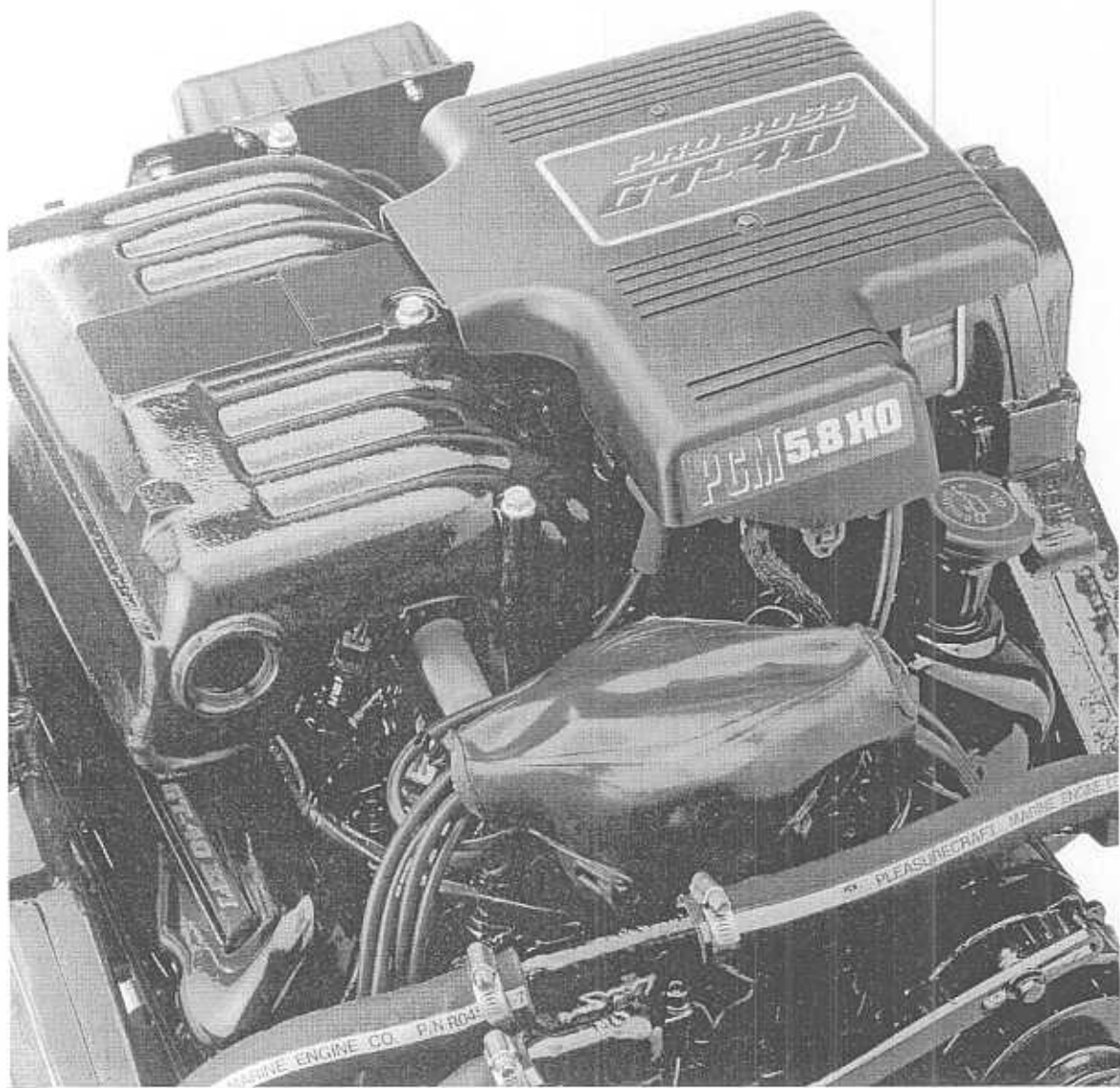


PLEASURECRAFT MARINE

Engine Owners Manual

FOR ALL CHEVROLET AND FORD BASED ENGINES



MANUAL CONTENTS

This manual is divided into sections and has a page numbering sequence that uses a section identifying prefix to the page number. This table of contents identifies the sections within this manual.

Each section has it's own table of contents at the beginning of that section.

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INTRODUCTION

Thank you for your selection of Pleasurecraft (PCM) Marine Power 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 power for your boating 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've introduced many breakthrough innovations that quickly became industry standards. The pyramidal exhaust system, light-weight transmission, computerized engine control and the fuel control cell 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.

This Operations Manual is designed to introduce you to the daily operation and maintenance requirements of your PCM engine. Please read it through carefully before running your boat for the first time, and keep it on hand to review from time to time. For more in-depth service and maintenance information, PCM has available a detailed manual designed for those with advanced technical skills. (See page FM2 for ordering information.)

Shortly after your purchase is registered with PCM, you will be mailed your Warranty Card and a Customer Survey. We appreciate your feedback and encourage you to fill out the survey after you've 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 via this vehicle.

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

General Information

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General Information

IMPORTANT: Read this manual carefully and thoroughly; particularly **WARNING, CAUTION, and IMPORTANT** information in bold type, such as this paragraph.



WARNING: It is recommended that the battery cables be removed from the battery when the boat is placed in storage, on display, or in transit. This will eliminate the possibility of the engine accidentally starting and causing damage to the engine due to lack of water.

Engine And Transmission Model And Serial Number Identification Locations

The engine model and serial number of your engine may be found in one of the locations listed below.

1. On a plate bolted onto the center of the intake manifold at the rear.
2. On a plate bolted onto the intake manifold, port and slightly forward of the carburetor.
3. On the port valve cover attached to the inside vertical surface at the front.
4. On the top and at the front of the port valve cover.
5. On a plate bolted onto the intake manifold, port and slightly forward of the carburetor.
6. On the port valve cover just aft of the flame arrestor.

The identification tag contains information formatted as follows.

A	B	C
PLP	PRR12	EFI

The PCM Serial Number and Model Identification tag is laid out as follows:

Box A contains information that is used to identify your engine and corresponds with the PCM Model Information listed in the Specification Section of this manual. Use this information to locate the proper maintenance specifications for your service needs. The example given "PLP" may be found on page SP 6.

Box B contains transmission information. The specifications list information that corresponds to the numbers (12 in Box B) identifies the transmission as a 1.23:1.

Box C identifies special characteristics of your engine. Box C (EFI) indicates the engine has Multi Point Fuel Injection.

Record the information from the Identification plates on the engine and transmission in the spaces below.

	PORT	STARBOARD
Eng. Model		
Eng. Serial #		
Trans. Model		
Trans. Serial #		

IMPORTANT! Before performing any operating or maintenance procedure covered in this manual be certain to read the entire manual to insure a full understanding of that procedure.

Glossary Of Terms

Aft	The back of the Boat.
Clock Wise	Indicates rotation in the same direction as the rotating hands of a clock.
Counter Clockwise	Indicates rotation in the direction opposite to the rotating hands of a clock.
EFI	Means Electronic Fuel Injection
Forward	The front of the Boat.
Fresh Water Cooling System	Indicates a self contained cooling system filled with a coolant such anti-freeze in a tank capped with a pressure cap that is cooled by sea water passing through a heat exchanger.
LH or Left Hand	Indicates Left Hand propeller or engine rotation
MEFI	Means Multi Point Fuel Injection

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Model Number	The series of letters and numbers on the Serial Plate that describes the engine configuration and content. This series is common to many engines.
PCM	Pleasurecraft Marine Engine Co. Inc.
Port	The Left side of the Boat while looking Forward.
RH or Right Hand	Indicates Right Hand propeller or engine rotation.
Sea Water Cooling System	A cooling system which uses only sea water to cool all parts of the engine.
Serial Number	The unique six (6) digit identifying number on the Serial Plate that specifies only one engine.
Starboard	The right side of the boat while looking Forward.
TBI	Means Throttle Body Injection

Directional References

Directional references are given as they appear when viewing the boat from stern, looking toward bow. The front of the boat is bow; the rear is stern. Starboard side is to the right; port side is to the left.

Service Recommendations

This manual includes operation instructions and maintenance schedules that are usually required in normal service. Do not attempt any repairs which are not specifically covered in this manual. Strict compliance to the recommendations for lubrication, maintenance, operation, etc., will assure you of superior performance and dependable service. Improper maintenance or use of unsuitable products will affect your warranty coverage.

Owner/Operator Responsibilities

It is the operator's responsibility to;

- A) Perform all safety checks before starting the engine.

- B) Ensure that all lubrication and maintenance instructions are complied with, before starting the engine.
- C) Operate the craft in a safe manner.
- D) Return the unit to an Authorized PCM Dealer for warranty service and or necessary maintenance.

Maintenance service and replacement parts, such as but not limited to, tune up parts, filters etc., are the responsibility of the owner/operator and as such, are not considered defects in workmanship or material within the terms of the warranty. The method and frequency of use of your engine determines the need for maintenance service.

Service For Your PCM Engine

Your PCM engine was manufactured by PCM from the finest materials available and distributed through your dealer who is in the best position to provide you with service. Your dealer is your direct contact to PCM authorized service. Your dealer has the necessary tools and training to properly handle your normal service requirements as well as supply you with the parts, service and service information you may require.

If your PCM dealer is unable to provide you with the parts, service or information you require, he has the knowledge and information necessary to contact PCM on your behalf. The PCM Service Department depends upon specific, and accurate information in order to aid your dealer to respond to your service and part needs. Your dealer has been trained to provide this information.

PCM facilities throughout the world are dedicated to the manufacturing and distributing of the finest marine engines available. Accordingly PCM does not repair engines or engine components in our locations.

In the unlikely event that your dealer, after being requested to do so, cannot satisfy your request for parts or service, please contact the PCM customer service department (see Literature below) for the location of a dealer nearby who will be able to perform the necessary service.

If you are anticipating a trip to an area where you are not aware of the location of a PCM servicing dealer, please contact the PCM customer service department prior to leaving, (see Literature

General Information

below) for the location of a PCM dealer in the area where you will be traveling.

Literature

To obtain service and/or parts literature for your PCM Engine(s), contact your dealer, or write:

PCM
PO Drawer 369
Little Mountain, SC 29075

Service Information Request

When contacting the factory about service or part information, please include the following:

1. Your name, address and telephone number.
2. Engine and transmission serial and model numbers.
3. Date purchased.
4. Name of selling or servicing dealer.
5. Boat manufacturer, model and length.
6. Number of hours unit has been operated.
7. Date of previous correspondence.
8. All other pertinent information necessary to allow us to properly respond to your request.

For your convenience, there is a form which can be used when writing PCM on page FM 5.

PCM Installation And Delivery Inspection

To insure your satisfaction the selling dealer must check the items listed on the PCM Pre Delivery Inspection form prior to delivery of your PCM Engine. Check with him to be sure that these checks have been completed. Items to be checked include, but are not limited to:

- | | |
|---|----------------------------|
| 1) Engine oil | 9) Alternator for charge |
| 2) Timing | 10) All lube points |
| 3) Drive fluid | 11) Shaft alignment |
| 4) Belt tension | 12) Control adjustments |
| 5) Idle speed | 13) Battery charge & level |
| 6) Drain Plugs | 14) Prop size & rotation |
| 7) Water lines | 15) All fuel & oil lines |
| 8) Control travel | 16) Exhaust hoses & clamp |
| 17) Check for leaks-water-oil & exhaust | |

Fuel Requirements

Use any good grade automotive regular or

premium gasoline with a minimum average octane rating of 89* in your PCM engine.

An 87* average octane gasoline may be used if the gasoline described above is not available; however, the ignition timing *MUST BE* retarded 4°, from the specifications listed in the specifications for your model, to prevent harmful detonation. See specification section.

* New U.S. Regulation requires posting average of research and motor octane. $(R + M)/2$.

Fuel will deteriorate during prolonged storage, causing damage to fuel system gaskets and plastic parts and clogging the passages of the carburetor. Use of a stabilizer can help prevent this.

Fuel used to test PCM engines contains STA BIL[®], a fuel stabilizer. It is recommended that STA BIL[®] or its equivalent be used according to the manufacturers directions, prior to any lay-up or any period of inactivity longer than thirty (30) days to insure protection of the fuel system components.

PCM reserves the right to refuse warranty on parts which are damaged from using improper gasoline or engines improperly stored.

Electrical System

A voltmeter is recommended to be used in the instrument panel, accordingly all engines that are produced in our factory are wired for use with a voltmeter. The voltmeter allows:

1. Display of the charge condition of the battery when the ignition switch is turned to the "on" position.
2. Current is to be routed directly from the alternator to the battery. There is virtually no current loss or line drop.
3. Detection of overcharging as an abnormally high voltage reading on the voltmeter so corrections can be made before battery damage occurs.

High voltage can result in battery damage, false instrument readings, and damage electrical components.

Circuit Breaker(Carburetor Equipped Engines)



CAUTION: Many boats come equipped with a safety switch, located

General Information

near the helm, that has a tether attached. This switch must be operational or the engine will not start or continue to run.

The electrical system, of all PCM engines, is protected by at least one 50 AMP circuit breaker under the electrical panel cover at the rear of all carburetor equipped engines. This breaker is designed and assembled to disconnect ALL systems from the battery should an electrical overload occur.

In the event that all electrical systems are dead, turn off all accessories then, push firmly on the red button with the number "50", which protrudes through the electrical cover, until it resets. After the breaker is reset, you should be able to start the engine(s).

If any breaker again disconnects or if resetting does not resolve the problem, have a qualified marine mechanic inspect the engine to determine the cause of the problem.



WARNING: *DO NOT* bypass breakers or fuses under any circumstances short of an emergency. Severe damage to the Electrical System and/or personal danger to the operator and other occupants of the boat could occur.

Circuit Breakers (EFI engines)



CAUTION: Many boats come equipped with a safety switch, located near the helm, that has a tether attached. This switch must be operational or the engine will not start or continue to run.

The entire electrical system, of the PCM GT40 engine, is protected by a 50 AMP circuit breaker. The ignition system is protected by its own 12.5 amp breaker, and the fuel pump circuit by its own 15 amp breaker. All protective devices are located on a panel at the rear of the engine.

PCM TBI engines have three fuses and a 50 amp breaker located at the rear of the engine behind the fuel injection ECM. The 50 Amp breaker protects the entire electrical system. The fuses protect the following EFI circuits.

- A. Fuel Pump Fuse - 15 Amp
- B. Injector/ECM Fuse - 10 Amp
- C. ECM / Battery Fuse - 15 Amp

If the engine quits or will not start turn off all accessories. If the battery has enough power to crank the engine using the starter, the breakers should be reset as follows. Push firmly on the red button of each breaker or replace any bad fuse. After the breaker is reset or the fuse replaced, you should be able to start the engine.

If any breaker again disconnects or fuse again blows or if resetting does not resolve the problem, have a qualified marine mechanic inspect the engine to determine the cause of the problem.

Additional Fused Protection.



CAUTION: Many boats come equipped with a safety switch, located near the helm, that has a tether attached. This switch must be operational or the engine will not start or continue to run.

A 40 Amp fuse on all PCM TBI engines and a 50 Amp fuse on the PCM GT40 engine is located within one (1) foot of the large (+) post of the battery. This fuse is designed to protect the engine wiring harness if an electrical overload occurs.

Note: The fuse lead to the battery and a quick disconnect in the power feed wire near the ECM may lose contact and cause a no start condition or cause the engine to stop running in the same manner as a blown fuse.

A 20 amp fuse may be located under the boats instrument panel in the ignition switch "I" terminal lead to protect electrical system. After checking the main breaker, check to see if any of these fuses are blown if key is turned to START and nothing happens.



WARNING: *DO NOT* bypass breakers or fuses under any circumstances short of an emergency. Severe damage to the Electrical System and/or personal danger to the operator and other occupants of the boat could occur.

Battery and Battery Cable Inspection

A fully charged battery is your best insurance that your PCM engine will start each time you go on board. We recommend the use of a 12-volt marine battery with an ampere-hour capacity suitable for engine size. See minimum

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specifications on page SP 1. Batteries tend to discharge when not in use, the rate of discharge varying with the condition of the battery itself and/or the entire electrical system.

When checking the battery condition, on your volt meter after a reasonable period of disuse, a reading of 10 to 11.5 volts may be found. If voltage reading is 10 volts or below, the battery should be charged by either a charging device or operation of the engine. Upon starting the voltage should immediately raise and within one or two minutes after starting the engine, the voltage reading on the meter should begin to slowly level off at a reading of 13.5 to 14.5 volts, as the engine continues to operate. If the voltage does not rise or rises and stays above 15 volts, after starting the engine, have the charging system checked.

Ignition Distributor

Carburetor Equipped Engines



WARNING: Distributors on all PCM engines are marine approved and must meet specifications. Use only PCM

Replacement Parts, which are manufactured to the same marine approved standards, as the original equipment parts on your engine when manufactured.



WARNING: Removal of the Distributor Cap must be accomplished by first loosening the screws which clamp the Distributor Cap retaining

clips into place. Failure to loosen these screws and prying on the cap could damage the cap and/or destroy the ability of the cap to seal the distributor causing the distributor to become vented and no longer sealed against possible ignition of fuel fumes if present.

Carburetor equipped engines models PLC, PLD, and PLP are equipped with Prestolite Breakerless Distributors. This distributor requires lubrication with a drop of 30W engine oil on the wick under the rotor every 100 hours of engine operation.

EFI Engines

All PCM EFI engines come equipped with maintenance free distributors. No lubrication or maintenance is necessary for the life of your PCM engine.

Cooling System

Standard

The Cooling System of each PCM Marine Engine incorporates a full circulation bypass system, permitting a full flow of water through the engine, even during warmup. Two heavy-duty marine-type pumps are used to accomplish this. A flexible impeller supply pump is used to keep the system full and cool the exhaust system.

A high volume circulating pump maintains full water circulation within the engine to prevent steam pockets and hot spots and assure longer valve and piston ring life. A heavy-duty thermostat is used to control the amount of water which is discharged from the engine after the desired operating temperature is reached. The discharged water is automatically replaced by cool water from the supply pump, maintaining an unusually stable engine temperature through an exceptionally simple system. The hot water is discharged into the exhaust manifold water jackets, further heating the manifold to reduce condensation.

Should overheating occur, stop the engine immediately. Check the water intake and sea strainer, if equipped, and/or transmission cooler for obstruction by weeds, etc. (Plastic sandwich bags and similar containers effectively close off a water intake-DONT LITTER!) Check water pump drive belts for tension and slippage. Inspect water intake hoses for kinks and bends.

On inboard and vee-drive models, check the transmission oil cooler for obstruction of the water tubes.

On all models equipped with engine oil cooler, check the engine oil cooler for obstruction of the water tubes.

A partial inspection of the flexible impeller of the supply pump of some engines can be made by removing the top hose and drive belt from the supply pump and looking into the pump chamber while slowly turning the pump pulley, other engines require removal of the pump for inspection. A badly damaged impeller may be readily detected in this manner.

If a problem is found and corrected, do not attempt to restart until the engine has cooled to normal limits. This is important to prevent engine

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damage due to thermal shock.



WARNING: Removal of hoses from the engine while the boat is on the water may allow water to enter the bilges and could sink the boat. Remove hoses only if you have determined you may do so in complete safety.

Optional Fresh Water

Engines manufactured with an optional fresh water cooling system, are identified with a "X" in the second position from the left in the model identifier on the engine identification tag. See box A of the information format explanation on page GN 1 of this manual.

The PCM Freshwater Cooling System consists of two (2) sections. The sea water section and the self-contained Fresh Water Section.

The coolant in the freshwater section circulates through the engine block, heads and the intake manifold absorbing the heat created by the engine operation. When the engine is at operating temperature the thermostat allows the coolant to flow around the sides of the tubes in a heat exchanger where heat is transferred to sea water flowing through the center of the heat exchanger tubes. The sea water is then directed into the manifolds and risers where it mixes with the exhaust which is directed overboard.

If overheating occurs the sea water section of this system should be inspected in the same manner as outlined in the "Cooling System (Sea Water)" section of this manual.

Checking Coolant Level



WARNING: Reservoir is equipped with a 14 lb.. (6.35kg) pressure cap. **DO NOT** remove the pressure cap when the engine is hot. To do so could cause personal injury. **ALWAYS ALLOW THE ENGINE TO COOL OFF BEFORE ATTEMPTING TO REMOVE THE PRESSURE CAP.** To remove the cap, turn it a quarter of a turn to the left and allow pressure in cooling system to escape. Then turn cap all-the-way off.

The fresh water section should also be checked for proper coolant level prior to each engine use. Coolant should be maintained at least 1

inch below the pressure cap seat in the expansion tank to insure room for coolant expansion.

If coolant is escaping from the system inspect the system components for leakage, and correct as necessary. Also have pressure cap tested to insure proper operation. A defective cap may allow coolant to escape through the overflow during engine operation and be extremely difficult to detect.

Contact your PCM Dealer at once if this problem cannot be resolved by the above procedures.

Flushing Instructions

IMPORTANT: Drain the sea water section of the cooling system if engine is removed from service in below freezing temperature.

NOTE: When engine is operated in salt water, flush it with fresh water periodically and before storage. If engine is flushed while boat is in water, water intake must have a sea water cock installed between water pickup and pump inlet.



CAUTION: Do not operate engine without cooling water flowing through water pump or Neoprene water pump impeller will become damaged. ***IF***

RUNNING THE ENGINE WITH THE BOAT OUT OF THE WATER, attach water hose to pump inlet and run engine slowly (650-700 RPM) in neutral to circulate water.

IMPORTANT: ***DO NOT*** increase engine speed above 1,000 RPM or water pump damage may occur.

IF RUNNING THE ENGINE WITH THE BOAT IN THE WATER, run the engine at 1,000 to 1,500 RPM. Watch water temperature gauge to prevent overheating.

OPERATING INSTRUCTIONS

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OPERATING INSTRUCTIONS

ALWAYS OBSERVE HIGH SAFETY STANDARDS AND COURTESY AFLOAT!

Consult your local Coast guard Auxiliary or Power Squadron for full details on boating safety.



WARNING: Before starting your engine, always ventilate engine compartment by opening hatch or (if equipped) operate bilge blower for a sufficient amount of time to remove any gas fumes from the engine compartment. It is doubly important after repairing, refueling or maintaining to check for fuel spillage or leaks before starting engine. Remove the battery cable from battery before attempting any maintenance or any repairs or when boat is placed in storage or in transit.

Starting and Operating

A routine pre-starting procedure similar to the one that follows should always be carried out before the first start up of the day.

1. Check oil in engine and transmission.
2. Check for gasoline fumes in bilges or engine compartment.
3. Operate engine room blower for sufficient time to remove any fumes.
4. Operate bilge pump until bilges are dry.
5. Check for adequate fuel in the fuel tank.
6. Check to insure that all necessary safety equipment is on board.

Other items to be inspected may exist, depending upon the nature of the boat. It is advisable to formulate a check list containing all items relative to your boat and follow it faithfully.

NOTE: Bilge blowers, bilge pumps, and other accessories should not be connected to the ignition terminal or ignition circuit. Carburetor equipped engines are equipped with an automatic choke which is opened by an electric heating unit. If the ignition is on for one or two minutes prior to starting, the choke will be open and inoperative, and starting may be extremely difficult.

Check Before Starting

Each time your engine is used the following items must be checked and adjusted if necessary to insure safe enjoyable operation.

1. Engine oil level.
2. Transmission fluid level.
3. Shifting linkage (forward, neutral and reverse) for shift lever in detent and proper direction.
4. Leakage (water, oil and fuel).
5. Coolant level, if fresh water cooled.
6. Operation of throttle and shift controls.
7. Battery condition.
8. Visually inspect for loose mounting fasteners.
9. Insure that the tethered kill switch, located near the helm of your boat, is fully and in electrical contact. See your boats operation manual. Proper methods of checking fluid levels and appropriate cautions to insure safety are found in the MAINTENANCE section of this manual.

Models equipped with inboard transmissions have a factory installed safety switch incorporated, which prevents actuation of the starter unless the shift selector is in neutral. Other models may not.



WARNING: Before starting, be sure the shift selector is in neutral.

Before starting a cold engine, equipped with a carburetor, pump the throttle two or three times from closed to open to closed. Open throttle slightly above the idle position and actuate starter.



CAUTION: Do not continue to operate starter for more than 30 seconds without pausing to allow starter motor to cool off for 2 minutes. This also will allow battery to recover between starting attempts.

As soon as the engine starts, return the throttle toward closed to establish the engine speed at 1,200 to 1,600 RPM's, and give the engine a short period to warm up and smooth out. When all else is in readiness, reduce speed to idle, shift into gear, and proceed normally. PCM EFI engines do not require throttle pumping prior to starting.

NOTE: Pumping the throttle should not be necessary with a warm engine. A warm engine should start readily with the throttle closed by simply actuating the starter.

OPERATING INSTRUCTIONS

Check While Running



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

Check After Starting

1. Oil pressure 35 to 80 PSI (Approx.) at 2000 RPM.
2. Cooling water flow and water temperature 140°-170° R/W and 170°-210° F/W.
3. Idle RPM (600-700) in gear.
4. Maximum forward underway RPM according to specifications for your engine (see section SP .)
5. Shifting linkage (forward, neutral and reverse) for shift lever in detent and proper direction.
6. Leakage (water, oil and fuel).
7. Exhaust water, oil, fuel system for leaks.
8. General operation of craft.



CAUTION: Do not operate at high RPM's in neutral. Do not shift into forward or reverse at speeds above idle RPM's.

During the warmup period, scan the instrument panel for correct operation of all systems. Oil pressure should quickly rise to 35 to 80 lbs. Water temperature should gradually increase to the normal controlled level of 140-170 degrees on direct water cooled models, 170-210 degrees on fresh water heat exchanger equipped cooled models.



CAUTION: Do not operate engine without cooling water flowing through water pump or Neoprene water pump impeller will become damaged. *IF RUNNING THE ENGINE WITH THE BOAT OUT*

OF THE WATER, attach water hose to pump inlet and run engine slowly (650-700 RPM) in neutral to circulate water. Raising RPMs over 1,000 may cause impeller damage. *IF RUNNING THE ENGINE WITH THE BOAT IN THE WATER*, run the engine at 1,000 to 1,500 RPM. Watch water temperature gauge to prevent overheating.

Alternator charge output should be indicated on the ammeter by the needle indicating toward the (+) side of zero. *IF EQUIPPED WITH A VOLTMETER, THE VOLTAGE SHOULD GRADUALLY RISE TO APPROXIMATELY 13.5 VOLTS OR HIGHER AND REMAIN THERE WHILE THE ENGINE IS OPERATING.*

Operating Limits

(See Specifications For Your Model)

Maximum RPM, underway at wide open throttle under normal load conditions, can be controlled only by propeller pitch, diameter and design. It is essential that the propeller selected by the installer does not overload or underload the engine.

Extreme overloading, resulting in low RPM's at wide open throttle, will deliver poor performance, poor fuel economy, and eventually result in engine damage.

Underloading, if operated above recommended maximum RPM's, will result in high RPM, poor fuel economy, and engine damage.

Operation in extremely shallow water can cause sand, silt and gravel to be pulled into the cooling system; this can create excessive water pump wear and in extreme cases may deposit in the engine water block water jackets and seriously damage the engine from improper cooling. Heavy weed growth can plug oil coolers and water intakes and cause damage. If operation under these conditions is necessary, a good quality sea water strainer or filter should be installed. The installation of a fresh water cooling system can reduce the danger of engine damage from this cause.

Check After Initial Run

1. Engine oil level.
2. Transmission fluid level.
3. Leakage (water, oil and fuel).
4. Engine mounting fasteners are tight.
5. Operation of throttle and shift controls.

OPERATING INSTRUCTIONS

Starting A Flooded Engine



WARNING: If the engine backfires upon attempting to start, the problem may be more serious than flooding. **DO NOT CONTINUE, CONTACT A TECHNICIAN TO CORRECT THE PROBLEM!** To persist in attempting to start the engine under those conditions could cause engine damage or physical harm to you and those around you.

In the event your engine becomes flooded caution should be observed when attempting to start the engine.

Position the throttle in wide open and activate the starter until the engine starts. When the engine starts allow the key to return to the run position and quickly return the throttle to approximately 2,500 RPM's or less, check gauges for normal readings and allow the cylinders to be purged of excess fuel. If gauge readings are abnormal shut the engine off at once and contact your PCM dealer. When the engine runs normally check the engine for fuel, water, and exhaust leaks which must be corrected before proceeding. If no leaks are present, the boat may be safely operated.

Break in



CAUTION: DO NOT ATTEMPT TO BREAK IN AN ENGINE BY PROLONGING IDLING OR RUNNING AT THE DOCK.

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



CAUTION: DO NOT OPERATE AT SUSTAINED FULL THROTTLE DURING THE FIRST 5 HOURS OF OPERATION.

Reduce throttle to 2,800 to 3,000 RPM and cruise at or below this speed for 1/2 hour. Reduce speed to idle, open throttle wide and operate at that speed for approximately 1 minute; reduce to cruise throttle for a few minutes and repeat. (Bringing the engine from idle speed to full 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 full throttle should not

be sustained for more than 1 to 2 minutes.



WARNING: FOLLOW THIS PROCEDURE ONLY WHEN CONDITIONS ARE SUCH THAT IT CAN BE DONE IN COMPLETE SAFETY.

During the early part of the break in period, correct propeller selection can be confirmed. (With a normal load aboard, the engine's RPM's should reach, but not exceed, maximum RPM's as listed under specifications for your model).

During the break-in, all gauges should be watched carefully and speed reduced if abnormal readings become evident.

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MAINTENANCE



WARNING: The maintenance instructions given in this manual are to be performed with extreme caution.

Improper or careless actions on the part of the person performing maintenance on your boat or engine could result in severe personal injury, property damage and or death. Proceed only when you determine that you may do so in complete safety. Contact your PCM dealer for any maintenance service which you are unable to perform with complete safety.

Replacing Fuel Filter



WARNING: Be careful of spilled fuel; Do not proceed if fuel is spilled. Gas vapor built up is explosive and could cause severe personal injury, property damage or even death. Do not smoke while servicing fuel filters or other fuel system components. Contact your PCM dealer for further assistance.

PCM recommends the use of a fuel filter and/or water separator and fuel filter on all its engines. Fuel filters are standard on all PCM Electronic fuel injection engines as a part of the PCM FCC (fuel control cell). Fuel Filters are not standard on other PCM engines; however, we do offer them as an option to all Boat Builders and Dealers. If your boat is not equipped with a fuel filter, see your PCM Dealer, he can provide you with the proper parts and installation service to protect your engine's fuel system. When replacing the fuel filter element, follow the manufacturer's instructions and the following cautions.

NOTE: *DO NOT* re-use old fuel filter components; always replace with new fuel filter and gasket.



CAUTION: Do not operate engine without cooling water flowing through water pump or Neoprene water pump impeller will become damaged. *IF RUNNING THE ENGINE WITH THE BOAT OUT OF THE WATER*, attach water hose to pump inlet and run engine slowly (650-700 RPM) in neutral to circulate water. *IF RUNNING THE ENGINE WITH THE BOAT IN THE WATER*, run the engine at 1,000 to 1500 RPM. Watch water temperature gauge to prevent overheating.

The PCM FCC has instructions on the bowl. Follow these instructions carefully when changing the FCC Filter Element.

Exhaust System

The system should be periodically inspected for leaks and for general condition to prevent leakage of water and exhaust gases into the hull. Flapper valves are suggested to be used on all exhaust systems. Any defects discovered must be corrected as soon as discovered to insure safe operation.



WARNING: Removal of hoses from the engine while the boat is on the water may allow water to enter the bilges and could sink the boat. Remove hoses only if you have determined you may do so in complete safety.

PCM Transmissions

Fluid Type

All PCM transmissions use DEXRON type Transmission fluid.

Change Frequency

Change transmission fluid once each year.

Transmission Fluid Level

The transmission fluid level should be checked frequently and fluid added if necessary. Level must be maintained between the two marks (FULL & LOW) on dipstick.

Maintaining Fluid Level On PCM Transmissions

Two methods of checking the fluid level are offered as follows. Method #1 is the preferred method but should be attempted by those who are certain that the procedure can be accomplished with absolute safety.

Method #1



WARNING: In order to prevent personal injury to you or others on board, whenever the engine is running the machinery space must be closed. Never operate the engine with the engine machinery space open or while some one is in the machinery space, either open or closed. Never open the machinery space

MAINTENANCE

unless the engine is shut off and the engines rotating parts are stationary and remain in a stationary position. Rotating machinery can cause injury and even death if an accident should occur. Whenever a problem exists that requires the operation of the engine with the machinery space open, extreme care must be exercised. *IT IS RECOMMENDED THAT UNCOVERED ENGINE OPERATION BE ATTEMPTED ONLY BY TRAINED AND QUALIFIED SERVICE PERSONNEL.*

1. The boat must be at rest in the water with the engine running at idle speed and the propeller shaft not turning.
2. Pull the dipstick straight up and out of the transmission case to remove dipstick.
3. Wipe the fluid off of the dipstick with a clean cloth.
4. Push dipstick fully into the installed position in transmission fill hole.
5. Remove dipstick and note level indicated. Add fluid, if required, to bring level up to the top mark.

NOTE! Add oil in small amounts to prevent overfilling. If the transmission is over filled the excess will have to be removed to prevent leakage or damage to the transmission.

6. Reinstall dipstick.

Method #2

Method # 2 eliminates the risk of entering the machinery space while the engine is running and should be used by those unwilling to accept the dangers of running machinery.

1. The boat must be at rest in the water.
2. Open the engine cover and pull the dipstick straight up and out of the transmission case to remove dipstick.
3. Wipe the fluid off of the dipstick with a clean cloth.
4. Close the engine compartment and start the engine to fill all the transmission and cooler cavities.
5. Shut the engine off, open the engine compartment and insert the dipstick fully into the transmission case opening. This step should be performed as quickly as safety will permit.
6. Remove dipstick and note level indicated. Add fluid, if required, to bring level up to the top mark.

NOTE! Add oil in small amounts to prevent overfilling. If the transmission is over filled the excess will have to be removed to prevent leakage or damage to the transmission.

7. If it was necessary to add oil Repeat steps 1 through 6. Reinstall dipstick.

Engine Lubrication

Selecting Crankcase Oil and Change Intervals

The crankcase oil should be selected in order to give the best performance under the climatic and operating conditions prevalent in the area in which the engine is operated. An oil, which will provide adequate lubrication under high operation temperatures, is required during warm or hot weather. An oil, which will permit easy starting at the lowest atmospheric temperature likely to be encountered, should be used during the colder months. When the crankcase is drained and refilled, crankcase oil should be selected on the basis of prevailing temperature for period during which oil is to be used.

AUTOMOTIVE GRADE API "SH" RATED OIL		
		40W40
	30W30	ABOVE 50°F
20W50	32°F to 50°F	
	BELOW 32°F	

We recommend SAE 40W40 of any good grade automotive oil of correct viscosity which has an A.P.I. classification of "SH" for use in all PCM engines. Multiple viscosity oils such as 20W40 and 20W50 which meet the A.P.I. classification "SH" may also be used during cold weather operation.

Engine oil and filter must be changed after the 25-Hour Break-In Period and every 50 hours of operation or every 60 days thereafter, whichever occurs first.

Changing Engine Oil



CAUTION: All engine waste fluids are considered to be hazardous wastes. Be certain these waste fluids are properly and legally disposed of in order to avoid polluting and or possible cite by authorities.

MAINTENANCE

The engine oil and oil filter of your PCM engine must be changed at the intervals recommended in the maintenance schedules found on page MT 10 of this manual. Oil changing should be carried out as follows.

1. Start engine and allow engine to warm up to normal operating temperature.
2. Drain oil into a suitable container.
3. Position a suitable container under the oil filter and remove the oil filter from the engine. *Be careful not to allow oil to spill into the bilge. Spilled oil must be thoroughly cleaned up and the cleaning materials and oil properly disposed of.*
4. Fill a new oil filter 3/4 full by carefully pouring oil into the threaded hole in the center of the filter. This initial filling of the filter reduces the time that the engine operates without oil flowing through the engine oil passages upon starting.
5. Lubricate the filter gasket with engine oil and install the filter on the block to the point where the gasket lightly contacts the block surface. Tighten the filter an additional 1/4 turn from this point.
6. Fill the engine oil pan with the proper type and grade, as indicated in "Engine Lubrication" above, and proper amount of engine oil for your engine as listed in the specification section of this manual.
7. After checking to determine that you can safely proceed without causing harm to any person, property or the engine, start the engine and carefully watch for oil leaks.
8. If leaks are present, *return the engine to idle speed* and shut off the engine immediately. Repair leaks and repeat step number 7 (seven) above.
9. Dispose of waste oil, old filter and cleaning materials in accordance with the applicable laws.

IMPORTANT! Some PCM engines come equipped with oil drain fittings and drain hoses others, a very small number where installation space constraints are severe, require that oil be removed using a pump attached to a tube inserted into the dipstick tube or that the oil pan drain plug be removed. The PCM models PLD and PLP with the dipstick tube located between the port manifold and block has a threaded fitting designed to connect to an oil pumping device for easy removal of oil from the engine.

Engine Crankcase Capacity



CAUTION: The dipstick should be considered as the device which insures the proper oil level. Unless major variations between capacities, listed in specifications, and dipstick readings exist, *always use the dipstick to determine the proper oil level of your engine.*

The engine crankcase capacity is listed in the Specification Section. (Sp section) The installed angle of the engine may change the oil level at the dipstick location, even though your engine oil pan capacity if filled with the amount of oil listed in the specifications, for your engine. Different dipsticks are used on some engines for 0° & 15° installation angles. ***BE CERTAIN THE PROPER AMOUNT OF OIL IS IN THE CRANKCASE AT ALL TIMES. IF ANY QUESTION ARISES, CONTACT YOUR PCM DEALER.***

Maintaining Engine Oil Level

It must be emphasized that every internal combustion engine should, particularly during the break-in period, use a certain amount of oil to act as a lubricating and cooling agent. The initial rate of consumption will normally, gradually decrease until it becomes stabilized after approximately 100 hours operation.

The engine oil level should be checked frequently and oil added when necessary.

When checking oil levels, the engine should be warm, the boat must be at rest in the water, the dipstick pushed down to the stop. If the engine has been running immediately prior to checking, sufficient time (approximately 1 minute) must be allowed for oil to drain back from the upper engine cavities to the pan or a false reading may be obtained.

The space between the "Full" and "Add" marks represents US one quart. It is not necessary to add oil unless the level is near the "Add" mark. **DO NOT ALLOW THE OIL LEVEL TO FALL BELOW THE ADD MARK!**

Adjusting Water Pump Drive Belt Tension

1. Check belt tension by depressing upper strand of belt at point midway between the sea water and circulation pump pulleys.
2. Belt should depress 1/4" (6.35mm). If depression is more than 1/4", adjust tension by loosening water pump mounting screws and pivoting pump, as required, to obtain correct

MAINTENANCE

tension.

3. After correct tension has been set, tighten mounting screws.

Adjusting Alternator Drive Belt Tension

1. Check belt tension by depressing upper strand of belt at a point midway between the alternator pulley and the circulating water pump pulley.
2. Belt should depress 1/4" (12.7mm). If depression is more than 1/4", adjust tension by loosening alternator mounting screws and pivoting alternator, as required, to obtain correct tension.
3. After correct tension has been set, tighten mounting screws.

If at any time you are unsure as to proper checking or adjusting procedures consult your dealer for guidance.

Fuel Pumps

Three different types of fuel pumps are currently used on PCM engines. The three types are:

- 1) Mechanical
- 2) Low Pressure Electrical (Feed)
- 3) High Pressure Electrical (Injection)

Mechanical and low pressure electrical pumps operate at 5 to 7 PSI, while high pressure pumps operate between 30 to 40 PSI.

Mechanical Fuel Pumps

Mechanical fuel pumps will be found on all PLC, PLD with carburetors. All mechanical fuel pumps used on PCM engines are special marine fuel pump sealed against leakage in the attaching flange area to prevent the possibility of fuel entry into the engine crankcase. In the event that the fuel pump diaphragm ruptures fuel will appear in the sight tube attached to the fuel pump and the carburetor. When fuel appears in the sight tube it will be necessary to replace the fuel pump immediately, to correct the problem. **REBUILDING OF THE PUMP IS NOT RECOMMENDED!!**

Electrical Fuel Pump

The electric feed pump being used on all PCM engines, other than the PLC and PLD models, is a high volume, internally regulated low pressure, constant flow, rotary vane, fully sealed, non repairable, marine approved fuel pump. The power source is 12 volt negative (-) ground and the pump operates at less than 5

amps.

Carburetor Equipped Engines With Electric Fuel Pumps

With the ignition on power is supplied through the ignition switch to an oil pressure switch mounted at the left side of the electrical bracket. This switch activates only when the engine is running to prevent the pump from operating if the ignition switch is inadvertently left in the on position.



WARNING: Do not bypass this switch!

During cranking of the engine a bypass circuit allows the fuel pump to function thus allowing priming after lay-up or in the event that the fuel tank is ran dry.

The pump circuit is protected by a 5 amp fuse (BUSS # MDL 5) in the water proof fuse holder located between the left rocker cover and the carburetor. Due to the fact that the pump is isolated in mounting the electrical circuit is completed through a ground wire attached next to the power lead on the bottom of the pump.

IMPORTANT! The pump terminals must be connected properly to prevent pump damage and or proper operation. The power (+) lead must be contacted to the terminal closest to the "OUT" fitting of the pump. The ground (-) lead must be connected to the terminal closest to the "IN" fitting of the pump.

Electric Fuel Pumps On EFI Engines

When the ignition switch is turned "ON", the Electronic Control Module (ECM) turns the fuel pump relay "ON" causing the fuel feed pump to fill the FCC bowl. At the same time the high pressure fuel pump in the FCC is turned on to pressurize the throttle body or fuel rail. After two seconds if the engine is not started the fuel pumps are shut off by the Electronic Control Module (ECM).

When the ignition switch is turned to the crank or start position, the ECM closes the fuel pump relay causing the fuel pump to run.

If the ECM does not receive ignition reference pulses (engine cranking or running), it shuts "OFF" the fuel pump relay, causing the fuel pump to stop.

An inoperative fuel pump relay will result in an "Engine Cranks But Won't Run" condition.

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Check battery with a hydrometer. If reading is below 1.230 (specific gravity), recharge or replace the present battery.

Inspect battery and cables for signs of corrosion on battery, cables and surrounding area, loose or broken battery box, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to the proper level with distilled water.

The top of the battery should be clean and the battery box and/or hold-down bolts properly tightened. Particular care should be taken so that the top of the battery is kept clean of acid film and dirt to prevent a short between the battery terminals.



CAUTION: Be certain to use the proper tools to remove the cables from the battery. Always disconnect the negative (-) cable first.

After removing battery from the boat, wash first with a diluted ammonia or soda solution to neutralize any acid present and then flush off with clean water. Care must be taken to keep vent plugs tight so that the neutralizing solution does not enter the cells.

To ensure good contact, the battery cables should be tight on the battery posts. If the battery posts or cable terminals are corroded, clean separately with a soda solution and wire brush. After cleaning and before installing clamps, apply a thin coating of petroleum grease to the posts and cable clamps to help retard corrosion. Reinstall as follows:



CAUTION: Engine electrical system is negative ground. Failure to connect battery leads, as outlined, will damage the system.

1. The battery should be contained in a leak proof battery box, positioned as close to the engine as possible and should be securely mounted in boat.
2. If removed, connect the negative (-) battery cable to ground on engine.
3. If removed, connect the positive (+) battery cable to the solenoid.
4. First connect the positive (+) battery cable to the positive (+) post on the battery and then the negative (-) battery cable to the negative (-) post on the battery.

Batteries should always be removed from the boat for flushing and/or recharging with battery chargers.

If the battery has remained undercharged, the local servicing dealer should check for loose alternator belt,

defective alternator components, high resistance in the charging circuit or a low voltage output.

Spark Plugs

Stray sparks can ignite an explosive atmosphere if present and stray electrical energy in the form of radiate energy (radio waves) can cause sensitive electronic circuits to malfunction. This can cause engine operation to deteriorate and increase the possibility of engine damage. The following cautions and procedures are designed to minimize the possibility of either stray spark or radiated energy from occurring.

Spark Plug Removal

Disconnect and Remove

1. Negative battery cable.
2. Twist boots one-half turn then remove spark plug wires and boots.

IMPORTANT! When removing the boot, *do not* use pliers or other tools that may tear the boot. *Do not* force anything between the wire and the boot, or through the silicone jacket of the wiring. *Do not* pull on the wires to remove the boot.

DO! Pull on the boot, or use a tool designed for this purpose. **DO!** label the plug wires if the identification numbers have worn off.

3. Spark plugs.

Inspection

1. Inspect each plug individually every 100 hours for badly worn electrodes, glazed, broken or blistered porcelain and replace where necessary. **NOTE:** Spark plugs should be replaced after 200 hours of operation. Always use the recommended Spark Plugs. See specifications for your engine for proper numbers.
2. Inspect each spark plug for make, number, and heat range. All plugs must be the same brand and number.

IMPORTANT! *Improper heat range may cause major engine damage.*



CAUTION: Never bend the center electrode to adjust gap. Always adjust by bending ground or side electrode.

3. Adjust spark plug gaps with a round feeler gauge. (See "Specifications.") Replace defective plugs.

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Installation

1. Always keep spark plug seats in cylinder head clean. If spark plugs will not thread into the head to the point where they contact the seat by hand, clean the threads in the cylinder head before installing the plugs.

NOTE: *Improper installation may cause unsatisfactory spark plug performance and engine damage.*

2. Install spark plugs to engine and torque to 11 ft. lbs. (15 N.m).
3. Replace or repair any loose or damaged spark plug wires. Install all wires to proper spark plug. Proper positioning of spark plug wires in supports is important to prevent cross-firing.

IMPORTANT! Special care should be used when installing spark plug boots to make sure the metal terminal within the boot is fully seated on the spark plug terminal and the boot has not moved on the wire. If boot to wire movement has occurred, the boot will give a false visual impression of being fully seated. A good check to make sure the boots have been properly installed is to push sideways on them. If they have been correctly installed, a stiff boot with only slight looseness will be noted. If the terminal has not been properly seated on the spark plug, only the resistance of the rubber boot will be felt when pushing sideways.

Replacement Wire routings must be kept intact during service and followed exactly when wires have been disconnected, or when replacement of the wires is necessary. Failure to route the wires properly can lead to radio noise and cross-firing of the plugs, or shorting of the leads to ground.

MAINTENANCE

Engine Troubleshooting

IMPORTANT: The following chart is a guide to aid you to find and correct minor engine malfunctions. If the problem has not been corrected after following the guide, DO NOT attempt further repairs. See your authorized PCM Dealer.



WARNING: Before attempting any checks or repairs, the battery cable **MUST BE REMOVED** from the battery to prevent possible personal injury or damage to equipment.

Trouble	Cause	What You Can Do About It
1. Starter won't turn engine	A. Control lever not in neutral. B. Loose or corroded battery connections. C. Weak battery. D. Tethered switch key not inserted or not making contact.	Make sure control lever is exactly in neutral Tighten cables on battery. If corroded, clean as described under "Battery Maintenance." Check level of electrolyte and refer to "Battery Maintenance." Remove then insert tethered switch key into switch.
2. Engine won't or is hard to start.	A. Empty fuel tank. B. Tank vent clogged. C. Shut-off valve closed. D. Clogged fuel filter. E. Choke not operating properly. F. Engine flooded. G. Fouled spark plugs or gap wrong. H. Cracked or dirty distributor Clean or replace cap or rotor. I. Poor connections or damaged connections	Check fuel supply. Make sure vent is free of obstruction. Check valve to make sure it is open. Inspect fuel filter. Replace if necessary, as outlined under "Replacing Fuel Filter." Inspect carburetor choke linkage for any binding or obstructions. Do not attempt to start engine for at least 5 minutes. Inspect spark plugs. Clean and gap or replace. Inspect contacts and or surfaces.
3. Poor idling or binding or engine misses while idling	J. Tethered switch key not inserted or not making contact. A. Choke not operating properly. B. Corroded wire ends or distributor cap towers C. Fouled spark plugs or gap wrong. D. Weak battery. E. Cracked or dirty distributor D. Tank vent clogged.	Check wires for wear or breaks and tighten all loose ignition wiring. Remove then insert tethered switch key into switch. Inspect carburetor choke linkage obstructions. Check wires and towers for corrosion. Clean or replace. Inspect spark plugs. Clean or replace. Check level of electrolyte and refer to "Battery Maintenance." Inspect contacts and surfaces. Clean or replace. Make sure vent is free of obstruction.

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4. Engine misses on acceleration or at high speed (loss of power)	E. Clogged fuel filter. F. Fouled spark plugs or gap wrong. A. Fouled spark plugs or gap wrong. B. Cracked or dirty distributor C. Poor connections or damaged ignition wiring	Inspect fuel filter. Replace if necessary, as outlined under "Replacing Fuel Filter" Inspect spark plugs. Clean or replace. Inspect plugs, clean or replace. Inspect contacts and surfaces. Clean or replace cap or rotor. Check wires for wear or breaks and tighten all loose connections.
5. Oil pressure drop	A. Low oil level. B. Clogged oil filter.	Refer to "Maintaining Engine Oil Level." Refer to "Draining Engine Oil and Replacing Oil Filter."
6. Engine backfires	A. Spark plug leads installed wrong.	Make sure correct lead is installed on proper plug and proper tower in distributor cap.
7. Alternator will not charge	A. Drive belt loose, or has low output. B. Connections loose or dirty. C. Unacceptable battery condition.	Refer to "Alternator Charging System." Inspect connections for corrosion and tighten all loose connections. Check level of electrolyte and refer to "Battery Maintenance."
8. Performance loss and poor acceleration	A. Throttle not fully open. B. Excessive water in bilge. C. Boat overload. D. Tank vent clogged.	Inspect cable and linkage for binding or obstruction Drain or pump water out of bilge. Reduce load.
	E. Clogged fuel filter.	Make sure vent is free of obstruction.
	F. Fouled spark plugs.	Inspect fuel filter. Replace if necessary, as outlined under "Replacing Fuel Filter." Clean or replace.

MAINTENANCE

Maintenance Chart

This chart indicates the intervals at which maintenance should be performed by a qualified person. maintenance operations require caution to prevent personal injury and/or property damage. Proceed only after you have determined that you may do so in *complete safety* or contact a qualified technician to perform these operations for you.

Service or Checking at the Most Frequent Interval Listed is Recommended

	Before Each Use	Weekly	At 1st 25 Hours of Operation	Every 50 Hours of Operation	Every 100 Hours of Operation	Once Each Year
Check Engine Oil	X					
Change Engine Oil		1	1	1	1	1
Replace Oil Filter		X	X	X	X	X
Check Transmission Fluid Level	X					
Check Sea Water Strainer	X	2	2	2	2	2
Check Water Pump & Alternator Belts for Tension	X					
Check Fuel System Lines and Connectors-Leak	X	X	X	X	X	X
Check Cooling System Hoses& Connections-Leaks	X					
Check for Loose, Damaged or Missing Parts	X					

The following operations must be performed by a QUALIFIED TECHNICIAN

*Check Engine to Propeller Shaft Alignment			X			X
*Change Transmission Fluid				X		
*Clean Flame Arrestor			X		X	X
*Clean Crankcase Ventilating System			X		X	X
*Change Fuel Filter					X	X
*Check Condition of Spark Plugs			X		X	X
*Check Battery Electrolyte Level			X	X	X	
*Check All Electrical Connections			X			X
*Lubricate Throttle and Shift Linkage Pivot Points			3			3

The inspection and maintenance schedule, above, is based on average operating conditions in utility service. Under severe operating, intervals should be shortened.

- 1) Refer to Viscosity Chart on Page MT 2. Change oil *before* annual layup.
- 2) If engine overheats, visually check. If clogged, clean out.
- 3) 30w Engine oil.



CAUTION:

All engine waste fluids *are considered to be hazardous wastes*. Be certain these waste fluids are properly and legally disposed of in order to avoid polluting and or possible cite by authorities.

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SPECIFICATIONS

Battery Specifications (Minimum)

12 Volt Marine Type with Tapered Post Connectors

Engine Size	Cold Crank @ 0° F (-18° C)	Amps for Load Test	25 Amp Rate Reserve Capacity (Minutes)
305 V-8 & 302 V-8	350 Amps	170	80
350 V-8 & 351 V-8	350 Amps	170	80
454 V-8 & 460 V-8	465 Amps	230	125

IMPORTANT: The engine electrical system is negative ground. Failure to connect battery leads accordingly will damage the electrical system.

CAUTION: All engine waste fluids are considered to be hazardous wastes. Be certain these waste fluids are properly and legally disposed of in order to avoid polluting and/or possible cite by authorities.

Closed Cooling System

Engine	Capacity	Pressure Cap	Anti freeze/Water
5, 5.8, & 5.7 liter engines	16 Qt.	14 PSI	50%/50%
7.4 liter engines	24 Qt.	14 PSI	50%/50%

Capacity is approximate. Add 50% anti freeze then complete the fill with clean water.

PCM Transmissions

Approximate Oil Capacity (Transmission only)

Manufacturer	Model	Installed Angle	Capacity
PCM	40I 1:1	10 to 16 degrees	2 US Qts.
PCM	40A 1.23:1	0 to 5 Degrees	2 US Qts.

NOTE: Oil capacity may not include capacity needed for transmission cooler and oil lines, which may require an amount greater than in the table above.

Specifications Common To All Pleasurecraft Engines

Recommended Fuel (R+M)/2	Unleaded 89 Octane Minimum	See Note #3 B
Recommended Engine Oil	Premium Grade "SH" Rated	
Recommended Transmission Oil	DEXRON	
Marine Approved Electrical System	12 Volt Neg. (-) Ground	See Note #4
Marine Approved Fuel Feed Pumps	Mechanical and Electric	See Note #1
Operating Pressure; All Feed Pumps	5.5 ± .5 PSI	See Note #1
Marine Approved Circuit Breakers	60, 15, 12.5 Amp	See Note #1
Marine Approved Alternator	50 Amp	See Note #1
Marine Approved Regulator	Integral Solid State	See Note #1

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SPECIFICATIONS

PCM Engine Model PLA MFI (APEX)

Displacement CID/liter	350/5.7	
Bore (inches)	4.000"	
Stroke (inches)	3.480	
Compression Ratio	9.4:1	
Horsepower @ 5,000 RPM	320	
Battery Recommended Min. CCA	350	See Note #4
Fuel Injection (Multi Point)	8 (30#)	See Note #1
Spark Plug Number 14mm	MR43LTS (AC)	
MAXIMUM (Intermittent) RPM's	5,000	See Note #9
Continuous Cruise RPM's (Max)	4,000	See Note #2
Idle Speed (in forward gear)	650 - 700	ECM Controlled
Distributor (Marine Approved)	Delco Electronic	ECM Controlled See Note #1
Ignition Timing @ 1,000 RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Fuel Pump (Low Pressure Feed)	5 to 6 PSI	See Note #1
Fuel Pump (High Pressure Injector)	39 (± 3) PSI	See Note #10
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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PCM Engine Model PLC

Displacement CID/liter	302/5.0	
Bore (inches)	4.00"	
Stroke (inches)	3.00"	
Compression Ratio	8.4:1	
Horsepower @ 4,400 RPM	215	
Battery Recommended Min. CCA	300	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	ASF 32 M (Motorcraft)	See Note #7
MAXIMUM (Intermittent) RPM's	4400	
Continuous Cruise RPM's (Max)	3600	See Note #2
Idle Speed (in forward gear)	650-700 RPM	
Distributor (Marine Approved)	Prestolite Breakerless	See Note #1
Ignition Timing @ Idle	10° BTDC	See Note #3 A&B
Spark Plug Gap	.045	
Firing Order	1-3-7-2-6-5-4-8	See Note #6
Fuel Pump Operating Pressure	5-6 # PSI	See Note #1
Oil Pan Capacity	4 Qts.	See Note #5

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SPECIFICATIONS

PCM Engine Model PLD

Displacement CID/liter	351/5.8	
Bore (inches)	4.00"	
Stroke (inches)	3.50"	
Compression Ratio	8.3:1	
Horsepower @ 4,400 RPM	260	
Battery Recommended Min. CCA	350	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	ASF32M (Motorcraft)	See Note #7
MAXIMUM (Intermittent) RPM's	4400	
Continuous Cruise RPM's (Max)	3600	See Note #2
Idle Speed (in forward gear)	650-700	
Distributor (Marine Approved)	Prestolite Breakerless	See Note #1
Ignition Timing @ Idle	10° BTDC	See Note #3 A&B
Spark Plug Gap	.045	
Firing Order	1-3-7-2-6-5-4-8	See Note #6
Fuel Pump Operating Pressure	5-6 # PSI	See Note #1
Oil Pan Capacity	4 Qts.	See Note #5

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PCM Engine Model PLH

Displacement CID/liter	350/5.7	
Bore (inches)	4.000"	
Stroke (inches)	3.480"	
Compression Ratio	9.1:1	
Horsepower @ 4,400 RPM	260	
Battery Recommended Min. CCA	350	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	4,400	
Continuous Cruise RPM's (Max)	3,600	See Note #2
Distributor (Marine Approved)	Delco Electronic	See Note #1
Idle Speed (in forward gear)	650 to 700	
Ignition Timing @ Idle RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.035"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Electric Fuel Pump	5-6 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

ALL NOTES APPEAR ON PAGE # SP 8

SPECIFICATIONS

PCM Engine Model PLK

Displacement CID/liter	454/7.4	
Bore (inches)	4.250"	
Stroke (inches)	4.000"	
Compression Ratio	8.12:1	
Horsepower @ 4,800 RPM	350	
Battery Recommended Min. CCA	450	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	4,400	
Continuous Cruise RPM's (Max)	3,600	See Note #2
Idle Speed (in forward gear)	650 - 700	
Distributor (Marine Approved)	Delco Electronic	See Note #1
Ignition Timing @ Idle RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Electric Fuel Pump	5 to 6 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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PCM Engine Model PLK TBI

Displacement CID/liter	454/7.4	
Bore (inches)	4.250"	
Stroke (inches)	4.000"	
Compression Ratio	8.12:1	
Horsepower @ 4,800 RPM	365	
Battery Recommended Min. CCA	450	See Note #4
Fuel injection	Rochester TBI	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	4,400	See Note #9
Continuous Cruise RPM's (Max)	3,600	See Note #2
Idle Speed (in forward gear)	650 - 700	ECM Controlled
Distributor (Marine Approved)	Delco Electronic	ECM Controlled See Note #1
Ignition Timing @ Idle RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Fuel Pump (Low Pressure Feed)	5 to 6 PSI	See Note #1
Fuel Pump (High Pressure Injector)	30 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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SPECIFICATIONS

PCM Engine Model PLL

Displacement CID/liter	350/5.7	
Bore (inches)	4.000"	
Stroke (inches)	3.480"	
Compression Ratio	9.1:1	
Horsepower @ 4,400 RPM	270	
Battery Recommended Min. CCA	350	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	4,400	
Continuous Cruise RPM's (Max)	3,600	See Note #2
Distributor (Marine Approved)	Delco Electronic	See Note #1
Idle Speed (in forward gear)	650 to 700	
Ignition Timing @ Idle RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Electric Fuel Pump	5-6 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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PCM Engine Model PLL TBI

Displacement CID/liter	350/5.7	
Bore (inches)	4.000"	
Stroke (inches)	3.480"	
Compression Ratio	9.3:1	
Horsepower @ 4,400 RPM	275	
Battery Recommended Min. CCA	350	See Note #4
Fuel Injection (TBI)	Rochester	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	4,400	See Note #9
Continuous Cruise RPM's (Max)	3,600	See Note #2
Idle Speed (in forward gear)	650 - 700	ECM Controlled
Distributor (Marine Approved)	Delco Electronic	ECM Controlled See Note #1
Ignition Timing @ 1,000 RPM	10° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Fuel Pump (Low Pressure Feed)	5 to 6 PSI	See Note #1
Fuel Pump (High Pressure Injector)	30 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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SPECIFICATIONS

PCM Engine Model PLN

Displacement CID/liter	454/7.4	
Bore (inches)	4.250"	
Stroke (inches)	4.000"	
Compression Ratio	8.63:1	
Horsepower @ 4,800 RPM	400	
Battery Recommended Min. CCA	450	See Note #4
Carburetor (Marine Approved)	Holley 4V D/P	See Note #1
Spark Plug Number 14mm	MR43T (AC)	
MAXIMUM (Intermittent) RPM's	5,200	
Continuous Cruise RPM's (Max)	4,100	See Note #2
Idle Speed (in forward gear)	650 to 700	
Distributor (Marine Approved)	Delco Electronic	See Note #1
Ignition Timing @ Idle RPM	7° BTDC	See Note #3 B & Note #11
Spark Plug Gap	.045"	
Firing Order	1-8-4-3-6-5-7-2	See Note #6
Electric Fuel Pump	5-6 PSI	See Note #1
Oil Pan Capacity	6 qt. @ 0° & 5 qt @ 15°	See Note #5 & 8

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PCM Engine Model PLP

Displacement CID/liter	351/5.8	
Bore (inches)	4.00"	
Stroke (inches)	3.50"	
Compression Ratio	8.3:1	
Horsepower @ 4,800 RPM	285	
Battery Recommended Min. CCA	350	See Note #4
Carburetor (Marine Approved)	Holley 4V	See Note #1
Spark Plug Number 14mm	AWSF22 (Motorcraft)	See Note #7
MAXIMUM (Intermittent) RPM's	4800	
Continuous Cruise RPM's (Max)	4000 to 4200	See Note #2
Idle Speed (in forward gear)	650-700	
Distributor (Marine Approved)	Prestolite Breakerless	See Note #1
Ignition Timing @ Idle RPM	10° BTDC	See Note #3 A & B
Spark Plug Gap	.045	
Firing Order	1-3-7-2-6-5-4-8	See Note #6
Fuel Pump Pressure	5 to 6 PSI	See Note #1
Oil Pan Capacity	4 Qts.	See Note #5

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SPECIFICATIONS

PCM Engine Model PLP EFI (GT40)

Displacement CID/liter	351/5.8	
Bore (inches)	4.00"	
Stroke (inches)	3.50"	
Compression Ratio	8.3:1	
Horsepower @ 4,800 RPM	310	
Battery Recommended Min. CCA	350	See Note #4
Fuel Injection (Multi Point)	8 (24#)	
Spark Plug Number 14mm	AWSF22 (Motorcraft)	See Note #7
MAXIMUM (Intermittent) RPM's	4,800	See Note #9
Continuous Cruise RPM's (Max)	4,000 to 4,200	See Note #2
Idle Speed (in forward gear)	650 to 700 RPM	ECM Controlled
Distributor (Marine Approved)	Motorcraft Electronic	See Note #1
Ignition Timing @ 2,000 RPM	5° BTDC	See Note #3
Spark Plug Gap	.045"	
Firing Order	1-3-7-2-6-5-4-8	See Note #6
Fuel Pump (High Pressure injector)	39 (± 3) PSI	See Note #10
Fuel Pump (Low Pressure Feed)	5 to 6 PSI	See Note #1
Oil Pan Capacity	4 Qts.	See Note #5

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SPECIFICATIONS

NOTES

- NOTE #1 This part is a special "MARINE APPROVED" part and is required by law to insure the safety of the public. Repair or replacement in a manner inconsistent with its original configuration or replacement with a non approved part is not only dangerous, but could be in violation of the law.
- NOTE #2 Do not cruise at high limits of above range, unless propped to turn at or near maximum RPM's, at full throttle.
- NOTE #3 A. Before setting ignition timing of EFI engines, the ECM on the GM TBI, must be set to the service mode and/or the SPOUT connector of the GT40, located near the engine oil fill tube, must be disconnected. Reconnect after setting timing.
B. Unleaded fuel of proper octane is recommended. (* See fuel requirements page # GN 3). Do not use fuels which contain methanol alcohol or more than 10% ethanol alcohol. If pinging and/or other pre-ignition or detonation signs are present, a mechanical problem may exist which requires immediate attention by a qualified marine technician.
- NOTE #4 CCA Ratings are absolute minimums. Larger batteries are better suited for longer life and owner satisfaction. **WARNING: DO NOT** reverse battery cables on battery terminals. DO NOT spark battery cables against terminals to check polarity. Damage to charging system components may result if these precautions are not observed.
- NOTE #5 When changing oil filter, run engine and add only enough oil to bring level back to full mark on dipstick to replenish amount used by the filter.
- NOTE #6 Spark plug wire routing diagrams are pictured on page # MT 11.
- NOTE #7 Numbers listed are MOTORCRAFT numbers. AUTOLITE equivalents are AUTOLITE # 303 or 3303 to replace MOTORCRAFT # ASF32M and AUTOLITE # 763 to replace MOTORCRAFT # AWSF 22.
- NOTE #8 6 Qt. at 0° & 5 Qt. at 15° (installed angle). Dipstick calibrated full at 15° and 1/4 above full and low mark on HP454 (LN). When changing oil filter, run engine and add only enough oil to bring level back to full mark on dipstick to replenish amount used by filter.
- NOTE #9 This PCM engine has electronic spark and RPM limiting control incorporated into the Electronic Control Module (ECM). Reduction in engine performance will be noted if excessive mechanical noise, detonation or spark knock is present.
- NOTE #10 Fuel pressure reading listed for multi point fuel injection, is checked with the key on and the *engine not running* or with the engine running with the vacuum hose *removed from the fuel pressure regulator*. Fuel pressure on PCM engines equipped with a TBI may be checked either while the engine is running or not running. There is no vacuum hose on the fuel pressure regulator of a PCM engine equipped with a TBI.
- NOTE #11 GM based engines with Delco ignition systems and ECM Controlled spark timing must be put into service mode before checking or setting the base timing. GM based engines with Delco ignition systems and distributor controlled timing (carburetor equipped, non TBI or MPI engines) require that *AFTER THE ENGINE IS STARTED AND RUNNING* an initial timing wire must be attached to a 12 volt B+ voltage source. Do not connect this wire to a 12 volt B+ voltage source until after the engine is running. If this wire is connected to a 12 volt B+ source while the engine is being started, the ignition control module (ICM) in the distributor may be damaged. If engine shuts off and must be restarted while this wire is connected to a 12 volt B+ source, *DETACH THIS WIRE BEFORE ATTEMPTING TO RESTART THE ENGINE.*

FORMS

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FORMS

TRANSFERABLE WARRANTY

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

DIRECT SALE BY OWNER

- The second purchaser can be registered as the owner and retain the unused portion of the warranty term by sending in the original owner's plastic Warranty Registration Card, page FM2 of this manual with OWNERSHIP CHANGE INFORMATION completed, a copy of the bill of sale showing the date sold to the second owner, as well as a completed Warranty Transfer Application.
- A new Warranty Registration Card will be issued to the second owner and the factory computer will reflect the change.
- There is a transfer fee which must be submitted via certified check with the Transfer Application to PCM, PO Drawer 369, Little Mountain SC, 29075. The amount of the transfer fee for engines built in the 1997 model year is \$ 100.00.

OUTSIDE THE UNITED STATES AND CANADA, PLEASE CONTACT YOUR LOCAL PCM DEALER OR THE PCM WARRANTY SERVICES AT (803) 345-1337 FOR INFORMATION ON HOW TO APPLY FOR THIS PROGRAM

WARRANTY TRANSFER APPLICATION

IMPORTANT! PURCHASER PLEASE NOTE: The checks listed below are designed to insure the safety and satisfaction of you, the owner. Therefore, we require that the following checks be performed at your expense by a qualified technician prior to deliver. By signing the check list, the technician certifies that he has checked the installation and operation of the engine and finds it to be performing properly. The owner or his agent should perform similar inspections periodically to identify any potential problems before they occur and to have any suspected defects checked and corrected immediately.

PRE DELIVERY CHECK LIST

TECHNICIAN: PLEASE CHECK OFF ALL POINTS AND SIGN BELOW.

- | | | |
|--|---|--|
| <input type="radio"/> Engine oil, check | <input type="radio"/> Check shaft alignment | <input type="radio"/> Check timing |
| <input type="radio"/> Drive lube, check | <input type="radio"/> Check control adjustments | <input type="radio"/> Check exhaust hoses & clamps |
| <input type="radio"/> Check battery charge and level | <input type="radio"/> Check control travel | <input type="radio"/> Check alternator for charge |
| <input type="radio"/> Tighten all water lines | <input type="radio"/> Tighten all drain plugs | <input type="radio"/> Set idle speed |
| <input type="radio"/> Check all lube points | <input type="radio"/> Check belts for tension | <input type="radio"/> Check prop size and rotation |
| | <input type="radio"/> Check for leaks, water, oil and exhaust | |

Engine Model: _____ Engine Serial: _____

Trans. Serial: _____ # of Engine Hours: _____

Date sold to 1st owner: _____ Date sold to 2nd owner: _____

I hereby certify that I have completed the predelivery checklist on engine # _____ and I have corrected any discrepancies or inconsistencies revealed by these checks. Date: _____

Technician's signature _____ Company Name _____

Purchaser's signature _____ Date : _____

FORMS

OWNERSHIP CHANGE INFORMATION

If you are the owner of a Pleasurecraft Marine engine on which the remaining warranty is being transferred or is out of warranty and would like to inform us of your ownership for notification purposes, please inform us of your ownership by filling out this OWNERSHIP CHANGE FORM and returning it to:

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

1. Name _____

Address _____

City _____ State _____ Zip _____

2. I am the new owner of a Pleasurecraft Marine Engine(s) with the following identification numbers:
(for location of numbers see your Owner's Manual)

Engine model Single or Port _____ Starboard _____

Serial Number Single or Port _____ Starboard _____

Gear Model Single or Port _____ Starboard _____

Serial Number Single or Port _____ Starboard _____

3. Previous Owner's:

Name _____

Address _____

City _____ State _____ Zip _____

Purchased from _____ Date _____

SERVICE MANUAL ORDERING INFORMATION:

A Service Manual is available for your PCM Engine. The current cost of this manual is twenty (\$20.00) dollars. *Contacting your PCM dealer or PCM to determine if the price has changed prior to submitting this application will prevent delay in filling your order.* This manual covers the engine, drive systems and related components.

To order, please print the requested information on the attached form and return with a check payable to Pleasurecraft Marine Engine Company. The price quoted includes the cost of the manual and postage.
Mail form and check to:

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

Please send _____ copies of the PCM Engine Service Manual to:

Name _____

Address _____

City, State, Zip _____

Engine Serial Number _____

FORMS

TEAM PCM

ADD-ONS & EXTRAS

	Description	Part #	Price	Qty	Total
PCM Logo Cap	PCM logo on twill cap, Khaki dome w/black bill		\$ 12.95		
PCM Logo Tee Shirt	Says "Team PCM Performance Team Driver" Heavy-duty 100% cotton, short sleeve pocket tee. White with red and black logo and lettering	-sm	\$ 12.95		
		-med	\$ 12.95		
		-lg	\$ 12.95		
		-xlg	\$ 12.95		
		-xxlg	\$ 12.95		

Total Order _____

Send check or money order to: PLEASURECRAFT MARINE ENGINE COMPANY
 PO DRAWER 369
 LITTLE MOUNTAIN, SC 29075

PLEASE ALLOW 2 WEEKS FOR DELIVERY. SHIP TO:

Name: _____

Address: _____

Daytime phone: _____ Date: _____

