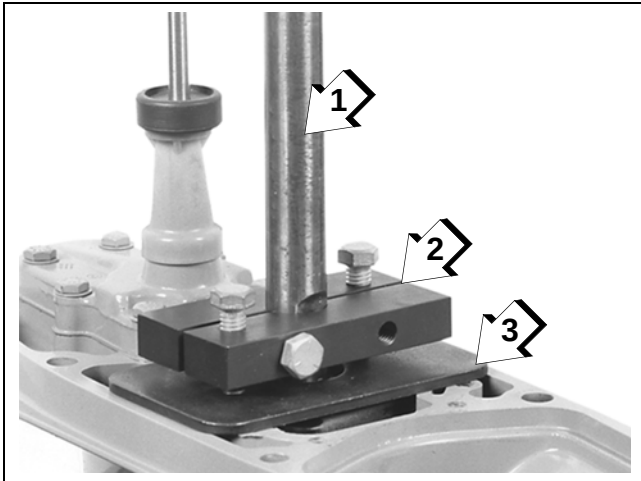


COA3159

Locked Driveshaft Removal

The driveshaft to pinion taper is a locking taper. If necessary, use Driveshaft Puller, P/N 390706, and Backing Plate, P/N 325867, to break the lock. Install the tools as shown by clamping them around the driveshaft. Alternately tighten the two vertical screws against the backing plate inserted

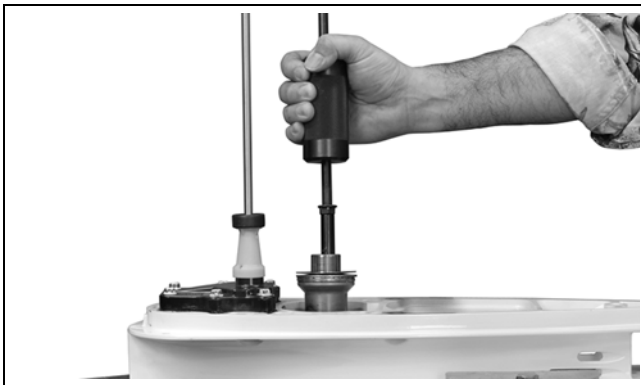
between the puller and the gearcase until the driveshaft pops loose from the pinion.



1. Drive shaft
2. Puller
3. Backing plate

41177

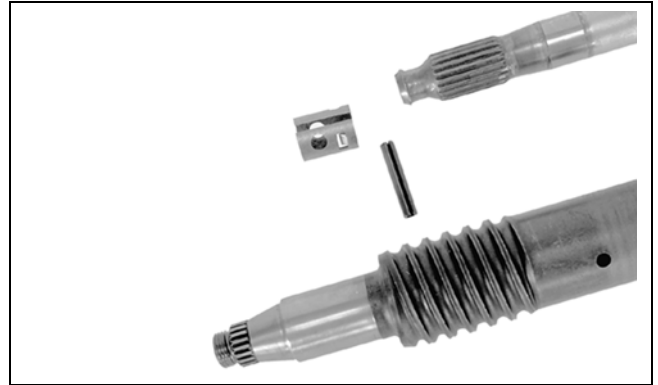
If upper driveshaft becomes separated from lower driveshaft, use Lower Driveshaft Puller, P/N 342681, to remove. Install puller into lower driveshaft and turn 90° to position hook under pin in driveshaft. Thread Slide Hammer, P/N 391008, into puller and remove driveshaft.



006880

Driveshaft Service

To separate the upper driveshaft (if needed) from the lower driveshaft, remove the roll pin. Replace the damaged component.



29337

To assemble the driveshaft, install **new** driveshaft retainer into the groove of the upper driveshaft.



29338

Install the upper driveshaft into the lower driveshaft, aligning the holes in the driveshaft retainer and the lower driveshaft.

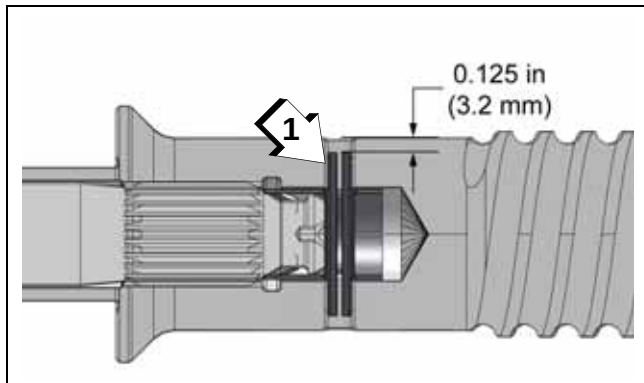


29330

Gearcase – Standard Rotation

Gearcase Disassembly

Install the roll pin to the specified dimension.



1. Roll pin

010491

Remove propeller shaft assembly from gearcase.

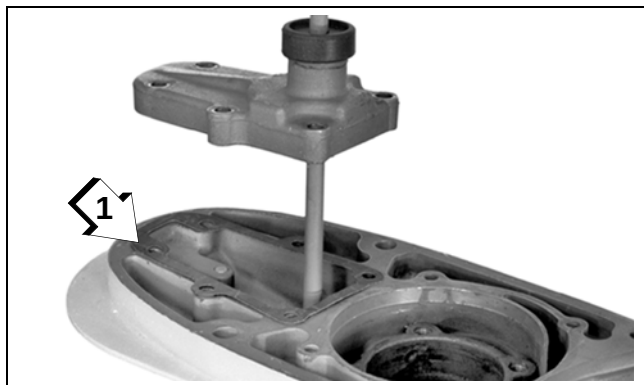


006839

Shift Housing, Gear and Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover gasket. Remove and discard the shift rod O-ring from inside of cover.



1. Cover gasket

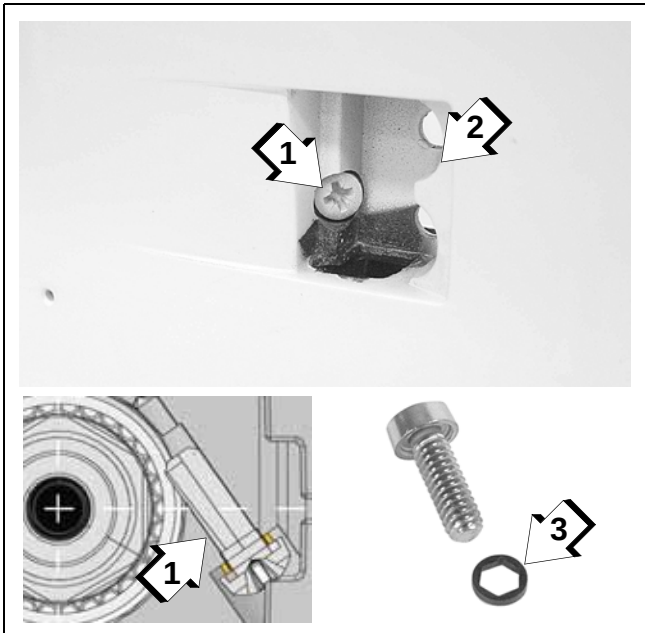
COA3141

IMPORTANT: Inspect gearcase housing, refer to **Gearcase Housing Inspection S, S2, L2, M2-Type** on p. 14.

Shifter, Bearing and Seal Service

Pinion Bearing Removal

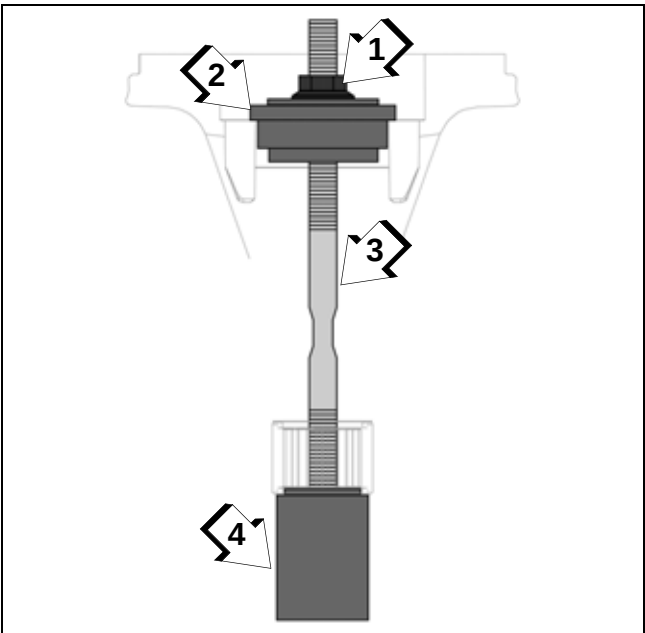
Remove pinion bearing retaining screw.



- | | |
|-----------------------------------|----------|
| 1. Pinion bearing retaining screw | DSC02370 |
| 2. Water screen pocket | DRC7416 |
| 3. Seal | DSC02313 |

Assemble Pinion Bearing Remover/Installer, P/N 5005927, in the gearcase as follows:

Use a 7/8 in. wrench to hold the remover in place.
Use a 3/4 in. wrench to turn flange nut clockwise.
Draw the bearing up from the housing.

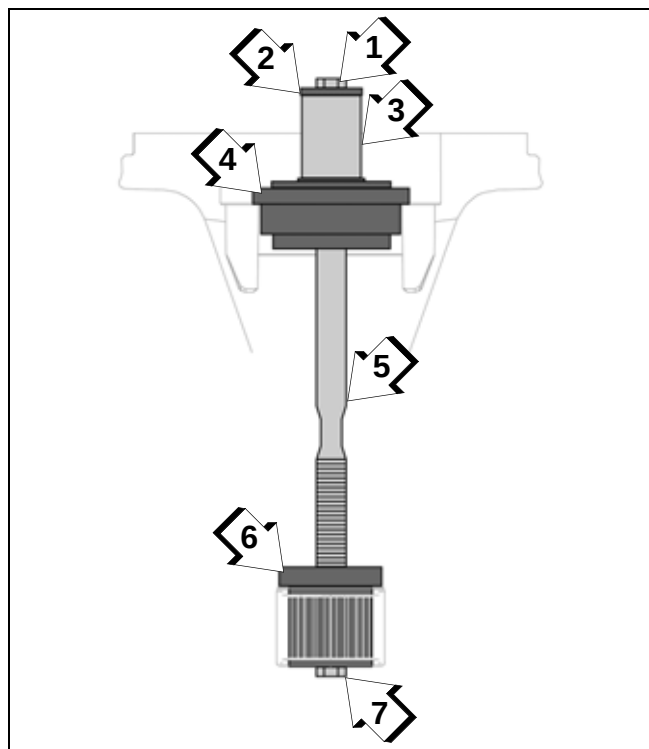


- | | |
|---------------------------|--------|
| 1. Flange nut, P/N 326586 | 010325 |
| 2. Plate, P/N 391260 | DR3419 |
| 3. Rod, P/N 326582 | |
| 4. Remover, P/N 326579 | |

5

Pinion Bearing Installation

Assemble the following components of Pinion Bearing Remover and Installer, P/N 5005927, as shown:



1. 1/4-20 X 1/2 in. Hex head screw
2. 1 in. O.D. Flat washer
3. Spacer, P/N 326584
4. Plate and Bearing P/N 391260
5. Rod P/N 326582
6. Installer/Remover, P/N 350958
7. 1/4-20 X 1 1/4 in. Hex head screw

824182

IMPORTANT: Spacers are different sizes and cannot be interchanged.

Apply *Needle Bearing* grease to the needle bearings and insert them into the bearing case ("O" Type gearcases).

Place the bearing on the installer tool with the **lettered side of the bearing facing the top** of the gearcase. Use *Needle Bearing* grease to hold the bearing on the tool.

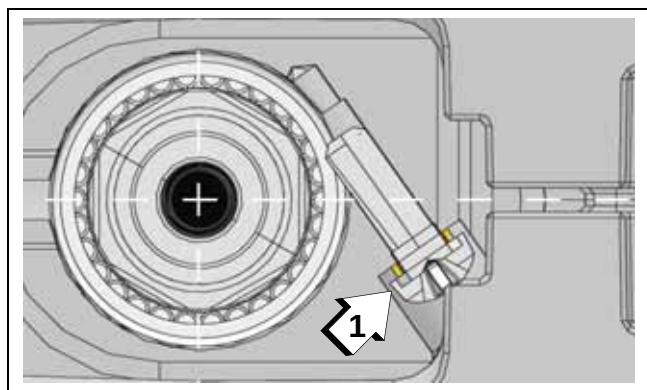
IMPORTANT: The pinion bearing is tapered so that, when installed correctly, its shape compensates for stresses in the gearcase and allows full bearing contact. Whenever a gearcase is disassembled, the pinion bearing should be checked to

ensure that it has been installed with the lettering facing up.

Insert the tool with the bearing into the gearcase. Drive the bearing into the gearcase until the washer on the tool contacts the spacer.

Remove the tool.

Place a new O-ring on the pinion bearing retaining screw. Apply *Gasket Sealing Compound* to O-ring. Apply *Nut Lock* to screw threads. Install the screw and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. O-ring

drc7416R

Shift Housing Disassembly

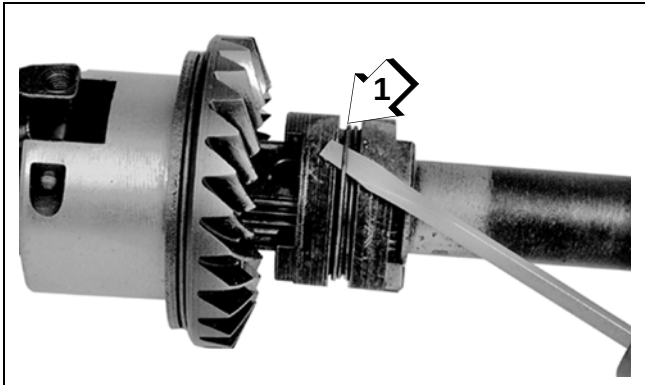
⚠ WARNING

Wear safety glasses to avoid injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

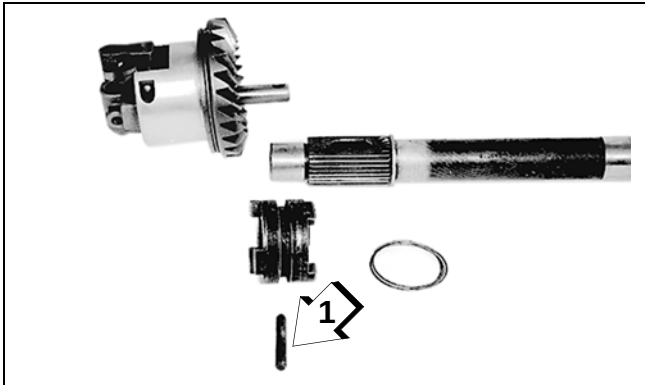
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by

unwrapping it from around the clutch dog. **Discard the spring.**



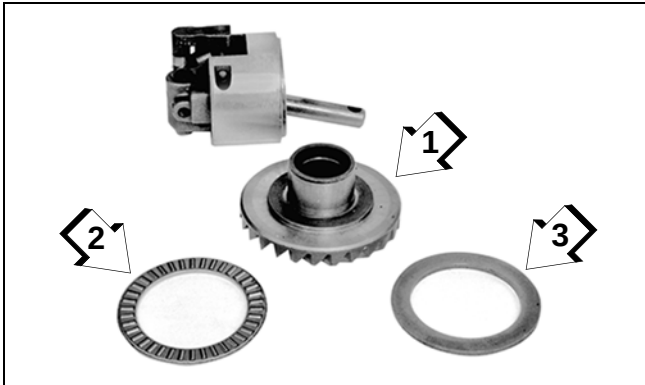
1. Clutch dog spring
COA3560

Push the pin out of the clutch dog. Remove all parts.



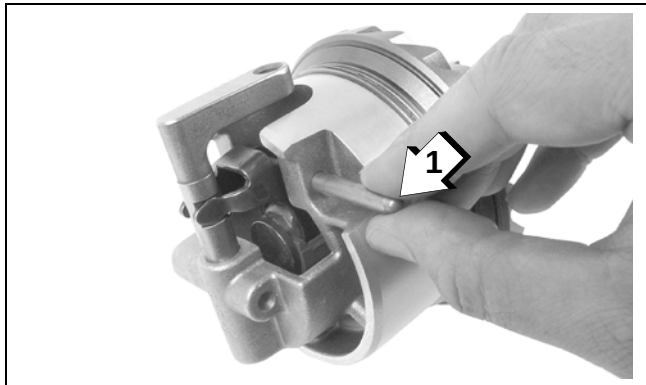
1. Pin
COA3561

Remove the gear, thrust bearing, and thrust washer from the shift housing.



1. Gear
2. Thrust bearing
3. Thrust washer
COA3562

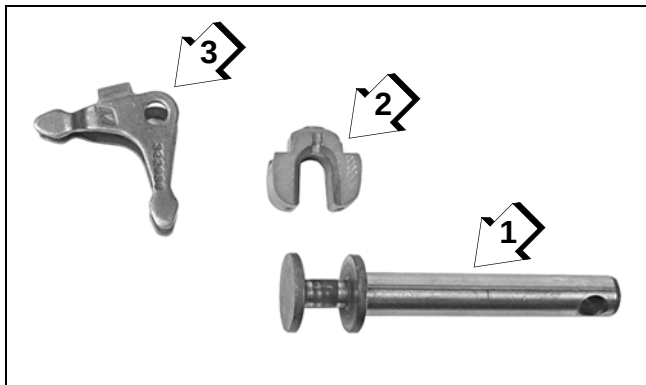
Remove the shift lever pin from the housing.



1. Shift lever pin
2. Shifter detent
DSC02449

Move the shifter detent as needed to help ease removal of the following parts:

- shift shaft
- cradle
- shift lever



1. Shift shaft
2. Cradle
3. Shift lever
DSC02489

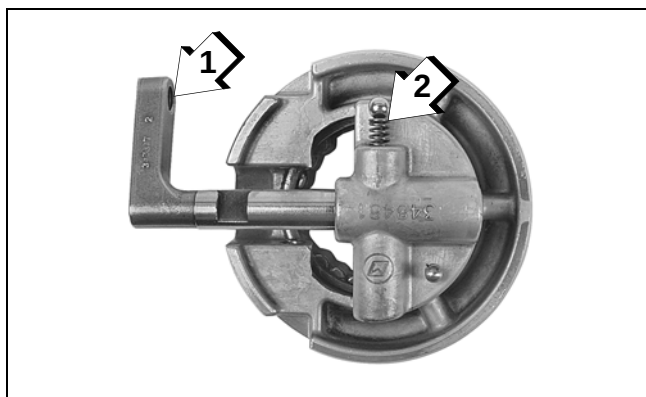
⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring and come out with great force.

Gearcase – Standard Rotation

Shifter, Bearing and Seal Service

Wrap the housing with a shop cloth to catch ball and spring. Rotate the shifter detent 90° in either direction, then pull the detent out of the housing.



1. Shifter detent
2. Ball and spring

DSC02518

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection ("O" Type).

Shift Housing Assembly

IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

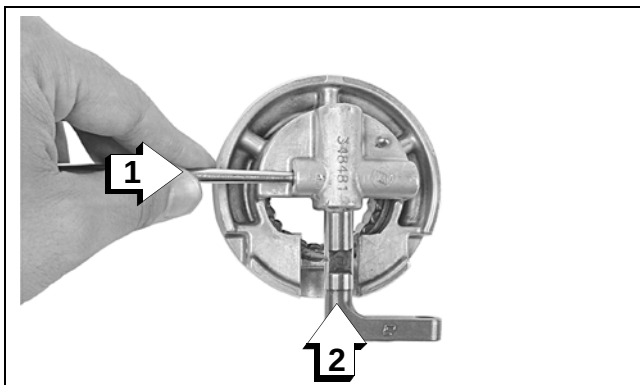
Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



010118

Insert shifter detent at 90° angle into the housing as shown, while depressing the ball and spring with a suitable tool. Once the shifter detent is past

the ball, remove the tool and position detent to engage NEUTRAL position.



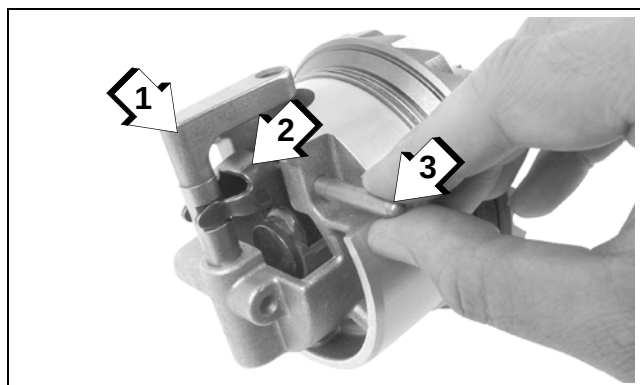
DSC02506

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case ("O" Type gearcases).



4520

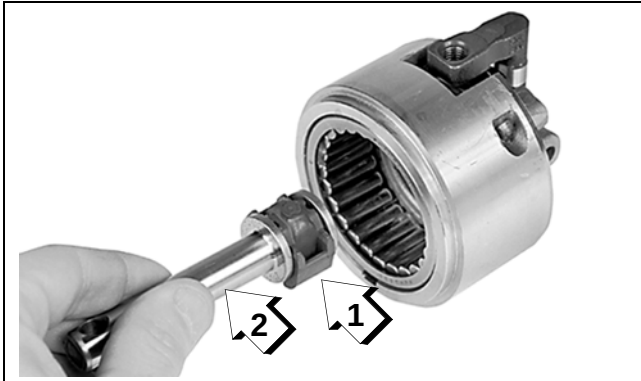
With shifter detent in NEUTRAL, install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Shifter detent
2. Shift lever
3. Pin, shift lever

DSC02449

Rest the cradle on the shift shaft.



TYPICAL
1. Cradle
2. Shift shaft

4512

Place the shift lever arms into the recesses of the shift cradle. Pull shifter detent back up to NEUTRAL position to hold the cradle and shaft in place.



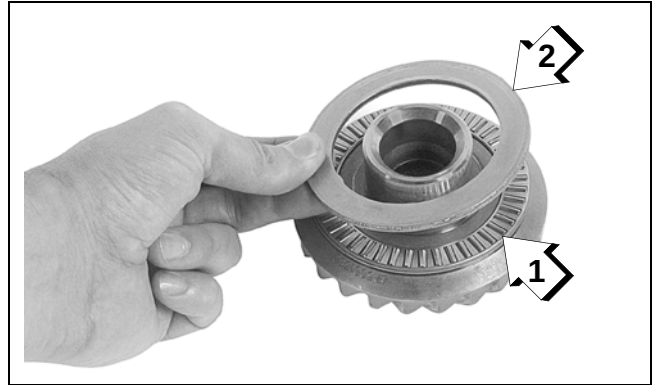
001219

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bear-

ing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.



1. "PROP END"

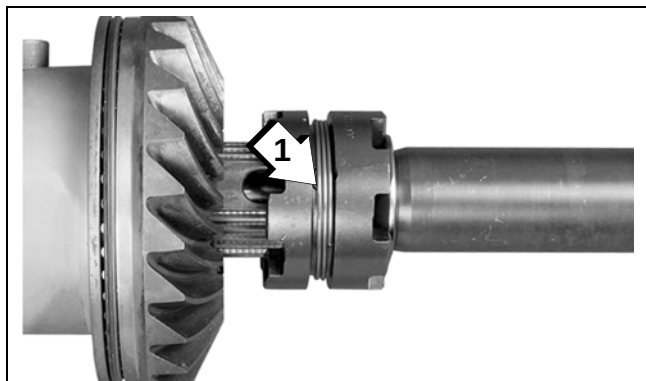
006906

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end

Gearcase – Standard Rotation

Shifter, Bearing and Seal Service

of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

006907

Driveshaft Bearing Housing Service

The driveshaft bearing is not serviceable. Replace the bearing housing assembly if the bearing is worn or damaged. Also, inspect the driveshaft bearing surface if the bearing is damaged.

Seal Removal

Remove the driveshaft bearing housing seals using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Discard the seals.



14155

Remove and discard the O-ring from the bearing housing.

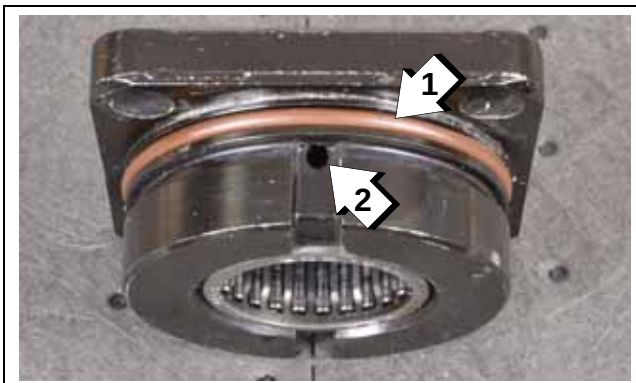
Clean the bearing housing in solvent to remove sealer from the seal bore and the O-ring groove.

Seal Installation

Lightly apply *Gasket Sealing Compound* to a new O-ring. Install the O-ring in top groove of the bearing housing. Do not allow sealant in oil passage.

NOTICE

Do not install the O-ring in the bearing housing's bottom groove. The bottom groove is an oil passage. Gearcase damage could result.



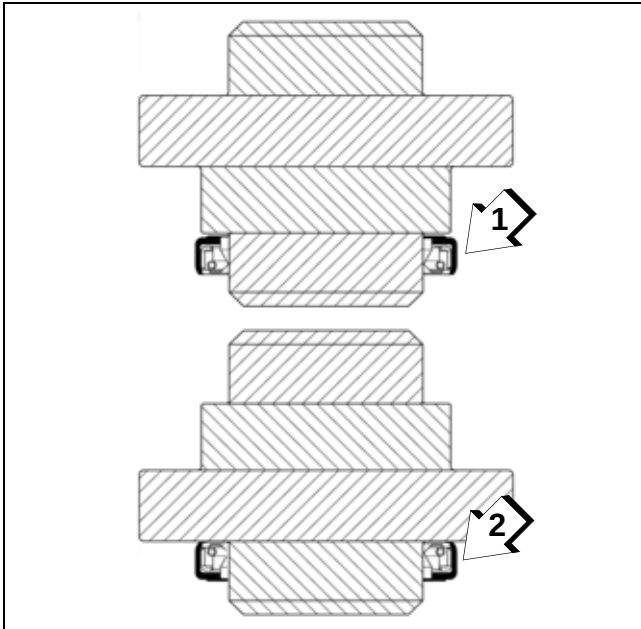
1. O-ring (top groove)
2. Oil passage

009526

Apply *Gasket Sealing Compound* to casings of new seals before installing.

Use Seal Installation Tool, P/N 330268 to install new seals back to back in bearing housing. Install inner seal with lip facing toward bearing housing, then the outer seal with lip facing away from bear-

ing housing. Apply *Triple-Guard* grease to seal lips.



1. Inner seal
2. Outer seal

010320

Propeller Shaft Bearing Housing Service

Rear Seal Removal

Remove seals using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131. Place the plate on top of the housing to support the bridge, and tighten jaws securely behind the inner seal.

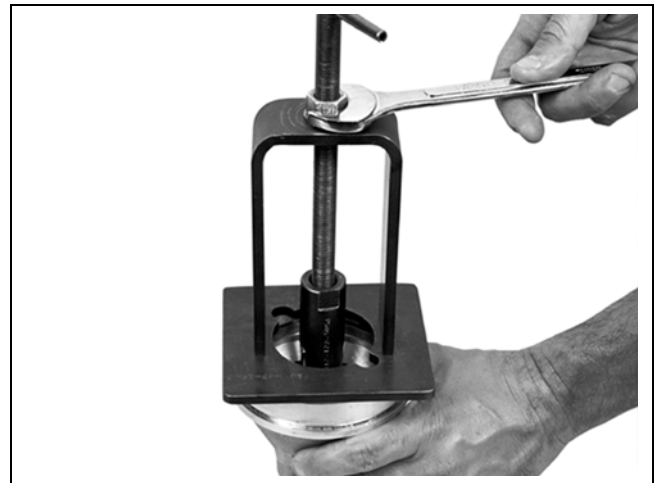


13520

Bearing Removal

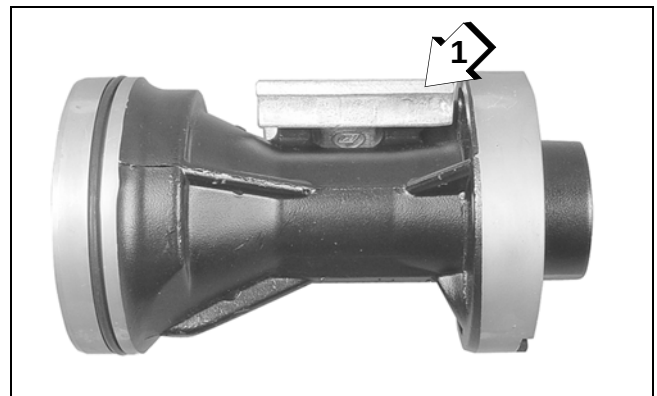
IMPORTANT: Inspect bearings in place. If a bearing is removed for any reason, it must be discarded.

Remove either bearing using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Place the puller plate on top of the housing to support the bridge, and tighten jaws securely behind the bearing.



13522

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size. Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).



1. Anode

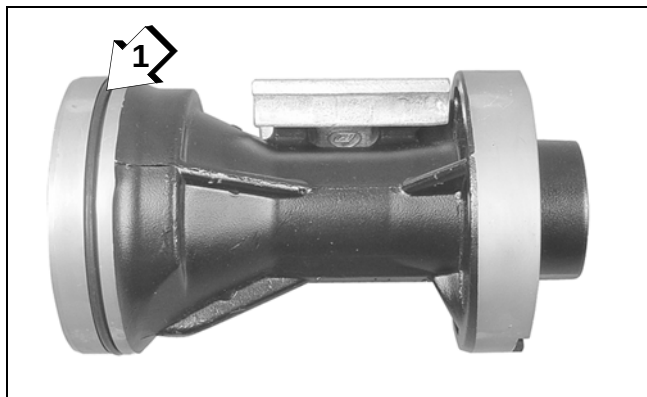
001220

Discard the bearing housing O-ring. Clean the housing and bearings in solvent and dry thoroughly. If bearings were not replaced, rotate the needles to check for freedom of movement.

Gearcase – Standard Rotation

Shifter, Bearing and Seal Service

Inspect O-ring groove. Sand off any sharp edges that might cut O-ring. Remove any nicks or burrs on front of bearing housing.



1. O-ring groove

DSC02291

Bearing installation tool:

- P/N 339750 – “O” Type gearcases



Forward Bearing

1. Bearing installation tool

29967

Bearing Installation

Oil, then install new bearings in bearing housing.

Place the **lettered end** of the bearing case on the bearing installer, then press the bearing into the housing until the tool seats. When installed, the lettered end of the bearing should be visible.



Rear Bearing

1. Bearing installation tool

44237

Rear Seal Installation

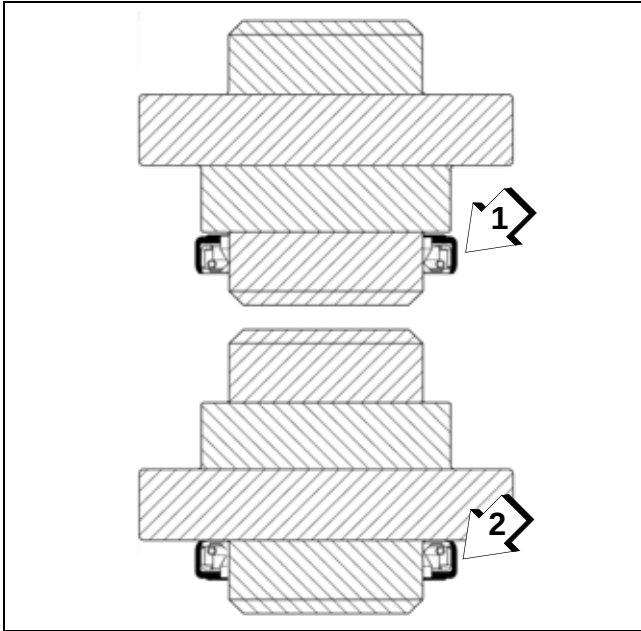
Apply *Gasket Sealing Compound* to metal casings of the seals before installing.

Use Seal Installation Tool to install new seals back to back in bearing housing.

Seal installation tool:

- P/N 336311

Install inner seal with lip facing toward the bearing housing, then outer seal with lip facing away from the bearing housing.



1. Inner seal
2. Outer seal

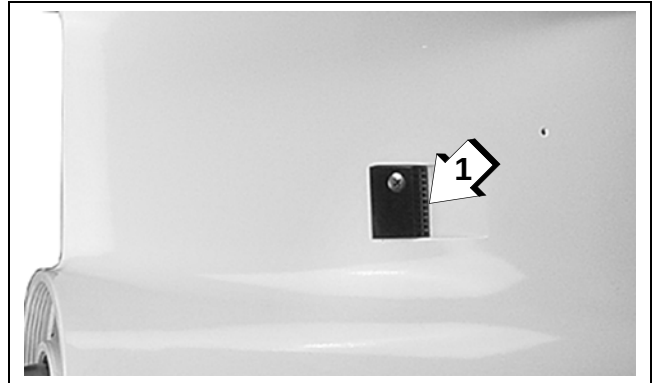
010320

Apply *Triple-Guard* grease to seal lips.

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Water intake screen

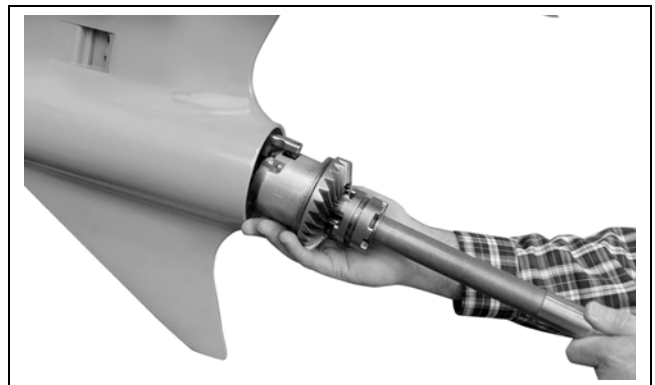
001991

5

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift housing pin with hole in forward end of gearcase housing.

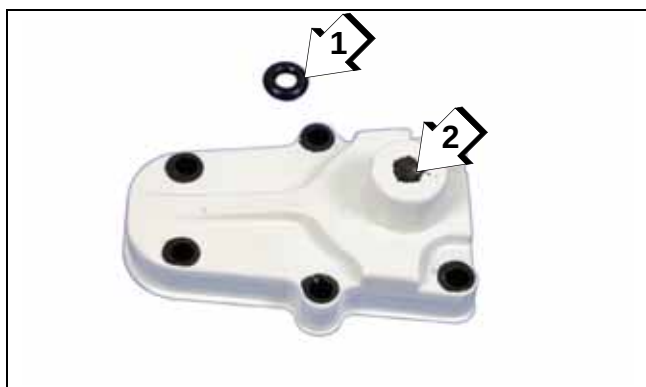


005427

Shift Rod Housing Installation

Lubricate a new shift rod cover O-ring with *Triple-Guard* grease. Install the O-ring into the shift rod cover.

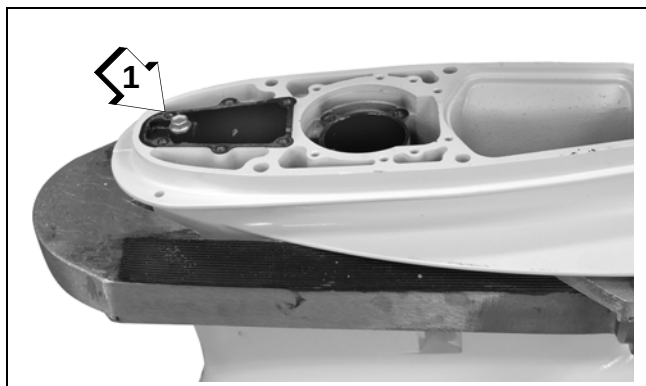
IMPORTANT: Make sure O-ring is fully seated in groove.



1. O-ring
2. Groove

006780

If removed, install pitot tube screw and seal in housing.

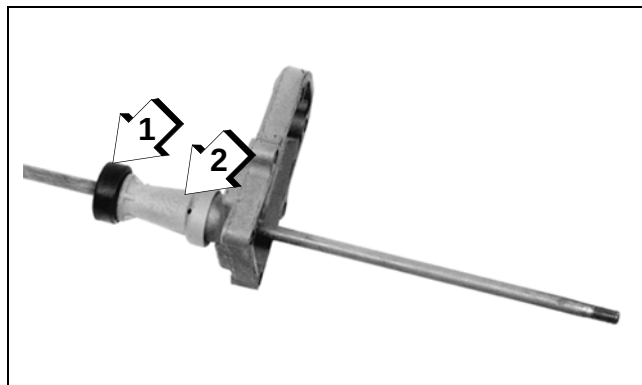


1. Screw and seal

006841

Place the shift rod grommet on the shift rod.

Install shift rod spacer under grommet on 25 in. models.



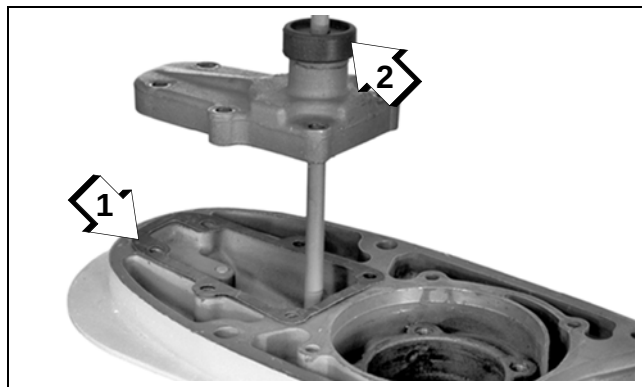
1. Grommet
2. Shift rod spacer

COA3568

Apply *Triple-Guard* grease to the threaded end of the shift rod and insert it through the cover. Turn the shift rod while pushing it through the cover to avoid damaging the O-ring.

Apply *Gasket Sealing Compound* to both sides of a new shift rod cover gasket. Place the gasket on the gearcase.

Thread the shift rod into the shifter detent about four turns.

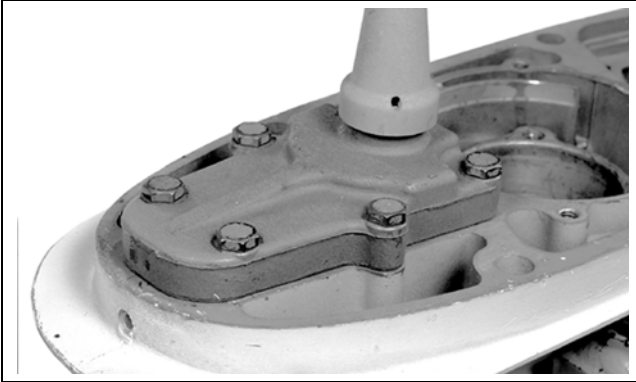


1. Cover gasket
2. Grommet

COA3141

Move shift rod from side to side while pushing on the propeller shaft to ensure proper alignment of the bearing housing locator pin into the pin hole in the gearcase.

Apply *Gasket Sealing Compound* to the threads of the shift rod cover screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



COA3569

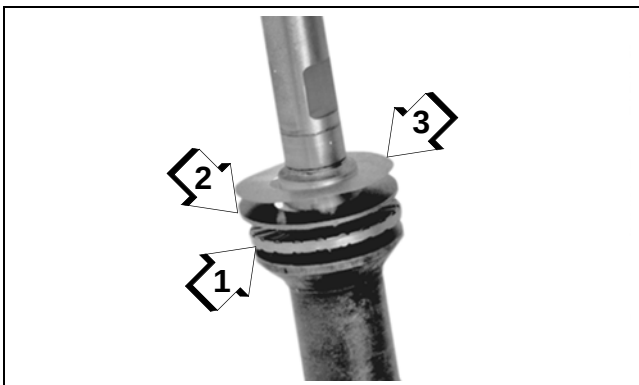
Refer to **Shift Rod Adjustment** on p. 13.

Pinion Gear and Driveshaft Installation

Refer to **Driveshaft Shimming** on p. 15 before proceeding.

Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on p. 124.

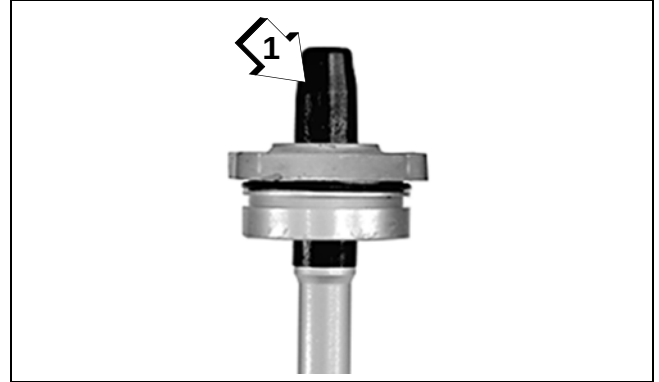
Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

COA3168

Using Driveshaft Seal Protector, P/N 318674, slide the driveshaft bearing housing onto the driveshaft and into position in the gearcase.



1. Seal protector

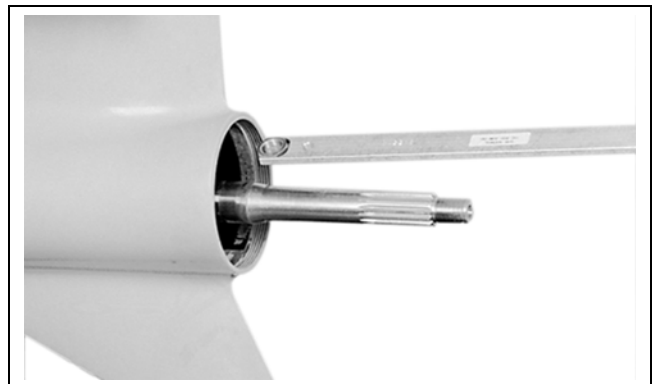
COA3130

Adjust shift rod to move clutch dog as far forward as possible. Be sure excess grease is removed from the pinion bearing.

IMPORTANT: The inside taper of the pinion gear and the driveshaft taper **MUST** be completely free of grease. Clean the tapers with *Cleaning Solvent*. Use a shop towel free of grease and lint.

Place the pinion gear into the gearcase. Insert the driveshaft into the gearcase and through the pinion gear.

Lightly coat the threads of a **new** pinion nut with outboard lubricant. Use Pinion Nut Starting Tool, P/N 342216, to install nut on the driveshaft. Turn the driveshaft by hand to thread the nut on to shaft.



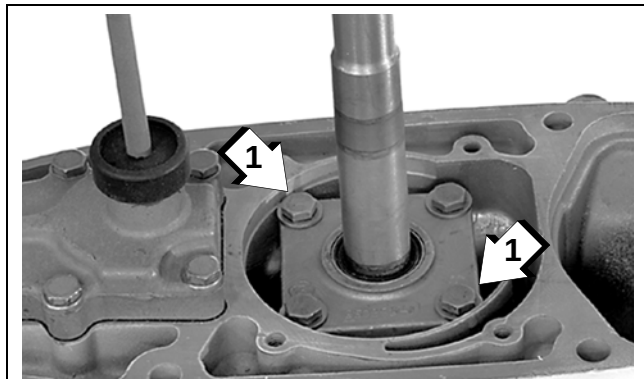
42230

Apply *Gasket Sealing Compound* to the threads of the driveshaft bearing housing screws. Tighten

Gearcase – Standard Rotation

Gearcase Assembly

screws **in stages** to a torque of 120 to 144 in. lbs. (13.5 to 16.5 N·m).



1. Driveshaft bearing housing screws

COA3153

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438, to tighten the pinion nut to a torque of 100 to 110 ft. lbs. (136 to 149 N·m). Pad handle of holder to prevent damage to gearcase.

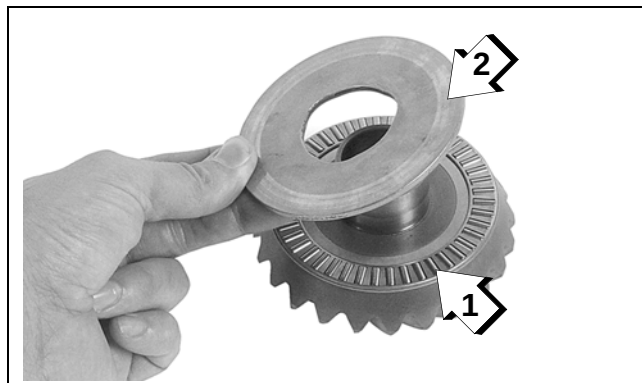


1. Holding socket
2. Pinion nut wrench
3. Retainer

42229

Propeller Shaft Bearing Housing and Gear Installation

Oil and install thrust bearing and thrust washer on hub of reverse gear. Slide the gear assembly onto the propeller shaft until it engages the pinion gear.



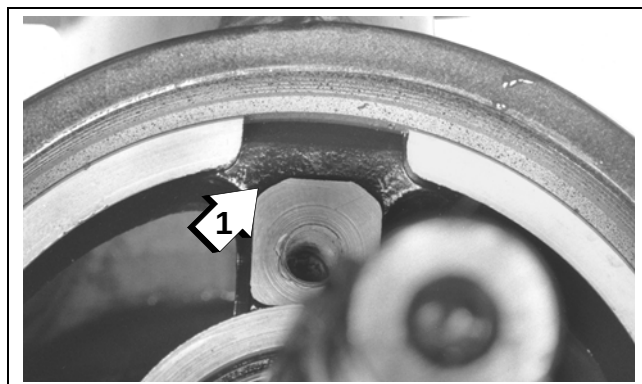
1. Thrust bearing
2. Thrust washer

DSC02295

Lightly apply *Gasket Sealing Compound* to a new bearing housing O-ring. Install O-ring in groove in the housing.

Install housing into gearcase. Align screw holes with retainer slots in gearcase.

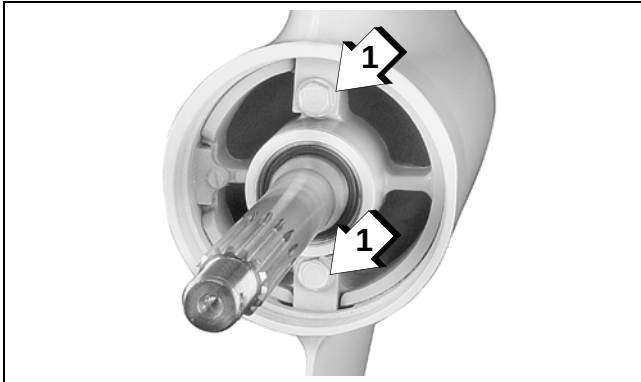
Housing must be completely seated to install retainer tabs.



1. Retainer tab notch

50106a

Install two retainers, washers and screws. Apply *Ultra Lock* to threads and tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).

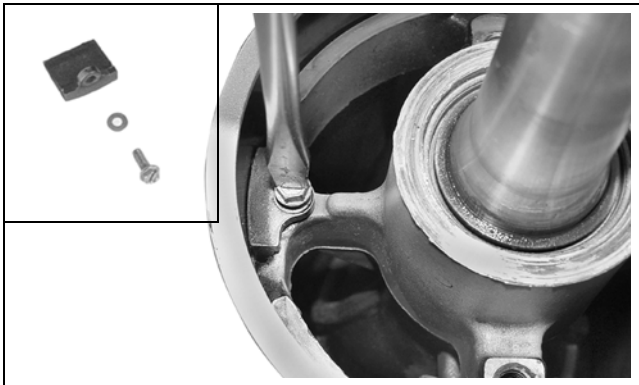


1. Retainer tab screws

001989

Loosen retainer screws 1/4 turn.

Install wedge, screw, and washer. Apply *Ultra Lock* to threads and tighten screw to a torque of 15 to 20 in. lbs. (1.7 to 2.3 N·m).



DSM02291
DSC02361

Re-tighten two retainer screws to 18 to 20 ft. lbs. (24 to 27 N·m).

Confirm that torque on the wedge screw is 15 to 20 in. lbs. (1.7 to 2.3 N·m).

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 111
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 109
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Gearcase – Counter Rotation

Gearcase Disassembly

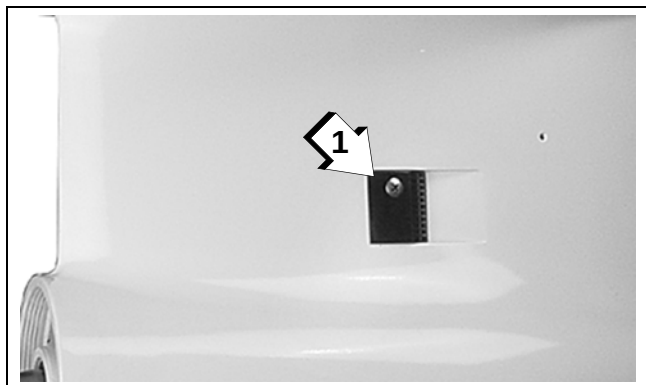
IMPORTANT: Counter rotation (CR) gearcases use unique components and require different service procedures. Use care when working on counter rotation gearcases. DO NOT interchange parts between standard and counter rotation models. Identify gearcase type before disassembly. Make sure the “CR” marking is on the end of the propeller shaft.

Pre-Disassembly Inspection

Refer to **Pre-Disassembly Inspection** on p. 114.

Water Intake Screens

Remove and clean water intake screens. Replace if damaged.

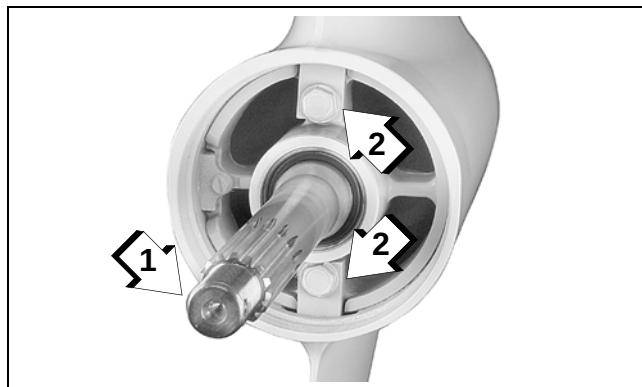


1. Water intake screen

001991

Propeller Shaft Bearing Housing Removal

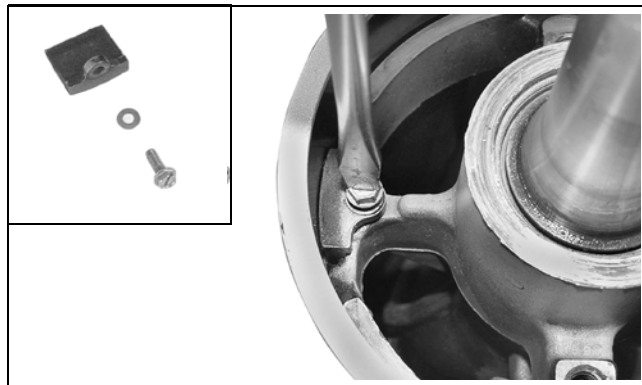
Remove the two screws, washers, and retainers holding the propeller shaft bearing housing.



1. “CR” marking
2. Retainer tab screws

001989

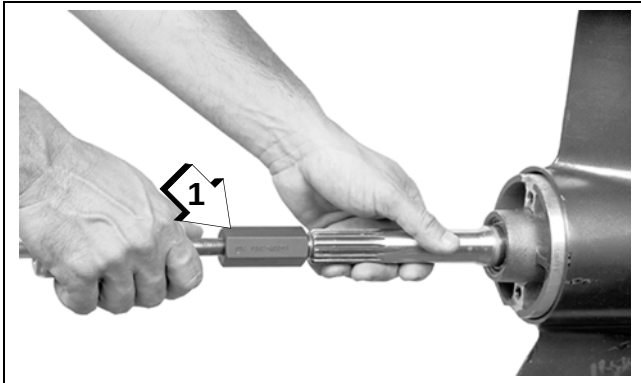
Remove wedge, screw, and washer.



DSM02291
DSC02361

To remove the propeller shaft, bearing housing and forward gear from gearcase, thread Propeller Shaft Adapter, P/N 432398, onto Slide Hammer, P/N 432128, until it seats. Thread adapter completely onto propeller shaft and pull propeller

shaft, bearing housing, and forward gear assembly out of gearcase.



1. Adapter, P/N 432398

13501

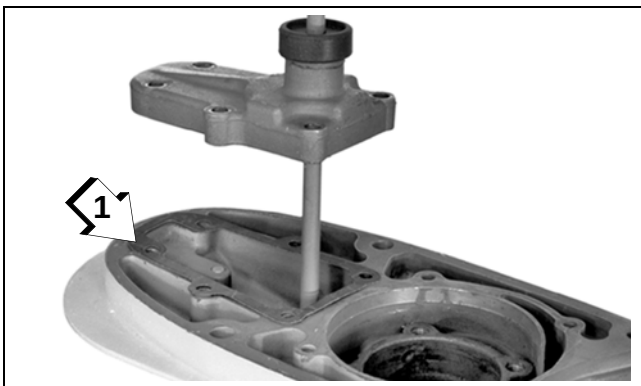
Pinion Gear Removal and Driveshaft Servicing

Refer to **Pinion Gear and Driveshaft Removal** on p. 115.

Shift Housing, Gear and Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover gasket. Remove the shift rod O-ring from inside of cover and discard.

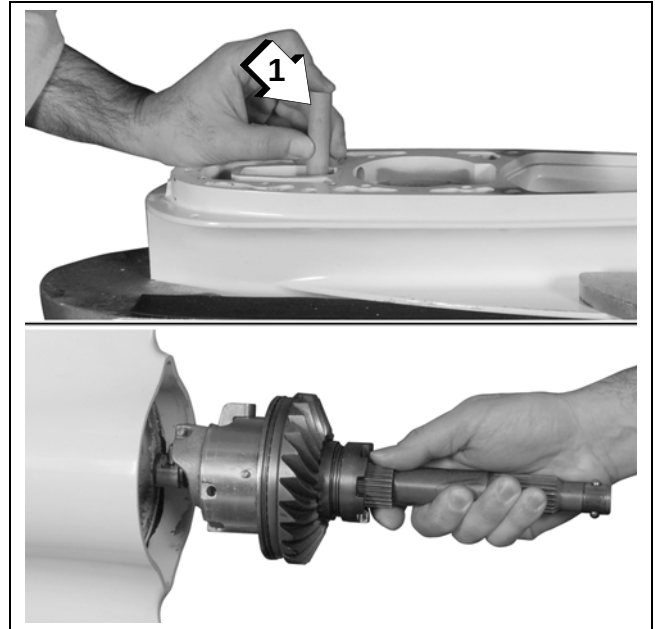


1. Cover gasket

COA3141

Use an appropriate tool to apply downward pressure on the detent while pulling on the propeller

shaft assembly. Remove propeller shaft assembly from the gearcase.



Counter Rotation Models

1. Tool

006929

IMPORTANT: Inspect gearcase housing, refer to **Gearcase Housing Inspection S, S2, L2, M2-Type** on p. 14.

Shifter, Bearing and Seal Servicing

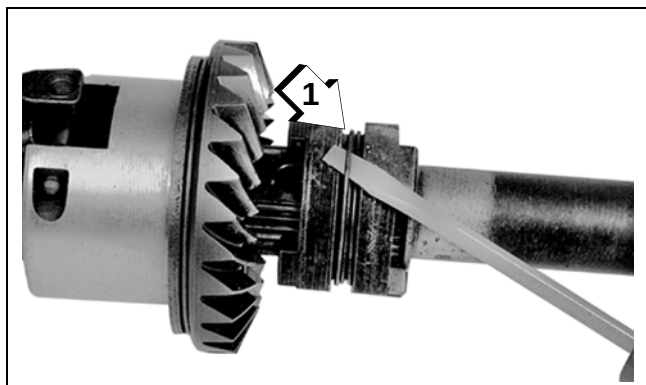
Shift Housing Disassembly

WARNING

Wear safety glasses to avoid injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

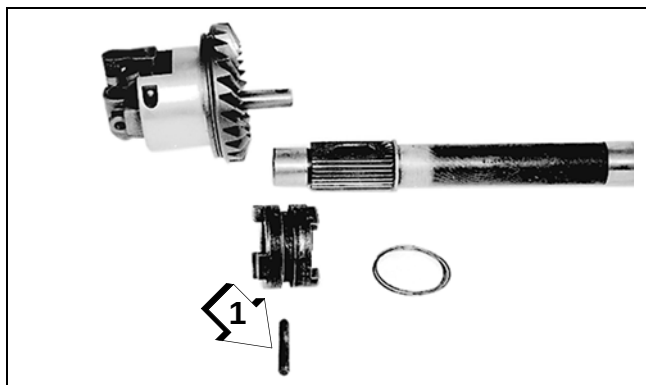
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

COA3560

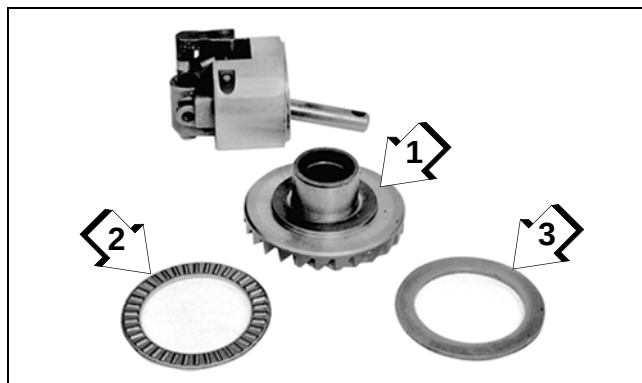
Push the pin out of the clutch dog. Remove all parts.



1. Pin

COA3561

Remove the gear, thrust bearing, and thrust washer from the shift housing.

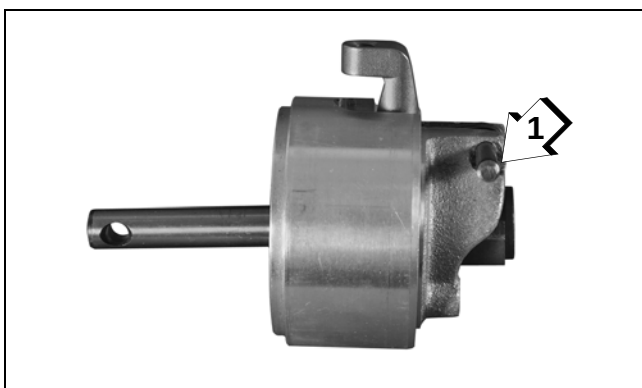


1. Gear
2. Thrust bearing
3. Thrust washer

COA3562

IMPORTANT: The shift housing supports the reverse gear on counter rotation gearcases.

Remove the shift lever pin from the housing. Remove shift shaft, cradle and shift lever. Move shifter detent as needed to help ease removal of parts.



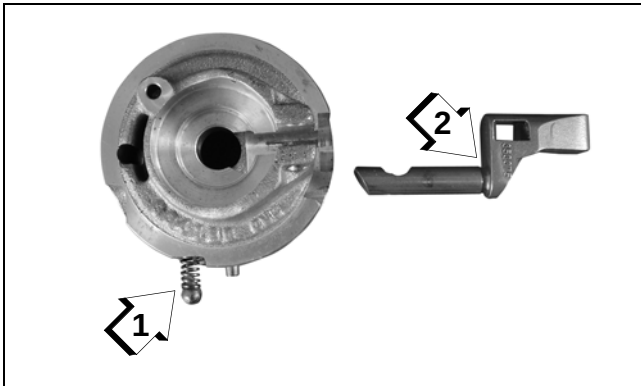
1. Pin

006861

WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Pull the shifter detent straight out of the housing.



1. Ball and spring
2. Shifter detent

006932

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection.

Shift Housing Assembly

IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

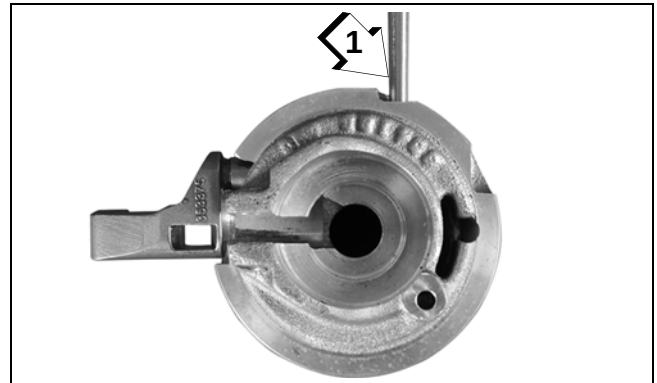
Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



006933

Insert shifter detent into the housing as shown, while depressing the ball and spring with a suit-

able tool. Once the detent is past the ball, remove the tool and position detent to engage NEUTRAL.



1. Punch

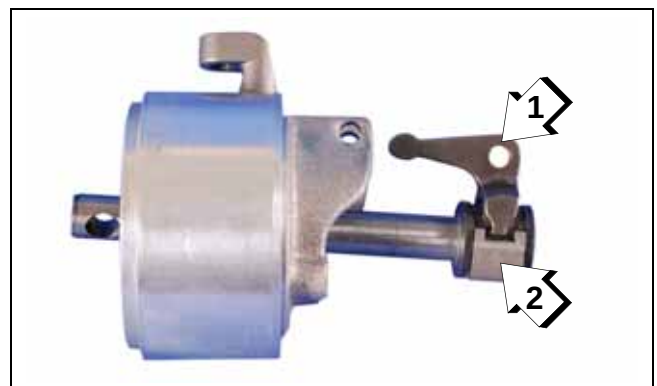
006934

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case.



4520

Rest the cradle and shift lever on the shift shaft and insert through the front side of the shift housing.



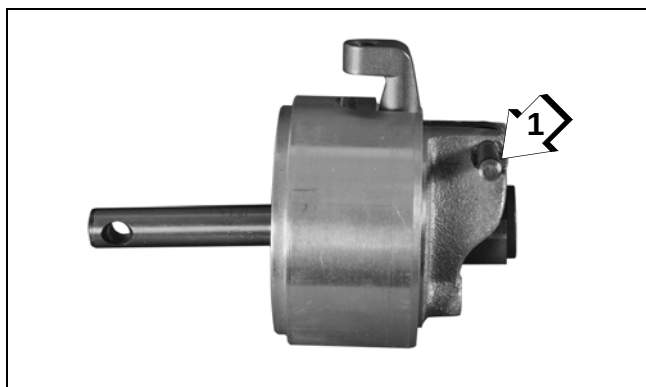
1. Cradle
2. Shift lever

006860

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

Install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Pin, shift lever

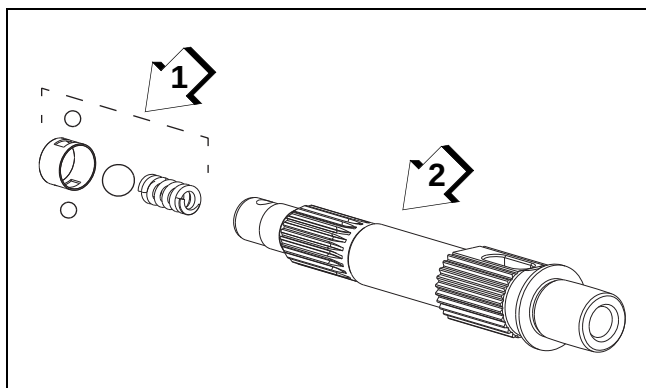
006861

Inspect clutch shaft detent balls, retainer and spring. These parts should not require removal under normal servicing.

⚠ WARNING

Wear safety glasses to avoid injury.

If these parts are damaged or removed, a new service kit should be installed. Refer to parts catalog for kit part number.



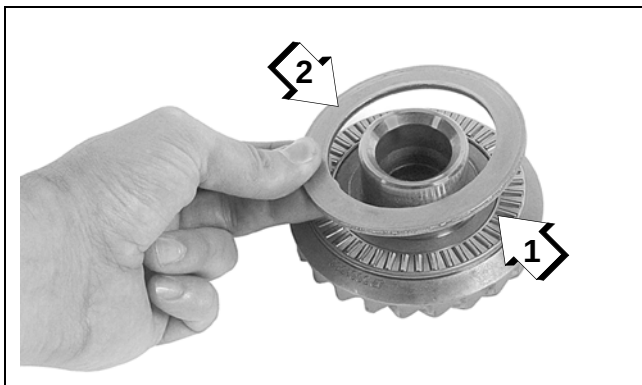
1. Clutch Shaft Retainer Kit
2. Clutch Shaft

010485

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bearing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

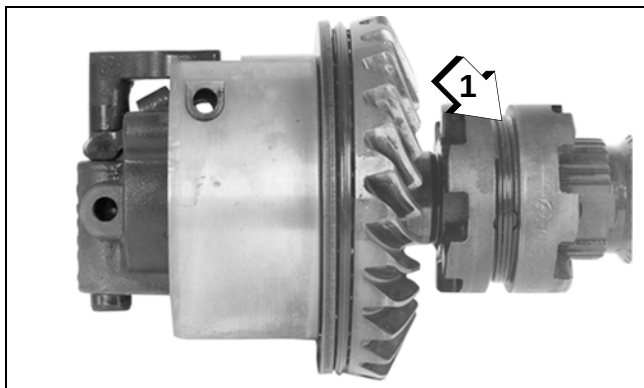
The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.



1. "PROP END"

006906

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

COB3101

Pinion Bearing

Refer to **Pinion Bearing Installation** on p. 120.

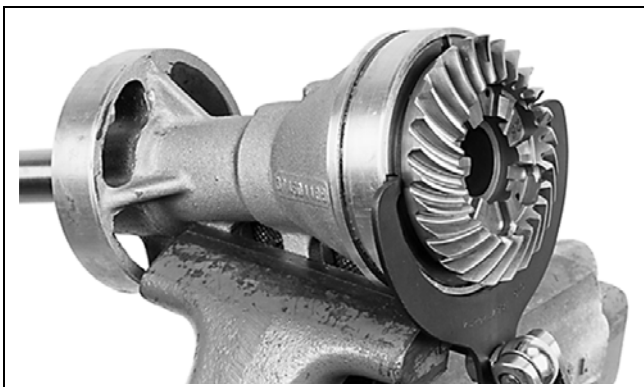
Propeller Shaft Bearing Housing and Forward Gear

Disassembly

Remove and discard the bearing housing O-ring.

Remove the anode and discard if more than two-thirds deteriorated.

Clamp the bearing housing by the anode bosses in a vise, as shown. Remove the forward gear assembly by unscrewing it with Spanner Wrench, P/N 432400.



13491

Remove gear housing retaining ring.



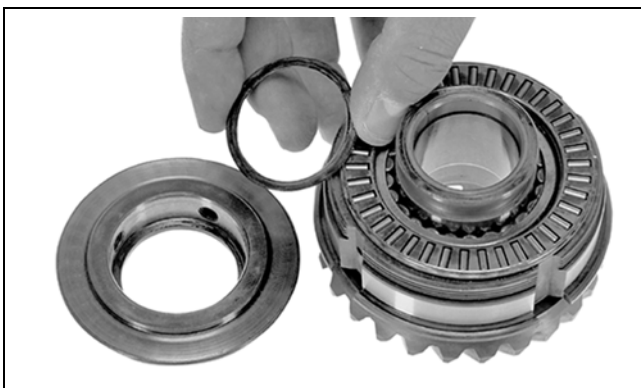
DSC02486A

Remove the set screws and remove the flange.



31965

Remove the shim from either the flange or forward gear.



31964

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

Remove the thrust bearing.



31963

Remove the bearing housing from the forward gear.



31961

Remove the thrust bearing from the forward gear.

Inspect the forward gear for excessive wear or damage.



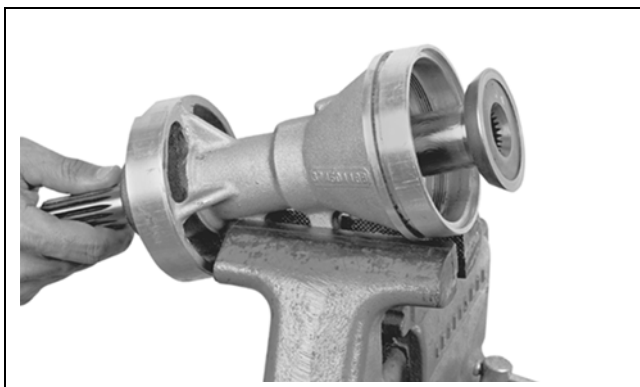
31960

Remove the forward gear bearing only if it needs to be replaced. If removal of the bearing is necessary, use Large Puller Jaws, P/N 432129, and Puller Bridge, P/N 432127, with an appropriate base. Leave the rollers in to allow for good contact with the puller jaws.



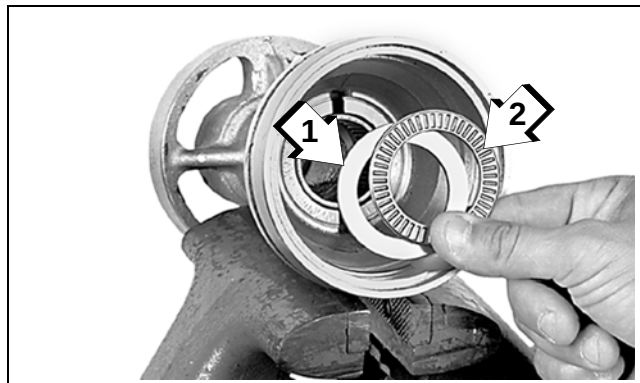
31958

Push propeller shaft out of the bearing housing.



13479

Remove the thrust washer and thrust bearing.



1. Thrust washer
2. Thrust bearing

13593

For seal and bearing service refer to **Propeller Shaft Bearing Housing Service** on p. 125.

Assembly

If removed, install a new forward gear bearing. Apply *Needle Bearing* grease to 25 new rollers. Install the rollers in the bearing.

Use Bearing Installation Tool, P/N 339778, to install the bearing, lettered side facing tool.



31956

Install the thrust bearing on the forward gear.



31960

Place the bearing housing on the forward gear.



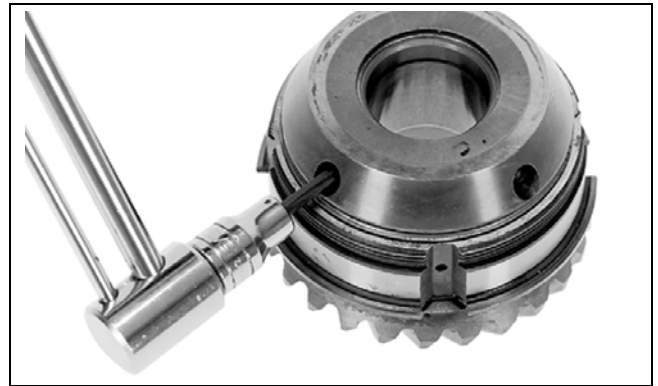
31961

Install 0.030 in. (0.7 mm) of shims and the thrust bearing in the flange. Install the thrust bearing on the forward gear.



31955

Install set screws and tighten to a torque of 144 to 168 in. lbs. (16.5 to 19 N·m). Use no thread sealant.



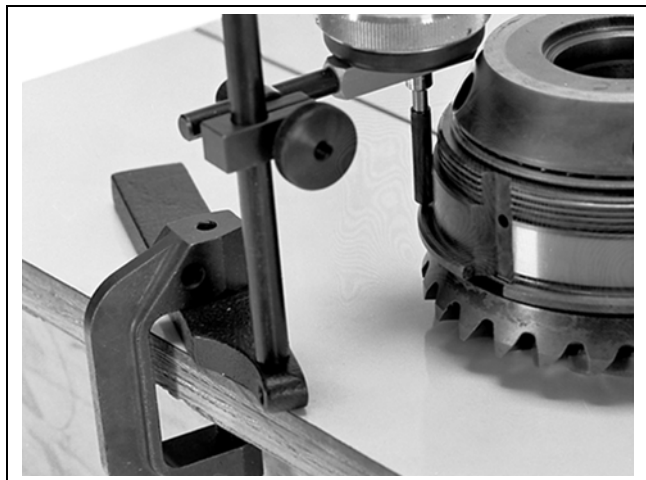
31967

Anchor a dial indicator gauge to a flat, level surface.

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

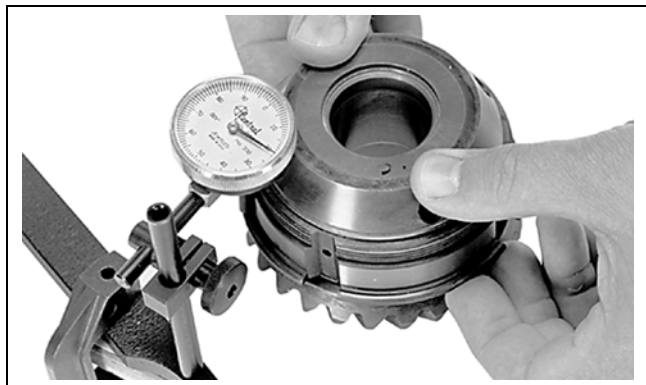
Place the gear assembly so the indicator needle makes contact with the flange on the housing. The indicator needle must be parallel with the side of the gear housing and perpendicular to the table surface. Zero the dial indicator.



31953

Grip the bearing housing 180° apart and pull up to get a reading on the indicator. To determine thickness of shims; use the following example:

- 0.030 in. of shims in the assembly
- 0.020 in. reading on the dial indicator
- = 010 in. difference
- + 0.001 in. necessary end play
- = 0.011 in. required shims

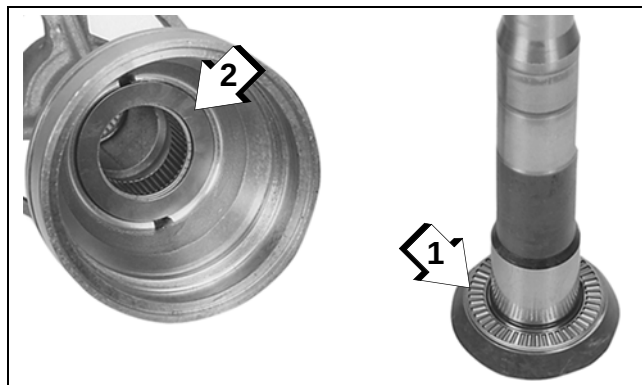


31968

Remove the 0.030 in. (0.7 mm) of shims from the assembly. Reassemble the gear assembly using a combination of shims to achieve the required thickness. Apply *Nut Lock* to the threads of the set screws and torque to 144 to 168 in. lbs. (16.3 to 19 N·m).

Apply *Needle Bearing* grease to the thrust bearing. Position bearing around shoulder on the propeller shaft.

Apply *Needle Bearing* grease to the thrust washer. Place washer in recess of bearing housing.



- 1. Thrust bearing
- 2. Thrust washer

14214

Coat bearing surfaces of propeller shaft with gearcase lubricant. Slide the propeller housing onto the propeller shaft. Thrust bearing must remain around shoulder on the propeller shaft.



14159

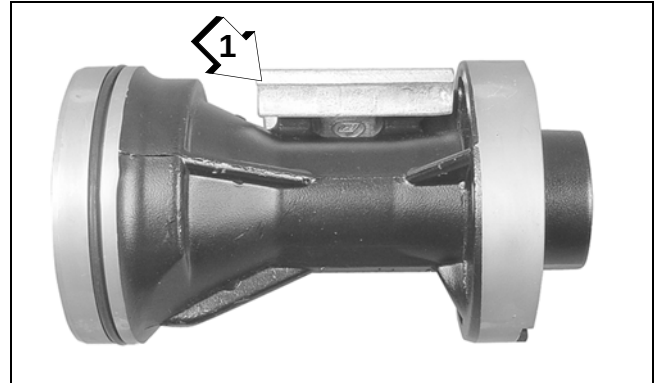
Gearcase – Counter Rotation Shifter, Bearing and Seal Servicing

Apply gearcase lubricant to the threads of the forward gear bearing housing.



DSC02486

Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).

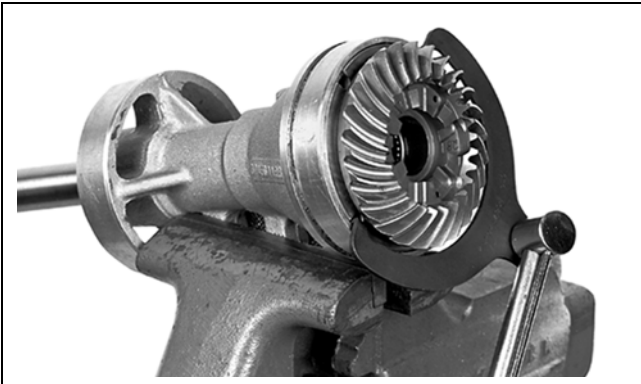


1. Anode

001220

IMPORTANT: To prevent damage to threads, install forward gear bearing housing assembly by hand until fully seated against propeller shaft bearing housing.

Use Spanner Wrench, P/N 432400, to tighten the gear assembly to a torque of 100 ft. lbs. (136 N·m).



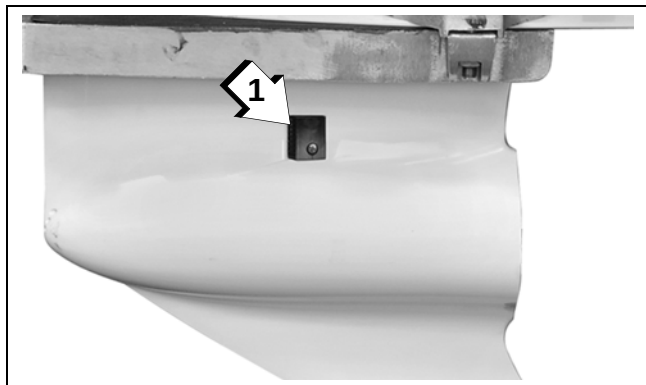
13529

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size.

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Water intake screen

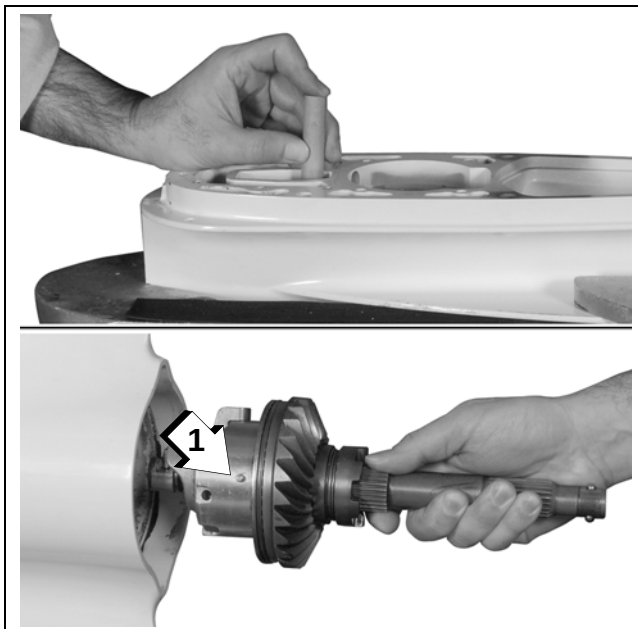
006886

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift

housing pin with hole in forward end of gearcase housing.



1. Pin

006929

Shift Rod Cover

Refer to **Shift Rod Housing Installation** on p. 128.

Pinion Gear and Driveshaft Installation

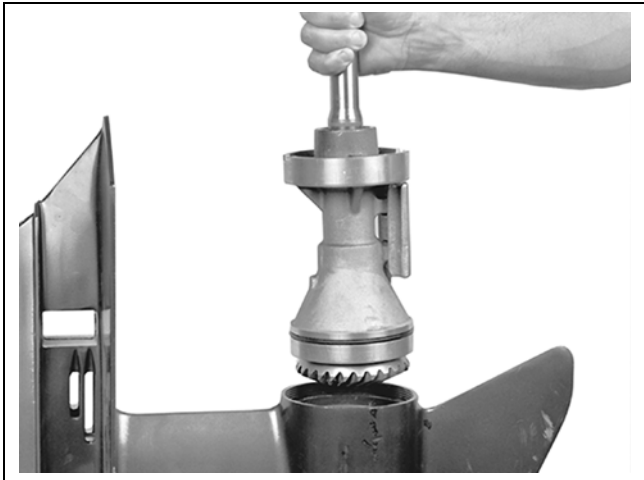
Refer to **Pinion Gear and Driveshaft Installation** on p. 129.

Propeller Shaft Bearing Housing and Gear Installation

Lightly apply *Gasket Sealing Compound* to a new bearing housing O-ring. Install O-ring in groove in the housing.

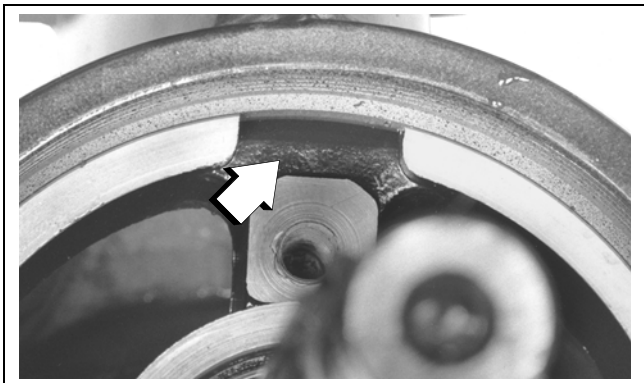
Install housing into gearcase. Align screw holes with retainer slots in gearcase.

IMPORTANT: The propeller shaft must engage the clutch shaft and the forward gear must fully engage the pinion gear.



13586

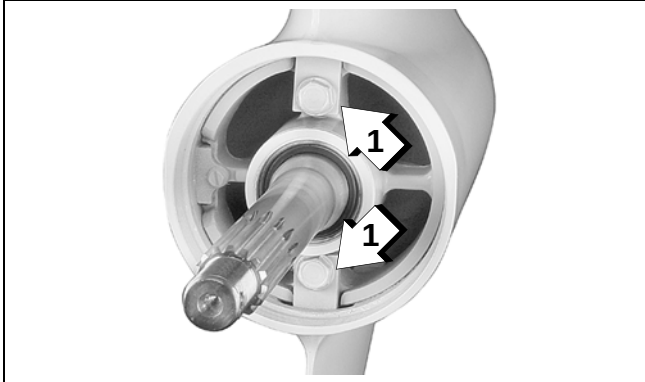
Housing must be completely seated to install retainer tabs.



Retainer Tab Notch

50106a

Install two retainers, washers and screws. Apply *Ultra Lock* to threads and tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).

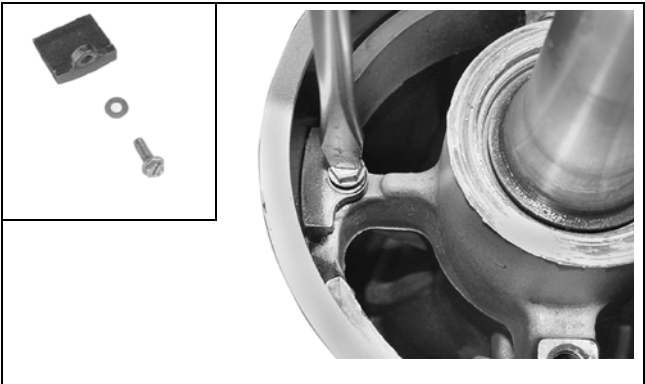


1. Retainer tab screws

001989

Loosen retainer screws 1/4 turn.

Install wedge, screw, and washer. Apply *Ultra Lock* to threads and tighten screw to a torque of 15 to 20 in. lbs. (1.7 to 2.3 N·m).



DSM02291
DSC02361

Gearcase – Counter Rotation

Gearcase Assembly

Re-tighten two retainer screws to 18 to 20 ft. lbs.
(24 to 27 N·m).

Confirm that torque on the wedge screw is 15 to
20 in. lbs. (1.7 to 2.3 N·m).

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Trim Tab Adjustment** on p. 18
- **Water Pump Service** on p. 111
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 109
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

L2-Type Gearcase

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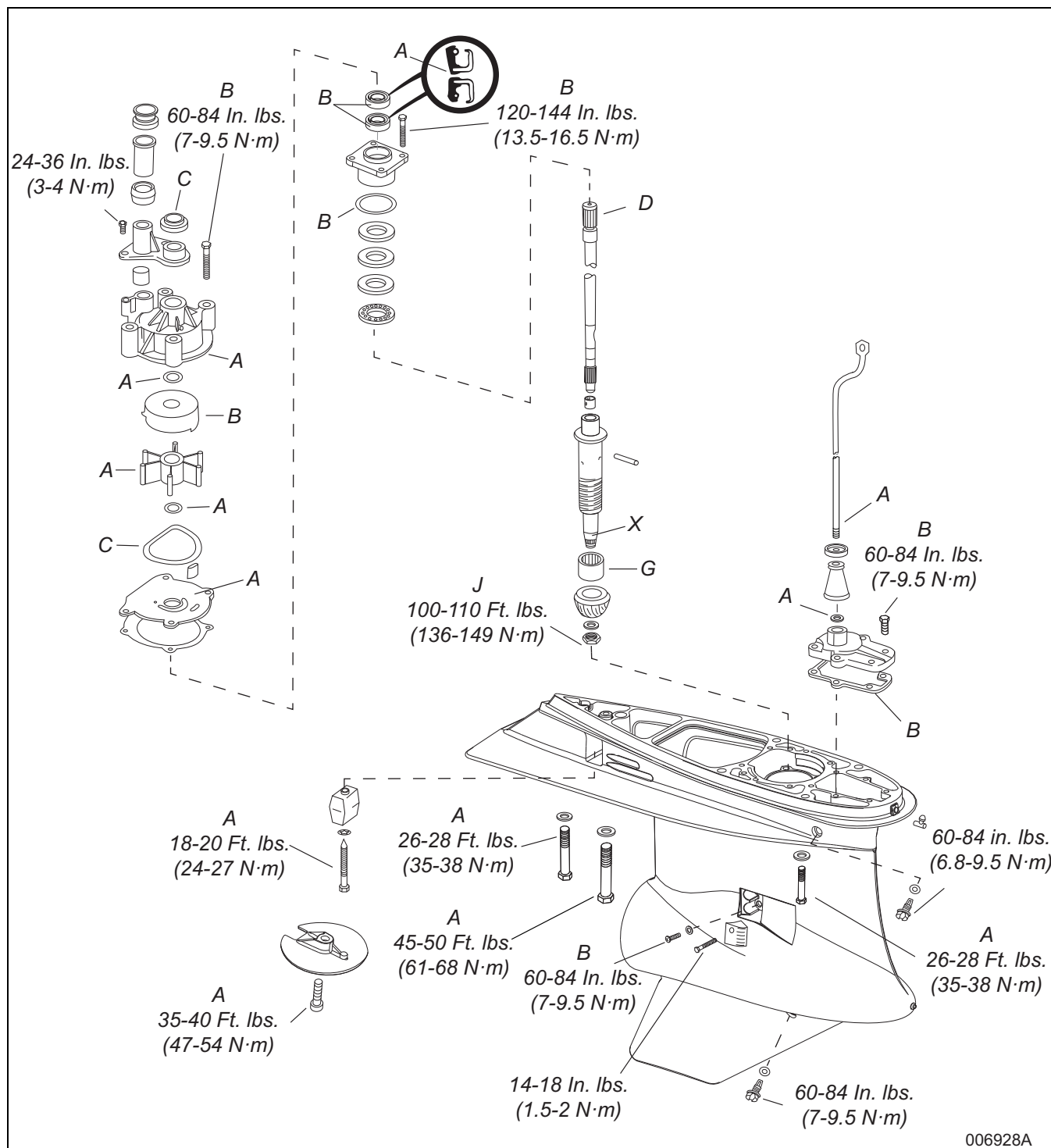
 Pinion Gear and Driveshaft Installation 169

 Propeller Shaft Bearing Housing and Gear Installation 170

 Final Assembly and Adjustment 172

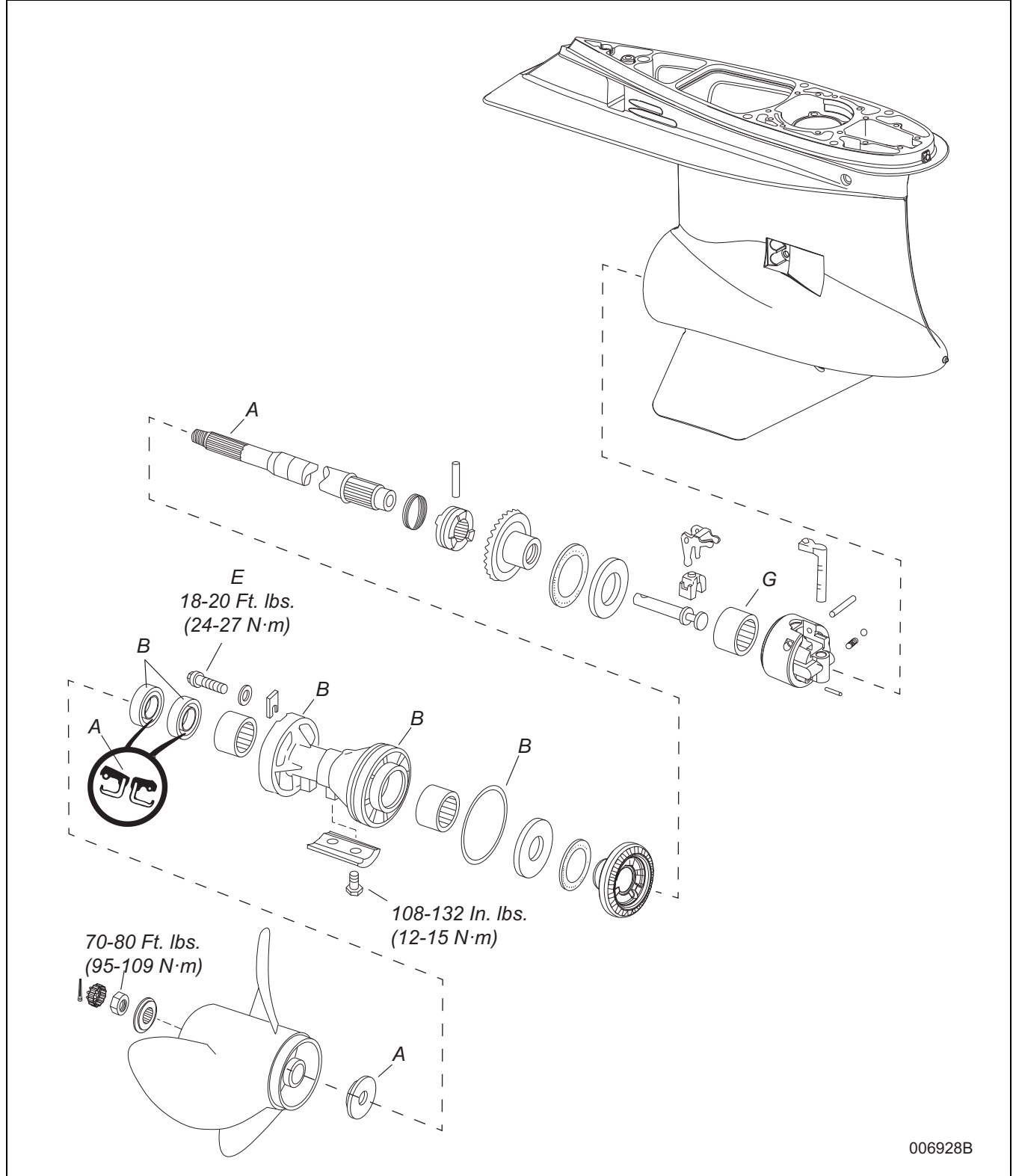
Service Charts

L2-Type Gearcase – Water Pump, Driveshaft and Housing



A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

L2-Type Gearcase – Propeller Shaft



006928B

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

Gearcase Removal and Installation

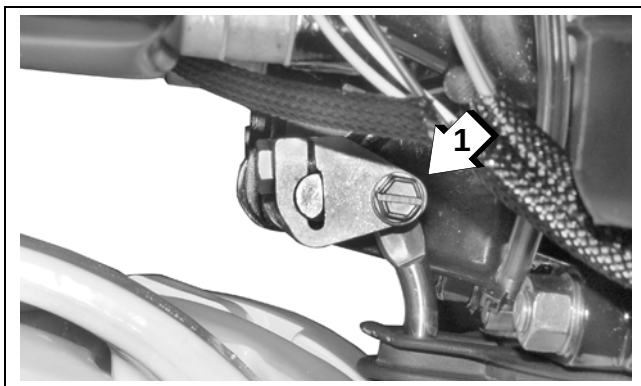
Gearcase Removal

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

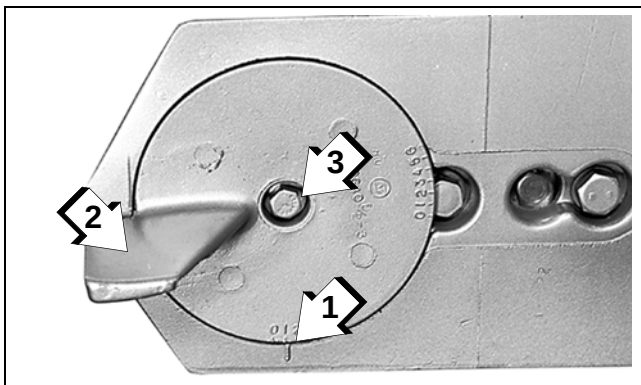
Remove pin and washer from shift rod lever to release the lower shift rod.



1. Shift rod screw

002013

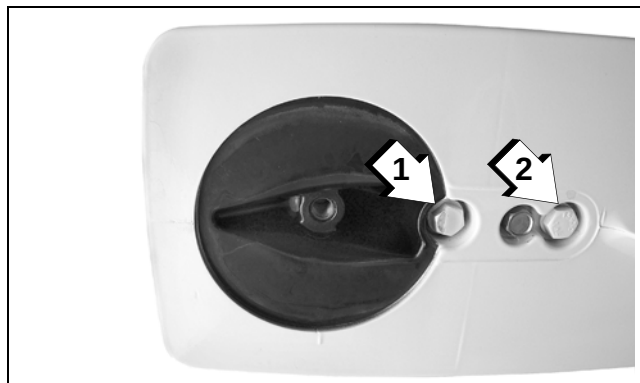
Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position. Remove the trim tab retaining screw and trim tab from the gearcase.



1. Index mark
2. Trim tab
3. Trim tab retaining screw

COA3663

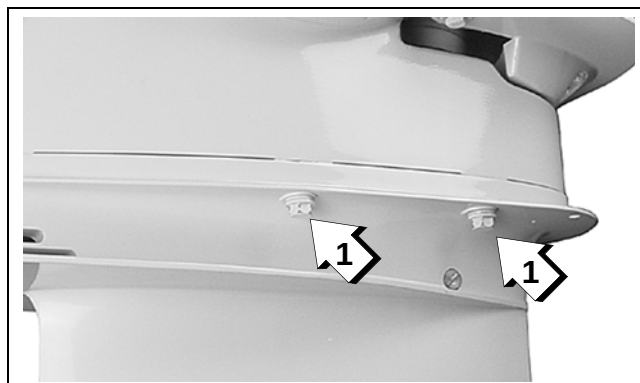
Remove the 3/8-16 in. screw and washer, and remove 7/16-14 x 3.5 in. screw and washer.



1. 3/8-16 x 3.5 in. screw
2. 7/16-14 x 3.5 in. screw

006869

Remove the four 3/8-16 x 1.75 in. gearcase retaining screws and washers.



1. Gearcase retaining screws

001990

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

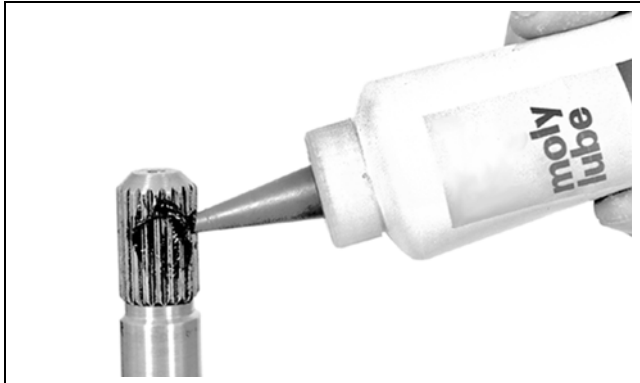
NOTICE

Before installing gearcase, shift rod adjustment **MUST** be checked. Refer to Shift Rod Adjustment on p. 324.

L2-Type Gearcase

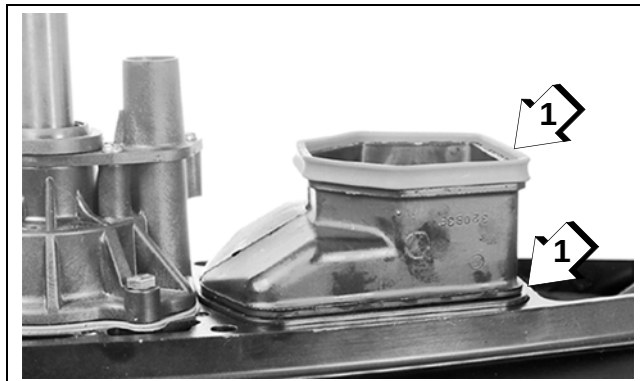
Gearcase Removal and Installation

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

Apply *Adhesive 847* to the lower exhaust housing seals' inner surfaces. Place two new seals on the housing. Apply *Triple-Guard* grease to the seals' outer surfaces and place the housing on the gearcase.



1. Lower exhaust seals

32002

Slide the gearcase into place, making sure:

- Driveshaft engages the crankshaft.
- Water tube enters the water pump.
- Lower inner exhaust housing installs correctly.
- Shift rod does not turn and is positioned properly in the shift rod lever below the crankcase.

Some outboard models include hollow alignment pins between the exhaust housing and gearcase.

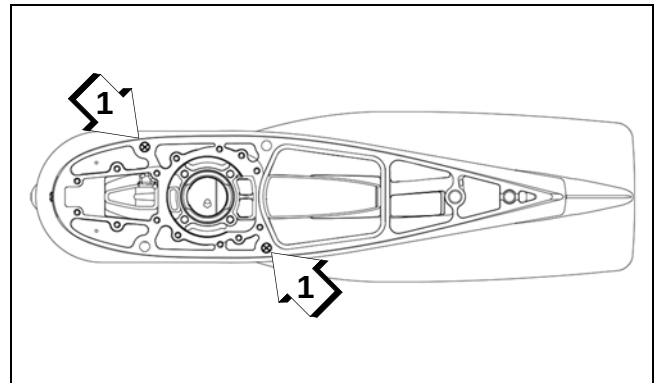
If outboard is not equipped with alignment pins, use Gearcase Alignment Kit, P/N 5007231, to

accurately align gearcase housing to exhaust housing. Position alignment bolts (2) as indicated.



Alignment Bolt(s)

005401



1. Position of alignment bolts (2)

005402

IMPORTANT: Replace alignment bolts with mounting screws after all other gearcase mounting screws are installed.

⚠ WARNING

Failure to properly tighten gearcase screws with a torque wrench could lead to gearcase damage or loss, resulting in loss of control and possible personal injury.

Screw torque should be checked regularly, especially in high-speed applications, or any time propeller damage has occurred.

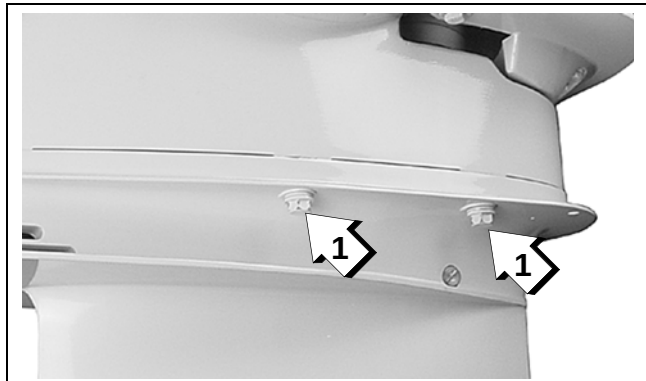
IMPORTANT: New gearcase screws are treated with a thread-locking material. Apply *Triple-Guard* grease to threads to ensure that the correct clamping force is achieved when tightening—If a previously installed screw is re-used, use a wire brush to remove any old thread-locking material or corrosion and lubricate threads with *Triple-Guard* grease.

L2-Type Gearcase

Gearcase Removal and Installation

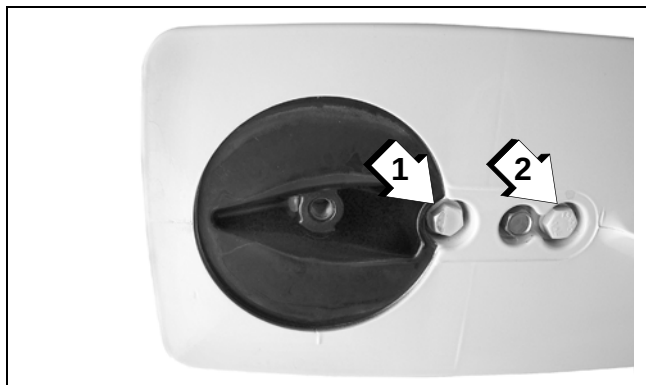
Install screws and washers and tighten to a torque of:

- **3/8 in.** screws – 26 to 28 ft. lbs. (35 to 38 N·m)
- **7/16 in.** screws – 45 to 50 ft. lbs. (61 to 68 N·m)



1. 3/8 in. screws

001990

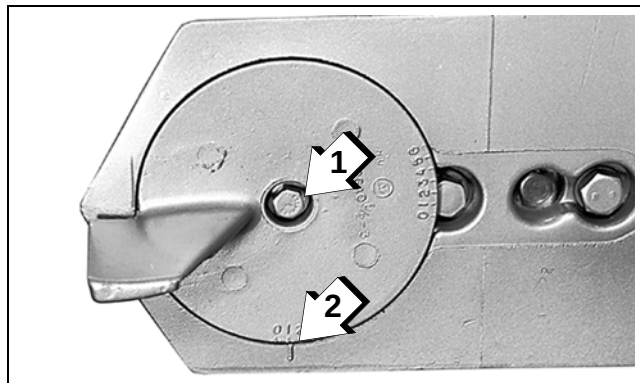


1. 3/8 in screw
2. 7/16 in. screw

COA3139

Apply *Triple-Guard* grease to threads of the trim tab screw. Install gasket on "M2"-type gearcases. Install and align the trim tab (cover on "L2"-type) with the index marks noted prior to disassembly. Tighten the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to

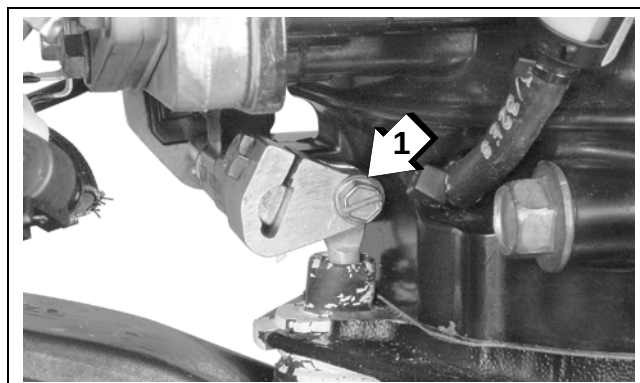
Trim Tab Adjustment on p. 18.



1. Trim tab screw
2. Index mark

COA3663

Place the shift rod in the shift rod lever. Install the retaining pin and washer. Tighten pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Shift rod screw

004241

⚠ WARNING

To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

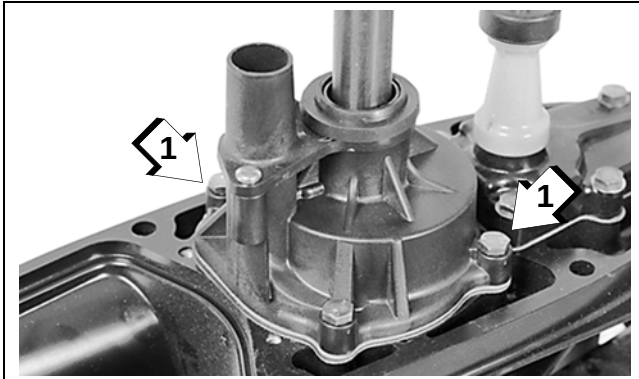
ICON Models: Use *Evinrude Diagnostics* software to calibrate shift actuator stroke. Refer to **Calibrate Actuator Stroke** in the correct **Service Manual**.

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Water Pump Service

Disassembly

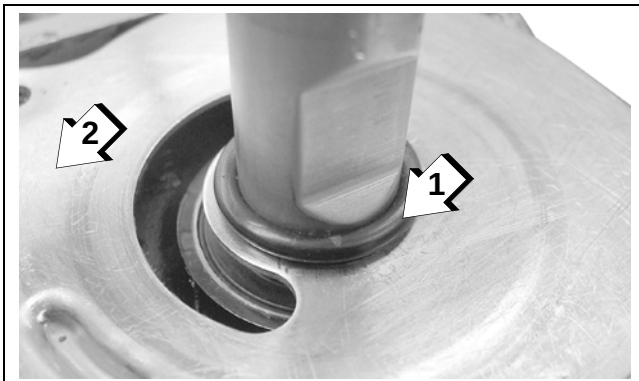
Rotate the driveshaft counterclockwise to unlock the impeller key. Remove the four impeller housing screws.



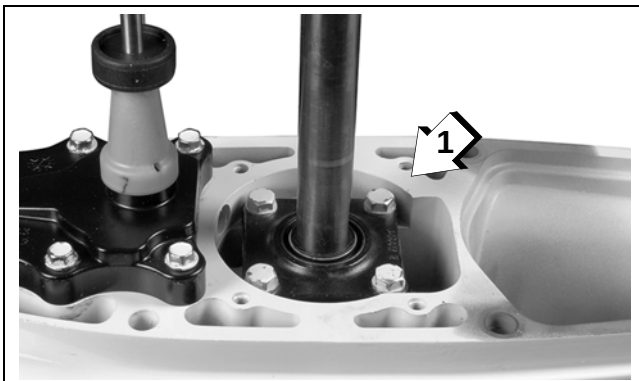
1. Screws

31998

Slide the water pump off the driveshaft. Remove the impeller key, O-ring, impeller plate, and gasket. Discard the gasket.



Clean all old gasket material from the gasket surface.



1. Gasket surface

006876

Remove all the parts from the housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

Check liner and wear plate for scoring, distortion, and impeller material transfer.

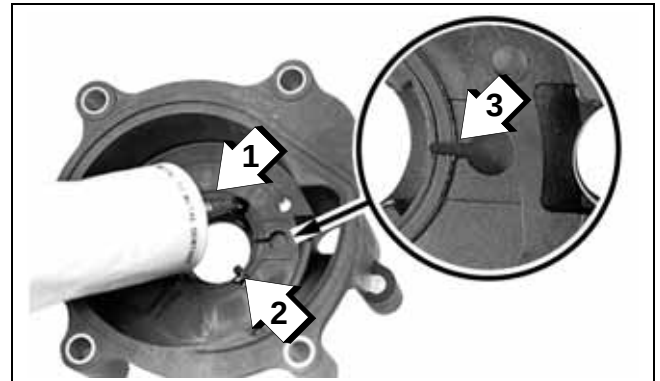
Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

Apply a drop of *Adhesive 847* in the seal ring groove at each of the four ribs.

IMPORTANT: Do not allow any sealer to get into the air bleed groove in the impeller housing. If this groove is blocked by adhesive, the pump will lose its prime and will not pump water.



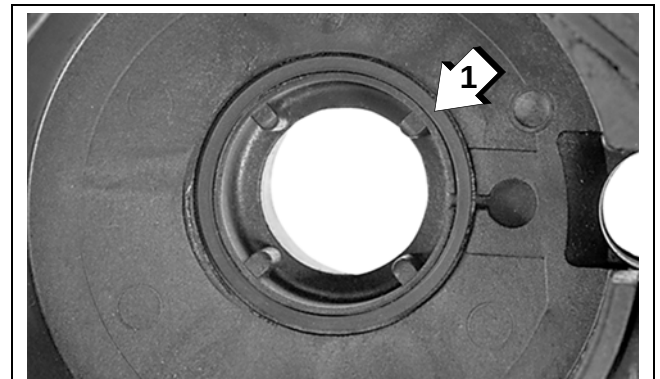
1. Seal ring groove

2. Ribs

3. Air bleed groove

2311

Install the O-ring in groove in the impeller housing.



1. O-ring

34814

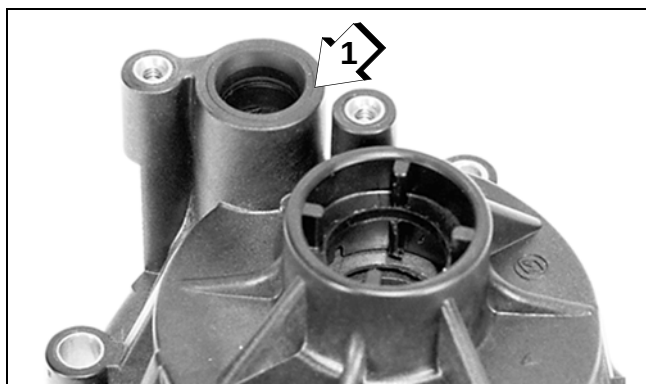
L2-Type Gearcase

Water Pump Service

Lightly coat the exterior rim of the impeller cup with *Gasket Sealing Compound*. Install the cup in the impeller housing. The cup locks in place in the housing with a square index tab.

Make sure vent hole in impeller cup is open.

On V6 models, install the water tube grommet with the inside taper facing up.

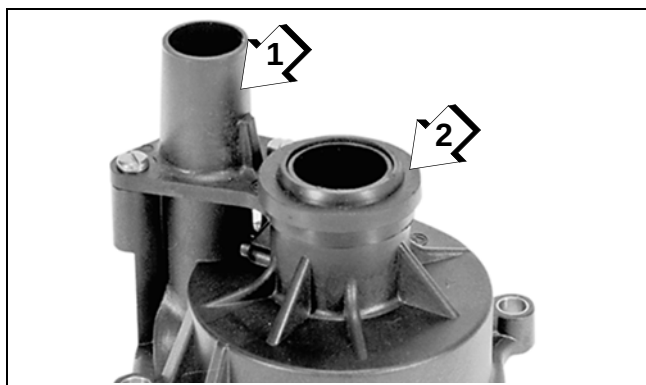


1. Water tube grommet

32000

On V6 models, apply *Triple-Guard* grease to screw threads and install the impeller housing cover. Tighten screws to a torque of 24 to 36 in. lbs. (3 to 4 N·m).

On all models, apply *Adhesive 847* to flat side of the impeller housing grommet. Install the grommet, flat side down. Apply *Triple-Guard* grease to the outer surface of the water tube grommet on V4 models.

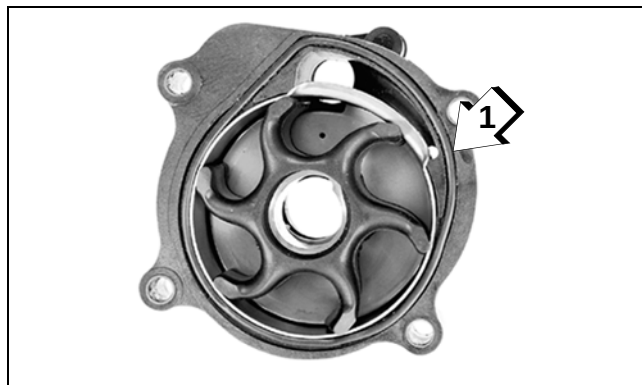


1. Impeller housing cover
2. Impeller housing grommet

32001

Lightly coat the inside of the liner with *Triple-Guard* grease. With a counterclockwise rotation, install the impeller into the liner with the slot for the impeller key facing out.

Apply a thin bead of *Adhesive 847* in the seal groove, and install the special shaped O-ring seal.

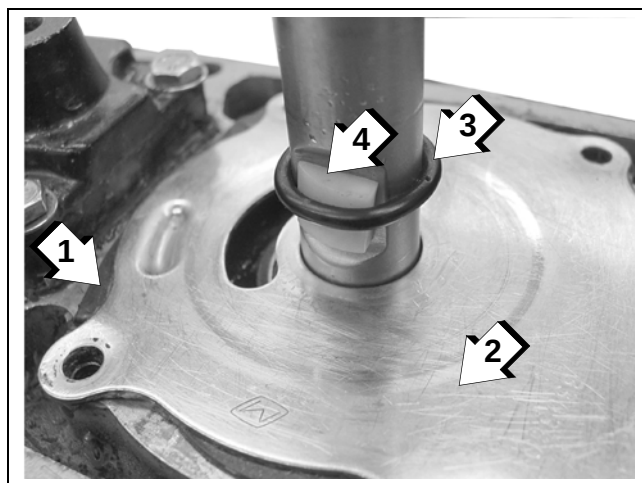


1. O-ring

34815

Apply *Gasket Sealing Compound* to both sides of a new impeller plate gasket. Install the gasket and impeller plate.

Apply *Triple-Guard* grease to a new impeller O-ring. Slide the O-ring down the driveshaft and half way over installed impeller key to temporarily hold key in place.



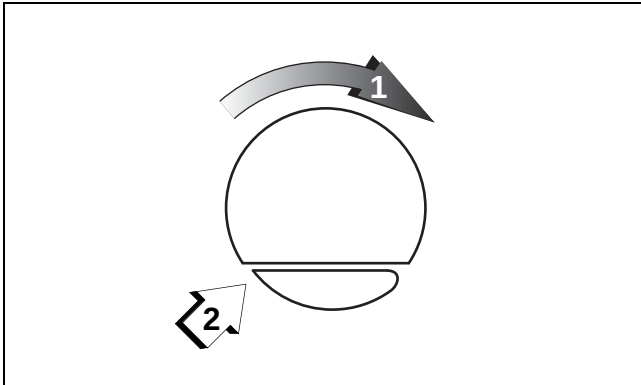
1. Impeller plate gasket
2. Impeller plate
3. O-ring
4. Drive key

DSC02326

The sharp edge of the key is the leading edge in clockwise rotation.

Slide the water pump down the driveshaft. Align impeller slot with the impeller key. Rotate the driveshaft to engage the key with the impeller, and

slide water pump down over key. Be sure impeller key does not fall out of position.



1. Driveshaft rotation
2. Drive key

CO2995

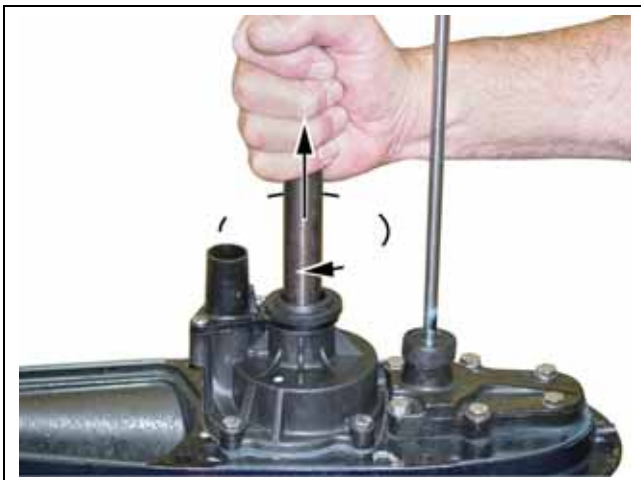
NOTICE

Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Align the impeller housing with the gearcase. Apply *Gasket Sealing Compound* to threads of the four impeller housing screws. Install the screws and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

After water pump is assembled completely, rotate driveshaft counter clockwise 1/4 turn to unlock and release impeller and key from driveshaft.

Next, pull up on driveshaft and turn clockwise to lock impeller to shaft. This process increases pump efficiency by locking the impeller lower on the driveshaft.



007078

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

Remove gearcase as described in **Gearcase Removal and Installation** on p. 148.

Remove water pump as described in **Water Pump Service** on p. 151.

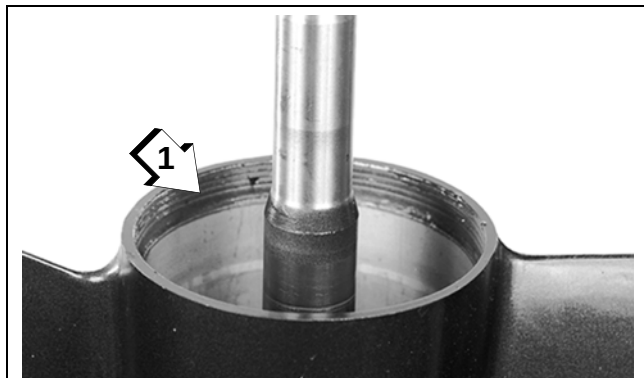
Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skeg, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **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.

L2-Type Gearcase

Gearcase Disassembly

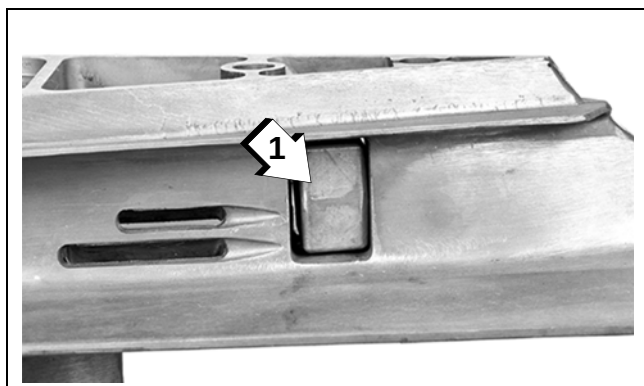
- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

4557

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.



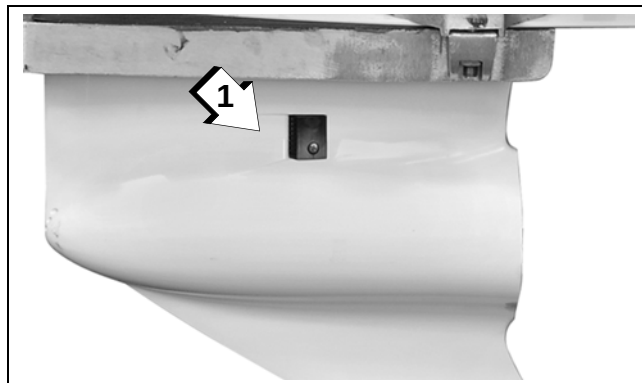
1. Gearcase anode

14161

- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.
- **Water Intake Screens** — Check for damage and blockage. If screens cannot be cleaned, they must be replaced. Different screens are available and should not be mixed. Refer to correct model parts manual for listing and description.

Water Intake Screens

Remove and clean water intake screens. Replace if damaged.



1. Water intake screen

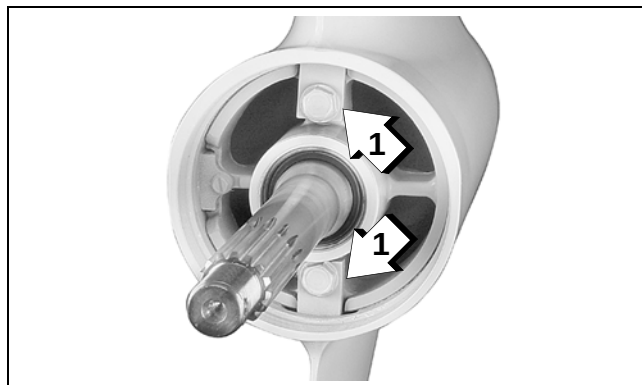
006886

Propeller Shaft Bearing Housing Removal

IMPORTANT: Identify gearcase type before disassembly. For counter rotation gearcases, refer to **Gearcase Disassembly** on p. 153.

The propeller shaft bearing housing on “L2” models is **PRESSED** into gearcase housing.

Remove the two screws, washers, and retainers holding the propeller shaft bearing housing.



1. Retainer tab screws

001989

Remove the propeller shaft bearing housing from the gearcase using:

- Propeller Shaft Bearing Housing Puller Kit, P/N 354060.

DO NOT use tools designed to push on the propeller shaft. Pushing force against the propeller

shaft could damage the forward gear thrust bearing or thrust washer.

IMPORTANT: The L2 type gearcase uses the adaptor ring included with puller kit.

Install the threaded adaptor from the puller kit on to the propeller shaft until seated.



006833

Assemble puller kit components. Hold adaptor with wrench and turn nut clockwise to pull bearing housing.



006834

Pull propeller shaft and bearing housing far enough to loosen the PRESSED bearing housing from the gearcase housing.



“L2” Type Gearcase

006836

Remove the bearing housing, thrust washer, thrust bearing, and reverse gear from gearcase.



006838

Pinion Gear and Driveshaft Removal

Adjust the shift rod to move the clutch dog as far forward as possible. This will help ease removal of the pinion nut.

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438 to loosen and remove the

L2-Type Gearcase

Gearcase Disassembly

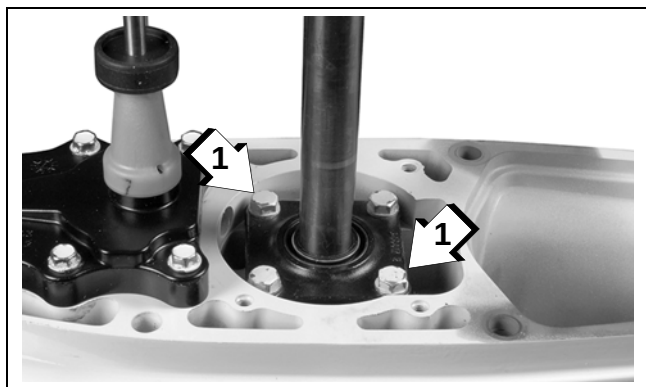
pinion nut from the bottom of the driveshaft. Pad handle of holder to prevent damage to gearcase.



1. Holding socket
2. Pinion holder
3. Retainer

42229

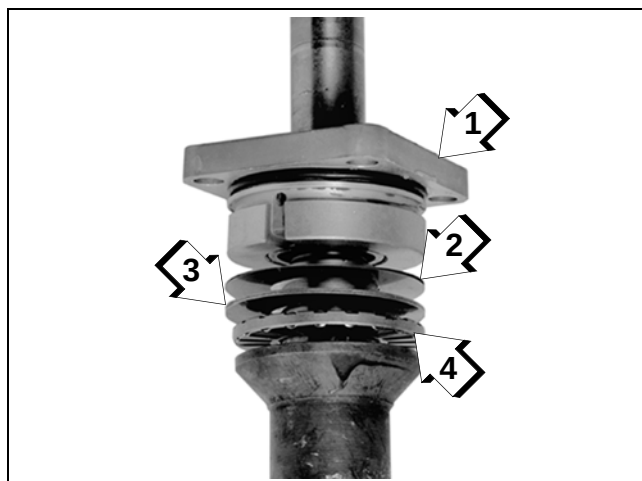
Remove the four driveshaft bearing housing screws.



1. Driveshaft bearing housing screws

006876

Remove the driveshaft from the gearcase. The bearing housing, shims, thrust bearing, and thrust washer will come out with the driveshaft.



1. Bearing housing
2. Shims
3. Thrust bearing
4. Thrust washer

COA3558

If driveshaft cannot be removed, refer to **Locked Driveshaft Removal** on p. 156.

Remove the pinion gear from the gearcase.

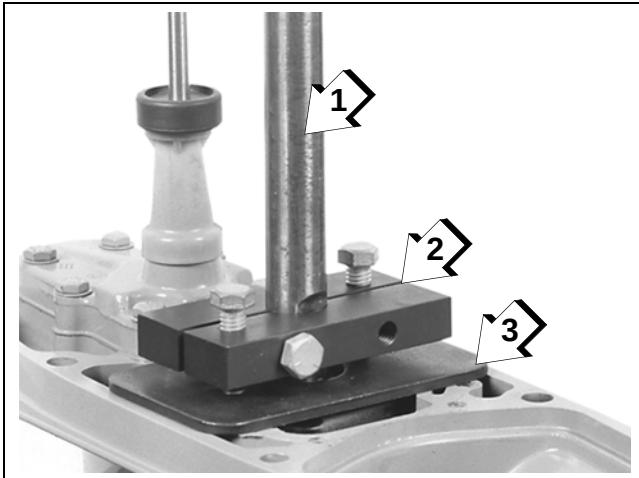


006878

Locked Driveshaft Removal

The driveshaft to pinion taper is a locking taper. If necessary, use Driveshaft Puller, P/N 390706, and Backing Plate, P/N 325867, to break the lock. Install the tools as shown by clamping them around the driveshaft. Alternately tighten the two vertical screws against the backing plate inserted

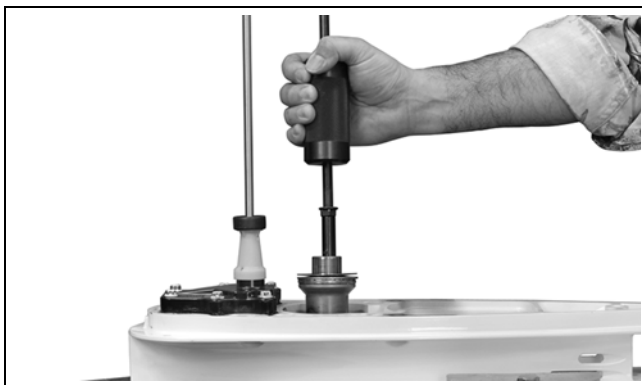
between the puller and the gearcase until the driveshaft pops loose from the pinion.



1. Drive shaft
2. Puller
3. Backing plate

41177

If upper driveshaft becomes separated from lower driveshaft, use Lower Driveshaft Puller, P/N 342681, to remove. Install puller into lower driveshaft and turn 90° to position hook under pin in driveshaft. Thread Slide Hammer, P/N 391008, into puller and remove driveshaft.



006880

Driveshaft Service

To separate the upper driveshaft (if needed) from the lower driveshaft, remove the roll pin. Replace the damaged component.



29337

To assemble the driveshaft, install **new** driveshaft retainer into the groove of the upper driveshaft.



29338

Install the upper driveshaft into the lower driveshaft, aligning the holes in the driveshaft retainer and the lower driveshaft.

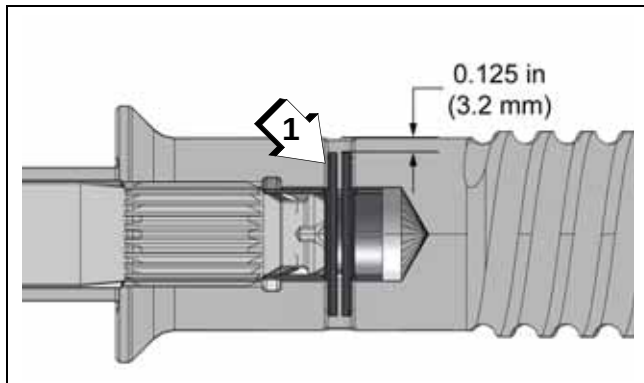


29330

L2-Type Gearcase

Gearcase Disassembly

Install the roll pin to the specified dimension.



1. Roll pin

010491

Remove propeller shaft assembly from gearcase.

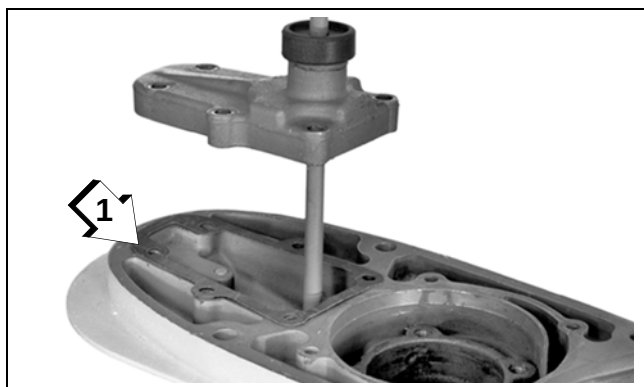


006839

Shift Housing, Gear and Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover gasket. Remove and discard the shift rod O-ring from inside of cover.



1. Cover gasket

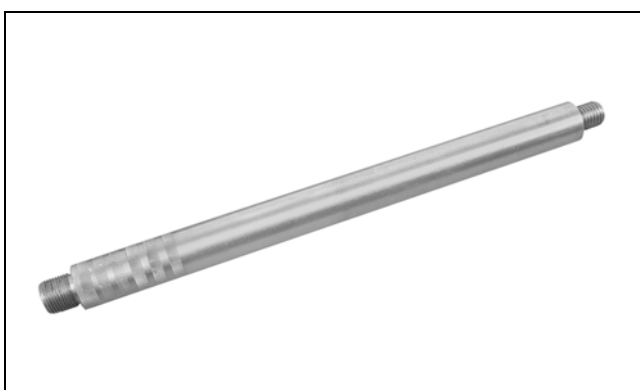
COA3141

IMPORTANT: Inspect gearcase housing, refer to Gearcase Housing Inspection S, S2, L2, M2-Type on p. 14.

NOTICE

Use Alignment Gauge Puller, P/N 354718, to install and remove press fit propeller shaft bearing housing in L2 Type gearcase housings.

Failure to follow this procedure will result in inability to remove gauging head, forward thrust bearing and forward bearing housing from gearcase housing.



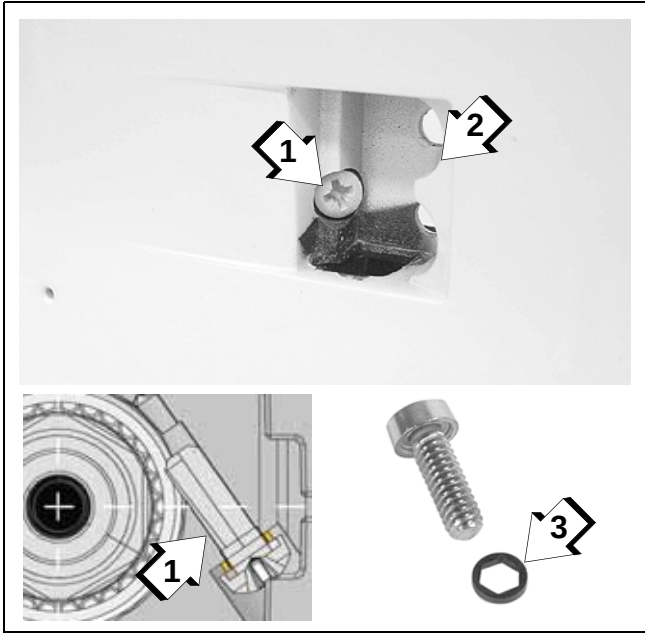
Alignment Gauge Puller, P/N 354718

354718

Shifter, Bearing and Seal Service

Pinion Bearing Removal

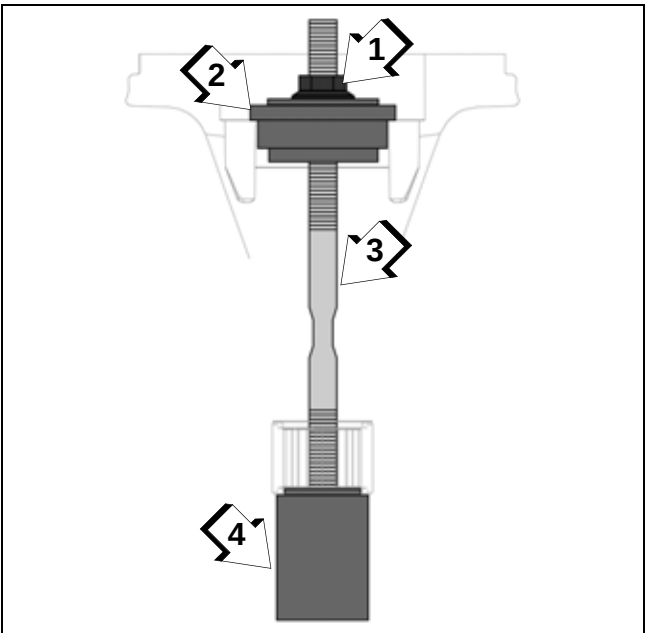
Remove pinion bearing retaining screw.



- | | |
|-----------------------------------|----------|
| 1. Pinion bearing retaining screw | DSC02370 |
| 2. Water screen pocket | DRC7416 |
| 3. Seal | DSC02313 |

Assemble Pinion Bearing Remover and Installer, P/N 5005927, in the gearcase as follows:

Use a 7/8 in. wrench to hold the remover in place. Use a 3/4 in. wrench to turn flange nut clockwise. Draw the bearing up from the housing.



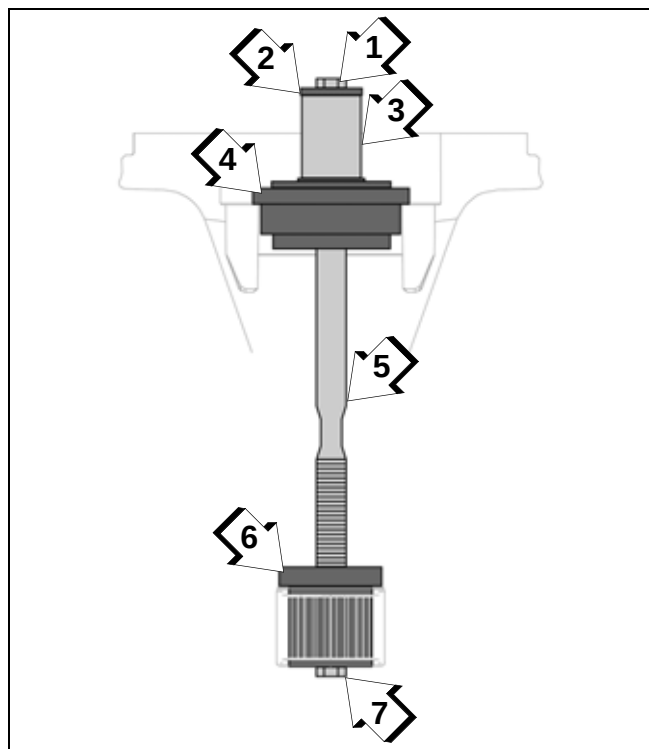
- | | |
|---------------------------|--------|
| 1. Flange nut, P/N 326586 | 010325 |
| 2. Plate, P/N 391260 | DR3419 |
| 3. Rod, P/N 326582 | |
| 4. Remover, P/N 326579 | |

L2-Type Gearcase

Shifter, Bearing and Seal Service

Pinion Bearing Installation

Assemble the following components of Pinion Bearing Remover and Installer, P/N 5005927, as shown:



1. 1/4-20 X 1/2 in. Hex head screw
2. 1 in. O.D. Flat washer
3. Spacer, P/N 326584
4. Plate and Bearing P/N 391260
5. Rod P/N 326582
6. Installer/Remover, P/N 350958
7. 1/4-20 X 1 1/4 in. Hex head screw

824182

IMPORTANT: Spacers are different sizes and cannot be interchanged.

Apply *Needle Bearing* grease to the needle bearings and insert them into the bearing case.

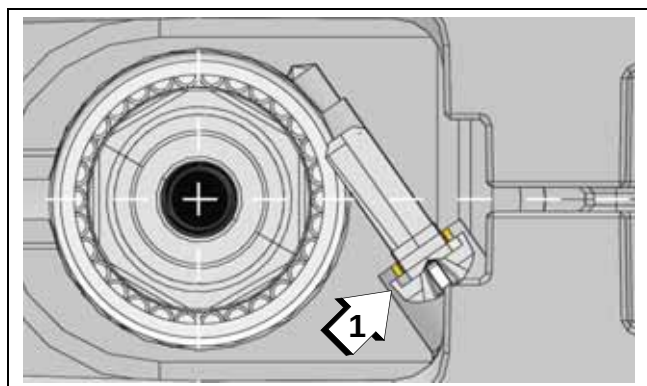
Place the bearing on the installer tool with the **lettered side of the bearing facing the top** of the gearcase. Use *Needle Bearing* grease to hold the bearing on the tool.

IMPORTANT: The pinion bearing is tapered so that, when installed correctly, its shape compensates for stresses in the gearcase and allows full bearing contact. Whenever a gearcase is disassembled, the pinion bearing should be checked to ensure that it has been installed with the lettering facing up.

Insert the tool with the bearing into the gearcase. Drive the bearing into the gearcase until the washer on the tool contacts the spacer.

Remove the tool.

Place a new O-ring on the pinion bearing retaining screw. Apply *Gasket Sealing Compound* to O-ring. Apply *Nut Lock* to screw threads. Install the screw and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. O-ring

drc7416R

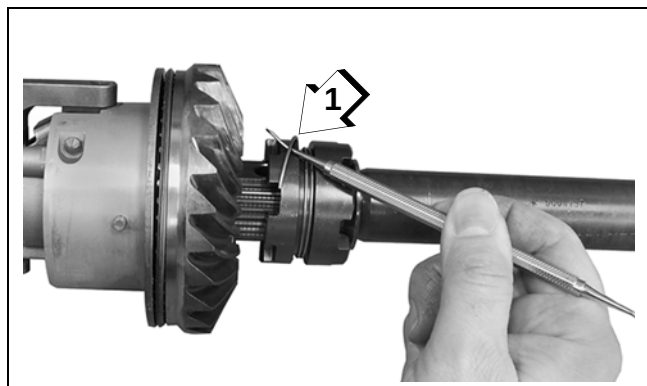
Shift Housing Disassembly

⚠ WARNING

Wear safety glasses to avoid personal injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

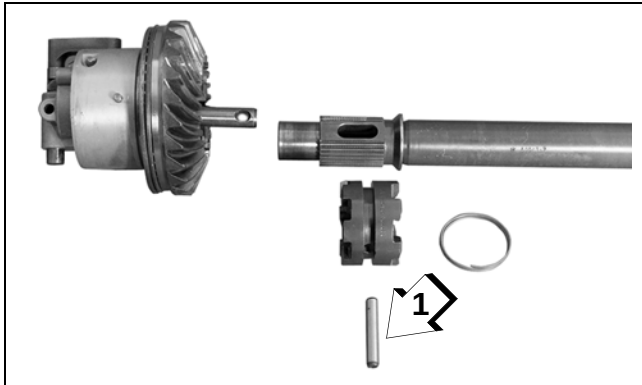
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

006887

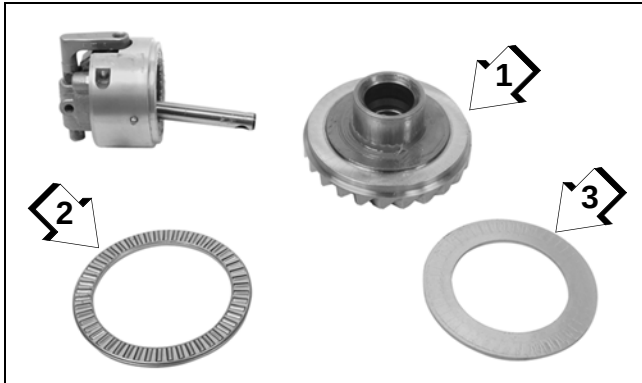
Push the pin out of the clutch dog. Remove all parts.



1. Pin

006888

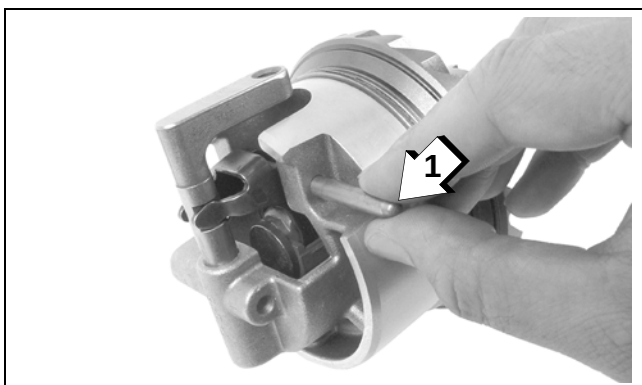
Remove the gear, thrust bearing, and thrust washer from the shift housing.



1. Gear
2. Thrust bearing
3. Thrust washer

006889

Remove the shift lever pin from the housing.

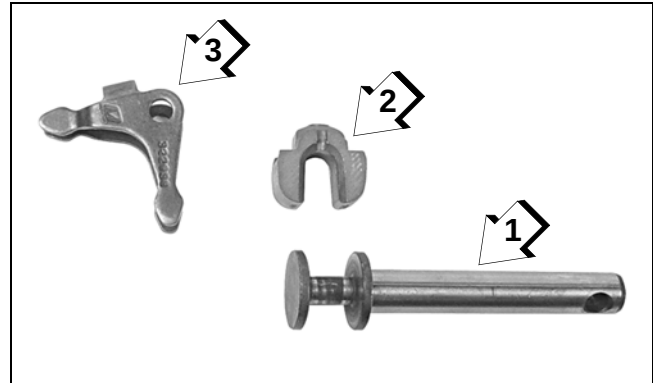


1. Shift lever pin
2. Shifter detent

DSC02449

Move the shifter detent as needed to help ease removal of the following parts:

- shift shaft
- cradle
- shift lever



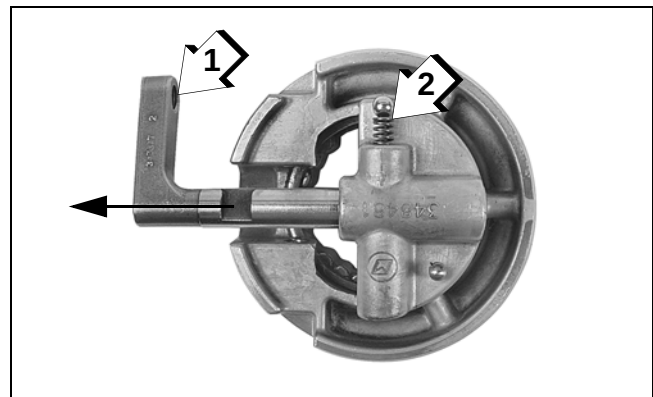
1. Shift shaft
2. Cradle
3. Shift lever

DSC02489

⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Rotate the shifter detent 90° in either direction, then pull the detent out of the housing.



1. Shifter detent
2. Ball and spring

DSC02518

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection (except "S2" Type).

L2-Type Gearcase

Shifter, Bearing and Seal Service

Shift Housing Assembly

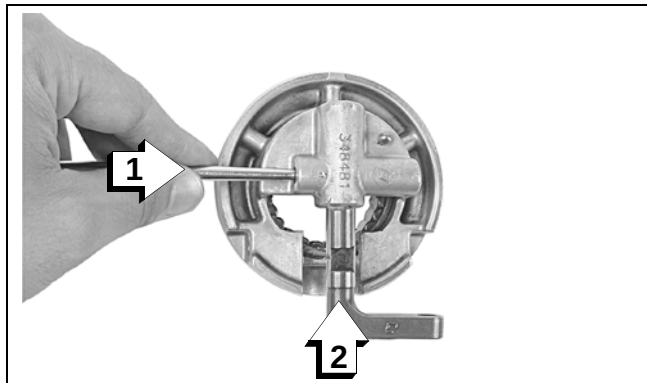
IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



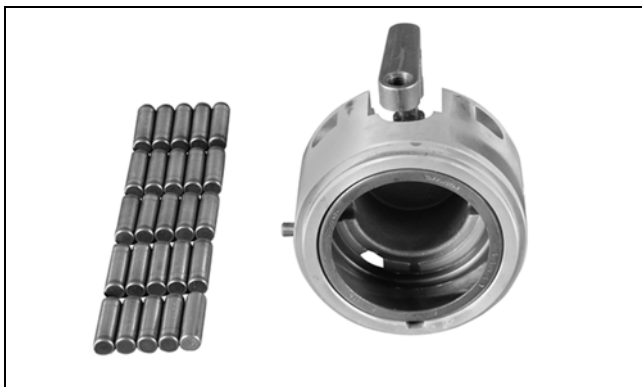
010118

Insert shifter detent at 90° angle into the housing as shown, while depressing the ball and spring with a suitable tool. Once the shifter detent is past the ball, remove the tool and position detent to engage NEUTRAL position.



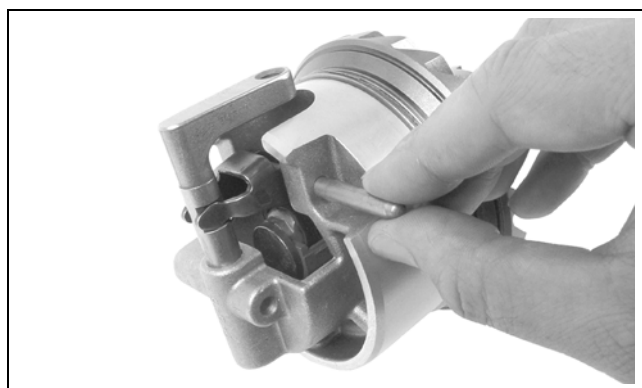
DSC02506

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case. (Note: "S2" Type has caged roller bearing.)



006901

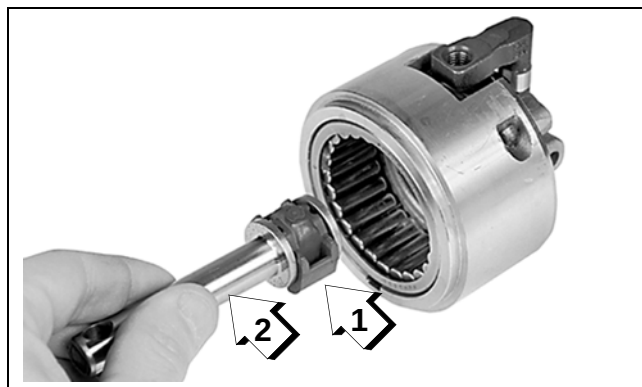
With shifter detent in NEUTRAL, install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



DSC02449

1. Shifter detent
2. Shift lever
3. Pin, shift lever

Rest the cradle on the shift shaft.



- TYPICAL**
1. Cradle
 2. Shift shaft

4512

Place the shift lever arms into the recesses of the shift cradle. Pull shifter detent back up to NEUTRAL position to hold the cradle and shaft in place.

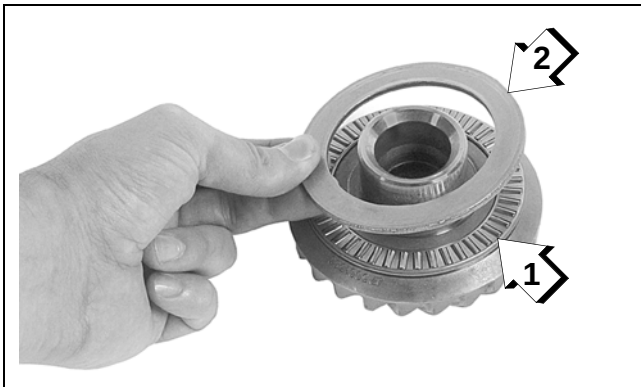


001219

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bearing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



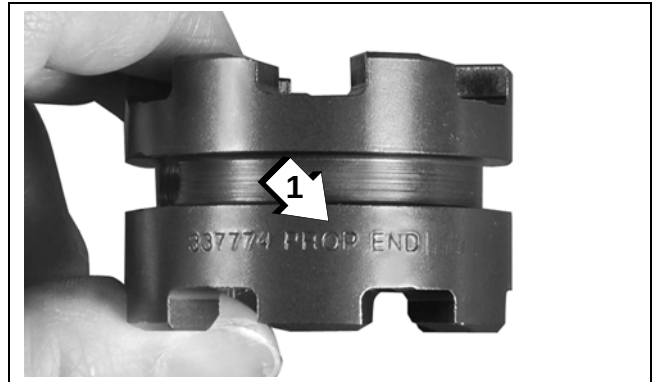
1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

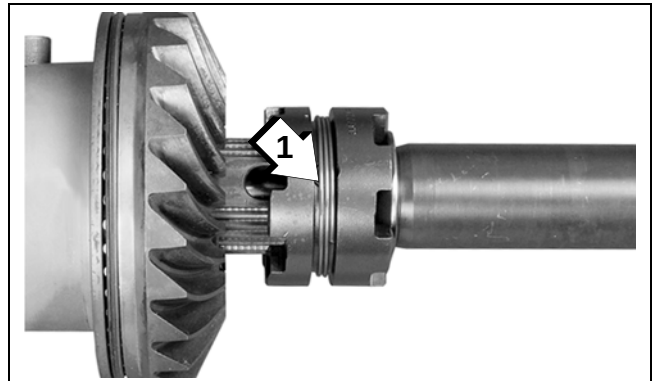
The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.



1. "PROP END"

006906

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end of the pin, **MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.**



1. Retaining spring

006907

L2-Type Gearcase

Shifter, Bearing and Seal Service

Driveshaft Bearing Housing Service

The driveshaft bearing is not serviceable. Replace the bearing housing assembly if the bearing is worn or damaged. Also, inspect the driveshaft bearing surface if the bearing is damaged.

Seal Removal

Remove the driveshaft bearing housing seals using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Discard the seals.



14155

Remove and discard the O-ring from the bearing housing.

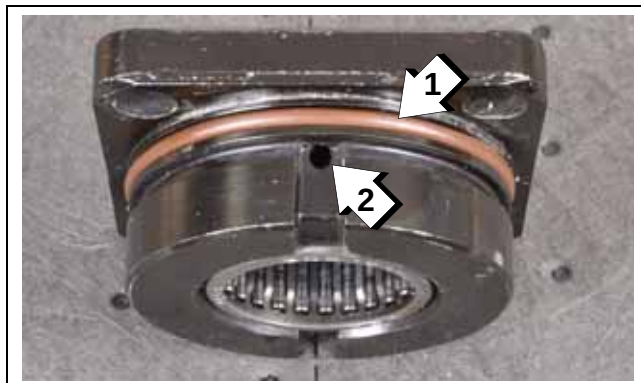
Clean the bearing housing in solvent to remove sealer from the seal bore and the O-ring groove.

Seal Installation

Lightly apply *Gasket Sealing Compound* to a new O-ring. Install the O-ring in top groove of the bearing housing. Do not allow sealant in oil passage.

NOTICE

Do not install the O-ring in the bearing housing's bottom groove. The bottom groove is an oil passage. Gearcase damage could result.



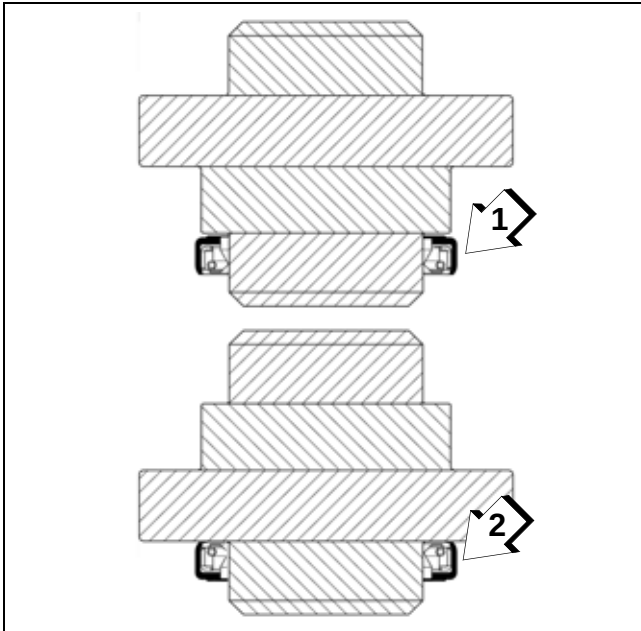
1. O-ring (top groove)
2. Oil passage

009526

Apply *Gasket Sealing Compound* to metal casings of new seals before installing.

Use Seal Installation Tool, P/N 330268 to install new seals back to back in bearing housing. Install inner seal with lip facing toward bearing housing, then the outer seal with lip facing away from bear-

ing housing. Apply *Triple-Guard* grease to seal lips.



1. Inner seal
2. Outer seal

010320

Propeller Shaft Bearing Housing Service

Rear Seal Removal

Remove seals using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131. Place the plate on top of the housing to support the bridge, and tighten jaws securely behind the inner seal.

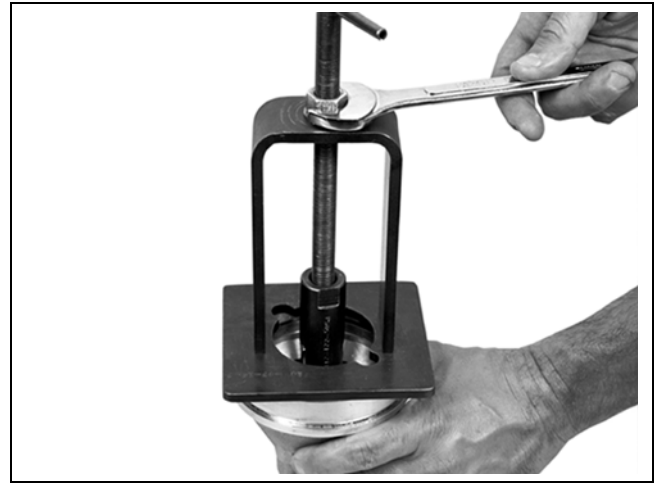


13520

Bearing Removal

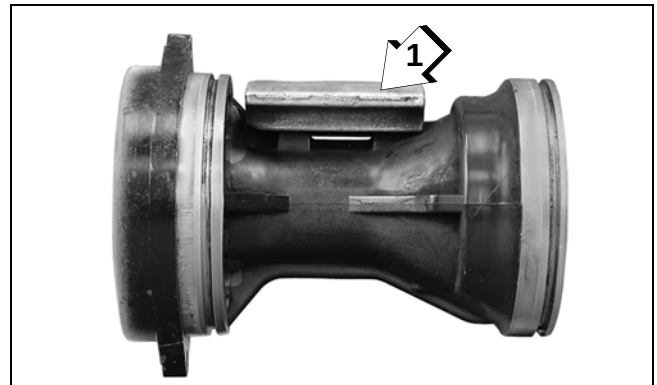
IMPORTANT: Inspect bearings in place. If a bearing is removed for any reason, it must be discarded.

Remove either bearing using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Place the puller plate on top of the housing to support the bridge, and tighten the jaws securely behind the bearing.



13522

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size. Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).



1. Anode

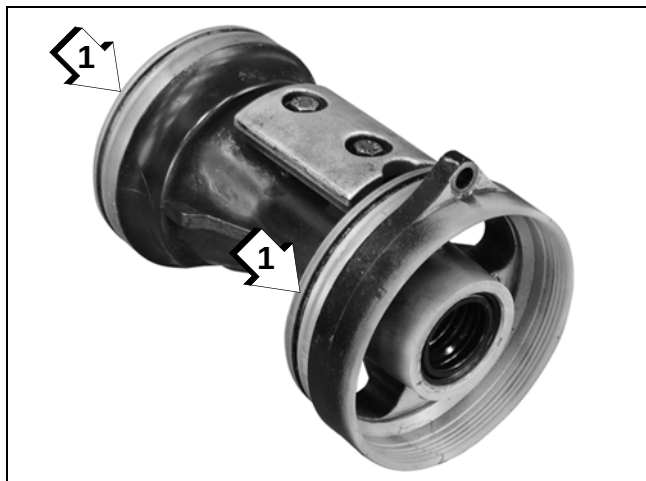
006897

Discard the bearing housing O-ring. Clean the housing and bearings in solvent and dry thoroughly. If bearings were not replaced, rotate the needles to check for freedom of movement.

L2-Type Gearcase

Shifter, Bearing and Seal Service

Inspect O-ring grooves. Sand off any sharp edges that might cut O-ring. Remove any nicks or burrs on front of bearing housing.



1. O-ring groove

006898

Bearing Installation

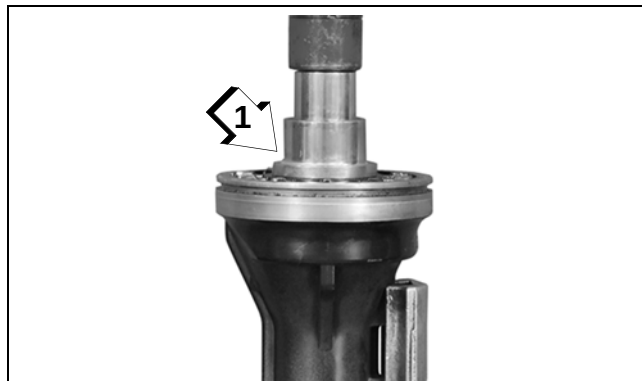
Oil, then install new bearings in bearing housing.

Place the **lettered end** of the bearing case on the bearing installer, then press the bearing into the housing until the tool seats. When installed, the lettered end of the bearing should be visible.

Standard Rotation Housing

Bearing Installation Tool:

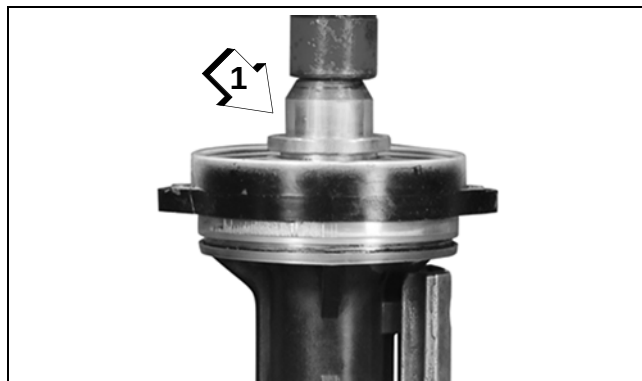
- P/N 354139 – front bearing
- P/N 354139 – rear bearing



Front Bearing

1. Bearing installation tool

006909



Rear Bearing

1. Bearing installation tool

006910

Rear Seal Installation

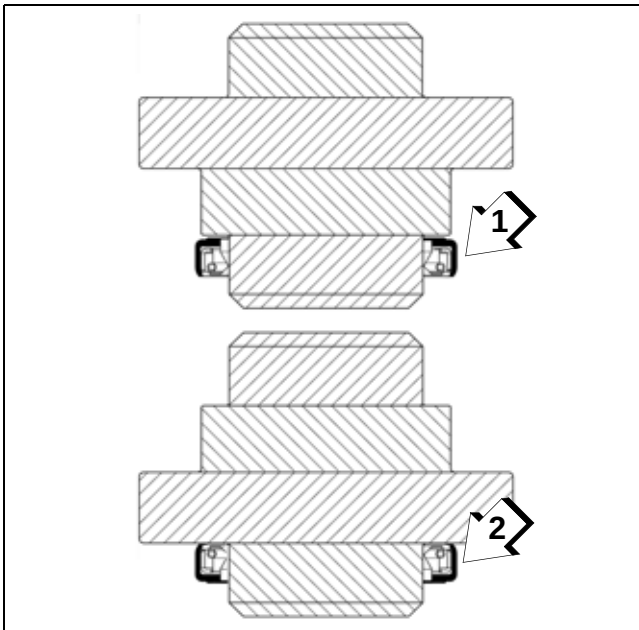
Apply *Gasket Sealing Compound* to metal casings of the seals before installing.

Use Seal Installation Tool to install new seals back to back in bearing housing.

Seal Installation Tool:

- P/N 354056

Install inner seal with lip facing toward the bearing housing, then outer seal with lip facing away from the bearing housing.



1. Inner seal
2. Outer seal

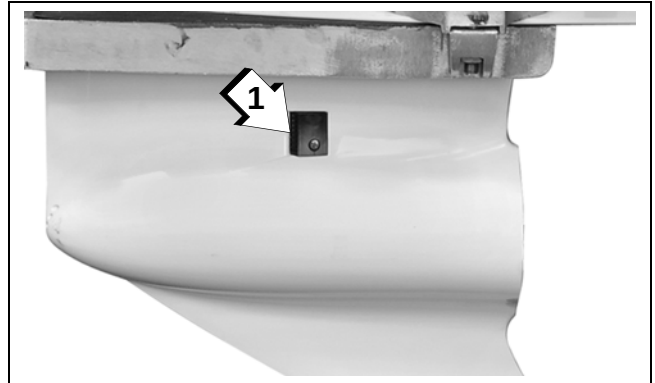
010320

Apply *Triple-Guard* grease to seal lips.

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



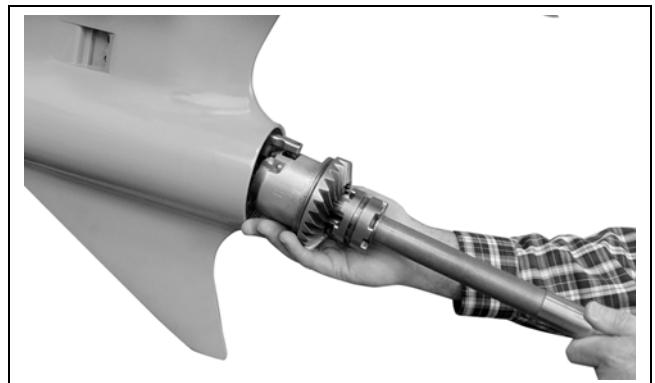
1. Water intake screen

006886

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift housing pin with hole in forward end of gearcase housing.



005427

L2-Type Gearcase

Gearcase Assembly

Shift Rod Housing Installation

Lubricate a new shift rod cover O-ring with *Triple-Guard* grease. Install the O-ring into the shift rod cover.

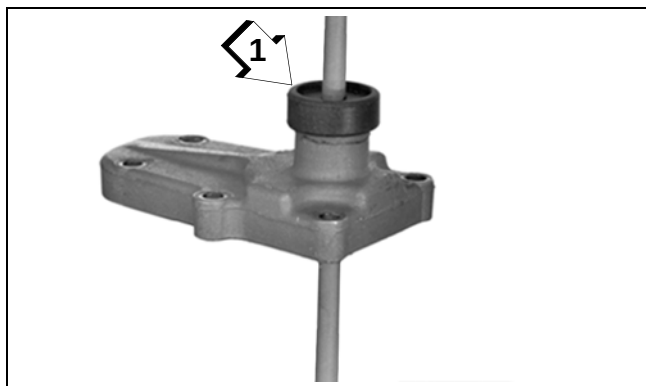
IMPORTANT: Make sure O-ring is fully seated in groove.



1. O-ring

006916

Place the shift rod grommet on the shift rod.

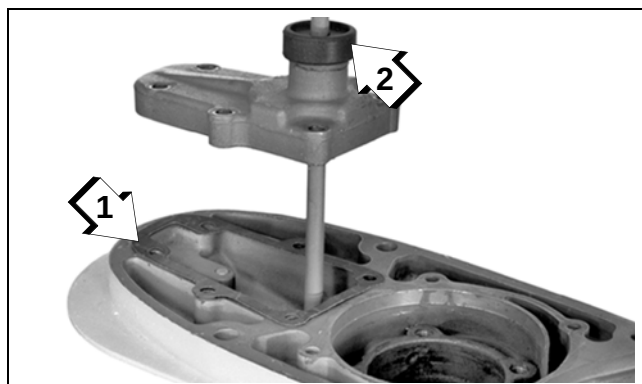


1. Grommet

006917A

Apply *Triple-Guard* grease to the threaded end of the shift rod and insert it through the cover. Turn the shift rod while pushing it through the cover to avoid damaging the O-ring.

Apply *Gasket Sealing Compound* to both sides of a new shift rod cover gasket. Place the gasket on the gearcase.



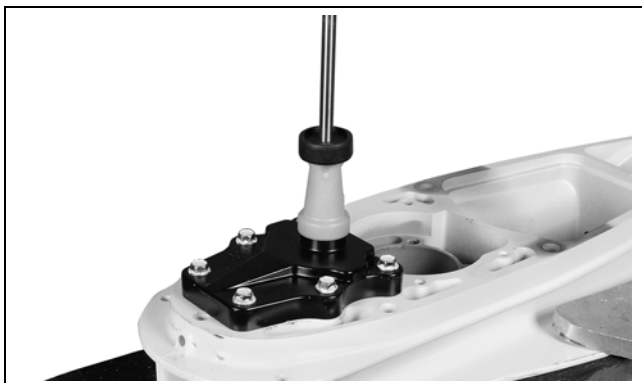
1. Cover gasket
2. Grommet

COA3141

Thread the shift rod into the shifter detent about four turns.

Move shift rod from side to side while pushing on the propeller shaft to ensure proper alignment of the bearing housing locator pin into the pin hole in the gearcase.

Apply *Gasket Sealing Compound* to the threads of the shift rod cover screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



006919

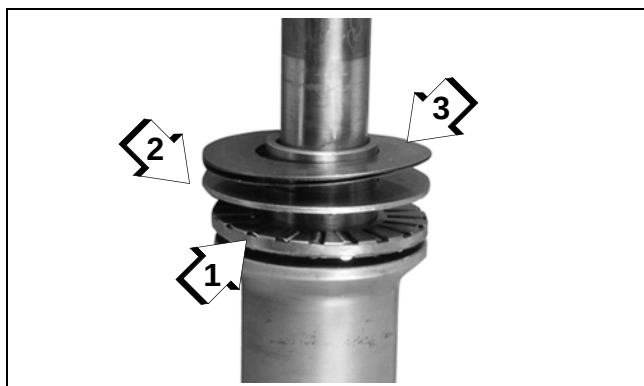
Refer to **Shift Rod Adjustment** on p. 13.

Pinion Gear and Driveshaft Installation

Refer to **Driveshaft Shimming** on p. 15.

Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on p. 164.

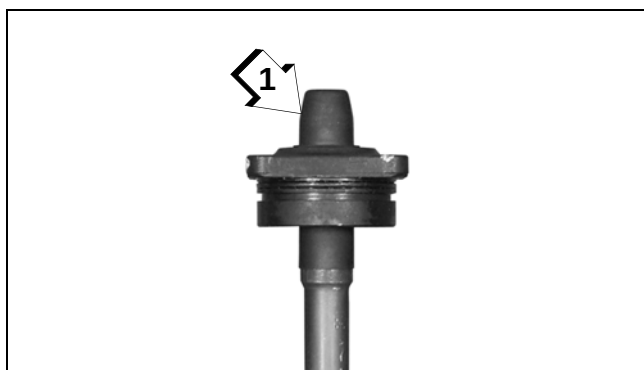
Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

006920

Using Driveshaft Seal Protector, P/N 318674, slide the driveshaft bearing housing onto the driveshaft and into position in the gearcase.

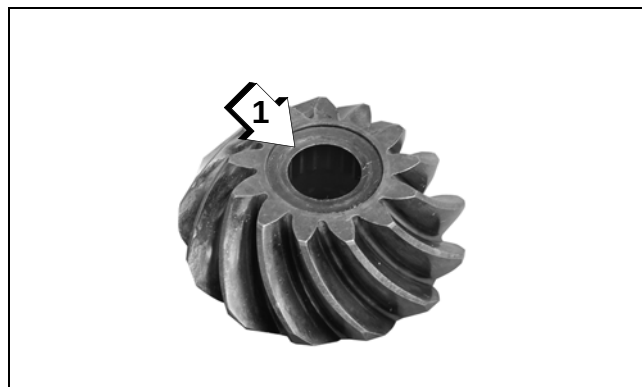


1. Seal protector

006921

Adjust shift rod to move clutch dog as far forward as possible. Be sure excess grease is removed from the pinion bearing.

Washer must be snapped into recess of pinion gear.



1. Washer

006922

IMPORTANT: The inside taper of the pinion gear and the driveshaft taper **MUST** be completely free of grease. Clean the tapers with *Cleaning Solvent*. Use a shop towel free of grease and lint.

Place the pinion gear into the gearcase. Insert the driveshaft into the gearcase and through the pinion gear.

Lightly coat the threads of a **new** pinion nut with outboard lubricant. Use Pinion Nut Starting Tool, P/N 342216, to install nut on the driveshaft. Turn the driveshaft by hand to thread the nut on to shaft.

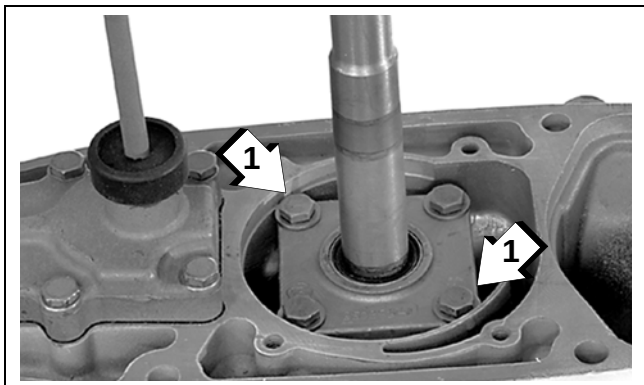


006923

L2-Type Gearcase

Gearcase Assembly

Apply *Gasket Sealing Compound* to the threads of the driveshaft bearing housing screws. Tighten screws **in stages** to a torque of 120 to 144 in. lbs. (13.5 to 16.5 N·m).



1. Driveshaft bearing housing screws

COA3153

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438, to tighten the pinion nut to a torque of 100 to 110 ft. lbs. (136 to 149 N·m). Pad handle of holder to prevent damage to gearcase.



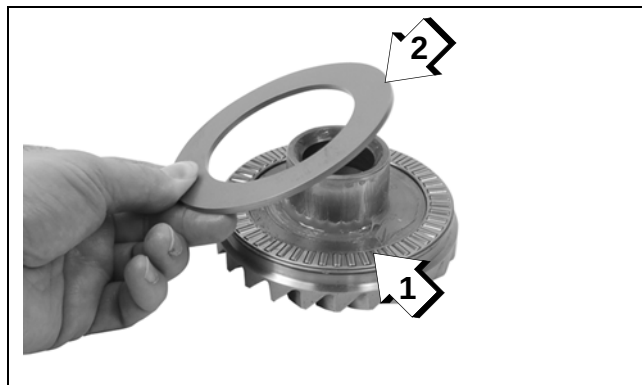
1. Holding socket
2. Pinion nut wrench
3. Retainer

42229

Propeller Shaft Bearing Housing and Gear Installation

IMPORTANT: The propeller shaft bearing housing on the "L2" type gearcases is **PRESSED** into the gearcase housing.

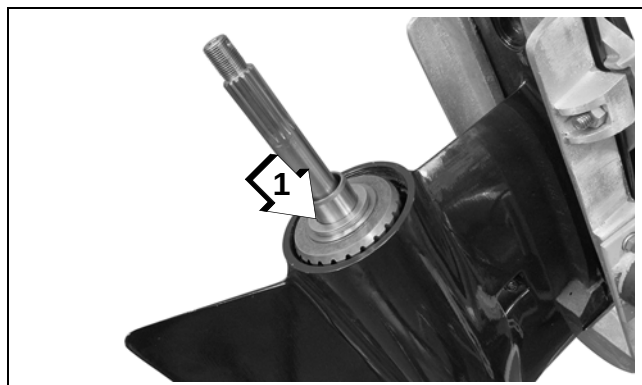
Oil and install thrust bearing and thrust washer on hub of reverse gear.



1. Thrust bearing
2. Thrust washer

006905

Slide the gear assembly onto the propeller shaft until it engages the pinion gear.



1. Thrust bearing and thrust washer

006843

Lightly apply *Triple Guard Grease* to a new bearing housing O-ring. Install O-ring in groove in the housing. Grease the machined side surfaces of bearing housing.

Install housing into gearcase. Align screw holes with retainer slots in gearcase.



006836

Use Installer Handle, P/N 345822, Propeller Shaft Bearing Housing Installer, P/N 354058, Gearcase Fixture, P/N 354059 and an appropriate floor press (10 ton or greater) to install housing into gearcase. Align and level gearcase assembly in fixture as shown. Secure fixture to floor press.



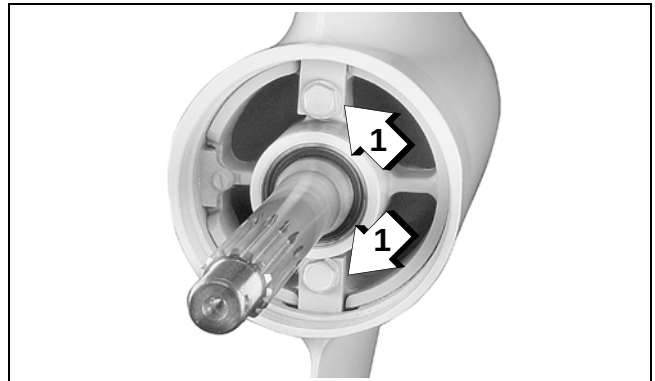
006844

Housing must be completely seated in gearcase to install retainer tabs. Depth to retainer tab surface on bearing housing is approximately 1 in. (25.4 mm).



006845

Install two retainers, washers and screws. Apply *Ultra Lock* to threads and tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).



1. Retainer tab screws

001989

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 151
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 148
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

M2-Type Gearcase

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Final Assembly and Adjustment	214

Service Charts

M2-Type Gearcase – Water Pump, Driveshaft and Housing

The diagram illustrates the assembly of the M2-Type Gearcase, Water Pump, Driveshaft, and Housing. Components are labeled with letters A through J and X. Torque specifications are provided for many of the fasteners in both inch-pounds (in. lbs.) and Newton-meters (N·m).

Assembly Details:

- Water Pump Assembly:** Components A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. Torque specifications: 24-36 in. lbs. (3-4 N·m), 60-84 in. lbs. (7-9.5 N·m), 120-144 in. lbs. (13.5-16.5 N·m).
- Driveshaft Assembly:** Components A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. Torque specifications: 100-110 Ft. lbs. (136-149 N·m), 18-20 Ft. lbs. (24-27 N·m), 26-28 Ft. lbs. (35-38 N·m), 45-50 Ft. lbs. (61-68 N·m), 35-40 Ft. lbs. (47-54 N·m).
- Housing Assembly:** Components A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. Torque specifications: 60-84 in. lbs. (6.8-9.5 N·m), 14-18 in. lbs. (1.5-2 N·m), 26-28 Ft. lbs. (35-38 N·m), 60-84 in. lbs. (7-9.5 N·m).

Legend:

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

006830A

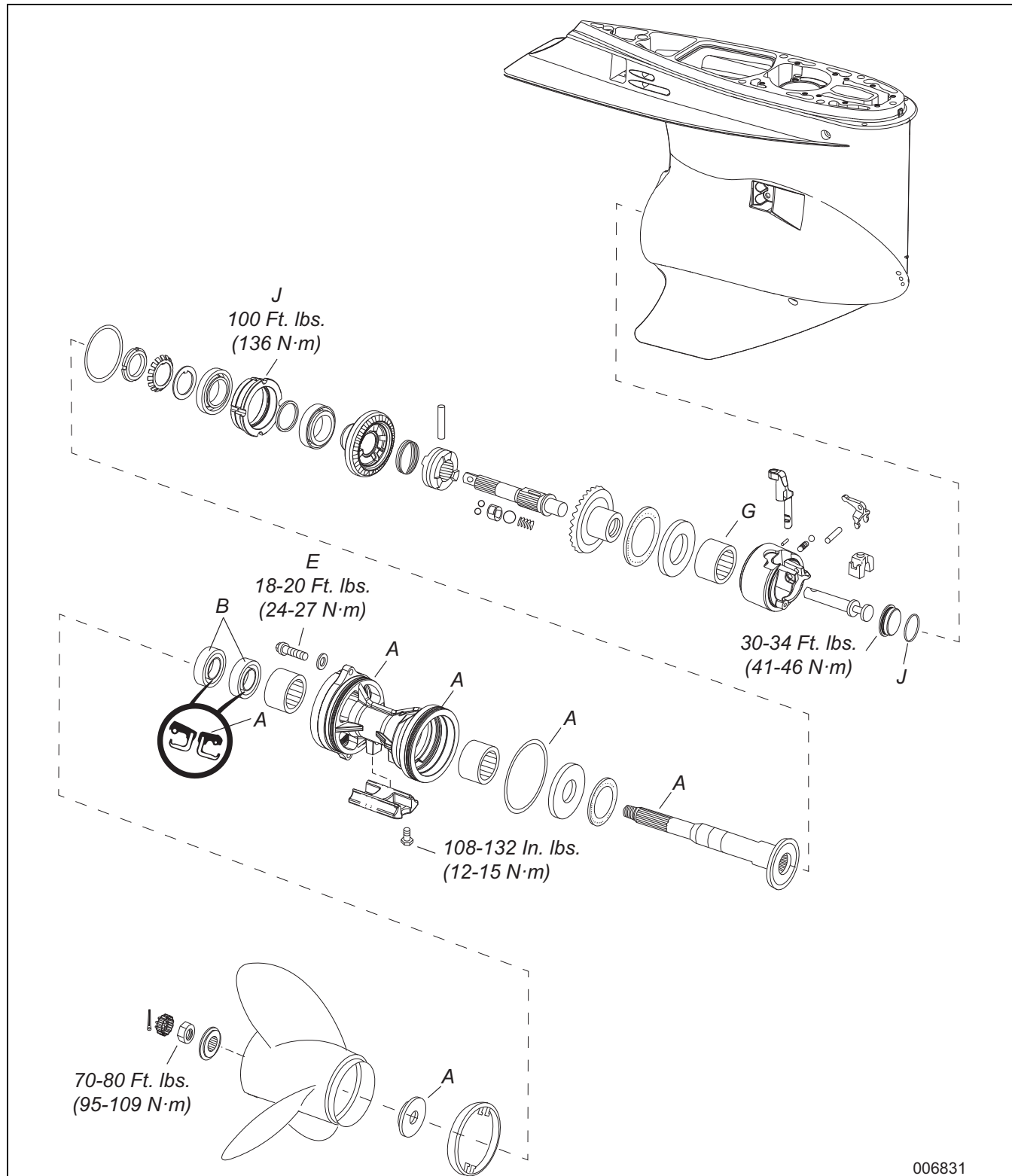
[illegible]

A	Triple-Guard Grease	D	Moly Lube	G	Needle Bearing Grease
B	Gasket Sealing Compound	E	Red Ultra Lock	J	Gearcase Lubricant
C	Adhesive 847	F	Blue Nut Lock	X	see Service Manual

M2-Type Gearcase

Service Charts

M2-Type Gearcase – Propeller Shaft, Standard Rotation



006831

A Triple-Guard Grease	D Moly Lube	G Needle Bearing Grease
B Gasket Sealing Compound	E Red Ultra Lock	J Gearcase Lubricant
C Adhesive 847	F Blue Nut Lock	X see Service Manual

Gearcase Removal and Installation

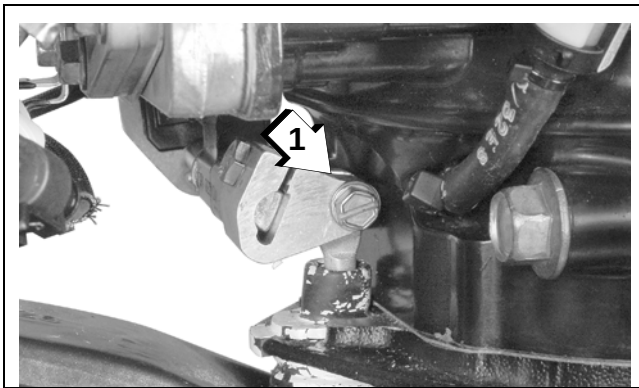
Gearcase Removal

⚠ WARNING

Turn the key switch OFF, and disconnect the Crankshaft Position Sensor (CPS), to prevent accidental starting while servicing.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

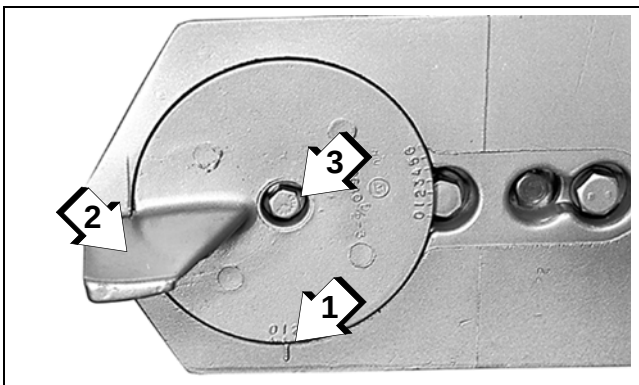
Remove pin and washer from shift rod lever to release the lower shift rod.



1. Shift rod screw

004241

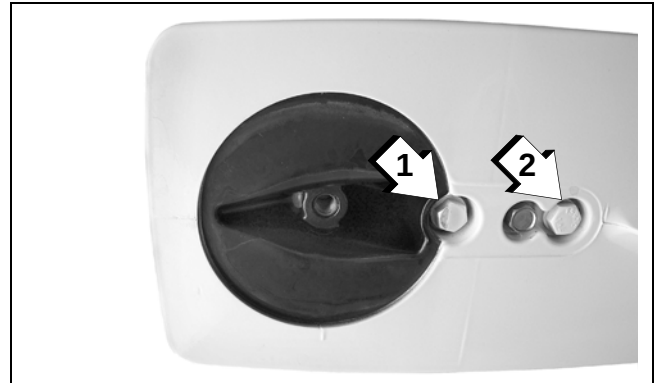
Note where the index mark on the gearcase aligns with the index number of the adjustable trim tab so the trim tab can be installed in the same position. Remove the trim tab retaining screw, gasket and trim tab from the gearcase.



1. Index mark
2. Trim tab
3. Trim tab retaining screw

COA3663

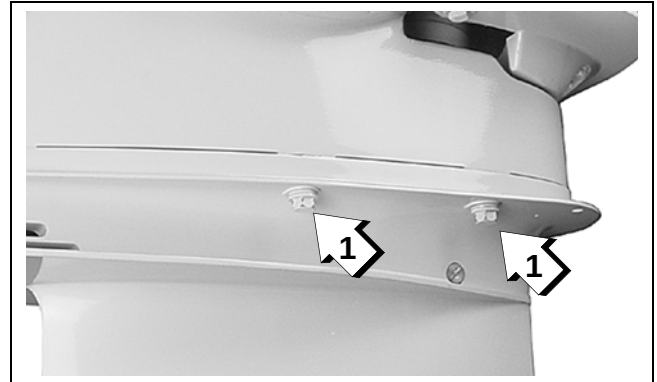
Remove the 3/8-16 x 3.5 in. screw and washer, and remove 7/16-14 x 3.5 in. screw and washer.



1. 3/8-16 x 3.5 in. screw
2. 7/16-14 x 3.5 in. screw

006869

Remove the four 3/8-16 x 1.75 in. gearcase retaining screws and washers.



1. Gearcase retaining screws

001990

Remove the gearcase assembly from the exhaust housing, being careful not to bend the shift rod.

Gearcase Installation

⚠ WARNING

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

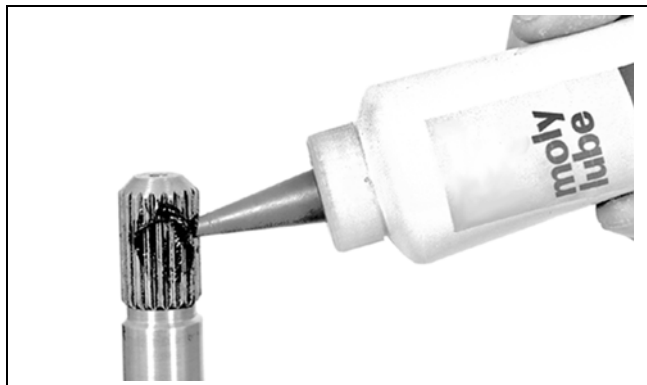
NOTICE

Before installing gearcase, shift rod adjustment **MUST** be checked. Refer to Shift Rod Adjustment on p. 324.

M2-Type Gearcase

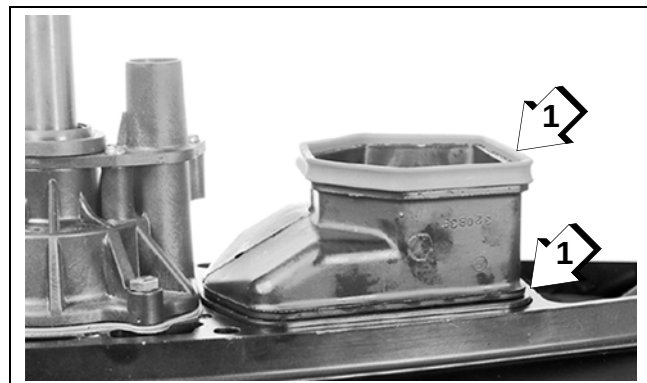
Gearcase Removal and Installation

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



30385

Apply *Adhesive 847* to the lower exhaust housing seals' inner surfaces. Place two new seals on the housing. Apply *Triple-Guard* grease to the seals' outer surfaces and place the housing on the gearcase.



20 inch Models

1. Lower exhaust seals

32002



25 & 30 inch Models

1. Lower exhaust seals

001985

Slide the gearcase into place, making sure:

- Driveshaft engages the crankshaft.
- Water tube enters the water pump.
- Lower inner exhaust housing installs correctly.
- Shift rod does not turn and is positioned properly in the shift rod lever below the crankcase.

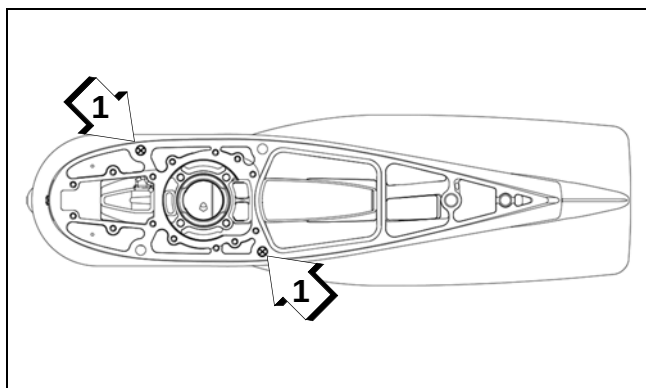
Some outboard models include hollow alignment pins between the exhaust housing and gearcase.

If outboard is not equipped with alignment pins, use Gearcase Alignment Kit, P/N 5007231, to accurately align gearcase housing to exhaust housing. Position alignment bolts (2) as indicated.



Alignment Bolt(s)

005401



1. Position of alignment bolts (2)

005402

IMPORTANT: Replace alignment bolts with mounting screws after all other gearcase mounting screws are installed.

⚠ WARNING

Failure to properly tighten gearcase screws with a torque wrench could lead to gearcase damage or loss, resulting in loss of control and possible personal injury.

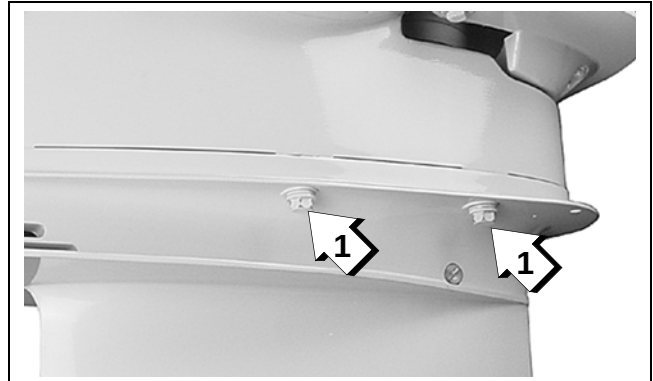
Screw torque should be checked regularly, especially in high-speed applications, or any time propeller damage has occurred.

IMPORTANT: New gearcase screws are treated with a thread-locking material. Apply *Triple-Guard* grease to threads to ensure that the correct clamping force is achieved when tightening—If a previously installed screw is re-used, use a wire brush to remove any old thread-locking material or corrosion and lubricate threads with *Triple-Guard* grease.

Install screws and washers and tighten to a torque of:

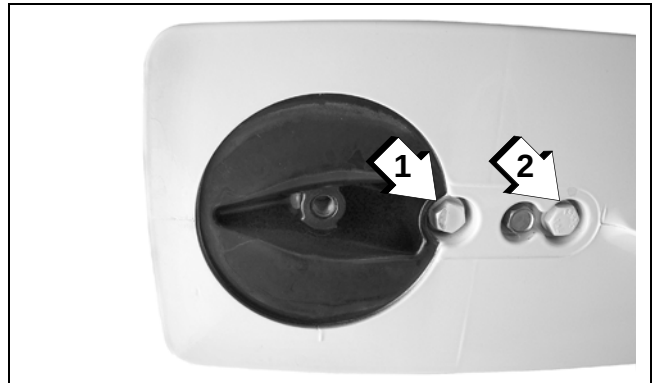
- **3/8 in.** screws – 26 to 28 ft. lbs. (35 to 38 N·m)

- **7/16 in.** screw – 45 to 50 ft. lbs. (61 to 68 N·m)



1. 3/8 in. screws

001990



1. 3/8 in screw
2. 7/16 in. screw

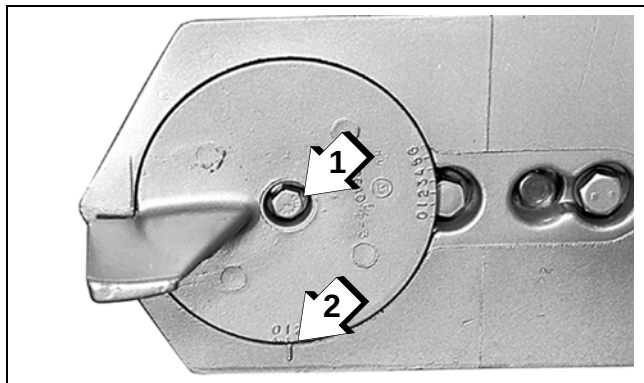
COA3139

Apply *Triple-Guard* grease to threads of the trim tab screw. Install gasket on gearcase. Install and align the trim tab with the index marks noted prior to disassembly. Tighten the trim tab screw to a torque of 35 to 40 ft. lbs. (47 to 54 N·m). For adjustment, refer to **Trim Tab Adjustment** on

M2-Type Gearcase

Gearcase Removal and Installation

p. 18.



1. Trim tab screw
2. Index mark

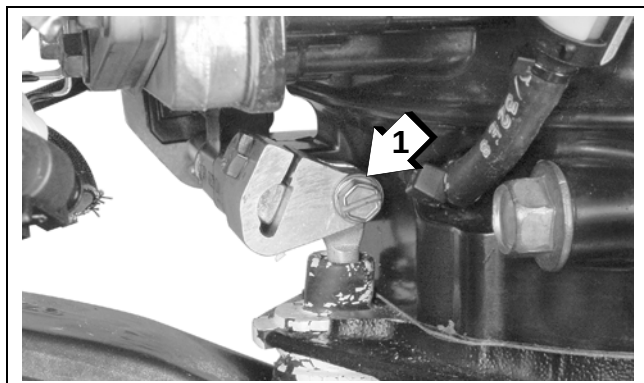
COA3663

IMPORTANT: During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

NOTICE

Standard rotation and counter rotation trim tabs must not be interchanged. This would result in inadequate cooling water supply to the propeller hub.

Place the shift rod in the shift rod lever. Install the retaining pin and washer. Tighten pin to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Shift rod screw

004241

⚠ WARNING

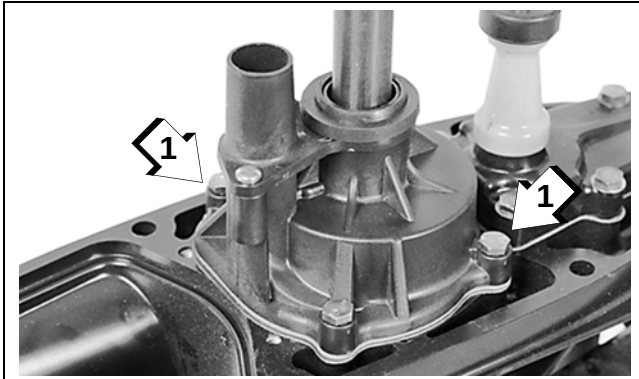
To prevent loss of operator control, check for proper shifting operation and adjust, if necessary.

ICON Models: Use *Evinrude Diagnostics* software to calibrate shift actuator stroke. Refer to **Calibrate Actuator Stroke** in the correct **Service Manual**.

Water Pump Service

Disassembly

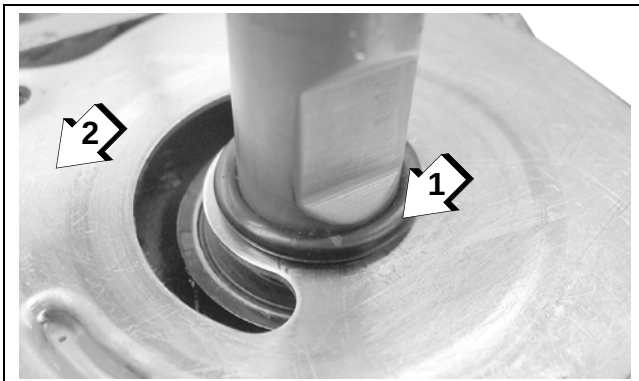
Rotate the driveshaft counterclockwise to unlock the impeller key. Remove the four impeller housing screws.



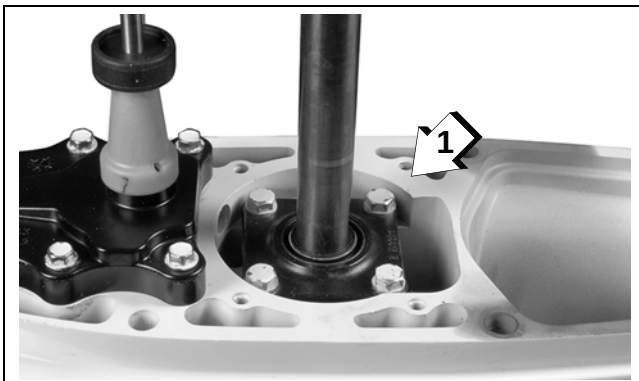
1. Screws

31998

Slide the water pump off the driveshaft. Remove the impeller key, O-ring, impeller plate, and gasket. Discard the gasket.



Clean all old gasket material from the gasket surface.



1. Gasket surface

006876

Remove all the parts from the housing.

Inspection

Check impeller for overheating, hub separation, and other wear or damage.

Check liner and wear plate for scoring, distortion, and impeller material transfer.

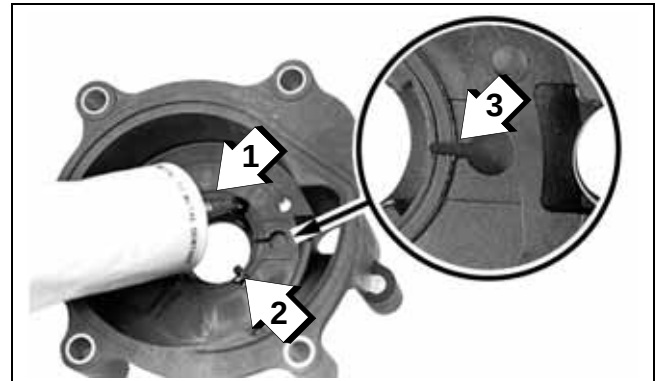
Inspect the housing for cracks or melting.

Make sure gasket surface is clean and smooth.

Assembly

Apply a drop of *Adhesive 847* in the seal ring groove at each of the four ribs.

IMPORTANT: Do not allow any sealer to get into the air bleed groove in the impeller housing. If this groove is blocked by adhesive, the pump will lose its prime and will not pump water.



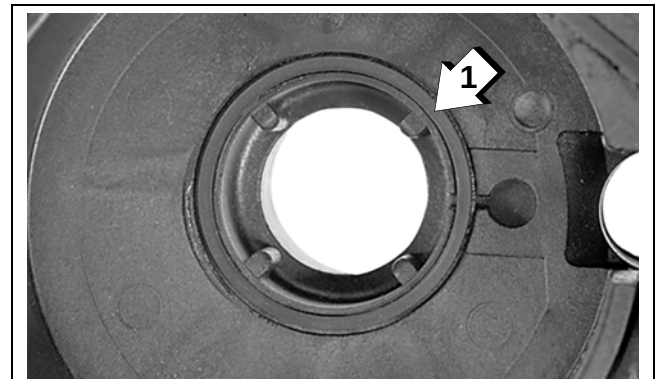
1. Seal ring groove

2. Ribs

3. Air bleed groove

2311

Install the O-ring in groove in the impeller housing.



1. O-ring

34814

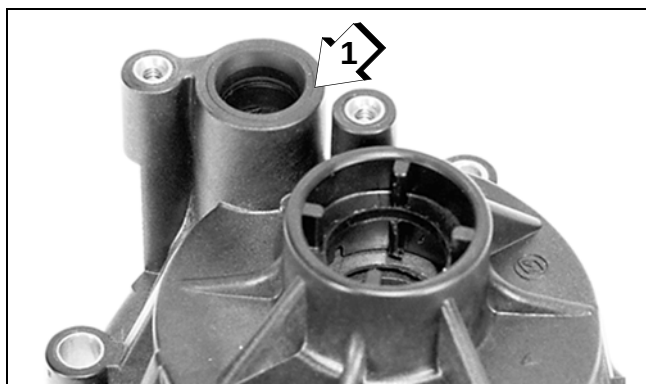
M2-Type Gearcase

Water Pump Service

Lightly coat the exterior rim of the impeller cup with *Gasket Sealing Compound*. Install the cup in the impeller housing. The cup locks in place in the housing with a square index tab.

Make sure vent hole in impeller cup is open.

On V6 models, install the water tube grommet with the inside taper facing up.

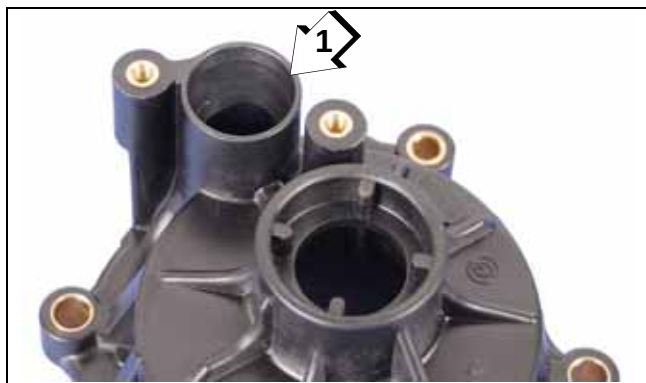


1. Water tube grommet

32000

On outboard models with 5/8 in. diameter water tube, apply a light coat of *Triple-Guard* grease to the inside of the impeller housing water tube cavity and to the water tube o-rings.

IMPORTANT: Impeller Housing, P/N 5007968, can be identified by a chamfer on the inside edge of the water tube cavity.



1. Chamfer

007170

On outboard models with 5/8 in. diameter water tube, remove water tube from exhaust housing and replace o-rings. Apply a light coat of *Triple-*

Guard grease to the o-rings and install water tube in exhaust housing.

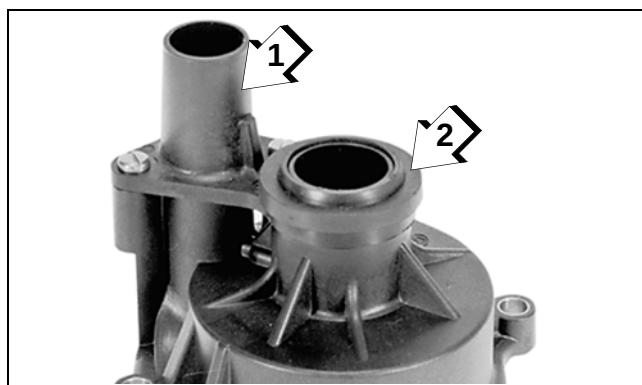


1. O-rings

007152

Apply *Triple-Guard* grease to screw threads and install the impeller housing cover. Tighten screws to a torque of 24 to 36 in. lbs. (3 to 4 N·m).

Apply *Adhesive 847* to flat side of the impeller housing grommet. Install the grommet, flat side down.



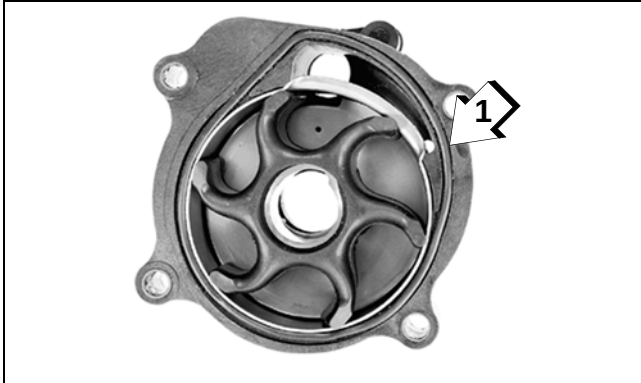
1. Impeller housing cover

2. Impeller housing grommet

32001

Lightly coat the inside of the liner with *Triple-Guard* grease. With a counterclockwise rotation, install the impeller into the liner with the slot for the impeller key facing out.

Apply a thin bead of *Adhesive 847* in the seal groove, and install the special shaped O-ring seal.

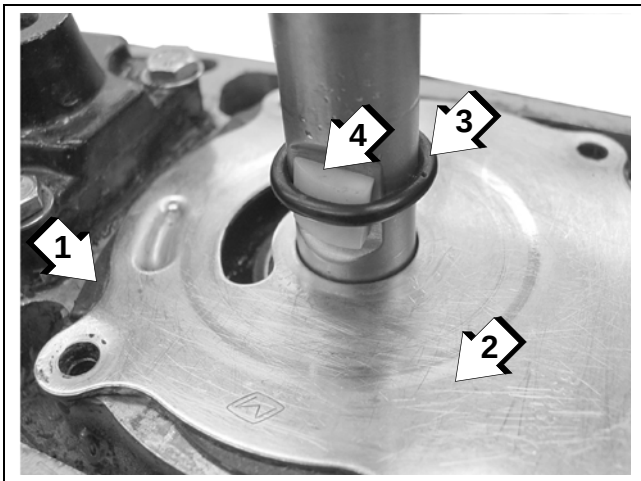


1. O-ring

34815

Apply *Gasket Sealing Compound* to both sides of a new impeller plate gasket. Install the gasket and impeller plate.

Apply *Triple-Guard* grease to a new impeller O-ring. Slide the O-ring down the driveshaft and half way over installed impeller key to temporarily hold key in place.



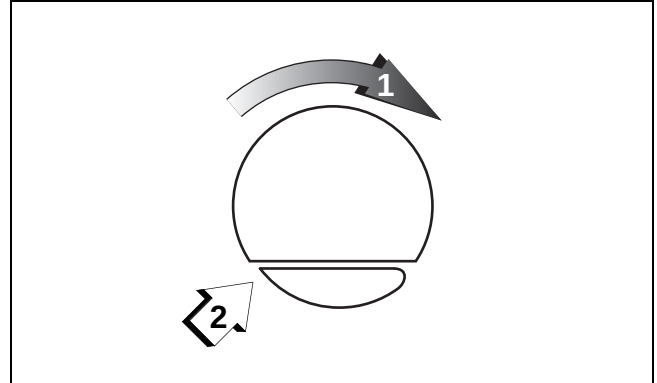
1. Impeller plate gasket
2. Impeller plate
3. O-ring
4. Drive key

DSC02326

The sharp edge of the key is the leading edge in clockwise rotation.

Slide the water pump down the driveshaft. Align impeller slot with the impeller key. Rotate the driveshaft to engage the key with the impeller, and

slide water pump down over key. Be sure impeller key does not fall out of position.



1. Driveshaft rotation
2. Drive key

CO2995

NOTICE

Make sure the impeller engages the impeller key. Serious powerhead damage will result if impeller key is not in place.

Align the impeller housing with the gearcase. Apply *Gasket Sealing Compound* to threads of the four impeller housing screws. Install the screws and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).

On 20 in. outboard models, place Grommet, P/N 349354, on housing cover.



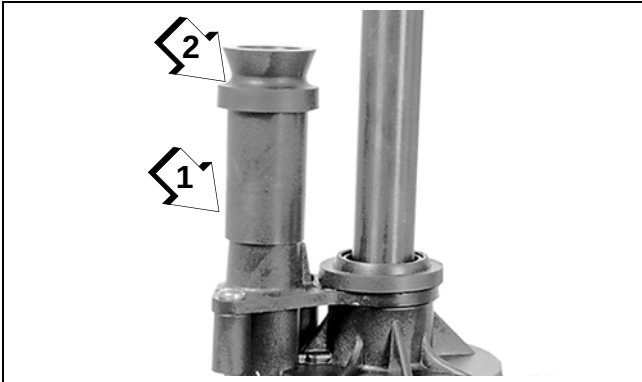
1. Grommet

007150

M2-Type Gearcase

Water Pump Service

On 25 in. and 30 in. models, place the appropriate water tube spacer and grommet on the impeller housing cover.

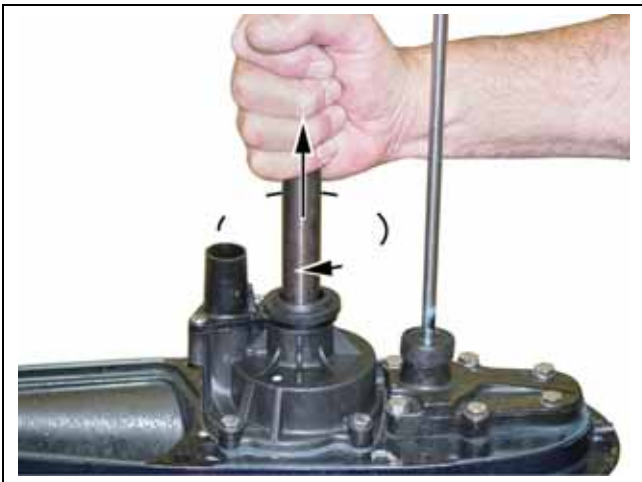


1. Spacer
2. Grommet

32728

After water pump is assembled completely, rotate driveshaft counter clockwise 1/4 turn to unlock and release impeller and key from driveshaft.

Next, pull up on driveshaft and turn clockwise to lock impeller to shaft. This process increases pump efficiency by locking the impeller lower on the driveshaft.



007078

Gearcase – Standard Rotation

Gearcase Disassembly

Pre-Disassembly Inspection

⚠ WARNING

Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

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

Remove the propeller and mounting hardware.

Drain and inspect oil as described in **Gearcase Lubricant** on p. 19.

Clean up any gearcase oil with shop towels.

ENVIRONMENTAL NOTE

Dispose of used oil or oil contaminated towels in an environmentally responsible manner, or according to local regulations.

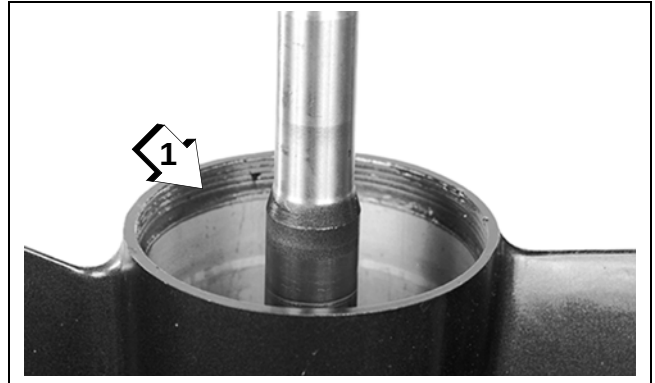
Remove gearcase as described in **Gearcase Removal and Installation** on p. 177.

Remove water pump as described in **Water Pump Service** on p. 181.

Before disassembling the gearcase, examine the following:

- **Gearcase Housing** — Check for visible damage to skeg, strut, anti-ventilation plate, bullet, and mating surface. Check seal areas for visible signs of lubricant leakage.
- **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.

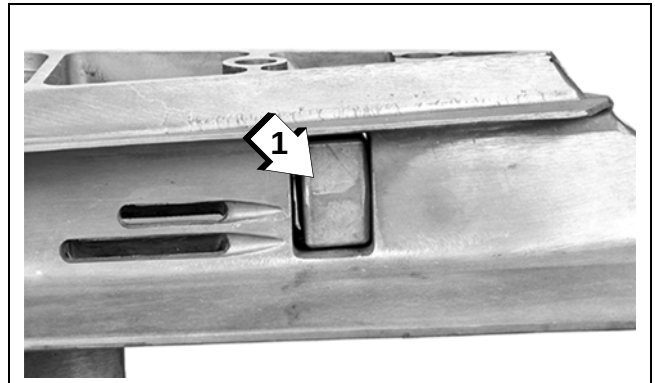
- **Hydrostatic Seal Grooves** — Must be in good condition to help prevent propeller ventilation.



1. Hydrostatic seal grooves

4557

- **Gearcase Anodes** — If anodes have eroded to two-thirds their original size, they must be replaced.



1. Gearcase anode

14161

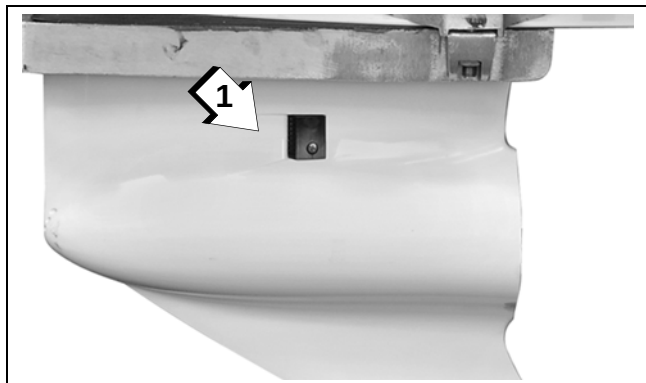
- **Drive Shaft** — Check splines for visible damage, twisting and wear. Severe spline wear indicates the exhaust housing or gearcase has been distorted, possibly by impact damage.
- **Water Intake Screens** — Check for damage and blockage. If screens cannot be cleaned, they must be replaced. Different screens are available and should not be mixed. Refer to correct model parts manual for listing and description.

Gearcase – Standard Rotation

Gearcase Disassembly

Water Intake Screens

Remove and clean water intake screens. Replace if damaged.



1. Water intake screen

006886

shaft could damage the forward gear thrust bearing or thrust washer.

Install the threaded adaptor from the puller kit on to the propeller shaft until seated.



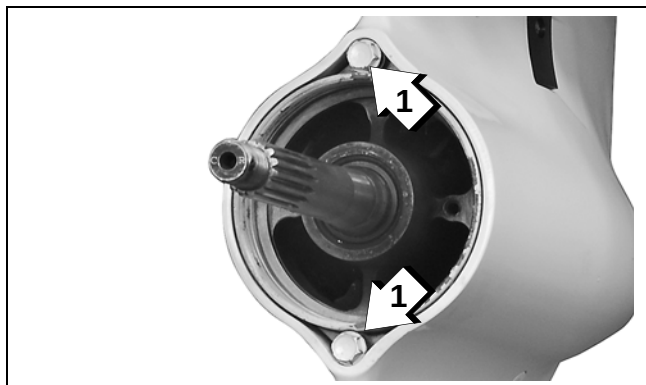
006833

Propeller Shaft Bearing Housing Removal

IMPORTANT: Identify gearcase type before disassembly. For counter rotation gearcases, refer to **Gearcase Disassembly** on p. 204.

The propeller shaft bearing housing on “M2” models is **PRESSED** into gearcase housing.

Remove the two screws holding the propeller shaft bearing housing.



1. Retainer screws

006835

Assemble puller kit components. Hold adaptor with wrench and turn nut clockwise to pull bearing housing.



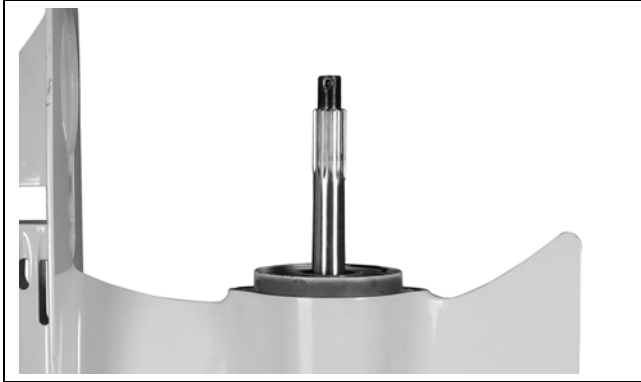
006834

Remove the propeller shaft bearing housing from the gearcase using:

- Propeller Shaft Bearing Housing Puller Kit, P/N 354060.

DO NOT use tools designed to push on the propeller shaft. Pushing force against the propeller

Pull propeller shaft and bearing housing far enough to loosen the **PRESSED** bearing housing from the gearcase housing.



006837

Remove the bearing housing, thrust washer, thrust bearing, and reverse gear from gearcase.



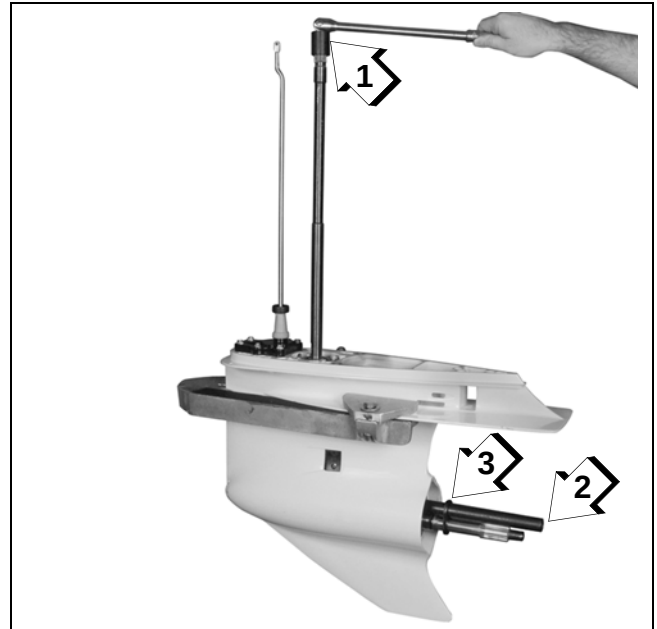
006838

Pinion Gear and Driveshaft Removal

Adjust the shift rod to move the clutch dog as far forward as possible. This will help ease removal of the pinion nut.

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438 to loosen and remove the

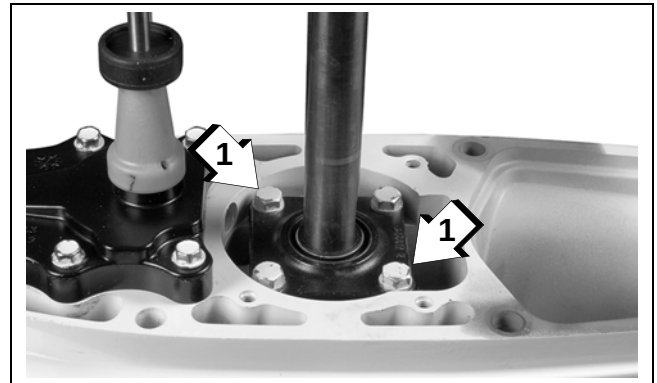
pinion nut from the bottom of the driveshaft. Pad handle of holder to prevent damage to gearcase.



006875

1. Holding socket
2. Pinion nut wrench
3. Retainer

Remove the four driveshaft bearing housing screws.



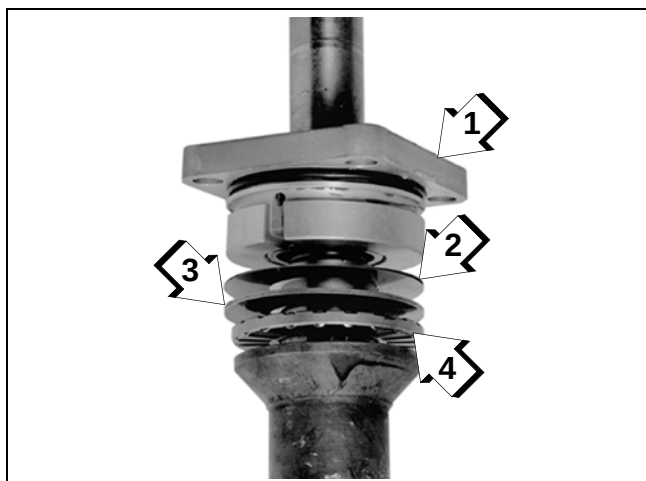
1. Driveshaft bearing housing screws

006876

Gearcase – Standard Rotation

Gearcase Disassembly

Remove the driveshaft from the gearcase. The bearing housing, shims, thrust bearing, and thrust washer will come out with the driveshaft.



1. Bearing housing
2. Shims
3. Thrust bearing
4. Thrust washer

COA3558

If driveshaft cannot be removed, refer to **Locked Driveshaft Removal** on p. 188.

Remove the pinion gear from the gearcase.

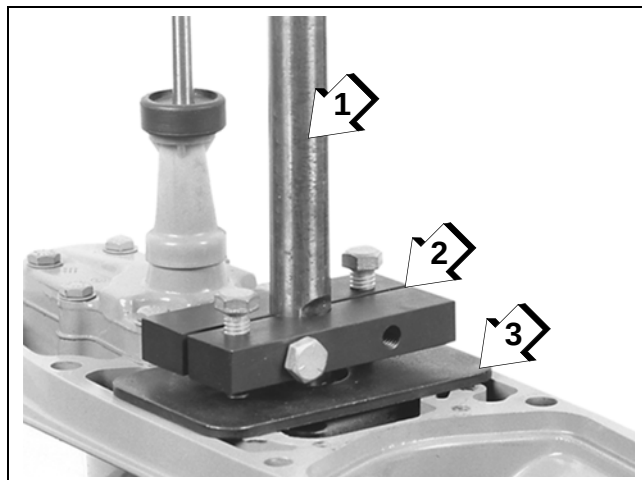


006878

Locked Driveshaft Removal

The driveshaft to pinion taper is a locking taper. If necessary, use Driveshaft Puller, P/N 390706, and Backing Plate, P/N 325867, to break the lock. Install the tools as shown by clamping them around the driveshaft. Alternately tighten the two vertical screws against the backing plate inserted

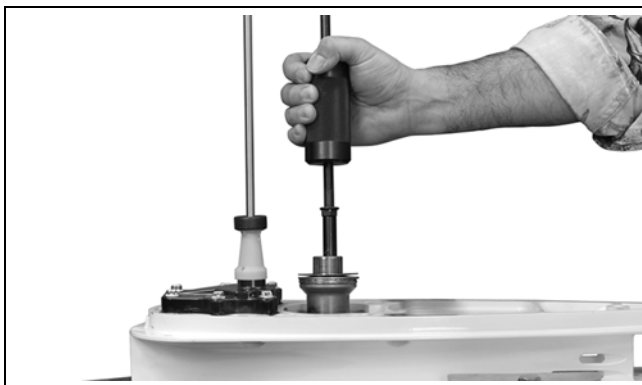
between the puller and the gearcase until the driveshaft pops loose from the pinion.



1. Drive shaft
2. Puller
3. Backing plate

41177

If upper driveshaft becomes separated from lower driveshaft, use Lower Driveshaft Puller, P/N 342681, to remove. Install puller into lower driveshaft and turn 90° to position hook under pin in driveshaft. Thread Slide Hammer, P/N 391008, into puller and remove driveshaft.



006880

Driveshaft Service

To separate the upper driveshaft (if needed) from the lower driveshaft, remove the roll pin. Replace the damaged component.



29337

To assemble the driveshaft, install **new** driveshaft retainer into the groove of the upper driveshaft.



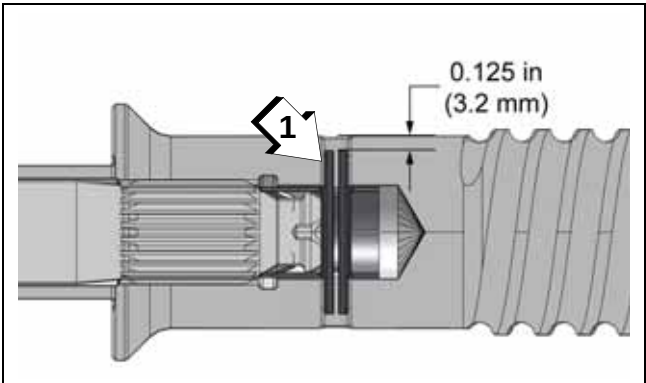
29338

Install the upper driveshaft into the lower driveshaft, aligning the holes in the driveshaft retainer and the lower driveshaft.



29330

Install the roll pin to the specified dimension.



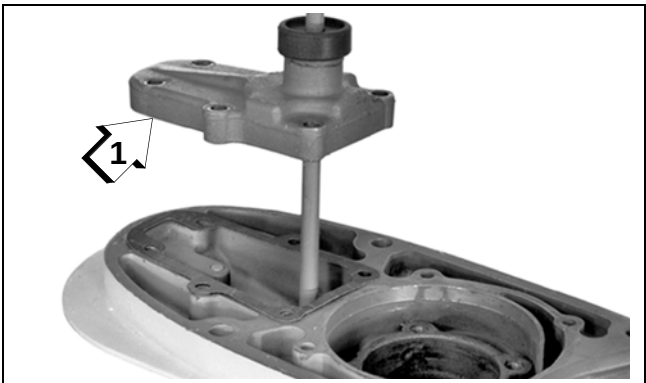
1. Roll pin

010491

Shift Housing, Gear, and
Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover seal. Remove and discard the shift rod O-ring from inside of cover.



1. Shift rod cover

COA3141

Gearcase – Standard Rotation

Shifter, Bearing and Seal Servicing

Remove propeller shaft assembly from gearcase.



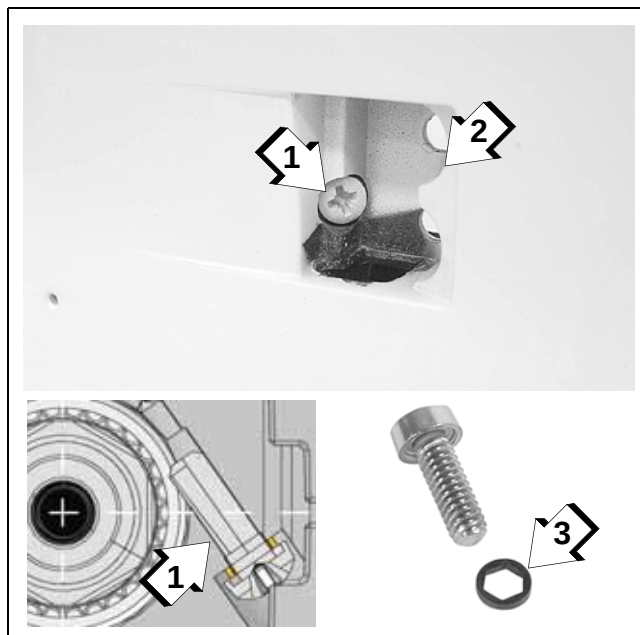
006839

IMPORTANT: Inspect gearcase housing, refer to **Gearcase Housing Inspection S, S2, L2, M2-Type** on p. 14.

Shifter, Bearing and Seal Servicing

Pinion Bearing Removal

Remove pinion bearing retaining screw.

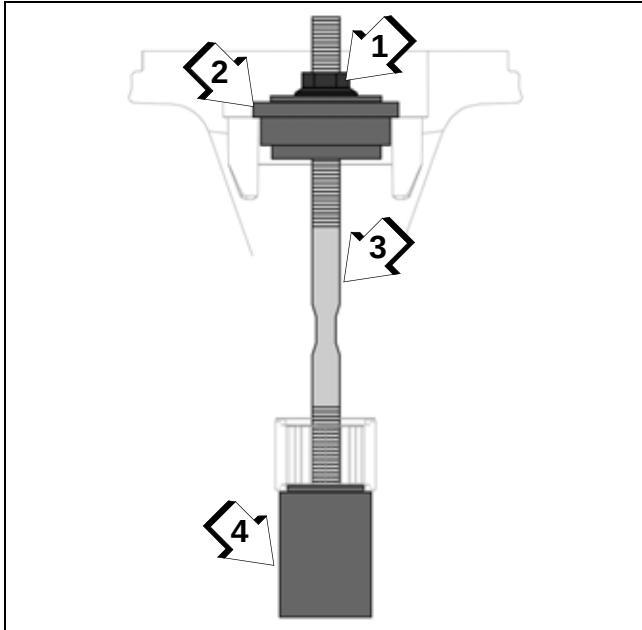


1. Pinion bearing retaining screw
2. Water screen pocket
3. Seal

DSC02370
DRC7416
DSC02313

Assemble Pinion Bearing Remover and Installer, P/N 5005927, in the gearcase as follows:

Use a 7/8 in. wrench to hold the remover in place.
Use a 3/4 in. wrench to turn flange nut clockwise.
Draw the bearing up from the housing.

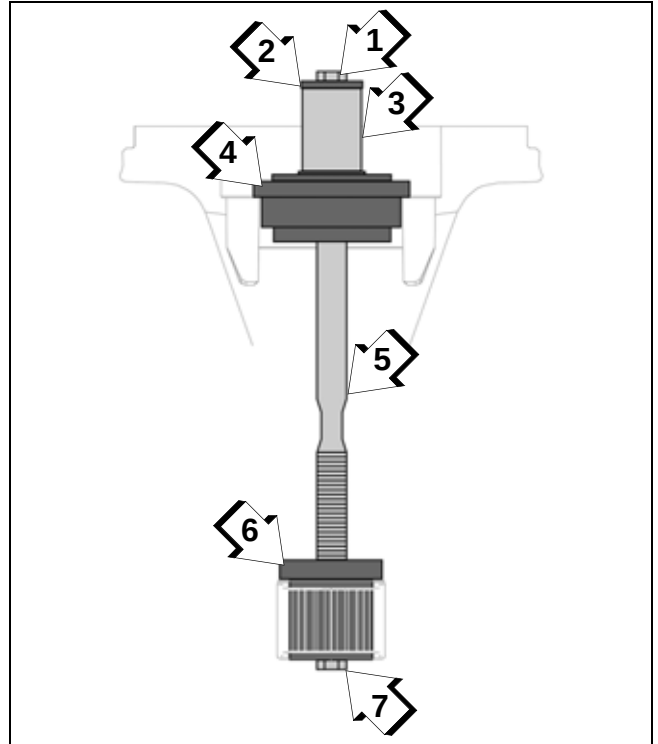


1. Flange nut, P/N 326586
2. Plate, P/N 391260
3. Rod, P/N 326582
4. Remover, P/N 326579

010325
DR3419

Pinion Bearing Installation

Assemble the following components of Pinion Bearing Remover and Installer, P/N 5005927, as shown:



1. 1/4-20 X 1/2 in. Hex head screw
2. 1 in. O.D. Flat washer
3. Spacer; P/N 350932 "M" and "M2"
4. Plate and Bearing P/N 391260
5. Rod P/N 326582
6. Installer/Remover, P/N 350958
7. 1/4-20 X 1 1/4 in. Hex head screw

824182

IMPORTANT: Spacers are different sizes and cannot be interchanged.

Apply *Needle Bearing* grease to the needle bearings and insert them into the bearing case.

Place the bearing on the installer tool with the **lettered side of the bearing facing the top** of the gearcase. Use *Needle Bearing* grease to hold the bearing on the tool.

IMPORTANT: The pinion bearing is tapered so that, when installed correctly, its shape compensates for stresses in the gearcase and allows full bearing contact. Whenever a gearcase is disassembled, the pinion bearing should be checked to ensure that it has been installed with the lettering facing up.

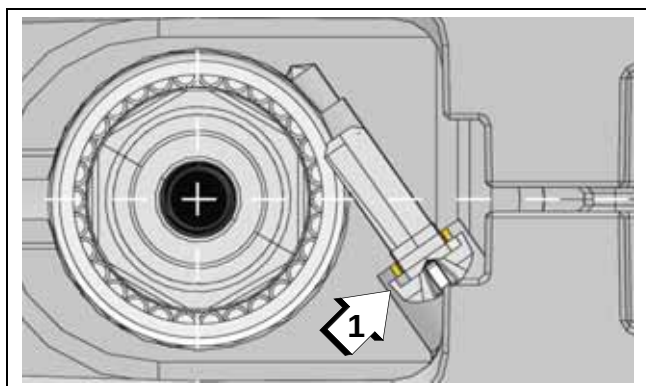
Gearcase – Standard Rotation

Shifter, Bearing and Seal Servicing

Insert the tool with the bearing into the gearcase. Drive the bearing into the gearcase until the washer on the tool contacts the spacer.

Remove the tool.

Position new O-ring on the pinion bearing retaining screw. Apply *Gasket Sealing Compound* to O-ring. Apply *Nut Lock* to screw threads. Install the screw and tighten to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. O-ring

drc7416R

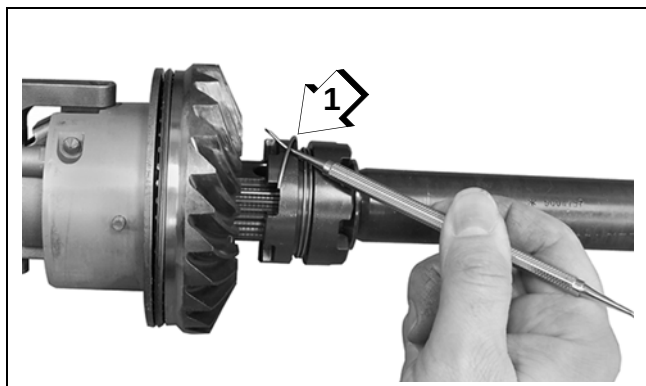
Shift Housing Disassembly

⚠ WARNING

Wear safety glasses to avoid personal injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

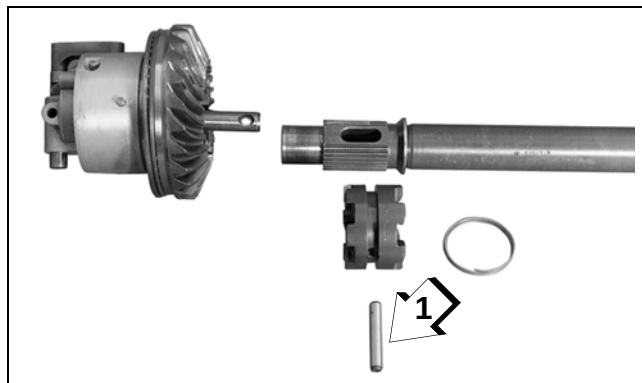
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

006887

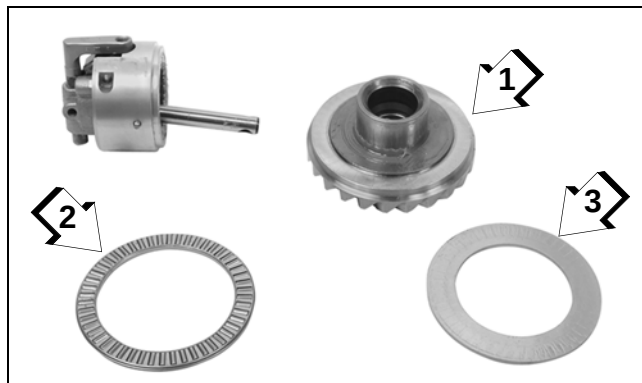
Push the pin out of the clutch dog. Remove all parts.



1. Pin

006888

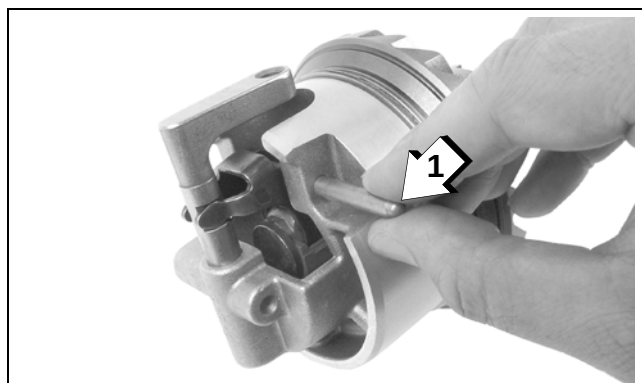
Remove the gear, thrust bearing, and thrust washer from the shift housing.



1. Gear
2. Thrust bearing
3. Thrust washer

006889

Remove the shift lever pin from the housing.

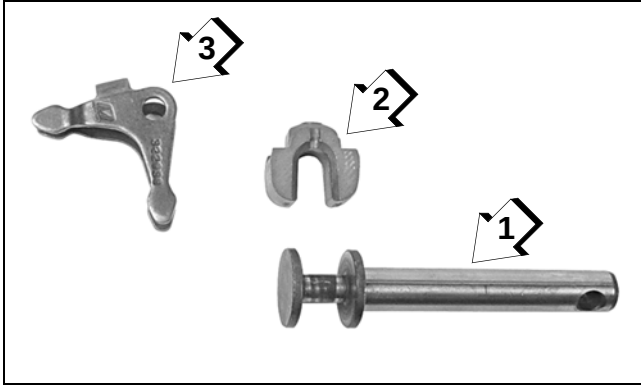


1. Shift lever pin
2. Shifter detent

DSC02449

Move the shifter detent as needed to help ease removal of the following parts:

- shift shaft
- cradle
- shift lever



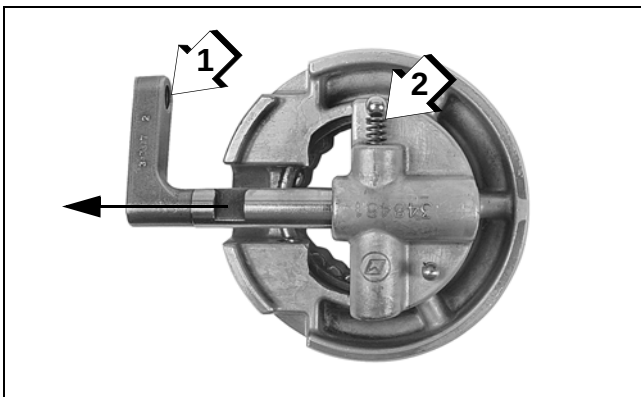
1. Shift shaft
2. Cradle
3. Shift lever

DSC02489

⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Rotate the shifter detent 90° in either direction, then pull the detent out of the housing.



1. Shifter detent
2. Ball and spring

DSC02518

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection.

Shift Housing Assembly

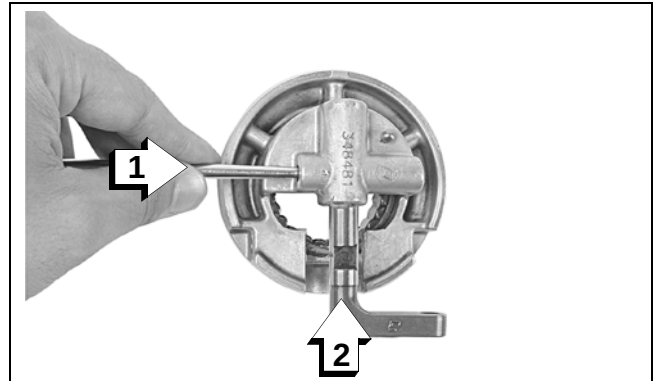
IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



010118

Insert shifter detent at 90° angle into the housing as shown, while depressing the ball and spring with a suitable tool. Once the shifter detent is past the ball, remove the tool and position detent to engage NEUTRAL position.

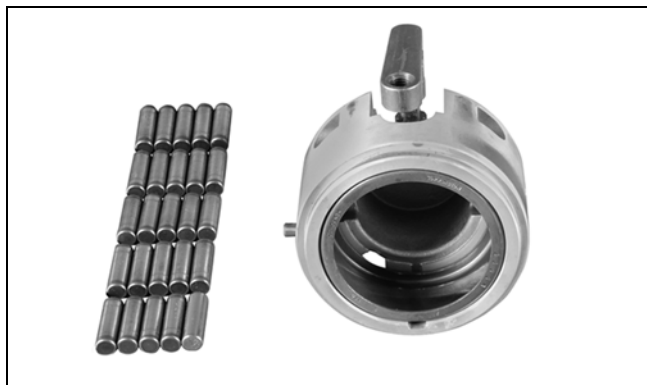


DSC02506

Gearcase – Standard Rotation

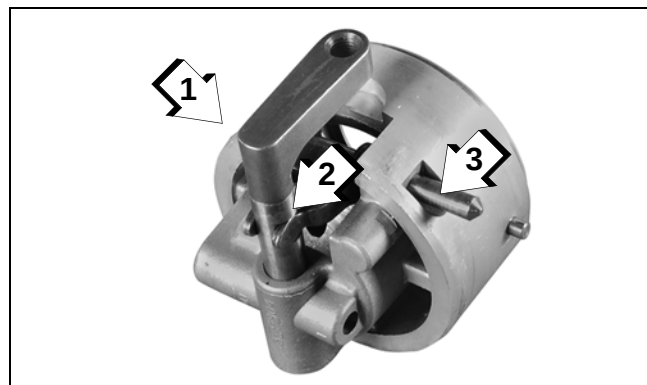
Shifter, Bearing and Seal Servicing

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case.



006901

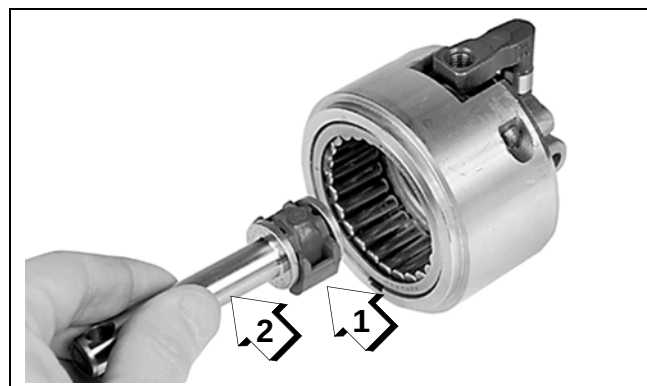
With shifter detent in NEUTRAL, install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Shifter detent
2. Shift lever
3. Pin, shift lever

006902

Rest the cradle on the shift shaft.



- TYPICAL**
1. Cradle
 2. Shift shaft

4512

Place the shift lever arms into the recesses of the shift cradle. Pull shifter detent back up to NEUTRAL position to hold the cradle and shaft in place.

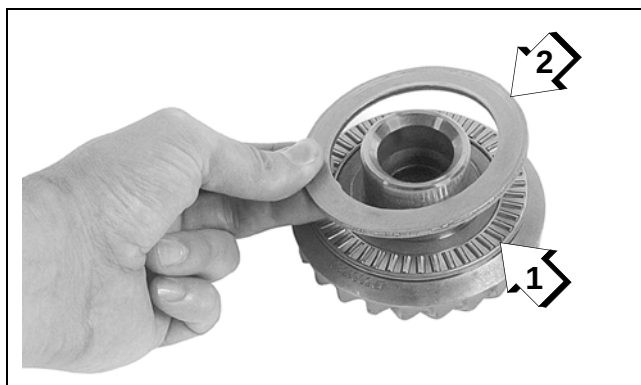


001219

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bearing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

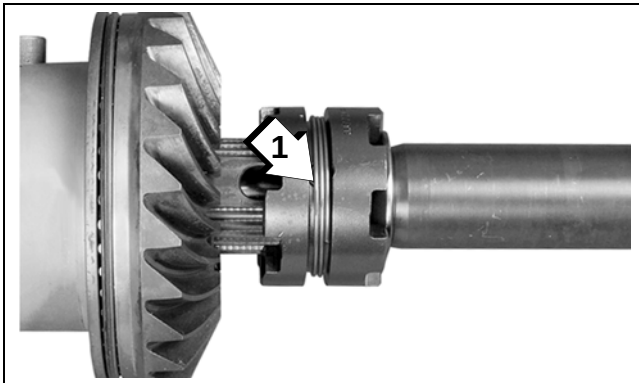
The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.



1. "PROP END"

006906

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

006907

Driveshaft Bearing Housing Service

The driveshaft bearing is not serviceable. Replace the bearing housing assembly if the bearing is worn or damaged. Also, inspect the driveshaft bearing surface if the bearing is damaged.

Seal Removal

Remove the driveshaft bearing housing seals using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Discard the seals.



14155

Remove and discard the O-ring from the bearing housing.

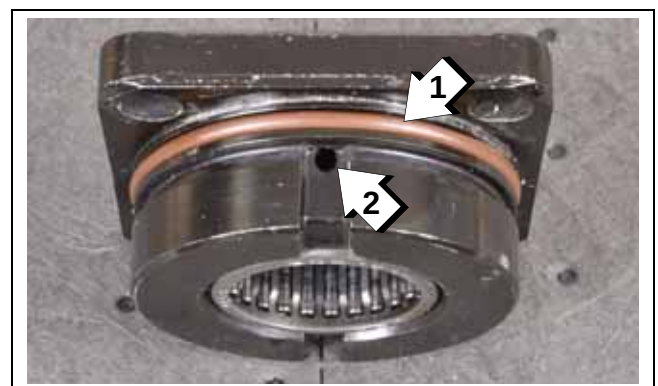
Clean the bearing housing in solvent to remove sealer from the seal bore and the O-ring groove.

Seal Installation

Lightly apply *Gasket Sealing Compound* to a new O-ring. Install the O-ring in top groove of the bearing housing. Do not allow sealant in oil passage.

NOTICE

Do not install the O-ring in the bearing housing's bottom groove. The bottom groove is an oil passage. Gearcase damage could result.



1. O-ring (top groove)
2. Oil passage

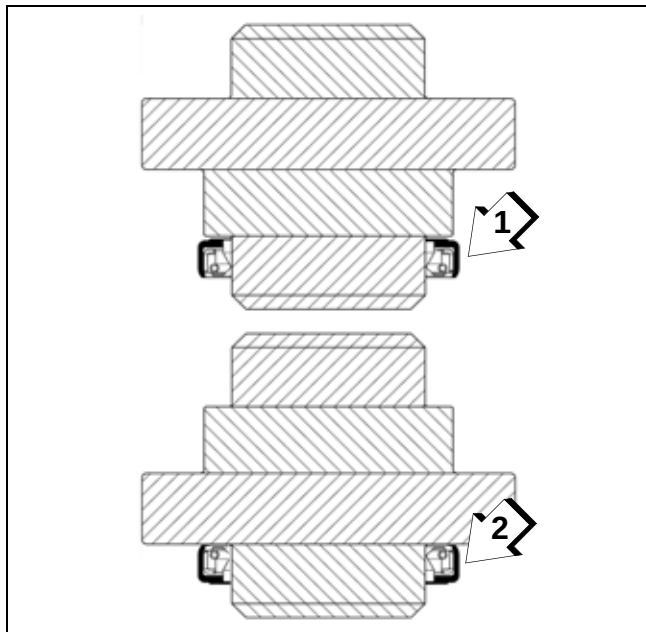
009526

Gearcase – Standard Rotation

Shifter, Bearing and Seal Servicing

Apply *Gasket Sealing Compound* to metal casings of new seals before installing.

Use Seal Installation Tool, P/N 330268 to install new seals back to back in bearing housing. Install inner seal with lip facing toward bearing housing, then the outer seal with lip facing away from bearing housing. Apply *Triple-Guard* grease to seal lips.



1. Inner seal
2. Outer seal

010320

Propeller Shaft Bearing Housing Service

Rear Seal Removal

Remove seals using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131. Position the

plate on top of the housing to support the bridge, and tighten jaws securely behind the inner seal.



13520

Bearing Removal

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

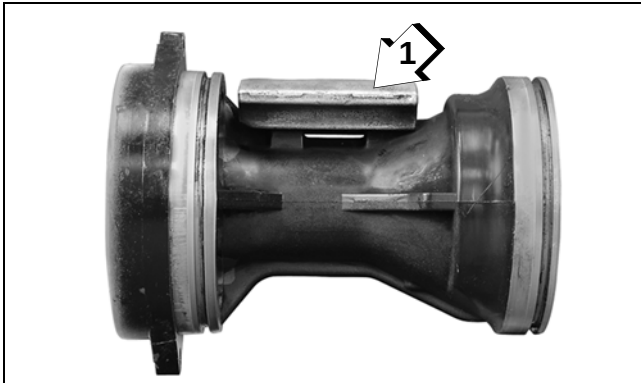
Remove either bearing using Puller Bridge, P/N 432127, and Large Puller Jaws, P/N 432129. Rest the puller plate on top of the housing to support the bridge, and tighten the jaws securely behind the bearing.



13522

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size.

Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).

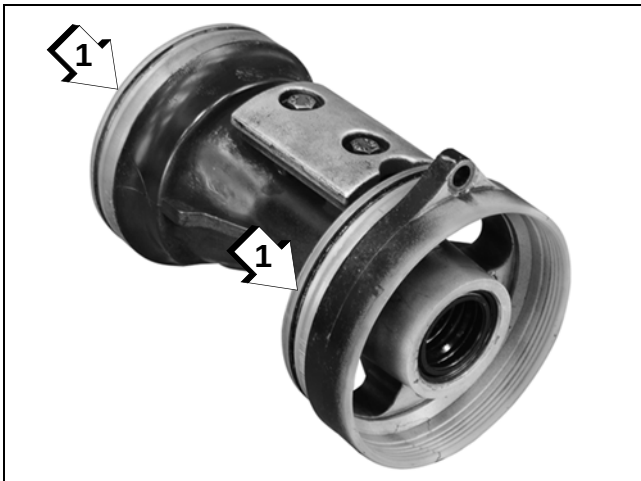


1. Anode

006897

Discard the bearing housing O-rings. Clean the housing and bearings in solvent and dry thoroughly. If bearings were not replaced, rotate the needles to check for freedom of movement.

Inspect O-ring grooves. Sand off any sharp edges that might cut O-ring. Remove any nicks or burrs on front of bearing housing.



1. O-ring groove

006898

Bearing Installation

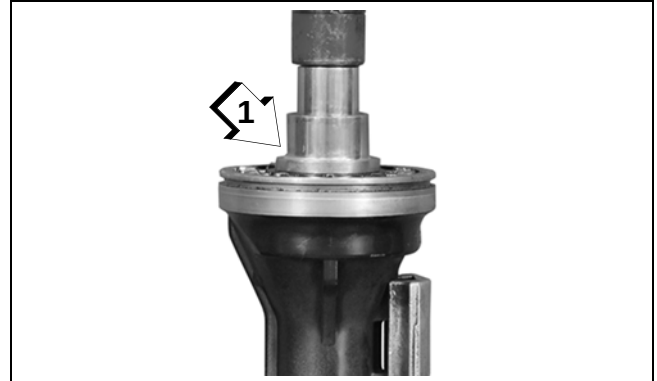
Oil, then install new bearings in bearing housing.

Place the **lettered end** of the bearing case on the bearing installer, then press the bearing into the housing until the tool seats. When installed, the lettered end of the bearing should be visible.

Standard Rotation Housing

Bearing Installation Tool:

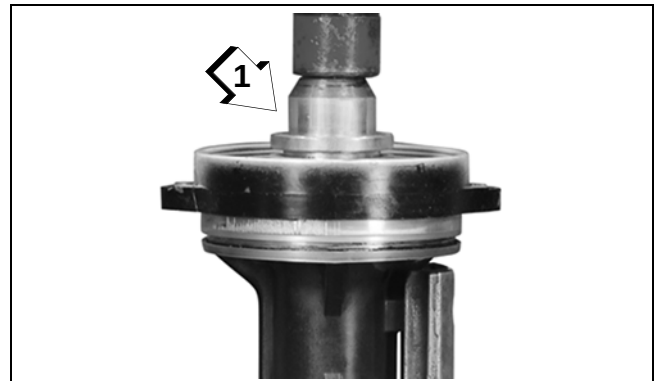
- P/N 354139 – front bearing
- P/N 354139 – rear bearing



Front Bearing

1. Bearing installation tool

006909



Rear Bearing

1. Bearing installation tool

006910

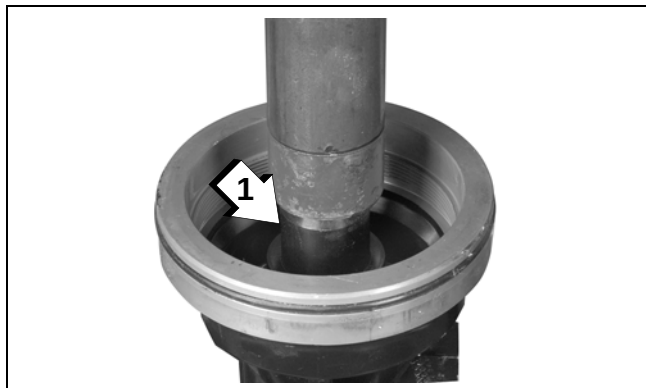
Gearcase – Standard Rotation

Shifter, Bearing and Seal Servicing

Counter Rotation housing

Bearing Installation Tool:

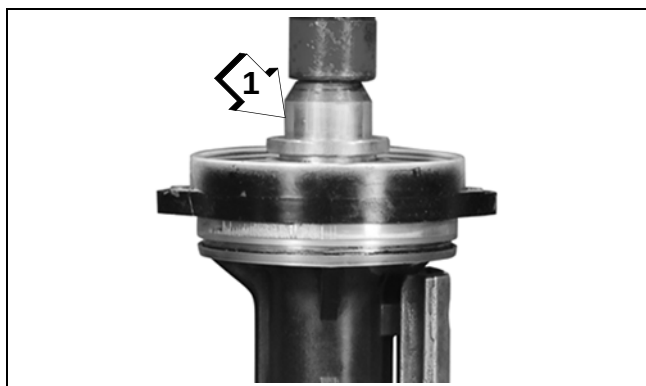
- P/N 432401 – front bearing
- P/N 354139 – rear bearing



Front Bearing

1. Bearing installation tool

006945



Rear Bearing

1. Bearing installation tool

006910

Rear Seal Installation

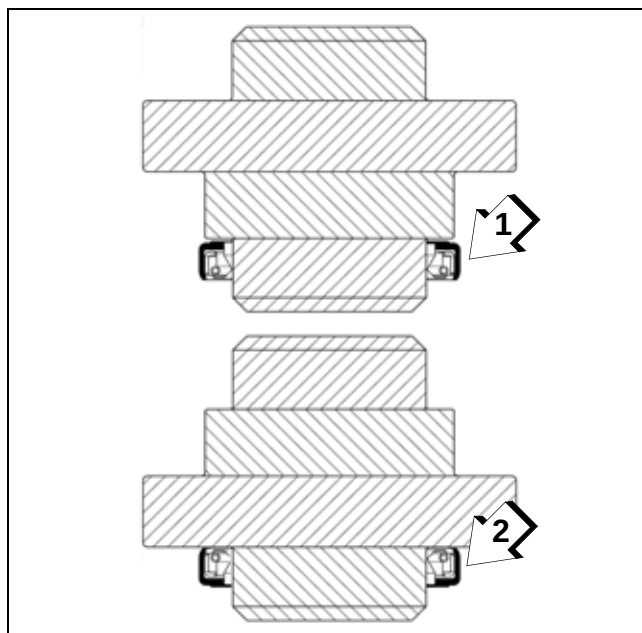
Apply *Gasket Sealing Compound* to metal casings of the seals before installing.

Use Seal Installation Tool to install new seals back to back in bearing housing.

Seal Installation Tool:

- P/N 354056 – “M2”

Install inner seal with lip facing toward the bearing housing, then outer seal with lip facing away from the bearing housing.



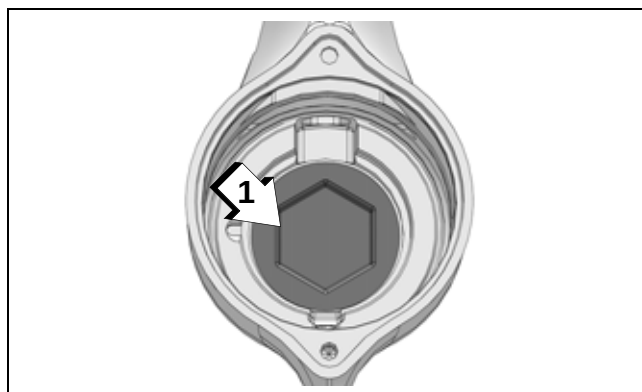
1. Inner seal
2. Outer seal

010320

Apply *Triple-Guard* grease to seal lips.

Gearcase Housing Plug

Do NOT remove the plug unless there is evidence of leaking. Use Plug Tool, P/N 357018, to remove the plug from the gearcase.



1. Plug Tool, P/N 357018

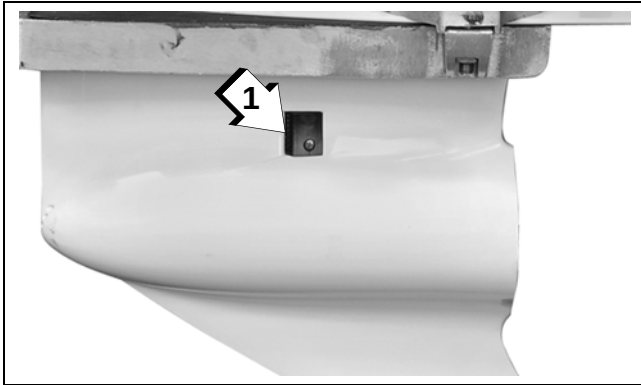
006945

Apply *Triple Guard* grease to a new o-ring and to the threads of the plug. Install the o-ring on the plug and tighten to a torque of 30 to 34 ft. lbs. (41 to 46 N·m).

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



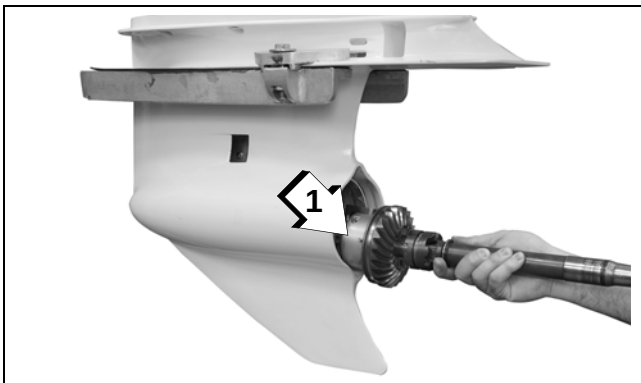
1. Water intake screen

006886

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift housing pin with hole in forward end of gearcase housing.



1. Pin

006885

Shift Rod Housing Installation

Lubricate a new shift rod cover O-ring with *Triple-Guard* grease. Install the O-ring into the shift rod cover.

IMPORTANT: Make sure O-ring is fully seated in groove.

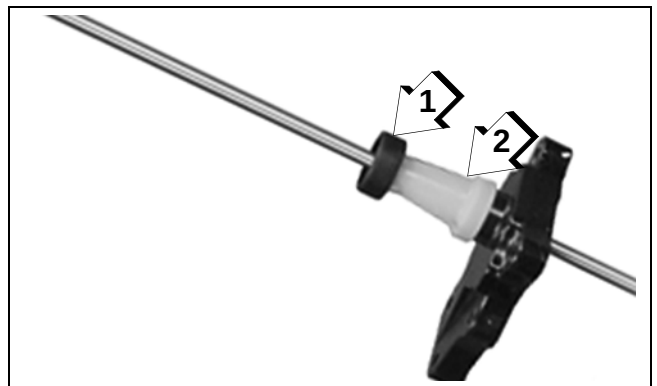


1. O-ring

006916

Install the shift rod spacer on the shift rod (25 in. models). On 30 in. models, install the extension (not shown).

Place the shift rod grommet on the shift rod.



1. Grommet

2. Shift rod spacer

006917

Apply *Triple-Guard* grease to the threaded end of the shift rod and insert it through the cover. Turn the shift rod while pushing it through the cover to avoid damaging the O-ring.

Gearcase – Standard Rotation

Gearcase Assembly

Apply *Adhesive 847* to seal groove of shift rod cover. Place a new shift rod cover seal in groove.



1. Cover seal

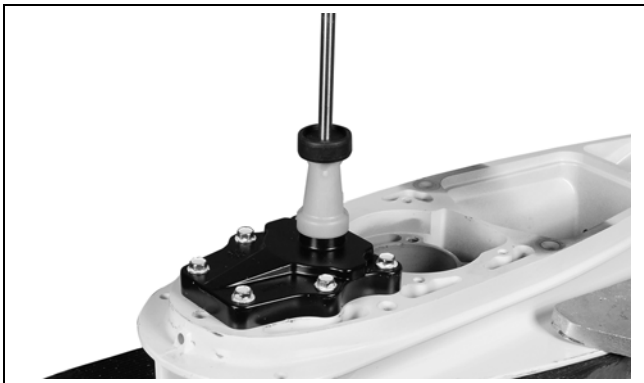
006918

All Gearcases

Thread the shift rod into the shifter detent about four turns.

Move shift rod from side to side while pushing on the propeller shaft to ensure proper alignment of the bearing housing locator pin into the pin hole in the gearcase.

Apply *Gasket Sealing Compound* to the threads of the shift rod cover screws. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



006919

Refer to **Shift Rod Adjustment** on p. 13.

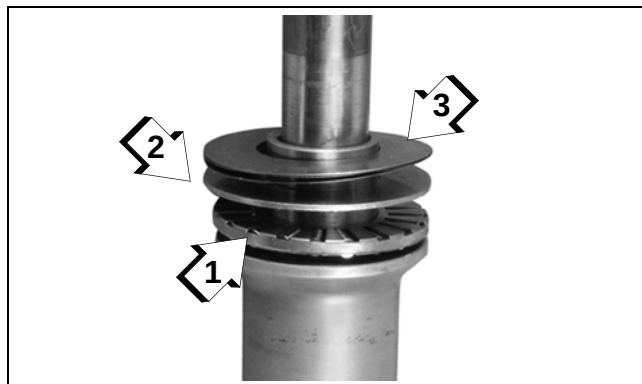
Pinion Gear and Driveshaft Installation

Refer to **Driveshaft Shimming** on p. 15.

Install new seals in driveshaft bearing housing. Refer to **Driveshaft Bearing Housing Service** on

p. 195.

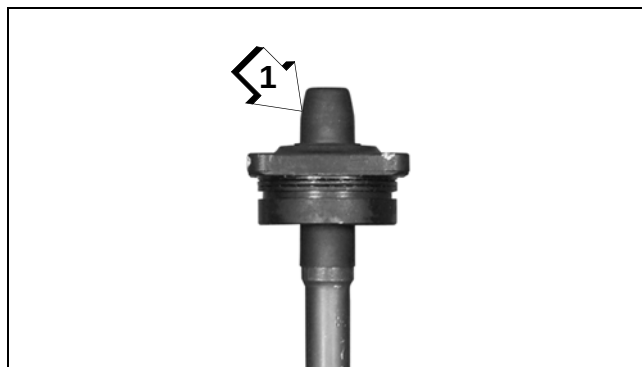
Place the driveshaft thrust bearing, thrust washer, and correct shim(s) on the driveshaft as shown.



1. Thrust bearing
2. Thrust washer
3. Shim(s)

006920

Using Driveshaft Seal Protector, P/N 318674, slide the driveshaft bearing housing onto the driveshaft and into position in the gearcase.

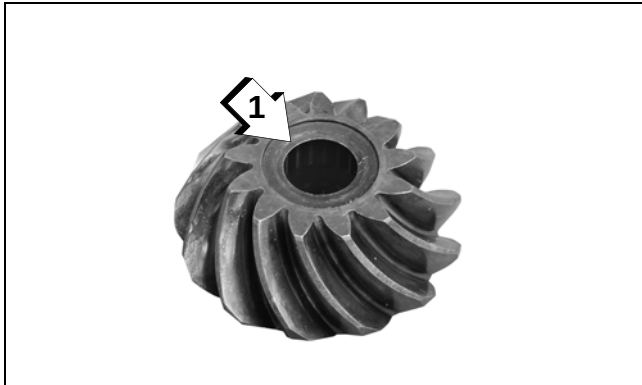


1. Seal protector

006921

Adjust shift rod to move clutch dog as far forward as possible. Be sure excess grease is removed from the pinion bearing.

Washer must be snapped into recess of pinion gear.



1. Washer

006922

IMPORTANT: The inside taper of the pinion gear and the driveshaft taper **MUST** be completely free of grease. Clean the tapers with *Cleaning Solvent*. Use a shop towel free of grease and lint.

Place the pinion gear into the gearcase. Insert the driveshaft into the gearcase and through the pinion gear.

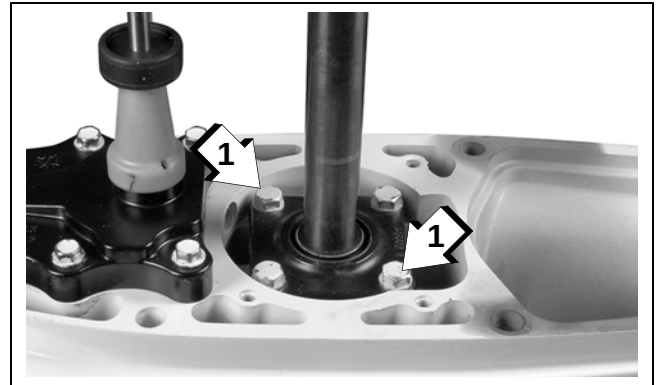
Lightly coat the threads of a **new** pinion nut with outboard lubricant. Use Pinion Nut Starting Tool, P/N 342216, to install nut on the driveshaft. Turn the driveshaft by hand to thread the nut on to shaft.



006923

Apply *Gasket Sealing Compound* to the threads of the driveshaft bearing housing screws. Tighten

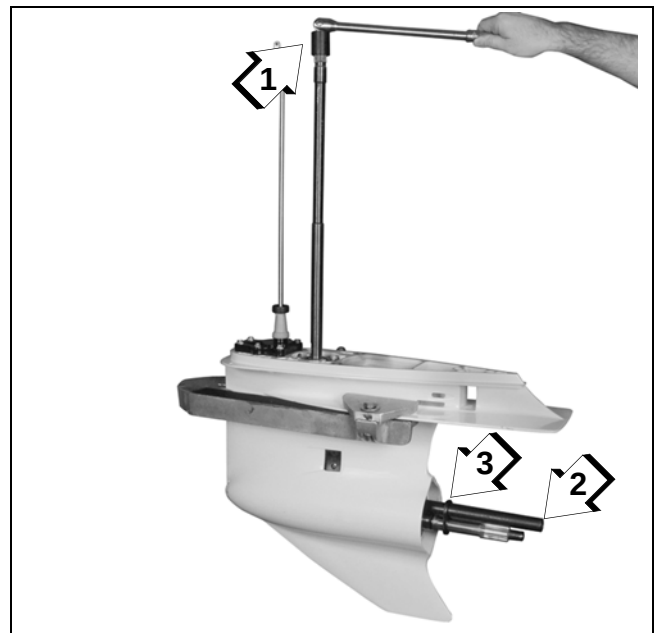
screws **in stages** to a torque of 120 to 144 in. lbs. (13.5 to 16.5 N·m).



1. Driveshaft bearing housing screws

006876

Use Driveshaft Holding Socket, P/N 311875, Pinion Nut Wrench, P/N 334455, and Wrench Retainer, P/N 341438, to tighten the pinion nut to a torque of 100 to 110 ft. lbs. (136 to 149 N·m). Pad handle of holder to prevent damage to gearcase.



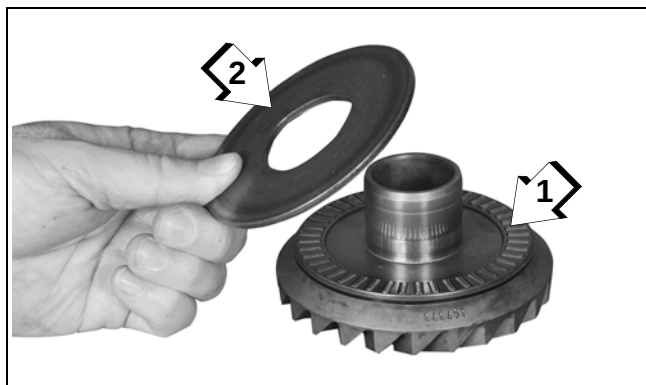
1. Holding socket
2. Pinion holder
3. Retainer

006875

Propeller Shaft Bearing Housing and Gear Installation

IMPORTANT: The propeller shaft bearing housing on the “M2” type gearcases is **PRESSED** into the gearcase housing.

Oil and install thrust bearing and thrust washer on hub of reverse gear. Slide the gear assembly onto the propeller shaft until it engages the pinion gear.



1. Thrust bearing
2. Thrust washer

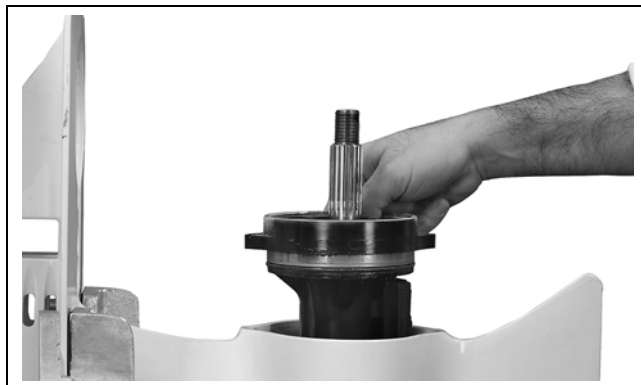
006925

Lightly apply *Triple Guard Grease* to new bearing housing O-rings. Install O-rings in grooves in the housing. Grease the machined side surfaces of bearing housing.



006924

Place bearing housing in gearcase.



006846

Align retaining holes in bearing housing with screw holes in gearcase. Thread Alignment Pins, P/N 354140, into gearcase.

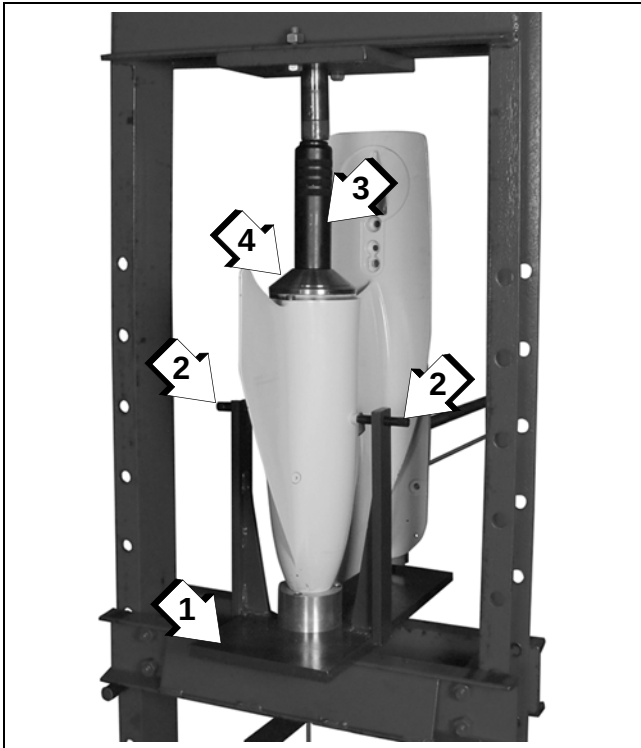


1. Alignment pins

006926

Use Installer Handle, P/N 345822, Propeller Shaft Bearing Housing Installer, P/N 354057, Gearcase Fixture, P/N 354059 and an appropriate floor press (10 ton or greater) to install housing into

gearcase. Align and level gearcase assembly in fixture as shown. Secure fixture to floor press.



1. Gearcase fixture, P/N 354059
2. Vertical alignment screws
3. Handle P/N 345822
4. Housing installer P/N 354057

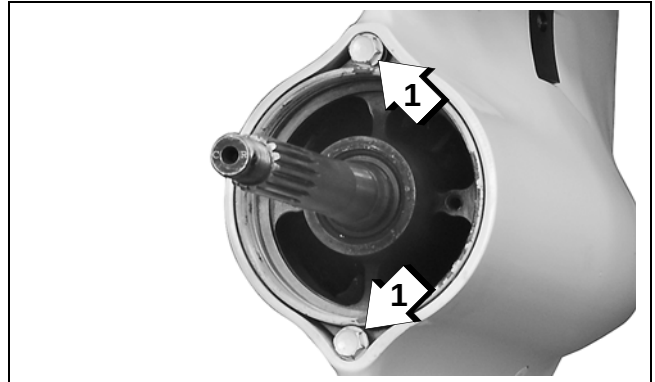
006927

Housing must be completely seated in gearcase to install retainer screws. Bearing housing is approximately level with gearcase.



006928

Apply *Ultra Lock* to threads and install two retaining screws. Tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).



1. Retainer screws

006835

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 181
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 177
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

Gearcase – Counter Rotation

Gearcase Disassembly

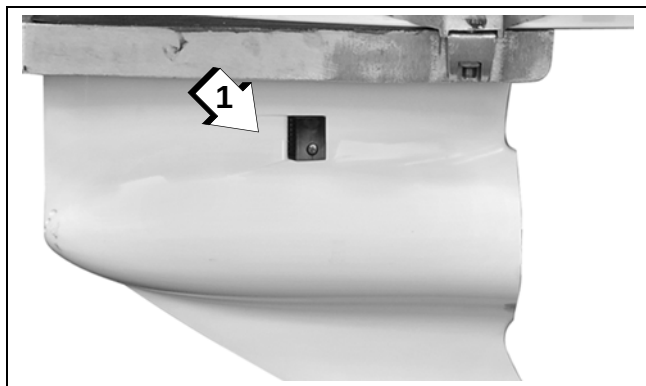
IMPORTANT: Counter rotation (CR) gearcases use unique components and require different service procedures. Use care when working on counter rotation gearcases. DO NOT interchange parts between standard and counter rotation models. Identify gearcase type prior to disassembly. Make sure the “CR” marking is on the end of the propeller shaft.

Pre-Disassembly Inspection

Refer to **Pre-Disassembly Inspection** on p. 185.

Water Intake Screens

Remove and clean water intake screens. Replace if damaged.



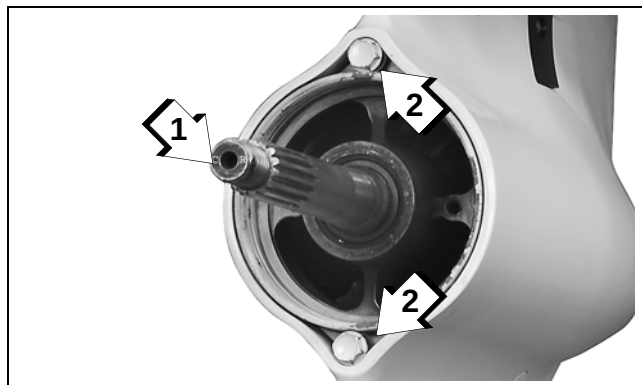
1. Water intake screen

006886

Propeller Shaft Bearing Housing Removal

IMPORTANT: The propeller shaft bearing housing on “M2” type gearcases is **PRESSED** into gearcase housing.

Remove the two retaining screws holding the propeller shaft bearing housing.



1. “CR” marking
2. Retainer screws

006835

Remove the propeller shaft bearing housing from the gearcase using:

- Propeller Shaft Bearing Housing Puller Kit, P/N 354060.

DO NOT use tools designed to push on the propeller shaft. Pushing against the propeller shaft could damage the forward gear thrust bearing or thrust washer.

Install the threaded adaptor from the puller kit on to the propeller shaft until seated.



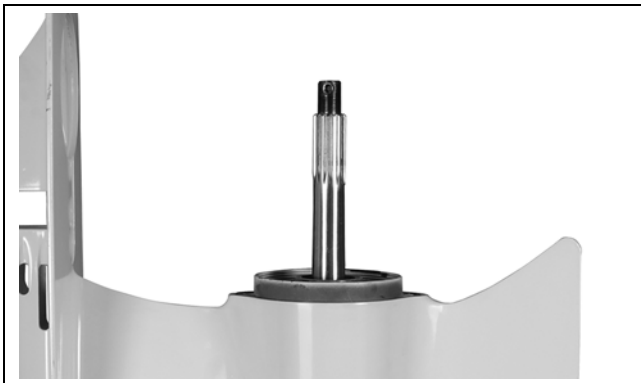
006833

Assemble puller kit components. Hold adaptor with wrench and turn nut clockwise to pull bearing housing.



006834

Pull propeller shaft and bearing housing far enough to loosen the **PRESSED** bearing housing from the gearcase housing.



006837

Remove propeller shaft, forward gear and bearing housing assembly from gearcase.



006850

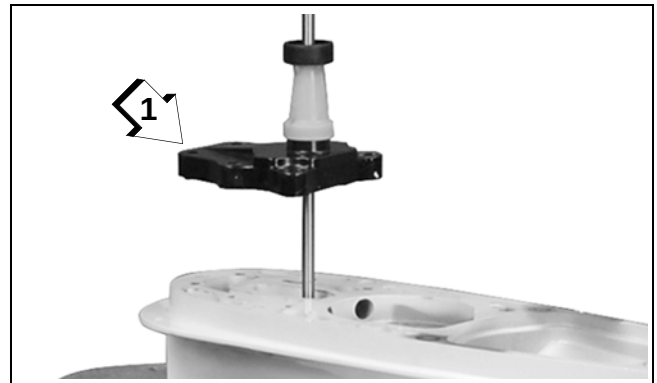
Pinion Gear Removal and Driveshaft Servicing

Refer to **Pinion Gear and Driveshaft Removal** on p. 187.

Shift Housing, Gear and Propeller Shaft Removal

Push down on the shift rod. This will move the detent lever downward to clear the inside of the gearcase when the shaft assembly is pulled out. Unscrew the shift rod from the detent lever. Remove screws, cover, and shift rod from the gearcase.

Discard the cover seal. Remove the shift rod O-ring from inside of cover and discard.



1. Shift rod cover

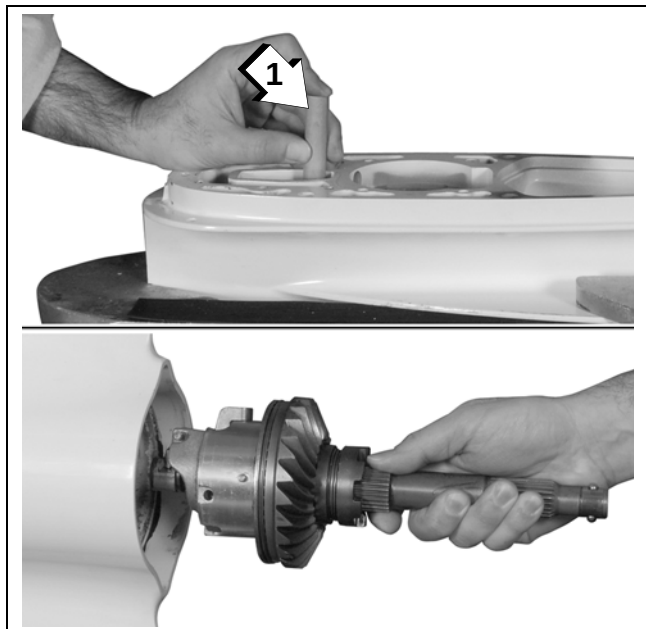
006884

Use an appropriate tool to apply downward pressure on the detent while pulling on the propeller

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

shaft assembly. Remove propeller shaft assembly from the gearcase.



Counter Rotation Models
1. Tool

006929

IMPORTANT: Inspect gearcase housing, refer to **Gearcase Housing Inspection S, S2, L2, M2-Type** on p. 14.

Shifter, Bearing and Seal Servicing

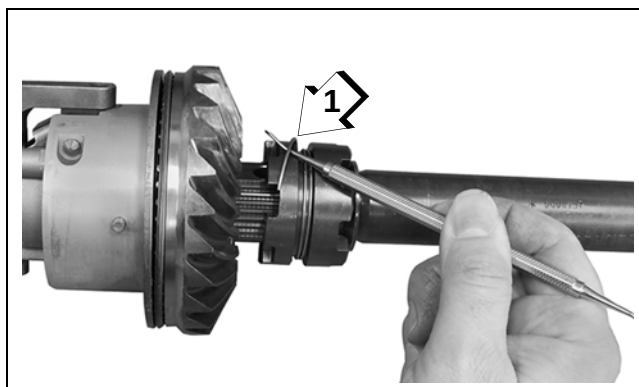
Shift Housing Disassembly

⚠ WARNING

Wear safety glasses to avoid personal injury.

IMPORTANT: The shift housing and bearing are serviced as an assembly. If either are worn or damaged, replace the complete assembly.

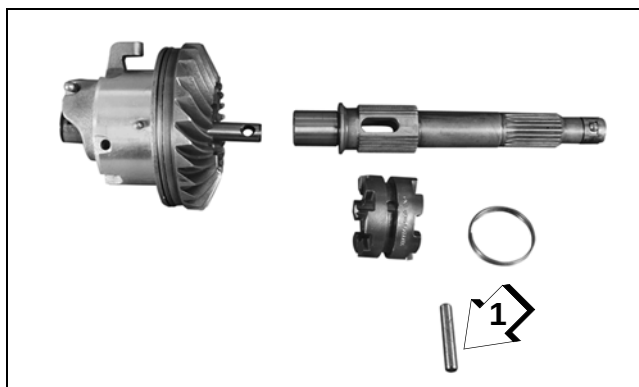
Insert a suitable tool under one end of the clutch dog spring and remove it from its groove by unwrapping it from around the clutch dog. **Discard the spring.**



1. Clutch dog spring

006887

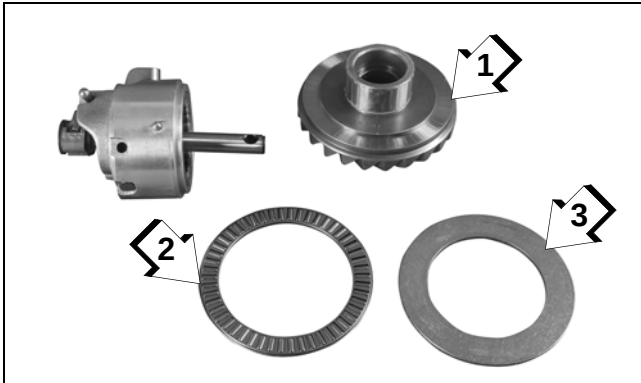
Push the pin out of the clutch dog. Remove all parts.



1. Pin

006930

Remove the gear, thrust bearing, and thrust washer from the shift housing.

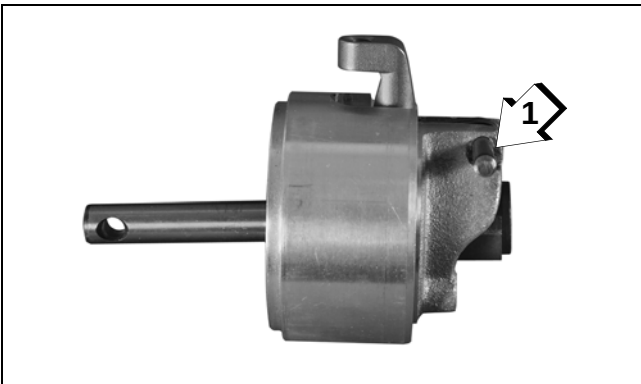


1. Gear
2. Thrust bearing
3. Thrust washer

006931

IMPORTANT: The shift housing supports the reverse gear on counter rotation gearcases.

Remove the shift lever pin from the housing. Remove shift shaft, cradle and shift lever. Move shifter detent as needed to help ease removal of parts.



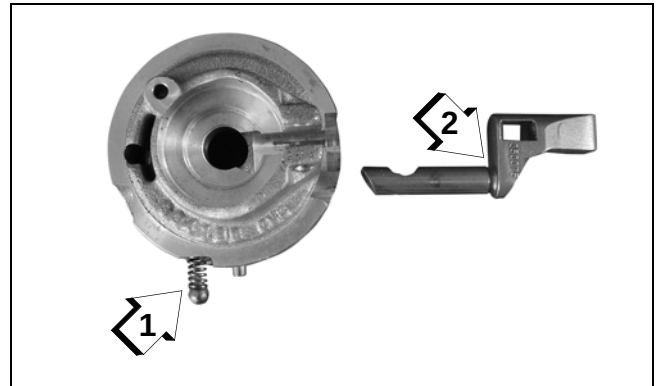
1. Pin

006861

⚠ WARNING

Wear safety glasses to avoid personal injury. The detent ball and spring come out with great force.

Wrap the housing with a shop cloth to catch ball and spring. Pull the shifter detent straight out of the housing.



1. Ball and spring
2. Shifter detent

006932

Remove the detent ball and spring.

Remove needle bearings from bearing housing for cleaning and inspection.

Shift Housing Assembly

IMPORTANT: Clean and inspect all parts before beginning assembly procedures. Replace any damaged parts.

Lightly coat the detent ball and spring with *Needle Bearing* grease. Insert the spring in the housing, then the ball.



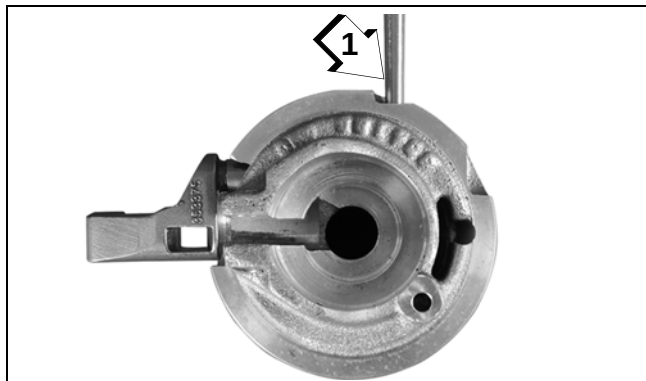
006933

Insert shifter detent into the housing as shown, while depressing the ball and spring with a suit-

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

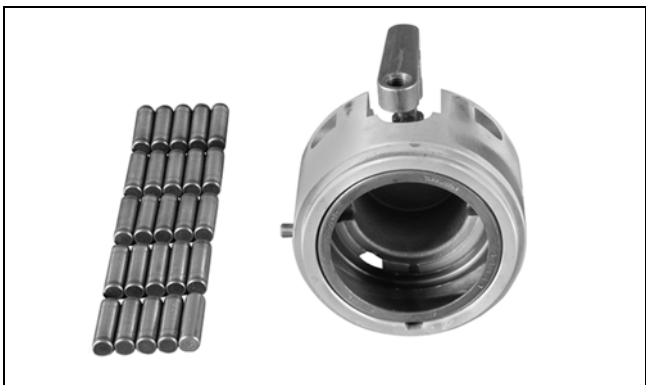
able tool. Once the detent is past the ball, remove the tool and position detent to engage NEUTRAL.



1. Punch

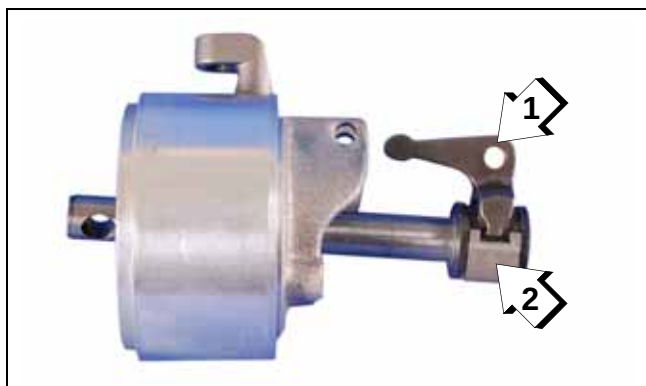
006934

Thoroughly grease 25 needle bearings with *Needle Bearing* grease and place in the bearing case.



006901

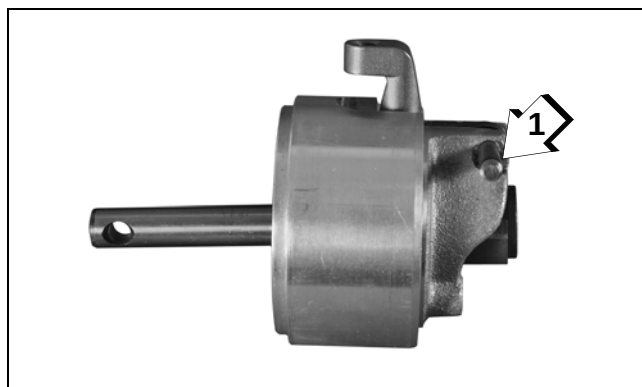
Rest the cradle and shift lever on the shift shaft and insert through the front side of the shift housing.



1. Cradle
2. Shift lever

006860

Install arms of shift lever into detent slots. Align the pivot holes and insert the retaining pin. Push shifter detent down.



1. Pin, shift lever

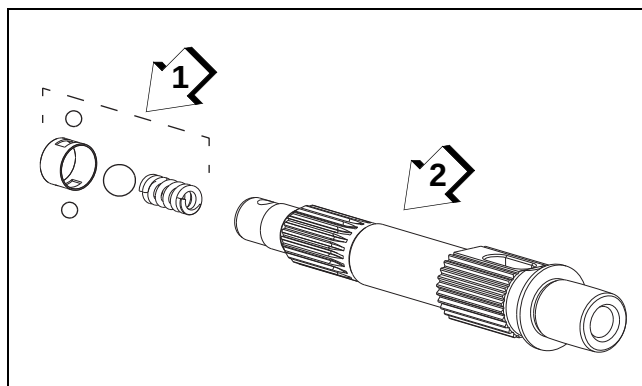
006861

Inspect clutch shaft detent balls, retainer and spring. These parts should not require removal under normal servicing.

⚠ WARNING

Wear safety glasses to avoid injury.

If these parts are damaged or removed, a new service kit should be installed. Refer to parts catalog for kit part number.



1. Clutch Shaft Retainer Kit
2. Clutch Shaft

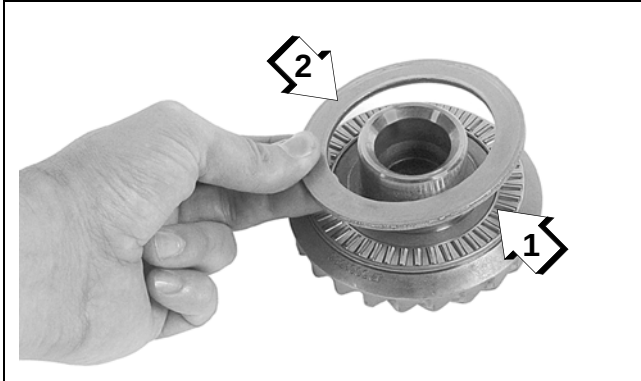
010485

Coat thrust bearing and thrust washer with *Needle Bearing* grease. Place the bearing on the back of the gear. Set the washer on top of the thrust bear-

ing. Insert the gear, bearing, and washer into the bearing housing.

NOTICE

Bearing and washer must be installed in the correct order.



1. Thrust bearing
2. Thrust washer

DSC02297

Align holes in the clutch dog with slot in the propeller shaft. Install the clutch dog on the shaft with "PROP END" facing rear of the shaft.

NOTICE

The clutch dog is not symmetrical. If installed backward, it will not fully engage and will immediately damage itself and the gears.

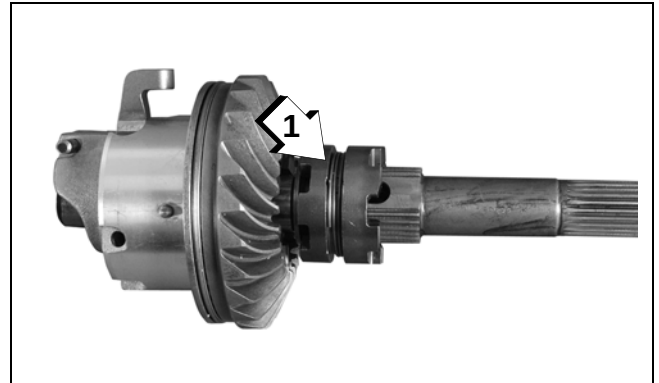


1. "PROP END"

006906

Slide the propeller shaft onto the shift shaft, align the hole in the shaft with the hole in the clutch dog, install the pin and then, a **new** clutch dog retaining spring. Place three coils over each end

of the pin, MAKING SURE NONE OF THE COILS OVERLAP OR ARE LOOSE.



1. Retaining spring

006935

Pinion Bearing

Refer to **Pinion Bearing Installation** on p. 191.

Propeller Shaft Bearing Housing and Forward Gear

Disassembly

Remove and discard the bearing housing O-ring.

Remove the anode and discard if more than two-thirds deteriorated.

Clamp the propeller shaft bearing housing by the anode bosses in a vise, as shown. Remove the forward gear bearing housing assembly from propeller shaft bearing housing. Use Spanner

Gearcase – Counter Rotation

Shifter, Bearing and Seal Servicing

Wrench, P/N 432400, to unscrew in a counter-clockwise direction.

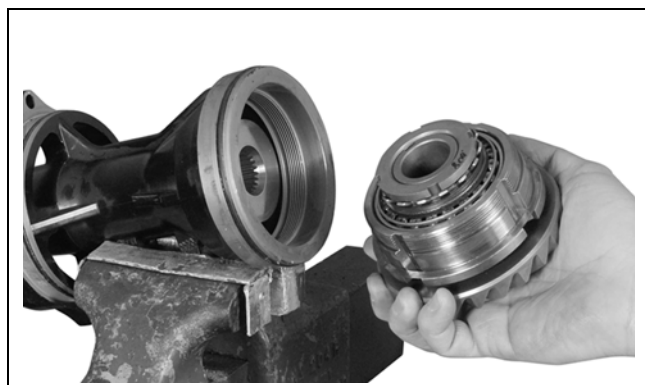


006936

Inspect the forward gear and bearing housing assembly for excessive wear or damage.

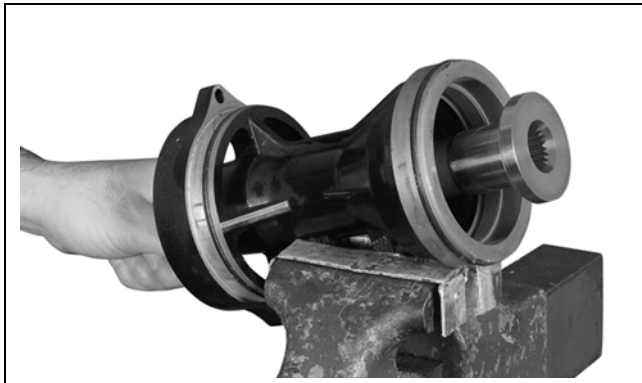


006853



006937

Push propeller shaft out of the bearing housing.



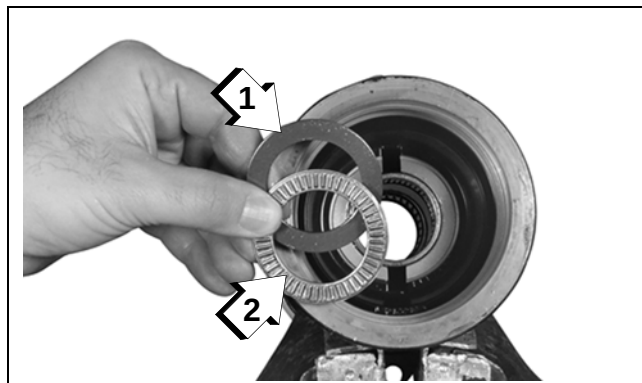
006939

Remove the shim(s).



006852

Remove the thrust washer and thrust bearing.



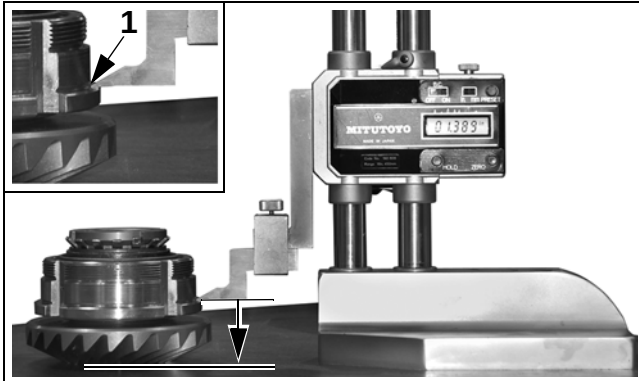
1. Thrust washer
2. Thrust bearing

006940

For seal and bearing service refer to **Propeller Shaft Bearing Housing Service** on p. 196.

Assembly

Position the forward gear bearing housing assembly on a flat, level surface. (Mirror or glass can be used.) Use depth gauge to measure distance from flange of housing to flat surface as shown.



1. Flange

006855

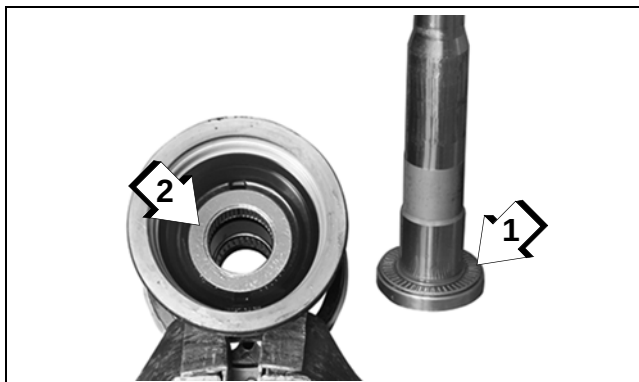
Add the appropriate shims to create a dimension of 0.140 in. (3.556 mm).

To determine thickness of shims; use the following example:

$$\begin{aligned} & \underline{1.389 \text{ in. reading on the gauge}} \\ & + 0.011 \text{ in. shims required} \\ & = 1.400 \text{ in. required dimension} \end{aligned}$$

Apply *Needle Bearing* grease to the thrust bearing. Position bearing around shoulder on the propeller shaft.

Apply *Needle Bearing* grease to the thrust washer. Place washer in recess of bearing housing.



1. Thrust bearing
2. Thrust washer

006941

Coat bearing surfaces of propeller shaft with gearcase lubricant. Slide the propeller housing onto the propeller shaft.

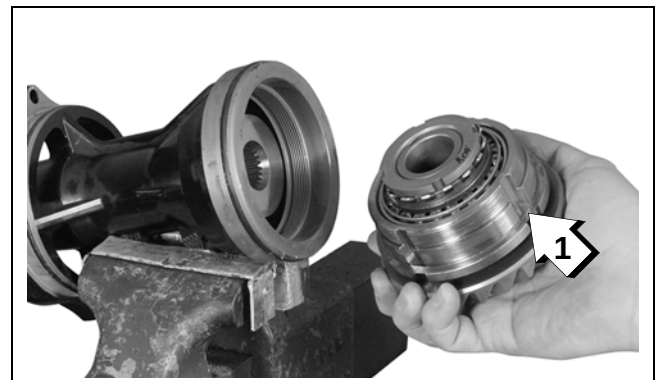


006942

IMPORTANT: Use caution when assembling the propeller shaft in the bearing housing. Thrust bearing must remain around shoulder on the propeller shaft.

Apply gearcase lubricant to the threads of the forward gear bearing housing.

Install forward gear assembly with correct shims in bearing housing.



1. Shim(s)

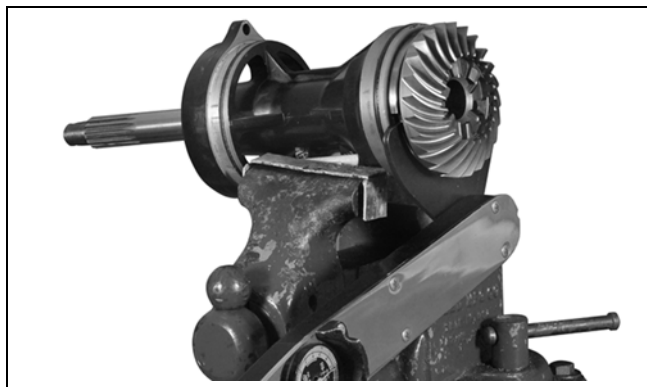
006937

IMPORTANT: To prevent damage to threads, install forward gear bearing housing assembly by hand until fully seated against propeller shaft bearing housing.

Gearcase – Counter Rotation

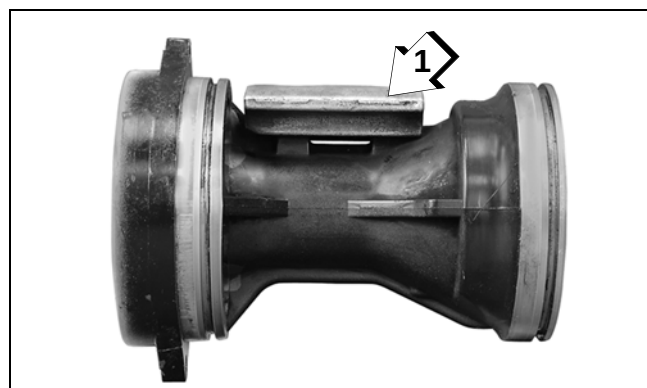
Gearcase Assembly

Use Spanner Wrench, P/N 432400, to tighten the gear assembly to a torque of 100 ft. lbs. (136 N·m).



006943

Inspect the bearing housing anode. Replace anode if it is reduced to two-thirds of original size. Tighten screws to a torque of 108 to 132 in. lbs. (12 to 15 N·m).



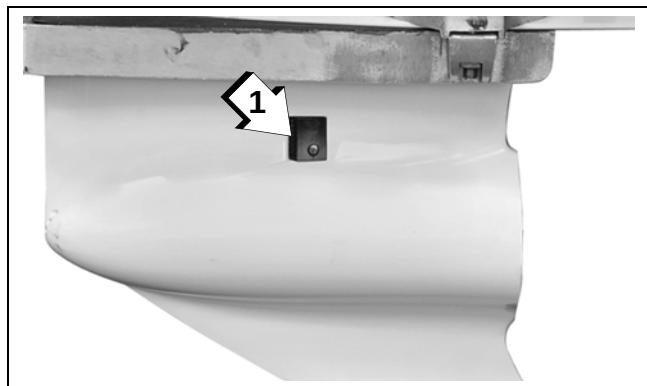
1. Anode

006897

Gearcase Assembly

Water Intake Screens

Install water intake screens. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



1. Water intake screen

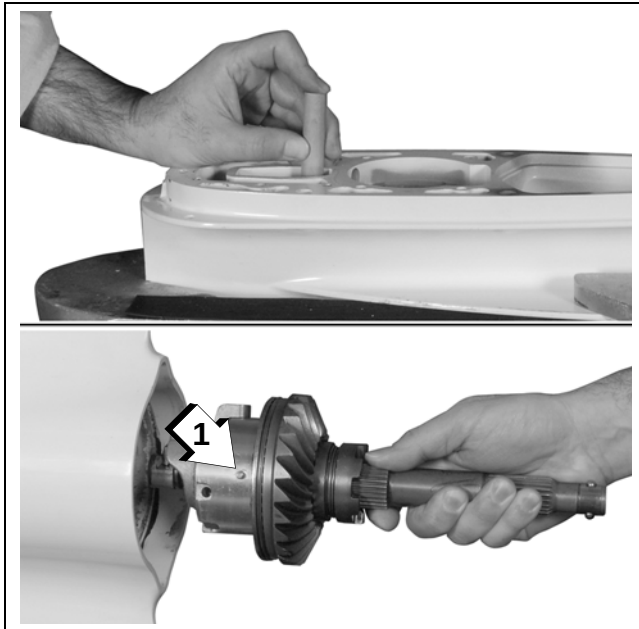
006886

Shift Housing, Gear, and Propeller Shaft Installation

Push shifter detent into farthest downward position. Tip the rear of the gearcase slightly downward to assist in the installation of the shaft assembly.

Be sure the thrust bearing and the thrust washer are in the proper position. Insert the shaft assembly fully into the gearcase while aligning shift

housing pin with hole in forward end of gearcase housing.



1. Pin

006929

Shift Rod Cover

Refer to **Shift Rod Housing Installation** on p. 199

Pinion Gear and Driveshaft Installation

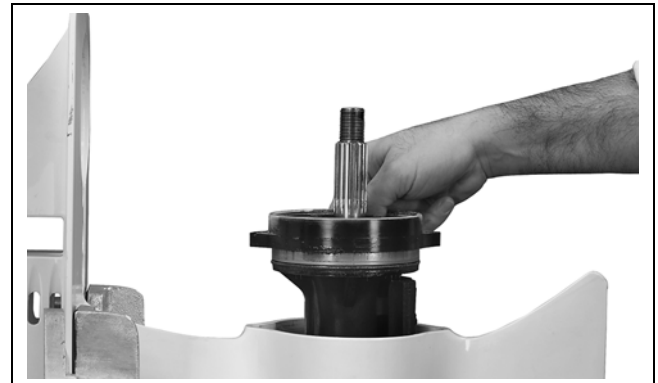
Refer to **Pinion Gear and Driveshaft Installation** on p. 200.

Propeller Shaft Bearing Housing and Gear Installation

IMPORTANT: The propeller shaft bearing housing on “M2” type gearcases is **PRESSED** into the gearcase housing.

Lightly apply *Triple Guard Grease* to new bearing housing O-rings. Install O-rings in grooves in the housing. Grease the machined side surfaces of bearing housing.

Place bearing housing in gearcase.



006846

Align retaining holes in bearing housing with screw holes in gearcase. Thread Alignment Pins, P/N 354140, into gearcase.



1. Alignment pins

006926

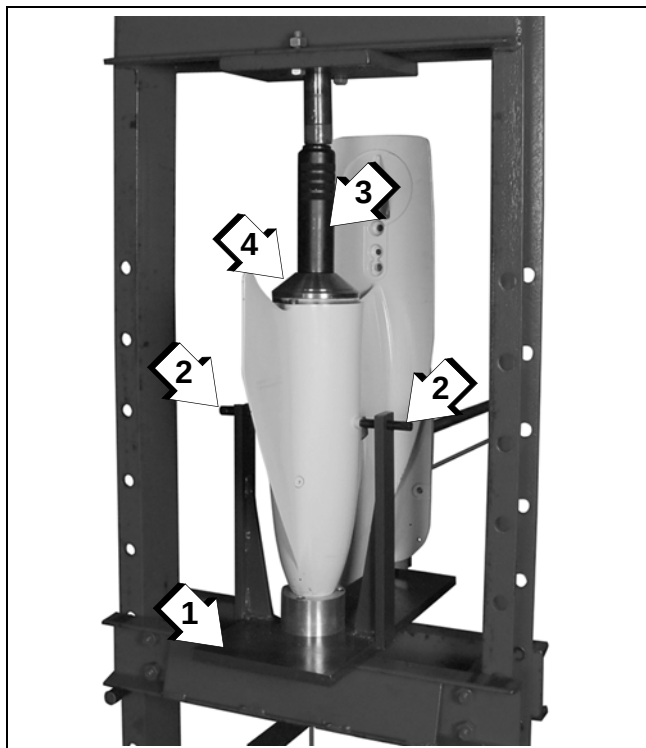
IMPORTANT: To align pinion, clutch dog and forward gears turn driveshaft clockwise while installing propeller shaft bearing housing. Gears **MUST** align for bearing housing to seat completely.

Use Installer Handle, P/N 345822, Propeller Shaft Bearing Housing Installer, P/N 354057, Gearcase Fixture, P/N 354059 and an appropriate floor press (10 ton or greater) to install housing into

Gearcase – Counter Rotation

Gearcase Assembly

gearcase. Align and level gearcase assembly in fixture as shown. Secure fixture to floor press.



1. Gearcase fixture, P/N 354059
2. Vertical alignment screws
3. Handle P/N 345822
4. Housing installer P/N 354057

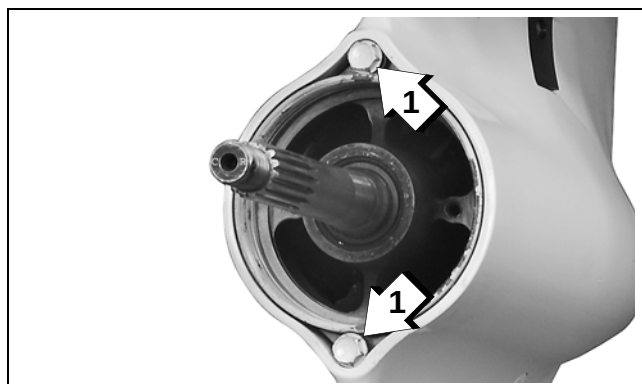
006927

Housing must be completely seated in gearcase to install retainer screws. Bearing housing is approximately level with gearcase.



006928

Apply *Ultra Lock* to threads and install two retaining screws. Tighten screws to a torque of 18 to 20 ft. lbs. (24 to 27 N·m).



1. Retainer screws

006835

Final Assembly and Adjustment

To complete gearcase assembly, refer to:

- **Gearcase Leak Test** on p. 12
- **Water Pump Service** on p. 181
- **Shift Rod Adjustment** on p. 13
- **Gearcase Removal and Installation** on p. 177
- **Gearcase Lubricant** on p. 19
- **Propeller Hardware Installation** on p. 11
- **Trim Tab Adjustment** on p. 18.

During break-in period of a reassembled gearcase, change the gearcase lubricant between 10 to 20 hours of operation.

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Marine Products and the Safety of People Who Use Them

⚠ WARNING

This Safety section contains information relevant to the safety of boaters and people that service boats. Please read this section carefully and share it with all shop technicians. Always follow common shop safety practices. If you have not had training related to common shop safety practices, you should do so not only to protect yourself, but also to protect the people around you.

It is impossible for this manual to cover every potentially hazardous situation you may encounter. However, your understanding and adherence to the recommendations contained in this manual and use of good judgment when servicing outboards will help promote safety. Always be alert and careful: a good foundation for safety.

Enjoyable boating is the goal of people who design and build marine products. To reach this goal, manufacturers are careful to make sure:

- Product user is informed; and
- Products are safe and reliable.

It is up to you, the people who...

- Rig boats;
- Fix machinery; and
- Maintain equipment

...to keep the products safe **and** reliable.

This section talks about safe boating and how you can help make it safe. Some of these safety issues you will know, others you may not.

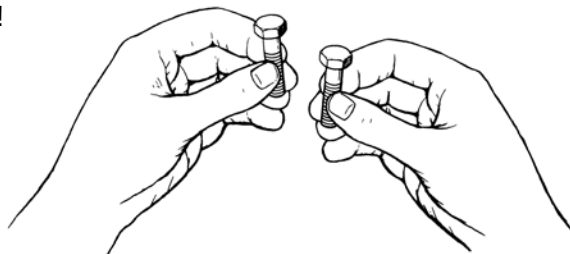
First!

A word about parts... Plain parts; special parts; all parts!

DO NOT SUBSTITUTE PARTS

"They look the same, but are they the same?"

- Same size?
- Same strength?
- Same material?
- Same type?

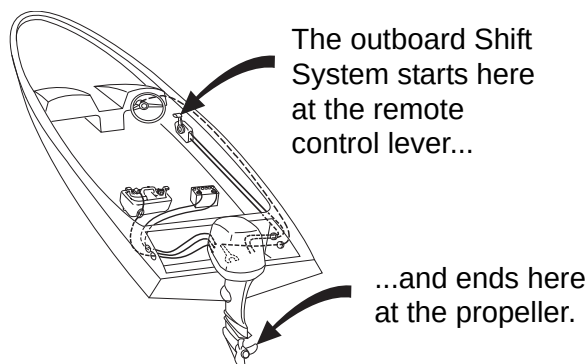


Don't substitute unless **you know** they are the **same** in **all** characteristics.

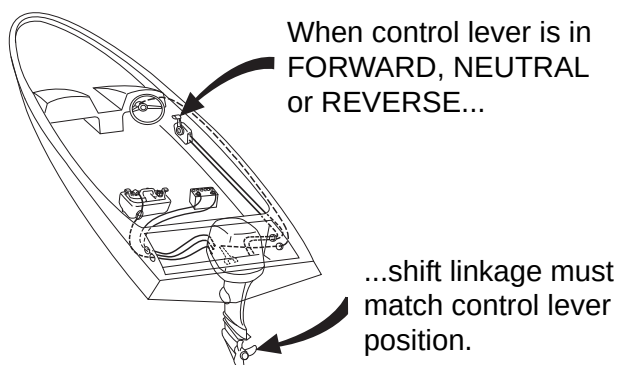
Second!

- Special locking bolts and nuts are often used to hold steering, shift, and throttle remote control cables to the outboard.
- When you take any outboard off a boat, keep track of special nuts and bolts. Do not mix with other parts. Store them on the outboard, then they are there when you need them.

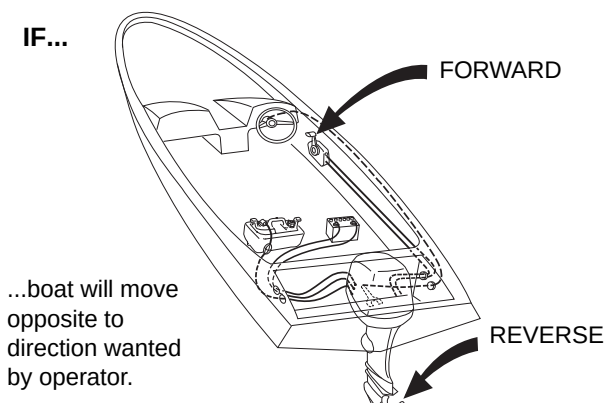
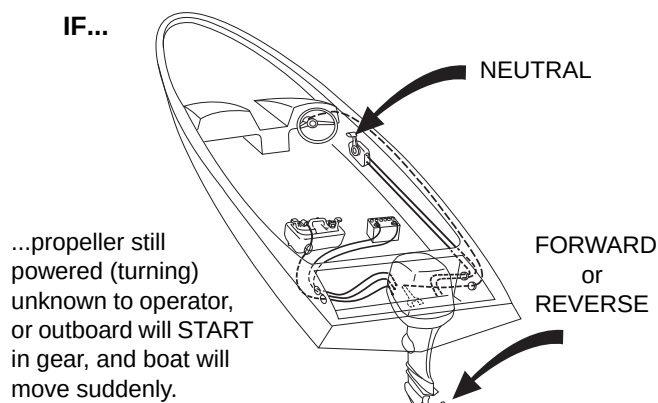
Outboard Shift Systems and Safety



What is most important?



What could happen?



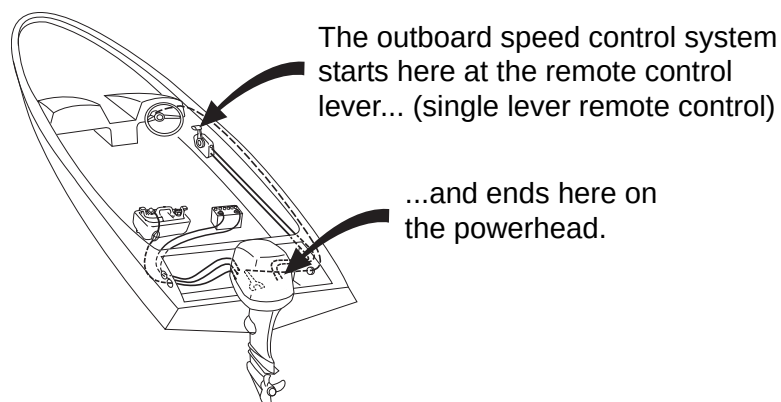
How can loss of shift control be minimized?

When rigging or after servicing

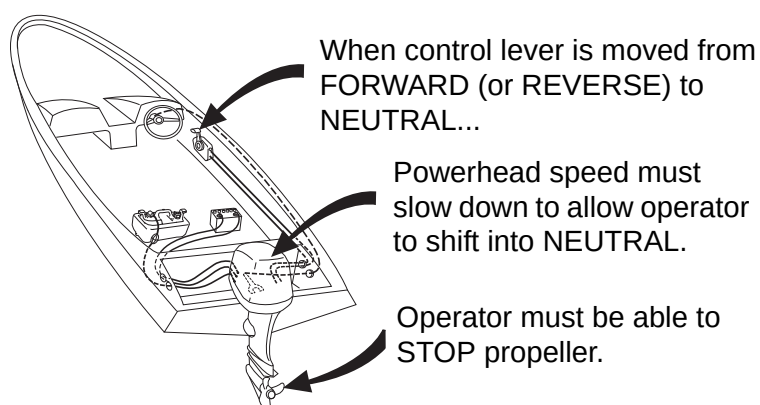
Read, understand, and follow manufacturer's instructions

- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Test your work. Do not guess. Make sure propeller does just what the operator wants and nothing else.
- Do not shift gears on a stopped outboard. Adjustments can be lost and parts weakened.

Outboard Speed Control System and Safety



What is most important?



What could happen?

If Operator cannot slow down the outboard or shift into NEUTRAL gear (stop propeller), Operator could panic and lose control of boat.

How can loss of speed control be minimized?

When rigging or after servicing

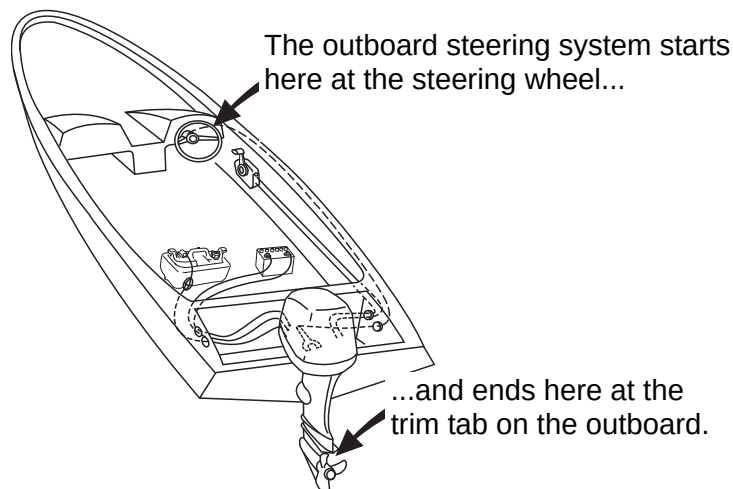
Read, understand, and follow manufacturer's **instructions**

- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Test your work. Do not guess. Make sure speed control system does just what the operator wants and nothing else.
- Make sure full throttle can be obtained so Operator will not overload parts.

Safety

Marine Products and the Safety of People Who Use Them

Outboard Steering Control System and Safety



What is most important?

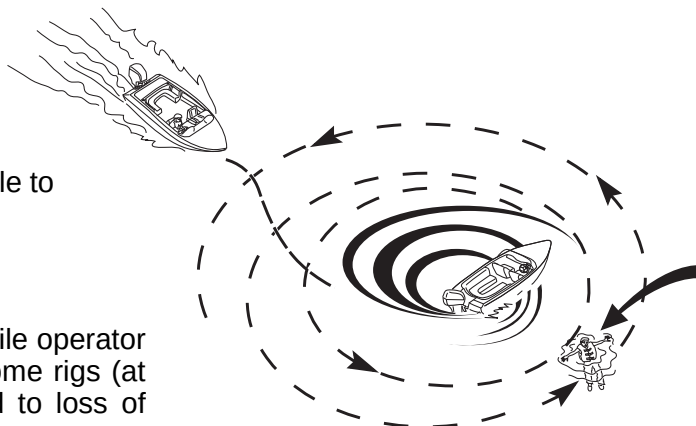
The steering system:

- Must not come apart;
- Must not jam; and
- Must not be sloppy or loose.

What could happen?

- If steering system comes apart, boat might turn suddenly and circle. Persons thrown into the water could be hit.

- If steering jams, operator may not be able to avoid obstacles. Operator could panic.
- If steering is loose, boat may weave while operator tries to steer a straight course. With some rigs (at high speed), loose steering could lead to loss of boat control.



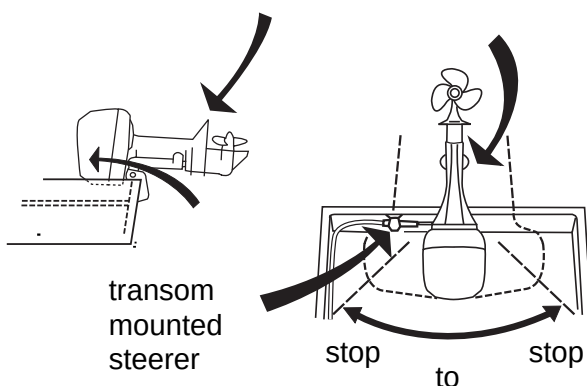
How can loss of steering control be minimized?

**When
rigging
or after
servicing**

- Use a steering system recommended by the outboard manufacturer which meets Marine Industry Safety Standards (ABYC).
- **Read, understand, and follow** manufacturer's **instructions**
- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Keep parts moving freely. Lubricate parts as shown in manual.
- Use the bolts, nuts and washers supplied with steering attachment kits—they are a special locking type that will not loosen, rust, or weaken.

Transom Mounted Steering Systems – Check to Uncover Possible Trouble!

Tilt outboard into boat, then turn it.

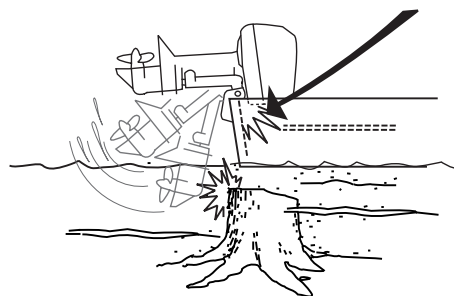


Be aware that raising or lowering outboard on transom can change a set-up which was OK earlier. If moved up or down even one-half inch, run test again to make sure steering parts are free and clear.

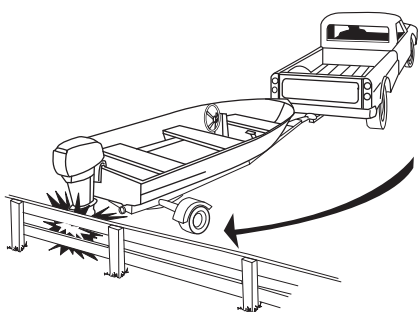
During this procedure, steering parts:

- Must not bind; and
- Must not touch other boat, outboard, or accessory parts in transom area.

Why? A hard blow to the outboard's gearcase can result in damage to steering parts.



Check for damaged parts. Blows to the outboard like this



or this can put heavy loads on steering parts. Look for:

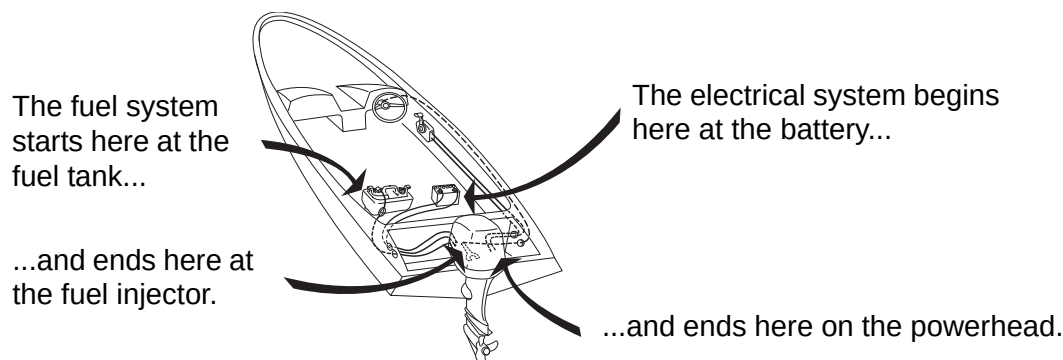
- Cracked parts, including steering parts, swivel brackets, and transom brackets;
- Bent parts; and
- Loose nuts and bolts.

Replace damaged parts. If weakened, parts could fail later on the water when least expected.

Safety

Marine Products and the Safety of People Who Use Them

Outboard Fuel, Electrical System, and Safety



What is most important?

- Fuel leakage must be eliminated.
- Stray electric sparks must be avoided.

What could happen?

- **When not boating**, fuel leaking in car trunk or van, or place where portable tank is stored (basement or cottage), could be ignited by any open flame or spark (furnace pilot light, etc.).
- **When boating**, fuel leaking under the engine cover could be ignited by a damaged or deteriorated electrical part or loose wire connection making stray sparks.

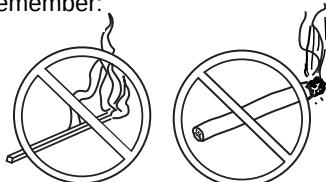
How Can Fire and Explosion Be Minimized?

- **Read, understand, and follow** manufacturer's **instructions**
- Follow warnings marked "⚠" closely.
- **Do not** substitute fuel or electrical systems parts with other parts which may look the same. Some electrical parts, like starter motors, are of special design to prevent stray sparks outside their cases.
- Replace wires, sleeves, and boots which are cracked or torn or look in poor condition.

When mixing and refueling, always mix gas and oil outside...



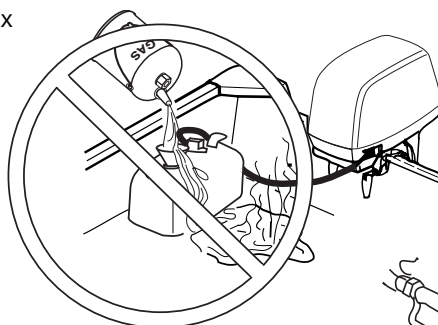
Remember:



Do not use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

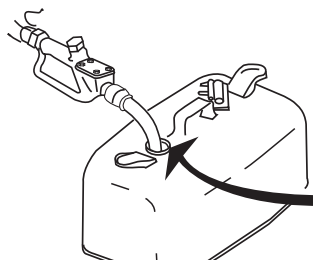


If you use a funnel, it has to be metal to ground the spout to



Always fill the tank outside the boat

Fumes are hard to control. They collect and hide in the bottom of the boat.



To avoid those static electric sparks, ground (touch) the spout against the tank.

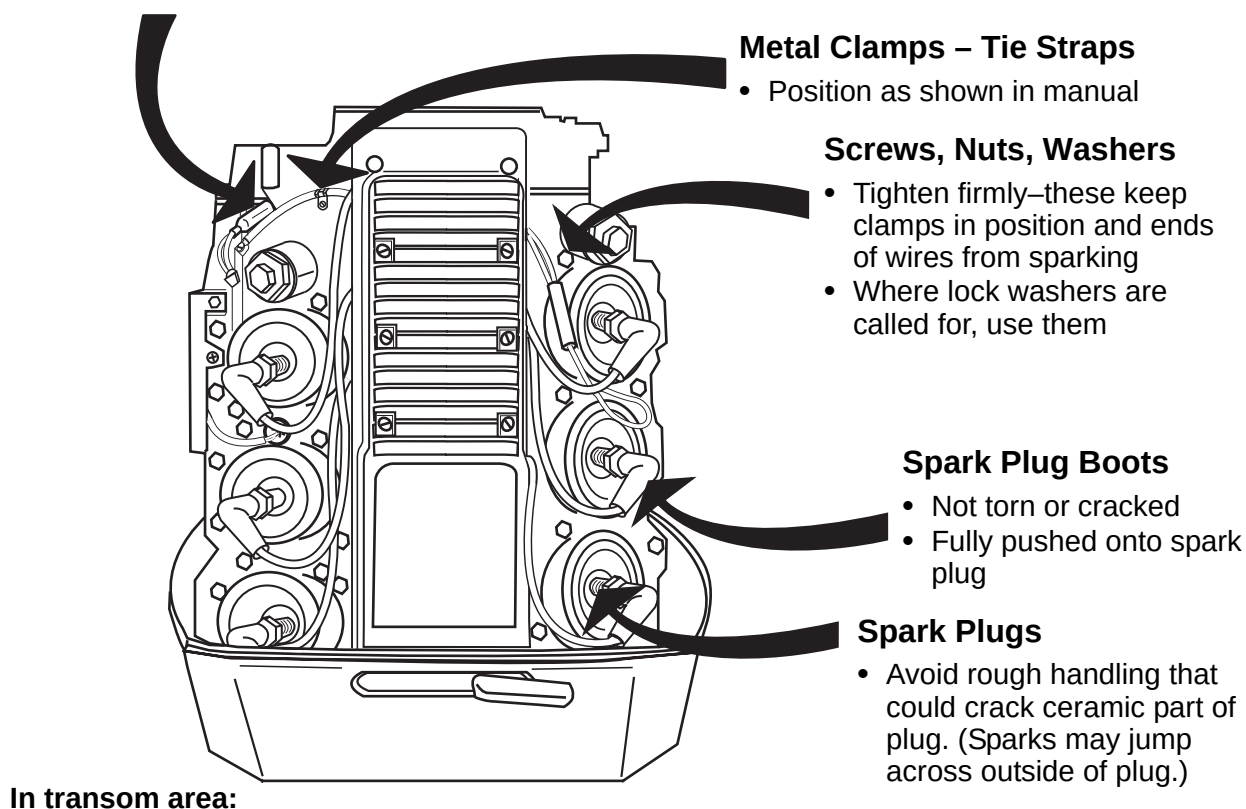
If electrical parts are replaced or even removed from the outboard, check the following:

Wire and high voltage lead routing

- As shown in service manual
- Away from moving parts which could cut wires or wire insulation
- Away from engine cover latches which can catch and cut insulation from high voltage spark plug leads

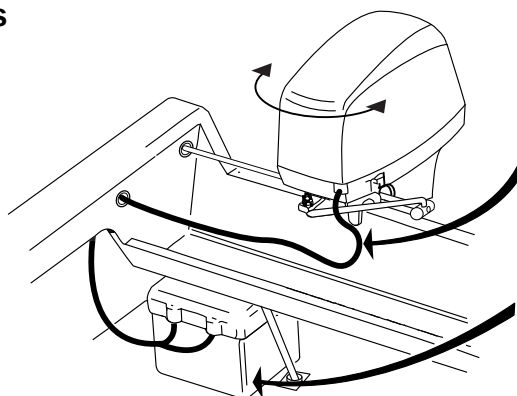
Sleeves, boots, shields

- In position (to avoid shock hazard)
- Not torn or cracked



All Connections

- Clean
- Tight
(Prevents sparks)



Electric Cable

- Not rubbing on sharp objects
- Enough slack to allow full turning without pull loads on cable (prevents sparks)

Batteries

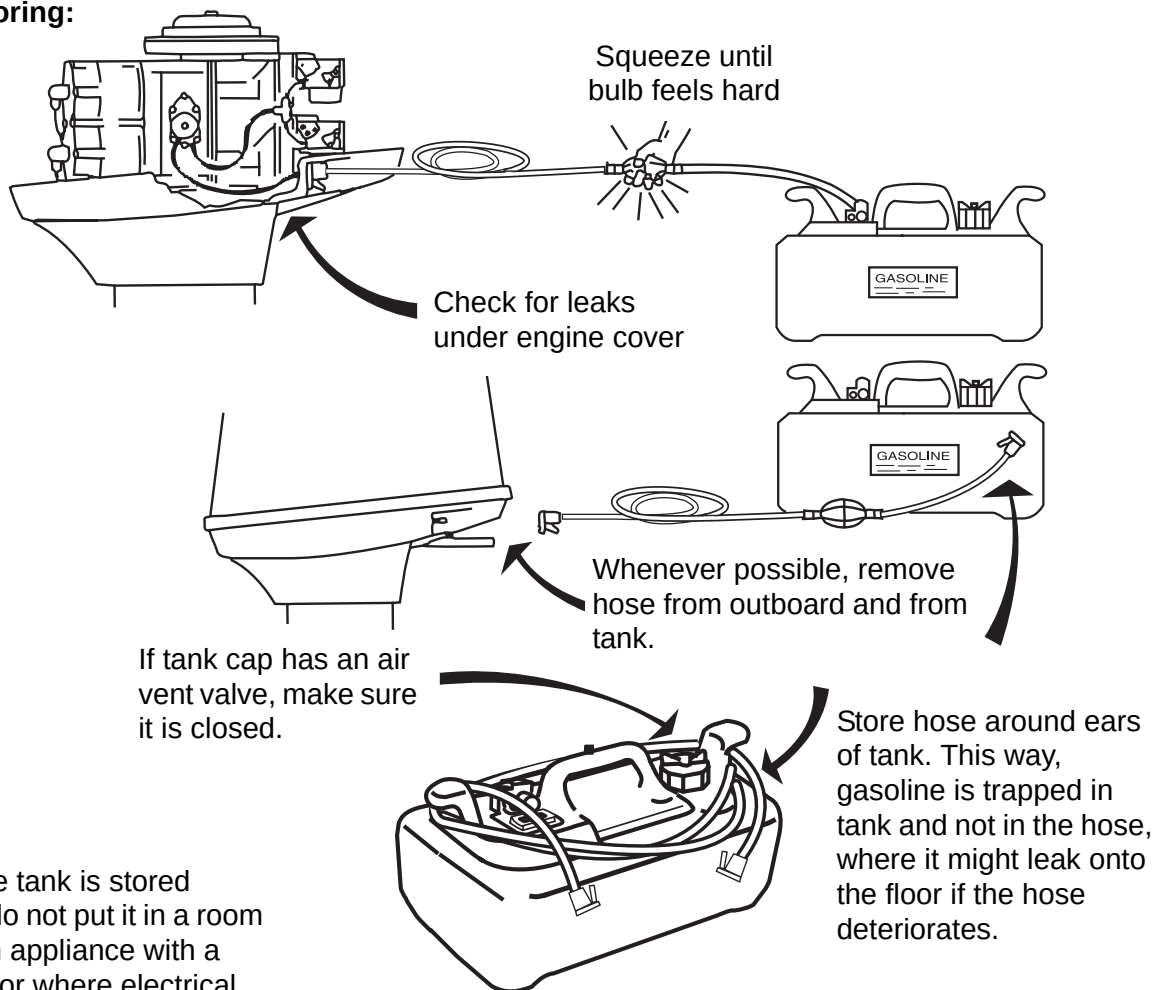
- Secure in approved battery box or battery tray
- Battery terminals insulated
- No strain on cables

Safety

Marine Products and the Safety of People Who Use Them

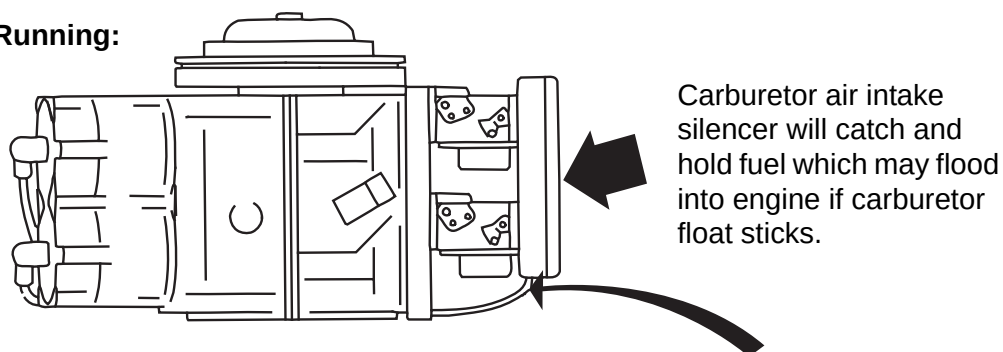
After repair on any part of the fuel system, pressure test engine portion of fuel system as shown:

When Storing:



If gasoline tank is stored indoors, do not put it in a room having an appliance with a pilot light or where electrical appliances or switches (which may spark) will be used.

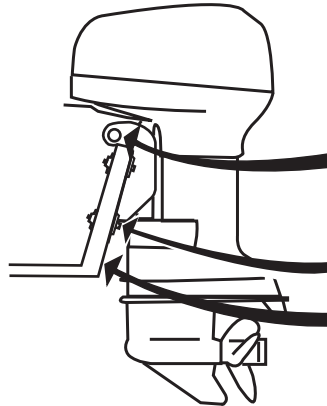
When Running:



- Make sure silencer and its gaskets are on engine and drain hose is in place.
- Air silencer mounting screws are special lock screws. Use only the special screws.

Outboard Mounting System and Safety

The mounting system includes:

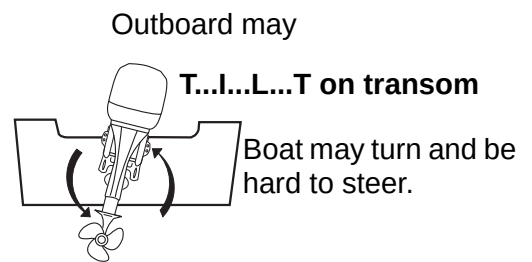
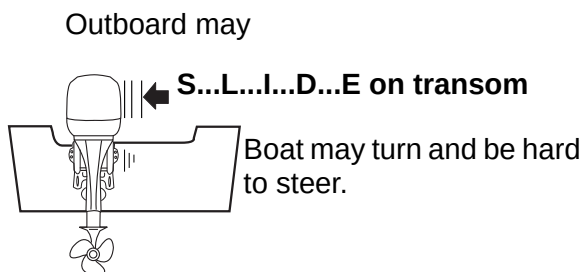


- outboard parts
- bolts, nuts, and washers
- boat's transom

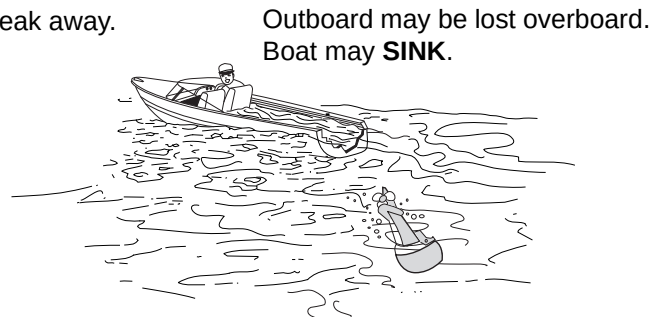
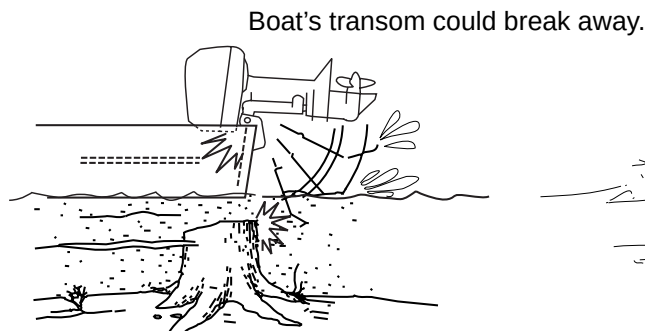
What is most important?

- Outboard must **stay** in position on boat's transom.

What could happen?



- If outboard hits something solid and does not stay on the transom, boat occupants may be injured from the outboard or its parts entering the boat.



S

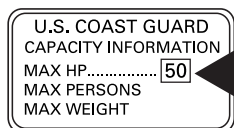
How Can Loss of Mounting Be Minimized?

- **Read, understand, and follow** manufacturer's **instructions**.
- Follow warnings marked "⚠" closely.

Safety

Marine Products and the Safety of People Who Use Them

If weakened, parts could fail later on the water, when not expected

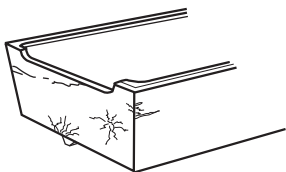


If boat plate shows...

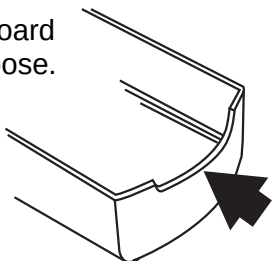
Use only



When rigging or fixing any boat, if transom looks weak, tell the owner.

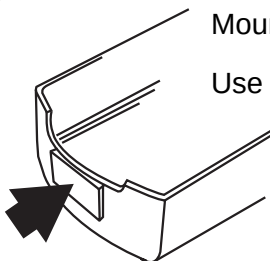


If transom is curved, outboard may come loose.



Mount on flat surface only.

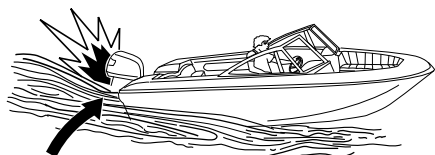
Use shims to make surface flat.



Use bolts, nuts, and washers supplied with outboard. They are usually special, and will not rust or weaken.

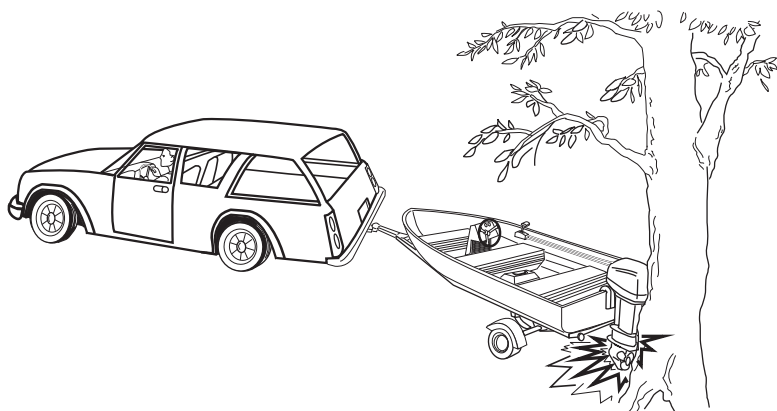


If owner tells you "I hit something really hard..."



Check for a high speed blow to the lower unit.

OR...



"I was backing up and I think the outboard may have hit a tree or something."

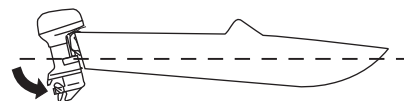
Check for a slow, heavy squash to the outboard.

- Look for damaged parts and loosened nuts and bolts in both the steering and mounting systems. Replace damaged parts.

Outboard Hydraulic Tilt/Trim Shock Absorption System and Safety

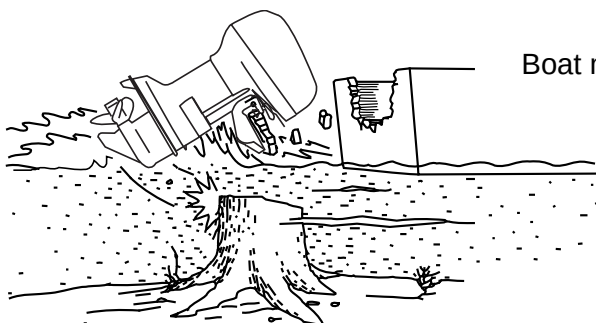
What is most important?

- Shock absorption system must always be ready to absorb some blows to the lower parts of the outboard.
- Outboard must not trim in too far suddenly.



What can happen?

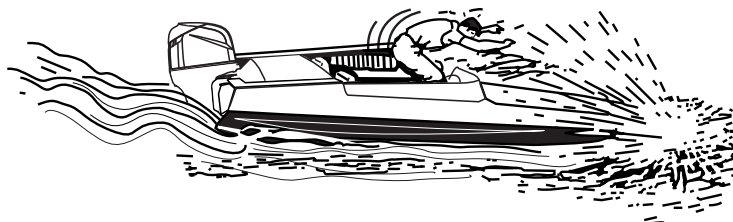
Without shock protection, a blow like this could cause serious damage to the outboard and injury to boat occupants from the outboard or its parts entering the boat. Transom could break away and outboard may be lost overboard.



Boat may **SINK**.



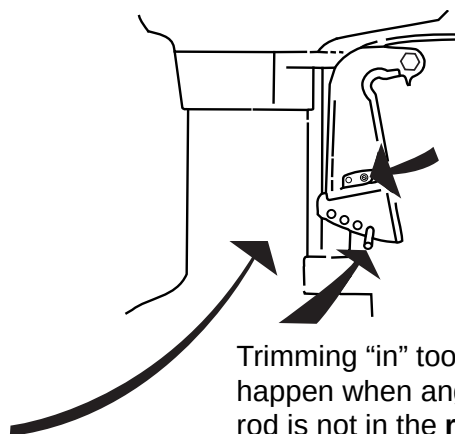
At high speeds, sudden trimming in too far may dive boat under water or spin it around.



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How can possible conditions be minimized?

- **Read, understand, and follow** manufacturer's **instructions**.
- Follow warnings marked "⚠" closely.
- Test your work whenever possible.
- If oil leaks are seen in service areas, determine source. Keep reservoir filled.
- If outboard is hydraulic tilt/trim model, always return rod to hole position determined by boat operator and make sure angle adjusting rod retain is in locked position.



Make sure manual release valve is closed tight. Torque to 45 to 55 in. lbs. (5.1 to 6.2 N·m).

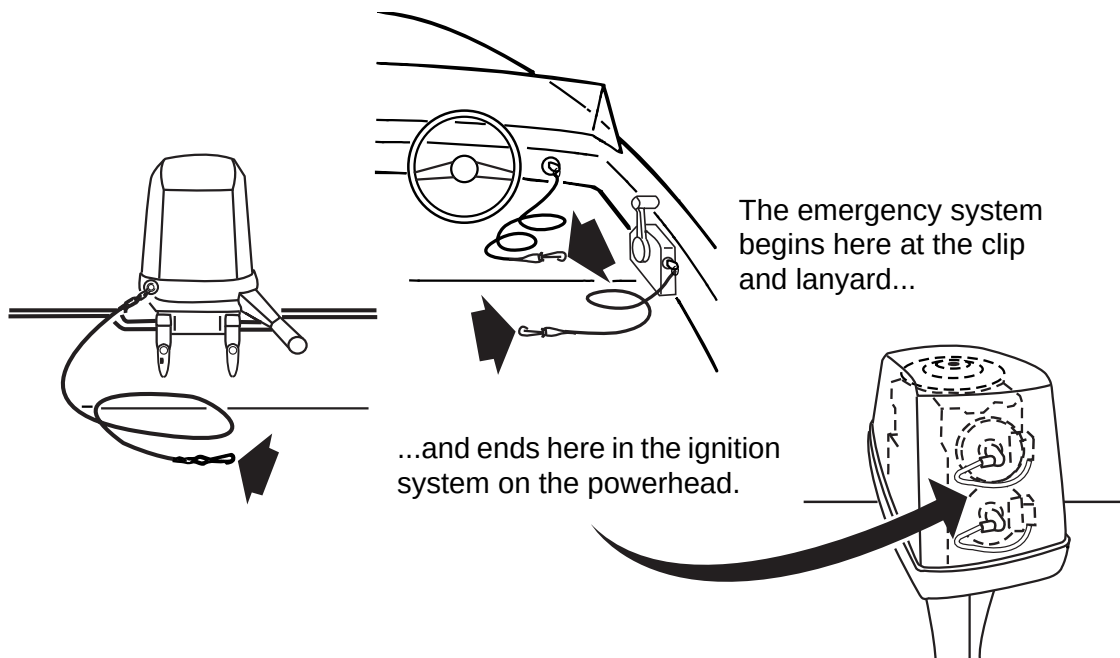
If left open, outboard has no shock protection.

Trimming "in" too far can happen when angle adjusting rod is not in the **right** hole or is not in **any** hole (lost).

Safety

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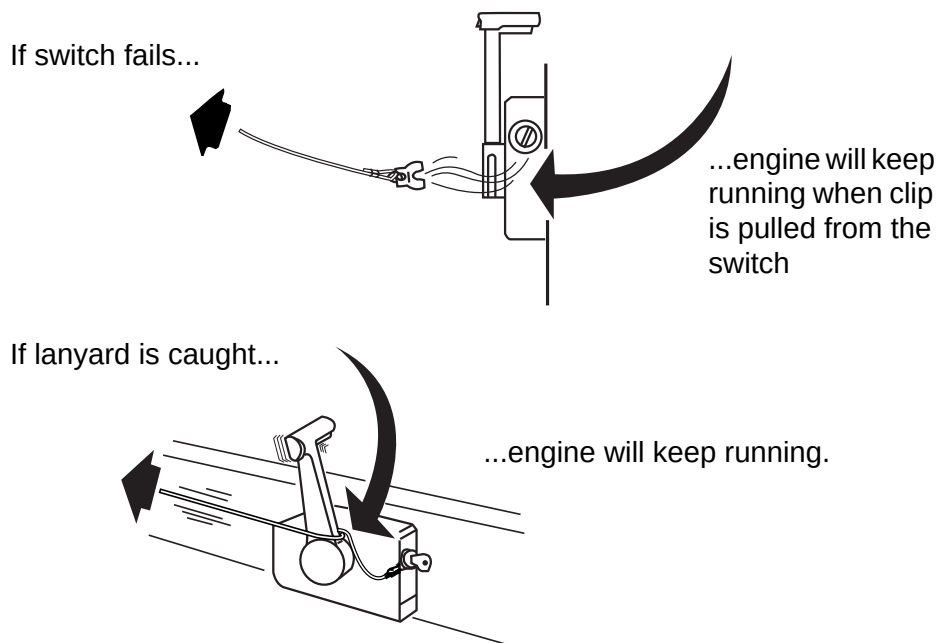
Outboard Emergency Stop System and Safety



What is most important?

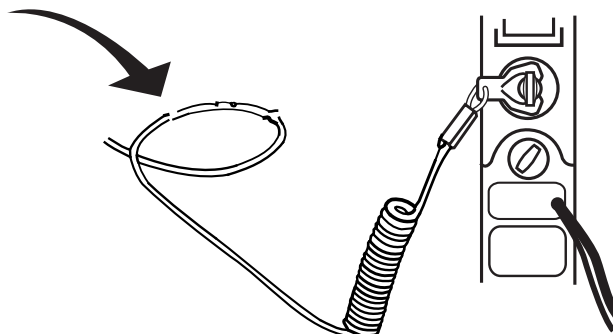
- The emergency stop system must **STOP** the engine when the clip is removed or the lanyard pulled from the emergency stop / key switch.

What could happen?

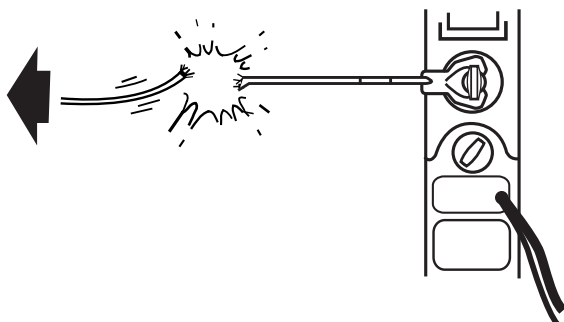


What could happen?

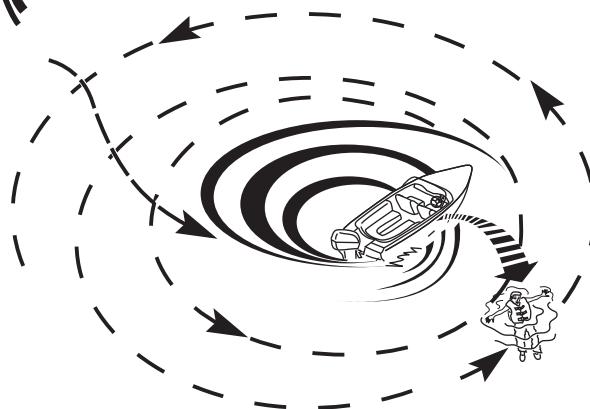
If lanyard is cut or frayed...



...lanyard or clip may break when pulled...



If engine does **NOT** stop when lanyard is pulled, an operator thrown from the boat could be hit as boat circles area. Or, boat may not turn but leave area as a runaway. Operator may drown and boat **WILL** run into something.



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How can failure of the emergency stop system be minimized?

- When rigging or after servicing**
- **Read, understand, and follow** manufacturer's instructions
 - Follow warnings marked "⚠" closely.
 - Assemble parts carefully.
 - Inspect lanyard for cuts or fraying; clip for wear. Replace with original parts. Do not substitute.
 - Locate control box and other items in area to keep lanyard from being caught.
 - **ALWAYS TEST EMERGENCY STOP SYSTEM. PULL LANYARD. ENGINE MUST STOP. IF IT DOES NOT, REPAIR BEFORE NEXT USE.**

Safety

Marine Products and the Safety of People Who Use Them

Summary

Now you know some things that can take the joy out of boating.

No doubt about it—proper safety takes time!

- Reading and understanding instructions
- Re-reading warnings marked “⚠”
- Putting parts together correctly
- Making correct adjustments
- Testing your work

And making sure

- Worn or damaged parts are replaced
- Replaced parts are like originals in every way
- Customer is told of things which need attention

But, do you really want the alternative?

Marine Products and the Safety of People Who Fix Them

The first part of this Safety section talked about safe boating and how you, the technician, can help keep it safe for the boater. But what about you? Technicians can be hurt while:

- Rigging boats
- Troubleshooting problems
- Fixing components
- Testing their work

Some of these safety issues you will know, others you may not.

Handling Outboards

When lifting outboards

Some outboards have a fixed lift bracket bolted to the powerhead. Because outboard will want to hang like this when off the floor...

If engine does not have fixed lifting bracket and you use Universal Puller, P/N 378103, and Lifting Eye, P/N 321537, or Lifting Eye and Adapter Assembly, P/N 396748...

...use only the special hardened screws and washers from the set.

Outboard can drop suddenly if hoist or engine stand are in poor shape, or too small for the job.

Center of gravity

Stand Clear!
It might hit you as it swings.

Regular screws are not strong enough. Screws may break and outboard may drop suddenly.

300 lbs.
(136.1 kg)

V6
455 lbs.
(206.4 kg)

- Make sure shop aids have extra capacity, and keep them in good repair.

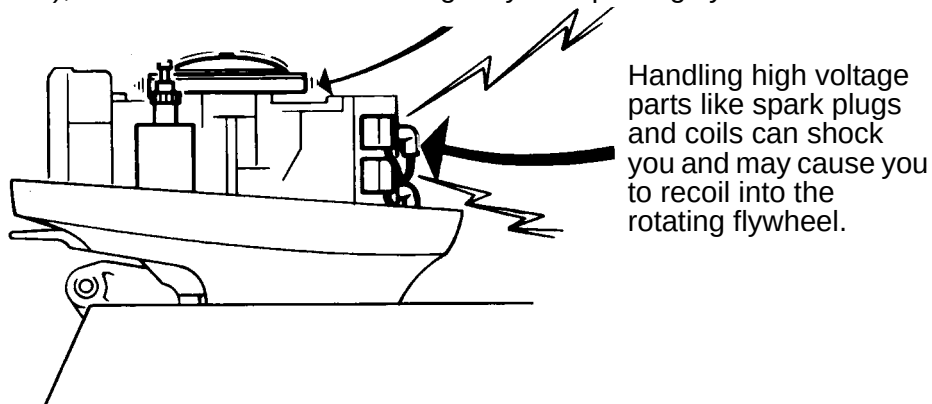
S

Safety

Marine Products and the Safety of People Who Fix Them

Running outboard with engine cover removed

Engine cover is a guard. When you remove cover/guard to work on the outboard, remember: loose clothing (open shirt sleeves, neckties), hair, jewelry (rings, watches, bracelets), hands and arms can be caught by the spinning flywheel.



- Two people working together on a live outboard must look out for each other. Never, ever, use the key to start the outboard before signaling your partner. He may be leaning over the outboard with hands on the flywheel, handling a "hot" electrical part, or near the propeller.

Outboard starting at the wrong time

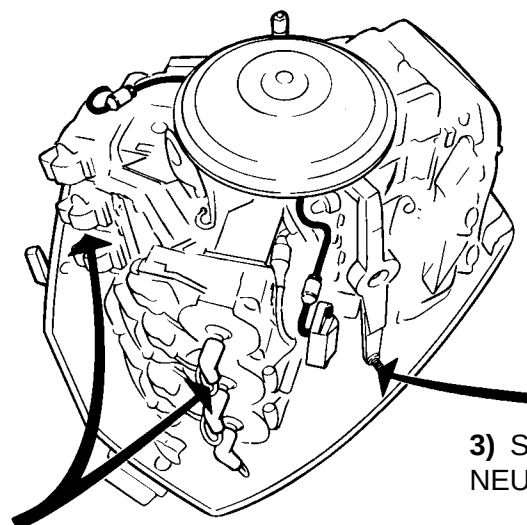
When you do things that turn the flywheel like:

- Off-season storage fogging (oiling) of outboard;
- Removing propeller with a powered tool;
- Electrical system checks;
- Servicing the flywheel; or
- Any other actions **ALWAYS...**

1) Turn key switch OFF

2) Twist and remove ALL spark plug leads

3) Shift to NEUTRAL



Check prop shaft. Is outboard really in NEUTRAL?

NO SPARK



NO START



NO SURPRISES

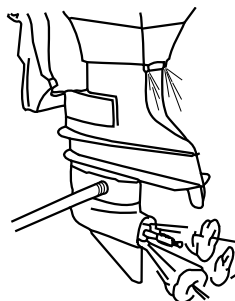
Running outboard too fast (Overspeeding)

- “Too fast” means running faster than outboard normally runs on boat.

Running too fast can happen when:

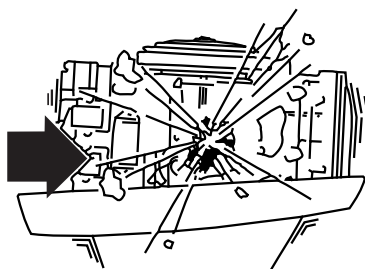
1) Using a flushing device...

Turn on water before starting outboard.
Keep engine speed below 2000 RPM.
With no load, outboard will run too fast very easily. Wear eye protectors.



2) Running with the wrong test wheel...

This may happen if outboard runs too fast.



Use the right test wheel.

Running outboards: Exhaust fumes

⚠ DANGER

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

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- Whenever running the engine, assure there is proper ventilation to avoid the accumulation of carbon monoxide (CO), which is odorless, colorless, and tasteless, and can lead to unconsciousness, brain damage, or death if inhaled in sufficient concentrations. CO accumulation can occur while docked, anchored, or underway, and in many confined areas such as the boat cabin, cockpit, swim platform, and heads. It can be worsened or caused by weather, mooring and operating conditions, and other boats. Avoid exhaust fumes from the engine or other boats, provide proper ventilation, shut off the engine when not needed, and be aware of the risk of backdrafting and conditions that create CO accumulation. In high concentrations, CO can be fatal within minutes. Lower concentrations are just as lethal over long periods of time.

Safety

Marine Products and the Safety of People Who Fix Them

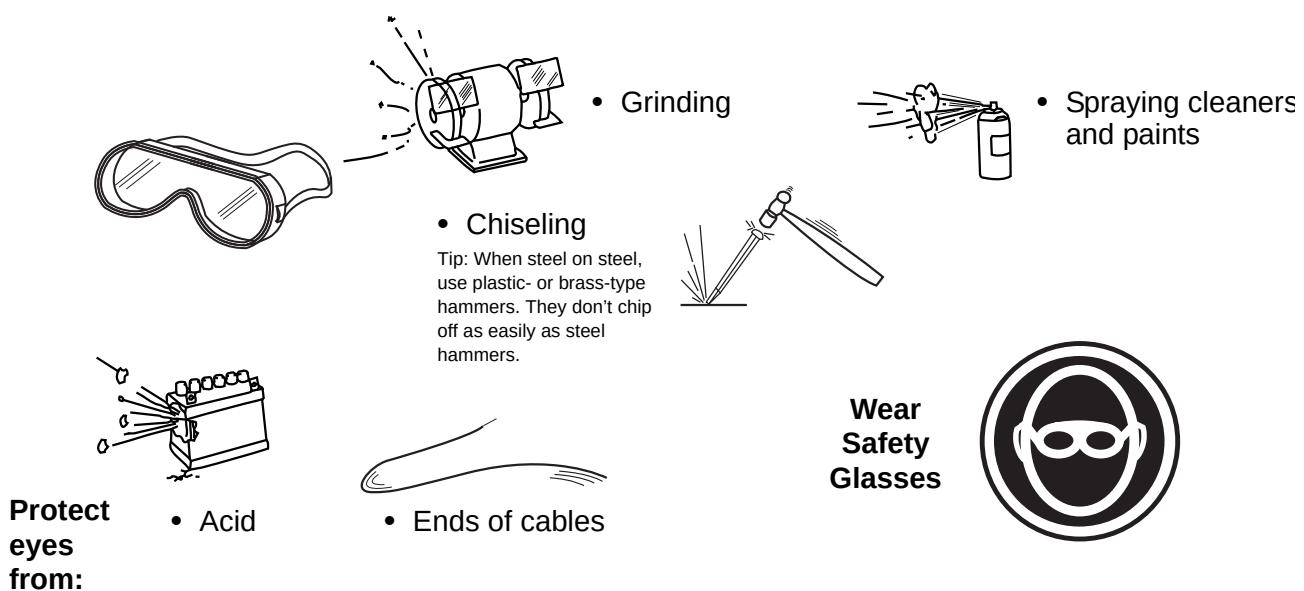
Running outboards: Propellers

⚠ DANGER

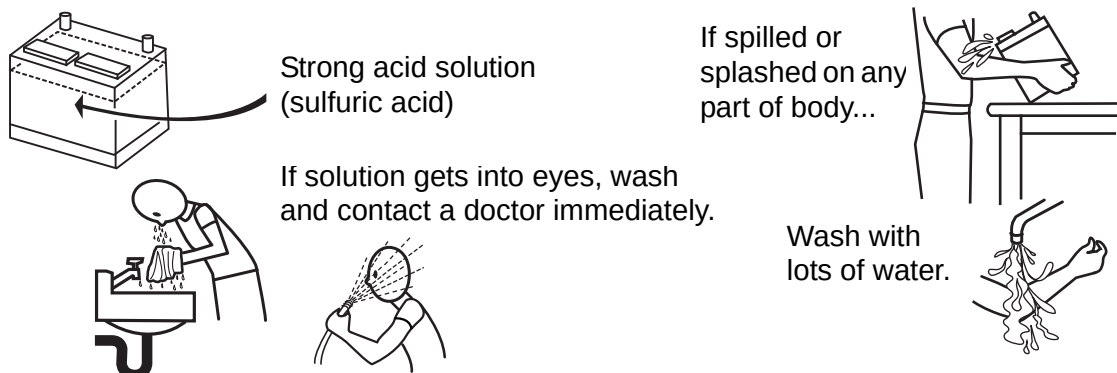
Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Always shut off the engine when near people in the water.

Eye protection

Eyes need protection when:

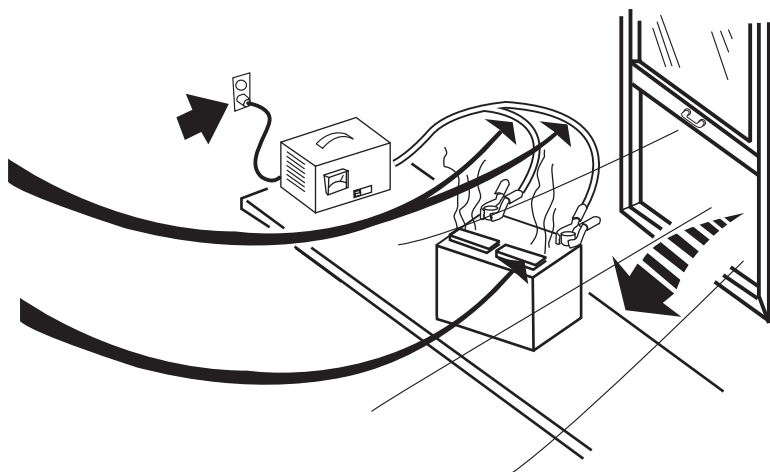


Handling Lead/Acid Batteries



Charging lead acid batteries

- 1) Attach and remove these cables with charger UNPLUGGED from 110 V wall socket. (This prevents shocks if charger is defective.)
- 2) Observe correct polarity when connecting these larger leads.
- 3) Always charge in a well ventilated area. Charging causes acid solution to give off hydrogen gas through the vents in the caps. **Make sure vents are open.** If clogged, pressure inside may build. Battery may EXPLODE.



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Battery gas is explosive!

While charging or discharging, remember:

- No smoking
- No flames
- No sparks



Never remove charger cables from battery posts. It is a sure way to make a lot of sparks in an area surrounded by battery gas.

DO NOT check battery charge by placing metal objects across posts. You will make sparks and serious burns are possible.



After charging:

- Shut off charger
- Pull charger plug out of 110 V outlet
- Take charger cables off battery posts

Safety

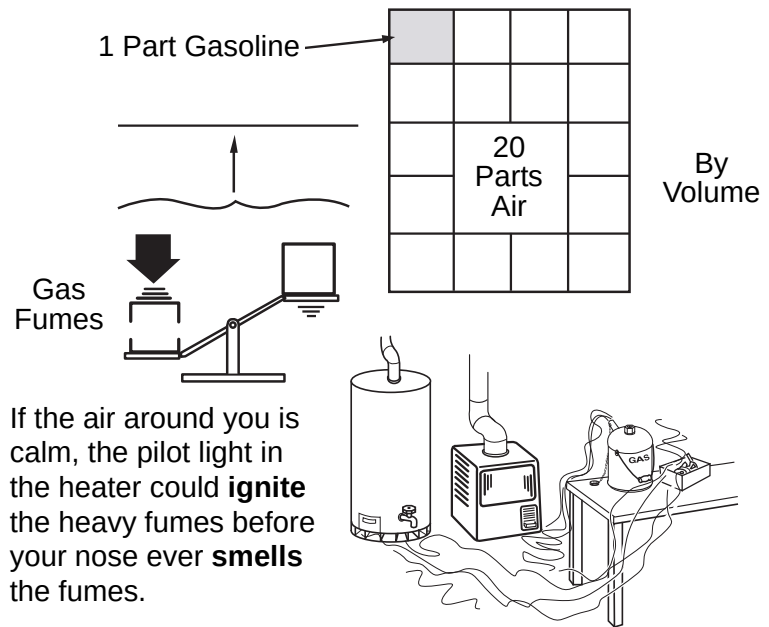
Marine Products and the Safety of People Who Fix Them

Gasoline – Handle With Care!

Gasoline vapor and air mixtures explode easily and violently when mixed as shown...

When you smell ANY odor of gasoline, explosion is possible.

Gasoline fumes are heavy and will sink to the lowest point in the boat or room and will STAY there, WAITING...



What can you do?



Store gasoline in sturdy, approved, sealed gas can and keep outside.

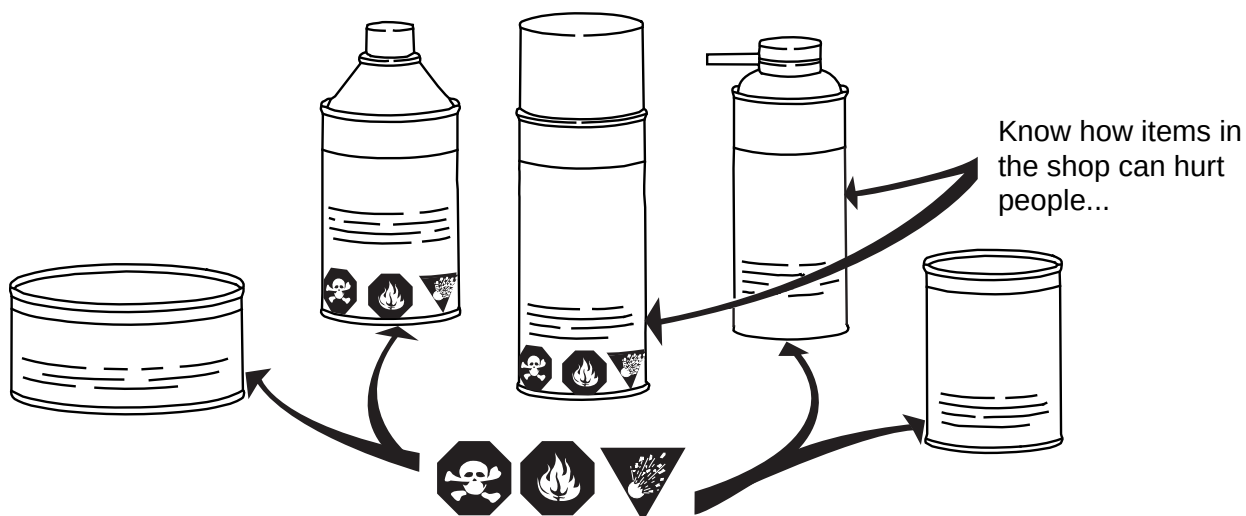
- Always store gasoline outside in a safe can (flame arrester and pressure relief valve in pour spout).
- Fill portable tanks outside of boat. Spillage will collect in bottom of boat.
- Use fuel as fuel **ONLY**, **not** for a cleaner or degreaser.
- If fumes are smelled in shop, basement, or garage, **immediately**:
 - Put out open flames, cigarettes, sparking devices;
 - Wipe up spill or leak;
 - Get towels and rags outside fast;
 - Open doors and windows; and
 - Check **lowest** area for fumes.

Be aware of items in and around repair area which can ignite fumes. Control them if fumes are smelled.

- Matches, cigarettes, blow torches, welders
- Electric motors (with unsealed cases)
- Electric generators (with unsealed cases)
- Light switches
- Appliance pilot lights or electric ignitors (furnace, dryer, water heaters)
- Loose wires on running outboards
- Other variables which may ignite fumes

How many of these are in your repair area?

Hazardous Products

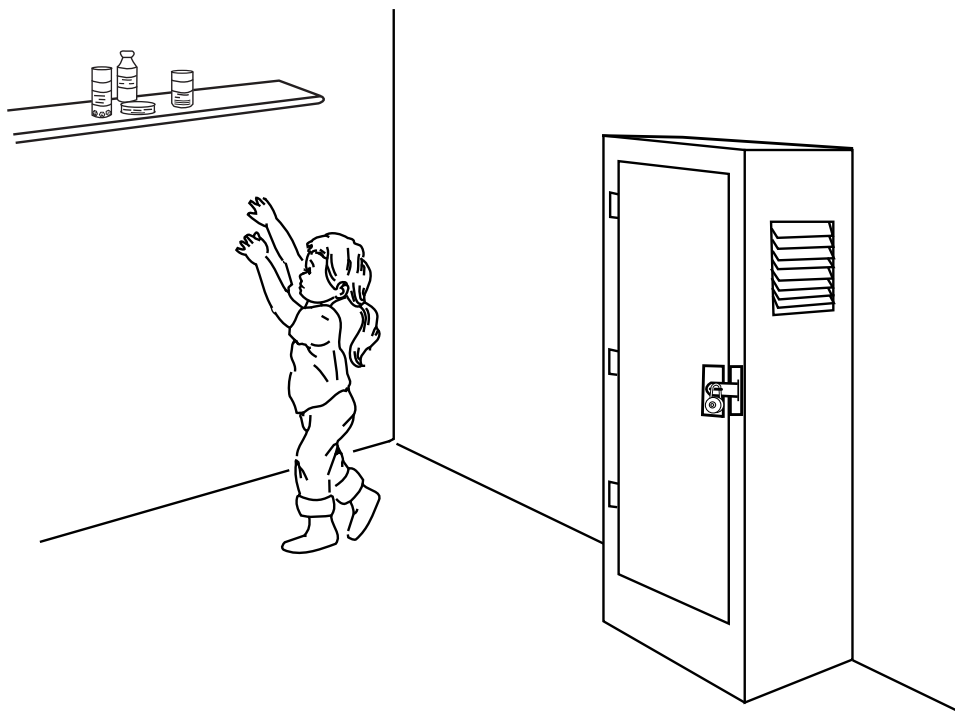


READ

- "How and where to use"
- "How to give First Aid." Have recommended First Aid materials on hand should an emergency arise
- "How to dispose of can"

It's all on the **back of the can or bottle label.**

And remember: Little children are very curious and will try to taste everything so **keep containers away from children!**



Safety Awareness Test

The Technician's Safety Awareness Test...

- 1) Did you read this Safety section from page S–1 to page S–24?
- 2) Are you ready to take responsibility for the safe maintenance practices and procedures of your repair shop, co-workers, and technicians?
- 3) Do you understand all the safety precautions and instructions contained in this entire service manual?
- 4) Will you follow all safety warnings, precautions, instructions and recommendations outlined in this service manual?
- 5) Do you understand that the service manual as a whole and this Safety section, in particular, contain essential information to help prevent personal injury and damage to equipment and your customers?
- 6) Have you received training related to common shop safety practices to protect yourself and others around you?
- 7) When replacement parts are required, will you use *Evinrude®/Johnson® Genuine Parts* or parts with equivalent characteristics, including type, strength and material?
- 8) Are you ready to follow the recommendations in this service manual before you service any boat or outboard?
- 9) Do you understand that safety-related accidents can be caused by carelessness, fatigue, overload, preoccupation, unfamiliarity of operator with the product, drugs and alcohol, just to name a few?

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