Service Manual Outline

Notice

Throughout this publication, “Dangers,” “Warnings” and “Cautions” are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully!

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus “common sense” operation, are major accident prevention measures.

⚠ DANGER

DANGER - Immediate hazards which will result in severe personal injury or death.

⚠ WARNING

WARNING - Hazards or unsafe practices which could result in severe personal injury or death.

⚠ CAUTION

CAUTION - Hazards or unsafe practices which could result in minor personal injury or product or property damage.

Notice to Users of This Manual

This service manual has been written and published by the service department of Mercury Marine to aid our dealers, mechanics and company service personnel when servicing the products described herein.

It is assumed that these personnel are familiar with the servicing procedures of these products, of like or similar products manufactured and marketed by Mercury Marine, and that they have been trained in the recommended servicing procedures for these products which include the use of mechanic’s common hand tools and the special Mercury Marine or recommended tools from other suppliers.

We could not possibly know of and advise the service trade of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by the manufacturer, first must completely satisfy himself that neither his nor the product’s safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at time of publication.

It should be kept in mind, while working on the product, that the electrical system and ignition system are capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the battery cables should be disconnected at the battery.

Any time the intake or exhaust openings are exposed during service they should be covered to protect against accidental entrance of foreign material which could enter the cylinders and cause extensive internal damage when the engine is started.

It is important to note that, during any maintenance procedure, replacement fasteners must have the same measurements and strength as those removed, whether metric or customary. Numbers on the heads of the metric bolts and on surfaces of metric nuts indicate their strength. Customary bolts use radial lines for this purpose, while most customary nuts do not have strength markings. Mismatched or incorrect fasteners can result in damage or malfunction, or possible personal injury. Therefore, fasteners removed should be saved for re-use in the same locations whenever possible. Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that meets the same specifications as the original.

Engine Mechanical Components

Many of the engine mechanical components are designed for marine applications. Unlike automotive engines, marine engines are subjected to extended periods of heavy load and wide-open-throttle operation and, therefore, require heavy-duty components. Special marine engine parts have design and manufacturing specifications which are required to provide long life and dependable performance. Marine engine parts also must be able to resist the corrosive action of salt or brackish water that will rust or corrode standard automotive parts within a short period of time.

Failure to use recommended Quicksilver service replacement parts can result in poor engine performance and/or durability, rapid corrosion of parts subjected to salt water and possibly complete failure of the engine.

Use of parts other than recommended service replacement parts, will void the warranty on those parts which are damaged as a result of the use of other than recommended replacement parts.

Replacement Parts

⚠ WARNING

Electrical, ignition and fuel system components on MerCruiser Engines and Stern Drives are designed and manufactured to comply with U.S. Coast Guard Rules and Regulations to minimize risks of fire or explosion.

Use of replacement electrical, ignition or fuel system components, which do not comply to these rules and regulations, could result in a fire or explosion hazard and should be avoided.

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 opening would permit sparks to ignite fuel vapors from fuel system leaks, if they existed.

V-8 Models Covered in This Manual

Gen V Engines

Model	Serial Number
Stern Drive Engines	
MCM 7.4L Bravo	OD830779 to OF800699
MCM 7.4L Bravo Three	OD838819 to OF800699
MCM 7.4LX MPI	OF595275 to OF801999
MCM 454 Magnum (Carburetor)	OD837587 to OF801999
MCM 454 Magnum EFI, EFI/MP and MPI	OF111570 to OF802349
MCM 502 Magnum (Carburetor)	OD831432 to OF114528
MCM 502 Magnum EFI, EFI/MP, MPI	OD840650 to OF802599
Inboard Engines	
MIE 7.4L (Carburetor)	OD840300 to OF820141
MIE 7.4L EFI/MP and MPI	OF490697 to OF820103
MIE 8.2L (Carburetor)	OD857200 to OF819619
Ski Engines	
MIE 454 Magnum EFI, EFI/MP and MPI Tournament Ski	OF215800 to OF820099

Gen VI Engines

Model	Serial Number
Stern Drive Engines	
MCM Bravo 7.4L (Carburetor)	OF800700 and above
MCM 7.4LX EFI	OF820000 and above
MCM 7.4LX MPI	OF802000 and above
MCM 454 Magnum (Carburetor)	OF801700 and Above
MCM 454 MPI	OF802350 and above
MCM 502 MPI	OF802600 and above
Inboard Engines	
MIE 7.4L (Carburetor)	OF820142 and above
MIE 7.4L EFI	OF874815 and above
MIE 7.4L MPI	OF820104 and above
MIE 8.2L MPI	OF775694 and OF775695
MIE 8.2L MPI	OF819620 and above

IMPORTANT INFORMATION

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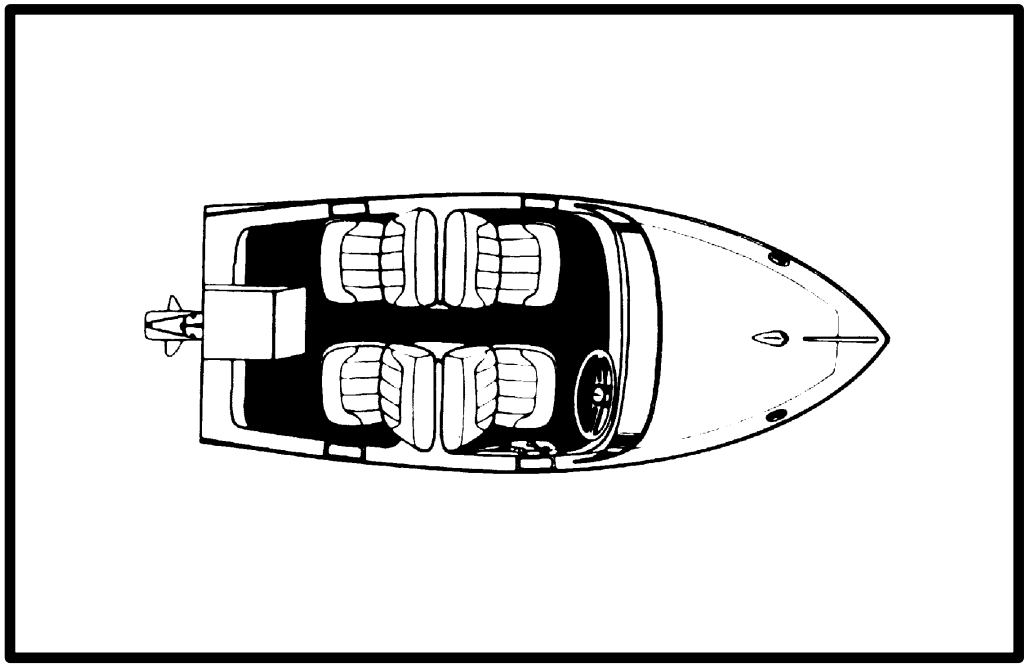

GENERAL INFORMATION

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Introduction

This comprehensive overhaul and repair manual is designed as a service guide for the models previously listed. It provides specific information, including procedures for disassembly, inspection, assembly and adjustment to enable dealers and service mechanics to repair and tune these engines.

Before attempting repairs or tune-up, it is suggested that the procedure first be read through to gain knowledge of the methods and tools used and the cautions and warnings required for safety.

How to Use This Manual

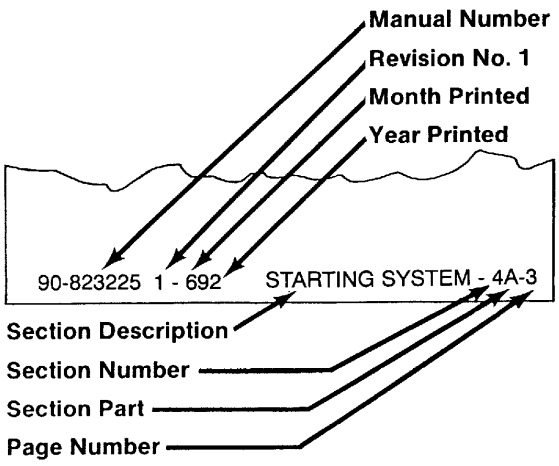
This manual is divided into sections which represent major components and systems.

Some sections are further divided into parts which more fully describe the component.

Sections and section parts are listed on the “Service Manual Outline” page following “V-8 Models Covered in This Manual” page.

Page Numbering

Two number groups appear at the bottom of each page. Following is an example and description.



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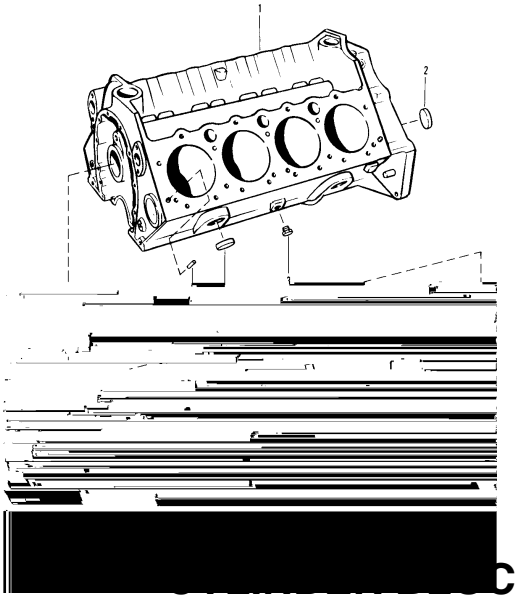
How To Read Parts Manual



[redacted]CK AND CAMSHAFT

M0033-**D8**

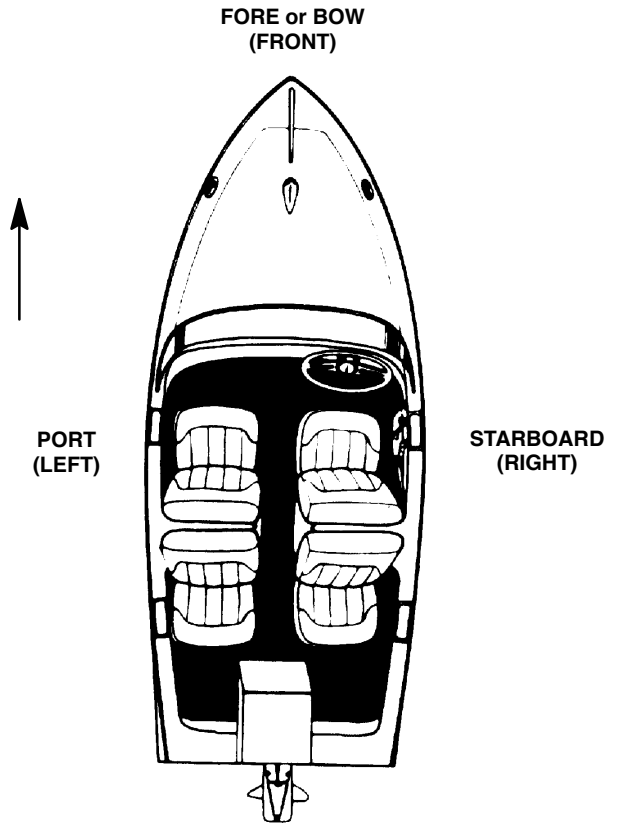
PART NO. (a)	REF. NO. (b)	DESCRIPTION (c)	QUAN. (d)
841-81631	1	CYLINDER BLOCK ASSEMBLY	1
N.S.S.	2	PLUG, expansion (1-1/4") (GM #3738306)	2
22-87238	3	DRAIN COCK, cylinder block	2
19-34270	4	PLUG, expansion - cylinder block (1-5/8" Diameter)	8
17-35465	5	PIN, dowel - block to head (5/16" Diameter)	4
22-72640	6	PLUG, expansion - camshaft bearing hole	1
23-85674	7	BEARING UNIT, camshaft (set)	1
72638	8	LIFTER, hydraulic valve	16
431-5943	9	CAMSHAFT	1
35378	10	CHAIN, camshaft timing	1
43-35338	11	SPROCKET, camshaft timing	1
43-48338	12	SPROCKET, crankshaft timing	1
10-34505	13	BOLT, camshaft timing sprockets (3/4")	3
12-39167	14	WASHER, camshaft timing sprocket bolt	3

(e) **841-8163 Cylinder Block Assembly includes only standard pistons, piston rings, crankshaft bearings and camshaft bearings.**

A. **Part Number:** For part ordering - Note N.S.S. for Reference Number 2, Plug, expansion - that means Not Sold Separately by Mercury Marine, however, in this case, the G.M. Part Number (for the plug) is given in the Description Column.
B. **Reference Number:** For part Shown on exploded parts view.
C. **Description:** This is the most important column because it gives:
1) Description of Part: Ref. No. 1 is a Cylinder Block Assembly, No. 9 is a Camshaft, etc.
2) What parts are included with a certain part: Notice how the Description of Part, for Ref. Nos. 1 and 8 thru 14, are at the left side of the column. Description of Part for Ref. Nos. 2 thru 7 are indented under "Cylinder Block Assembly". If Ref. No. 1 (Cylinder Block Assembly) was ordered, all indented parts (Ref. Nos 2thru 7) would come with the part. Ref. Nos. 8 thru 14 would not come with Ref. No. 1 and would have to be ordered separately. If 2 Cylinder Blocks were listed, both cylinder blocks would come with the indented parts. In some cases, an indented part will have anoth er part indented under it. The second indented part will come with the first indented part.
3) Serial number break: If serial number information is listed, check product serial number to ensure that correct part is ordered.4) Special information: Many times special information will be shown after description such as; L.H. Rota tion, R. H. Rotation, Filter up, Filter Down, etc. This will help in selecting the correct part.
D. **Quantity:** Quantity that has to be ordered.
E. **Special Information Block:** Additional information, part numbers for gasket sets, etc.

Directional References

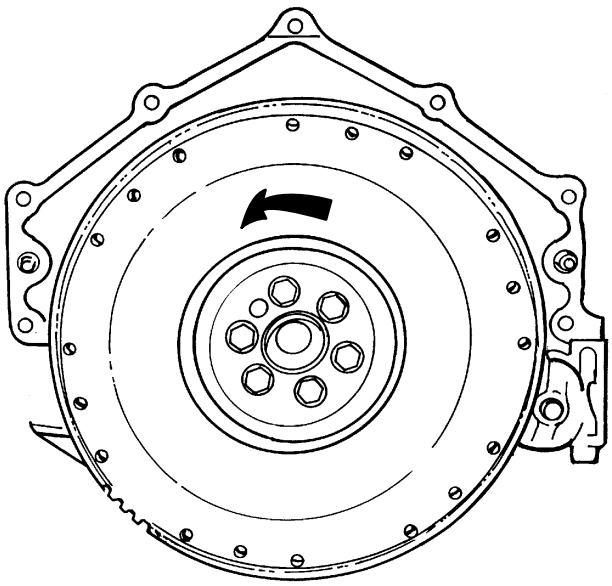
Front of boat is bow; rear is stern. Starboard side is right side; port side is left side. In this maintenance manual, all directional references are given as they appear when viewing boat from stern looking toward bow.



72000

Engine Rotation

Engine rotation is determined by observing flywheel rotation from the rear (stern end) of the engine looking forward (toward water pump end). Propeller rotation is not necessarily the same as engine rotation. When ordering replacement engine, short blocks or parts for engine, be certain to check engine rotation. Do not rely on propeller rotation in determining engine rotation.



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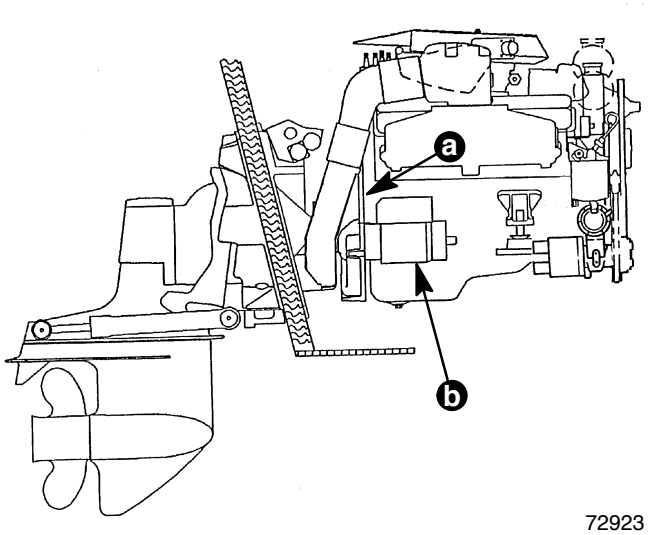
Standard Left-Hand Rotation

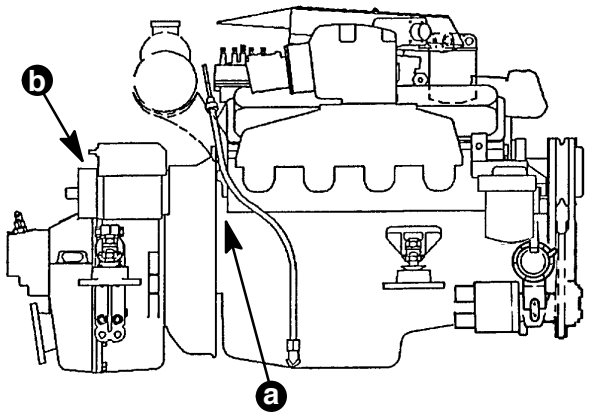
Engine Serial Number Locations



72923

Stern Drive (MCM)

a - Serial Number Plate
b - Starter Motor



72924

Inboard (MIE)

a - Serial Number Plate
b - Starter Motor

Propeller Information

Refer to the “Propeller” section in appropriate MerCruiser Stern Drive Service Manual, or order publication 90-86144-92, “Everything you need to know about propellers.”

Changing diameter, pitch or coupling of a propeller will affect engine RPM and boat performance. The blade configuration also will affect performance. Two like propellers, same pitch and diameter, from two different manufacturers also will perform differently.

It is the responsibility of the boat manufacturer and/or selling dealer to equip the boat with the correct propeller to allow the engine to operate within its specified RPM range at wide-open-throttle (W.O.T.).

Because of the many variables of boat design and operation, only testing will determine the best propeller for the particular application.

To test for correct propeller, operate boat (with an average load onboard) at W.O.T. and check RPM with an accurate tachometer. Engine RPM should be near top of the specified range so that, under heavy load, engine speed will not fall below specifications.

If engine exceeds the specified RPM, an increase in pitch and/or diameter is required.

If engine is below rated RPM, a decrease in pitch and/or diameter is required.

Normally, a change of approximately 150 RPM will be achieved for each single inch of pitch change of a propeller.

⚠CAUTION

If a propeller is installed that does not allow engine RPM to reach the specified full-throttle RPM range, the engine will “labor” and will not produce full power. Operation under this condition will cause excessive fuel consumption, engine overheating and possible piston damage (due to detonation). On the other hand, installation of a propeller, that allows engine to run above the specified RPM limit, will cause excessive wear on internal engine parts which will lead to premature engine failure.

Water Testing New Engines

Use care during the first 20 hours of operation on new MerCruiser engines or possible engine failure may occur. If a new engine has to be water-tested at full throttle before the break-in period is complete, follow this procedure.

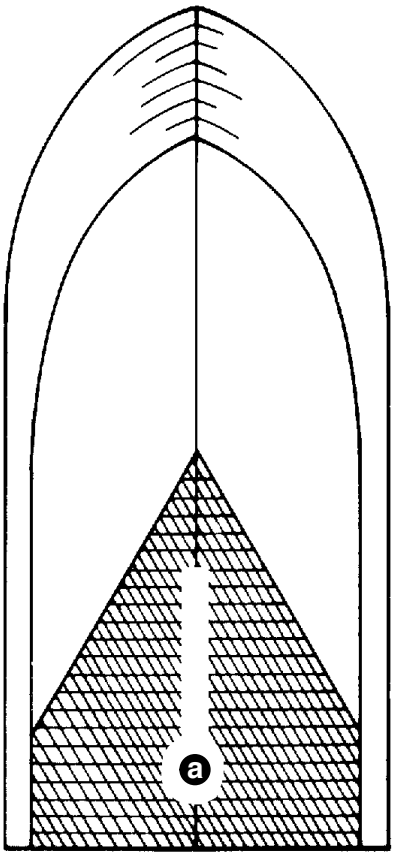
1. Start engine and run at idle RPM until normal operating temperature is reached.
2. Run boat up on plane.
3. Advance engine RPM (in 200 RPM increments) until engine reaches its maximum rated RPM.

IMPORTANT: Do not run at maximum RPM for more than 2 minutes.

Boat and Engine Performance

Boat Bottom

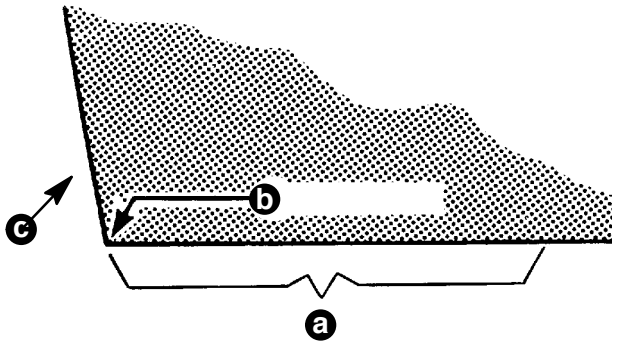
For maximum speed, a boat bottom should be as flat as possible in a fore-aft direction (longitudinally) for approximately the last 5 ft. (1.5 m).



72002

a - Critical Bottom Area

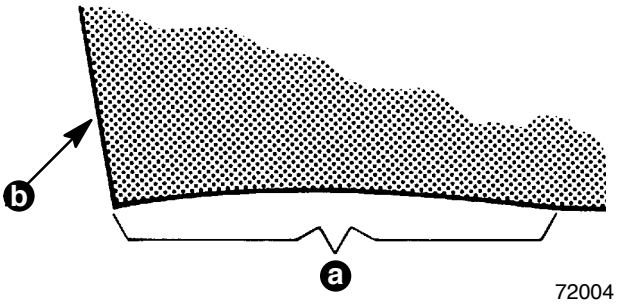
For best speed and minimum spray, the corner between the bottom and the transom should be sharp.



72003

a - Flat
b - Sharp Corner
c - Transom

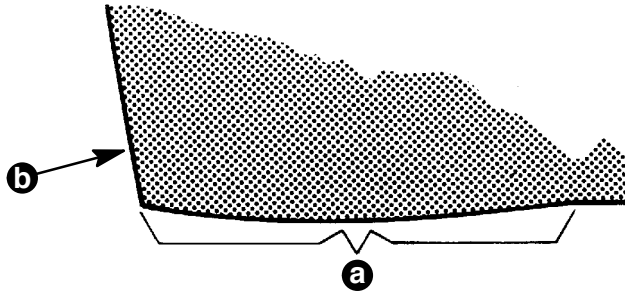
The bottom is referred to as having a “hook” if it is concave in the fore-and-aft direction. A hook causes more lift on the bottom near the transom and forces the bow to drop. This increases wetted surface and reduces boat speed. A hook, however, aids in planing and reduces any porpoising (rhythmical bouncing) tendency. A slight hook is often built in by the manufacturer. A hook also can be caused by incorrect trailering or storing the boat with support directly under the transom.



72004

a - Hook
b - Transom

A “rocker” is the reverse of a hook. The bottom is convex or bulged in the fore-and-aft direction. It can cause the boat to porpoise.



72005

a - Rocker
b - Transom

Any hook, rocker or surface roughness on the bottom, particularly in the all-important center-aft portion will have a negative effect on speed, often several miles per hour on a fast boat.

Marine Fouling

Fouling is an unwanted build-up (usually animal-vegetable-derived) occurring on the boat’s bottom and drive unit. Fouling adds up to drag, which reduces boat performance. In fresh water, fouling results from dirt, vegetable matter, algae or slime, chemicals, minerals and other pollutants. In salt water, barnacles, moss and other marine growth often produce dramatic build-up of material quickly. Therefore, it is important to keep the hull as clean as possible in all water conditions to maximize boat performance.

Antifouling paint, if required, may be applied to boat hull observing the following precautions.

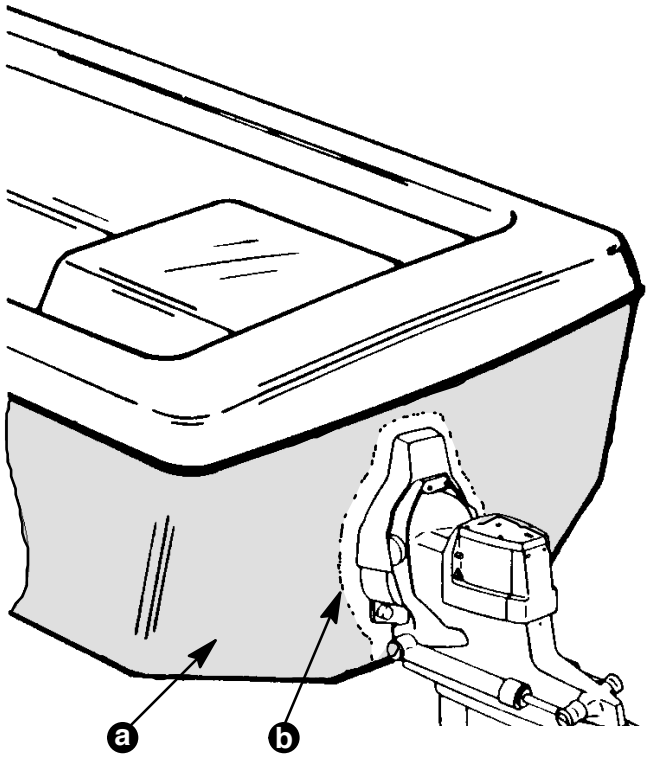
IMPORTANT: DO NOT paint anodes or MerCathode System reference electrode and anode, as this will render them ineffective as galvanic corrosion inhibitors.

⚠CAUTION

Avoid corrosion damage. Do not apply antifouling paint to MerCruiser drive unit or transom assembly.

IMPORTANT: If antifouling protection is required, Tri-Butyl-Tin-Adipate (TBTA) base antifouling paints are recommended on MerCruiser boating applications. In areas where Tri-Butyl-Tin-Adipate base paints are prohibited by law, copper base paints can be used on boat hull and boat transom. Corrosion damage that results from the improper application of antifouling paint will not be covered by the limited warranty. Observe the following:

Avoid an electrical interconnection between the MerCruiser Product, Anodic Blocks, or MerCathode System and the paint by allowing a minimum of 1 in. (26mm) UNPAINTED area on transom of the boat around these items.



71176

a - Antifouling Paint
b - MINIMUM 1 Inch (26 mm) UNPAINTED Area

Weight Distribution

Weight distribution is extremely important; it affects a boat’s running angle or attitude. For best top speed, all movable weight - cargo and passengers - should be as far aft as possible to allow the bow to come up to a more efficient angle (3 to 5 degrees). On the negative side of this approach is the problem that, as weight is moved aft, some boats will begin an unacceptable porpoise.

Secondly, as weight is moved aft, getting on plane becomes more difficult.

Finally, the ride in choppy water becomes more uncomfortable as the weight goes aft. With these factors in mind, each boater should seek out what weight locations best suit his/her needs.

Weight and passenger loading placed well forward increases the “wetted area” of the boat bottom and, in some cases, virtually destroys the good performance and handling characteristics of the boat. Operation in this configuration can produce an extremely wet ride, from wind-blown spray, and could even be unsafe in certain weather conditions or where bow steering may occur.

Weight distribution is not confined strictly to fore and aft locations, but also applies to lateral weight distribution. Uneven weight concentration to port or starboard of the longitudinal centerline can produce a severe listing attitude that can adversely affect the boat’s performance, handling ability and riding comfort. In extreme rough water conditions, the safety of the boat and passengers may be in jeopardy.

Water in Boat

When a boat loses performance, check bilge for water. Water can add considerable weight to the boat, thereby decreasing the performance and handling.

Make certain that all drain passages are open for complete draining.

Elevation and Climate

Elevation has a very noticeable effect on the wide-open- throttle power of an engine. Since air (containing oxygen) gets thinner as elevation increases, the engine begins to starve for air. Humidity, barometric pressure and temperature do have a noticeable effect on the density of air. Heat and humidity thin the air. This phenomenon can become particularly annoying when an engine is propped out on a cool dry day in spring and later, on a hot, sultry day in August, doesn’t have its old zip.

Although some performance can be regained by dropping to a lower pitch propeller, the basic problem still exists. The propeller is too large in diameter for the reduced power output. The experienced marine dealer or a Quicksilver Propeller Repair Station can determine how much diameter to remove from a lower-pitch propeller for specific high-elevation locations. In some cases, a gear-ratio change to the drive unit to more reduction is possible and very beneficial. It is a known fact that weather conditions exert a profound effect on power output of internal combustion engines. Therefore, established horsepower ratings refer to the power that the engine will produce at its rated RPM under a specific combination of weather conditions.

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IMPORTANT INFORMATION

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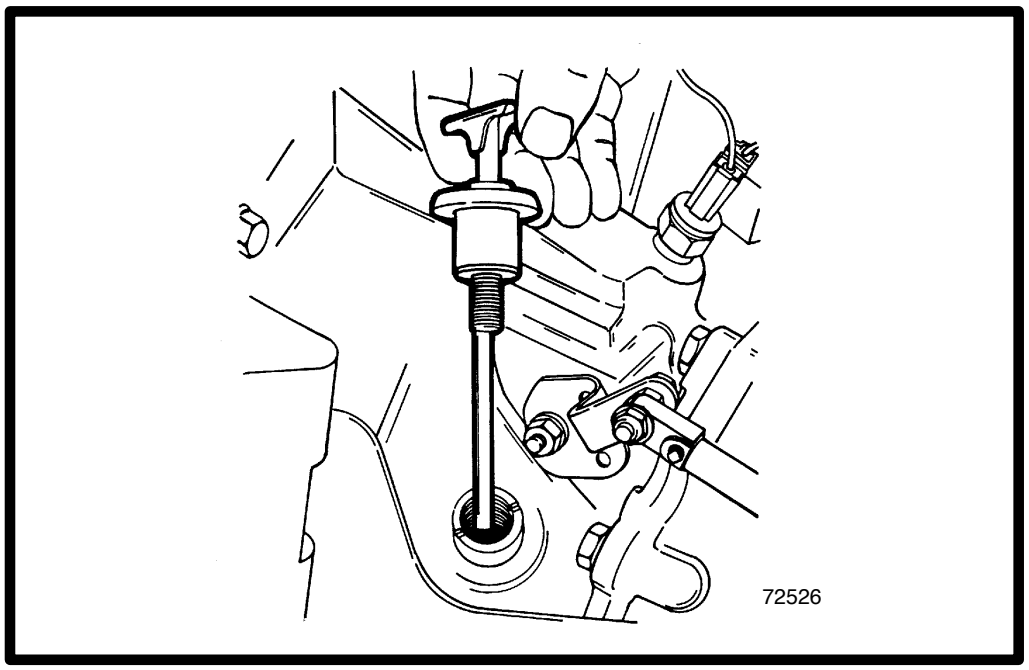

MAINTENANCE

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Maintenance Schedule

Maintenance Intervals

Maintenance intervals and the tasks to be performed, as shown in this current schedule, or as found in a previously printed schedules, are generally based on an average boating application and environment. However, individual operating habits and personal maintenance preferences can have an impact on the suggested intervals. In consideration of these factors, MerCruiser has adjusted some maintenance intervals and corresponding tasks to be performed. In some cases, this may allow for more individual tasks to be performed in a single visit to the serving dealer, rather than multiple visits. Therefore, it is very important that the boat owner and servicing dealer discuss the current Maintenance Schedule and develop appropriate maintenance intervals to coincide with the individual operating habits, environment, and maintenance requirements.

Always disconnect battery cables from battery BEFORE working around electrical systems components to prevent injury to yourself and damage to electrical system should a wire be accidentally shorted.

SCHEDULED MAINTENANCE THAT CAN BE PERFORMED BY OWNER/OPERATOR

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

Task	Interval
Engine Crankcase Oil - Check level	Weekly
Closed Cooling Coolant - Check level	
Power Steering Fluid - Check level	
Stern Drive Unit Oil - Check level	
Battery - Check level and inspect for damage	
Fuel Pump Sight Tube (If Equipped) - Check that no fuel is present	
Power Trim Pump Oil - Check level	
Anodes - Inspect for erosion	
Gear Housing Water Pickups - Check for marine growth or debris	
Drive Belt(s) - Inspect condition and check tension	Every 100 hours of operation or 120 days. Whichever occurs first.
Propeller Shaft - Lubricate	**Saltwater Use**: Every 50 hours of operation or 60 days, Whichever occurs first. **Freshwater Use:** Every 100 hours of operation or 120 days, Whichever occurs first.
Power Package - Exterior Surfaces - Spray with rust preventative	
Power Package Exterior Surfaces - Clean and paint	Once a year
Cooling System - Flush seawater section	**Saltwater Use:** After every use.

Maintenance Schedule (Continued)

To Be Done by Dealer

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

Task	Interval
Seawater Pickup Pump - Disassemble and inspect	Whenever insufficient seawater flow is suspected. (If operating temperature exceeds normal range.)
Crankcase Oil and Filter Change	End of first boating season and thereafter, every100 hours of operation or once yearly, whichever occurs first.
Ignition system - Clean and Inspect condition.	
Flame Arrestor and Crankcase Ventilation Hose - Clean and Inspect.	
Positive Crankcase Ventilation (PCV) Valve (If So Equipped) - Change	
Stern Drive unit Oil - Change	
Gimbal Ring Clamping Screws - Retorque to 40 ft. lb. (54 N·m)	
Rear Engine Mounts - Check torque to 30-40 ft. lb. (47-54 N·m)	
Gimbal Bearing - Lubricate	
Cooling System - Clean and Inspect	
Engine Alignment - Check	
Engine Coupling Universal Joint Shaft Splines - Lubricate	
Steering System - Lubricate and inspect for loose, damage or missing parts.	
Electrical System - Check for loose or damaged wiring.	
Cooling System Hoses and Clamps - Inspect for damage and deterioration. Check Clamps for tightness.	
Closed Cooling System Pressure Cap - Clean, inspect and test .	
Continuity Circuit - Check components for loose connections, broken or frayed wires.	
Shift and Throttle Cable and Linkage - Lubricate and inspect for loose, damaged or missing parts	
Engine Exhaust System - Inspect externally for damage, deterioration and restrictions. Check for tightness.	
Ignition System - Check Timing and adjust as needed.	

Maintenance Schedule (Continued)

To Be Done by Dealer

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

Task	Interval
Steering Head and Remote Control - Inspect and Lubricate.	End of first boating season and thereafter, every 100 hours of operation or once yearly, whichever occurs first.
Carburetor (If So Equipped) - Inspect and adjust.	
Throttle Body (Fuel Injection Models) - Inspect	
Fuel Filters - Replace	Once a Year
Quicksilver Mercathode System - Test output.	
Closed Cooling Coolant - Test for Alkalinity	
Heat Exchanger - Clean seawater section.	
Drive Unit Bellows and Clamps - Inspect	
Universal Joint Cross Bearings- Inspect	End of first boating season and thereafter, every 200 hours of operation or once yearly, whichever occurs first.
Closed Cooling Coolant - Replace	Every Two Years

Tune-Up Specifications

MCM (Stern Drive)

Model	MCM 7.4L	MCM 7.4L PT Bravo Three	MCM 454 Magnum	MCM 454 EFI	MCM 502 Magnum	MCM 502 EFI Magnum
Propshaft Ratings HP (KW)	300 (224)	300 (224)	350 (261)	385 (287)	390 (291)	415 (309)
Number of Cylinders	V-8					
Displacement	454 C.I.D (7.4L)				502 C.I.D. (8.2L)	
Bore/Stroke In. (mm)	4.25x4.00 (108x101.6)				4.47 x 4.00 (113.5 x 101.6)	
Compression Ratio	8.0:1		8.6:1			
Compression Pressure	150 PSI (1034 kPa)					
Idle RPM (in Forward Gear)	650			600	650	600
Max. RPM (at W.O.T.)	4200-4600		4600-5000			
Oil Pressure (at 2000 RPM)	30-70 PSI (207-483 kPa)					
Min. Oil Pressure (at Idle)	4 PSI (28 kPa)					
Fuel Pump Pressure (at 1800 RPM)	3-7 PSI (21-48 kPa)					
Fuel Rail Pressure (Running) (E.F.I. Only)				37 PSI (255 kPa)		37 PSI (255 kPa)
Electrical System	12 V Negative (–) Ground					
Min. Battery Requirements	450 cca 575 mca 90A/h			650 cca, 825 mca, or 150A/h	550 cca, 700 mca or 120A/h	650 cca, 825 mca, or 150A/h
Firing Order	1-8-4-3-6-5-7-2					
Spark Plug Type	AC MR43T/Champion RV15YC4/NGK BR6FS					
Spark Plug Gap	.035 in (0.9 mm)					
Timing (at Idle RPM)	8 Degrees BTDC					
Preliminary Idle Mixture	1 1/4 Turns				1 1/4 Turns	
Thermostat	143° F (62° C)			160° F (71° C)	143° F (62° C)	160° F (71° C)