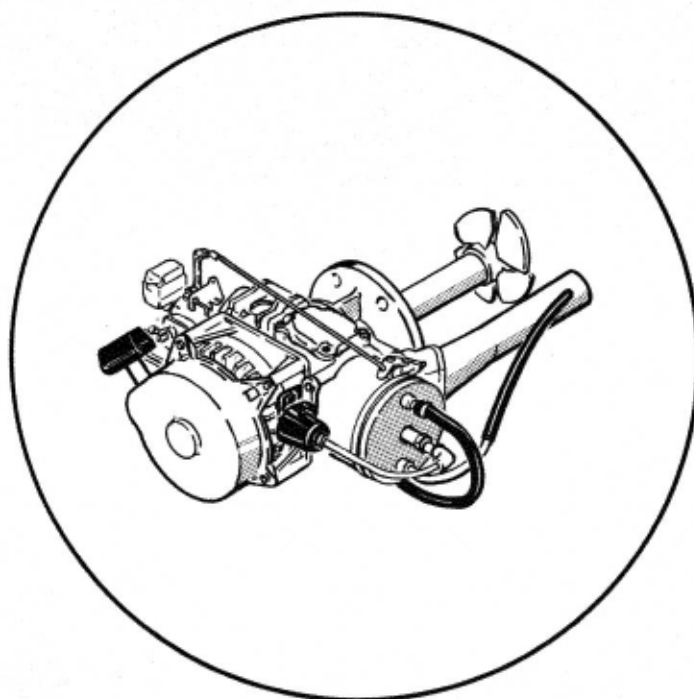


SERVICE MANUAL

MODEL JB 100 JET BOARD

ENGINE



ENGINE MODEL JB-750



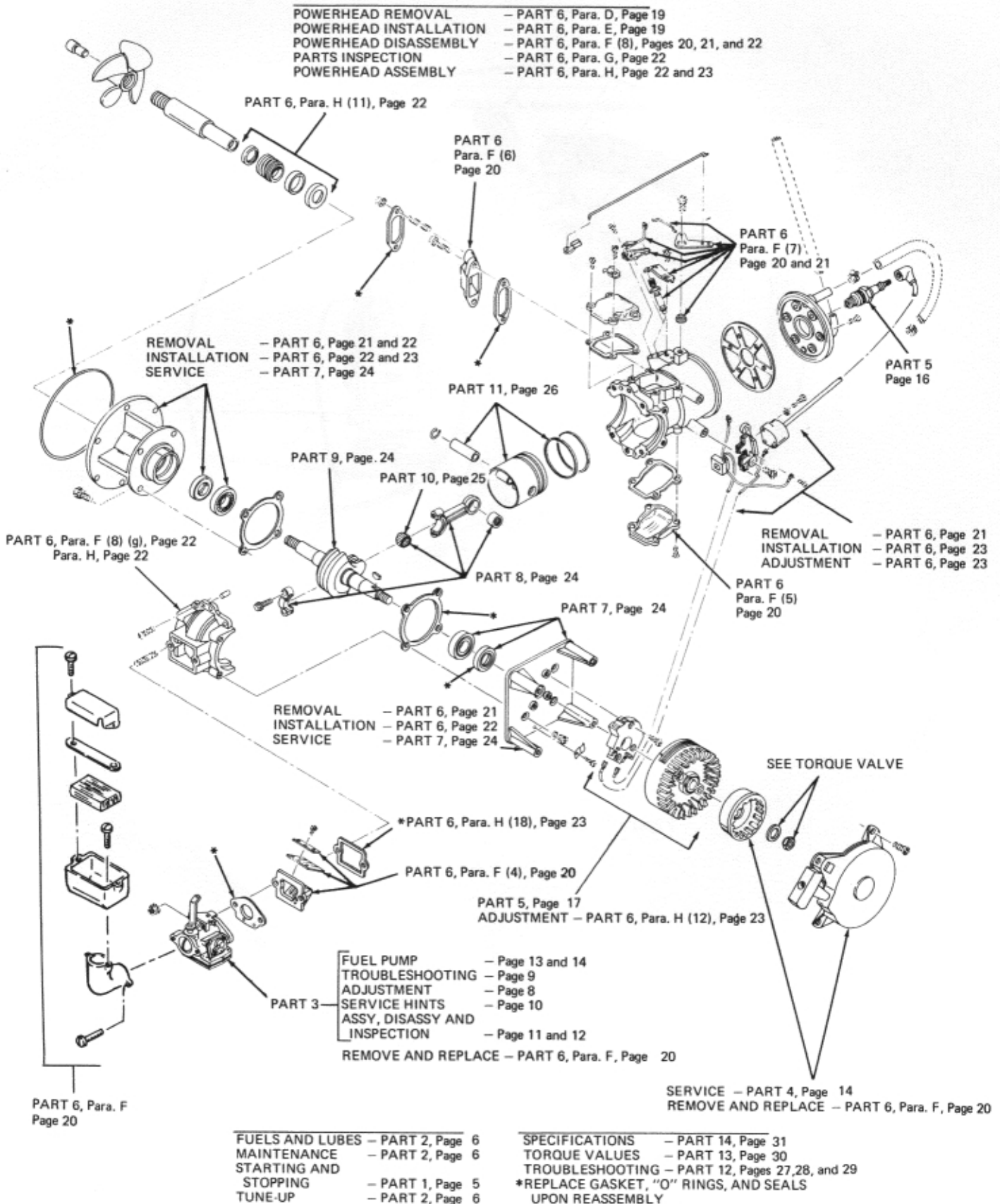
9255 SUNSET BOULEVARD/LOS ANGELES, CALIF. 90069

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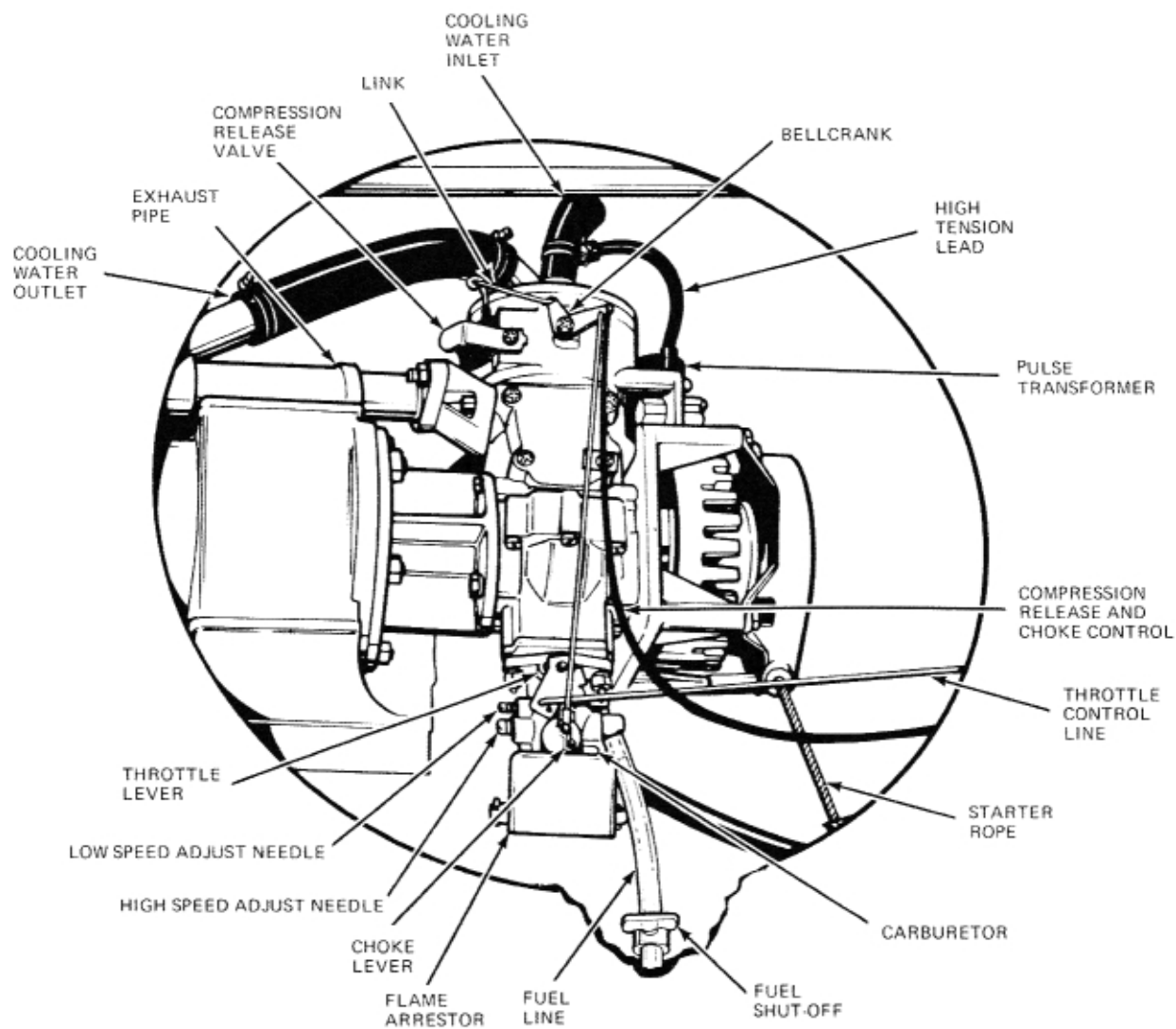


Figure 1. Jet Board Powerhead Assembly

PART 1. TO START ENGINE

1. Remote hatch cover.
2. Fill fuel tank or attach remote fuel line.
3. Place board in water.
4. Pull choke assembly up and rotate 90 degrees clockwise.
5. Insert safety switch.
6. Set throttle to full speed.
7. Press primer three times.
8. Pull starter rope until engine starts.
9. Return choke to normal position.
10. Immediately after engine starts, push board down and back to ensure that pump is drawing water.
11. Turn throttle down to let engine warm up for a few seconds.

TO STOP ENGINE PULL SAFETY SWITCH OUT

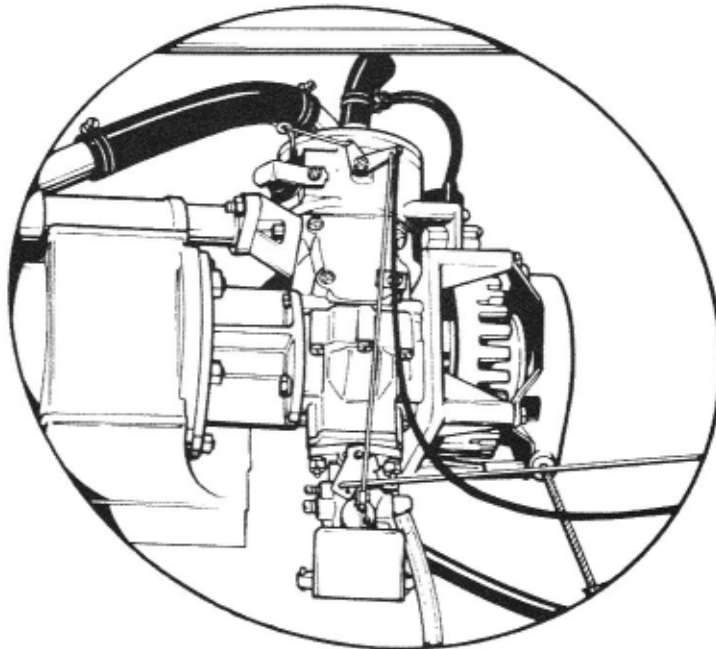


Figure 2 To Start Engine

PART 2. ENGINE CARE

A. MAINTENANCE RULES

To insure proper engine operation the following rules should be observed.

- (1) Use clean, fresh gasoline, and correct fuel and oil mixture.
- (2) Maintain proper cooling of engine.
- (3) Clean engine and exhaust ports frequently to prevent carbon buildup.
- (4) Keep all fasteners, especially mounting bolts tight, to prevent damaging vibration.
- (5) If impeller is balanced, vibration will be cut down considerably.
- (6) Keep spark plug clean and correctly gapped.
- (7) The powerhead must be firmly and rigidly mounted to the Jet Board. Keep mounting bolts tight.

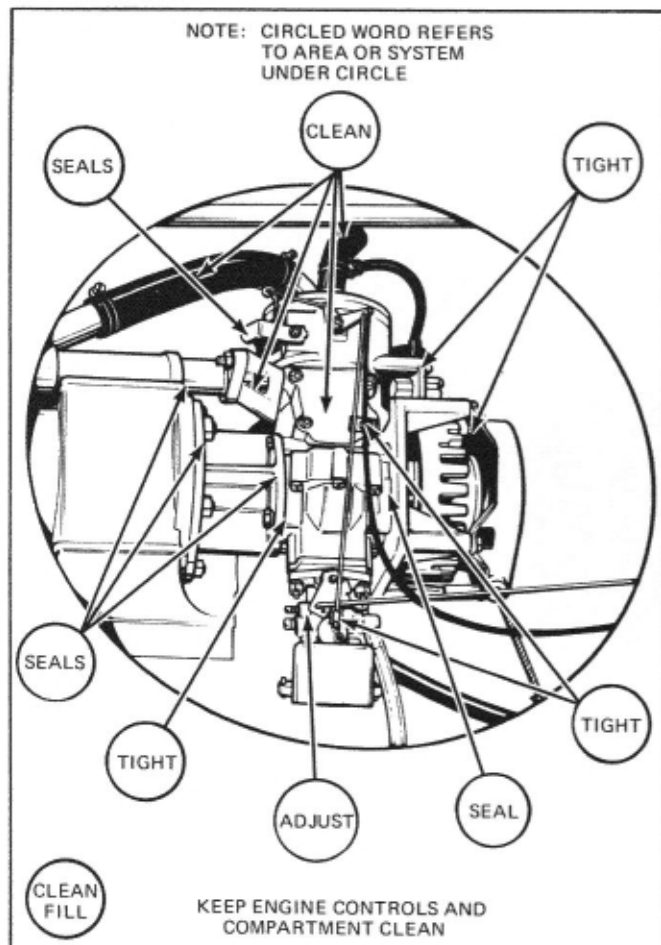


Figure 3 Engine Care

B. FUEL AND LUBRICANT

The powerhead is mist lubricated by oil mixed with the gasoline. For best performance, use a good grade of regular gasoline and a good grade of No. 30 oil.

CAUTION

Multiple weight oils such as all season, 10W-30, are not recommended.

General Comments. Cleanliness of fuel and oil is essential for proper engine operation. Make sure that gasoline and oil are stored in clean, covered, rust-free containers. Dirt in fuel can clog small ports and passages of carburetor causing powerhead failure. Use fresh gasoline only. Gasoline, standing for long periods of time, develops a gum that will result in fouled spark plugs, clogged fuel lines, carburetors, and fuel screens.

REFER TO THE OPERATOR'S INSTRUCTIONS FOR CORRECT FUEL/OIL MIXTURE RATIO.

C. ENGINE TUNE-UP PROCEDURE

- (1) Upon receiving an engine for repair, learn the history of the unit from the customer.
- (2) Clean fuel lines, filter, and tank.
- (3) Check engine compression with gauge. The crankshaft should resist turning as the piston approaches top-dead-center, then snap over sharply as top-dead-center is passed. Low compression engines should be overhauled.
- (4) Clean and regap, or replace spark plug.
- (5) Check ignition.
- (6) Fill fuel tank with correct fuel/oil mixture.
- (7) Start engine. If engine does not start, refer to trouble chart.
- (8) Adjust carburetor.
- (9) Run engine, checking frequently for signs of improper operation.

PART 3. CARBURETOR

A. GENERAL

The fuel system consists of a carburetor, gas shut-off valve, gas filter, fuel tank, and fuel lines. The function of the fuel system is to mix fuel and air in the proper proportion so that the mixture will burn efficiently in the engine at any rate of speed.

B. DIAPHRAGM OPERATION

The diaphragm carburetor has a rubber-like diaphragm that is exposed to crankcase pressure on one side and to atmospheric pressure on the other. As the crankcase pressure decreases the diaphragm moves against the inlet needle allowing the inlet needle to move from its seat. This permits the fuel to flow through the inlet valve to maintain the correct fuel level in the fuel chamber.

C. CARBURETOR OPERATION

- (1) The carburetor is designed to provide the correct fuel mixture to the powerhead at any operating speed.
- (2) In the **CHOKE** or start, the choke shutter is closed, and the only air entering the powerhead enters through openings around the shutter. As the powerhead is started, the air pressure in the carburetor is reduced as air is drawn into the powerhead. Since the air passage is blocked by the choke shutter, fuel is drawn from the main nozzle and from both idle fuel discharge ports and mixes with the air that passes through the throttle shutter. This makes a very rich fuel mixture which is needed to start a cold powerhead.
- (3) At **IDLE**, a relatively small amount of fuel is required to operate the powerhead. The throttle is almost closed, shutting off the fuel supply from all except the one idle fuel discharge orifice, so that the suction created by the engine draws fuel only from that orifice.
- (4) During **INTERMEDIATE** operation, a second orifice is uncovered as the throttle shutter opens, and more fuel is allowed to mix with the air flowing into the powerhead.
- (5) During **HIGH SPEED** operation, the throttle shutter is fully opened. Air flows through the carburetor at high speed. The venturi, which decreases the size of the air passage through the carburetor, further accelerates

the air flow. This high speed movement of the air decreases the air pressure, and fuel is drawn into the air stream through the main nozzle that opens into the venturi, mixing with the air in the air passage. As powerhead load increases, air is automatically bled into the main nozzle through the air bleed tube located in the air horn. This allows liquid fuel to be metered freely from the main nozzle.

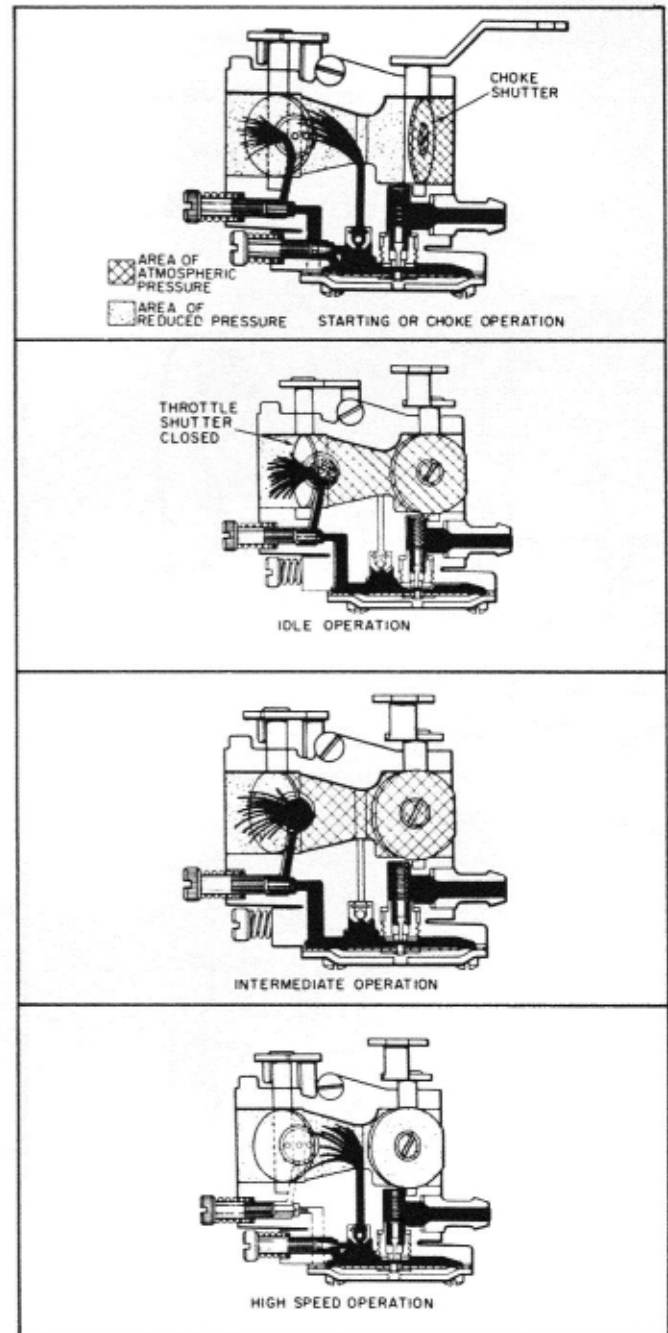


Figure 4 Carburetor Operation

D. CARBURETOR REMOVAL

- (1) Close the fuel shut-off valve and disconnect carburetor fuel lines. Drain fuel tank.
- (2) Disconnect choke and throttle control wires from carburetor.
- (3) Remove cap screws, or nuts and lockwashers that hold carburetor to powerhead; remove carburetor.

E. CARBURETOR INSTALLATION

- (1) Secure carburetor on engine.
- (2) Connect choke and throttle control wires.
- (3) Connect carburetor fuel lines.
- (4) Adjust carburetor as described in paragraph F.

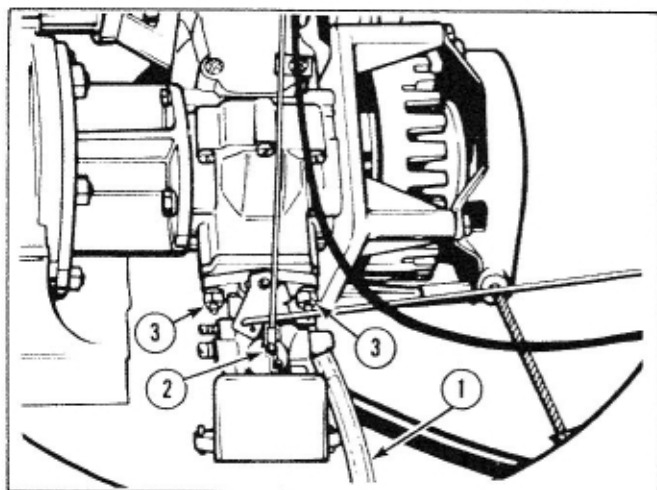


Figure 5 Carburetor Removal and Installation

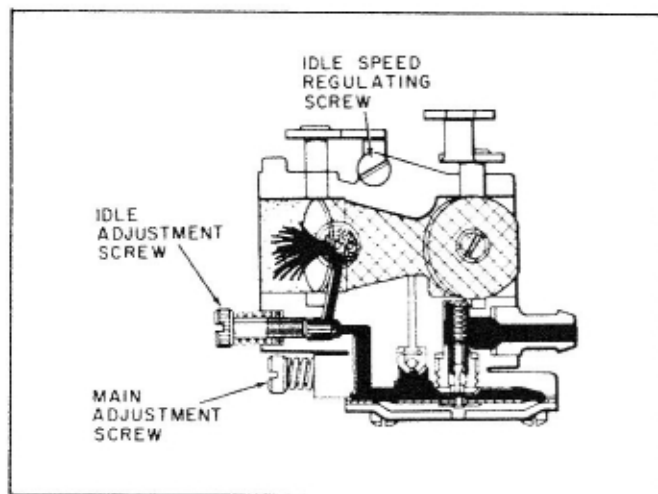


Figure 6 Adjustment Screws

F. FUEL MIXTURE ADJUSTMENTS

Check adjustment screw tip for damage. If ridge ring on seat area can be felt with thumb nail, needle must be replaced.

Three screws must be adjusted before attempting to operate a newly overhauled carburetor.

ADJUSTMENT

INITIAL SETTING

- | | |
|---|--|
| (1) Main Mixture and Idle Mixture Needles | Turn completely in finger-tight and then back out 1 turn. |
| (2) Idle Speed (Top of Carburetor) Screw | Back out screw. Then turn in until screw just touches throttle lever and continue 1 turn more. |

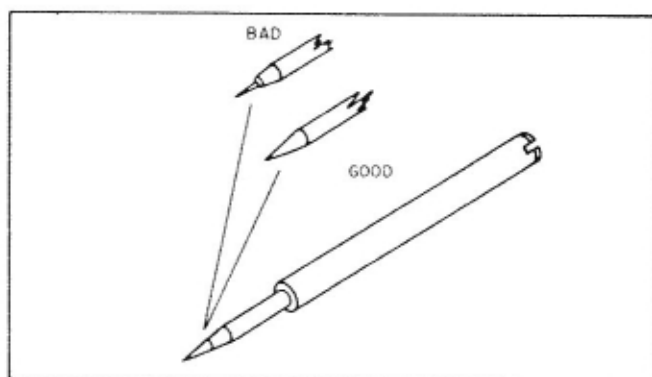


Figure 7 Check Needle Tip

Allow engine to warm up to normal running temperature. With engine running at maximum recommended RPM, loosen main metering screw until engine "lopes" or rolls, then tighten screw until engine starts to cut out. Note the number of turns from one extreme to the other. Loosen screw to a point midway between the extremes.

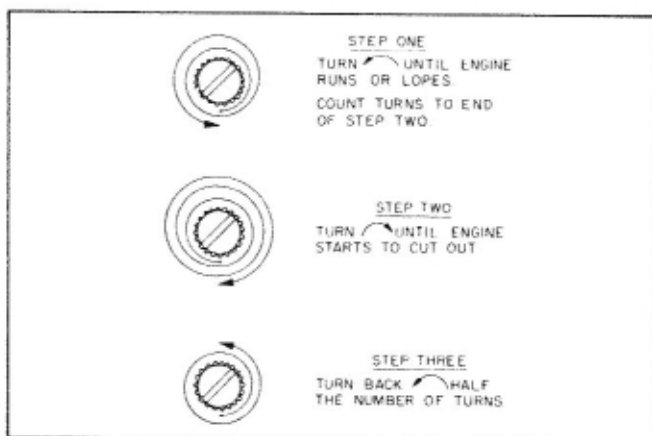


Figure 8 General Application Adjustments

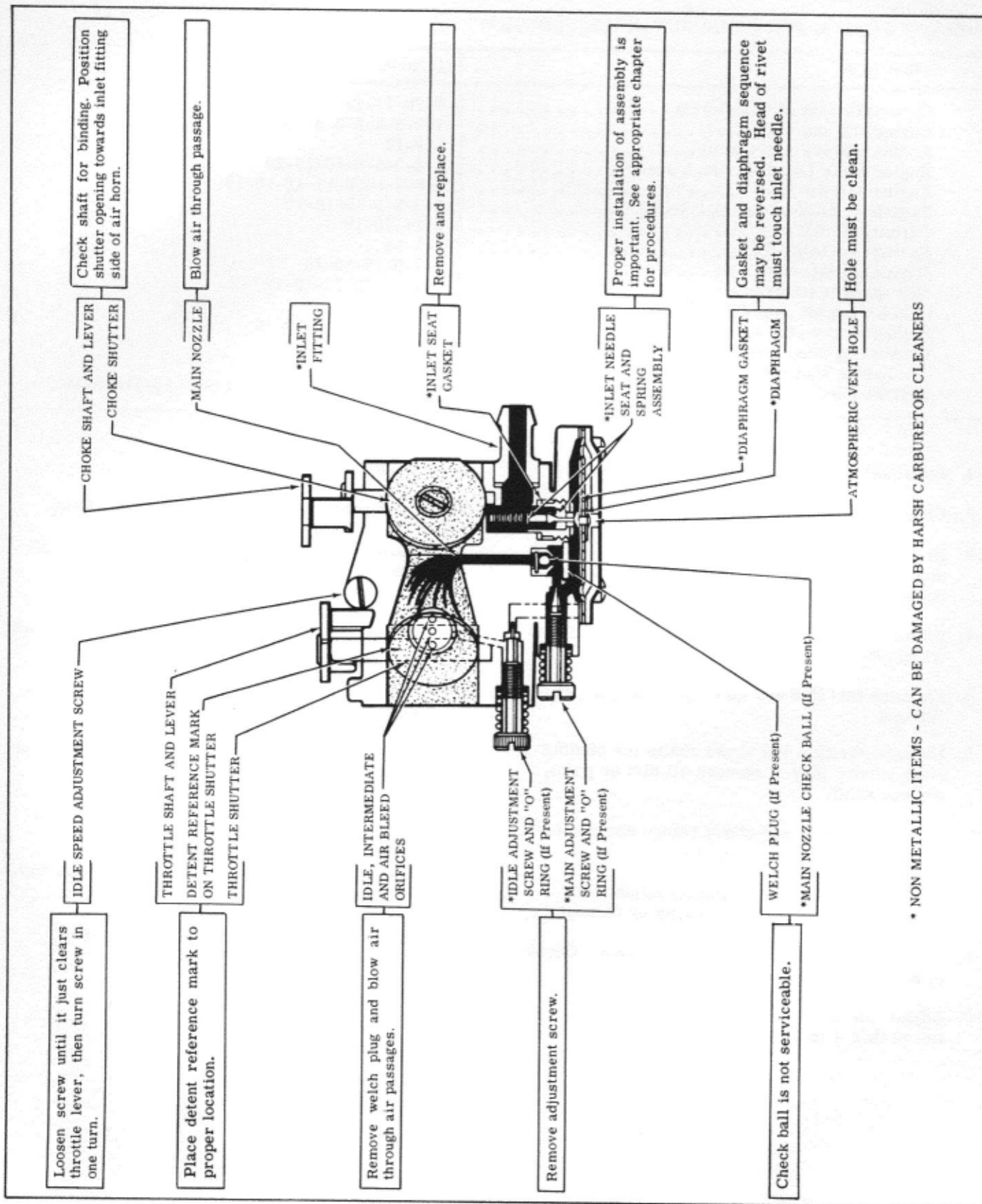
G. TROUBLESHOOTING

POINTS TO CHECK FOR CARBURETOR MALFUNCTION

TROUBLE	CORRECTIONS
Carburetor out of adjustment	9-10-11-13
Engine will not start	1-2-3-4-5-6-9-10-12-13-17-18
Engine will not accelerate	2-9-10
Engine hunts (at idle or high speed)	3-6-7-8-9-10-19-20
Engine will not idle	3-6-7-9-10-11-12-18-19
Engine lacks power at high speed	2-5-6-9-10-18-19
Carburetor floods	3-15-18-19
Carburetor leaks	5-8-16
Engine overspeeds	6-7-9-12-13-16
Idle speed is excessive	6-7-11-12-13-18-19
Choke does not open fully	6-7-13
Engine starves for fuel at high speed (leans out) . .	1-3-5-9-13-15-17-19
Carburetor runs rich with main adjustment	9-15-16-17-18-19
needle shut off	
Performance unsatisfactory after being serviced . .	1-2-3-4-5-6-7-8-9-13-14-15-16-17-18-19

- Open fuel shut off valve — fill tank with fuel.
- Check ignition, spark plug and compression.
- Dirt or restriction in fuel system — clean tank and fuel strainers, check for kinks or sharp bends.
- Check for stale fuel or water in fuel — fill with fresh fuel.
- Examine fuel line and pick-up for sealing at fittings.
- Examine throttle and choke shafts for binding or excessive play — remove all dirt or paint, replace shaft.
- Examine throttle and choke return springs for operation.
- Examine idle and main mixture adjustment screws and "O" rings for cracks or damage.
- Adjust main mixture adjustment screw. Check to see that it is the correct screw.
- Adjust idle mixture adjustment screw. Check to see that it is the correct screw.
- Adjust idle speed screw.
- Check position of choke and throttle plates.
- Adjust control cable or linkage to assure full choke and carburetor control.
- Clean carburetor after removing all non-metallic parts that are serviceable. Trace all passages.
- Check inlet needle and seat for condition and proper installation.
- Check sealing of welch plugs, cups, plugs and gaskets.
- Check fuel pump operation — pump element, inner and outer one way valves.
- Check diaphragm for cracks or distortion and check nylon check ball for function.
- Check sequence of gasket and diaphragm.

H. SERVICE HINTS FOR DIAPHRAGM CARBURETORS



* NON METALLIC ITEMS - CAN BE DAMAGED BY HARSH CARBURETOR CLEANERS

Figure 9 Service Hints

I. DISASSEMBLY, INSPECTION AND ASSEMBLY HINTS

NOTE

Use a good brand of clean carburetor cleaner. Soak only metal parts (except inlet seat fitting). Use new gaskets when servicing.

- (1) **THROTTLE PLATE . . .** Install throttle plate with short line stamped in plate to top of carburetor, parallel with throttle shaft, and facing out when throttle is closed. Second line should be toward 3 o'clock position.
- (2) **CHOKE PLATE . . .** Install with flat of choke plate toward fuel inlet side of carburetor. Mark to face in and parallel with choke shaft.
- (3) **IDLE ADJUSTING SCREW . . . SPRING** loaded, with neoprene "O" ring seal. Do not soak "O" ring in carburetor cleaner. Idle adjusting screws vary in design - observe during removal for proper replacement. Check for wear as shown in Figure 9.
- (4) **HIGH SPEED ADJUSTING SCREW . . . SPRING** loaded, with neoprene "O" ring seal. Do not soak "O" ring in carburetor cleaner. Replace if damaged. Check for wear as shown in Figure 9.
- (5) **IDLE FUEL CHAMBER . . .** Welch plug can be removed if carburetor is extremely dirty. Remove by drilling hole OFF CENTER - toward top and pry out with suitable tool.
- (6) **DIAPHRAGMS . . .** are serviced and replaced by removing four screws retaining diaphragm cover to carburetor body. When cover is removed diaphragm and gasket may be serviced. **DO NOT SOAK** diaphragm in carburetor cleaner. Inspect diaphragm for cracks, tears. Replace if necessary and prevent wrinkling when replacing.
- (7) Regardless of metal disc size, always replace diaphragm rivet head toward inlet needle valve. Always replace diaphragm with identical one. To be sure of placing the new diaphragm and gasket correctly.

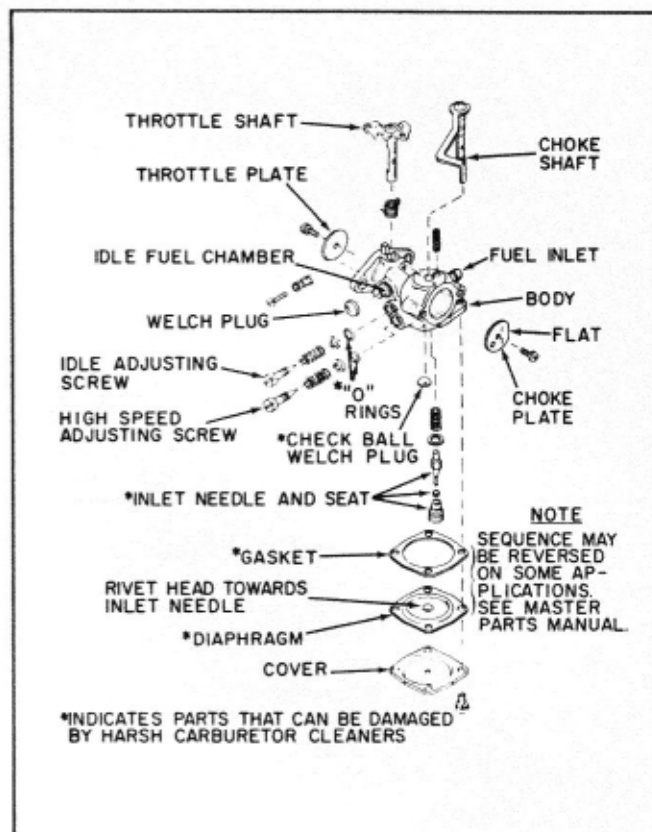


Figure 10 Diaphragm Carburetor (Exploded View)

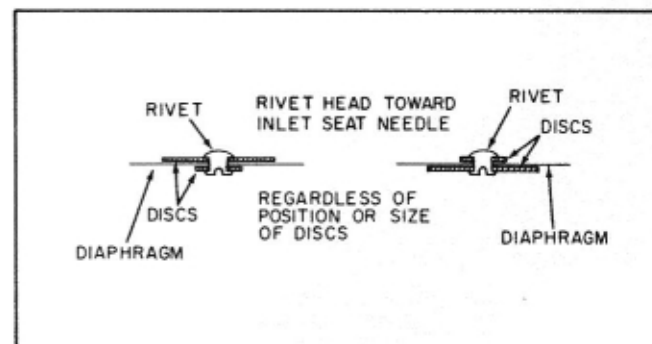


Figure 11 Correct Diaphragm Position

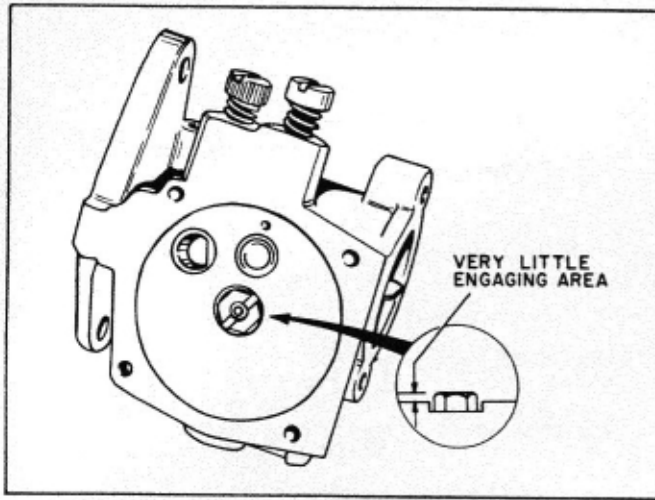


Figure 12 Tecumseh Carburetor

- (8) **INLET NEEDLE AND SEAT . . .** Use 9/32" socket to remove hex head inlet seat. Grind chamfer off socket for better grip.

CAUTION

The inlet needle is spring loaded. Exercise care during removal to prevent loss of spring. Inlet seat fitting is metal with neoprene seat. **DO NOT SOAK** in carburetor cleaner or remove seat. Always remove old gasket from carburetor main body and replace.

- (9) **FUEL INLET FITTING . . .** Diaphragm carburetor inlet fittings have a strainer in the fitting.

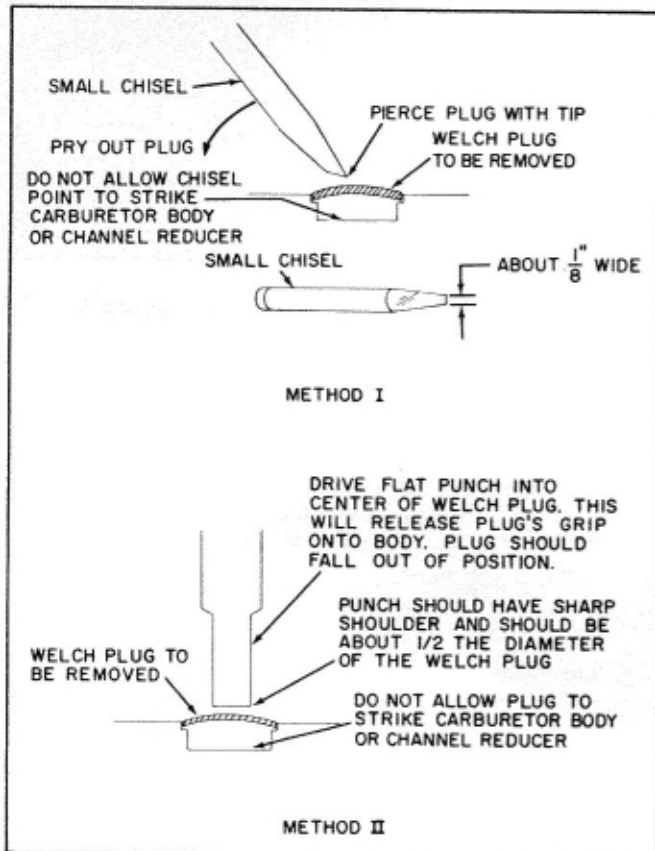


Figure 13 Welch Plug Removal

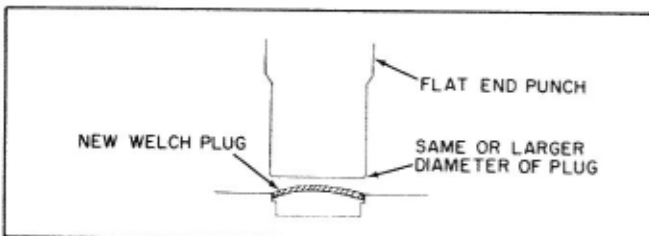


Figure 14 Welch Plug Replacement

J. WELCH PLUG SERVICE

Removing Welch Plug

Method I

- Drive small chisel into welch plug.
- Push down on chisel to pry plug out of position.
- Sharpen small chisel to sharp wedge as shown in Figure 13.

Method II

- Select flat punch size equal to about 1/2 the diameter of welch plug.
- Drive punch into center of plug. Dent in plug will release its grip on carburetor body and plug will fall out of position.

Installing New Welch Plug

- Clean receptacle in carburetor body thoroughly.
- Place welch plug into receptacle with convex (raised portion) up.
- With punch that is equal or greater than size of plug, flatten plug by striking punch with hammer.

CAUTION: Merely flatten welch plug. Do not dent or drive the center of the plug below the top surface of the carburetor.

K. FUEL PUMP SYSTEM

- (1) The Pump Element is inserted into an opening in the mounting flange end of the carburetor body and held in place by the gasket and intake manifold flange. Crankcase pulsations operate the Pump Element.

NOTE

The following operation refers to Figures 16 and 17.

- (2) Rapid deflation (1) draws fuel through the passage (3) from inlet fitting into the pump element cavity (2).
- (3) Rapid inflation (1) forces fuel out of the element cavity (2), through the passage (3) and is blocked at the inlet fitting flap valve (4). The body flap valve (5) opens to allow fuel passage into the carburetor.

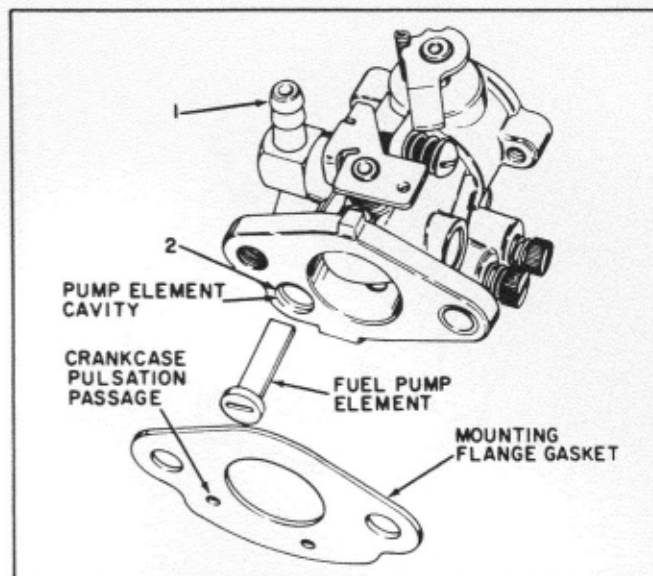


Figure 15 Diaphragm Carburetor with Fuel Pump

L. FUEL PUMP SYSTEM SERVICE

- (1) If the engine is not running properly, make normal idle and high speed screw adjustments.
- (2) Check fuel supply and tank position. Fill with proper, clean fuel.
- (3) Check tank fuel valve for open.
- (4) Check fuel pick-up tube for cracks and flexibility.
- (5) Remove carburetor to check for pulsation passage alignment.
- (6) Check condition of pump element.
- (7) Check for air leaks at gasket surface.
- (8) Check flap valve assembly.

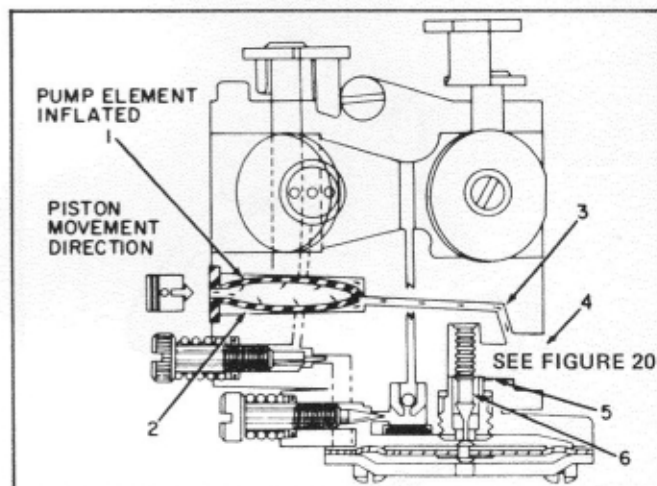


Figure 16 Diaphragm Carburetor with Inflated Fuel Pump

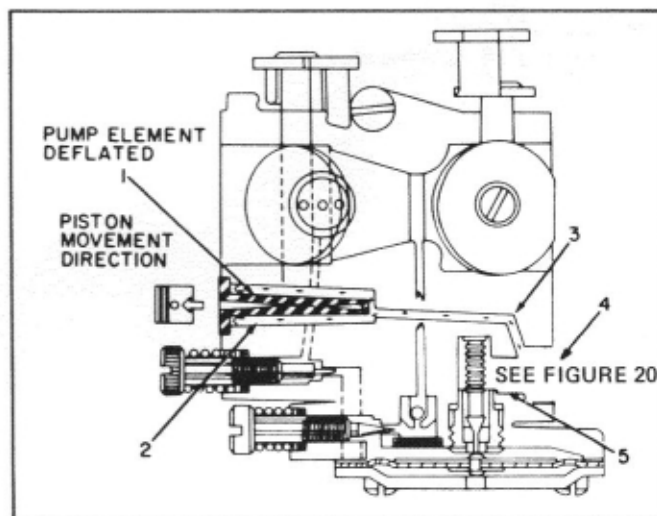


Figure 17 Diaphragm Carburetor with Fuel Pump Deflated

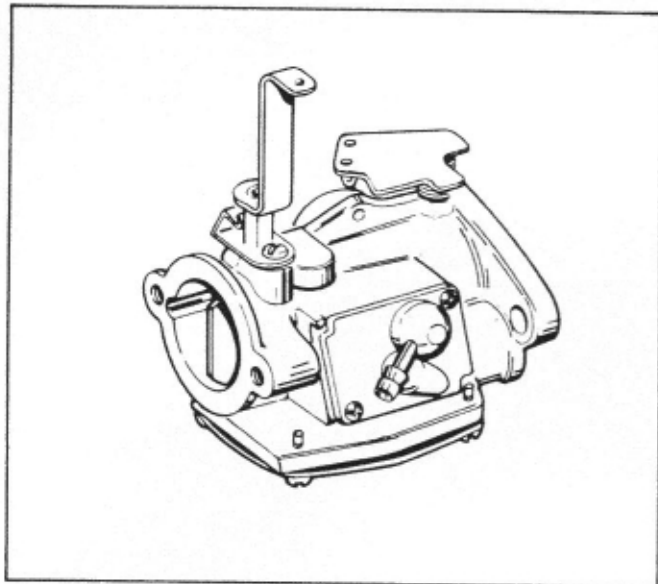


Figure 18 Carburetor Inlet

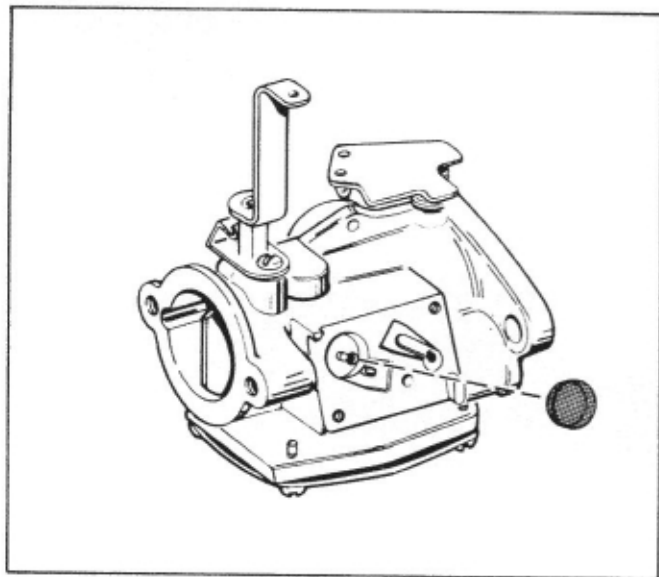


Figure 19 Carburetor Flap Valve Surface

M. FLAP VALVE SERVICE

- (1) Check for fuel leakage around inlet fitting.
- (2) To check flap valves sealing, carburetor must be disassembled and pump element removed. Blow through the pump element cavity. No blow-by should be felt at inlet elbow.

Blow through inlet elbow. Air should be felt at pump element cavity.

Raise inlet needle manually, and blow through pump element cavity. Air should be felt through inlet needle seat.

- (3) Remove two screws and pump cover.
- (4) Replace gasket and flap valve displaying signs of brittleness, tearing, or other visual damage.

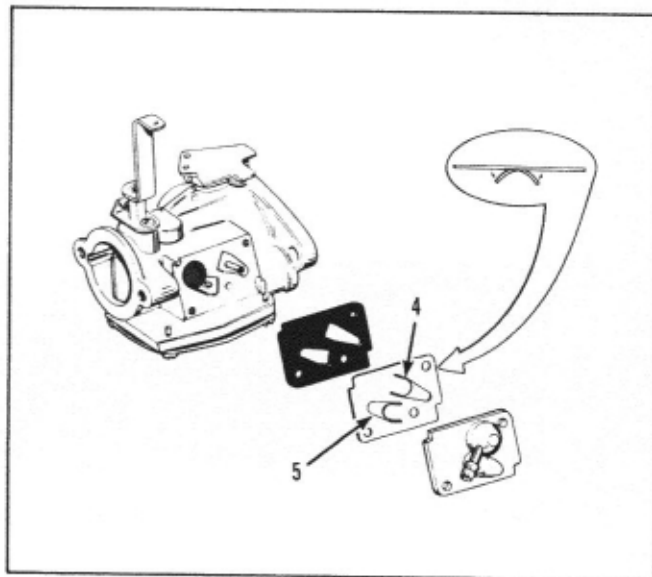


Figure 20 Flap Valve Retainer

PART 4. STARTER

A. OPERATION

- (1) Pulling the starter rope rotates the pulley and cams the starter dogs into engagement with the starter hub, providing the energy to turn the powerhead. The inside of the starter hub is notched to receive the dog.
- (2) Releasing the starter rope on rewind starters, moves the starter dog (or friction shoes) out of mesh with the starter hub. The powerful clocktype spring recoils the pulley in reverse direction to rewind the rope.

B. REWIND STARTER SERVICE

Note position of starter on engine before removal and replace in same position. If starter dogs don't emerge immediately after rope is pulled, tighten retainer screw to 45-55 in. lbs.

C. DISASSEMBLY

NOTE

FOR DISASSEMBLY - Follow numbering on Figure 21. (*) Numbers are elaborated upon in text. FOR ASSEMBLY - Follow reverse numbering on Figure 21. (†) Numbers are elaborated upon in text.

- (1*) Release spring tension before disassembly. Hold pulley with thumb firmly after removing handle and pull rope out of pulley. Ease tension to slowly unwind spring.
- (6*) Note position of dog for correct replacement upon assembly.
- (9*†) Remove and replace spring and keeper as an assembly. Be careful not to yank spring. Replace in correct position.

D. ASSEMBLY

- (1†) Wind pulley about 6 times, and hold. Install rope through eyes and attach handle. Ease tension and let spring wind up rope.

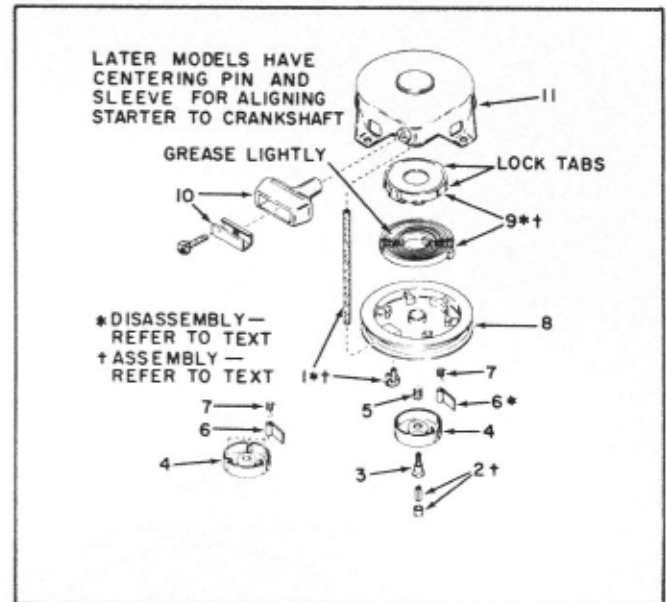


Figure 21 Recoil Starter

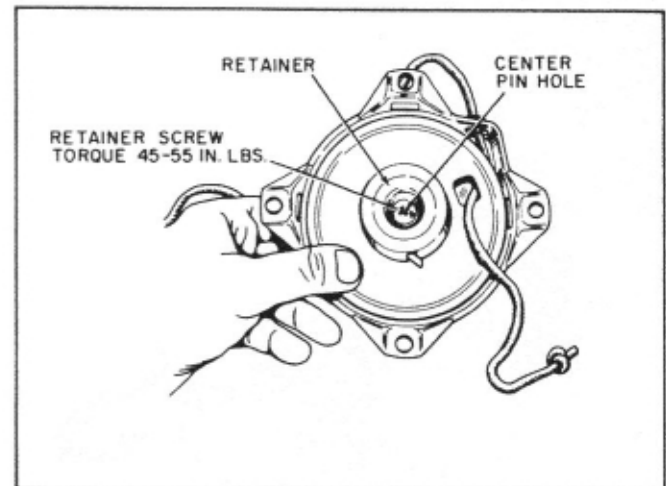


Figure 22 Rope Replacement

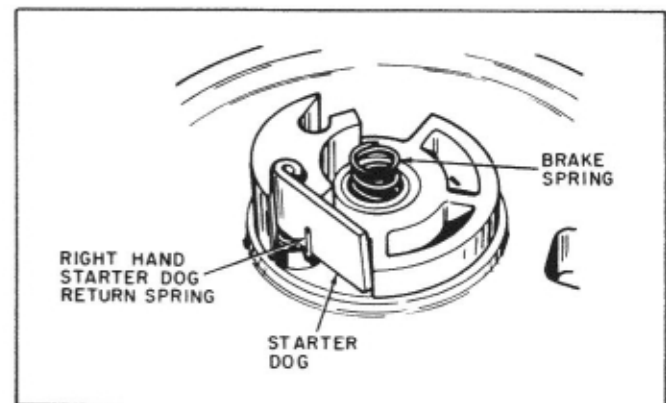


Figure 23 Starter Dog Positioning

PART 5. SOLID STATE IGNITION

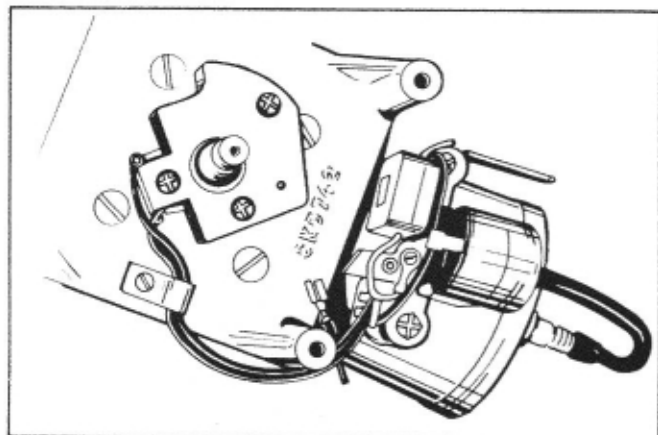


Figure 24 Solid State System

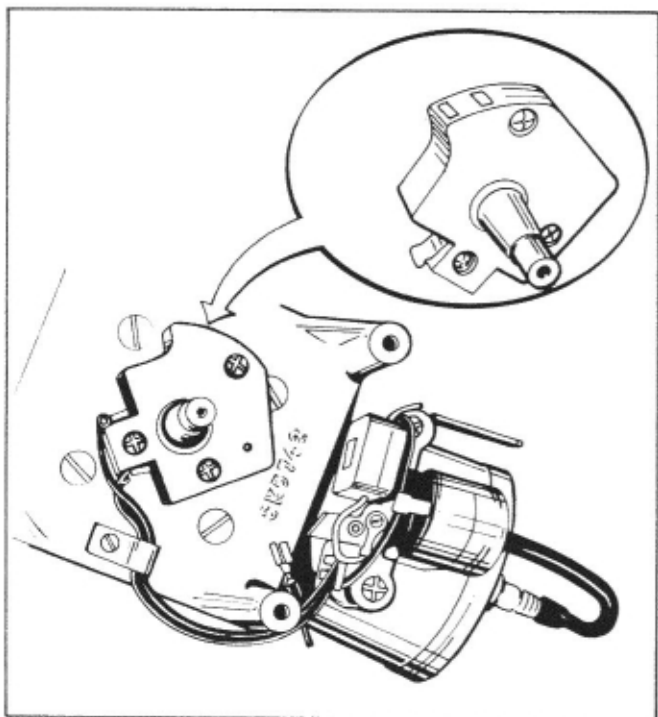


Figure 25 Air Gap on Module

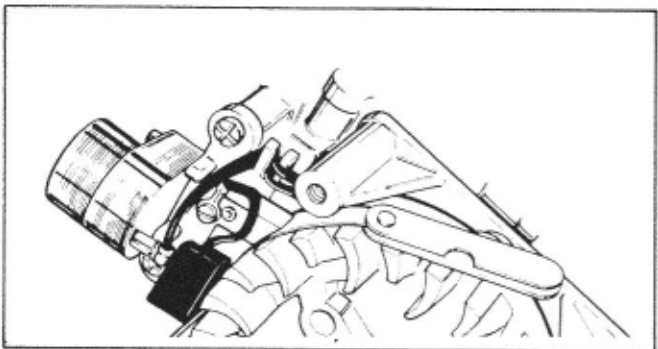


Figure 26 Air Gap on Stator Laminations

A. SOLID STATE IGNITION

- (1) The only check which can be made to determine whether the ignition system is working, is to remove the spark plug and check for spark.
- (2) A spark indicates that the unit is all right - that the spark plug should be replaced.
- (3) No spark indicates that the plug needs replacement. Check again. Absence of spark indicates the malfunction is elsewhere.
 - (a) High Tension Lead. Inspect for cracks or indications of arcing. Replace the transformer if questionable lead is found.
 - (b) Low Tension Leads. Check all leads for shorts. Check ignition cut-off lead to see that unit is not grounded out. Repair leads, if possible, or replace.
 - (c) Pulse Transformer. Replace and test for spark.
 - (d) Magneto Generative Coil. Replace and test for spark. Air gap is .011-.015.
 - (e) Flywheel. Check magnets for strength. Check key and keyway. Be sure that key locks flywheel to crankshaft.
 - (f) Module. Replace and test for spark. Air gap is .011 - .015.
 - (g) Stator Laminations. Replace if damaged.

B. SPARK PLUG SERVICE

- (1) Checking Spark Plug. Remove spark plug, then ground plug and crank engine. If hot spark jumps the spark gap, the ignition system is operating satisfactorily.
- (2) Spark Plug Service. Spark plugs should be removed, cleaned, and adjusted periodically. Check point gap with wire feeler gauge and adjust gap. Replace if points are pitted and burned or the porcelain is cracked. Correct replacement number is JB610120. Apply a little graphite grease to the threads to prevent sticking. Be sure cleaned plugs are free of all foreign material.
- (3) Conditions Causing Frequent Spark Plug Fouling. If spark plugs foul, frequently

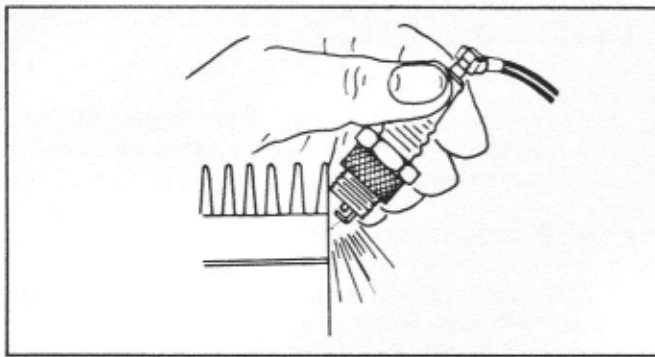


Figure 27 Checking Spark Plug

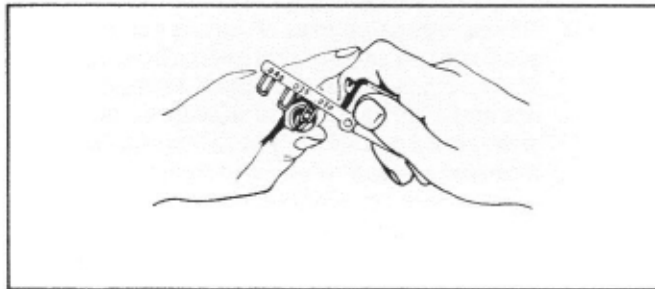


Figure 28 Checking Spark Plug Gap with Wire Feeler Gauge

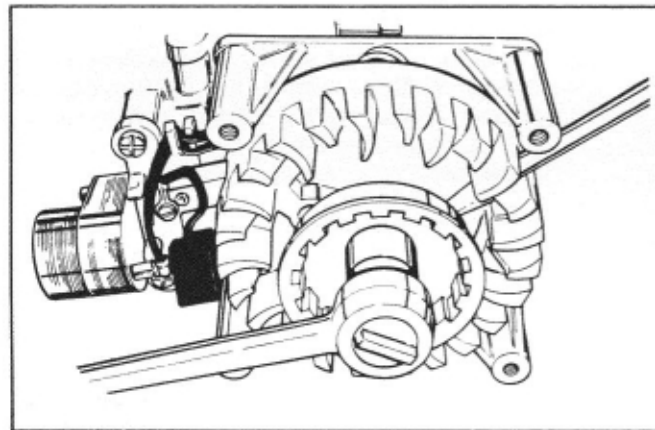


Figure 29 Flywheel Nut Removal

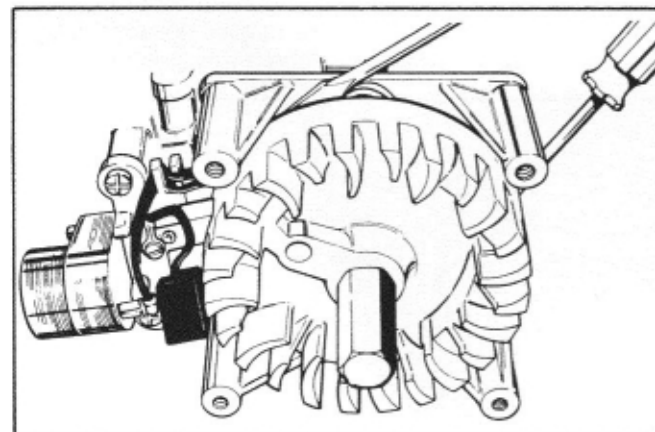


Figure 30 Knock Off Tool

check for the following conditions.

- (a) Carburetor setting too rich.
- (b) Partially closed choke valve.
- (c) Poor grade of gasoline.
- (d) Clogged exhaust system.
- (e) Incorrect spark plug.
- (f) Too much oil in 2-cycle engine fuel mixture.

C. FLYWHEEL CHECKS

- (1) Disassemble powerhead to provide access to magneto.
 - (a) Remove starter. Place a box end wrench on flywheel nut and rap sharply with a soft hammer. This will loosen the flywheel nut.
 - (b) Remove flywheel, nut, and starter cup. Turn correct knockoff tools onto crankshaft, to within 1/16 inch of flywheel. Hold flywheel firmly and rap top of puller sharply with a hammer to jar flywheel loose. Remove puller and flywheel.
 - (c) Flywheel Magnets. A rough test to determine strength of magnetic field follows. The Alnico magnets cast into the flywheel rarely lose their magnetic strength. If magnets are suspected faulty, place flywheel upside down on a wooden surface. Hold a screwdriver by the extreme end of handle with point down. Move blade to within one inch of magnets. The magnets should attract screwdriver blade against magnet.

NOTE

Alnico magnets cannot be recharged on a conventional charger. Never store flywheels in nested piles. It may dissipate the magnetic strength of the magnets.

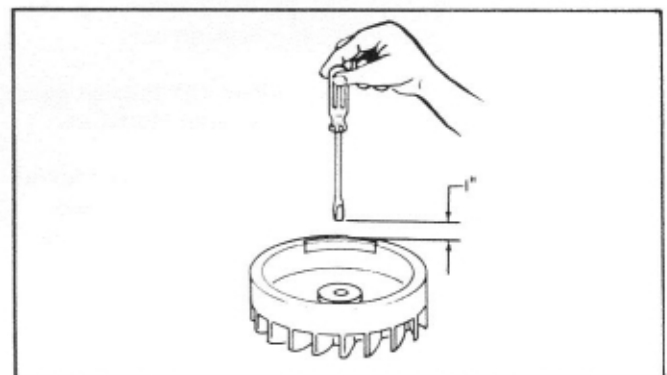


Figure 31 Field Test for Magnetic Strength of Flywheel Magnets

PART 6. POWERHEAD – BASIC SERVICE

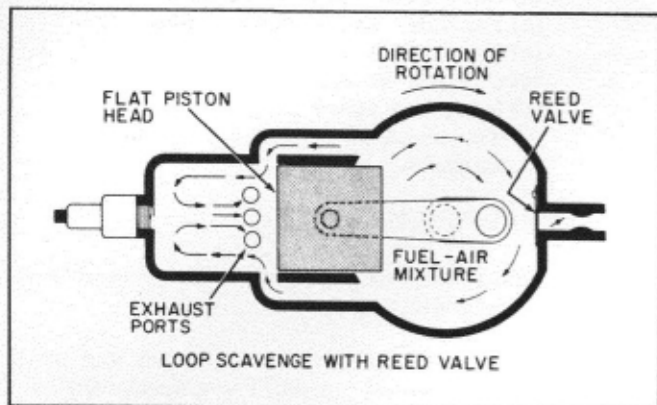


Figure 32

A. OPERATION

- (1) Figure 32 illustrates the loop scavenge design and uses the vacuum-pressure activated reed valve. Here the ports are located on three sides of the cylinder; the intake ports are located on two sides opposite each other and the exhaust ports are illustrated by the three holes just above the head of the piston.
- (2) A flat piston is used in this unit. As the mixture shoots into the combustion chamber through the two sets of intake ports it collides and is directed to the top of the combustion chamber looping when it strikes the cylinder head, thus forcing all spent gases out through the open exhaust ports before it.

B. TERMS USED IN 2-CYCLE THEORY

- (1) **EXHAUST or SCAVENGE PHASE** - The phase resulting from the burning of air and fuel. The burned gases must be cleared out of the combustion chamber and replaced by a fresh charge of fuel-air mixture. The exhaust passes out through the exhaust ports into the outside air.
- (2) **EXHAUST PORTS** - Allow the burned gases to pass out of the combustion chamber.
- (3) **PORTS** - Small openings in the cylinder allowing gases to pass into and out of the combustion chamber. The ports are open or closed by the upward and downward movement of the piston.
- (4) **LUBRICATION** - The powerhead utilizes an oil mist lubrication. The correct quantity of oil is mixed with the fuel and enters the crankcase through the carburetor with

the fuel-air mixture. The oil then clings to the moving parts and lubricates the bearing surfaces.

C. PRE-OVERHAUL CHECK

A thorough check of the powerhead before overhaul will frequently point up cause of improper operation. If check of carburetion (Part 3) and ignition systems (Part 5) reveals no faulty operation, check following items:

- (1) Check compression. Disconnect spark plug lead to insure that powerhead will not start, crank engine by hand in direction of normal rotation. This should be done when powerhead is cold. There should be considerable resistance to turning, as piston approaches top-dead-center. Hold piston against compression for several seconds. If resistance to pull decreases rapidly, it indicates poor compression. Poor compression is usually the result of worn piston rings, worn cylinder bore, or ring gaps not staggered around the piston.
- (2) Crank powerhead slowly, checking for noise, binding, scraping, or other signs of improper operation. These symptoms may be due to damaged bearings, or to a bent crankshaft or connecting rod.
- (3) Rock crankshaft back and forth to check for excessive play. Excessive play indicates worn rod bearings or a worn piston pin.
- (4) Check seals at ends of crankcase for evidence of oil leaks, indicating a faulty seal. A leaking crankcase or crankcase seals will result in faulty fuel metering, erratic operation, and hard starting.
- (5) Check around entire crankcase for leaks where crankcase halves are joined. Leaks

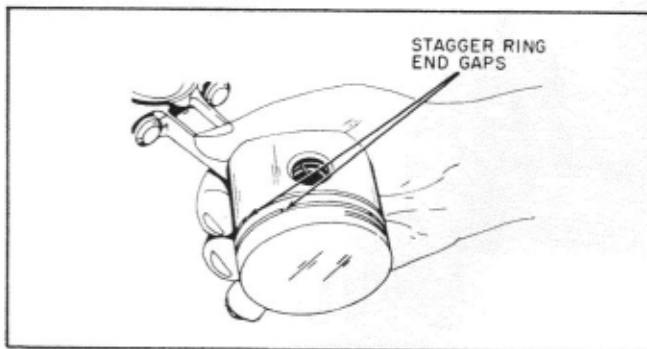


Figure 33

are usually indicated by oil deposits.

- (6) If applicable, remove the carburetor and check the reed plate assembly. Reeds should not be open more than 0.010 inch, and should not be warped, bent, chipped, or cracked.

D. REMOVAL OF POWERHEAD FROM THE JET BOARD

- (1) Remove the retaining clip and throttle linkage from the throttle lever.
- (2) Be sure that the fuel line valve is turned off, then remove the fuel hose from the carburetor inlet fitting. Catch any uncapped fuel.
- (3) To remove the starter rope, pull the rope out, and tie a knot at the starter housing to keep it extended. Remove the handle by untying the handle knot.
- (4) Disconnect the ignition cut-off lead at the ignition transformer.
- (5) Remove the water hose at the tube into the pump housing.
- (6) Disconnect the choke and compression release control line by loosening the Bowden wire clip on the transfer port cover to release the Bowden wire. Raise the Bowden wire to allow separation from the bellcrank.

- (7) Support the powerhead, then remove six nuts and lockwashers securing the powerhead to the pump housing.
- (8) Pull engine away from the pump so that the impeller disengages from the housing and the exhaust pipe is withdrawn from its sealed surface.

E. INSTALLATION OF POWERHEAD TO JET BOARD

- (1) Position powerhead so that the impeller shaft seats in the bearing and the exhaust pipe seals in the "O" ring. Tighten the six nuts securing the powerhead to the pump housing.
- (2) Connect the water hose from the adapter to the upper tube on the cylinder water jacket. Connect the water hose from the pump housing to the lower tube (curved) on the cylinder water jacket.
- (3) Connect the ignition cut off lead to its terminal.
- (4) Thread the starter rope through the starter handle receptacle hole. Attach the handle, then loosen the knot tied to hold the rope in the extended position. Allow the spring to retract the starter rope and handle into its receptacle.

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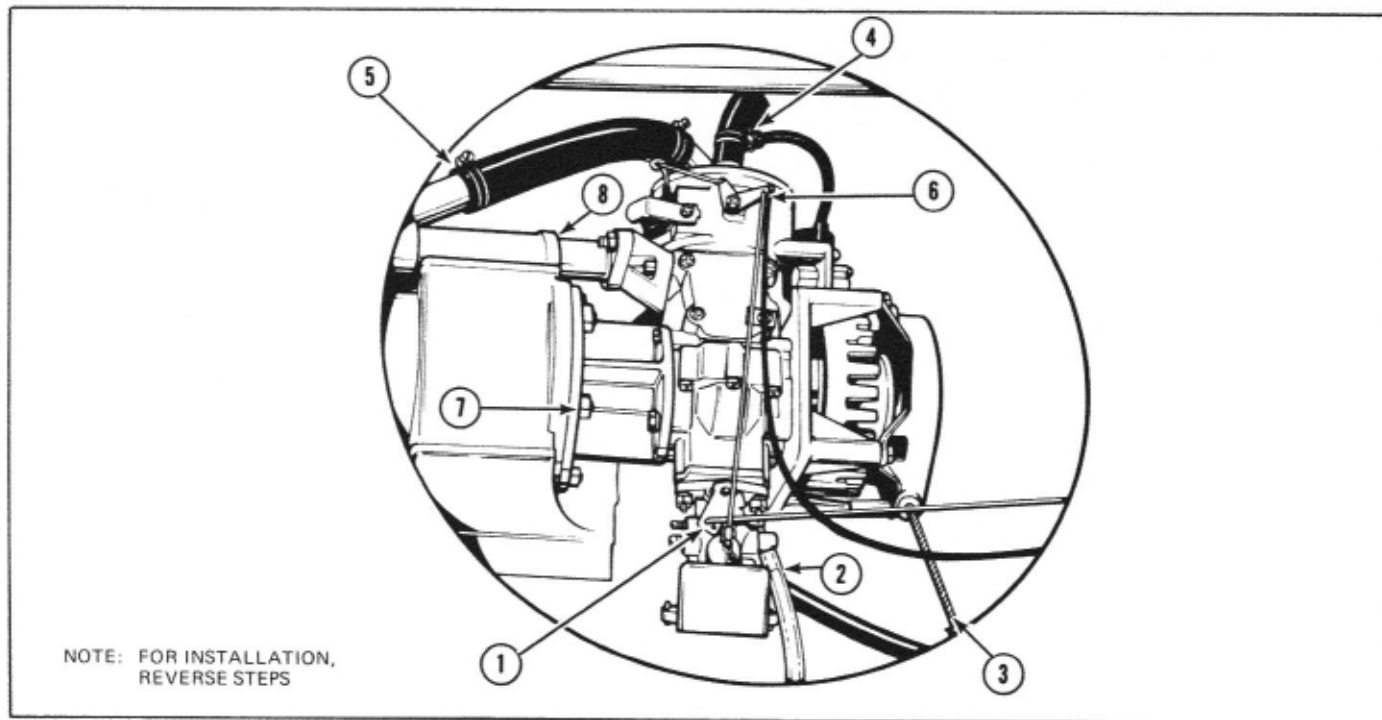


Figure 34 Removal of Engine from Jet Board

- (5) Connect the fuel line to the carburetor.
- (6) Position the retaining clip at the throttle lever mounting hole, then install the throttle linkage and secure with clip.
- (7) Install the Bowden wire control into the bell crank, and loosely install the cable under the retaining clip on the transfer port cover.

Adjust the cable so that the Bowden wire control will actuate the compression release and choke levers satisfactorily, then tighten screw to secure the cable in position.

F. POWERHEAD DISASSEMBLY

NOTE: The subdivisions outlined below are in no particular sequence.

(1) Starter

- (a) Removal. Remove 4 cap screws and lockwashers.
- (b) Disassembly, inspection and reassembly. Refer to Part 4.
- (c) Installation. Install starter to adapter and secure with 4 cap screws and lockwashers. Torque screws to 45-55 in. lbs.

(2) Carburetor and Reed Plate

- (a) Removal. Remove two self-locking nuts from reed plate and remove carburetor and plate.
- (b) Carburetor disassembly, inspection and Reassembly. Refer to Part 3.
- (d) Installation. Secure carburetor and reed plate with two self-locking screws. Tighten nuts. Use new gaskets on re-assembly.

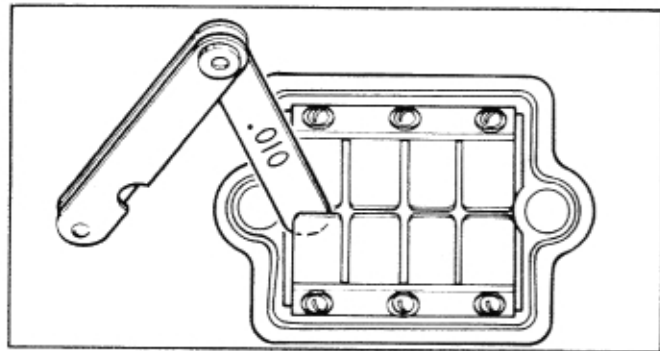


Figure 35 Reed Plate Check

(3) Flame Arrester

- (a) Removal. Remove screw, lockwashers and bracket holding arrester screen in cover. Remove screen to allow access to two screws and lockwashers securing cover to carburetor. Unit is now dis-assembled.
- (b) Clean arrester screen with water or compressed air. Straighten any bent fins, or replace if restricting.
- (c) Installation. Secure cover to carburetor with two cap screws and lockwashers. Install arrester screen and retain with bracket and two cap screws and lockwashers.

(4) Reed Plate

- (a) Inspect reeds for pitting, cracks, and corrosion.
- (b) Clean reeds, stops, and adapters of oil or other foreign matter.
- (c) Check reeds for seal against the adapter plate. Reeds should not bend away from the plate more than 0.010 inch. Tighten screw to 3-5 in. lbs. if reeds are replaced.

(5) Transfer Port Covers

- (a) Remove four screws securing cover to crankcase. Replace gasket.
- (b) Check internal area for foreign matter.
- (c) Reinstall cover, new gasket. Be sure Bowden wire clamp is assembled at correct location. Secure each cover with four cap screws. Torque to 50-55 in. lbs.

(6) Engine Exhaust System

- (a) Remove exhaust pipe nuts and pipe to get at 30° offset manifold. Remove two screws and manifold.
- (b) Clean exhaust ports and parts with a wooden stick to get rid of carbon. A solvent type cleaner will help soften the carbon.
- (c) When installing the manifold and pipe, use new gaskets.

(7) Manual Compression Release

- (a) Remove spring retainer.

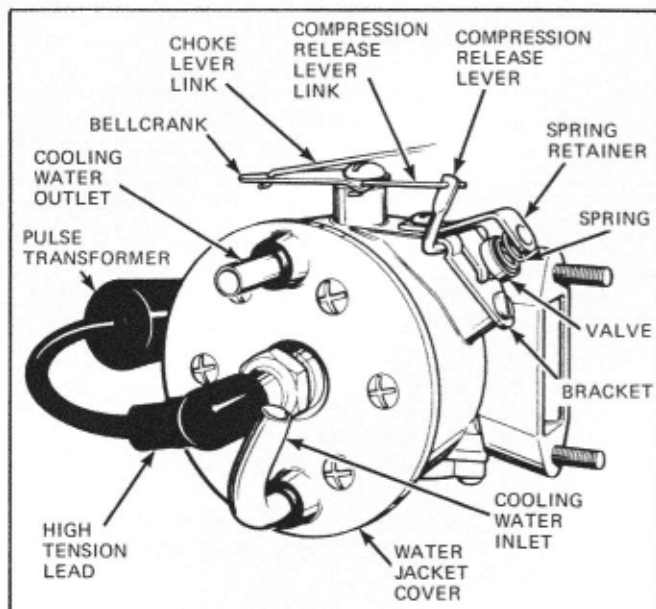


Figure 36 Compression Release and Water Jacket Cover

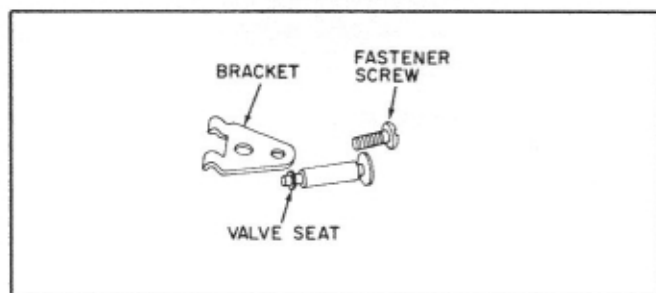


Figure 37

- (b) Remove bracket and separate parts.
- (c) Check valve and port for carbon build-up or for evidence of compression leakage at sealing surfaces.
- (d) Check levers and links for bends or distortion.

(8) Powerhead Block Disassembly

- (a) Remove starter. Refer to paragraph 1 above.
- (b) Lock the flywheel in position, then turn the impeller off. A mallet may be necessary to impact the impeller loose. The impeller shaft should readily unthread from the crankshaft. The spring loaded water seal should be replaced.
- (c) Remove the flywheel. Refer to paragraph C, Part 5.
- (d) The ignition unit can be removed after taking out three screws securing the

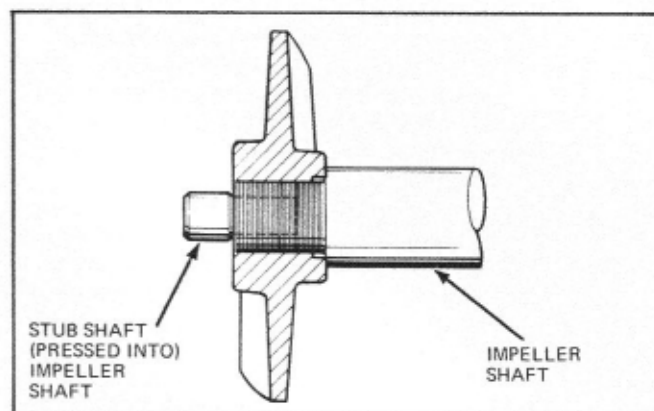


Figure 38 Impeller and Shaft

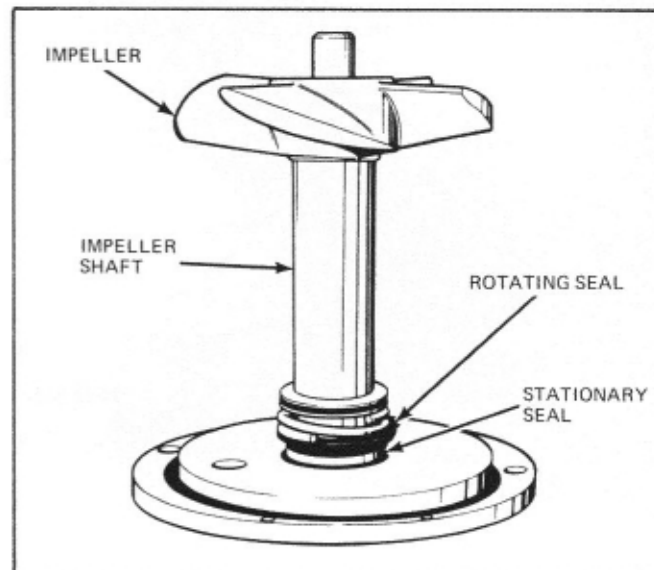


Figure 39 Impeller Shaft and Seal

magneto module and two screws holding the generating coil and pulse transformer unit.

- (e) Remove four screws from both the magneto and impeller end adapter.

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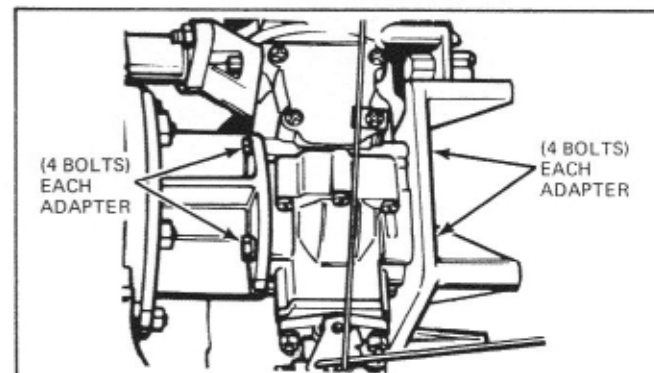


Figure 40 Removing Bearing Adapters

- (f) On the magneto end, install the knock off tool on the crankshaft threads. Hold the adapter in one hand and impact the knock off tool with a MALLET until the adapter separates from the crankcase.
- (g) On the impeller side, remove the water seal from the impeller shaft, and re-install the shaft on crankshaft. Impact the impeller side adapter with a soft MALLET until it separates from the crankcase.
- (h) Remove six screws securing crankcase cap to crankcase and separate the two parts. Clean off all gasket material with lacquer thinner. Do not gouge matching surfaces with a scraper.

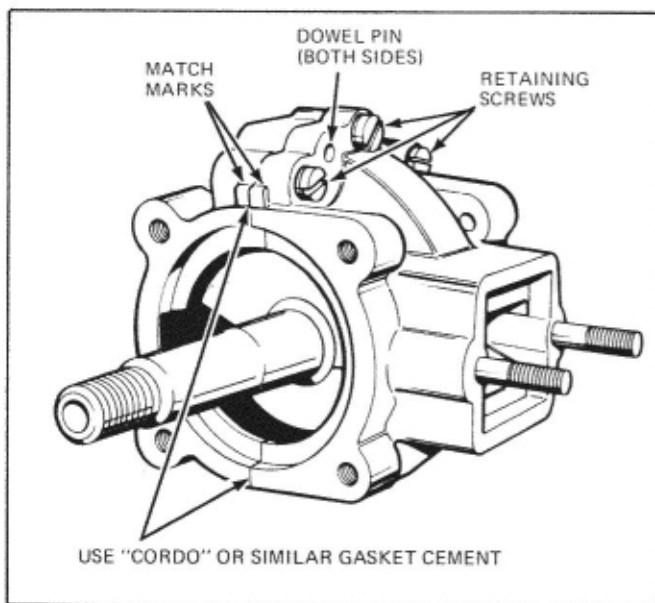


Figure 41 Fitting Halves Together

- (i) Withdraw piston, rod, and crankshaft from cylinder bore.
- (j) Separate the piston, rod, and crankshaft as necessary.

G. INSPECTION OF PARTS

- (1) To service seals refer to Part 7.
- (2) To check piston and rings, refer to Part 11.
- (3) To service connecting rod and bearing refer to Part 8.
- (4) To service ball bearing refer to Part 7.
- (5) To service crankshaft refer to Part 9.
- (6) To service adapter refer to Part 7.

H. POWERHEAD ASSEMBLY

- (1) Install piston to connecting rod with piston pin. Secure pin with two keepers.
- (2) Wrap single row needle bearings around crankshaft throw, then install connecting rod and cap. Torque rod bolts to 75 in. lbs.
- (3) Install piston rings on piston with inside chamfer up. Stagger the rings for best compression.
- (4) Compress piston rings with ring compressor and position the piston to the cylinder bore. Press the piston into the bore.
- (5) Coat matching surfaces with a thin coat of LIQUID gasket cement as CORDO or PERMATEX #3.
- (6) Position one crankcase half on the other with the match marks together and aligned by the dowel pins. Thread the six retaining screws in until they just start to tighten, but no further.
- (7) Install a new gasket on each adapter.
- (8) Center the crankshaft so that it will enter the bearing without binding, as the P. T. O. adapter pilot contacts the crankcase. Be sure that the adapter bolt aligns with the crankcase bolt holes so that the water return line points toward the cylinder head. Install the four cap screws to hold that position, then install magneto end adapter plate and screws. Install the magneto adapter so that the bolt holes align with the lead retaining clip are toward the bottom as the powerhead normally is mounted in the jet board.

NOTE

The impeller adapter water return tube and the lead retaining clip will both be on the same downward side of the engine.

- (9) Cross-tighten the screws by alternately drawing adapters into crankcase no more than one full turn of a screw at a time.

NOTE

It may be necessary to draw crankcase screws up slightly to align bolts in adapters and crankcase.

- (10) When adapters are pressed into the crankcase, cross-tighten crankcase half screws.

Torque to 55-60 in. lbs. Then cross-tighten adapter bolts.

- (11) Install water seal in impeller adapter and on the impeller shaft. The rubber seal rounded edge on the shaft must be away from the shaft shoulder. Install the impeller shaft and water seal to the P. T. O. end threads on crankshaft.
- (12) Install the ignition module to the magneto adapter plate. Set air gap with gauge. Fasten leads under retaining clip and route leads outside of starter mounting leg. Install the generating coil and pulse transformer unit to the posts on the cylinder and tighten screws to hold the unit out away from the flywheel radius.

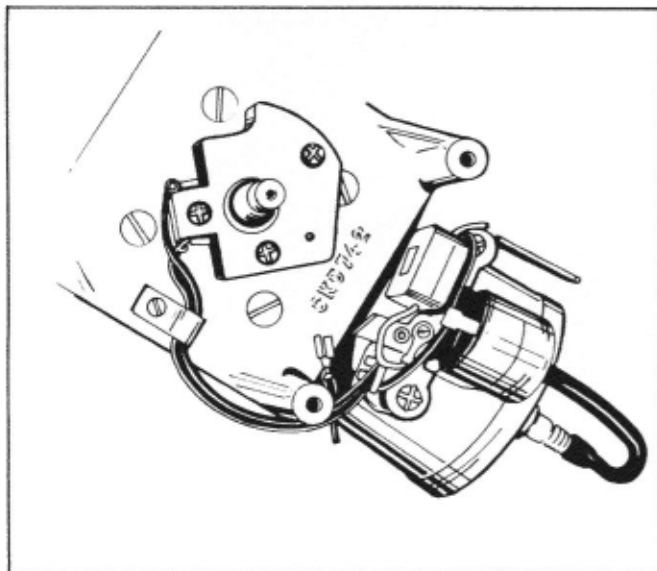


Figure 42

- (13) Install the flywheel key and flywheel, starter cup, centering washer and flywheel nut. Torque the nut to 30-33 ft. lbs.
- (14) Turn the flywheel magnets to the proximity of the stator laminations. Both stator legs should be adjusted together to insure true air gap. A piece of .011 to .015 thick feeler stock across both magnets will establish the proper gap.

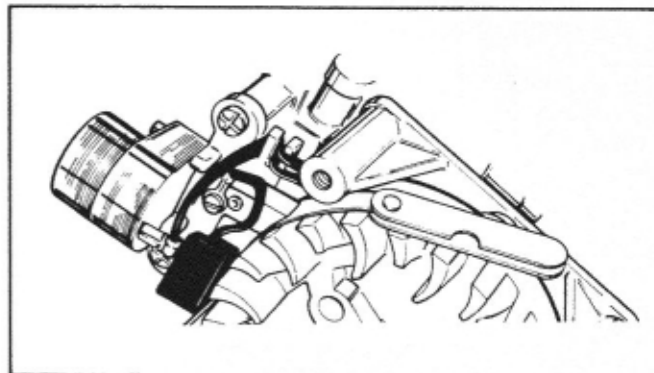


Figure 43

- (15) Loosen the stator holding screws and allow magnetic attraction to position the laminations to the feeler stock.
- (16) Be sure the stator doesn't twist away from the feeler stock when tightening both stator screws.
- (17) Check air gap with feeler gauge. Correct air gap should be .011 to .015 inch.
- (18) When installing the reed plate, be sure the gasket and plate pulsation hole is correctly positioned to align with the carburetor pump element.

PART 7. BEARING AND SEAL ADAPTER SERVICE

To remove ball bearings, place opposite adapter surface on protective plate on hot plate and heat adapter. Protect bearings from heat build-up. When adapter is "hot" (no more than 400°) turn it over and bearing should drop out, or a slight tapping will drive bearing out. Pry out oil seal and replace after adapter cools slightly. Position new bearing in recess while adapter is still enlarged from heat.

Protect seals from keyway and threads on crankshaft when assembling adapter to crankcase.

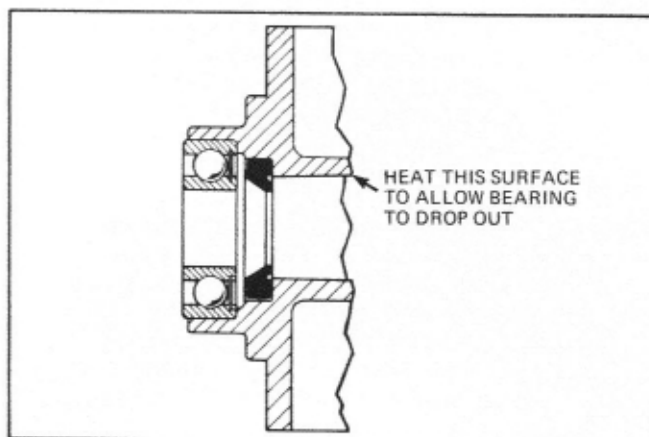


Figure 44 Ball Bearing and Seal in Adapter
(Typical of Both Main Bearings)

PART 8. CONNECTING ROD

The connecting rod has needle bearings at both ends. A caged needle bearing is at the wrist pin end.

Thirty-three (33) uncased, uncaged single row needle bearings are used on the crankshaft throw end of the rod.

Needle bearing installation. See Crankshaft Service Instructions, Part 10 below.

After the bearings are installed on the crankshaft, carefully fit the connecting rod to the bearing surfaces so as not to dislodge any needles.

Align match marks, then fit the rod cap over the other half of the exposed bearings and secure the cap with cap bolts. Torque the bolts to 75 in. lbs. by tightening back and forth. Force solvent (lacquer thinner) into installed needles to remove all beeswax. Force lubricate the bearing with S.A.E. 30 oil.

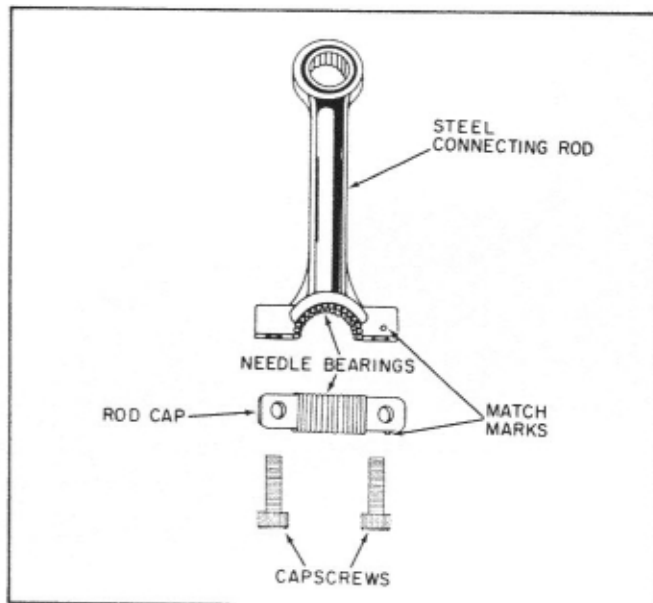


Figure 45

PART 9. CRANKSHAFT SERVICE

Use a micrometer to check bearing journals for out-of-round condition. The main bearing journals should not be more than 0.0005 inch out-of-round. Connecting rod journal should not be more than 0.001 inch out-of-round. Replace a crankshaft that is not within these limits. Do not attempt to regrind the crankshaft, since undersized parts are not available.

Check tapered portion of crankshaft (magneto end) keyways, and threads. Damaged threads may be restored with a thread die. If taper of shaft is rusty, it indicates that engine has been operating with a loose flywheel. Clean rust off taper and check for wear. If taper or keyway is worn, replace crankshaft.

Check all bearing journal diameters. They should be within limits indicated in the Table of Specifications.

Check oil seal contact surfaces for any micro scratches which could cause premature wear to oil seals.

Check crankshaft for bend by placing it between two pivot points (dead centers). Position dial indicator sensor onto crankshaft bearing surface and rotate shaft. A significant variance in indicator readings is indicative of the amount of bend in the crankshaft. General maximum limits are .002 to .004 true indicator reading (T.I.R.)

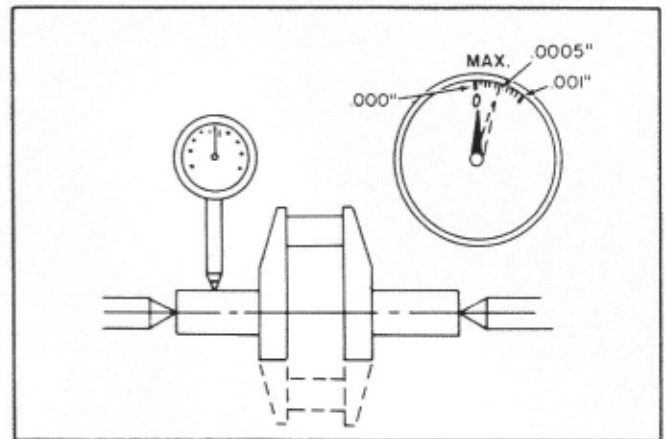


Figure 46

PART 10. NEEDLE BEARING INSTALLATION

- (1) Clean crankshaft journal and connecting rod bearing thoroughly so they are free of oil. Hands must also be free of oil and dirt.
- (2) Place bearings with beeswax onto cool metallic surface so as to stiffen beeswax. Hand temperatures will melt wax, so avoid prolonged handling.
- (3) Remove paper backing on bearings and wrap needles around crankshaft journal. Beeswax will hold needles onto journal.
- (4) Needles must be wrapped uniformly around the crank pin.
- (5) Refer to connecting rod service for concluding steps, Part 8.

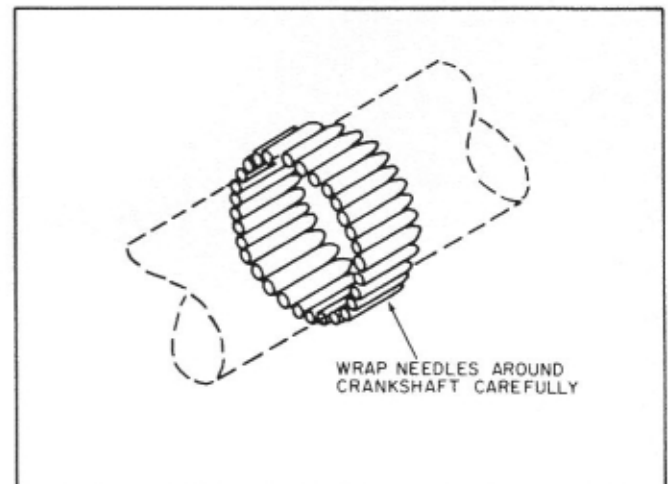


Figure 47

PART 11. PISTON AND RING SERVICE

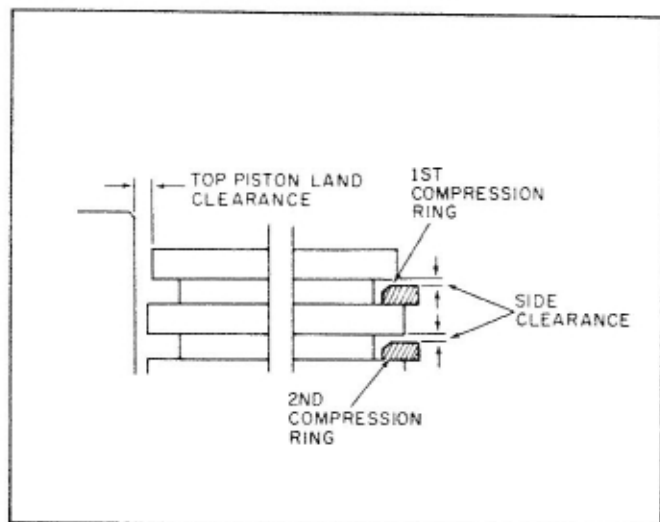


Figure 48 Piston Ring Side Clearance

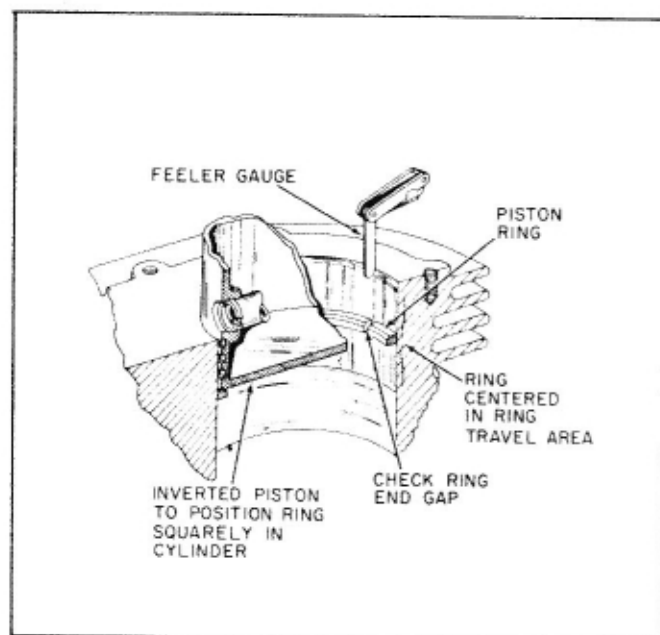


Figure 49 Piston Ring End Gap

- A. Make sure all carbon is cleaned from piston and ring grooves. Check piston for scoring or other damage. Check fit of piston in cylinder bore. Move piston from side to side to check clearance. If clearance is no greater than 0.003 and cylinder is not scored or damaged, piston should be serviceable.
- B. Check piston ring side clearance to make sure it is within the limits as listed in the Table of Specifications.
- C. Check piston rings for wear by inserting them into cylinder in area of ring wear. Check at various places to make sure that gap between ends of ring does not exceed the dimensions indicated in the Table of Specifications.
- D. Bore wear can be checked by the same method except use a new ring to measure end gap.
- E. If replacement rings have beveled or chamfered edge, install with bevel up toward top (crown) of the piston. The two piston rings installed on piston are identical.

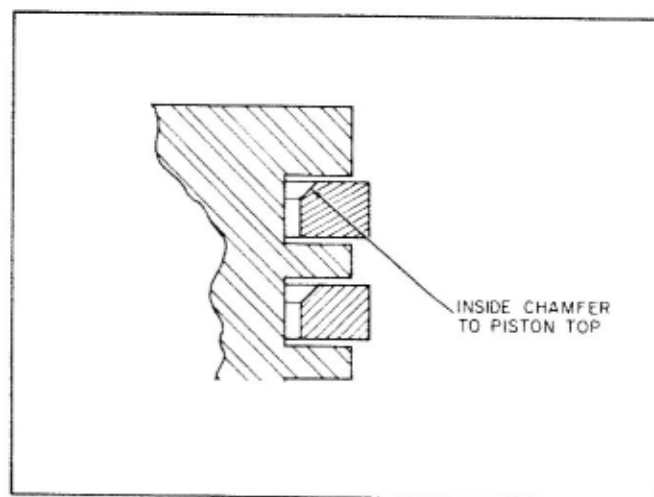


Figure 50 Piston Ring Positioning

PART 12. TROUBLESHOOTING

POWERHEAD TROUBLESHOOTING CHART	
Cause	Remedy
POWERHEAD FAILS TO START OR STARTS WITH DIFFICULTY	
<p>No Fuel in tank</p> <p>Safety switch not installed correctly</p> <p>Fuel shut-off valve closed</p> <p>Obstructed fuel line</p> <p>Gas filter plugged</p> <p>Tank cap vent obstructed</p> <p>Water in fuel</p> <p>Powerhead over-choked</p> <p>Improper carburetor adjustment</p> <p>Loose or defective magneto wiring</p> <p>Faulty magneto</p> <p>Spark plug fouled</p> <p>Spark plug porcelain cracked</p> <p>Poor compression</p>	<p>Fill tank with clean, fresh fuel.</p> <p>Reposition switch.</p> <p>Open valve.</p> <p>Clean fuel screen and line. If necessary, remove and clean carburetor.</p> <p>Replace filter.</p> <p>Open vent in fuel tank cap, or replace cap.</p> <p>Drain tank. Clean carburetor and fuel lines. Dry spark plug points. Fill tank with clean, fresh fuel.</p> <p>Close fuel shut-off and pull starter until engine starts. Reopen fuel shut-off for normal fuel flow immediately after engine starts.</p> <p>Adjust carburetor.</p> <p>Check magneto wiring for shorts or grounds; repair if necessary.</p> <p>Check air gap on module and generating coil.</p> <p>Clean and regap spark plug.</p> <p>Replace spark plug.</p> <p>Overhaul engine.</p>
POWERHEAD KNOCKS	
<p>Carbon in combustion chamber</p> <p>Loose or worn connecting rod or bearings</p> <p>Loose flywheel</p> <p>Worn cylinder</p>	<p>Clean carbon from head and piston.</p> <p>Replace connecting rod, and/or bearings.</p> <p>Check flywheel key and keyway; replace parts if necessary. Tighten flywheel nut to proper torque.</p> <p>Replace cylinder.</p>

POWERHEAD TROUBLESHOOTING CHART (Cont.)

Cause	Remedy
POWERHEAD MISSES UNDER LOAD	
Spark plug fouled	Clean and regap spark plug.
Spark plug porcelain cracked	Replace spark plug.
Improper spark plug gap	Regap spark plug.
Gas filter restricting	Replace gas filter.
Improper carburetor adjustment	Adjust carburetor.
Reed fouled or sluggish	Clean or replace reed.
Crankcase seals leak	Replace worn crankcase seals.
POWERHEAD LACKS POWER	
Choke partially closed	Open choke.
Improper carburetor adjustment	Adjust carburetor.
Worn piston or rings	Replace piston or rings.
Reed fouled or sluggish	Clean or replace reed.
Improper amount of oil in fuel mixture	Drain tank; fill with correct mixture.
Crankcase or pump seals leaking	Replace worn seals.
POWERHEAD OVERHEATS	
Carburetor improperly adjusted	Adjust carburetor.
Water flow obstructed	Remove any obstructions from water passages.
Carbon in combustion chamber	Remove cylinder head or cylinder and clean carbon from head and piston.
Improper amount of oil in fuel mixture	Drain tank; fill with correct mixture.

POWERHEAD TROUBLESHOOTING CHART (Cont.)	
Cause	Remedy
POWERHEAD SURGES OR RUNS UNEVENLY	
Fuel tank cap vent hole clogged Gas filter restricted Carburetor improperly adjusted Carburetor throttle linkage or throttle shaft and/or butterfly binding or sticking	Open vent hole. Replace filter. Adjust carburetor. Clean, lubricate, or adjust linkage and deburr throttle shaft or butterfly.
POWERHEAD VIBRATES EXCESSIVELY	
Powerhead not securely mounted Bent or broken impeller blades	Tighten loose mounting bolts. Replace impeller.

PART 13. TORQUE TABLE

ITEM	TORQUE
Water Jacket Screws	50-55 in. lbs.
Spark Plug	18-22 ft. lbs.
Transfer Port Cover Screws	50-55 in. lbs.
Stator Holddown Screws	60 in. lbs. Use Loc-Tite
Module Holddown Screw	30-35 in. lbs.
Starter Retaining Screw	75 in. lbs.
Starter Center Screw	45-55 in. lbs.
Flywheel Nut	30-33 ft. lbs.
Crankcase Half Screws	55-60 in. lbs.
Carburetor Retaining Nuts	Tighten
Reed Valve Holddown Screws	3-5 in. lbs.
Connecting Rod Cap Bolts	75 in. lbs.
Bell Crank Sleeve Retaining Screw	35-40 in. lbs.
Compression Release Bracket Screws	30 in. lbs.
Exhaust Manifold Bolt	75-80 in. lbs.

PART 14. SPECIFICATIONS

Bore	2.3750
Stroke	1.6875
Displacement Cubic Inches	7.500
Module Gap	$\frac{.011}{.015}$
Stator Air Gap	$\frac{.011}{.015}$
Spark Plug Gap	$\frac{.033}{.038}$
Piston Ring End Gap	$\frac{.005}{.013}$
Piston Diameter	$\frac{2.3700}{2.3703}$
Piston Ring Groove Width	$\frac{.0655}{.0665}$
Piston Ring Width	$\frac{.110}{.100}$
Piston Pin Diameter	$\frac{.4997}{.4999}$
Connecting Rod Diameter Crankshaft End	$\frac{.7566}{.7569}$
Crankshaft Rod Needle Diameter	$\frac{.0653}{.0655}$
Crank Pin Journal Diameter	$\frac{.6240}{.6243}$
Lower Main Journal Diameter	$\frac{.6691}{.6695}$
Top Main Journal Diameter	$\frac{.6691}{.6695}$
Crankshaft End Play	$\frac{.0152}{.0172}$
Compression Pressure at Cranking Speeds (Release Closed)	100 lbs.