

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

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

Name of engine manufacturer: V M Motori, s.p.a.		
Address: 29 Via Ferrarese		
Town: Cento (FE)	Post Code: 44042	Country: Italy

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

Name of Notified Body for exhaust emission assessment: T Ü V Product Service Gmbh			
Address: 65 Ridlerstrasse			
Town: München	Post Code: 80339	Country: Germany	ID Number: 0123

Name of Notified Body for noise emission assessment: International Marine Certification Institute (IMCI)			
Address: Rue Abbé Cuypers 3			
Town: Bruxelles	Post Code: B-1040	Country: Belgium	ID Number: 0609

Conformity assessment module used for exhaust emissions: ☒ B+C ☐ B+D ☐ B+E ☐ B+F ☐ G ☐ H

Conformity assessment module used for noise emissions: ☐ A ☒ Aa ☐ G ☐ H

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

Description of Engines and Essential Requirements

Engine Type:	Fuel Type:	Combustion Cycle:
☒ z or sterndrive with integral exhaust	☒ Diesel	☒ 4 stroke

IDENTIFICATION OF ENGINE(S) COVERED BY THIS DECLARATION OF CONFORMITY		
Name of engine model or engine family:	Unique engine identification number(s) or engine family code(s)	EC Type-examination certificate or type-approval certificate number
4.2L 350/320/270	MR706LX / MR706LH / MR706LS	SB5 06 08 57278 006
2.8L 220	MR704LX / MR704LY / MR704LH / MR704LS	SB5 08 07 57278 008

Essential requirements	Standards	Other normative document/ method	Technical file	Please specify in more detail (* = mandatory standard)
Annex I.B-Exhaust Emissions				
B.1 Engine Identification	☐	☐	☒	
B.2 Exhaust Emission Requirements	☒ *	☐	☐	*EN ISO 8178-1:1996
B.3 Durability	☐	☐	☒	
B.4 Owner's Manual	☒	☐	☐	ISO 8665:2006
Annex I.C-Noise Emissions				
C.1 Noise Emission Levels	☒	☐	☐	*EN ISO 14509
C.2 Owner's Manual	☐	☒	☐	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) will meet the exhaust emission requirements of Directive 94/25/EC as amended by Directive 2003/44/EC when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions, and that this (these) engine(s) must not be put into service until the recreational craft into which it is (they are) to be installed has been declared in conformity with the relevant provisions of the above mentioned Directives.

Name / function:

Mark D. Schwabero, President, Mercury Marine



Date and place of issue:

April 20, 2012

Fond du Lac, Wisconsin, U.S.A.

Regulatory contact:

Regulations and Product Safety Department

Mercury Marine

W6250 W. Pioneer Road

Fond du Lac, WI 54936

U.S.A.

Identification Record

Please record the following information:

Engine Model and Horsepower		Engine Serial Number
Transom Assembly Serial Number (Sterndrive)	Gear Ratio	Sterndrive Unit Serial Number
Transmission Model (Inboard)	Gear Ratio	Transmission Serial Number
Propeller Number	Pitch	Diameter
Hull Identification Number (HIN)		Purchase Date
Boat Manufacturer	Boat Model	Length
Exhaust Gas Emissions Certification Number		

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

Descriptions and specifications contained herein were in effect at the time this guide was approved for printing. Mercury Marine, whose policies are based on continuous improvement, reserves the right to discontinue models at any time or to change specifications or designs without notice and without incurring obligation.

Mercury Marine, Fond du Lac, Wisconsin, U.S.A.

Welcome

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

With proper care and maintenance, you will 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 Marine products. We sincerely hope your boating will be pleasant!

Mercury Marine

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.

Read This Manual Thoroughly

IMPORTANT: If you do not understand any portion of this manual, contact your dealer. Your dealer can also provide 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 and user to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully.

These safety alerts alone cannot eliminate the hazards that they signal. Strict compliance with these special instructions while performing the service, plus common sense operation, are major accident prevention measures.

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.

Copyright and Trademark Information

© MERCURY MARINE. All rights reserved. Reproduction in whole or in part without permission is prohibited.

Alpha, Axis, Bravo One, Bravo Two, Bravo Three, Circle M with Waves Logo, K-planes, Mariner, MerCathode, MerCruiser, Mercury, Mercury with Waves Logo, Mercury Marine, Mercury Precision Parts, Mercury Propellers, Mercury Racing, MotorGuide, OptiMax, Quicksilver, SeaCore, Skyhook, SmartCraft, Sport-Jet, Verado, VesselView, Zero Effort, Zeus, #1 On the Water and We're Driven to Win are registered trademarks of Brunswick Corporation. Pro XS is a trademark of Brunswick Corporation. Mercury Product Protection is a registered service mark of Brunswick Corporation.

TABLE OF CONTENTS

Section 1 - Warranty

Warranty Information.....	2	What is Not Covered.....	8
Warranty Registration United States and Canada.....	2	Expense of Claiming This Limited Warranty.....	9
Warranty Registration—Outside the United States and Canada.....	2	Transfer of Warranty—Australia and New Zealand Policy.....	9
Transfer of Warranty.....	2	Global Warranty Charts.....	10
Diesel Duty-Cycle Application Definitions	3	United States Warranty Chart—MerCruiser Gas and Diesel.....	10
Warranty Policy—Diesel Models.....	3	Outside United States.....	10
High-Output Recreational Use Limited Warranty.....	3	Canada Warranty Chart—MerCruiser Gas and Diesel.....	11
Light-Duty Commercial Use Worldwide Limited Warranty.....	4	Outside Canada.....	11
3-Year Limited Warranty Against Corrosion—Diesel Models (Recreational Use Only).....	6	Australia and New Zealand Warranty Chart—MerCruiser Gas and Diesel.....	11
Warranty Policy—Australia and New Zealand.....	7	Outside Australia and New Zealand.....	11
MerCruiser Limited Warranty—Australia and New Zealand Policy.....	7	South Pacific Warranty Chart—MerCruiser Gas and Diesel.....	11
What is Covered.....	7	Outside of the South Pacific.....	11
Guarantees Under Australian Consumer Law.....	7	Asia Warranty Chart—MerCruiser Gas and Diesel.....	12
Duration of Coverage for This Limited Warranty.....	7	Outside of Asia.....	12
Warranty Period for Recreational Use.....	7	Europe and the Confederation of Independent States (CIS) Warranty Charts—MerCruiser Gas and Diesel.....	12
Warranty Period for Commercial Use.....	8	Outside Europe and CIS.....	12
Transfer of Coverage.....	8	Middle-East and Africa (excluding South Africa) Warranty Charts—MerCruiser Gas and Diesel.....	12
Termination of Coverage.....	8	Outside Middle-East and Africa.....	12
Conditions That Must Be Met to Obtain Warranty Coverage	8	South Africa Warranty Charts—MerCruiser Gas and Diesel.....	13
What Mercury Will Do.....	8	Outside South Africa.....	13
How to Obtain Warranty Coverage Under This Limited Warranty.....	8		

Section 2 - Getting to Know Your Power Package

Identification.....	16	Remote Controls.....	23
Serial Number Decal.....	16	Panel Mount Features.....	23
Engine Data Label.....	16	Console Mount Features.....	23
Bravo Sterndrive Serial Number and Identification.....	17	Power Trim.....	24
Bravo Transom Serial Number.....	17	Single-Engine Trim and Trailer.....	25
Features And Controls.....	18	Dual-Engine Trim and Trailer.....	25
Audio Warning System.....	18	Trim without Key.....	25
Switches.....	18	Overload Protection—Upper Engine Circuit Breaker Panel.....	25
Lanyard Stop Switch.....	19	Overload Protection—Port Side Power Distribution Box.....	26
Keep the Lanyard Stop Switch and Lanyard Cord in Good Operating Condition.....	20	Vessel Integration Panel (VIP) Overload Protection.....	27
Instrumentation.....	20	Power Trim and MerCathode Overload Protection.....	27
VesselView.....	20	Engine Guardian System.....	28
SmartCraft Speedometer, Tachometer, and Digital Gauges.....	21	SeaCore Equipped Drives.....	28
System Link Digital Gauges.....	21	SeaCore Components and Castings.....	28
Emergency Stop Switch.....	22	Stainless Steel Fasteners.....	28

Section 3 - On the Water

Safe Boating Recommendations.....	32	Stay Clear of Exhaust Areas.....	33
Carbon Monoxide Exposure.....	33	Good Ventilation	33
Be Alert To Carbon Monoxide Poisoning.....	33	Poor Ventilation	34

Important Operation Information.....	34	Boats Having An Open Front Deck.....	39
Launching.....	34	Boats With Front-Mounted, Raised Pedestal Fishing Seats.....	39
Duty Cycle Rating Requirements.....	34	Wave and Wake Jumping.....	39
High-Output Rating.....	34	Impact with Underwater Hazards.....	40
Operation Chart.....	35	Sterndrive Impact Protection.....	40
Freezing Temperature and Cold Weather Operation.....	35	Conditions Affecting Operation.....	41
Drain Plug and Bilge Pump.....	36	Weight Distribution (Passengers and Gear) Inside the Boat.....	41
Trailing the Boat.....	36	Bottom of Boat.....	41
Starting, Shifting, and Stopping.....	36	Cavitation.....	41
Before Starting the Engine.....	36	Ventilation.....	41
Important Information – SmartStart.....	36	Elevation and Climate.....	41
Starting a Cold Engine.....	36	Propeller Selection.....	42
Engine Warm-Up.....	37	Getting Started.....	42
Starting a Warm Engine.....	37	Initial Break-In Procedure.....	42
Shifting.....	38	Sterndrive 10-Hour Break-In Period (New or With Replacement Gears).....	42
Engine Shut Down (Stopping).....	38	Engine Break-In.....	42
Starting the Engine After Stopped While in Gear.....	38	20-Hour Break-In Period.....	42
Protecting People in the Water.....	38	After the 20-Hour Break-In Period.....	43
While You Are Cruising.....	38	End of First Season Checkup.....	43
While Boat Is Stationary.....	38		
High-Speed and High-Performance.....	39		
Passenger Safety In Pontoon Boats And Deck Boats.....	39		

Section 4 - Specifications

Fuel Requirements.....	46	2.8.....	48
Diesel Fuel in Cold Weather.....	46	4.2.....	48
Antifreeze/Coolant.....	46	Bravo Sterndrive Fluid Specifications—Diesel.....	48
Engine Oil.....	47	Power-Assisted Steering and Power Trim Fluids.....	49
Engine Specifications.....	48	Approved Power-Assisted Steering Fluids.....	49
Fluid Specifications.....	48	Approved Power Trim Fluids.....	49
Engine.....	48	Approved Paints.....	49

Section 5 - Maintenance

Owner and Operator Responsibilities.....	52	Filling.....	65
Dealer Responsibilities.....	52	Changing.....	66
Maintenance.....	52	2.8 Air Filter.....	66
Do-It-Yourself Maintenance Suggestions.....	52	Removal.....	66
Inspection.....	52	Inspection.....	67
Maintenance Schedules.....	53	Installation.....	67
Routine Maintenance.....	53	4.2 Air Filter.....	68
Scheduled Maintenance.....	54	Removal.....	68
Engine Oil.....	55	Inspection.....	68
Checking.....	55	Installation.....	69
Filling.....	55	Water-Separating Fuel Filter.....	69
Changing Oil and Filter.....	56	Draining.....	70
Sterndrive Gear Lube.....	58	Replacing.....	70
Checking.....	58	Filling.....	72
Filling.....	58	Fuel System.....	73
Changing.....	59	Priming.....	73
Power Trim Fluid.....	62	Filling (Bleeding).....	73
Checking.....	62	Fuel Tank Cleaning and Flushing.....	74
Filling.....	63	Seawater System.....	74
Changing.....	64	Draining the Seawater System.....	74
Power-Assisted Steering Fluid.....	64	Sterndrive Water Inlets Check.....	76
Checking.....	64	Checking the Seawater Pickups.....	77
Filling.....	65	Cleaning the Seawater Strainer, if Equipped.....	77
Changing.....	65	Flushing the Seawater System—Sterndrive Models.....	79
Engine Coolant.....	65	With the Boat out of the Water.....	79
Check Coolant.....	65	With the Boat in the Water.....	81

Engine Seawater Pump Inspection.....	82	Driveshaft Extension Models.....	97
Replacing the Engine Coolant in the Closed-Cooling System.....	82	Sterndrive, Bellows, and Engine Alignment.....	98
Draining the Closed-Cooling System.....	82	Maintaining Torques.....	99
Filling the Closed-Cooling System.....	83	Bravo Gimbal Ring U-bolt Nuts.....	99
Corrosion Protection.....	84	Engine Mounts.....	100
General Information.....	84	Propellers.....	100
Engine Corrosion Protection Components.....	84	Bravo Sterndrive Propeller Removal.....	100
Removal.....	84	Bravo One Models.....	101
Cleaning and Inspection.....	85	Bravo Two Models.....	101
Installation.....	86	Bravo Three Models.....	102
Sterndrive Corrosion Protection Components.....	87	Bravo Sterndrive Propeller Installation.....	103
Continuity Circuit—Bravo Sterndrive.....	90	Bravo One Models.....	103
MerCathode.....	92	Bravo Three.....	104
Boat Bottom Care.....	93	Drive Belts.....	105
Painting Your Power Package.....	93	Serpentine Belt.....	105
Sterndrive Surface Care.....	94	Inspection.....	105
Lubrication.....	94	Replacement.....	106
Steering System.....	94	Power-Assisted Steering Pump Belt.....	107
Throttle Cable.....	96	Inspection.....	107
Shift Cable.....	96	Adjustment.....	107
Transom Assembly.....	97	Replacement.....	108
Engine Coupler.....	97	Battery.....	109
		Battery Precautions for Multiple Engines.....	109

Section 6 - Storage

Cold Weather (Freezing Temperature), Seasonal Storage, and Extended Storage.....	112	Seasonal Storage Instructions.....	113
Cold Weather (Freezing Temperature) Storage.....	112	Extended Storage Instructions.....	114
Preparing Your Power Package for Seasonal or Extended Storage.....	112	Battery.....	114
		Recommissioning.....	114

Section 7 - Troubleshooting

Diagnosing Electronically Controlled Fuel System Problems.....	118	Battery Will Not Charge.....	119
Troubleshooting Charts.....	118	Remote Control Operates Hard, Binds, Has Excessive Free-play, or Makes Unusual Sounds.....	120
Starter Motor Will Not Crank Engine, or Cranks Slow....	118	Steering Wheel Turns Hard or Jerky.....	120
Engine Will Not Start, or Is Hard to Start.....	118	Power Trim does not Operate (Electric Motor Operates but Sterndrive does not Move).....	120
Engine Runs Rough, Misses, or Backfires.....	118	Power Trim Does Not Operate (Electric Motor Does Not Operate).....	120
Poor Performance.....	119		
Incorrect Engine Temperature.....	119		
Low Engine Oil Pressure.....	119		

Section 8 - Customer Assistance Information

Owner Service Assistance.....	122	Contact Information for Mercury Marine Customer Service.....	123
Local Repair Service.....	122	Customer Service Literature.....	123
Service Away From Home.....	122	English Language.....	123
Stolen Power Package.....	122	Other Languages.....	124
Attention Required After Submersion.....	122	Ordering Literature.....	124
Replacement Service Parts.....	122	United States and Canada.....	124
Parts and Accessories Inquiries.....	122	Outside the United States and Canada.....	124
Resolving a Problem.....	122		

Section 9 - Maintenance Log

Maintenance Log.....	126
----------------------	-----

Section 1 - Warranty

Table of Contents

Warranty Information.....	2	Expense of Claiming This Limited Warranty	9
Warranty Registration United States and Canada.....	2	Transfer of Warranty—Australia and New Zealand Policy	9
Warranty Registration—Outside the United States and Canada.....	2	Global Warranty Charts.....	10
Transfer of Warranty.....	2	United States Warranty Chart—MerCruiser Gas and Diesel.....	10
Diesel Duty-Cycle Application Definitions	3	Outside United States	10
Warranty Policy—Diesel Models.....	3	Canada Warranty Chart—MerCruiser Gas and Diesel	11
High-Output Recreational Use Limited Warranty.....	3	Outside Canada	11
Light-Duty Commercial Use Worldwide Limited Warranty	4	Australia and New Zealand Warranty Chart—MerCruiser Gas and Diesel.....	11
3-Year Limited Warranty Against Corrosion—Diesel Models (Recreational Use Only).....	6	Outside Australia and New Zealand	11
Warranty Policy—Australia and New Zealand.....	7	South Pacific Warranty Chart—MerCruiser Gas and Diesel.....	11
MerCruiser Limited Warranty—Australia and New Zealand Policy.....	7	Outside of the South Pacific	11
What is Covered	7	Asia Warranty Chart—MerCruiser Gas and Diesel.....	12
Guarantees Under Australian Consumer Law	7	Outside of Asia	12
Duration of Coverage for This Limited Warranty	7	Europe and the Confederation of Independent States (CIS) Warranty Charts—MerCruiser Gas and Diesel....	12
Warranty Period for Recreational Use	7	Outside Europe and CIS	12
Warranty Period for Commercial Use	8	Middle-East and Africa (excluding South Africa) Warranty Charts—MerCruiser Gas and Diesel.....	12
Transfer of Coverage	8	Outside Middle-East and Africa	12
Termination of Coverage	8	South Africa Warranty Charts—MerCruiser Gas and Diesel.....	13
Conditions That Must Be Met to Obtain Warranty Coverage	8	Outside South Africa	13
What Mercury Will Do	8		
How to Obtain Warranty Coverage Under This Limited Warranty	8		
What is Not Covered	8		

Warranty Information

Warranty Registration United States and Canada

1. To be eligible for warranty coverage, the product must be registered with Mercury Marine. At the time of sale, the dealer should complete the warranty registration and immediately submit it to Mercury Marine via MercNET, E-mail, or mail. Upon receipt of this warranty registration, Mercury Marine will record the registration.
2. Warranty coverage is not effective until your product is registered with Mercury Marine.
3. You may change your address at any time, including at time of warranty claim, by calling Mercury Marine or sending a letter or fax with your name, old address, new address, and engine serial number to Mercury Marine's Warranty Registration Department. Your dealer can also process this change of information.

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

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

Warranty Registration—Outside the United States and Canada

1. It is important that your selling dealer fills out the warranty registration card completely and mails it to the distributor or Marine Power Service Center responsible for administering the warranty registration and claim program for your area.
2. 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.
3. 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, and should be retained by you for future use when required. Should you ever require warranty service on this product, your dealer may ask you for the warranty registration card to verify date of purchase and to use the information on the card to prepare the warranty claim forms.
4. In some countries, the Marine Power Service Center will issue you a permanent (plastic) warranty registration card within 30 days after receiving the factory copy of the warranty registration card from your distributor 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.
5. For further information concerning the warranty registration card and its relationship to Warranty Claim processing, refer to the International Warranty. See Table of Contents.

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

Transfer of Warranty

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

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

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

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

There is no charge for this service.

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

Diesel Duty-Cycle Application Definitions

Continuous duty: This engine rating will allow for load factors above 65% and will allow the continuous use of full power.

Medium duty: This engine rating will allow for load factors up to 50% and is for applications that use full power for 33% of engine run time (4 hours of full power for every 12 hours of engine run time) with the remainder at cruise speeds.

Recreational or light duty commercial: This engine rating will allow for load factors up to 40 percent and will allow for the engine to use full power for 13% of engine run time (1 hour of full power for every 8 hours of engine run time) with the remainder at cruise speeds.

Warranty Policy–Diesel Models

High-Output Recreational Use Limited Warranty

WHAT IS COVERED: Mercury Marine warrants each new engine/drive package (product) to be free of defects in material and workmanship during the period described following.

DURATION OF COVERAGE: 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. This Limited Warranty provides specific coverage in the regions stipulated in the **Global Warranty Charts** for pleasure (noncommercial) applications, or the accumulation of 1000 hours of operation, whichever occurs first. Commercial use of a product that is registered as a pleasure craft voids the warranty. Commercial use includes any work-related or employment-related use of the product, or any use of the product that generates income during 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 term of this warranty beyond its original expiration date. Unexpired warranty coverage can be transferred from one recreational use customer to a subsequent recreational use customer upon proper registration of the product.

HIGH-OUTPUT RATING: High-output rating applies to variable load applications where full power is limited to one (1) hour out of every eight (8) hours of operation. Reduced power operation (the seven hours out of eight hours in which the engine is not operated at full power) must be at or below cruise speed. Cruise speed is dependant on the engine's maximum engine rated speed (RPM):

Full Power Engine Rated Speed (RPM)	Cruise Speed Reduction from Engine Rated Speed (RPM)
3000 RPM – 115 HP (Tier 2 only)	300 RPM
4000 RPM	400 RPM
This rating is for pleasure (noncommercial) applications that operate 500 hours or fewer per year.	

CONDITIONS THAT MUST BE MET TO OBTAIN WARRANTY COVERAGE: Warranty coverage is available only to retail customers that purchase from a dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified predelivery inspection process is complete 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 registered), may void the warranty at the sole discretion of Mercury Marine. Routine maintenance outlined in the Operation, Maintenance, and Warranty Manual must be timely performed in order to obtain warranty coverage. Mercury Marine reserves the right to make any warranty coverage contingent upon proof of proper maintenance.

WHAT MERCURY WILL DO: Mercury Marine's sole and exclusive obligation under this warranty is limited to, at our option, repairing a defective part, replacing such part or parts with new or Mercury Marine certified remanufactured parts, or refunding the purchase price of the Mercury 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: Warranty claims must be made through a Mercury Marine authorized repair facility. The customer must provide Mercury Marine with a reasonable opportunity to repair and reasonable access to the product for warranty service. The purchaser shall not, unless requested by Mercury Marine, ship the product or parts of the product directly to Mercury Marine.

TERMINATION OF COVERAGE: Warranty coverage may be terminated if:

- The product was repossessed from a retail customer
- Purchased at an auction
- Purchased from a salvage yard
- Purchased from an insurance company that obtained the product as a result of an insurance claim
- Registered with incorrect information

WHAT IS NOT COVERED: This limited warranty does not cover:

- Routine maintenance items
- Adjustments

Section 1 - Warranty

- Normal wear and tear
- Damage caused by abuse
- Damage caused by abnormal use
- Damage caused by the use of a propeller or gear ratio that does not allow the engine to run in its recommended RPM range (see the Operation, Maintenance and Warranty manual)
- Damage caused by operating the product in a manner inconsistent with the recommended operation and duty cycle section of the Operation, Maintenance and Warranty manual
- Damage caused by neglect
- Damage caused by an accident
- Damage caused by submersion
- Damage caused by improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product)
- Damage caused by improper service
- Damage caused by the 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
- Damage caused by the use of fuels, oils, or lubricants that are not suitable for use with the product
- Alteration or removal of parts
- Damage caused by 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
- Damage caused by running the engine out of water
- Mounting the engine too high on the transom
- Damage caused by operating the boat with the engine overtrimmed

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 MAY VARY FROM STATE TO STATE AND COUNTRY TO COUNTRY.

Light-Duty Commercial Use Worldwide Limited Warranty

WHAT IS COVERED: Mercury Marine warrants each new engine/drive package (product) to be free of defects in material and workmanship during the period described following.

DURATION OF COVERAGE: The warranty period begins on the date the product is first sold to a light-duty commercial-use retail purchaser or the date on that the product is first put into service, whichever occurs first. This Limited Warranty provides coverage for one (1) year or 500 hours of use, whichever occurs first. The repair or replacement of parts, or the performance of service under this warranty, does not extend the life of the warranty beyond its original expiration date. Unexpired warranty coverage cannot be transferred.

LIGHT-DUTY COMMERCIAL RATING: Applies to variable load applications where full power is limited to one (1) hour out of every eight (8) hours of operation. Reduced power operation (the 7 hours out of 8 hours in which the engine is not operated at full power) must be at or below cruise speed. Cruise speed is dependant on the engine's maximum engine rated speed (RPM):

Full Power Engine Rated Speed (RPM)	Cruise Speed Reduction from Engine Rated Speed (RPM)
3500–4500 RPM	400 RPM

COMMERCIAL USE: Is defined as any work or employment related use of this 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.

Operation of the product in excess of the light-duty commercial specifications will void the warranty.

CONDITIONS THAT MUST BE MET 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. Routine maintenance outlined in the Operation, Maintenance, and Warranty Manual must be timely performed in order to obtain warranty coverage. Mercury Marine reserves the right to make any warranty coverage contingent upon proof of proper maintenance.

WHAT MERCURY WILL DO: Mercury Marine's sole and exclusive obligation under this warranty is limited to, at our option, repairing a defective part, replacing such part or parts with new or Mercury Marine certified re-manufactured 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: Warranty claims must be made through a Mercury Marine authorized repair facility. The customer must provide Mercury Marine with a reasonable opportunity to repair and reasonable access to the product for warranty service. The purchaser shall not, unless requested by Mercury Marine, ship the product or parts of the product directly to Mercury Marine.

TERMINATION OF COVERAGE: Warranty coverage may be terminated if:

- The product was repossessed from a retail customer
- Purchased at an auction
- Purchased from a salvage yard
- Purchased from an insurance company that obtained the product as a result of an insurance claim
- Registered with incorrect information

WHAT IS NOT COVERED: This limited warranty does not cover:

- Routine maintenance items
- Adjustments
- Normal wear and tear
- Damage caused by abuse
- Damage caused by abnormal use
- Damage caused by the use of a propeller or gear ratio that does not allow the engine to run in its recommended RPM range (see the Operation, Maintenance and Warranty manual)
- Damage caused by operating the product in a manner inconsistent with the recommended operation and duty cycle section of the Operation, Maintenance and Warranty manual
- Damage caused by neglect
- Damage caused by an accident
- Damage caused by submersion
- Damage caused by improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product)
- Damage caused by improper service
- Damage caused by the 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
- Damage caused by the use of fuels, oils, or lubricants that are not suitable for use with the product
- Alteration or removal of parts
- Damage caused by 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
- Damage caused by running the engine out of water
- Mounting the engine too high on the transom
- Damage caused by operating the boat with the engine overtrimmed

Section 1 - Warranty

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 MAY VARY FROM STATE TO STATE AND COUNTRY TO COUNTRY.

3-Year Limited Warranty Against Corrosion—Diesel Models (Recreational Use Only)

WHAT IS COVERED: Mercury Marine warrants that each new recreational use engine/drive package (Product) will not be rendered inoperative as a direct result of corrosion for the period of time described in the following.

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 reregistration of the product. Warranty coverage may be terminated for used product repossessed from a retail customer, purchased at an auction, from a salvage yard, or from an insurance company that obtained the product as a result of an insurance claim.

CONDITIONS THAT MUST BE MET TO OBTAIN WARRANTY COVERAGE: Warranty coverage is available only to retail customers that purchase from a dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified predelivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Corrosion prevention devices specified in the Operation, Maintenance and Warranty manual must be in use on the boat, and routine maintenance outlined in the Operation, Maintenance and 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 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 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; 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.

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.

Warranty Policy—Australia and New Zealand

MerCruiser Limited Warranty—Australia and New Zealand Policy

This Limited Warranty is given by Marine Power International Pty Ltd ACN 003 100 007 of 41–71 Bessemer Drive, Dandenong South, Victoria 3175 Australia (telephone (61) (3) 9791 5822), e-mail: merc_info@mercmarine.com.

What is Covered

Mercury Marine warrants its new products to be free of defects in material and workmanship during the period described below. The benefits to the consumer given by the warranty are in addition to other rights and remedies of the consumer under a law in relation to the goods or services to which the warranty relates.

Guarantees Under Australian Consumer Law

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Duration of Coverage for This Limited Warranty

You are only entitled to claim this Limited Warranty for defects which appear during the relevant warranty period (see the following). Your claim must also be received by us before the warranty period expires.

MerCruiser Petrol Sterndrive and Inboard Engines

- 2-year product warranty
- 3-year corrosion warranty
- 1-year/500 hours product warranty light commercial

MerCruiser SeaCore

- 3-year product warranty
- 4-year corrosion warranty
- 1-year/500 hours product warranty light commercial

MerCruiser TowSport Engines

- 3-year product warranty
- 3-year corrosion warranty
- 1-year/500 hours product warranty light commercial

MerCruiser Diesel

- 2-year product warranty
- 3-year corrosion warranty
- 1-year/500 hours product warranty light commercial

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. The repair or replacement of parts or the performance of service under this warranty does not extend the life of this limited warranty beyond its original expiration date. The warranty period is specific to the model covered. Refer to your model for the base coverage period.

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

Termination of Coverage

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

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

Conditions That Must Be Met to Obtain Warranty Coverage

Warranty coverage under this Limited Warranty 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 predelivery 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 registered) 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, and 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 Will Do

Mercury Marine's sole and exclusive obligation under this Limited 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 Under This Limited Warranty

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. A list of dealers and their contact details is available at <http://www.mercurymarine.com.au/home.aspx>. If the purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury Marine at the address shown above. Mercury Marine will then arrange for the inspection and any covered repair. This Limited Warranty will not cover the purchaser for all related transportation charges and travel time. If the service provided is not covered by this limited warranty, the purchaser shall pay for all related labor and material and any other expenses associated with that service, provided that a consumer will not be obligated to pay where the service has been carried out to remedy a failure of an acceptable quality guarantee which is binding on Mercury Marine under the Australian Consumer Law. 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 under this Limited Warranty.

What is Not Covered

This limited warranty does not cover the following:

- Operating the boat with the engine over trimmed
- 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. Refer to the Operation, Maintenance, and Warranty manual.
- Operation of the product in a manner inconsistent with the recommended operation and duty cycle section of the Operation, Maintenance, and Warranty manual.

- Neglect
- Accident
- Submersion
- Improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product)
- Improper service
- Use of an accessory or part that was not manufactured or sold by Mercury Marine that causes damage to the Mercury product
- Jet pump impellers and liners
- Operation with fuels, oils, or lubricants that are not suitable for use with the product. Refer to the Operation, Maintenance, and 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

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 this limited 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 limited 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 limited 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.

Expense of Claiming This Limited Warranty

This Limited Warranty does not cover any expenses you may incur claiming the warranty.

DISCLAIMERS AND LIMITATIONS

EXCEPT FOR APPLICABLE GUARANTEES AND OTHER RIGHTS AND REMEDIES THAT A CONSUMER MAY HAVE UNDER THE AUSTRALIAN CONSUMER LAW OR OTHER LAW IN RELATION TO WHICH THE PRODUCTS RELATE, 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 LIMITED WARRANTY.

Transfer of Warranty—Australia and New Zealand Policy

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 hull identification number (HIN) to Mercury Marine's Warranty Registration Department. In Australia and New Zealand, mail to:

Section 1 - Warranty

Mercury Marine
Attn: Warranty Registration Department
Brunswick Asia Pacific Group
Private Bag 1420
Dandenong South, Victoria 3164
Australia

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.

You may change your address at any time, including at the time of the warranty claim, by calling Mercury Marine or sending a letter or fax with your name, old address, new address, and hull identification number (HIN) to Mercury Marine's Warranty Registration Department.

Global Warranty Charts

United States Warranty Chart—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Installation Quality Certification Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	1 year	2 years	3 years	Contact the Marine Power Service Center closest to you
MerCruiser TowSport	2 years	3 years	3 years	
MerCruiser SeaCore	3 years	4 years	4 years	
MerCruiser Inboard 5.7 - 6.2 MPI, 8.2 H.O.	1 year	3 years	3 years	
MerCruiser Inboard 5.7 - 6.2 - 8.2 horizon	3 years	4 years	3 years	
Mercury Diesel Sterndrive and Inboard	2 years	Not available at time of printing	3 years	

Outside United States

For product purchased outside of United States, contact the distributor in your country, or the authorized Marine Power Service Center closest to you.

Canada Warranty Chart—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Installation Quality Certification Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	1 year	2 years	3 years	Contact the Marine Power Service Center closest to you
MerCruiser TowSport	2 years	3 years	3 years	
MerCruiser SeaCore	3 years	4 years	4 years	
MerCruiser Inboard 5.7 - 6.2 MPI, 8.2 H.O.	1 year	3 years	3 years	
MerCruiser Inboard 5.7 - 6.2 - 8.2 horizon	3 years	4 years	3 years	
Mercury Diesel Sterndrive and Inboard	2 years	Not available at time of printing	3 years	

Outside Canada

For product purchased outside of Canada, contact the distributor in your country, or the authorized Marine Power Service Center closest to you.

Australia and New Zealand Warranty Chart—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	2 years	3 years	Contact the Marine Power Service Center closest to you
MerCruiser SeaCore	3 years	4 years	
MerCruiser TowSport	3 years	3 years	
Mercury Diesel Sterndrive and Inboard	2 years	3 years	

Outside Australia and New Zealand

For product purchased outside of Australia and New Zealand, contact the distributor in your country, or the authorized Marine Power Service Center closest to you.

South Pacific Warranty Chart—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	2 years	3 years	Contact the Marine Power Service Center closest to you
Mercury Diesel Sterndrive and Inboard	2 years	3 years	

Outside of the South Pacific

For product purchased outside of the South Pacific, contact the distributor in your country, or the authorized Marine Power Service Center closest to you.

Asia Warranty Chart—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Gasoline Sterndrive and Inboard	1 year	3 years	Contact the Marine Power Service Center closest to you
Mercury Diesel Sterndrive and Inboard	1 year	3 years	

Outside of Asia

For product purchased outside of the Asian region, contact the distributor in your country, or the Marine Power Service Center closest to you.

Europe and the Confederation of Independent States (CIS) Warranty Charts—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Installation Quality Certification Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	2 years	3 years	3 years	Contact the Marine Power Service Center closest to you
Horizon, Scorpion, SeaCore	3 years	4 years	3 years	
Mercury Diesel Sterndrive and Inboard	2 years	Not available at time of printing	3 years	

Outside Europe and CIS

For products purchased outside of Europe and CIS regions, contact the distributor in your country, or the Marine Power Service Center closest to you.

Middle-East and Africa (excluding South Africa) Warranty Charts—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Installation Quality Certification Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	1 year	2 years	3 years	Contact the Marine Power Service Center closest to you
Horizon, Scorpion, SeaCore	2 years	3 years	4 years	
Mercury Diesel Sterndrive and Inboard	1 year	Not available at time of printing	3 years	

Outside Middle-East and Africa

For products purchased outside of Middle-East and Africa regions, contact the distributor in your country, or the Marine Power Service Center closest to you.

South Africa Warranty Charts—MerCruiser Gas and Diesel

Product	Standard Limited Warranty	Installation Quality Certification Warranty	Standard Limited Corrosion Warranty	Commercial Application
MerCruiser Sterndrive and Inboard	1 year	2 years	3 years	Contact the Marine Power Service Center closest to you
Horizon, Scorpion, SeaCore	2 years	3 years	4 years	
Mercury Diesel Sterndrive and Inboard	1 year	Not available at time of printing	3 years	

Outside South Africa

For products purchased outside of South Africa, contact the distributor in your country, or the Marine Power Service Center closest to you.

Notes:

Section 2 - Getting to Know Your Power Package

Table of Contents

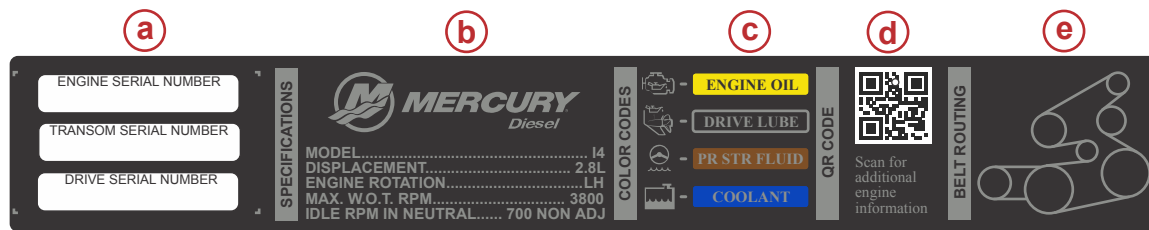
Identification.....	16	Remote Controls.....	23
Serial Number Decal.....	16	Panel Mount Features	23
Engine Data Label.....	16	Console Mount Features	23
Bravo Sterndrive Serial Number and Identification.....	17	Power Trim.....	24
Bravo Transom Serial Number.....	17	Single-Engine Trim and Trailer	25
Features And Controls.....	18	Dual-Engine Trim and Trailer	25
Audio Warning System.....	18	Trim without Key.....	25
Switches.....	18	Overload Protection—Upper Engine Circuit Breaker	
Lanyard Stop Switch.....	19	Panel.....	25
Keep the Lanyard Stop Switch and Lanyard Cord in		Overload Protection—Port Side Power Distribution Box	
Good Operating Condition	20		26
Instrumentation.....	20	Vessel Integration Panel (VIP) Overload Protection.....	27
VesselView	20	Power Trim and MerCathode Overload Protection.....	27
SmartCraft Speedometer, Tachometer, and Digital		Engine Guardian System.....	28
Gauges	21	SeaCore Equipped Drives.....	28
System Link Digital Gauges	21	SeaCore Components and Castings.....	28
Emergency Stop Switch.....	22	Stainless Steel Fasteners.....	28

Identification

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

Serial Number Decal

The serial number decal is located on top of the engine cover.



54680

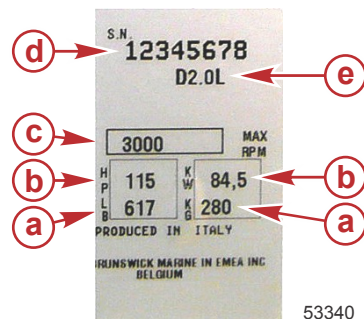
2.8 shown, 4.2 similar

- a - Serial numbers
- b - Engine specifications
- c - Maintenance color codes
- d - Quick reference code
- e - Belt routing

Engine Data Label

A tamper-resistant engine data label is affixed to the engine at the time of manufacture. It contains important information. Note that the engine data label will not affect the fit, function, or performance of the engine and neither boatbuilders nor dealers may remove the engine data label or the engine component it is affixed to before sale. If modifications are necessary or the engine data label is damaged, contact Mercury Marine about the availability of a replacement.

The owner or operator is not to modify the engine in any manner that would alter the horsepower or allow exhaust gas emission levels to exceed their predetermined factory specifications.



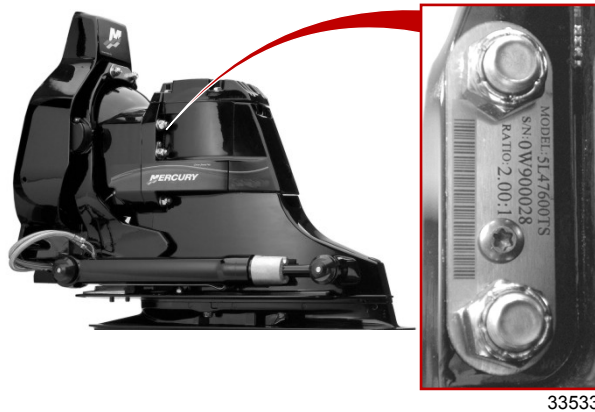
53340

Engine data label example

- a - Engine weight
- b - Engine power rating
- c - Maximum engine speed (RPM)
- d - Engine serial number
- e - Abbreviated engine description

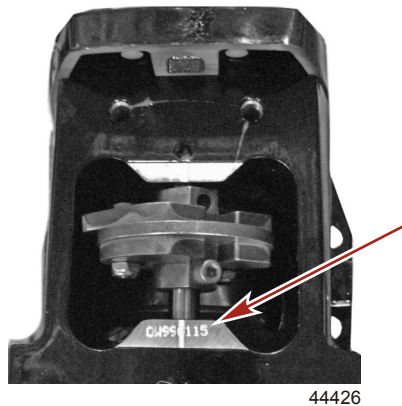
Bravo Sterndrive Serial Number and Identification

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

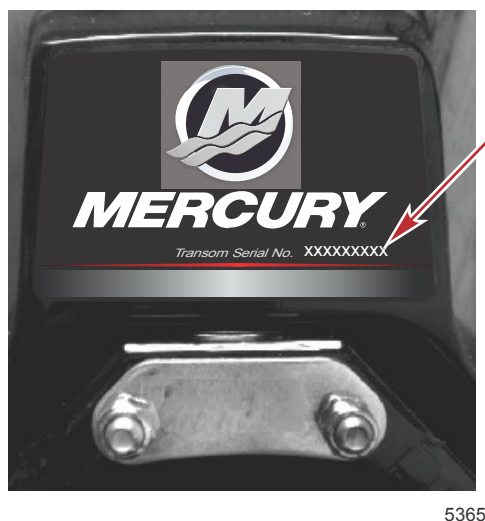
The serial number is also stamped on the driveshaft housing behind the back cover. This is used as a permanent reference for authorized MerCruiser dealers.



Bravo sterndrive serial number stamping

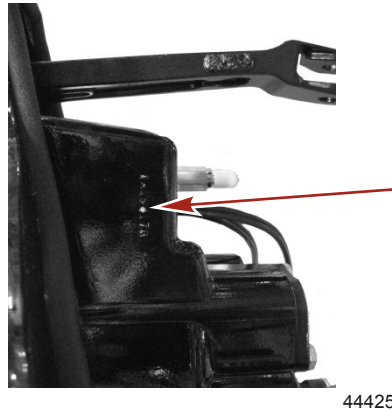
Bravo Transom Serial Number

The Bravo transom serial number is stamped in the transom assembly decal.



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.



Serial number location on gimbal housing

Features And Controls

Audio Warning System

Your power package is equipped with an audio warning system. The audio warning system monitors critical components and informs the operator when a malfunction has occurred. The warning system is not capable of protecting the power package from damage caused by a malfunction.

When an electronic control system detects a recordable malfunction, the audio warning system will sound to alert the operator. The duration and type of horn sound depend upon the nature of the fault condition. In the case of any horn sounding, the user should refer to the helm displays to understand the specific situation.

For the operator to view the fault code of the malfunction indicated and any recommended actions, the power package must be equipped with a gauge package that supports the warning system and can display fault codes.

The following instruments have screens that display fault codes:

- VesselView
- SmartCraft System Tachometer
- SmartCraft System Speedometer

NOTICE

The sound from an audio warning horn indicates that a critical fault malfunction has occurred. Operating a power package with a critical fault can damage components. If the audio warning horn emits a sound, do not continue operations unless avoiding a hazardous situation.

If the audio warning sounds, stop the engine immediately if you are not in a hazardous situation. Investigate the cause and correct it, if possible. If you cannot determine the cause, consult an authorized repair facility.

Switches



Four position key switch

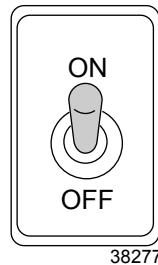
- **"OFF"** In the "OFF" position, all electrical circuits are off. The engine will not operate with the key switch in the "OFF" position.
- **"ACC"** In the "ACC" position, any accessory connections to the electrical circuits can be operated. The engine will not operate with the key switch in the "ACC" position.
- **"ON"** In the "ON" position, all electrical circuits and instrumentation receive power. The engine can be started with an optional start stop switch.
- **"START"** Turn the key to the start position and release to start the engine.

NOTE: The key can only be removed with the key switch in the "OFF" position.



Dual engine start-stop switch

A start-stop switch is optional equipment. The start-stop switch works in conjunction with the key switch. There is one start-stop switch for each engine. Each button on a multi-engine start-stop switch functions independently. The key switch must be in the run position to start a stopped engine with the the start-stop switch. Pressing a start-stop switch button when an engine is running will shut down the corresponding engine.



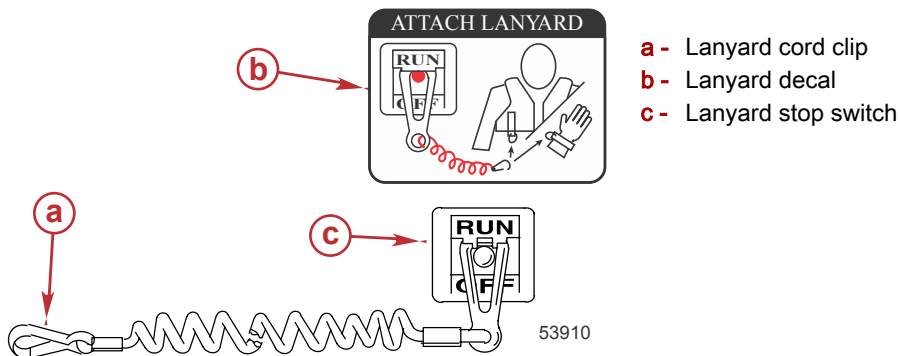
Typical bilge blower toggle switch

Operates the bilge blower, if equipped

Lanyard Stop Switch

A lanyard switch is designed to shut down the engine in the event the operator unexpectedly moves away from the helm, as may happen in an accidental ejection. The lanyard is connected to the operator's personal flotation device or wrist.

A decal near the lanyard stop switch reminds the operator to attach the lanyard to his or her personal flotation device or wrist.



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

- Low-sided sport boats

Section 2 - Getting to Know Your Power Package

- 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
- Carelessness caused by consuming alcohol or drugs
- High-speed boating maneuvers

The lanyard is a cord usually between 122 and 152 cm (4 and 5 ft) long 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 operator's normal position. The operator can shorten the lanyard by wrapping the lanyard around his wrist, or by tying 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 its velocity. While the boat is coasting, it can cause injury to anyone in the boat's path as it would under power.

Instruct all passengers on the proper starting and operating procedures should they be required to operate the boat in an emergency.

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.

Keep the Lanyard Stop Switch and Lanyard Cord in Good Operating Condition

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

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

Instrumentation

VesselView

Your power package may be connected to a SmartCraft VesselView display. VesselView 7 is a comprehensive boat information center that can display information for up to four gasoline or diesel engines. It continuously monitors and reports basic operating data including detailed information such as seawater temperature and depth, trim status, boat speed and steering angle, and the status of fuel, oil, water, and waste tanks.

VesselView can be fully integrated with a vessel's global positioning system (GPS) or other NMEA-compatible device to provide up-to-the-minute navigation, speed, and fuel-to-destination information.

VesselView 4 and 7 are equipped with a micro SD card port that allows an authorized OEM or dealership to import the personality configuration. It can also be used by the owner to import pictures or graphics. When more than one VesselView is used, either as a triple or quad-engine application for multiple helms, the same micro SD card can be used to download those configurations.



52421

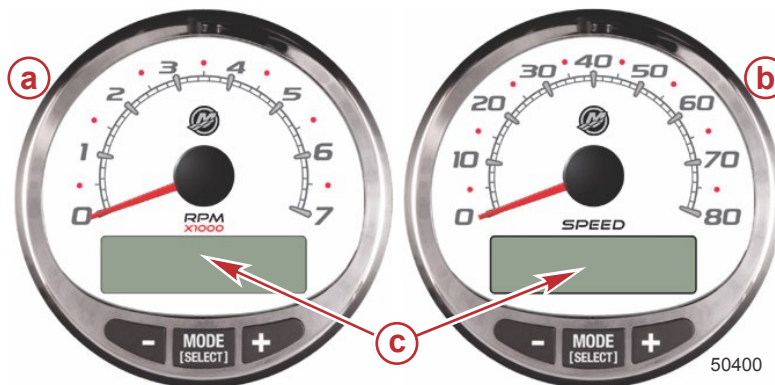
VesselView

Refer to your VesselView operations manual for detailed instructions on how to operate this display.

SmartCraft Speedometer, Tachometer, and Digital Gauges

The SmartCraft instrument package augments the information provided by VesselView. The instrument package may display:

- Engine RPM
- Boat speed
- Coolant temperature
- Oil pressure
- Battery voltage
- Fuel consumption
- Engine operating hours



50400

SmartCraft tachometer and speedometer

- a - Tachometer
- b - Speedometer
- c - LCD display

The SmartCraft instrument package also aids in identifying the fault codes associated with the engine audio warning system. The SmartCraft instrument package displays critical engine alarm data and other potential problems on its LCD display.

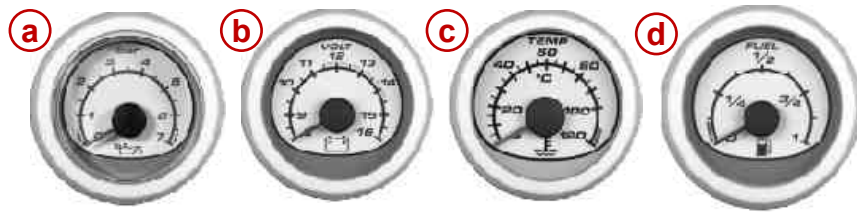
For basic operation information on the SmartCraft instrument package and for details on the warning functions monitored by the system, refer to the manual provided with your gauge package.

System Link Digital Gauges

Some instrumentation packages include gauges that augment the information provided by VesselView and the SmartCraft tachometer and speedometer. The owner and operator should be familiar with all the instruments and their functions on the boat. Have your boat dealer explain the gauges and normal readings that appear on your boat.

Section 2 - Getting to Know Your Power Package

The following types of digital gauges may be included with your power package.



37925

System Link digital gauges

Item	Gauge	Indicates
a	Oil pressure gauge	Engine oil pressure
b	Voltmeter	Battery voltage
c	Water temperature gauge	Engine operating temperature
d	Fuel gauge	Quantity of fuel in tank

Emergency Stop Switch

An emergency stop (E-stop) switch is used to turn off the engines in an emergency situation, such as a person overboard or a tangled propeller. When activated, an E-stop switch interrupts the power supply to the engine and transmission. If the boat is equipped with an E-stop switch, the E-stop switch turns off all of the engines.



35308

Typical E-stop switch

Activation of an E-stop switch stops the engine, or engines, immediately, but the boat can continue to coast for some distance depending upon the velocity and degree of any turn at shutdown. 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 recommend instructing other occupants on proper starting and operating procedures should they need to operate the engine in an emergency.

Accidental or unintended activation of the switch during normal operation is also possible, which can cause any or all of the following potentially hazardous situations:

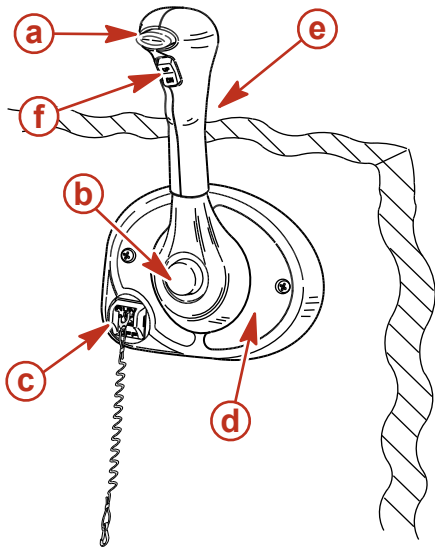
- Occupants can be thrown forward due to unexpected loss of forward motion, and passengers in the front of the boat could be ejected over the bow and possibly struck by the propulsion or steering components.
- The operator can lose power and directional control in heavy seas, strong current, or high winds.
- The operator can lose control of the vessel when docking.

Restarting an engine using the key switch or start button after an E-stop shutdown without first turning the key switch to the off position for at least 30 seconds will restart the engine but cause fault codes to be set. Unless you are in a potentially hazardous situation, turn the key switch off and wait at least 30 seconds before restarting the engine or engines. If after restarting, some fault codes are still being displayed, contact your authorized Mercury Diesel repair facility.

Remote Controls

Your boat may be equipped with 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



mc77019-1

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

Neutral lock button. Prevents accidental shift and throttle engagement. The 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.

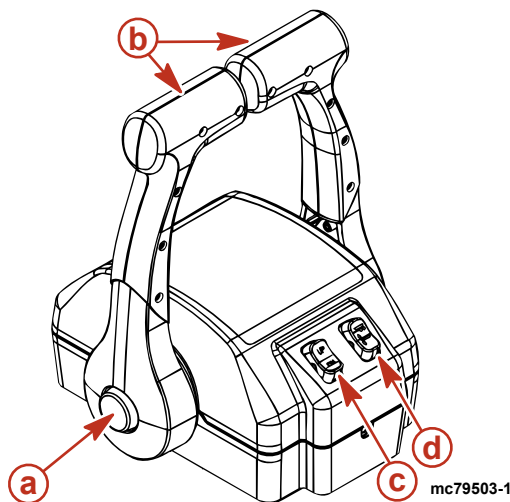
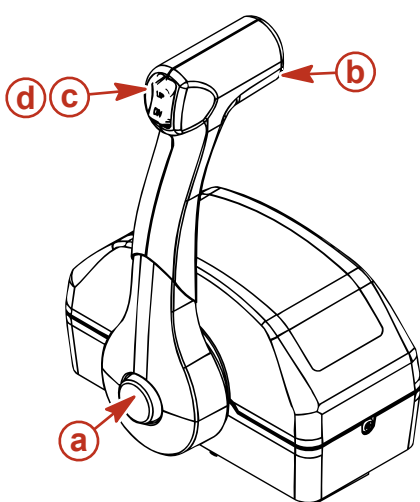
Lanyard stop switch. Turns the ignition off whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. See **Lanyard Stop Switch** for information on the use of this switch.

Control handle. 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 the instructions provided with the remote control for complete adjustment instructions.

Trim (tilt) button. See **Power Trim**.

Console Mount Features



- a - Throttle-only button
- b - Control handle
- c - Power trim switch
- d - Trailer switch

mc79503-1

Section 2 - Getting to Know Your Power Package

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.

Control handles. 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 the instructions provided with the remote control for complete adjustment instructions.

Power trim switch. See the **Power Trim** section for detailed power trim operating procedures.

Trailer switch. Used to raise the sterndrive for trailering, launching, beaching, or shallow water operation. See **Power Trim** for detailed trailer switch operation.

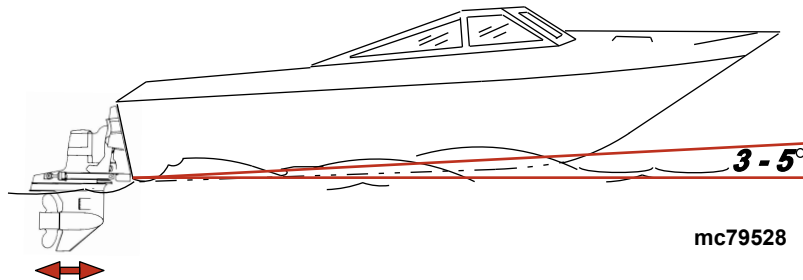
Power Trim

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 for trailering, beaching, launching, low-speed (below 1200 RPM engine speed), and shallow water operation.

⚠ WARNING

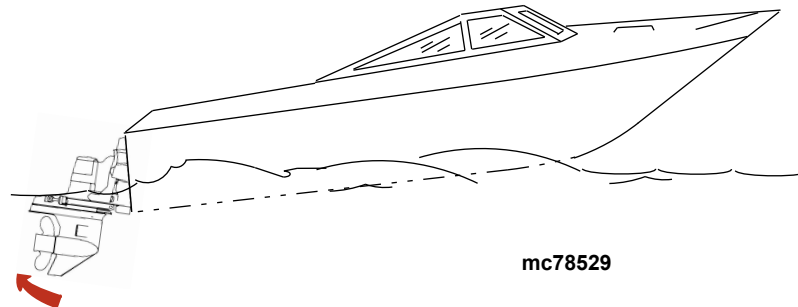
Excessive trim can cause serious injury or death at high speeds, and single-ram trim systems do not provide a trim-out limiting device or trim indicator. Use caution when trimming with a single-ram trim system and never trim out beyond the unit's side support flanges while the boat is underway or at engine speeds above 1200 RPM.

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



Trimming the sterndrive up (out) can:

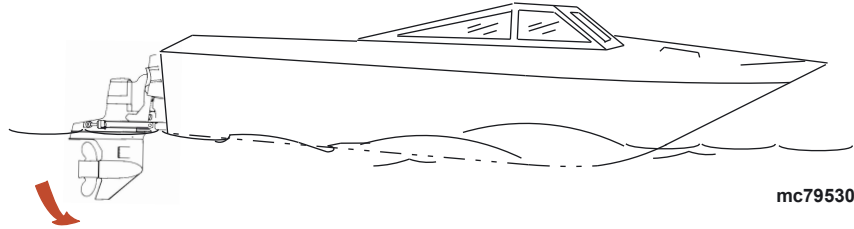
- Generally increase top speed
- Increase clearance over submerged objects or a shallow bottom
- Cause the boat to accelerate and plane off slower
- In excess, cause boat porpoising (bouncing) or propeller ventilation
- Cause engine overheating if trimmed up (out) to a point where any cooling water intake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



Trimming the sterndrive 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 excessively trimmed down (in), may lower the bows 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 and Trailer

Single-engine applications have a button that can be pressed to trim the sterndrive up (out) or down (in).

To raise the sterndrive for trailering, beaching, launching, low-speed (below 1200 RPM), and shallow water operation, push the trim button to raise the sterndrive 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 Engine Control Module (ECM) limits the extent to which the sterndrive can be trimmed up (out) when engine speed is above 1200 RPM.

Dual-Engine Trim and 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 sterndrives simultaneously or may have separate buttons for each sterndrive.

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

Trim without Key

CAUTION

The Trim Without Key mode allows trim operation after the ignition key switch is turned off. To avoid injury or product damage, do not attempt any engine- or sterndrive-related repairs or maintenance until performing the Wide Open Throttle Reverse operation to end the Trim Without Key mode.

Trim without key allows trim operation for up to 15 minutes after the ignition key switch is turned off. On multi-engine applications, the trim without key time 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 with the key off.

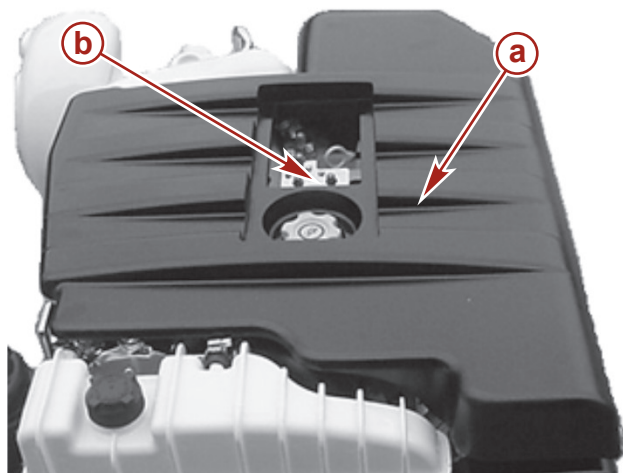
Overload Protection—Upper Engine Circuit Breaker Panel

If an electrical overload occurs, a fuse will burn out (blow) or a circuit breaker will trip open. Find and correct the cause for the electrical overload before replacing the fuse or resetting the circuit breaker.

NOTE: In an emergency, when the engine must be operated and the cause for the high current draw cannot be located and corrected, turn off or disconnect all the accessories connected to the engine and instrumentation wiring. Reset the circuit breaker. If the breaker remains open, the electrical overload has not been eliminated. Further checks must be made on the electrical system. Contact your Mercury Diesel authorized repair facility.

Section 2 - Getting to Know Your Power Package

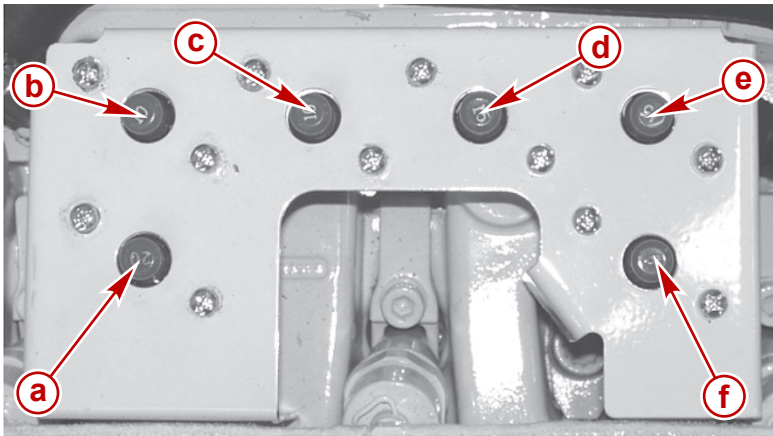
Circuit breakers provide protection for the engine electrical system. The circuit breaker panel is located beneath a small access panel in the engine cover on top of the engine.



Typical engine cover with access panel
a - Engine cover
b - Circuit breakers

24727

After finding and correcting the cause of the overload, reset the circuit breaker by pressing the reset button.



23245

Circuit breakers viewed from the port side of the engine

Reference	Circuit breaker rating	Protection	Location on fuse panel
a	20 A	Key unswitched power to helm	Lower left
b	10 A	Switched power to ECM	Upper left
c	10 A	Key switch to ECM	Middle left
d	15 A	Switched power to ECM	Middle right
e	15 A	ECM switched power to SIM	Upper right
f	5 A	Power—diagnostic connector	Lower right

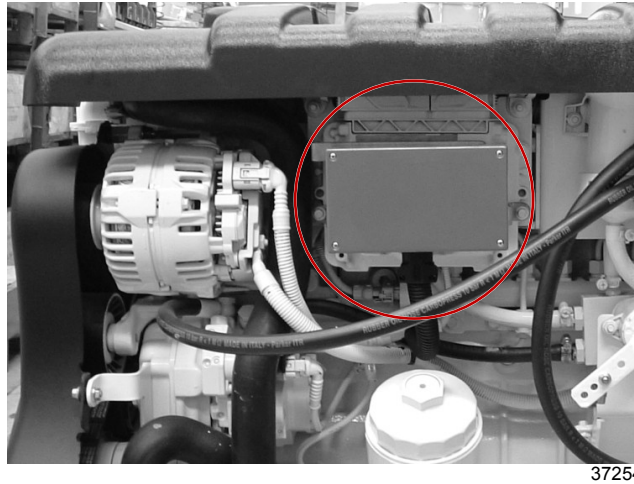
Overload Protection—Port Side Power Distribution Box

If an electrical overload occurs, a fuse will burn out (blow) or a circuit breaker will trip open. Find and correct the cause for the electrical overload before replacing the fuse or resetting the circuit breaker.

NOTE: In an emergency, when the engine must be operated and the cause for the high current draw cannot be located and corrected, turn off or disconnect all the accessories connected to the engine and instrumentation wiring. The circuit breaker should automatically reset. If the breaker remains open, the electrical overload has not been eliminated. Further checks must be made on the electrical system. Contact your Mercury Diesel authorized repair facility.

Circuit breakers provide protection for the engine electrical system as indicated. The circuit breaker panel is located within a power distribution box mounted on the engine control module.

After finding and correcting the cause of the overload, connect the starting battery and turn the ignition switch to the run position. The circuit breaker should automatically reset. If a circuit breaker fails to reset, contact your Mercury Diesel authorized repair facility



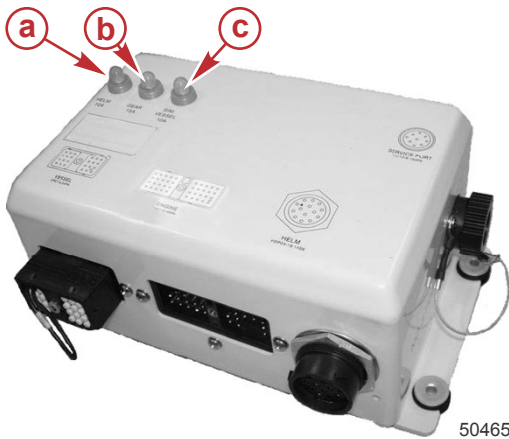
37254

Port Side Power Distribution Box

Circuit Protection	Circuit Breaker Rating
Key unswitched power to helm	20 A
Switched power to ECM	10 A
Key switch to ECM	10 A
Switched power to ECM	15 A
ECM switched power to SIM	15 A
Power—diagnostic connector	5 A

Vessel Integration Panel (VIP) Overload Protection

A vessel integration panel (VIP) is typically mounted in the engine compartment. The VIP contains three circuit breakers that help protect system wiring.



50465

- a** - Helm circuit breaker (10 A)
- b** - Gear circuit breaker (15 A)
- c** - SIM/Vessel circuit breaker (10 A)

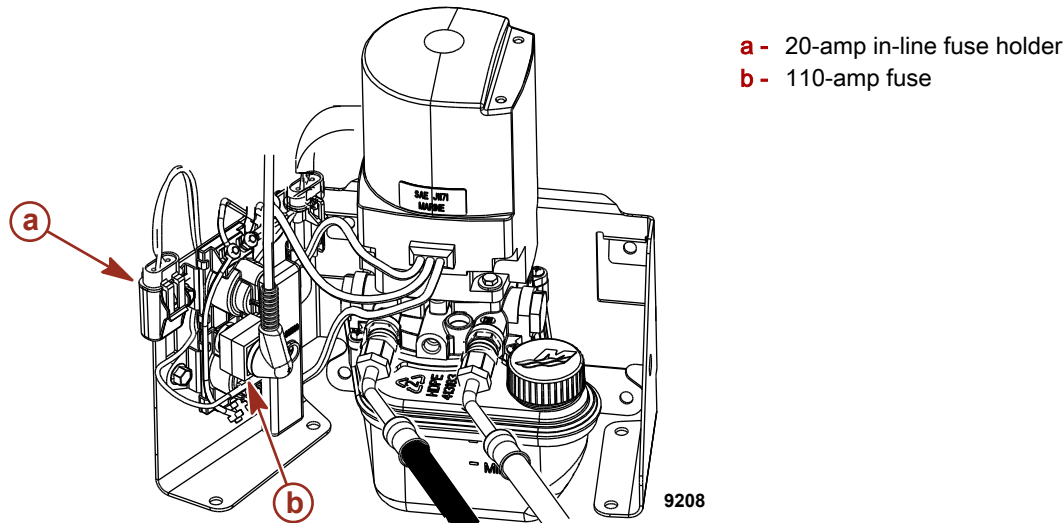
Power Trim and MerCathode Overload Protection

If an electrical overload on the electrical system occurs, a fuse will open (blow). Find and correct the cause before replacing the fuse.

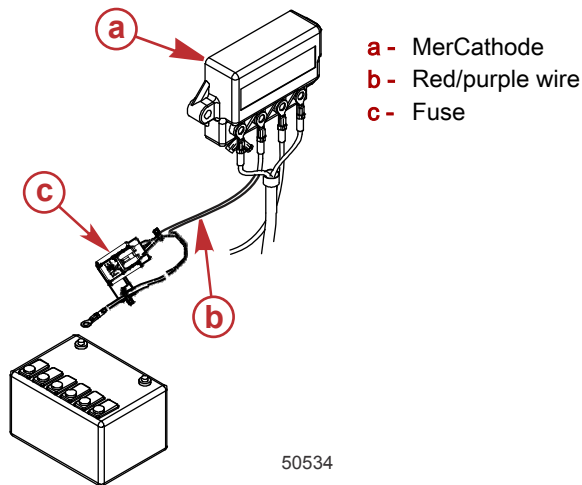
NOTE: If you must operate the engine in an emergency, turn off and disconnect all accessories from the engine and instrumentation wiring in an attempt to isolate the electrical overload or excessive current draw. Replace the fuse. If the fuse burns out, the electrical overload has not been eliminated and further checks must be made on the electrical system. Contact your Mercury Diesel authorized repair facility.

Section 2 - Getting to Know Your Power Package

1. The power trim system is protected from overload by a 110-amp fuse and a 20-amp in-line fuse on the power trim pump.



2. The MerCathode system has a fuse connected to the positive (+) terminal on the controller. If the fuse is open (blown), the system will not operate, resulting in a loss of corrosion protection. Replace the fuse with one of the same amp rating.



Engine Guardian System

The Engine Guardian system monitors the critical sensors on the engine for any early indications of problems. Engine Guardian is functional whenever your engine is operating, so you never have to be concerned about whether or not you are protected. The system will respond to a problem by sounding the warning horn for six seconds and/or reducing engine power in order to provide engine protection.

If Engine Guardian has been activated, reduce the engine speed. The problem will need to be identified and corrected. The system must be reset before the engine will operate at higher speeds. Moving the throttle lever back to the idle position will reset the Engine Guardian system. If the Engine Guardian system has determined the reset has not corrected the problem, Engine Guardian will remain activated, limiting the throttle. The problem must be identified and corrected before Engine Guardian will allow the engine to reach a normal operating RPM.

SeaCore Equipped Drives

SeaCore Components and Castings

Mercury MerCruiser SeaCore power packages are equipped with additional stainless steel components and particular aluminum castings with special coatings. Do not replace SeaCore components with non-SeaCore. Use only the specified Mercury MerCruiser SeaCore components and castings on these power packages.

Stainless Steel Fasteners

SeaCore models are equipped with additional stainless steel fasteners to maximize corrosion resistance in saltwater environments.

Stainless steel fasteners are subject to galling when installed without lubrication. Galling can result in fastener destruction, improper clamp loads, or both. Galled fasteners may appear to torque properly, but still have incorrect clamp loads.

Apply lubricant 2-4-C with PTFE or an equivalent, on the threads of stainless steel fasteners during installation to avoid galling. Lubricate at least the first 8 mm (1/4 in.) of the threads before installation.

Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Threads of stainless steel fasteners	92-802859A 1

Notes:

Section 3 - On the Water

Table of Contents

Safe Boating Recommendations.....	32	While Boat Is Stationary	38
Carbon Monoxide Exposure.....	33	High-Speed and High-Performance.....	39
Be Alert To Carbon Monoxide Poisoning	33	Passenger Safety In Pontoon Boats And Deck Boats...	39
Stay Clear of Exhaust Areas	33	Boats Having An Open Front Deck	39
Good Ventilation	33	Boats With Front-Mounted, Raised Pedestal Fishing	
Poor Ventilation	34	Seats	39
Important Operation Information.....	34	Wave and Wake Jumping.....	39
Launching.....	34	Impact with Underwater Hazards.....	40
Duty Cycle Rating Requirements.....	34	Sterndrive Impact Protection	40
High-Output Rating.....	34	Conditions Affecting Operation.....	41
Operation Chart.....	35	Weight Distribution (Passengers and Gear) Inside the	
Freezing Temperature and Cold Weather Operation....	35	Boat.....	41
Drain Plug and Bilge Pump.....	36	Bottom of Boat.....	41
Trailing the Boat.....	36	Cavitation.....	41
Starting, Shifting, and Stopping.....	36	Ventilation.....	41
Before Starting the Engine.....	36	Elevation and Climate.....	41
Important Information – SmartStart.....	36	Propeller Selection.....	42
Starting a Cold Engine.....	36	Getting Started.....	42
Engine Warm-Up.....	37	Initial Break-In Procedure.....	42
Starting a Warm Engine.....	37	Sterndrive 10-Hour Break-In Period (New or With	
Shifting.....	38	Replacement Gears).....	42
Engine Shut Down (Stopping).....	38	Engine Break-In.....	42
Starting the Engine After Stopped While in Gear.....	38	20-Hour Break-In Period	42
Protecting People in the Water.....	38	After the 20-Hour Break-In Period	43
While You Are Cruising	38	End of First Season Checkup.....	43

Safe Boating Recommendations

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 U.S., 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 U.S., 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 onboard.

- 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
- ☐ Radio
- ☐ Paddle or oar
- ☐ Spare propeller, thrust hubs, and an appropriate wrench
- ☐ First aid kit and instructions
- ☐ Waterproof storage containers
- ☐ Spare operating equipment, batteries, bulbs, and fuses
- ☐ Compass and map or chart of the area
- ☐ Personal flotation device (one per person onboard)

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 onboard, plus a throwable cushion or ring. We strongly advise that everyone wear a life jacket at all times while in the boat.

Prepare other boat operators.

- Instruct at least one person onboard 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's capacity plate). Know your boat's operating and loading limitations. Know if your boat will float if it is full of water. When in doubt, contact your authorized Mercury Marine 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. Passengers should not sit or ride 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 operate a boat while under the influence of alcohol or drugs. It is the law.

- Alcohol or drugs can 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 operator's 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.

- Your boat traveling at 40 km/h (25 mph) will overtake a fallen skier who is 61 m (200 ft) in front of you in five seconds.

Watch fallen skiers.

- When using your boat for waterskiing or similar activities, always keep a fallen or down skier on the operator's side of the boat while returning to 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.

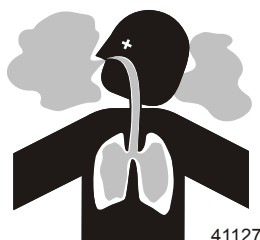
Early symptoms of carbon monoxide poisoning, which are similar to the symptoms of seasickness and intoxication, include headache, dizziness, drowsiness, and nausea.

⚠ 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

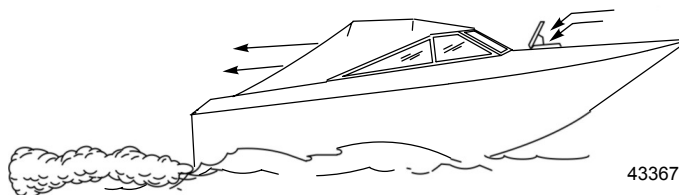


Engine exhaust gases contain harmful carbon monoxide. Avoid areas of concentrated engine exhaust gases. When engines are running, keep swimmers away from the boat, and do not sit, lie, or stand on swim platforms or boarding ladders. While underway, do not allow passengers to be positioned immediately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

Good Ventilation

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

Example of desired air flow through the boat:

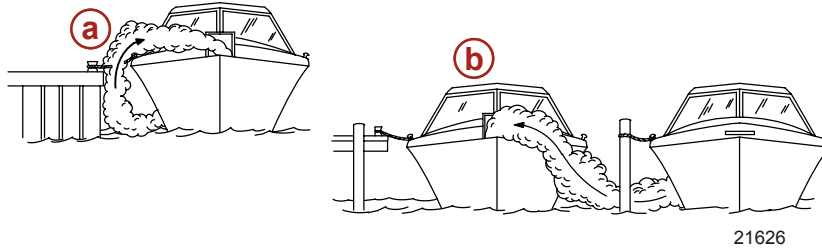


Poor Ventilation

Under certain running 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.

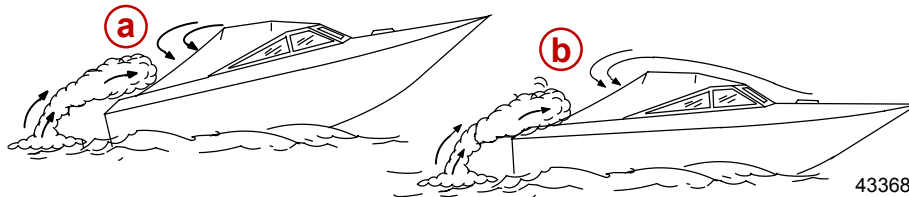
Although the occurrence is rare, on a very calm day, swimmers and passengers in an open area of a stationary boat that contains or is near a running engine may be exposed to a hazardous level of carbon monoxide.

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



- 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:



- 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)

Important Operation Information

Launching

IMPORTANT: Install the bilge drain plug before launching the boat.

Duty Cycle Rating Requirements

IMPORTANT: Damage caused by incorrect application or failure to operate the power package within the specified operating parameters will not be covered by the Mercury Marine Limited Warranty.

Mercury Diesel engines must be used in applications that meet the operation specifications indicated by a Mercury Diesel product application engineer. The power package must be equipped with a gear ratio and propeller that allows the engine to operate at wide open throttle (WOT) at the engine's rated speed (RPM). Use of Mercury Diesel engines in applications that do not meet specified operational parameters is not approved.

High-Output Rating

A **High-output rating** applies to pleasure (nonrevenue generating) applications that operate 500 hours or less per year, where full power is limited to one (1) hour out of every eight (8) hours of operation. Reduced power operation must be at or below cruise speed (RPM). Cruise speed is dependant on the engine's maximum rated speed (RPM).

Operation Chart

Starting Procedure	After Starting	While Underway	Stopping and Shut Down
Open the engine hatch. Air out the bilge completely.	Observe all instrumentation to monitor the condition of the engine. If not normal, stop the engine.	Frequently review all instrumentation to monitor engine condition.	Shift the remote control lever to the neutral position.
Turn the battery switch on, if equipped.	Check for fuel, oil, water, fluid, and exhaust leaks, etc.	Listen for the audio alarm.	Run the engine at idle-RPM for several minutes to allow the turbocharger and engine to cool.
Turn on and run the engine compartment bilge blower, if equipped, for five minutes.	Check shift and throttle control operation.		Turn the key switch to "OFF" position.
Check for leaks: fuel, oil, water, fluid, etc.	Check steering operation.		Turn the battery switch off, if equipped.
Open the fuel shut-off valve, if equipped.			Close the fuel shut-off valve, if equipped.
Open the seacock, if equipped.			Close the seacock, if equipped.
Prime the fuel injection system, if necessary.			Flush the seawater cooling circuit, if operating in saltwater, brackish water, or polluted water.
Turn the key switch to "START" position. Release the key when the engine starts.			
Warm-up the engine at a fast idle-RPM for several minutes.			

Freezing Temperature and Cold Weather Operation

IMPORTANT: If the boat is operated during periods of freezing temperature, take precautions to prevent freezing damage to the power package. Damage caused by freezing is not covered by the Mercury Marine 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 connect the water inlet hose before starting the engine.

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

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

Refer to **Section 6** for cold weather or extended storage related information.

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 or a bilge pump. It is 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 Marine Limited Warranty.

Trailer the Boat

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

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

Starting, Shifting, and Stopping

⚠ WARNING

Vapors can ignite and cause an explosion, resulting in engine damage or severe personal injury. Do not use volatile starting aids such as ether, propane, or gasoline in the engine air intake system.

⚠ 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.

Before Starting the 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.

IMPORTANT: Observe the following before starting:

- If running the engine with the boat out of the water, provide water to both the engine and sterndrive seawater pickup pumps. Refer to **Section 5—Flushing the Seawater System**.
- Trim the sterndrive to the full down (in) position.
- Ensure that the engine crankcase is filled to the correct level with the specified engine oil. Refer to **Section 4: Specifications—Engine Oil**.
- Ensure all electrical connections are secure.
- Check all items listed in **Section 5—Maintenance Schedules** and the **Operation Chart**.
- Perform any other necessary procedures as indicated by your dealer or Mercury Diesel authorized repair facility.

Important Information – SmartStart

IMPORTANT: This power package is equipped with SmartStart. SmartStart performs all appropriate starting operations upon initial start switch actuation. To begin the SmartStart sequence, turn the ignition key switch to the "START" position and release, or turn the ignition key switch to the run position and press and release the start/stop switch, if equipped.

SmartStart controls the starting process automatically. When the start switch is actuated, the system signals the engine's electronic controller to start the engine. The starter will receive power until the engine starts and will time out after a few seconds, or when the engine reaches 400 RPM. Attempting to start the engine with the engine running will turn the engine off.

Starting a Cold Engine

⚠ 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.

NOTE: Check the fluid levels before starting the engine. Refer to **Section 5—Maintenance Schedule**.

IMPORTANT: Mercury Marine DTS and Axis models are equipped with SmartStart. SmartStart features push and release starting. The PCM completely controls the starting process after it receives a start command from the ignition key or start button. The starting process will time-out if the engine does not start after a few seconds or when cranking speed reaches 400 RPM. Attempting to start the engine with the engine already running will turn the engine off.

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

- Place the control handle in neutral.

NOTE: If the engine has not been run for a period of time and will not readily start with the standard starting procedure, use the fuel primer located on the fuel filter header. Cycle the primer plunger up and down four or five strokes then attempt to start the engine.

- Turn the ignition key to the "RUN" position.
- Turn the ignition key switch to the "START" position then release, or press 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 reaches normal operating temperature.
IMPORTANT: Engine oil pressure should exceed 69 kPa (10 psi) within seconds of starting the engine. Stop the engine if the engine oil pressure does not meet this specification. Locate and correct the problem. If you are unable to correct the problem, see a Mercury Diesel authorized repair facility.
- Ensure all instrumentation is functioning properly and indicating normal readings.

Engine Warm-Up

NOTICE

Engine wear caused by increased friction and limited oil flow is greatest when an engine is cold. Decrease engine wear by allowing the engine coolant temperature to reach normal operating range before hard acceleration or applying full throttle.

- After starting, ensure that all instrumentation is functioning properly.
- Operate the engine at 1,000 to 1,200 RPM until the engine temperature is within the normal operating range. It is very important that any engine be warmed up before applying full load. The warm-up period provides time for the lubricating oil to establish a film between moving parts.
NOTE: Engine warm-up time during cold weather can be reduced by operating the vessel at a reduced engine speed. Begin normal vessel operation when systems reach operating temperatures.
- After the engine has reached operating temperature:
 - The oil pressure should be within the range specified. Refer to **Section 4: Specifications—Engine Specifications**. Stop the engine if the oil pressure is not within the range specified.
 - Check the fuel system for leakage from the injection pump, fuel pipes, fuel filter, or fuel lines.
 - Check for oil leakage. Check the engine and the sterndrive for oil leakage. Especially check the oil filter, oil lines, oil line connectors, and oil pan.
 - Check for coolant leaks. Check the coolant hoses and connection pipes of the heat exchanger, fluid coolers, aftercooler, water pump, and drain fittings.
- Locate and correct any problems, or see your Mercury Diesel authorized repair facility if you are unable to determine the problem.

Starting a Warm Engine

⚠ 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.

NOTE: Check the fluid levels before starting the engine. Refer to **Section 5—Maintenance Schedule**.

IMPORTANT: Mercury Marine SmartCraft equipped models feature push and release starting. The PCM completely controls the starting process after it receives a start command from the ignition key or start button. The starting process will time-out if the engine does not start after a few seconds or when cranking speed reaches 400 RPM. Attempting to start the engine with the engine already running will turn the engine off.

- Turn on and run the engine compartment bilge blower (if equipped) for 5 minutes. Or, open the engine hatch to air out the bilge before attempting to start the engine.
- Place the control handle in neutral.
- Turn the ignition key to the "RUN" position.
- Turn the ignition key switch to the "START" position then release, or depress the start/stop button and release.
IMPORTANT: Stop the engine if the oil pressure does not exceed 69 kPa (10 psi) within seconds of starting the engine. Stop the engine if the engine oil pressure does not meet this specification. Locate and correct the problem. If you are unable to correct the problem, see a Mercury Diesel authorized repair facility.
- Ensure that all instrumentation is functioning properly and indicating normal readings.

Shifting

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.

NOTICE

Failure to rotate the propeller shaft when shifting gears or forcing the shift mechanism while the engine is not operating can result in product damage. If you must shift gears with the engine off, manually rotate the propeller shaft in the appropriate direction.

1. Ensure that the remote control shift lever is in neutral.
2. To shift the sterndrive, move the remote control shift lever with a firm, quick motion forward to shift to forward gear, or backward to shift to reverse.
3. After shifting the sterndrive, advance the throttle to the desired setting.
IMPORTANT: Avoid stopping the engine if the sterndrive is in gear. If the engine does stop with the sterndrive in gear, Refer to the following procedure:
 - a. Push and pull repeatedly on the remote control handle until the handle returns to the neutral detent position. This may take several tries if the power package was operating above idle RPM when the engine stopped.
 - b. After the handle returns to the neutral detent position, resume normal starting procedures.

Engine Shut Down (Stopping)

1. Place the remote control lever in neutral.

NOTICE

Immediately stopping the engine after high load operation can damage the turbocharger bearings. Idle the engine for several minutes before shutdown.

2. Operate the engine at idle speed for several minutes to allow the turbocharger and engine to cool.
3. Turn the key switch to the "OFF" position or press the start-stop switch button if equipped.

Starting the Engine After Stopped While in Gear

IMPORTANT: Avoid stopping the engine if the sterndrive is in gear. If the engine does stop with the sterndrive in gear, see the following procedure:

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

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

If your boat is considered a high-speed or high-performance boat, 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 the **Hi-Performance Boat Operation** booklet from your Mercury Diesel authorized repair facility.

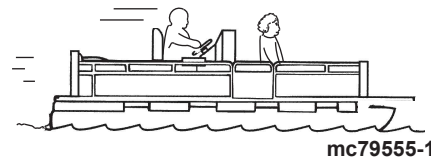
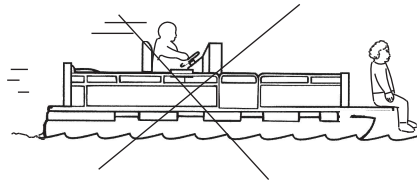
Passenger Safety In Pontoon Boats And Deck Boats

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 rail while the boat is in motion. Keep all passengers behind the front rail or enclosure.

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.



mc79555-1

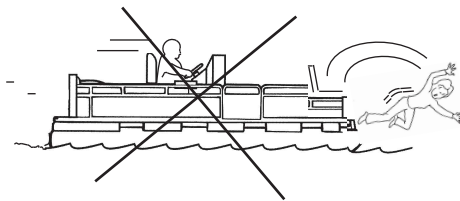
⚠ WARNING

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.

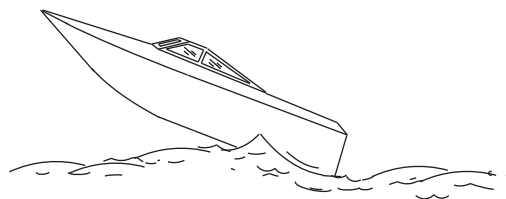


mc79557-1

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.



mc79680-1

Section 3 - On the Water

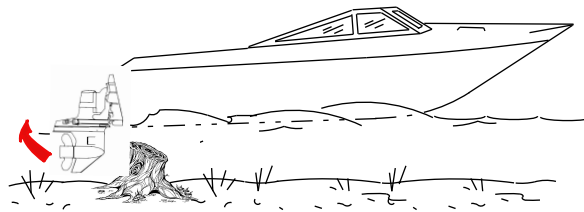
Operating recreational boats over waves and wakes is a natural part of boating. However, when this activity is done with enough speed to force the boat hull partially or completely out of the water, certain hazards arise, particularly when the boat reenters the water.

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.



mc79679-1

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).

The following demonstrate some, but not all, examples of what can happen if the boat strikes an object:

- The boat could move suddenly in a new direction. Such a sharp change in direction or turn can throw occupants 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, or boat.

Keep in mind that 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 Diesel repair facility for a thorough inspection and any 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.

Sterndrive Impact Protection

The power trim hydraulic system is designed to provide impact protection for the sterndrive. If a submerged object is struck while the boat is moving forward, the hydraulic system will cushion the pickup of the sterndrive as it clears the object, reducing damage to the sterndrive. After the sterndrive has cleared the object, the hydraulic system allows the sterndrive 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.

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)

Bottom of Boat

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

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

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

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

NOTE: Engines equipped with an Engine Control Module (ECM) reduce the effects of changes in elevation and climate by automatically adjusting fuel flow for weather conditions and elevation. ECM controlled engines, however, do not compensate for increased loading or hull conditions.

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

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

For optimum engine performance under changing weather conditions and high elevation, use a propeller that allows the engine to operate at rated RPM at wide open throttle (WOT) with a maximum boat load during your normal boating.

In most cases, the rated RPM at WOT can be achieved by changing to a lower pitch propeller.

Propeller Selection

NOTICE

Operating the engine with the wrong propeller installed can limit power, increase fuel consumption, overheat the engine, or cause internal powerhead damage. Choose a propeller that allows the engine to operate at the specified wide open throttle RPM.

The boat manufacturer and the selling dealer are responsible for equipping the power package with the correct propellers.

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

NOTE: Use an accurate service tachometer to verify RPM.

Select a propeller that will allow the engine power package to operate at the rated engine RPM with a maximum load.

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

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

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

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

Getting Started

Initial Break-In Procedure

It is important to follow this procedure to properly break in the engine.

IMPORTANT: Mercury Marine recommends that the boat not be accelerated hard until this procedure has been completed.

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

1. Refer to the appropriate **Starting, Shifting, and Stopping** section and start the engine.
2. Operate the engine at a fast idle until it has reached normal operating temperature.
3. Operate the engine in gear for three minutes at each of the following: 1200 RPM, 2400 RPM, and 3000 RPM.
4. Operate the engine in gear for three minutes at each of the following: 1500 RPM, 2800 RPM, and 3400 RPM.
5. Operate the engine in gear for three minutes at each of the following: 1800 RPM, 3000 RPM, and maximum rated full throttle RPM.

Sterndrive 10-Hour Break-In Period (New or With Replacement Gears)

It is important that the following procedure be used on new sterndrives and rebuilt sterndrives with new replacement gears. This break-in procedure allows the proper seating of the sterndrive gears and related components, which greatly reduces the likelihood of problems.

- Avoid full throttle starts.
- Do not operate at any one constant speed for extended periods of time.
- Do not exceed 75% of full throttle during the first 5 hours. During the next 5 hours, operate at intermittent full throttle.
- The sterndrive should be shifted into forward gear a minimum of 10 times during break-in, with run-in time at moderate RPM after each shift.

Engine Break-In

20-Hour Break-In Period

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

- 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 constant speed 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 (five 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.
- Check the engine oil level frequently. Add oil as needed. High oil consumption is normal during the break-in period.

After the 20-Hour Break-In Period

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

- Change the engine oil and filter and the transmission fluid at the interval indicated in the **Maintenance Schedule**. Refer to **Specifications** and **Maintenance**.
- Use a propeller that allows the engine to operate at the rated engine RPM when at full throttle with a fully loaded boat. Refer to **Specifications** and **Maintenance**.
- Operation at 3/4 throttle setting or lower is recommended. Refrain from prolonged operation at wide-open throttle RPM.

End of First Season Checkup

At the end of the first season of operation, contact an authorized repair facility 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.

Notes:

Section 4 - Specifications

Table of Contents

Fuel Requirements.....	46	2.8	48
Diesel Fuel in Cold Weather.....	46	4.2	48
Antifreeze/Coolant.....	46	Bravo Sterndrive Fluid Specifications—Diesel.....	48
Engine Oil.....	47	Power-Assisted Steering and Power Trim Fluids.....	49
Engine Specifications.....	48	Approved Power-Assisted Steering Fluids	49
Fluid Specifications.....	48	Approved Power Trim Fluids	49
Engine.....	48	Approved Paints.....	49

Fuel Requirements

⚠ WARNING

Failure to comply with regulations can result in injury from fire or explosion. Electrical system components on this engine are not rated as external ignition-protected (EIP). Do not store or use gasoline on boats equipped with these engines, unless provisions have been made to exclude gasoline vapors from the engine compartment (REF: 33 CFR).

⚠ 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.

⚠ WARNING

This engine requires diesel fuel. Mixing gasoline, gasohol, or alcohol and diesel fuel can cause serious injury or death due to fire or explosion. Never mix gasoline, gasohol, or alcohol with diesel fuel.

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

Mercury diesels are required to use grade 2-D ULSD (ultra-low sulphur diesel) fuel meeting ASTM Standards D975 (or fuel rated Diesel DIN EN 590), and having a minimum cetane rating of 51.

BIODIESEL: The blend of diesel fuel used may not contain more than 7% biodiesel fuel. Use of LSD or blends of ULSD fuel containing more than 7% biodiesel fuel may result in fuel system degradation, injection nozzle clogging, hard starting, increased oil change intervals, or excessive exhaust smoke.

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

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

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

- Corrosion on metal parts
- Deterioration of elastomer and plastic parts
- Excessive wear of internal engine parts, particularly bearings, and corrosion and extensive damage to other engine parts
- Difficulty starting and operating the engine

Diesel Fuel in Cold Weather

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

Antifreeze/Coolant

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.

Diesel engines are high-compression engines that operate at higher temperatures than typical internal combustion engines. Therefore, the closed-cooling system and engine, including related cooling passages, must remain as clean as possible to provide adequate engine cooling. To ensure proper cooling, we recommend filling the closed-cooling section of the cooling system with a low silicate formula of ethylene glycol antifreeze in a solution with deionized water. Common tap water or softened water contains unwanted minerals that can leave large deposits in the system that restrict the cooling system efficiency. A low silicate formula prevents the antifreeze from separating and forming a silicate gelatin. This gelatin can block passages in the engine and heat exchanger, causing the engine to overheat.

Only premixed coolant should be added to the closed-cooling system. Additives and inhibitors introduced into acceptable coolant solutions will form a protective film on the internal passages and provide protection against internal cooling system erosion.

Do not drain the closed-cooling section for storage. The closed-cooling section should be kept filled year-round with an acceptable antifreeze/coolant solution to avoid rust forming on the internal surfaces. If the engine will be exposed to freezing temperatures, ensure that the closed-cooling section is filled with a properly mixed antifreeze/coolant solution to protect the engine and closed-cooling system to the lowest temperature to which they will be exposed.

NOTE: It is recommended that a 50/50 solution of coolant (antifreeze) and deionized, purified water be used. A 50/50 solution will provide freeze protection to -35°C (-31°F). Decreasing the solution to 40/60 will provide freeze protection to -25°C (-13°F). Even in the warmest climates, never decrease the solution below 40/60. Increasing the solution to 60/40 will provide freeze protection to -50°C (-58°F).

IMPORTANT: The antifreeze/coolant used in these marine engines must be a low silicate ethylene glycol, containing special additives, and deionized, purified water. Using other types of engine coolant may cause fouling of the heat exchangers and overheating of the engine. Do not combine different types of coolants without knowing that they are compatible. Refer to the coolant manufacturer's instructions.

The acceptable antifreeze/coolants is listed in the following table. Refer to **Section 5 - Maintenance** for respective change intervals.

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

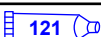
Engine Oil

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.

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

We strongly recommend the use of:

Tube Ref No.	Description	Where Used	Part No.
 121	15W-40 4-Cycle Diesel Engine Oil	Engine crankcase	92-858042K01

This oil is a specially blended 15W-40 oil with marine additives for all-temperature operation. It exceeds requirements for API CF-2, CF-4, CG-4, and CH-4 oils.

Other recommended oils:

Description	Where Used	Part Number
Shell Myrina	Engine crankcase	Obtain Locally
Mopar		
Texaco Ursa Super TD		
Wintershall Multi-Rekord		
Veedol Turbostar		
Wintershall Vliva 1		

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

Engine Specifications

Description	Specifications	
	2.8	4.2
Engine type	In-line 4-cylinder diesel	In-line 6-cylinder diesel
Displacement	2.8 L (169 cid)	4.2 L (254 cid)
Firing order	1 - 3 - 4 - 2	1 - 5 - 3 - 6 - 2 - 4
Bore	94 mm (3.700 in.)	
Stroke	100 mm (3.937 in.)	
Rated engine RPM (refer to Conditions Affecting Operation - Propeller Selection for additional information)	3800	
Idle RPM in neutral (engine at normal operating temperature)	700	600
Oil pressure @ idle	2.4 bar [240 kPa] (35 psi)	2.1 bar [210 kPa] (30 psi)
Oil pressure @ 3800 RPM	6.2 bar [620 kPa] (87 psi)	6.6 bar [660 kPa] (93 psi)
Thermostat (water)	83° C (181° F)	89° C (192° F)
Thermostat (oil)	95° C (203° F)	87° C (187° F)
Coolant temperature	80–85° C (176–185° F)	
Electrical system	12-volt negative (–) ground	
Alternator rating	1540W, 14V, 110 A	
Recommended battery rating	750 CCA, 950 MCA, or 180 Ahm	

Fluid Specifications

IMPORTANT: All capacities are approximate fluid measures.

Engine

IMPORTANT: You may need to adjust oil levels depending on the installation angle and cooling systems (heat exchanger and fluid lines).

Always use the dipstick to determine the exact quantity of oil or fluid required.

2.8

All models	Capacity liters (US qt)	Fluid Type	Part Number
Engine oil (with filter)	8.9 (9.4)	15W40 4-cycle Diesel Engine Oil	92-858042K01
Closed cooling system	11 (11.6)	Mercury Extended Life Antifreeze	92-877770K1

4.2

All models	Capacity liters (US qt)	Fluid Type	Part Number
Engine oil (with filter)	13.8 (14.6)	15W40 4-cycle Diesel Engine Oil	92-858042K01
Closed cooling system	17.25 (18.2)	Mercury Extended Life Antifreeze	92-877770K1

Bravo Sterndrive Fluid Specifications—Diesel

Sterndrive Model	Fluid Capacity includes the Sterndrive and the Gearlube Monitor	Fluid Type	Fluid Part Number
Bravo One X Diesel Bravo One XR	2736 ml (92-1/2 oz.)	High Performance Gear Lubricant	92-858064K01
Bravo Two X Diesel	3209 ml (108-1/2 oz.)		
Bravo Three X Diesel Bravo Three XR	2972 ml (100-1/2 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	

Approved Paints

Description	Part Number
Marine Cloud White	8M0071082
Mercury Light Gray Primer	92-80287852
Mercury Phantom Black	92-802878Q1

Notes:

Section 5 - Maintenance

Table of Contents

Owner and Operator Responsibilities.....	52	Flushing the Seawater System—Sterndrive Models.....	79
Dealer Responsibilities.....	52	With the Boat out of the Water	79
Maintenance.....	52	With the Boat in the Water	81
Do-It-Yourself Maintenance Suggestions.....	52	Engine Seawater Pump Inspection.....	82
Inspection.....	52	Replacing the Engine Coolant in the Closed-Cooling System	82
Maintenance Schedules.....	53	Draining the Closed-Cooling System.....	82
Routine Maintenance.....	53	Filling the Closed-Cooling System.....	83
Scheduled Maintenance.....	54	Corrosion Protection.....	84
Engine Oil.....	55	General Information.....	84
Checking.....	55	Engine Corrosion Protection Components.....	84
Filling.....	55	Removal	84
Changing Oil and Filter.....	56	Cleaning and Inspection	85
Sterndrive Gear Lube.....	58	Installation	86
Checking.....	58	Sterndrive Corrosion Protection Components.....	87
Filling.....	58	Continuity Circuit—Bravo Sterndrive.....	90
Changing.....	59	MerCathode.....	92
Power Trim Fluid.....	62	Boat Bottom Care.....	93
Checking.....	62	Painting Your Power Package.....	93
Filling.....	63	Sterndrive Surface Care.....	94
Changing.....	64	Lubrication.....	94
Power-Assisted Steering Fluid.....	64	Steering System.....	94
Checking.....	64	Throttle Cable.....	96
Filling.....	65	Shift Cable.....	96
Changing.....	65	Transom Assembly.....	97
Engine Coolant.....	65	Engine Coupler.....	97
Check Coolant.....	65	Driveshaft Extension Models.....	97
Filling.....	65	Sterndrive, Bellows, and Engine Alignment.....	98
Changing.....	66	Maintaining Torques.....	99
2.8 Air Filter.....	66	Bravo Gimbal Ring U-bolt Nuts.....	99
Removal.....	66	Engine Mounts.....	100
Inspection.....	67	Propellers.....	100
Installation.....	67	Bravo Sterndrive Propeller Removal.....	100
4.2 Air Filter.....	68	Bravo One Models	101
Removal.....	68	Bravo Two Models	101
Inspection.....	68	Bravo Three Models	102
Installation.....	69	Bravo Sterndrive Propeller Installation.....	103
Water-Separating Fuel Filter.....	69	Bravo One Models	103
Draining.....	70	Bravo Three	104
Replacing.....	70	Drive Belts.....	105
Filling.....	72	Serpentine Belt.....	105
Fuel System.....	73	Inspection	105
Priming.....	73	Replacement	106
Filling (Bleeding).....	73	Power-Assisted Steering Pump Belt.....	107
Fuel Tank Cleaning and Flushing.....	74	Inspection	107
Seawater System.....	74	Adjustment	107
Draining the Seawater System.....	74	Replacement	108
Sterndrive Water Inlets Check.....	76	Battery.....	109
Checking the Seawater Pickups.....	77	Battery Precautions for Multiple Engines	109
Cleaning the Seawater Strainer, if Equipped.....	77		

Owner and 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 a Mercury Diesel authorized repair facility for a periodic checkup.

Normal maintenance service and replacement parts are the responsibility of the owner or 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 Mercury Diesel authorized repair facility for service aids.

Dealer Responsibilities

It is the dealer's responsibility to provide predelivery inspection and preparation:

- Before delivery, making certain that the Mercury power package is in proper operating condition.
- Making all necessary adjustments for maximum efficiency.
- Explaining and demonstrating the operation of the power package and the boat.
- Providing a copy of the Predelivery Inspection Checklist.
- Completing the warranty registration and immediately submitting it to Mercury Marine via MercNET, e-mail, or mail. All power packages must be registered for warranty purposes.

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 Maintenance Schedule for a complete listing of all scheduled maintenance to be performed. Some listings can be done by the owner or operator, while others should be performed by a Mercury Diesel authorized repair facility. Before attempting maintenance or repair procedures not covered in this manual, we recommended that you purchase the appropriate Mercury or Mercury MerCruiser Service Manual and read thoroughly.

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

- Blue—Coolant
- Yellow—Engine oil
- Orange—Transmission fluid
- Black—Gear lube oil

Do-It-Yourself Maintenance Suggestions

Mercury power packages are highly technical, complex pieces of machinery. Only qualified personnel using the proper tools should attempt major repair.

- Your safety is our concern. Always read and understand the Cautions, Warnings, Important Notices, and Notes.
- Do not attempt repairs unless specifically trained in that procedure.
- Reference the correct service manual for the product. Do not attempt repairs unless qualified.
- Special tools and equipment are required to perform certain repairs. Failure to use the correct special tools and equipment can result in severe damage to the product.
- Always have a Mercury Diesel authorized repair facility service your power package and do periodic maintenance inspections to help provide safe and trouble-free boating.

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.

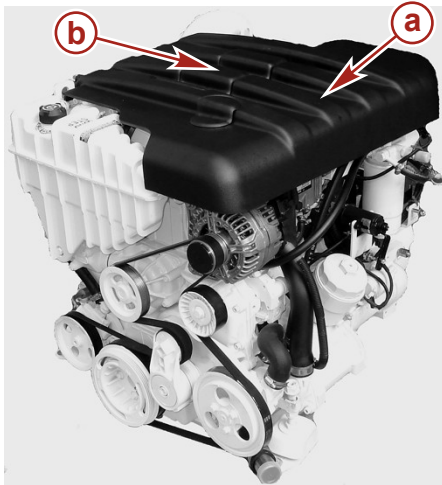
1. Check for loose, damaged, or missing parts, hoses and clamps; tighten or replace as necessary.
2. Check electrical connections and leads for damage.

3. Remove and inspect the propeller. If badly nicked, bent, or cracked, contact your Mercury Diesel authorized repair facility.
4. Repair nicks and corrosion damage on power package exterior finish. Contact your Mercury Diesel authorized repair facility.

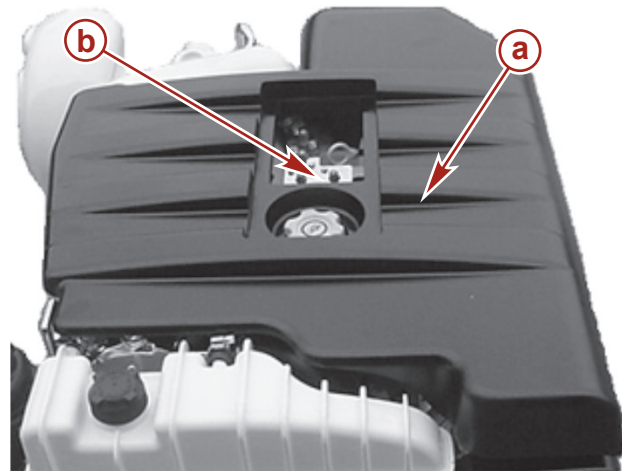
It may be necessary to remove the engine cover during some maintenance inspections and procedures. To remove the engine cover:

NOTE: The engine cover contains an access panel which can be used to access the engine circuit breakers and the oil fill cap and dipstick without removing the entire engine cover.

1. Lift and detach the engine cover from the mounts.



24522



24727

Typical engine cover

Engine cover with access panel showing

- a** - Engine cover
b - Engine cover access panel location

2. Set the engine cover over the mounts and press the cover down in the mount areas to reattach the engine cover.

Maintenance Schedules

Routine Maintenance

IMPORTANT: Some procedures can be done by the owner or operator, while others should be performed by a Mercury Diesel authorized repair facility. Before attempting maintenance or repair procedures not covered in this manual we recommended that you purchase the appropriate Mercury Service Manual, and read it thoroughly.

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

Task Interval	Maintenance to Be Performed
Each day start	- Check the engine oil level. This task interval can be extended based on operator experience with the product. - Check the engine coolant level. - Check the power-assisted steering fluid level. - Check the sterndrive gear lube level in the gear lube monitor.
Each day end	- If operating in saltwater, brackish water, or polluted water, flush the seawater section of the cooling system after each use. - Drain any water from the primary fuel filter after each use. Drain any water from both fuel filters if operating in freezing temperatures.
Weekly	- Drain any water from the fuel filters. - Check the trim pump fluid level. - Check the seawater inlets for debris or marine growth. - Check and clean the seawater strainer. - Inspect the sterndrive anodes and replace if eroded 50% or more.

Task Interval	Maintenance to Be Performed
Every two months	- Check the battery connections and fluid level. - Lubricate the propeller shaft and tighten the propeller nut to the specified torque. If operating in only freshwater, this maintenance may be extended to every four months. - Treat the engine surfaces with Corrosion Guard if operating in saltwater, brackish, or polluted waters. - Inspect the air filter every two months or every 50 hours, whichever occurs first. - Inspect the engine anodes and replace if 50% or more eroded. - Ensure that the gauges and the wiring connections are secure. Clean the gauges every two months or every 50 hours, whichever occurs first. If operating in saltwater, the interval is reduced to every 25 hours or 30 days whichever occurs first.

Scheduled Maintenance

Task Interval	Maintenance to Be Performed
Annually	Touch up the power package with paint and spray with Corrosion Guard.
Every 100 hours or annually (whichever occurs first)	- Change the sterndrive gear lube. - Torque the gimbal ring U-bolt locknuts. - Check the steering system and the remote control for loose, missing, or damaged parts. Lubricate the cables and linkages. - Inspect and lubricate the sterndrive U-joint splines. Inspect the bellows, the exhaust tube, and check the clamps. - Lubricate the engine coupler (lubricate the engine coupler every 50 hours if operated at idle for prolonged periods of time). - Check the continuity circuit for loose or damaged connections. If the boat is equipped with a MerCathode system, test the unit's output. - Check the engine alignment. - Torque the engine mounts. - Check the electrical system for loose, damaged, or corroded terminals. - On driveshaft extension models, lubricate the driveshaft U-joints, transom end (tailstock) bearings, and engine end (output) bearings. - Inspect the cooling system and the exhaust system for damage or leaks. Check both systems hose clamps for tightness.
Every 200 hours or annually (whichever occurs first)	- Change the engine oil and filter. - Replace the fuel filters. - Replace the air filter. - Inspect the condition and tension of the engine accessory drive belts. - Disassemble and inspect the engine seawater pump and replace worn components. - Check the seawater pump drive belt. - Clean the seawater section of the closed-cooling system. Clean, inspect, and test the pressure cap. Check the anodes and replace if eroded by 50% or more. - Check the closed-cooling fluid level and level of protection. - Clean the seawater strainer. - Check the run history for faults. - Check the engine timing belt.
Every 2 years	Replace the engine coolant.
Every 700 hours or 3 years (whichever occurs first)	Replace the power-assisted steering pump drive belt.

Task Interval	Maintenance to Be Performed
Every 1000 hours or 5 years (whichever occurs first)	- Replace the engine timing belt. - Clean the fuel tank. - Clean the aftercooler core.

Engine Oil

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.

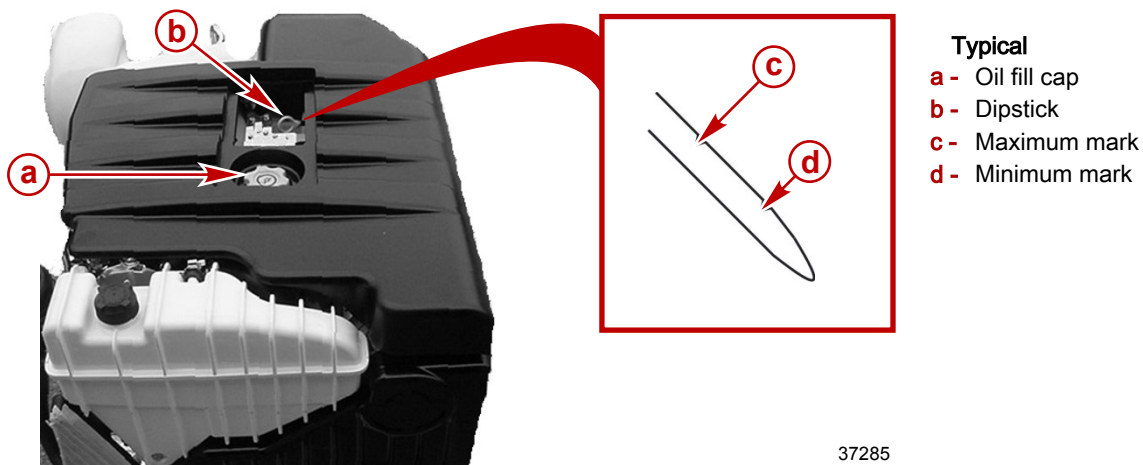
Checking

IMPORTANT: Check the engine oil at the intervals specified by the maintenance schedule. It is normal for an engine to use a small amount of oil during operation. The amount of oil consumed depends upon engine speed. Oil consumption is the highest at wide open throttle and decreases substantially as engine speed is reduced.

NOTICE

With the engine running, the crankshaft journals or rod journals may strike and break the dipstick, resulting in damage to internal engine components. Stop the engine completely before removing or inserting the dipstick.

- To check the engine oil level during operation, stop the engine and allow five minutes for the oil to drain into the pan.
- Remove the dipstick, wipe clean, and reinstall.
- Remove the dipstick and observe the oil level. The oil level must be between the marks on the dipstick. If necessary, add oil. Refer to **Filling**.

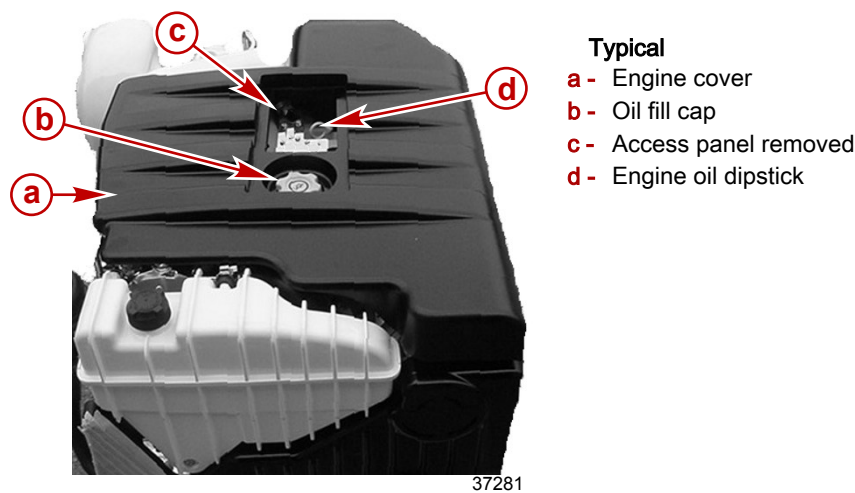


37285

Filling

IMPORTANT: Do not overfill the engine with oil.

1. Remove the oil fill cap.



2. Add the specified oil to bring the oil level up to, but not over, the maximum mark on the dipstick.

2.8	Capacity	Fluid Type
Engine oil (with filter)	8.9 L (9.4 U.S. qt)	4-Cycle 15W40 Marine Engine Oil

4.2	Capacity	Fluid Type
Engine oil (with filter)	13.8 L (14.6 U.S. qt)	4-Cycle 15W40 Marine Engine Oil

IMPORTANT: Always use the dipstick to determine the amount of oil required to refill the engine oil.

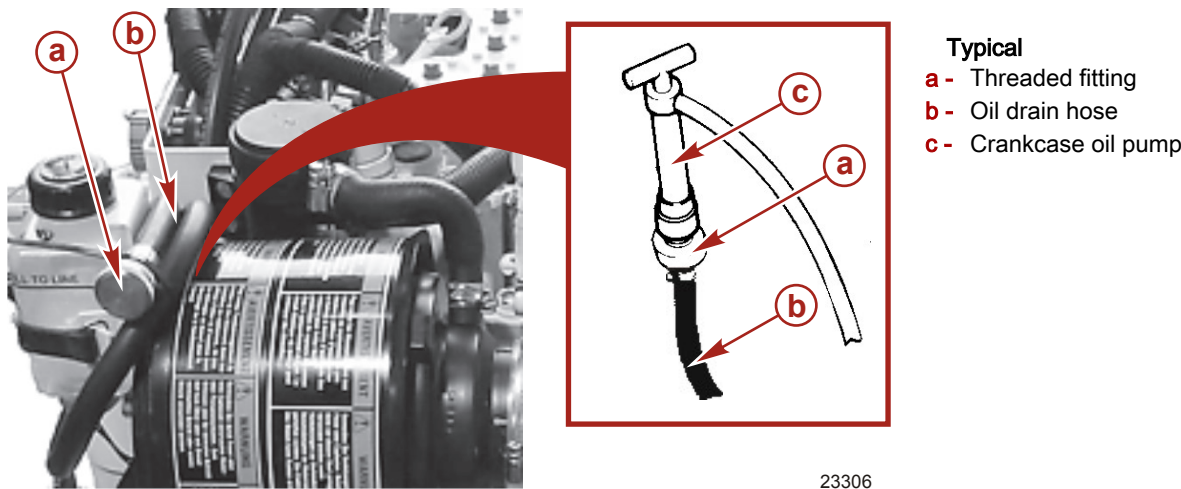
3. Install the oil fill cap.

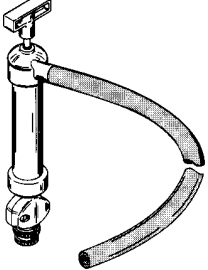
Changing Oil and Filter

See the **Maintenance Schedule** for the change interval. You should change the engine oil before placing the boat in storage.

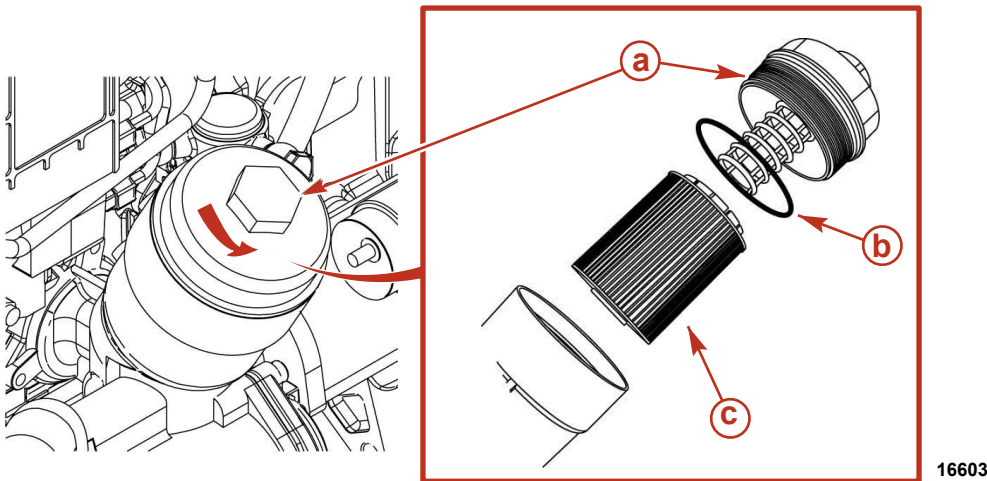
IMPORTANT: Change the engine oil when the engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use only recommended engine oil. See Specifications.

1. Start the engine and allow it to warm up to normal operating temperature.
2. Stop the engine and allow some time for the oil to drain into the oil pan (approximately five minutes).
3. Remove the fitting from the end of crankcase oil drain hose.
4. Install the crankcase oil pump (order separately) onto the threaded fitting of the oil drain hose.



Crankcase oil pump	91-90265A 5
 11591	Aids in the removal of engine oil without draining the crankcase.

5. Pump the oil out of the crankcase into the drain pan.
6. Contain and dispose of the oil or oil waste as directed by local authorities.
7. Remove the crankcase oil pump and install the crankcase oil drain hose fitting when the crankcase is empty. Tighten securely.
8. Install the oil dipstick.
9. Place a suitable container under the oil filter housing to contain any oil leakage that may occur. Use an appropriate socket to loosen the oil filter top piece.
10. Remove the top piece and cartridge type oil filter.
11. Disconnect and discard the old filter element. Discard the old O-ring from the top piece.



Typical

- a** - Top piece
- b** - O-ring
- c** - Filter element

12. Install the new O-ring. Apply lubricant to the O-ring.

Tube Ref No.	Description	Where Used	Part No.
 121	15W40 4-cycle Diesel Engine Oil	Oil filter O-rings	92-858042K01

13. Push the filter element onto the top piece until it is locked. Listen for a click.
14. Install the top piece with the new filter element into the oil filter housing.
IMPORTANT: Overtightening the top piece will cause deformation resulting in oil leakage.

- Turn the oil filter top piece until the sealing surface contacts the housing. Torque the top piece using an appropriate socket.



- a - Top piece
b - Oil filter housing

23195

Description	Nm	lb. in.	lb. ft.
Oil filter top piece	25		18

- Remove the oil fill cap and refill the engine with new oil. See **Filling**.
IMPORTANT: When refilling the engine with oil, always use the dipstick to determine how much oil is required.
- Start the engine and check for leaks.

Sterndrive Gear Lube

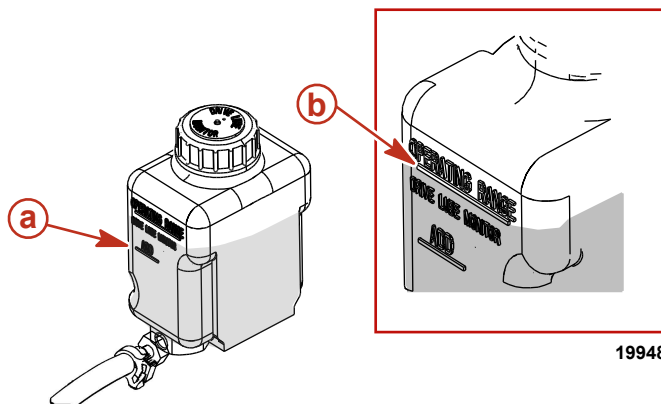
NOTICE

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.

Checking

NOTE: The gear lube level will fluctuate during operation. The gear lube level should be checked with the engine cold, before starting.

- Check the gear lube monitor to determine the gear lube level. Keep the gear lube level within the recommended operating range. Refer to **Filling**.



Gear lube level shown is at the correct operating range

- a - "ADD" mark
b - "OPERATING RANGE" mark

19948

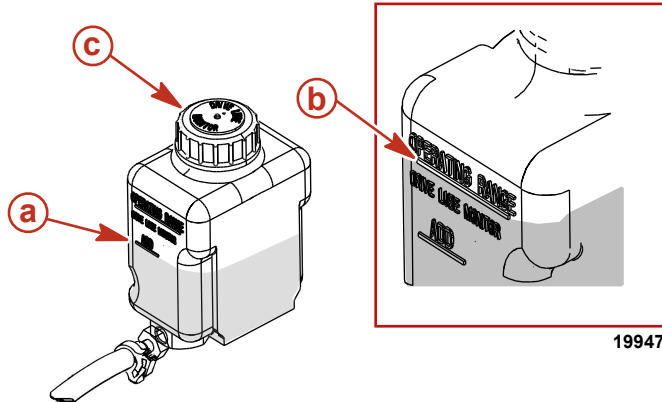
IMPORTANT: If any water is visible at the bottom of the gear lube monitor or appears at the fill and drain plug hole, or if the gear lube appears discolored, contact your Mercury Diesel authorized repair facility immediately. Both conditions may indicate a water leak in the sterndrive.

Filling

IMPORTANT: If more than 59 ml (2 fl. oz.) of High Performance Gear Lube is required to fill the gear lube monitor, a seal may be leaking. Damage to the sterndrive may occur due to lack of lubrication. Contact your Mercury Diesel authorized repair facility.

- If the gear lube level is below or near the "ADD" mark, the specified gear lube must be added.

2. Remove the gear lube monitor cap.
3. Fill the gear lube monitor with the specified gear lube so that the gear lube level is in the operating range. Do not overfill.

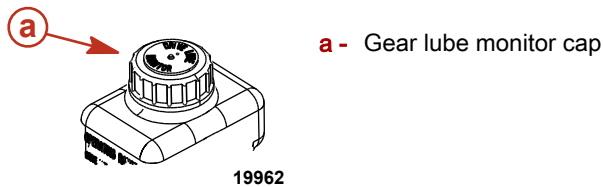


Gear lube monitor

- a - Gear lube level at the "ADD" mark
- b - Gear lube level at the "OPERATING RANGE" mark
- c - Gear lube monitor cap

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

4. Ensure that the rubber gasket is inside the gear lube monitor cap and install the cap. Do not overtighten.

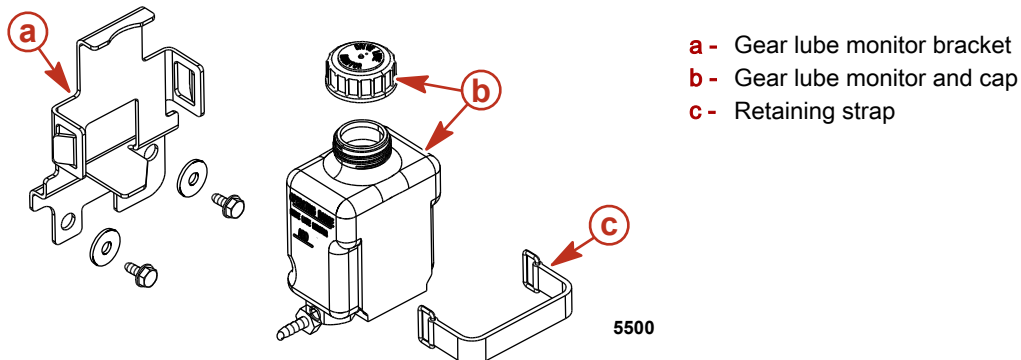


- a - Gear lube monitor cap

NOTE: When filling the entire sterndrive, Refer to **Changing**.

Changing

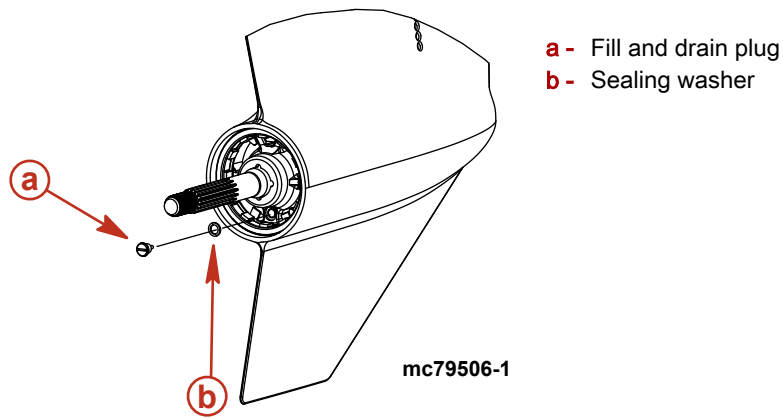
1. Remove the gear lube monitor from the bracket.



- a - Gear lube monitor bracket
- b - Gear lube monitor and cap
- c - Retaining strap

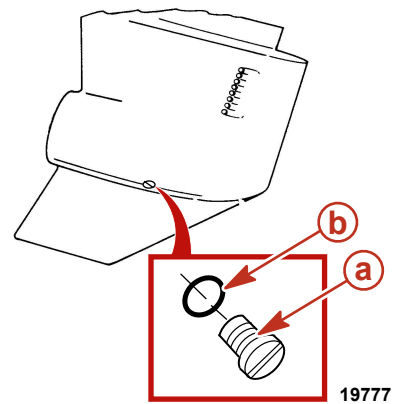
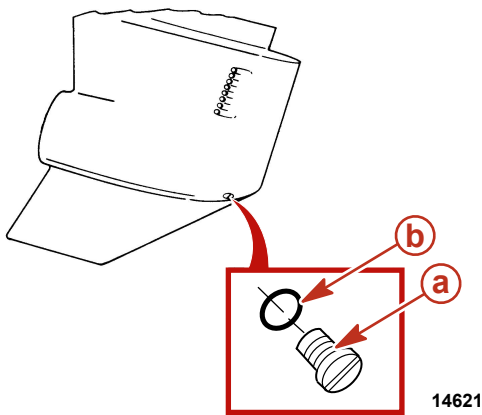
2. Empty the contents of the gear lube monitor into a suitable container.
3. Install the gear lube monitor in the bracket.
4. Remove the propeller. Refer to **Propellers**.
5. **Bravo One Models:**
 - a. Lower the sterndrive to the full down (in) position.
 - b. Remove the gear lube fill and drain plug and sealing washer.

- c. Drain the gear lube into a suitable container



6. Bravo Two models and Bravo Three models:

- a. Place the sterndrive in full trim limit out (up) position.
- b. Remove the fill and drain plug and sealing washer.
- c. Drain the gear lube into a suitable container.

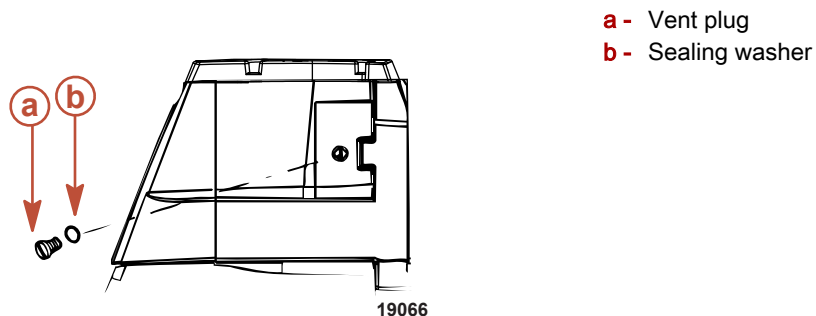


Bravo Two

- a - Fill and drain plug
b - Sealing washer

Bravo Three

7. Remove the vent plug and sealing washer. Allow the gear lube to drain completely.



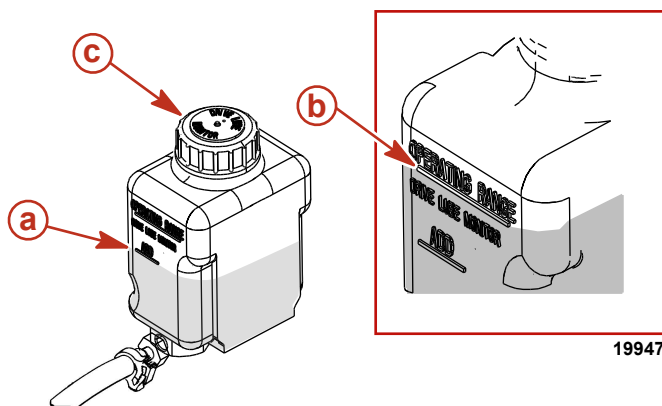
IMPORTANT: If any water drains from the fill and drain plug hole, or if the gear lube appears milky, the sterndrive is leaking and should be checked immediately by your Mercury Diesel authorized repair facility.

8. Lower the sterndrive so that the propeller shaft is level.
9. Fill the sterndrive through the fill and drain plug hole with the specified gear lube until an air-free stream of lube flows from the vent plug hole.

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

IMPORTANT: Use only Mercury/Quicksilver High Performance Gear Lube in the sterndrive.

10. Install the vent plug and sealing washer.
11. Continue to pump gear lube into the drive through the fill and drain plug hole until the gear lube appears in the gear lube monitor.
12. Fill the gear lube monitor so that the gear lube level is in the operating range. Do not overfill.

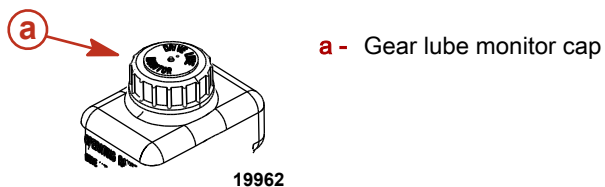


Gear lube monitor

- a** - Gear lube level at the "ADD" mark
- b** - Gear lube level at the "OPERATING RANGE" mark
- c** - Gear lube monitor cap

Sterndrive Model	Fluid Capacity includes the Sterndrive and the Gear lube Monitor	Fluid Type	Fluid Part Number
Bravo One X Diesel Bravo One XR	2736 ml (92-1/2 oz.)	High Performance Gear Lube	92-802854A1
Bravo Two X Diesel	3209 ml (108-1/2 oz.)		
Bravo Three X Diesel Bravo Three XR	2972 ml (100-1/2 oz.)		

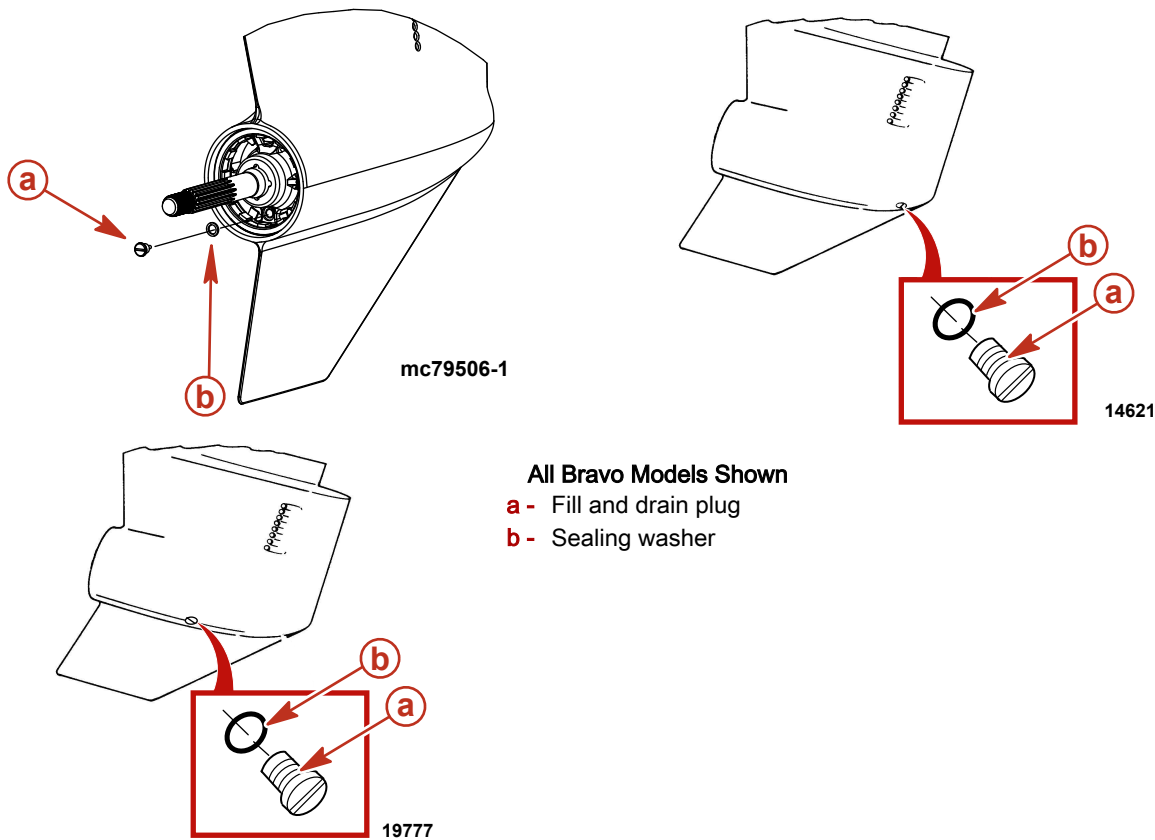
13. Ensure that the rubber gasket is inside the gear lube monitor cap and install. Do not overtighten.



- a** - Gear lube monitor cap

14. Remove the pump from the sterndrive fill and drain plug hole.

15. Quickly install the sealing washer and the fill and drain plug. Torque to the following specifications.



Description	Nm	lb. in.	lb. ft.
Fill and drain plug	6.8	60	

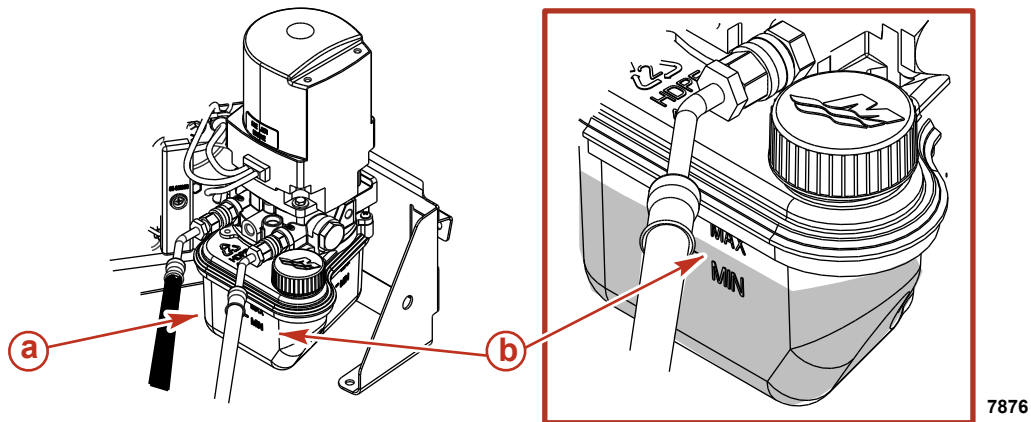
16. Install the sterndrive propeller. Refer to **Propellers**.
17. Recheck the gear lube level at the gear lube monitor after the first use. Refer to **Checking**.
- IMPORTANT:** The gear lube level in the gear lube monitor will rise and fall during sterndrive operation; always check the gear lube level when the sterndrive is cool and the engine is shut down.

Power Trim Fluid

Checking

- IMPORTANT:** Check the fluid level with the sterndrive in the full down (in) position only.
1. Place the sterndrive in full down (in) position.

- Observe the fluid level. The fluid level must be between the "MIN" and "MAX" lines on the reservoir.



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

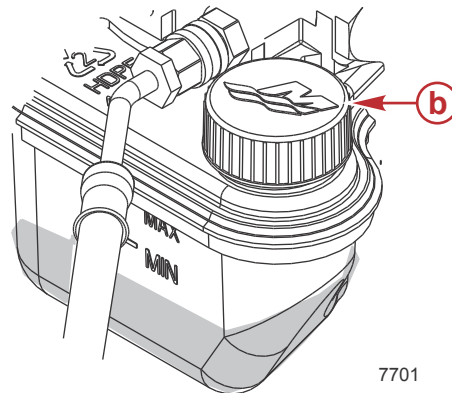
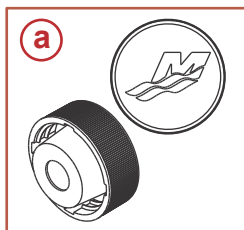
- Fill as necessary with the specified fluid. See **Filling**.

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

Filling

- If the fluid level is below the "MIN" line, the specified fluid must be added.
- Remove the fill cap from the reservoir.

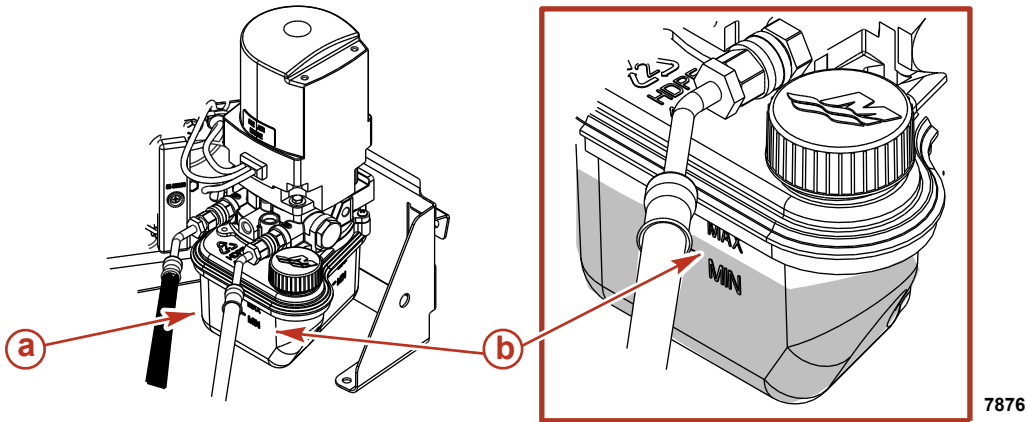
NOTE: The fill cap is vented.



Power trim pump reservoir shows the fluid level is below "MIN" line

- a - Fill cap assembly
- b - Fill cap installed

3. Add the specified fluid to bring the fluid level to within the "MIN" and "MAX" lines on the reservoir.



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

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

4. Install the fill cap.

Changing

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

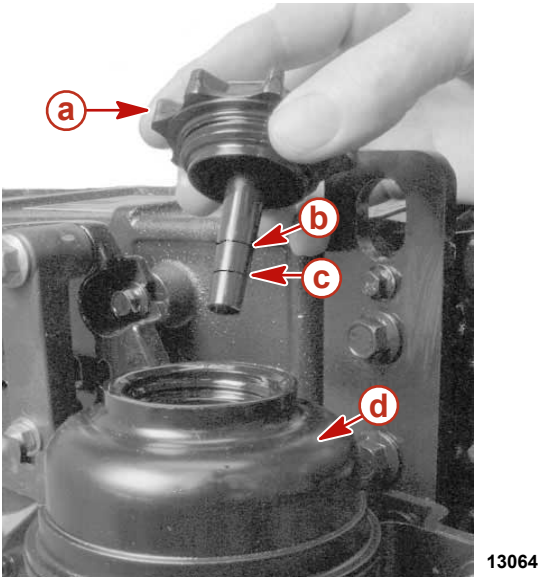
Power-Assisted Steering Fluid

IMPORTANT: Use only Quicksilver Power Trim and Steering Fluid or Dexron III automatic transmission fluid (ATF) in the power-assisted steering system.

IMPORTANT: Running the pump dry will damage the pump. Always check steering fluid levels before operating the boat.

Checking

- Center the sterndrive and stop the engine.
- Remove the fill cap and dipstick from the fluid reservoir and observe the level.
 - The proper fluid level with the engine cold should be between the full cold mark and the end of the dipstick.
 - With the engine at normal operating temperature, the fluid level should be between the full hot and full cold marks.



Typical

- a - Fill cap and dipstick
b - Full hot mark
c - Full cold mark
d - Fluid reservoir

IMPORTANT: If fluid is not visible in the fluid reservoir, see your Mercury Diesel authorized repair facility.

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.

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. See your Mercury Diesel authorized repair facility.

Engine Coolant

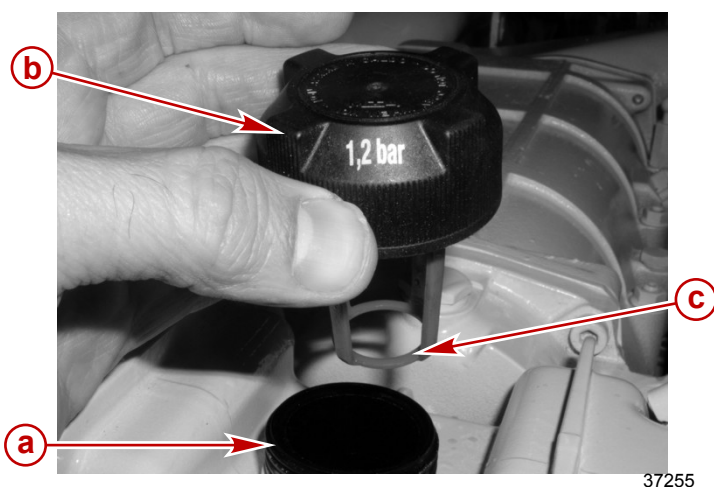
⚠ CAUTION

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

Check Coolant

IMPORTANT: When possible, check the engine coolant before starting the engine.

1. Allow the engine to cool.
2. Remove the pressure cap from the coolant expansion tank.
3. The coolant level in the coolant expansion tank should be above the coolant level indicator attached to the bottom of the coolant cap.



- a - Filler neck
- b - Coolant cap
- c - Level indicator

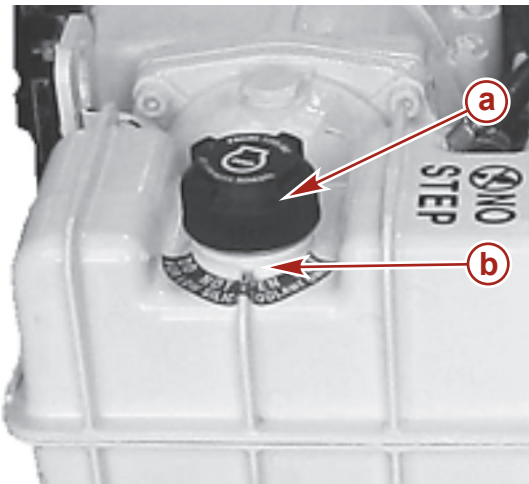
4. If the coolant level is low:
 - a. Inspect the coolant recovery system for leaks.
 - b. Inspect the gasket in the pressure cap for damage and replace if necessary.
 - c. The pressure cap maintains pressure on the cooling system and may not be holding pressure properly. To have the cap tested, contact your Mercury Diesel authorized repair facility.
 - d. Add the specified coolant as necessary. Refer to **Add Coolant**.

IMPORTANT: Tighten the pressure cap to prevent coolant loss.
5. If the coolant level is correct, install the pressure cap and tighten.

Filling

1. Allow the engine to cool.
2. Remove the pressure cap from the coolant expansion tank.

3. If the coolant is low in the coolant expansion tank, add the specified coolant as necessary to bring the level to within 25 mm (1 in.) of the bottom of the fill neck or between the upper and lower marks, if applicable.



- a - Pressure cap
b - Bottom of fill neck

23248

Description	Where Used	Part Number
Mercury Extended Life Antifreeze	Closed-cooling system	92-877770K1

IMPORTANT: When installing the pressure cap, be sure to tighten it securely to prevent coolant loss.

4. Install the pressure cap. Tighten securely.

Changing

Change (replace) the engine coolant at the prescribed interval. See **Replacing the Engine Coolant in the Closed-Cooling System**.

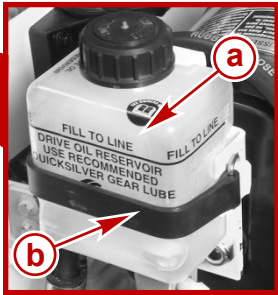
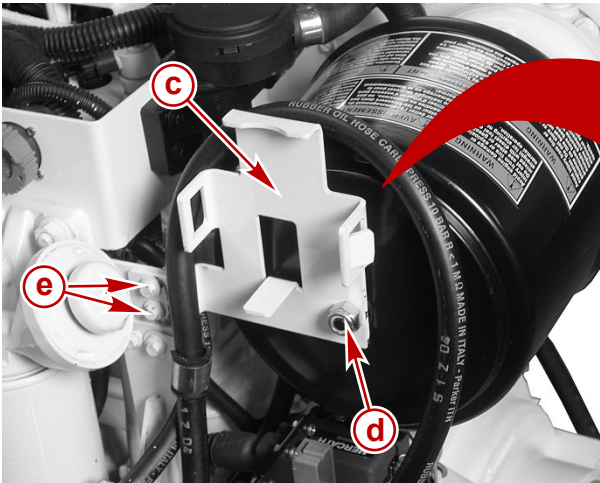
2.8 Air Filter

Removal

IMPORTANT: Keep gear lube monitor bottle in an upright position to prevent fluid from spilling.

NOTE: It is not necessary to drain the gear lube monitor to perform this procedure.

1. Remove the gear lube monitor retaining strap and remove the gear lube monitor from the bracket and set aside.
2. Remove the air filter cover retaining nut from the gear lube monitor bracket on the air filter.
3. Remove the gear lube monitor bracket.



- a - Gear lube monitor
b - Gear lube monitor retaining strap
c - Gear lube monitor bracket
d - Air filter cover retaining nut
e - Gear lube monitor bracket retaining bolts

26147

4. Remove the air filter cover.

NOTE: It is not necessary to remove the air filter bracket mounted on the turbocharger inlet.

- Remove the air filter cartridge from the air filter bracket mounted on the turbocharger inlet.



12618

Shown removed from the engine for clarity only

- a - Air filter cartridge
b - Air filter bracket

Inspection

- The air filter cannot be cleaned. Replace the air filter if it is dirty or contaminated.
- Replace the air filter if the foam element is deteriorated or torn.
- Replace the air filter at the recommended interval. See **Maintenance Schedules** for the replacement interval under normal conditions.

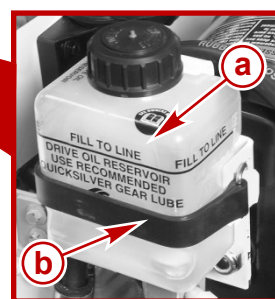
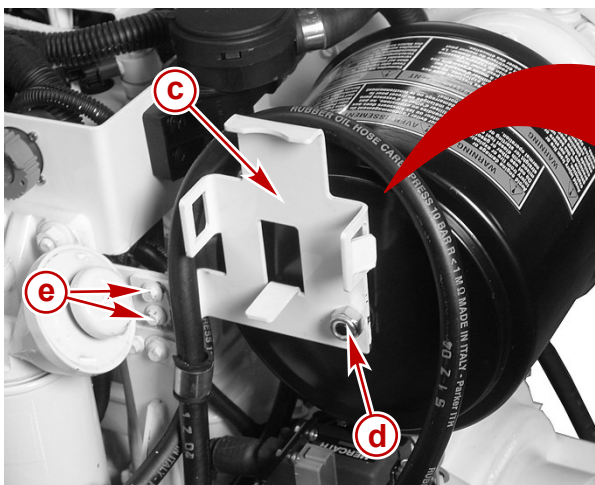
Installation

IMPORTANT: Treatment such as partial oil saturation is not required and is not recommended on the foam element before use. The foam element must be clean and dry for proper filtration.

- Install the air filter cartridge onto the air filter bracket.
- Install the air filter cover, gear lube monitor bracket, and nuts.
- Torque the air filter cover retaining nut and gear lube monitor bracket nuts.

Description	Nm	lb. in.	lb. ft.
Air filter cover retaining nut	10.8	95	
Gear lube monitor bracket nuts	11		8

- Install the gear lube monitor in the bracket and hold in place with the retaining strap.



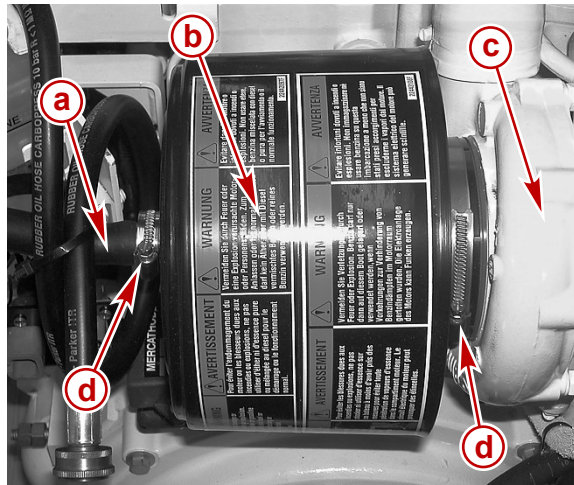
- a - Gear lube monitor
b - Gear lube monitor retaining strap
c - Gear lube monitor bracket
d - Air filter cover retaining nut
e - Gear lube monitor bracket retaining bolts

26147

4.2 Air Filter

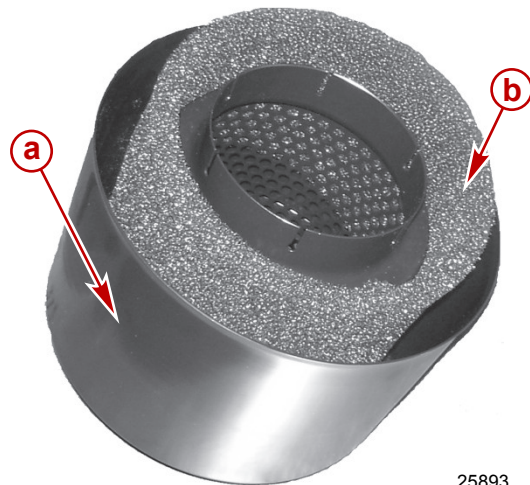
Removal

1. Loosen the clamp and remove the oil separator vent hose.
2. Loosen the clamp and remove the air filter housing from the turbocharger inlet.



25881

3. Remove the air filter element from the air filter housing



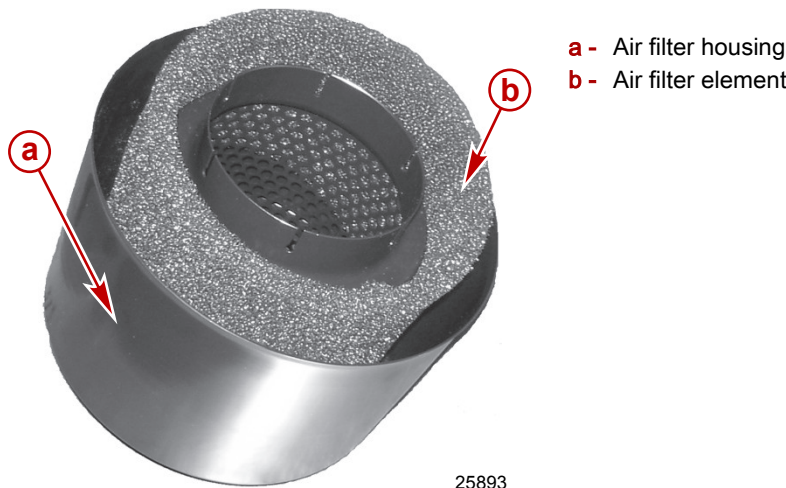
25893

Inspection

1. The air filter cannot be cleaned. Replace the air filter if it is dirty or contaminated.
2. Replace the air filter if the foam element is deteriorated or torn.
3. Replace the air filter at the recommended interval. See **Maintenance Schedules** for the replacement interval under normal conditions.

Installation

- 1. Slide the filter element into the air filter housing. Ensure that the element is seated fully into the air filter housing.



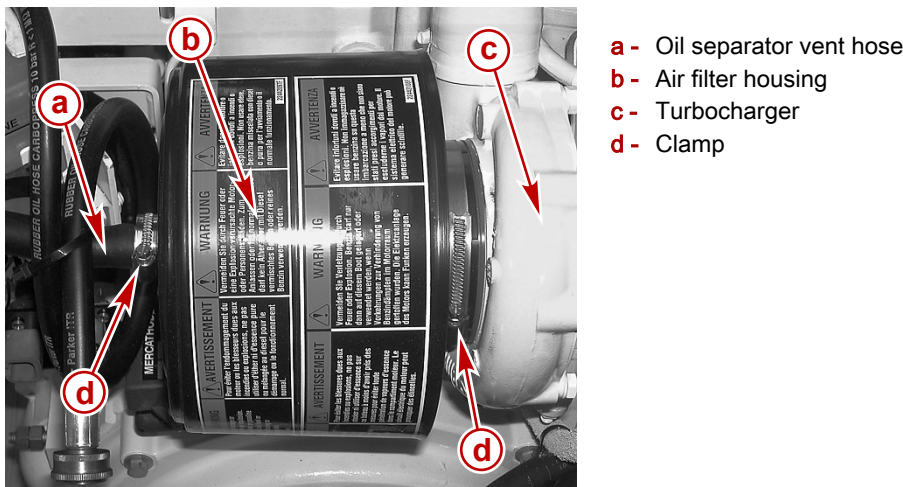
25893

NOTE: The warning labels on the air filter housing must be visible after the air filter housing is installed.

- 2. Install the air filter housing on to the turbocharger inlet.
- 3. Torque the air filter housing clamp.

Description	Nm	lb. in.	lb. ft.
Air filter housing clamp	3.4–6.8	30–60	

- 4. Install the oil separator vent hose. Tighten the oil separator vent hose clamp securely.



25881

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.

NOTICE

Water entering the fuel injection system will cause corrosion and rusting of the injectors and other components, disabling the fuel injection system. Check daily for water in the water-separating fuel filter and have the engine inspected immediately if there is evidence of water in the fuel system.

IMPORTANT: Use a suitable container to collect fuel. Clean up any spills immediately and dispose of fuel in a safe manner in accordance with all local, federal, and international regulations.

The engine-mounted water-separating fuel filter is equipped with a water-in-fuel (WIF) sensor that should alert the operator when water is present in the filter. This fuel filter needs to be replaced at specified intervals or whenever water is detected in the fuel, whichever comes first.

The operator may be alerted that the WIF sensor has detected water in the fuel, depending upon the boat instrumentation package and if equipped:

- A message may be displayed on an instrument
- An indicator lamp may be illuminated

See **Instrumentation**.

Drain or replace the remote mounted primary filter (such as a Racor® filter) at specified intervals, or whenever water is detected in the engine-mounted fuel filter.

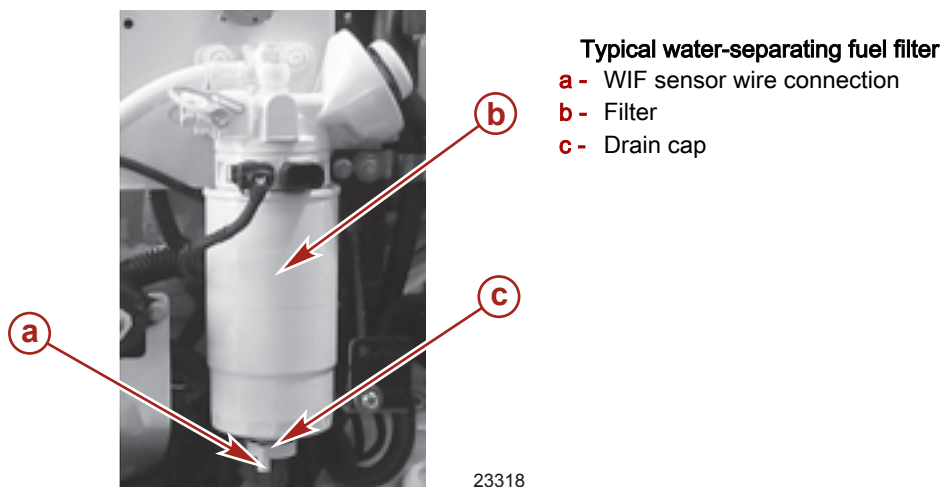
Draining

The engine-mounted water-separating fuel filter can be drained of water and small dirt particles by opening the drain cap on the bottom of the filter.

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

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

1. Place a container under the drain cap on the filter.
2. Open the drain by turning the drain cap counterclockwise (as viewed from the bottom of the filter) until fuel starts draining. Do not remove the drain cap.



3. Drain until the fuel is clear in appearance.
4. Close the drain cap by turning clockwise. Tighten securely.
5. Fill the fuel filter. See **Filling**.

Replacing

⚠ 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.

IMPORTANT: The element cannot be cleaned and reused. It must be replaced.

1. Disconnect both battery cables from the battery.
2. Disconnect the WIF sensor wires, if equipped.

3. Remove the water-separating fuel filter and sealing ring from the mounting bracket. Do not use a filter wrench.

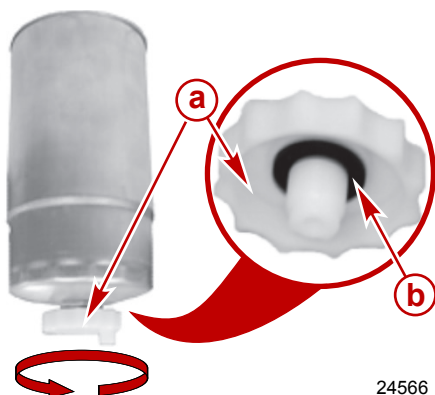


23459

Typical**a -** Water-separating fuel filter

NOTE: It may be necessary to keep the existing drain cap and use it on the new filter. Be sure to replace the O-ring on the drain cap.

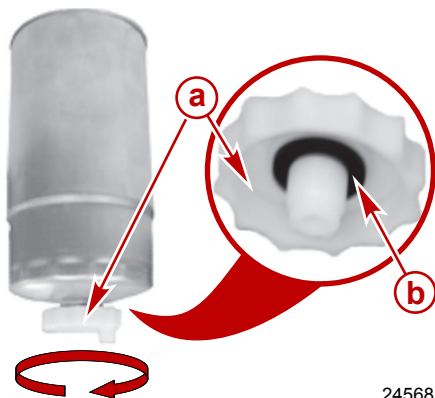
4. Remove the drain cap and O-ring seal from the bottom of the existing fuel filter. Note the position of the O-ring seal.



24566

Typical**a -** Drain cap**b -** O-ring seal

5. Discard the used filter and O-ring seal as defined by local authorities.
6. Install the O-ring and drain cap on the new water-separating fuel filter.



24568

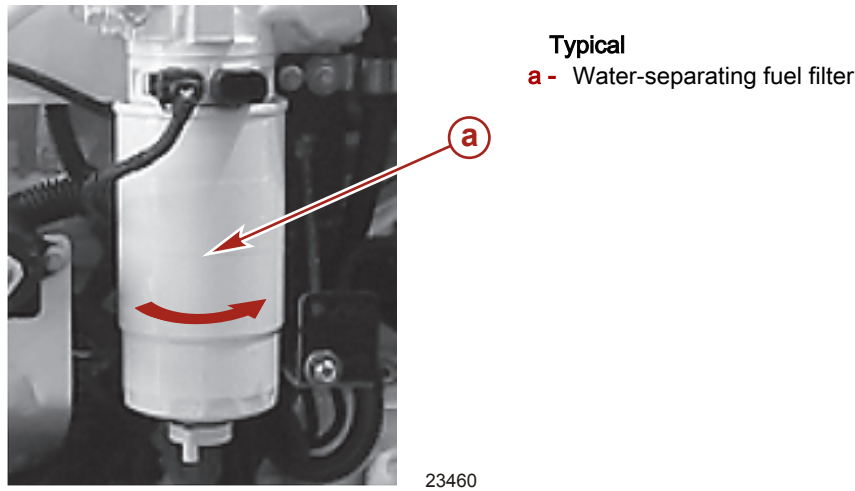
Typical**a -** Drain cap**b -** O-ring seal

7. Lubricate the fuel filter seals.



Tube Ref No.	Description	Where Used	Part No.
80	SAE Engine Oil 30W	Water-separating fuel filter sealing ring	Obtain Locally

8. Align the filter to the bracket. Twist the filter by hand to secure the filter to the bracket. Do not use a filter wrench.



- 9. Ensure that the drain cap is securely tightened.
- 10. Connect the WIF sensor wires, if equipped.
- 11. Fill the water-separating fuel filter with fuel. Refer to **Filling**.
- 12. Check the filter and drain cap for fuel leaks.
- 13. Connect the battery cables.
- 14. Start and operate the engine. Check the filter connection for fuel leaks. If leaks exist, recheck filter installation. If leaks continue, stop the engine immediately and contact your Mercury Diesel authorized repair facility.

Filling

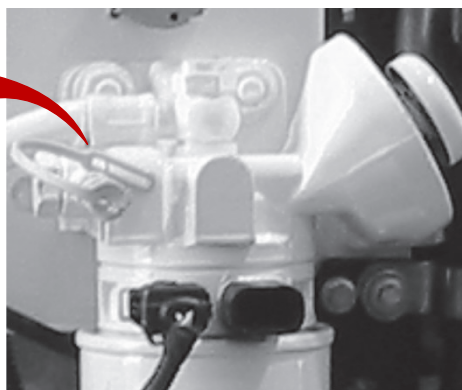
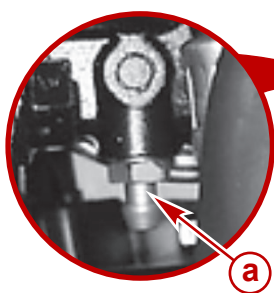
A type of hand pump and primer plunger is located on the fuel filter bracket and is used to

- Refill the fuel filter when draining or changing the filter.
- Refill the fuel system on the engine if the system was run dry.
- Prime the fuel system if the engine has not been run for an extended period.

IMPORTANT: Only fill the fuel filter with the hand pump and primer plunger to ensure that unfiltered fuel does not get into the fuel system.

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

1. Loosen the air vent (bleed) screw on the fuel filter bracket.

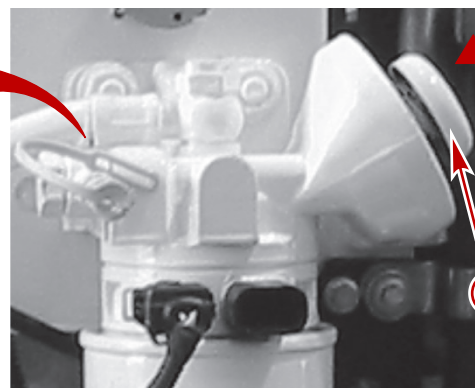
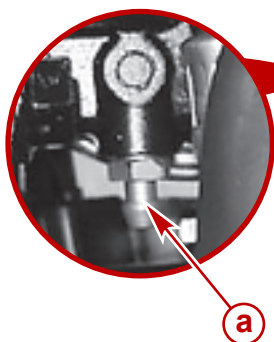


Typical

a - Air vent screw

23469

2. Move the primer plunger up and down repeatedly. The filter is full when an air-free stream of fuel flows from the air vent screw.



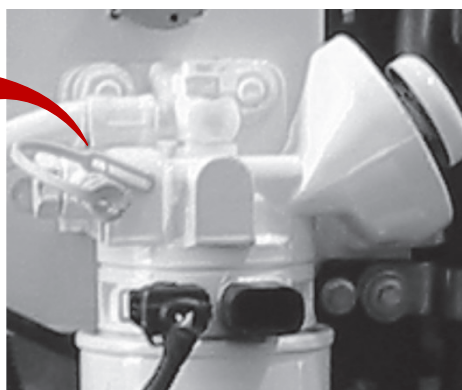
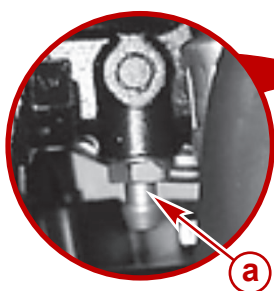
Typical

a - Air vent screw

b - Primer plunger

23468

3. Securely tighten the air vent screw.



Typical

a - Air vent screw

23469

Fuel System

Priming

Prime the engine if it has not been run for an extended period or if the engine will not start.

1. Move the hand pump and primer plunger up and down several times as previously outlined.
2. Attempt to start the engine.

Filling (Bleeding)

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

1. See **Water Separating Fuel Filter - Filling** and fill the fuel filter.
2. Check the filter and drain cap for fuel leaks. Ensure that the bleed screw on the fuel filter bracket is closed.

Fuel Tank Cleaning and Flushing

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

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

Seawater System

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: The engine must be as level as possible to ensure complete draining of the cooling system.

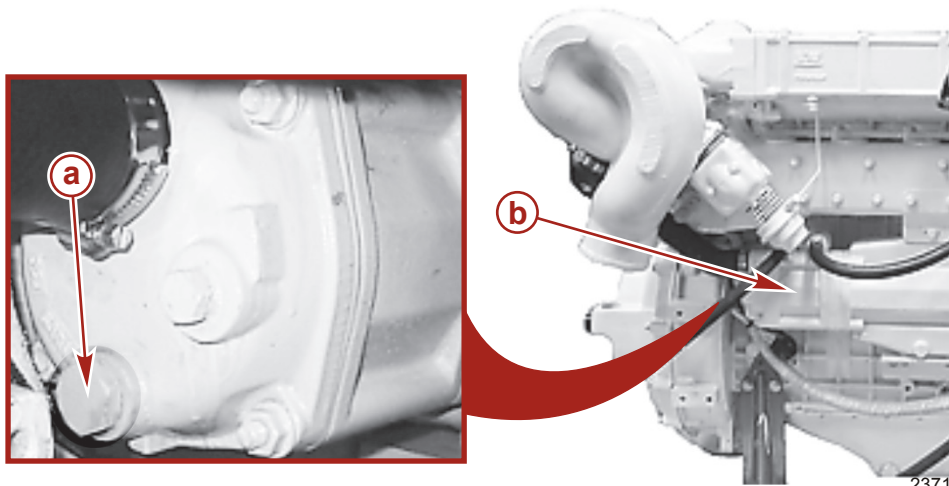
Drain the seawater system of the power package before cold weather (freezing temperature), seasonal storage, or extended storage.

IMPORTANT: The boat must not be operating during this procedure.

⚠ 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.

1. Remove the boat from the water if possible.
2. **If the boat is to remain in the water**, turn on the bilge pump, close the seacock (if equipped), or disconnect and plug the seawater inlet hose.
3. Make the engine as level as possible to ensure complete draining of the seawater system.
NOTE: The anode assembly on the back of the fluid cooler can be used as a drain plug.
4. Remove the drain plug from the aft end cover of the fluid cooler.

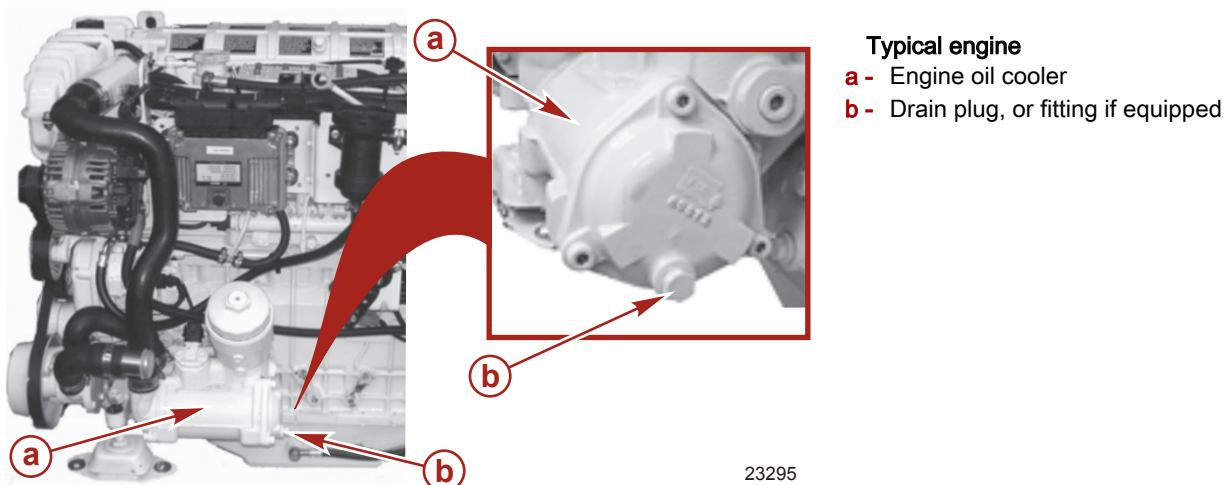


Typical engine

- a** - Anode assembly drain plug
- b** - Fluid cooler

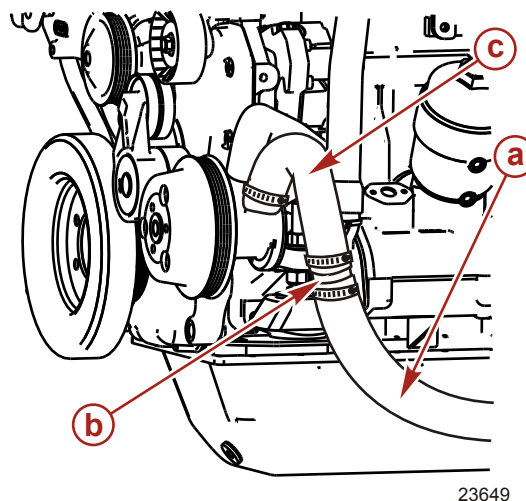
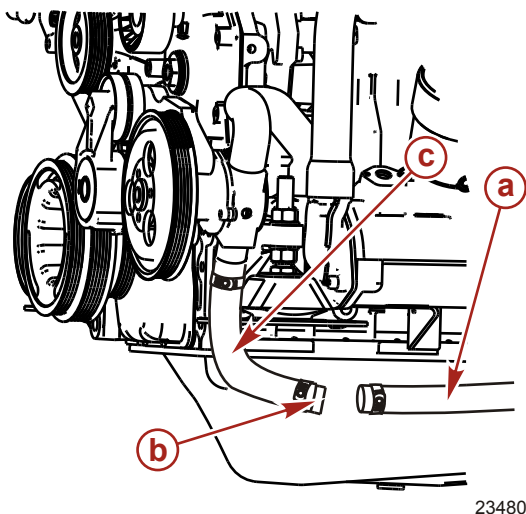
23710

5. Remove the drain plug, or fitting (if equipped), from the aft end cover of the engine oil cooler.



NOTE: In the following steps, the hoses may require lowering or bending to allow seawater to drain completely.

6. Disconnect the seawater inlet hose from the connector on the seawater pump hose and drain.



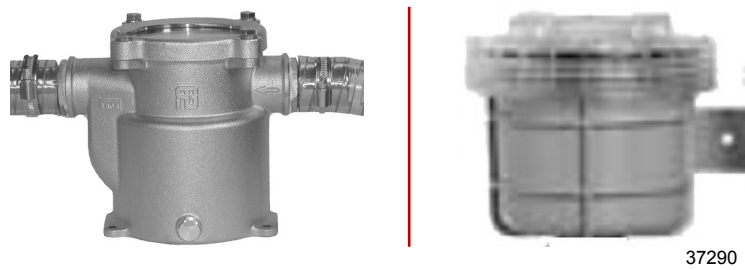
2.8

- a -** Seawater inlet hose
b - Connector
c - Seawater pump hose

4.2

7. Repeatedly clean out the drain holes using a stiff piece of wire until the seawater section is completely drained.
8. **On models equipped with a seawater strainer:**
 - a. Remove the drain plug and washer if equipped.
 - b. Remove both hoses from the seawater strainer and drain them completely.
 - c. Drain and empty the seawater strainer.
 - d. Connect the hoses and tighten the hose clamps.

- e. Install the sealing washer and drain plug, if equipped.



Typical

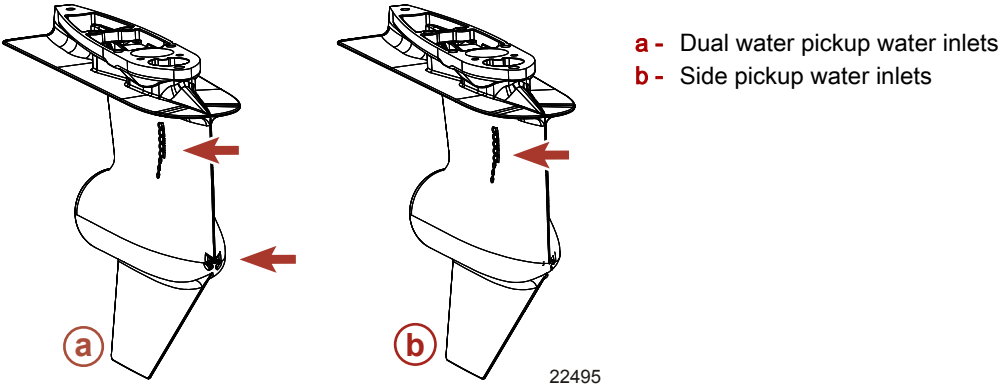
- 9. After the seawater has completely drained, apply sealant to the threads of the drain plugs or fittings (if equipped). Install and tighten the drain plugs or fittings.

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

- 10. Connect all hoses. Tighten the hose clamps.

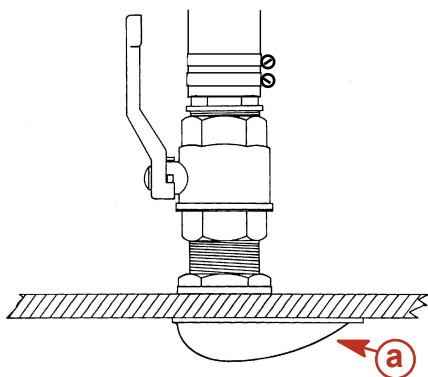
Sterndrive Water Inlets Check

- 1. Obtain a piece of wire the appropriate size to insert into the water inlets holes.
- 2. Insert the wire in and out of the sterndrive water inlets to ensure that they are open and to remove debris or marine growth. Do not scrape the sterndrive paint.
- 3. Remove the wire from the sterndrive and retain for periodic water inlet checks.



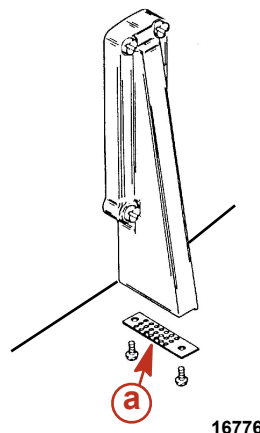
Checking the Seawater Pickups

1. Ensure that the water inlet holes for the seawater pickup are clean and not obstructed.



Typical through-hull seawater pickup

a - Water inlet holes



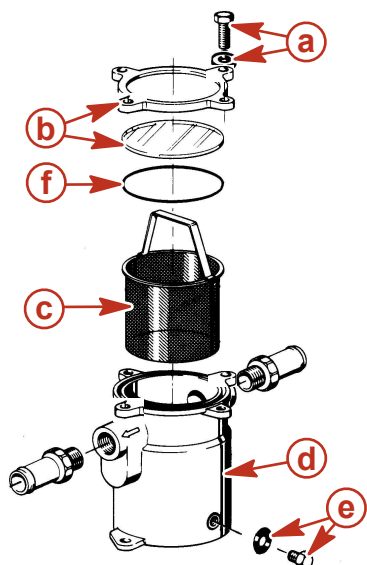
Typical through-transom seawater pickup

Cleaning the Seawater Strainer, if Equipped

NOTICE

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

1. With the engine off, close the seacock, if equipped, or remove and plug the seawater inlet hose.
2. For metal seawater strainers:
 - a. Remove the screws, washers, and cover.
 - b. Remove the strainer, drain plug, and sealing washer.
 - c. Clean any debris from the strainer housing.
 - d. Flush both the strainer and housing with clean water.
 - e. Inspect the cover gasket and replace if damaged.



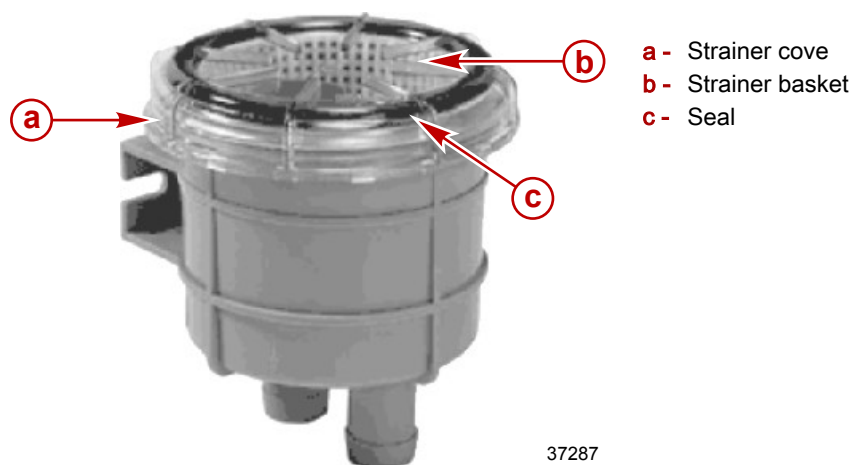
- a** - Screws and washers
- b** - Cover with glass
- c** - Strainer
- d** - Housing
- e** - Drain plug and sealing washer
- f** - Seal

12863

3. For plastic seawater strainers:
 - a. Remove the cover.
 - b. Remove the strainer.

Section 5 - Maintenance

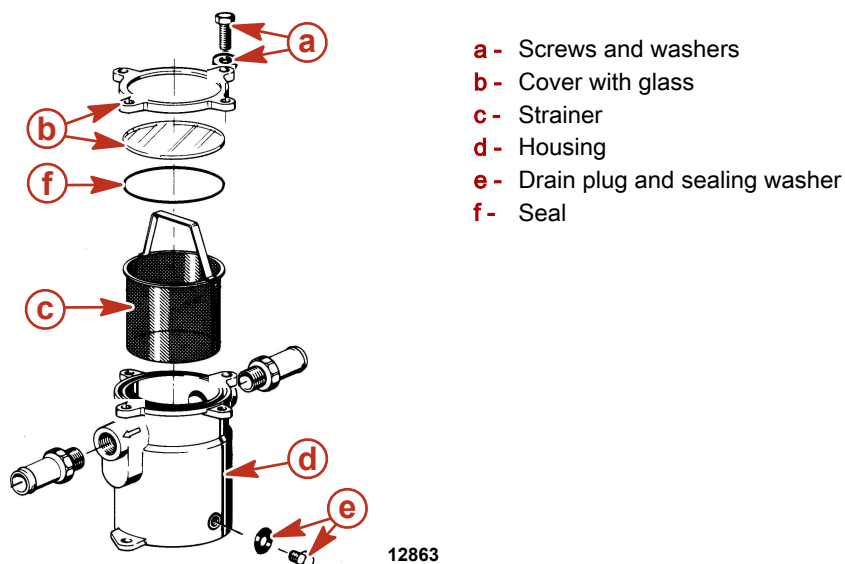
- c. Clean any debris from the strainer housing.
- d. Flush both the strainer and housing with clean water.
- e. Inspect the cover gasket and replace if damaged.



⚠ CAUTION

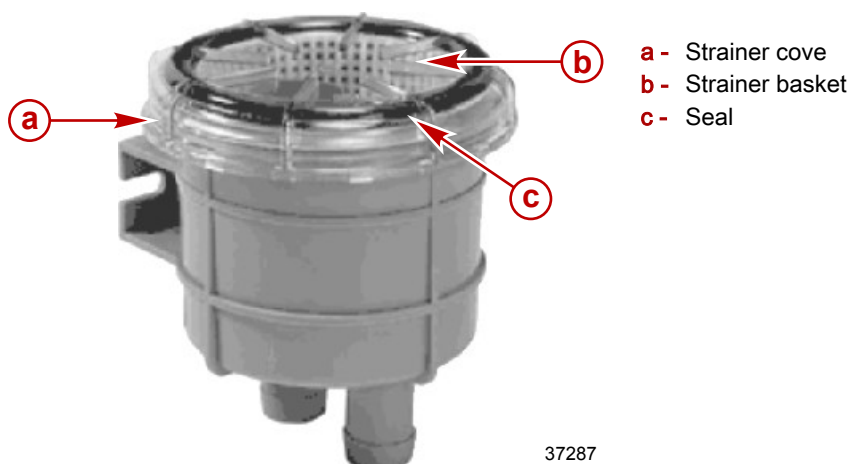
Seawater leaking from the seawater strainer could cause excess water in the bilge, damaging the engine or causing the boat to sink. Do not overtighten the cover screws, or the cover may warp and introduce seawater into the bilge.

- 5. For metal seawater strainers:
 - a. Install the strainer, drain plug, and sealing washer.
 - b. Install the strainer basket.
 - c. Assemble the cover.
 - d. Tighten the cover screws. Do not overtighten.



- 6. For plastic seawater strainers:
 - a. Insert the plastic strainer basket.
 - b. Check the cover seal installation.

- c. Screw the strainer cover on.



37287

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

Flushing the Seawater System—Sterndrive Models

Flushing the seawater system with fresh water is needed only for applications operating in saltwater, brackish water, polluted water, or water with a high mineral content to avoid salt or silt buildup. For best results we recommend flushing the seawater system after each outing. After each operation in saltwater and before storage, the seawater cooling system must be flushed.

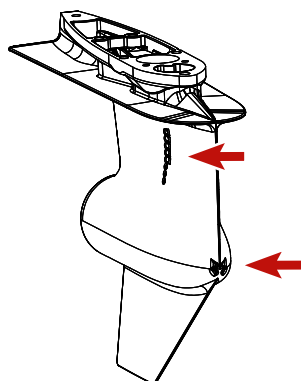
With the Boat out of the Water

1. Lower the sterndrive to the full down (in) position.

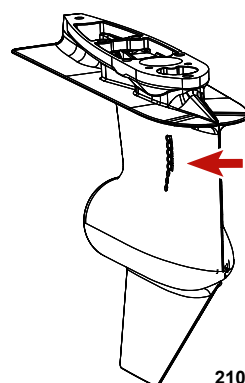
⚠ WARNING

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. See **Propellers**.
3. Install the appropriate flushing attachment over the water inlet holes in the gear housing.



Dual water pickup

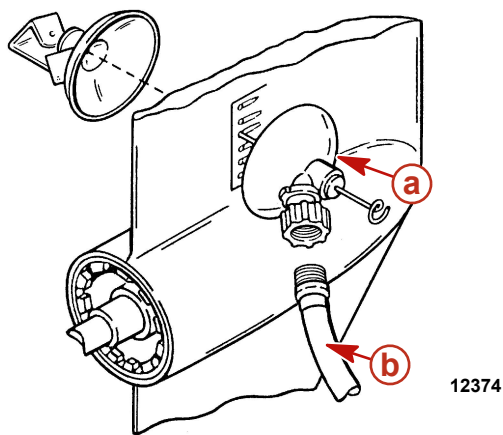


21081

Side pickup

Flushing Device	91-44357Q 2
 9192	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.
Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1
 9194	Blocks off the front water inlet holes on the dual water inlet gearcases.

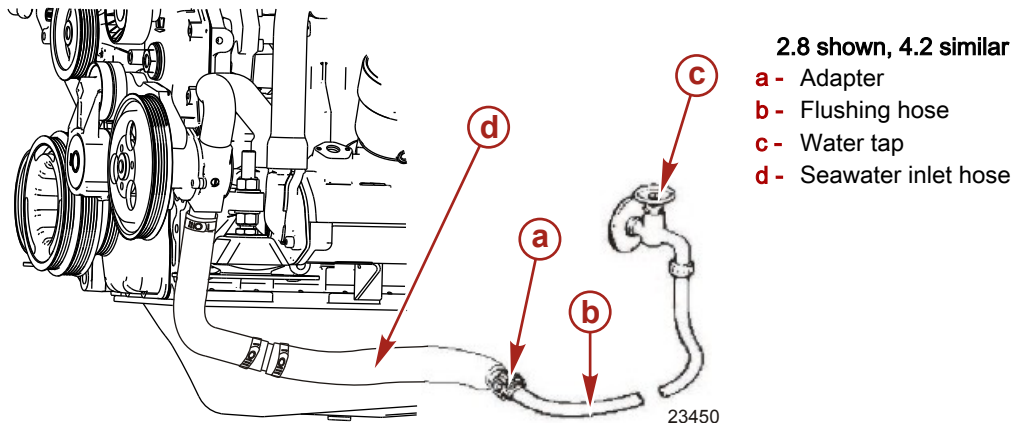
4. Connect a flushing hose from a water tap to the flushing attachment.



Typical
a - Flushing attachment
b - Hose

IMPORTANT: Engines with the sterndrive water inlet blocked off at the gimbal housing and using a through-hull or through-transom water inlet need a supply of cooling water available to both the sterndrive and to the engine during operation.

5. If your power package uses a through-hull or through-transom pickup, connect a second flushing hose from a water tap to the seawater inlet hose connected to the seawater pump inlet using an appropriate adapter.



6. Partially open the water source to about 1/2 maximum. Do not use full water pressure.

7. Place the remote control in neutral, idle speed position and start the engine.

NOTICE

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

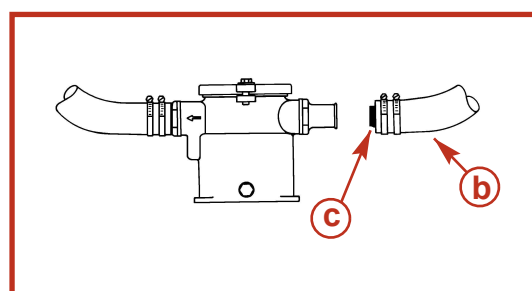
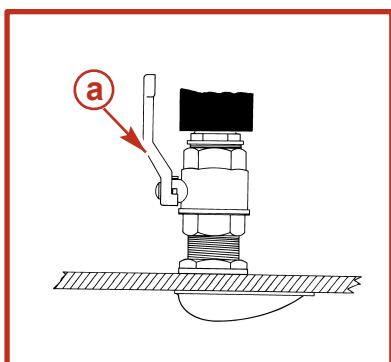
8. Operate the engine at idle speed in neutral for about ten minutes or until the discharge water is clear.
9. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
10. Stop the engine.
11. Shut off the water tap.
12. Remove the sterndrive flushing attachment.
13. **If your power package uses a through-hull pickup,**
 - a. Remove the adapter from the seawater pump inlet hose connection.
 - b. Reconnect the seawater inlet hose. Tighten the hose clamps securely.

With the Boat in the Water

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.

1. Close the seacock, if equipped, or disconnect and plug the seawater inlet hose.

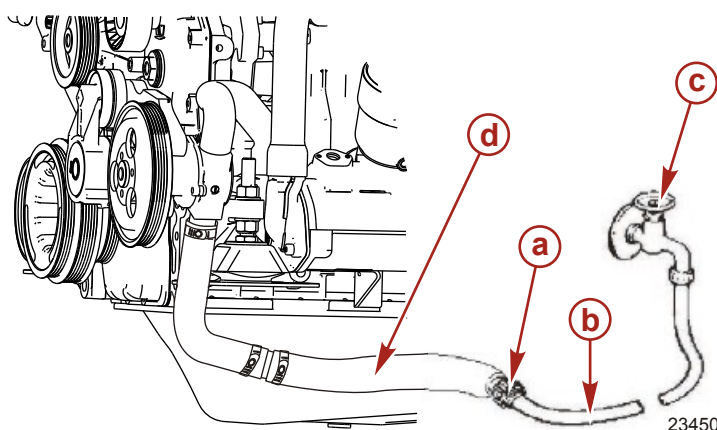


13171

Typical

- a** - Seacock
- b** - Seawater inlet hose
- c** - Plug

2. Using an appropriate adapter, connect a flushing hose from a water tap to the seawater inlet hose connected to the seawater pump inlet.



2.8 shown, 4.2 similar

- a** - Adapter
- b** - Flushing hose
- c** - Water tap
- d** - Seawater inlet hose

23450

3. Lower the sterndrive to the full down (in) position.
4. Partially open the water source to about 1/2 maximum. Do not use full water pressure.

5. Place the remote control in neutral, idle speed position and start the engine.

NOTICE

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

6. Operate the engine at idle speed in neutral for about ten minutes or until the discharge water is clear.
7. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
8. Stop the engine.
9. Shut off the water tap.
10. Remove the adapter from the seawater pump inlet hose connection.
11. Do not open the seacock or reconnect the water inlet hose at this time to prevent water from siphoning into the boat or engine.
12. Place an appropriate tag on the key switch stating that the seacock must be opened or the seawater inlet hose must be reconnected before operating the engine.

Engine Seawater Pump Inspection

IMPORTANT: Mercury strongly recommends that this service be performed by a Mercury Diesel authorized repair facility.

Remove and inspect the engine seawater pump at the interval specified in the **Maintenance Schedule**. See your Mercury Diesel authorized repair facility.

Replacing the Engine Coolant in the Closed-Cooling System

Draining the Closed-Cooling System

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: For instructions on draining the seawater section, refer to **Draining the Seawater System** in this section.

IMPORTANT: Observe the following points.

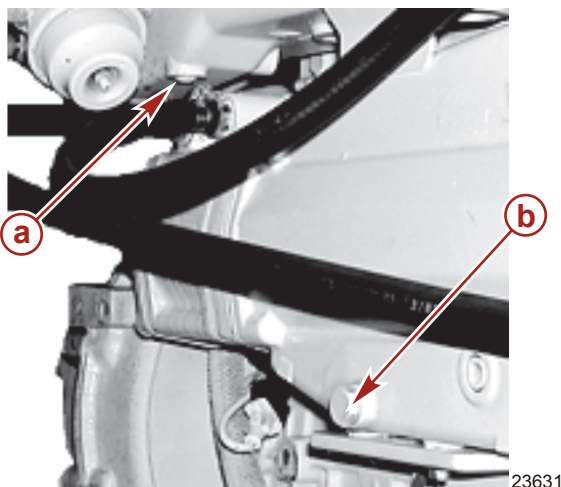
- Ensure that the engine is as level as possible to promote complete draining of the cooling system.
- The closed-cooling section must be filled year-round with the required coolant. If the engine will be exposed to freezing temperatures, ensure that the closed-cooling section is filled with a solution of ethylene glycol antifreeze and water properly mixed to protect the engine to the lowest temperature to which it will be exposed.
- Do not use propylene glycol antifreeze in the closed-cooling section of the engine.

⚠ 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.

1. Allow the engine to cool.
2. Remove the pressure cap from the expansion tank and coolant reservoir.
NOTE: Drain coolant into a suitable container. Dispose of old coolant properly.
3. Remove the intake and exhaust manifold drain plug.

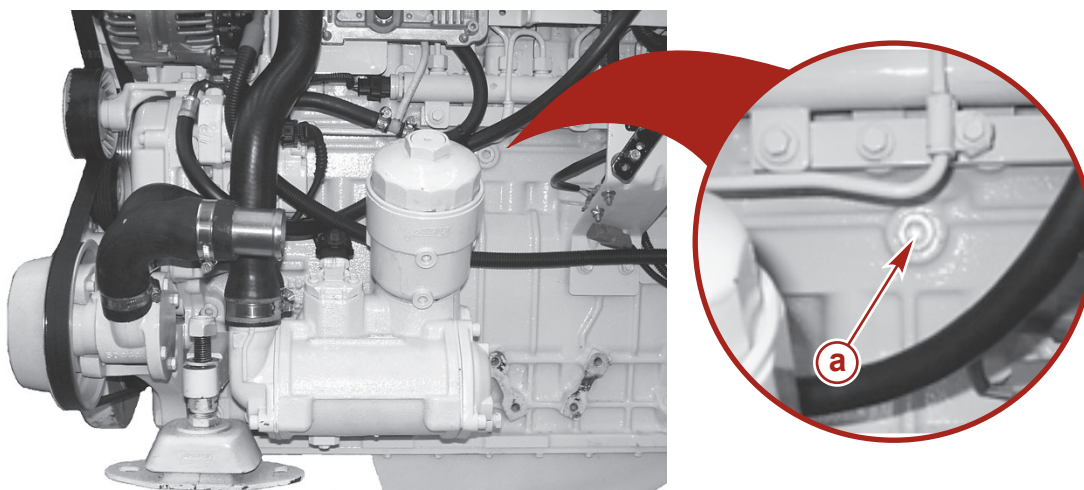
4. Remove the heat exchanger drain plug.



4.2 shown, 2.8 similar

- a - Intake and exhaust manifold drain plug
- b - Fluid cooler drain plug

5. Open the engine block drain plug.



24552

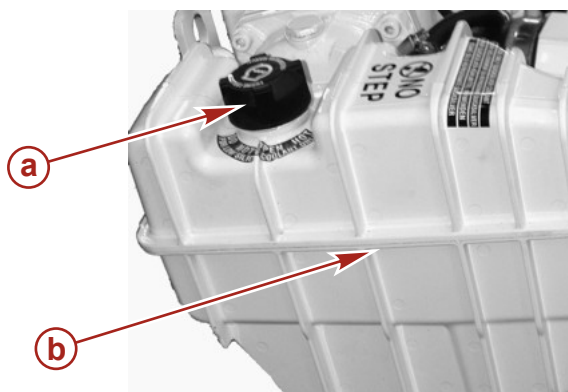
4.2 shown, 2.8 similar

- a - Engine block drain plug

6. After the coolant has drained completely, install the intake and exhaust manifold drain plug, the heat exchanger drain plug, and the engine block drain plug. Tighten all drain plugs securely.
7. If required, clean the closed-cooling system. See your local Mercury Diesel authorized repair facility.
8. Fill the system with the specified coolant. Refer to **Filling the Closed Cooling System**.

Filling the Closed-Cooling System

1. Remove the pressure cap.



- a - Pressure cap
- b - Coolant expansion tank

23302

IMPORTANT: Use only the specified coolant.

- If the coolant is being replaced or the level is low, slowly add the specified coolant to the level indicated in the table.

Coolant level in expansion tank		
All models	Within 25 mm (1 in.) of the bottom of the filler neck, or between the upper and lower marks, if marked	

Description	Where Used	Part Number
Mercury Extended Life Antifreeze	Closed-cooling system	92-877770K1

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.

- Ensure that the seawater pickup pump is supplied cooling water.
- Do not install the pressure cap. Start and operate the engine at fast idle (1500–1800 RPM). Add coolant if necessary to maintain the coolant at the level specified previously.
IMPORTANT: When installing the pressure cap, be sure to tighten it securely to avoid coolant loss.
- Install the pressure cap after the engine has reached normal operating temperature (with the thermostat fully open) and the coolant level remains constant.
- Test the engine operation. Observe the temperature gauge and check the engine for coolant leaks. If the temperature gauge indicates excessive temperature or if the coolant is leaking, stop the engine immediately and inspect for the cause.
- After the first operation, allow the engine to cool.
- Remove the pressure cap and add the specified coolant to the level indicated in the table.

Coolant level in expansion tank	
All models	Within 25 mm (1 in.) of the bottom of the filler neck, or between the upper and lower marks, if marked

- Install and securely tighten the pressure cap.

Corrosion Protection

General Information

Whenever two or more dissimilar metals (such as those found on this power package) 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 erosion is known as *galvanic corrosion* and, if it is not controlled, it will eventually cause the need for replacement of power package components exposed to water.

To help control the effects of galvanic corrosion, Mercury power packages come with several sacrificial anodes and other corrosion protection devices. For a more comprehensive explanation of corrosion and corrosion protection refer to the **Marine Corrosion Protection Guide**.

IMPORTANT: Replace sacrificial anodes if eroded 50% or more. Mercury strongly recommends avoiding the use of anodes from other manufacturers. Refer to your Mercury Diesel authorized repair facility for additional information.

Engine Corrosion Protection Components

The engine is equipped with a sacrificial anode located on top of the aftercooler end cover to assist in protecting the engine and the seawater cooling system from corrosion. 4.2 models contain a second sacrificial anode assembly on the stern end of the fluid cooler.

Removal

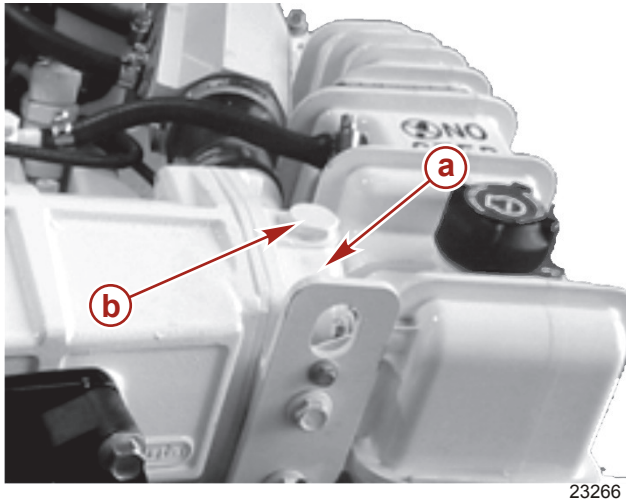
- Allow the engine to cool.

NOTICE

Failure to close the seawater inlet or seacock when removing or replacing the anode plugs can lead to water damage. Close the seacock or remove and plug the seawater inlet hose to prevent water from entering the anode plug holes.

- With the engine off, close the seacock, if equipped, or remove and plug the seawater inlet hose.
- Drain the seawater system. See **Draining the Seawater System**.

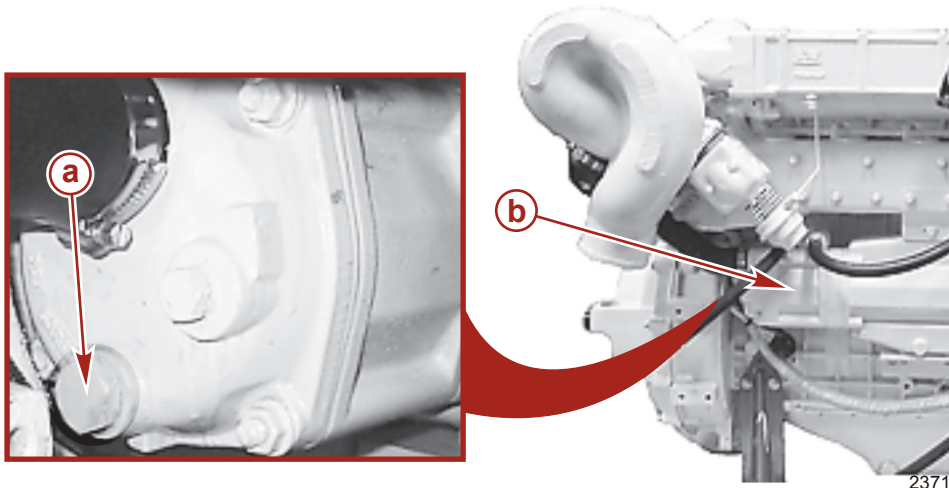
4. Remove the anode assembly (anode plug and the sacrificial anode) from the top of the aftercooler end cover.



- a** - Aftercooler end cover
b - Anode assembly

23266

5. **On 4.2 models**, remove the anode assembly (anode plug and the sacrificial anode) from the aft end of the fluid cooler.

**4.2**

- a** - Anode assembly
b - Fluid cooler

23710

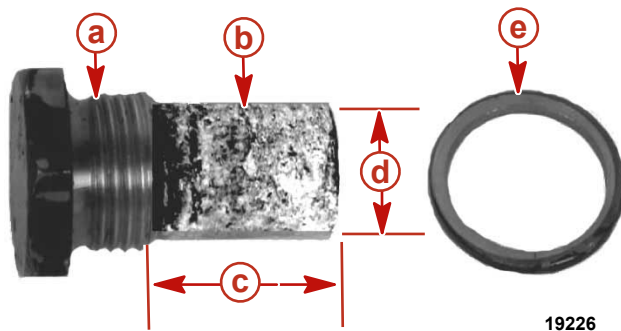
Cleaning and Inspection

Inspection and replacement interval will vary according to the condition of the seawater and the mode of engine operation.

NOTE: Using sandpaper, fiber brush, or cleaning pad, remove the deposits from the surface of the anode before trying to determine the amount of erosion. Do not use a mild steel brush, which might leave deposits that could accelerate corrosion.

1. Remove the deposits.
2. Inspect and measure the anode. Compare the measurements to the specifications for a new sacrificial anode and replace the anode assembly when deteriorated 50%.

NOTE: Sacrificial anodes are available only as an assembly. Replace both the plug and anode as a unit.



Anode assembly

- a** - Anode plug
b - Sacrificial anode
c - Length
d - Diameter
e - Sealing washer

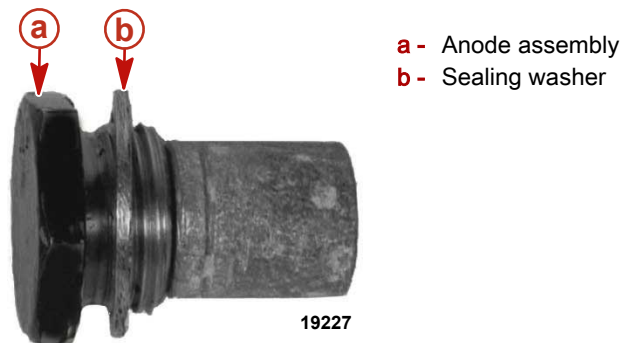
19226

Sacrificial anode measurements (new)	
Length	19 mm (3/4 in.)
Diameter	16 mm (5/8 in.)

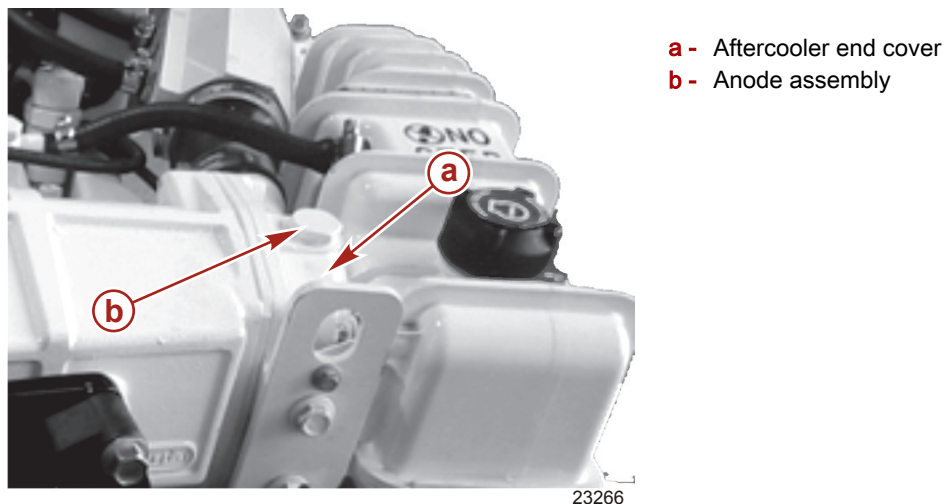
3. Discard the sealing washer.

Installation

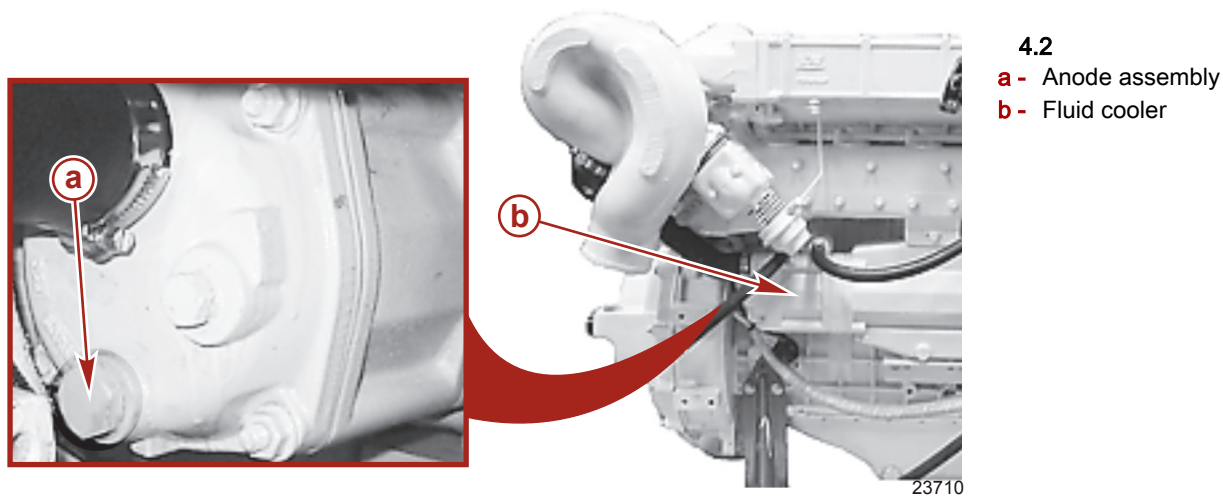
1. Install a new sealing washer on the anode assembly (anode plug with the sacrificial anode).



2. Install the anode assembly and washer into the aftercooler end cover. Tighten securely.



3. **On 4.2 models**, install the anode assembly and washer into the aft end of the fluid cooler. Tighten securely.



4. Unplug and connect the seawater inlet hose, or open the seacock if equipped.

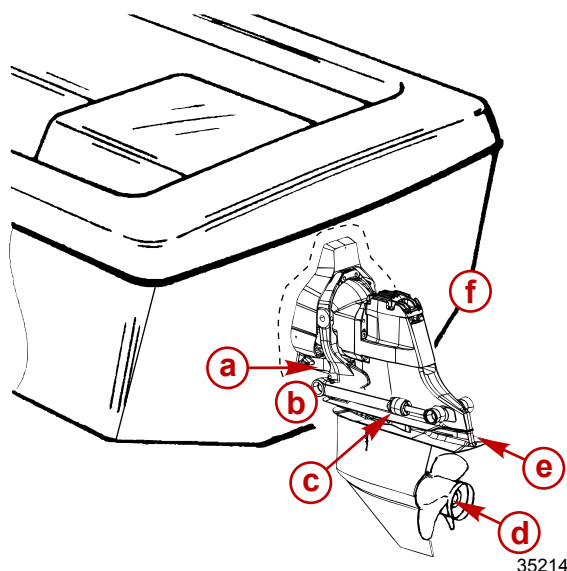
NOTICE

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

5. Ensure that the seawater pickup pump is supplied cooling water.
6. Start the engine and check for leaks

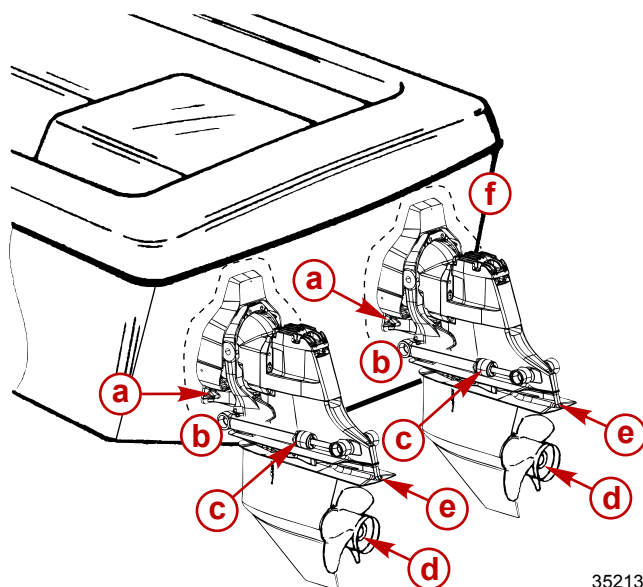
Sterndrive Corrosion Protection Components

To help control the effects of galvanic corrosion, sterndrives come with several sacrificial anodes and other corrosion protection devices. For a more comprehensive explanation of corrosion and corrosion protection, refer to the **Marine Corrosion Protection Guide**.



Typical single sterndrive

- a** - Anode (Alpha models), MerCathode (Bravo models)
- b** - Ventilation plate anode
- c** - Trim cylinder anodes
- d** - Bearing carrier anodes
- e** - Gearcase anodic plate
- f** - Anode kit on lower hull



Dual sterndrive

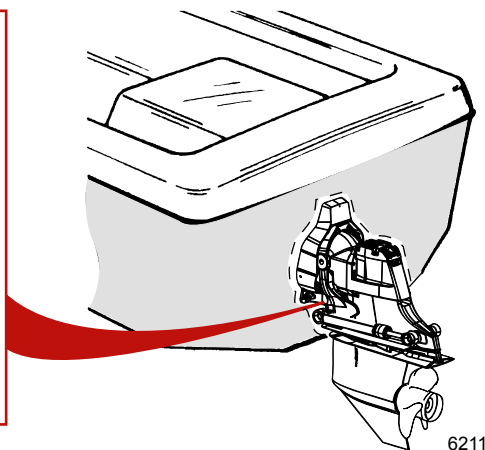
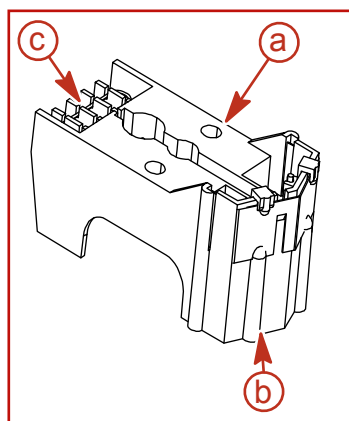
- a** - Anode (Alpha models), MerCathode (Bravo models)
- b** - Ventilation plate anode
- c** - Trim cylinder anodes
- d** - Bearing carrier anodes
- e** - Gearcase anodic plate
- f** - Anode kit on lower hull

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.

Section 5 - Maintenance

Do not pressure-wash the MerCathode assembly, if equipped. Doing so will damage the coating on the reference electrode wire and decrease the corrosion protection.



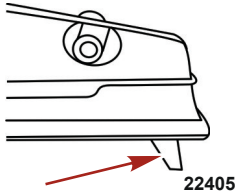
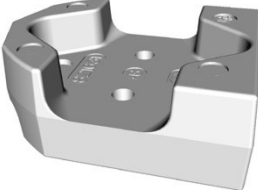
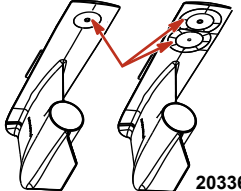
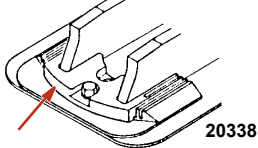
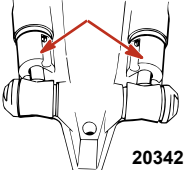
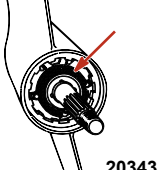
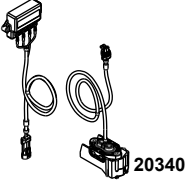
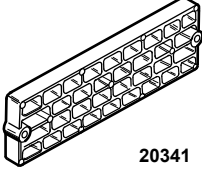
MerCathode mounted to the underside of the gimbal housing, if equipped

- a -** MerCathode reference electrode, if equipped
- b -** Do not paint
- c -** Do not pressure wash

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

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

MerCathode System—The electrode assembly, if equipped, replaces the anode block. The system should be tested to ensure adequate output. Perform the test when the boat is moored, using a Quicksilver reference electrode and test meter. Contact your Mercury Diesel authorized repair facility.

Description	Location	Figure
Alpha sterndrive gearcase anodic plate	Mounted on the underside of the lower gearcase.	 22405
Alpha sterndrive gimbal housing anode	Mounted on the underside of the gimbal housing.	 53380
Bravo sterndrive gearcase anode plate	Mounted on the underside of the lower gearcase.	 20336
Alpha and Bravo sterndrive ventilation plate anode	Mounted on the front of the gearcase.	 20338
Alpha and Bravo sterndrive trim cylinder anodes	Mounted on each of the trim cylinders.	 20342
Alpha and Bravo sterndrive bearing carrier anode	Located in front of the propeller, between the front side of the propeller and the gear housing.	 20343
MerCathode System	The MerCathode electrode, if equipped, 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.	 20340
Anode kit (if equipped)	Mounted to the boat transom.	 20341

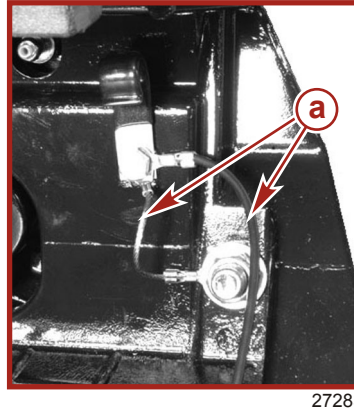
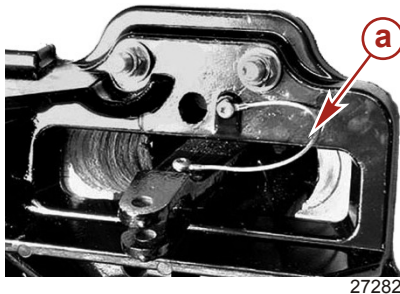
In addition to the corrosion protection devices, take the following steps to inhibit corrosion:

1. Paint the power package.
2. Annually spray the power package components on the inside of the boat with Corrosion Guard to protect the finish from dulling and corrosion. You may also spray external power package components.
3. Keep all lubrication points, especially the steering system, shift, and throttle linkages, well lubricated.
4. Flush the cooling system periodically, preferably after each use.

Continuity Circuit—Bravo Sterndrive

The transom assembly and sterndrive have ground-circuit wires to ensure good electrical continuity between the engine, transom assembly, and sterndrive components. Good continuity to a ground is essential for the anode and MerCathode system to function effectively.

1. Inspect the steering lever ground wire for loose connections, broken connectors, or frayed wiring.
2. Inspect the inner transom plate ground wire for loose connections, broken connectors, or frayed wiring.

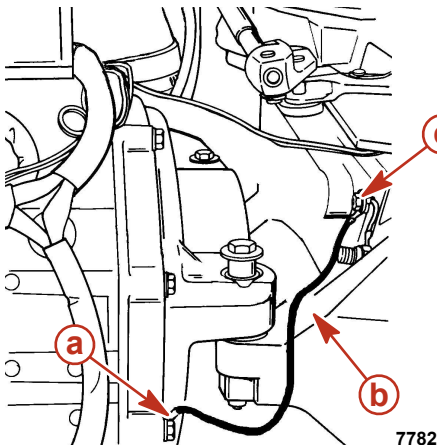


Steering lever continuity wire

a - Continuity wire

Transom plate continuity wires

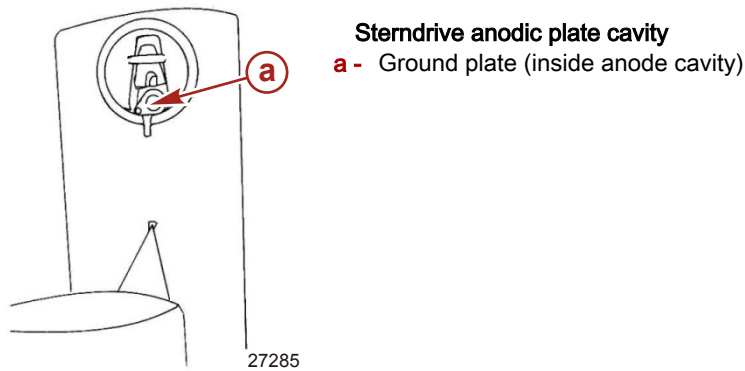
3. Inspect the flywheel housing grounding stud and ground wire, and the inner transom plate grounding screw for loose connections, broken connectors, or frayed wiring.



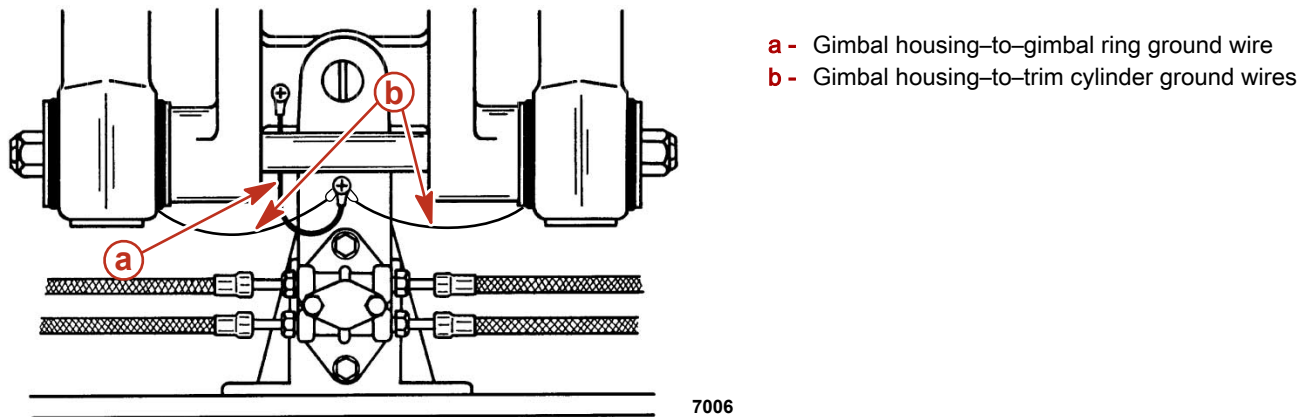
Typical

- a** - Flywheel housing screw or grounding stud
- b** - Continuity circuit (ground) wire
- c** - Inner transom plate grounding screw

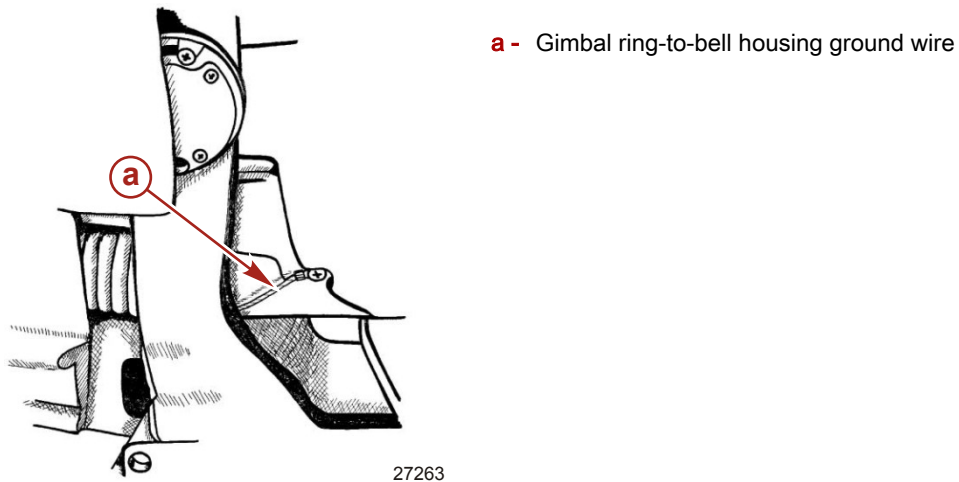
4. Inspect the driveshaft housing-to-gear housing ground plate inside the anode cavity for a loose or faulty connection.



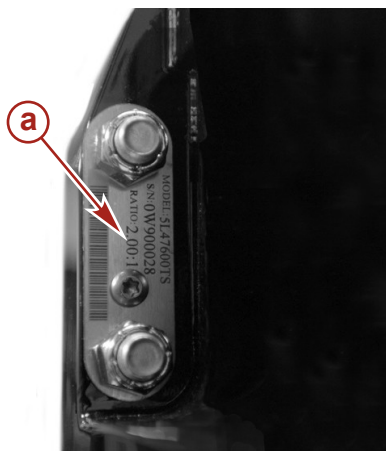
5. Inspect the gimbal housing ground wires for loose connections, broken connectors, or frayed wiring.



6. Inspect the gimbal ring ground wire for loose connections, broken connectors, or frayed wiring.



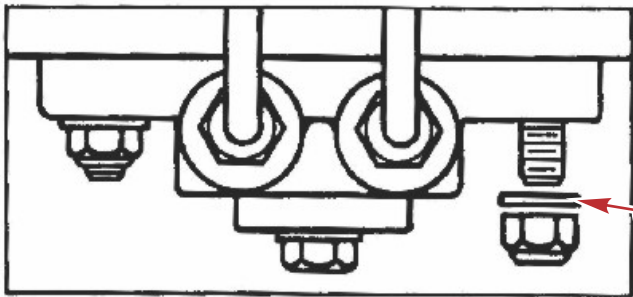
7. Inspect the sterndrive ground plate for loose or broken connections.



a - Sterndrive-to-bell housing ground plate

27264

8. Inspect the continuity washers under the hydraulic manifold block fasteners for a loose or faulty connection .



a - Continuity washers

9957

9. Inspect the sterndrive U-joint bellows ground clips and exhaust tube ground clip for loose or faulty connections.

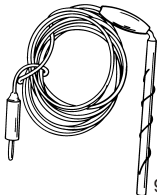


Exhaust tube ground clip shown, U-joint bellows ground clips similar
a - Exhaust tube ground clip

19627

MerCathode

If the boat is equipped with a MerCathode system, the system should be tested to ensure that it is providing adequate output to protect the underwater metal parts on the boat. The test should be made where the boat is moored, using a Reference Electrode and Test Meter.

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

9188

Refer to the appropriate Mercury MerCruiser sterndrive service manual for testing procedures.

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.

Painting Your Power Package

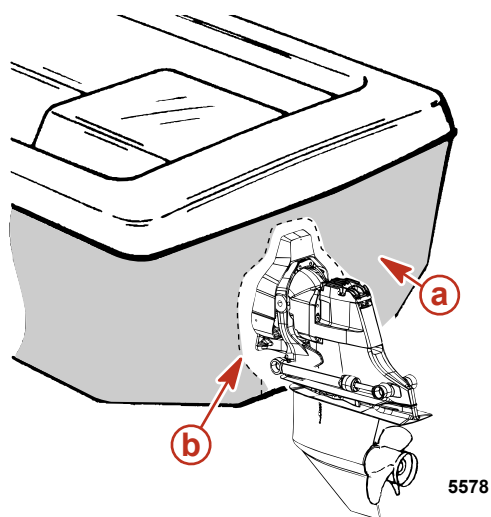
IMPORTANT: Corrosion damage that results from the improper application of anti-fouling paint will not be covered by the limited warranty.

1. **Painting the boat hull or transom:** you may apply anti-fouling paint to the boat hull and transom. However, observe the following:

IMPORTANT: Do not paint anodes or MerCathode System reference electrode and anode. Paint will render them ineffective as inhibitors of galvanic corrosion.

IMPORTANT: If anti-fouling protection is required for the boat hull or transom, you can use copper-based or tin-based paints where not prohibited by law. If using copper-based or tin-based anti-fouling paints, observe the following:

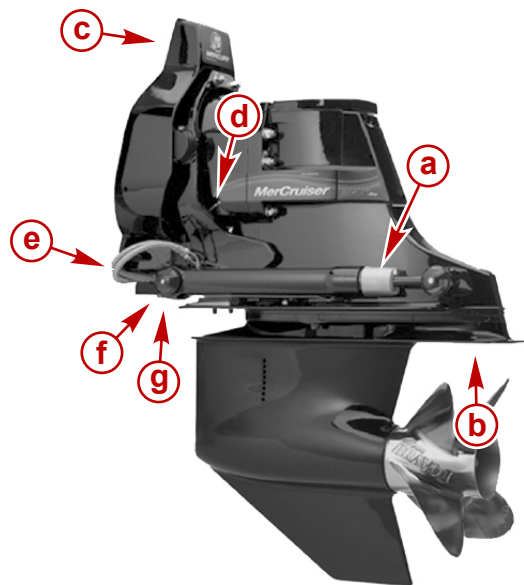
- Avoid any electrical interconnection between the paint and the Mercury MerCruiser product, anodic blocks, or MerCathode system by allowing a minimum of 40 mm (1-1/2 in.) unpainted area on the transom of the boat around these items.



- a - Painted boat transom
- b - Unpainted area on transom

2. **Painting the sterndrive unit or transom assembly:** The sterndrive unit and transom assembly should be painted with a good-quality marine paint or an anti-fouling paint that does not contain copper, tin, or any other material that could conduct electrical current. Do not paint drain holes, anodes, MerCathode system, or items specified by the boat manufacturer.

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.

Lubrication

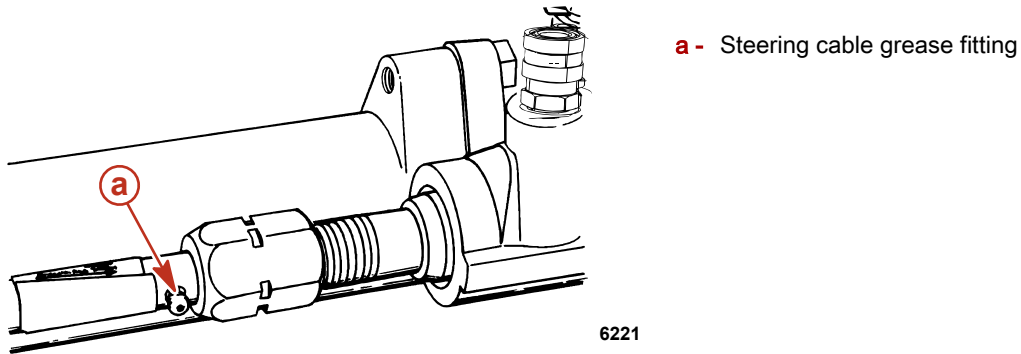
Steering System

⚠ 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.

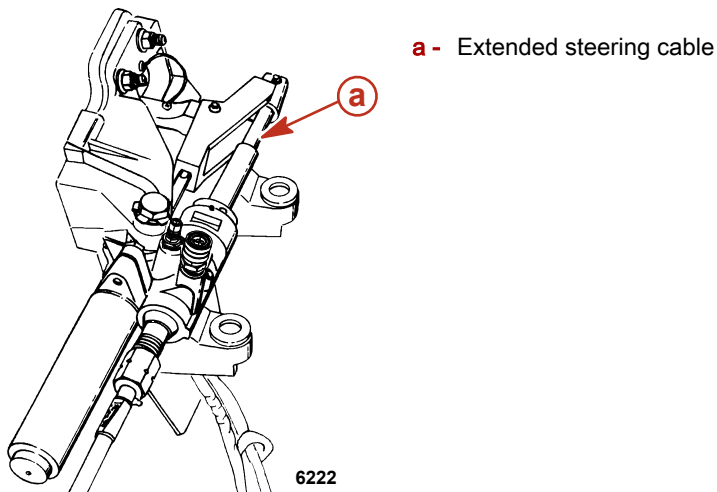
NOTE: If the steering cable does not have a grease fitting, the inner wire of the cable cannot be greased.

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.



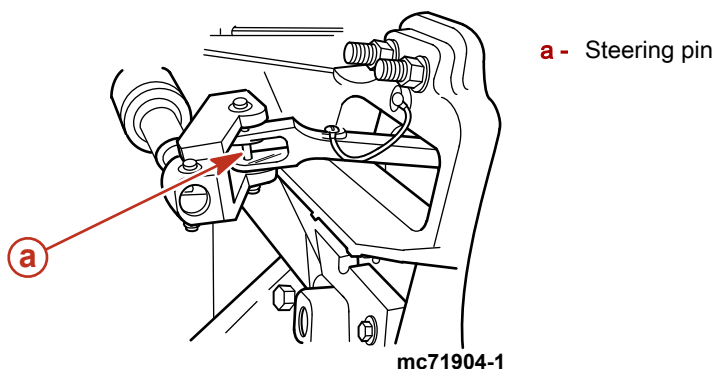
Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Steering cable grease fitting	92-802859A 1

2. 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.
 95	2-4-C with PTFE	Steering cable	92-802859A 1

3. Lubricate the steering pin.



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

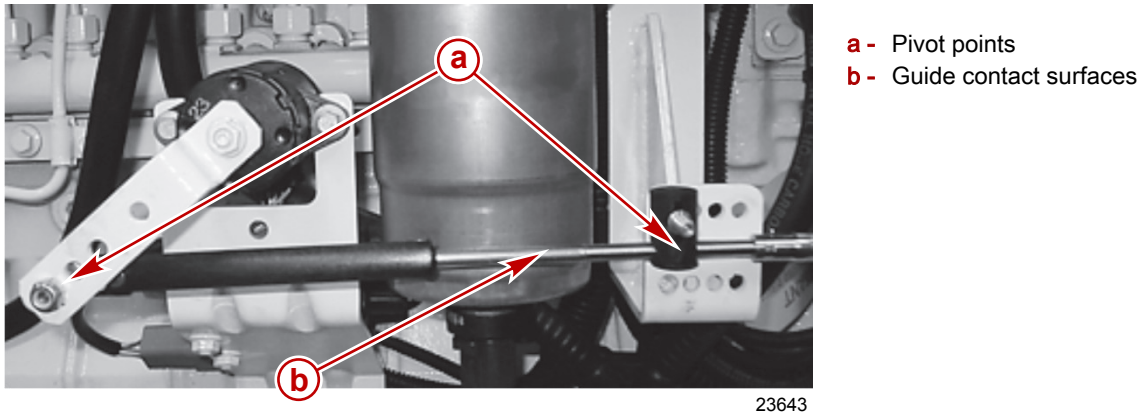
4. On dual engine boats: Lubricate the tie bar pivot points.

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

5. 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

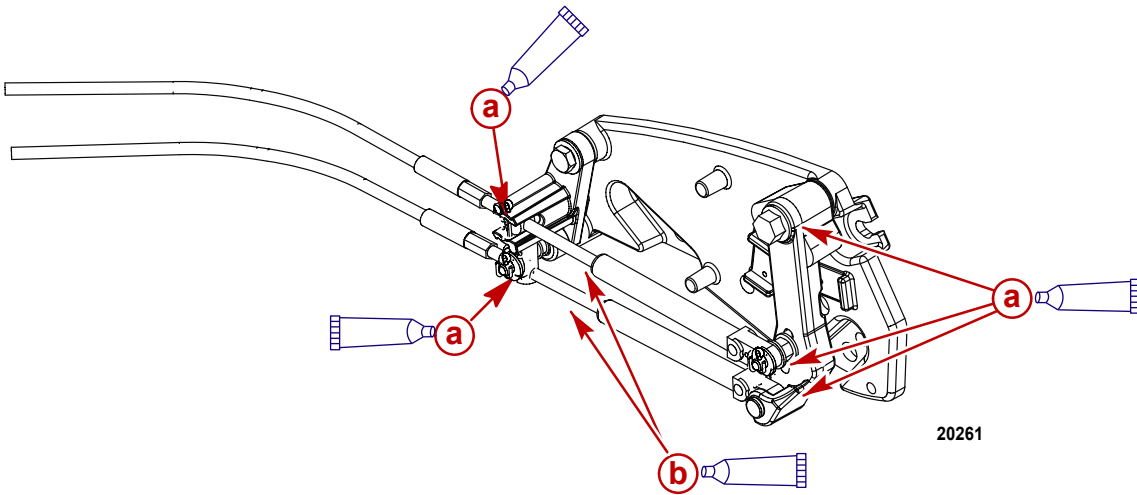
1. Lubricate the pivot points and guide contact surfaces.



Tube Ref No.	Description	Where Used	Part No.
	SAE Engine Oil 30W	Throttle cable pivot points and guide contact surfaces	Obtain Locally

Shift Cable

1. Lubricate the pivot points and guide contact surfaces.



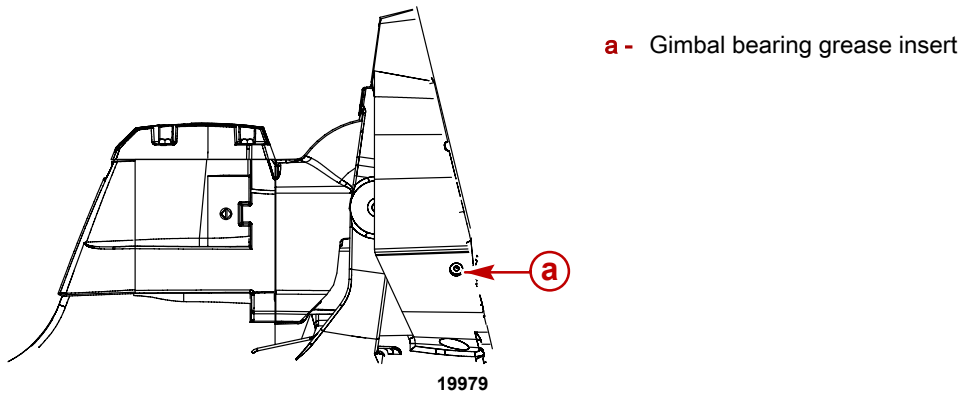
Typical sterndrive model shift cable

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

Tube Ref No.	Description	Where Used	Part No.
	SAE Engine Oil 30W	Shift cable pivot points and guide contact surfaces	Obtain Locally

Transom Assembly

1. Lubricate the gimbal bearing by applying approximately 8-10 pumps of grease from a typical hand-operated grease gun.



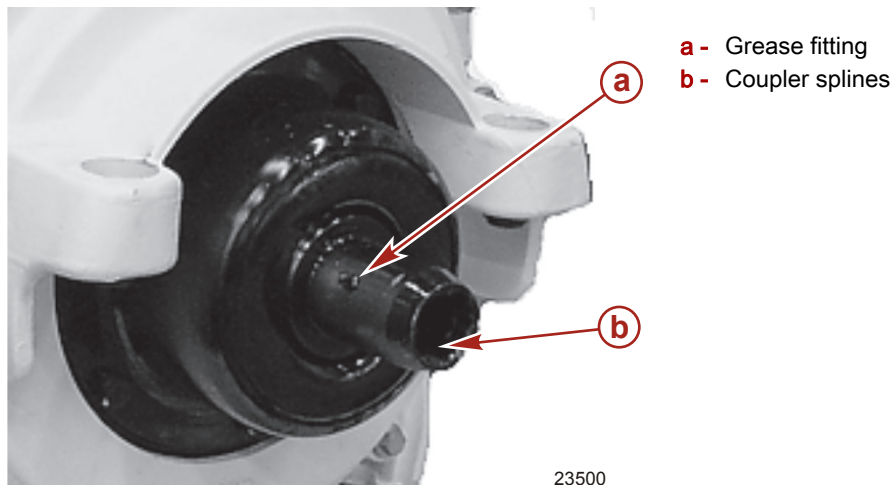
Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Gimbal bearing grease insert	8M0071842

Engine Coupler

IMPORTANT: These engines are equipped with a sealed engine coupler. The sealed coupler and the shaft splines can be lubricated without removing the sterndrive.

Lubricate the engine coupler splines through the grease fitting on the coupler by applying approximately 8–10 pumps of Extreme Grease from a typical hand-operated grease gun.

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

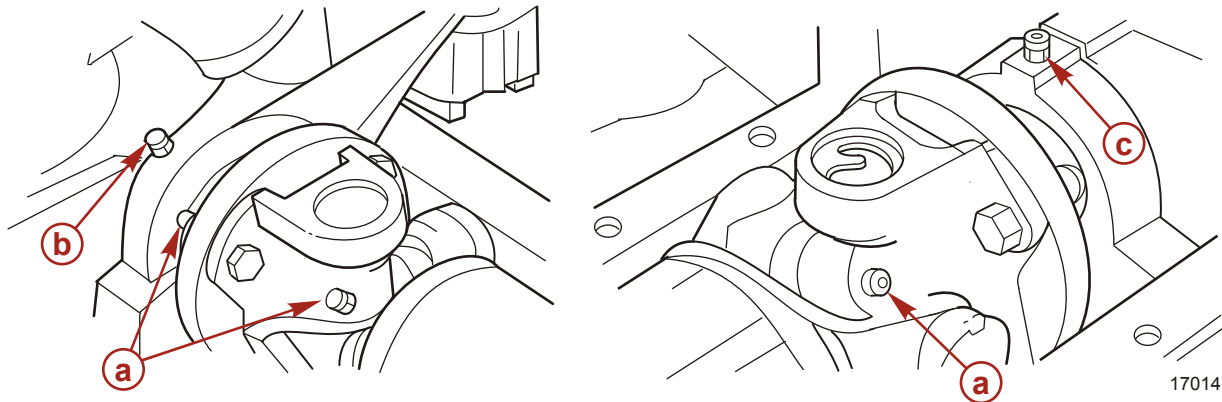


Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Engine coupler and shaft splines	8M0071842

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.

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



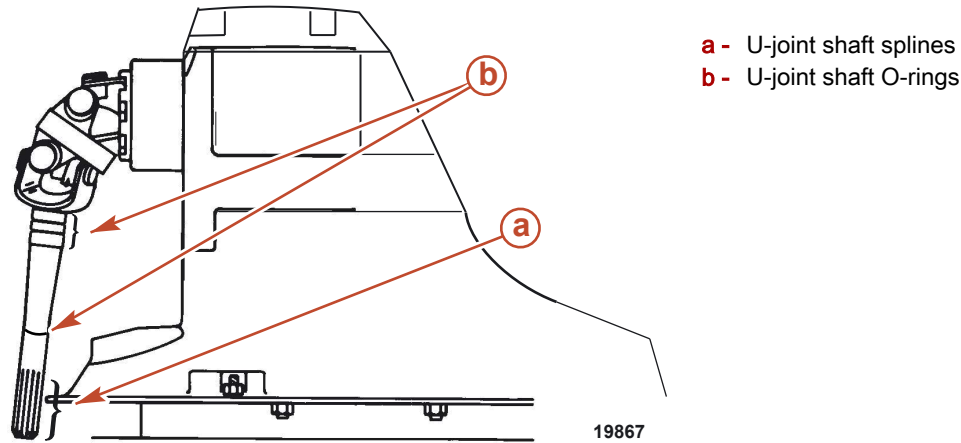
- a - Driveshaft grease fittings
- b - Transom end grease fitting
- c - Engine end grease fitting

Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Transom end grease fitting, engine end grease fitting, driveshaft grease fittings	8M0071842

Sterndrive, Bellows, and Engine Alignment

IMPORTANT: Have your Mercury Diesel authorized repair facility perform the maintenance procedures listed, or refer to the appropriate Mercury MerCruiser Bravo Sterndrive Service Manual.

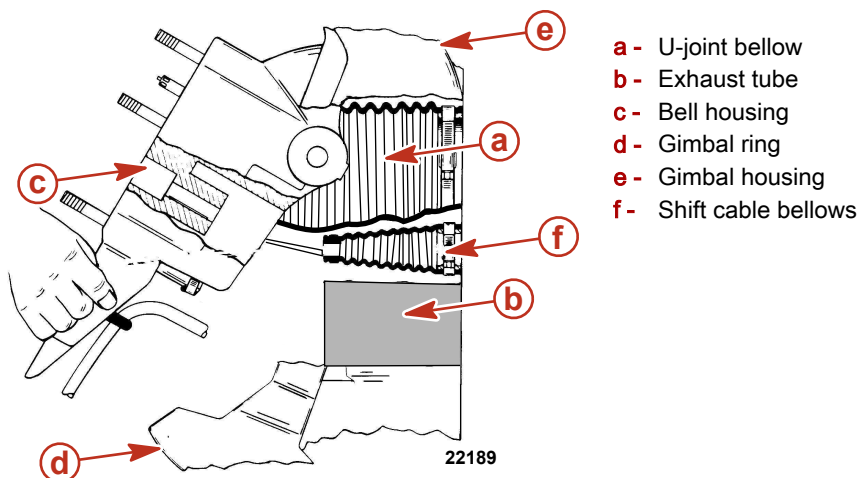
1. Lubricate the U-joint shaft splines and the O-rings.



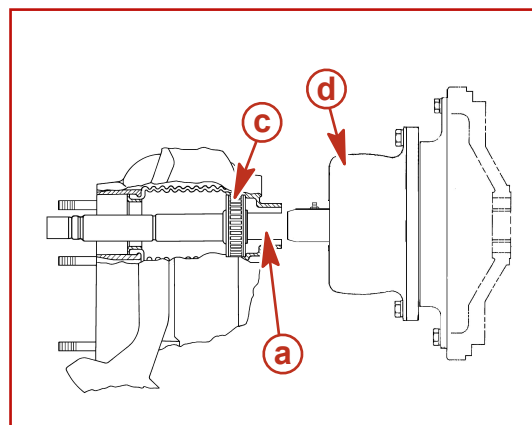
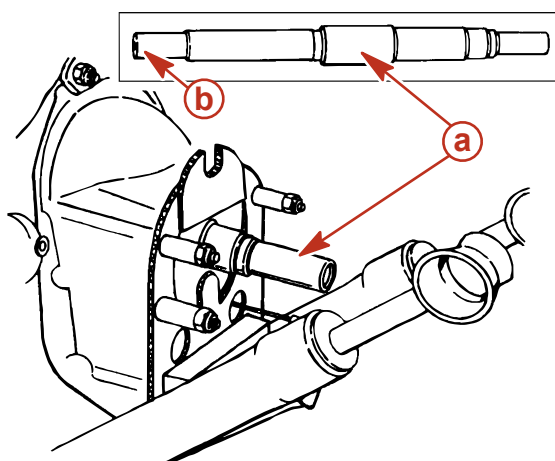
Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	U-joint shaft splines and O-rings	8M0071842

2. Inspect the U-joint bellows for cracks or other signs of deterioration. Ensure that the bellows clamps are tight.

3. Rotate the bell housing in the upward and side-to-side directions to inspect the exhaust tube, shift cable bellows, and clamps.



4. Check the engine alignment.



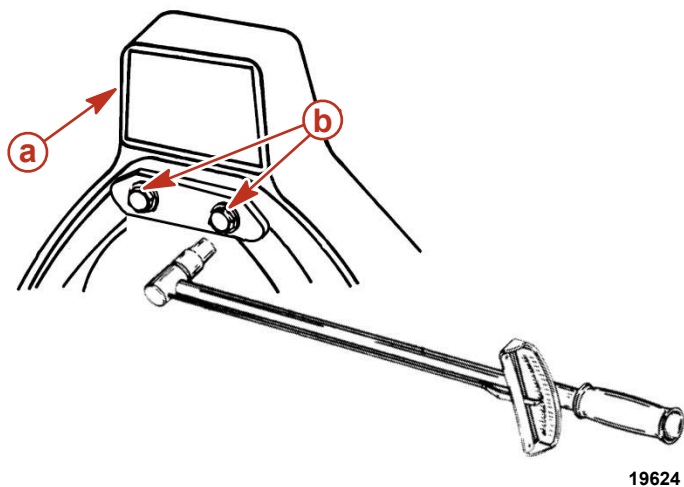
- a - Alignment tool
- b - End of alignment tool to insert through gimbal housing assembly
- c - Gimbal bearing
- d - Engine coupler

Maintaining Torques

Bravo Gimbal Ring U-bolt Nuts

NOTE: The gimbal ring is a component of the transom assembly.

Tighten the gimbal ring U-bolt nuts to the specified torque.

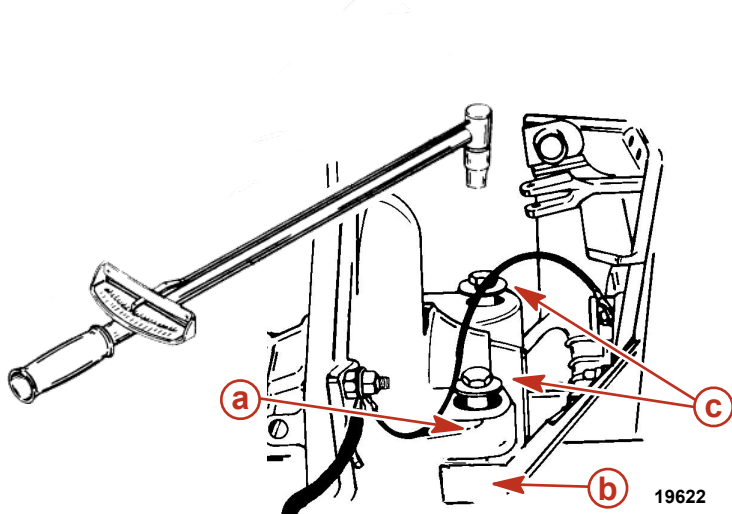


- a - Transom assembly
- b - Gimbal ring U-bolt nuts

Description	Nm	lb-in.	lb-ft
Gimbal ring U-bolt nuts for 7/16 in. U-bolt	95	–	70

Engine Mounts

Loosen the rear engine mount bolts 1 to 1-1/2 turns. Retorque the rear engine mount bolts.



- a - Rear engine mount
- b - Transom plate mount
- c - Rear engine mount bolt

Description	Nm	lb. in.	lb. ft.
Rear engine mounts	47		35

Propellers

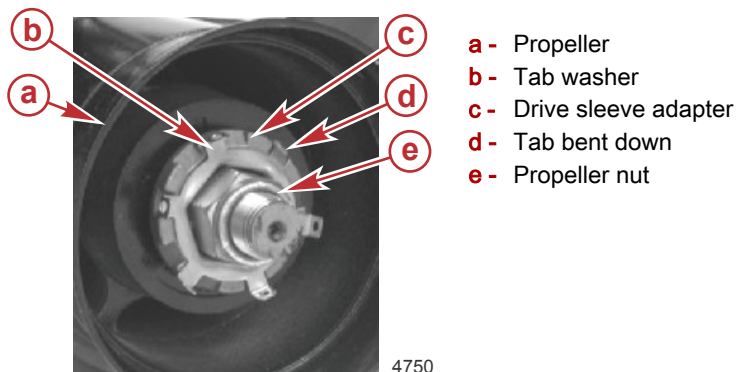
Bravo Sterndrive Propeller Removal

⚠ WARNING

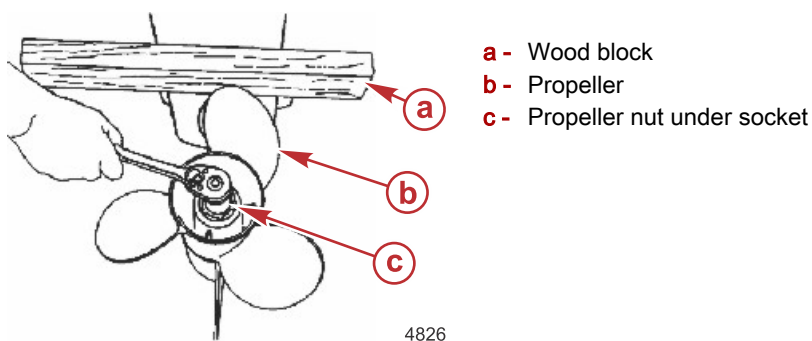
Rotating propellers can cause serious injury or death. Never operate the boat out of the water with a propeller installed. Before installing or removing a propeller, place the drive unit in neutral and engage the lanyard stop switch to prevent the engine from starting. Place a block of wood between the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

Bravo One Models

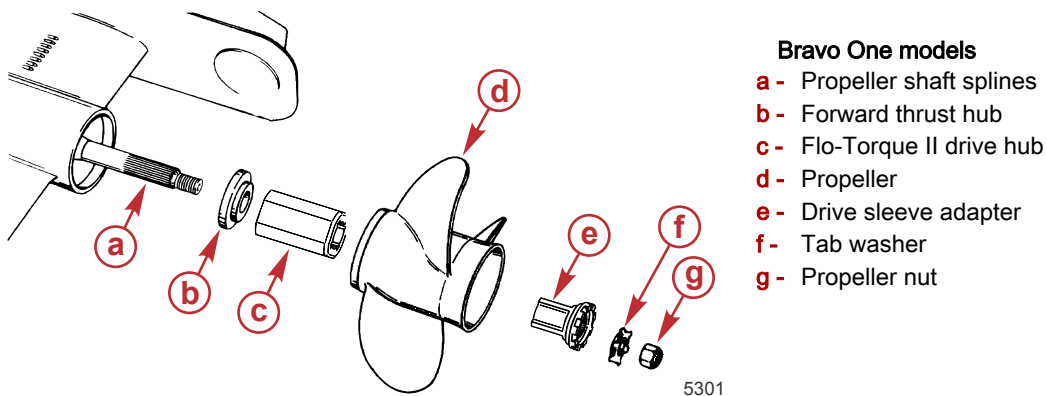
1. Straighten the bent tabs of the tab washer on the propeller shaft.



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

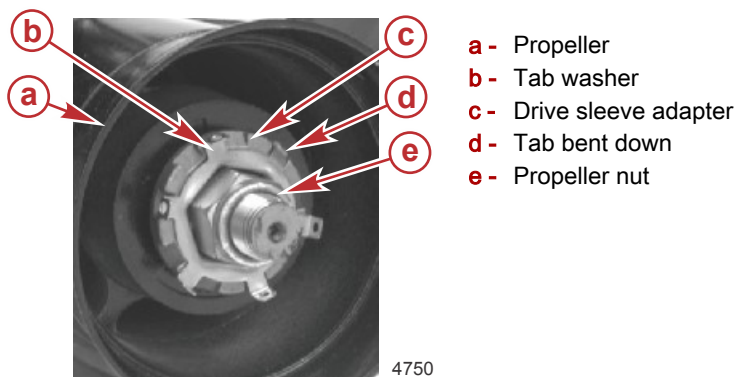


3. Turn the propeller shaft nut counterclockwise and remove the nut.
4. Slide the propeller and the attaching hardware from the propeller shaft.

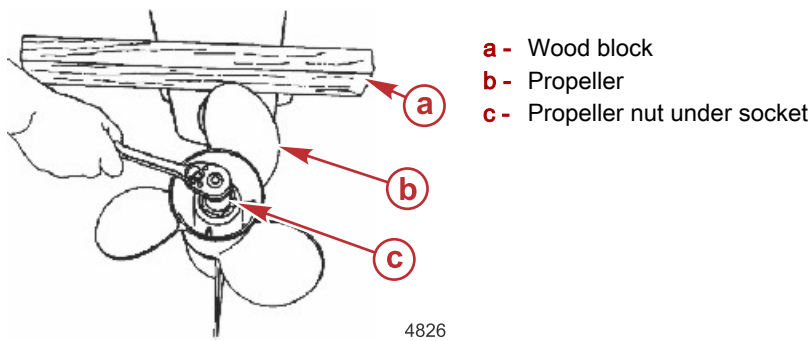


Bravo Two Models

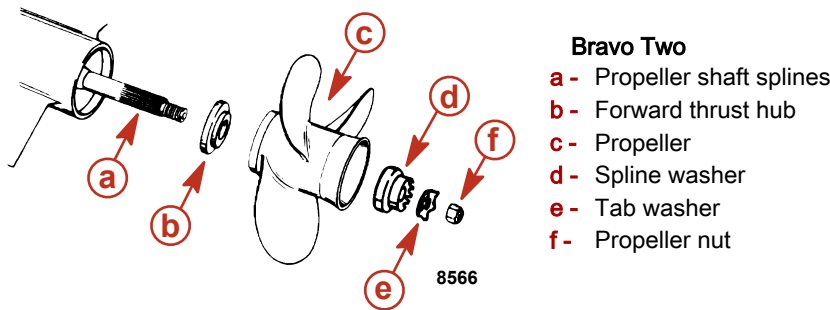
1. Straighten the bent tabs of the tab washer on the propeller shaft.



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

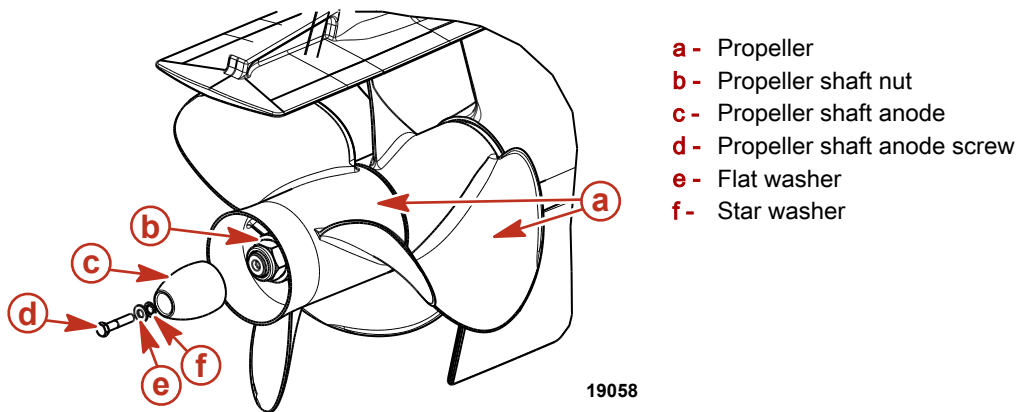


- 3. Turn the propeller shaft nut counterclockwise to remove the nut.
- 4. Slide the propeller and attaching hardware from the propeller shaft.



Bravo Three Models

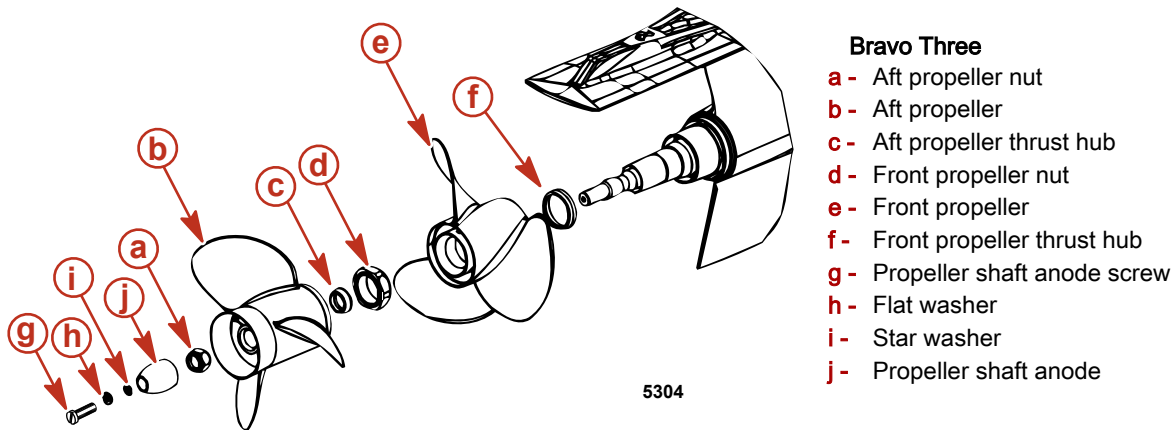
- 1. Place a block of wood between the propeller blade and the sterndrive's anti-ventilation plate.
- 2. Remove the bolt and washers securing the propeller shaft anode.
- 3. Remove the propeller shaft anode.



- 4. Turn the aft propeller shaft nut counterclockwise to remove the nut.
- 5. Slide the propeller and thrust hub off of the propeller shaft.
- 6. Using the propeller nut tool, turn the front propeller shaft nut counterclockwise and remove the nut.

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

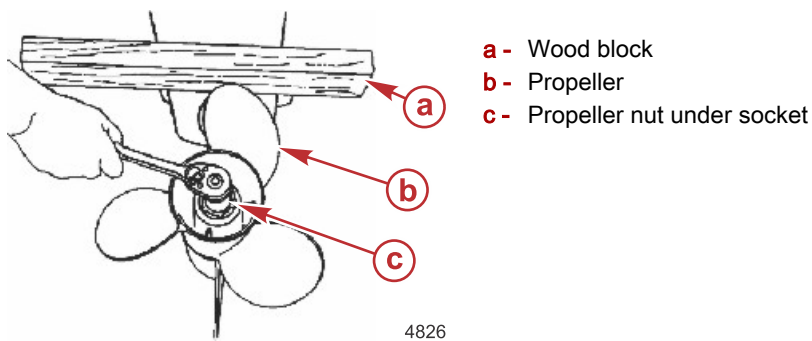
7. Slide the propeller and the thrust hub off the propeller shaft.



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.



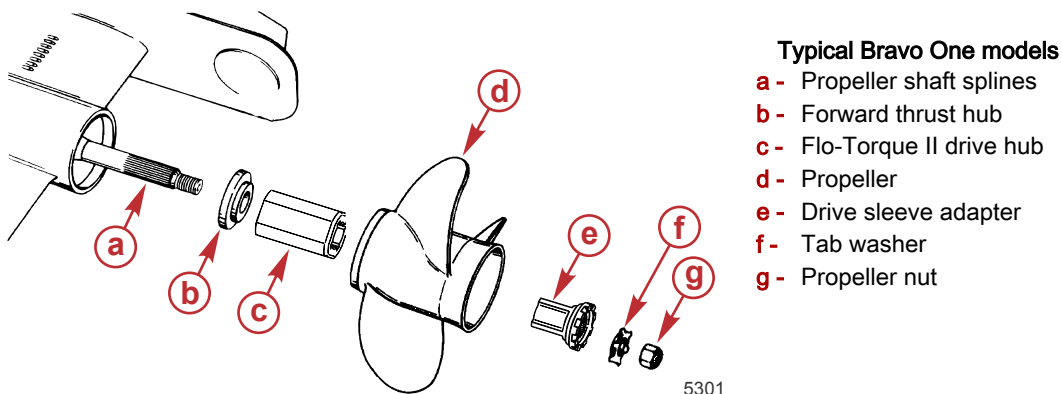
Bravo One Models

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

1. Liberally coat the propeller shaft spline with one of the following lubricants.

Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Propeller shaft splines	92-802859A 1
	Extreme Grease	Propeller shaft splines	8M0071842

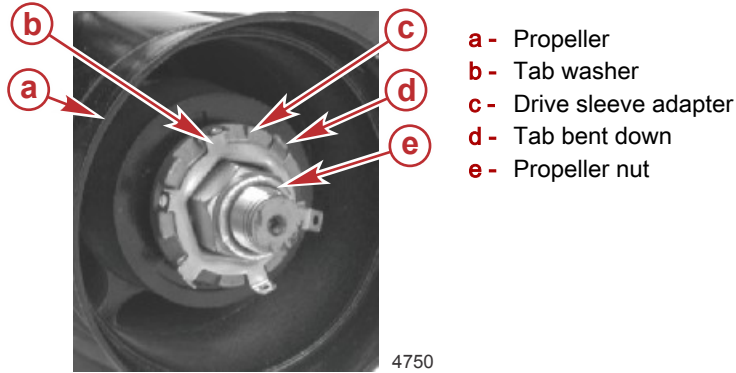
2. Install the propeller with the attaching hardware as shown.
3. Tighten the propeller nut to the specified torque.



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

Description	Nm	lb-in.	lb-ft
Bravo One propeller nut	75	–	55
	Then align tabs with grooves		

4. **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.
5. Bend the three tabs down into the grooves.



Bravo Three

1. Liberally coat the propeller shaft spline with one of the following lubricants.

Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C with PTFE	Propeller shaft splines	92-802859A 1
	Extreme Grease	Propeller shaft splines	8M0071842

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

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

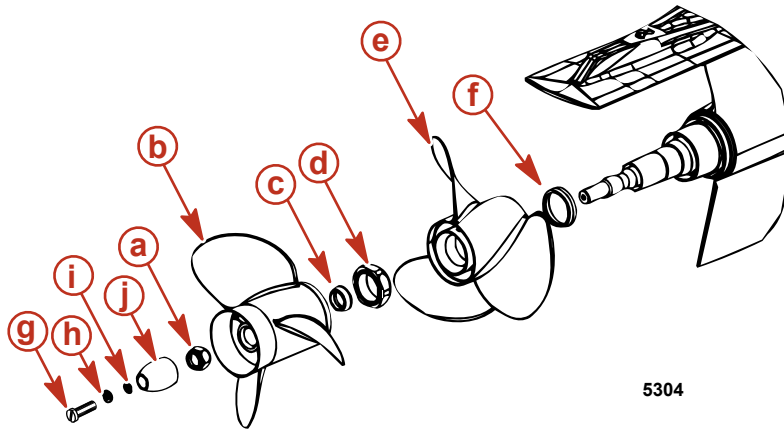
Description	Nm	lb-in.	lb-ft
Bravo Three front propeller nut	136	–	100

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 torque.

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

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

8. Install the propeller shaft anode and secure with the screw. Tighten the screw to the specified torque.



Bravo Three

- a - Rear propeller nut
- b - Rear propeller
- c - Rear 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

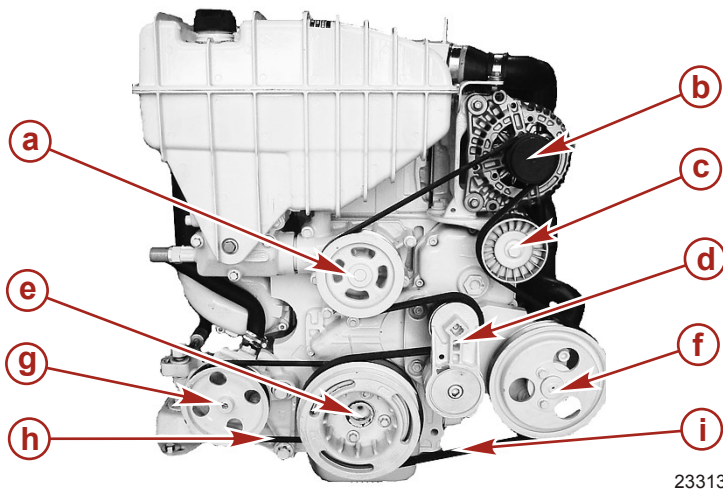
Description	Nm	lb-in.	lb-ft
Propeller shaft anode screw	19	168	–

Drive Belts

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

⚠ WARNING

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



2.8 shown, 4.2 similar

- a - Water circulating pump pulley
- b - Alternator pulley
- c - Idler
- d - Automatic tensioner
- e - Crankshaft pulley
- f - Seawater pump pulley
- g - Power assisted steering pulley
- h - Power assisted steering belt
- i - Serpentine belt

Serpentine Belt

Inspection

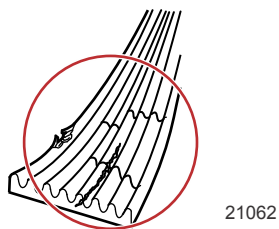
- Inspect the belt for proper tension and for the following:

- Excessive wear
- Cracks

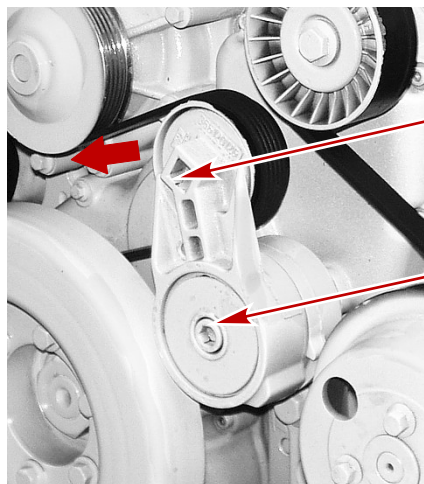
NOTE: Minor, transverse cracks (across the belt width) may be acceptable. Longitudinal cracks (in the direction of belt length) that join transverse cracks are not acceptable.

- Fraying

- Glazed surfaces



2. Check the operation of the automatic tensioner and associated components.
 - a. Position a suitable tool in the automatic tensioner release slot.
 - b. Rotate the automatic tensioner in the direction of the arrow.



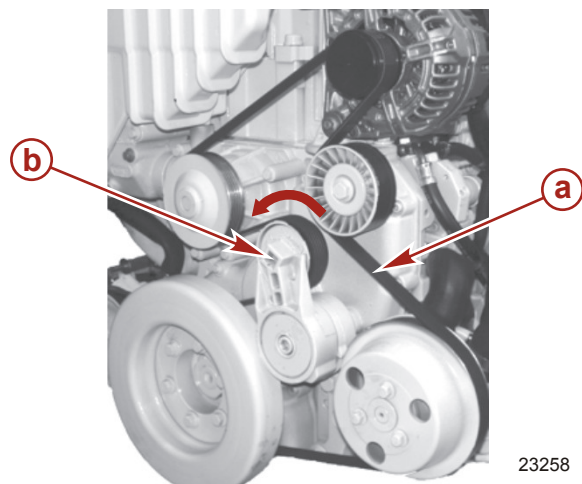
- a - Automatic tensioner
- b - Release slot

- c. Release the automatic tensioner and allow it to glide back slowly.
- d. The automatic tensioner must return to the initial position and hold tension on the serpentine belt.

Replacement

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

1. Position a suitable tool in the automatic tensioner release slot.
2. Rotate the automatic tensioner in the direction of the arrow to remove the tension on the serpentine belt.



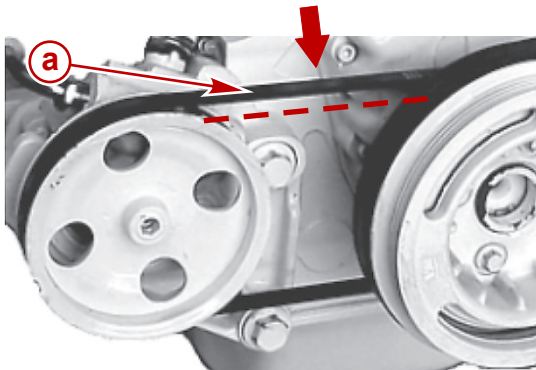
- a - Serpentine belt
- b - Release slot

3. Remove the serpentine belt.
4. Replace the serpentine belt.
5. Carefully release the automatic tensioner with the breaker bar, ensuring that the belt stays positioned properly.

Power-Assisted Steering Pump Belt

Inspection

1. Inspect the belt for proper tension and for the following:
 - Excessive wear
 - Cracks
 - Fraying
 - Glazed surfaces
2. Replace the belt if worn or damaged. See **Replacement**.
3. Check belt tension by depressing the upper strand of the belt, with moderate hand pressure, at the point shown. The belt must correspond to the specifications in the following table.



23632

2.8 shown, 4.2 similar

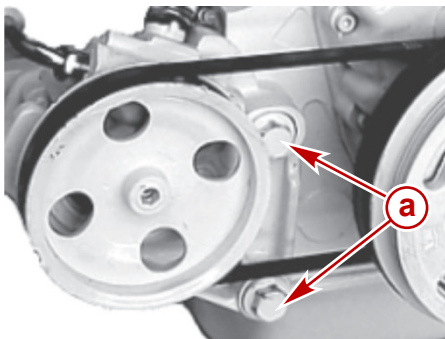
a - Power steering pump belt

Power-assisted steering drive belt tension	
Belt deflection, with moderate hand pressure	5 mm (3/16 in.)

4. Adjust the tension if necessary. See **Adjustment**.

Adjustment

1. Loosen the power-assisted steering pump mounting bolts.

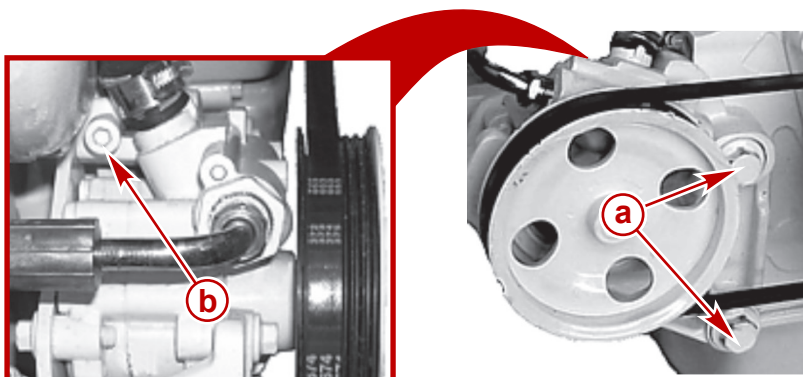


23767

2.8 shown, 4.2 similar

a - Mounting bolts

2. Use the adjustment screw to move the power-assisted steering pump to tension the power-assisted steering belt.



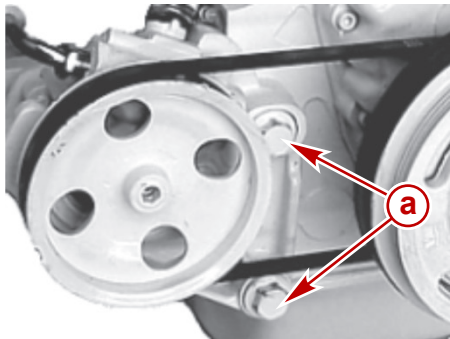
23650

a - Mounting bolts

b - Adjustment screw

Power-assisted steering drive belt tension		
Belt deflection, with moderate hand pressure	5 mm (3/16 in.)	

3. Torque the power-assisted steering pump mounting and tensioning flange bolts.



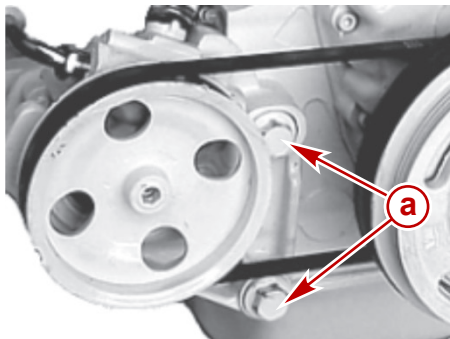
23767

2.8 shown, 4.2 similar
a - Mounting bolts

Description	Nm	lb. in.	lb. ft.
Power-assisted steering pump mounting bolts	21		15

Replacement

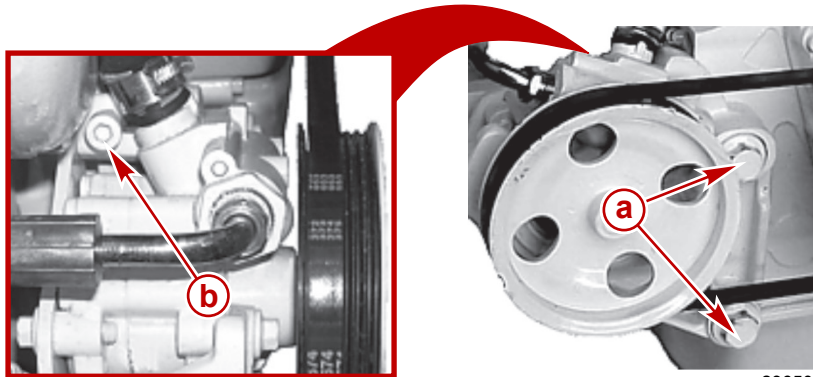
1. Remove the serpentine belt. See **Serpentine Belt**.
2. Loosen the power-assisted steering pump mounting bolts.



23767

2.8 shown, 4.2 similar
a - Mounting bolts

3. Loosen the existing power-assisted steering pump belt by turning the adjustment screw counterclockwise.

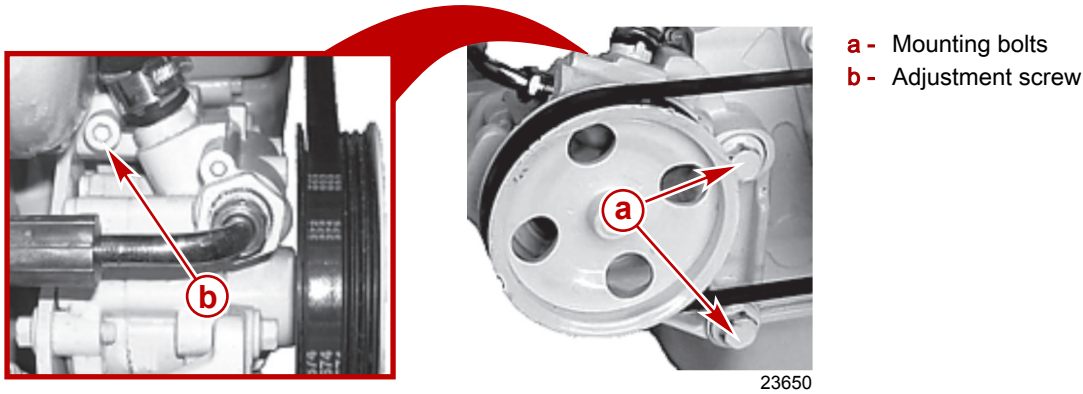


23650

a - Mounting bolts
b - Adjustment screw

4. Remove the existing power-assisted steering pump belt.
5. Install the new power-assisted steering pump belt.

6. Use the adjustment screw to move the power-assisted steering pump to tension the power-assisted steering belt.

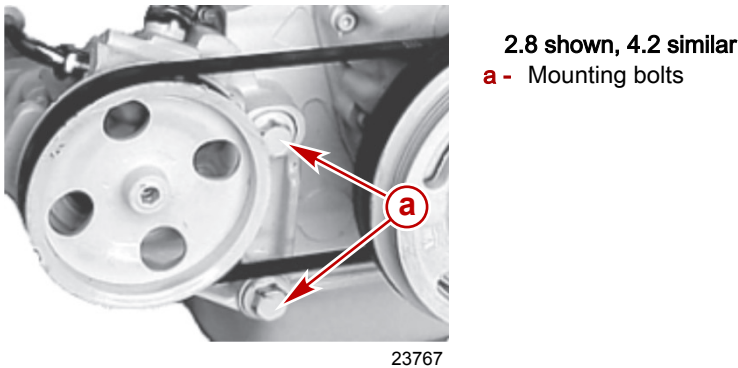


Power-assisted steering drive belt tension

Belt deflection, with moderate hand pressure

5 mm (3/16 in.)

7. Torque the power-assisted steering pump mounting and tensioning bolts.



Description	Nm	lb. in.	lb. ft.
Power-assisted steering pump mounting and tensioning flange bolt	21		15

8. Install the serpentine belt. See **Serpentine Belt**.

Battery

Refer to the 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.

Battery Precautions for Multiple Engines

Alternators: Alternators are designed to charge a single battery that supplies electrical power to the individual engine on which the alternator is mounted. Connect only one battery to one alternator. Do not connect two batteries to the same alternator unless a battery isolator is used.

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

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

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

Battery Switches: Battery switches should always be positioned so that 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.

Section 6 - Storage

Table of Contents

Cold Weather (Freezing Temperature), Seasonal Storage, and Extended Storage.....	112	Seasonal Storage Instructions.....	113
Cold Weather (Freezing Temperature) Storage.....	112	Extended Storage Instructions.....	114
Preparing Your Power Package for Seasonal or Extended Storage.....	112	Battery.....	114
		Recommissioning.....	114

Cold Weather (Freezing Temperature), Seasonal Storage, and Extended Storage

IMPORTANT: Mercury recommends this service be performed by a Mercury Diesel authorized repair facility. Damage caused by freezing is not covered by the Mercury 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.

You should consider a boat is in storage whenever it is not in operation. The amount of time that the power package is not operated may be for a brief period, such as during a day, overnight, for a season, or for an extended period of time. Certain precautions and procedures must be observed to protect the power package from freeze damage, corrosion damage, or both types of damage during storage.

Freeze damage can happen when water trapped in the seawater cooling system freezes. For example, after operating the boat, exposure to freezing temperatures for even a brief period of time could result in freeze damage.

Corrosion damage is the result of saltwater, polluted water, or water with a high mineral content trapped in the seawater cooling system. Saltwater should not stay in an engine's cooling system for even a brief storage time; drain and flush the seawater cooling system after each outing.

Cold weather operation refers to operating the boat whenever the possibility of freezing temperatures exists. Likewise, cold weather (freezing temperature) storage refers to whenever the boat is not being operated and the possibility of freezing temperatures exists. In such cases, the seawater section of the cooling system must be completely drained immediately after operation.

Seasonal storage refers to when the boat is not being operated for one month or more. The length of time varies depending on the geographic location of the boat in storage. Seasonal storage precautions and procedures include all of the steps for cold weather (freezing temperature) storage and some additional steps that must be taken when storage will last longer than the short time of cold weather (freezing temperature) storage.

Extended storage means storage for a period of time that may last for several seasons or longer. Extended storage precautions and procedures include all of the steps for cold weather (freezing temperature) storage and seasonal storage plus some additional steps.

Refer to the specific procedures in this section related to the conditions and the length of storage for your application.

Cold Weather (Freezing Temperature) Storage

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.

1. Read all precautions and perform all procedures found in **Draining the Seawater System** and drain the seawater section of the cooling system.
2. Place a caution tag at the helm advising the operator to unplug and connect the water inlet hose or open the seacock, if equipped, before operating the boat.
3. For additional assurance against freezing and corrosion fill the seawater cooling system with a mixture of propylene glycol antifreeze and tap water. See **Seasonal Storage Instructions** in this section.

Preparing Your Power Package for Seasonal or Extended Storage

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.

IMPORTANT: If the boat has already been removed from the water, supply water to the water inlet holes before starting the engine. Follow all warnings and flushing attachment procedures stated in **Flushing the Seawater System**.

1. Supply cooling water to the water inlet holes or seawater pump inlet.

2. Start the engine and operate until it reaches normal operating temperature.
3. Stop the engine.
4. Change the engine oil and filter.
5. Start the engine and run for about 15 minutes. Check for oil leaks.
6. Flush the seawater cooling system. See **Flushing the Seawater System**.

Seasonal Storage Instructions

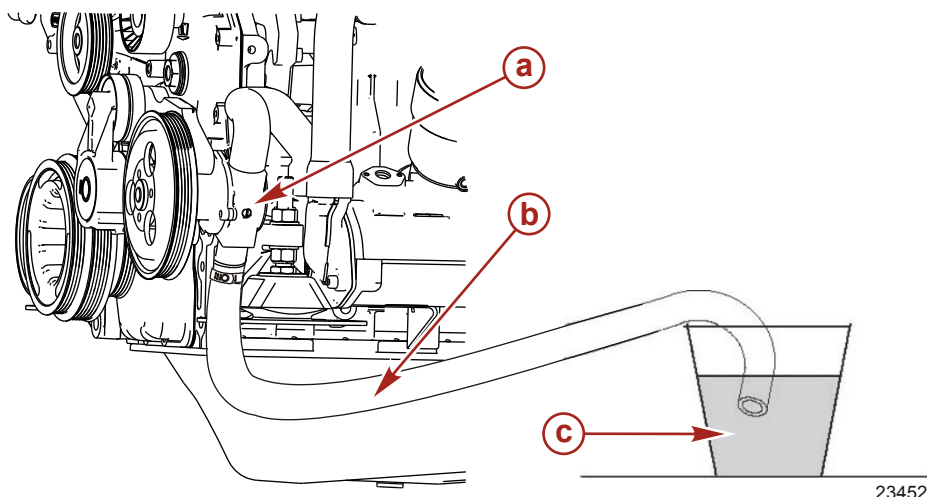
1. Observe all precautions and perform all procedures found in **Preparing Your Power Package for Seasonal or Extended Storage**.
2. Observe all precautions and perform all procedures found in **Draining the Seawater System** and drain the seawater section of the cooling system.

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.

IMPORTANT: Mercury recommends the use of propylene glycol antifreeze in the seawater section of the cooling system for cold weather (freezing temperature), seasonal storage, or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer's recommendations.

3. Fill a container with approximately 5.6 liters (6 U.S. quarts) of propylene glycol antifreeze and tap water mixed to manufacturer's recommendation to protect the engine to the lowest temperature to which it will be exposed during cold weather or extended storage.
4. Disconnect the seawater inlet hose from the seawater pump. Using an adapter, if necessary, temporarily connect a hose of appropriate length to the seawater pump and place the other end of the hose into the container of propylene glycol antifreeze and tap water.



Typical

- a - Seawater pump
- b - Temporary hose
- c - Container of propylene glycol antifreeze and tap water

NOTE: Discharge of propylene glycol into the environment may be restricted by law. Dispose of propylene glycol in accordance with federal, state, and local laws and guidelines.

5. Start the engine and operate at idle speed until the antifreeze mixture has been pumped into the engine seawater cooling system.
6. Stop the engine.
7. Remove the temporary hose from the seawater pump.
8. Clean the outside of the engine and repaint required areas with primer and spray paint. After the paint has dried, coat the engine with the specified corrosion-inhibiting oil or equivalent.

Section 6 - Storage

Description	Where Used	Part Number
Corrosion Guard	Outside of engine	92-802878-55
Light gray primer		92-802878-52
Marine Cloud White paint		8M0071082
Mercury Phantom Black	Shift plate and air filter housing	92-802878Q1

9. Your Mercury Diesel authorized repair facility should now perform all checks, inspections, lubrications, and fluid changes outlined in **Maintenance Schedules**.

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.

10. On Sterndrive models, place the sterndrive in the full down (in) position.
11. Follow the battery manufacturer's instructions for storage and store the battery.

Extended Storage Instructions

IMPORTANT: Mercury recommends that this service be performed by a Mercury Diesel authorized repair facility.

1. Read all precautions and perform all procedures found in **Preparing Your Power Package for Seasonal or Extended Storage**.
2. Read all precautions and perform all procedures found in **Draining the Seawater System**.
3. Read all precautions and perform all procedures found in **Seasonal Storage Instructions**.
IMPORTANT: The seawater pump impeller material can be damaged by prolonged exposure to direct sunlight.
4. Remove the seawater pump impeller and store away from direct sunlight. Refer to a Mercury Diesel authorized repair facility for additional information and service.
5. Place a caution tag at the instrument panel and in the engine compartment stating that the seawater pump is out and not to operate the engine.

Battery

Follow the battery manufacturer's instructions for storage.

Recommissioning

NOTE: Discharge of propylene glycol into the environment may be restricted by law. Contain and dispose of propylene glycol in accordance with federal, state, and local laws and guidelines.

1. On engines prepared for extended storage, have a Mercury Diesel authorized repair facility install the seawater pump impeller, if it was removed for storage.
2. On engines that were prepared for cold weather (freezing temperature), seasonal, or extended storage, refer to **Draining the Seawater System** and drain the propylene glycol into a suitable container. Dispose of the propylene glycol in accordance with federal, state, and local laws and guidelines.
3. Ensure that all cooling system hoses are in good condition, connected properly, and clamped tightly. Verify that all drain valves and drain plugs are installed and tight.
4. Inspect all drive belts.
5. Perform all lubrication and maintenance specified for completion according to the **Maintenance Schedules**, except items that were performed at time of engine service.
6. Fill the fuel tanks with fresh diesel fuel. Do not use old fuel. Check the general condition of the fuel lines and inspect the connections for leaks.
7. Replace the water-separating fuel filter or filters (some engines may have more than one).

⚠ 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.

8. Install a fully charged battery. Clean the battery cable clamps and terminals. Reconnect the cables (refer to the CAUTION listed above). Secure each cable clamp when connecting. Coat terminals with a battery terminal anti-corrosion spray to help retard corrosion.
9. Perform all checks in the Starting Procedure column found in the **Operation Chart**. Refer to the **On the Water** section.

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.

10. Supply cooling water to the water inlet openings.
11. Start the engine and closely observe instrumentation. Ensure that all systems are functioning correctly.
12. Carefully inspect the engine for fuel, oil, fluid, water, and exhaust leaks.
13. Check the steering system, shift, and throttle control for proper operation.

Notes:

Section 7 - Troubleshooting

Table of Contents

Diagnosing Electronically Controlled Fuel System Problems.....	118	Battery Will Not Charge.....	119
Troubleshooting Charts.....	118	Remote Control Operates Hard, Binds, Has Excessive	
Starter Motor Will Not Crank Engine, or Cranks Slow.....	118	Free-play, or Makes Unusual Sounds.....	120
Engine Will Not Start, or Is Hard to Start.....	118	Steering Wheel Turns Hard or Jerky.....	120
Engine Runs Rough, Misses, or Backfires.....	118	Power Trim does not Operate (Electric Motor Operates	
Poor Performance.....	119	but Sterndrive does not Move).....	120
Incorrect Engine Temperature.....	119	Power Trim Does Not Operate (Electric Motor Does Not	
Low Engine Oil Pressure.....	119	Operate).....	120

Diagnosing Electronically Controlled Fuel System Problems

A Mercury Diesel authorized repair facility has the proper service tools for diagnosing problems on electronically controlled fuel systems. The engine control module (ECM) on these engines has the ability to detect 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.

Troubleshooting Charts

Starter Motor Will Not Crank Engine, or Cranks Slow

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

Engine Will Not Start, or Is Hard to Start

Possible Cause	Remedy
Lanyard stop switch activated.	Check lanyard stop switch.
Improper starting procedure.	Read starting procedure.
Empty fuel tank or fuel shut-off valve closed.	Fill tank or open valve.
Throttle not operating properly.	Check the throttle for freedom of movement.
Faulty electrical stop-circuit.	Have a Mercury Diesel authorized repair facility service the electrical stop circuit.
Clogged fuel filters.	Replace fuel filters.
Stale or contaminated fuel.	Drain tank. Fill with fresh fuel.
Fuel line or tank vent line kinked or clogged.	Replace kinked lines or blow out the lines with compressed air to remove obstruction.
Air in fuel injection system.	Purge fuel injection system.
Faulty wire connections.	Check wire connections.
Electronic fuel system fault.	Have the electronic fuel system checked by a Mercury Diesel authorized repair facility.

Engine Runs Rough, Misses, or Backfires

Possible Cause	Remedy
Throttle not operating properly.	Check the throttle for binding or an obstruction.
Idle speed too low.	Have idle speed checked and adjusted by a Mercury Diesel authorized repair facility.
Clogged fuel or air filters.	Replace fuel or air filters.
Stale or contaminated fuel.	If fuel is 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.
Air in fuel system.	Purge fuel injection system.
Electronic fuel system faulty.	Have electronic system checked by a Mercury Diesel authorized repair facility.

Poor Performance

Possible Cause	Remedy
Throttle not fully open.	Inspect throttle cable and linkages for proper operation.
Trim limiter engaged.	Trim sterndrive below trim limit.
Damaged or improper propeller.	Replace propeller. See a Mercury Diesel authorized repair facility.
Excessive bilge water.	Drain and check for cause of entry.
Boat overloaded or improperly distributed.	Reduce load or redistribute more evenly.
Boat bottom fouled or damaged.	Clean or repair as necessary.
Electronic fuel system fault.	Have electronic fuel system checked by a Mercury Diesel Authorized Repair Facility.

Incorrect 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. See a Mercury Diesel authorized repair facility.
Coolant level low in closed cooling section.	Check for cause of low coolant level and repair. Fill system with proper coolant solution.
Heat exchanger cores plugged with foreign material.	Clean heat exchanger. See a Mercury Diesel authorized repair facility.
Loss of pressure in closed cooling section.	Check for leaks. Clean, inspect, and test pressure cap. See a Mercury Diesel authorized repair facility.
Faulty seawater pickup pump.	Repair. See a Mercury Diesel authorized repair facility.
Seawater discharge restricted or plugged.	Clean exhaust elbows. See a Mercury Diesel authorized repair facility.
Seawater inlet hose kinked (restricted).	Position hose to prevent kinking (restriction).
Use of improperly designed hose on inlet side of seawater pump allowing it to collapse.	Replace hose with wire reinforced design.
Faulty thermostats.	Replace. See a Mercury Diesel authorized repair facility.

Low Engine Oil Pressure

Possible Cause	Remedy
Faulty senders.	Have system checked by a Mercury Diesel authorized repair facility.
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 Charge

Possible Cause	Remedy
Excessive current draw from battery.	Turn off non-essential accessories.
Loose or dirty electrical connections or damaged wiring.	Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connections. Repair or replace damaged wiring.

Section 7 - Troubleshooting

Possible Cause	Remedy
Alternator drive belt loose or in poor condition.	Replace or adjust.
Unacceptable battery condition.	Test battery.

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

Possible Cause	Remedy
Insufficient lubrication on shift and throttle linkage fasteners.	Lubricate.
Obstruction in the shift or throttle linkages.	Remove the obstruction.
Loose or missing shift and throttle linkages.	Check all throttle linkages. If any are loose or missing, see a Mercury Diesel authorized repair facility immediately.
Shift or throttle cable kinked.	Straighten cable or have a Mercury Diesel authorized repair facility replace cable if damaged beyond repair.
Improper shift cable adjustment.	Have adjustment checked by a Mercury Diesel authorized repair facility.

Steering Wheel Turns Hard or Jerky

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

Power Trim does not Operate (Electric Motor Operates but Sterndrive does not Move)

Possible Cause	Remedy
The trim pump oil level is low.	Fill the trim pump with oil.
The drive unit is binding in the gimbal ring.	Check for obstruction. See a Mercury Diesel authorized repair facility.

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

Possible Cause	Remedy
Blown fuse.	Replace the fuse.
Loose or dirty electrical connections or damaged wiring.	Check all the associated electrical connections and the wires (especially the battery cables). Clean and tighten the faulty connection. Repair or replace the wiring.

Section 8 - Customer Assistance Information

Table of Contents

Owner Service Assistance.....	122	Contact Information for Mercury Marine Customer	
Local Repair Service	122	Service	123
Service Away From Home	122	Customer Service Literature.....	123
Stolen Power Package	122	English Language	123
Attention Required After Submersion	122	Other Languages	124
Replacement Service Parts	122	Ordering Literature.....	124
Parts and Accessories Inquiries	122	United States and Canada	124
Resolving a Problem	122	Outside the United States and Canada	124

Owner Service Assistance

Local Repair Service

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

NOTE: *Quicksilver parts and accessories are engineered and built by Mercury Marine specifically for Mercury MerCruiser sterndrives and inboards.*

Service Away From Home

If you are away from your local dealer and the need arises for service, contact the nearest authorized dealer. If, for any reason, you cannot obtain service, contact the nearest regional service center. Outside the United States and Canada, contact the nearest Marine Power International service center.

Stolen Power Package

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

Attention Required After Submersion

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

Replacement Service Parts

WARNING

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

Marine engines are expected to operate at or near full throttle for most of their life. They are also expected to operate in both fresh and saltwater environments. These conditions require numerous special parts. Exercise care when replacing marine engine parts because specifications are different from those of the standard automotive engine. For example, one of the most important special replacement parts is the cylinder head gasket. Marine engines cannot use steel-type automotive head gaskets because saltwater is highly corrosive. A marine engine head gasket uses special materials to resist corrosion.

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

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

Parts and Accessories Inquiries

Direct any inquiries concerning Quicksilver replacement parts and accessories to your local authorized dealer. The dealer has the necessary information to order parts and accessories for you. Only authorized dealers can purchase genuine Quicksilver parts and accessories from the factory. Mercury Marine does not sell to unauthorized dealers or retail customers. When inquiring about parts and accessories, the dealer requires the **engine model** and **serial numbers** to order the correct parts.

Resolving a Problem

Satisfaction with your Mercury MerCruiser product is important to your dealer and to us. If you ever have a problem, question, or concern about your power package, contact your dealer or any authorized Mercury MerCruiser dealership. If you need additional assistance:

1. Talk with the dealership's sales manager or service manager. Contact the owner of the dealership if the sales manager and service manager have been unable to resolve the problem.
2. If your question, concern, or problem cannot be resolved by your dealership, please contact a Mercury Marine Service Office for assistance. Mercury Marine will work with you and your dealership to resolve all problems.

The following information will be needed by Customer Service:

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

- Nature of the problem

Contact Information for Mercury Marine Customer Service

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

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

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

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

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

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

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

Customer Service Literature

English Language

English language publications are available from:

Mercury Marine

Attn: Publications Department

W6250 Pioneer Road

P.O. Box 1939

Fond du Lac, WI 54935-1939

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

When ordering be sure to:

- List your product, model, year, and serial numbers.
- Check the literature and quantities you want.
- Enclose full remittance in check or money order (NO COD).

Other Languages

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

Ordering Literature

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

Model		Serial Number	
Horsepower		Year	

United States and Canada

For additional literature for your Mercury Marine power package, contact your nearest Mercury Marine dealer or contact:

Mercury Marine		
Telephone	Fax	Mail
(920) 929-5110 (USA only)	(920) 929-4894 (USA only)	Mercury Marine Attn: Publications Department P.O. Box 1939 Fond du Lac, WI 54935-1939

Outside the United States and Canada

Contact your nearest Mercury Marine authorized service center to order additional literature that is available for your particular power package.

Submit the following order form with payment to:	Mercury Marine Attn: Publications Department W6250 Pioneer Road P.O. Box 1939 Fond du Lac, WI 54936-1939
--	--

Ship To: (Copy this form and print or type—This is your shipping label)

Name	
Address	
City, State, Province	
ZIP or postal code	
Country	

Quantity	Item	Stock Number	Price	Total
			.	.
			.	.
			.	.
			.	.
			.	.
Total Due				.

Section 9 - Maintenance Log

Table of Contents

Maintenance Log.....	126
----------------------	-----

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

[illegible]