



ENGINE OWNER'S MANUAL

INCLUDES

**Routine Maintenance
Troubleshooting Guidelines
Electronic Fuel Injection
Dealer Directory**

SECTION ONE

OWNERS OPERATION MANUAL

	Pages
1. General Emissions Coverage.....	2-3
2. Carbon Monoxide Exposure.....	3
3. Introduction.....	4
4. Engine Identification.....	4
5. Emissions Control Information.....	4
6. Warranty Registration/Sea Trial Information.....	4
7. EFI Introduction and Description.....	5
8. Marine Power Domestic Distributors.....	6
9. Engine Specifications.....	7-14
3.0L/181 CID.....	7
4.3L/262 CID.....	8
5.7L/350 CID.....	9
6.0L/364 CID.....	10
7.4L/454 CID.....	11
8.1L/495 CID.....	12
8.2L/502 CID.....	13
500X/530X.....	14
10. A Word To The Do-It-Yourselfer.....	15

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GENERAL EMISSIONS WARRANTY COVERAGE

CALIFORNIA EMISSIONS CONTROL WARRANTY STATEMENT YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources board and Marine Power Holding LLC is pleased to explain the emission control system warranty on your 2003 inboard engine. In California, new inboard engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. Marine Power Holding LLC must warrant the emission control system on your inboard engine for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your inboard engine.

Your emission control system may include parts such as carburetor or fuel injection system, the ignition system, and catalytic converter. Also included may be hoses, belts, connectors, and other emission-related assemblies.

Where a warrantable condition exists, Marine Power Holding LLC will repair your inboard engine at no cost to you, including diagnosis, parts, and labor.

MANUFACTURER'S WARRANTY COVERAGE:

For 2003-2008 spark-ignition inboard engines, select emission control parts from model year 2003-2008 inboard engines are warranted for 2 years.

For 2009 and later spark-ignition inboard marine engines, select emission control parts from model year 2009 and later inboard engines are warranted for 3 years.

OWNER'S WARRANTY RESPONSIBILITIES:

As the inboard engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Marine Power Holding LLC recommends that you retain all receipts covering maintenance on your inboard engine, but Marine Power Holding LLC cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

As the inboard engine owner, you should however be aware that Marine Power Holding LLC may deny you warranty coverage if your inboard engine or part has failed due to abuse, neglect, or improper maintenance or unapproved modifications.

You are responsible for presenting your inboard engine to a Marine Power Holding LLC distribution center as soon as a problem exists. The warranty repairs will be complete within a reasonable amount of time, not to exceed 30 days.

1. MARINE POWER ("the Company") warrants each new MARINE POWER propulsion engine and factory installed accessories designed, built and equipped with all applicable regulations adopted by the Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code; and to be free from defects in materials and workmanship that cause the failure of a warranted part to be identified in all material respects to that part as described in the engine manufacturer application for certification.
2. The warranty shall commence, on the date of the first retail purchase and extends to original and subsequent purchasers. However, in no event shall the duration of this Warranty exceed two (2) years measured from the original retail sale date.
3. Any warranted part that is not scheduled for replacement as required maintenance in the written instructions in the owner's manual will be warranted for the two (2) year warranty period. If the part fails during the period of warranty coverage, the part will be repaired or replaced by Marine Power at a warranty station. Any such part repaired or replaced under warranty will be warranted for the remainder of the period.
4. Any warranted part that is scheduled only for regular inspection in the written instructions in the owner's manual will be warranted for the two (2) year warranty period. A statement in such written instructions to the effect of "repair and replace as necessary" does not reduce the period of warranty coverage. Any such part repaired or replaced under warranty will be warranted for the remaining warranty period.
5. Any warranted part that is scheduled for replacement as required maintenance in the written instructions in the owner's manual will be warranted for the period of time before the first scheduled replacement date for the part. If the part fails before the first scheduled replacement, the part will be repaired or replaced by Marine Power at a warranty station. Any such part repaired or replaced under warranty will be warranted for the remainder of the period to the first scheduled replacement point for the part.
6. Repair or replacement of any warranted part under the warranty provisions of the article will be performed at a warranty station at no charge to the owner. Warranty services and repairs will be provided at all Marine Power distribution centers and trained marine dealers.
7. The engine owner will not be charged for diagnostic labor that is directly associated with diagnosis of a defective, emission related warranted part, provided that such diagnostic work is performed at a warranty station.
8. Marine Power is liable for damages to other engine components proximately caused by a failure under warranty of any warranted part.
9. Throughout the two (2) year warranty period Marine Power will maintain a supply of warranted parts sufficient to meet the expected demands for such parts.
10. Any replacement part may be used in the performance of any warranty maintenance or repairs and will be provided without charge to the owner. Such usage will not reduce Marine Power's warranty obligations.
11. MARINE POWER, distributor, or dealer must be advised of any warranty related problem prior to the expiration of the warranty.

12. This Warranty will not apply to:
- A) Use of an accessories or parts not manufactured or sold by MARINE POWER.
 - B) Neglect, failure to follow maintenance schedules, accident, abnormal operations, misuse, negligence, improperly maintained, improperly operated or installed, racing, or engine modification. Problems arising from installation, application, exhaust to engine, fuel lines to the engine, propping, cooling to the engine or engine damage due to defective electrical hookups.
 - C) Rust, corrosion or effects of weather.
 - D) Water inversion through exhaust.
 - E) Detonation or operation with fuels, oils or lubricants which are not suitable for use with this product. Detonation causes: Poor fuel quality, overloading of engine, improper gear or propeller selection, engine overheating, excessive back pressure, incorrect ignition timing, excessive total timing.
 - F) Reimbursement for: haulout, launch, towing, storage charges, rental charges of any type, inconvenience of any type, loss of time or income, expense of returning a MARINE POWER product to a service facility, towing, lodging, loss or damage to personal property.
13. Add-on or modified parts, as defined in CCR, section 1900 (b)(1) and (b)(10), Title 13, that are not exempted by the Air Resources Board will not be used. The use of any non-exempted add-on or modified parts by the ultimate purchaser will be grounds for disallowing a warranty claim made in accordance with this article statement. Marine Power will not be liable under this statement to warranted failures of warranted parts caused by the use of non-exempted add-on or modified part
14. The following parts are covered by this general emissions warranty statement.
- A) Fuel Metering System
 - 1) Carburetor and internal parts (and/or pressure regulator or fuel injection system)
 - 2) Cold start enrichment system
 - 3) Intake valve(s)
 - B) Air Induction System
 - 1) Intake manifold
 - 2) Air Filter
 - C) Ignition System
 - 1) Spark Plugs
 - 2) Electronic ignition system
 - 3) Spark advance/retard system
 - 4) Ignition coil and/or control module
 - 5) Ignition wires
 - D) Lubrication System
 - 1) Oil pump and internal parts
 - E) Positive Crankcase Ventilation (PCV) System
 - 1) PCV valve
 - 2) Oil filler cap
 - F) Exhaust System
 - 1) Exhaust manifold
 - 2) Exhaust valves
 - G) Miscellaneous Items Used in Above Systems
 - 1) Hoses, clamps, fittings, tubing, sealing gaskets or devices, and mounting hardware
 - 2) Pulleys, belts and idlers
 - 3) Vacuum, temperature, check, and timer sensitive valves and switches
 - 4) Electronic controls
15. Reasonable access must be provided to the product for warranty service. Removal and/or replacement of boat partitions or material because of boat design for necessary access to the product is not covered.
16. Warranty service must be requested by delivering the product for inspection to the retailer from whom the product was purchased or any convenient marine service center.
17. Proof of Warranty must be provided at time of request for Warranty service. A properly completed Warranty Registration / Sea Trial form should be on file with MARINE POWER. Otherwise a valid bill of sale will be required for proof of purchase date.
18. All incidental and/or consequential damages are excluded from this Warranty. Implied warranties are limited to the life of this Warranty. All implied warranties including merchantability, fitness for a particular purpose, or otherwise are disclaimed in their entirety after expiration of the appropriate two (2) year warranty period. This Warranty gives you specific rights, and you may also have other rights, which may vary from state to state. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
19. MARINE POWER reserves the right to change or improve design of any product previously assembled without notice and without obligation.
20. In the event that a warranty claim is required outside of the continental United States, with the exception of Alaska and Hawaii, there may be additional charges to the engine owner. Any/All litigations must be filed within the State of Louisiana, Parish of Tangipahoa. MARINE POWER will not warranty any engine sold outside the continental United States, with the exception of Alaska and Hawaii, unless competent and trained personnel and available to provide service to the engine.

W002-0300

2. CARBON MONOXIDE EXPOSURE

CAUTION: CARBON MONOXIDE EXPOSURE

Carbon Monoxide is a odorless, colorless and tasteless gas that cannot be smelled, seen or tasted. Sustained exposure to carbon monoxide gas may lead to brain damage, unconsciousness or death.

Carbon Monoxide is a hazardous gas that is produced when items containing carbon are burned. Items such as, but not limited to, wood, coal, gasoline, natural gas, propane or oil. Carbon Monoxide (CO) is found in many areas such as any type of internal combustion engines, heaters, charcoal grills, cooking ranges and any other open flame appliances. There are many possible variables for the accumulation of carbon monoxide. Wind direction, boat speed, vessel proximity to other vessels or structures are just a few of the possible variables that would permit exposure to carbon monoxide gases. It is important that regular inspections of the exhaust system are conducted and maintenance is properly performed by a qualified technician.

Adequate air circulation in all areas of your boat are necessary in order to prevent build-up of carbon monoxide. Please contact your boat manufacturer if you have questions regarding these hazards. For more information regarding safe boating practices, and/or carbon monoxide poisoning on recreational boats, contact the following:

National Marine Manufacturers Association

200 East Randolph Drive, Suite 5100
Chicago, IL 60601-6528
312.946.6200
www.nmma.org

American Boat & Yacht Council, Inc.

3069 Solomon's Island Road
Edgewater, MD 21037-1416
410.956.1050
www.abyc.com

United States Coast Guard

Office of Boating Safety
CG Headquarters G-OPB-3
2100 Second Street SW
Washington, DC 20593
202.267.0984
www.uscgboating.org

3. INTRODUCTION

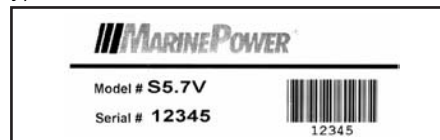
The pleasure and peace of mind derived from your new engine is in direct proportion to the amount of care that it is given. We have tried to include as much as possible in our updated Engine Owners Manual to help you. **READ THIS MANUAL THOROUGHLY AND COMPLETELY** before attempting to operate your MARINE POWER engine. Become familiar with the components and the maintenance schedules. If there is anything you do not completely understand contact your nearest MARINE POWER dealer or distributor.

This manual contains five (5) sections:

Section ONE	Owner's Operation Manual	Page 1
Section TWO	General Information	Page 18
Section THREE	Routine Maintenance	Page 25
Section FOUR	Engine Diagrams	Page 37
Section FIVE	Troubleshooting Guide	Page 49

4. ENGINE IDENTIFICATION

Every Marine Power engine is equipped with an Engine Identification tag, also known as a Serial Number tag. This tag contains information (model number and serial number) that will be required before any warranty work (if necessary) can be done.



5. EMISSIONS CONTROL

INFORMATION

MARINE POWER EMISSION CONTROL INFORMATION			
THIS ENGINE CONFORMS TO 2003 CALIFORNIA EMISSION REGULATIONS FOR SPARK-IGNITION MARINE ENGINES.			
ENGINE FAMILY:	3MPEM 06.0 100	ENGINE	5.7L
FUEL:	UNLEAD	DISP:	04/2003
SPARK PLUG:	GASOLINE	DATE OF	.060+/- .022 IN
EMISSION CONTROLS:	479111	MFR:	
	ECM	GAP:	
SEE OPERATOR'S MANUAL FOR MAINTENANCE SPECIFICATIONS			

MARINE POWER EMISSION CONTROL INFORMATION			
THIS ENGINE CONFORMS TO 2003 CALIFORNIA EMISSION REGULATIONS FOR SPARK-IGNITION MARINE ENGINES.			
ENGINE FAMILY:	3MPEM 06.0 100	ENGINE	6.0L
FUEL:	UNLEAD	DISP:	04/2003
SPARK PLUG:	GASOLINE	DATE OF	.060+/- .022 IN
EMISSION CONTROLS:	479111	MFR:	
	ECM	GAP:	
SEE OPERATOR'S MANUAL FOR MAINTENANCE SPECIFICATIONS			

6. WARRANTY REGISTRATION / SEA TRIAL INFORMATION

The Federal Boat Safety Act of 1971 requires that registration of marine products sold in the United States be maintained by the manufacturer and dealers of those products. It is imperative that MARINE POWER HOLDING, LLC receive your **WARRANTY REGISTRATION/SEA TRIAL** form properly completed for warranty purposes, and to comply with federal regulation. This registration also enables us to contact you, if it should become necessary, to change or improve the product for your protection. **WARRANTY REGISTRATION MUST BE RECEIVED WITHIN 10 DAYS AFTER DATE OF PURCHASE BY FIRST OWNER. NON-COMPLIANCE MAY VOID ALL WARRANTIES.** Please read the Limited Warranty document that is included with your engine registration papers and in this manual. This document explains your warranty coverage. Please note that no warranty repairs are to be performed without prior authorization from the Marine Power Distributor in your area. **Contact your selling dealer directly for any required warranty repairs.**

7. EFI INTRODUCTION AND DESCRIPTION

WHAT IT IS....

Electronic Fuel Injection (EFI) has become the industry standard for marine engines. EFI is the basic term which applies to any fuel delivery system which uses a computer to determine how much fuel to add at a specific moment in time.

TWO BASIC TYPES....

There are two basic types of EFI used in the marine industry, Throttle Body Injection (TBI) and Multiport Fuel Injection (MPFI, MFI, PFI) etc. The TBI system is a wet flow design which flows a mixture fuel and air through the intake manifold. The PFI system flows air through the intake manifold, then injects fuel towards the cylinder head to complete the mixture, thus allowing the intake to be designed to flow air only. PFI systems are slightly more efficient than the TBI systems. Combustion requires a finely atomized mixture to ignite. In the wet flow TBI system some of the fuel will condense or collect on the intake walls and then pass into the combustion chamber. When solid fuel passes into the combustion chamber it is not burned and subsequently it is passed out the exhaust. This is why the PFI systems are more efficient than the TBI systems.

HOW IT WORKS....

The Engine Control Module (ECM) refers to the computer which makes the necessary calculations to deliver fuel and spark to the engine. The ECM relies on input from sensors and switches to perform its calculations. The ECM then sends out its data along its output wires to the various items which it controls.

Typical inputs which the ECM uses are RPM, throttle position, manifold absolute pressure, coolant temperature and a knock sensor. With the data being collected from these sensors at a very high rate, the ECM then calculates the proper fuel to be delivered and the proper spark timing to ignite the mixture.

The ECM delivers the fuel through injectors, which are electronic solenoids. The fuel is injected at high pressures of 30 to 40 PSI which creates a much finer mixture of fuel and air. The injector is pulsed for a length of time, called the Base Pulse Width (BPW). The BPW can be modified for enrichment when cold, a lean condition when hot, enrichment when knock is detected and so on.

BENEFITS & FEATURES....

The primary benefit of fuel injection is the repeatability or accuracy of the amount of fuel delivered (BPW). The fuel injectors are very precise in their ability to deliver fuel and maintain their accuracy over the entire life span of the engine.

Another feature of EFI is the ability to develop "calibrations" for the ECM which are specific to each application. For example EFI installed in an inboard ski boat application will have little in common with EFI installed in a jet boat. The calibration is tailored to develop maximum power and efficiency for each application.

Another benefit of fuel injection is the high level of reliability in the components used. Generally speaking, a carbureted engine begins to deteriorate as soon as it is purchased. Fuel which sits for extended time attacks the carburetor and begins to hamper performance. The older style points ignition system also breaks down with age due to friction which wears out the components being used to control spark timing. Within 2 or 3 years the fuel and spark delivery has deteriorated and the engine must be tuned up in order to restore the original power. Also, a side effect of this deterioration is that the engine may actually be damaged by being over or under fueled.

EFI also offers the owner a level of protection which older engines did not have as standard features. The ECM monitors the temperature, RPM's and other inputs and then makes decisions whether or not to allow the engine to continue to run in the current conditions. For example, the engine may be running above the ideal RPM, if the ECM detects that the RPM is over the calibrated rev limiter, then the ECM will reduce the RPM's to a level which the engine can handle. The rev limiter can protect the engine from a prop which is not correctly matched or is too loose for the application.

▲ CAUTION ▲ CAUTION ▲ CAUTION

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed:

- ▲ Proper service and repair are important to the safety of the service technician and the safe, reliable operation of all Electronic Fuel Injection (EFI) Marine Power engines. If part replacement is necessary, the part **must** be replaced with one of the same part number or with an equivalent part. **Do not** use a replacement part of lesser quality.
- ▲ The service procedures recommended and described in this manual are effective methods of performing service and repair. Some of these procedures require the use of tools specially designed for the purpose.
- ▲ Accordingly, anyone who intends to use a replacement part, service procedure or tool which is not recommended by the system manufacturer, must first determine that neither his safety nor the safe operation of the engine will be jeopardized by the replacement part, service procedure or tool selected.

Note: Under no circumstances should your EFI unit be repaired or serviced except by an authorized Marine Power EFI trained technician for warranty service. Prior authorization from area distributor is required.

8. MARINE POWER DOMESTIC DISTRIBUTORS

Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia

JERRY'S MARINE SERVICE

100 SW 16th Street

Fort Lauderdale, FL 33315

(954) 525-0311 • (800) 432-2231

www.jerrysmarine.com

DONOVAN MARINE

3199 S.W. 42nd Street

Fort Lauderdale, FL 33312

(954) 581-2453 • (877) 936-4722

DONOVAN MARINE

5181 110th Avenue North, Unit B

Clearwater, FL 33760-4817

(727) 572-0192 • (800) 226-4562

DONOVAN MARINE

6545 Trade Center Drive

Jacksonville, FL 32254

(904) 786-3008 • (800) 582-9749

DONOVAN MARINE

3590 Northwest 35th Street

Miami, FL 33142

(305) 638-1830

DONOVAN MARINE

7289 Spa Road, Unit B

North Charleston, SC 29418

(843) 569-0786 • (800) 922-0674

JERRY'S MARINE SERVICE

3601-B Meeting Street Road

Charleston, SC 29405

(843) 554-3732 • (800) 788-2231

DONOVAN MARINE

1650 Horizon Parkway, Suite 200

Buford, GA 30518

(770) 614-7647

Northeastern United States

JERRY'S MARINE SERVICE OF NEW JERSEY

780 Vassar Avenue

Lakewood, NJ 08701

(908) 901-8404 • (888) 244-4735

DONOVAN MARINE

3 Hilltop Road

Norwich, CT 06360

(860) 887-9500 • (877) 941-9500

Michigan, Wisconsin, Ohio, Illinois, Indiana, Minnesota, Iowa, North Dakota, South Dakota, Nebraska

MARYSVILLE MARINE DIST.

1551 Michigan Avenue

P.O. Box 126

Marysville, MI 48040

(810) 364-7653 • (800) 367-0987

www.marysvillemarine.com

MARYSVILLE MARINE DIST. WEST

405 South Thompson Road

Sun Prairie, WI 53590

(608) 825-3878 • (800) 992-3878

MICHIGAN MOTORZ

4706 Fernlee Avenue

Royal Oak, MI 48073

(248) 554-4400

Tennessee, Kentucky, Missouri, Kansas

MARYSVILLE MARINE DIST. SOUTH

855 Springfield Highway, Suite 104

Goodlettsville, TN 37072

(615) 851-9456

DONOVAN MARINE

1890 Elm Tree Drive

Nashville, TN 37210

(615) 834-8262 • (800) 288-4450

DONOVAN MARINE

4043 Delp Street

Memphis, TN 38118

(901) 365-2786

Southern California, Arizona, Nevada, Hawaii

MARINE POWER WEST COAST

6310 Industrial Avenue

Riverside, CA 92504

(805) 444-8144

Texas, Louisiana, Mississippi, Alabama, Florida Panhandle

PALMER POWER CORPORATION

6451 Rupley Circle

Houston, TX 77087

(713) 644-6410 • (800) 364-4637

DONOVAN MARINE

3130 Pawnee Street

Houston, TX 77054

(713) 734-4171 • (800) 669-8392

DONOVAN MARINE

6316 Humphreys Street

Harahan, LA 70123

(504) 486-3258 • (800) 747-5783

DONOVAN MARINE

634 Peters Road

Harvey, LA 70058

(504) 361-4637

DONOVAN MARINE SERVICES

130 Beauregard Road

Amelia, LA 70340

(985) 631-9411

COMMERCIAL MARINE, INC.

5401 Paris Road

P.O. Box 16

Chalmette, LA 70044-0016

(504) 271-7201

www.commercialmarine.com

DONOVAN MARINE

400 N. Carrollton Avenue (70119)

P.O. Box 19100

New Orleans, LA 70179

(504) 488-5731 • (800) 347-4464

DONOVAN MARINE

36368 North L Street

Pensacola, FL 32505

(850) 432-7775

Washington, Idaho, N.W. United States and Western Canada

MARINE POWER NORTHWEST

1140 36th Street North

Lewiston, ID 83501

(208) 746-8621 • (208) 746-8623

Oregon, Western California

MARINE POWER OREGON

6445 Crater Lake Highway

Central Point, OR 97502

(541) 826-8488

9. ENGINE SPECIFICATIONS

3.0L / 181 CID

	CARBURETED
ENGINE TYPE	INLINE 4
CRANKSHAFT HORSEPOWER * (HP/KW)	140 / 104
DISPLACEMENT (LITER/CID)	3.0L / 181 CID
BORE & STROKE (INCHES)	4.00 x 3.60
COMPRESSION RATIO	9.25:1
MAXIMUM RPM @ WIDE OPEN THROTTLE	4300 - 4600
IDLE RPM IN FORWARD GEAR	650 - 800 RPM
FUEL PUMP PRESSURE	4 -7 PSI
OIL PRESSURE @ 2000 RPM	20 - 60 PSI
MINIMUM OIL PRESSURE @ IDLE	10 PSI
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED
SPARK PLUG TYPE	MR 43 LTS
SPARK PLUG GAP	.035 IN (0.9MM)
TIMING @ IDLE RPM	-1° ATDC
TOTAL MAX TIMING ADVANCE @ 4000 RPM	23° TOTAL
FIRING ORDER	1 - 3 - 4 - 2
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND
ALTERNATOR RATING	70 AMPS
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)
TRANSMISSION OIL ***	DEXTRON III
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE
CAPACITIES:	
CLOSED COOLING	APPROXIMATELY 10 U.S. QUARTS
CRANKCASE OIL (ADD 2/3 QT OIL FOR EACH OIL FILTER USED ON ENGINE)	APPROXIMATELY 4 U.S. QUARTS
TRANSMISSIONS: (See Transmission Specifications on Page 14)	

• RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

9. ENGINE SPECIFICATIONS

4.3L / 262 CID

	CARBURETED	MPI
ENGINE TYPE	V - 6	
CRANKSHAFT HORSEPOWER * (HP/KW)	225 / 167	230 / 171
DISPLACEMENT (LITER/CID)	4.3L / 262 CID	
BORE & STROKE (INCHES)	4.00 x 3.48	
COMPRESSION RATIO	9.4:1	
MAXIMUM RPM @ WIDE OPEN THROTTLE	4300 - 4600	4200 - 4600
IDLE RPM IN FORWARD GEAR	650 - 800 RPM	
FUEL PUMP PRESSURE	4 -7 PSI	
OIL PRESSURE @ 2000 RPM	20 - 60 PSI	
MINIMUM OIL PRESSURE @ IDLE	10 PSI	
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED	
SPARK PLUG TYPE	262 STD - MR43T 4.3L VORTEC - MR43LTS	4.3 VORTEC - AC 41-932
SPARK PLUG GAP	.035 IN (0.9MM)	
TIMING @ IDLE RPM	2°	Set At Factory
TOTAL MAX TIMING ADVANCE @ 4000 RPM	26°	
FIRING ORDER	1 - 6 - 5 - 4 - 3 - 2	
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND	
ALTERNATOR RATING	70 AMPS	
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE	
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)	
TRANSMISSION OIL ***	DEXTRON III	
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE	
CAPACITIES:		
CLOSED COOLING	APPROXIMATELY 16 U.S. QUARTS	
CRANKCASE OIL (ADD 2/3 QT OIL FOR EACH OIL FILTER USED ON ENGINE)	APPROXIMATELY 4.5 U.S. QUARTS	
TRANSMISSIONS: (See Transmission Specifications on Page 14)		

- RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

9. ENGINE SPECIFICATIONS

5.7L / 350 CID

	CARBURETED	MPI
ENGINE TYPE	V - 8	
CRANKSHAFT HORSEPOWER * (HP/KW)	315 / 235	325-335 / 242
DISPLACEMENT (LITER/CID)	5.7L / 350 CID	
BORE & STROKE (INCHES)	4.00 x 3.48	
COMPRESSION RATIO	9.4:1	
MAXIMUM RPM @ WIDE OPEN THROTTLE	4300 - 4600	4200 - 5000
IDLE RPM IN FORWARD GEAR	650 - 800 RPM	
FUEL PUMP PRESSURE	4 - 7 PSI	39 PSI
OIL PRESSURE @ 2000 RPM	20 - 60 PSI	
MINIMUM OIL PRESSURE @ IDLE	10 PSI	
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED	
SPARK PLUG TYPE	PRE-VORTEC - MR43T VORTEC - MR43LTS	5.7 VORTEC - AC 41-932
SPARK PLUG GAP	.035 in.	.060 in. (Platinum)
TIMING @ IDLE RPM	8°	10°
TOTAL MAX TIMING ADVANCE @ 4000 RPM	26°	
FIRING ORDER	LH 1 - 8 - 4 - 3 - 6 - 5 - 7 - 2 • RH 1 - 2 - 7 - 5 - 6 - 3 - 4 - 8	
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND	
ALTERNATOR RATING	70 AMPS	
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE	
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)	
TRANSMISSION OIL ***	DEXTRON III	
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE	
CAPACITIES:		
CLOSED COOLING	APPROXIMATELY 18 U.S. QUARTS	
CRANKCASE OIL	ALUM. PAN: APPROXIMATELY 7 U.S. QUARTS SHEET METAL PAN: APPROXIMATELY 5 U.S. QUARTS JETPAC PAN W/SINGLE FILTER: 8 U.S. QUARTS JETPAC PAN W/DUAL FILTERS: 9 U.S. QUARTS	
TRANSMISSIONS: (See Transmission Specifications on Page 14)		

* RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

9. ENGINE SPECIFICATIONS

6.0L / 364 CID

	MPI
ENGINE TYPE	V-8
CRANKSHAFT HORSEPOWER * (HP/KW)	375 HP @ 5200 RPM
DISPLACEMENT (LITER/CID)	6.0L / 364 CID
BORE & STROKE (INCHES)	4.00 X 3.62 IN.
COMPRESSION RATIO	9.4:1
MAXIMUM RPM @ WIDE OPEN THROTTLE	5200 RPM
IDLE RPM IN FORWARD GEAR	650 RPM / 800 RPM (JET EQUIPPED)
FUEL PUMP PRESSURE	50 PSI / 55 PSI @ WOT
OIL PRESSURE @ 2000 RPM	60 PSI
MINIMUM OIL PRESSURE @ IDLE	10 psi
THERMOSTAT	160° (71°C) Fresh Water Cooled Only
SPARK PLUG TYPE	PLATINUM - AC #12567759
SPARK PLUG GAP	.59" (1.5MM)
TIMING @ IDLE RPM	COMPUTER CONTROLLED
TOTAL MAX TIMING ADVANCE @ 4000 RPM	COMPUTER CONTROLLED
FIRING ORDER	1 - 8 - 7 - 2 - 6 - 5 - 4 - 3
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND
ALTERNATOR RATING	70 AMPS
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)
TRANSMISSION OIL ***	DEXTRON III
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE
CAPACITIES:	
CLOSED COOLING	APPROX. 24 U.S. QUARTS
CRANKCASE OIL	APPROX. 6.5 QTS. PLUS FILTER(S) JETPAC PAN W/SINGLE FILTER: 7 U.S. QUARTS
TRANSMISSIONS: (See Transmission Specifications on Page 14)	

* RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

**** TBI HP RATING SAME AS MPI

9. ENGINE SPECIFICATIONS

7.4L / 454 CID

	STANDARD (CARBURETED)	PREMIUM (CARBURETED)
ENGINE TYPE	V - 8	
CRANKSHAFT HORSEPOWER * (HP/KW)	330 / 246	380 / 282
DISPLACEMENT (LITER/CID)	7.4L / 454 CID	
BORE & STROKE (INCHES)	4.25 x 4.00	
COMPRESSION RATIO	8.0:1	8.6:1
MAXIMUM RPM @ WIDE OPEN THROTTLE	4300 - 4600	4600 - 5000
IDLE RPM IN FORWARD GEAR	650 - 800 RPM	
FUEL PUMP PRESSURE	4 - 7 PSI	4 - 7 PSI
OIL PRESSURE @ 2000 RPM	20 - 60 PSI	
MINIMUM OIL PRESSURE @ IDLE	10 PSI	
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED	
SPARK PLUG TYPE	AC MR43T	AC MR43T
SPARK PLUG GAP	.035 IN (0.9MM)	
TIMING @ IDLE RPM	12°	12°
TOTAL MAX TIMING ADVANCE @ 4000 RPM	32°	32°
FIRING ORDER	LH 1 - 8 - 4 - 3 - 6 - 5 - 7 - 2 • RH 1 - 2 - 7 - 5 - 6 - 3 - 4 - 8	
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND	
ALTERNATOR RATING	70 AMPS	
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE	
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)	
TRANSMISSION OIL ***	DEXTRON III	
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE	
CAPACITIES:		
CLOSED COOLING	APPROXIMATELY 24 U.S. QUARTS	
CRANKCASE OIL (ADD 2/3 QT OIL FOR EACH OIL FILTER USED ON ENGINE)	ALUM. PAN: APPROXIMATELY 8 U.S. QUARTS SHEET METAL PAN: APPROXIMATELY 8 U.S. QUARTS	
TRANSMISSIONS: (See Transmission Specifications on Page 14)		

* RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

**** TBI HP RATING SAME AS MPI

9. ENGINE SPECIFICATIONS

8.1L / 495 CID

	STANDARD VORTEC	HI-PERF HP2	HI-PERF HP3
ENGINE TYPE	V - 8		
CRANKSHAFT HORSEPOWER * (HP/KW)	385 / 287	450 / 335	550 / 410
DISPLACEMENT (LITER/CID)	8.1L / 496 CID		
BORE & STROKE (INCHES)	BORE: 4.25" (107.95MM) STROKE: 4.37" (111MM)		
COMPRESSION RATIO	9.1:1		
MAXIMUM RPM @ WIDE OPEN THROTTLE	4600 RPM	5000 RPM	5200 RPM
IDLE RPM IN FORWARD GEAR	650 RPM		
FUEL PUMP PRESSURE	38 - 44 PSI		
OIL PRESSURE @ 2000 RPM	50 - 80 PSI		
MINIMUM OIL PRESSURE @ IDLE	10 PSI		
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED		
SPARK PLUG TYPE	PLATINUM (MP PART #810E-210)		
SPARK PLUG GAP	.059 IN (1.5MM)		
TIMING @ IDLE RPM	COMPUTER CONTROLLED		
TOTAL MAX TIMING ADVANCE @ 4000 RPM	COMPUTER CONTROLLED		
FIRING ORDER	1 - 8 - 7 - 2 - 6 - 5 - 4 - 3		
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND		
ALTERNATOR RATING	70 AMPS		
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE		
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)		20W50 SYNTHETIC
TRANSMISSION OIL ***	DEXTRON III		
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE		
CAPACITIES:			
CLOSED COOLING	APPROXIMATELY 24 U.S. QUARTS		
CRANKCASE OIL (ADD 1 QT OIL FOR EACH OIL FILTER USED ON ENGINE)	ALUM. PAN: APPROXIMATELY 8 U.S. QUARTS SHEET METAL PAN: APPROXIMATELY 8 U.S. QUARTS JETPAC PAN W/SINGLE FILTER: 7 U.S. QUARTS JETPAC PAN W/DUAL FILTER: 8 U.S. QUARTS		
TRANSMISSIONS: (See Transmission Specifications on Page 14)			

* RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

**** TBI HP RATING SAME AS MPI

9. ENGINE SPECIFICATIONS

8.2L / 502 CID

	CARBURETED	MPI
ENGINE TYPE	V - 8	
CRANKSHAFT HORSEPOWER * (HP/KW)	450 / 335	
DISPLACEMENT (LITER/CID)	8.2L / 502 CID	
BORE & STROKE (INCHES)	4.47 x 4.00	
COMPRESSION RATIO	8.75:1	
MAXIMUM RPM @ WIDE OPEN THROTTLE	4300 - 4800	4600 - 5000
IDLE RPM IN FORWARD GEAR	650 - 800 RPM	
FUEL PUMP PRESSURE	4 - 7 PSI	39 PSI
OIL PRESSURE @ 2000 RPM	20 - 60 PSI	
MINIMUM OIL PRESSURE @ IDLE	10 PSI	
THERMOSTAT	143° F (62° C) RAW WATER COOLER 160° F (71° C) FRESH WATER COOLED	
SPARK PLUG TYPE	AC MR43T	
SPARK PLUG GAP	.035 IN (0.9MM)	
TIMING @ IDLE RPM	12°	12°
TOTAL MAX TIMING ADVANCE @ 3500 RPM	32°	Computer Controlled
FIRING ORDER	1 - 8 - 4 - 3 - 6 - 5 - 7 - 2	
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND	
ALTERNATOR RATING	70 AMPS	
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE	
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)	
TRANSMISSION OIL ***	DEXTRON III	
CLOSED COOLING FLUID	50% WATER / 50% ANTIFREEZE	
CAPACITIES:		
CLOSED COOLING	APPROXIMATELY 24 U.S. QUARTS	
CRANKCASE OIL (ADD 1 QT OIL FOR EACH OIL FILTER USED ON ENGINE)	ALUM. PAN: APPROXIMATELY 8 U.S. QUARTS SHEET METAL PAN: APPROXIMATELY 8 U.S. QUARTS JETPAC PAN W/SINGLE FILTER: 7 U.S. QUARTS JETPAC PAN W/DUAL FILTER: 8 U.S. QUARTS	
TRANSMISSIONS: (See Transmission Specifications on Page 14)		

- RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3

9. ENGINE SPECIFICATIONS - "X" PERFORMANCE MOTORS

500X / 530X

	500X Carbureted	530X PFI
ENGINE TYPE	V-8	
CRANKSHAFT HORSEPOWER * (HP/KW)	500 / 373	530 / 395
DISPLACEMENT	8.2L	
BORE & STROKE (INCHES)	4.47 X 4.00	
COMPRESSION RATIO	9.6:1	9.6:1
MAXIMUM RPM @ WIDE OPEN THROTTLE	5200	
IDLE RPM IN FORWARD GEAR	700 - 900 RPM	
FUEL PUMP PRESSURE	4 - 7 PSI	39 PSI
OIL PRESSURE # 2000 RPM	20 - 60 PSI	
MINIMUM OIL PRESSURE @ IDLE	10 PSI	
THERMOSTAT	143° (62° C) Raw Water Cooled	
SPARK PLUG TYPE	Champion 415 (RN9YC)	Champion 415 (RN9YC)
SPARK PLUG GAP	.035	
TIMING @ IDLE RPM	12°	12°
TOTAL MAX TIMING ADVANCE @ 4000 RPM	32°	N/A
FIRING ORDER	1 - 8 - 4 - 3 - 6 - 5 - 7 - 2	
ELECTRICAL SYSTEM	12 VOLT NEGATIVE (-) GROUND	
ALTERNATOR RATING	70 AMPS	
RECOMMENDED BATTERY RATING	MINIMUM 350 AMPS COLD CRANKING AMPERAGE	
CRANKCASE OIL **	SAE 30 (70° and Below); SAE 40 (70° and Above)	
TRANSMISSION OIL ***	DEXTRON III	
CLOSE COOLING FLUID	50% WATER / 50% ANTIFREEZE	
CAPACITIES:		
CLOSED COOLING	APPROX. 24 U.S. QUARTS	
CRANKCASE OIL (ADD 1 QT OIL FOR EACH OIL FILTER)	APPROX. 8 U.S. QUARTS	
TRANSMISSION OIL CAPACITIES:		
BORG WARNER 71-72C SERIES 1:1	2 U.S. QUARTS (1.9L)	
BORG WARNER 71-72C SERIES 1.5 - 2.9:1	3 U.S. QUARTS (2.8L)	
BORG WARNER 5000 SERIES 1:1 - 2.8:1	2 U.S. QUARTS (1.9L)	
BORG WARNER V-DRIVES (ALL RATIOS)	4 U.S. QUARTS (3.8L)	
ZF 63A SERIES	3.2 U.S. QUARTS (3.0L)	
ZF 63V SERIES	4.2 U.S. QUARTS (4.0L)	
ZF45D SERIES	2.1 U.S. QUARTS (2.0L)	
ZF 45A SERIES	3.2 U.S. QUARTS (3.0L)	

* RATED BY MARINE POWER, INC. IN ACCORDANCE WITH SAE J607. PROP SHAFT RATING WILL VARY ACCORDING TO DRIVE USED.

** SYNTHETIC OIL MAY BE SUBSTITUTED.

*** ANY TYPE HYDRAULIC TRANSMISSION FLUIDS WHICH MEET ALLISON TYPE C-3 SPECIFICATIONS.

10. A WORD TO THE " DO-IT-YOURSELFER"

The past twenty years has seen a revolution in the way both automotive and marine engines are built. The most revolutionary is the advent of Electronic Fuel Injection or EFI.

Before EFI, the carburetor was the most popular and easiest way of supplying fuel to the engine. The carburetor injected fuel into the engine by using a mechanical means of linkage, throttle plates, jets, etc. While it did an excellent job for many years, it was not efficient and it was adjustable only to a certain point with a screwdriver.

Today it is much different. EFI engines are operated by a computer and sophisticated engine calibrations. These calibrations are critical to how much fuel the engine receives and are peculiar to a specific engine type. The sensors that feed information back to the computer are not adjustable nor can they be repaired. The sensors must be replaced.

Marine engine technicians receive specialized training in the diagnosing and correcting of EFI equipped engines. A factory trained technician is required to properly diagnose and repair your Marine Power EFI engine to avoid irreparable or permanent engine damage.

ENGINE PROBLEMS

Engine problems are very difficult to attempt to solve over the telephone. In most cases the trained eye of a good marine technician is the easiest and fastest way of determining and solving a problem. Contacting the dealer, distributor or the factory and trying to resolve the problem over the telephone only tends to lengthen the time of repair.

ENGINE CARE

Most engine problems can be avoided with a good engine maintenance schedule. Marine engines are operating at much higher rpm's than automobile vehicles. The work that a marine engine does at cruising speed is comparable to an automobile engine going uphill in a strong headwind all the time. The engine parts must work harder and thus require more attention. Oil, filters, sparkplug wires, sparkplug, distributor rotors and distributor caps can make all the difference in the world in performance versus being towed back in.

GASOLINE

Gasoline can be a major contributor to engine damage. Old, last season fuel loses its octane rating and does not create the correct amount of cylinder burn. This can cause DETONATION or "fuel knock" where the fuel will explode violently in the cylinder. The explosion, in turn, causes overheating or damage to the spark plugs, pistons, and valves. Any engine stored for thirty (30) days or longer needs a fuel stabilizer. We recommend that STA-BIL® be added to the fuel per the manufacturer's directions. This will prevent the formation of harmful varnish in the fuel system.

CRANKCASE OIL

Some engines are installed on an angle. This causes the oil to flow to the back of the oil pan. Consequently, the oil level on the dipstick may change. It is the responsibility of the installer and the owner to determine the correct oil dipstick reading. Too little as well as too much oil will cause engine damage.

COLD WEATHER OR EXTENDED STORAGE

If you put your boat away for the winter or you will not be using it for an extended length of time, it is recommended that a competent marine service facility be contacted to perform the winterization or storage.

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SECTION TWO

GENERAL INFORMATION

11. General Information.....	18-24
Engine Compartment.....	18
Engine Mounting.....	18
Engine Bed.....	18
Sea Water Piping.....	18
Fuel Lines.....	19
Electrical Connections.....	19
Exhaust Piping.....	19
Hydro-Lock.....	20
Water Inversion.....	20
Detonation &/or Pre-Ignition.....	20
Pre-Start Checklist.....	21
Gasoline Recommendation.....	21
Starting Engine-Carbureted.....	21
Starting Engine-EFI.....	22
Proper Engine Break-In.....	22
10 Hour Service.....	23
Engine Rotation Information.....	24
Propeller Information.....	24

11. GENERAL INFORMATION

NOTE: Before shipment, each engine has been carefully tested, inspected and drained of coolant. It may be necessary to delete or add oil from the engine and transmission for various engine installations. If engine is equipped with a closed cooling system, it is imperative to fill the system with a 50/50 mix of ethylene glycol base antifreeze and clean fresh water. Failure to use a 50/50 mixture of antifreeze and water can result in engine damage. (See Engine Specification Section)

ENGINE COMPARTMENT

The engine compartment should be well-planned giving consideration to accessibility and ventilation. Engines must have air as well as fuel to operate efficiently. The battery should be located as close as possible to the starter motor so that the battery leads can be kept short.

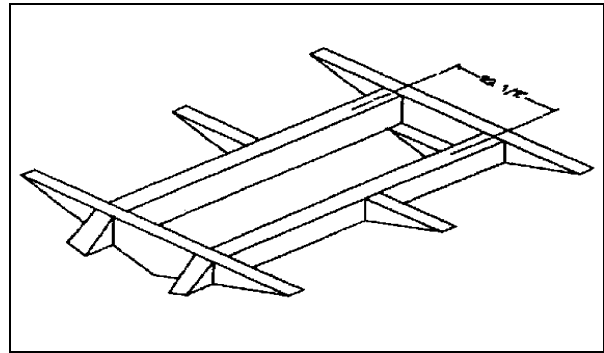
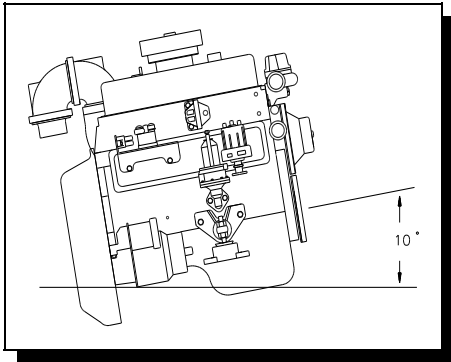
ENGINE MOUNTING

Engine installation is very important. If the angle is too severe (over 10 degrees may require a wedge plate under the carburetor), oil and fuel problems may be encountered.

ENGINE BED

The engine bed should be of horizontal design and heavily constructed to maintain engine alignment. All of the thrust used in moving the boat is transferred

to the hull through the engine bed. The standard engine has support mounts that are intended to be used on engine beds arranged for 22½" bolt centers. Use adequate bolts for each support. Make certain there is no interference on the underside of the engine between the oil pan or other components located in that area and the hull.



ENGINE BED

SEA WATER PIPING

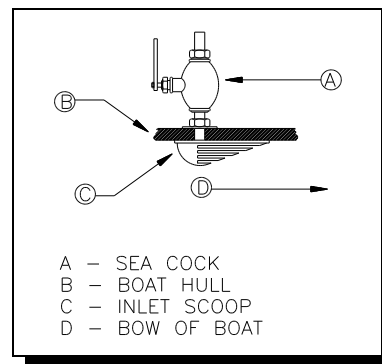
▼ CAUTION

DO NOT operate engine without water being supplied to raw water pump as damage to the impeller and engine will result.

The through-hull fitting and sea cock should be placed as close to the engine as possible and be one size larger than the water pump inlet. The water pump inlet scoop should face the bow of the boat in an area where there are no obstructions. Obstructions could cause water turbulence and prevent a solid stream of water from entering the sea scoop.

The hose on the suction side of the pump must be of a non-collapsing type. **It is highly recommended that a sea strainer of adequate size be installed between the sea cock and engine.** If no sea strainer is installed, periodically check the cooling

inlet system to clear debris from engine and transmission oil coolers. Debris entering the cooling system is one of the main causes of overheating.



11. GENERAL INFORMATION - Continued

FUEL LINES

IMPORTANT! In repower applications, inspect all fuel lines for possible restrictions. Fuel tanks should be installed *below* the height of the fuel system. It is *recommended* that an *antisiphon valve* be included in the fuel tank.

A 3/8" minimum (inner-dimension) "Type A1" USCG Approved tubing is recommended for the fuel line from the tank to the engine for all 181/3.0L, 262/4.3L and 350/5.7L engines. All 6.0L and larger engines must be 1/2" minimum inner dimension. It should be adequately secured and provided with a flexible section near the engine to reduce vibration to the line. Fittings for the tubing should conform to current Coast Guard or American Boating & Yacht Council standards. It is also recommended that older copper fuel lines be replaced with an approved fuel line.

All Marine Power EFI engines require the fuel return line be connected only to the fuel tank.

Fuel tanks should be of a size adequate with the hull requirements and should be anchored securely and vented in such a manner to conform to Coast Guard regulations. The fuel tank filling arrangements should conform to all safety regulations, and must be outboard. The installation of an approved fuel shut off valve at the tank is mandatory.

ELECTRICAL CONNECTIONS

All electrical connections should conform to U.S. Coast Guard or American Boating & Yacht Council standards.

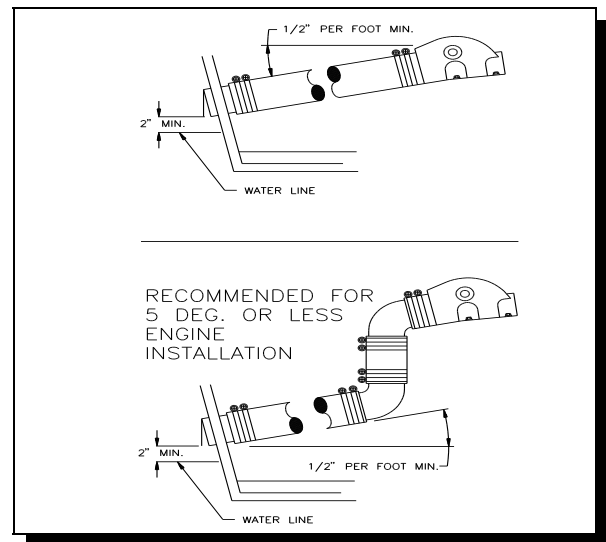
EXHAUST PIPING

WARNING! MARINE POWER does not warranty items damaged due to Hydro-Lock.

Exhaust hose(s) must be installed to prevent water from returning to engine. Exhaust hose(s) must have a definite slope to the transom of not less than 1/2" per foot of length. If pipe is used in the exhaust line installation, it must be separately supported so the weight of the pipe is not carried by the exhaust manifold outlets.

Marine Power requires installation of external and internal flappers to prevent hydro-lock. Hydro-lock is not warrantable.

To prevent water inversion it may be necessary to install 90 degree exhaust dumps adjacent to the manifold exhaust risers. This type of installation is usually found in boats with exceptionally long sloping exhaust routing, i.e. tunnel drive or negative engine installation angles, such as V-Drives. *Consult your dealer.*



11. GENERAL INFORMATION - Continued

HYDRO-LOCK

Water can enter the engine cylinders through the exhaust system. Beware of these situations:

1. **Following Wakes:** Sudden slow-downs may cause the boat wake to flow over the transom of your boat.
2. **Engine Shutdown:** Sudden engine shutdown while the boat is moving may force water into the exhaust system.
3. **Improper Installation:** Refer to exhaust pipe section. An exhaust system without flappers and the specified incline increases the likelihood of water entering the engine.
4. **Improper Hoisting:** Operators are sometimes tempted to reduce hoisting time for propeller changes by hoisting only the boat stern. Such hoisting can cause residual water in the exhaust system to enter engine cylinders.

Water entering engine cylinders will cause the engine to lock because water does not compress. To remedy this situation, take the following steps:

1. Change engine oil & filters.
2. Remove all spark plugs.
3. Remove coil wire.
4. Crank engine for 15 seconds.
5. Replace spark plugs and reattach coil wire.
6. Start engine - if there are any abnormal sounds **STOP ENGINE** immediately and *contact your MARINE POWER dealer.*

WATER INVERSION

Water inversion is water that is pulled back into the exhaust and usually ends up in the piston cylinder. Most of the time this happens under the following conditions:

- Shutting off engine at high RPM's
- Water comes up the exhaust after a quick slowdown
- Long periods of idling
- Exhaust drop not sufficient

Usually the water is not found until the next time the boat is used. In some cases this may not be for weeks. In the case of a salt water environment this is catastrophic due to the rusting.

To minimize this problem Marine Power requires the installation of flappers at the transom and in the exhaust hose just after the exhaust riser or elbow.

DETONATION &/OR PRE-IGNITION

Detonation is most commonly known as "pinging", "spark knock" or "fuel knock". It is the abnormal combustion of the fuel which causes the fuel to explode severely within the combustion chamber.

In a four-cycle engine, normal combustion or burning starts at the spark plug and a wave of flames move across the combustion chamber. This results in an even pressure rise in the combustion chamber which pushes the piston downward.

Detonation begins as normal combustion with the spark-ignited flame progressing across the combustion chamber while applying the heat and pressure to the unburned portion of fuel. Instead of continuing to burn evenly, the last portion of the fuel explodes violently which in turn causes overheating of the pistons, valves and spark plugs.

This may occur at any speed and is not often detected, serious and tragic engine damage may occur.

There are many causes of detonation, with the most common being the use of a low-octane gasoline. Detonation may also occur when using the proper octane gasoline if engine maintenance has been neglected.

- Poor or improper fuel quality/octane
- Improper initial ignition timing setting
- Improper propeller selection
- Engine overload, such as operating twin-engine boat with only one engine
- Improper cooling operation resulting in engine overheating
- Fuel starvation or vapor lock resulting from poor fuel quality / lean out
- Malfunctioning carburetor causing lean mixture
- Operating engine that is out of proper tune, dead cylinder, defective distributor cap
- Excessive exhaust backpressure caused by restricted exhaust mufflers or outlets

11. GENERAL INFORMATION - Continued

PRE-START CHECKLIST

▼ CAUTION

DO NOT operate engine without water being supplied to raw water pump as pump impeller and engine will be damaged.

IMPORTANT! MARINE POWER *requires* that your servicing dealer perform a sea trial for proper completion of your warranty/sea trial form. Failure to properly register your engine will result in delay receiving warranty repairs, if required. *Registration is required by the Federal Boat Safety Act.*

1. Check engine and transmission oil level.
2. Check that all engine drain plugs are installed and tightened.
3. Check for proper coolant level if engine is equipped with optional closed cooling system. Ensure that the coolant tank cap is tight. The cooling system must be filled with a 50/50 mix of ethylene glycol base antifreeze and clean fresh water. (See *Routine Maintenance Section for "Filling" instructions.*)
4. Check throttle linkage to make sure it operates freely and that it returns to the idle position.
5. Check transmission shift lever. Refer to your transmission operator manual.
6. Inspect fuel and water system for leakage.
7. Check that all engine mounts are tight.
8. Check that battery is secure and all electrical connections are tight.

GASOLINE RECOMMENDATION

Marine Power recommends the use of unleaded gasoline of at least 87 octane to insure adequate engine performance.

ALCOHOL ADDED GASOLINE:

Use of ethanol or methanol type gasolines are not recommended for use in your Marine Power engine. Adverse effects such as, but not limited to, corrosion, excessive wear to internal parts, or damage to flexible

fuel lines are possible. If this type of gasoline is used, a complete fuel system inspection is required prior to engine operation. Repair or replace worn or damaged parts immediately.

STARTING ENGINE - CARBURETED

A fully charged battery (12-14V) is necessary to crank a cold engine. At lower temperatures a richer fuel mixture is desired at startup. For carbureted engines, you may have to pump the throttle control more than usual while cranking the engine to start.

▼ CAUTION

DO NOT operate engine without water being supplied to raw water pump as pump impeller and engine will be damaged.

WARNING! Gasoline vapors are highly explosive under certain conditions.

1. Operate bilge blower for five (5) minutes. If not equipped with bilge blower, *open* engine hatch and leave *open* while starting engine to remove any explosive fumes from engine compartment.
2. Place shift lever in the neutral position.
3. Pump throttle lever two (2) times to prime intake manifold.
4. Place throttle 1/4 open.
5. Turn ignition switch to start position. The engine should start within twenty (20) seconds.
6. Run engine at 1000 RPM until it reaches normal operating temperature:

Raw Water Cooling: Operating temperature should be 140 - 165 degrees.

Closed Cooling: Operating temperature should range 160 - 190 degrees.

11. GENERAL INFORMATION - Continued

The closed cooling system is designed to provide extended life to your new Marine Power engine. Your engine will operate at a different temperature range from a raw water cooled engine. Please refer to the appropriate engine specification page for proper cooling ranges.

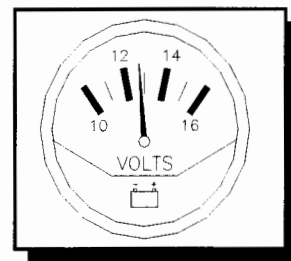
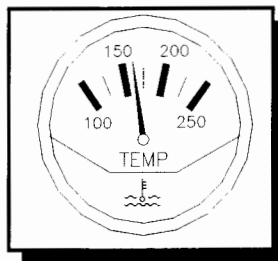
The cooling system does require certain preventative maintenance to keep it in optimum operating conditions.

Zinc Anode: Your cooling system is equipped with a zinc anode that is approximately 2" long. This anode should be inspected for deterioration after the first 10 hours of operation. Inspect again after 50 hours of operation and every 50 hours thereafter.

Recovery Bottle: The plastic recovery bottle is attached to the heat exchanger tank (on most models) and fills with coolant during operation when the internal water temperature is higher. If necessary, add coolant only when engine is cold.

Filler Neck and Pressure Cap: DO NOT remove pressure cap when engine is HOT. If coolant is low, add the proper mixture (50% water/50% antifreeze) to the top of the filler neck located on the heat exchanger tank. If coolant is consistently low, additional inspection for leaks in the cooling system may be required.

7. Check water outlets (exhausts) for water flow.
8. If oil pressure or water flow is not normal, shut off engine and locate problem. (See Trouble Shooting Section).
9. Check voltmeter operation. Normal reading is 13.0 - 14.5 volts at 2000 RPM.
10. Check idle RPM. Normal reading is 650 - 800 RPM in gear. For Jetpac applications, normal reading is 800-1000 RPM.
11. Check operation of throttle and shift controls.
12. Inspect exhaust, water, oil and fuel systems for leaks.



STARTING ENGINE: EFI

1. Fill the fuel/water separator filter 2/3 to the top with clean, fresh gasoline. Put a light film of oil on filter gasket. Screw the filter onto the base. Hand tighten the filter plus 1/2 turn, if possible, after the filter gasket contacts the base. **DO NOT OVERTIGHTEN.** *NOTE: On EFI equipped engines, the fuel/water separator must be 2/3 filled with fuel before installing filter.*
2. Many of the EFI engines are equipped with the optional G-Force Fuel System. This system includes a fuel cannister containing a fuel filter/water separating element and high pressure pump. This unit will self prime and requires no initial filling.
3. Check the following:
 - a) Sufficient fuel in the fuel tank.
 - b) Both the fuel feed line and the fuel return line have no kinks or sharp bends which may cause restrictions. This may effect the initial start-up and engine performance.
4. Cycle the ignition switch **1-2** times. One cycle is defined as follows:
 - a) Key to ignition position.
 1. Fuel pump runs for ten (10) seconds then shuts off.
 2. Key to "OFF" position.
 3. Pause for 10 seconds.
5. After cycling the ignition 1-2 times, turn the switch to the start position until the engine starts or 20 seconds elapse.

11. GENERAL INFORMATION - Continued

PROPER ENGINE BREAK-IN

▼ CAUTION

First twenty-five (25) hours vary the RPM. Avoid sustained periods of wide open throttle. Some EFI engines will not reach WOT until engine is up to normal operating temperatures.

▼ CAUTION

If the engine is to be operated (after the initial break-in period) near or at maximum rpms in rough water conditions wherein the craft may become temporarily airborne, a RPM Rev Limiter Device must be installed on the engine to prevent a runaway condition which could seriously damage the engine or its component parts. Rev limiters are included on all EFI systems.

AT NO TIME SHOULD THE ENGINE BE OPERATED BEYOND THE SPECIFIED MAXIMUM RPM RATING. FAILURE TO ADHERE TO THESE RECOMMENDATIONS WILL VOID THE TERMS OF WARRANTY .

To insure maximum life of your MARINE POWER engine, the following engine break-in schedule is recommended:

First hour - Perform sea trial.

IMPORTANT! During the break-in period, pay close attention to the following steps.

1. **OIL LEVEL:** Check the oil level *before* each engine start up and every eight (8) hours of continuous operation. It should be understood that internal combustion engines will use a certain amount of oil during operation as a cooling and lubricating agent (especially during break-in period). Oil consumption should decrease after approximately 100 hours of operation.

IMPORTANT! The space between the "FULL" and "ADD" marks on the dipstick represent one quart. It is not necessary to add oil unless the level is at or below the "ADD" mark.

▼ CAUTION

Engine dipstick level may change due to the angle of installation. Ensure that "high" oil level is properly marked accordingly.

▼ CAUTION

When adding crankcase oil, DO NOT OVERFILL. If crankcase is overfilled, it will cause foaming or aeration of oil in the oil pan. This will effect oil pressure which may result in severe internal engine damage.

2. **VOLTMETER:** Normal reading is 13.0 -14.5 volts at 2000 RPM.
3. **OIL PRESSURE:** Not less than 10 PSI at idle.
4. **NORMAL OPERATING TEMP:**
Raw water cooling: Less than 165 degrees.
Closed cooling: Between 160 and 190 degrees.
5. **IDLE RPM:** Normal reading is 650 - 800 RPM in gear. Note: For Jetpac applications, normal reading is 800-1000 RPM.
6. **THROTTLE AND SHIFT CONTROLS:** Check that movement is not constrictive. Verify that linkage is adjusted so that engine may reach Wide Open Throttle (WOT).
7. **EXHAUST, OIL, WATER AND FUEL SYSTEM:** Inspect for leaks. Be sure to check riser bolt tightness after 10 hours and every 50 hours of operation. *Refer to Maintenance Schedule.*

10 HOUR SERVICE

It is very important to re-tighten exhaust manifold riser bolts after 10 hours of operation. Failure to do so can cause non-warrantable engine damage.

11. GENERAL INFORMATION

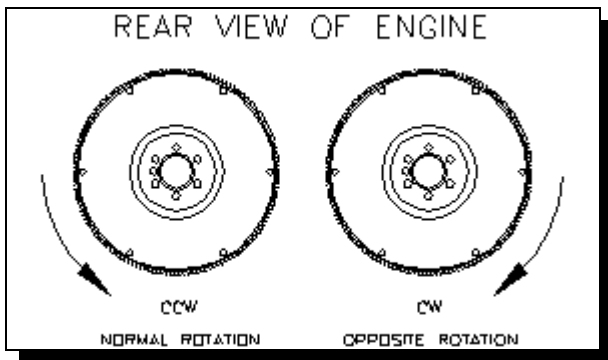
ENGINE ROTATION

Directional references used in this section are given as if standing behind the boat, looking forward:

- front of boat is bow
- rear of boat is stern
- right side is starboard
- left side is port

The raw water (or seawater) pump is located at the front of the engine on the crankshaft pulley. Engine rotation can be determined by looking at the stern end of the engine and observing the flywheel rotation. Do not assume engine rotation by looking at the propeller rotation; it may not be the same. This information is critical when ordering parts for your engine.

Left Hand Engines: CCW or Normal Rotation
Right Hand Engines: CW or Opposite Rotation



PROPELLER WARNING

WARNING! MARINE POWER does not warranty items damaged due to detonation. The propeller selected should allow the engine to operate at or near the recommended wide open throttle RPM range with a normal load. Wide Open Throttle RPM range is listed in *Engine Specification Section*.

WARNING! Using a propeller too large will not allow the engine to reach its rated RPM range which will create an overloaded condition and possible destructive detonation that can be harmful to the engine's performance and life.

PROPELLER INFORMATION

Diameter, pitch or coupling of a propeller will affect engine rpm and boat performance. Configuration of the blade also effects performance. Even propellers from different manufacturers with the same pitch and diameter will perform differently.

Testing for a correct propeller is accomplished by operating the boat (with an average load) at Wide Open Throttle (WOT) rpm's should be at the high end of the specified range and checked with an accurate tachometer. This will allow the engine not to fall below the rpm specified range under a heavy load condition. If the engine rpm is above or below the specified range, a change in the diameter and/or pitch of the propeller is required. Newly installed engines operating 100 - 300 RPM below wide open throttle is usually a propeller problem.

SECTION THREE

ROUTINE MAINTENANCE

12.	Routine Maintenance.....	26-36
	How To Use This Section.....	26
	Please Be Careful.....	26
	Troubleshooting.....	26
	Crankcase Oil Change.....	26
	Ambient Oil Temperature.....	27
	Oil Filters.....	27
	Starter (Top Mount Only).....	28
	Flame Arrestor.....	28
	Carburetor Fuel Filter.....	28
	Changing Carburetor Fuel Filter-Holley.....	28
	Water Separating Fuel Filter.....	29
	Changing Fuel/Water Filter.....	29
	G-Force Fuel System.....	29
	Battery Cables.....	29
	Multiple Engine Battery Precautions-EFI.....	30
	Alternation Belt Tension.....	30
	Checking Belt Tension.....	30
	Delco EST Ignition - Using Timing Tool: Carbureted Engine.....	31
	Engine Tune-Ups.....	32
	Raw Water Cooled Engines.....	32
	Closed Cooling System.....	32
	Filling Closed Cooling System.....	32
	Extended Storage and Storage in Below Freezing Temps....	33
	Fogging Procedures.....	34
	Returning Engine To Service After Extended Storage.....	34
13.	Scheduled Maintenance By Owner.....	35
14.	Scheduled Maintenance By Qualified Technician.....	36

12. ROUTINE MAINTENANCE

HOW TO USE THIS SECTION

This manual provides basic information on routine maintenance of Marine Power engines. Whether the reader is an experienced marine mechanic or a first time boat owner, we strongly suggest you thoroughly read these procedures ***BEFORE*** you attempt any procedure. Make sure you are familiar with the tools suggested and the methods recommended. Safety is our first concern. If repair required is beyond your expertise, please contact your dealer or other qualified technician.

This manual contains guidelines to convey a particular level of risk:

- ***DANGER:*** HAZARDS THAT WILL RESULT IN SEVERE INJURY OR DEATH.
- ***WARNING:*** HAZARDS THAT COULD RESULT IN SEVERE INJURY OR DEATH.
- ***CAUTION:*** HAZARDS WHICH COULD RESULT IN MINOR INJURY OR PROPERTY DAMAGE.

PLEASE BE CAREFUL

Electrical, ignition and fuel system components on Marine Power engines comply with U.S. Coast Guard (USCG) Rules and Regulations to minimize risks of fire and explosion. Use of replacement electrical, ignition and fuel components which do not comply with these rules and regulations could result in a fire or explosion and must be avoided. The electrical and ignition system is capable of violent electrical shock. Always disconnect the battery cables when performing any work where the cables could touch.

Take care to properly install and tighten all components when servicing the electrical, ignition and fuel systems. If the installation is not correct, sparks could ignite fuel vapors from the fuel system.

If you are doing repair work around the intake or exhaust openings, always protect those openings against foreign matter entering the cylinders.

Care must be taken to use exact replacement parts. Damage could result if mismatched. If a grade 5, hex head bolt is removed, the same grade 5, hex head bolt must be replaced. If you cannot re-use the same bolt, do not improvise.

Performance could be sacrificed without original Marine Power parts or parts recommended by Marine Power. A marine environment is a tough one. Parts subjected to salt water can rapidly corrode and engine failure could result. Warranty on Marine Power Engines could also be affected if other than recommended replacement parts are used.

TROUBLESHOOTING

If a problem is detected, contact your Marine Power selling/installing dealer first. He is trained to diagnosis your problem and handle warranty repair.

NOTE: Some of the remedies described should be attempted by qualified personnel.

Please refer to the *Troubleshooting Guide* section. Remember that a problem is not normally caused only by one part, but by the relation of one part with other parts. This list cannot give all possible problems and corrections. The serviceman must find the problem and its source, then make the necessary repairs. A normal maintenance schedule has been prepared to help the operator care for his or her new engine.

Following this schedule will help the owner get the most trouble-free operation of his new engine.

CRANKCASE OIL CHANGE

IMPORTANT! Start engine and operate until normal temperature is reached. Warm oil flows more freely carrying away more impurities. Remove the oil into a suitable container. Some oil will remain in the pan and engine. It is a small quantity and will make the new oil appear used.

WARNING! The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and contiguous zone of the United States, if such discharge causes a film upon, or discoloration of, the surface of the water, or causes an emulsion or sludge beneath the surface of the water. ***Violators are subject to a penalty of \$5000.***

12. ROUTINE MAINTENANCE - Continued

▼ CAUTION

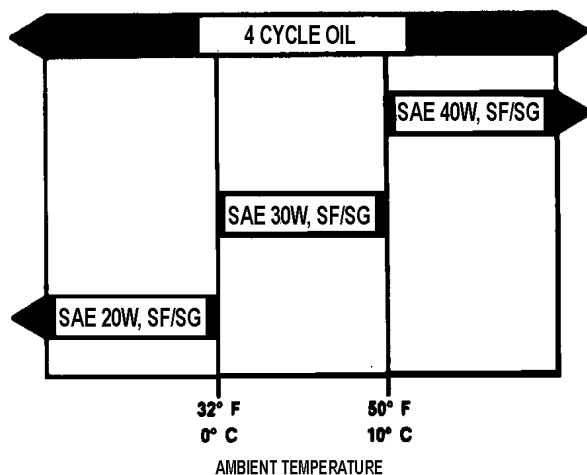
DO NOT overfill crankcase with oil. Agitation or splashing of oil may cause it to become aerated, which will effect oil pressure and may result in internal engine damage from lack of lubrication. Oil being splashed by reciprocating engine parts onto the walls of the cylinder in greater quantity than the rings can control will subsequently be drawn into the combustion chamber and burned. Continuous operation under these conditions can cause carbon to form on chamber surfaces, which will adversely affect engine performance and may lead to premature engine repair.

Start engine and run for **5** minutes to circulate oil throughout. Inspect entire engine for leakage. Shut off engine and wait **5** minutes for oil to drain back into pan. Check level with dipstick. Add oil to proper level if needed.

Marine Power does not recommend the use of multi-viscosity, non-detergent type oils. Oils that contain solid additives or low quality oils (other than 20W-40 or 20W-50) are also not recommended.

The following is a guideline for crankcase oil selection for ambient temperatures. A new oil filter should also be included with your oil change.

AMBIENT OIL TEMPERATURE



NOTE: For All High Performance Engines, Carbureted and MPI: Please refer to Maintenance Schedule for specific intervals to check engine crankcase oil. This type of engine will normally use a certain amount of oil to cool and lubricate during operation, therefore, oil consumption will be higher. These engines are equipped with forged aluminum pistons designed to withstand higher horsepower output. Since the pistons are forged, they require increased piston to cylinder bore clearance to accomodate for higher thermo-expansion causing additional oil consumption during wide open throttle operation. It is not uncommon for these types of high performance engines to use up to one (1) quart of oil per 1-5 hours of during this type of operation.

OIL FILTER(S)

NOTE: Lay a towel or catch basin under the filter(s) to catch any spilled oil.

1. Unscrew old filter by using a oil filter wrench and turn counter clockwise. Once removed, clean mounting base. Be sure old gasket is removed from mounting base.
2. Apply thin film of oil (do not use grease) to filter gasket. Be sure gasket is seated properly in base of filter.
3. Hand tighten filter, plus ½ turn, after gasket contacts mounting base. Use a filter wrench is necessary. Do not over tighten.
4. Check to see that oil shows **"FULL"** on dipstick. Start engine. Turn on water. Run for approximately 5 minutes and inspect for leaks.
5. Turn off water. Shut off engine and wait 5 minutes for oil to drain back into pan. Check level with dipstick. Add oil to proper level if needed.

ALWAYS CONTACT YOUR NEAREST MARINE POWER SERVICING DEALER IF YOU HAVE A PROBLEM.

12. ROUTINE MAINTENANCE - Continued

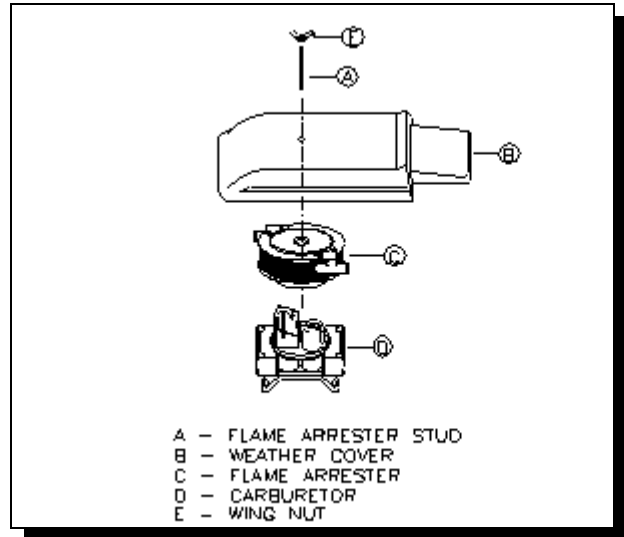
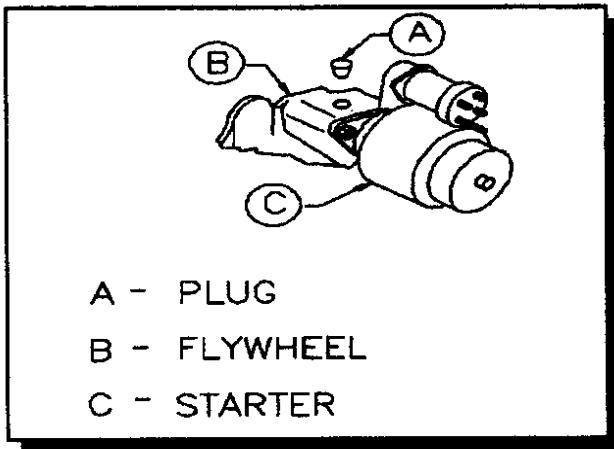
STARTER (TOP MOUNT ONLY)

Starters are notorious for problems due to moisture and corrosion.

However, Marine Power uses a top-mounted rear entry starter on most Sportpac and Jetpac models, that reduces starter problems and is more accessible.

Spray lubricating oil on the starter pinion and shaft.

1. Remove rubber plug "A" in flywheel housing.
2. Spray lubrication oil through hole and replace rubber plug.



CARBURETOR FUEL FILTER

WARNING! Do not perform this task while engine is hot. Gasoline vapors are highly explosive under certain conditions.

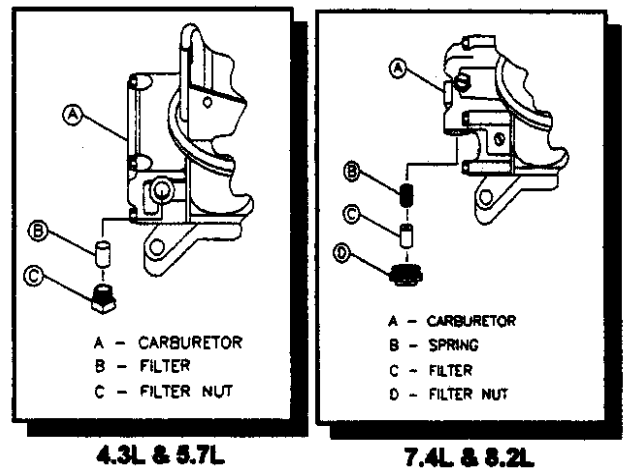
IMPORTANT! Lay an absorbent towel under the fuel line connection at the carburetor to absorb fuel. Dispose of properly.

CHANGING CARBURETOR FUEL FILTER

FLAME ARRESTOR

Clean the flame arrester regularly.

1. Remove wingnut ("E") from top of flame arrester cover. Remove weather cover ("B"). Remove breather hose from flame arrester. Remove flame arrester ("C") from engine.
2. Clean with a suitable solvent and blow dry.
3. Reverse steps to assemble.



HOLLEY

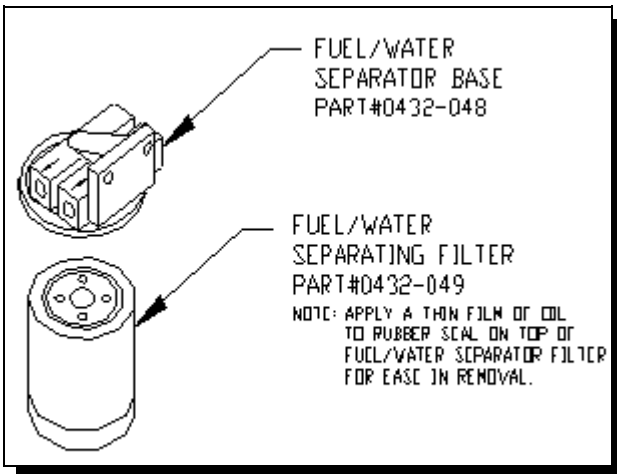
12. ROUTINE MAINTENANCE - Continued

WATER SEPARATING FUEL FILTER

IMPORTANT! Lay an absorbent towel under the fuel line connection at the carburetor to absorb fuel. Dispose of properly.

1. Unscrew old filter by using an oil filter wrench and turning counter-clockwise. Once removed, clean mounting base.
2. For EFI equipped engines, fill 3/4 full with clean, fresh gasoline before reinstalling filter.
3. Hand tighten, plus 1/2 turn, new filter by turning filter clockwise after gasket contacts mounting base. Use an oil filter wrench if necessary. **DO NOT OVERTIGHTEN.**
4. Start engine and inspect for leaks.

CHANGING FUEL/WATER FILTER



BATTERY CABLES

WARNING: Do not recharge a weak battery in a boat. Remove and recharge in a ventilated area away from fuel vapors, sparks or flames.

Electrical systems in a marine environment require periodic attention. Continued use of a weak battery or dirty terminals can cause solenoid or starter problems. Clean battery and terminals every 100 hours. Note the condition of your battery cables. When reconnecting battery cables make sure that the RED cable is on the (+) terminal and the BLACK cable is on the (-) terminal. Black is ground.

G-FORCE FUEL SYSTEM

1. Position catch basin under filter.
2. Remove drain plug.
3. Unscrew cannister bowl.
4. Pull element down from pump.
5. Push new element (Part #425611) on pump until click is felt.
6. Replace o-ring (included with filter).
7. Re-install cannister bowl on unit-snug tight only.
8. Two 10-second key ups should prime system.

12. ROUTINE MAINTENANCE

MULTIPLE ENGINE BATTERY PRECAUTIONS - EFI

The alternator is designed to charge the battery that supplies electrical power to the engine. When batteries for two separate engines are connected, one alternator will supply all the charging current for both batteries. In normal instances, the other engine's alternator will not be required to supply any charging current.

The Electronic Control Module (ECM) requires a steady, stable voltage source. In multiple engine operation, an electrical onboard device may cause a sudden drain of voltage at the engine's battery. The voltage may go below the ECM's minimum required voltage of nine (9) volts and the idle alternator on the other engine may now start charging. This could cause a voltage "spike" in the engine's electrical system. In these cases, the ECM could shut off. When the voltage returns to the required range, the ECM will reset itself. The engine should begin to run normally. However, this ECM shut down occurs so rapidly that the engine just appears to have an ignition miss. In multi-EFI power packages, each engine must be connected to its own battery. This provides the required voltage source for the ECM.

In these applications where battery switches are used, it is important that each switch be positioned to allow each engine to run off its own individual battery. DO NOT run engines with the battery switches in "BOTH" or "ALL" positions. This will allow the other engine's battery to be used in case of emergency to start the engine with the dead battery.

ALTERNATOR BELT TENSION

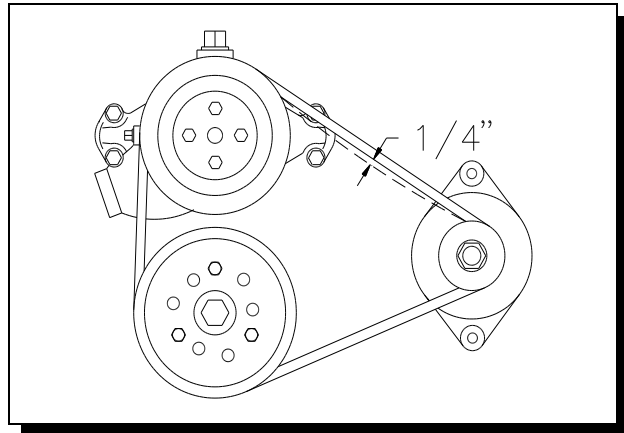
WARNING! Make sure ignition key is removed and engine is not running before inspecting belts.

To check belt tension, press down on belt midway between the alternator pulley and the circulating pump pulley. The belt should depress one-quarter inch. If belt depresses more than one-half inch, loosen alternator mounting screw

and adjust tension by pivoting alternator. When correct tension is achieved, tighten alternator mounting screw.

Serpentine belt system maintains tension with a spring-loaded tensioner. Normally, no maintenance is required.

CHECKING BELT TENSION



12. ROUTINE MAINTENANCE - Continued

DELCO EST IGNITION

USING THE TIMING TOOL: Carbureted Engine

For EFI Engines - Refer to EFI Section

The timing tool is used in setting the initial engine timing on MARINE POWER carbureted engines. This connector by-passes the electronic spark timing of the engine and allows the initial timing to be adjusted by rotating the distributor. Use the following procedure (become familiar with entire procedure before beginning):

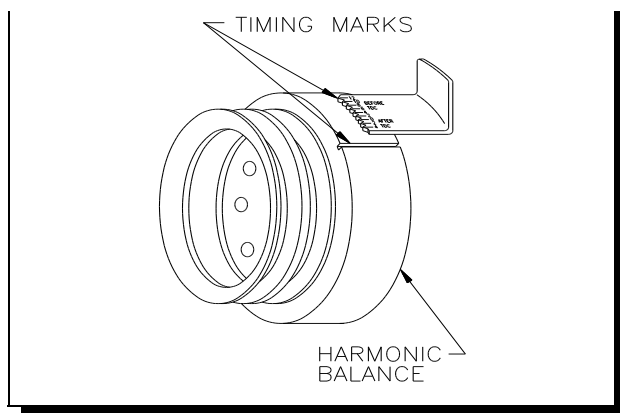
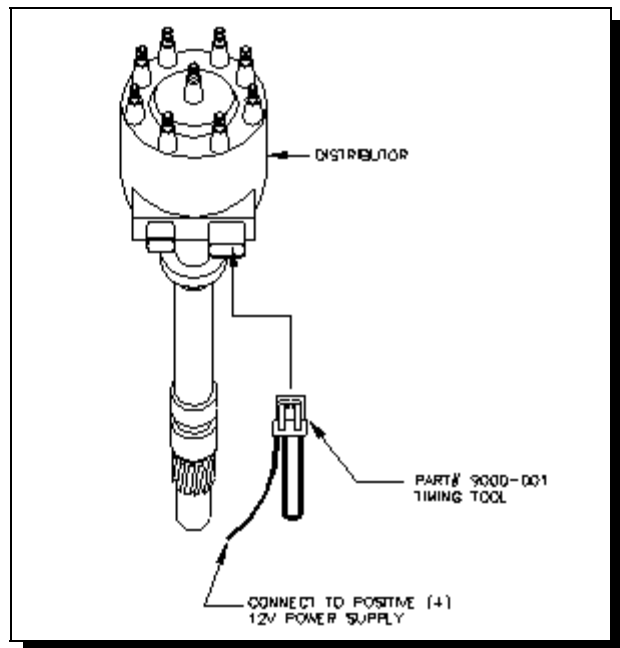
The ignition timing marks are located on the engine's front cover. A saw slot on the balancer indicates engine at (TDC) Top Dead Center. Adjust ignition timing as follows:

1. Connect a timing light to the number one (1) spark plug wire. Connect the timing light power lead to a 12 volt power source. **DO NOT CONNECT TO 12 VOLTS ON ALTERNATOR.**
2. Start engine and allow to warm to operating temperature. Bring engine to idle (650-800 RPM).
3. **WHILE ENGINE IS RUNNING**, install the timing tool supplied with your engine into the terminal connector on the distributor.
4. Loosen distributor clamp just enough to rotate distributor in place.

Note: An adjustable timing light is required to set initial and total timing.

5. Secure the bare wire end of the timing tool to battery positive (+) voltage. (the most convenient location of this voltage is on the cranking motor solenoid.) If desired, a suitable clip, such as an alligator clip may be permanently attached to the bare wire end of the timing tool to hold it in place.
6. Rotate distributor to set mechanical timing. **REFER TO THE APPROPRIATE "ENGINE SPECIFICATIONS" SECTION OF THIS MANUAL FOR CORRECT TOTAL AND INITIAL TIMING FOR YOUR ENGINE.**

7. Tighten distributor clamp to hold in position when initial timing is obtained.
8. Recheck timing.
9. Remove the timing tool from distributor.
10. Check total timing at 4000 RPM. (See Engine Specifications Section.)
11. Disconnect and remove the timing light.



12. ROUTINE MAINTENANCE - Continued

ENGINE TUNE-UPS

Refer to Maintenance Chart for tune-up schedules.

1. Disconnect battery terminals.
2. Remove distributor cap and inspect for corrosion on the electrodes, cracks and wear. Replace if necessary.
3. Spray interior of distributor with a moisture displacing product.
4. Re-install rotor and cap, and tighten.
5. Replace spark plugs. Check gap. Refer to Engine Specification Section.
6. Check spark plug wires for deterioration and/or damage. Replace if necessary to assure maximum running efficiency.
7. Spray carburetor and control linkages with a light oil product.
8. Inspect pump impeller and alternator belt.
9. Refer to timing procedures to set timing.
10. Check zinc anodes in fresh water cooling tank seasonally, if equipped. Replace if more than half is eroded.

RAW WATER COOLED ENGINES

Raw water cooled engines are cooled by pumping lake/river/sea water from water inlet (seacock) or stern drive leg in to engine and out through exhausts. This water must be drained for freezer protection. (See *Raw Water Cooling Diagram* for your specific engine.)

CLOSED COOLING SYSTEM

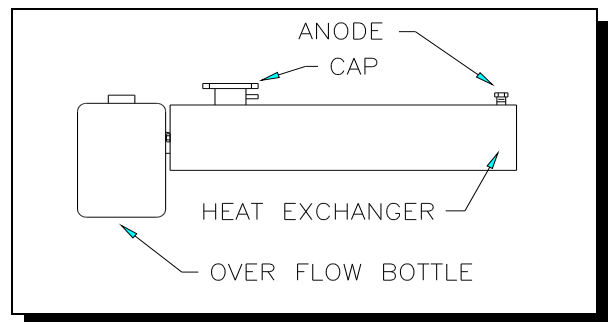
The closed cooling system is designed to provide extended life to your new Marine Power engine. Your engine will operate at a different temperature range from a raw water cooled engine. Please refer to the appropriate engine specification page for proper cooling ranges.

The cooling system does require certain preventative maintenance to keep it in optimum operating conditions.

Zinc Anode: Your cooling system is equipped with a zinc anode that is approximately 2" long. This anode should be inspected for deterioration after the first 10 hours of operation. Inspect again after 50 hours of operation and every 50 hours thereafter.

Recovery Bottle: The plastic recovery bottle is attached to the heat exchanger tank (on most models) and fills with coolant during operation when the internal water temperature is higher. If necessary, add coolant only when engine is cold.

Filler Neck and Pressure Cap: DO NOT remove pressure cap when engine is HOT. If coolant is low, add the proper mixture (50% water/50% antifreeze) to the top of the filler neck located on the heat exchanger tank. If coolant is consistently low, additional inspection for leaks in the cooling system may be required.



FILLING CLOSED COOLING SYSTEM

SAFETY WARNING: Do not remove pressure cap when engine is hot. Coolant is under pressure and may be forced out causing personal injury. After engine is cooled, remove cap slowly to allow pressure to escape.

IMPORTANT! The closed cooling system must remain filled year-round with the proper mixture of 50% antifreeze/50% water to assure protection of system during the lowest exposed temperatures.

12. ROUTINE MAINTENANCE - Continued

FILLING CLOSED COOLING SYSTEM - Continued

- Insure that all drain plugs are installed and tightened.
- Fill heat exchanger (tank) with 50/50 antifreeze/water mixture. After initial fill, start engine and continue filling heat exchanger. Engine must be purged of air by bleeding system. Engines may be bled in a variety of ways; however, the follow bleed points are suggested:
 - **3.0L/181 Side Mount Full System:** Heat exchanger cap is sufficient.
 - **4.3L/5.7L Front Mount Full System:** Heat exchanger cap is sufficient.
 - **4.3L/5.7L Rear Mount Full System:** Disconnect hose from top of circulating water pump.
 - **6.0L Side Mount Full System:** Air bleed on starboard exhaust manifold.
 - **8.1L Side Mount Full System:** Open pet cock on water tube crossover and remove 1/8" plug on top of heat exchanger at rear of engine.
 - **7.4L/8.2L Front Mount Full System:** Heat exchanger cap is sufficient.
 - **7.4L/8.2L Rear Mount Full System:** Disconnect hose from top of circulating water pump.
- Bleeds should be left open until all sign of air bubbles disappear. Engines bled at cap must be ran @ 2000 rpm with cap ope to bleed all air. 6.0L and 8.1L engines are difficult to purge. Use caution - thermostat must open to remove all air, this process may take ten (10) minutes. Continue filling the heat exchanger after bleeds are closed. After thermostat has opened and heat exchanger is topped off, install heat exchanger cap. Fill plastic reservoir ½ full.
- Check for leaks after finished fill procedures.

EXTENDED STORAGE AND STORAGE IN BELOW FREEZING TEMPERATURES

RAW WATER COOLED ENGINES:

WARNING! These operations should be performed only by qualified marine service personnel.

Note: Raw water cooling requires no filling.

▼ CAUTION

Do not operate engine without water being supplied to the sea water pump as pump impeller and engine will be damaged.

1. Shut down engine and change engine oil and filters. (Refer to Normal Maintenance Section.)
- V6-V8 blocks must be drained on both sides. Drain plug locations are as follows:
 - **3.0L/181:** Single plug on port side of lower block.
 - **4.3L/5.0L/5.7L/7.4L/8.2L Carbureted:** Plug on lower center portion of block on each side.
 - **4.3L/5.7L EFI:** Knock sensor is located in port block drain. Sensor must be removed for draining and retorqued to 22 ft.lb. When re-installed.
 - **6.0L:** Plug on starboard side is vertically located on lower block. Use 8mm Allen wrench to remove. Plug on port side is parallel to lower block surface. Use 17mm Allen wrench to remove.
 - **8.1L:** Plug on each side of lower center block. Use 8mm Allen wrench to remove.
- Re-install hose on circulating pump after system has drained completely. Coat all plug threads with sealant and re-install into proper locations.
- Remove engine oil and transmission cooler drain plugs.
- Remove hoses from sea water pump, if applicable.
- Remove circulating pump hose and all exhaust manifold drain plugs. Drain engine completely.
3. Any engine stored for thirty (30) days or longer needs a fuel stabilizer. We recommend that STA-BIL® be added to the fuel per the manufacturer's directions. This will prevent the formation of harmful varnish in the fuel system..
4. Fog engine. (Refer to Fogging Procedures.)
5. Reconnect suction hose to sea water inlet. (See Raw Water Cooling Diagram for your engine)

▼ CAUTION

Do not use 100% water or antifreeze as engine coolant. Overheating and engine damage will result.

12. ROUTINE MAINTENANCE - Continued

CLOSED COOLING ENGINES:

1. Follow raw water drawing procedure except for the following:
 - Draining manifolds are not necessary unless closed system is half system type as on 5.0/5.7V EL models.
 - Engine block does not need draining
 - Circulating water pump hose does not need to be removed.
2. Remove end caps on heat exchanger. Inspect for debris and trapped water.
3. Refill closed cooling system according to instructions in Filling Closed Cooling System section.

FOGGING PROCEDURES

This procedure necessary for carbureted models only:

1. Remove flame arrestor cover and flame arrestor.
2. Start engine and run at 1500 to 2000 RPM.
3. Pour approximately one (1) cup of rust preventive oil (or if not available, SAE 20W motor oil) into carburetor.

▼ CAUTION

Do not pour an excessive amount of oil into the carburetor at one time. This can cause engine to stall and/or create a hydraulic lock condition in a cylinder resulting in engine damage.

4. Turn ignition switch off.
5. Clean flame arrestor and re-install on engine with cover.
6. Cover complete carburetor assembly with plastic bag to prevent moisture from entering carburetor during storage.

RETURNING ENGINE TO SERVICE AFTER EXTENDED STORAGE

If you followed the storage procedure the new season start-up time should be minimal. Please do the following before attempting to start your engine.

1. Check that all engine drain plugs are installed and seacock on water inlet is open. Check coolant levels.
2. Check all hoses to make sure they are properly connected and clamps are tightened.
3. Inspect bilge area and around engine for nesting creatures, signs of leakage, or physical damage.
4. Clean battery cables and install a fully charged battery. Attach red wire to positive (+) terminal and black wire to negative (-) terminal. It is recommended that a anti-corrosion battery terminal spray be use to coat terminal connections.
5. After engine is started, monitor gauges to insure engine is operating in normal operating temperatures.
6. After engine has reached normal operating temperature, inspect engine for leaks such as fuel, exhaust, water and oil.

13. SCHEDULED MAINTENANCE BY OWNER

SERVICE:	ENGINE STARTUP EACH DAY	AFTER FIRST 10 HOURS OF OPERATION	EVERY 50 HOURS OF OPERATION	EVERY 100 HOURS OF OPERATION
CHECK ENGINE OIL LEVEL *	✓			✓
INSPECT FUEL LINES AND CONNECTIONS FOR LEAKS	✓			✓
CHECK COOLANT LEVEL IN TANK (IF EQUIPPED WITH CLOSED COOLING)	✓			✓
INSPECT AND CLEAN SEA STRAINER (IF EQUIPPED)	✓			✓
INSPECT ENTIRE POWER PACKAGE FOR LEAKS (WATER, FUEL, OIL, EXHAUST, ETC.)		✓	✓	✓
INSPECT BELTS FOR TENSION AND WEAR		✓	✓	✓
INSPECT BATTERY (TERMINALS AND FLUID LEVELS)		✓	✓	✓
CHECK BATTERY CONNECTION TO ENGINE		✓	✓	✓
TOUCH UP EXTERIOR SURFACE WITH MARINE POWER PAINT		✓	✓	✓
INSPECT ZINC ANODES IN HEAT EXCHANGER FOR DETERIORATION (IF EQUIPPED WITH CLOSED COOLING)		✓	✓	✓
CHECK POWER STEERING FLUID (IF EQUIPPED)				✓
CHECK TRANSMISSION FLUID LEVEL	✓		✓	✓
LUBRICATE STARTER PINION AND SHAFT			✓	✓

* ENGINE START-UP EACH DAY AND ONCE EVERY EIGHT (8) HOURS OF OPERATION

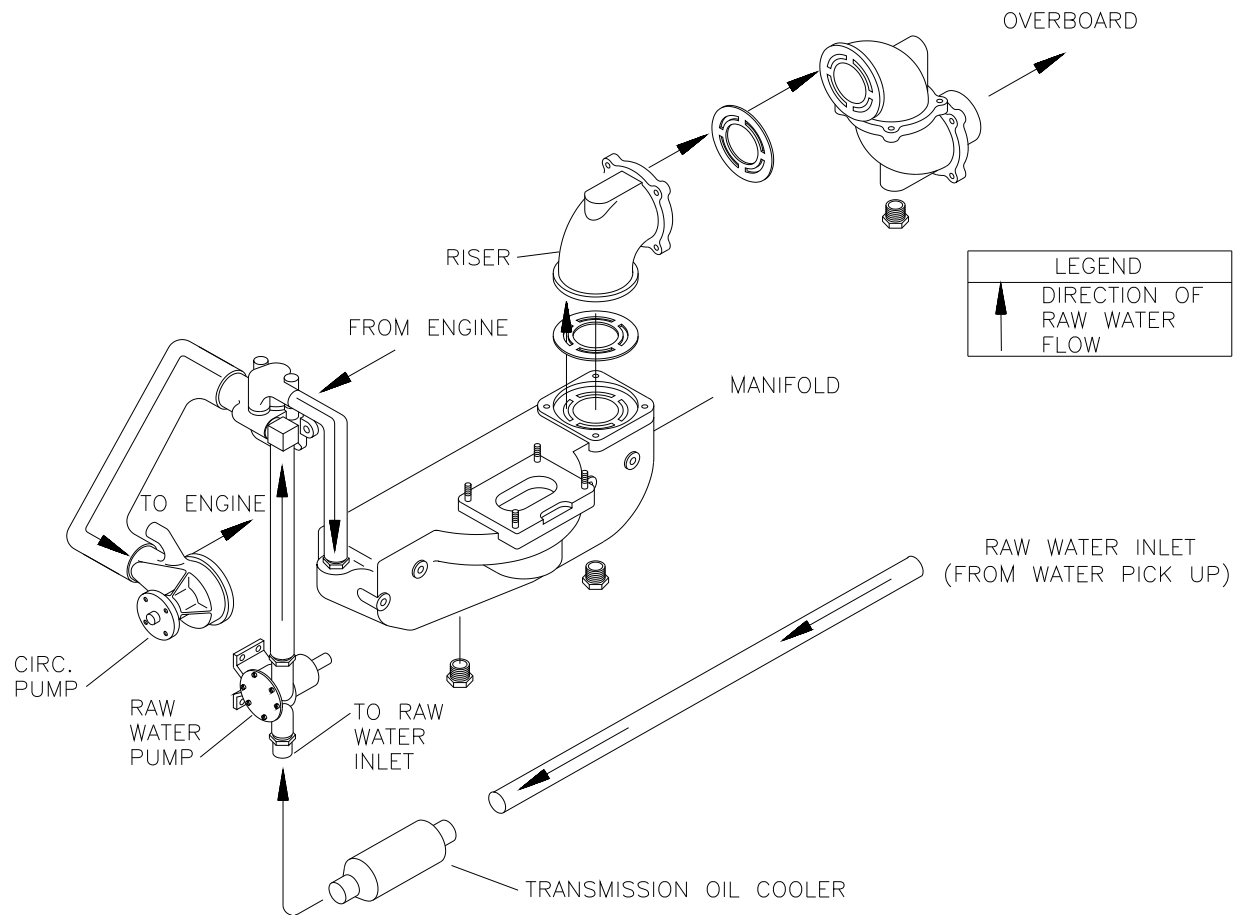
14. SCHEDULE MAINTENANCE BY QUALIFIED TECHNICIAN

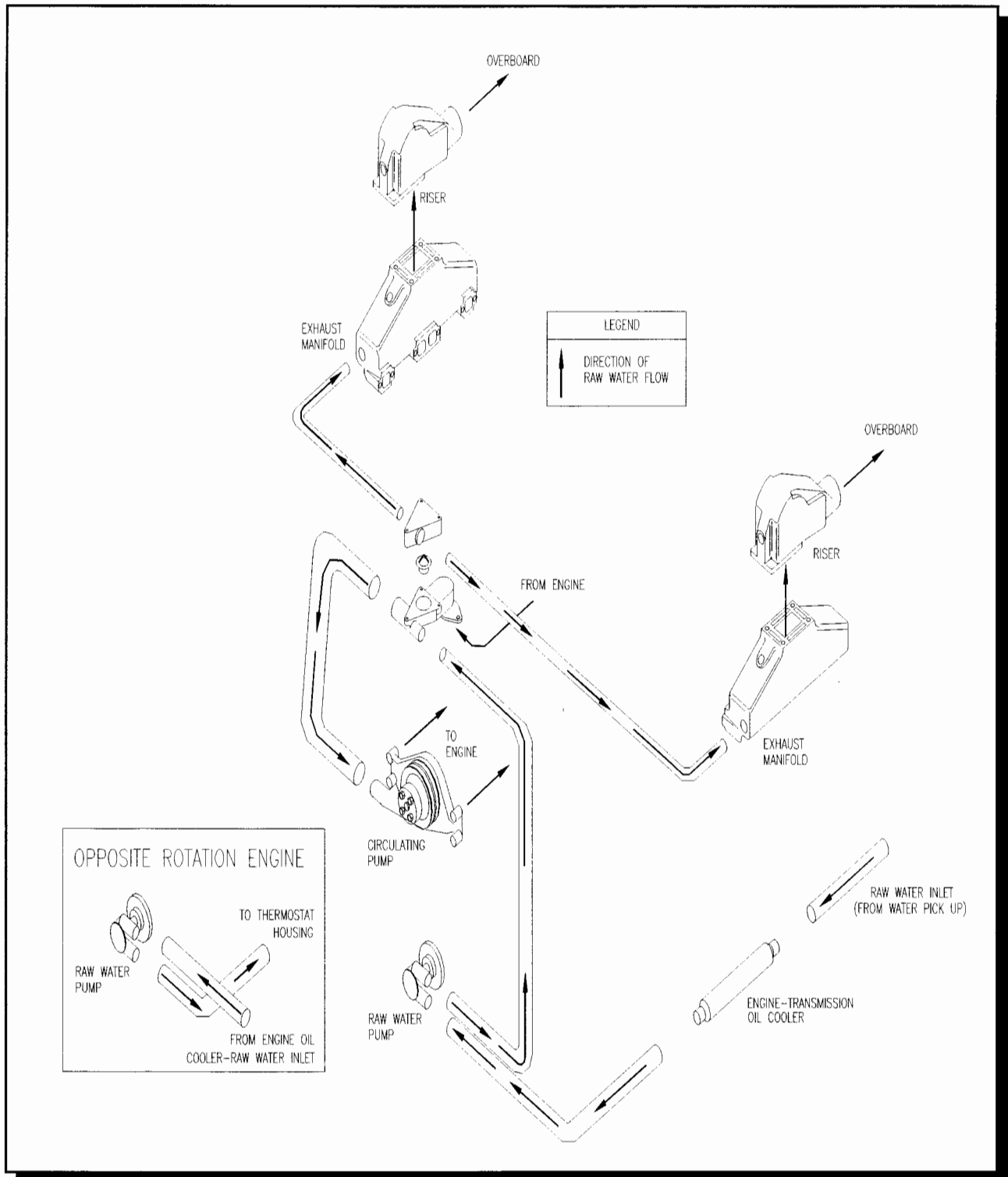
SERVICE:	AFTER FIRST 10 HOURS OF OPERATION	EVERY 50 HOURS OF OPERATION	EVERY 100 HOURS OF OPERATION	AT LEAST ONCE EACH YEAR
CHANGE ENGINE OIL AND FILTERS	✓	✓		✓
CHANGE FILTER ON FUEL/WATER SEPARATOR		✓		✓
CHECK ENGINE MOUNTS (TIGHTNESS)	✓		✓	✓
CHECK RISER AND MANIFOLD BOLTS FOR TIGHTNESS	✓	✓	✓	✓
CHECK FOR LOOSE, DAMAGED OR MISSING ENGINE PARTS			✓	✓
CHECK WIRE HARNESS PLUGS FOR CORROSION AND CONNECTIONS			✓	✓
INSPECT DISTRIBUTOR FOR CRACKS OR DETERIORATION			✓	✓
CHECK CONDITION OF SPARK PLUGS (REPLACE IF NECESSARY)			✓	✓
INSPECT HOSES FOR DETERIORATION			✓	✓
REPLACE IMPELLER IN SEAWATER PUMP			✓	✓
CHECK PROPELLER AND SHAFT ALIGNMENT				✓
CHECK AND ADJUST IGNITION TIMING (Carbureted Engine Only)				✓
CHECK AND ADJUST CARBURETOR				✓
CLEAN AND INSPECT FLAME ARRESTOR AND CRANK CASE VENT HOSE			✓	✓
CLEAN AND INSPECT CARBURETOR FILTER			✓	✓
CHANGE TRANSMISSION FLUID				✓
CHANGE COOLANT (IF EQUIPPED WITH CLOSED COOLING)				✓
CLEAN SEAWATER SECTION OF HEAT EXCHANGER				✓

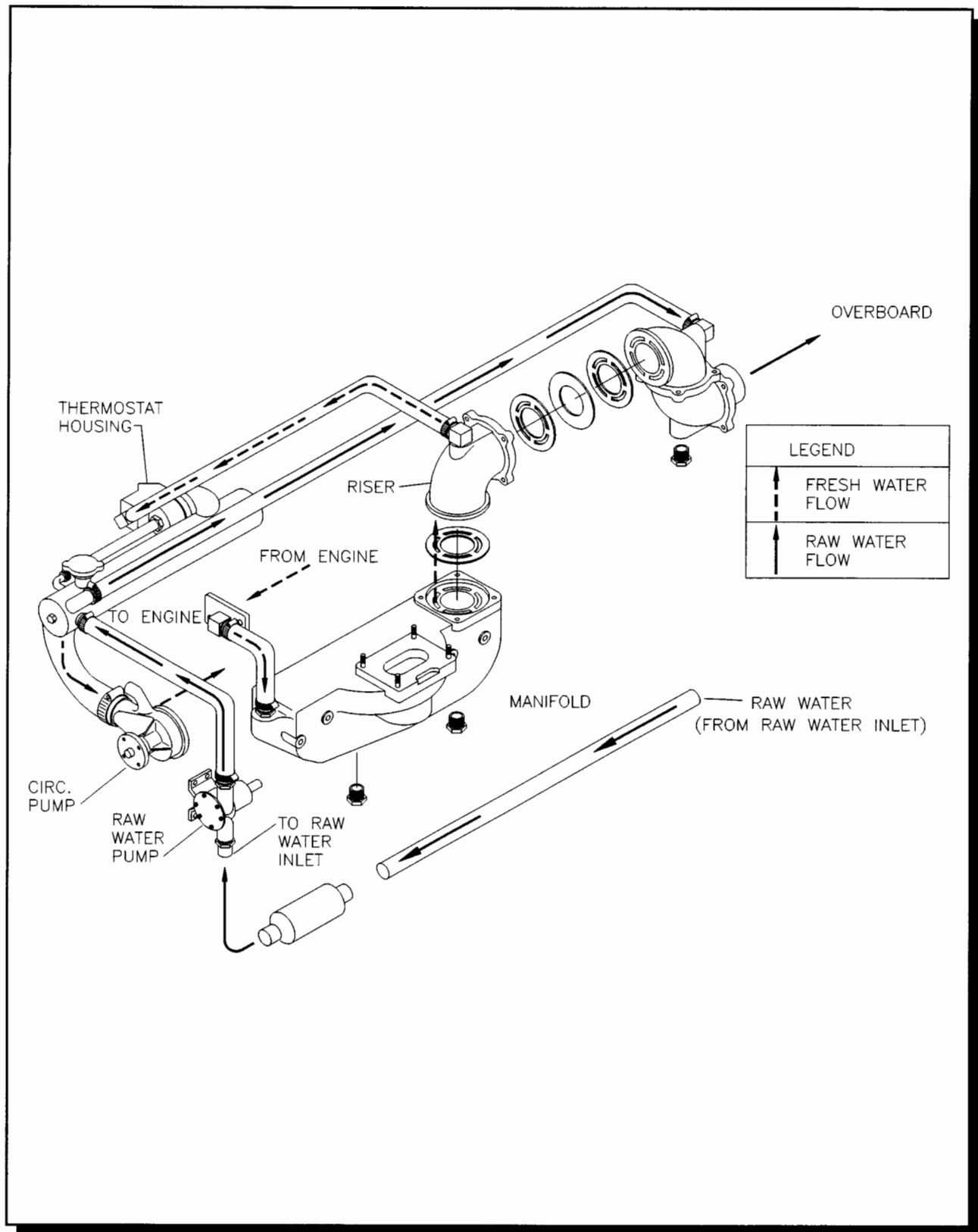
SECTION FOUR

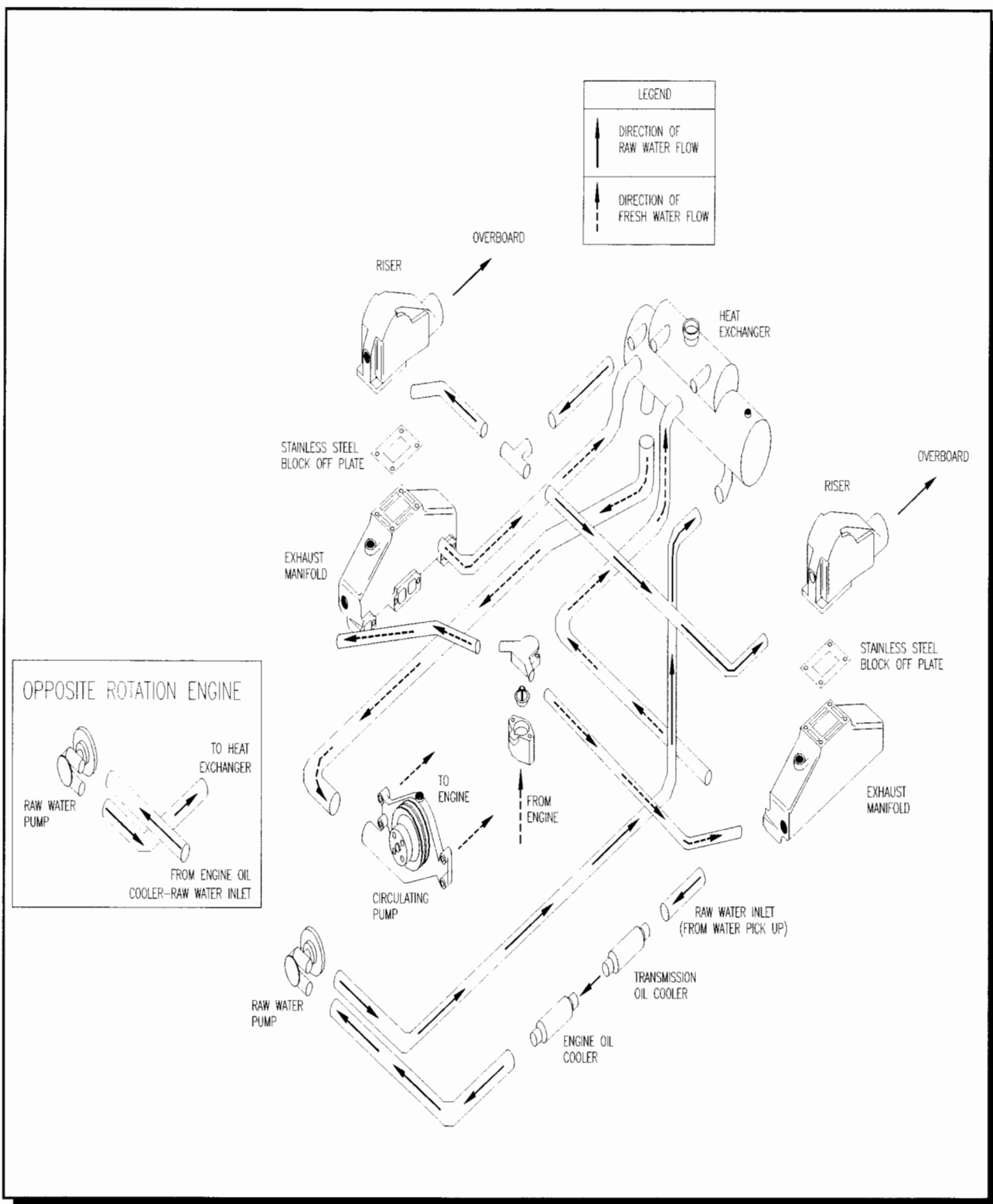
ENGINE DIAGRAMS

15. Coolant Flow Diagram: Raw Water Cooling 181.....	38
16. Coolant Flow Diagram: Raw Water Cooling V6/V8.....	39
17. Coolant Flow Diagram: Closed Cooling 181.....	40
18. Coolant Flow Diagram: Closed Cooling Front Mount V6/V8.....	41
19. Coolant Flow Diagram: Closed Cooling Rear Mount V6/V8.....	42
20. Primary Engine Wiring Harness: Carbureted/Electric Fuel Pump.....	43
21. Shift Assist Wiring Diagram: Carbureted Merc & Early OMC.....	44
22. TBI Shift Interrupt Wiring Diagram.....	44
23. Initial Timing Jumper Wiring Diagram.....	45
24. Shift Interrupt - OMC.....	45
25. EFI Primary Engine Wiring Harness.....	46
26. EFI Secondary Engine Wiring Harness.....	47
27. Engine Instrument Panel Wiring.....	48



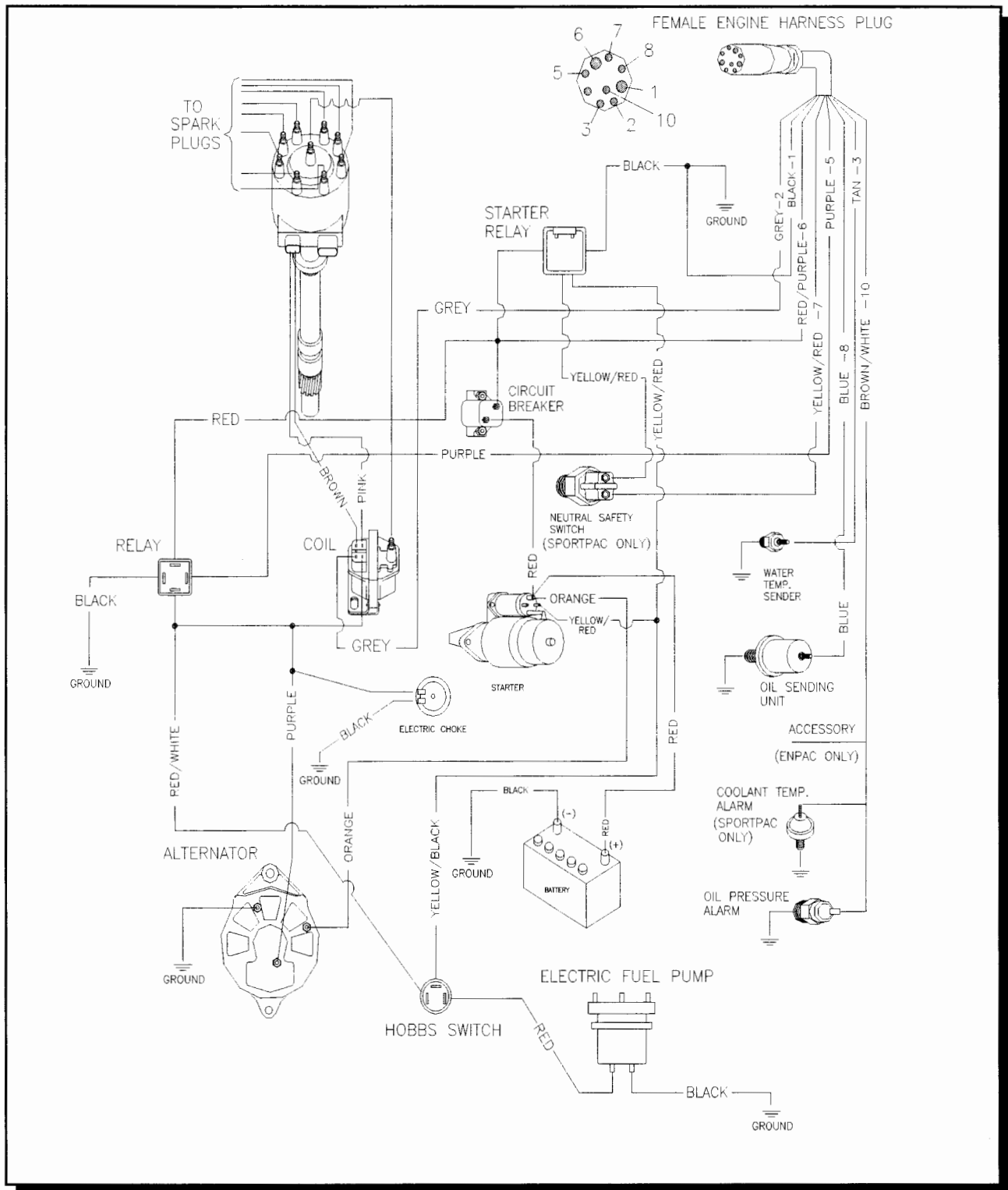




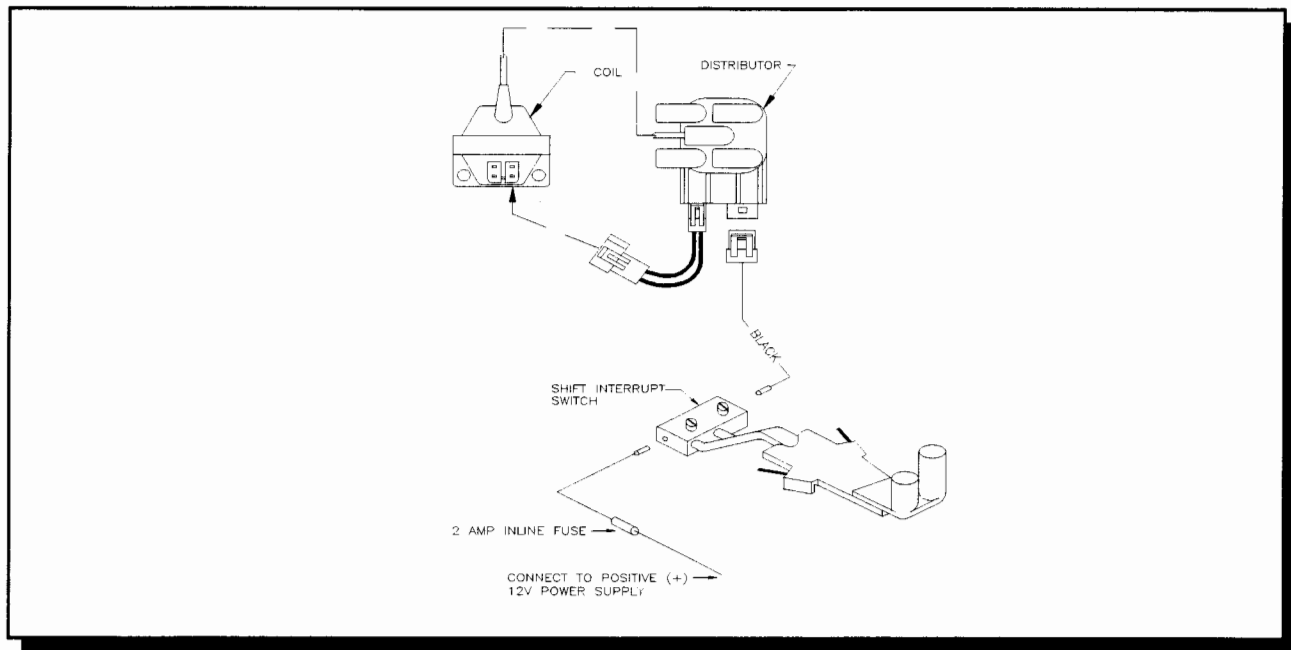


20. PRIMARY ENGINE WIRING HARNESS 181 (SPORTPAC), 4.3, 5.7, 454, 502

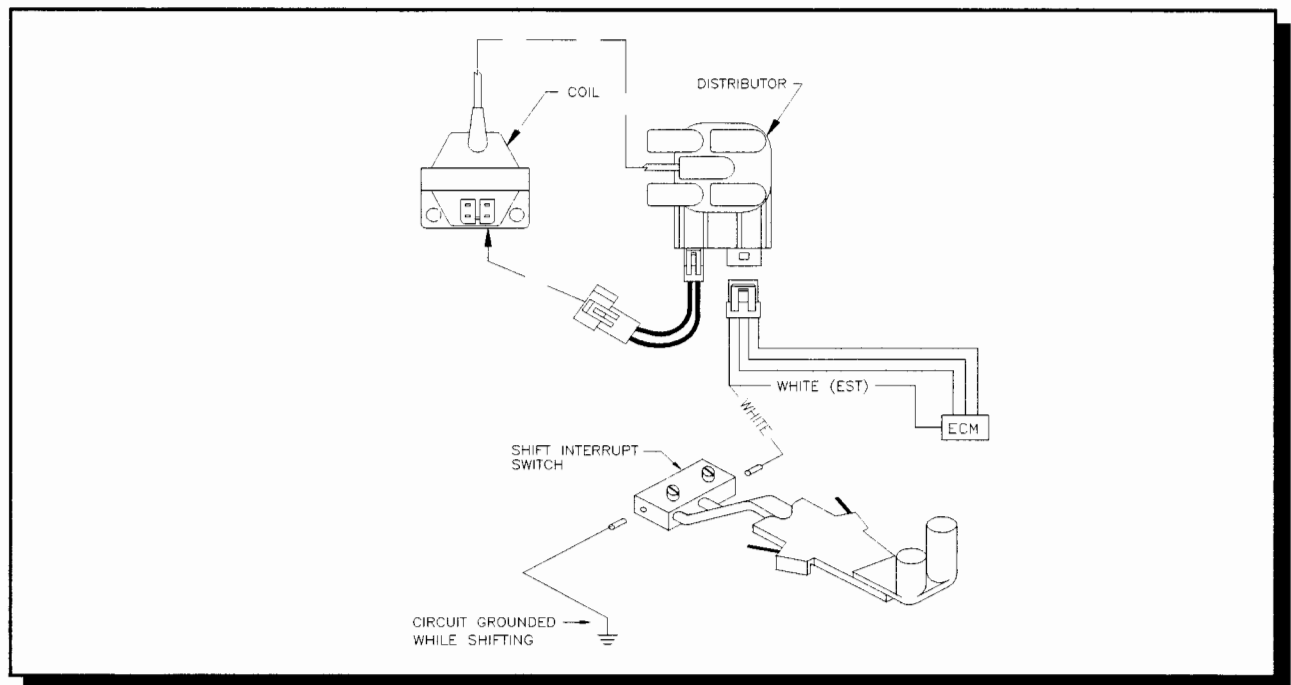
Carb/Electric Fuel Pump



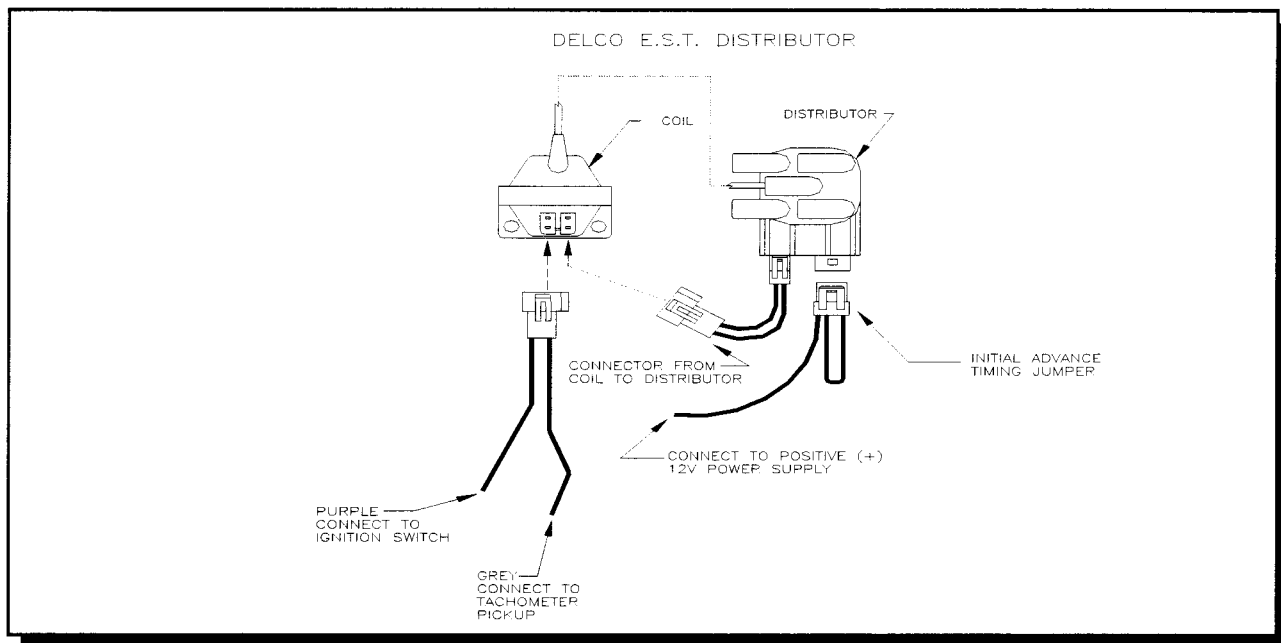
21. SHIFT ASSIST WIRING DIAGRAM Carbureted Mercruiser & Early OMC Applications



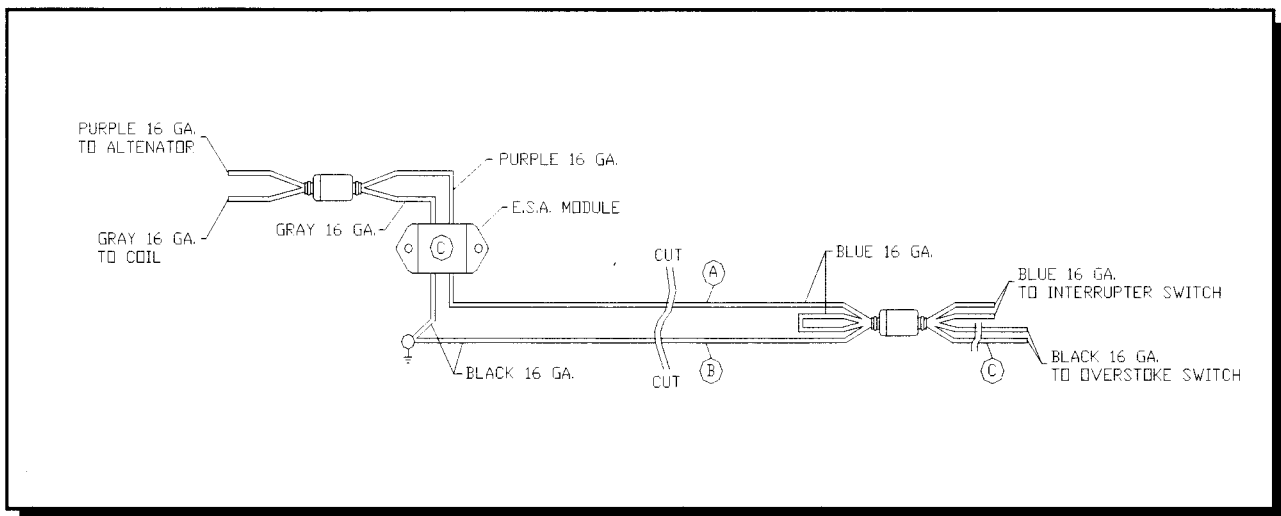
22. TBI SHIFT INTERRUPT WIRING DIAGRAM



23. INITIAL TIMING JUMPER WIRING DIAGRAM



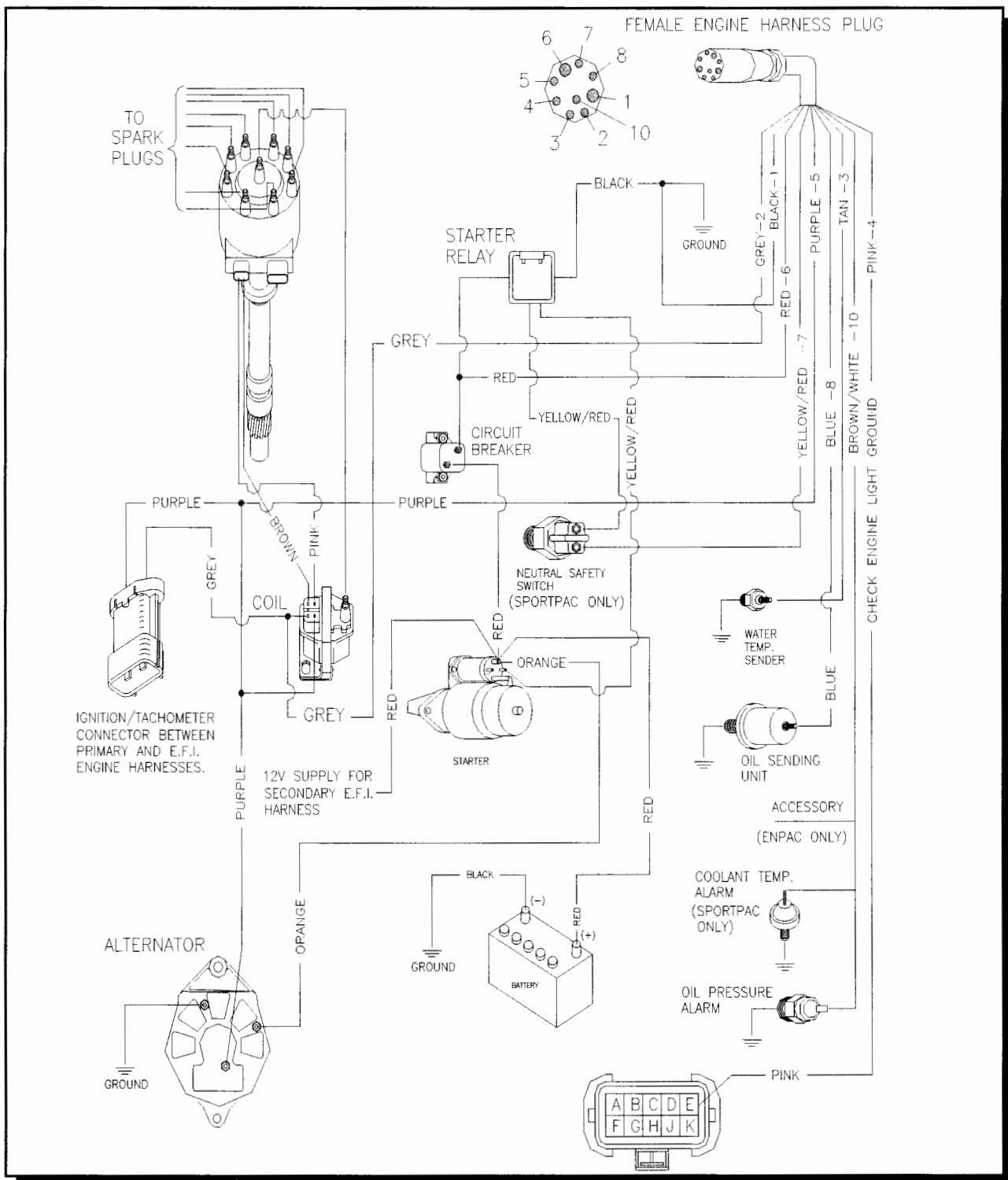
24. SHIFT INTERRUPT - OMC



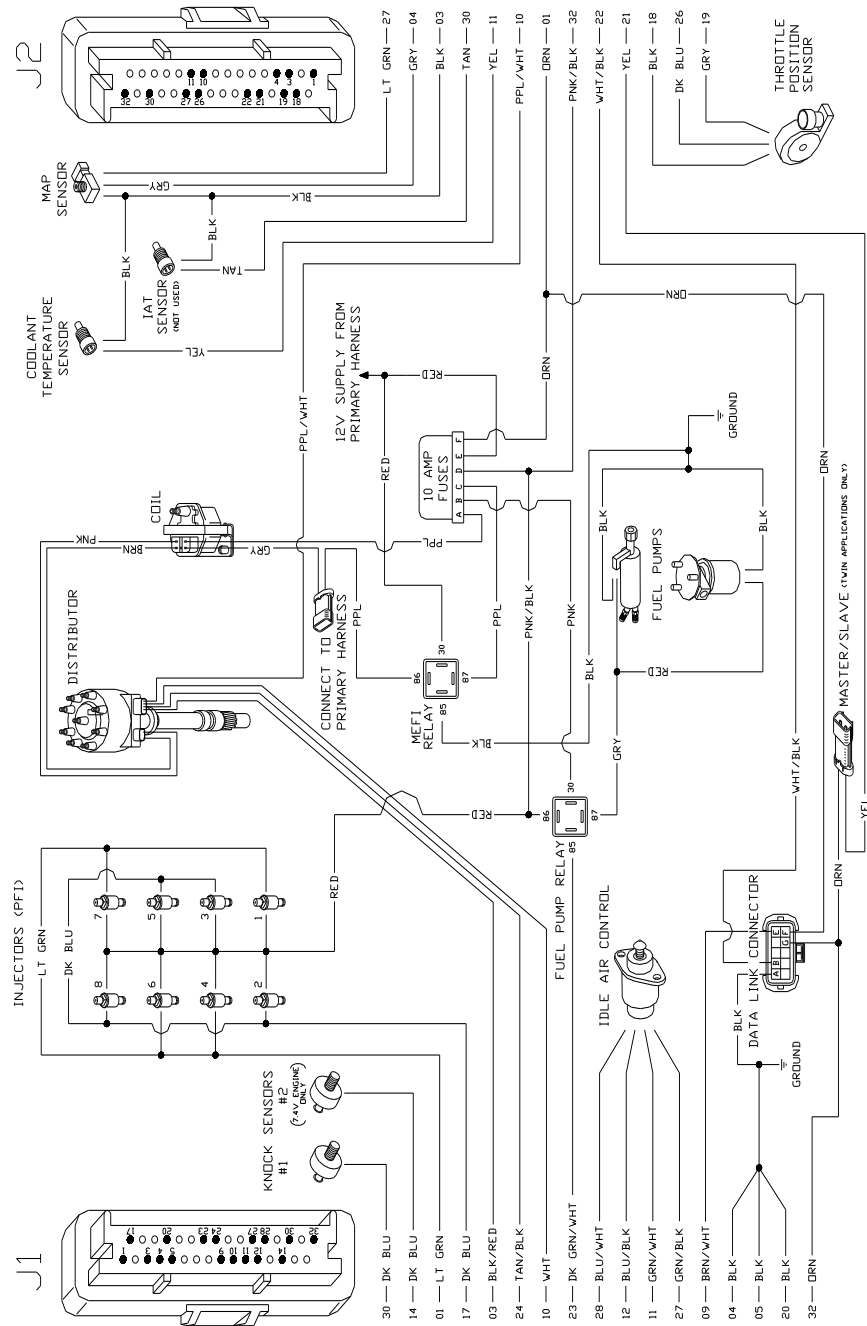
Installation Instructions:

1. Cut the blue 16 gauge wire (A) and connect to 12V positive supply when ignition switch is in the "ON" position with 2 amp in-line fuse.
2. Cut the black 16 gauge wire (B) and connect the shift interrupt wire on the engine. (Refer to shift cutout wiring diagram.)
3. Cut the black 16 gauge wire (C). The overstroke switch and the E.S.A. module are no longer used.

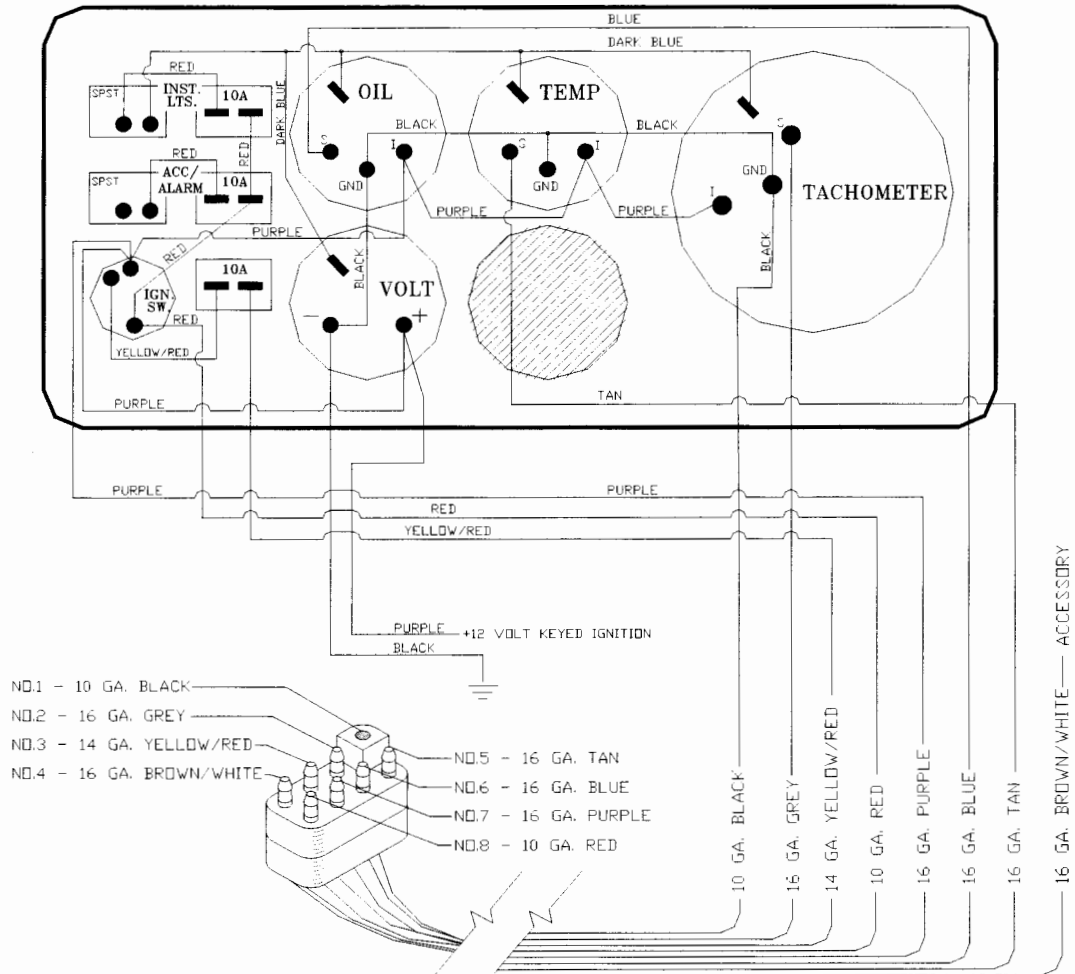
25. EFI PRIMARY ENGINE HARNESS



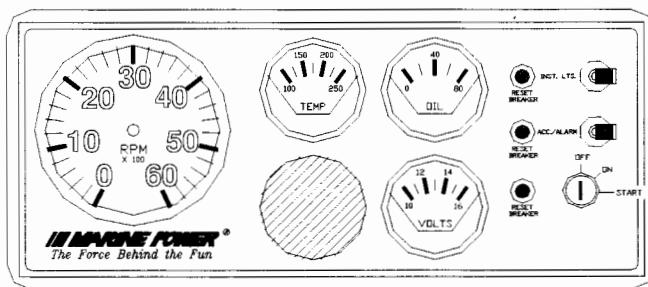
26. EFI SECONDARY WIRING HARNESS



27. ENGINE INSTRUMENT PANEL WIRING (Back of Panel)



8X MOLDED MALE PLUG
7 PINS AND 1 SOCKET



- 16 GA. TAN ——— TEMPERATURE SENDER
- 16 GA. BLUE ——— OIL SENDER
- 16 GA. PURPLE ——— IGNITION
- 10 GA. RED ——— BATTERY POSITIVE
- 10 GA. BLACK ——— GROUND
- 16 GA. GREY ——— TACHOMETER SENDER
- 14 GA. YELLOW/RED ——— STARTER SOLENOID
- 16 GA. BROWN/WHITE ——— ACCESSORY

SECTION FIVE

TROUBLESHOOTING GUIDE

28.	Troubleshooting Guide.....	50-54
	Engine Will Not Turn Over.....	50
	Engine Cranks But Will Not Start.....	50
	Engine Starts and Stops - Carbureted.....	50
	Engine Starts and Stops - EFI.....	50
	Engine Runs Poorly At Idle and Acceleration.....	51
	Engine Runs Poorly At High RPM.....	51
	High Speed Miss.....	51
	Fuel System - Rich.....	52
	Fuel System - Lean.....	52
	Poor Fuel Economy.....	52
	Oil Pressure - Low.....	52
	Oil Pressure - High.....	53
	Excessive Oil Consumption.....	53
	Engine Overheating.....	53
	Water In Engine Cylinder or Base.....	54
29.	Excessive Oil Consumption Troubleshooting Chart.....	55
30.	Warranty Registration Transfer Form.....	56

SERVICING DEALERS

Servicing Dealers Information.....	57
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28. TROUBLESHOOTING GUIDE

The following troubleshooting hints are not all inclusive but are the most common found. In all cases, if the cause of the problem is outside your capability to repair or correct contact your dealer.

Engine Will Not Turn Over

POSSIBLE CAUSE	REMEDY
Low Battery or Bad Connection Faulty Battery Cable Trip Circuit Breaker Faulty Neutral Switch Bad Starter Solenoid or Motor Faulty Fuel Pump Shift control in Gear Faulty Relay Solenoid Hydro Lock	Check / Charge / Replace. Requires 12 -14 Volts Remove spark plug look for water in the cylinder

Engine Cranks But Will Not Start

POSSIBLE CAUSE	REMEDY
Faulty Fuel Pump Blown Fuel Pump Fuse Faulty Oil Pressure Switch Insufficient Fuel Supply Insufficient Cranking RPM's Check Distributor Cap & Rotor Fouled Plugs Engine Timing Correct Firing Order Low Compression Bad / Old Fuel Fouled Carburetor	Check / Charge / Replace. Requires 12 -14 Volts Replace Check Fuel Supply Shut Off Valve, Check Fuel Filter Check Battery Voltage Replace Replace Re-time Check / Correct
ENSURE A TUNE UP IS DONE EVERY 100 HOURS OR EVERY SEASON	

Engine Starts and Stops (Carbureted)

POSSIBLE CAUSE	REMEDY
Cold Engine Engine Idle Too Slow Faulty Key Switch Faulty Carburetor Internal Failure Compression	When engine starts, move throttle to a higher rpm (Carburetor Only) Adjust Choke (Carbureted Engine Only) Check in line filter. Check carburetor filter

Engine Starts and Stops (EFI)

POSSIBLE CAUSE	REMEDY
Faulty Fuel Pump Operation Vapor Lock Insufficient Fuel Supply	Verify fuel supply and return not reversed. Verify fuel supply and pickup not sucking air.

28. TROUBLESHOOTING GUIDE

Engine Runs Poorly At Idle and Acceleration

POSSIBLE CAUSE	REMEDY
Incorrect Firing Order Incorrect Ignition Timing Choke Adjustment Faulty Spark Plug Contaminated Carburetor Internal Cylinder Head Problem Engine Surge, Stall, Lack Power	Check / Adjust/ Replace Check for sticking or burnt valve or broken valve spring. Carburetor float adjustment, Power Piston, Leaking Gaskets

Engine Runs Poorly At High RPM

POSSIBLE CAUSE	REMEDY
Low Grade or Old Fuel Ignition Timing In Need of a Tune-UP Ignition Coil Engine Overheating Restricted Exhaust Overfilled Crankcase Plugged Fuel Tank Vent Restricted Anti-Siphon Valve Restricted Exhaust Low Compression	Check / Clean / Replace

ENGINE PERFORMANCE CAN BE GREATLY AFFECTED BY BOAT HULL AND PROP CONDITION

High Speed Miss

POSSIBLE CAUSE	REMEDY
Water in fuel Clogged fuel filter Insufficient fuel supply Spark plug or wires Faulty distributor Module Loose ignition connection Ignition coil Ignition timing. Total advance incorrect Faulty tachometer Faulty fuel pump Loose electrical connection at fuel pump Detonation	Inspect / Clean / Replace

28. TROUBLESHOOTING GUIDE

Fuel System - Rich

POSSIBLE CAUSE	REMEDY
Dirty / Clogged Flame Arrester Carburetor Float Adjustment Carburetor Gasket Leaking Return Line Not Directed Back To Tank	Check / Clean / Replace

Fuel System - Lean

POSSIBLE CAUSE	REMEDY
Empty Fuel Tank Vapor Lock Automatic choke	Stuck open, adjust

Poor Fuel Economy

POSSIBLE CAUSE	REMEDY
Boat Hull Dirty Incorrect Prop Size or Damage Clogged Flame Arrester Tune -up Low Engine Compression Engine Running Too Hot or Cold Incorrect Fuel Grade Boat Overload Weight Distribution Carburetor Settings Incorrect Spark Plug or Gap Initial or Advanced Timing Wrong Plugged or Restricted Exhaust	Clean / Check / Adjust

Oil Pressure - Low

POSSIBLE CAUSE	REMEDY
Low oil level in crankcase Excessive oil in crankcase Erroneous oil gauge readings Incorrect Dipstick Oil line position and routing Incorrect oil viscosity or diluted Oil Pump malfunctioning Oil leak Excessive Bearing Clearance	Refer to owner manual for correct oil levels Remove excess oil. Refer to owner manual for correct oil levels Contact dealer to perform a mechanical oil pressure check Rod, Cam or Main Bearings
Engine oil pressure as low as 5 pounds at idle is acceptable. At 2000 rpm 30 pounds is acceptable	

28. TROUBLESHOOTING GUIDE

Oil Pressure - High

POSSIBLE CAUSE	REMEDY
Oil too thick - Wrong Viscosity Erroneous oil gauge readings Clogged or restricted oil passage Oil valve relief valve stuck closed	Change oil Contact dealer to perform a mechanical oil pressure check Contact dealer Contact dealer

Excessive Oil Consumption

POSSIBLE CAUSE	REMEDY
External Leak Excessive oil in crankcase Oil / Fuel dilution Extended excessive RPM's Incorrect oil viscosity Incorrect dipstick Excessive oil temperature Defective oil cooler Remote oil lines installed wrong Engine breather tubes blocked Defective piston rings Defective Cylinders Excessive bearing Clearance	Clean / Check / Adjust
The amount of oil used is greatly dependent upon engine speed. Oil usage will be greater at higher rpm's	

Engine Overheating

VERIFY IF ENGINE IS ACTUALLY OVERHEATING.	
POSSIBLE CAUSE	REMEDY
Clogged seawater intake Clogged seawater strainer Improperly installed strainer Loose hose connections Seawater hose kinked or collapsed Water turbulence under boat Defective thermostat Seawater pump impeller worn Obstruction in cooling system Engine circulating pump defective Low coolant level Antifreeze not properly mixed Heat exchanger core plugged.	Clear intake. Ensure that all hoses after the intake are clear. Tighten hose connections Replace seasonally Mix to a 50 /50 ratio

28. TROUBLESHOOTING GUIDE

Engine Overheating (Continued)

VERIFY IF ENGINE IS ACTUALLY OVERHEATING.	
POSSIBLE CAUSE	REMEDY
Water hoses reversed Exhaust riser obstruction Transmission cooler blocked Air leak in hose Slipping circulating pump belt Head gasket failure	Mix to a 50 /50 ratio Riser should be changed every three to four years. See dealer

Water In Engine Cylinder or Base

POSSIBLE CAUSE	REMEDY
Operator error Exhaust restricted or blocked Engine and exhaust too low in boat Defective exhaust riser gasket Defective exhaust manifold or riser Cylinder head gasket leak Cracked block or cylinder head Intake manifold gasket Incorrect engine rotation	See Boater's Beware. REMOVE water from engine immediately Repair or Replace. REMOVE water from engine immediately Redesign add riser spacers. REMOVE water from engine immediately Contact dealer. REMOVE water from engine immediately. Contact dealer. REMOVE water from engine immediately Contact dealer. REMOVE water from engine immediately Contact dealer. REMOVE water from engine immediately Contact dealer. REMOVE water from engine immediately Contact dealer. REMOVE water from engine immediately
Remove water by removing spark plugs and turning the engine over by hand. Once water is removed spray cylinder with Marvel Mystery Oil or two cycle engine oil. Drain all the oil and change the oil filter(s). Again, turn the engine over by hand to circulate the oil. Contact your dealer immediately to make the required repairs. Upon completion of repairs, run the engine and again change the oil.	

29. EXCESSIVE OIL CONSUMPTION TROUBLESHOOTING CHART

CAUSE	INFORMATION
Normal Oil Consumption	One quart of oil consumed within 5-15 hours of wide-open throttle operation is normal.
Oil Level Too High	
Oil Leak	Clean bilge, put clean white towel on bilge floor and run engine to locate oil leak(s).
Oil Too Thin	Oil diluted or wrong viscosity.
Cylinder Head Drain Holes Plugged	Oil will flood valve guides.
Defective Valve Seals	
Leaking Intake Manifold Gasket	
Worn Valve Guides or Valve Stems	
Defective Piston Rings	Worn, stuck, glazed, scuffed, improperly installed ring grooves worn, improper break-in; Wrong end gap.
Defective Cylinders	Scored, tapered, glazed, out of round; Excessive piston to cylinder clearance; cracked piston.
Excessive Bearing Clearance	
Defective Oil Cooler (if equipped)	Crack in cooler tubes.

SERVICING DEALERS

SERVICING DEALERS

**Note: If You Are Unable to Locate a
Independent Servicing Dealer,
Please Contact a Marine Power
Distributor Closest to You for
Further Assistance.**

SERVICE AND MAINTENANCE RECORD

[illegible]

