

ZEUS STEERING ACTUATOR SEAL KIT

ZEUS 3000 SERIES

IMPORTANT: This document guides our dealers, boatbuilders, and company service personnel in the proper installation or service of our products. If you have not been trained in the recommended servicing or installation procedures for these or similar Mercury Marine products, have the work performed by an authorized Mercury Marine dealer technician. Improper installation or servicing of the Mercury product could result in damage to the product or personal injury to those installing or operating the product. Always refer to the appropriate Mercury Marine service manual for component removal and installation instructions.

NOTE: After completing installation, place these instructions with the product for the owner's future use.

Components Contained in Kit

Qty.	Description
1	Unidirectional seal
1	O-ring and backup ring
2	Groove pin

Additional Required Components (Purchase Separately)

Qty.	Description	Part Number
1	End cap torque fixture	8M6006766
1	Gearcase support assembly kit	8M0155308

NOTE: After use, keep the gearcase support assembly kit parts together for future use.

Items Required If Transmission Fluid Contamination Is Found

Qty.	Description	Part Number
2	Transmission fluid filter kit	87919421

Preparation/Transmission Removal

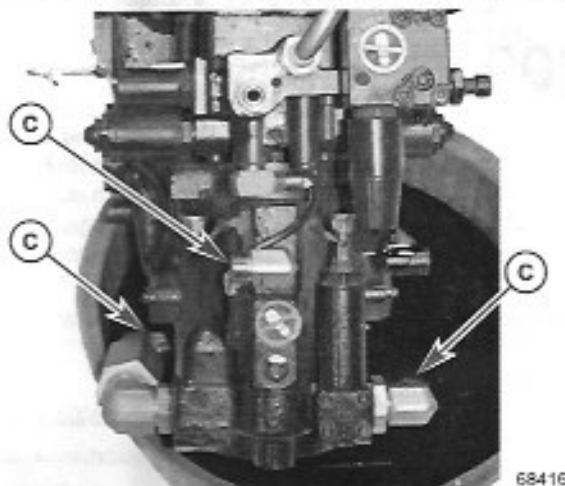
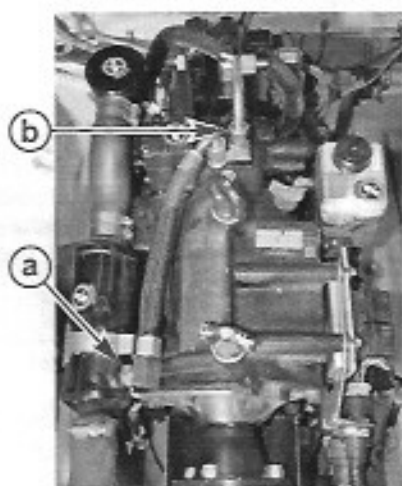
IMPORTANT: Refer to the appropriate service manual for service procedures not detailed herein.

1. Ensure that the boat is positioned over concrete or other hard stable surface.
2. Drain the gear lube bottle into an appropriate container. Dispose of the fluid according to local rules and regulations.
3. Drain the gearcase into an appropriate container. Dispose of the fluid according to local rules and regulations.
4. Drain the fluid from the steering actuator reservoir into an appropriate container. Dispose of the fluid according to local rules and regulations.
5. Remove the transmission. Refer to the appropriate service manual, as required.

NOTE: It is not necessary to completely disassemble the transmission. Remove only those components necessary to remove the transmission assembly from the boat.

- To avoid incorrect reassembly, detach one transmission hose at the cooler and the other at the transmission, as shown. Drain the fluid from the hoses.
- Remove the three hydraulic pump hoses from the fittings on the transmission assembly. Drain the fluid from the hoses.
- Detach or remove other dress components as required.

- Use an overhead hoist or other suitable equipment to remove the transmission from the boat.



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Transmission shown installed (left) and removed (right)

- a - Detach one transmission hose at the cooler
- b - Detach one transmission hose at the transmission
- c - Remove three hydraulic pump hoses from the assembly

6. Collect a sample of transmission fluid, and check it for hydraulic lube contamination. Contaminated fluid will be thick and green in color.

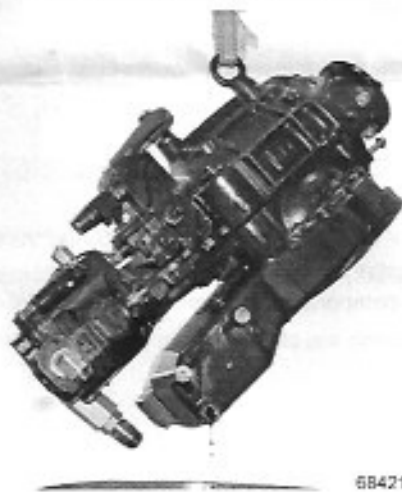
IMPORTANT: A transmission that shows contamination must be fully drained, inspected for a leaking seal, and flushed again after the sea trial.

- If the fluid is contaminated, then complete the steps in **Draining the Transmission** prior to proceeding with the seal replacement.
- If no contamination was found, skip to **Supporting the Gearcase**.

Draining the Transmission

IMPORTANT: If the transmission fluid was found to be contaminated, follow these steps to fully drain the transmission. Otherwise, proceed to **Supporting the Gearcase**.

1. For installations with a drop box, drain the drop box by positioning the transmission horizontally and removing the drain plug on the bottom of the drop box.
2. Use an overhead hoist or other suitable means to support the transmission at a substantial angle, with the drain plug at the lower end.
3. Place a suitable container below the drain plug, and remove the drain plug.



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- Loosen one screw to remove the transmission fluid filter housing cap. Remove and discard the filter and both cap O-rings.



- a - Screw
- b - Transmission fluid filter housing cap
- c - Transmission fluid filter housing
- d - Cap assembly (removed from housing)
- e - Small O-ring
- f - Large O-ring (to access, remove screw and separate cap pieces)

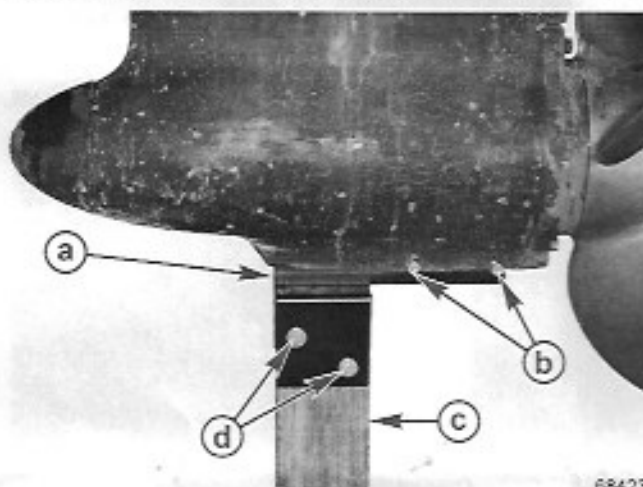
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- Use a clean rag to wipe the interior of the transmission fluid filter housing.
- Allow the transmission to fully drain while performing the **Seal Removal** and **Seal Installation** procedures.

Supporting the Gearcase

IMPORTANT: DO NOT use a forklift or other improvised method to support the gearcase. Use only the following method to support the gearcase. Failure to do so can result in misalignment of the actuator gearset. It is also possible for the entire gearcase and a portion of the Helac® gearset to fall to the surface below, if the gearcase is not properly supported.

- Remove the skag from the gearcase by punching out the groove pins. Discard the groove pins (new pins are supplied in the kit).
- Install the supplied gearcase support assembly in place of the removed skag. Fasten with two 1-1/2 in. screws and nuts (contained in the gearcase support assembly kit, purchased separately).
- Attach a length of 4 x 4 lumber (obtain locally) to the underside of the gearcase support assembly, using the four lag screws (contained in the gearcase support assembly kit, purchased separately).

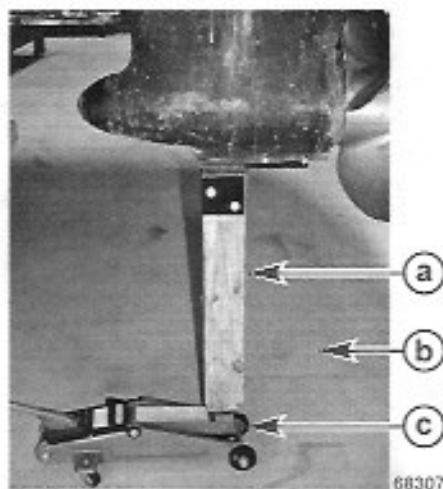


- a - Gearcase support assembly (contained in the gearcase support assembly kit, purchased separately)
- b - 1-1/2 in. screws and nuts (contained in the gearcase support assembly kit)
- c - 4 x 4 lumber (obtain locally)
- d - Lag screws (contained in the gearcase support assembly kit)

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NOTE: Cut the 4 x 4 lumber to a length that is sufficient to span the distance between the underside of the gearcase support assembly and an available floor jack while requiring minimal jack rise to support the assembly.

- Place a fully compressed floor jack below the piece of 4 x 4 lumber. Ensure that the floor jack is on a hard flat surface.



- a - 4 x 4 lumber (obtain locally, cut to length)
- b - Hard flat surface
- c - Floor jack

IMPORTANT: Applying excessive force with the floor jack can damage the bearings in the actuator.

- Use the floor jack to apply only enough force to hold the gearcase in place.

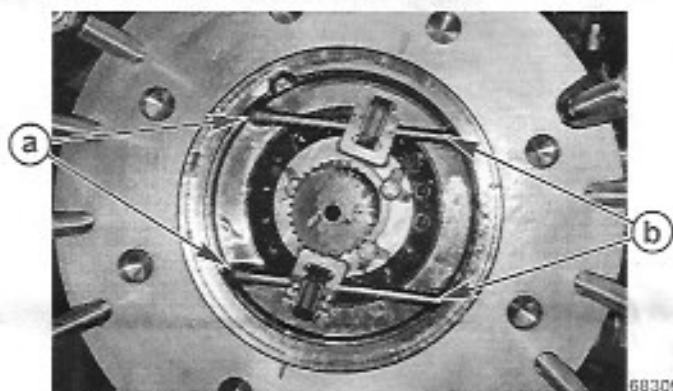
Seal Removal

NOTICE

Avoid catastrophic damage to the steering actuator. Failure to complete this procedure in a timely fashion could result in leakage of the supporting floor jack, thus causing incidental lowering of the gearcase and subsequent significant negative impact on the outcome of this procedure. After removing the end cap, do not delay in completing the procedure.

- Use a 1-1/4 in. socket to loosen the steering position sensors. Remove the sensors from the assembly, being careful to not lose the plastic end caps.

NOTE: It may be necessary to loosen the lube bottle hose fitting to gain access to one of the sensors. The sensors are interchangeable.

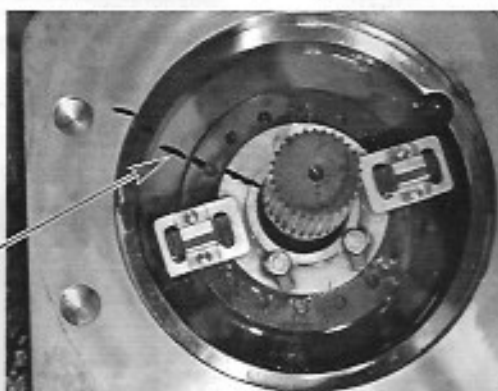


- a - Steering position sensor plastic end caps
- b - Steering position sensors

- Use a hand pump to remove any lube from the top of the actuator. Collect the lube in an appropriate container.
- Use clean disposable rags to wipe the remaining fluid from the cavity. Dispose of the rags and lube according to local rules and regulations.

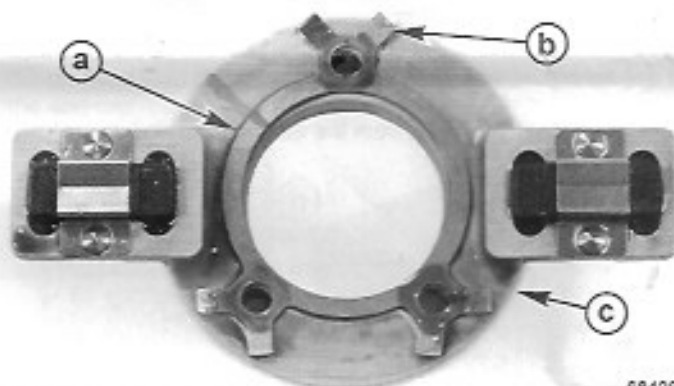
NOTE: Do not allow any debris to enter the actuator cavity.

4. Use a marker to make a witness mark across the actuator parts, to ensure proper alignment during assembly.



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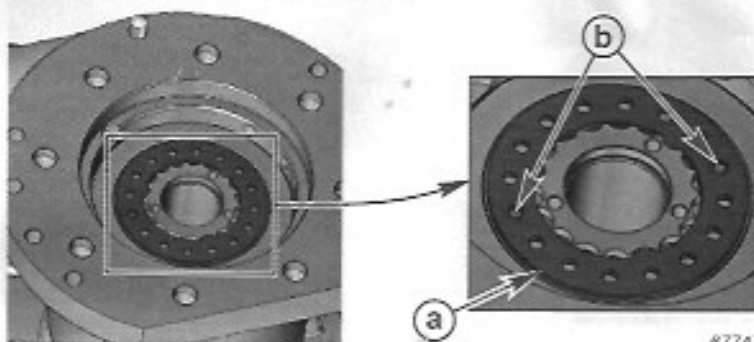
5. Use a flat-blade screwdriver and mallet to lightly push down the three lock tabs on the lock plate ring.
6. Remove three screws, and remove the lock plate ring and the magnet assembly.



- a - Lock plate ring
- b - Lock tab
- c - Magnet assembly

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7. Remove the locking and two staked pins.



- Driveshaft not shown, for clarity
- a - Lockring
 - b - Staked pins (2)

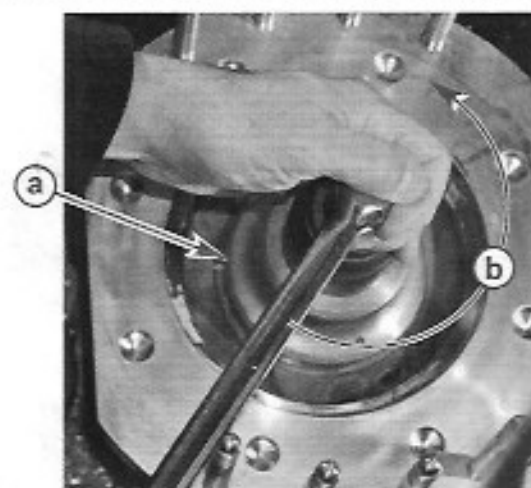
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8. Remove the driveshaft.
9. Use clean disposable rags to wipe the remaining fluid from the cavity. Dispose of the rags according to local rules and regulations.

NOTE: Do not allow any debris to enter the actuator cavity.

10. Stuff a clean rag into the driveshaft cavity, to prevent items from falling in.
11. Ensure that the floor jack is exerting sufficient force to hold the gearcase and steering actuator in place.
12. Use the end cap torque fixture to unthread the end cap counterclockwise.

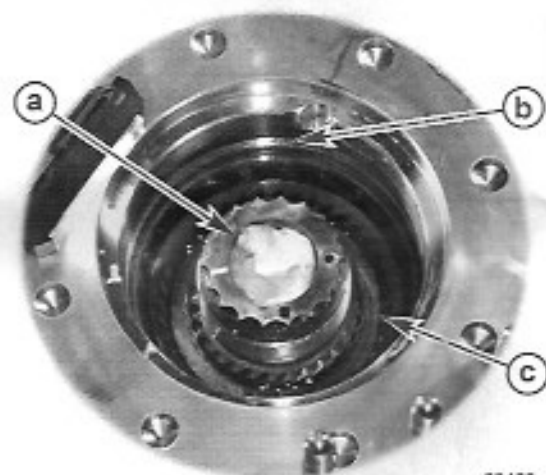
NOTE: The end cap and shaft may rotate together slightly until the piston bottoms out.



- a - End cap torque fixture
- b - Rotate counterclockwise

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13. Clean any remaining fluid from the cavity.
14. Remove the unidirectional seal from the actuator housing.
15. Use a pick to remove the O-ring and backup ring from the end cap.
16. Clean the unidirectional seal area of the actuator bore, removing any debris from the damaged seal. Be careful to not let any debris fall into the actuator.



- a - Clean rag inserted into driveshaft cavity
- b - Unidirectional seal removed and area cleaned
- c - Fluid and debris removed from the cavity

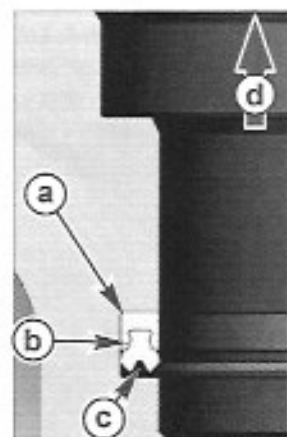
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Seal Installation

IMPORTANT: Ensure that the unidirectional seal is installed with the proper orientation.

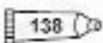
The seal is comprised of two pieces; ensure that the pieces remain together during installation.

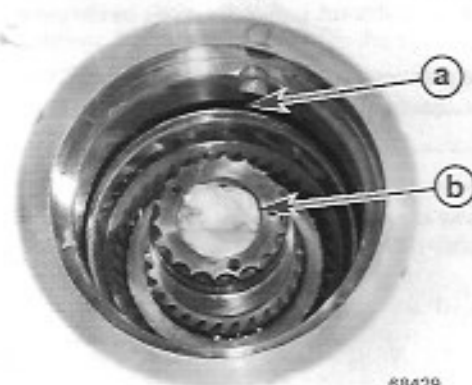
1. Lubricate a new unidirectional seal with Synthetic Power Steering Fluid SAE 0W-30. Install the new seal with the grooved piece facing downward. Keep the two pieces of the seal together during installation.



- a - Upper portion of two-piece unidirectional seal
- b - Lower portion of two-piece unidirectional seal
- c - Groove in lower portion of seal
- d - Top of steering actuator housing

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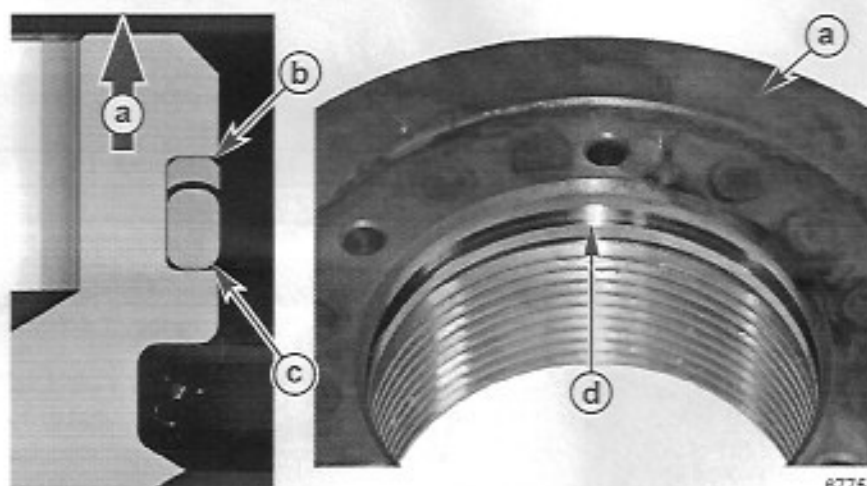
Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Unidirectional seal	92-858077K01



- a - Unidirectional seal installed in steering actuator housing
b - Clean rag inserted into driveshaft housing

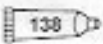
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2. Lubricate the new O-ring and backup ring with Synthetic Power Steering Fluid SAE 0W-30. Position the O-ring against the grooved-side of the backup ring, and install both rings into the end cap, with the backup ring facing toward the top of the end cap.

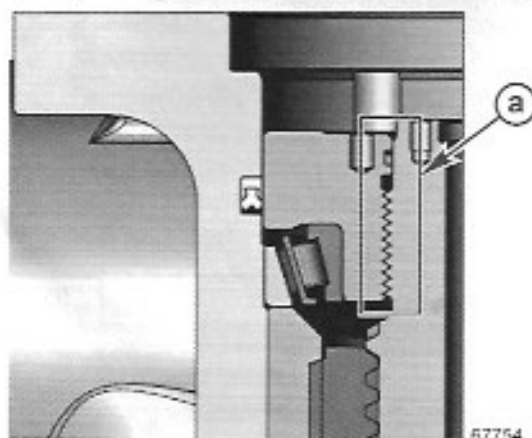


- a - Top of end cap
b - Backup ring (grooved-side down)
c - O-ring
d - Groove in end cap

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
Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	O-ring and backup ring	92-858077K01

3. Use Synthetic Power Steering Fluid SAE 0W-30 to lubricate the surfaces indicated in the following illustration.



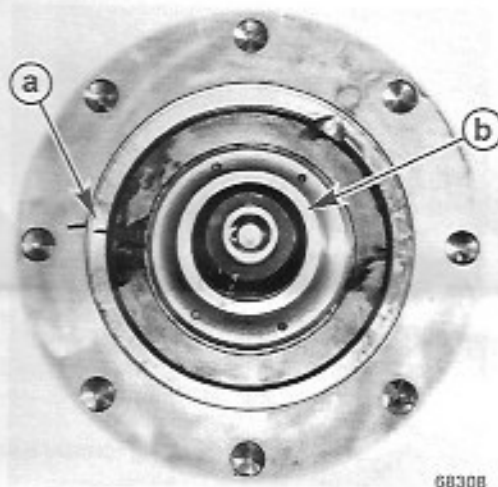
- a - Lubricate with Synthetic Power Steering Fluid SAE 0W-30

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Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	End cap and steering actuator contact surfaces	92-858077K01

IMPORTANT: The original bearing preload torque is 216.9 Nm (160 lb-ft). While installing the end cap, it will be necessary to turn the end cap past the alignment of the witness marks several times before the preload torque is approximated. Do not undertighten the end cap.

4. Use the end cap torque fixture to install the end cap. Tighten the end cap to approximate the original preload torque of 216.9 Nm (160 lb-ft), and then back off to align the witness marks (this should be no more than a fraction of a turn).



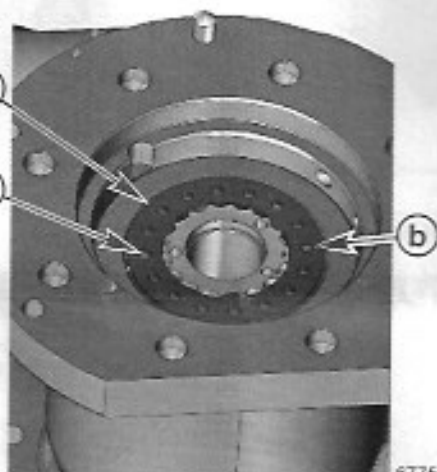
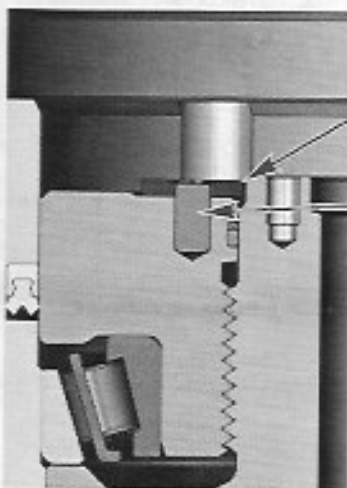
a - Witness marks

NOTE: Marks are enhanced in this photo for clarity. Marks appear slightly offset due to the angle at which the photo was taken.

b - End cap torque fixture

Description		Nm	lb-in.	lb-ft
End cap	First	216.9	-	160
	Final	Back off to align witness marks		


5. Install the locking with the witness marks aligned. If the dowel pins came out, insert them into the dowel pin holes, and stake each pin four times.



a - Locking

b - Dowel pins (2)

6. Apply Loctite 271 Threadlocker to the threads of the lock plate ring screws.


Tube Ref No.	Description	Where Used	Part No.
 7	Loctite 271 Threadlocker	Threads of lock plate ring screws	92-809819

7. Install the lock plate ring (silver) and magnet assembly, and secure with the screws. Tighten the screws to the specified torque.

Description	Nm	lb-in.	lb-ft
Screws	12.2	108	-

8. Use a flat-blade screwdriver to raise the three lock tabs on the lock plate ring, to secure the screws in position.

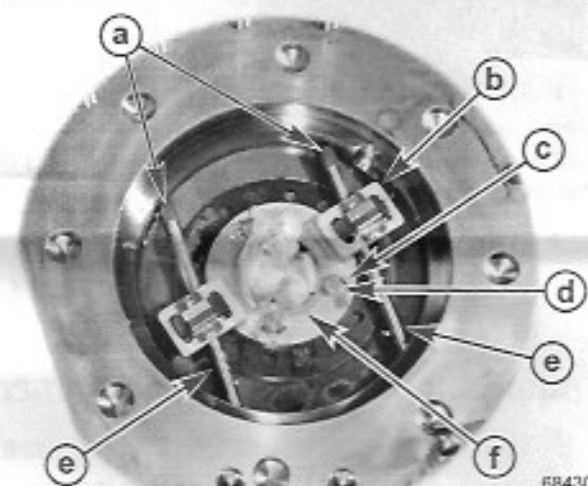
9. Apply 2-4-C with PTFE to the threads of the steering position sensors.

Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Threads of the steering position sensors	92-802859A 1

10. Install the steering position sensors into the steering actuator housing. Ensure that the plastic cap ends are on the sensors. Tighten the sensors to the specified torque.

NOTE: The steering position sensors are interchangeable.

Description	Nm	lb-in.	lb-ft
Steering position sensors	47.5	-	35



- a - Steering position sensor plastic end caps
- b - Magnet assembly
- c - Lock tab
- d - Screw (3)
- e - Steering position sensor
- f - Lock plate ring


11. If the lube bottle hose fitting was loosened to remove the sensors, tighten the fitting.
 12. Remove the rag from the driveshaft cavity.
 13. Install the driveshaft. Ensure that the shaft splines are engaged.

NOTE: The driveshaft will only insert in one direction; the splines are finer on one end than on the other.


Pressure Testing a Contaminated Transmission

IMPORTANT: If the transmission fluid was found to be contaminated, perform these steps prior to installing the transmission in the boat.

1. Flush the fully-drained transmission with a single quart of power steering fluid:
- Add one quart of Synthetic Power Steering Fluid SAE 0W-30 to the transmission through the dipstick opening.

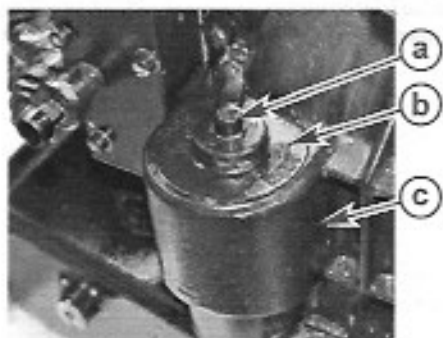
Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Transmission	92-858077K01

- If possible, move the transmission enough to cause the fluid to move about the interior of the transmission.
 - Suspend the end of the transmission higher than the drain plug.
 - Remove the drain plug, and allow the fresh fluid to fully drain.
 - When the fluid is fully drained, install the drain plug.
2. For installations with a drop box, flush the drop box with a single quart of power steering fluid:
- Place the lift eye in the rear lift position, and hang the transmission with the drop box facing downward.
 - Add one quart of Synthetic Power Steering Fluid SAE 0W-30 to the transmission through the dipstick opening.

Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Transmission	92-858077K01

- Remove the drain plug, and allow the fresh fluid to fully drain.
 - When the fluid is fully drained, install the drain plug.
3. Wipe clean the interior of the transmission fluid filter housing.

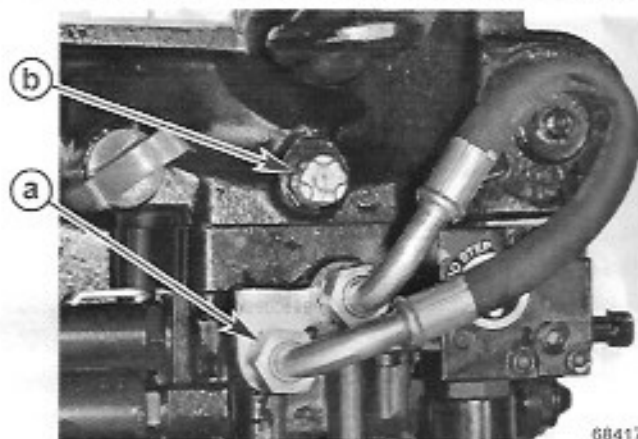
4. Insert a new transmission filter into the housing.
5. Install new O-rings onto the transmission fluid filter housing cap (lubricate with clean power steering fluid), and assemble the cap pieces.
6. Insert the cap onto the transmission fluid filter housing, and tighten the screw to secure the cap.



- a - Screw
- b - Cap
- c - Transmission fluid filter housing
- d - Cap assembly (shown removed from the housing)
- e - Small O-ring
- f - Large O-ring

68420

7. Pressure check the transmission for possible seal failure:
 - a. Temporarily connect the loose transmission hose to the vacant fitting.
 - b. Use a thin, low profile wrench to remove the vent plug.



- a - Temporary connection
- b - Vent plug

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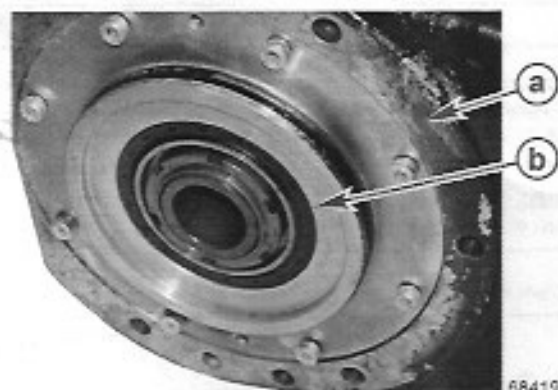
- c. Use a vacuum and pressure tool or other suitable means to apply 34.5 kPa (5 psi) to the transmission through the vent plug hole.



- a - Vent plug hole
- b - To vacuum and pressure tool

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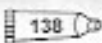
- d. Spray the transmission seal with soapy water and inspect for leaks. If leaks are found, service the transmission accordingly. Refer to the appropriate service manual.



- a - Underside of transmission
b - Transmission seal

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- e. Remove the vacuum and pressure tool, and install the vent plug.
f. Disconnect the temporary transmission hose connection made in step 7a.
8. Fill the transmission with Synthetic Power Steering Fluid SAE 0W-30.

Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Transmission	92-858077K01

Transmission Installation/Final Steps

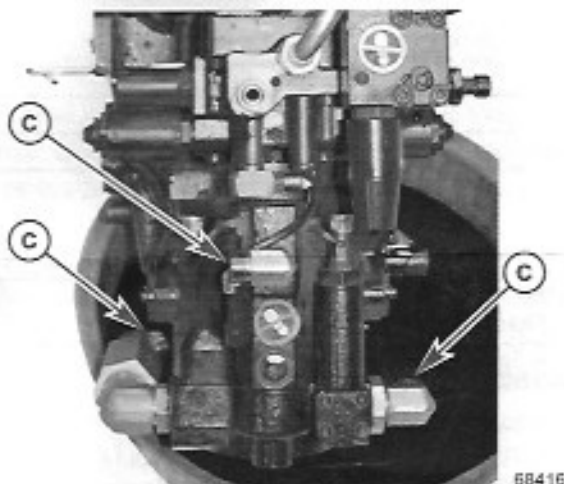
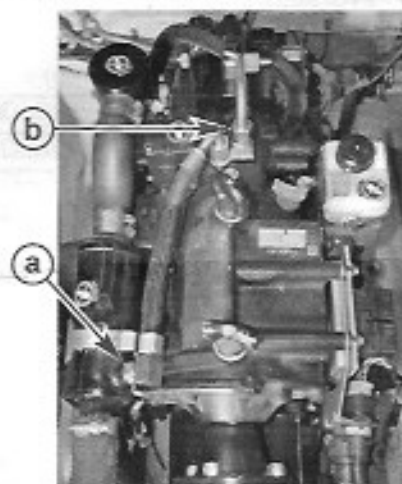
All Vessels

IMPORTANT: Refer to the appropriate service manual, as required, for the following procedures.

1. Install the transmission. Tighten the nuts to the specified torque.

Description	Nm	lb-in.	lb-ft
Transmission nuts	55	-	40.6

2. Install all dress components removed from the transmission and hydraulic pump, including the two transmission hoses and three hydraulic pump hoses.

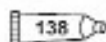


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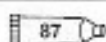
Transmission shown installed (left) and removed (right)

- a - Attach transmission hose at the cooler
b - Attach transmission hose at the transmission
c - Attach three hydraulic pump hoses
3. Remove the jack and support fixture.
4. Install the skeg with the new groove pins (supplied in the kit).
5. If the steering actuator fluid was found to be contaminated, flush the hydraulic system. Refer to the appropriate service manual.

6. Fill the hydraulic tank to the proper level with Synthetic Power Steering Fluid SAE 0W-30.

Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Hydraulic tank	92-858077K01

7. Fill the gearcase with High Performance Gear Lubricant. Refer to the appropriate owner's manual or service manual, as required.

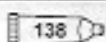
Tube Ref No.	Description	Where Used	Part No.
 87	High Performance Gear Lubricant	Gearcase	92-858064K01

8. Put the boat in the water.

Additional Instructions if Transmission Fluid Was Contaminated

IMPORTANT: These steps must be performed only if the transmission fluid was found to be contaminated. Otherwise, skip to the Sea Trial.

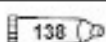
- Ensure that a new transmission filter has been installed.
- Check the transmission fluid level and add fluid as required.
NOTE: Check the level with the dipstick resting in the opening, not threaded in.
- Start the engine and run it for one minute. Shut off the engine, check the hydraulic reservoir, and add fluid as required.
- Start the engine and run it for five minutes. Shift through forward, neutral, and reverse five times.
- Turn off the engine.
- Drain the transmission (and drop box, if equipped) through the drain plugs. Dispose of the fluid according to local rules and regulations.
- Fill the transmission with Synthetic Power Steering Fluid SAE 0W-30.

Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Transmission	92-858077K01

- Start the engine, and perform a sea trial for 10-15 minutes.
- Drain the transmission (and drop box, if equipped) through the drain plugs. Dispose of the fluid according to local rules and regulations.
- Replace the transmission fluid filter and O-rings. Tighten the filter cap screw to the specified torque.

Description	Nm	lb-in.	lb-ft
Transmission fluid filter cap screw	7	62	-

11. Fill the transmission with Synthetic Power Steering Fluid SAE 0W-30.

Tube Ref No.	Description	Where Used	Part No.
 138	Synthetic Power Steering Fluid SAE 0W-30	Transmission	92-858077K01

Sea Trial (All Vessels)

- Perform a sea trial, to test the repair.
 - Connect CDS G3 and monitor the transmission input speed sensor (TISS) and transmission output speed sensor (TOSS), to ensure that the clutches are not slipping.
- Check the transmission and hydraulic steering fluids to ensure levels are correct.

Products of Mercury Marine
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