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mercruiser

SERVICE MANUAL

Number 15

MARINE ENGINES

GM V-8 Cylinder

Printed in U.S.A.

90-816463 392

V8 Models Covered In This Manual

Alpha Engines

Models	Serial Numbers	Years
MCM 5.0L	0C408718-0D832471	1989-1992
MCM 5.0LX	0C407922-0D831002	
MCM 5.7L	0C408286-0D830699	
MCM 350 Magnum	0C407752-0D830981	

Bravo Engines

Models	Serial Numbers	Years
MCM 5.0L	0D713710-0D833076	1992
MCM 5.7L	0C407810-0D831825	1989-1992
MCM 7.4L	0C407647-0D830778	
MCM 454 Magnum	0C407647-0D837586	
MCM 502 Magnum	0C878221-0D840099	1990-1992

Ski Engines

Models	Serial Numbers	Years
MIE 5.7L Competition Ski	0C410403-0D840219	1989-1992
MIE 350 Magnum Competition Ski	0D505374-0D840099	1991-1992

Inboard Engines

Models	Serial Numbers	Years
MIE 5.7L	0C396695-0D839999	1989-1992
MIE 7.4L	0C396833-0D840299	
MIE 8.2L	0C878221-0D857199	1990-1992

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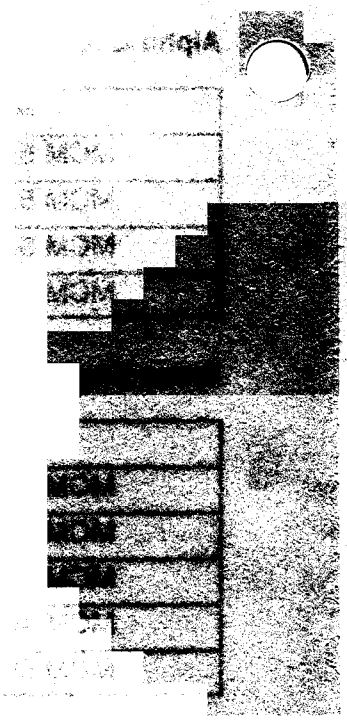


Notice

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. That they have been trained in the recommended servicing procedures of these products which includes 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 publications.

It should be kept in mind, while working on the product, that the electrical system and ignition system is 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 matches the original.

Replacement Parts

⚠WARNING

Electrical, ignition and fuel system componets 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.

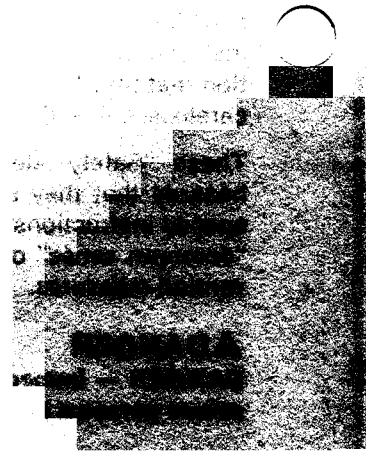
When servicing the electrical, ignition and fuel systems, it is extremely important that all components are properly installed and tightened. If not, any electrical or ignition component opening would permit sparks to ignite fuel vapors from fuel system leaks, if they existed.

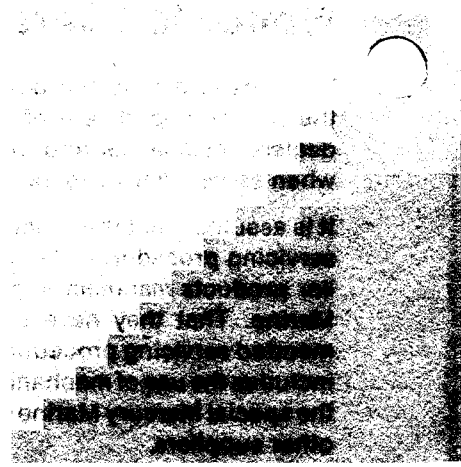
Engine Mechanical Components

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

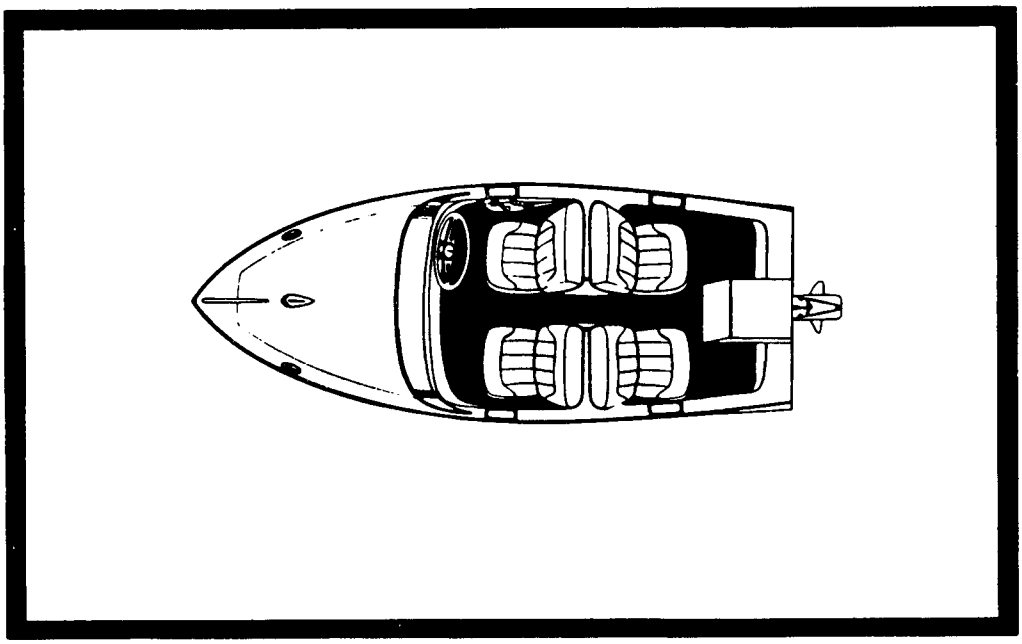




IMPORTANT INFORMATION

1

A



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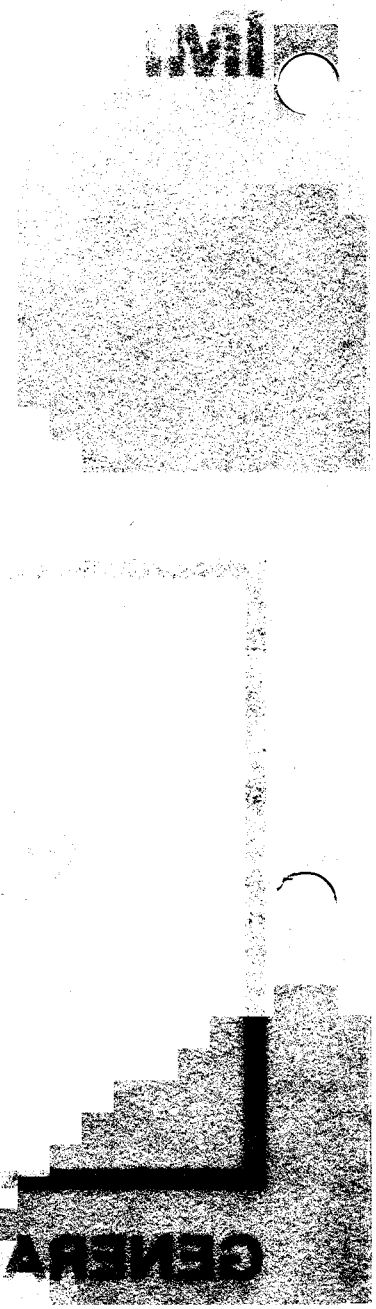


NOTICE

Refer to Appropriate Stern Drive service manual for transom assembly and Stern Drive unit repair.

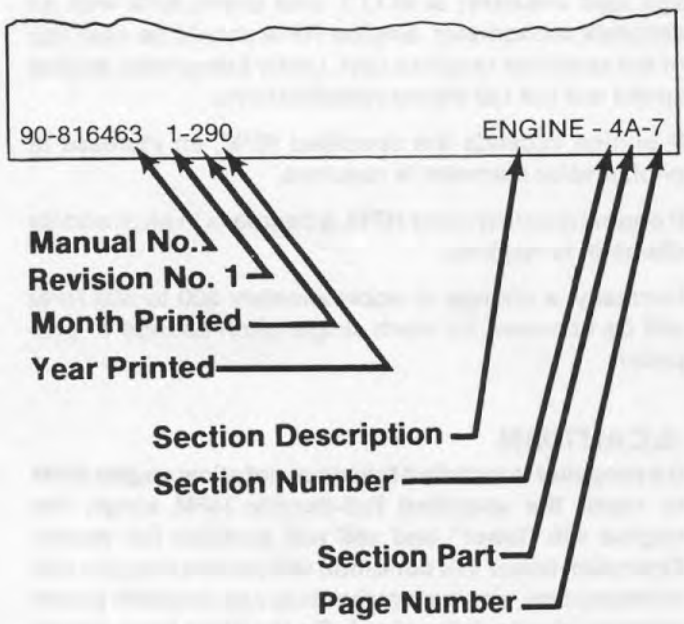
How to Use This Manual

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.

Page Numbering

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



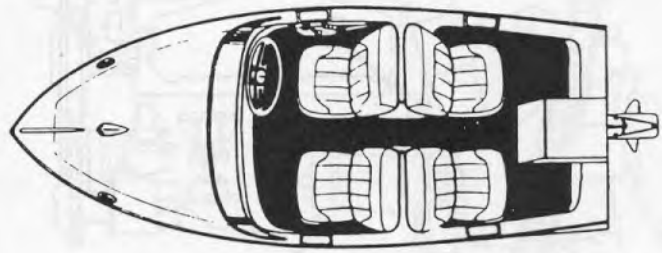
Introduction

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.

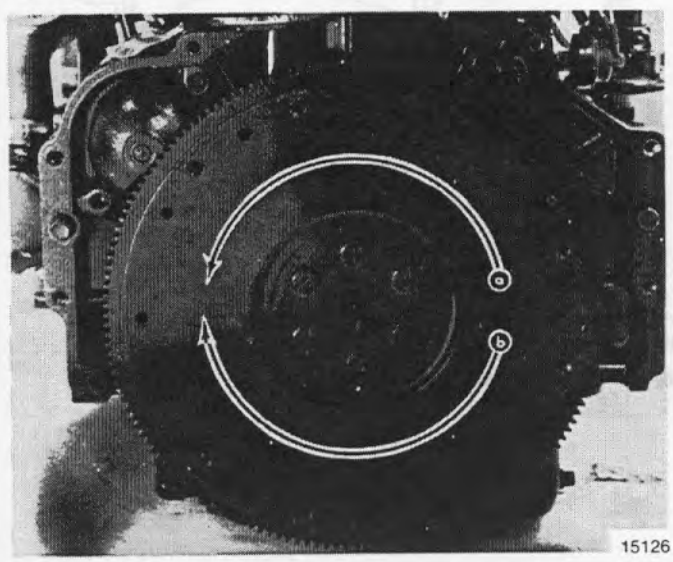
Directional References

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.



Engine Rotation

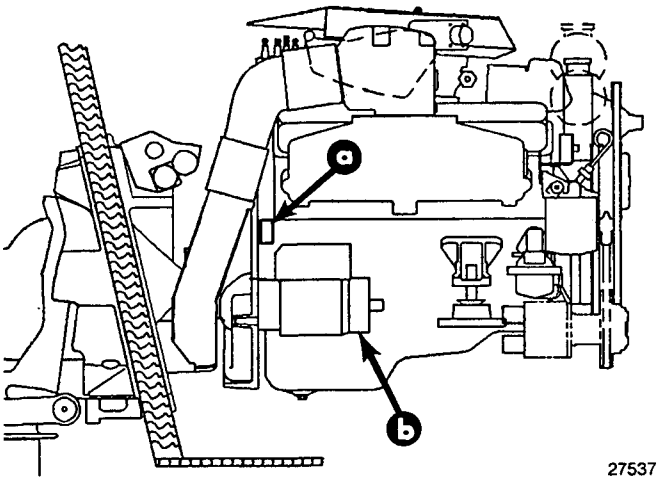
Engine rotation is determined by observing flywheel rotation from the rear (stern end) of the engine looking forward (water pump end). Propeller rotation is not necessarily the same as engine rotation. When ordering replacement engine, short blocks or parts for engine, be certain to check engine rotation.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



a - Standard Left Hand Rotation - All MCM Stern Drive Engines; MIE Inboard L.H. Rotation Engines

b - Opposite Right Hand Rotation - MIE Inboard R.H. Rotation Engines

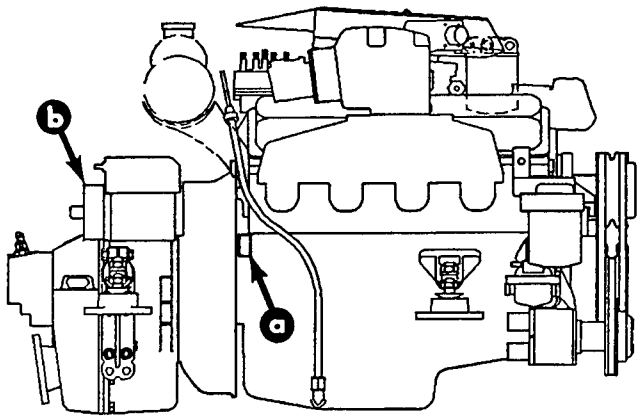
Engine Serial Number Locations



27537

a - Serial Number Plate
b - Starter Motor

MCM - All Engines



27576

a - Serial Number Plate
b - Starter Motor

MIE - All Engines

Propeller Information

Refer to the "Propeller" Section in appropriate MerCruiser Stern Drive Service Manual, or order publication P/N 90-86144 "What You Should Know About Quicksilver 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 300 to 500 RPM will be achieved for each single pitch change of 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.

Hi-Performance Boating

Written by Marine Engineers, order publication P/N 90-86168, entitled "Hi-Performance Boat Operation."

Engine 20-Hour Break-In Period

IMPORTANT: Proper break-in is essential to obtaining minimum oil consumption, maximum engine performance and service.

The first 20 hours of operation is the engine (new or rebuilt) break-in period. During this period, it is extremely important that the engine is operated, as outlined following.

1. Do not operate engine below 1500 RPM for extended periods of time during the first 10 hours. During this period, shift into gear as soon as possible after starting engine and advance throttle so that RPM is above 1500 (provided that conditions permit safe operation at this speed).
2. Do not operate at any one constant speed for extended periods of time.
3. Do not exceed 3/4 of full throttle during the first 10 hours of operation. During the next 10 hours, occasional operation at full throttle (5 minutes at-a-time maximum) is permissible.
4. Avoid full throttle acceleration from stopped position.
5. Do not operate at full throttle until engine reaches normal operating temperature.
6. Observe instrumentation carefully. If an abnormal reading occurs, stop engine immediately and determine cause.
7. Frequently check crankcase oil level and add oil if necessary. It is normal for oil consumption to be somewhat high during the break-in period.
8. At end of 20-hour break-in period, drain break-in oil from crankcase and replace oil filter. Fill crankcase with correct grade and viscosity oil.

20-Hour Checkup

After first 20 hours of operation, an Authorized MerCruiser Dealer should be contacted for the following maintenance. The boat owner is responsible for any charges.

- Change crankcase oil and filter.
- Hurth Transmissions, only - change transmission filter.
- Magnum Models Only - retorque intake manifold to 35 lb. ft. (48 N·m).
- Check all fluid levels.
- Cooling System - Inspect all hoses for damage and deterioration; check all hose clamps for adequate tightness.
- Check carburetor adjustment.
- Inspect ignition system and timing.
- Check for loose, missing or damaged parts.
- Check shift and throttle cable adjustments - lubricate and inspect for loose, damaged or missing parts.
- Steering System - Lubricate and inspect for loose, damaged or missing parts.
- Inspect all drive belts.
- Check engine alignment.
- Complete Engine Exhaust System Inspection - Inspect for damaged and deterioration; check all hose clamps for adequate tightness.
- Retorque gimbal ring clamping U-bolt to 40 lb. ft. (54 N·m).
- Change oil in Seawater/Fuel Pump (if so equipped). Use only Quicksilver High Performance Gear Lube to refill pump.

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.

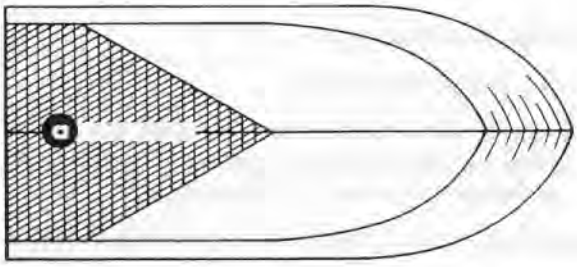
1. Start engine and run at idle RPM until normal operating temperature is reached.
2. Run boat up on plane.
3. Advance engine RPM (in 200 RPM increments) until engine reaches its maximum rated RPM.

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

Boat and Engine Performance

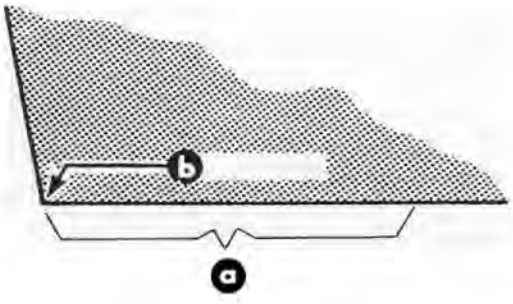
Boat Bottom

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



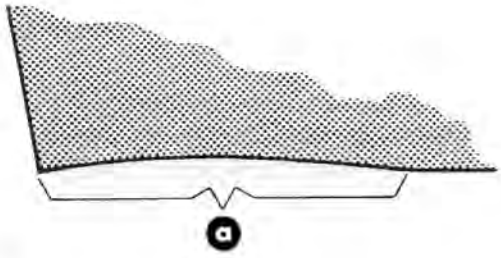
a - Critical Bottom Area

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



a - Flat
b - Sharp Corner

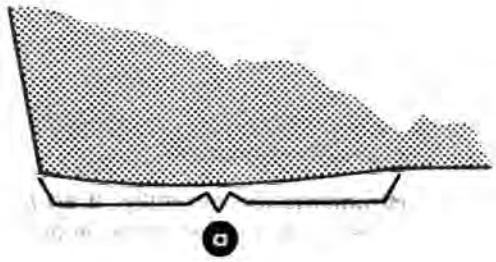
The bottom is referred to as having a "hook" if it is concave in the fore-and-aft direction. A hook causes more lift on the bottom near the transom and forces the bow to drop. This increases wetted surface and reduces boat speed. A hook, however, aids in planing and reduces any porpoising (rhythmical 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.



a - Hook

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.

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.



a - Rocker

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. So it is important to keep the hull as clean as possible in all water conditions to maximize boat performance.

Special hull treatments, such as anti-fouling paint, will reduce the rate of bottom fouling. However, due to the fact that drive units (outboard or stern drive) are made primarily of aluminum, be sure to select an anti-fouling paint having a copper-free, organo-tin base. The BIS (Tri Butyl Tin) Adipate (TBTA) base paint will not set up a galvanic corrosion "cell" as it is completely compatible with aluminum and avoids any electrolysis problems connected with many other paints. Applied according to instructions, it also is very effective.

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°). 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 suits 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

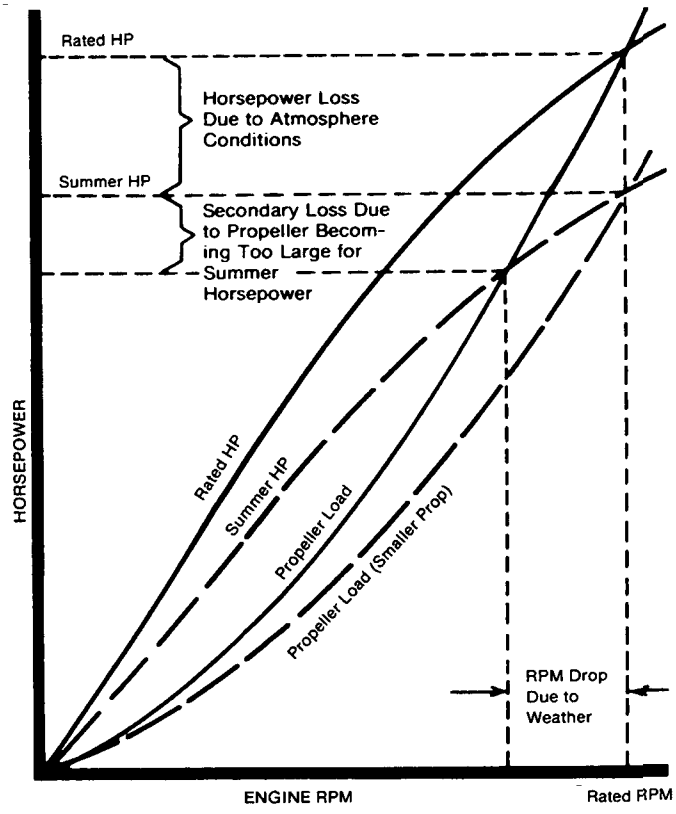
When a boat loses performance, check bilge for water. Water can add considerable weight to the boat, thereby decreasing the performance and handling.

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. (See chart)

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.



IMPORTANT INFORMATION

Scheduled Maintenance to be Performed by Dealer

TASK	INTERVAL
20-Hour Checkup (See NOTE 1)	At First 20 Hours of Operation.
Seawater Pickup Pump - Disassemble and Inspect	Whenever Insufficient Seawater Flow is Suspected. (If Operating Temperature Exceeds Normal Range.)
Transmission Fluid - Change	After first 20 hours of operation, then every 100 hours of operation thereafter.
Transmission Filter (Hurth Transmissions) - Change	
Flame Arrestor and Crankcase Ventilation Hose - Clean and inspect	Every 100 Hours of Operation or Once Yearly, Whichever Occurs First.
Stern Drive Unit Oil - Change	
Gimbal Ring Clamping Screws - Retorque to 40 lb. ft. (54 N·m)	
Intake Manifold (Magnum and 8.2L Models Only) - Retorque to 35 lb. ft. (48 N·m)	
Seawater/Fuel Pump (If So Equipped) - Check Oil	
Engine Alignment - Check	
Transom Gimbal Housing Assembly Swivel Shaft and Gimbal Bearing - Lubricate	
Engine Coupling, Universal Joint Shaft Splines - Lubricate*	

MAINTENANCE

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Maintenance Schedule

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

Only perform maintenance which applies to your particular power package.

Scheduled Maintenance to be Performed by Owner/Operator

TASK	INTERVAL
Seawater Strainer - Check and Clean	Before Use
Water Pickups - Check for marine growth or debris	Whenever Insufficient Seawater Flow is Suspected. (If Operating Temperature Exceeds Normal Range).
Engine Crankcase Oil - Check level (See NOTE 1)	Weekly
Transmission Fluid - Level Check	
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 - Check that no fuel is present	
Power Trim Pump Oil - Check level	
Anodes - Inspect for erosion	
Drive Belts (All) - 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 Each Use.

NOTE 1: 454 Magnum, 502 Magnum and 8.2L Models - Check every 3 hours of operation.

Maintenance (Continued)

Only perform maintenance which applies to your particular power package.

Scheduled Maintenance to be Performed by Dealer

TASK	INTERVAL
20-Hour Checkup (See NOTE 1)	At First 20 Hours of Operation.
Seawater Pickup Pump - Disassemble and Inspect	Whenever Insufficient Seawater Flow is Suspected. (If Operating Temperature Exceeds Normal Range.)
Transmission Fluid - Change	After first 20 hours of operation, then every 100 hours of operation thereafter.
Transmission Filter (Hurth Transmissions) - Change	
Flame Arrestor and Crankcase Ventilation Hose - Clean and inspect	Every 100 Hours of Operation or Once Yearly, Whichever Occurs First.
Stern Drive Unit Oil - Change	
Gimbal Ring Clamping Screws - Retorque to 40 lb. ft. (54 N·m)	
Intake Manifold (Magnum and 8.2L Models Only) - Retorque to 35 lb. ft. (48 N·m)	
Seawater/Fuel Pump (If So Equipped) - Check Oil	
Engine Alignment - Check	
Transom Gimbal Housing Assembly Swivel Shaft and Gimbal Bearing - Lubricate	
Engine Coupling, Universal Joint Shaft Splines - Lubricate*	
Crankcase Oil and Filter - Change	
Ignition System - Clean and inspect condition	
Universal Joint Cross Bearings - Lubricate	Every 200 Hours of Operation or Once Yearly, Whichever Occurs First.
Steering System - Lubricate and inspect for loose, damaged or missing parts	**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.
Electrical System - Check for loose or damaged wiring	

NOTE 1: For a list of 20-Hour Checkup maintenance items to be performed, see SECTION 1A - "IMPORTANT INFORMATION," of this manual.

*Use Quicksilver Engine Coupler Spline Grease (Part Number 92-816391A4).

Maintenance (Continued)

Only perform maintenance which applies to your particular power package.

Scheduled Maintenance to be Performed by Dealer

TASK	INTERVAL
Continuity Circuit - Check components for loose connections, broken or frayed wires.	**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.
Shift and Throttle Cable and Linkage - Lubricate and inspect for loose, damaged or missing parts	
Cooling System Hoses and Clamps - Inspect for damage and deterioration. Check clamps for tightness.	
Engine Exhaust System - Inspect for damage, deterioration and restrictions. Check clamps for tightness.	
Ignition System - Check timing and adjust if needed	Once a Year
Fuel filters - Replace	
Steering Head and Remote Control - Inspect and lubricate	
Quicksilver MerCathode System - Test output	
Closed Cooling Coolant - Test for alkalinity	
Heat Exchanger - Clean seawater section	
Carburetor - Inspect and adjust	
Drive Unit Bellows and Clamps - Inspect	
Closed Cooling Coolant - Replace	Every Two Years

Tune-Up Specifications

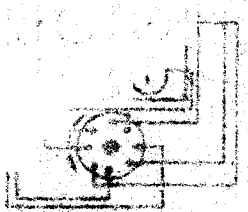
MODEL	MCM 5.0L	MCM 5.0LX	MCM 5.7L	MCM 350 MAGNUM
Number of Cylinders	V8			
Displacement	305 CID (5.0 Litre)		350 CID (5.7 Litre)	
Bore/Stroke	3.74/3.48 In. (95/88.4mm)		4.00/3.48 In. (101.6/88.4mm)	
Compression Ratio	9.3:1			
Compression Pressure	150 - 160 PSI (1034 - 1103 kPa)			
Idle RPM (In Forward Gear)	650 - 700			
Max. RPM (at W.O.T.)	4200 - 4600		4200 - 4600 4400 - 4800 (NOTE)	
Oil PSI (At 2000 RPM)	30 - 60 PSI (207 - 414 kPa)			
Min. Oil PSI (At Idle)	4 PSI (28 kPa)			
Fuel Pump PSI (At 1800 RPM)	4-1/2 - 5 PSI (31 - 34.5 kPa)			
Electrical System	12 Volt Negative (-) Ground			
Min. Battery Cold Cranking Amps	305		350 375 (NOTE)	
Firing Order	1-8-4-3-6-5-7-2			
Spark Plug Type	AC-MR43T/Champion RV8C			
Spark Plug Gap	.035 In. (0.9mm)			
Timing (At Idle RPM)	8° BTDC			
Preliminary Idle Mixture	1-1/4 Turns	2 - 3 Turns		
Thermostat	143° F (62° C)			

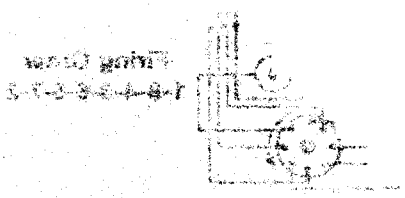
NOTE: Engines with roller lifters and matching camshaft; Engine Block Code "CD." See Engine Block Code Information, SECTION 3A.

Tune-Up Specifications
(Continued)

MODEL	MCM 7.4L	MCM 454 MAGNUM	MCM 502 MAGNUM
Number of Cylinders	V8		
Displacement	454 CID (7.4 Litre)		502 CID (8.2 Litre)
Bore/Stroke	4.25/4.00 In. (108/101.6mm)		4.47/4.00 In. (113.5/101.6mm)
Compression Ratio	8.5:1 8.6:1 (NOTE)	8.8:1 8.6:1 (NOTE)	8.75:1
Compression Pressure	150 - 160 PSI (1034 - 1103 kPa)		
Idle RPM (In Forward Gear)	650 - 700		
Max. RPM (at W.O.T.)	4200 - 4600	4600 - 5000	4600 - 5000
Oil PSI (At 2000 RPM)	30 - 70 PSI (207 - 483 kPa)		
Min. Oil PSI (At Idle)	4 PSI (28 kPa)		
Fuel Pump PSI (At 1800 RPM)	4-1/2 - 5 PSI (31 - 34.5 kPa) 3 - 7 PSI (21 - 48 kPa) (NOTE)		3 - 7 PSI (21 - 48 kPa)
Electrical System	12 Volt Negative (-) Ground		
Min. Battery Cold Cranking Amps	450		550
Firing Order	1-8-4-3-6-5-7-2		
Spark Plug Type	AC-MR43T/Champion RV8C		
Spark Plug Gap	.035 In. (0.9mm)		
Timing (At Idle RPM)	8° BTDC		
Preliminary Idle Mixture	2 - 3 Turns		
Thermostat	143° F (62° C)		

NOTE: Generation V Engines (engines with Cast Aluminum Rocker Arm Covers and lack of engine block fuel pump mounting pad).



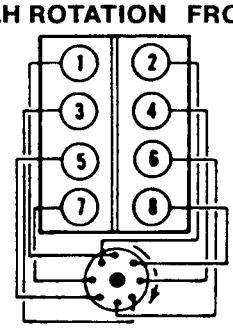


Tune-Up Specifications
(Continued)

MODEL	MIE 5.0 Litre	MIE 5.7 Litre	MIE 7.4 Litre	MIE 8.2 Litre
Number of Cylinders	V8			
Displacement	305 CID (5.0 L)	350 CID (5.7 L)	454 CID (7.4 L)	502 CID (8.2 L)
Bore/Stroke	3.74/3.48 In. (95/88.39mm)	4.00/3.48 In. (101.6/88.39mm)	4.25/4.00 In. (108/101.6mm)	4.47/4.00 In. (113.5/101.6mm)
Compression Ratio	9.3:1		8.5:1 8.6:1 (NOTE)	8.75:1
Compression Pressure	180 PSI (1241 kPa)		180 PSI (1241 kPa) 150 PSI (1035 kPa) (NOTE)	150 PSI (1035 kPa)
Idle RPM (In Forward Gear)	650 - 700 RPM			
Max. RPM (at W.O.T.)	4000 - 4400 RPM			4400 - 4800 RPM
Oil PSI (At 2000 RPM)	30 - 60 PSI (207 - 414 kPa)		30 - 70 PSI (207 - 483 kPa)	
Min. Oil PSI (At Idle)	4 PSI (28 kPa)			
Fuel Pump PSI (At 1800 RPM)	4-1/2 - 5 PSI (31 - 34.5 kPa)		4-1/2 - 5 PSI (31 - 34.5 kPa) 3 - 7 PSI (21 - 48 kPa) (NOTE)	3 - 7 PSI (21 - 48 kPa)
Electrical System	12 Volt Negative (-) Ground			
Min. Battery Cold Cranking Amps	305	350	450	550
Firing Order	A or B			A only
Spark Plug Type	AC-MR43T/Champion RV8C			
Spark Plug Gap	.035 In. (0.9mm)			
Timing (At Idle RPM)	8° BTDC			12° BTDC
Preliminary Idle Mixture	2 - 3 Turns			
Thermostat	143° F (62° C)			

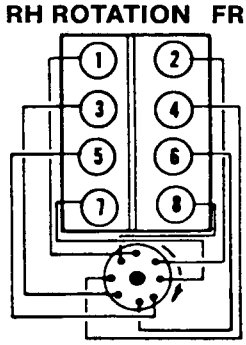
NOTE: Generation V Engines (engines with Cast Aluminum Rocker Arm Covers and lack of engine block fuel pump mounting pad).

A LH ROTATION FRONT



Firing Order
1-8-4-3-6-5-7-2

B RH ROTATION FRONT



Firing Order
1-2-7-5-6-3-4-8

Tune-Up Specifications
(Continued)

MODEL	MIE 5.7 Litre Comp. Ski	MIE 350 Magnum Tournament Ski
Number of Cylinders	V8	
Displacement	350 CID (5.7 L)	
Bore/Stroke	4.00/3.48 In. (102/88mm)	
Compression Ratio	9.3:1	
Compression Pressure	180 PSI (1241 kPa)	150 PSI (1035 kPa)
Idle RPM (In Forward Gear)	650 - 700	
Max. RPM (at W.O.T.)	4000 - 4400	4400 - 4800
Oil Pressure (At 2000 RPM)	30 - 60 PSI (207 - 414 kPa)	
Min. Oil Pressure (At Idle)	4 PSI (28 kPa)	
Fuel Pump Pressure	4-1/2 - 5 PSI (31 - 34.5 kPa)	3 - 7 PSI (21 - 48 kPa)
Electrical System	12 Volt Negative (-) Ground	
Min. Battery Cold Cranking Amps	350	375
Firing Order	L.H. Rot. 1-8-4-3-6-5-7-2 R.H. Rot. 1-2-7-5-6-3-4-8	L.H. Rot. 1-8-4-3-6-5-7-2
Spark Plug Type	AC-MR43T/Champion RV8C	
Spark Plug Gap	.035 In. (0.9mm)	
Breaker Point Gap	.016 - .019 In. (0.40 - 0.48mm)	Not Applicable (Thunderbolt IV HEI)
Dwell	28° - 31°	
Breaker Point Spring Tension	25 - 30 Oz. (709 - 850g)	
Timing (At Idle RPM)	10° BTDC	8° BTDC
Preliminary Idle Mixture	2 - 3 Turns	
Thermostat	143° F (62° C)	

Fluid Capacities

NOTICE
All capacities are approximate fluid measures.
Units: U.S. Qts. (L)

MIE MODEL	5.0L	5.7L	350 Magnum Tournament Ski/ 5.7 COMP. SKI	7.4L	8.2L
Crankcase Oil[1] Capacity w/New Filter	6 Qts. (5.7L)		4 Qts. (3.8L)[3] 5 Qts. (4.73L)[4]	8 Qts. (7.57L) 7 Qts. (6.6L)[5]	8 Qts. (7.57L)
Seawater Cooling System[2]	15 Qts. (14.1L)			20 Qts. (19.3L)	
Closed Cooling System[2]	20 Qts. (19L)			28 Qts. (26.5L)	
Transmission[1] (Borg-Warner) 1:1	2 Qts. (1.9L)				
Transmission[1] (Borg-Warner) 1.5:1 - 3.0:1	3 Qts. (2.9L)				
Transmission[1] (Borg-Warner) All V-Drives	4-1/2 Qts. (4.5L)			4-1/2 Qts. (4.5L)	
Transmission[1] (Hurth - 630A) - 8° Down Angle				4-1/4 Qts. (4.0L)	
Transmission[1] (Hurth) - V-Drive				5 Qts. (4.8L)	
Transmission[1] (Hurth - 800A) - Down Angle				4-1/2 Qts. (4.2L)	

[1]Always use dipstick to determine exact quantity of oil required

[2]Seawater Cooling System capacity information is for winterization use only

[3]1988-89 Engines

[4]1990 and Newer Engines

[5]Generation V Engines (engines with Cast Aluminum Rocker Arm Covers and lack of engine block fuel pump mounting pad)

MCM MODEL	5.0L	5.0LX 5.7L 350 MAGNUM	7.4L 454 MAGNUM 502 MAGNUM
Crankcase Oil[1] (with Filter)	5 Qts. (4.7L)	5-1/2 Qts. (5.2L) 5 Qts. (4.7L)[3]	8 Qts. (7.57L) 7 Qts. (6.6L)[4]
Seawater Cooling System[2]	15 Qts. (14.1L)		20 Qts. (19L)
Closed Cooling System	20 Qts. (19L)		28 Qts. (26.5L)

[1]Always use dipstick to determine exact quantity of oil required

[2]Seawater Cooling System capacity information is for winterization use only

[3]Engines with roller lifters and matching camshaft; Engine Code "CD." See Engine Block Code Information, SECTION 3A

[4]Generation V Engines (engines with Cast Aluminum Rocker Arm Covers and lack of engine block fuel pump mounting pad)

Fuel Specifications

Fuel

⚠CAUTION

Use of improper gasoline can damage the engine seriously. Engine damage, that results from use of improper gasoline, is considered misuse of the engine and is not covered under MerCruiser Warranty.

The use of any good grade unleaded regular or premium gasolines with a minimum posted octane rating [(A.K.I.) Anti-Knock Index] of 87, are satisfactory for use in your engine. In areas where unleaded regular or premium gasolines are not available, a good grade **leaded** regular with a minimum posted octane rating (A.K.I.) of 89 may be used. However, gasolines containing alcohol, either methyl alcohol (methanol) or ethyl alcohol (ethanol) may cause increased:

- Corrosion of metal parts.
- Deterioration of elastomer and plastic parts.
- Fuel permeation through flexible fuel lines.
- Wear and damage of internal engine parts.
- Starting and operating difficulties.

Some of these adverse effects are due to the tendency of gasolines containing alcohol to absorb moisture from the air, resulting in a phase of water and alcohol separating from the gasoline in the fuel tank.

The adverse effects of alcohol are more severe with methyl alcohol (methanol) and are worse with increasing alcohol content.

⚠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 the entire fuel system is mandatory, particularly after storage. All fuel components including fuel tanks, whether plastic, metal or fiberglass, fuel lines, primer bulbs, fittings, fuel filters and carburetors should be inspected for leakage, softening, hardening, swelling or corrosion. Any sign of leakage or deterioration requires replacement before further engine operation.

Because of possible adverse effects of alcohol in gasoline, it is recommended that only alcohol-free gasoline 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.

IMPORTANT: When operating a MerCruiser engine on gasoline containing alcohol, storage of gasoline in the fuel tank for long periods should be avoided. Long periods of storage, common to boats, create unique problems. In cars, alcohol-blend fuels normally are consumed before they can absorb enough moisture to cause trouble, but 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.

No Lead Gasoline

Recent regulations by the U.S. Enviromental Protection Agency (EPA) and the Canadian government have required the removal of lead (anti-knock compound) from all gasoline by 1988 due to the lead emission in exhaust being a health hazard.

In order to maintain octane ratings, many gasoline manufacturers are adding ethyl alcohol (ethanol) or methyl alcohol (methanol) to the gasoline to replace the lead.

The use of any good grade unleaded regular or premium gasolines with a minimum posted octane rating [(A.K.I.) Anti-Knock Index] of 87, are satisfactory for use in your engine. In areas where unleaded regular or premium gasolines are not available, a good grade **leaded** regular with a minimum posted octane rating (A.K.I.) of 89 may be used.

GASOLINE/ALCOHOL BLENDS

Many new motor vehicle owner manuals are warning about the potential damage from using gasoline containing alcohol, especially **METHANOL.** They cite possible fuel system damage and performance problems. These are just two of the hazards that may be caused by alcohol. These same problems as well as the additional safety risk of fire and explosion from fuel system leaks apply to marine inboard engines. **METHANOL** is more severe in its bad effect than is **ETHANOL.** Alcohol is also more severe in older engines since newer engines have materials which are more resistant to alcohol.

Effects of Gasoline/Alcohol Blends on Marine Engines

Corrosion of metals may result from use of alcohol-gasoline blends. Portable or permanently installed fuel tanks of metal or fiberglass, fuel filters, fuel lines and float bowls may be affected by alcohol blended fuels. Many fiberglass fuel tanks are slowly dissolved by alcohol, leading immediately to filter and carburetor plugging and eventually to tank failure.

Alcohol containing fuels will absorb moisture from the air. At first, this moisture will remain in solution, but once the water content of the fuel has built up to about one-half of one percent, it will separate out, (phase separation) bringing the alcohol with it. This alcohol-water mixture settles to the bottom of the fuel tank and if this mixture gets into the engine, engines can be seriously damaged internally, as it may wash the protective film of oil off the bore of any cylinder that it enters. Before the engine can be restarted, it is necessary to remove the separated alcohol and water layer, flush out the fuel system with clean fuel and remove and dry the spark plugs.

BOAT/MOTOR STORAGE

When operating a MerCruiser engine on gasoline containing alcohol, storage of gasoline in the fuel tank for long periods of time should be avoided.

Long periods of storage, common to boats, create unique problems. In cars, gasoline/alcohol blend fuels normally are consumed before they can absorb enough moisture to cause trouble, but 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.

WINTER STORAGE

If boat is to be placed in winter storage, carburetors must be run dry at idle RPM. Permanent fuel tanks should be drained completely and Quicksilver Gasoline Stabilizer and Conditioner added to any fuel remaining in the tank. Portable fuel tanks should be emptied completely.

WARRANTY

Performance problems, fuel system or other damage resulting from the use of gasoline-alcohol blended fuels is not the responsibility of Mercury Marine and will not be covered under our warranty.

CONTINUING EVALUATIONS

The effects of gasoline blended with ETHANOL and METHANOL are still being evaluated by the United States Coast Guard, the National Marine Manufacturers Association (NMMA), Mercury Marine and other engine and boat manufacturers.

We have recommended pump posting of alcohol content of gasoline. Further we recommend using gasoline known not to contain any METHANOL or ETHANOL when possible.

TEST FOR ALCOHOL CONTENT IN GASOLINE

The following is an acceptable and widely used field procedure for the detection of alcohol in gasoline. (Outboard motors only; Test should be conducted **before the addition of oil** as the oil may obscure any change in separation level.) Use any small transparent bottle or tube that can be capped and is or can be provided with graduations or a mark at about 1/3 full. A pencil mark on a piece of adhesive tape may be used.

PROCEDURE

1. Fill the container with water to the mark.
2. Add fuel almost to fill the container, leaving some air space; then, cap the container. The proportions of fuel to water are not critical, but there should be 2-3 times as much fuel as water.
3. Shake container vigorously and allow it to sit **upright for up to about 3-5 minutes.** If the volume of water appears to have increased, alcohol is present. If you are not sure, there is no need for concern. If the dividing line between water and fuel becomes cloudy, use the middle of the cloudy band.

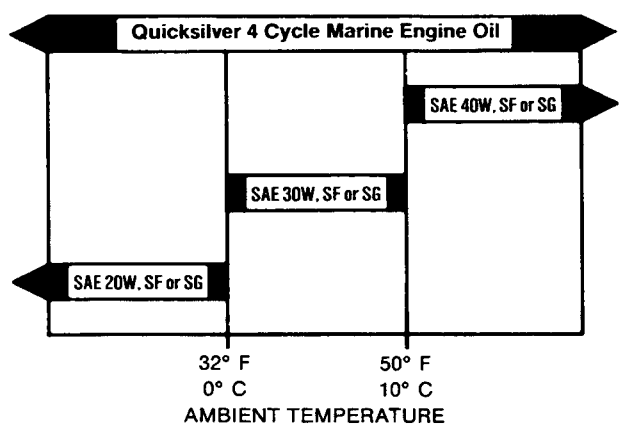
Crankcase Oil

To help obtain optimum engine performance and to provide maximum protection, we strongly recommend the use of Quicksilver 4-Cycle Marine Engine Oil. If not available, a good grade, straight weight, detergent automotive oil of correct viscosity, with an API classification of SF or SG, may be used.

The chart following is a guide to crankcase oil selection. Oil filter should always be changed with oil.

In those areas where recommended straight weight oil is not available, a multi-viscosity 20W-40 (SF or SG) or, as a second but less preferable choice, 20W-50 (SF or SG) may be used.

IMPORTANT: The use of non-detergent oils, multi-viscosity oils (other than 20W-40 or 20W-50), low quality oils or oils which contain solid additives specifically are not recommended.



Power Steering Fluid

Use Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF), Dexron, Dexron II.

Transmission Fluid

Borg-Warner - 10 wt. tractor hydraulic fluid meeting the c3/to-2 specification (preferably Mobil 423, Chevron, or Citgo).

Hurth - Automatic transmission fluid (ATF) Dexron II.

Coolant for Closed Cooling System

⚠CAUTION

Alcohol or Methanol base anti-freeze or plain water, are not recommended for use in fresh water section of cooling system at any time.

We recommend that the coolant section of Closed Cooling System be filled with Quicksilver Pre-Mixed Engine Coolant. In areas where the possibility of freezing DOES NOT exist, it is permissible to use a solution of rust inhibitor and water (mixed to manufacturer's recommendations).

MerCruiser V-8 engines can use any type of permanent anti-freeze or any brand anti-freeze solution that meets G.M. specification 1825M.

Maintaining Crankcase Oil Level

Overfilled Engine Crankcase

Overfilled crankcases (oil level being too high) can cause a fluctuation or drop in oil pressure and rocker arm "clatter," on MerCruiser engines. The over-full condition results in the engine crankshaft splashing and agitating the oil, causing it to foam (become aerated). The aerated oil causes the hydraulic valve lifters to "bleed down." This, in turn, results in rocker arm "clatter" and loss of engine performance, due to the valves not opening properly.

Care must be taken when checking engine oil level. Oil level must be maintained between the "ADD" mark and the "FULL" mark on the dipstick. To ensure that you are not getting "false reading," make sure the following steps are done before checking the oil level.

- Boat "at rest" in the water, OR
- If boat is on a trailer, raise or lower bow until the boat is setting at the approximate angle that it would be if setting "at rest" in the water.
- Allow sufficient time for oil to drain into the crankcase if engine has just been run or oil has just been added.

Checking Engine Oil Level/Filling

IMPORTANT: ENGINE CRANKCASE OIL MUST BE CHECKED AT INTERVALS SPECIFIED IN "MAINTENANCE CHART." It is normal for an engine to use a certain amount of oil in the process of lubricating and cooling the engine. Oil consumption will be higher on the 8.2 litre and 454/502 Magnums. These engines utilize forged (rather than cast) aluminum pistons to withstand the higher stresses created by their higher horsepower output. The forged pistons require increased piston-to-cylinder bore clearance to accommodate their higher thermo-expansion rate and thus, it is normal for some oil to be burnt-up in the combustion chambers. The amount of oil consumption is greatly dependant upon engine speed, with consumption being highest at wide-open-throttle and decreasing substantially as engine speed is reduced.

It is not uncommon for big block high performance engines to use up to 1 quart of oil in 1-5 hours if the engine is operated continuously at the upper end of the RPM range.

1. Stop engine and allow boat to come to a rest.
2. Allow oil to drain back into oil pan - approximately 5 minutes.
3. Remove dipstick. Wipe clean and reinstall. Push dipstick all-the-way into dipstick tube.
4. Remove dipstick and note the oil level.
5. Oil level must be between the "FULL" and "ADD" marks.
6. If oil level is below "ADD" mark, proceed to 7 and 8.
7. Remove oil filler cap from valve rocker arm cover.
8. Add required amount of oil to bring level up to, but not over, the "FULL" mark on dipstick.

Changing Oil and Filter

1. Start engine and run until it reaches normal operating temperatures.

IMPORTANT: Change oil when engine is warm from operation, as it flows more freely, carrying away more impuritites.

2. Stop engine.
3. Remove drain plug from oil pan.

NOTE: If drain plug is not accessible because of boat construction, oil may be removed thru dipstick tube, using a Quicksilver Crankcase Oil Pump. (See Quicksilver Accessory Guide.)

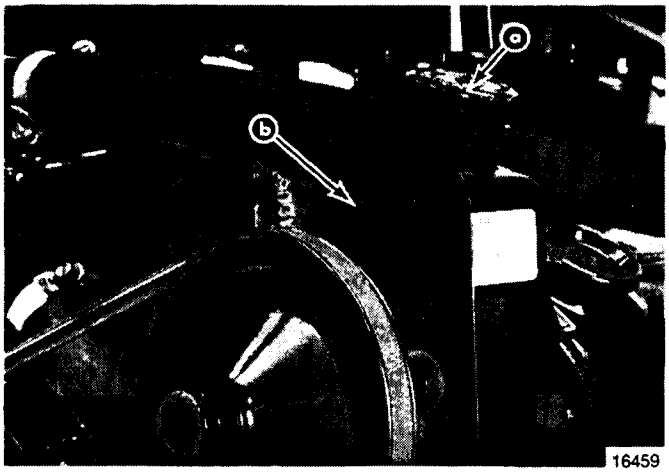
4. After oil has drained completley, reinstall drain plug and tighten securely.
5. Remove and discard oil filter and its sealing ring.

6. Coat sealing ring on new filter with engine oil, and install on engine. Tighten filter securely (following filter manufacturer's instructions). Do not overtighten.
7. Fill crankcase with oil.
8. Start engine, and check for leaks.

Maintaining Power Steering Pump Fluid Level

With Engine Warm

1. Stop engine and position drive unit so that it is straight back.
2. Remove fill cap/dipstick from Power Steering pump and note fluid level.



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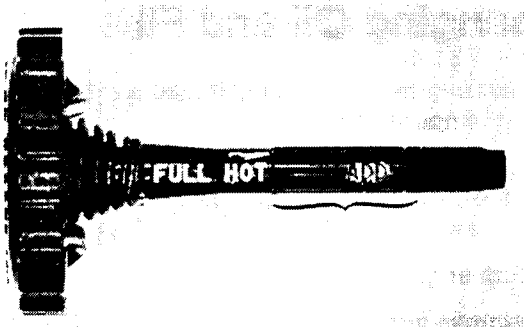
a - Fill Cap/Dipstick
b - Pump

3. Level should be between the "FULL HOT" mark and "ADD" mark on dipstick.



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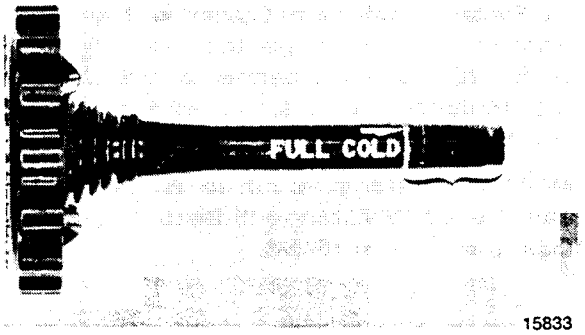
4. If level is below "ADD" mark, but fluid is still visible in pump reservoir, add required amount of Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF), Dexron, or Dexron II, thru fill cap opening, to bring level up to "FULL HOT" mark on dipstick - DO NOT OVERFILL.
5. If fluid is not visible in reservoir, a leak exists in the Power Steering system. Find cause and correct.

With Engine Cold

1. With engine stopped, position drive unit so that it is straight back.
2. Remove fill cap/dipstick from Power Steering pump and note fluid level.
3. Level should be between "FULL COLD" mark and bottom of dipstick.



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4. If level is below bottom of dipstick, but fluid is still visible in pump reservoir, add required amount of Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF), Dexron, or Dexron II, thru fill cap opening, to bring level up to "FULL COLD" mark on dipstick - DO NOT OVERFILL.
5. If fluid is not visible in reservoir, a leak exists in the Power Steering system. Find cause and correct.

Filling and Bleeding Power Steering System

IMPORTANT: Power Steering system must be filled exactly as explained, following, to be sure that all air is bled from the system. All air must be removed, or fluid in pump may foam during operation and be discharged from pump reservoir. Foamy fluid also may cause Power Steering system to become spongy, which may result in poor boat control.

1. With engine stopped, position drive unit so that it is straight back. Remove fill cap/dipstick from power steering pump. Add Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF), Dexron, or Dexron II as required, to bring level up to "FULL-COLD" mark on dipstick.

IMPORTANT: Use only Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF), Dexron, or Dexron II, in power steering system.

2. Turn steering wheel back-and-forth to end of travel in each direction several times; then, recheck fluid level and add fluid, if necessary.
3. Install vented fill cap.

⚠CAUTION

DO NOT operate engine without water being supplied to seawater pickup pump or pump impeller may be damaged and subsequent overheating damage to engine may result.

4. Start engine and run at fast idle (1000-1500 RPM) until engine reaches normal operating temperature. During this time, turn steering wheel back-and-forth to end of travel in each direction several times.
5. Position drive unit so that it is straight back and stop engine. Remove fill cap from pump. Allow any foam in pump reservoir to disperse; then, check fluid level and add fluid, as required, to bring level up to "FULL-HOT" mark on dipstick. Do not overfill. Reinstall fill cap securely.

IMPORTANT: Drive unit must be positioned straight back and Power Steering fluid must be hot to accurately check fluid level.

6. If fluid is still foamy (in Step 5), repeat Steps 4 and 5 until fluid does not foam and level remains constant.

Maintaining Closed Cooling Coolant Level

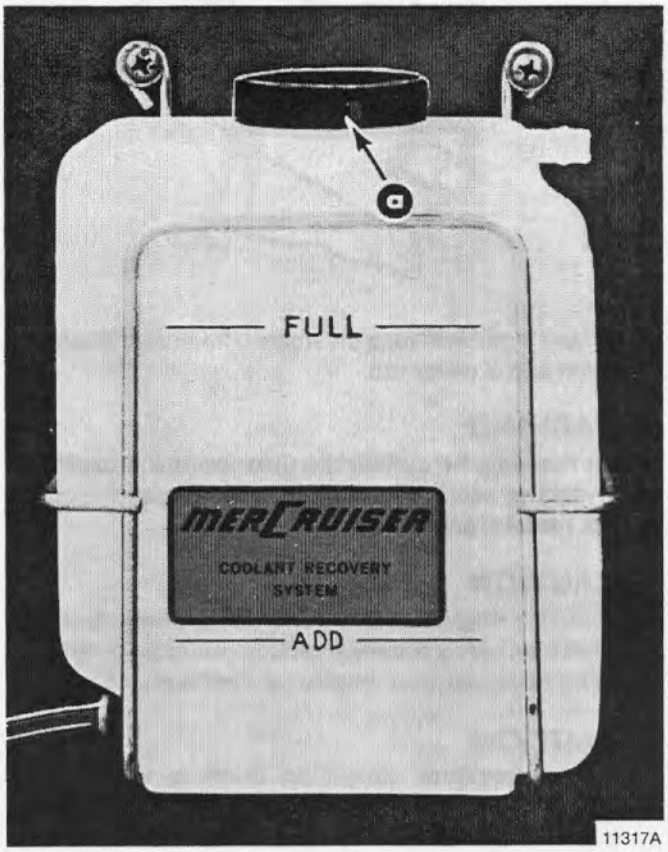
⚠WARNING

Allow engine to cool down before removing pressure cap. Sudden loss of pressure could cause hot coolant to boil and discharge violently. After engine has cooled down, turn cap 1/4-turn to allow any pressure to escape slowly; then, push down and turn cap all-the way off.

1. Coolant level in heat exchanger should be full (to bottom of filler neck).

IMPORTANT: When reinstalling pressure cap, be sure to tighten it until it contacts stop on filler neck.

2. Coolant level should be between the "ADD-FULL" marks on coolant recovery reservoir with the engine at normal operating temperature.



a - Filler Cap

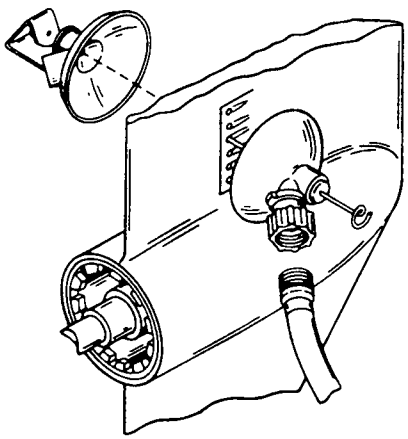
Flushing Cooling System

If engine is operated in salty, polluted, or mineral-laden water, flush cooling system (preferably after each use) to reduce corrosion and prevent the accumulation of deposits in the system. Thoroughly flush cooling system prior to storage.

MCM Stern Drive

BOAT OUT OF WATER

1. Install flushing attachment over water pick-up holes in gear housing as shown.



2. Attach a garden hose betweeen the flushing attachment and a water tap.

⚠WARNING

When flushing, be certain the area around propeller is clear, and no one is standing nearby. To avoid possible injury, remove propeller.

⚠CAUTION

Do not run engine above 1500 RPM when flushing. Suction created by seawater pickup pump may collapse flushing hose, causing engine to overheat.

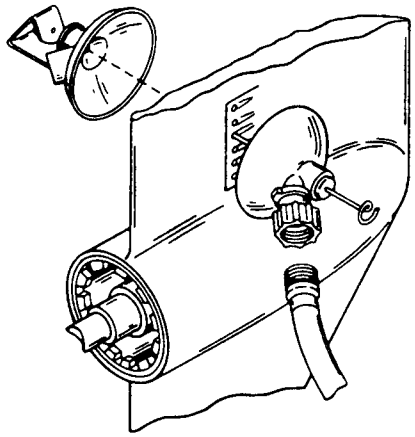
⚠CAUTION

Watch temperature gauge on dash to ensure that engine does not overheat.

3. Partially open water tap (approximately 1/2 maximum capacity). DO NOT use full water pressure.
4. Place remote control in neutral, idle speed position, and start engine.
5. Operate engine at idle speed in neutral for 10 minutes, or until discharge water is clear; then, stop engine.
6. Shut off water tap. Remove garden hose and flushing attachment.

BOAT IN WATER

1. Raise drive unit to full "Up" position.
2. Install flushing attachment over water pick-up holes in gear housing as shown.



3. Attach a garden hose betweeen the flushing attachment and a water tap.
4. Lower drive unit to full "In" position.

⚠CAUTION

Do not run engine above 1500 RPM when flushing. Suction created by seawater pickup pump may collapse flushing hose, causing engine to overheat.

⚠CAUTION

Watch temperature gauge on dash to ensure that engine does not overheat.

5. Partially open water tap (approximately 1/2 maximum capacity). DO NOT use full water pressure.
6. Place remote control in neutral, idle speed position, and start engine.
7. Operate engine at idle speed in neutral for 10 minutes, then stop engine.
8. Shut-off water tap.
9. Raise drive unit to full "Up" position.
10. Remove garden hose and flushing attachment.

MIE Inboard

⚠CAUTION

If cooling system is to be flushed with boat in the waters, water inlet valve (if so equipped) must be closed or water inlet hose must be disconnected and plugged, to prevent water from flowing into boat.

IMPORTANT: If a valve is to be installed for this purpose, valve used must have an internal cross-sectional area equal to or greater than water inlet hose to prevent restricting water flow during normal operation. A 1-1/4 in. (32mm) or larger brass ball valve or gate valve is recommended.

1. Remove inlet hose from seapump.

NOTE: If boat is left in water, shut off seacock or plug hose to prevent seawater from entering boat.

2. Using an adaptor, connect a garden hose from a water tap to seapump inlet.

3. Partially open water tap (approximately 1/2 maximum). DO NOT use full water pressure.

4. Place the remote control lever in neutral position and start engine.

⚠WARNING

When flushing, be certain the area around propeller is clear, and no one is standing nearby. To avoid possible injury, remove propeller.

⚠CAUTION

Do not run engine above 1500 RPM when flushing. Suction created by seawater pickup pump may collapse flushing hose, causing engine to overheat.

⚠CAUTION

Watch temperature gauge on dash to ensure that engine does not overheat.

5. Operate engine at idle speed in neutral for 10 minutes, or until discharge water is clear. Stop engine.

6. Shut off water tap. Remove garden hose and adaptor from pump inlet and reconnect water inlet hose. Be sure to tighten hose clamp securely.

⚠CAUTION

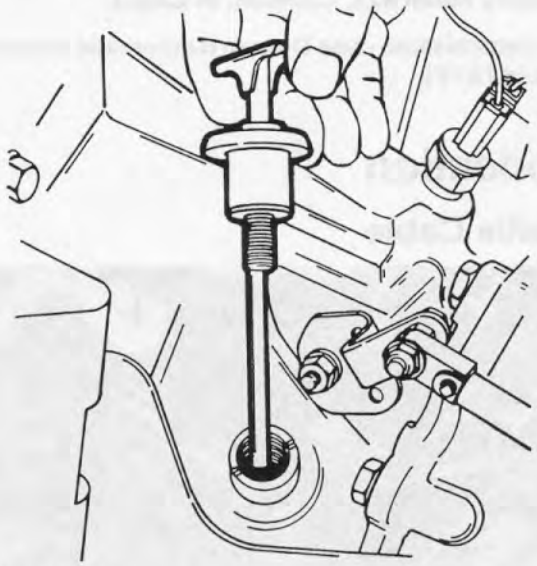
If boat is in the water, or is to remain in the water, seacock, if so equipped, must be left closed until engine is to be restarted to prevent water from flowing back into seawater cooling system. If boat is not fitted with a seacock, water inlet hose must be left disconnected and plugged to prevent water from flowing into cooling system and/or boat. As a precautionary measure, attach a tag to the ignition switch or steering wheel with the warning that the valve must be opened or the water inlet hose reconnected prior to starting the engine.

Maintaining Transmission Fluid Level

IMPORTANT: Be sure to push dipstick all-the-way down into dipstick tube when checking fluid level.

1. Remove dipstick to check transmission fluid level. Fluid level may be over the full mark because the cooler and lines have drained back into transmission.

   If fluid level is low, add the specified fluid, thru dipstick hole, until full.



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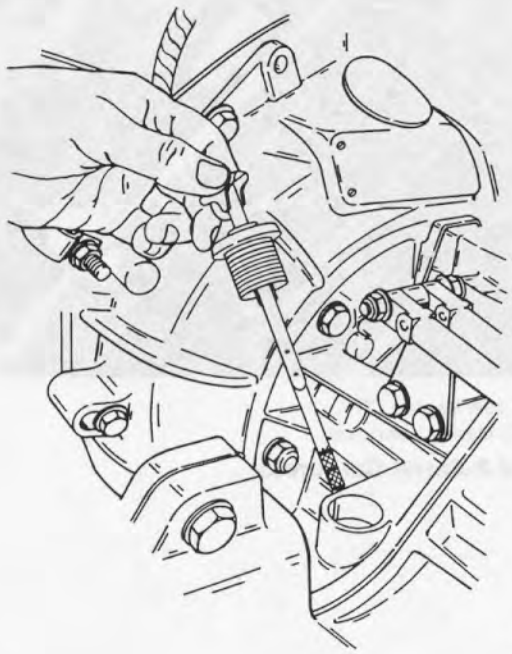

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