3-4 CLEANING AND INSPECTING ALL MODELS

The success of the overhaul work is largely dependent on how well the cleaning and inspecting procedures are completed. If some parts are not thoroughly cleaned, or if an unsatisfactory unit is allowed to be returned to service through negligent inspection, the time and expense involved in the work will not be justified with peak engine performance and long operating life. Therefore, the procedures in the following sections should be followed in detail and the work performed with patience and attention to detail.

THERMOSTAT SERVICE

Inspect the thermostat cover and the thermostat opening in the cylinder head cover for cracks and corrosion damage. Such damage could cause leakage. Remove and **DISCARD** the old thermostat gasket. Wash the thermostat with clean water.

Obtain a thermostat tester or similar device, as shown in the accompanying illustration. Test the thermostat as follows:

a- Open the thermostat valve. Insert a length of thread between the valve and the thermostat body. Allow the valve to close against the thread.

b- Suspend the thermostat by the thread inside the tester. Do not allow the thermostat to touch the bottom or sides of the tester.

c- Suspend a thermometer inside the tester, with the bottom of the thermometer even with the bottom of the thermostat. Do not allow the thermometer to touch the bottom or sides of the tester.

d- Fill the tester with water to cover the thermostat. Plug the tester into an electrical outlet.

e- Observe the temperature at which the thermostat begins to open. As soon as the thermostat starts to open, it will drop off the thread. The thermostat **MUST** begin to open at 140° to 145°F.

f- Continue to heat the water until the thermostat is completely open. Unplug the tester.

g- Allow the water in the tester to cool before testing the next thermostat.

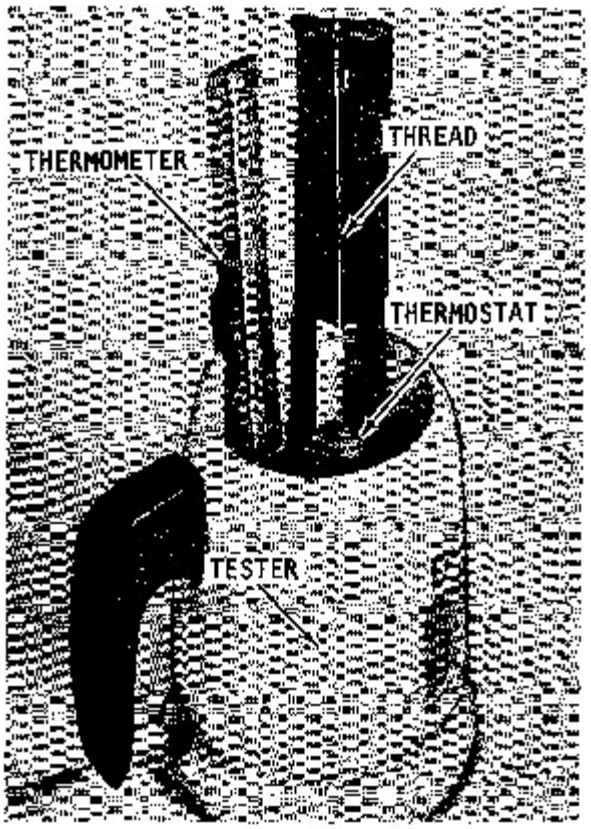
Replace the thermostat, if it fails to open at the specified temperature, or if it does not fully open.

Two different temperature senders may be installed on powerheads covered in this manual. The sender is actually an electrical switch designed to close at a preset temperature and allow current to flow. One unit is a 190°F, the other, a 240°F sender. The location of the temperature sender on the powerhead determines the heat range of the sender. A sender installed directly below the spark plug opening is rated at 240°F and will activate the overheating alarm at 248°F. The 190°F sender is installed on the outer side of a cylinder head and will activate the overheating alarm at 198°F.

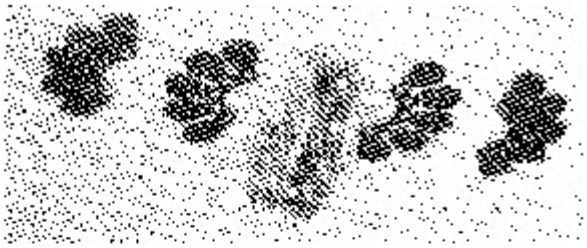
Because of their heat range, the sender cannot be tested in the same manner as a thermostat. Therefore, if the sender is suspected as being faulty, remove the unit and replace it with a new one.

REED BLOCK SERVICE INTEGRAL-TYPE

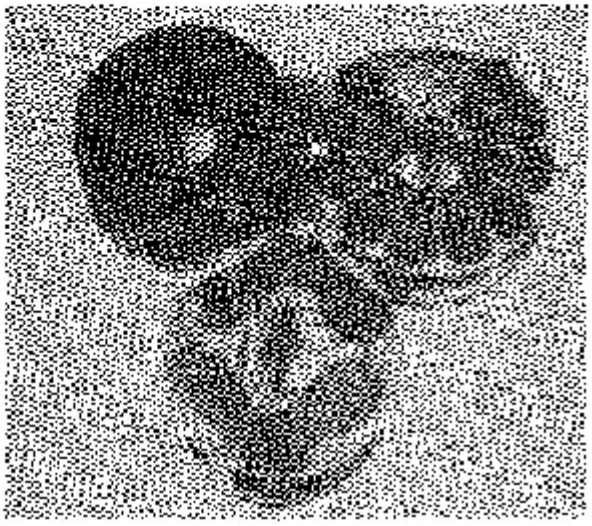
Secure the reed blocks together with screws and nuts tightened to torque value of 85 in lb (7Nm).



Thermostat ready for testing, as described in the text.



Arrangement of reed box parts. The reed box is in the center with the reed and reed plate on each side.

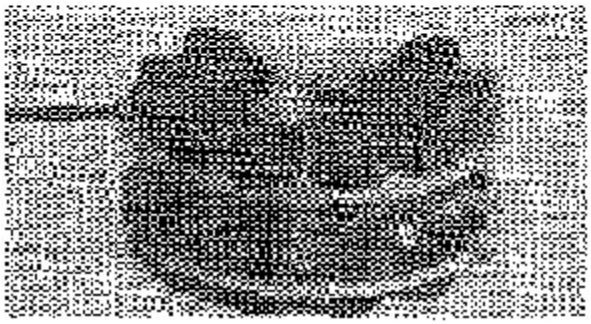


Typical reed boxes used on the powerheads for the outboard units covered in this manual.

Check for chipped or broken reeds. Observe that the reeds are not preloaded or standing open. Satisfactory reeds will not adhere to the reed block surface, but still there is not more than 0.007" (0.18mm) clearance between the reed and the block surface.

DO NOT remove the reeds, unless they are to be replaced. **ALWAYS** replace reeds in sets. **NEVER** turn used reed over to be used a second time.

Check the reed location over the reed block openings to be sure the reed is centered.



Using a drill bit shank to measure the reed stop height, if a measurement scale is not available. Refer to the Specifications in the Appendix for the proper height.

See "Reed Stop Settings" in the Specifications in the Appendix and adjust the reed stops as required.

GOOD WORDS

If the powerhead shows evidence of having overheated, check the condition of the plastic locating pins. If the pins are damaged (melted) the pins will affect engine performance by poor idle, hard starting, etc.

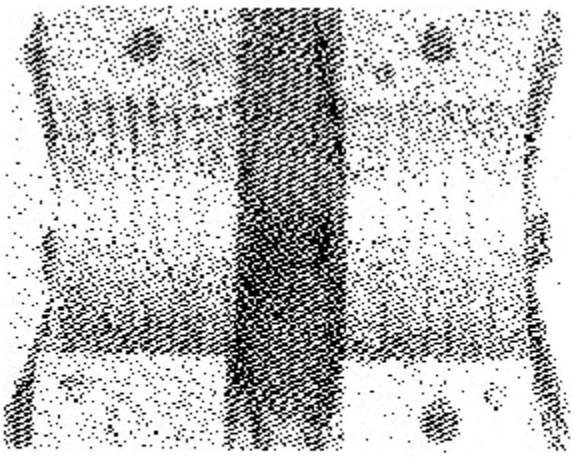
REED BLOCK SERVICE SEPARATE REED BLOCK HOUSING NEW RE-DESIGNED INLINE BLOCKS

DO NOT remove the reeds, unless they are to be replaced. **ALWAYS** replace reeds in sets. **NEVER** turn used reed over to be used a second time.

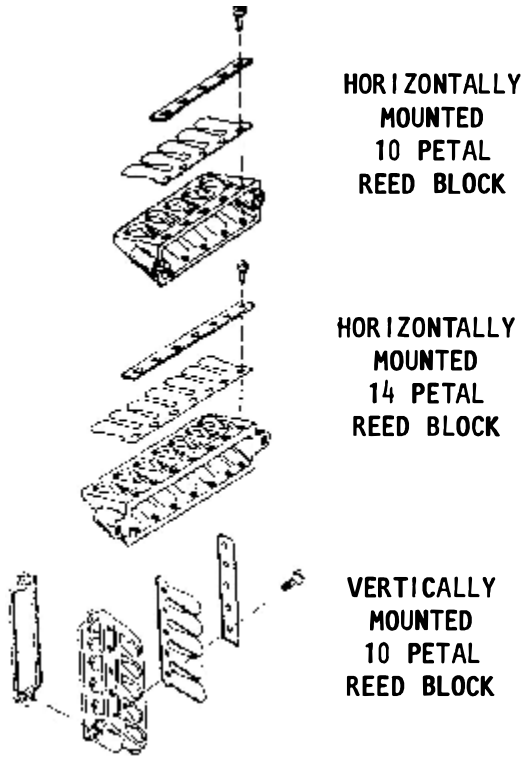
Clean the gasket surfaces of the reed blocks and the reed block housing. Inspect the surfaces for any signs of damage, deep grooves, cracks or distortion that might cause leakage. Check the face of each reed block to be sure a reed has not made an indentation. Check for chipped or broken reeds. Replace any damaged parts.

Assembling

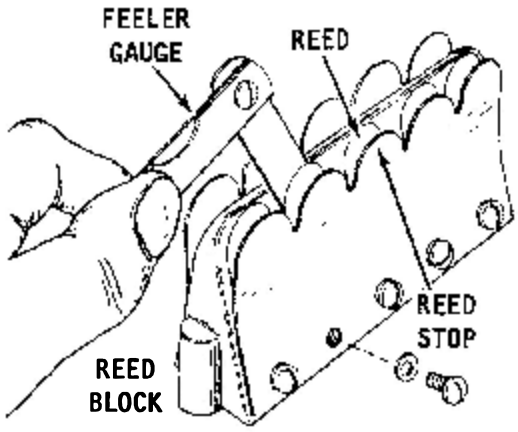
Place the reeds and the reed stops in position on the reed blocks. Secure the reeds and stops in place with the screws and lockwashers. Tighten the screws to a torque



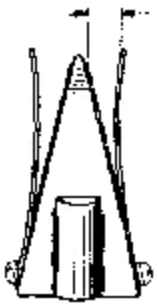
*The grooves inside the reed block must be in good condition in order to form an effective seal between cylinders. The groove should be checked for wear. The grooves in the block half on the right show excessive wear. Therefore, both halves of the reed block **MUST** be replaced. The crankshaft throw may be out-of-round, the main bearing may be worn, insufficient lubrication, or a worn block may cause such damage. The reed block half on the left is satisfactory. Therefore, if both halves are in this condition, the reed block may be used again.*



Three different reed designs are used on the powerheads covered in this manual.



Measuring the reed opening with a feeler gauge.



The dimension shown indicates the reed stop opening.

value of 25 in lb (3Nm). Check to be sure the reeds are preloaded. They should not adhere to the reed block and still there should not be more than 0.020" (.51mm) clearance between the reed and the reed block surface.

Check each reed stop to be sure they are not bent sideways. Refer to the reed stop opening chart in the Appendix for the correct dimension for the powerhead being serviced.

Place the reed block gaskets, and then the reed blocks into position in the reed block housing. Tighten the attaching screws to a torque value of 60 in lb (7Nm).

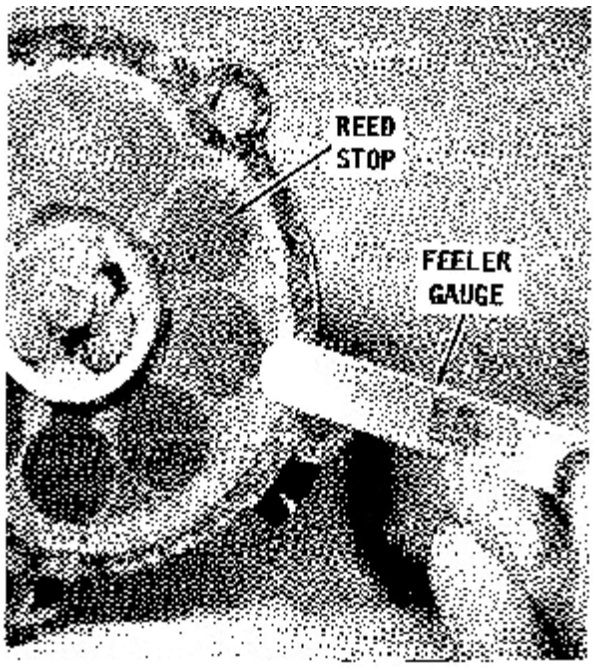
CRITICAL WORDS

When one "teardrop" reed and one "straight cut" reed are used, the reed block **MUST BE** installed in the reed block housing with the "teardrop" reed toward the center (inside) the reed block housing.

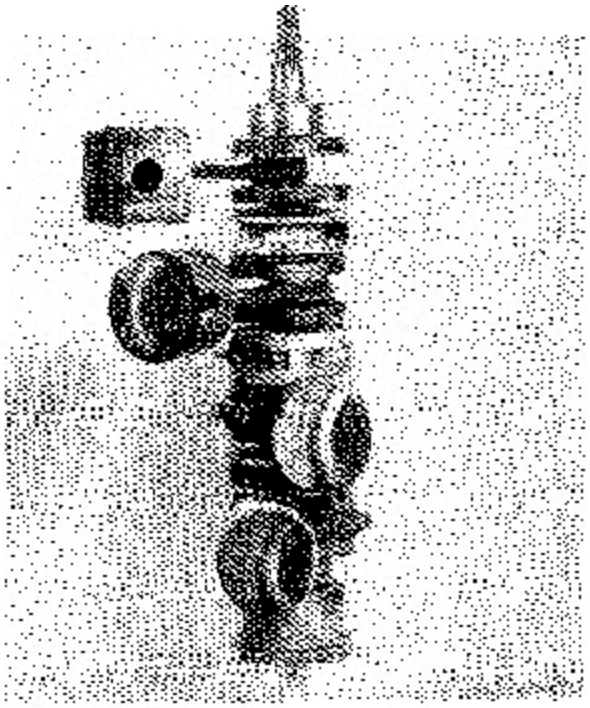
Check the reed location over the reed block openings to be sure the reed is centered.

CRANKSHAFT SERVICE

Inspect the splines for signs of abnormal wear. Check the crankshaft for straightness. Inspect the crankshaft oil seal surfaces to be sure they are not grooved, pitted or scratched. Replace the crankshaft if it is severely damaged or worn. Check all crank-



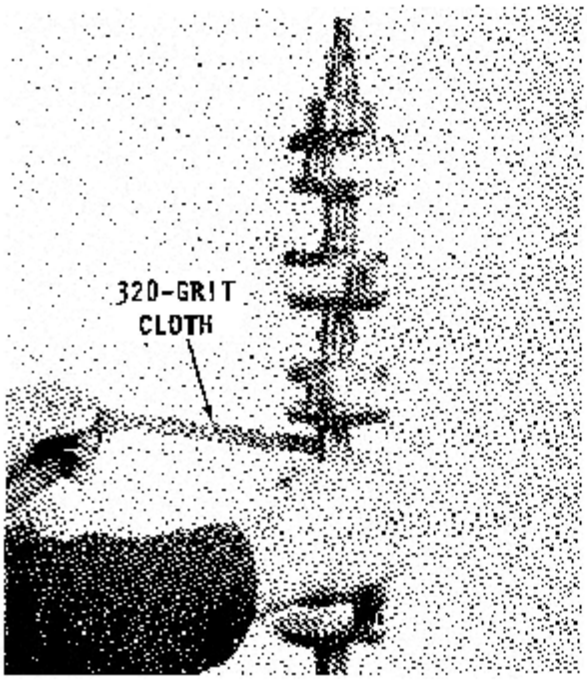
Measuring the reed opening on a "rose petal" design reed block housing, installed on the large bore 3- and 4-cylinder powerheads.



Crankshaft assembly from a submerged engine. This complete assembly must be replaced because of salt water damage, and failure of the owner to disassemble the unit quickly.

shaft bearing surfaces for rust, water marks, chatter marks, uneven wear or overheating. Clean the crankshaft surfaces with 320-grit carborundum cloth. **NEVER** spin-dry a crankshaft ball bearing with compressed air.

Clean the crankshaft and crankshaft ball bearing with solvent. Dry the parts, but not the ball bearing with compressed air. Check the crankshaft surfaces a second time. Replace the crankshaft if the surfaces cannot be cleaned properly for satisfactory service. If the crankshaft is to be installed for service, lubricate the surfaces with light oil. **DO NOT** lubricate the crankshaft ball bearing at this time.



Cleaning the crankshaft with crocus cloth.

CRANKSHAFT AND END CAP BEARINGS

After the crankshaft has been cleaned, grasp the outer race of the crankshaft ball bearing installed on the lower end of the crankshaft, and attempt to work the race back-and-forth. There should not be excessive "play". A very slight amount of side "play" is acceptable because there is only about 0.001" (.025mm) clearance in the bearing.

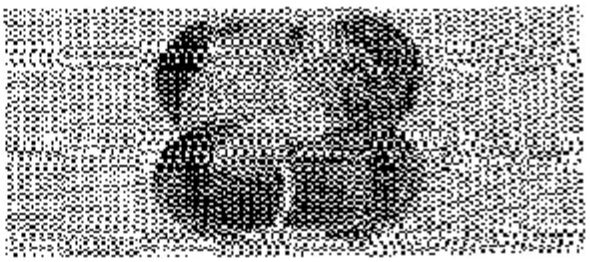
Lubricate the ball bearing with light oil. Check the action of the bearing by rotating the outer bearing race. The bearing should have a smooth action and no rust stains. If the ball bearing sounds or feels rough or catches, the bearing should be removed and discarded.

Clean the crankshaft center main roller bearings with solvent, and then dry them thoroughly, **BUT NOT** with compressed air. Lubricate the bearings with light weight oil. **NEVER** intermix halves of upper and lower crankshaft center main roller bearings. The bearings **MUST** be replaced only in pairs.

Inspect the center main roller bearings. Replace the bearings in pairs if they are rusted, fractured, worn, galled or badly discolored.

Clean the crankshaft roller bearings installed in the upper end cap with solvent, and then dry them, **BUT NOT** with compressed air. Lubricate the bearings with lightweight oil.

Inspect the upper end cap roller bearing to be sure it is not rusted, fractured, worn, galled, or badly discolored. If the bearing is damaged, it should be removed and discarded.



Bearing liners showing the matching V marks for proper alignment. The inside diameter of the liners should be cleaned with crocus cloth.

Cleaning the inside diameter of the rod and rod cap with crocus cloth.

CONNECTING ROD SERVICE

Stand each connecting rod upright on a surface plate and check the alignment. The rod is bent and unfit for further service, if:

a- Light can be seen under any portion of the machined surfaces -- the surfaces which mate with the rod cap.

b- The rod has a slight wobble on the plate.

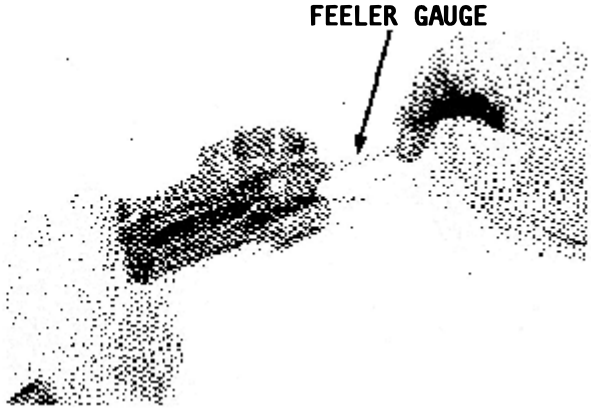
c- A 0.002" (.05mm) feeler gauge can be inserted between the machined surface and the surface plate.

Inspect the connecting rod bearings for rust or signs of bearing failure. **NEVER** intermix new and used bearings. If even one bearing in a set needs to be replaced, all bearings at that location **MUST** be replaced.

Inspect the bearing surface of the rod and the rod cap for rust and pitting.

Inspect the bearing surface of the rod and the rod cap for water marks. Water marks are caused by the bearing surface being subjected to water contamination, which causes "etching". The etching resembles the size of the bearing as shown in the accompanying illustration.

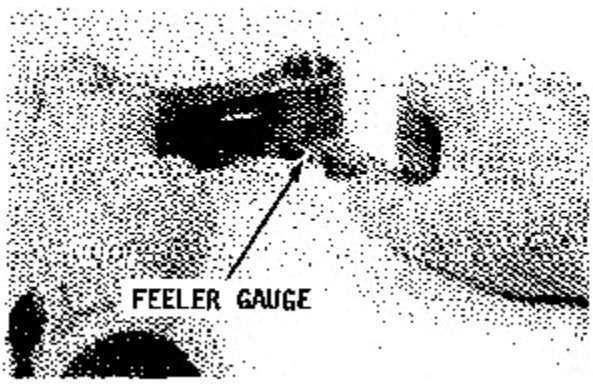
Cleaning the inside diameter of the piston pin end with crocus cloth.



*Check for rod warpage by placing one on top of a known good rod, and then attempting to insert a feeler gauge between the two surfaces. There should be **NO** clearance between the two rods.*

Inspect the bearing surface of the rod and rod cap for signs of spalling. Spalling is the loss of bearing surface, and resembles flaking or chipping. The spalling condition will be most evident on the thrust portion of the connecting rod in line with the **I**-beam. Bearing surface damage is usually caused by improper lubrication.

Check the bearing surface of the rod and rod cap for signs of chatter marks. This condition is identified by a rough bearing surface resembling a tiny washboard. The condition is caused by a combination of low-speed low load operation in cold water, and is aggravated by inadequate lubrication and improper fuel. Under these conditions, the crankshaft journal is hammered by the connecting rod. As ignition occurs in the cylinder, the piston pushes the connecting rod with tremendous force, and this force is transferred to the connecting rod journal. Since there is little or no load on the crankshaft, it bounces away from the con-



*Checking for rod warpage at the piston pin end. This is accomplished by laying one rod on top of a known good rod, and then checking for clearance between the two with a feeler gauge. There should be **NO** clearance.*

necting rod. The crankshaft then remains immobile for a microsecond, until the piston travel causes the connecting rod to catch up to the waiting crankshaft journal, then hammers it. In some instances, the connecting rod crankpin bore becomes highly polished.

While the powerhead is running, a "whirr" and/or "chirp" sound may be heard during rapid acceleration from idle speed to about 1500 rpm, then quickly returned to idle. If chatter marks are discovered, the crankshaft and the connecting rods should be replaced.

Inspect the bearing surface of the rod and rod cap for signs of uneven wear and possible overheating. Uneven wear is usually caused by a bent connecting rod or by improper shimming for crankshaft end "play" -- failure to maintain the same amount of shim material under each end cap. Improper shimming causes the crankshaft journal to be off-center under the cylinder bore.

Overheating is identified by a bluish bearing surface color and is caused by inadequate lubrication or operating the powerhead at excessively high rpm.

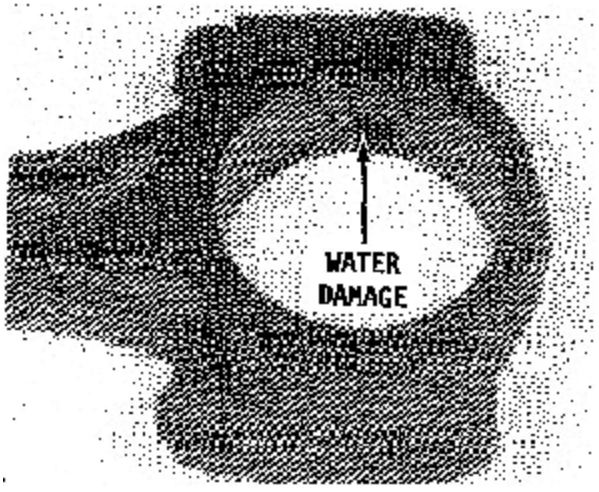
Connecting Rod Bearing Surfaces

Service the connecting rod bearing surfaces according to the following procedures and precautions.

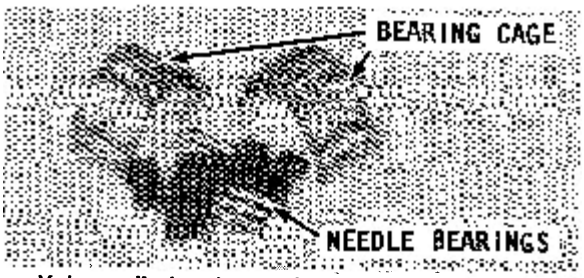
a- Align the etched marks on the connecting rod with the etched marks on the connecting rod cap.

b- Tighten the connecting rod cap attaching bolts securely.

c- Two types of bearings are used on the crankpin end of the rod. One is a noncaged type with individual needles. The other is a caged type with separate rollers. Clean the caged type with 320-grit carborundum cloth.



*Water scoring on the inside of the rod and rod cap. Such damage is caused by water in the crankcase. This rod set **MUST** be replaced.*



Main needle bearings and cage. The bearings should be thoroughly cleaned and closely inspected.

d- Use **ONLY** crocus cloth to clean the bearing surface at the crankshaft end of the connecting rod. **NEVER** use any other type abrasive material.

e- Insert the cloth in a slotted 3/8" (9.5mm) diameter shaft. Chuck the shaft in a drill press and operate the press at high speed and at the same time, keep the connecting rod at a 90° angle to the slotted shaft.

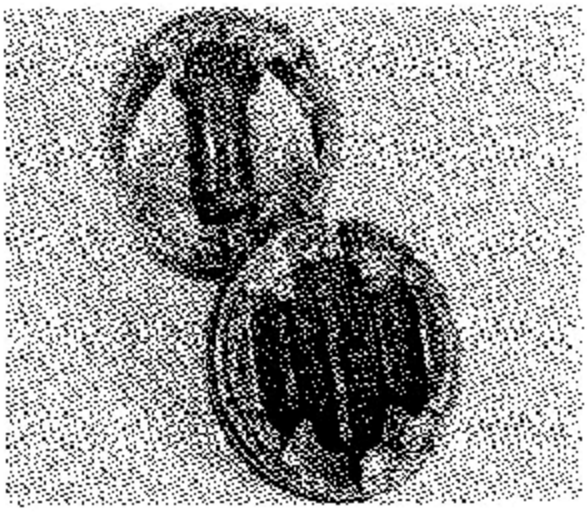
f- Clean the connecting rod **ONLY** enough to remove marks. **DO NOT** continue, once the marks have disappeared.

g- Clean the piston pin end of the connecting rod using the method described in Step "e", above, using 320 grit carborundum cloth.

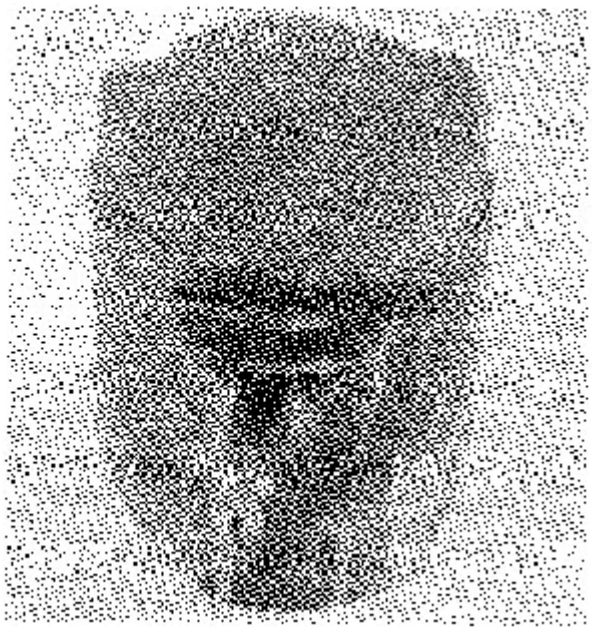
h- Thoroughly wash the connecting rods to remove abrasive grit. After washing, check the bearing surfaces a second time.

i- If the connecting rod cannot be cleaned properly, it should be replaced.

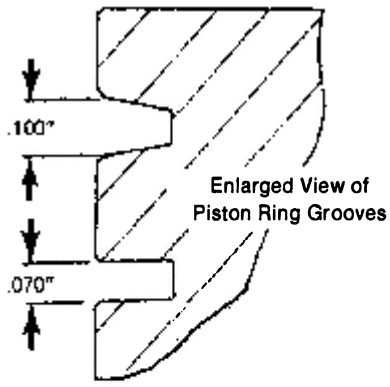
j- Lubricate the bearing surfaces of the connecting rods with light weight oil to prevent corrosion.



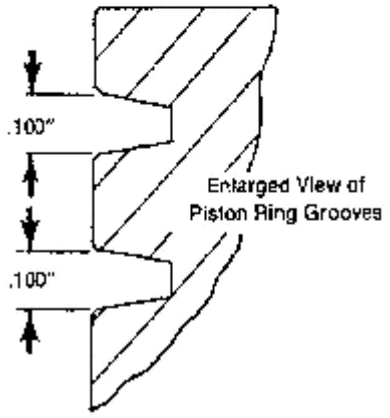
It is believed, this crown seized with the cylinder wall when the unit was operated at high rpm and the timing was not adjusted properly. At the same instant, the rod apparently pulled the lower part of the piston downward, severing it from the crown.



This piston was damaged when the water pump failed to deliver sufficient coolant to the powerhead.



Piston with the top ring a keystone (tapered) ring and the bottom ring rectangular.

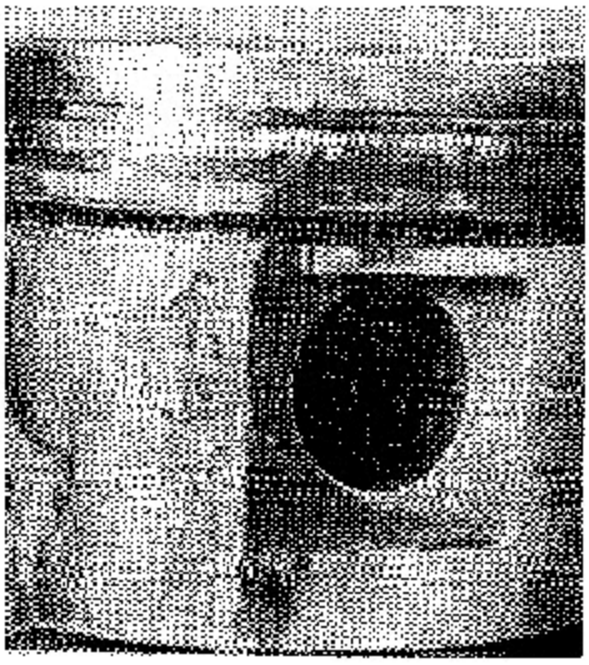


Piston with both the top and bottom ring a keystone (tapered) ring.

PISTON SERVICE

CRITICAL WORDS

NEVER attempt to reuse a 3-ring piston once it has been removed from a connecting rod. When the piston is removed, from the rod, the piston is damaged and unfit for further service. **ALSO,** if the engine was submerged while it was running, the piston pin and/or the connecting rod may be bent. If the piston pin is bent, the piston **MUST** be replaced. Piston pins are **NOT** sold separately, because they are a matched fit with the piston. If the piston pin is bent, the connecting rod **MUST** be checked for straightness as described in earlier paragraphs of this section.



The rings on this piston became stuck due to lack of adequate lubrication, incorrect timing, or overheating.

Inspect each piston for evidence of scoring, cracks, metal damage, cracked piston pin boss, or worn pin boss. Be especially critical during inspection if the engine has been submerged. If a piston pin is bent, the pin and piston **MUST** be replaced as a set, because the pin will damage the boss when it is removed. Clean carbon deposits from the top of the piston using a soft wire brush, carbon removal solution, or by sand blasting. If a wire brush is used, **TAKE CARE** not to

burr or round machined edges. Clean the piston skirt with crocus cloth. After the pistons have been cleaned, check each piston for size and roundness using a micrometer as follows:

FIRST, THESE WORDS

Two different shaped piston are used on some powerheads covered in this manual -- tapered and barrel profile. The difference can **ONLY** be determined by accurate measurement.

a- Measure the outside of the piston skirt. Make this measurement at the bottom of the skirt in line with the piston pin and at right angle (90°) to the piston pin.

b- Measure the outside of the piston above the top piston ring in line with the piston pin and again at right angle (90°) to the piston pin.

c- Measure the outside of the piston 29/32" (23mm) up from the bottom of the piston in line with the piston pin and again at right angle (90°) to the piston pin.

d- Measure the outside of the piston 1/2" (12.7mm) up from the bottom of the piston in line with the piston pin and again at right angle (90°) to the piston pin.

Piston Ring Identification

CRITICAL WORDS

Powerheads covered in this manual contain two different type 2-ring pistons.

Some pistons contain one keystone, tapered, ring. This tapered ring is always used in the top ring groove. This same piston also uses one rectangular ring which is used in the bottom ring groove.

Other 2-ring pistons contain two keystone rings.

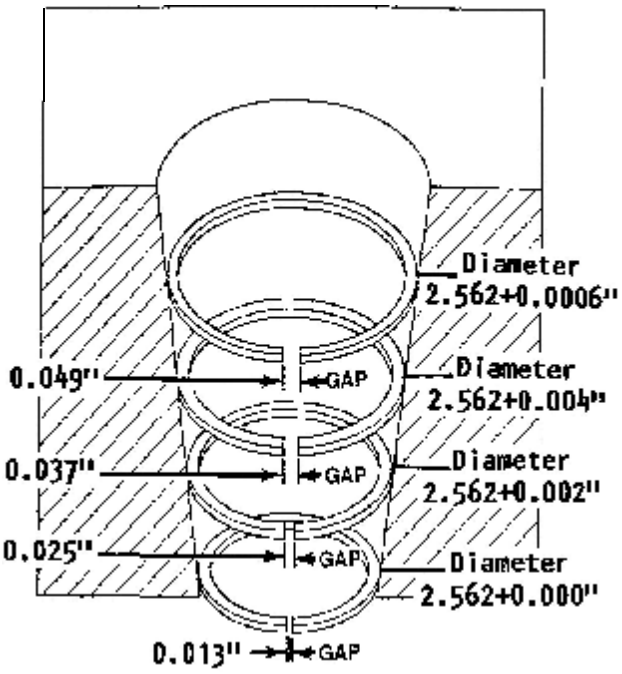
Therefore, it will be necessary to measure ring thickness in order to identify each ring, as shown in the accompanying illustration. This information must be kept in mind when using a broken ring to clean piston ring grooves.

Measure and identify the type of rings used on the pistons being serviced.

Inspect the piston ring locating pins to be sure they are tight. There is one locating pin in each ring groove. If the locating pins are loose, the piston must be replaced.

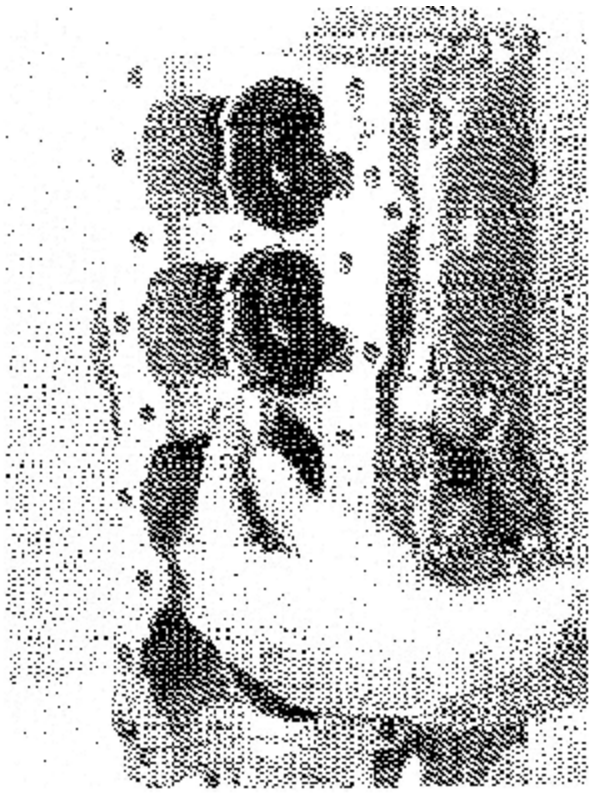
Ring End Gap Clearance

Check each ring to be sure the end gap is not excessive. The end gap may be checked

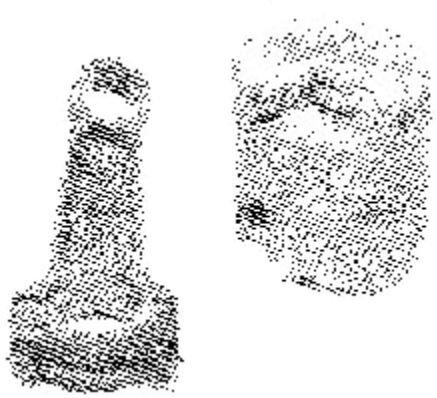


The cylinder taper drastically affects ring end gap, as shown in this cross-section line drawing.

by placing the ring squarely in the cleaned cylinder bore, and then measuring the end gap with a feeler gauge, as shown in the accompanying illustration on this page. Standard acceptable end gap is 0.005" (0.13mm) per inch of bore. To determine



Using a feeler gauge to measure the amount of ring end gap. The ring is temporarily installed in the cylinder at right-angle to the wall, as explained in the text.



Piston and rod damaged from operating the engine at too high an rpm without sufficient load on the propeller shaft. This combination caused the powerhead to literally "blow apart". Operating the engine above an idle speed with a flush attachment connected to the lower unit could result in the same type of internal destruction.

the exact amount of end gap, simply multiply the cylinder bore by 0.005" (0.13mm).

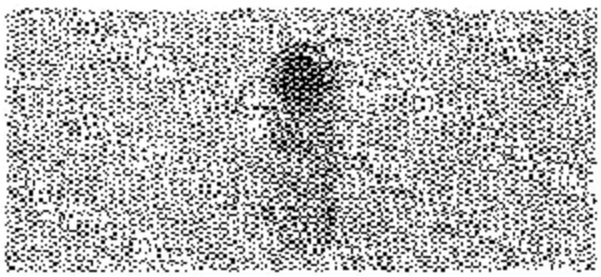
Example: Bore = 3.00" times 0.005" equals an acceptable end gap of 0.015" (0.33mm)

CYLINDER BLOCK SERVICE

FIRST THESE WORDS

The crankcase cover and the cylinder block are a matched, line bored assembly. Therefore, the cover and the block should **ALWAYS** be kept together and **NEVER** mismatched with a part from another set. If the crankcase cover or cylinder block is to be submerged in a very strong cleaning solution, the crankcase cover/cylinder block bleed system **MUST** be removed to prevent damage to the hoses and check valves.

Clean the cylinder block and crankcase cover. Pay particular attention to remove all sealant and old gasket material from matching surfaces. Remove all carbon deposits from the exhaust ports.



Piston pin cleaned and ready for installation. The pin has been carefully checked and passed inspection for further service.

Inspect the cylinder block and crankcase cover for cracks or fractures.

Inspect the gasket surfaces for nicks, deep grooves, cracks or any distortion which might cause a compression leak.

Check all water and oil passages in the cylinder block and crankcase cover to be sure they are not obstructed. Check to be sure the plugs are in place and tight.

On 4-cylinder powerheads equipped with the "2+2" concept, accelerator pump check valves are located at cylinder No. 3 and No. 4 on the starboard side of the block. These check valves **MUST** be removed if the block is to be honed or cleaned to avoid damage or blockage of the valve.

Measure the cylinder bore diameter of each cylinder with an inside micrometer. Check for tapered, out of round, and oversize bore condition. Refer to the Specifications in the Appendix.

If a cylinder bore is tapered, out of round or worn more than 0.006" (.15mm) from standard Cylinder Block Finish Hone diameter, it will be necessary to rebore that particular cylinder to 0.015" (.38mm) or 0.030" (.76mm) oversize and install an oversize piston and ring assembly.

GOOD WORDS

Oversize piston weight is approximately the same as a standard size piston. Therefore, it is **NOT** necessary to rebore all cylinders in a block just because one cylinder requires reboring. The APBA (American Power Boat Association) accepts and permits the use of 0.015" (.38mm) oversize pistons.

HONING PROCEDURES

To ensure satisfactory powerhead performance and long life following the overhaul work, the honing work should be performed with patience, skill, and in the following sequence:

a- Follow the hone manufacturer's recommendations for use of the hone and for cleaning and lubricating during the honing operation.

b- Pump a continuous flow of honing oil into the work area. If pumping is not practical, use an oil can. Apply the oil generously and frequently on both the stones and work surface.

c- Begin the stroking at the smallest diameter. Maintain a firm stone pressure against the cylinder wall to assure fast stock removal and accurate results.

d- Expand the stones as necessary to compensate for stock removal and stone wear. The best crosshatch pattern is obtained using a stroke rate of 30 complete cycles per minute. Again, use the honing oil generously.

e- Hone the cylinder walls **ONLY** enough to deglaze the walls.

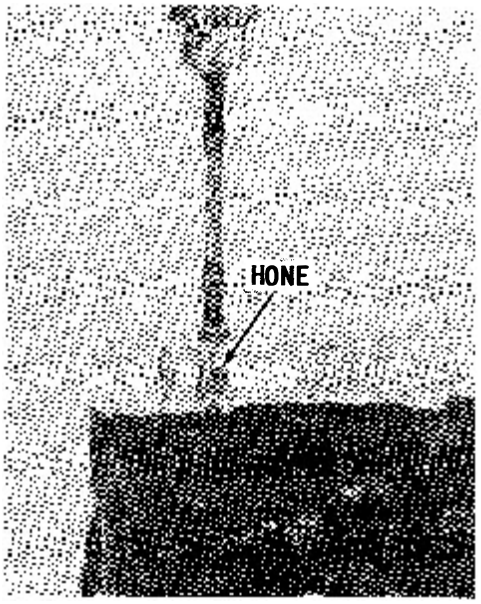
f- After the honing operation has been completed, clean the cylinder bores with hot water and detergent. Scrub the walls with a stiff bristle brush and rinse thoroughly with hot water. The cylinders **MUST** be thoroughly cleaned to prevent any abrasive material from remaining in the cylinder bore. Such material will cause rapid wear of new piston rings, the cylinder bore, and the bearings.

g- After cleaning, swab the bores several times with engine oil and a clean cloth, and then wipe them dry with a clean cloth. **NEVER** use kerosene or gasoline to clean the cylinders.

h- Clean the remainder of the cylinder block to remove any excess material spread during the honing operation.

STOP!

If the cylinder block is to be submerged in a carbon removal solution, the crankcase bleed system **MUST** be removed from the block to prevent damage to hoses and check valves.



*Using a hone to clean the cylinder walls. The secret of honing is to keep the hone moving in long even strokes the full length of the cylinder **AND** to keep the stones wet with an ample amount of lubricant.*

Use an inside micrometer or telescopic gauge and micrometer to check the cylinders for wear. Check the bore for out of round and/or oversize bore. If the bore is tapered, out of round or worn more than 0.003" - 0.004" (0.08 - 0.10mm) the cylinders should be rebored to 0.015" (0.38mm) oversize and oversize pistons and rings installed.

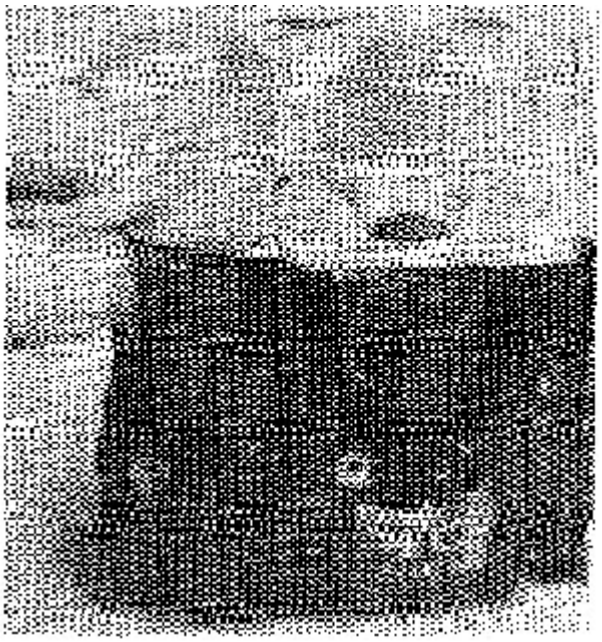
SPECIAL WORDS

If overheating has occurred, check and resurface the spark plug area of the cylinder block, if necessary. This can be accomplished with 240-grit sandpaper. Use a circular motion to prevent leaving grooves from finger pressure through the sandpaper.

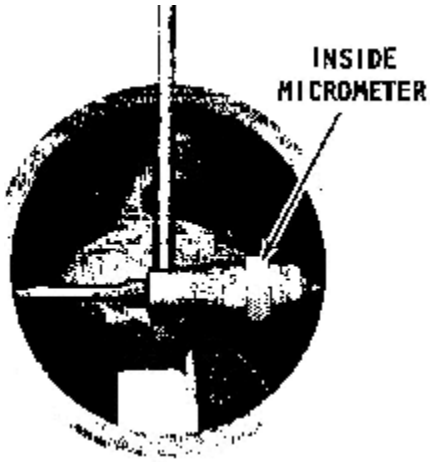
Cylinder sleeves are an integral part of the die cast cylinder block and **CANNOT** be replaced. In other words, the cylinder cannot be resleeved.

CYLINDER BLOCK SERVICE

Inspect the cylinder block and cylinder bores for cracks or other damage. Remove carbon with a fine wire brush on a shaft attached to an electric drill or use a carbon remover solution.



*Cleaning the crankshaft mating surface of a 2-cylinder powerhead with solvent and a rag. A tool or abrasive material should **NEVER** be used to clean these surfaces. This procedure and rule applies to the 3- and 4-cylinder units covered in this manual.*



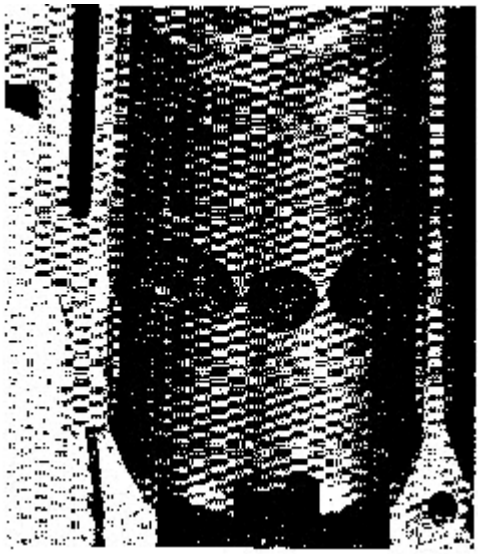
Checking the cylinder taper using an inside micrometer. One measurement should be taken near the top and another near the bottom. The difference between the two measurements is the amount of taper. Check the Specifications for allowances.

After all cleaning and inspecting procedures have been completed, coat the cylinder bores several times with light weight engine oil and a clean cloth.

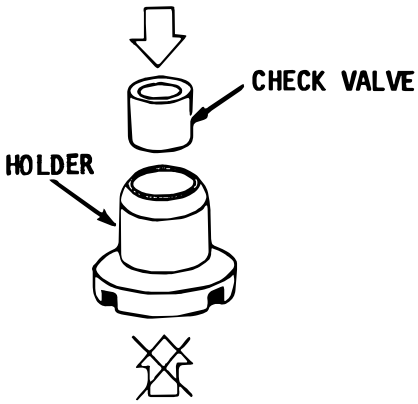
Be sure all parts to be reused have been carefully cleaned and thoroughly inspected. Parts not properly cleaned, or parts not suitable for service can damage a good powerhead within a few minutes after starting the engine.

NEW gaskets **MUST** always be used during an overhaul.

A torque wrench is essential to correctly assemble the powerhead. **NEVER** attempt to assemble a powerhead without a torque wrench. Attaching bolts for covers **MUST** be tightened to the required torque value in three progressive stages, following the specified tightening sequence. On the first stage, tighten to 1/3 the torque value. On the second stage, tighten to 2/3 the total torque value. Finally, on the third and last stage, tighten to the full torque value.



This sectioned cylinder shows an ideal cross hatch pattern on the cylinder wall. The pattern is necessary to seat the ring/s against the cylinder wall to provide an adequate seal for maximum compression.



*A good check valve -- installed only on 50hp and 60hp powerheads since 1991 — will allow air to pass in the direction shown. If the valve allows air to pass in the opposite direction, it **MUST** be replaced.*

Check Valves
50hp and 60hp Powerheads Only

Two check valves are installed in the intake manifold. The purpose of these valves is to prevent the build-up of excess pressure inside the crankcase. If the crankcase pressure exceeds a pre-set limit, a nylon ball is lifted off its seat inside the check valve and pressure is released.

To test each valve, pull out the holder -- with check valve inside -- from the orifice in the intake manifold. Attempt to blow air through each end. A good valve will allow air to pass through only from the crankcase side to the manifold side. A defective valve will allow air to pass through from the manifold side to the crankcase side. If a defective valve is allowed to remain in place, it will lean the air/fuel mixture and cause the powerhead to overheat.

Inspect the valve by holding it up to the light. If light can be seen, the nylon ball has probably melted and the valve must be replaced. If no light is seen, insert a fine wire into the check valve and attempt to move the ball. The ball should move slightly. If the ball is stuck in place, crankcase pressure will not be sufficient to move the ball off its seat and the powerhead will be damaged. If the check valve is found to be defective, it **MUST** be replaced.

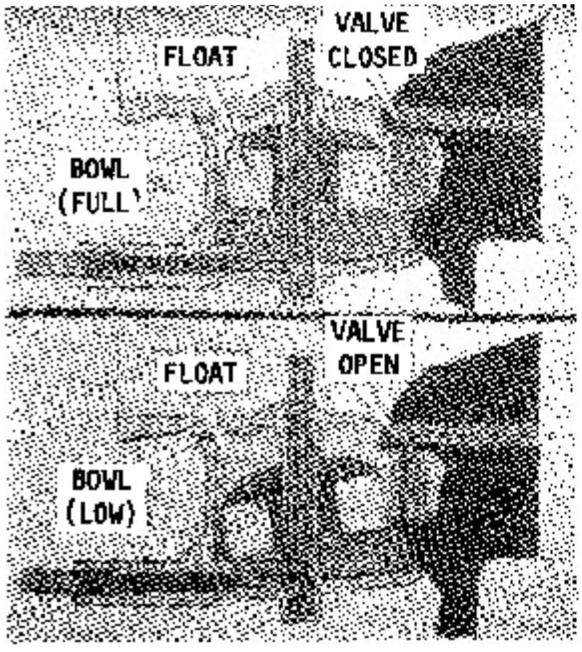
4
FUEL

4-1 INTRODUCTION

The carburetion and ignition principles of two-cycle engine operation **MUST** be understood in order to perform a proper tune-up on an outboard motor.

If you have any doubts concerning your understanding of two-cycle engine operation, it would be best to study the Introduction section in the first portion of Chapter 3, before tackling any work on the fuel system.

The fuel system includes the fuel tank, fuel pump, fuel filters, carburetor, connecting lines, with a squeeze bulb, and the associated parts to connect it all together. Regular maintenance of the fuel system to obtain maximum performance, is limited to changing the fuel filter at regular intervals and using fresh fuel.



Fuel flow principle of a modern carburetor.

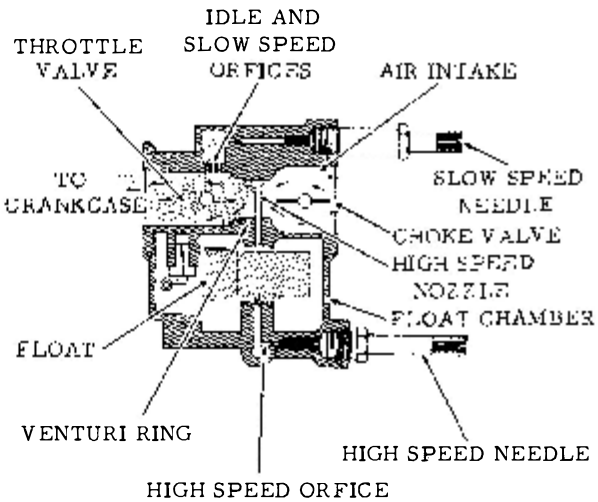
If a sudden increase in gas consumption is noticed, or if the engine does not perform properly, a carburetor overhaul, including boil-out, or replacement of the fuel pump may be required.

4-2 GENERAL CARBURETION INFORMATION

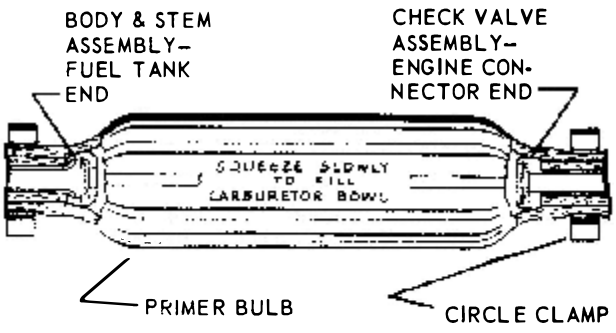
The carburetor is merely a metering device for mixing fuel and air in the proper proportions for efficient engine operation. At idle speed, an outboard engine requires a mixture of about 8 parts air to 1 part fuel. At high speed or under heavy duty service, the mixture may change to as much as 12 parts air to 1 part fuel.

Float Systems

A small chamber in the carburetor serves as a fuel reservoir. A float valve admits fuel into the reservoir to replace the fuel consumed by the engine. If the carburetor has more than one reservoir, the fuel



Fuel flow through the venturi, showing principle and related parts controlling intake and outflow.



Major parts of a common fuel line squeeze bulb.

level in each reservoir (chamber) is controlled by identical float systems.

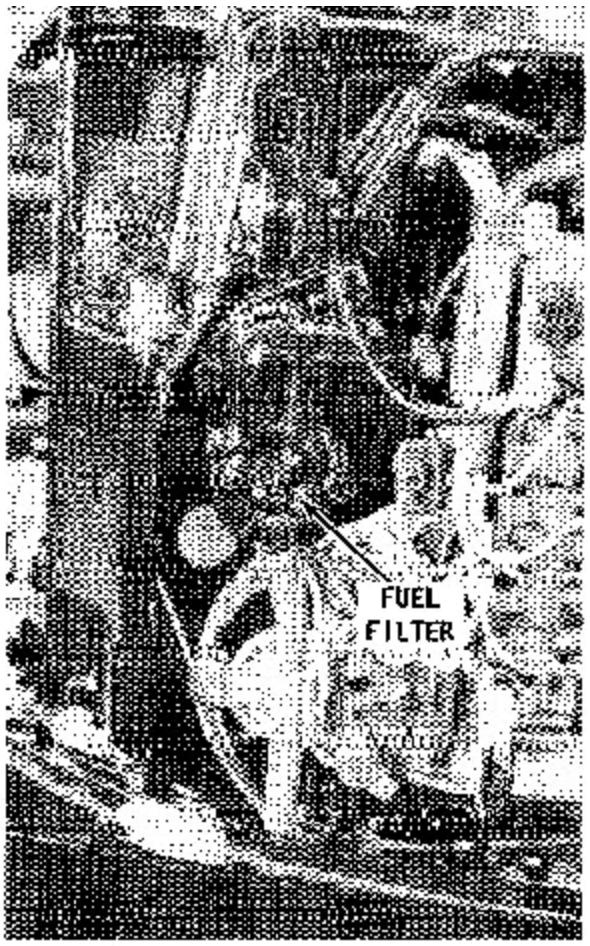
Fuel level in each chamber is extremely critical and must be maintained accurately. Accuracy is obtained through proper adjustment of the float/s. This adjustment will provide a balanced metering of fuel to each cylinder at all speeds.

Following the fuel through its course, from the fuel tank to the combustion chamber of the cylinder, will provide an appreciation of exactly what is taking place. In order to start the engine, the fuel must be moved from the tank to the carburetor by a squeeze bulb installed in the fuel line. This action is necessary because the fuel pump does not have sufficient pressure to draw fuel from the tank during cranking before the engine starts.

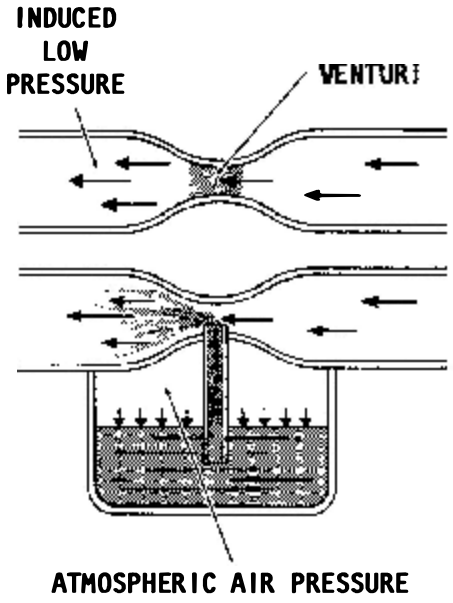
After the engine starts, the fuel passes through the pump to the carburetor. All systems have some type of filter installed somewhere in the line between the tank and the carburetor. Many units have a filter as an integral part of the carburetor.

At the carburetor, the fuel passes through the inlet passage to the needle and seat, and then into the float chamber (reservoir). A float in the chamber rides up and down on the surface of the fuel. After fuel enters the chamber and the level rises to a predetermined point, a tang on the float closes the inlet needle and the flow entering the chamber is cutoff. When fuel leaves the chamber as the engine operates, the fuel level drops and the float tang allows the inlet needle to move off its seat and fuel once again enters the chamber. In this manner a constant reservoir of fuel is maintained in the chamber to satisfy the demands of the engine at all speeds.

A fuel chamber vent hole is located near the top of the carburetor body to permit atmospheric pressure to act against the fuel in each chamber. This pressure assures an adequate fuel supply to the various operating systems of the engine.



Typical fuel filter location on the powerheads covered in this manual.



Air flow principle of a modern carburetor.