CA741

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.

CD736

⚠ 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.

Printed in U.S.A.

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 Mercury MerCruiser products. We sincerely hope your boating will be pleasant!

Consumer Affairs Department

CE433

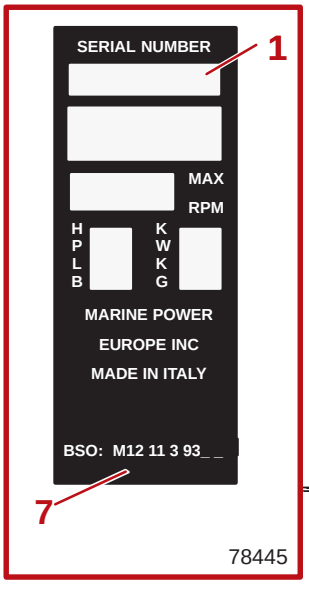
Identification Record

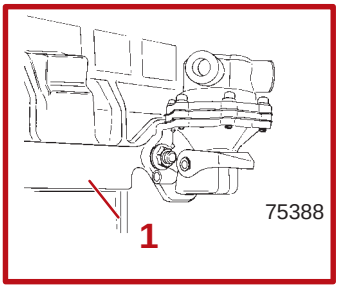
Please record the following information:

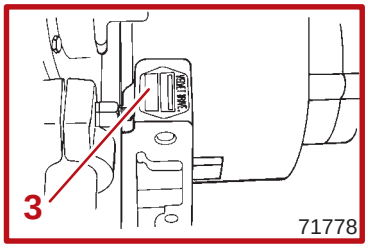
1.			
	Engine Model and Horsepower		Engine Serial Number
2.			
	Transom Assembly Serial Number (Sterndrive)	Gear Ratio	Sterndrive Unit Serial Number
3.			
	Transmission Model (Inboard)	Gear Ratio	Transmission Serial Number
4.			
	Propeller Number	Pitch	Diameter
5.			
	Hull Identification Number (HIN)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

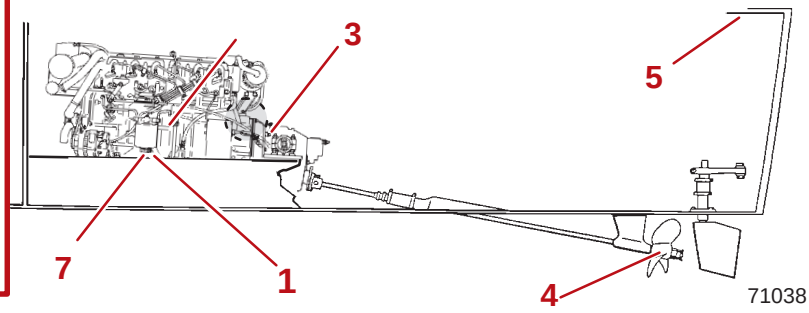
Serial Numbers

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









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Warranty Information

CD55
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.

CD56
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.

Recreational Use Diesel Limited Warranty

I. WHAT IS COVERED
Mercury Marine warrants its new products to be free of defects in material and workmanship during the period described below.

II. DURATION OF COVERAGE
This Limited Warranty provides coverage for one (1) year from the date the product is first sold to a recreational use retail purchaser, or the date on which the product is first put into service, whichever occurs first. Commercial use of the product voids the warranty. Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, for any part of the warranty period, even if the product is only occasionally used for such purposes. The repair or replacement of parts, or the performance of service under this warranty, does not extend the life of this warranty beyond its original expiration date. Unexpired warranty coverage can be transferred from one recreational use customer to a subsequent recreational use customer upon proper re-registration of the product. Unexpired warranty coverage cannot be transferred either to or from a commercial use customer.

III. CONDITIONS THAT MUST BE MET IN ORDER TO OBTAIN WARRANTY COVERAGE
Warranty coverage is available only to retail customers that purchase from a Dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre-delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Inaccurate warranty registration information regarding recreational use, or subsequent change of use from recreational to commercial may void the warranty at the sole discretion of Mercury Marine. Routine maintenance outlined in the Operation, Maintenance and Warranty Manual must be timely performed in order to obtain warranty coverage. If this maintenance is performed by the retail customer Mercury Marine reserves the right to make future warranty coverage contingent on proof of proper maintenance.

IV. WHAT MERCURY WILL DO
Mercury's sole and exclusive obligation under this warranty is limited to, at our option, repairing a defective part, replacing such part or parts with new or Mercury Marine certified re-manufactured parts, or refunding the purchase price of the Mercury product. Mercury reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

V. HOW TO OBTAIN WARRANTY COVERAGE
The customer must provide Mercury with a reasonable opportunity to repair, and reasonable access to the product for warranty service. Warranty claims shall be made by delivering the product for inspection to a Mercury dealer authorized to service the product. If purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury. We will then arrange for the inspection and any covered repair. Purchaser in that case shall pay for all related transportation charges and/or travel time. If the service provided is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. The warranty registration card is the only valid registration identification and must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

VI. WHAT IS NOT COVERED

This limited warranty does not cover routine maintenance items, tune ups, adjustments, normal wear and tear, damage caused by abuse, abnormal use, use of a propeller or gear ratio that does not allow the engine to run in its recommended rpm range (see the Operation, Maintenance and Warranty Manual), operation of the product in a manner inconsistent with the recommended operation/duty cycle section of the Operation, Maintenance and Warranty Manual, neglect, accident, submersion, improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product), improper service, use of an accessory or part which damages the Mercury product and was not manufactured or sold by us, jet pump impellers and liners, operation with fuels, oils or lubricants which are not suitable for use with the product (see the Operation, Maintenance and Warranty Manual), alteration or removal of parts, or water entering the engine through the fuel intake, air intake or exhaust system. Use of the product for racing or other competitive activity, or operating with a racing type lower unit, at any point, even by a prior owner of the product, voids the warranty.

VII. Expenses related to haul-out, launch, towing, storage, telephone, rental, inconvenience, slip fees, insurance coverage, loan payments, loss of time, loss of income, or any other type of incidental or consequential damages are not covered by this warranty. Also, expenses associated with the removal and/or replacement of boat partitions or material caused by boat design for access to the product are not covered by this warranty.

VIII. No individual or entity, including Mercury Marine authorized dealers, has been given authority by Mercury Marine to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against Mercury Marine.

IX. For additional information regarding events and circumstances covered by this warranty, and those that are not, see the Warranty Coverage section of the Operation, Maintenance and Warranty Manual, incorporated by reference into this warranty.

X. DISCLAIMERS AND LIMITATIONS

THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME STATES/COUNTRIES DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. 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.

Light Duty Commercial Use Diesel Limited Warranty

I. WHAT IS COVERED
Mercury Marine warrants its new products to be free of defects in material and workmanship during the period described below.

II. DURATION / DESCRIPTION OF COVERAGE
This Limited Warranty provides coverage from the date the product is first sold to a retail customer, or the date on which the product is first put into service, whichever occurs first. The warranty provides coverage for a period of one year, or the accumulation of 500 hours of operation, whichever occurs first. Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, for any part of the warranty period, even if the product is only occasionally used for such purposes. Light duty commercial use is defined as annual operation not to exceed 500 hours, operation of the product at full rated power at maximum rated RPM for less than 10% of total operation time, and continuous cruising RPM is limited to no greater than 90% of wide open throttle RPM (see the Operation, Maintenance and Warranty Manual for further discussion and examples, incorporated by reference into this limited warranty statement, of light duty commercial operation). Operation of the product in excess of the light duty commercial specifications will void the warranty. The repair or replacement of parts, or the performance of service under this warranty, does not extend the life of this warranty beyond its original expiration date. Unexpired warranty coverage can be transferred to a subsequent purchaser upon proper re–registration of the product.

III. CONDITIONS THAT MUST BE MET IN ORDER TO OBTAIN WARRANTY COVERAGE
Warranty coverage is available only to retail customers that purchase from a Dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre–delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Inaccurate warranty registration information regarding recreational use, or subsequent change of use from recreational to commercial (unless properly re–registered) may void the warranty at the sole discretion of Mercury Marine. Routine maintenance outlined in the Operation, Maintenance and Warranty Manual must be timely performed in order to obtain warranty coverage. If this maintenance is performed by the retail customer Mercury Marine reserves the right to make future warranty coverage contingent on proof of proper maintenance.

IV. WHAT MERCURY WILL DO
Mercury's sole and exclusive obligation under this warranty is limited to, at our option, repairing a defective part, replacing such part or parts with new or Mercury Marine certified re–manufactured parts, or refunding the purchase price of the Mercury product. Mercury reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

V. HOW TO OBTAIN WARRANTY COVERAGE
The customer must provide Mercury with a reasonable opportunity to repair, and reasonable access to the product for warranty service. Warranty claims shall be made by delivering the product for inspection to a Mercury dealer authorized to service the product. If purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury. We will then arrange for the inspection and any covered repair. Purchaser in that case shall pay for all related transportation charges and/or travel time. If the service provided is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. The warranty registration card is the only valid registration identification and must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

VI. WHAT IS NOT COVERED

This limited warranty does not cover routine maintenance items, tune ups, adjustments, normal wear and tear, damage caused by abuse, abnormal use, use of a propeller or gear ratio that does not allow the engine to run in its recommended RPM range (see the Operation, Maintenance and Warranty Manual), operation of the product in a manner inconsistent with the recommended operation/duty cycle section of the Operation, Maintenance and Warranty Manual, neglect, accident, submersion, improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product), improper service, use of an accessory or part which damages the Mercury product and was not manufactured or sold by us, jet pump impellers and liners, operation with fuels, oils or lubricants which are not suitable for use with the product (see the Operation, Maintenance and Warranty Manual), alteration or removal of parts, or water entering the engine through the fuel intake, air intake or exhaust system. Use of the product for racing or other competitive activity, or operating with a racing type lower unit, at any point, even by a prior owner of the product, voids the warranty.

VII. Expenses related to haul-out, launch, towing, storage, telephone, rental, inconvenience, slip fees, insurance coverage, loan payments, loss of time, loss of income, or any other type of incidental or consequential damages are not covered by this warranty. Also, expenses associated with the removal and/or replacement of boat partitions or material caused by boat design for access to the product are not covered by this warranty.

VIII. No individual or entity, including Mercury Marine authorized dealers, has been given authority by Mercury Marine to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against Mercury Marine.

IX. For additional information regarding events and circumstances covered by this warranty, and those that are not, see the Warranty Coverage section of the Operation, Maintenance and Warranty Manual, incorporated by reference into this warranty.

X. DISCLAIMERS AND LIMITATIONS

THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME STATES/COUNTRIES DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. 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.

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Warranty Coverage and Exclusion

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, Maintenance and Warranty 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.

CD855

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 54935-1939

- 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 with these special instructions while 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 and Maintenance 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

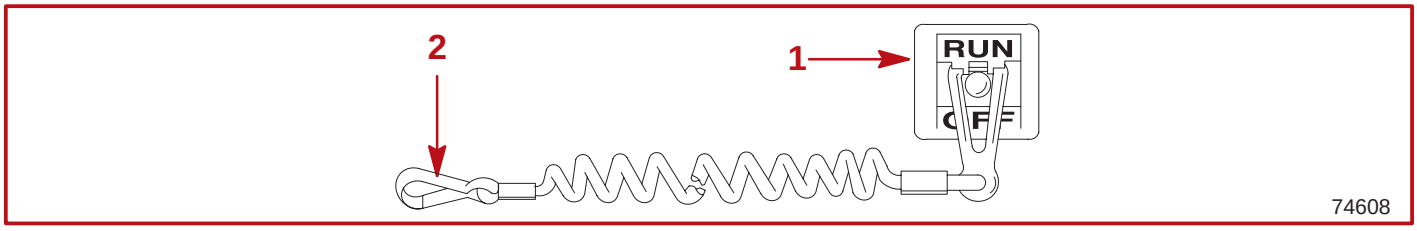
The use of accessories not manufactured or sold by Mercury Marine is not recommended for use with your Mercury MerCruiser unit. If your Mercury MerCruiser unit is equipped with an accessory not manufactured by Mercury Marine, be sure to read the Operation and Maintenance Manual for the accessory before 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.

⚠ 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.

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.

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.

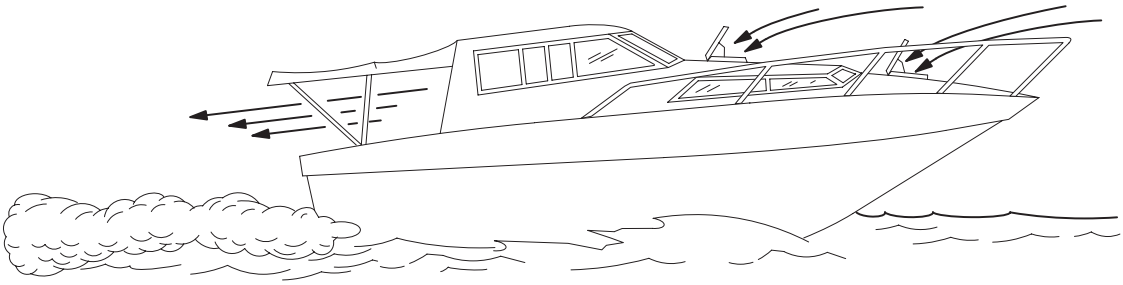
2 Loss of power and directional control in heavy seas, strong current or high winds.

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.

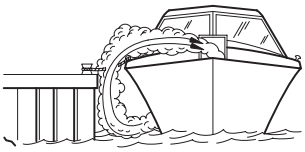
CA641



1

Courtesy of ABYC

CA642



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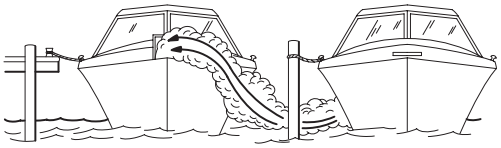
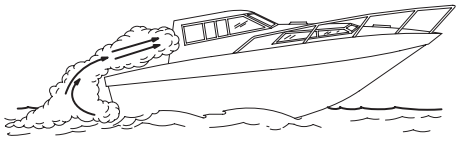


2B

3A



3B

Courtesy of ABYC

CA620
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.

CA643

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.

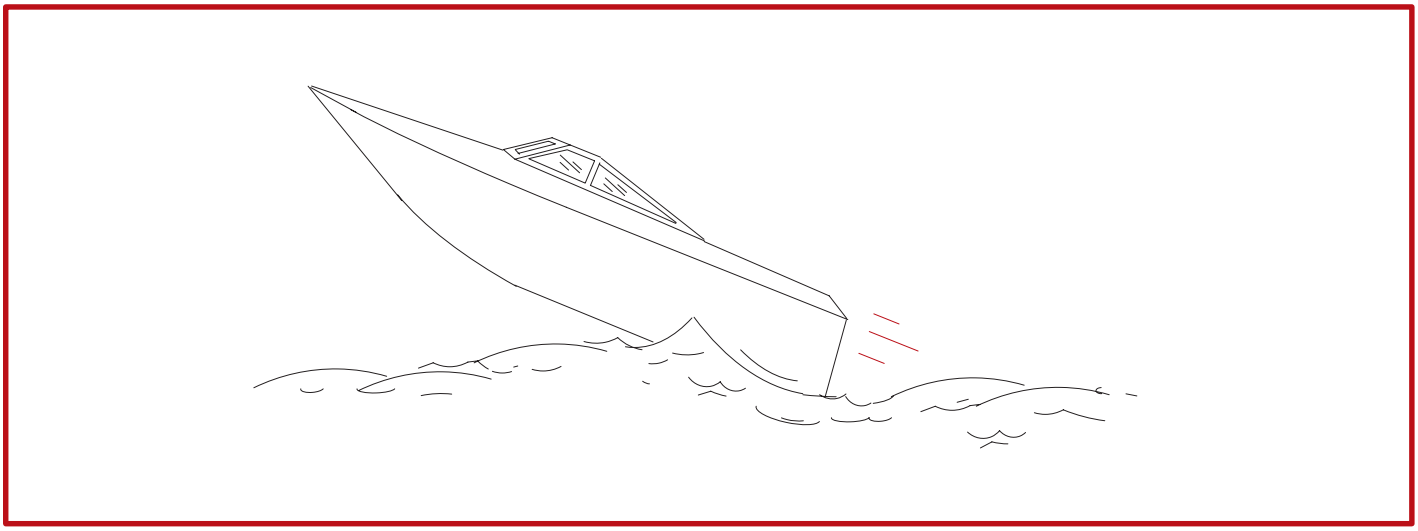
B Mooring close to another boat that has its engine running.

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.

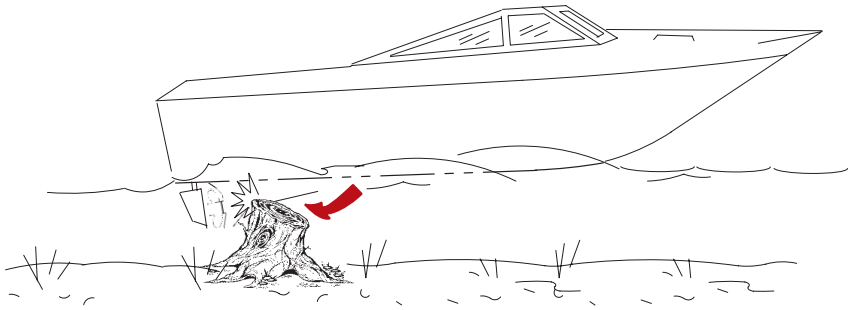
There is another less common hazardous result from allowing your boat to launch off a wave or wake. If the bow of your boat pitches down far enough while airborne, upon water contact it may penetrate under the water surface and “submarine” for an instant. This will bring the boat nearly to a stop in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

CE336

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 underwater drive components, rudder 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 underwater drive components, rudder 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 drive system 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 with damaged underwater drive components, rudder or boat bottom 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.

CA476
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, wearable-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.

CA282
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.

CC828
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 90-849250--1) from your dealer, distributor, or Mercury Marine.

CD3
Conditions Affecting Operation

CD4
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).

CA8
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.

CD476

How Elevation and Climate Affect Performance

NOTE: *Engines equipped with Electronic Diesel Injection (EDI or 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.

CE434

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 propellers. The specified wide open throttle (WOT) operating rpm ranges are listed below.

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

Engine RPM Limits		
MIE Model	**Specified Wide Open Throttle Operating RPM Range With Normal Load Aboard Boat**	**RPM Governor or Limiter Setting (Begins At:)**
D4.2L	3400-3600	3630 ± 20
D4.2L LD	3400-3600	3650 ± 50
D2.8L D-Tronic	3600-3800	3875 ± 50
D4.2L D-Tronic		
D4.2L 300	3700-3900	3950± 50

Select a propeller that will allow the engine power package to operate at or near the top of the specified WOT operating rpm range with a normal load. Generally, there is a 100-150 rpm difference between 1 inch changes in propeller diameter or pitch.

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

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).

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

CD5
Important Information

CD857
Operation and Maintenance

OPERATION / DUTY CYCLE

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

PLEASURE DUTY RATING

- Engine specified wide open throttle operating rpm range:

Model	RPM
D4.2L and D4.2L LD	3400-3600
D2.8L D-Tronic, D4.2L D-Tronic	3600-3800
D4.2L 300	3700-3900

- Wide open throttle operation is limited to short periods of time.

LIGHT DUTY RATING

- Engine specified wide open throttle operating rpm range:

Model	RPM
D4.2L and D4.2L LD	3400-3600
D2.8L D-Tronic, D4.2L D-Tronic	3600-3800

- Wide open throttle operation is limited to less that 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 Mercury MerCruiser Diesel Limited Warranty.

CD478
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 Mercury 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 Mercury MerCruiser Dealer for service aids.

⚠ CAUTION

Except on the D-Tronic models, the injection pump lever Wide-Open-Throttle (WOT) Stop Screw adjusts the engine speed governor, and is factory set and sealed. Readjusting the governed speed and operating above the specified rpm will cause extensive engine damage and/or failure. Removal of the seal and/or readjustment of the governed speed is considered misuse of engine, and resulting damages will not be covered by the limited warranty.

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 Mercury 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.

CE8

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.

CA20

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, Maintenance and Warranty Manual."

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 Mercury MerCruiser Limited Warranty.

CA409
Attention Required After Submersion

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

CA21
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.

CE9
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 modifications that are required in Mercury MerCruiser marine engines to provide long life and dependable performance.

CA772
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 Mercury 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.

CD329

Diagnosing EDI Problems (If So Equipped)

Your Authorized Mercury 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.

CE335

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.

1 Follow instructions “A” or “B”:

A **On D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300 Engines:** Proceed to Step 2.

B **On D4.2L and D4.2L LD Engines Only:** After a lengthy layup (several months or more) pre-lubricate the turbocharger and engine. To do this, hold the STOP switch toggle lever DOWN while you simultaneously turn the key switch to START position for 15 seconds. This will rotate the starter motor and engine/oil pump. During this process the engine will not run because no fuel is injected. Allow the starter motor to cool down for one minute and repeat the above described process. To avoid overheating the starter motor, do not engage starter motor for more than 15 seconds each time. Proceed to step 2 after a slight increase in oil pressure is observed.

2 Refer to appropriate Starting, Shifting and Stopping section and start engine. Allow engine to idle until it has reached normal operating temperature.

3 Run engine in gear for 3 minutes at each of the following rpms: 1200 rpm, 2400 rpm and 3000 rpm.

4 Run engine in gear for 3 minutes at each of the following rpms: 1500 rpm, 2800 rpm and 3400 rpm.

5 Run engine in gear for 3 minutes at each of the following rpms: 1800 rpm, 3000 rpm and Maximum Rated Full Throttle rpm.

CE11

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 transmission 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.

CA211

After Break-In Period

To help extend the life of your Mercury 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.

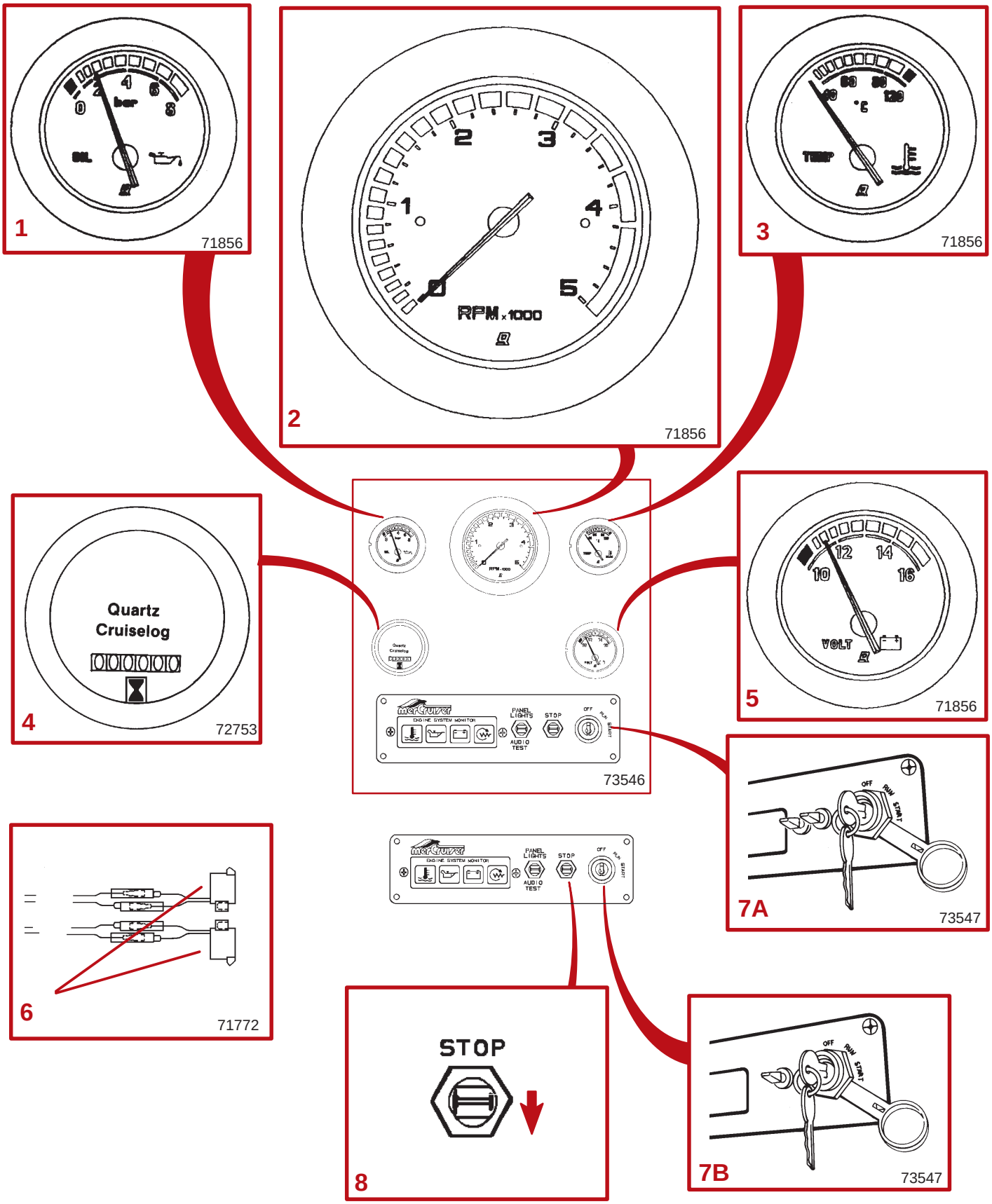
CA414

End of First Season Checkup

At the end of the first season of operation, an Authorized Mercury 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

CE230



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.

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 Audio Warning Horn Standard Features - Horn sounds if:

(1) Cooling system temperature too high
(2) Oil pressure is too low
(3) Transmission fluid temperature is excessive

7 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 (if equipped) and all instruments are operational. In the START position the engine can be started.

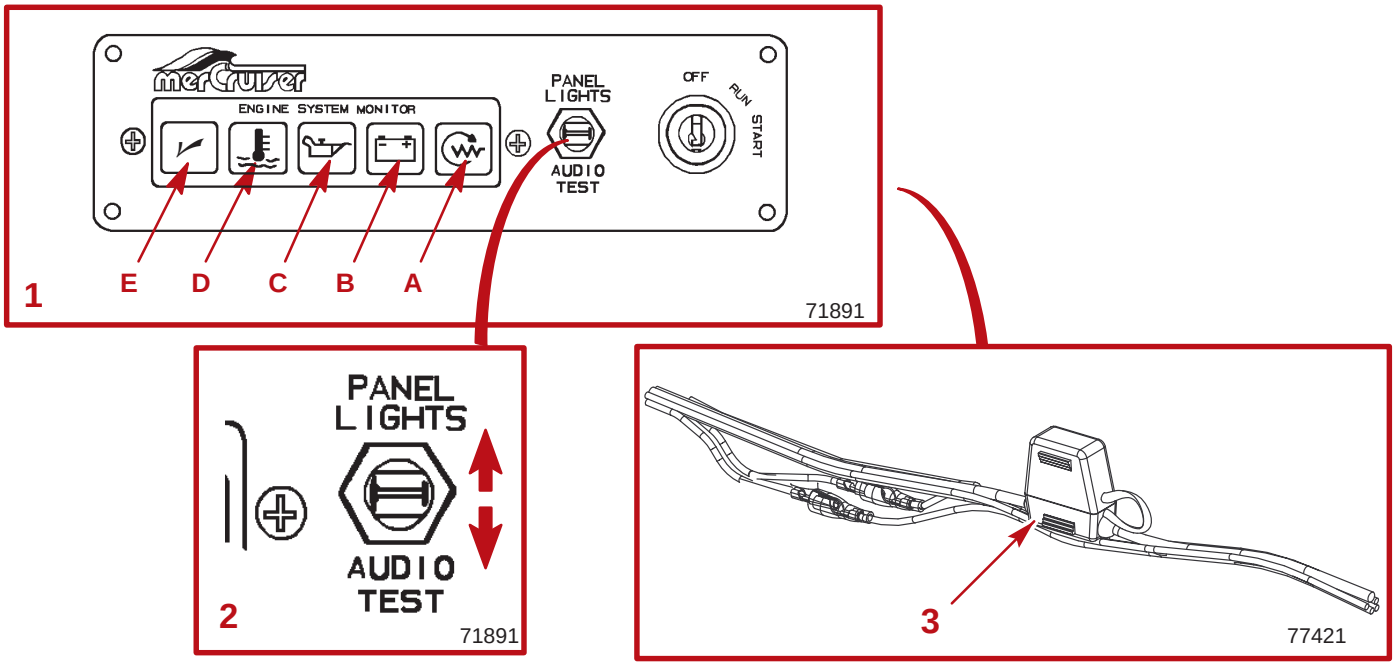
NOTE: *Key can only be removed in the OFF position.*

A D4.2L, and D4.2L LD - If engine is running the key switch CANNOT be used to stop engine. The engine can only be stopped by using the engine stop switch, while the key switch is in the RUN position. No electrical circuit is operational when the key switch is turned to the OFF position.

B D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300 - The engine is stopped when the key switch is turned to the OFF position.

8 Engine Stop Switch - D4.2L, and D4.2L LD - is used to stop the engine. This is done by electrically shutting off fuel delivery system. The stop switch is toggled DOWN and held until engine stops completely. Then, key switch can be turned to the OFF position.

CD691



CE436

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

A Preheat Indicator Lamp - is on when the glow plugs, if equipped, are preheating the combustion chambers. The light stays on until the preheat period is complete. The timed preheat period begins when the key switch is turned to the RUN position, and then, only when the engine is cold. On D4.2L models, the engine can be started only after the light goes out.

B Charge Indicator Lamp - indicates a problem with charging system if lamp illuminates while engine is operating. Lamp will light when key switch is in the RUN position and engine is not operating. When engine starts, light should go out.

C Oil Pressure Warning Lamp - indicates low engine oil pressure if lamp illuminates while engine is operating.

D Coolant Temperature Warning Lamp - indicates excessive engine coolant temperature if lamp illuminates while engine is operating, or transmission fluid temperature is too high (Refer to the following note).

NOTE: *The audio warning horns are wired in a parallel circuit. If a horn sounds while engine is running, check coolant temperature and coolant level or this may be an indication of excessive transmission temperature. The cause should be determined and corrected.*

E Malfunction Indicator Lamp (MIL) - D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300 Only - additional lamp indicates when a problem exists that requires service if lamp illuminates while engine is operating.

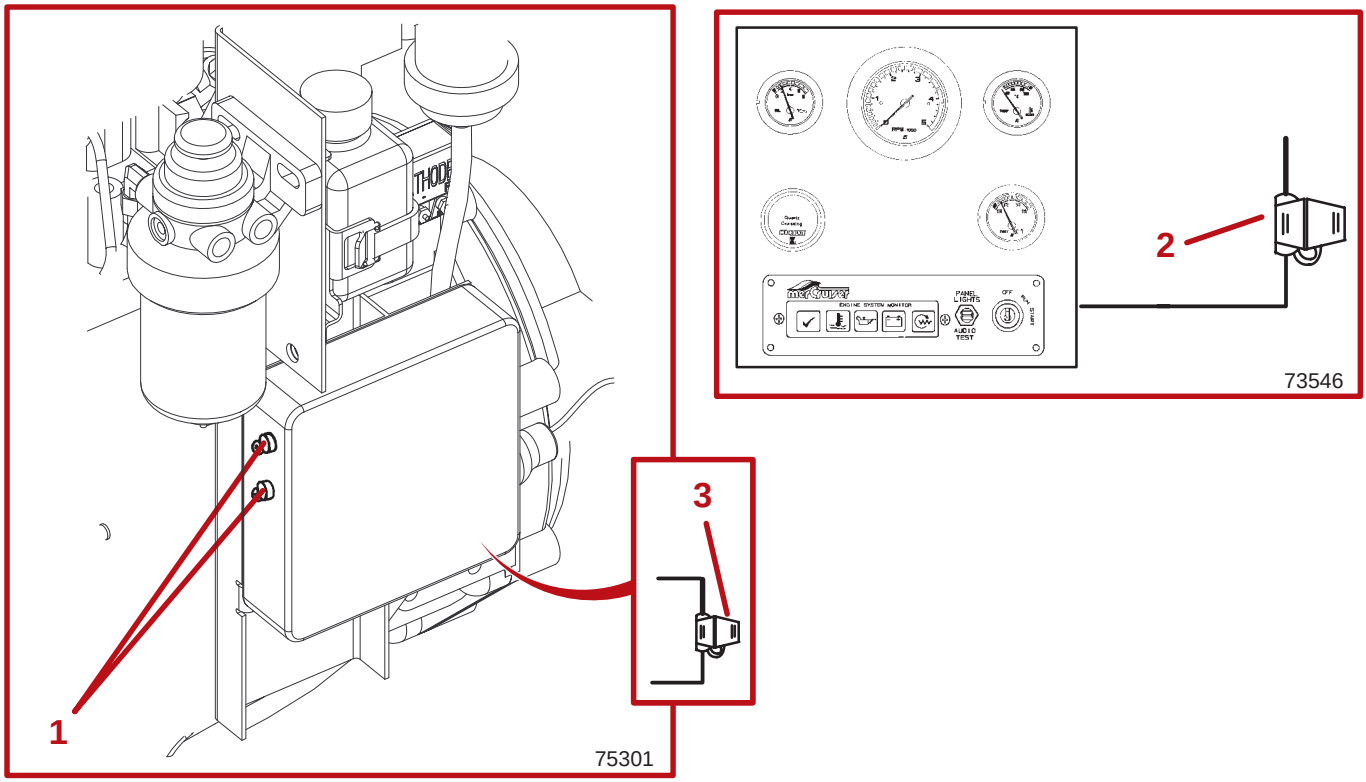
2 Panel Lights/Audio Test Switch - has three positions; in the NORMAL position all electrical circuits operate in a standard fashion (as described above). With switch toggled UP the instrumentation lights are all illuminated. When the switch is toggled DOWN the audio warning horn will sound allowing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

3 20 Amp Fuse and Holder - located in-line on key switch power supply wire and protects the instrumentation and wiring should an electrical overload occur. If an overload occurs, the fuse will burn out. Check burned (blown) fuse if key is turned to RUN or START and instruments do not work and/or if switches do not function.

IMPORTANT: Cause for overload must be determined and corrected before attempting to install new fuse or fuse failure will occur again.

After cause is corrected, install new fuse and check systems to function.

CE437



CE438

Electrical System Overload Protection

If an electrical overload occurs, a fuse will blow or a circuit breaker will trip open.

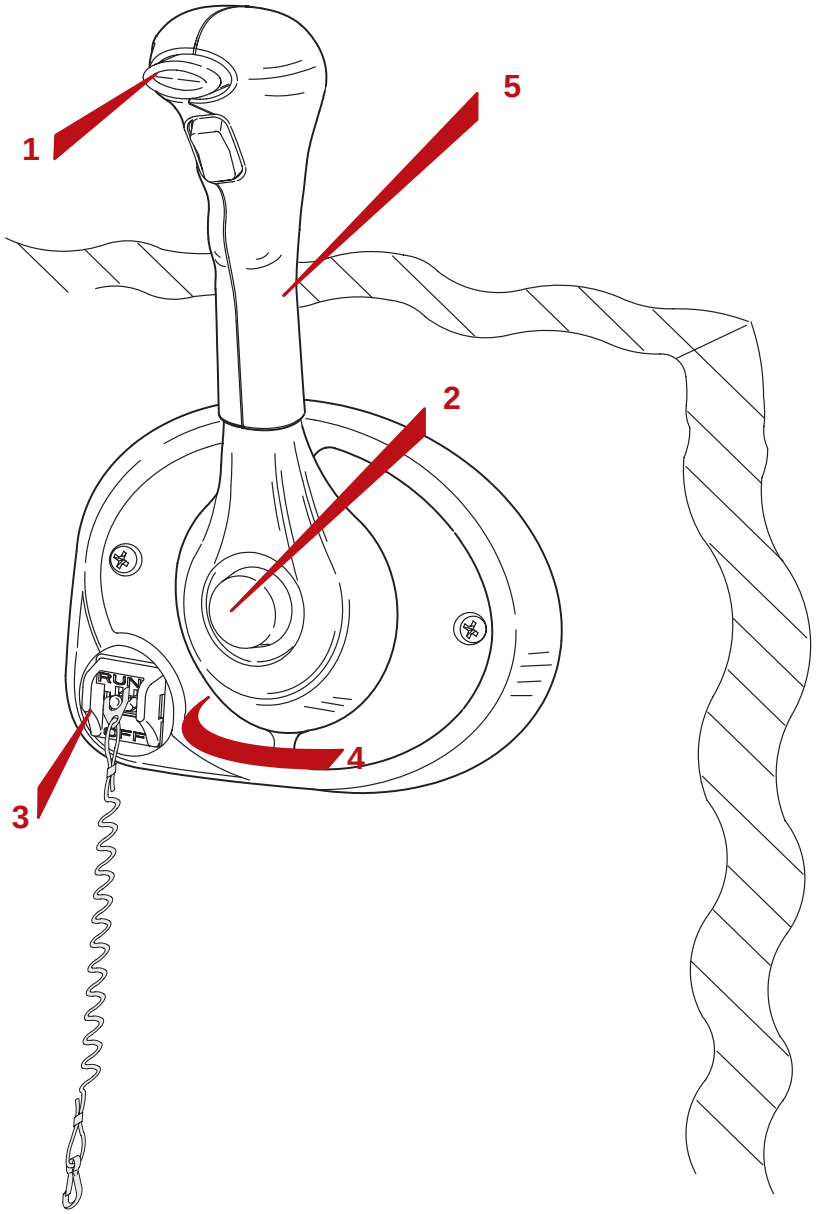
IMPORTANT: The cause must be found and corrected before replacing fuse or resetting circuit breaker.

1 Two 60 amp circuit breakers provide protection for engine wiring harness and instrumentation power lead. Reset by pushing RESET button IN (on 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 When equipped with Quicksilver instrumentation and wiring a 20 amp fuse and holder is located in-line on key switch power supply wire and protects the Instrumentation and wiring should an electrical overload occur. If an overload occurs, the fuse will burn out. Check “blown” (burned) fuse if key is turned to RUN or START and instruments do not work and/or if switches do not function.

3 The Engine Control Module (ECM) is protected from overload by a 5 amp in-line fuse inside the electrical box.



77019

CA933
Remote Controls

CC980
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.

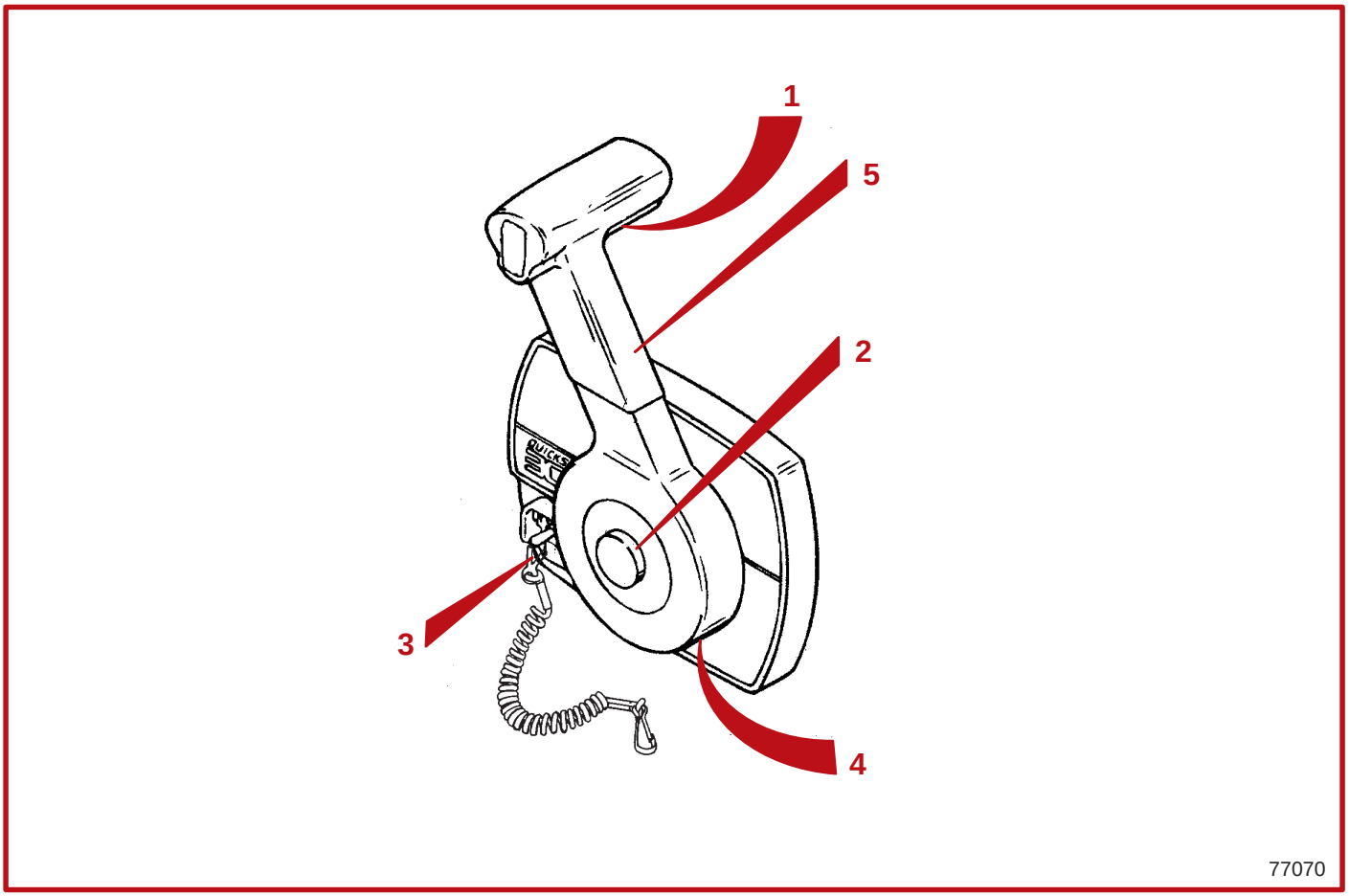
1 Neutral Lock Button - Prevents accidental shift and throttle engagement. Neutral lock button must be pushed IN to move the control handle out of neutral.

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 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.

4 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 slipping of the remote control handle. Turn screw clockwise to increase tension and counterclockwise to decrease tension. Adjust to tension desired.

5 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.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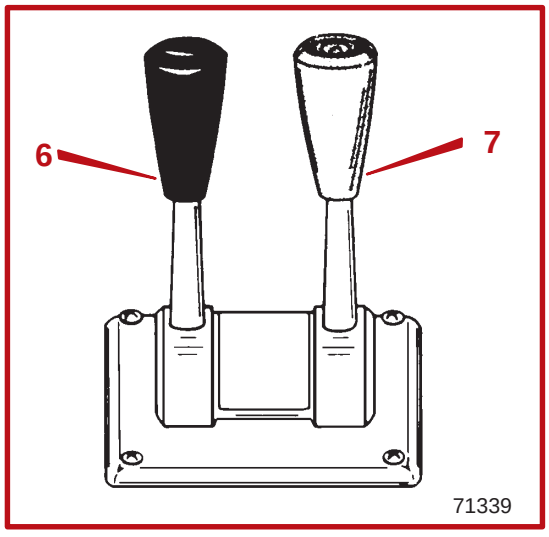
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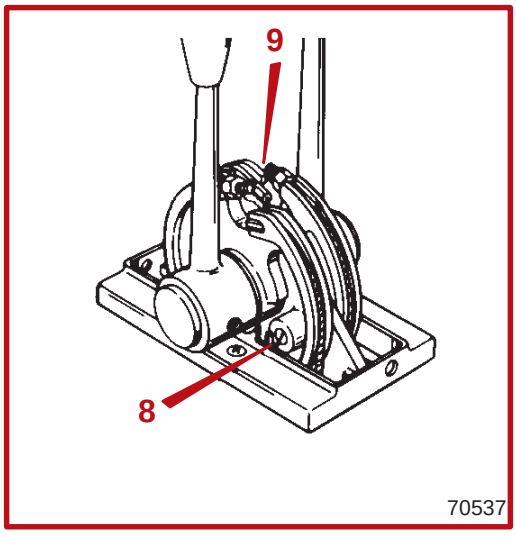
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70537

CC981

Commander 3000 Classic (Panel Mounted)

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 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.

4 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.

5 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 pulling back to increase speed.

⚠ CAUTION

DO NOT shift the control handle into REVERSE when the engine is not running. Forcing the shift mechanism into REVERSE when the engine is not running could damage the remote control mechanism.

CC984

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.*

6 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.

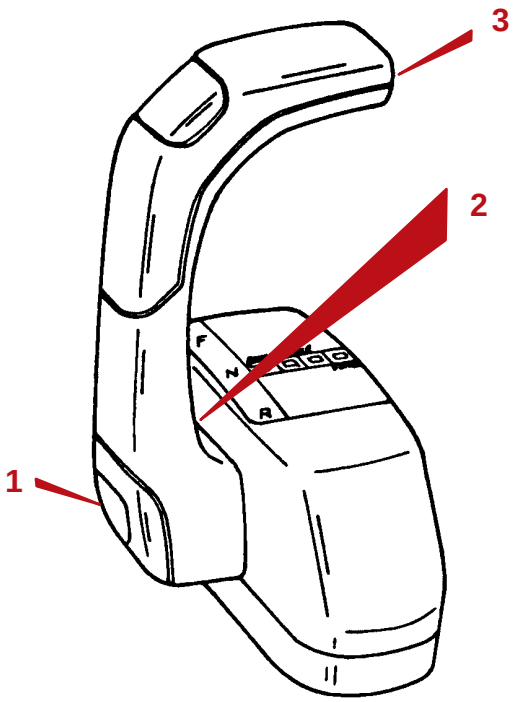
7 Throttle Lever - allows engine RPM to be increased or decreased.

8 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.

9 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.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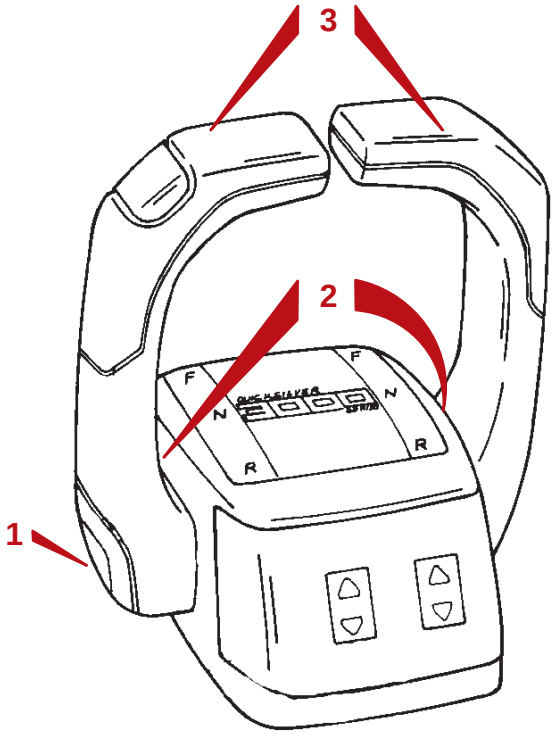
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CC982

Commander 3000 Series (Console Mounted)

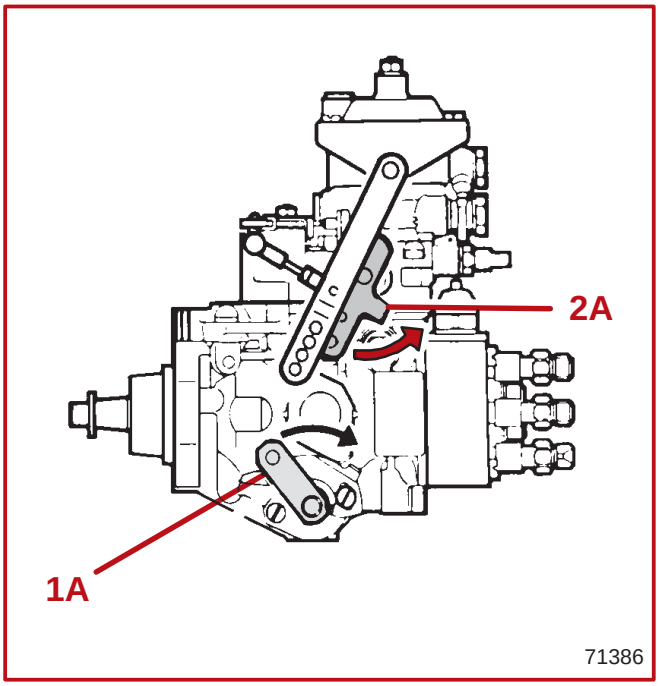
Your boat may be equipped with one of many Quicksilver® remote controls available. All controls feature an integral safety switch that allows starting engine in NEUTRAL only. Also, all controls may not have all features shown.

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 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.

2 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.

3 Control Handle(s) - Operation of the 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.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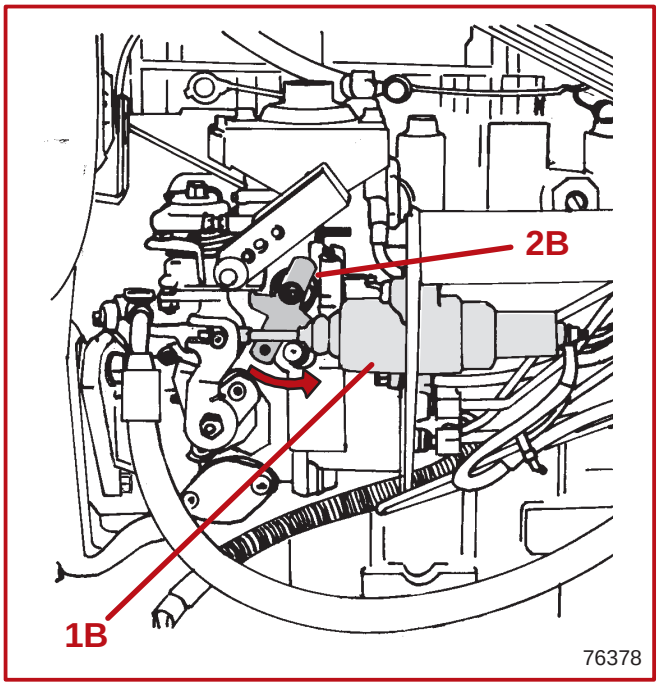
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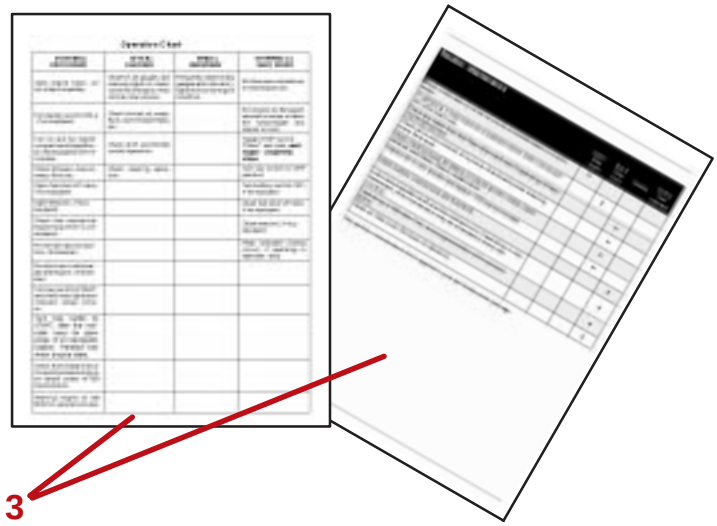
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CD692

Starting, Shifting and Stopping - D4.2L and D4.2L LD

NOTE: *Does not include engines equipped with D-Tronic fuel injection.*

⚠ 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.

1 Cold Start Assist:

A On D4.2L models, a Cold Start Lever located on the injection pump is used to aid in starting when the temperature is below 50 degrees F (10 degrees C). This is done by moving lever in direction shown. Lever should be reset as soon as engine starts and idles smoothly.

B On D4.2L LD models, a Cold Start Device located on the injection pump is used to aid in starting when the temperature is below 50 degrees F (10 degrees C). This is done using an electric solenoid and a coolant temperature switch circuit. Lever will reset as soon as engine coolant reaches a prescribed temperature.

2 Mechanical Engine Stop Lever - located on the injection pump of all engines except D-Tronic Engines. It is used to manually shut off engine by cutting off the fuel supply. It can be engaged by moving the lever in the direction shown.

A D4.2L Models

B D4.2L LD Models

BEFORE STARTING THE ENGINE

⚠ 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 drive unit may result.

IMPORTANT: Observe the following before starting:

- **Provide water to the seawater pickup pump.**
- **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.**

3 Check all items listed in the Maintenance Schedules and Operation Chart - D4.2L and D4.2L LD. Refer to the Table Of Contents.

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

CD693
STARTING COLD ENGINE

IMPORTANT: Always check all fluid levels before starting engine. Refer to Maintenance Chart.

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

2 On D4.2L only, set cold start lever if temperature is below 50° F (10° C).

3 After a lengthy layup (several months or more) pre-lubricate the turbocharger and engine. To do this, hold the STOP switch toggle lever DOWN while you simultaneously turn the key switch to START position for 15 seconds. This will rotate the starter motor and engine/oil pump. During this process the engine will not run because no fuel is injected. Allow the starter motor to cool down for one minute and repeat the above described process. To avoid overheating the starter motor, do not engage starter motor for more than 15 seconds each time. Proceed to next step after a slight increase in oil pressure is observed.

4 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 knob located on the fuel filter header. Move knob up and down four or five strokes.

5 Turn key switch to the RUN position. Observe indicator lamp for glow plugs. When cylinder temperature is great enough to sustain combustion, the indicator lamp will cease to be lighted and the engine can be started.

6 Turn key switch to START position and release when engine starts. Check to ensure charge indicator and oil pressure warning lamps go out.

⚠ CAUTION

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

NOTE: *On D4.2L only, reset cold start lever when engine idles smoothly.*

7 Run engine at IDLE rpm until engine temperature is within normal operating range.

⚠ CAUTION

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

8 Check to ensure all instrumentation is functioning properly and indicating normal readings.

CE31
ENGINE WARM UP

⚠ CAUTION

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

9 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.*

10 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 Mercury MerCruiser Dealer if you are unable to determine the problem.

CE426
STARTING WARM ENGINE

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

2 Turn key switch to the RUN position.

3 Turn key switch to START position and release when engine starts. Ensure that charge indicator and oil pressure warning lamps go out.

⚠ CAUTION

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

4 Ensure that all instrumentation is functioning properly and indicating normal readings.

CE33
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 Mercury MerCruiser Dealer if you are unable to determine the problem.

CB575
IMPORTANT: Avoid stopping engine if the drive unit is in gear. If engine does stop with drive unit in gear, refer to the following procedure:

3 Push and pull repeatedly on remote control handle until handle returns to the neutral detent position. This may take several tries if the power package was operating above idle rpm when the engine stopped.

4 After handle returns to the neutral detent position,resume normal starting procedures.

CD341
ENGINE SHUT-DOWN (STOPPING)

5 Place remote control lever in NEUTRAL.

⚠ CAUTION

Avoid damaging the turbocharger and engine. Immediate engine shutdown (stopping) after high load operation may result in permanent turbocharger bearing damage. Operate the engine at IDLE for several minutes before shut-down.

6 Operate the engine at idle speed for several minutes to allow the turbocharger and engine to cool.

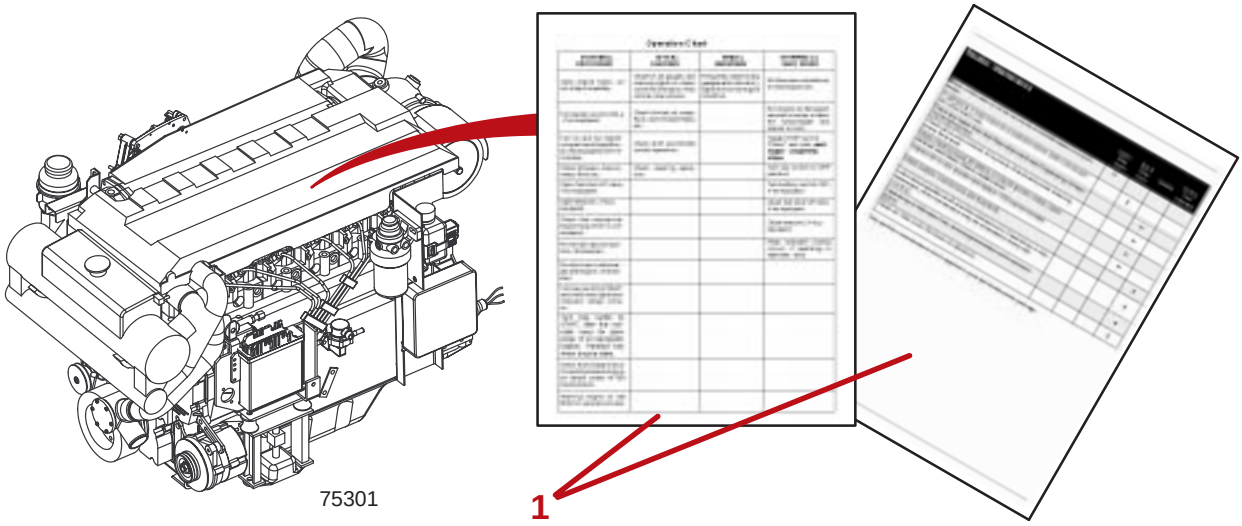
7 Toggle STOP switch DOWN and hold, until engine stops completely.

8 Turn key switch to the OFF position.

Operation Chart - D4.2L and D4.2L LD

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 the turbocharger and engine to cool.
Turn on and run engine compartment bilge blower, if so equipped, for five minutes.	Check shift and throttle control operation.		Toggle STOP switch DOWN and hold, **until engine completely stops.**
Check for leaks - fuel, oil, water, fluid, etc.	Check steering operation.		Turn key switch to OFF position.
Open fuel shut-off valve, if so equipped.			Turn battery switch OFF, if so equipped.
Open seacock, if so equipped.			Close fuel shut-off valve, if so equipped.
Check that mechanical engine-stop lever is *not* engaged.			Close seacock, if so equipped.
Prime fuel injection system, if necessary.			Flush seawater cooling circuit, if operating in saltwater area.
Pre-lubricate turbocharger and engine, if necessary.			
Turn key switch to RUN and check that lights and indicator lamps come on.			
Turn key switch to START, *after* the indicator lamp for glow plugs (if so equipped) ceases. Release key when engine starts.			
Check that charge indicator and oil pressure indicator lamps cease AFTER engine starts.			
Warm-up engine at idle rpm for several minutes.			

CD631



CE439

Starting, Shifting and Stopping - D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300

⚠ 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.

⚠ CAUTION

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

IMPORTANT: Observe the following before starting:

- **Provide water to the seawater pickup pump.**
- **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 Schedules and Operation Chart - D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300.

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

CE298
STARTING COLD ENGINE

IMPORTANT: Always check all fluid levels before starting engine. Refer to Maintenance Chart.

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

2 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 knob located on the fuel filter header. Move knob up and down four or five strokes. Attempt to start engine following normal procedure.

3 Turn key switch to the RUN position. Observe indicator lamp for glow plugs, if equipped. When cylinder temperature is great enough to sustain combustion, the indicator lamp will cease to be lighted and the engine can be started.

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

5 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 Mercury 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.

CE31
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 Mercury MerCruiser Dealer if you are unable to determine the problem.

CE32
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 Mercury MerCruiser Dealer if you are unable to determine the problem.

CE33
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 Mercury MerCruiser Dealer if you are unable to determine the problem.

CB575
IMPORTANT: Avoid stopping engine if the drive unit is in gear. If engine does stop with drive unit in gear, refer to the following procedure:

3 Push and pull repeatedly on remote control handle until handle returns to the neutral detent position. This may take several tries if the power package was operating above idle rpm when the engine stopped.

4 After handle returns to the neutral detent position,resume normal starting procedures.

CD366
ENGINE SHUT-DOWN (STOPPING)

1 Place remote control lever in NEUTRAL.

⚠ CAUTION

Avoid damaging the turbocharger and engine. Immediate engine shutdown (stopping) after high load operation may resulting in permanent turbocharger bearing damage. Operate the engine at IDLE for several minutes before shut-down.

2 Operate the engine at idle speed for several minutes to allow the turbocharger and engine to cool.

3 Turn key switch to the OFF position.

Operation Chart - D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300

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 equipped.	Check for fuel, oil, water, fluid, and exhaust leaks, etc.		Run engine at idle speed several minutes to allow the turbocharger and engine to cool.
Turn on and run engine compartment bilge blower, if 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, if equipped, to OFF.
Open fuel shutoff valve, if equipped.			Close fuel shutoff valve, if equipped.
Open seacock, if equipped.			Close seacock, if equipped.
Prime fuel injection system, if necessary.			Flush seawater cooling circuit, if operating in salt-water area.
Turn key switch to RUN and check that lights and indicator lamps come on.			
Turn key switch to START, *after* the indicator lamp for glow plugs, if equipped, ceases. Release key when engine starts.			
Check that charge indicator and oil pressure indicator lamps cease AFTER engine starts.			
Warm-up engine at idle rpm for several minutes.			

CE13
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.

CE440
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 silicate formula of ethylene glycol antifreeze in solution with deionized water. A low silicate formula prevents antifreeze 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 antifreeze/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.

Description	Part Number
Premixed Marine Engine Coolant	92-813054A2
Fleetguard Compleat (Product 91-50663 With DCA4 Additive)	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.

CE16
Diesel Fuel In Cold Weather

Unaltered diesel fuels thicken and “gel” in cold temperatures, unless treated. Virtually all diesel fuels are “climatized” 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.

CD865
Engine Oil

⚠ CAUTION

ENVIRONMENTAL HAZARD! **Discharge of oil or oil waste into the environment is restricted by law. Do NOT spill oil or oil waste into the environment when using or servicing your boat. Contain and dispose of oil or oil waste as defined by local authorities.**

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 and CH-4.

We strongly recommend the use of:

Description	Part Number
Mercury Diesel Engine Oil	92-877695K1

These oils are both specially blended 15W-40 oil with Marine Additives, for all temperature operation. They both exceed requirements for API CF-2, CF-4, CG-4 and CH-4 oils.

Other recommended oils:

SHELL MYRINA	TEXACO URSA SUPER TD	VEEDOL TURBOSTAR
MOPAR	WINTERSHALL MULTI-REKORD	WINTERSHALL VIVA 1

These oils are approved by Mercury Marine and Marine Power Europe. For all temperature operation use 15W-40 oil.

Engine Specifications

D4.2L

Description		Specification - Inboard (MIE)
		D4.2L
Crankshaft Horsepower (Kilowatts) [1]		220 (164)
Propeller Shaft Horsepower (Kilowatts) [1]		210 (157)
Engine Type		In-Line 6 Cylinder Diesel
Displacement		254 cu. in. (4.2 L)
Firing Order		1 - 5 - 3 - 6 - 2 - 4
Bore		3.700 in. (94 mm)
Stroke		3.937 in. (100 mm)
Compression Ratio		21.5:1
Valve Clearance - Intake / Exhaust		Hydraulic
Maximum Pressure Difference Between Cylinders		72 psi (500 kPa)
Maximum High Idle No Load rpm		4200 ± 50
Governed rpm Setting (Begins At:)		3630 ± 20
Rated rpm At Wide Open Throttle [2]		3600
Idle rpm in Forward Gear		700
Oil Pressure:	750 rpm	22-36 psi [1.5 - 2.5 bar (152-248 kPa)]
	3600 - 3800 rpm	50-58 psi [3.5 - 4 bar (345-400 kPa)]
Oil Temperature		212 - 230 F (100 - 110 C) Degrees
Thermostats:	Water: (2 Total) 1 at temp. :	160 F (70 C) Degrees
	1 at temp :	180 F (82 C) Degrees
	Oil:	203 F (95 C) Degrees
Coolant Temperature		176 - 185 F (80 - 85 C) Degrees
Electrical System		12-volt Negative (–) Ground
Alternator Rating		949W, 14.6v, 65A
Recommended Battery Rating		750 cca / 950 mca / 180 Ah
Starter		12v, 2.7 kW

[1] Power rated in accordance with NMMA Procedure - ISO 3046 (Technically Identical to ICOMIA 28-83).

[2] Refer to “Conditions Affecting Operation - Propeller Selection” for additional information.

D4.2L LD

Description		Specification - Inboard (MIE)
		D4.2L LD
Crankshaft Horsepower (Kilowatts) [1]		200 (149)
Propeller Shaft Horsepower (Kilowatts) [1]		194 (145)
Engine Type		In-Line 6 Cylinder Diesel
Displacement		254 cu. in. (4.2 L)
Firing Order		1 - 5 - 3 - 6 - 2 - 4
Bore		3.700 in. (94 mm)
Stroke		3.937 in. (100 mm)
Compression Ratio		16.5:1
Valve Clearance - Intake / Exhaust		Hydraulic
Maximum Pressure Difference Between Cyl.		72 psi (500 kPa)
Maximum High Idle No Load rpm		4000 ± 50
Governed rpm Setting (Begins At:)		3650 ± 50
Rated rpm at Wide Open Throttle [2]		3600
Idle rpm in Forward Gear		600
Oil Pressure:	600 rpm	19-22 psi [1.3 - 1.5 bar (130-149 kPa)]
	3600 rpm	50-58 psi [3.5 - 4 bar (345-400 kPa)]
Oil Temperature		212 - 230 F (100 - 110 C) Degrees
Thermostats:	Water: (2 Total) 1 at temperature :	160 F (70 C) Degrees
	1 at temperature. :	180 F (82 C) Degrees
	Oil: (1 Total)	203 F (95 C) Degrees
Coolant Temperature		176 - 185 F (80 - 85 C) Degrees
Electrical System		12-volt Negative (–) Ground
Alternator Rating		980W, 14.6v, 70A
Recommended Battery Rating		750 cca / 950 mca / 180 Ah
Starter		12v, 2.7 kW

[1] Power rated in accordance with NMMA Procedure - ISO 3046 (Technically Identical to ICOMIA 28-83).

[2] Refer to “Conditions Affecting Operation - Propeller Selection” for additional information.

D2.8L D-TRONIC AND D4.2L D-TRONIC

Description		Specification - Inboard (MIE)	
		D2.8L D-Tronic	D4.2L D-Tronic
Crankshaft Horsepower (Kilowatts) [1]		165 (123)	250 (186)
Propeller Shaft Horsepower (Kilowatts) [1]		160 (119)	240 (179)
Engine Type		In-Line 4 Cylinder Diesel	In-Line 6 Cylinder Diesel
Displacement		169 cu. in. (2.8 L)	254 cu. in. (4.2 L)
Firing Order		1 - 3 - 4 - 2	1 - 5 - 3 - 6 - 2 - 4
Bore		3.700 in. (94 mm)	
Stroke		3.937 in. (100 mm)	
Compression Ratio		16.5:1	
Valve Clearance - Intake / Exhaust		Hydraulic	
Maximum Pressure Difference Between Cylinders		72 psi (500 kPa)	
Maximum High Idle No Load rpm		4200 ± 50	
Governed rpm Setting (Begins At:)		3850 ± 50	
Rated rpm at Wide Open Throttle [2]		3800	
Low Idle rpm		700 [3]	
		600 [4]	
Oil Pressure:	750 rpm	22-45 psi (1.5 - 3.1 bar [152-310 kPa])	
	3800 rpm	50-80 psi (3.5 - 5.6 bar [345-556 kPa])	
Oil Temperature		212 - 230 F (100 - 110 C) Degrees	
Thermostats:	Water: (2 Total) 1 at temperature :	160 F (70 C) Degrees	
	1 at temperature :	180 F (82 C) Degrees	
	Oil: (1 Total)	203 F (95 C) Degrees	
Coolant Temperature		176 - 185 F (80 - 85 C) Degrees	
Electrical System		12-volt Negative (–) Ground	
Alternator Rating		949W, 14.6v, 65A	
Recommended Battery Rating		750 cca / 950 mca / 180 Ah	
Starter		12v, 2.7 kW	

[1] Power rated in accordance with NMMA Procedure - ISO 3046 (Technically Identical to ICOMIA 28-83).

[2] Refer to “Conditions Affecting Operation - Propeller Selection” for additional information.

[3] Mercury Serial Number 0L343084 and Below on D2.8L D-Tronic Engines. Mercury Serial Number 0L343703 and Below on D4.2L D-Tronic Engines.

[4] Mercury Serial Number 0L343085 and Above on D2.8L D-Tronic Engines. Mercury Serial Number 0L343704 and Above on D4.2L D-Tronic Engines.

Description		Specification - Inboard (MIE)
		D4.2L 300
Crankshaft Horsepower (Kilowatts) [1]		300 (224)
Propeller Shaft Horsepower (Kilowatts) [1]		288 (215)
Engine Type		In-Line 6 Cylinder Diesel
Displacement		254 cu. in. (4.2 L)
Firing Order		1 - 5 - 3 - 6 - 2 - 4
Bore		3.705 in. (94.1 mm)
Stroke		3.941 in. (100.1 mm)
Compression Ratio		17.0:1
Valve Clearance - Intake / Exhaust		Hydraulic
Maximum Pressure Difference Between Cylinders		72 psi (500 kPa)
Maximum High Idle No Load rpm		4200 ± 50
Governed rpm Setting (Begins At:)		3950 ± 50
Rated rpm at Wide-Open-Throttle [2]		3800
Low Idle rpm		600
Oil Pressure:	750 rpm	19-22 psi (1.3 - 1.5 bar [130-149 kPa])
	3800 rpm	50-80 psi (3.5 - 5.6 bar [345-556 kPa])
Oil Temperature		212 - 230 F (100 - 110 C) Degrees
Thermostats:	Water: (2 Total) 1 at temp. :	160 F (70 C) Degrees
	1 at temp. :	180 F (82 C) Degrees
	Oil:	203 F (95 C) Degrees
Coolant Temperature		176 - 185 F (80 - 85 C) Degrees
Electrical System		12-volt Negative (–) Ground
Alternator Rating		949W, 14.6v, 65A
Recommended Battery Rating		750 cca, 950 mca, or 180 Ah
Starter		12v, 3.0 kW

[1] Power rated in accordance with NMMA Procedure - ISO 3046 (Technically Identical to ICOMIA 28-83).

[2] Refer to Conditions Affecting Operation - Propeller Selection for additional information.

CD868
Fluid Capacities

ENGINES

NOTICE
Unit Of Measurement: U.S. Quarts (Liters). **All capacities are approximate fluid measures.**

Model		D2.8L D-Tronic	D4.2L D4.2L LD D4.2L D-Tronic D4.2L 300
Total Oil Capacity [1]		8-1/2 (10)	12-3/4 (12)
Oil Drainage	Oil Pan	6-1/2 (8)	10-3/4 (10)
	Oil Filter	1 (1)	
	Oil Cooler	1 (1)	
Closed Cooling Circuit		11-2/3 (11)	13-3/4 (13)

[1] Always use dipstick to determine exact quantity of oil required

CE359
TRANSMISSIONS

IMPORTANT: It may be necessary to adjust oil levels depending on installation angle and cooling systems (heat exchanger and fluid lines).

NOTICE
Unit Of Measurement: U.S. Quarts (Liters). **All capacities are approximate fluid measures.**

Make And Model		Specification[1]	Fluid Type
Hurth	630A	3-1/4 (3)	Dexron III Automatic Transmission Fluid
	630V	4-1/2 (4)	
	450A	4-1/2 (4)	

[1] Always use dipstick to determine exact quantity of oil required

CD10
Maintenance

CE365
General 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 be purchased and read thoroughly.

NOTE: *Maintenance points are color coded for ease of identification. See the decal on engine for identification.*

CE419
Maintenance Aids

1 Hurth Transmission Fluid – Dexron III Automatic Transmission Fluid (ATF).
2 All pivot points - SAE 30W motor oil.
3 All Exterior Surfaces - Quicksilver Primer and Spray Paint, as needed, and Quicksilver Corrosion Guard.
4 Crankcase Oil - use ONLY specified engine oil. Refer to Specifications.
5 Closed Cooling System Coolant - use ONLY specified engine coolant. Refer to Specifications.

Maintenance Schedules

Routine Maintenance *

	Each Day Start	Each Day End	Weekly	Every Two Months
Check engine oil level (interval can be extended based on experience). Check coolant level in coolant recovery bottle.	●			
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 transmission fluid.			●	
Check water pickups for debris or marine growth. Check water strainer and clean. Check coolant level.			●	
Check battery connections and fluid level.				●
Clean air filter every 50 hours of operation.				●
Operating in Saltwater Only: treat engine surface with corrosion guard.				●
Ensure that the gauges and the wiring connections are secure. Clean the gauges.[1]				●

***** Only perform maintenance which applies to your particular power package.

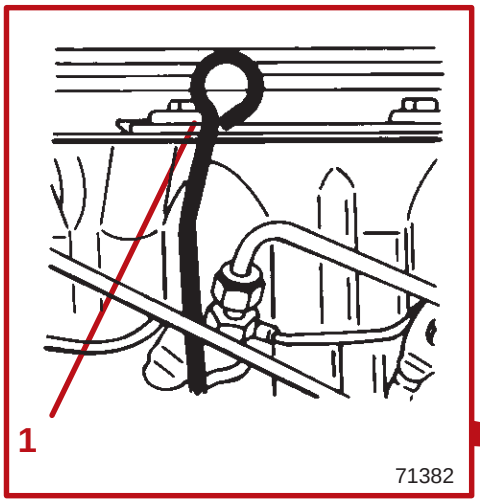
[1] Or every 50 hours, whichever occurs first. If operating in saltwater, interval is reduced to every 25 hours or 30 days whichever occurs first

Maintenance Schedules (Continued)

Scheduled Maintenance *	After First 20 hours	Annually	Every 100 hours or Annually ◆	Every 200 hours or 3 years ◆	Every 2 years	Every 500 hours or 5 years ◆	Every 1000 hours or 5 years ◆	Per OEM
Change engine oil and filter.	●		●					
Touch-up paint power package and spray with corrosion guard.		●						
Change transmission fluid.			●					
Replace fuel filter(s).			●					
Check steering system and remote control for loose, missing or damaged parts. Lubricate cables and linkages.			●					
Retorque engine mounts.			●					
Check electrical system for loose, damaged or corroded fasteners.			●					
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 on diesel models.			●					
Replace coolant.					●			
Replace air filter.				●				
Clean aftercooler core.						●		
Clean fuel tank.							●	
Check engine-to-propeller shaft alignment.								●

***** Only perform maintenance which applies to your particular power package.

◆ Whichever Occurs First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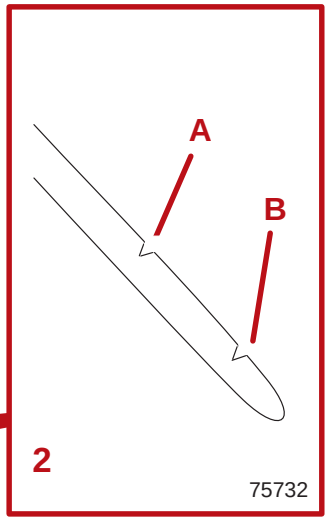
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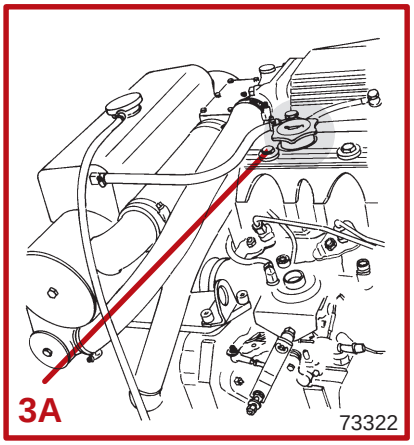
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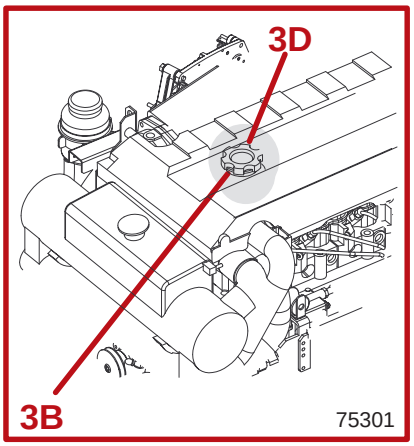
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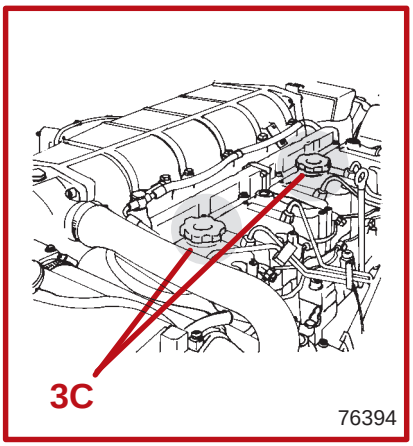
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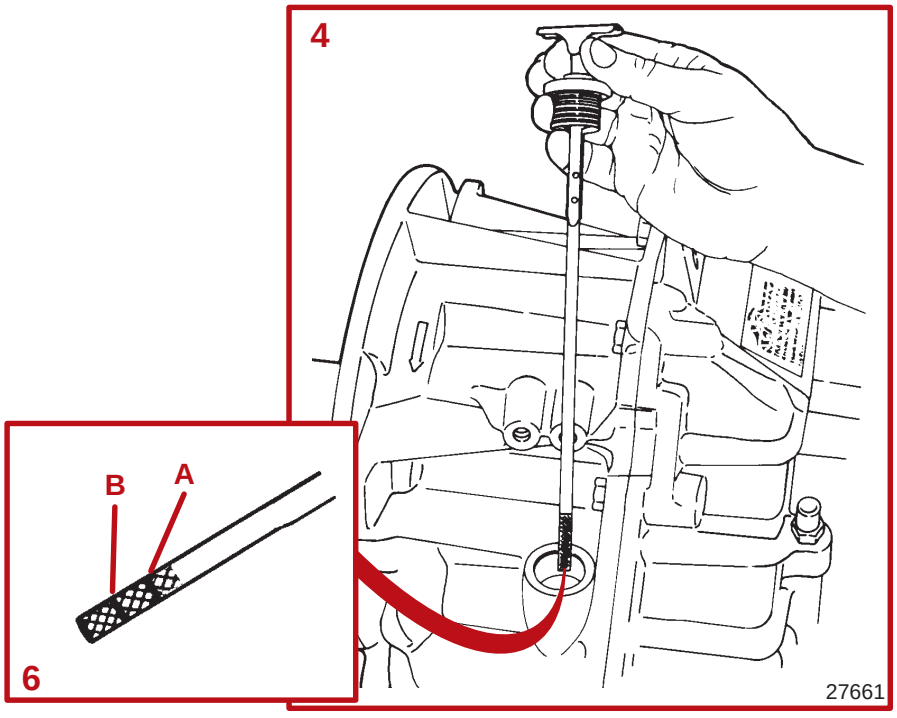
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CD871
Checking Fluid Levels

ENGINE OIL

⚠ CAUTION

Avoid possible injury or damage to oil dipstick and internal engine components. Do not remove crankcase oil dipstick when engine is running. Stop the engine completely before removing or inserting dipstick.

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

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

2 Remove dipstick and observe oil level. Oil must be between marks on dipstick. If necessary, add oil as follows.

A Maximum Mark

B Minimum Mark

3 Remove oil filler cap. Add specified oil to bring level up to, but not over, MAX mark on dipstick. Reinstall oil filler cap.

A D4.2L

B D2.8L D-Tronic and D4.2L D-Tronic

C D4.2L LD

D D4.2L 300

CE445

TRANSMISSION FLUID

ZF / Hurth Hydraulic Transmission

4 Push dipstick handle down and seat fully before checking fluid level.

5 Remove dipstick. Dipstick has neoprene seal - twist and pull to remove. Check fluid level as indicated on dipstick. Fluid level may be somewhat over maximum mark, as some of the fluid from transmission fluid cooler and hoses may have drained back into transmission.

6 If low, add transmission fluid to bring level up to maximum mark on dipstick.

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

B MINIMUM Fluid Level - do not allow fluid level to drop below this line.

IMPORTANT: To accurately check fluid level, engine must be run at 1500 rpm for two minutes immediately prior to checking level.

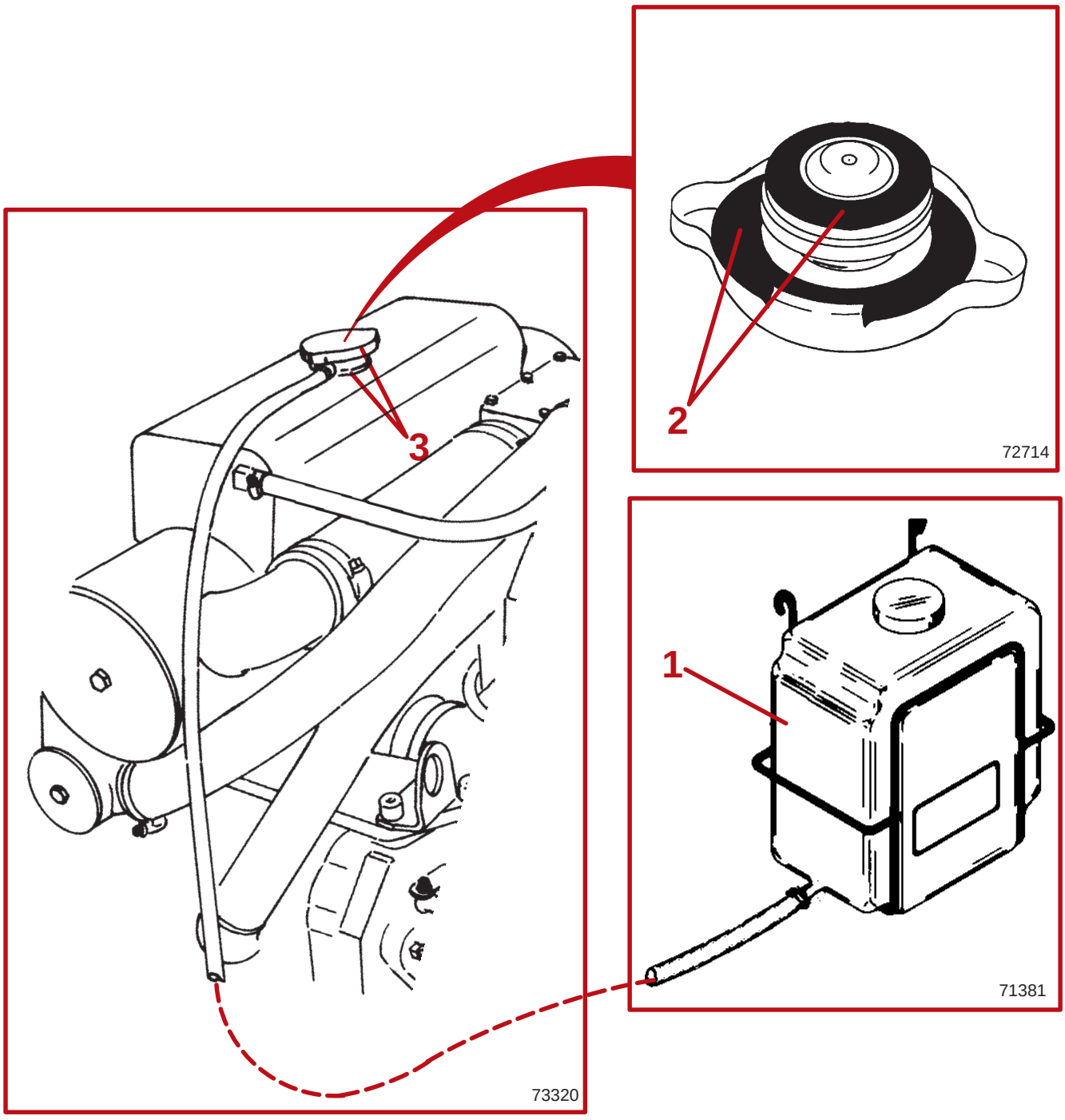
7 Start engine and run at 1500 rpm for two minutes to fill all hydraulic circuits.

IMPORTANT: Be sure to push dipstick all the way down into dipstick tube when checking fluid level.

8 Stop engine and quickly check fluid level. Add specified automatic transmission fluid, if necessary, to bring level up to maximum mark on dipstick.

9 Reinstall dipstick.

10 If transmission fluid level was extremely low, contact your Authorized Mercury MerCruiser Dealer.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CD166
ENGINE COOLANT

1 Before starting engine, check coolant level in coolant recovery bottle. Coolant level must be between the “ADD” and “FULL” marks (on front of bottle). If level is low, remove fill cap from coolant recovery bottle and add specified coolant as required. Refer to “Specifications” for proper coolant.

⚠ WARNING

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

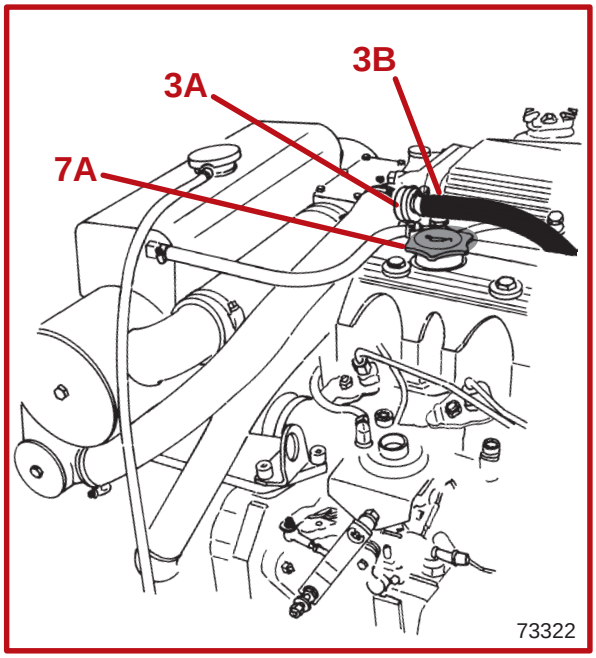
2 If coolant level in coolant recovery bottle was low:

- 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 Mercury 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.

3 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 specified coolant as necessary to bring up to proper level. Refer to items **1** and **2** above.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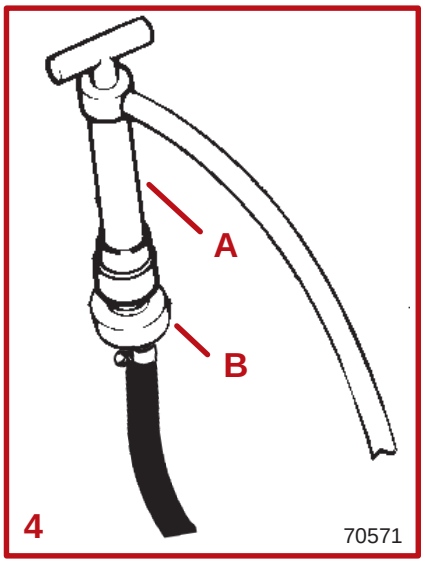
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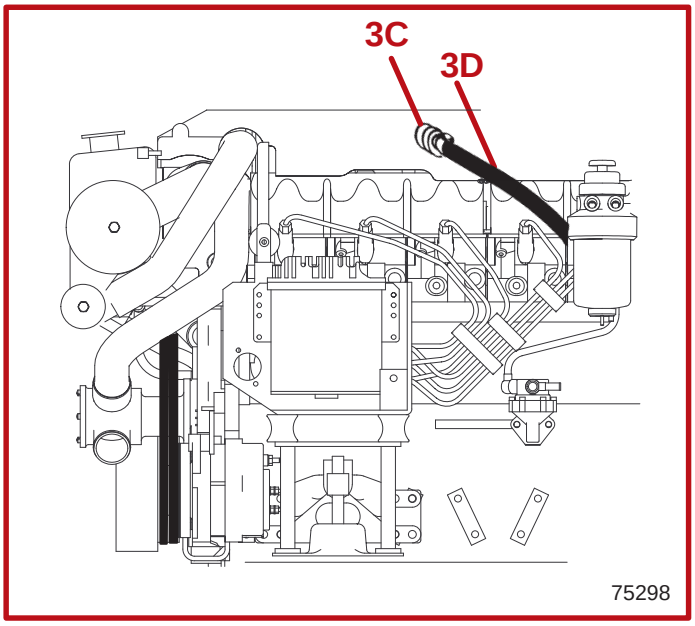
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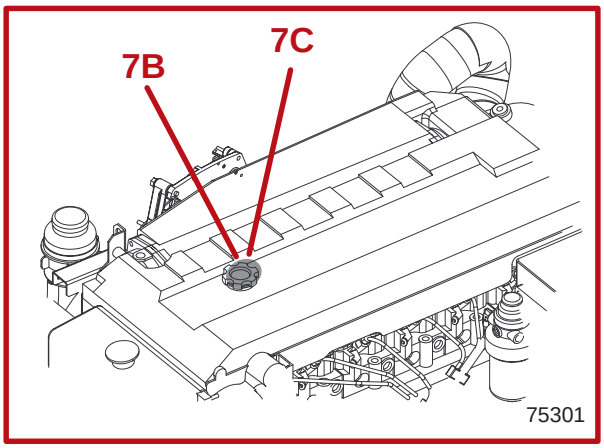
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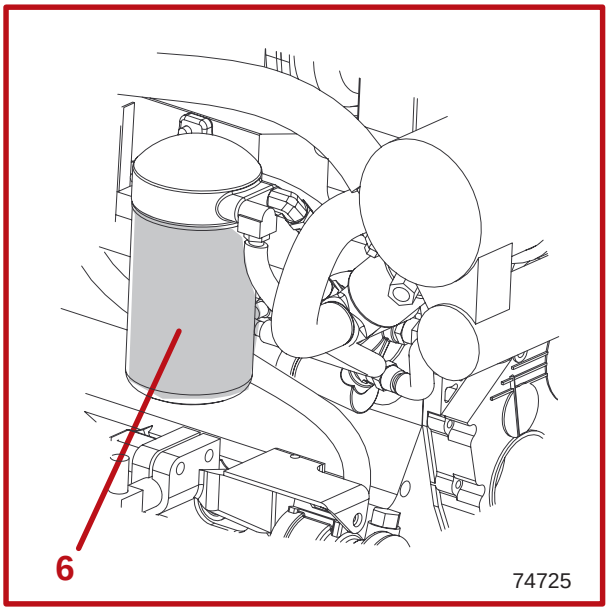
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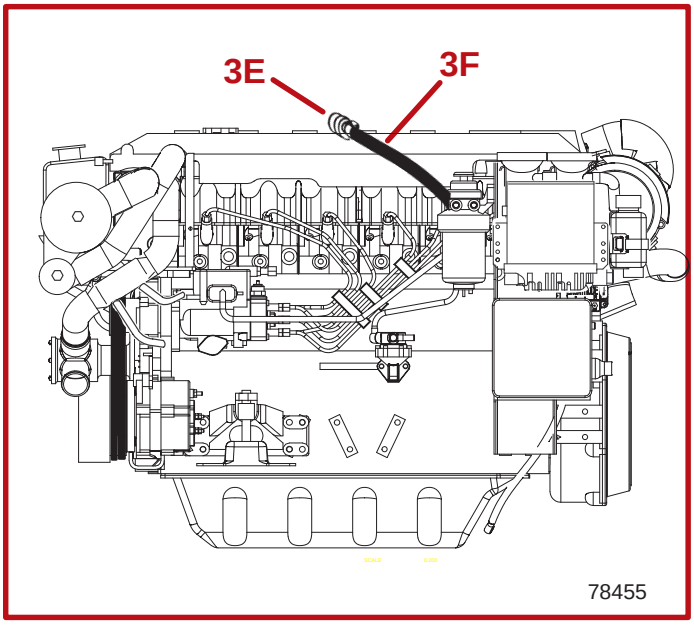
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CE446

Changing Fluids

Refer to Maintenance Schedules for lubricant change interval. Lubricant should be changed before placing boat in storage.

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

ENGINE OIL AND FILTER - D4.2L, D2.8L D-TRONIC, D4.2L D-TRONIC AND D4.2L 300

IMPORTANT: Change oil when engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use only recommended motor oil. Refer to Specifications.

1 Start engine and allow it to warm up to normal operating temperature.

2 Stop engine and allow some time for oil to drain into oil pan (approximately 5 minutes).

3 Remove fitting from end of crankcase oil drain hose laying on top of engine.

A Fitting - D4.2L

B Oil drain hose - D4.2L

C Fitting - D2.8L D-Tronic, D4.2L D-Tronic and Early D4.2L 300 With Front Mounted ECM

D Oil drain hose - D2.8L D-Tronic, D4.2L D-Tronic and Early D4.2L 300 With Front Mounted ECM

E Fitting - D4.2L 300 With Rear Mounted ECM

F Oil drain hose - D4.2L 300 With Rear Mounted ECM

4 Install crankcase oil pump onto threaded fitting of oil drain hose.

A Crankcase oil pump (Quicksilver Part Number 90265A2)

B Threaded fitting

5 Pump oil out of crankcase into drain pan. When crankcase is empty, remove pump and reinstall crankcase oil drain hose fitting. Tighten securely.

6 Remove and discard oil filter and sealing ring. Coat sealing ring on new filter with oil and install filter. Hand tighten only, do not use a filter wrench.

7 Remove oil fill cap and refill engine with new oil. Refer to Specifications for quantity and grade of oil.

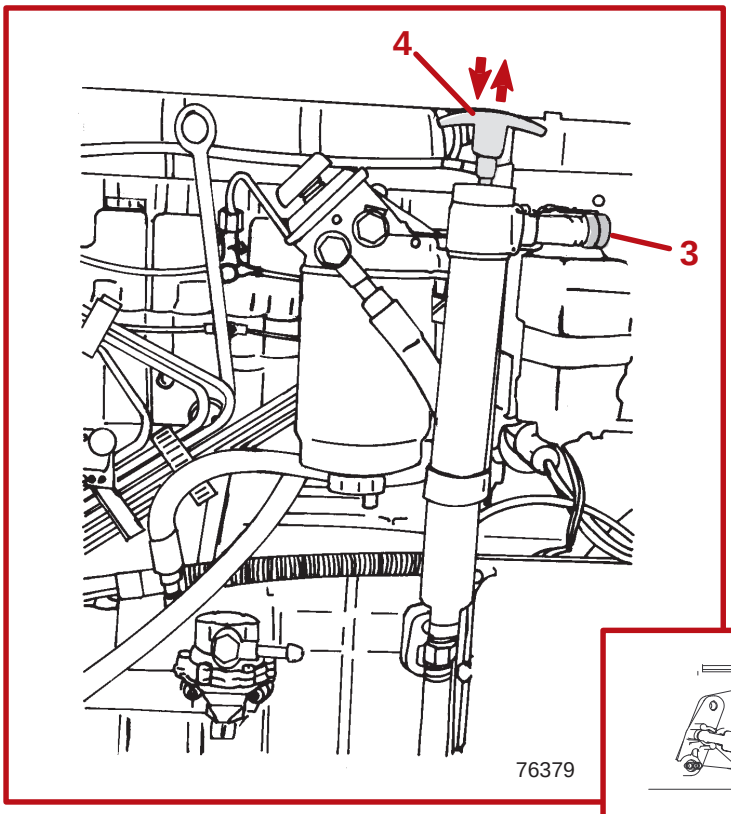
A D4.2L

B D2.8L D-Tronic and D4.2L D-Tronic

C D4.2L 300

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

IMPORTANT: On D4.2L Engines only: After oil change, pre-lubricate turbocharger and engine. To do this, move the stop switch toggle lever DOWN and hold in this position while you turn the key switch to START position. Doing this TOGETHER turns the engine without starting it. 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. Watch that starter does not overheat.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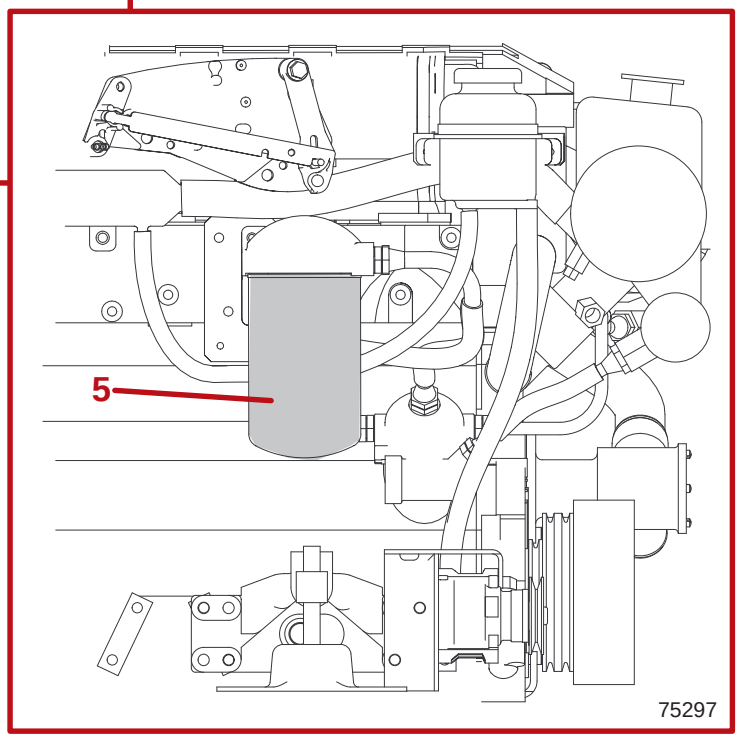
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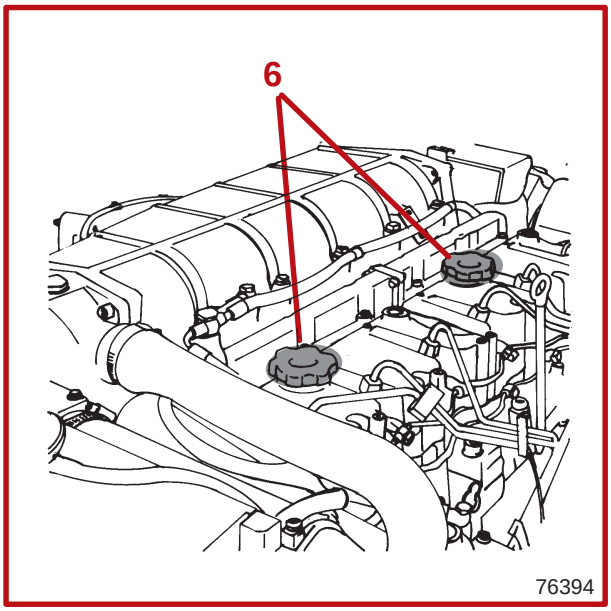
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ENGINE OIL AND FILTER - D4.2L LD

IMPORTANT: Change oil when engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use only recommended motor oil. Refer to Specifications.

1 Start engine and allow it to warm up to normal operating temperature.

2 Stop engine and allow some time for oil to drain into oil pan (approximately 5 minutes).

3 Remove fitting from end of crankcase oil pump. Attach a suitable hose for draining.

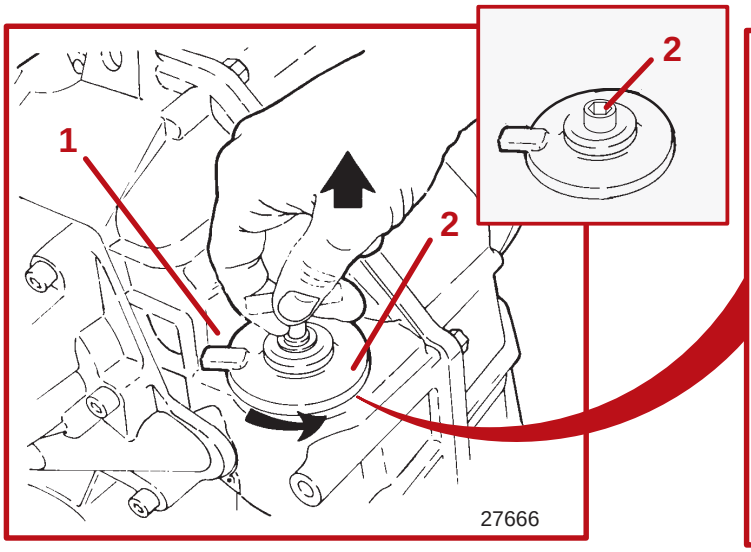
4 Pump oil out of crankcase into drain pan. When crankcase is empty, remove hose and reinstall crankcase oil pump fitting. Tighten securely.

5 Remove and discard oil filter and sealing ring. Coat sealing ring on new filter with oil and install filter. Hand tighten only, do not use a filter wrench.

6 Remove oil fill cap and refill engine with new oil. Refer to Specifications for quantity and grade of oil.

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

IMPORTANT: After oil change, pre-lubricate turbocharger and engine. To do this, move the Stop Switch toggle lever DOWN and hold in this position while you turn the Key Switch to START position. Doing this TOGETHER turns the engine without starting it. 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. Watch that starter does not overheat.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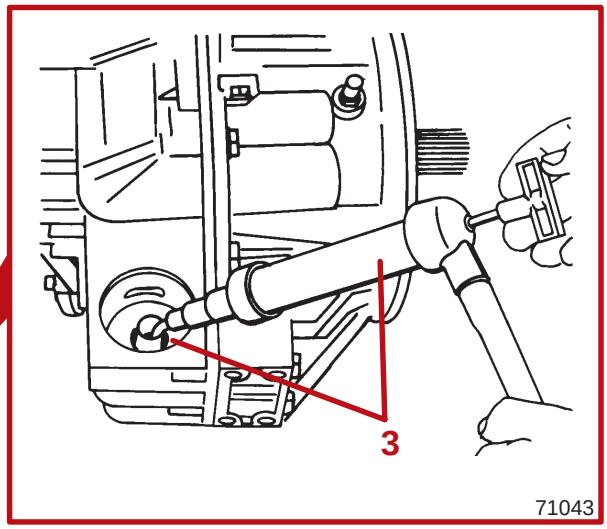
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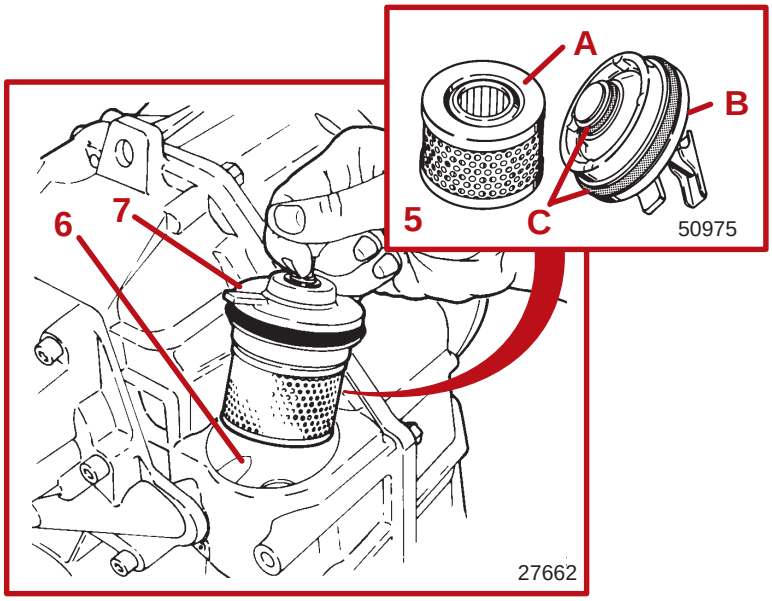
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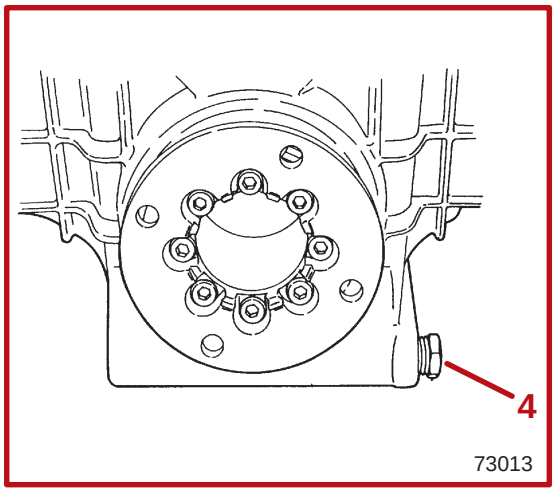
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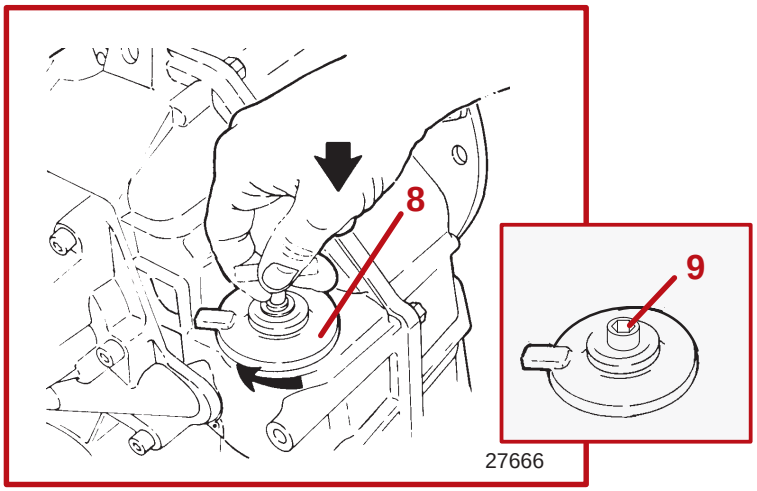
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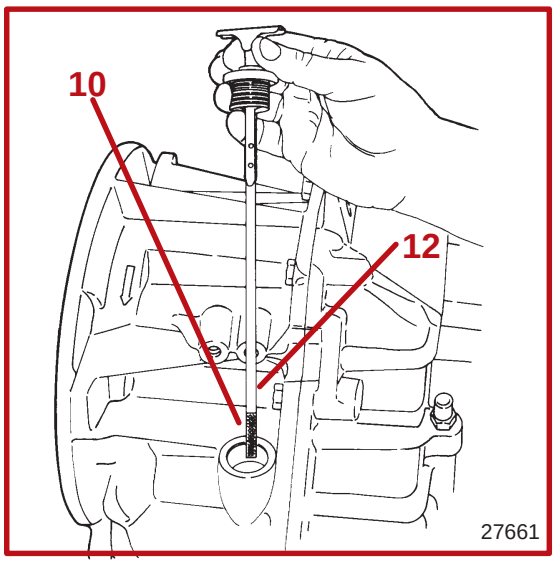
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TRANSMISSION FLUID

1 Clean the exterior of transmission around the fluid filter assembly.

2 Use a 6 mm allen wrench and remove the fluid filter assembly from the transmission by turning assembly nut counterclockwise and pulling at the same time.

3 **Hurth Down-Angle Models:** Push the hose of a suction pump through suction pipe and down to the bottom of the housing. Pump the fluid from the housing.

4 **Hurth V-Drive Models:** Remove drain plug from transmission and allow fluid to drain. Reinstall drain plug and tighten securely.

5 Remove and discard the filter element and the O-rings.

A Filter Element

B Cover

C O-rings

6 Coat new O-rings with transmission fluid.

7 Install new O-rings and filter element.

8 Install the fluid filter assembly in the transmission cavity by turning clockwise and pushing at the same time.

⚠ CAUTION

Transmission fluid filter assembly must be properly seated to avoid fluid foaming and/or loss of fluid resulting in decreased efficiency and/or damage to transmission.

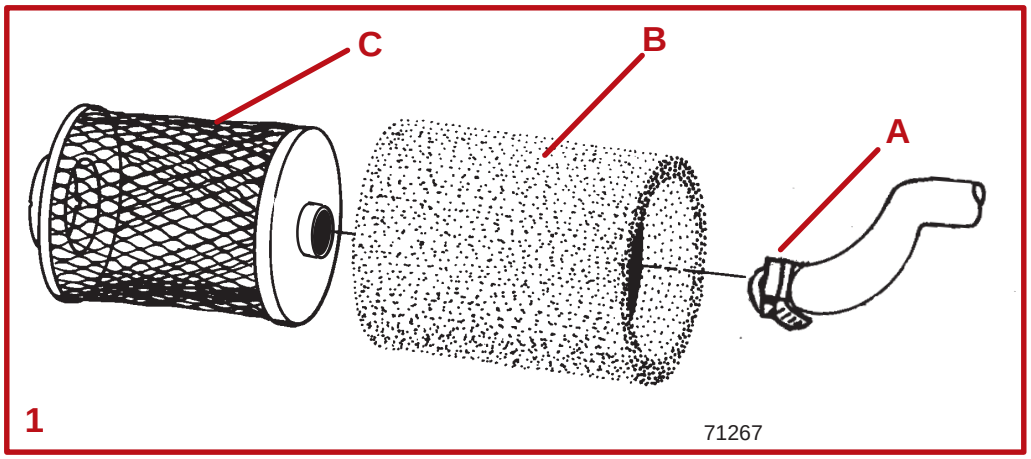
9 Using a 6 mm allen wrench turn assembly nut clockwise until tight.

IMPORTANT: Use only specified Automatic Transmission Fluid (ATF).

10 Fill the transmission with specified fluid to the proper level through the dipstick tube. Refer to Specifications - Fluid Capacities.

11 Start engine and run for two minutes to fill system with fluid.

12 Stop engine and quickly check fluid level. Refer to Checking Fluid Levels - Transmission Fluid.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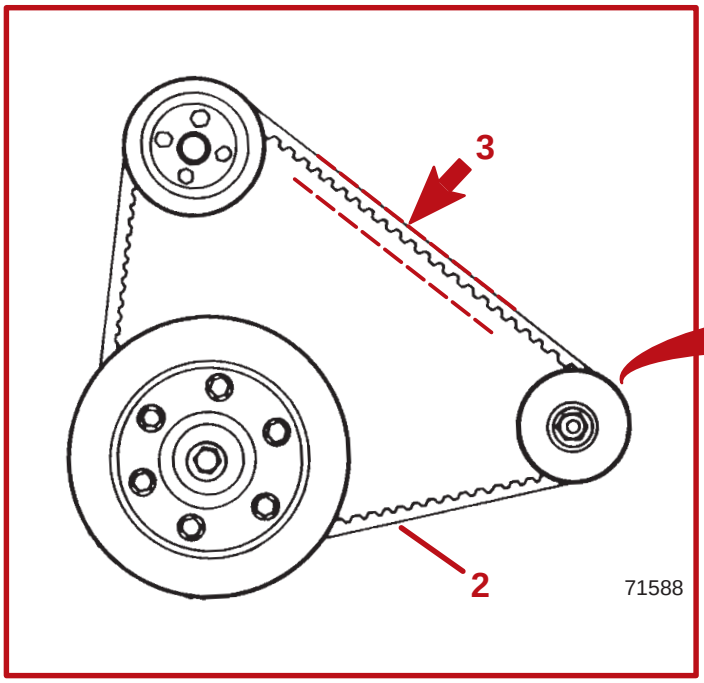
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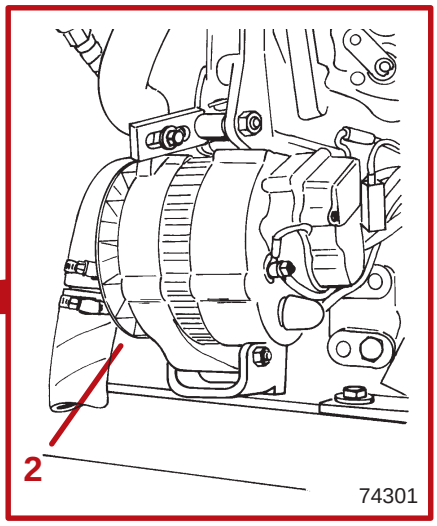
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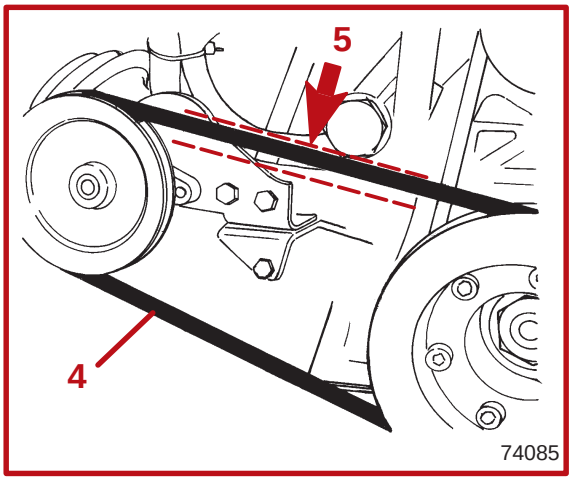
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CD648

Air Filter Cleaning / Replacement

1 Disconnect crankcase vent hose from end of air cleaner. Carefully remove air cleaner foam element from around air intake screen housing mounted on turbocharger inlet. Wash foam element in warm water and detergent until clean.

A Crankcase Vent Hose

B Foam Element

C Intake Screen Housing

⚠ CAUTION

Avoid potential fire hazards and injury, or damage to polyester foam element. Do not clean foam element in petroleum based solvents or cleaners.

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

Allow element to completely dry before use and install around air intake screen. Replace the foam element if it is deteriorated or torn. Refer to Maintenance Schedules for replacement interval under normal conditions.

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

CE429

Drive Belts - All Engines

All drive belts must be periodically inspected for tension and condition (excessive wear, cracks, fraying, or glazed surfaces).

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

IMPORTANT: On models with dual-row pulleys and dual belts always inspect both belts. Never renew just one of the two belts driving the alternator and engine water circulating pump. Always replace both belts as a pair, preferably as a "matched pair."

⚠ WARNING

Make sure engine is shut off and ignition key is removed before inspecting belts.

ALTERNATOR DRIVE BELT AND ENGINE WATER CIRCULATING PUMP BELT, OR BELTS

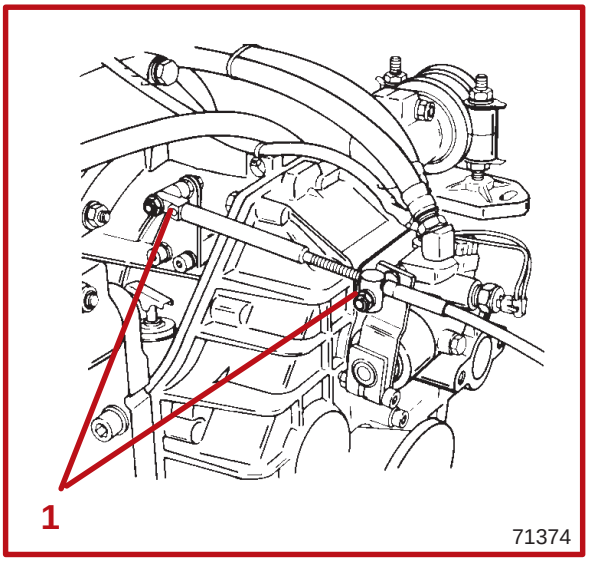
2 Inspect drive belt, or belts, for excessive wear or damage.

3 Check belt tension by depressing upper strand of belt, with moderate hand pressure, at point shown. Belt should move no more than 3/16 in. (5 mm) either way.

VACUUM PUMP BELT (IF EQUIPPED)

4 Inspect drive belt for excessive wear or damage.

5 Check belt tension by depressing upper strand of belt, with moderate hand pressure, at point shown. Belt should move no more than 3/16 in. (5 mm) either way.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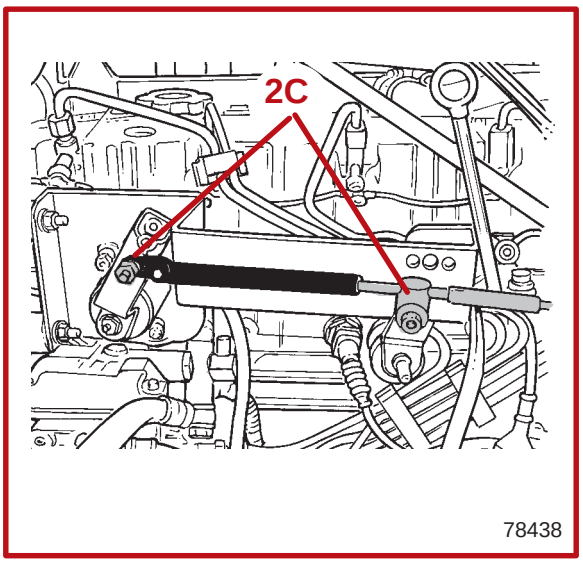
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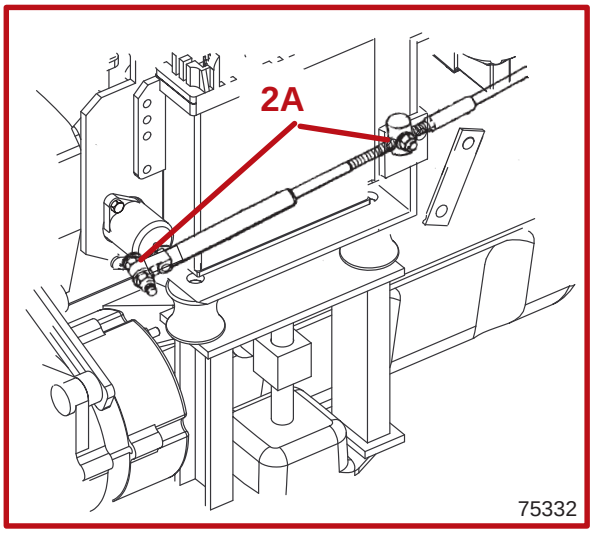
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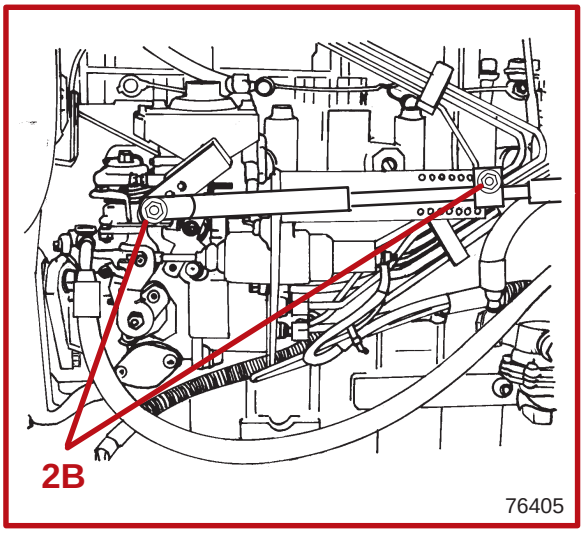
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CE374
Lubrication

SHIFT CABLE

1 Lubricate pivot points with SAE 30W motor oil.

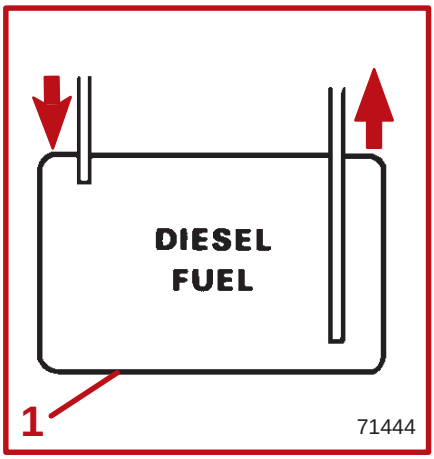
CD878
THROTTLE CABLE

2 Lubricate pivot points with SAE 30W motor oil.

A D2.8L D-Tronic, D4.2L D-Tronic and D4.2L 300 With Front Mounted ECM

B D4.2L, and D4.2L LD

C D4.2L 300 With Rear Mounted ECM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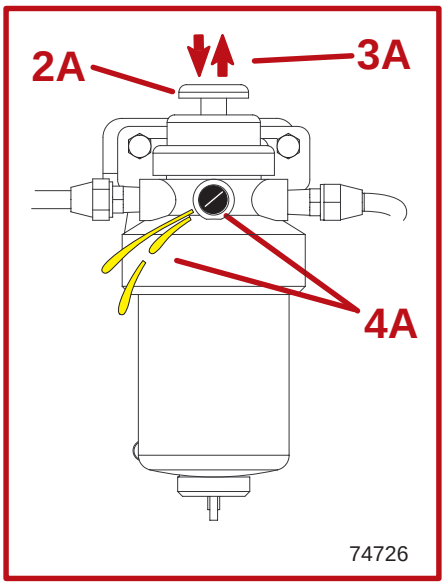
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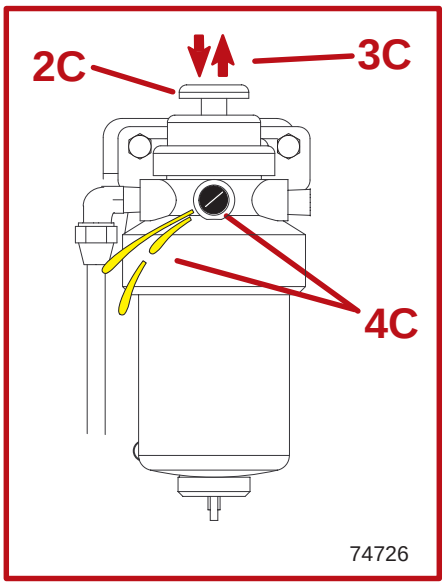
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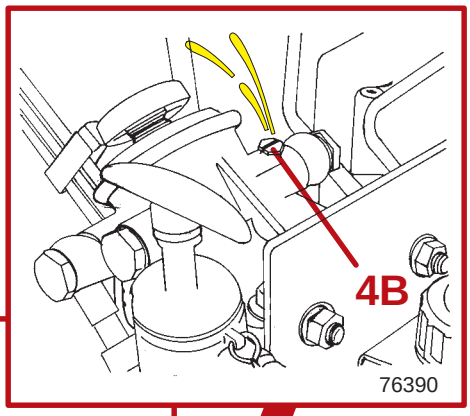
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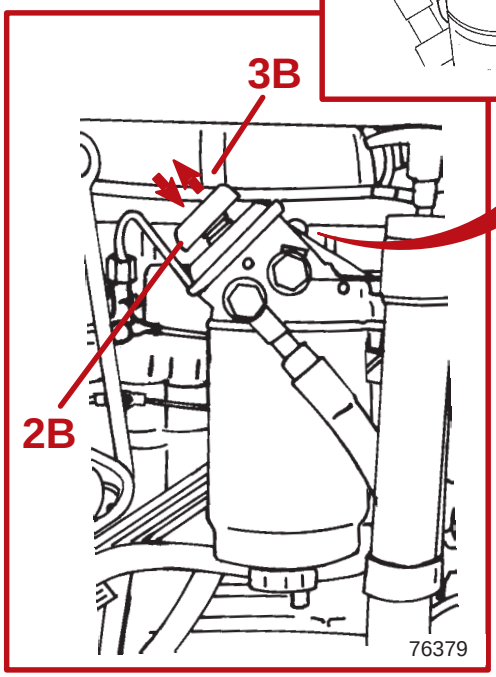
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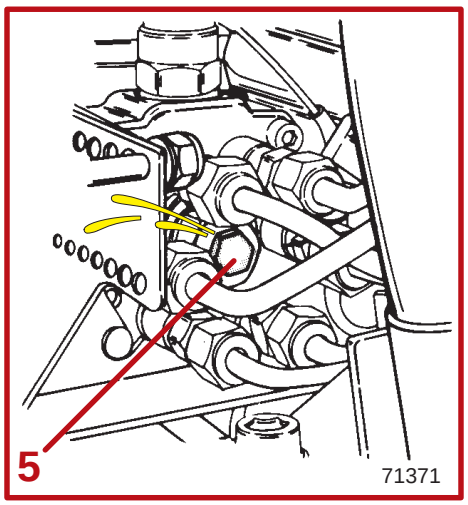
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CE406
Fuel System

⚠ 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.

1 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.

CD880
HAND PUMP/PRIMER

2 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.

A D4.2L Models.

B D2.8L D-Tronic, D4.2L D-Tronic and D4.2L LD Models.

C D4.2L 300

CD881
PRIMING FUEL SYSTEM

3 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.

A D4.2L Models.

B D2.8L D-Tronic, D4.2L D-Tronic and D4.2L LD Models.

C D4.2L 300

CD882
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.

A D4.2L Models.

B D2.8L D-Tronic, D4.2L D-Tronic and D4.2L LD Models.

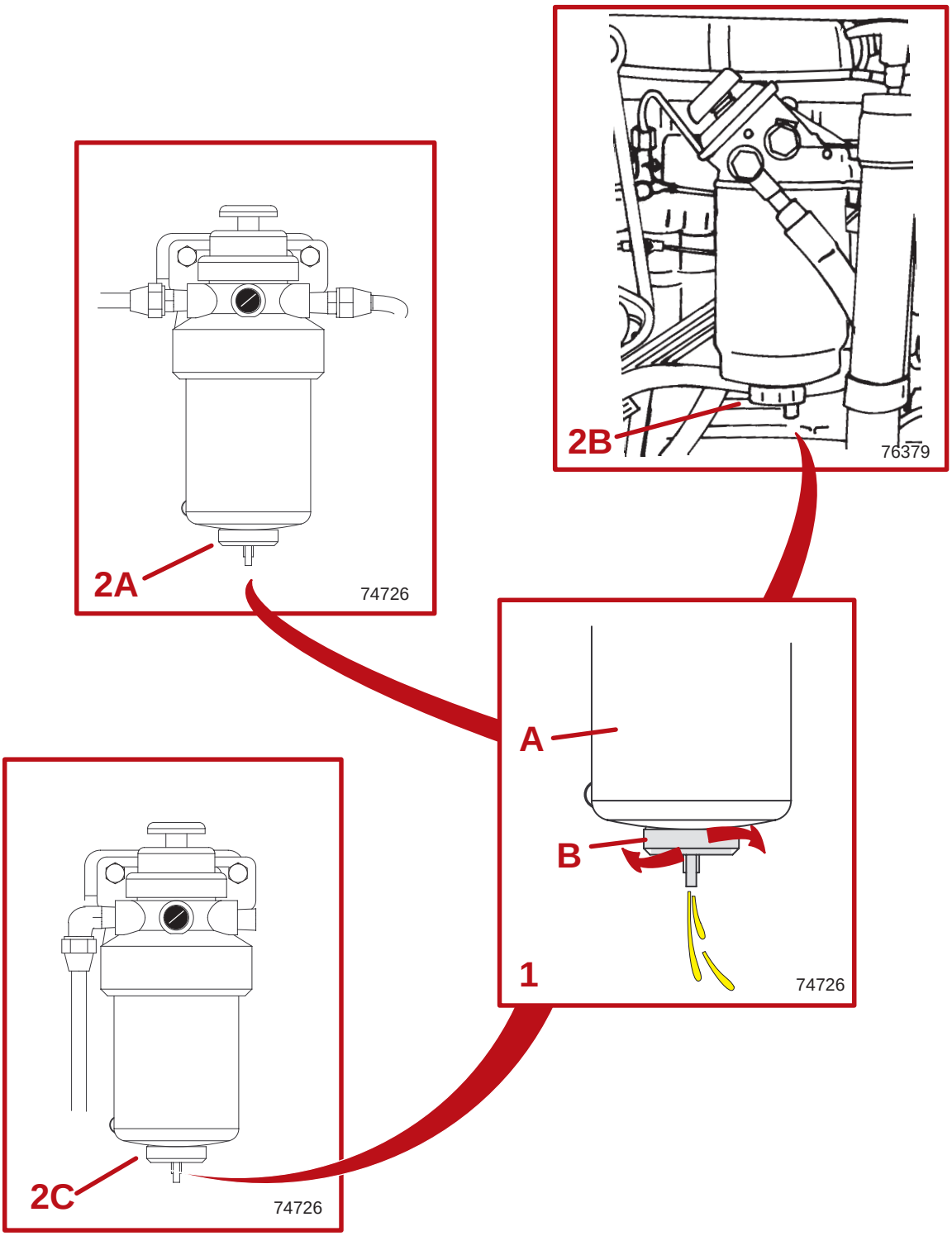
C D4.2L 300

CD725
FILLING (BLEEDING) FUEL SYSTEM

NOTE: *Follow this procedure if fuel system was run dry or if part of fuel system was drained for a service function.*

Fill fuel system up to the point that fuel filter is full following previous procedure (Filling Fuel Filter); then, ensure that bleed screw on fuel filter bracket is closed.

5 **D4.2L and D4.2L LD Only:** Loosen, DO NOT REMOVE, bleed screw on fuel injection pump (located between fuel line connection fittings on injection pump). Continue to repeatedly move plunger on hand pump/primer, until an air-free stream of fuel flows from injection pump bleed screw. Tighten bleed screw.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CD884

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.

1 The filter can be drained of water and small dirt particles by opening drain cap on bottom of filter.

A Filter

B Drain Cap

2 Open by turning the drain cap counterclockwise *(as viewed from the bottom of the filter)* until fuel starts draining. Do not remove the drain cap.

NOTE: *Place a suitable container under fuel filter to catch contaminated fuel and/or water. Dispose of properly.*

A D4.2L Models.

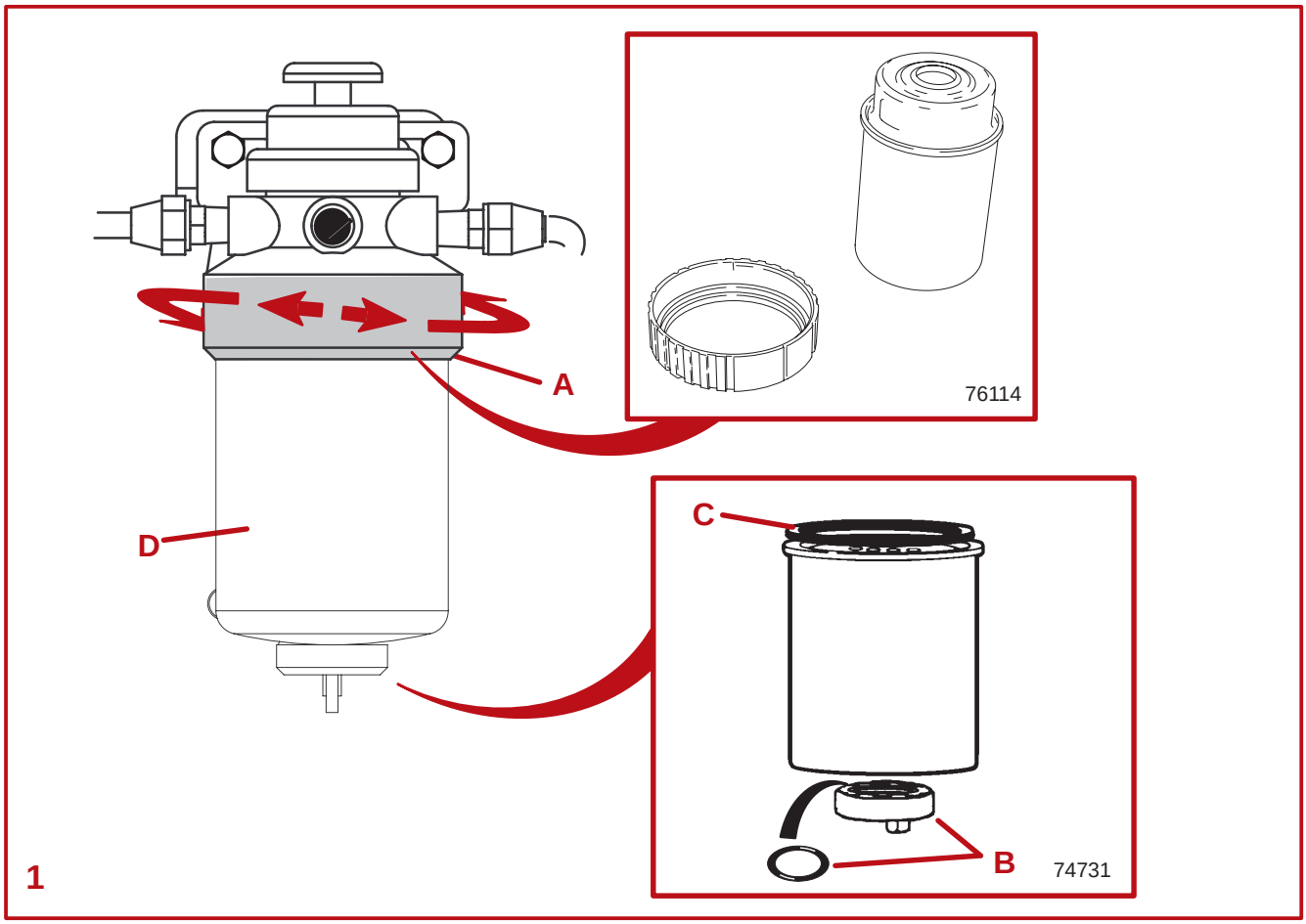
B D2.8L D-Tronic, D4.2L D-Tronic and D4.2L LD Models.

C D4.2L 300

3 Drain until fuel is clear in appearance. Close drain cap by turning clockwise. Tighten securely.

4 Fill fuel filter as previously outlined.

NOTE: *To ensure complete draining, in warm weather open the drain cap 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.*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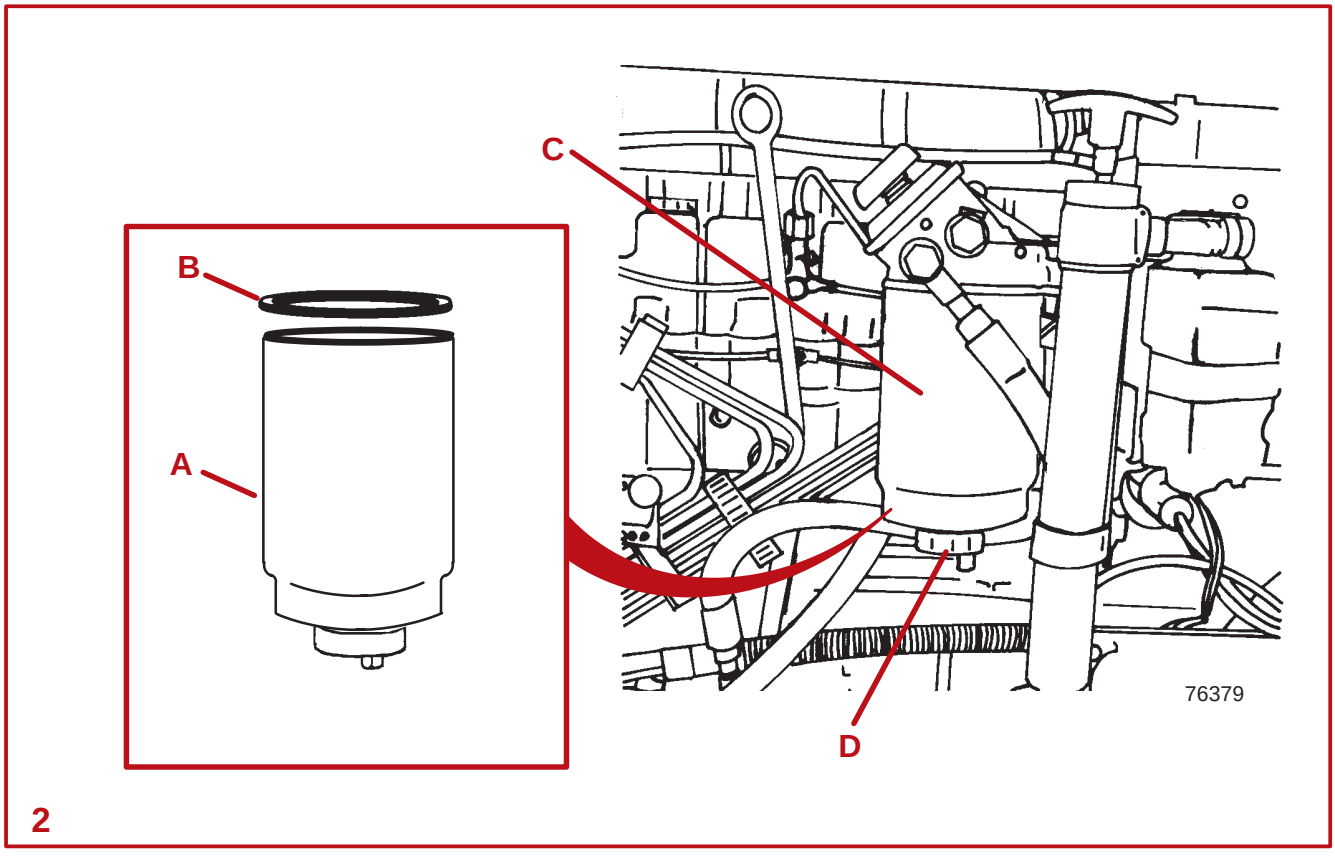
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REPLACING WATER SEPARATING FUEL FILTER

⚠ 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 Mercury 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 On D4.2L, D2.8L D-Tronic,D4.2L D-Tronic Models and D4.2L 300:

A Twist locking ring by hand. Remove water separating fuel filter and sealing ring from mounting bracket. Do not use a filter wrench.

B Remove the drain cap and O-ring from bottom of the existing filter. Install new filter.

C Coat sealing ring on new filter with clean motor oil.

D Align filter to bracket. Twist locking ring by hand to secure filter to bracket. Do not use a filter wrench.

E Check that bottom drain cap is securely tightened. Fill fuel filter as explained previously. Check filter and drain cap for fuel leaks.

2 On D4.2L LD Models:

A Remove and discard water separating fuel filter and sealing ring from mounting bracket.

B Coat sealing ring on new filter with clean motor oil.

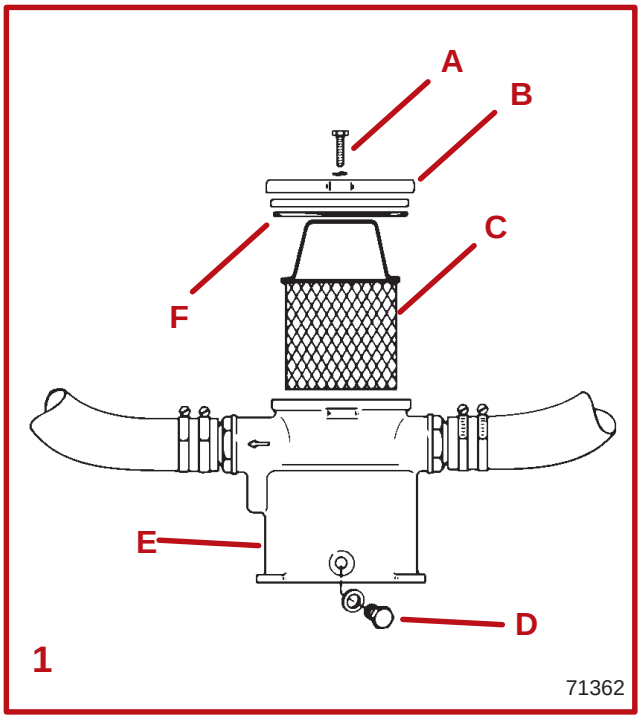
C Thread filter onto bracket and tighten securely by hand. Do not use a filter wrench.

D Check that bottom drain cap is securely tightened. Fill fuel filter as explained previously. Check filter and drain cap for fuel leaks.

⚠ WARNING

Make sure no fuel leaks exist before closing engine hatch.

3 All Models: Supply cooling water to water inlets. Start and operate the engine. Check filter connection for fuel leaks. If leaks exist, recheck filter installation. If leaks continue, stop engine immediately and contact your Authorized Mercury MerCruiser Dealer.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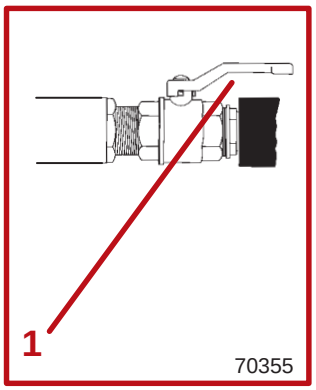
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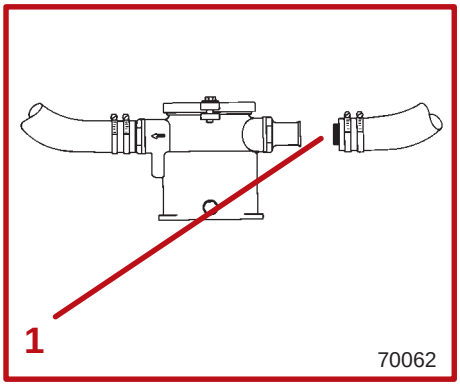
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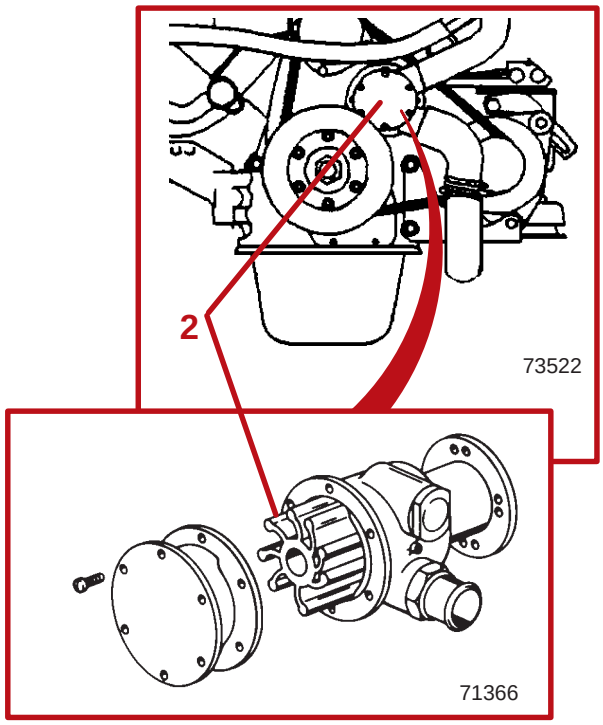
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CE376
Cleaning Quicksilver Seawater Strainer

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.

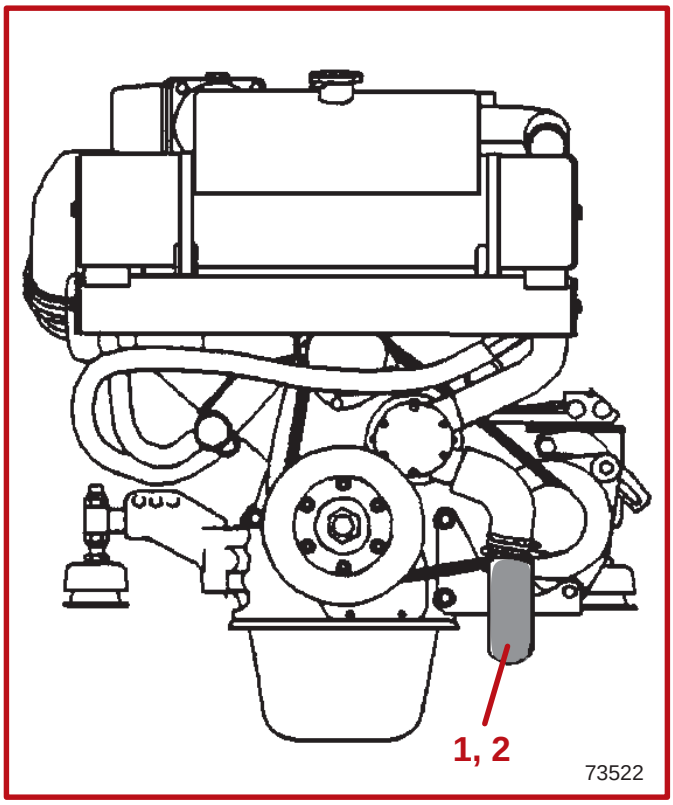
1 With engine off, close seacock if so equipped, or remove and plug seawater inlet hose. Remove screws and washers, and cover. Remove strainer, drain plug and washer, and clean any debris from strainer housing; flush both strainer and housing with clean water. Check gasket - replace when necessary (if 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 Housing
F Gasket

CB66
Seawater Pump Impeller

This maintenance should be performed by an Authorized Mercury MerCruiser Dealer.

2 Seawater pump impeller should be inspected whenever insufficient seawater flow is suspected (if operating temperature exceeds normal range).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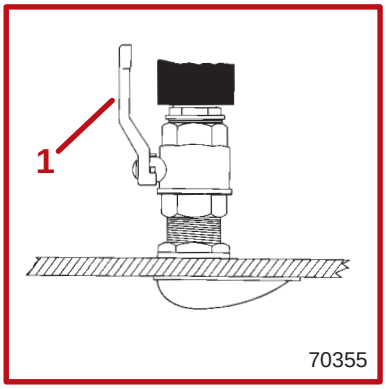
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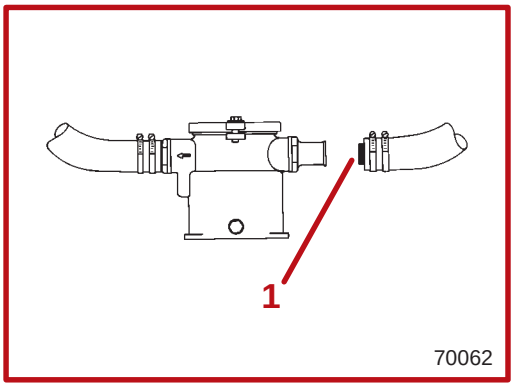
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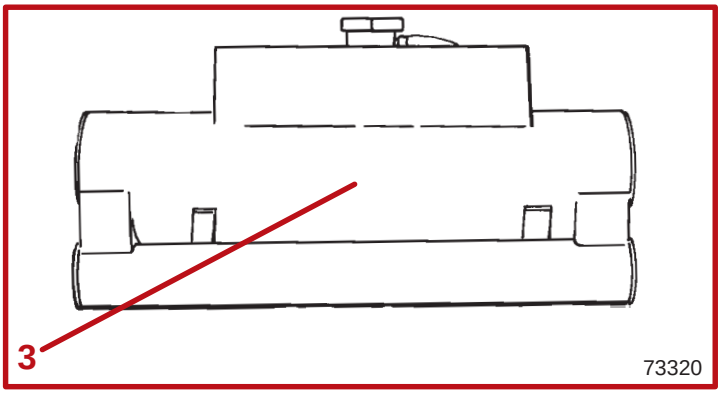
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Flushing Seawater Cooling System

To prevent silt and/or salt buildup in the seawater circuit of cooling system, flush with freshwater at specified Intervals.

⚠ WARNING

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

⚠ CAUTION

When flushing seawater cooling system, 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 Close seacock, if equipped, or disconnect and plug seawater inlet hose. Disconnect water inlet hose from seawater pickup pump connection. Using appropriate flushing adaptor, connect water hose between adaptor and water tap. Partially open water tap (about 1/2 maximum).

⚠ 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

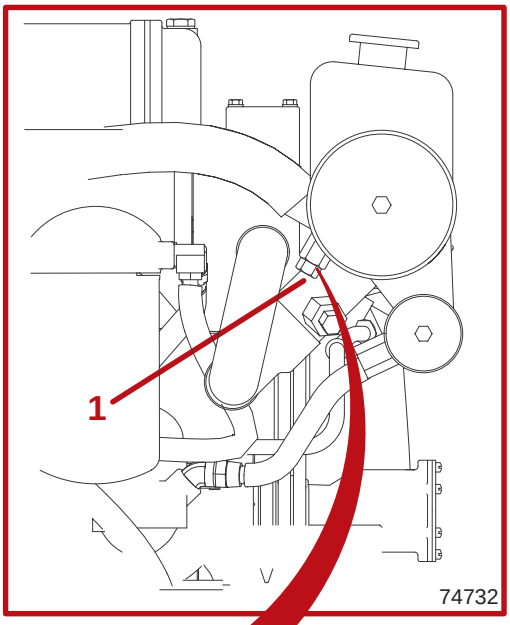
Watch temperature gauge on dash to ensure that engine does not overheat.

2 Place remote control in NEUTRAL, idle speed position and start engine. Operate engine at idle speed, in NEUTRAL, for about 10 minutes, or until discharge water is clear. Stop engine. Shut off water, remove flushing adaptor from seawater pump inlet hose connection and reconnect water inlet hose. Tighten hose clamp securely.

⚠ CAUTION

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

3 The closed cooling section of cooling system that contains coolant does not need to be flushed. Coolant is changed at specified intervals. Refer to “Maintenance Schedules.”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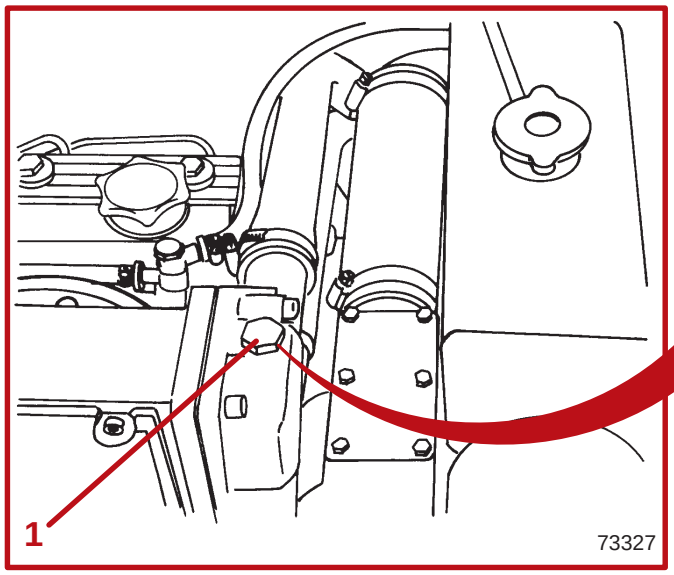
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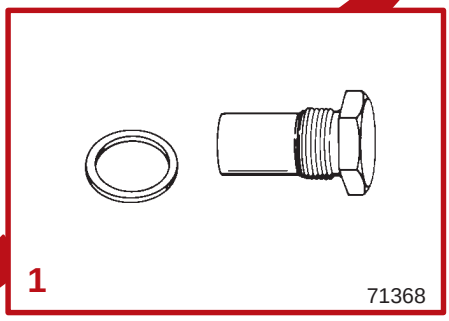
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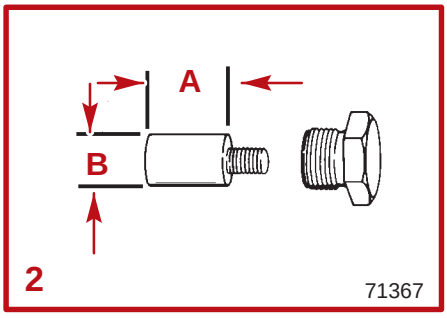
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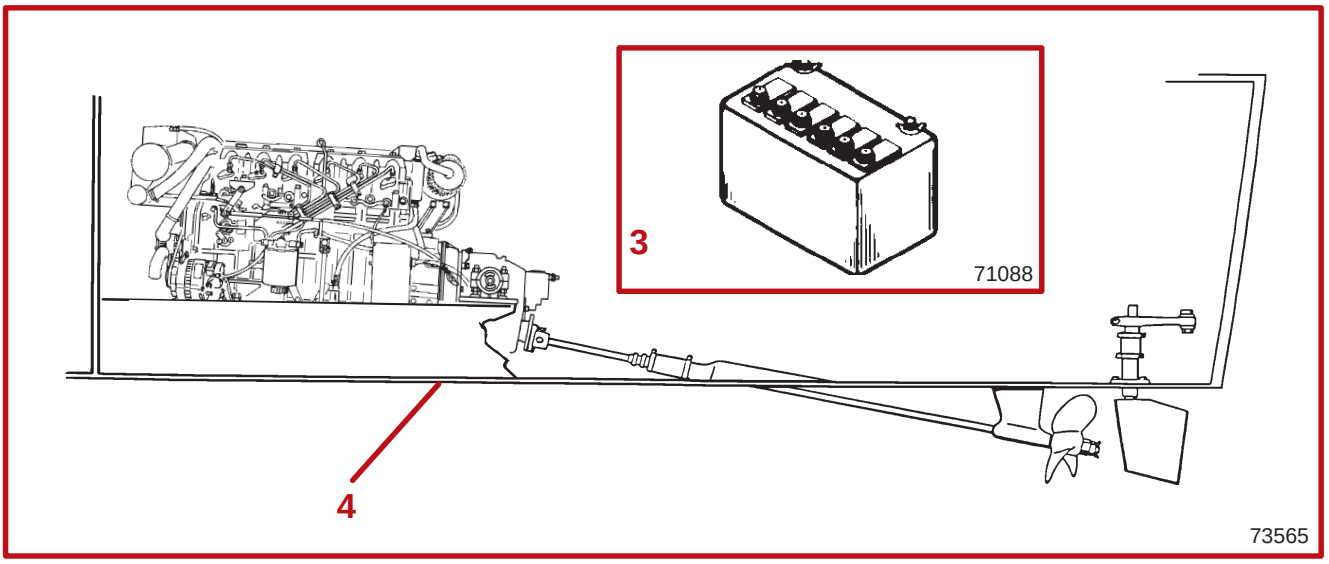
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CD119
Corrosion And Corrosion Protection

INTERNAL COMPONENTS

1 There are anodes as part of the intercooler and heat exchanger systems, which serves as a sacrificial anodes.

2 Replace when eroded more than 50%; check at least once yearly.

A Length When New - 3/4 in. (19mm)

B Diameter When New - 5/8 in. (15mm)

CA103
Miscellaneous Maintenance

BATTERY

3 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.

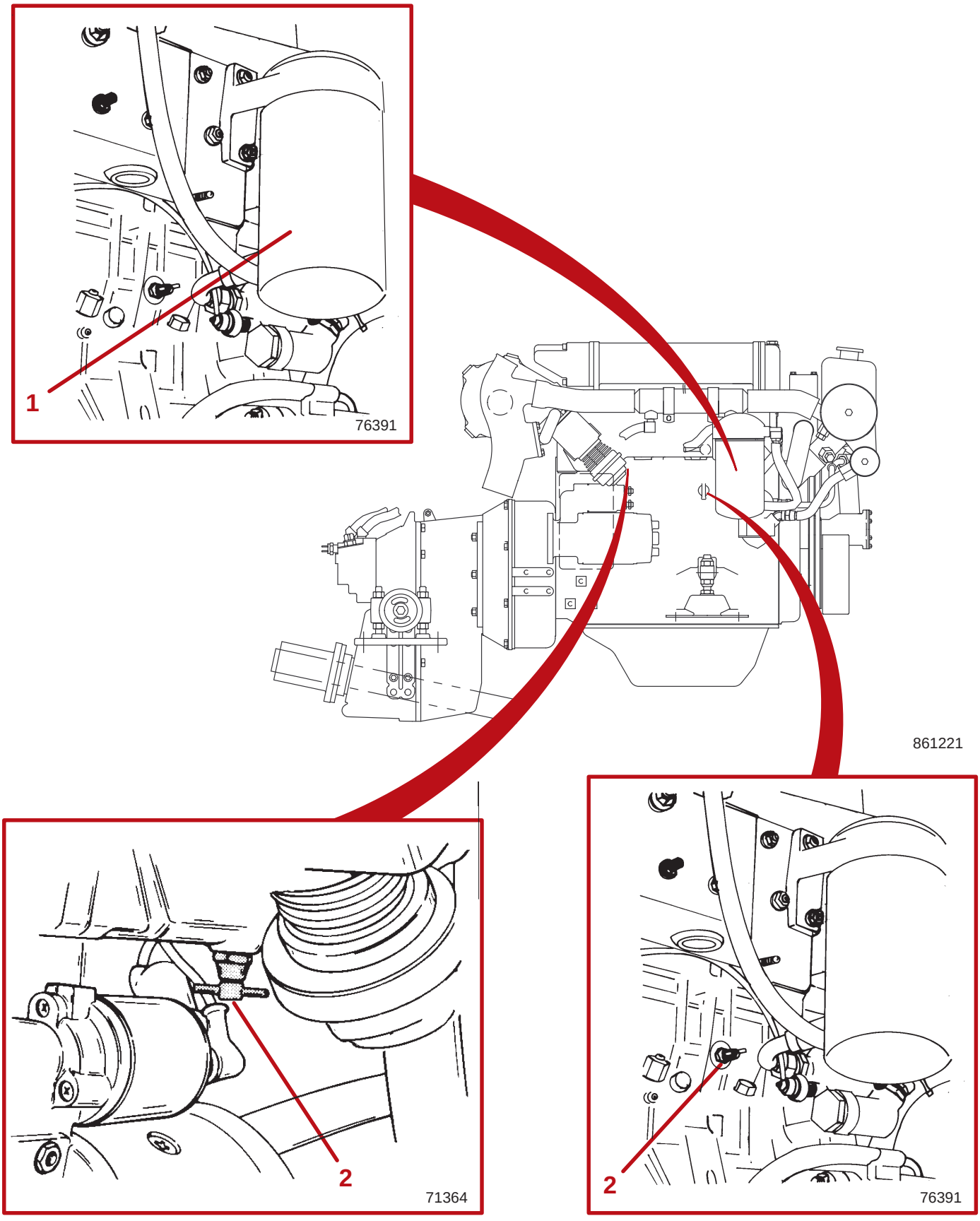
⚠ WARNING

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.

CC72
ANTIFOULING PAINTS

4 **Antifouling Paint -** In some areas it may be advisable to paint bottom of boat to help prevent marine growth. See your dealer for recommendations for your boat.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CD44
Cold Weather Or Extended Storage

CA115
Battery Winter Storage

Follow battery manufacturer's instructions for storage.

CD280
Power Package Layup

IMPORTANT: Mercury MerCruiser strongly recommends that this service should be performed by an Authorized Mercury MerCruiser Dealer. Damage caused by freezing IS NOT covered by the Mercury MerCruiser Limited Warranty.

⚠ 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 drive unit 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.

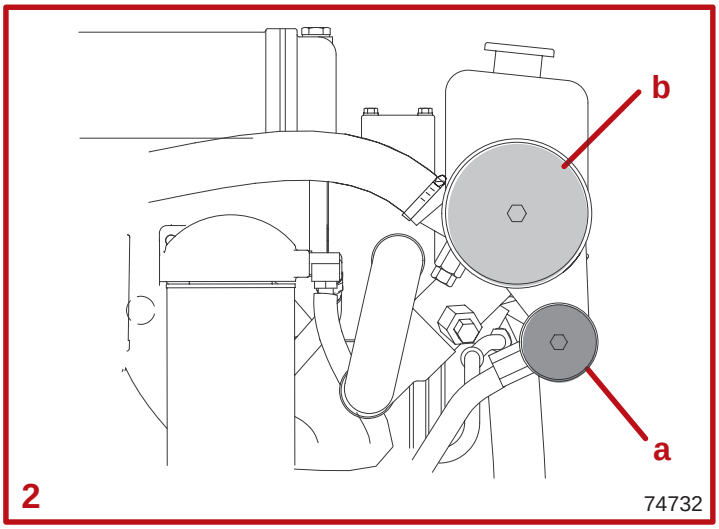
IMPORTANT: Closed cooling section must be kept filled year-round with the specified coolant.

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

IMPORTANT: Drain seawater section of closed cooling system only.

2 Do not open either of these two drain valves. They are in the closed cooling circuit.

NOTE: *Refer to the following pages for continuation of specific draining instructions.*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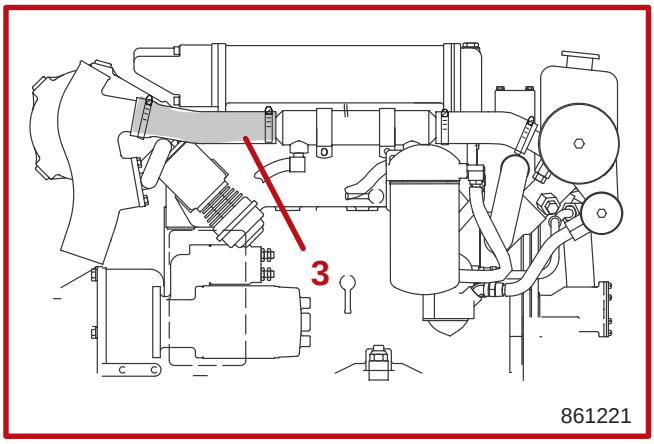
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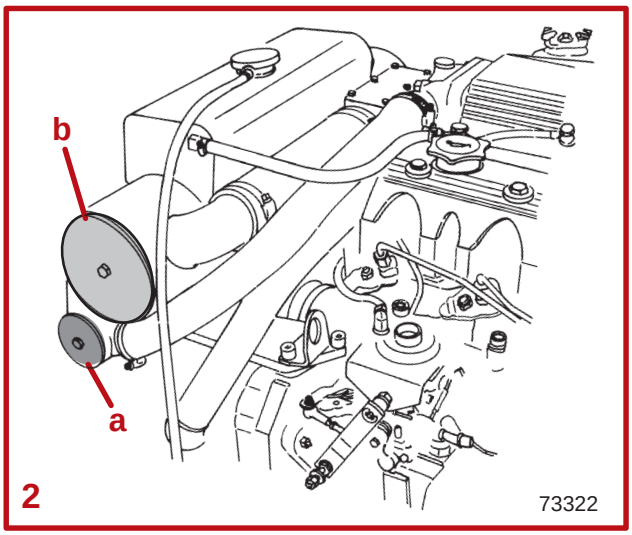
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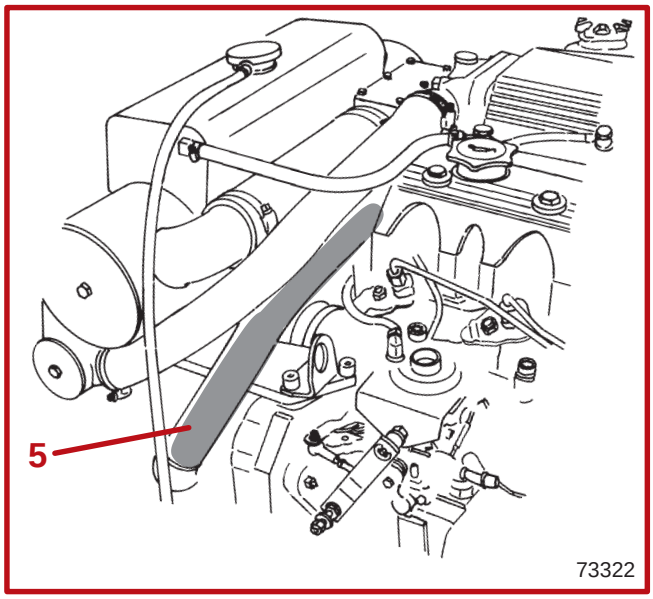
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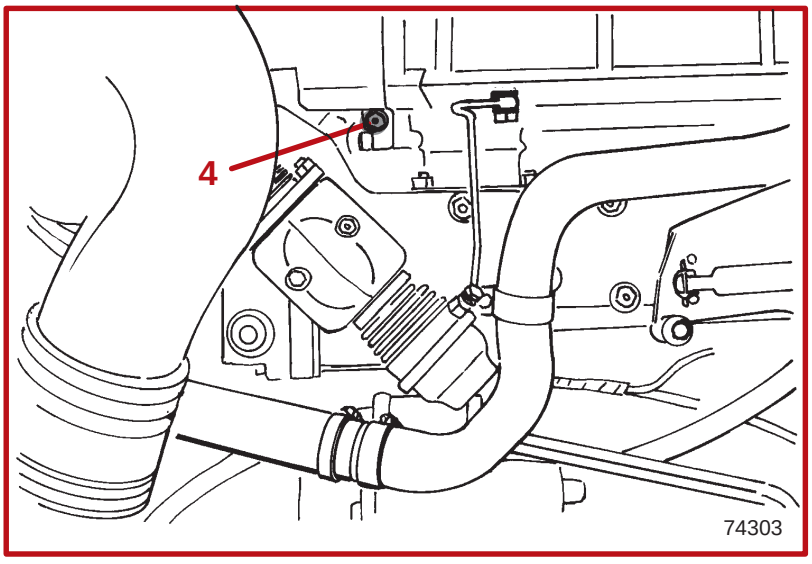
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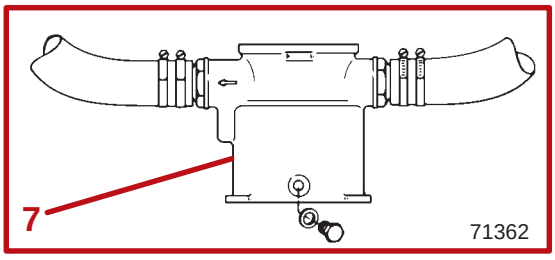
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Power Package Layup (Continued)

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 the end covers "**a**" and "**b**" from BOTH port and starboard ends of upper and lower sections of heat exchanger tank. Drain tank completely. Sponge-out or soak-up any water that remains in the bottom part of each section, until all water passage tubes are completely free of standing water.

⚠ CAUTION

Avoid damage to heat exchanger and subsequent possible engine damage. Remove all water from heat exchanger sections. Failure to do so could cause corrosion or freeze damage to heat exchanger water passage tubes.

NOTE: *In the following it may be necessary to lower or bend the hoses to allow water to drain completely.*

3 Disconnect seawater outlet hose at aft end of power steering cooler. Lower hose and drain completely.

4 Remove the drain plug from the aft end cover of the intercooler.

NOTE: *D4.2L engine intercooler drain plug shown, all models similar.*

5 Remove seawater pump outlet hose from top of seawater pump and drain.

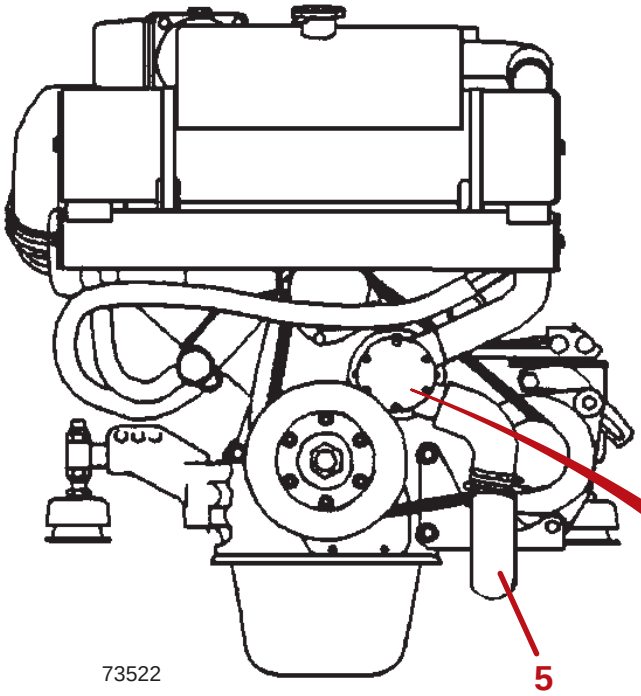
6 Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

⚠ CAUTION

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

7 Remove hose(s) at seawater strainer and drain hose(s) completely. Empty seawater strainer, refer to "Cleaning Quicksilver Seawater Strainer." Reconnect hose(s) and tighten hose clamps securely.

8 After seawater section of cooling system has been drained completely, coat threads of intercooler drain plug with Perfect Seal and reinstall. Tighten securely. Reconnect hoses. Tighten hose clamps securely. Install and torque the end covers "**b**" on the upper heat exchanger section to 120-132 lb-in. (14-15 Nm). Torque the end covers "**a**" on the lower heat exchanger section to 108-120 lb-in. (12-14 Nm).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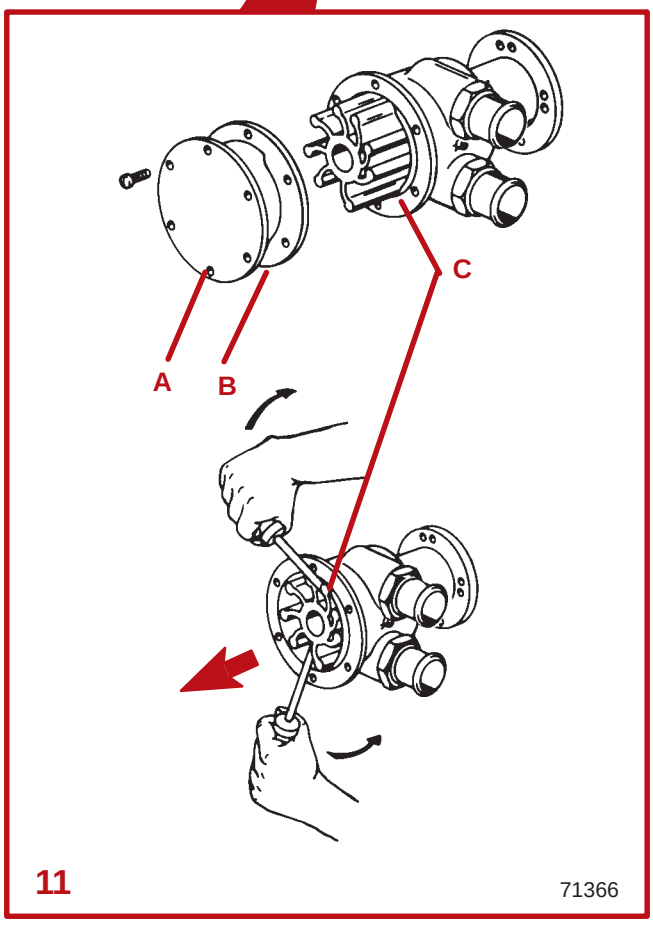
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CD666

Power Package Layup (Continued)

Dealer should perform the remaining tasks prior to layup:

1 After draining, perform all checks, inspections, lubrication and fluid changes outlined in Maintenance Schedules.

⚠ 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.

2 Close seacock, if equipped, or disconnect and plug seawater inlet hose, if boat is to remain in the water.

3 Clean seawater strainer (refer to “Cleaning Quicksilver Seawater Strainer”).

IMPORTANT: Mercury MerCruiser recommends that propylene glycol antifreeze (a nontoxic and environmentally safe) 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.

4 Fill a container with approximately 6 U.S. quarts (5.6L) 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.

5 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 mixed in step 4.

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

7 Reconnect water inlet hose to seawater pump.

8 Clean engine and coat with Quicksilver Corrosion Guard.

9 Lubricate all cables and linkages.

10 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.)

11 Remove seawater pump impeller for storage. Remove seawater pump cover mounting screws. Remove cover and gasket. Ease impeller off pump shaft with two screwdrivers. Reinstall cover for storage.

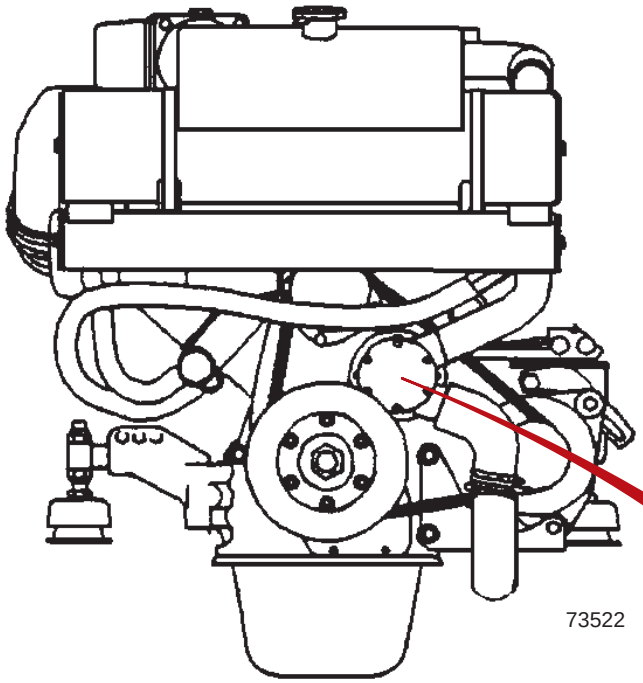
NOTE: *Pump shown removed for visual clarity only.*

A Cover and Screws

B Gasket

C Impeller

IMPORTANT: Place a CAUTION TAG at instrument panel and in engine compartment stating that “Seawater Pump Impeller is Out - DO NOT Operate Engine” and the warning that the seacock must be opened or the water inlet hose reconnected prior to starting the engine.



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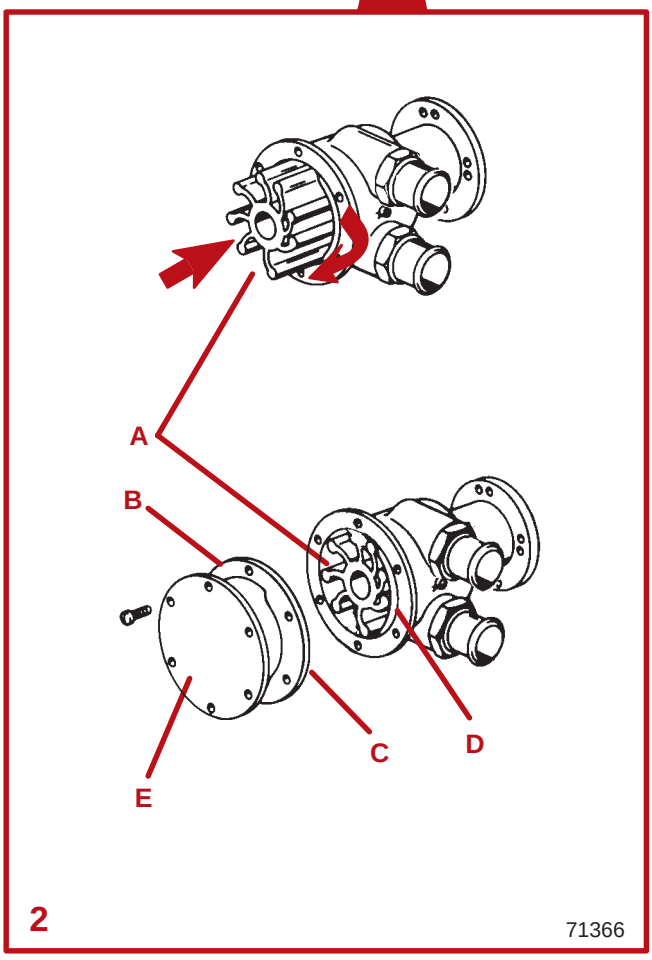


Power Package Recommissioning

⚠ WARNING

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

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

2 Install seawater pump impeller. Place impeller in pump and press onto pump shaft firmly. Install pump cover, with gasket, and tighten screws securely.

IMPORTANT: Use new gasket. Install in correct position - wide surface on side of cam.

A Impeller

B Gasket

C Wide Surface

D Cam

E Cover and Screws

3 Replace fuel filter.

4 Bleed fuel system (see Maintenance - Fuel System).

⚠ 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. It battery cables are reversed, or connection order is reversed, electrical system damage will result.

5 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.

6 Perform all checks on Operation Chart in the Starting Procedure column.

IMPORTANT: On D4.2L and D4.2L LD Engines: After not having been operated for two months or longer, it is necessary to pre-lubricate the engine. To do this, hold the STOP switch toggle lever DOWN while you simultaneously turn the key switch to START position for 15 seconds. This will rotate the starter motor and engine/oil pump. During this process the engine will not run because no fuel is injected. Allow the starter motor to cool down for one minute and repeat the above described process. To avoid overheating the starter motor, do not engage starter motor for more than 15 seconds each time.

7 Pre-lubricate the engine if necessary. Refer to above Important. Start engine and closely observe instrumentation to make sure that all systems are functioning correctly.

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

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

CD49
Troubleshooting

CD361
Starter Motor Will Not Crank Engine, Or Cranks It Very Slowly

Possible Cause	Remedy
• Battery switch turned off.	• Turn switch on.
• Remote control not in neutral position.	• Position control lever in neutral.
• Open circuit breaker or blown fuse.	• Check and reset circuit breaker or replace fuse.
• Loose or dirty electrical connections or damaged wiring.	• Check all electrical connections and wires (especially battery cables). Clean and tighten faulty connection.
• Bad battery.	• Test and replace if bad.

Engine Will Not Start, Or Is Hard To Start

Possible Cause	Remedy
• Improper starting procedure.	• Read starting procedure.
• Empty fuel tank or fuel shutoff valve closed.	• Fill tank or open valve.
• Faulty mechanical fuel delivery pump.	• Have pump replaced by an Authorized Mercury MerCruiser Dealer, if fuel is present.
• Throttle not operating properly.	• Check throttle for freedom of movement.
• Faulty electrical stop-circuit.	• Have Authorized Mercury MerCruiser Dealer service electric stop-circuit.
• Clogged fuel filters.	• Replace filters.
• Stale or contaminated fuel.	• If contaminated, drain tank. Fill with fresh fuel.
• Fuel line or tank vent line kinked or clogged.	• Replace kinked lines or blow out lines with compressed air to remove obstruction.
• Air in fuel injection system.	• Purge fuel injection system.
• Glow-plugs or glow-plug system inoperative, if equipped.	• Test, and repair or replace components.
• EDI System fault.	• Have EDI System checked by an Authorized Mercury MerCruiser Dealer.

Engine Runs Rough, Misses And/Or Backfires

Possible Cause	Remedy
• Throttle not operating properly.	• Check throttle linkages for binding or an obstruction.
• Idle speed too low.	• Check idle speed and adjust, if necessary.
• Clogged fuel or air filters.	• Replace filters.
• Stale or contaminated fuel.	• If contaminated, drain tank. Fill with fresh fuel.
• Kinked or clogged fuel line or fuel tank vent line.	• Replace kinked line or blow out line with compressed air to remove obstruction.
• Air in fuel injection system.	• Purge fuel injection system.
• EDI System fault.	• Have EDI System checked by an Authorized Mercury MerCruiser Dealer.

Poor Performance

Possible Cause	Remedy
• Throttle not fully open.	• Inspect throttle cable and linkages for operation.
• Damaged or improper propeller.	• Replace.
• Excessive bilge water.	• Drain and check for cause of entry.
• Boat overloaded or load improperly distributed.	• Reduce load or redistribute load more evenly.
• Boat bottom fouled or damaged.	• Clean or repair as necessary.
• EDI System fault.	• Have EDI System checked by an Authorized Mercury MerCruiser Dealer.

Excessive Engine Temperature

Possible Cause	Remedy
• Seacock closed, if equipped.	• Open.
• Drive belt loose or in poor condition.	• Replace and/or adjust belt.
• Seawater pickups obstructed.	• Remove obstruction.
• Faulty thermostat.	• Replace.
• Coolant level low in closed cooling section.	• Check for cause of low coolant level and repair. Fill system with proper coolant solution.
• Heat exchanger cores plugged with foreign material.	• Clean seawater side of water/water heat exchanger, and seawater strainer.
• Loss of pressure in closed cooling section.	• Check for leaks. Clean, inspect and test pressure cap.
• Closed cooling section dirty.	• Clean and flush.
• Faulty seawater pickup pump.	• Repair.
• Seawater discharge restricted or plugged.	• Clean exhaust elbow.
• Seawater inlet hose kinked (restricted).	• Position hose to prevent kinking (restriction).
• Use of improperly designed hose on inlet side of seawater pump allowing it to collapse.	• Replace hose with wire reinforced design.

Insufficient Engine Temperature

Possible Cause	Remedy
• Faulty thermostats.	• Replace.

Low Engine Oil Pressure

Possible Cause	Remedy
• Faulty senders.	• Have system checked by an Authorized Mercury MerCruiser Dealer.
• Insufficient oil in crankcase.	• Check and add oil.
• Excessive oil in crankcase (causing it to become aerated).	• Check and remove required amount of oil. Check for cause of excessive oil (improper filling, bad fuel pump, etc.).
• Diluted or improper viscosity oil.	• Change oil and oil filter, using correct grade and viscosity oil. Determine cause for dilution (excessive idling, faulty fuel pump, etc.).

Battery Will Not Come Up On Charge

Possible Cause	Remedy
• Excessive current draw from battery.	• Turn off non-essential accessories.
• Loose or dirty electrical connections or damaged wiring.	• Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connections. Repair or replace damaged wiring.
• Alternator drive belt loose or in poor condition.	• Replace and/or adjust.
• Unacceptable battery condition.	• Test battery.

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

Possible Cause	Remedy
• Insufficient lubrication on shift and throttle linkage fasteners.	• Lubricate.
• Loose or missing shift and throttle linkage fasteners.	• Check all linkages. If any are loose or missing, see Authorized Mercury MerCruiser Dealer immediately.
• Obstruction in shift or throttle linkages.	• Remove obstruction.
• Shift or throttle cable kinked.	• Straighten cable, or have dealer replace cable if damaged beyond repair.
• Improper shift cable adjustment.	• See Authorized Mercury MerCruiser Dealer immediately for shift cable adjustment.
• Vacuum leak at shift cylinder, hose or fittings of Power Shift Assembly, if equipped.	• Repair cut, pinched, or kinked hose or faulty shift cylinder.

CA461
Owner Service Assistance

Local Repair Service

Always return your Mercury 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 Mercury 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.

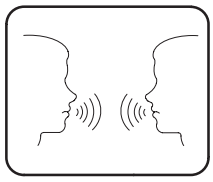
Parts And Accessories Inquiries

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.

CB577

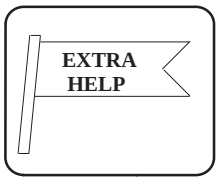
Resolving A Problem

Satisfaction with your Mercury 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 Mercury 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 
United States		
(405) 743-6566	(405) 743-6570	Mercury MerCruiser 3003 N. Perkins Rd. Stillwater, OK 74075
Canada		
(905) 567-MERC (6372)	(905) 567-8515	Mercury Marine Ltd. 2395 Meadowpine Blvd. Mississauga, Ontario Canada L5N 7W6
Australia, Pacific		
(61) (3) 791-5822	(61) (3) 793-5880	Mercury Marine Australia 132-140 Frankston Road Dandenong,Victoria 3164 Australia
Europe, Middle East, Africa		
(32) (87) 32 • 32 • 11	(32) (87) 31 • 19 • 65	Marine Power - Europe, Inc. Parc Industriel de Petit-Rechain B-4800 Verviers Belgium
Mexico, Central America, South America, Caribbean		
(305) 385-9585	(305) 385-5507	Mercury Marine - Latin America & Caribbean 9010 S.W. 137th Ave. Suite 226 Miami, FL 33186 U.S.A.
Japan		
81-53-426-2500	81-53-423-2510	Mercury Marine - Japan 283-1 Anshin-cho Hamamatsu Shizuoka, 435-0005 Japan
Asia, Singapore		
5466160	5467789	Mercury Marine Singapore 72 Loyang Way Singapore 508762

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Customer Service Literature

English Language

English language publications are available from:

Attn.: Publications Department

Mercury Marine

W6250 West Pioneer Road

P.O. Box 1939

Fond du Lac, WI 54935-1939

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.

caa781

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.

cab781

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.

cac781

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.

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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.

caf781

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.

cag781

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.

cah781

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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Αλλες 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.

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Ordering Literature

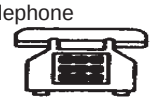
Before ordering literature, please have the following information about your power package available:

Model _____ **Horsepower**_____
Serial Number_____ **Year**_____

UNITED STATES AND CANADA

For information on additional literature that is available for your particular Mercury 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 54935-1939

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 Mercury MerCruiser power package and how to order that literature.

Owner’s Logbook

Date	Maintenance and Repair	Operating Hours

Owner’s Logbook

Date	Maintenance and Repair	Operating Hours

Owner’s Logbook

Date	Maintenance and Repair	Operating Hours