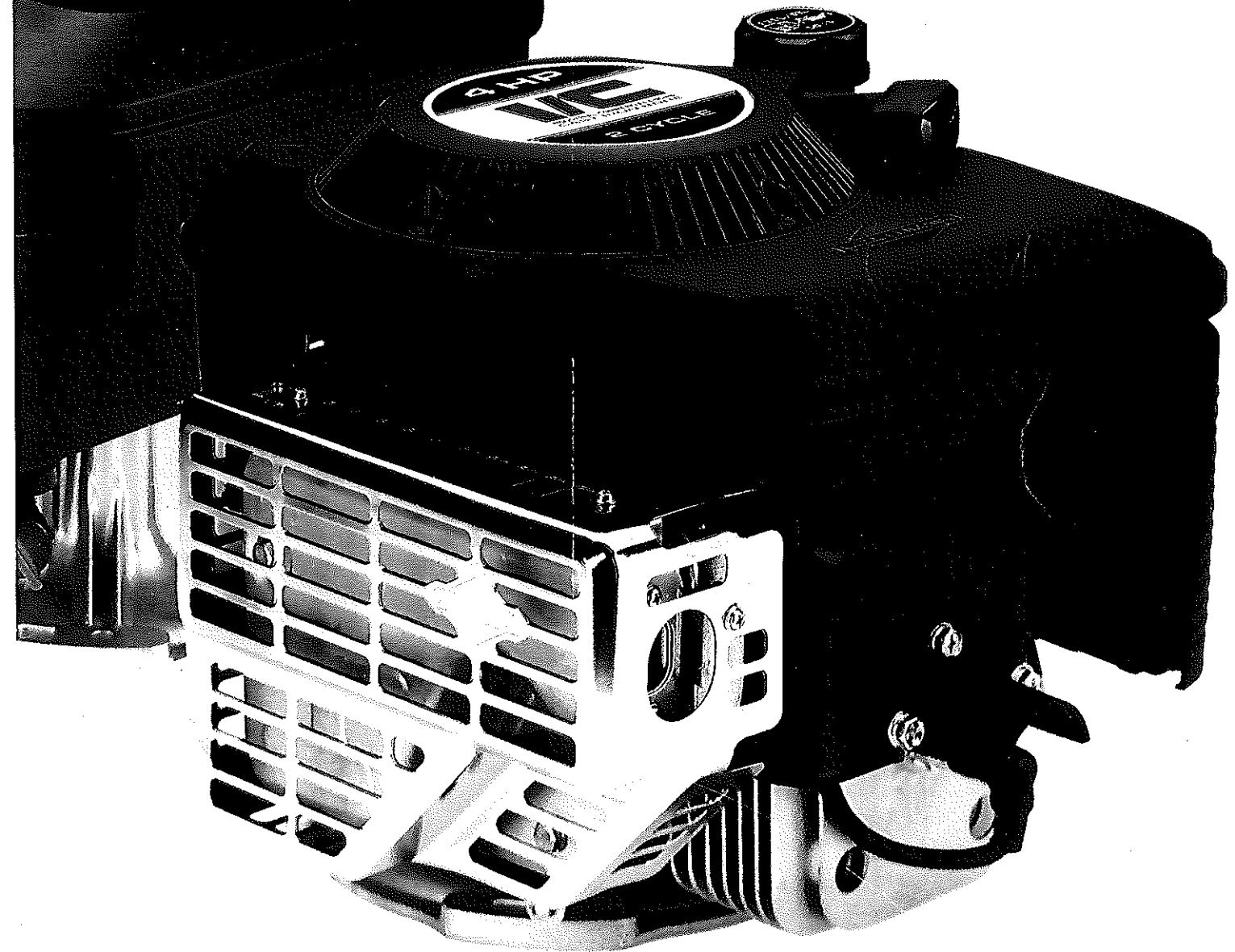


# MODEL 95700, 96700 2 CYCLE ENGINE SERVICE AND REPAIR INSTRUCTIONS



BRIGGS & STRATTON CORPORATION • P.O. BOX 702 • MILWAUKEE, WI 53201 U.S.A.

## FOREWORD

Before attempting the 2-cycle engine overhaul or tune-up, it is necessary that your shop be equipped with proper tools, equipment and mechanics who are thoroughly familiar with Briggs & Stratton 2-cycle engine design and construction. With your shop thus equipped, this manual will serve as a guide in performing the various steps necessary to do a complete and satisfactory job.

In order to keep all tables as simple as possible, only the basic engine models are listed unless there is a difference between them and special models.

To make inspection of parts simple and accurate, only the sizes at which they should be rejected are shown. This eliminates the necessity for figuring allowances for wear, etc. If a part is worn larger (inside dimensions such as cylinder bore) or smaller (such as crankshaft journal surfaces) than the given sizes, they should be rejected and replaced with new parts.

The terms "inspect," "check," "test" and "replace" are used as follows:

INSPECT - Visual inspection, look for signs of wear, scoring, cracks, stripped threads, etc.

CHECK - Measure by means of plug gauges, feeler gauges, micrometer, scale, etc.

TEST - Analyze with proper testing equipment.

REPLACE - This usually means to take off the old part and re-assemble it or replace with a new one.

Illustrations do not necessarily designate a particular model, and should only be used to identify repair procedures.

NOTE: All fasteners used on these engines are metric threads except for the drilled and tapped hole in the P.T.O. end of the crankshaft.

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**COMMON SPECIFICATIONS  
2-CYCLE ENGINES  
MODEL SERIES 95700-96700**

Armature Air Gap .....	.008-.016" (.20-.40 mm)
Armature Resistance	
Primary .....	.2-.4 Ohms
Secondary .....	2500-3500 Ohms
Compression .....	90-120 P.S.I. (6.32-8.40 kp.cm <sup>2</sup> )
Crankshaft End Play .....	.002-.015" (.05-.38 mm)
Crankshaft Journals .....	.982 (24.96 mm) or less
Cylinder Bore, Standard	
Chrome Plated .....	2.362" (60 mm) Replace if worn to 2.368" (60.15 mm) or more. Replace if bore is scored, regardless of size.
Cast Iron .....	2.362" (60 mm) Replace if worn to 2.369" (60.18 mm) or more. Replace if bore is scored, regardless of size.
Piston, skirt diameter at thrust sides .....	Replace if skirt is worn to 2.356" (59.84 mm) or less.
Piston Pin Bore .....	Replace if worn to .553" (14.05 mm) or more.
Piston Pin .....	Replace if worn to .550" (13.97 mm) or less.
Piston Ring End Gap	
Compression Rings .....	Replace if end gap is .040" (1.02 mm) or more.

**TORQUE SPECIFICATIONS**

	<u>in. lbs.</u>	<u>kgcm</u>	<u>Nm</u>
Air Cleaner	35	40	3.95
Band Brake Bracket	25-30	29-35	2.82-3.39
Carburetor Spacer	50	60	5.65
Crankcase Screws	60	70	6.78
Cylinder Mounting Screws	110	125	12.43
Flywheel Nut	30*	4.15*	40.7
Governor Lever Bolt	30	35	4.0
Muffler Bolts	85	98	9.6
Spark Plug	160	185	18

\*Foot Lbs., kgm, kpm or Nm.

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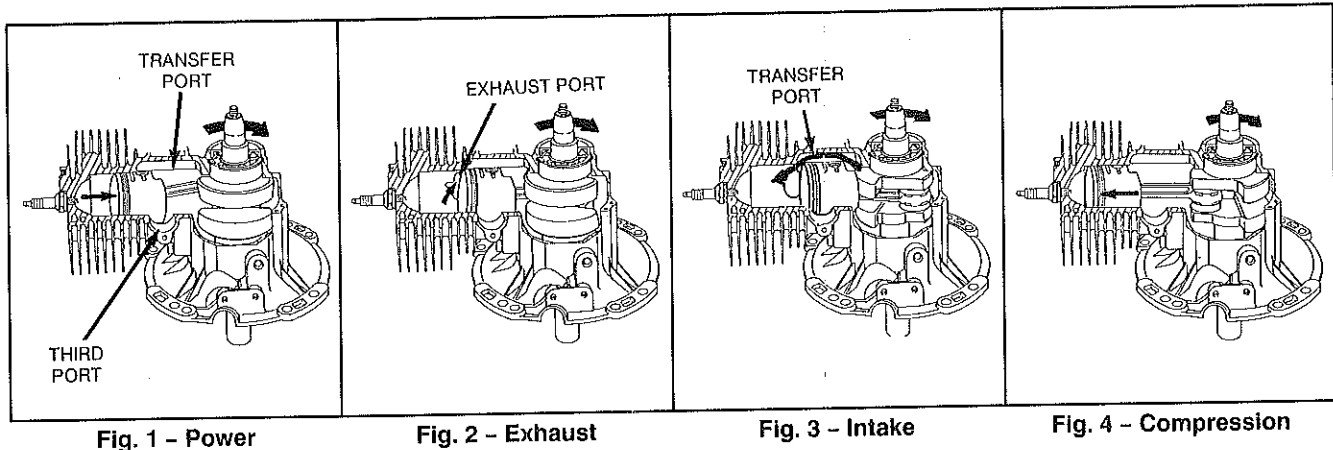
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## Section 1

# GENERAL INFORMATION



All Briggs & Stratton 2-cycle engines are of the same basic 2 stroke cycle design. They are a third port, loop scavenged design. As the name (2-cycle) indicates, there are only 2 strokes of the piston to complete the entire power cycle in one revolution of the crankshaft. Four major events occur during each revolution of the crankshaft. They are: Fig. 1 - Power, Fig. 2 - Exhaust, Fig. 3 - Intake, and Fig. 4 - Compression. Ignition of the Air-Fuel mixture will occur during compression. During the 1st Cycle (first 1/2 revolution) Power and Exhaust occur. During the 2nd Cycle (second 1/2 revolution) Intake and Compression occur. To describe these events, we will assume that the piston is at Top Dead Center and Ignition has occurred. A fresh charge of Air-Fuel mixture is in the crankcase.

### 1ST CYCLE

1. Power      The burning Air-Fuel mixture expands, pushing the piston and connecting rod down, causing the crankshaft to revolve. Until the piston opens the Exhaust Port, power will continue. The Third Port has closed, Fig. 1.
2. Exhaust      When the Exhaust Port begins to open, the Third Port has closed. As the piston continues to move down, the exhaust gases flow out the Exhaust Ports and because the volume of the crankcase is decreasing, the Air-Fuel mixture in the crankcase is increasing in pressure until the piston begins to reach Bottom Dead Center, Fig. 2.

### 2ND CYCLE

3. Intake      Near the bottom of the down stroke and during the beginning of the up stroke, the Transfer Ports open. Because the pressure is higher in the crankcase than in the combustion chamber, the Air-Fuel mixture in the crankcase moves from the crankcase through the Transfer Ports into the combustion chamber. This action also purges the remaining exhaust gases out the Combustion Chamber, Fig. 3.
4. Compression      As the piston continues to move up, it closes the Transfer Ports and the Exhaust Ports. With Transfer and Exhaust Ports closed, the Air-Fuel mixture is being compressed in the combustion chamber. Because the volume is increasing in the crankcase, the pressure is dropping to less than atmospheric pressure. As the piston approaches Top Dead Center, the Third Port starts to open. With pressure higher in the carburetor than in the crankcase, the air mixes with fuel in the carburetor and pushes into the crankcase. Just before Top Dead Center, ignition of the air-fuel mixture occurs to begin the next complete revolution of the crankshaft, Fig. 4.

# GENERAL INFORMATION

1

## IN THE INTEREST OF SAFETY



THIS SAFETY ALERT SYMBOL INDICATES THAT THIS MESSAGE INVOLVES PERSONAL SAFETY. SIGNAL WORDS DANGER, WARNING AND CAUTION INDICATE HAZARD DEGREE. DEATH, PERSONAL INJURY AND/OR PROPERTY DAMAGE MAY OCCUR UNLESS INSTRUCTIONS ARE FOLLOWED CAREFULLY.



### WARNING: DO NOT

1. DO NOT run engine in an enclosed area. Exhaust gases contain carbon monoxide, an odorless and deadly poison.
2. DO NOT place hands or feet near moving or rotating parts.
3. DO NOT store, spill, or use gasoline near an open flame, or devices such as a stove, furnace, or water heater which use a pilot light or devices which can create a spark.
4. DO NOT refuel indoors where area is not well ventilated. Outdoor refueling is preferred.
5. DO NOT fill fuel tank while engine is running. Allow engine to cool for 2 minutes before refueling. Store fuel in approved safety containers.
6. DO NOT remove fuel tank cap while engine is running.
7. DO NOT operate engine when smell of gasoline is present or other explosive conditions exist.
8. DO NOT operate engine if gasoline is spilled. Move machine away from the spill and avoid creating any ignition until the gasoline has evaporated.
9. DO NOT transport engine with fuel in tank.
10. DO NOT smoke when filling fuel tank.
11. DO NOT choke carburetor to stop engine. Whenever possible, gradually reduce engine speed before stopping.
12. DO NOT run engine at excessive speeds. This may result in injury.
13. DO NOT tamper with governor springs, governor links or other parts which may increase the governed engine speed.
14. DO NOT tamper with the engine speed selected by the original equipment manufacturer.
15. DO NOT check for spark with spark plugs or spark plug wires removed. Use an approved tester.
16. DO NOT crank engine with spark plug removed. If engine is flooded, place throttle in "FAST" position and crank until engine starts.
17. DO NOT strike flywheel with a hard object or metal tool as this may cause flywheel to shatter in operation. Use proper tools to service engine.
18. DO NOT operate engine without a muffler. Inspect periodically and replace, if necessary. If engine is equipped with muffler deflector(s), inspect periodically and replace, if necessary, with correct deflector(s).
19. DO NOT operate engine with an accumulation of grass, leaves, dirt or other combustible material in the muffler area.
20. DO NOT use this engine on any forest covered, brush covered, or grass covered unimproved land unless a spark arrester is installed on the muffler. The arrester must be maintained in effective working order by the operator. In the State of California the above is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal lands.
21. DO NOT touch hot muffler(s), cylinder, or fins because contact may cause burns.
22. DO NOT run engine with air cleaner or air cleaner cover removed.



### WARNING: DO

1. ALWAYS DO remove the wire from the spark plug when servicing the engine or equipment TO PREVENT ACCIDENTAL STARTING.
2. DO wear eye protection when operating or repairing equipment.
3. DO keep cylinder fins and governor parts free of grass and other debris which can affect engine speed.



4. DO pull starter cord slowly until resistance is felt (if equipped). Then pull cord rapidly to avoid kick-back and prevent hand or arm injury.
5. DO examine muffler periodically to be sure it is functioning effectively. A worn or leaking muffler should be repaired or replaced as necessary.
6. DO use fresh gasoline. Stale fuel can gum carburetor and cause leakage.
7. DO check fuel lines and fittings frequently for cracks or leaks. Replace if necessary.

**NOTE:** Use Original Briggs & Stratton Service Replacement Parts when servicing your engine. Briggs & Stratton Authorized Service Centers carry a stock of such parts. The use of Briggs & Stratton parts preserves the original design of your engine. Imitation replacement parts may not fit or function as original Briggs & Stratton parts and can expose the operator to

potential personal injury. Contact any Briggs & Stratton Authorized Service Center for Original Briggs & Stratton Replacement Parts.

## FUEL/OIL MIXTURE

We recommend the use of Briggs & Stratton 2-cycle engine oil or a quality BIA or NMMA certified for service TC-W 2-cycle oil. Purchase clean, fresh "regular" or "lead-free" summer grade gasoline.

**TO MIX:** The recommended gasoline to oil ratio is 50:1 (32:1 is acceptable). For a 50:1 ratio, in a separate container, thoroughly mix 2.5 ounces (0.08 liters) of oil with 1 gallon (4 liters) of gasoline. For a 32:1 ratio, in a separate container, thoroughly mix 4 ounces (.125 liters) of oil with 1 gallon (4 liters) of gasoline.

**CAUTION:** Observe recommended gasoline to oil mixing ratio to prevent engine damage.

## FUEL/OIL MIXTURE CHART

50:1					
U.S.		Imperial		Metric	
Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Gallons	2 Cycle Oil Liters
1	2.5	1	3.2	4	.08
2	5	2	6.4	8	.16
5	13	5	16	20	.4

32:1					
U.S.		Imperial		Metric	
Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Gallons	2 Cycle Oil Liters
1	4	1	5	4	.125
2	8	2	10	8	.25
5	20	5	25	20	.625

To assure thorough mixing of oil and gasoline:

- fill container partially with gasoline.
- add oil per chart.
- shake container vigorously.
- add remainder of gasoline into container and shake vigorously.

# GENERAL INFORMATION

## BRIGGS & STRATTON NUMERICAL NUMBER SYSTEM

All Briggs & Stratton engines have a unique numerical designation system. Each engine is identified by a Model, Type and Code number. Example: Model            Type            Code

96722            3025 01            900521

This chart explains the numerical model designation system. It is possible to determine most of the important mechanical features of the engine by merely knowing the model number. Here is how it works.

<u>CUBIC INCH DISPLACEMENT</u>	<u>FIRST DIGIT AFTER DISPLACEMENT</u>	<u>SECOND DIGIT AFTER DISPLACEMENT</u>	<u>THIRD DIGIT AFTER DISPLACEMENT</u>	<u>FOURTH DIGIT AFTER DISPLACEMENT</u>
	<u>BASIC DESIGN SERIES</u>	<u>CRANKSHAFT, CARBURETOR GOVERNOR</u>	<u>BEARINGS, REDUCTION GEARS &amp; AUXILIARY DRIVES</u>	<u>TYPE OF STARTER</u>
6	0	0 - Horizontal Diaphragm	0 - Plain Bearing DU	0 - Without Starter
8	1	1 - Horizontal Vacu-Jet	1 - Flange Mounting Plain Bearing	1 - Rope Starter
9	2			
10	3			
11	4	2 - Horizontal Pulsa-Jet	2 - Ball Bearing	2 - Rewind Starter
12	5	3 - Horizontal Flo-Jet	3 - Flange Mounting Ball Bearing	3 - Electric - 110 Volt, Gear Drive
13	6	(Pneumatic Governor)		
14	7	4 - Horizontal Flo-Jet (Mech. Governor)	4 - Pressure Lube Horizontal	4 - Electric Starter-Generator - 12 Volt, Belt Drive
16	8			
17	9			
19				
20		5 - Vertical Vacu-Jet	5 - Gear Reduction (6 to 1) (Counterclockwise Rotation)	5 - Electric Starter-Only - 12 Volt, Gear Drive
22				
23				
24				
25		6 - Vertical Sono-Duct	6 - Gear Reduction (6 to 1) (Clockwise Rotation)	6 - Alternator only*
26				
28				
29		7 - Vertical Flo-Jet	7 - Pressure Lube Vertical	7 - Electric Starter, 12 Volt Gear Drive, With Alternator
30				
32				
35				
40		8 - Vertical Sono-Duct Pulsa-Jet	8 - Auxiliary Drive Perpendicular to Crankshaft	8 - Vertical-Pull Starter
42				
		9 - Vertical Pulsa-Jet	9 - Auxiliary Drive Parallel to Crankshaft	9 -

\* Digit 6 formerly used for "Wind-Up" Starter on 60000, 80000 & 90000

To identify Model 96722

9	6	7	2	2
9 Cubic Inch	Design Series 6	Vertical Crankshaft Flo-Jet Carburetor	Ball Bearing	Rewind Starter

The type number identifies certain unique features such as the crankshaft or governor spring used on an engine.

The code number identifies the assembly date of the engine. In some instances it is necessary to know the code number as well as the model and type number when performing adjustments, repairs or ordering replacement parts for an engine. Here is how it works.

Example: 900521

- The first two digits, 90, indicate the calendar year, 1990.
- The second two digits, 05, indicates the calendar month, May.
- The third two digits, 21, indicates the calendar month day.

## Section 2 IGNITION

2

Briggs & Stratton 2-cycle engines use MAGNETRON® ignition, a self-contained transistor module (no moving parts), ignition armature and flywheel.

### CHECK IGNITION (With Engine Starter)

**WARNING:** BE SURE THERE IS NO FUEL OR FUEL VAPOR PRESENT, WHICH MIGHT BE IGNITED BY THE SPARK AND CAUSE A FIRE OR EXPLOSION.

NOTE: Magnetron® ignition system requires a minimum of 350 RPM to produce spark.

With spark plug installed, attach Tool #19368 tester to spark plug lead and ground the other end of the tester as shown in Fig. 1. Spin the flywheel rapidly with engine starter. If spark jumps the .166" tester gaps, you may assume the ignition system is functioning satisfactorily.

**WARNING:** ON MAGNETRON® EQUIPPED ENGINES, SPARK CAN STILL OCCUR WITH A SHEARED FLYWHEEL KEY. A SEVERE SHOCK OR KICKBACK HAZARD EXISTS.

NOTE: Engines equipped with Magnetron® ignition system will still display spark at tester with a partially or fully sheared flywheel key. A partially sheared flywheel key will effect ignition timing and engine performance.

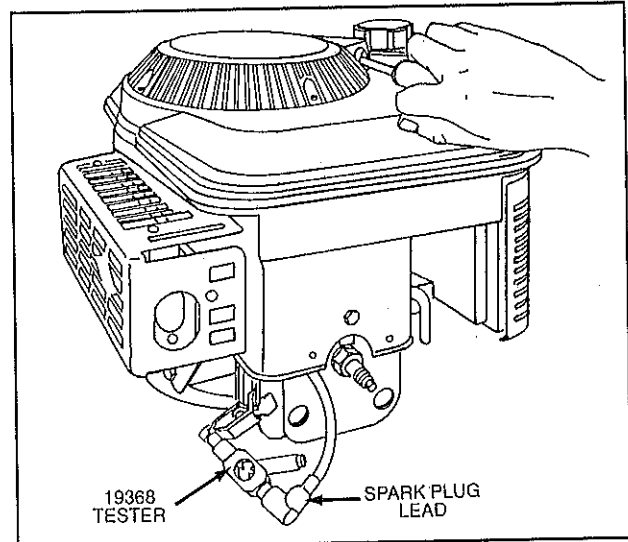


Fig. 1 - Checking for Spark

### CHECK IGNITION (Engine Running)

If engine runs but misses during operation, a quick check to determine if ignition is or is not at fault can be made by installing Tool #19368 tester between the ignition cable and spark plug, Fig. 2. If spark jumps tester gap every revolution, but the miss continues, the problem is the spark plug or fuel system. A spark miss will be readily apparent.

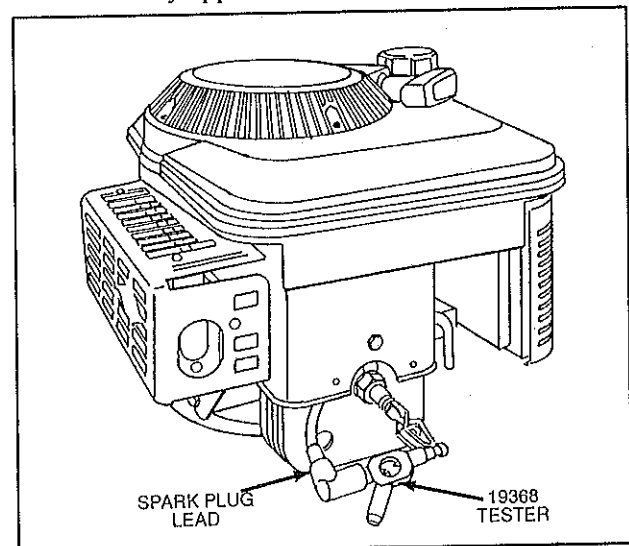


Fig. 2 - Running Check

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 5 OF THIS SECTION.

# IGNITION

## General

### SPARK PLUG

Spark plugs recommended by Briggs & Stratton for 2-cycle engines are:

Spark Plug Type	Champion	B&S Part No.
Standard Plug	J-19 LM	492167
Resistor Plug	RJ-19 LM	802592

### Replace Spark Plugs

Replace spark plugs every 100 hours of operation or every season, whichever occurs first. Replace spark plugs if electrodes are burned away, or the porcelain is cracked. Set spark plug gap at .030" for all models, Fig. 3.

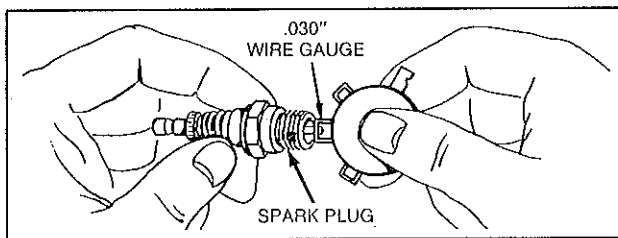


Fig. 3 - Adjusting Spark Plug Gap

NOTE: Do not blast clean spark plugs. Spark plugs should be cleaned by scraping or hand wire brushing and washing in a commercial solvent.

### ARMATURE TESTING

Use an approved tester to test armatures. Specifications are supplied by the tester manufacturer or can be found in Briggs & Stratton form MS-7862, "Instruction Book for Testing Briggs & Stratton Ignition Coils."

### IGNITION FLYWHEEL TYPE - MAGNETRON®

The flywheel is located on the crankshaft with a woodruff key. It is held in place by a starter cup, three screws and flywheel nut. The flywheel key must be in good condition to assure proper location of the flywheel for ignition timing, Fig. 4. DO NOT use a

steel key under any circumstances. Use only the woodruff key, as originally supplied.

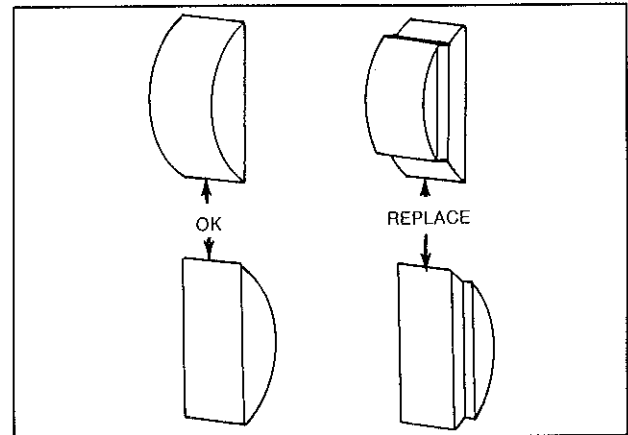


Fig. 4 - Flywheel Keys

### REMOVE STARTER CUP

Use flywheel holder, Tool #19167 or flywheel strap wrench, Tool # 19367 to hold flywheel from turning. Use 14 mm socket and appropriate wrench to remove flywheel nut, Fig. 5.

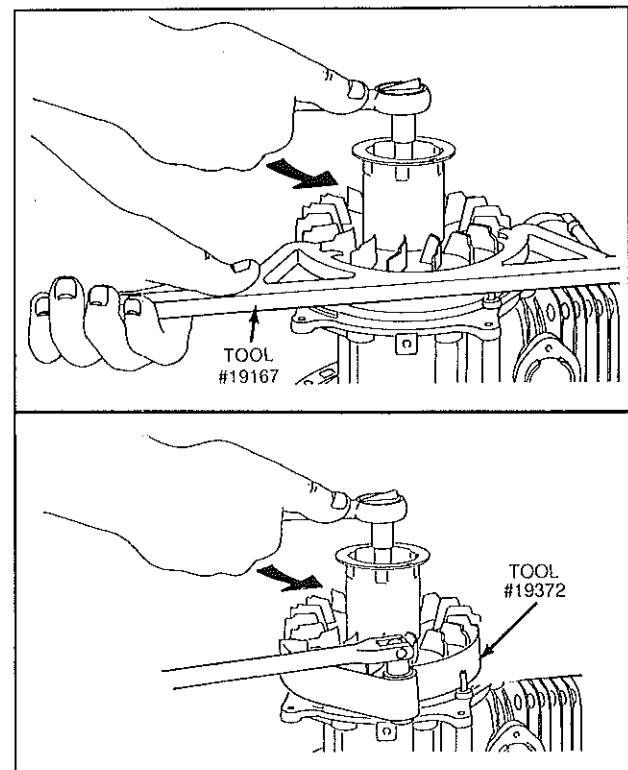


Fig. 5 - Removing Starter Cup

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 5 OF THIS SECTION.

# IGNITION

## Remove/Install Armature

2

### REMOVE FLYWHEEL

**⚠ DO NOT STRIKE FLYWHEEL WITH A HARD OBJECT OR A METAL TOOL AS THIS MAY CAUSE FLYWHEEL TO SHATTER IN OPERATION. ALWAYS USE APPROVED FLYWHEEL REMOVAL TOOLS.**

Two holes are provided in the flywheel to use #19069 flywheel puller. Use flywheel nut, part #800009, to protect the crankshaft threads by turning nut down flush with top of threads, Fig. 6.

**NOTE: CARE IS REQUIRED NOT TO DAMAGE THE FLYWHEEL FINS OR MAGNETS.** Turn puller screws into flywheel puller holes until they bottom. Turn upper puller nuts down on puller equally until flywheel loosens.

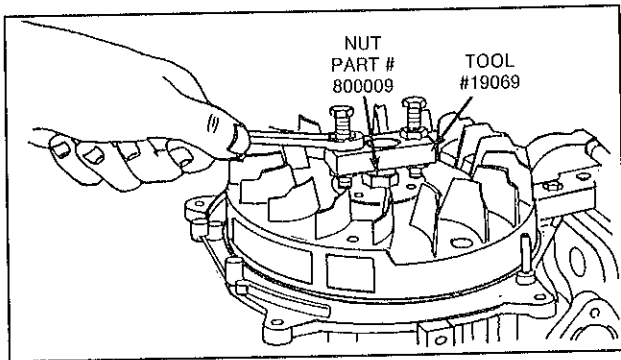


Fig. 6 - Removing Flywheel

### INSPECT FLYWHEEL KEY AND KEYWAYS, FLYWHEEL AND CRANKSHAFT

Inspect flywheel key for partial or complete shearing. If sheared, replace. Inspect flywheel and crankshaft keyways for damage. If damaged, replace with new parts.

### INSTALL FLYWHEEL

REMOVE ALL OIL OR GREASE, clean flywheel internal taper and crankshaft taper. Install woodruff key in crankshaft and install flywheel on crankshaft.

Install flywheel cup and three screws. Then install flywheel nut. Use 19167 flywheel holder or 19367

strap wrench to hold flywheel and torque nut to 30 ft. lbs.

### REMOVING ARMATURE AND MAGNETRON® IGNITION

The flywheel does not need to be removed to service MAGNETRON® except to check keyways and flywheel key.

Remove armature screws and lift off armature. Disconnect stop switch wire.

### INSTALL ARMATURE AND MAGNETRON® IGNITION

Install stop switch wire on armature. Install armature as shown in Fig. 7. Note position of grommet. Mounting holes in armature are slotted. Push armature away from flywheel as far as possible and tighten one screw to hold armature in place, Fig. 8.

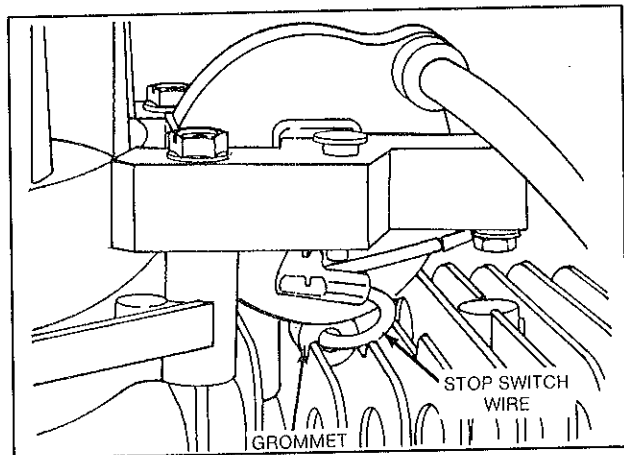


Fig. 7 - Installing Armature

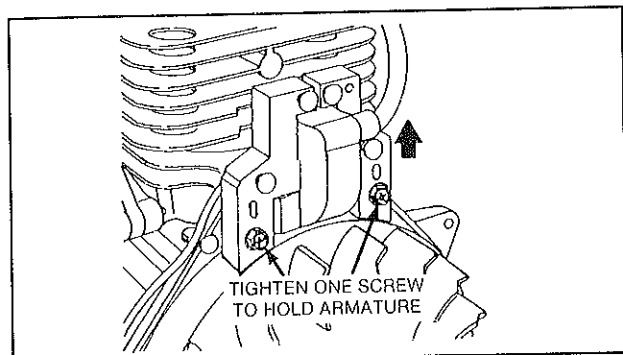


Fig. 8 - Installing Armature

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 5 OF THIS SECTION.

# IGNITION

## Stop Switch Test

### ADJUST ARMATURE AIR GAP

With armature up as far as possible, and one screw tightened, rotate flywheel so that magnets are directly below armature. Place thickness gauge .008" - .016" between magnet and armature laminations, Fig. 9. Loosen the one mounting screw and the magnets will pull the armature down firmly against the thickness gauge. Tighten both mounting screws. Rotate flywheel to remove gauge.

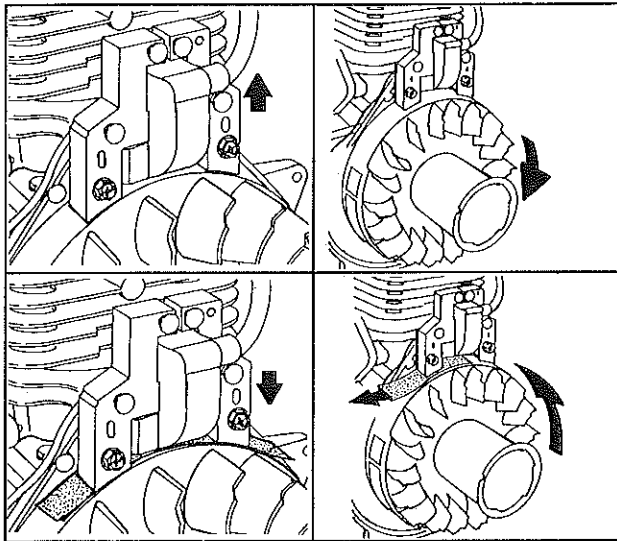


Fig. 9 - Adjusting Armature Air Gap

### STOP SWITCH TEST

Move control lever away from the stop switch, Fig. 10, using safety control shown in Fig. 11 or by moving lever at engine, in direction shown, Fig. 12. Then release control completely. Control lever at engine MUST contact stop switch at tang as shown, Fig. 12.

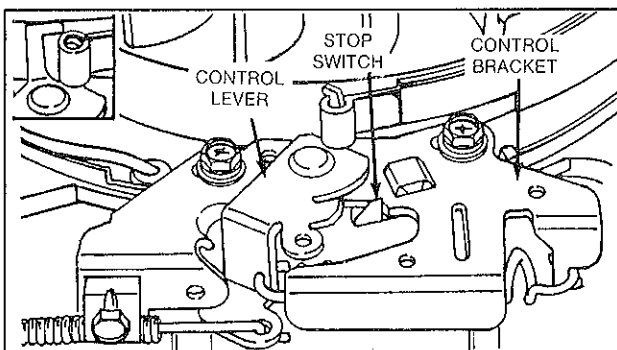


Fig. 10 - Control Lever - RUN Position

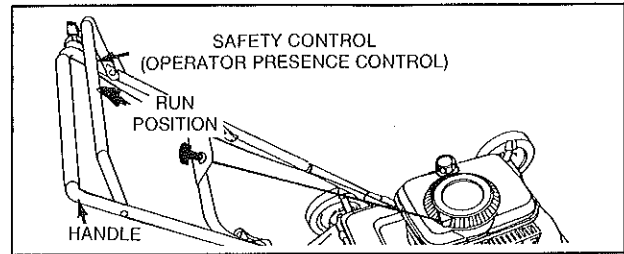


Fig. 11 - Typical Control

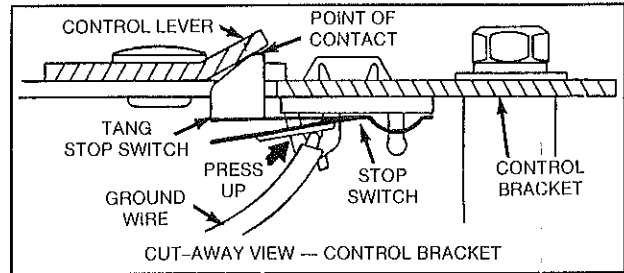


Fig. 12 - Control Lever - STOP Position

If control lever does not contact stop switch tang, check to be certain equipment control cable is not binding and examine stop switch. If required, press up at point indicated by arrow, Fig. 12 to insure stop switch is completely seated in control bracket. If stop switch is still loose, replace stop switch. Repeat test. Contact equipment manufacturer if control cable requires service. If control lever contacts stop switch tang, proceed to Stop Switch Wire Continuity Test.

If after re-checking Stop Switch Test, the stop switch tang does not contact control lever, complete control bracket must be replaced. Control bracket replacement and adjustment procedure is described in Section 4, Governor Controls, Carburetor Linkage and System 2® Controls.

### STOP SWITCH WIRE CONTINUITY TEST

The stop switch wire may be checked for continuity using the digital multimeter, Tool #19357 or VOA meter, Tool #19236.

To test, place equipment control lever and safety control, if engine is mounted on equipment, in "RUN" position, Fig. 11.

Attach one meter lead to a good ground (unpainted bracket or engine surface). Hold other lead against stop switch tang, Fig. 13, while moving stop switch wire up and down, Fig. 14.

**CAUTION: DO NOT** pull on stop switch wire.

# IGNITION

## Testing Stop Switch

Meter should indicate continuity while the stop switch wire is being moved. If meter shows continuity, stop switch wire is good. If meter indicates no continuity be sure proper contact is made at stop switch tang and engine ground. Then re-test. If meter still indicates no continuity, replace stop switch wire.

### Testing With Digital Multimeter

1. Insert red test lead into  $V\Omega\text{}$  receptacle in meter.
2. Insert black test lead into **COM** receptacle in meter.
3. Rotate selector to  $\text{}$  position.
4. When meter test leads are attached as shown in Fig. 13, a continuous tone  $\text{}$  indicates continuity. No tone indicates no continuity (incomplete circuit). An incomplete circuit will be displayed as "OL."

### Testing With V.O.A. Meter

The following tests will be made using the "OHMS" test lead.

1. Insert the white connector into the OHMS receptacle on the meter.
2. Set the meter selector switch to OHMS position.
3. Set the range switch to RX1 position.
4. Zero the meter.
5. When meter test leads are attached as shown in Fig. 13, the meter should read at, or close to, "0" on the OHMS scale.

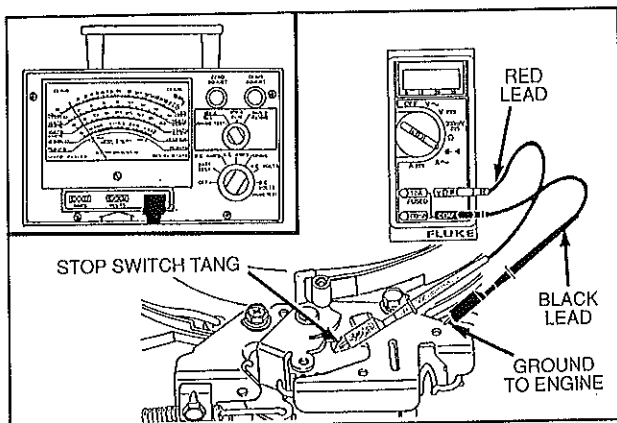


Fig. 13 - Attach Leads

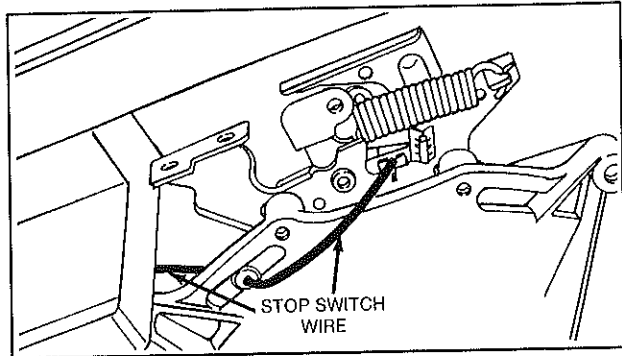


Fig. 14 - Move Stop Switch Wire

To prevent stop switch wire damage, route as shown in Fig. 15 or Fig. 16.

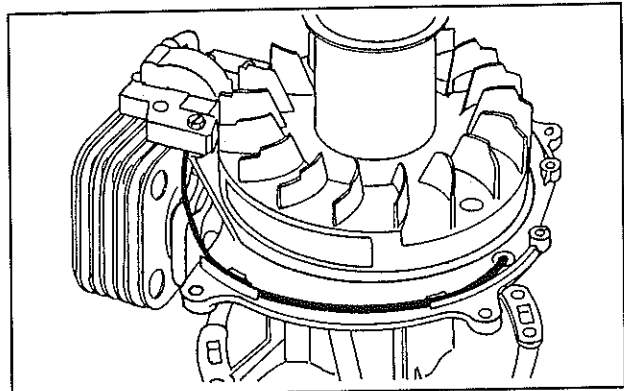


Fig. 15 - Typical Wire Routing

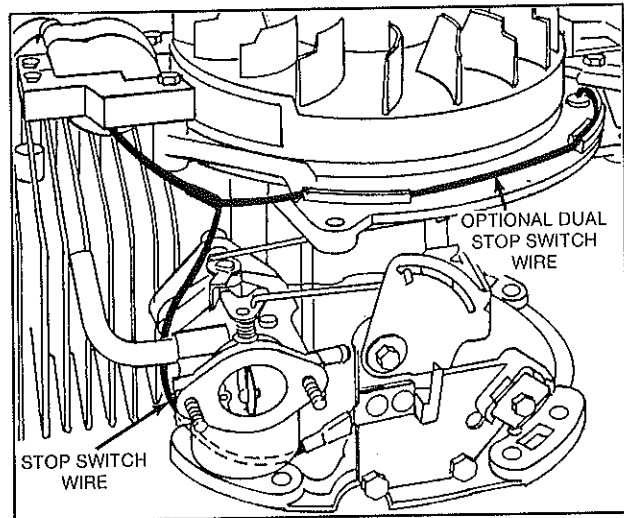


Fig. 16 - Typical Wire Routing

### METRIC EQUIVALENTS

DIMENSIONS	
Inches	Millimeters
.030	.76
.166	4.20

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 5 OF THIS SECTION.

## Section 3 CARBURETION

### AIR CLEANERS

**⚠ WARNING:** NEVER OPERATE ENGINE WITH AIR CLEANER OR AIR CLEANER ELEMENT REMOVED. FIRE MAY RESULT.

A properly serviced air cleaner protects the internal parts of the engine from dirt and dust particles in the air. If the air cleaner instructions are not carefully followed, the dirt and dust which should be collected in the cleaner, will be drawn into the engine. These particles are highly abrasive and will cause the piston rings and cylinder bore to wear quickly, as well as all of the internal moving parts.

The air cleaner on every engine brought in for a check-up or repair should be examined and serviced. If the cleaner shows signs of neglect, show it to the customer before cleaning, and instruct him on proper care to assure long engine life.

**NOTE:** Replace air cleaner gaskets and mounting gaskets that are worn or damaged, to prevent dirt and dust entering engine through improper sealing. Replace bent mounting studs. If air cleaner back plate is warped or bent, it must be replaced.

**⚠ CAUTION:** TO PREVENT ACCIDENTAL STARTING when servicing the engine or equipment, always remove the spark plug or wire from the spark plug.

#### To Service Air Cleaner

Clean cartridge at three month intervals or every 25 hours of operation, whichever occurs first.

**NOTE:** Service more often if necessary.

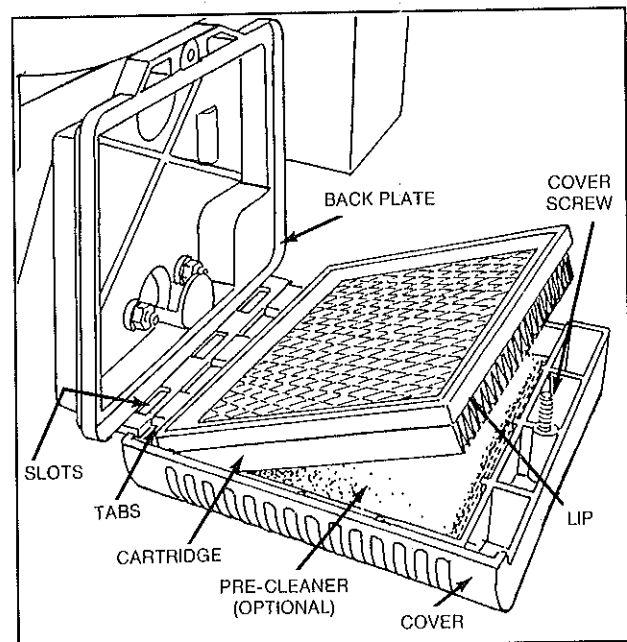
#### Cartridge Air Cleaner

1. Loosen screw and tilt cover as illustrated, Fig. 1.
2. Carefully remove pre-cleaner (when equipped) and cartridge.

3. Clean by tapping gently on a flat surface. If very dirty, replace cartridge and pre-cleaner or clean as follows:
  - a. Wash in a low sudsing detergent and warm water solution.
  - b. Rinse thoroughly with flowing water from inside out until water is clear.
  - c. Allow cartridge and pre-cleaner (when so equipped) to stand and air dry thoroughly before using.

**NOTE:** DO NOT use petroleum solvents such as kerosene, to clean cartridge. DO NOT oil cartridge or pre-cleaner (when equipped). DO NOT use pressurized air to clean or dry cartridge.

4. Install pre-cleaner in cover (when equipped). Install cartridge with pleats facing cover. Insert cover tabs in slots in back plate and close cover. Fasten screw securely.



**Fig. 1 - Air Cleaner**



# CARBURETION

## Operation

### OPERATION OF CARBURETOR

The carburetor used on Model Series 95700, 96700 2-cycle engines is a one piece Flo-Jet with gravity feed from the fuel tank.

### Float System Operation

When the fuel shut-off valve is opened, fuel flows from the fuel tank to the carburetor. The fuel tank cap is vented to permit air to flow into the tank as fuel flows out. If the fuel tank cap vent becomes plugged, fuel flow will stop causing the engine to stop, Fig. 2.

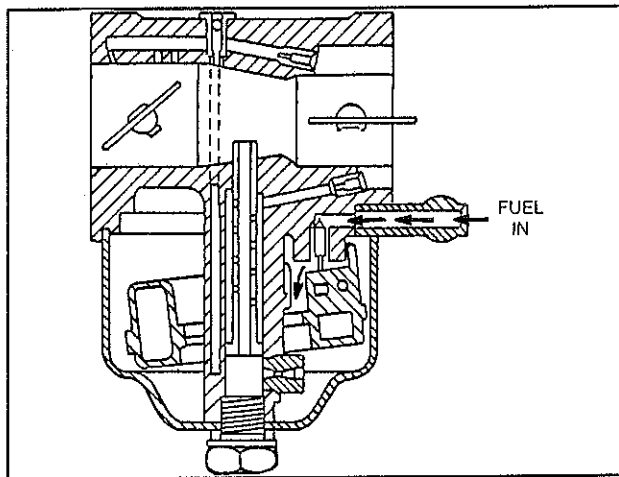


Fig. 2

As fuel flows past the fuel inlet needle and fills the carburetor bowl, the float rises and begins to raise the fuel inlet needle. When the fuel inlet needle contacts the fuel inlet seat, fuel flow stops. This becomes the float level, Fig. 3. The carburetor has a bowl vent which allows air to vent to the atmosphere. If this vent is blocked, fuel flow will stop, in turn stopping the engine.

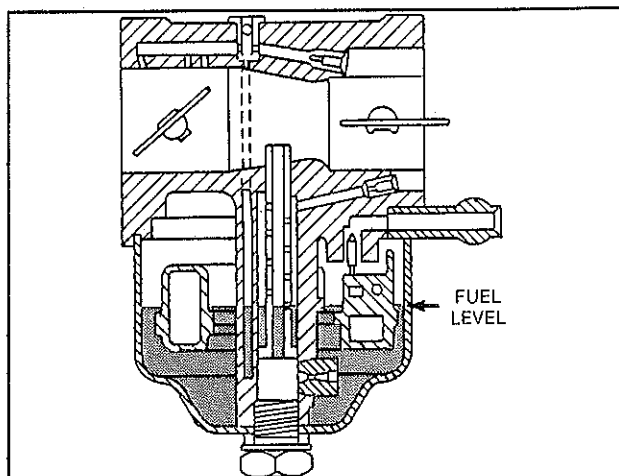


Fig. 3 - Normal Fuel Level

### Idle System Operation

When the engine is idling, the fuel flows as follows:

1. As the intake port is opened by the piston, a partial vacuum forms between the throttle plate and the intake port. Atmospheric pressure in the carburetor bowl pushes fuel through the fixed high speed jet, Fig. 4, and up the idle passage. Atmospheric pressure also pushes air into the throat of the carburetor.
2. Atmospheric pressure also enters through the idle air jet, Fig. 4.
3. The fuel being pushed up the idle passage enters the center of the idle speed jet and mixes with air from the idle air jet.
4. This air/fuel mixture then is pushed to the primary idle port and out into the carburetor and mixes with the air coming in through the throat of the carburetor and into the intake port of the engine, Fig. 4.
5. As the throttle valve opens, engine speed increases. The air/fuel mixture flow increases and flows out of the primary and secondary idle ports, Fig. 5.

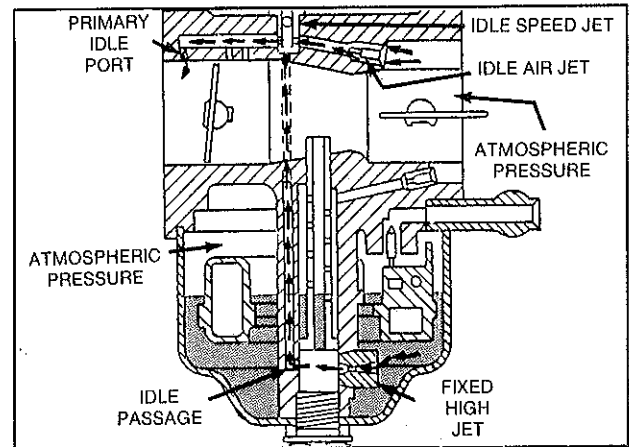


Fig. 4 - Idle System Operation

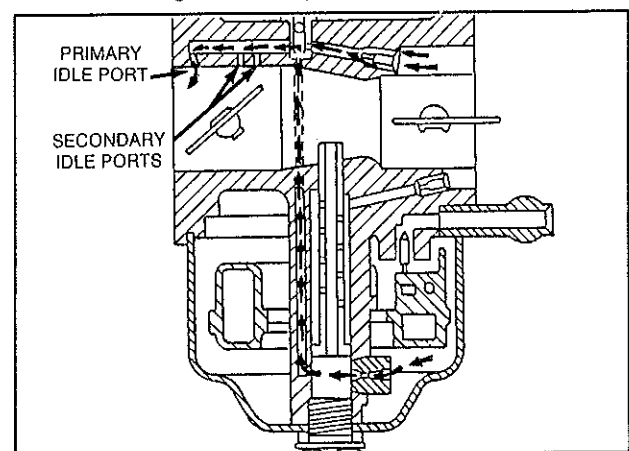


Fig. 5 - Part Throttle Operation

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION Operation

## High Speed System Operation

When the engine is running with the speed control in the "FAST" position, the fuel flows as follows:

1. As the piston opens the intake port, a partial vacuum forms in the carburetor throat, Fig. 6.
2. Atmospheric pressure pushes air through the venturi causing a drop in pressure at the venturi throat, Fig. 6.
3. Atmospheric pressure also pushes fuel through the fixed high speed jet and up the inside of the main pickup tube.
4. Atmospheric pressure pushes air through the main air jet to the outside of the main pickup tube, Fig. 6.
5. This air then enters through the main pickup tube bleed holes and mixes with the fuel coming up the inside of main pickup tube, Fig. 6.
6. This air/fuel mixture is pushed up and out of the main pickup tube into the incoming air at the venturi and into the engine through the intake port.
7. The throttle valve controls the amount of air/fuel mixture entering the engine, as the governor responds to changing loads.

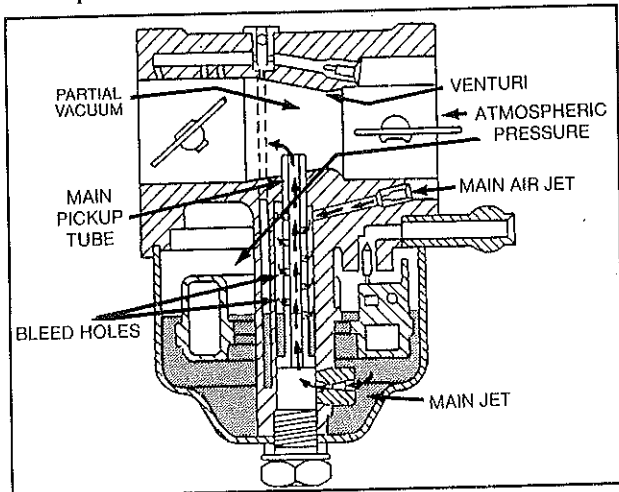


Fig. 6 - High Speed Operation

## Choke System Operation

When starting a cold engine, the choke valve is closed and the following events occur:

1. As the piston opens the intake port, a partial vacuum forms in the carburetor behind the choke valve, Fig. 7.
2. Atmospheric pressure acts on the idle system through the air bleed hole in the choke valve and

fuel flows as described in "IDLE SYSTEM OPERATION."

3. Atmospheric pressure acts on the high speed system as described in "HIGH SPEED SYSTEM OPERATION."

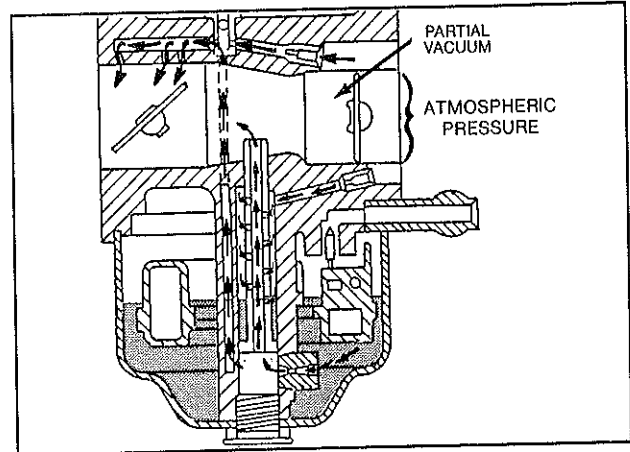


Fig. 7 - Choke Operation

## CARBURETOR IDENTIFICATION

Two types of carburetors are used on Model Series 95700 and 96700 2 Cycle Engines. The carburetors are interchangeable.

Engines built after code date 8808080 are equipped with the Briggs & Stratton Walbro carburetor. Engines built before code date 8808090 were equipped with Briggs & Stratton Mikuni carburetor.

The carburetors can easily be identified as shown in Fig. 8 and Fig. 9.

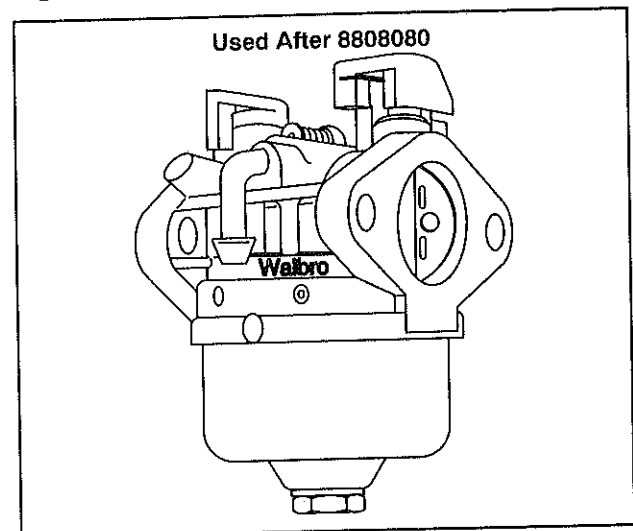


Fig. 8 - Walbro Carburetor

# CARBURETION

## Disassembly - Walbro

Used Before 8808090

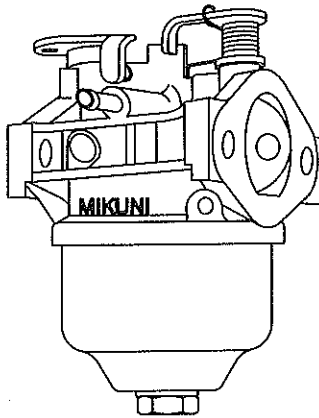


Fig. 9 - Mikuni Carburetor

### REMOVE CARBURETOR

#### All Models

Remove air cleaner cover, pre-cleaner (when equipped), and cartridge. Remove two nuts and screw holding back cover plate, Fig. 10.

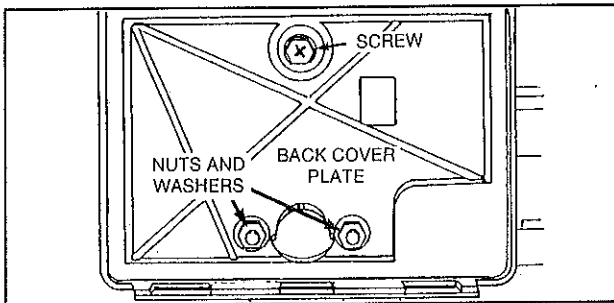


Fig. 10 - Remove Back Cover Plate

Remove two screws from control bracket. Rotate swivel lever and unhook choke link, Fig. 11. Swing control bracket and swivel lever out of the way. Remove choke link from carburetor.

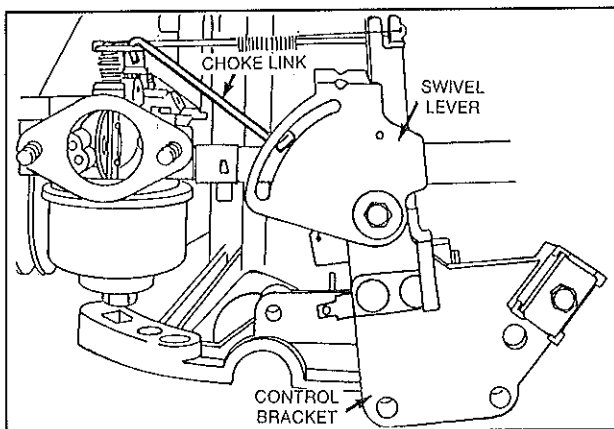


Fig. 11 - Removing Control Bracket and Swivel Level

Remove fuel line clamp and fuel line from carburetor.

Unhook governor link spring from governor lever and lift governor link up and out of governor lever slot, Fig. 12. Remove carburetor and remove link and spring from throttle lever.

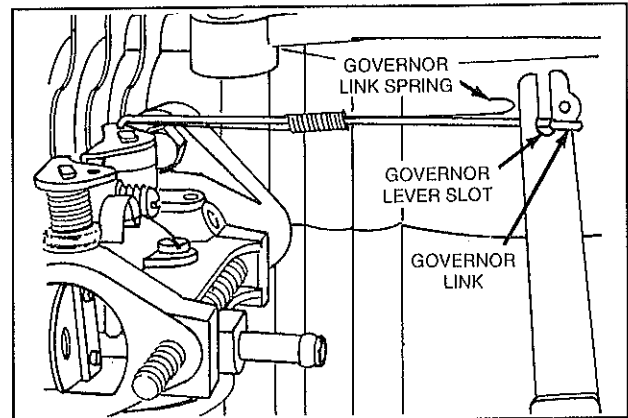


Fig. 12 - Removing Carburetor

### DISASSEMBLE WALBRO CARBURETOR

Remove bowl mounting screw, washer and bowl, Fig. 13. Remove bowl vent tube.

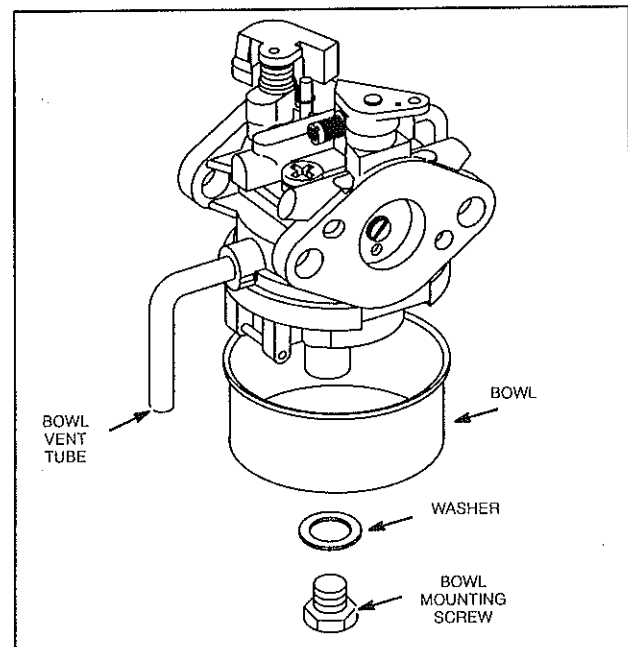


Fig. 13 - Removing Bowl

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION

## Disassembly - Walbro

Remove float hinge pin. Then, remove float and fuel inlet needle assembly, Fig. 14. Remove bowl gasket.

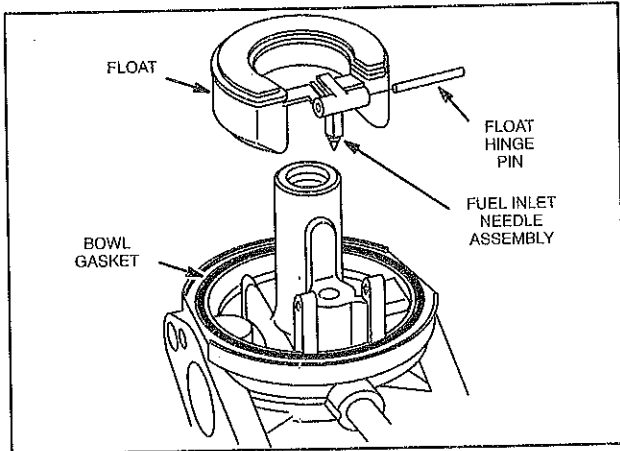


Fig. 14 - Removing Float Assembly

Remove fixed high speed jet, Fig. 15.

NOTE: Special high altitude jets are available. See illustrated parts list for part numbers.

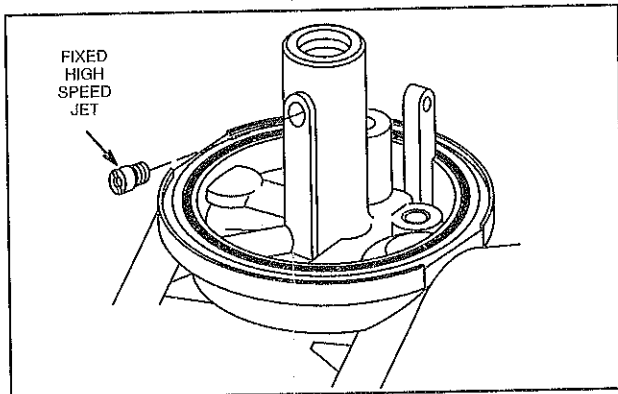


Fig. 15 - Removing High Speed Jet

Remove idle speed adjustment screw and spring. Remove idle jet cover plug. Remove idle jet, Fig. 16.

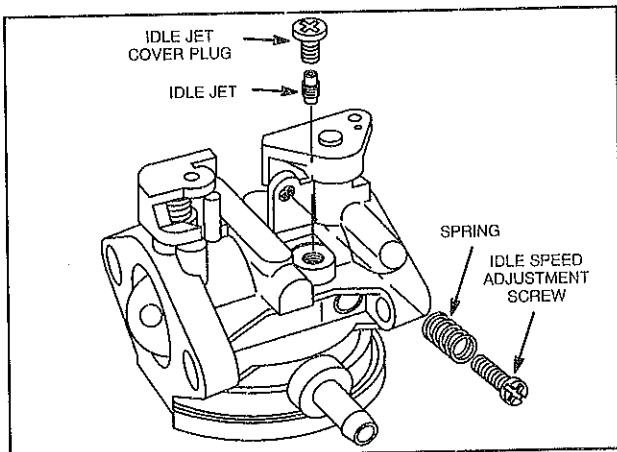


Fig. 16 - Removing Idle Jet

Remove throttle valve screw and throttle valve. Remove throttle shaft and dust seal, Fig. 17.

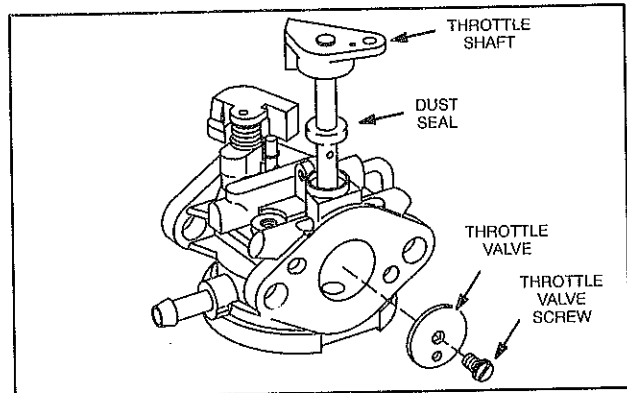


Fig. 17 - Removing Throttle Shaft

Carefully insert sharp tool between choke shaft and choke valve as shown, Fig. 18. Grasp choke valve with pliers and remove. Remove choke shaft, spring, washer and dust seal.

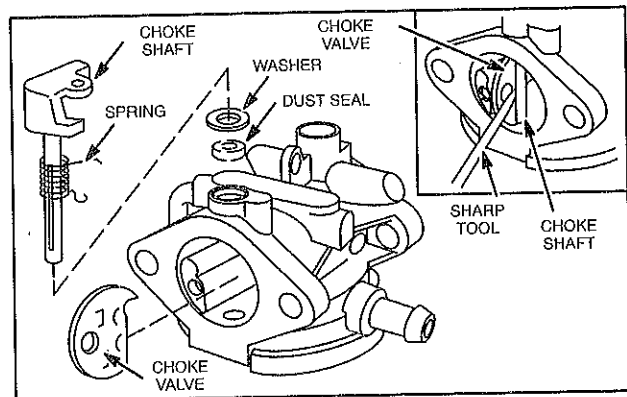


Fig. 18 - Removing Choke Shaft

The welch plug does not need to be removed for normal carburetor overhaul. If the welch plug must be removed, use a modified 5/32" pin punch. Drive punch into welch plug at a low angle and pry out plug, Fig. 19.

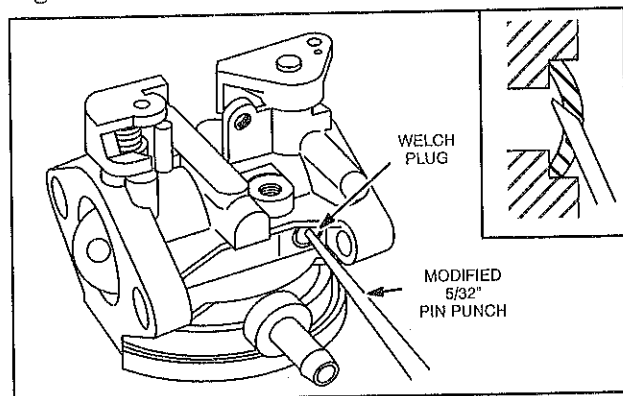


Fig. 19 - Removing Welch Plug

This completes carburetor disassembly procedure.

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION

## Assembly - Walbro

### CLEAN FUEL SYSTEM

Gummy or dirty fuel tanks and carburetors should be cleaned in a carburetor cleaner such as Bendix Carburetor Cleaner or equivalent. DO NOT soak rubber, neoprene or plastic parts in cleaner.

3

### INSPECT CARBURETOR

Check all moving parts for wear, nicks and burrs. Replace, if worn or damaged. Check float for leaks or damage. Replace, if damaged or leaking. Check all mating surfaces for nicks, burrs, foreign material, or cracks. Replace all damaged parts.

#### Check Throttle and Choke Shaft and Bushings for Wear

Wear between throttle shaft and bushing should not exceed .010" (.25 mm). Check wear by placing carburetor on a 1/4" (6 mm) thick flat surface, as shown in Fig. 20. Measure the distance between the throttle lever and flat surface with a feeler gauge while moving shaft up and down, Fig. 20.

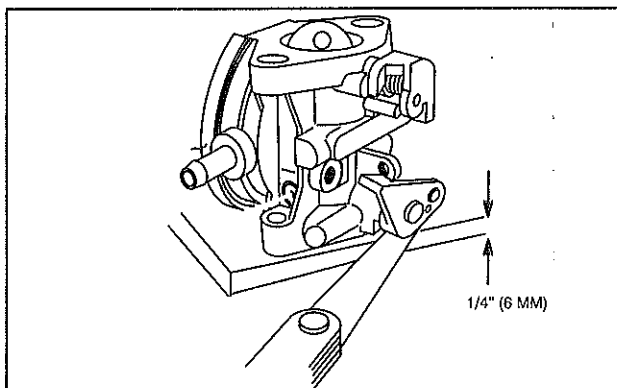


Fig. 20 - Checking Throttle Wear

If the difference is greater than .010" (.25 mm), this indicates that the throttle shaft and/or bushings are worn. Wear on the throttle shaft can be checked by comparing the worn and unworn portions of the shaft, Fig. 21.

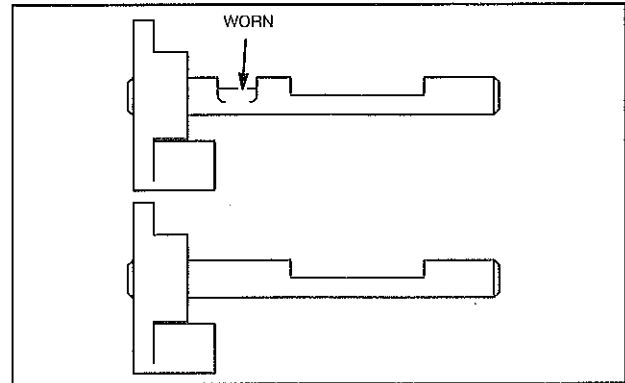


Fig. 21 - Checking Throttle Shaft Wear

Choke shaft and bushings are checked in the same manner.

Throttle and choke shaft are replaceable. If throttle and/or choke shaft bushings are worn, replace carburetor.

### ASSEMBLE WALBRO CARBURETOR

When assembling carburetor, use new seals, washers and gaskets.

If welch plug was removed, install new plug using 1/4" pin punch. Press in until plug is flat. Do not cave in welch plug. Use a sealant on outside diameter of plug to prevent air leaks.

Assemble choke shaft spring to choke shaft with "U" bend down and "L" shaped bend in notch in choke lever. Then install washer and new dust seal, Fig. 22. Insert shaft into upper bushing and hook "U" end of spring over post. Rotate choke shaft counterclockwise approximately 1/4 turn until choke lever clears post. Then insert choke shaft the rest of the way. Hold choke lever in this position while inserting choke valve. Push in choke valve until it snaps into position.

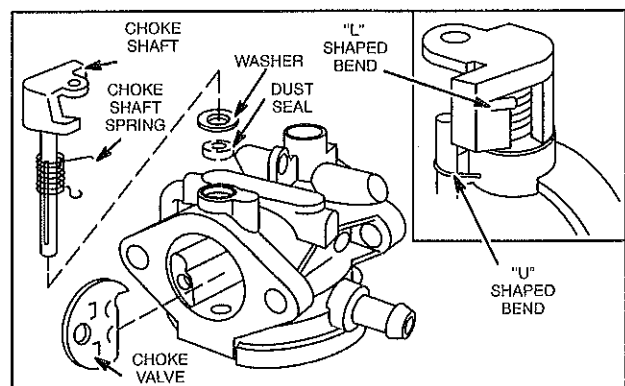


Fig. 22 - Installing Choke Shaft

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION Assembly - Walbro

Install new dust seal on throttle shaft. Then insert throttle shaft into carburetor with flat side out, Fig. 23.

Note: Sides of throttle valve are beveled. Assemble throttle valve to shaft with number facing out. Tighten screw securely. Check for freedom of movement.

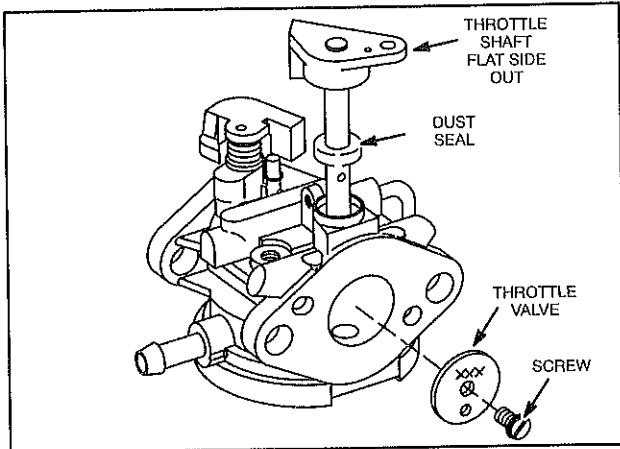


Fig. 23 - Installing Throttle Shaft

Install fixed high speed jet, Fig. 24.

Note: Special high altitude jets are available. See illustrated parts list for part number.

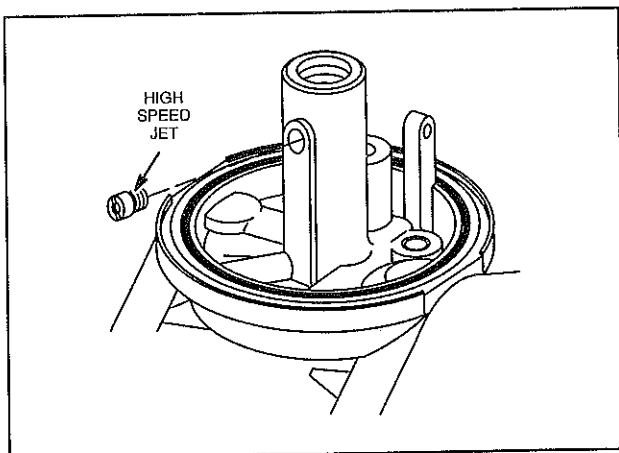


Fig. 24 - Installing High Speed Jet

Install carburetor bowl gasket in carburetor body groove, Fig. 25. Make sure gasket does not twist or kink.

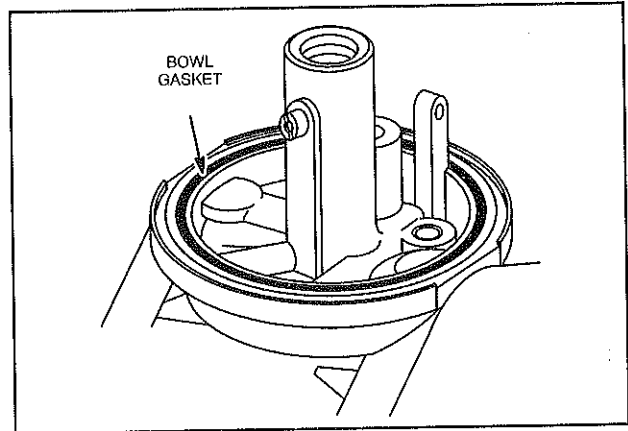


Fig. 25 - Installing Bowl Gasket

Slide fuel inlet needle onto float tab, and install float assembly, Fig. 26.

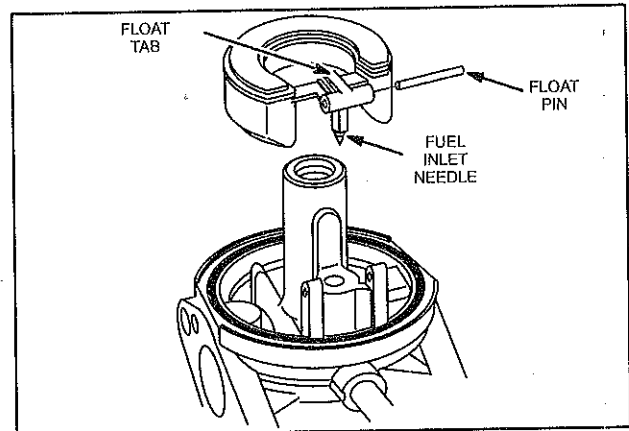


Fig. 26 - Installing Float Assembly

Install bowl, washer and screw. Tighten screw securely.

Install idle speed jet. Then install idle speed jet plug, Fig. 27. Install speed adjustment screw and spring. Install bowl vent tube, Fig. 13.

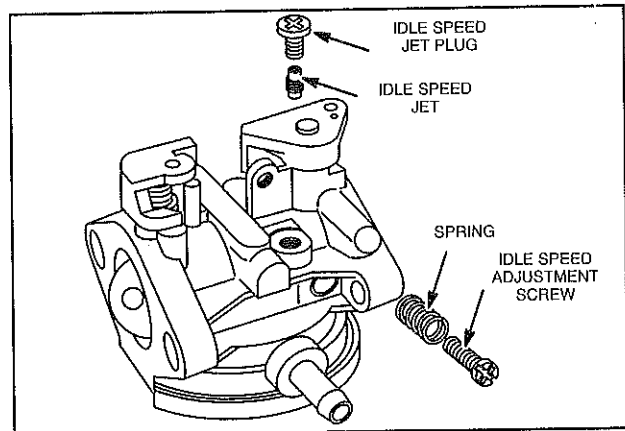


Fig. 27 - Installing Idle Speed Jet

# CARBURETION

## Disassembly - Mikuni

### DISASSEMBLE MIKUNI CARBURETOR

Remove bowl mounting screw, washer and bowl, Fig. 28. Remove bowl vent tube.

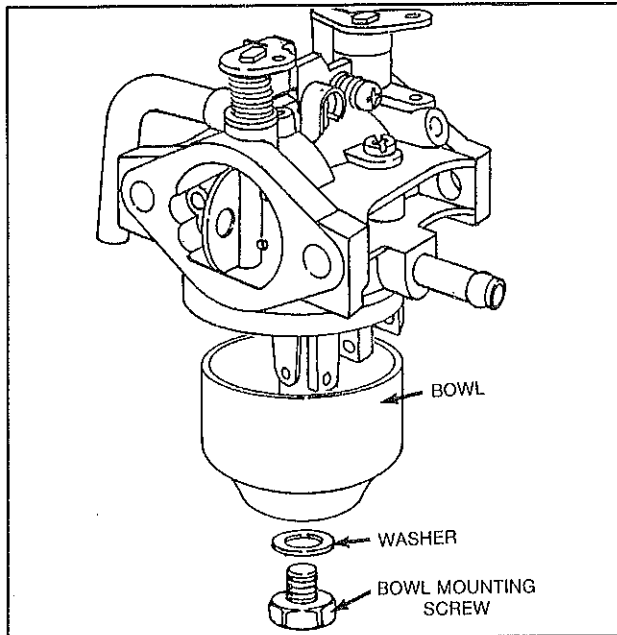


Fig. 28 - Removing Bowl

Note that the float hinge pin has two flats, Fig. 29. With a 1/16" diameter punch, or the tip of a #0 or #1 Phillips screwdriver, push pin out from the opposite end, Fig. 29. Remove float and fuel inlet needle assembly.

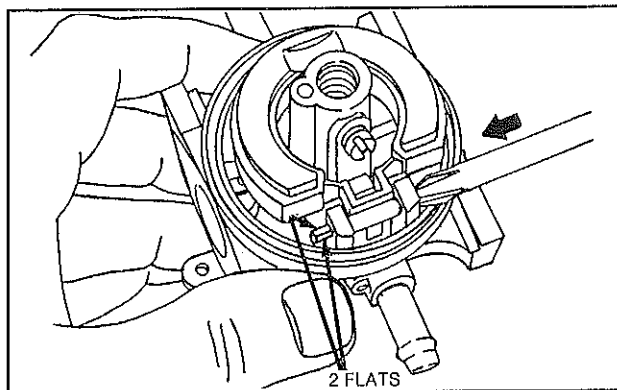


Fig. 29 - Removing Float Hinge Pin

Remove carburetor bowl gasket, Fig. 30.

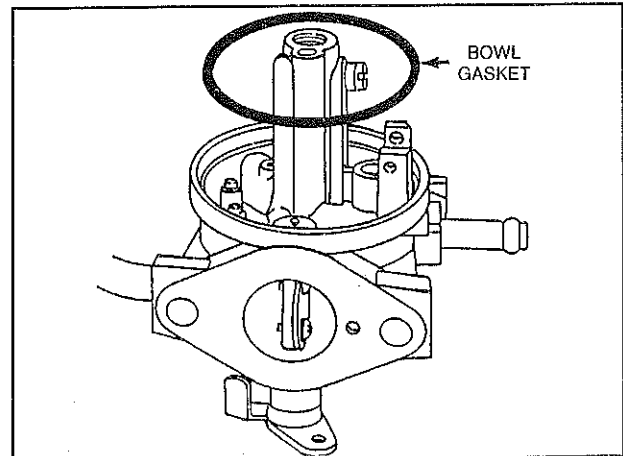


Fig. 30 - Removing Bowl Gasket

Remove fixed high speed jet, Fig. 31.

NOTE: Special high altitude jets are available. See illustrated parts list for part numbers.

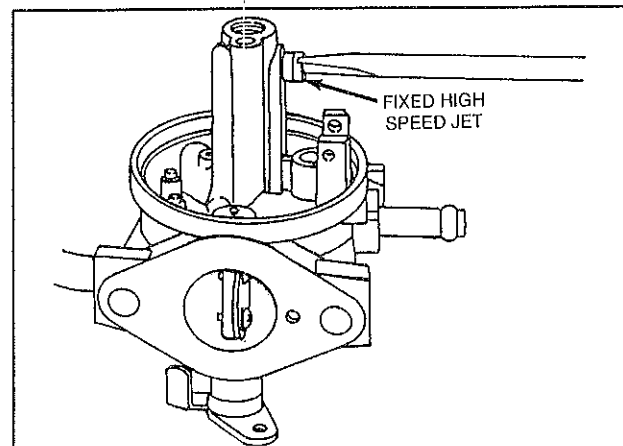


Fig. 31 - Removing High Speed Jet

Remove the idle jet, Fig. 32.

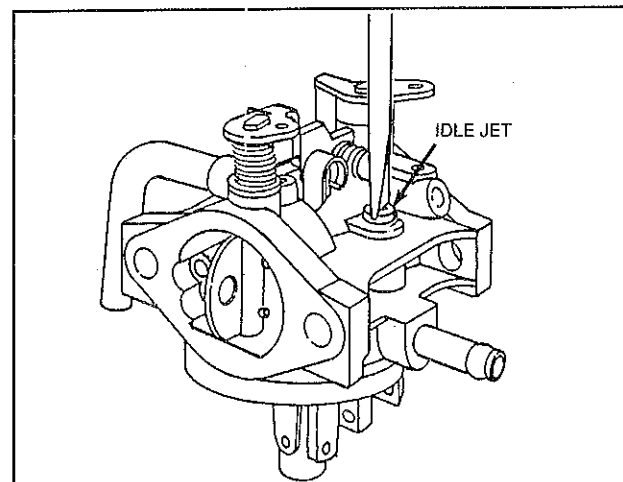


Fig. 32 - Removing Idle Jet

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION

## Disassembly - Mikuni

Turn idle speed screw counterclockwise until throttle valve seats in throttle bore.

With a #1 Phillips screwdriver, remove two screws and throttle valve, Fig. 33. Remove throttle shaft and felt washer. Then remove throttle shaft seal.

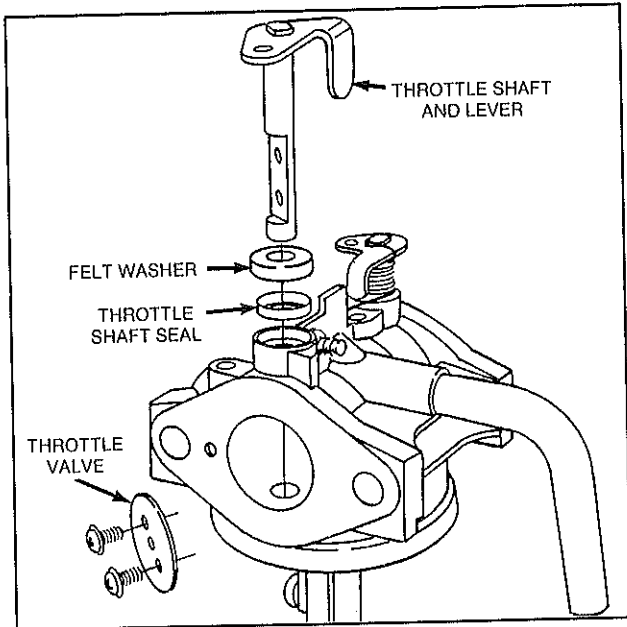


Fig. 33 - Removing Throttle Shaft

With a #1 Phillips screwdriver, remove choke valve screws and remove choke valve, Fig. 34. Remove choke shaft, spring, plastic washer and felt washers.

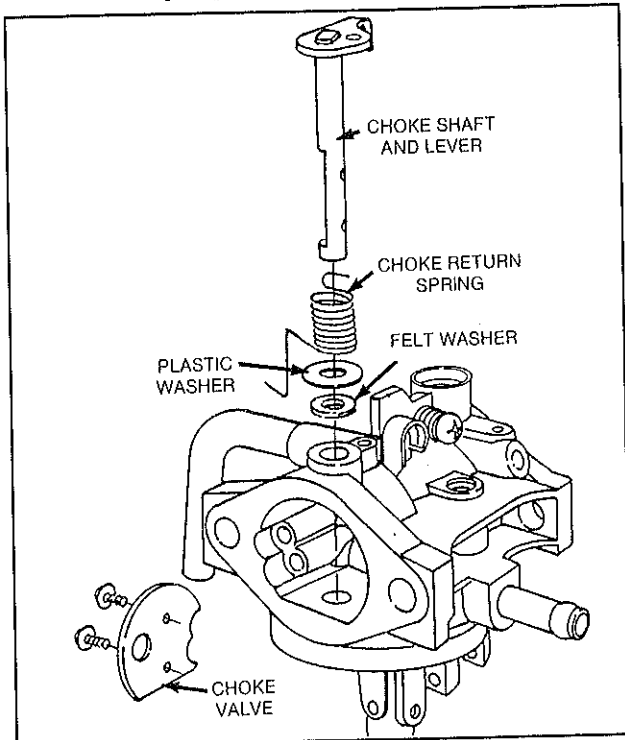


Fig. 34 - Removing Choke Shaft

This completes the carburetor disassembly procedure.

### CLEAN FUEL SYSTEM

Gummy or dirty fuel tanks and carburetors should be cleaned in a carburetor cleaner such as Bendix Carburetor Cleaner or equivalent. DO NOT soak rubber, neoprene or plastic parts in cleaner.

### INSPECT CARBURETOR

Check all moving parts for wear, nicks and burrs. Replace, if worn or damaged. Check float for leaks or damage. Replace, if damaged or leaking. Check all mating surfaces for nicks, burrs, foreign material, or cracks. Replace all damaged parts.

### Check Throttle and Choke Shaft and Bushings for Wear

Wear between throttle shaft and bushing should not exceed .010" (.25 mm). Check wear by placing carburetor on a 3/8" (9 mm) thick flat surface, as shown in Fig. 35. Measure the distance between the throttle lever and flat surface with a feeler gauge while moving shaft up and down, Fig. 35.

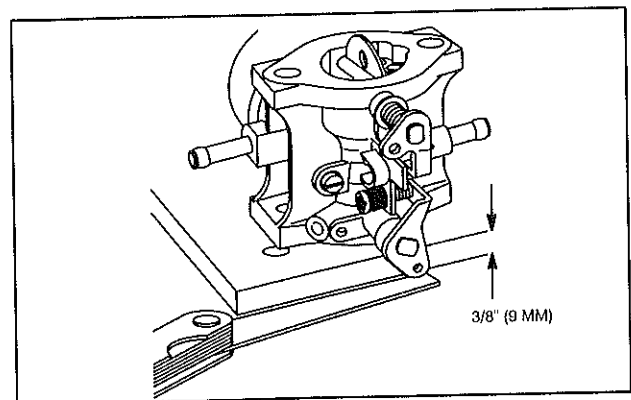


Fig. 35 - Checking Throttle Wear

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.



# CARBURETION

## Assembly - Mikuni

If the difference is greater than .010" (.25 mm), this indicates that the throttle shaft and/or bushings are worn. Wear on the throttle shaft can be checked by comparing the worn and unworn portions of the shaft, Fig. 36.

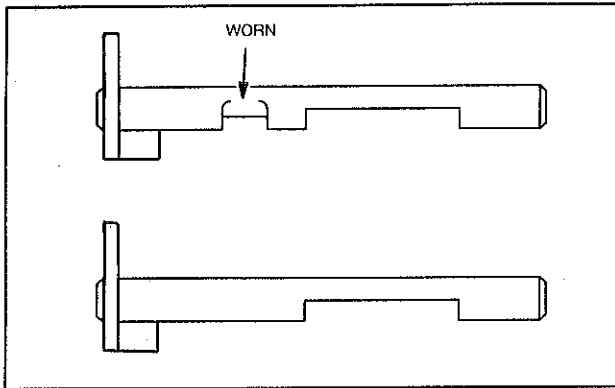


Fig. 36 - Checking Throttle Shaft Wear

Choke shaft and bushings are checked in the same manner.

Throttle and choke shaft are replaceable. If throttle and/or choke shaft bushings are worn, replace carburetor.

### ASSEMBLE MIKUNI CARBURETOR

When assembling carburetor, use new seals, washers and gaskets.

Assemble choke shaft spring, washer and felt seal on choke shaft, Fig. 37.

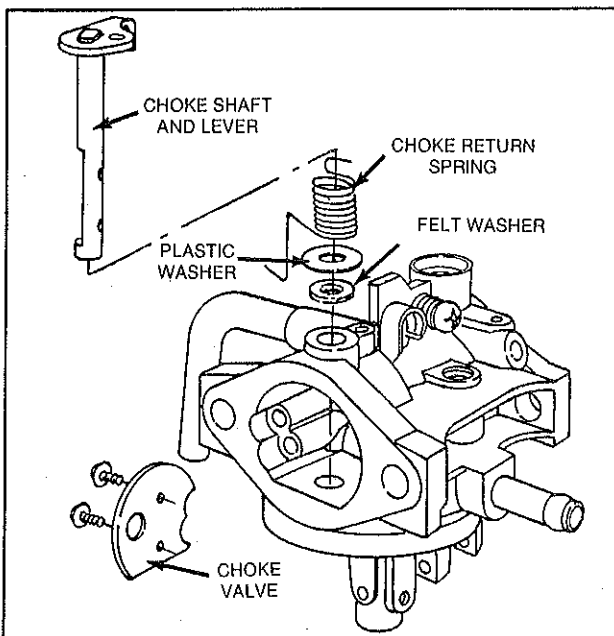


Fig. 37 - Assembling Choke Shaft

Slide choke shaft assembly into carburetor with spring as shown, Fig. 38.

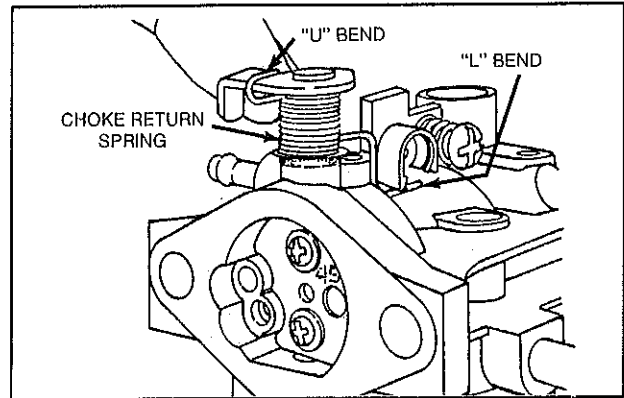


Fig. 38 - Installing Choke Shaft Assembly

Place a small drop of non-hardening sealant (Permatex II® or equivalent) on choke valve screws. Rotate choke shaft counterclockwise and install choke valve on flat of choke shaft, Fig. 39. Install screws securely. Check for freedom of movement.

Install throttle shaft seal with flat side down (sealing lips out), Fig. 39. Lightly coat seal with recommended engine oil.

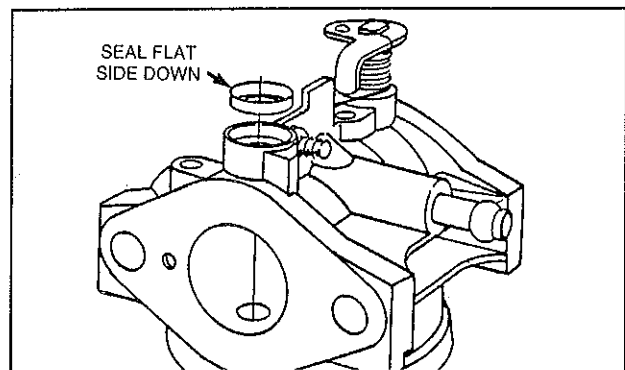


Fig. 39 - Installing Throttle Shaft Seal

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

# CARBURETION Assembly - Mikuni

Place a drop of non-hardening sealant (Permatex #2 or equivalent) on throttle valve screws. Install throttle shaft and spacer, Fig. 40. Install throttle valve on throttle shaft flat with numbers toward fuel bowl vent, Fig. 40. Install screws securely. Check for freedom of movement.

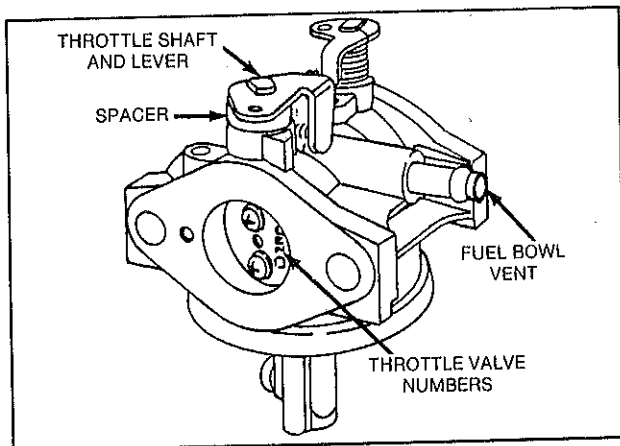


Fig. 40 - Installing Throttle Shaft

Install fixed high speed jet, Fig. 41.

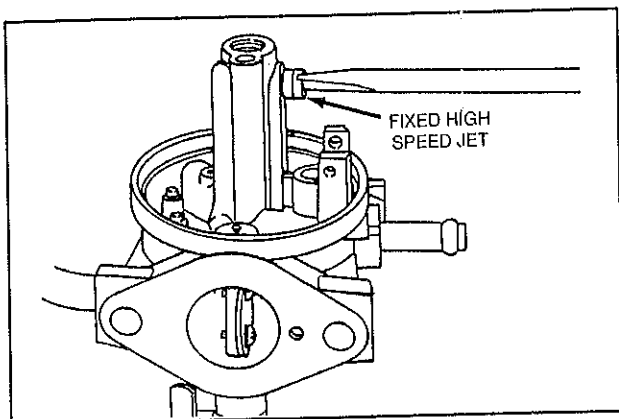


Fig. 41

Install carburetor bowl gasket in carburetor body groove, Fig. 42. Use care to make sure gasket does not twist or kink.

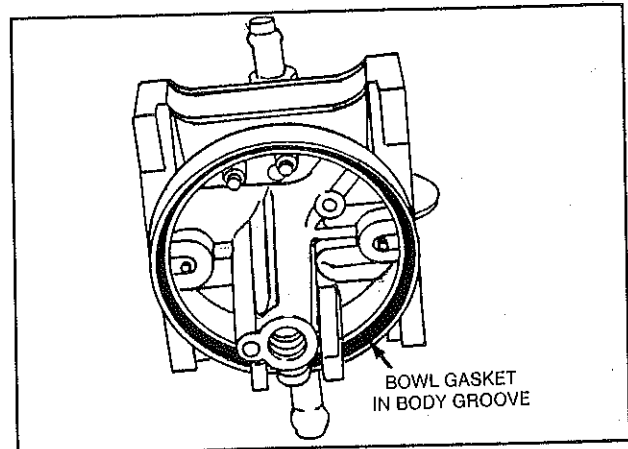


Fig. 42 - Installing Bowl Gasket

Install fuel inlet valve spring in fuel inlet valve groove, Fig. 43.

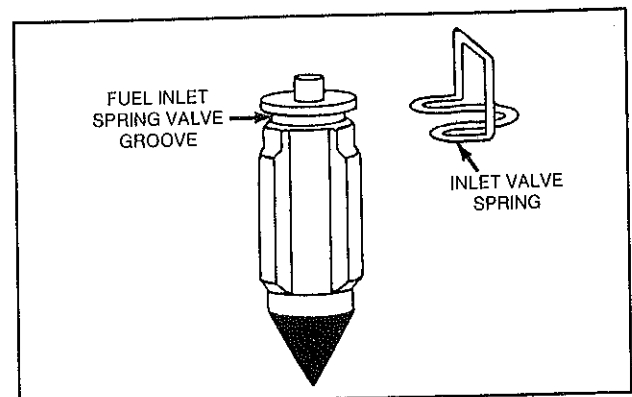


Fig. 43 - Installing Inlet Valve Spring

Slide fuel inlet needle assembly onto float tab, and place assembly in carburetor, Fig. 44.

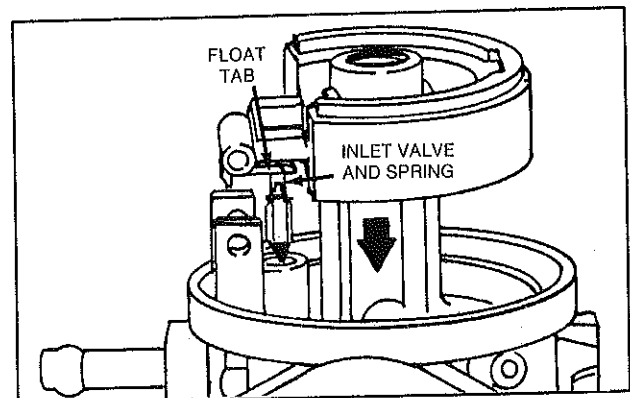


Fig. 44 - Installing Float Assembly

# CARBURETION

## Installation

Slide float hinge pin into place with flats as shown, Fig. 45. Gently tap hinge pin to seat it.

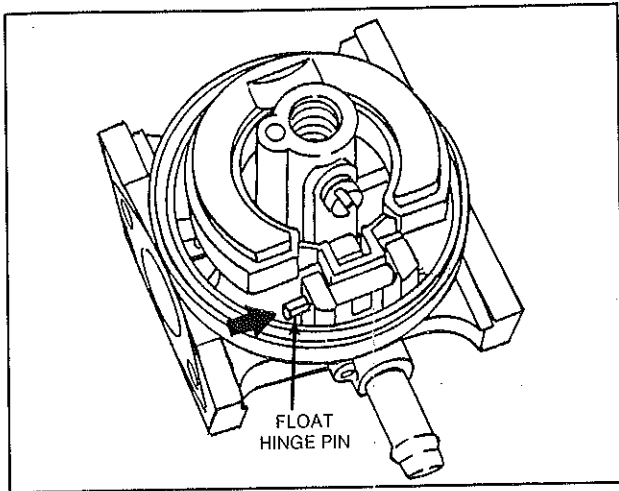


Fig. 45 - Installing Float Hinge Pin

Install bowl, washer, and bowl mounting screw. Tighten screw securely.

Install idle speed jet securely, Fig. 46. Install bowl vent tube.

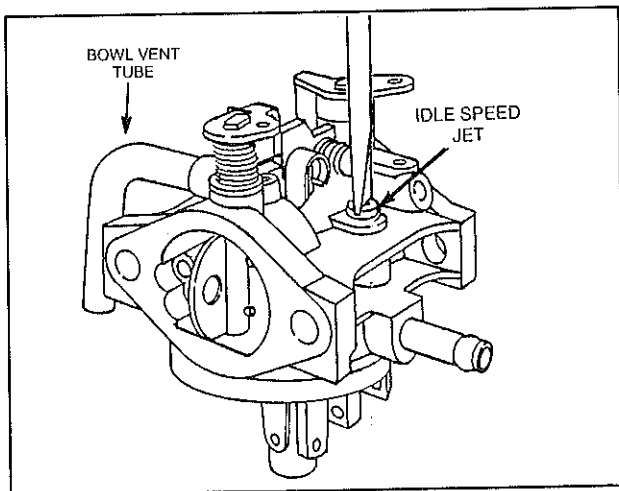


Fig. 46 - Installing Idle Jet

### INSTALL CARBURETOR

Install governor link spring and governor link in throttle lever hole, Fig. 47. Slide carburetor assembly onto carburetor mounting screws, Fig. 47.

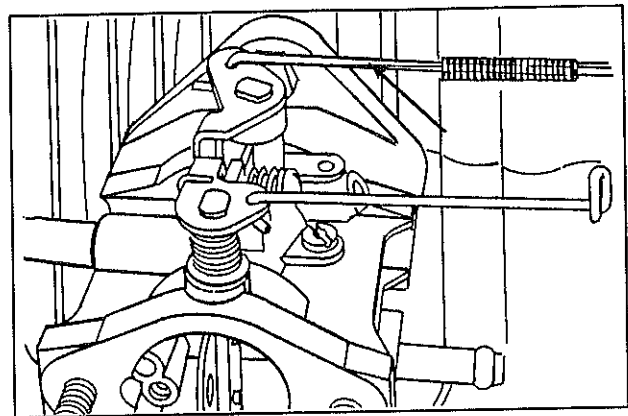


Fig. 47 - Assembling Carburetor to Engine

Slide governor link into governor lever slot, Fig. 48, and hook governor link spring into hole on governor lever, Fig. 48.

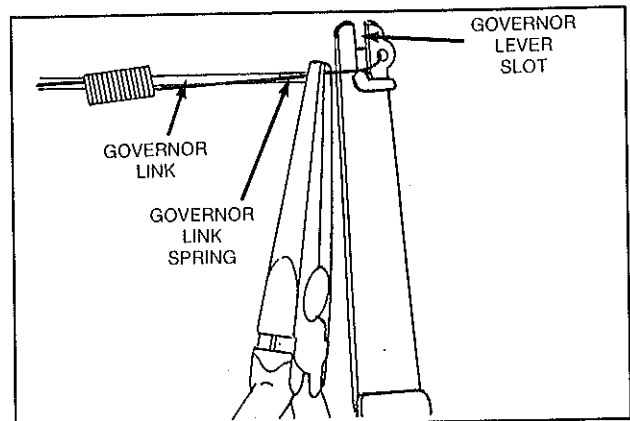


Fig. 48 - Installing Governor Link and Spring

Hook choke link (end with single bend) into choke lever hole, Fig. 49.

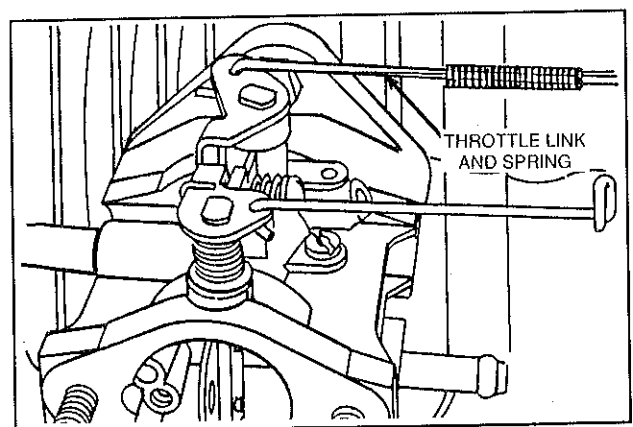


Fig. 49 - Installing Choke Link

# CARBURETION

## Inspect Fuel Tank

Hook choke link (end with double bend) into slot on swivel lever, Fig. 50, and rotate swivel lever clockwise to normal position, Fig. 51. Install two bolts in control bracket.

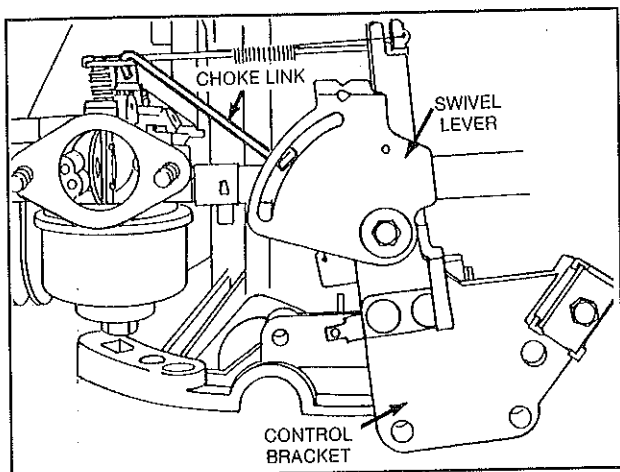


Fig. 50 - Assembling Choke Link

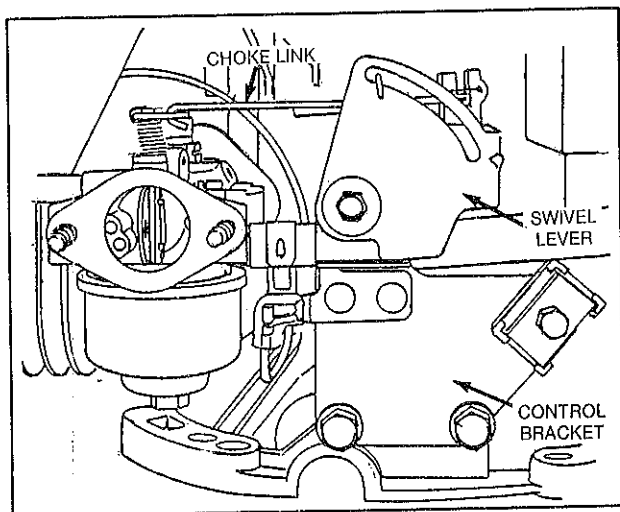


Fig. 51 - Installing Swivel Bracket

### INSTALL AIR CLEANER BASE

Place air cleaner base gasket(s) on carburetor mounting screws. Install air cleaner base, two washers, two nuts and screw. Torque nuts and screw to 35 in. lbs.

Install air cleaner cartridge, pre-cleaner (when so equipped) and cover.

### FUEL TANK

#### Inspect Fuel Tank

Inspect fuel tank for cracked or leaking seams, Fig. 52. With fuel shut off valve removed, use a light source, such as a flashlight, and shine light up through fuel shut-off valve opening and inspect fuel tank filter for dirt, debris or gum deposits. Replace fuel tank if cracked, fuel leaks or fuel filter is clogged.

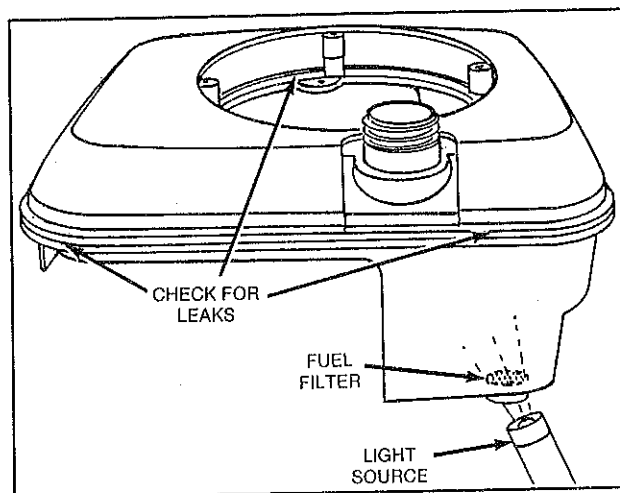


Fig. 52 - Inspecting Fuel Filter

#### Install Fuel Valve

Assemble "O" ring on shoulder of fuel valve as shown, Fig. 53. PUT SEALANT, such as Permatex II®, on threads of fuel valve. Install fuel valve and "O" ring in fuel tank by hand, turning valve by hand until valve seats. Position outlet to face fuel line.

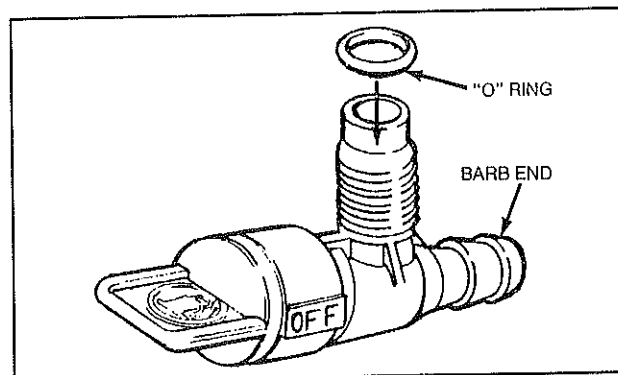


Fig. 53 - Assembling "O" Ring

# CARBURETION

## Adjustment

### CARBURETOR ADJUSTMENT

The carburetor has one adjustment, idle RPM. Turn idle speed adjustment screw clockwise to increase RPM or counterclockwise to decrease RPM until you obtain 1200 RPM with a warm engine, Fig. 54.

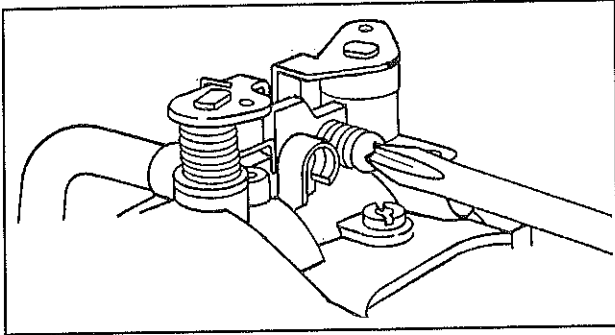


Fig. 54 - Adjust Idle RPM

### METRIC EQUIVALENTS

DIMENSIONS, FRACTIONAL		
Inches	Millimeters	
5/64	1.9	
TORQUE		
In. Lbs.	Kgcm, Kpcm	Nm
35	40	4

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 14 OF THIS SECTION.

## Section 4

# GOV. CONTROL & CARB. LINKAGE

THE PURPOSE OF THE GOVERNOR IS TO MAINTAIN, WITHIN CERTAIN LIMITS, A DESIRED ENGINE SPEED, EVEN THOUGH THE LOAD MAY VARY.

### MECHANICAL GOVERNOR

The governor spring tends to pull the throttle open. The force of the counterweights, which are operated by centrifugal force, tends to close the throttle. The engine speed at which these two forces balance is called the governed speed. The governed speed can be varied by changing governor spring tension or governor springs, Fig. 1 and Fig. 2.

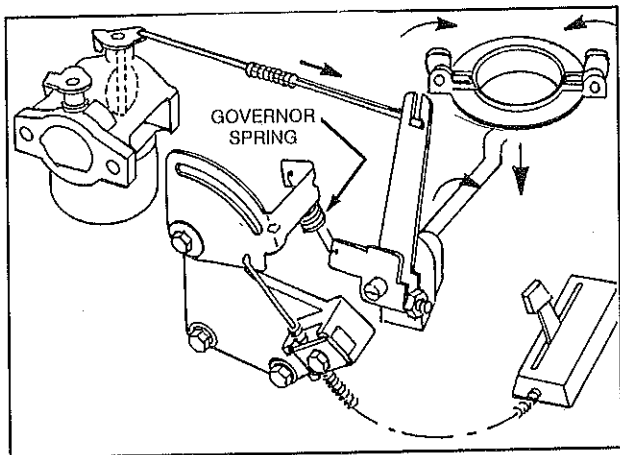


Fig. 1 - Throttle Opening

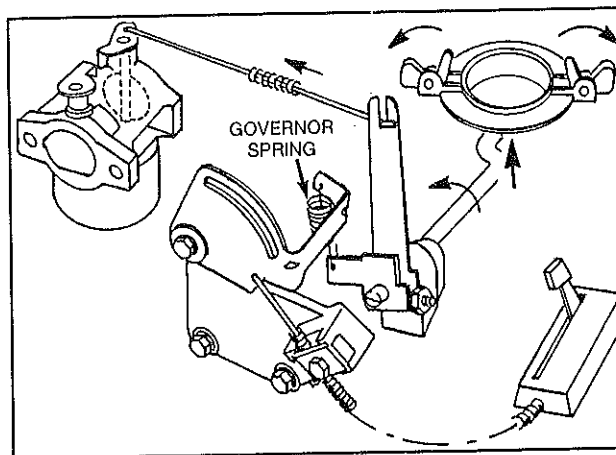


Fig. 2 - Throttle Closing

### CHECKING

Worn linkage or damaged governor springs should be replaced to ensure proper governor operation. If spring or linkage is changed, check top no load RPM, Fig. 3, with engine assembled and running.

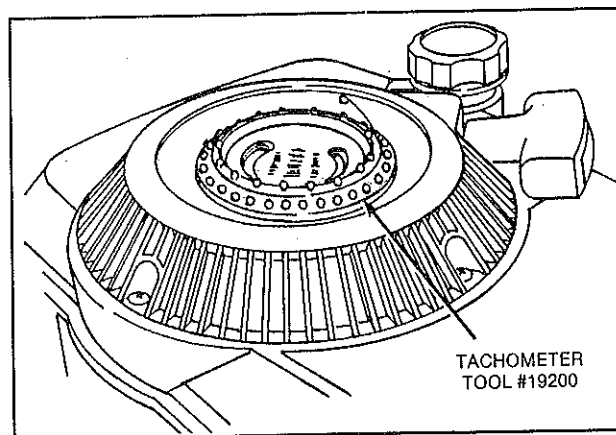


Fig. 3 - Checking Top No Load RPM

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 6 OF THIS SECTION.

# GOV. CONTROLS & CARB. LINKAGE

## Band Brake

### GOVERNED SPEED LIMITS

To comply with specified top governed speed limits, Briggs & Stratton supplies engines with an adjustable top speed limit to the equipment manufacturers. The adjustable top speed limit will allow no more than a desired top governed speed when the engine is operated on a rigid test stand at our own factory. However, the design of the equipment manufacturer's machine can affect engine speeds. Therefore, the top governed speed should be checked with an accurate tachometer when the engine is operated on a completely assembled machine, Fig. 3.

If a governor spring must be replaced, consult the appropriate Illustrated Parts List. Choose the proper governor spring by engine type number. **AFTER A NEW GOVERNOR SPRING IS INSTALLED, CHECK THE ENGINE TOP GOVERNED SPEED WITH AN ACCURATE TACHOMETER.**

Refer to Service Engine Sales Manual Microfiche, MS-6225 or the Service Sales Manual, MS-4052 for Top-No-Load RPM by engine model and type number.



**WARNING: DO NOT EXCEED THE MAXIMUM ENGINE SPEED SPECIFIED BY THE EQUIPMENT MANUFACTURER.**

Run engine for 5 minutes to allow the engine to reach normal operating temperature before measuring with a tachometer.

Depending on governor spring and swivel lever hole, the TOP NO LOAD RPM range will be:

LOWER HOLE	UPPER HOLE
*2600-2700 RPM	*2800-2900 RPM
*3000-3100 RPM	*3200-3300 RPM
*3400 RPM	*3500-3600 RPM

\* See "Illustrated Parts List" for governor spring part numbers.

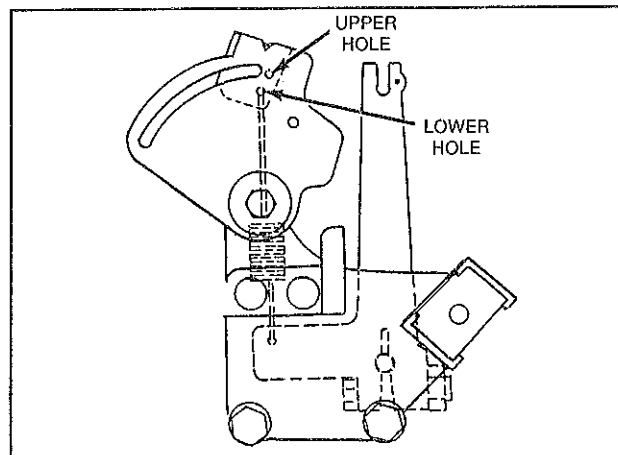


Fig. 4

### BAND BRAKE

Some of these engines are equipped with System 2® band brakes. The band brake **MUST STOP** the engine within three seconds when operator releases equipment safety control, with remote control set at the "FAST" position, Fig. 5. Stopping time may be checked with Tool #19255 BLADE MONITOR®.

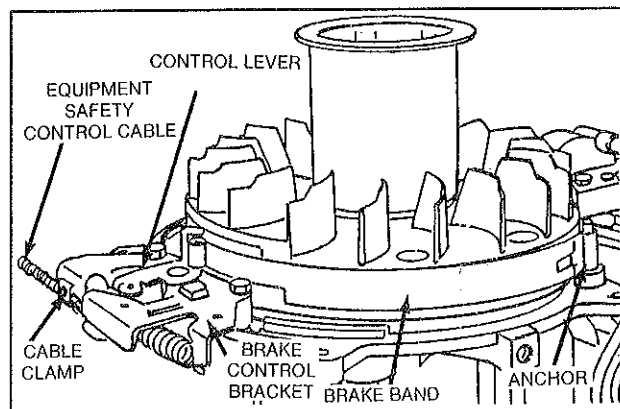


Fig. 5 - Band Brake

If engine stopping time exceeds three seconds with remote control in "FAST" position, check the following for adjustment, alignment or damage:

- Brake band - worn or damaged.
- Anchor post - misaligned or bent.
- Brake spring - not securely anchored or loose.
- Control bracket lever - rivet worn or loose. (Check ignition system as noted in Section 2.)
- Control bracket - misadjusted.
- Equipment controls - damaged.

To examine, adjust or replace the band brake, disconnect the spark plug wire and remove the spark plug.

# GOV. CONTROLS & CARB. LINKAGE

## Band Brake

### DISASSEMBLE BAND BRAKE

Remove fuel tank, muffler guard and blower housing, Fig. 6A and Fig. 6B. Remove band brake control cable. NOTE: Some manufacturers use a pop rivet to secure the control cable bracket. DO NOT REMOVE THE POP RIVET. Bend control lever tang to clear band brake loop, early style, Fig. 7. Release brake spring tension and remove band brake. Replace brake band if brake material is damaged or worn to less than .030" thick.

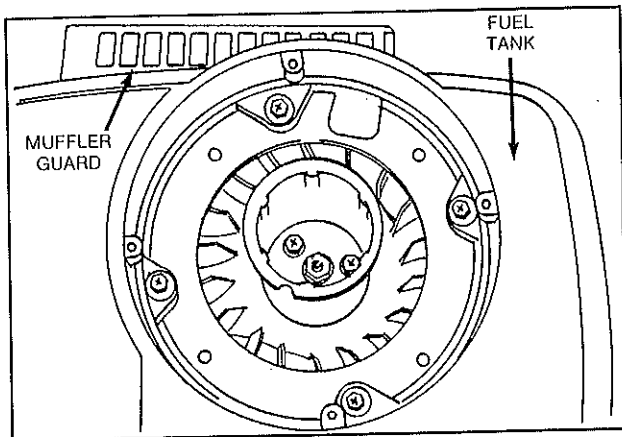


Fig. 6A - Removing Muffler Guard and Fuel Tank

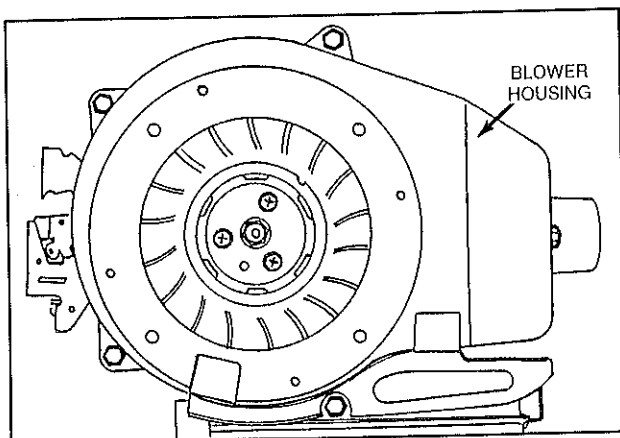


Fig. 6B - Removing Blower Housing

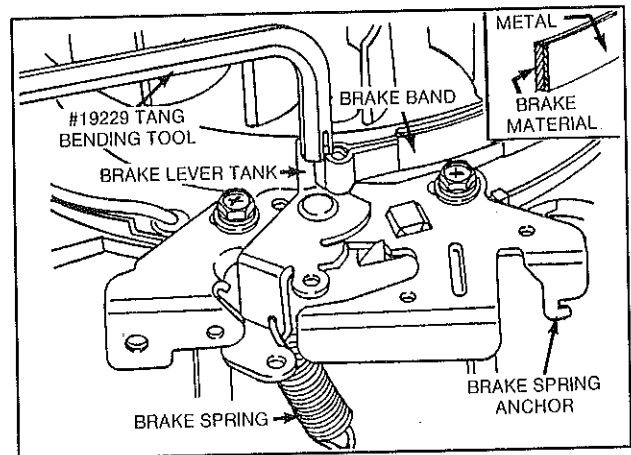


Fig. 7 - Removing Band Brake

### ASSEMBLE BAND BRAKE

Install engine stop switch wire in control bracket stop switch terminal. Assemble control bracket to cylinder with screws finger tight. Install brake band loop on control lever, Fig. 7. Using Tang Bender, Tool #19352, bend tab over brake band loop, early style.

NOTE: Brake material on steel band MUST be toward flywheel side after assembly. Install brake spring on brake spring anchor. Band brake bracket will move to the end of the adjusting slots.

### ADJUST BAND BRAKE

Place bayonet end of Tool #19256 Brake Adjustment Gauge in control lever, Fig. 8. Push on control lever and install other end of gauge in cable clamp hole. NOTE: Some manufacturers install their cable control clamp bracket using a pop rivet. Place gauge through hole in pop rivet, Fig. 8.

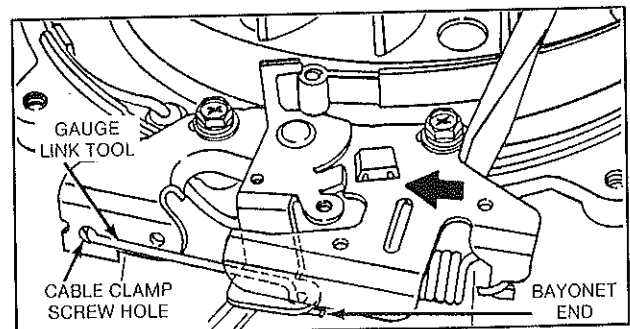


Fig. 8 - Adjusting Band Brake

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 6 OF THIS SECTION.



# GOV. CONTROLS & CARB. LINKAGE

## Governor Adjustment

With a screwdriver, apply pressure to the control bracket **ONLY** and move it in direction shown by arrow until tension on gauge is just eliminated. While holding control bracket in this position, torque both screws to 25-30 in. lbs. When removing gauge, you should feel slight friction on gauge and control lever will not move.

### CHECK BAND BRAKE ADJUSTMENT

Using torque wrench, Tool #19197, and a 14 mm socket, turn flywheel clockwise with brake engaged, Fig. 9. Torque wrench should show 45 inch pounds or more while turning at a steady rate. If the reading is less than 45 inch pounds torque, check for the following. Look for damaged parts, misalignment, or misadjustment.

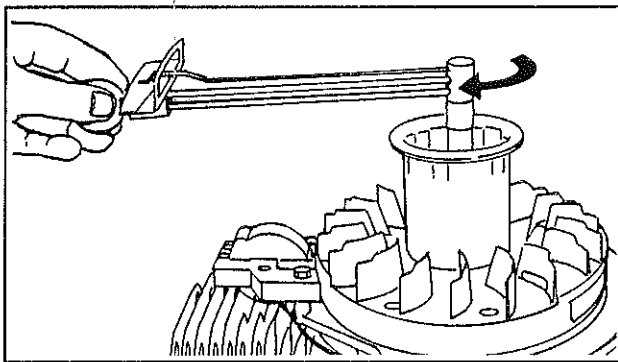


Fig. 9 - Checking Brake Adjustment

When band brake is released, engine must turn freely. If brake band drags against flywheel restricting movement, check for damaged brake band or anchors.

### FINAL ASSEMBLY

Install engine on powered equipment and assemble brake control cable to brake control bracket. Install blower housing, muffler guard and fuel tank. Install and adjust remote control.

Conduct Stop Switch and Stop Switch Wire Tests, Section 2, Ignition.

Fill fuel tank with proper fuel/oil mixture. Check blade stopping time with Tool #19255 **BLADE MONITOR®**.

### ADJUST GOVERNOR (STATIC)



**WARNING:** BEFORE STARTING OR RUNNING ENGINE, STATIC ADJUSTMENT OF THE GOVERNOR MUST BE MADE. FAILURE TO MAKE STATIC ADJUSTMENTS FIRST COULD RESULT IN ENGINE OVERSPEEDING WHICH MAY RESULT IN ENGINE OR EQUIPMENT DAMAGE CAUSING PERSONAL INJURY OR PROPERTY DAMAGE.

Static adjustment of the governor must be done anytime the engine is disassembled, the governor lever or governor crank are removed or replaced.

NOTE: THE STATIC GOVERNOR ADJUSTMENT IS DIFFERENT ON ENGINES WITH A CODE DATE **AFTER 8808080**. BE SURE OF CODE DATE **BEFORE** PERFORMING STATIC GOVERNOR ADJUSTMENT.

### ADJUST GOVERNOR - AFTER CODE DATE 8808080

Slide governor lever on to governor crank. Install governor link and spring. Rotate governor lever **clockwise** as far as it will go and maintain this position (wide open throttle). With a screwdriver, rotate governor crank **clockwise** as far as it will go. Hold in this position and torque governor nut to 30 in. lbs., Fig. 10.

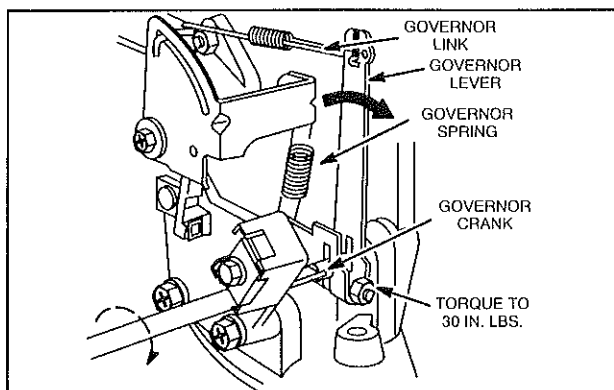


Fig. 10 - Adjusting Governor After Code Date 8808080

NOTE: Engines manufactured after 8808090 do not have a governor lever stop on the crankcase..

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 6 OF THIS SECTION.

# GOV. CONTROLS & CARB. LINKAGE

## Remote Controls

### ADJUST GOVERNOR – BEFORE CODE DATE 8808090

NOTE: Governor link and spring must be removed when making static governor adjustment.

Slide governor lever onto governor crank. With a screwdriver, turn governor crank **counterclockwise** as far as it will go, Fig. 11. Rotate governor lever **counterclockwise** until governor lever arm contacts stop on crankcase. Hold in this position and torque governor nut to 30 in. lbs., Fig. 11.

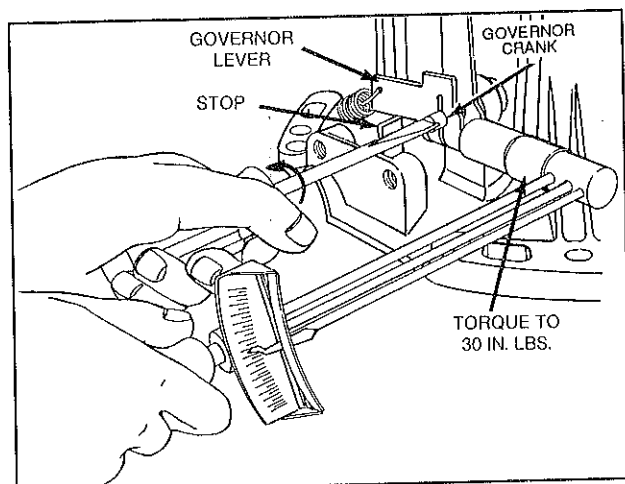


Fig. 11 – Adjusting Governor Before Code Date 8808090

### REMOTE CONTROLS

These engines are equipped with Choke-A-Matic® remote controls. The remote control must be correctly adjusted in order to obtain proper operation of the choke and stop switch (optional).

NOTE: REMOTE CONTROL SYSTEM MUST BE MOUNTED ON POWERED EQUIPMENT IN NORMAL OPERATING POSITION BEFORE ADJUSTMENTS ARE MADE.

#### Check Operation

Remove air cleaner. Check operation by moving remote control to “CHOKE” or “START” position.

The carburetor choke must be closed as illustrated, Fig. 12.

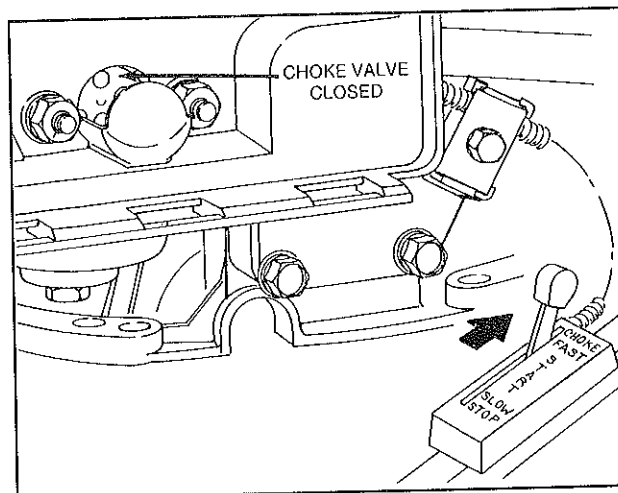


Fig. 12 – Checking Choke Operation

Move remote control to “STOP.” Swivel lever on control bracket **MUST** make positive contact with stop switch (optional) as illustrated, Fig. 13.

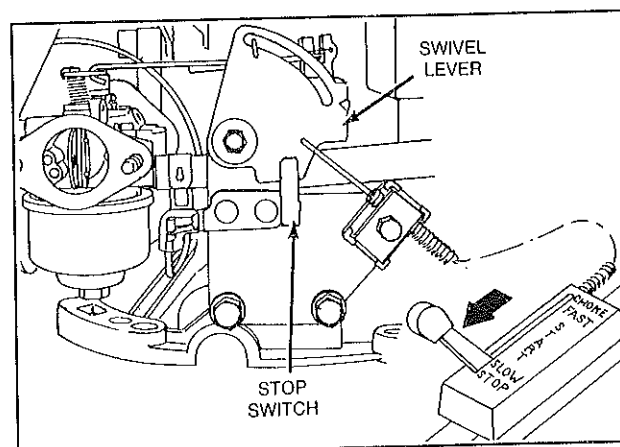


Fig. 13 – Checking Stop Switch Operation

#### To Adjust

Place remote control on equipment in “FAST” position.

# GOV. CONTROLS & CARB. LINKAGE

## Remote Controls

Swivel lever "C" should be just touching choke link "D." To adjust, loosen casing clamp screw "A" on control bracket. Move casing "B" forward or backward until correct position is obtained. Tighten casing clamp screw "A," Fig. 14.

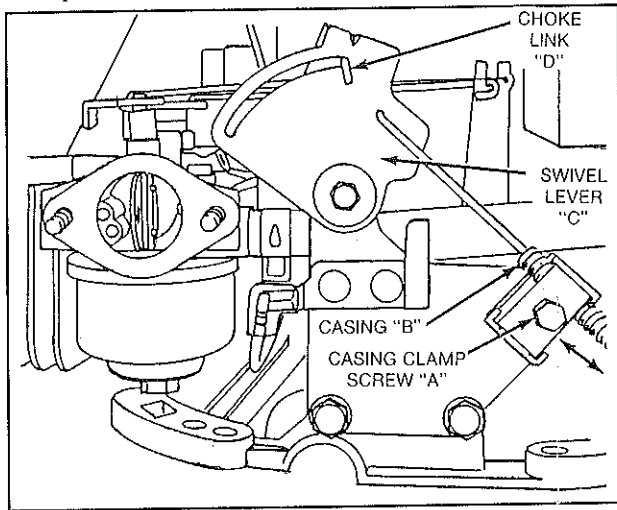


Fig. 14 - Adjusting Remote Control  
(Parts Removed for Clarity)

### METRIC EQUIVALENTS

DIMENSIONS, DECIMAL		
Inches	Millimeters	
.030	.76	
TORQUE		
In. Lbs.	Kgcm	Nm
25	29	3.0
30	35	3.5
45	51	5.0

## Section 5

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

### COMPRESSION CHECK

To determine condition of cylinder bore, piston and rings, check compression as follows:

Remove spark plug and ground armature wire to engine using 19368 Ignition Tester. Install accurate compression gauge in spark plug hole and crank engine using rewind starter. Continue cranking until gauge registers no further increase in pressure. Readings should be approximately 90 to 120 P.S.I.

These values will vary with altitude and condition of engine.

### DISASSEMBLY OF CYLINDER, PISTON AND CRANKCASE

Before cylinder, piston and crankcase can be disassembled, all external parts must be removed.

### REMOVE CYLINDER

Using a 5 mm hex allen wrench, remove four socket head screws as shown. With a soft head mallet, gently tap cylinder to loosen cylinder from gasket. Carefully remove cylinder from crankcase, Fig. 1.

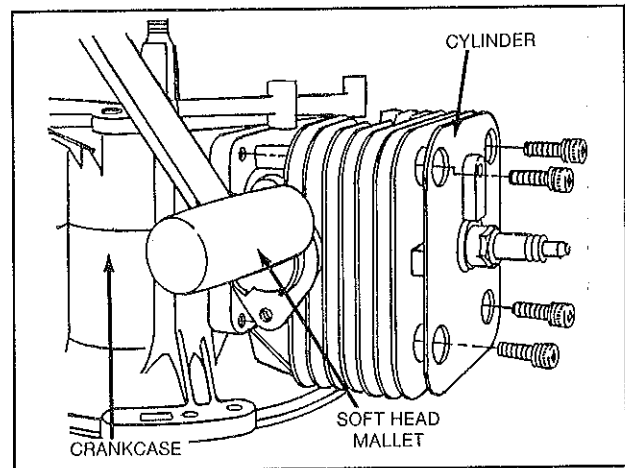


Fig. 1 - Removing Cylinder

### DISASSEMBLE CRANKCASE

Remove four cap screws, Fig. 2, holding two crankcase halves together. Place flywheel upside down on work surface and insert magneto end of crankshaft into flywheel taper, Fig. 3. To prevent crankshaft from rotating, use a wood block such as shown in Fig. 4 or a small wood hammer handle, Fig. 5.

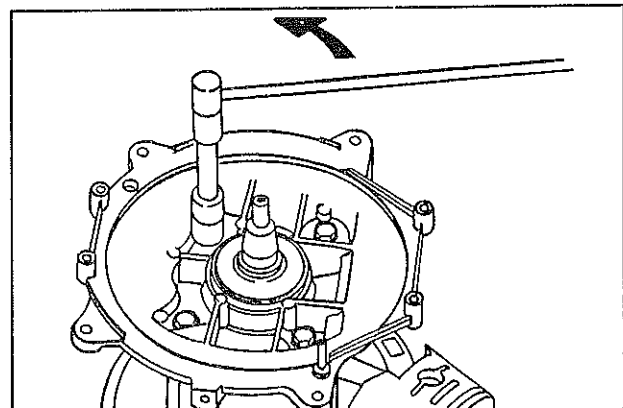


Fig. 2 - Removing Crankcase Screws

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS Disassemble

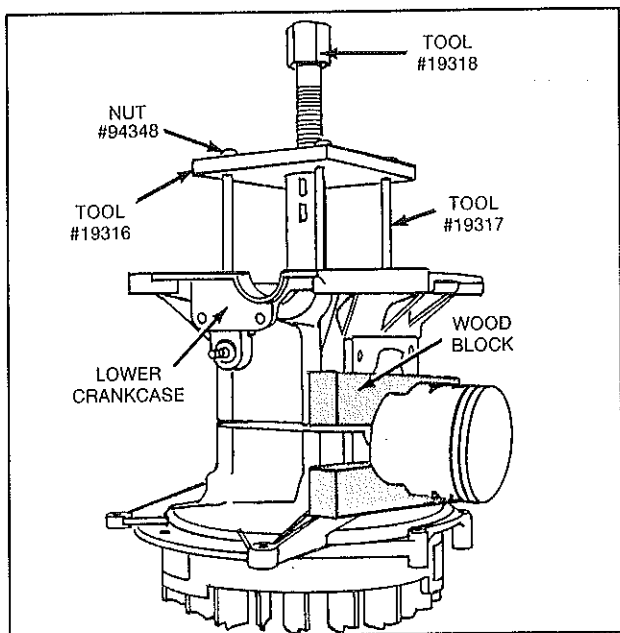


Fig. 3 - Use of Wood Block

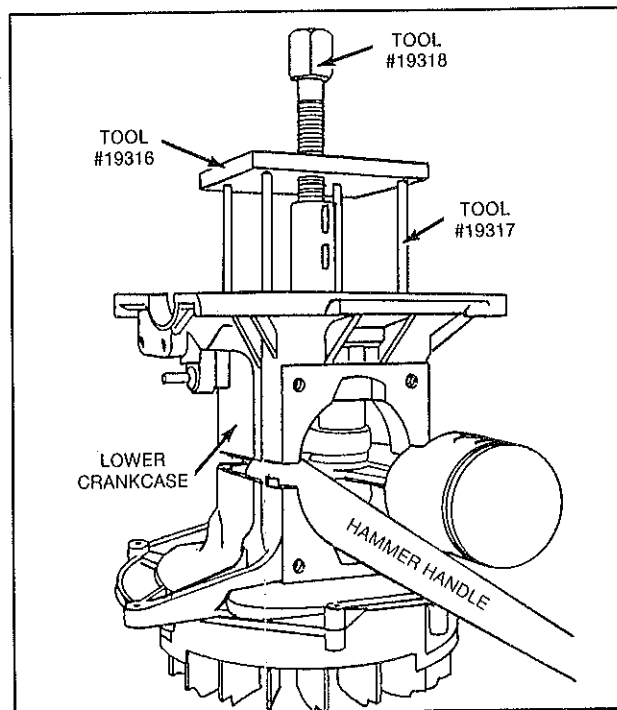


Fig. 5 - Use of Hammer Handle

5

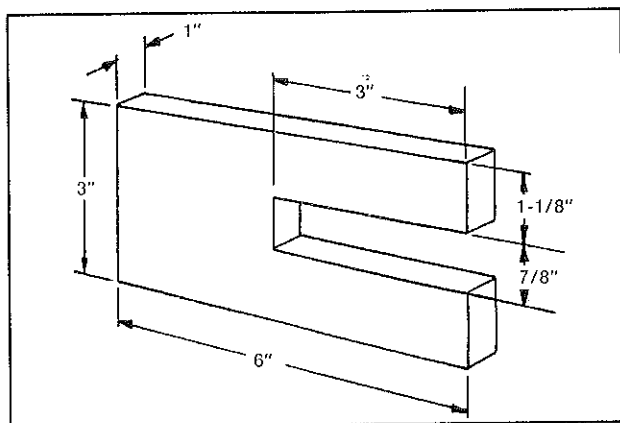


Fig. 4 - Wood Block Dimensions

## REMOVE LOWER CRANKCASE

Place Puller Plate (with "X" toward piston), Tool #19316, and Puller Screw, Tool #19318, on PTO end of crankshaft. Thread Puller Studs, Tool #19317, into lower crankcase half, Fig. 3. Turn puller screw until two halves are separated and lift off puller and lower crankcase.

## REMOVE UPPER CRANKCASE

Insert Puller Studs, Tool #19316, with short threads down, Fig. 6. Protect crankshaft threads with flywheel nut. Place Puller Plate (with "X" toward piston), Tool #19316, on crankshaft and install four nuts and washers on puller studs, Fig. 6. Turn Puller Screw, Tool #19318, until upper crankcase is free and lift off crankcase and puller.

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS Disassemble

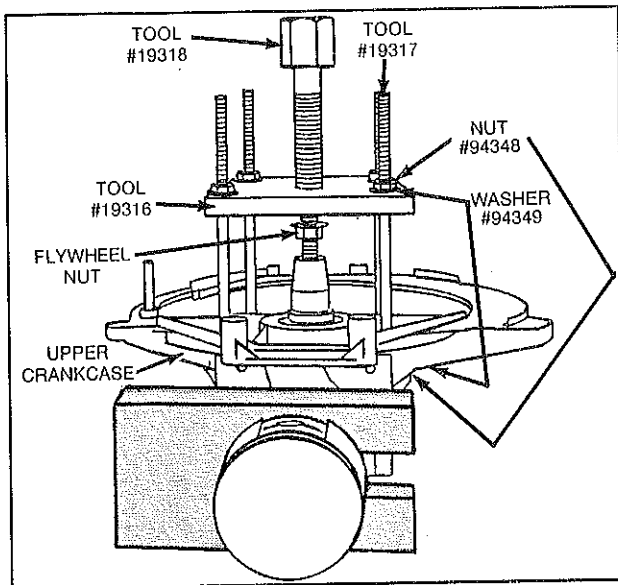


Fig. 6 - Removing Crankcase (Typical)

## REMOVE OIL SEALS

Remove oil seals from both crankcase halves.

## REMOVE BALL BEARINGS

NOTE: Before ball bearings can be removed, oil seals and governor crank (PTO side) must be removed. Remove bearing retainer, Fig. 7.

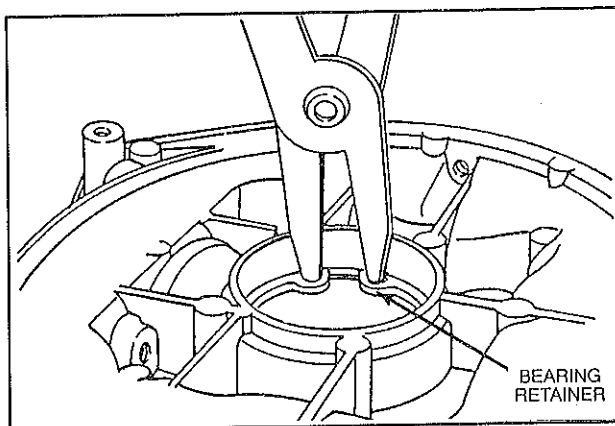


Fig. 7 - Removing Bearing Retainer

Place Tool #19319, with hollow side toward ball bearing, inside crankcase. Place Tool #19320, against ball bearing (large end in on magneto side or small end in on PTO side) and puller bolt Tool #19318. Tighten

bolt until bearing falls free into hollow of Tool #19314, Fig. 8 or Fig. 9.

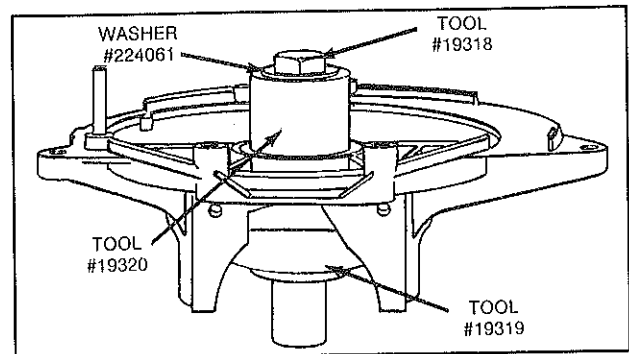


Fig. 8 - Removing Magneto Bearing

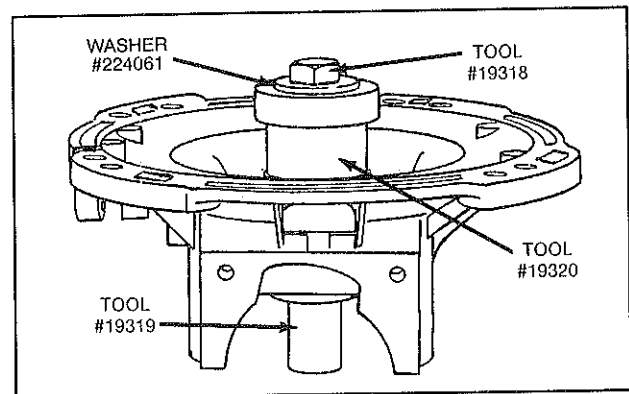


Fig. 9 - Removing PTO Bearing

NOTE: Do not re-use ball bearings after they have been removed.

## REMOVE PISTON

Remove piston pin locks using a sharp pointed tool, Fig. 10.

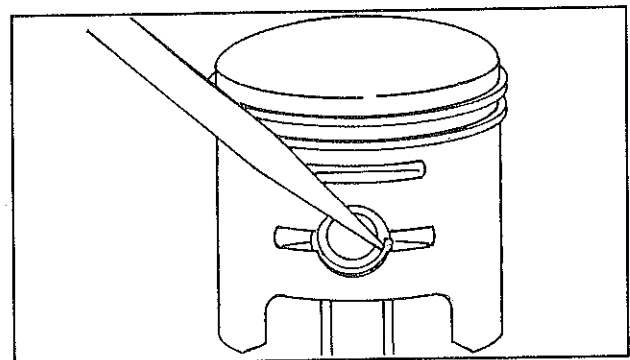


Fig. 10 - Removing Piston Pin Lock

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Disassemble and Inspect

Push piston pin out by hand using tool illustrated, Fig. 11, or similar tool, Fig. 12.

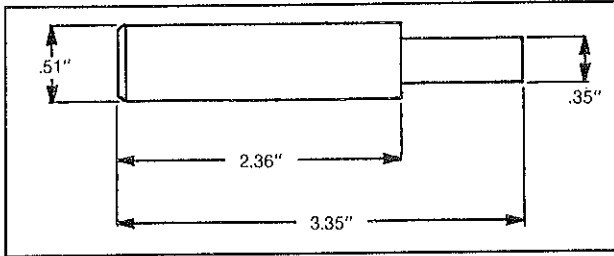


Fig. 11 - Tool Dimensions

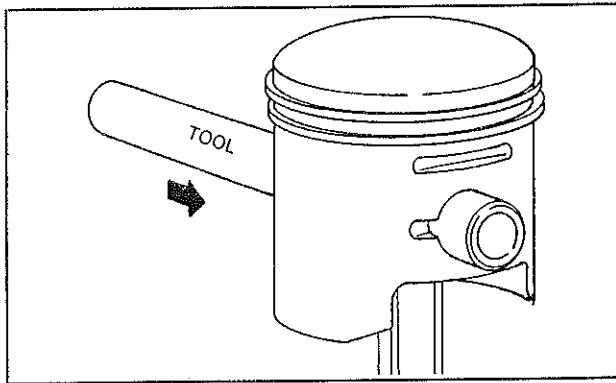


Fig. 12 - Removing Piston Pin

Place each piston ring in cylinder bore approximately 1-1/4" deep in cylinder bore and measure piston ring end gap. Replace rings if end gap is .040" or more, Fig. 13.

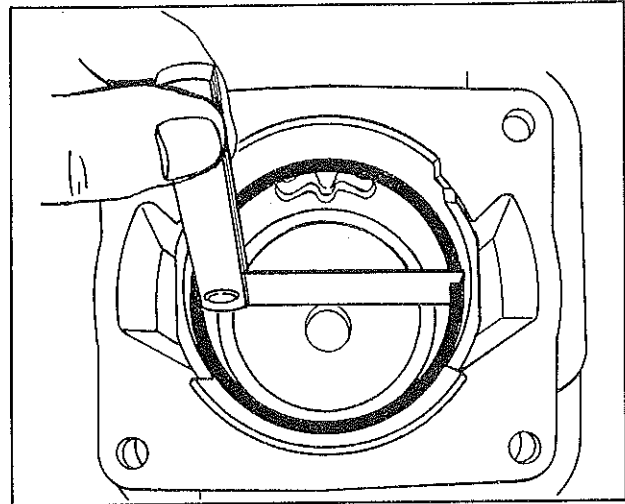


Fig. 13 - Checking Piston Ring End Gap

Measure piston skirt, Fig. 14. Replace piston if it is worn to 2.356" or less. If piston has deep score marks, replace piston.

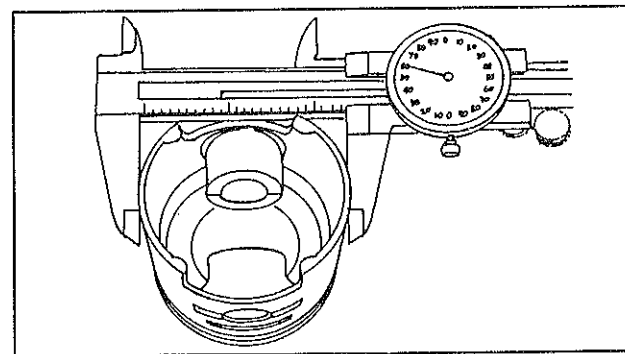


Fig. 14 - Checking Piston Skirt Wear

**NOTE: DO NOT DRIVE OUT PISTON PIN WITH A HAMMER.** This can bend or twist the connecting rod.

### REMOVE PISTON RINGS

Using ring expander, Tool #19340, remove the top and then the lower piston ring.

Always use a ring expander when removing piston rings to prevent ring distortion. Never remove rings by hand.

### CHECK PISTON AND RINGS

Soak piston and rings in solvent to remove carbon deposits. **NOTE:** Do not use a wire brush or metal scraper to remove carbon deposits as this may damage the piston.

### CHECK PISTON PIN

Using Dial Caliper, Tool #19199, or a micrometer, measure piston pin. Replace piston pin if it is worn to .550" or less or is discolored.

Measure piston pin hole. Replace piston if pin hole is worn to .553" or more.

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.**

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Inspect and Assemble

### CHECK CYLINDER

Measure cylinder bore at the top, center and bottom of ring travel in two directions, Fig. 15, using Telescoping Gauge, Tool #19198 and Dial Caliper, Tool #19199 or equivalent. Replace cylinder (chrome plated bore) if it is worn to 2.368" or more. Replace cylinder (cast iron bore) if it is worn to 2.369" or more. Replace cylinder if cylinder bore has deep scores or chrome plating is damaged. Replace cylinder if bore is worn out of round.

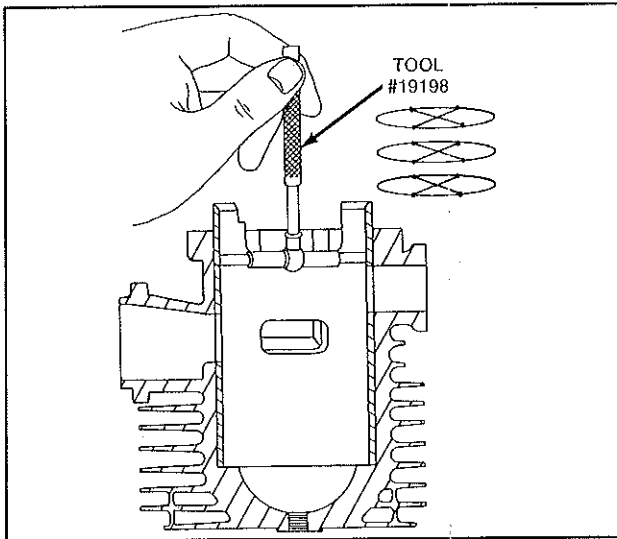


Fig. 15 - Checking Cylinder Bore Wear

### INSTALL PISTON AND PISTON PIN ON CONNECTING ROD

Install new piston pin lock in piston, Fig. 17. Note location of open end of piston pin lock.

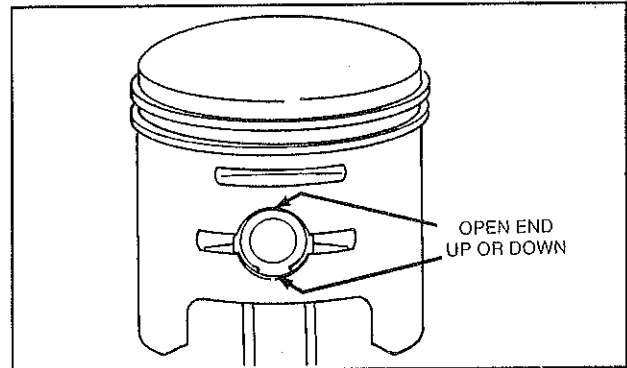


Fig. 17 - Piston Pin Lock Installed Correctly

Start piston pin from opposite side of piston. NOTE: Arrow on piston points toward exhaust port. If piston is installed backwards, piston rings may break on the exhaust port. Place needle bearing in connecting rod and push piston pin through bearing and piston pin bore until piston pin seats on piston pin lock, Fig. 18.

Install second piston pin lock.

### CHECK CRANKSHAFT

Check crankshaft for wear, Fig. 16. Replace crankshaft if journals are worn to .982" or less or more than .0005" out of round.

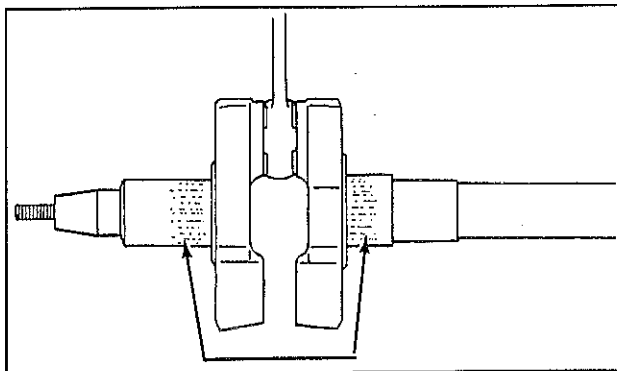


Fig. 16

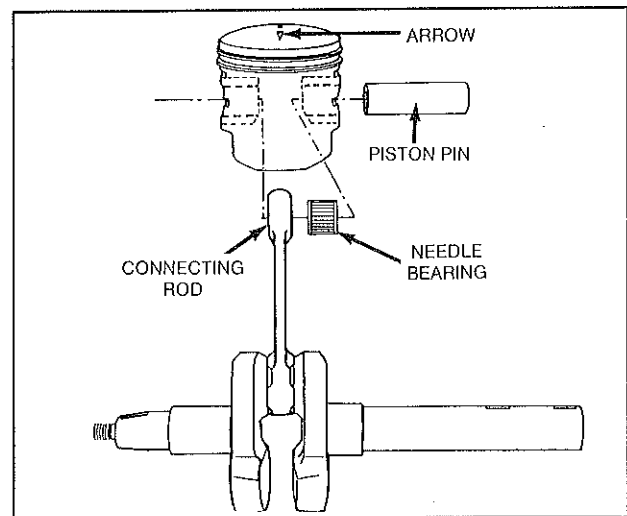


Fig. 18 - Installing Piston Pin

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.



# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Assemble

### INSTALL BALL BEARINGS

Before ball bearing can be installed in magneto half of crankcase, the snap ring must be installed to properly locate the bearing, Fig. 19.

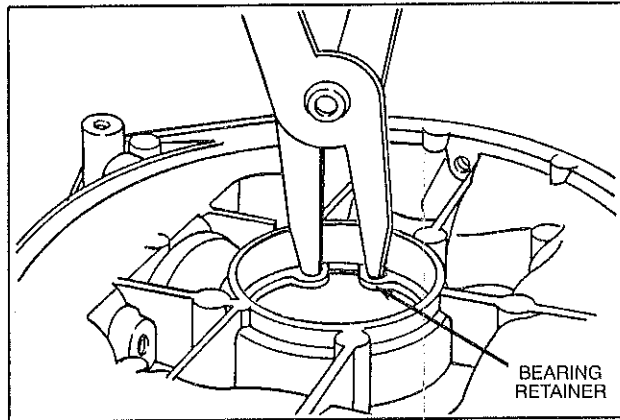


Fig. 19 - Installing Bearing Retainer

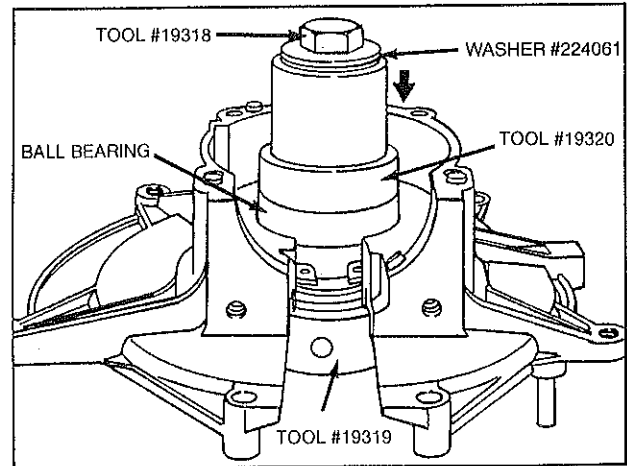


Fig. 21 - Installing Magneto Bearing

### INSTALL SEALS

Slide Tool #19319 through center of ball bearing, Fig. 22 and Fig. 23. Slide seal down over pilot with flat side of seal toward outside of engine. Place Tool #19320, on seal and turn draw bolt until seal is seated, Fig. 22 and Fig. 23.

Place Tool #19319, on seal side of upper or lower crankcase piloting on the seal bore, Fig. 20 and Fig. 21. Slide bearing down over pilot and place Tool #19320 on bearing, Fig. 20 and Fig. 21. Turn draw bolt down until bearing seats on snap ring or bearing bore shoulder, Fig. 20 and Fig. 21.

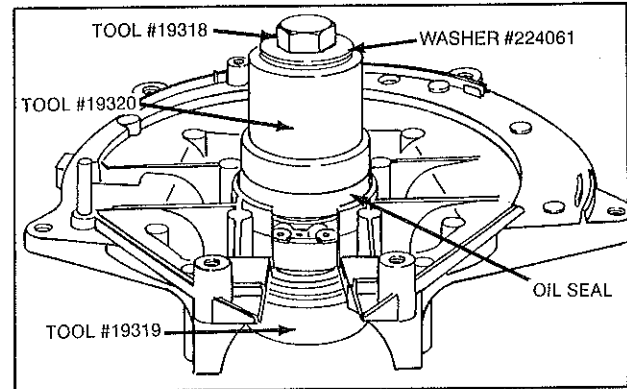


Fig. 22 - Installing Magneto Oil Seal

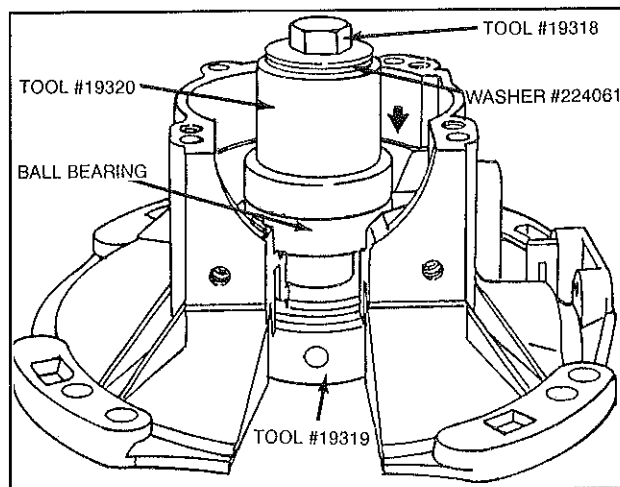


Fig. 20 - Installing PTO Bearing

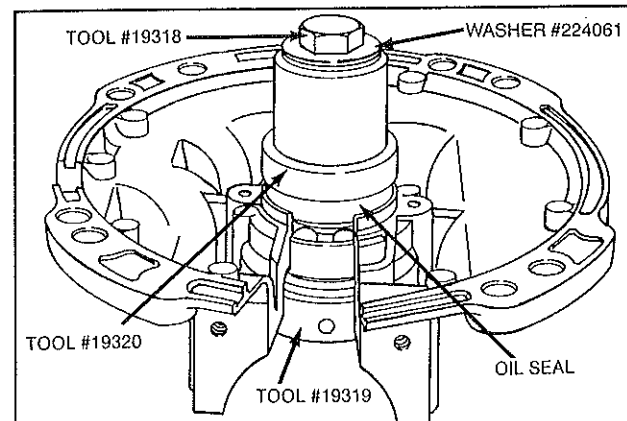


Fig. 23 - Installing PTO Oil Seal

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Crankshaft End Play

### CRANKSHAFT END PLAY

It is recommended that crankshaft end play be checked when replacing a crankcase or crankshaft assembly.

### TOOLS REQUIRED

The following tools are required for checking end play.

1. Dial caliper, Tool #19199.
2. A rigid 12" ruler.

NOTE: Ruler must be rigid and flat to provide accurate measurement.

### CHECKING END PLAY

1. Place rigid 12" ruler across crankcase gasket mounting surface.
2. Use dial caliper and measure distance from top of ruler to thrust face of ball bearing, Fig. 24. Record this dimension.

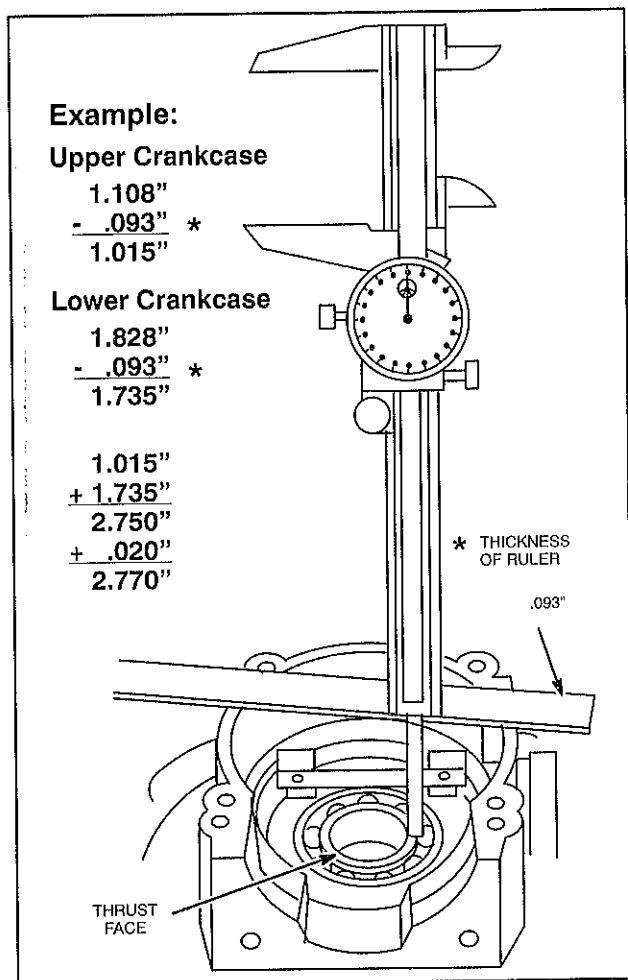


Fig. 24 - Measuring Crankcase

3. Measure and subtract thickness of ruler from dimension obtained in step 2. Record this dimension. NOTE: Ruler thickness for example shown is .093".
4. Repeat steps 1 through 3 for other crankcase half.
5. Now add the dimensions obtained from each crankcase half. Add and record .020" to this dimension (thickness of compressed crankcase gasket). This total dimension is the distance between the thrust surfaces of the upper and lower crankcase halves.
6. Using dial caliper, measure crankshaft between thrust surfaces, Fig. 25. Record this dimension.
7. Subtract dimension recorded in step 6 from step 5. to obtain end play dimension.

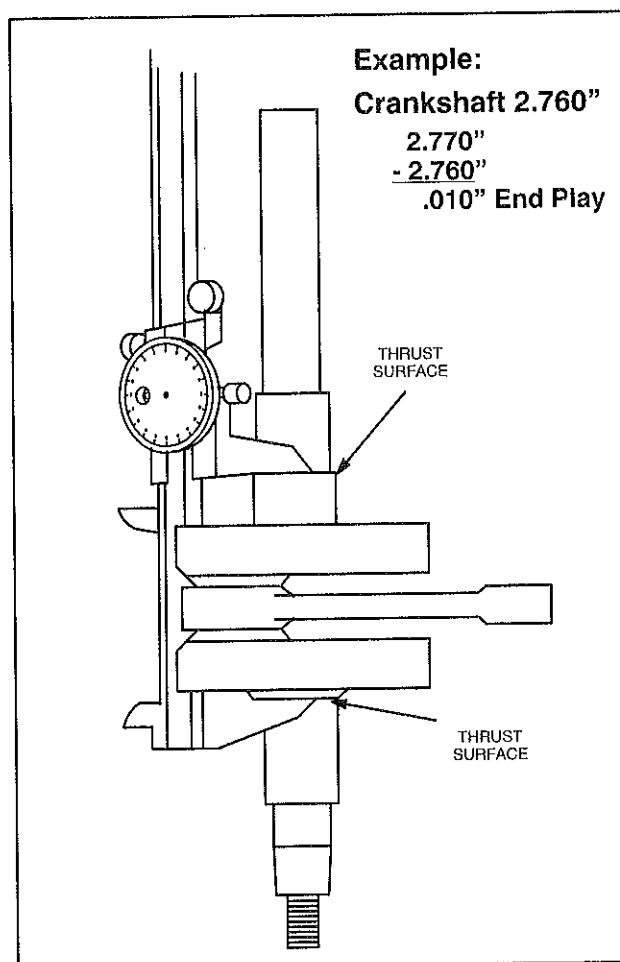


Fig. 25 - Measuring Crankshaft

If end play dimension exceeds .015", install thrust washer, Part #800093, on magneto side of crankshaft.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Assemble

### ASSEMBLE CRANKSHAFT TO MAGNETO CRANKCASE HALF

Slide magneto half of crankcase down onto magneto ball bearing journal. Thread Tool #19315 onto threads of crankshaft, Fig. 26. Place Tool #19314, over Tool #19315. Thread flywheel nut onto Tool #19315 and continue to turn nut until bearing seats on crankshaft throw, Fig. 26. **DO NOT ALLOW CRANKSHAFT TO TURN.**

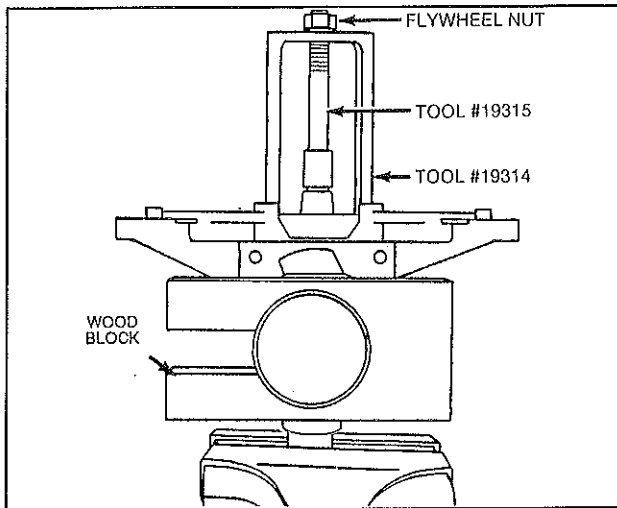


Fig. 26 - Installing Crankshaft, Magneto Crankcase Half (Typical)

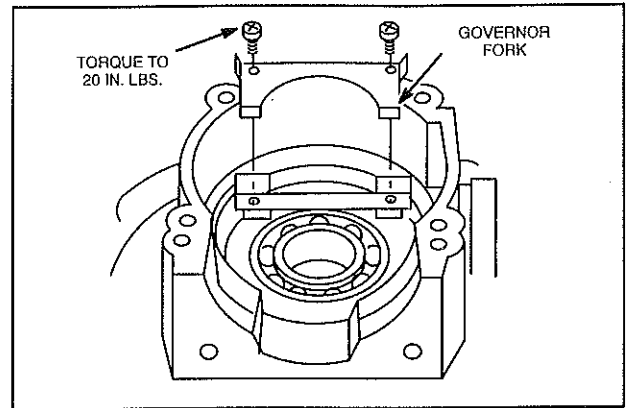


Fig. 28 - Installing Governor After Code Date 8808080

### INSTALL GOVERNOR CRANK BEFORE CODE DATE 8808090

Install new oil seal in crankcase with lip in and flush with chamfer, Fig. 27. Slide governor shaft through governor shaft bearing and rotate governor shaft as shown, Fig. 29. Place washer on shaft and install "E" ring in slot of governor shaft, Fig. 30.

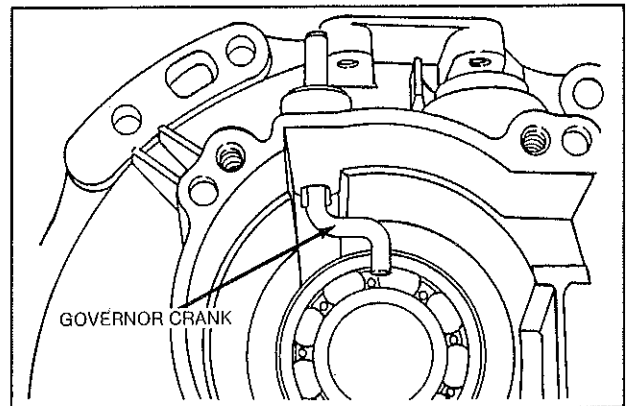


Fig. 29 - Installing Governor Shaft Before Code Date 8808090

### INSTALL GOVERNOR CRANK AFTER CODE DATE 8808080

Install new oil seal in crankcase with lip in and flush with chamfer, Fig. 27. Slide governor shaft through governor shaft bearing and install governor fork, Fig. 28. Torque screws to 20 in. lbs.

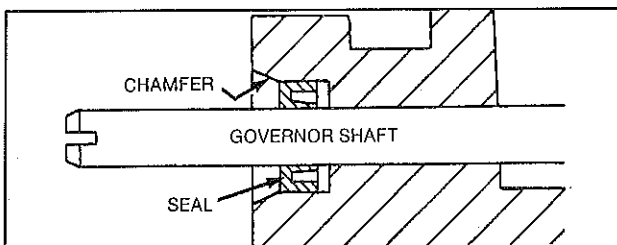


Fig. 27 - Seal Installed Correctly

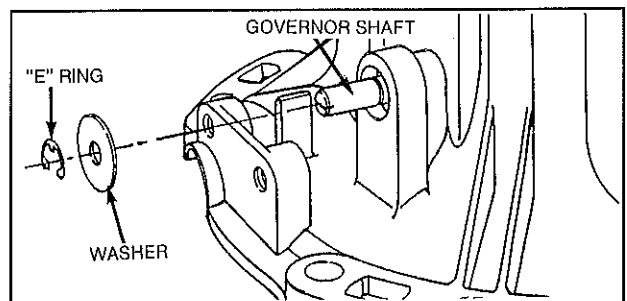


Fig. 30 - Installing "E" Ring

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS Assemble

## ASSEMBLE PTO CRANKCASE HALF TO CRANKSHAFT

Place flywheel upside down on work surface. Insert magneto end of crankshaft into flywheel taper. Place new crankcase gasket on crankcase, Fig. 31. Slide governor assembly down on governor journal with locating post on governor in hole in crankpin. Assemble with weights as shown in Fig. 32.

NOTE: Fig. 33 shows the INCORRECT installation of the governor weights.

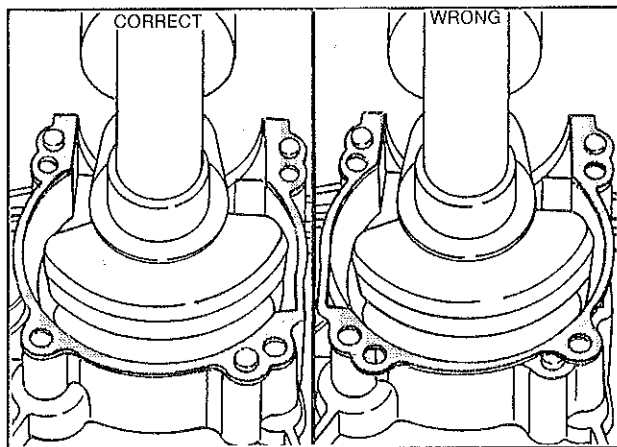


Fig. 31 - Gasket Placement

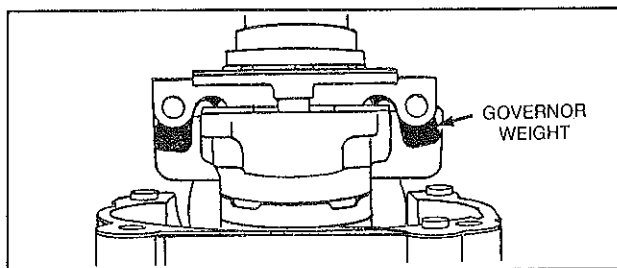


Fig. 32 - Governor Weights Installed Correctly

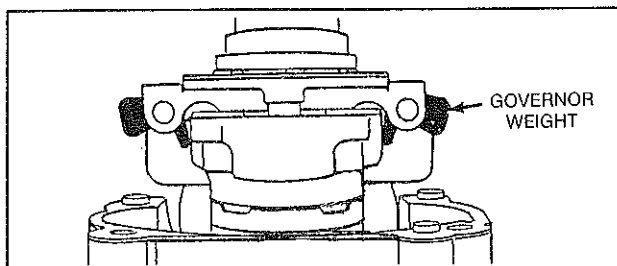


Fig. 33 - Governor Weights Installed Incorrectly

Slide PTO half of crankcase down on crankshaft, Fig. 34, while holding governor crank in its proper position. Place Tool #19314, on crankcase and use blade adapter bolt to assemble the two halves. DO NOT ALLOW THE CRANKSHAFT TO TURN.

NOTE: One of the puller studs, Tool #19317 can be threaded into the crankcase halves to keep the two halves in line.

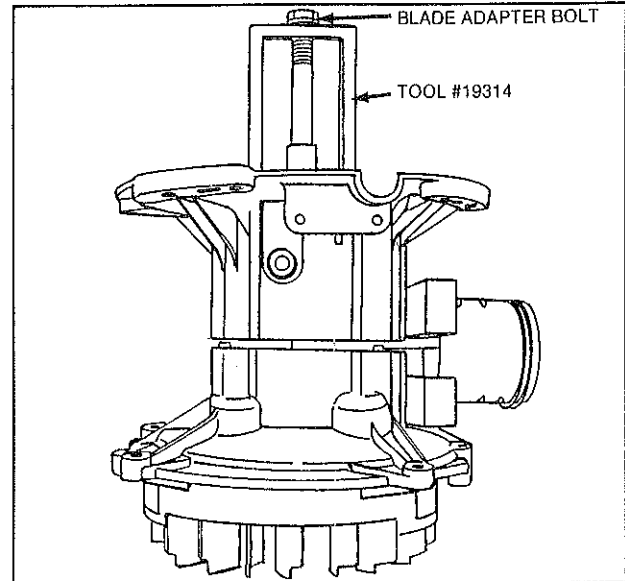


Fig. 34 - Assembling Two Crankcase Halves

NOTE: If two crankcase halves do not go together or very high resistance is felt, one of the two ball bearings is not seated in its bore or against the snap ring. Disassemble and correct.

Place crankcase and crankshaft assembly in its normal position and install the four crankcase bolts. Torque bolts to 60 in. lbs.

After torquing the crankcase bolts, trim off excess crankcase gasket material flush with crankcase, Fig. 35.

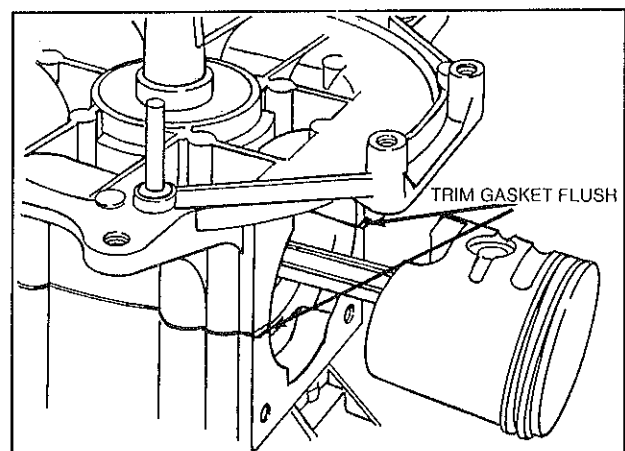


Fig. 35 - Trimming Crankcase Gasket

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## Assemble

### INSTALL PISTON RINGS

The upper and lower compression rings are different. The lower compression ring is machined flat and can be installed either way. The upper compression ring is machined with a bevel on the top surface and is stamped with a letter "N" on the top surface, Fig. 36. Install this ring in the top ring groove with the letter "N" toward the top of the piston.

Using ring expander, Tool # 19340, install piston rings in order shown, Fig. 36. Always use a ring expander when installing piston rings to prevent ring distortion. Never install rings by hand.

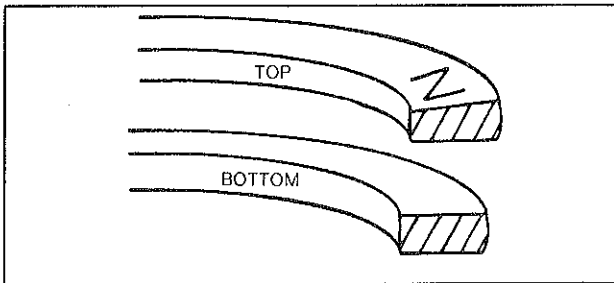


Fig. 36 - Ring Identification

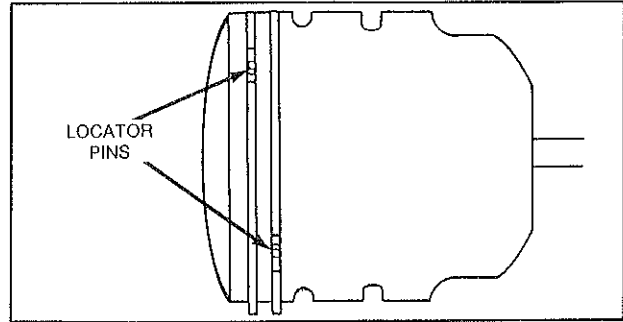


Fig. 37 - Ring Gaps Centered on Locator Pins

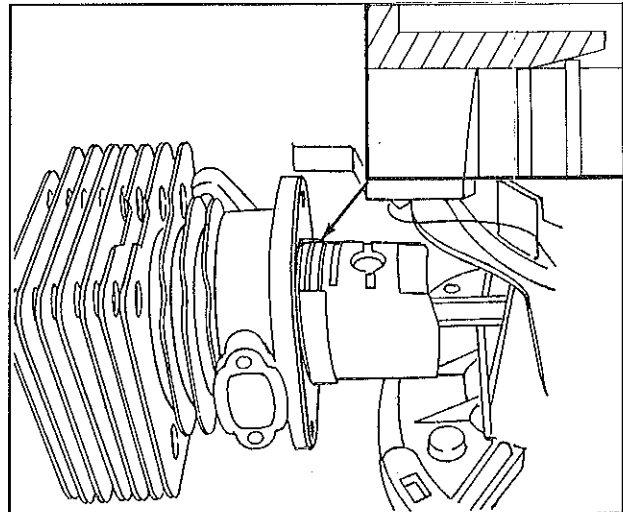


Fig. 38 - Installing Cylinder

### ASSEMBLE CYLINDER TO CRANKCASE

Cylinder has a bevel which serves as a ring compressor.

Rotate both rings until notches in rings are centered on locator pins in ring grooves, Fig. 37. Lubricate cylinder bore, piston and rings with same oil used in engines fuel/oil mixture. Slide cylinder and new cylinder gasket onto piston and rings and carefully compress rings. Slide cylinder over piston making sure gasket remains aligned, Fig. 38. Install four socket head screws. Torque screws to 110 in. lbs., Fig. 39.

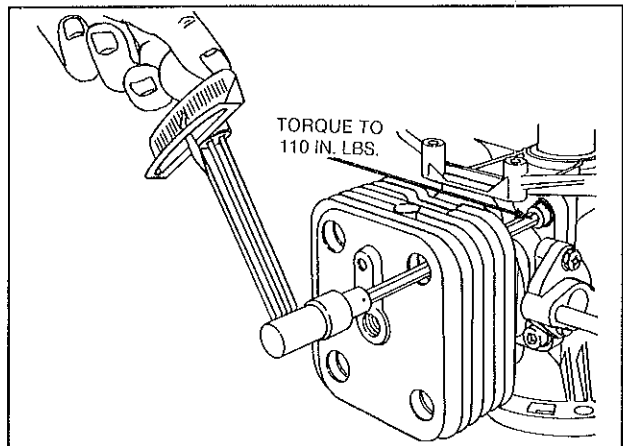


Fig. 39 - Torquing Cylinder Screws

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 11 OF THIS SECTION.

# CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

## METRIC EQUIVALENTS

DIMENSIONS, FRACTIONAL	
Inches	Millimeters
7/8	22.2
1	25.4
1-1/8	28.5
1-1/4	31.7
3	76.2
6	152.4
DIMENSIONS, DECIMAL	
Inches	Millimeters
.0005	.01
.010	.25
.020	.50
.040	1.00
.093	2.36
.350	9.00
.510	13.00
.550	13.97
.553	14.05
.982	24.94
1.015	25.78
1.108	28.14
1.735	44.06
1.828	46.43
2.356	59.84
2.360	60.00
2.368	60.15
2.369	60.17
2.750	69.85
2.760	70.10
2.770	70.35
3.350	85.00

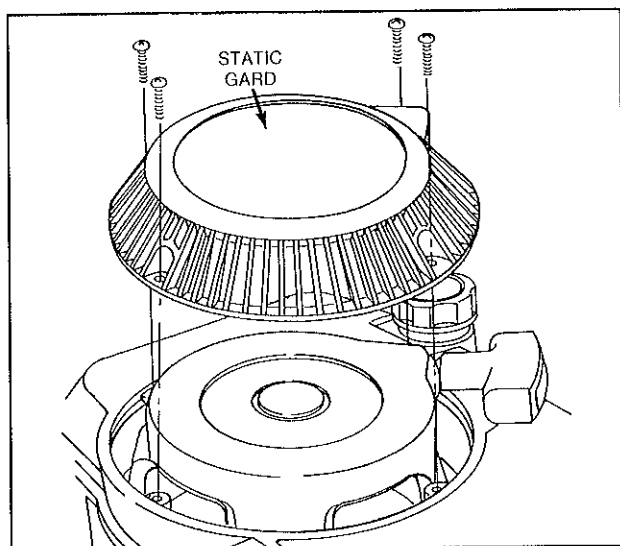
PRESSURE		
P.S.I.	Bar	kPa
90	6.2	620
120	8.2	830
TORQUE		
In. Lbs.	Kgcm	Nm
60	69	6.8
110	127	12.5

## Section 6

# STARTERS

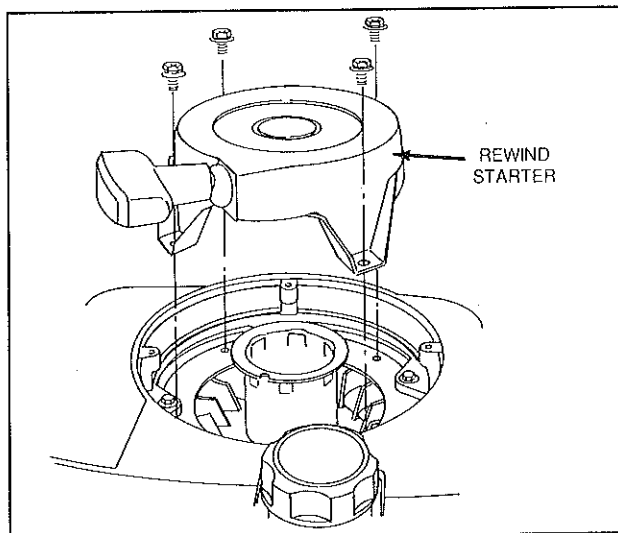
### REMOVE STARTER

Remove four screws and static guard, Fig. 1.



**Fig. 1 - Removing Static Guard**

Remove four screws and rewind starter, Fig. 2.

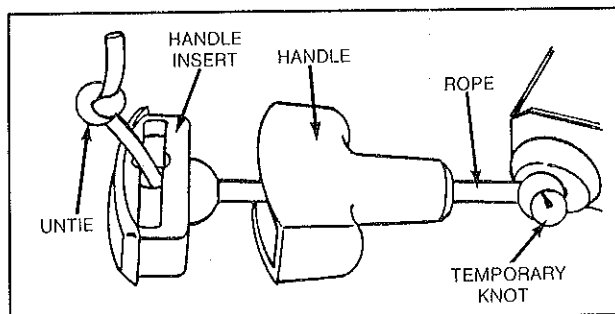


**Fig. 2 - Removing Rewind Starter**

### REPLACE ROPE

#### Remove Rope

Pull rope out part way and tie a temporary knot. Remove rope insert from rope handle, Fig. 3 and pull knot out of rope insert. Untie knot and remove insert and handle from rope.



**Fig. 3 - Removing Handle and Insert from Rope**

Pull rope out as far as it will go. While holding rewind pulley, grasp knot with a pair of needle nose pliers and pull rope out of pulley.

Slowly release spring tension on pulley until rewind spring is completely unwound.

#### Inspect Rope

Inspect rope for fraying or broken strands. Replace if frayed or broken strands are found. If re-using old rope, burn each end of rope with an open flame. Using caution, wipe with waste cloth while it is still hot, to prevent swelling and unraveling.

**NOTE:** WHEN INSTALLING A NEW ROPE, CHECK PARTS LIST TO BE SURE CORRECT DIAMETER AND LENGTH ROPE IS USED. THE SERVICE REPLACEMENT ROPE IS CUT TO LENGTH AS REQUIRED. For engines equipped with band brake, cut rope to 87". For all other engines, cut rope to 60".

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 4 OF THIS SECTION.

# STARTERS

## Rewind Starters

### Install Rope

Turn pulley counterclockwise to hook spring on inner spring retainer. Continue to turn pulley until spring is wound tight. Then rotate pulley **CLOCKWISE** until rope hole in pulley is in line with starter housing eyelet and hold pulley, Fig. 4.

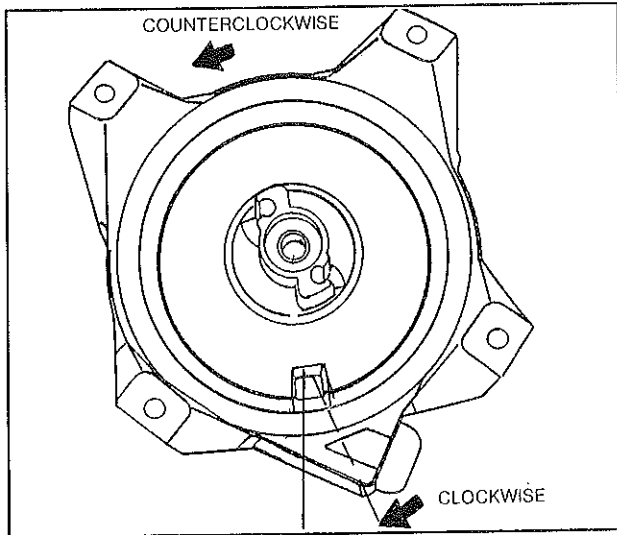


Fig. 4 - Winding Spring

Tie a figure eight knot, Fig. 5, at one end of the rope.

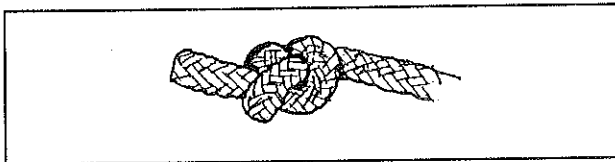


Fig. 5 - Tie Knot

Insert other end of rope through knot cavity and rope hole in pulley, Fig. 6. Thread end of rope through eyelet and pull rope until knot is in rope cavity, Fig. 6.

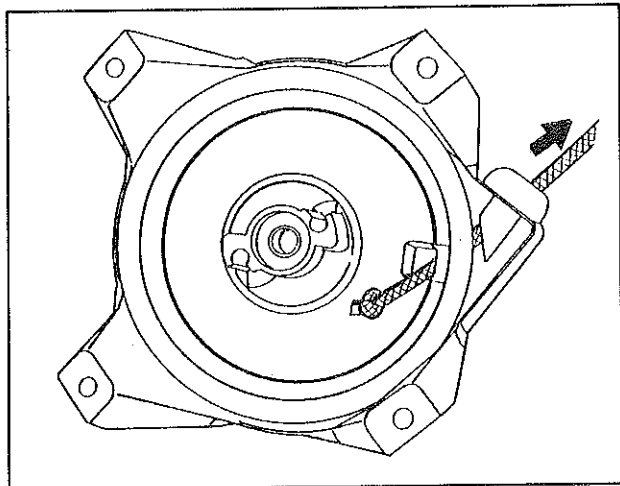


Fig. 6 - Inserting Rope

While still holding pulley, tie a temporary knot part way out on rope. Let pulley and spring slowly pull rope into temporary knot. Insert rope through starter rope handle and starter rope insert, Fig. 7. Tie knot on end of rope, Fig. 7. Pull knot into rope insert and pull insert into rope handle. Untie temporary knot and slowly let rope into starter. Operate starter to check for smooth operation.

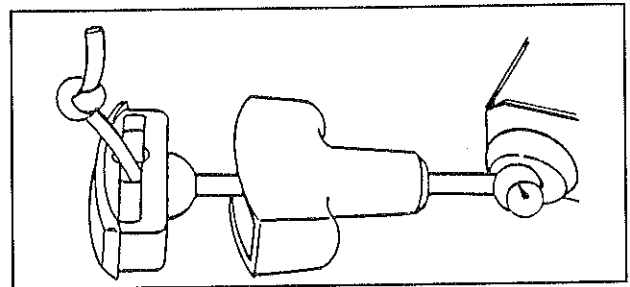


Fig. 7 - Assemble Rope and Handle

### REPLACE STARTER SPRING

Remove rope as described in "Remove Rope."

### Remove Pulley and Spring

Remove retainer screw, retainer and brake spring, Fig. 8. Lift out starter dog and spring, Fig. 9. Rotate pulley and spring until pulley feels free. Lift out pulley and spring.

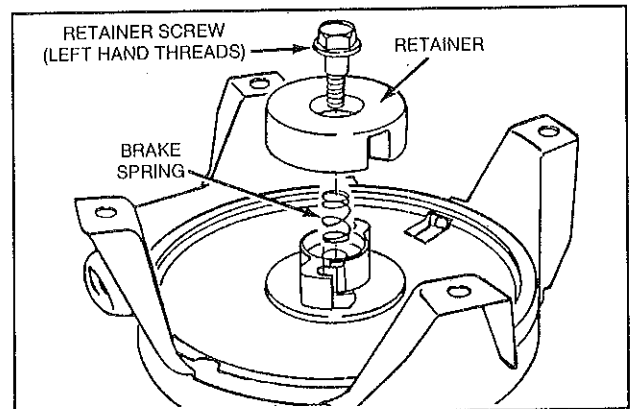


Fig. 8 - Removing Retainer

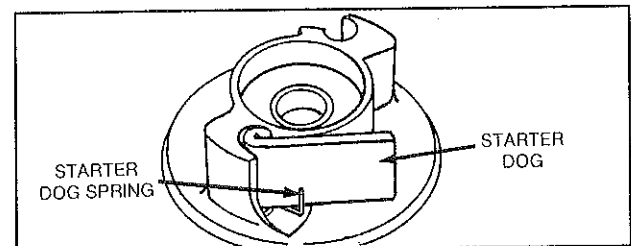


Fig. 9 - Removing Starter Dog and Spring

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 4 OF THIS SECTION.



# STARTERS

## Rewind Starters

Grasp spring with a pair of pliers and lift out spring, Fig. 10. With pliers, set spring in starter housing and allow spring to unwind, Fig. 11.

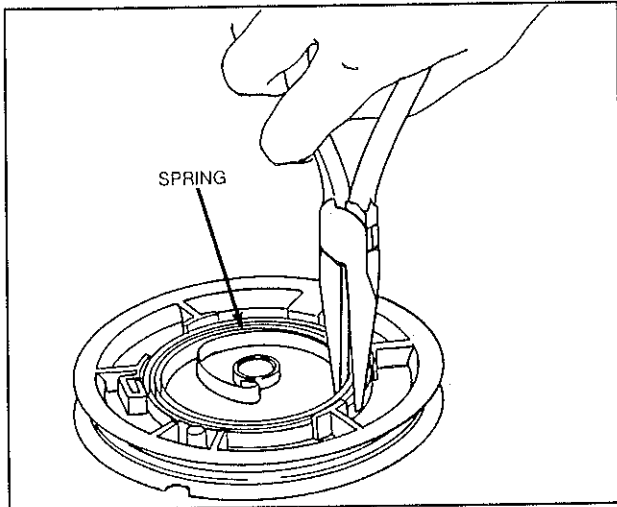


Fig. 10 - Remove Spring

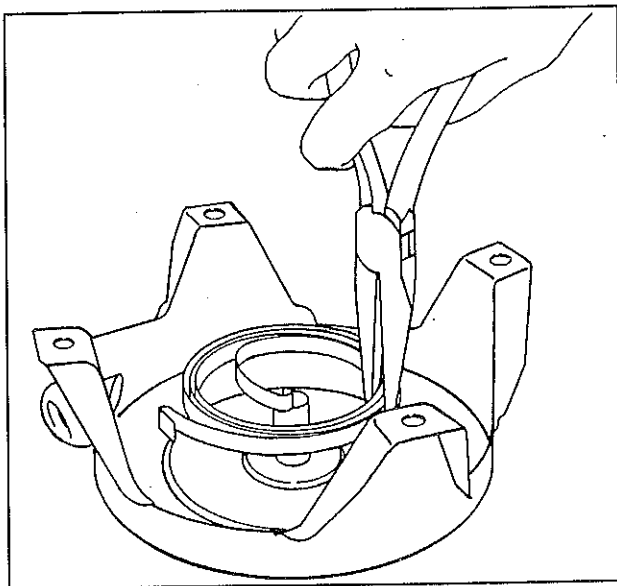


Fig. 11 - Unwind Spring

### Inspect Spring, Starter Housing and Pulley

Inspect spring for sharp bends, kinks or burrs. Replace, if damaged.

Inspect pulley for cracks, rough edges or burrs in pulley groove, wear on spring anchor retainer and wear in center hole, Fig. 12. Replace pulley if damaged or worn.

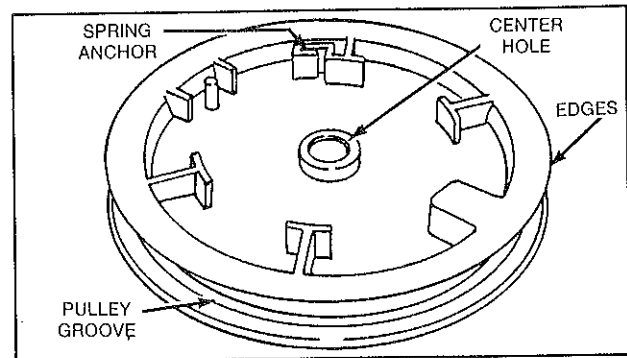


Fig. 12 - Inspect Pulley

Inspect starter housing for wear at the rope eyelet, center pivot post and at the inner spring anchor, Fig. 13. Replace if worn.

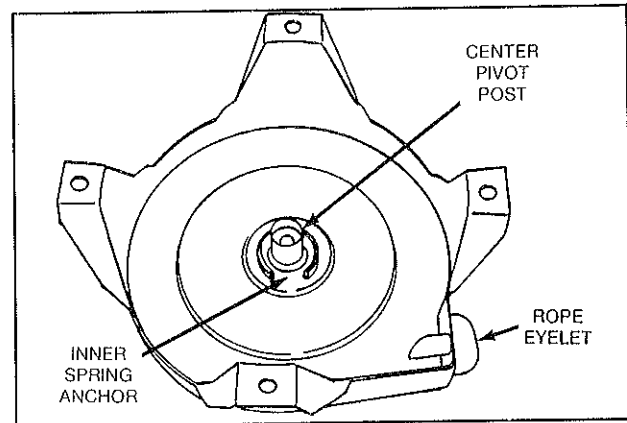


Fig. 13 - Inspect Starter Housing

### Install New Spring

Service replacement spring is held by a spring retainer. Place a dab of grease on bottom of pulley where spring will rest, Fig. 14. While holding spring with a pair of needle nose pliers, cut retainer. Place spring in pulley with spring hook in spring retainer slot, Fig. 14.

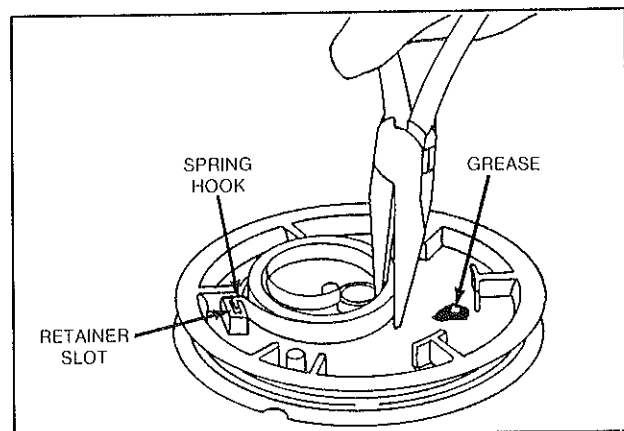


Fig. 14 - Installing Spring

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 4 OF THIS SECTION.

# STARTERS

## Rewind Starters

### Install Original Spring

Place a dab of grease on bottom of pulley where spring will rest, Fig. 14. Place spring hook in spring retainer slot and carefully wind spring into pulley, Fig. 15.

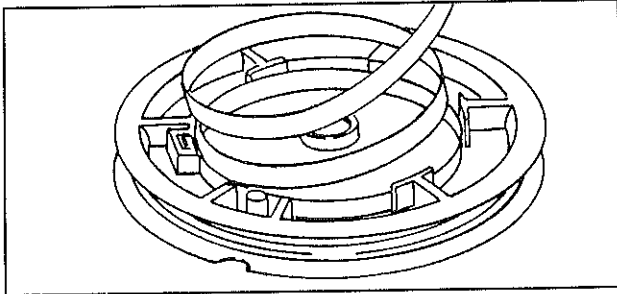


Fig. 15 - Installing Spring

### Install Pulley and Spring

Place pulley and spring in starter housing. Rotate pulley slowly COUNTERCLOCKWISE until spring hooks on inner spring retainer.

### Install Dog, Dog Spring, Brake Spring and Retainer

Install dog and dog spring in pulley, Fig. 16.

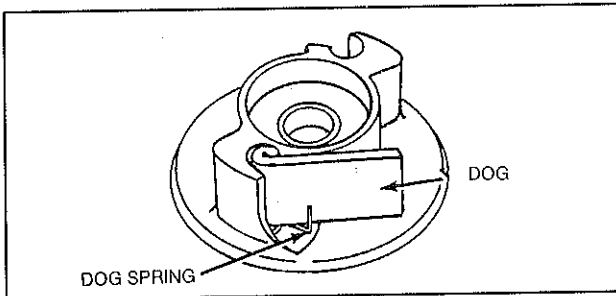


Fig. 16 - Installing Dog and Dog Spring

Place brake spring in center of pulley pivot. Lower retainer onto pulley and rotate it slowly CLOCKWISE until dog extends out through slot in retainer. Install and torque retainer screw to 30 in. lbs., Fig. 17.

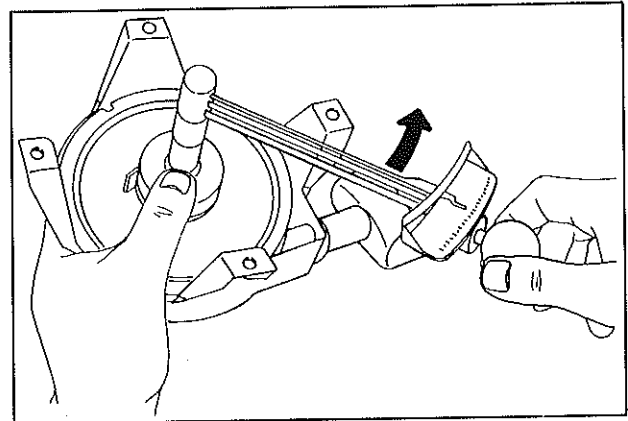


Fig. 17 - Installing Retainer Assembly

Complete assembly of starter as described in "Install Rope."

### METRIC EQUIVALENTS

DIMENSIONS		
Inches	Meters	
60	1.5	
87	2.2	
TORQUE		
In. Lbs.	Kgcm	Nm
30	35	3.4

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 4 OF THIS SECTION.

## Section 7 MUFFLERS

### MUFFLER

The standard muffler is a compact sound reducing muffler.

### REMOVING MUFFLER

Remove muffler screws.

### INSPECTING MUFFLER

Check muffler for exhaust leaks around seams, pin holes and leakage between the gasket and muffler. Replace muffler or gaskets if leaking. Also inspect muffler outlet for any exhaust deposits.

With muffler removed, and piston at top dead center, combustion deposits may be scraped from exhaust port. Use a small wood stick to prevent damage to the piston, rings and port. To prevent piston rings from sticking, use compressed air to clear debris from exhaust port.



**WARNING:** TO PREVENT EYE INJURY ALWAYS WEAR EYE PROTECTION WHEN USING COMPRESSED AIR.

### INSTALLING MUFFLER

When installing muffler, always use a new gasket. Lubricate screw threads with anti-seize lubricant, Part #93963. Torque screws to 85 inch pounds, Fig. 1.

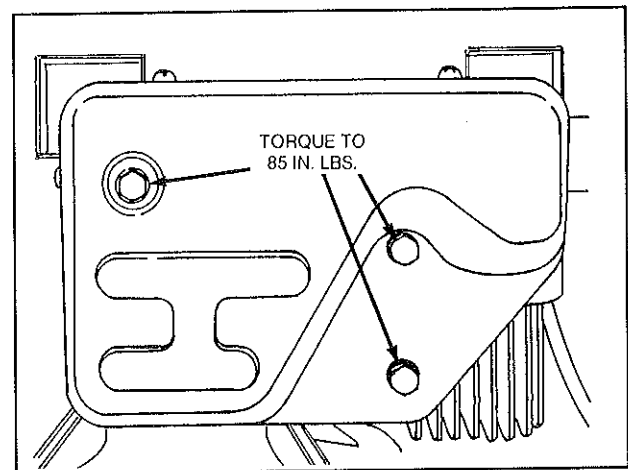


Fig. 1 - Installing Muffler

**7**

### INSPECT SPARK ARRESTER

If engine's muffler is equipped with spark arrester screen assembly, remove every fifty hours for cleaning and inspection. Replace if damaged or corroded.

### METRIC EQUIVALENTS

TORQUE		
In. Lbs.	Kgcm	Nm
85	98	9.6

NOTE: METRIC EQUIVALENTS ARE LISTED AT THE BOTTOM OF THIS PAGE.

# Section 8 TROUBLESHOOTING

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A. INTRODUCTION

The following sections list common two-stroke-cycle engine troubles. The paragraphs list the most common causes first and their most likely remedy. If the engine is not operating satisfactorily, first check to see if engine is getting fuel, second see if it is getting spark, third check the compression. Check the first listed cause and then proceed to check out the rest of the causes listed in turn. When the cause of the trouble has been found, correct the trouble by following the possible remedy listed for that cause.

Some engine problems may be caused by more than one fault. If the remedy suggested does not correct the trouble, attempt to isolate additional causes and correct them.

Before making any adjustments or corrections to the engine, carefully check it over and make sure that the cooling fins are clean, all parts are securely mounted, the fuel tank is filled and the filters are serviced. Visually check all parts for obvious damage or fault. Only after this type of checkup should adjustments or disassembly be attempted.

B. ENGINE FAILS TO START OR STARTS WITH DIFFICULTY

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
No fuel in tank . . . . .	Fill tank with correct fuel/oil mixture.
Fuel shut-off valve closed . . . . .	Open fuel shut-off valve.
Obstructed fuel line . . . . .	Remove fuel line and replace it with a new line or blow it clean using compressed air.
Fuel tank vent plugged . . . . .	Clean threads on tank and fuel cap.
Air cleaner dirty. . . . .	Service air cleaner.
Engine flooded . . . . .	If engine is flooded, place equipment controls in "FAST" position and crank engine until it starts (do not choke).
Engine over- or under-choked . . . . .	Check equipment control adjustment. When starting cold engine move equipment control to "CHOKE" or "START" position. Choke must close all the way. Choke must be in open position when equipment control is in "RUN" position.
Carburetor throttle valve not opening . . . . .	Check equipment control adjustment. Check governor linkage. Be sure that it is clean and moves freely.
Too much oil in fuel . . . . .	Drain fuel tank and refill with correct fuel/oil mixture.



# TROUBLESHOOTING

## B. ENGINE FAILS TO START OR STARTS WITH DIFFICULTY (Cont'd.)

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Water in fuel . . . . .	Drain fuel tank, fuel line and carburetor. Refill fuel tank with correct fuel/oil mixture.
Float valve sticks . . . . .	Drain and clean fuel tank and fuel line. Disassemble and clean carburetor. Refill fuel tank with correct fuel/oil mixture.
Carburetor jet clogged . . . . .	Drain and clean fuel tank and fuel line. Disassemble and clean carburetor. Refill fuel tank with correct fuel/oil mixture.
No spark . . . . .	Check ignition using tester #19368.
Spark plug fouled . . . . .	Clean and regap or replace spark plug.
Sheared flywheel key . . . . .	Replace flywheel key. Check flywheel taper and taper on crankshaft. Replace damaged parts. Torque flywheel nut to specified torque.
Defective stop-switch . . . . .	Replace stop-switch.
Flywheel-to-armature air gap incorrect . . . . .	Adjust armature air gap.
Fuel vapor lock . . . . .	Allow engine to cool. Check and clean cooling system.
Carburetor mounting gaskets leaking . . . . .	Replace gaskets.
Loose carburetor . . . . .	Tighten carburetor and spacer.
Poor compression . . . . .	Check pistons, rings and cylinder. Repair or replace all worn and faulty parts.

## C. ENGINE MISSES OR RUNS UNEVENLY

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Spark plug fouled or incorrect gap . . . . .	Clean and regap or replace spark plug.
Stop switch wire insulation worn and contacting engine ground . . . . .	Replace wire.
Dirt or water in carburetor . . . . .	Drain and clean fuel tank and fuel line. Disassemble and clean carburetor. Refill fuel tank with correct fuel/oil mixture.
Crankcase seals or gaskets leaking . . . . .	Replace leaking seals and gaskets.
Fuel vapor lock . . . . .	Shut off engine and allow it to cool. Check and clean cooling system.

# TROUBLESHOOTING

## D. ENGINE LACKS POWER OR STALLS

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Air cleaner dirty . . . . .	Service air cleaner.
Improper amount of oil in fuel mixture . . . . .	Drain fuel system. Refill fuel tank with correct fuel/oil mixture.
Muffler or exhaust ports clogged . . . . .	Clean or replace muffler. Clean exhaust ports.
Fuel tank vent plugged . . . . .	Clean threads on tank and fuel cap.
Choke partially closed . . . . .	Check equipment control adjustment. Check governor linkage. Be sure that it is clean and moves freely.
Throttle valve not opening . . . . .	Check equipment control adjustment. Check governor linkage. Be sure that it is clean and moves freely.
Spark plug fouled or incorrect gap . . . . .	Clean and regap or replace spark plug.
Sheared flywheel key . . . . .	Replace flywheel key. Replace damaged parts.
Fuel system dirty . . . . .	Drain and clean fuel tank and fuel line. Disassemble and clean carburetor. Refill fuel tank with correct fuel/oil mixture.
Carburetor jets clogged . . . . .	Drain and clean fuel tank and fuel line. Disassemble and clean carburetor. Refill fuel tank with correct fuel/oil mixture.
Stop switch wire insulation worn and contacting engine ground . . . . .	Replace wire.
Crankcase seals or gaskets leaking . . . . .	Replace leaking seals or gaskets.
Worn piston or rings (poor compression) . . . . .	Check pistons, rings and cylinders. Repair or replace all worn and faulty parts.

## E. ENGINE KNOCKS OR IS NOISY

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Loose blade or blade adapter . . . . .	Replace if worn or tighten to original equipment manufacturer's torque specifications.
Carbon in combustion chamber . . . . .	Clean cylinder and piston head.
Loose or worn connecting rod . . . . .	Replace crankshaft and connecting rod assembly. Check bearings; replace them if necessary.
Loose flywheel . . . . .	Check for a sheared or partially sheared key. Check flywheel taper and taper on crankshaft. Replace damaged part. Torque flywheel nut to specified torque.

# TROUBLESHOOTING

## E. ENGINE KNOCKS OR IS NOISY (Cont'd.)

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Worn piston rings . . . . .	Replace piston rings.
Worn piston pin bore . . . . .	Replace piston.
Bent blower housing . . . . .	Remove blower housing; straighten or replace it.
Worn ball bearings . . . . .	Replace ball bearings. Check main journals for wear. Replace crankshaft, if worn.

## F. ENGINE OVERHEATS

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Insufficient oil in fuel mixture . . . . .	Drain fuel system. Refill fuel tank with correct fuel/oil mixture.
Cooling air flow obstructed Cooling fins clogged . . . . .	Clean cooling fins. Check for damaged or missing shrouds.
Carbon in combustion chamber . . . . .	Remove cylinder and remove carbon from cylinder and piston.
Excessive load on engine . . . . .	Check bottom of deck for debris build up.
Fuel vapor lock . . . . .	Shut off engine and allow it to cool. Check and clean cooling system.

## G. ENGINE VIBRATES EXCESSIVELY

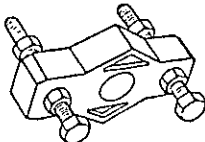

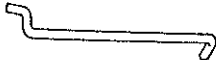
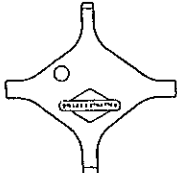
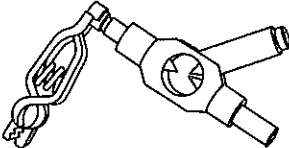
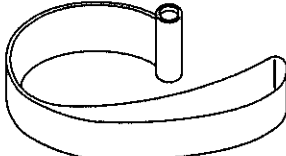

<u>PROBABLE CAUSE</u>	<u>POSSIBLE REMEDY</u>
Parts loose on equipment . . . . .	Tighten parts on equipment.
Parts out of balance on equipment . . . . .	Balance or replace out of balance parts.
Engine mounting bolts loose . . . . .	Tighten engine mounting bolts.
Bent crankshaft . . . . .	Replace crankshaft. <b>DO NOT ATTEMPT TO STRAIGHTEN CRANKSHAFT.</b> Check main bearings for damage and replace if damaged.
Worn main bearings . . . . .	Replace main bearings.
Flywheel loose . . . . .	Check for a partially sheared or sheared flywheel key. Check flywheel taper and taper on crankshaft. Inspect threads on flywheel nut and crankshaft for damage. Replace damaged parts. Torque flywheel nut to specified torque.



# Section 9 TOOLS

It is assumed that Authorized Briggs & Stratton Service Centers have common hand tools to repair engines.


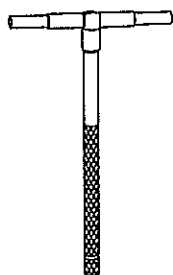
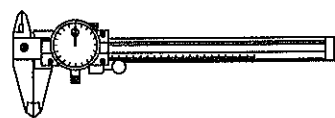
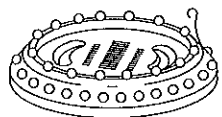
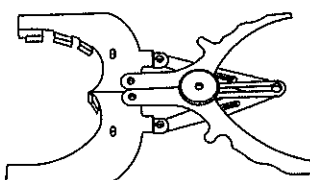
All Authorized Briggs & Stratton Service Centers are required to have Tool Kit #19300. Tools listed below are used on 2-cycle engines and are part of Tool Kit #19300.

DESCRIPTION	TOOL NO.	USE
FLYWHEEL PULLER	19069	Remove Flywheel 
FLYWHEEL HOLDER	19167	Hold flywheel while removing or installing flywheel nut 
BRAKE ADJUSTMENT GAUGE	19256	Setting band brake 
FOUR BLADED SCREWDRIVER	19280	Removing Carburetor Jets 
IGNITION TESTER	19368	Check for Ignition Spark 
FLYWHEEL STRAP WRENCH	19372	Hold flywheel while removing and installing flywheel nut 
VALVE GUIDE LUBRICANT	93963	Lubricate spark plug threads, muffler bolts and cylinder head bolts 




# TOOLS

The following special tools are required for authorized Briggs & Stratton Service Centers, in addition to Tool Kit #19300.

DESCRIPTION	TOOL NO.	USE
TORQUE WRENCH	19197	Accurately Torque Connecting Rods, Cylinder Heads, Sumps, Crankcase Covers Range 0-200 in. lbs. 
GAUGE, TELESCOPING	19198	Measure Cylinder Bores for Wear Range 2" to 3-1/2" 
DIAL CALIPER	19199	Measure Engine Wear Range 0" to 6" Accurate to .001" 
TACHOMETER	19200	Set Correct Idle and Top No Load RPM Range 800 to 50,000 RPM 
RING EXPANDER	19340	Remove and install piston rings 

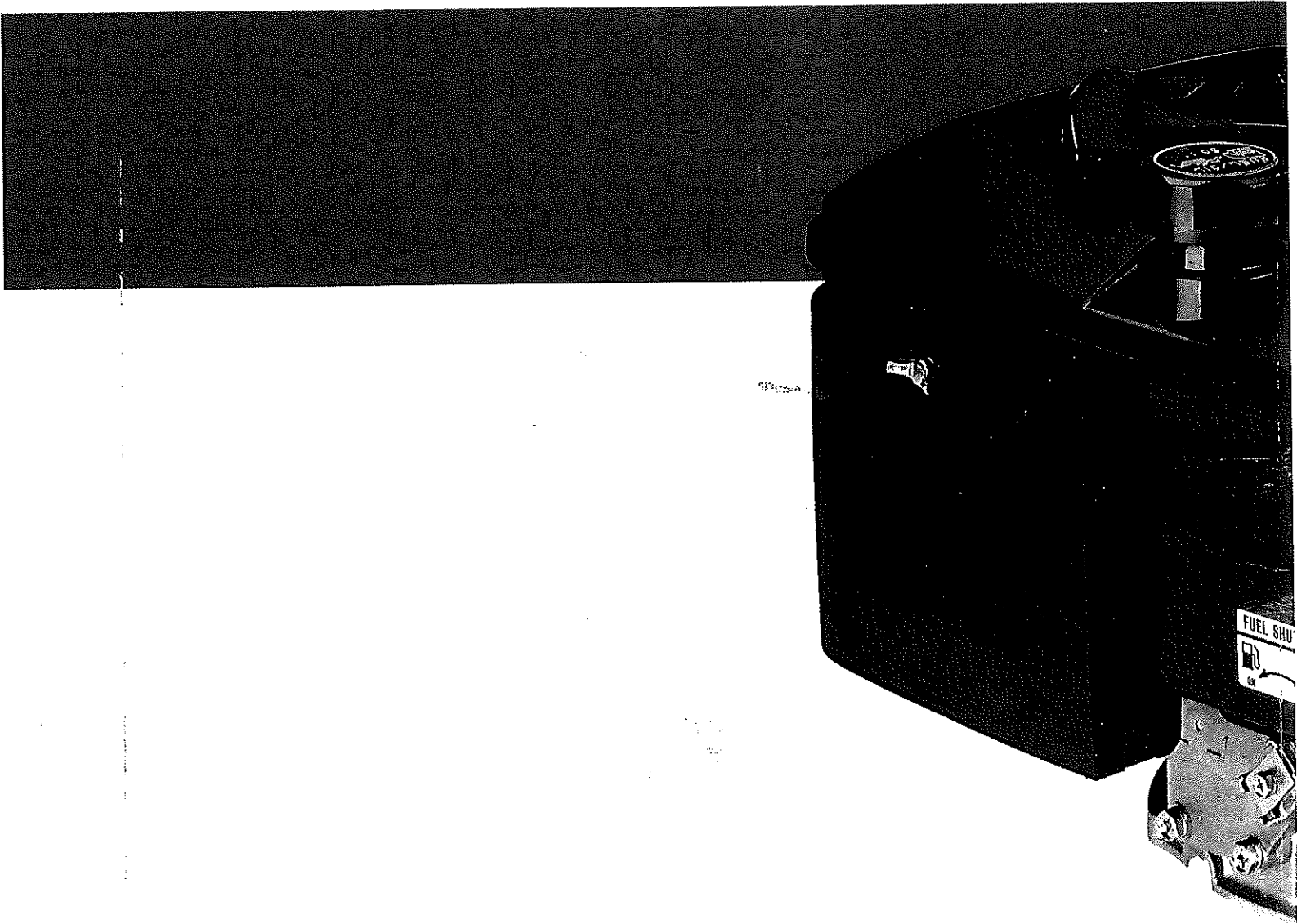
The following tools, while not required, are recommended for complete engine repair.

DESCRIPTION	TOOL NO.	USE
PAINT, 13 oz. SPRAY CAN	271402 271403 271675	Ice White Satin Black American Red 

# TOOLS

The following tools, while not required, are recommended for complete engine repair.

DESCRIPTION	TOOL NO.	USE
<p>PULLER KIT</p> <p>CRANKSHAFT PULLER PULLER STUD PULLER PLATE PULLER STUD PULLER SCREW BUSHING BUSHING NUT WASHER WASHER</p>	<p>19332</p> <p>19314 19315 19316 19317 19318 19319 19320 94348 94349 94350</p>	
DIGITAL MULTIMETER	19357	<p>Measure electrical equipment</p> <p>AC Volts, 0 to 750 DC Volts, 0 to 1000 Ohms, 0 to 320,000,000 AC &amp; DC Amps, 0 to 10 Continuous 0 to 20 for 30 Seconds Audible Diode Test Audible Continuity Test Auto Ranging</p>
<p>FIX-A-THREAD KITS</p> <p>THREAD INSERT REFILLS</p>	<p>100010 100011 100013 100017 100018 100020</p>	<p>For Repairing Damaged and Stripped Threads</p> <p>Thread Repair Kit M5x.8 Thread Repair Kit M6x1 Thread Repair Kit 14mm Spark Plug</p> <p>M5x.8 Refill M6x1 Refill 14mm Spark Plug Refill - 3/8"</p>
GASOLINE TESTER	100023	<p>Use to determine the alcohol content in gasoline</p>
2 CYCLE ENGINE OIL	272075	<p>Certified NMMA and BIA TC-W</p>



**The power in power equipment**