



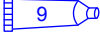

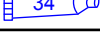
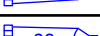

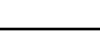

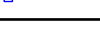
Cooling System

Section 6A - All Models

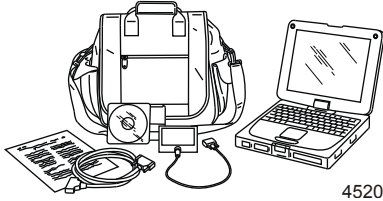


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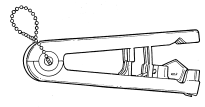
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Lubricant, Sealant, Adhesives

Tube Ref No.	Description	Where Used	Part No.
	Shell Alvania No. 2 Grease	The cavity between seals	Obtain Locally
		The bearings and the cavity between the bearings	
	Loctite 271 Threadlocker	Outside diameter of the two new rear seals	92-809819
		The outside diameter of the bearing housing front oil seal	
	Loctite 567 PST Pipe Sealant	Hose fitting threads and plastic plug threads	92-809822
	Perfect Seal	Water circulating pump gasket and the threads of the attaching fasteners	92-34227Q02
	Special Lubricant 101	Pump shaft	92-802865Q02
	Loctite 242 Threadlocker	Impeller housing cover or seawater pump actuator housing screw	92-809821
	Loctite 609	Front seal	Obtain Locally
	SAE Engine Oil 30W	Shaft and the bearings	Obtain Locally
		Outer diameter of the bearings	
		Seawater pump shaft	
	2-4-C with Teflon	Quad ring seal	92-802859A 1
	RTV 587 Ultra Blue Silicone Sealer	Sealing surfaces and screw shaft	92-809825

Special Tools

Computer Diagnostic System (CDS)	Order through SPX
 <p style="text-align: right;">4520</p>	<p>Monitors all electrical systems for proper function, diagnostics, and calibration purposes. For additional information, pricing, or to order the Computer Diagnostic System contact:</p> <p>SPX Corporation 28635 Mound Rd. Warren, MI 48092</p> <p>or call: USA - 1-800-345-2233 Canada - 800-345-2233 Europe - 49 6182 959 149 Australia - (03) 9544-6222</p>
Universal Puller Plate	91-37241
 <p style="text-align: right;">8505</p>	Removes bearings from gears and the driveshaft.
Power Steering Pump Pulley Remover	Kent Moore J-21239
 <p style="text-align: right;">25952</p>	Removes the pulley on the DHB power steering pumps and water pumps with smaller shafts.

Pulley Pusher Installer	91-93656A1
 10047	Installs the pulley onto the power steering pump.
Air Line Cutter	91-883502
 24887	Cuts water drain system air lines without collapsing them.

Flow Specifications

Alpha Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min)	Minimum kPa (psi)
5.0L, 305 CID	Seawater cooling	4000	57 L/min (15 gal/min)	38 kPa (5.5 psi)
5.7L, 350 CID	Seawater cooling	4000	65 L/min (17 gal/min)	42 kPa (6 psi)

Alpha Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min) per minute	Minimum kPa (psi)
5.0L, 305 cid	Closed cooling	4000	106 L/min (28 gal/min)	138 kPa (20 psi)
5.7L, 350 cid				

Bravo Sterndrive Models	Cooling	Drive	RPM	Minimum flow L/min (gal/min) per minute	Minimum kPa (psi)
5.0L, 305 cid	Seawater cooling	Bravo	4000	57 L/min (15 gal/min)	69 kPa (10 psi)
5.7L, 350 cid				65 L/min (17 gal/min)	75 kPa (11 psi)
6.2L, 377 cid				65 L/min (17 gal/min)	75 kPa (11 psi)
5.0L, 305 cid	Closed cooling	Bravo	4000	106 L/min (28 gal/min)	138 kPa (20 psi)
5.7L, 350 cid					
6.2L, 377 cid					

Inboard Models	Cooling	Seawater Pickup	RPM	Minimum flow L/min (gal/min) per minute	Minimum kPa (psi)
350 Mag MPI	Closed cooling	Through-the-Hull	4000	106 L/min (28 gal/min)	138 kPa (20 psi)
350 Mag MPI Horizon					
MX 6.2 MPI					
MX 6.2 MPI Horizon					

Tow Sports Models	Cooling	Seawater Pickup	RPM	Minimum flow L/min (gal/min) per minute	Minimum kPa (psi)
5.7L	Seawater cooling	Through-the-Hull	4000	65 L/min (17 gal/min)	42 kPa (6 psi)
350 Mag MPI					
Black Scorpion					
MX 6.2 Black Scorpion					

Seawater Inlet Specifications

Seawater Inlet Specifications	
Seawater inlet hose	32 mm (1-1/4 in.) I.D. (wire reinforced)
Seawater pickup	Low restriction with 32 mm (1-1/4 in.) connections
Seacock (ABYC requirement)	
Sea strainer (optional)	

General Information

Mercury MerCruiser engines have either a seawater cooling system or a closed cooling system. Seawater cooling systems are sometimes called raw water cooling or standard cooling, while closed cooling systems are sometimes called fresh water cooling. On engines with seawater cooling, the engine is cooled entirely by the seawater in which the boat is being operated. Closed cooling systems use a combination of fresh water (antifreeze and water) and seawater for cooling. Both types of systems are designed to keep the engine operating temperature at approximately 71 degrees C (160 degrees F) for optimum performance, fuel economy and durability. (Refer to cooling system flow diagrams at end of section.)

To monitor the cooling system, a temperature switch is incorporated into the audio warning system, which alerts the operator of an abnormal condition if the temperature exceeds approximately 93 degrees C (200 degrees F). A temperature sender is also employed to operate a temperature gauge at the dash. On dual helm applications, this sender must be replaced with a dual station sender to obtain the proper temperature reading at both stations. Refer to the **Instrumentation and Controls** section for more information.

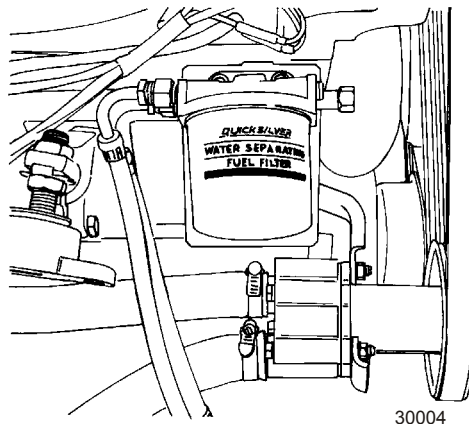
The cooling system must receive a sufficient amount of seawater under all operating conditions to operate properly. The design and installation of the seawater supply system is the boat manufacturer's responsibility. Cooling system components must be constructed, sized, and installed in accordance with the following guidelines.

NOTICE

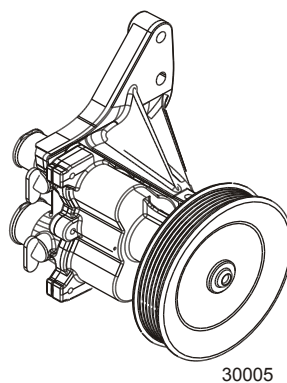
Without sufficient cooling water, the engine, the water pump, and other components will overheat and suffer damage. Provide a sufficient supply of water to the water inlets during operation.

Seawater Pump Identification

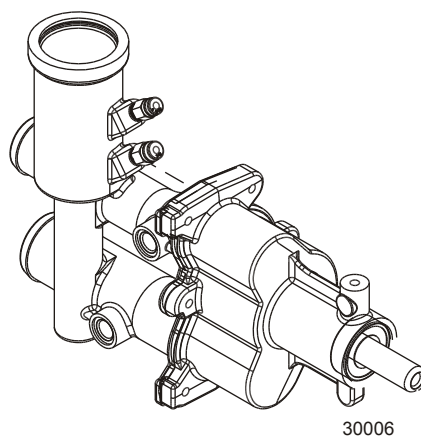
The seawater inlet connection is the lower inlet on the composite pump and the upper inlet on the brass seawater pump.



Composite seawater pump



Brass seawater pump without air actuator

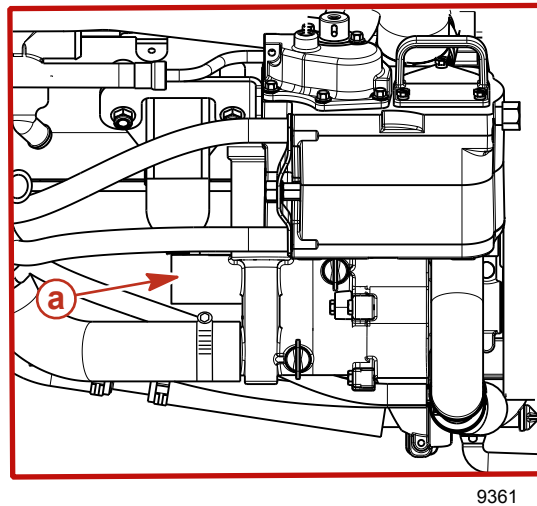
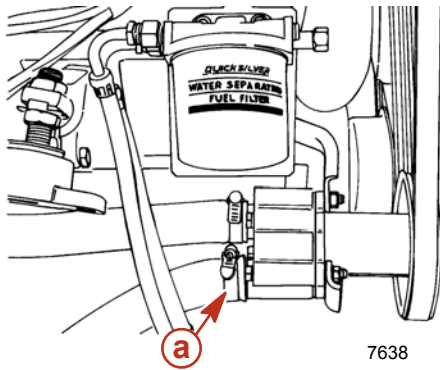


Brass seawater pump with air actuator

Seawater Inlet Hose

- Use a 32 mm (1-1/4 in.) I.D. wire reinforced hose that is capable of supporting 10 in. Hg vacuum, to prevent the seawater inlet hose from collapsing from the seawater pump suction.
- The hose should be oil and seawater resistant.
- Use the shortest hose length possible with the least number of bends to minimize restriction.
- All connections must be secured with a hose clamp.

- Fasten hose as appropriate to maintain proper routing and to prevent chafing or contact with other moving parts.



Typical composite seawater pickup pump

Typical brass seawater pickup pump

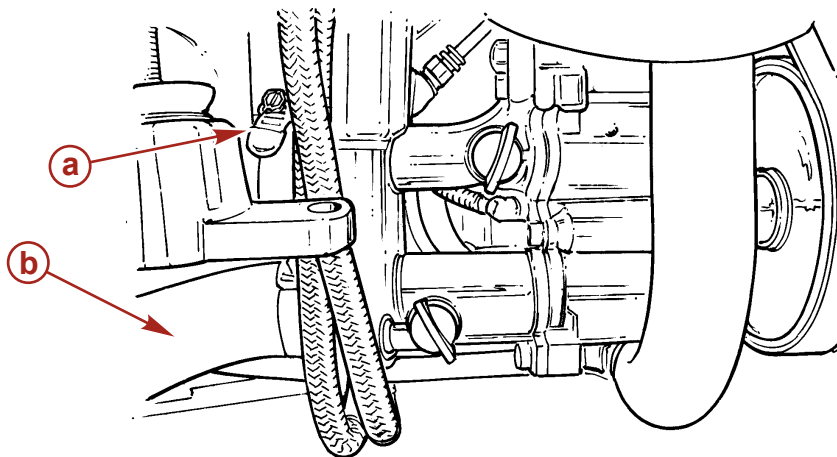
a - Seawater inlet hose connection

Seawater Pump Output Test

If an overheating problem exists, use this test to determine if a sufficient amount of water is being supplied to cool the engine.

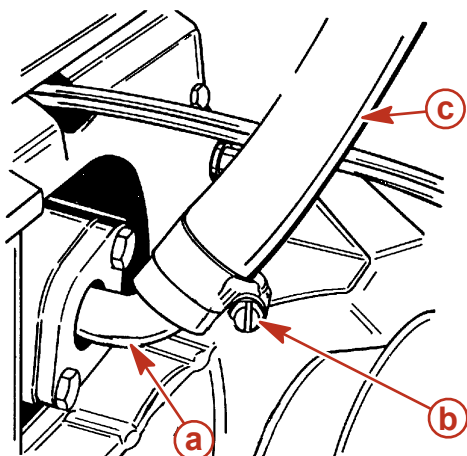
IMPORTANT: The following information should be observed before proceeding with the test:

- The boat must be in the water for this test. This test cannot be performed with a flush-test device and water hose.
 - Performed this test accurately or problems may not be detected. An error in setting the engine rpm, timing the test or measuring the water output will affect the overall accuracy of the test and may produce misleading results. To help ensure accurate results, use a shop tachometer with an error of less than 5 percent. Do not use the boat tachometer as it may not have the necessary precision. Use a stop watch to time the duration of the test to help ensure the accuracy is maintained within one second. Use a 9.5 L (10 US qt) or larger capacity container to measure the water output.
 - Due to the manner in which this test is performed, it may not be possible to detect a marginal condition or a high-speed water pump output problem.
1. Models with the engine mounted seawater pump, remove the water hose that is between the pump outlet and the engine, and replace with another hose of the same diameter, but approximately 1 m (3 ft) longer. The hose should be of adequate wall thickness to prevent it from kinking when performing the test. Clamp the hose at the pump outlet only. Do not clamp the hose at the engine cooler end.



a - Seawater inlet hose
b - Seawater outlet hose to cooler

- Models with sterndrive (Alpha) mounted seawater pump, remove the water inlet hose, which is between the gimbal housing water tube and the engine, and replace with another hose of the same diameter, but approximately 1 m (3 ft) longer. The hose should be of adequate wall thickness to prevent it from kinking when performing the test. Clamp the hose at the gimbal housing water tube only. Do not clamp the hose at the engine end.



- a - Water tube
- b - Hose clamp
- c - Water hose

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- Place a 9.5 IL (10 US qt) or larger container near the unclamped end of the hose.
- With the assistance of another person, start the engine and adjust the speed to exactly 1000 RPM while holding the unclamped end of the hose on the connection on the engine. Remove the hose from the connection on the engine and direct the water flow into the container for exactly 15 seconds. At the end of 15 seconds, direct the water flow overboard, return the engine to idle and stop the engine. Reconnect the hose to the engine.
- Measure the quantity of water discharged into the container and compare with the specifications given in the following chart.
- Repeat the test four times to check the repeatability of the results.

NOTE: Values listed are 70% of the nominal flow at 1000 RPM.

Engine Mounted Seawater Pump Output For A 15 Second Period	
Model	Minimum Quantity L (US qt.)
Bravo seawater cooled engine	7.1 L (7.5 US qt)
Bravo closed cooled engine and external water pick up	9.0 L (9.5 US qt)
All inboard and tow sport models	9.0 L (9.5 US qt)

Alpha Sterndrive Seawater Pump Output For A 15 Second Period	
Model	Minimum Quantity L (US qt)
Alpha models	4.7 L (5.0 US qt)

Collecting Water Pressure Data

IMPORTANT: For models equipped with a water pressure transducer, collect the water pressure data using a Computer Diagnostic System (CDS).

Computer Diagnostic System (CDS)	Order through SPX
----------------------------------	-------------------

IMPORTANT: On seawater cooled Alpha sterndrive models, collect the water pressure data between the transom and the seawater inlet on the power assisted steering fluid cooler.

IMPORTANT: On Alpha and Bravo sterndrive models equipped with closed cooling, the water pressure data is to be collected within 152 mm (6 in.) of the seawater pump inlet.

Specifications

Alpha Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min)	Minimum kPa (psi)
4.3 L, 262 cid	Seawater cooled	4000	50 L/min (13 gal/min)	35 kPa (5 psi)
5.0 L, 305 cid	Seawater cooled	4000	57 L/min (15 gal/min)	38 kPa (5.5 psi)

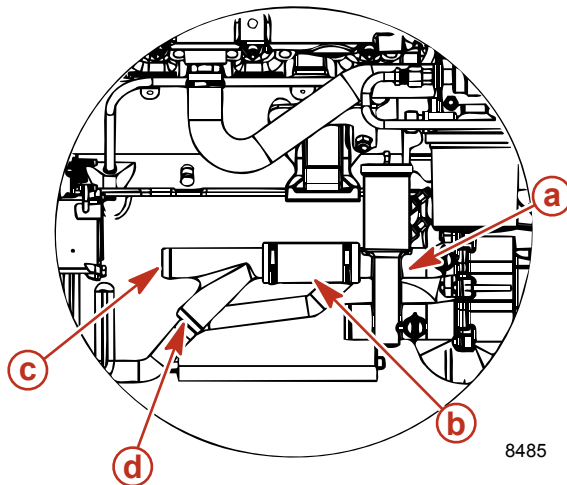
Alpha Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min)	Minimum kPa (psi)
5.7 L, 350 cid	Seawater cooled	4000	65 L/min (17 gal/min)	42 kPa (6 psi)
Alpha Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min)	Minimum kPa (psi)
5.0 L, 305 cid	Closed cooled	4000	106 L/min (28 gal/min)	138 kPa (20 psi)
5.7 L, 350 cid				
Bravo Sterndrive Models	Cooling	RPM	Minimum flow L/min (gal/min)	Minimum kPa (psi)
5.0 L, 305 cid	Seawater cooled	4000	57 L/min (15 gal/min)	69 kPa (10 psi)
5.7 L, 350 cid			65 L/min (17 gal/min)	75 kPa (11 psi)
6.2 L, 377 cid			65 L/min (17 gal/min)	75 kPa (11 psi)
5.0 L, 305 cid	Closed cooled	4000	106 L/min (28 gal/min)	138 kPa (20 psi)
5.7 L, 350 cid				
6.2 L, 377 cid				

Sterndrives With Closed Cooling Engines

Bravo Models With Closed Cooling

NOTE: Closed cooled Bravo models require a through the hull or through the transom pickup in addition to the sterndrive water inlets in order to meet the minimum flow specifications.

When additional water inlets are used, a Y-fitting is installed to the engine seawater pump.



Dual seawater pickup for Bravo closed cooled engines

- a - Engine seawater pump
- b - Hose from seawater pump inlet port to Y-fitting
- c - Y- fitting port to Bravo drive
- d - Y-fitting port to additional water inlet

Models operated above the fiftieth parallel of the northern hemisphere or below the fiftieth parallel of the southern hemisphere do not require the dual seawater pickup with a bravo sterndrive on closed cooling models.

Remove the Y-fitting at the seawater pump inlet. Install a seawater supply hose that meets MerCruiser specifications. Cut the hose to fit from the transom inlet fitting to the seawater pump inlet.

SeaCore Models

Some SeaCore models do not require a through-the-hull or through-the-transom seawater pickup to meet the minimum flow specifications. See the chart, **Seawater Pickups for SeaCore Sterndrive Engine Models**.

SeaCore Bravo One and Bravo Three Models

The SeaCore Bravo One and Bravo Three engine packages do not require a through-the-hull or through-the-transom seawater pickup in addition to the sterndrive water pickups if:

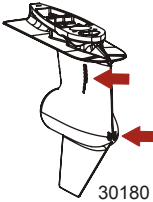
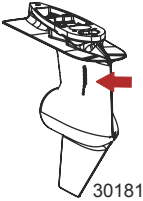
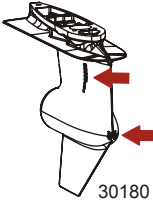
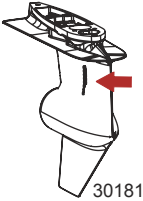
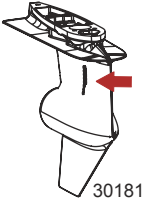
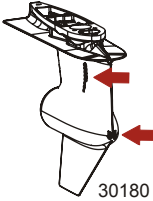
- The sterndrive gearcase has dual water pickups.
- The boat is capable of 64 km/h (40 MPH) with the boat fully loaded and operated within the specified operating range.

NOTE: When not installing the through-the-hull or through-the-transom seawater pickup, see **Installing the Seawater Supply Hose**.

SeaCore Bravo Two Models

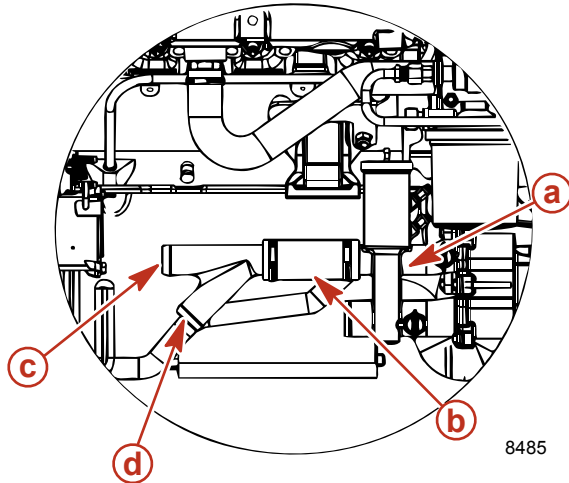
The SeaCore Bravo Two engine packages must have a through-the-hull or through-the-transom seawater pickup in addition to the sterndrive side water pickups. Install the Y-fitting at the engine's seawater pump inlet. See **Installing the Y-Fitting**.

Seawater Pickups for SeaCore Sterndrive Engine Models

Seawater Pickups for SeaCore Sterndrive Engine Models			
Boat speed with the boat fully loaded and operated within the specified operating range	SeaCore Bravo has side water pickup	SeaCore Bravo has dual water pickup	Through-the-hull or through-the-transom seawater pickup
64 km/h (40 MPH) or greater			Not required See Installing the Seawater Supply Hose
Less than 64 km/h (40 MPH)			Required See Installing the Y-Fitting
64 km/h (40 MPH) or greater			Required See Installing the Y-Fitting
Greater or Less than 64 km/h (40 MPH) Models operated above the fiftieth parallel of the northern hemisphere or below the fiftieth parallel of the southern hemisphere.			Not required See Installing the Seawater Supply Hose

Installing the Y-Fitting

Engine models that require a through-the-hull or through-the-transom seawater pickup, require a Y-fitting at the engine seawater pump inlet port. The Y-fitting directs the seawater from the sterndrive and through-the-hull or through-the-transom seawater pickup to the engine's seawater pump to meet the minimum flow specifications.



Typical Y-fitting installation

- a - Engine seawater pump
- b - Hose 101.6 mm (4 in.) from seawater pump inlet to Y-fitting port
- c - Y-fitting port to water inlet at transom
- d - Y-fitting port to through-the-hull or through-the-transom seawater pickup

NOTE: For models not factory equipped with a Y-fitting, refer to **Mercury Parts Catalog, Closed Cooling Systems (Bravo)** to order the specified Y-fitting, seawater supply bulk hose, and hose clamps that meets MerCruiser specifications.

1. Cut a 101.6 mm (4 in.) length piece of the supply hose and install it to the seawater pump inlet and the Y-fitting port.
2. Install a seawater supply hose to the Y-fitting port and the sterndrive's water inlet at the transom. Cut off any excess hose as needed.
3. Install a seawater supply hose to the Y-fitting port and the through-the-hull or through-the-transom seawater pickup. Cut off any excess hose as needed.
4. Properly secure all hoses to all fittings to prevent water leaking into the boat.

Installing the Seawater Supply Hose

For engine models not using through-the-hull or through-the-transom seawater pickup:

1. If applicable, remove the Y-fitting at the seawater pump inlet.
2. Install a seawater supply hose that meets MerCruiser specifications to the engine's seawater pump inlet.
3. Route the seawater supply hose directly to the seawater inlet fitting on the transom. Cut off any excess hose as needed.
4. Properly secure the hose at both ends to prevent water leaking into the boat.

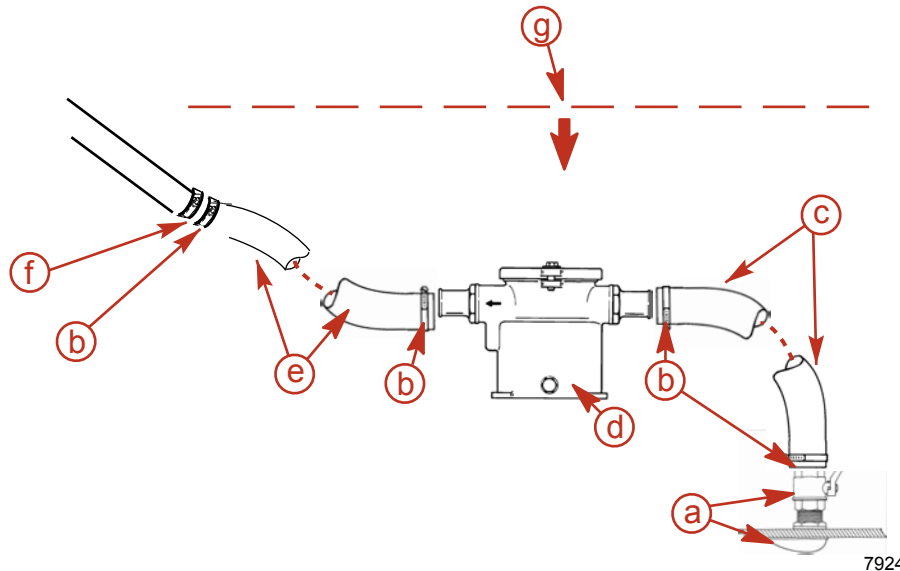
NOTE: For models not factory-equipped with a seawater supply hose, refer to the **Mercury Parts Catalog, Standard Cooling Systems (Bravo)** to order the specified bulk hose, hose clamps, and quick connect fittings that meet MerCruiser specifications.

NOTE: For models with quick connection fittings and pull test information, refer to **Section 6, Seawater Inlet Fitting Connection**.

Through-the-Hull Seawater Pickup System

Through-Hull Seawater Pickup System

IMPORTANT: Use a 32 mm (1-1/4 in.) I.D. wire reinforced hose that is capable of supporting 10 in. Hg vacuum when suction is created by the seawater pump impeller.



Typical installation shown with a through the hull seawater pickup

- a - Seawater pickup and seacock
- b - Hose clamp
- c - Seawater hose to seawater strainer
- d - Quicksilver seawater strainer
- e - Seawater hose to engine
- f - Seawater pump hose connector (if equipped)
- g - Below seawater pump level

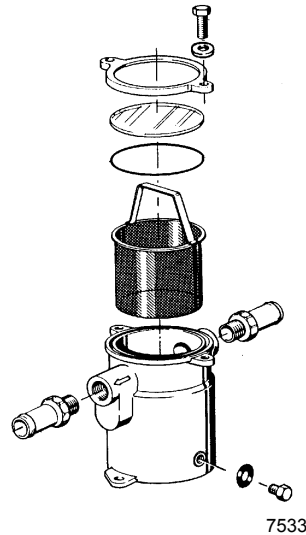
IMPORTANT: Do not install the seawater pickup directly in line with the propeller, as the pickup may create turbulence and allow air to flow into the propeller slipstream. This will cause propeller ventilation and will adversely affect boat performance.

IMPORTANT: Make gradual bends in the seawater hoses to avoid kinks. Hoses must not come in contact with steering system components, engine coupler, or drive shaft.

- The seawater pickup must be large enough to permit sufficient seawater flow to engine seawater pickup pump for adequate engine cooling.
- The seawater pickup also must supply a positive head while underway.
- The seawater pickup should be located as close to the seawater pump inlet as possible and in an area where an uninterrupted, solid stream of seawater will flow past when the boat is underway.

Sea Strainer

A sea strainer is recommended if the boat is operated in an area with a high debris content. Use a 32 mm (1-1/4 in.) I.D. wire reinforced hose on the inlet and outlet side of the strainer fittings. The strainer must be sized to minimize restriction (See **Specifications**) and to provide a reasonable service interval. Locate the strainer in an area that will be easily accessible for servicing. If the boat is not equipped with a seacock, the strainer should be located above the seawater-line to prevent seawater entry into boat when servicing. The strainer must have provision to allow draining in freezing temperature periods.



Typical Sea Strainer

Seawater Pickup

Either a through-transom or through-hull seawater pickup can be used. Select pickup location to minimize the 32 mm (1-1/4 in.) I.D. wire reinforced seawater inlet hose length while providing an optimum location for seawater pickup. The location should be in an area that will provide a solid, air-free flow of seawater under all operating conditions. Avoid areas with a disturbed seawater flow, such as those behind or in close proximity to the propeller. Locations that are too far forward or outboard should also be avoided as these are prone to aeration problems at high boat trim angles and in turns. Check for aeration as outlined under **Seawater Supply Test**.

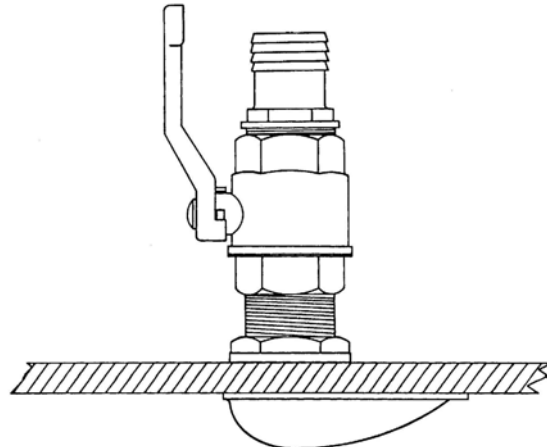
IMPORTANT: Do not install the seawater pickup directly in line with the propeller, as pickup may create turbulence and allow air to flow into the propeller slip-stream. This will cause propeller ventilation and will adversely affect boat performance.

Openings in seawater pickup should be approximately 3 mm (1/8 in.) maximum to prevent larger debris from entering and clogging the cooling system.

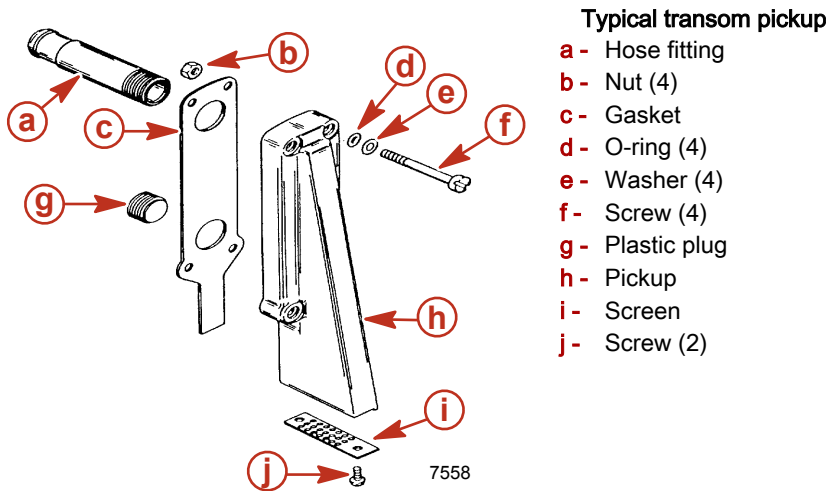
IMPORTANT: Use a seawater strainer if the seawater pickup openings exceed 3 mm (1/8 in.).

Provisions should be made to minimize galvanic corrosion, given the hull material being used and the composition of the surrounding components. Some industry standards and regulations also require that the pickup be connected into the boat's bonding system to minimize stray current corrosion. Refer to applicable standards and regulations for more details.



IMPORTANT: External seawater pickup must have an integral seacock.



Typical seacock



- Typical transom pickup**
- a- Hose fitting
 - b- Nut (4)
 - c- Gasket
 - d- O-ring (4)
 - e- Washer (4)
 - f- Screw (4)
 - g- Plastic plug
 - h- Pickup
 - i- Screen
 - j- Screw (2)

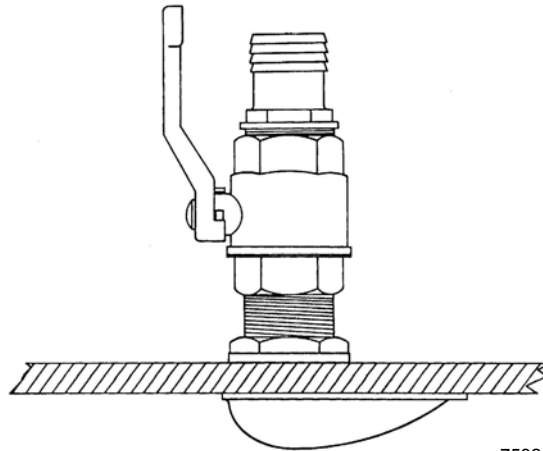
Tube Ref No.	Description	Where Used	Part No.
 9	Loctite 567 PST Pipe Sealant	Hose fitting threads and plastic plug threads	92-809822
 116	RTV 587 Ultra Blue Silicone Sealer	Sealing surfaces and screw shaft	92-809825

Seacock

The ABYC and other industry standards and regulations require the use of a seacock on certain types of applications to stop the entry of seawater in the event of a leak in the cooling system. Refer to applicable standards and regulations for specific requirements. The seacock also allows the seawater to be shut off when servicing the engine.

All Models

The seacock must provide minimum restriction to seawater flow (see **Specifications**). A ball valve or gate valve is recommended. The ball valve is most common and is typically equipped with a lever type handle that operates in a 90 degree arc. This design gives a clear indication of whether the valve is open or shut. Industry standards and requirements typically require that the seacock be rigidly attached to the hull at the seawater pickup. Seacock location should be readily accessible for quick, easy operation.



Typical seacock

Seawater Strainer

Seawater Strainer Mounting Requirements

Use a properly sized strainer to maintain an adequate supply of water for cooling the engine.

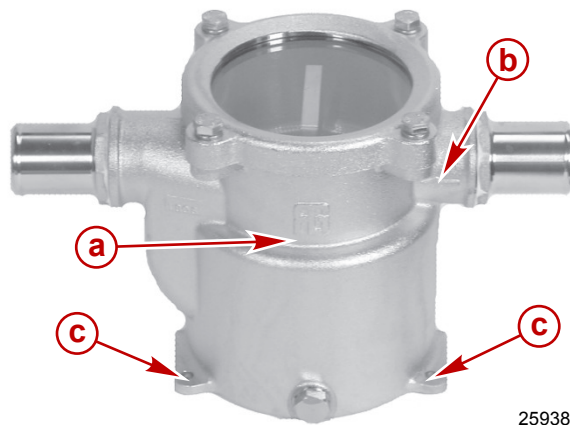
- Mount the seawater strainer in a location that will allow easy access for servicing, and maintenance.
- Mount the seawater strainer in a vibration free location.
- Do not mount the seawater strainer on the engine.
- If not equipped with a seacock, mount the seawater strainer above the seawater-line to prevent seawater entry into the boat when servicing.
- Use a 32 mm (1/4 in.) I.D. wire hose.
- Do not allow hoses to come in contact with hot or moving parts on the engine.

Installation

Refer to the manufacturer's instructions for detailed installation, operation, and maintenance.

IMPORTANT: Install a Quicksilver seawater strainer using the following guidelines.

1. Position the seawater strainer in the appropriate location and below the level of the seawater pump.
2. Ensure the arrow that indicates the direction of seawater flow points toward the seawater pump.
3. Install the seawater strainer using flat washers and lag bolts



Typical seawater strainer

- a - Seawater strainer
- b - Arrow indicating direction of water flow
- c - Mounting screw hole location (screws not shown)

Cleaning the Seawater Strainer, if Equipped

NOTICE

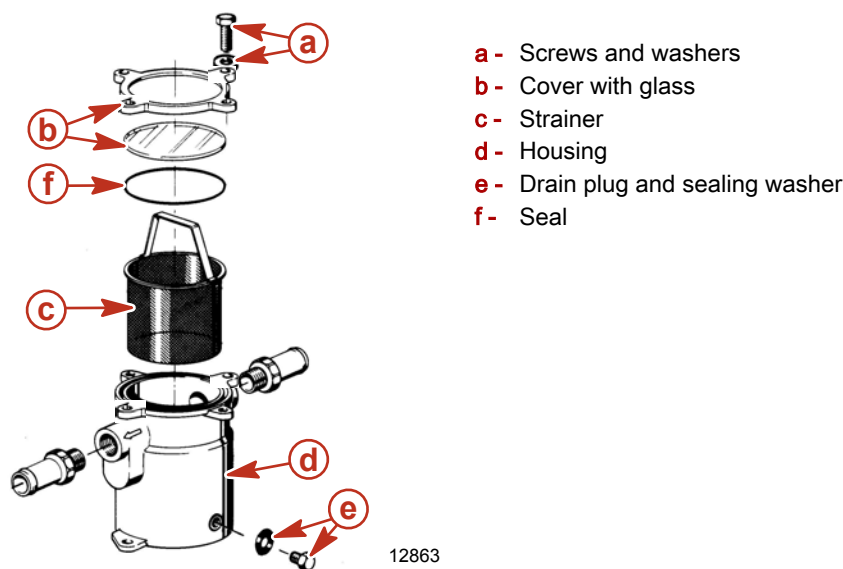
An open seawater strainer or seacock during some service or maintenance procedures can introduce water into the boat, causing damage or sinking the boat. Always close the water supply from the seawater pump, water inlet, or seacock when performing service or maintenance on the cooling system.

1. With the engine off, close the seacock, if equipped, or remove and plug the seawater inlet hose.
2. Remove the screws, washers, and cover.
3. Remove the strainer, drain plug, and sealing washer.
4. Clean all the debris from the strainer housing. Flush both the strainer and housing with clean water.
5. Check the cover gasket and replace when damaged or if it leaks.
6. Reinstall the strainer, drain plug, and sealing washer.

CAUTION

Seawater leaking from the seawater strainer could cause excess water in the bilge, damaging the engine or causing the boat to sink. Do not overtighten the cover screws, or the cover may warp and introduce seawater into the bilge.

7. Install the seal and cover using the screws and washers. Do not overtighten the cover screws.



8. Open the seacock, if equipped, or remove the plug and reconnect the seawater inlet hose.
9. Upon first starting the engine, check for leaks or air in the system that would indicate an external leak.

Shaft Log Seal

Shaft Log Seal Connection—Early Models

Models Covered	Serial Number Or Year
Inboard and Tow Sports Models	0M316999 and below

NOTICE

Incorrectly installing the water supply hose to the shaft log seal can cause increased exhaust system corrosion or submersion or freeze damage due to siphoning. Position and securely fasten the water supply hose with a portion of the hose above the engine exhaust elbows.

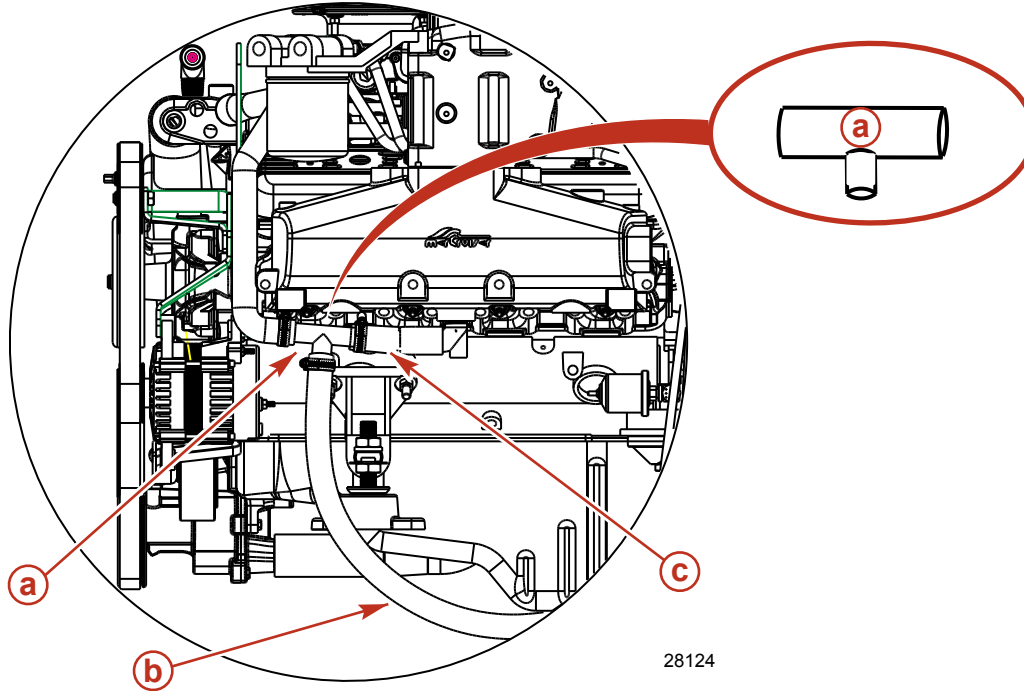
Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows (to prevent a siphoning action when engine is not running). Fasten the hose securely to keep it properly positioned.

IMPORTANT: Accessing cooling water from the wrong location can cause damage to the engine.

1. Using a T-fitting, splice into the port exhaust manifold water hose.
2. Install the T-fitting.

All Models

3. Install the shaft log seal hose to the T-fitting.
4. Fasten the T-fitting with the hose clamps. Tighten securely.



- a - T-fitting
- b - Hose to shaft log seal
- c - Port exhaust manifold water hose

5. Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows.
6. Fasten the hose securely to keep it properly positioned.

Shaft Log Seal Connection—Later Models Except Scorpion Models

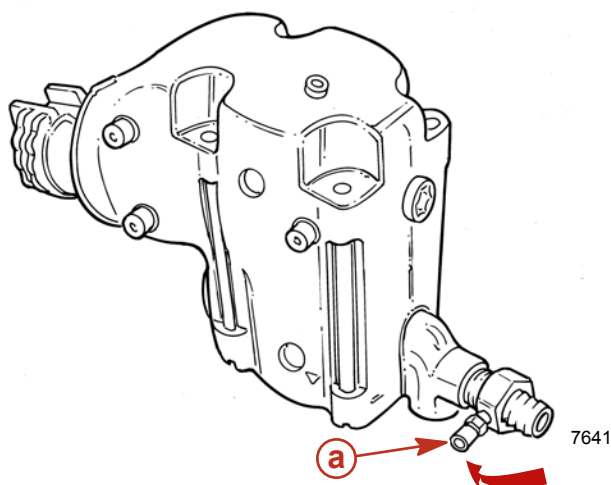
Models Covered	Serial Number Or Year
Inboard And Tow Sports Models	0M317000–1A089999

NOTICE

Incorrectly installing the water supply hose to the shaft log seal can cause increased exhaust system corrosion or submersion or freeze damage due to siphoning. Position and securely fasten the water supply hose with a portion of the hose above the engine exhaust elbows.

Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows (to prevent a siphoning action when engine is not running). Fasten the hose securely to keep it properly positioned.

A fitting is installed at the factory into the proper port on the port exhaust elbow.



a - Shaft log seal fitting

IMPORTANT: If not using a shaft log seal, this fitting must remain plugged.

1. Attach the shaft log seal cooling water hose to the reducer fitting.
2. Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows.
3. Fasten the hose securely to keep it properly positioned.

Shaft Log Seal Connection—Scorpion Models

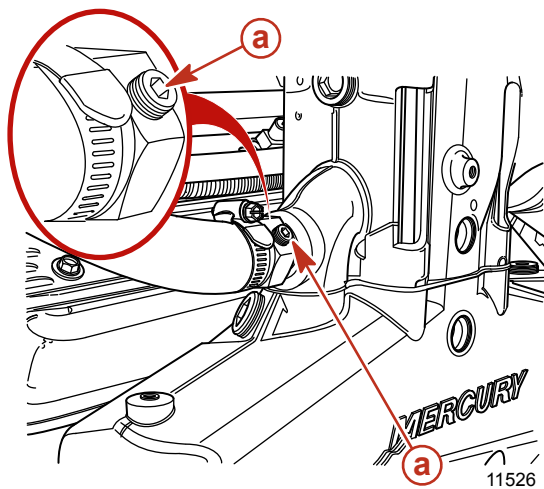
Models Covered	Serial Number Or Year
Black Scorpion	0M391600–1A089999
MX 6.2 Black Scorpion	0M391750–1A089999

NOTICE

Incorrectly installing the water supply hose to the shaft log seal can cause increased exhaust system corrosion or submersion or freeze damage due to siphoning. Position and securely fasten the water supply hose with a portion of the hose above the engine exhaust elbows.

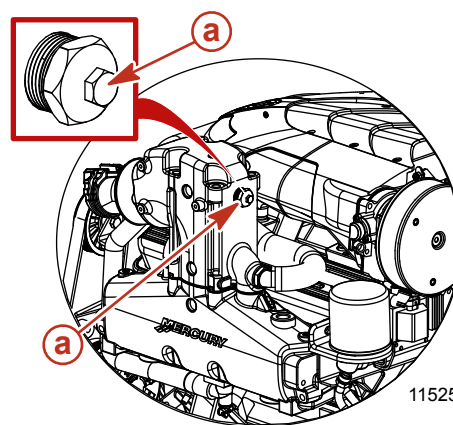
Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows (to prevent a siphoning action when engine is not running). Fasten the hose securely to keep it properly positioned.

A brass plug is installed at the factory into the proper port on the port exhaust elbow.



In-line models

a - Brass plug



V-Drive models

IMPORTANT: If not using a shaft log seal, this fitting must remain plugged.

All Models

1. Remove the brass plug installed at factory. **V-drive Models:** Ensure the brass reducer fitting remains secure in the exhaust elbow casting.
2. Install the shaft log seal fitting from the parts bag.
3. Attach the shaft log seal cooling water hose to the shaft log seal fitting.
4. Route the propeller shaft log seal hose so that a portion of the hose extends above the top of the engine exhaust elbows.
5. Fasten the hose securely to keep it properly positioned.

Hot Water Heater Installation

Requirements

When connecting a cabin heater or hot water heater:

- The supply hose (from the engine to the heater) and return hose (from the heater to the engine) must not exceed 16 mm (5/8 in.) I.D.
- Make the heater connections only at the locations shown.
- Refer to the manufacturers' instructions for the installation information.
- Do not reposition the engine temperature switch.

NOTE: Some models may be equipped with additional fittings.

NOTICE

Blocking the coolant flow at the heater can cause reduced engine performance or overheating. Check for continuous coolant flow from the engine to the water circulating pump.

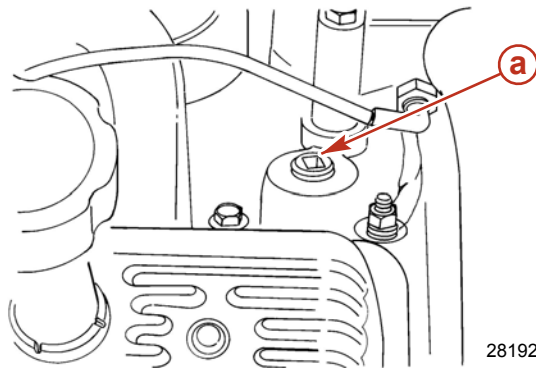
NOTICE

Prevent engine damage from overheating. In models equipped with closed cooling, low coolant levels may allow an air pocket to form when the hot water heater or cabin heater is mounted higher than the fill cap on the heat exchanger. Mount the heater lower than the fill cap of the heat exchanger and maintain the recommended coolant level.

Seawater Cooled Models

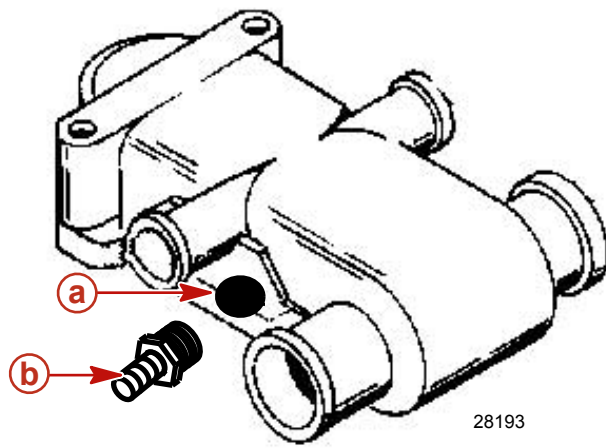
Supply Hose Connection for Early Models

Models Covered	Serial Number Or Year
Carbureted MCM models	0M087348–0M599999
Carbureted MIE models	0L677227–0M316999



Carbureted intake manifold shown

a - Intake manifold plug

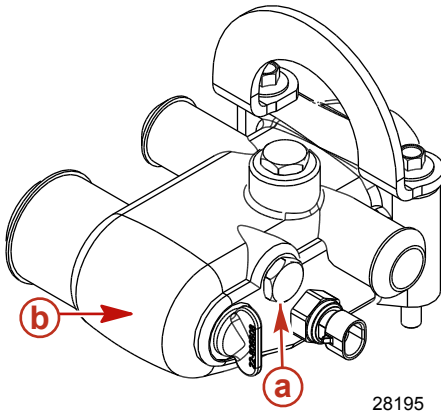


Supply hose alternate location

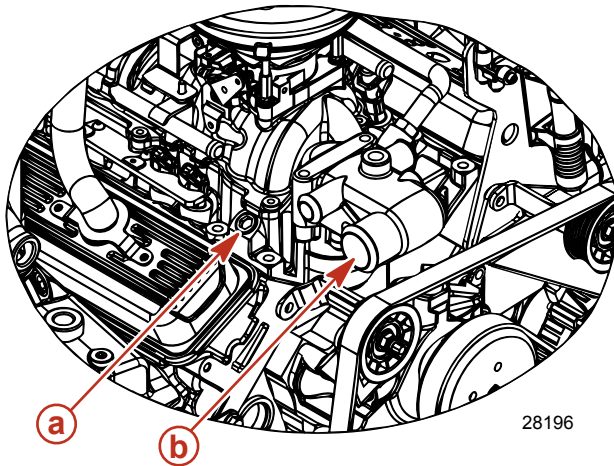
- a** - Thermostat housing supply location
- b** - Hose connector

Supply Hose Connection for Air or Manual Drain Models

Models Covered	Serial Number Or Year
MPI Sterndrive models	0M600000-1A299999
MPI Inboard models	0M310000-1A089999



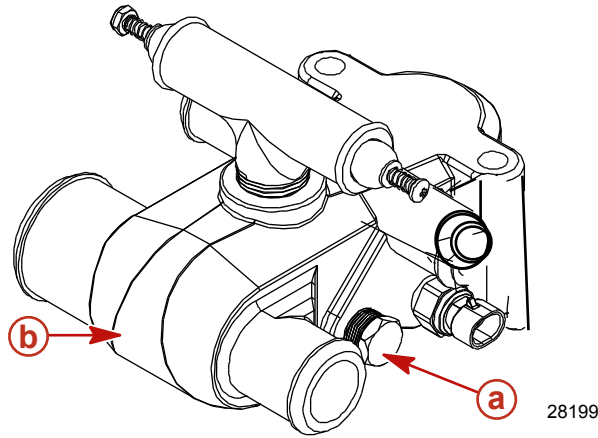
- a** - Supply location
- b** - Thermostat housing



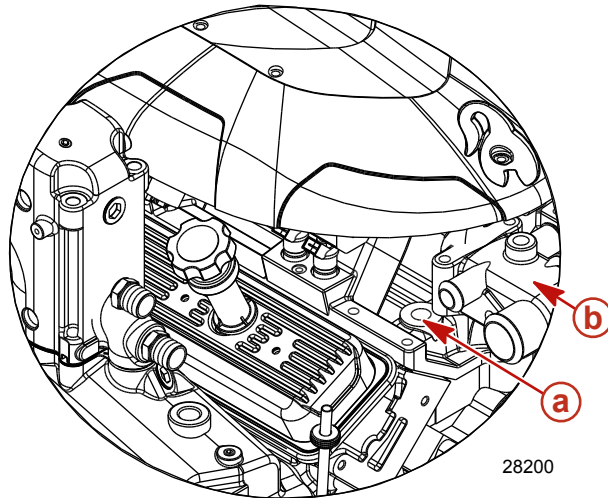
- MPI intake manifold shown**
- a** - Intake manifold supply location
 - b** - Thermostat housing

Supply Hose Connection for Multiple Point Drain Models

Models Covered	Serial Number Or Year
MPI sterndrive models	0M600000-1A299999
Carbureted sterndrive models	
Carbureted inboard models	0M317000-1A089999



- a - Supply location
- b - Thermostat housing



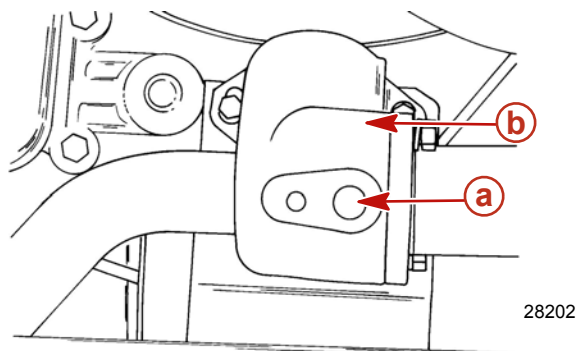
- Scorpion intake manifold shown
- a - Intake manifold supply location
 - b - Thermostat housing

Closed-Cooling Models

Supply Hose Connection for Early Models

Models Covered	Serial Number Or Year
Sterndrive Models	0M599999 and below

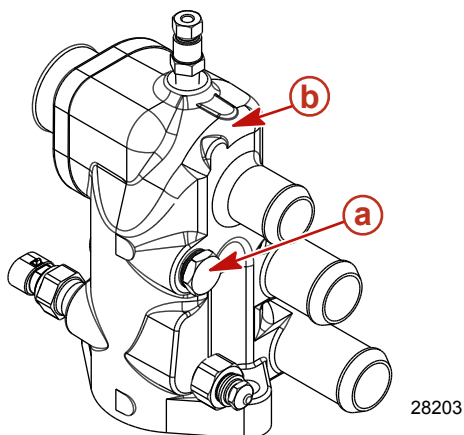
Models Covered	Serial Number Or Year
Inboard and Tow Sports Models	0M316999 and below



- a - Supply location
- b - Thermostat housing (top view)

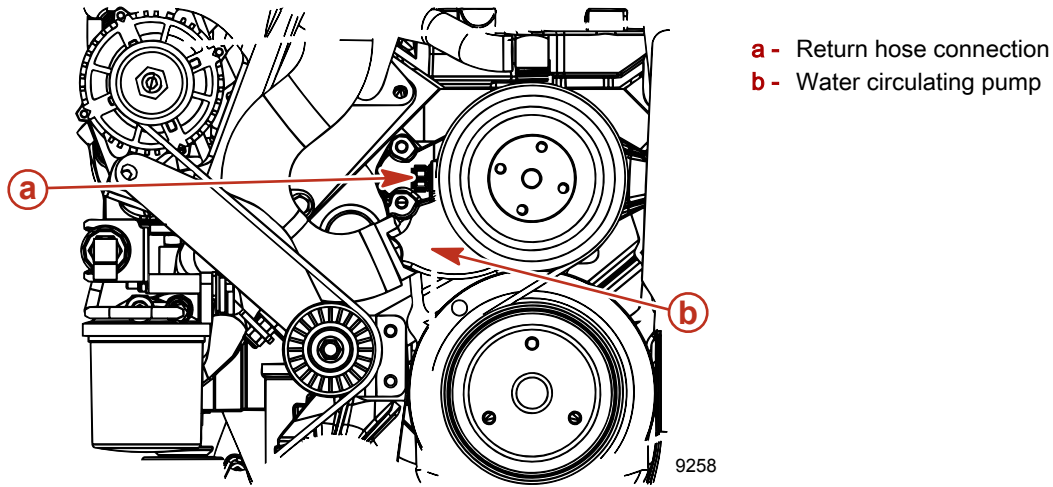
Supply Hose Connection for Later Models

Models Covered	Serial Number Or Year
Sterndrive Models	0M600000-1A299999
Inboard and Tow Sports Models	0M317000-1A089999



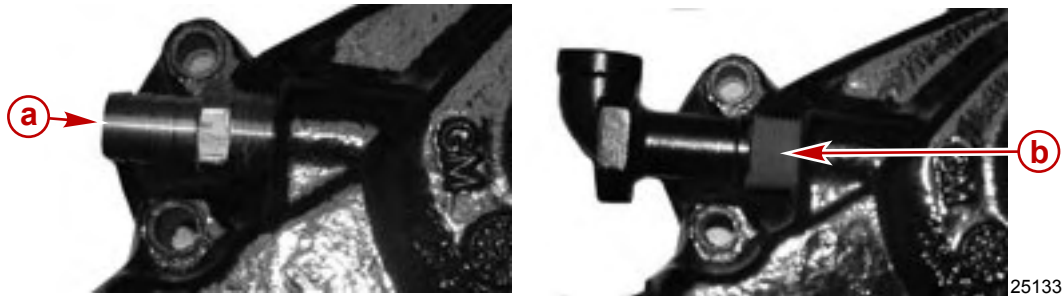
- a - Supply location
- b - Thermostat housing

Return Hose Connection—All Models



- a - Return hose connection
- b - Water circulating pump

IMPORTANT: A special fitting 22-865526 may be used if the hex of the standard hose barb fitting contacts the water pump housing not allowing the fitting to turn before the fitting is tight.



- a - Standard fitting
- b - Special fitting

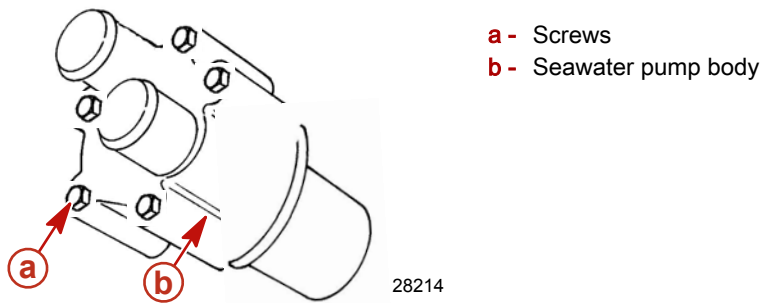
Composite Seawater Pump

Removal

1. Drain the seawater section of the cooling system.
2. Close the seacock valve, if equipped.
3. Remove both of the hoses from the aft side of the seawater pump.
4. Remove the serpentine belt.
5. Remove the two bolts attaching the seawater pump and bracket to the engine.

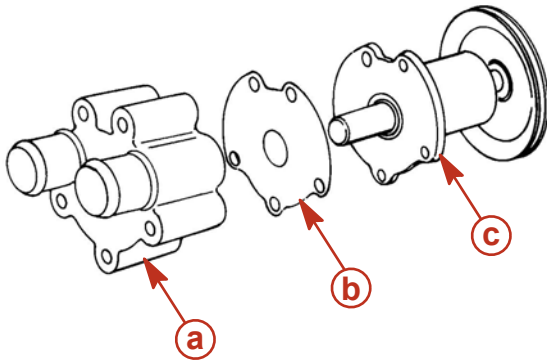
Disassembly

1. Remove the five screws from the seawater pump body.



- a - Screws
- b - Seawater pump body

- Remove the seawater pump body and wear plate from the bearing housing.



- a - Seawater pump body
- b - Wear plate
- c - Bearing housing

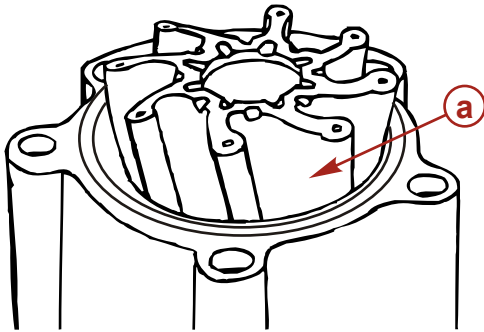
28215

- Remove the impeller from the seawater pump body.

Assembly

IMPORTANT: The vanes of the impeller must be installed as shown.

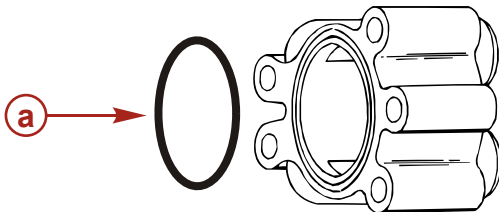
- Lubricate the seawater pump impeller with a water and soap solution. Install the impeller into the housing by rotating and pushing it into place. Push it down until it is flush with the housing.



- a - Impeller

6723

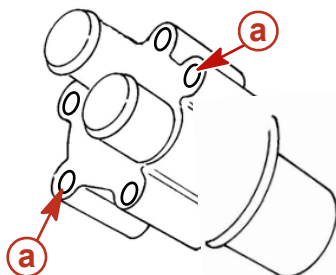
- Place the quad ring into the pump body groove.



- a - Quad ring
- b - Seawater pump

6724

- Place the wear plate onto the bearing housing.
- Align the flat of impeller with the flat on the shaft and slide the assembly down against the bearing housing.
NOTE: Assembly of the pump requires the mounting bracket to be installed while performing the following step.
- Install two screws in the seawater pump body holes as shown. Use these two screws to align the seawater pump body, then install the remaining screws. Tighten the screws to specification.



- a - Holes for alignment

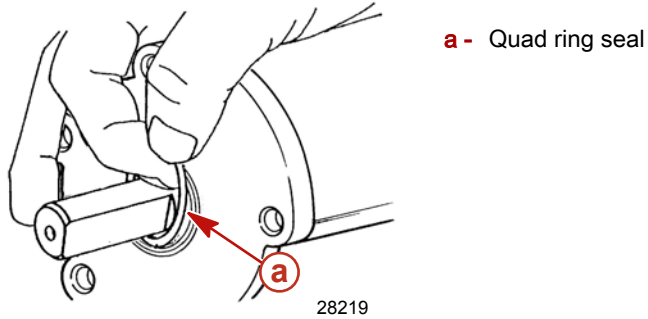
28216

Description	Nm	lb-in.	lb-ft
Seawater pump body screw	41	32	-

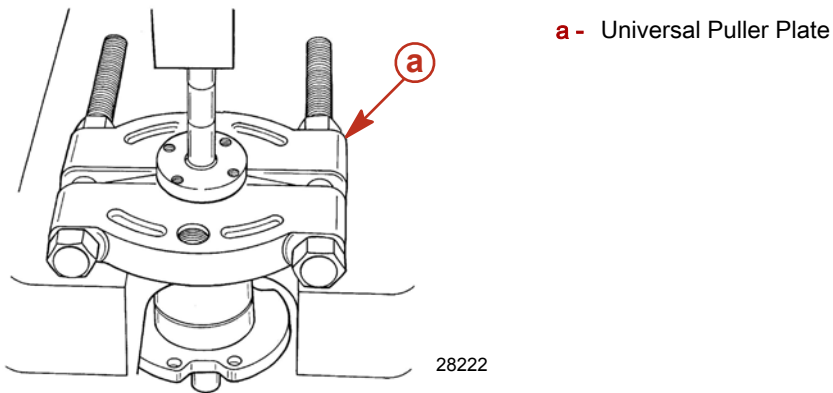
Seawater Pump Bearing Housing

Disassembly

1. Remove the gasket, inner wear plate, and quad ring seal. Discard the gasket and quad ring seal.

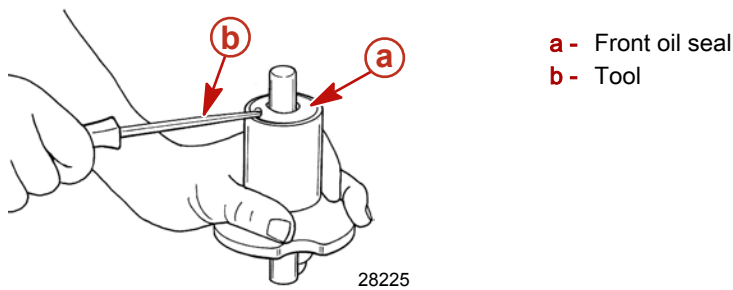


2. Press the hub off of the shaft with a Universal Puller Plate and an arbor press.

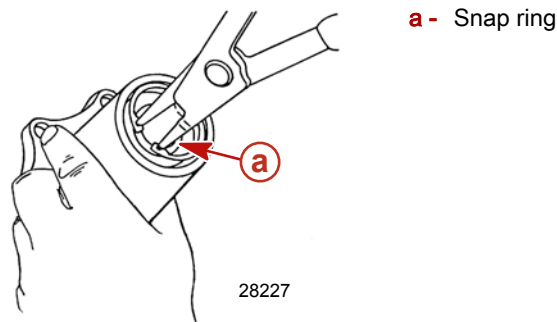


Universal Puller Plate	91-37241
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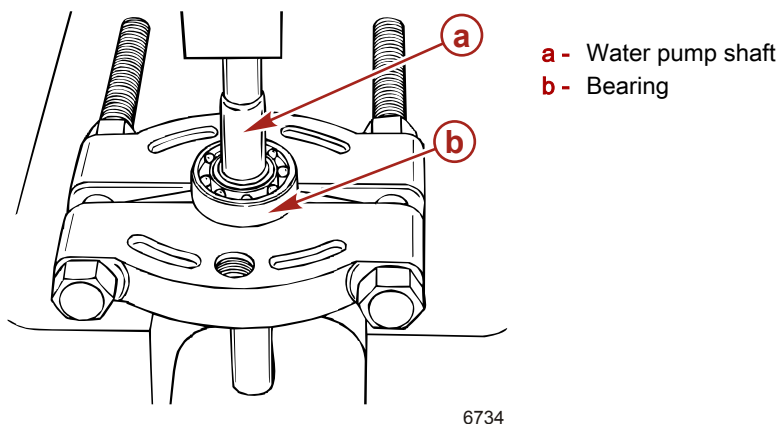
3. Puncture the front oil seal with a tool and pry the oil seal from the bearing housing.



- Remove the snap ring from the bearing housing bore and press the shaft and bearings out of the pulley end of the housing. The bearings have a slip fit in the housing; do not use excessive force.



- If the bearings require replacement, remove the bearings from shaft with a Universal Puller Plate and an arbor press. The bearings must be replaced if removed.



Universal Puller Plate	91-37241
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- If the rear seals require replacement, press the seals from the bearing housing.

Cleaning and Inspection

⚠ WARNING

Spin-drying bearings with compressed air can cause serious injury or death. The bearings can explode, even if spun at very slow speeds. Do not allow the bearings to spin when drying with compressed air.


- Clean the metal parts in solvent and blow them dry with compressed air.
- Remove the gasket material and sealer from the sealing surfaces.
- Inspect all pump components for wear or cracks.
- Inspect the bearing housing surfaces, where the bearings contact the housing, for evidence that the bearing outer races have rotated inside the housing.
- Inspect the pump shaft for grooves in the surface where seals contact the shaft. Inspect the surface where the bearings contact shaft for evidence that the inner races have rotated on the shaft.
- Inspect the impeller for wear on the sides and tips of the blades and for cracks in the area where the blades flex. Replace the impeller if the blades have taken a set (remain in the curved position).
- After cleaning, apply a coat of light engine oil to the shaft and the bearings to prevent rust.

Tube Ref No.	Description	Where Used	Part No.
80	SAE Engine Oil 30W	Shaft and the bearings	Obtain Locally

- Inspect the pump pulley.
- Inspect the serpentine drive belt for excessive wear.

Assembly

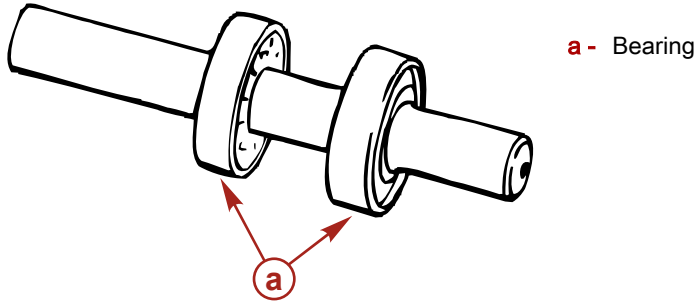
1. Apply a thin coat of sealant to outside diameter of the two new rear seals.

Tube Ref No.	Description	Where Used	Part No.
 7	Loctite 271 Threadlocker	Outside diameter of the two new rear seals	92-809819

2. Install the rear seals into the bearing housing with the seal edges facing the impeller end.
3. Press the first seal into the bearing housing until it seats and the second seal (water seal) in until flush with the bearing housing.
4. Pack the cavity between the seals with lubricant.

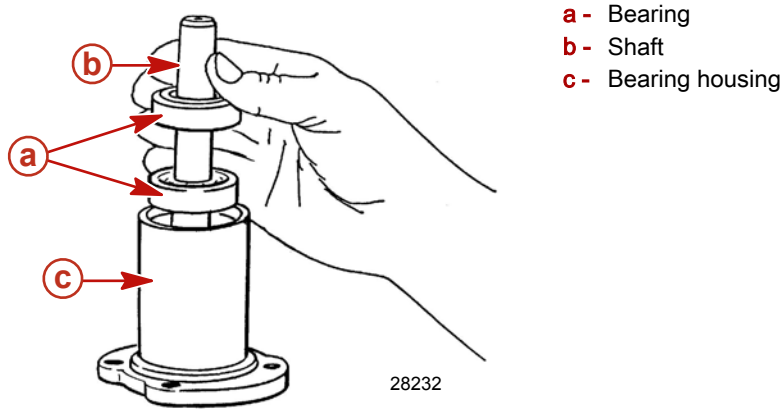
Tube Ref No.	Description	Where Used	Part No.
	Shell Alvania No. 2 Grease	The cavity between seals	Obtain Locally

5. Using an arbor press and suitable tool, press the ball bearings onto the shaft until they seat. Press on the inner race of bearing only.

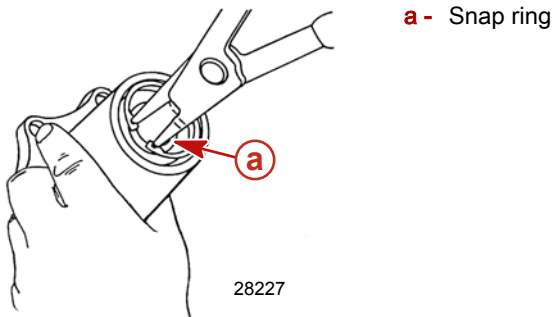


6736


6. Pack the bearings and the cavity between the bearings with lubricant. Slide the bearings and shaft into the bearing housing bore and install the snap ring.



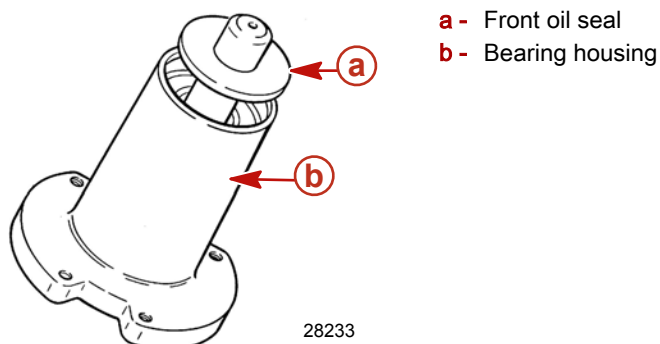
28232




28227

Tube Ref No.	Description	Where Used	Part No.
	Shell Alvania No. 2 Grease	The bearings and the cavity between the bearings	Obtain Locally

- Apply a thin coat of sealant to the outside diameter of the new bearing housing front oil seal and press the seal into the housing the with seal edge facing inward until it seats.

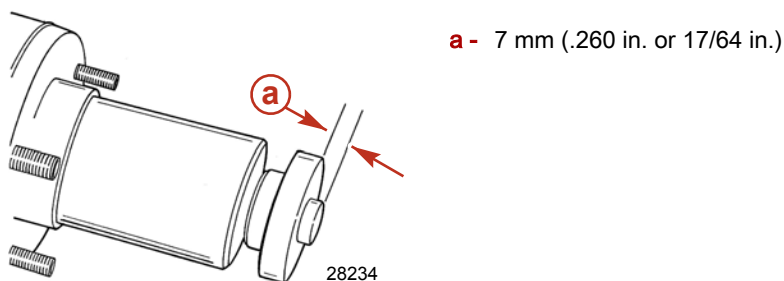


- a - Front oil seal
- b - Bearing housing


Tube Ref No.	Description	Where Used	Part No.
	Loctite 271 Threadlocker	The outside diameter of the bearing housing front oil seal	92-809819

IMPORTANT: Support the impeller end of the pump shaft when installing the pulley hub to prevent placing a load on the bearings.

- Apply lubricant to the pump shaft. Using an arbor press and appropriate tool, press the pulley hub onto the pump shaft to the dimension specified.

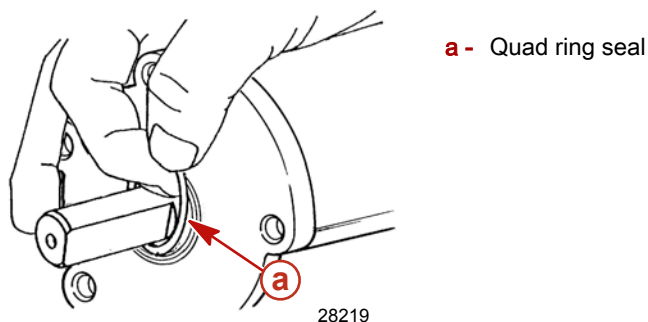


- a - 7 mm (.260 in. or 17/64 in.)

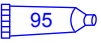
Tube Ref No.	Description	Where Used	Part No.
	Special Lubricant 101	Pump shaft	92-802865Q02

IMPORTANT: Pulley hub must be pressed onto pump shaft to exact dimension on pumps with stamped steel mounting bracket as this establishes proper drive belt alignment.

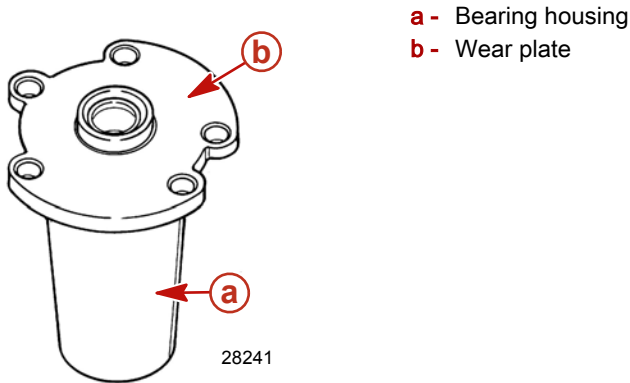
- Clamp the bearing housing in a soft-jawed vise with the flange end up.
- Coat the quad ring seal with lubricant and install into the groove in the housing.



- a - Quad ring seal

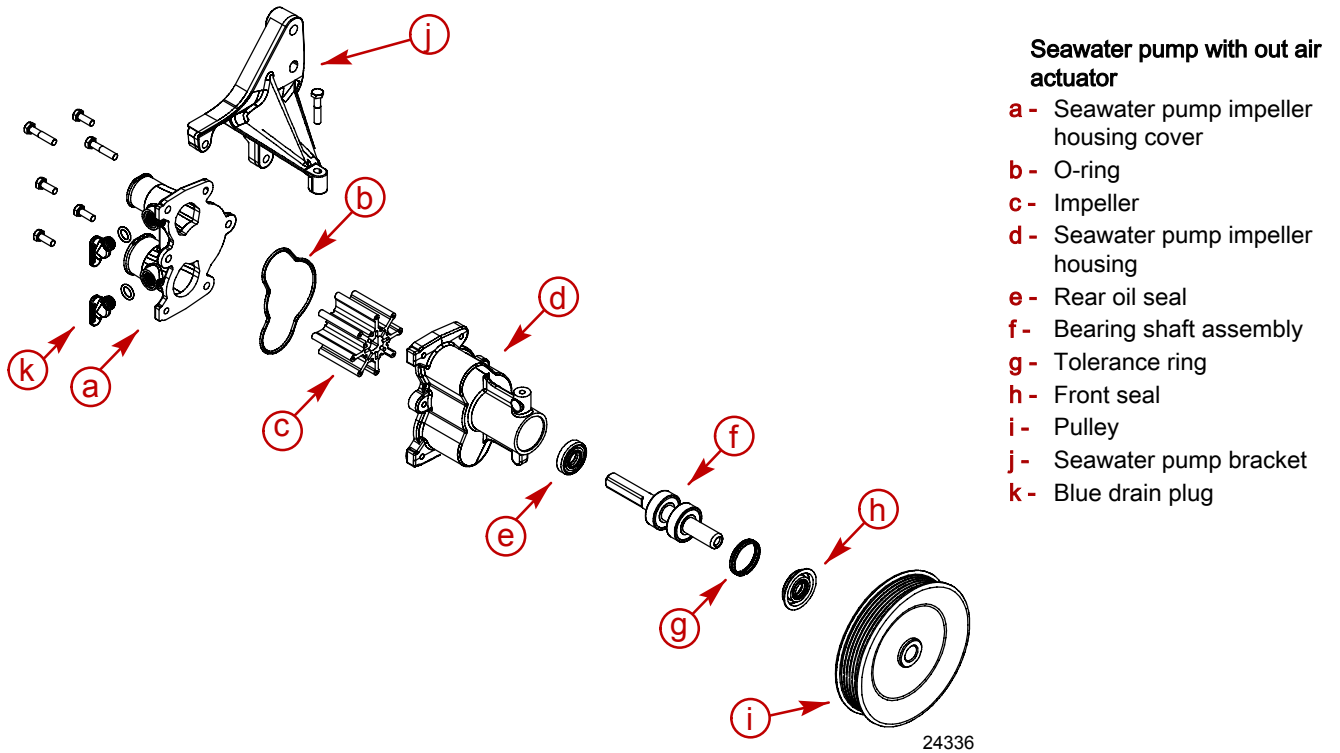
Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with Teflon	Quad ring seal	92-802859A 1

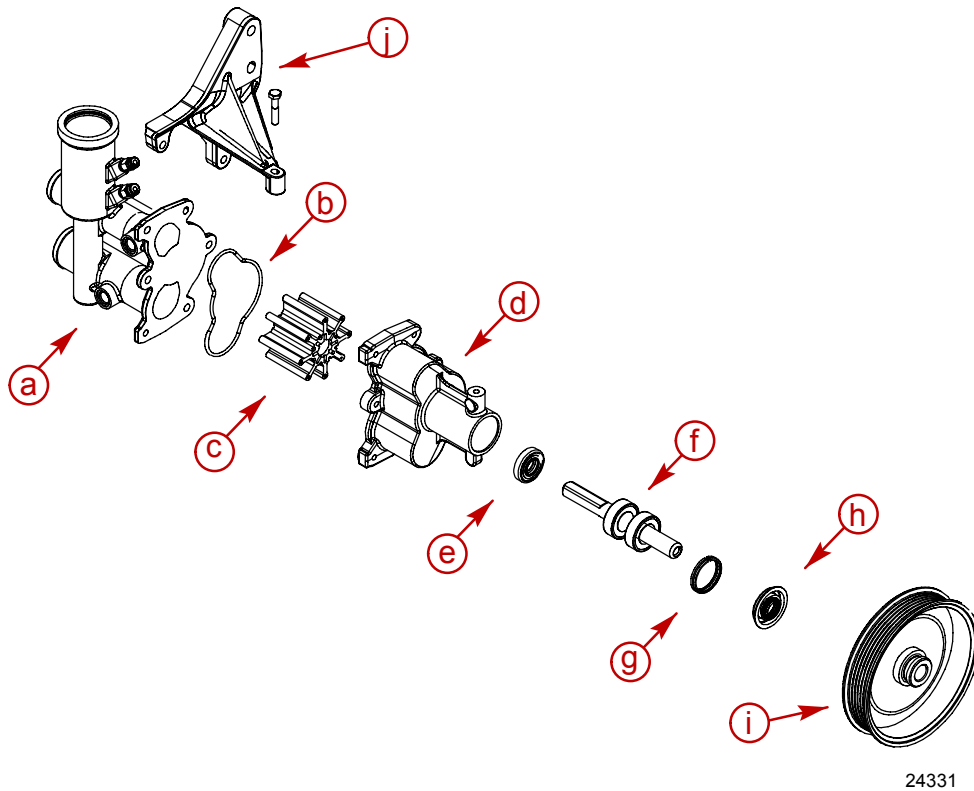
11. Place the wear plate over the bearing housing.



Brass Seawater Pump

Seawater Pump Exploded View





Seawater pump with air actuator

- a - Seawater pump actuator housing
- b - O-ring
- c - Impeller
- d - Seawater pump impeller housing
- e - Rear oil seal
- f - Bearing shaft assembly
- g - Tolerance ring
- h - Front seal
- i - Pulley
- j - Seawater pump bracket

Removal

1. Drain the seawater section of the cooling system.
2. Remove both of the hoses from the aft side of the seawater pump.
3. For models equipped with an air-actuated drain valve:
 - a. Disconnect the vent hose from the top of the drain valve.
 - b. Disconnect the air hoses from the drain valve, by pushing in and holding the plastic ring around the air hose, and pulling the air hose out of the fitting.

IMPORTANT: If a belt is to be reused, it should be installed in the same direction of rotation as before.

4. Remove the serpentine drive belt.
5. Remove the seawater pump and bracket assembly.

Disassembly

⚠ CAUTION

Removing the snap ring from the top of the air-actuated drain valve can allow the components to come apart forcefully, resulting in injury or product damage. Do not try to repair the valve or remove the snap ring.

1. Remove the seawater pump mounting bracket.
2. Remove the seawater pump pulley using an appropriate puller.

Power Steering Pump Pulley Remover	Kent Moore J-21239
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3. Remove the seawater pump impeller housing cover or the seawater pump actuator housing if equipped.
4. Remove the O-ring.
5. Remove the impeller.
6. Remove the seal from the front of the seawater pump housing.
7. Remove the tolerance ring.
8. Press the bearing shaft assembly out of the housing from the impeller side.
9. Remove the rear oil seal.

Cleaning and Inspection

⚠ WARNING

Spin-drying bearings with compressed air can cause serious injury or death. The bearings can explode, even if spun at very slow speeds. Do not allow the bearings to spin when drying with compressed air.

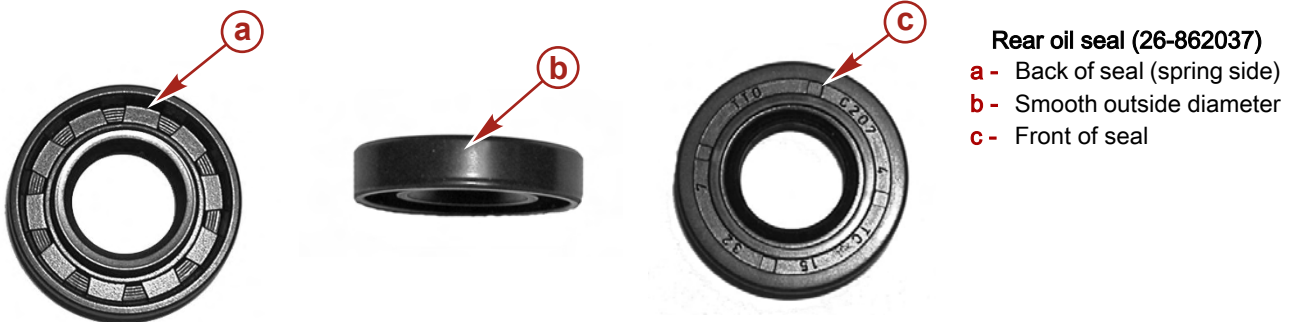
1. Clean the metal parts in solvent and dry with compressed air.
2. Clean the gasket material and sealant from the sealing surfaces.
3. Inspect the bearing housing. Examine the surfaces (where the bearings contact the housing) for evidence of the bearing outer races turning in the housing.
4. Inspect the seals in the bearing housing for signs of damage or leaks.
5. Rotate the bearing shaft in the bearing housing. Replace the bearing shaft assembly if the bearings feel rough or if either end of the shaft wobbles.
6. Inspect the impeller housing and impeller housing cover surfaces where the impeller rides. Replace the impeller housing if significant grooves exist.

NOTE: A revised housing cover assembly is available as a service replacement. The assembly is a composite material with a replaceable stainless steel wear plate.

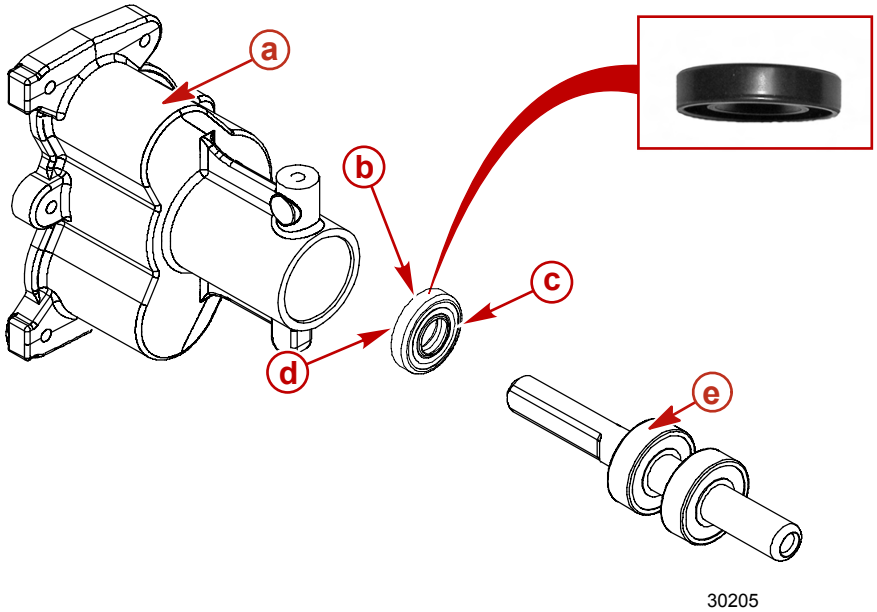
7. Inspect the face of the impeller housing cover for grooves. The face of the impeller housing cover can be resurfaced to remove grooves. Remove a maximum of 1.0 mm (0.040 in.) of material.
8. Inspect the pump impeller and replace if any of the following conditions exist:
 - wear on the ends and tips of the blades
 - cracks in the area where the blades flex
 - cracks in the impeller hub
 - blade set (blades remain curved)
9. Inspect the pump pulley for bends or cracks.
10. Inspect the serpentine belt for excessive wear.

Assembly

1. Models with the serial number 0M024999 and below, Install the rear seal with the spring toward the impeller cavity.
IMPORTANT: Models with the serial number 0M025000 and above use one of two rear oil seal types. Identify the rear oil seal to be installed and follow that specific seal instruction for correct orientation.
2. Models with the serial number 0M025000 and above, and using the rear oil seal (26-862037). Orient the front of the seal toward the bearing shaft assembly.



29827



Orientation of the rear oil seal (26-862037)

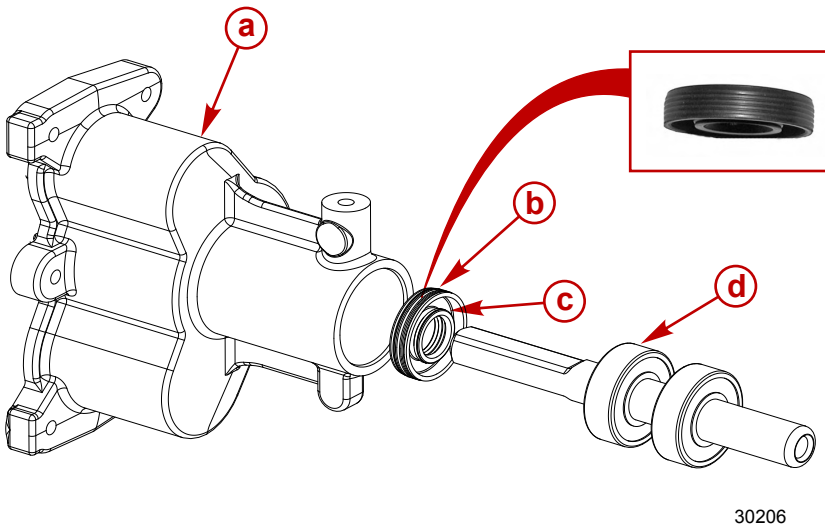
- a** - Seawater pump impeller housing
- b** - Smooth outside diameter of rear oil seal
- c** - Front of rear oil seal
- d** - Back of seal (spring side)
- e** - Bearing shaft assembly

3. Models with the serial number 0M025000 and above, and using the rear oil seal (26-8M2001645). Orient the back of the rear oil seal (spring side) toward the bearing shaft assembly.



Rear oil seal (26-8M2001645)


- a** - Back of seal (spring side)
- b** - Grooved outside diameter
- c** - Front of seal



Orientation of the rear oil seal (26-8M2001645)

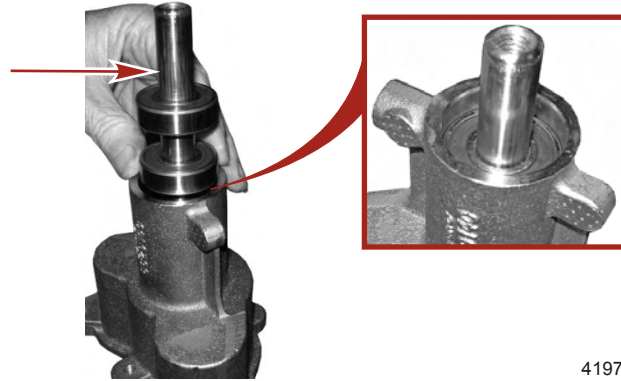
- a** - Seawater pump impeller housing
- b** - Grooved outside diameter of rear oil seal
- c** - Back of rear oil seal (spring side)
- d** - Bearing shaft assembly

4. Lubricate the bearing shaft and the outer diameter of the bearings.

Tube Ref No.	Description	Where Used	Part No.
 80	SAE Engine Oil 30W	Outer diameter of the bearings	Obtain Locally

IMPORTANT: The bearing shaft assembly is a slip fit in the bearing housing. Minimal force is required to install the bearing shaft assembly into the housing.

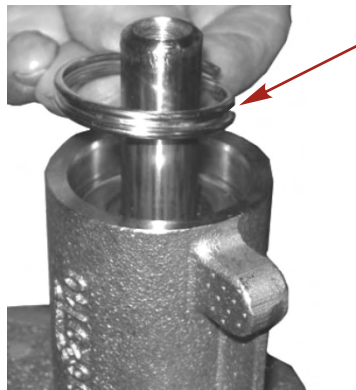
- Install the bearing shaft assembly into the impeller housing. The end of the shaft with flat surfaces should extend into the impeller cavity. Clean any assembly lube or oil from the forward end of the impeller housing.



41977

Bearing shaft assembly


- Insert the tolerance ring into the impeller housing.



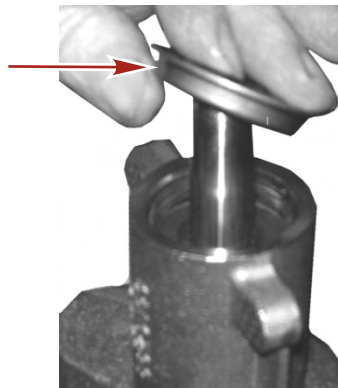
41978

Tolerance ring

- Apply adhesive to the outer diameter of front seal. Do not allow adhesive to contact the seal portion or the bearing shaft assembly.

Tube Ref No.	Description	Where Used	Part No.
 68	Loctite 609	Front seal	Obtain Locally

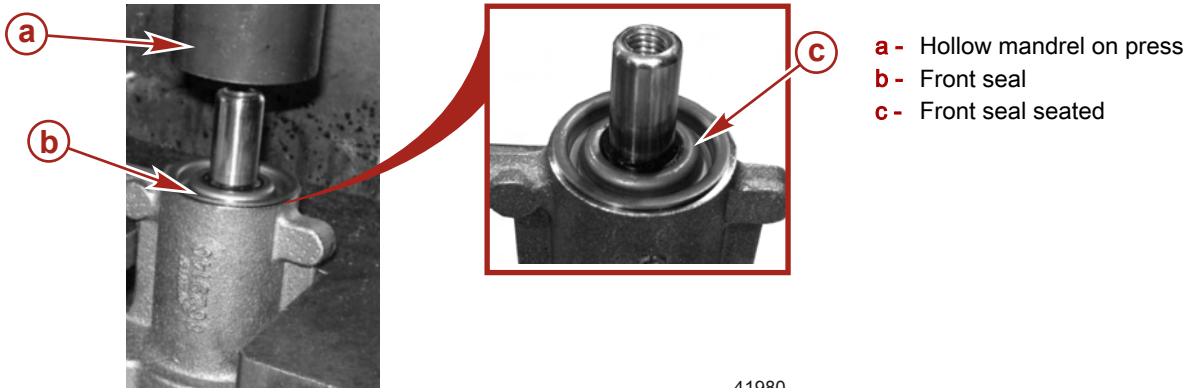
- Install the front seal onto the bearing shaft assembly and slide it down until it contacts the end of the impeller housing.



41979

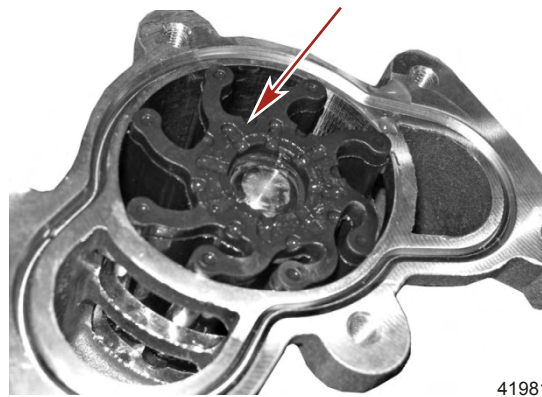
Front seal

- Use a suitable mandrel that will press the front seal without contacting the bearing shaft. Press the front seal into place. Wipe away excess adhesive.



41980

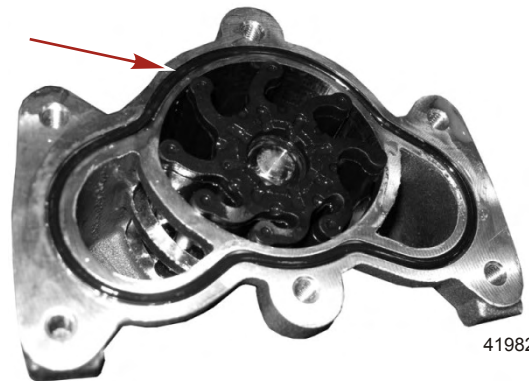
- Lubricate the impeller with soapy water. Align the flat surfaces of the impeller hub and bearing shaft and install the impeller into the impeller cavity.



41981

Impeller installed

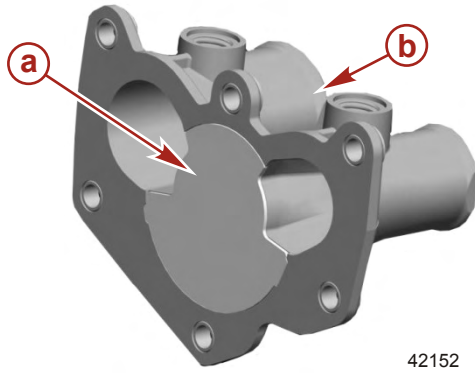
- Install the O-ring into the groove in the impeller housing rear face.



41982

O-ring installed in grove

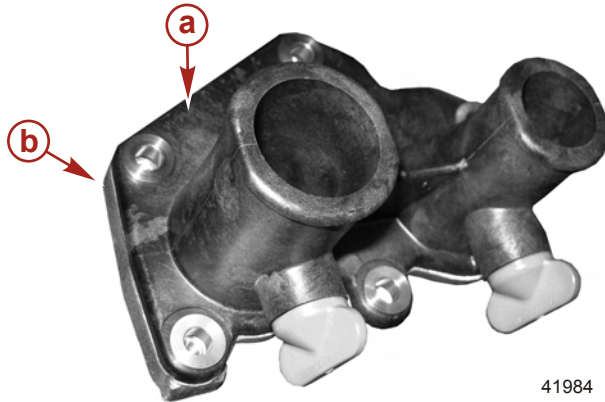
12. If you are installing the composite housing cover, Install the stainless steel wear plate if not already installed.



- a - Stainless steel wear plate
- b - Composite housing cover

42152


13. Align and install the impeller housing cover or the seawater pump actuator housing if equipped onto the impeller housing assembly.



- Seawater pump actuator housing is not shown**
- a - Impeller housing cover
 - b - Seawater pump

41984

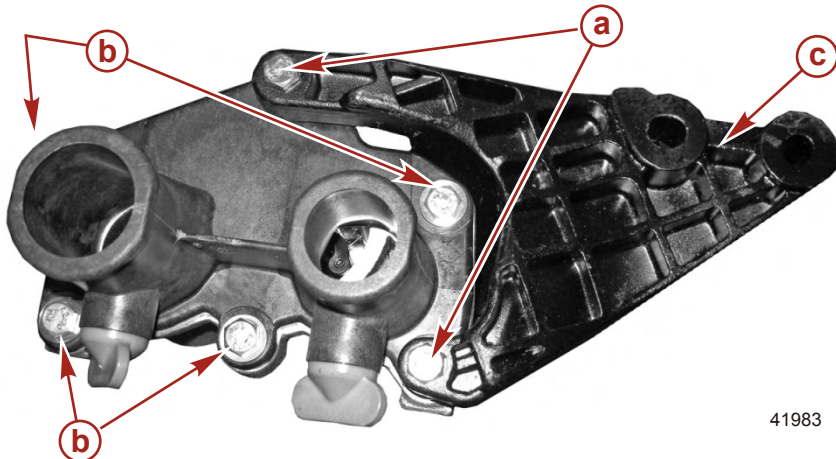
14. Apply adhesive to the threads of the impeller housing cover or the seawater pump actuator housing screws.

Tube Ref No.	Description	Where Used	Part No.
 66	Loctite 242 Threadlocker	Impeller housing cover or seawater pump actuator housing screw	92-809821

15. Install the four short impeller housing cover or the seawater pump actuator housing screws and tighten to specification.

Description	Nm	lb-in.	lb-ft
Impeller housing cover or the seawater pump actuator housing screw	10	88	-

16. Install the seawater pump bracket onto the seawater pump assembly. Install the two long screws through the bracket and into the seawater pump assembly. tighten the screws to specification.

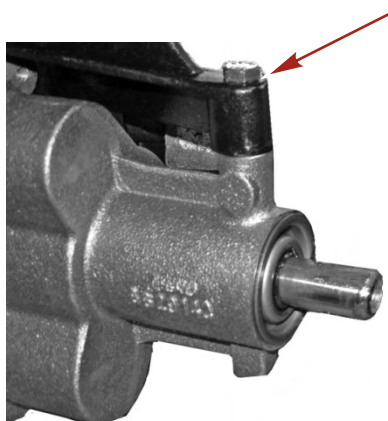


- a - Seawater pump bracket screw (2)
- b - Impeller housing cover screw (4)
- c - Seawater pump bracket

41983


Description	Nm	lb-in.	lb-ft
Seawater pump bracket to seawater pump assembly screw	10	88	–

17. Apply adhesive to the threads of the remaining seawater pump bracket screw that attaches the seawater pump bracket to the top of the seawater pump assembly. Install and tighten the screw to specification.



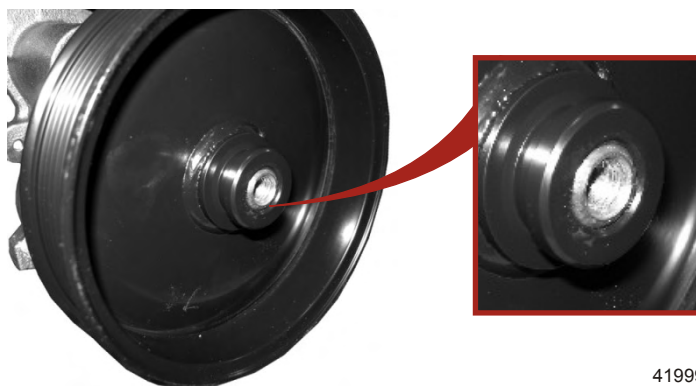
41985

Seawater pump bracket long screw

Tube Ref No.	Description	Where Used	Part No.
 66	Loctite 242 Threadlocker	Impeller housing cover or seawater pump actuator housing screw	92-809821

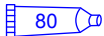
Description	Nm	lb-in.	lb-ft
Seawater pump bracket to seawater pump assembly screw	10	88	–

18. Lubricate the seawater pump shaft and install the seawater pump pulley onto the shaft using an appropriate pulley installer. Ensure that the end of the shaft is even with the face of pulley hub.



41999

Seawater pump pulley installed

Tube Ref No.	Description	Where Used	Part No.
 80	SAE Engine Oil 30W	Seawater pump shaft	Obtain Locally

Pulley Pusher Installer	91-93656A1
Power Steering Pump Pulley Remover	Kent Moore J-21239

19. Install the blue drain plugs in the seawater pump cover or actuator housing if removed.

Installation

1. Fasten the seawater pump and bracket to the engine. Tighten the bolts to specification.

Description	Nm	lb-in.	lb-ft
Seawater pump bracket to engine bolt	40	-	30

2. Install the seawater inlet and outlet hoses. Tighten the hose clamps securely.
3. For models equipped with an air-actuated drain valve:
 - a. Install the vent hose onto the top of the drain valve.
NOTE: *The air lines for the air-actuated drain valve are two different sizes.*
 - b. Install the appropriate air lines into the appropriate fittings on the air-actuated drain valve by fully inserting the air lines into the fittings. Pull on the air lines to ensure that they are properly installed.
IMPORTANT: *If a belt is to be reused, it should be installed in the same direction of rotation as before.*

NOTICE

Without sufficient cooling water, the engine, the water pump, and other components will overheat and suffer damage. Provide a sufficient supply of water to the water inlets during operation.

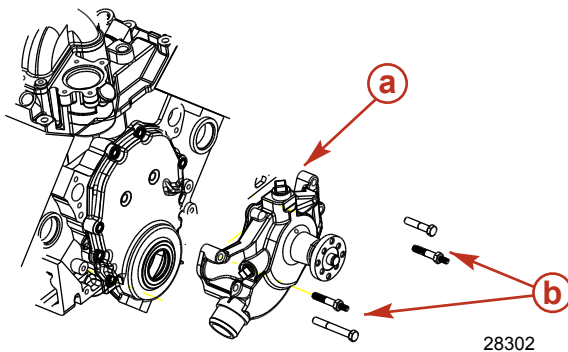
4. Install the serpentine drive belt.
5. Supply cooling water to the engine.
6. Start the engine and check for leaks.

Water Circulating Pump

Removal

NOTE: *The water circulating pump pulley on warm manifold closed cooled models is a new design and cannot be replaced with a previous Mercury MerCruiser water circulating pump pulley.*

1. Allow the engine to cool.
2. Drain the seawater or closed cooling section of the engine.
3. Remove the hoses attached to the water circulating pump.
4. With the drive belt installed to prevent rotation, loosen the water circulating pump pulley bolts.
IMPORTANT: *If a belt is to be reused, it must be installed in the same direction of rotation as before.*
5. Mark the direction of rotation and remove the serpentine drive belt.
6. Remove the water circulating pump bolts and pulley.
7. Remove the fasteners and the water circulating pump.



- a - Water circulating pump
- b - Fasteners

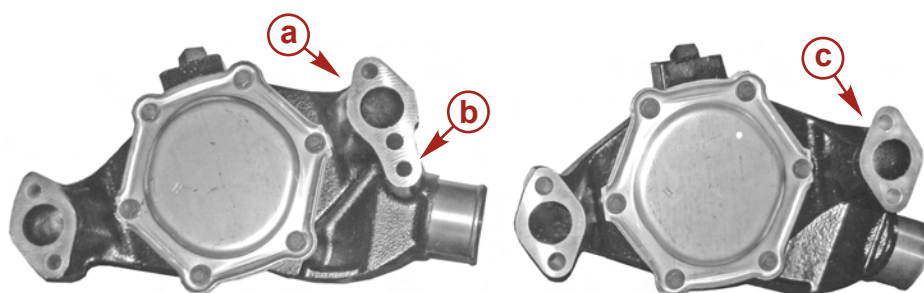
Cleaning and Inspection

1. Clean all gasket material and sealant from the sealing surfaces.
2. Check the bearing for excessive play.
3. Check the bearing for abnormal noise when turning the shaft.
4. Check the pump body for cracks.
5. Check the seal for signs of leaking.

Installation

The marine circulating water pump was revised in 2006 which removed it's internal by pass. However, either versions of the water pump are usable on the small block V8 GM engines.


IMPORTANT: The earlier version gasket is usable on both pumps. Do not use a revised pump gasket on the earlier version pump.



42028

- a** - Earlier version circulating water pump
- b** - Internal by pass
- c** - Revised circulating water pump

- Coat both sides of the new water circulating pump gaskets and the threads of the attaching fasteners with sealant.

Tube Ref No.	Description	Where Used	Part No.
 19	Perfect Seal	Water circulating pump gasket and the threads of the attaching fasteners	92-34227Q02

- Install the new water circulating pump gaskets to the cylinder block
- Install the water circulating pump. Tighten the bolts to specification.

Description	Nm	lb-in.	lb-ft
Water circulating pump fasteners	47	-	35

- Install the water circulating pump pulley to the water circulating pump. Tighten the bolts securely.
- Reconnect the hoses to the water circulating pump. Tighten the hose clamps securely.
- Install the serpentine drive belt and adjust the belt tension.
- Fill the closed cooling system, if equipped.

NOTICE

Without sufficient cooling water, the engine, the water pump, and other components will overheat and suffer damage. Provide a sufficient supply of water to the water inlets during operation.

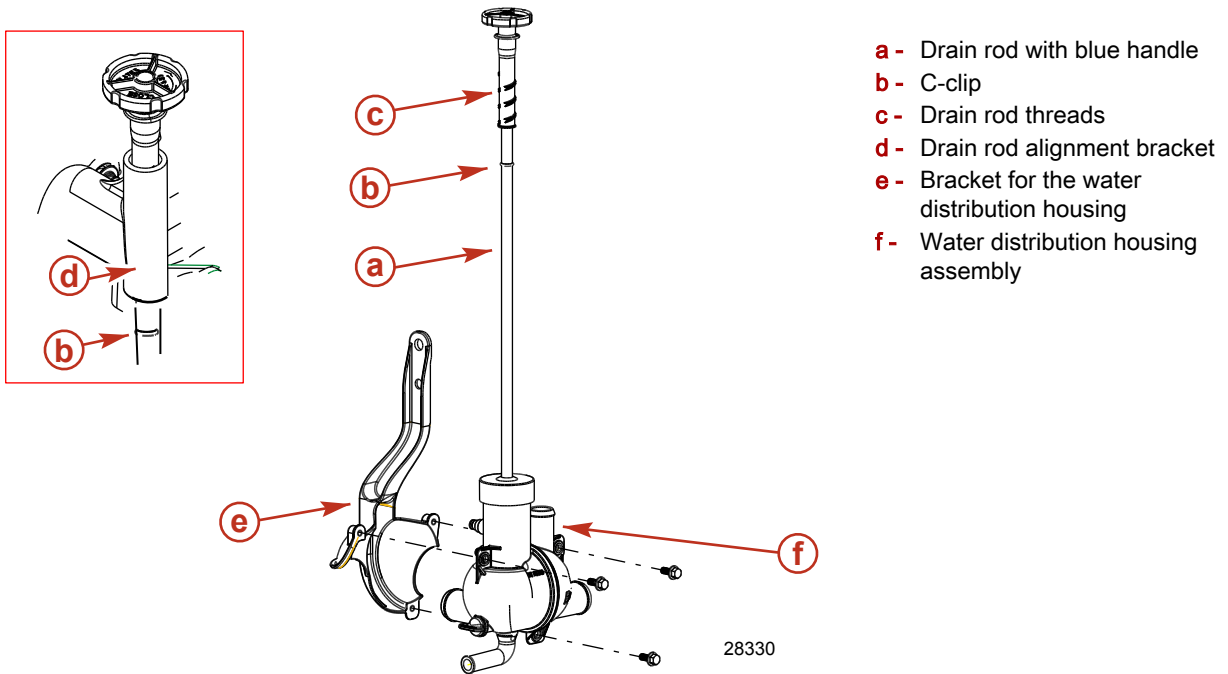
- Supply cooling water to the engine.
- Start the engine and check for leaks.

Water Distribution Housing

Removal

- Drain the seawater section of the cooling system.
- On Alpha manual single point drain, remove the drain rod from the water distribution housing.
 - Remove the C-clip from the drain rod. Retain the C-clip.

- b. Turn the drain rod handle counterclockwise until the drain rod threads clear the alignment bracket. Pull the drain rod straight up to completely remove.



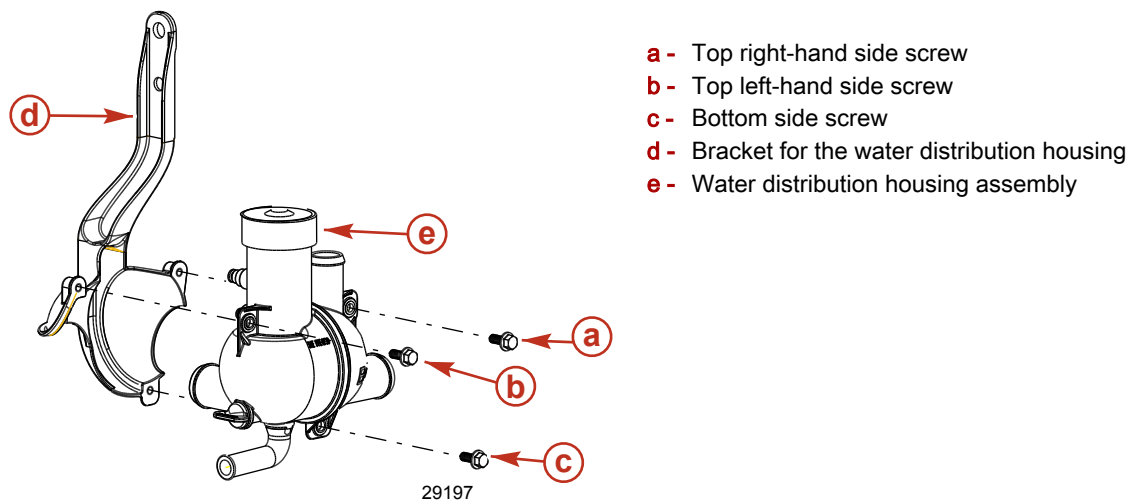
3. On air actuated single point drain, remove each air line from the water distribution housing by pressing on the fitting release location and pulling the line out.
4. Disconnect the hoses from the water distribution housing.
5. Remove the bolt and nut attaching the water distribution housing and bracket to the engine.
6. Remove the bracket from the the water distribution housing.

Cleaning and Inspection

1. Clean the water distribution housing with water and dry with a clean cloth or compressed air.
2. Inspect the housing for leaks, cracks, or corrosion damage. Replace, if necessary.

Installation

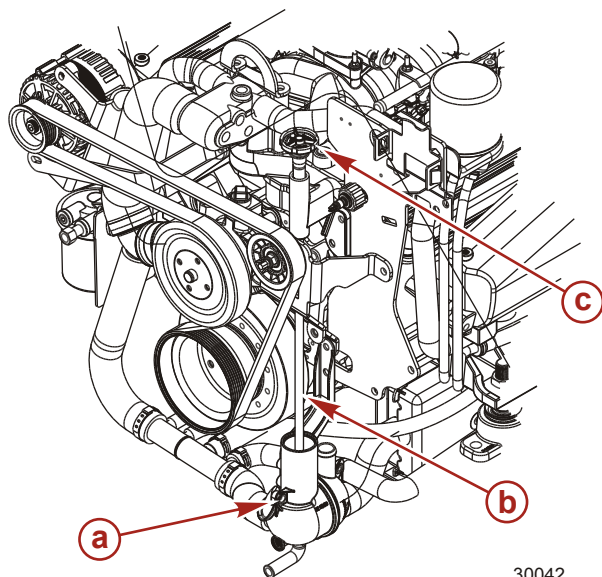
1. Align the water distribution housing with the bracket.
2. Install and tighten the screws in the order listed.
 - a. Top right-hand side screw.
 - b. Top left-hand side screw.
 - c. Bottom side screw.
3. Tighten the screws in the same order.



Description	Nm	lb-in.	lb-ft
Water distribution housing to bracket screws	13	120	–

4. Install the bracket and water distribution housing to the engine. Do not tighten the bolt and nut at this time.
5. On manual single point drain:
 - a. To obtain correct alignment, leave the hoses disconnected from the water distribution housing during installation.
 - b. Position the water distribution housing assembly to align with drain rod.
 - c. Engage the drain rod into the water distribution housing to complete alignment.
 - d. Ensure that the rod is correctly aligned. The rod must screw in and out of the water distribution housing easily and with little pressure.
 - e. Install C-clip to drain rod.

- a - Water distribution housing
 b - Drain rod
 c - Drain rod handle



30042

6. Tighten the bolt and nut attaching the water distribution housing bracket to the engine.

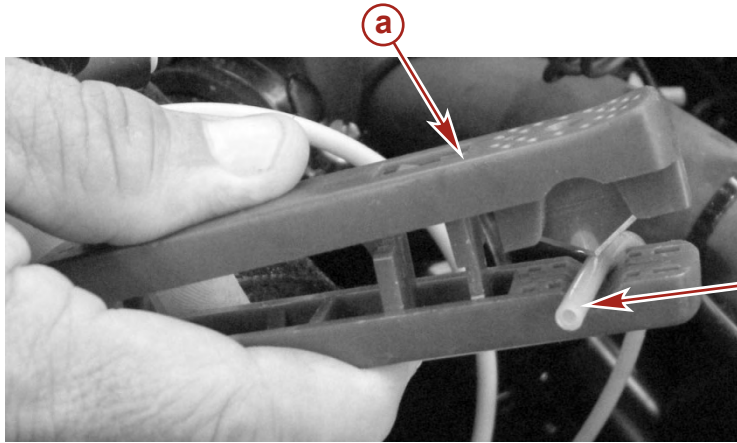
Description	Nm	lb-in.	lb-ft
Water distribution housing bracket bolt and nut	38	–	28

7. On air actuated single point drain, install the air lines to the air manifold.

IMPORTANT: Ensure that the air lines are routed to avoid sharp bends and/or contact with moving parts.

NOTE: The air line must remain cylindrical. The air line must not be distorted when cut. There is a 1 mm (0.04 in.) maximum allowable angle on the end of the air lines

- a. Using the air line cutter, cut the bulk air line to the appropriate length for installation.

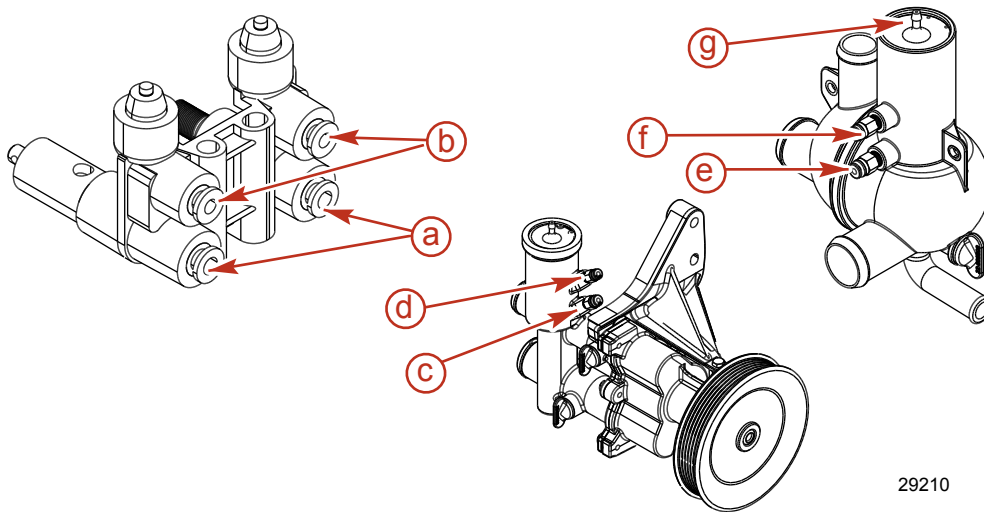


- a - Air line cutter
- b - Air line

42000

Air Line Cutter	91-883502
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- b. Connect the air lines from the air manifold assembly to the seawater pump connectors and the water distribution housing connectors by inserting the end of the air line onto the connector approximately 6 mm (1/4 in.).
- c. Connect the gray 3/16 in. OD air lines into the lower connectors on the air manifold, the water distribution housing, and the seawater pump.
- d. Connect the green 5/32 in. OD air lines into the upper line connectors on the air manifold, the water distribution housing, and the seawater pump.
- e. Connect the black 5/16 in. OD vent tube onto the water distribution housing air actuator; secure with tie straps.



29210

- a - Lower air manifold assembly air line connector 3/16 in.
- b - Upper air manifold assembly air line connector 5/32 in.
- c - Lower seawater pump air actuator air line connector 3/16 in.
- d - Upper seawater pump air actuator air line connector 5/32 in.
- e - Lower water distribution housing air actuator air line connector 3/16 in.
- f - Upper water distribution housing air actuator air line connector 5/32 in.
- g - Vent tubing connection 5/16 in.

8. Ensure that each air line is securely connected by pulling on the line.
9. Secure the air lines with tie straps.
10. Connect the hoses to the water distribution housing. Tighten the hose clamps securely.