



OWNER'S OPERATION

and

MAINTENANCE MANUAL

A Division of





AIRBOAT ENGINES

Thank you for your selection of Pleasurecraft (PCM) Marine Airboat engine for your boating needs. We welcome you to Team PCM, which puts you in the company of tens of thousands of boaters who have relied on Pleasurecraft inboards as their power of choice for over 20 years.

When you chose PCM, you selected the utmost in premium airboat power for your application. Pleasurecraft is the world's largest manufacturer of gasoline marine inboards, and the clear-cut leader in cutting edge technology. Over the years, we have introduced many breakthrough innovations that quickly became industry standards. The pyramidal exhaust system, light-weight transmission, computerized engine control and the Fuel Control Cell (FCC) are all PCM innovations. No matter which PCM model you purchased, you can be sure it is equipped with the latest in modern technology for added performance and durability.

READ THIS MANUAL THOROUGHLY

Before starting your engine(s), READ THIS MANUAL CAREFULLY AND COMPLETELY. If you do not understand any portion of the manual, contact your Dealer for clarification or assistance. Ask your Dealer for a demonstration of actual starting and operating procedures.

The descriptions and specifications contained in this manual were in effect at the time of printing. PCM Engines' policy of continued improvement reserves the right to change specifications or design without notice and without obligation.

This manual will cover the following PCM engines:

Year	Model
2006	8.1L MPI (HO)
2006	6.0L MPI

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SAFETY INFORMATION

“Safety Warnings” and additional information or instructions are used to alert the installer/operator of possible safety hazards in performing certain service or maintenance procedures incorrectly or carelessly. DANGERS and WARNINGS are accompanied by the international HAZARD symbol: 

These “Safety Warnings” alone cannot eliminate the hazards that they signal. Strict compliance with these warning instructions while performing service and maintenance procedures, plus “common sense” operation, are major accident prevention measures.

REPLACEMENT PARTS



DANGER

Electrical, ignition and fuel system components are designed and manufactured to comply with U.S. Coast Guard rules and regulations to minimize the possibility of fire or explosion hazard.

Use of replacement parts (i.e. automotive, after-market, etc.) in the electrical, ignition and fuel systems, which are not U.S. Coast Guard approved, could cause a fire or explosion hazard and should be avoided.

Always request that genuine PCM Engines replacement parts be used in any repairs or maintenance being performed on your engine(s).

SAFETY WARNINGS



DANGER

Signals serious damage, failure or breakdown of equipment; severe injury or high probability of death to the user if proper precautions are not taken. This signal word is applied in extreme situations



WARNING

Indicates a potential hazard which could result in personal injury.



CAUTION

Indicates a hazard which could result in damage to equipment.

IMPORTANT: or **IMPORTANT:** Used to provide information to perform a procedure more easily.

WARRANTY NOTICE: Indicates a possible warranty exclusion.

SERVICE and WARRANTY - 1

OWNER'S SERVICE AND WARRANTY INFORMATION

PLEASURECRAFT MARINE ENGINE CO., INC.'S COMMITMENT TO YOU

Pleasurecraft Marine Engine Co. is committed to assuring your satisfaction with your new PCM engine. Your Dealer also wants you to be completely satisfied, and invites you to return for all your servicing needs, both during and after the warranty period.

OWNER WARRANTY REGISTRATION

It is important that your selling dealer fill out the "Warranty Registration Card" completely and mail it to the factory immediately upon the purchase of the new product. It identifies the name and address of the original purchaser, product model(s) and serial number(s), and the selling dealer's name and address. The dealer is also certifying that you are the original purchaser of the product.

Upon receipt of the "Warranty Registration Card" at the factory, you will be issued an "Owner Warranty Registration Card." The "Owner Registration Card" is your only valid registration identification, and must be presented to the servicing dealer, should warranty service be required.

Along with your Warranty Card you will receive a Customer Survey. We appreciate your feedback and encourage you to fill out the survey after you have had a chance to run your boat for several weeks. We take this input very seriously, and have implemented many of the ideas our customers have given us through this survey. You may also visit our web site at www.pleasurecraft.com.

If your "Owner Registration Card" is not received within 30 days from the date of purchase, please contact your boat dealer or engine seller. The product warranty is not effective until the Product is registered at the factory.

Again, thanks for choosing PCM. We sincerely wish you happy days on the water.

Mail registration information to:

Pleasurecraft Marine Engine Co.
P.O. Drawer 369
Little Mountain, SC 29075

NOTE: OWNERS WARRANTY REGISTRATION CARD IS LOCATED AT THE BACK OF THIS MANUAL.

NOTICE: Registration lists must be maintained by the factory and dealer on marine products sold in the United States and some foreign countries, should notification under **FEDERAL BOAT SAFETY ACT** be required. It is our desire to have all products registered at the factory, should it ever be necessary to contact you. Make sure your Dealer/Distributor fills out the registration card immediately and sends the card to the factory.

ENGINE OPERATION AND CARE

Considering the investment that you have made in your new PCM engine, we know you will want to operate and maintain it properly. We urge you to follow the maintenance instructions contained in your engine's "Operation and Maintenance Manual."

If you have any questions on how to keep your engine in good working condition, see your selling dealer, the place where many owners choose to have their maintenance work done. Your dealer can be relied on to use proper parts and practices.

MAINTENANCE RECORDS

It is recommended that receipts covering the performance of regular maintenance be retained. Damage to your engine, caused by lack of maintenance, is not covered under your warranty. Receipts can be very important if a question arises as to whether a malfunction is caused by lack of maintenance or a defect in material or workmanship. An "Engine Maintenance Log" is provided in the MAINTENANCE SCHEDULE section of the OPERATION AND MAINTENANCE MANUAL for your convenience in recording the service performed.

LOCAL REPAIR SERVICE

To obtain service or make a claim under your warranty, contact your selling dealer. They have trained technicians, knowledge, special tools, and equipment to properly service your engine, if the need arises. They know you and your boat the best.

SERVICE AWAY FROM HOME

If you are away from home and your local dealer, and the need for service arises, contact the nearest authorized PCM dealer. Refer to the yellow pages in the telephone directory. If, for any reason, you cannot obtain service, contact Pleasurecraft Marine Engine Co. for referral to the nearest authorized servicing dealer.



SERVICE and WARRANTY - 1

REPLACEMENT PART INQUIRIES

All inquiries concerning replacement parts should be directed to your local authorized dealer. The dealer has the necessary information to order parts for you if they are not in stock. Only authorized distributors can purchase parts from the factory. PCM does not sell to unauthorized dealers or retail customers. When checking on parts, the dealer will require the engine model and serial number to order the correct parts.

REPLACEMENT SERVICE PARTS



WARNING

Electrical, ignition and fuel system components on PCM engines are designed and manufactured to comply with U.S. Coast Guard rules and regulations to minimize the risks of fire or explosion. Use of replacement electrical, ignition or fuel system components, which do not comply with these rules and regulations, could result in a fire or explosion hazard and should be avoided.

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

APPLICABLE LIMITED WARRANTY

Following is the limited warranty applicable to PCM Airboat engines sold and used in the United States and Canada.

Distributors and Dealers are not agents of PCM. PCM does not authorize any person to create any other obligation or liability in connection with this product.

SERVICE and WARRANTY - 1

**PLEASURECRAFT MARINE ENGINE CO.
AIR BOAT ENGINE
ONE YEAR LIMITED WARRANTY**

(For Engines Sold and Used in the United States and Canada Only)

1. Pleasurecraft Marine Engine Co., Inc., (hereinafter referred to as "PCM") warrants each of its new inboard marine engines and accessories attached thereto ("Products"), to be free from defects in material and workmanship for a period of 400 hours of operation or twelve (12) calendar months, except to the extent limited herein. This Limited Warranty commences FROM THE DAY OF DELIVERY REQUIRED TO BE ENTERED BELOW AT THE TIME OF DELIVERY TO THE PURCHASER; however, in no event shall the duration of the Limited Warranty exceed one (1) year, as measured from the original retail sale date.
2. Under this Limited Warranty, PCM's obligation is limited to repairing or replacing those parts of Products that have become defective within the applicable warranty period, because of defective materials or workmanship. PCM will arrange for the correction of all defects under this Limited Warranty to be made free of charge at the selling dealership or an authorized PCM service center. PCM, at its discretion, may provide for the repair or replacement of any defective part at PCM's facility. PCM will make payment for labor to replace such parts as provided in the, then, current flat rate labor manual or Warranty Procedures Manual.
3. This Limited Warranty does not apply to Product defects caused by normal wear and tear to Products, and/or damage to Products arising out of negligence or lack of proper care, improper installation or service, operation with fuels, oils or lubricants which are not suitable for use with Products, alterations or removal of parts, water entering an engine through the exhaust system or carburetor, installation of accessories or parts not manufactured or sold by PCM, or Products rendered defective by accident.
4. If a part should become defective within the applicable warranty period, advance authorization by PCM is necessary before the part is replaced or a defect is corrected by a service representative; otherwise PCM will not be liable for the expense of the replacement or correction.
5. Replacement parts and accessories supplied by PCM, and installed on a Product during the period when the Product is covered under the provisions of this Limited Warranty, are warranted for the unexpired portion of the existing warranty period, or ninety (90) days from the date of installation of such new parts or accessories, whichever is longer.
6. Reasonable access to the Product must be provided for warranty service. This Limited Warranty does not cover: (1) telephone or telegram charges, towing charges, storage, launch and haul out charges, loss or damage to personal property, loss of revenue, loss of time, travel, lodging, inconveniences or other CONSEQUENTIAL DAMAGES, or (2) removal and/or replacement of boat partitions or material, because of boat design, for necessary access to the Product.



SERVICE and WARRANTY - 1

7. NO OTHER WARRANTY GIVEN

THE OBLIGATIONS SET FORTH IN THE PRECEDING PARAGRAPHS ARE CRUSADER'S SOLE OBLIGATIONS AND OWNER/USER'S EXCLUSIVE REMEDY. PCM MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED (except to the extent provided in the immediately following paragraph), AND MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

However, to the extent that any warranty may be implied by law, the term of such implied warranty shall be limited to a period of time corresponding to the period of express warranty applicable to the particular Product, and its use by the owner/user, as set forth herein, commencing on the date of the first retail sale of the Product to the first registered owner or registered user. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

This is the sole warranty provided respecting PCM's Products, and no other party may make a warranty to owner/user.

PCM SHALL NOT BE LIABLE FOR ANY LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS OR DIRECT OR INDIRECT, INCIDENTAL (except as specifically provided herein) OR CONSEQUENTIAL DAMAGES. Some state do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Any owner/user hereby waives for himself/herself/itself and his/her/its successors and assigns (a) any and all claims for punitive damages, and (b) all claims of negligence or strict liability or both. In no event will PCM's liability exceed the purchase price of the Products which is actually paid to PCM.

- To make a claim under this Limited Warranty, contact the selling dealer from which your PCM powered boat was originally purchased or the nearest authorized PCM servicing dealer. It is recommended that your warranty service be performed by the dealer which sold the Product to you because of that dealer's personal interest in you as a customer. Your PCM powered Product must be delivered to the servicing dealer within the applicable warranty period. Proof of purchase may be required by the PCM dealer to substantiate any warranty claim. Use your PCM Owner Warranty Registration Card to establish proof of purchase.

9. ITEMS NOT COVERED UNDER LIMITED WARRANTY

This Limited Warranty is limited to defects in material and workmanship. To avoid misunderstandings regarding warranty coverage, the following describes some, but not all, of the more common types of service that are not covered by this Limited Warranty.

- Normal service requirements arising during the warranty period, such as fuel system or ignition adjustments, tune-ups, filter, adjusting controls or lubrications.
- Damage caused by neglect, lack of maintenance, abnormal operation accident or improper installation or service.
- Normal wear of the piston rings, cylinders, water pump and other engine and transmission parts.
- Haul out, launching, towing charges, dockage or storage fees, removal and/or replacement of boat partitions or material, because of boat design, for necessary access to the product.
- All related transportation charges and/or travel time.
- The cost of shipping replacement parts by air freight or other premium freight methods.
- Additional service work requested by the customer or performed by the dealer other than that necessary to satisfy the warranty obligation.
- Labor performed by other than an authorized dealer may be covered only under the following circumstances: when performed on an emergency basis (providing there are no authorized dealers in the area who can perform the work required, and prior factory approval has been given to have the work performed at this facility).
- Damage from participating in, or preparing for, racing or other competitive activity.
- Water entering the engine cylinders or oiling system through the intake manifold system, exhaust system, submersion, or in any manner if not caused by a PCM manufacturing defect.
- Water in starters.
- Improper winterizing resulting in freezing and breaking of the engine block, cylinder heads, exhaust manifolds, heat exchanger or other damage.
- Repairs made necessary by normal wear, rust, electrolysis or corrosion, or by the use of the parts or accessories which are either incompatible with the PCM product or adversely affect its operation, performance or durability.
- Valve or valve seat grinding required because of wear.
- Failure or damage due to lack of cooling water caused by starting the Product out of the water or by foreign material blocking the water inlets.
- Cleaning of the engine fuel system due to water or dirt contamination of the boat fuel system.
- Use of fuel and lubricants which are not suitable for use with or on the Product. Refer to the Operation and Maintenance Manual.
- Damage to the engine and/or transmission caused by striking a submerged object. (This is considered a marine hazard).

10. This Limited Warranty shall be governed by, and construed and interpreted in accordance with, the laws of the State of Ohio, without application of its conflicts of laws principles, except only to the extent replaced or precluded by other law of mandatory application.

11. SPECIAL STATE LEGAL REQUIREMENTS

This Warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

The PCM California Model Years 2003-2008 Emissions Warranty and California Emission Control Warranty Statement is a separate document included in this Manual. Any questions concerning the Emissions Warranty can be obtained by calling 1-803-345-0050.



SERVICE and WARRANTY - 1

THINGS YOU SHOULD KNOW ABOUT THE WARRANTY

Warranty Repair Component Exchanges

In the interest of customer satisfaction, PCM may offer an exchange service on some engine components. This service is intended to reduce the amount of time that your boat is not available for use, due to repairs. Components used for the exchange service may be new, remanufactured, reconditioned or repaired, depending upon the component involved. All exchange components used meet PCM standards and are warranted the same as new components.

Production Changes

PCM and its Distributors reserve the right to make changes in the engines built and/or sold by it at any time without incurring any obligation to make the same or similar changes on engines previously built and/or sold.

Proof of Date of Purchase

PCM will accept the return of a properly filled out "Warranty Registration Card", supplied with each engine, as proof of purchase. Failure of purchaser to return such card will require the owner to provide a copy of the original "Bill of Sale" (sales contract) for the Product to be serviced. Warranty claims will not be accepted until adequate "Proof of Purchase" is presented by the purchaser, and the date of purchase is substantiated.

Access to Product

Reasonable access must be provided to the Product for warranty service. The warranty does not cover the removal and/or replacement of boat partitions and/or other components which must be removed for necessary access to the Product.

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board and Pleasurecraft Marine Engine Co. (hereinafter "Pleasurecraft") are pleased to explain the emission control system warranty on your Model Years 2003-2008 inboard engine. In California, new inboard engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Pleasurecraft 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 the 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, Pleasurecraft will repair your inboard engine at no cost to you, including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE:

Select emission control parts from Model Years 2003-2008 inboard engines are warranted for 2 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. Pleasurecraft recommends that you retain all receipts covering maintenance on your inboard engine, but Pleasurecraft cannot deny warranty coverage 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 Pleasurecraft may deny you warranty coverage if your inboard engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
- You are responsible for presenting your inboard engine to a Pleasurecraft distribution center as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed thirty (30) days.

If you have any questions regarding your warranty rights and responsibilities, you should contact Pleasurecraft at 1-803-345-0050.



SERVICE and WARRANTY - 1

PLEASURECRAFT MARINE ENGINE CO. MODEL YEARS 2003-2008 GENERAL EMISSIONS WARRANTY COVERAGE

1. Pleasurecraft Marine Engine Co. (hereinafter referred to as "Pleasurecraft") warrants to the first owner purchasing at retail, and all subsequent owners, of every Pleasurecraft Model Years 2003-2008 inboard engine that the emissions control devices on Pleasurecraft inboard marine engines are free from defects in materials and workmanship when manufactured and will remain so for a period of two (2) years from the date of delivery to the first owner purchasing the engine at retail or from the date the engine is first placed into service for demonstration or any other purpose prior to sale to the first owner purchasing the engine at retail.
2. Pursuant to the California Code of Regulations Title 13, Chapter 9, Article 4.7§ 2445.1, Pleasurecraft warrants that each Pleasurecraft engine is designed, built and equipped to conform with all applicable regulations adopted by the California Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code, and is free from defects in materials and workmanship that cause the failure of a warranted part to be identical in all material respects to that part as described in Pleasurecraft's application for certification.
3. Any part covered under this Warranty that is not scheduled for replacement as required maintenance, in the written instructions to be found within the Pleasurecraft Owners/Operators Manual, is warranted for the period of two (2) years. If the part fails during the period of warranty coverage, Pleasurecraft will repair or replace the defective part at any Pleasurecraft warranty station. The repair or replacement will be performed at no charge to the owner. Any such part repaired or replaced under this Warranty will be warranted for the remainder of the two (2) year period.
4. Any part covered under this Warranty that is scheduled only for regular inspection in the written instructions to be found within the Pleasurecraft Owners/Operators Manual, is warranted for the period of two (2) years. If the part fails during the period of warranty coverage, Pleasurecraft will repair or replace the defective part at any Pleasurecraft warranty station. The repair or replacement will be performed at no charge to the owner. Any such part repaired or replaced under this Warranty will be warranted for the remainder of the two (2) year period.
5. Any part covered under this Warranty that is scheduled for replacement as required maintenance in the written instructions to be found within the Pleasurecraft Owners/Operators Manual will be warranted for the period of time before the first scheduled replacement date for that part. If the part fails before the first scheduled replacement, Pleasurecraft will repair or replace the defective part at any Pleasurecraft warranty station. The repair or replacement will be performed at no charge to the owner. Any such part repaired or replaced under this Warranty will be warranted for the remainder of the period prior to the first scheduled replacement date for the part.
6. Replacement of any part under this Warranty with a Pleasurecraft supplied part, will not shorten nor extend the warranty period(s) stated in paragraphs one (1) thru five (5) above.
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 Pleasurecraft warranty station.
8. To insure prompt repair under this Warranty, Pleasurecraft will maintain a supply of warranted parts sufficient to meet the expected demand for such parts. Any replacement part may be used in the performance of any warranty maintenance or repairs and will be provided by Pleasurecraft without charge to the owner.

SERVICE and WARRANTY - 1

9. Parts covered under this warranty are: spark plugs, spark advance/retard system, ignition coil and/or control module, ignition wires, PCV valve, oil filler cap, intake valve(s), intake manifold, exhaust manifold, exhaust valve(s) hoses, clamps, fittings, tubing, sealing gaskets or devices, mounting hardware, pulleys, belts and idlers, temperature check, and valves and switches and electronic controls.
10. Exclusions: The repair or replacement of any warranted part otherwise eligible for coverage under this Warranty may be excluded from such warranty coverage if Pleasurecraft demonstrates that the engine and/or part has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for repair or replacement of the part.
11. Pleasurecraft original equipment parts are "identical in all material respects to that part as described in the engine manufacturer's application for certification". The use of any replacement parts not supplied by Pleasurecraft may not meet this requirement and will be grounds for disallowing a claim made under this Warranty. Pleasurecraft will not be liable under this Warranty to provide warranty coverage for product failures caused by parts other than Pleasurecraft original equipment parts.
12. If you have any questions regarding your warranty rights and responsibilities, or the location of Pleasurecraft warranty stations, you should contact Pleasurecraft at 1-803-345-0050.



BOATING RESPONSIBILITIES - 2

CARBON MONOXIDE HAZARD



DANGER

Carbon Monoxide (CO) is a colorless, odorless and tasteless gas. You cannot see it, smell it or taste it. Prolonged exposure to carbon monoxide can lead to unconsciousness, brain damage or death!

Carbon monoxide is produced when anything that contains carbon, such as gasoline, natural gas, oil, propane, coal or wood is burned. Carbon monoxide is commonly found in the exhaust of internal combustion engines (boat power plants, generators, etc.). In addition, open flame devices like cooking ranges, heaters and charcoal grills also produce carbon monoxide.

Carbon monoxide accumulation, in and around boats is affected by vessel geometry; overall vessel design; closeness to other structures; wind direction; boat speed; and many other variables. In no way can this section cover all of the possible variables. Do not rely on this section as the exclusive listing of measures to prevent the accumulation of carbon monoxide.

Consult your boat operators manual for detailed information on the inspection and/or maintenance of the exhaust system for your particular application. If an inspection reveals possible leaks, DO NOT operate your engine(s) until it can be serviced by a qualified technician.

Proper and adequate air circulation, around and throughout the boat, is absolutely necessary to aid in the prevention of carbon monoxide build-up. If you have any questions or concerns regarding the operation of your boat and carbon monoxide hazards, DO NOT operate your engines until you have contacted your boat manufacturer.

To find out more about making boating safer, including how you can prevent carbon monoxide poisoning on recreational boats, contact:

National Marine Manufacturers Association

200 East Randolph Drive
Suite 5100
Chicago, IL 60601-6528
www.nmma.org
312-946-6200

United States Coast Guard

Office of Boating Safety
CG Headquarters G-OPB-3
2100 Second Street SW
Washington, DC 20593
www.uscgboating.org
202-267-0984

American Boat & Yacht Council, Inc.

3069 Solomon's Island Road
Edgewater, MD 21037-1416
www.abyc.com
410-956-1050

2 - BOATING RESPONSIBILITIES

SAFE BOATING SUGGESTIONS

The nation's waterways are becoming increasingly crowded and, in order to enjoy them safely, the operator should acquaint himself/herself with safe boating practices. Boating safely and seamanship courses are offered by the following national and state organizations:

- Power Squadrons
- Coast Guard Auxiliary
- Red Cross
- State, provincial or local agencies in charge of water safety enforcement

PCM Engines highly recommends that all power boat operators attend one of these courses. To help locate a course being offered near you, contact Boat U.S. Foundation's toll-free national boating safety hotline, 1-800-336-BOAT, and in Virginia, 1-800-245-BOAT.

WATER WISDOM

The following are suggestions for safe operation of your boat to ensure the safety of yourself and your passengers:

- Know your boat's loading and operating limitations. **DO NOT OVERLOAD!**
- Make periodic checks of safety equipment onboard.
- Do not consume alcoholic beverages or take illegal drugs when operating a boat. Some state laws apply to boats as well as motor vehicles.
- File a "float plan." Let someone know your destination and your expected time of return.
- Monitor the weather. Know the signs of weather change and avoid severe weather and rough seas whenever possible.
- Follow the "Rules of the Road" when boating. Always be on the alert and watch out for "the other guy."
- Plan and chart your course. Be aware of, and avoid, hazardous areas.
- Be sure your boat is equipped with the required safety equipment. Check with the Coast Guard and local government agencies as to the regulations and restrictions in your area. Contact your local Coast Guard Auxiliary and take advantage of their seasonal boat inspections.

The following is a list of suggested safety equipment and spare parts which may be useful in case of an emergency:

- Approved personal flotation devices (life jackets); one for each person on board.
- Approved throwable personal flotation device for man-overboard protection.
- Approved fire extinguishers
- Signal devices: flares, spotlight, signal flag and horn or whistle
- PCM Engines' "Onboard Kit," plus spare fuses, bulbs, batteries, etc. Tools necessary for minor repairs
- Spare propeller
- Anchor and anchor line
- First aid kit and first aid book
- Ship-to-shore radio, compass and chart of the area in which you are traveling
- Manual bilge pump and spare drain plugs
- Waterproof storage containers

OPERATION AND MAINTENANCE

It is the owner's/operator's responsibility to perform all safety checks before operating his/her boat. All lubrication and maintenance schedules must be adhered to assure optimum performance and dependability from your PCM engine. When service and maintenance are required, return to your authorized PCM Engine Dealer.

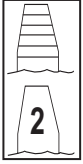


BOATING RESPONSIBILITIES - 2

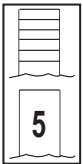
RULES OF THE ROAD

Channel Buoy Guide

The color of the paint is the only characteristic which has the same meaning on all buoys. Red buoys always indicate the starboard side of the channel from seaward. (Red Right Returning)



1. **Nun Buoy:** This buoy indicates the starboard side of the channel when returning from sea. It is conical shape, the color red and indicates even numbers. A nun buoy with red and green horizontal bands (top band red), and not numbered, indicates an obstruction. The principal channel is to the left of the buoy when returning from sea.



2. **Can Buoy:** This buoy indicates the port side of the channel when returning from sea. It is cylindrical shape, the color green and indicates odd numbers. A can buoy with green and red horizontal bands (top band green), and not numbered, indicates an obstruction. The principal channel is to the right of the buoy when returning from sea.



3. **Lighted Buoy (RED):** This buoy has a flashing red light. It indicates the starboard side of the channel when returning from sea.



4. **Lighted Buoy (GREEN):** This buoy has a quick flashing green light. It indicates the port side of the channel when returning from sea. The quick flashing light indicates special caution required.

Small Craft Winds up to 38 MPH	Gale Winds 38 - 54 MPH	Storm Winds over 55 MPH	Hurricane Winds over 63 MPH

Storm Warning Signals - Pennants (by day) Lights (by night)

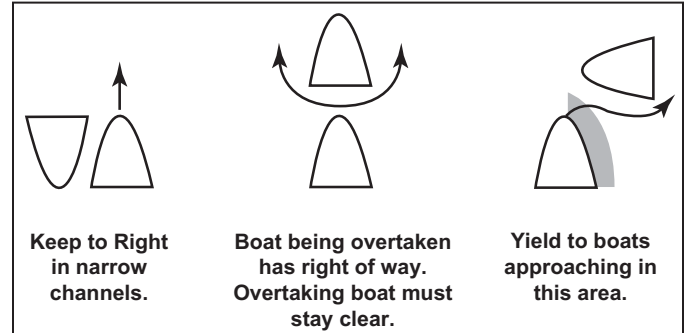
Boat Capacity

- Load only to manufacturer's specifications
- Distribute load evenly; keep it low
- Passengers should only ride on the parts of the boat that are designed for that purpose
- If water is rough, carry fewer passengers

Observe the Rules of the Road

PORT (Left) - Leaving the harbor with green buoys to your right.

STARBOARD (Right) - Entering the harbor with red buoys to your right.



Know Your Horn Signals

- 1 Short Blast = Passing you on my port side
- 2 Short Blasts = Passing you on my starboard side
- 3 Short Blasts = I am going astern
- 5 Short Blasts = Danger

Always refer to the latest U.S. Coast Guard Navigation Rules CG-169

Keep An Alert Lookout For:

Bad weather, Swimmers, Other boats, Water skiers, Fisherman, Divers and/or any other obstructions

Keep Your Wake Under Control, particularly upon entering or leaving harbor areas. You are responsible for wake damage to other vessels and/or property.

Do Not Fool With Fuel

1/2 pint of gasoline = 15 sticks of dynamite

1. During fueling, moor boat properly; remove all passengers.
2. Keep all doors, hatches and ports closed.
3. Shut down all electronic gear; extinguish galley fires, pilot lights and smoking materials.
4. Do not overload tanks.
5. Keep filling nozzles in contact with the fill pipe to prevent sparks.
6. Secure the fill cap tightly; wipe away any spillage.
7. Ventilate all components for a minimum of five minutes before starting engines.
8. Keep fuel lines and bilges clean.

3 - ENGINE IDENTIFICATION

ENGINE IDENTIFICATION

When ordering service parts or obtaining information, always give the engine model and the serial number. This information can be found on the following decal.



Figure 3-1 Engine Identification Decal

OWNER IDENTIFICATION AND REGISTRATION INFORMATION

We suggest that you record the following information for quick reference when ordering parts or requesting service or warranty.

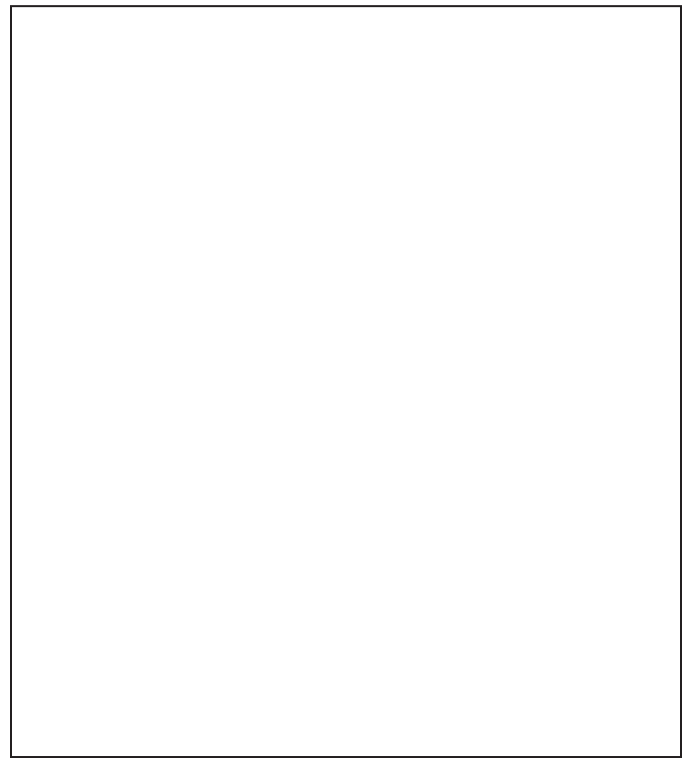


Figure 3-2 Engine Identification Tag Locations (8.1L)

	PORT	STARBOARD
Engine Model Number:		
Serial Number(s):		
Gear Model Number:		
Serial Number(s):		
Boat Make:		
Boat Model:		
Hull Serial Number:		
Propeller Size:		
Ignition Key Number:		

ENGINE IDENTIFICATION - 3

PCM

2006 MODEL IDENTIFICATION / ADVISORY

MODEL 0 2 - 6 0 0 V - 0 1 SERIAL 460000

1st - 2nd Space: **MANUFACTURING CODE**

3rd - 5th Space: **ENGINE CODE**

810	= 8.1L	(496 CID MPI)	(GM)
811	= 8.1L	(496 CID H.O. MPI)	(GM)
600	= 6.0L	(364 CID MPI)	(GM)
570	= 5.7L	(350 CID LH MPI)	(GM)
571	= 5.7L	(350 CID RH MPI)	(GM)
572	= 5.7L	(350 CID LH Carburetor)	(GM)
573	= 5.7L	(350 CID RH Carburetor)	(GM)
500	= 5.0L	(305 CID LH MPI)	(GM)
501	= 5.0L	(305 CID RH MPI)	(GM)
502	= 5.0L	(305 CID LH Carburetor)	(GM)
503	= 5.0L	(305 CID RH Carburetor)	(GM)

6th Space: **DRIVE CONFIGURATION**

Blank - Direct Drive

V - V-Drive

7th - 8th Space: **SPECIFICATION CODE**

SERIAL NUMBER I.D.

1st DIGIT INDICATES DECADE ENGINE WAS MANUFACTURED (3 = 1990, 4 = 2000, 5 = 2010)
2nd DIGIT INDICATES YEAR ENGINE WAS MANUFACTURED.

4 - ELECTRONIC FUEL INJECTION INFORMATION

ELECTRONIC FUEL INJECTION SYSTEM

The PCM engines covered in this manual are equipped with an Electronic Fuel Injection (EFI) system, which allows precise control of fuel and spark delivery. The fuel system components of the EFI system are:

- The electric fuel pump
- The throttle body assembly
- The fuel injectors

The fuel injection system is controlled by an Electronic Control Module (ECM). The ECM is the decision center of the system. The ECM constantly monitors information from various sensors on the engine, and electronically processes the information, in order to control ignition timing and fuel delivery for optimum performance and fuel economy. The ECM incorporates an engine overspeed protection, calibrated to a specific RPM, to prevent engine damage from over-revving.

The sensors that the ECM monitors are:

- Engine Coolant Temperature (ECT) Sensor
- Throttle Position (TP) Sensor
- Manifold Absolute Pressure (MAP) Sensor
- Knock Sensor (KS) System
- Crankshaft Positioning (CKP) Sensor
- Camshaft Positioning (CMP) Sensor
- Intake Air Temperature (IAT) Sensor

POWER REDUCTION MODE

The ECM monitors engine oil pressure and engine coolant temperature whenever the engine is running. If either one of these inputs indicate an abnormal reading, the system will go into "Power Reduction" mode, followed by the illumination of an indicator lamp and/or sounding of the warning buzzer (if equipped). This is a feature that will help protect the engine during an over-temp or low oil pressure condition.

When in "Power Reduction" mode, the ECM will allow normal engine performance up to 2000 RPM. Above 2000 RPM, the ECM allows fuel delivery through only half of the fuel injectors. Once the RPM is brought down below 1200 RPM, normal engine operation is restored until the RPM exceeds 2000 RPM. The feature allows maneuverability of the boat while removing the possibility of high engine speed operation until the problem is corrected.

NOTICE: If it is not possible to safely shut off the engine, return the engine to idle speed. Once returned to idle, the ECM will allow the engine to operate normally below 2000 RPM.

OPERATING INSTRUCTIONS - 5

ENGINE ALARM SYSTEM (IF EQUIPPED)

The PCM engine electronic system is programmed to control the engine alarm system. This system utilizes an audible alarm and/or optional indicator lamps to warn the operator of possible engine problems, and that the engine has entered the “Power Reduction” mode as covered earlier in this manual.

The alarm has a “self” checking feature programmed into the system. This feature will sound the alarm for two short pulses upon initial start-up of the engine.

If the alarm sounds during operation, immediately throttle back to idle speed. Observe the indicator lamps to locate the problem circuit. The engine should be shut off to prevent damage to the engine.

NOTICE: Some boat builders may install their own alarm system. It is recommended that the boat owner check with his or her boat dealer for an explanation of the particular alarm system upon initial delivery.

INSTRUMENTATION

Boat manufacturers install many different types of instrumentation on boats. Become familiar with the instrumentation on your boat and be aware of abnormal operating conditions. The following is a brief explanation of typical instrumentation found on most boats:

1. Tachometer - indicates the engine RPM (revolutions per minute)
2. Engine Synchronizer (twin engines only)
3. Water Temperature Gauge - indicates the engine coolant temperature
4. Oil Pressure Gauge - indicates the engine oil pressure
5. Voltmeter - indicates the battery voltage and charging system voltage
6. Hour Meter - indicates the engine operating time
7. Fuel Level Gauge - indicates the fuel tank level
8. Check Engine Lamp - indicates a problem with the engine control system

5 - OPERATING INSTRUCTIONS

STARTING ENGINE (FUEL INJECTED ENGINES)

IMPORTANT: The following items should be checked before starting the engine, and each time the boat is operated:

- Fuel system for any signs of leakage
- Operation of remote controls and steering
- Engine and transmission oil levels
- Fuel tank levels
- Exhaust system for leaks and tightness of the clamps
- Battery connections and water level in battery cells
- Accessory drive belt(s)
- Cooling system for leaks. Check coolant level. Check for signs of coolant leaks. If the water is leaking externally, it is possible that the water is also leaking internally. This could result in internal engine damage. It is very important to service these maintenance items as soon as a problem is indicated.

After performing the initial safety checks, proceed as follows to start the engine:

1. Turn the battery switch ON (if equipped).
2. Open the fuel valve.
3. Do not pump or open the throttle when starting the engine. The ECM will automatically regulate the fuel and control desired idle speed.
4. Turn the ignition key to the start position. When the engine starts, release the key.

NOTICE: Engine idle speed is controlled by the ECM and is based on the operating temperature of the engine. Upon initial start-up, engine RPM will be slightly higher and will automatically decrease as the engine operating temperature increases.

5. **In the event the engine becomes flooded,** move the throttle lever to a 100% open position. At this throttle position, the ECM will command the injectors to deliver no fuel during engine cranking. When the engine starts, return the throttle back to the idle position.

IMPORTANT: If the engine fails to start within 20-30 seconds, turn the ignition key to the OFF position and allow 2 minutes for the starter motor to cool off before attempting to restart the engine.

NOTICE: If engine still fails to start, contact your PCM Engine Dealer for service.

6. Check engine oil pressure immediately after the engine starts. If oil pressure is not within specifications (see Engine Specifications), immediately stop the engine and determine the cause.
7. Check voltmeter for proper charging system operation.
8. Check the engine and gear box for fuel, oil, and coolant leaks.
9. Allow the engine to reach normal operating temperature. Check the temperature gauge to ensure the engine is operating within the normal temperature range. If the temperature is abnormally high, stop the engine immediately and determine the cause.

STOPPING ENGINE

When returning to the dock, or whenever stopping the engine, bring the throttle back to the idle position. After the engine reaches idle speed, turn the ignition key to the OFF position.

Before stopping the engine after extended high speed operation, allow the engine to idle at 1200 RPM for 3 to 5 minutes to allow the engine to cool down before shutting off the ignition.

After stopping the engine, complete the following:

1. Turn the battery switch OFF, if equipped.
2. Close the fuel valve.



CONDITIONS AFFECTING OPERATION - 6

PROPELLER SELECTION

Best all-around performance and maximum engine life is achieved when the engine is propped to run near the top of (but within) the recommended full throttle RPM range with a normal load. See ENGINE SPECIFICATIONS for rated full throttle RPM for your model engine.

Generally, gross weight (total weight of the entire boat, including full fuel and water, optional equipment, passengers and other miscellaneous gear) is one of the major factors and should be one of the primary considerations when selecting a propeller. Other factors to take into consideration are as follows:

- Warmer weather and higher humidity will cause an RPM loss.
- Operating the boat in a higher elevation will cause an RPM loss.
- Operating the boat with an increased load will cause an RPM loss (additional equipment, passengers, etc.).

If full throttle RPM is above or below the recommended range as stated in ENGINE SPECIFICATIONS, the propeller must be changed to prevent loss of performance.

ENGINE RPM CHART

Model	Minimum Full Load	Preferred	Maximum
8.1L (HO)	4600	5000	5200
6.0L	4800	5200	5300



CAUTION

Prolonged WOT operation will shorten the life of your engine and could cause premature engine failure. See NORMAL CRUISING SPEEDS in SPECIFICATIONS. Problems caused by WOT operation are considered abuse and are not covered under the PCM Warranty.

NOTICE: These engines incorporate an RPM “REV LIMIT” in order to prevent the engine from over-revving.

7 - ENGINE BREAK-IN PERIOD



WARNING

Use this procedure **ONLY** when conditions are such that it can be done in complete safety.

The break-in period of your engine is the first 25 hours of operation. Proper engine break-in is essential to achieve maximum performance, longevity and minimum oil consumption. During the break-in period, the following operation guidelines must be adhered to:

- After the engine is thoroughly warmed up, and the boat is underway, open the throttle to wide open throttle until maximum RPM is reached. **DO NOT EXCEED MAXIMUM RPM.** (RPM should cease climbing after 10 to 20 seconds).



CAUTION

DO NOT operate at full throttle in neutral at any time, or at sustained full throttle during the first 5 hours of operation. Thereafter, use sustained wide open throttle in the event of an emergency.

- Reduce the throttle to 2800 - 3000 RPM, and cruise at or below this speed for 1/2 hour. Reduce the speed to idle. Go to wide open throttle until maximum RPM is reached and operate for approximately 1 minute. Reduce throttle to 2800-3000 RPM and operate for a few minutes. (Bringing the engine speed from idle to wide open throttle will load the engine and assist in seating the piston rings). This cycle can be repeated from time to time during the first 5 hours of operation, but wide open throttle should not be sustained for more than 1 minute.
- During the early part of the break in period, the correct propeller selection can be confirmed. (With a normal load aboard, the engine's RPM should reach, but not exceed, the maximum RPM as listed in the specifications section).
- During the break in, all gauges should be watched carefully, and the speed should be reduced if abnormal readings become evident.



CAUTION

DO NOT attempt to break in any engine by prolong idling, or running at the dock.

The engine oil level should be checked often and oil added when necessary. It must be understood that every internal combustion engine will use a certain amount of oil during operation to act as a lubricating and cooling agent, especially during the break-in period. Oil consumption should decrease and become stabilized after approximately 100 hours of operation.

At the end of your 25-hour break-in period, contact your dealer and have the recommended 25-hour inspection done.

NOTICE: PCM Engines assumes no responsibility for the costs related to the 25-hour inspection. This is the owner's responsibility.

25-HOUR ENGINE INSPECTION - 8

After the first 25 hours of operation, it is recommended that the engine be given an inspection. Your boat dealer or a PCM servicing dealer should be contacted to perform the necessary checks and adjustments to ensure the proper engine performance. The following maintenance should be performed:

- Change the engine oil and filter.
- Replace the primary fuel filter
- Check the engine alignment.
- Inspect the accessory drive belt(s) and check the tension.
- Check all the fluid levels.
- Check the throttle cable adjustments and check for freedom of movement.
- Cooling System - Inspect all the hoses for leaks, damage and deterioration. Check all the hose clamps for adequate tightness.
- Exhaust System - Inspect the entire exhaust system for leaks, damage and deterioration.
- Battery - Check the electrolyte level and specific gravity. Inspect the case for damage. Check the battery cables and connections.
- Engine Assembly - Check for loose, missing or damaged parts. Pay close attention to engine mounts, starter and alternator mounting fasteners.

NOTICE: PCM Engines assumes no responsibility for the costs related to the 25-hour inspection. This is the owner's responsibility.

9 - FUEL REQUIREMENTS

GASOLINE REQUIREMENTS

WARRANTY NOTICE: Damage caused to the engine through the use of improper gasoline, low-quality or gasoline with an octane rating below the minimum requirements listed below, is considered misuse of the engine. Such damage is not covered by the PCM Engines warranty.

The ignition timing set by the factory requires the use of a high-quality lead-free regular gasoline with the following octane specification.

Pump Octane Number (R+M/2) (PUMP) - 87

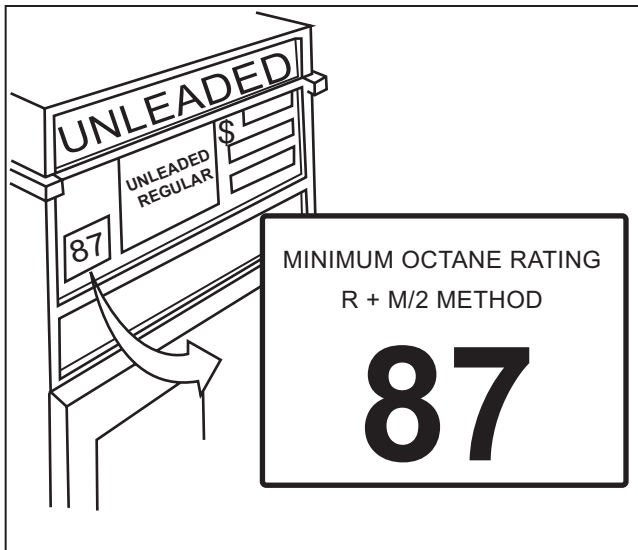


Figure 9-1 Fuel Requirements

NOTICE: Most PCM Fuel Injected engines are calibrated to operate on 87 octane fuel and maximum performance is obtained when using this fuel. Some applications may require a higher octane fuel. These particular applications will be noted.

If a slight pinging is heard during acceleration and the proper octane fuel is being used, it is considered normal. If a constant, heavy knock occurs, the engine should be evaluated by a PCM Engine service technician.

GASOLINE CONTAINING ALCOHOL

Gasoline containing alcohol, either ethanol (ethyl alcohol) or methanol (methyl alcohol) is not recommended for use in your engine. Gasoline containing alcohol will attract and hold moisture and may cause the following:

- Hard starting and operating difficulties (vapor lock, low speed stalling)
- Corrosion of metal parts
- Excessive wear and damage to internal engine parts
- Fuel permeation through flexible fuel lines
- Deterioration of some nonmetallic materials

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

If gasoline containing alcohol is used, or if the presence of alcohol is uncertain, more frequent inspections of the complete fuel system are required. Any sign of fuel leakage or deterioration must be repaired immediately before further engine operation.



CAUTION

Fire and Explosion Hazard - Gasoline is extremely flammable and highly explosive, and, if ignited, can cause serious bodily injury or death. Careful inspection of the entire fuel system including, but not limited to, fuel tanks, fuel lines, fuel filters and all fittings is mandatory, especially after periods of storage. Replace any component that shows signs of leakage, corrosion, deterioration, swelling, hardening or softening.

NOTICE: Some gasolines contain an octane-enhancing additive called methylcyclopentadienyl manganese tricarbonyl (MMT), and they should not be used. These fuels may reduce spark plug life, and engine performance may be effected.

OIL REQUIREMENTS - 10

ENGINE OIL RECOMMENDATIONS

Use of Supplemental Additives

Engine oils meeting PCM Engines' recommendations already contain a balanced additive treatment. The use of supplemental additives which are added to the engine oil by the customer are unnecessary and may be harmful. PCM Engines does not review, approve or recommend such products.

Synthetic Oils

Synthetic engine oils are not recommended for use in PCM Engines. Synthetics may offer advantages in cold temperature pumpability and high temperature oxidation-resistance. However, synthetic oils have not proven to provide operational or economic benefits over conventional petroleum-based oils in PCM Engines. Their use does not permit the extension of oil change intervals.

Engine Oil Requirements

The following chart shows the recommended oil viscosity for various ambient temperature ranges:

Prevailing Ambient Temperature	Recommended A.P.I. Classification & Viscosity
Above 50°F	SAE 15W-40 "SM"
Below 50°F	SAE 5W-30 "SM"

IMPORTANT: The use of oils which contain "solid" additives, non-detergent oils or low quality oils specifically are not recommended.

WARRANTY NOTICE: PCM Engines reserves the right to refuse warranty on part(s) and/or engine(s) damaged by using improper fuels and engine oils.

Oil Change Intervals (Common)

Crankcase oil and oil filter change - Recommended intervals:

- Initial oil change - 1st 60 days or 25 hours of operation, whichever occurs first
- Regular oil changes - Every 50 hours of operation or 120 days, whichever occurs first

ENGINE MAINTENANCE

Refer to the MAINTENANCE SCHEDULE for a complete listing of required maintenance and the frequency at which it should be performed. Some procedures may be performed by the owner/operator while others should be performed by an authorized PCM Engines Dealer. Before performing any maintenance or repair procedure not covered in this manual, it is strongly recommended that a PCM Engines repair manual be purchased and read thoroughly.

CHECKING FLUID LEVELS

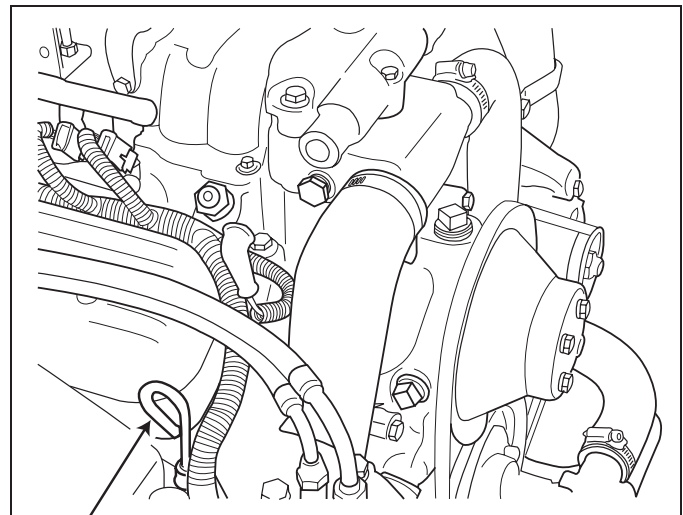
Engine Crankcase Oil



CAUTION

Do not overfill engine crankcase with oil, as excess oil will be splashed by reciprocating engine parts onto the cylinder walls in greater quantity than the rings can control. The oil, subsequently, will be drawn into the combustion chamber and burned. Continuous operation under these conditions can cause carbon to form on combustion chamber surfaces, which will adversely affect engine performance and may lead to premature engine failure. Splashing or agitation of oil also may cause it to become aerated, which will affect the oil pressure, and may result in internal engine damage from lack of lubrication.

1. Stop the engine if running. Allow approximately 5 minutes for the oil to drain back into the oil pan.
2. Remove the dipstick, wipe it clean, and reinstall it fully into the dipstick tube.
3. Remove the dipstick and observe the oil level. The oil level must be between the "FULL" and "ADD" marks. If the oil level is below the "ADD" mark, add specified oil to bring the level up to, but not over, the "FULL" mark on the dipstick. (Figure 11-1).



ENGINE OIL
DIPSTICK

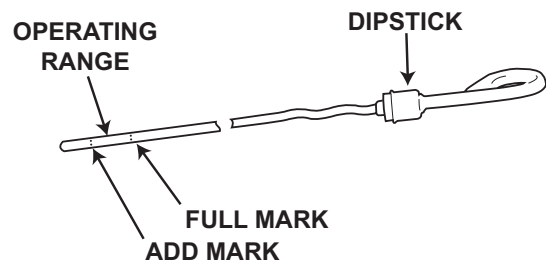


Figure 11-1 Engine Oil Dipstick (Typical)



WARNING

The machinery space must be closed anytime the engine is running to prevent injury to you or others on board. Never operate the engine with the engine machinery space open while someone is in the machinery space, either closed or open. Never open the machinery space unless the engine is shut off and the engines rotating parts are stationary. Rotating machinery can cause injury and even death if an accident should occur. Extreme care must be exercised if a problem exists that requires operation of the engine with the machinery space open. ***IT IS RECOMMENDED THAT UNCOVERED ENGINE OPERATION BE ATTEMPTED BY TRAINED AND QUALIFIED SERVICE PERSONNEL ONLY.***

ENGINE MAINTENANCE - 11

LUBRICATION

Throttle Cable

Lubricate pivot points and exposed cable (Figure 11-2) with SAE 30W-30 engine oil.

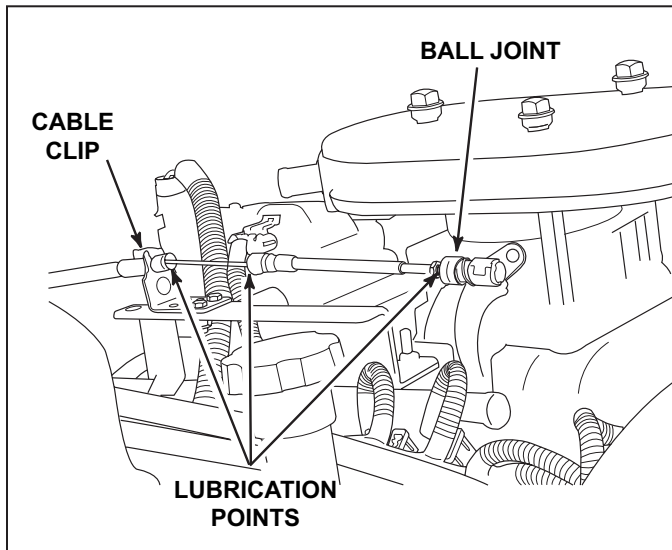


Figure 11-2 Typical Throttle Cable

ELECTRICAL SYSTEM CIRCUIT BREAKER

Main Circuit Breaker

PCM engines are equipped with a circuit breaker which provides electrical overload protection for both engine and instrumentation wiring and components. Should an electrical overload occur, the circuit breaker will open and prevent electrical current flow.

When this circuit breaker opens, the cause for the high current draw must be found and corrected. The circuit breaker can be reset by pushing the "Reset" button IN after waiting a few minutes. If the cause of the overload cannot be found, disconnect all accessories which are connected to the main wire harness.

If resetting is still not possible, check the battery and alternator connections and all other harness connectors on the main harness. Check for loose or disconnected lead wires and shorted circuits.

ELECTRICAL SYSTEM FUSES

PCM engines utilizes fuses to control the fuel pump, ECM and fuel injectors. The fuse block is mounted to a bracket on the starboard rear of the valve cover.

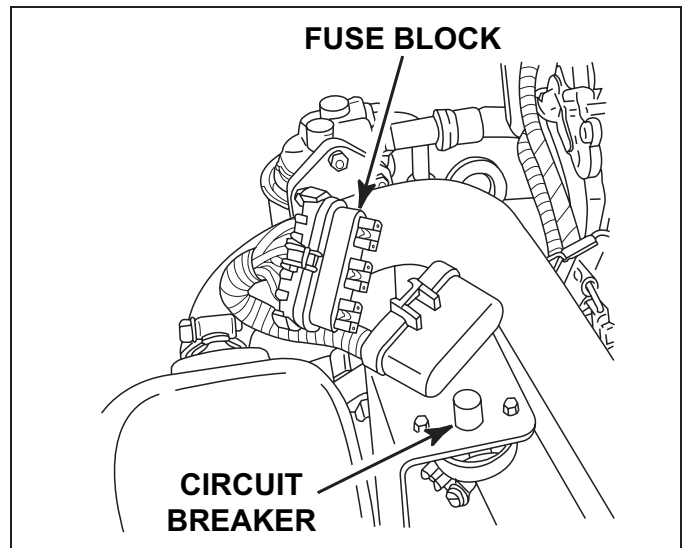


Figure 11-3 Typical Electrical System Circuit Breaker and Fuses

IGNITION FUSE

If the engine will not crank when the ignition key is turned to the START position, and the main circuit breaker is not tripped, check for blown ignition fuse. The ignition fuse may be located on the instrument panel, the fuse holder block or as part of the instrument wiring harness. Check the wiring diagrams supplied from the boat manufacturer for the exact location.



WARNING

Always disconnect the battery cables from the battery, when servicing the electrical system, to prevent personal injury and to prevent damage to the electrical system components.

ELECTRICAL SYSTEM WIRING AND CONNECTORS

The electrical system wiring and connectors should be checked periodically for loose or dirty connections and damaged wiring. If electrical components or wiring show signs of corrosion, deterioration or damage, consult a PCM Engine dealer to make necessary repairs.

11 - ENGINE MAINTENANCE

BATTERY



WARNING

Battery electrolyte is a corrosive acid and should be handled with care. If electrolyte is spilled or splashed on any part of the body, IMMEDIATELY flush the exposed area with liberal amounts of water and obtain medical aid as soon as possible. Safety glasses and rubber gloves are recommended when handling batteries or filling with electrolyte.



WARNING

Hydrogen gases that escape from the battery when charging are highly explosive. Do not use jumper cables and a booster battery to start the engine. Do not recharge a weak battery in the boat. Remove the battery from the boat and recharge in a well ventilated area away from fuel vapors, sparks and open flames.

Follow maintenance instructions and warnings as supplied by the battery manufacturer. If this information is not available, follow these guidelines for the proper battery care.

- Do not operate the engine with an open in the battery circuit, as this may cause damage to the alternator. Make sure that all connections are clean and secure.
- When removing the battery cables, always remove negative (-) cable first, and then remove the positive (+) cable. When installing battery cables, install the positive (+) cable first, then install the negative (-) cable.
- Periodically check the battery for signs of corrosion, frayed battery leads or cracked case. Repair or replace as necessary.
- Periodically check the electrolyte level. Add distilled water to bring up to the proper levels.

TESTING COOLANT FOR ALKALINITY

It is recommended that the coolant in the fresh-water section be tested each year for alkalinity. Coolant that is not alkaline has lost the effectiveness of its rust inhibitors, which can lead to internal corrosion and cooling system problems. It is recommended to replace the standard ethylene glycol coolant in the system every two years to prevent a build-up of harmful chemicals within the fresh-water system.



WARNING

Do not remove cooling system filler cap when the engine is hot. Allow the engine to cool and then remove the pressure cap slowly, allowing the pressure to vent. Hot coolant, under pressure, may discharge violently and cause severe burns.

1. Obtain red litmus paper from a local supplier (drugstore, laboratory, etc.).
2. Remove the pressure cap from the coolant filler neck and insert one end of the litmus paper into the coolant.
3. If red litmus paper turns blue, coolant is alkaline and does not need to be replaced. If the litmus paper remains red, the coolant is not alkaline and must be replaced.

ENGINE MAINTENANCE - 11



WARNING

Do not remove cooling system filler cap when the engine is hot. Allow the engine to cool and then remove the pressure cap slowly, allowing the pressure to vent. Hot coolant, under pressure, may discharge violently and cause severe burns.

DRAINING FRESH-WATER COOLING SYSTEM

NOTICE: To protect the environment, dispose of coolant properly. Check your local restrictions for proper disposal instructions of removed coolant.

NOTICE: Refer to cooling system water flow diagrams for drain locations.

1. Remove the following drain plugs to drain coolant from the fresh-water cooling system:
 - Remove the large hose from the engine block water circulating pump, or drain plug on circulation pump
 - Drain plugs on the cylinder block (one on each side)
2. After system has drained completely, coat all the drain plugs with PerfectSeal (or equivalent) and reinstall in the proper locations. Reinstall the hose(s) on the water circulating pump and tighten the clamps securely.

FILLING FRESH-WATER COOLING SYSTEM

A new extended life engine coolant known as DEX-COOL™ is recommended for use in your engine. It is imperative to note the following about DEX-COOL™ engine coolant:

- IT IS PINK IN COLOR TO DISTINGUISH IT FROM CONVENTIONAL COOLANT.
- THE SERVICE CHANGE INTERVAL ON ENGINES BUILT WITH DEX-COOL™ IS 5 YEARS.
- TO MAINTAIN FULL CORROSION PROTECTION DURABILITY, DEX-COOL™ MUST NOT BE MIXED WITH CONVENTIONAL (CONTAINING SILICATE) ENGINE COOLANTS.
- DEX-COOL™ IS AN ETHYLENE GLYCOL BASED PRODUCT, THEREFORE, BOIL AND FREEZE PROTECTION ARE MEASURED IN THE SAME FASHION AS CONVENTIONAL COOLANTS.

TO FULLY REALIZE ITS MANY ADVANTAGES, DEX-COOL™ MUST NEVER BE MIXED WITH CONVENTIONAL COOLANTS.

DEX-COOL™ can become contaminated by inadvertently topping-off with conventional coolant, adding conventional coolant to the system or even if fill/drain containers are shared between coolants. If contamination occurs, the cooling system must be immediately drained and flushed, and refilled with DEX-COOL™. No short-term damage will occur, however, the service interval will be reduced from 5 years to 2 years.

The fresh-water cooling side of the cooling system must be filled with a 50/50 mixture of DEX-COOL™ (or equivalent, which meets GM6277M) extended life antifreeze and water solution.

IMPORTANT: More than 50% antifreeze solution can contribute to an overheating condition.

1. Make sure that all drain plugs are properly installed.
2. Remove the pressure cap. Fill the system with antifreeze solution until the system is filled. See ENGINE FLUID CAPACITIES for system capacities.
3. Start the engine and operate at idle speed (800-1000 RPM) to purge any air from the system. When the system is full, install the pressure cap.

11 - ENGINE MAINTENANCE

FUEL SYSTEM DESCRIPTION



WARNING

Extreme caution must be exercised when servicing the fuel system and/or replacing fuel filter. Gasoline is extremely flammable and highly explosive under certain conditions. Be sure the ignition key is off and do not smoke or allow open flame in the area while servicing. Wipe up any spilled fuel immediately.



WARNING

Extreme caution must be exercised when servicing the fuel system. The fuel system operates under high pressure. Use caution when removing or replacing components, as residual pressure may be present.



WARNING

Make sure that there are no fuel leaks before closing the engine hatch.



WARNING

Visually inspect unit for fuel leaks before operating the engine. If fuel leaks are present, DO NOT operate the engine, contact your service center immediately.

Fuel Control Cell (FCC) Fuel System

The Fuel Control Cell (FCC) eliminates vapor lock and air ingestion caused by fuel tank slosh, and provides the necessary filtration and water separation.

The FCC system incorporates two (2) fuel pumps to provide an uninterrupted flow of fuel to your PCM marine engine. Fuel is fed into the FCC bowl by a low-pressure, high-volume electric fuel pump. This pump flows fuel at a volume much greater than the fuel flow rate required of the high-pressure pump and engine demands. The high-pressure pump, mounted inside the FCC bowl, provides the necessary fuel pressure and volume to maintain proper engine performance. The FCC constantly has an ample supply of fuel to meet the idle, cruise and acceleration fuel requirements of the engine.

The fuel pressure regulator, located on the fuel rail, controls the fuel pressure, and maintains a constant pressure across the fuel delivery system. Excess fuel, not used by the engine, returns to the FCC bowl.

The fuel delivered to the engine by the FCC is filtered by a filter and water separator element, which surrounds the high pressure pump inside the FCC bowl.

As indicated above, fuel enters the FCC bowl from two (2) locations, the low-pressure pump (initial input) and the fuel pressure regulator (unused, recirculating fuel). Fuel exits the FCC bowl at two (2) locations, the high-pressure output to the fuel injection system and all excess fuel in the FCC bowl is routed back to the tank via the return line.

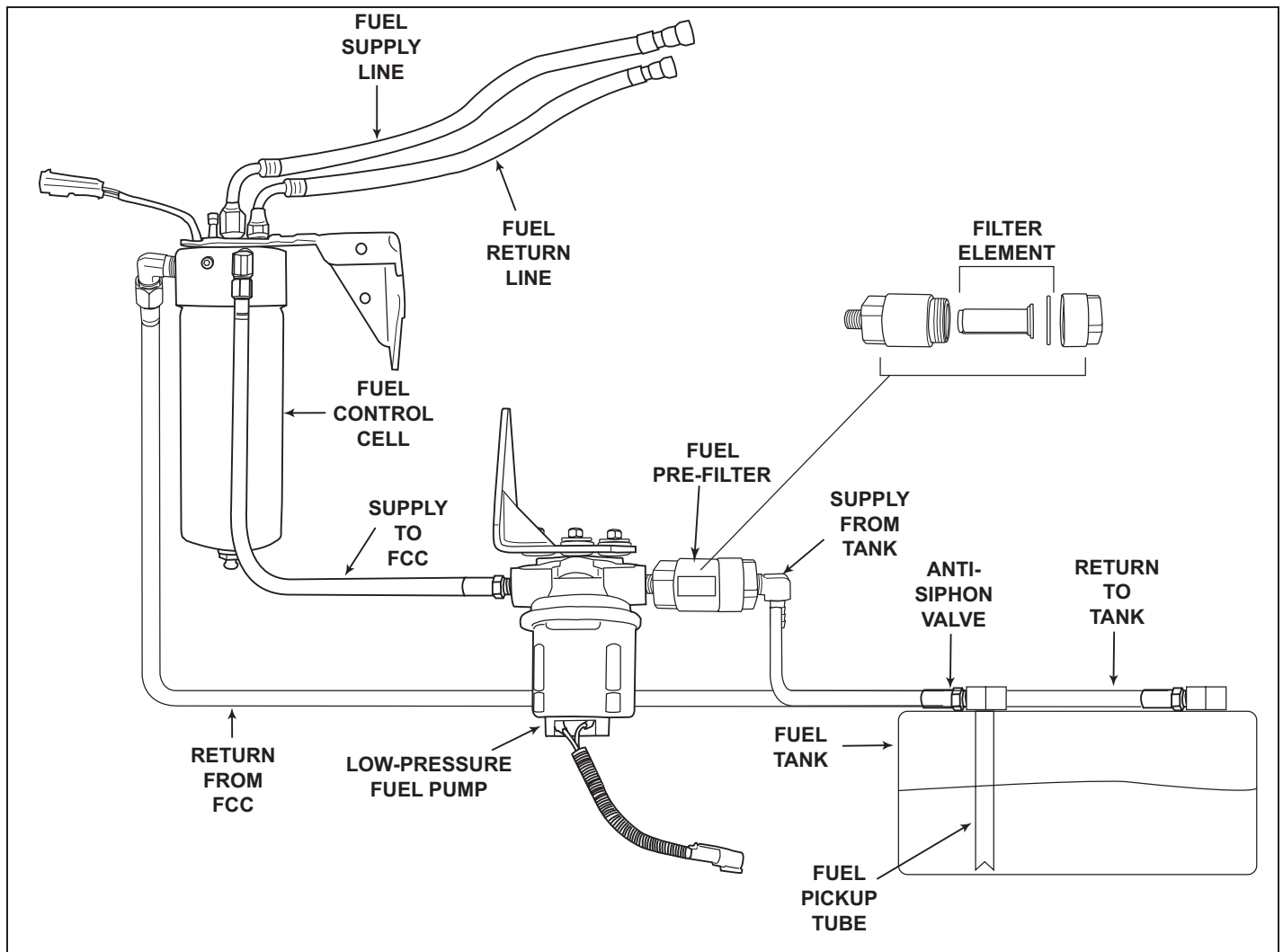


Figure 11-4 Fuel Control Cell (FCC) Fuel System (Typical)

Servicing the FCC

The frequency of draining the water or replacing the filter element is determined by the contamination level of the fuel. Replace the filter element at least once a year, or when a loss of power is noticed (whichever occurs first).



WARNING

Improper use, installation or servicing may cause an explosion or fire resulting in bodily injury, or death. This unit should only be serviced by a qualified technician. Read and follow all instructions before proceeding. Run the engine and check for fuel leaks after installation, element replacement or draining the bowl. DO NOT remove the FCC bowl unless servicing the filter element, otherwise contamination or bowl O-ring swelling may result.

Primary Fuel Filter (FCC Screw-on Canister)



WARNING

Extreme caution must be exercised when servicing the fuel system. The fuel system operates under high pressure. Use caution when removing or replacing components, as residual pressure may be present.

Draining the FCC Bowl, ENGINE OFF

1. Disconnect the two-wire electrical connector.
2. Hold the 3/4" jam nut, located at the bottom of the FCC bowl, with a wrench. Remove the 7/16" plug, and drain the bowl contents into an approved container.

CAUTION: Both fuel and water will drain from the FCC bowl.

3. Apply pipe sealant, suitable for use with gasoline, to the threads of the 7/16" plug.
4. Tighten the 7/16" plug while holding the 3/4" jam nut with a wrench.
5. Reconnect the two-wire electrical connector.
6. Cycle the ignition key several times to run the electric fuel pumps and fill the FCC bowl with fuel. Inspect the drain plug area for leaks. Correct any leaks prior to operating the engine.
7. Start the engine and inspect for fuel leaks. Correct any leaks prior to operating the engine any further.

Filter Element Replacement, ENGINE OFF

FCC SERVICE KIT#: RP080026

1. Disconnect the two-wire electrical connector.
2. Hold the 3/4" jam nut, located at the bottom of the FCC bowl, with a wrench. Remove the 7/16" plug, and drain the bowl contents into an approved container.

CAUTION: Both fuel and water will drain from the FCC bowl.

3. Using a strap-type oil filter wrench, remove the FCC bowl by turning it counterclockwise as viewed from the bottom.
4. Slide the bowl downward over the suspended filter element. It may be necessary to pull the unit to one side in order to remove the FCC bowl.
5. Remove the fuel filter element from the suspended pump by gripping the fuel pump with one hand, and pulling the filter element downward with the other hand.
6. Push on new filter element (part number RP080026) over the electric fuel pump.

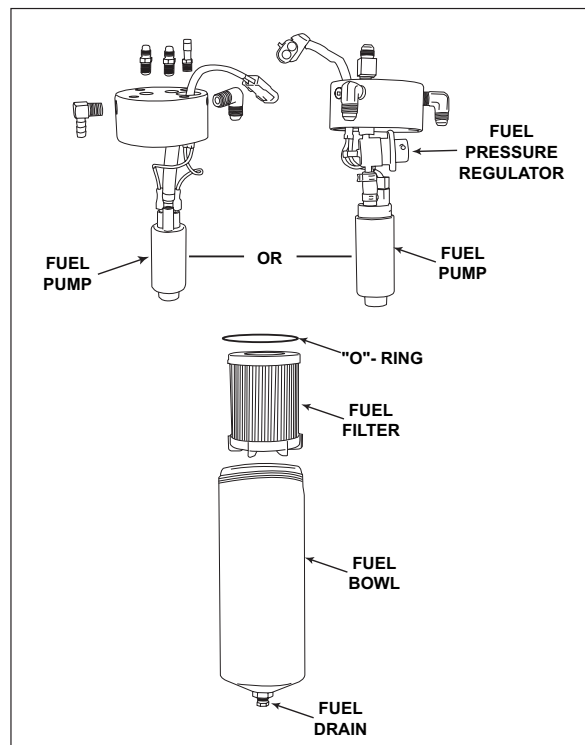


Figure 11-5 Fuel Control Cell (FCC) - Screw-on Canister (Typical)

7. Using a pick made of soft material, such as a toothpick, remove the old O-ring from the inside of the FCC bowl mounting head.

CAUTION: The mounting head O-ring groove may be damaged by using sharp steel tools to remove this O-ring.

8. Lubricate the new O-ring with a fuel resistant O-ring lubricant and install the new O-ring into the FCC bowl mounting head.
9. Apply pipe sealant, suitable for use with gasoline, to the threads of the 7/16" plug.
10. Install and tighten the 7/16" plug while holding the 3/4" jam nut with a wrench.
11. Grease taper and the threads on the FCC bowl and, by hand, thread the FCC bowl into the FCC mounting head. Tighten the bowl firmly back into the mounting head with an oil filter wrench.
12. Reconnect the two-wire electrical connector.
13. Cycle the ignition key several times to run the electric fuel pumps and fill the FCC bowl with fuel. Inspect the drain plug area for leaks. Correct any leaks prior to operating the engine.
14. Start the engine and inspect for fuel leaks. Correct any leaks prior to operating the engine any further.

DO NOT ATTEMPT TO SERVICE ANY OTHER PARTS ON THIS UNIT.

ENGINE MAINTENANCE - 11

Primary Fuel Filter (FCC Clamp-on Canister)



WARNING

Extreme caution must be exercised when servicing the fuel system. The fuel system operates under high pressure. Use caution when removing or replacing components, as residual pressure may be present.

Draining the FCC Bowl, ENGINE OFF

1. Disconnect the two-wire electrical connector.
2. Remove the 7/16" plug, and drain the bowl contents into an approved container.

CAUTION: Both fuel and water will drain from the FCC bowl.

3. Apply pipe sealant, suitable for use with gasoline, to the threads of the 7/16" plug.
4. Tighten the 7/16" plug.
5. Reconnect the two-wire electrical connector.
6. Cycle the ignition key several times to run the electric fuel pumps and fill the FCC bowl with fuel. Inspect the drain plug area for leaks. Correct any leaks prior to operating the engine.
7. Start the engine and inspect for fuel leaks. Correct any leaks prior to operating the engine any further.

Filter Element Replacement, ENGINE OFF

FCC SERVICE KIT#: RP080026

1. Disconnect the two-wire electrical connector.
2. Remove the 7/16" plug, and drain the bowl contents into an approved container.

CAUTION: Both fuel and water will drain from the FCC bowl.

3. Remove the canister retaining clamp.
4. Slide the canister downward over the suspended filter element. It may be necessary to pull the unit to one side in order to remove.
5. Remove the fuel filter element from the suspended pump by gripping the fuel pump with one hand, and pulling the filter element downward with the other hand.
6. Visually inspect all internal components, i.e. hoses, wires, etc.
7. Push on new filter element (part number RP080026) over the electric fuel pump.
8. Using a pick made of soft material, such as a toothpick, remove the old O-rings from the FCC head.

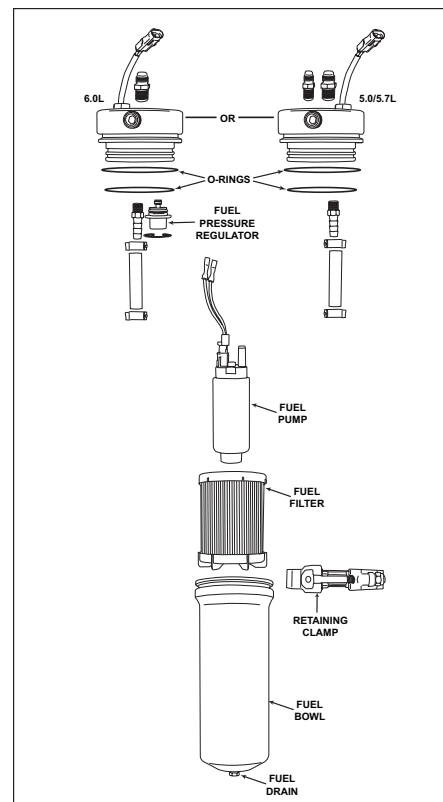


Figure 11-5a Fuel Control Cell (FCC) - Clamp-on Canister (Typical)

CAUTION: The mounting head O-ring grooves may be damaged by using sharp steel tools to remove this O-ring.

9. Install the new O-rings in the same location. Lubricate the new O-rings with a fuel resistant O-ring lubricant.
10. Apply pipe sealant, suitable for use with gasoline, to the threads of the 7/16" plug.
11. Install and tighten the 7/16" plug into the canister.
12. Install the canister firmly back onto the FCC head.
13. Reinstall the retaining clamp and tighten securely.
14. Reconnect the two-wire electrical connector.
15. Cycle the ignition key several times to run the electric fuel pumps and fill the FCC bowl with fuel. Inspect the drain plug area for leaks. Correct any leaks prior to operating the engine.
16. Start the engine and inspect for fuel leaks. Correct any leaks prior to operating the engine any further.

DO NOT ATTEMPT TO SERVICE ANY OTHER PARTS ON THIS UNIT.

Servicing the Fuel Pre-Filter

The frequency of replacing the filter element is determined by the contamination level of the fuel. Replace the filter element at least once a year, or when a loss of power is noticed (whichever occurs first).



WARNING

Improper use, installation or servicing may cause an explosion or fire resulting in bodily injury, or death. This unit should only be serviced by a qualified technician. Read and follow all instructions before proceeding. Run the engine and check for fuel leaks after installation or element replacement.

Filter Element Replacement, ENGINE OFF

PRE-FILTER SERVICE KIT#: RP077014

The pre-filter assembly does not need to be removed from the low pressure fuel pump to service the filter element.

1. Disconnect the fuel supply line from the pre-filter fitting and block the line to prevent fuel spillage.
2. Secure the filter by the wrench flats at the low pressure fuel pump.
3. Remove the filter end cap.
4. Remove the old filter and seal.
5. Install the new filter and seal.
6. Re-install the filter end cap and tighten securely.
7. Re-install the fuel supply line and tighten retaining clamp securely.
8. Start the engine and inspect for fuel leaks. Correct any leaks prior to operating the engine any further.



WARNING

Make sure there are no fuel leaks before closing the engine hatch.

Priming Fuel System

To prime the fuel system, cycle the ignition key 3 times using the following procedures:

1. Turn ignition key to ON position for 5 seconds.
2. Turn ignition key OFF.
3. Pause for 10 seconds.
4. Repeat steps 1-3 three times.

Crank the engine until it starts or 30 seconds elapse. If the engine does not start, repeat the priming procedures.

FLAME ARRESTOR

At specified intervals, the flame arrestor should be checked for blockage caused by dirt or other foreign material.

Loosen the clamp securing the flame arrestor to the air intake tube or throttle body. Remove the flame arrestor. Clean the flame arrestor with solvent and dry with compressed air. Reinstall the flame arrestor and tighten the clamp(s) securely.

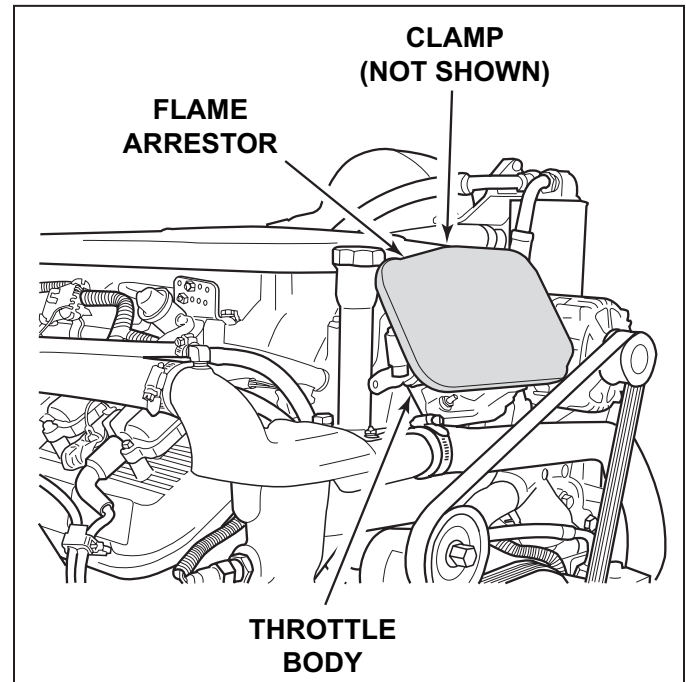


Figure 11-6 Flame Arrestor - 8.1L (Typical)

ENGINE MAINTENANCE - 11

8.1L ACCESSORY DRIVE BELT

The PCM 8.1L engine uses a single serpentine belt to drive the engine water circulation pump and the alternator.



WARNING

Engine must be shut OFF and the ignition key removed before inspecting the drive belt(s). The drive belt(s) should be checked periodically for condition and tension. If the belt(s) shows signs of cracking, glazing or deterioration, replace with new belt(s).

DRIVE BELT INSPECTION

Inspect the drive belt for excessive wear, shredding or missing sections.

Inspect the drive belt for contamination from excessive dirt, oil, coolant or other substances that may effect the drive belt operation.

If a problem is found, replace the belt after inspecting the following items:

- All pulleys and tensioners for signs of misalignment
- All pulleys and tensioners for signs of rust or other damage
- Bent pulleys or tight bearings in the engine water circulation pump, and alternator

DRIVE BELT REPLACEMENT (8.1L)

8.1L SERPENTINE BELT #: R066024

1. Note the routing of the belt before removing.
2. Using a 15 mm box wrench or socket, turn the belt tensioner to relieve the tension on the belt. Slide the belt off of the pulleys. **Release the tensioner slowly to prevent the tensioner from snapping against its stop, and possibly causing damage to the tensioner.**
3. Slide the belt onto the pulleys using the same routing as noted prior to removal.
4. Compress the belt tensioner, and slide the belt over the tensioner pulley. Release the tension slowly to tension the belt.

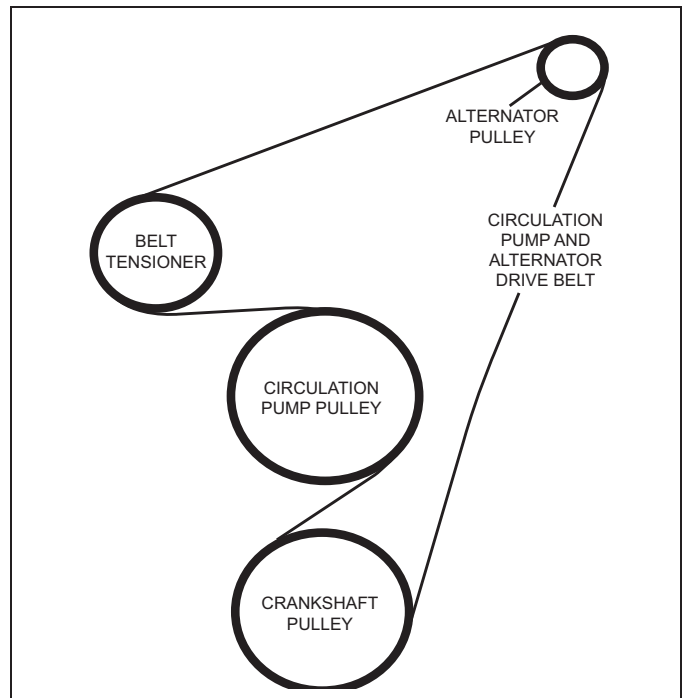


Figure 11-7 8.1L Accessory Drive Belt Configuration

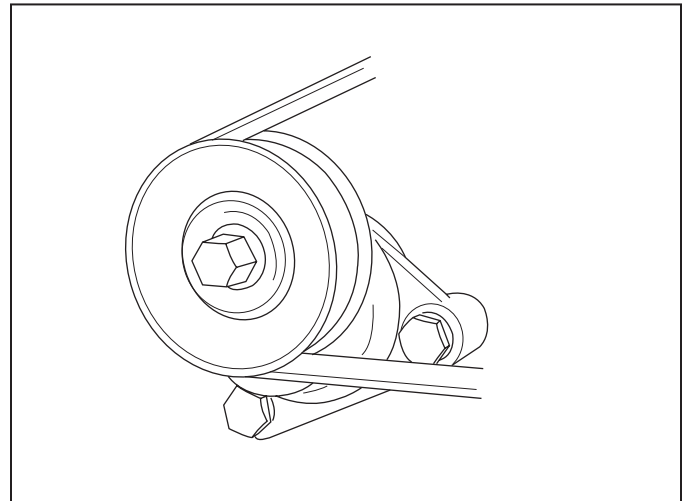


Figure 11-8 Belt Tensioner (8.1L)

6.0L ACCESSORY DRIVE BELT

The PCM 6.0L engine uses a single serpentine belt to drive the engine water circulation pump and the alternator.



WARNING

Engine must be shut OFF and the ignition key removed before inspecting the drive belt(s). The drive belt(s) should be checked periodically for condition and tension. If the belt(s) shows signs of cracking, glazing or deterioration, replace with new belt(s).

DRIVE BELT INSPECTION

Inspect the drive belt for excessive wear, shredding or missing sections.

Inspect the drive belt for contamination from excessive dirt, oil, coolant or other substances that may effect the drive belt operation.

If a problem is found, replace the belt after inspecting the following items:

- All pulleys and tensioners for signs of misalignment
- All pulleys and tensioners for signs of rust or other damage
- Bent pulleys or tight bearings in the engine water circulation pump, sea-water pump and alternator

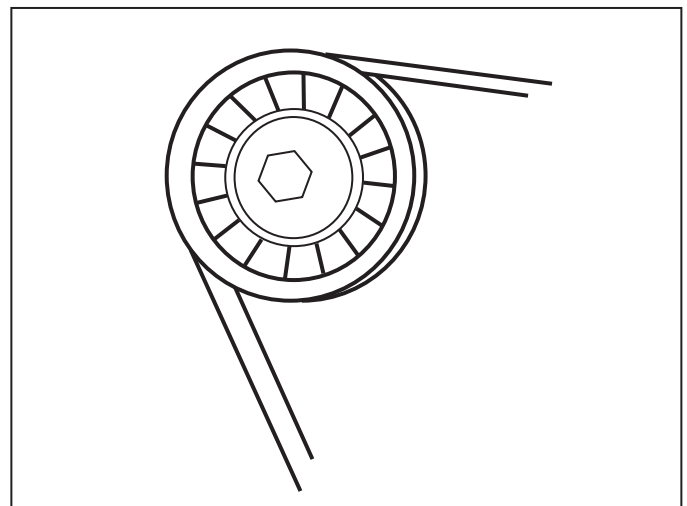


Figure 11-10 Belt Tensioner (6.0L)

DRIVE BELT REPLACEMENT (6.0L)

6.0L SERPENTINE BELT #: R066032

1. Note the routing of the belt before removing.
2. Using a 15 mm box wrench or socket, turn the belt tensioner to relieve the tension on the belt. Slide the belt off of the pulleys. **Release the tensioner slowly to prevent the tensioner from snapping against its stop, and possibly causing damage to the tensioner.**
3. Slide the new belt onto the pulleys using the same routing as noted prior to removal.
4. Compress the belt tensioner, and slide the belt over the tensioner pulley. Release the tension slowly to tension the belt.

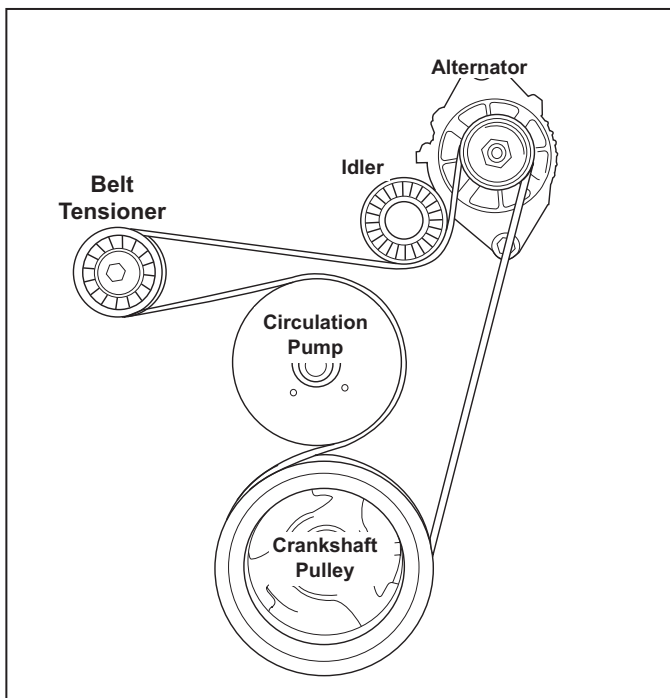


Figure 11-9 6.0L Accessory Drive Belt Configuration

11 - ENGINE MAINTENANCE

CHANGING OILS



WARNING

IMPORTANT: The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and continuous zone of the United States, if such discharge causes a film or sheen upon, or discoloration of the surface of the water, or causes sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of \$5,000.00.

Refer to the MAINTENANCE SCHEDULE for oil change intervals. The engine oil should be changed prior to placing the boat into storage.

IMPORTANT: Change the engine oil when the engine is warm from operation. Warm oil flows more freely, and allows more foreign material and impurities to be removed.

1. With the engine at normal operating temperature, remove the dipstick and install a crankcase oil pump onto the dipstick tube (Figure 11-9). Insert the discharge hose into a suitable container. Pump the oil from the engine until the crankcase is empty. Remove the oil pump from the dipstick tube.
2. Remove the oil filter by turning it counterclockwise, using an oil filter wrench if necessary. Discard the old filter and sealing ring.

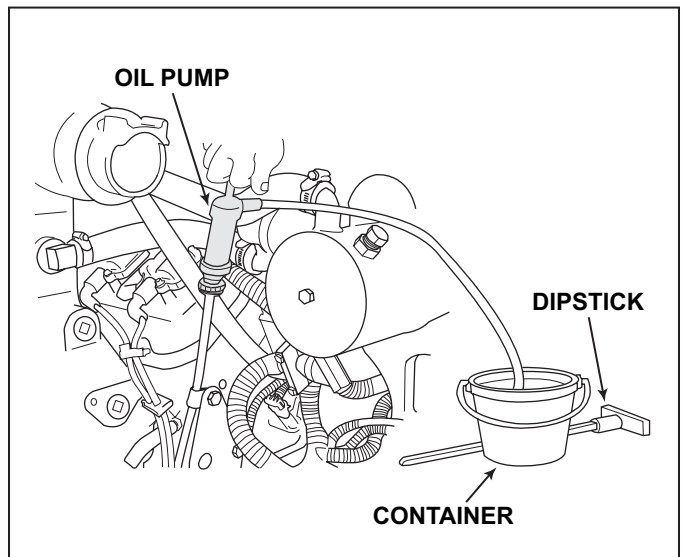


Figure 11-11 Engine Oil Removal (Typical)

3. Coat the sealing ring, on the new filter, with a light coating of clean engine oil. Install the oil filter securely by hand. **DO NOT** overtighten.
4. Fill the engine with the recommended oil, see OIL REQUIREMENTS, through the oil fill location on the valve cover (Figure 11-10).

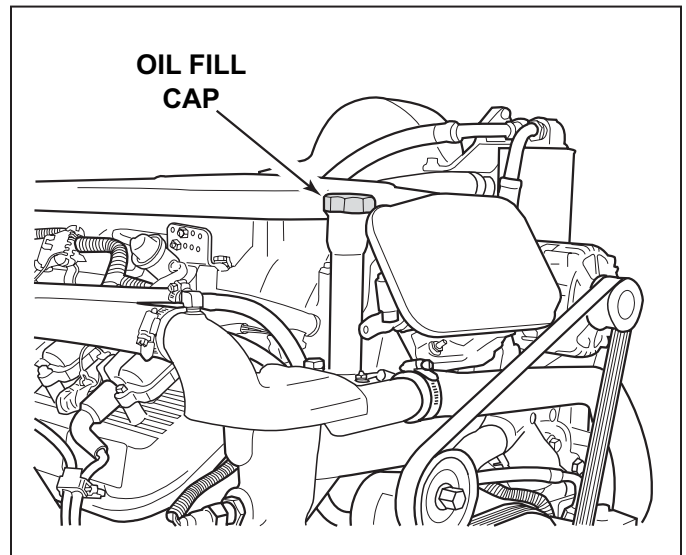


Figure 11-12 Engine Oil Fill (8.1L)

5. Start the engine and operate for 5 minutes to circulate the oil throughout the engine. Check entire system for leaks, especially around the oil filter.
6. Stop the engine and wait 5 minutes to allow the oil to completely drain down. Check the oil level and add oil, if needed, to bring the engine oil to the proper level.

11 - ENGINE MAINTENANCE

MAINTENANCE SCHEDULE

Location and Service	Check Daily	After 1st 25 Hrs of Operation	Every 50 Hours of Operation	Every 100 Hours of Operation	Once Each Year
Check coolant level	X				
Check oil level - Engine crankcase	X				
Engine Assembly (complete - Check for obvious leaks (water, oil, fuel and exhaust)	X				
Remote Control and Steering System - Check for proper operation	X				
Cooling System - Check condition and tightness of all hose clamps		X		X ¹	X
Drive Belt - Inspect condition and check tension		X		X	X
Exhaust System - Check for leaks at the manifold	X				
Ignition System and Spark Plugs - Clean and inspect condition		O		O	O
Engine Assembly (complete) - Check for loose, missing or damaged parts (especially engine mounts, starter and alternator mounting fasteners)		X		X	X
Change engine oil and filter		X	X		X
Engine Alignment - Check and adjust if necessary		O			O
Ignition Timing - Not Adjustable					
Battery - Check electrolyte level and specific gravity. Inspect case for damage. Check cables and connections.		X	X		X
Electrical System (complete) - Check for loose or dirty connections and damaged wiring			X ²		X
Flame Arrestor and Crankcase Ventilation System - Clean and inspect				X	X
Hoses (all) - Inspect for cracks, swelling, weather checking or other signs of deterioration				X	X
Throttle Cable Linkage - Inspect and lubricate (A)				X ¹	X
Fuel Filters - Service or replace		O		O	O

ENGINE MAINTENANCE - 11

MAINTENANCE SCHEDULE (cont'd)

Fresh-water cooled models - Check coolant for alkalinity	At least once each year (X)
Fresh-water cooled models - Change coolant	Every two years (C)
Engine Assembly Exterior Surfaces - spray with rust-preventative oil (B)	Fresh water areas - Every 60 days (X) Salt water areas - Every 30 days (X)

Notes:

- (X) Denotes service to be performed by the owner/operator
- (O) Denotes service to be performed by an authorized PCM Engines dealer
- (A) Use SAE 30 engine oil
- (B) Use WD-40 penetration oil or equivalent
- (C) Every five (5) years when using DEX-COOL™
- ¹ In fresh-water areas, every 100 hours of operation or 120 days (whichever occurs first). In salt-water areas, every 50 hours of operation or 60 days (whichever occurs first).
- ² In fresh-water areas, every 50 hours of operation or 60 days (whichever occurs first). In salt-water areas, every 25 hours of operation or 30 days (whichever occurs first).

11 - ENGINE MAINTENANCE

VISUAL INSPECTION

It is important for the owner/operator to visually inspect the complete engine assembly at regular intervals. Most often, costly repairs can be avoided if potential problems are corrected before there is a failure.

Inspect the complete engine assembly for obvious fuel, oil, water or exhaust leaks. Check for loose, damaged or missing parts. Check all hose clamps for adequate tightness. Check the electrical system for loose or dirty connections or damaged wiring.

Touch up scratches, nicks and corrosion damage to the exterior finish of the engine. Spray paint may be obtained from your local PCM Engines dealer.

Protect engine finish from corrosion by periodically spraying the engine exterior finish with a rust preventative oil (such as WD-40).

ENGINE FLUID CAPACITIES

Model	MP 8.1L	MP 6.0L
Crankcase Oil Capacity W / New Filter	7 Quarts (6.65 L) ¹	5 Quarts (4.75 L) ¹
Fresh Water Cooling System Capacity	Applications Vary See Your Dealer	Applications Vary See Your Dealer

1 - Capacities are dependent on installation angle. Oil capacities are approximate. Always use the dipstick to determine the exact quantity of oil required.

ENGINE MAINTENANCE - 11

FILTER REQUIREMENTS

Description	Part No.
Oil Filter, 8.1L	PF454
Oil Filter, 6.0L	PF46
Fuel Control Cell (FCC) Fuel Filter Element	RP080026
Fuel Pre-Filter Element	RP077014

12 - ENGINE SPECIFICATIONS

ENGINE SPECIFICATIONS

MODEL (Horsepower)	MP 8.1L (HO) (425 HP)	MP 6.0L (375 HP)
Displacement	8.1L (496 CID)	6.0L (364 CID)
Bore	4.25 in. (107.95 mm)	4.0007 in. (101.618 mm)
Stroke	4.370 in. (111.0 mm)	3.622 in. (92.0 mm)
Compression Ratio	9.1:1	9.4:1
Compression Pressure	130 - 175 psi	130 - 215 psi
WOT Operating RPM Preferred WOT RPM	4600 - 5200 5000	4800 - 5300 5200
Cruising RPM (Max)	3800	4000
Idle RPM (In Gear)	650 (Not Adjustable)	650 (Not Adjustable)
Oil Pressure @ 2000 RPM	25 - 60 psi (172 - 414 kPa)	25 - 80 psi (172 - 552 kPa)
Minimum Oil Pressure	10 psi (69 kPa) at Idle	10 psi (69 kPa) at Idle
Spark Plug P/N Spark Plug Gap	R030009 0.060 in.	R030011 0.060 in.
Firing Order	1-8-7-2-6-5-4-3 (LH)	1-8-7-2-6-5-4-3 (LH)
Thermostat	FWC 170°F (76.7°C)	FWC 160°F (61.7°C)
Over- Temperature	220° F (104.8° C)	220° F (104.8° C)
Electrical System	12 Volt Negative (-) Ground	12 Volt Negative (-) Ground
Alternator Rating	70 Amps	70 Amps
Ignition Timing	Not Adjustable	Not Adjustable
CAM Retard	Not Adjustable	Not Adjustable
Battery Rating	650 CCA (Minimum) 120 Ah	650 CCA (Minimum) 120 Ah
Fuel Pressure STD. FCC	57-62 psi @ WOT	57-62 psi @ WOT

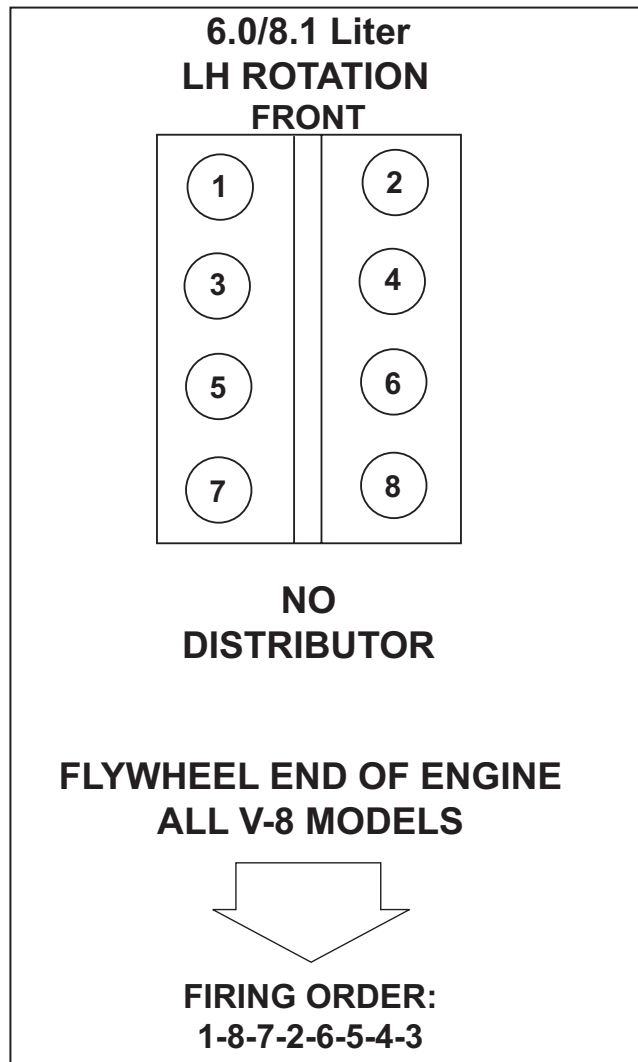


Figure 12-1 Firing Order

TUNE-UP SPECIFICATIONS

Model	MP 8.1L (HO) (425 HP)	MP 6.0L (375 HP)
Spark Plug Type	R030009	R030011
Spark Plug Gap	0.060 in. (1.52 mm)	0.060 in. (1.52 mm)
Ignition Timing	Fixed, Not Adjustable	Fixed, Not Adjustable
Firing Order	1-8-7-2-6-5-4-3 (LH Rotation)	1-8-7-2-6-5-4-3 (LH Rotation)
CAM Retard	Not Adjustable	Not Adjustable

13 - OUT-OF-SEASON STORAGE

ENGINE STORAGE

IMPORTANT: This service should be performed by an Authorized PCM Dealer.



CAUTION

Refer to **FLUSHING COOLING SYSTEM** before proceeding.

1. Fill the fuel tanks with gasoline (that does not contain alcohol) and add a sufficient amount of gasoline stabilizer, such as STA-BIL™ fuel stabilizer, to prevent the formation of fuel gum and varnish. Follow the instructions on the container.

IMPORTANT: If the boat is to be placed into storage with fuel containing alcohol in the fuel tanks, the engine fuel system must be run dry at idle RPM. Fuel tanks should be drained completely and fuel conditioner, such as STA-BIL™, added to any fuel remaining in the tanks.

2. Run the engine and allow it to reach normal operating temperature. Shut down the engine and change the oil and oil filter (See ENGINE MAINTENANCE).
3. Remove the flame arrestor and start the engine. Operate the engine at a fast idle speed (1000-1500 RPM). Use an aerosol-type fogging solution and spray sufficient amount, into the throttle body assembly bores, to treat internal surfaces of the engine. Refer to the instructions on the fogging solution canister. Turn the ignition switch to the OFF position.
4. Clean the flame arrestor and the vent hoses, and reinstall on the engine. Cover the throttle body assembly, to prevent the possibility of the water entering the engine through the throttle body assembly, during storage.
5. Close the fuel shut-off valve (if equipped).

FRESH-WATER COOLED MODELS

IMPORTANT: The fresh-water section of the cooling system must be kept filled year around with recommended coolant. Make certain that the cooling system is protected with an ethylene glycol antifreeze mixture properly mixed to protect the engine to the lowest temperature that it will be exposed to.

See DRAINING FRESH-WATER COOLING SYSTEM in ENGINE MAINTENANCE section for draining and refilling procedures of FWC system, if required.

BATTERY STORAGE

Follow the battery manufacturer's instructions for storage. If not available, use the following instructions:

- Remove the battery from the boat and clean, removing dirt and grease from the top of the battery.
- Fill the battery with distilled water to the manufacturer's specifications.
- Store the battery in a cool, dry place. Do not store on a concrete surface.
- Periodically (every 30 to 45 days), check the water level and recharge the battery to the manufacturer's specifications. Do not fast charge.



CAUTION

A discharged battery can be damaged by freezing.

FITTING OUT AFTER STORAGE

When recommissioning the engine after storage, the following items should be checked:

- Check all the cooling system hoses. Be sure they are properly connected and all the hose clamps are tight.



CAUTION

When installing the battery, make certain that you connect the POSITIVE (+) BATTERY CABLE to the POSITIVE (+) BATTERY TERMINAL first, and the NEGATIVE (-) BATTERY CABLE to the NEGATIVE (-) BATTERY TERMINAL last. If the battery cables are reversed, the electrical system will be damaged.



WARNING

Do not use jumper cables and/or a booster battery to start the engine. Do not recharge a weak battery in the boat. Remove the battery and recharge in a ventilated area away from fuel vapors, sparks or open flame.

- Install the fully charged battery. Be sure that all the connections are clean and free from corrosion. Coat the battery terminal connections with an anti-corrosion battery terminal spray.
- Refer to the OPERATING INSTRUCTIONS section and perform all the safety checks before starting the engine.
- Start the engine and closely observe the instrument panel. Allow the engine to reach normal operating temperature. Inspect the engine carefully for fuel, exhaust, oil and coolant leaks.
- Check the steering and throttle controls for proper operation.

14 - TROUBLESHOOTING

Engine performance complaints usually fall under one of the basic headings listed in the Troubleshooting Guide. When a problem cannot be easily diagnosed, consult a PCM Engines Servicing Dealer for assistance.

Malfunction	Possible Cause	Corrective Action
<p>Engine will not crank with the starter motor, or cranks slowly.</p> <p>NOTICE: Battery voltage must be AT or ABOVE 10 volts while the engine is cranking or the engine management system will not function.</p>	<p>Problem with the engine management system.</p> <p>Battery switch turned OFF (if equipped)</p> <p>Remote control not in Neutral position.</p> <p>Blown the ignition fuse or open circuit breakers.</p> <p>Loose and/or dirty wiring connections.</p> <p>Dead Battery</p>	<p>Contact PCM Engines Dealer.</p> <p>Turn the battery switch ON.</p> <p>Position the remote control exactly in Neutral.</p> <p>Replace the fuse - reset circuit breakers.</p> <p>Check the battery cables and starter circuit wiring. Clean and tighten all connections. Repair or replace the damaged wiring.</p> <p>Recharge, test and replace as necessary.</p>
<p>Engine Cranks - will not start or is hard starting.</p> <p>NOTICE: Battery voltage must be AT or ABOVE 10 volts while the engine is cranking or the engine management system will not function.</p>	<p>Improper starting procedure.</p> <p>No fuel - empty fuel tank</p> <p>No fuel to the throttle body (TBI) or the injectors (MPI)</p> <p>Engine flooded</p> <p>Ignition system malfunction</p> <p>Contaminated fuel</p>	<p>Refer to "STARTING ENGINE" in the OPERATING INSTRUCTIONS section.</p> <p>Check the fuel tank level - fill tank(s). Open shut-off valve(s).</p> <p>Plugged fuel filters. Plugged or kinked fuel lines or plugged fuel-tank vent. Faulty fuel pump - check electrical connections. Faulty anti-siphon valve.</p> <p>Open the throttle 100% and crank the engine. When the engine starts, immediately return the throttle to 1000 RPM.</p> <p>Contact PCM Engines Dealer.</p> <p>Check fuel for water or other contamination. If contaminated, drain and clean the fuel system.</p>

TROUBLESHOOTING - 14

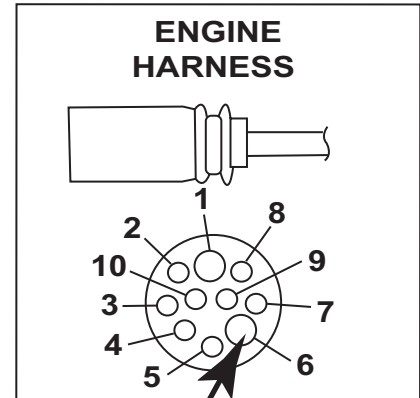
Malfunction	Possible Cause	Corrective Action
Engine Overheats	<p>Loose or worn drive belt(s)</p> <p>Collapsed, kinked or leaking hoses.</p> <p>Faulty thermostat</p> <p>Faulty temperature sending unit or gauge</p> <p>Coolant level low in the fresh-water section of the cooling system</p> <p>Improper coolant mixture</p>	<p>Adjust or replace the belts as necessary.</p> <p>Replace the hoses.</p> <p>Replace the thermostat.</p> <p>Test and replace as necessary.</p> <p>Check the cooling system for leaks. Refill the system. See Warning before removing the fill cap.</p> <p>Install the proper coolant mixture (50% antifreeze - 50% water).</p>
Insufficient engine temperature	<p>Faulty thermostat</p> <p>Faulty temperature sender</p>	<p>Replace the thermostat.</p> <p>Replace the temperature sender.</p>
Engine oil pressure low	<p>Faulty oil pressure sending unit or gauge</p> <p>Oil level low</p> <p>Crankcase overfilled causing oil aeration</p> <p>Diluted or improper grade/viscosity of oil</p>	<p>Test and replace as necessary.</p> <p>Add specified oil. Check the engine for leaks.</p> <p>Remove the required amount of oil. Determine the cause of overfilled condition (improper filling, etc.).</p> <p>Change the oil and filter. Determine the cause of dilution. (insufficient engine temperature, excessive idling, etc.)</p>

14 - TROUBLESHOOTING

Malfunction	Possible Cause	Corrective Action
<p>Engine misses, runs rough and/or backfires</p>	<p>Ignition system malfunction</p> <p>Plugged fuel filters</p> <p>Faulty fuel pump.</p> <p>Plugged or kinked fuel lines or fuel tank vent</p> <p>Anti-siphon valve faulty</p> <p>Flame arrestor dirty</p>	<p>Contact PCM Engines Dealer.</p> <p>Replace the fuel filters.</p> <p>Have fuel pump replaced by a PCM Engines Dealer/</p> <p>Repair or replace the fuel lines. Remove obstruction.</p> <p>Clean or replace as necessary.</p> <p>Clean the flame arrestor.</p>
<p>Poor engine or boat performance</p>	<p>Ignition malfunction</p> <p>Throttle not fully open</p> <p>Damaged or improper propeller</p> <p>Excessive water in the bilge</p> <p>Excessive growth on the boat bottom</p> <p>Boat overloaded</p> <p>Dirty flame arrestor</p> <p>Engine overheating</p>	<p>Contact PCM Engines Dealer.</p> <p>Check the remote control and throttle body linkage for freedom of movement and proper adjustment.</p> <p>Repair or replace as necessary.</p> <p>Pump the water out and investigate source of entry.</p> <p>Clean the bottom and paint with an anti-fouling paint.</p> <p>Reduce and/or redistribute the load.</p> <p>Clean the flame arrestor.</p> <p>Repair the cooling system (See "Engine Overheats").</p>

WIRE HARNESS COLOR CHART

CIRCUIT NUMBER	CIRCUIT NAME	ENGINE HARNESS WIRE COLOR
1.	GROUND	BLACK
2.	TACHOMETER	GRAY
3.	WATER TEMPERATURE	TAN
4.	ENGINE ALARM	TAN/BLACK
5.	IGNITION	PURPLE/WHITE
6.	BATTERY	RED/WHITE
7.	STARTER	YELLOW/RED
8.	OIL PRESSURE	LT. BLUE
9.	CHECK ENGINE LIGHT	BROWN/WHITE
10.	DATA LINE	ORANGE/BLACK



NOTE: ENGINE HARNESS WIRED FOR PANELS USING VOLTMETERS ONLY.

NOTE (A): POWER FOR A FUSED ACCESSORY PANEL MAY BE TAKEN FROM THIS LOCATION. LOAD CANNOT EXCEED 30 AMPS.

(A)

Figure 15-1 Typical Instrumentation Wiring

16 - LITERATURE

To obtain service and/or parts literature for your PCM Marine Engine, contact the following:

PCM Engines
Pleasurecraft Engine Group
Publications Department
1737 Highway 76 East
Little Mountain, SC 29075

1. **SERVICE:** For more detailed information, PCM has a detailed service manual available. This manual contains complete engine and component disassembly and reassembly instructions. Troubleshooting and maintenance charts are also included.
2. **PARTS:** Parts manuals with exploded views for service parts are available for all current engine models.

IMPORTANT: When contacting the factory for service information, be sure to include your engine model and serial number to insure the service information you receive is correct.

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PLEASURECRAFT MARINE ENGINE CO.

AIR BOAT ENGINE LIMITED ENGINE WARRANTY

Pleasurecraft Marine Engine Co., Inc. (hereinafter PCM) extends to the purchaser of each new marine base engine supplied by PCM to an authorized PCM dealer a LIMITED WARRANTY for a period of 200 hours of operation or twelve (12) calendar months, six (6) calendar months in commercial use, FROM THE DAY OF DELIVERY REQUIRED TO BE ENTERED BELOW AT THE TIME OF DELIVERY TO THE PURCHASER. This warranty is applied in the same manner and under the same conditions as the LIMITED WARRANTY which covers all new marinized PCM engines, COPY AVAILABLE UPON REQUEST, with the following exceptions:

1. PCM will reimburse or credit the customer for the repair or replacement under this warranty for any part which in the opinion of PCM is found to be defective, in the following manner.
 - A. Parts: Reimbursement or credit for parts used in the repair of covered items on any base engine covered by this warranty, will be paid at PCM's current published dealer net price of such a part.
 - B. Labor: Reimbursement or credit for labor performed in the repair of covered items on any base engine covered by this warranty will be paid in accordance with the published Chevrolet or Ford bench flat rate labor repair time figured at PCM's normal labor rate as agreed upon with the dealer prior to repair.
2. The person making repairs under this warranty must receive prior authorization from PCM before repairs are made to any failed base engine. Major failures may require inspection at PCM facility or by their designate, prior to replacement.

THIS WARRANTY DOES NOT COVER THE FOLLOWING:

1. Failure resulting from any outside source not a part of the base engine, including but not limited to, parts transferred to or added to the base engine or add-on items or parts, accessories, controls, etc. or any other item which in the opinion of PCM adversely affects the performance or reliability of the base engine whether such item is assembled to, or in any other way involved in the operation of the final configuration as installed in the purchaser's application of the base engine.
2. Engines used in applications other than marine use, not approved in writing by PCM prior to the delivery are not covered by this warranty.
3. Labor for removal or reinstallation of the engine in the boat and /or labor for removal or reinstallation of add-on parts in or out of the boat are not covered by this warranty.
4. Any and all items not covered by PCM complete engine warranty are not covered by this warranty. (Copy available on request.)
5. Engines not registered upon sale as required below are not covered by this warranty. The purchaser is required to sign this warranty registration at the time of purchase and return to PCM at the address listed within ten (10) days of purchase to validate this warranty.

BASE ENGINE DELIVERY RECORD / WARRANTY REGISTRATION

ENGINE MODEL NUMBER: _____ SERIAL NUMBER: _____

SELLING DEALER: _____

ADDRESS: _____

CITY STATE ZIP: _____

DEALER SIGNATURE: _____

CUSTOMER: _____

ADDRESS: _____

CITY STATE ZIP: _____

PHONE: _____

After reading the above warranty statement and entries, the provisions of which I understand and accept, I now affix my signature below, as purchaser, in proof of receipt of this base engine and acceptance of the above warranty provisions:

CUSTOMER SIGNATURE: _____ DATE: _____

IMPORTANT: MAKE COPIES OF THIS COMPLETED FORM. ONE COPY FOR THE OWNER, ONE COPY FOR THE DEALER AND ONE COPY TO THE DISTRIBUTOR.

MAIL TO: PLEASURECRAFT MARINE ENGINE CO., P.O. BOX 369, LITTLE MOUNTAIN, SC 29075



