8M0128973 517 eng

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.

Copyright and Trademark Information

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)		

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Section 1 - Getting to Know Your Power Package

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Adaptive Speed Control (ASC)

This power package utilizes Adaptive Speed Control (ASC) to maintain the engine RPM that is demanded at the remote control, regardless of the load change. As an example of how ASC functions, when the operator steers the boat into a hard turn or is navigating at a slow on-plane speed in following seas when boat control is needed without a lot of speed, the propulsion control module will automatically adjust the engine to maintain the RPM without the operator changing the position of the remote control throttle handle. ASC allows the operator to keep both hands on the steering wheel, which is safer, and the operator can focus on the boating experience.

Additional Operation Instructions for Joystick Piloting Sterndrive (JPS)

Refer to the **JPS Operation Manual** for additional important operation and maintenance instructions if your boat is equipped with JPS.

Identification

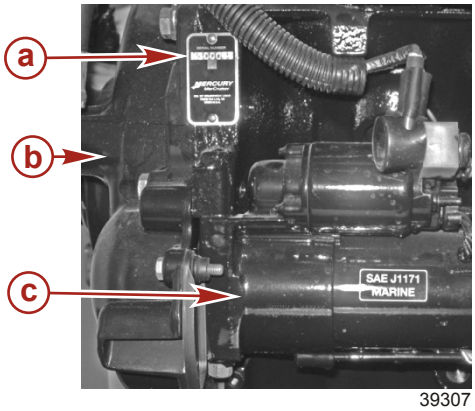
The serial numbers are the manufacturer's keys to numerous engineering details which apply to your MerCruiser power package. When contacting MerCruiser about service, always specify model and serial numbers.

Engine Serial Number

The serial number is located in two places on the engine. One is on the engine specification decal located on the engine cover, and the other is secured to the Starboard side of the engine block near the starter motor.

A quick reference code on the engine cover or heat exchanger can be used to access additional information about the engine and safe boating practices.

a - Quick reference code
b - Engine specification decal



Engine block location
a - Engine serial number plate
b - Flywheel housing
c - Starter motor

Alpha Sterndrive Serial Number

The drive serial number and the drive ratio are located on the port side of the sterndrive.

54406

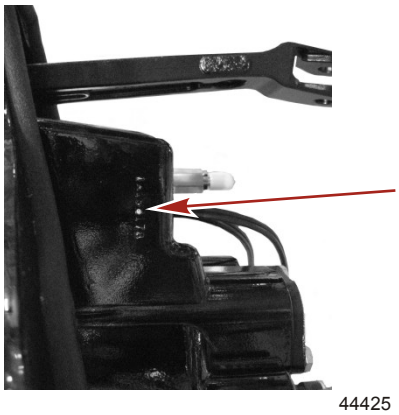
Alpha sterndrive

Alpha Transom Serial Number

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

53651

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

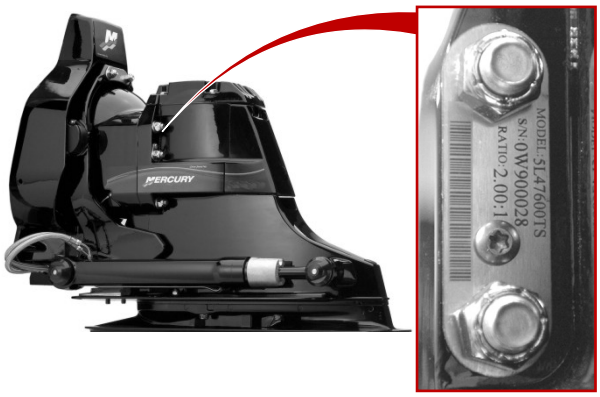


44425

Serial number location on gimbal housing

Bravo Sterndrive Serial Number and Identification

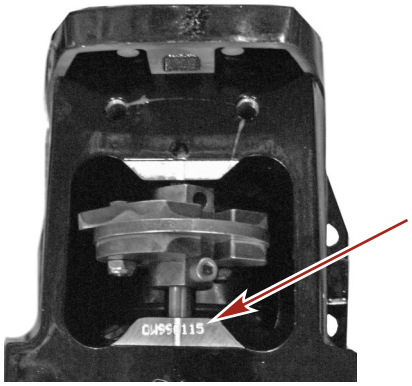
The Bravo sterndrive serial number, gear ratio, model number, and bar code are embedded in the ground plate on the port side of the sterndrive.



33533

Bravo sterndrive information on ground plate

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



44426

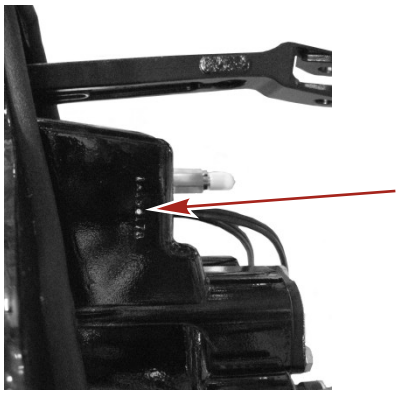
Bravo sterndrive serial number stamping

Bravo Transom Serial Number

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

53651

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



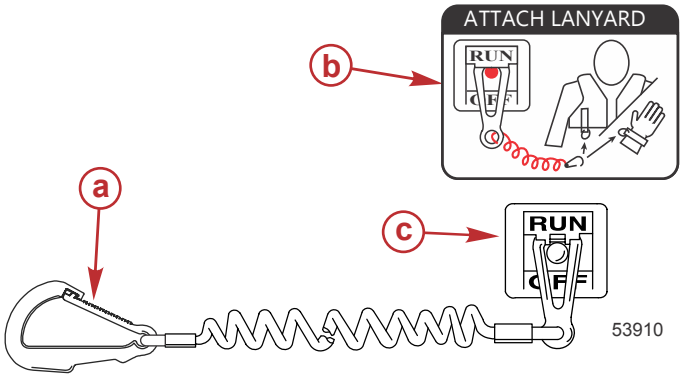
44425

Serial number location on gimbal housing

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.

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.

61325

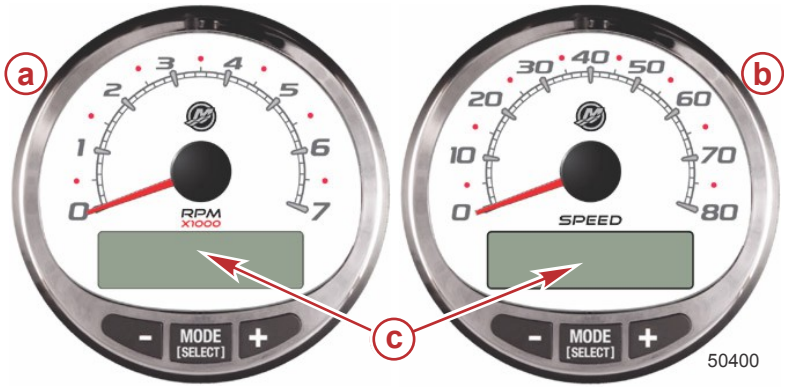
VesselView

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

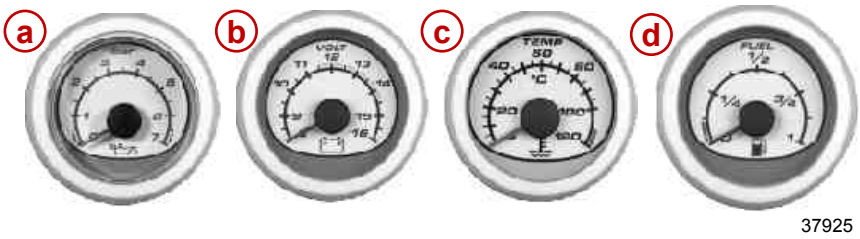
The SmartCraft instrument package also aids in identifying fault codes associated with the engine audio warning system. The SmartCraft instrument package displays critical engine alarm data and other potential problems on its LCD display.

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.



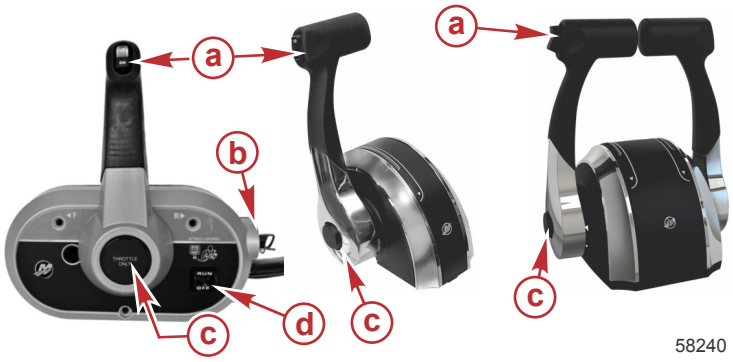
System Link digital gauges

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

Remote Controls (Non-DTS Models)

Remote Control Features—Non-DTS

Your boat may be equipped with one of the Mercury Precision or Quicksilver remote controls shown. If not, consult your dealer for a description of the functions and operations of the remote control.



a - Trim/tilt switch
b - Ignition key switch—OFF, ON, START
c - Throttle only button
d - Lanyard stop switch

- **Trim/tilt switch** - Used to trim the drive during operation or raise the drive for trailering, launching, beaching, or shallow water operation.
- **Throttle only button** - The throttle only button allows throttle advancement without shifting the engine. The throttle only button disengages the shifting mechanism from the control handle. The throttle only button can be pressed and held in only when the remote control handle is in the neutral position. While holding the throttle only button in, move the throttle handle forward to assist in starting the engine.
- **Lanyard stop switch (if equipped)** - The purpose of a lanyard stop switch is to shut down the engine when the operator moves far enough away from the operator's position to activate the switch. A lanyard stop switch can be installed as an accessory, generally on the dashboard or side adjacent to the operator's position.
- **Control handle** - Operation of the shift and throttle is controlled by the movement of the control handle. Push the control handle forward from neutral with a quick firm motion to the first detent for forward gear. Continue pushing forward to increase speed. Pull the control handle back from neutral with a quick firm motion to the first detent for reverse gear. Continue pulling back to increase speed.

  IMPORTANT: Forcing the shift mechanism while the engine is not operating can result in product damage.

Gear Shifting

IMPORTANT: Observe the following:

- **Never shift the drive into gear unless the engine speed is at idle.**
- **Do not shift the drive into reverse when the engine is not running.**
- Your power package has three gear shift positions to provide operation: forward (F), neutral (N), and reverse (R).
- When shifting, always stop at the neutral position and allow the engine speed to return to idle.
- Always shift into gear with a quick motion.
- After shifting into gear, advance the lever further to increase speed.

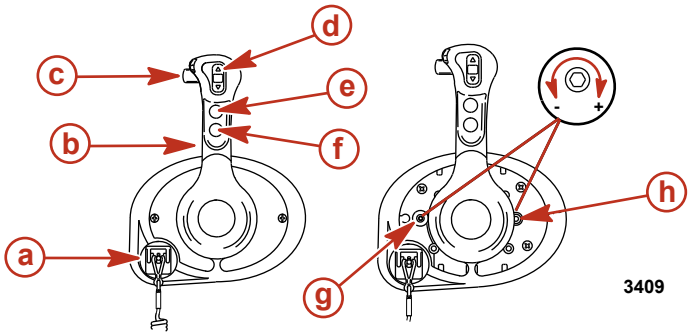
Remote Controls (DTS Models)

Remote Controls

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

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

Panel Mount Features



- **a -** Lanyard stop switch
- **b -** Control handle
- **c -** Shift lock
- **d -** Trim/tilt switch
- **e -** Throttle only button
- **f -** Start/stop button
- **g -** Detent tension adjustment screw
- **h -** Control handle friction adjustment screw

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

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

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

Trim/tilt switch (if equipped) - Refer to **Power Trim**.

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

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

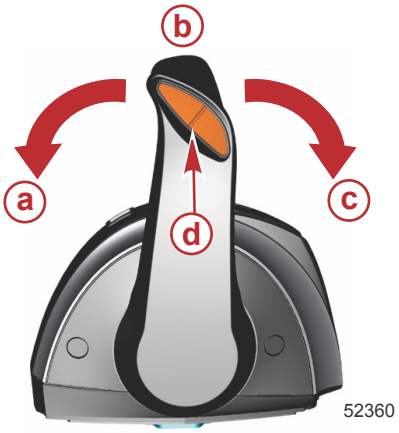
Detent tension adjustment screw - This screw can be adjusted to increase or decrease the effort required to move the control handle out of the detent positions (cover must be removed). Turning the screw clockwise will increase tension.

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

DTS Slim Binnacle Single Handle Console Features and Operation

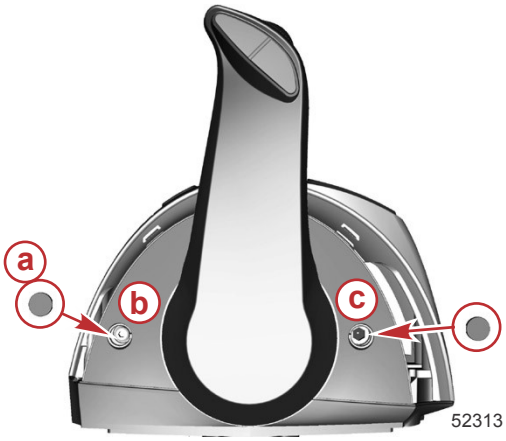
1. Operation of shift and throttle is controlled by the movement of the control handle. Push the control handle forward from neutral to the first detent for forward gear. Continue pushing forward to increase speed. Pull the control handle back from neutral to the first detent for reverse gear. Continue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

2. Trim switch (if equipped) - When the power trim switch is activated on the ERC handle, the DTS command module senses a closed circuit for either up or down trim. The DTS command module formulates a signal and sends it to the PCM. The PCM closes the ground circuit to the up or down trim relay.



a - Forward
b - Neutral
c - Reverse
d - Trim switch

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



a - Caps (2)
b - Detent tension adjustment
c - Control handle tension adjustment

NOTE: *The control handle tension and detent tension screws may require periodic maintenance adjustment.*

Special Digital Throttle and Shift (DTS) Features

The DTS system features several alternate operational modes for the electronic remote control (ERC) levers.

Slim binnacle ERC

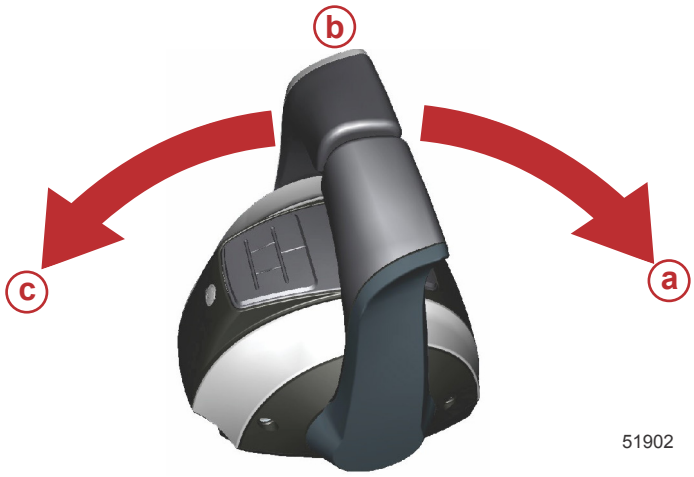
Item	Control	Function
a	Trim control (handle)	Raises and lowers the sterndrive for best efficiency, or for conditions such as shallow water, trailering, etc.
b	Stop/Start	Allows the operator to start or stop the engine without the use of the key switch. The key switch must be in the run position for the start/stop switch to function.
c	Transfer	Allows boat control to be transferred to a different helm.
d	Throttle-only	Allows the boat operator to increase engine RPM for warm-up without shifting the transmission into gear.
e	+	Increases brightness settings for the CAN pad, VesselView, and SmartCraft gauges.
f	–	Decreases brightness settings for the CAN pad, VesselView, and SmartCraft gauges.
g	Dock	Reduces control lever operation throttle capacity to approximately 50% of normal control lever throttle demand.
h	Neutral light	Illuminates when the drive is in the neutral gear position. The lights flash when the engine is in throttle only mode.

Dual-Handle Electronic Remote Control (ERC)—Operation and Adjustment

Operation

The electronic remote control (ERC) handle controls the shift and throttle operation. Push the control handle forward from neutral to the first detent for forward gear. Continue pushing the handle forward to increase speed. Pull the control handle from the forward position to the neutral position to decrease speed and eventually stop. Pull the control handle back from neutral to the first detent for reverse gear. Continue pulling the handle back to increase speed in reverse.

NOTE: *In certain modes, the gear position is determined by the electronic shift control (ESC), not the position of the ERC levers. When using the joystick or while in Skyhook, the computer controls the shifting in and out of gears even though the handles are in neutral.*



a - Forward
b - Neutral
c - Reverse

The amount of force needed to move the handles and to move the handles through the detents is adjustable to help prevent unwanted motion.

Adjustment

NOTE: *The control handle tension and detent tension may require periodic maintenance using the adjustment screws.*

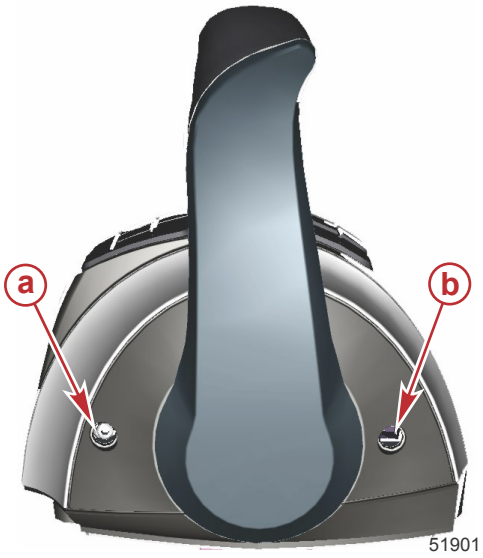
To adjust the handle detent tension:

1. Remove the side cover plugs of the handle that needs adjustment.
2. Turn the adjustment screw clockwise to increase tension on the control handle and counterclockwise to decrease tension.
3. Adjust to the tension desired.

To adjust handle tension:

1. Remove the side cover plugs of the handle that needs adjustment.
2. Turn the adjustment screw clockwise to increase tension on the control handle and counterclockwise to decrease tension.

3. Adjust to the tension desired.



a - Detent tension adjustment screw
b - Handle tension adjustment screw

Special Digital Throttle and Shift (DTS) Features

The DTS system features several alternate operational modes for the electronic remote control (ERC) levers. Any of the listed features can operate simultaneously.

Dual engine ERC

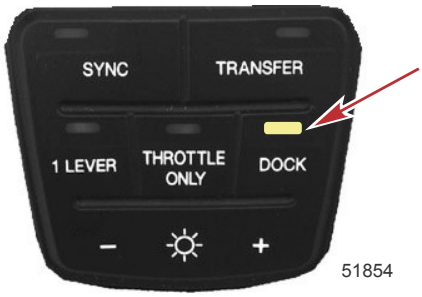
Item	Control	Function
a	Trim control (handle)	Raises and lowers the sterndrives for best efficiency, or for conditions such as shallow water, trailering, etc.
b	Neutral lights	Illuminate when the drive is in the neutral gear position. The lights flash when the engine is in throttle only mode.
c	TRANSFER	Allows boat control to be transferred to a different helm. Refer to **Helm Transfer**.
d	DOCK	Available with joystick operation and the control levers. Joystick operation reduces throttle capacity to approximately 70% of normal joystick throttle demand. Control lever operation reduces throttle capacity to approximately 50% of normal control lever throttle demand.
e	+	Increases brightness settings for the CAN pad, VesselView, and SmartCraft gauges.

Item	Control	Function
f	THROTTLE ONLY	Allows the boat operator to increase engine RPM for warm-up without shifting the transmission into gear.
g	–	Decreases brightness settings for the CAN pad, VesselView, and SmartCraft gauges.
h	1 LEVER	Enables the throttle and shift functions of both engines to be controlled by the port lever.
i	SYNC	Turns off or on the auto-synchronization feature. Refer to **Sync**.

NOTE: *Not all functions may be active.*

Dock

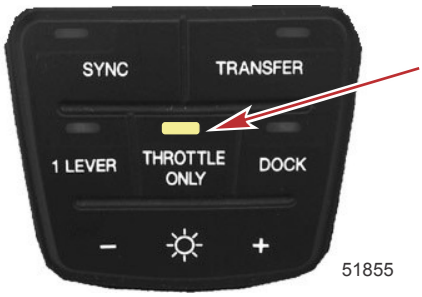
Dock mode is available with joystick operation and remote control lever operation. Dock mode reduces throttle capacity to approximately 70% of normal joystick throttle demand, allowing finer control of engine power in close quarter situations. If more power is needed for vessel maneuvering when environmental conditions require more thrust, use the electronic remote control levers.



DOCK button

Throttle Only

NOTE: *On vessels equipped with a joystick, throttle only mode should be used to disable the joystick if the captain is not in command at the helm. Placing the ERC in throttle only mode will avoid unintended gear engagement. The engines will turn using the steering wheel or the joystick and the RPM of the engines can be increased while in the throttle only mode, but the gear position will remain in neutral.*



THROTTLE ONLY button

To engage throttle only mode:

1. Place both ERC levers in neutral.
2. Press the THROTTLE ONLY button. The button light will turn on and the neutral lights will blink.
3. Place either ERC lever into gear. The warning horn will beep each time the levers are moved in and out of gear while in throttle only, but will remain in neutral.
4. The RPM of the engines can be increased.
5. Throttle only mode also affects the joystick. The engines will move and the RPM can be increased, but will remain in neutral.

NOTE: *Pressing the THROTTLE ONLY button while the ERC levers are not in the neutral position turns the button light off and remains in throttle only mode. You must place the ERC levers into the neutral position to disengage throttle only mode.*

To disengage throttle only mode:

1. Place both ERC levers into neutral. Throttle only will not disengage unless the ERC levers are in neutral.
2. Press the THROTTLE ONLY button. The button light will turn off.

3. The neutral lights stop flashing and remain illuminated. The joystick can now be used.

1 Lever

The joystick piloting system features the ability to command both engines with a single lever on a dual-engine application. This feature simplifies engine management during rough sea conditions by allowing you to use a single lever to command both engines simultaneously. It has no affect on the joystick function. It is not the same as the system feature called Sync.

1 LEVER button

To engage 1 Lever mode:

1. Place both ERC levers in neutral.
2. Press the 1 LEVER button. The button light will turn on.
3. Place the starboard ERC lever into gear.
4. When the handle is moved, the engines RPM and gear position is synchronized.

To disengage 1 Lever mode:

1. Place both ERC levers in neutral.
2. Press the 1 LEVER button. The button light turns off.

Sync

Sync is an automatic engine synchronization feature that is always on unless it is manually turned off. Sync monitors the position of both ERC levers. When both levers are within 10% of one another, the port engine synchronizes to the starboard engine's RPM. The SmartCraft system will automatically disengage sync after 95% of throttle position range to allow each engine the ability to reach maximum available RPM. Sync cannot engage until the engines are at a minimum speed.

The indicator light on the SYNC button is on when both engines are on. The light is yellow at idle and 95% of throttle and when the engines are not synchronized. The light turns red when the engines are synchronized.

SYNC button

The RPM display of VesselView also shows an orange icon under the RPM numbers if the engine's RPMs differ more than 10% of each other, and the icon turns red when they are synchronized.

To disengage sync mode:

1. Place the ERC levers in any detent.
2. Press the SYNC button. The button light turns off.

To engage sync mode, press the SYNC button at any time.

Transfer (Boats Equipped with Dual Helms)

The TRANSFER button allows the boat operator to transfer control of the boat from the active helm to the inactive helm on boats equipped with dual helms. Refer to **Helm Transfer**.

TRANSFER button

Helm Transfer

Some boats are designed to allow control of the vessel from more than one location. These locations are commonly referred to as helms or stations. Helm transfer is a term used to describe the method of transferring control from one helm (or station) to another helm.

⚠ WARNING

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

The helm transfer function allows the boat operator to select which helm is in control of the vessel. Before a transfer can be initiated the ERC levers at the active helm and at the helm intended for the transfer must be in the neutral position.

NOTE: *If you attempt to transfer helm control when the ERC levers are not in neutral, a beep will sound and the helm transfer will not succeed until the levers at the helms are moved to neutral and transfer is requested again.*

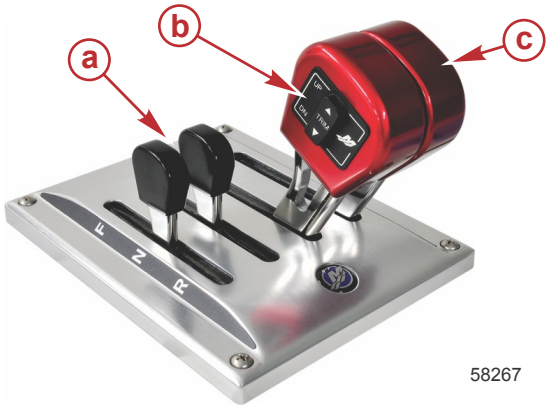
Some fault codes may appear on VesselView if other control or navigation functions are attempted after the helm transfer procedure is started. To remove the fault codes it may be necessary to cycle the key switch off and on, and then restart the helm transfer procedure. Ensure that other control and navigation inputs are performed after helm transfer is complete to avoid setting fault codes.

NOTICE

The ERC levers must be in neutral to perform a helm transfer. While in neutral your vessel could drift and collide with objects nearby resulting in damage. Keep an adequate look out while performing the helm transfer.

To avoid damage, use extra care when attempting a helm transfer while the vessel is close to docks, piers, or other fixed items or when near other vessels.

Zero Effort Features



- **a -** Shift levers in neutral position
- **b -** Trim switch
- **c -** Throttle levers at the idle position

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

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

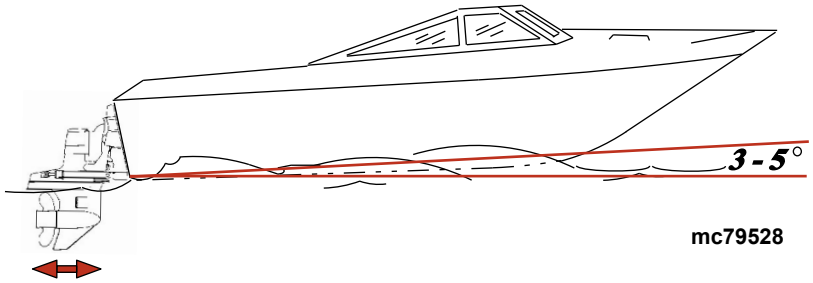
Trim/tilt switch - Refer to **Power Trim**.

Power Trim

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

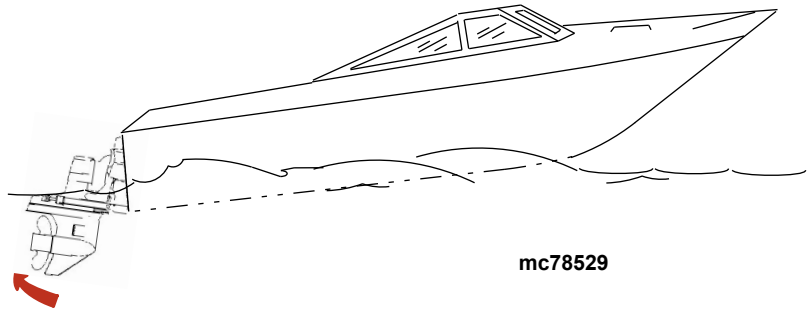
⚠ WARNING
Excessive trim can cause serious injury or death at high speeds. Use caution when trimming the sterndrive, and never trim out beyond the gimbal ring support flanges while the boat is underway or at engine speeds above 1200 RPM.

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



Trimming sterndrive unit up/out can:

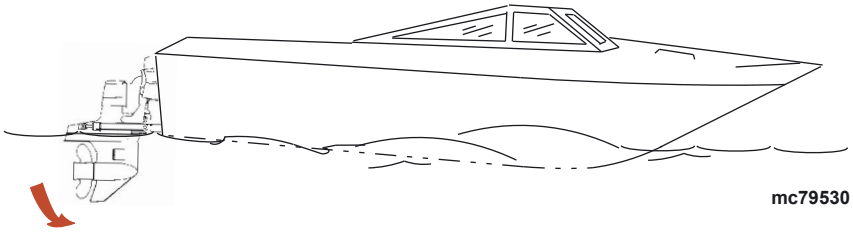
- Generally increase top speed
- Increase clearance over submerged objects or a shallow bottom
- Cause boat to accelerate and plane off slower
- In excess, cause boat porpoising (bouncing) or propeller ventilation
- Cause engine overheating if trimmed up/out to a point where any cooling water intake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



Trimming sterndrive unit down/in can:

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

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



Single Engine Trim/Trailer

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

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

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

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

Dual Engine Trim/Trailer

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

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

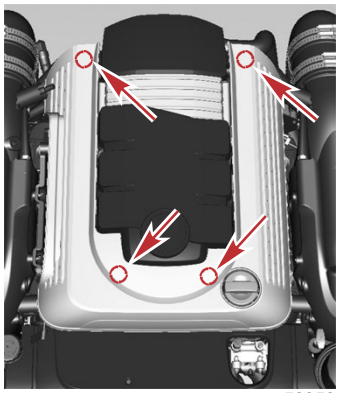
Some controls also have a trailer button that trims the sterndrives to a position suitable for trailer purposes only.

Electrical System Overload Protection

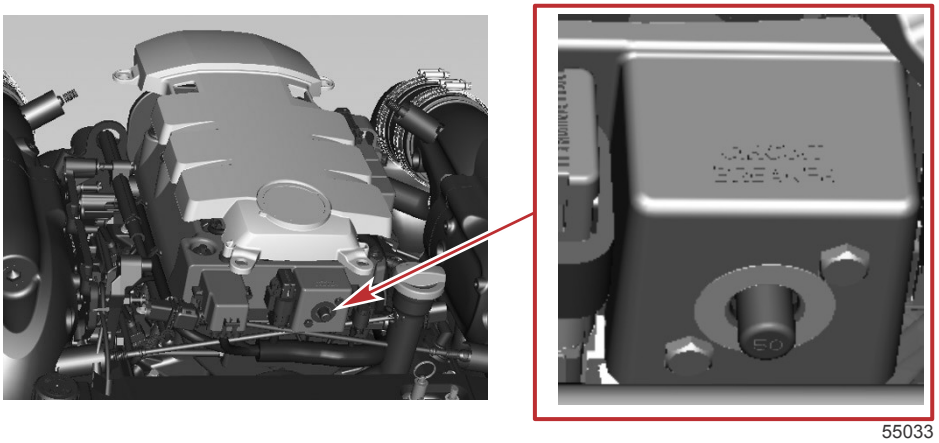
If an electrical system overload occurs, a fuse will fail or the circuit breaker will open. The cause must be found and corrected before replacing the fuse or resetting the circuit breaker.

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

To access the circuit breaker and fuses, remove the outside engine cover. Pull the outside engine cover up to remove it from the four rubber mount grommets.

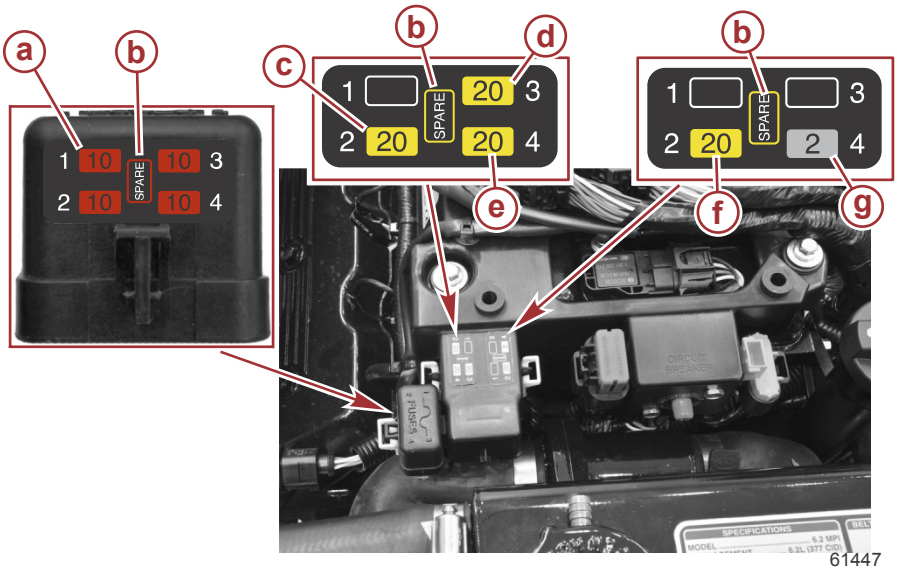


The circuit breaker provides protection for the engine wiring harness and the instrumentation power lead.



55033

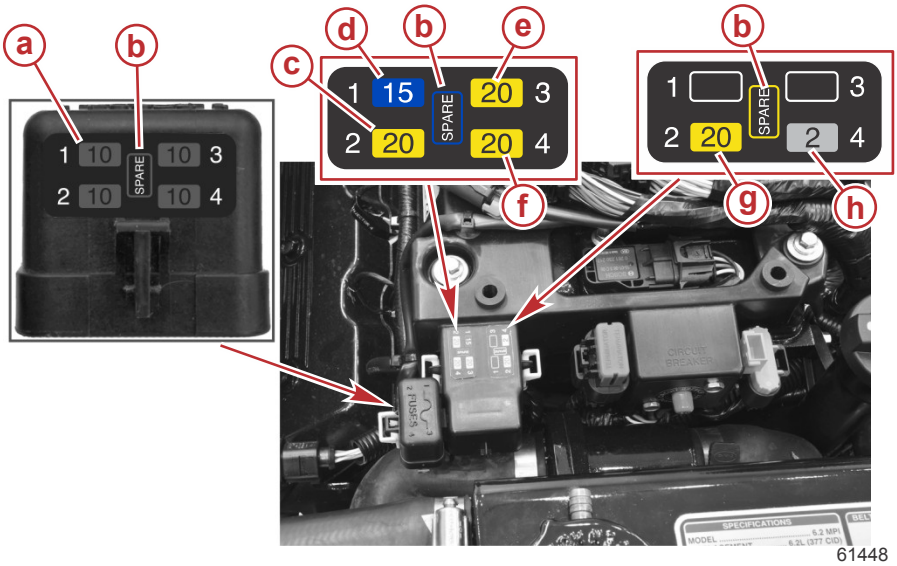
All of the engine protection fuses are located at the front of the engine. To access the fuses, disengage the fuse holders from the electrical plate assembly.



61447

Mechanical engine, freshwater cooled shown, others similar

- **a -** Oxygen sensor fuses (4)
- **b -** Spare fuse
- **c -** Engine and trim relays
- **d -** Fuel injectors
- **e -** Alternator and fuel pump relay
- **f -** Ignition coils
- **g -** Malfunction indicator lamp (MIL)

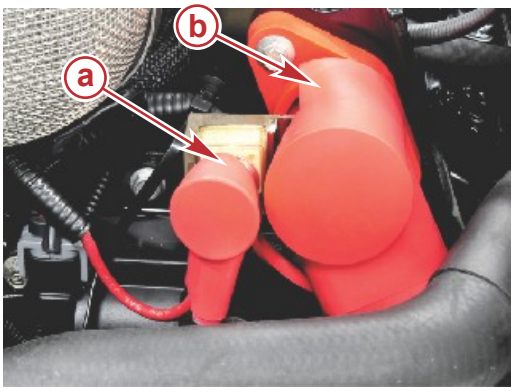


61448

DTS engine, freshwater cooled shown, others similar

- **a -** Oxygen sensor fuses (4)
- **b -** Spare fuse
- **c -** Engine and trim relays
- **d -** DTS helm power
- **e -** Fuel injectors
- **f -** Alternator and fuel pump relay
- **g -** Ignition coils
- **h -** Malfunction indicator lamp (MIL)

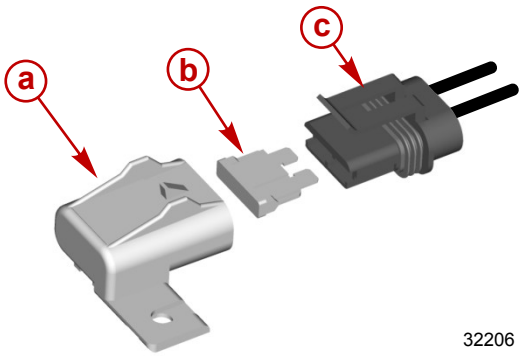
A 90-amp fuse located near the flame arrestor, protects the engine power harness if an electrical overload occurs. The fuse is translucent so it can be inspected if the fuse has failed and is open.



56871

a - 90-amp fuse
b - Hot stud

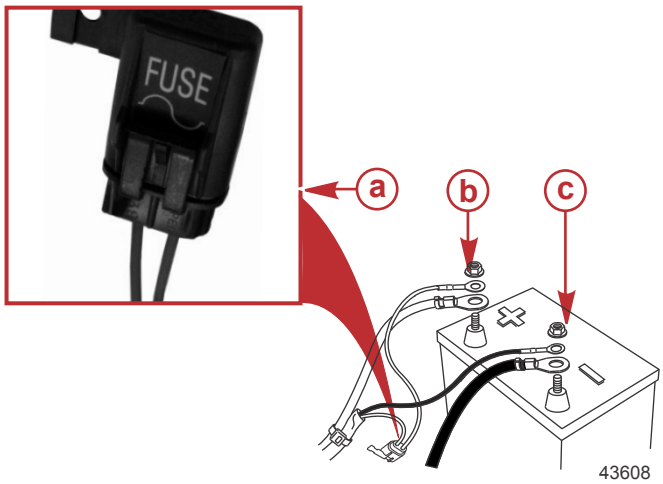
A 15-amp fuse located at the aft end of the engine, protects the accessory circuits.



32206

a - Cover
b - 15-amp fuse
c - Accessory harness

This power package uses a clean power harness that is connected to the engine starting battery. This clean power harness minimizes an excessive voltage drop to the engine and drive digital control electrical system. This harness is protected by a 5-amp fuse and is located near the engine starting battery.



43608

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

Visual and Audio Warning Systems

Service Engine Light and OBD-M MIL Kit

Boats powered by emissions control technology (ECT) catalyzed engines must be equipped with a SmartCraft-enabled gauge capable of displaying the service engine icon, or a dash-mounted service engine light. Malfunction indicator lamp (MIL) kits containing a dash-mounted service engine light and a special harness that connects to the engine harness may be purchased separately.

The service engine icon or MIL will provide a visual indication of a malfunction with the engine's emission control system and will remain illuminated while the OBD-M fault is active.

SC 1000 gauge and service engine light

Testing the OBD-M Malfunction Indicator Lamp (MIL)

1. Turn the ignition switch to the on position without cranking the engine.
2. The service engine icon and MIL will remain illuminated for four seconds if the visual indication system is functioning correctly.

Audio Warning System

IMPORTANT: The audio warning system alerts the operator that a problem has occurred. It does not protect the engine from damage.

Most faults cause the warning horn circuit to activate. How the warning horn activates depends on the severity of the problem.

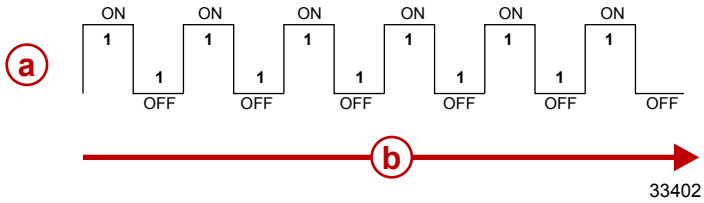
There are two warning horn states:

- Caution
- Critical

There is also an alarm that sounds if the helm has not been properly configured using the G3 service tool.

Caution

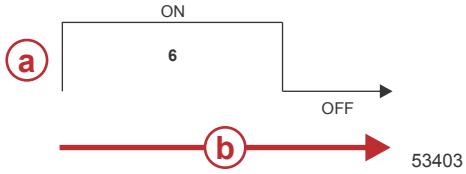
If a caution state is detected, the audio warning system will sound for six one-second intervals.



a - Horn (on or off)
b - Time (in seconds)

Critical

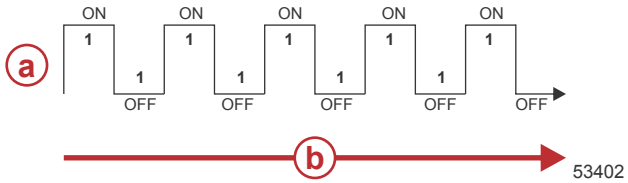
If a critical state is detected, the audio warning system sounds for six seconds and then turns off.



a - Horn (on or off)
b - Time (in seconds)

Nonconfigured Alarm–DTS Only

If the helm has not been properly configured using the G3 service tool, the audio warning system will sound for five one-second intervals.



a - Horn (on or off)
b - Time (in seconds)

Testing the Audio Warning System

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

Guardian Strategy

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

- Oil pressure
- Engine overspeed
- Exhaust manifold temperature

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

The PCM stores the fault for diagnostics. For example, if the water inlet becomes partially blocked, Engine Guardian reduces the available power level of the engine to help prevent damage from decreased water flow to the engine. If the debris passes through, and full water flow is restored, Engine Guardian restores engine power to normal.

Notes:

Section 2 - On the Water

Table of Contents

Additional Operation Instructions for Joystick Piloting Sterndrive (JPS)

Refer to the **JPS Operation Manual** for additional important operation and maintenance instructions if your boat is equipped with JPS.

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.

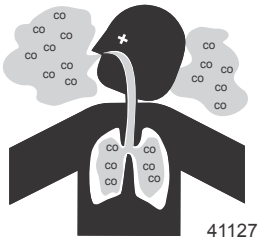
Early symptoms of carbon monoxide poisoning, which are similar to the symptoms of seasickness and intoxication, include headache, dizziness, drowsiness, and nausea.

⚠ 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

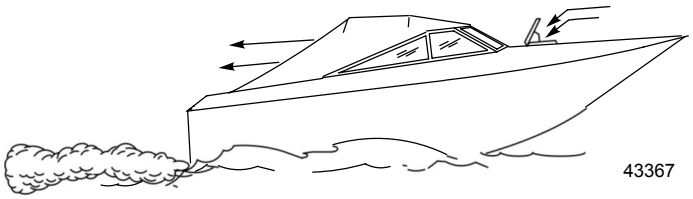


Engine exhaust gases contain harmful carbon monoxide. Avoid areas of concentrated engine exhaust gases. When engines are running, keep swimmers away from the boat, and do not sit, lie, or stand on swim platforms or boarding ladders. While underway, do not allow passengers to be positioned immediately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

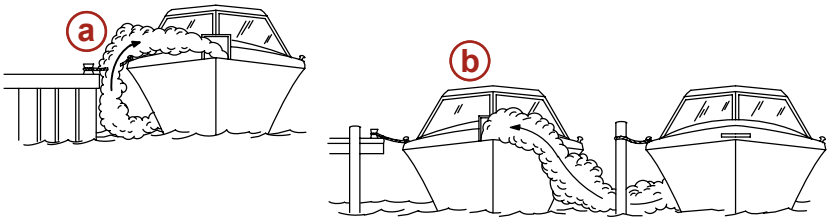


Poor Ventilation

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.

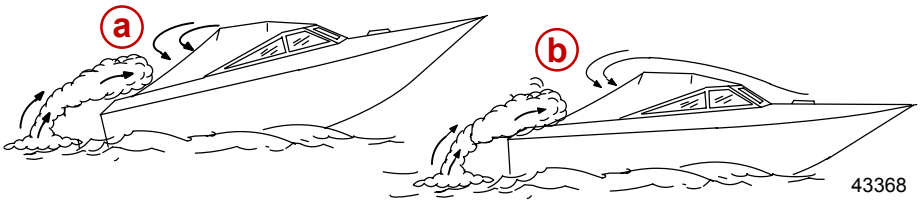
1. Examples of poor ventilation while the boat is stationary:



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)

Basic Boat Operation

Launching and Boat Operation

IMPORTANT: Install bilge drain plug prior to launching boat.

Operation Chart

Operation Chart			
BEFORE STARTING	**AFTER STARTING**	**WHILE UNDERWAY**	**AFTER STOPPING**
Install bilge drain plug.	Observe all gauges to check condition of engine. If not normal, stop engine.	Observe all gauges to check condition of engine. If not normal, stop engine.	Turn ignition key to the "OFF" position.
Open engine hatch.	Check for fuel, oil, water, fluid, and exhaust leaks.	Listen for the audio alarm.	Turn battery switch to the "OFF" position.

Operation Chart			
BEFORE STARTING	AFTER STARTING	WHILE UNDERWAY	AFTER STOPPING
Turn battery switch on.	Check shift and throttle control operation.		Close fuel shut off valve.
Operate bilge blowers.	Check steering operation.		Close seacock, if equipped.
Open fuel shut off valve.			Flush cooling system if in saltwater.
Open seacock, if equipped.			Drain bilge.
Close the drain system.			
Place sterndrive unit in full down/in position.			
Check the engine oil.			
Perform all other checks specified by your dealer and/or boatbuilder.			
Listen for the audio warning alarm to sound when the ignition switch is in the "ON" position.			

Starting and Stopping the Engine

Starting the Engine

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

NOTICE

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

⚠ WARNING

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

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

3. Turn 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 temperature reaches 60° C (140° F).
5. If the engine does not start after three attempts:
   a. Push the throttle only button and position the remote control handle or throttle lever to the 1/4 throttle position.
   b. Turn the ignition key to START. Release the key when the engine starts and allow the switch to return to the ON position.
6. If the engine does not start after step 5:
   a. Move the remote control handle throttle lever to the full throttle position, then return to 1/4 throttle.
   b. Turn the ignition key to START. Release the key when the engine starts and allow the switch to return to the ON position.
7. Inspect the power package for fuel, oil, water, and exhaust leaks.
8. Move the control handle with a firm, quick motion forward to shift to forward gear, or backward to shift to reverse. After shifting, advance the throttle to the desired setting.

NOTICE

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

Stopping the Engine

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

Starting the Engine After It Has Stopped While In Gear—Non-DTS Applications

IMPORTANT: Avoid stopping the engine while the sterndrive unit is in gear. If the engine does stop while the sterndrive is in gear, the following procedure for non-DTS applications should be attempted. If you are unable to return the sterndrive to neutral, contact your dealer.

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

Throttle Only Operation

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

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

Panel mount and console mount remote controls: Panel mount and console mount remote controls are equipped with a throttle only button. To activate throttle only mode:

1. Refer to **Remote Controls** section for remote control features.
2. Move the control lever to the idle/neutral position.
3. Press the throttle only button, and move the control lever to the idle/forward or idle/reverse position.
4. Advancing the control lever beyond the idle/forward or idle/reverse position will cause engine speed to increase.

   IMPORTANT: Moving the control lever back to the idle/neutral position will deactivate the throttle only mode and allow the engine to shift into gear.
5. Throttle only mode is deactivated by moving the control lever to the idle/neutral position. Moving the control lever from the idle/neutral position to the idle/forward or idle/reverse position without pressing the throttle only button will shift the unit into the chosen gear.

Trailering the Boat

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

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

Freezing Temperature Operation

IMPORTANT: If the boat is operated during periods of freezing temperature, precautions must be taken to prevent freeze damage to the power package. Damage caused by freezing is not covered by Mercury MerCruiser Limited Warranty.

Drain Plug and Bilge Pump

The engine compartment in your boat is a natural place for water to collect. For this reason, boats are normally equipped with a drain plug and/or a bilge pump. It is very important to check these items on a regular basis to ensure that the water level does not come into contact with your power package. Components on your engine will be damaged if submerged. Damage caused by submersion is not covered by the Mercury MerCruiser Limited Warranty.

Protecting People in the Water

While You Are Cruising

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

Always slow down and exercise extreme caution any time you are boating in an area where there might be people in the water.

Whenever a boat is moving (even coasting) and the gear shift is in neutral, there is sufficient force by the water on the propeller to cause the propeller to rotate. This neutral propeller rotation can cause serious injury.

While Boat Is Stationary

⚠ WARNING

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

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

High-Speed and High-Performance Operation

If your boat is considered a high-speed or high-performance boat and you are unfamiliar with its operation, we recommend that you never operate it at its high speed capability without first requesting an initial orientation and demonstration ride with your dealer or an operator experienced with your boat. For additional information, refer to **Hi-Performance Boat Operation** booklet (90-849250R03) from your dealer, distributor, or Mercury Marine.

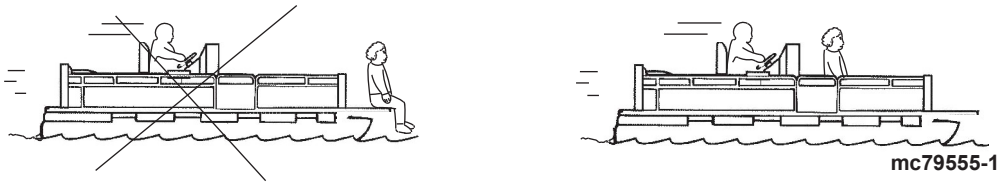
Passenger Safety in Pontoon Boats and Deck Boats

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

Boats Having an Open Front Deck

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

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.

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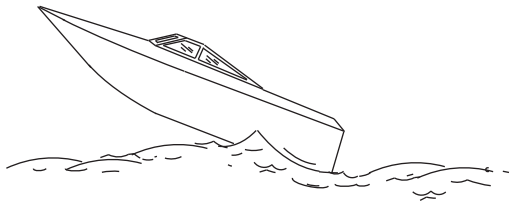
Wave and Wake Jumping

⚠ 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.



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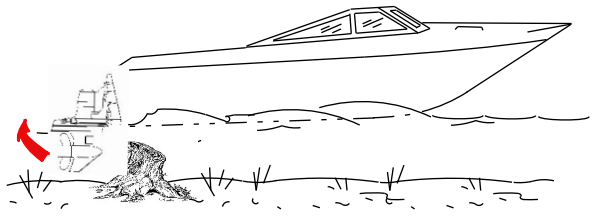
Operating recreational boats over waves and wakes is a natural part of boating. However, when this activity is done with enough speed to force the boat hull partially or completely out of the water, certain hazards arise, particularly when the boat reenters the water.

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

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

Impact with Underwater Hazards

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



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

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

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

- Impact damage to the underwater drive components, rudder, and/or boat.

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

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

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

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

⚠ WARNING

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

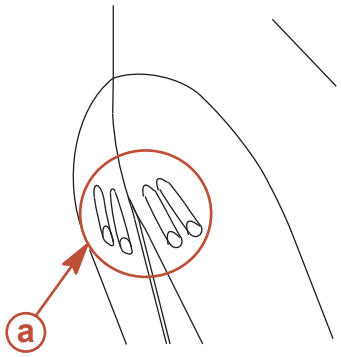
Drive Unit Impact Protection

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

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

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

Operating with Low Water Inlets in Shallow Water



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a - Low water inlets

NOTICE

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

Extreme care should be exercised when operating a boat equipped with low water inlets while maneuvering in shallow water. Also, avoid beaching a boat with the engine operating.

Conditions Affecting Operation

Weight Distribution (Passengers and Gear) Inside the Boat

Shifting weight to rear (stern):

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

Shifting weight to front (bow):

- Improves ease of planing
- Improves rough water ride

- At extremes, can cause the boat to veer back and forth (bow steer)

The Bottom of the Boat

To maintain maximum speed, the boat bottom should be:

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

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

Cavitation

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

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

Ventilation

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

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

Elevation and Climate

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

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

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

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

Propeller Selection

General Information

IMPORTANT: The installed propeller must allow the engine to operate at the specified wide-open throttle (WOT) RPM range. The engine operating range is listed in the specification section of the manual.

It is the responsibility of the boat manufacturer or the selling dealer to equip the power package with the correct propeller. Refer to **Propellers** http://www.mercurymarine.com/propellers/prop-selector.

If full throttle operation is below the recommended range, the propeller must be changed to prevent loss of performance and possible engine damage. Conversely, operating an engine with a propeller that allows the WOT RPM to reach the limiter, may cause a warning horn activation and may record the engine over revolution event in the propulsion control module.

After the 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
- Operating in a higher elevation causes an RPM loss
- Operating with increased load (additional passengers, pulling skiers, etc.)

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

Because of the many variables of boat design, only testing will determine the best propeller for a particular application. Available propellers are listed in the **Mercury Precision Parts/Quicksilver Accessories Guide**.

Engine RPM Limiter

IMPORTANT: This engine is equipped with a RPM limiter. This limit is slightly above the normal operating range of the engine and is designed to help prevent damage from excessive engine RPM. When the engine reaches the RPM limiter, the horn will sound. Once the RPM drops into the recommended operating RPM range, normal engine operation resumes.

Getting Started

20-Hour Break-In Period

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

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

After the Break-In Period

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

- Ensure that the propeller allows the engine to operate at or near the top of the specified wide-open throttle (WOT) RPM range. Refer to **Specifications** and **Maintenance**.
- Operate the engine at 3/4 throttle or lower. Refrain from prolonged operation at WOT RPM.

End of First Season Checkup

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

Notes:

Section 3 - Specifications

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Fuel Requirements

NOTICE

Running out of fuel can damage catalyst components. Do not allow the fuel tanks to become empty during operation.

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

Fuel Ratings

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

USA and Canada - A posted pump octane rating of 87 (R+M)/2, minimum, for all models. Premium gasoline 91 (R+M)/2 octane is also acceptable for all models. **Do not** use leaded gasoline.

Outside USA and Canada - A posted pump octane rating of 91 RON, minimum, for all models. Premium gasoline (95 RON) is also acceptable for all models. **Do not** use leaded gasoline.

Using Reformulated (Oxygenated) Gasoline (USA Only)

Reformulated gasoline is required in certain areas of the USA and is acceptable for use in your Mercury Marine engine. The only oxygenate currently in use in the USA is alcohol (ethanol, methanol, or butanol).

Gasoline Containing Alcohol

Bu16 Butanol Fuel Blends

Fuel blends of up to 16.1% butanol (Bu16) that meet the published Mercury Marine fuel rating requirements are an acceptable substitute for unleaded gasoline. Contact your boat manufacturer for specific recommendations on your boat's fuel system components (fuel tanks, fuel lines, and fittings).

Methanol and Ethanol Fuel Blends

IMPORTANT: The fuel system components on your Mercury Marine engine will withstand up to 10% alcohol (methanol or ethanol) content in the gasoline. Your boat's fuel system may not be capable of withstanding the same percentage of alcohol. Contact your boat manufacturer for specific recommendations on your boat's fuel system components (fuel tanks, fuel lines, and fittings).

Be aware that gasoline containing methanol or ethanol may cause increased:

- Corrosion of metal parts
- Deterioration of rubber or plastic parts
- Fuel permeation through the rubber fuel lines
- Likelihood of phase separation (water and alcohol separating from the gasoline in the fuel tank)

⚠ WARNING

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

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

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

Engine Oil

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

Application	Recommended Oil
All MerCruiser engines	Mercury/Quicksilver 25W-40 Synthetic Blend Engine Oil, NMMA FC-W Catalyst Compatible rated

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

If Mercury/Quicksilver 25W-40 Synthetic Blend Engine Oil is unavailable, use the following lubricants, listed in order of recommendation.

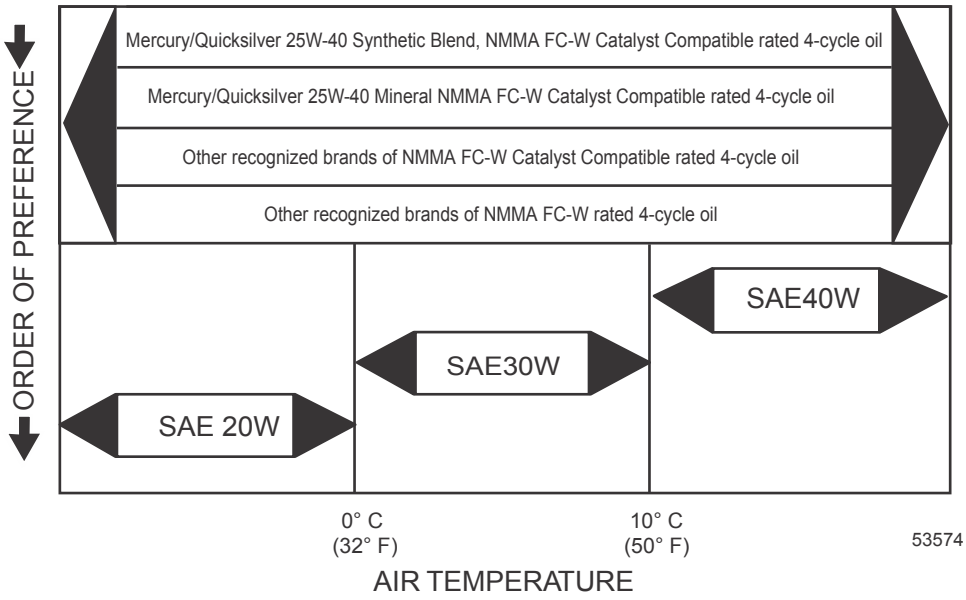
1. Mercury/Quicksilver 25W-40 Mineral NMMA FC-W Catalyst Compatible.

IMPORTANT: If you are servicing a catalyst engine, use the following oils for short periods of time only.

2. Other recognized brands of NMMA FC-W Catalyst Compatible rated 4-cycle oil.
3. Other recognized brands of NMMA FC-W rated 4-cycle oils.
4. A good-grade, straight-weight detergent automotive oil according to the last row of the operating chart below.

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

Use the following information for selecting the type of oil according to the order of preference.



Engine Specifications

4.5L MPI Engine Specifications

NOTE: *Performance specifications are obtained and corrected in accordance with SAE J1228/ISO 8665 Crankshaft Power.*

All measurements are taken with the engine at normal operating temperature.

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

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

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

IMPORTANT: Do not mix spark plug types in an engine. All spark plugs should have the same part number.

		200 Model	250 Model
Crankshaft power		147 kW (200 hp)	184 kW (250 hp)
Displacement		4.5 L (275 cid)	
Alternator amperage	Hot	72 A	
	Cold	65 A	
RPM	WOT operating range	4400–4800	4800–5200
	Rev limiter	4950	5350
	Idle in neutral	625 (not adjustable)	
	Idle in gear	650 (not adjustable)	
Minimum oil pressure	At 2000 RPM	124 kPa (18 psi)	
	At idle	41 kPa (6 psi)	
Thermostat	Standard cooling	60 °C (140 °F)	
	Closed cooling	77 °C (170 °F)	

		200 Model	250 Model
Firing order		1-6-5-4-3-2	
Minimum battery rating*	All models	800 CCA, 1000 MCA, 190 Ah	
Spark plug type	Factory installed	NGK (BPR5EFS-13)	
Spark plug gap		1.3 mm (0.051 in.)	
Emission control system	ECT	Emission control technology, heated oxygen sensor (HO_2S), catalyst	
	EC	Electronic engine control	

*Battery manufacturers may rate and test their batteries to different standards. MCA, CCA, Ah, and reserve capacity (RC) are the ratings recognized by Mercury Marine. Manufacturers that use standards different than these, such as equivalent MCA, do not meet Mercury Marine battery requirements.

6.2L MPI Engine Specifications

NOTE: *Performance specifications are obtained and corrected in accordance with SAE J1228/ISO 8665 Crankshaft Power.*

All measurements are taken with the engine at normal operating temperature.

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

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

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

IMPORTANT: Do not mix spark plug types in an engine. All spark plugs should have the same part number.

		300 Model	350 Model
Crankshaft power		221 kW (300 hp)	257 kW (350 hp)
Displacement		6.2 L (377 cid)	
Alternator amperage	Hot	72 A	
	Cold	65 A	
RPM	WOT operating range	5000–5400	
	Rev limiter	5550	
	Idle in neutral	625 (not adjustable)	
	Idle in gear	650 (not adjustable)	
Minimum oil pressure	At 2000 RPM	124 kPa (18 psi)	
	At idle	41 kPa (6 psi)	
Thermostat	Standard cooling	60 °C (140 °F)	
	Closed cooling	77 °C (170 °F)	
Firing order		1-8-4-3-6-5-7-2	
Minimum battery rating*	All models	800 CCA, 1000 MCA, 190 Ah	
Spark plug type	Factory installed	NGK (BPR5EFS-13)	
Spark plug gap		1.3 mm (0.051 in.)	
Emission control system	ECT	Emission control technology, heated oxygen sensor (HO_2S), catalyst	
	EC	Electronic engine control	

*Battery manufacturers may rate and test their batteries to different standards. MCA, CCA, Ah, and reserve capacity (RC) are the ratings recognized by Mercury Marine. Manufacturers that use standards different than these, such as equivalent MCA, do not meet Mercury Marine battery requirements.

Fluid Specifications

IMPORTANT: All capacities are approximate fluid measures.

Engine

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

All Models	Capacity	Fluid Type
4.5L engine oil (with filter)	4.25 L (4.50 US qt)	Mercury/Quicksilver 25W-40 Synthetic Blend Engine Oil, NMMA FC-W®
4.5L seawater cooling system (winterization use only)	20 L (21 US qt)	Propylene glycol and purified water
4.5L closed-cooling system	14.2 L (15 US qt)	Mercury Extended Life Coolant Antifreeze or extended-life ethylene glycol 5/100 antifreeze mixed 50/50 with purified water
6.2L engine oil (with filter)	4.7 L (5 US qt)	Mercury/Quicksilver 25W-40 Synthetic Blend Engine Oil, NMMA FC-W®
6.2L seawater cooling system (winterization use only)	26.5 L (28 US qt)	Propylene glycol and purified water
6.2L closed-cooling system	17 L (17.9 US qt)	Mercury Extended Life Coolant Antifreeze or extended-life ethylene glycol 5/100 antifreeze mixed 50/50 with purified water

Alpha Sterndrive

NOTE: *Oil capacity includes gear lube monitor.*

Model	Capacity	Fluid Type
Alpha One	1892 mL (64 oz)	High Performance Gear Lubricant

Bravo Sterndrives

NOTE: *Oil capacity includes gear lube monitor.*

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

Power-Assisted Steering and Power Trim Fluids

Approved Power-Assisted Steering Fluids

Description	Part Number
Power Trim and Steering Fluid	92-858074K01
Dexron III	Obtain locally

Approved Power Trim Fluids

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

Notes:

Section 4 - Maintenance

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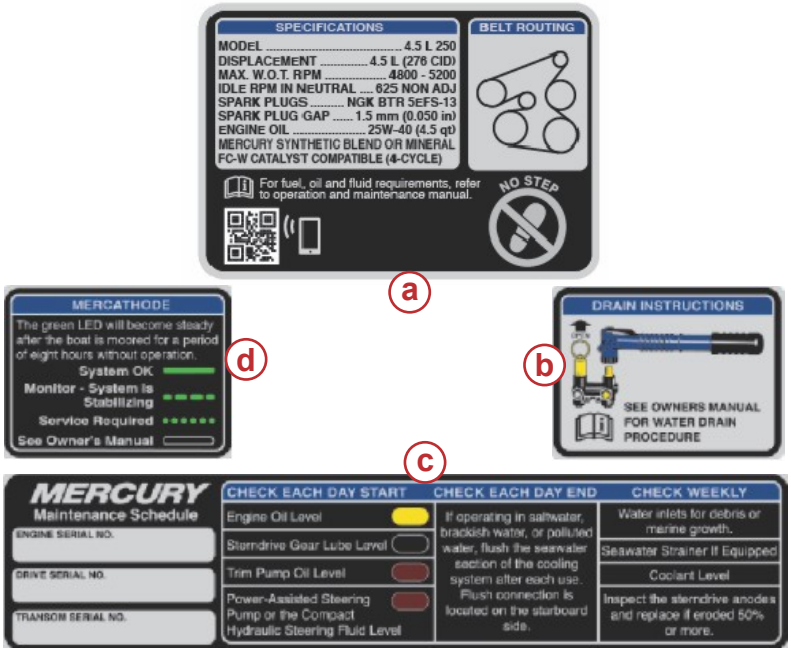
Service Decals

Closed Cooling Service Decals - Alpha and Bravo Drive



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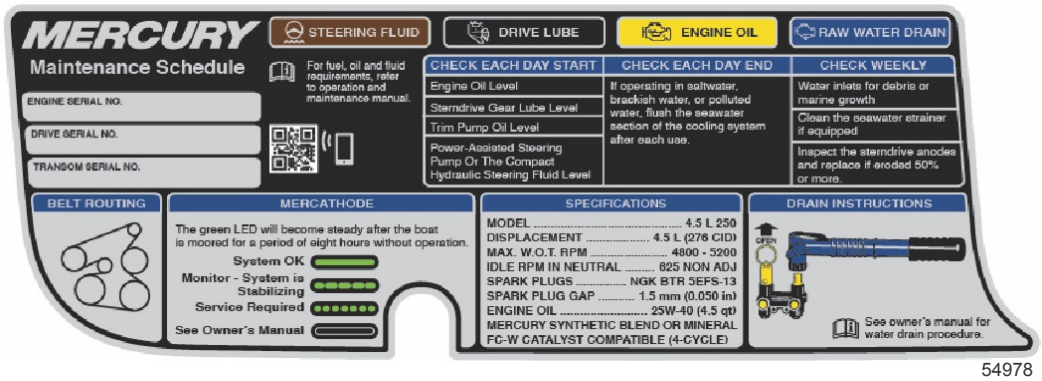
- **a -** Specifications
- **b -** Cooling system drain
- **c -** Serial numbers and maintenance identification colors
- **d -** Mercathode system diagnostic (where applicable)

Bravo Standard Cooling Service Decal



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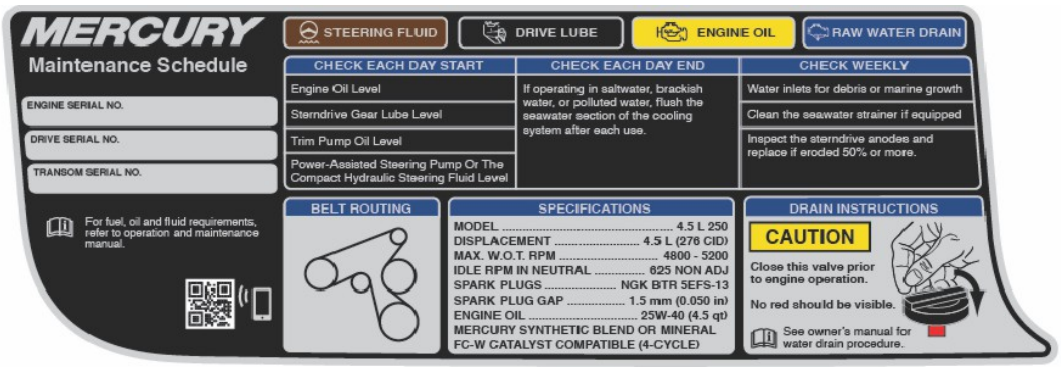
Bravo standard cooling service decal

Alpha Standard Cooling Service Decal



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Alpha standard cooling service decal

Additional Operation Instructions for Joystick Piloting Sterndrive (JPS)

Refer to the **JPS Operation Manual** for additional important operation and maintenance instructions if your boat is equipped with JPS.

Owner/Operator Responsibilities

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

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

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

Dealer Responsibilities

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

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

Maintenance

⚠ WARNING

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

⚠ WARNING

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

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

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

Maintenance Point Color Codes	
Yellow	Engine oil
Black	Drive lube
Brown	Power steering fluid
Blue	Drain or flush
Red	Water separating fuel filter

Do-It-Yourself Maintenance Suggestions

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

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

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

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

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

Inspection

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

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

MerCruiser Gas Sterndrive Inspection and Maintenance Schedule

New sterndrive installations may require as much as 470 mL (16 fl oz) of gear lube added to the monitor bottle during the break-in period (20 hours of running time). It is important to monitor and maintain the gear lube level during the break-in period. During the initial drive installation, air may be trapped in the top of the driveshaft housing. This void is filled from the gear lube monitor during the sterndrive break-in period. As the air is purged from the sterndrive through the monitor bottle, the lube level in the bottle will drop.

Daily Checks

- Check the engine oil level
- Check the power steering fluid level
- Check the power trim pump fluid level
- Check the sterndrive gear oil level

- Check the lanyard stop switch

After Each Use

- Flush the engine with fresh water, brackish or saltwater use only

Weekly Checks

- Check the seawater inlets for marine growth
- Clean the seawater strainer, if equipped
- Check the coolant level, if equipped
- Inspect the anodes
- Verify the operation of the MerCathode module, if equipped

Every Two Months or 50 Hours

- Lubricate the engine coupler [1.]

Annually or 100 Hours

- Lubricate the engine coupler [1.]
- Lubricate the propeller shaft splines
- Clean the gauges and check wire connection—dealer item
- Check the torque of the propeller nut
- Check the battery condition and connections—dealer item
- Touch up any paint nicks and spray the power package with Corrosion Guard
- Change the engine oil and filter
- Change the sterndrive gear oil
- Check the closed cooling fluid level and concentration for freeze protection, if equipped
- Replace the water-separating fuel filter
- Clean the crankcase vent—8.2L only
- Clean the IAC muffler—8.2L only
- Clean the flame arrestor—8.2L only
- Inspect the condition of the accessory drive belt—dealer item
- Tighten the connection of the gimbal ring to the steering shaft—dealer item
- Check the steering system for loose components—dealer item
- Check the remote control system for loose components—dealer item
- Check the MerCathode module operation for proper protection and check the continuity circuit—dealer item
- Replace the PCV valve
- Jackshaft models—check U-joints and tailstock bearings—dealer item
- Spray the power package with Corrosion Guard
- Inspect anodes, if equipped

Three Years or 300 Hours

- Inspect the spark plugs and spark plug wires [2.]
- Clean the flame arrestor and crankcase vent hoses
- Check the engine mount fasteners for tightness and tighten to the specified torque—dealer item
- Check the electrical system for loose, damaged, or corroded fasteners—dealer item
- Check the exhaust and cooling system hose clamps for tightness. Inspect for damage or leaks—dealer item.
- Inspect and clean seawater side of closed cooling system, if equipped—dealer item
- Clean, inspect, and test the closed cooling pressure cap, if equipped—dealer item
- Inspect seawater pump. Replace worn components—dealer item.
- Inspect the exhaust system. If the power package is equipped with water shutters, verify they are not missing or damaged —dealer item.
- Check the engine alignment—dealer item

1. Power packages that are used extensively at idle or trolling speeds must have the coupler lubricated every 50 hours.
2. Inspect the condition of the spark plugs and spark plug wires. Replace as necessary. If the condition of these components is satisfactory, repeat the inspection every 100 hours or once a year, whichever occurs first.

- Inspect the gimbal housing bellows and verify clamp tightness—dealer item
- Inspect the gimbal bearing for roughness—dealer item
- Lubricate the engine coupler—dealer item
- Replace the vent valve on each exhaust elbow, port and starboard, if equipped—dealer item

Five Years or 500 Hours

- Replace the antifreeze—replace the antifreeze every two years if not using extended life antifreeze—dealer item

Engine Oil

Checking

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

1. With the engine warm but not running, wait five minutes to allow the oil to drain into the oil pan.
2. Remove the dipstick, wipe it clean, and install it fully into the dipstick tube. Wait 60 seconds to allow trapped air to vent.
3. Remove the dipstick and observe the oil level. The oil level must be between FULL or OK range and ADD. Install dipstick into dipstick tube. If the oil level is low, refer to **Filling.**

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Oil Level—Overfilled

IMPORTANT: Do not overfill the engine with oil. An overfilled crankcase can cause a fluctuation or drop in oil pressure, rocker arm clatter, and a loss of engine performance.

An overfilled crankcase (oil level too high) can cause a fluctuation or drop in oil pressure, and rocker arm clatter. This condition results in the engine crankshaft splashing and agitating the oil, causing it to foam (become aerated). The aerated oil causes the hydraulic valve lifters to bleed down. This results in rocker arm clatter and loss of engine performance.

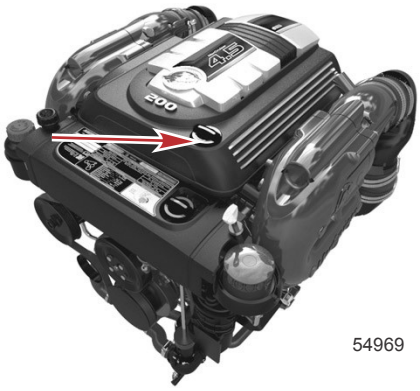
Care must be taken when checking the engine oil level. The oil level must be maintained within the full maximum and the add minimum mark on the dipstick. To avoid getting a false reading, adhere to the following procedures.

Filling

IMPORTANT: Do not overfill the engine with oil.

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

1. Remove the oil fill cap.



4.5 liter oil fill cap

2. Add the specified engine oil to bring the level up to, but not over, the full or OK range mark on the dipstick. Check the oil level with the dipstick.
3. Replace the fill cap.

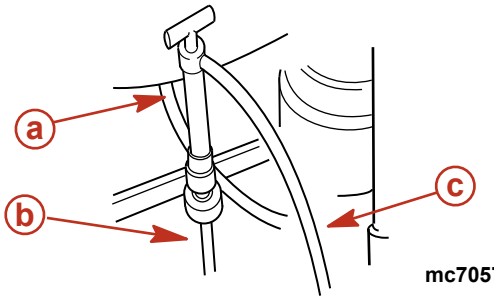
Changing Oil and Filter

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

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

Engine Oil Drain Pump

1. Loosen the oil filter to vent the system.
2. Remove the dipstick.
3. Install the oil pump onto the dipstick tube.



a - Typical oil pump
b - Dipstick tube
c - Oil drain hose

4. Insert the hose end of the crankcase oil pump onto an appropriate container and, using the handle, pump until the crankcase is empty.
5. Remove the pump.
6. Install the dipstick.

Changing Filter

1. Remove and discard the oil filter.

4.5L oil filter shown, 6.2L is similar

2. Apply clean engine oil to the sealing ring on the new filter and install.
3. Tighten the oil filter securely. Do not overtighten.
4. Remove the oil fill cap.

   IMPORTANT: Always use the dipstick to determine exactly how much oil is required.
5. Add the recommended engine oil to bring the level up to the operating range on the dipstick.

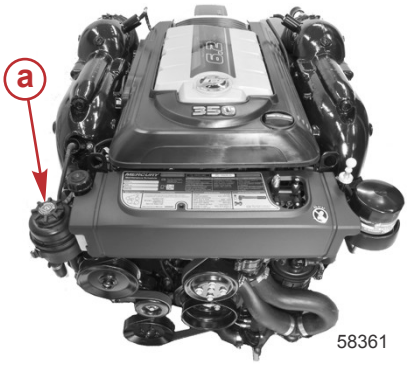
Engine Model	Engine Oil Capacity	Fluid Type
4.5L	4.25 L (4.5 US qt)	Mercury/Quicksilver 25W-40 Synthetic Blend Engine Oil, NMMA FC-W®
6.2L	4.7 L (5 US qt)	

6. With the boat at rest in the water, start the engine, run the engine for three minutes, and check for leaks.
7. Stop the engine and allow several minutes for the oil level to stabilize. Check the oil level and add oil to bring the oil level up to, but not over, the FULL or OK range.

Power Steering Fluid

Checking

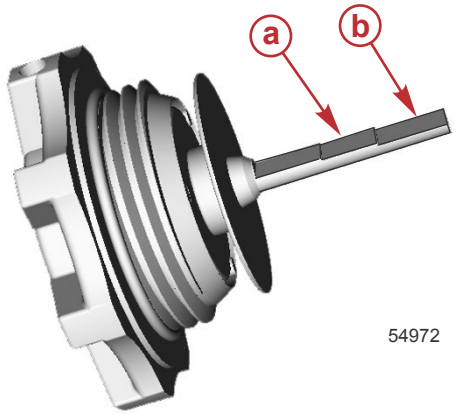
1. Stop the engine and center the sterndrive unit.
2. Remove the fill cap/dipstick and observe the level.



a - Fill cap/dipstick

   a. The proper fluid level with the engine at normal operating temperature should be within the warm range.

b. The proper fluid level with the engine cold should be within the cold range.



a - Warm range
b - Cold range

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

Filling

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

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

3. Install the fill cap/dipstick.

Changing

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

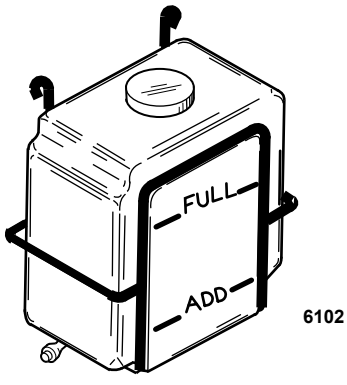
Engine Coolant - Closed-Cooling

Checking

⚠ 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. With the engine at normal operating temperature, check the coolant level in the coolant recovery bottle.
2. The coolant level should be between the ADD and FULL marks.



3. Add the specified fluid as necessary.

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

4. If the recovery bottle is empty of fluid, allow the engine to cool to the ambient air temperature.
5. Remove the cap from the heat exchanger and observe the fluid level.

Heat exchanger cap

6. The coolant level in the heat exchanger should be at the bottom of the filler neck. If the coolant level is low, contact your authorized Mercury MerCruiser dealer.
7. Install the cap onto the heat exchanger and tighten it until it seats on the filler neck.

Filling

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.

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

Air trapped in the closed cooling system can cause the engine to overheat, resulting in engine damage. Minimize the possibility of trapping air when initially filling the closed cooling system by positioning the boat so that the front of the engine is higher than the rear of the engine.

NOTE: *Add coolant only when the engine is at normal operating temperature.*

1. Remove the fill cap from the coolant recovery bottle. Inspect the gasket and replace if necessary.

   IMPORTANT: Coolant flows at a high rate of speed in this closed cooling system. Higher idle speeds can trap air in the system and make purge procedures more difficult. Operate at idle when filling the system or purging air.
2. Fill to the full mark with the specified coolant.

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

3. Check the antifreeze concentration for adequate freeze protection and correct if necessary. Refer to the **Specifications** section.
4. Install the fill cap to the coolant recovery bottle.

Changing

Contact your authorized Mercury MerCruiser dealer.

Alpha Sterndrive Gear Lube

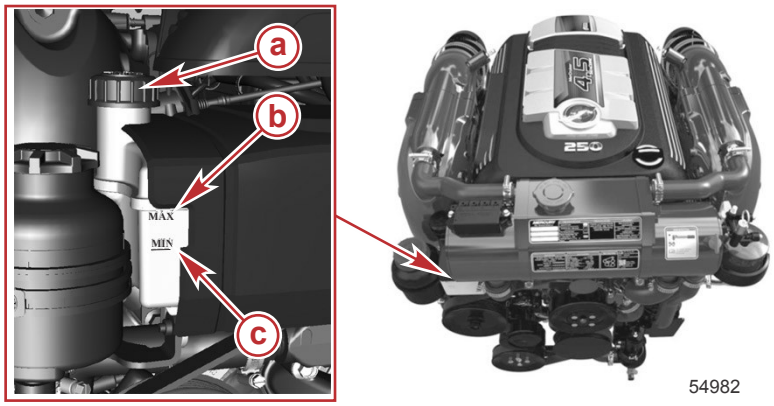
NOTICE
Discharge of oil, coolant, or other engine/drive fluids into the environment is restricted by law. Use caution not to spill oil, coolant, or other fluids into the environment when using or servicing your boat. Be aware of the local restrictions governing the disposal or recycling of waste, and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

Checking

IMPORTANT: The gear lube level fluctuates during operation. Check before starting, when the engine is cold.

NOTE: *The gear lube monitor bottle has a sensor in it that is connected to the engine warning system.*

1. Check the gear lube level in the monitor bottle. Keep the gear lube level within the recommended operating range.



a - Gear lube monitor cap
b - Maximum range
c - Minimum range

2. Inspect the gear lube condition. If any water is visible in the bottom of the gear lube monitor, if water appears at the fill and drain plug hole, or if the gear lube appears discolored, there may be a water leak in the sterndrive.

Filling

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

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

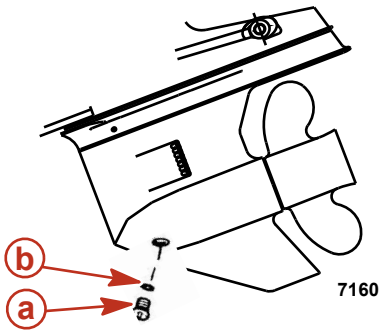
Tube Ref No.	Description	Where Used	Part No.
87	High Performance Gear Lubricant	Gear lube monitor	92-858064K01

3. Ensure that the rubber gasket is inside the cap and install. Tighten the cap securely, but do not overtighten.

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

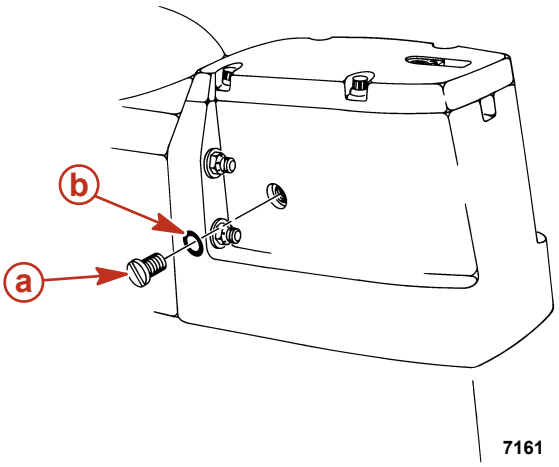
Changing

1. Remove the gear lube monitor cap.
2. Place the sterndrive unit in full trim out position. Remove the oil fill and drain screw and sealing washer and drain the gear lube into an appropriate container.



a - Oil fill and drain screw
b - Sealing washer

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



a - Oil vent screw
b - Sealing washer

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

4. Lower the sterndrive unit so that the propeller shaft is level. Fill the sterndrive unit through the oil fill and drain hole with the specified gear lubricant until an air-free stream of lubricant flows from the oil vent hole.

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

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

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

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

Model	Capacity	Fluid Type
Alpha One	1892 ml (64 oz)	High Performance Gear Lubricant

8. Remove the pump from the oil fill and drain hole. Quickly install the sealing washer and oil fill and drain screw. Tighten securely.
9. Check the oil level after the first use.

IMPORTANT: The gear lube level fluctuates during operation. Check when the engine is cold.

Bravo Sterndrive Gear Lube

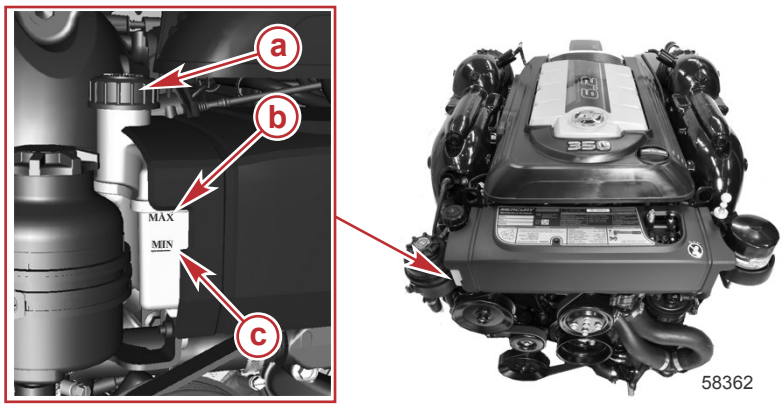
Checking

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

IMPORTANT: The gear lube level fluctuates during operation. Check before starting, when the engine is cold.

NOTE: *The gear lube monitor bottle has a sensor in it that is connected to the engine warning system.*

1. Check the gear lube level in the monitor bottle. Keep the gear lube level within the recommended operating range.



a - Gear lube monitor cap
b - Maximum range
c - Minimum range

2. Inspect the gear lube condition. If any water is visible in the bottom of the gear lube monitor, if water appears at the fill and drain plug hole, or if the gear lube appears discolored, there may be a water leak in the sterndrive.

Filling

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

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

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

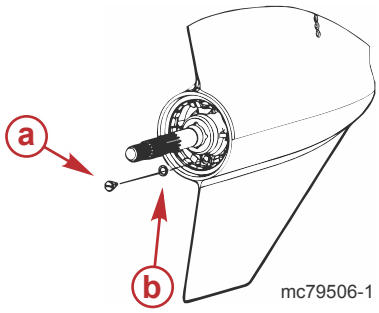
1. Remove the gear lube monitor cap.
2. Fill the monitor with the specified fluid until the gear lube level is in the operating range. Do not overfill.

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

3. Replace the cap.

Changing

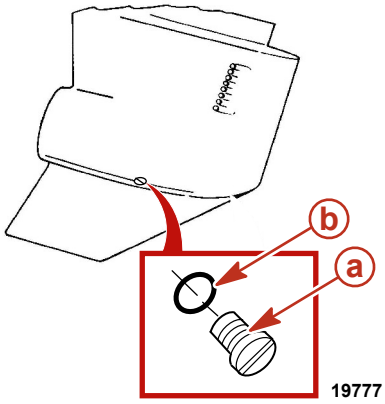
1. Remove the gear lube monitor cap.
2. Bravo One models:
   a. Remove the propeller.
   b. Position the sterndrive unit to the full down position.
   c. Remove the oil fill and drain screw and sealing washer.
   d. Drain the fluid into a suitable container.



a - Oil fill and drain screw
b - Sealing washer

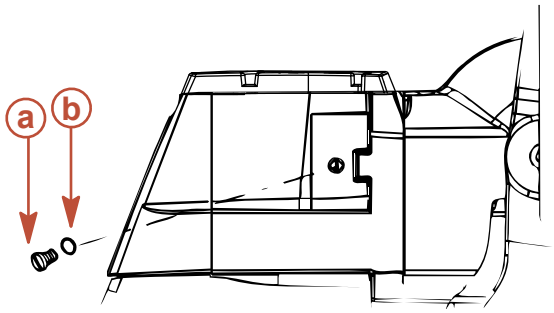
3. All other models:
   a. Place the sterndrive unit in full trim out position.
   b. Remove the oil fill and drain screw and sealing washer.

c. Drain the fluid into a suitable container.



a - Oil fill and drain screw
b - Sealing washer

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



a - Oil vent screw
b - Sealing washer

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

5. Lower the sterndrive unit so the propeller shaft is level.

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

6. Fill the sterndrive unit through the oil fill and drain hole with specified gear lubricant until an air-free stream of lubricant flows from the oil vent hole.

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

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

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

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

11. Remove the pump from the oil fill and drain hole. Quickly install the sealing washer and screw. Tighten securely.
12. Install the propeller. Refer to **Propellers**.
13. Check the oil level after the first use.

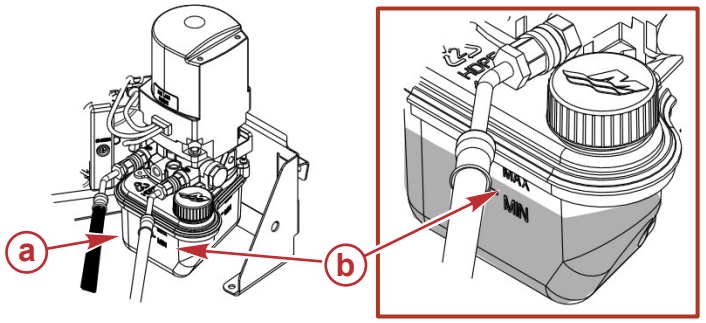
IMPORTANT: Oil level in the gear lube monitor rises and falls during operation. Always check the oil level when the sterndrive is cool and the engine is off.

Power Trim Fluid

Checking

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

1. Place the sterndrive unit in full down/in position.
2. Observe the oil level. Level must be between the MIN and MAX lines on the reservoir.



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a - Reservoir
b - MIN and MAX lines

3. Fill as necessary with the specified fluid.

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

4. If the specified fluid is not available,10W-30 oil (obtain locally) can be used.

Filling

1. Remove the fill cap from the reservoir.

   NOTE: *Fill cap is vented.*

2. Add lubricant to bring level to the within the MIN and MAX lines on the reservoir.

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

3. Install the cap.

Changing

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

Battery

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

⚠ WARNING

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

⚠ WARNING

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

Auxiliary Batteries

Mercury strongly recommends using at least group 27 or 31 type AGM batteries when load shedding devices are used in place of auxiliary batteries. Boats using JPS are typically large vessels with many DC loads and the minimum group 24 batteries will not be sufficient.

The use of a load shedding type device is also applicable in place of an auxiliary house battery or when connecting house loads to the starting battery.

Connect electrical components such as LVDs (low voltage disconnects), VSRs (voltage sensing relays), and ACRs (automatic closing relays) to an isolated auxiliary battery bank.

Review ABYC regulations for power connection points.

Multiple EFI Engine Battery Precautions

Alternators: Alternators are designed to charge the battery that supplies electrical power to the engine that the alternator is mounted on.

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

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

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

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

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

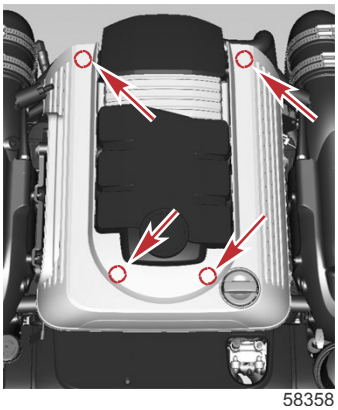
Generators: The generator's battery should be considered another engine's battery.

Flame Arrestor

⚠ WARNING

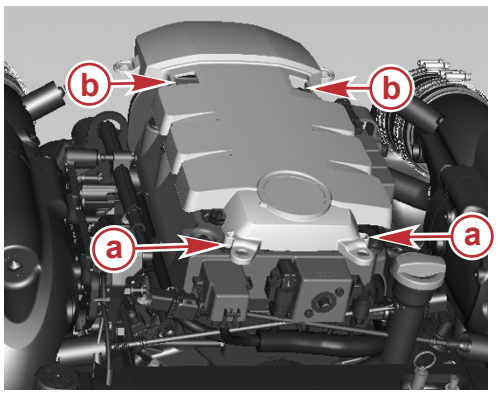
Fuel is flammable and explosive. Ensure that the key switch is off and the lanyard is positioned so that the engine cannot start. Do not smoke or allow sources of spark or open flame in the area while servicing. Keep the work area well ventilated and avoid prolonged exposure to vapors. Always check for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

1. There are two engine covers you must remove to access the flame arrestor:
   a. Pull the outside engine cover up to remove it from the four rubber mount grommets.



58358

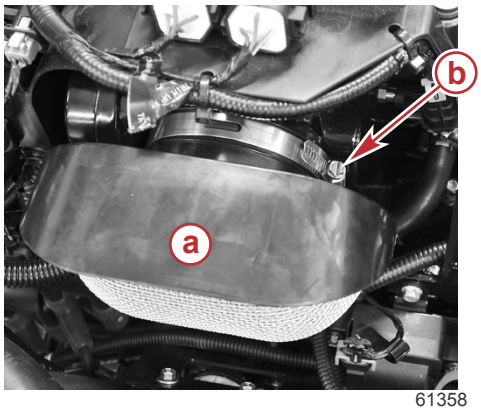
b. Lift up on the front of the second cover to disengage the cover from the front grommets. Pull the cover towards the front of the vessel to remove it from the two rear grommets.



54984

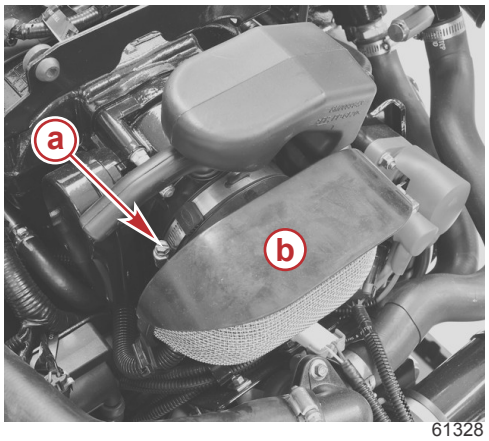
a - Front grommets
b - Rear grommets

2. Loosen the clamp securing the flame arrestor and remove the flame arrestor.



61358

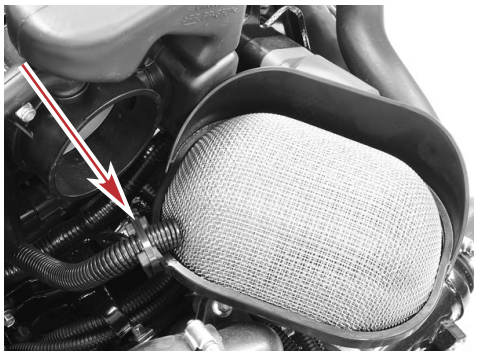
4.5L
a - Flame arrestor
b - Clamp securing the flame arrestor



61328

6.2L
a - Clamp securing the flame arrestor
b - Flame arrestor

3. Cut the cable tie securing the crankcase vent hose to the flame arrestor and gently pull the vent hose off the flame arrestor.



61330

6.2L crankcase vent hose shown, 4.5L similar

4. Clean the flame arrestor with warm water and a mild detergent.
5. Inspect the flame arrestor for holes, cracks, or deterioration. Replace if necessary.
6. Allow the flame arrestor to air dry completely before use.
7. Install the vent hose and secure with a cable tie.
8. Install the flame arrestor and tighten the flame arrestor clamp to the specified torque.

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

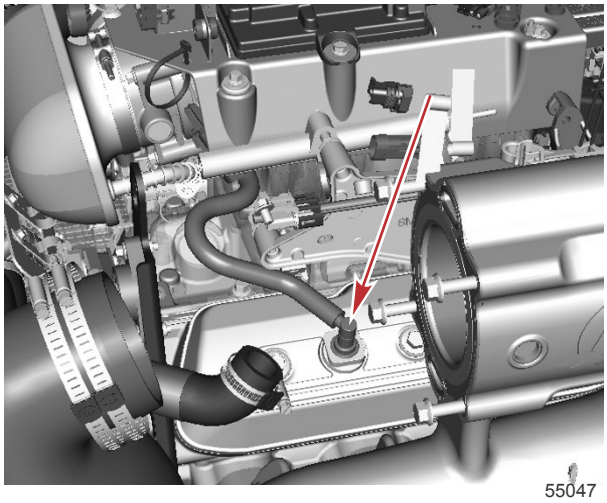
9. Install the engine covers.

Changing the Positive Crankcase Ventilation (PCV) Valve

This engine is equipped with a positive crankcase ventilation (PCV) valve. The PCV valve should be inspected every 100 hours of operation or at least once a year, whichever occurs first.

NOTE: *The PCV valve should be replaced with Mercury Mercruiser OEM parts to ensure compliance with emission regulations.*

1. Pull the PCV valve out of the starboard valve cover and remove from the hose.



55047

Exhaust manifold removed for visual clarity

2. Inspect the PCV valve for cracks or deterioration and replace if necessary.
3. Inspect the rubber grommet on the valve cover for cracks or deterioration and replace if necessary.
4. Install the PCV valve into the hose and insert into the rubber grommet on the valve cover. Insert the PCV valve into the rubber grommet.

Fuel System Maintenance

Fuel System

⚠ 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.

IMPORTANT: Use an approved container to collect and store fuel. Wipe up spilled fuel immediately. Material used to contain spilled fuel must be disposed of in an approved receptacle.

Before servicing any part of the fuel system:

1. Stop engine and disconnect the battery.
2. Perform fuel system service in a well-ventilated area.
3. Inspect any completed service work for sign of fuel leakage.

Fuel Line Inspection

Visually inspect the fuel line for cracks, swelling, leaks, hardness, or other signs of deterioration or damage. If any of these conditions are found, the fuel line must be replaced.

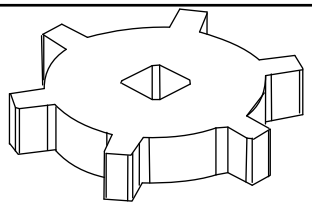
Water-Separating Fuel Filter

The water-separating fuel filter is a low-pressure filter that removes debris and water before the fuel reaches the high-pressure fuel pump. It is best to service the water-separating fuel filter when the engine is cold or after the engine has not run for several hours. Although the engine may not have run for hours, high ambient air temperatures can cause the fuel system to become pressurized. The amount of pressure within the system is dependent on the type of fuel system installed on the vessel.

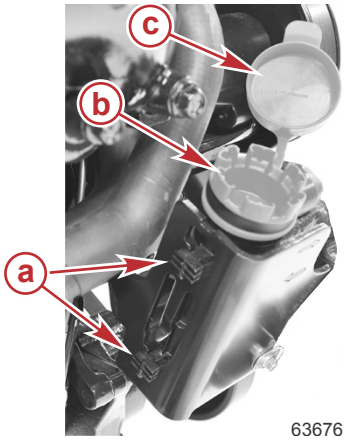
Refer to the **Inspection and Maintenance Schedule**, preceding, for the proper maintenance interval.

Filter Housing Removal

1. Verify the ignition key switch is off and remove the key.
2. Disconnect the batteries.
3. Locate the water-separating fuel filter on the starboard front side of the engine.
4. Remove the red service cap.
5. Place a rag or towel around the fuel filter housing to prevent the fuel from leaking or spraying.
6. Use the fuel filter removal/installation tool or the shaft of a screwdriver between the lugs on the filter cover and turn the fuel filter cover counterclockwise to loosen it. Do not remove the cover.

Fuel Filter Removal/Installation Tool	91-896661
 24896	Aids in the removal and installation of the fuel filter cap assembly.

7. Slide the filter housing up to release it from the bracket. The fuel hoses have enough slack to remove the filter housing from the bracket.



63676

a - Bracket retainers
b - Filter cover
c - Red service cap

Draining the Filter Housing

⚠ 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.

Tip the filter housing and remove the filter cover to drain the fluid into an approved container. Dispose of the fuel according to local regulations.


61360

Fuel Filter Inspection

The fuel filter is an important component in the fuel delivery system and should be inspected for debris or degradation every 100 hours of operation. Replace the fuel filter when necessary.

Filter Housing Installation

1. Place the filter housing mounting tabs into the slots on the bracket and push down on the filter housing to slide the mounting tabs into the lock position.
2. Lubricate the filter O-ring seals with clean oil.
3. Install the filter and tighten the cover securely.
4. Install the red service cap.
5. Connect the battery cables.
6. Turn the ignition key to the ON or RUN position. Do not start the engine.
7. Inspect the filter housing and hoses for leaking fuel.

IMPORTANT: Inspect for leaking fuel before starting the engine.

Lubrication

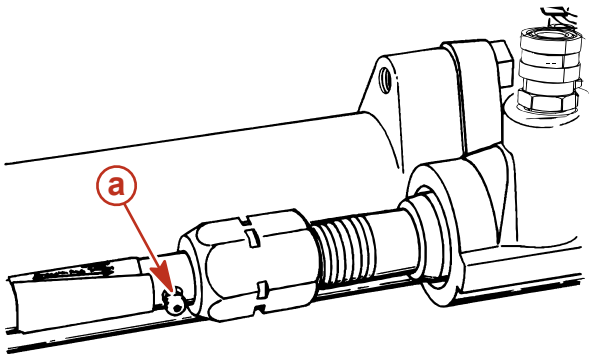
Steering System

⚠ WARNING

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

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

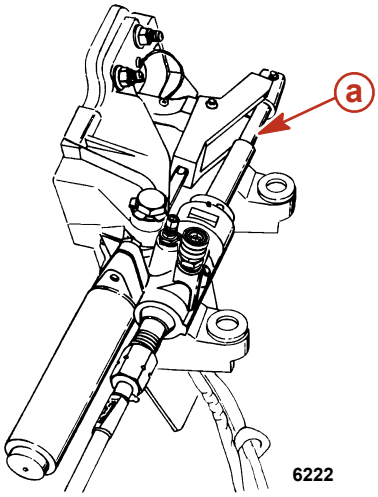
1. **If the steering cable has grease fittings**, turn the steering wheel until the steering cable is fully retracted into the cable housing. Apply approximately three pumps of grease from a typical hand-operated grease gun.



a - Steering cable grease fitting

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

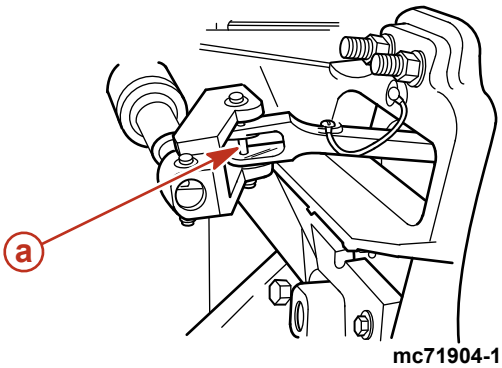
2. Turn the steering wheel until the steering cable is fully extended. Lightly lubricate the exposed part of the cable.



a - Extended steering cable

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

3. Lubricate the steering pin.



mc71904-1

a - Steering pin

Tube Ref No.	Description	Where Used	Part No.
139	Mercury 25W-40 Synthetic Blend 4-Stroke Engine Oil	Steering pin	92-8M0078629

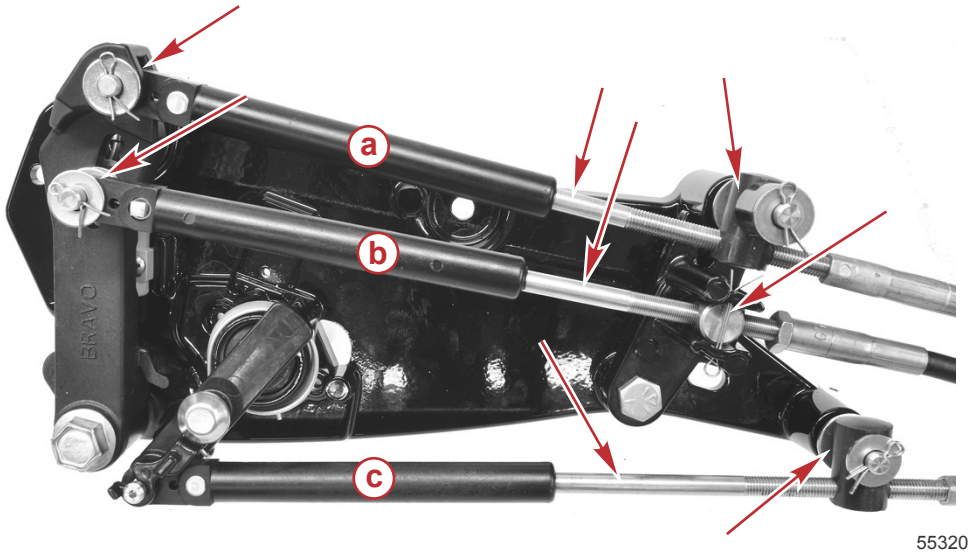
4. On dual engine boats: Lubricate the tie bar pivot points.

Tube Ref No.	Description	Where Used	Part No.
139	Mercury 25W-40 Synthetic Blend 4-Stroke Engine Oil	Tie bar pivot points	92-8M0078629

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

Remote Control Cable Lubrication

Lubricate the points shown in the following illustration with oil at least once a year, more often if the product is operated in salt water.



55320

Bravo shift plate shown, Alpha shift plate similar

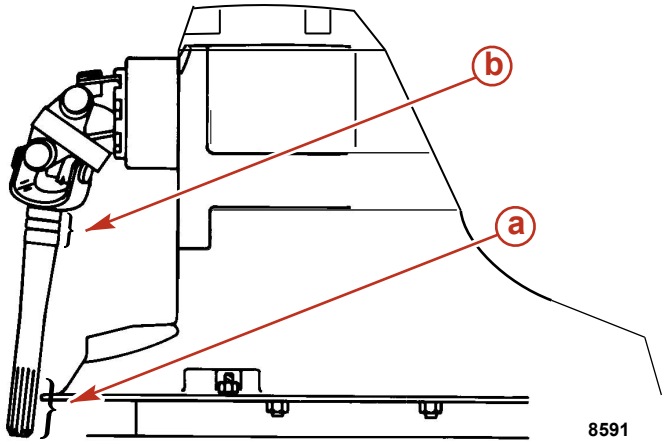
a - Remote control shift cable

b - Intermediate shift cable

c - Remote control throttle cable

Driveshaft U-joint Splines and O-Rings (Sterndrive Unit Removed)

1. Apply grease to the driveshaft U-joint splines and O-rings.



a - Driveshaft U-joint splines
b - O-rings (3)

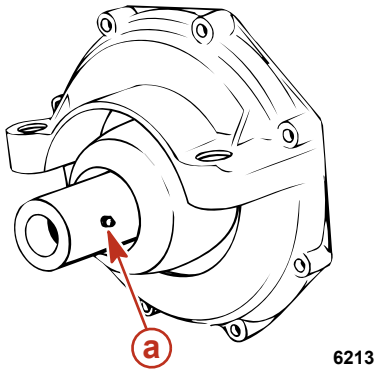
Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Driveshaft U-joint splines and O-rings	8M0071842

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

Engine Coupler

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

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



a - Grease fitting

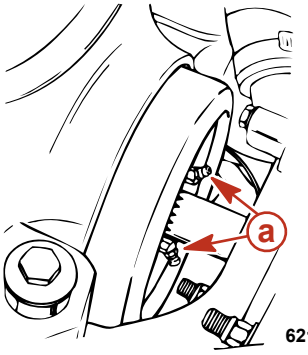
Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Coupler	8M0071842

NOTE: *Your power package is equipped with a sealed engine coupler and Perm-a-Lube U-joints. The sealed coupler and shaft splines can be lubricated without removing the sterndrive unit. The Perm-a-Lube U-joints do not require lubrication.*

Engine Coupler

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

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



Bravo drive coupler

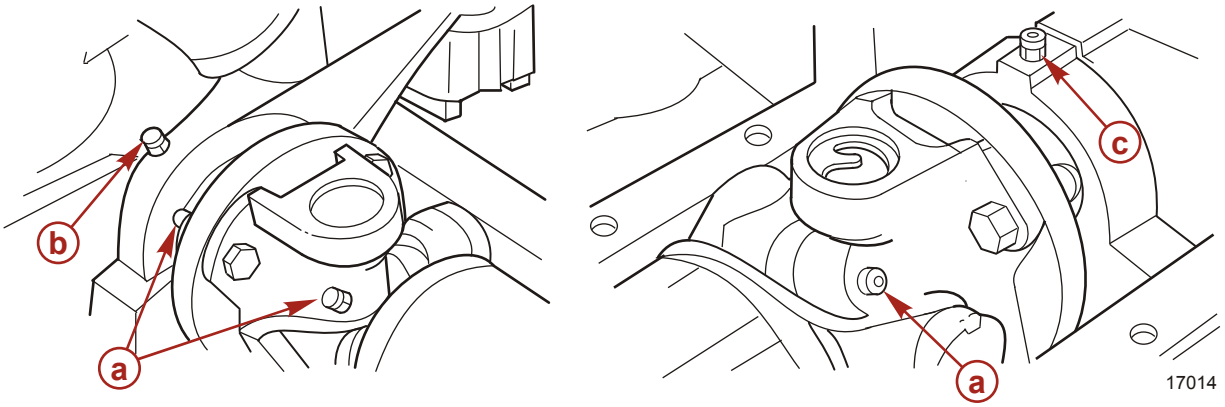
a - Grease fitting

Tube Ref No.	Description	Where Used	Part No.
	Extreme Grease	Coupler	8M0071842

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

Driveshaft Extension Models

1. Lubricate the transom end grease fitting and engine end grease fitting by applying approximately 10–12 pumps of grease from a typical hand-operated grease gun.
2. Lubricate the driveshaft grease fittings by applying approximately 3–4 pumps of grease from a typical hand-operated grease gun.



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

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

Propellers

Propeller Repair

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

Alpha or Bravo One Propeller Removal

⚠ WARNING

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

1. Place a wood block between the propeller blade and the anti-ventilation plate to prevent rotation. Straighten the bent tabs on the locknut retainer.
2. Turn the propeller shaft locknut counterclockwise to remove the nut.
3. Slide the components off the propeller shaft.

Alpha or Bravo One Propeller Installation

NOTICE

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

IMPORTANT: If reusing the locknut retainer, carefully inspect the retainer for cracks or other damage. Replace the retainer if its condition is questionable.

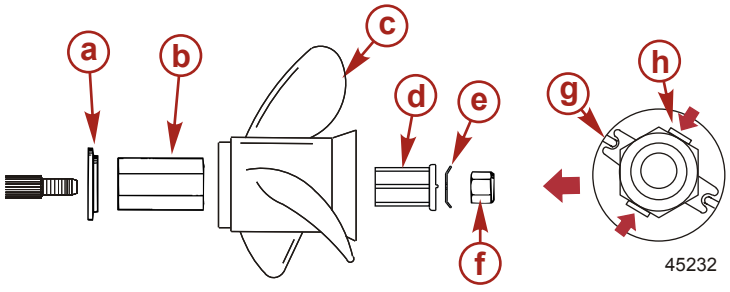
1. Apply one of the following lubricants onto the propeller shaft.

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

2. Install the propeller onto the shaft as shown in the following illustrations. If the components supplied with the propeller are different than what is shown, refer to the propeller installation instructions provided with your product or contact your dealer.
3. Place the locknut retainer over the raised pins on the drive sleeve adapter and tighten the locknut to the specified torque.

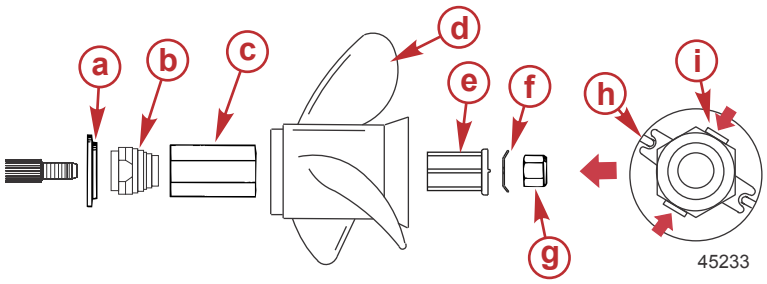
Description	Nm	lb-in.	lb-ft
Locknut - propellers without a hub bushing	75	–	55.3
Locknut - propellers with a hub bushing	136	–	100

4. Secure the locknut by bending the tabs up against the flats on the nut.



Flo-Torq II propeller without a hub bushing

- **a -** Forward thrust washer
- **b -** Drive sleeve
- **c -** Propeller
- **d -** Drive sleeve adapter
- **e -** Locknut retainer
- **f -** Locknut
- **g -** Raised pins
- **h -** Tabs bent against the locknut



Flo-Torq II propeller with a hub bushing

- **a -** Forward thrust washer
- **b -** Hub bushing
- **c -** Drive sleeve
- **d -** Propeller
- **e -** Drive sleeve adapter
- **f -** Locknut retainer
- **g -** Locknut
- **h -** Raised pins
- **i -** Tabs bent against the locknut

Bravo Two Propeller Removal

⚠ WARNING

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

1. Place a wood block between the propeller blade and anti-ventilation plate to prevent rotation. Straighten bent tabs on tab washer.
2. Turn propeller shaft nut counterclockwise to remove nut.
3. Slide tab washer, spline washer, propeller, and thrust hub off propeller shaft.

Bravo Two Propeller Installation

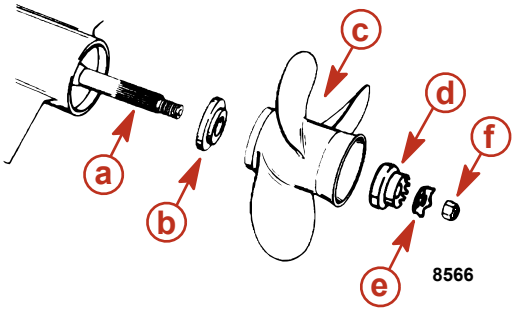
IMPORTANT: The selected propeller's rotation must match the forward gear direction of propeller shaft rotation.

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

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

NOTE: *Extreme Grease is for saltwater applications only.*

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



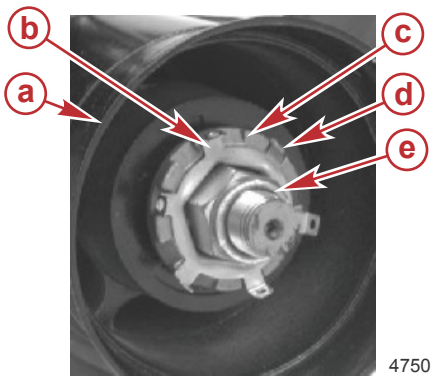
Bravo Two

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

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

Description	Nm	lb-in.	lb ft
Bravo Two propeller nut	81	–	60
	Then align tabs with grooves		

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



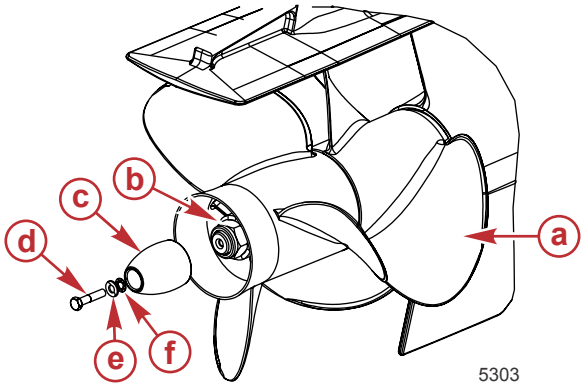
- **a -** Propeller
- **b -** Tab washer
- **c -** Drive sleeve adapter
- **d -** Tab bent down
- **e -** Propeller nut

Bravo Three Propeller Removal

⚠ WARNING

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

1. Place a wood block between the propeller blades and the anti-ventilation plate to prevent rotation.
2. Remove the bolt and washers securing the propeller shaft anode.
3. Remove the propeller shaft anode.

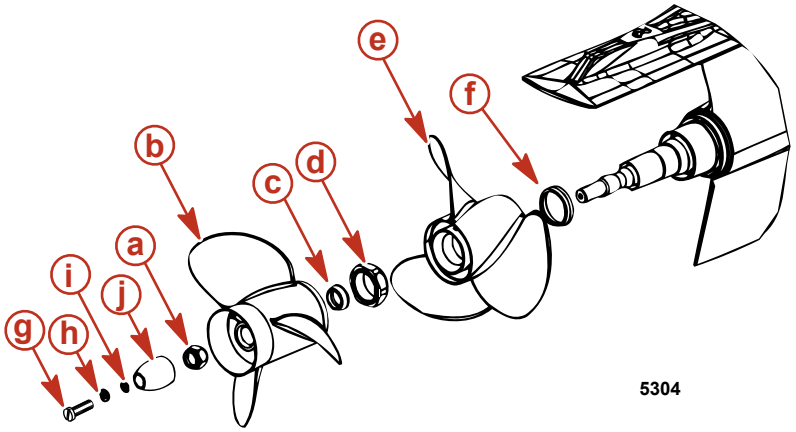


5303

- **a -** Propeller
- **b -** Rear propeller nut
- **c -** Propeller shaft anode
- **d -** Propeller shaft anode screw
- **e -** Flat washer
- **f -** Star washer

4. Turn the rear propeller nut 37 mm (1-7/16 in.) counterclockwise to remove the nut.
5. Slide the propeller and thrust hub off the propeller shaft.
6. Turn the front propeller nut 70 mm (2-3/4 in.) counterclockwise to remove the nut.
7. Slide the propeller and thrust hub off the propeller shaft.

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



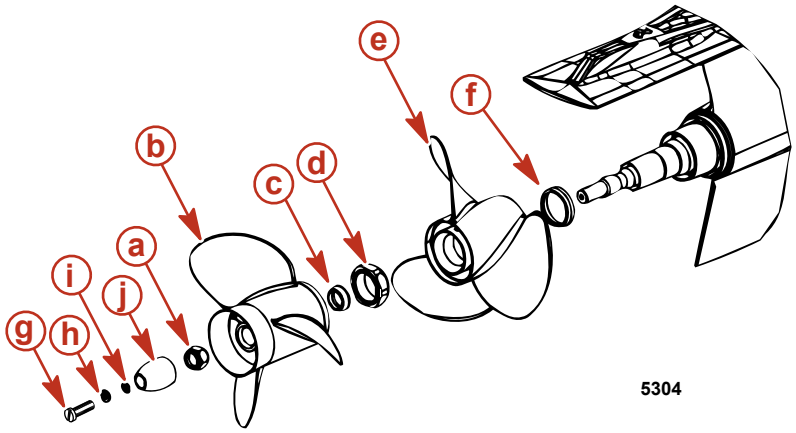
5304

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

Bravo Three Propeller Installation

NOTICE

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



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

1. Slide the front propeller thrust hub onto the propeller shaft with the outside taper facing toward the propeller hub (toward end of propeller shaft).
2. Apply a liberal amount of one of the following lubricants to the propeller shaft.

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

3. Align the splines and install the front propeller onto the propeller shaft.
4. Install the front propeller nut and tighten to the specified torque. Check the propeller every 20 hours of operation and tighten to the specified torque as needed.

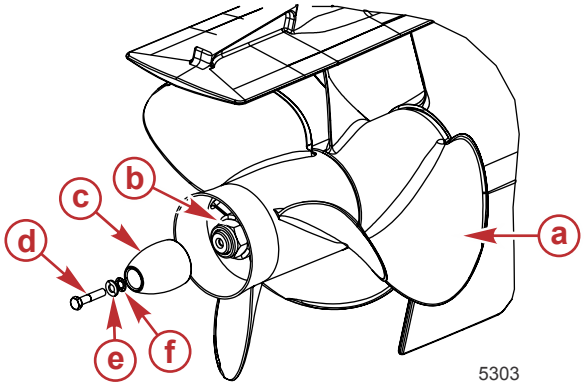
Description	Nm	lb-in.	lb-ft
Front propeller nut	136	–	100

5. Slide the rear thrust hub onto the propeller shaft with the outside taper facing toward the propeller hub (toward end of propeller shaft).
6. Align the splines and install the rear propeller onto the propeller shaft.
7. Install the rear propeller nut and tighten to the specified torque. Check the propeller every 20 hours of operation and tighten to the specified torque as needed.

Description	Nm	lb-in.	lb-ft
Rear propeller nut	81	–	60

8. Install the propeller shaft anode over the rear propeller nut.
9. Place the flat washer onto the propeller shaft anode screw.
10. Place the star washer onto the propeller shaft anode screw.

11. Apply Loctite 271 Threadlocker onto the propeller shaft anode screw threads.



- **a -** Propeller
- **b -** Rear propeller nut
- **c -** Propeller shaft anode
- **d -** Propeller shaft anode screw
- **e -** Flat washer
- **f -** Star washer

Tube Ref No.	Description	Where Used	Part No.
7	Loctite 271 Threadlocker	Propeller shaft anode screw threads	92-809819

12. Secure the propeller shaft anode to the propeller shaft with the propeller shaft anode screw and washers. Tighten the anode screw to the specified torque.

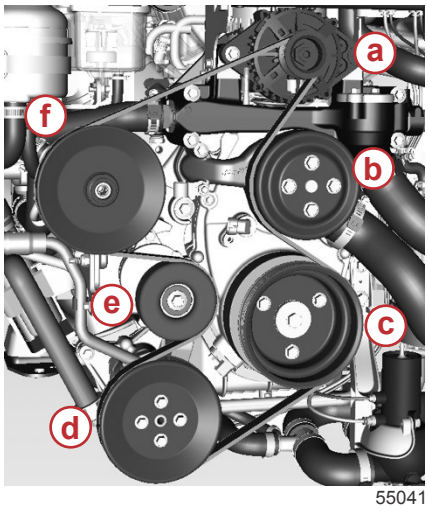
Description	Nm	lb-in.	lb-ft
Propeller shaft anode screw 38 mm (0.3125-18 x 1.5 in.) long	27	–	20

Serpentine Drive Belt

Serpentine Drive Belt Routing

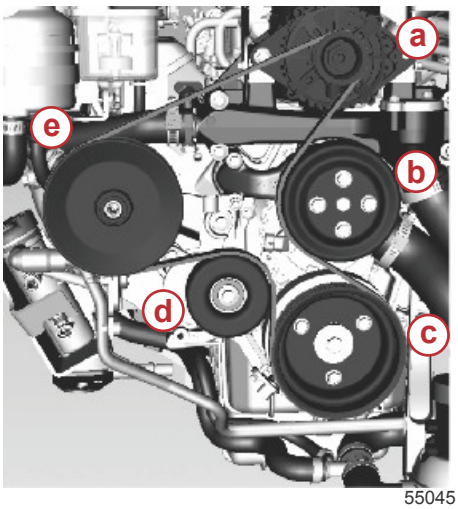
⚠ WARNING

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.



With a seawater pump

- **a -** Alternator pulley
- **b -** Water circulating pump pulley
- **c -** Crankshaft pulley
- **d -** Seawater pump pulley
- **e -** Belt tensioner
- **f -** Power steering pump pulley

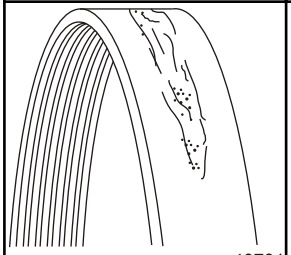
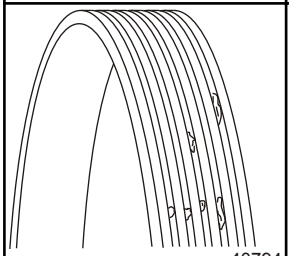
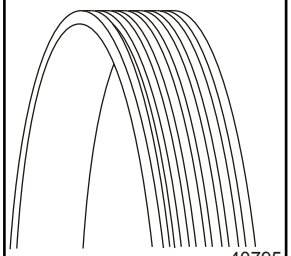
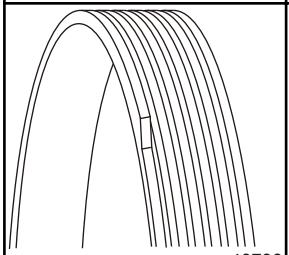


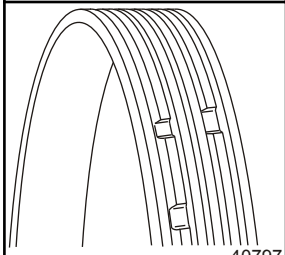
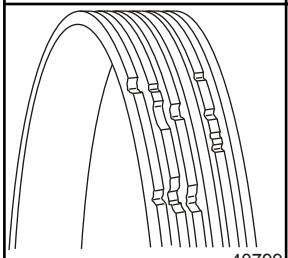
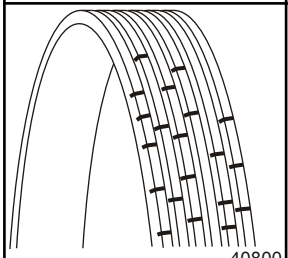
55045

Without a seawater pump

- **a -** Alternator pulley
- **b -** Water circulating pump pulley
- **c -** Crankshaft pulley
- **d -** Belt tensioner
- **e -** Power steering pump pulley

Serpentine Belt Failure Identification

Appearance	Description	Cause	Solution
 40791	**Abrasion** Each side of the belt appears shiny or glazed. Severe condition: Fabric is exposed.	Belt is in contact with an object. Can be caused by improper belt tension or tensioner failure.	Replace the belt and inspect for contact with an object. Verify the belt tensioner is functioning.
 40794	**Pilling** Belt material is sheared off from the ribs and builds up in the belt grooves.	There are a number of causes including lack of tension, misalignment, worn pulleys, or a combination of these factors.	When pilling leads to belt noise or excess vibration, the belt should be replaced.
 40795	**Improper install** The belt ribs begin separating from the joined strands. If left unattended, the cover will often separate, causing the belt to unravel.	Improper belt installation is a common cause of premature failure. One of the outermost belt ribs is placed outside the pulley groove, causing a belt rib to run without a supporting or aligning pulley groove.	The belt life has been severely limited and should be replaced immediately. Ensure all ribs of the replacement belt fit into the pulley grooves. Run the engine. Then, with the engine off and battery disconnected, inspect the belt for proper installation.
 40796	**Misalignment** Sidewalls of the belt may appear glazed or the edge-cord may become frayed and the ribs are removed. A noticeable noise may result. In severe cases, the belt can jump off the pulley.	Pulley misalignment. Misalignment forces the belt to kink or twist while running, causing premature wear.	Replace the belt and verify the alignment of the pulley.

Appearance	Description	Cause	Solution
 40797	**Chunk-out** Pieces or chunks of rubber material have broken off the belt. When chunk-out has occurred, a belt can fail at any moment.	Chunk-out can happen when several cracks in one area move parallel to the cord line. Heat, age, and stress are the primary contributors.	Replace the belt immediately.
 40799	**Uneven rib wear** Belt shows damage to the side with the possibility of breaks in the tensile cord or jagged edged ribs.	A foreign object in the pulley can cause uneven wear and cut into the belt.	Replace the belt and inspect all pulleys for foreign objects or damage.
 40800	**Cracking** Small visible cracks along the length of a rib or ribs.	Continuous exposure to high temperatures, the stress of bending around the pulley leads to cracking. Cracks begin on the ribs and grow into the cord line. If three or more cracks appear in a three-inch section of a belt, eighty percent of the life is gone.	Replace the belt immediately.

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.*

Checking

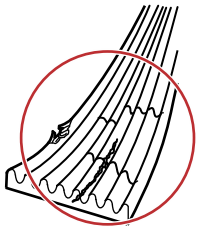
Inspect the drive belt for:

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

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

Description	
Deflection	13 mm (1/2 in.)

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



21062

Replacing

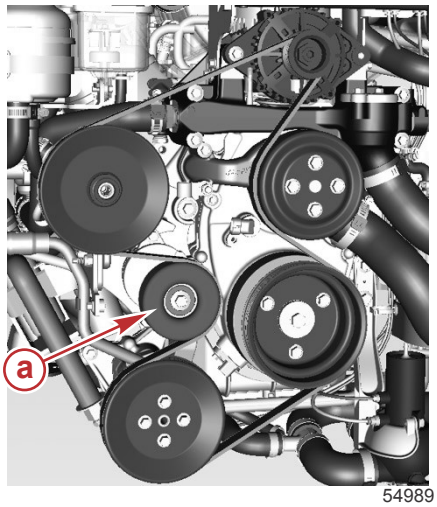
IMPORTANT: If the belt is removed and is found to be in acceptable condition to use, you must install it in the same direction of rotation as before.

NOTE: *All power packages have a decal on the front of the engine. The decal shows the serpentine belt routing. Refer to the decal when installing the serpentine belt.*

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

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

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



Standard cooling shown, closed cooling similar

a - Belt tensioner

3. Inspect the belt for damage and replace as necessary.
4. Route the belt according to the diagram on the decal.
5. Carefully release the tensioner and ensure that the belt stays positioned properly.
6. Check the belt tension.

   NOTE: *Proper tension is a measurement of deflection with moderate thumb pressure on the belt at the location that has the longest distance between two pulleys.*

Description	
Deflection	13 mm (½ in.)

Corrosion Protection

Corrosion Information

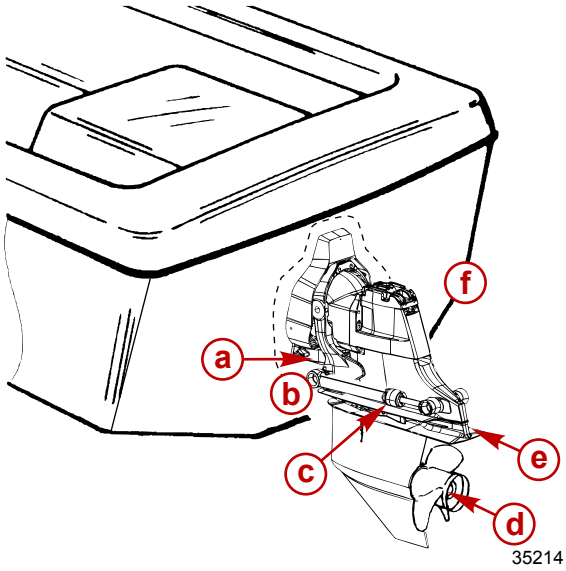
Whenever two or more dissimilar metals are submerged in a conductive solution, such as saltwater, polluted water or water with a high mineral content, a chemical reaction takes place causing electrical current to flow between metals. The electrical current flow causes the metal that is most chemically active, or anodic, to erode. This is known as galvanic corrosion. For more information contact your authorized Mercury MerCruiser dealer.

Maintaining Ground Circuit Continuity

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

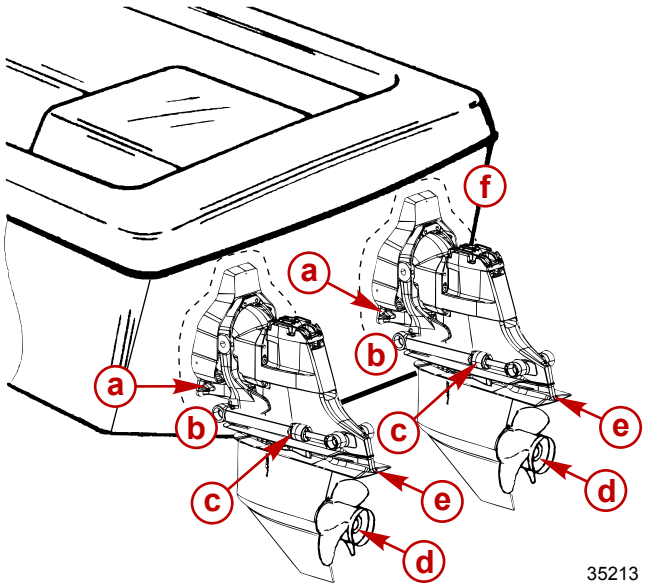
Sterndrive Corrosion Protection Components

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



Typical single sterndrive

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



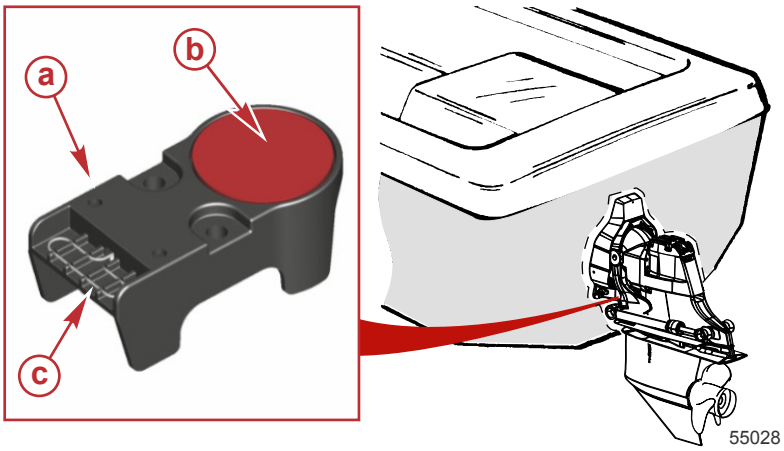
Dual sterndrive

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

NOTICE

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

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



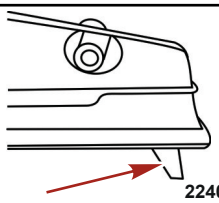
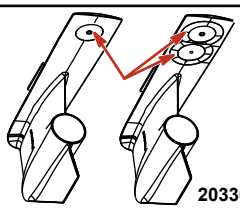
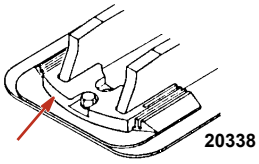
MerCathode mounted to the underside of the gimbal housing, if equipped

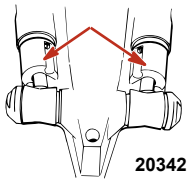
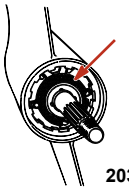
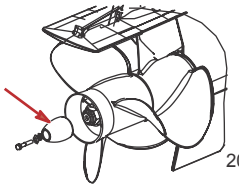
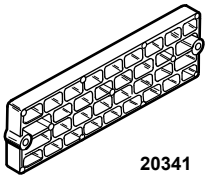
- **a -** MerCathode reference electrode, if equipped
- **b -** Do not paint
- **c -** Do not pressure wash

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

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

MerCathode system—The electrode assembly, if equipped, replaces the anode block. The system should be monitored to ensure adequate output. After the boat has been moored for a minimum of eight hours, inspect the MerCathode control module LED for a visual indication on the state of protection. Refer to **MerCathode Theory of Operation**.

Description	Location	Figure
Alpha sterndrive gearcase anodic plate	Mounted on the underside of the lower gearcase.	 22405
Alpha sterndrive gimbal housing anode	Mounted on the underside of the gimbal housing.	 53380
Bravo sterndrive gearcase anode plate	Mounted on the underside of the lower gearcase.	 20336
Alpha and Bravo sterndrive ventilation plate anode	Mounted on the front of the gearcase.	 20338

Description	Location	Figure
Alpha and Bravo sterndrive trim cylinder anodes	Mounted on each of the trim cylinders.	 20342
Alpha and Bravo sterndrive bearing carrier anode	Located in front of the propeller, between the front side of the propeller and the gear housing.	 20343
Propshaft anode (Bravo Three)	Located behind the aft propeller.	 20344
MerCathode System	The MerCathode electrode, if equipped, is mounted to the underside of the gimbal housing. The MerCathode controller is mounted on the engine or on the boat transom. The controller harness connects to the electrode harness.	 20340
Anode kit (if equipped)	Mounted to the boat transom.	 20341

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

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

MerCathode System Battery Requirements

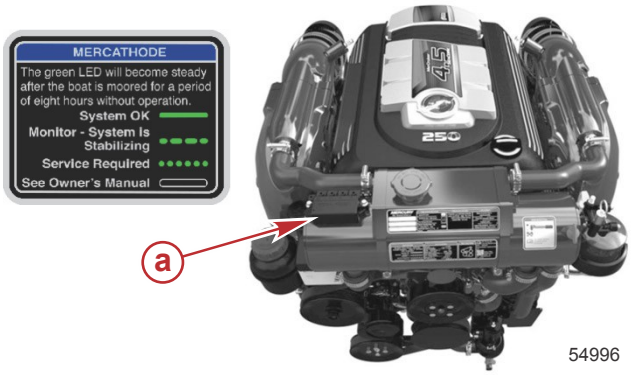
The Mercury MerCruiser MerCathode system requires a minimum battery charge of 12.6 volts at all times to maintain functionality.

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

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

MerCathode Control Module

The MerCathode control module is mounted on the front of the engine. A decal near the control module is a quick reference to identify the operation condition of the control module. Refer to **MerCathode Theory of Operation** for a thorough explanation on the state of protection the MerCathode is providing and whether or not the system requires inspection by an authorized Mercury MerCruiser dealer.



Closed cooling

a - MerCathode control module

Standard cooling

a - MerCathode control module LED

MerCathode Theory of Operation

The MerCathode system provides corrosion protection by impressing a reverse blocking current that stops the destructive flow of galvanic currents. The MerCathode controller will regulate output to maintain 0.94 volts at the reference electrode.

A constant LED indicates that the system is operating correctly. A flashing LED indicates that a fault has occurred, or that an abnormal condition exists.

IMPORTANT: When a boat or new drive is first put into service, the LED may initially indicate that the protective current is not being supplied through the MerCathode anode. This condition is normal, and, in such cases, the LED may flash for a period. The light from the LED will become steady after the boat is moored for a period of eight hours without operation.

MerCathode LED Codes

MerCathode LED	Definition	Required Action
Solid green	No fault. The controller is working properly.	No action is necessary. This is the normal LED indication for a properly functioning MerCathode system.
2 flashes per second	There is an open or short in the reference electrode/anode, a high temperature, or a sensed reference electrode voltage in excess of 1.4 V.	The system is not operating correctly. Contact your local Mercury Service dealer for assistance.
1 flash per 4 seconds	The reference voltage is outside of the normal, expected range: either above 1.04 V or below 0.86 V.	The system is stabilizing. Monitor it for further change.
LED not on	There is no power to the controller or both the reference electrode and anode are open.	• If the boat is out of the water, no action is necessary. • Check the battery voltage; it must be 9 V or higher. • Check the 5-amp fuse in the controller wire harness. • If further assistance is required, contact your local Mercury Service dealer.

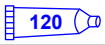
Do Not Use Caustic Cleaning Chemicals

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.

Power Package Exterior Surfaces

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

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

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

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

Boat Bottom Care

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

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

Painting Your Power Package

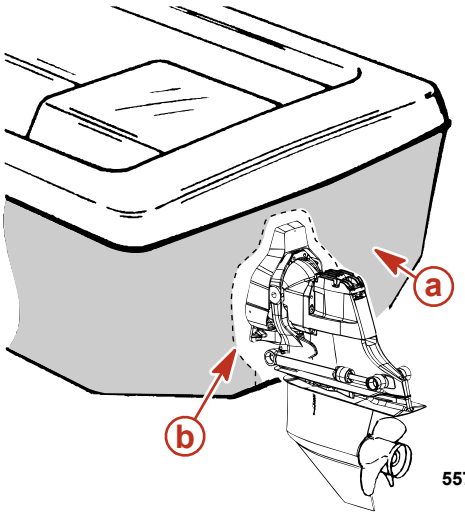
IMPORTANT: Corrosion damage that results from the improper application of antifouling paint will not be covered by the limited warranty.

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

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

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

- Avoid any electrical interconnection between the paint and the Mercury MerCruiser product, anodic blocks, or MerCathode system by allowing a minimum of 40 mm (1.5 in.) unpainted area on the transom of the boat around these items.



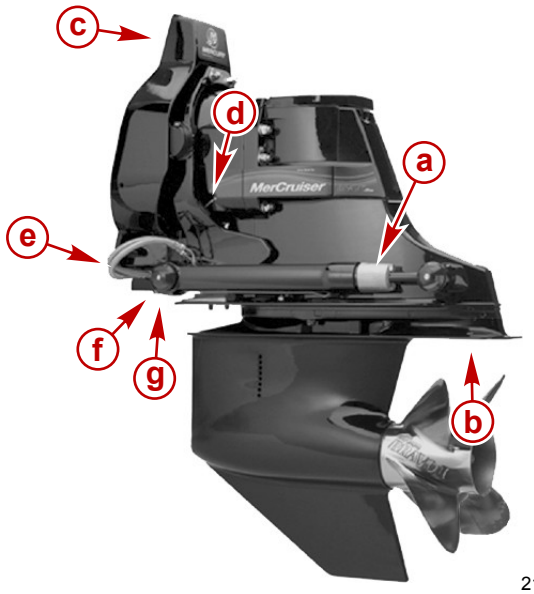
a - Painted boat transom
b - Unpainted area on transom

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

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

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

Sterndrive Surface Care



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

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

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

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

- Spray all electrical connections with sealant.

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

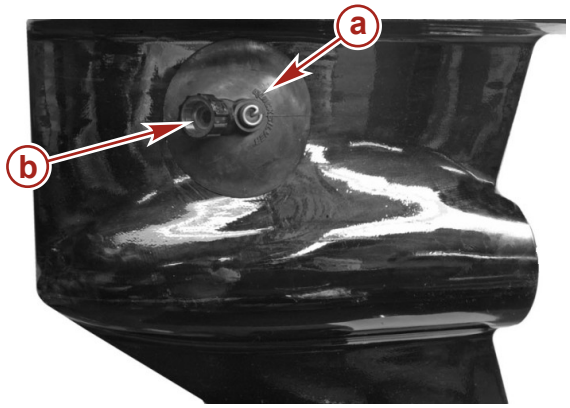
- Inspect the sacrificial trim tab or anode plate if equipped, at regular intervals and replace it before it is half gone. If a stainless steel propeller is installed, additional anodes or a MerCathode system will be required.
- Inspect the propeller shaft for fishing line, which can cause corrosion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

Important Information About Flushing Procedures

MerCruiser sterndrive and inboard engines are used in many different vessels for a variety of recreational and commercial applications. Choosing the correct flushing procedure for your engine will depend on the engine model, and in some cases the marine hardware and cooling system water supply features provided by the boat manufacturer.

Contact your authorized Mercury MerCruiser dealer for information about the best flushing procedure for your engine and boat model.

Flushing Attachments



21515

Flushing attachments for side water pickup
a - Flushing device
b - Hose attachment

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

Flushing the Power Package (Alpha Models)

Alpha Models with Standard Cooling

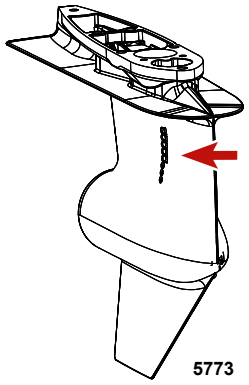
⚠ WARNING

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.

Sterndrive Water Pickups

This sterndrive is equipped with side water pickups. Side pickups require the flushing attachment (44357Q 2).

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



Side pickup

NOTE: *Flushing is required for salty, brackish, mineral-laden, or polluted water applications. Flush the engine after each outing for best results.*

1. Remove the propeller.
2. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
3. Lower the sterndrive to the full down/in position.
4. Connect the hose between the flushing attachment and the water source.
5. With the sterndrive in normal operating position, open the water source completely.
6. Place the remote control in the neutral idle speed position and start the engine.

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

7. Press the throttle only button and slowly advance the throttle until the engine reaches 1300 RPM (± 100 RPM).
8. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
9. With the sterndrive in neutral, operate the engine for at least 10 minutes.
10. Slowly return the throttle to the idle speed position.
11. Stop the engine.
12. Shut off the water and remove the flushing attachment.
13. Raise the sterndrive to the full up/out position.
14. Install the propeller.

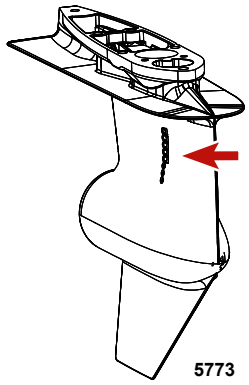
Alpha Models with Closed Cooling

IMPORTANT: Alpha models equipped with closed cooling have a sea pump on the engine and a through-the-hull or transom-mounted seawater pickup that supplies water to the engine. The water inlet on the gearcase housing supplies water to the water pump in the sterndrive and is necessary for drive cooling, but does not supply water to the engine on models with closed cooling. Models with closed cooling use a block-off plate on the gimbal housing. Water flow from the sterndrive water pump is discharged at the transom assembly.

IMPORTANT: Installations using block off plates at the gimbal housing that use a through-the-hull or through-the-transom pickup still require a supply of cooling water for both the sterndrive and the engine during operation.

Sterndrive Water Pickups

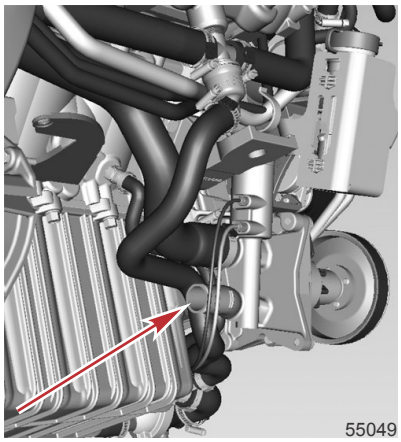
This sterndrive is equipped with side water inlets. Use flushing attachment (44357Q 2) for the side water inlets on the gearcase housing.



Side water pickup

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

1. Close the seacock, if equipped. Do not remove hoses from through-the-hull fittings that are not equipped with seacocks.
2. Supply water to the engine seawater pump by removing the hose from the seacock or engine seawater pump at the location shown.
3. Use a suitable adapter and connect the flushing hose from the water source to the water inlet of the seawater pump.



Seawater inlet hose connection

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.

4. Remove the propeller.
5. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
6. Lower the sterndrive to the full down/in position.
7. Connect the hose between the flushing attachment and the water source.
8. With the sterndrive in normal operating position, open the sterndrive water source.
9. Open the engine sea pump water source.
10. 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.

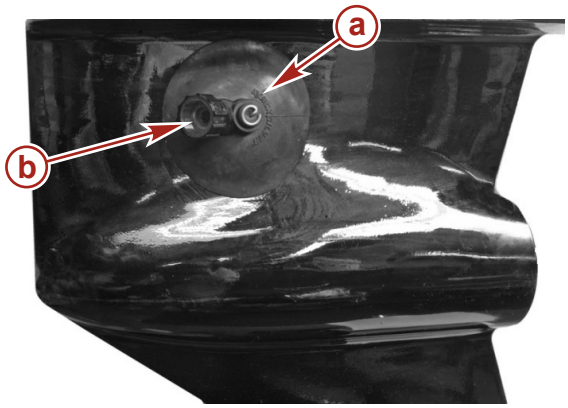
11. Press the throttle only button and slowly advance the throttle until the engine reaches 1300 RPM (± 100 RPM).
12. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
13. With the sterndrive in neutral, operate the engine for at least 10 minutes.
14. Slowly return the throttle to the idle speed position.
15. Stop the engine.
16. Shut off the sterndrive water source, and remove the flushing attachment.
17. Shut off the engine seawater pump water source.
18. Raise the sterndrive to the full up/out position.
19. Install the propeller.
20. Connect the engine seawater pump hose to the sea pump and seacock.
21. Open the seacock before starting the engine.

Flushing the Power Package—Bravo Models

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

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

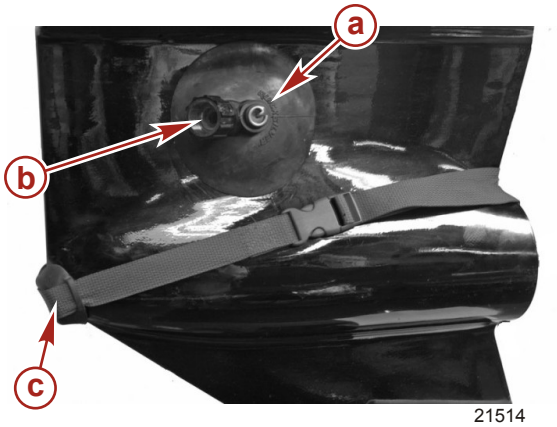
Flushing Attachments



21515

Flushing attachments for side water pickup

- **a -** Flushing device
- **b -** Hose attachment



21514

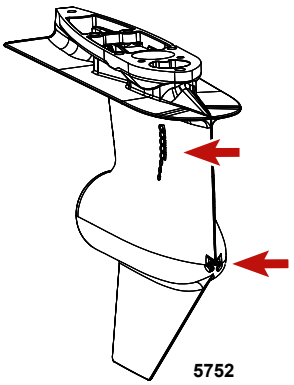
Flushing attachments for dual water pickup

- **a -** Flushing device
- **b -** Hose attachment
- **c -** Dual water pickup flush gearcase seal kit

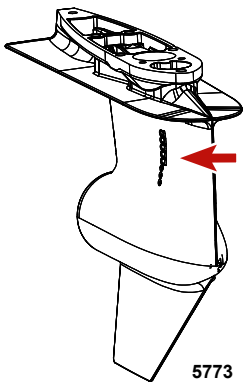
Flushing Device	91-44357Q 2
 9192	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.
Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1
 9194	Blocks off the front water inlet holes on the dual water inlet gearcases.

Sterndrive Water Pickups

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



Dual water pickup



Side water pickup

NOTE: *Flushing is only required after operation in salty, brackish, mineral-laden, or polluted water. Flushing is required after each outing for best results.*

1. On models with the sterndrive seawater inlet blocked, supply water to the sterndrive and to the engine. Refer to **Alternative Water Pickups**.
2. On models using the sterndrive seawater inlet and a through-the-hull or through-the-transom alternative water pickup, supply water only to the sterndrive by taking the following steps to block off, or disconnect and plug the hose from the alternative seawater pickup pump inlet Y-fitting.
   a. If equipped with a seacock, close the seacock on the hose from the alternative water pickup.
   b. If not equipped with a seacock, disconnect the hose from the alternative water pickup and plug both ends.
3. On models using the sterndrive water pickups for water supply: proceed to Step 4 or Step 5.
4. If flushing the cooling system with the boat in the water:
   a. Raise the sterndrive to the trailer position.
   b. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
   c. Lower the sterndrive to the full down (in) position.

5. If flushing the cooling system with the boat out of the water:

⚠ WARNING

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

   a. Engage the E-stop switch and remove the propeller.
   b. Lower the sterndrive to the full down (in) position.
   c. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
6. Connect the hose between the flushing attachment and the water source.
7. With the sterndrive in a normal operating position, open the water source fully.
8. Disengage the E-stop switch, 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.

9. Press the throttle only button and slowly advance the throttle until the engine reaches 1300 RPM (± 100 RPM).
10. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
11. With the sterndrive in neutral, operate the engine for at least 10 minutes.
12. Slowly return the throttle to the idle speed position.
13. Stop the engine.
14. Shut off the water.
15. If the boat is moored in the water, remove the seawater inlet hose from the seawater pump and plug the hose to prevent water from siphoning into the engine.
16. Remove the flushing attachment.
17. Tag the ignition switch with an appropriate tag requiring the seawater inlet hose to be connected prior to operating the engine.
18. Install the propeller.

Alternative Water Pickups

IMPORTANT: Two water sources are needed for this procedure.

NOTE: *Flushing is only required after operation in salty, brackish, mineral-laden, or polluted water. Flushing is required after each outing for best results.*

IMPORTANT: When flushing Bravo model engines out of the water, you must have a supply of cooling water available to both the sterndrive and to the engine during operation.

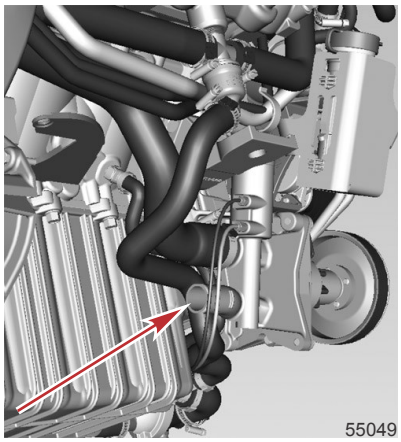
1. If flushing the cooling system with the boat in the water:
   a. Raise the sterndrive to the trailer position.
   b. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
   c. Lower the sterndrive unit to full down (in) position.
2. If flushing the cooling system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

⚠ WARNING

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

   a. Engage the lanyard stop switch and remove the propeller.
   b. Lower the sterndrive to full down (in) position.
   c. Install the appropriate flushing attachment over the water inlet holes in the gear housing.
3. Connect the hose between the flushing attachment and the water source.
4. Close the seacock, if equipped, to prevent water from siphoning into the engine or boat.

5. Remove the seawater inlet hose from the seawater pump at the location shown. Plug the hose to prevent water from siphoning into the engine or boat.



Seawater inlet hose connection

6. Use a suitable adapter to connect the flushing hose from the water source to the water inlet of the seawater pump.

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.

7. With the sterndrive in a normal operating position, open the water source fully.
8. 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.

9. Slowly advance the throttle until the engine reaches 1300 RPM (± 100 RPM).
10. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
11. With the sterndrive in neutral, operate the engine for at least 10 minutes.
12. Slowly return the throttle to the idle speed position.
13. Stop the engine.
14. Shut off the water and remove the flushing attachments.
15. If the boat is out of the water, install the water inlet hose to the aft side of the seawater pump. Tighten the hose clamp securely.
16. Install the propeller.
17. If the boat is moored in the water, tag the ignition switch with an appropriate tag requiring the seawater inlet hose to be connected prior to operating the engine.

SeaCore Power Package Flushing Procedure

NOTE: *Flushing is only required after operation in salty, brackish, mineral-laden, or polluted water. Flushing is required after each outing for best results.*

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

Models Using the Sterndrive Water Pickup

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

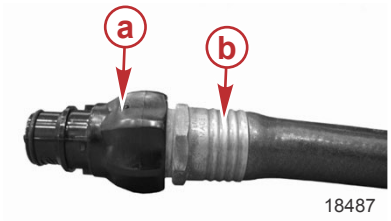
IMPORTANT: Do not allow the engine to pull air or seawater from alternative water pickup sources during the flushing procedure. If equipped, ensure that all alternative water inlet hoses are plugged at both ends.

1. Remove the boat from the water.

⚠ WARNING

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

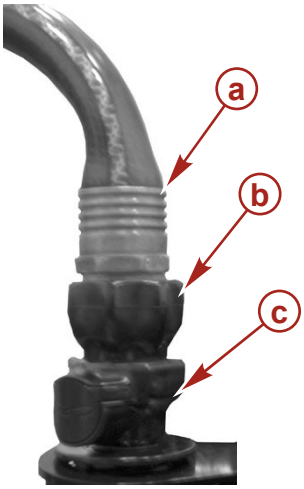
2. Engage the lanyard stop switch and remove the propeller.
3. Remove the quick-connect fitting from the parts bag supplied with the engine.
4. Attach the quick-connect fitting to a water hose.



18487

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

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



18489

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

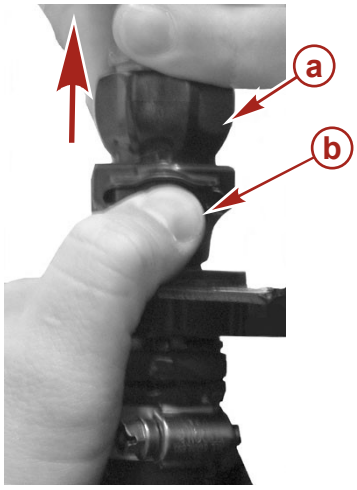
6. Open the water source of the water hose to a full flow.
7. Allow the water to flush the sterndrive for 30 seconds.
8. Place the remote control in neutral idle speed position.
9. Disengage the lanyard stop switch and start the engine.

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.

10. Slowly advance the throttle until the engine reaches 1300 RPM (± 100 RPM).
11. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
12. With the sterndrive in neutral, operate the engine for at least 10 minutes.
13. Slowly return the throttle to the idle speed position, shut off the engine, and engage the lanyard stop switch.
14. Allow the water to flush the sterndrive for 10 seconds.
15. Turn off the water source.

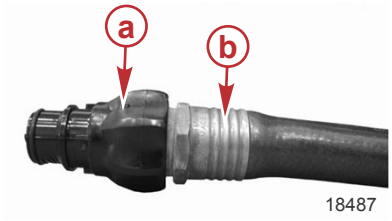
16. Press the release button on the flush socket to disconnect the quick-connect fitting and water hose from the engine.



18488

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

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



18487

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

18. Store the quick-connect fitting on the boat for easy access.

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


63788

Quick-connect fitting: store on the boat, NOT the engine

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

18490

Dust cover installed in the flush socket
a - Dust cover
b - Flush socket

20. Install the propeller.

Notes:

Section 5 - Storage

Table of Contents

5

Draining the Seawater System

Draining the Raw Water

⚠ CAUTION

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

IMPORTANT: Only drain the raw water section of the closed cooling system. Raw water is sometimes referred to as seawater.

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

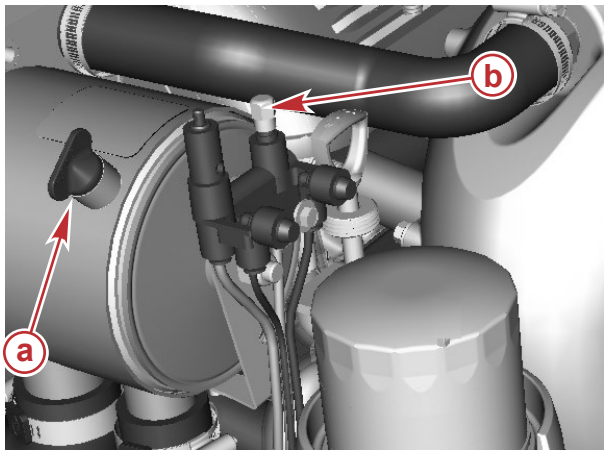
IMPORTANT: The engine must not be operating at any point during the draining procedure.

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

Air Actuated Single-Point Drain System—Closed Cooling

The following instructions apply to draining procedures performed on engines in vessels that are in the water. For vessels that are not in the water, you do not need to close the seacock (if equipped) or remove and plug the water inlet hose.

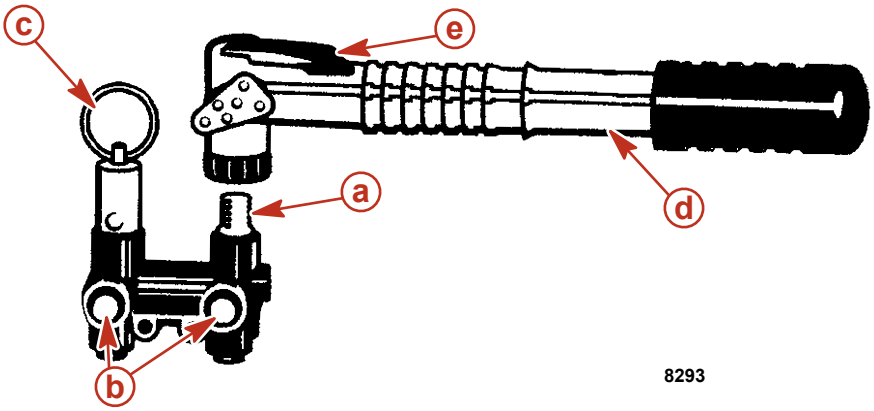
1. Close the seacock (if equipped) or remove and plug the water inlet hose.
2. Remove the blue plug from the heat exchanger.
3. Remove the cap from the air actuated valve assembly.



55099

a - Blue plug
b - Cap

4. Ensure that the lever on top of the pump is flush with the handle (horizontal).
5. Install the air pump on the actuator fitting.
6. Pull the lever on the air pump (vertical) to lock the pump onto the fitting.

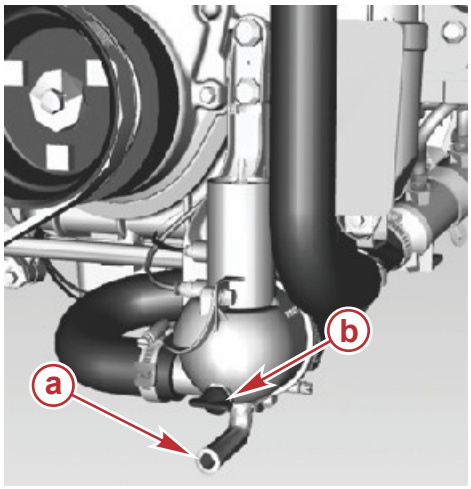


8293

a - Actuator fitting
b - Green indicators
c - Manual release valve
d - Air pump
e - Lever (locking)

7. Pump air into the system until both green indicators extend out of the actuator assembly.
8. Check to ensure water drains out of the distribution housing.

IMPORTANT: If water does not drain from the distribution housing when both green indicators are extended, remove the blue plug on the distribution housing.

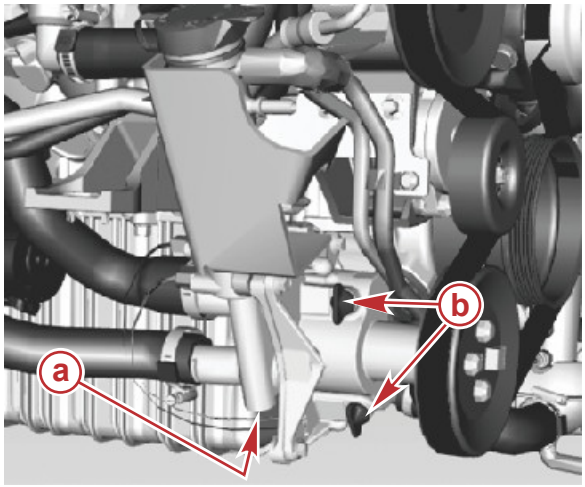


55101

a - Distribution housing water drain
b - Blue plugs

9. Check to ensure water drains out of the seawater pump housing.

   IMPORTANT: If water does not drain from the seawater pump housing when both green indicators are extended, remove the blue plugs on the seawater pump housing.

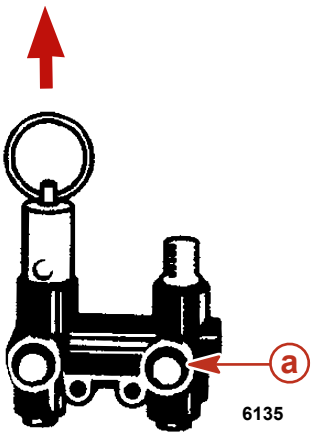


56033

a - Seawater pump housing water drain
b - Blue plugs

10. Allow the system to drain for a minimum of ten minutes. Pump air as necessary to keep the green indicators extended.
11. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pump. Do not allow the engine to start.
12. After the water has drained from the engine, install the blue plugs on the distribution housing and seawater pump if they were removed and tighten securely.
13. Push the locking lever down on the air pump and remove the pump from the air actuator assembly. Install the cap on the fitting.
14. Install the blue plug on the heat exchanger and tighten securely.
15. The drain system should remain open while transporting the boat or while performing other maintenance. This helps ensure that all water is drained.

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



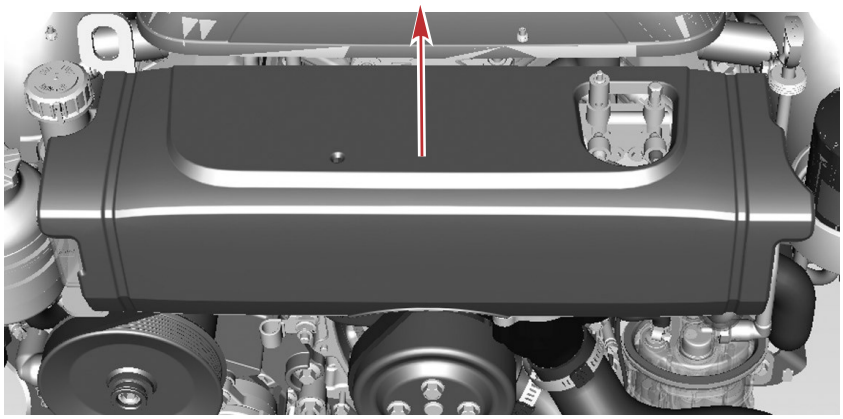
a - Green indicators

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

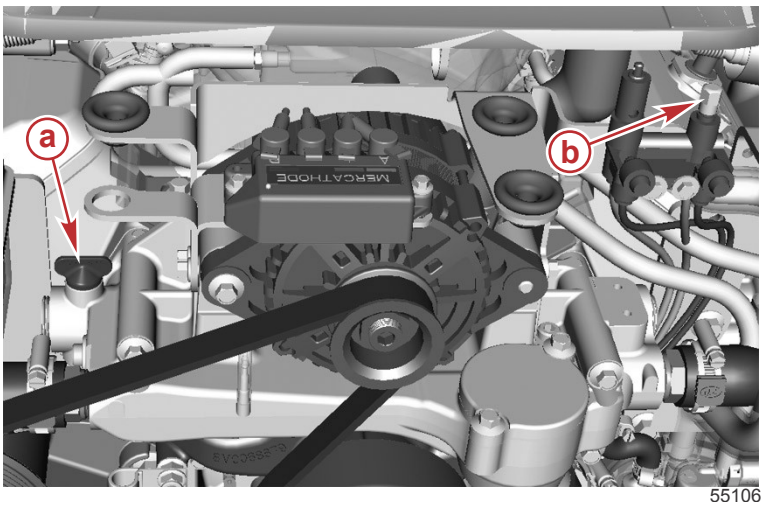
Air Actuated Single-Point Drain System (Bravo Standard Cooling)

The following instructions apply to draining procedures performed on engines in vessels that are in the water. For vessels that are not in the water, you do not need to close the seacock (if equipped) or remove and plug the water inlet hose.

1. Close the seacock (if equipped) or remove and plug the water inlet hose.
2. Remove the engine front cover by pulling it up.


55105

3. Remove the blue plug from the engine block crossover.
4. Remove the cap from the air actuated valve assembly.

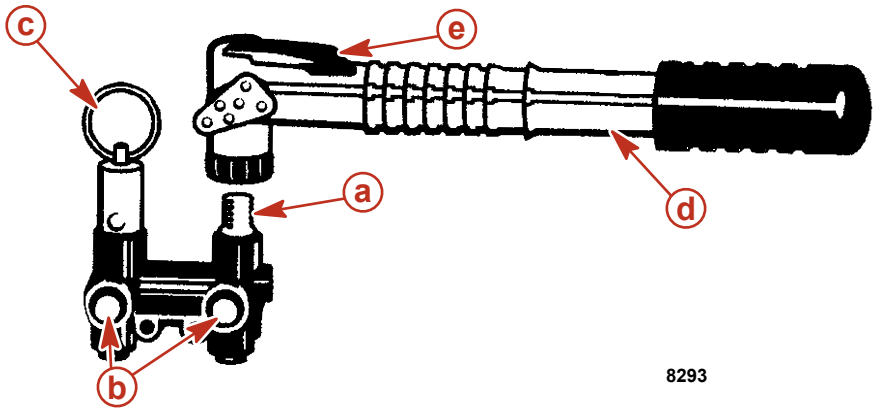


55106

a - Blue plug
b - Cap

5. Ensure that the lever on top of the pump is flush with the handle (horizontal).

6. Install the air pump on the actuator fitting.
7. Pull the lever on the air pump (vertical) to lock the pump onto the fitting.

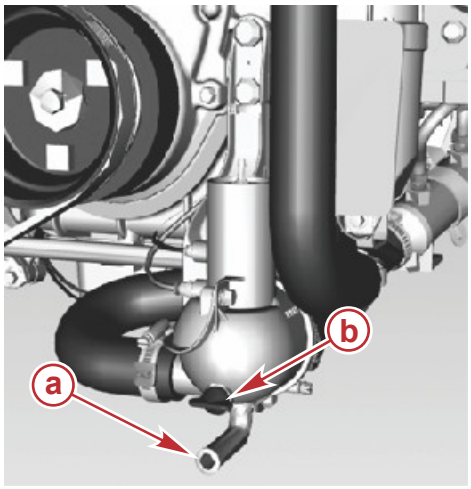


8293

a - Actuator fitting
b - Green indicators
c - Manual release valve
d - Air pump
e - Lever (locking)

8. Pump air into the system until both green indicators extend out of the actuator assembly.
9. Water should begin to drain out of the distribution housing.

IMPORTANT: If water does not drain from the distribution housing when both green indicators are extended, remove the blue plug on the distribution housing and the seawater pump housing.

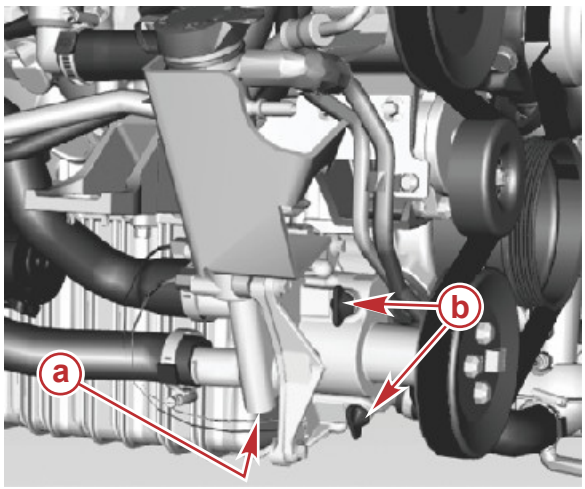


55101

a - Distribution housing water drain
b - Blue plugs

10. Check to ensure water drains out of the seawater pump housing.

IMPORTANT: If water does not drain from the seawater pump housing when both green indicators are extended, remove the blue plugs on the seawater pump housing.

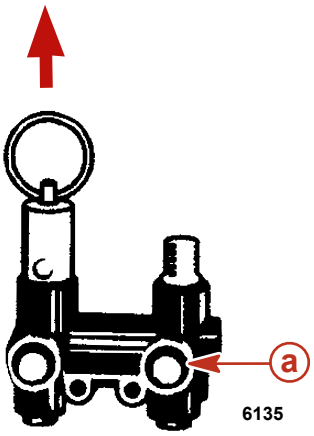


56033

a - Seawater pump housing water drain
b - Blue plugs

11. Allow the system to drain for a minimum of ten minutes. Pump air as necessary to keep the green indicators extended.

12. Crank the engine over slightly with the starter motor to purge any water trapped in the seawater pump. Do not allow the engine to start.
13. After the water has drained from the engine, install the blue plugs on the distribution housing and seawater pump if they were removed and tighten securely.
14. Push the locking lever down on the air pump and remove the pump from the air actuator assembly. Install the cap on the fitting.
15. Install the blue plug on the heat exchanger and tighten securely.
16. Mercury MerCruiser recommends the drain system remain open while transporting the boat or while performing other maintenance. This helps ensure that all water is drained.
17. Before launching the boat, pull up on the manual release valve. Verify that the green indicators are no longer extended.



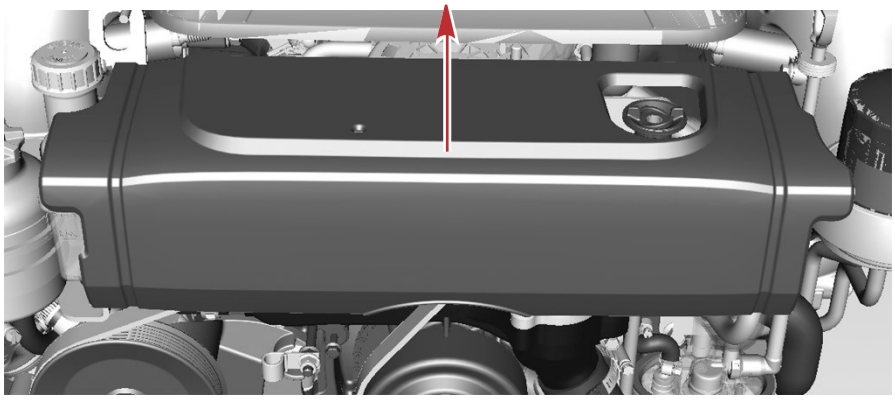
a - Green indicators

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

Manual Single-Point Drain System (Alpha Standard Cooling)

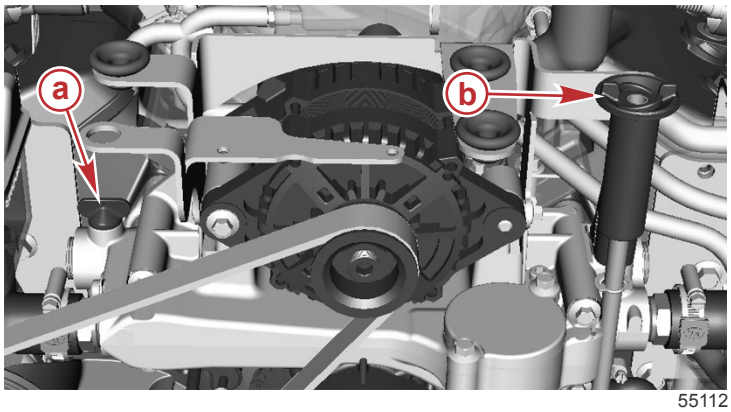
The following instructions apply to draining procedures performed on engines in vessels that are in the water. For vessels that are not in the water, you do not need to close the seacock (if equipped) or remove and plug the water inlet hose.

1. Close the seacock (if equipped) or remove and plug the water inlet hose.
2. Remove the engine front cover by pulling it up.



3. Remove the blue plug from the engine block.

4. Rotate the blue shut-off handle counterclockwise until it stops. The red on the handle shaft indicates the drain is sufficiently open to allow the water to drain from the engine.

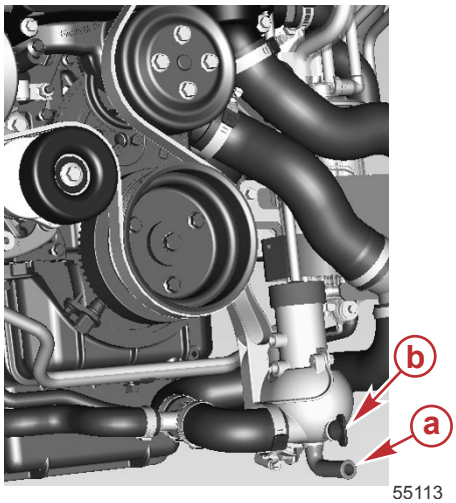


55112

a - Blue plug
b - Blue shut-off handle

5. Water should begin to drain out of the distribution housing.

IMPORTANT: If water does not drain from the distribution housing after opening the blue shut-off handle, remove the blue plug on the distribution housing.



55113

a - Blue plug
b - Distribution housing water drain

6. Allow the system to drain for a minimum of ten minutes or longer.
7. After the water has drained from the engine, install the blue plugs on the distribution housing and engine block if they were removed and tighten them securely.
8. Rotate the blue shut-off handle clockwise until it stops. The handle is fully seated when no red is visible. Do not overtighten the handle.

Cold Weather or Extended Storage

Reformulated (Oxygenated) Gasolines (U.S.A. Only)

This type of gasoline is required throughout most of the U.S.A. There are two types of oxygenates used in fuels: alcohol (ethanol) or ether (MTBE or ETBE). Gasoline containing ethanol is especially subject to absorbing atmospheric moisture, forming gums or solids, or it may separate into a layer of fuel floating on top of a layer of water and alcohol. To reduce the potential for separation, storage should be in containers that prevent oxidation or water vapors mixing. If ethanol is used in the gasoline in your area, refer to **Fuel Containing Alcohol**.

Fuels for your Mercury Marine engine may contain up to 10% of ethanol or ether.

Fuel Containing Alcohol

Fuels containing either methanol (methyl alcohol) or ethanol (ethyl alcohol) may cause certain adverse effects. These adverse effects are more severe with methanol. Increasing the percentage of alcohol in the fuel can also worsen these adverse effects.

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

The fuel system components on your Mercury Marine engine will withstand up to 10% alcohol content in the gasoline. We do not know what percentage your boat's fuel system will withstand. Contact your boat manufacturer for specific recommendations on the boat's fuel system components (fuel tanks, fuel lines, and fittings). Be aware that gasolines containing alcohol may cause increased:

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

⚠ WARNING

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

Because of possible adverse effects of alcohol in gasoline, only alcohol-free gasoline should be used. If only fuel containing alcohol is available, or if the presence of alcohol is unknown, increased inspection frequency for leaks and abnormalities is required.

IMPORTANT: When operating a Mercury Marine engine on gasoline containing alcohol, storage of gasoline in the fuel tank for long periods should be avoided. Long periods of storage, common to boats, create unique problems. In cars, alcohol-blend fuels normally are consumed before they can absorb enough moisture to cause problems. Conversely, boats may not be used for days, weeks, or months, long enough for phase separation to take place. In addition, internal corrosion may take place during storage if alcohol has washed protective oil films from internal components.

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

NOTICE

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

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

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

Preparing Power Package for Storage—MPI Models

Multipoint fuel injection (MPI) systems must have a special mix of fuel, stabilizer, and lubricant, completely fill the fuel delivery system. This fuel mix stabilizes the fuel and lubricates the fuel pumps, fuel pressure regulator, fuel injectors and, reduces internal oxidation of the fuel system metal components.

IMPORTANT: This special fuel mix can be used on Mercury Marine catalyzed gasoline engines.

Special Fuel Mix

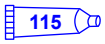
⚠ WARNING

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

⚠ WARNING

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

1. Fill a 23 liter (6 US gal) remote fuel tank with 19 L (5 US gal) regular unleaded 87 octane (90 RON) gasoline.
2. Pour into the remote fuel tank 1.89 L (2 US qt) of Premium Plus 2-Cycle TC-W3 Outboard Oil and 29.5 ml (1 oz) of Mercury Quickstor Fuel Stabilizer.

Tube Ref No.	Description	Where Used	Part No.
	Premium Plus 2-Cycle TC-W3 Outboard Oil	Fuel system	92-858026K01
	Quickstor Fuel Stabilizer	Fuel system	92-8M0047932

3. Install the remote fuel tank cap and ensure the added ingredients are thoroughly mixed with the fuel.

Engine and Fuel System Preparation

⚠ WARNING

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

⚠ WARNING

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

NOTICE

Running out of fuel can damage catalyst components. Do not allow the fuel tanks to become empty during operation.

1. Check the antifreeze concentration where applicable. Refer to the **Specifications** section.
2. Before adding Mercury Quickstor Fuel Stabilizer to the fuel in the tank, determine the type of fuel that is in the fuel tanks and proceed with the following:
   a. Vessels using fuel without alcohol—fill the vessel fuel tanks with fresh gasoline that does not contain alcohol and add a sufficient amount of Mercury Quickstor Fuel Stabilizer to treat the gasoline. Follow the instructions on the container.
   b. Vessels using fuel containing alcohol—drain the fuel tanks as low as possible and add a sufficient amount of Mercury Quickstor Fuel Stabilizer to treat the remaining gasoline. Follow the instructions on the container.
3. Flush the cooling system. Refer to the **Maintenance** section.
4. Supply cooling water to the engine. Refer to the **Maintenance** section.
5. Close the fuel shut off valve, if equipped, or disconnect and plug the boat fuel tank hose.
6. Connect the remote fuel tank with the special fuel mix to the fuel inlet fitting.
7. Start the engine and run the engine at 1300 RPM for five minutes. This is usually enough time for the special fuel mix to circulate through the fuel system. Check to ensure there are no oil leaks. Shut the engine off.

   IMPORTANT: Do not allow the engine to run out of fuel.
8. Disconnect the special fuel mix hose from the inlet fitting. Connect the boat fuel tank hose to the inlet fitting. Open the fuel shut off valve, if equipped.
9. Change the oil and oil filter.
10. Replace the water-separating fuel filter element where applicable.
11. Drain the engine seawater cooling system. Refer to **Draining the Seawater System**.

NOTICE

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

12. Fill the seawater cooling system with propylene glycol mixed to the manufacturer's recommendation to protect the engine to the lowest temperature to which it will be exposed during freezing temperatures or extended storage. This will also prevent the formation of exfoliating rust in the cooling system passages.
13. Tilt the sterndrive to the full down position.
14. Store the battery according to the manufacturer's instructions.

Battery Storage

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

Recommissioning the Power Package

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

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

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

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

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

Section 6 - Troubleshooting

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6

Diagnosing EFI Problems

Your authorized Mercury MerCruiser dealer has the proper service tools for diagnosing problems on electronic fuel injection (EFI) systems. The propulsion control module (PCM) has the ability to detect problems with the system when they occur, and store a trouble code. This code can then be read later by a service technician using a special diagnostic tool.

Diagnosing DTS Problems

Your authorized Mercury MerCruiser dealer has the proper service tools for diagnosing problems on digital throttle and shift (DTS) systems. The propulsion control module (PCM) has the ability to detect problems with the system when they occur, and store a trouble code. This code can then be read later by a service technician using a special diagnostic tool.

Additional Operation Instructions for Joystick Piloting Sterndrive (JPS)

Refer to the **JPS Operation Manual** for additional important operation and maintenance instructions if your boat is equipped with JPS.

Engine Guardian System

The Engine Guardian System monitors the critical sensors on the engine for any early indications of problems. The system will respond to a problem by emitting a caution or critical warning horn strategy. Reduce engine power to provide engine protection.

If a critical guardian state has been activated, the warning horn will be active for six seconds and then turn off. Warning text enabled SmartCraft gauges will display a message indicating the reason of the critical Guardian warning. It may be necessary to consult an authorized Mercury dealer for assistance.

Troubleshooting Charts

Starter Motor Will Not Crank Engine, or Cranks Slowly

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

Engine Will Not Start or Is Hard to Start

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

Engine Runs Rough, Misses, or Backfires

Possible Cause	Remedy
Clogged fuel filter.	Replace filter.
Stale or contaminated fuel.	Drain fuel tank. Fill with fresh fuel.
Kinked or clogged fuel line or fuel tank vent line.	Replace kinked lines or blow out lines with compressed air to remove obstruction.
Flame arrestor dirty.	Clean the flame arrestor.
Faulty ignition system component.	Service ignition system.
Idle speed too low.	Have EFI system checked by an authorized Mercury MerCruiser dealer.
EFI system fault.	Have EFI system checked by an authorized Mercury MerCruiser dealer.

Poor Performance

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

Excessive Engine Temperature

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

Insufficient Engine Temperature

Possible Cause	Remedy
Faulty thermostat.	Replace.

Low Engine Oil Pressure

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

Battery Will Not Recharge

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

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

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

Electronic Remote Controls

Symptom	Remedy
The ERC lever is too hard or too easy to move out of the neutral detent.	Adjust the detent tension.
The ERC lever has too much or too little resistance through its range of motion.	Adjust the handle tension screw.
The ERC lever increases engine RPM, but the engines do not engage gears and the boat does not move.	Check the throttle-only button on the DTS trackpad. If the light is on, put the ERC levers in neutral and push the button to disengage.
	Turn off all engine key switches. Then turn them back on.
	Check your Mercury-approved multifunction display (MFD) for fault codes or popup warnings. Expand the fault code text to see if a course of action is required.
	Contact your authorized Mercury Marine dealer.
The ERC lever controls the engines, but they do not reach wide-open throttle.	If the engine reaches only 50% of available power, check the dock button on the DTS trackpad. If the light is on, put the handles in neutral and push the button to disengage.
	Check your Mercury-approved MFD to see if cruise control is enabled. Disable cruise control.
	Check for damage to the propeller, and change the propeller if damage is found. Contact your authorized Mercury Marine dealer for service on the damaged propeller.
	Check your Mercury-approved MFD for Guardian fault codes that indicate reduced engine power. If found, contact your authorized Mercury Marine dealer.
The ERC lever controls the engine, but does not respond in a linear manner.	Check the troll button on the DTS trackpad. If the light is on, put the handles in neutral and push the troll button to disengage.
	Ensure that dock mode or cruise control are not engaged.
When one ERC lever is moved, all engines respond.	Check the single-lever button on the DTS trackpad. If the light is on, put the handles in neutral and push **1 LEVER** to disengage.
The ERC control, joystick, and steering wheel do not function.	Press **TRANSFER** on the DTS trackpad to restore helm control. (Multiple helm boats only.)
The boat moves forward, but will not move backwards quickly.	Trim the drives down.

Steering Wheel Jerks or Is Difficult to Turn

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

Power Trim Does Not Operate (Motor Does Not Operate)

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

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

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

Notes:

Section 7 - Customer Assistance Information

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7

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 questions concerning genuine Mercury Precision Parts or Quicksilver Marine Parts and Accessories to a local authorized dealer. Dealers have the proper systems to order parts and accessories, if they are not in stock. Engine model and serial number are required to order 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
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			.	.
			Total Due	.

Section 8 - Checklists

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Predelivery Inspection (PDI)

IMPORTANT: This checklist is for packages that are not equipped with joystick piloting. For engine packages equipped with joystick piloting, use the checklist included with the joystick piloting operation manual.

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

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

Predelivery Inspection Checklist, Continued

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

Customer Delivery Inspection (CDI)

IMPORTANT: This checklist is for packages that are not equipped with joystick piloting. For engine packages equipped with joystick piloting, use the checklist included with the joystick piloting operation manual.

Perform these tasks after the Predelivery Inspection (PDI).

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

N/A	Completed	Item
	☐	Operation and Maintenance manual—provide and review with customer. Emphasize the importance of safety warnings and Mercury engine testing procedures.
	☐	Approve the external appearance of the product (paint, cowl, decals, etc.)
	☐	Warranty—provide and explain the limited warranty to the customer. Explain dealer services.
☐	☐	Explain the optional Mercury Product Protection Plan (North America only)
		Operation of equipment—explain and demonstrate:
	☐	E-stop switch/lanyard stop switch operation (all helms)
	☐	Cause and effect of steering torque or pull; instruct on using a firm steering grip; explain boat spin-out and how to trim for neutral steering
	☐	Explain the warning horn strategy—caution and critical
☐	☐	U.S. Coast Guard capacity plate
	☐	Proper seating
	☐	Importance of personal flotation devices (PFDs or life vests) and throwable PFDs (throw cushions)
☐	☐	Functions of SmartCraft accessories (if applicable)
	☐	Off-season storage and maintenance schedule
	☐	Explain the power package flushing procedure
	☐	Engine (starting, stopping, shifting, using throttle)

N/A	Completed	Item
	☐	Boat (lights, battery switch location, fuses/breakers)
☐	☐	Trailer (if applicable)
		Registration:
	☐	Complete and submit warranty registration—provide the customer with a copy

Section 9 - Maintenance Log

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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