



MERCURY®

**2.8L and 4.2L Diesel
Inboard Models**

OPERATION &
MAINTENANCE
MANUAL



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 and Maintenance 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 products. We sincerely hope your boating will be pleasant!

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

Name / function:


John Pfeifer, President,
Mercury Marine

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, 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.

▲ 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.

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

▲ WARNING

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

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.**

Descriptions and specifications contained herein were in effect at the time this 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.

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 Manual included with the product. The Warranty Manual contains a description of what is covered, what is not covered, the duration of coverage, how to best obtain warranty coverage, **important disclaimers and limitations of damages**, and other related information. Please review this important information.

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

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Identification Records

Please record the following applicable information:

MerCruiser		
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 (Europe Only)		

TABLE OF CONTENTS

Section 1 - Getting to Know Your Power Package

Identification.....	2	VesselView.....	6
Serial Number Decal.....	2	SmartCraft Digital Instruments.....	6
Engine Data Label.....	2	System Link Digital Instruments.....	7
ZF Marine Transmissions.....	3	Emergency Stop Switch.....	7
Technodrive Transmissions.....	3	Remote Controls.....	8
Features and Controls.....	3	Panel Mount Features.....	8
Audio Warning System.....	3	Console Mount Features.....	8
Switches.....	4	Overload Protection—Upper Engine Circuit Breaker Panel.....	9
Lanyard Stop Switch.....	4	Overload Protection—Port Side Power Distribution Box..	10
Keep the Lanyard Stop Switch and Lanyard Cord in Good Operating Condition.....	5	Vessel Integration Panel (VIP) Overload Protection.....	11
Instrumentation.....	6	Engine Guardian System.....	11

Section 2 - On the Water

Safe Boating Recommendations.....	14	Engine Shut Down (Stopping).....	20
Carbon Monoxide Exposure.....	15	Protecting People in the Water.....	20
Be Alert To Carbon Monoxide Poisoning.....	15	While Boat is in Operation.....	20
Stay Clear of Exhaust Areas.....	15	While the Boat is Stationary.....	20
Good Ventilation.....	15	High-Speed and High-Performance.....	20
Poor Ventilation.....	16	Passenger Safety In Pontoon Boats and Deck Boats.....	20
Important Operation Information.....	16	Boats Having An Open Front Deck.....	20
Launching.....	16	Boats With Front-Mounted, Raised Pedestal Fishing Seats.....	21
Duty Cycle Rating Requirements.....	16	Wave and Wake Jumping.....	21
High-Output Rating.....	16	Impact With Underwater Hazards.....	22
Operation Chart.....	17	Conditions Affecting Operation.....	22
Freezing Temperature and Cold Weather Operation.....	17	Weight Distribution (Passengers and Gear) Inside the Boat.....	22
Drain Plug and Bilge Pump.....	18	Bottom of Boat.....	22
Trailing the Boat.....	18	Elevation and Climate.....	23
Starting, Shifting, and Stopping.....	18	Propeller Selection.....	23
Before Starting the Engine.....	18	Getting Started.....	23
Important Information—SmartStart.....	18	Initial Break-In Procedure.....	23
Starting a Cold Engine.....	18	Engine Break-In.....	24
Engine Warm-Up.....	19	20-Hour Break-In Period.....	24
Starting a Warm Engine.....	19	After the 20-Hour Break-In Period.....	24
Shifting.....	19	End of First Season Checkup.....	24
Trolling Valve Operation on Technodrive Transmissions.....	19		

Section 3 - Specifications

Fuel Requirements.....	26	Fluid Specifications.....	28
Diesel Fuel in Cold Weather.....	26	Engine.....	28
Antifreeze/Coolant.....	26	2.8L.....	29
Engine Oil.....	27	4.2L.....	29
Engine Specifications.....	28	Transmission.....	29
2.8L Specification.....	28	Approved Paints.....	29
4.2L Specification.....	28		

Section 4 - Maintenance

Owner and Operator Responsibilities.....	32	Draining.....	49
Dealer Responsibilities.....	32	Replacing.....	49
Cleaning Care Recommendation.....	32	Filling.....	51
Do Not Use Caustic Cleaning Chemicals.....	32	Fuel System.....	52
Cleaning Gauges.....	32	Priming.....	52
Cleaning Remote Controls.....	32	Filling (Bleeding).....	52
Maintenance.....	32	Fuel Tank Cleaning and Flushing.....	53
Do-It-Yourself Maintenance Suggestions.....	33	Seawater System.....	53
Inspection.....	33	Draining the Seawater System.....	53
Maintenance Schedule.....	34	Checking the Seawater Pickups.....	55
Routine Maintenance.....	34	Cleaning the Seawater Strainer, if Equipped.....	55
Scheduled Maintenance.....	35	Flushing the Seawater System—Inboard Models.....	57
Engine Oil.....	35	With the Boat out of the Water.....	57
Checking.....	35	With the Boat in the Water.....	58
Filling.....	36	Engine Seawater Pump Inspection.....	59
Changing Oil and Filter.....	36	Replacing the Engine Coolant in the Closed-Cooling System.....	60
ZF Marine Transmission Fluid.....	38	Draining the Closed-Cooling System.....	60
Check Fluid Level.....	38	Filling the Closed-Cooling System.....	61
Add Fluid.....	39	Corrosion Protection.....	62
Change Fluid.....	39	General Information.....	62
Technodrive Transmission Fluid.....	40	Engine Corrosion Protection Components.....	62
Check Fluid.....	40	Removal.....	62
Add Fluid.....	41	Cleaning and Inspection.....	63
Change Fluid.....	42	Installation.....	63
Engine Coolant.....	44	Antifouling Paint.....	64
Check Coolant.....	44	Lubrication.....	65
Filling.....	45	Throttle Cable.....	65
Changing.....	45	Shift Cable.....	65
2.8 Air Filter.....	45	Drive Belts.....	65
Removal.....	45	Drive Belt.....	65
Inspection.....	46	Serpentine Belt.....	66
Installation.....	46	Inspection.....	66
4.2 Air Filter.....	46	Replacement.....	67
Removal.....	46	Battery.....	67
Inspection.....	47	Battery Precautions for Multiple Engines.....	67
Installation.....	48		
Water-Separating Fuel Filter.....	48		

Section 5 - Storage

Cold Weather (Freezing Temperature), Seasonal Storage, and Extended Storage.....	70	Seasonal Storage.....	71
Cold Weather (Freezing Temperature) Storage.....	70	Extended Storage Instructions.....	72
Preparing Your Power Package for Seasonal or Extended Storage.....	70	Battery.....	72
		Recommissioning.....	72

Section 6 - Troubleshooting

Diagnosing Electronically Controlled Fuel System Problems.....	74	Poor Performance.....	74
Troubleshooting Charts.....	74	Incorrect Engine Temperature.....	75
Starter Motor Will Not Crank Engine, or Cranks Slow.....	74	Low Engine Oil Pressure.....	75
Engine Will Not Start, or Is Hard to Start.....	74	Battery Will Not Charge.....	75
Engine Runs Rough, Misses, or Backfires.....	74	Remote Control Operates Hard, Binds, Has Excessive Free-play, or Makes Unusual Sounds.....	75

Section 7 - Customer Assistance Information

Owner Service Assistance.....	78	Contact Information for Mercury Marine Customer Service	
Local Repair Service.....	78	79
Service Away From Home.....	78	Customer Service Literature.....	79
Stolen Power Package.....	78	English Language.....	79
Attention Required After Submersion.....	78	Other Languages.....	80
Replacement Service Parts.....	78	Ordering Literature.....	80
Parts and Accessories Inquiries.....	78	United States and Canada.....	80
Resolving a Problem.....	78	Outside the United States and Canada.....	80

Section 8 - Maintenance Log

Scheduled Maintenance Log.....	82	Vessel Maintenance Notes.....	83
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Section 1 - Getting to Know Your Power Package

1

Table of Contents

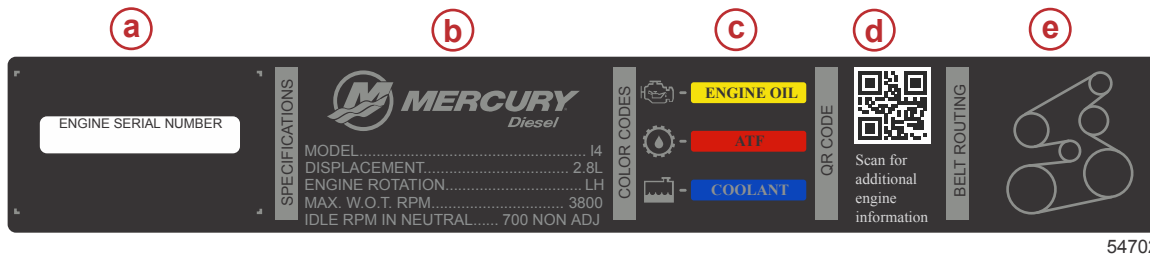
Identification.....	2	SmartCraft Digital Instruments	6
Serial Number Decal.....	2	System Link Digital Instruments	7
Engine Data Label.....	2	Emergency Stop Switch.....	7
ZF Marine Transmissions.....	3	Remote Controls.....	8
Technodrive Transmissions.....	3	Panel Mount Features	8
Features and Controls.....	3	Console Mount Features	8
Audio Warning System.....	3	Overload Protection—Upper Engine Circuit Breaker	
Switches.....	4	Panel.....	9
Lanyard Stop Switch.....	4	Overload Protection—Port Side Power Distribution Box	
Keep the Lanyard Stop Switch and Lanyard Cord in		10
Good Operating Condition	5	Vessel Integration Panel (VIP) Overload Protection.....	11
Instrumentation.....	6	Engine Guardian System.....	11
VesselView	6		

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.



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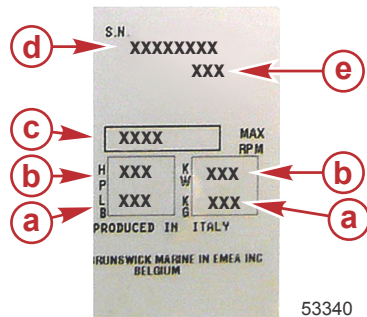
2.8 shown, 4.2 similar

- a - Serial number
- 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.



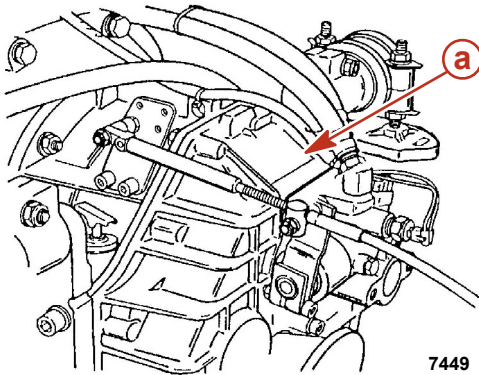
Engine data label example

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

53340

ZF Marine Transmissions

On the ZF Marine 63A 8° down-angle and 63IV V-drive transmissions, the transmission identification plate indicates gear ratio, serial number, and model.

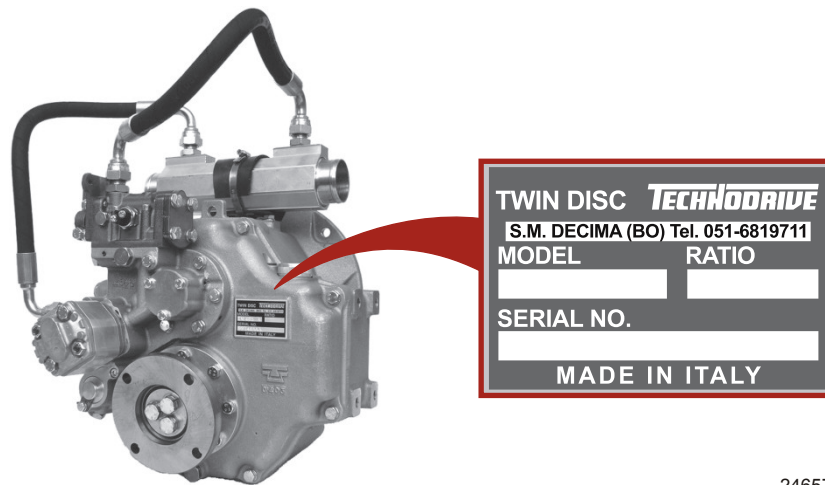


Typical ZF Marine down-angle transmission show (V-drive similar)
 a - Transmission identification plate

7449

Technodrive Transmissions

On the Technodrive TM 485-A, the transmission identification plate indicates gear ratio, serial number, and model.



24657

Typical Technodrive transmission shown

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



38160

- **"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 accessories connected 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.

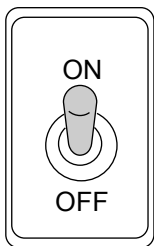
Dual-Engine Start-Stop Switch



28082

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 multiengine start-stop switch functions independently. The key switch must be in the run position to start a stopped engine with the start-stop switch. Pressing a start-stop switch button when an engine is running will shut down the corresponding engine.

Bilge Blower Toggle Switch



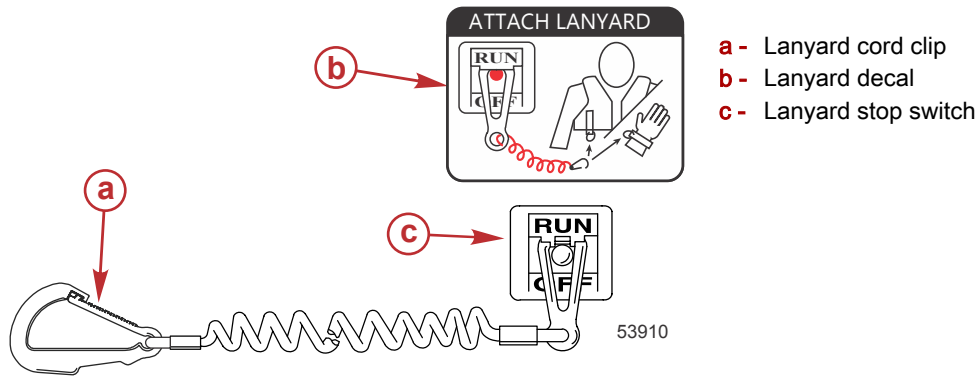
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Operates the bilge blower, if equipped.

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.



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

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

- Low-sided sport boats
- Bass boats
- High-performance boats

Accidental ejections can also occur from:

- Poor operating practices
- Sitting on the seat or gunwale at planing speeds
- Standing at planing speeds
- Operating at planing speeds in shallow or obstacle-infested waters
- Releasing your grip on the steering wheel
- 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.

Section 1 - Getting to Know Your Power Package

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

There are several VesselView products available. VesselView will display all engine information, fault codes, vessel information, basic navigation data, and system information. When an operating system error or failure occurs, VesselView displays an alarm message.

VesselView may also be connected to other vessel systems such as GPS, generators, and chartplotters. This vessel integration allows the operator to monitor and control a wide range of vessel systems from a single display.

Refer to the VesselView operator's manual for more information.

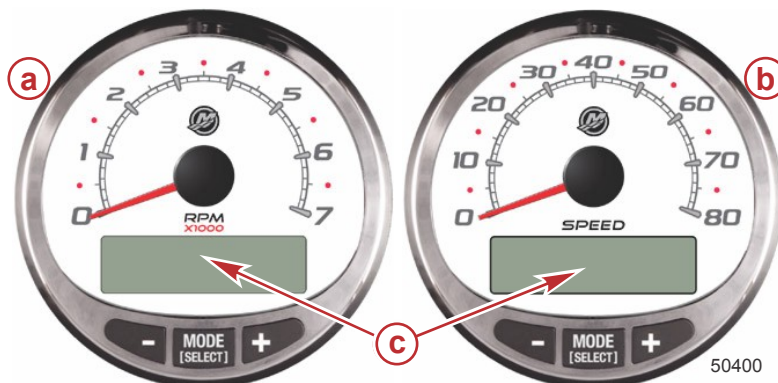


VesselView

SmartCraft Digital Instruments

The SmartCraft instrument package augments the VesselView display. The instrument package may include:

- Tachometer
- Speedometer
- Engine coolant temperature
- Engine oil pressure
- Battery voltage
- Fuel consumption
- Engine operating hours



SmartCraft tachometer and speedometer

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

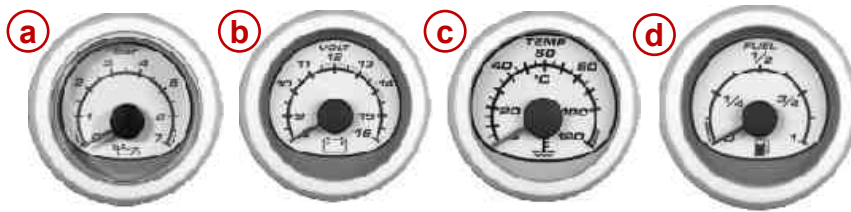
The SmartCraft instrument package also aids in identifying fault codes associated with the engine audio warning system. The SmartCraft instrument package displays critical engine alarm data and other potential problems on its LCD display.

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 Instruments

Some instrumentation packages include system link gauges that augment the information provided by VesselView or a SmartCraft system 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.

The following digital instruments 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:

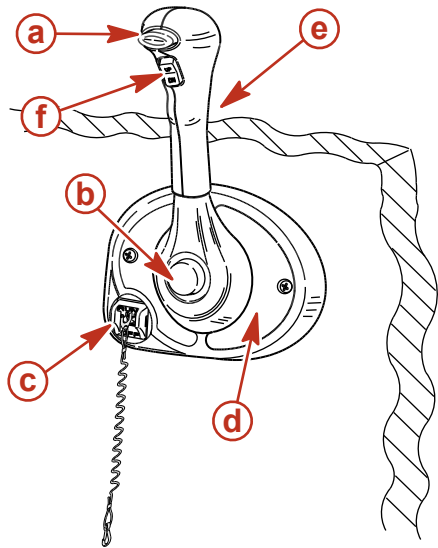
- Occupants can be thrown forward due to unexpected loss of forward motion, and passengers in the front of the boat could be ejected over the bow and possibly struck by the propulsion or steering components.
- The operator can lose power and directional control in heavy seas, strong current, or high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



- 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.

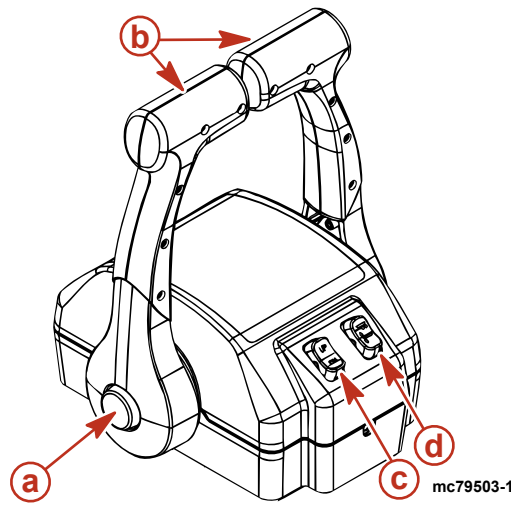
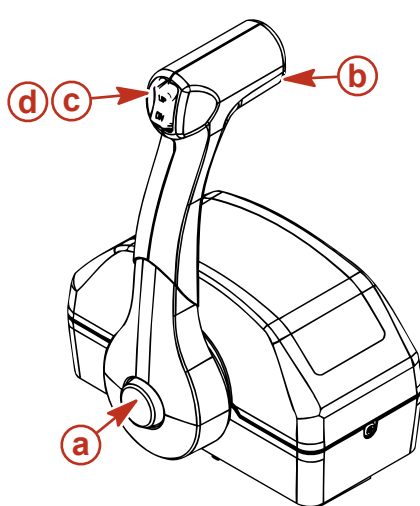
Lanyard stop switch. Turns the ignition off whenever the operator (when attached to the lanyard) moves far enough away from the operator's position to activate the switch. See **Lanyard Stop Switch** for information on the use of this switch.

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

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.

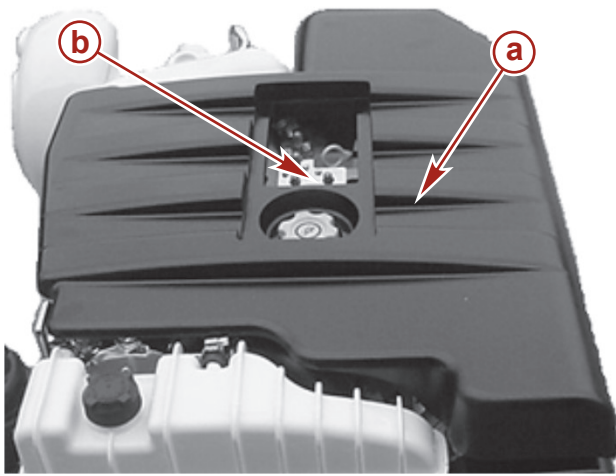
Trailer switch. Used to raise the sterndrive for trailering, launching, beaching, or shallow water operation. See **Power Trim** for detailed trailer switch operation.

Overload Protection—Upper Engine Circuit Breaker Panel

If an electrical overload occurs, a fuse will open (blow) or a circuit breaker will open (trip). Find and correct the cause of 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 of 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.*

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.



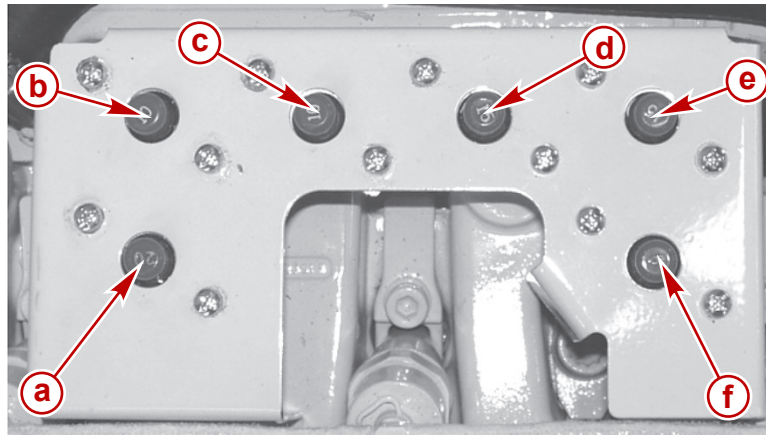
Typical engine cover with access panel

- a - Engine cover
- b - Circuit breakers

24727

Section 1 - Getting to Know Your Power Package

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

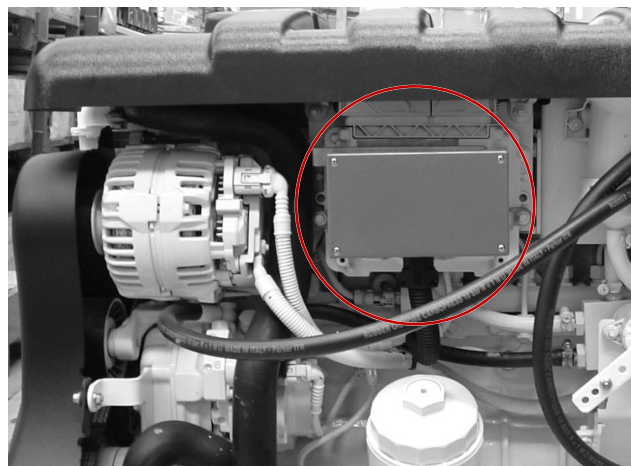
Overload Protection—Port Side Power Distribution Box

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.



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Port side power distribution box

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.



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

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.

Notes:

Section 2 - On the Water

Table of Contents

Safe Boating Recommendations.....	14	Engine Shut Down (Stopping).....	20
Carbon Monoxide Exposure.....	15	Protecting People in the Water.....	20
Be Alert To Carbon Monoxide Poisoning	15	While Boat is in Operation	20
Stay Clear of Exhaust Areas	15	While the Boat is Stationary	20
Good Ventilation	15	High-Speed and High-Performance.....	20
Poor Ventilation	16	Passenger Safety In Pontoon Boats and Deck Boats...	20
Important Operation Information.....	16	Boats Having An Open Front Deck	20
Launching.....	16	Boats With Front-Mounted, Raised Pedestal Fishing	
Duty Cycle Rating Requirements.....	16	Seats	21
High-Output Rating.....	16	Wave and Wake Jumping.....	21
Operation Chart.....	17	Impact With Underwater Hazards.....	22
Freezing Temperature and Cold Weather Operation....	17	Conditions Affecting Operation.....	22
Drain Plug and Bilge Pump.....	18	Weight Distribution (Passengers and Gear) Inside the	
Trailing the Boat.....	18	Boat.....	22
Starting, Shifting, and Stopping.....	18	Bottom of Boat.....	22
Before Starting the Engine.....	18	Elevation and Climate.....	23
Important Information—SmartStart.....	18	Propeller Selection.....	23
Starting a Cold Engine.....	18	Getting Started.....	23
Engine Warm-Up.....	19	Initial Break-In Procedure.....	23
Starting a Warm Engine	19	Engine Break-In.....	24
Shifting.....	19	20-Hour Break-In Period	24
Trolling Valve Operation on Technodrive Transmissions		After the 20-Hour Break-In Period	24
.....	19	End of First Season Checkup.....	24

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.

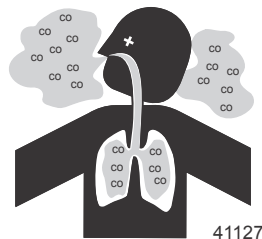
Early symptoms of carbon monoxide poisoning, which are similar to the symptoms of seasickness and intoxication, include headache, dizziness, drowsiness, and nausea.

⚠ 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

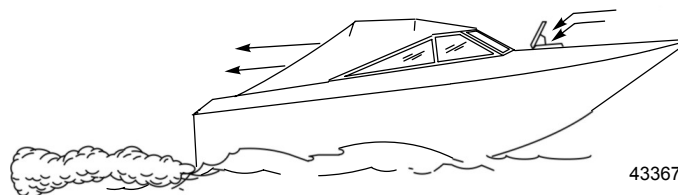


Engine exhaust gases contain harmful carbon monoxide. Avoid areas of concentrated engine exhaust gases. When engines are running, keep swimmers away from the boat, and do not sit, lie, or stand on swim platforms or boarding ladders. While underway, do not allow passengers to be positioned immediately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

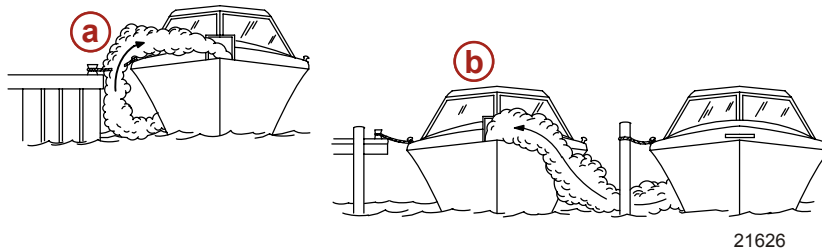


Poor Ventilation

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 **Storage** 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.

Trailing 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 the engine:

- Provide water to the seawater pickup pump.
- Ensure that the engine crankcase is filled to the correct level with the proper grade of oil for the prevailing temperature. Refer to Section 3 - Specifications.
- Ensure that all electrical connections are secure.
- Check all applicable items in the Maintenance Schedules and Operation Chart.
- Perform any other necessary checks as indicated by your Mercury Diesel authorized repair facility or specified in your boat owner's and operation manual.

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 4 - Maintenance Schedule**.

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

2. 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 before attempting to start the engine.

3. Turn the ignition key to the "RUN" position.

4. 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.
5. Verify that 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.

1. After starting, ensure that all instrumentation is functioning properly.
2. Operate the engine at 1,000 to 1,200 RPM until the engine temperature is within the normal operating range. It is crucial 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.
3. After the engine has reached operating temperature:
 - a. The oil pressure should be within the range specified. Refer to **Section 3 - Engine Specifications**. Stop the engine if the oil pressure is not within the range specified.
 - b. Check the fuel system for leakage from the injection pump, fuel pipes, fuel filter, or fuel lines.
 - c. Check the engine and the transmission, oil filter, oil lines, oil line connectors, and oil pan for leaks.
 - d. Check the coolant hoses, heat exchanger connections, aftercooler, water pump, and drain fittings for leaks.
4. 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

1. 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.
2. Place the remote control handle in neutral.
3. Turn the key switch to "START" position and release the key when the engine starts.
4. Ensure that all the instrumentation is functioning properly and indicates normal readings.

Shifting

NOTICE

Shifting into gear at engine speeds above idle will damage the transmission. Shift 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.

To shift the unit, verify the remote control throttle lever is in neutral. Move the remote control shift lever forward to shift into forward gear or backward to shift into reverse. After shifting the transmission, advance the throttle to the desired setting.

Trolling Valve Operation on Technodrive Transmissions

The trolling valve is a device that slows the propeller speed below the normal speed attained with the engine at idle. Trolling mode allows the propeller speed to vary from a few RPM to 70% of the propeller RPM in normal operating mode.

CAUTION

Avoid injury or damage to the boat. When the power package is in trolling mode, helm control during maneuvering and docking is limited and unstable. Disengage from trolling mode before attempting any precise maneuvers or docking.

NOTICE

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

NOTICE

Excessive engine RPM in trolling mode may overheat transmission fluid and damage the transmission or engine. Never operate the engine above 1100 RPM when the trolling mode feature is engaged.

Refer to the appropriate Technodrive operating manual for trolling valve operation instructions.

To prevent serious transmission damage, never operate the engine above 1100 RPM while in trolling mode.

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.

Protecting People in the Water

While Boat is in Operation

People in the water cannot take quick action to avoid a boat heading in their direction.



Approach slowly and exercise extreme caution when boating in areas where people may be in the water.

When a boat is moving 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 the 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 down the engine before allowing people in the water near the 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.

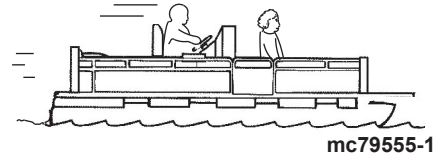
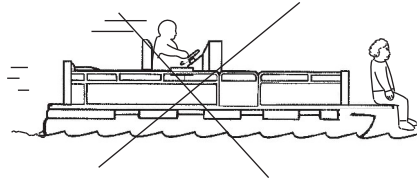
Passenger Safety In Pontoon Boats and Deck Boats

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.



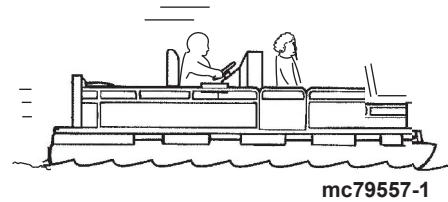
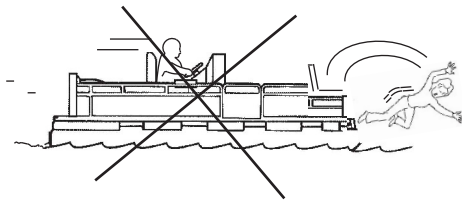
▲ WARNING

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

Boats With Front-Mounted, Raised Pedestal Fishing Seats

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

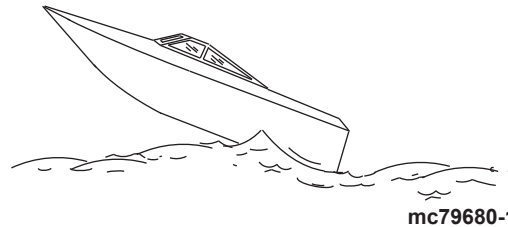
Any unexpected, sudden reduction in boat speed could result in the elevated passenger falling over the front of the boat.



Wave and Wake Jumping

▲ WARNING

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

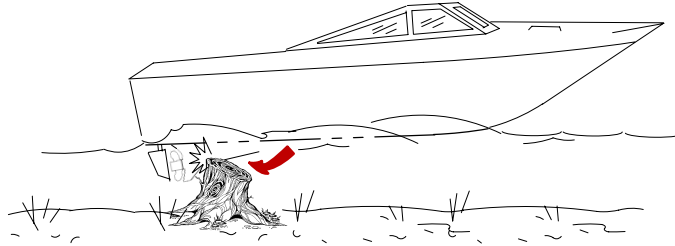


Operating recreational boats over waves and wakes is a natural part of boating. However, when this activity is done with enough speed to force the boat hull partially or completely out of the water, certain hazards arise, particularly when the boat reenters the water.

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



17269

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

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

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

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

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

The boat should also be checked for any 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 running 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.

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.

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 waterskiing, 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.

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.

Section 3 - Specifications

Table of Contents

Fuel Requirements.....	26	Fluid Specifications.....	28
Diesel Fuel in Cold Weather.....	26	Engine.....	28
Antifreeze/Coolant.....	26	2.8L	29
Engine Oil.....	27	4.2L	29
Engine Specifications.....	28	Transmission.....	29
2.8L Specification	28	Approved Paints.....	29
4.2L Specification	28		

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 antigel 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 4 - Maintenance** for respective change intervals.

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

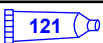
Engine Oil

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

2.8L Specification

Description	Specifications
Engine type	In-line 4-cylinder diesel
Displacement	2.8 L (169 cid)
Horsepower	220
Kilowatts	162
Firing order	1-3-4-2
Bore	94 mm (3.700 in.)
Stroke	100 mm (3.937 in.)
Rated engine RPM	3800
Idle RPM in neutral (engine at normal operating temperature)	700
Oil pressure at idle	2.4 bar (240 kPa [35 psi])
Oil pressure at 3800 RPM	6.2 bar (620 kPa [87 psi])
Thermostat (water)	83° C (181° F)
Thermostat (oil)	95° C (203° F)
Coolant temperature	80–85° C (176–185° F)
Electrical system	12-volt negative (–) ground
Alternator rating	1540 W, 14 V, 110 A
Recommended battery rating	750 CCA, 950 MCA, or 180 Ah

4.2L Specification

Description	Specifications		
Engine type	In-line 6-cylinder diesel		
Displacement	4.2 L (254 cid)		
Horsepower	270	320	350
Kilowatt	199	235	257
Firing order	1-5-3-6-2-4		
Bore	94 mm (3.700 in.)		
Stroke	100 mm (3.937 in.)		
Rated engine RPM	3800		
Idle RPM in neutral (engine at normal operating temperature)	600		
Oil pressure at idle	2.1 bar (210 kPa [30 psi])		
Oil pressure at 3800 RPM	6.6 bar (660 kPa [93 psi])		
Thermostat (water)	89° C (192° F)		
Thermostat (oil)	87° C (187° F)		
Coolant temperature	80–85° C (176–185° F)		
Electrical system	12-volt negative (–) ground		
Alternator rating	1540 W, 14 V, 110 A		
Recommended battery rating	750 CCA, 950 MCA, or 180 Ah		

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.

2.8L

All models	Capacity liters (US qt)	Fluid Type	Part Number
Engine oil (with filter)	8.9 (9.4)	15W-40 4-cycle Diesel Engine Oil	92-858042K01
Closed cooling system	11 (11.6)	Mercury Extended Life Antifreeze	92-877770K1

4.2L

All models	Capacity liters (US qt)	Fluid Type	Part Number
Engine oil (with filter)	13.8 (14.6)	15W-40 4-cycle Diesel Engine Oil	92-858042K01
Closed cooling system	17.25 (18.2)	Mercury Extended Life Antifreeze	92-877770K1

Transmission

NOTE: Capacities are for the transmission only and do not include the fluid cooler or fluid cooler hose capacities.

Model	Capacity liters (US qt)	Fluid Type	Part Number
ZF Marine 63A	4 (4.2)	Dexron III Automatic Transmission Fluid or Equivalent	Obtain Locally
ZF Marine 63IV	4.4 (4.6)		
Technodrive 485-A	2.6 (2.5)	SAE 20W-40 or SAE 15W-40 engine oil	

Approved Paints

Description	Part Number
Mercury Diesel White	8M0108939
Mercury Light Gray Primer	92-80287852
Mercury Phantom Black	92-802878Q1

Notes:

Section 4 - Maintenance

Table of Contents

Owner and Operator Responsibilities.....	32	Draining.....	49
Dealer Responsibilities.....	32	Replacing.....	49
Cleaning Care Recommendation.....	32	Filling.....	51
Do Not Use Caustic Cleaning Chemicals.....	32	Fuel System.....	52
Cleaning Gauges.....	32	Priming.....	52
Cleaning Remote Controls.....	32	Filling (Bleeding).....	52
Maintenance.....	32	Fuel Tank Cleaning and Flushing.....	53
Do-It-Yourself Maintenance Suggestions.....	33	Seawater System.....	53
Inspection.....	33	Draining the Seawater System.....	53
Maintenance Schedule.....	34	Checking the Seawater Pickups.....	55
Routine Maintenance.....	34	Cleaning the Seawater Strainer, if Equipped.....	55
Scheduled Maintenance.....	35	Flushing the Seawater System—Inboard Models.....	57
Engine Oil.....	35	With the Boat out of the Water.....	57
Checking.....	35	With the Boat in the Water.....	58
Filling.....	36	Engine Seawater Pump Inspection.....	59
Changing Oil and Filter.....	36	Replacing the Engine Coolant in the Closed-Cooling System.....	60
ZF Marine Transmission Fluid.....	38	Draining the Closed-Cooling System.....	60
Check Fluid Level.....	38	Filling the Closed-Cooling System.....	61
Add Fluid.....	39	Corrosion Protection.....	62
Change Fluid.....	39	General Information.....	62
Technodrive Transmission Fluid.....	40	Engine Corrosion Protection Components.....	62
Check Fluid.....	40	Removal.....	62
Add Fluid.....	41	Cleaning and Inspection.....	63
Change Fluid.....	42	Installation.....	63
Engine Coolant.....	44	Antifouling Paint.....	64
Check Coolant.....	44	Lubrication.....	65
Filling.....	45	Throttle Cable.....	65
Changing.....	45	Shift Cable.....	65
2.8 Air Filter.....	45	Drive Belts.....	65
Removal.....	45	Drive Belt.....	65
Inspection.....	46	Serpentine Belt.....	66
Installation.....	46	Inspection.....	66
4.2 Air Filter.....	46	Replacement.....	67
Removal.....	46	Battery.....	67
Inspection.....	47	Battery Precautions for Multiple Engines.....	67
Installation.....	48		
Water-Separating Fuel Filter.....	48		

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.

Cleaning Care Recommendation

Do Not Use Caustic Cleaning Chemicals

IMPORTANT: Do not use caustic cleaning chemicals on any part of the MerCruiser power package. Some cleaning products contain strong caustic agents. For example, some hull cleaners contain hydrochloric acid. These cleaners can degrade some of the components they contact, including critical steering fasteners.

Damage to steering fasteners may not be obvious during visual inspection, and this damage may lead to catastrophic failure. Some caustic cleaning chemicals may cause or accelerate corrosion. Exercise caution when using cleaning chemicals around the power package, and follow the recommendations on the packaging of the cleaning product.

Cleaning Gauges

IMPORTANT: Never use high-pressure water to clean gauges.

Routine cleaning of the gauges is recommended to prevent a buildup of salt and other environmental debris. Crystallized salt can scratch the gauge display lens when using a dry or damp cloth. Ensure that the cloth has a sufficient amount of fresh water to dissolve and remove salt or mineral deposits. Do not apply aggressive pressure on the display lens while cleaning.

When water marks cannot be removed with a damp cloth, mix a 50/50 solution of warm water and isopropyl alcohol to clean the display lens. **Do not use** acetone, mineral spirits, turpentine type solvents, or ammonia based cleaning products. The use of strong solvents or detergents may damage the coating, the plastics, or the rubber keys on the gauges. If the gauge has a sun cover available, it is recommended that the cover be installed when the unit is not in use to prevent UV damage to the plastic bezels and rubber keys.

Cleaning Remote Controls

IMPORTANT: Never use high-pressure water to clean remote controls.

Routine cleaning of the remote control external surfaces is recommended to prevent a buildup of salt and other environmental debris. Use a cloth towel which has a sufficient amount of fresh water to dissolve and remove salt or mineral deposits.

When water marks cannot be removed with a damp cloth, mix a 50/50 solution of warm water and isopropyl alcohol to clean the remote control. **Do not use** acetone, mineral spirits, turpentine type solvents, or ammonia based cleaning products. The use of strong solvents or detergents may damage the coating, the plastics, or the rubber components on the remote control.

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: See Maintenance Schedule for 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 an authorized Mercury Diesel repair facility. Before attempting maintenance or repair procedures not covered in this manual, we recommended that you purchase the appropriate Mercury Diesel service manual and read it thoroughly.

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

- Blue—Coolant
- Yellow—Engine Oil
- Orange—Fuel
- Brown—Transmission Fluid

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 to correct potential problems before they occur. The entire power package should be checked carefully, including all accessible engine parts.

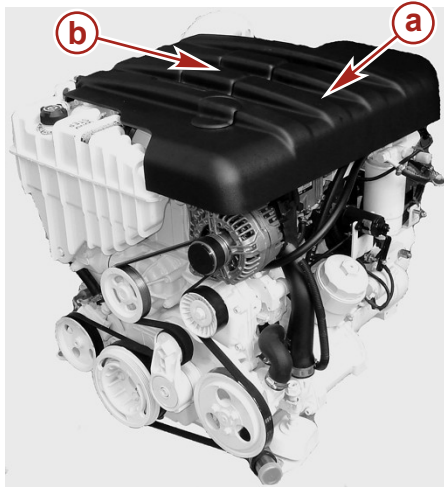
1. Check for loose, damaged, or missing parts, hoses, and clamps. Tighten or replace as necessary.
2. Check electrical connections and leads for damage or corrosion.
3. Remove and inspect the propeller. If the propeller is badly nicked, bent, or cracked, contact your Mercury Diesel authorized repair facility.
4. Repair nicks and corrosion damage on power package exterior finish. Contact your Mercury Diesel authorized repair facility.

NOTE: A small panel in the engine cover allows access to the engine circuit breakers, the engine oil fill cap, and the engine oil dipstick without removing the entire engine cover.

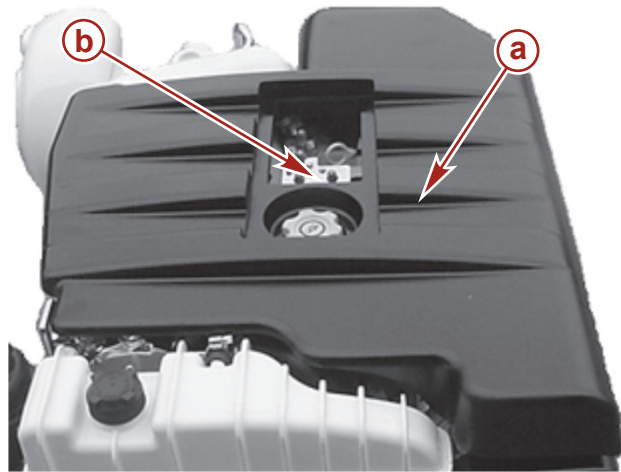
It may be necessary to remove the engine cover during some maintenance inspections and procedures. To remove the engine cover:

Section 4 - Maintenance

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



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Engine cover

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

Engine cover with access panel showing

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

Maintenance Schedule

Routine Maintenance

NOTE: Perform only the maintenance tasks that apply to your particular power package.

Each day start	<ul style="list-style-type: none"> • Check the engine oil level. (This interval can be extended based on operator experience with the product.) • Check the engine coolant level. • Check the transmission oil level.
Each day end	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Drain any water from the fuel filters. • Check the seawater inlets for debris or marine growth. • Check and clean the seawater strainer.
Every two months	<ul style="list-style-type: none"> • Check the battery connections and fluid level. • Treat the engine surfaces with Corrosion Guard if operating in saltwater, brackish water, or polluted waters. • Inspect the air filter. (Inspect every two months or every 50 hours, whichever occurs first.) • Inspect the engine anodes and replace if eroded by 50% or more. • Ensure that the gauges and all wiring connections are secure. • Clean the gauges. (If operating in saltwater reduce the interval to every 25 hours or 30 days, whichever occurs first.)

Scheduled Maintenance

After first 50 hours	<ul style="list-style-type: none"> • Clean the transmission oil filter and change the transmission oil.
Annually	<ul style="list-style-type: none"> • Touch-up the power package with paint and spray with Corrosion Guard. • Clean the transmission oil filter and change the transmission oil.
Every 100 hours or annually (whichever occurs first)	<ul style="list-style-type: none"> • Check the steering system and the remote control for loose, missing, or damaged parts. Lubricate the cables and linkages. • Check the engine alignment. • Torque the engine mounts. • Check the electrical system for loose, damaged, or corroded terminals. • Inspect the cooling system and the exhaust system for damage or leaks. Check both systems hose clamps for tightness. • Clean the transmission oil filter and change the transmission oil.
Every 200 hours or annually (whichever occurs first)	<ul style="list-style-type: none"> • 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. • Clean the seawater strainer. • Check the closed cooling fluid level and level of protection. • Check the run history for faults. • Check the engine timing belt.
Every 2 years	<ul style="list-style-type: none"> • Replace the engine coolant.
Every 1000 hours or 5 years (whichever occurs first)	<ul style="list-style-type: none"> • Replace the engine timing belt. • Clean the fuel tank. • Clean the aftercooler core.
According to OEM Schedule	<ul style="list-style-type: none"> • Check the engine to propeller shaft alignment.

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.

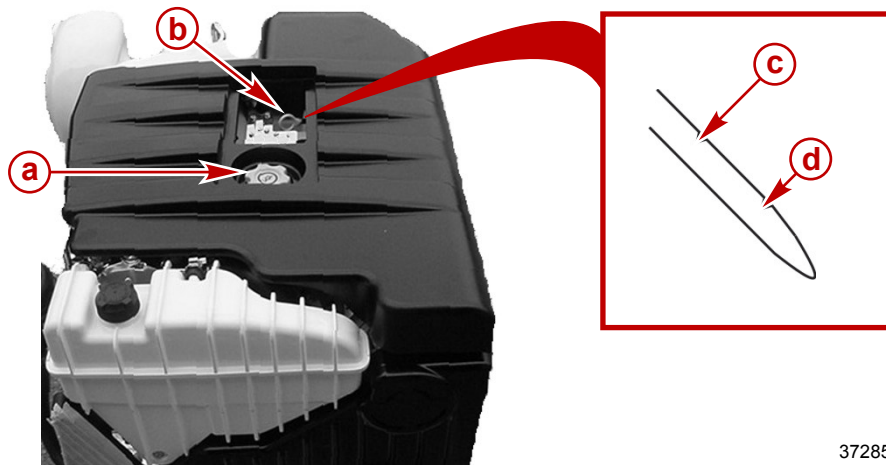
NOTICE

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.

1. To check the engine oil level during operation, stop the engine and allow five minutes for the oil to drain into the pan.
2. Remove the dipstick, wipe clean, and reinstall.

Section 4 - Maintenance

- 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**.



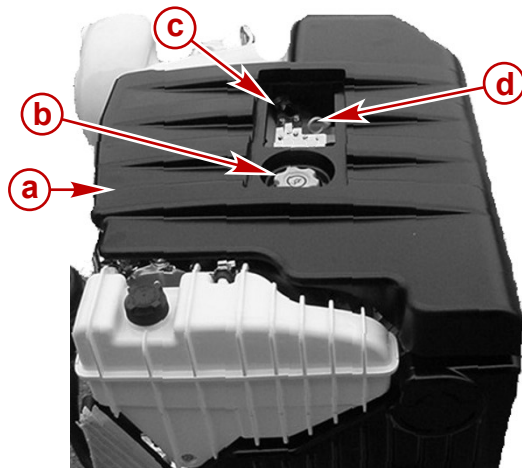
- Typical**
- a** - Oil fill cap
 - b** - Dipstick
 - c** - Maximum mark
 - d** - Minimum mark

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Filling

IMPORTANT: Do not overfill the engine with oil.

- Remove the oil fill cap.



- Typical**
- a** - Engine cover
 - b** - Oil fill cap
 - c** - Access panel removed
 - d** - Engine oil dipstick

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

2.8L	Capacity	Fluid Type
Engine oil (with filter)	8.9 L (9.4 U.S. qt)	4-Cycle 15W-40 Marine Engine Oil

4.2L	Capacity	Fluid Type
Engine oil (with filter)	13.8 L (14.6 U.S. qt)	4-Cycle 15W-40 Marine Engine Oil

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

- Install the oil fill cap.

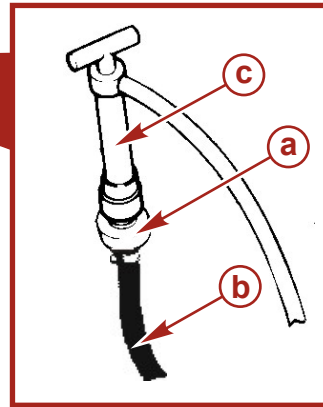
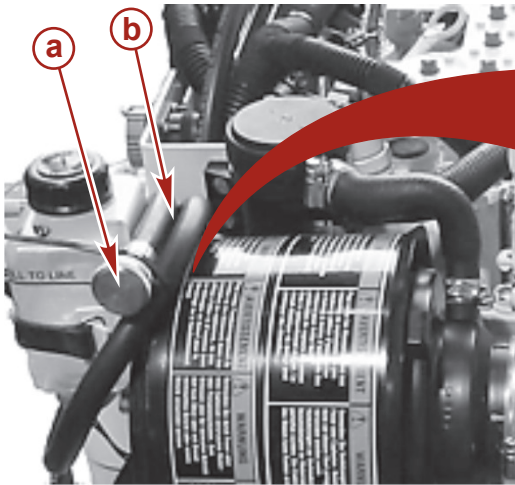
Changing Oil and Filter

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.

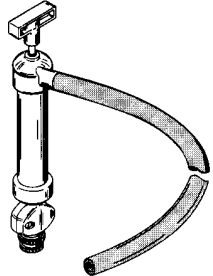
- Start the engine and allow it to warm up to normal operating temperature.
- Stop the engine and allow some time for the oil to drain into the oil pan (approximately five minutes).
- Remove the fitting from the end of crankcase oil drain hose.

- Install the crankcase oil pump (order separately) onto the threaded fitting of the oil drain hose.

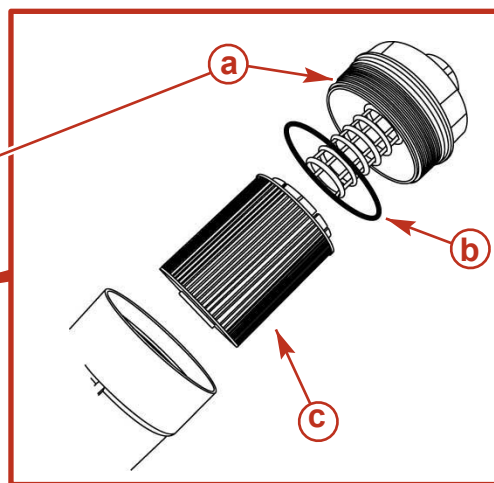
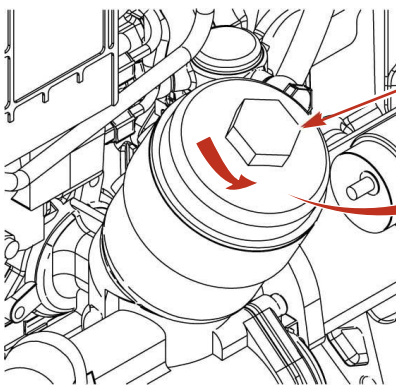


- Typical**
- a** - Threaded fitting
 - b** - Oil drain hose
 - c** - Crankcase oil pump

23306

Crankcase oil pump	91-90265A 5
 <p style="text-align: right;">11591</p>	<p>Aids in the removal of engine oil without draining the crankcase.</p>

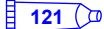
- Pump the oil out of the crankcase into the drain pan.
- Contain and dispose of the oil or oil waste as directed by local authorities.
- Remove the crankcase oil pump and install the crankcase oil drain hose fitting when the crankcase is empty. Tighten securely.
- Install the oil dipstick.
- Place a 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.
- Remove the top piece and cartridge type oil filter.
- 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

16603

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

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

Section 4 - Maintenance

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.
15. 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

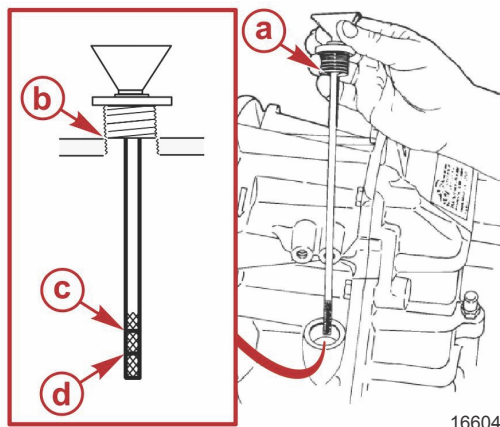
Description	Nm	lb-in.	lb-ft
Oil filter top piece	25	–	18

16. 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.
17. Start the engine and check for leaks.

ZF Marine Transmission Fluid

Check Fluid Level

1. Remove the dipstick.
IMPORTANT: When checking the fluid level, rest the dipstick on top of the threaded housing hole. Do not screw the dipstick into the threaded housing hole.
2. Check the fluid level as indicated on the dipstick with the dipstick resting on the top of the threaded hole.
NOTE: The fluid level may be somewhat over the maximum mark, as some of the fluid from the transmission fluid cooler and hoses may have drained back into the transmission.
3. If the fluid level is below the minimum mark on the dipstick, add transmission fluid. Refer to **Add Fluid**.



- a - Dipstick
- b - Threaded hole
- c - Maximum fluid level
- d - Minimum fluid level

16604

IMPORTANT: To accurately check the fluid level, operate the engine at 1500 RPM for two minutes immediately before checking the level.

4. Start the engine and operate at 1500 RPM for two minutes to fill all the hydraulic circuits.
5. Stop the engine and quickly check the fluid level with the dipstick resting on the top of the threaded hole.
6. If the fluid level is low, add transmission fluid to bring the level up to the maximum mark on the dipstick. Refer to **Add Fluid**.

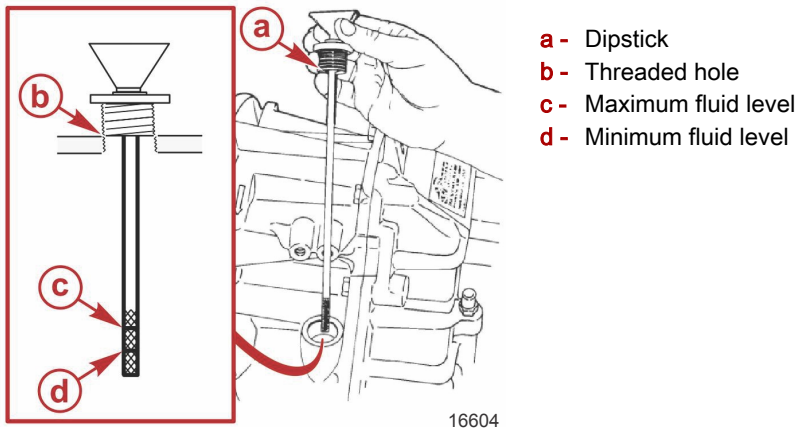
NOTE: If the transmission fluid level was extremely low, see your local Mercury Diesel authorized repair facility.

7. Install the dipstick.

Add Fluid

1. If necessary, add the specified automatic transmission fluid through the dipstick threaded hole to bring the level up to the maximum mark on the dipstick.

IMPORTANT: Use only the specified automatic transmission fluid (ATF).



- a - Dipstick
- b - Threaded hole
- c - Maximum fluid level
- d - Minimum fluid level

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

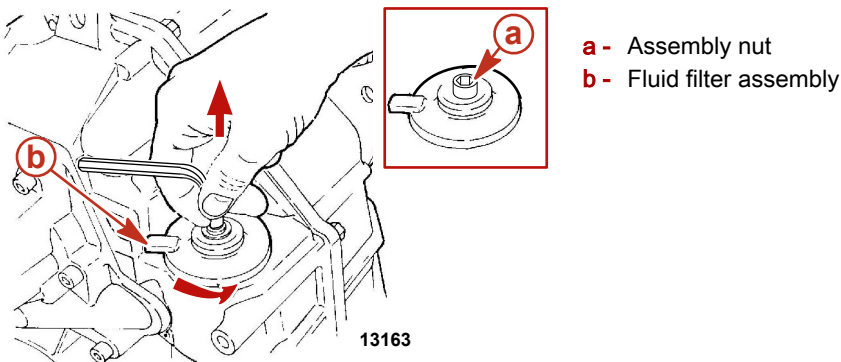
NOTE: Capacities are for the transmission only and do not include the fluid cooler or fluid cooler hose capacities.

Model	Capacity	Fluid type	Part Number
ZF Marine 63A	4.0 L (4.2 US qt)	Dexron III® Automatic Transmission Fluid or Equivalent	Obtain locally
ZF Marine 63IV	4.4 L (4.6 US qt)		

2. Install the dipstick.
3. Check the fluid level. Refer to **Check Fluid Level**.

Change Fluid

1. Clean the exterior of the transmission around the fluid filter assembly.
2. Use a 6 mm Allen wrench and remove the fluid filter assembly by turning the assembly nut counterclockwise and pulling at the same time.

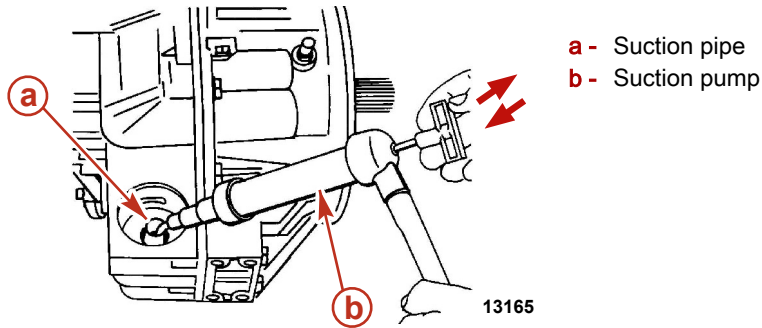


- a - Assembly nut
- b - Fluid filter assembly

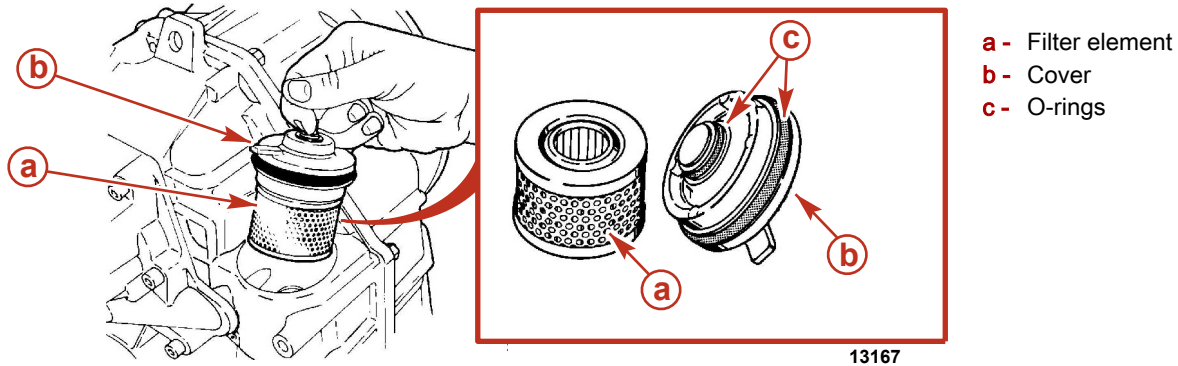
3. Push the hose of a suction pump through the suction pipe and down to the bottom of the housing.

Section 4 - Maintenance

- Pump the fluid from the housing into a suitable container. Dispose of the fluid properly.



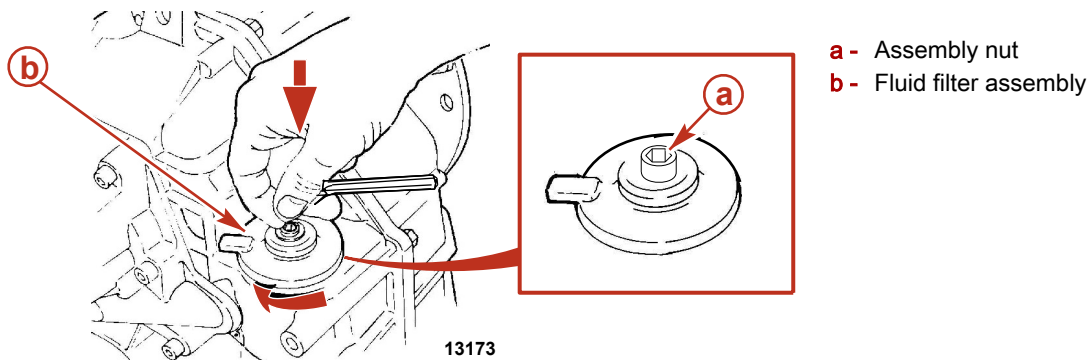
- Remove and discard the filter element and the O-rings.
- Coat the new O-rings with transmission fluid.
- Install the new O-rings and filter element.



NOTICE

Improper installation of the transmission fluid filter assembly may cause the fluid to foam or leak out, resulting in decreased efficiency and damage to the transmission. Properly seat the transmission fluid filter during installation.

- Install the fluid filter assembly in the transmission cavity by turning clockwise and pushing at the same time.
- Using a 6 mm Allen wrench, turn the filter assembly nut clockwise to tighten. Tighten the nut to the specified torque.



Description	Nm	lb-in.	lb-ft
Filter assembly nut	7	62	-

- Fill the transmission to the proper level with the specified fluid. See **Add Fluid**.

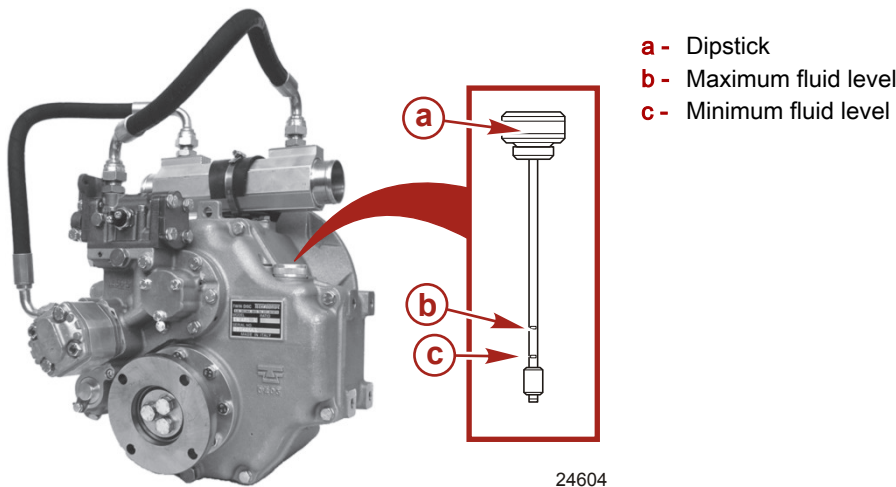
Technodrive Transmission Fluid

Check Fluid

- Remove the dipstick.
IMPORTANT: When checking the fluid level, rest the dipstick on top of the threaded housing hole. Do not screw the dipstick onto the threaded housing hole.
- Check the fluid level as indicated on the dipstick with the dipstick resting on the top of the threaded hole.

NOTE: The fluid level may be somewhat over the maximum mark, as some of the fluid from the transmission fluid cooler and hoses may have drained back into the transmission.

- If the fluid level is below the minimum mark on the dipstick, add transmission fluid. See **Add Fluid**.

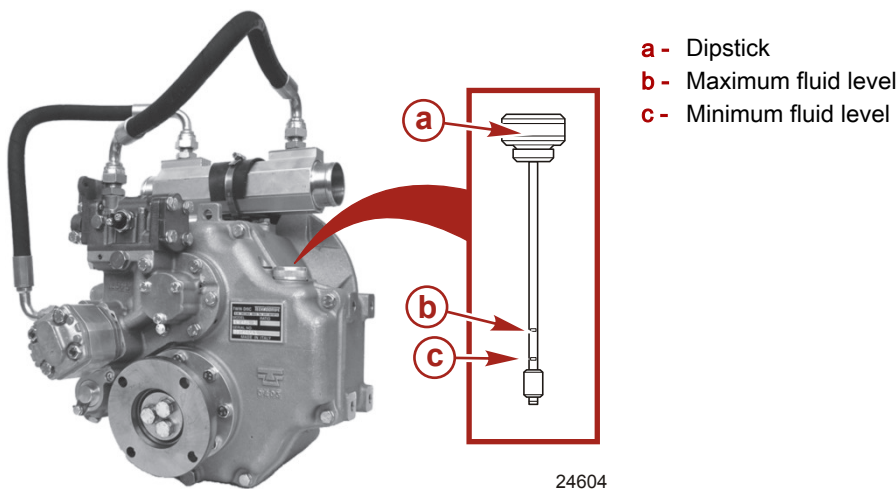


IMPORTANT: To accurately check the fluid level, operate the engine at 1500 RPM for two minutes immediately before checking the level.

- Start the engine and operate at 1500 RPM for two minutes to fill all the hydraulic circuits.
- Stop the engine and quickly check the fluid level with the dipstick resting on the top of the threaded hole.
- If the fluid level is low, add transmission fluid to bring the level up to the maximum mark on the dipstick. See **Add Fluid**.
NOTE: If the transmission fluid level was extremely low, see your local Mercury Diesel authorized repair facility.
- Install the dipstick.

Add Fluid

- If necessary, add specified transmission fluid through the dipstick threaded hole to bring the level up to the maximum mark on the dipstick.



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

Model	Capacity	Fluid type	Part Number
Technodrive 485A	2.6 L (2.7 US qt)	SAE 20W-40 or SAE 15W-40 engine oil	Obtain Locally

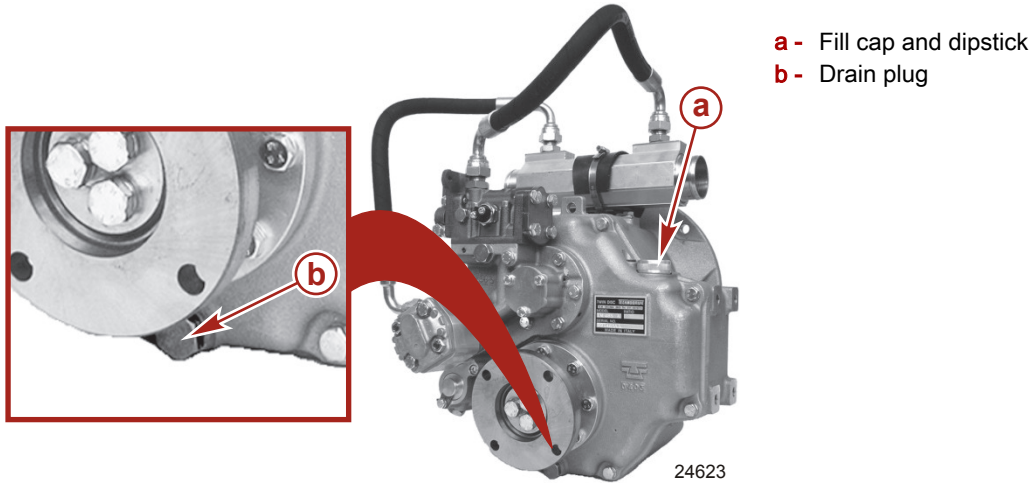
- Install the dipstick.
- Check the fluid level. Refer to **Check Fluid**.

Change Fluid

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.

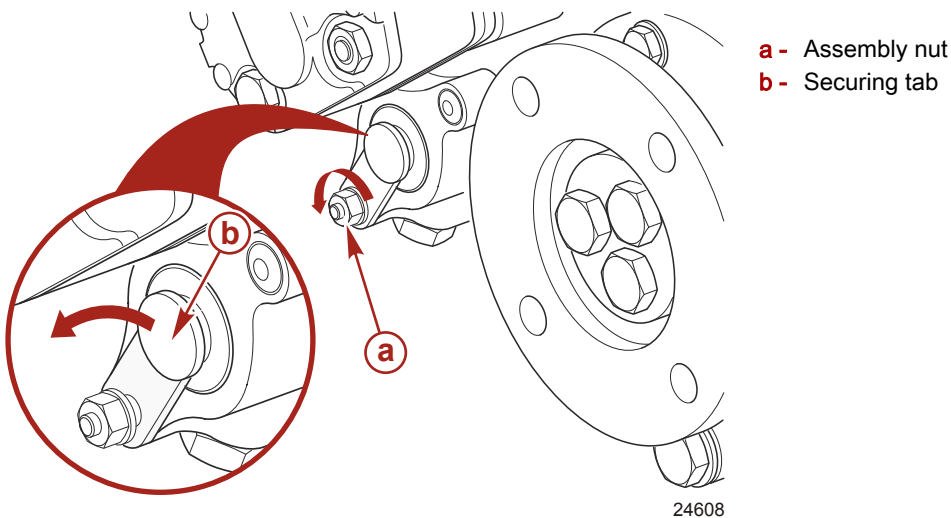
1. Remove the fill cap and dipstick.
2. Remove the transmission fluid drain plug and drain the transmission into a suitable container.



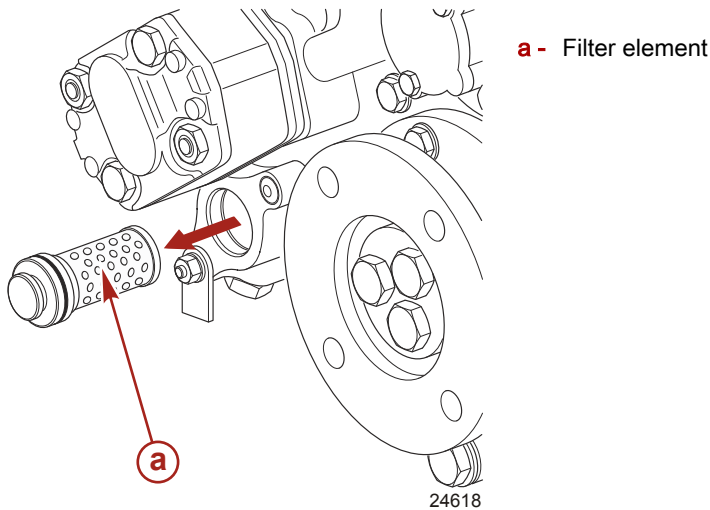
3. Dispose of the waste according to local regulations.
4. Reinstall the transmission fluid drain plug.
5. Tighten the drain plug to the specified torque.

Description	Nm	lb-in.	lb-ft
Transmission fluid drain plug	17	150	-


6. Clean the exterior of the transmission around the fluid filter assembly.
7. Loosen the assembly nut, and rotate the securing tab in the direction shown.



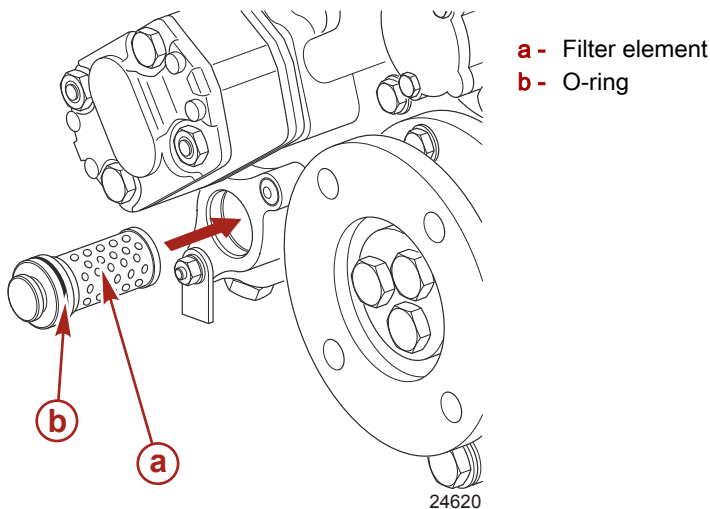
8. Remove the filter element.



9. Clean the filter element with a mild cleaning solvent, obtained locally.
 10. Lubricate the O-rings with SAE Engine Oil 30W.

Tube Ref No.	Description	Where Used	Part No.
 80	SAE Engine Oil 30W	Transmission filter element O-ring	Obtain Locally

11. Reinstall the filter element.

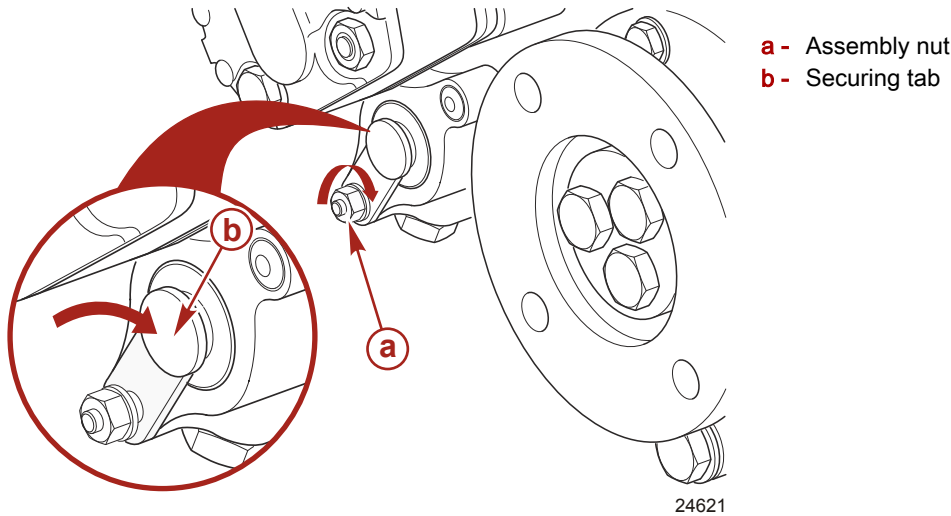


NOTICE

Improper installation of the transmission fluid filter assembly may cause the fluid to foam or leak out, resulting in decreased efficiency and damage to the transmission. Properly seat the transmission fluid filter during installation.

12. Replace the securing tab over the filter assembly by turning it clockwise.

13. Tighten the assembly nut to the specified torque.



Description	Nm	lb-in.	lb-ft
Assembly nut	5-8	48-72	-

14. Fill the transmission to the proper level with the specified fluid. See **Add Fluid**.

Engine Coolant

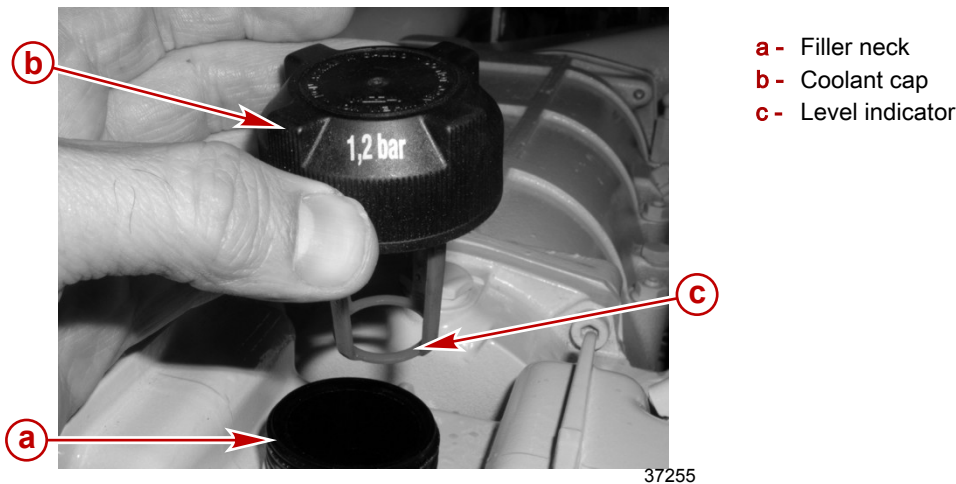
⚠ CAUTION

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.



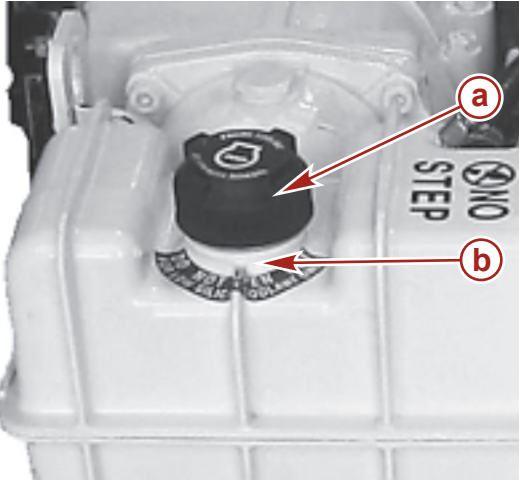
4. If the coolant level is low:
 - a. Inspect the coolant recovery system for leaks.
 - b. Inspect the gasket in the pressure cap for damage and replace if necessary.
 - c. The pressure cap maintains pressure on the cooling system and may not be holding pressure properly. To have the cap tested, contact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

IMPORTANT: Tighten the pressure cap to prevent coolant loss.

- If the coolant level is correct, install the pressure cap and tighten.

Filling

- Allow the engine to cool.
- Remove the pressure cap from the coolant expansion tank.
- 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	877770K1

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

- 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

- Remove the retaining nut from the air filter cover.
- Remove the air filter cover.

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

3. 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

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

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.

1. Install the air filter cartridge onto the air filter bracket.
2. Install the air filter cover and retaining nut.
3. Torque the retaining nut.

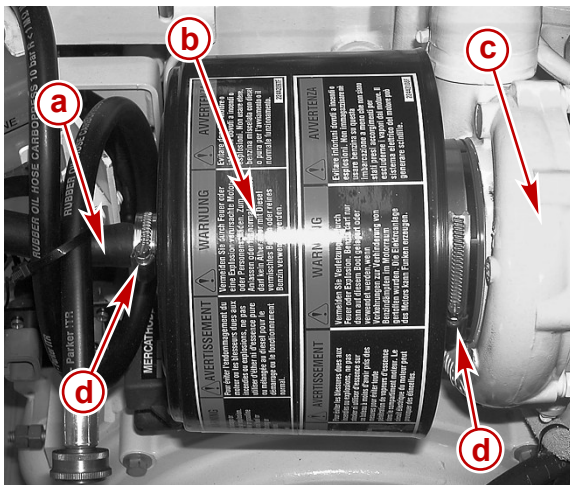
Description	Nm	lb-in.	lb-ft
Air filter cover retaining nut	10.8	95	-

4.2 Air Filter

Removal

1. Loosen the clamp and remove the oil separator vent hose.

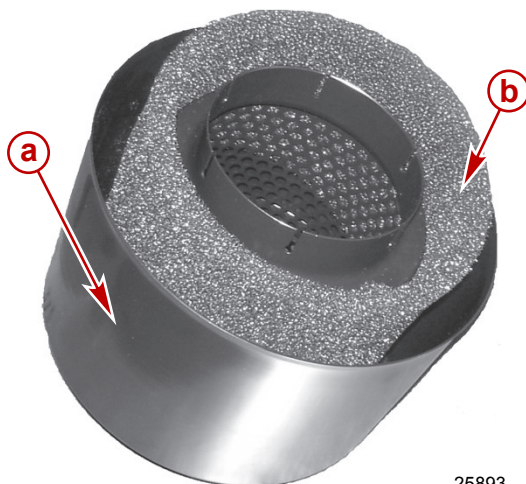
- Loosen the clamp and remove the air filter housing from the turbocharger inlet.



25881

- a - Oil separator vent hose
- b - Air filter housing
- c - Turbocharger
- d - Clamp

- Remove the air filter element from the air filter housing



25893

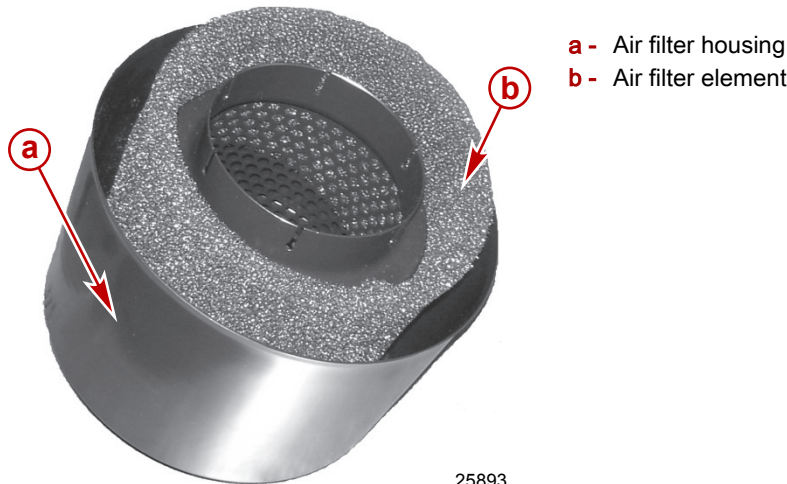
- a - Air filter housing
- b - Air filter element

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

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



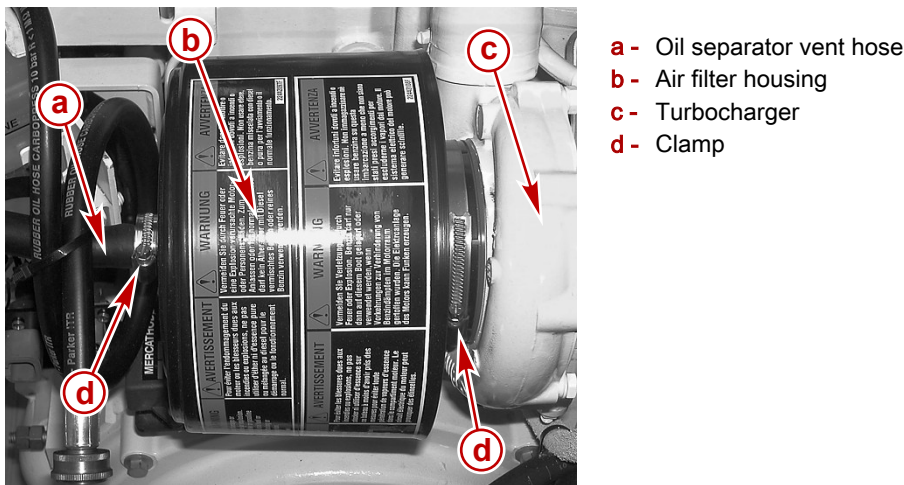
25893

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

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

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

- 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 fault code may be displayed on a system viewer.
- The audio warning system may sound.

See **Features and Controls**.

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.

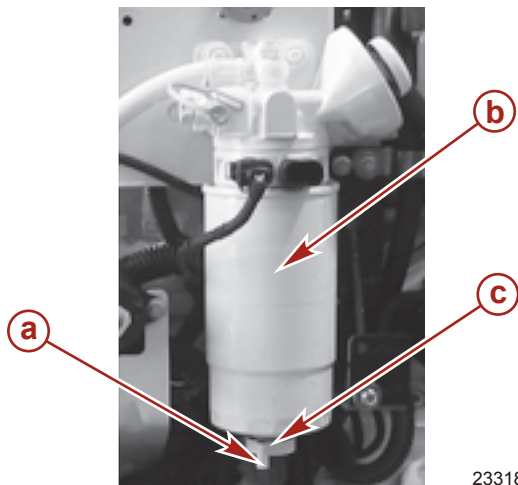
Draining

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.



Typical water-separating fuel filter

- a** - WIF sensor wire connection
- b** - Filter
- c** - 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.

Section 4 - Maintenance

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



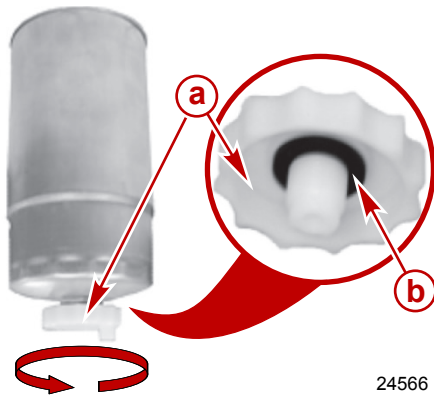
23459

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.



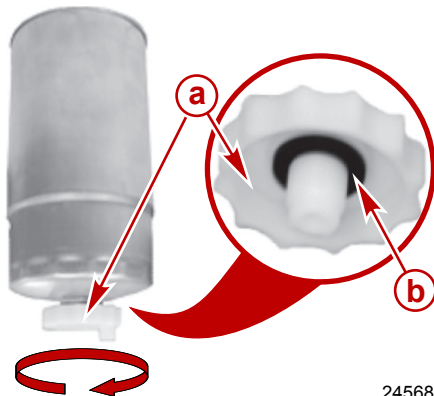
24566

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.



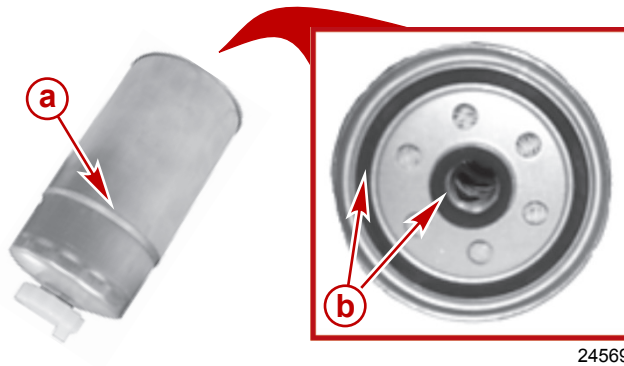
24568

Typical


a - Drain cap

b - O-ring seal

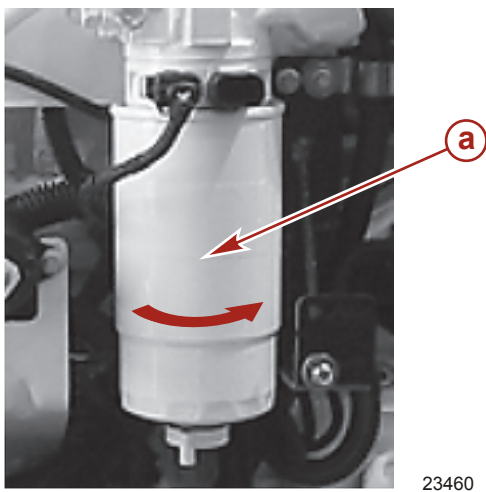
7. Lubricate the fuel filter seals with SAE engine oil 30W.



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



- Typical**
a - Water-separating fuel filter

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 the filter installation. If leaks continue, stop the engine immediately and contact your Mercury Diesel authorized repair facility.

Filling

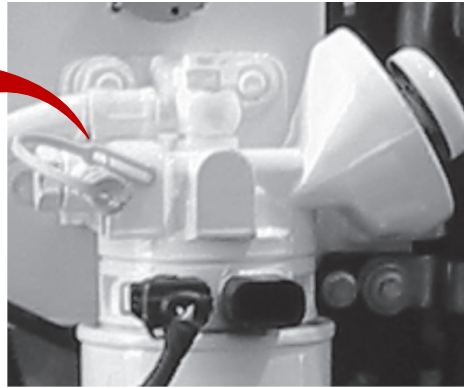
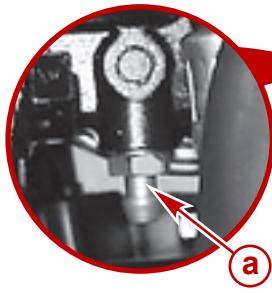
A type of hand pump and primer plunger is located on the fuel filter bracket and is used to

- 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.

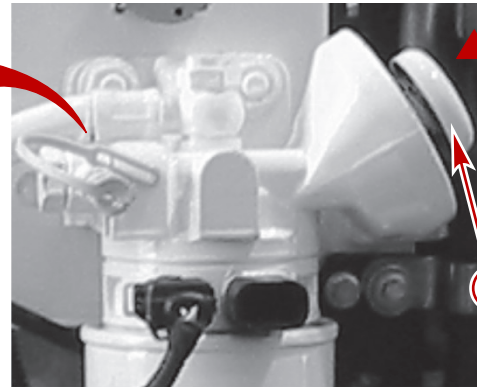
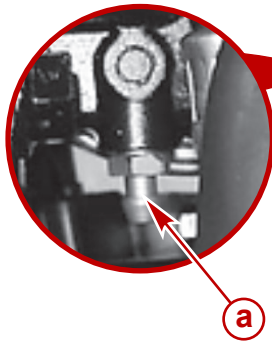
1. Loosen the air vent (bleed) screw on the fuel filter bracket.



Typical
a - Air vent screw

23469

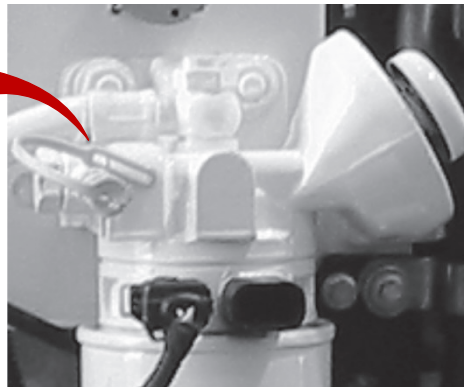
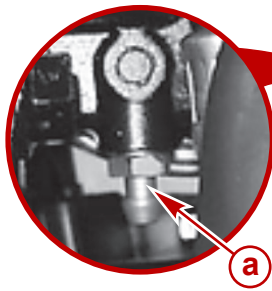
2. Move the primer plunger up and down repeatedly. The filter is full when an air-free stream of fuel flows from the air vent screw.



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.

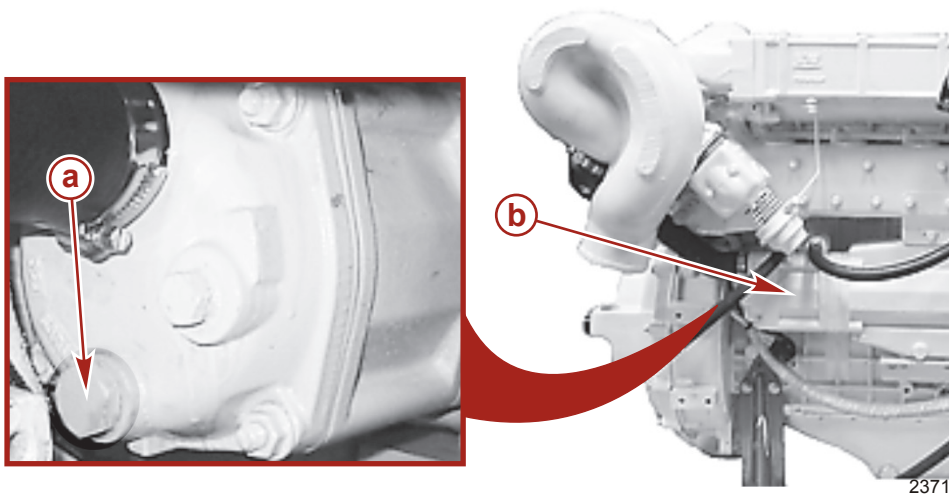
IMPORTANT: The boat must not be operating during this procedure.

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

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.



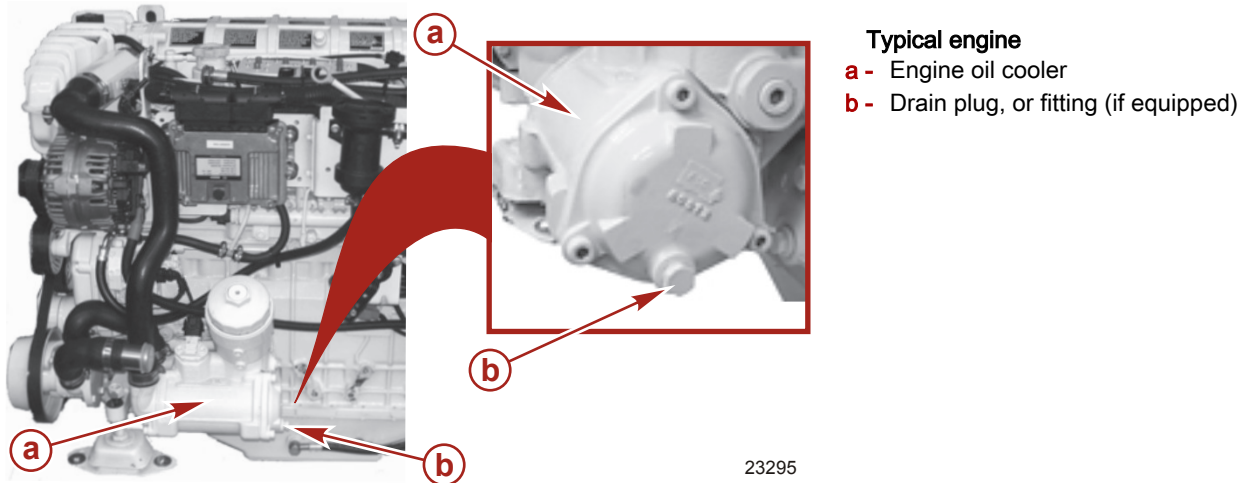
Typical engine

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

23710

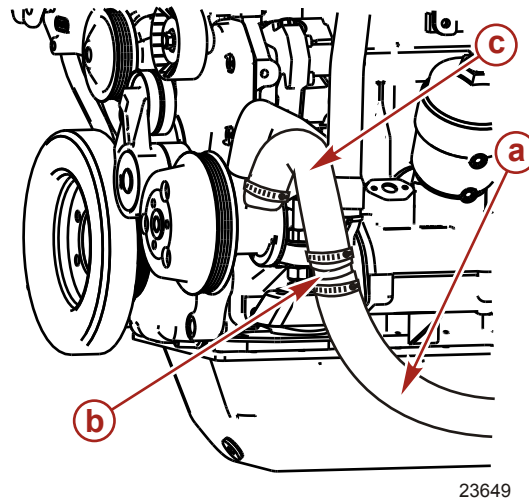
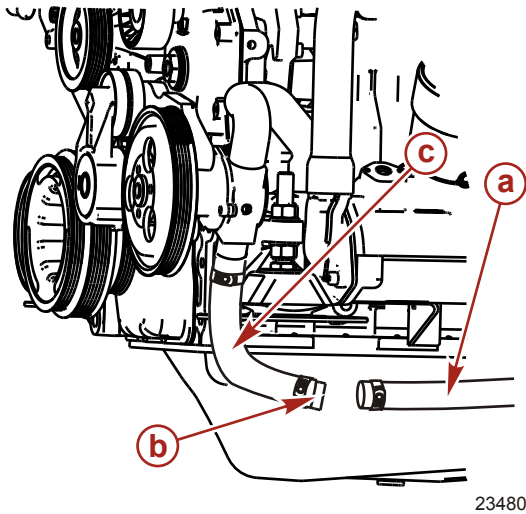
Section 4 - Maintenance

- 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.

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



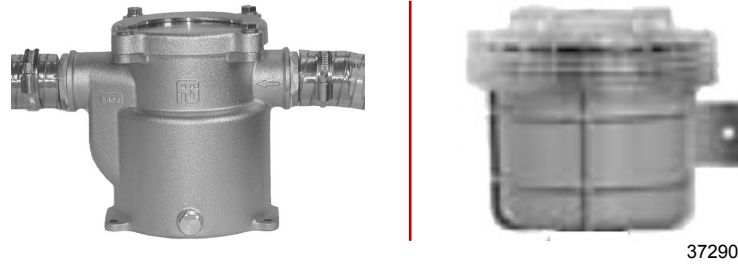
2.8

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

4.2


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

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



Typical seawater strainers

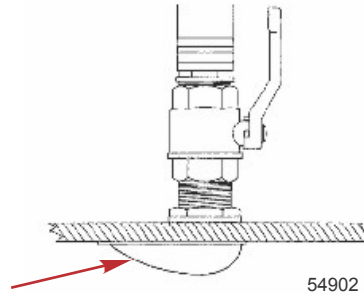
9. After the seawater has completely drained, apply sealant to the threads of the drain plugs or fittings (if equipped). Install and tighten the drain plugs or fittings.

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.

Checking the Seawater Pickups

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



Typical through-the-hull seawater pickup

Cleaning the Seawater Strainer, if Equipped

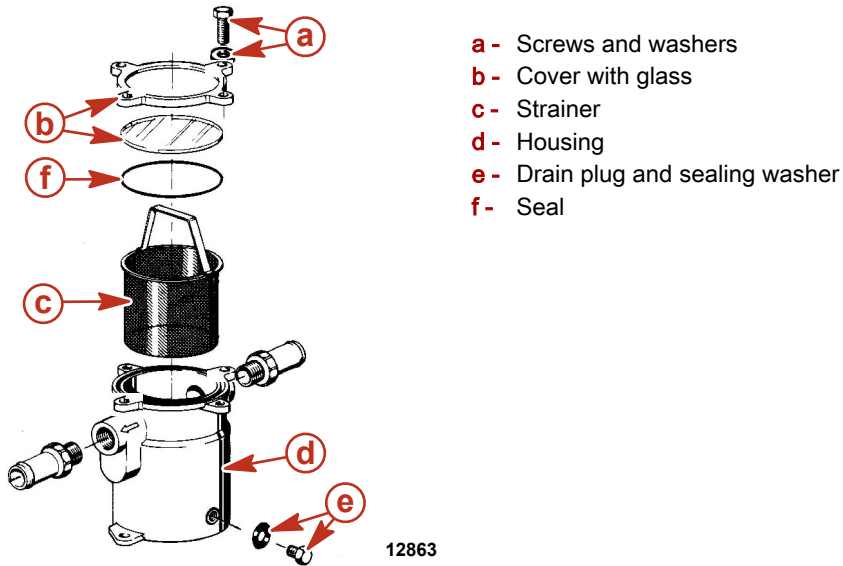
NOTICE

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.

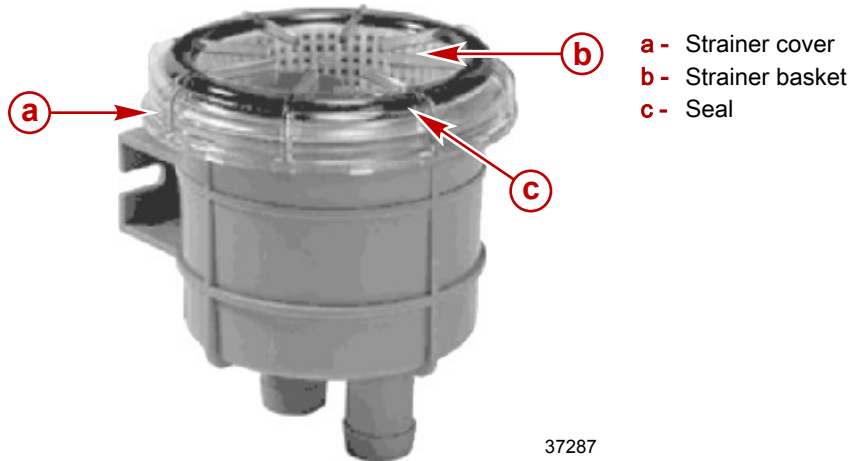
Section 4 - Maintenance

- e. Inspect the cover gasket and replace if damaged.



3. For plastic seawater strainers:

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



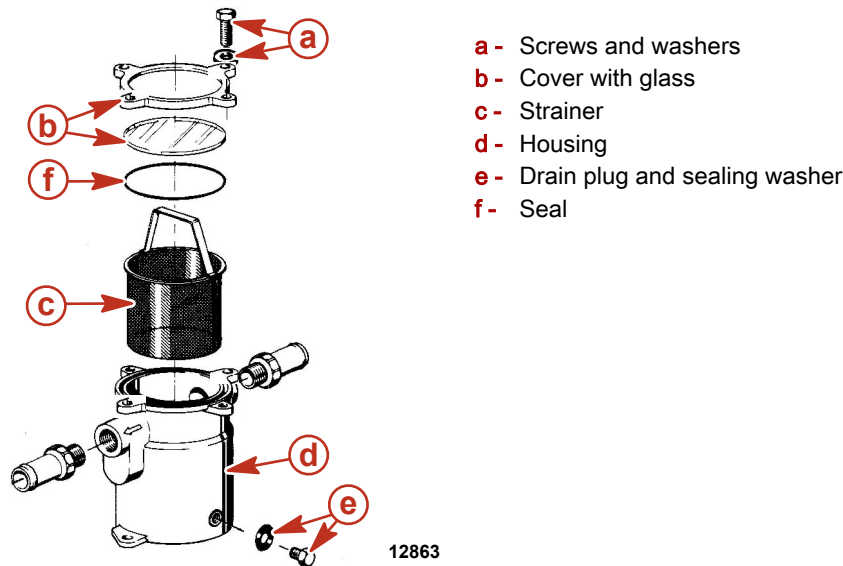
▲ CAUTION

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.

4. For metal seawater strainers:

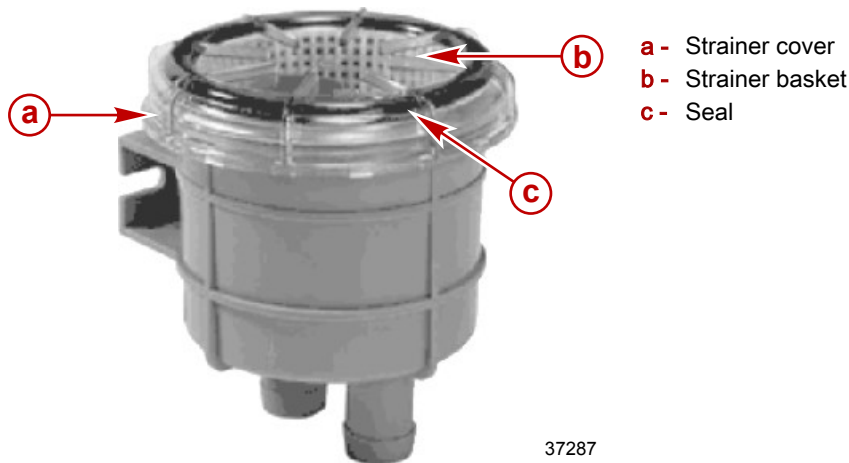
- Install the strainer, drain plug, and sealing washer.
- Install the strainer basket.
- Assemble the cover.

- d. Tighten the cover screws. Do not overtighten.



5. For plastic seawater strainers:

- a. Insert the plastic strainer basket.
- b. Check the cover seal installation.
- c. Screw the strainer cover on.



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

Flushing the Seawater System—Inboard 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

NOTICE

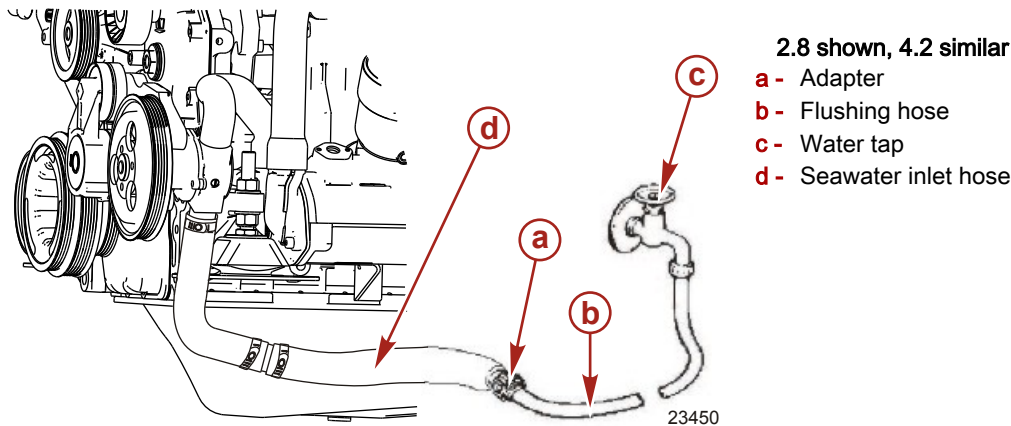
Without sufficient cooling water, the engine, the water pump, and other components will overheat and suffer damage. Provide a sufficient supply of water to the water inlets during operation.

⚠ WARNING

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.

Section 4 - Maintenance

1. Remove the propeller. Refer to the boat manufacturer's instructions.
2. Disconnect the seawater inlet hose from the seawater pickup pump connection.
3. Using an suitable adapter, connect a flushing hose from a water tap to the seawater inlet hose connected to the seawater pump inlet.



4. Partially open the water source to about 1/2 maximum. Do not use full water pressure.
5. Place the remote control in the neutral, idle speed position and start the engine.

NOTICE

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

6. Operate the engine at idle speed in neutral for about 10 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. Reconnect the seawater inlet hose. Tighten the hose clamps securely.

With the Boat in the Water

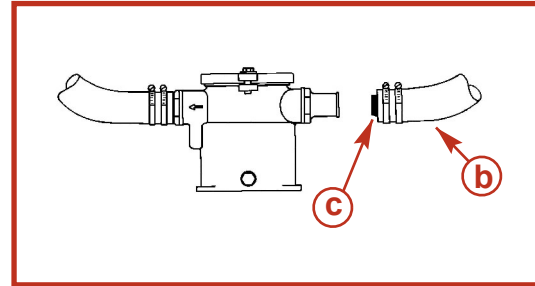
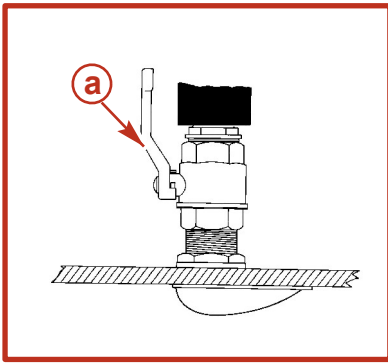
NOTICE

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.

NOTICE

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

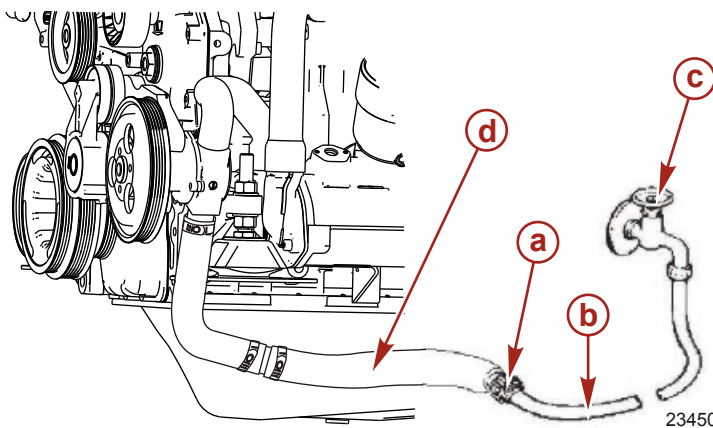
1. Close the seacock (if equipped) or disconnect and plug the seawater inlet hose.



13171

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

2. Using a suitable 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. Partially open the water source to about 1/2 maximum. Do not use full water pressure.
4. Place the remote control in the neutral, idle speed position and start the engine.

NOTICE

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

5. Operate the engine at idle speed in neutral for about 10 minutes, or until the discharge water is clear.
6. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
7. Stop the engine.
8. Shut off the water tap.
9. Remove the adapter from the seawater pump inlet hose connection.
10. To prevent water from siphoning into the boat or engine, do not open the seacock or reconnect the water inlet hose at this time.
11. 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.

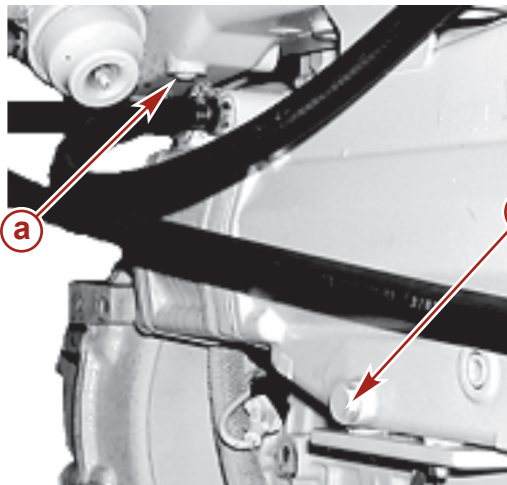
▲ CAUTION

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.

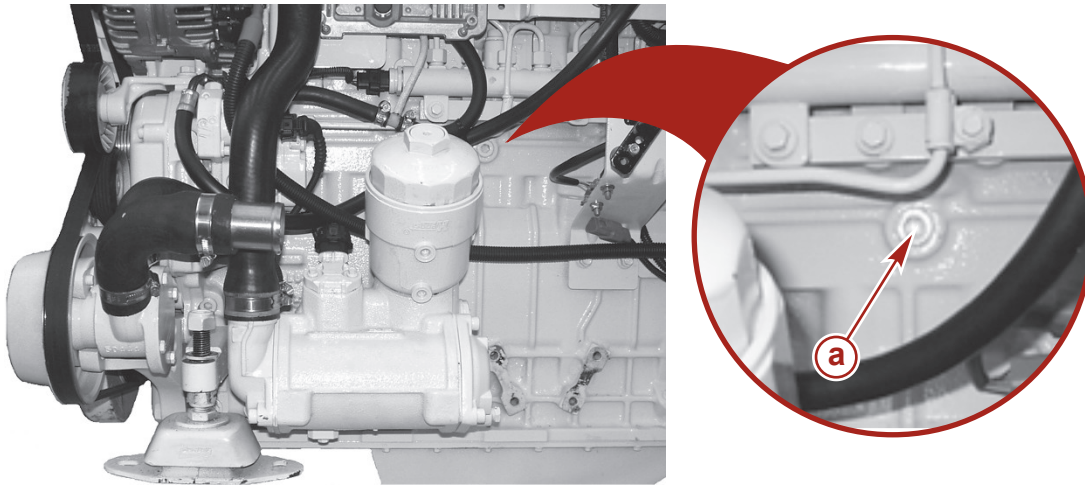
3. Remove the intake and exhaust manifold drain plug.
4. Remove the heat exchanger drain plug.



4.2L shown, 2.8L similar

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

- Open the engine block drain plug.



24552

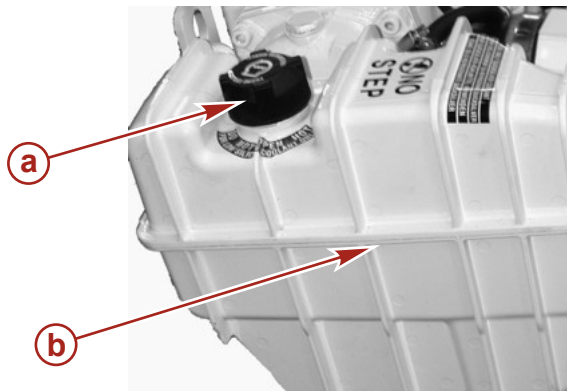
4.2L shown, 2.8L similar

a - Engine block drain plug

- 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.
- If required, clean the closed-cooling system. See your local Mercury Diesel authorized repair facility.
- Fill the system with the specified coolant. Refer to **Filling the Closed-Cooling System**.

Filling the Closed-Cooling System

- 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	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.

Section 4 - Maintenance

5. Install the pressure cap after the engine has reached normal operating temperature (with the thermostat fully open) and the coolant level remains constant.
6. 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.
7. After the first operation, allow the engine to cool.
8. 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

9. 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

This 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. It also contains a second sacrificial anode assembly on the stern end of the fluid cooler.

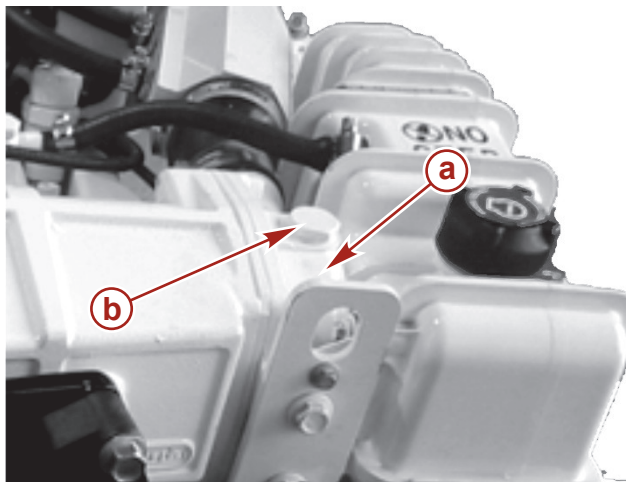
Removal

1. 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.

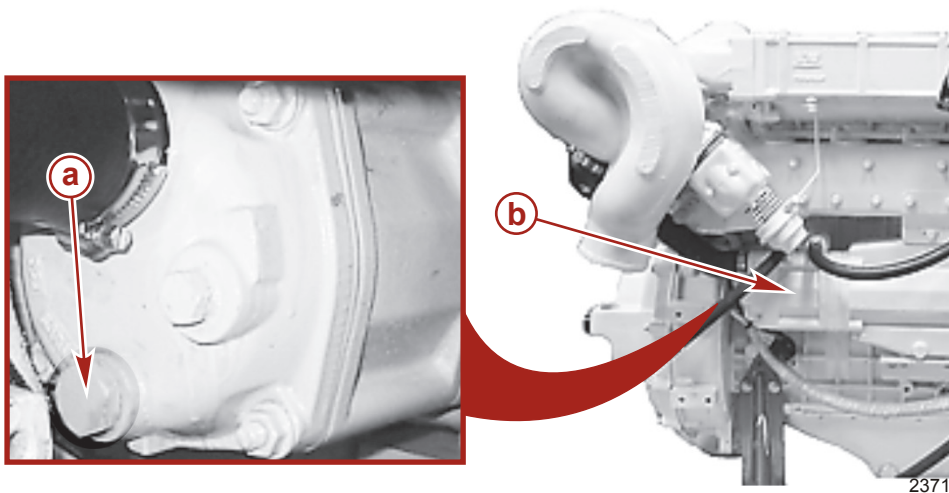
2. With the engine off, close the seacock, if equipped, or remove and plug the seawater inlet hose.
3. Drain the seawater system. See **Draining the Seawater System**.
4. Remove the anode assembly (anode plug and the sacrificial anode) from the top of the aftercooler end cover.



- a - Aftercooler end cover
- b - Anode assembly

23266

- Remove the anode assembly (anode plug and the sacrificial anode) from the aft end of the fluid cooler.



Typical engine
a - Anode assembly
b - Fluid cooler

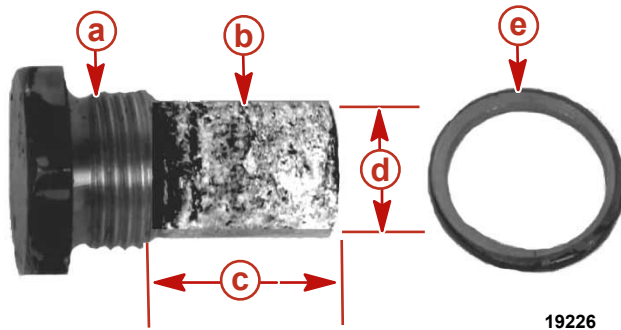
Cleaning and Inspection

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.

- Remove the deposits.
- 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.



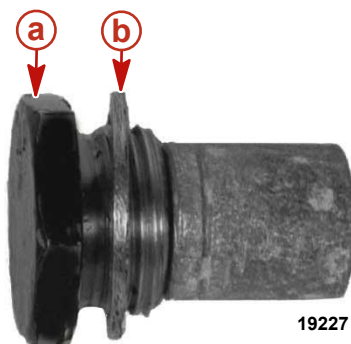
Anode assembly
a - Anode plug
b - Sacrificial anode
c - Length
d - Diameter
e - Sealing washer

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

- Discard the sealing washer.

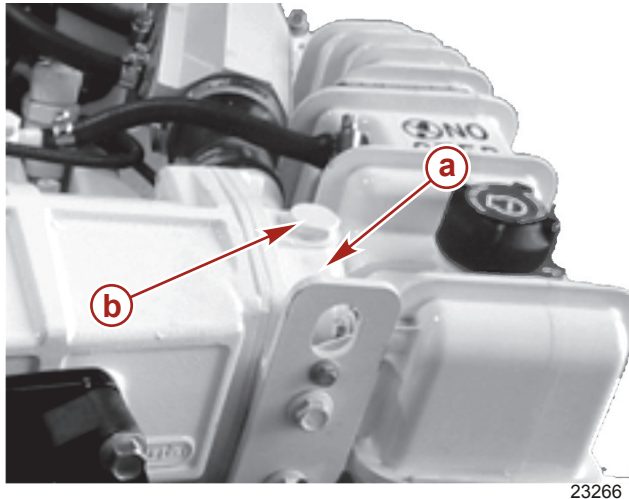
Installation

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



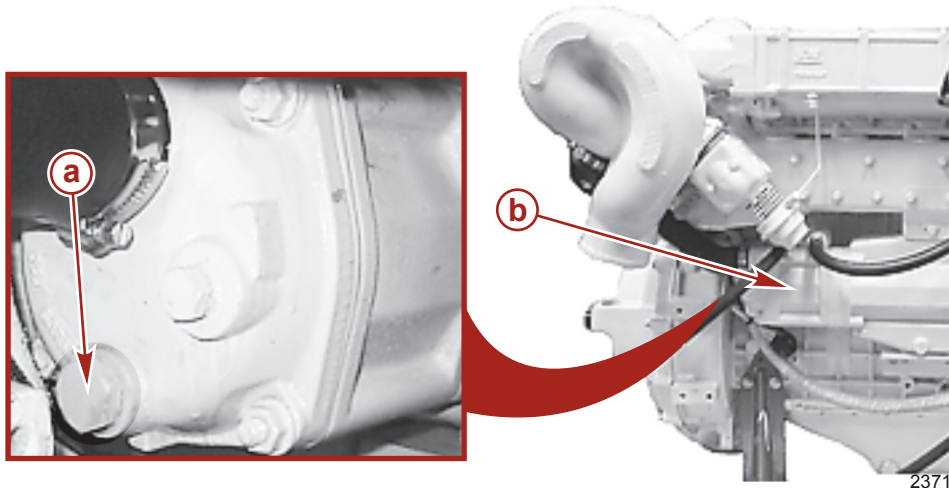
a - Anode assembly
b - Sealing washer

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



- a - Aftercooler end cover
- b - Anode assembly

3. Install the anode assembly and washer into the aft end of the fluid cooler. Tighten securely.



- Typical engine
- a - Anode assembly
- b - Fluid cooler

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

Antifouling Paint

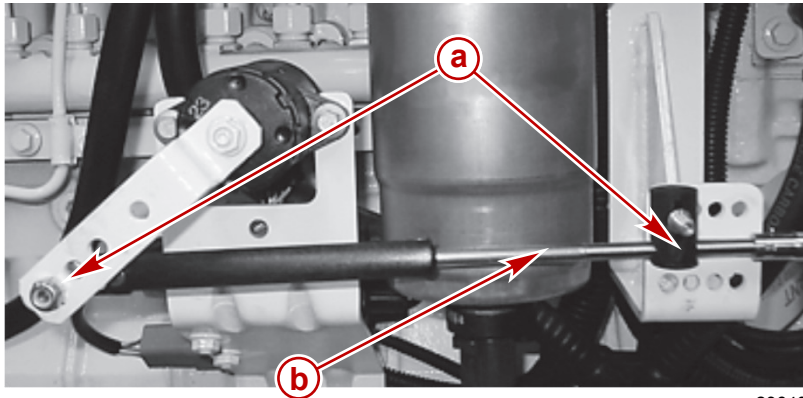
IMPORTANT: Corrosion damage that results from the improper application of antifouling paint is not covered by the limited warranty.

In some areas it may be advisable to paint the bottom of the boat to help prevent marine growth. Contact a Mercury Diesel authorized repair facility for recommendations for your boat.

Lubrication


Throttle Cable

Lubricate the pivot points and guide contact surfaces.



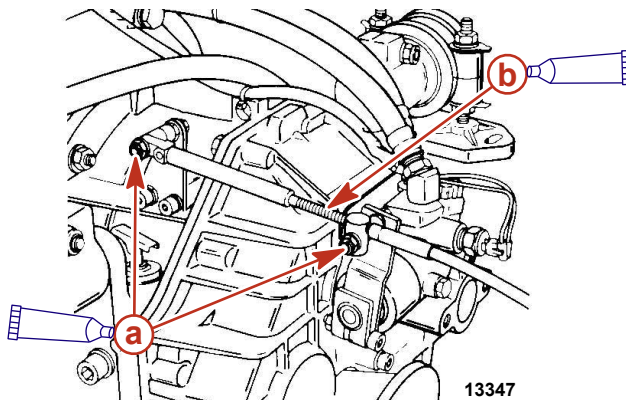
- a** - Pivot points
- b** - Guide contact surfaces

23643

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


Shift Cable

Lubricate the pivot points and guide contact surfaces.



- Typical inboard model shift cable and transmission linkage
- a** - Pivot points
 - b** - Guide contact surface

13347

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

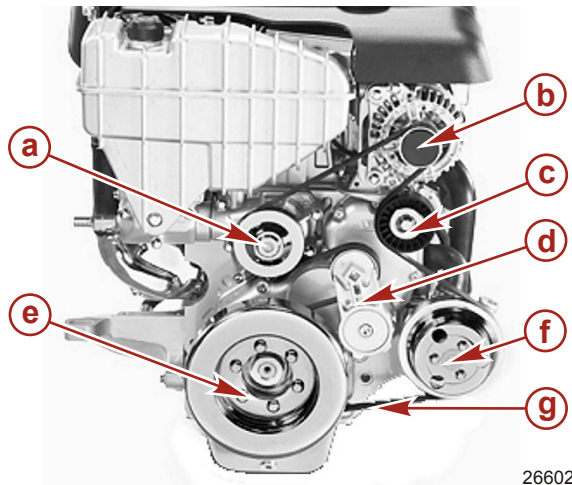
Drive Belts

Drive Belt

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.



4.2L inboard shown, 2.8L similar

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

26602

Serpentine Belt

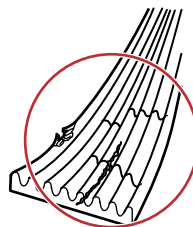
Inspection

1. 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.

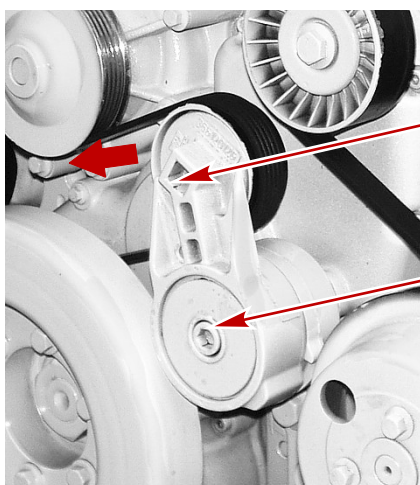
- Fraying
- Glazed surfaces



21062

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

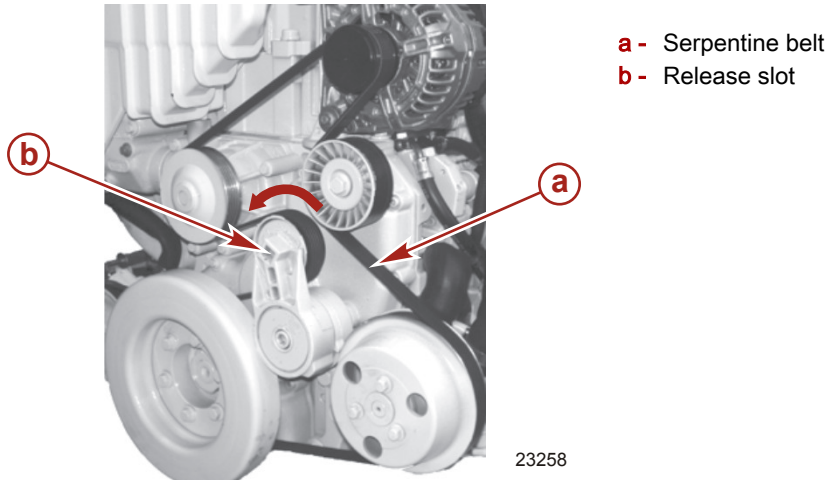
23256

- 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.



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.

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) and Vessel Integration Panel (VIP). The ECM and VIP require 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 drop below the ECM or VIP minimum voltage requirements. The alternator on the second engine may also start charging, causing 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. Intermittent or temporary VIP shutdown can cause a loss of instrumentation, engine misfire and can adversely effect power package performance and boat safety.

Batteries. Boats with multiengine electronic control power packages require each engine be connected to its own battery, ensuring that the engine's 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 the **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 5 - Storage

Table of Contents

Cold Weather (Freezing Temperature), Seasonal Storage, and Extended Storage.....	70	Seasonal Storage.....	71
Cold Weather (Freezing Temperature) Storage.....	70	Extended Storage Instructions.....	72
Preparing Your Power Package for Seasonal or Extended Storage.....	70	Battery.....	72
		Recommissioning.....	72

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

IMPORTANT: Mercury Marine strongly recommends that this service be performed by a Mercury Diesel authorized repair facility. 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 reconnect the water inlet hose before starting the engine.

A boat is considered to be 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

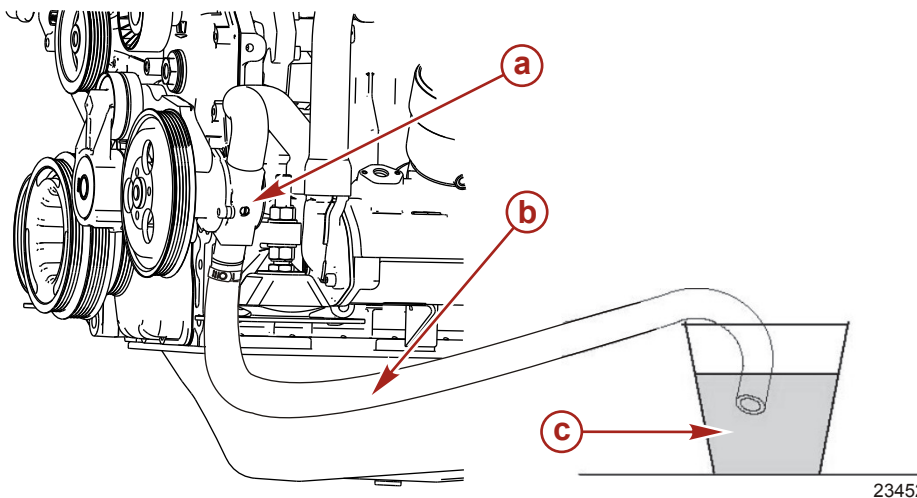
1. Read all precautions and perform all procedures found in **Preparing Your Power Package for Seasonal or Extended Storage**.
2. Read all precautions and perform all procedures found in **Draining the Seawater System** and drain the seawater section of the cooling system.

NOTICE

Water trapped in the seawater section of the cooling system can cause corrosion or freeze damage. Remove the boat from the water to drain the seawater section of the cooling system immediately after operation or before any length of storage in freezing temperatures.

IMPORTANT: We recommend 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 L (6.0 US qt) 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 required, temporarily connect an appropriate length piece of hose to 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

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

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 any areas required with primer and spray paint. After the paint has dried, coat the engine with the specified corrosion inhibiting oil or equivalent.

Description	Where Used	Part Number
Corrosion Guard	Outside of engine	92-802878-55
Light gray primer		92-802878-52
Mercury Diesel White		8M0108939

Section 5 - Storage

Description	Where Used	Part Number
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**.
10. 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.

Section 6 - Troubleshooting

Table of Contents

Diagnosing Electronically Controlled Fuel System Problems.....	74	Poor Performance.....	74
Troubleshooting Charts.....	74	Incorrect Engine Temperature.....	75
Starter Motor Will Not Crank Engine, or Cranks Slow...	74	Low Engine Oil Pressure.....	75
Engine Will Not Start, or Is Hard to Start.....	74	Battery Will Not Charge.....	75
Engine Runs Rough, Misses, or Backfires.....	74	Remote Control Operates Hard, Binds, Has Excessive Free-play, or Makes Unusual Sounds.....	75

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.
Damaged or improper propeller.	Replace propeller. See a Mercury Diesel authorized repair facility.
Excessive bilge water.	Drain and check for cause of entry.

Possible Cause	Remedy
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 nonessential accessories.
Loose or dirty electrical connections or damaged wiring.	Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connections. Repair or replace damaged wiring.
Alternator drive belt loose or in poor condition.	Replace 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.

Section 6 - Troubleshooting

Possible Cause	Remedy
Improper shift cable adjustment.	Have adjustment checked by a Mercury Diesel authorized repair facility.

Section 7 - Customer Assistance Information

Table of Contents

Owner Service Assistance.....	78	Contact Information for Mercury Marine Customer Service	79
Local Repair Service	78	Customer Service Literature.....	79
Service Away From Home	78	English Language	79
Stolen Power Package	78	Other Languages	80
Attention Required After Submersion	78	Ordering Literature.....	80
Replacement Service Parts	78	United States and Canada	80
Parts and Accessories Inquiries	78	Outside the United States and Canada	80
Resolving a Problem	78		

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 54936-1939

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

When ordering be sure to:

- 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 54936-1939

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 8 - Maintenance Log

Table of Contents

Scheduled Maintenance Log.....	82	Vessel Maintenance Notes.....	83
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Scheduled Maintenance Log

100 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

200 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

300 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

400 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

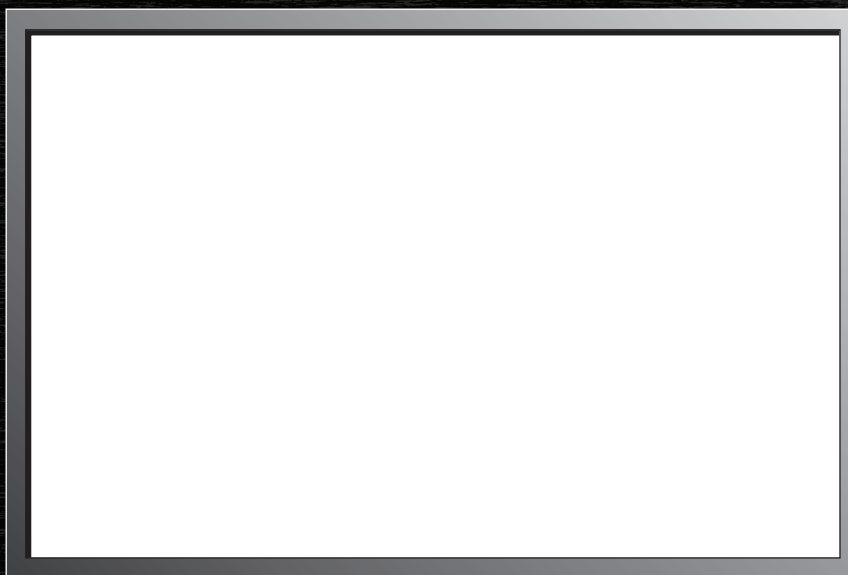
500 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

600 Hours		
Actual Hours		
Service Notes		
Dealer Name	Signature	Date

Vessel Maintenance Notes

Record all general maintenance performed on your power package here. Save all work orders and receipts.

Date	Engine Hours	Maintenance Completed	Servicing Dealer



www.mercurymarine.com.au
41-71 Bessemer Drive
Dandenong South, Victoria 3175 Australia

www.mercurymarine.com
P.O. Box 1939
Fond du Lac, WI 54936-1939 USA

www.brunswick-marine.com
Parc Industriel de Petit-Rechain
B-4800 Verviers, Belgium

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