Declaration of Conformity for Recreational Craft Propulsion Engines with the Requirements of Directive 94/25/EC as Amended by 2003/44/EC

Manufacturer:

Mercury Racing
N7480 County Road UU
Fond du Lac, WI 54937-9385
USA

Authorized Representative:

Brunswick Marine EMEA, Inc.
Parc Industriel de Petit-Rechain
Verviers, 4800,
Belgium

Notified Body for Exhaust Emission Assessment:

Det Norske Veritas AS
Veritasveien 1
Hovik, 1322,
Norway
ID Number: 0575

Conformity Assessment Module used for Exhaust Emissions: H

Other Community Directives Applied: Electromagnetic Compatibility Directive 2004/108/EC

Description of Engine(s) and Essential Requirements		
Engine Type:	**Fuel Type:**	**Combustion Cycle**
z or sterndrive without integral exhaust	Petrol	4-Stroke

Identification of Engines Covered by This Declaration of Conformity

Name of engine family	Unique engine identification number: starting serial number			EC Module H certificate number
MCM 520 CE	0M968960			RCD-H-2
Essential requirements	Standards	Other normative document/ method	Technical File	Please specify in more detail (* = mandatory standard)
Annex 1.B–Exhaust Emissions				
B.1 Engine Identification			X	
B.2 Exhaust Emission Requirements	X*			*EN ISO 8178-1:1996
B.3 Durability			X	
B.4 Owner's Manual	X			ISO 8665:2006
Annex 1.C–Noise Emissions	See the Declaration of Conformity of the craft in which the engines have been installed.			

Identification of Sterndrive Systems Covered by This Declaration of Conformity

Sterndrive	Unique sterndrive identification number: starting serial number			EC Type (examination certificate or type-approval certificate number)
Bravo Integrated Transom System	0M968960			HSSMECR002 & IGPMECR002
	Standards	Other normative document /method	Technical File	Details
Annex 1.A.5.4–Steering System				
B.1 Drive Identification		X		
B.2 Steering System Requirements	X			ISO 10592:1995 Small Craft – Hydraulic Steering Systems
B.3 Durability		X		
B.4 Owner's Manual	X			

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engines will meet the exhaust emission requirements of Directive 94/25/EC as amended by Directive 2003/44/EC when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions and that these engines must not be put into service until the recreational craft into which they are to be installed has been declared to be in conformity with the relevant provisions of the above mentioned directives.

Mark Schwabero

President–Mercury Marine, Fond du Lac, WI USA

Regulatory contact:
Engineering–Regulations
Mercury Racing
N7480 County Road UU
Fond du Lac, WI 54937-9385
USA

Thank You

for your purchase of one of the finest marine power packages available. It incorporates numerous design features to ensure 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.

Again, thank you for purchasing one of our Mercury Marine products. We sincerely hope your boating will be pleasant!

Warranty Message

⚠ 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.

The product you have purchased comes with a limited warranty from Mercury Marine; the terms of the warranty are set forth in the **Warranty Information** section 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.

Safety Alerts and Notices

Throughout this publication, dangers, warnings, cautions, and notices, accompanied by the international HAZARD symbol ⚠, are used to alert the operator and technician to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. Observe these safety alerts carefully.

These safety alerts alone cannot eliminate the hazards they signal. Strict compliance to these special instructions when performing the service, and common sense operation are major accident prevention measures.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Indicates a situation which, if not avoided, could result in engine or major component failure.

IMPORTANT: Identifies information essential to the successful completion of the task.

NOTE: *Indicates information that helps in the understanding of a particular step or action.*

⚠ WARNING

The engine exhaust from this product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

Copyright and Trademark Information

Warranty Information

General Information

Specifications

Operation

Conditions Affecting Operation

Maintenance

Cold Weather or Extended Storage

Troubleshooting

Owner Service Assistance

Ordering Literature

Maintenance Log

WARRANTY INFORMATION

Warranty Registration United States and Canada

Outside United States and Canada–Check with your local distributor.

1. You may change your registered address at any time, including at time of warranty claim, by calling Mercury Marine or sending a letter or fax with your name, old address, new address, and engine serial number to Mercury Marine's warranty registration department. Your dealer can also process this change of information.
   Mercury Marine
   Attn.: Warranty Registration Department
   W6250 W. Pioneer Road
   P.O. Box 1939
   Fond du Lac, WI 54936-1939
   920-929-5054
   Fax 920-907-6663

NOTE: *Registration lists must be maintained by Mercury Marine and any dealer on marine products sold in the United States, should a safety recall notification under the Federal Safety Act be required.*

2. At the time of sale, the dealer or the boat manufacturer, must complete the warranty registration and immediately submit it to Mercury Marine via MercNET, E-mail, or mail. Upon receipt of this warranty registration, Mercury Marine will record the registration.

IMPORTANT: Your warranty coverage begins at the time of sale, but warranty claims cannot be processed until the product is registered with Mercury Marine.

Transfer of Warranty

The limited 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.

To transfer the warranty to the subsequent owner, send or fax a copy of the bill of sale or purchase agreement, new owner's name, address and engine serial number to Mercury Marine's Warranty Registration Department. In the United States and Canada, mail to:

Mercury Marine
Attn: Warranty Registration Department
W6250 W. Pioneer Road
P.O. Box 1939
Fond du Lac, WI 54936-1939
920-929-5054
Fax +1 920 907 6663

Upon processing the transfer of warranty, Mercury Marine will send registration verification to the new owner of the product by mail.

There is no charge for this service.

WARRANTY INFORMATION

For products purchased outside the United States and Canada, contact the distributor in your country, or the Marine Power Service Center closest to you.

Mercury Racing Division Two-Year Limited Warranty

WHAT IS COVERED

Mercury Marine warrants its new products (and remanufactured products sold under the trade name "Pacemaker") to be free of defects in material and workmanship during the period described below.

DURATION OF COVERAGE

This Limited Warranty provides coverage for two (2) years from either 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. 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 recreational use purchaser upon proper reregistration of the product.

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 predelivery 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 and Maintenance Manual must be timely performed in order to maintain warranty coverage. Mercury Marine reserves the right to make warranty coverage contingent upon proof of proper maintenance.

WHAT MERCURY WILL DO

Mercury Marine’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 remanufactured 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.

WARRANTY INFORMATION

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 the 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. The 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. The purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. Proof of registered ownership must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

WHAT IS NOT COVERED

This limited warranty does not cover routine maintenance items, tune ups, adjustments, and normal wear and tear.

This limited warranty also does not cover damage caused by any of the following: abuse, abnormal use, use of a propeller or gear ratio that does not allow the engine to run in its recommended wide-open throttle RPM range, operation of the product in a manner inconsistent with the recommended operation/duty cycle section of the this 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 not manufactured or sold by us, operation with fuels, oils or lubricants which are not suitable for use with the product, alteration or removal of parts, water entering the engine through the fuel intake, air intake or exhaust system, insufficient cooling water caused by blockage of the cooling system by a foreign body, running the engine out of water, mounting the engine too high on the transom, or running the boat with the engine trimmed out too far.

Expenses related to haul-out, launch, towing, storage, telephone, rental, inconvenience, slip fees, insurance coverage, loan payments, loss of time, loss of income, tournament fees, club fees, prize money 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.

The commercial use of the product, defined as any work or employment related use of the product, or any income generating use of the product, even if such use is only occasional, will void the warranty. Use of the product for racing or other competitive activity, at any point, even by a prior owner of the product, voids the warranty.

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.

WARRANTY INFORMATION

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

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 and 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.

Products Sold to Government Agencies

Contact the Mercury Racing Sales Department for a copy of the Government Agencies Warranty Packet Kit, which explains the conditions required for government agencies to receive warranty when purchasing Mercury Racing Outboard or Sterndrive product.

Mercury Racing Sales Department
N7840 County Road UU
Fond du Lac, WI 54937-9385
920-921-5330
Fax 920-921-6533

Warranty Against Corrosion (Worldwide)

IMPORTANT: Corrosion failure warranty is not available for this product.

Warranty Coverage and Exclusions for Mercury Racing Sterndrive Products

The purpose of this section is to help eliminate some of the more common misunderstandings regarding warranty coverage. The following information explains some of the types of services that are not covered by warranty. The provisions set forth following have been incorporated by reference into the Mercury Racing Division Three-Year Limited Warranty Against Corrosion Failure, the Mercury Racing Division 90-Day, Six-Month and One-Year Limited Warranties.

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 INFORMATION

Warranty is limited to defects in material or workmanship, but 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 predelivery inspection process is completed and documented.

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

GENERAL EXCLUSIONS FROM WARRANTY

1. Minor adjustments and tune-ups, including checking, cleaning or adjusting spark plugs, ignition components, carburetor or EFI settings, filters, belts, controls, and checking lubrication made in connection with normal services.
2. Damage caused by lack of maintenance.
3. Haul-out, launch, towing charges, and all related transportation charges and/or travel time, etc.
4. Additional service work requested by customer other than that necessary to satisfy the warranty obligation.
5. Labor performed by other than an authorized dealer may be covered only under following circumstances: When performed on an emergency basis providing there are no authorized dealers in the 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.
6. Use of other than Mercury Precision or Quicksilver parts when making warranty repairs.
7. 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.
8. Lower unit and/or propeller damage caused by striking a submerged object is considered a marine hazard.
9. Water in the starter motor.
10. Starter motors and/or armatures, or field coil assemblies, which are burned, or where lead is thrown out of commutator because of excess cranking.
11. Valve or valve seat grinding required because of wear.

WARRANTY INFORMATION

California Emission Control Warranty Statement

INTRODUCTION

The California Air Resources Board has promulgated air emissions regulations for inboard and sterndrive engines. The regulations apply to all inboard and sterndrive engines that were manufactured for the model year 2003 and newer. Mercury Racing, in compliance with those regulations, provides this limited warranty for the emission control systems (see the components of the emission control system listed following), and further warrants that the inboard or sterndrive engine was designed, built, and equipped to conform with all applicable regulations adopted by the California Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code. For information regarding the limited warranty for the nonemissions related components of the inboard or sterndrive engine, please see the limited warranty statement for your engine.

WHAT IS COVERED

Mercury Racing warrants the components of the emissions control systems (see the components of the emission control system listed following) of its new, model year 2009 and newer California certified high performance sterndrive engines, registered to a California resident, to be free from defects in material or workmanship that cause the failure of a warranted part to be identical in all material respects to that part as described in the application of Mercury Racing for certification from the California Air Resources Board, for the period of time, and under the conditions identified below. The cost to diagnose a warranty failure is covered if the warranty claim is approved. Damage to other engine components caused by the failure of a warranted part will also be repaired under warranty.

WARRANTY INFORMATION

DURATION OF COVERAGE

This limited warranty provides coverage for the components of the emissions control systems. Specific emission control related parts on new high performance sterndrive engines greater than 500 horsepower are warranted for a period of 3 years or 480 hours (as determined by the engine's ECM-integrated hour meter), whichever occurs first, for electronic emission-related components including, but not limited to, sensors (e.g., oxygen sensors, mass air flow sensors, crankshaft position sensors, etc.), solenoids (e.g., fuel injectors, idle control valves, pressure regulators, etc.), ignition components, powertrain control modules, and for the following: catalysts, carburetors, fuel pumps, evaporative components (including low-permeation hoses), exhaust gas recirculation, and other direct emissions devices. For new high performance sterndrive engines mechanical emission-related components, including but not limited to, the engine block, crankshaft, camshaft, connecting rods, valves, manifolds, rotating parts, pistons, and turbo/superchargers are warranted for a period of 1 year or 150 hours (as determined by the engine's ECM-integrated hour meter), whichever occurs first for engines greater than 500 horsepower and less than or equal to 650 horsepower and for a period of 1 year or 50 hours (as determined by the engine's ECM-integrated hour meter), whichever occurs first for engines greater than 650 horsepower. Emission related normal maintenance items such as spark plugs and filters that are on the warranted parts list are warranted up to their first required replacement interval only. Refer to **Emission Control System Components** and **Maintenance Schedule.** 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. Refer to **Transfer of Warranty.**

HOW TO OBTAIN WARRANTY COVERAGE

The customer must provide Mercury Racing 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, please notify Mercury Racing and Mercury Racing 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 Racing, ship the product or parts of the product directly to Mercury Racing.

WARRANTY INFORMATION

WHAT MERCURY RACING WILL DO

Mercury Racing's sole and exclusive obligation under this warranty is limited to, at our expense and at our option, repairing or replacing defective parts with new or Mercury Marine certified remanufactured 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.

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 wide-open throttle RPM range (see Specifications), operation of the product in a manner inconsistent with the recommended operation procedures, neglect, accident, submersion, improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product), improper service, jet pump impellers and liners, operation with fuels, oils or lubricants which are not suitable for use with the product (see Specifications), alteration or removal of parts.

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.

Nonwarranty maintenance, replacement, or repair of emission control devices and systems may be performed by any marine engine repair establishment or individual. The use of non-Mercury Racing parts for nonwarranty maintenance or repairs will not be grounds for disallowing other warranty work. The use of add-on (as defined at section 1900 (b)(1) and (b)(10) of Title 13 of the California Code of Regulations) or modified parts not exempted by the California Air Resources Board may be grounds for disallowing a warranty claim, at the discretion of Mercury Racing. Failures of warranted parts caused by the use of a nonexempted add-on or modified part will not be covered.

WARRANTY INFORMATION

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.

If you have any questions regarding your warranty rights and responsibilities, refer to **Owner Service Assistance** for contact information.

California Emission Control Warranty Rights and Obligations

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board is pleased to explain the emission control system warranty on your 2013-2014 model year sterndrive engine. In California, new sterndrive engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. Mercury Racing must warrant the emission control system on your sterndrive engine for the periods of time listed below provided there has been no abuse, neglect, or improper maintenance of your sterndrive engine.

Your emission control system may include parts such as the carburetor or fuel injection system, the ignition system, and catalytic converter. Also included may be hoses, belts, connectors and other emission-related assemblies. Where a warrantable condition exists, Mercury Marine will repair your sterndrive engine at no cost to you; including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE

Select electronic emission-related control parts from model year 2009 and newer sterndrive engines are warranted for 3 years or 480 hours, whichever occurs first. Select mechanical emission-related components are warranted for 1 year or 150 hours of operation, whichever occurs first for engines greater than 500 horsepower and less than or equal to 650 horsepower and for 1 year or 50 hours, whichever occurs first for engines greater than 650 horsepower. However, warranty coverage based on the hourly period is only permitted for engines that are equipped with hour meters as defined in s 2441(a)(13) or their equivalent. If any emission-related part on your engine is defective under warranty, the part will be repaired or replaced by Mercury Racing.

WARRANTY INFORMATION

OWNER'S WARRANTY RESPONSIBILITIES

As the sterndrive engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Mercury Racing recommends that you retain all receipts covering maintenance on your sterndrive engine, but Mercury Racing cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

As the sterndrive engine owner, you should however be aware that Mercury Racing may deny you warranty coverage if your sterndrive engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your sterndrive engine to a Mercury Marine distribution center as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed 30 days. If you have any questions regarding your warranty rights and responsibilities, you should contact Mercury Racing at 1-920-924-2088.

E.P.A. Emission Controls

INTRODUCTION

Consistent with the obligations created by 40 CFR Part 1045, Subpart B, Mercury Marine provides an emission warranty of three years or 480 hours of engine use, whichever occurs first, to the retail purchaser for electrical components of the emission control system, and one year or 150 hours of engine use, whichever occurs first, to the retail purchaser for mechanical components of the emission control system. The engine is designed, built, and equipped to conform at the time of sale with applicable regulations under section 213 of the Clean Air Act, and the engine is free from defects in materials and workmanship that cause the engine to fail to conform with applicable regulations.

EMISSION CONTROL SYSTEM COMPONENTS

The emission-related warranty covers all components whose failure would increase an engine's emission of any regulated component including the following list of components:

1. Fuel metering system
    a. Carburetor and internal parts (or fuel pressure regulator or fuel injection system)
    b. Air/fuel ratio feedback and control system
    c. Cold start enrichment system
    d. Intake valves
2. Air induction system
    a. Controlled hot air intake system
    b. Intake manifold

c. Air filter
d. Turbocharger systems
e. Heat riser valve and assembly

3. Ignition system
   a. Spark plugs
   b. Magneto or electronic ignition system
   c. Spark control system
   d. Ignition coil or control module
   e. Ignition wires
4. Lubrication system
   a. Oil pump and internal parts
   b. Oil injectors
   c. Oil meter
5. Positive crankcase ventilation (PCV) system
   a. PCV valve
   b. Oil filler cap
6. Exhaust system
   a. Exhaust manifold
   b. Exhaust elbow
   c. Intermediate exhaust elbow
   d. Lower exhaust pipe
   e. Tailpipe
7. Catalysts or thermal reactor system
   a. Catalytic converter
   b. Thermal reactor
   c. Exhaust manifold
   d. Exhaust valves
8. Evaporative system
   a. Carbon canister
   b. Fuel tanks
   c. Purge valve
9. Miscellaneous items used in above systems
   a. Hoses, clamps, fittings, tubing, sealing gaskets or devices, and mounting hardware
   b. Pulleys, belts, and idlers
   c. Vacuum, temperature, check and time sensitive valves and switches
   d. Electronic controls

WARRANTY INFORMATION

NOTE: *The EPA emission-related warranty does not cover components whose failure would not increase an engine's emissions on any regulated pollutant.*

GENERAL INFORMATION

Before Operating Your Boat

Read this manual carefully. Safety and operating information that is practiced along with using good common sense can help prevent personal injury and product damage. If you have any questions, contact your dealer.

This manual as well as safety labels posted on the engine package use safety alerts to draw your attention to special safety instructions that must be followed.

⚠ WARNING

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

⚠ CAUTION

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

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

NOTE: *Indicates information that helps in the understanding of a step or action.*

Boat Horsepower Capacity

⚠ WARNING

Exceeding the boat's maximum horsepower rating can cause serious injury or death. Overpowering the boat can affect boat control and flotation characteristics or break the transom. Do not install an engine that exceeds the boat's maximum power rating.

Do not overpower or overload your boat. Most boats will carry a required capacity plate indicating the maximum acceptable power and load as determined by the manufacturer following certain federal guidelines. If in doubt, contact your dealer or the boat manufacturer.

U.S. COAST GUARD CAPACITY	
MAXIMUM HORSEPOWER	XXX
MAXIMUM PERSON CAPACITY (POUNDS)	XXX
MAXIMUM WEIGHT CAPACITY	XXX

26777

High-Speed and High-Performance Boat Operation

If your power package is to be used on 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/power package combination. For additional information, obtain a copy of our **High-Performance Boat Operation** booklet from your dealer, distributor, or Mercury Marine.

Paddle Wheel and Water Temperature Sensors

Paddle wheels cannot be utilized on vessels that are capable of speeds in excess of 50 mph. Water temperature sensors cannot be connected to Race sterndrive engines that are equipped with a propulsion control module (PCM). The water temperatue sensor connection is utilized by the PCM for monitoring engine oil temperature.

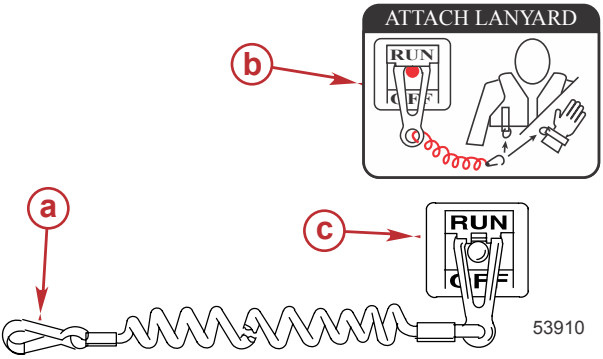
Lanyard Stop Switch

The purpose of a lanyard stop switch 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. Tiller handle outboards and some remote control units are equipped with a lanyard stop switch. A lanyard stop switch can be installed as an accessory - generally on the dashboard or side adjacent to the operator's position.

A decal near the lanyard stop switch is a visual reminder for the operator to attach the lanyard to their personal flotation device (PFD) or wrist.

GENERAL INFORMATION

The lanyard cord is usually 122–152 cm (4–5 feet) in length when stretched out, with an element on one end made to be inserted into the switch and a clip on the other end for attaching to the operator's PFD or wrist. The lanyard is coiled to make its at-rest condition as short as possible to minimize the likelihood of lanyard entanglement with nearby objects. Its stretched-out length is made 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.



a - Lanyard cord clip
b - Lanyard decal
c - Lanyard stop switch

Read the following Safety Information before proceeding.

Important Safety Information: 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. Falling overboard and accidental ejections are more likely to occur in certain types of boats such as low sided inflatables, bass boats, high performance boats, and light, sensitive handling fishing boats operated by a hand tiller. Falling overboard and accidental ejections 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 or tiller handle 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 (if the operator is accidentally ejected).

⚠ WARNING

If the operator falls out of the boat, stop the engine immediately to reduce the possibility of serious injury or death from being struck by the boat. Always properly connect the operator to the stop switch using a lanyard.

⚠ 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.

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:

- 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 gearcase or propeller.
- Loss of power and directional control in heavy seas, strong current, or high winds.
- Loss of control when docking.

KEEP THE LANYARD STOP SWITCH AND LANYARD CORD IN GOOD OPERATING CONDITION

Before each use, check to ensure the lanyard stop switch works properly. Start the engine and stop it by pulling the lanyard cord. If the engine does not stop, have the switch repaired before operating the boat.

Before each use, visually inspect the lanyard cord to ensure it is in good working condition and that there are no breaks, cuts, or wear to the cord. Check that the clips on the ends of the cord are in good condition. Replace any damaged or worn lanyard cords.

Trailering the Boat

The boat can be trailered with the drive unit in up or down position. Adequate road clearance is required between road and gear housing skeg when trailering with the drive unit in down position.

If adequate road clearance is a problem, place drive unit in full up position.

Protecting People in the Water

WHILE YOU ARE CRUISING

It is very difficult for a person in the water to take quick action to avoid a boat heading in their direction, even at slow speeds.

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 (even coasting) and the gear shift is in neutral, 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

⚠ WARNING

A spinning propeller, a moving boat, or any solid device attached to the boat can cause serious injury or death to swimmers. Stop the engine immediately whenever anyone in the water is near your boat.

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

Exhaust Emissions

BE ALERT TO CARBON MONOXIDE POISONING

Carbon monoxide (CO) is a deadly gas that is present in the exhaust fumes of all internal combustion engines, including the engines that propel boats, and the generators that power boat accessories. By itself, CO is odorless, colorless, and tasteless, but if you can smell or taste engine exhaust, you are inhaling CO.

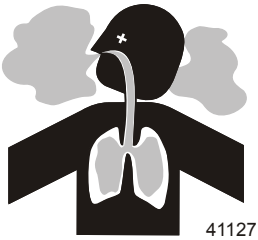
Early symptoms of carbon monoxide poisoning, which are similar to the symptoms of seasickness and intoxication, include headache, dizziness, drowsiness, and nausea.

⚠ WARNING

Inhaling engine exhaust gases can result in carbon monoxide poisoning, which can lead to unconsciousness, brain damage, or death. Avoid exposure to carbon monoxide.

Stay clear from exhaust areas when engine is running. Keep the boat well-ventilated while at rest or underway.

STAY CLEAR OF EXHAUST AREAS

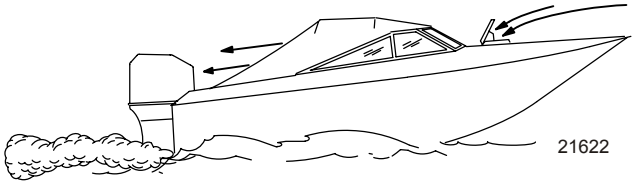


Engine exhaust gases contain harmful carbon monoxide. Avoid areas of concentrated engine exhaust gases. When engines are running, keep swimmers away from the boat, and do not sit, lie, or stand on swim platforms or boarding ladders. While underway, do not allow passengers to be positioned immediately behind the boat (platform dragging, teak/body surfing). This dangerous practice not only places a person in an area of high engine exhaust concentration, but also subjects them to the possibility of injury from the boat propeller.

GOOD VENTILATION

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

Example of desired air flow through the boat:

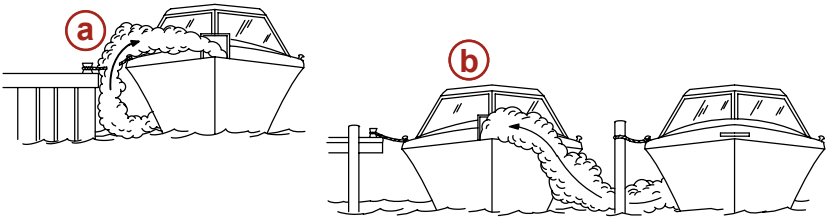


POOR VENTILATION

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

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

1. Examples of poor ventilation while the boat is stationary:



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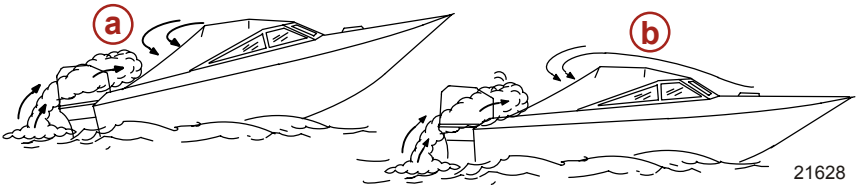
a - Operating the engine when the boat is moored in a confined space
b - Mooring close to another boat that has its engine operating

2. Examples of poor ventilation while the boat is moving:



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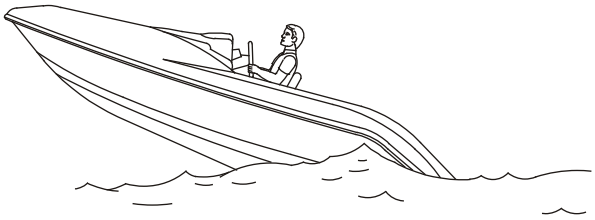
a - Operating the boat with the trim angle of the bow too high
b - Operating the boat with no forward hatches open (station wagon effect)

Wave and Wake Jumping

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



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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 veer violently in a new direction. Such a sharp change in direction can cause occupants to be thrown out of their seats, or out of the boat.

⚠ WARNING

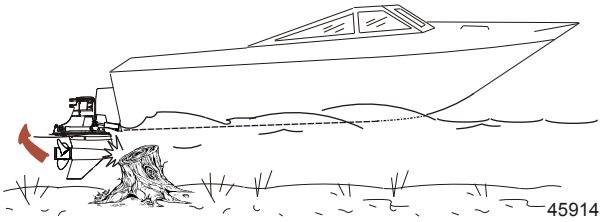
Wave or wake jumping can cause serious injury or death from occupants being thrown within or out of the boat. Avoid wave or wake jumping whenever possible.

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 to a nearly instantaneous stop and can send the occupants flying forward. The boat may also steer sharply to one side.

Impact With Underwater Hazards

IMPORTANT: Operating in shallow waters can severely damage the boat or power package. Maintain a minimum safe speed when operating the vessel in shallow waters or in areas with underwater obstacles.

Reduce speed and proceed with caution whenever you drive a boat in shallow water areas, or in areas where you suspect underwater obstacles may exist which could be struck by the sterndrive or the boat bottom. The most important thing you can do to help reduce injury or impact damage from striking a floating or underwater object is to control the boat speed. Under these conditions, boat speed should be kept to a minimum planing speed 24 to 40 km/h (15 to 25 MPH).



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

- Part of the sterndrive or the entire sterndrive could break loose and cause serious injury or damage to the boat.
- The boat could move suddenly in a new direction. Such a sharp change in direction 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, or even out of the boat.
- Impact damage to the sterndrive and/or boat.

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

⚠ WARNING

Operating a boat or engine with impact damage can result in product damage, serious injury, or death. If the vessel experiences any form of impact, have an authorized Mercury Marine dealer inspect and repair the vessel or power package.

After striking a submerged object, stop the engine as soon as possible and inspect it for any broken or loose parts. If damage is present or suspected, the sterndrive 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, or water leaks.

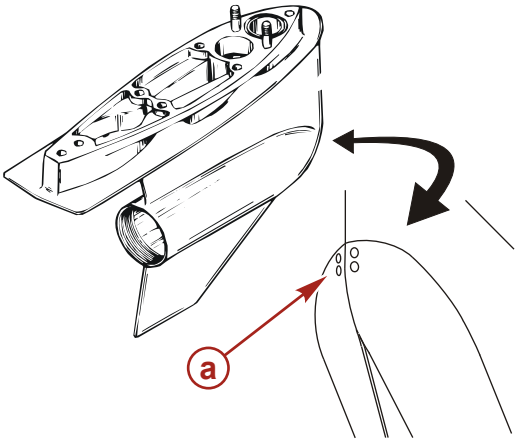
Operating a damaged sterndrive could cause additional damage to other parts of the sterndrive, or could affect control of the boat. If continued running is necessary, do so at greatly reduced speeds.

Operating in Shallow Water

NOTICE

Operating in shallow water can cause severe engine damage due to clogged water inlets. Ensure that the water inlets on the gearcase do not ingest sand, silt, or other debris, which can restrict or stop cooling water supply to the engine.

Extreme care should be exercised when operating a boat equipped with only low water inlets while maneuvering in shallow water. Due to a small amount of total water inlet area, there is high suction at the water inlets. These inlets will easily clog with bottom contact and are susceptible to clogging when operated in shallow or weedy water.



Low water inlet gearcase

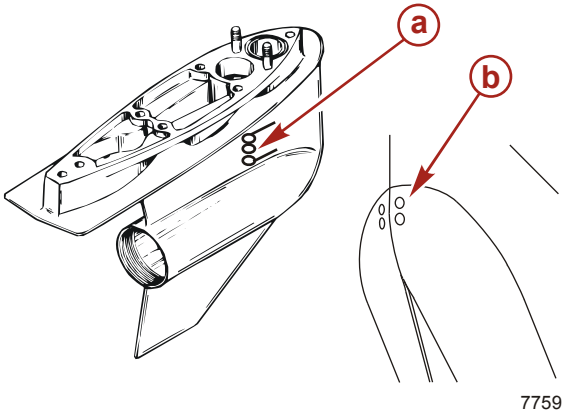
a - Low water inlets

The design of the dual water inlet gearcase reduces the risk of restricting or shutting off the water supply to the engine, but caution should still be used when operating in shallow or weedy water.

CLEARING A DUAL WATER INLET GEARCASE

1. Idle the boat out to deep water.
2. Bring the boat up on plane but operate at a moderate speed until the engine temperature and block water pressure returns to normal.

NOTE: *Engine block pressure at the gauge can still be low if the line to the gauge is clogged.*



Dual water inlet gearcase

a - Strut inlets

b - Low water inlets

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.

Use flotation devices. Have an approved personal flotation device of suitable size for each person aboard (it is the law) and have it readily accessible.

Do not overload your boat. Most boats are rated and certified for maximum load (weight) capacities (refer to your boat capacity plate). If in doubt, contact your dealer or the boats manufacturer.

Perform safety checks and required maintenance. Follow a regular schedule and ensure that all repairs are properly made.

Check safety equipment onboard. Here are suggestions of the types of safety equipment to carry when boating:

- Approved fire extinguisher; paddle or oar.
- Signal devices: flashlight, rockets or flares, flag and whistle or horn.
- Spare propeller, thrust hubs and an appropriate wrench.
- Tools for necessary minor repairs; first aid kit and book.
- Anchor, extra anchor line; waterproof storage containers.
- Manual bilge pump and extra drain plugs; compass and map or chart of area.
- Spare operating equipment; batteries, bulbs, fuses, etc.

- Transistor radio and 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.

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
4. Your state boating law enforcement agency

Direct all inquiries to the Boat U.S. Foundation information number 1-800-336-BOAT (2626).

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.

Make sure everyone in the boat is properly seated. Do not allow anyone to sit or ride on any part of the boat that was not intended for such use. This includes the back of seats, gunwales, transom, bow, decks, raised fishing seats, any rotating fishing seat; or anywhere that an 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). Alcohol or drug use impairs your judgment and greatly reduces your ability to react quickly.

Know your boating area and avoid hazardous locations.

Prepare other boat operators. Instruct at least one other person onboard in the basics of starting and operating the power package, and boat handling, in case the driver becomes disabled or falls overboard.

Passenger boarding. Stop the engine whenever passengers are boarding, unloading, or are near the back (stern) of the boat. Just shifting the power package into neutral is not sufficient.

GENERAL INFORMATION

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 speed.

Never drive your boat directly behind a water-skier in case the skier falls. As an example, your boat traveling at 40 km/h (25 MPH) will overtake a fallen skier 61 m (200 ft) in front of you in five seconds.

Watch fallen skiers. When using your boat for waterskiing or similar activities, always keep a fallen or down skier on the operator's side of the boat while returning to assist 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
4. There is complete loss of the boat

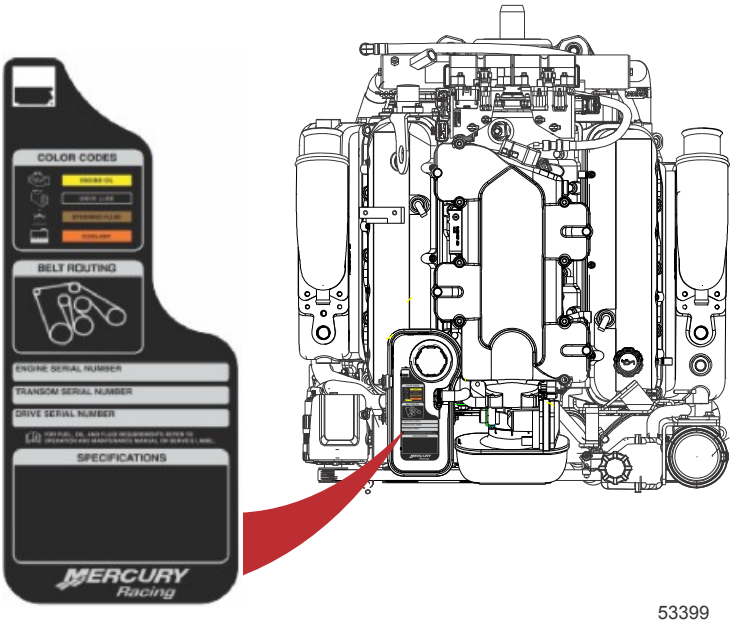
IMPORTANT: Seek further assistance from local law enforcement for a complete list of rules and regulations.

Stolen Power Package

If your power package is stolen, immediately advise the local authorities and Mercury Marine of the model and serial numbers and to whom the recovery is to be reported. This **Stolen Power Package** information is placed into a file at Mercury Marine to aid authorities and dealers in recovery of stolen engines.

SPECIFICATIONS

Engine Identification



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Record the following information for future use:

Engine Model/Horsepower: _____

Engine Serial Number: _____

Transom Assembly Serial Number: _____

Propeller Number & Pitch: _____

Sterndrive Serial Number & Gear Ratio: _____

Running Rotation: _____

Hull Identification Number: _____

Boat Model & Length: _____

SMARTPHONE LINK

Look for a smartphone link on the upper corner of the information label to access quick product information.

Fuel Requirements

Use a major brand of unleaded gasoline, preferably without alcohol. Mercury Marine recommends fuels that contain fuel injector cleaner for added internal cleanliness.

SPECIFICATIONS

⚠ WARNING

Fuel leakage is a fire or explosion hazard, which can cause serious injury or death. Periodically inspect all fuel system components for leaks, softening, hardening, swelling, or corrosion, particularly after storage. Any sign of leakage or deterioration requires replacement before further engine operation.

NOTICE

The use of improper fuel can cause serious damage to the engine. Damage resulting from the use of improper fuel is considered engine misuse and is not covered under the limited warranty. Use only the recommended fuel in the engine.

OCTANE REQUIREMENTS (U.S./CANADA)

FUEL TYPE	MINIMUM POSTED OCTANE
Unleaded regular	(R+M) ÷ 2 = 87 or RON = 91*

NOTE: **Research Octane Number*

OCTANE REQUIREMENTS (OUTSIDE THE U.S./CANADA)

FUEL TYPE	MINIMUM POSTED OCTANE
Unleaded regular [1.]	(R+M) ÷ 2 = 87 or RON = 91*

NOTE: **Research Octane Number*

USING REFORMULATED (OXYGENATED) FUELS (USA ONLY)

This type of fuel is required in certain areas of the U.S. The two types of oxygenates used in these fuels are alcohol (ethanol) or ether (MTBE or ETBE). If ethanol is the oxygenate that is used in the gasoline in your area, refer to the **Fuel Containing Alcohol** section.

These reformulated fuels are acceptable for use in your Mercury engine.

FUEL CONTAINING ALCOHOL

If the fuel in your area contains either methanol (methyl alcohol) or ethanol (ethyl alcohol), you should be aware of certain adverse effects that can occur. These adverse effects are more severe with methanol. Increasing the percentage of alcohol in the fuel can also worsen these adverse effects.

Some of these adverse effects are caused because the alcohol in the fuel can absorb moisture from the air, resulting in a separation of the water/alcohol from the gasoline in the fuel tank.

1. Mercury Racing does not recommend using leaded gasoline. Leaded gasoline is acceptable in areas where unleaded gasoline is not available; however, lead particles may build up in the exhaust passages and/or the combustion chambers.

The fuel system components on your Mercury engine will withstand up to 10% alcohol content in the gasoline. We do not know what percentage your boat's fuel system will withstand.

Fuel containing alcohol may increase:

- Corrosion of metal parts.
- Deterioration of rubber or plastic parts.
- Fuel permeation through rubber fuel lines.
- Starting and operating difficulties.

IMPORTANT: Operating a Mercury Marine engine with gasoline containing alcohol creates unique problems as a result of long storage periods common to a boat. Cars normally consume alcohol-blend fuels before they absorb enough moisture to cause problems; however, boats often sit idle long enough for phase separation to occur. In addition, alcohol can wash protective oil films from internal components causing corrosion.

IMPORTANT: Because of possible adverse effects of alcohol in gasoline, it is recommended that only alcohol-free fuel be used where possible.

If only fuel containing alcohol is available, or if the presence of alcohol is unknown, increased inspection frequency for leaks and abnormalities is required.

Low Permeation Fuel Hose Requirement

Low permeation fuel hose must be installed on all sterndrive engine packages that are manufactured for sale, sold, or offered for sale in the United States.

- The Environmental Protection Agency (EPA) requires that any sterndrive engine package manufactured after January 1, 2009, must use low permeation fuel hose for the primary fuel hose connecting the fuel tank to the engine.
- Low permeation hose is USCG Type B1-15 or Type A1-15, defined as not exceeding 15/gm²/24 h with CE 10 fuel at 23 °C as specified in SAE J 1527 - marine fuel hose.

Crankcase Oil

OIL RECOMMENDATIONS

Preferred Oils	NMMA Classification
Mercury Racing 4-Stroke Oil, 25W-50 Synthetic Blend, or 25W-40 Sterndrive/Inboard Oil	FC-W®
Use a new oil filter with every oil change	

SPECIFICATIONS

IMPORTANT OIL PRACTICES

Do Not Use
• Straight weight oils
• Non-detergent oils
• Oils containing solid additives
• Multi-viscosity oils other than the ones recommended
• Low quality oils
Do Not Mix
• Different brands of oils, straight weight or multi-viscosity
• Different weights of straight weight or different weights of multi-viscosity oils.

Capacities

Unit

Unit Capacity	
Crankcase Oil Capacity with New Filter[1.]	7.6 L (8 U.S. qts)
Bravo - Drive Unit Oil Capacity (with Monitor)	2.65 L (2.8 U.S. qts)
Bravo III XR - Drive Unit Oil Capacity (with Monitor)	2.8 L (3 U.S. qts)
Closed-Cooling System	13 L (14 U.S. qts)

1. Always use a dipstick to determine exact quantity of oil required.

SPECIFICATIONS

General Engine Specifications

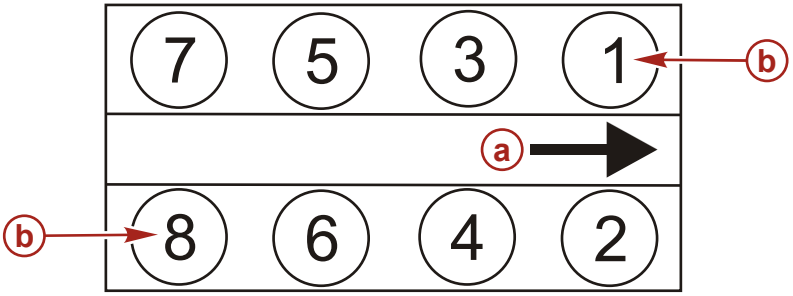
Crankshaft horsepower[1.]	388 kW, 520 HP
Displacement	8.57 L (523 cid)
Cylinder arrangement	V8
Bore	116 mm (4.560 in.)
Stroke	102 mm (4.00 in.)
Compression ratio	8.6:1
Alternator	95 amp/1238 watt
Battery requirements	Group 31M, 1150 CCA (minimum)
Electrical system	12-volt negative (–) ground
Ignition type	PCM distributorless, wasted spark
Spark plug type	NGK BKR6ES
Spark plug gap	0.9 mm (0.035 in.)
Fuel system	Sequential port electronic fuel injection
Emission control system	Electronic engine control (EC)
Length of Bravo engine package (transom mount to front of engine)	869 mm (34.2 in.)
Width	843 mm (33.2 in.)
Height (bottom of oil pan to highest part of the engine which could be the exhaust system)	843 mm (33.2 in.)
Weight	552 kg (1218 lb)

1. Kilowatts/horsepower rating is in compliance with the SAE J1228/ISO 3046 Standard. Usable power will be reduced by gear losses.

SPECIFICATIONS

Engine Operating Limitations

Maximum wide-open throttle (WOT) RPM	4800–5200 RPM
Rev limit[1]	5500 RPM
Idle RPM in gear	700 RPM
Idle RPM out of gear	800 RPM
Maximum fuel system flow rate	155 L/hr (41 gals/hr) at 5200 RPM
Fuel pressure at idle	300 kPa (43.5 psi)
Fuel pressure at wide-open throttle	270 kPa (39.2 psi)
Coolant thermostat initially opens at:	62° C (143° F)
Coolant thermostat is wide open at:	70° C (158° F)
Minimum water pressure supplied to the engine at WOT	172 kPa (25 psi)
Maximum water pressure supplied to the engine at WOT	345 kPa (50 psi)
Minimum oil pressure at idle (hot)	138–207 kPa (20–30 psi)
Minimum oil pressure at WOT (hot)	331–379 kPa (48–55 psi)



a - Front of engine and boat
b - Firing order 1-8-4-3-6-5-7-2

Engine Break-in

IMPORTANT: Failure to follow the engine break-in procedures can result in poor performance throughout the life of the engine and can cause engine damage. Always follow break-in procedures.

1. Engines are equipped with an ignition system that has a built-in 5500 RPM rev limiter. Engine is performing normally if it will not exceed this RPM.

5 Hr. Break-in Procedure
• Allow engine to warm-up for 30–60 seconds.
• Do not exceed 3/4 throttle.
• Avoid full throttle acceleration from idle speed.
• Always vary throttle setting.
• Run engine the majority of time between 3000–4500 RPM.
• Frequently check engine oil level. Add oil if needed. It is normal for oil consumption to be high during break-in period.

After Break-In Period

To help extend the life of your power package, Mercury Marine recommends the following:

After 5 hr. Break-in
• 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.
• Do not advance the throttle until the engine runs smoothly at idle and water temperature reaches a minimum of 54 °C (130 °F). Do not operate at full throttle until the engine oil temperature reaches 60 °C (140 °F).
• Follow the maintenance schedule in this manual.

OPERATION

Instrumentation

Mercury Racing requires that the following critical engine functions be monitored:

- Oil pressure
- Engine RPM
- Water temperature
- System voltage
- Guardian fault messages

The use of SmartCraft instrumentation will display all of the above critical engine functions as well as others not listed. SmartCraft instrumentation will also display information about power train sensor faults and Guardian activation.

Warning System

The engine's warning system includes an audible alert consisting of a horn located in the helm harness, and the Engine Guardian system. Do not attempt to alter or disable the warning system in any way.

ENGINE GUARDIAN SYSTEM

The Engine Guardian system monitors sensors on the engine for early indications of problems. If a sensor indicates a fault, the system responds to the problem by sounding the horn and, depending on the type of fault, may reduce engine power to provide engine protection. Refer to the VesselView manual to display the details. When the key switch is turned "ON," the warning horn beeps once to verify horn operation.

Fault Type and Related Warning Signal

If there are two stages for a warning fault, Stage 1 occurs first. If a fault remains active, Stage 2 becomes active. If multiple faults are active, the operator is warned of the more severe fault first. If another fault with the same severity occurs during Stage 2, the horn will return to Stage 1 signaling. Monitor the VesselView for warning messages.

- Caution: 1 second on and 1 second off for 6 cycles
- OBD-M Stage 1: 5 seconds on 1 cycle followed by 60 seconds off.
- OBD-M Stage 2: 0.5 seconds on and 0.5 seconds off for 1 cycle followed by 60 seconds off.
- Severe Stage 1: 6 seconds on and 6 seconds off for 2 cycles followed by 59 seconds off.
- Severe Stage 2: 0.5 seconds on and 0.5 seconds off for 2 cycles followed by 59 seconds off.
- To stop the warning horn, turn off the engine. If the horn continues to sound on restart, the system detected a fault again. See your Mercury Marine dealer to correct the problem as soon as possible.

- If the beeping does not reoccur, the problem does not need immediate attention but will require you to see your authorized Mercury Marine dealer to diagnose and clear the fault.

If the propulsion control module (PCM) detects a fault signal from an engine sensor, it records a fault code. A computer diagnostic system (CDS) is required to extract specific problem codes from the PCM.

CALIFORNIA ENGINES

In addition to the aforementioned procedure used to clear active faults, the California Air Resources Board (C.A.R.B.), requires a special clearing procedure for certain warning faults. These faults are:

- MAPR_TPS1Rationality and TPS2
- TPS1_ETC_NoAdapt, TPS2, TPS3, TPS4
- TPS1_RangeLow, TPS2, TPS3, TPS4
- TPS1_RangeHigh, TPS2, TPS3, TPS4
- BaroRange
- Injector1_OutputFault, Injector2, Injector3, Injector4, Injector5, Injector6, Injector7, Injector8
- Horn_OutputFault
- MAP_Angle_RangeHigh
- MAP_Angle_RangeLow
- SysVolt_RangeHigh
- SysVolt_RangeLow
- IAT_RangeHigh
- IAT_RangeLow
- StbdECT_RangeHigh
- StbdECT_RangeLow
- EncoderFault
- CrankCamTrigger

NOTICE
The engine must start to clear the fault using the following procedure.

To clear the fault, the engine must be started three times. If the horn still sounds after three start cycles, the fault still exists. See your authorized Mercury dealer to fix the problem and clear the fault.

Electrical System Overload Protection

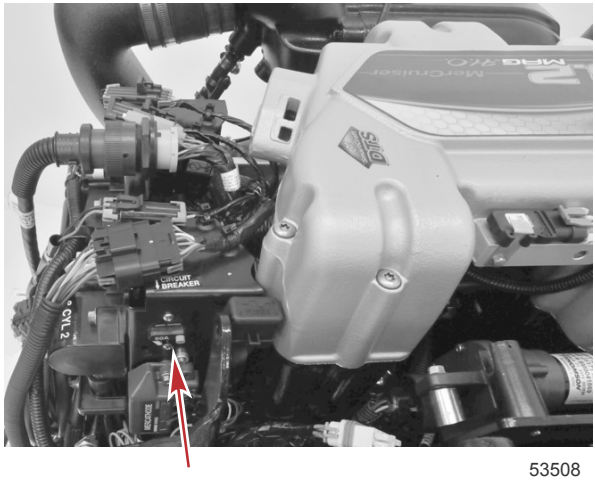
If an electrical overload occurs, a fuse will blow or the circuit breaker will trip open. The cause must be found and corrected before replacing the fuse or resetting the circuit breaker.

NOTE: *In an emergency, when you must operate the engine and cannot locate the cause for the high current draw, turn off or disconnect all accessories connected to the engine and instrumentation wiring. Reset the circuit breaker. If the breaker remains open, the electrical overload has not been eliminated. Contact your authorized dealer.*

The circuit breaker provides protection for the engine wiring harness and the instrumentation power lead. To test or reset the circuit breaker:

Reset the breaker by pushing the red button back into the housing.

NOTE: *The circuit breaker is located at the starboard rear of the engine in the electrical center.*



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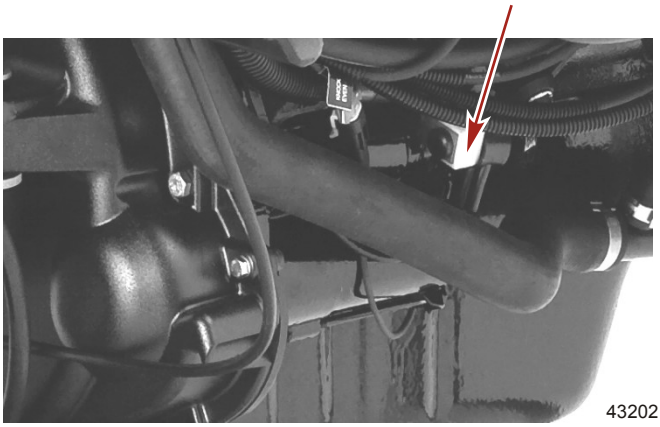
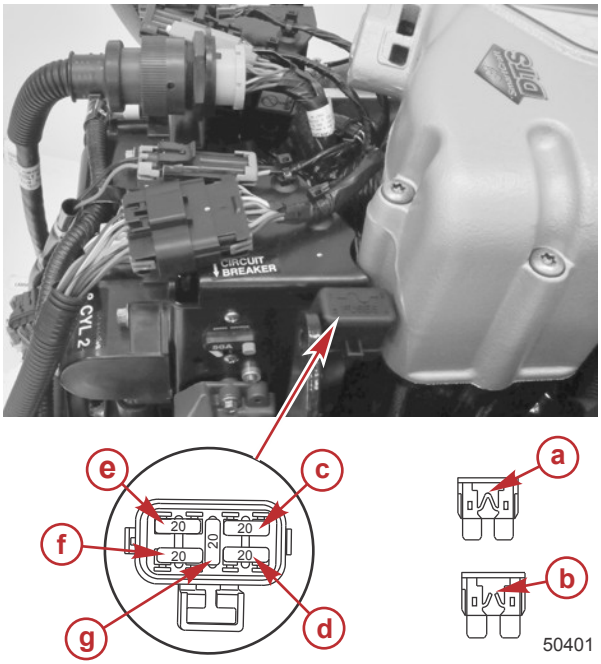
A 90-amp fuse, located on the large post of the starter solenoid, protects the engine wiring harness if an electrical overload occurs.



43202

OPERATION

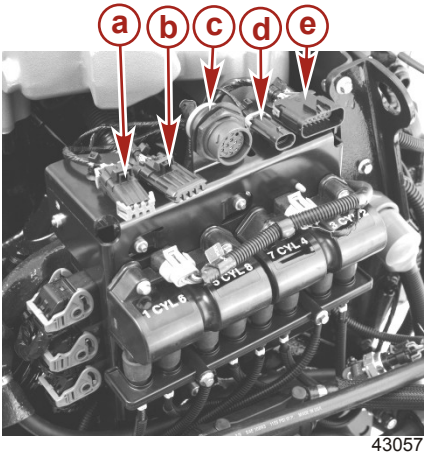
Four fuses protect the main power, fuel pump, ignition, and accessory circuits. Four 10-amp fuses protect the O_2 sensors. These are located near the 14-pin harness connector.



- **a -** Good fuse
- **b -** Bad fuse
- **c -** Alternator and fuel pump circuit—20-amp fuse
- **d -** Power to 14-pin helm harness—20-amp fuse
- **e -** ECM driver power, fuel pump relay, coils, and start relay (DTS—20-amp fuse
- **f -** Trim down relay (DTS), trim up relay, and injectors circuit—20-amp fuse
- **g -** Spare fuse

OPERATION

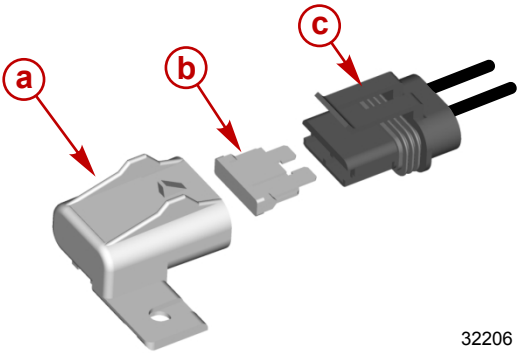
The clean power harness connected to the engine starting battery minimizes voltage drop to the electrical system and is protected by a 5-amp fuse.



43057

- **a -** Paddle wheel and tank level connector
- **b -** Diagnostic connector
- **c -** 14-pin harness connector
- **d -** Clean power harness connector
- **e -** Transom harness connector

A 15-amp accessory fuse protects the accessory circuits. This fuse is located on the rear of the engine.

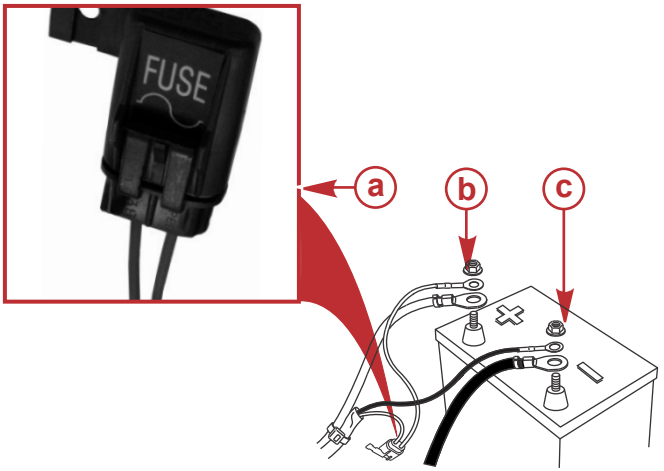


32206

- **a -** Fuse cover
- **b -** 15-amp fuse
- **c -** Accessory harness

OPERATION

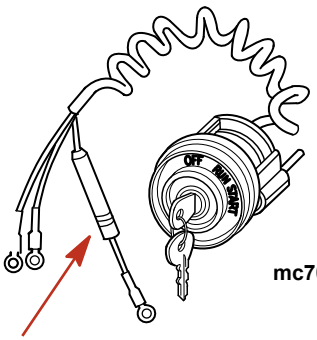
The emissions control system is protected by a 5-amp fuse located in the clean power harness.



43608

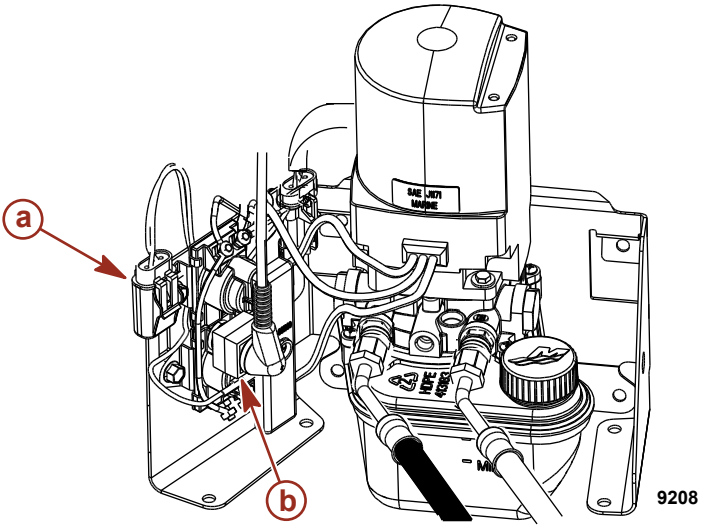
- **a -** 5-amp fuse
- **b -** Positive battery terminal (harness lead with fuse)
- **c -** Negative battery terminal

A 20-amp fuse may be located in the ignition switch "I" terminal lead to protect the electrical system. Check for an open fuse if the engine does not start, and the circuit breaker is not tripped.



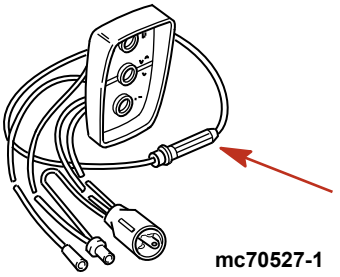
mc70525-1

The power trim system is protected from overload by both a 110-amp fuse and a 20-amp spade fuse on the power trim pump. The trim pump may also have an in-line circuit protection device in the power trim positive lead near the battery switch or battery connection.



a - 20-amp spade fuse
b - 110-amp fuse

The Quicksilver three-button power trim control panel is protected by a 20-amp in-line fuse.

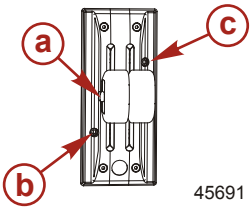


The Quicksilver MerCathode System has a 5-amp in-line fuse in the wire which connects to the positive (+) terminal on controller. If the fuse is open, the system will not operate and will not protect against corrosion.

Remote Controls (Console Mounted Zero Effort)

1. Shift only with the engine at idle speed. Always move to the desired gear position with a quick, firm motion.

2. The throttle control handle friction is adjustable using a 5/16 in. hex head wrench; clockwise increases friction.



a - Trim switch
b - Port friction adjustment
c - Starboard friction adjustment

Starting, Shifting, and Stopping

⚠ WARNING

Explosive fumes contained in the engine compartment can cause serious injury or death from fire or explosion. Before starting the engine, operate the bilge blower or vent the engine compartment for at least five minutes.

NEW ENGINES OR ENGINES COMING OUT OF STORAGE

Refer to **Power Package Recommissioning.**

IMPORTANT: Observe the following:

- **Do not start the engine without supplying water to the seawater pickup pump (to prevent pump or engine damage).**
- **Never shift the drive unit unless the engine is at idle RPM.**

Perform the following as appropriate:

- ☐ Check all items listed in **Operation Chart.**
- ☐ Perform any other necessary checks, as indicated by your dealer, or specified in your boat owner's manual.
- ☐ Place the drive unit in the full down/in position.
- ☐ Place the control handle in neutral.

COLD OR WARM ENGINE

EFI engines require no throttle advance to start. The boat can be operated after the engine has started and is idling smoothly.

NOTE: *Engines that have not been started for extended periods or have had fuel filter changes may not stay running on the first few initial attempts to start. Do not advance the throttle to keep the engine running. Continue to restart the engine until it idles smoothly, which means the fuel system is primed. Allow the engine to warm up to 54 °C (130 °F) before advancing the throttle. Do not operate at full throttle until the engine reaches an oil temperature of 60 °C (140 °F).*

OPERATION

FLOODED ENGINE

Before trying a restart, check for full battery voltage (13.8–14.2 volts). Move control/throttle lever to full throttle. Be prepared to decrease the engine speed to idle as soon as the engine starts.

STARTING PROCEDURE

1. Turn the key switch to "START." Release the key and allow the switch to return to the "RUN" position.
2. Check the oil pressure gauge immediately after the engine starts. If oil pressure is below the minimum requirement, see **Specifications**, stop the engine immediately, and determine cause.
3. If the engine is cold, make sure the engine is idling smoothly before operating the boat.
4. Check the coolant temperature gauge to ensure that the engine temperature is not abnormally high. If it is, stop the engine immediately and determine cause.
5. Ensure that the charging system is functioning correctly.
6. Observe the power package for fuel, oil, water, and exhaust leaks.

Operation Chart

1. **Before Starting**
   - ☐ Open the engine hatch.
   - ☐ Turn battery switch "ON," if equipped.
   - ☐ Operate bilge blowers, if equipped.
   - ☐ Open fuel shut off valve.
   - ☐ Open seacock, if equipped.
   - ☐ Perform all other checks specified by your dealer and/or boatbuilder.
2. **After Starting**
   - ☐ Observe all gauges to check condition of engine. If not normal, stop engine.
   - ☐ Check for fuel, oil, water, fluid and exhaust leaks, etc.
   - ☐ Check shift and throttle control operation.
   - ☐ Check steering operation.
3. **While Underway**
   - ☐ Observe all gauges to monitor engine condition.
4. **After Stopping**
   - ☐ Shift to neutral. Turn ignition key "OFF."
   - ☐ Turn battery switch "OFF," if equipped.

- [ ] Close fuel valve.
- [ ] Close seacock.
- [ ] Flush cooling system if in saltwater area.

Freezing Temperature Operation

IMPORTANT: If boat is operated in freezing temperatures, ensure that closed coolant is rated for the temperature range in which it is to be used. The seawater section of the engine must be drained after use to prevent freezing. Damage caused by freezing is not covered by Mercury Racing's Limited Warranty.

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. Engine components will be damaged if submerged. Damage caused by submersion is not covered by the Mercury Racing Limited Warranty.

Launching And Boat Operation Care

NOTICE

Some boating maneuvers can introduce water into the engine through the exhaust system, causing severe engine damage. Be careful when unloading a boat from its trailer, slowing down rapidly, backing up rapidly, and stopping suddenly.

In any of the situations described in the preceding caution, water entering the engine could cause severe damage to internal parts. Refer to **Attention Required After Submersion** in the **Maintenance** section of this manual.

CONDITIONS AFFECTING OPERATION

Weight Distribution

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

Shifting weight to rear (stern) may:

- Increase speed and engine RPM.
- Cause the boat to porpoise.
- Cause the bow to bounce in choppy water.
- Increase the danger of a following wave splashing into the boat when coming off plane.

Shifting weight to front (bow) may:

- Improve ease of planing.
- Improve rough water ride.
- Cause the boat to veer back and forth (bow steer).

Bottom Of Boat

To maintain maximum speed, ensure that the bottom of the boat is:

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

Marine vegetation may accumulate when the boat is docked, clogging water inlets and causing the engine to overheat. This growth must be removed before operation.

Cavitation

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

- Weeds or other debris snagged on propeller or gear housing.
- Bent propeller blade or damaged gear housing skeg.
- Raised burrs or sharp edges on propeller or gear housing.

Ventilation

Ventilation occurs when surface air or exhaust gases surround the propeller, causing propeller speed-up (slippage) and a decrease in boat speed. Excessive ventilation is annoying and usually caused by:

- A drive unit trimmed out too far.
- A damaged propeller or gear housing, allowing exhaust gases to escape between propeller and gear housing.
- A drive unit installed too high on the transom.

CONDITIONS AFFECTING OPERATION

Propeller Selection

IMPORTANT: Choosing the correct propeller allows the engine to run at its specified maximum wide-open throttle RPM. Use an accurate service tachometer to verify engine operating RPM.

It is the boat manufacturer and/or the selling dealer's responsibility to equip the power package with the correct propellers. Specified engine wide-open throttle (WOT) and operating RPM range are listed in **Specifications.**

IMPORTANT: All Mercury Racing engines have an RPM rev-limiter that is set to an upper (or limited) RPM. This limit is slightly above the normal operating range of the engine and is designed to help prevent damage from excessive engine RPM. Once the RPM drops into the recommended operating RPM range, normal engine operation resumes.

Select a propeller that allows the engine to operate in the upper half of the recommended full throttle RPM range with the boat normally loaded (refer to **Specifications**).

If full throttle operation is below the recommended range, change the propeller to prevent loss of performance and possible engine damage. On the other hand, operating an engine above the recommended operating RPM range causes higher than normal wear or damage. "Propeller lines normally are designed so that the next size pitch will change engine RPM by 300 to 500. For every 1" of pitch change, the effect will be approximately 200 RPM."

RPM loss may require changing to a lower pitch propeller due to the following conditions:

- Operating in warmer weather and greater humidity.
- Operating in a higher elevation.
- Operating with a damaged propeller or dirty boat bottom.
- Operating with increased load (additional passengers, pulling skiers, etc.).

Conditions That Lower Engine Performance

The following conditions lower engine performance and cannot be compensated by the engine fuel or electronic management systems.

- Above sea level elevations.
- High temperature.
- Low barometric pressure.
- High humidity.

The conditions listed above reduce air density to the engine which in turn reduces the following:

- Boost pressure on supercharged engines.
- Horsepower and torque throughout the RPM range.
- Peak RPM.
- Cranking compression.

CONDITIONS AFFECTING OPERATION

EXAMPLE: An engine running at an elevation of 2,438 m (8,000 ft) will have over a 30% power loss while engine power on a hot and humid day can be reduced by as much as 14%. These losses apply to both normally aspirated and supercharged engines.

Compensating for power robbing conditions:

- Switch to a lower pitch propeller.
- Change the gear ratio.

Some boat performance can be regained by dropping to a lower pitch propeller, but engine performance will remain lower. In some cases, a gear ratio reduction may be more beneficial. To optimize engine performance, prop the engine to allow operation at or near the top end of the recommended maximum RPM range at wide-open throttle with a normal boat load.

MAINTENANCE

Service Responsibilities

OWNER/OPERATOR RESPONSIBILITIES

It is the owner/operator's responsibility to perform the following:

- Perform all safety checks.
- Return the unit to an authorized Mercury Marine dealer for a periodic checkup.

Proper maintenance and care of your power package will ensure optimum performance and dependability, and will keep your overall operating expenses at a minimum. See your authorized Mercury Marine dealer for service aids.

DEALER RESPONSIBILITIES

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

- Completing a Warranty Registration Card and mailing it to the factory immediately upon sale of the new product.
- Properly equipping the boat.
- Making certain that the Mercury Marine power package and other equipment are in proper operating condition prior to delivery.
- Making all necessary adjustments for maximum efficiency.
- Familiarizing the customer with the onboard equipment.
- Explaining and demonstrating the operation of the power package and boat.
- Providing you with a copy of a **Predelivery Inspection Checklist** prior to delivery.

Replacement Service Parts

⚠ WARNING

Avoid fire or explosion hazard. Electrical, ignition, and fuel system components on Mercury Marine products comply with federal and international standards to minimize risk of fire or explosion. Do not use replacement electrical or fuel system components that do not comply with these standards. When servicing the electrical and fuel systems, properly install and tighten all components.

Marine engines are expected to operate at or near full throttle for most of their life. They are also expected to operate in 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.

For example, one of the most important, and probably the least suspected special replacement part, is the cylinder head gasket. Since saltwater is highly corrosive, the steel-type automotive head gasket cannot be used. A marine engine head gasket uses special materials to resist corrosive action.

Since marine engines must be capable of running at or near maximum RPM much of the time, special valve springs, valve lifters, pistons, bearings, 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 Marine engines to provide long life and dependable performance.

Do-It-Yourself Maintenance Suggestions

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

- Present-day marine equipment, such as your Mercury Marine power package, are highly technical pieces of machinery. Electronic ignition and special fuel delivery systems provide greater fuel economies, but increased complexity for the untrained mechanic.
- Do not attempt any repairs that are not covered in this manual unless you are aware of the precautions and procedures required. Your safety is our concern.
- If you attempt to service the product yourself, we suggest you order the service manual for that model. This 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.
- Special tools and equipment may be 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 for the repair.
- 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 and attempt to diagnose a problem or request the repair procedure. It is difficult for them to diagnose a problem over the telephone.
- Your authorized Mercury Marine dealer is there to service your power package. They have qualified factory-trained mechanics.

Mercury Marine recommends that 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.

MAINTENANCE

IMPORTANT: Refer to Maintenance Charts (on following pages) for complete listing of all scheduled maintenance to be performed. Some listings can be done by the owner/operator, while others should be performed by an authorized Mercury Marine dealer. Before attempting maintenance or repair procedures not covered in this manual, Mercury Marine recommends purchasing a Mercury Marine service manual.

Servicing High-Horsepower Engines

All high-performance engines require frequent maintenance and inspection schedules due to the extreme duty cycles and related stress these products endure. Failure to follow the detailed maintenance and service schedule as written and supplied by Mercury Marine could lead to catastrophic engine failure and increased owner expense.

Engine Maintenance Charts

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

Interval	Task
Check prior to every use and every 3 hours of operation.	Engine crankcase oil - Check level.
	Engine - Inspect
	Seawater filter - Check for debris or leakage.
	Power steering fluid - Check level.
After every use in salty, brackish, or mineral-laden water.	Flush the seawater section of the cooling system.
Every 25 hours of operation or once every 30 days, whichever occurs first.	Crankcase oil and filter - Change.
	Check the oil level in the sea pump/fuel pump and inspect for fuel contamination.
	Battery - Check water level and inspect for damage.
	Fuel pump sight tube - Ensure that no fuel is present. Vapor or condensation is acceptable.
	Check the engine coolant level.

Interval	Task
Every 50 hours or once a year, whichever occurs first.	Perform all 25-hour maintenance items.
	Serpentine and drive belts (All) - Inspect condition and check tension.
	Cooling system hoses and clamps - Inspect for damage and deterioration. Check clamps for tightness.
	Electrical system - Check for loose or damaged wiring.
	Continuity circuit - Check components for loose connections, broken or frayed wires.
	Throttle cable and linkage - Lubricate and inspect for loose, damaged, or missing parts.
	Engine exhaust system - Inspect for damage, deterioration and restrictions. Check clamps for tightness.
	Water separator filter - Inspect (if installed on the boat).
Freshwater use: Twice a year.	Power package exterior surfaces - Spray with rust preventative.
Saltwater use: Every 50 hours of operation or every 60 days, whichever occurs first.	Power package exterior surfaces - Spray with rust preventative.

Interval	Task
Every 100 hours of operation or once a year, whichever occurs first.	Power package exterior surfaces - Clean and paint.
	Check engine cylinder compression.
	Oil coolers for the engine and power steering - Clean seawater section.
	Flame arrestor and crankcase ventilation hose - Inspect, clean, or replace.
	Engine alignment - Check.
	Exhaust - Check for signs of water leakage.
	Exhaust system internal and external shutters - Inspect.
	MerCathode system - Test output.
Every 100 hours of operation or recommissioning after storage.	Fuel filters - Replace.
Every 100 hours of operation or once a season and whenever insufficient seawater flow is suspected (if the operating temperature exceeds normal).	Seawater pick-up pump - Disassemble and inspect.
Every 150 hours of operation.	Replace positive crankcase ventilation (PCV) valve.
Every 200 hours of operation.	Ignition system - Clean and inspect condition. Adjust or replace spark plugs as needed.
Every 5 years.	Flush the closed cooling system and refresh coolant.

Bravo Drive Maintenance Charts

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

Interval	Task
Check prior to every use and every 3 hours of operation.	Drive, transom, and propeller - Inspect.

Interval	Task
Every 25 hours of operation or once every 30 days, whichever occurs first.	Gear housing water pickups - Check for marine growth or debris.
	Anodes - Inspect for erosion.
	Sterndrive unit oil - Check level.
	Trim pump - Check oil level.
Saltwater use: Every 50 hours of operation or 60 days, whichever occurs first.	Propeller shaft - Lubricate.

Interval	Task
Every 50 hours or once a year, whichever occurs first.	Perform all 25 hour maintenance items.
	Shift cable and linkage - Lubricate and inspect for loose, damaged, or missing parts.
	Engine coupler and universal joint shaft splines and O-rings - Lubricate.
	Sterndrive unit - Oil change.
	Sterndrive unit universal joint cross bearings - Inspect and lubricate.
	Gimbal ring clamping screws - Retorque to 67–74 Nm (50–55 lb-ft).
	Gimbal bearing - Lubricate.
	Transom gimbal housing assembly swivel shaft and gimbal bearing - Lubricate.
	Engine driveshaft - Lubricate (driveline models).
	Engine output shaft bearings - Lubricate (driveline models).
	Input shaft/rear bearing support block bearing - Lubricate (driveline models).
	Steering system - Lubricate and inspect for loose, damaged, or missing parts.
	Propeller shaft - Inspect for bending.

Interval	Task
Every 100 hours of operation or once a year, whichever occurs first.	Power package exterior surfaces - Clean and paint.
	Steering head and remote control - Inspect and lubricate.
	Drive unit bellows and clamps - Inspect.
	Propeller shaft bearing - Inspect by measuring shaft deflection.
	Drive bearing carrier - Check bore for evidence of friction with the propeller shaft.
	Rear driveline bearing support block - Check alignment (driveline models)

Checking Fluid Levels

CRANKCASE OIL

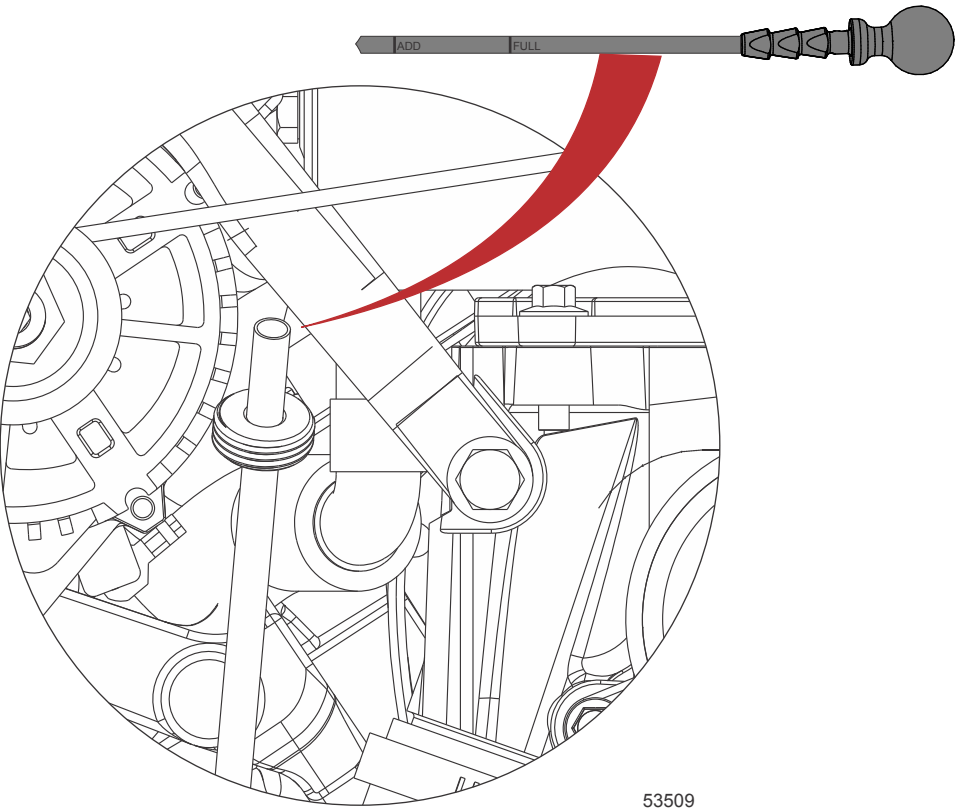
The engine crankcase oil level must be checked at the intervals specified in the **Maintenance Chart.**

NOTE: *Oil consumption is greatly dependant on engine speed. Consumption is highest at wide-open throttle and decreases substantially as engine speed is reduced. It is common for big block, high-performance engines to use up to one quart of oil in one to five hours if the engine is operated continuously at the upper end of the RPM range.*

Stop the engine. Allow approximately five minutes for the oil to drain into the oil pan. The boat must be at rest in the water.

1. Remove the dipstick, wipe it clean, and install the dipstick.

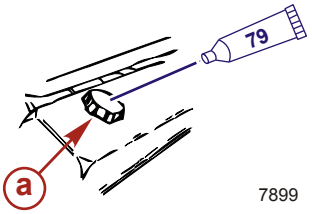
2. Remove the dipstick and check the oil level. The oil level must be between the "FULL" and "ADD" mark.



53509

IMPORTANT: Do not overfill crankcase oil.

3. If the oil level is below the "ADD" mark, remove the oil filler cap. Add the specified oil to bring the level up to, but not over, the "FULL" range mark on the dipstick.



7899

a - Filler cap

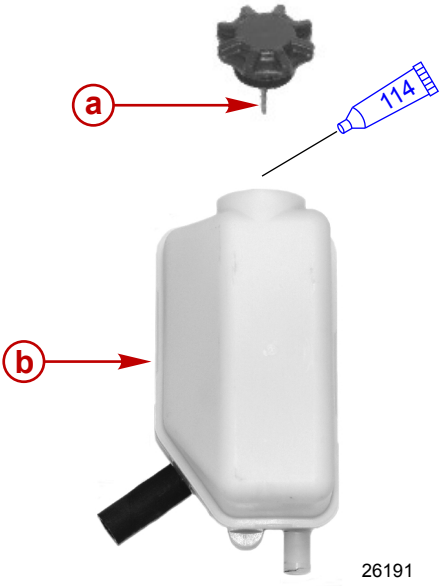
Tube Ref No.	Description	Where Used	Part No.
	25W50 Synthetic Blend 4-Stroke Racing Engine Oil	Engine crankcase	8M0078013
152	25W-50 Verado FourStroke Outboard Oil	Engine crankcase	92-858084K01
79	MerCruiser 4-cycle 25W40 Engine Oil	Engine crankcase	92-858048K01

POWER STEERING PUMP

Stop the engine and position the drive unit straight back.

IMPORTANT: If fluid is not visible in the reservoir, contact your authorized Mercury MerCruiser dealer.

1. Remove the fill cap/dipstick and observe the level. The oil level must be at the lower mark when the engine is cold and at the upper mark when the engine is warm.



a - Cap/dipstick
b - Power steering pump reservoir

Tube Ref No.	Description	Where Used	Part No.
114	Power Trim and Steering Fluid	Power steering pump	92-858074K01

2. Add power steering fluid if required.
3. Install the fill cap/dipstick.

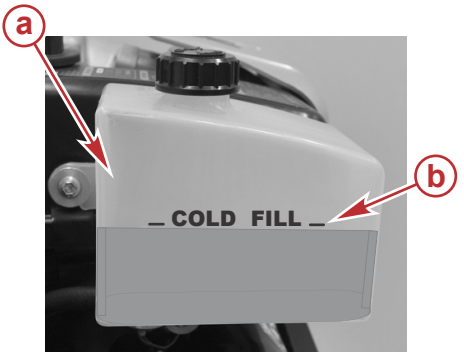
DRIVE UNIT OIL

NOTE: *The oil level will fluctuate during operation. The oil level should be checked with a cold engine before starting.*

1. Check the gear lube monitor oil level; keep the oil level at or near the "COLD FILL" line.
2. If there is water at bottom of the monitor and/or if the oil appears a milky tan, contact your authorized Mercury MerCruiser dealer immediately; both conditions indicate a water leak somewhere in the drive unit.

NOTE: *If the gear oil is green, use High Performance Gear Lube. If the gear oil is amber, use Mercury Racing Gear Oil.*

IMPORTANT: If more than 59 ml (2 fl oz) of gear lube is required to fill the monitor, a seal may be leaking. Damage to the drive unit may occur due to lack of lubrication. Contact your authorized Mercury MerCruiser dealer for service.



53517

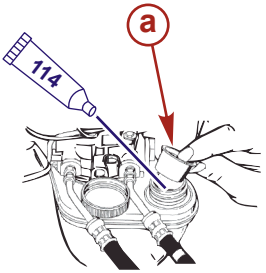
a - Gear lube monitor
b - "COLD FILL" line

Tube Ref No.	Description	Where Used	Part No.
	SAE 85W90 Mercury Racing Gear Oil	Gear lube monitor	8M0078015
87	High Performance Gear Lubricant	Gear lube monitor	92-858064K01

POWER TRIM PUMP FLUID

1. Place the drive unit in the full down/in position.
2. Remove the fill cap from reservoir and observe the fluid level. The level must be up to, but not over, the bottom of the filler neck.

NOTE: *Ensure that the cap plug has been removed and discarded from the filler neck at first use.*

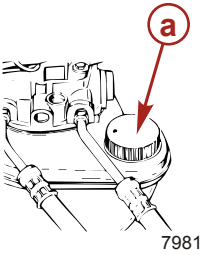


a - Cap plug

Tube Ref No.	Description	Where Used	Part No.
114	Power Trim and Steering Fluid	Power trim pump reservoir	92-858074K01

3. Add power trim and steering fluid, if required, to bring the level to the bottom of the filler neck.
4. Install the fill cap.

NOTE: *The fill cap is vented; check it frequently to ensure that the vent is open and unrestricted.*



a - Reservoir cap

Closed Cooling System

COOLANT REQUIREMENT

NOTICE
Using propylene glycol antifreeze in the closed cooling system can damage the cooling system or the engine. Fill the closed cooling system with an ethylene glycol antifreeze solution suitable to the lowest temperature to which the engine will be exposed.

MAINTENANCE

NOTE: *All factory-installed closed cooling systems come filled with Extended Life Coolant. This antifreeze requires draining and replacing every five years or 1000 hours of operation, whichever comes first. The color of this antifreeze is orange. Any "top-off" fluid used must be Extended Life Coolant.*

Tube Ref No.	Description	Where Used	Part No.
122	Extended Life Antifreeze/Coolant	Closed cooling system	92-877770K1

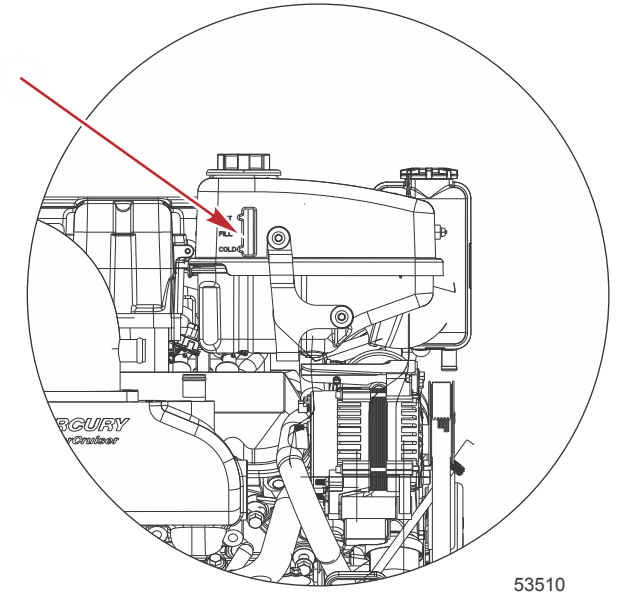
CHECKING COOLANT LEVEL

⚠ CAUTION

A sudden loss of pressure can cause hot coolant to boil and discharge violently resulting in serious injury from burns. Allow the engine to cool down before removing the coolant pressure cap.

IMPORTANT: When reinstalling the coolant reservoir cap, ensure that it is tightened securely.

The coolant level should be at the full mark on the coolant reservoir with the engine cold.



53510

FILLING THE CLOSED COOLING SYSTEM

IMPORTANT: The engine must be cooled to ambient temperature to correctly perform the following procedure.

NOTICE

Using propylene glycol antifreeze in the closed cooling system can damage the cooling system or the engine. Fill the closed cooling system with an ethylene glycol antifreeze solution suitable to the lowest temperature to which the engine will be exposed.

The coolant section of the closed cooling system must be filled with a 50/50 mixture of Extended Life Antifreeze/Coolant and distilled water.

Tube Ref No.	Description	Where Used	Part No.
 122	Extended Life Antifreeze/Coolant	Closed cooling system	92-877770K1

NOTE: *Coolant section capacity is approximate.*

8.2 Models	Capacity	Fluid Type
Closed cooling system	17.4L (18.4 US qt)	Extended Life Antifreeze/ Coolant

⚠ CAUTION

A sudden loss of pressure can cause hot coolant to boil and discharge violently resulting in serious injury from burns. Allow the engine to cool down before removing the coolant pressure cap.

IMPORTANT: When filling the coolant section after it has been completely drained, the engine should be level or slightly lower at the flywheel end.

1. Remove the pressure cap from the coolant reservoir.
2. Fill the reservoir to the full mark with the recommended coolant solution.
3. When refilling the coolant section after it has been completely drained, fill the reservoir to within 12 mm (0.50 in.) of the top of the reservoir neck before starting the engine.
4. Replace the pressure cap.

NOTICE

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

5. Supply cooling water to the engine.

6. With the engine running, check the hose connections, fittings, and gaskets for leaks. Also observe the engine temperature gauge to ensure that the engine operating temperature is normal. If the gauge indicates excessive temperature, stop the engine immediately and determine the cause.

⚠ CAUTION

A sudden loss of pressure can cause hot coolant to boil and discharge violently resulting in serious injury from burns. Allow the engine to cool down before removing the coolant pressure cap.

7. After the engine has cooled completely, recheck the coolant level and add coolant, if necessary.
8. If the reservoir was completely emptied of coolant, a significant amount of air remains in the cooling system. Refill the reservoir to the "FULL" mark, repeat the warm-up/cool-down cycle, and check the coolant level again.
9. Maintain the coolant level in the reservoir at or near the "FULL" mark with the engine cold.

DRAINING

Contact your authorized Mercury MerCruiser dealer.

CLEANING

Contact your authorized Mercury MerCruiser dealer.

Changing Fluids

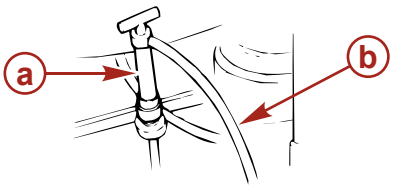
See the **Maintenance Chart** for the lubricant change frequency. The lubricant should be changed before placing the boat in storage.

Power trim and power steering fluids do not require changing.

CRANKCASE OIL AND FILTER (BOAT IN THE WATER)

IMPORTANT: When changing the oil, make sure that the engine is near operating temperature. Use only the recommended motor oil (refer to Specifications).

1. With the engine off but at normal operating temperature, remove the dipstick.
2. Install the crankcase oil pump onto the dipstick tube.
3. Insert the hose end of crankcase oil pump into an appropriate container and, using the pump handle, pump until the crankcase is empty.

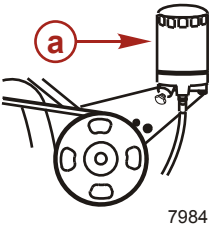


7983

a - Crankcase oil pump
b - Crankcase oil pump hose

4. Remove the crankcase oil pump.
5. Place a container beneath the oil filter.

NOTE: *To allow the oil to drain from the filter, loosen the filter just enough to break the internal vacuum. Let the oil drain back into the system for 15 minutes prior to completely removal of the filter.*

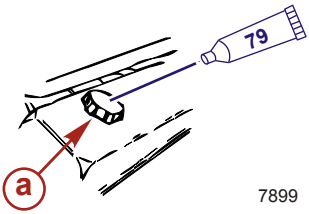


7984

a - Crankcase oil filter

6. Remove the oil filter from the adapter, and discard the old oil filter and old sealing ring.
7. Coat the sealing ring on the new filter with motor oil, and install a new sealing ring and filter.
8. Tighten the filter securely. Do not overtighten.
9. Remove the oil filler cap. Add oil to bring the level up to, but not over, the "FULL" mark on the dipstick.

IMPORTANT: Always use the dipstick to determine exactly how much oil is required.



7899

a - Crankcase oil filler cap

Tube Ref No.	Description	Where Used	Part No.
	25W50 Synthetic Blend 4-Stroke Racing Engine Oil	Crankcase	8M0078013
152	25W-50 Verado FourStroke Outboard Oil	Crankcase	92-858084K01
79	MerCruiser 4-Cycle 25W-40 Engine Oil	Crankcase	92-858048K01

CRANKCASE OIL AND FILTER (BOAT OUT OF THE WATER)

⚠ WARNING

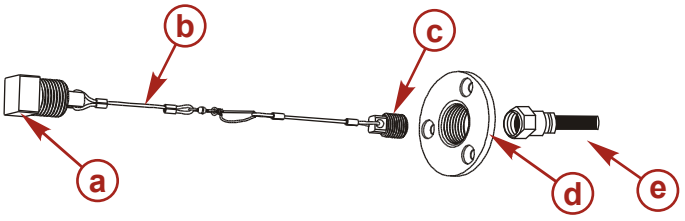
Performing tests with the engine running may cause the propeller to rotate and result in serious injury or death. Use caution when performing a test that requires the engine running, and remove the propeller to avoid injury.

NOTICE

Operating the engine out of the water at high speeds creates suction, which can collapse the water supply hose and overheat the engine. Do not operate the engine above 1400 RPM out of the water and without sufficient cooling water supply.

IMPORTANT: Change the oil only when the engine is warm from operation. Use only the recommended motor oil; see Specifications.

1. Provide cooling water to the engine.
2. Place the remote control into the neutral position and start the engine. Operate the engine at idle or in neutral until the engine reaches normal operating temperature.
3. Stop the engine, shut off the water, and remove the flushing attachment.
4. Remove the bilge plug. The oil drain hose is tethered to the plug.



6150

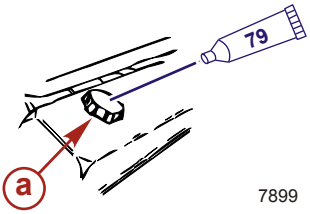
a - Bilge drain plug
b - Tether
c - Oil drain plug
d - Bilge drain flange
e - Oil drain hose

5. Pull the oil drain hose through the bilge drain flange.
6. Place an appropriate container directly under the oil drain hose.
7. Using two wrenches, separate the oil drain hose plug from the oil drain hose, and allow the crankcase oil to drain until empty.
8. Place a container below the oil filter.

NOTE: To allow the oil to drain from the filter, loosen the filter enough to break the internal vacuum. Let the oil drain back into the system for 15 minutes prior to complete removal of the filter.

9. Remove the oil filter from the adapter and discard the old oil filter and the old sealing ring.
10. Coat the sealing ring on new the filter with motor oil. Install the new sealing ring and filter. Tighten the filter securely. Do not overtighten.
11. Using two wrenches, connect the oil drain hose plug to the oil drain hose and place it back into the boat.
12. Tighten the bilge drain plug.
13. Remove the oil filler cap. Add oil to bring the level up to, but not over, the "FULL" mark on the dipstick.

IMPORTANT: Always use the dipstick to determine exactly how much oil is required.



a - Crankcase oil filler cap

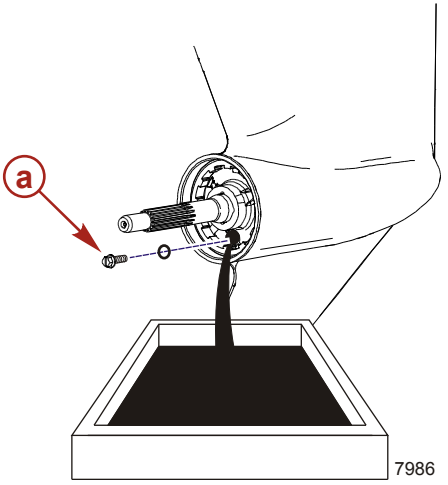
Tube Ref No.	Description	Where Used	Part No.
	25W-50 Synthetic Blend 4-Stroke Racing Engine Oil	Crankcase	8M0078013
152	25W-50 Verado FourStroke Outboard Oil	Crankcase	92-858084K01
79	MerCruiser 4-Cycle 25W-40 Engine Oil	Crankcase	92-858048K01

DRIVE UNIT OIL (BRAVO ONE XR MODELS)

Mercury Racing Gear Lube is now available for use in your drive unit. This oil will increase the service life of your drive unit when used in place of other oils. Do not mix Mercury Racing Gear Lube with any other oil. Drain the drive unit and monitor bottle, and fill it with the new oil.

The color of Mercury Racing Gear Lube is amber.

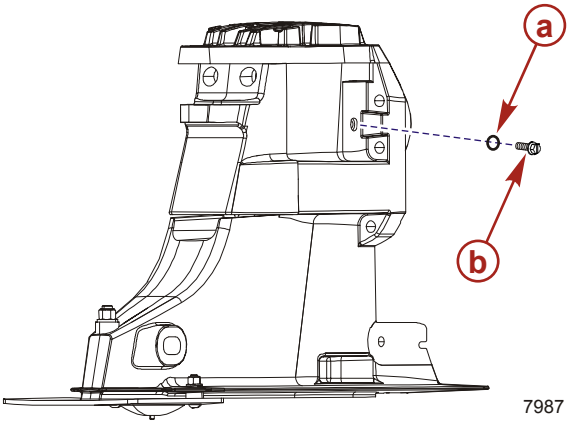
1. Remove the propeller, place the drive unit in full down position, remove the oil fill/drain screw and sealing washer, and drain the oil.



a - Oil fill/drain plug

2. Remove the oil vent screw and sealing washer. Allow the oil to drain completely.

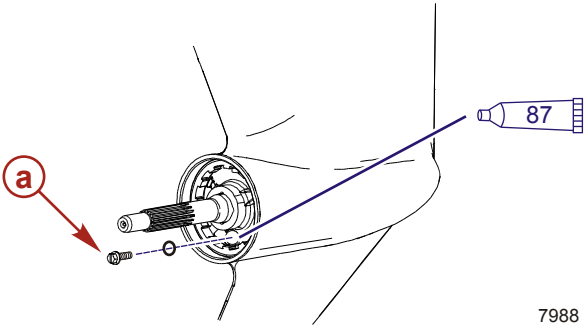
IMPORTANT: If any water drained from the oil fill/drain hole, or if the oil appears milky, the drive unit is leaking and should be checked immediately by your authorized Mercury MerCruiser dealer.



a - Sealing washer
b - Oil vent screw

3. Adjust the drive unit so the propeller shaft is level.

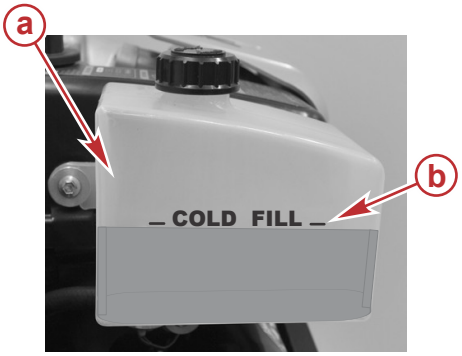
4. Fill the drive unit through the oil fill/drain hole with High-Performance Gear Lube until an air-free stream of lubricant flows from the oil vent hole.



a - Oil fill/drain screw

Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Drive unit	92-858064K01
	SAE 85W90 Mercury Racing Gear Oil	Drive unit	8M0078015

5. Remove the tube from the oil fill/drain hole. Quickly install the sealing washer and the oil fill/drain screw. Securely tighten the screw.
6. Add the specified gear lube to the monitor bottle.
7. When the oil starts to run out the oil vent hole, reinstall the drive oil vent screw and seal. Securely tighten the screw.



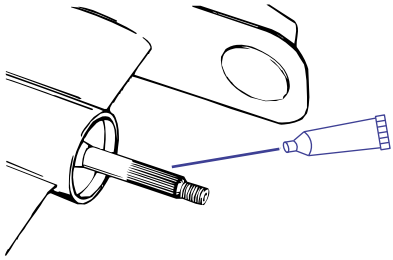
a - Gear lube monitor bottle
b - "COLD FILL" line

Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Gear lube monitor bottle	92-858064K01
	SAE 85W90 Mercury Racing Gear Oil	Gear lube monitor bottle	8M0078015

8. Continue adding gear lube until the oil level is at the top line marked "COLD FILL" on the bottle.
9. Lubricate the neck of the O-ring with High Performance Gear Lubricant to ensure ease of installation and removal of the cap.
10. Install the filler cap, being careful to not overtighten.

IMPORTANT: Check the reservoir bottle oil level after the first use.

11. Heavily grease the propeller shaft with Extreme Grease. Reinstall the propeller and tighten the nut to the specified torque.



7990

Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Neck of the O-ring on the gear lube monitor bottle	92-858064K01
	Extreme Grease	Propeller shaft splines	8M0071842

Description	Nm	lb-in.	lb-ft
Propeller nut	75	–	55

IMPORTANT: The oil level in the gear lube monitor will rise and fall during drive operation. Always check the oil level when the drive is cool and the engine is shut down.

Lubrication

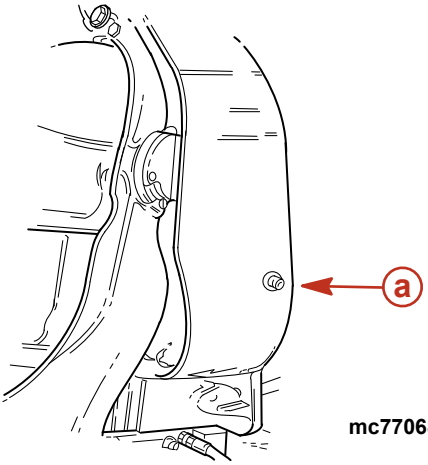
DRIVE UNIT AND TRANSOM ASSEMBLY

IMPORTANT: Disconnect the speedometer hose fitting from the driveshaft housing prior to removing the sterndrive unit to prevent damage to the fitting.

IMPORTANT: The sterndrive must be removed in order to lubricate the U-joints. Contact your authorized Mercury MerCruiser dealer for this service.

NOTE: *The engine coupling and shaft splines are greased with engine coupler spline grease. Universal joints are greased with 2-4-C with PTFE lubricant.*

Lubricate the gimbal bearing with 2-4-C with PTFE lubricant.



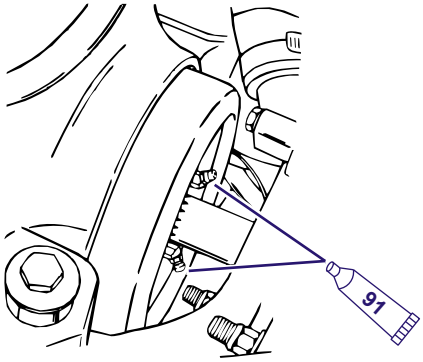
mc77068-1

a - Gimbal bearing grease fitting

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C with PTFE	Gimbal bearing	92-802859A 1

ENGINE COUPLER

Lubricate the engine coupler and shaft splines with Engine Coupler Spline Grease.

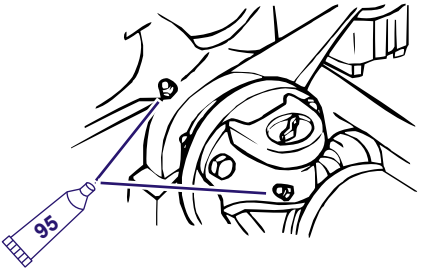


8014

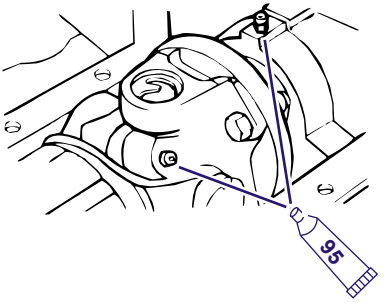
Tube Ref No.	Description	Where Used	Part No.
91	Engine Coupler Spline Grease	Engine coupler and shaft splines	8M0071842

DRIVESHAFT EXTENSION MODELS

Lubricate driveshaft grease fittings at the transom end with 2-4-C with PTFE lubricant.



8015



8016

Tube Ref No.	Description	Where Used	Part No.
95	2-4-C with PTFE	Driveshaft grease fittings	92-802859A 1

Propellers

BRAVO 1 XR MODEL PROPELLERS

⚠ WARNING

Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the propeller blade and the anti-ventilation plate.

NOTICE

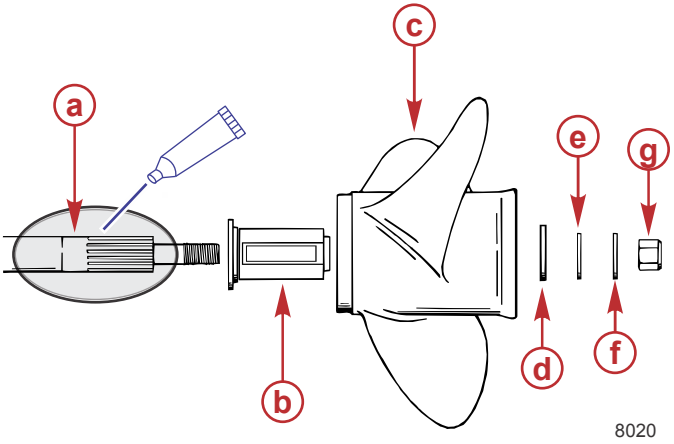
Operating the engine with a loose propeller can damage the propeller, the drive, or drive components. Always tighten the propeller nut or nuts to specification and check for tightness periodically and at the required maintenance interval.

Installation

1. Apply the following lubricant to the entire exposed surface of the propeller shaft:

Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Exposed area of propeller shaft	8M0071842

2. Install the Bravo XR replaceable hub propeller components in the order shown:



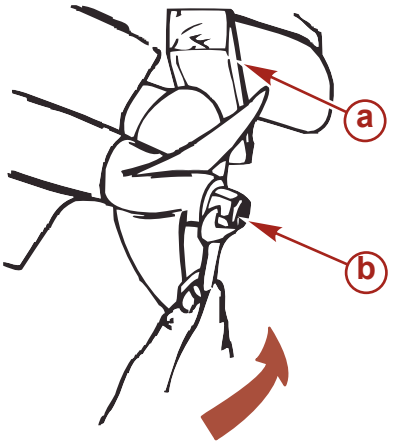
- **a -** Propeller shaft
- **b -** Prop hub assembly
- **c -** Propeller assembly
- **d -** Washer
- **e -** Belleville washer
- **f -** Washer
- **g -** Locknut

3. After first use: Retighten propeller nut.

Description	Nm	lb-in.	lb-ft
Propeller nut	75	–	55

Removal

1. Place a wood block between the propeller blade and the anti-ventilation plate to prevent rotation.

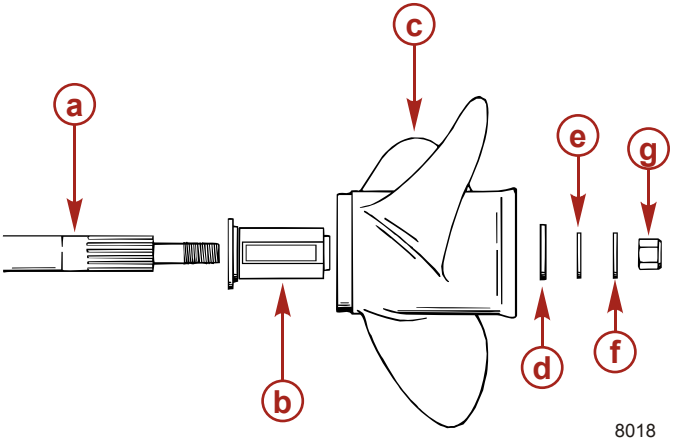


7448

a - Wood block
b - Propeller nut

2. Remove the propeller nut.

3. Remove the washers and propeller with the propeller hub assembly.



- **a -** Propeller shaft
- **b -** Propeller hub assembly
- **c -** Propeller assembly
- **d -** Washer
- **e -** Belleville washer
- **f -** Washer
- **g -** Locknut

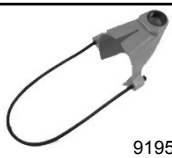
NOTE: *Some damaged propellers can be repaired. See your authorized Mercury Marine dealer.*

Flushing the Power Package

The following procedure explains flushing the power package through the sterndrive water pickups.

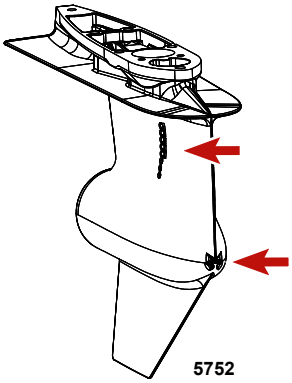
FLUSHING ATTACHMENTS

Flushing Device	91-44357Q 2
 9192	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.

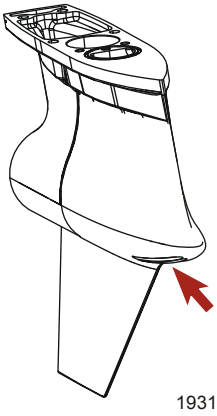
Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1
 9194	Blocks off the front water inlet holes on the dual water inlet gearcases.
Flushing Kit	91-849996T 1
 9195	Use for flushing gearcases with low water inlets.
Flushing Attachment	91-843122A01
 14565	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.

STERNDRIVE WATER PICKUPS

There are three types of water pickups available on Mercury MerCruiser sterndrives: low water, dual water, and side pickups. Dual water pickups require the flushing attachment (91-44357Q 2) and the flush seal kit (91-881150K 1). The High-Performance low water pickup drive requires the flushing attachment (91-849996T 1) while the SportMaster low water pickup drive requires flushing attachment (91-843122A01). Side pickups require the flushing attachment (91-44357Q 2).



Dual water pickup



SportMaster low water pickup

NOTE: *Flushing is needed only for salty, brackish, mineral-laden or polluted water applications. Flushing is recommended after each outing.*

NOTICE

Flushing the engine with the boat in the water can cause seawater to flow into the engine, resulting in engine damage. Close the seacock before flushing the engine. Keep the seacock closed until starting the engine.

1. Drain the seawater section of the cooling system.
2. If flushing the cooling system with the boat in the water:
   a. Raise sterndrive unit to trailer position.
   b. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
   c. Lower sterndrive unit to full down/in position.

⚠ WARNING

Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the propeller blade and the anti-ventilation plate.

3. If flushing the cooling system with the boat out of the water:
   a. Lower sterndrive unit to full down/in position.
   b. Remove propeller.
   c. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
4. Connect a hose between the flushing attachment and the water source.
5. With the sterndrive unit in normal operating position, partially open the water source (about 1/2 maximum).
6. Place the remote control in the neutral idle speed position and start the engine.

NOTICE

Operating the engine out of the water at high speeds creates suction, which can collapse the water supply hose and overheat the engine. Do not operate the engine above 1400 RPM out of the water and without sufficient cooling water supply.

7. Operate the engine at idle speed, in neutral, for about 10 minutes or until the discharge is clear.
8. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
9. Stop the engine.

10. Shut off the water and remove the flushing attachment.

Cleaning Seawater (Raw Water) Section of Oil Cooler

NOTICE

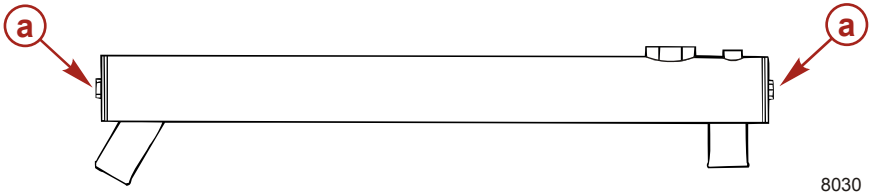
An open seawater strainer or seacock during some service or maintenance procedures can introduce water into the boat, causing damage or sinking the boat. Always close the water supply from the seawater pump, water inlet, or seacock when performing service or maintenance on the cooling system.

The seawater section of oil cooler should be cleaned at least once a year or whenever decreased cooling efficiency is noticed.

ENGINE OIL COOLER

NOTE: *The engine oil cooler is located on the top rear portion of the engine.*

1. Remove end plates and gaskets.



a - End plates (2)

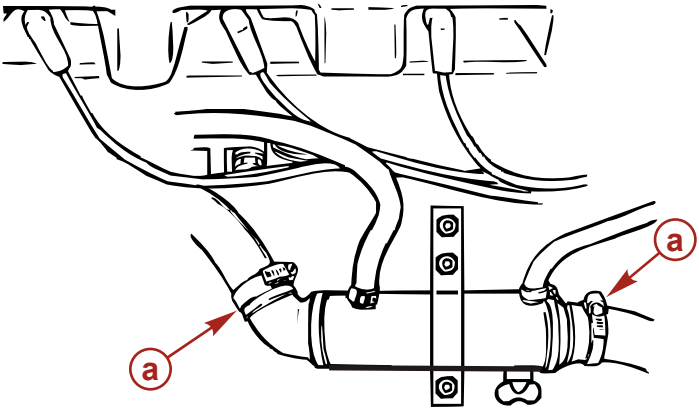
2. Clean oil cooler with a suitable brush.
3. Flush passages with fresh water.
4. Inspect gaskets for deterioration and replace if necessary.
5. Install gaskets and end plates. Tighten screws securely.

POWER STEERING COOLER

NOTE: *The power steering cooler is located on the lower port side of the engine.*

1. Loosen water hose clamps and remove hoses if it is necessary to inspect or clean cooler.

IMPORTANT: If the oil hoses need to be removed from the cooler, be prepared to cap or plug them to avoid draining the power steering reservoir.



a - Hose clamps (2)

2. Install the cooler and tighten the hose clamps securely.
3. Check the power steering fluid level.
4. Start the engine and inspect the cooling system for leaks.

Changing Positive Crankcase Ventilation Valve

This engine is equipped with a positive crankcase ventilation valve (PCV). Change the valve every 150 hours of operation.

- Pull valve out of intake manifold and remove valve from hose.
- Install new PCV valve into hose, and install into intake manifold.
- Ensure that the valve is tightly seated in manifold.

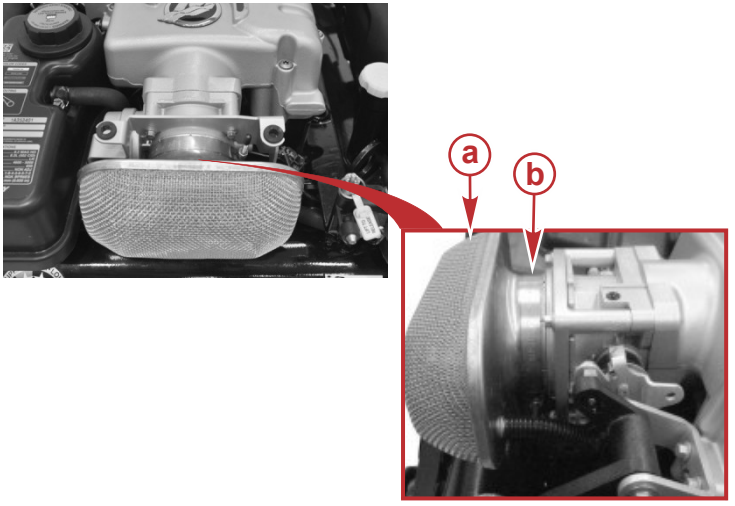
Use only Mercury MerCruiser replacement parts.

Cleaning the Flame Arrestor

⚠ WARNING

Fuel is flammable and explosive. Ensure that the key switch is off and the lanyard is positioned so that the engine cannot start. Do not smoke or allow sources of spark or open flame in the area while servicing. Keep the work area well ventilated and avoid prolonged exposure to vapors. Always check for leaks before attempting to start the engine, and wipe up any spilled fuel immediately.

1. Loosen the flame arrestor clamp, and remove the flame arrestor.



50396

a - Flame arrestor
b - Flame arrestor clamp

2. Clean the flame arrestor with solvent and dry with compressed air, or set aside and allow to air dry completely.
3. Install the flame arrestor and tighten the clamp to the specified torque.

Description	Nm	lb-in.	lb-ft
Flame arrestor clamp	6.2	55	–

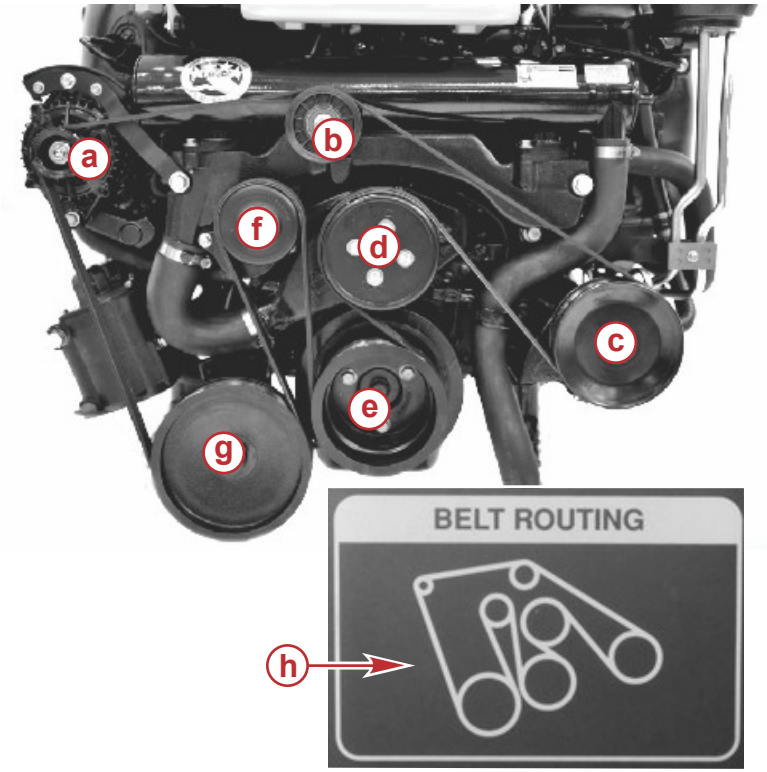
4. Install the silencer.

Serpentine Drive Belt

INSPECTION

⚠ WARNING

Inspecting the belts with the engine running may cause serious injury or death. Turn off the engine and remove the ignition key before inspecting the belts.



50406

- **a -** Alternator pulley
- **b -** Idler pulley
- **c -** Power steering pump pulley
- **d -** Water circulating pump pulley
- **e -** Crankshaft pulley
- **f -** Tensioner pulley
- **g -** Seawater pump pulley

h - Belt routing diagram

CHECKING

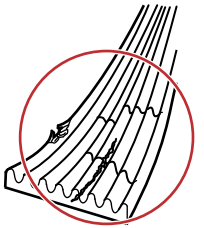
Inspect the drive belt for:

- Proper belt tension deflection
- Excessive wear
- Cracks
- Fraying
- Glazed surfaces
- Proper tension

Use moderate thumb pressure on the belt at the location with the longest distance between two pulleys.

Description	
Deflection	13 mm (1/2 in.)

NOTE: *Minor, transverse cracks (across the belt width) may be acceptable. Longitudinal cracks (in the direction of belt length) that join transverse cracks are not acceptable.*



21062

REPLACING

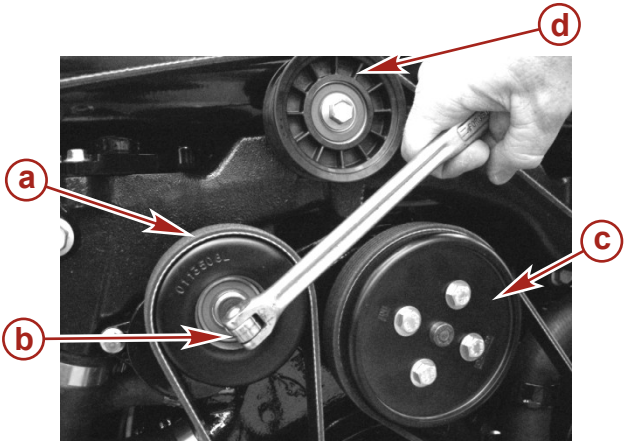
IMPORTANT: If reusing a belt, install it in the same direction of rotation as before.

The belt tensioner operates within the limits of movement provided by the cast stops when the belt length and geometry are correct. If the tensioner contacts either of the cast stops during operation, check the mounting brackets and the belt length. Loose brackets, bracket failure, accessory drive component movement, incorrect belt length, or belt failure can cause the tensioner to contact the cast stops. See your authorized MerCruiser dealer for service if these conditions exist.

⚠ CAUTION

Rapid release of the belt tensioner, or allowing the tensioner to snap back quickly, could cause injury or product damage. Relieve the spring tension slowly.

1. Use a breaker bar and appropriate socket to relieve the tensioner. Rotate the tensioner away from belt until it stops.
2. Remove the belt from the idler pulley and slowly relieve the tension on the breaker bar.



43546

- **a -** Tensioner pulley
- **b -** Socket and breaker bar
- **c -** Water circulating pump pulley
- **d -** Idler pulley

3. Remove the belt and route the replacement belt according to the belt routing diagram.
4. Carefully release the tensioner and ensure that the belt stays positioned properly.
5. Check the belt tension.

Description	
Deflection[1.]	13 mm (½ in.)

1. Use moderate thumb pressure on the belt at the location that has the longest distance between two pulleys.

Water-Separating Fuel Filter

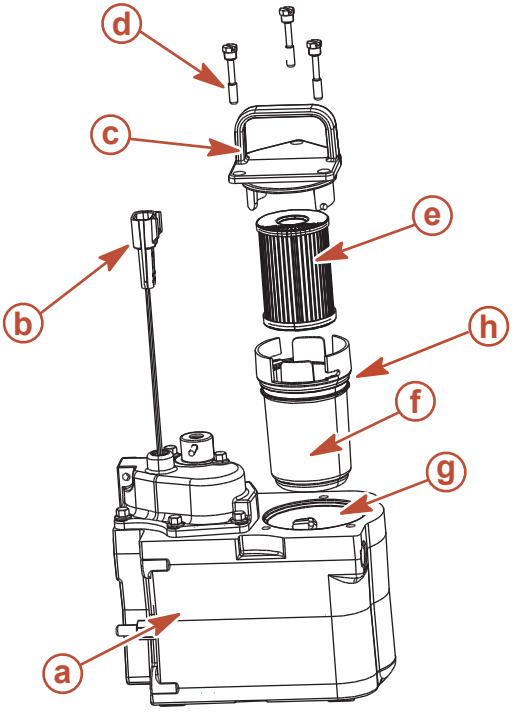
⚠ WARNING

Fuel is flammable and explosive. Ensure that the key switch is off and the lanyard is positioned so that the engine cannot start. Do not smoke or allow sources of spark or open flame in the area while servicing. Keep the work area well ventilated and avoid prolonged exposure to vapors. Always check for leaks before attempting to start the engine, and wipe up any spilled fuel immediately.

⚠ CAUTION

Failure to release pressure from the fuel system will result in fuel spraying out, which can cause a fire or explosion. Allow the engine to cool completely and release all fuel pressure before servicing any part of the fuel system. Always protect eyes and skin from pressurized fuel and vapors.

GEN III MODELS



8837

- **a -** Cool Fuel Module
- **b -** Cool Fuel Module harness
- **c -** Filter cap
- **d -** Filter assembly retaining screw
- **e -** Fuel filter element
- **f -** Filter cup
- **g -** Cool Fuel Module filter reservoir
- **h -** O-ring

Removal

1. Allow the engine to cool down.

NOTE: *Mercury MerCruiser recommends that the engine be shut off for 12 hours prior to filter removal.*

2. Close fuel supply valve, if equipped.
3. Disconnect the Cool Fuel Module harness from the engine wiring harness.
4. Turn the key switch to the start position and allow the starter to operate for five seconds.
5. Turn the key switch to the off position.
6. Loosen each filter assembly retaining screw until the screw is disengaged from the Cool Fuel Module. Do not remove the filter assembly retaining screws from the filter cap.
7. Unseat the filter assembly by grasping the filter assembly handle and pulling upward. Do not remove the filter assembly from the Cool Fuel Module at this time.
8. Allow any fuel that may be in the filter assembly to drain out through the bottom of the filter assembly and into the Cool Fuel Module filter reservoir.
9. Remove the filter cup from the filter cap by grasping the filter cap and rotating it in a clockwise direction while holding the filter cup stationary.
10. Remove the used water-separating fuel filter element from the filter cup, place it in a clean, approved container.
11. Dispose of any water or debris that may be in the filter cup.

Installation

1. Install a new water-separating fuel filter element into the filter cup. Push the element into the cup until completely seated.
2. Install new O-ring on the filter cup.
3. Attach the filter cap to the filter cup by grasping the filter cap and rotating it in a counterclockwise direction while holding the filter cup stationary, until the filter cap locks securely into place.
4. Install the fuel filter assembly slowly into the Cool Fuel Module to prevent spilling fuel, and align the screws retained in the filter cap with the screw holes in the Cool Fuel Module. Tighten the filter assembly retaining screws until hand tight.
5. Ensure that the filter cap is firmly seated against the Cool Fuel Module and torque each filter assembly retaining screw.

Description	Nm	lb-in.	lb-ft
Filter assembly retaining screw	6	53	–

6. Open fuel supply valve, if equipped.
7. Reconnect the Cool Fuel Module harness to the engine wiring harness.
8. Properly ventilate the engine compartment.

NOTICE

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

9. Supply cooling water to the engine.
10. Start the engine. Check for gasoline leaks around the fuel filter assembly. If leaks exist, stop the engine immediately. Recheck the filter installation, clean spilled fuel, and properly ventilate the engine compartment. If leaks continue, stop engine immediately and contact your authorized Mercury MerCruiser dealer.

Corrosion and Corrosion Protection

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

Refer to the Quicksilver booklet, **Everything You Need to Know About Marine Corrosion** for more corrosion information.

NOTICE

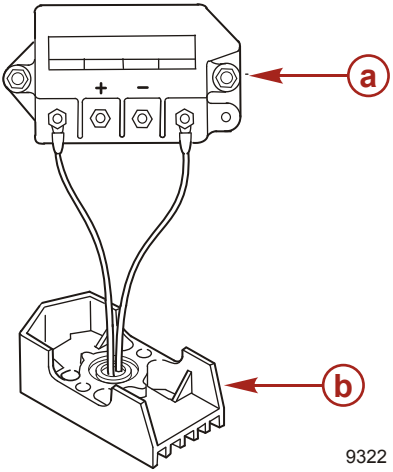
Using magnesium anodes in salt water causes an electrochemical reaction on the metal surface of the drive, resulting in corrosion damage from the paint blistering and peeling off the drive. Use magnesium anodes in fresh water only.

IMPORTANT: Mercury Marine recommends installing a MerCathode system or anti-corrosion kit whenever using a stainless steel propeller, or if the boat is equipped with stainless steel components immersed below the waterline that are connected into the engine ground system. If a boat is equipped with stainless steel aft planes, a large anode should be installed on each to handle the increased galvanic corrosion potential.
Replace the sacrificial anodes if eroded 50% or more.
Mercury Marine recommends using anodes sold through Mercury Precision Parts only. Some other manufacturers of aluminum anodes use alloys that are insufficiently pure to adequately protect critical drive components for the duration of the anodes' expected life.

MERCATHODE SYSTEM

The MerCathode system should be tested to ensure adequate output.

NOTE: *This test should be made where the boat is moored, using a reference electrode and test meter. Contact your authorized Mercury MerCruiser dealer to arrange for this test.*

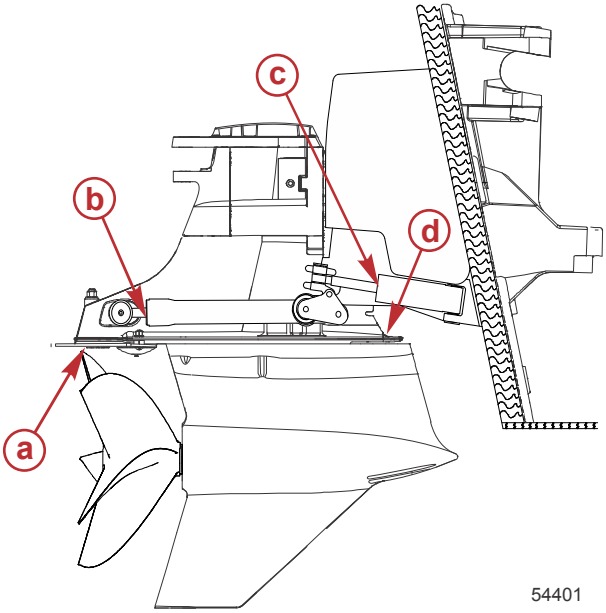


a - MerCathode
b - Electrode assembly

SACRIFICIAL ANODES

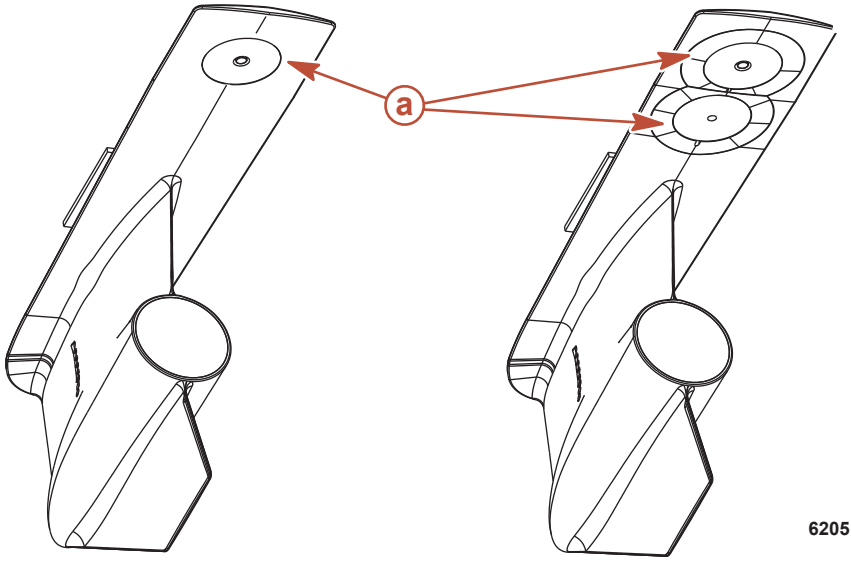
Sacrificial anodes help protect the power package against galvanic corrosion by sacrificing its metal to be slowly eroded instead of the metal components on the power package. These anodes are installed at different locations on your power package.

1. Replace the anodes when they have eroded to 50% of their original size.



a - Splash plate anode
b - Trim actuator anode
c - Steering actuator anode
d - Upper gear housing anode

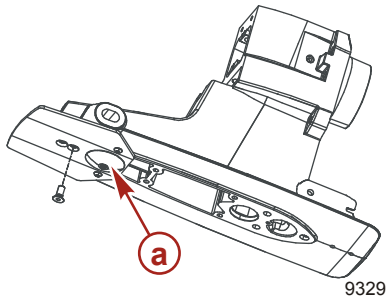
2. **Gear housing with integrated splash plate anode -** is located in the splash plate, just above the propellers.



XR Bravo One XR Bravo Three

a - Gear housing anode

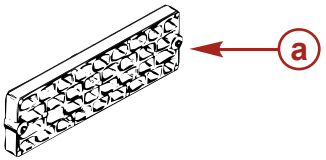
3. **SportMaster splash plate anode** - is located on the splash plate that is attached to the gear housing just above the propeller.



SportMaster gearcase

a - Splash plate anode

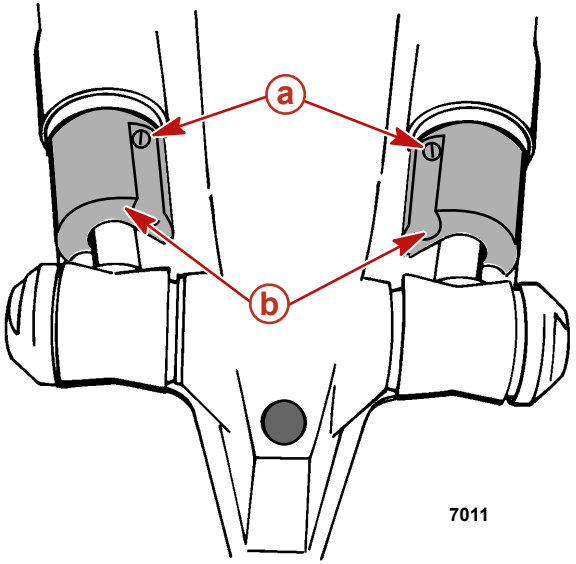
4. **Anodic block kit (optional) -** is mounted to the boat transom. Acts as a sacrificial anode. Replace as required.



8033

a - Anodic block

5. **Trim cylinder anodes -** are mounted on each trim cylinder. To replace the trim cylinder anodes:
   a. Remove the two screws from each anode.
   b. Install the new anodes and tighten securely.

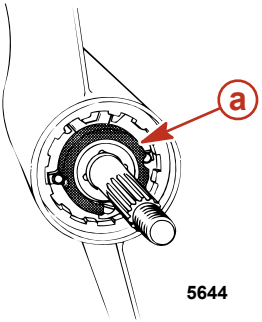


7011

a - Screws (2)
b - Trim cylinder anodes (2)

6. **Bearing carrier anode (XR Bravo One) -** is located in front of the propeller, between the front side of the propeller and the gear housing. Refer to **Propellers** in this manual for propeller removal and installation. To replace the bearing carrier anode:
   a. Remove the propeller.
   b. Remove the two screws from the anode.
   c. Install a new anode and tighten securely.

d. Reinstall the propeller. See **Propeller Installation** for proper torque.

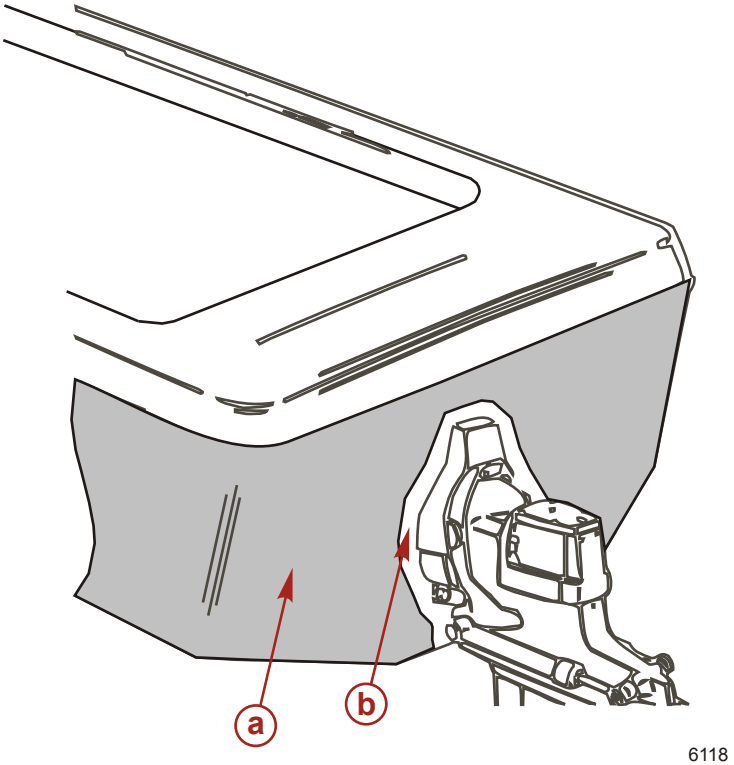


a - Bearing carrier anode

PAINTING THE BOAT HULL OR TRANSOM

1. If antifouling protection is required for boat hull or boat transom, copper or tin base paints can be used unless otherwise prohibited by law.

2. If using copper or tin based antifouling paints, avoid any electrical interconnection between the Mercury Marine product, anodic blocks, and the paint by allowing a minimum of 40 mm (1.5 in.) unpainted area on the transom of the boat around these items.



6118

a - Antifouling paint
b - Unpainted area

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

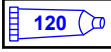
NOTE: *Do not paint anodes or the MerCathode system reference electrode and anode, as this will render them ineffective as galvanic corrosion inhibitors.*

PAINTING THE DRIVE UNIT OR TRANSOM ASSEMBLY

Paint the drive unit and transom assembly with a good quality marine paint or an antifouling paint that does not contain copper, tin, or any other material that could conduct electrical current. Do not paint drain holes, anodes, or items specified by the boat manufacturer.

ADDITIONAL CORROSION PREVENTION TIPS

1. Spray the power package components on the inside of the boat every two to three weeks with Corrosion Guard to protect the finish from dulling and corrosion. External power package components may also be sprayed.

Tube Ref No.	Description	Where Used	Part No.
	Corrosion Guard	Power package	92-802878 55

2. All lubrication points, especially the steering system and shift and throttle linkages, should be kept well-lubricated.
3. Flush the seawater system after each use in salty, brackish, or mineral-laden water.

Battery

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:

⚠ WARNING

An operating or charging battery produces gas that can ignite and explode, spraying out sulfuric acid, which can cause severe burns. Ventilate the area around the battery and wear protective equipment when handling or servicing batteries.

⚠ WARNING

Recharging a weak battery in the boat, or using jumper cables and a booster battery to start the engine, can cause serious injury or product damage from fire or explosion. Remove the battery from the boat and recharge in a ventilated area away from sparks or flames.

Bottom of Boat

To maintain maximum speed, ensure that the boat bottom is:

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

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

MAINTENANCE

Inspection and Maintenance

Inspect the power package often and at regular intervals to help maintain its top operating performance, and correct potential problems before they occur. The entire power package should be checked carefully, including all accessible engine parts.

1. Check for loose, damaged or missing parts, hoses and clamps; tighten or replace as required.
2. Check plug leads and electrical leads for damage.
3. Remove and inspect the propeller. If nicked, bent or cracked, see your authorized Mercury Marine dealer.
4. Repair nicks and corrosion damage on the power package's exterior finish.

Attention Required After Submersion

- Before recovery, contact an authorized Mercury Marine dealer.
- After recovery, immediate service by an authorized Mercury Marine dealer is required to prevent serious damage to power package.

COLD WEATHER OR EXTENDED STORAGE

Draining the Seawater System

⚠ CAUTION

Water can enter the bilge when the drain system is open, damaging the engine or causing the boat to sink. Remove the boat from the water or close the seacock, disconnect and plug the seawater inlet hose, and ensure the bilge pump is operational before draining. Do not operate the engine with the drain system open.

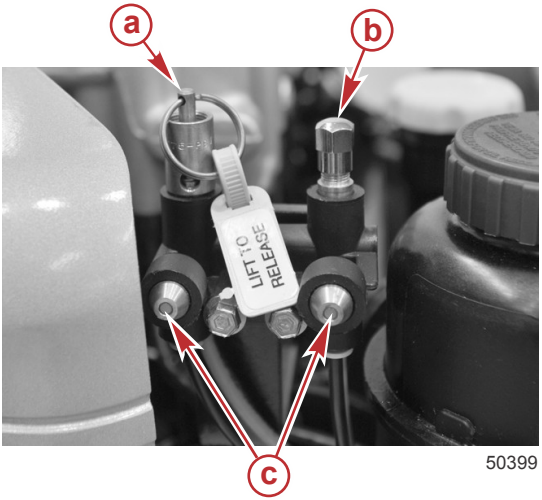
IMPORTANT: Only drain the seawater section of the closed cooling system.
IMPORTANT: The boat must be as level as possible to ensure complete draining of the cooling system.

Your power package is equipped with a drain system. Refer to **Drain System Identification** to determine which instructions apply to your power package.

IMPORTANT: The engine must not be operating at any point during the draining procedure.

Drain System Identification

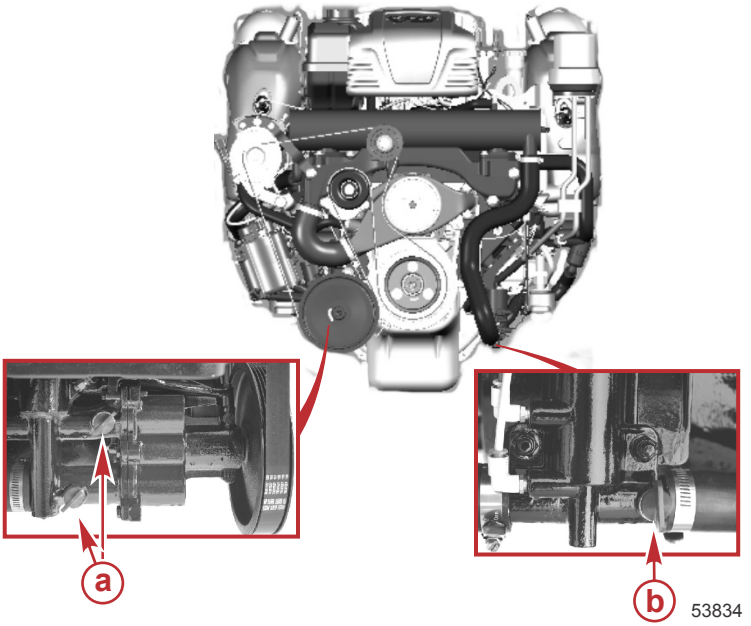
AIR-ACTUATED SINGLE-POINT DRAIN SYSTEM



50399

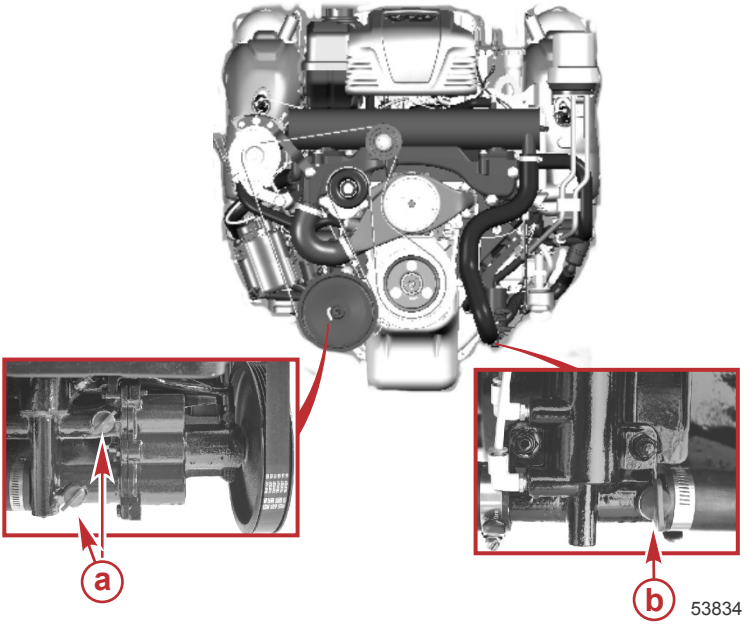
a - Manual pressure release valve
b - Threaded cap for air connection
c - Green indicators

COLD WEATHER OR EXTENDED STORAGE



a - Starboard side air-actuated drain location
b - Port side air-actuated drain location

MANUAL DRAIN SYSTEM



a - Starboard side blue drain plugs
b - Port side blue drain plug

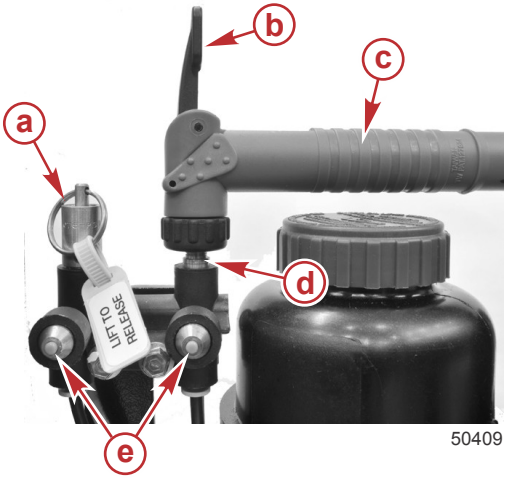
Air-Actuated Single-Point Drain System

BOAT IN THE WATER

NOTE: *This procedure is written for the air pump that was shipped with the engine from the factory. However, any air source can be used.*

1. Close the seacock (if equipped) or remove and plug the water inlet hose.
2. Obtain the air pump.
3. Remove the threaded cap from the air connection.
4. Ensure that the lever on top of the air pump is against the handle (horizontal).
5. Install the air pump on the air connection.
6. Pull the lever on the air pump (vertical) to seal the pump to the connection.

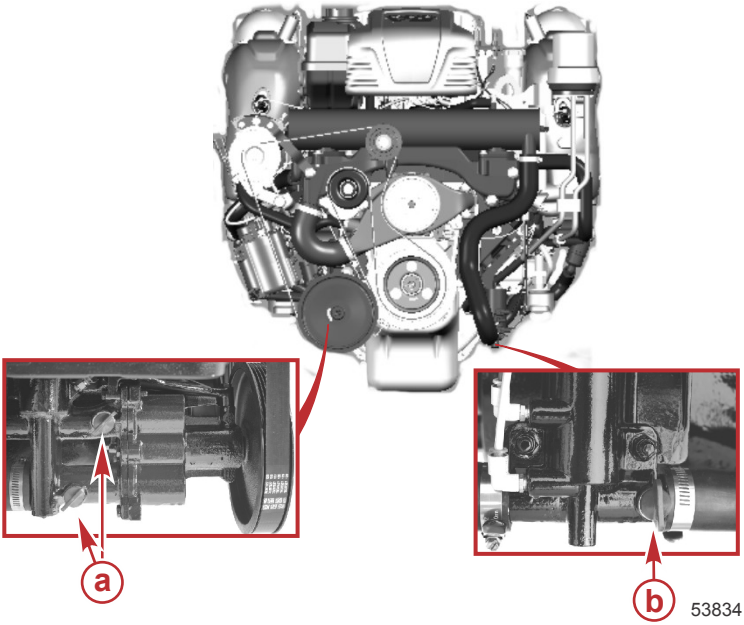
7. Pump air into the system until both green indicators extend and water drains from both sides of the engine. The port side will begin draining before the starboard side.



50409

a - Manual release valve
b - Air pump lever (locked)
c - Air pump
d - Air connection
e - Green indicators extended

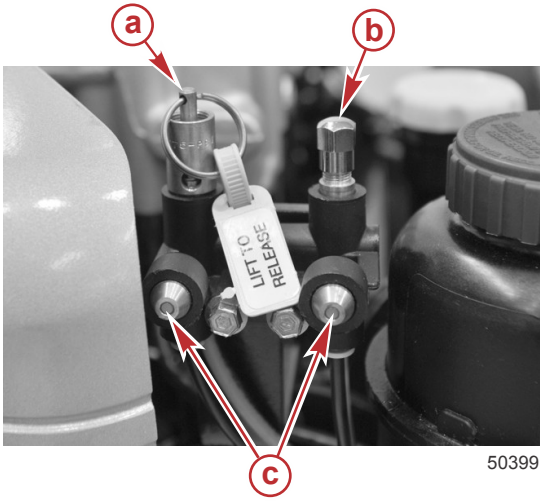
8. Verify that water is draining from each opening. If not, use the **Manual Drain System** instructions.



a - Starboard side air-actuated drain location
b - Port side air-actuated drain location

9. Allow the system to drain for a minimum of five minutes. Pump air as necessary to keep the green indicators extended.
10. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
11. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pump. Do not allow the engine to start.
12. Remove the air pump from the air connection and return it to the mounting bracket.
13. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance. This helps ensure that all water is drained.

14. Before launching the boat, pull up on the manual release valve. Verify that the green indicators are no longer extended.



a - Manual pressure release valve
b - Threaded cap for air connection
c - Green indicators

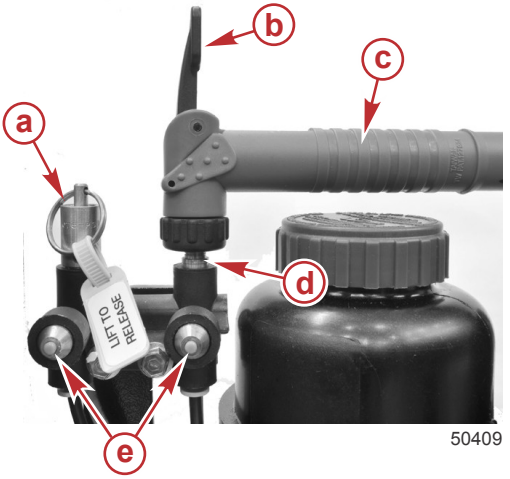
15. Open the seacock, if equipped, or unplug and reconnect the water inlet hose prior to operating the engine.

BOAT OUT OF THE WATER

NOTE: *This procedure is written for the air pump that is attached to the engine. However, any air source can be used.*

1. Place the boat on a level surface and ensure that the boat is level.
2. Obtain the air pump.
3. Ensure that the lever on top of the pump is flush with the handle (horizontal).
4. Install the air pump on the air connection.
5. Pull the lever on the air pump (vertical) to seal the pump to the air connection.

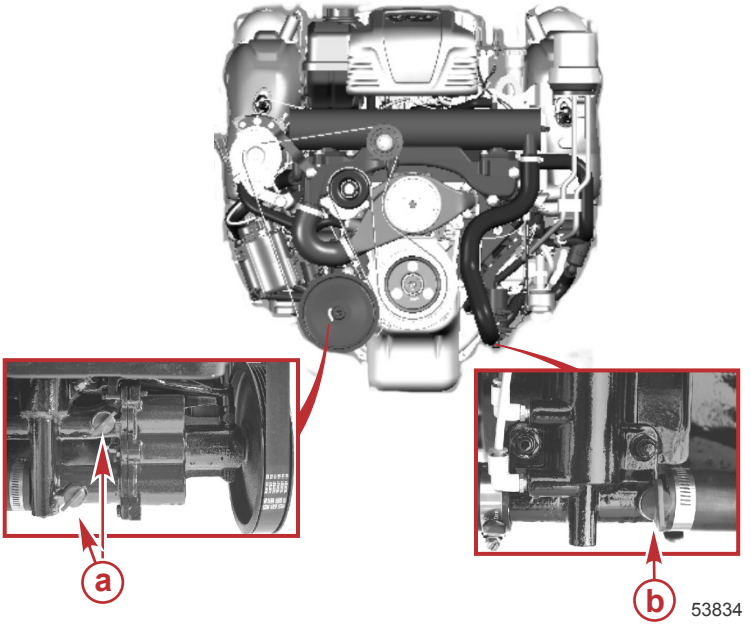
6. Pump air into the system until both green indicators extend and water drains from both sides of the engine. The port side will begin draining before the starboard side.



50409

a - Manual release valve
b - Air pump lever (locked)
c - Air pump
d - Air connection
e - Green indicators extended

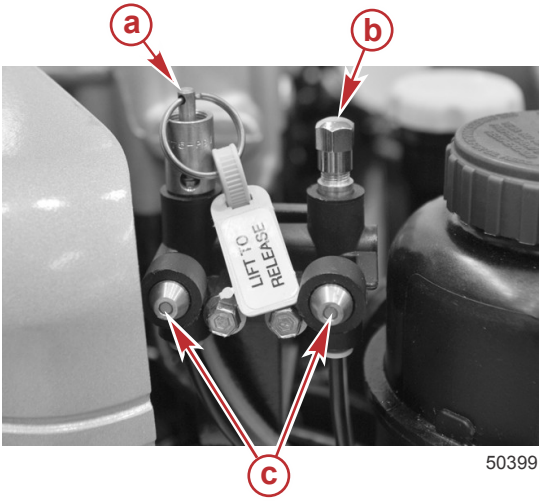
7. Verify that water is draining from each opening. If not, use the **Manual Drain System** instructions.



a - Starboard side air-actuated drain location
b - Port side air-actuated drain location

8. Allow the system to drain for a minimum of five minutes. Pump air as necessary to keep the green indicators extended.
9. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
10. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pump. Do not allow the engine to start.
11. Remove the air pump from the air manifold and return it to the mounting bracket.
12. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance. This helps ensure that all water is drained.

13. Before launching the boat, pull up on the manual release valve. Verify that the green indicators are no longer extended.



a - Manual pressure release valve
b - Threaded cap for air connection
c - Green indicators

Manual Drain System

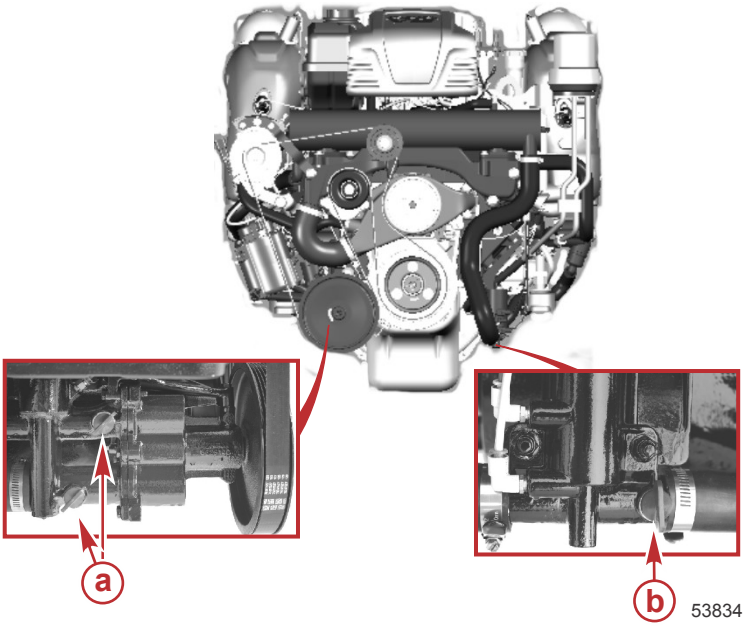
BOAT IN THE WATER

NOTE: *Use this procedure if the air-actuated single-point drain system fails.*

NOTE: *It may be necessary to lift, bend, or lower hoses to allow water to completely drain when hoses are disconnected.*

1. Close the seacock (if equipped) or remove and plug the water inlet hose.

2. Remove the two blue drain plugs from the seawater pickup pump (front, starboard side).



a - Starboard side blue drain plugs
b - Port side blue drain plug

3. Verify that water is draining from each opening.
4. Allow the system to drain for a minimum of five minutes. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance to ensure that all water is drained.
5. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
6. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pickup pump. Do not allow the engine to start.
7. Prior to launching the boat or starting the engine, close the drain system by installing the four blue drain plugs.
8. Open the seacock, if equipped, or unplug and reconnect the water inlet hose prior to operating the engine.

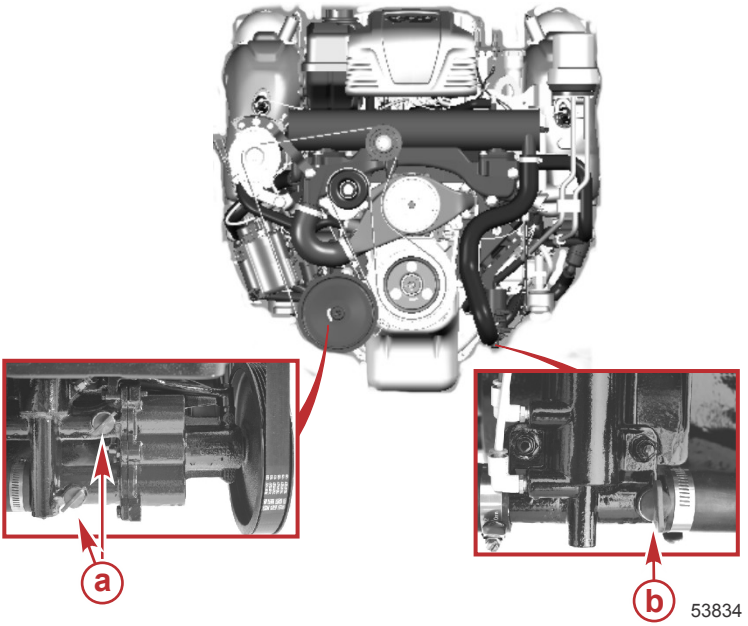
BOAT OUT OF THE WATER

NOTE: *Use this procedure if the air-actuated single-point drain system fails.*

COLD WEATHER OR EXTENDED STORAGE

NOTE: *It may be necessary to lift, bend, or lower hoses to allow water to completely drain when hoses are disconnected.*

1. Place the boat on a level surface to ensure complete draining of the system.
2. Remove the port side blue drain plug.
3. Remove two blue drain plugs from the seawater pickup pump (front, starboard side).



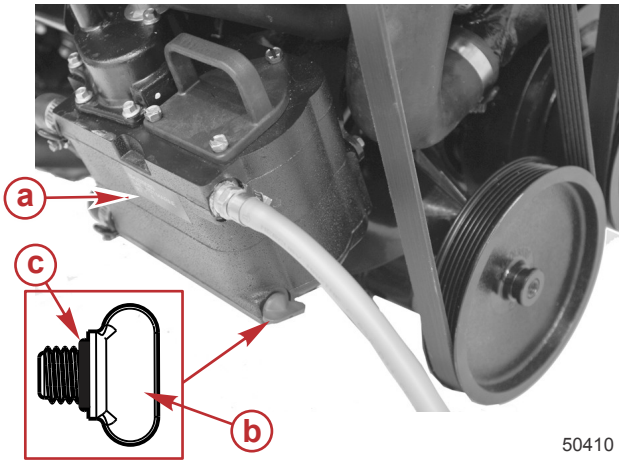
a - Starboard side blue drain plugs
b - Port side blue drain plug

4. Verify that water is draining from each opening.
5. Allow the system to drain for a minimum of five minutes. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance to ensure that all water is drained.
6. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
7. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pickup pump. Do not allow the engine to start.
8. Prior to launching the boat or starting the engine, close the drain system by installing the two blue drain plugs.

Draining Water from the Cool Fuel Module

Mercury MerCruiser recommends draining the Gen 3 Cool Fuel Module if it is equipped with a drain plug.

1. Remove the drain plug from the Gen 3 Cool Fuel Module and allow the water to completely drain from the module.
2. Inspect the drain plug and the O-ring for damage. Replace if needed.
3. Place the O-ring on the drain plug and apply Perfect Seal to the threads. Install the drain plug in the module drain hole. Tighten the drain plug to finger-tight.



50410

a - Gen 3 Cool Fuel Module
b - Drain plug
c - O-ring

Tube Ref No.	Description	Where Used	Part No.
19	Perfect Seal	Drain plug threads	92-34227Q02

Battery Storage

Whenever the battery will be stored for an extended period of time, be sure the cells are full of water and the battery is fully charged and in good operating condition. It should be clean and free of leaks. Follow the battery manufacturer's instructions for storage.

Recommissioning the Power Package

1. Ensure that all cooling system hoses are connected properly and hose clamps are tight.

COLD WEATHER OR EXTENDED STORAGE

⚠ CAUTION

Disconnecting or connecting the battery cables in the incorrect order can cause injury from electrical shock or can damage the electrical system. Always disconnect the negative (-) battery cable first and connect it last.

2. Install a fully charged battery. Clean the battery cable clamps and terminals and reconnect the cables. Tighten each cable clamp securely when connecting.
3. Coat the terminal connections with a battery terminal anticorrosion agent.
4. Perform all the checks in the **Operation Chart**.

NOTICE

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

5. Start the engine and closely observe instrumentation to ensure that all systems are functioning correctly.
6. Carefully inspect the engine for fuel, oil, fluid, water, and exhaust leaks.
7. Inspect the steering system, shift and throttle control for proper operation.

TROUBLESHOOTING

Engine Will Not Crank

Possible Causes	Remedy
Battery switch turned "OFF."	Turn switch "ON."
Gearshift not in neutral position.	Position control lever to 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.
Defective battery.	Test and replace if defective.
Defective starter.	Test and replace if defective.
Flywheel ring gear is damaged.	Confirm diagnostic and replace flywheel.
Engine is seized.	Check to see if engine can be rotated by hand with the spark plugs removed. If not, then determine cause.
Faulty ignition switch.	Test wire with a remote starter switch at the starter motor.

Engine Cranks But Will Not Start

Possible Cause	Remedy
Improper starting procedure.	Read starting procedure.
Low battery voltage.	Charge the battery.
Empty fuel tank or fuel shut off valve closed.	Fill tank or open valve.
Faulty fuel pump, wiring, fuel pump fuse, 50-amp circuit breaker or a fuel pump relay.	Replace faulty component.
Faulty ignition system component.	Service ignition system.
Lanyard stop activated.	Reset.
Obstructed fuel filter.	Replace filters.
Stale or contaminated fuel.	If contaminated, drain tank and fill with fresh fuel.

Possible Cause	Remedy
Fuel line or tank vent line kinked or restricted.	Replace kinked lines or blow out lines with compressed air to remove obstruction.
Crankshaft position sensor faulty.	Test and replace if faulty.
Faulty fuel pressure regulator diaphragm.	Test and replace if faulty. Do not attempt to start the engine if the fuel pressure regulator diaphragm is ruptured.

Engine Hard to Start, Runs Rough, Misses, and/or Backfires

Possible Cause	Remedy
Faulty ignition system component.	Service ignition system.
Clogged fuel filter.	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 lines or blow out lines with compressed air to remove obstruction.
Flame arrestor plugged.	Clean or replace the flame arrestor.
Rev limiter engaging at wide-open throttle.	Change to propeller with more pitch.

Low Engine Coolant (Closed Cooling) Temperature

Possible Cause	Remedy
Faulty thermostat.	Replace.

TROUBLESHOOTING

Poor Performance

Possible Cause	Remedy
Throttle not fully open.	Inspect throttle cable and linkages for proper operation.
Damaged or wrong propeller.	Replace propeller.
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.
Flame arrestor dirty.	Change or clean flame arrestor.

Insufficient Engine Temperature

Possible Cause	Remedy
Faulty water thermostat.	Replace water thermostat.
Faulty gauge or sender.	Test with shop gauge; test sender.
Faulty oil thermostat.	Replace.

High Engine Temperature

Possible Cause	Remedy
Seacock closed.	Open.
Serpentine belt loose or in poor condition.	Replace or adjust belt.
Insufficient coolant in closed cooling system.	Add coolant and check for leaks.
Recirculating pump defective.	Replace.
Seawater pickups obstructed.	Inspect.
Faulty thermostat.	Replace.
Oil cooler cores plugged with foreign material.	Clean cooler cores.
Faulty seawater pickup pump.	Repair.
Seawater discharge restricted or plugged.	Clean exhaust elbows.
Faulty gauges or senders.	Test with shop gauges; test senders.
Aerated water supply to water pick-up.	Place water pick-up in a non-aerated water supply.

Low Engine Oil Pressure

Possible Cause	Remedy
Insufficient oil in system.	Check and add oil.
Excessive oil in system (causing it to become aerated).	Check and bring oil to required level. Check for cause of excessive oil (improper filling, defective 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.).
Faulty gauge or sender.	Test with mechanical shop gauge; test sender.
Excessive oil temperature.	Faulty oil thermostat.
Engine mechanical: oil pump, excessive bearing clearance, etc.	Repair as necessary.

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.
Defective battery.	Test battery.

Power Trim Does Not Operate (Motor Doesn't Run)

Possible Cause	Remedy
Open fuse.	Replace fuse.
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.

TROUBLESHOOTING

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

Possible Cause	Remedy
Trim pump oil level low.	Fill pump with oil.
Drive binding in gimbal ring.	Check for obstruction.

Electrical Analog Trim Gauge Malfunction

Possible Cause	Remedy
Gauge indicates off-scale high with no self-test[1] function.	Check wires between the sender and the trim module.
	Replace defective trim sender.
Gauge does not indicate properly but the self test[1] function works.	Index the trim sender, test the trim sender circuit or replace defective trim sender.

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 Marine dealer immediately.
Shift or throttle cable kinked.	Replace cable.
Friction adjustment excessive.	Adjust friction.

1. Self-test: When the key switch is placed to the "RUN" position, the pointer on the analog gauge will sweep from the bottom of the scale to the top of the scale and then point to the actual trim position.

Steering Wheel Turns Hard or Jerky

Possible Cause	Remedy
Low power steering pump fluid level.	Refill system with fluid and check for leaks.
Sepentine belt loose or damaged.	Replace and/or adjust.
Insufficient lubrication on steering system components.	Lubricate.
Loose or missing steering fasteners or parts.	Check all parts and fasteners. If any are loose or missing, see authorized Mercury Marine dealer immediately.
Contaminated power steering fluid.	Drain and replace.

Seawater Pressure Is Below Specification

Possible Cause	Remedy
Insufficient water supply.	Check if seacock is completely open.
	Check supply hoses for obstruction.
	Check for external water pick-up obstruction.
	Check for sea strainer obstruction.
	Check condition of sea pump.

Seawater Pressure Is Above Specification

Possible Cause	Remedy
High boat speed causing high ram pressure.	Install a sea strainer with a bypass relief valve.

Owner Service Assistance

LOCAL REPAIR SERVICE

If you need service for your Mercury MerCruiser-powered boat, take it to your authorized dealer. Only authorized dealers specialize in Mercury MerCruiser products and have factory-trained mechanics, special tools and equipment, and genuine Quicksilver parts and accessories to properly service your engine.

NOTE: *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. 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.

STOLEN POWER PACKAGE

If your power package is stolen, immediately inform the local authorities and Mercury Marine of the model and serial numbers and to whom the recovery is to be reported. This information is maintained in a database at Mercury Marine to aid authorities and dealers in recovery of stolen power packages.

ATTENTION REQUIRED AFTER SUBMERSION

1. Before recovery, contact an authorized Mercury MerCruiser dealer.
2. After recovery, immediate service by an authorized Mercury MerCruiser dealer is required to reduce the possibility of serious engine damage.

REPLACEMENT SERVICE PARTS

⚠ WARNING

Avoid fire or explosion hazard. Electrical, ignition, and fuel system components on Mercury Marine products comply with federal and international standards to minimize risk of fire or explosion. Do not use replacement electrical or fuel system components that do not comply with these standards. When servicing the electrical and fuel systems, properly install and tighten all components.

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. Exercise care when replacing marine engine parts because specifications are different from those of the standard automotive engine. For example, one of the most important special replacement parts is the cylinder head gasket. Marine engines cannot use steel-type automotive head gaskets because saltwater is highly corrosive. A marine engine head gasket uses special materials to resist corrosion.

OWNER SERVICE ASSISTANCE

Because marine engines must be capable of running at or near maximum RPM much of the time, they also have special valve springs, valve lifters, pistons, bearings, camshafts, and other heavy-duty moving parts.

Mercury MerCruiser marine engines have other special modifications to provide long life and dependable performance.

Parts and Accessories Inquiries

Direct any inquiries concerning Quicksilver replacement parts and accessories to your local authorized dealer. The dealer has the necessary information to order parts and accessories for you. 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 about parts and accessories, the dealer requires the **engine model** and **serial numbers** to order the correct parts.

RESOLVING A PROBLEM

Satisfaction with your Mercury MerCruiser product is 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 you need additional assistance:

1. Talk with the dealership's sales manager or service manager. Contact the owner of the dealership if the sales manager and service manager have been unable to resolve the problem.
2. If your question, concern, or problem cannot be resolved by your dealership, please contact a 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 Customer Service:

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

CONTACT INFORMATION FOR MERCURY MARINE CUSTOMER SERVICE

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

United States, Canada		
Telephone	English +1 920 929 5040 Français +1 905 636 4751	Mercury Marine W6250 Pioneer Road P.O. Box 1939 Fond du Lac, WI 54936-1939
Fax	English +1 920 929 5893 Français +1 905 636 1704	

OWNER SERVICE ASSISTANCE

United States, Canada	
Website	www.mercurymarine.com

Australia, Pacific		
Telephone	+61 3 9791 5822	Brunswick Asia Pacific Group 41–71 Bessemer Drive Dandenong South, Victoria 3175 Australia
Fax	+61 3 9706 7228	

Europe, Middle East, Africa		
Telephone	+32 87 32 32 11	Brunswick Marine Europe Parc Industriel de Petit-Rechain B-4800 Verviers, Belgium
Fax	+32 87 31 19 65	

Mexico, Central America, South America, Caribbean		
Telephone	+1 954 744 3500	Mercury Marine 11650 Interchange Circle North Miramar, FL 33025 U.S.A.
Fax	+1 954 744 3535	

Japan		
Telephone	+072 233 8888	Kisaka Co., Ltd. 4-130 Kannabecho Sakai-shi Sakai-ku 5900984 Osaka, Japan
Fax	+072 233 8833	

Asia, Singapore		
Telephone	+65 65466160	Brunswick Asia Pacific Group T/A Mercury Marine Singapore Pte Ltd 29 Loyang Drive Singapore, 508944
Fax	+65 65467789	

ORDERING LITERATURE

United States and Canada

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

Engine Model:		**Horsepower:**	
Serial Number:		**Model year:**	

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 54936-1939

Outside The United States and Canada

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

Engine Model:		**Horsepower:**	
Serial Number:		**Model year:**	

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.

MAINTENANCE LOG

Maintenance Log

Record all maintenance performed on your outboard here. Be sure to save all work orders and receipts.

Date	Maintenance Performed	Engine Hours