

*NOTE: The following applies to CE-marked products only.*

## Declaration of Conformity—Mercury MerCruiser

This sterndrive or inboard engine when installed in accordance to Mercury MerCruiser's instructions complies with the requirements of the following directives by meeting the associated standards, as amended:

**Recreational Craft Propulsion Engines with the Requirements of Directive 94/25/EC as amended by 2003/44/EC**

<b>Name of engine manufacturer:</b> Mercury Marine MerCruiser		
<b>Address:</b> 3003 N. Perkins Road		
<b>Town:</b> Stillwater, OK	<b>Post Code:</b> 74075	<b>Country:</b> USA

<b>Name of Authorized Representative:</b> Brunswick Marine in EMEA Inc.		
<b>Address:</b> Parc Industriel de Petit-Rechain		
<b>Town:</b> Verviers	<b>Post Code:</b> 4800	<b>Country:</b> Belgium

<b>Name of Notified Body for exhaust emission assessment:</b> Det Norske Veritas AS			
<b>Address:</b> Veritasveien 1			
<b>Town:</b> Hovik	<b>Post Code:</b> 1322	<b>Country:</b> Norway	<b>ID Number:</b> 0575

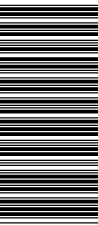
<b>Conformity assessment module used for exhaust emissions:</b>	<input type="checkbox"/> B+C	<input type="checkbox"/> B+D	<input type="checkbox"/> B+E	<input type="checkbox"/> B+F	<input type="checkbox"/> G	<input checked="" type="checkbox"/> H
<b>Conformity assessment module used for noise emissions:</b>	<input type="checkbox"/> A		<input type="checkbox"/> Aa	<input type="checkbox"/> G	<input checked="" type="checkbox"/> H	
<b>Other Community Directives applied:</b> Electromagnetic Compatibility Directive 2004/108/EC						

### Description of Engines and Essential Requirements

Engine Type	Fuel Type	Combustion Cycle
<input checked="" type="checkbox"/> z or sterndrive with integral exhaust	<input checked="" type="checkbox"/> Petrol	<input checked="" type="checkbox"/> 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:
Vazer 100	1A035000	RCD-H-1
Vazer 100 ECT	1A035000	RCD-H-1
3.0 TKS	0W319169	RCD-H-1
3.0 MPI ECT	1A300000	RCD-H-1
4.3 TKS	0W319169	RCD-H-1
4.3 MPI	0W319169	RCD-H-1
4.3 MPI ECT	1A300000	RCD-H-1
SeaCore 4.3	0W319169	RCD-H-1
5.0 MPI	0W319169	RCD-H-1
SeaCore 5.0	0W319169	RCD-H-1
5.0 MPI ECT	1A300000	RCD-H-1
SeaCore 5.0 ECT	1A300000	RCD-H-1
350 MAG	0W319169	RCD-H-1
SeaCore 350 MAG	0W319169	RCD-H-1
350 MAG ECT	1A300000	RCD-H-1
SeaCore 350 MAG ECT	1A300000	RCD-H-1
377 MAG	0W319169	RCD-H-1
SeaCore 377 MAG	0W319169	RCD-H-1



Name of engine family:	Unique engine identification number: starting serial number	EC Module H certificate number:
377 MAG ECT	1A343300	RCD-H-1
496 MAG	0W319169	RCD-H-1
SeaCore 496 MAG	0W319169	RCD-H-1
496 MAG H.O.	0W319169	RCD-H-1
SeaCore 496 MAG H.O.	0W319169	RCD-H-1
496 MAG ECT	1A300000	RCD-H-1
SeaCore 496 MAG ECT	1A300000	RCD-H-1
496 MAG H.O. ECT	1A300000	RCD-H-1
SeaCore 496 MAG H.O. ECT	1A300000	RCD-H-1
8.2 MAG	1A351489	RCD-H-1
SeaCore 8.2 MAG	1A351489	RCD-H-1
8.2 MAG ECT	1A350340	RCD-H-1
SeaCore 8.2 MAG ECT	1A350340	RCD-H-1
8.2 MAG H.O.	1A351489	RCD-H-1
SeaCore 8.2 MAG H.O.	1A351489	RCD-H-1
8.2 MAG H.O. ECT	1A350340	RCD-H-1
SeaCore 8.2 MAG H.O. ECT	1A350340	RCD-H-1

Essential requirements	standards	other normative document/ method	technical file	Please specify in more detail (* = mandatory standard)
<b>Annex 1.B—Exhaust Emissions</b>				
B.1 engine identification	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
B.2 exhaust emission requirements	<input checked="" type="checkbox"/> *	<input type="checkbox"/>	<input type="checkbox"/>	*EN ISO 8178-1:1996
B.3 durability	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
B.4 owner's manual	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ISO 8665:1995
<b>Annex 1.C—Noise Emissions</b>				
C.1 Noise emission levels	<input checked="" type="checkbox"/> *	<input type="checkbox"/>	<input type="checkbox"/>	*EN ISO 14509
C.2 Owner's manual	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Owner's manual

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engine(s) mentioned above complies (comply) with all applicable essential requirements in the way specified.

**Name / function:**

Mark Schwabero, President, Mercury Marine

**Signature and title:**



**Date and place of issue:** January 28, 2011  
Stillwater, Oklahoma, USA

Regulatory contact:  
Regulations and Product Safety Department  
Mercury Marine  
W6250 W. Pioneer Road  
Fond du Lac, WI 54936  
USA

## Identification Record

Please record the following information:

<b>Engine Model and Horsepower</b>		<b>Engine Serial Number</b>
<b>Transom Assembly Serial Number (Sterndrive)</b>	<b>Gear Ratio</b>	<b>Sterndrive Unit Serial Number</b>
<b>Transmission Model (Inboard)</b>	<b>Gear Ratio</b>	<b>Transmission Serial Number</b>
<b>Propeller Number</b>	<b>Pitch</b>	<b>Diameter</b>
<b>Hull Identification Number (HIN)</b>		<b>Purchase Date</b>
<b>Boat Manufacturer</b>	<b>Boat Model</b>	<b>Length</b>

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

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

Mercury Marine, Fond du Lac, Wisconsin, USA. Printed in USA.

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Mercury, Mercury Marine, MerCruiser, Mercury MerCruiser, Mercury Racing, Mercury Precision Parts, Mercury Propellers, Mariner, Quicksilver, Alpha, Axius, Bravo One, Bravo Two, Bravo Three, K-Planes, MerCathode, OptiMax, Precision Pilot, Pro Max, SeaCore, Skyhook, SmartCraft, Sport-Jet, Total Command, Verado, VesselView, Zero Effort, Zeus, #1 On The Water, M with Waves logo, Mercury with Waves logo, and SmartCraft logo are all registered trademarks of Brunswick Corporation. Mercury Product Protection logo is a registered service mark of Brunswick Corporation.

## Welcome

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

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

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

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

Mercury MerCruiser

## Warranty Message

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


Mercury Marine products are designed and manufactured to comply with our own high quality standards, applicable industry standards and regulations, as well as certain emissions regulations. At Mercury Marine every engine is operated and tested before it is boxed for shipment to make sure that the product is ready for use. In addition, certain Mercury Marine products are tested in a controlled and monitored environment, for up to 10 hours of engine run time, in order to verify and make a record of compliance with applicable standards and regulations. All Mercury Marine product, sold as new, receives the applicable limited warranty coverage, whether the engine participated in one of the test programs described above or not.

## Read This Manual Thoroughly

**IMPORTANT:** If you don't understand any portion of this manual, contact your dealer for a demonstration of actual starting and operating procedures.

## Notice

Throughout this publication, and on your power package, dangers, warnings, cautions, and notices, accompanied by the

International Hazard Symbol , may be used to alert the installer/user to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully.

These safety alerts alone cannot eliminate the hazards they warn of. Strict compliance with these special instructions while performing the service, plus 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 operator (driver) is responsible for the correct and safe operation of the boat, the equipment aboard and the safety of all occupants aboard. We strongly recommend that the operator read this Operation, Maintenance and Warranty Manual and thoroughly understand the operational instructions for the power package and all related accessories before the boat is used.

### WARNING

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

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# Section 1 - Warranty

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## Warranty Registration: United States and Canada

To ensure that your warranty coverage begins promptly, your selling dealer should fill out the Warranty Registration Card completely and mail it to the factory immediately upon sale of the new product.

The Warranty Registration Card identifies the name and address of the original purchaser, product model and serial number(s), date of sale, type of use and selling dealer's code, name, and address. The dealer also certifies that you are the original purchaser and user of the product. A temporary Owner Warranty Registration Card will be presented to you when you purchase the product.

Upon receipt of the Warranty Registration Card at the factory, Mercury MerCruiser will send you an owner resource guide that includes your warranty registration confirmation. If you do not receive your owner resource guide within 60 days from date of new product sale, please contact your selling dealer.

Because of your selling dealer's ongoing interest in your satisfaction, the product should be returned to him for warranty service.

The product warranty is not effective until the product is registered at the factory.

**NOTE:** *Registration lists must be maintained by the factory and dealer on marine products sold in the United States in the event that a safety recall notification under the Federal Boat Safety Act is required.*

You may change your address at any time, including at time of warranty claim, by calling Mercury MerCruiser or sending a letter or fax to Mercury MerCruiser's warranty registration department with your name, old address, new address, and engine serial number. Your dealer can also process this change of information.

United States customers or dealers may contact:

Mercury Marine  
Attn: Warranty Registration Department  
W6250 Pioneer Road  
P.O. Box 1939  
Fond du Lac, WI 54936-1939  
920 929 5054  
Fax 920 907 6663  
registration\_support@mercmarine.com

Canadian customers or dealers may contact:

Mercury Marine Canada Limited  
2395 Meadowpine Blvd.  
Mississauga,  
Canada, L5N 7W6  
Fax 1 800 663 8334

## Warranty Registration: Outside the United States and Canada

To ensure that your warranty coverage begins promptly, your selling dealer should fill out the warranty registration card completely and mail it to the distributor responsible for administering the warranty registration and claim program for your area.

The warranty registration card identifies your name and address, product model and serial numbers, date of sale, type of use, and the selling distributor's and dealer's code number, name, and address. The distributor or dealer also certifies that you are the original purchaser and user of the product. A copy of the warranty registration card, designated as the purchaser's copy, **MUST** be given to you immediately after the card has been completely filled out by the selling distributor or dealer. This card represents your factory registration identification. Keep the card; if you ever need warranty service on this product, your dealer may ask you for the warranty registration card to verify date of purchase and to use the information on the card to prepare the warranty claim forms.

In some countries, the distributor will issue a permanent (plastic) warranty registration card to you within 30 days after receiving the factory copy of the warranty registration card from your distributor or dealer. If you receive a plastic warranty registration card, you may discard the purchaser's copy that you received from the distributor or dealer when you purchased the product. Ask your distributor or dealer if this plastic card program applies to you. For further information concerning the warranty registration card and its relationship to warranty claim processing, refer to the International Warranty. See Table of Contents.

**NOTE:** *Registration lists must be maintained by the factory and dealer on marine products sold in the United States in the event of a safety recall notification under the Federal Boat Safety Act.*

## 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 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 920-929-5893

In Canada mail to:  
Mercury Marine Canada Limited  
2395 Meadowpine Blvd.  
Mississauga,  
Canada, L5N 7W6  
Fax 1-800-663-8334

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.

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

## Mercury Installation Quality Certification Program



15502

Mercury MerCruiser products installed by a Mercury Installation Quality Certified Manufacturer are Installation Quality certified products and may receive an additional one (1) year of limited warranty coverage.

The Installation Quality Certification program was developed to recognize MerCruiser boatbuilder customers who have achieved higher manufacturing standards. It is the first and only comprehensive manufacturer-installation certification program in the industry.

The program has three goals:

1. To enhance overall product quality.
2. To improve the boat ownership experience.
3. To enhance overall customer satisfaction.

The certification process is designed to review all facets of manufacturing and engine installation. The program is composed of design, manufacturing and installation review stages with which builders must comply. Certification applies leading-edge methodologies to create:

- Efficiencies and best practices specific to engine installation.
- World-class assembly and component specifications.
- Efficient installation processes.
- Industry standard end-of-line test procedures

Boat builders that successfully complete the program and meet all certification requirements earn Installation Quality System Certified Manufacturer status and receive an additional one (1) year of Mercury limited factory warranty coverage on all MerCruiser-powered boats that are registered on and after the boat builder's certification date for all worldwide registrations.

## Section 1 - Warranty

Mercury has designated a section of our Website to promote the Installation Quality Certification Program and communicate its benefits to consumers. For a current list of MerCruiser-powered boat brands that have earned Installation Quality Certification, visit [www.mercurymarine.com/mercruiser\\_warranty](http://www.mercurymarine.com/mercruiser_warranty).

## Mercury Product Protection Plan: United States and Canada

**IMPORTANT: Certain performance products, triple engine installations, and commercial applications are excluded from the Mercury Product Protection Plan program.**

The Mercury Product Protection Plan provides coverage against unexpected mechanical and electrical breakdowns that may occur beyond the standard limited warranty. The plan may be purchased up to twelve months after the original engine registration date and is available with terms ranging from one to five years.

The optional Mercury Product Protection Plan is the only factory authorized extended warranty plan available for your engine. See your participating Mercury MerCruiser dealer for complete program details.

## Mercury MerCruiser Limited Warranty (Gasoline-Fueled Products Only)

### Mercury MerCruiser Limited Warranty (Gasoline-Fueled Products Only)

#### What is Covered

Mercury Marine warrants its new products to be free of defects in material and workmanship during the period described following.

#### Duration of Coverage

##### Warranty Period for Recreational Use

The warranty period begins on 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. Products installed by an Installation Quality Certified Installer receive one (1) year of additional warranty coverage. 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. The warranty period is specific to the model covered; see your model for the base coverage period:

##### Coverage for Horizon Inboard Models, and Vazer 100 Sterndrive Models

The Limited Warranty for Horizon Inboard Models and Vazer 100 Models is four (4) years when installed by an Installation Quality Certified Installer or three (3) years for non-certified installations.

##### Coverage for SeaCore Sterndrive Models

The Limited Warranty for SeaCore Sterndrive Models is four (4) years when installed by an Installation Quality Certified Installer or three (3) years for non-certified installations.

##### Coverage for Tow Sports Inboard Models

The Limited Warranty for Tow Sports 5.7 TKS models is two (2) years when installed by an Installation Quality Certified Installer or one (1) year for non-certified installations.

The Limited Warranty for all other Tow Sports Inboard models is three (3) years when installed by an Installation Quality Certified Installer or two (2) years for non-certified installations.

##### Coverage for All Other Models

The Limited Warranty for all other Gasoline Sterndrive and Inboard models except those described above is two (2) years when installed by an Installation Quality Certified Installer or one (1) year for non-certified installations.

##### Warranty Period for Commercial Use

The warranty period begins on the date the product is first sold to a commercial-use retail purchaser or the date on which the product is first put into service, whichever occurs first. Commercial users of these products receive warranty coverage for either one (1) year from the date of first retail sale or the accumulation of 500 hours of operation, whichever occurs first. Commercial use is defined as any work-related or employment-related use of the product, or any use of the product that generates income for any part of the warranty period, even if the product is only occasionally used for such purposes. The repair or replacement of parts or the performance of service under this warranty does not extend the life of this warranty beyond its original expiration date.

#### Transfer of Coverage

Unexpired warranty coverage can be transferred from one recreational-use customer to a subsequent recreational-use customer upon proper reregistration of the product. Unexpired warranty coverage cannot be transferred either to or from a commercial-use customer.

**Termination of Coverage**

Warranty coverage is terminated for used product obtained in any of the following ways:

- Repossession from a retail customer
- Purchase at auction
- Purchase from a salvage yard
- Purchase from an insurance company that obtained the product as a result of an insurance claim

**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 pre-delivery inspection process specified by Mercury Marine is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Inaccurate warranty registration information regarding recreational use or subsequent change of use from recreational to commercial (unless properly reregistered) may void the warranty at the sole discretion of Mercury Marine. Routine maintenance must be performed according to the maintenance schedule in the Operation, Maintenance & Warranty manual in order to obtain warranty coverage. Mercury Marine reserves the right to make any warranty coverage contingent upon proof of proper maintenance.

**What Mercury Marine 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 Marine product. Mercury Marine reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

**How to Obtain Warranty Coverage**

The customer must provide Mercury Marine 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 Marine dealer authorized to service the product. If the purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury Marine. Mercury Marine will then arrange for the inspection and any covered repair. The purchaser in that case shall pay for all related transportation charges and travel time. If the service provided is not covered by this warranty, the 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 Marine, ship the product or parts of the product directly to Mercury Marine. Proof of registered ownership must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

## Section 1 - Warranty

### What Is Not Covered

This limited warranty does not cover the following:

- Routine maintenance items
- Adjustments
- Normal wear and tear
- Damage caused by abuse
- Abnormal use
- Use of a propeller or gear ratio that does not allow the engine to run in its recommended RPM range (see the Operation, Maintenance & Warranty manual)
- Operation of the product in a manner inconsistent with the recommended operation and duty cycle section of the Operation, Maintenance & Warranty manual
- Neglect
- Accident
- Submersion
- Improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product)
- Improper service
- Use of an accessory or part that was not manufactured or sold by Mercury Marine and that damages the Mercury product
- Jet pump impellers and liners
- Operation with fuels, oils, or lubricants that are not suitable for use with the product (see the Operation, Maintenance & Warranty manual)
- Alteration or removal of parts
- Water entering the engine through the fuel intake, air intake, or exhaust system or damage to the product from 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
- Operating the boat with the engine over trimmed

Use of the product for racing or other competitive activity, or operating with a racing-type lower unit at any point, even by a previous owner of the product, voids the warranty. 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 or replacement of boat partitions or other material in order to gain access to the product are not covered by this 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. If such affirmation, representation, or warranty is made, it shall not be enforceable against Mercury Marine.

### 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.**

## 3-Year Limited Warranty Against Corrosion

### 3-YEAR LIMITED WARRANTY AGAINST CORROSION

#### What Is Covered

Mercury Marine warrants that each new Mercury, Mariner, Mercury Racing, Sport Jet, M<sup>2</sup> Jet Drive, Tracker by Mercury Marine Outboard, MerCruiser Inboard or Sterndrive engine (Product) will not be rendered inoperative as a direct result of corrosion for the period of time described below.

#### Duration of Coverage

This limited corrosion warranty provides coverage for three (3) years from either the date the product is first sold, or the date on which the product is first put into service, whichever occurs first. The repair and 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 subsequent (noncommercial use) purchaser upon proper re-registration of the product. Warranty coverage is terminated for used product repossessed from a retail customer, purchased at auction, from a salvage yard, or from an insurance company that obtained the product as a result of an insurance claim.

#### **Condition That Must Be Met in Order to Obtain Warranty Coverage**

Warranty coverage is available only to retail customers that purchase from a dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre-delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Corrosion prevention devices specified in the Operation, Maintenance & Warranty manual must be in use on the boat, and routine maintenance outlined in the Operation, Maintenance & Warranty manual must be timely performed (including without limitation the replacement of sacrificial anodes, use of specified lubricants, and touch-up of nicks and scratches) 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's sole and exclusive obligation under this warranty is limited to, at our option, repairing a corroded part, replacing such part or parts with new or Mercury Marine certified re-manufactured parts, or refunding the purchase price of the Mercury product. Mercury reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

#### **How to Obtain Warranty Coverage**

The customer must provide Mercury with a reasonable opportunity to repair, and reasonable access to the product for warranty service. Warranty claims shall be made by delivering the product for inspection to a Mercury dealer authorized to service the product. If purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury. We will then arrange for the inspection and any covered repair. Purchaser in that case shall pay for all related transportation charges and/or travel time. If the service provided is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. 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 electrical system corrosion; corrosion resulting from damage, corrosion which causes purely cosmetic damage, abuse or improper service; corrosion to accessories, instruments, steering systems; corrosion to factory installed jet drive unit; damage due to marine growth; product sold with less than a one year limited Product warranty; replacement parts (parts purchased by the Customer); products used in a commercial application. Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, for any part of warranty period, even if the product is only occasionally used for such purposes.

## **4-Year Limited Corrosion Warranty: SeaCore Sterndrive Models with Gas Engines**

### **4-YEAR LIMITED CORROSION WARRANTY: SEACORE STERNDRIVE MODELS WITH GAS ENGINES**

#### **What Is Covered**

Mercury Marine warrants that each new MerCruiser SeaCore engine, transom, and sterndrive package will not be rendered inoperative as a direct result of corrosion for the period of time described below.

#### **Duration of Coverage**



## Section 1 - Warranty

This limited corrosion warranty provides coverage for four (4) years from either the date on which the MerCruiser SeaCore engine, transom, and sterndrive package is first sold or the date on which it 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 (noncommercial-use) purchaser upon proper reregistration of the product. Warranty coverage is terminated for used product obtained in any of the following ways:

- Repossession from a retail customer
- Purchase at auction
- Purchase from a salvage yard
- Purchase from an insurance company that obtained the product as a result of an insurance claim

### Condition 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 pre-delivery inspection process specified by Mercury Marine is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Corrosion-prevention devices specified in the Operation, Maintenance & Warranty manual must be in use on the boat, and routine maintenance outlined in the Operation, Maintenance & Warranty manual must be performed according to the maintenance schedule in the Operation, Maintenance & Warranty manual (including without limitation the replacement of sacrificial anodes, use of specified lubricants, and touch-up of nicks and scratches) in order to maintain warranty coverage. Mercury Marine reserves the right to make warranty coverage contingent upon proof of proper maintenance.

### What Mercury Marine Will Do

Mercury's sole and exclusive obligation under this warranty is limited to, at our option, repairing a corroded 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.

### How to Obtain Warranty Coverage

The customer must provide Mercury Marine 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 Marine dealer authorized to service the product. If the purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury Marine. Mercury Marine 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, the 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 Marine, ship the product or parts of the product directly to Mercury Marine. 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 the following:

- Electrical system corrosion
- Corrosion resulting from damage
- Corrosion that causes purely cosmetic damage
- Abuse or improper service
- Corrosion to accessories, instruments, and steering systems
- Corrosion to a factory-installed jet drive unit
- Damage due to marine growth
- Replacement parts (parts purchased by the customer)
- Product sold with less than a one-year limited product warranty
- Products used in a commercial application. Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, for any part of warranty period, even if the product is only occasionally used for such purposes.



## Global Application Warranty Charts for 8.2 Sterndrive Models

### Warranty for Consumer Applications

Engine Model	Region	Standard Factory Limited Warranty by Certification Status of Boat Manufacturer		Consumer Limited Corrosion Warranty
		Not Certified	Installation Quality Certified	
8.2 MAG 8.2 MAG H.O.	The Americas (excluding the United States and Brazil)	1 year	2 years	3 years
	Brazil	2 years	2 years	2 years
	Europe, Middle East, Africa		3 years	3 years
	Australia, New Zealand		2 years	
	Japan	1 year	1 year	1 year
	South Pacific	2 years	2 years	2 years
	Other Asia	1 year	1 year	1 year
SeaCore 8.2 MAG SeaCore 8.2 MAG H.O.	The Americas (excluding the United States and Brazil)	3 years	4 years	4 years
	Brazil	2 years	2 years	2 years
	Europe, Middle East, Africa	3 years	4 years	4 years
	Australia, New Zealand		3 years	
	Japan	1 year	1 year	1 year
	South Pacific	2 years	2 years	2 years
	Other Asia	1 year	1 year	1 year

### Warranty for Commercial Applications

Engine Model	Region	Standard Factory Limited Warranty by Certification Status of Boat Manufacturer		Commercial Limited Corrosion Warranty
		Not Certified	Installation Quality Certified	
8.2 MAG 8.2 MAG H.O. SeaCore 8.2 MAG SeaCore 8.2 MAG H.O.	The Americas (excluding the United States and Brazil)	1 year	1 year	1 year
	Brazil	1 year or 500 hours	1 year or 500 hours	1 year or 500 hours
	Europe, Middle East, Africa			
	Australia, New Zealand			
	Japan			
	South Pacific			
	Other Asia			

## Warranty for Government Applications

Engine Model	Region	Standard Factory Limited Warranty by Certification Status of Boat Manufacturer		Government Limited Corrosion Warranty
		Not Certified	Installation Quality Certified	
8.2 MAG 8.2 MAG H.O. SeaCore 8.2 MAG SeaCore 8.2 MAG H.O.	The Americas (excluding the United States and Brazil)	1 year	1 year	1 year
	Brazil	1 year or 500 hours	1 year or 500 hours	1 year or 500 hours
	Europe, Middle East, Africa			
	Australia, New Zealand			
	Japan			
	South Pacific			
	Other Asia			

## Emission Control Warranty Information

### Important Information

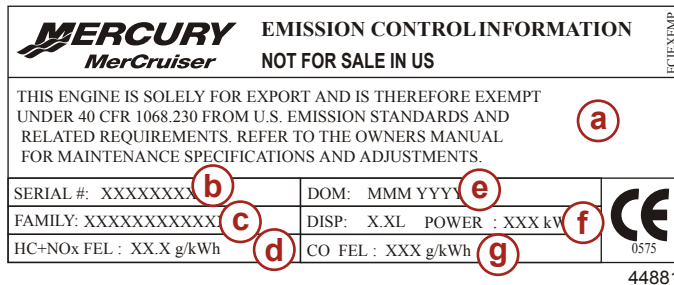
To identify the applicable emission control warranty coverage for a particular product, refer to the **Emission Control Information** label affixed to the engine.

Engines designated as exempt from either Federal EPA or California emission control regulations are not covered by a separate emission control component warranty. The product's Mercury MerCruiser manufacturer's warranty is not affected by the engine's designation under Federal EPA or California emission control regulations.

For a list of typical emission control related engine components, refer to **Emission Control System Components** in the warranty section of your owners manual.

### Emission Control Information Label



A tamper-resistant emission control information (ECI) label is affixed to the engine in a visible location at the time of manufacture by Mercury MerCruiser. Please note that the low emissions certification will not affect the fit, function, or performance of the engine. Boatbuilders and dealers may not remove the label or the part it is affixed to before sale. If modifications are necessary, contact Mercury MerCruiser about the availability of replacement decals before proceeding. In addition to the required emissions statement, the label lists the engine serial number, family, applicable emission standard, date of manufacture (month, year), and engine displacement.



- a - Applicable standard
- b - Engine serial number
- c - Engine family name
- d - Hydrocarbons plus oxides of nitrogen family emission limit
- e - Date of manufacture
- f - Engine displacement, engine power
- g - Carbon monoxide family emission limit

**IMPORTANT:** A CE mark in the lower right corner of the Emission Control Information label indicates that an EU Declaration of Conformance applies. Refer to the front page of this manual for further information.

**IMPORTANT:** Engines designated as exempt from either Federal EPA or California emission control regulations are not covered by a separate emission control component warranty. The product's Mercury MerCruiser manufacturer's warranty is not affected by the engine's designation under Federal EPA or California emission control regulations.

ECI Label	Standard of Compliance						
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  <p><b>EMISSION CONTROL INFORMATION</b> <b>NOT FOR SALE IN US</b></p> </div> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">ECIEXEMP</div> </div> <p>THIS ENGINE IS SOLELY FOR EXPORT AND IS THEREFORE EXEMPT UNDER 40 CFR 1068.230 FROM U.S. EMISSION STANDARDS AND RELATED REQUIREMENTS. REFER TO THE OWNERS MANUAL FOR MAINTENANCE SPECIFICATIONS AND ADJUSTMENTS.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; font-size: x-small;">SERIAL #: XXXXXXXXX</td> <td style="width: 50%; font-size: x-small;">DOM: MMM YYYY</td> </tr> <tr> <td style="font-size: x-small;">FAMILY: XXXXXXXXXXXXX</td> <td style="font-size: x-small;">DISP: X.XL POWER : XXX kW</td> </tr> <tr> <td style="font-size: x-small;">HC+NOx FEL : XX.X g/kWh</td> <td style="font-size: x-small;">CO FEL : XXX g/kWh</td> </tr> </table> <div style="text-align: right; margin-top: 10px;">               44880         </div>	SERIAL #: XXXXXXXXX	DOM: MMM YYYY	FAMILY: XXXXXXXXXXXXX	DISP: X.XL POWER : XXX kW	HC+NOx FEL : XX.X g/kWh	CO FEL : XXX g/kWh	<p>Indicates a marine engine for export and is exempt under 40 CFR 1068.255 from United States EPA exhaust emission regulations for 2010. This marine engine is not for sale in U.S.</p>
SERIAL #: XXXXXXXXX	DOM: MMM YYYY						
FAMILY: XXXXXXXXXXXXX	DISP: X.XL POWER : XXX kW						
HC+NOx FEL : XX.X g/kWh	CO FEL : XXX g/kWh						

### Owner Responsibility

The operator must have routine engine maintenance performed to maintain emission levels within prescribed certification standards.

The operator may not modify the engine in any manner that alters the horsepower or allows emissions levels to exceed factory specifications.

## Notes:

# Section 2 - Getting to Know Your Power Package

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## Additional Operation Instructions for Axis Systems

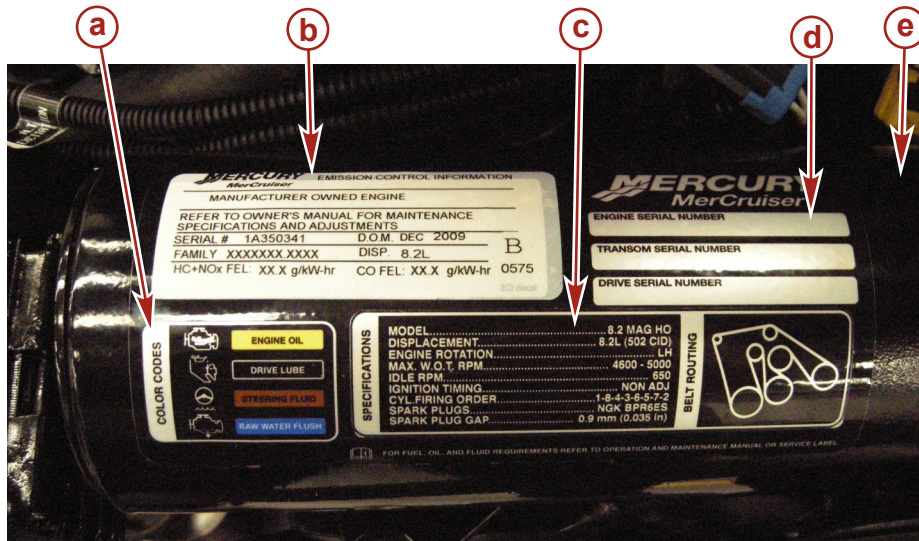
If your boat has DTS engines equipped with an Axis system, refer also to the **Axis Operation Manual** included with the boat.

### Identification

The serial numbers are the manufacturer's key to numerous details which apply to your MerCruiser power package. When contacting MerCruiser about service, always specify model and serial numbers.

### Information Decal

The information decal is located on the top starboard side of the heat exchanger.

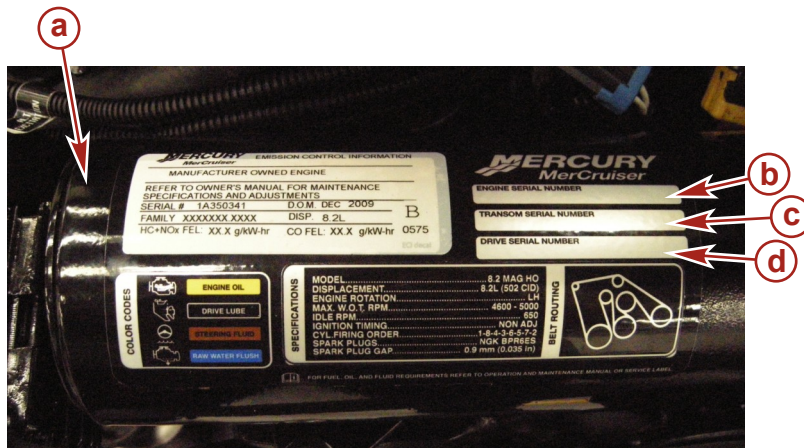


- a - Service point decal
- b - Emissions control information decal
- c - Specification decal
- d - Serial numbers decal
- e - Heat exchanger

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### Engine Serial Number Decal

The serial number decal is located on top of the heat exchanger.



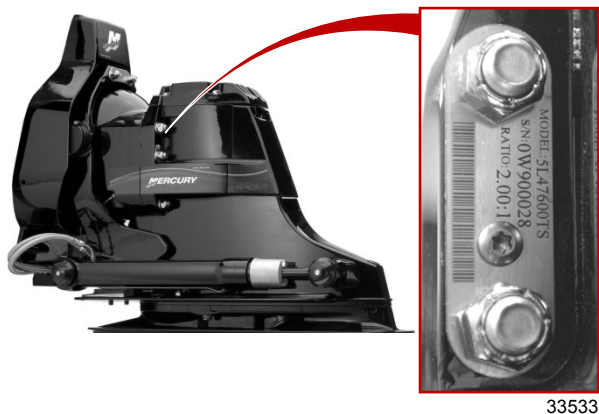
- a - Heat exchanger
- b - Engine serial number
- c - Transom serial number
- d - Sterndrive serial number

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The engine serial number is also stamped in the engine block.

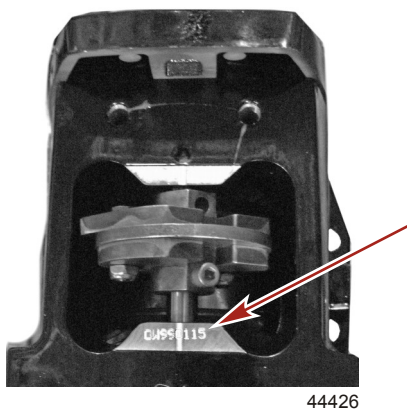
## Bravo Sterndrive Serial Number and Identification

The Bravo sterndrive serial number, gear ratio, model number, and bar code are embedded in the ground plate on the port side of the sterndrive.



Bravo sterndrive information on ground plate

The serial number is also stamped on the driveshaft housing behind the back cover. This is used as a permanent reference for authorized MerCruiser dealers.



Bravo sterndrive serial number stamping

## Bravo Transom Serial Number

The Bravo transom serial number is stamped in the U-bolt plate of the Bravo transom assembly.

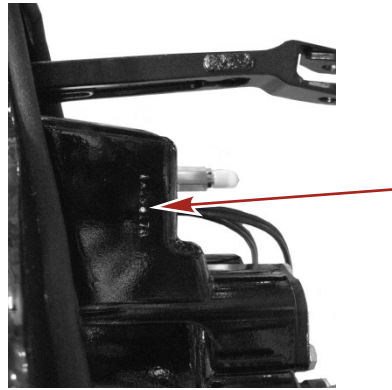


Serial number location on U-bolt plate



## Section 2 - Getting to Know Your Power Package

The serial number is also stamped on the gimbal housing. This is used as a permanent reference for authorized MerCruiser dealers.

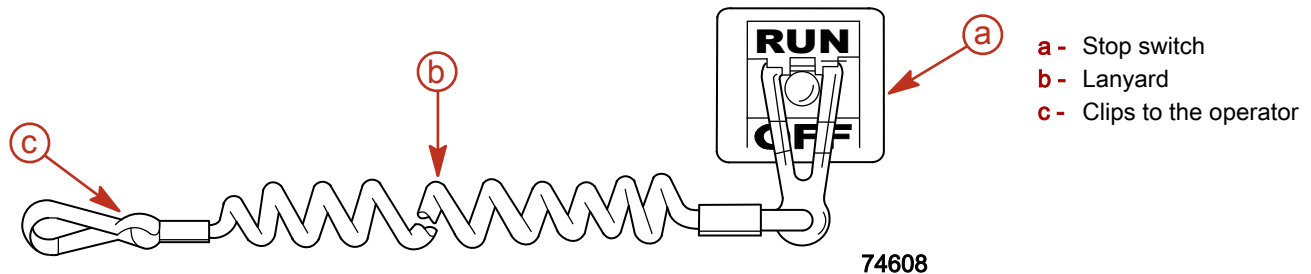


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Serial number location on gimbal housing

## Lanyard Stop Switch

The purpose of a lanyard stop switch is to turn off the engine when the operator moves outside the operator's position (as in accidental ejection from the operator's position).



Accidental ejections, such as falling overboard, are more likely to occur in:

- low-sided sport boats
- bass boats
- high performance boats

Accidental ejections can also occur from:

- poor operating practices
- sitting on the seat or gunwale at planing speeds
- standing at planing speeds
- operating at planing speeds in shallow or obstacle infested waters
- releasing your grip on the steering wheel that is pulling in one direction
- consuming alcohol or drugs
- high speed boating maneuvers

The lanyard is a cord usually between 122 and 152 cm (4 and 5 ft) in length when stretched out, with an element on one end made to be inserted into the switch and a snap on the other end for attaching to the operator. 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.

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

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



**⚠ WARNING**

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.

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 propulsion or steering components.
- Loss of power and directional control in heavy seas, strong current or high winds.
- Loss of control when docking.

**⚠ WARNING**

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

## Instrumentation

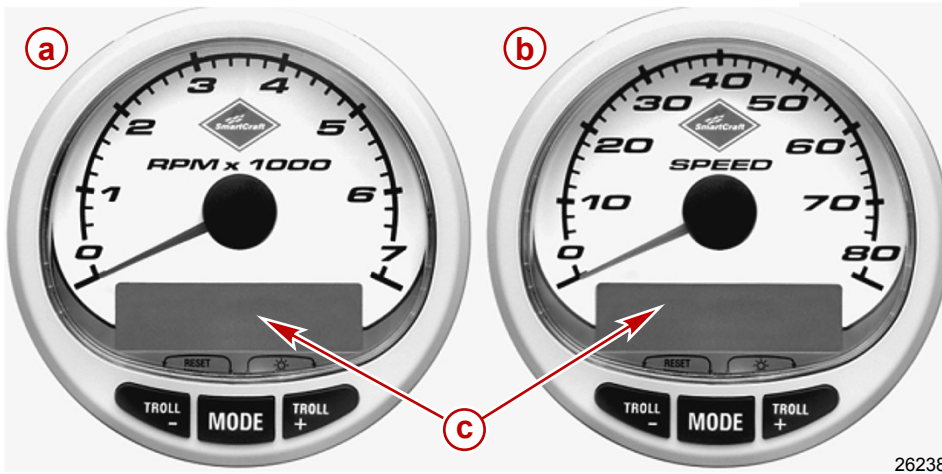
### Troll Control Speed Range Specification

Troll Control Speed Range Specification	
Engine Model	RPM
8.2 Mag	600–1000
8.2 Mag H.O.	650–1200

## Digital Gauges

A Mercury SmartCraft System instrument package can be purchased for this product. A few of the functions the instrument package will display are engine RPM, coolant temperature, oil pressure (requires a SmartCraft oil pressure sender kit), battery voltage, fuel consumption, and engine operating hours.

SmartCraft digital gauges also feature troll control. This allows a vessel to maintain a constant speed with an engine speed between the specified RPM range.



**SmartCraft gauges**

- a** - Tachometer
- b** - Speedometer
- c** - LCD system view display

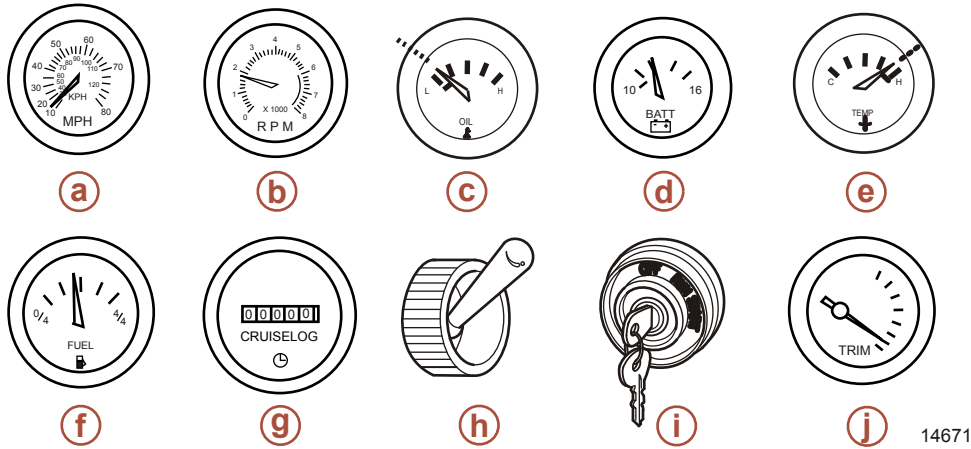
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The SmartCraft instrument package also aids in Engine Guardian diagnostics. The SmartCraft Instrument package displays critical engine alarm data and potential problems.

Refer to the manual with your gauge package for the warning functions monitored by and basic operation of the SmartCraft instrument package.

## Analog Gauges

The following is a brief explanation of the instrumentation typically found on some boats. The owner and operator should be familiar with all instruments and their functions. Because of the large variety of instrumentation and manufacturers, you should have your boat dealer explain the particular gauges and normal readings for your boat.



14671

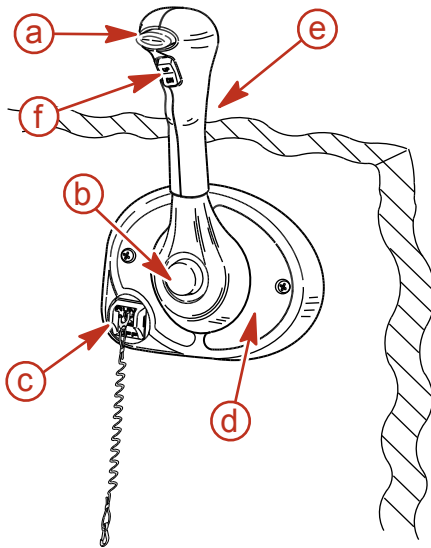
Reference	Gauge	Function
a	Speedometer	Indicates boat speed.
b	Tachometer	Indicates engine RPM.
c	Oil pressure gauge	Indicates engine oil pressure.
d	Voltmeter	Indicates battery voltage.
e	Coolant temperature gauge	Indicates engine operating temperature.
f	Fuel gauge	Indicates quantity of fuel in tank.
g	Hour meter	Records engine operating time.
h	Bilge blower switch	Operates the bilge blower.
i	Ignition switch	Allows the operator to start and stop engine.
j	Power trim gauge	Indicates sterndrive angle (trim up [out] and down [in]).

## Remote Controls (Non-DTS Models)

### Remote Controls

Your boat may be equipped with a Mercury Precision Parts or Quicksilver remote controls. All controls may not have all features shown. Consult your dealer for a description and/or demonstration of your remote control.

### Panel Mount Features



- a - Neutral lock button
- b - Throttle only button
- c - Lanyard stop switch
- d - Control handle tension adjustment screw
- e - Control handle
- f - Trim/tilt button

mc77019-1

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

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

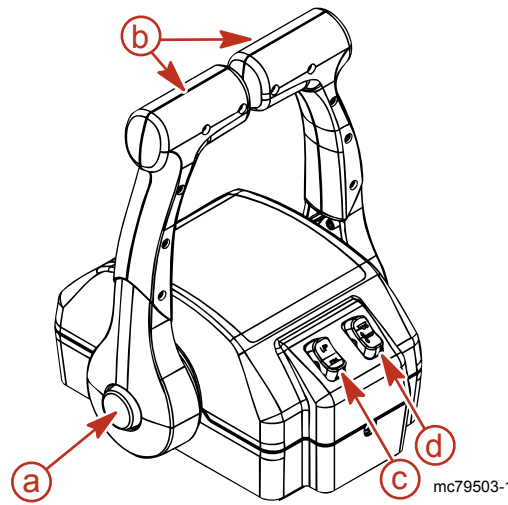
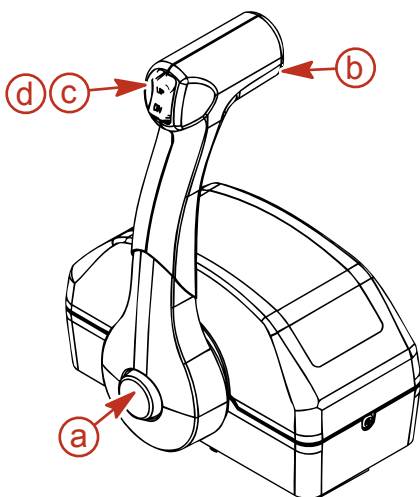
**Lanyard Stop Switch** - Turns the ignition off whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. Refer to **Lanyard Stop Switch** for information on the use of this switch.

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

**Control Handle Tension Adjustment Screw - (not visible)** This screw is used to adjust the effort required to move the remote control handle. Refer to instructions provided with remote control for complete adjustment instructions.

**Trim/Tilt Button** - Refer to **Power Trim**.

### Console Mount Features



- a - Throttle Only Button
- b - Control Handle
- c - Power Trim Switch
- d - Trailer Switch

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**Throttle Only Button** - Allows engine throttle advancement without shifting the engine. This is done by disengaging the shift mechanism from the control handle. The throttle only button can be depressed only when the remote control handle is in the neutral position.

## Section 2 - Getting to Know Your Power Package

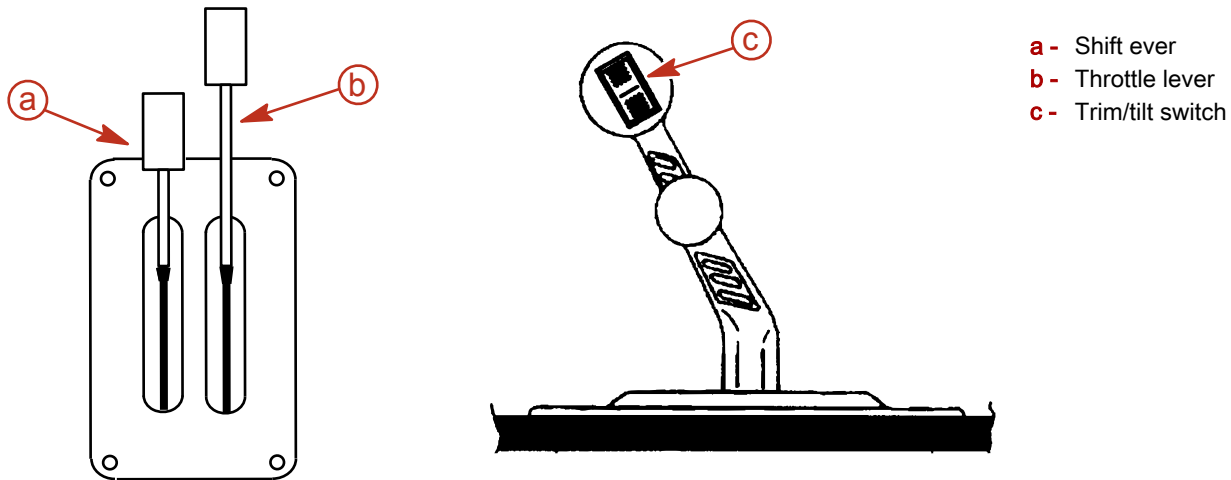
**Control Handles** - Operation of the the shift and throttle are controlled by the movement of the control handle. Push the control handle forward from neutral with a quick firm motion to the first detent for forward gear and continue pushing forward to increase speed. Pull the control handle back from neutral with a quick firm motion to the first detent for reverse gear and continue pushing back to increase speed.

**Control Handle Tension Adjustment Screw - (not visible)** This screw is used to adjust the effort required to move the remote control handle. Refer to instructions provided with remote control for complete adjustment instructions.

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

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

### Zero Effort Features



- a - Shift lever
- b - Throttle lever
- c - Trim/tilt switch

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**Shift Lever** - Shift functions are controlled by the movement of the shift lever. Shift into reverse by moving the shift lever to its aft position. Shift into neutral by moving the shift lever to its center position. Shift into forward by moving the shift lever to its forward position.

**Throttle Lever** - Throttle functions are controlled by the movement of the throttle lever. Increase the RPM by moving the throttle lever forward. Achieve Wide Open Throttle (WOT) by placing the throttle lever in its full forward position. Decrease RPM by moving the throttle lever back. Achieve minimum RPM (idle) by placing the throttle lever in its full aft position.

**Trim/Tilt Switch** - Refer to **Power Trim**.

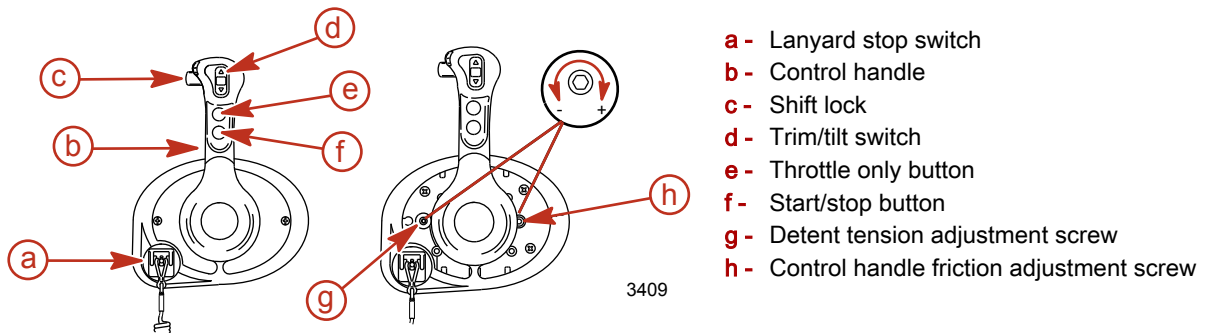
## Remote Controls (DTS Models)

### Remote Controls

**IMPORTANT:** Your boat must be equipped with a Mercury Marine electronic remote control. Start in gear protection is provided by this control system and prevents the engine from starting when the control is actuated in forward or reverse. Refer to the Mercury Precision Parts/Quicksilver Accessories Guide.

The Digital Throttle and Shift System (DTS) required to operate this engine package provides start and stop functions, throttle control, shift control, start in gear protection, and emergency lanyard stop functions. The DTS system works with specialized helm components such as a command module kit and electronic remote control. Consult your dealer for a description and/or demonstration of your remote control.

## Panel Mount Features



**Lanyard Stop Switch** - Turns the ignition off whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. Refer to **Lanyard Stop Switch** for information on the use of this switch.

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

**Shift Lock** - Pressing the shift lock allows the engine to shift. The shift lock must always be pressed when moving the control handle out of the neutral position.

**Trim/Tilt Switch (if equipped)** - Refer to **Power Trim**.

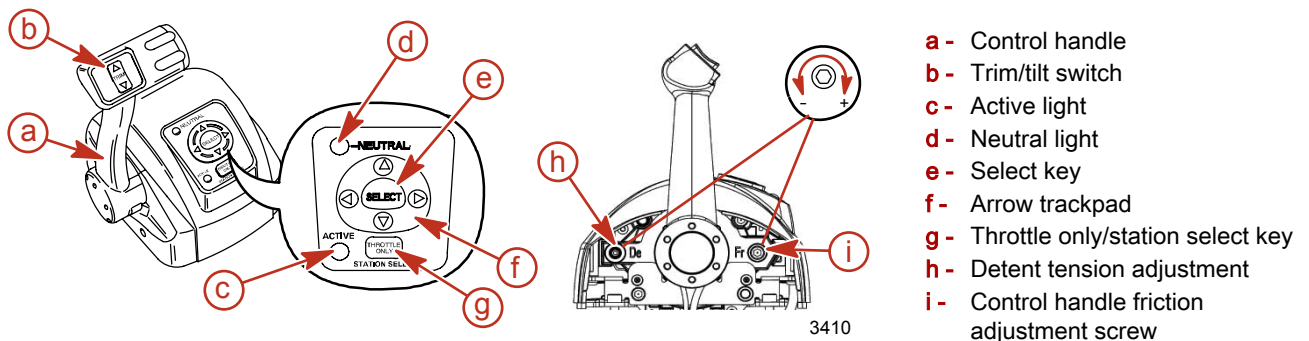
**Throttle Only Button** - Allows engine throttle advancement without shifting the engine. The throttle only button can be depressed only when the remote control is in the neutral position, and should only be used to assist in starting or warming up the engine.

**Start/Stop Button** - Allows the boat operator to start or stop the engine without using the ignition key.

**Detent Tension Adjustment Screw** - This screw can be adjusted to increase or decrease the effort required to move the control handle out of the detent positions (cover must be removed). Turning the screw clockwise will increase tension.

**Control Handle Friction Adjustment Screw** - This screw can be adjusted to increase or decrease the tension on the control handle (cover must be removed). This will help prevent unwanted motion of the handle in rough water. Turn the screw clockwise to increase tension and counterclockwise to decrease tension.

## Console Mount Features - Single Engine



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

**Trim/Tilt Switch (if equipped)** - Refer to **Power Trim**.

**Active Light** - The active light is illuminated to show the remote control is active and ready for use.

**Neutral Light** - The neutral light is illuminated when the engine is in neutral gear position.

**NOTE:** Gear position is determined by sensing the position of the shift actuator on the engine, not the position of the gear switch.

**Select Key** - Selects System View on-screen options and confirms data entries.

**Arrow Trackpad** - Navigates through System View on-screen function messages.

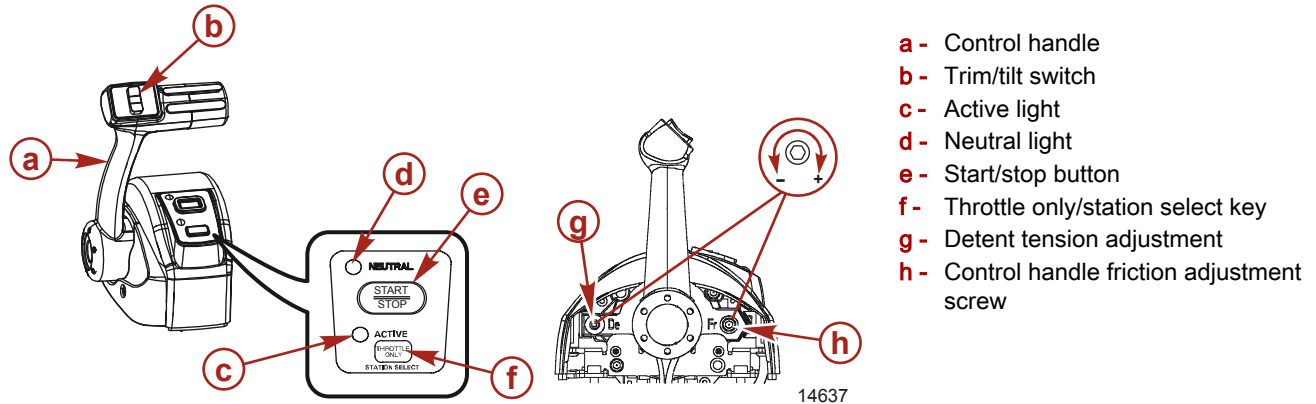
## Section 2 - Getting to Know Your Power Package

**Throttle Only/Station Select Key** - Allows engine throttle advancement without shifting the engine. The throttle only/station select button also allows the boat operator to select which remote control is in control of the engine operation when operating with multiple helms. Refer to **Dual Helm Station Transfer**.

**Detent Tension Adjustment Screw** - This screw can be adjusted to increase or decrease the effort required to move the control handle out of the detent positions (cover must be removed). Turning the screw clockwise will increase tension.

**Control Handle Friction Adjustment Screw** - This screw can be adjusted to increase or decrease the tension on the control handle (cover must be removed). This will help prevent unwanted motion of the handle in rough water. Turn the screw clockwise to increase tension and counterclockwise to decrease tension.

### Slim Binnacle Console Mount Features - Single Engine



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

**Trim/Tilt Switch (if equipped)** - Refer to **Power Trim**.

**Active Light** - The active light is illuminated to show the remote control is active and ready for use.

**Neutral Light** - The neutral light is illuminated when the engine is in neutral gear position.

**NOTE:** Gear position is determined by sensing the position of the shift actuator on the engine, not the position of the gear switch.

**Stop/Start Button** - Allows the boat operator to start or stop the engine without using the ignition key.

**Throttle Only/Station Select Key** - Allows engine throttle advancement without shifting the engine. The throttle only/station select button also allows the boat operator to select which remote control is in control of the engine operation when operating with multiple helms. Refer to **Dual Helm Station Transfer**.

**Detent Tension Adjustment Screw** - This screw can be adjusted to increase or decrease the effort required to move the control handle out of the detent positions (cover must be removed). Turning the screw clockwise will increase tension.

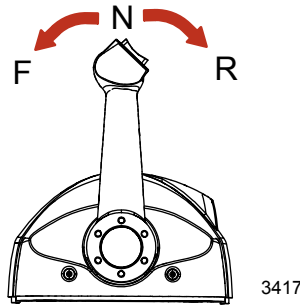
**Control Handle Friction Adjustment Screw** - This screw can be adjusted to increase or decrease the tension on the control handle (cover must be removed). This will help prevent unwanted motion of the handle in rough water. Turn the screw clockwise to increase tension and counterclockwise to decrease tension.



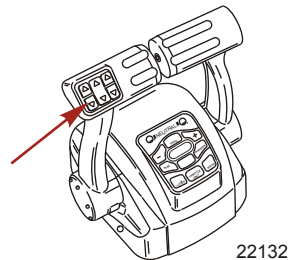
## Dual Console Control with CAN Trackpad Features and Operation

### Dual-Handle Console Control With CAN Trackpad—Features and Operation

1. Operation of shift and throttle is controlled by the movement of the control handle. Push the control handle forward from neutral to the first detent for forward gear. Continue pushing the handle forward to increase speed. Pull the control handle back from neutral to the first detent for reverse gear. Continue pulling the handle back to increase speed.



2. Trim switch (if equipped) - Pressing the trim switch allows the engine to trim up and down.

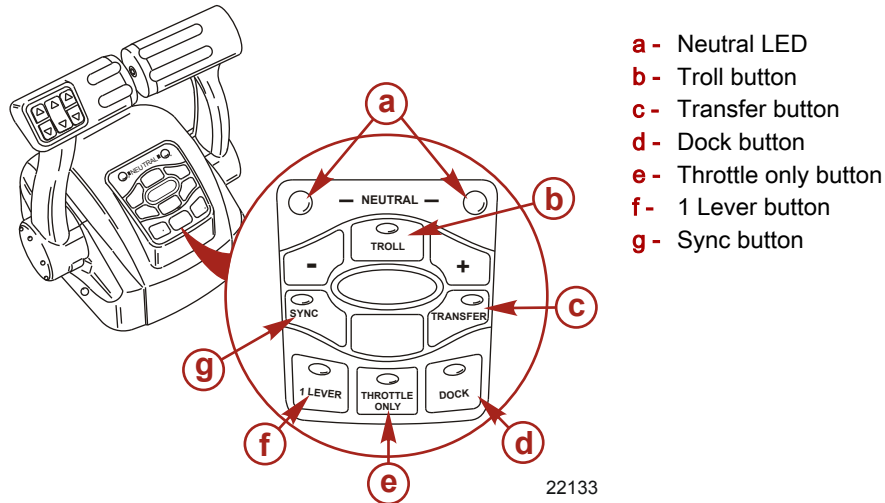


3. Neutral lights - The neutral lights illuminate when the engine is in neutral gear position. The lights will flash when the engine is in throttle only mode.
 

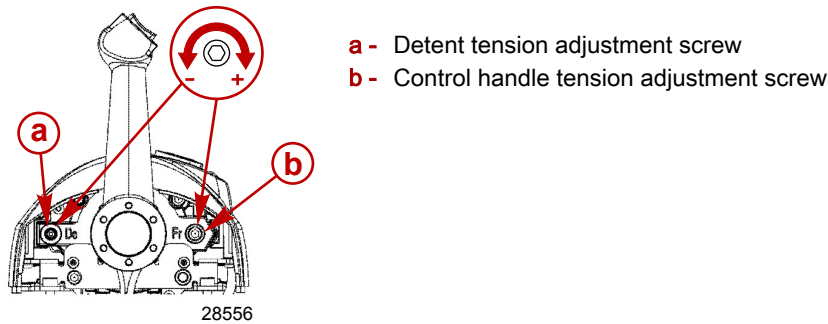
**NOTE:** Gear position is determined by the position of the shift actuator on the engine, not the position of the control handle.
4. Troll button - Pressing the "TROLL" button activates troll control. The troll control feature allows the boat operator to set the engine speed for slow speed cruising or maneuvering. To activate, move the control handles into forward detent and press the button. Use the - or + buttons to decrease or increase speed, up to a specified maximum RPM. Refer to **Troll Control Speed Range Specification**. If troll control is set at a desired speed and then shut off, the system remembers the set speed and will return to that speed when reengaged. To turn off the troll control press the "TROLL" button, move the throttle to a different speed, or shift the engine into neutral.
5. Transfer button - Pressing the "TRANSFER" button allows engine operation to be transferred from a different helm. Refer to **Helm Transfer**.
6. Dock button - Pressing the "DOCK" button initiates docking mode. Docking mode reduces throttle capacity to approximately 50% of normal throttle. To turn off docking mode, shift the engine into neutral and press the "DOCK" button.
7. Throttle only button - Allows the boat operator to increase engine RPM for warm-up, without shifting the engine into gear. To engage throttle only, move the control handle into the neutral position. Press the throttle only button and move the control handle ahead to the forward detent. The horn will sound once and the neutral light will start flashing. The horn will sound twice when throttle only is engaged. Advance throttle to increase engine RPM. To disengage, return control handle to neutral position and press the throttle only button. Engine RPM is limited to prevent engine damage.
8. 1 lever button - Pressing the "1 LEVER" button initiates single lever mode. Single lever mode enables the throttle and shift functions of both engines to be controlled by the port control handle. To turn off single lever mode, shift the engine into neutral and press the "1 LEVER" button.

## Section 2 - Getting to Know Your Power Package

9. Sync button - Pressing the "SYNC" button turns off or on the auto synchronization feature. Refer to **Synchronizing Engines**.



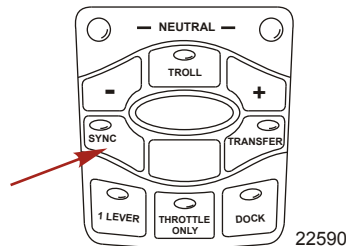
10. Control handle tension adjustment screw - This screw can be adjusted to increase or decrease the tension on the control handle (cover must be removed). This will help prevent unwanted motion of the handle in rough water. Turn the screw clockwise to increase tension and counterclockwise to decrease tension. Adjust to tension desired.
11. Detent tension adjustment screw - This screw can be adjusted to increase or decrease the effort to move control handle out of detent positions (cover must be removed). Turning the screw clockwise will increase tension. Adjust to tension desired.



## Synchronizing Engines

The auto synchronizing feature, when engaged, will automatically adjust all engine speeds to match the speed of the starboard engine.

Press the "SYNC" button on the CAN trackpad to turn auto synchronization on or off. When the sync LED is yellow, the "SYNC" button has been pressed, but the conditions are not right for auto synchronization to engage. When the sync LED turns red, engine synchronization has been engaged. The engines will remain synchronized as long as engine speed is over 900 RPM for two seconds, remote control handles are positioned within 10% of each other, and the engines are below 95% throttle opening. To disengage the auto synchronization feature, press the "SYNC" button.





## Helm Transfer

**⚠ WARNING**

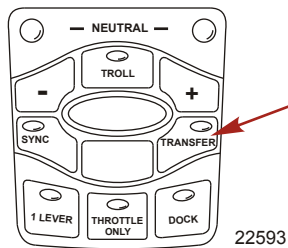
**Avoid serious injury or death from loss of boat control. The boat operator should never leave the active station while engine is in gear. Helm transfer should only be attempted while both stations are manned. One-person helm transfer should only be performed while engine is in neutral.**

***NOTE:** Neutral position is preferred when doing a station transfer. If conditions do not allow the remote control to be placed in the neutral position, a helm transfer can be done while in gear.*

The helm transfer function allows the boat operator to select which helm is in control of engine operation. Pressing the "TRANSFER" button two times allows engine control to be transferred to a new helm. When a helm transfer is initiated, the control will automatically start adjusting engine RPM and gear position to match the control handle setting at the new helm. Adjust the control handles to the desired throttle and gear position.

Once the "TRANSFER" button is pressed, the transfer LED will light up and one beep will sound. Press the "TRANSFER" button again to complete the helm transformation. When helm transformation is complete, another beep will sound and the transfer LED will turn off.

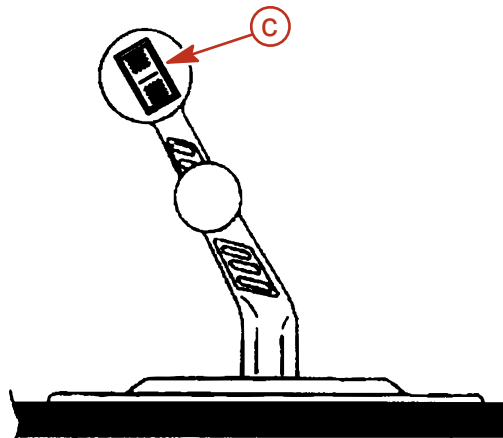
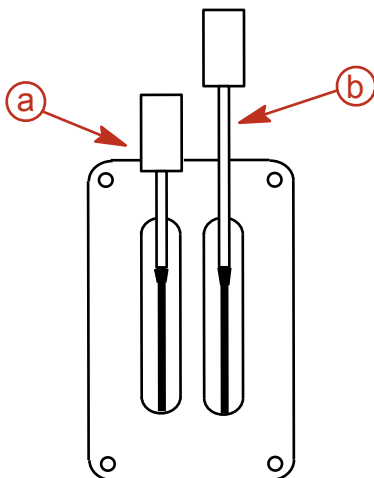
***NOTE:** There is a 10 second time frame to complete a helm transfer. If the helm transfer is not completed, the action will be cancelled and a double beep will sound. Pressing the "TRANSFER" button again will reinitiate a helm transfer.*



## Synchronizing Helms Prior to Transfer

Pressing the "TRANSFER" button allows the boat operator 10 seconds to match up the control handle settings at the new helm with the handle settings that are at the old (to be inactive) helm. If the handles are not matched, the neutral lights will flash. The light blinks faster as the handles are nearing match position. Once the light stays on continuously, the handles are matched and the button can be pressed again to complete the transfer. This completes the transfer process, and gives control to the new station. If the helm transfer is not completed within 10 seconds, the action will be cancelled.

## Zero Effort Features



- a - Shift lever
- b - Throttle lever
- c - Trim/tilt switch

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**Shift Lever** - Shift functions are controlled by the movement of the shift lever. Shift into reverse by moving the shift lever to its aft position. Shift into neutral by moving the shift lever to its center position. Shift into forward by moving the shift lever to its forward position.

## Section 2 - Getting to Know Your Power Package

**Throttle Lever** - Throttle functions are controlled by the movement of the throttle lever. Increase the RPM by moving the throttle lever forward. Achieve Wide Open Throttle (WOT) by placing the throttle lever in its full forward position. Decrease RPM by moving the throttle lever back. Achieve minimum RPM (idle) by placing the throttle lever in its full aft position.

**Trim/Tilt Switch** - Refer to **Power Trim**.

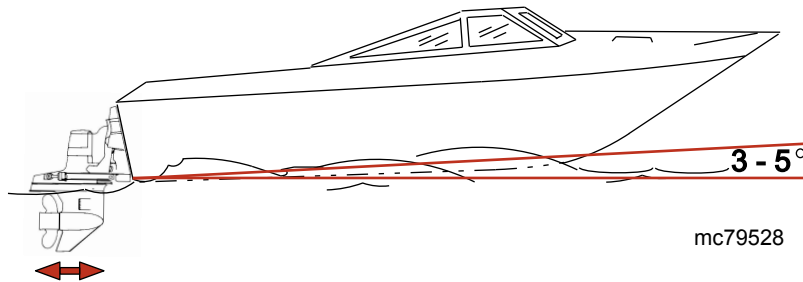
## Power Trim

Power trim allows the operator to adjust the sterndrive angle while underway, to provide the ideal boat angle for varying load and water conditions. Also, the trailering feature allows the operator to raise and lower the sterndrive unit for trailering, beaching, launching, low speed (below 1200 RPM engine speed) and shallow water operation.

### ⚠ WARNING

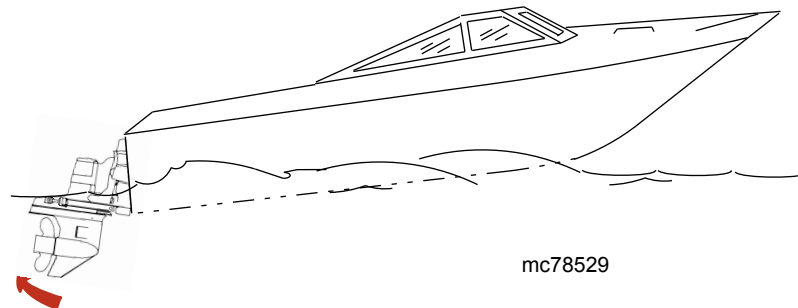
Excessive trim can cause serious injury or death at high speeds. Use caution when trimming the sterndrive, and never trim out beyond the gimbal ring support flanges while the boat is underway or at engine speeds above 1200 RPM.

For best performance trim the sterndrive unit so that the boat bottom is at a 3-5° angle to the water.



Trimming sterndrive unit up/out can:

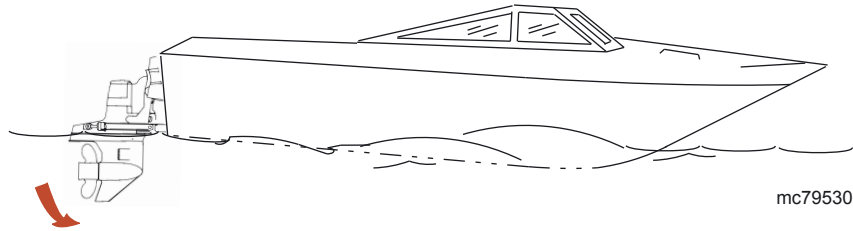
- Generally increase top speed
- Increase clearance over submerged objects or a shallow bottom
- Cause boat to accelerate and plane off slower
- In excess, cause boat porpoising (bouncing) or propeller ventilation
- Cause engine overheating if trimmed up/out to a point where any cooling water intake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



Trimming sterndrive unit down/in can:

- Help the boat accelerate and plane off quicker
- Generally improve the ride in choppy water
- In most cases, reduce boat speed

- If in excess, lower the bow of some boats to a point at which they begin to plow with their bow in the water while on plane. This can result in an unexpected turn in either direction called bow steering or over steering if any turn is attempted or if a significant wave is encountered.



## Single Engine Trim/Trailer

Single engine applications will have a button that can be pressed to trim the sterndrive unit up or down.

To raise the sterndrive unit for trailering, beaching, launching, low speed (below 1200 rpm), and shallow water operation push the trim button to raise the sterndrive unit to the full up/out position.

Some controls also have a trailer button that trims the sterndrive to a position suitable for trailer purposes only.

**NOTE:** The DTS control system limits the extent to which the sterndrive unit can be trimmed up/out when engine speed is above 3500 RPM.

## Dual Engine Trim/Trailer

### NOTICE

**If using external tie bars, raising or lowering the drives independently of each other can damage the drive and steering systems. If using an external tie bar, raise and lower all drives together as a unit.**

Dual engine applications may have a single integral button to operate both sterndrive units simultaneously or may have separate buttons for each sterndrive unit.

Some controls also have a trailer button that trims the sterndrives to a position suitable for trailer purposes only.

## Trim without Key

Trim without key is a method of allowing trim operation after the ignition key switch is turned off. The command module and PCM remain powered and are able to process trim requests for up to 15 minutes after the key switch is turned off. The command module does not process any requests other than trim during this period. Once the 15 minute period expires, the command module sends a command through the CAN lines to shut down the PCM. On multi-engine applications, the timeout is managed separately for each engine.

The trim without key period may be ended at any time by moving the control handle to Wide-Open Throttle Reverse (WOTR) with the key off. To end the 15 minute period for the center engine in a shadow mode application, ensure all ignition key switches are in the "OFF" position and both remote control handles are in the Wide-Open Throttle Reverse (WOTR) position.

## Trim Delta

Trim delta controls the distance between the individual adjacent drive angles when trimming. The trim delta limit is preset, and will not allow extreme drive angle differences that could damage tie bars. If the maximum trim delta limit is met, the drive furthest in the trim process "up or down", will stop trimming until the adjacent drive is back within the delta limit. Once the drive or drives are back within this delta window, the trim process will continue.

## 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.

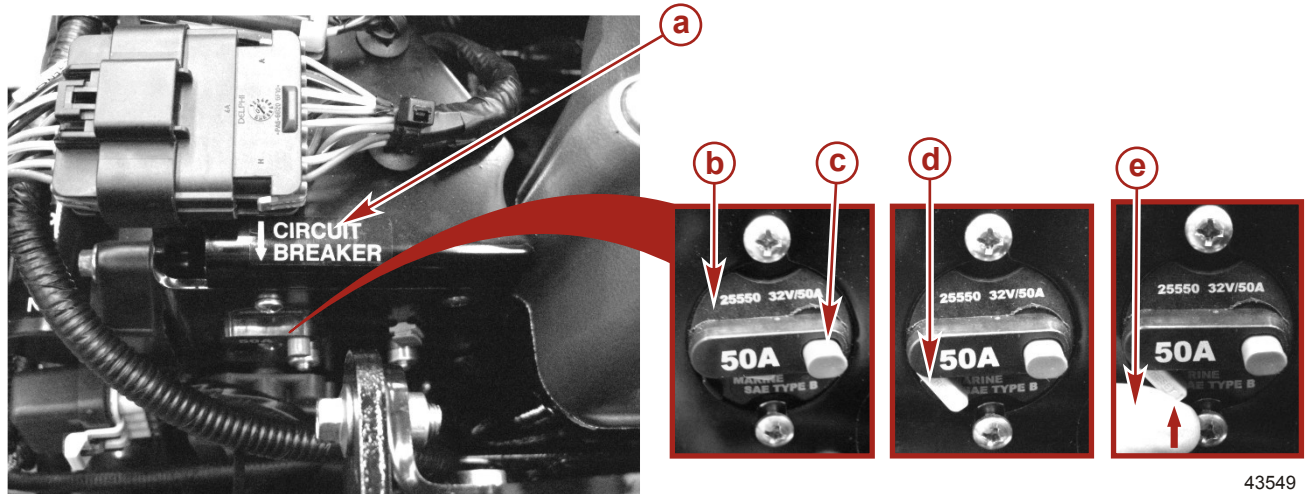
**NOTE:** In an emergency, when you must operate the engine and cannot locate the cause for the high current draw, turn off or disconnect all accessories connected to the engine and instrumentation wiring. Reset the circuit breaker. If the breaker remains open, the electrical overload has not been eliminated.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

1. Push the red test button. A yellow lever appears if the circuit breaker is functioning properly.
2. Reset the breaker by pushing the yellow lever back into the housing.

## Section 2 - Getting to Know Your Power Package

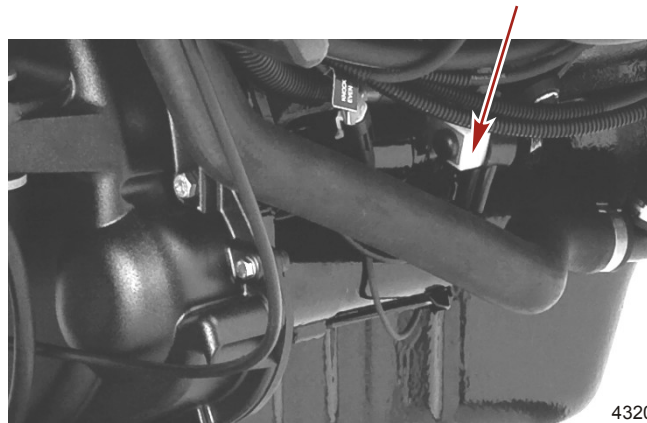
**NOTE:** The circuit breaker is located at the starboard rear of the engine in the electrical center.



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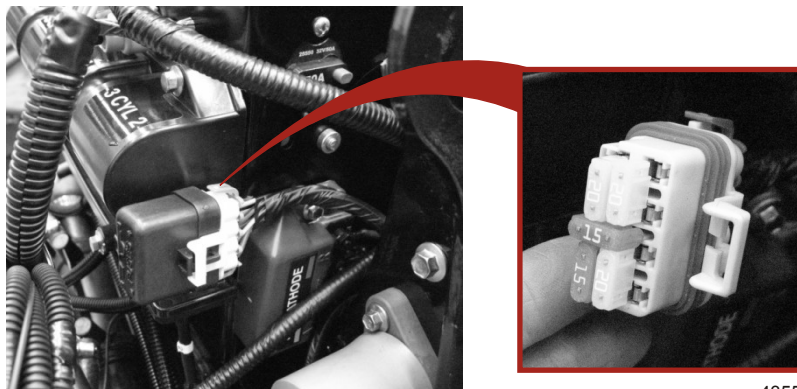
- a - Decal
- b - Circuit breaker
- c - Red test button
- d - Yellow lever
- e - Finger

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



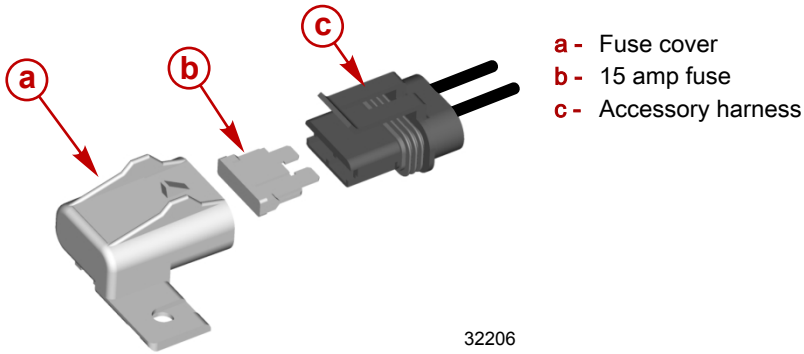
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Four fuses protect the main power, fuel pump, ignition, and accessory circuits. These are located on the top of the engine near the PCM. Four 10 amp fuses protect the O<sub>2</sub> sensors. These are located near the 14-pin harness connector.



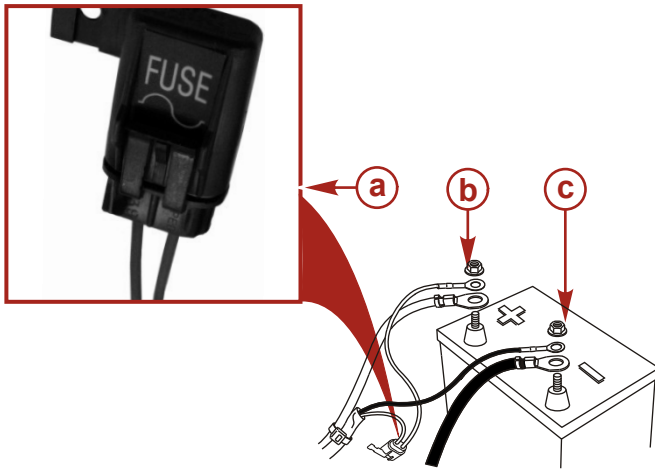
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A 15 amp accessory fuse protects the accessory circuits. This fuse is located on the rear of the engine.

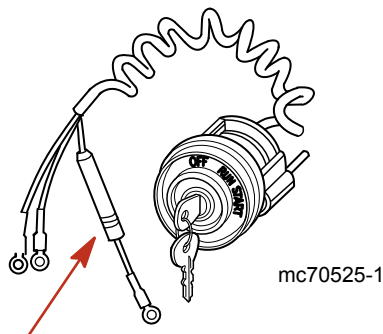


The Emissions Control system is protected by a 5 amp fuse located in the Clean Power Harness.

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

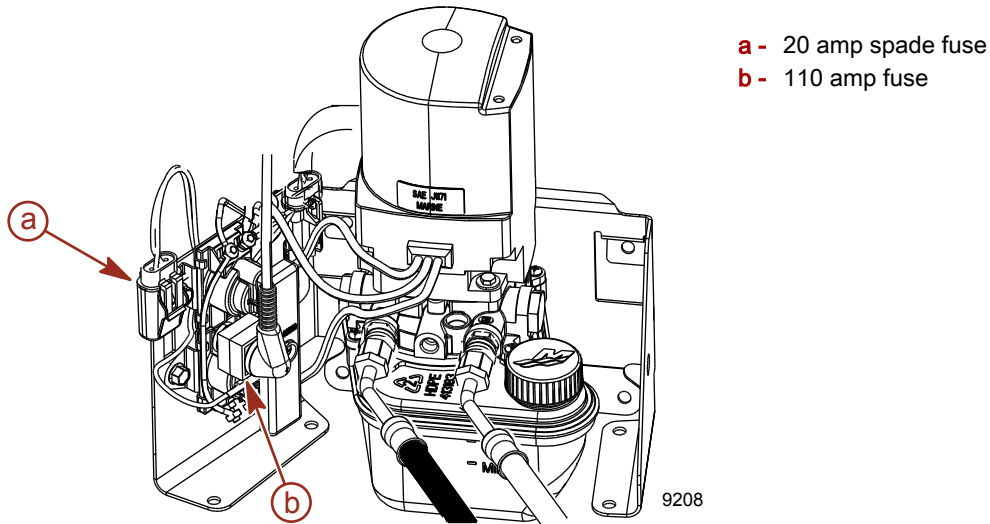


A 20 amp fuse may be located in the ignition switch "I" terminal lead to protect the electrical system. Check for an open fuse if the engine does not start, and the circuit breaker is not tripped.

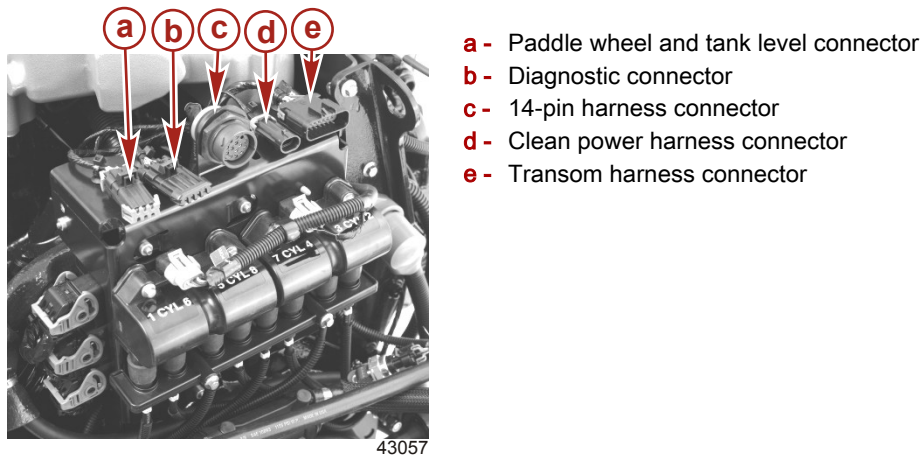


## Section 2 - Getting to Know Your Power Package

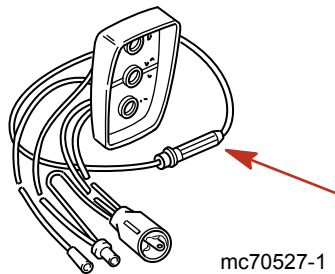
The power trim system is protected from overload by both a 110 amp fuse and a 20 amp spade fuse. The trim pump may also have an in-line circuit protection device in the power trim positive lead near the battery switch or battery connection.



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.

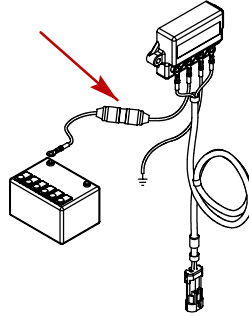


The Quicksilver Three-Button Power Trim Control Panel is protected by a 20 amp in-line fuse.





The Quicksilver MerCathode System has a 20 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.



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## Audio Warning System

The Mercury MerCruiser power package may be equipped with an Audio Warning System. The Audio Warning System will not protect the engine from damage. It is designed to warn the operator that a problem has occurred.

The audio warning system will sound with a continuous horn if one of the following occurs:

- Engine oil pressure too low
- Engine temperature too hot
- Sterndrive oil level too low (if equipped with a drive reservoir having low oil level switch)
- Transmission temperature is too hot (if equipped)

### *NOTICE*

**A continuous horn indicates a critical fault. Operating the engine during a critical fault can damage components. If the warning horn emits a continuous beep, do not operate the engine unless avoiding a hazardous situation.**

If the alarm sounds, stop the engine immediately. Investigate cause and correct it, if possible. If the cause cannot be determined, contact your authorized Mercury MerCruiser dealer.

## Testing the Audio Warning System

1. Turn the ignition switch to the "ON" position without cranking the engine.
2. Listen for the audio alarm. The alarm will sound if the system is functioning correctly.

## Guardian Strategy

Engine Guardian reduces the potential for engine damage by restricting engine power when the PCM detects a potential problem. Below are some examples of what Engine Guardian monitors:

- Oil pressure
- Engine overspeed
- Exhaust manifold temperature

**IMPORTANT: Guardian can reduce power anywhere from 100% to idle, depending on the severity of the problem. If forced to idle, boat speed might not respond to throttle operation.**

The PCM stores the fault for diagnostics. For example, if the water inlet becomes partially blocked, Guardian reduces the available power level of the engine to help prevent damage from decreased water flow to the engine. If the debris passes through, and full water flow is restored, Guardian restores engine power to normal. To avoid recurrence of the problem, contact an authorized Mercury MerCruiser dealer.

## Notes:



# Section 3 - On the Water

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## Additional Operation Instructions for Axis Systems

If your boat has DTS engines equipped with an Axis system, refer also to the **Axis Operation Manual** included with the boat.

### Safe Boating Suggestions

To safely enjoy the waterways, familiarize yourself with local and all other governmental boating regulations and restrictions and consider the following suggestions.

#### **Know and obey all nautical rules and laws of the waterways.**

- We recommend that all powerboat operators complete a boating safety course. In the US, the U.S. Coast Guard Auxiliary, the Power Squadron, the Red Cross, and your state or provincial boating law enforcement agency provide courses. For more information in the US, call the Boat U.S. Foundation at 1-800-336-BOAT (2628).

#### **Perform safety checks and required maintenance.**

- Follow a regular schedule and ensure that all repairs are properly made.

#### **Check safety equipment on board.**

- Here are some suggestions of the types of safety equipment to carry when boating:
  - Approved fire extinguishers
  - Signal devices: flashlight, rockets or flares, flag and whistle or horn
  - Tools necessary for minor repairs
  - Anchor and extra anchor line
  - Manual bilge pump and extra drain plugs
  - Drinking water
  - Transistor radio
  - Paddle or oar
  - Spare propeller, thrust hubs, and an appropriate wrench
  - First aid kit and instructions
  - Water-proof storage containers
  - Spare operating equipment, batteries, bulbs and fuses
  - Compass and map or chart of the area
  - Personal flotation device (1 per person on board)

#### **Watch for signs of weather change and avoid foul weather and rough-sea boating.**

#### **Tell someone where you are going and when you expect to return.**

#### **Passenger boarding.**

- Stop the engine whenever passengers are boarding, unloading or are near the back (stern) of the boat. Shifting the drive unit into neutral is not sufficient.

#### **Use personal flotation devices.**

- Federal Law requires that there be a U. S. Coast Guard approved life jacket (personal flotation device), correctly sized and readily accessible for every person on board, plus a throwable cushion or ring. We strongly advise that everyone wear a life jacket at all times while in the boat.

#### **Prepare other boat operators.**

- Instruct at least 1 person on board in the basics of starting and operating the engine and boat handling in case the driver becomes disabled or falls overboard.

#### **Do not overload your boat.**

- Most boats are rated and certified for maximum load (weight) capacities (refer to your boat capacity plate). Know your boat's operating and loading limitations. Know if your boat will float if full of water. When in doubt, contact your authorized Mercury MerCruiser dealer or the boat manufacturer.

#### **Ensure that 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 backs of seats, gunwales, transom, bow, decks, raised fishing seats and any rotating fishing seat; anywhere that sudden unexpected acceleration, sudden stopping, unexpected loss of boat control or sudden boat movement could cause a person to be thrown overboard or into the boat. Ensure that all passengers have a proper seat and are in it before any boat movement.

**Never be under the influence of alcohol or drugs while boating (it is the law).**

- They impair your judgment and greatly reduce your ability to react quickly.

**Know your boating area and avoid hazardous locations.****Be alert.**

- The operator of the boat is responsible by law to maintain a proper lookout by sight and hearing. The operator must have an unobstructed view particularly to the front. No passengers, load or fishing seats should block the operators view when the boat is above idle or planing transition speed. Watch out for others, the water and your wake.

**Never drive your boat directly behind a water skier in case the skier falls.**

- As an example, your boat traveling at 40 km/h (25 MPH) will overtake a fallen skier who was 61 m (200 ft.) in front of you in 5 seconds.

**Watch fallen skiers.**

- When using your boat for water skiing or similar activities, always keep a fallen or down skier on the operator's side of the boat while returning to attend to the skier. The operator should always have the down skier in sight and never back up to the skier or anyone in the water.

**Report accidents.**

- Boat operators are required by law to file a Boating Accident Report with their state boating law enforcement agency when their boat is involved in certain boating accidents. A boating accident must be reported if 1) there is loss of life or probable loss of life, 2) there is personal injury requiring medical treatment beyond first aid, 3) there is damage to boats or other property where the damage value exceeds \$500.00 or 4) there is complete loss of the boat. Seek further assistance from local law enforcement.

## Carbon Monoxide Exposure

### 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.

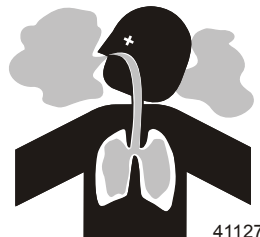
Early symptoms of carbon monoxide poisoning, which are similar to the symptoms of seasickness and intoxication, include headache, dizziness, drowsiness, and nausea.

#### 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



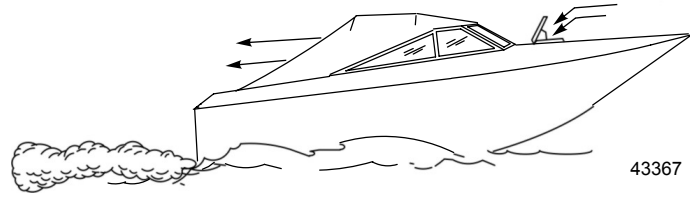
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Engine exhaust gases contain harmful carbon monoxide. Avoid areas of concentrated engine exhaust gases. When engines are running, keep swimmers away from the boat, and do not sit, lie, or stand on swim platforms or boarding ladders. While underway, 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:



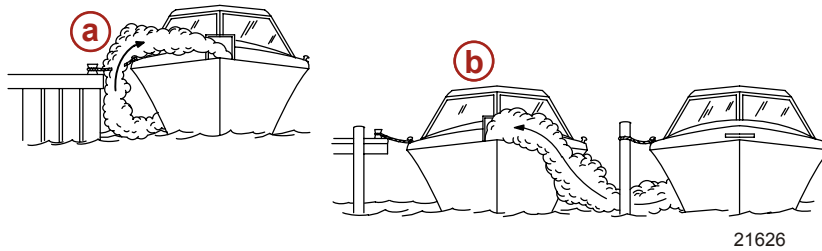
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## Poor Ventilation

Under certain running 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.

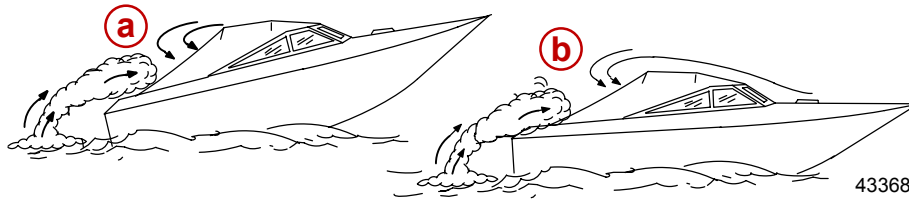
1. Examples of poor ventilation while the boat is stationary:



21626

- 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:



43368

- 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)

## Basic Boat Operation (Non-DTS Models)

### Launching and Boat Operation

**IMPORTANT:** Install the bilge drain plug prior to launching the boat.

Follow these guidelines when operating your boat to avoid possible water ingestion:

- Do not turn the key off when the engine is above idle speed.
- Do not use the lanyard stop switch to shut off the engine when operating above idle speed.
- Enter the water slowly when launching your boat from a steep ramp.
- Do not shift into reverse while on plane.
- When coming off plane, avoid impact with large following waves by applying short, light bursts of power to minimize the wave action against the stern of the boat.
- Do not come off plane quickly and immediately shut of the engine.

### Operation Chart

Operation Chart			
Before Starting	After Starting	While Underway	After Stopping
Install the bilge drain plug.	Observe all gauges to check condition of engine. If not normal, stop the engine.	Observe all gauges to check condition of engine. If not normal, stop the engine.	Turn the ignition key to the "OFF" position.

Operation Chart			
Before Starting	After Starting	While Underway	After Stopping
Open engine hatch.	Check for fuel, oil, water, fluid and exhaust leaks.	Listen for the audio alarm.	Turn battery switch to the "OFF" position.
Turn battery switch on.	Check shift and throttle control operation.		Close fuel shut off valve.
Operate bilge blowers.	Check steering operation.		Close seacock, if equipped.
Open fuel shut off valve.			Flush cooling system if in saltwater.
Open seacock, if equipped.			Drain bilge.
Close the drain system.			
Place sterndrive unit in full down (in) position.			
Check the engine oil.			
Perform all other checks specified by your dealer or boat builder.			
Listen for Audio Warning Alarm to sound when the ignition switch is in the "ON" position.			

## Starting and Stopping the Engine

**NOTE:** Only perform those functions applicable to your power package.

### Starting the Engine

1. Check all items listed in the Operation Chart.
2. Place the remote control handle in neutral.

### 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.

### ⚠ 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.

3. Turn ignition key to "START". Release key when engine starts and allow switch to return to "ON" position. Allow engine to warm up (6-10 minutes on first start of the day).
4. If engine does not start after 3 attempts:
  - a. Push the **throttle only** button and position the remote control handle/throttle lever to the 1/4 throttle position.
  - b. Turn ignition key to "START". Release key when engine starts and allow switch to return to "ON" position.
5. If engine does not start after step 4:
  - a. Move the remote control handle/throttle lever to full throttle position, then return to 1/4 throttle.
  - b. Turn ignition key to "START". Release key when engine starts and allow switch to return to "ON" position.
6. Inspect the power package for fuel, oil, water and exhaust leaks.
7. Move control handle with a firm, quick motion forward to shift to forward gear, or backward to shift to reverse. After shifting, advance throttle to desired setting.

### NOTICE

Shifting into gear at engine speeds above idle will damage the drive system. Shift the drive into gear only when the engine is operating at idle.

## Stopping the Engine

1. Move the remote control handle to neutral/idle and allow the engine to slow to idle speed. If engine has been operated at high speed for a long period of time, allow the engine to cool at idle speed for 3 to 5 minutes.
2. Turn ignition key to the "OFF" position.

## Starting the Engine After It Has Been Stopped While In Gear

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

1. Push and pull repeatedly on the remote control handle until handle returns to the neutral/idle position. This may take several tries if the power package was operating above idle RPM when the engine stopped.
2. After the handle returns to the neutral/idle position, resume normal starting procedures.

## Throttle-Only Operation

1. Refer to **Remote Controls** section for remote control features.
2. Move the control lever to the idle/neutral position.
3. Depress and hold the throttle only button, and move the control lever to the idle/forward or idle/reverse position.
4. Advancing the control lever beyond the idle/forward or idle/reverse position will cause engine speed to increase.  
**IMPORTANT: Moving the control lever back to the idle/neutral position will disengage the throttle only button and allow the engine to shift into gear.**
5. Throttle only mode is deactivated by moving the control lever to the idle/neutral position. Moving the control lever from the idle/neutral position to the idle/forward or idle/reverse position without pressing the throttle only button will shift the unit into the chosen gear.

## Trailing the Boat

Your boat can be trailered with the sterndrive unit in the up or down position. Adequate clearance is required between the road and sterndrive when transporting.

If adequate road clearance is a problem, place the sterndrive unit in full trailer position and support it with an optional trailer kit which is available from your authorized Mercury MerCruiser dealer.

## Freezing Temperature Operation

**IMPORTANT: If the boat is operated during periods of freezing temperature, precautions must be taken to prevent freeze damage to the power package. Damage caused by freezing is not covered by Mercury MerCruiser 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 come into contact with your power package. Components on your engine will be damaged if submerged. Damage caused by submersion is not covered by the Mercury MerCruiser Limited Warranty.

## Basic Boat Operation (DTS Models)

### Launching and Boat Operation

**IMPORTANT: Install the bilge drain plug prior to launching the boat.**

Follow these guidelines when operating your boat to avoid possible water ingestion:

- Do not turn the key off when the engine is above idle speed.
- Do not use the lanyard stop switch to shut off the engine when operating above idle speed.
- Enter the water slowly when launching your boat from a steep ramp.
- Do not shift into reverse while on plane.
- When coming off plane, avoid impact with large following waves by applying short, light bursts of power to minimize the wave action against the stern of the boat.
- Do not come off plane quickly and immediately shut of the engine.

## Operation Chart

Operation Chart			
Before Starting	After Starting	While Underway	After Stopping
Install the bilge drain plug.	Observe all gauges to check condition of engine. If not normal, stop the engine.	Observe all gauges to check condition of engine. If not normal, stop the engine.	Turn the ignition key to the "OFF" position.
Open engine hatch.	Check for fuel, oil, water, fluid and exhaust leaks.	Listen for the audio alarm.	Turn battery switch to the "OFF" position.
Turn battery switch on.	Check shift and throttle control operation.		Close fuel shut off valve.
Operate bilge blowers.	Check steering operation.		Close seacock, if equipped.
Open fuel shut off valve.			Flush cooling system if in saltwater.
Open seacock, if equipped.			Drain bilge.
Close the drain system.			
Place sterndrive unit in full down (in) position.			
Check the engine oil.			
Perform all other checks specified by your dealer or boat builder.			
Listen for Audio Warning Alarm to sound when the ignition switch is in the "ON" position.			

## Starting and Stopping the Engine

**NOTE:** Perform only those functions applicable to your power package.

### Starting the Engine

1. Check all items listed in the **Operation Chart**.
2. Place the remote control handle in neutral.

### 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.

### 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.

**NOTE:** MerCruiser DTS models are equipped with SmartStart. The SmartStart feature incorporates push button starting. Rather than holding the start button or key switch to start the engine and then releasing it when the engine starts, SmartStart completely controls the starting process. When the start button is pushed, the DTS system signals the engine PCM to start the engine. If the engine does not start, the starting process times out after eight seconds or when the engine reaches 400 RPM. Attempting to start the engine with the engine already running will turn the engine off.

3. Turn ignition key to "RUN" position.
4. Turn the ignition key switch to the "START" position then release, or depress the start/stop button and release. If the engine is cold, allow the engine to operate at idle for 6-10 minutes or until the engine temperature reaches 60 °C (140 °F).
5. If the engine does not start after three attempts:
  - a. Push the throttle-only button and position the remote control handle or throttle lever to the 1/4 throttle position.



## Section 3 - On the Water

- b. Turn the ignition key to "START." Release key when the engine starts and allow the switch to return to the "ON" position.
6. If the engine does not start after step 5:
  - a. Move the remote control handle.throttle lever to the full throttle position, then return to 1/4 throttle.
  - b. Turn the ignition key to "START." Release key when the engine starts and allow the switch to return to the "ON" position.
7. Inspect the power package for fuel, oil, water, and exhaust leaks.
8. Move the control handle with a firm, quick motion forward to shift to forward gear, or backward to shift to reverse. After shifting, advance throttle to desired setting.

### NOTICE

Shifting into gear at engine speeds above idle will damage the drive system. Shift the drive into gear only when the engine is operating at idle.

## Stopping the Engine

1. Move the remote control handle to neutral/idle and allow the engine to slow to idle speed. If engine has been operated at high speed for a long period of time, allow the engine to cool at idle speed for 3 to 5 minutes.
2. The engine can be stopped by any one of the following 4 methods:
  - a. Move the ignition key switch to the "ACCESSORY" or "OFF" position. The engine will stop and the control system will be deactivated.
  - b. Depress the start/stop button, if equipped. The engine will stop and the control system will remain active.
  - c. Momentarily move the ignition key switch to the "START" position, then release immediately. The control system will recognize that the engine is running and will stop the engine. The control system will remain active. Moving the ignition key switch to the "START" position again will issue a start request to the control system and the control system will start the engine, if appropriate.
  - d. Activate the lanyard stop switch, if equipped. The engine will stop, but the control system will remain active. The control system will not allow the engine to start if the lanyard stop switch is activated.

## Throttle-Only Operation

**NOTE:** When operating in throttle only (neutral) mode, the DTS Control System will not allow the engine speed to increase above 3500 RPM.

**Zero effort remote controls:** Zero effort remote controls have separate throttle control and shift control levers. Advancing the throttle control lever beyond the idle position while the shift control lever is in the neutral position will cause engine speed to increase, but only up to the maximum neutral engine speed of 3500 RPM.

### ⚠ WARNING

The Digital Throttle and Shift (DTS) Zero Effort control can shift the engine or transmission at speeds greater than idle, causing unexpected boat movement, which may result in injury, death, or property damage due to loss of boat control. Always place the throttle control lever in the idle position before moving the shift control lever into forward or reverse gear position.

**Panel Mount and Console Mount Remote Controls:** Panel mount and console mount remote controls are equipped with a throttle only button. To activate throttle only mode:

1. Refer to **Remote Controls** section for remote control features.
2. Move the control lever to the idle/neutral position.
3. Depress the throttle only button, and move the control lever to the idle/forward or idle/reverse position. The DTS control system will sound two beeps on the audio warning horn to indicate throttle only mode is active. On console mount remote controls, the neutral light will begin to blink.
4. Advancing the control lever beyond the idle/forward or idle/reverse position will cause engine speed to increase. **IMPORTANT: Moving the control lever back to the idle/neutral position will deactivate the throttle only mode and allow the engine to shift into gear.**
5. Throttle only mode is deactivated by moving the control lever to the idle/neutral position. Moving the control lever from the idle/neutral position to the idle/forward or idle/reverse position without pressing the throttle only button will shift the unit into the chosen gear.



## Trailing the Boat

Your boat can be trailered with the sterndrive unit in the up or down position. Adequate clearance is required between the road and sterndrive when transporting.

If adequate road clearance is a problem, place the sterndrive unit in full trailer position and support it with an optional trailer kit which is available from your authorized Mercury MerCruiser dealer.

## Freezing Temperature Operation

**IMPORTANT:** If the boat is operated during periods of freezing temperature, precautions must be taken to prevent freeze damage to the power package. Damage caused by freezing is not covered by Mercury MerCruiser 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 come into contact with your power package. Components on your engine will be damaged if submerged. Damage caused by submersion is not covered by the Mercury MerCruiser Limited Warranty.

## 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.

## High-Speed and High-Performance Operation

If your boat is considered a high-speed or high-performance boat with which you are unfamiliar, we recommend that you never operate it at its high speed capability without first requesting an initial orientation and demonstration ride with your dealer or an operator experienced with your boat. For additional information, refer to **Hi-Performance Boat Operation** booklet (90-849250-R2) from your dealer, distributor or Mercury Marine.

## Passenger Safety in Pontoon Boats and Deck Boats

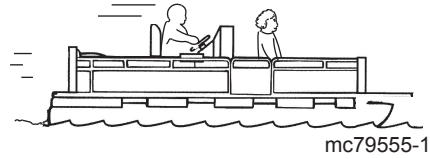
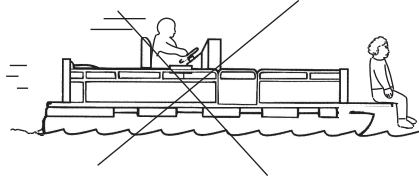
Whenever the boat is in motion, observe the location of all passengers. Do not allow any passengers to stand or use seats other than those designated for traveling faster than idle speed. A sudden reduction in boat speed, such as plunging into a large wave or wake, a sudden throttle reduction, or a sharp change of boat direction, could throw them over the front of boat. Falling over the front of the boat between the two pontoons will position them to be run over.

### Boats Having an Open Front Deck

No one should ever be on the deck in front of the fence while the boat is in motion. Keep all passengers behind the front fence or enclosure.

## Section 3 - On the Water

Persons on the front deck could easily be thrown overboard or persons dangling their feet over the front edge could get their legs caught by a wave and pulled into the water.



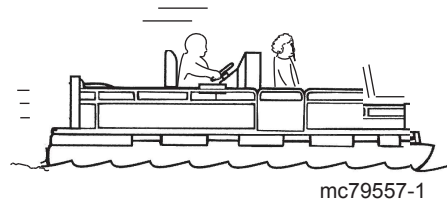
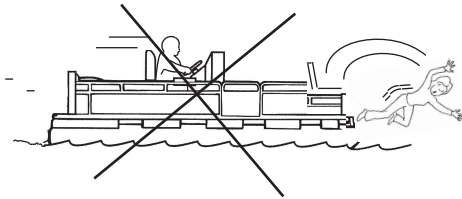
### **⚠ WARNING**

**Sitting or standing in an area of the boat not designed for passengers at speeds above idle can cause serious injury or death. Stay back from the front end of deck boats or raised platforms and remain seated while the boat is in motion.**

## Boats With Front-Mounted, Raised Pedestal Fishing Seats

Elevated fishing seats are not intended for use when the boat is traveling faster than idle or trolling speed. Sit only in seats designated for traveling at faster speeds.

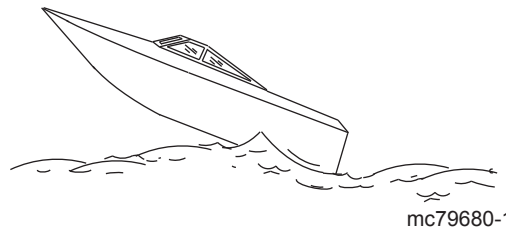
Any unexpected, sudden reduction in boat speed could result in the elevated passenger falling over the front of the boat.



## Wave and Wake Jumping

### **⚠ 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.**



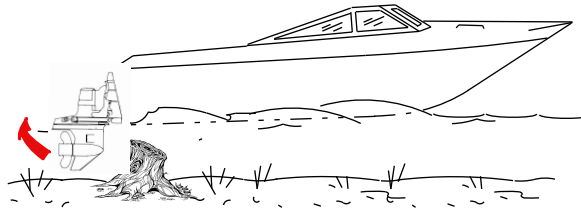
Operating recreational boats over waves and wakes is a natural part of boating. However, when this activity is done with enough speed to force the boat hull partially or completely out of the water, certain hazards arise, particularly when the boat re-enters the water.

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

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

## Impact with Underwater Hazards

Reduce speed and proceed with caution whenever you're driving a boat in shallow water or in areas where the waters are suspected of having underwater obstacles that could be struck by the underwater drive components, rudder or the boat bottom.



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**IMPORTANT: The most important thing you can do to help reduce injury or impact damage from striking a floating or underwater object is control the boat speed. Under these conditions, boat speed should be kept to a maximum speed of 24 to 40 km/h (15 to 25 mph).**

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

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

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

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

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

Operating with damaged underwater drive components, rudder or boat bottom could cause additional damage to other parts of the power package, or could affect control of the boat. If continued operation is necessary, do so at greatly reduced speeds.

### **⚠ 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.**

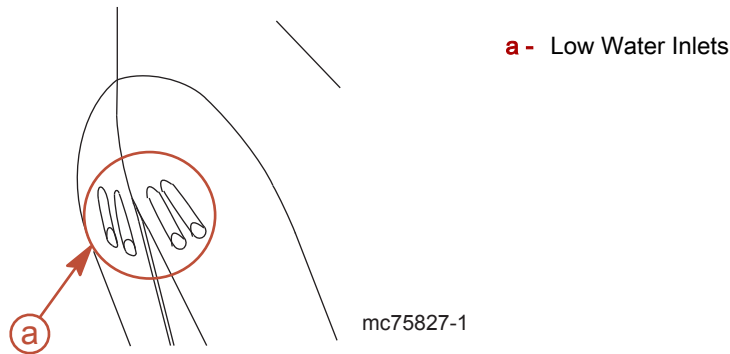
## Drive Unit Impact Protection

The power trim hydraulic system is designed to provide impact protection for the sterndrive unit. If a submerged object is struck while the boat is moving forward, the hydraulic system will cushion the kickup of the sterndrive unit as it clears the object, reducing damage to the unit. After the sterndrive unit has cleared the object, the hydraulic system allows the sterndrive unit to return to its original operating position, preventing loss of steering control and engine overspeed.

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

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

## Operating with Low Water Inlets 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 low water inlets while maneuvering in shallow water. Also, avoid beaching a boat with the engine operating.

## Conditions Affecting Operation

### Weight Distribution (Passengers and Gear) Inside the Boat

#### Shifting weight to rear (stern):

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

#### Shifting weight to front (bow):

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

### The Bottom of the Boat

To maintain maximum speed, the boat bottom should be:

- Clean, free of barnacles and marine growth
- Free of distortion; nearly flat where it contacts the 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 the water inlets and cause the engine to overheat.

### Cavitation

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

- Weeds or other debris snagged on the propeller
- Bent propeller blade
- Raised burrs or sharp edges on the propeller

### Ventilation

Ventilation is caused by surface air or exhaust gases that are introduced around the propeller resulting in propeller speed-up and a reduction in boat speed. Air bubbles strike the propeller blade and cause erosion of the blade surface. If allowed to continue, eventual blade failure (breakage) will occur. Excessive ventilation is usually caused by:

- Drive unit trimmed out too far

- A missing propeller diffuser ring
- A damaged propeller or gear housing, which allows exhaust gases to escape between propeller and gear housing
- Drive unit installed too high on transom

## Elevation and Climate

Elevation and climate changes will affect the performance of your power package. Loss of performance can be caused by:

- Higher elevations
- Higher temperatures
- Low barometric pressures
- High humidity

For you to have optimum engine performance under changing weather conditions, it is essential that the engine be propped to allow the engine to operate at or near the top end of the specified maximum RPM range with a normal boat load during your normal boating weather conditions.

In most cases, recommended RPM can be achieved by changing to a lower pitch propeller.

## Propeller Selection

**IMPORTANT: The engines covered in this manual are equipped with an RPM rev-limiter that is set to an upper RPM limit. This limit, which is slightly above the normal operating range of the engine, helps prevent damage from excessive engine RPM. Once the RPM returns to the recommended operating RPM range, normal engine operation resumes.**

The boat manufacturer and the selling dealer are responsible for equipping the power package with the correct propeller. Refer to Mercury Marine's web page [http://www.mercurymarine.com/everything\\_you\\_need\\_to\\_know\\_about\\_propellers6](http://www.mercurymarine.com/everything_you_need_to_know_about_propellers6).

Select a propeller that will allow the engine power package to operate at or near the top end of the recommended WOT operating RPM range with a normal load.

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

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

- Warmer weather and greater humidity cause a loss of RPM.
- Operating in a higher elevation causes a loss of RPM.
- Operating with a dirty boat bottom causes a loss of RPM.
- Operating with increased load (additional passengers, pulling skiers) causes a loss of RPM.

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

## Getting Started

### 20-Hour Break-In Period

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

- Do not operate below 1500 RPM for extended periods of time for the first 10 hours. Shift into gear as soon as possible after starting and advance the throttle above 1500 rpm **if conditions permit safe operation.**
- Do not operate at one speed consistently for extended periods.
- Do not exceed 3/4 throttle during the first 10 hours. During the next 10 hours, occasional operation at full throttle is permissible (5 minutes at a time maximum).
- Avoid full throttle acceleration from idle speed.
- Do not operate at full throttle until the engine reaches normal operating temperature.
- Frequently check engine oil level. Add oil as needed. It is normal for oil consumption to be high during the break-in period.

### After Break-In Period

To help extend the life of your Mercury MerCruiser power package, follow these recommendations:

- Ensure that propeller allows the engine to operate at or near the top of the specified WOT RPM range. Refer to **Specifications** and **Maintenance**.
- Operate the engine at 3/4 throttle or lower. Refrain from prolonged operation at wide-open-throttle RPM.
- Change the engine oil and oil filter. Refer to **Maintenance**.
- Change the transmission oil and filter. Refer to **Maintenance** (ZF Transmission models).<sup>1</sup>

## End of First Season Checkup

At the end of the first season of operation, contact an authorized Mercury MerCruiser dealer to discuss or perform scheduled maintenance items. If you are in an area where the product is operated continuously, year-round, you should contact your dealer at the end of the first 100 hours of operation or once yearly, whichever occurs first.

1. Require fluid and filter change after the first 25 hours and then every 100 hours.

# Section 4 - Specifications

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## Fuel Requirements

**IMPORTANT:** Use of improper gasoline can damage your engine. Engine damage resulting from the use of improper gasoline is considered misuse of the engine and will not be covered under the limited warranty.

## Fuel Ratings

Mercury MerCruiser engines will operate satisfactorily with any major brand of unleaded gasoline that meets the following specifications:

**USA and Canada** - A posted pump Octane Rating of 87 (R+M)/2, minimum. Premium gasoline 92 (R+M)/2 Octane is also acceptable. Do not use leaded gasoline.

**Outside USA and Canada** - A posted pump Octane Rating of 91 RON, minimum. Premium gasoline (98 RON) is also acceptable. If unleaded gasoline is not available, use a major brand of leaded gasoline.

## Using Reformulated (Oxygenated) Gasoline (USA Only)

Reformulated gasoline is required in certain areas of the USA and are acceptable for use in your Mercury MerCruiser engine. The two types of oxygenates used in these fuels are alcohol (ethanol) and ether (MTBE or ETBE). If ethanol is the oxygenate that is used in the gasoline in your area, refer to **Gasoline Containing Alcohol**.

## Gasoline Containing Alcohol

If the gasoline in your area contains either methanol (methyl alcohol) or ethanol (ethyl alcohol), be aware of possible adverse effects. These adverse effects are more severe with methanol and worsen according to the percentage of alcohol in the fuel. Alcohol in gasoline can absorb moisture from the air, causing the water and the alcohol to separate from the gasoline in the fuel tank.

**IMPORTANT:** The fuel system components on your Mercury MerCruiser engine will withstand up to 10% alcohol content in the gasoline. We do not know what percentage your boat's fuel system will withstand. Contact your boat manufacturer for specific recommendations on your boat's fuel system components (fuel tanks, fuel lines, and fittings).

Be aware that gasoline containing alcohol may cause increased:

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

### 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.

**IMPORTANT:** If you use gasoline that contains or might contain alcohol, you must increase the frequency of inspection for leaks and abnormalities.

**IMPORTANT:** When operating a Mercury MerCruiser engine on gasoline containing alcohol, do not store the gasoline in the fuel tank for long periods. Cars normally consume alcohol-blend fuels before they can absorb enough moisture to cause trouble, boats often sit idle long enough for phase separation to take place. Internal corrosion may take place during storage if alcohol has washed protective oil films from internal components.

## Engine Specifications

### 8.2 MAG, 8.2 MAG H.O. and SeaCore 8.2 MAG, 8.2 MAG H.O.

**NOTE:** Performance specifications are obtained and corrected in accordance with SAE J1228/ISO 8665 Crankshaft Power. All measurements are taken with the engine at normal operating temperature.

RPM range is measured using an accurate service tachometer with the engine at normal operating temperatures.

Oil pressure must be checked with the engine at normal operating temperature.

**NOTE:** Oil pressure specifications are for reference and may vary.



		8.2 MAG	8.2 MAG H.O.
<b>Propshaft power</b>		283 kW (380 hp)	320 kW (430 hp)
<b>Displacement</b>		8.2 L (502 cid)	
<b>Alternator amperage</b>	Hot	72 A	
	Cold	65 A	
<b>RPM</b>	WOT	4400–4800	4600–5000
	Rev limiter	4950	5150
<b>Idle RPM</b>	Mechanical	650	
	DTS		
<b>Minimum oil pressure</b>	At 2000 RPM	207 kPa (30 psi)	
	At idle	103 kPa (15 psi)	
<b>Thermostat</b>		76° C (170° F)	
<b>Timing at idle</b>		Not Adjustable	
<b>Firing order</b>		1-8-4-3-6-5-7-2	
<b>Minimum battery rating</b>	Non-DTS models	750 CCA, 950 MCA, 180 Ah	
	DTS models	800 CCA, 1000 MCA, 190 Ah	
<b>Spark plug type</b>		NGK BPR6ES	
<b>Spark plug gap</b>		0.83 mm (0.033 in.)	

## Engine Oil

For optimum engine performance and maximum protection, use the following oil:

Application	Recommended Oil
All MerCruiser engines	Mercury MerCruiser Full-Synthetic Engine Oil, 20W-40, NMMA FC-W rated

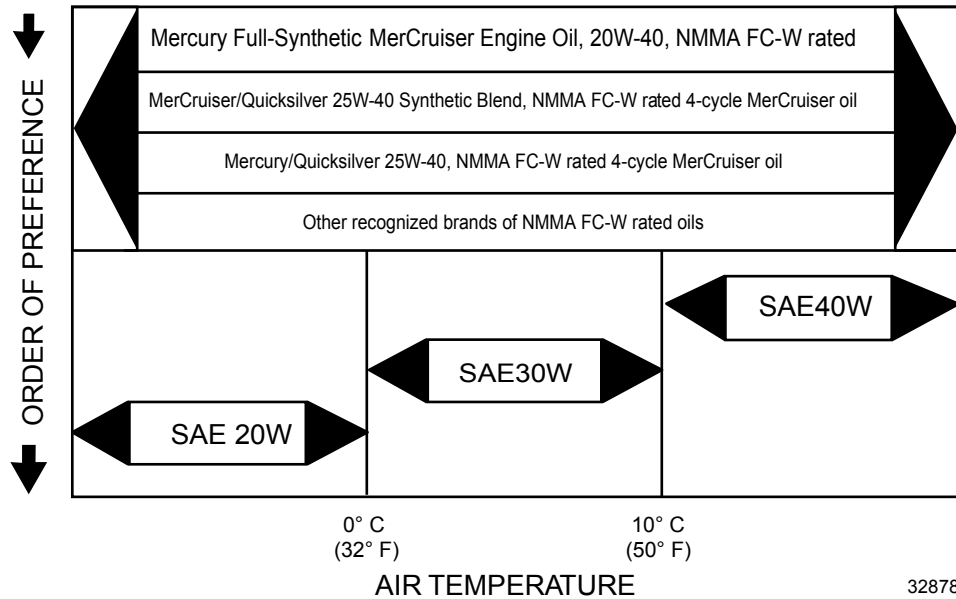
**IMPORTANT:** Lubrication requirements for catalyzed engines differ from the requirements for noncatalyzed engines. Some marine-grade lubricants contain high levels of phosphorus, which can damage the catalyst system on MerCruiser engines. Although these high-phosphorus lubricants may allow acceptable engine performance, exposure over time will damage the catalyst. Catalysts damaged by lubricants containing high levels of phosphorus may not be covered by the MerCruiser Limited Warranty.

If Mercury MerCruiser Full-Synthetic Engine Oil, 20W-40 oil is unavailable, use the following lubricants, listed in order of recommendation. If you are servicing a catalyst engine, use these for short periods of time only.

1. Mercury/Quicksilver 25W-40 Synthetic Blend, NMMA FC-W-rated 4-cycle MerCruiser oil
2. Mercury/Quicksilver 25W-40, NMMA FC-W-rated 4-cycle MerCruiser oil
3. Other recognized brands of NMMA FC-W-rated 4-cycle oils
4. A good-grade, straight-weight detergent automotive oil according to the last row of the operating chart below

## Section 4 - Specifications

**NOTE:** We do not recommend nondetergent oils, multi-viscosity oils (other than as specified), non FC-W-rated synthetic oils, low-quality oils, or oils that contain solid additives.



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## Fluid Specifications

### Engine

**IMPORTANT:** All capacities are approximate fluid measures.

All Models	Capacity	Fluid Type
Engine oil (with filter)	6.5 L (7 US qt)	Mercury Full-Synthetic MerCruiser Engine Oil 20W-40
Seawater cooling system (winterization use only)	20 L (21 US qt)	Propylene glycol and purified water
Closed cooling system	14.3 L (15 US qt)	Mercury Extended Life Coolant Antifreeze or extended life ethylene glycol 5/100 antifreeze mixed 50/50 with purified water

### 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.

### Bravo Sterndrives

**NOTE:** Oil capacity includes gear lube monitor.

Model	Capacity	Fluid Type
Bravo One	2736 mL (92-1/2 oz)	High Performance Gear Lubricant
Bravo Two	3209 mL (108-1/2 oz)	
Bravo Three (single seawater pickup)	2972 mL (100-1/2 oz)	
Bravo Three (dual seawater pickup)	2736 mL (92-1/2 oz)	

## Power-Assisted Steering and Power Trim Fluids

### Approved Power-Assisted Steering Fluids

Description	Part Number
Power Trim and Steering Fluid	92-858074K01

**Approved Power Trim Fluids**

Description	Part Number
Power Trim and Steering Fluid	92-858074K01
SAE Engine Oil 10W-30	Obtain locally
SAE Engine Oil 10W-40	

## Notes:

# Section 5 - Maintenance

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## Additional Operation Instructions for Axis Systems

If your boat has DTS engines equipped with an Axis system, refer also to the **Axis Operation Manual** included with the boat.

## Owner/Operator Responsibilities

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

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

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

## Dealer Responsibilities

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

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

## Maintenance

### WARNING

Performing service or maintenance without first disconnecting the battery can cause product damage, personal injury, or death due to fire, explosion, electrical shock, or unexpected engine starting. Always disconnect the battery cables from the battery before maintaining, servicing, installing, or removing engine or drive components.

### WARNING

Fuel vapors trapped in the engine compartment may be an irritant, cause difficulty breathing, or may ignite resulting in a fire or explosion. Always ventilate the engine compartment before servicing the power package.

**IMPORTANT:** Refer to the maintenance schedule for the complete listing of all scheduled maintenance to be performed. A repair shop or person of the owner's choosing may maintain, replace, or repair emission control devices and systems. Certain other items should be performed only by an authorized Mercury MerCruiser dealer. Before attempting maintenance or repair procedures not covered in this manual, we recommend that you purchase a Mercury MerCruiser service manual and read it thoroughly.

*NOTE: Maintenance points are color-coded for ease of identification.*

Maintenance Point Color Codes	
Yellow	Engine oil
Black	Drive lube
Brown	Power steering fluid
Blue	Drain or flush

## Do-It-Yourself Maintenance Suggestions

Present day marine equipment, such as your Mercury MerCruiser power package, are highly technical pieces of machinery. Electronic ignition, special fuel delivery and exhaust systems provide greater performance, fuel economy, and lower exhaust emissions. but also are more complex for the untrained mechanic.

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

- Do not attempt any repairs unless you are aware of the Cautions, Warnings 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. The service manual outlines the correct procedures to follow. It is written for the trained mechanic, so there may be procedures you don't understand. Do not attempt repairs if you do not understand the procedures.
- There are special tools and equipment that are required to perform some repairs. Do not attempt these repairs unless you have these special tools and/or equipment. You can cause damage to the product in excess of the cost a dealer would charge you.
- Also, if you partially disassemble an engine or drive assembly and are unable to repair it, the dealer's mechanic must reassemble the components and test to determine the problem. This will cost you more than taking it to the dealer immediately upon having a problem. It may be a very simple adjustment to correct the problem.
- Do not telephone the dealer, service office or the factory to attempt for them to diagnose a problem or to request the repair procedure. It is difficult for them to diagnose a problem over the telephone.

Your authorized dealer is there to service your power package. They have qualified factory trained mechanics.

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

## Inspection

Inspect your 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.

- Check for loose, damaged or missing parts, hoses and clamps; tighten or replace as necessary.
- Check plug leads and electrical leads for damage.
- Remove and inspect the propeller. If badly nicked, bent or cracked, contact your authorized Mercury MerCruiser dealer.
- Repair nicks and corrosion damage on power package exterior finish. Contact your authorized Mercury MerCruiser dealer.

## Maintenance Schedule—Sterndrive Models

### Routine Maintenance

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

Task Interval	Maintenance to Be Performed
Each day start	<ul style="list-style-type: none"> <li>• Check the engine oil level. (You can extend this interval based on experience with the product.)</li> <li>• Check the sterndrive gear lube level.</li> <li>• Check the trim pump oil level.</li> <li>• Check the power-assisted steering pump or the compact hydraulic steering fluid level, depending on the steering system of your model.</li> </ul>
Each day end	<ul style="list-style-type: none"> <li>• If operating in saltwater, brackish water, or polluted water, flush the seawater section of the cooling system after each use.</li> </ul>
Weekly	<ul style="list-style-type: none"> <li>• Check the water inlets for debris or marine growth.</li> <li>• Check and clean the seawater strainer, if equipped.</li> <li>• Check the coolant level.</li> <li>• Inspect the sterndrive anodes and replace if 50% eroded.</li> </ul>
Every two months or 50 hours	<ul style="list-style-type: none"> <li>• Lubricate the propeller shaft and retighten the nut. (If operating only in freshwater, you can extend the interval to every four months.)</li> <li>• If operating in saltwater, brackish water, or polluted water, apply Corrosion Guard to the power package.</li> <li>• Check the battery connections and the fluid level.</li> <li>• Ensure that the gauges and the wiring connections are secure. Clean the gauges. (If operating in saltwater, reduce this interval to every 25 hours or 30 days, whichever occurs first.)</li> </ul>

## Scheduled Maintenance

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

Task Interval	Maintenance to Be Performed
After the initial 20-hour break-in period	Change the engine oil and filter.
Every 100 hours or annually (whichever occurs first)	<ul style="list-style-type: none"> <li>• Touch-up the paint on the power package.</li> <li>• Change the engine oil and filter.</li> <li>• Change the sterndrive gear lube.</li> <li>• Check the coolant level and antifreeze concentration for adequate freeze protection. Correct if necessary. Refer to the <b>Specifications</b> section.</li> <li>• Tighten the connection of the gimbal ring to the steering shaft to specifications.</li> <li>• Replace the water-separating fuel filter.</li> <li>• Check the steering system and the remote control for loose, missing, or damaged parts. Lubricate the cables and the linkages.</li> <li>• Check the continuity circuit for loose or damaged connections. Test the MerCathode unit output if equipped.</li> <li>• Recommended Maintenance and replacement of the (PVC) valve.</li> <li>• Clean the flame arrester, IAC muffler, and the crankcase ventilation hoses.</li> <li>• Inspect the condition and the tension of the belts.</li> <li>• Driveshaft extension models: Lubricate the driveshaft U-joints, and tailstock input and output bearings.</li> </ul>
Every 300 hours or 3 years	<ul style="list-style-type: none"> <li>• Check the engine mount nuts for tightness and torque if necessary.</li> <li>• Replace spark plugs.</li> <li>• Inspect the spark plug wires and replace as necessary.</li> <li>• Check the electrical system for loose, damaged, or corroded fasteners.</li> <li>• Check the cooling system and the exhaust system hose clamps for tightness. Inspect both systems for damage or leaks.</li> <li>• Disassemble and inspect the seawater pump and replace worn components.</li> <li>• Clean the seawater section of the closed cooling system. Clean, inspect, and test the pressure cap.</li> <li>• Inspect the exhaust system components. If the package was equipped with water shutters (flapper valves), verify that they are not missing or worn.</li> <li>• Check the engine alignment.</li> <li>• Inspect the U-joints, the splines, the bellows, and check the clamps.</li> <li>• Lubricate the U-joint splines and cross bearings, if equipped with grease fittings.</li> <li>• Inspect the gimbal bearing for roughness. Replace if necessary. See your certified Mercury MerCruiser dealer.</li> <li>• Lubricate the engine coupler.</li> </ul>
Every 5 years	<ul style="list-style-type: none"> <li>• Replace the coolant/antifreeze. Replace every two years if not using extended-life coolant/antifreeze.</li> </ul>

## Maintenance Log

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

Date	Maintenance Performed	Engine Hours





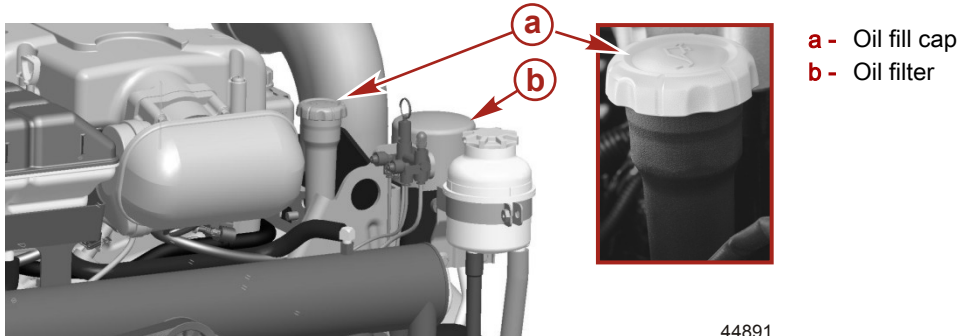
- Remove the dipstick and observe the oil level. Oil level must be in the operating range. Reinstall the dipstick into the dipstick tube.

### Filling

**IMPORTANT: Do not overfill the engine with oil.**

**IMPORTANT: Always use the dipstick to determine the exact quantity of oil required.**

- Remove oil fill cap.



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**IMPORTANT: Add the specified engine oil to bring the level up to, but not over, the operating range mark on the dipstick.**

- Add the specified engine oil to bring the level up to, but not over, the operating range mark on the dipstick. Recheck the oil level.
- Replace the fill cap.

All Models	Capacity	Fluid Type
Engine oil (with filter)	6.5 liters (7 U.S. Quart)	Mercury Full-Synthetic MerCruiser Engine Oil 20W-40

### Engine Oil and Filter

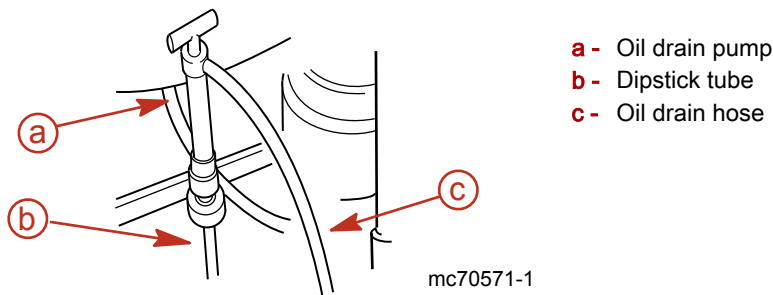
Replace the oil filter at every oil change.

See **Maintenance Schedule** for the change interval. Engine oil should be changed before placing the boat in storage.

**IMPORTANT: Change engine oil when the engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use only recommended engine oil (refer to the Specifications section).**

### Oil Removal with Drain Pump

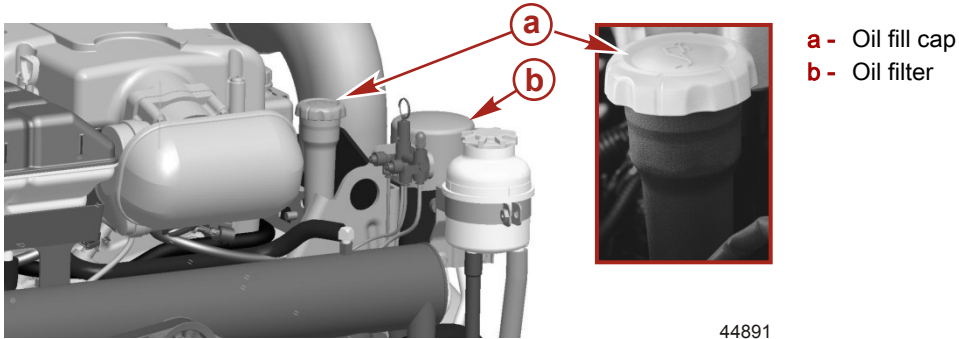
- Loosen the oil filter to vent the system.
- Remove the dipstick.
- Install the oil drain pump onto the dipstick tube.



- Insert the hose end of the crankcase oil pump onto an appropriate container and use the handle to pump until the crankcase is empty.
- Remove the pump.
- Install the dipstick.

## Changing the Oil Filter

1. Remove and discard oil filter.



2. Coat the sealing ring on the new filter with engine oil.
3. Install and tighten the oil filter securely following the filter manufacturer's instructions. Do not overtighten.
4. Remove oil fill cap.
5. Use the dipstick to determine the amount of engine oil required. Replace the dipstick.
6. Add the required amount of the recommended oil to bring the level up to the bottom of the OK range on the dipstick.
7. With the boat at rest in the water, repeat steps 5 and 6 if necessary.

**NOTE:** Adding 0.95 L (1 US qt) of engine oil raises the level from the bottom of the operating range to the top of the operating range.

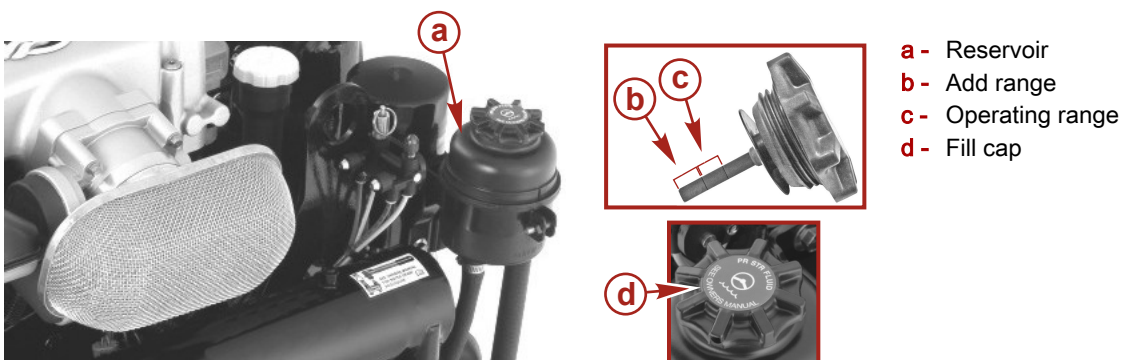
All Models	Capacity	Fluid Type
Engine oil (with filter)	6.5 L (7 US qt)	Mercury Full-Synthetic MerCruiser Engine Oil 20W-40

8. Start the engine and operate for three minutes, checking for leaks.
9. Stop the engine and allow the oil to drain into the oil pan for approximately five minutes with the boat at rest in the water.

## Power-Assisted Steering Fluid

### Checking

1. Stop the engine and center the sterndrive unit.  
**IMPORTANT:** If fluid is not visible on the fill cap dipstick contact your authorized Mercury MerCruiser dealer.
2. Remove the fill cap from the power steering fluid reservoir and observe the level. The oil level should be at the lower mark when the engine is cold and at the upper mark when the engine is warm.





3. Add the specified fluid if necessary. Refer to **Filling**.

### Filling

1. Remove the fill cap and dipstick and observe the fluid level.
2. Add the specified fluid to bring the fluid level up to the proper level.

## Section 5 - Maintenance

Tube Ref No.	Description	Where Used	Part No.
 114	Power Trim and Steering Fluid	Power-assisted steering pump	92-858074K01
 28	Dexron III Automatic Transmission Fluid	Power-assisted steering system	Obtain Locally

3. Install the fill cap and dipstick.

## Changing

Power-assisted steering fluid does not require changing unless it becomes contaminated with water or debris. Contact your authorized Mercury MerCruiser dealer.


## 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.

**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

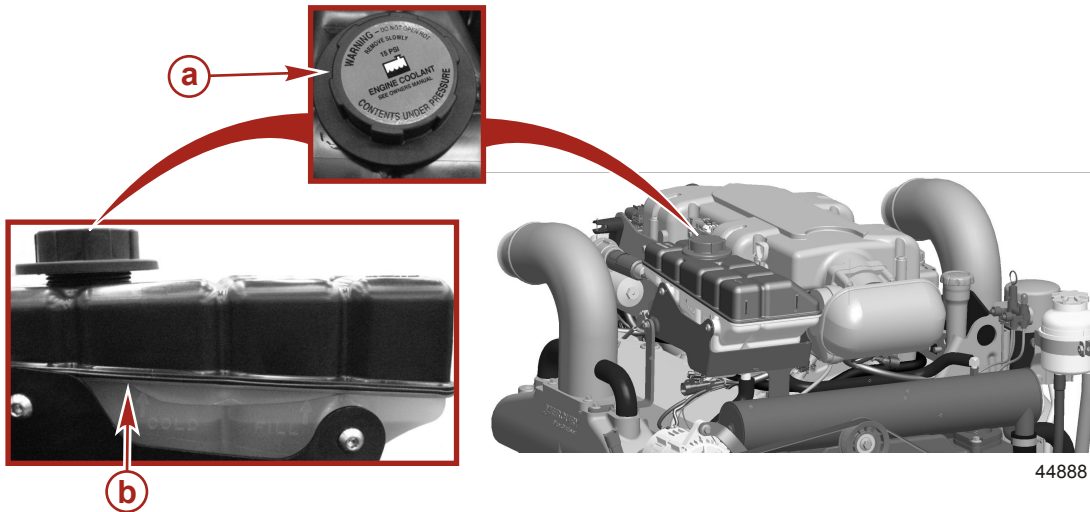
## Checking Coolant Level

#### 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 pressure cap, ensure that it is tightened securely.

1. The coolant level should be at the "FULL" mark on the coolant reservoir with the engine cold.



**Coolant reservoir**

- a - Coolant reservoir cap
- b - Full mark (engine cold)

### 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 Coolant and distilled water.

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

**NOTE:** The coolant section capacity is approximately 14.3 Liter (15 US qt).

	<b>8.2 (502 cid)</b>
Closed cooling system	14.3 Liter (15 US qt)

**⚠ 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. 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.

## Section 5 - Maintenance

4. Supply cooling water to the engine.
5. 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.**

6. After the engine has cooled completely, recheck the coolant level and add coolant, if necessary.
7. 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.
8. 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.

## Sterndrive Gear Lube

### Checking

### NOTICE

**Discharge of oil, coolant, or other engine/drive fluids into the environment is restricted by law. Use caution not to spill oil, coolant, or other fluids into the environment when using or servicing your boat. Be aware of the local restrictions governing the disposal or recycling of waste, and contain and dispose of fluids as required.**

**NOTE:** *The oil level fluctuates during operation, so check with the engine cold before starting.*

1. Check the gear lube oil level. Keep the oil level within the recommended operating range.
2. Inspect the lubricant condition. If any water is visible at the bottom of the gear lube monitor, if water appears at the fill and drain plug hole, or if the gear lube appears discolored, contact your authorized Mercury MerCruiser dealer immediately. These conditions can indicate a water leak in the sterndrive.



43200

**Gear lube monitor**


## Filling

New installations may require as much as 470 mL (16 fl oz) of gear lube added to the monitor bottle during the break-in period (20 hours of running time). It is important to monitor and maintain the gear lube level during the break-in period.

**IMPORTANT:** The gear lube monitor must be checked and filled if necessary at the beginning of each day when the engine is cold. If the gear lube alarm sounds during the day's activity, add the appropriate amount of gear lube to the monitor bottle.

**NOTE:** *If filling the entire sterndrive, see **Changing**.*

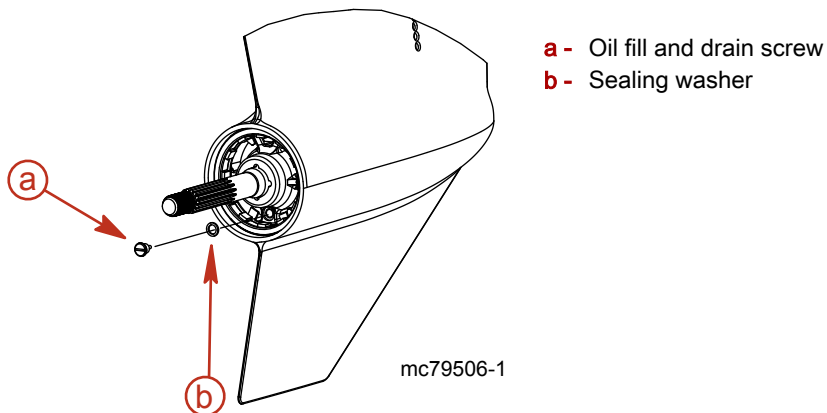
1. Remove the gear lube monitor cap.
2. Fill the monitor with the specified fluid until the gear lube level is in the operating range. Do not overfill.

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

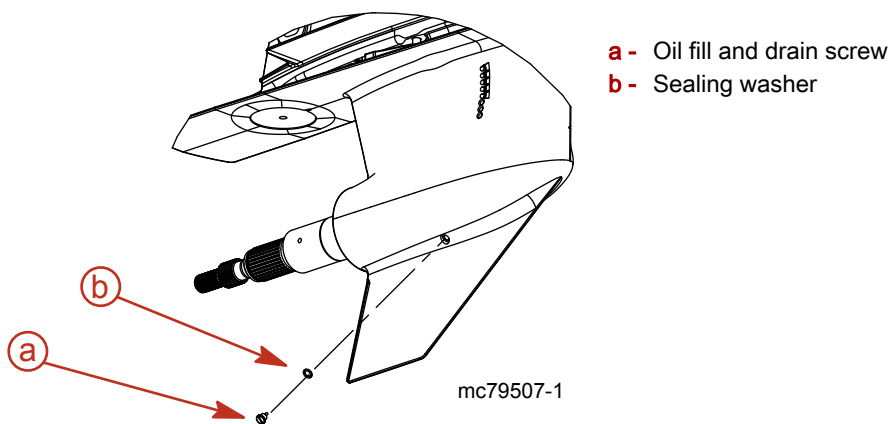
- Replace the cap.

## Changing

- Remove the gear lube monitor from the bracket.
- Empty the contents into a suitable container.
- Install the gear lube monitor in the bracket.
- Bravo One Models:
  - Remove the propeller.
  - Position the sterndrive unit to the full down position.
  - Remove the oil fill and drain screw and sealing washer.
  - Drain the fluid into a suitable container.



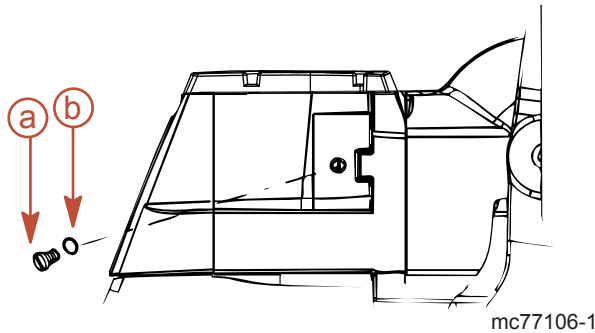
- All Other Models:
  - Place the sterndrive unit in full trim out position.
  - Remove the oil fill and drain screw and sealing washer.
  - Drain the fluid into a suitable container.





## Section 5 - Maintenance


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



- a - Oil vent screw
- b - Sealing washer

**IMPORTANT:** If any water drains from the unit, or if the fluid appears milky, the sterndrive unit is leaking. See your authorized Mercury MerCruiser dealer.

- Lower the sterndrive unit so the propeller shaft is level.  
**IMPORTANT:** Use only Mercury/Quicksilver High Performance Gear Lubricant in sterndrive unit.
- Fill the sterndrive unit through the oil fill and drain hole with specified gear lubricant until an air-free stream of lubricant flows from oil vent hole.

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

- Install the oil vent screw and sealing washer.
- Continue to pump gear lubricant into the drive through the oil fill and drain hole until gear lubricant appears in the gear lube monitor.
- Fill the monitor so that the oil level is in the operating range. Do not overfill.
- Ensure that the rubber gasket is inside the cap and install. Do not overtighten.

**NOTE:** Oil capacities include the gear lube monitor.

Model	Capacity	Fluid Type
Bravo One	2736 ml (92-1/2 oz.)	High Performance Gear Lubricant
Bravo Two	3209 ml (108-1/2 oz.)	
Bravo Three (Single seawater pickup)	2972 ml (100-1/2 oz.)	
Bravo Three (Dual seawater pickup)	2736 ml (92-1/2 oz.)	

- Remove the pump from the oil fill and drain hole. Quickly install the sealing washer and screw. Tighten securely.
- Reinstall the propeller. Refer to **Propellers**.
- Check the oil level after the first use.  
**IMPORTANT:** Oil level in the gear lube monitor rises and falls during operation. Always check the oil level when the sterndrive is cool and the engine is off.

## Power Trim Fluid

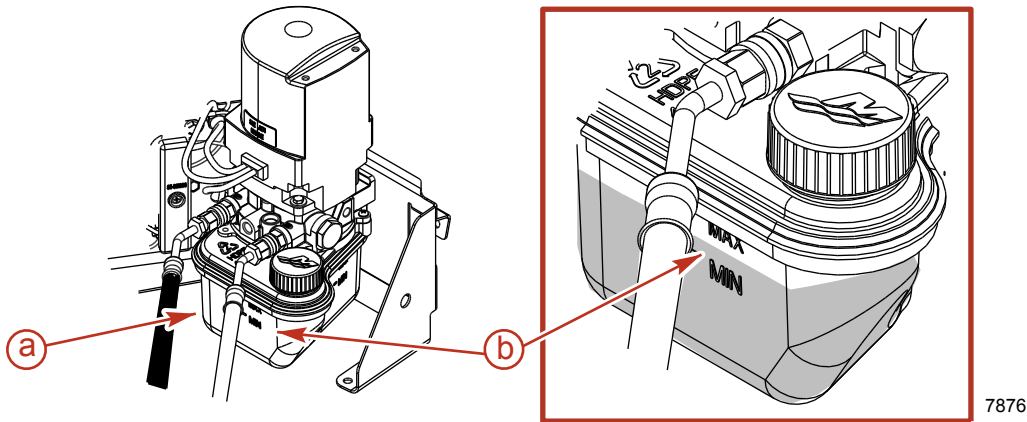
### Checking

**IMPORTANT:** Check the oil level with the sterndrive unit in the full down/in position only.

- Place the sterndrive unit in full down/in position.




- Observe the oil level. Level must be between the "MIN" and "MAX" lines on the reservoir.




- a - Reservoir
- b - "MIN" and "MAX" lines

- Fill as necessary with the specified fluid.

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

## Filling

- Remove the fill cap from the reservoir.  
*NOTE: Fill cap is vented.*
- Add lubricant to bring level to the within the "MIN" and "MAX" lines on the reservoir.

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

- Install the cap.

## Changing

Power trim fluid does not require changing unless it becomes contaminated with water or debris. Contact your authorized Mercury MerCruiser dealer.

## Battery

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

### ⚠ 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.

### ⚠ 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.

## Multiple EFI Engine Battery Precautions

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

## Section 5 - Maintenance

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

In either case, the ECM could shut off. When the voltage returns to the range that the ECM requires, the ECM will reset itself, and the engine will operate normally. The ECM shuts off and resets itself so quickly that the engine may only seem to have an ignition miss.

**Batteries:** Boats with multiengine EFI power packages require each engine be connected to its own battery. This ensures that the engine's ECM has a stable voltage source.

**Battery switches:** Battery switches should always be positioned so each engine is operating off of its own battery. Do not operate engines with switches in both or all position. In an emergency, another engine's battery can be used to start an engine with a dead battery.

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

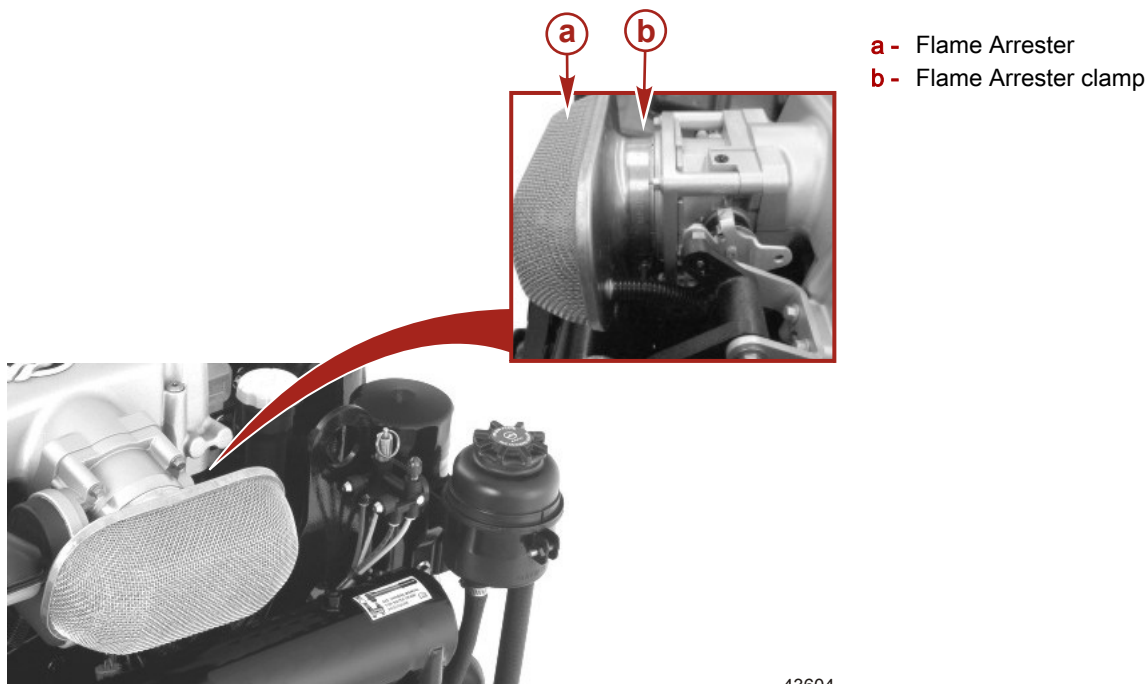
**Generators:** The generator's battery should be considered another engine's battery.

## Cleaning the Flame Arrester

### ⚠ 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 Arrester clamp and remove the flame Arrester.



2. Clean the flame Arrester with solvent and dry with compressed air or set aside and allow to air dry completely.
3. Install the flame Arrester and tighten the clamp to specification.

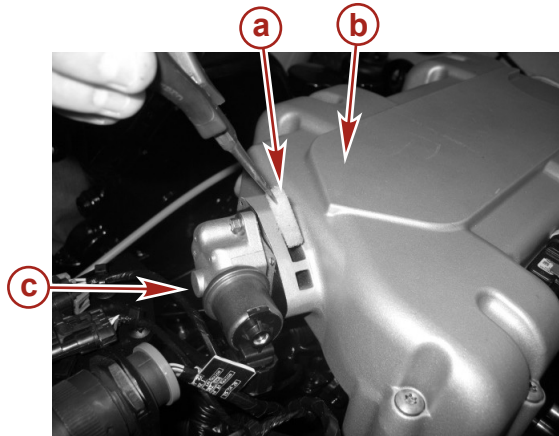
Description	Nm	lb-in.	lb-ft
Flame arrester clamp	4.5	40	-

## Cleaning the IAC Muffler (Non-DTS Models Only)

### ⚠ 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. Locate the idle air control valve (IAC) on the rear of the engine.
2. Remove the IAC muffler from the slot in the plenum.



44887

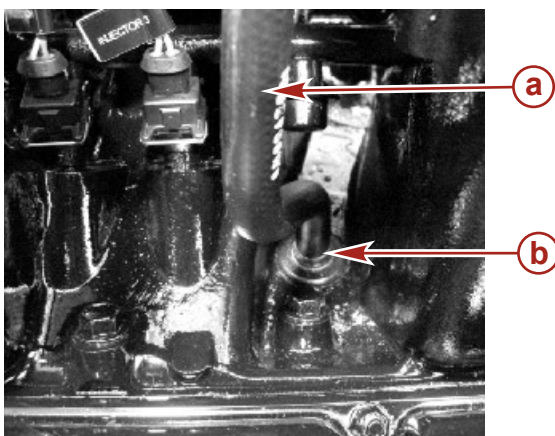
- a - IAC muffler
- b - Plenum
- c - IAC

3. Inspect the muffler for holes, cracks, or deterioration. Replace if damaged.  
**IMPORTANT: Do not use a cleaner that contains methyl ethyl ketone and do not use cleaner on electrical connections.**
4. Clean the muffler with warm water and mild detergent. Replace if necessary.
5. Allow the IAC muffler to dry completely before use.
6. Install the IAC muffler.

## Changing the Positive Crankcase Ventilation Valve (PCV)

This engine is equipped with a positive crankcase ventilation valve (PCV). We recommend changing it every 100 hours of operation or at least once a year, whichever occurs first.

1. Pull the PCV valve out of the intake manifold and remove the PCV valve from the hose.



43215

- a - Hose from plenum to PCV valve
- b - PCV valve

2. Inspect the PCV valve and replace if necessary.
3. Install the PCV valve into the intake manifold.
4. Ensure that the PCV valve is tightly seated into the intake manifold.

We recommend the use of Mercury MerCruiser replacement parts.

## Water-Separating Fuel Filter

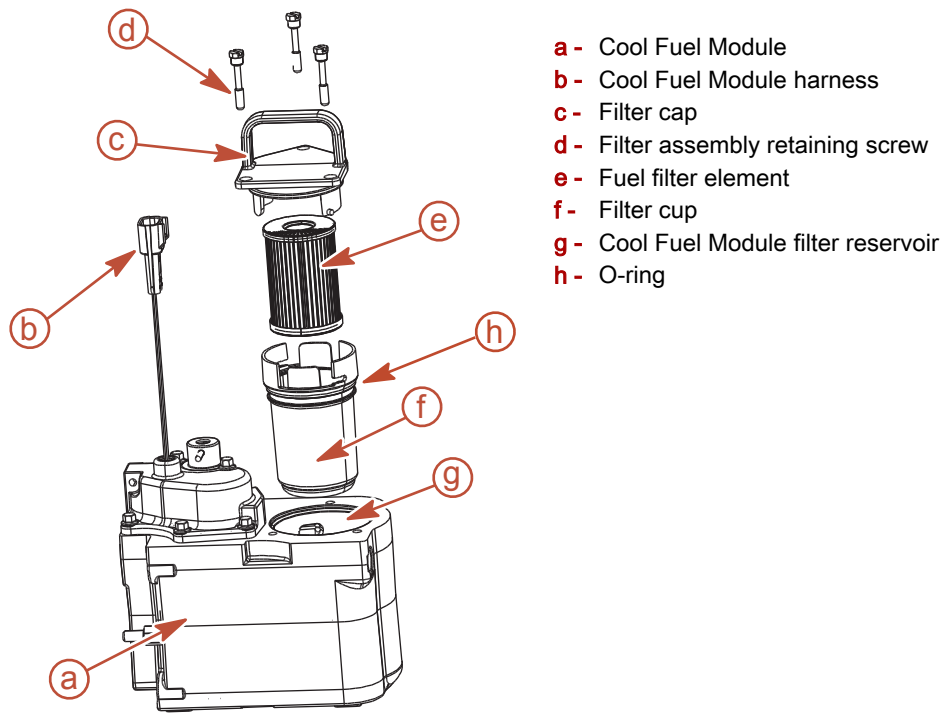
### ⚠ WARNING

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

### 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 5 seconds.
5. Turn key switch to 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 counter clockwise 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.

## Lubrication

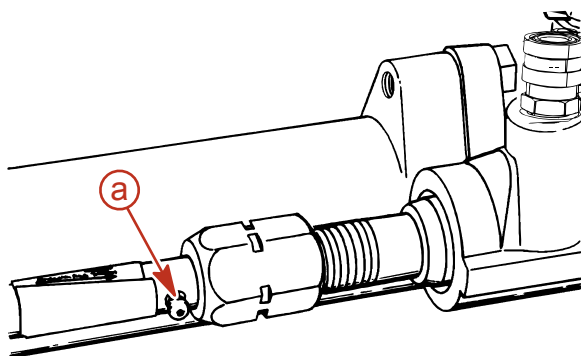
### Steering System

### ⚠ WARNING

Incorrect cable lubrication can cause hydraulic lock, leading to serious injury or death from loss of boat control. Completely retract the end of the steering cable before applying lubricant.


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

1. **If the steering cable has grease fittings:** Turn the steering wheel until the steering cable is fully retracted into the cable housing. Apply approximately three pumps of grease from a typical hand-operated grease gun.



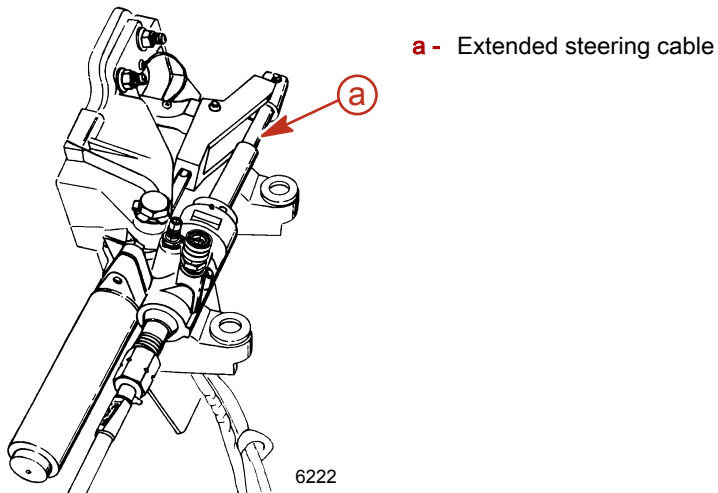
**a -** Steering cable grease fitting


6221

Tube Ref No.	Description	Where Used	Part No.
 34	Special Lubricant 101	Steering cable grease fitting	92-802865Q02

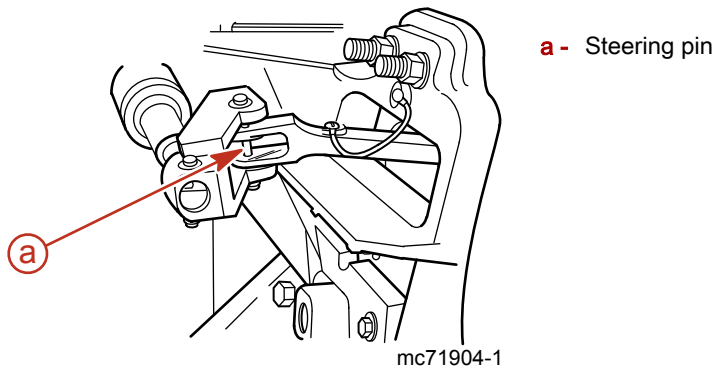
## Section 5 - Maintenance


- Turn the steering wheel until the steering cable is fully extended. Lightly lubricate the exposed part of the cable.




Tube Ref. No.	Description	Where Used	Part No.
 34	Special Lubricant 101	Steering cable	92-802865Q02

- Lubricate the steering pin.



Tube Ref. No.	Description	Where Used	Part No.
	Synthetic Blend MerCruiser Engine Oil SAE25W-40	Steering pin	92-883725K01

- On dual engine boats: Lubricate the tie bar pivot points.

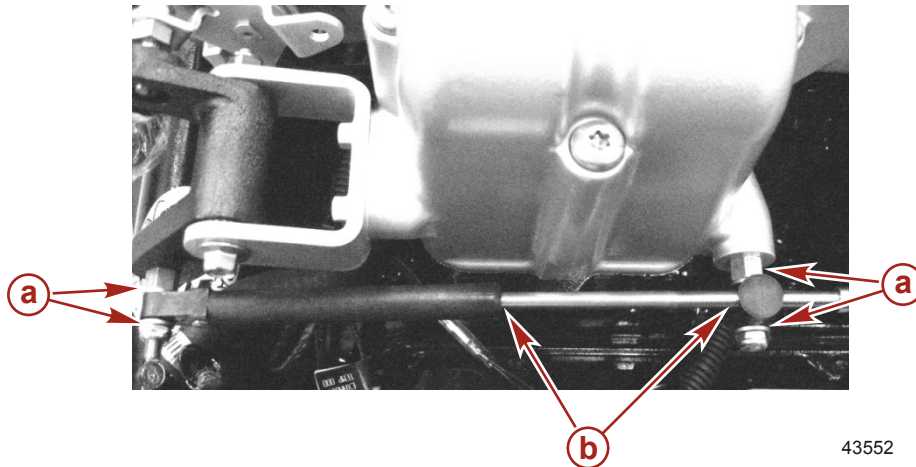
Tube Ref. No.	Description	Where Used	Part No.
	Synthetic Blend MerCruiser Engine Oil SAE25W-40	Tie bar pivot points	92-883725K01

- Upon first starting the engine, turn the steering wheel several times to starboard and then port to ensure that the steering system operates properly before getting underway.




## Throttle Cable

Lubricate the pivot points and the guide contact surfaces.



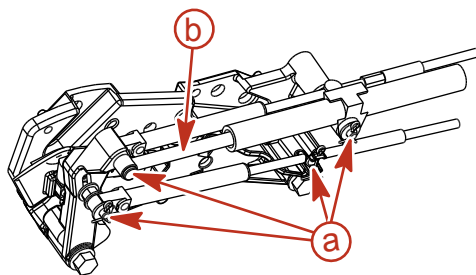
- a** - Pivot points
- b** - Guide contact surfaces

43552

Tube Ref. No.	Description	Where Used	Part No.
	Synthetic Blend MerCruiser Engine Oil SAE25W-40	Throttle cable pivot points and guide contact surfaces	92-883725K01

## Shift Cable - Typical

Lubricate the pivot points and the guide contact surfaces.

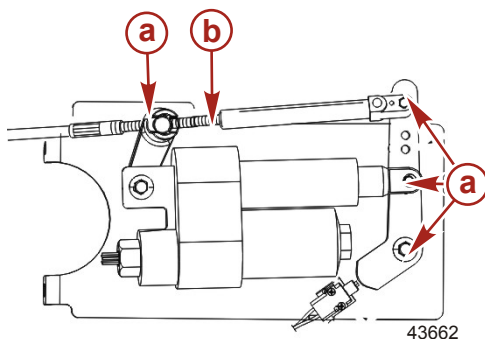


- a** - Pivot points
- b** - Guide contact surfaces

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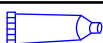
## Shift Cable - DTS

Lubricate the pivot points and the guide contact surfaces.



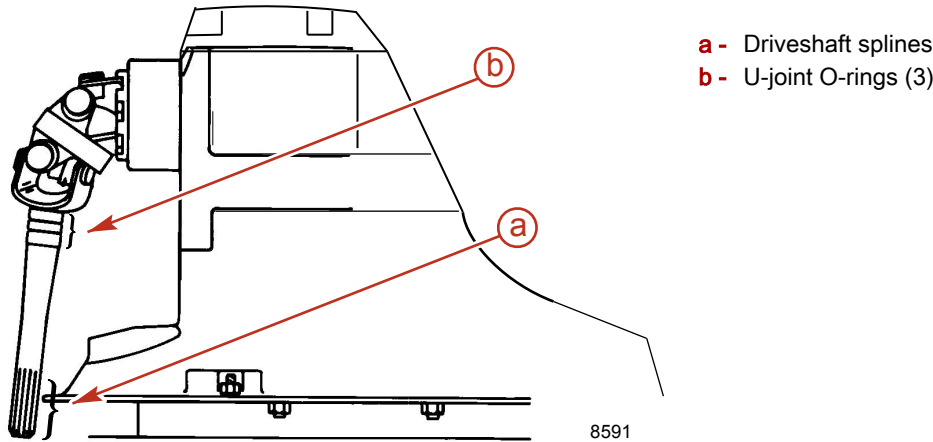
- a** - Pivot points
- b** - Guide contact surfaces


43662

Tube Ref. No.	Description	Where Used	Part No.
	Synthetic Blend MerCruiser Engine Oil SAE25W-40	Shift cable pivot points and guide contact surfaces	92-883725K01

## Sterndrive U-Joint Shaft Splines and O-Rings (Sterndrive Unit Removed)

1. Coat sterndrive U-joint O-rings and driveshaft splines with grease.



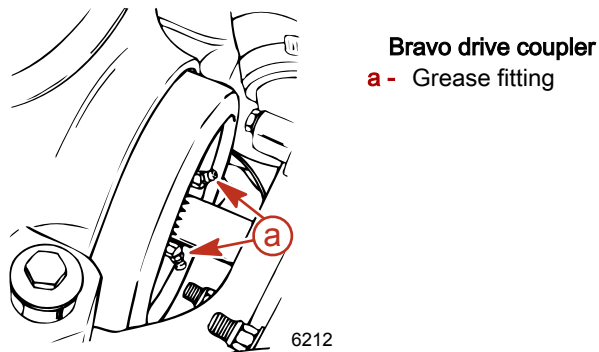
Tube Ref No.	Description	Where Used	Part No.
 91	Engine Coupler Spline Grease	Driveshaft splines and U-joint O-rings	92-802869A 1


2. For propeller shaft lubrication, refer to **Propellers**.

## Engine Coupler

Lubricate engine coupler splines through grease fittings on coupler by applying approximately 8-10 pumps of grease from a typical hand-operated grease gun.

**NOTE:** If the boat is operated at idle for prolonged periods of time, coupler should be lubricated every 50 hours.



Tube Ref No.	Description	Where Used	Part No.
 91	Engine Coupler Spline Grease	Coupler	92-802869A 1

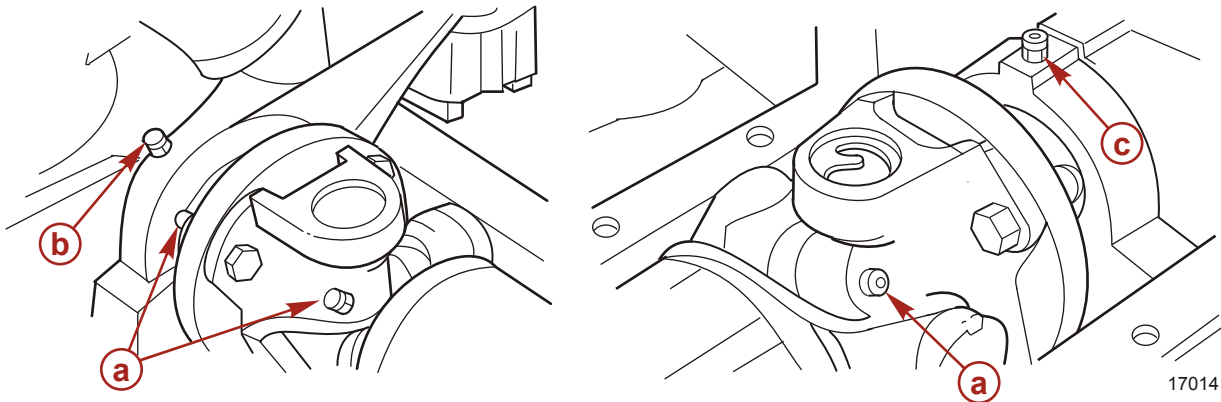
**NOTE:** The coupler and shaft splines can be lubricated without removing the sterndrive unit. Apply lubricant from a typical hand-operated grease gun until a small amount of grease begins to push out.

## Driveshaft Extension Models


1. Lubricate the transom end grease fitting and engine end grease fitting by applying approximately 10–12 pumps of grease from a typical hand-operated grease gun.



- Lubricate the driveshaft grease fittings by applying approximately 3–4 pumps of grease from a typical hand-operated grease gun.



- a - Driveshaft grease fittings
- b - Transom end grease fitting
- c - Engine end grease fitting

Tube Ref No.	Description	Where Used	Part No.
 42	U-Joint and Gimbal Bearing Grease	Transom end grease fitting, engine end grease fitting, driveshaft grease fittings	92-802870A1

## Propellers

### Propeller Repair

Some damaged propellers can be repaired. Contact your authorized Mercury MerCruiser dealer.

### Bravo Sterndrive Propeller Removal

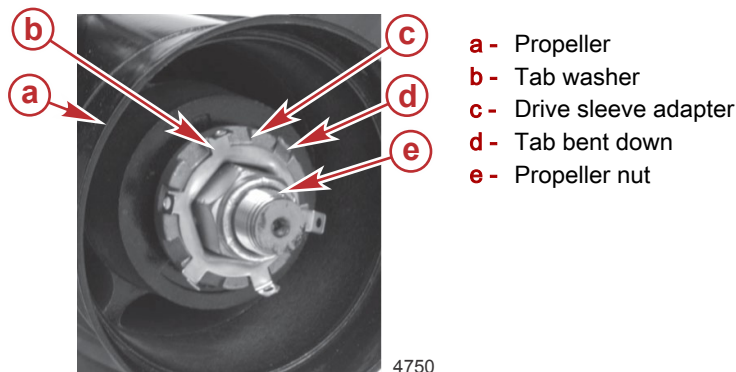
#### ⚠ WARNING

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.

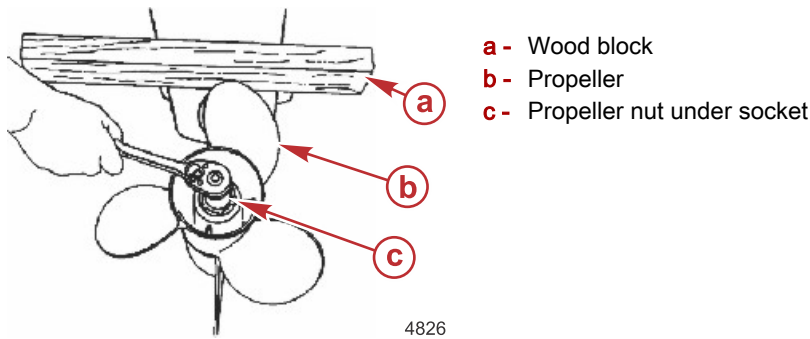
### Bravo One Models

**NOTE:** Bravo One XR models do not use the tab washer.

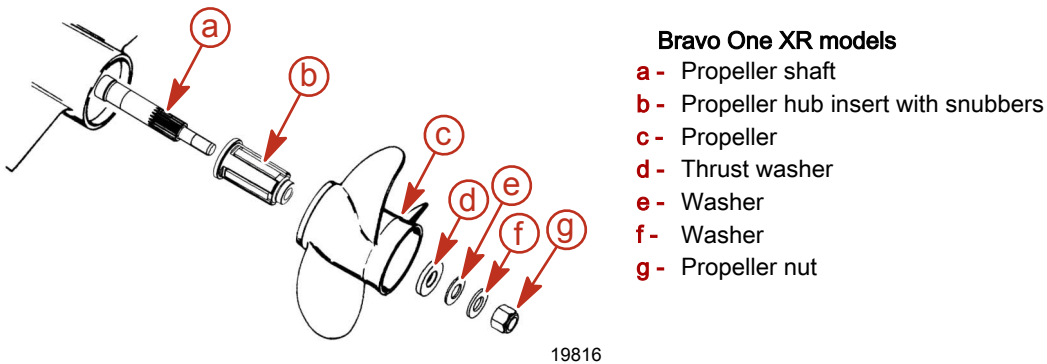
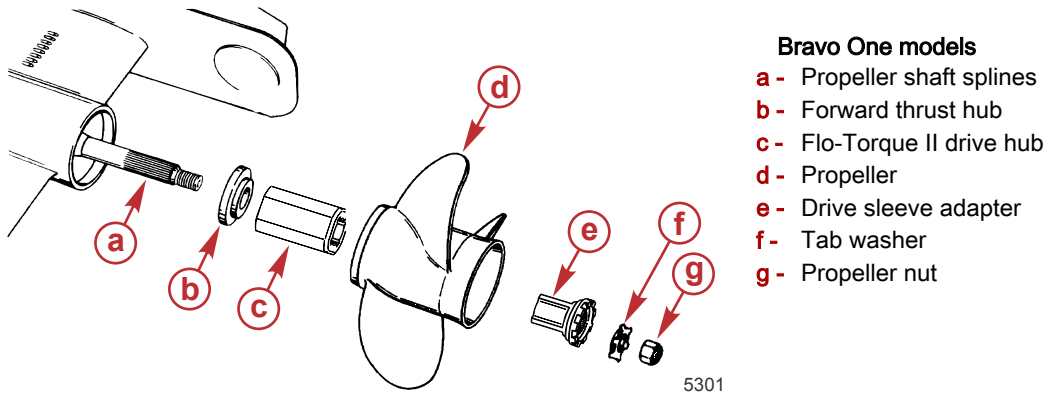
- If equipped, straighten the bent tabs of the tab washer on the propeller shaft.



- Place a block of wood between the propeller blade and the sterndrive's anti-ventilation plate.

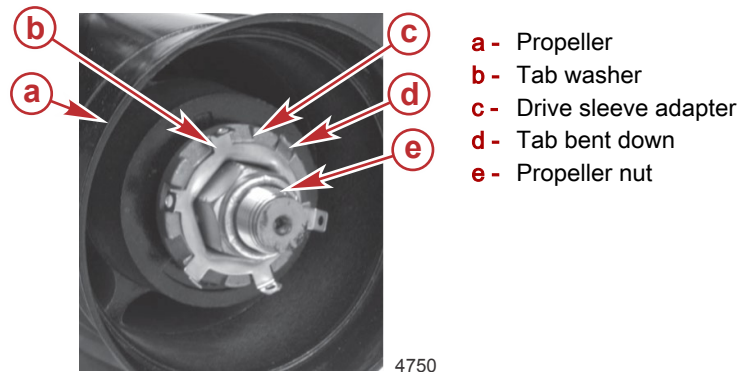


- Turn the propeller shaft nut counterclockwise and remove the nut.
- Slide the propeller and the attaching hardware from the propeller shaft.

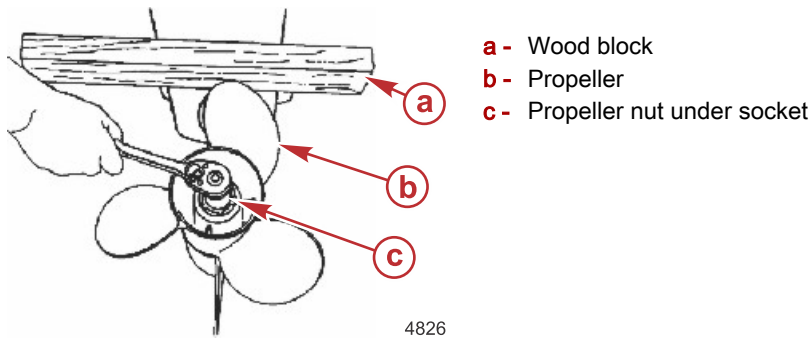


### Bravo Two Models

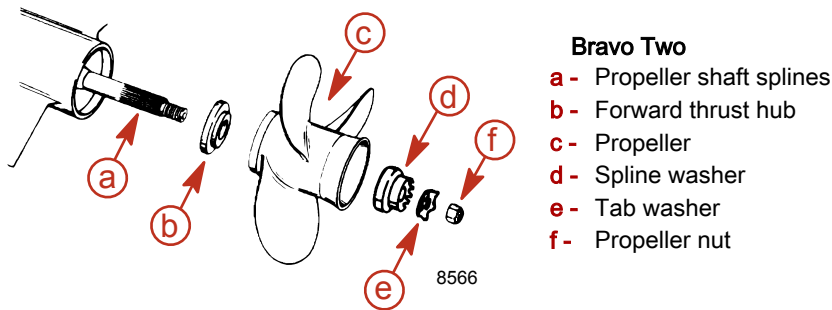
- Straighten the bent tabs of the tab washer on the propeller shaft.



- Place a block of wood between the propeller blade and the sterndrive's anti-ventilation plate.

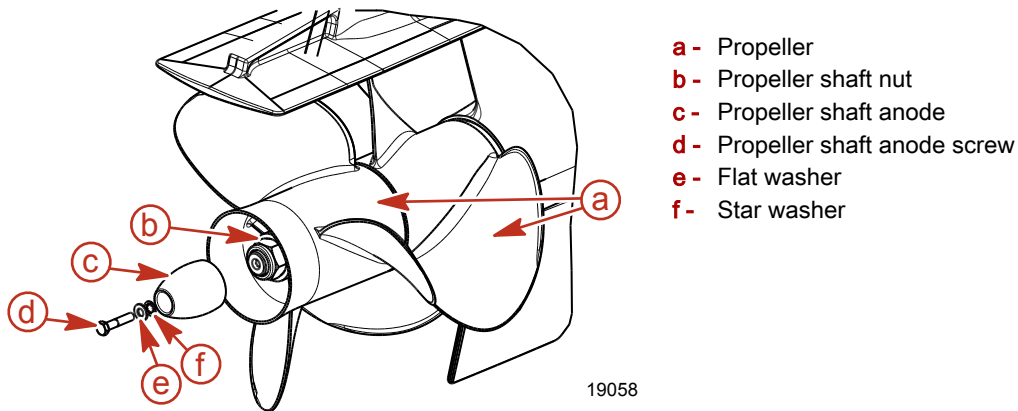


- Turn propeller shaft nut counterclockwise to remove nut.
- Slide the propeller and attaching hardware from the propeller shaft.



### Bravo Three Models

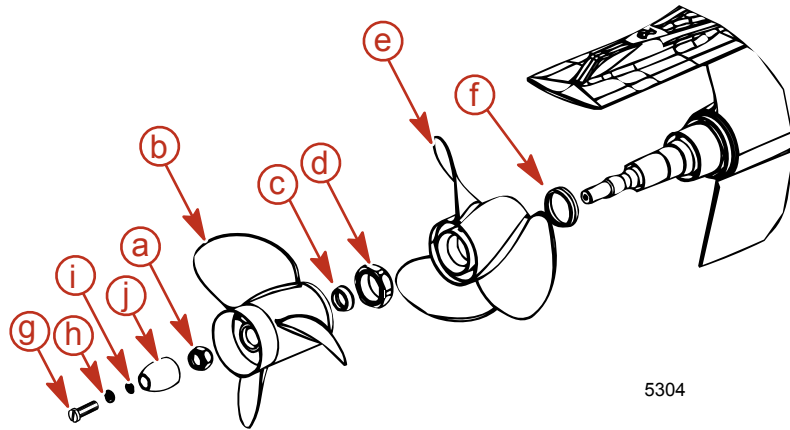
- Place a block of wood between the propeller blade and the sterndrive's anti-ventilation plate.
- Remove the bolt and washers securing the propeller shaft anode.
- Remove the propeller shaft anode.



- Turn aft propeller shaft nut counterclockwise to remove nut.
- Slide propeller and thrust hub off propeller shaft.
- Use the propeller nut tool, turn the front propeller shaft nut counterclockwise and remove the nut.

Propeller Nut Tool	91-805457T 1
<p>10677</p>	Aids in the removal and installation of the front propeller nut.

- Slide the propeller and the thrust hub off the propeller shaft.



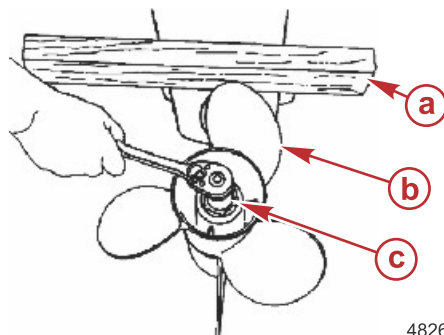
- Bravo Three**
- a - Aft propeller nut
  - b - Aft propeller
  - c - Aft propeller thrust hub
  - d - Front propeller nut
  - e - Front propeller
  - f - Front propeller thrust hub
  - g - Propeller shaft anode screw
  - h - Flat washer
  - i - Star washer
  - j - Propeller shaft anode

5304

## Bravo Sterndrive Propeller Installation

### ⚠ 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.



- a - Wood block
- b - Propeller
- c - Propeller nut under socket

4826

## Bravo One Models

**IMPORTANT:** Use the correct rotation propeller. The propeller rotation must match the direction of rotation of the propeller shaft.

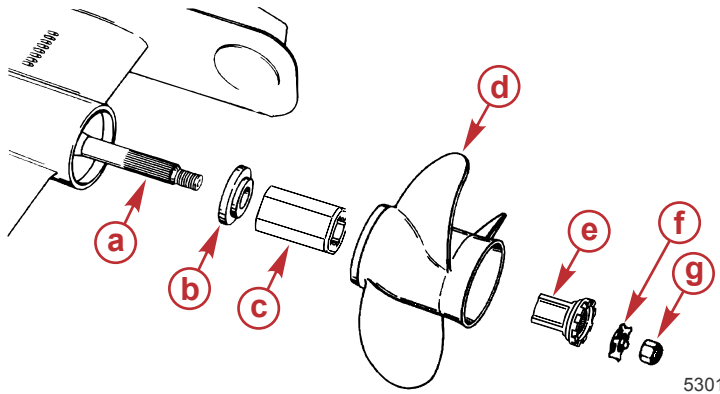
- Coat the propeller shaft spline with one of the following Quicksilver lubricants.

Tube Ref No.	Description	Where Used	Part No.
34	Special Lubricant 101	Propeller shaft splines	92-802865Q02
95	2-4-C with PTFE	Propeller shaft splines	92-802859A 1
94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1

**NOTE:** Anti-Corrosion Grease is for saltwater applications only.

- Install the propeller with the attaching hardware as shown.

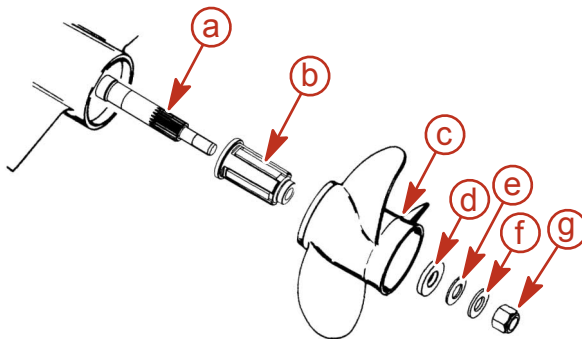
- Tighten the propeller nut to the specified torque.



**Typical Bravo One models**

- a - Propeller shaft splines
- b - Forward thrust hub
- c - Flo-Torque II drive hub
- d - Propeller
- e - Drive sleeve adapter
- f - Tab washer
- g - Propeller nut

5301



**Bravo One XR models**

- a - Propeller shaft
- b - Propeller hub insert with snubbers
- c - Propeller
- d - Thick washer
- e - Washer
- f - Washer
- g - Propeller nut

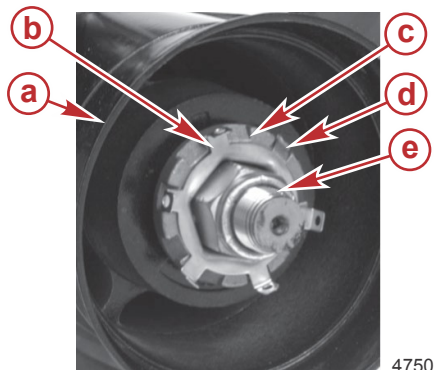
19816

**NOTE:** The propeller torque stated is a minimum torque value.

Description	Nm	lb-in.	lb-ft
Bravo One propeller nut	75	-	55

**NOTE:** Bravo One XR models do not use the tab washer.

- Models equipped with the tab washer: Continue to tighten the propeller nut until the three tabs on the tab washer align with the grooves on the spline washer.
- Bend the three tabs down into the grooves.




- a - Propeller
- b - Tab washer
- c - Drive sleeve adapter
- d - Tab bent down
- e - Propeller nut



4750

**Bravo Two Models**

**IMPORTANT:** Use the correct rotation propeller. The propeller rotation must match the direction of rotation of the propeller shaft.

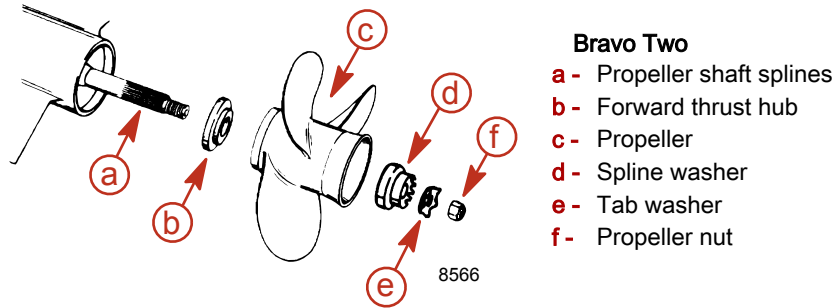
- Coat the propeller shaft spline with one of the following Quicksilver lubricants.

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

Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Propeller shaft splines	92-802859A 1
 94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1

**NOTE:** Anti-Corrosion Grease is for saltwater applications only.

2. Install the propeller with the attaching hardware as shown.
3. Tighten the propeller nut to the specified torque.



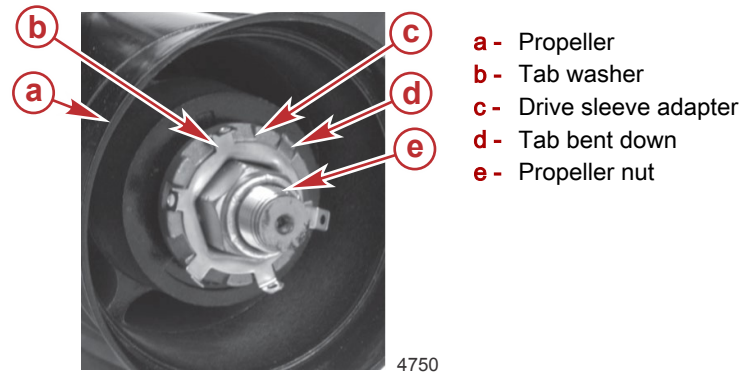
**Bravo Two**

- a - Propeller shaft splines
- b - Forward thrust hub
- c - Propeller
- d - Spline washer
- e - Tab washer
- f - Propeller nut

**NOTE:** The propeller torque stated is a minimum torque value.




Description	Nm	lb-in.	lb-ft
Bravo Two propeller nut	81	-	60

4. Continue to tighten the propeller nut until the three tabs on the tab washer align with the grooves on the spline washer.
5. Bend the three tabs down into the grooves.




**Bravo Three**

1. Coat the propeller shaft spline with one of the following Quicksilver lubricants.

Tube Ref No.	Description	Where Used	Part No.
 34	Special Lubricant 101	Propeller shaft splines	92-802865Q02
 95	2-4-C with PTFE	Propeller shaft splines	92-802859A 1
 94	Anti-Corrosion Grease	Propeller shaft splines	92-802867Q 1

**NOTE:** Anti-Corrosion Grease is for saltwater applications only.

2. Slide the forward thrust hub onto the propeller shaft, with the tapered side toward the propeller hub.
3. Align the splines and place the front propeller on the propeller shaft.
4. Install the front propeller locknut and tighten using the propeller nut tool.

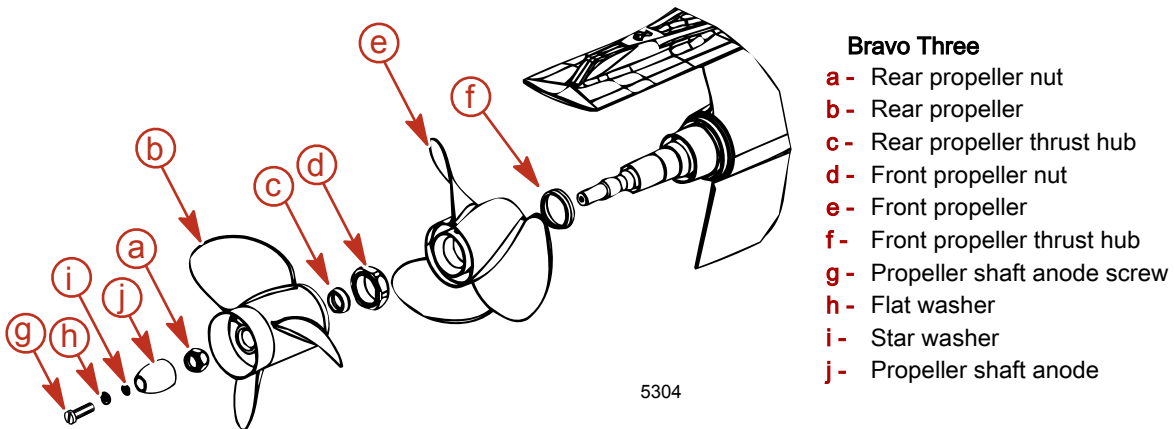
Propeller Nut Tool	91-805457T 1
 10677	Aids in the removal and installation of the front propeller nut.

Description	Nm	lb-in.	lb-ft
Bravo Three front propeller nut	136	–	100

5. Slide the aft thrust hub onto the propeller shaft with the tapered side toward the propeller hub.
6. Align the splines and install the aft propeller.
7. Install the propeller nut and tighten to the specified torque.

Description	Nm	lb-in.	lb-ft
Bravo Three rear propeller nut	81	–	60

8. Install the propeller shaft anode and the screw and tighten to the specified torque.



Description	Nm	lb-in.	lb-ft
Propeller shaft anode screw	19	168	–

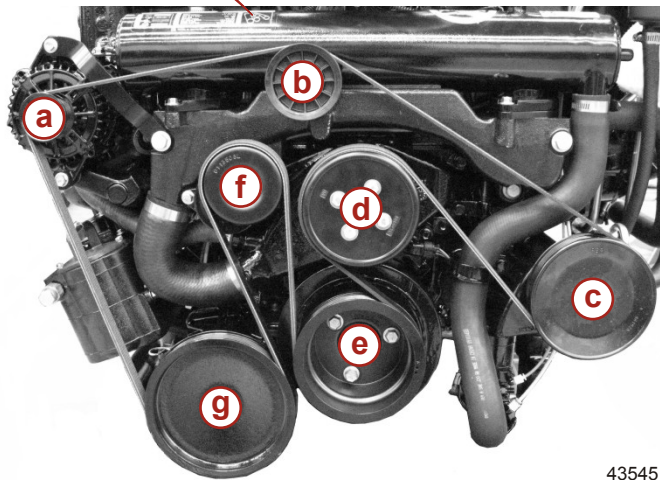
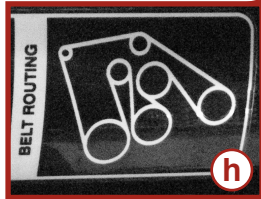


# Serpentine Drive Belt

## 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.



- 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

43545

## Checking

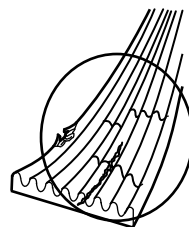
Inspect the drive belt for:

- 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.

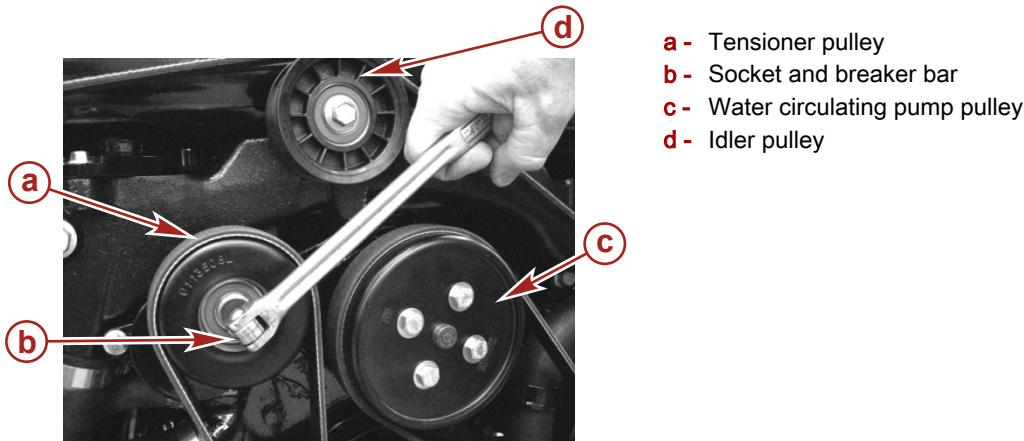


The belt tensioner operates within the limits of movement provided by the cast stops when the belt length and geometry are correct. If the tensioner contacts either of the cast stops during operation, check the mounting brackets and the belt length. Loose brackets, bracket failure, accessory drive component 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

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 <sup>1</sup> .	13 mm (½ in.)

## Corrosion Protection

### Corrosion Information

Whenever two or more dissimilar metals are submerged in a conductive solution, such as saltwater, polluted water or water with a high mineral content, a chemical reaction takes place causing electrical current to flow between metals. The electrical current flow causes the metal that is most chemically active, or anodic, to erode. This is known as galvanic corrosion. For more information contact your authorized Mercury MerCruiser dealer and refer to the **Mercury Precision Parts / Marine Corrosion Protection Guide** (90-881813003).

### Maintaining Ground Circuit Continuity

The transom assembly and sterndrive are equipped with a ground wire circuit to ensure good electrical continuity between the engine, transom assembly, and sterndrive components. Good continuity is essential for the MerCathode System to function effectively.

### MerCathode System Battery Requirements

The Mercury MerCruiser MerCathode system requires a minimum battery charge of 12.6 volts at all times to maintain functionality.

Boats equipped with a MerCathode system that use shore power, and are not run for a long period of time, must use a battery charger to maintain a minimum battery charge of 12.6 volts or above.

Boats equipped with a MerCathode system that do not have access to shore power must be operated often enough to maintain a minimum battery charge of 12.6 volts or above at all times.

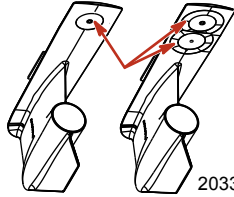
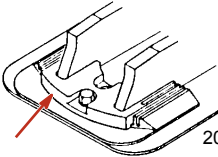
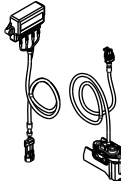
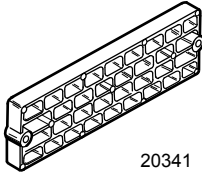
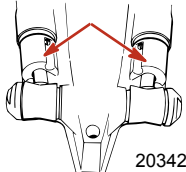

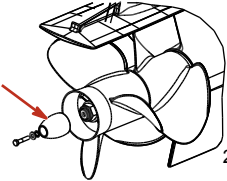
1. Use moderate thumb pressure on the belt at the location that has the longest distance between two pulleys.

## Anodes and MerCathode System Locations

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

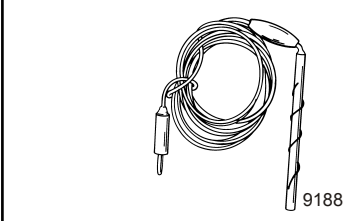
The following sacrificial anodes are installed at different locations on your power package. These anodes help protect against galvanic corrosion by sacrificing their metal to be slowly eroded instead of the metal components on the power package.

**MerCathode System**—Electrode assembly replaces the anode block. System should be tested to ensure adequate output. The test should be performed where boat is moored, using Quicksilver Reference Electrode and Test Meter.

Description	Location	Figure
Gearcase anode plate	Mounted on the underside of the lower gearcase.	 <p>20336</p>
Ventilation plate anode	Mounted on the front of the gearcase.	 <p>20338</p>
MerCathode System	The MerCathode electrode is mounted to the underside of the gimbal housing. The MerCathode controller is mounted on the engine or on the boat transom. The controller harness connects to the electrode harness.	 <p>20340</p>
Anode kit (if equipped)	Mounted to the boat transom.	 <p>20341</p>
Trim cylinder anodes	Mounted on each of the trim cylinders.	 <p>20342</p>
Bearing carrier anode (Bravo One)	Located in front of the propeller, between the front side of the propeller and the gear housing.	 <p>20343</p>
Propshaft anode (Bravo Three)	Located behind the aft propeller.	 <p>20344</p>

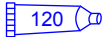
## Checking the Quicksilver MerCathode System

The MerCathode system should be tested to ensure adequate output. Perform the test where boat is moored, using the reference electrode and test meter. Contact your authorized Mercury MerCruiser dealer for service and information .

Reference Electrode	91-76675T 1
	Senses and electrical current in the water when testing the MerCathode system. Use to check hull potential.

## Power Package Exterior Surfaces

1. Spray the entire power package at recommended intervals with Corrosion Guard. Follow the instructions on the can for proper application.

Tube Ref No.	Description	Where Used	Part No.
 120	Corrosion Guard	Painted surfaces	92-802878 55

2. Clean the entire power package. External surfaces that have become bare should be repainted with the recommended primer and spray paint at recommended intervals.

Description	Where Used	Part Number
Mercury Light Gray Primer	Painted surfaces	92-802878 52
Mercury Phantom Black		92-802878Q 1

## Boat Bottom Care

To achieve maximum performance and fuel economy, the boat bottom must be kept clean. Accumulation of marine growth or other foreign matter can greatly reduce boat speed and increase fuel consumption. To ensure best performance and efficiency, periodically clean the boat bottom in accordance with manufacturer's recommendations.

In some areas, it may be advisable to paint the bottom to help prevent marine growth. Refer to the following information for special notes about the use of antifouling paints.

## Antifouling Paint

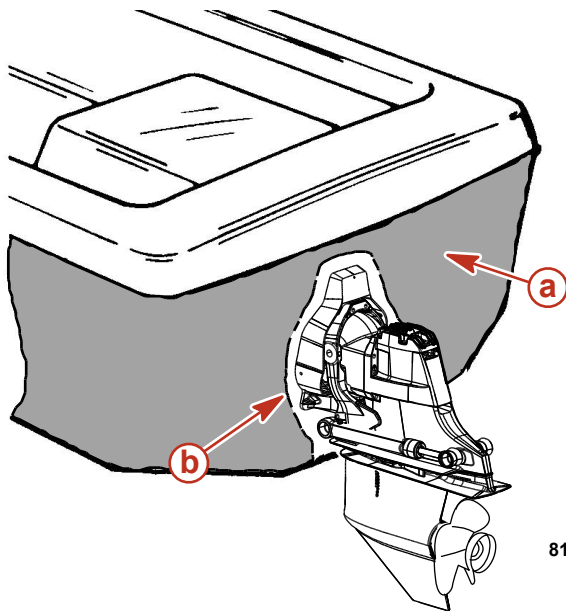
**IMPORTANT:** Corrosion damage that results from the improper application of antifouling paint will not be covered by the limited warranty.

You may apply antifouling paint to the boat hull and boat transom but you must observe the following precautions:

**IMPORTANT:** Do not paint or pressure-wash the anodes or the MerCathode system reference electrode and anode. Doing so will render them ineffective as inhibitors of galvanic corrosion.

**IMPORTANT:** If antifouling protection is required for the boat hull or boat transom, you can use copper-based paint if it is not prohibited by law. If you are using copper based antifouling paint, observe the following precaution:

- Avoid an electrical interconnection between the Mercury MerCruiser product, anodic blocks, or MerCathode system and the paint by allowing a minimum of 40 mm (1-1/2 in.) unpainted area on transom of the boat around these items.



- a - Painted boat transom
- b - Minimum 40 mm (1-1/2 in.) unpainted area around transom assembly

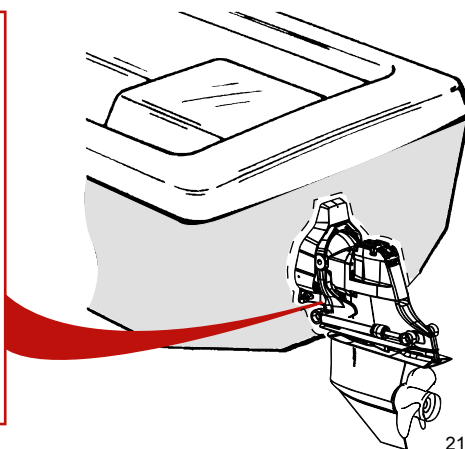
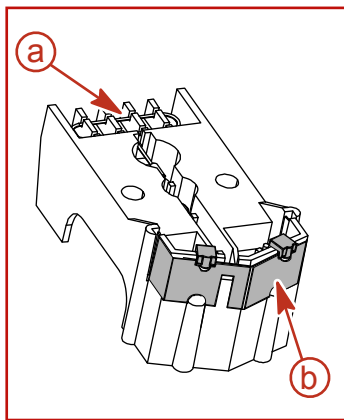
8107

**NOTE:** Sterndrive and transom assembly can be painted with a good marine paint or an antifouling paint that does not contain copper or any other material that could conduct electrical current. Do not paint drain holes, anodes, the MerCathode system or items specified by the boat manufacturer.

**NOTICE**

Washing the MerCathode assembly can damage components and lead to rapid corrosion. Do not use any cleaning equipment such as brushes or high-pressure washers to clean the MerCathode assembly.

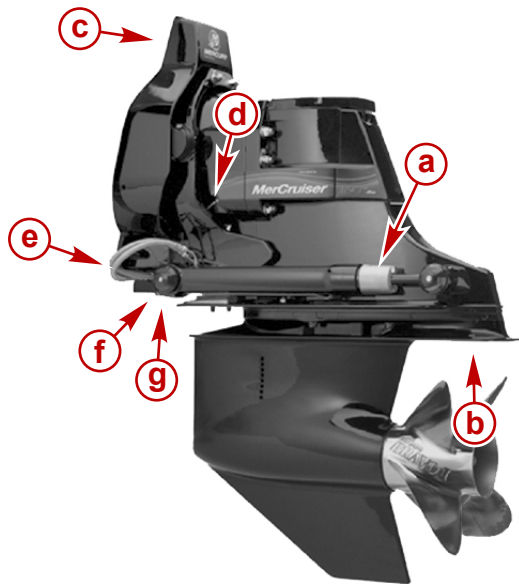
Do not power-wash a sterndrive that has a MerCathode assembly. Doing so can damage the coating on the reference wire of the MerCathode assembly and increase corrosion.



- a - Reference electrode
- b - Anode plate

21563

## Sterndrive Surface Care



### Standard Bravo sterndrive

- a - Sacrificial trim cylinder anode
- b - Sacrificial anodic plate
- c - Steering lever ground wire
- d - Ground wire between the gimbal ring and bell housing
- e - Stainless steel hoses
- f - Ground wire between the gimbal housing and trim cylinder
- g - Ground wire between the gimbal ring and gimbal housing

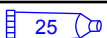
21083

We recommend the following maintenance items to help keep your sterndrive corrosion-free:

- Maintain a complete paint covering on the sterndrive.
- Check the finish regularly. Prime and paint nicks and scratches using Mercury enamel paint and touch up paint. Use only tin-based antifouling paint or its equivalent on or near aluminum surfaces below the waterline.
- If bare metal is showing, apply two coats of paint.

Description	Where used	Part number
Mercury Phantom Black	Bare metal	92- 802878-1

- Spray all electrical connections with sealant.

Tube Ref No.	Description	Where Used	Part No.
 25	Liquid Neoprene	All electrical connections	92- 25711 3




- Inspect the sacrificial trim tab or anode plate if equipped, at regular intervals and replace it before it is half gone. If a stainless steel propeller is installed, additional anodes or a MerCathode system will be required.
- Inspect the propeller shaft for fishing line, which can cause corrosion on a stainless steel shaft.
- Remove the propeller at least every 60 days and lubricate the propeller shaft.
- Do not use lubricants containing graphite on or near the aluminum in saltwater.
- Do not paint trim tabs or the mounting surface.

## Flushing the Seawater System—Sterndrive Models

### General Information—Bravo Sterndrive

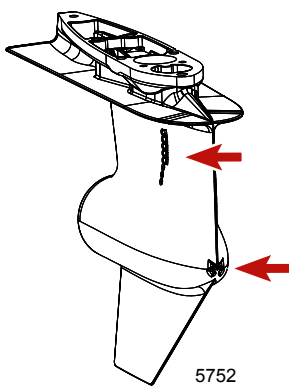
Your boat could be equipped with a combination of any of three different types of water pickups: through-hull, through-transom, and through-sterndrive. The flushing procedures for these systems are separated into two categories: sterndrive water pickups and alternative water pickups.

## Flushing Attachments

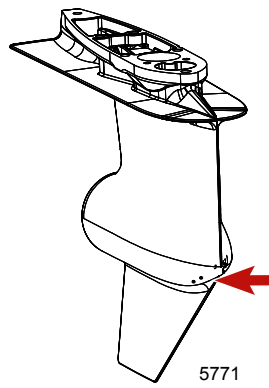
Flushing Device	91-44357Q 2
 <p>9192</p>	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.
Dual Water Pickup Flush Gearcase Seal Kit	91-881150K 1
 <p>9194</p>	Blocks off the front water inlet holes on the dual water inlet gearcases.
Flushing Kit	91-849996T 1
 <p>9195</p>	Use for flushing gearcases with low water inlets.

## Sterndrive Water Pickups

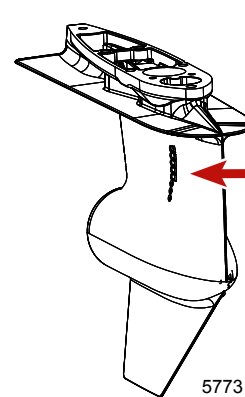
There are three types of water pickups available on Mercury MerCruiser sterndrives: low water, dual water, and side pickups. Dual water pickups require the flushing attachment (44357Q 2) and the flush seal kit (881150K 1), low water pickups require the flushing attachment (849996T 1), and side pickups require the flushing attachment (44357Q 2).



Dual water pickup



Low water pickup



Side pickup

## Boat Out of the Water—Bravo Sterndrive

**IMPORTANT:** Flushing the power package is most effective when performed with the boat and sterndrive out of the water.  
**IMPORTANT:** Flushing is needed if the engine package has been operated in saltwater, brackish water, mineral-laden water, or polluted water. For best results, flushing is recommended after each outing and before cold weather and extended storage.

1. Lower the sterndrive 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.

2. Remove the propeller. Refer to the appropriate Mercury MerCruiser sterndrive service manual.
3. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
4. Connect the water supply hose to the water source.

**NOTICE**

Flushing the engine when it is not operating will result in water collecting in the exhaust system, damaging the engine. Do not supply flush water for more than 15 seconds without the engine operating.

5. With the sterndrive in the normal operating position, completely open the water source to provide maximum water supply.
6. Place the remote control in the neutral idle speed position.
7. Immediately 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.

8. Press the throttle-only button and slowly advance the throttle until the engine reaches 1300 RPM ( $\pm$  100 RPM).
9. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
10. Operate the engine with the sterndrive in neutral for a minimum of 10 minutes.
11. **For power packages operated in saltwater, brackish water, mineral-laden water, or polluted water**, continue to operate the engine until the discharge water is clear.
12. Slowly return the throttle to idle speed position.
13. Stop the engine.
14. Immediately shut off the supply water and remove the flushing attachment.
15. Install the propeller. Refer to the appropriate Mercury MerCruiser sterndrive service manual.

**Boat in the Water—Bravo Sterndrive**

**IMPORTANT:** Flushing the power package is most effective when performed with the boat and sterndrive out of the water.

**IMPORTANT:** Flushing is needed if the engine package has been operated in saltwater, brackish water, mineral-laden water, or polluted water. For best results, flushing is recommended after each outing and before cold weather and extended storage.

1. Raise the sterndrive to the trailer position.
2. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
3. Lower the sterndrive to the full down/in position.
4. Connect the water supply hose to the water source.

**NOTICE**

Flushing the engine when it is not operating will result in water collecting in the exhaust system, damaging the engine. Do not supply flush water for more than 15 seconds without the engine operating.

5. With the sterndrive in the normal operating position, completely open the water source to provide maximum water supply.
6. Place the remote control in the neutral idle speed position.
7. Immediately start the engine.
8. Press the throttle-only button and slowly advance the throttle until the engine reaches 1300 RPM ( $\pm$  100 RPM).
9. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
10. Operate the engine with the sterndrive in neutral for a minimum of 10 minutes.
11. **For engine packages operated in saltwater, brackish water, mineral-laden water, or polluted water**, continue to operate the engine until the discharge water is clear.
12. Slowly return the throttle to the idle speed position.
13. Stop the engine.
14. Immediately shut off the supply water. Do not remove the flushing attachment from the sterndrive at this time.



**NOTICE**

Disconnecting the seawater inlet hose will cause water to enter the bilge resulting in engine damage. Close the seacock before disconnecting the seawater inlet hose. Plug the seawater inlet hose immediately after disconnecting it.

15. Close the seacock, if equipped, then disconnect the seawater inlet hose to prevent water from siphoning into the engine or boat.
16. If not equipped with a seacock, disconnect the seawater inlet hose from the seawater pump, and immediately plug the hose to prevent water from siphoning into the engine or boat.
17. Raise the sterndrive to the trailer position.
18. Remove the flushing attachment from the sterndrive.
19. Tag the ignition switch with an appropriate tag requiring the seacock to be opened or the seawater inlet hose to be reconnected before operating the engine.

### Boat Out of the Water—Alternative Water Pickups

**IMPORTANT:** Flushing the power package is most effective when performed with the boat and sterndrive out of the water.

**IMPORTANT:** Flushing is needed if the engine package has been operated in saltwater, brackish water, mineral-laden water, or polluted water. For best results flushing is recommended after each outing and before cold weather and extended storage.

1. Lower the sterndrive to the 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.

2. Remove the propeller. Refer to the appropriate Mercury MerCruiser sterndrive service manual.
3. Close the seacock, if equipped.
4. If not equipped with a seacock, disconnect the seawater inlet hose from the seawater pump.
5. Using a suitable adapter, connect the flushing hose from the water source to the water inlet of the seawater pump.

**NOTICE**

Flushing the engine when it is not operating will result in water collecting in the exhaust system, damaging the engine. Do not supply flush water for more than 15 seconds without the engine operating.

6. With the sterndrive in the normal operating position, completely open the water source to provide maximum water supply.
7. Place the remote control in the neutral idle speed position.
8. Immediately 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.

9. Press the throttle-only button and slowly advance the throttle until the engine reaches 1300 RPM ( $\pm$  100 RPM).
10. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
11. Operate the engine with the sterndrive in neutral for a minimum of 10 minutes.
12. **For engine packages operated in saltwater, brackish water, mineral-laden water, or polluted water,** continue to operate the engine until the discharge water is clear.
13. Slowly return the throttle to the idle speed position.
14. Stop the engine.
15. Immediately shut off the supply water and remove the flushing attachment.
16. Install the water inlet hose to the seawater inlet of the seawater pump. Tighten the hose clamp securely.
17. Install the propeller. Refer to the appropriate Mercury MerCruiser sterndrive service manual.

### Boat in the Water—Alternative Water Pickups

**IMPORTANT:** Flushing the power package is most effective when performed with the boat and sterndrive out of the water.

**IMPORTANT:** Flushing is needed if the engine package has been operated in saltwater, brackish water, mineral-laden water, or polluted water. For best results flushing is recommended after each outing and before cold weather and extended storage.

1. Lower the sterndrive to the full down/in position.



**NOTICE**

Disconnecting the seawater inlet hose will cause water to enter the bilge resulting in engine damage. Close the seacock before disconnecting the seawater inlet hose. Plug the seawater inlet hose immediately after disconnecting it.

2. Close the seacock, if equipped, then disconnect the seawater inlet hose to prevent water from siphoning into the engine or boat.
3. If not equipped with a seacock, disconnect the seawater inlet hose from the seawater pump and immediately plug the hose to prevent water from siphoning into the engine or boat.
4. Using a suitable adapter, connect the flushing hose from the water source to the water inlet of the seawater pump.

**NOTICE**

Flushing the engine when it is not operating will result in water collecting in the exhaust system, damaging the engine. Do not supply flush water for more than 15 seconds without the engine operating.

5. With the sterndrive in the normal operating position, completely open the water source to provide maximum water supply.
6. Place the remote control in the neutral idle speed position.
7. Immediately 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.

8. Press the throttle-only button and slowly advance the throttle until the engine reaches 1300 RPM ( $\pm$  100 RPM).
9. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
10. Operate the engine with the sterndrive in neutral for a minimum of 10 minutes.
11. **For engine packages operated in saltwater, brackish water, mineral-laden water, or polluted water**, continue to operate the engine until the discharge water is clear.
12. Slowly return the throttle to the idle speed position.
13. Stop the engine.
14. Immediately shut off the supply water and remove the flushing attachment.
15. Tag the ignition switch with an appropriate tag requiring the seacock to be opened or the seawater inlet hose to be reconnected before operating the engine.

## SeaCore Power Package Flushing Procedure

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

**IMPORTANT:** Flushing the SeaCore power package with the boat and sterndrive in the water is less effective. Flushing the SeaCore power package is most effective when performed with the boat and sterndrive out of the water, such as on a boat lift or trailer.

### Models Using the Sterndrive Water Pickup

**IMPORTANT:** The system is designed to flush the Bravo sterndrive and the engine with one water source. Do not block or remove the inlet water hose from the sterndrive to the engine.

**NOTE:** Engines with the sterndrive water inlet blocked off at the gimbal housing: Refer to **Alternative Water Pickups**.

**⚠ WARNING**

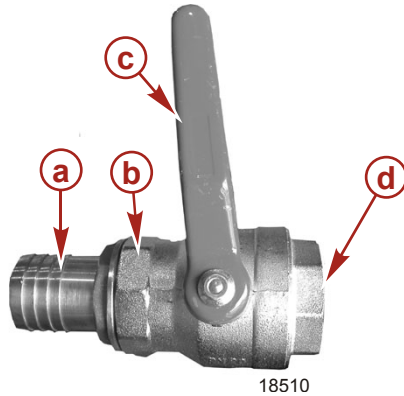
Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the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

**IMPORTANT:** Do not allow the engine to pull air or seawater from alternative water pickup sources during the flushing procedure. If equipped, ensure that all alternative water inlet hoses are plugged at both ends.

1. Remove the boat from the water.

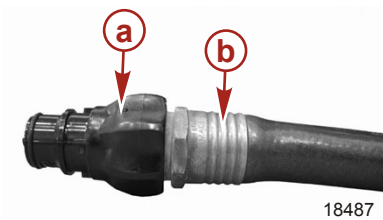
## Section 5 - Maintenance

2. Close the seacock, if equipped.



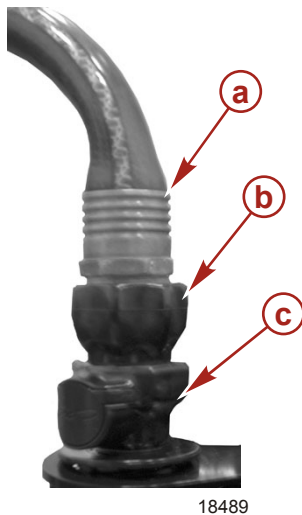
- For visual clarity, the seacock shown is not installed
- a - Hose fitting to engine
  - b - Seacock
  - c - Handle (closed position)
  - d - To water source pickup attachment

3. If equipped with an alternative water pickup and not equipped with a seacock, disconnect the water hose from the alternative water pickup and plug both ends, excluding the Bravo sterndrive.
4. Ensure that the inlet water hose from the sterndrive to the engine is connected.
5. Remove the quick-connect fitting from the parts bag supplied with the engine.
6. Attach the quick-connect fitting to a water hose.



- a - Quick connect fitting (water hose end)
- b - Water hose

7. Snap the quick-connect fitting with the water hose into the flush socket on the engine.



- a - Water hose
- b - Quick-connect fitting (water hose end)
- c - Flush socket

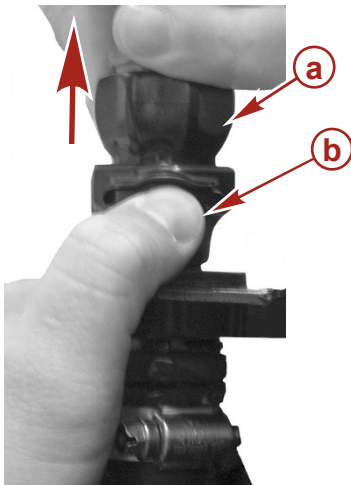
8. Open the water source of the water hose to a full flow.
9. Allow the water to flush the sterndrive for 30 seconds.
10. Place the remote control in neutral idle speed position and start engine.

### 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.

11. Operate the engine at idle speed in neutral gear. Do not exceed 1200 RPM.
12. Monitor the engine temperature while operating the engine.

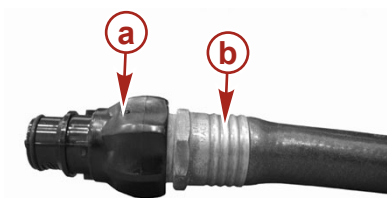
13. Flush the engine for 5–10 minutes or until discharge water is clear.
14. Shut off the engine.
15. Turn off the water source.
16. Disconnect the quick-connect fitting and water hose from the flush socket on the engine by pressing the release button on the flush socket.



18488

- a - Quick-connect fitting (water hose end)
- b - Flush socket release button

17. Remove the quick-connect fitting from the water hose.

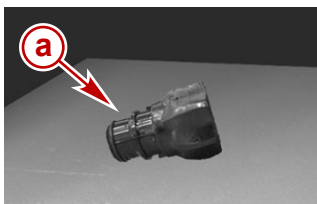


18487

- a - Quick-connect fitting (water hose end)
- b - Water hose

18. Retain the quick-connect fitting with the water hose end for repeated use by storing it separately in a storage compartment on the boat for easy access.

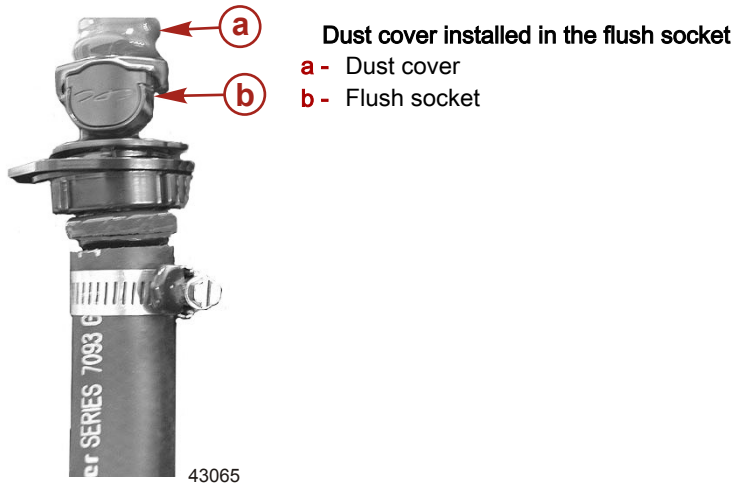
**IMPORTANT: Do not store the quick-connect fitting in the flush socket on the engine. Doing so would allow the seawater pump to suck air during engine operation causing an overheating problem. Damages due to engine overheating are not covered by Mercury MerCruiser Warranty.**



25900

- Quick-connect fitting stored in the boat**
- a - Quick-connect fitting (water hose end)

19. Insert the dust cover in the flush socket on the engine.



**IMPORTANT:** If the unit is to be stored in the water, the seacock should remain closed until time of usage. If unit is to be stored out of the water, open the seacock.

20. Open the seacock, if equipped, or reconnect the alternative water inlet source prior to operating the engine.

# Section 6 - Storage

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## Cold Weather or Extended Storage

**IMPORTANT:** Mercury MerCruiser strongly recommends that this service should be performed by an authorized Mercury MerCruiser dealer. Damage caused by freezing temperatures is not covered by the Mercury MerCruiser Limited Warranty.

### NOTICE

Water trapped in the seawater section of the cooling system can cause corrosion or freeze damage. Drain the seawater section of the cooling system immediately after operation or before any length of storage in freezing temperatures. If the boat is in the water, keep the seacock closed until restarting the engine to prevent water from flowing back into the cooling system. If the boat is not fitted with a seacock, leave the water inlet hose disconnected and plugged.

*NOTE:* As a precautionary measure, attach a tag to the key switch or steering wheel of the boat reminding the operator to open the seacock or unplug and reconnect the water inlet hose before starting the engine.

**IMPORTANT:** Mercury MerCruiser requires that propylene glycol antifreeze, mixed to the manufacturers instructions, be used in the seawater section of the cooling system for freezing temperatures or extended storage. Ensure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer's recommendations.

## Preparing Power Package for Storage

1. Fill the fuel tanks with fresh gasoline (that does not contain alcohol) and a sufficient amount of Quicksilver Gasoline Stabilizer for Marine Engines to treat the gasoline. Follow instructions on the container.
2. Check the antifreeze concentration. Refer to the **Specifications** section.
3. If the boat is to be placed in storage with fuel containing alcohol in fuel tanks (if fuel without alcohol is not available): Fuel tanks should be drained as low as possible and Mercury/Quicksilver Gasoline Stabilizer for Marine Engines added to any fuel remaining in the tank. Refer to **Fuel Requirements** for additional information.
4. Flush the cooling system. Refer to the **Maintenance** section.
5. Supply cooling water to engine. Refer to the **Maintenance** section
6. Operate the engine sufficiently to bring it up to normal operating temperature and allow fuel with Mercury/Quicksilver Gasoline Stabilizer to circulate through the fuel system. Shut off the engine.
7. Change the oil and oil filter.
8. Prepare the engine and fuel system for storage. See **Engine and Fuel System Preparation**.
9. Drain the engine seawater cooling system. See **Draining the Seawater System**.

### NOTICE

Water trapped in the seawater section of the cooling system can cause corrosion or freeze damage. Drain the seawater section of the cooling system immediately after operation or before any length of storage in freezing temperatures. If the boat is in the water, keep the seacock closed until restarting the engine to prevent water from flowing back into the cooling system. If the boat is not fitted with a seacock, leave the water inlet hose disconnected and plugged.

10. For additional assurance against freezing and rust, after draining, fill the seawater cooling system with propylene glycol mixed to the manufacturer's recommendation to protect engine to the lowest temperature to which it will be exposed during freezing temperatures or extended storage.
11. Store the battery according to the manufacturer's instructions.

## Engine and Fuel System Preparation

### ⚠ WARNING

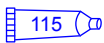

Fuel is flammable and explosive. Ensure that the key switch is off and the lanyard is positioned so that the engine cannot start. Do not smoke or allow sources of spark or open flame in the area while servicing. Keep the work area well ventilated and avoid prolonged exposure to vapors. Always check for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

### ⚠ WARNING

Fuel vapors trapped in the engine compartment may be an irritant, cause difficulty breathing, or may ignite resulting in a fire or explosion. Always ventilate the engine compartment before servicing the power package.

1. In a 23 liter (6 US gal.) remote fuel tank mix:
  - a. 19 liter (5 US gal.) regular unleaded 87 octane (90 RON) gasoline
  - b. 1.89 liter (2 US qt.) Premium Plus 2-Cycle TC-W3 Outboard Oil

- c. 150 ml (5 oz) Fuel System Treatment and Stabilizer or 30 ml (1 oz) Fuel System Treatment and Stabilizer Concentrate

Tube Ref No.	Description	Where Used	Part No.
 115	Premium Plus 2-cycle TC-W3 Outboard Oil	Fuel system	92-858026K01
 124	Fuel System Treatment & Stabilizer	Fuel system	92-8M0047932

- Allow the engine to cool.  
**IMPORTANT: Immediately wipe up any fuel spills or sprays.**
- Close the fuel shut off valve, if equipped. Disconnect and plug the fuel inlet fitting if not equipped with a fuel shut off valve.
- Connect the remote fuel tank (with the fogging mixture) to the fuel inlet fitting.  
**IMPORTANT: Supply cooling water to the engine.**
- Start and operate the engine at 1300 RPM for five minutes.
- After the specified operating time is complete, slowly return the throttle to idle and shut the engine off.  
**IMPORTANT: Ensure that some fogging mixture remains in the engine. Do not allow the engine's fuel system to become completely dry.**
- Replace the water separating fuel filter element. Refer to **Section 5**.

## Maintenance

### WARNING

Performing service or maintenance without first disconnecting the battery can cause product damage, personal injury, or death due to fire, explosion, electrical shock, or unexpected engine starting. Always disconnect the battery cables from the battery before maintaining, servicing, installing, or removing engine or drive components.

### WARNING

Fuel vapors trapped in the engine compartment may be an irritant, cause difficulty breathing, or may ignite resulting in a fire or explosion. Always ventilate the engine compartment before servicing the power package.

**IMPORTANT:** Refer to the maintenance schedule for the complete listing of all scheduled maintenance to be performed. A repair shop or person of the owner's choosing may maintain, replace, or repair emission control devices and systems. Certain other items should be performed only by an authorized Mercury MerCruiser dealer. Before attempting maintenance or repair procedures not covered in this manual, we recommend that you purchase a Mercury MerCruiser service manual and read it thoroughly.

**NOTE:** Maintenance points are color-coded for ease of identification.

Maintenance Point Color Codes	
Yellow	Engine oil
Black	Drive lube
Brown	Power steering fluid
Blue	Drain or flush

## 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.

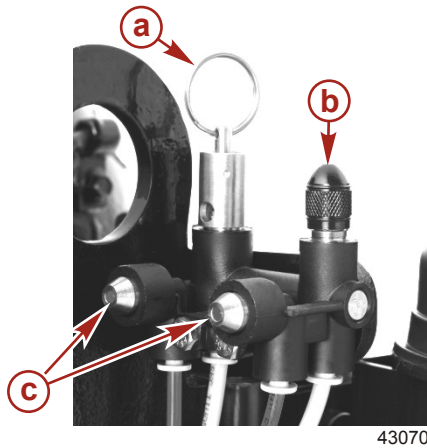
Your power package is equipped with a drain system. Refer to **Drain System Identification** to determine which instructions apply to your power package.

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

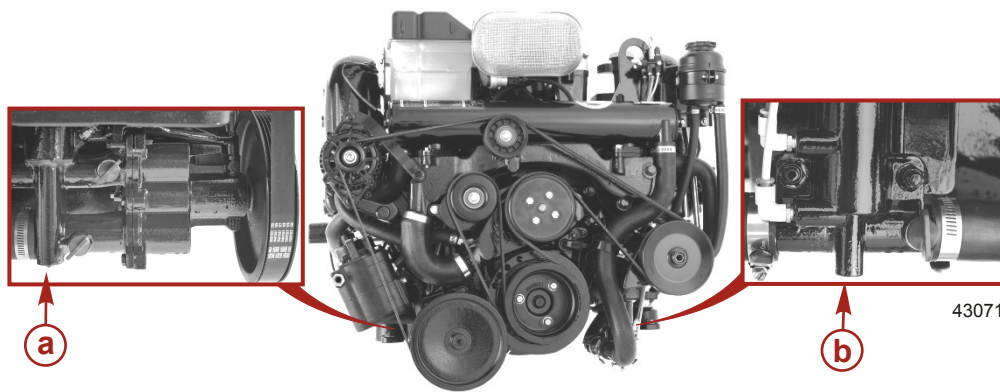


## Drain System Identification

### Air-Actuated Single-Point Drain System

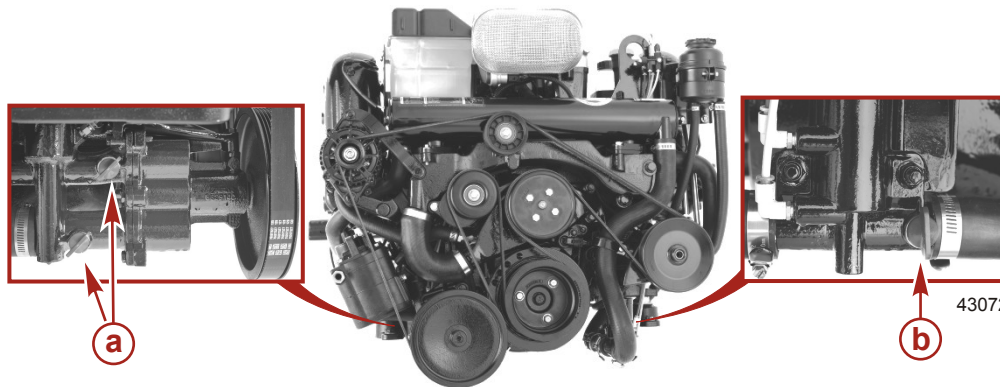


- a** - Manual pressure release valve
- b** - Threaded cap for air connection
- c** - Green indicators



- 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

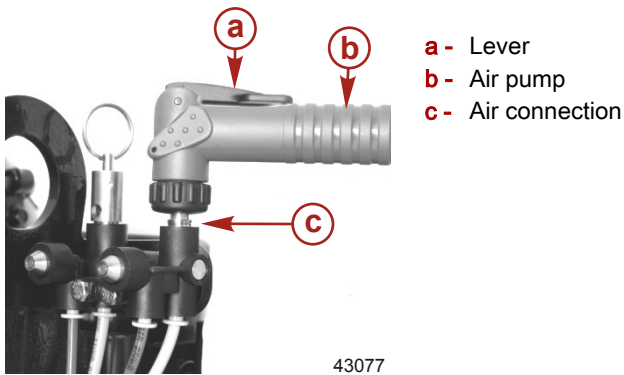
#### Boat in the Water

**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.

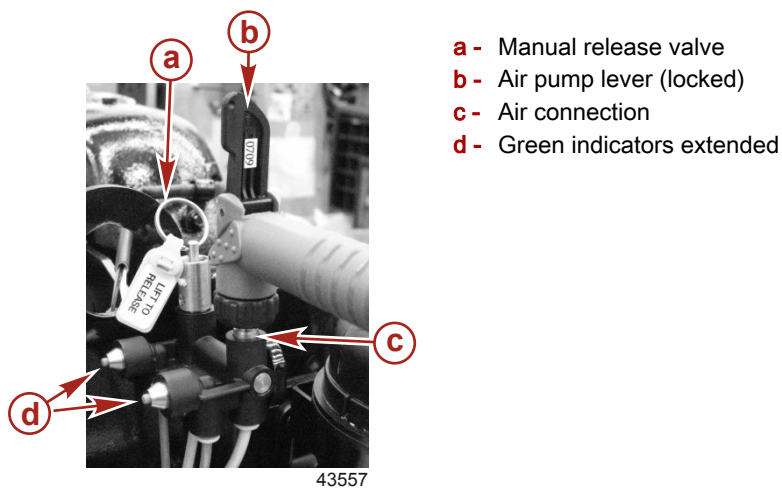
1. Close the seacock (if equipped) or remove and plug the water inlet hose.
2. Obtain the air pump.
3. Remove the threaded cap from the air connection.
4. Ensure that the lever on top of the air pump is against the handle (horizontal).



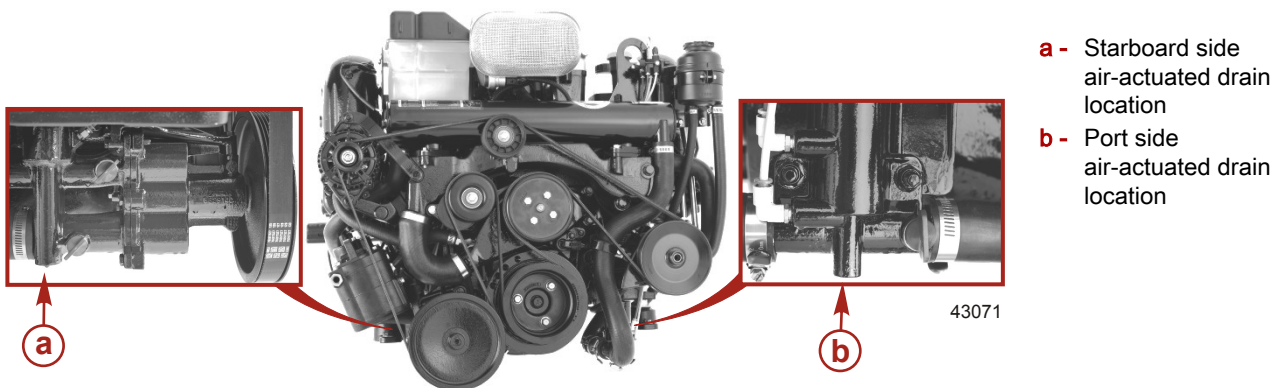
5. Install the air pump on the air connection.



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.



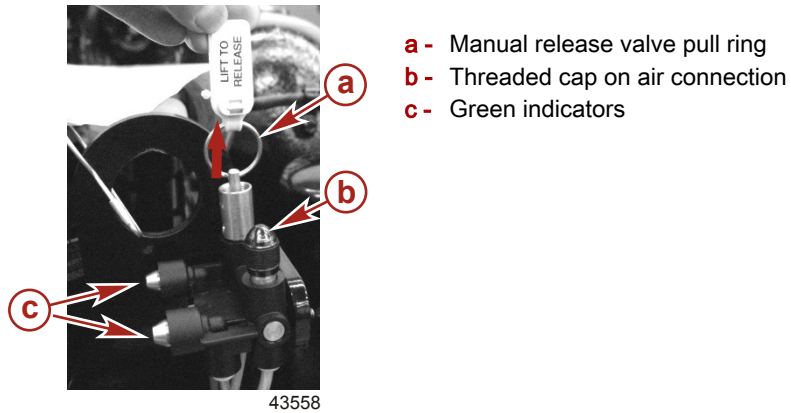
8. Verify that water is draining from each opening. If not, use the **Manual Drain System** instructions.



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 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.

## Section 6 - Storage

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

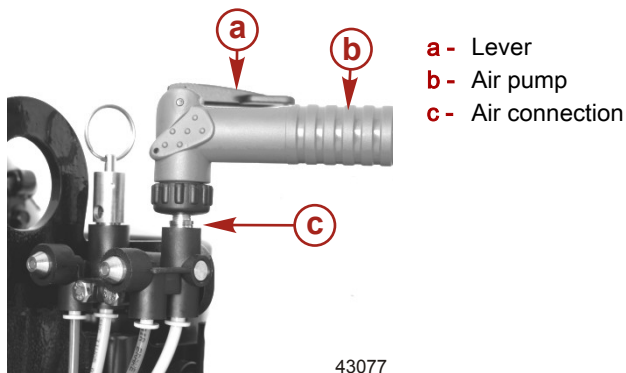


15. Open the seacock, if equipped, or unplug and reconnect the water inlet hose prior to operating the engine.

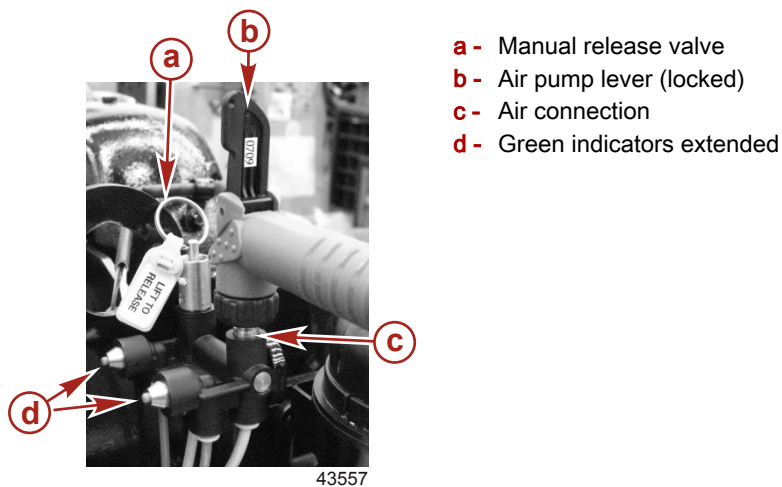
### Boat out of the Water

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

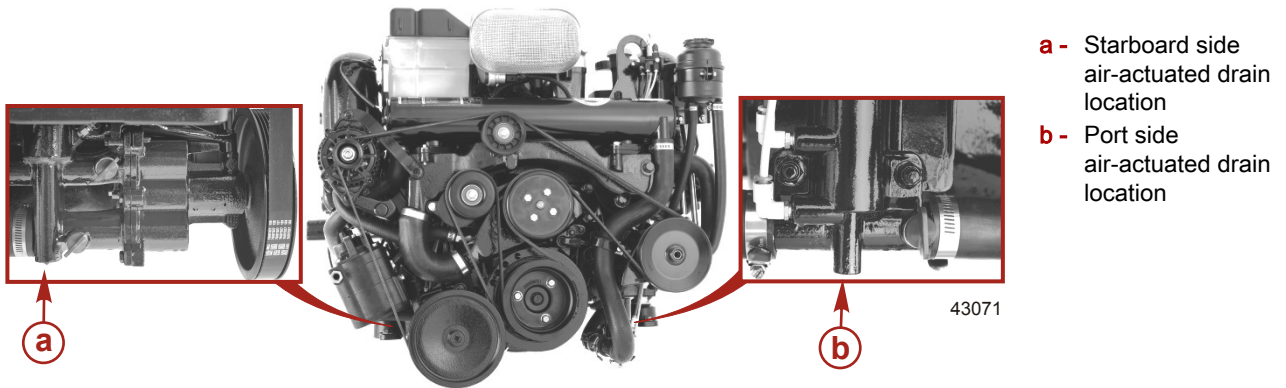
1. Place the boat on a level surface and ensure the boat is level.
2. Obtain the air pump.
3. Ensure that the lever on top of the pump is flush with the handle (horizontal).
4. Install the air pump on the air connection.



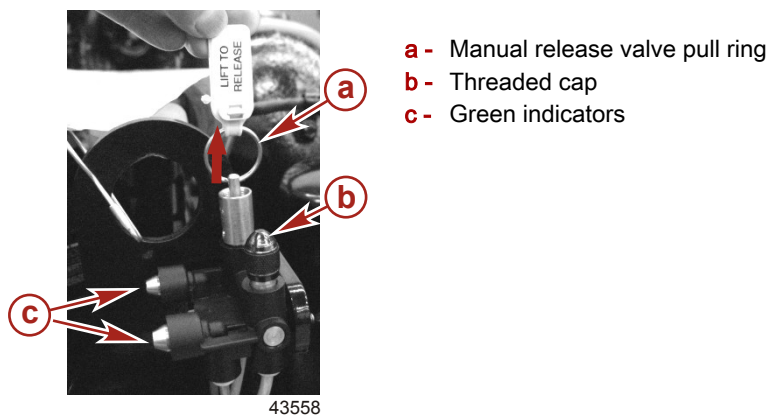
5. Pull the lever on the air pump (vertical) to seal the pump to the air connection.
6. Pump air into the system until both green indicators extend and water drains from both sides of the engine. The port side will begin draining before the starboard side.



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



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 starter motor to purge any water trapped in the seawater pump. Do not allow 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.



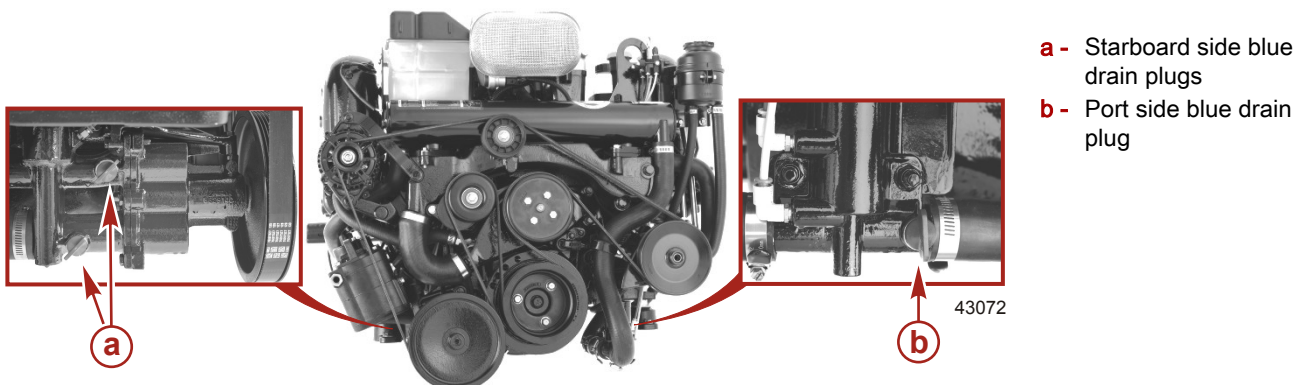
## Manual Drain System

### 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).



## Section 6 - Storage

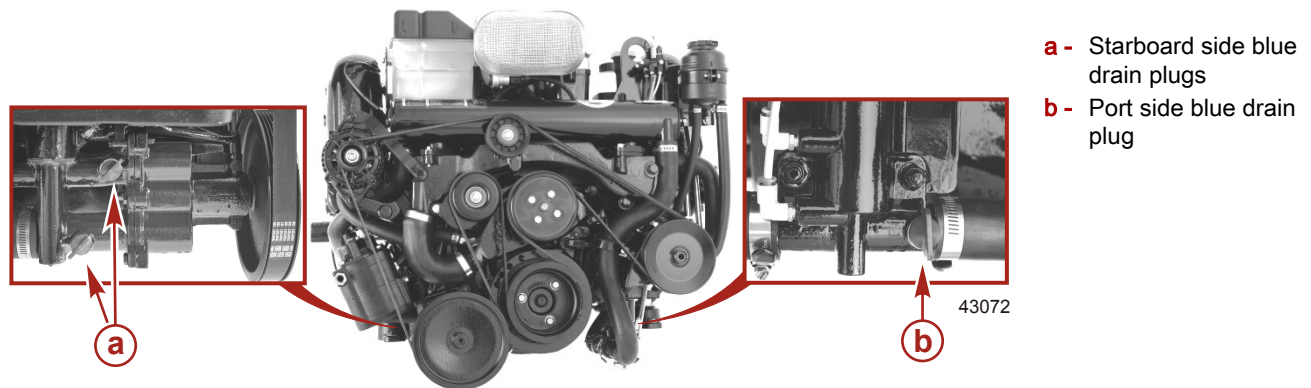
3. Verify that water is draining from each opening.
4. Allow the system to drain for a minimum of five minutes. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance to ensure that all water is drained.
5. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
6. Crank the engine over slightly with 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.

**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).

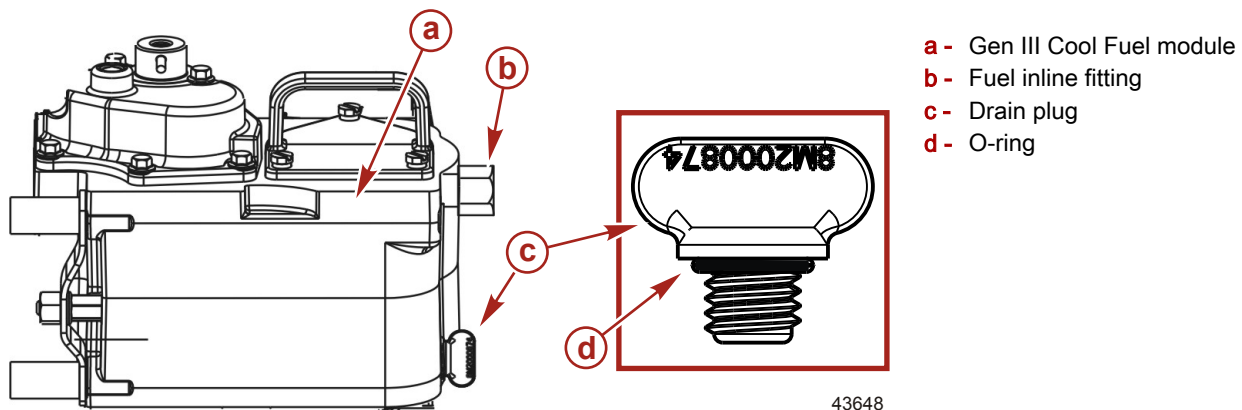


4. Verify that water is draining from each opening.
5. Allow the system to drain for a minimum of five minutes. Mercury MerCruiser recommends leaving the drain system open while transporting the boat or while performing other maintenance to ensure that all water is drained.
6. For DTS engines, pull the lanyard stop switch (if equipped), or disable the ignition circuit by pulling the fuse marked "CD."
7. Crank the engine over slightly with 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 Gen III Cool Fuel Module

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

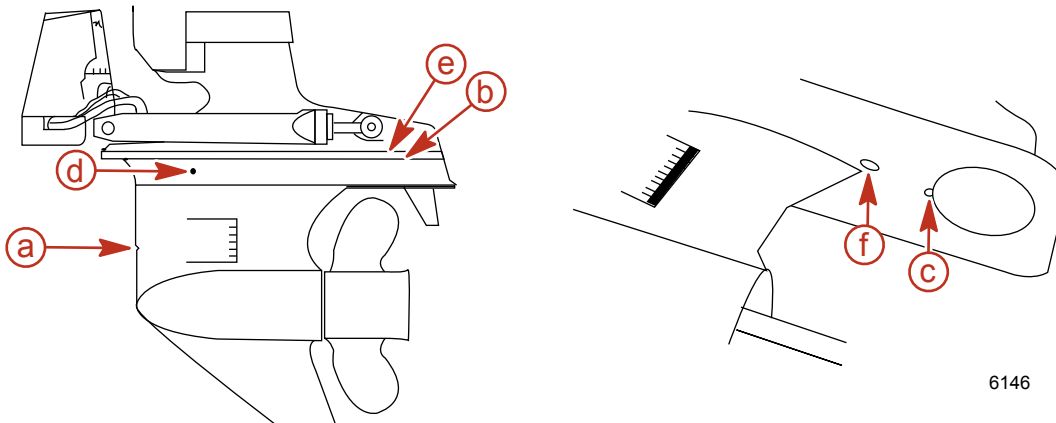
1. Remove the drain plug from the Gen III Cool Fuel module and allow the water to completely drain from the module.
2. Inspect the drain plug and the O-ring for damage. Replace if needed.
3. Place the O-ring on the drain plug and install the drain plug in the module drain hole. Tighten the drain plug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



## Draining the Sterndrive

**NOTE:** This procedure is needed only for salty, brackish, mineral-laden, or polluted water applications; and for freezing temperatures or extended storage.

1. Insert a small wire repeatedly to ensure that vent holes, water drain holes, and passages are unobstructed and open.



### Sterndrive water drain holes

- a - Speedometer pitot tube
- b - Trim tab cavity vent hole
- c - Trim tab cavity drain passage
- d - Gear housing water drain hole (1 each - port and starboard)
- e - Gear housing cavity vent hole
- f - Gear housing cavity drain hole

### NOTICE

The universal joint bellows may develop a set when stored in a raised or up position, causing the bellows to fail when returned to service and allowing water to enter the boat. Store the sterndrive in the full down position.

2. Lower the sterndrive unit to the full down/in position.
3. For additional assurance against freezing and rust, after draining, fill the cooling system with propylene glycol mixed to the manufacturer's recommendation to protect engine to the lowest temperature to which it will be exposed during freezing temperatures or extended storage.

**IMPORTANT:** Mercury MerCruiser requires that propylene glycol antifreeze, mixed to the manufacturer's instructions, be used in the seawater section of the cooling system for freezing temperatures or extended storage. Ensure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer's recommendations.

## 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.

### 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 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 before starting column of 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.



# Section 7 - Troubleshooting

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## Diagnosing EFI Problems

Your authorized Mercury MerCruiser dealer has the proper service tools for diagnosing problems on Electronic Fuel Injection (EFI) Systems. The Electronic Control Module (ECM) on these engines has the ability to detect some problems with the system when they occur, and store a Trouble Code in the ECM's memory. This code can then be read later by a service technician using a special diagnostic tool.

## Diagnosing DTS Problems

Your authorized Mercury MerCruiser dealer has the proper service tools for diagnosing problems on Digital Throttle and Shift (DTS) Systems. The Electronic Control Module (ECM)/Propulsion Control Module (PCM) on these engines has the ability to detect some problems with the system when they occur, and store a Trouble Code in the ECM/PCM's memory. This code can then be read later by a service technician using a special diagnostic tool.

## Additional Operation Instructions for Axis Systems

If your boat has DTS engines equipped with an Axis system, refer also to the **Axis Operation Manual** included with the boat.

## Engine Guardian System

The Engine Guardian System monitors the critical sensors on the engine for any early indications of problems. The system will respond to a problem by emitting a continuous beep and/or reducing engine power in order to provide engine protection.

If Guardian System has been activated, reduce throttle speed. The horn will turn off when throttle speed is within the allowable limit. Consult an authorized Mercury MerCruiser dealer for assistance.

## Troubleshooting Charts

### Starter Motor Will Not Crank Engine, or Cranks Slowly

Possible Cause	Remedy
Battery switch turned off.	Turn the switch on.
Remote control not in neutral position.	Position the control lever in neutral.
Open circuit breaker or fuse.	Check and reset the main power circuit breaker or replace the fuse. Check the 5 amp fuse on the power harness connected to the battery, and replace if necessary.
Loose or dirty electrical connections or damaged wiring.	Check all electrical connections and wires (especially battery cables). Clean and tighten all faulty connections.
Bad battery or low battery voltage.	Test the battery and charge if necessary; replace if bad.
Lanyard stop switch activated.	Check the lanyard stop switch.

### Engine Will Not Start or Is Hard to Start

Possible Cause	Remedy
Lanyard stop switch activated.	Check the lanyard stop switch.
Improper starting procedure.	Read the starting procedure.
Insufficient fuel supply.	Fill fuel tank or open valve.
Faulty ignition system component.	Service the ignition system.
Clogged fuel filter.	Replace fuel filter.
Stale or contaminated fuel.	Drain fuel tank. Fill with fresh fuel.
Fuel line or tank vent line kinked or clogged.	Replace kinked lines or blow out lines with compressed air to remove obstruction.
Faulty wire connections.	Check wire connections.
EFI system fault.	Have EFI System checked by an authorized Mercury MerCruiser dealer.



## Engine Runs Rough, Misses, or Backfires

Possible Cause	Remedy
Clogged fuel filter.	Replace filter.
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 dirty.	Clean Flame Arrestor.
Faulty ignition system component.	Service ignition system.
Idle speed too low.	Have EFI system checked by an authorized Mercury MerCruiser dealer.
EFI System fault.	Have EFI System checked by an authorized Mercury MerCruiser dealer.

## Poor Performance

Possible Cause	Remedy
Throttle not fully open.	Inspect the throttle cable and linkages for proper operation.
Damaged or improper propeller.	Replace the propeller.
Excessive bilge water.	Drain and check for cause of entry.
Boat overloaded or load improperly distributed.	Reduce load or redistribute load more evenly.
Flame arrestor dirty.	Clean the flame arrestor.
Boat bottom fouled or damaged.	Clean or repair as necessary.
Ignition problem.	See <b>Engine Runs Rough, Misses or Backfires</b> .
Engine overheating.	See <b>Excessive Engine Temperature</b> .
EFI System fault	Have EFI System checked by an authorized Mercury MerCruiser dealer.

## Excessive Engine Temperature

Possible Cause	Remedy
Water inlet or seacock closed.	Open.
Drive belt loose or in poor condition.	Replace or adjust belt.
Seawater pickups or sea strainer obstructed.	Remove obstruction.
Faulty thermostat.	Replace.
Coolant level (if equipped) low in closed cooling section.	Check for cause of low coolant level and repair. Fill system with proper coolant solution.
Heat Exchanger or Fluid Cooler plugged with foreign material	Clean Heat Exchanger, Engine Oil Cooler, and Transmission Oil Cooler (if equipped).
Loss of pressure in closed cooling section.	Check for leaks. Clean, inspect and test pressure cap.
Faulty seawater pickup pump.	Repair.
Seawater discharge restricted or plugged.	Clean exhaust elbows.

## Insufficient Engine Temperature

Possible Cause	Remedy
Faulty thermostat.	Replace.

## Low Engine Oil Pressure

Possible Cause	Remedy
Insufficient oil in crankcase.	Check and add oil.
Excessive oil in crankcase (causing it to become aerated).	Check and remove required amount of oil. Check for cause of excessive oil (improper filling).
Diluted or improper viscosity oil.	Change oil and oil filter, using correct grade and viscosity oil. Determine cause for dilution (excessive idling).

## Battery Will Not Recharge

Possible Cause	Remedy
Excessive current draw from battery.	Turn off non-essential accessories.
Alternator drive belt loose or in poor condition.	Replace and/or adjust.
Unacceptable battery condition.	Test battery, replace if necessary.
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.
Faulty alternator	Test alternator output, replace if necessary.

## Remote Control Is Difficult to Move, Has Excessive Play, or Makes Unusual Sounds

Possible Cause	Remedy
Insufficient lubrication on shift and throttle linkage fasteners.	Lubricate.
Obstruction in shift or throttle linkages.	Remove obstruction.
Loose or missing shift and throttle linkages.	Check all throttle linkages. If any are loose or missing, see authorized Mercury MerCruiser dealer immediately.
Shift or throttle cable kinked.	Straighten cable or have authorized Mercury MerCruiser dealer replace cable if damaged beyond repair.

## Steering Wheel Jerks or Is Difficult to Turn

Possible Cause	Remedy
Low power steering pump fluid level.	Check for leak. Refill system with fluid.
Drive belt loose or in poor condition.	Replace and/or adjust.
Insufficient lubrication on steering components.	Lubricate.
Loose or missing steering fasteners or parts.	Check all parts and fasteners if any are loose or missing, see authorized Mercury MerCruiser dealer immediately.
Contaminated power steering fluid.	See authorized Mercury MerCruiser dealer.

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

Possible Cause	Remedy
Blown fuse.	Replace fuse. Fuses may be located near the dash trim switch, at the trim pump, in the positive (red) power trim battery lead near the battery switch, or a combination of these.
Loose or dirty electrical connections or damaged wiring.	Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connection. Repair or replace wiring.

**Power Trim Does Not Operate (Motor Operates but Sterndrive Unit Does Not Move)**

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

## Notes:

# Section 8 - Customer Assistance

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## 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. Refer to the Yellow Pages of the telephone directory. If, for any reason, you cannot obtain service, contact the nearest Regional Service Center. Outside the United States and Canada, contact the nearest Marine Power International Service Center.

### 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 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.

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 if they are not in stock. Only authorized dealers can purchase genuine Quicksilver parts and accessories from the factory. Mercury Marine does not sell to unauthorized dealers or retail customers. When inquiring on parts and accessories, the dealer requires the **engine model** and **serial numbers** to order the correct parts.

### Resolving a Problem

Satisfaction with your Mercury MerCruiser product is very important to your dealer and to us. If you ever have a problem, question or concern about your power package, contact your dealer or any authorized Mercury MerCruiser dealership. If 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 Mercury Marine Service Office for assistance. Mercury Marine will work with you and your dealership to resolve all problems.

The following information will be needed by the 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 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.

Telephone	Fax	Mail
+1 920 929 5040	+1 920 906 6033	Mercury Marine W6250 West Pioneer Road P.O. Box 1939 Fond du Lac, WI 54936-1939
+1 905 567 6372 (MERC)	+1 905 567 8515	Mercury Marine Ltd. 2395 Meadowpine Blvd. Mississauga, Ontario L5N 7W6 Canada
+61 3 9791 5822	+61 3 9793 5880	Mercury Marine – Australia Private Bag 1420 Dandenong South, Victoria 3164 Australia
+ 32 87 32 32 11	+32 87 31 19 65	Marine Power – Europe, Inc. Parc Industriel de Petit-Rechain B-4800 Verviers, Belgium
+954 744 3500	+954 744 3535	Mercury Marine – Latin America & Caribbean 11650 Interchange Circle North, Miramar, FL 33025 U.S.A.
+81 53 423 2500	+81 53 423 2510	Mercury Marine – Japan 283-1 Anshin-cho Hamamatsu, Shizuoka 435-0005 Japan
+65 6546 6160	+65 6546 7789	Mercury Marine – Singapore 29, Loyang Drive Singapore, 508944

## Ordering Literature

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

- Model
- Serial number
- Horsepower
- Year built

## United States and Canada

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

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

## Outside the United States and Canada

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

Print or type your mailing address, which be used as your shipping label, and include your order and payment. Mail to:

Mercury Marine

Attn: Publications Department

W6250 West Pioneer Road

P.O. Box 1939

Fond du Lac, WI 54936-1939

USA



# Section 9 - Checklists

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## Predelivery Inspection (PDI)

**IMPORTANT:** This checklist is for packages that are not equipped with Axius. For engine packages equipped with Axius, use the Axius-specific checklist, which appears in Section 5 of the Axius Operation Manual.

Perform these tasks before the Customer Delivery Inspection (CDI).

N/A	Check/ Adjust	Item
<input type="checkbox"/>	<input type="checkbox"/>	Service bulletin updates or repairs completed
	<input type="checkbox"/>	Drain plug installed and drain valves closed
<input type="checkbox"/>	<input type="checkbox"/>	Seawater inlet valve open
	<input type="checkbox"/>	Engine mounts tight
<input type="checkbox"/>	<input type="checkbox"/>	Engine alignment
<input type="checkbox"/>	<input type="checkbox"/>	Drive unit fasteners tightened to specifications
<input type="checkbox"/>	<input type="checkbox"/>	Power trim cylinders fasteners tight
	<input type="checkbox"/>	Battery of proper rating, fully charged, secured, with protective covers in place
	<input type="checkbox"/>	All electrical connections tight
	<input type="checkbox"/>	Exhaust system hose clamps tight
	<input type="checkbox"/>	All fuel connections tight
	<input type="checkbox"/>	Correct propeller selected, installed, and tightened to specifications
	<input type="checkbox"/>	Throttle, shift and steering system fasteners tightened to specifications
<input type="checkbox"/>	<input type="checkbox"/>	Test OBDM warning system and MIL (light) operation (EC models only)
	<input type="checkbox"/>	Steering operation throughout range
	<input type="checkbox"/>	Throttle plates open and close completely
	<input type="checkbox"/>	Crankcase oil level
<input type="checkbox"/>	<input type="checkbox"/>	Power trim oil level
<input type="checkbox"/>	<input type="checkbox"/>	Stern drive unit oil level
<input type="checkbox"/>	<input type="checkbox"/>	Power steering fluid level
<input type="checkbox"/>	<input type="checkbox"/>	Closed Cooling fluid level
<input type="checkbox"/>	<input type="checkbox"/>	Transmission fluid level
<input type="checkbox"/>	<input type="checkbox"/>	V-engines: serpentine belt tension
<input type="checkbox"/>	<input type="checkbox"/>	Alternator belt tension (3.0L)
<input type="checkbox"/>	<input type="checkbox"/>	Power steering pump belt tension (3.0L)
<input type="checkbox"/>	<input type="checkbox"/>	SmartCraft gauges calibrated, if equipped
<input type="checkbox"/>	<input type="checkbox"/>	Warning system operation
<input type="checkbox"/>	<input type="checkbox"/>	Trim limit switch operation

**Predelivery Inspection Checklist, Continued**

N/A	Check/ Adjust	Item
		<b>On-the-Water Test</b>
<input type="checkbox"/>	<input type="checkbox"/>	Engine alignment (Inboard models only)
	<input type="checkbox"/>	Starter neutral safety switch operation
	<input type="checkbox"/>	E-stop switch/lanyard stop switch operation (all helms)
	<input type="checkbox"/>	Seawater pump operation
	<input type="checkbox"/>	Operation of instruments
	<input type="checkbox"/>	Fuel, oil, and water leaks
	<input type="checkbox"/>	Exhaust leaks
	<input type="checkbox"/>	Ignition timing
	<input type="checkbox"/>	Forward, neutral, and reverse gear operation
	<input type="checkbox"/>	Steering operation throughout range
	<input type="checkbox"/>	Acceleration from idle RPM is normal
	<input type="checkbox"/>	WOT_____ RPM within specification (in forward gear)
<input type="checkbox"/>	<input type="checkbox"/>	EC models: run two full operating cycles (key on/off) to WOT with engine at normal operating temperature while monitoring engine with G3 CDS to verify engine goes into closed-loop engine control.
<input type="checkbox"/>	<input type="checkbox"/>	Power trim operation
<input type="checkbox"/>	<input type="checkbox"/>	Boat handling
		<b>After On-the-Water Test</b>
	<input type="checkbox"/>	Propeller nut tightened to specification
	<input type="checkbox"/>	Fuel, oil, coolant, water and fluid leaks
	<input type="checkbox"/>	Oil and fluid levels
	<input type="checkbox"/>	Apply Quicksilver Corrosion Guard to engine package
	<input type="checkbox"/>	Operation, Maintenance & Warranty manual in boat
		<b>If Boat Is Registered to a Resident of California</b>
<input type="checkbox"/>	<input type="checkbox"/>	CARB hang tag in boat
<input type="checkbox"/>	<input type="checkbox"/>	CARB decal properly affixed to boat hull

**Customer Delivery Inspection (CDI)**

**IMPORTANT:** This checklist is for packages that are not equipped with Axius. For engine packages equipped with Axius, use the Axius-specific checklist, which appears in Section 5 of the Axius Operation Manual.

Perform these tasks after the Predelivery Inspection (PDI).

This inspection must take place in the presence of the customer.

N/A	Completed	Item
	<input type="checkbox"/>	Operation and maintenance manual—provide and review with customer. Emphasize the importance of safety warnings and Mercury engine testing procedures.
	<input type="checkbox"/>	Approve the external appearance of the product (paint, cowl, decals, etc.)
	<input type="checkbox"/>	Warranty—provide and explain the limited warranty to the customer. Explain dealer services.
<input type="checkbox"/>	<input type="checkbox"/>	Explain the optional Mercury Product Protection Plan (North America only)
		<b>Operation of equipment—explain and demonstrate:</b>
	<input type="checkbox"/>	E-stop switch / lanyard stop switch operation (all helms)
	<input type="checkbox"/>	Cause and effect of steering torque or pull; instruct on using a firm steering grip; explain boat spin-out and how to trim for neutral steering.
<input type="checkbox"/>	<input type="checkbox"/>	U.S. Coast Guard capacity plate
	<input type="checkbox"/>	Proper seating
	<input type="checkbox"/>	Importance of personal flotation devices (PFDs or life vests) and throwable PFDs (throw cushions)

## Section 9 - Checklists

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N/A	Completed	Item
<input type="checkbox"/>	<input type="checkbox"/>	Functions of SmartCraft accessories (if applicable)
	<input type="checkbox"/>	Off-season storage and maintenance schedule
	<input type="checkbox"/>	Engine (starting, stopping, shifting, using throttle)
	<input type="checkbox"/>	Boat (lights, battery switch location, fuses/breakers)
<input type="checkbox"/>	<input type="checkbox"/>	Trailer (if applicable)
		<b>Registration:</b>
	<input type="checkbox"/>	Complete and submit warranty registration—provide the customer with a copy.