

## Warranty Message

The product you have purchased comes with a **limited warranty** from Mercury Marine; the terms of the warranty are set forth in the *Warranty* Sections of this manual. The warranty statement contains a description of what is covered, what is not covered, the duration of coverage, how to best obtain warranty coverage, **important disclaimers and limitations of damages**, and other related information. Please review this important information.

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### **WARNING**

The operator (driver) is responsible for the correct and safe operation of the boat, the equipment aboard and the safety of all occupants aboard. We strongly recommend that the operator read this Operation, Maintenance and Warranty Manual and thoroughly understand the operational instructions for the power package and all related accessories before the boat is used.

### **WARNING**

#### CALIFORNIA

#### PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

The description and specifications contained herein were in effect at the time this guide was approved for printing. Mercury Marine, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change specifications or designs, without notice and without incurring obligation. **Mercury Marine** Fond du Lac, Wisconsin, U.S.A.

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# **WELCOME!**

You have selected one of the finest marine power packages available. It incorporates numerous design features to assure operating ease and durability.

With proper care and maintenance, you will thoroughly enjoy using this product for many boating seasons. To ensure maximum performance and carefree use, we ask that you thoroughly read this manual.

The Operation, Maintenance and Warranty Manual contains specific instructions for using and maintaining your product. We suggest that this manual remain with the product for ready reference whenever you are on the water.

Thank you for purchasing one of our MerCruiser products. We sincerely hope your boating will be pleasant!

**CONSUMER AFFAIRS DEPARTMENT**

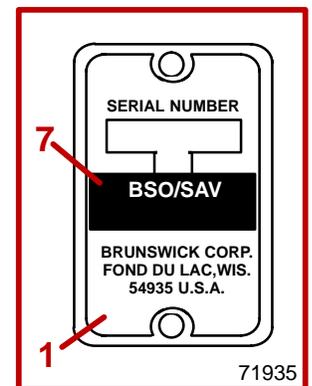
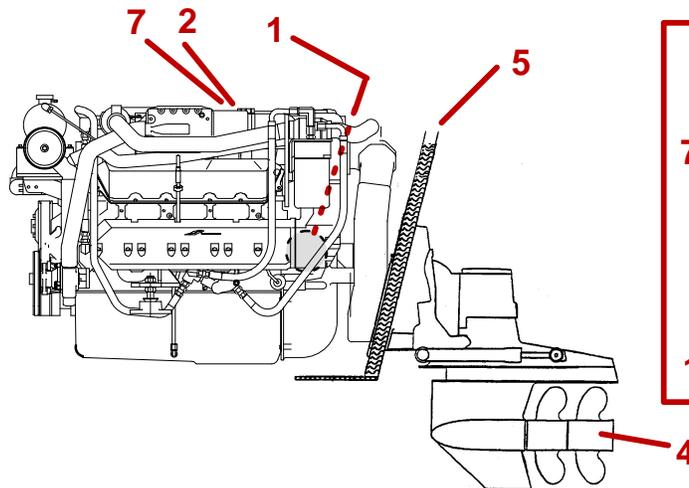
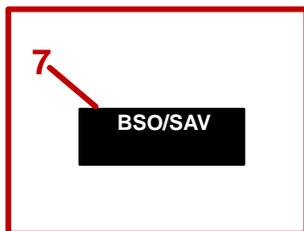
# Identification Record

Please record the following information:

1.	Engine Model and Horsepower	Engine Serial Number	
2.	Transom Assembly Serial Number (Sterndrive)	Gear Ratio	Sterndrive Unit Serial Number
3.	Transmission Model (Inboard)	Gear Ratio	Transmission Serial Number
4.	Propeller Number	Pitch	Diameter
5.	Hull Identification Number (HIN)	Purchase Date	
6.	Boat Manufacturer	Boat Model	Length
7.	Exhaust Gas Emissions Certificate Number (Europe Only)		

## Serial Numbers

The serial numbers are the manufacturer's keys to numerous engineering details which apply to your MerCruiser® power package. When contacting your Authorized MerCruiser Dealer about service, **always specify model and serial numbers.**



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# Warranty Information

## Owner Warranty Registration

### UNITED STATES AND CANADA ONLY

- It is important that your selling dealer fills out the Warranty Registration Card completely and mails it to the factory immediately upon sale of the new product.
- It identifies name and address of the original purchaser, product model and serial number(s), date of sale, type of use and selling dealer's code, name and address. The dealer also certifies that you are the original purchaser and user of the product.
- Upon receipt of the Warranty Registration Card at the factory, you will be issued a plastic Owner Warranty Registration Card which is your only valid registration identification. It must be presented to the servicing dealer should warranty service be required. Warranty claims will not be accepted without presentation of this card.
- A temporary Owner Warranty Registration Card will be presented to you when you purchase the product. It is valid only for 30 days from date of sale while your plastic Owner Warranty Registration Card is being processed. Should your product need service during this period, present the temporary registration card to the dealer. He will attach it to your warranty claim form.
- Because of your selling dealer's continuing personal interest in your satisfaction, the product should be returned to him for warranty service.
- If your plastic card is not received within 30 days from date of new product sale, please contact your selling dealer.
- The product warranty is not effective until the product is registered at the factory.
- NOTICE: Registration lists must be maintained by factory and dealer on marine products sold in the United States, should notification under the Federal Boat Safety Act be required.

## International Owner Registration

### OUTSIDE THE UNITED STATES AND CANADA

- It is important that your selling dealer fills out the Warranty Registration Card completely and mails it to the distributor or Marine Power Service Center responsible for administering the warranty registration/claim program for your area.
- The Warranty Registration Card identifies your name and address, product model and serial number(s), date of sale, type of use and the selling distributors/dealer's code number, name and address. The distributor/dealer also certifies that you are the original purchaser and user of the product.
- A copy of the Warranty Registration Card, designated as the "Purchaser's Copy", MUST be given to you immediately after the card has been completely filled out by the selling distributor/dealer. This card represents your factory registration identification, and should be retained by you for future use when required. Should you ever require warranty service on this product, your dealer may ask you for the Warranty Registration Card to verify date of purchase and to use the information on the card to prepare the warranty claim form(s).
- In some countries, the Marine Power Service Center will issue you a permanent (plastic) Warranty Registration Card within 30 days after receiving the "Factory Copy" of the Warranty Registration Card from your distributor/dealer. If you receive a plastic Warranty Registration Card, you may discard the "Purchaser's Copy" that you received from the distributor/dealer when you purchased the product. Ask your distributor/dealer if this plastic card program applies to you.
- For further information concerning the Warranty Registration Card and its relationship to Warranty Claim processing, refer to the "International Warranty." Refer to "Table of Contents."

**IMPORTANT: Registration lists must be maintained by the factory and dealer in some countries by law. It is our desire to have ALL products registered at the factory should it ever be necessary to contact you. Make sure your dealer/distributor fills out the warranty registration card immediately and sends the factory copy to the Marine Power International Service Center for your area.**

## Mercury MerCruiser Diesel Limited Warranty

- I. We warrant each new production MerCruiser Diesel Sterndrive Power Package, Inboard Engine and Accessories attached thereto (hereafter referred to as "Product"), manufactured by MerCruiser (hereafter referred to as the "Company"), and sold to the consumer in a country to which distribution is authorized by the Company, to be free from defects in material and workmanship.
- II. This warranty shall become effective upon the date of sale to the first purchaser or user of the Product. The warranty period for D7.3L D-Tronic engines, which are engines designed exclusively for Pleasure Craft applications, is one (1) year from date of sale to the first purchaser or user of the product. The warranty period for D7.3L D-Tronic LD engines, which are engines designed for Light-Duty Craft applications, is one (1) year from date of sale to the first purchaser or user of the product, or the accumulation of 500 hours of engine operation, whichever occurs first. For purposes of this warranty Pleasure Craft is defined as a recreational planing craft used exclusively for pleasure and recreation. Light-Duty Craft is defined as a planing hull vessel used in law enforcement, commercial, or professional entertainment activity, or in an enterprise or venture in which revenue (in any amount) is generated directly or indirectly. Light-Duty Craft is further defined as having an annual operating time not to exceed 500 hours, Wide-Open-Throttle operation is limited to less than 10% of operating time, and continuous cruising rpm is limited to at or less than 90% of Wide-Open-Throttle rpm. If the applicable law prohibits limitation of warranty coverage to one (1) year, then the warranty shall be the minimum period required by law. The unused period of the applicable warranty, if any, is transferable to subsequent purchasers.
- III. To validate the warranty, the "Warranty Registration Card", included with each Product, must be properly completed by the selling dealer and forwarded immediately after the sale to Mercury Marine (U.S.A. and Canada) or to a Marine Power International Branch, or Distributor Service Office (outside the U.S.A. and Canada).
- IV. Purchaser must provide proof of purchase and substantiate the original date of sale by presenting to the dealer, authorized to service the Product, the original purchaser's copy of the "Warranty Registration Card" or the "Owner Warranty Registration Card". If either of these items is not available, purchaser must provide a copy of the original purchaser's "Bill of Sale" (Sales Contract) for the Product to be serviced. Warranty claims will not be accepted by the dealer until the original date of sale and Product serial number can be verified.
- V. Since this warranty applies to defects in material or workmanship, it does not apply to normal wear, adjustments, tune-ups or to damage caused by: 1) Neglect, lack of maintenance, accident, abnormal operation, improper installation or service; 2) Use of a propeller not properly suited to application/boat load or, failure to follow instructions in applicable service and warranty information manuals or operation and maintenance manual; 3) Use of an accessory or part not manufactured or sold by us; 4) Operation with fuels, oils, lubricants or coolants/coolant additives which are not suitable for use with the Product or recommended by us; 5) Participating in or preparing for racing or other competitive activity or operating with racing type lower unit; 6) Alteration or removal of parts; 7) Water entering engine cylinder/s through the exhaust system or air intake system; 8) Use of product in a full-displacement or semi-displacement hull vessel; or 9) Use or operation of the product in a manner inconsistent with the "Recommended Operation/Duty Cycle" section of the Operation, Maintenance and Warranty Manual.

**MerCruiser Diesel Limited Warranty (continued on following page)**

- VI. Reasonable access must be provided to the Product for warranty service. This warranty will not apply to: 1) Haul-out, launch, towing and storage charges, telephone or rental charges of any type, inconvenience, or loss of time or income, or other consequential damages; or 2) Removal and/or replacement of boat partitions or material because of boat design for necessary access to the Product.
- VII. Claim shall be made under this warranty by delivering the Product for inspection to a MerCruiser dealer authorized to service the Product. If purchaser cannot deliver Product to such authorized dealer, he may give notice in writing to the Company (U.S.A. and Canada) or the nearest Marine Power International Branch or Distributor Service Office (outside the U.S.A. and Canada). We shall then arrange for the inspection and repair, provided such service is covered under this warranty. Purchaser shall pay for all related transportation charges and/or travel time. If the service is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Any Product or parts shipped by purchaser for inspection or repair must be shipped with transportation charges prepaid.
- VIII. Our sole and exclusive obligation under this warranty shall be limited to repairing a defective part or, at our option, refunding the purchase price or replacing such part or parts with new or Mercury certified remanufactured parts as shall be necessary to remedy any malfunction resulting from defects in material or workmanship as covered by this warranty. The repair or replacement of parts, or the performance of service, under this warranty, does not extend the period of this warranty beyond its original expiration date. We reserve the right to improve the design of any Product without assuming any obligation to modify any Product previously manufactured.

**IX. ALL INCIDENTAL AND/OR CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM THIS WARRANTY. WARRANTIES OF MERCHANTABILITY AND FITNESS ARE EXCLUDED FROM THIS WARRANTY. IMPLIED WARRANTIES ARE LIMITED TO THE LIFE OF THIS WARRANTY. SOME STATES OR COUNTRIES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY TO YOU.**

- X. This warranty gives you specific legal rights and you may also have other legal rights which vary from state to state and country to country.

## Warranty Coverage and Exclusion

The purpose of this section is to help eliminate some of the more common misunderstandings regarding warranty coverage. The table explains some of the types of services that are not covered by warranty.

Keep in mind that warranty covers repairs that are needed within the warranty period because of defects in material and workmanship. Installation errors, accidents normal wear and a variety of other causes that affect the product are not covered.

Warranty is limited to defects in material or workmanship, but only when the consumer sale is made in the country to which distribution is authorized by us.

Should you have any questions concerning warranty coverage contact your authorized dealer. They will be pleased to answer any questions that you may have.

### **WARRANTY DOES NOT APPLY TO THE FOLLOWING:**

- Minor adjustments or checks, including checking fuel injection pump timing, cleaning fuel injectors, filters, or adjusting belts, controls, and checking lubrication made in connection with normal services.
- Damage caused by neglect, lack of maintenance, accident, abnormal operation, improper installation or service, or freezing temperatures.
- Haul-out, launch, towing charges; removal and/or replacement of boat partitions or material because of boat design for necessary access to the product; all related transportation charges and/or travel time, etc. Reasonable access must be provided to the product for warranty service. Customer must deliver product to an Authorized Dealer.
- Additional service work requested by customer other than that necessary to satisfy the warranty obligation.
- Labor performed by other than an Authorized Dealer may be covered only under following circumstances: When performed on emergency basis (providing there are no Authorized Dealers in area who can perform the work required or have no facilities to haul out, etc., and prior factory approval has been given to have the work performed at this facility).
- All incidental and/or consequential damages (storage charges, telephone or rental charges of any type, inconvenience or loss of time or income) are the owner's responsibility.
- Use of other than Quicksilver replacement parts when making warranty repairs.
- Oils, lubricants or fluids changed as a matter of normal maintenance is customer's responsibility unless loss or contamination of same is caused by product failure that would be eligible for warranty consideration.
- Participating in or preparing for racing or other competitive activity.
- Engine noise does not necessarily indicate a serious engine problem. If diagnosis indicates a serious internal engine condition which could result in a failure, condition responsible for noise should be corrected under the warranty.
- Lower unit and/or propeller damage caused by striking a submerged object is considered a marine hazard.
- Water entering the engine via the air filter or exhaust system or submersion. Also, water in the starter motor.
- Starter motors and/or armatures or field coil assembly, which are burned, or where lead is thrown out of commutator because of excess cranking.
- Valve or valve seat grinding required because wear.
- Failure of any parts caused by lack of cooling water, which results from starting power package out of water, foreign material blocking inlets or power package being mounted too high.
- Use of fuels and lubricants which are not suitable for use with or on the product. Refer to your Operation and Maintenance Manual.
- Our limited warranty does not apply to any damage to our products caused by the installation or use of parts and accessories which are not manufactured or sold by us. Failures which are not related to the use of those parts or accessories, are covered under warranty, if they otherwise meet the terms of the limited warranty for that product.

## Transferable Warranty

The product warranty is transferable to a subsequent purchaser, but only for the remainder of the unused portion of the limited warranty. This will not apply to products used for commercial applications.

### DIRECT SALE BY OWNER

- The second owner can be registered as the new owner and retain the unused portion of the limited warranty by sending the former owner's plastic Owner Warranty Registration Card and a copy of the bill of sale to show proof of ownership. In the United States and Canada, mail to:

**Attn: Warranty Registration Department  
Mercury Marine  
W6250 West Pioneer Road  
P.O. Box 1939  
Fond du Lac, WI 54936-1939**

- A new Owner Warranty Registration Card will be issued with the new owner's name and address. Registration records will be changed on the factory computer registration file.
- There is no charge for this service.

**Outside the United States and Canada, please contact the closest Mercury Marine Service Office, or the closest distributor in your country, for the transferable warranty procedure that would apply to you.**

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## Read This Manual Thoroughly

**IF YOU DON'T UNDERSTAND ANY PORTION, CONTACT YOUR DEALER FOR A DEMONSTRATION OF ACTUAL STARTING AND OPERATING PROCEDURES.**

### NOTICE

Throughout this publication, and on your power package, **WARNINGS** and **CAUTIONS**, accompanied by the International Hazard Symbol , may be used to alert the installer/user to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. **Observe them carefully.**

These "Safety Alerts" alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus "common sense" operation, are major accident prevention measures.

### **WARNING**

Hazards or unsafe practices which **COULD** result in severe personal injury or death.

### **CAUTION**

Hazards or unsafe practices which could result in minor personal injury or product or property damage.

**IMPORTANT:** Indicates information or instructions that are necessary for proper operation and / or maintenance.

### **WARNING**

The operator (driver) is responsible for the correct and safe operation of the boat, the equipment aboard and the safety of all occupants aboard. We strongly recommend that the operator read this Operation, Maintenance and Warranty Manual and thoroughly understand the operational instructions for the power package and all related accessories before the boat is used.

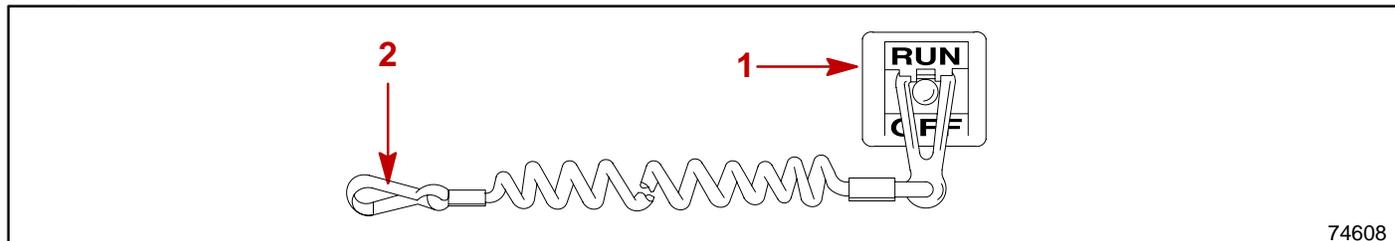
We strongly recommend that other occupants be instructed on proper starting and operation procedures so they will be prepared should they be required to operate the power package and boat in an emergency.

### **WARNING**

The use of accessories not manufactured or sold by Mercury Marine are not recommended for use with your MerCruiser unit. If your MerCruiser unit is equipped with an accessory not manufactured by Mercury Marine, be sure to read the operation and maintenance manual for the accessory before operation. If you haven't been supplied with such a manual, contact your dealer or the manufacturer of the accessory to secure the applicable manual.

## GENERAL INFORMATION

### Lanyard Stop Switch



The purpose of a lanyard stop switch (1) is to turn off the engine when the operator moves far enough away from the operator's position (as in accidental ejection from the operator's position) to activate the switch. Some remote control units are equipped with a lanyard stop switch. A lanyard stop switch can be installed on the dashboard or side adjacent to the operator's position.

The lanyard is a cord usually between 4 and 5 feet (1220 and 1524 mm) in length when stretched out with an element on one end made to be inserted into the switch and a snap (2) on the other end for attaching to the operator. The lanyard is coiled to make its at-rest condition as short as possible so as to minimize the likelihood of lanyard entanglement with nearby objects. It is made as long as it is in its stretched condition to minimize the likelihood of accidental activation should the operator choose to move around in an area close to the normal operator's position. If it is desired to have a shorter lanyard, wrap the lanyard around the operator's wrist or leg, or tie a knot in the lanyard.

**IMPORTANT:** The purpose of a lanyard stop switch is to stop the engine when the operator moves far enough away from the operator's position to activate the switch. This would occur if the operator accidentally falls overboard or moves within the boat a sufficient distance from the operator's position. Accidental ejections and falls overboard are more likely to occur in certain types of boats such as low sided sport boats or bass boats, and high-performance boats. Accidental ejections and falls overboard are also likely to occur as a result of poor operating practices such as sitting on the back of the seat or gunwale at planing speeds, standing at planing speeds, sitting on elevated fishing boat decks, operating at planing speeds in shallow or obstacle-infested waters, releasing your grip on a steering wheel that is pulling in one direction, drinking alcohol or consuming drugs, or daring, high-speed boat maneuvers.

## Lanyard Stop Switch (Continued)

While activation of the lanyard stop switch will stop the engine immediately, a boat will continue to coast for some distance depending upon the velocity and degree of any turn at shut-down. However, the boat will not complete a full circle. While the boat is coasting, it can cause injury to anyone in the boat's path as seriously as the boat would when under power.

We strongly recommend that other occupants be instructed on proper starting and operating procedures should they be required to operate the engine in an emergency (e.g. if the operator is accidentally ejected).

### **WARNING**

**Should the operator fall out of the boat, the possibility of serious injury or death from being run over by the boat can be greatly reduced by stopping the engine immediately. Always properly connect both ends of the stop switch lanyard to the stop switch and the operator.**

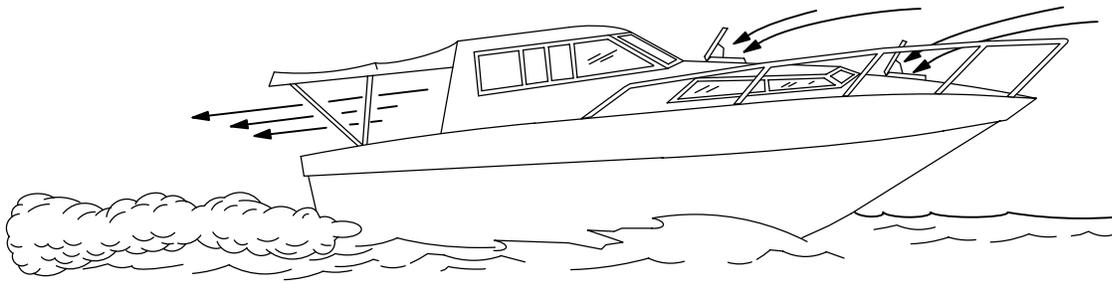
Accidental or unintended activation of the switch during normal operation is also a possibility. This could cause any, or all, of the following potentially hazardous situations:

- 1 Occupants could be thrown forward due to unexpected loss of forward motion – a particular concern for passengers in the front of the boat who could be ejected over the bow and possibly struck by the gear case or propeller.
- 2 Loss of power and directional control in heavy seas, strong current or high winds.
- 3 Loss of control when docking.

### **WARNING**

**Avoid serious injury or death from deceleration forces resulting from accidental or unintended stop switch activation. The boat operator should never leave the operator's station without first disconnecting the stop switch lanyard from the operator.**

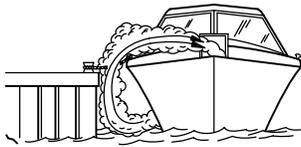
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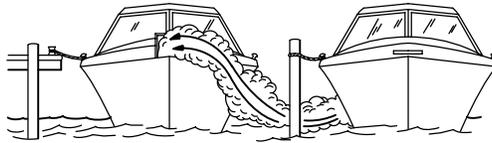
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Courtesy of ABYC

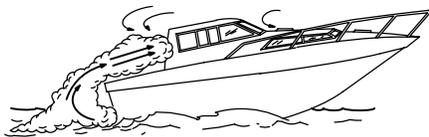
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2A



2B



3A



3B

Courtesy of ABYC

## Exhaust Emissions

### BE ALERT TO CARBON MONOXIDE POISONING

Carbon monoxide is present in the exhaust fumes of all internal combustion engines including the outboards, sterndrives and inboard engines that propel boats, as well as the generators that power various boat accessories. Carbon monoxide is a deadly gas that is odorless, colorless and tasteless.

Early symptoms of carbon monoxide poisoning, which should not be confused with seasickness or intoxication, include headache, dizziness, drowsiness, and nausea.

### **WARNING**

**Avoid the combination of a running engine and poor ventilation. Prolonged exposure to carbon monoxide in sufficient concentration can lead to unconsciousness, brain damage or death.**

### GOOD VENTILATION

Ventilate passenger area, open side curtains, or forward hatches to remove fumes.

#### 1 Example of desired air flow through the boat.

### POOR VENTILATION

Under certain running and/or wind conditions, permanently enclosed or canvas enclosed cabins or cockpits with insufficient ventilation may draw in carbon monoxide. Install one or more carbon monoxide detectors in your boat.

Although the occurrence is rare, on a very calm day, swimmers and passengers in an unclosed area of a stationary boat that contains or is near a running engine may be exposed to a hazardous level of carbon monoxide.

#### 2 Examples of poor ventilation while boat is stationary:

**A** Running the engine when the boat is moored in a confined space.

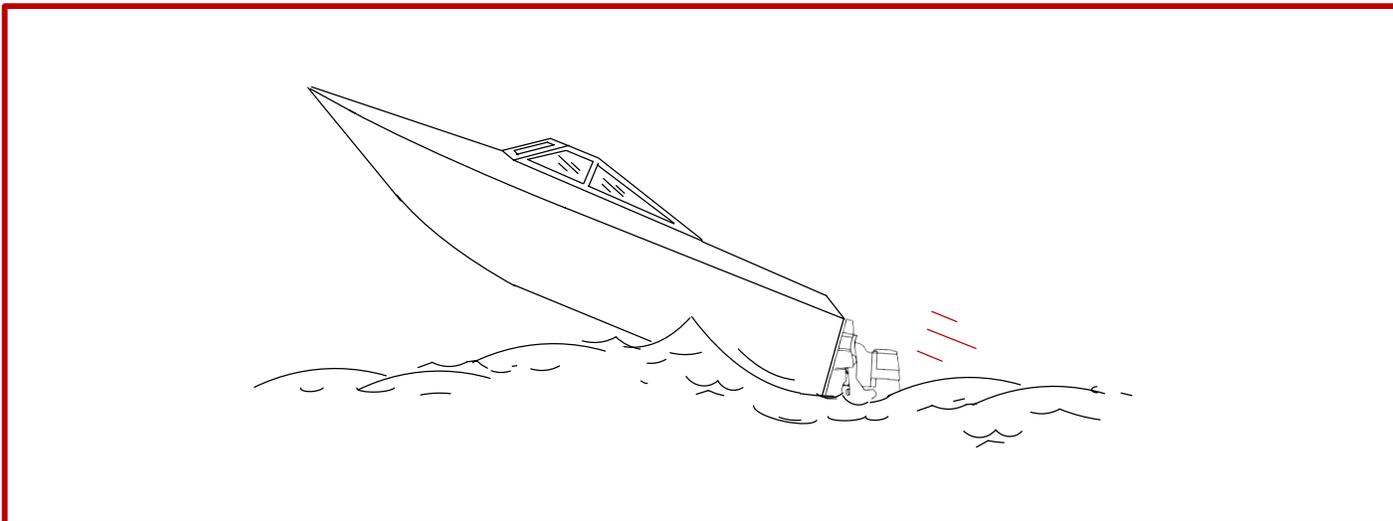
**B** Mooring close to another boat that has its engine running.

#### 3 Examples of poor ventilation while boat is moving:

**A** Running the boat with the trim angle of the bow too high.

**B** Running the boat with no forward hatches open (station wagon effect).

## Wave And Wake Jumping



Operating recreational boats over waves and wakes is a natural part of boating. However, when this activity is done with speed to force the boat hull partially or completely out of the water, certain hazards arise, particularly when the boat re-enters the water.

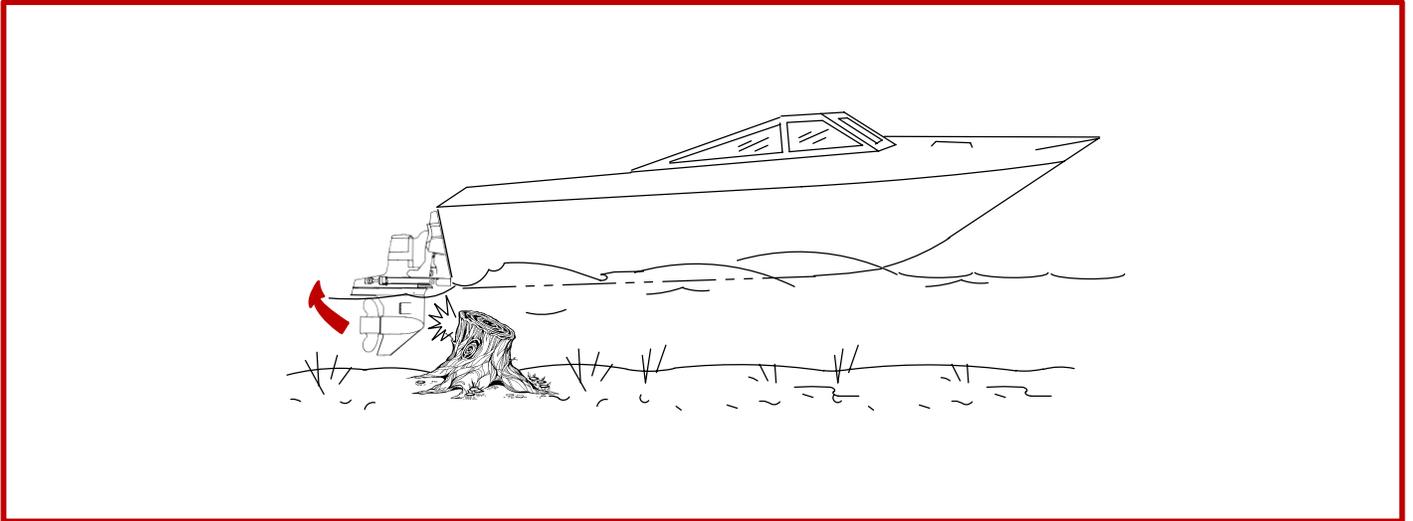
The primary concern is the boat changing direction while in the midst of the jump. In such case the landing may cause the boat to violently veer in a new direction. Such a sharp change in direction or turn can cause occupants to be thrown out of their seats or out of the boat.

There is another less common hazardous result from allowing your boat to launch off a wave or wake. If the bow of your boat pitches down far enough while airborne, upon water contact it may penetrate under the water surface and “submarine” for an instant. This will bring the boat nearly to a stop in an instant and can send the occupants flying forward. The boat may also steer sharply to one side.

### **⚠ WARNING**

**Avoid serious injury or death from being thrown within or out of a boat when it lands after jumping a wave or wake. Avoid wave or wake jumping whenever possible. Instruct all occupants that if a wake or wave jump occurs, get low and hang on to any boat hand hold.**

## Impact With Underwater Hazards



Reduce speed and proceed with caution whenever you're driving a boat in shallow water areas or in areas where the waters are suspected of having underwater obstacles that could be struck by the sterndrive or the boat bottom. **The most important thing you can do to help reduce injury or impact damage from striking a floating or underwater object is control the boat speed. Under these conditions, boat speed should be kept to a minimum planing speed of 15 to 25 mph (24 to 40 km/h).**

Striking a floating/underwater object may result in an infinite number of situations. Some of these situations could result in the following:

- The boat could move suddenly in a new direction. Such a sharp change in direction or turn can cause occupants to be thrown out of their seats or out of the boat.
- A rapid reduction in speed. This will cause occupants to be thrown forward, even out of the boat.
- Impact damage to the sterndrive and/or boat.

Keep in mind, one of the most important things you can do to help reduce injury or impact damage in these situations is control the boat speed. Boat speed should be kept to a minimum planing speed when driving in waters known to have underwater obstacles.

After striking a submerged object, stop engine as soon as possible and inspect the sterndrive unit for any broken or loose parts. If damage is present or suspected, the power package should be taken to an authorized dealer for a thorough inspection and necessary repair.

The boat should also be checked for any hull fractures, transom fractures, water leaks.

Operating a damaged sterndrive could cause additional damage to other parts of the power package, or could affect control of the boat. If continued running is necessary, do so at greatly reduced speeds.

### **⚠ WARNING**

**Avoid serious injury or death from loss of boat control. Continued boating with major impact damage can result in sudden component failure with or without subsequent impacts. Have the power package thoroughly inspected and any necessary repairs made.**

## Safe Boating Suggestions

In order to safely enjoy the waterways, familiarize yourself with local and other governmental boating regulations and restrictions, and consider the following suggestions.

- **Know and obey all nautical rules and laws of the waterways.** Boat operators should complete a boating safety course. Courses are offered in the U.S.A. by (1) The U.S. Coast Guard Auxiliary, (2) The Power Squadron, (3) The Red Cross and (4) your state or provincial boating law enforcement agency. Inquiries may be made to the Boating Hotline, 1-800-368-5647 or the Boat U.S. Foundation information number 1-800-336-BOAT.

We strongly recommend that all powerboat operators attend one of these courses.

You should also review the NMMA Sources of Waterway Information booklet. It lists regional sources of safety, cruising and local navigation and is available at no charge by writing to:

Sources of Waterway Information  
National Marine Manufacturers Association  
410 N. Michigan Avenue  
Chicago, IL 60611 U.S.A.

- **Perform safety checks and required maintenance.** Follow a regular schedule and ensure that all repairs are properly made.
- **Check safety equipment on board.** Here are suggestions of the types of safety equipment to carry when boating:
  - (1) Approved fire extinguisher(s); paddle or oar.
  - (2) Signal devices: flashlight, rockets or flares, flag and whistle or horn.
  - (3) Spare propeller, thrust hubs and an appropriate wrench.
  - (4) Tools for necessary minor repairs; first aid kit and book.
  - (5) Anchor and extra anchor line; water-proof storage containers.
  - (6) Manual bilge pump and extra drain plugs; compass and map or chart of area.
  - (7) Spare operating equipment; batteries, bulbs, fuses, etc.
  - (8) Transistor radio.
  - (9) Drinking water.
- **Know signs of weather change and avoid foul weather and rough-sea boating.**
- **Tell someone where you are going and when you expect to return.**
- **Passenger boarding.** Stop the engine whenever passengers are boarding, unloading or are near the back (stern) of the boat. Just shifting the drive unit into neutral is not sufficient.
- **Use personal flotation devices.** Federal Law requires that there be a U.S. Coast Guard approved, wear-able-type life jacket (personal flotation device), correctly sized and readily accessible for every person on board, plus a throwable cushion or ring. We strongly advise that everyone wear a life jacket at all times while in the boat.
- **Prepare other boat operators.** Instruct at least one person on board in the basics of starting and operating the engine and boat handling in case the driver becomes disabled or falls overboard.
- **Do not overload your boat.** Most boats are rated and certified for maximum load (weight) capacities (refer to your boat capacity plate). When in doubt, contact your dealer or the boats manufacturer. Know your boat's operating and loading limitations.
- **Make sure everyone in the boat is properly seated.** Don't allow anyone to sit or ride on any part of the boat that was not intended for such use. This includes backs of seats, gunwales, transom, bow, decks, raised fishing seats, any rotating fishing seat; anywhere that sudden unexpected acceleration, sudden stopping, unexpected loss of boat control or sudden boat movement could cause a person to be thrown overboard or into the boat.

- **Never be under the influence of alcohol or drugs while boating (it is the law).** They impair your judgment and greatly reduce your ability to react quickly.
- **Know your boating area and avoid hazardous locations.**
- **Be alert.** The operator of the boat is responsible by law to “maintain a proper lookout by sight (and hearing).” The operator must have an unobstructed view particularly to the front. No passengers, load, or fishing seats should block the operators view when operating the boat above idle or planing transition speed. Watch “the other guy,” the water and your wake.
- **Never drive your boat directly behind a water skier in case the skier falls.** As an example, your boat traveling at 25 miles per hour (40 km/hr) in 5 seconds will overtake a fallen skier who was 200 feet in front of you.
- **Watch fallen skiers.** When using your boat for water skiing or similar activities, always keep a fallen or down skier on the operator’s side of the boat while returning to attend the skier. The operator should always have the down skier in sight and never back up to the skier or anyone in the water.
- **Report accidents.** Boat operators are required by law to file a Boating Accident Report with their state boating law enforcement agency when their boat is involved in certain boating accidents. A boating accident must be reported if (1) there is loss of life or probable loss of life, (2) there is personal injury requiring medical treatment beyond first aid, (3) there is damage to boats or other property where the damage value exceeds \$500.00 or (4) there is complete loss of the boat. Seek further assistance from local law enforcement.

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## Protecting People In The Water

### WHILE YOU ARE CRUISING

It is very difficult for a person standing or floating in the water to take quick action to avoid a boat heading in his/her direction even at slow speed.

Always slow down and exercise extreme caution any time you are boating in an area where there might be people in the water.

Whenever a boat is moving (coasting) and the drive unit is in neutral position, there is sufficient force by the water on the propeller to cause the propeller to rotate. This neutral propeller rotation can cause serious injury.

### WHILE BOAT IS STATIONARY

Shift the drive unit into neutral and shut off the engine before allowing people to swim or be in the water near your boat.

#### **WARNING**

**Stop your engine immediately whenever anyone in the water is near your boat. Serious injury to the person in the water is likely if contacted by a rotating propeller, a moving boat, a moving gear case, or any solid device rigidly attached to a moving boat or gear case.**

CA283

## High-Speed And High-Performance Boat Operation

If your boat is considered a high-speed or high-performance boat with which you are unfamiliar, we recommend that you never operate it at its high speed capability without first requesting an initial orientation and familiarization demonstration ride with your dealer or an operator experienced with your boat. For additional information, obtain a copy of our “Hi-Performance Boat Operation” booklet (Part Number 90-86168--3) from your dealer, distributor, or Mercury Marine.

## Conditions Affecting Operation

### Weight Distribution

Positioning of weight (passengers and gear) inside the boat has the following effects:

A. Shifting weight to rear (stern) will:

- Generally increases speed and engine RPM.
- At extremes, can cause boat to porpoise.
- Causes bow to bounce in choppy water.
- Increases danger of following wave splashing into boat when coming off plane.

B. Shifting weight to front (bow) will:

- Improves ease of planing on some boats.
- Improves rough water ride.
- At extremes, can cause boat to veer back and forth (bow steer).

### Bottom Of Boat

To maintain maximum speed, the following conditions of the boat bottom should be observed.

- A. Clean, free of barnacles and marine growth.
- B. Free of distortion; nearly flat where it contacts the water.
- C. Straight and smooth, fore and aft.

Marine vegetation may accumulate when boat is docked. This growth must be removed before operation; it may clog water inlets and cause engine to over heat.

### Cavitation

Cavitation occurs when water flow cannot follow the contour of a fast-moving underwater object, such as a gear housing or propeller. Cavitation permits the propeller to speed up, but the boat speed to reduce. Cavitation can seriously erode the surface of the gear housing or propeller. Common causes of cavitation are:

- A. Weeds or other debris snagged on propeller or gear housing.
- B. Bent propeller blade or damaged gear housing skew.
- C. Raised burrs or sharp edges on propeller or gear housing.

### Ventilation

Ventilation is caused by surface air or exhaust gases which are introduced around the propeller resulting in propeller speedup and a reduction in boat speed. Excessive ventilation is annoying and usually caused by:

- A. Drive unit trimmed out too far.
- B. A missing propeller diffuser ring.
- C. A damaged propeller or gear housing, which allows exhaust gases to escape between propeller and gear housing.
- D. Drive unit installed too high on transom.

## Propeller Selection

**IMPORTANT:** Installed propeller must allow engine to run at the upper end of the specified throttle operating revolutions per minute (rpm) range, with a normal load aboard the boat. Use an accurate service tachometer to verify engine operating rpm.

It is the responsibility of the boat manufacturer and/or the selling dealer to equip the power package with the correct propeller(s). Specified engine wide-open-throttle (WOT) and operating rpm range are listed below and in “Specifications.”

**IMPORTANT:** The engines covered in this manual are equipped with a device that limits engine rpm. Be sure that propeller being used does not allow engine to run against limiter, as a significant loss in performance will result.

Engine rpm		
MCM Model	Engine Specified WOT Operating Rpm Range	Rpm Limiter Setting (Begins At:)
D7.3L D-Tronic	3600-3800	3850
D7.3L D-Tronic LD	3400-3600	3650

Select a propeller that will allow the engine power package to operate at or near the top end of the specified wide-open-throttle operating rpm range with a normal load. High rpm, caused by an excessive trim angle, should not be used in determining correct propeller selection.

If full throttle operation is below the specified range, the propeller must be changed to prevent loss of performance and possible engine damage. On the other hand, operating an engine above the specified operating rpm range will cause higher than normal wear and/or damage. Generally, there is a 200 rpm change between propeller pitches.

After initial propeller selection, the following common problems may require that the propeller be changed to a lower pitch:

- Warmer weather and greater humidity cause an rpm loss (not as significant on D-Tronic models).
- Operating in a higher elevation causes an rpm loss (not as significant on D-Tronic models).
- Operating with a damaged propeller or dirty boat bottom causes an rpm loss.
- Operating with increased load (additional passengers, pulling skiers, etc.).

For better acceleration, such as is needed for water skiing, use the next lower pitch propeller. However, do not operate at full throttle when using the lower pitch propeller but not pulling skiers.

## How Elevation And Climate Affect Performance

**NOTE:** *Engines equipped with EDI (D-Tronic engines) reduce the effects of changes in elevation and climate by automatically adjusting fuel flow for weather conditions and elevation. EDI engines however, do not compensate for increased loading or hull conditions.*

Generally, elevation has a very noticeable effect on the wide-open-throttle power of an engine. Since air (containing oxygen) gets thinner as elevation increases, the engine begins to starve for air. Humidity, barometric pressure and temperature do have a noticeable effect on the density of air. Heat and humidity thin the air. This condition can become particularly annoying when an engine is propped out on a cool, dry day in spring and later, on a hot, sultry day in August, doesn't have its old zip.

Although some performance can be regained by dropping to a lower-pitch propeller, the basic problem still exists. In some cases, a gear-ratio change to more reduction is possible and very beneficial.

Summer conditions of high temperature, low barometric pressure and high humidity all combine to reduce the engine power. This, in turn, is reflected in decreased boat speeds, as much as 2 or 3 miles per hour in some cases. Nothing will regain this speed for the boater, but the coming of cool, dry weather.

In pointing out the practical consequences of weather effects, an engine -- running on a hot, humid summer day -- may encounter a loss of as much as 14% of the horsepower it would produce on a dry brisk spring or fall day. With the drop in available horsepower, this propeller will, in effect, become too large. Consequently, the engine operates at less than its recommended rpm. This will result in further loss of horsepower at the propeller with another decrease in boat speed. This secondary loss, however, can be somewhat regained by switching to a lower-pitch propeller that allows the engine to again run at recommended rpm.

For boaters to realize optimum engine performance under changing weather conditions, it is essential that the engine be propped to allow it to operate at or near the top end of the recommended maximum rpm range at wide-open-throttle with a normal boat load.

Not only does this allow the engine to develop full power, but equally important is the fact that the engine also will be operating in an rpm range that discourages damaging detonation. This, of course, enhances overall reliability and durability of the engine.

# Important Information

## Operation and Maintenance

### RECOMMENDED OPERATION / DUTY CYCLE

It is the operator's responsibility to operate within the following recommended operational capability, or duty cycle, as applicable to engine and installation:

#### D7.3L D-Tronic Models - PLEASURE DUTY RATING

- Engine Specified Operating Rpm Range is 3600-3800 rpm.
- Wide-Open-Throttle operation is limited to short periods of time.

#### D7.3L D-Tronic LD Models - LIGHT DUTY RATING

- Engine Specified Operating Rpm Range is 3400-3600 rpm.
- Wide-Open-Throttle operation is limited to less than 10% of operating time.
- Continuous cruising rpm is limited to at or less than 90% of Wide-Open-Throttle rpm.
- Annual operating time is not to exceed 500 hours.

#### **NOTE:**

Pleasure duty rating applies to recreational planing craft used exclusively for pleasure and recreation.

Light duty rating applies to planing boats where the use of full rated power at maximum rated rpm is limited (as stated above). Examples of Light Duty applications include, but are not limited to: search and rescue craft, fast patrol boats, fire boats, dive boats, and limited season fishing boats such as sport-fish charter boats. Application to common commercial crafts having full-displacement or semi-displacement hulls exceeds the recommended operational capability, or duty cycle.

**IMPORTANT:** Damage caused by improper application or failure to operate within the operational capability, or duty cycle, will not be covered by the MerCruiser Diesel Limited Warranty.

CE7

## **OWNER/OPERATOR RESPONSIBILITIES**

It is the operator's responsibility to perform all safety checks, ensure that all lubrication and maintenance instructions are complied with for safe operation, and return the unit to an Authorized MerCruiser Dealer for a periodic checkup.

Normal maintenance service and replacement parts are the responsibility of the owner/operator and as such, are not considered defects in workmanship or material within the terms of the warranty. Individual operating habits and usage contribute to the need for maintenance service.

Proper maintenance and care of your power package will assure optimum performance and dependability, and will keep your overall operating expenses at a minimum. See your Authorized MerCruiser Dealer for service aids.

CA14

## **DEALER RESPONSIBILITIES**

In general, a dealer's responsibilities to the customer include predelivery inspection and preparation such as:

- Make sure that the boat is properly equipped.
- Prior to delivery, make certain that the MerCruiser power package and other equipment are in proper operating condition.
- Make all necessary adjustments for maximum efficiency.
- Familiarize the customer with the on-board equipment.
- Explain and demonstrate the operation of the power package and boat.
- At the time of delivery, the dealer should provide you with a copy of a Predelivery Inspection Checklist.
- Your selling dealer should fill out the Warranty Registration Card completely and mail it to the factory (branch or distributor) immediately upon sale of the new product.

## Freezing Temperature And Cold Weather Operation

**IMPORTANT:** If boat is operated during periods of freezing temperature, precautions must be taken to prevent freezing damage to power package. Refer to the following and to “Cold Weather or Extended Storage” for related information and draining instructions.

### CAUTION

**Seawater (raw water) section of cooling system MUST BE COMPLETELY drained for winter storage or immediately after cold weather use, if the possibility of freezing temperatures exist. Failure to comply may result in trapped water causing freeze and/or corrosion damage to engine.**

In order to operate the engine in temperatures of 32° F (0° C) or lower, observe the following instructions:

- At the end of each daily operation, COMPLETELY drain seawater section of cooling system to protect against damage by freezing.
- At the end of each daily operation, drain water from water separator, if equipped. Fill fuel tank at end of daily operation to prevent condensation.
- Use required permanent-type antifreeze solution to protect components against damage by freezing.
- Be sure to use proper cold weather lubrication oil, and be sure the crankcase contains a sufficient amount.
- Make certain that the battery is of sufficient size and is fully charged. Check that all other electrical equipment is in optimum condition.
- At temperatures of -4° F (-20° C) and below, it is recommended that you use a coolant heater to improve cold starting.
- If operating in arctic temperatures of -20° F (-29° C) or lower, consult your dealer for information about special cold weather equipment and precautions.

CA408

## Drain Plug and Bilge Pump

The engine compartment in your boat is a natural place for water to collect. For this reason, boats are normally equipped with a drain plug and/or a bilge pump. It is very important to check these items on a regular basis to ensure that the water level does not rise to come in contact with your power package. Components on your engine will be damaged if submerged. Damage caused by submersion is not covered by the MerCruiser Limited Warranty.

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## Drive Unit Impact Protection

The Power Trim hydraulic system is designed to provide impact protection for drive unit. If a submerged object is struck while boat is moving forward, the hydraulic system will cushion kick-up of drive unit as it clears the object, reducing damage to unit. After drive unit has cleared object, the hydraulic system allows drive unit to return to original operating position, preventing loss of steering control and engine over speed.

Use extreme caution when operating in shallow water or where underwater objects are known to be present. Use extreme care to prevent striking submerged objects while operating in REVERSE. No impact protection is provided in REVERSE.

If drive unit should strike a submerged object, stop engine as soon as possible and inspect drive unit for damage. If damage is present or suspected, boat should be taken to an Authorized MerCruiser Dealer for thorough inspection and necessary repair. Operating a damaged drive unit could cause additional damage to other parts of drive unit, or could affect control of boat. If continued running is necessary, do so at greatly reduced speeds.

**IMPORTANT:** Impact protection system cannot be designed to ensure total protection from impact damage under all conditions.

## Launching and Boat Operation Care

### **⚠ CAUTION**

**During launching from a trailer, if the unloading ramp is steep or the trailer bed must be tilted, the boat may enter the water rapidly and at a steep angle. This may force water through the exhaust system into the cylinders. The more weight on the transom, the more likely this is to occur.**

**Slowing down rapidly, stopping suddenly or backing up rapidly may cause a following wave to “swamp” the transom causing water to enter the cylinders through the exhaust system causing severe engine damage.**

**When backing up rapidly, the same situation may occur as stated in the preceding paragraph.**

In any of these situations, water entering the engine could cause severe damage to internal parts. Refer to “Attention Required After Submersion,” in this “Operation and Maintenance Manual.”

## Attention Required After Submersion

- Before recovery, contact an Authorized MerCruiser Dealer.
- After recovery, immediate service by an Authorized MerCruiser Dealer is required to prevent serious damage to power package.

## Trailing Boat

Boat can be trailered with drive unit in up or down position. Adequate road clearance is required between road and gear housing skew when trailering with drive unit in down position.

If adequate road clearance is a problem, place drive unit in full trailer position and support with an optional trailer kit which is available from your Authorized MerCruiser Dealer.

## Stolen Power Package

If your power package is stolen, immediately advise the local authorities and Mercury Marine of the model and serial number(s) and to whom the recovery is to be reported. This “Stolen Motor” information is placed into a file at Mercury Marine to aid authorities and dealers in recovery of stolen motors.

## Replacement Service Parts

Marine engines are expected to operate at or near full throttle for most of their life. They are also expected to operate in both fresh and saltwater environments. These conditions require numerous special parts. Care should be exercised when replacing marine engine parts, as specifications are quite different from those of the standard automotive engine.

Since marine engines must be capable of running at or near maximum rpm much of the time, special pistons, camshafts and other heavy-duty moving parts are required for long life and peak performance.

These are but a few of the many special components that are required in MerCruiser marine engines to provide long life and dependable performance.

## Do-It-Yourself Maintenance Suggestions

If you are one of those persons who likes to do-it-yourself, here are some suggestions for you.

- Present-day marine equipment, such as your MerCruiser power package, are highly technical pieces of machinery. Electronic ignition and special fuel delivery systems provide greater fuel economies, but also are more complex for the untrained mechanic.
- Do not attempt any repairs which are not covered in this manual unless you are aware of the precautions (“Cautions” and “Warnings”) and procedures required. Your safety is of our concern.
- If you attempt to service the product yourself, we suggest you order the service manual for that model. The service manual outlines the correct procedures to follow. It is written for the trained mechanic, so there may be procedures you don’t understand. Do not attempt repairs if you do not understand the procedures.
- There are special tools and equipment that are required to perform some repairs. Do not attempt these repairs unless you have these special tools and/or equipment. You can cause damage to the product in excess of the cost a dealer would charge you.
- Also, if you partially disassemble an engine or drive assembly and are unable to repair it, the dealer’s mechanic must reassemble the components and test to determine the problem. This will cost you more than taking it to the dealer immediately upon having a problem. It may be a very simple adjustment to correct the problem.
- Do not telephone the dealer, service office or the factory to attempt for them to diagnose a problem or request the repair procedure. It is difficult for them to diagnose a problem over the telephone.
- Your Authorized Dealer is there to service your power package. They have qualified factory-trained mechanics.

It is recommended you have the dealer do periodic maintenance checks on your power package. Have them winterize it in the fall and service it before the boating season. This will reduce the possibility of any problems occurring during your boating season when you want trouble-free boating pleasure.

## Diagnosing EDI Problems

Your Authorized MerCruiser Dealer has the proper service tools for diagnosing problems on Electronic Diesel Injection (EDI) Systems. The Electronic Control Module (ECM) on these engines have the ability to detect some problems with the system when they occur, and store a “Trouble Code” in the ECM’s memory. This code can then be read later by a service technician using a special diagnostic tool.

## Multiple EDI Engine Battery Precautions

### Situation

**Alternators:** Alternators are designed to charge the battery that supplies electrical power to the engine that the alternator is mounted on. When batteries for two different engines are connected, one alternator will supply all of the charging current for both batteries. Normally, the other engine's alternator will not be required to supply any charging current.

**EDI Electronic Control Module (ECM):** The ECM requires a stable voltage source. During multiple engine operation, an onboard electrical device may cause a sudden drain of voltage at the engine's battery. The voltage may go below the ECM's minimum required voltage. Also, the alternator on the other engine may now start charging. This could cause a voltage spike in the engine's electrical system.

In either case, the ECM could shut off. When the voltage returns to the range that the ECM requires, the ECM will reset itself. The engine will now run normally. This ECM shut down usually happens so fast that the engine just appears to have an ignition miss.

### Recommendations

**Batteries:** Boats with multi-engine EDI power packages require each engine be connected to its own battery. This ensures that the engine's Electronic Control Module (ECM) has a stable voltage source.

**Battery Switches:** Battery switches should always be positioned so each engine is running off its own battery. DO NOT operate engines with switches in BOTH or ALL position. In an emergency, another engine's battery can be used to start an engine with a dead battery.

**Battery Isolators:** Isolators can be used to charge an auxiliary battery used for powering accessories in the boat. Isolators should not be used to charge the battery of another engine in the boat unless the type of isolator is specifically designed for this purpose.

**Generators:** The generator's battery should be considered in the same manner as another engine's battery.

## Engine Break-In

### INITIAL BREAK-IN PROCEDURE

It is especially important that the following procedure be used on new diesel engines. This break-in procedure allows the proper seating of the pistons and rings, which greatly reduces the likelihood of problems.

**IMPORTANT: It is recommended that the boat not be accelerated hard until this procedure has been completed.**

**IMPORTANT: Never operate the starter motor longer than 15 seconds at a time, to avoid overheating the starter motor. If engine does not start, wait 1 minute to allow the starter motor to cool; then, repeat starting procedure.**

### INITIAL BREAK-IN PROCEDURE IS AS FOLLOWS:

1. Refer to "Starting, Shifting and Stopping" and start engine. Allow engine to idle until it has reached normal operating temperature.
2. Run engine in gear for 3 minutes at each of the following rpms: 1200 rpm, 2400 rpm and 3000 rpm.
3. Run engine in gear for 3 minutes at each of the following rpms: 1500 rpm, 2800 rpm and 3200 rpm.
4. Run engine in gear for 3 minutes at each of the following rpms: 1800 rpm, 3000 rpm and Maximum Rated Full-Throttle rpm.

## 20-HOUR BREAK-IN PERIOD

**IMPORTANT:** The first 20 hours of operation is the engine break-in period. Correct break-in is essential to obtain minimum oil consumption and maximum engine performance. During this break-in period, the following rules must be observed:

- DO NOT operate engine below 1500 rpm for extended periods during the first 10 hours. During this period, shift into gear as soon as possible after starting engine and advance throttle so that rpm is above 1500 (provided that conditions permit safe operation at this speed).
- DO NOT operate at any one constant speed for extended periods.
- DO NOT exceed 75% of full throttle during the first 10 hours except during engine Initial Break-In Procedure. During the next 10 hours, occasional operation at full throttle (5 minutes at a time maximum) is permissible.
- AVOID full throttle acceleration from stopped position.
- DO NOT operate at full throttle until engine reaches normal operating temperature.
- OBSERVE INSTRUMENTS, if an abnormal reading occurs, stop engine immediately and determine cause.
- FREQUENTLY CHECK crankcase oil and sterndrive unit fluid levels. Add if necessary. It is normal for oil consumption to be somewhat high during the break-in period.
- AT END OF 20-HOUR break-in period, remove break-in oil and replace oil filter. Fill crankcase with correct grade and viscosity oil.

## Sterndrive Unit 10-Hour Break-In Period

It is especially important that the following procedure be used on new sterndrive units. This break-in procedure allows the proper seating of drive unit gears and related components, which greatly reduces the likelihood of problems.

1. Avoid full throttle starts.
2. DO NOT operate at any one constant speed for extended periods of time.
3. DO NOT exceed 75% of full throttle during the first 5 hours. During the next 5 hours, operate at intermittent full throttle.
4. Drive unit should be shifted into forward gear a minimum of 10 times during break-in, with run-in time at moderate rpm after each shift.

## After Break-In Period

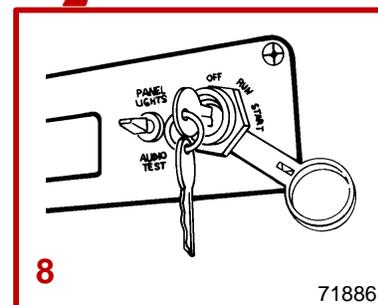
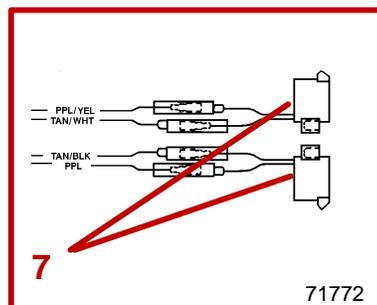
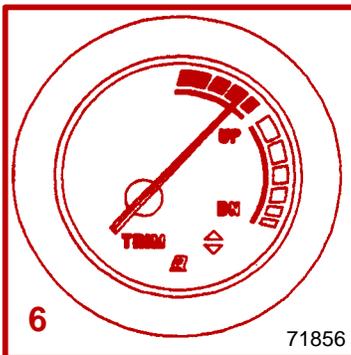
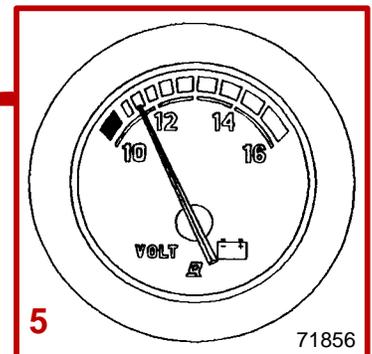
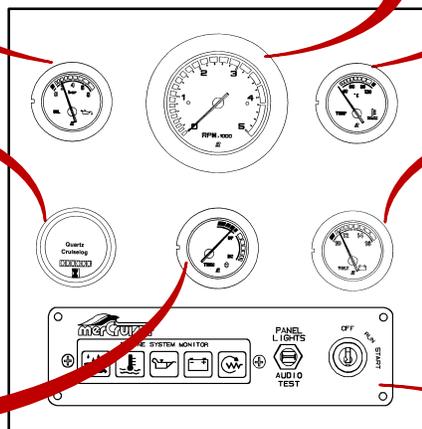
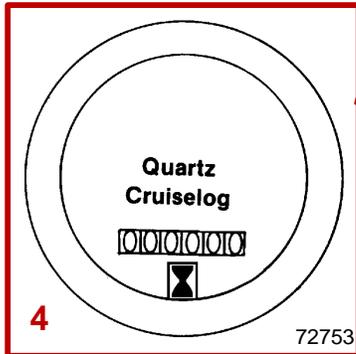
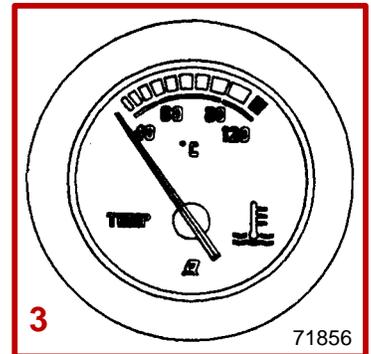
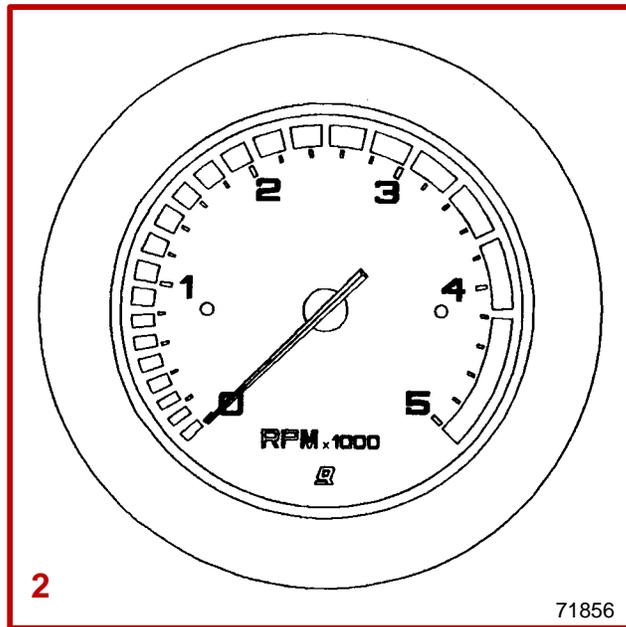
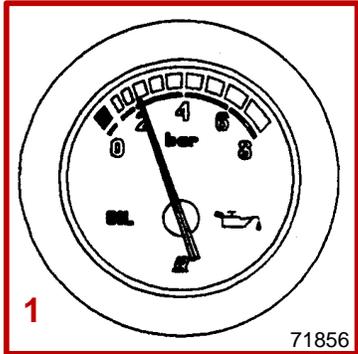
To help extend the life of your MerCruiser power package, the following recommendations should be considered;

- Use a propeller that allows the engine to operate at or near the top of the maximum rpm range (See “Specifications” section) when at full throttle with a normal boat load.
- Operation at 3/4 throttle setting or lower is recommended. Refrain from prolonged operation at maximum (full throttle) rpm.

## End of First Season Checkup

At the end of the first season of operation, an Authorized MerCruiser Dealer should be contacted to discuss and/or perform various scheduled maintenance items. If you are in an area where the product is operated continuously (year-round operation), you should contact your dealer at the end of the first 100 hours of operation, or once yearly, whichever occurs first.

# Operation



## Quicksilver Instruments and Instrumentation

Shown is the basic Quicksilver instrumentation and engine system monitor display for the Diesel Power Package. The instrumentation shown is required for safe operation of boat and engine. Operator should become familiar with all instrumentation before operating the engines.

Gauges and engine system monitor panel may be individually mounted, or collectively mounted in the optional single panel available from Quicksilver.

**NOTE:** Refer to manufacturer's instructions and explanations about instrumentation, if equipped with other than Quicksilver instrumentation.

**1 Oil Pressure Gauge** - indicates engine oil pressure. Refer to "Specifications" for normal operating readings.

**2 Tachometer** - indicates engine speed (rpm).

**3 Coolant Temperature Gauge** - indicates engine coolant temperature. Refer to "Specifications" for normal operating readings.

**4 Cruise Log (Engine Hour Meter)** - records engine running time (Optional).

**5 Voltmeter** - indicates battery voltage, and if alternator and charging circuit are functioning properly. The green area on the gauge is the normal operating range.

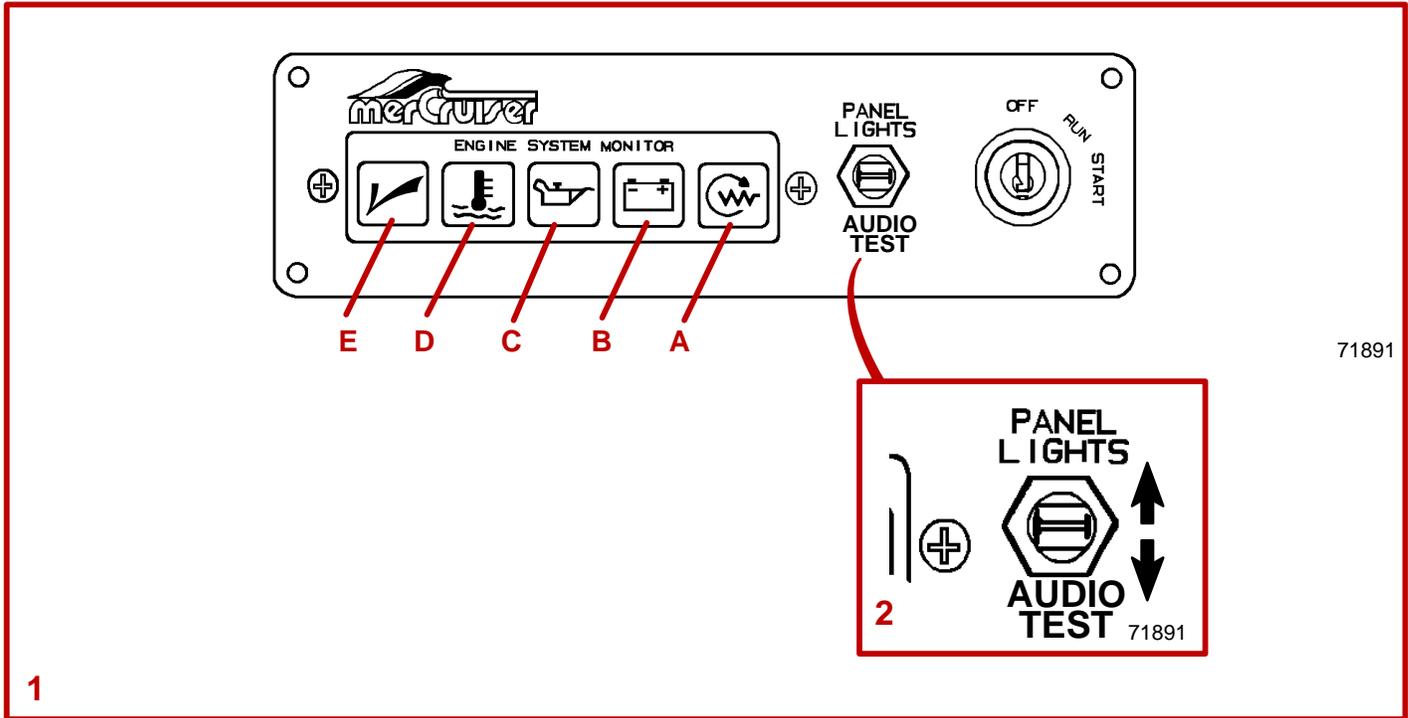
**6 Trim/Tilt Gauge** - indicates drive unit trim angle ("Up/Out" or "Down/In").

**7 Audio Warning Buzzer Standard Features** - Buzzer sounds if:

- 8** (1) Cooling system temperature too high.
- (2) Engine oil pressure too low.
- (3) Sterndrive gear lube level low.

**9 Key Switch** - has three positions; in the "OFF" position, all electrical circuits are off and engine cannot be started. In the "RUN" position, all electrical circuits, indicator lamps, automatic preheating and all instrumentation is operational. In the "START" position the engine can be started. The engine is stopped when the key switch is turned to the "OFF" position.

**NOTE:** Key can only be removed in the "OFF" position.



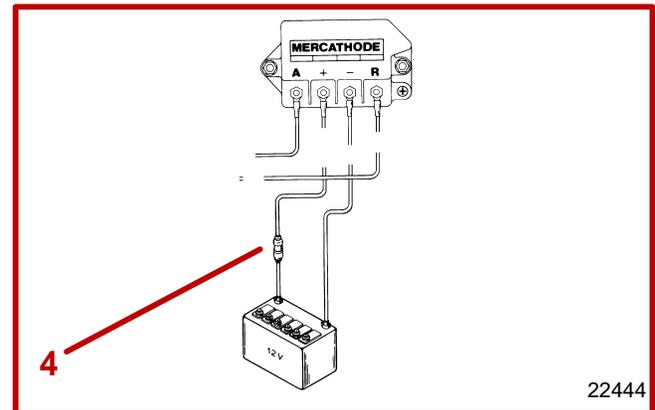
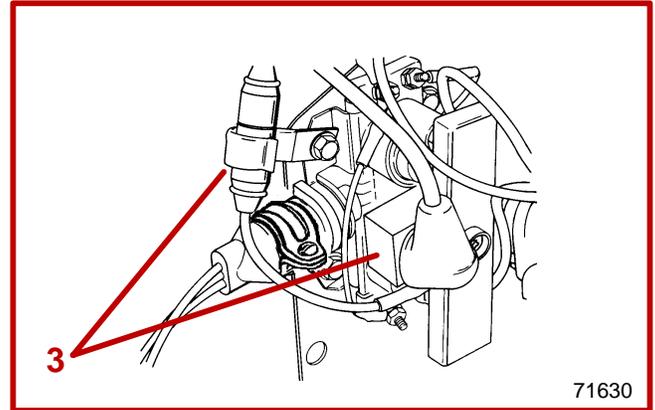
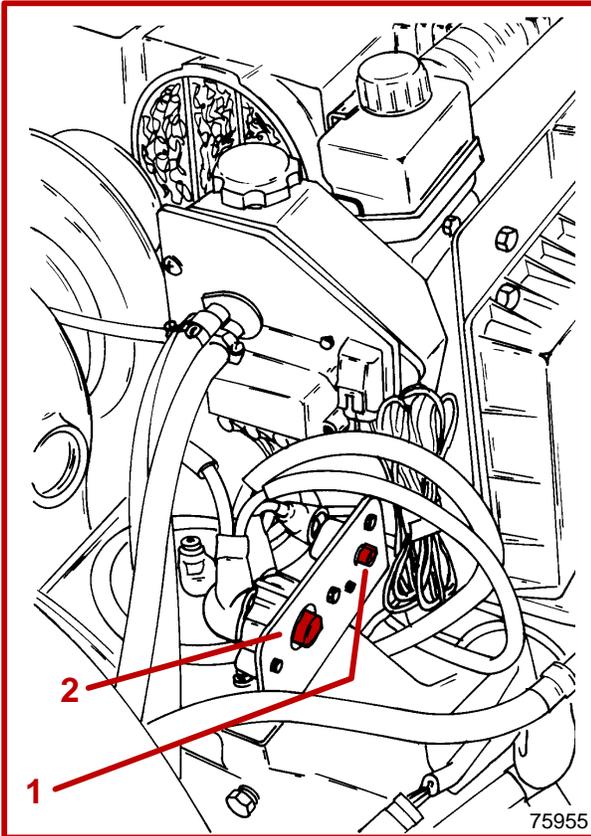
## 1 Engine System Monitor Features - The appropriate light functions as follows:

- A Preheat Indicator Lamp** - lights up when the glow plugs are preheating the combustion chambers. The timed preheat period begins when the key switch is turned on. THE ENGINE SHOULD BE STARTED ONLY AFTER THE LAMP GOES OFF.
- B Charge Indicator Lamp** - indicates a problem with charging system if lamp illuminates while engine is running. Lamp will light when key switch is "ON" and engine is not running. When engine starts, light should go off.
- C Oil Pressure Warning Lamp** - indicates low engine oil pressure, if lamp illuminates while engine is running, or sterndrive gear lube oil level low.

**NOTE:** The oil pressure warning lamp is wired in a parallel circuit with the gear lube monitor bottle switch. If lamp illuminates while engine is running, and oil temperature and oil level are normal, this may be an indication of low oil level in the gear lube monitor bottle. The cause should be determined and corrected.

- D Coolant Temperature Warning Lamp** - indicates excessive engine coolant temperature if lamp illuminates while engine is running.
- E Check Engine Lamp** - if Check Engine light illuminates during operation it may indicate an abnormal condition has been detected by engine sensors, the system can be reset by turning off and re-starting the engine. If the lamp illuminates again shortly after re-starting the engine contact the nearest MerCruiser Service Center for diagnosing the problem.

**2 Panel Lights/Audio Test Switch** - has three positions; in the normal position all electrical circuits operate in a standard fashion (as described above). With switch toggled "UP" the instrumentation lights are all illuminated. When the engine is running and the switch is toggled "DOWN" the audio warning buzzer will sound allowing the operator to perform a test of the audio warning buzzer.



CD20

## Electrical System Overload Protection

If an electrical overload occurs the circuit breaker will trip open.

**IMPORTANT: The cause must be found and corrected before replacing fuse or resetting circuit breaker.**

**1** One 30 amp circuit breaker provides protection for engine wiring harness and instrumentation power lead. Reset by pushing RESET button IN (from outside).

In an emergency, when engine must be operated and cause for high current draw cannot be located and corrected, turn OFF or disconnect all accessories connected to engine and instrumentation wiring. Reset circuit breaker. If breaker remains open, electrical overload has not been eliminated. Further checks must be made on electrical system.

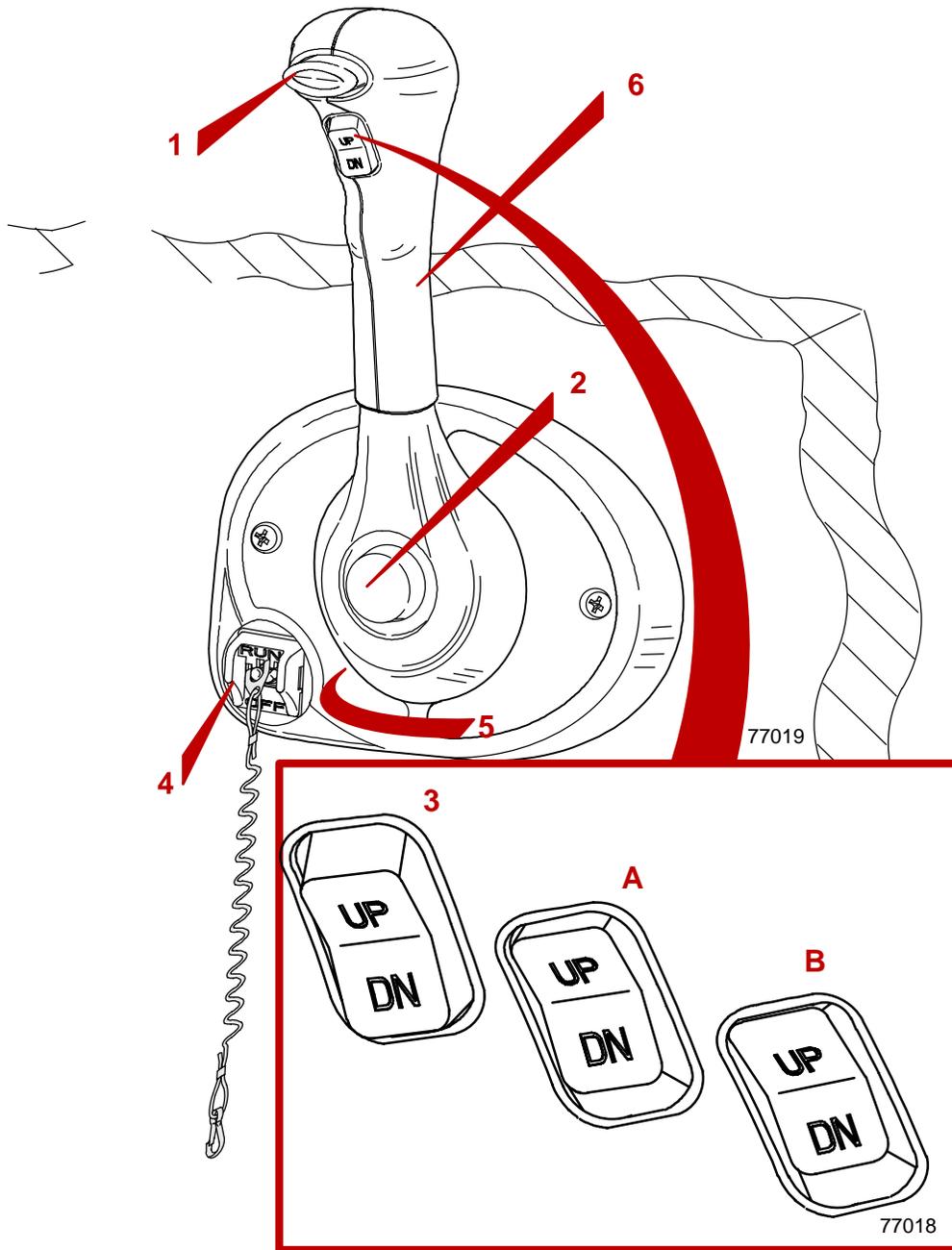
**2** One 150 amp circuit breaker provides protection for glow plug system and related engine wiring harness connections. Reset by pushing RESET button IN (from outside). If breaker remains open, electrical overload has not been eliminated. Further checks must be made on glow plug system and/or electrical system.

**3** The Power Trim system is protected from overload by 110 amp fuse and a 20 amp in-line fuse on Power Trim pump.

CA31

## MerCathode System

**4** A 20 amp in-line fuse is in the wire which connects to positive (+) terminal on controller. If fuse is "blown" (defective), the system will not operate.



## Remote Controls

### MPC 4000 (PANEL MOUNTED)

Your boat may be equipped with one of many Quicksilver® remote controls available. All controls feature an integral safety switch that allows starting engine in NEUTRAL only. Also, all controls may not have all features shown. If boat is equipped with a remote control other than shown, consult your dealer for a description and/or demonstration of the control.

**1 Neutral Lock Button** - Prevents accidental shift and throttle engagement. Neutral lock button must be pushed IN to move the control handle out of neutral.

**2 Throttle Only Button** - Allows engine throttle advancement without shifting the engine. This is done by disengaging the shift mechanism from the control handle. The throttle only button can be depressed only when the remote control handle is in the "Neutral" position, and should only be used to assist in starting the engine.

**3 Power Trim / Trailer Two Position Switch** - See "Power Trim" for detailed switch operation.

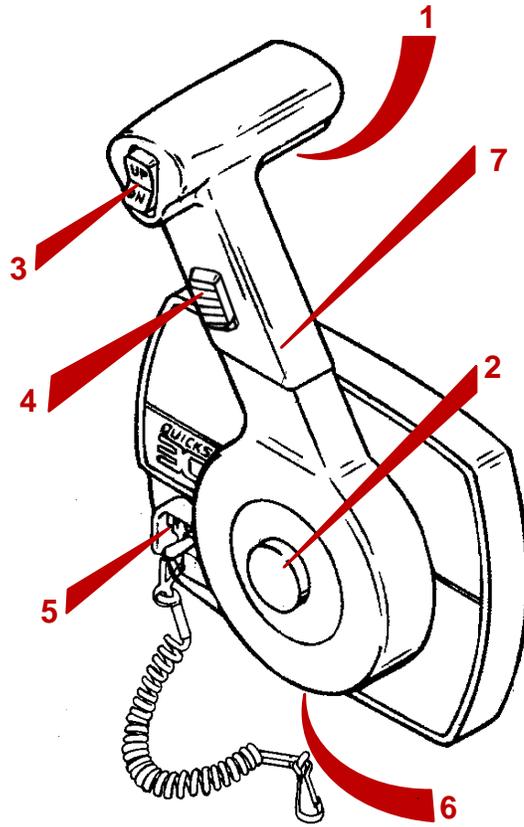
**A** First position is used to trim drive UP.

**B** Second position is used to raise drive unit for trailering, launching, beaching or shallow water operation.

**4 Lanyard Stop Switch** - Turns ignition OFF whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. See "Lanyard Stop Switch" at the front of this manual for safety warning on the use of this switch.

**5 Control Handle Throttle Friction Screw** - This screw (located behind bezel cover) can be adjusted to INCREASE or DECREASE the tension on the control handle. This will help prevent Creep of the remote control handle. Turn screw clockwise to increase tension and counterclockwise to decrease tension. Adjust to tension desired.

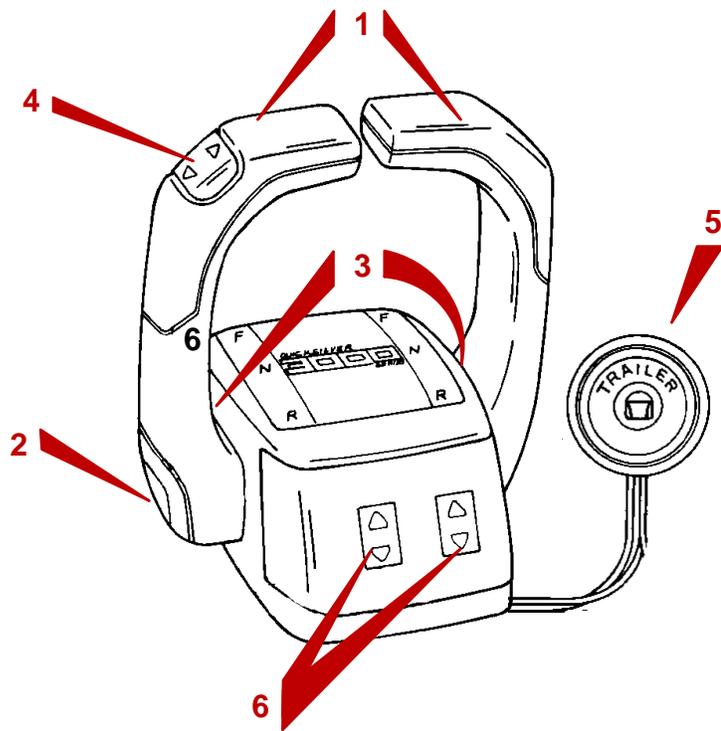
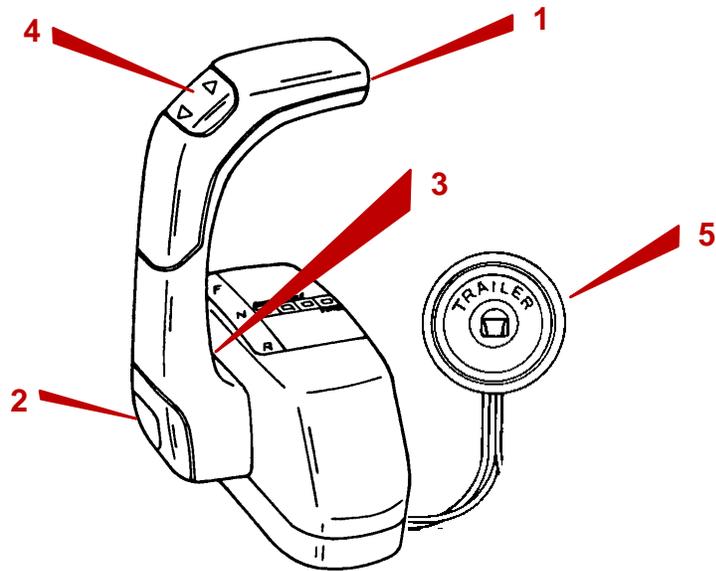
**6 Control Handle** - Operation of the shift and throttle are controlled by the movement of the control handle. Push the control handle forward from NEUTRAL with a quick firm motion to the first detent for FORWARD gear. Continue pushing forward to increase speed. Pull the control handle back from NEUTRAL with a quick firm motion to the first detent for REVERSE gear. Continue pushing back to increase speed.



**COMMANDER 3000 CLASSIC (PANEL MOUNTED)**

Your boat may be equipped with one of many Quicksilver® remote controls available. All controls feature an integral safety switch that allows starting engine in NEUTRAL only. Also, all controls may not have all features shown. If boat is equipped with a remote control other than shown, consult your dealer for a description and/or demonstration of the control.

- 1 Neutral Lock Bar** - Prevents accidental shift and throttle engagement. Neutral lock bar must be pulled UP to move the control handle out of neutral.
- 2 Throttle Only Button** - Allows engine throttle advancement without shifting the engine. This is done by disengaging the shift mechanism from the control handle. The throttle only button can be depressed only when the remote control handle is in the NEUTRAL position, and should only be used to assist in starting the engine.
- 3 Power Trim Switch** - See "Power Trim" for detailed power trim operating procedures.
- 4 Trailer Switch** - Used to raise drive unit for trailering, launching, beaching or shallow water operation. See "Power Trim" for detailed trailer switch operation.
- 5 Lanyard Stop Switch** - Turns ignition OFF whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. See "Lanyard Stop Switch" at the front of this manual for safety warning on the use of this switch.
- 6 Control Handle Tension Adjustment Screw** - This screw can be adjusted to INCREASE or DECREASE the tension on the control handle. This will help prevent slipping of the remote control handle. Turn screw CLOCKWISE to increase tension and COUNTERCLOCKWISE to decrease tension. Adjust to tension desired.
- 7 Control Handle** - Operation of the shift and throttle are controlled by the movement of the control handle. Push the control handle forward from NEUTRAL with a quick firm motion to the first detent for FORWARD gear. Continue pushing forward to increase speed. Pull the control handle back from NEUTRAL with a quick firm motion to the first detent for REVERSE gear. Continue pushing back to increase speed.



**COMMANDER 3000 SERIES (CONSOLE MOUNTED)**

**1 Control Handle(s)** - Operation of the shift and throttle are controlled by the movement of the control handle. Push the control handle forward from NEUTRAL with a quick firm motion to the first detent for Forward gear. Continue pushing forward to INCREASE speed. Pull the control handle back from NEUTRAL with a quick firm motion to the first detent for REVERSE gear. Continue pushing back to INCREASE speed.

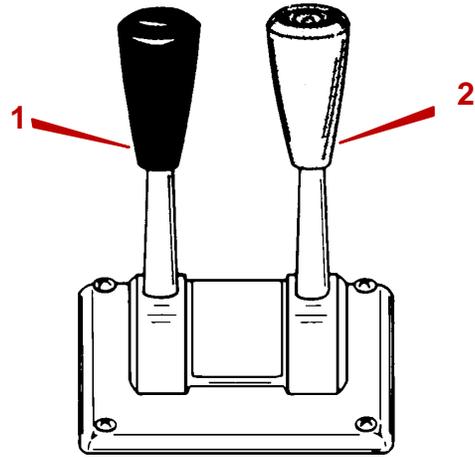
**2 Throttle Only Button** - Allows engine throttle advancement without shifting the engine. This is done by disengaging the shift mechanism from the control handle. The throttle only button can be depressed only when the remote control handle is in the NEUTRAL position, and should only be used to assist in starting the engine.

**3 Control Handle Tension Adjustment Screw** - This screw can be adjusted to INCREASE or DECREASE the tension on the control handle (cover must be removed to adjust). This will help prevent slipping of the remote control handle. Turn screw CLOCKWISE to increase tension and COUNTERCLOCKWISE to decrease tension. Adjust to tension desired.

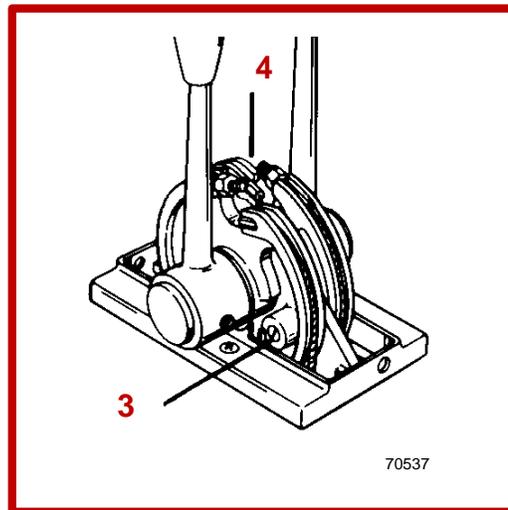
**4 Power Trim Switch** - See "Power Trim" section for detailed power trim operating procedures.

**5 Trailer Switch** - Used to raise drive unit for trailering, launching, beaching or shallow water operation. See "Power Trim" for detailed trailer switch operation.

**6 Power Trim Adjustment Switches (Used on Three Button Trim Control Only)** - See "Power Trim" section for detailed power trim operating procedures.



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**COMMANDER SERIES (CONSOLE MOUNTED)****TWO LEVER**

Your boat may be equipped with one of many Quicksilver® remote controls available. All controls feature an integral safety switch that allows starting engine in NEUTRAL only. Also, all controls may not have all features shown.

**NOTE:** *If boat is equipped with a remote control other than shown, consult your dealer for a description and/or demonstration of the control.*

**1 Shift Lever** - shifts unit into gear with full lever movement. Move lever forward to shift to FORWARD gear. Move lever backward to shift to REVERSE gear. Lever in full vertical position shifts to NEUTRAL.

**⚠ CAUTION**

**Never shift unit into or out of gear unless throttle lever is at idle RPM.**

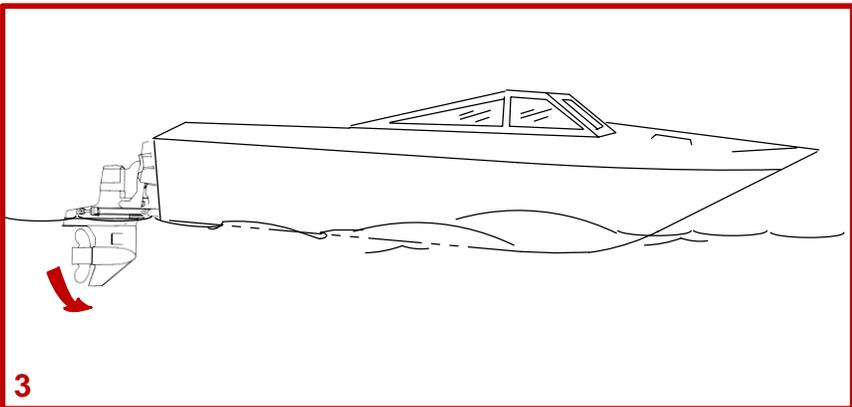
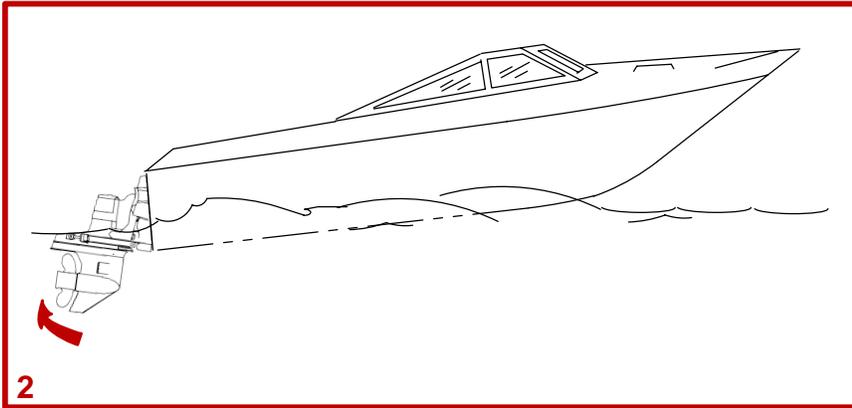
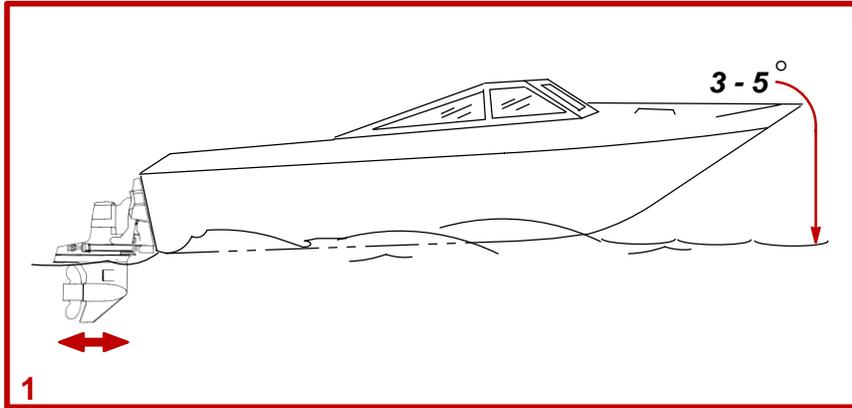
**2 Throttle Lever** - allows engine rpm to be increased or decreased.

**3 FRICTION Screw** - adjusts control handle friction so motor speed can be set and driver does not have to hold handle.

Turn screw CLOCKWISE to increase friction. Do not thread screw all the way out.

**4 DETENT Screw** - controls the effort needed to move control handle out of NEUTRAL. To increase tension, turn screw CLOCKWISE; to decrease, turn screw COUNTERCLOCKWISE. Do not thread screw all the way out.

**IMPORTANT:** Boats equipped with dual power packages may have both shift levers on one control and both throttle levers on the other control.



## Power Trim

Power Trim allows the operator to adjust the drive angle, while underway, to provide the ideal boat angle for varying load and water conditions. Also, the Power Trim system “Trailing” feature allows the operator to raise and lower the drive unit for trailering, beaching, launching and low speed (below 1200 rpm engine speed), shallow water operation.

### CAUTION

**Never trim the drive unit UP/OUT using TRAILER switch while boat is underway at engine speeds above 1200 rpm. Use extreme caution when operating with drive unit raised. Severe damage to the drive unit may result if unit is raised beyond the gimbal ring support flanges at engine speeds above 1200 rpm.**

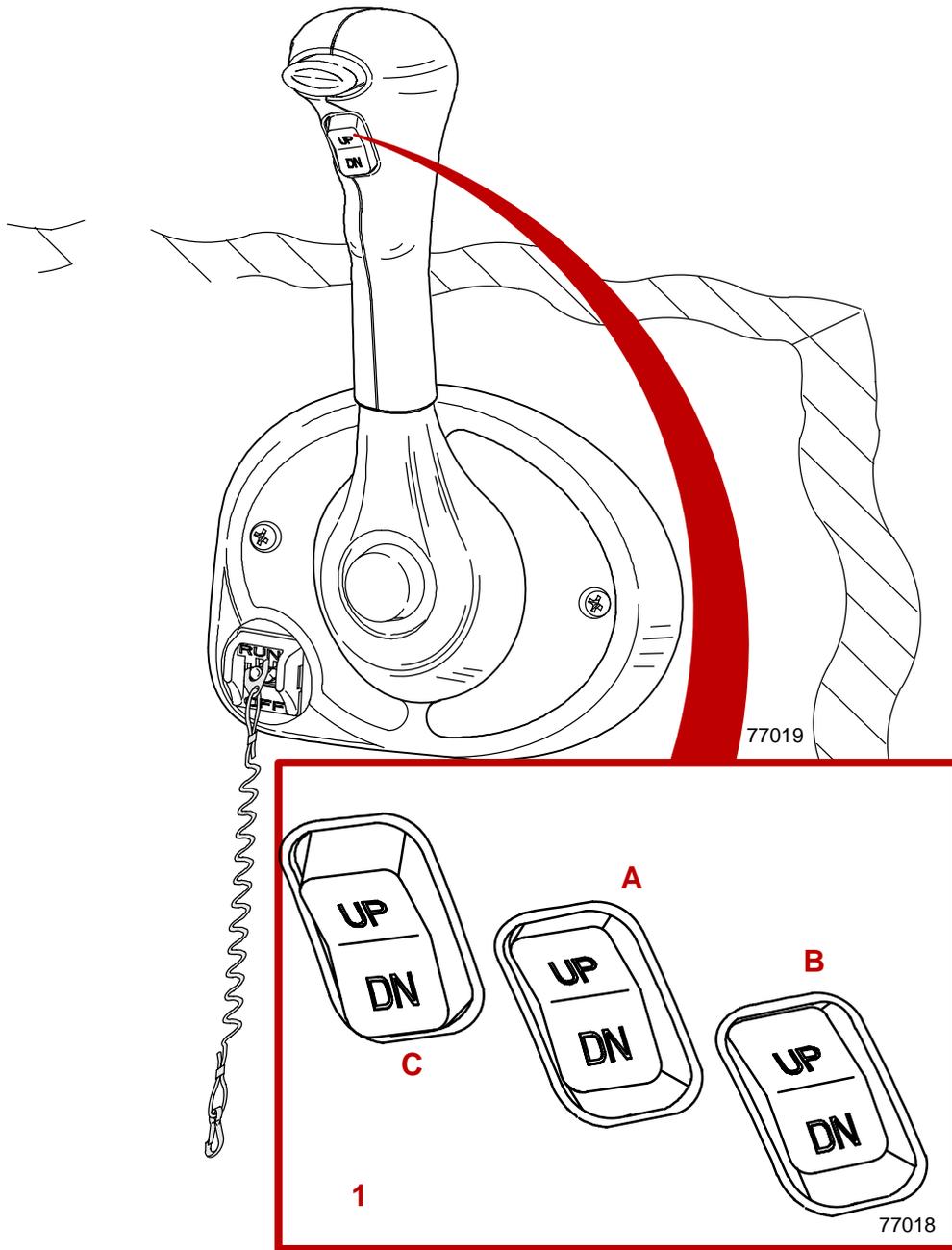
**1** In most cases, best overall performance is obtained with the drive unit adjusted so the boat bottom will run at a 3° to 5° angle to the water.

#### **2 Trimming Drive Unit UP/OUT Can:**

- Generally increase top speed.
- Increase clearance over submerged objects or a shallow bottom.
- Cause boat to accelerate and plane off slower.
- In excess, cause boat “porpoising” (bouncing) or propeller ventilation.
- Cause engine overheating if trimmed UP/OUT to a point where any cooling water intake holes are above the water line.

#### **3 Trimming Drive Unit DOWN/IN Can:**

- Help the boat accelerate and plane off quicker.
- Generally improve the ride in choppy water.
- In most cases, reduce boat speed.
- If in excess, lower the bow of some boats to a point at which they begin to plow with their bow in the water while on plane. This can result in an unexpected turn in either direction called “bow steering” or “over steering” if any turn is attempted, or if a significant wave is encountered.



**POWER TRIM OPERATION - PANEL MOUNT  
MERCURY MARINE PROPELLER COMPANY**

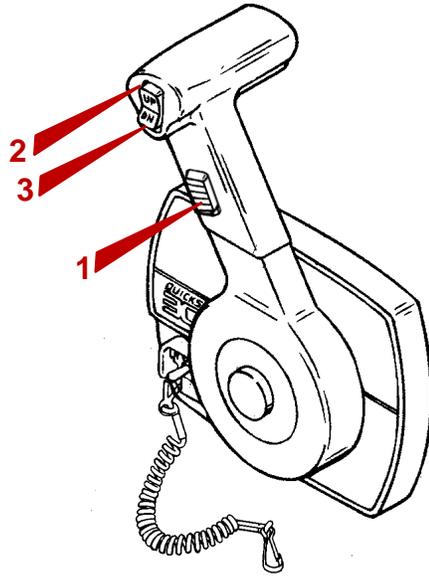
**IMPORTANT:** If TRAILER button is held depressed after drive unit reaches end of upward travel, an internal circuit breaker will open and pump will stop. Should this happen, release button and allow motor to cool for about one minute. Circuit breaker will reset and Power Trim operation may be resumed.

**1** Trim / Trailer Two Position Switch

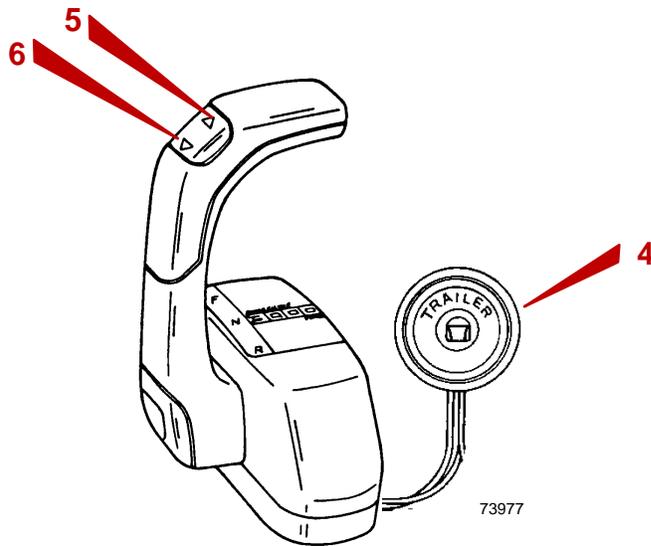
**A** Trim Up/Out: Press upper button on Trim/Trailer switch to first position to trim sterndrive unit to desired trim position.

**B** Trailer Position: Press upper button on Trim/Trailer Switch to the second position and raise sterndrive unit to desired trailer height.

**C** Lower Drive Unit: Press lower button on Trim/Trailer switch until sterndrive unit reaches desired position.



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**POWER TRIM OPERATION - PANEL MOUNT  
COMMANDER 3000 CLASSIC**

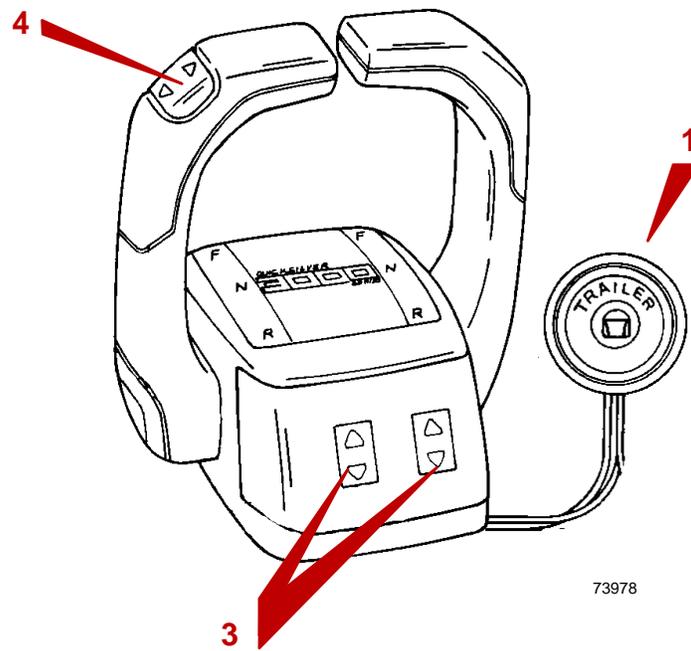
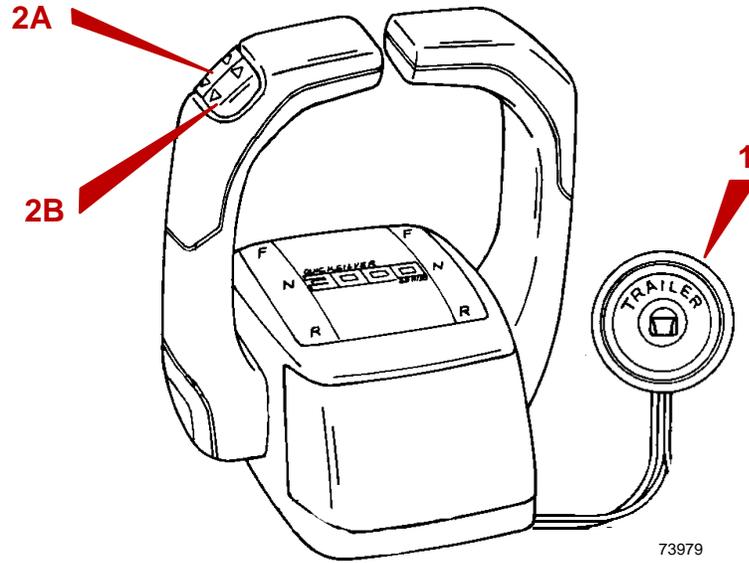
**IMPORTANT:** If TRAILER button is held depressed after drive unit reaches end of upward travel, an internal circuit breaker will open and pump will stop. Should this happen, release button and allow motor to cool for about one minute. Circuit breaker will reset and Power Trim operation may be resumed.

- 1 Trailer Position: Press button until drive unit reaches desired height.
- 2 Trim Up/Out: Press UP on Trim switch until drive unit reaches desired trim position.
- 3 Lower Drive Unit: Press DOWN on Trim switch until drive unit reaches desired position.

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**POWER TRIM OPERATION - CONSOLE MOUNT  
(SINGLE ENGINE VERSION)**

- 4 Trailer Position: Press button until drive unit reaches desired height.
- 5 Trim Up/Out: Press UP on Trim switch until drive unit reaches desired trim position.
- 6 Lower Drive Unit: Press DOWN on Trim switch until drive unit reaches desired position.



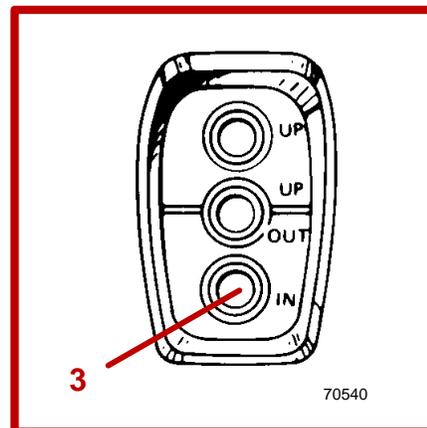
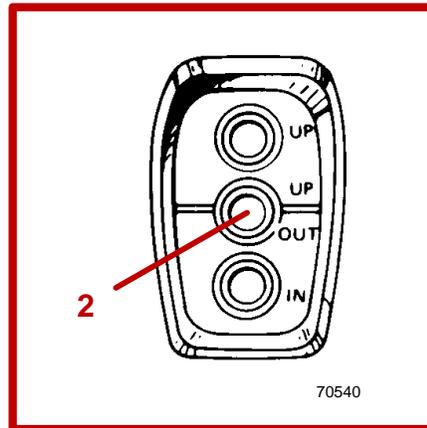
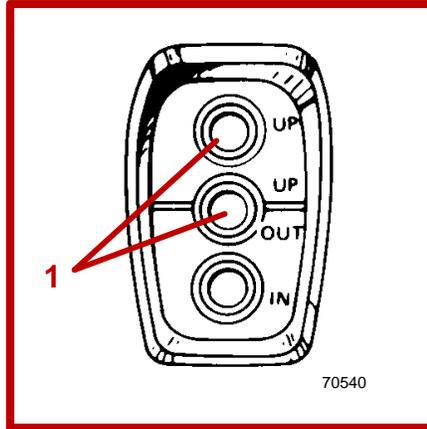
**POWER TRIM OPERATION - DUAL ENGINE CONSOLE MOUNT (TWO BUTTON AND THREE BUTTON VERSIONS)**

**IMPORTANT:** If TRAILER button is held depressed after drive unit reaches end of upward travel, an internal circuit breaker will open and pump will stop. Should this happen, release button and allow motor to cool for about one minute. Circuit breaker will reset and Power Trim operation may be resumed.

**⚠ CAUTION**

**When lowering or raising sterndrives equipped with a dual engine tie bar kit, the sterndrives must be raised or lowered evenly to prevent the tie bar from becoming twisted. Failure to raise or lower sterndrives evenly may result in tie bar or sterndrive damage.**

- 1 Trailer Button (Both Versions)** - Press button until drive unit reaches desired height for trailering drive units.
- 2 Two Button Trim Control (Dual Buttons in Handle)** - used to control both drive units from the handle. Press UP on button(s) to trim drive unit UP/OUT. Press down on button(s) to trim drive unit DOWN/IN.
  - A** Forward Trim Button - Used to trim the port drive unit.
  - B** Rear Trim Button - Used to trim the starboard drive unit.
- 3 Three Button Trim Control (Trim Adjustment Switches)** - With a single integral trim button in the handle to control two drive units simultaneously, these two switches control the fine tune adjustment of each drive unit. Using these Fine Tune Switches, set each drive unit to the desired trim angle. Then use the single trim switch in the handle to control the trim of both drive units simultaneously.
- 4 Three Button Trim Control (Single Trim Switch in Handle)** - used to trim both drives simultaneously after drives have been fine-tuned as described above.



**POWER TRIM OPERATION - THREE BUTTON TRIM PANEL  
(USED ON MODELS WITH TWO-LEVER CONTROL)**

**IMPORTANT:** If TRAILER button is held depressed after drive unit reaches end of upward travel, an internal circuit breaker will open and pump will stop. Should this happen, release button(s) and allow motor to cool for about one minute. Circuit breaker will reset and Power Trim operation may be resumed.

- 1** Trailer Position: Simultaneously press the UP button (top) along with the UP/OUT button (center) until drive unit reaches desired trailer position.
- 2** Trim Drive Unit UP/OUT: Press center UP/OUT button until drive unit reaches desired trim position.
- 3** Trim Drive Unit IN/DOWN: Press IN button until drive unit reaches desired trim position.

## Starting, Shifting and Stopping

### BEFORE STARTING THE ENGINE

#### WARNING

Do not use volatile starting aids, such as Ether, Propane, or Gasoline in the engine air intake system. Explosion hazard resulting from ignition of vapors by glow plugs could cause severe personal injury and engine damage.

#### CAUTION

It is good practice to ventilate the engine compartment prior to servicing any engine components to remove any fuel vapors which may cause difficulty breathing or be an irritant.

**IMPORTANT:** As an added precaution, the following steps must be observed before starting:

- Do not start engine without water being supplied to seawater pickup pump (to prevent pump or engine damage).
- Never operate the starter motor longer than 15 seconds at a time, to avoid overheating the starter motor. If engine does not start, wait 1 minute to allow the starter motor to cool; then, repeat starting procedure.
- Be sure engine crankcase is filled to correct level with the proper grade of oil for the prevailing temperature. Refer to “Specifications - Crankcase Oil”.
- Be sure that all electrical connections are secure.
- Check the air cleaner for proper installation of filter element.

1 Check all items listed in the MAINTENANCE CHART AND OPERATION CHART (Refer to “Table Of Contents”).

2 Perform any other necessary checks, as indicated by your dealer, or specified in your boat owner’s manual.

3 If engine has not been run for a period of time and will not readily start with the standard starting procedure, there is a hand pump/primer located on the engine to improve initial fuel supply. Refer to “Maintenance - Fuel System, Priming Fuel System” and follow instructions given.

### STARTING COLD ENGINE

**IMPORTANT:** Check fluid levels before starting engine. Refer to Maintenance Schedule.

1 Turn on and run engine compartment bilge blower (if so equipped) for five minutes. Or, open engine hatch to air out bilge before attempting to start engine(s).

2 Turn key switch to RUN position. Observe preheat indicator (glow plug) lamp. Lamp should be illuminated when engine is cold. The engine should be started only after the lamp goes off.

**NOTE:** Engine can be started once preheat indicator lamp goes out.

3 Turn key switch to START position. Release key when engine starts and allow switch to return to RUN position.

4 Check to ensure all instrumentation is functioning properly and indicating normal readings. Check to ensure charge indicator and oil pressure warning lamps go out. Within seconds after starting the engine, oil pressure should exceed 10 psi (69 kPa) minimum. If the oil pressure does not meet these minimum limits, stop the engine, locate and correct the problem, or see your Authorized MerCruiser Dealer if you are unable to determine the problem.

#### CAUTION

Do not increase the engine speed until the oil pressure gauge indicates normal. Shut the engine down if oil pressure does not register on the gauge within 20 to 30 seconds after start.

**ENGINE WARM UP****⚠ CAUTION**

**Improper or no warm-up of engine can seriously impair the life of your diesel engine.**

**1** After starting, check to ensure all instrumentation is functioning properly. Run engine at idle rpm until engine temperature is within normal operating range. It is very important that any engine be warmed up before applying full load. The warm-up period provides time for the lubricating oil to establish a film between moving parts.

**NOTE:** *Engine warm-up time during cold weather can be reduced by operating vessel at reduced engine speed. Commence normal vessel operation when systems reach operating temperatures.*

**2** After the engine has reached operating temperature, oil pressure should be within range listed in the engine specifications chart. Stop the engine if oil pressure is not within this range. Locate and correct the problem, or see your Authorized MerCruiser Dealer if you are unable to determine the problem.

**STARTING WARM ENGINE**

**1** Turn on and run engine compartment bilge blower for five minutes (if so equipped). Or, open engine hatch to air out bilge before attempting to start engine(s).

**2** Turn key switch to the “RUN” position. Check to ensure glow plug preheat lamp is not illuminated.

**3** Turn key switch to the “START” position and release when engine fires. Check to ensure charge indicator and oil pressure warning lamps go out.

**4** Check to ensure all instrumentation is functioning properly and indicating normal readings. Oil pressure should be within the range listed in the engine specifications chart. Stop the engine if oil pressure is not within this range. Locate and correct the problem, or see your Authorized MerCruiser Dealer if you are unable to determine the problem.

**SHIFTING****⚠ CAUTION**

**Never attempt to shift unit unless engine is at idle rpm. Damage to drive unit could occur.**

**1** To shift unit, be sure remote control/throttle lever is in NEUTRAL. Move control/shift lever with a firm, quick motion forward to shift to FORWARD gear, or backward to shift to REVERSE. After shifting drive unit, advance throttle to desired setting.

**2** Once underway, engine oil pressure should be within the range listed in the engine specifications chart at maximum rpm, or Wide-Open-Throttle. Stop the engine if oil pressure is not within this range. Locate and correct the problem, or see your Authorized MerCruiser Dealer if you are unable to determine the problem.

**IMPORTANT:** Starting procedure if engine is shut-off or stops with drive unit in gear.

**1.** Pull/push remote control handle to neutral-lock position (it will be necessary to exert force to move handle).

**2.** Turn key to start position, momentarily, to release clutch from gear.

**3.** Resume normal starting procedure.

**ENGINE SHUT-DOWN (STOPPING)**

**1** Place remote control lever in “Neutral.”

**2** Run engine at idle speed for several minutes to allow engine to cool down.

**3** Turn key switch to the “OFF” position.

## OPERATION CHART

STARTING PROCEDURE	AFTER STARTING	WHILE UNDERWAY	STOPPING & SHUT DOWN
Open engine hatch. Air out bilge completely.	Observe all gauges and warning lights to check condition of engine. If not normal, stop engine.	Frequently observe all gauges and indicator lights to monitor engine condition.	Shift remote control lever to neutral position.
Turn battery switch ON, if so equipped.	Check for fuel, oil, water, fluid, and exhaust leaks, etc.		Run engine at idle speed several minutes to allow it to cool down.
Turn on and run engine compartment bilge blower, if so equipped, for five minutes.	Check shift and throttle control operation.		Turn key switch to OFF position.
Check for leaks - fuel, oil, water, fluid, etc.	Check steering operation.		Turn battery switch OFF, if so equipped.
Open fuel shutoff valve, if so equipped.			Close fuel shutoff valve, if so equipped.
Open seacock, if so equipped.			Close seacock, if so equipped.
Prime fuel injection system, if necessary.			Flush seawater cooling circuit, if operating in saltwater area.
Turn key switch to "RUN" and check that lights and indicator lamps come on.			
Turn key switch to START, AFTER pre-heater indicator lamp has gone out. Release key when engine starts.			
Check that charge indicator and oil pressure indicator lamps go out AFTER engine starts.			
Warm-up engine at idle rpm for several minutes.			

CB13

**IMPORTANT: Starting procedure if engine is shut-off or stops with drive unit in gear.**

1. Pull/push remote control handle to neutral-lock position (it will be necessary to exert force to move handle).
2. Turn key to start position, momentarily, to release clutch from gear.
3. Resume normal starting procedure.

# Specifications

CD11

## Seacock

Seacock (water inlet valve) used, must have an internal cross-sectional area equal to or greater than hose to prevent restricting water flow. A 1-1/2 in. (38mm) brass ball or gate valve is minimum required.

Seacock should be installed in an area where it is easily accessible and supported adequately to prevent hose fatigue.

CE14

## Seawater Strainer

Seawater Strainer should be provided, and be of sufficient size to ensure that an adequate supply of water will be maintained for cooling engine. A minimum flow rate of 40 gallons (150 litres) per minute is required.

Strainer should be installed in an area where it will be easily accessible for inspection and cleaning. Strainer should be installed in water inlet hose after seacock to allow operator to shut off water inlet when cleaning strainer.

CD535

## Anti-Freeze/Coolant

### CAUTION

**Alcohol or Methanol base antifreeze or plain water are not recommended for use in closed cooling section of cooling system at any time.**

Because diesel engines are high compression engines and related higher engine operating temperatures are created, the closed cooling system and engine, including related cooling passages must remain as clean as possible to provide adequate engine cooling. This can only be assured by using the proper anti-freeze, water, additives and inhibitors. It is recommended that the closed cooled section of the cooling system be filled with a low, or no, silicate formula of ethylene glycol antifreeze in solution with deionized water. A low silicate formula prevents anti-freeze separation which causes a silicate gelatin to form. This gelatin will block engine and heat exchanger passages causing engine overheating.

The coolant, if not premixed, should be mixed before being added to the closed cooling system using a proper anti-freeze together with deionized water. Common tap water or softened water contains unwanted minerals which can leave large deposits in the system that restrict the cooling system efficiency. In addition, additives and inhibitors introduced into acceptable coolant solutions will form a protective film on internal passages and provide protection against internal cooling system erosion.

The closed cooling section should be kept filled year-round with an acceptable anti/freeze/coolant solution. Do not drain closed cooled section for storage, as this will promote rusting of internal surfaces. If engine will be exposed to freezing temperatures, make sure that closed cooled section is filled with a properly mixed anti-freeze/coolant solution, to protect engine and closed cooling system to lowest temperature to which they will be exposed.

**IMPORTANT: The anti-freeze/coolant used in these marine engines must be a low (or no) silicate ethylene glycol, containing special additives, and deionized, purified water. Using other types of engine coolant may cause fouling of the heat exchangers, and overheating of the engine. Do not combine different types of coolants without knowing that they are compatible. Refer to the coolant manufacturer's instructions.**

Some acceptable types of anti-freeze/coolants are listed in the following table. Refer to "Maintenance Schedules" for respective change intervals.

Quicksilver Premixed Marine Engine Coolant	92-813054A2
Fleetguard Complete0	Obtain Locally

## Fuel Requirements

### WARNING

Electrical system components on this engine are not external ignition protected. **DO NOT STORE OR UTILIZE GASOLINE ON BOATS EQUIPPED WITH THESE ENGINES, UNLESS PROVISIONS HAVE BEEN MADE TO EXCLUDE GASOLINE VAPORS FROM ENGINE COMPARTMENT (REF: 33 CFR).** Failure to comply could result in fire, explosion and/or severe personal injury.

### WARNING

**FIRE HAZARD:** Fuel leakage from any part of the fuel system can be a fire hazard which can cause serious bodily injury or death. Careful periodic inspection of entire fuel system is mandatory, particularly after storage. All fuel components including fuel tanks, whether plastic, metal or fiberglass, fuel lines, primers, fittings, and fuel filters should be inspected for leakage, soften, hardening, swelling or corrosion. Any sign of leakage or deterioration requires replacement before further engine operation.

**IMPORTANT:** Use of improper or water contaminated diesel fuel can damage your engine seriously. Use of improper fuel is considered misuse of engine, and damage caused thereby will not be covered by warranty.

### WARNING

**Under *no circumstances* should gasoline, gasohol and/or alcohol be mixed with diesel fuel for any reason. This mixture of gasoline, gasohol and/or alcohol with diesel fuel is highly flammable and produces a significant risk to the user.**

Grade 2-D diesel fuel is required, meeting ASTM Standards D975 (or fuel rated Diesel DIN 51601), and having a minimum cetane rating of 45.

The Cetane number is a measure of the ignition quality of diesel fuel. Increasing the cetane number will not improve overall engine performance, but it may be necessary to raise the cetane rating for low temperature, or high altitude use. A lower cetane number could cause hard starting and slower warm-up, and could increase engine noise and exhaust emissions.

**NOTE:** *If your engine suddenly becomes noisy after a fuel fill, you possibly received substandard fuel with a low cetane rating.*

Sulphur content of the above fuel is rated at 0.50% by weight, maximum (ASTM). Limits may vary in countries outside of the United States.

On intermittent use engines, high sulphur content diesel fuel will greatly increase:

- Corrosion on metal parts.
- Deterioration of elastomer and plastic parts.
- Corrosion and extensive damage, and excessive wear of internal engine parts, particularly bearings.
- Starting and operating difficulties.

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## Diesel Fuel In Cold Weather

Unaltered diesel fuels thicken and “gel” in cold temperatures, unless treated. Virtually all diesel fuels are “clima-tized” to allow their use in the particular region for that time of the year. If it becomes necessary to further treat diesel fuel, it is the owner/operator’s responsibility to add a commercial “standard brand” “anti-gel” diesel fuel additive, following that product’s directions.

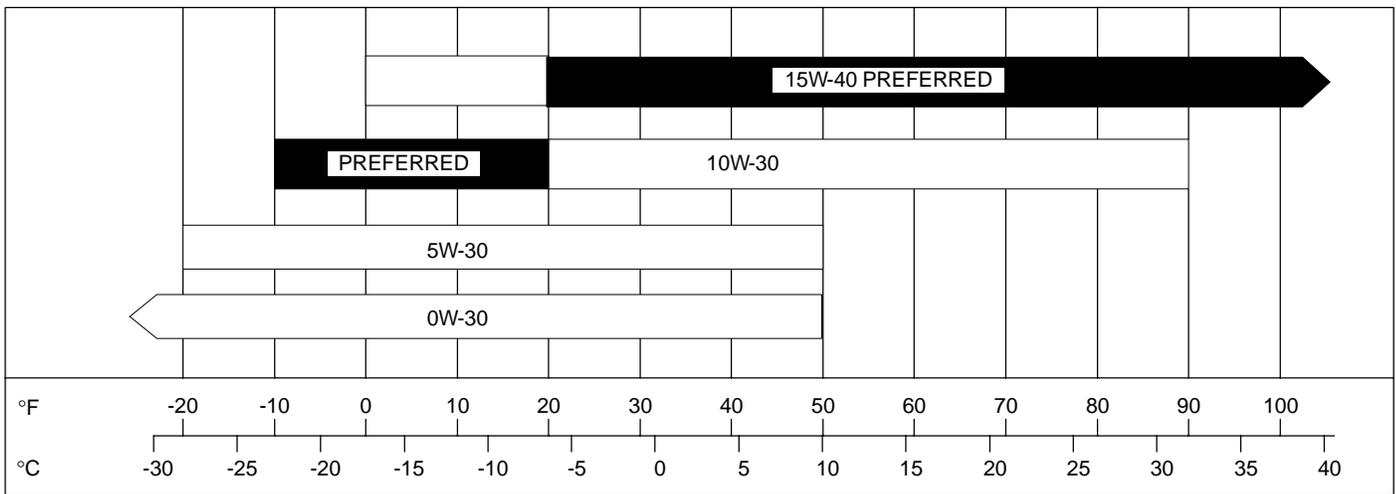
CD556

## Crankcase Oil

To help obtain optimum engine performance and to provide maximum protection, the engine requires engine oil with a rating of HD-SAE-API, CG-4.

For all temperature operation use 15W-40 oil.

### OIL VISCOSITY RECOMMENDATIONS



### SAE Viscosity Grades / Expected Temperature Range

## Engine

DESCRIPTION		SPECIFICATION - MCM (Sterndrive)	
		D7.3L D-Tronic	D7.3L D-Tronic LD
Crankshaft Horsepower (Kilowatts) <sup>1</sup>		300 (223)	260 (195)
Propeller Shaft Horsepower (Kilowatts) <sup>1</sup>		270 (202)	230 (170)
Engine Type		V-8 Cylinder Diesel	
Displacement		444 cu. in. (7.3L)	
Firing Order		1-2-7-3-4-5-6-8	
Bore		4.11 in. ( 104.39 mm )	
Stroke		4.18 in. ( 106.20 mm )	
Compression Ratio		15:1	
Valve Clearance - Intake / Exhaust		Non-Adjustable (Hydraulic)	
Maximum Pressure Difference Between Cyl.		75 PSI ( 517 kPa )	
Maximum High Idle No Load rpm		3950	3750
Governed rpm Setting (Begins At:)		3850	3650
Rated rpm at Wide-Open-Throttle <sup>2</sup>		3600-3800	3400-3600
Low Idle rpm		625 ± 25	
Oil Pressure:	750 rpm	10 PSI [ 0.7 bar (69 kPa) ] Minimum	
	3600 rpm	40-70 PSI [ 2.8 - 4.8 bar ( 276-482 kPa ) }	
Oil Temperature		190° - 250° F ( 88° - 121° C )	
Thermostat:	Water:	170° F ( 77° C )	
Coolant Temperature		170° - 210° F ( 77° - 99° C )	
Electrical System		12-volt Negative ( - ) Ground	
Alternator Rating		949W, 14.6v, 65A	
Recommended Battery Rating		1500 cca or 300 Ah	
Starter		12v, 2.4 kW	

<sup>1</sup> Power rated in accordance with NMMA Procedure - ISO 3046 (Technically Identical to ICOMIA 28-83).

<sup>2</sup> Refer to "Conditions Affecting Operation - Propeller Selection" for additional information.

## Capacities

**NOTE:** All measurements are given in US Quarts (Liters).

ITEM		SPECIFICATION - MCM (Sterndrive) D7.3L D-Tronic and D7.3L D-Tronic LD
Total Oil-Filling Capacity <sup>1</sup>		16.5 (15.6)
Oil Drainage:	from oil pan	13.5 (12.8)
	from oil filter	1 (1)
	from oil cooler	1 (1)
Closed Cooling System		26 (24-1/2)

<sup>1</sup> Always use dipstick to determine exact quantity of oil or fluid required.

## DRIVES

NOTICE	
<p align="center"><b>Unit Of Measurement: U.S. Quarts (Liters).</b>  <b>All capacities are approximate fluid measures.</b></p>	

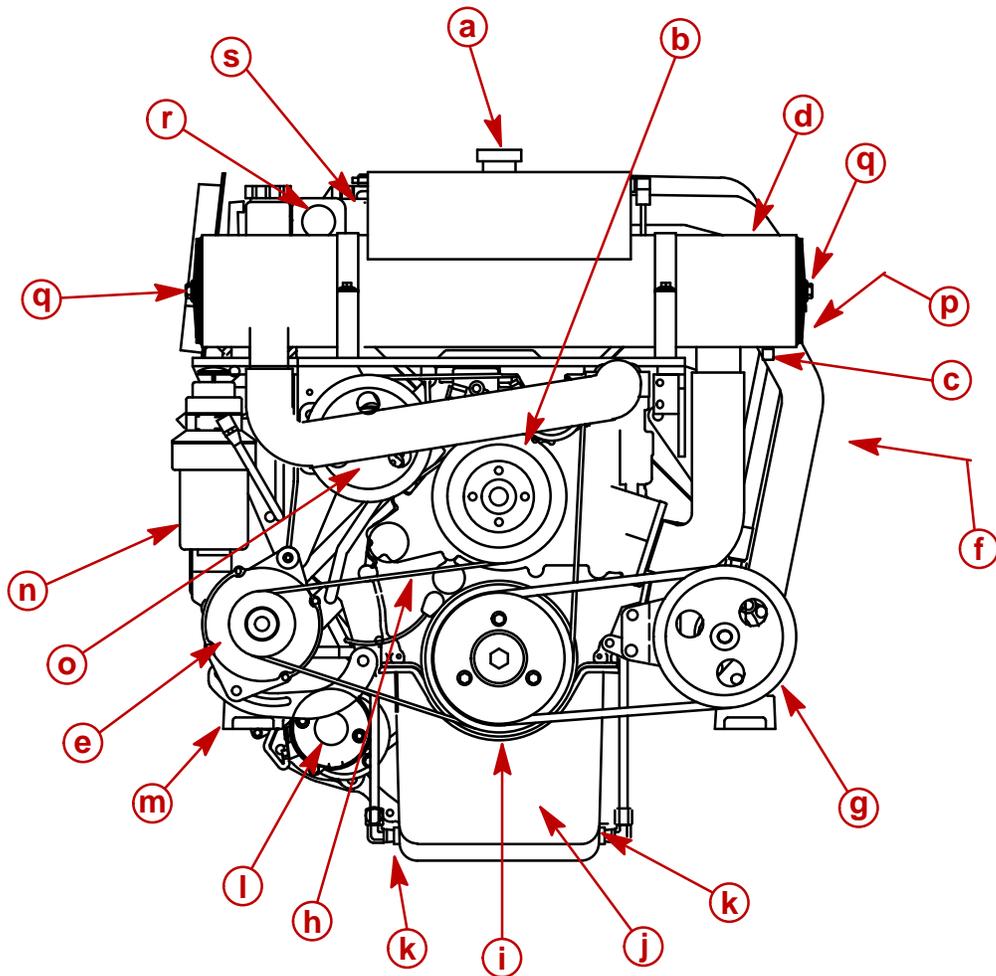
Item	Specification	
Drive Unit Oil Capacity (With Gear Lube Monitor)	Bravo One	2.75 (2.6)
	Bravo Two	3.2 (3)
	Bravo Three	3 (2.9)

# Maintenance

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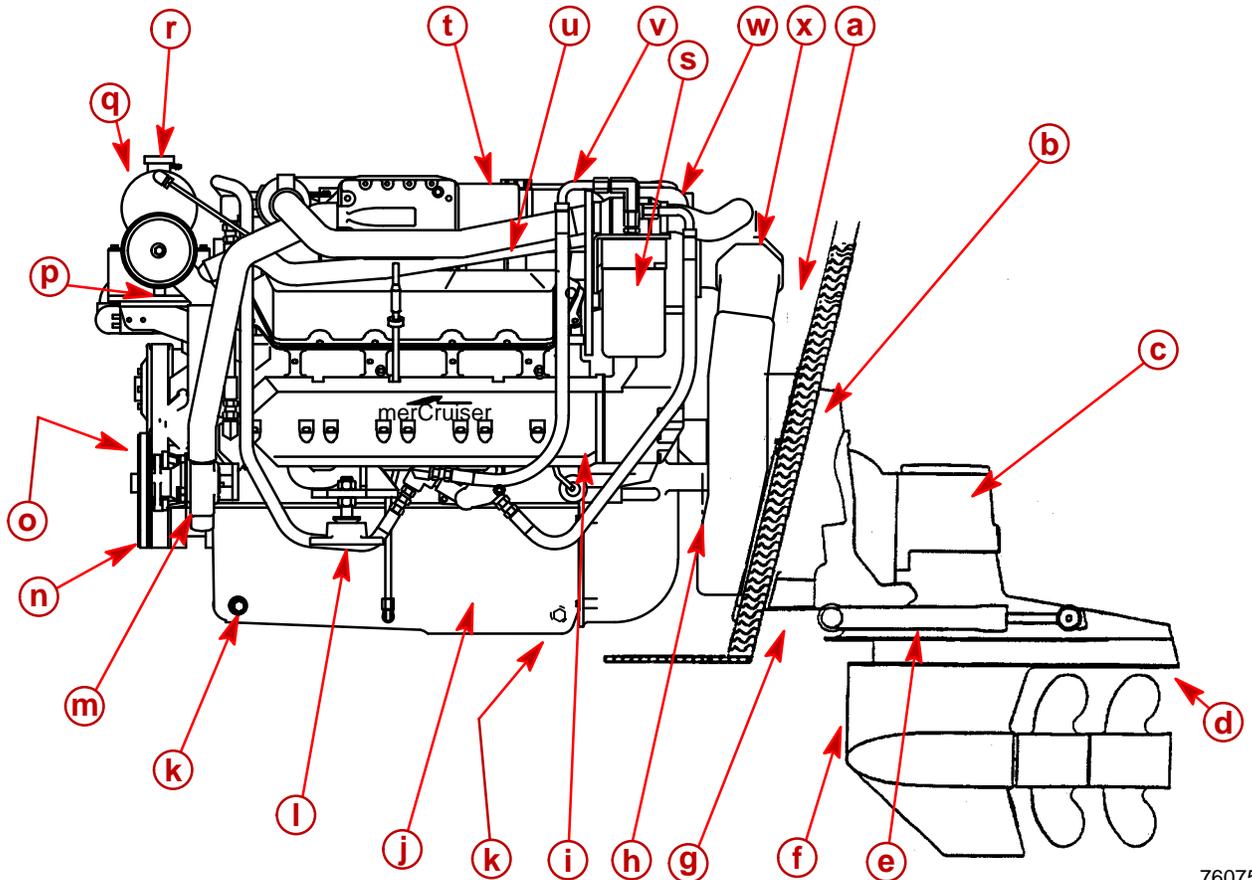
## Power Package Views

### FRONT



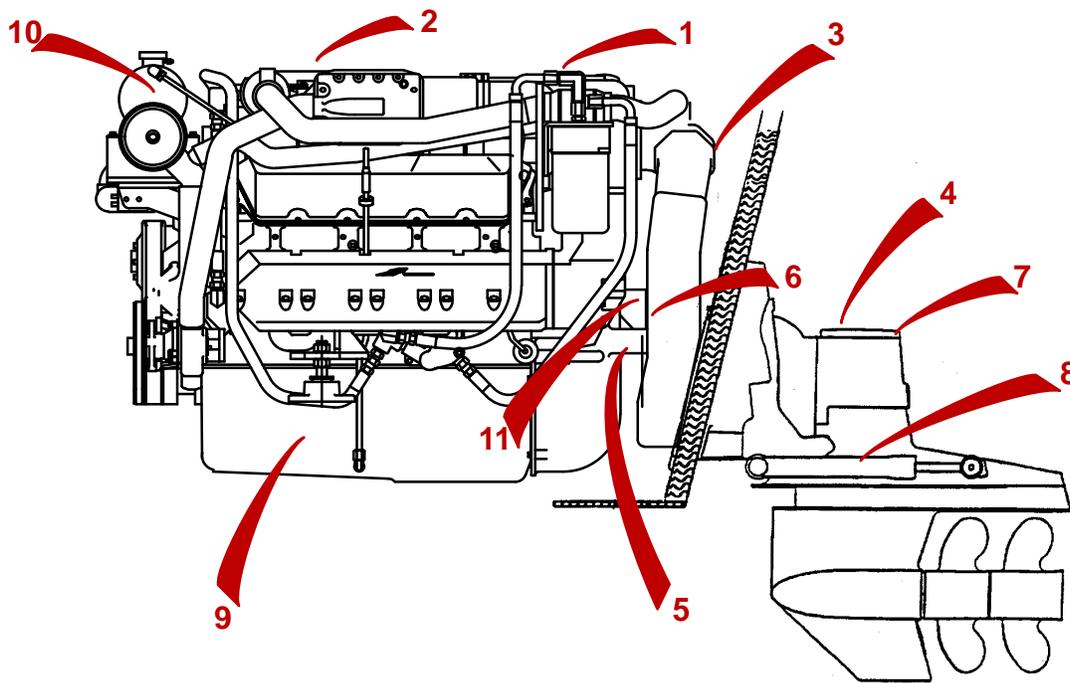
- a** - Heat Exchanger/Coolant Tank Cap
- b** - Engine Water Circulating Pump and Pulley
- c** - Sacrificial Anode (On Heat Exchanger)
- d** - Heat Exchanger/Coolant Tank
- e** - Alternator
- f** - Port Exhaust Manifold
- g** - Seawater Pump and Pulley
- h** - Engine Water Circulating Pump Belt
- i** - Crankshaft Pulley
- j** - Oil Pan
- k** - Oil Pan Drain Plug
- l** - Starter
- m** - Starboard Front Engine Mount
- n** - Water Separating Fuel Filter
- o** - Power Steering Pump and Pulley
- p** - Engine Oil Dipstick
- q** - Heat Exchanger End Cap (For Draining Seawater Cooling Water)
- r** - Engine Oil Cooler
- s** - Sacrificial Anode (On Engine Oil Cooler)

PORT (LEFT) SIDE



76075

- a** - Steering System
- b** - Transom Assembly
- c** - Sterndrive Unit
- d** - Antiventilation Plate
- e** - Power Trim Cylinder
- f** - Speedometer Pitot Tube
- g** - MerCathode Electrode
- h** - Rear Engine Mount
- i** - Exhaust Manifold
- j** - Oil Pan
- k** - Oil Pan Drain Plug
- l** - Front Engine Mount
- m** - Seawater Pump and Pulley
- n** - Crankshaft Pulley
- o** - Alternator
- p** - Sacrificial Anode (On Heat Exchanger)
- q** - Heat Exchanger/Coolant Tank
- r** - Heat Exchanger/Coolant Tank Cap
- s** - Engine Oil Filter
- t** - Aftercooler
- u** - Engine Oil Fill Cap (Port)
- v** - Air Filter
- w** - Turbocharger
- x** - Exhaust Elbow



76075

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## General Maintenance Information

### ⚠ WARNING

Always disconnect battery cables from battery before working around electrical system components to prevent injury to yourself or damage to electrical system.

### ⚠ WARNING

Always disconnect battery cables from battery BEFORE working on fuel system to prevent fire. This eliminates the engine wiring as a potential source of ignition.

**IMPORTANT:** Refer to Maintenance Schedules for complete listing of all routine and scheduled maintenance to be performed. Some listings can be done by owner/operator, while others should be performed by an Authorized Mercury MerCruiser Dealer. Before attempting maintenance or repair procedures not covered in this manual, it is recommended that a Mercury MerCruiser Service Manual(s) be purchased and read thoroughly.

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## Maintenance Aids

- 1 Power Steering System - Quicksilver Power Trim and Steering Fluid, or Dexron II automatic transmission fluid (ATF).
- 2 All pivot points - SAE 30W motor oil.
- 3 Exposed Portion of Steering Cable and Propeller Shaft - Quicksilver Special Lubricant 101.
- 4 Sterndrive Unit - Quicksilver Hi-Performance Gear Lube.
- 5 All Grease Fittings (Unless Otherwise Specified) - Quicksilver 2-4-C Marine Lubricant.
- 6 Engine Coupler and Universal Joint Shaft Splines - Quicksilver Engine Coupler Spline Grease (92-816391A4).
- 7 All Exterior Surfaces - Quicksilver Primer and Spray Paint, as needed, and Quicksilver Corrosion Guard.
- 8 Power Trim System - Quicksilver Power Trim and Steering Fluid, or SAE 10W-30 motor oil.
- 9 Crankcase Oil - use ONLY specified engine oil. Refer to "Specifications".
- 10 Closed Cooling System Coolant - use ONLY specified engine coolant. Refer to "Specifications".
- 11 Universal Joints - Quicksilver U-Joint and Gimbal Bearing Grease (92-828052A3); Except Bravo X - Use Exxon Unirex EP2 Grease (Obtain Locally).

## Maintenance Schedules

Routine Maintenance	Each Day Start	Each Day End	Weekly	Every Two Months
Check crankcase oil (interval can be extended based on experience).	•			
If operating in salt, brackish or polluted waters, flush cooling system after each use.		•		
Drain any water from fuel filter after each use (If operating in freezing temperatures).			•	
Check drive unit oil level, trim pump oil level and power steering pump fluid level.			•	
Check water pickups for debris or marine growth. Check water strainer and clean. Check coolant level.			•	
Inspect drive unit anodes and replace if 50 percent eroded.			•	
Check battery connections and fluid level.				•
Lubricate propeller shaft and the retorque nut (if operating in only freshwater, this maintenance may be extended to every four months).				•
Operating in Saltwater Only: treat engine surface with corrosion guard.				•
Clean air filter every 50 hours of operation.				•

## Maintenance Schedules (Continued)

Scheduled Maintenance									
	After First 20 hours	Annually	Every 100 hours or Annually ◆	Every 200 hours or 3 years ◆	Every 300 hours or 3 years ◆	Every 2 years	Every 5 years	Every 500 hours or 5 years ◆	Every 1000 hours or 5 years ◆
Change crankcase oil and filter.	•								
Touch-up paint power package and spray with corrosion guard.		•							
Change crankcase oil and filter.			•						
Change drive unit oil and retorque connection of gimbal ring to steering shaft.			•						
Replace fuel filter(s).			•						
Check steering system and remote control for loose, missing or damaged parts. Lubricate cables and linkages.			•						
Inspect U-joints, splines, and bellows. Check clamps. Check engine alignment. Lubricate U-joints and splines.			•						
Lubricate gimbal bearing and engine coupler <sup>8</sup>			•						
Check continuity circuit for loose or damaged connections. Test MerCathode <sup>®</sup> unit output on Bravo Models.			•						
Retorque engine mounts.			•						
Check electrical system for loose, damaged or corroded fasteners.			•						

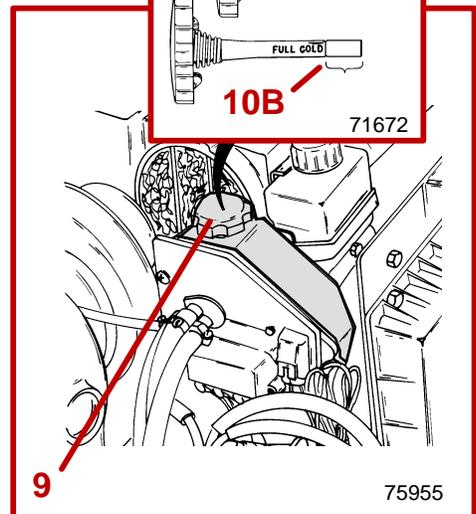
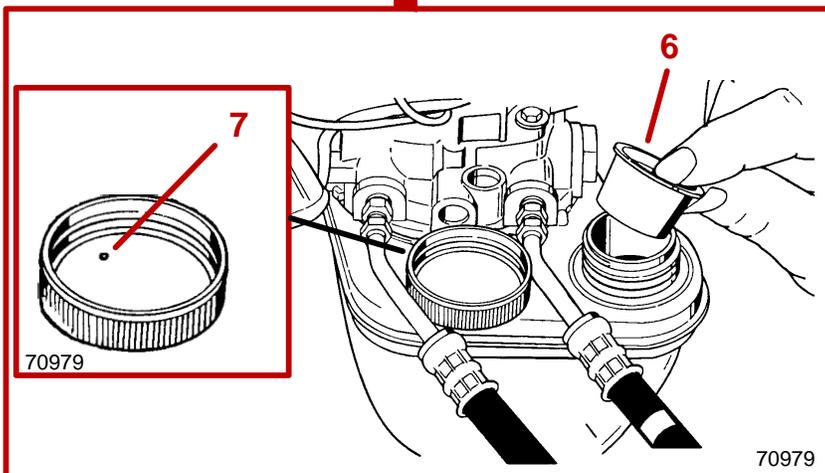
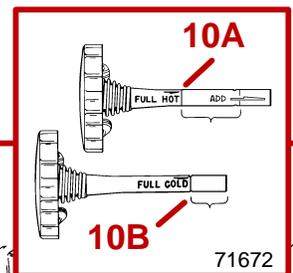
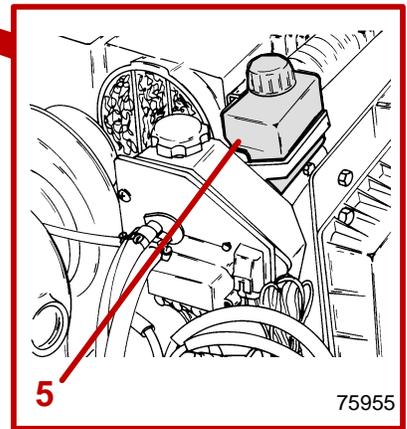
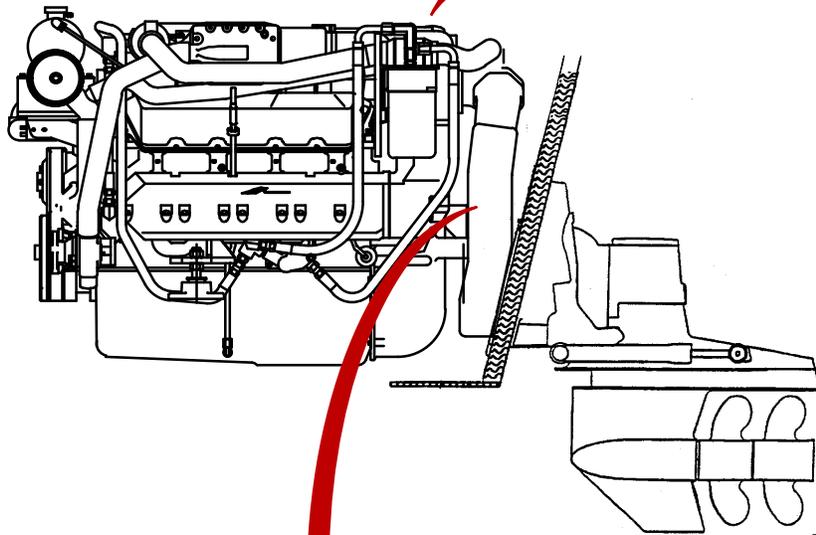
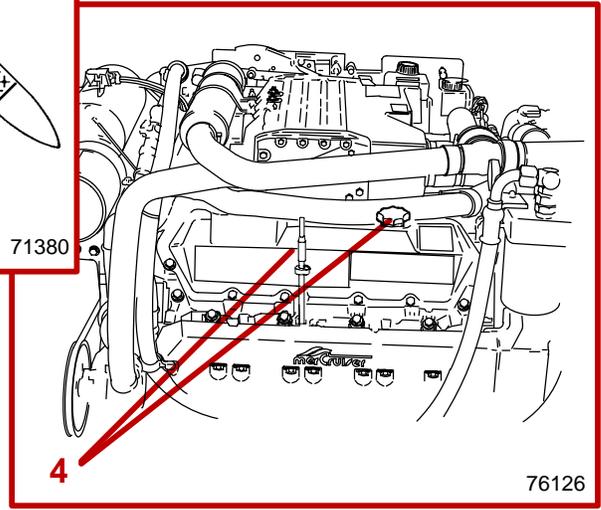
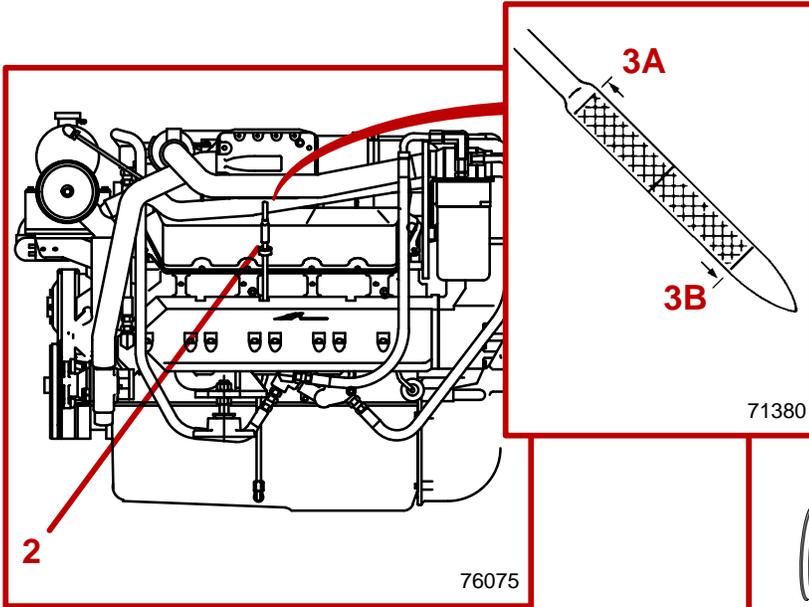
◆ Whichever Occurs First

<sup>8</sup> Lubricate engine coupler every 50 hours if operated at idle for prolonged periods of time.

## Maintenance Schedules (Continued)

Scheduled Maintenance (Continued)									
	After First 20 hours	Annu- ally	Every 100 hours or Annually ◆	Every 200 hours or 3 years ◆	Every 300 hours or 3 years ◆	Every 2 years	Every 5 years	Every 500 hours or 5 years ◆	Every 1000 hours or 5 years ◆
Lubricate drive shaft U-joints and tailstock input and output bearings.			•						
Inspect condition and tension of belts.			•						
Check cooling system and exhaust system hose clamps for tightness Inspect both systems for damage or leaks.			•						
Disassemble and inspect seawater pump and replace worn components.			•						
Clean seawater section of closed cooling system. Clean, inspect and test pressure cap. Check anodes.			•						
Replace coolant.						•			
Replace air filter.				•					
Clean aftercooler core.								•	
Clean fuel tank.									•

◆ Whichever Occurs First



## Checking Fluids Levels

### CRANKCASE OIL

1 Check engine oil daily before first start-up.

**NOTE:** *If it becomes necessary to check oil level during operation, stop engine and allow 5 minutes for oil to drain into pan.*

2 Remove dipstick. Wipe clean and reinstall into dipstick tube.

3 Remove dipstick and observe oil level. Oil must be between marks and on dipstick.

**A** MAXIMUM Oil Level - top line. Fill to this level; do not overfill.

**B** MINIMUM Oil Level - Do not allow oil level to drop below this line.

4 If necessary, add oil as follows: Remove oil filler cap (port oil filler cap is shown on opposite page - port similar). Add specified oil to bring level up to, but not over, "MAXIMUM" mark on dipstick. Reinstall oil filler cap.

### DRIVE UNIT OIL

5 Check gear lube monitor oil level; keep oil level at or near "Fill" line. Check for water at bottom of monitor, and/or if oil appears a milky-tan, contact your Authorized MerCruiser Dealer immediately; both conditions indicate a water leak somewhere in the drive unit.

**IMPORTANT:** **If more than 2 fl. oz. (59 ml) of Quicksilver High Performance Gear Lube are required to fill gear lube monitor, a seal may be leaking. Contact your Authorized MerCruiser Dealer for service. Damage to drive unit may occur due to lack of lubrication.**

### POWER TRIM PUMP FLUID

Power trim pump fluid level must be checked with the drive unit in the full "Down/In" position.

6 New trim pumps have a shipping "cap plug" in the reservoir fill neck. Remove fill cap from reservoir and check to ensure that this "cap plug" is NOT present in filler neck. **Remove** and **discard** "cap plug" if present.

7 Remove fill cap and observe oil level. Level must be up to, but not over, the bottom edge of fill neck.

**IMPORTANT:** **Fill cap has a small hole in it which acts as a vent. Frequently check that vent is open and unrestricted.**

8 Add Quicksilver Power Trim and Steering Fluid if available, as necessary, to bring oil to proper level or use SAE 10W-30 or 10W-40 motor oil. Install fill cap.

### POWER STEERING PUMP FLUID

**IMPORTANT:** **If fluid is not visible in reservoir, contact your Authorized MerCruiser Dealer.**

Power steering fluid must be checked with engine off and drive unit pointed straight back. Check with engine warm.

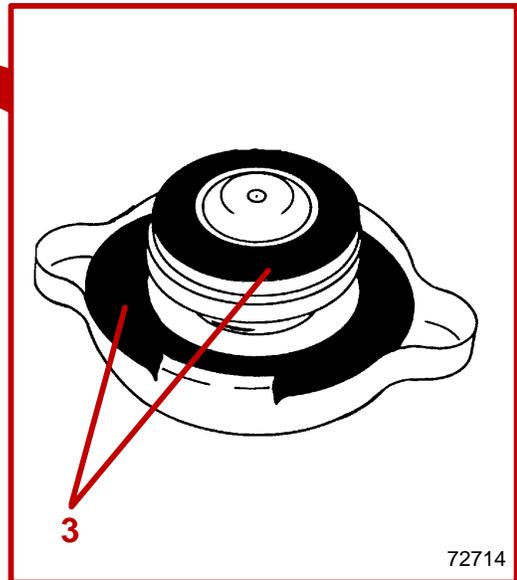
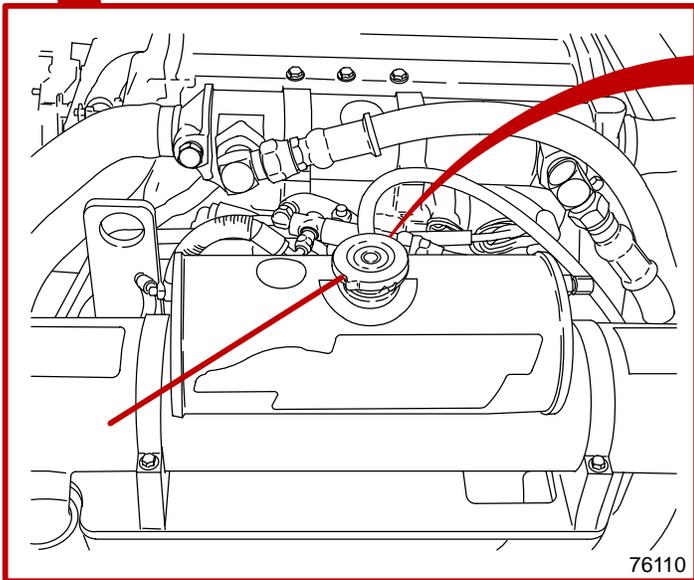
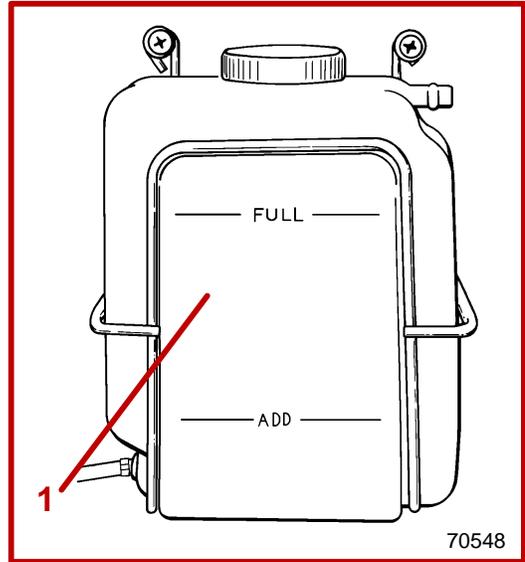
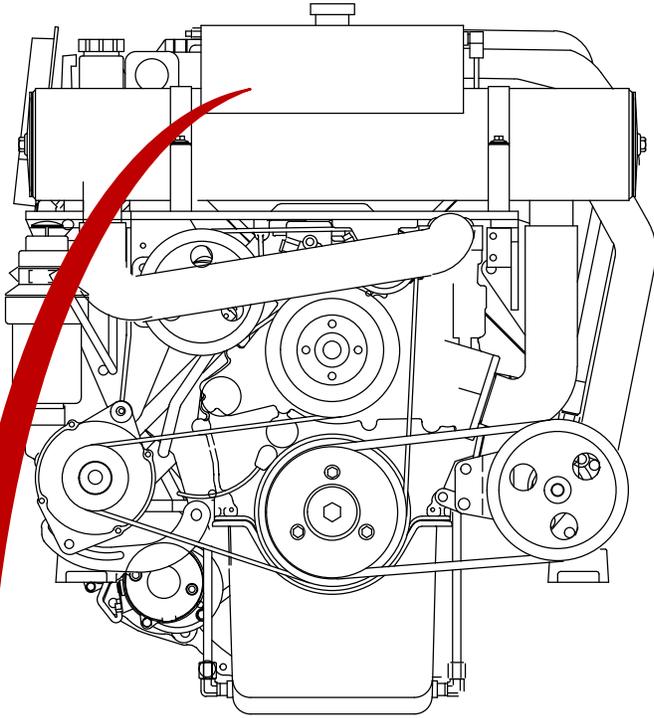
9 Remove fill cap/dipstick from reservoir. Wipe clean and reinstall into reservoir.

10 Remove fill cap/dipstick and observe fluid level. Fluid must be between marks on fill cap/dipstick.

**A** MAXIMUM – "FULL HOT" Fluid Level - top line. Fill to this level when fluid is hot; *do not overfill*.

**B** MINIMUM – "FULL COLD" Fluid Level - Fill to this level when fluid is cold. Do not allow fluid to drop below this level.

11 If necessary, add Quicksilver Power Trim and Steering Fluid or, if Quicksilver Power Trim and Steering Fluid is not available, use Dexron II, to bring fluid to proper level. Replace fill cap/dipstick.



**ENGINE COOLANT**

1 Check coolant level in coolant recovery bottle. Add specified coolant as required.

**NOTE:** Coolant recovery system is considered to be functioning properly when coolant level in heat exchanger/coolant tank remains at bottom edge of its filler neck.

**⚠ WARNING**

**Do not remove coolant tank cap when engine is hot. Coolant may discharge violently, causing severe burns.**

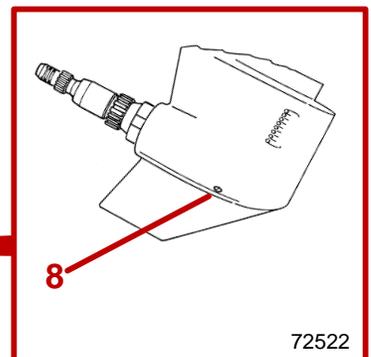
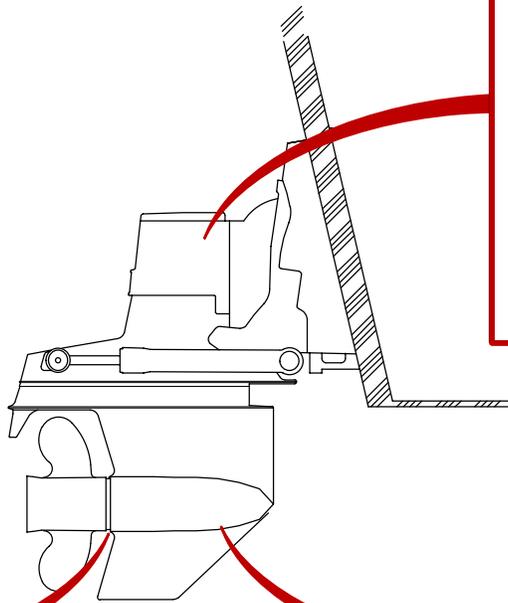
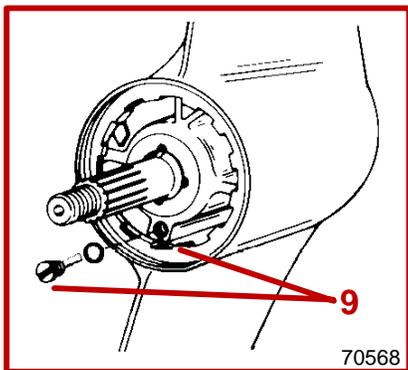
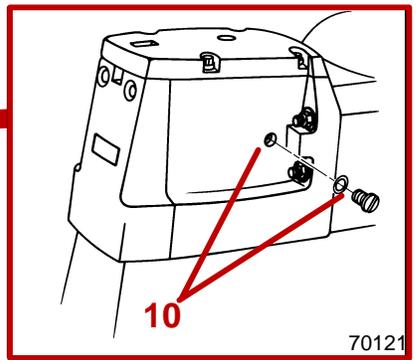
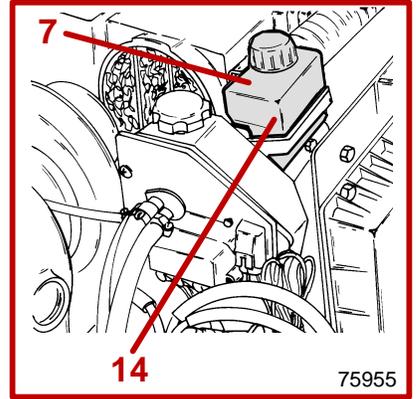
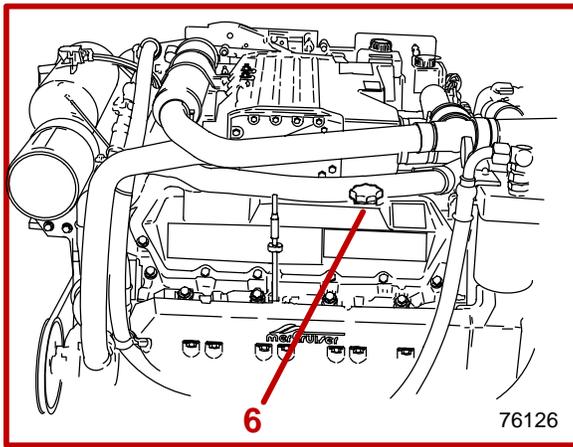
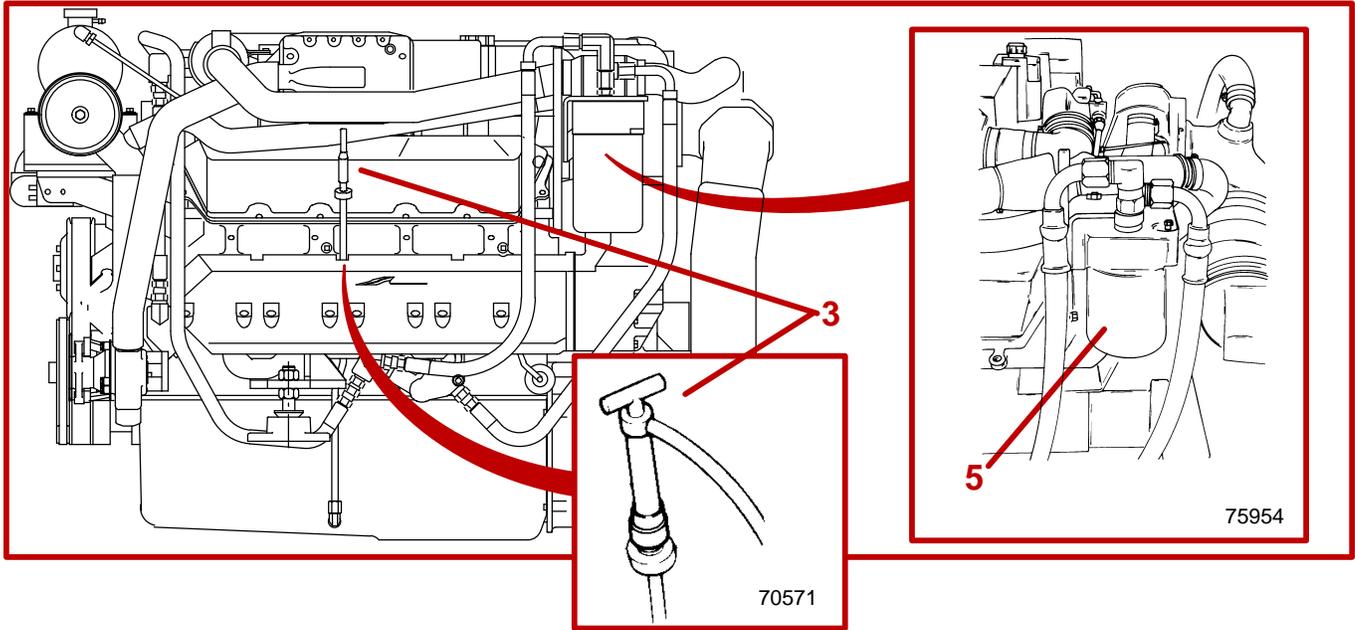
2 Periodically, to ensure that coolant recovery system is functioning properly, you should allow engine to cool and then *slowly and carefully* remove coolant tank cap. Coolant level must be to the bottom edge of the tank filler neck. If coolant is low, add coolant as necessary to bring up to proper level. Refer to “Specifications” for proper coolant.

3 If coolant level was low:

- Inspect coolant recovery system for leaks.
- Inspect coolant tank cap gaskets for damage and replace if necessary.
- Also, the tank cap maintains pressure on the coolant tank. It may not be holding pressure properly. To have cap tested, contact your Authorized MerCruiser Dealer.

**⚠ CAUTION**

**If the coolant should get extremely low and the engine very hot, let the engine cool for approximately 15 minutes before adding coolant; then, with the engine running, add coolant slowly. Adding cold coolant to a hot engine may crack the cylinder head or crankcase. Never use water alone.**



## Changing Fluids

See MAINTENANCE CHART for lubricant change interval. Lubricant should be changed before placing boat in storage. Power Trim or Power Steering fluids do not require changing.

Coolant in closed cooling system should be changed at specified intervals by your Authorized MerCruiser Dealer.

### CRANKCASE OIL AND FILTER

**IMPORTANT: Change oil when engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use only recommended motor oil (see SPECIFICATIONS).**

1 With engine at normal operating temperature, remove dipstick. Install Quicksilver Crankcase Oil Pump onto dipstick tube.

*NOTE: Oil dipstick may be located on either port or starboard side of engine.*

2 Pump oil out of crankcase into drain pan. When crankcase is empty, remove pump. Install oil dipstick.

3 Remove and discard oil filter and sealing ring (not visible in picture).

4 Coat sealing ring on new filter with oil. Fill oil filter with specified oil prior to installation.

5 Install oil filter until sealing ring makes contact with engine then tighten one and a half more turns.

**IMPORTANT: When refilling engine with oil always use dipstick to determine how much oil is required.**

6 Remove oil fill cap (port oil filler cap is shown on opposite page) and refill engine to proper level with new oil (refer to "Specifications" for quantity and grade of oil). Use dipstick to determine exactly how much oil is required.

**IMPORTANT: Keep oil level as near the high level mark as possible. Never operate an engine with oil level below low level mark. DO NOT OVERFILL!**

### DRIVE UNIT OIL

7 Remove gear lube monitor from bracket. Empty content into suitable container. Install monitor on bracket.

8 **Bravo Two and Bravo Three:** Place drive unit in full trim limit UP/OUT position, remove OIL FILL/DRAIN SCREW and sealing washer.

9 **Bravo One:** Remove propeller, place drive unit in full trim limit DOWN/IN position, remove OIL FILL/DRAIN SCREW and sealing washer.

10 Remove OIL VENT screw and sealing washer. Allow oil to drain completely.

**IMPORTANT: If any water drained from OIL FILL/DRAIN hole, or if oil appears milky tan, drive unit is leaking and should be checked immediately by your Authorized MerCruiser Dealer.**

11 **Bravo Two and Bravo Three:** Lower drive unit so propeller shaft is level.

12 Fill drive unit, through OIL FILL/DRAIN hole, with specified gear lube until an air-free stream of lubricant flows from OIL VENT hole.

**IMPORTANT: Use only Quicksilver High Performance Gear Lube in drive unit.**

13 Install OIL VENT screw and sealing washer.

14 Continue to fill until gear lube appears in the gear lube monitor.

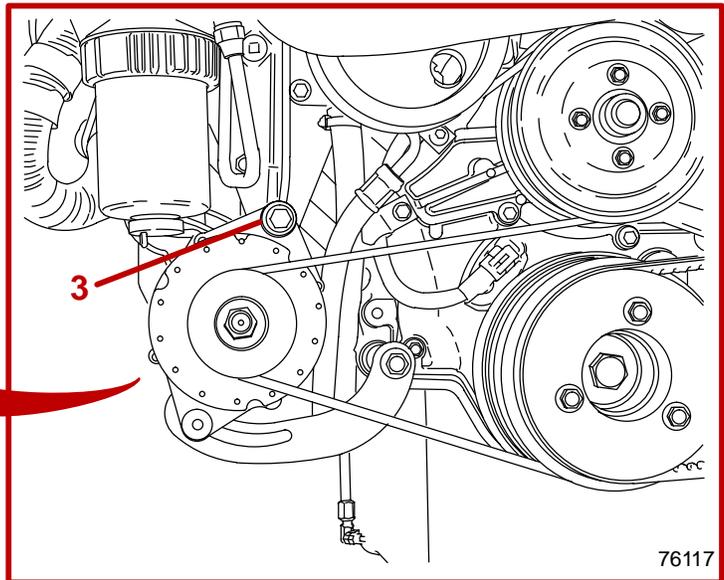
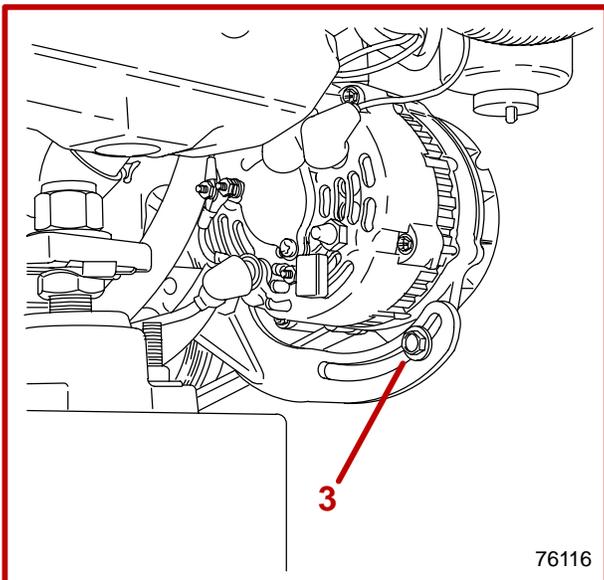
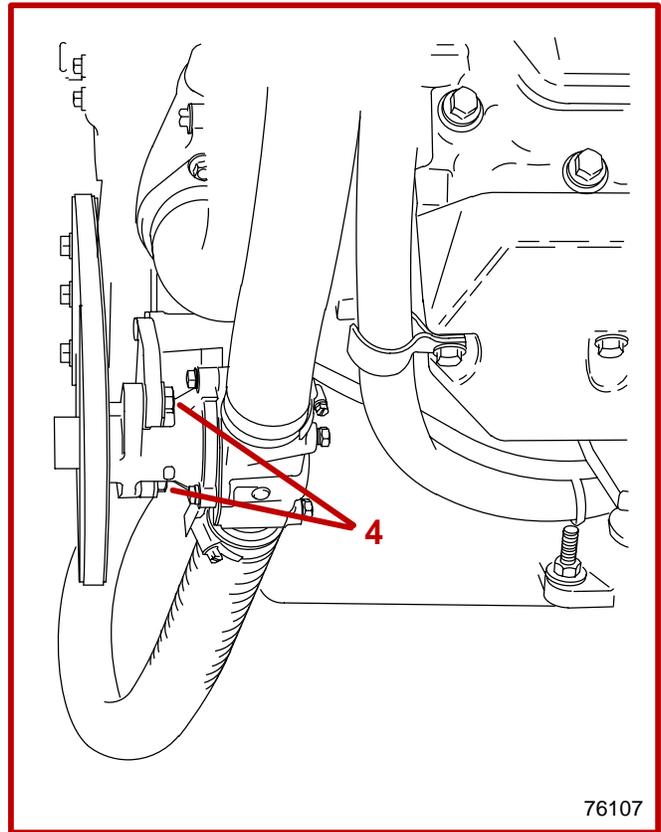
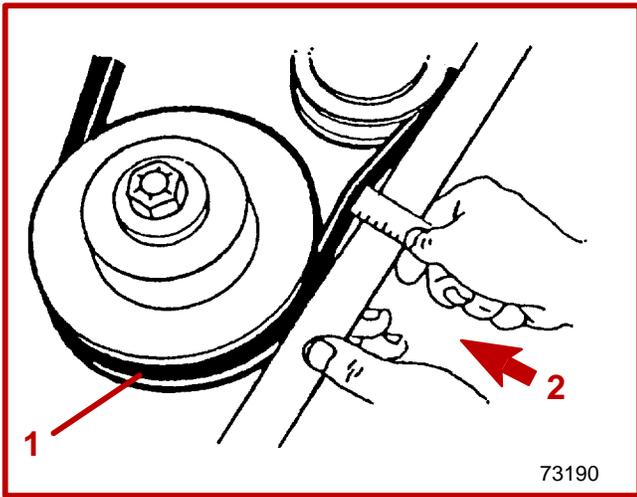
**A** Fill monitor to FULL mark. Ensure that rubber gasket is inside monitor cap. Install cap; do not overtighten.

**B** Quickly install sealing washer and OIL FILL/DRAIN screw. Tighten securely.

15 **Bravo One Models:** Grease propeller shaft heavily, with specified lubricant (Refer to "Propeller Installation" if necessary). Reinstall propeller and torque nut to 55 lb. ft. (75 N·m) MINIMUM.

16 Recheck oil level after first use.

**IMPORTANT: Oil level in gear lube monitor will rise and fall during drive operation; always check oil level when drive is cool and engine is shut down.**



## Drive Belts

If any drive belts or pulleys need replacement or drive belt tension needs adjustment, see your Authorized MerCruiser Dealer.

### CHECKING

#### WARNING

**Avoid possible serious injury. Make sure engine is shut off and ignition key is removed before inspecting belts or pulleys.**

**IMPORTANT:** Observe the following drive belt and pulley guidelines:

- Do not use belt dressing.
- Replace a belt if worn, cracked, grease or oil soaked. Always check condition of remaining belts.
- When replacing a belt, the pulley alignment must be checked under tensioned condition (brackets securely clamped). A misalignment that can be detected by visual inspection is detrimental to the belt performance.
- If a belt is disturbed for any reason, it must be correctly tensioned prior to operation.
- Replace pulleys if worn, or clean if still suitable for service.

### TENSION

**1** All drive belts must be periodically inspected for tension and condition.

Inspect the serpentine belt for the following:

- Power Steering Pump
- Alternator
- Circulating Pump

Inspect the V-belt for the following:

- Seawater Pump
- Vacuum Pump (If So Equipped)

**2** Check belt tension by depressing upper strand of belt at midpoint between the pulleys on the longest span. If there is more than 1/2 inch (13 mm) deflection for the V-belt, or 3/16 inch (5 mm) deflection for the serpentine belt, see your Authorized MerCruiser Dealer to have the tension adjusted.

### REPLACEMENT

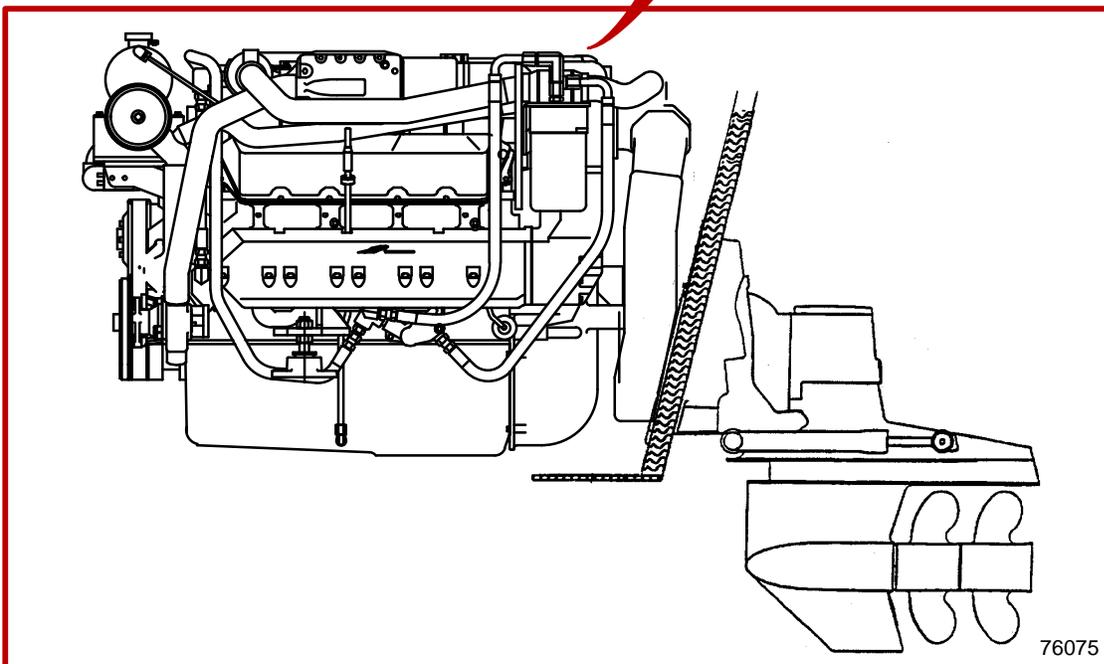
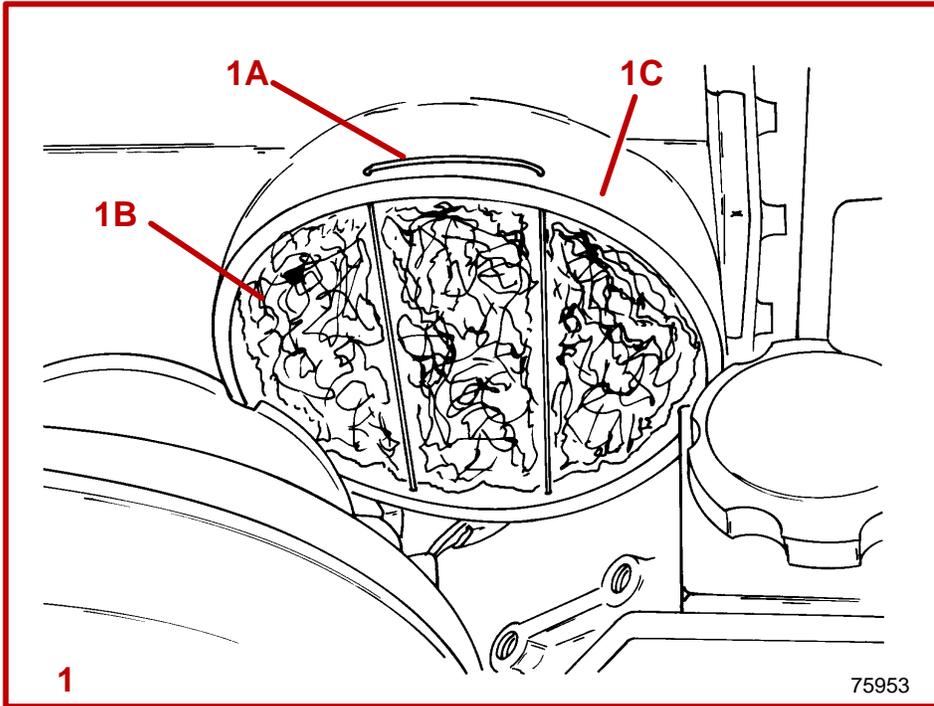
**NOTE:** During belt replacement, do not force belt(s) into pulley grooves by prying with a screwdriver, pry bar, etc. This will damage belt side cords which will cause belt(s) to turn over in pulley grooves and result in complete destruction of belt(s).

#### Alternator Belt

**3** Loosen mounting bolt and tensioning bolt. Move alternator. Remove old belt and install new belt. Adjust belt tension. When tension is correct, retighten all fasteners securely.

#### Seawater Pump Belt

**4** Loosen mounting bolt and tensioning bolt. Move seawater pump. Remove old belt and install new belt. Adjust belt tension. When tension is correct, retighten all fasteners securely.



## Air Filter - Cleaning and Replacement

1 Disconnect and remove wire retainer. Carefully remove air cleaner element from air intake housing. Wash element in warm water and detergent until clean.

### CAUTION

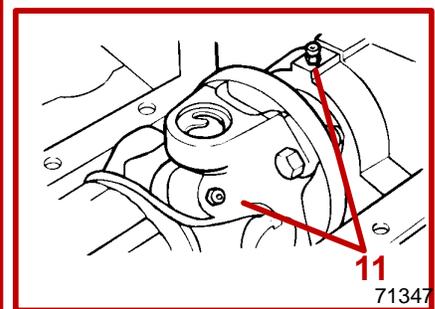
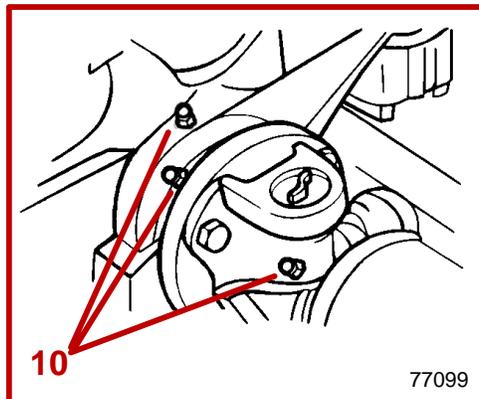
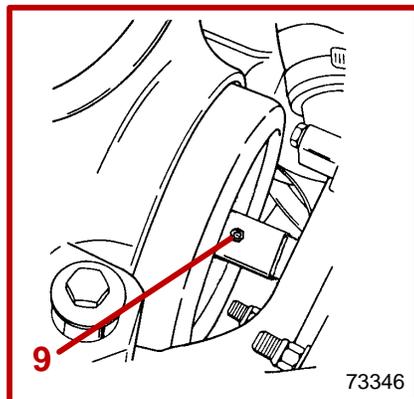
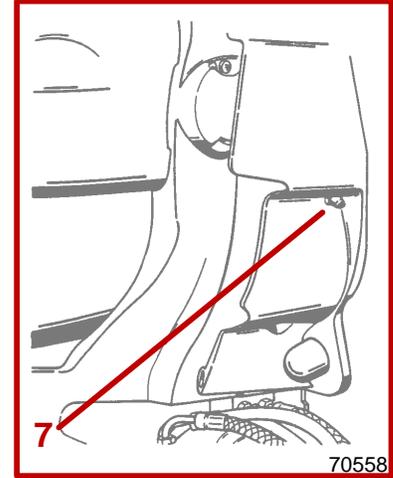
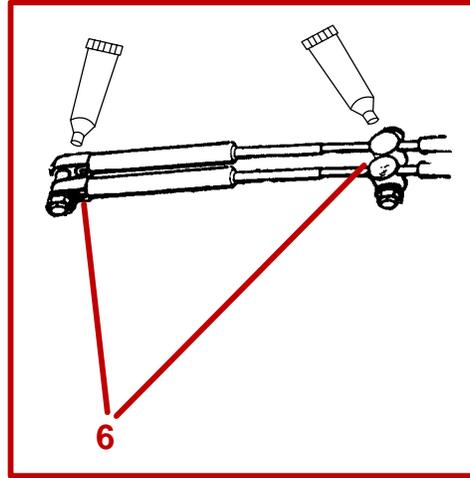
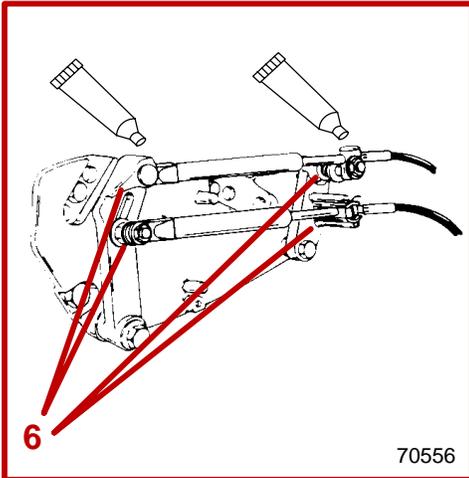
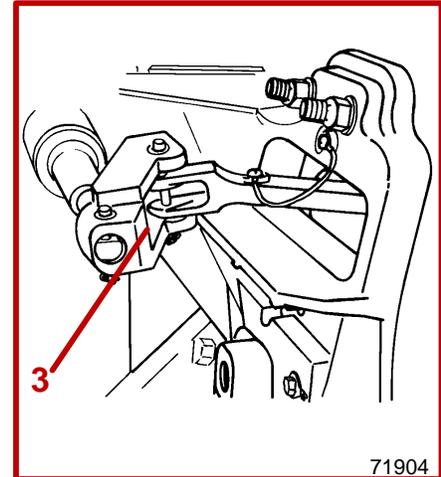
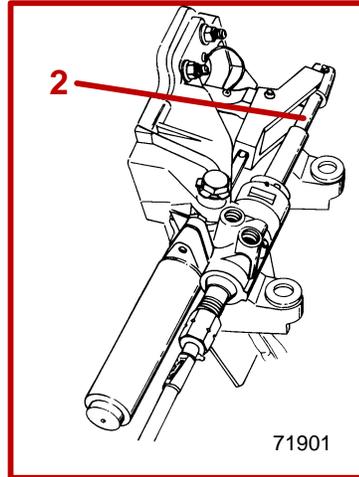
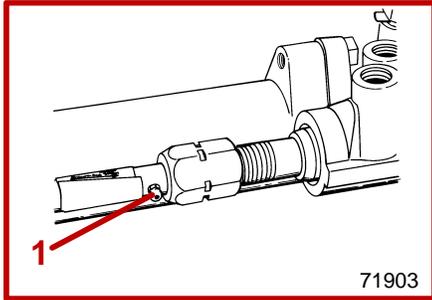
**Avoid potential fire hazards and personal injury, do not clean elements in petroleum based solvents or cleaners.**

**IMPORTANT:** No treatment (such as partial oil saturation) is required or recommended on air cleaner element prior to use. Use element clean and dry for proper filtration.

Allow element to completely dry before use. Replace the element if it is deteriorated or torn.

**IMPORTANT:** To prevent unfiltered air from entering the engine be certain that all of the air intake screen is covered by the element when installed.

- A Wire Retainer
- B Air Cleaner Element
- C Air Intake Housing



## Lubrication

### STEERING SYSTEM

**1 If Steering Cable Has Grease Fittings:** Turn steering until steering cable is fully retracted into cable housing. Apply approximately 3 pumps of grease from a typical hand-operated grease gun. Lubricate at fitting with 2-4-C Marine Lubricant with Teflon.

### **WARNING**

**Do not grease steering cable while extended. Hydraulic lock could occur and cause loss of steering control.**

***NOTE:** If steering cable does not have grease fitting, inner wire of cable cannot be greased.*

- 2** Turn steering until steering cable fully extended. Lubricate by applying a thin coat of Special Lubricant 101 on exposed part of cable.
- 3** Lubricate steering system pivot points with SAE 30W motor oil.
- 4** On dual engine boats: Lubricate all pivot points, including tie bar pivot points, with SAE 30W motor oil.
- 5** Upon first starting engine, turn steering wheel several times to starboard, and then port, to ensure that the steering system operates properly, before getting underway.

### SHIFT CABLE AND THROTTLE CABLE

- 6** Lubricate pivot points with SAE 30W motor oil.

### DRIVE UNIT AND TRANSOM ASSEMBLY

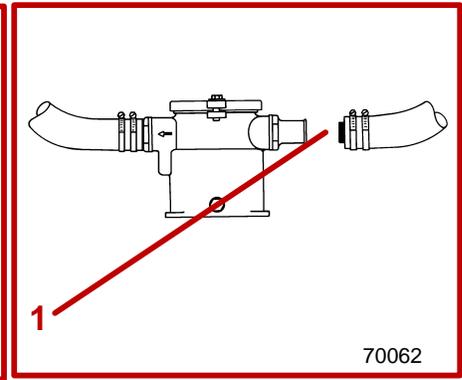
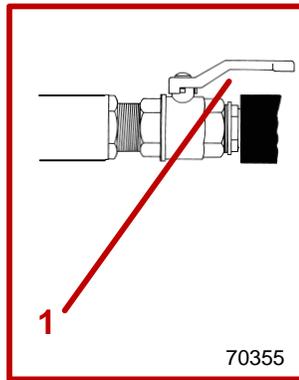
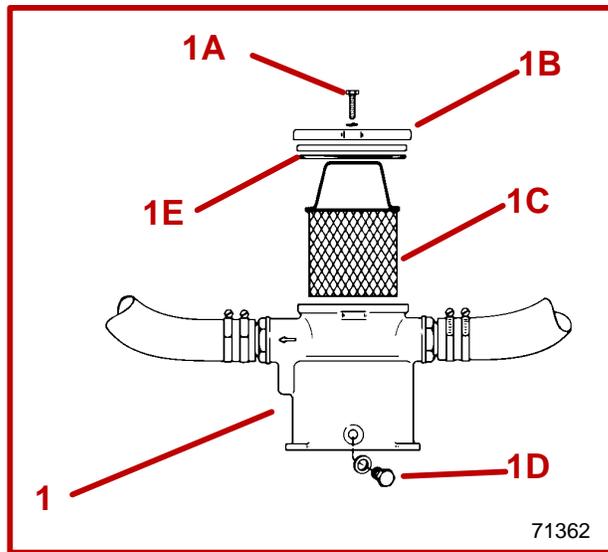
- 7** Lubricate gimbal bearing by applying approximately 8-10 pumps of grease from a typical hand-operated grease gun using Quicksilver U-Joint and Gimbal Bearing Grease.
- 8** For propeller shaft lubrication, see PROPELLER.

### ENGINE COUPLER

- 9** Lubricate engine coupler splines through grease fittings on coupler by applying approximately 8-10 pumps of grease from a typical hand-operated grease gun using Quicksilver Engine Coupler Spline Grease. If boat is operated at idle for prolonged periods of time, coupler should be lubricated every 50 hours.

### Drive Shaft Extension Models

- 10** Lubricate drive shaft grease fittings, at transom end, by applying approximately 3 - 4 pumps of grease from a typical hand-operated grease gun using Quicksilver U-joint and Gimbal Bearing Grease.
- 11** Lubricate drive shaft grease fittings, at engine end, by applying approximately 3 - 4 pumps of grease from a typical hand-operated grease gun using Quicksilver U-joint and Gimbal Bearing Grease.



## Cleaning Quicksilver Seawater Strainer

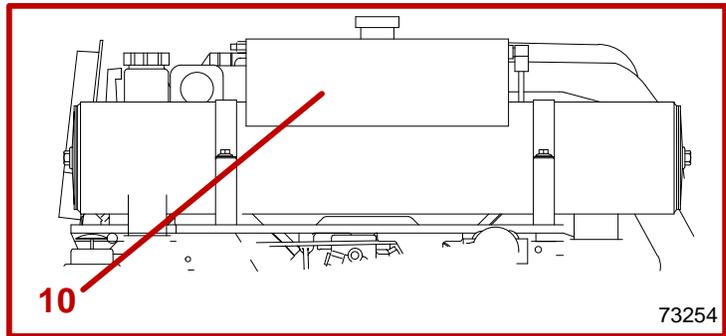
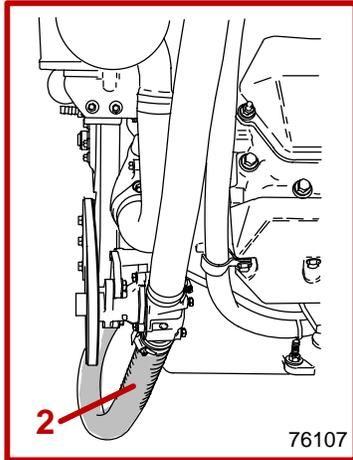
**NOTE:** Refer to manufacturers instructions if equipped with other than a Quicksilver seawater strainer.

### ⚠ CAUTION

**When cleaning seawater strainer, close seacock, if so equipped. If boat is not equipped with a seacock, remove and plug seawater inlet hose to prevent a siphoning action that may occur, allowing seawater to flow from the drain holes or removed hoses.**

**1** With engine off, close seacock if so equipped, or remove and plug seawater inlet hose. Remove screws and washers, and cover. Remove strainer, drain plug and washer, and clean any debris from strainer housing; flush both strainer and housing with clean water. Check gasket - replace when necessary (if it leaks). Reinstall drain plug and washer. Reattach cover with screws and washers. Prior to starting engine, open seacock if so equipped, or remove plug from seawater inlet hose and reconnect. Tighten hose clamps securely. After starting engine, check for leaks, and/or air in system (which would indicate an external leak).

- A** Screws and Washers
- B** Cover
- C** Strainer
- D** Drain Plug and Washer
- E** Gasket



## Flushing Seawater Cooling System

### ⚠ WARNING

When flushing, be certain the area around propeller is clear, and no one is standing nearby. To avoid possible injury, remove propeller.

### ⚠ CAUTION

Do not run engine above 1500 rpm when flushing. Suction created by seawater pickup pump may collapse flushing hose, causing engine to overheat.

### ⚠ CAUTION

Watch temperature gauge on dash to ensure that engine does not overheat.

### ⚠ CAUTION

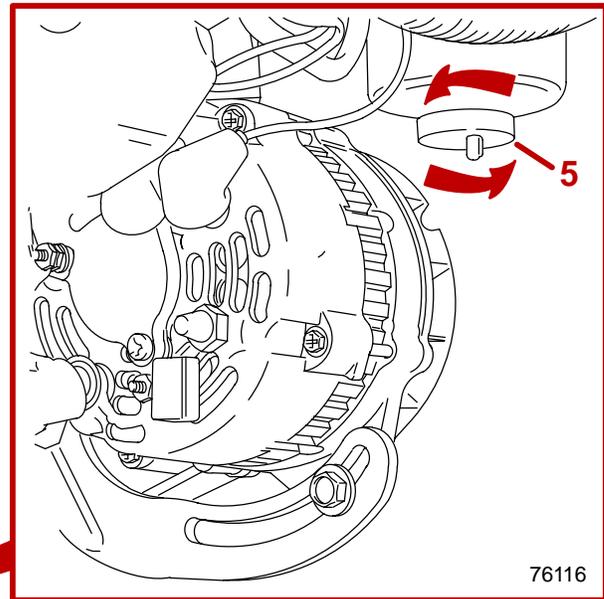
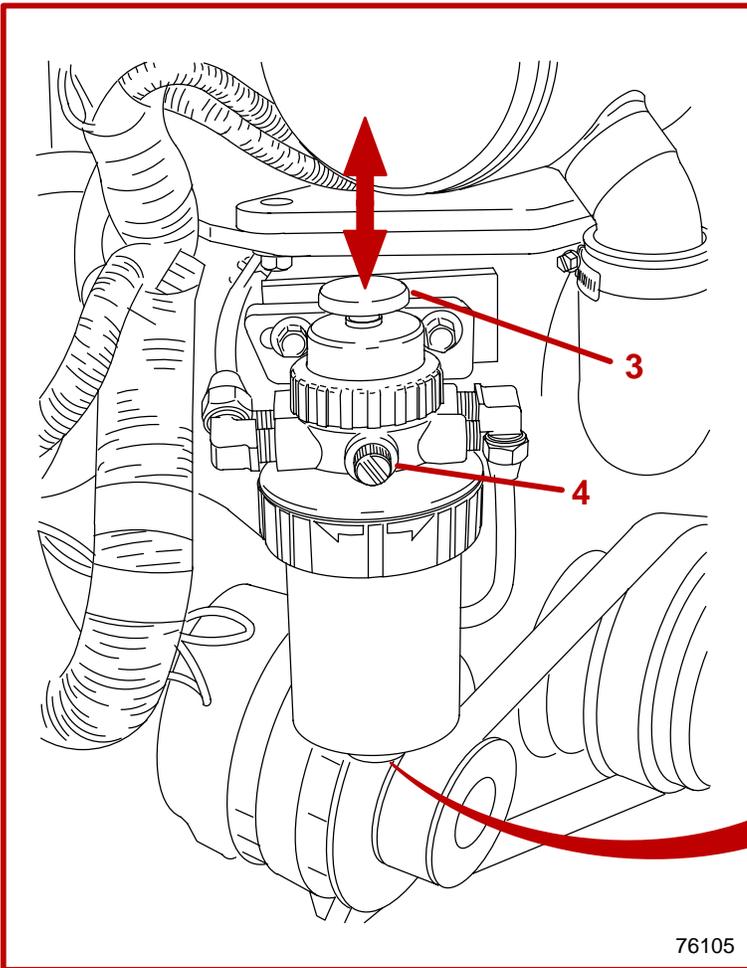
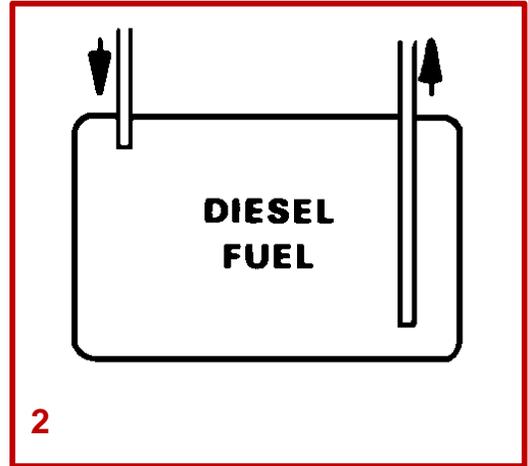
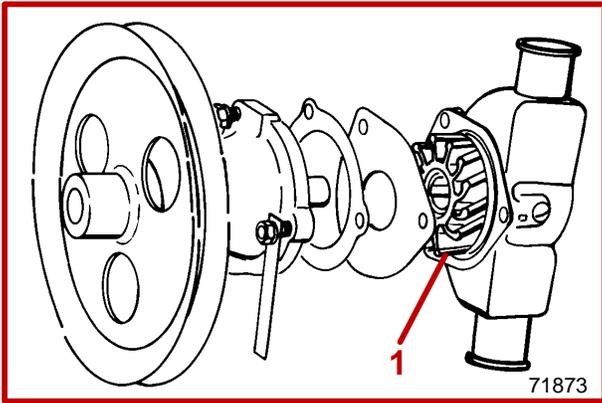
If cooling system is to be flushed with boat in the water, water inlet valve (if so equipped) must be closed, or water inlet hose must be disconnected and plugged to prevent water from flowing into boat.

### ⚠ CAUTION

If boat is in the water, do not open water inlet valve until engine is to be restarted, to prevent contaminated water from flowing back into engine.

**NOTE:** To prevent silt and/or salt buildup in cooling system, flush with freshwater at specified intervals.

- 1 If boat is in the water, close water inlet valve (if equipped) or disconnect and plug seawater inlet hose.
- 2 Disconnect water inlet hose (lower hose) from seawater pickup pump.
- 3 Using appropriate connector, connect hose between connector and water tap.
- 4 Partially open water tap (about 1/2 maximum).
- 5 Place remote control in NEUTRAL, idle speed position, and start engine.
- 6 Operate engine at idle speed, in NEUTRAL, for about 10 minutes or until discharge water is clear.
- 7 Stop engine.
- 8 Shut off water, remove flushing connector from pump inlet and reconnect water inlet hose.
- 9 Tighten hose clamp securely.
- 10 The closed section of cooling system that contains coolant does not need to be flushed. Coolant is changed at specified intervals. Refer to "Maintenance Chart."



CB66

## Seawater Pump Impeller

This maintenance should be performed by an Authorized MerCruiser Dealer.

**1** Seawater pump impeller should be inspected whenever insufficient seawater flow is suspected (if operating temperature exceeds normal range).

CE406

## Fuel System

### CAUTION

**Absolute cleanliness is required for work on the fuel system, fuel injection components have very close tolerances. Even minute particles of dirt or small amounts of water can impair the function of the fuel injection system.**

### FUEL TANK CLEANING AND FLUSHING

**IMPORTANT:** Diesel fuel should not be left in tank during winter storage, as an accumulation of rust, sludge and wax residue will form.

**2** Refer to boat manufacturer's instructions and clean fuel tank at specified intervals. Unless specified otherwise, flush and clean diesel fuel tank every 1000 hours or 5 years, whichever occurs first.

CD283

### HAND PUMP/PRIMER

**3** A plunger-type of hand pump/primer is located on the fuel filter bracket and is used to: (1) refill fuel system if system was run dry; (2) refill fuel filter when changing filter; or (3) to prime the fuel system if engine has not been run for a while.

To operate the hand pump/primer, move the plunger (upper portion) up and down as needed.

CE63

### PRIMING FUEL SYSTEM

Prime engine if it has not been run for a while or if engine will not start. Move the hand pump/primer plunger up and down several times as previously outlined. Attempt to start engine.

CD284

### FILLING FUEL FILTER

**NOTE:** Follow this procedure after installing new filter or if fuel has been drained from filter checking for water.

**4** Loosen bleed screw on fuel filter bracket. As previously outlined, move plunger on hand pump/primer up and down repeatedly, until an air free stream of fuel flows from bleed screw. Filter is full when this occurs. Tighten bleed screw.

CD578

### DRAINING WATER SEPARATING FUEL FILTER

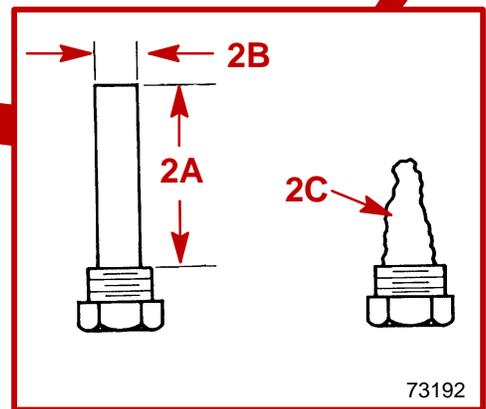
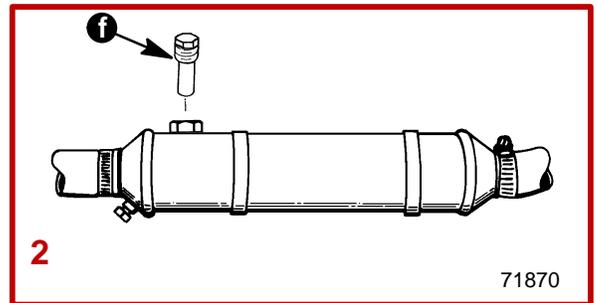
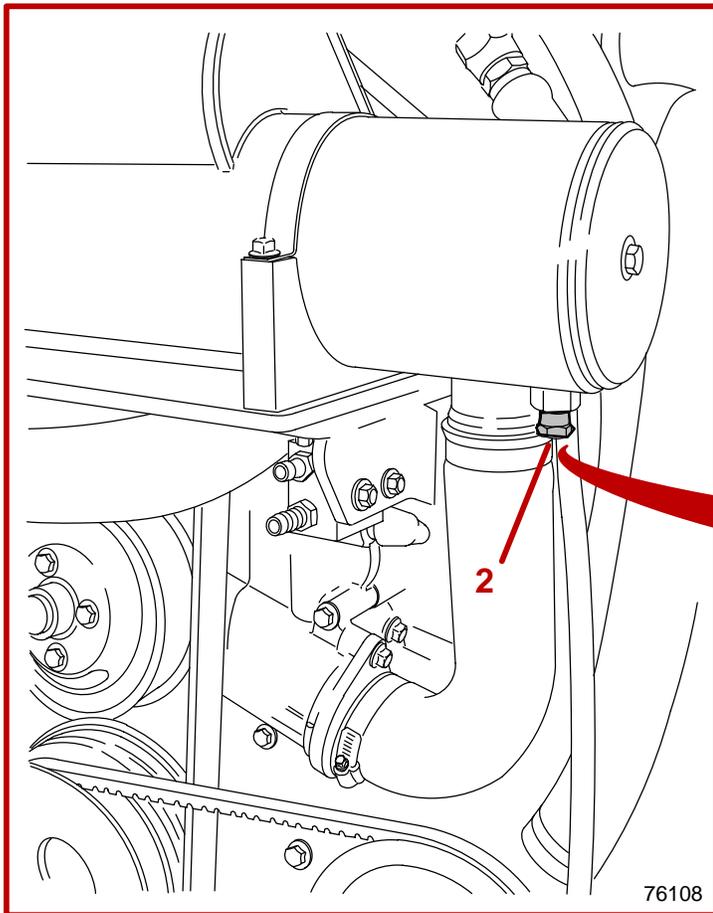
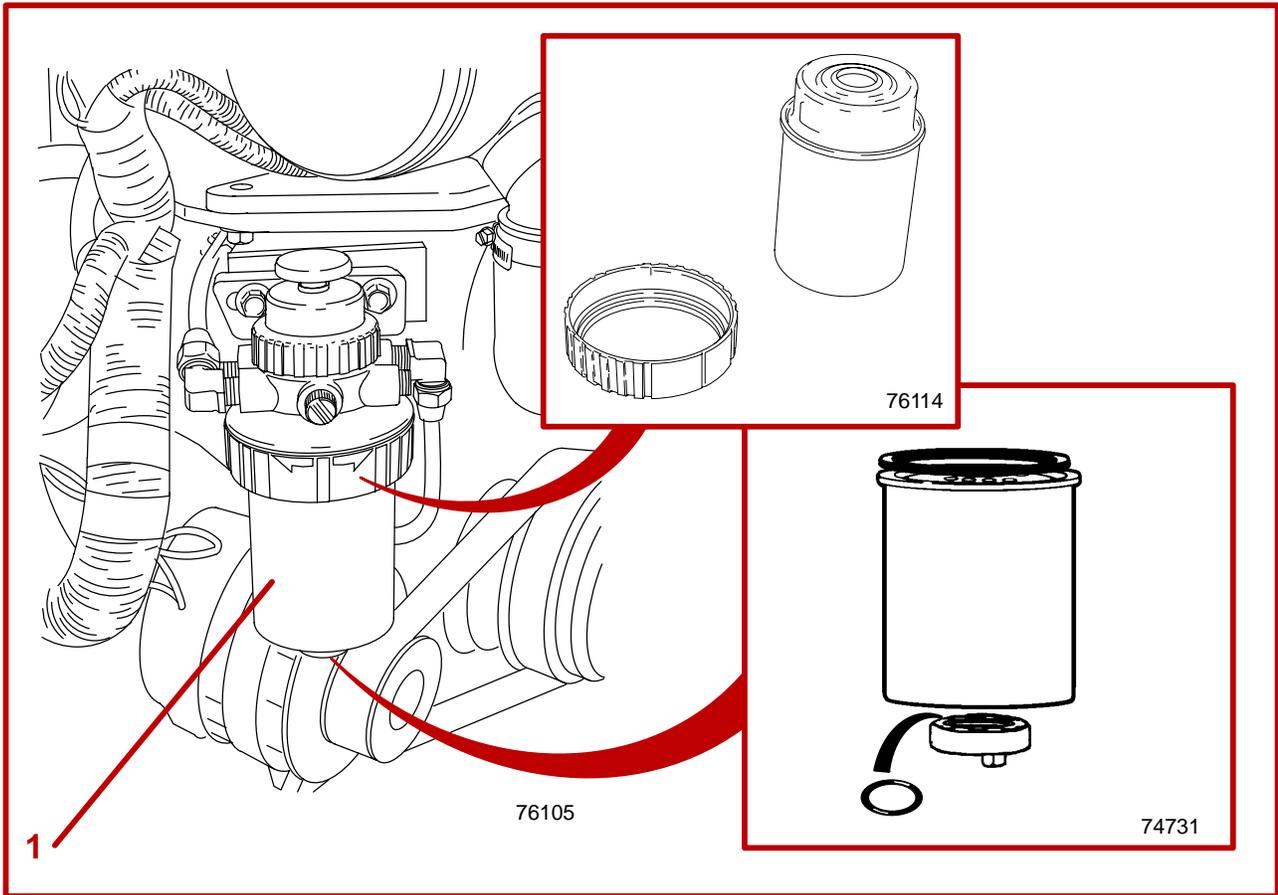
### WARNING

**Be careful when draining water separating fuel filter. Diesel fuel is flammable. Be sure ignition key is OFF. Do not allow fuel to contact any hot surfaces which may cause it to ignite. Do not allow sources of open flame in the area. Wipe up any spilled fuel immediately. Dispose of fuel soaked rags, paper, etc. in an appropriate air tight, fire retardant container. Fuel soaked items may spontaneously ignite and result in a fire hazard which could cause serious bodily injury or death.**

**IMPORTANT:** Keep diesel fuel away from drive belts and other engine components that could be harmed from being exposed to, or saturated with, diesel fuel.

**5** The filter can be drained of water and small dirt particles by opening drain cock at bottom of filter. Open by turning the drain counterclockwise (as viewed from the bottom of the filter). Drain until fuel is clear in appearance. Close drain by turning clockwise. Tighten securely. Fill fuel filter as previously outlined.

**NOTE:** To ensure complete draining, in warm weather open the water bleed valve before starting daily operations. In cold weather, where there is a possibility that the condensed water will freeze, drain the filter shortly after the end of daily operations.



**REPLACING WATER SEPARATING FUEL FILTER****⚠ CAUTION**

Any water entering the fuel injection system will disable the system. Check for water in water separating fuel filter before startup, daily.

**⚠ CAUTION**

If water should enter the fuel injection system, take unit to an Authorized MerCruiser Dealer IMMEDIATELY, so that corrosion and rusting of the injectors and other components can be avoided.

**⚠ WARNING**

Be careful when changing water separating fuel filter. Diesel fuel is flammable. Be sure ignition key is OFF. Do not allow fuel to contact any hot surfaces which may cause it to ignite. Do not allow sources of open flame in the area. Wipe up any spilled fuel immediately. Dispose of fuel soaked rags, paper, etc. in an appropriate air tight, fire retardant container. Fuel soaked items may spontaneously ignite and result in a fire hazard which could cause serious bodily injury or death.

1 Replace as follows:

**A** Remove filter retaining ring.

**B** Pull down on filter to remove it.

**C** Clean filter sealing surface on fuel filter adaptor.

**D** Install new gasket.

**E** Install new filter and secure with retaining ring.

**F** Remove the drain cap and O-ring from bottom of the filter. Install on new filter. Check that bottom drain cap is securely tightened.

**G** Fill fuel filter as explained previously. Check drain cap for fuel leaks.

**⚠ WARNING**

**Make sure no leaks exist before closing engine hatch.**

**H** Start and run engine. Check filter connection for fuel leaks. If leaks exist, recheck filter installation. If leaks continue, stop engine immediately and contact your Authorized MerCruiser Dealer.

**Corrosion And Corrosion Protection****INTERNAL COMPONENTS**

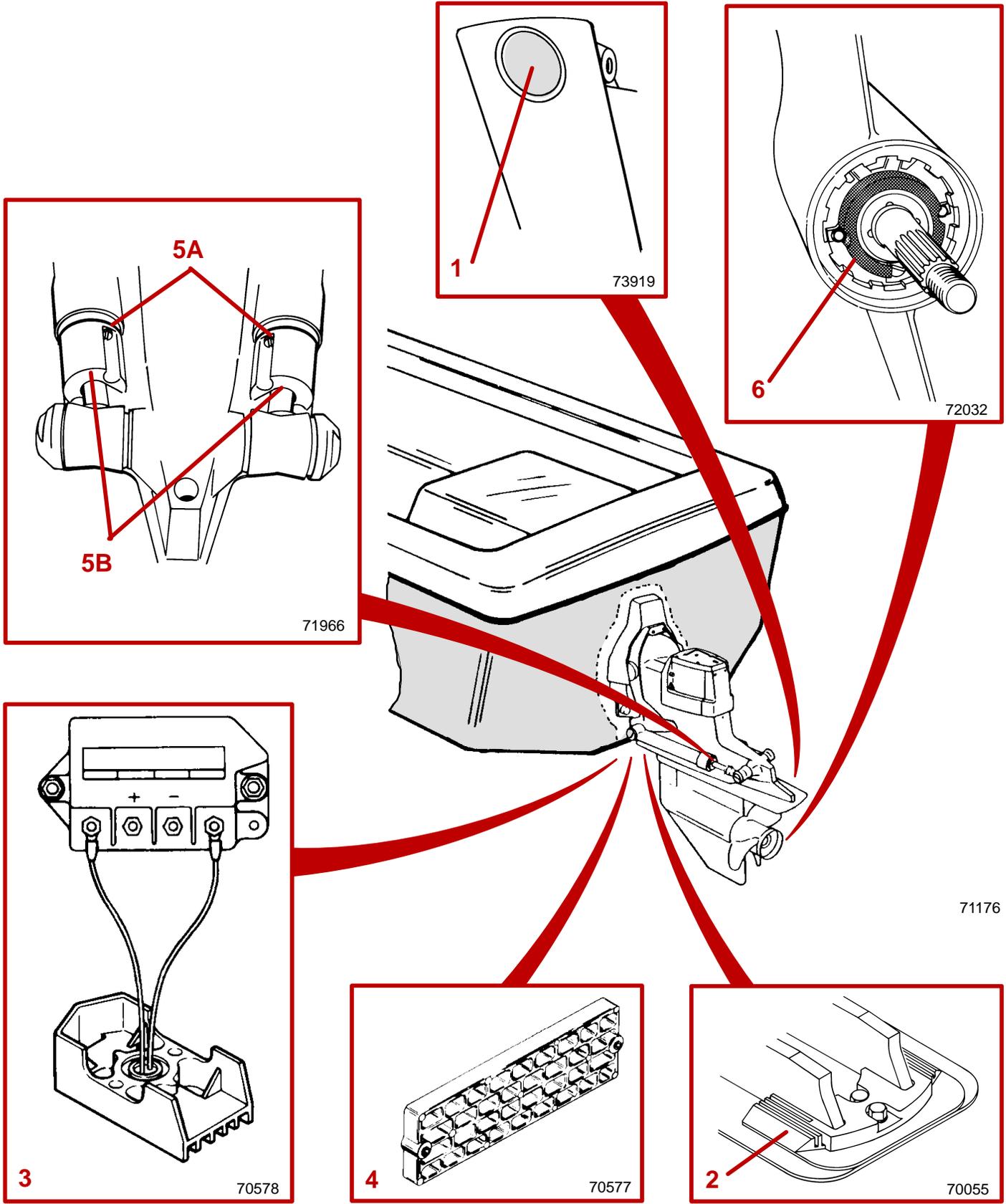
2 Sacrificial anodes are installed in the cooling system. They are mounted in the oil cooler and heat exchanger.

Check at least once yearly. Replace when eroded more than 50%.

**A** Length When New - 1-1/2 in. (38 mm)

**B** Diameter When New - 1/2 in. (13 mm)

**C** Example of a deteriorated anode.



## EXTERNAL COMPONENTS

Whenever two or more dissimilar metals (like those found on the sterndrive) are submerged in a conductive solution, such as saltwater, polluted water, or water with a high mineral content, a chemical reaction takes place causing electrical current to flow between metals. The electrical current flow causes the metal that is most chemically active, or anodic, to erode. This is known as galvanic corrosion and, if not controlled, it will in time cause the need for replacement of power package components exposed to water.

**IMPORTANT: Replace sacrificial anodes if eroded 50% or more.**

**1 Universal Anodic Plate** - serves as a sacrificial anode.

Remove plug from drive shaft housing to access attaching screw and insert 1/2 inch socket. Unthread attaching screw and remove universal anodic plate. **Do not remove screw.** Install new anodic plate and tighten screw securely. Install plug.

**2 Anodic Plate** - serves as a sacrificial anode. Unscrew both attaching screws and remove. Install a new anodic plate and tighten securely.

**3 MerCathode System** - should be tested to ensure adequate output.

Test should be made where boat is moored, using Quicksilver Reference Electrode and Test Meter. Contact your Authorized MerCruiser Dealer to arrange for this test.

**4 Anode Kit (if so equipped)** - Mounted to boat transom. Acts as a sacrificial anode. Replace as required.

CA163

**5 Trim Cylinder Anodes** - are mounted on each trim cylinder. To replace the trim cylinder anodes:

**A** Remove two screws from each anode.

**B** Install new anodes and tighten securely.

CD359

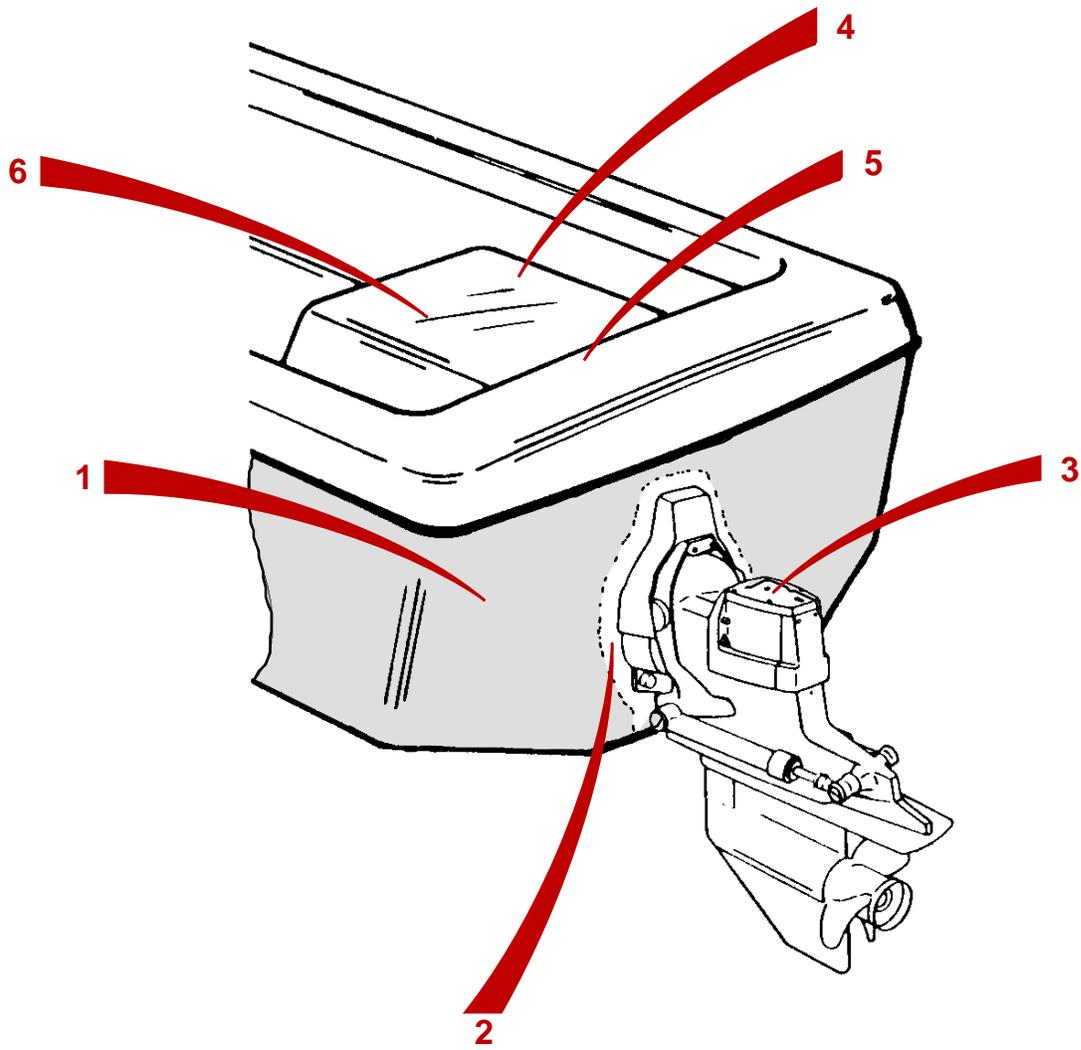
**6 Propeller Anode (Bravo One)** - is located in front of the propeller, between the front side of the propeller and the gear housing. Refer to "Propeller" section in this manual for propeller removal and installation. To replace the propeller anode:

**A** Remove propeller.

**B** Remove two screws from anode.

**C** Install new anode and tighten securely.

**D** Reinstall propeller.



71176

In addition to the corrosion protection devices, the following steps should be taken to inhibit corrosion:

**IMPORTANT: Corrosion damage that results from the improper application of anti-fouling paint will not be covered by the limited warranty.**

**1 Painting Boat Hull or Boat Transom:** Antifouling paint may be applied to boat hull and boat transom but you must observe the following precautions:

**IMPORTANT: DO NOT paint anodes or MerCathode System reference electrode and anode, as this will render them ineffective as galvanic corrosion inhibitors.**

**IMPORTANT: If anti-fouling protection is required for boat hull or boat transom, copper or tin base paints, if not prohibited by law, can be used. If using copper or tin based anti-fouling paints, observe the following:**

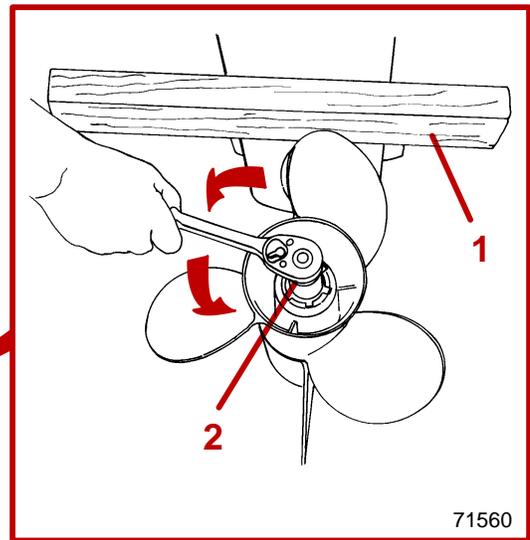
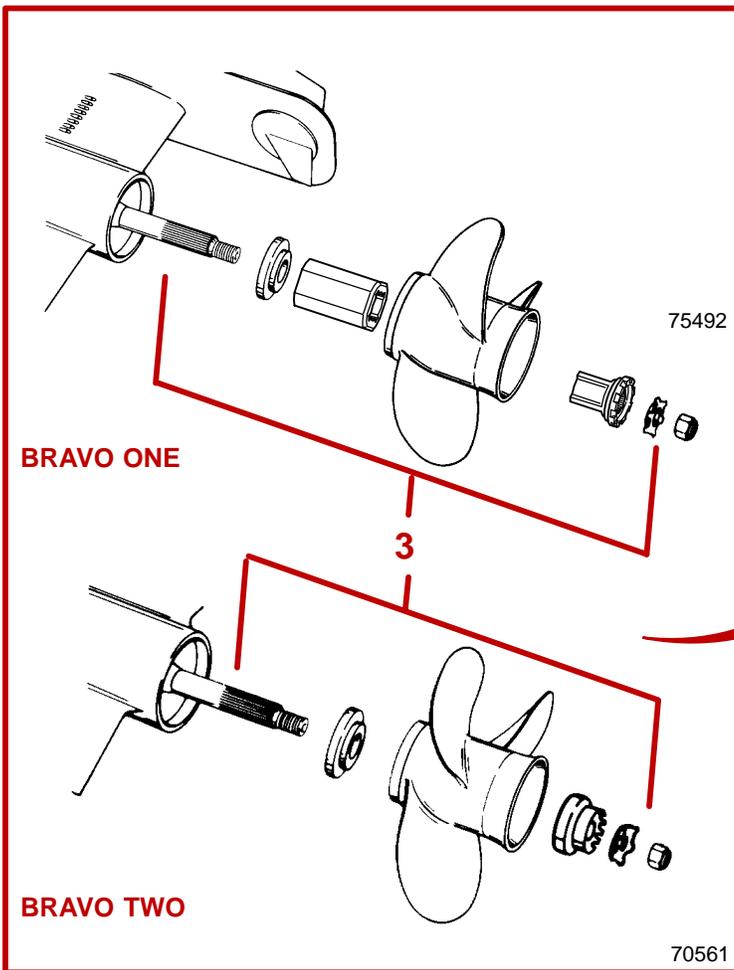
**2 Avoid any electrical interconnection between the MerCruiser Product, Anodic Blocks, or MerCathode System and the paint by allowing a minimum of 1-1/2 in. (40mm) UNPAINTED area on transom of the boat around these items.**

**3 Painting Drive Unit or Transom Assembly:** Drive unit and transom assembly should be painted with a good quality marine paint or an anti-fouling paint that DOES NOT contain copper, tin, or any other material that could conduct electrical current. Do not paint drain holes, anodes, MerCathode system, and items specified by boat manufacturer.

**4** Spray power package components on inside of boat every 2-3 weeks with Quicksilver Corrosion Guard to protect finish from dulling and corrosion. External power package components may also be sprayed.

**5** All lubrication points, especially steering system, shift and throttle linkages, should be kept well lubricated.

**6** Flush cooling system periodically, preferably after each use.



## Propellers

### REMOVAL - BRAVO ONE AND BRAVO TWO

#### **WARNING**

**Avoid Injury:** Remote Control must be in NEUTRAL and ignition key removed from switch before removing and/or installing propeller.

#### **WARNING**

**Avoid Injury:** Place a block of wood between anti-ventilation plate and propeller to protect hands from propeller blades and to prevent propeller from rotating when removing propeller nut.

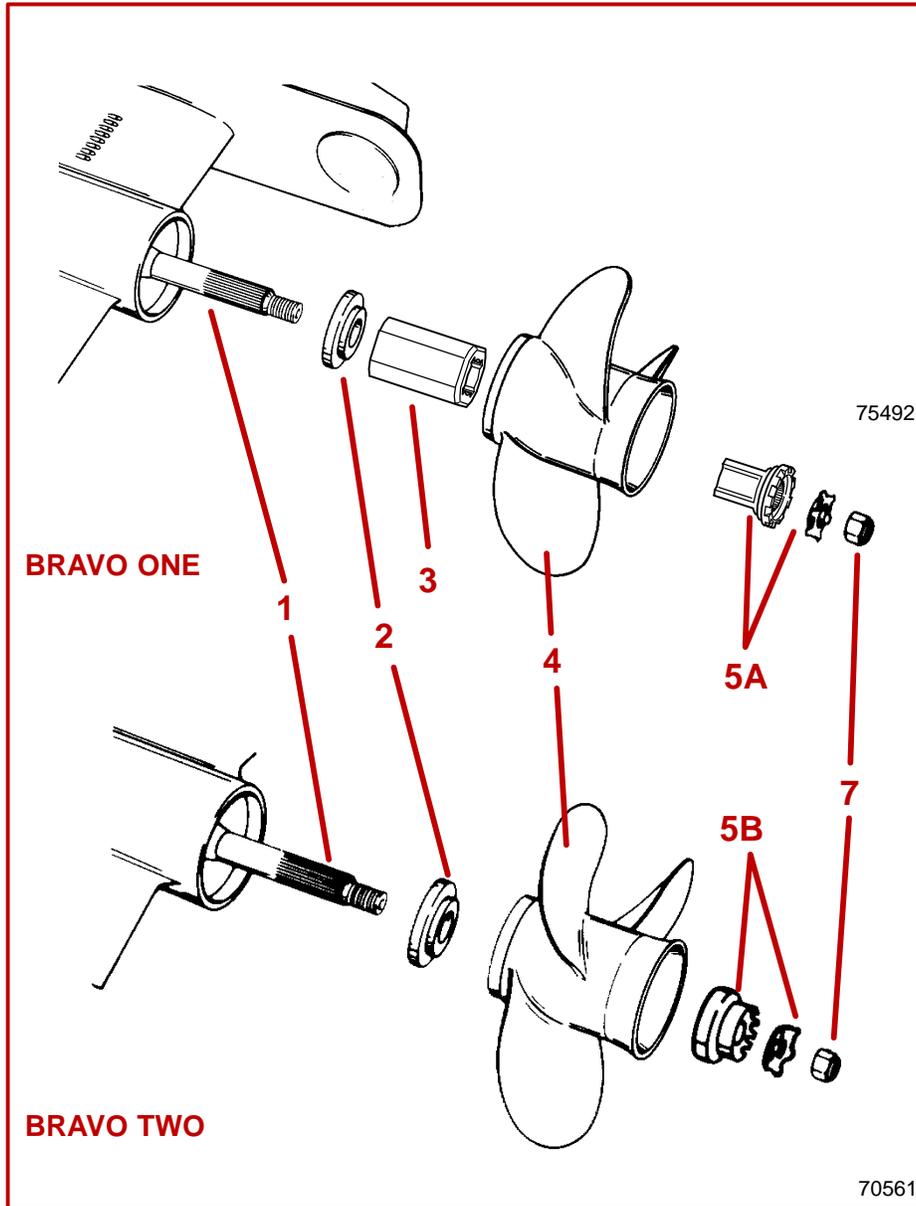
#### **WARNING**

**Avoid Injury:** Periodically check propeller nut for tightness during boating season. A minimum of 55 lb-ft (75 Nm) torque is required.

- 1 Place wood block between propeller blade and anti-ventilation plate to prevent rotation. Straighten bent tabs on tab washer.
- 2 Turn propeller shaft nut counterclockwise to remove nut.
- 3 Slide tab washer, spline washer, propeller and thrust hub off propeller shaft.

### REPAIR

Some damaged propellers can be repaired. See your dealer.



**INSTALLATION - BRAVO ONE AND BRAVO TWO**

- 1 Apply a liberal coat of one of the following Quicksilver lubricants to propeller shaft: Anti-Corrosion Grease, Special Lubricant 101, or 2-4-C Marine Lubricant with Teflon.
- 2 Slide thrust hub into propeller hub, with stepped side toward propeller hub.
- 3 **Bravo One:** Install Flo-Torq II Drive Hub with drive sleeve.

**NOTE:** *The drive sleeve is tapered and will slide fully into the propeller as the nut is tightened and properly torqued.*

- 4 Align splines and place propeller on propeller shaft.
- 5 Install final attaching hardware.

**IMPORTANT: If reusing locking tab washer, carefully inspect tabs for cracks or other damage. Replace tab washer if condition is questionable.**

**A Bravo One:** Install drive sleeve adaptor and locking tab washer (Flo-Torq II Drive Hub).

**B Bravo Two:** Install spline washer and locking tab washer.

- 6 Place wood block between propeller blade and anti-ventilation plate to prevent rotation.
- 7 Install propeller nut.

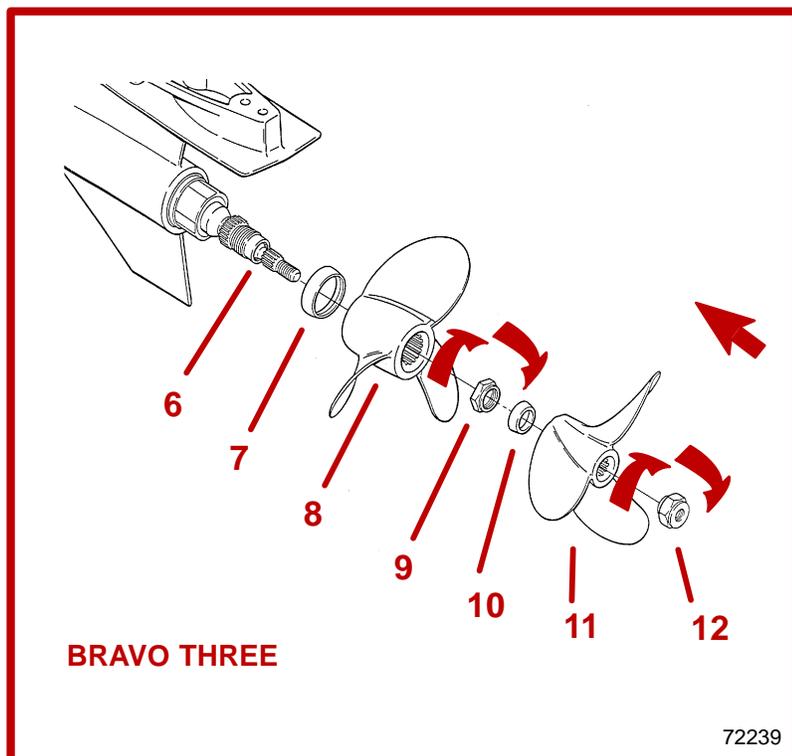
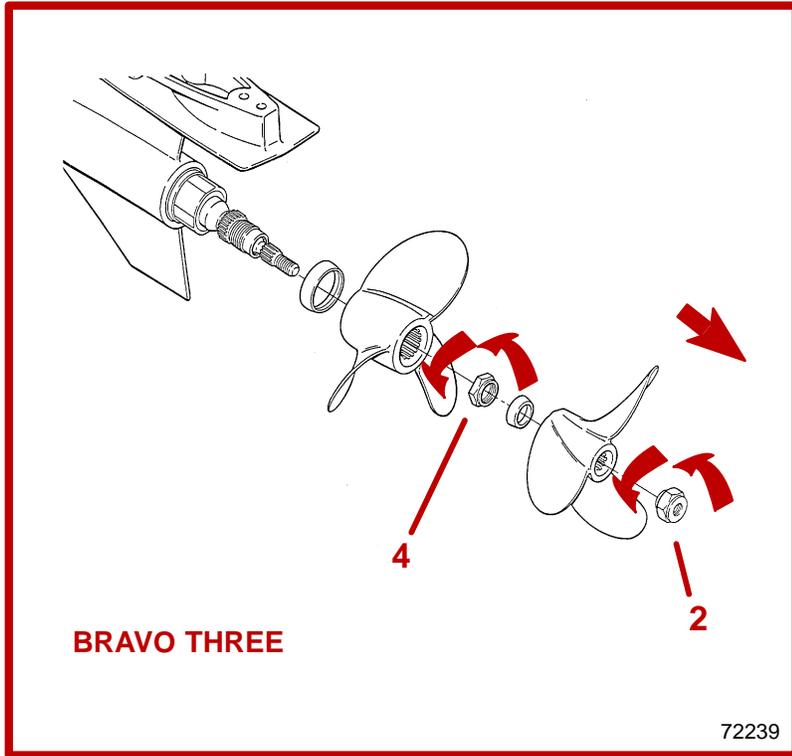
**A** Torque nut to a minimum of 55 lb-ft (75 Nm).

**IMPORTANT: Installation is correct when at least 2 threads of propeller shaft are exposed through propeller nut.**

- B** Continue to tighten propeller nut until 3 tabs on tab washer align with three grooves on spline washer or drive sleeve adaptor, if not already aligned.
- C** Bend three tabs on tab washer down into grooves.
- D** After first use, bend the three tabs straight. Repeat steps 7A, 7B and 7C.
- E** Check propeller at least every 20 hours of operation.

**⚠ CAUTION**

**Avoid loss of propeller (propulsion). Do not operate with a propeller nut that is improperly tightened.**



**REMOVAL - BRAVO THREE****⚠ WARNING**

**Avoid Injury: Remote Control must be in NEUTRAL and ignition key removed from switch before removing and/or installing propellers.**

**⚠ WARNING**

**Avoid Injury: Place a block of wood between splash-plate and propellers to protect hands from propeller blades and to prevent propellers from rotating when removing propeller nuts.**

**⚠ CAUTION**

**Avoid Injury: Do not operate with loose propeller. Periodically check propeller nuts for tightness during boating season.**

- 1 Place wood block between propeller blades and anti-ventilation plate to prevent rotation.
- 2 Turn aft propeller shaft nut counterclockwise to remove nut.
- 3 Slide propeller and thrust hub off propeller shaft.
- 4 Turn front propeller shaft nut counterclockwise to remove nut.
- 5 Slide propeller and thrust hub off propeller shaft.

**REPAIR**

Some damaged propellers can be repaired. See your dealer.

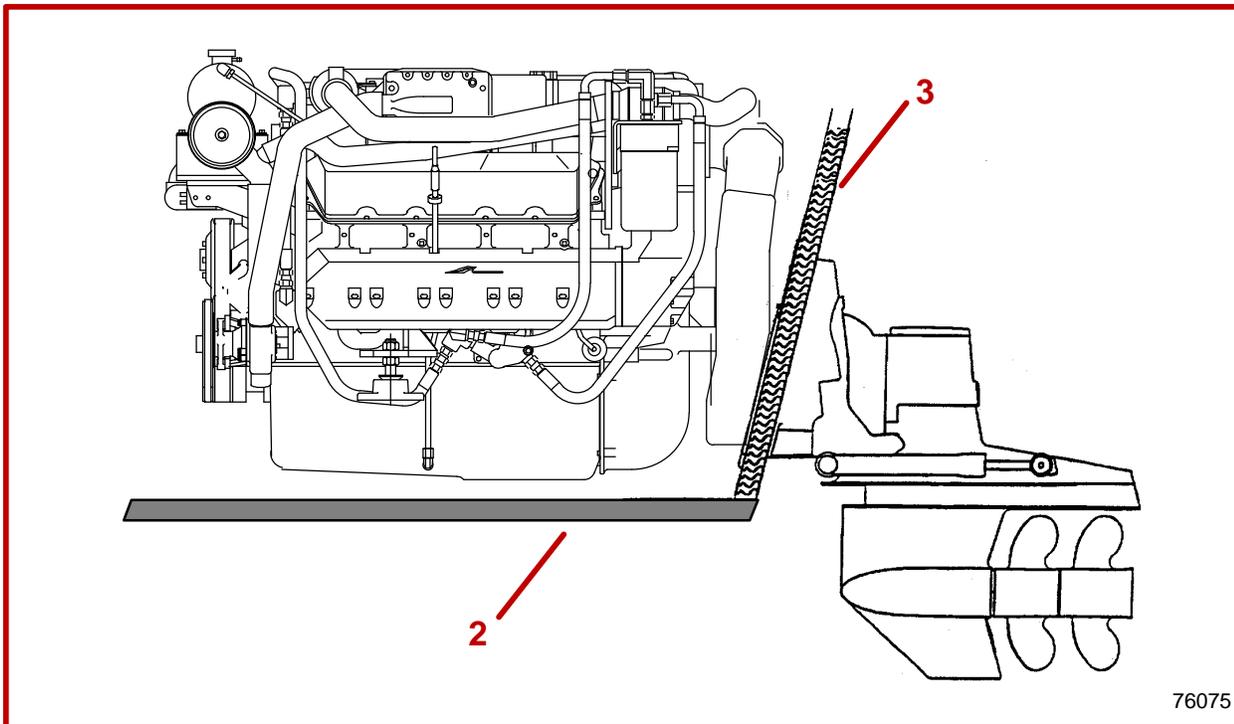
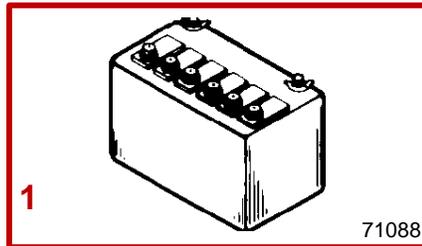
**INSTALLATION - BRAVO THREE**

- 6 Apply a liberal coat of one of the following Quicksilver lubricants to both propeller shafts: Special Lubricant 101, 2-4-C Marine Lubricant with Teflon, or Anti-Corrosion Grease.
- 7 Slide forward thrust hub onto propeller shaft, with tapered side toward propeller hub (toward end of shaft).
- 8 Align splines and place propeller on propeller shaft.
- 9 Install propeller nut. Tighten nut securely. A minimum of 100 lb-ft (136 Nm) torque is required. Check propeller at least after 20 hours of operation. Do not operate with loose propeller.
- 10 Slide aft thrust hub onto propeller shaft, with tapered side toward propeller hub (toward end of shaft).
- 11 Align splines and place propeller on propeller shaft.
- 12 Install propeller nut. Tighten nut securely. A minimum of 60 lb-ft (81 Nm) torque is required. Check propeller at least after 20 hours of operation. Do not operate with loose propeller.

**⚠ CAUTION**

**Avoid loss of propeller (propulsion). Do not operate with a propeller nut that is improperly tightened.**

# Miscellaneous Maintenance



## Battery

**1** All lead acid batteries discharge when not in use. Recharge every 30 to 45 days. or when specific gravity drops below battery manufacturer's specifications.

Refer to specific instructions and warnings accompanying your battery. If this information is not available, observe the following precautions when handling a battery.

### **⚠ WARNING**

**Do not use jumper cables and a booster battery to start engine. Do not recharge a weak battery in the boat. Remove battery and recharge in a ventilated area away from fuel vapors, sparks or flames.**

### **⚠ WARNING**

**Batteries contain acid which can cause severe burns - Avoid contact with skin, eyes and clothing Batteries also produce hydrogen and oxygen gasses when being charged. This explosive gas escapes fill/vent cell caps, and may form an explosive atmosphere around the battery for several hours after it has been charged; sparks or flames can ignite the gas and cause an explosion which may shatter the battery and could cause blindness or other serious injury.**

**Safety glasses and rubber gloves are recommended when handling batteries or filling with electrolyte. Hydrogen gases that escape from the battery during charging are explosive. When charging batteries, be sure area where batteries are located, is well-vented. Battery electrolyte is a corrosive acid and should be handled with care. If electrolyte is spilled or splashed on any part of the body, immediately flush the exposed area with liberal amounts of water and obtain medical aid as soon as possible.**

## Bottom Of Boat

**2** To maintain maximum speed, the following conditions the boat bottom should be observed:

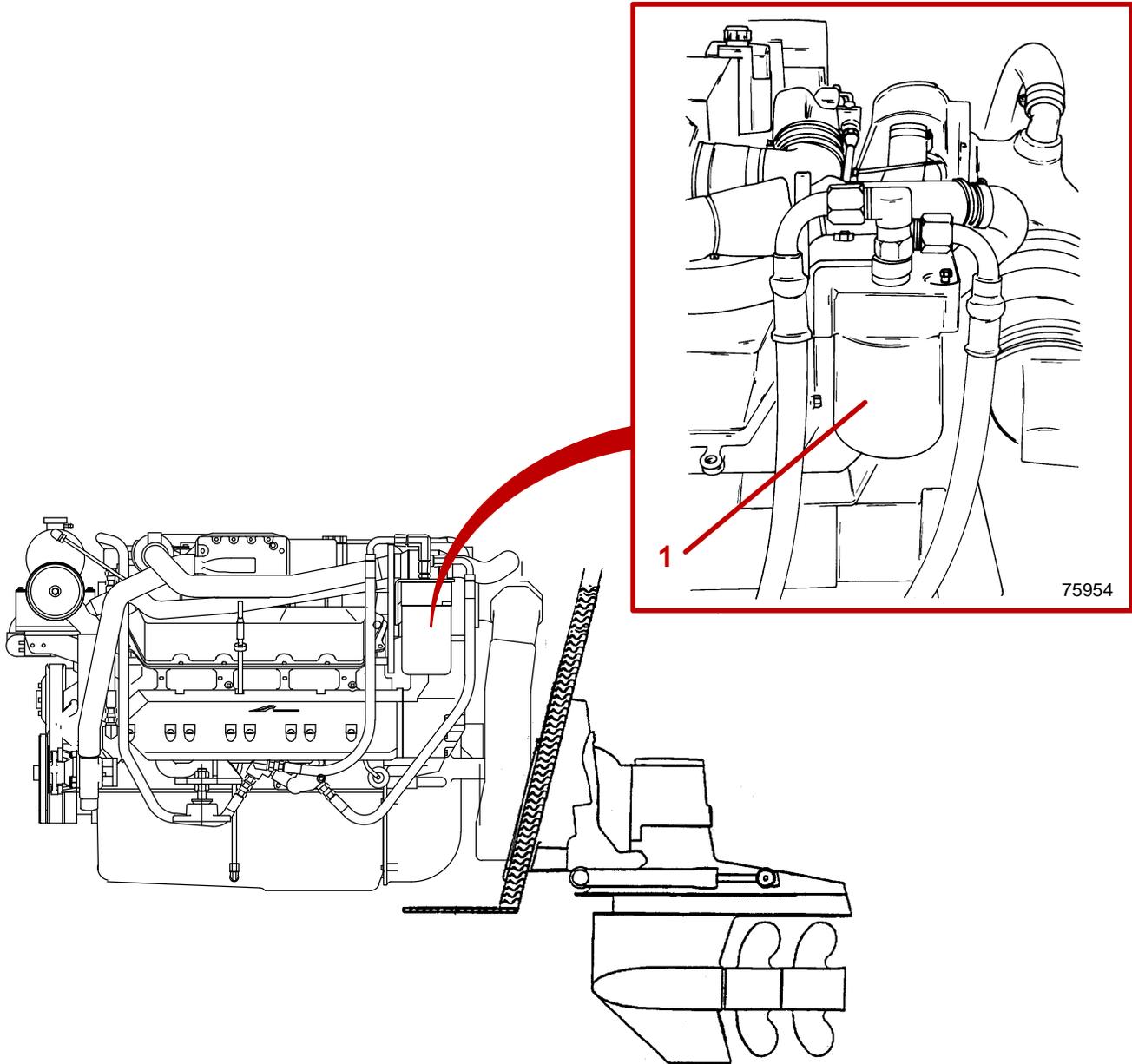
- Clean, free of barnacles and marine growth.
- Free of distortion, nearly flat where it contacts water.
- Straight and smooth fore and aft.

### Antifouling Paints

**3** Refer to Antifouling Paint recommendations and related information on previous pages.

Refer to "Corrosion And Corrosion Protection" for additional information.

# Cold Weather Or Extended Storage



## Power Package Layup

**IMPORTANT:** This service should be performed by an Authorized MerCruiser Dealer.

### CAUTION

The engine must be prepared for long storage periods to prevent internal corrosion and severe damage.

**IMPORTANT:** If boat has already been removed from water, before starting engine a source of water must be supplied to water intake (inlet) openings. Follow all warnings and flushing attachment procedures stated in “FLUSHING COOLING SYSTEM”.

### CAUTION

**DO NOT** operate engine without water flowing thru seawater pickup pump, as pump impeller may be damaged and subsequent overheating damage to engine or transmission may result.

1 Start engine and run until it reaches normal operating temperature. Stop engine. Change oil and filter. Start engine and run for about 15 minutes. Check for oil leaks.

### WARNING

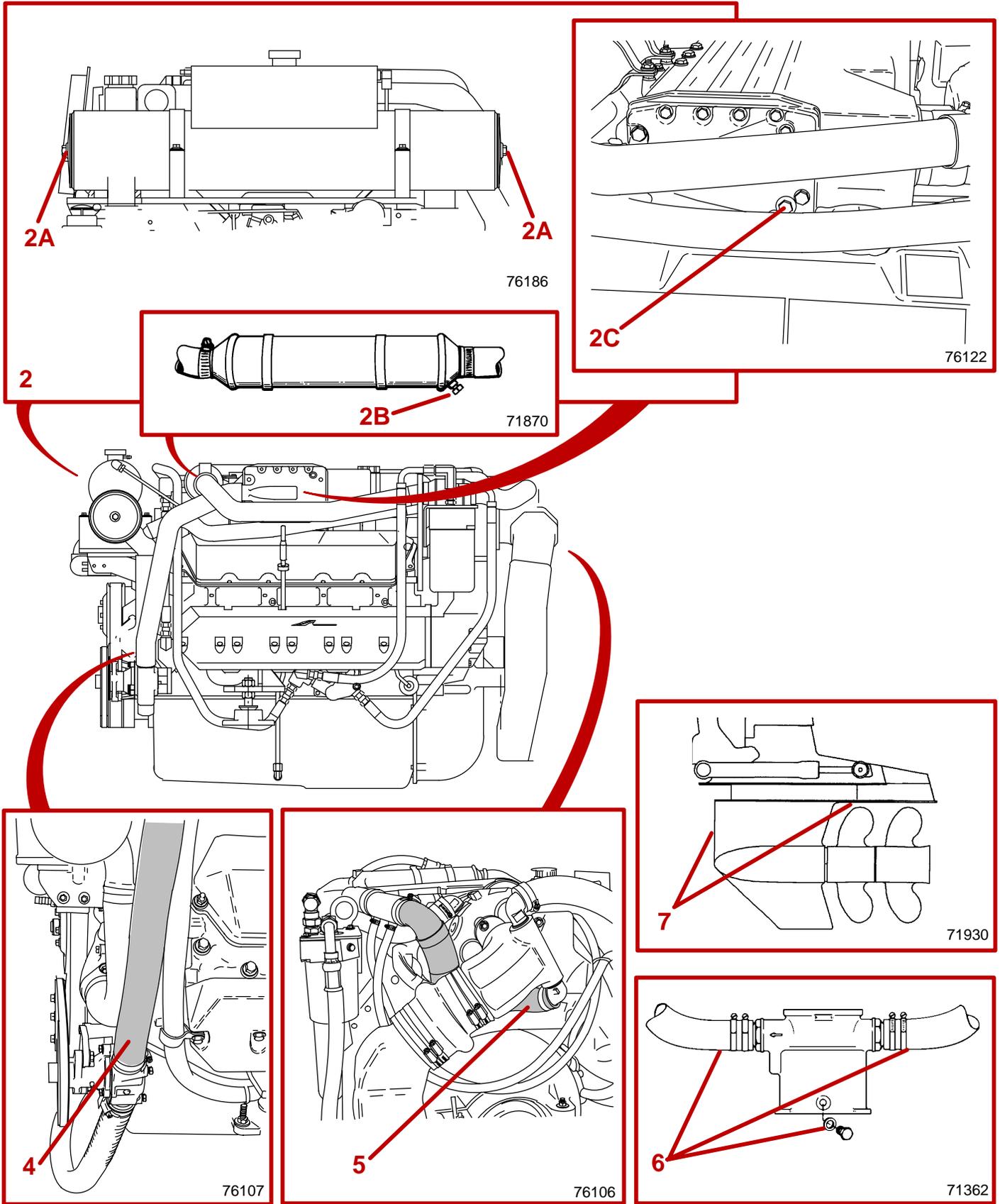
**Do not** remove coolant cap when engine is hot - coolant may discharge violently.

**IMPORTANT:** Closed cooling section must be kept filled year-round with the specified coolant.

**IMPORTANT:** Do not use Propylene Glycol Antifreeze in the closed cooling section of the engine.

**IMPORTANT:** Drain seawater section of closed cooling system only.

**NOTE:** Refer to the following pages for continuation of specific draining instructions.



## Power Package Layup (Continued)

Drain seawater section of cooling system and prepare for cold weather or extended storage following these procedures:

### DRAINING INSTRUCTIONS

#### **⚠ CAUTION**

If boat is to remain in the water, seacock, if so equipped, must remain closed until engine is to be restarted to prevent water from flowing back into seawater cooling system. If boat is not fitted with a seacock, water inlet hose must be disconnected and plugged to prevent water from flowing into cooling system and/or boat. As a precautionary measure, attach a tag to the ignition switch or steering wheel with the warning that the seacock must be opened or the water inlet hose reconnected prior to starting the engine.

**IMPORTANT:** Observe the following information to ensure complete draining of cooling system:

- Engine must be as level as possible.
  - A wire should be repeatedly inserted into all drain holes to ensure there are no obstructions in passages.
- 1 Close seacock, if so equipped, or disconnect and plug seawater inlet hose, if boat is to remain in the water.
  - 2 Remove and drain the following:
    - A The end covers from both the port and starboard sides of heat exchanger. Drain tank completely.

**IMPORTANT:** Use compressed air to blow any remaining water from the tubes in the heat exchanger.

- B The drain plug on the lower side of the engine oil cooler.
- C The aftercooler drain plugs located on the starboard and port aftercooler side covers.

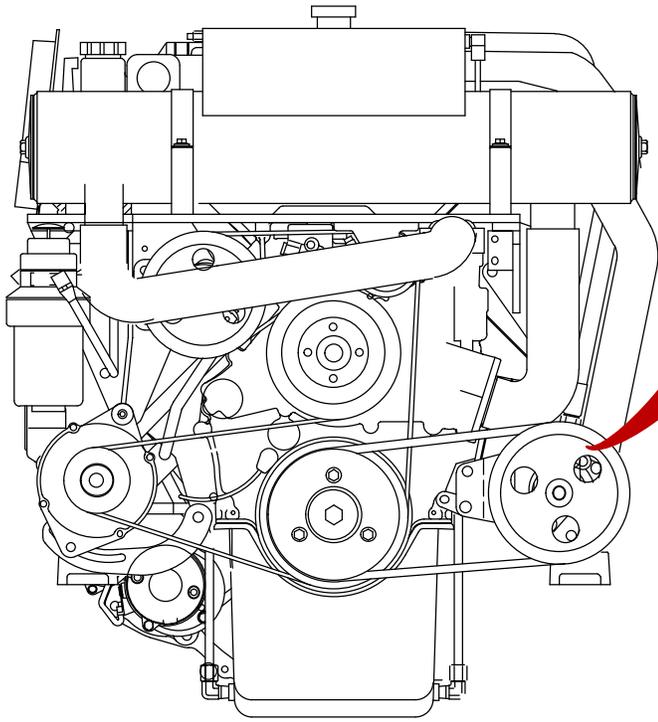
**NOTE:** Only the port aftercooler side cover is shown. Starboard is similar.

- 3 Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.
- 4 Remove seawater pump outlet hose from top of seawater pump and drain.
- 5 Disconnect seawater outlet hose at bottom of exhaust elbow. Lower hose and drain completely.

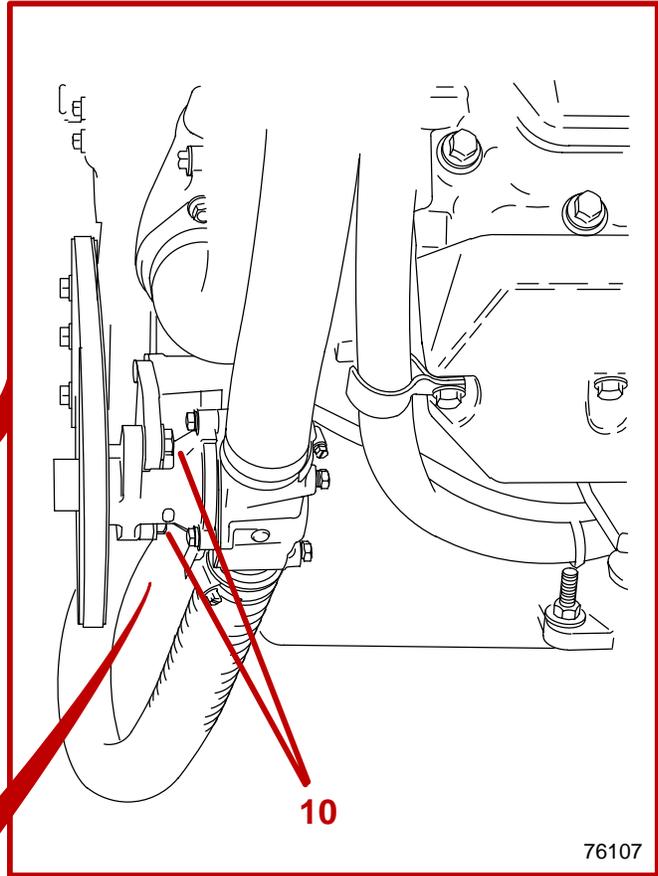
#### **⚠ CAUTION**

**Avoid water entering boat. Do not unplug seawater inlet hose unless a seacock is present and it is closed.**

- 6 Remove hose(s) at seawater strainer and drain hose(s) completely. Remove drain plug and empty seawater strainer. Reconnect hoses - tighten hose clamps securely. Install drain plug and tighten securely.
- 7 Make sure that the speedometer pitot tube, propeller plate cavity vent hole and drain passages are unobstructed and open.
- 8 After seawater section of cooling system has been drained completely, coat threads of drain plugs with Perfect Seal and reinstall. Tighten securely. Reconnect hoses. Connect hose to seawater pump outlet (top) and hose at exhaust elbow. Tighten clamps securely. Tighten hose clamps securely. Replace end cover gaskets and seals, if worn or deteriorated. Install end cover assemblies on the heat exchanger. Torque the end covers to 120-132 lb. in. (14-15 N·m).

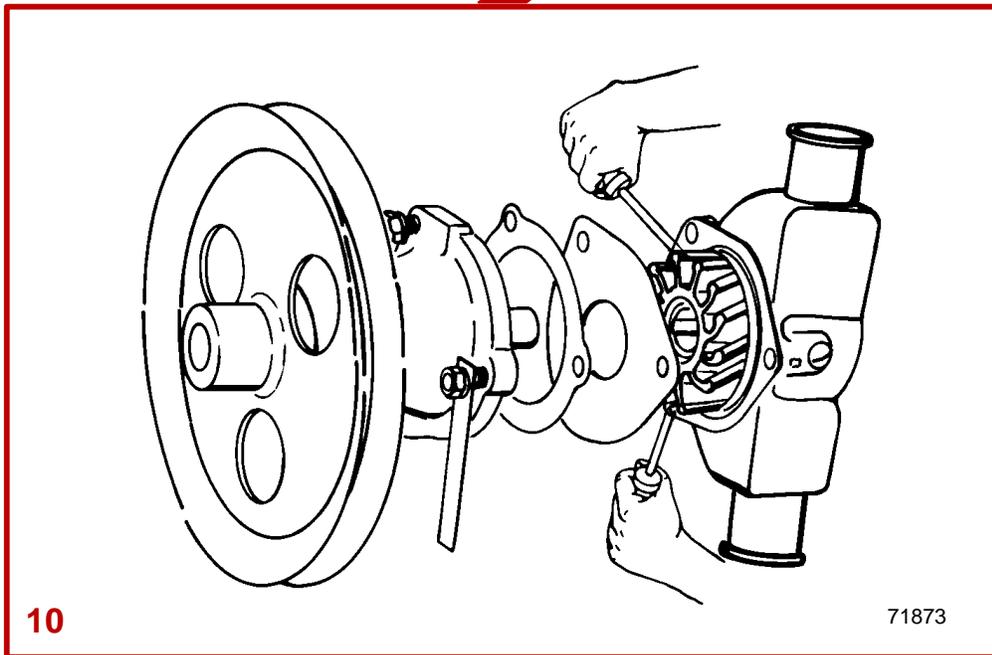


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## Power Package Layup (Continued)

Dealer should perform these remaining tasks prior to layup:

**1** After draining, perform all checks, inspections, lubrication and fluid changes outlined in MAINTENANCE CHART.

**2** Clean seawater strainer (refer to MAINTENANCE SECTION).

**IMPORTANT: MerCruiser recommends that propylene glycol antifreeze (nontoxic and biodegradable, which makes it friendly to lakes and rivers) be used in seawater section of the cooling system for cold weather or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer's recommendations. Also, check local laws about disposal of the antifreeze solution after use.**

**3** Fill a container with approximately 6 U.S. quarts (5-1/2L) of antifreeze and tap water mixed to manufacturer's recommendation to protect engine to the lowest temperature to which it will be exposed during cold weather or extended storage.

**4** Disconnect hose from seawater inlet side of seawater pump. Connect an appropriate length piece of hose to seawater pump and place the other end of the hose into container of coolant.

**5** Start engine and run at idle speed until coolant mixture has been pumped into engine seawater system, then stop engine.

**6** Clean engine and coat with Quicksilver Corrosion Guard.

**7** Lubricate all cables and linkages.

**8** Remove and store battery in a cool, dry place. Do not store on a concrete surface, or on the ground. Place on a dry, wood board or a thick plastic base (Refer to battery manufacturer's instructions.)

**9** Disconnect water inlet adaptor and hose from seawater pump.

**10** Remove seawater pump and components as follows:

**A** Remove seawater pump mounting bolt and tensioning bolt. Remove seawater pump.

**B** Make matching marks on pump cover and pump housing prior to disassembly (to aid in reassembly later). Remove the three seawater pump cover mounting screws. Remove cover (with pulley and shaft), gasket, and plate.

**C** Take notice of O-ring, and location of O-ring in groove on housing.

**D** Ease impeller out of pump body with two screwdrivers. Be careful not to damage pump impeller.

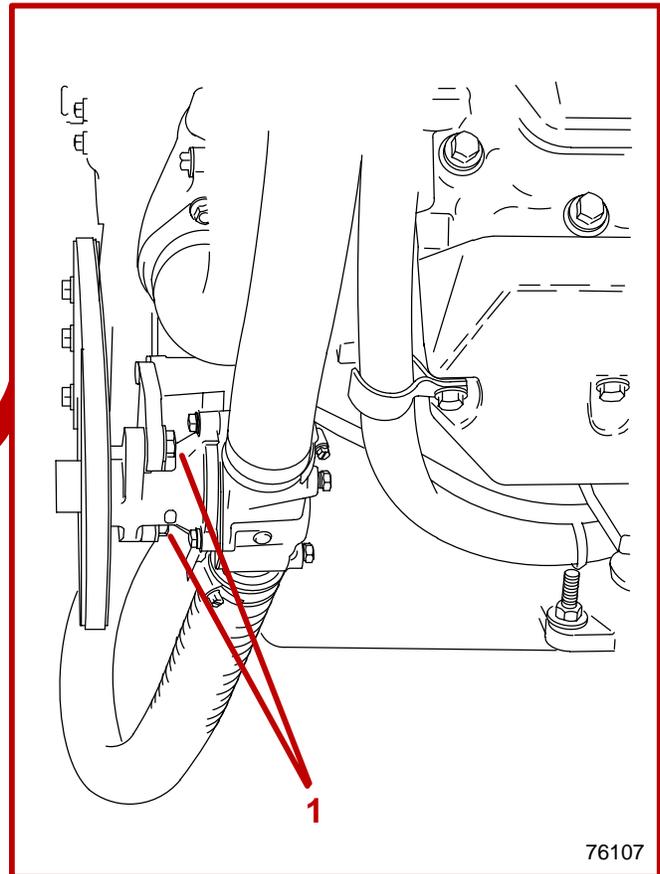
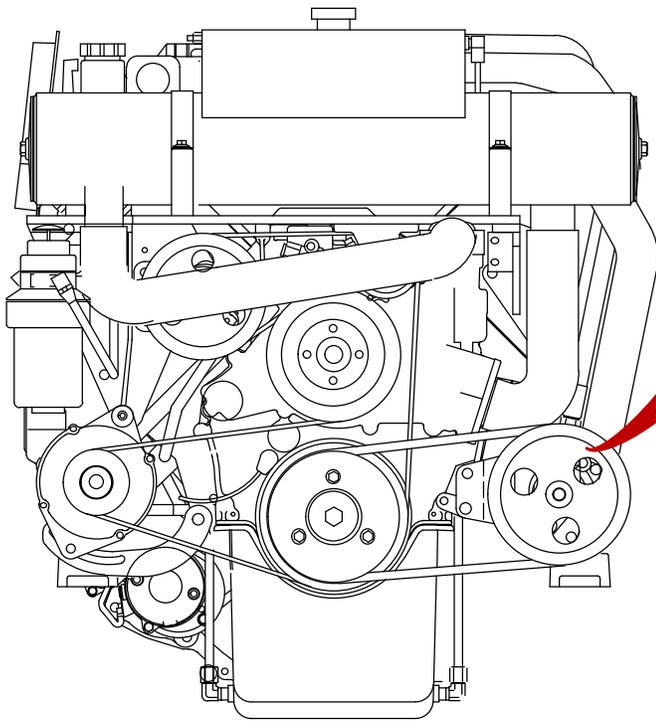
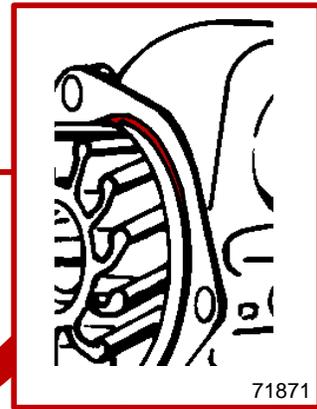
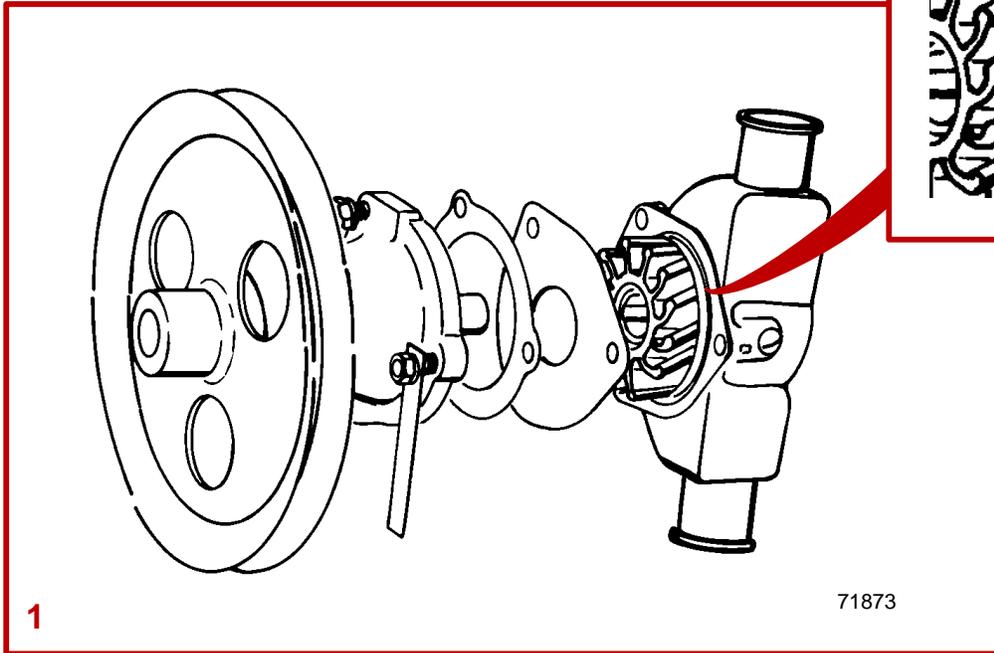
**E** Reassemble the components, except for the impeller, for storage.

**IMPORTANT: Place a CAUTION TAG at instrument panel and in engine compartment stating that "Seawater Pump is Out - DO NOT Operate Engine."**

### CAUTION

**Sterndrive unit should be stored in full "down" position. Universal Joint bellows may develop a "set" if unit is stored in raised position and may fail when unit is returned to service.**

**11** Place sterndrive unit in the full "down" position.



## Power Package Recommissioning

**IMPORTANT:** This service should be performed by an Authorized MerCruiser Dealer.

### WARNING

To prevent possible injury or damage to equipment, do not install battery until all maintenance has been performed on engine.

1 Reinstall seawater pump components and pump as follows:

**NOTE:** Use new gasket and O-ring. Install in correct position.

**A** Place impeller in pump housing.

**B** Install new O-ring in groove on housing.

**C** Install pump plate, with new gasket in position as shown.

**D** Engage pump shaft key in impeller keyway and install seawater pump cover. Align matching marks made prior to disassembly.

**E** Install the three seawater pump cover mounting screws. Tighten securely.

**F** Install pump on engine using mounting bolt and tensioning bolt with hardware. Tension drive belt. Tighten fasteners securely.

2 Check that all cooling system hoses are in good condition, connected properly, and hose clamps are tight.

3 Replace fuel filter.

4 Bleed fuel system (see "MAINTENANCE - FUEL SYSTEM").

5 Fill up with fresh diesel fuel. Old fuel should not be used. Check fuel lines and connections for leaks and general condition.

### CAUTION

When installing battery, be sure to connect **POSITIVE (+) battery cable to POSITIVE (+) battery terminal FIRST**, and **NEGATIVE (-) battery cable to NEGATIVE (-) battery terminal LAST**. If battery cables are reversed, or connection order is reversed, electrical system damage will result.

6 Install fully-charged battery. Clean battery cable clamps and terminals and reconnect cables (see **CAUTION** listed above). Secure each cable clamp when connecting. Coat terminals with a battery terminal anti-corrosion spray to help retard corrosion.

7 Perform all checks on OPERATION CHART in the STARTING PROCEDURE column.

**IMPORTANT:** Avoid starter motor overheating. **DO NOT** engage starter for more than 15 seconds; allow at least one minute cool-down time before re-engaging starter for another 15 seconds.

8 Start engine and closely observe instrumentation to make sure that all systems are functioning correctly.

9 Carefully inspect engine for fuel, oil, fluid, water and exhaust leaks.

10 Check steering system, shift and throttle control for proper operation.

## Troubleshooting

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### Starter Motor Will Not Crank Engine, Or Cranks It Very Slowly

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Battery switch turned off</li> <li>• Remote control not in neutral position</li> <li>• Open circuit breaker or blown fuse</li> <li>• Loose or dirty electrical connections or damaged wiring</li> <li>• Bad battery</li> <li>• Battery size - incorrect rating</li> </ul>	<ul style="list-style-type: none"> <li>• Turn switch on.</li> <li>• Position control lever in neutral.</li> <li>• Check and reset circuit breaker or replace fuse.</li> <li>• Check all electrical connections and wires (especially battery cables). Clean and tighten faulty connection.</li> <li>• Test and replace if bad.</li> <li>• Replace with properly rated battery.</li> </ul>

### Engine Will Not Start, Or Is Hard To Start

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Battery size - incorrect rating</li> <li>• Improper starting procedure</li> <li>• Empty fuel tank or fuel shutoff valve closed</li> <li>• Faulty fuel pump</li> <li>• Low oil level</li> <li>• Throttle not operating properly</li> <li>• Faulty electrical circuit (Example: Start relay dropping out.)</li> <li>• Clogged fuel filters</li> <li>• Stale or contaminated fuel</li> <li>• Fuel line or tank vent line kinked or clogged</li> <li>• Air in fuel injection system</li> <li>• Glow-plug system inoperative</li> </ul>	<ul style="list-style-type: none"> <li>• Replace with properly rated battery.</li> <li>• Read starting procedure.</li> <li>• Fill tank or open valve.</li> <li>• Have pump replaced by an Authorized MerCruiser Dealer, if fuel is present.</li> <li>• Add oil.</li> <li>• Check throttle for freedom of movement.</li> <li>• Have Authorized MerCruiser Dealer service electric circuits. (Example: Check start relay ground circuit.)</li> <li>• Replace filters.</li> <li>• If contaminated, drain tank. Fill with fresh fuel.</li> <li>• Replace kinked lines or blow out lines with compressed air to remove obstruction.</li> <li>• Purge fuel injection system.</li> <li>• Test, and repair or replace components.</li> </ul>

## Engine Runs Rough, Misses And/Or Backfires

Possible Cause	Remedy
<ul style="list-style-type: none"><li>• Clogged fuel or air filters</li></ul>	<ul style="list-style-type: none"><li>• Replace filters.</li></ul>
<ul style="list-style-type: none"><li>• Stale or contaminated fuel</li></ul>	<ul style="list-style-type: none"><li>• If contaminated, drain tank. Fill with fresh fuel.</li></ul>
<ul style="list-style-type: none"><li>• Kinked or clogged fuel line or fuel tank vent line</li></ul>	<ul style="list-style-type: none"><li>• Replace kinked line or blow out line with compressed air to remove obstruction.</li></ul>
<ul style="list-style-type: none"><li>• Air in fuel injection system</li></ul>	<ul style="list-style-type: none"><li>• Purge fuel injection system.</li></ul>
<ul style="list-style-type: none"><li>• Engine Oil - Level over full or wrong viscosity</li></ul>	<ul style="list-style-type: none"><li>• Correct engine oil level or viscosity problem.</li></ul>

## Poor Performance

Possible Cause	Remedy
<ul style="list-style-type: none"><li>• Throttle not fully open</li></ul>	<ul style="list-style-type: none"><li>• Inspect throttle cable and linkages for operation.</li></ul>
<ul style="list-style-type: none"><li>• Damaged or improper propeller</li></ul>	<ul style="list-style-type: none"><li>• Replace.</li></ul>
<ul style="list-style-type: none"><li>• Excessive bilge water</li></ul>	<ul style="list-style-type: none"><li>• Drain and check for cause of entry.</li></ul>
<ul style="list-style-type: none"><li>• Boat overloaded or load improperly distributed</li></ul>	<ul style="list-style-type: none"><li>• Reduce load or redistribute load more evenly.</li></ul>
<ul style="list-style-type: none"><li>• Boat bottom fouled or damaged</li></ul>	<ul style="list-style-type: none"><li>• Clean or repair as necessary.</li></ul>

## Excessive Engine Temperature

Possible Cause	Remedy
<ul style="list-style-type: none"><li>• Seacock closed, if so equipped</li><li>• Drive belt loose or in poor condition</li><li>• Seawater pickups obstructed</li><li>• Faulty thermostat</li><li>• Coolant level low in closed cooling section</li><li>• Heat exchanger cores plugged with foreign material</li><li>• Loss of pressure in closed cooling section</li><li>• Closed cooling section dirty</li><li>• Faulty seawater pickup pump</li><li>• Seawater discharge restricted or plugged</li><li>• Seawater inlet hose kinked (restricted)</li><li>• Use of improperly designed hose on inlet side of seawater pump allowing it to collapse</li><li>• Excessive exhaust back pressure</li></ul>	<ul style="list-style-type: none"><li>• Open.</li><li>• Replace and/or adjust belt.</li><li>• Remove obstruction.</li><li>• Replace.</li><li>• Check for cause of low coolant level and repair. Fill system with proper coolant solution.</li><li>• Clean seawater side of water/water heat exchanger.</li><li>• Check for leaks. Clean, inspect and test pressure cap.</li><li>• Clean and flush.</li><li>• Repair.</li><li>• Clean exhaust elbow.</li><li>• Position hose to prevent kinking (restriction).</li><li>• Replace hose with wire reinforced design.</li><li>• Check that exhaust bellows was replaced with exhaust tube</li></ul>

## Insufficient Engine Temperature

Possible Cause	Remedy
<ul style="list-style-type: none"><li>• Faulty thermostats</li></ul>	<ul style="list-style-type: none"><li>• Replace.</li></ul>

## Low Engine Oil Pressure

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Insufficient oil in crankcase</li> <li>• Excessive oil in crankcase (causing it to become aerated)</li> <li>• Diluted or improper viscosity oil</li> <li>• Faulty sender</li> </ul>	<ul style="list-style-type: none"> <li>• Check and add oil.</li> <li>• Check and remove required amount of oil. Check for cause of excessive oil (improper filling, bad fuel pump, etc.).</li> <li>• Change oil and oil filter, using correct grade and viscosity oil. Determine cause for dilution (excessive idling, faulty fuel pump, etc.).</li> <li>• Have system checked by an Authorized Mercury MerCruiser Dealer.</li> </ul>

## Battery Will Not Come Up On Charge

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Excessive current draw from battery</li> <li>• Loose or dirty electrical connections or damaged wiring</li> <li>• Alternator drive belt loose or in poor condition</li> <li>• Unacceptable battery condition</li> </ul>	<ul style="list-style-type: none"> <li>• Turn off non-essential accessories.</li> <li>• Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connections. Repair or replace damaged wiring.</li> <li>• Replace and/or adjust.</li> <li>• Test battery.</li> </ul>

## Remote Control Operates Hard, Binds, Has Excessive Free-play Or Makes Unusual Sounds

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Insufficient lubrication on shift and throttle linkage fasteners</li> <li>• Loose or missing shift and throttle linkage fasteners</li> <li>• Obstruction in shift or throttle linkages</li> <li>• Shift or throttle cable kinked</li> <li>• Improper shift cable adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>• Lubricate.</li> <li>• Check all linkages. If any are loose or missing, see Authorized MerCruiser Dealer immediately.</li> <li>• Remove obstruction.</li> <li>• Straighten cable, or have dealer replace cable if damaged beyond repair.</li> <li>• See Authorized MerCruiser Dealer immediately for shift cable adjustment.</li> </ul>

## Steering Wheel Turns Hard Or Jerky

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Low power steering pump fluid level</li> <li>• Drive belt loose or in poor condition</li> <li>• Insufficient lubrication on steering system components</li> <li>• Loose or missing steering fasteners or parts</li> <li>• Contaminated power steering fluid</li> </ul>	<ul style="list-style-type: none"> <li>• Refill system with fluid.</li> <li>• Replace and/or adjust.</li> <li>• Lubricate.</li> <li>• Check all parts and fasteners. If any are loose or missing, see Authorized MerCruiser Dealer immediately.</li> <li>• Drain and replace.</li> </ul>

## Power Trim Does Not Operate (Electric Motor Does Not Run)

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Blown Fuse</li> <li>• Loose or dirty electrical connections or damaged wiring</li> </ul>	<ul style="list-style-type: none"> <li>• Replace fuse.</li> <li>• Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connection. Repair or replace wiring.</li> </ul>

## Power Trim Does Not Operate (Electric Motor Runs But Drive Unit Does Not Move)

Possible Cause	Remedy
<ul style="list-style-type: none"> <li>• Pump oil level low</li> <li>• Drive unit binding in gimbal ring</li> </ul>	<ul style="list-style-type: none"> <li>• Fill pump with oil.</li> <li>• Check for obstruction.</li> </ul>

# Owner Service Assistance

## Local Repair Service

Always return your MerCruiser powered boat to your local Authorized Dealer, should the need for service arise. Only he has the factory trained mechanics, knowledge, special tools and equipment and the genuine Quicksilver parts and accessories\* to properly service your engine should the need occur. He knows your engine best.

\* Quicksilver parts and accessories are engineered and built by Mercury Marine, specifically for MerCruiser® sterndrives and inboards.

## Service Away From Home

If you are away from your local dealer and the need arises for service, contact the nearest Authorized Dealer. Refer to the Yellow Pages of the telephone directory. If, for any reason, you cannot obtain service, contact the nearest Regional Service Center. Outside the United States and Canada, contact the nearest Marine Power International Service Center.

## Parts And Accessories Inquiries

All inquiries concerning Quicksilver replacement parts and accessories should be directed to your local Authorized Dealer. The dealer has the necessary information to order parts and accessories for you should he not have them in stock. Only Authorized Dealers can purchase genuine Quicksilver parts and accessories from the factory. Mercury Marine does not sell to unauthorized dealers or retail customers. When inquiring on parts and accessories, the dealer requires the **motor model** and **serial number(s)** to order the correct parts.

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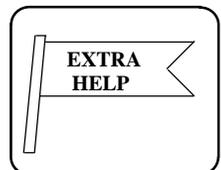
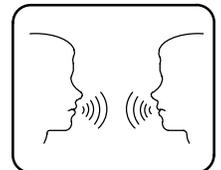
## Resolving A Problem

Satisfaction with your MerCruiser product is very important to your dealer and to us. If you ever have a problem, question or concern about your power package, contact your dealer or any Authorized MerCruiser Dealership. If additional assistance is required, take these steps.

- 1** *Talk with the dealership's sales manager or service manager. If this has already been done, then contact the owner of the dealership.*
- 2** *Should you have a question, concern or problem that cannot be resolved by your dealership, please contact Mercury Marine Service Office for assistance. Mercury Marine will work with you and your dealership to resolve all problems.*

*The following information will be needed by the service office:*

- Your name and address
- Daytime telephone number
- Model and serial number for your power package
- The name and address of your dealership
- Nature of problem



Mercury Marine Service Offices are listed on the next page.

## Mercury Marine Service Offices

For assistance, call, fax, or write. Please include your daytime telephone number with mail and fax correspondence.

Telephone 	Fax 	Mail 
<b>United States</b>		
(405) 743-6566	(405) 743-6570	MerCruiser 3003 N. Perkins Rd. Stillwater, OK 74075
<b>Canada</b>		
(905) 567-MERC (6372)	(905) 567-8515	Mercury Marine Ltd. 2395 Meadowpine Blvd. Mississauga, Ontario Canada L5N 7W6
<b>Australia, Pacific</b>		
(61) (3) 791-5822	(61) (3) 793-5880	Mercury Marine Australia 132-140 Frankston Road Dandenong, Victoria 3164 Australia
<b>Europe, Middle East, Africa</b>		
(32) (87) 32 • 32 • 11	(32) (87) 31 • 19 • 65	Marine Power - Europe, Inc. Parc Industriel de Petit-Rechain B-4800 Verviers Belgium
<b>Mexico, Central America, South America, Caribbean</b>		
(305) 385-9585	(305) 385-5507	Mercury Marine - Latin America & Caribbean 9010 S.W. 137th Ave. Suite 226 Miami, FL 33186 U.S.A.
<b>Japan</b>		
81-53-423-2500	81-53-423-2510	Mercury Marine - Japan 283-1 Anshin-cho Hamamatsu, Shizuoka, 435-0005 Japan
<b>Asia, Singapore</b>		
5466160	5467789	Mercury Marine Singapore 72 Loyang Way Singapore 508762

# Customer Service Literature

## English Language

English language publications are available from:

**Mercury Marine**  
**Attn: Publications Department**  
**W6250 West Pioneer Road**  
**P.O. Box 1939**  
**Fond du Lac, WI 54936-1939**

**Outside the United States and Canada, contact the nearest Mercury Marine or Marine Power International Service Center for further information.**

When ordering be sure to:

1. List your product, model, year and serial number(s).
2. Check the literature and quantities you want.
3. Enclose full remittance in check or money order (NO C.O.D.'s).

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## Other Languages

To obtain an Operation, Maintenance and Warranty Manual in another language, contact the nearest Mercury Marine or Marine Power International Service Center for information. A list of part numbers for other languages is provided with your power package.

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## Andre sprog

Kontakt det nærmeste Mercury Marine eller Marine Power International servicecenter for oplysninger om hvordan du kan anskaffe en Betjenings- og vedligeholdelsesmanual på et andet sprog. En liste med reservedelsnumre for andre sprog leveres sammen med din power-pakke.

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## Andere talen

Voor het verkrijgen van een Handleiding voor gebruik en onderhoud in andere talen dient u contact op te nemen met het dichtstbijzijnde internationale servicecentrum van Mercury Marine of Marine Power voor informatie hierover. Een lijst met onderdeelnummers voor andere talen wordt bij uw motorinstallatie geleverd.

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## Muut kielet

Saadaksesi Käyttö- ja huolto-ohjekirjoja muilla kielillä, ota yhteys lähimpään Mercury Marine tai Marine Power International huoltokeskukseen, josta saat lähempiä tietoja. Moottorisi mukana seuraa monikielinen varaosanumeroluettelo.

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## Autres langues

Pour obtenir un Manuel d'utilisation et d'entretien dans une autre langue, contactez le centre de service après-vente international Mercury Marine ou Marine Power le plus proche pour toute information. Une liste des numéros de pièces en d'autres langues accompagne votre bloc-moteur.

## Andere Sprachen

Um eine Betriebs- und Wartungsanleitung in einer anderen Sprache zu erhalten, wenden Sie sich an das nächste Mercury Marine oder Marine Power International Service Center. Eine Liste mit Teilenummern für Fremdsprachen ist im Lieferumfang Ihres Motors enthalten.

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## Altre lingue

Per ottenere il manuale di funzionamento e manutenzione in altra lingua, contattate il centro assistenza internazionale Mercury Marine o Marine Power più vicino. In dotazione con il gruppo motore, viene fornito l'elenco dei codici prodotto dei componenti venduti all'estero.

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## Andre språk

Ytterligere informasjon om bruks- og vedlikeholdshåndbok på andre språk kan fås ved henvendelse til nærmeste internasjonale servicecenter for Mercury Marine eller Marine Power. En liste over delenumre for andre språk følger med aggregatet.

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## Outros idiomas

Para obter um Manual de Operação e Manutenção em outro idioma, contate o Centro de Serviço Internacional de "Marine Power" (Potência Marinha) ou a Mercury Marine mais próxima para obter informações. Uma lista de números de referência para outros idiomas é fornecida com o seu pacote de propulsão.

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## Otros idiomas

Para obtener un Manual de operación y mantenimiento en otro idioma, póngase en contacto con el centro de servicio más cercano de Mercury Marine o Marine Power International para recibir información. Con su conjunto motriz se entrega una lista de los números de pieza para los otros idiomas.

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## Andra språk

För att få Instruktions- och underhållsböcker på andra språk, kontakta närmaste Mercury Marine eller Marine Power International servicecenter, som kan ge ytterligare information. En förteckning över artikelnummer på andra språk medföljer ditt kraftpaket.

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## Άλλες γλώσσες

Για να αποκτήσετε ένα Εγχειρίδιο Λειτουργίας και Συντήρησης σε άλλη γλώσσα, επικοινωνήστε με το πλησιέστερο Διεθνές Κέντρο Σέρβις της Mercury Marine ή της Marine Power για πληροφορίες. Το πακέτο ισχύος σας συνοδεύεται από έναν κατάλογο αριθμών παραγγελίας για άλλες γλώσσες.

## Ordering Literature

Before ordering literature, please have the following information about your power package available:

Model \_\_\_\_\_ Horsepower \_\_\_\_\_  
 Serial Number \_\_\_\_\_ Year \_\_\_\_\_

### United States and Canada

For information on additional literature that is available for your particular MerCruiser power package and how to order that literature contact your nearest dealer or contact:

Mercury Marine

Telephone 	Fax 	Mail 
(920) 929-5110	(920) 929-4894	Mercury Marine Attn: Publications Department P.O. Box 1939 Fond du Lac, WI 54936-1939

### Outside The United States and Canada

Contact your nearest dealer or Marine Power Service Center for information on additional literature that is available for your particular MerCruiser power package and how to order that literature.





