

Declaration of Conformance – Mercury Racing Sterndrive 600SCi (600 HP)

Manufacturer:

Mercury Racing
N7480 County Road UU
Fond du Lac, WI 54935
USA

Authorized Representative:

Marine Power Europe, Inc.
Parc Industriel de Petit-Rechain B-2800
Verviers,
Belgium

Recreational Craft Directive 2003/44/EC amending 94/25/EC

Applicable Requirement	Standards Applied
Owner's manual (A.2.5)	ISO 10240
Handling characteristics (A.4)	ISO 8665
Inboard Engine (A.5.1.1)	ISO 15584; ISO 7840; ISO 10133
Fuel System (A.5.2)	ISO 7840; ISO 8469
Electrical System (A.5.3)	ISO 10133; ISO 8846
General Steering System (A.5.4.1)	Applicable portions of: ABYC P-21; EN ISO 10592
Exhaust emission requirements (B.2)	ISO 8178-1
Owner's manual (B.4)	ISO 8665

Module used for exhaust emission assessment: Modules B+C,
EC-Type Examination Certificate No.: EXMERC001.

The notified body responsible for EC-Type Examination for the engine exhaust emissions assessment is

IMCI
Rue Abbe Cuypers 3
B – 1040, Brussels – Belgium

Notified Body No.: 0609

90-8M8021150 1106

HP600 SCi (Bravo Drive)

© 2006 Mercury Marine

Engine Type: Sterndrive
Fuel Type: Gasoline
Combustion Cycle: 4 Stroke

Engine Family Name: 600SCi
Starting Serial Number: 0M955821

Electromagnetic Compatibility Directive 89/336/EC

Generic emission standard	BS EN 61000-6-3
Generic immunity standard	BS EN 61000-6-1
Vehicles, boats and internal combustion engine driven devices - Radio disturbance characteristics	SAE J551; CISPR 12
Electrostatic discharge testing	BS EN 61000-4-2; BS EN 61000-4-3

This declaration is issued under the sole responsibility of Mercury Marine and Marine Power Europe.

 Patrick C. Mackey

President - Mercury Marine, Fond du Lac, WI USA

Regulatory contact:
Engineering - Regulations
Mercury Racing
N7480 County Road UU
Fond du Lac, WI 54935-9585
USA

Thank You

for your purchase of one of the finest marine power packages available. It incorporates numerous design features to assure operating ease and durability.

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

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

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



Mercury Racing,
N7480 County Road "UU"
Fond du Lac, WI 54935-9585

7406

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 Information** section of this manual. The warranty statement contains a description of what is covered, what is not covered, the duration of coverage, how to best obtain warranty coverage, important disclaimers and limitations of damages, and other related information. Please review this important information.


WARNING

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

WARNING

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

Safety Alerts and Notices

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

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

WARNING

WARNING—indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

CAUTION—indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury or property damage. It may also be used to alert against unsafe practices.

IMPORTANT: Indicates information or instructions that are necessary for a particular step or action.

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

Copyright and Trademark Information

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

Litho in U.S.A.

© 2006, Mercury Marine

Mercury, Mercury Marine, MerCruiser, Mercury MerCruiser, Mercury Racing, Mercury Precision Parts, Mercury Propellers, Mariner, Quicksilver, #1 On The Water, Alpha, Bravo, Pro Max, OptiMax, Sport-Jet, K-Planes, MerCathode, RideGuide, SmartCraft, Zero Effort, M with Waves logo, Mercury with Waves logo, and SmartCraft logo are all registered trademarks of Brunswick Corporation. Mercury Product Protection logo is a registered service mark of Brunswick Corporation.

TABLE OF CONTENTS

Warranty Information

Warranty Registration United States And Canada.....	1
Transfer Of Warranty.....	1
Mercury Racing Division One Year Limited Warranty.....	2
Products Sold to Government Agencies.....	6
3 Year Limited Warranty Against Corrosion.....	7
Warranty Coverage and Exclusions for Mercury Racing Sterndrive Products.....	10

General Information

Boater's Responsibilities.....	12
Boat Horsepower Capacity.....	12
High-Speed and High-Performance Boat Operation.....	13
Paddle Wheel and Water Temperature Sensors.....	13
Lanyard Stop Switch.....	13
Trailer Boat.....	15
Protecting People In The Water.....	15
Exhaust Emissions.....	16
Wave And Wake Jumping.....	18
Impact With Underwater Hazards.....	19
Operating in Shallow Water.....	20
Safe Boating Suggestions.....	22
Stolen Power Package.....	25

Specifications

Engine Identification.....	26
General Engine Specifications.....	27
Engine Operating Limitations (HP600).....	28
Fuel Requirements.....	28
Oil Recommendations.....	31
Capacities.....	32
California Emissions Regulations.....	32
Engine Break-in.....	32
After Break-In Period.....	33

TABLE OF CONTENTS

Operation

Instrumentation.....	34
Warning System.....	34
Electrical System Overload Protection.....	37
Remote Controls (Console Mounted Zero Effort).....	42
Remote Controls.....	43
Power Trim.....	46
Freezing Temperature Operation.....	53
Starting, Shifting and Stopping.....	53
Operation Chart.....	55
Drain Plug and Bilge Pump.....	56
Launching And Boat Operation Care.....	57

Conditions Affecting Operation

Weight Distribution.....	58
Bottom Of Boat.....	58
Cavitation.....	58
Ventilation.....	59
Propeller Selection.....	59
Conditions That Lower Engine Performance.....	60

Maintenance

Special Tools.....	61
Servicing High Horsepower Engines.....	62
Service Responsibilities.....	62
Replacement Service Parts.....	63
Do-It-Yourself Maintenance Suggestions.....	64
Engine Maintenance Charts.....	65
Bravo Drive Maintenance Charts.....	67
Checking Fluid Levels.....	69
Changing Fluids.....	76
Lubrication.....	89
Propellers.....	92
Flushing the Power Package.....	96
Seawater Pump Impeller Inspection.....	99

TABLE OF CONTENTS

Cleaning the Seawater (Raw Water) Section of the Engine Oil, Power Steering, and Fuel Coolers.....	100
Serpentine and Supercharger Drive Belts.....	102
Fuel Filters.....	107
Corrosion and Corrosion Protection.....	109
Battery.....	114
Bottom of Boat.....	115
Inspection and Maintenance.....	115
Attention Required After Submersion.....	116

Cold Weather or Extended Storage

Power Package Lay-up.....	117
Draining Instructions.....	119
Battery Winter Storage.....	123
Power Package Recommissioning.....	123

Troubleshooting

Engine Will Not Crank	127
Engine Cranks But Will Not Start.....	128
Engine Hard to Start, Runs Rough, Misses, and/or Backfires.	128
Poor Performance.....	129
Engine Coolant Temperature Too Low.....	129
Engine Coolant Temperature Too High.....	130
Low Engine Oil Pressure.....	130
Power Trim Does Not Operate (Motor Doesn't Run).....	131
Battery Will Not Come Up On Charge.....	131
Power Trim Does Not Operate (Motor Runs But Drive Unit Does Not Move).....	131
Electrical Analog Trim Gauge Malfunction.....	132
Remote Control Operates Hard, Binds, Has Excessive Free-Play or Makes Unusual Sounds.....	132
Steering Wheel Turns Hard or Jerky.....	132
Seawater Pressure Is Below Specification.....	133
Seawater Pressure Is Above Specification.....	133

TABLE OF CONTENTS

Owner Service Assistance

Local Repair Service.....	134
Service Away From Home.....	134
Parts And Accessories Inquiries.....	134
Service Assistance.....	134
Mercury Mercruiser Service Offices.....	135

Ordering Literature

United States and Canada.....	137
Outside The United States and Canada.....	137

Maintenance Log

Maintenance Log.....	138
----------------------	-----

WARRANTY INFORMATION

Warranty Registration United States And Canada

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

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

Mercury Marine

Attn.: Warranty Registration Department

W6250 W. Pioneer Road

P.O. Box 1939

Fond du Lac, WI 54936-1939

920-929-5054

Fax 920-929-5893

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

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

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

3. Upon processing the warranty registration, Mercury Marine will send the purchaser a Mercury Owner Resource Guide. The back page of this guide contains your warranty registration information and should be saved. If this registration verification is not received within 30 days, please contact your selling dealer immediately.

Transfer Of Warranty

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

WARRANTY INFORMATION

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

Mercury Marine
Attn: Warranty Registration Department
W6250 W. Pioneer Road
P.O. Box 1939
Fond du Lac, WI 54936-1939
920-929-5054
Fax 920-929-5893

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

There is no charge for this service.

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

Mercury Racing Division One Year Limited Warranty

WHAT IS COVERED

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

DURATION OF COVERAGE

This Limited Warranty provides coverage for one (1) year from either the date the product is first sold to a recreational use retail purchaser, or the date on which the product is first put into service, whichever occurs first. The repair or replacement of parts, or the performance of service under this warranty, does not extend the life of this warranty beyond its original expiration date. Unexpired warranty coverage can be transferred to a subsequent purchaser upon proper re-registration of the product.

WARRANTY INFORMATION

CONDITIONS THAT MUST BE MET IN ORDER TO OBTAIN WARRANTY COVERAGE

Warranty coverage is available only to retail customers that purchase from a Dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre-delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Inaccurate warranty registration information regarding recreational use, or subsequent change of use from recreational to commercial may void the warranty at the sole discretion of Mercury Marine. Routine maintenance outlined in the Operation and Maintenance Manual must be timely performed in order to maintain warranty coverage. Mercury Marine reserves the right to make warranty coverage contingent upon proof of proper maintenance.

WHAT MERCURY WILL DO

Mercury's sole and exclusive obligation under this warranty is limited to, at our option, repairing a defective part, replacing such part or parts with new or Mercury Marine certified re-manufactured parts, or refunding the purchase price of the Mercury product. Mercury reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

WARRANTY INFORMATION

HOW TO OBTAIN WARRANTY COVERAGE

The customer must provide Mercury with a reasonable opportunity to repair and reasonable access to the product for warranty service. Warranty claims shall be made by delivering the product for inspection to a Mercury dealer authorized to service the product. If purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury. We will then arrange for the inspection and any covered repair. Purchaser in that case shall pay for all related transportation charges and/or travel time. If the service provided is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. Proof of registered ownership must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

WARRANTY INFORMATION

WHAT IS NOT COVERED

This limited warranty does not cover routine maintenance items, tune ups, adjustments, normal wear and tear, damage caused by abuse, abnormal use, use of a propeller or gear ratio that does not allow the engine to run in its recommended wide-open-throttle RPM range (see the **Operation and Maintenance Manual**), operation of the product in a manner inconsistent with the recommended operation/duty cycle section of the **Operation and Maintenance Manual**, neglect, accident, submersion, improper installation (proper installation specifications and techniques are set forth in the installation instructions for the product), improper service, use of an accessory or part not manufactured or sold by us, operation with fuels, oils or lubricants which are not suitable for use with the product (see the **Operation and Maintenance Manual**), alteration or removal of parts, water entering the engine through the fuel intake, air intake or exhaust system, or damage to the product from insufficient cooling water caused by blockage of the cooling system by a foreign body, running the engine out of water, mounting the engine too high on the transom, or running the boat with the engine trimmed out too far. The commercial use of the product, defined as any work or employment related use of the product, or any income generating use of the product, even if such use is only occasional, will void the warranty. Use of the product for racing or other competitive activity, at any point, even by a prior owner of the product, voids the warranty. Expenses related to haul-out, launch, towing, storage, telephone, rental, inconvenience, slip fees, insurance coverage, loan payments, loss of time, loss of income, tournament fees, club fees, prize money or any other type of incidental or consequential damages are not covered by this warranty. Also, expenses associated with the removal and/or replacement of boat partitions or material caused by boat design for access to the product are not covered by this warranty.

WARRANTY INFORMATION

No individual or entity, including Mercury Marine authorized dealers, has been given authority by Mercury Marine to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against Mercury Marine. For additional information regarding events and circumstances covered by this warranty, and those that are not, see the **Warranty Coverage** section of the **Operation and Maintenance Manual**, incorporated by reference into this warranty.

DISCLAIMERS AND LIMITATIONS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EX-PRESSLY DISCLAIMED. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME STATES/COUNTRIES DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH VARY FROM STATE TO STATE AND COUNTRY TO COUNTRY.

Products Sold to Government Agencies

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

Mercury Racing Sales Department
N7840 County Road UU
Fond du Lac, WI 54935
920-921-5330
Fax 920-921-6533

WARRANTY INFORMATION

3 Year Limited Warranty Against Corrosion

WHAT IS COVERED: Mercury Marine warrants that each new Mercury, Mariner, Mercury Racing Outboard, Sport Jet, M² Jet Drive, Tracker by Mercury Marine Outboard, Mercury MerCruiser Inboard or Sterndrive Engine, Mercury Racing Bravo style sterndrive engine (Product) will not be rendered inoperative as a direct result of corrosion for the period of time described below.

DURATION OF COVERAGE: This limited corrosion warranty provides coverage for three (3) years from either the date the product is first sold, or the date on which the product is first put into service, whichever occurs first. The repair or replacement of parts, or the performance of service under this warranty does not extend the life of this warranty beyond its original expiration date. Unexpired warranty coverage can be transferred to subsequent (non-commercial use) purchaser upon proper re-registration of the product.

CONDITIONS THAT MUST BE MET IN ORDER TO OBTAIN WARRANTY COVERAGE: Warranty coverage is available only to retail customers that purchase from a Dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre-delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Corrosion prevention devices specified in the Operation and Maintenance Manual must be in use on the boat, and routine maintenance outlined in the Operation and Maintenance Manual must be timely performed (including without limitation the replacement of sacrificial anodes, use of specified lubricants, and touch-up of nicks and scratches) in order to maintain warranty coverage. Mercury Marine reserves the right to make warranty coverage contingent upon proof of proper maintenance.

WARRANTY INFORMATION

WHAT MERCURY WILL DO: Mercury's sole and exclusive obligation under this warranty is limited to, at our option, repairing a corroded part, replacing such part or parts with new or Mercury Marine certified re-manufactured parts, or refunding the purchase price of the Mercury product. Mercury reserves the right to improve or modify products from time to time without assuming an obligation to modify products previously manufactured.

HOW TO OBTAIN WARRANTY COVERAGE: The customer must provide Mercury with a reasonable opportunity to repair, and reasonable access to the product for warranty service. Warranty claims shall be made by delivering the product for inspection to a Mercury dealer authorized to service the product. If purchaser cannot deliver the product to such a dealer, written notice must be given to Mercury. We will then arrange for the inspection and any covered repair. Purchaser in that case shall pay for all related transportation charges and/or travel time. If the service provided is not covered by this warranty, purchaser shall pay for all related labor and material, and any other expenses associated with that service. Purchaser shall not, unless requested by Mercury, ship the product or parts of the product directly to Mercury. Proof of registered ownership must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

WHAT IS NOT COVERED: This limited warranty does not cover electrical system corrosion; corrosion resulting from damage, corrosion which causes purely cosmetic damage, abuse or improper service; corrosion to accessories, instruments, steering systems; corrosion to factory installed jet drive unit; damage due to marine growth; replacement parts (parts purchased by customer); products used in a commercial application. Commercial use is defined as any work or employment related use of the product, or any use of the product which generates income, for any part of the warranty period, even if the product is only occasionally used for such purposes.

WARRANTY INFORMATION

Corrosion damage caused by stray electrical currents (on-shore power connections, nearby boats, submerged metal) is not covered by this corrosion warranty and should be protected against by the use of a corrosion protection system, such as the Mercury Precision Parts or Quicksilver MerCathode system and/or Galvanic Isolator. Corrosion damage caused by improper application of copper base anti-fouling paints is also not covered by this limited warranty. If anti-fouling protection is required, Tri-Butyl-Tin-Adipate (TBTA) base anti-fouling paints are recommended on Outboard and MerCruiser boating applications. In areas where TBTA base paints are prohibited by law, copper base paints can be used on the hull and transom. Do not apply paint to the outboard or MerCruiser product. In addition, care must be taken to avoid an electrical interconnection between the warranted product and the paint. For MerCruiser product, an unpainted gap of at least 38 mm (1.5 in.) should be left around the transom assembly. Refer to the **Operation and Maintenance Manual** for additional details.

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

DISCLAIMERS AND LIMITATIONS:

THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME STATES/COUNTRIES DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH VARY FROM STATE TO STATE AND COUNTRY TO COUNTRY.

WARRANTY INFORMATION

Warranty Coverage and Exclusions for Mercury Racing Sterndrive Products

The purpose of this section is to help eliminate some of the more common misunderstandings regarding warranty coverage. The following information explains some of the types of services that are not covered by warranty. The provisions set forth following have been incorporated by reference into the Mercury Racing Division Three Year Limited Warranty Against Corrosion Failure, the Mercury Racing Division 90 Day, 6 months and One Year Limited Warranties.

Keep in mind that warranty covers repairs that are needed within the warranty period because of defects in material and workmanship. Installation errors, accidents, normal wear, and a variety of other causes that affect the product are not covered.

Warranty is limited to defects in material or workmanship, but only to retail customers that purchase from a Dealer authorized by Mercury Marine to distribute the product in the country in which the sale occurred, and then only after the Mercury Marine specified pre-delivery inspection process is completed and documented.

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

GENERAL EXCLUSIONS FROM WARRANTY

1. Minor adjustments and tune-ups, including checking, cleaning or adjusting spark plugs, ignition components, carburetor or EFI settings, filters, belts, controls, and checking lubrication made in connection with normal services.
2. Damage caused by lack of maintenance.
3. Haul-out, launch, towing charges, and all related transportation charges and/or travel time, etc.
4. Additional service work requested by customer other than that necessary to satisfy the warranty obligation.

WARRANTY INFORMATION

5. Labor performed by other than an authorized dealer may be covered only under following circumstances: When performed on emergency basis (providing there are no authorized dealers in the area who can perform the work required or have no facilities to haul out, etc., and prior factory approval has been given to have the work performed at this facility).
6. Use of other than Mercury Precision or Quicksilver parts when making warranty repairs.
7. Engine noise does not necessarily indicate a serious engine problem. If diagnosis indicates a serious internal engine condition, which could result in a failure, condition responsible for noise should be corrected under the warranty.
8. Lower unit and/or propeller damage caused by striking a submerged object is considered a marine hazard.
9. Water in the starter motor.
10. Starter motors and/or armatures or field coil assembly, which are burned, or where lead is thrown out of commutator because of excess cranking.
11. Valve or valve seat grinding required because of wear.

GENERAL INFORMATION

Boater's Responsibilities

The operator (driver) is responsible for the correct and safe operation of the boat and safety of its occupants and general public. It is strongly recommended that each operator (driver) read and understand this entire manual before operating the power package.

Be sure at least one additional person on board is instructed in the basics of starting and operating the power package, and boat handling in case the driver is unable to operate the boat.

Boat Horsepower Capacity

WARNING

Avoid serious injury, death or property damage from overpowering a boat. Using a power package that exceeds the maximum horsepower limit of a boat can:

- Cause loss of boat control.
- Place too much weight at the transom altering the designed flotation characteristics of the boat
- Cause the boat to break apart, particularly around the transom area.

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

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

ob00306

GENERAL INFORMATION

High-Speed and High-Performance Boat Operation

If your power package is to be used on a high speed or high performance boat with which you are unfamiliar, we recommend that you never operate it at its high speed capability without first requesting an initial orientation and familiarization demonstration ride with your dealer or an operator experienced with your boat/power package combination. For additional information, obtain a copy of our **Hi-Performance Boat Operation** booklet from your dealer, distributor, or Mercury Marine.

Paddle Wheel and Water Temperature Sensors

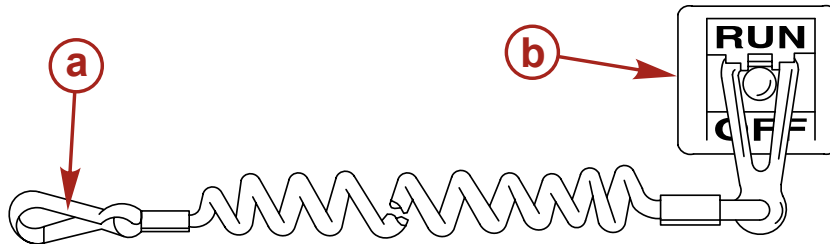
Paddle wheels cannot be utilized on vessels that are capable of speeds in excess of 50 mph. Water temperature sensors cannot be connected to Race Sterndrive engines that are equipped with a Propulsion Control Module (PCM). The water temperature sensor connection is utilized by the PCM for monitoring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

Lanyard Stop Switch

The purpose of a lanyard stop switch is to turn off the engine when the operator moves far enough away from the operator's position (as in accidental ejection from the operator's position) to activate the switch. A lanyard stop switch can be installed as an accessory - generally on the dashboard or side adjacent to the operator's position.

GENERAL INFORMATION

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



21629

- a** - Lanyard cord
- b** - Lanyard stop switch

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

⚠ WARNING

Should the operator fall out of the boat, the possibility of serious injury or death from being run over by the boat can be greatly reduced by stopping the engine immediately. Always properly connect both ends of the stop switch lanyard to the stop switch and the operator.

⚠ WARNING

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

Accidental or unintended activation of the switch during normal operation is also a possibility. This could cause any, or all, of the following potentially hazardous situations:

GENERAL INFORMATION

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

Trailing Boat

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

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

Protecting People In The Water

WHILE YOU ARE CRUISING

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



21604

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.

GENERAL INFORMATION

WHILE BOAT IS STATIONARY

WARNING

Stop your engine immediately whenever anyone in the water is near your boat. Serious injury to the person in the water is likely if contacted by a rotating propeller, a moving boat, a moving gearcase, or any solid device rigidly attached to a moving boat or gearcase.

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

Exhaust Emissions

BE ALERT TO CARBON MONOXIDE POISONING

Carbon monoxide is present in the exhaust fumes of all internal combustion engines. This includes the outboards, sterndrives and inboard engines that propel boats, as well as the generators that power various boat accessories. Carbon monoxide is a deadly gas that is odorless, colorless and tasteless.

Early symptoms of carbon monoxide poisoning which should not be confused with seasickness or intoxication, include headache, dizziness, drowsiness, and nausea.

WARNING

Avoid the combination of a running engine and poor ventilation. Prolonged exposure to carbon monoxide in sufficient concentration can lead to unconsciousness, brain damage, or death.

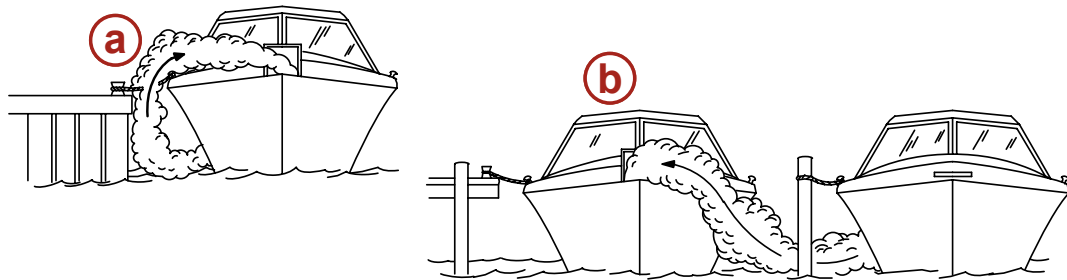
POOR VENTILATION

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

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

GENERAL INFORMATION

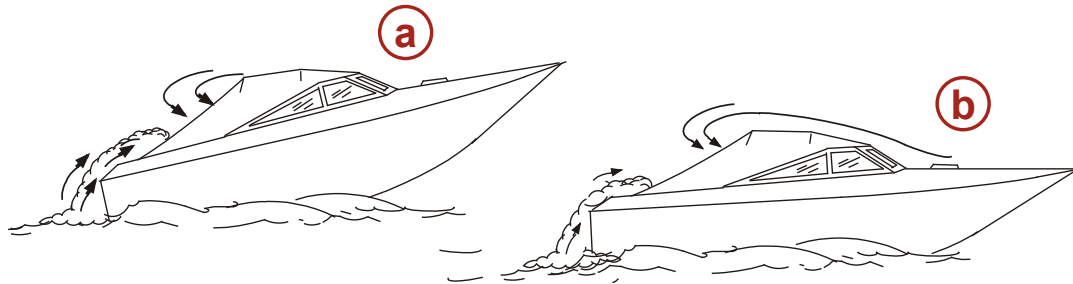
While Boat Is Stationary



21626

- a** - Running the engine when the boat is moored in a confined space.
- b** - Mooring close to another boat that has its engine running.

While Boat is Moving

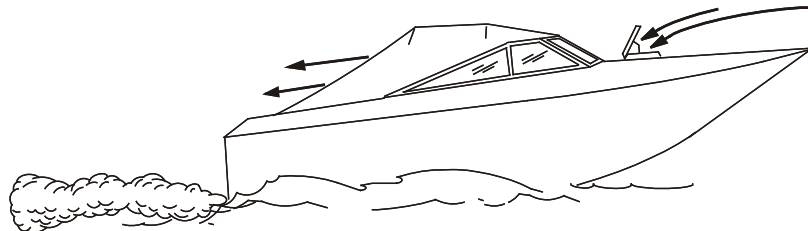


5449

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

GOOD VENTILATION

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



5448

GENERAL INFORMATION

Wave And Wake Jumping

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



5450

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

⚠ WARNING

Avoid serious injury or death from being thrown within or out of a boat when it lands after jumping a wave or wake. Avoid wave or wake jumping whenever possible. Instruct all occupants that if a wake or wave jump occurs, get low and hang on to any boat hand hold.

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

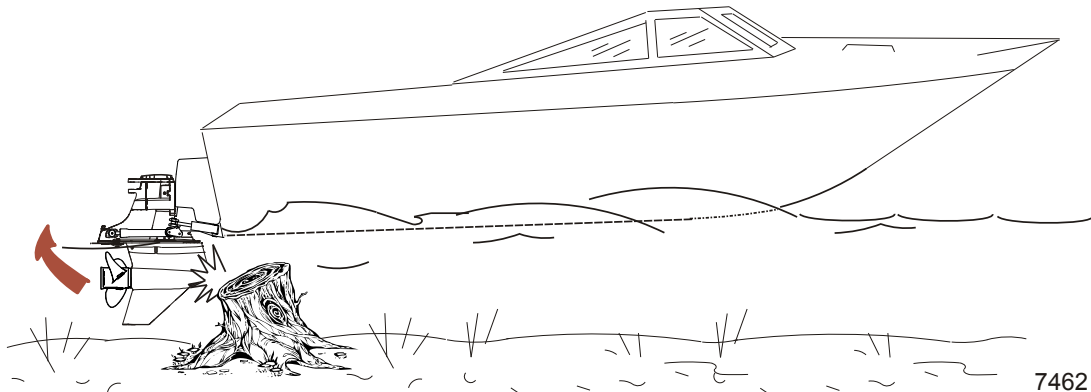
GENERAL INFORMATION

Impact With Underwater Hazards

⚠ WARNING

Avoid serious injury or death. When operating in shallow water or areas with underwater obstacles, maintain a minimum and safe speed.

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



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

- Part of the sterndrive or the entire sterndrive could break loose and fly into the boat.
- The boat could move suddenly in a new direction. Such a sharp change in direction can cause occupants to be thrown out of their seats or out of the boat.
- A rapid reduction in speed. This will cause occupants to be thrown forward, or even out of the boat.
- Impact damage to the sterndrive and/or boat.

GENERAL INFORMATION

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

WARNING

Avoid serious injury or death from loss of boat control due to sudden component failure. Do not operate a boat with impact damage. Have the power package inspected and repaired as necessary.

After striking a submerged object, stop the engine as soon as possible and inspect it for any broken or loose parts. If damage is present or suspected, the sterndrive should be taken to an authorized dealer for a thorough inspection and necessary repair. The boat should also be checked for any hull fractures, transom fractures, or water leaks.

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

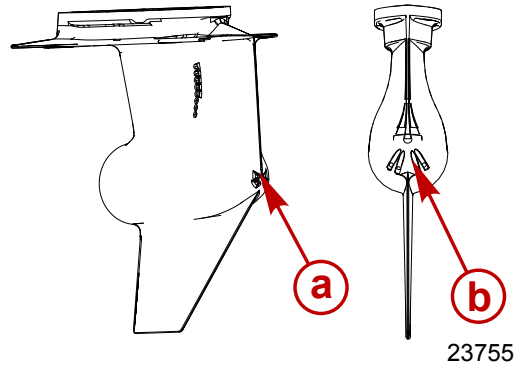
Operating in Shallow Water

CAUTION

Serious engine damage could occur by failing to follow these instructions. Sand, silt or mud could be sucked into the water inlets restricting or shutting off the water supply to the engine.

GENERAL INFORMATION

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



Low Water Inlet and Sportmaster Gearcase

a - Low water pick-up gearcase

b - Sportmaster gearcase

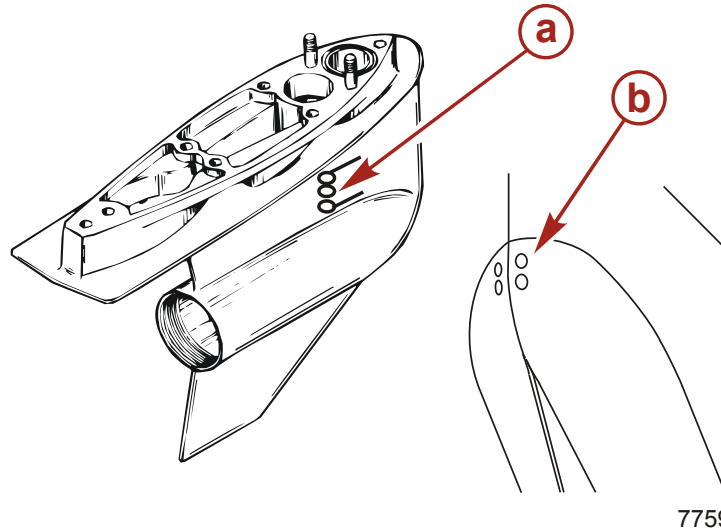
The design of the dual water inlet gear case reduces the risk of restricting or shutting off the water supply to the engine, but caution should still be used when operating in shallow or weedy water.

CLEARING A DUAL WATER INLET GEAR CASE

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

GENERAL INFORMATION

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



Dual Water Inlet Gear Case

a - Strut inlets

b - Low water inlets

Safe Boating Suggestions

In order to safely enjoy the waterways, familiarize yourself with local and other governmental boating regulations and restrictions, and consider the following suggestions.

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

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

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

Check safety equipment on-board. Here are suggestions of the types of safety equipment to carry when boating:

- Approved fire extinguisher; paddle or oar.
- Signal devices: flashlight, rockets or flares, flag and whistle or horn.
- Spare propeller, thrust hubs and an appropriate wrench.
- Tools for necessary minor repairs; first aid kit and book.

GENERAL INFORMATION

- Anchor, extra anchor line; water-proof storage containers.
- Manual bilge pump and extra drain plugs; compass and map or chart of area.
- Spare operating equipment; batteries, bulbs, fuses, etc.
- Transistor radio and drinking water.

Know signs of weather change and avoid foul weather and rough-sea boating.

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

Know and obey all nautical rules and laws of the waterways. Boat operators should complete a boating safety course. Courses are offered in the U.S.A. by:

- The U.S. Coast Guard Auxiliary
- The Power Squadron
- The Red Cross
- Your state boating law enforcement agency

Direct all inquiries to the Boating Hotline, 1-800-368-5647 or the Boat U.S. Foundation information number 1-800-336-BOAT.

We strongly recommend that all powerboat operators attend one of these courses.

You should also review the NMMA Sources of Waterway Information booklet. It lists regional sources of safety, cruising and local navigation and is available at no charge by writing to:

Sources of Waterway Information

National Marine Manufacturers Association

410 N. Michigan Avenue

Chicago, IL 60611 U.S.A.

Make sure everyone in the boat is properly seated. Do not allow anyone to sit or ride on any part of the boat that was not intended for such use. This includes the back of seats, gunwales, transom, bow, decks, raised fishing seats, any rotating fishing seat; or anywhere that an unexpected acceleration, sudden stopping, unexpected loss of boat control, or sudden boat movement could cause a person to be thrown overboard or into the boat.

GENERAL INFORMATION

Never be under the influence of alcohol or drugs while boating (it is the law). Alcohol or drug use impairs your judgment and greatly reduces your ability to react quickly.

Know your boating area and avoid hazardous locations.

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

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

Be alert. The operator of the boat is responsible by law to maintain a proper lookout by sight and hearing. The operator must have an unobstructed view particularly to the front. No passengers, load, or fishing seats should block the operators view when operating the boat above idle speed.

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

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

Report accidents. Boat operators are required by law to file a Boating Accident Report with their state boating law enforcement agency when their boat is involved in certain boating accidents. A boating accident must be reported if:

1. There is loss of life or probable loss of life
2. There is personal injury requiring medical treatment beyond first aid
3. There is damage to boats or other property where the damage value exceeds \$500.00
4. There is complete loss of the boat

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

GENERAL INFORMATION

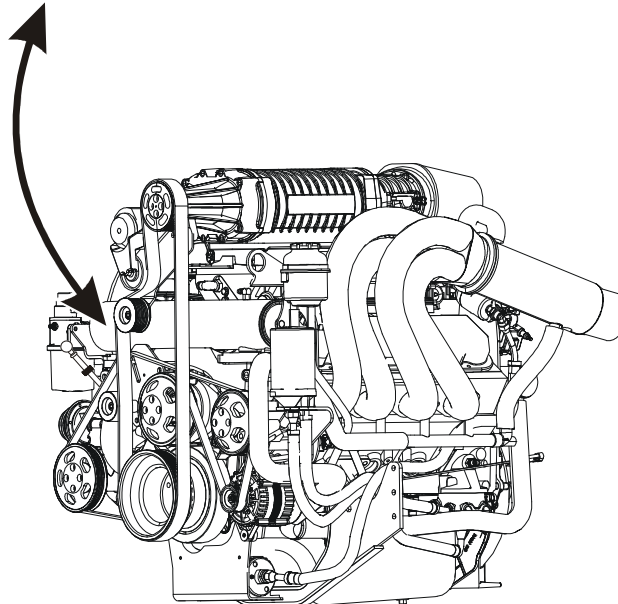
Stolen Power Package

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

SPECIFICATIONS

Engine Identification

Model:	HP600 SCi	SERIAL NUMBERS	
Displacement:	502 C.I.D.		
Max WOT RPM:	4800 - 5200	ENGINE	<input type="text"/>
Spark Plugs:	NGK BPR6ES	DRIVE	<input type="text"/>
Spark Plug Gap:	0.035 Inch		
Spark Timing:	**non-adjustable	TRANSOM	<input type="text"/>
Fuel Octane:	91 (R+M)/2 or 98 RON International		
Engine Oil:	**Kendall GT-1 SAE 20W50		
Engine Coolant:	Dex-Cool®		
**see owner's manual			



10013

a - Engine identification placard

Record the serial numbers from the engine placard in the space provided below.

Serial Numbers	
Engine	<input type="text"/>
Drive	<input type="text"/>
Transom	<input type="text"/>

SPECIFICATIONS

General Engine Specifications

Horsepower	600 HP (447 kW)
Displacement	8.2 L (502 c.i.)
Cylinder arrangement	V-8
Bore	114 mm (4.47 in.)
Stroke	102 mm (4.00 in.)
Compression ratio	7.5:1
Supercharger	3.3 L Screw-type compressor
Alternator	65 amp / 917 watt
Battery requirements	750 CCA 950 MCA
Ignition type	PCM 03 Distributorless
Spark plug type	NGK BPR6ES
Spark plug gap	0.889 mm (0.035 in.)
Fuel system	Sequential Fuel Injection
Length (transom mount to front of engine)	907 mm (35.7 in.)
Width	838 mm (33.0 in.)
Height	691 mm (27.2 in.)
Weight	575 kg / 1267 lbs

SPECIFICATIONS

Engine Operating Limitations (HP600)

Maximum wide open throttle (W.O.T.) RPM	4800 - 5200 RPM
Rev limit	5400 RPM
Idle RPM in gear	700 RPM
Idle RPM out of gear	750 RPM
Maximum fuel system flow rate	211 L/hr (56 gals/hr) at 5200 RPM
Fuel pressure at idle	407 to 421 kPa (59 to 61 psi)
Fuel pressure at 5200 RPM	469 to 496 kPa (68 to 72 psi)
Coolant thermostat initially opens at temperature	62° C (143° F)
Coolant thermostat is at maximum open at temperature	70° C (158° F)
Minimum water pressure supplied to the engine	207 kPa (30 psi) at 5200 RPM (from oil cooler sensor)
Maximum water pressure supplied to the engine	290 kPa (42 psi) at 5200 RPM (from oil cooler sensor)
Minimum oil pressure at idle (Hot)	138 kPa (20 psi)
Minimum oil pressure at 5200 RPM (Hot)	331 kPa (48 psi)
Maximum oil temperature	85° C (185° F)

Fuel Requirements

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

WARNING

FIRE AND EXPLOSION HAZARD: Fuel leakage from any part of the fuel system can be a fire and explosion hazard which can cause serious bodily injury or death. Careful periodic inspection of entire fuel system is mandatory, particularly after storage. All fuel components should be inspected for leakage, softening, hardening, swelling or corrosion. Any sign of leakage or deterioration requires replacement before further engine operation.

SPECIFICATIONS

⚠ CAUTION

Use of improper fuel can seriously damage your engine. Engine damage resulting from use of improper fuel is considered misuse of the engine and damage caused thereby will not be covered under the Mercury Racing limited warranty.

OCTANE REQUIREMENTS (U.S./CANADA)

FUEL TYPE	MINIMUM POSTED OCTANE
Premium Unleaded	$(R+M) \div 2 = 91$ or RON = 98*

*NOTE: *Research Octane Number*

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

FUEL TYPE	MINIMUM POSTED OCTANE
Premium Unleaded ¹ .	$(R+M) \div 2 = 91$ or RON = 98*

*NOTE: *Research Octane Number*

USING REFORMULATED (OXYGENATED) FUELS (USA ONLY)

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

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

FUEL CONTAINING ALCOHOL

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

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

SPECIFICATIONS

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

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

Fuel containing alcohol may increase:

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

CAUTION

When operating a Mercury engine with fuel containing alcohol, avoid storing the fuel in the fuel tank for long periods of time. Long storage periods, common to boats, create unique problems. In cars, alcohol-blend fuels are normally consumed before they can absorb enough moisture to cause trouble. However, boats often sit idle 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: Because of possible adverse effects of alcohol in gasoline, it is recommended that only alcohol-free fuel be used where possible.

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

SPECIFICATIONS

Oil Recommendations ENGINE CRANKCASE OIL

Preferred Oils	API Classification
Kendall Motor Oil 20W-50	SJ, CF-2, CH-4
Oil Filter Should Always Be Changed With Oil	

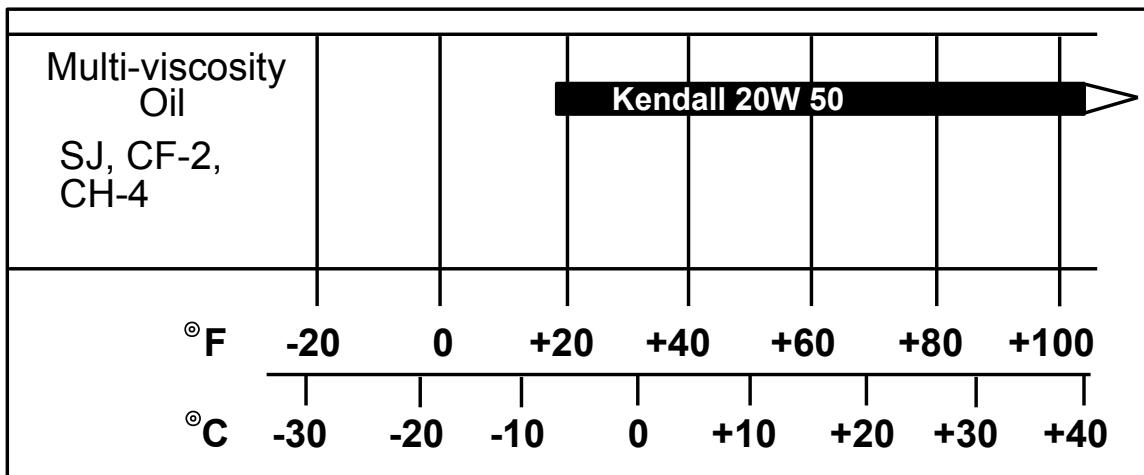
SUPERCHARGER GEARCASE OIL

Preferred Oils	API Classification
Castrol Syntec Synthetic Motor Oil 5W-50	SL, SJ, CF

IMPORTANT OIL PRACTICES

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

TEMPERATURE/OIL VISCOSITY CHART



9160

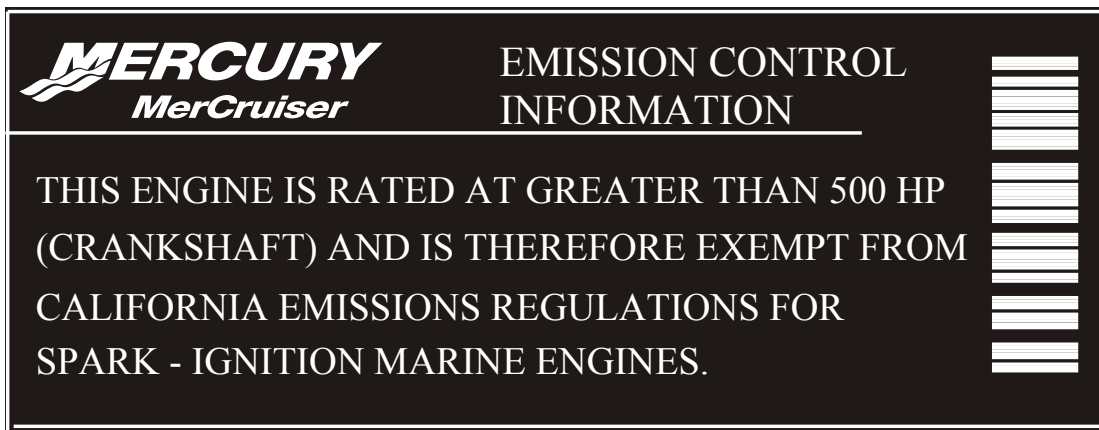
SPECIFICATIONS

Capacities

Model	HP600 SCi
Crankcase Oil Capacity with New Filter ¹ .	8 L (8.5 U.S. qts)
Supercharger Gearcase	177 ml (6 U.S. oz)
Bravo - Drive Unit Oil Capacity (with Monitor)	2.65 L (2.8 U.S. qts)
Closed Cooling System	13 L (14 U.S. qts)

California Emissions Regulations

An emission certification label, showing emission levels and engine specifications directly related to emissions, is placed on the engine at the time of manufacture.



6104

Engine Break-in

⚠ CAUTION
Severe damage to the engine can result by not complying with the engine break-in procedure. Engine damage may not be covered by the limited warranty.

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

SPECIFICATIONS

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

After Break-In Period

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

After 5 hr. Break-in
• Use a propeller that allows the engine to operate at or near the top of the maximum RPM range (See Specifications section) when at full throttle with a normal boat load.
• Do not advance the throttle until the engine runs smoothly at idle and water temperature reaches a minimum of 54 °C (130 °F). Do not operate at full throttle until the engine oil temperature reaches 60 °C (140 °F).
• Follow the maintenance schedule in this manual.

OPERATION

Instrumentation

It is important to monitor critical engine and boat functions while the boat is in operation. The SmartCraft boat information system uses gauges and/or a System View monitor screen to display the information.

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

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

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

Warning System

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

CAUTION

Avoid engine damage. Do not operate the engine after a continuous horn is heard, EXCEPT TO AVOID A HAZARDOUS SITUATION.

OPERATION

ENGINE GUARDIAN SYSTEM

The Engine Guardian system monitors sensors on the engine for any early indications of problems. If a sensor indicates a fault, the system responds to the problem by emitting a continuous or intermittent horn and, depending on the type of fault, may reduce engine power to provide engine protection. If the boat is equipped with System View, a message will be given on the display screen in conjunction with the horn. Refer to the System View manual for details. When the key switch is turned "ON", the warning system's horn beeps once to verify horn operation.

Fault Type and Related Warning Signal

- Critical - Steady horn
- Severe - 5 beeps, each 3 seconds long
- Warning - 3 beeps, each 1.5 seconds long
- Caution - 2 beeps, each 1 second long
- To stop an activated horn warning, turn off the engine. If the horn continues to sound on restart, the system detected a fault again. See your Mercury Marine dealer to correct the problem as soon as possible.
- If on restart the beeping stops, the problem does not need immediate attention but will require you to see your authorized Mercury Marine dealer to diagnose and clear the fault.

If the Propulsion Control Module (PCM) detects a fault signal from an engine sensor, it records a fault code. A Digital Diagnostic Terminal (DDT) or Computer Diagnostic System (CDS) is required to extract specific problem codes from the PCM.

WARNING SYSTEM TABLE

The following table is divided into four columns. The Possible Cause column lists items that could be initiating the fault. The Horn column lists the type of audible alert that will be given if a fault is detected. If the boat is equipped with System View, the Monitor Display column indicates whether or not a message will be given on the screen. The Guardian Activated and Engine Power Reduced column indicates if the PCM will reduce engine power or force the engine into an idle based on the severity of the problem. The table lists only the possible problem areas and not specific error codes or messages recorded by the PCM.

OPERATION

Possible Cause	Horn	Monitor Display	Guardian Activated and Engine Power Reduced
PCM Error	Steady Horn	Yes	Forced Idle
Battery charging high or low	Steady Horn	Yes	Yes
Low Seawater Pressure	Steady Horn	Yes	Yes
Low Oil Pressure	Steady Horn	Yes	Yes
Engine Overspeed	Steady Horn	Yes	No
Charge Temperature Overheat	Steady Horn	Yes	Yes
MAP Sensor Error	Steady Horn	Yes	No
Oil Temperature High	Steady Horn	Yes	No
Coil Pack Failure	5 Beeps-3 Sec. Long	Yes	No
Fuel Injector Failure	5 Beeps-3 Sec. Long	Yes	No
Fuel Pump Failure	5 Beeps-3 Sec. Long	Yes	No
Idle Air Control Failure	5 Beeps-3 Sec. Long	Yes	No
Guardian Envoked	3 Beeps-1.5 Sec. Long	Yes	No
Coolant Overheat	3 Beeps-1.5 Sec. Long	Yes	Yes
Knock Sensor	3 Beeps-1.5 Sec. Long	Yes	Yes
Charge Temperature Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	No
Oil Temperature Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	No
Cam Sensor	3 Beeps-1.5 Sec. Long	Yes	No
Oil Pressure Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	Yes

OPERATION

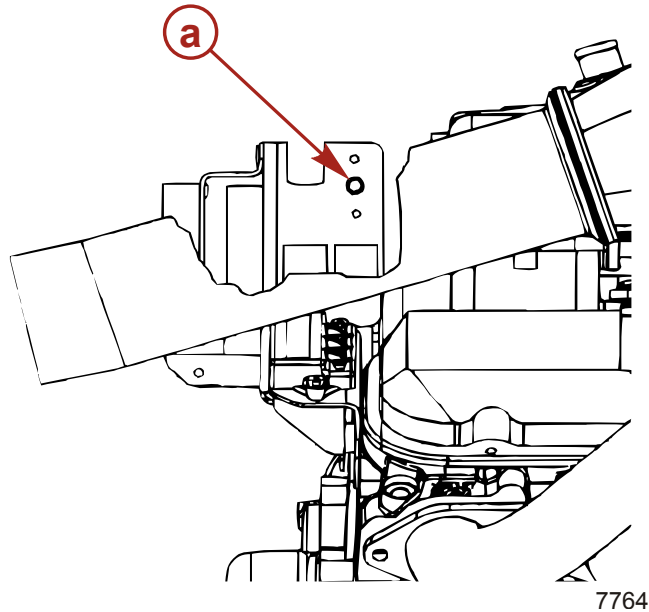
Possible Cause	Horn	Monitor Display	Guardian Activated and Engine Power Reduced
Fuel Pressure Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	No
Block Pressure Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	No
Charge Temperature Sensor Failure	3 Beeps-1.5 Sec. Long	Yes	No
Coolant Temperature Sensor	3 Beeps-1.5 Sec. Long	Yes	No
Throttle Position Sensor	3 Beeps-1.5 Sec. Long	Yes	Yes
Low Battery Voltage	2 Beeps-1 Sec. Long	Yes	No
Low Drive Lube	2 Beeps-1 Sec. Long	Yes	No

Electrical System Overload Protection

If an electrical overload occurs, a fuse or circuit breaker opens. Locate and correct the problem before replacing the fuse or resetting the circuit breaker.

OPERATION

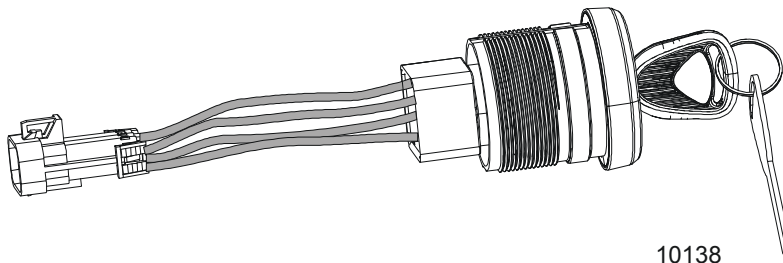
A circuit breaker protects the engine wiring harness and instrumentation power lead. Reset by pushing the reset button.



a - Reset button

In an emergency, if you cannot locate and correct the cause of the high current draw, and you must operate the engine, perform the following:

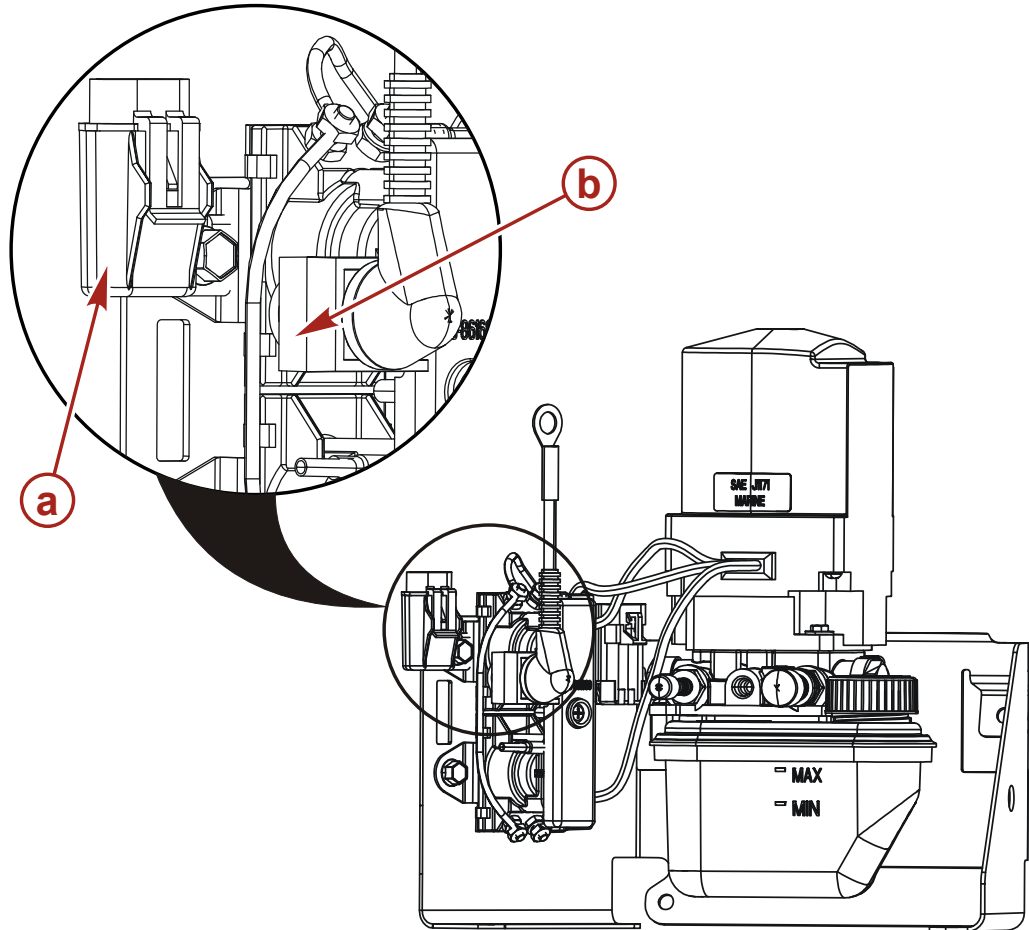
1. Turn off or disconnect all accessories connected to the engine and instrumentation wiring and reset the circuit breaker.
2. If the breaker remains open, electrical overload is still present. Inspect the electrical system.
3. A 15 amp fuse, located on the engine's electrical panel, protects the keyswitch power. Check for an open fuse if the key is turned to "START" and nothing happens (and circuit breaker is not tripped).



a - Ignition switch "I" terminal lead

OPERATION

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

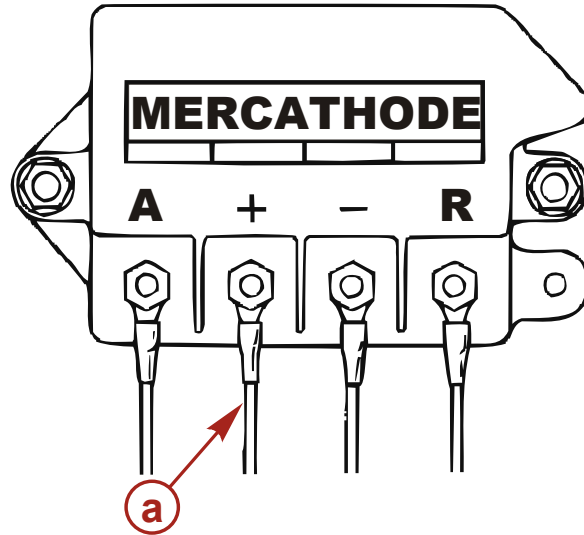


10121

- a** - 20 amp fuse holder
- b** - 110 amp fuse

OPERATION

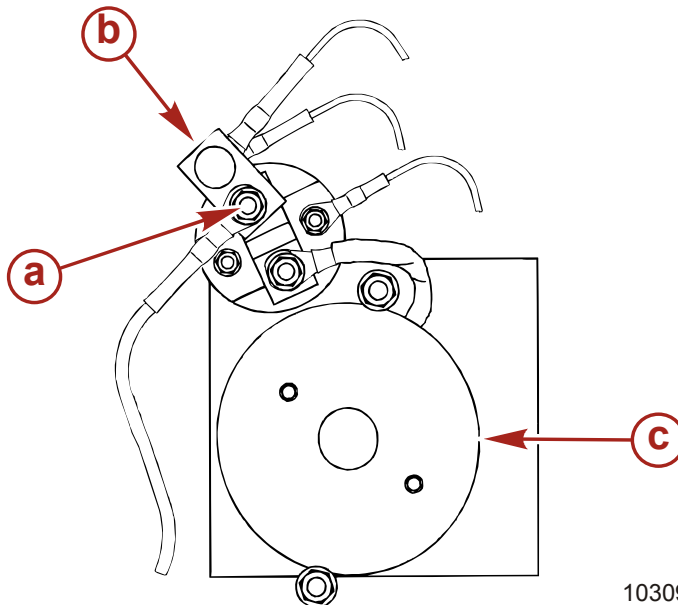
5. The MerCathode system has a 20 amp in-line fuse in the wire, which connects to the positive (+) terminal on the controller. If the fuse is open, the MerCathode system will not operate and a loss of corrosion protection will result.



7775

a - 20 amp in-line fuse

6. A 90 amp fuse is located on the starter.

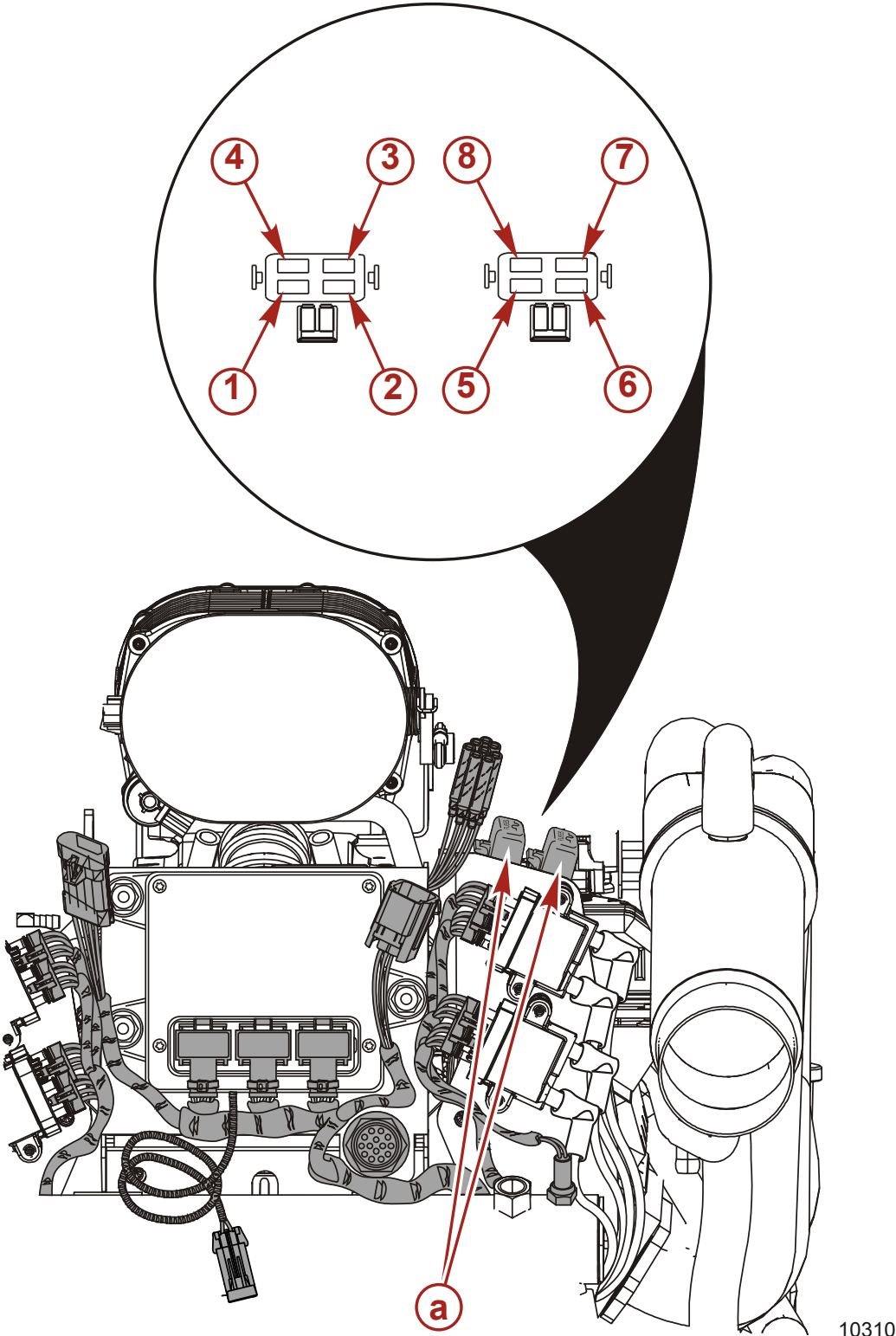


10309

a - Positive (+) battery cable
b - 90 amp fuse
c - Starter

OPERATION

7. Eight fuses are located at the upper rear of the engine in two fuse holders (four fuses in each holder).



a - Fuse holders (2)

10310

OPERATION

Fuse Holder - C26	Fuse Holder - C27
(1) - 15 amp - RED to RED/BLU constant power	(5) - 20 amp - RED/BLK to RED/PNK coil
(2) - 5 amp - PPL to PPL/WHT accessories	(6) - 20 amp - RED/GRN to RED/WHT fuel injection
(3) - 15 amp - RED/GRN to RED/ORN hour meter	(7) - 25 amp - RED/BLK to RED/PNK fuel pump
(4) - 15 amp - RED to RED/PPL key switch/CAN power	(8) - 20 amp - RED/GRN to RED/BLU driver power

Remote Controls (Console Mounted Zero Effort)

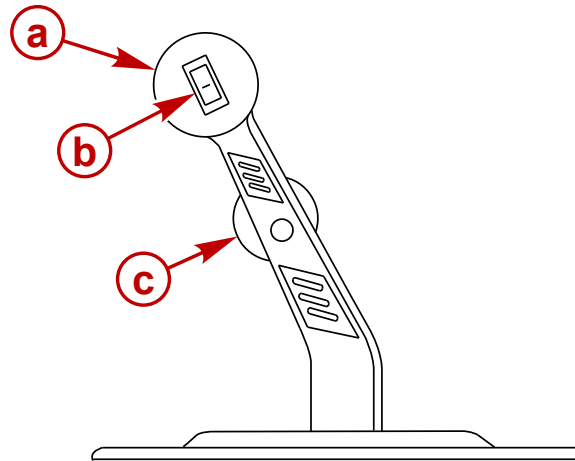
1. Control the throttle by moving the longer control lever(s) or, to increase speed, push the control lever forward. Detents give the movement of the lever a notched, precise feel. The detents also help hold the lever at the desired engine RPM to reduce operator fatigue.

CAUTION

Avoid possible engine damage. Never shift the unit into or out of gear unless the engine is at idle RPM.

OPERATION

- Control shifting by moving the shorter control lever(s). This control shifts the unit into gear with full lever movement. Move the lever forward to engage the forward gear. Move lever backward to engage reverse gear. Place the lever in the center position to shift to neutral. Shifting should occur only with the engine at idle speed. Always move to the desired gear position with a quick, firm motion. The control handle should be adjusted by your dealer to engage forward, reverse, and neutral when the lever is at the appropriate detent.



4090

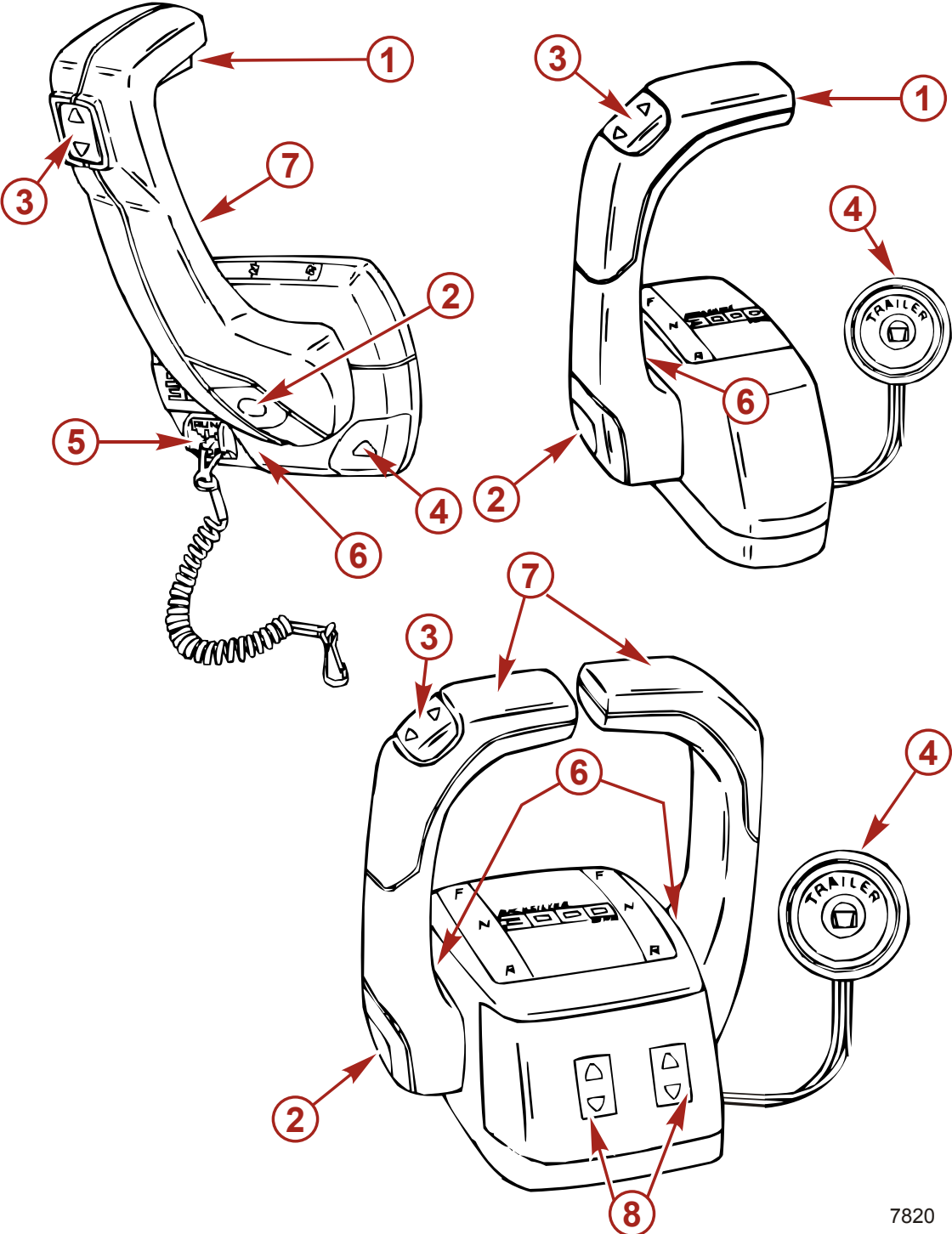
- a** - Throttle control lever
- b** - Power trim switch
- c** - Shift control lever

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

Remote Controls

All controls feature an integral safety switch that allows starting the engine in neutral only. If the boat is equipped with a remote control other than that shown, consult your dealer for a description and/or demonstration of the control.

OPERATION



7820

OPERATION

- 1 - Neutral Lock Bar** - Prevents accidental shift and throttle engagement. The neutral lock bar must be pulled up to move the control handle out of neutral.
- 2 - Throttle Only Button** - Allows throttle advancement without shifting the engine by disengaging the shift mechanism from the control handle. The throttle only button can be depressed only when the remote control handle is in the neutral position, and should only be used to assist in starting the engine.
- 3 - Power Trim Switch** - See the **Power Trim** section for detailed power trim operating procedures.
- 4 - Trailer Switch (May not apply to all Bravo XR Drives)** - See the **Power Trim** section for detailed trailer switch operation.
- 5 - Lanyard Stop Switch** - Turns the ignition off. See the **Lanyard Stop Switch** section at the front of this manual for operation and safety warning on the use of this switch.
- 6 - Control Handle Tension Adjustment Screw** - This screw can be adjusted to increase or decrease the tension on the control handle. This will help prevent Creep of the remote control handle. Turn the screw clockwise to increase tension and Counter-clockwise to decrease tension. Adjust to the tension desired.
- 7 - 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. Continue pulling back to increase speed.
- 8 - Power Trim Adjustment Switches** - (Used on Three Button Trim Control Only) - See the **Power Trim** section for detailed power trim operating procedures.

OPERATION

Power Trim

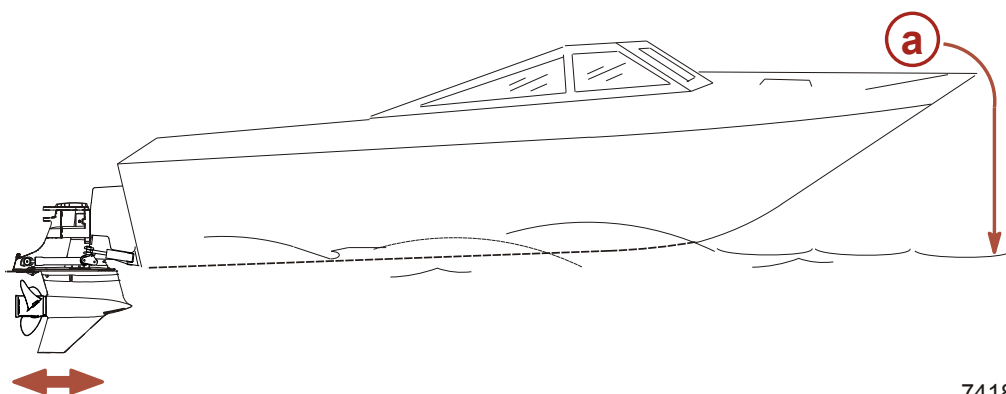
Power Trim allows the operator to adjust the drive unit(s) angle to provide the ideal boat angle for varying load and water conditions. The operator must use caution while underway to prevent trimming the drive unit up/out too far which could cause damage to the drive unit. Ideal drive unit trim angle while the boat is on plane is determined by boat transom and hull design. If the drive unit is trimmed up/out too far at high speeds, it could cause the boat to become extremely difficult to control.

Do not operate the engine over 1200 RPM when the drive unit's trim angle is greater than 12° . While operating the engine over 1200 RPM, a maximum trim angle of 12° beyond vertical is considered to be within mechanical limitations to prevent damage to the drive unit.

It is recommended that the boat is equipped with a trim indicator (s) in the dash so the operator is aware the drive unit's trim angle.

IMPORTANT: Each boat manufacturer has the option as to how the power trim will function on their particular boat. The boat owner/operator must be aware of how the power trim functions before operating the boat.

In most cases, best overall performance is obtained with the drive unit adjusted so the boat bottom will run at a 3° to 5° angle to the water. However, this is determined by the design characteristics of the boat.



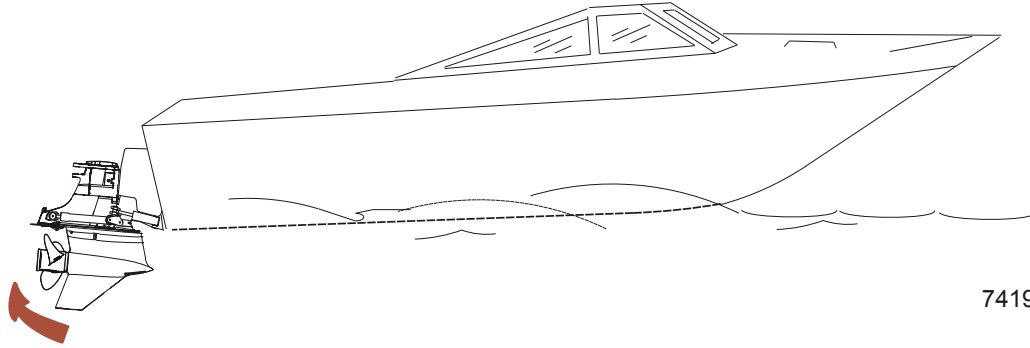
a - Boat bottom at 3° to 5° angle with the water

Trimming Drive Unit Up/Out Can:

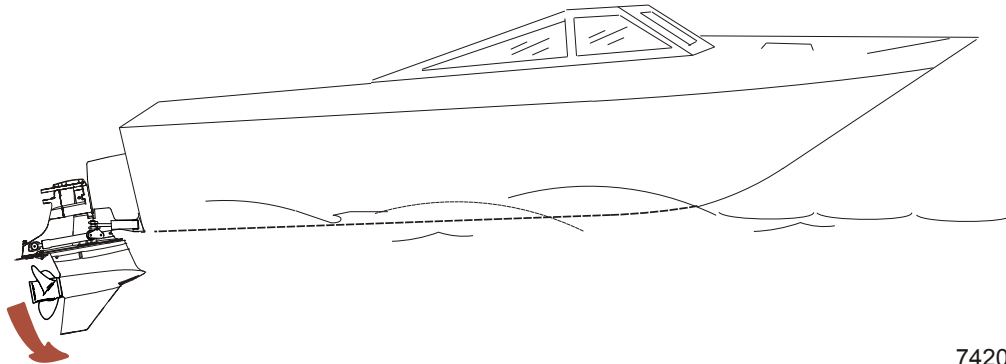
- Generally increase top speed.

OPERATION

- Increase clearance over submerged objects or a shallow bottom.
- Cause the boat to accelerate and plane off slower.
- In excess, cause boat porpoising (bouncing) or propeller ventilation.



Trimming Drive 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.

OPERATION

POWER TRIM OPERATION

Zero Effort Remote Control with Integral Trim Switch

WARNING

Avoid personal injury or damage to the sterndrive unit. Without trim limit protection, the drive unit can be trimmed up or out to a position where there is no drive unit side support from the gimbal ring.

Mercury recommends that a mechanical (cable actuated) or electrical trim position indicator be used to provide drive unit trim angle information to the operator, and that the trim gauge be marked clearly to indicate the maximum up or out position (12°) where side support is still provided.

The drive unit must not be trimmed to a position beyond the gimbal ring side support at engine speeds above 1200 RPM.

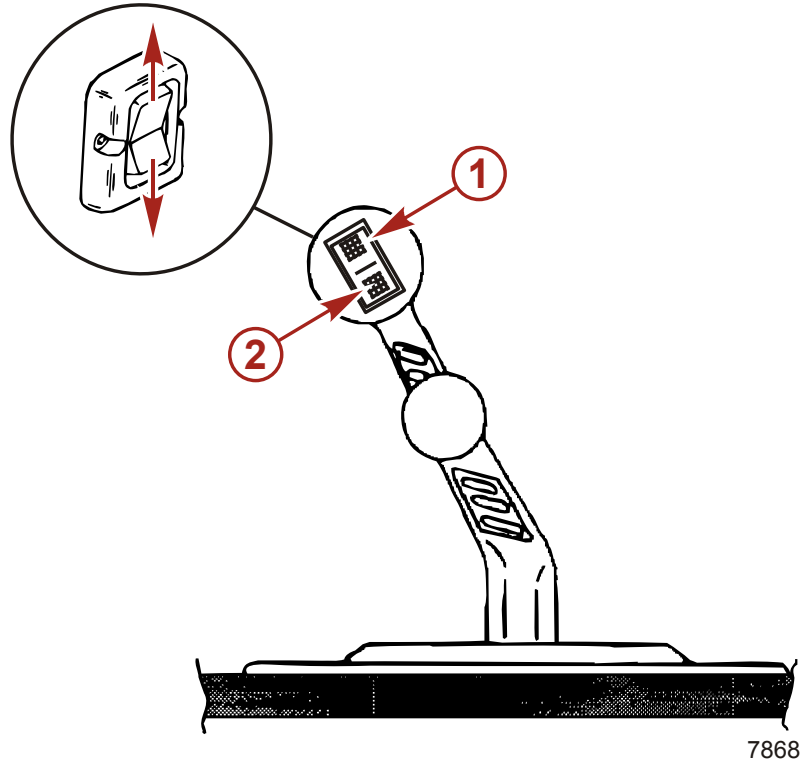
On boats equipped with multiple drives, each drive unit may be trimmed independently. There may be individual remote trim or trailer switches for each drive unit on the dash. It is important to equalize the units trim position by monitoring the trim position gauges or indicators. Or, if gauges/indicators are not available, trim the units fully down/in to equalize the units. Then, by operating the power trim with the integral trim switch on the Zero Effort Control handle, both drive units will trim simultaneously.

A boat builder may install a circuit breaker or fuse to protect the power trim equipment. Holding the trim switch or trailer button depressed after the drive unit reaches the end of its travel may cause the circuit overload protection to open.

OPERATION

⚠ CAUTION

Avoid twisting or binding dual engine tie bars. Damage to the tie bar and sterndrives could occur. Always raise or lower the sterndrive units evenly.



- 1 - Trailing and trimming up/out position** - Press the (top) up/out portion of the switch until drive unit reaches desired trim/trailing position.
- 2 - Trim drive unit in/down position** - Press the (bottom) in/down portion of the switch until drive unit reaches desired trim position.

OPERATION

Panel and Console Mount Remote Control Operation

WARNING

Avoid personal injury or damage to the sterndrive unit. Without trim limit protection, the drive unit can be trimmed up or out to a position where there is no drive unit side support from the gimbal ring.

Mercury recommends that a mechanical (cable actuated) or electrical trim position indicator be used to provide drive unit trim angle information to the operator, and that the trim gauge be marked clearly to indicate the maximum up or out position (12°) where side support is still provided.

The drive unit must not be trimmed to a position beyond the gimbal ring side support at engine speeds above 1200 RPM.

On boats equipped with multiple drives, each drive unit may be trimmed independently. There may be individual remote trim or trailer switches for each drive unit. It is important to equalize the units trim position by monitoring the trim position gauges or indicators. Or, if gauges/indicators are not available, trim the units fully down/in to equalize the units. Then, by operating the power trim with the integral trim switch in the Console Mount Remote Control handle, both drive units will trim simultaneously.

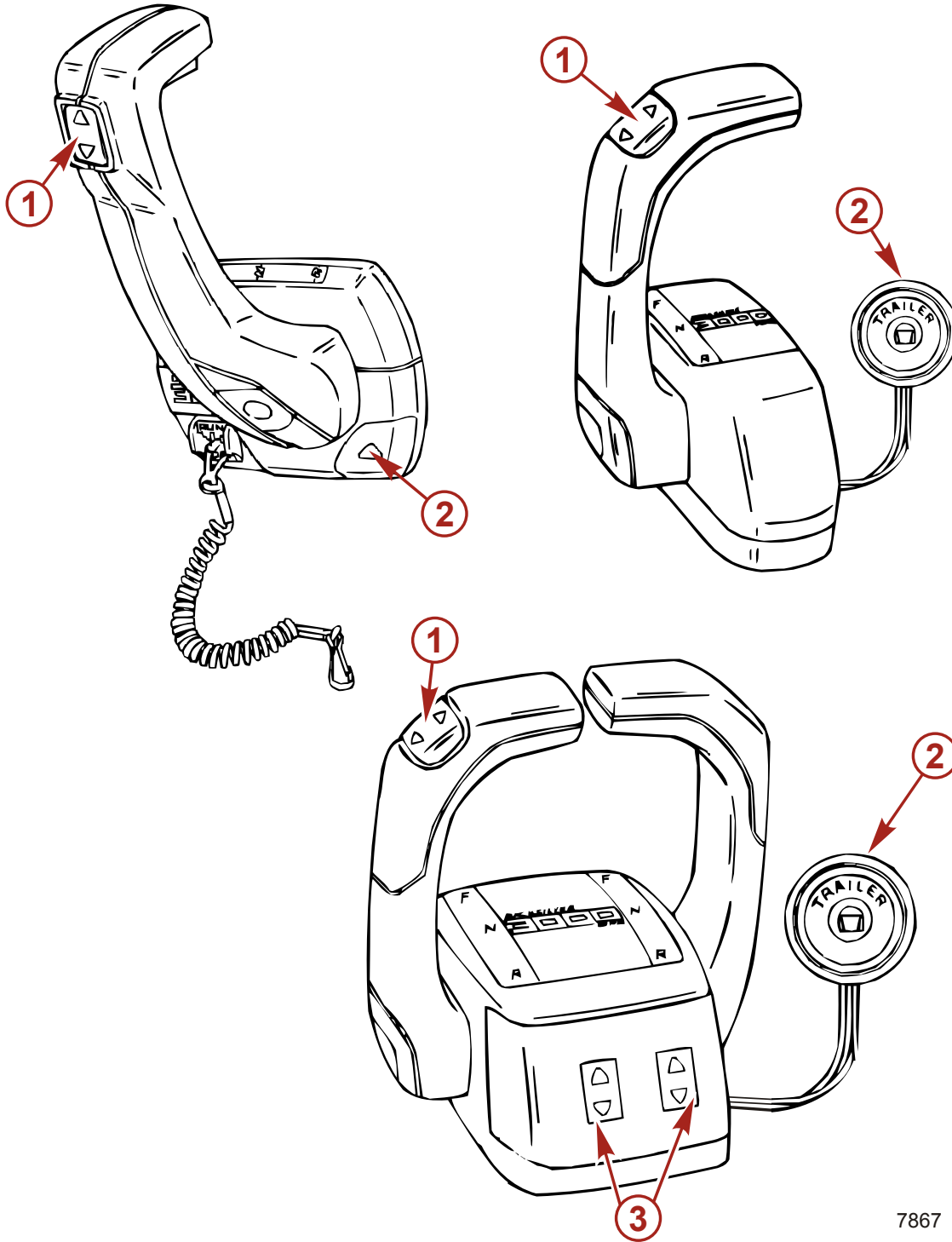
A boat builder may install a circuit breaker or fuse to protect the power trim equipment. Holding the trim switch or trailer button depressed after the drive unit reaches the end of its travel may cause the circuit overload protection to open.

CAUTION

Avoid twisting or binding dual engine tie bars. Damage to the tie bar and sterndrives could occur. Always raise or lower the sterndrive units evenly.

OPERATION

OPERATION



7867

OPERATION

- 1 - Integral Trim Control** - Used to trim one or more drive units simultaneously from the handle while the boat is underway. Press up on the switch to trim the drive unit (s) up/out. Press down on switch to trim drive unit(s) down/in.
- 2 - Trailer Button** -Used to operate the power trim through-out its full range. This would be used to position the drive unit up/out to its trailering position. Press the button until drive unit reaches desired height for trailering drive units.
- 3 - Independent Trim Control (Trim Adjustment Switches)** - With a single integral trim switch in the handle to control two drive units simultaneously, the independent trim control switches control each drive unit's trim independently. These switches can be used to fine tune the trim adjustment of each drive unit. Press the switches to set each drive unit to the desired trim angle. Then use the integral trim switch in the handle to control the trim of both drive units simultaneously.

Freezing Temperature Operation

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

Starting, Shifting and Stopping

WARNING

Avoid fire or explosion. Before starting the engine, operate the bilge blower for at least five minutes to remove any explosive fumes from the engine compartment. If the boat is not equipped with a bilge blower, open the engine hatch and leave it open while starting the engine.

NEW ENGINES OR ENGINES COMING OUT OF STORAGE
See **Power Package Recommissioning**.

OPERATION

IMPORTANT: Observe the following:

- Do not start the engine without supplying water to the seawater pickup pump (to prevent pump or engine damage).
- Do not operate the starter motor continuously for more than 30 seconds.
- **Never shift the drive unit unless the engine is at idle RPM.**

Perform the following as appropriate:

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

COLD OR WARM ENGINE

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

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

FLOODED ENGINE

Move control/throttle lever to half throttle. Be prepared to decrease engine speed to 1000 - 1500 RPM as soon as engine starts.

STARTING PROCEDURE

1. Turn the key switch to "START." Release the key when the engine starts and allow the switch to return to the "RUN" position.
2. Check the oil pressure gauge immediately after the engine starts. If oil pressure is not within the specified range, see **Specifications**, stop the engine immediately, and determine cause.

OPERATION

3. If the engine is cold, make sure the engine is idling smoothly before operating the boat.
4. After the engine has warmed up, check the water temperature gauge to ensure that the engine temperature is not abnormally high. If it is, stop the engine immediately and determine cause.
5. Ensure that the charging system is functioning correctly.
6. Observe the power package for fuel, oil, water, and exhaust leaks.

STARTING PROCEDURE IF ENGINE IS SHUT OFF OR STOPS WITH DRIVE UNIT IN GEAR

1. Pull/push remote control handle to neutral-lock position (it will be necessary to exert force to move handle).
2. Turn the key to the "START" position momentarily, to release the clutch from gear.
3. Resume the normal starting procedure.

SHIFTING

1. To shift the drive unit into gear, move the control/shift lever with a firm, quick motion forward to shift to forward gear, or backward to shift to reverse.
2. After shifting the drive unit, advance the throttle to the desired setting.

STOPPING

1. To shift the drive unit out of gear, throttle the engine back to idle speed, then move the control/shift lever to neutral. If the engine has been operating at high speed for a long period of time, allow the engine to cool by running at idle speed for three to five minutes.
2. Turn key switch to "OFF."

Operation Chart

1. Before Starting

- Open the engine hatch.
- Turn battery switch "ON," if equipped.
- Operate bilge blowers, if equipped.
- Open fuel shut off valve.

OPERATION

- Open seacock, if equipped.
- Perform all other checks specified by your dealer and/or boat builder.

2. After Starting

- Observe all gauges to check condition of engine. If not normal, stop engine.
- Check for fuel, oil, water, fluid and exhaust leaks, etc.
- Check shift and throttle control operation.
- Check steering operation.

3. While Underway

- Observe all gauges to monitor engine condition.

4. After Stopping

- Shift to neutral. Turn ignition key "OFF."
- Turn battery switch "OFF," if equipped.
- Close fuel valve.
- Close seacock.
- Flush cooling system if in saltwater area.

Drain Plug and Bilge Pump

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

The bilge drain can be used to change crankcase oil. Refer to the **Maintenance** section.

OPERATION

Launching And Boat Operation Care

CAUTION

Avoid product damage.

The following situations could cause water to enter the engine through the exhaust system, which could cause engine component failure:

- Unloading a boat from a trailer
- Slowing down rapidly or stopping suddenly
- Backing up rapidly

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

CONDITIONS AFFECTING OPERATION

Weight Distribution

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

Shifting weight to rear (stern) may:

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

Shifting weight to front (bow) may:

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

Bottom Of Boat

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

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

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

Cavitation

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

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

CONDITIONS AFFECTING OPERATION

Ventilation

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

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

Propeller Selection

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

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

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

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

If full throttle operation is below the recommended range, change the propeller to prevent loss of performance and possible engine damage. On the other hand, operating an engine above the recommended operating RPM range causes higher than normal wear or damage. Generally, there is a 200 - 300 RPM change between propeller pitches.

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

- Operating in warmer weather and greater humidity

CONDITIONS AFFECTING OPERATION

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

Conditions That Lower Engine Performance

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

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

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

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

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

To compensate for power robbing conditions:

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

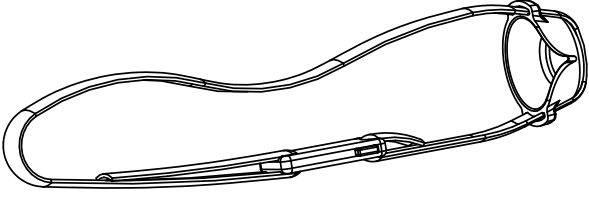
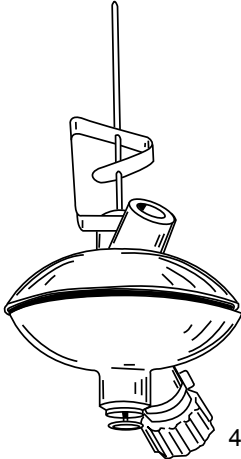
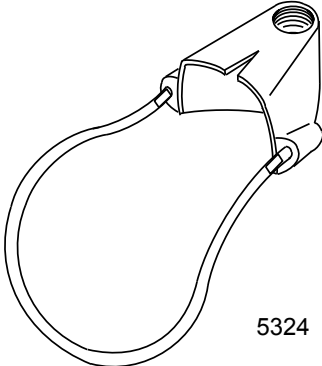

Some boat performance can be regained by dropping to a lower pitch propeller, but engine performance will remain lower. In some cases, a gear ratio reduction may be more beneficial. To optimize engine performance, prop the engine to allow it to allow operation at or near the top end of the recommended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

Other advantages to propeller or gear ratio changes:

- Reduces the possibility of detonation
- Enhances overall reliability and durability of the engine

MAINTENANCE

Special Tools

<p>Dual Water Pick-Up Flush Gear Case Seal Kit</p>	<p>91-881150Q1</p>
<p>Description: Use to block-off the front water inlet holes on the dual water inlet gearcases.</p>	 <p>5321</p>
<p>Flushing Device</p>	<p>91-44357Q2</p>
<p>Description: Attaches to the drive unit water intakes, provides a fresh water connection when flushing the cooling system or operating the engine.</p>	 <p>4730</p>
<p>Flushing Kit</p>	<p>91-849996T1</p>
<p>Description: Use for flushing drives with low water inlet gearcases.</p>	 <p>5324</p>
<p>Flushing Attachment</p>	<p>91-843122A01</p>
 <p>14565</p>	<p>Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.</p>

MAINTENANCE

Servicing High Horsepower Engines

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

Service Responsibilities

OWNER/OPERATOR RESPONSIBILITIES

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

- Perform all safety checks.
- Make sure lubrication and maintenance instructions are complied with for safe operation.
- Return the unit to an authorized Mercury Marine dealer for a periodic checkup.
- Perform normal maintenance service using authorized replacement parts.

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

DEALER RESPONSIBILITIES

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

- Completing a Warranty Registration Card provided with the product and mailing it to the factory or by using the electronic registration system provided by Mercury Marine for the selling dealer.
- Properly equipping the boat.
- Making certain that the Mercury Marine power package and other equipment are in proper operating condition prior to delivery.
- Making all necessary adjustments for maximum efficiency.
- Familiarizing the customer with the on-board equipment.

MAINTENANCE

- Explaining and demonstrating the operation of the power package and boat.
- Providing the customer with a copy of a **Pre-delivery Inspection Checklist** prior to delivery.

Replacement Service Parts

WARNING

Avoid fire or explosion hazard. Electrical, ignition and fuel system components on Mercury Marine gasoline power packages are designed and manufactured to comply with U.S. Coast Guard rules and regulations to minimize risks of fire or explosion.

Do not use replacement electrical, ignition or fuel system components, which do not comply to these rules and regulations.

When servicing the electrical, ignition, and fuel systems, it is extremely important that all components are properly installed and tightened. If not, any electrical or ignition component would permit sparks to ignite fuel vapors from fuel system leaks, if they existed.

Marine engines are expected to operate at or near full throttle for most of their life. They are also expected to operate in fresh and saltwater environments. These conditions require numerous special parts. Care should be exercised when replacing marine engine parts, as specifications are quite different from those of the standard automotive engine.

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

Since marine engines must be capable of running at or near maximum RPM much of the time, special valve springs, valve lifters, pistons, bearings, camshafts and other heavy-duty moving parts are required for long life and peak performance.

These are but a few of the many special modifications that are required in Mercury Marine engines to provide long life and dependable performance.

MAINTENANCE

Do-It-Yourself Maintenance Suggestions

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

- Present-day marine equipment, such as your Mercury Marine power package, are highly technical pieces of machinery. Electronic ignition and special fuel delivery systems provide greater fuel economies, but are more complex for the untrained mechanic.
- Do not attempt any repairs that are not covered in this manual unless you are aware of the precautions (Cautions and Warnings) and procedures required. Your safety is of our concern.
- If you attempt to service the product yourself, we suggest you order the service manual for that model. This manual outlines the correct procedures to follow. It is written for the trained mechanic, so there may be procedures you don't understand. Do not attempt repairs if you do not understand the procedures.
- Special tools and equipment may be required to perform some repairs. Do not attempt these repairs unless you have these special tools and/or equipment. You can cause damage to the product in excess of the cost a dealer would charge you for the repair.
- If you partially disassemble an engine or drive assembly and are unable to repair it, the dealer's mechanic must re-assemble 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 request the repair procedure. It is difficult for them to diagnose a problem over the telephone.
- Your authorized Mercury Marine dealer is there to service your power package. They have qualified factory-trained mechanics.

MAINTENANCE

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

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

Engine Maintenance Charts

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

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

MAINTENANCE

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

MAINTENANCE

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

Bravo Drive Maintenance Charts

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

MAINTENANCE

Interval	Task
Check prior to every use and every 3 hours of operation.	Drive, transom, and propeller - Inspect
Every 25 hours of operation or once every 30 days, whichever occurs first.	Gear housing water pickups - Check for marine growth or debris.
	Anodes - Inspect for erosion.
	Sterndrive unit oil - Check level.
Saltwater use: Every 50 hours of operation or 60 days, whichever occurs first.	Propeller Shaft - Lubricate.
Every 50 hours or once a year, whichever occurs first.	Perform all 25 hour maintenance items.
	Shift cable and linkage - Lubricate and inspect for loose, damaged or missing parts.
	Water separator filter - Inspect (If Installed on boat).
	Engine coupling, universal joint shaft spline - Lubricate.
	Sterndrive unit - Oil change.
Every 50 hours or once a year, whichever occurs first.	Sterndrive unit universal joint cross bearings - Inspect and lubricate.
	Gimbal ring clamping screws - Re-torque to 67-74 Nm (50-55 lb. ft.).
	Gimbal bearing - Lubricate.
	Transom gimbal housing assembly swivel shaft and gimbal bearing - Lubricate.
	Engine driveshaft - Lubricate (drive line models).
	Engine output shaft bearings - Lubricate.
	Input shaft/rear bearing support block bearing - Lubricate.
	Steering system - Lubricate and inspect for loose, damaged or missing parts.
Propeller shaft - Inspect for bending.	

MAINTENANCE

Interval	Task
Every 100 hours of operation or once a year, whichever occurs first.	Supercharger - Change oil.
	Power package exterior surfaces - Clean and paint.
	Check engine cylinder compression.
	Oil coolers for the engine and power steering - Clean seawater section.
	Replace positive crankcase ventilation (PCV) valve.
	Flame arrestor and crankcase ventilation hose - Inspect, clean or replace.
	Engine alignment - Check.
	Exhaust - Check for signs of water leakage.
	Exhaust system internal and external shutters - Inspect.
	Engine output shaft, bearing, and pilot bushing - Inspect and lubricate.
	Rear bearing support block - Check alignment.
	MerCathode system - Test output.
	Steering head and remote control - Inspect and lubricate.
	Drive unit bellows and clamps - Inspect.
Propeller shaft bearing - Inspect by measuring shaft deflection.	
Drive bearing carrier - Check bore for evidence of friction with the propeller shaft.	

Checking Fluid Levels

CRANKCASE OIL

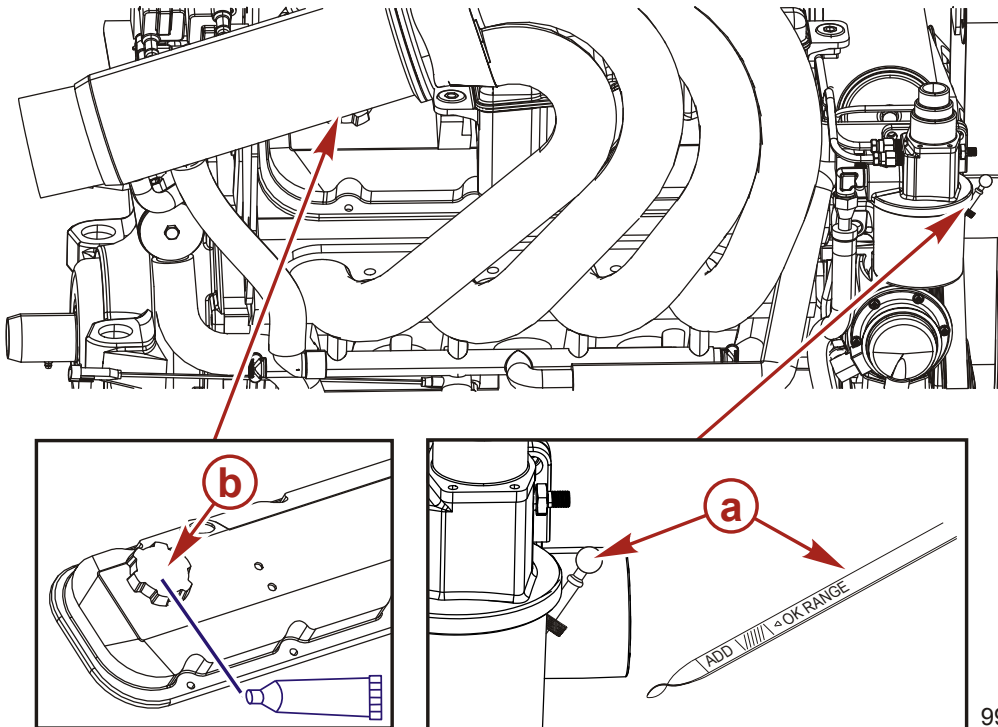
IMPORTANT: Check the engine crankcase oil at the intervals specified in the Maintenance Chart.

MAINTENANCE

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


1. Stop the engine.
2. Allow approximately five minutes for the oil to drain into the oil pan. The boat must be at rest in the water or at the approximate angle that it would be if setting in the water.
3. Remove the dipstick, wipe it clean, and re-install it all the way into the dipstick tube.
4. Remove the dipstick and check the oil level. The oil level must be between the "OK RANGE" and the "ADD" marks.
5. If the oil level is below the "ADD" mark, remove the oil filler cap (port or starboard). Add the specified oil to bring the level up to, but not over, the "OK RANGE" mark on the dipstick.

IMPORTANT: Do not overfill the crankcase oil.



- a** - Oil level dipstick
- b** - Crankcase oil filler cap

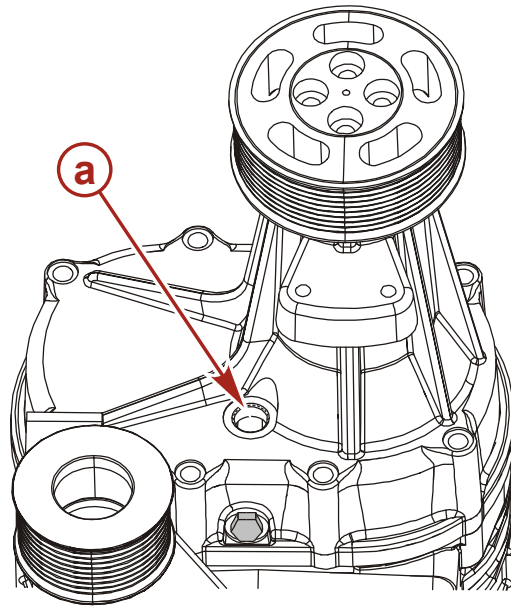
MAINTENANCE

Tube Ref No.	Description	Where Used	Part No.
	Kendall GT-1 SAE 20W50	Engine crankcase	Obtain Locally

SUPERCHARGER GEARCASE OIL

IMPORTANT: A sight-glass is located in the front gearcase cover of the supercharger. The oil should be covering approximately half of the sight-glass. If the oil level increases, decreases, or changes to an abnormal color, it would indicate that there is an internal problem with the supercharger. Contact your authorized Mercury Marine dealer.

1. Stop the engine.
2. Allow approximately 5 minutes for the oil in the supercharger case to settle and the sight-glass to clear.
3. Visually inspect the level and quality of the oil in the sight-glass gauge. The oil should be covering approximately half of the sight-glass.



7356

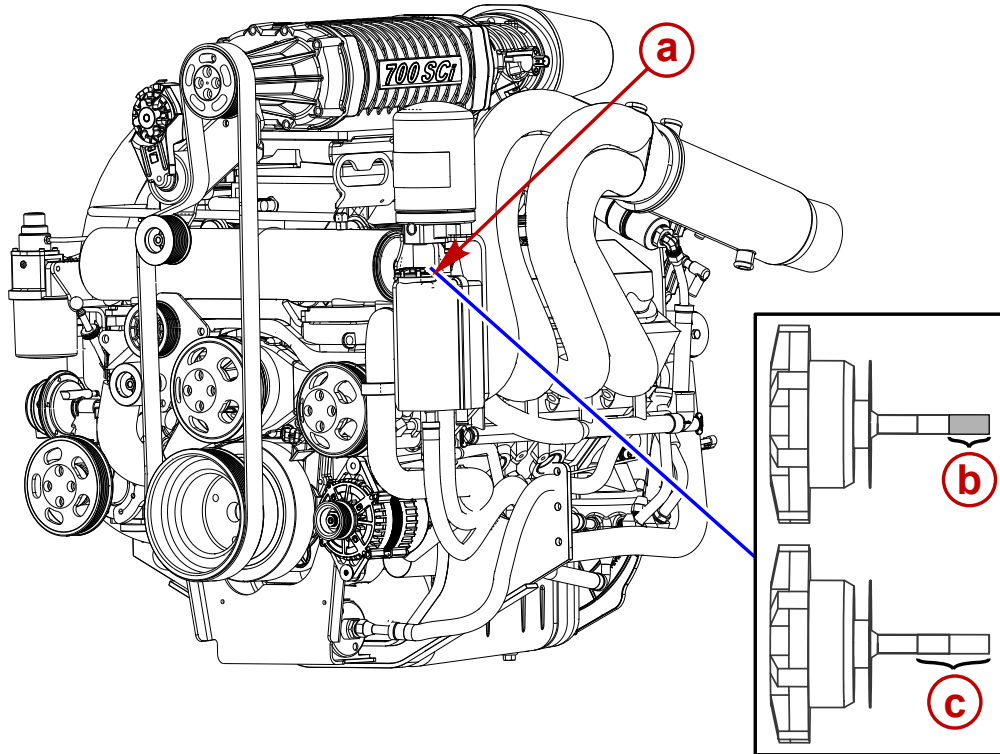
a - Sight-glass

POWER STEERING PUMP

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


MAINTENANCE

1. Stop the engine and turn the drive unit the straight ahead position.
2. Remove the fill cap/dipstick and observe the level. The oil level must be between the lower and upper marks.
3. Add power steering fluid if required to bring the oil level up to the full mark on the cap/dipstick.



21834

- a** - Power steering reservoir fill/dipstick cap
- b** - Add fluid mark
- c** - Full fluid mark

Tube Ref No.	Description	Where Used	Part No.
 114	Power Trim and Steering Fluid	Power steering pump	92-858074K0 1

4. Re-install the cap/dipstick.

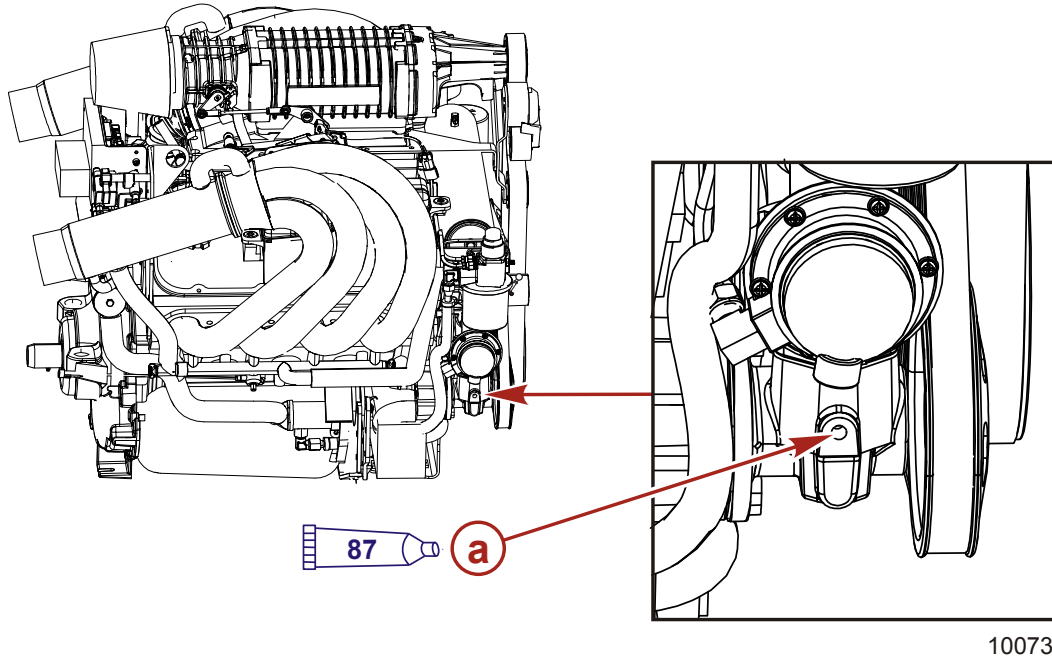
SEAWATER/FUEL PUMP OIL

IMPORTANT: Oil must be changed at specified intervals. Refer to the Maintenance Chart for specific requirements. Use only High Performance Gear Lube in the pump.


1. Remove the fill screw and check the oil level.

MAINTENANCE

- Oil should be up to the bottom of the fill hole. A low oil level indicates that there is an internal problem and that you should contact your authorized Mercury Marine dealer for appropriate service. Do not operate engine if this oil level is low.



a - Oil level screw

Tube Ref No.	Description	Where Used	Part No.
 87	High Performance Gear Lubricant	Seawater/fuel pump	92-802854A1

ENGINE COOLANT

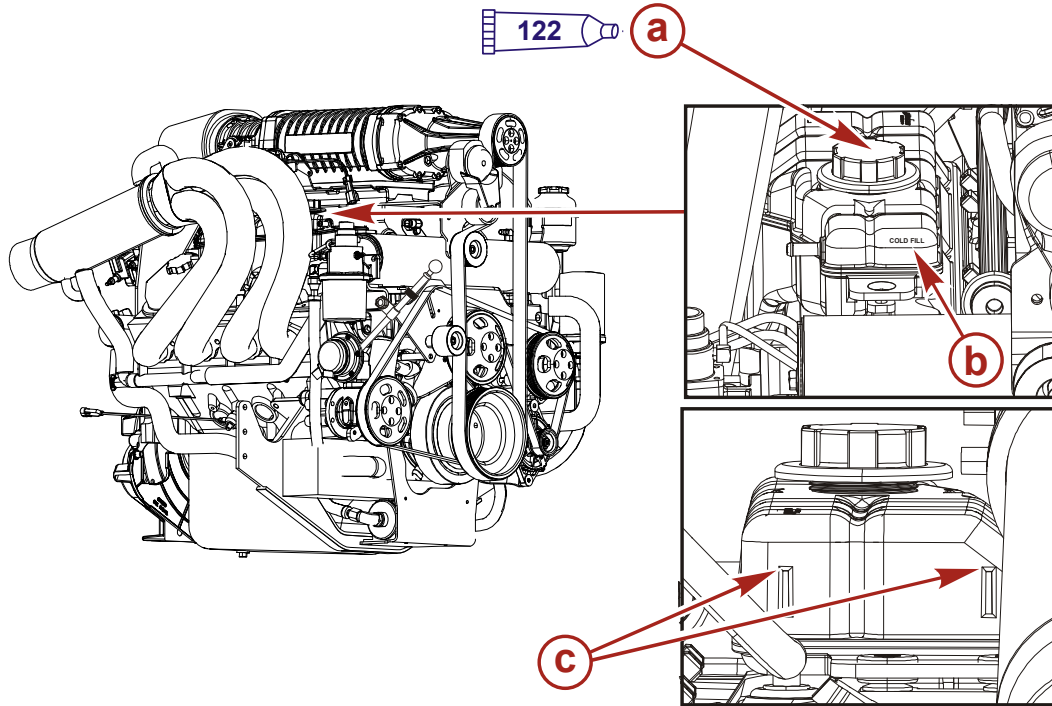
WARNING

Avoid personal injury and burns from hot engine coolant. Allow the engine to cool down before removing the coolant pressure cap. A sudden loss of pressure could cause hot coolant to boil and discharge violently.

IMPORTANT: Check engine coolant before starting engine.


MAINTENANCE

1. Check the coolant level in the coolant reservoir when the engine is cold. Coolant should be at the "COLD FULL" line marked on the front of the reservoir or to the top of the raised bosses on the back of the reservoir. Add specified coolant by turning the cap 1/4 turn to allow any pressure to escape slowly, then push down and turn the cap all the way off.



10140

- a** - Coolant reservoir cap
- b** - Cold full decal on the front of the reservoir
- c** - Cold full raised bosses on the back of the reservoir

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

2. If coolant is low, inspect coolant recovery system for leaks.
3. Inspect the cap for damage and replace if necessary.

CHANGING ENGINE COOLANT

Contact your authorized Mercury Marine dealer.

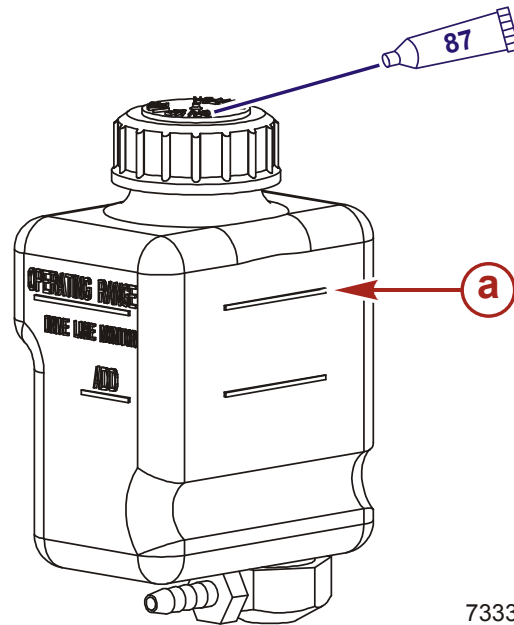
MAINTENANCE

DRIVE UNIT OIL


NOTE: Oil level will fluctuate during operation. Oil level should be checked with the cold engine before starting.

1. Check gear lube monitor oil level; keep oil level at or near the "FULL" line.
2. Check for water at the bottom of the monitor and/or if the oil appears a milky tan color. Contact your authorized Mercury Marine dealer immediately because both conditions indicate a water leak somewhere in the drive unit.

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



a - Gear lube monitor

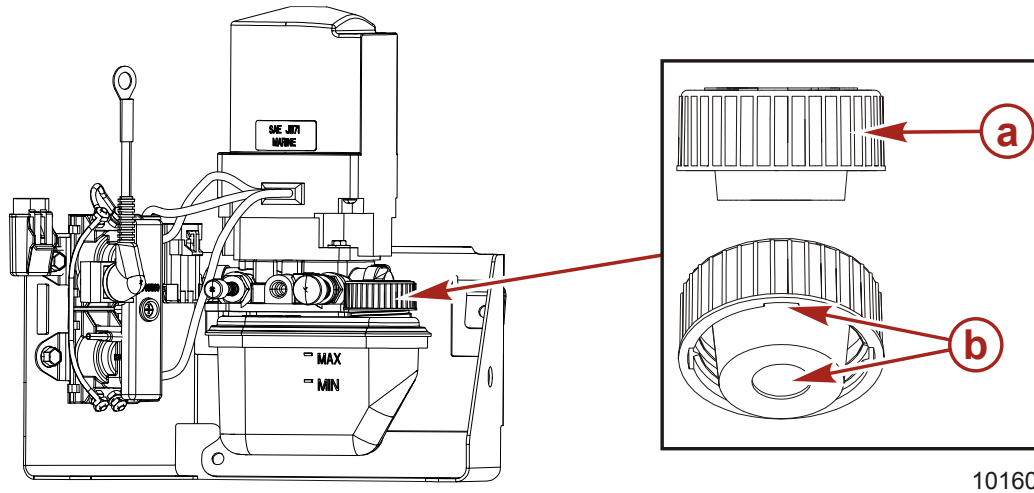
Tube Ref No.	Description	Where Used	Part No.
	High Performance Gear Lubricant	Gear lube monitor	92-802854A1

POWER TRIM PUMP FLUID


1. Place drive unit in full down/in position.
2. The oil level should be between the "MAX" and "MIN" marks on the plastic reservoir.

MAINTENANCE

- If the oil level is below the "MIN" mark, remove the fill cap and add Power Trim and Steering Fluid to bring the oil level up to the "MAX" mark on the reservoir.



- a - Vented trim pump fill cap
- b - Trim pump filter and vents (4)

Tube Ref No.	Description	Where Used	Part No.
	Power Trim and Steering Fluid	Power trim pump reservoir	92-858074K0 1

- Inspect the fill cap vent slots to ensure that they are clean. Re-install the fill cap.

Changing Fluids

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

Power trim or power steering fluids do not require changing.

CRANKCASE OIL AND FILTER (BOAT IN THE WATER)

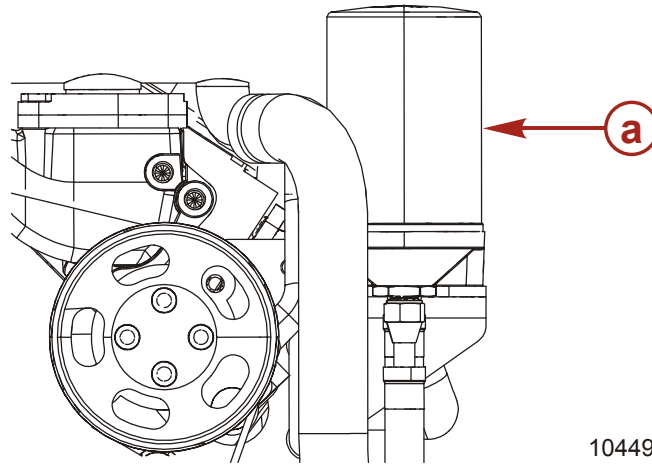
CAUTION

ENVIRONMENTAL HAZARD! Discharge of oil or oil waste into the environment is restricted by law. Do not spill oil or oil waste into the environment when using or servicing your boat. Contain and dispose of oil or oil waste as directed by local authorities.

MAINTENANCE

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

NOTE: To allow the oil to drain from the filter, loosen the filter just enough to break the internal vacuum (approximately 1/4 turn). Then turn the filter back clockwise until the oil filter seal makes light contact with the housing (approximately an 1/8 turn) to prevent unwanted oil leakage. Let the oil drain back into the system for 15 minutes prior to complete removal of the filter.



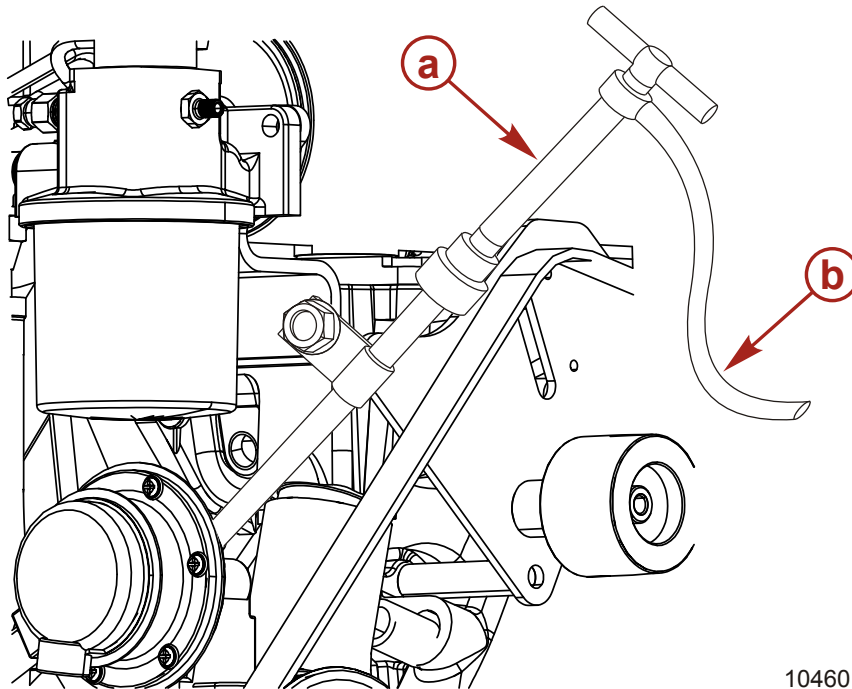
10449

a - Crankcase oil filter

1. With the engine at normal operating temperature, remove the dipstick.
2. Install a crankcase oil pump onto the dipstick tube.

MAINTENANCE

3. Insert the hose end of the crankcase oil pump into an appropriate container and using the pump handle, pump until the crankcase is empty.



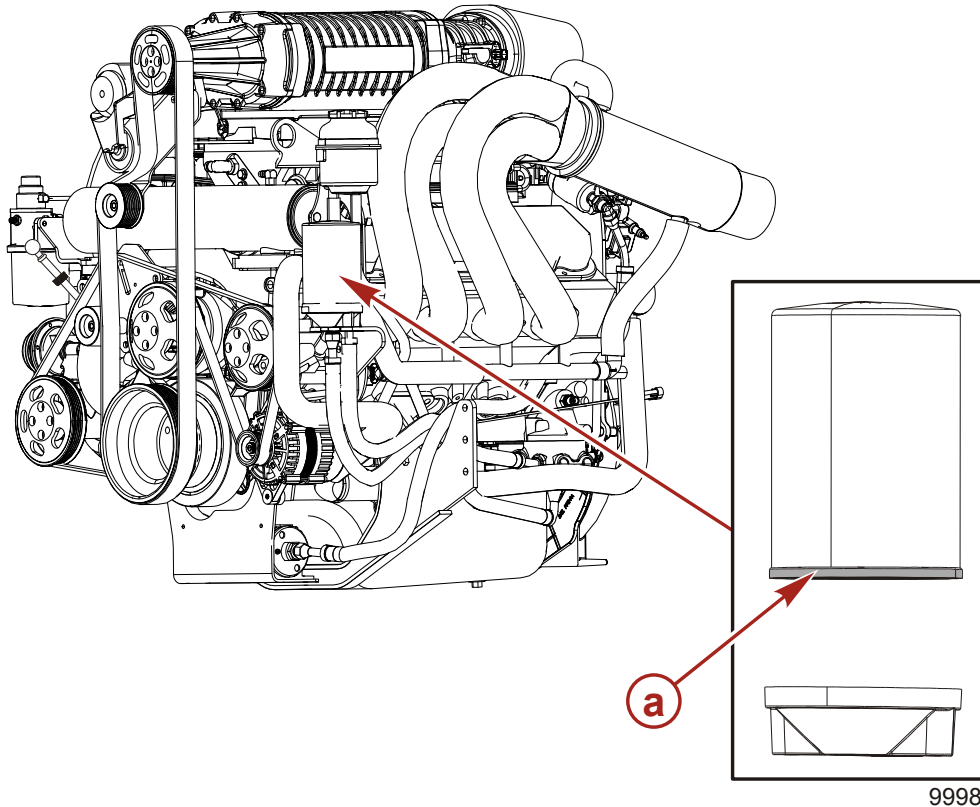
10460

- a** - Crankcase oil pump
- b** - Crankcase oil pump hose

4. Remove the crankcase oil pump.
5. Place a container below the oil filter.
6. Remove the oil filter from the adaptor and discard the old oil filter and old sealing ring.
7. Coat the sealing ring on the new filter with motor oil and install the new sealing ring and filter.

MAINTENANCE

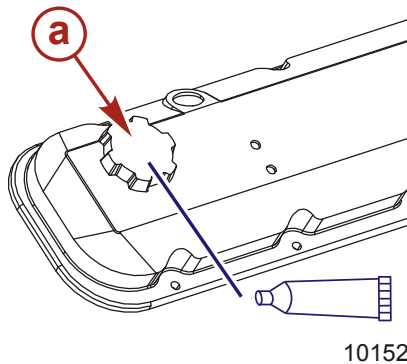
8. Tighten the filter securely by hand. Do not overtighten.



a - Oil filter sealing ring


9. Remove the oil filler cap (port or starboard).
10. Add oil to bring level up to, but not over, the "OK RANGE" mark on the dipstick.

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



a - Crankcase oil fill cap

MAINTENANCE

Tube Ref No.	Description	Where Used	Part No.
	Kendall GT-1 SAE 20W50	Engine crankcase	Obtain Locally

11. Start the engine and check for acceptable oil pressure. Allow the engine to idle for at least one minute. Shut off the engine. Wait a few minutes for the engine oil to return to the crankcase and then check the oil level. Add the specified oil to bring the level up to, but not over, the "OK RANGE" mark on the dipstick.

NOTE: It is normal for the oil level to be low after changing the oil and filter because the filter is empty and gets filled at start up.

CRANKCASE OIL AND FILTER (BOAT OUT OF THE WATER)

WARNING

If the engine is to be tested with boat out of the water, the propeller must be removed to avoid injury.

CAUTION

Avoid engine damage from overheating. If the engine is operated above 1500 RPM during flushing, suction created by the seawater pickup pump may collapse the flushing water hose causing the engine to overheat.

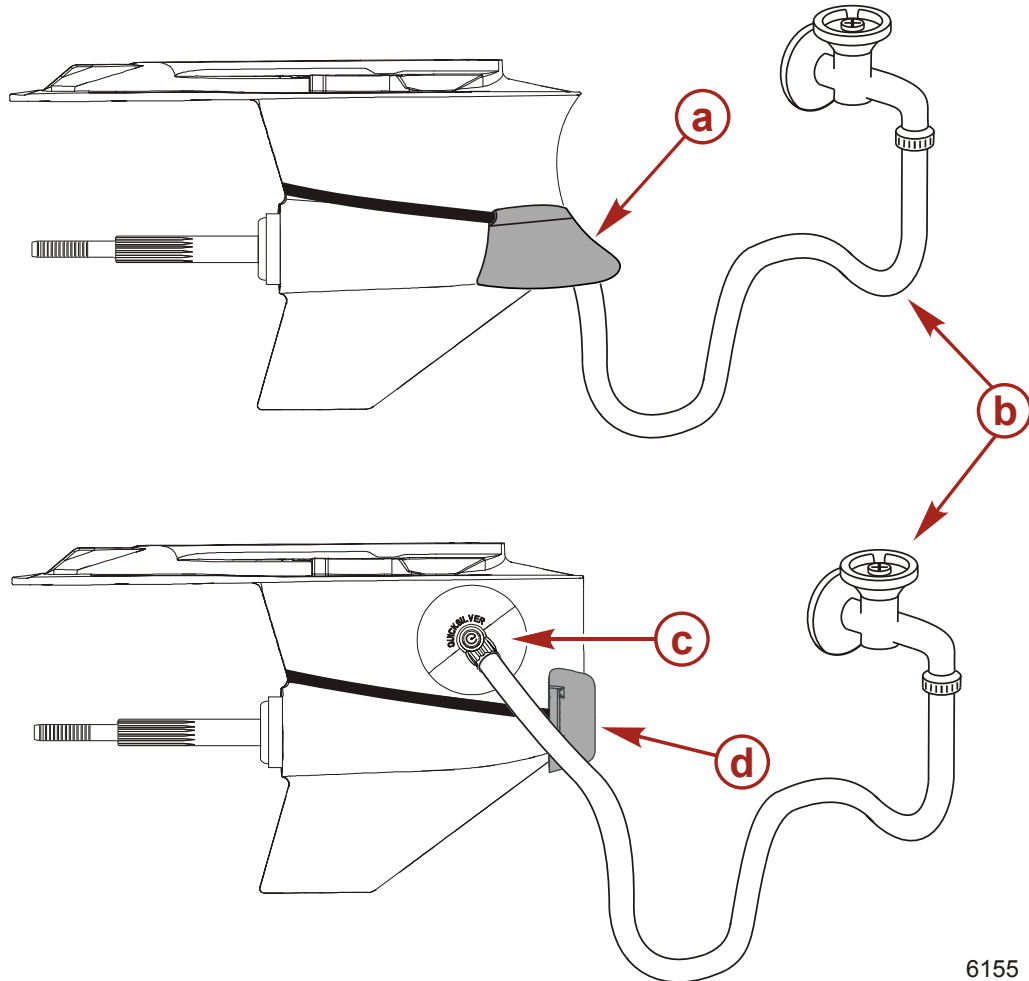
CAUTION

ENVIRONMENTAL HAZARD! Discharge of oil or oil waste into the environment is restricted by law. Do not spill oil or oil waste into the environment when using or servicing your boat. Contain and dispose of oil or oil waste as directed by local authorities.

IMPORTANT: Change oil when the engine is warm from operation. Warm oil flows more freely, carrying away more impurities. Use Mercury Precision Parts or flushing attachment(s) over the water intake holes and attach a water hose. Use only recommended motor oil, see *Specifications*.

MAINTENANCE

1. Install the appropriate flushing attachment(s) over the water intake holes and attach a water hose.



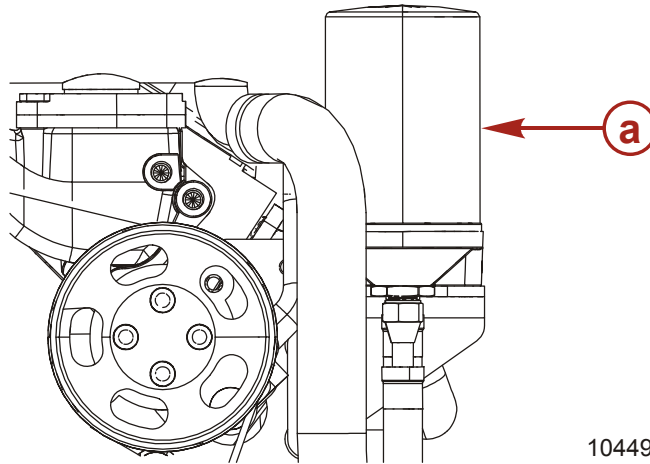
6155

- a** - Flushing attachment over water intake holes (SportMaster Gearcase)
- b** - Fresh water source
- c** - Flushing attachment for dual water inlet drives
- d** - Nose cone water pickup cover for dual water inlet drives

2. With the drive unit in normal operating position, partially open the water tap (about 1/2 maximum).
3. Place the remote control in neutral position and start the engine. Operate the engine at idle speed, in neutral, until the engine reaches normal operating temperature.
4. Stop the engine and shut off the water.

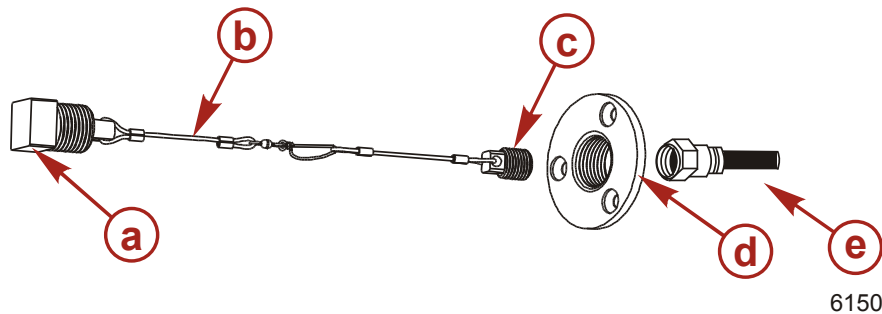
MAINTENANCE

NOTE: To allow the oil to drain from the filter, loosen the filter just enough to break the internal vacuum (approximately 1/4 turn). Then turn the filter back clockwise until the oil filter seal makes light contact with the housing (approximately an 1/8 turn) to prevent unwanted oil leakage. Let the oil drain back into the system for 15 minutes prior to complete removal of the filter.



a - Crankcase oil filter

5. Remove the bilge plug. The oil drain hose is tethered to the plug.



a - Bilge drain plug

b - Tether

c - Oil drain plug

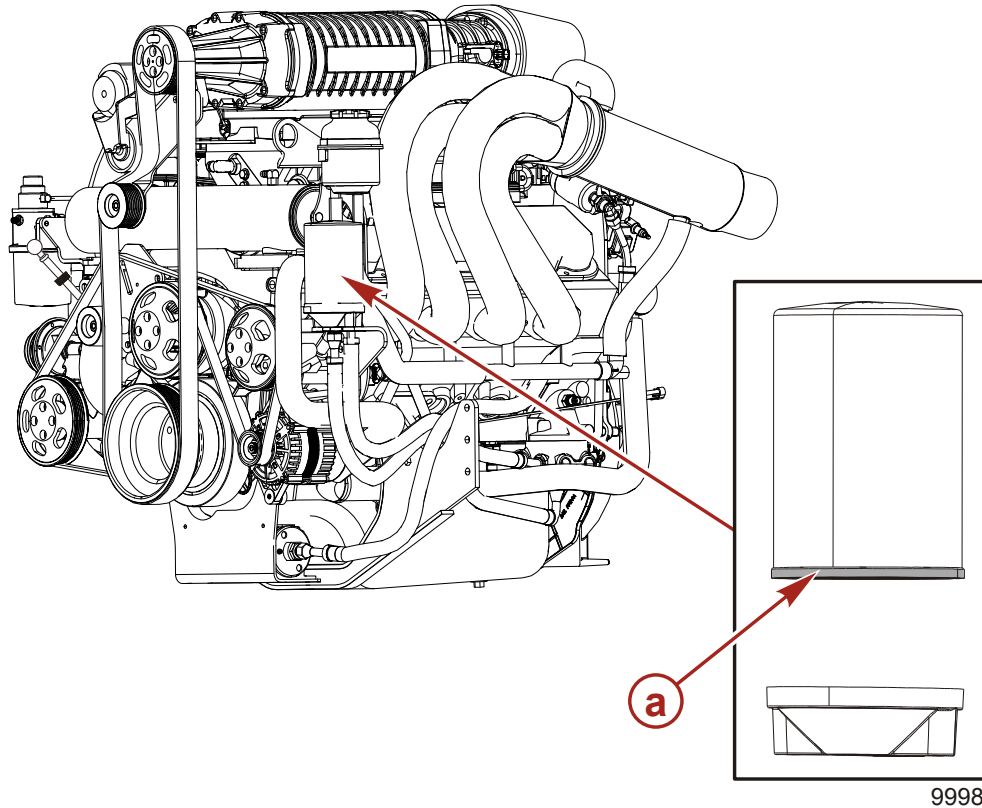
d - Bilge drain flange

e - Oil drain hose

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

MAINTENANCE

10. Remove the oil filter from the adaptor and discard the old oil filter and sealing ring.
11. Coat the sealing ring on the new filter with motor oil. Install the sealing ring and filter. Tighten the filter securely by hand. Do not overtighten.

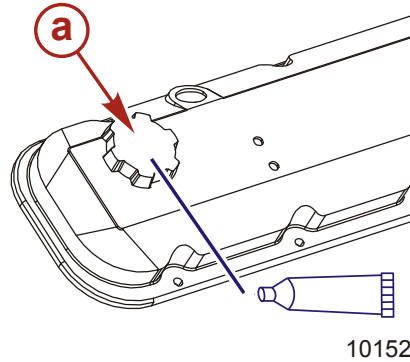


a - Oil filter sealing ring


12. Using two wrenches, connect the oil drain hose plug to the oil drain hose and place it back into the boat.
13. Tighten the bilge drain plug.
14. Remove the oil filler cap (port or starboard). Add oil to bring level up to, but not over the "FULL" mark on the dipstick.

MAINTENANCE

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



a - Crankcase oil filler cap

Tube Ref No.	Description	Where Used	Part No.
	Kendall GT-1 SAE 20W50	Engine crankcase	Obtain Locally

15. Turn on the water to the flushing attachment.
16. Start the engine and check for acceptable oil pressure. Allow the engine to idle for at least one minute. Shut off the engine and the water to the flushing attachment. Wait a few minutes for the engine oil to return to the crankcase and then check the oil level. Add the specified oil to bring the level up to, but not over, the "OK range" mark on the dipstick.

NOTE: It is normal for the oil level to be low after changing the oil and filter because the filter is empty and gets filled at start up.

17. Remove the flushing attachment(s).

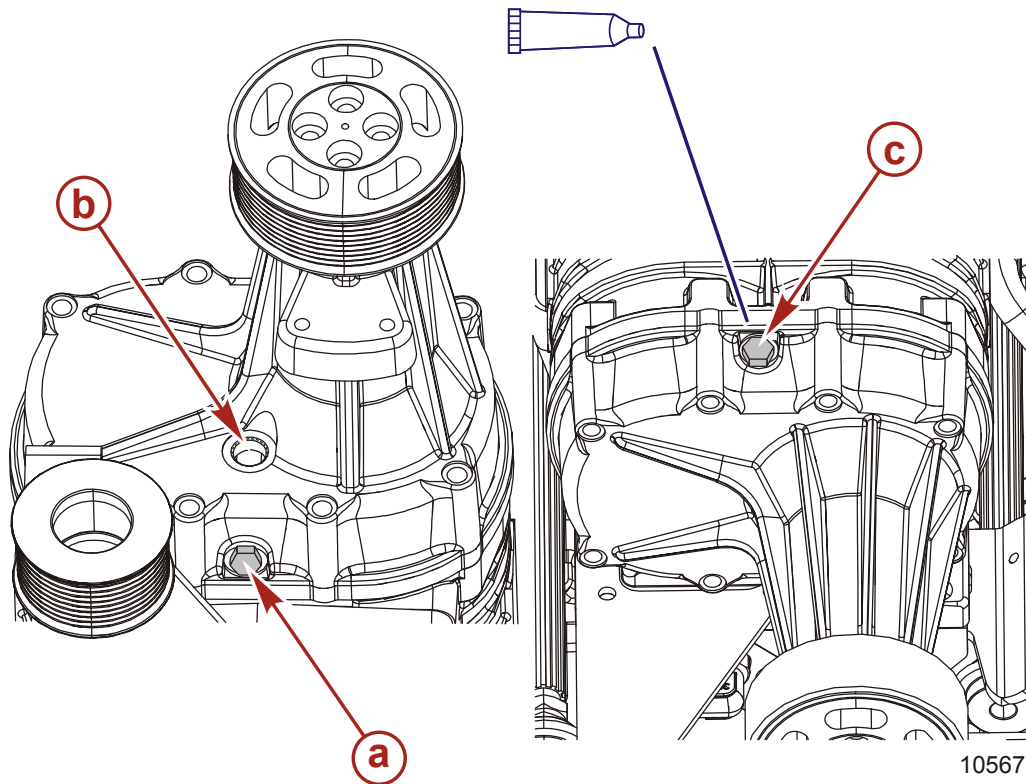
SUPERCHARGER GEARCASE OIL

IMPORTANT: Change the supercharger oil when the engine and supercharger are warm from operation. Warm oil flows more freely, carrying away more impurities. Use only the recommended oil in the supercharger, see *Specifications*. If the oil level in the sight-glass has increased, decreased, or changed to an abnormal color, it would indicate an internal problem with the supercharger. Contact your authorized Mercury Marine dealer.

1. Remove the fill plug from the top of the supercharger gearcase.

MAINTENANCE

2. Place a catch pan under the drain plug in the bottom of the supercharger gearcase.
3. Remove the drain plug and drain the oil.
4. Clean and inspect the plug o-rings, the gearcase fill and drain hole threads and the plug threads.
5. Install the drain plug in the gearcase and torque to specifications.
6. Fill the gearcase through the top fill hole with approximately 177 milliliters (6 oz) of oil. The oil should cover half of the sight-glass in the gearcase.
7. Install the fill plug and torque to specifications.




a - Drain plug
b - Sight-glass

c - Fill plug

Description	Nm	lb. in.	lb. ft.
Fill and drain plugs, supercharger gearcase	13.5		10

MAINTENANCE

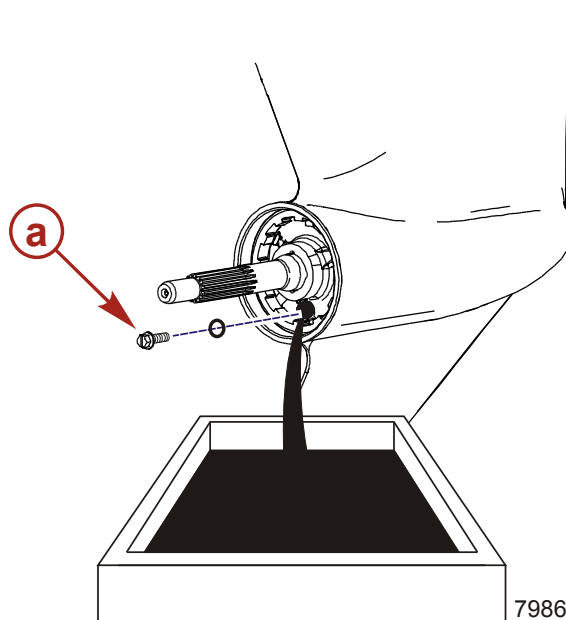
Tube Ref No.	Description	Where Used	Part No.
	Castrol Syntec 5W-50 Synthetic Oil	Supercharger gearcase	Obtain Locally

DRIVE UNIT OIL (XR MODELS)

IMPORTANT: Use only High Performance Gear Lube in drive unit.

1. Remove the propeller and place the drive unit in the full down position.
2. Place a suitable container below the drive fill/drain screw.
3. Remove the fill/drain screw and sealing washer and drain the oil.

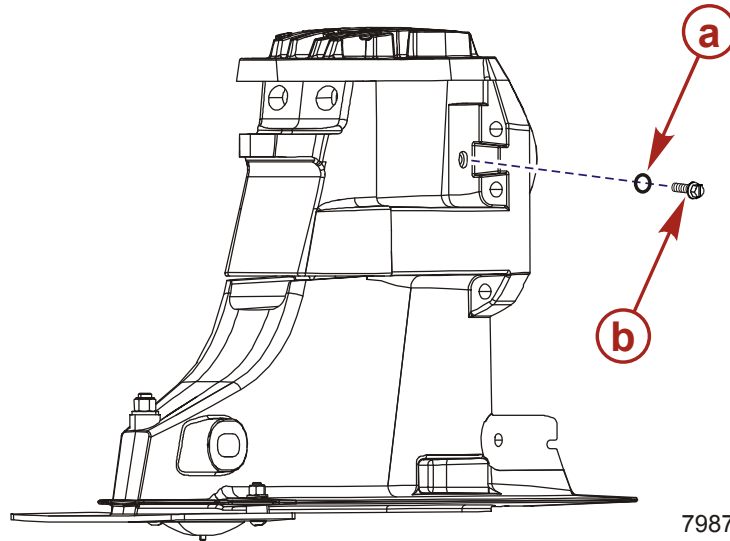
IMPORTANT: If any water drained from the oil fill/drain hole, or if oil appears milky, the drive unit is leaking and should be checked immediately by your authorized Mercury Marine dealer.



a - Oil fill/drain plug

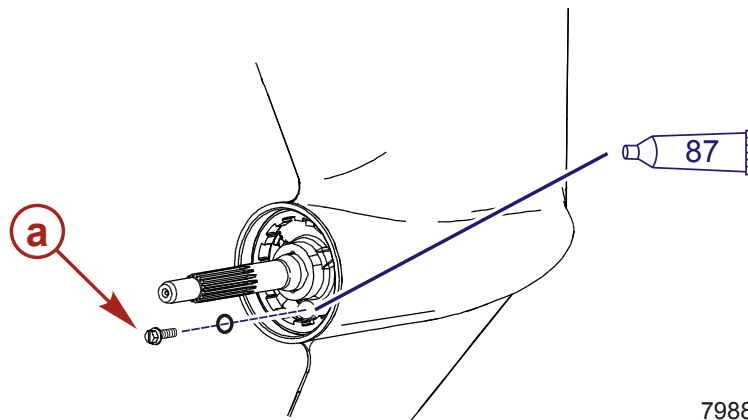
MAINTENANCE

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




- a** - Sealing washer
- b** - Oil vent screw

- Adjust the drive unit so that the propeller shaft is level.
- Fill the drive unit through the oil fill/drain hole with High Performance Gear Lube until an air-free stream of lubricant flows from the oil vent hole.

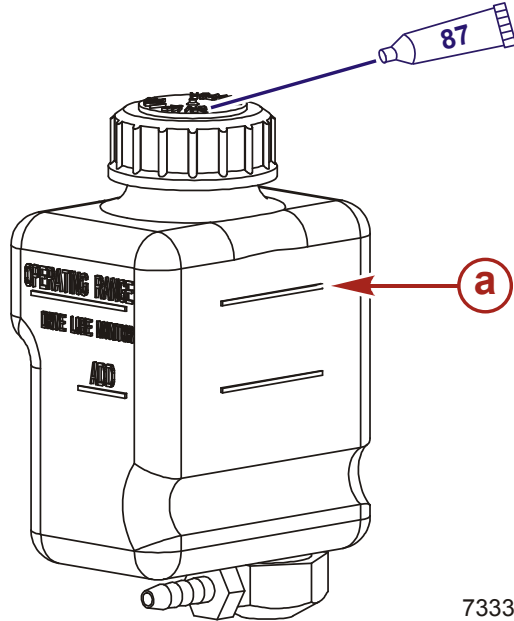


- a** - Oil fill/drain screw


Tube Ref No.	Description	Where Used	Part No.
 87	High Performance Gear Lubricant	Drive unit	92-802854A1

MAINTENANCE

7. Remove the tube from the oil fill/drain hole and quickly install the sealing washer and the oil fill/drain screw. Tighten securely.
8. Add specified gear lube to the monitor bottle.
9. When oil starts to run out of the oil vent hole of the drive, re-install the oil vent screw and sealing washer. Tighten securely.



a - Gear lube monitor bottle

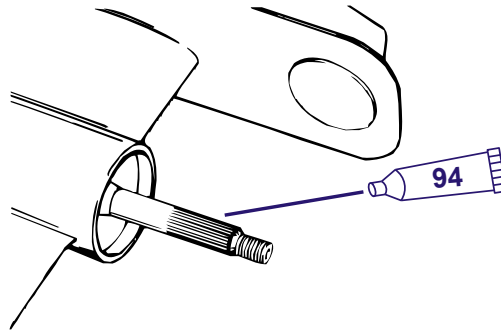
Tube Ref No.	Description	Where Used	Part No.
 87	High Performance Gear Lubricant	Gear lube monitor	92-802854A1

10. Continue adding gear lube to the monitor bottle until the oil level is at the "FULL" line mark on the bottle.
11. Lubricate the O-ring on the bottle neck with sterndrive oil to ensure ease of installation and removal of the cap.
12. Install the filler cap, and be careful to not overtighten.


IMPORTANT: Re-check the reservoir bottle oil level after the first use.

MAINTENANCE

13. Grease the propeller shaft with anti-corrosion grease. Re-install the propeller and torque the prop nut to specification.



7990

Tube Ref No.	Description	Where Used	Part No.
 94	Anti-Corrosion Grease	Propeller shaft	92-802867A1

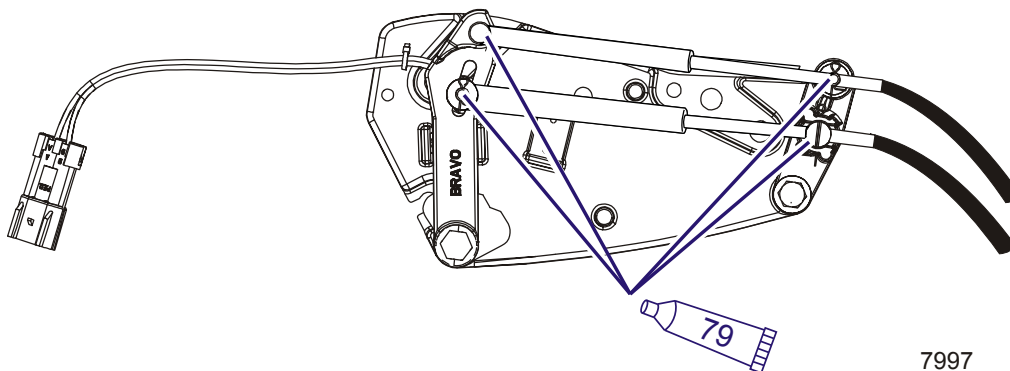
Description	Nm	lb. in.	lb. ft.
Propeller nut	75		55

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

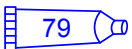
Lubrication

SHIFT CABLE

Lubricate the pivot points with 4 Cycle 25W40 motor oil.



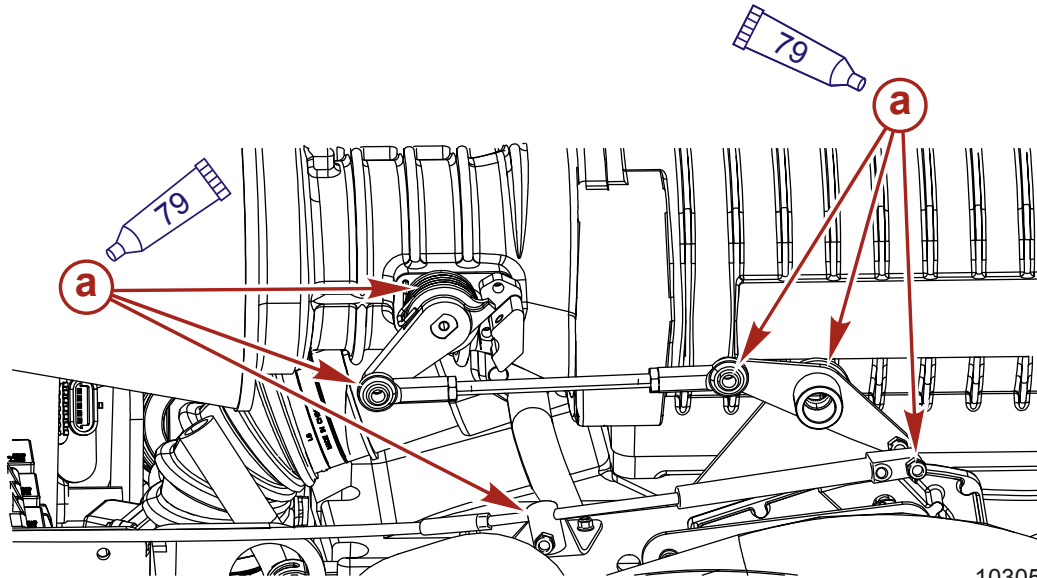
7997

Tube Ref No.	Description	Where Used	Part No.
 79	MerCruiser 4-cycle 25W40 Engine Oil	Pivot points	92-802837A1


MAINTENANCE

THROTTLE CABLE

Lubricate pivot points with 4 Cycle 25W40 motor oil.



a - Lubrication points

Tube Ref No.	Description	Where Used	Part No.
	MerCruiser 4-cycle 25W40 Engine Oil	Pivot points	92-802837A1

DRIVE UNIT AND TRANSOM ASSEMBLY

CAUTION

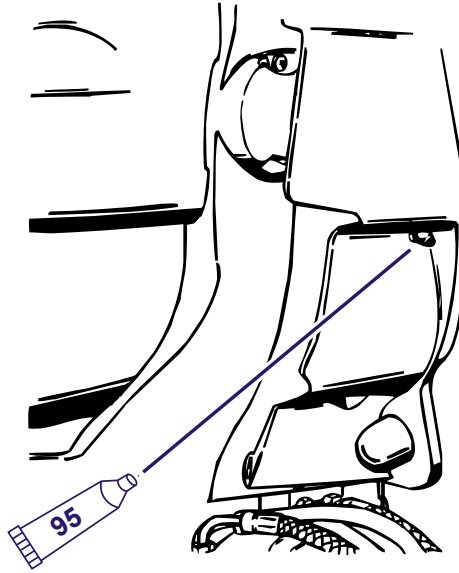
Avoid speedometer hose fitting damage. Disconnect the speedometer hose fitting from the driveshaft housing before removing the sterndrive unit.

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


NOTE: The engine coupling and shaft splines are greased with engine coupler spline grease. Universal joints are greased with 2-4-C with Teflon lubricant. Contact your authorized Mercury Marine dealer for this service.

MAINTENANCE

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

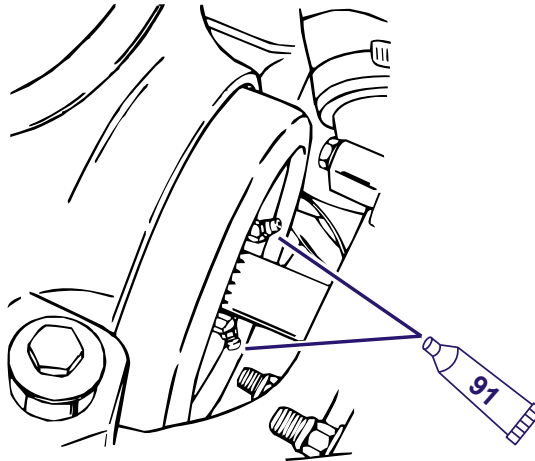


8013

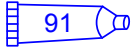
Tube Ref No.	Description	Where Used	Part No.
 95	2-4-C Marine Lubricant with Teflon	Gimbal bearing	92-802859A1

ENGINE COUPLER

Lubricate the engine coupler and shaft splines with engine coupler spline grease.



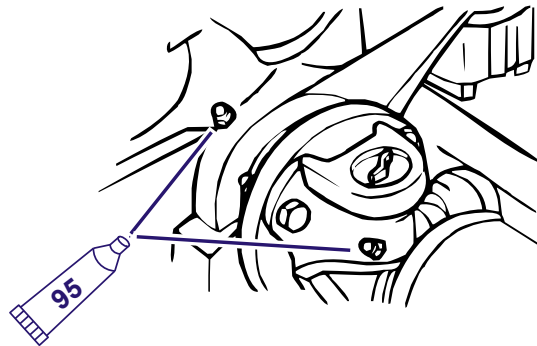
8014

Tube Ref No.	Description	Where Used	Part No.
 91	Engine Coupler Spline Grease	Engine coupler and shaft splines	92-802869A1

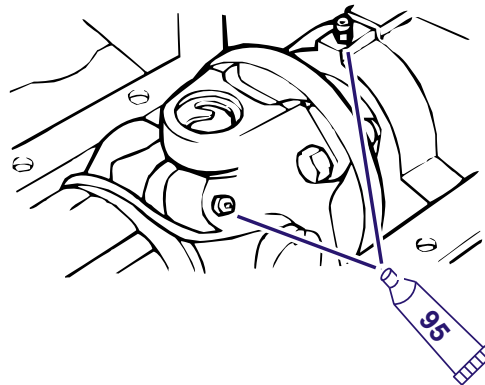
MAINTENANCE

DRIVE SHAFT EXTENSION MODELS


Lubricate the drive shaft grease fittings at the transom end with 2-4-C with Teflon lubricant.



8015



8016

Tube Ref No.	Description	Where Used	Part No.
	2-4-C Marine Lubricant with Teflon	Drive shaft grease fittings	92-802859A1

Propellers

XR MODEL PROPELLERS

WARNING

Avoid serious injury or death. Place the remote control in neutral and remove the ignition key from the switch before removing and/or installing the propeller. Place a block of wood between the anti-ventilation plate and the propeller to protect hands from propeller blades and to prevent the propeller from rotating when removing the propeller nut.

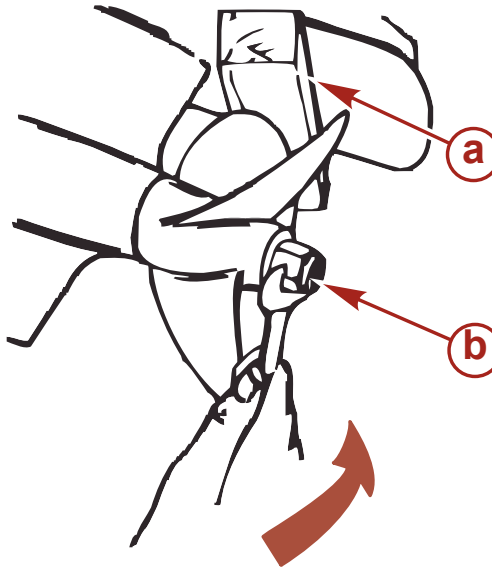
MAINTENANCE

⚠ CAUTION

Avoid Injury: Periodically check propeller nut for tightness during boating season. A minimum of 75 Nm (55 lb. ft.) torque is required.

Removal

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



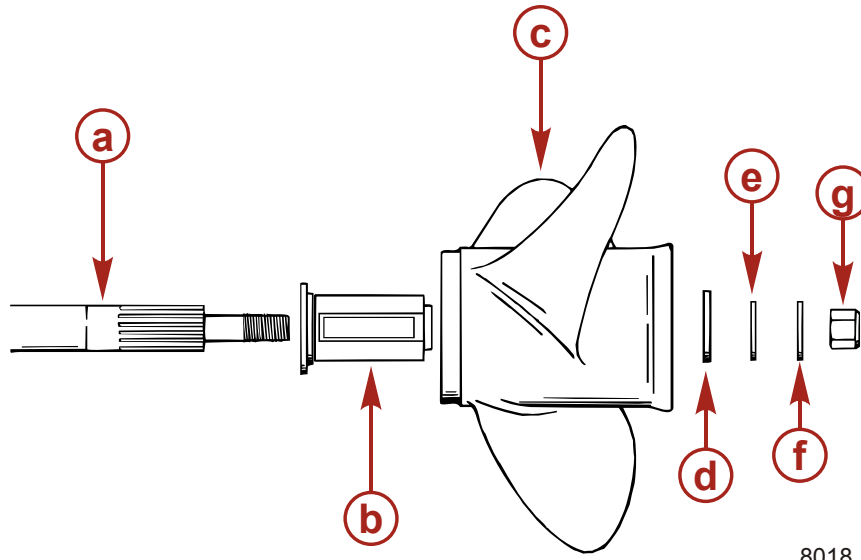
7448

- a** - Wood block
- b** - Propeller nut

2. Turn the propeller shaft nut counter-clockwise to remove the nut.

MAINTENANCE

3. Remove the washers, propeller and prop hub assembly.



8018

a - Propshaft

b - Prop hub assembly

c - Propeller assembly

d - Washer

e - Belleville washer

f - Washer

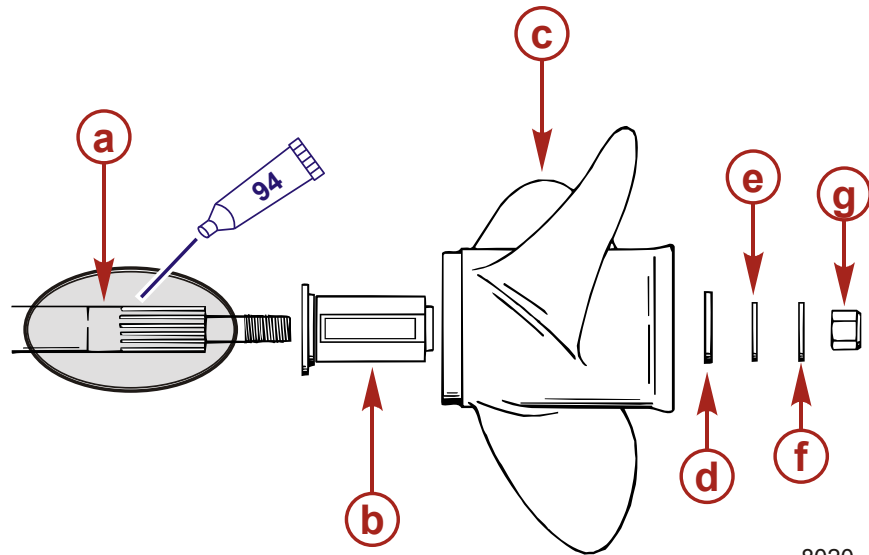
g - Locknut

NOTE: Some damaged propellers can be repaired. See your dealer.


MAINTENANCE

Installation

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



- 8020
- a** - Propshaft
 - b** - Prop hub assembly
 - c** - Propeller assembly
 - d** - Washer
 - e** - Belleville washer
 - f** - Washer
 - g** - Locknut

Tube Ref No.	Description	Where Used	Part No.
 94	Anti-Corrosion Grease	Exposed surfaces of propeller shaft	92-802867A1

2. Apply the following lubricants to the entire exposed surface of the propshaft:
 - **Salt Water:** Anti-Corrosion Grease
 - **Fresh Water:** Anti-Corrosion Grease or Optimal Paste White T-Grease
3. After first use:
 - Re-tighten propeller nut.
 - Check propeller at least every 20 hours of operation.
 - Do not operate with a loose propeller.

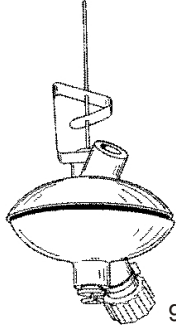
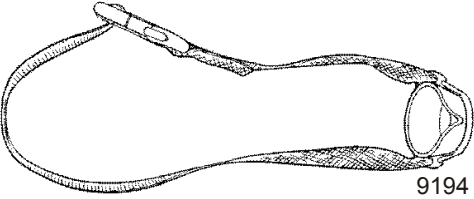
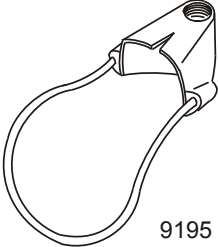

Description	Nm	lb. in.	lb. ft.
Propeller nut	75		55

MAINTENANCE

Flushing the Power Package

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

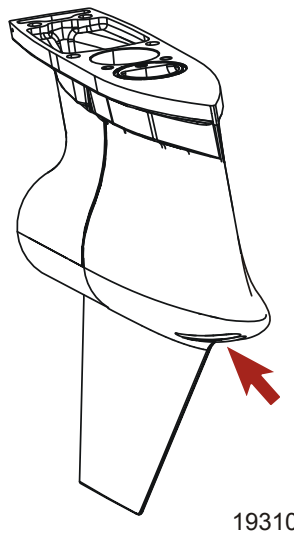
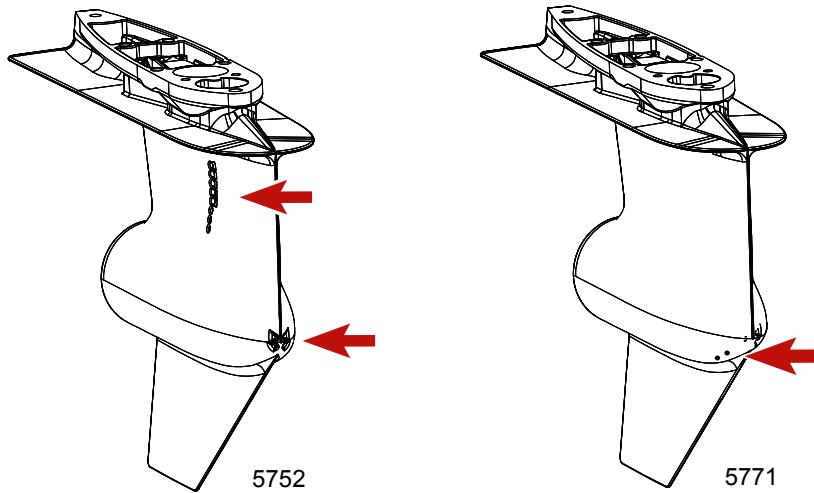
FLUSHING ATTACHMENTS

Flushing Device	91-44357Q 2
 9192	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.
Dual Water Pick-up Flush Gearcase Seal Kit	91-881150K 1
 9194	Blocks off the front water inlet holes on the dual water inlet gearcases.
Flushing Kit	91-849996T 1
 9195	Use for flushing gearcases with low water inlets.
Flushing Attachment	91-843122A01
 14565	Attaches to the water intakes; provides a fresh water connection when flushing the cooling system or operating the engine.

MAINTENANCE

STERNDRIVE WATER PICKUPS

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



Dual Water Pickup

SportMaster Low Water Pickup

Hi-Performance Low Water Pickup

MAINTENANCE

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

CAUTION

If flushing the engine with the boat in the water, seawater can flow into the engine causing damage. The water inlet must be closed when flushing the engine.

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

WARNING

Contact with moving drive components and the propeller can cause personal injury or death. To avoid possible injury, remove the propeller and ensure that no people or animals are in the area of the drive unit while flushing.

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

MAINTENANCE

⚠ CAUTION

Avoid engine damage from overheating. If the engine is operated above 1500 RPM during flushing, suction created by the seawater pickup pump may collapse the flushing water hose causing the engine to overheat.

7. Operate the engine at idle speed, in neutral, for about 10 minutes or until the discharge is clear.

⚠ CAUTION

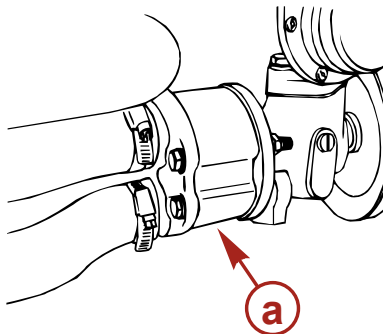
Engine overheating can cause engine damage. To avoid, observe the water temperature gauge and ensure that the engine is operating in the normal range.

8. Observe the water temperature gauge to ensure that the engine is operating in the normal range.
9. Stop the engine.
10. Shut off the water and remove the flushing attachment.

Seawater Pump Impeller Inspection

NOTE: The seawater pump is located at the lower front on the starboard side of the engine.

1. Inspect the seawater pump impeller if insufficient seawater flow occurs (if operating temperature exceeds normal range).
2. If service is required, have the work performed by an authorized Mercury Marine dealer.



8022

a - Seawater pump

MAINTENANCE

Cleaning the Seawater (Raw Water) Section of the Engine Oil, Power Steering, and Fuel Coolers

⚠ CAUTION

Avoid seawater entry into the boat. When cleaning engine oil or power steering coolers with the boat in the water, be sure to close off the water supply from the seawater pump to the cooler or water may enter the boat when end plates or hoses are removed.

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

ENGINE OIL COOLER

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

1. Remove the end plates and gaskets.



a - End plates (2)

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

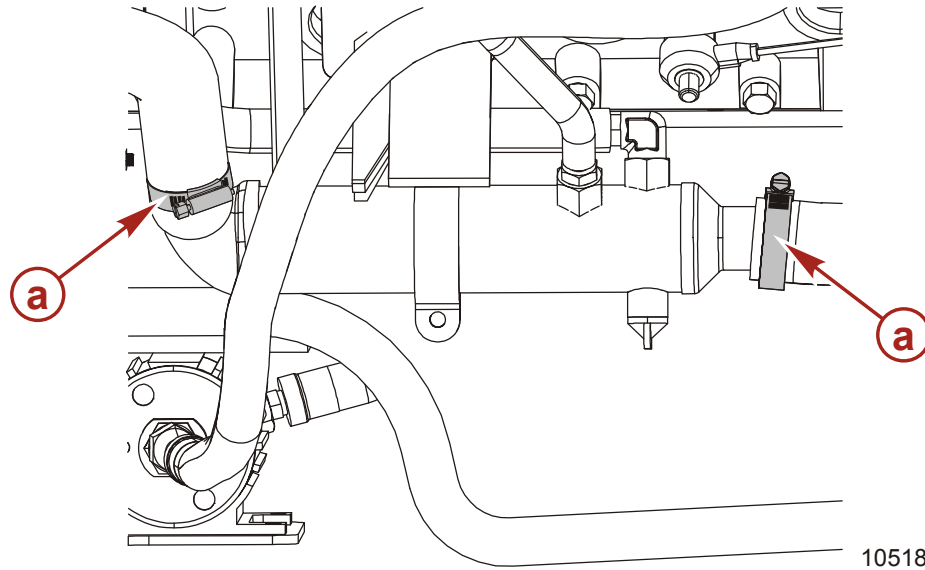
POWER STEERING COOLER

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

1. Loosen the water hose clamps and remove the hoses to inspect or clean the cooler.

MAINTENANCE

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



a - Hose clamps (2)

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

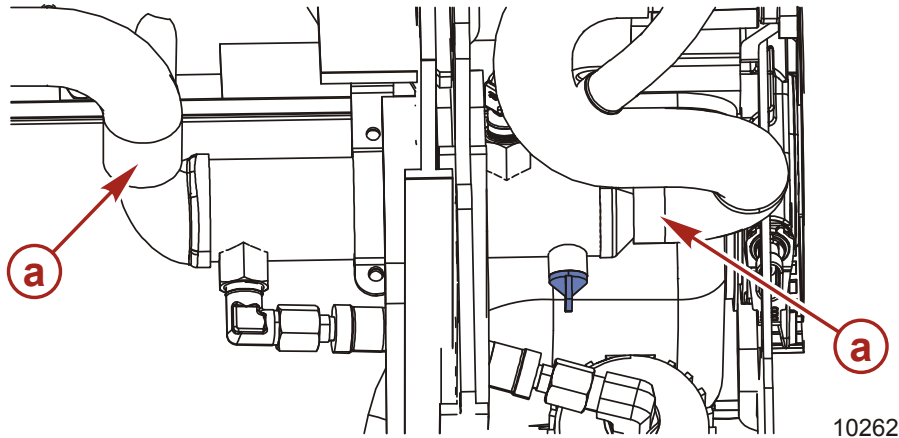
FUEL COOLER

NOTE: The fuel cooler is located on the lower starboard side of the engine.

1. Loosen the water hose clamps and remove the water hoses to inspect or clean the cooler.

MAINTENANCE

2. If the fuel hoses need to be removed from the cooler, have this service done by an authorized Mercury Marine dealer.



a - Hose clamps to the fuel cooler

3. Re-install the cooler and tighten the hose clamps securely.
4. Start the engine and inspect the cooling system for leaks.

Serpentine and Supercharger Drive Belts

SERPENTINE DRIVE BELT ROUTING AND TENSION

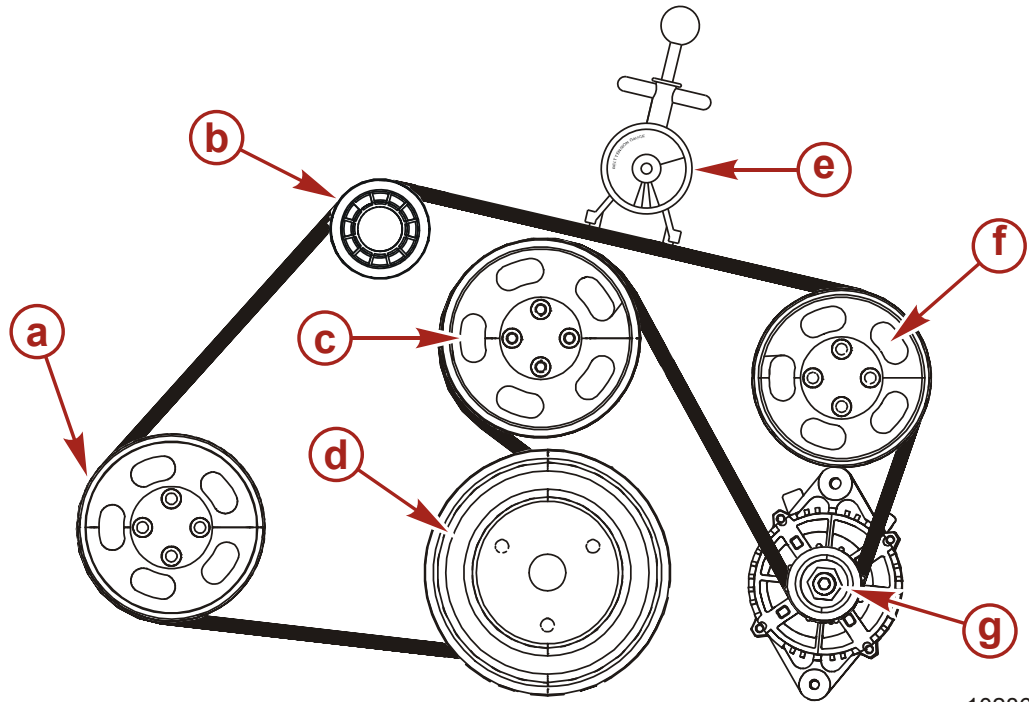
WARNING

Avoid possible serious injury. Make sure that the engine is turned off and the ignition key is removed before inspecting belts.

IMPORTANT: The drive belt must be routed as shown or damage may result.

MAINTENANCE

1. Install the belt tension gauge onto the belt.



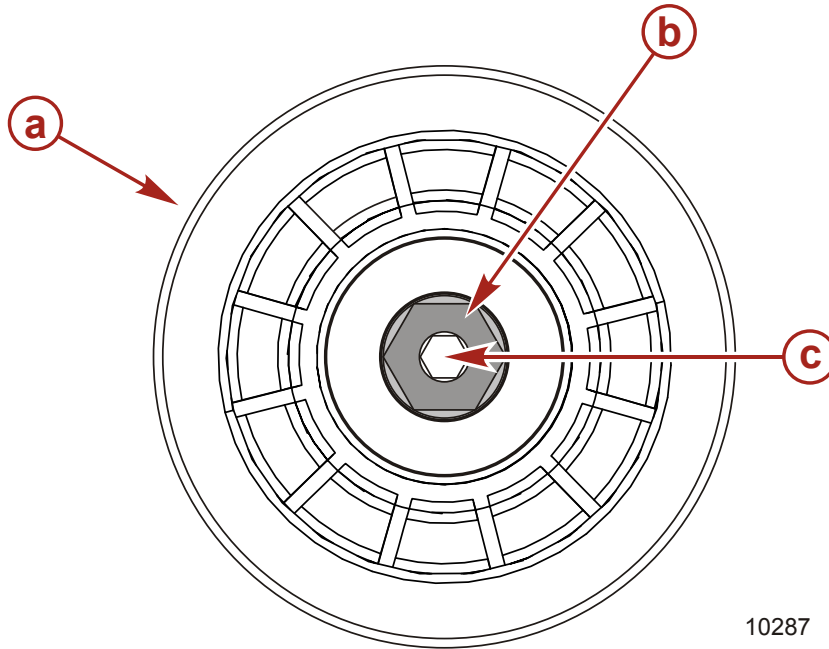
10286

- | | |
|---------------------------------------|--|
| a - Seawater pump pulley | e - Belt tension gauge |
| b - Belt adjustment pulley | f - Power steering pulley
(non-power steering models have an idler pulley) |
| c - Re-circulating pump pulley | |
| d - Crankshaft pulley | g - Alternator pulley |

2. Loosen the 5/8 in. locking nut on the adjusting screw. Leave the wrench on the adjustment nut.
3. Use a 5/16 in. socket and tighten the adjusting screw until the belt tension conforms to the correct setting on the gauge.

MAINTENANCE

4. Hold the adjustment stud and tighten the 5/8 in locking nut.

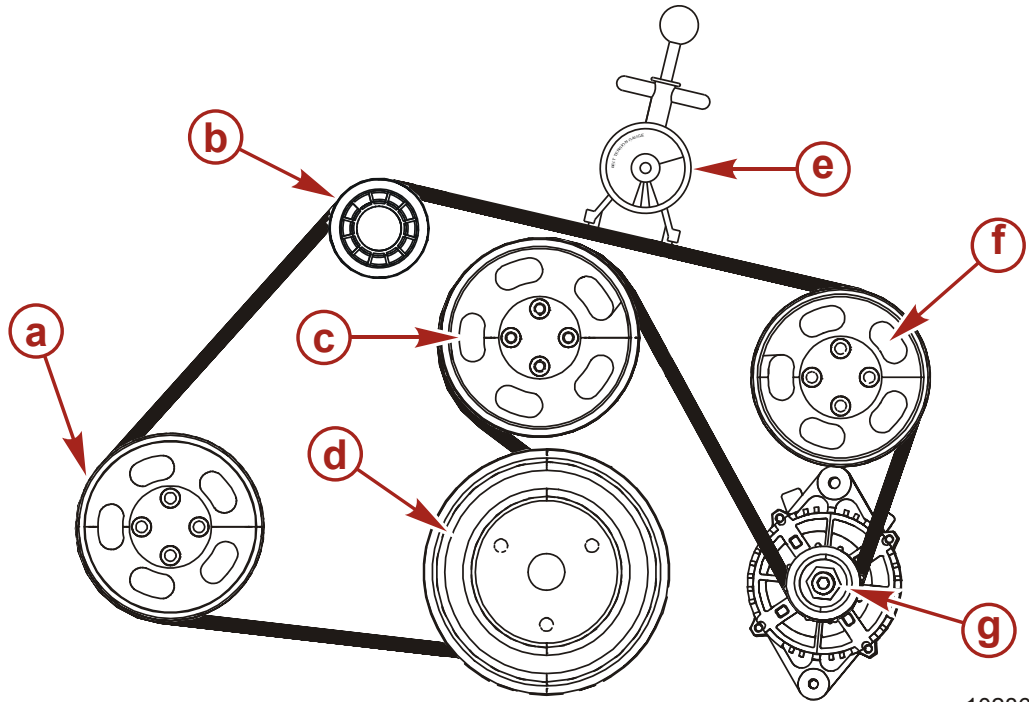


- a** - Belt tensioner pulley
- b** - Adjustment locking nut
- c** - Adjustment screw

5. Remove the belt tension gauge from the belt.

MAINTENANCE

6. Run the engine for a short period of time and re-check the tension.



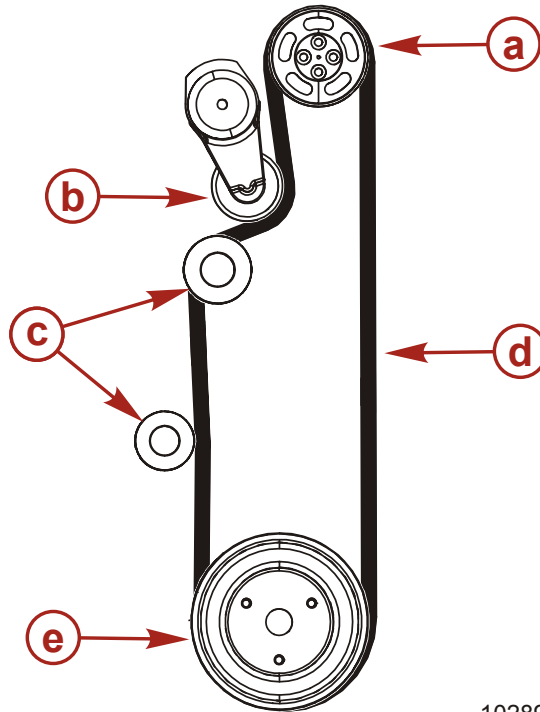
10286

- a** - Seawater pump pulley
- b** - Belt adjustment pulley
- c** - Re-circulating pump pulley
- d** - Crankshaft pulley
- e** - Belt tension gauge
- f** - Power steering pulley
(non-power steering models have an idler pulley)
- g** - Alternator pulley

Description	N	lb.
New Belt	489	110
Used Belt	400	90

MAINTENANCE

SUPERCHARGER DRIVE BELT ROUTING AND TENSION



10289

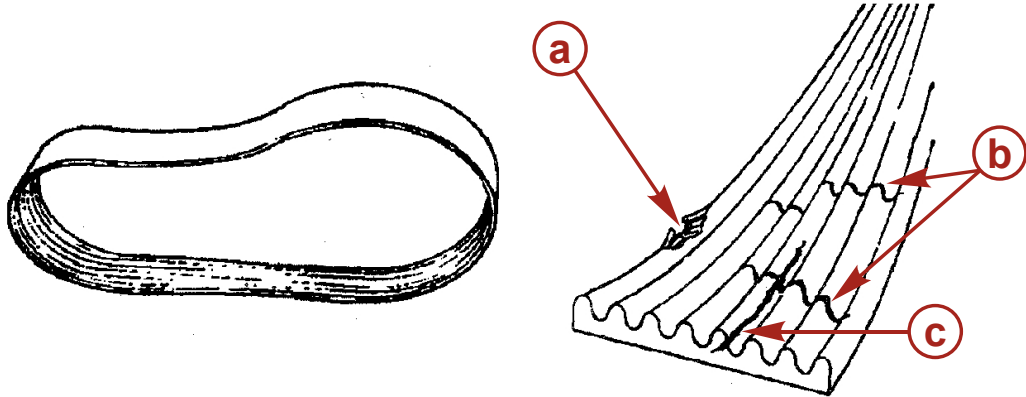
- a** - Supercharger pulley
- b** - Self adjusting belt tensioner
- c** - Idler pulley
- d** - Supercharger belt
- e** - Crankshaft pulley

The supercharger belt uses a self tensioner and does not require tension adjustment.

MAINTENANCE

INSPECTING BELTS

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.



6164

- a** - Fraying
- b** - Transverse cracks
- c** - Longitudinal cracks

The belt will have to be replaced for the following conditions:

- Excessive wear
- Cracks as explained previously
- Fraying
- Glazed surfaces

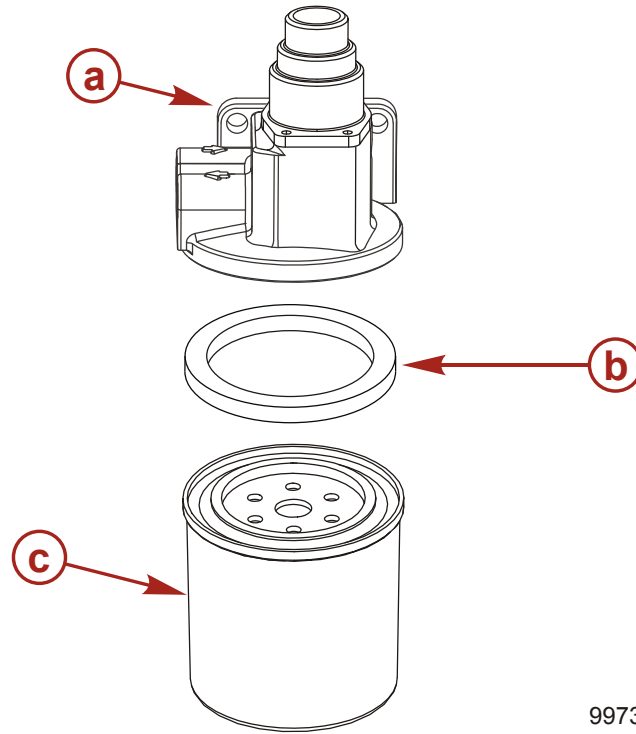
Fuel Filters

WARNING

Avoid serious injury or death from a gasoline fire or explosion. When changing fuel system components be sure that the ignition key is "OFF", that the lanyard stop switch is positioned so that the engine cannot start, and that there are no sources of high heat, spark, open flame, or lit smoking materials in use in the area. Wipe up any spilled fuel immediately.

MAINTENANCE

1. Remove the water separating fuel filter (by turning counter-clockwise) and the sealing ring from the water separating/fuel pressure regulator housing and discard.



9973

a - Water separating/fuel pressure regulator housing

c - Water separating fuel filter

b - Sealing ring

2. Coat the sealing ring on the new filter with clean motor oil.
IMPORTANT: Do not use a filter wrench when installing the water separating fuel filter.
3. Thread the filter clockwise onto the housing and tighten securely by hand. Do not over-tighten.
4. Start and run the engine. If the engine stops or will not start, it may be necessary to prime the fuel system (see *Priming the Fuel System Prior to Starting* in the **Cold Weather or Extended Storage** section of this manual.)
5. Check the filter for gasoline leaks. If leaks exist, re-check the filter installation.
6. If leaks continue, stop the engine immediately and contact your authorized Mercury Marine dealer.

MAINTENANCE

Corrosion and Corrosion Protection

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

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

CAUTION

Avoid corrosion damage. Do not use magnesium anodes in salt water. They will provide overprotection, resulting in a different electrochemical reaction that will create hydrogen on the metal surface of the drive, under the paint. This causes the paint to blister and peel completely from the surface of the overprotected drive.

CAUTION

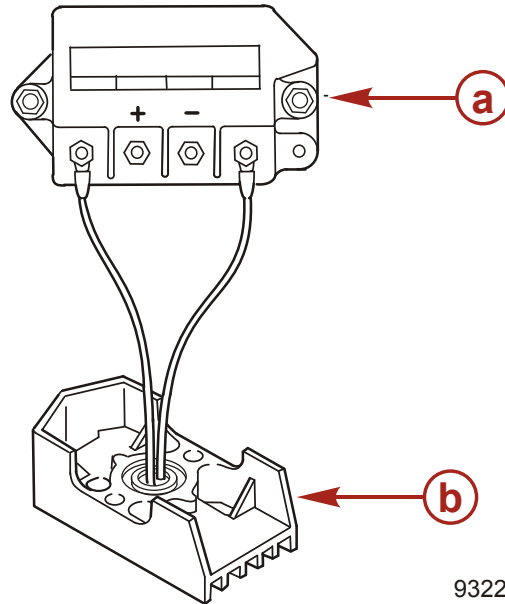
Avoid corrosion damage. Mercury Marine recommends using anodes sold through Mercury Precision Parts only. Some other manufacturers of aluminum anodes use alloys that are insufficiently pure to adequately protect critical drive components for the duration of the anodes' expected life.

IMPORTANT: Mercury Marine recommends a MerCathode System or Anti-Corrosion Kit be installed whenever using a stainless steel propeller, or if the boat is equipped with stainless steel components (immersed below the waterline) that are connected into the engine ground system. If a boat is equipped with stainless steel after planes, a large anode should be installed on each to handle the increased galvanic corrosion potential. Replace the sacrificial anodes if they are eroded 50% or more.

MAINTENANCE

MERCATHODE SYSTEM

NOTE: The MerCathode system should be tested to ensure adequate output. The test should be made where boat is moored, using a reference electrode and test meter. Contact your authorized Mercury Marine dealer to arrange for this test.

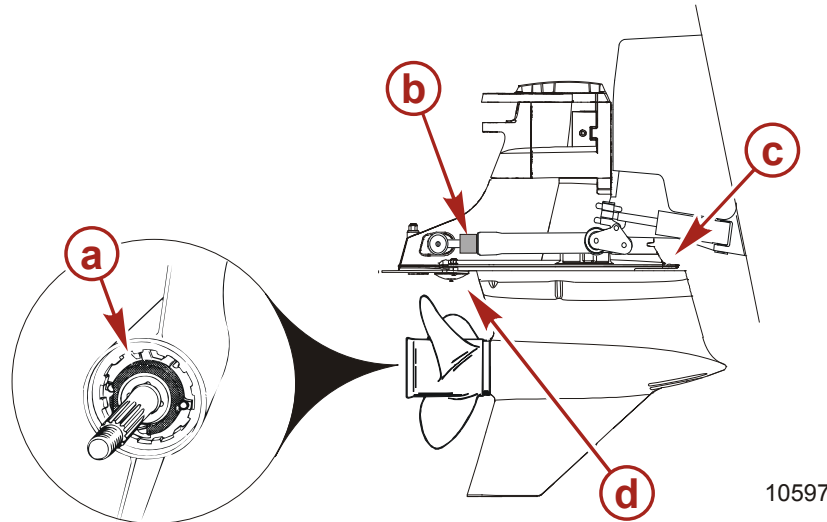


- a** - MerCathode
- b** - Electrode assembly

MAINTENANCE

ANODES

Anodes help protect the power package against galvanic corrosion by sacrificing its metal to be slowly eroded instead of other metals.



a - Bearing carrier anode

b - Trim cylinder anodes

c - Drive shaft housing
anodic plate

d - Gear housing anode

The following maintenance items are recommended to ensure that your sterndrive unit stays corrosion free.

- Inspect the sacrificial anodes at regular intervals and replace them before they are half gone.
- Inspect the propeller shaft for fishing line, which can cause corrosion on the stainless steel propeller shaft.
- Remove the propeller at least every 60 days and lubricate the propeller shaft with anti-corrosion grease.
- Do not use lubricants containing graphite on or near aluminum in saltwater.

Refer to the drive unit service manual for complete information on anode maintenance and replacement. Or, contact your authorized Mercury Marine dealer.

In addition to the anode corrosion protection devices, follow these steps to inhibit corrosion:

- Spray all electrical connections with Liquid Neoprene sealant.
- Maintain a complete paint covering on the sterndrive unit.

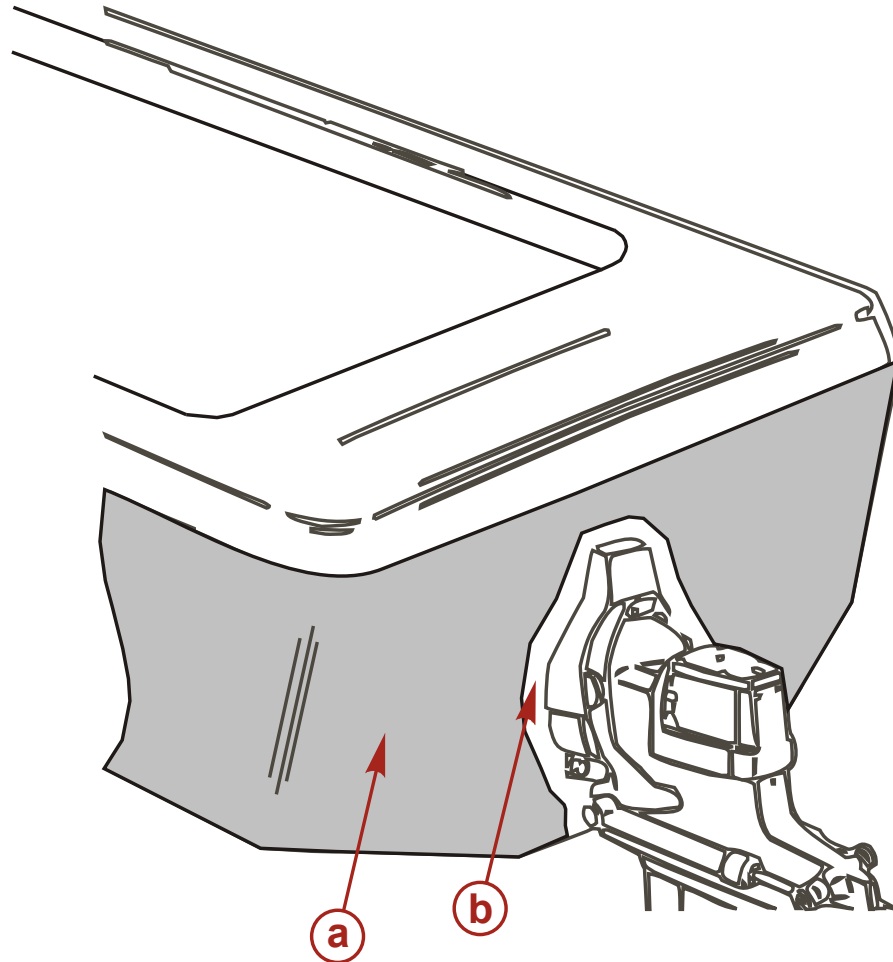
MAINTENANCE

- Check the finish regularly. Prime and paint nicks and scratches using Mercury Phantom Black paint. Use only tin based anti-fouling paint or equivalent on or near aluminum surfaces below the waterline.
- If the surface is showing bare metal, apply 2 coats of paint.
- Do not paint the anodes. This will prevent them from functioning properly.
- Do not paint the trim tabs or the mounting surfaces.

MAINTENANCE

PAINTING THE BOAT HULL OR BOAT TRANSOM

If anti-fouling protection is required for the boat hull or boat transom, copper or tin base paints can be used unless otherwise prohibited by law. If using copper or tin based anti-fouling paints, avoid any electrical interconnection between the Mercury Marine Product, anodic blocks, and the paint by allowing a minimum of 40 mm (1.5 in.) unpainted area on the transom of the boat around these items.



6118

- a** - Anti-fouling paint
- b** - Unpainted area

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

MAINTENANCE

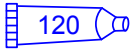
NOTE: Do not paint the anodes or the MerCathode System reference electrode and anode, as this will render them ineffective as galvanic corrosion inhibitors.

PAINTING THE DRIVE UNIT OR TRANSOM ASSEMBLY

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

ADDITIONAL CORROSION PREVENTION TIPS

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

Tube Ref No.	Description	Where Used	Part No.
 120	Corrosion Guard	Power package	92-802878-5 5

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

Battery

All lead acid batteries discharge when not in use. Recharge every 30 to 45 days, or when specific gravity drops below battery manufacturer's specifications.

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

MAINTENANCE

WARNING

Avoid serious injury or death. Observe the following when jump starting, charging or handling a battery:

- Do not use jumper cables or a booster battery to start an engine.
- Do not recharge a weak battery in the boat. Remove the battery and recharge it in a well ventilated area away from fuel vapors, sparks or flames.
- Hydrogen gases that escape from the battery during charging are explosive. This explosive gas escapes fill/vent cell caps and may form an explosive atmosphere around the battery for several hours after it has been charged. Sparks, smoking materials or flames could ignite these gases and cause an explosion that could shatter the battery and cause serious injury or death.
- Batteries contain acid that can cause severe burns - Avoid contact with skin, eyes and clothing.

Bottom of Boat

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

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

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

Inspection and Maintenance

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

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

MAINTENANCE

3. Remove and inspect the propeller. If nicked, bent or cracked, see your authorized Mercury Marine dealer.
4. Repair nicks and corrosion damage on the power package's exterior finish. Use Quicksilver spray paints - see your authorized Mercury Marine dealer.

Attention Required After Submersion

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

COLD WEATHER OR EXTENDED STORAGE

Power Package Lay-up

IMPORTANT: This service should be performed by an authorized Mercury MerCruiser dealer.

CAUTION

Avoid engine or sterndrive damage; Do not operate the engine without water flowing through the seawater pickup pump. The pump impeller can be damaged and damage to the engine or sterndrive unit may result.

IMPORTANT: Before starting the engine, attach a water source to the seawater pickup pump. Follow all warnings and flushing attachment procedures stated in the *Flushing Cooling System* section of this manual.

1. Run engine sufficiently to bring it up to normal operating temperature. Shut off engine and change oil and oil filter.
2. Flush cooling system. Refer to **Flushing Cooling System** shown earlier in this manual.

WARNING

Avoid Fire or Explosion. Ensure that the engine compartment is well ventilated and no gasoline vapors are present during the following operation.

3. Close the fuel shut off valve if equipped.
4. Prepare fuel system for extended storage by mixing the following in a 23 liter (6 U.S. gal) remote outboard fuel tank:
 - 19 liter (5 U.S. gal) premium unleaded 91 octane (R+M)/2 (98 RON) gasoline.
 - 1.89 liter (64 fl oz) Premium Plus 2-cycle TC-W3 outboard oil.
 - 150 ml (5 fl oz) Fuel System Treatment and Stabilizer or 30 ml (1 fl oz) Fuel System Treatment and Stabilizer Concentrate.
5. Disconnect and plug the boat's fuel line from the water separating fuel filter inlet.
6. Connect the remote outboard fuel tank to the inlet of the water separating fuel filter.

COLD WEATHER OR EXTENDED STORAGE

IMPORTANT: If the boat is out of the water, follow instructions for running the engine on a flush device as found in the service manual for the engine being fogged.

7. Start and run the engine at 1300 RPM for five minutes.
8. After the specified running time is complete, slowly return the throttle to idle RPM and shut off the engine.

CAUTION

When operating a Mercury engine with fuel containing alcohol, avoid storing the fuel in the fuel tank for long periods of time. Long storage periods, common to boats, create unique problems. In cars, alcohol-blend fuels are normally consumed before they can absorb enough moisture to cause trouble. However, boats often sit idle 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: Do not run the engine's fuel system dry of this fogging mixture in the 23 liter (6 U.S. gal) remote outboard fuel tank.

*NOTE: Refer to **Fuel Requirements** for additional information.*

9. Close fuel shut off valve, if equipped.
10. Place drive unit in the full down position.

CAUTION

Avoid damage to the sterndrive unit. Always store the sterndrive unit in the full down position. The universal joint bellows may develop a set if unit is stored in raised position and may fail when unit is returned to service.

COLD WEATHER OR EXTENDED STORAGE

Draining Instructions

CAUTION

To prevent damage from freezing temperatures, remove and plug the seawater inlet hose. This prevents a siphoning action that may occur, allowing seawater to flow into the drain holes or hoses.

Completely drain the cooling system for winter storage, or immediately after cold weather use, if the possibility of freezing temperatures exist. Failure to comply may result in trapped water causing freezing and/or corrosion damage to the engine.

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

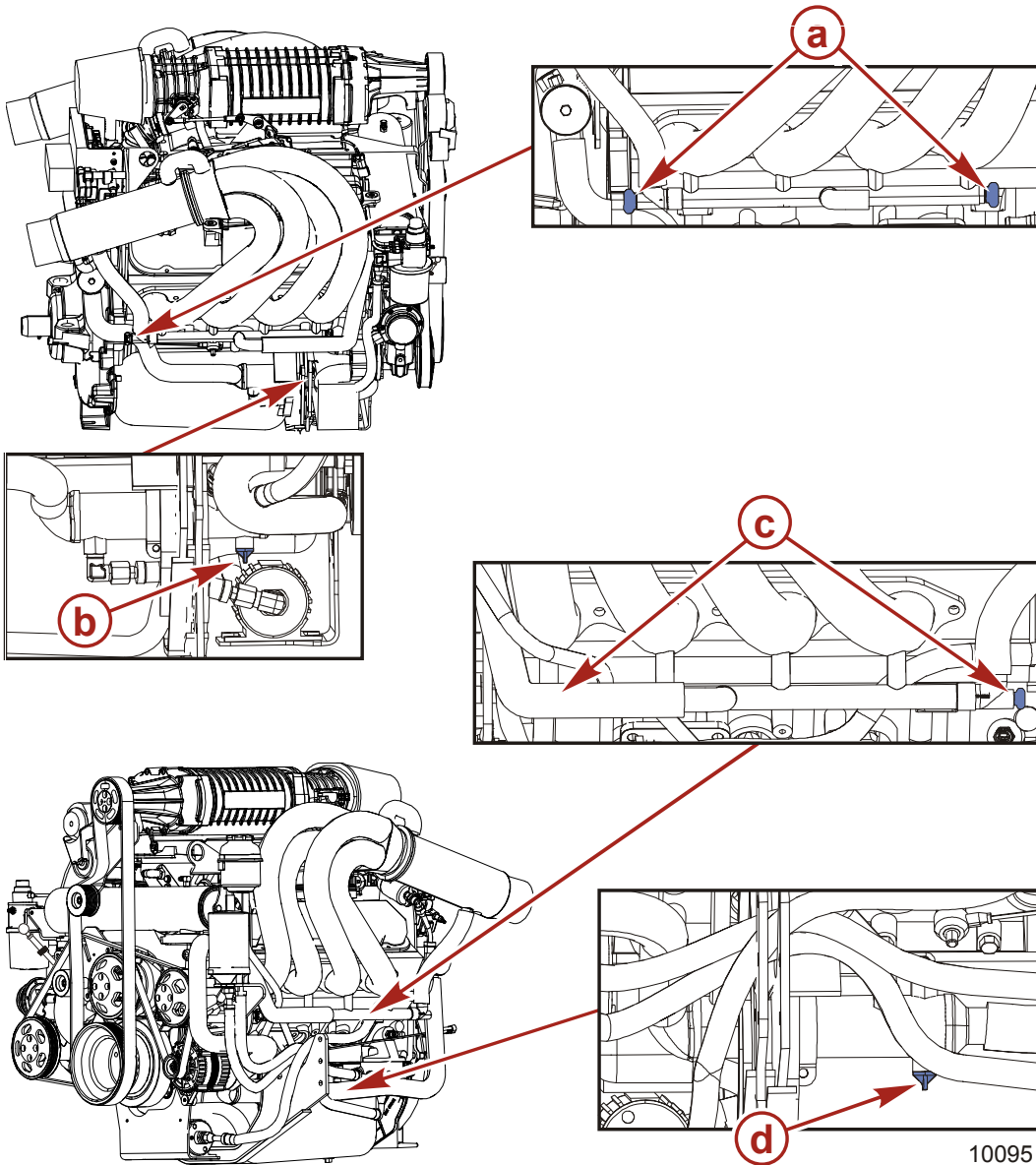
1. Remove the following drain plugs:

NOTE: Removing the drain plugs from the following locations will ensure that the charge cooler is drained.

- End of exhaust manifold balance rails (plastic wing-nut plugs, port and starboard)
- Fuel cooler (plastic wing-nut plug, Starboard side of the engine)

COLD WEATHER OR EXTENDED STORAGE

- Power steering cooler (plastic wing-nut plug, Port side of the engine)



- a** - Exhaust header balance rail plastic wing-nut plugs (2, Starboard side)
- b** - Fuel cooler plastic wing-nut plug

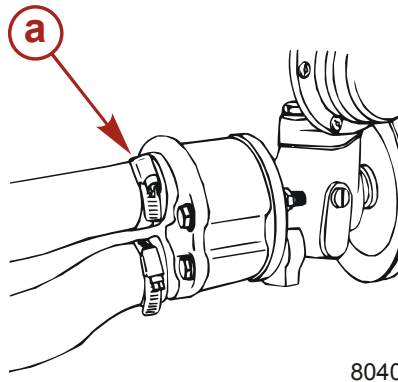
- c** - Exhaust header balance rail plastic wing-nut plugs (2, Port side, one plug is hidden)
- d** - Power steering cooler plastic wing-nut plug

2. Repeatedly clean out drain holes using a stiff piece of wire. Do this until the entire system is drained.

COLD WEATHER OR EXTENDED STORAGE

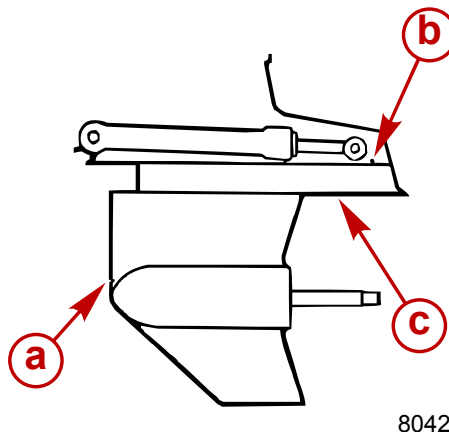
3. Loosen the hose clamp and remove the hose from the inlet fitting of the seawater pickup pump.

NOTE: Lift or bend hoses to allow water to drain completely.



a - Hose clamp

4. After draining the seawater cooling system, install the drain plugs (Perfect Seal is not required on wing nut type plugs), reconnect the hoses and tighten all hose clamps securely.
5. Make sure the following passages are open and unobstructed:



- a** - Speedometer pitot tube
- b** - Trim tab cavity vent hole
- c** - Trim tab cavity drain passage

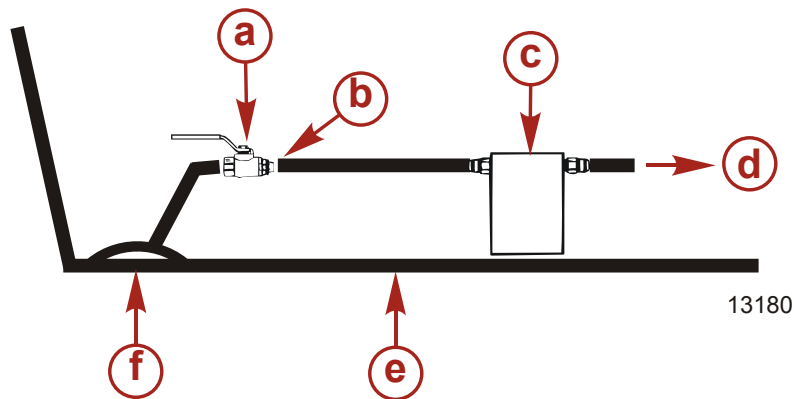
6. For additional assurance against freezing and rust in the engine seawater cooling system when storing for winter or long periods of non use, perform the following steps:

COLD WEATHER OR EXTENDED STORAGE

IMPORTANT: A nontoxic and environmentally safe ethylene glycol antifreeze containing a rust inhibitor must be used when preparing the seawater section of the cooling system for cold weather or extended storage. Be certain to follow the manufacturer's recommendations.

NOTE: If the boat is in the water during the following procedure, the seawater shut off valve must be closed and the hose removed from the engine side of the valve to avoid water entering the boat.

- a. Remove the seawater inlet hose leading to the seawater pump and place the hose into a container of ethylene glycol antifreeze and water. The antifreeze mixture should be at the correct concentration level to protect the engine to the lowest temperature to which it will be exposed during cold weather or extended storage.



- a - Seawater shut off valve
- b - Disconnect hose here and place into container of antifreeze
- c - Sea strainer
- d - To the seawater pump
- e - Boat bottom
- f - Water pick-up

- b. Operate the engine at idle until antifreeze is expelled from the exhaust manifolds of the engine.
 - c. Stop the engine and reconnect the pickup hose.
7. Perform all checks, inspections, lubrication, and fluid changes outlined in the **Maintenance Chart** under at least once a year.

COLD WEATHER OR EXTENDED STORAGE

Battery Winter Storage

Follow the battery manufacturer's instructions for storage.

Power Package Recommissioning

WARNING

To prevent possible injury or damage to equipment, do not install the battery until all engine maintenance has been performed.

1. Ensure that all cooling system hoses are connected properly and hose clamps are tight, all removed drain plugs have been installed and are tight.

CAUTION

Reversing the battery cables or connection order will damage the electrical system. When installing the battery, be sure to connect the positive (+) battery cable to the positive (+) battery terminal first, and the negative (-) battery cable to the negative (-) battery terminal second.

2. Install a fully-charged battery. Clean the battery cable clamps and terminals and reconnect cables. Tighten each cable clamp securely when connecting.
3. Coat battery terminal connections with an anti-corrosion agent.
4. Perform all checks in **Operation Chart** in the *Before Starting* column.
5. Refer to **Flushing Cooling System** before starting engine.
6. Supply water to the engine cooling system.

STARTING WITHOUT PRIMING THE FUEL SYSTEM

IMPORTANT: The throttle must not be advanced until the engine idles and runs smoothly and the water temperature reaches a minimum of 54 °C (130 °F). Advancing the throttle prematurely while the PCM is in its rich running mode will result in poor engine starting and performance.

1. Connect the main permanent fuel line to the engine.

COLD WEATHER OR EXTENDED STORAGE

2. Do not advance the throttle until the engine idles and runs smoothly and the water temperature reaches a minimum of 54 °C (130 °F).
3. Crank the engine over for 10 seconds at a time and stop.
4. Repeat the cranking procedure until the engine starts and runs smoothly. Observe the instrumentation to ensure all systems are functioning.
5. Inspect engine for fuel, oil, fluid, water and exhaust leaks.
6. Check the steering system.
7. Check shifting and throttle control for proper operation.

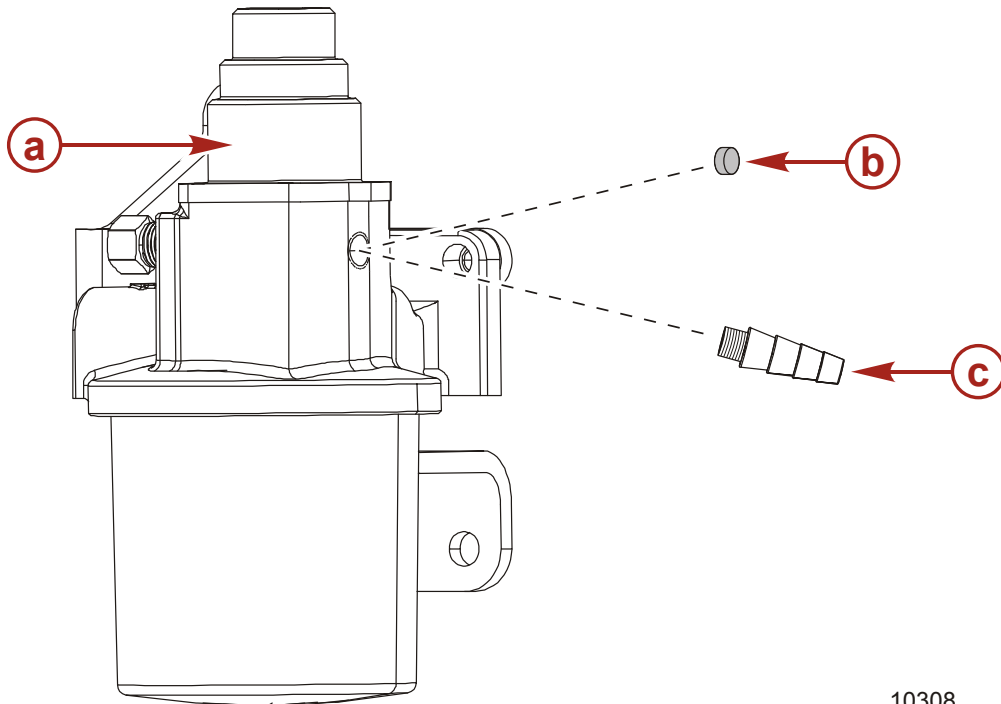
PRIMING THE FUEL SYSTEM PRIOR TO STARTING

WARNING

Avoid fire or explosion. Gasoline is extremely flammable and highly explosive. Ensure key switch is "OFF." Do not smoke or allow a spark or open flame in area when removing or installing fuel components. Wipe up any spilled fuel immediately.

COLD WEATHER OR EXTENDED STORAGE

1. Remove the plug from the water separating filter/fuel pressure regulator housing as shown and install a 1/8 in. NPT barbed fitting (obtain locally) into the housing.



- 10308
- a** - Water separating filter/fuel pressure regulator housing
 - b** - Plug
 - c** - 1/8 in. NPT barbed fitting

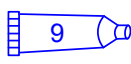
2. Attach an outboard type portable fuel tank with primer bulb to the barbed fitting with a hose clamp.
3. Squeeze the primer bulb until the bulb becomes firm.
NOTE: Do not turn the key switch to the "START" position during the following priming procedure.
4. Cycle the ignition key switch to the "RUN" position for three seconds and then "OFF."
5. Repeat steps 3 and 4, one or two more times. The object of this procedure is to prime the fuel system but not to the point of having the system completely full and the primer bulb hard and under pressure.
6. With the primer bulb soft, remove the remote fuel line and fitting from the water separating fuel filter.

COLD WEATHER OR EXTENDED STORAGE

WARNING

Avoid fuel spillage and fire hazard. When removing the remote fuel tank line from the engine connection, ensure that the primer bulb is soft. If the primer bulb is hard, pressurized fuel will be sprayed in the engine compartment.

7. Re-install the plug in the water separating filter/fuel pressure regulator housing using pipe sealant on the threads.

Tube Ref No.	Description	Where Used	Part No.
	Loctite 567 PST Pipe Sealant	Plug for the water separating filter/fuel pressure regulator housing	92-809822

8. Attempt to start the engine by turning the key switch to the "START" position for a maximum of 15 seconds or until the engine starts and runs smoothly. Do not advance the throttle until the water temperature has reached a minimum of 54 °C (130 °F).

IMPORTANT: The throttle must not be advanced until the engine idles and runs smoothly and the water temperature has reached a minimum of 54 °C (130 °F). Advancing the throttle prematurely while the ECM is in its rich running mode will result in poor engine starting and performance.

9. Inspect the engine for oil, fuel, water, exhaust, or any fluid leaks.
10. Check the steering system.
11. Check shifting and throttle control for proper operation.

TROUBLESHOOTING

Engine Will Not Crank

Possible Causes	Remedy
Battery switch "OFF".	Switch to "ON" position.
Remote control not in neutral position.	Position control lever to neutral.
Open 50 amp circuit breaker or 15 or 90 amp fuse circuit.	Check and reset circuit breaker or replace fuse.
Master or starter solenoid defective.	Replace.
Loose or dirty electrical connections or damaged wiring, battery cable diameter (gauge) too small for the application.	Check all electrical connections and wires (especially battery cables). Clean and tighten faulty connection.
Low battery charge or defective battery.	Test and replace if defective.
Defective starter.	Test and replace if defective.
Defective key switch.	Replace.
Defective neutral/safety switch.	Replace.

TROUBLESHOOTING

Engine Cranks But Will Not Start

Possible Cause	Remedy
Improper starting procedure	Read starting procedure
Low battery voltage	Charge the battery
Empty fuel tank or fuel shut off valve closed	Fill tank or open valve
Faulty fuel pump, wiring, fuel pump fuse, 50 amp circuit breaker or a fuel pump relay	Replace faulty component
Faulty ignition system component	Service ignition system
Lanyard Stop Activated	Reset
Obstructed fuel filter	Replace filters
Stale or contaminated fuel	If contaminated, drain tank and fill with fresh fuel
Fuel line or tank vent line kinked or restricted	Replace kinked lines or blow out lines with compressed air to remove obstruction
Crankshaft position sensor faulty	Test and replace if faulty
Faulty fuel pressure regulator diaphragm	Test and replace if faulty. Do not attempt to start the engine if the fuel pressure regulator diaphragm is ruptured.

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

Possible Cause	Remedy
Faulty ignition system component.	Service ignition system.
Dirty fuel filter.	Replace filters.
Stale or contaminated fuel.	Drain the fuel tank and fill it with fresh fuel.
Fuel line or fuel tank obstructed.	Replace damaged lines or clean out lines with compressed air to remove the obstruction.
Flame arrestor dirty.	Clean or replace the flame arrestor.
Rev limiter engaging at wide-open-throttle.	Use a propeller with more pitch.

TROUBLESHOOTING

Poor Performance

Possible Cause	Remedy
Throttle not fully open.	Inspect throttle cable and linkages for proper operation.
Damaged or incorrect propeller.	Replace propeller.
Excessive bilge water.	Drain and check for cause of entry.
Boat overloaded or load improperly distributed.	Reduce load or redistribute load more evenly.
Boat bottom fouled or damaged.	Clean or repair as necessary.
Flame arrestor dirty or restricted.	Change or clean flame arrestor.
Stale or contaminated fuel.	If contaminated, drain tank. Fill with fresh fuel.

Engine Coolant Temperature Too Low

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

TROUBLESHOOTING

Engine Coolant Temperature Too High

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

Low Engine Oil Pressure

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

TROUBLESHOOTING

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

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

Battery Will Not Come Up On Charge

Possible Cause	Remedy
Excessive current draw from battery.	Turn off non-essential accessories.
Loose or dirty electrical connections or damaged wiring.	Check all associated electrical connections and wires (especially battery cables). Clean and tighten faulty connections. Repair or replace damaged wiring.
Alternator drive belt loose or in poor condition.	Replace and/or adjust.
Defective battery.	Test battery.

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

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

TROUBLESHOOTING

Electrical Analog Trim Gauge Malfunction

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

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

Possible Cause	Remedy
Insufficient lubrication on shift and throttle linkage fasteners.	Lubricate.
Loose or missing shift and throttle linkage fasteners.	Check all linkages. If any are loose or missing, see authorized Mercury Marine dealer immediately.
Shift or throttle cable kinked.	Replace cable.
Friction adjustment excessive.	Adjust friction.

Steering Wheel Turns Hard or Jerky

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

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

TROUBLESHOOTING

Seawater Pressure Is Below Specification

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

Seawater Pressure Is Above Specification

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

OWNER SERVICE ASSISTANCE

Local Repair Service

Always return your outboard to your local authorized dealer should the need for service arise. Only he has the factory trained mechanics, knowledge, special tools, equipment, and genuine parts and accessories to properly service your engine should the need occur. He knows your engine best.

Service Away From Home

If you are away from your local dealer and the need arises for service, contact the nearest authorized dealer. Refer to the Yellow Pages of the telephone directory. If, for any reason, you cannot obtain service, contact the nearest Mercury Marine Service Office.

Parts And Accessories Inquiries

All inquiries concerning genuine replacement parts and accessories should be directed to your local authorized dealer. The dealer has the necessary information to order parts and accessories for you. When inquiring on parts and accessories, the dealer requires the model and serial number to order the correct parts.

Service Assistance

Satisfaction with your Sterndrive or Inboard product is very important to your dealer and to us. If you ever have a problem, question or concern about your Sterndrive or Inboard product, contact your dealer or any authorized Mercury Marine dealer. If additional assistance is required, take these steps.

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

The following information will be needed by the service office:

- Your name and address
- Daytime telephone number

OWNER SERVICE ASSISTANCE

- Model and serial number of your outboard
- The name and address of your dealership
- Nature of problem

Mercury Mercruiser Service Offices

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

United States		
Telephone	Fax	Mercury MerCruiser 3003 N. Perkins Road Stillwater, OK 74075
(405) 743-6566	(405) 743-6570	
United States (Mercury Racing)		
Telephone	Fax	Mercury Racing N7480 County Rd. UU Fond du Lac, WI 54935-9585
(920) 924-2088	(920) 924-2096	
Canada		
Telephone	Fax	Mercury Marine Ltd. 2395 Meadowpine Blvd. Mississauga, Ontario L5N 7W6 Canada
(905) 567-6372	(905) 567-8515	
Australia, Pacific		
Telephone	Fax	Mercury Marine Australia 132-140 Frankston Road Dandenong, Victoria 3164 Australia
(61) (3) 9791-5822	(61) (3) 9793-5880	

OWNER SERVICE ASSISTANCE

Europe, Middle East, Africa		
Telephone	Fax	Marine Power - Europe, Inc. Parc Industriel de Petit-Rechain B-4800 Verviers, Belgium
(32) (87) 32 • 32 • 11	(32) (87) 31 • 19 • 65	
Mexico, Central America, South America, Caribbean		
Telephone	Fax	Mercury Marine 11650 Interchange Circle North Miramar, FL 33025 U.S.A.
(954) 744-3500	(954) 744-3535	
Japan		
Telephone	Fax	Mercury Marine - Japan 283-1 Anshin-cho Hamamatsu Shizuoka, 435-0005 Japan
81-53-423-2500	81-53-423-2510	
Asia, Singapore		
Telephone	Fax	Mercury Marine- Singapore 72 Loyang Way Singapore, 508762
5466160	5467789	

ORDERING LITERATURE

United States and Canada

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

Engine Model:		Horsepower:	
Serial Number:		Model year:	

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

MERCURY MARINE		
Telephone	Fax	Mail
(920) 929-5110	(920) 929-4894	Mercury Marine Attn: Publications Department P.O. Box 1939 Fond du Lac, WI 54936-1939

Outside The United States and Canada

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

Engine Model:		Horsepower:	
Serial Number:		Model year:	

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

