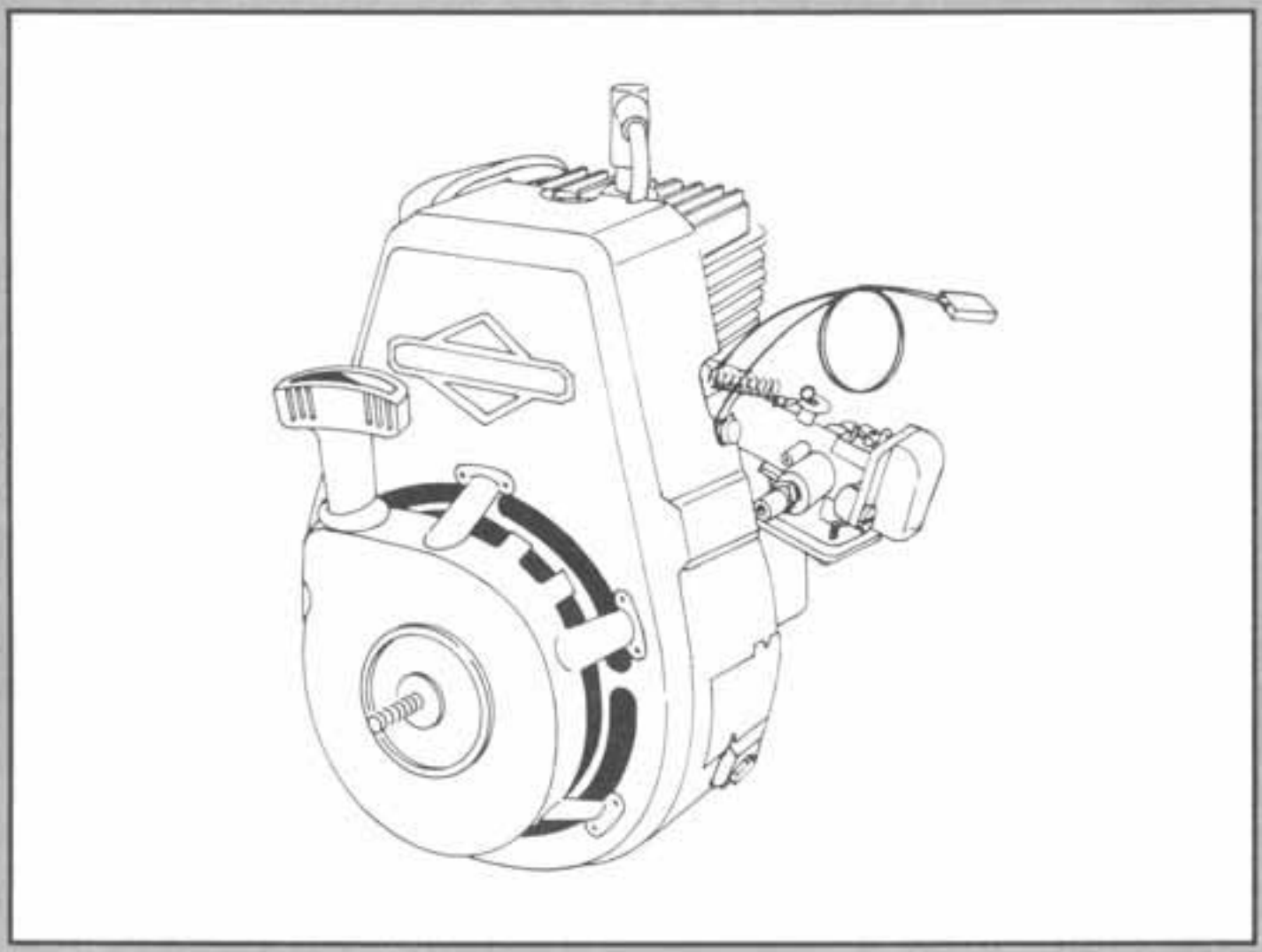
BRIGGS & STRATTON

2 CYCLE ENGINE SERVICE AND REPAIR INSTRUCTIONS



BRIGGS & STRATTON CORPORATION, Milwaukee, Wisconsin 53201, U.S.A.

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FORM MS-7679-6/86

FORWARD

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 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 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, micrometers, scale, etc.

TEST — Analyze with proper test equipment.

REPLACE — This usually means to take off the old part and reassemble it or replace with a new one.

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

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COMMON SPECIFICATIONS

2 CYCLE ENGINES

MODEL SERIES 62030 - 62033

Armature Air Gap	.006 - .010" (.15 - .25 mm)
Armature Resistance	
Primary	.2 - .3 Ohms
Secondary	2500 - 3500 Ohms
Breaker Plunger Reject Dimension	.931" (23.6 mm) or less
Breaker Point Gap	.020" (.51 mm)
Carburetor Adjustment, Initial	1-1/2 turns
Compression P.S.I.	
Engines without Compression Release	90 to 110 P.S.I. (6.32 to 7.73 kp/cm²)
Engines with Compression Release	80 to 90 P.S.I. (5.62 to 6.32 kp/cm²)
Condensor Capacitance	.16 - .24 Microfarads
Crankshaft End Play	.002 - .013" (.05 - .33 mm)
Crankshaft Reject Dimensions	
Magneto Journal	.7515" (19.088 mm) or less
Crankpin Journal	.7420" (18.846 mm) or less
P.T.O. Journal	.7515" (19.088 mm) or less
Cylinder Bore, Standard	2.125" (53.975 mm) [replace cylinder if worn .003" (.076 mm) or more than .0025" (.063 mm) out of round]
Spark Plug Gap	.030" (.76 mm)

TORQUE SPECIFICATIONS

	In./Lbs.	mkp	nm
Back Plate to Cylinder	85	.97	9.60
Carburetor Mounting Screws	100	1.15	11.29
Compression Release Cover	30	.35	3.39
Connecting Rod	55	.63	6.21
Crankcase Cover	90	1.04	10.17
Muffler Bolts	115	1.32	12.99
Spark Plug	170	1.95	19.20
Starter Clutch	30†	4.14	40.67
Starter Motor Bracket	100	1.15	11.29
Transfer Port Covers	20	.23	2.25

†Ft./Lbs.

2 Cycle Repair Instructions (Form 7879)

Section 1
GENERAL INFORMATION

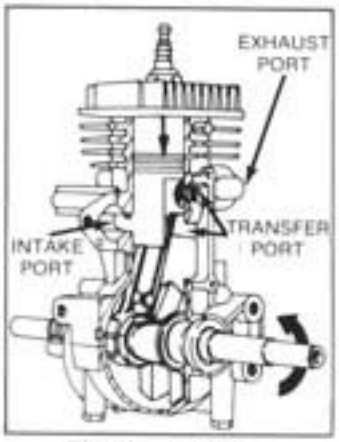


Fig. 1 — Power

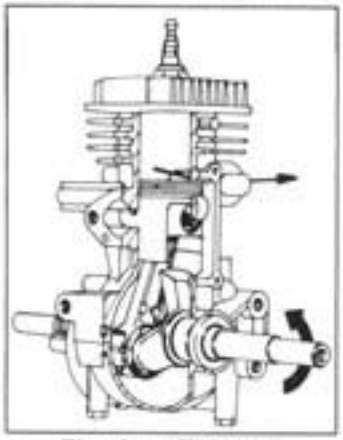


Fig. 2 — Exhaust

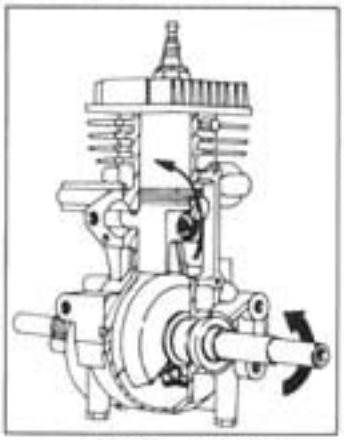


Fig. 3 — Intake

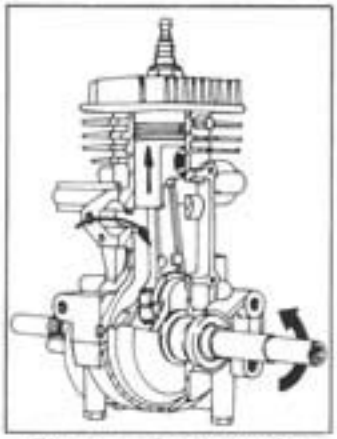


Fig. 4 — Compression

All Briggs & Stratton 2 cycle engines are of the same basic 2 stroke cycle design. It is 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 normal air 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.

IN THE INTEREST OF SAFETY

DANGER

DO NOT RUN THE ENGINE IN AN ENCLOSED AREA. Exhaust gases contain carbon monoxide, an odorless and deadly poison.

A FIRE OR EXPLOSION CAN OCCUR RESULTING IN PERSONAL INJURY IF THE FOLLOWING INSTRUCTIONS ARE NOT FOLLOWED:

1. DO NOT FILL GASOLINE TANK while engine is running. Refuel, ONLY, after engine has cooled down.
2. Do not operate the engine when an odor of gasoline is present or other explosive conditions exist.
3. If gasoline is spilled, move machine away from the area of the spill and avoid creating any source of ignition until the gasoline has evaporated.
4. DO NOT STORE, SPILL OR USE GASOLINE NEAR AN OPEN FLAME, or devices such as a stove, furnace, water heater which utilize a pilot light, or devices which can create a spark.
5. Refuel outdoors preferably, or only in well ventilated areas.
6. DO NOT OPERATE ENGINE WITHOUT A MUFFLER, inspect periodically and replace, if necessary.
7. Periodically clean the muffler area to prevent grass, dirt and combustible material from accumulating.
8. DO NOT use this engine on any forest covered, brush covered or grass covered unimproved land unless a spark arrester is attached to the muffler.
9. Except for adjustment, DO NOT operate the engine if air cleaner or cover directly over the carburetor air intake is removed.

WARNING

DO NOT RUN ENGINE AT EXCESSIVE SPEEDS. Operating an engine at excessive speeds increases the danger of personal injury.

DO NOT TAMPER WITH GOVERNOR SPRINGS, GOVERNOR LINKS OR OTHER PARTS WHICH MAY INCREASE THE GOVERNED ENGINE SPEED.

Do not tamper with the engine speed selected by the original equipment manufacturer.

DO NOT TOUCH hot mufflers, cylinders or fins as contact may cause burns.

Dirt and grass clippings or other debris, in cooling fins or governor parts can affect engine speed.

TO PREVENT HAND OR ARM INJURY, always pull starter cord rapidly to avoid kickback.

ALWAYS KEEP HANDS AND FEET CLEAR OF MOVING OR ROTATING PARTS.

USE CLEAN GASOLINE

We recommend "regular or low-lead" grade gasoline for all Briggs & Stratton 2 cycle engines. The use of low-lead gasolines will result in reduced combustion deposits.

We also recommend that gasoline be purchased in small quantities, not more than a 30-day supply. FRESH gasoline minimizes gum deposits, and also insures a fuel with volatility tailored for the season.

NOTE: We DO NOT recommend the use of gasoline which contains alcohol, such as gasohol. However, if gasoline with alcohol is used, it MUST NOT contain more than 10 percent Ethanol and MUST be removed from the engine during storage. DO NOT use gasoline containing Methanol.

FUEL/OIL MIXTURE

Use a quality BIA certified for service TC-W 2-cycle oil. Purchase clean, fresh "regular" or "low lead" winter grade gasoline.

INITIAL START ONLY: For proper break-in, the first tank of fuel must have a gasoline to oil ratio of 16: 1. In a separate container, thoroughly mix 8 ounces (0.25 liters) of oil with 1 gallon (3.79 liters) of gasoline.

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

FUEL OIL MIXTURE CHART

U.S.		Imperial		Metric	
Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Gallons	2 Cycle Oil Ounces	Gasoline Liters	2 Cycle Oil Liters
1 (Break-In)	8 (Break-In)	1 (Break-In)	10 (Break-In)	4 (Break-In)	0.25 (Break-In)
1	4	1	5	4	0.125
2	8	2	10	8	0.25
5	20	5	25	20	0.625

PRIME ENGINE

With thumb covering vent hole, push primer button on control panel required number of times as illustrated.

DO NOT operate engine in temperatures above 50° F.

Do not overprime as a flooding condition may occur.

A warm engine requires little or no priming.

TEMPERATURE RANGE	PUSH PRIMER
10° F to 40° F	2
Under 10° F	3

Check Carburetion

Before making a carburetion check, be sure the fuel tank has an ample supply of fresh, clean gasoline with the proper fuel-oil mix ratio. See that the shut-off valve is open and fuel flows freely through the fuel line. Inspect and adjust the needle valve. Check to see that the choke closes completely. If engine will not start, remove and inspect the spark plug. If plug is wet, look for —

1. Overchoking.
2. Excessively rich fuel mixture.
3. Water in fuel.
4. Inlet valve stuck open.
5. "O" ring not seated.

If plug is dry, look for —

1. Leaking carburetor mounting gaskets.
2. Gummy or dirty carburetor.
3. Carburetor inlet valve stuck shut.
4. Inoperative fuel pump.
5. Leaking crankcase seal.
6. Crankshaft seals damaged.
7. Empty fuel tank.

A simple check to determine if the fuel is getting to the combustion chamber through the carburetor, is to remove the spark plug and pour a small quantity of gasoline through the spark plug hole. REPLACE THE PLUG. If the engine fires a few times and then stops, look for the same condition as for a dry plug.

Equipment — Effecting Engine Operation

Frequently, what appears to be a problem with engine operations, such as hard starting, vibration, etc., may be the fault of the equipment powered by the engine rather than the engine itself. Since many varied types of equipment are powered by Briggs & Stratton engines, it is not possible to list all of the various conditions that may exist. Listed are the most common effects of equipment problems, and what to look for as the most common cause.

Hard Starting or Will Not Start

1. Starting under load — Make sure the unit is disengaged when engine is started; or if permanently engaged, does not have a heavy starting load.
2. Check remote control assembly for proper choke cable adjustment.
3. Check electrical system for shorted or grounded wires, loose or corroded connections, or defective switches.
4. Crankcase leakage.
5. Empty fuel tank.
6. Fuel tank cap vents plugged.

Vibration

1. Paddles on auger could be bent or out of balance — remove and balance or replace.
2. Mounting bolts loose — tighten.
3. Bent crankshaft. REPLACE. DO NOT STRAIGHTEN.
4. Loose drive chain or belt.

Power Loss

1. Bind or drag in unit due to ice or snow build-up — if possible, disengage and stop engine. Operate unit manually to feel for any binding action.
2. No lubrication in transmission or gear box.
3. Excessive drive chain or belt tension may cause seizure.
4. Crankcase leakage.
5. Incorrect fuel-oil mixture.

Noise

1. Auger or paddle pulley — an oversize or worn coupling can result in knocking, usually under acceleration. Check for fit, or tightness.
2. No lubrication.
3. Loose or worn drive chain or belt.

GENERAL INFORMATION
Check-Up

CHECK-UP

1

Most complaints concerning engine operation can be classified as one or a combination of the following:

1. Will not start or hard starting.
2. Engine misses.
3. Lack of power.
4. Knocks or is noisy.
5. Overheating.
6. Surges or runs unevenly.
7. Stalls.
8. Vibration.

When the cause of malfunction is not readily apparent, perform a check of the Compression, Ignition and Carburetion Systems. This check-up, performed in a systematic manner, can usually be done in a matter of minutes. It is the quickest and surest method of determining the cause of failure. This check-up will point up possible cause of future failures, which can be corrected at the time. The basic check-up procedure is the same for all engine models, while any variation, by model will be shown under the subject heading.

NOTE: What appears to be an engine malfunction may be a fault of the powered equipment rather than the engine. If equipment is suspect, see Equipment, affecting engine operation.

Check Compression

To check compression, use a compression tester. Remove the spark plug and install the tester. Crank the engine, using the rewind starter and observe the reading on the gauge. The P.S.I. reading should be 90 to 110 P.S.I. (6.32 to 7.73 kp/cm²) for non-compression release engines and 80 to 90 P.S.I. (5.62 to 6.32 kp/cm²) for compression release engines.

If compression is below 90 P.S.I. (engines without compression release) or 80 P.S.I. (engines with compression release), look for —

1. Worn or stuck rings.
2. Worn or scored cylinder bore.
3. Broken connecting rod.
4. Distorted cylinder bore.
5. Broken rings.
6. Crankcase leakage.

Check Ignition

Remove the spark plug. Spin the flywheel rapidly with one end of the ignition cable clipped to the 19051 tester and with the other end of the tester grounded on the cylinder head. If spark jumps the .166" tester gap, you may assume the ignition system is functioning satisfactorily. Try new spark plug. See Section 2.

If spark does not occur, disconnect stop switch wire from engine, and look for —

1. Incorrect armature air gap.
2. Sheared flywheel key.
3. Incorrect breaker point gap.
4. Dirty or burned breaker points.
5. Breaker plunger stuck or worn.
6. Shorted or open ground wire (when so equipped).
7. Shorted or grounded stop switch (when so equipped).
8. Condenser failure.
9. Armature failure.
10. Magnetron™ failure.

NOTE: If engine runs but misses during operation, a quick check to determine if ignition is or is not at fault can be made by inserting the 19051 tester between the ignition cable and the spark plug. A spark miss will be readily apparent. See Section 2.

NUMERICAL MODEL NUMBER SYSTEM

This handy chart explains the unique Briggs & Stratton 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:

A. The first one or two digits indicate the CUBIC INCH DISPLACEMENT.

B. The first digit after the displacement indicates BASIC DESIGN SERIES, relating to cylinder construction, ignition, general configuration, etc.

C. The second digit after the displacement indicates POSITION OF CRANKSHAFT and TYPE OF CARBURETOR.

D. The third digit after the displacement indicates TYPE OF BEARINGS and whether or not the engine is equipped with REDUCTION GEAR or AUXILIARY DRIVE.

E. The last digit indicates the TYPE OF STARTER.

CUBIC INCH DISPLACEMENT	FIRST DIGIT AFTER DISPLACEMENT BASIC DESIGN SERIES	SECOND DIGIT AFTER DISPLACEMENT CRANKSHAFT, CARBURETOR GOVERNOR	THIRD DIGIT AFTER DISPLACEMENT BEARINGS, REDUCTION GEARS & AUXILIARY DRIVES	FOURTH DIGIT AFTER DISPLACEMENT TYPE OF STARTER
6	0	0-Horizontal Diaphragm	0-Plain Bearing	0-Without Starter
8	1	1-Horizontal Vacu-Jet	1-Flange Mounting Plain Bearing	1-Rope Starter
9	2	2-Horizontal Pulsa-Jet	2-Ball Bearing	2-Rewind Starter
10	3	3-Horizontal Flo-Jet Pneumatic Governor	3-Flange Mounting Ball or Needle Bearing	3-Electric-120 Volt, Gear Drive
11	4	4-Horizontal Flo-Jet Mechanical Governor	4-	4-Elec. Starter-Generator-12 Volt, Belt Drive
13	5	5-Vertical Vacu-Jet	5-Gear Reduction (6 to 1)	5-Electric-12 Volt Gear Drive Starter Only
17	6	6-	6-Gear Reduction (6 to 1) Reverse Rotation	6-Alternator Only*
19	7	7-Vertical Flo-Jet	7-	7-Electric-12 Volt Gear Drive Starter with Alternator
22	8	8-	8-Auxiliary Drive Perpendicular to Crankshaft	8-Vertical-Pull Starter
23	9	9-Vertical Pulsa-Jet	9-Auxiliary Drive Parallel to Crankshaft	*Digit 6 formerly used for "Wind-Up" Starter on 60000, 80000 and 92000 Series
24				
25				
32				
40				
42				

To identify Model Series 62032

6	2	0	3	2
6 Cubic Inch	Design Series 2	Horizontal Diaphragm	Flange Mounting Ball Bearing or Needle Bearing	Rewind Starter

2 Cycle Repair Instructions (Form 7879)

Section 2
IGNITION

Briggs & Stratton 2 cycle engines use two types of ignition:

1. MAGNETRON™ ignition, a self-contained transistor module (no moving parts), ignition armature and flywheel.

2. A flywheel magneto system with internal breaker points and condenser under the breaker point cover.

CHECK IGNITION

Remove armature lead from the spark plug terminal and remove spark plug. Attach spark tester tool #19051 to cylinder head and armature lead to tester terminal, Fig. 1. Spin the flywheel rapidly with starter. NOTE: Flywheel must rotate at 350 RPM, minimum with MAGNETRON™ ignition. If spark jumps .166 (4.2 mm) tester gap, you may assume that ignition is good. NOTE: To determine if an engine miss is ignition or not, use tester #19051 in series with armature lead and spark plug, Fig. 2. Start and run engine. 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.

NOTE: Flywheel must rotate at 350 RPM, minimum with MAGNETRON™ ignition.

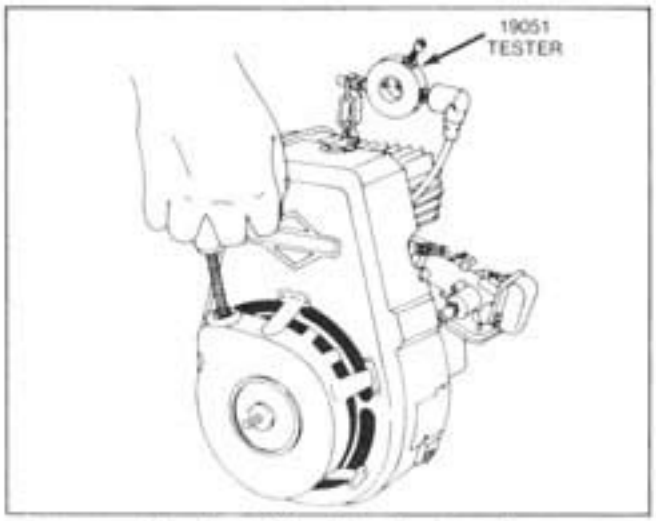


Fig. 1 — Checking for Spark

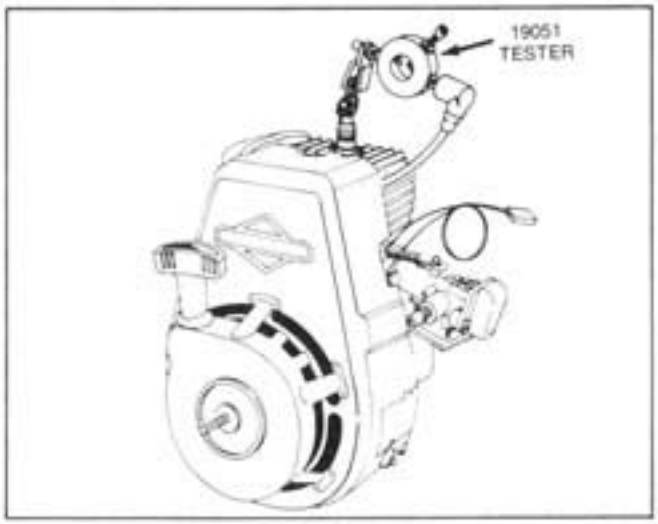


Fig. 2 — Check for Missing — Spark or Fuel

SPARK PLUG

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

Standard	Resistor	Manufacturer
CJ-8	RCJ-8	Champion
235	245	Autolite
WS9E	WRS9E	Robert Bosch

SPARK PLUG CLEANING

Clean spark plugs with a pen knife or wire brush and solvent and set gap at .030 (.076 mm) for all models, Fig. 3. If electrodes are burned away, or the porcelain is cracked, replace with a new plug. DO NOT USE ABRASIVE CLEANING MACHINES.

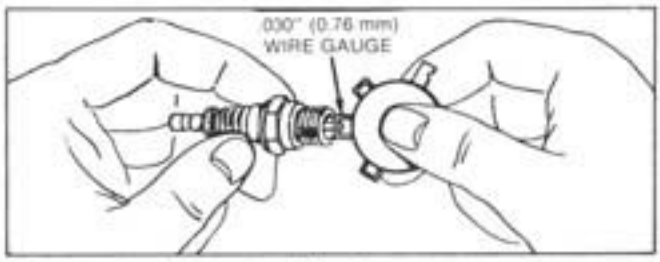


Fig. 3

IGNITION
General

COIL AND CONDENSER TESTING

Use an approved tester to test coils and condensers. Specifications are supplied by the tester manufacturer or can be found in Briggs & Stratton form MS-7862.

IGNITION
Flywheel Type — MAGNETRON™

2

The flywheel is located on the crankshaft with a special aluminum key. It is held in place by a Belleville washer and starter clutch. The flywheel key must be in good condition to assure proper location of the flywheel for ignition timing. DO NOT use a steel key under any circumstances. Use only the special metal key, as originally supplied.

IGNITION
Flywheel Type — Internal Breaker

The flywheel is located on the crankshaft with a soft zinc key. It is held in place by a Belleville washer and starter clutch. The flywheel key must be in good condition to insure proper location of the flywheel for ignition timing. DO NOT use a steel key under any circumstances. Use only the soft metal key as originally supplied.

CHECKING KEYWAYS

The keyway of both flywheel and crankshaft should not be distorted. Flywheels are die cast aluminum with ceramic magnets.

REMOVE FLYWHEEL STARTER CLUTCH

Use flywheel holder tool #19167 to hold flywheel from turning. Use starter clutch wrench, tool #19244 and appropriate wrench to remove starter clutch. Fig. 4. Clutch has right hand threads.

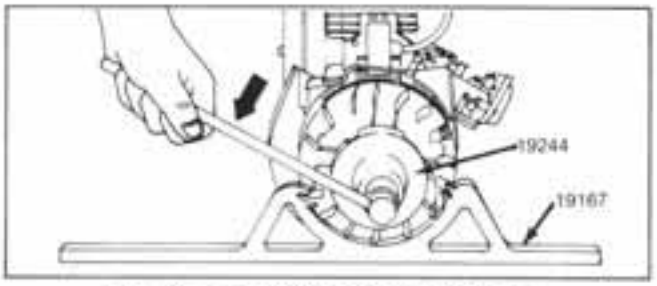


Fig. 4 — Removing Starter Clutch

REMOVE FLYWHEEL

Two holes are provided in the flywheel to use #19069 flywheel puller and nut #92284, Fig. 5, to protect the crankshaft threads.

NOTE: CARE IS REQUIRED NOT TO DAMAGE THE FLYWHEEL FINS, MAGNETS OR RING GEAR. Turn puller screws into flywheel puller holes until they bottom. Turn upper puller nuts down on puller bar equally until flywheel is free.

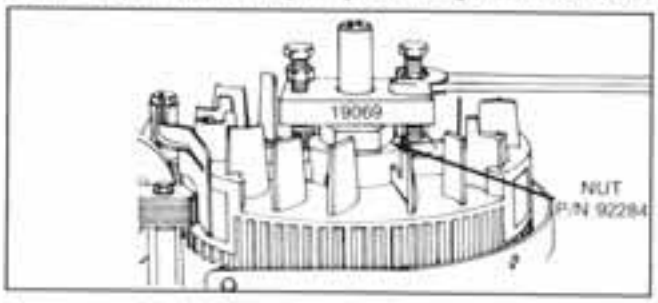


Fig. 5 — Removing Flywheel

REMOVING BREAKER COVER

Care should be taken when removing breaker cover to avoid damaging cover. If cover is bent or damaged, it should be replaced to insure a proper dust seal.

BREAKER POINTS

Breaker point gap on all models, so equipped, is .020" (.51 mm). Breaker points should be checked for contact and for signs of burning or pitting. Points set too wide will advance spark timing and may cause kickback when starting. Points gapped too close retard spark timing and decrease engine power.

REMOVE BREAKER POINTS

Remove movable point by loosening breaker point screw, Fig. 6. The condenser includes the stationary point and is removed by loosening the clamp screw, Fig. 6. Depress the condenser spring to remove the armature primary wire and ground wire.

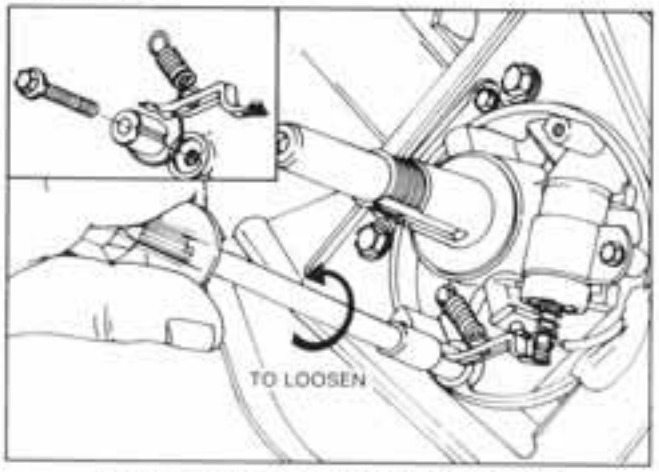


Fig. 6 — Removing Breaker Points

BREAKER POINT PLUNGER

If breaker point plunger is worn to .931" (23.6 mm) or less, it should be replaced, Fig. 7.

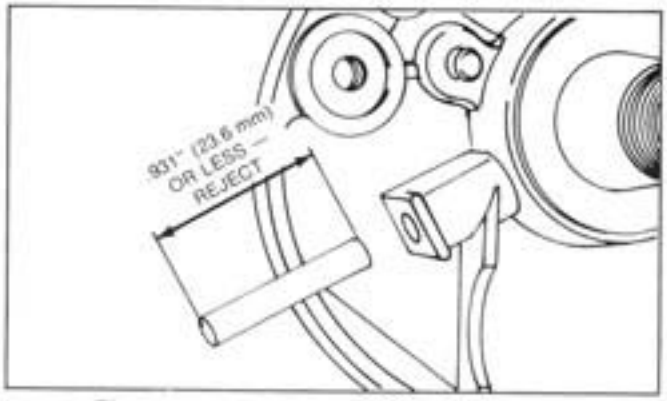


Fig. 7 — Breaker Plunger Inspection

OIL WIPER

Inspect oil wipers to make sure that oil is present in wiper. If wiper is dry, soak in a #10W motor oil and squeeze out excess oil.

INSTALL BREAKER POINTS

Insert breaker point plunger in plunger hole and install oil wiper - level with oil wiper hole and in contact with crankshaft. Install breaker post, ground wire and movable point arm so groove of post fits notch in recess of cylinder, Fig. 8, insert. Tighten breaker post screw with a 1/4" nut driver or socket. Hook open loop of breaker spring through two holes in breaker point arm, Fig. 8. Hook closed loop of breaker spring on groove of spring post and pull on breaker arm until arm snaps into groove on breaker post, Fig. 8. This keeps tension on movable point arm and breaker plunger. Slide condenser spring on condenser point post and depress spring using spring depressor. With spring compressed, insert armature primary wire and ground wire on models using ground wire. Release spring, Fig. 9.

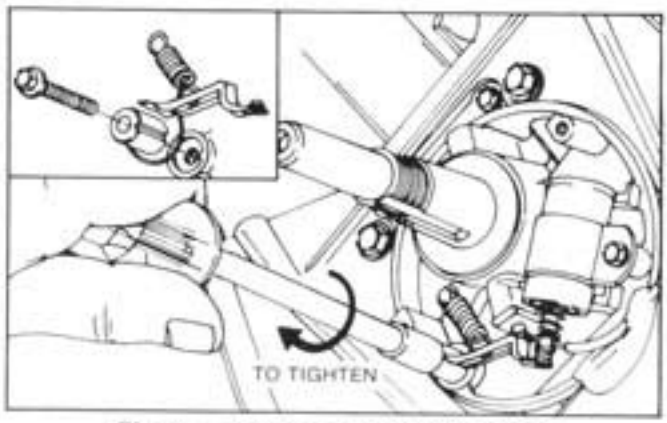


Fig. 8 — Installing Breaker Points

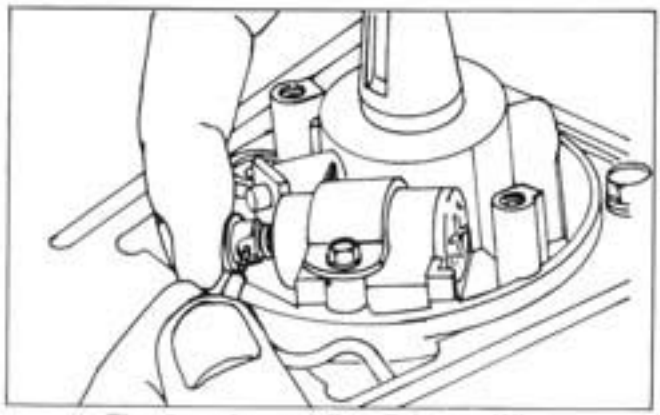


Fig. 9 — Assembling Primary Wire

ADJUSTING BREAKER POINT GAP

Turn crankshaft until points open to widest gap. Adjust breaker point gap by moving condenser forward or backwards with screwdriver until a gap of .020" (0.5 mm) is obtained, Fig. 10. NOTE: Always clean breaker points after adjustment. Open the points and insert a piece of lintless paper. Draw paper through the points. Open point when removing paper so it will not tear, leaving paper between the points.

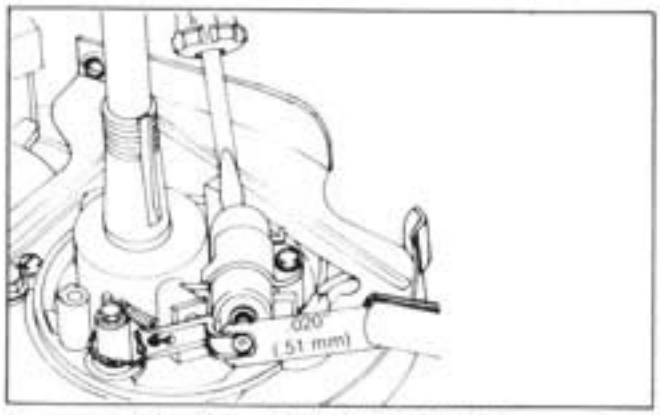


Fig. 10 — Adjusting Point Gap

BREAKER POINT COVER

The breaker point cover, Fig. 11, protects the points from dirt. The opening for the primary and/or ground wire should be sealed with #2 Permatex or similar sealer to prevent dirt from entering the breaker box. Slide breaker point cover gasket down crankshaft until plunger and oil wiper cavity are covered. Install breaker point cover and tighten the two screws. Cover must not be distorted or it will not seal around the outer edge. Replace if damaged.

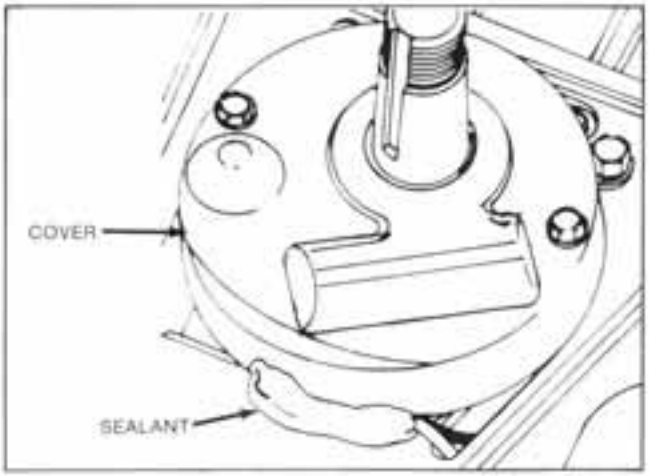


Fig. 11 — Breaker Cover and Sealant

REMOVING ARMATURE AND MAGNETRON™ IGNITION

The flywheel does not need to be removed to service MAGNETRON™ except to check keyways and flywheel key . If damaged, replace parts.

Remove armature screws and lift off armature. Use breaker point condenser P/N 294628 or 5/32" punch to release stop switch wire from MAGNETRON™ module. Fig. 12. Stop switch wire is soldered to module and armature primary wires. Unsolder to disconnect.

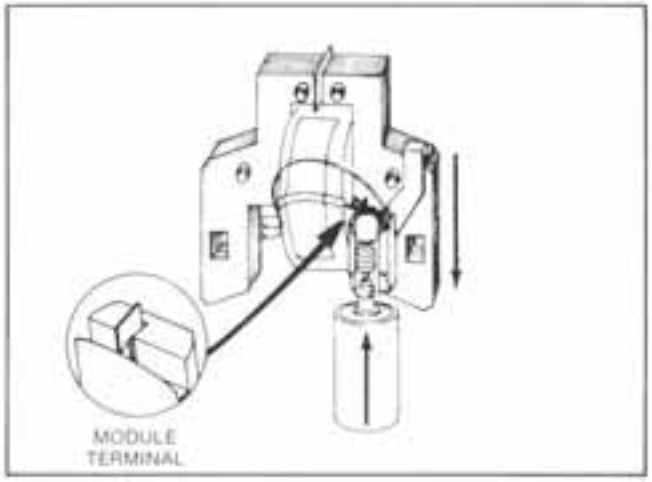


Fig. 12 — MAGNETRON™ Module

REMOVING MAGNETRON™ MODULE

Unsolder armature primary wire from module wire. Fig. 13. Remove tape and move module ground wire to clear armature coil and laminations. Push module retainer away from laminations and push module off laminations. Fig. 14.

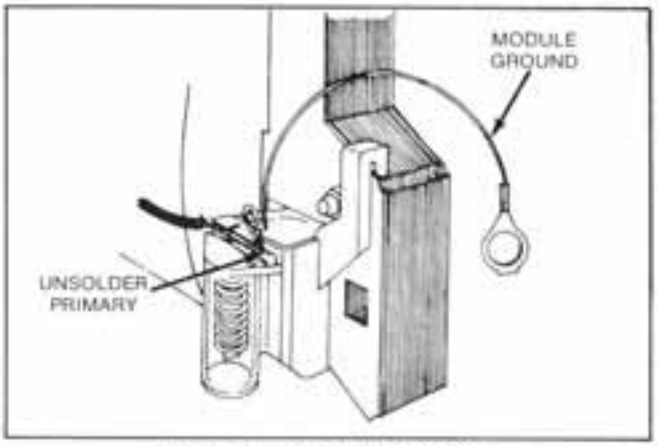


Fig. 13 — Unsolder Wires

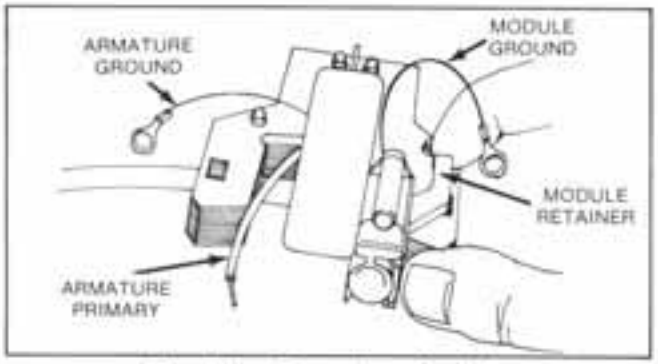


Fig. 14 — Removing Module

INSTALLING MAGNETRON™ MODULE

Module is installed in reverse order of removal. Note that module retainer must be on back side of coil laminations, Fig. 15. Use #2 Permatex™ or similar sealant to hold ground wires in place. Fig. 15.

Ignition timing is controlled by the location of the flywheel and crankshaft keyways on 2 cycle engines.

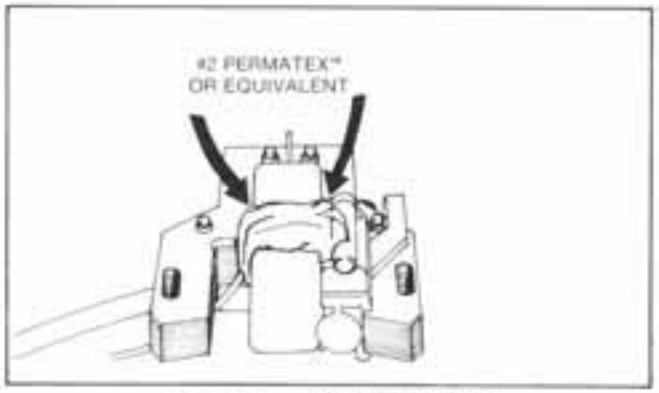


Fig. 15 — Sealing Wires

INSTALL ARMATURE— MAGNETRON AND BREAKER POINT IGNITION

Route armature primary wire (breaker point ignition) or ground wire (MAGNETRON™ ignition) as shown in Fig. 16. Install armature and governor air vane, Fig. 18. Mounting holes in armature are slotted. Push armature up away from flywheel as far as possible and tighten one screw to hold armature in place.

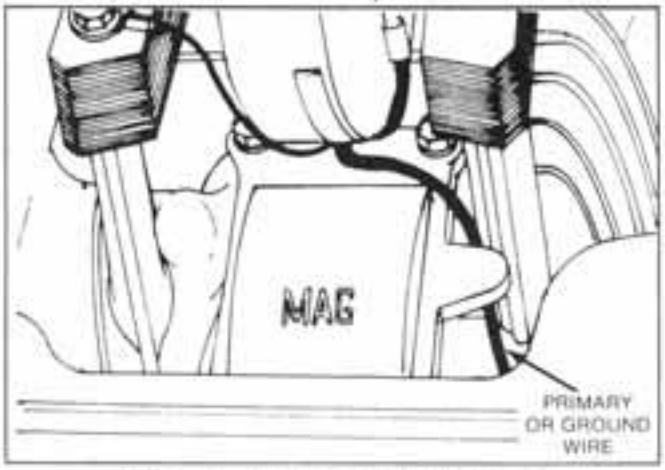


Fig. 16 — Primary Wire Routing

INSTALL FLYWHEEL AND FLYWHEEL KEY

Inspect the key, Fig. 19, for partial shearing. If sheared, replace. Check flywheel and crankshaft keyways for damage. If damaged, replace with new parts, as listed in parts list.

REMOVE ALL OIL OR GREASE, clean flywheel internal taper and tapered end of crankshaft before assemblying flywheel to shaft. Insert correct key into keyway. Slip the spring washer over crankshaft with hollow side toward flywheel. Install flywheel starter clutch.Tighten flywheel starter clutch in the reverse of removal operations. Torque starter clutch to specifications listed in Common Specifications, page II.

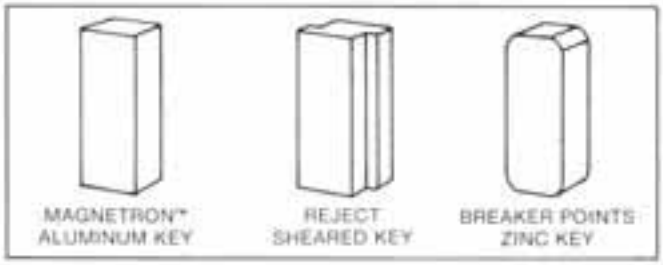


Fig. 17 — Flywheel Keys

WARNING: ON MAGNETRON™ EQUIPPED ENGINES, SPARK CAN STILL OCCUR WITH A SHEARED FLYWHEEL KEY.

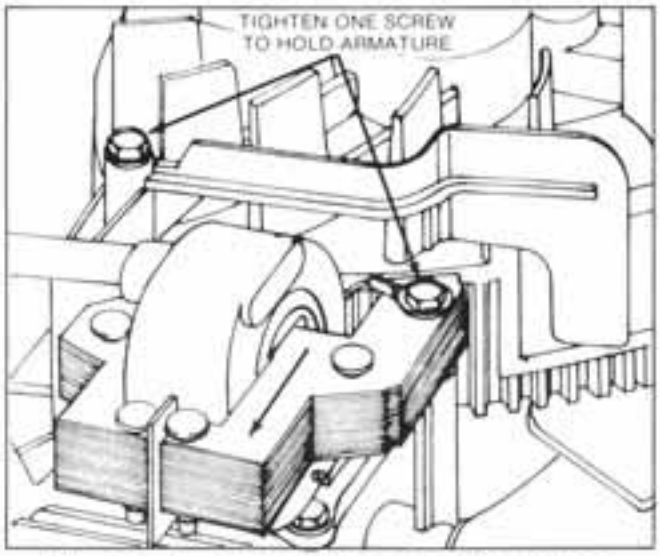


Fig. 18 — Installing Air Vane and Armatures

ADJUST ARMATURE AIR GAP

Set air gap between the flywheel and armature as shown in Common Specifications, page II. With armature up as far as possible, and one screw tightened, slip the proper gauge between armature and flywheel, Fig. 19. Turn flywheel until magnets are directly below the armature. Loosen the one mounting screw and the magnets should pull the armature down firmly against the thickness gauge. Tighten the mounting screws.

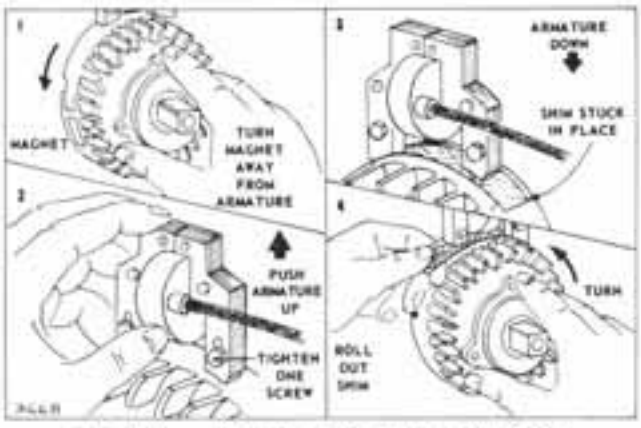


Fig. 19 — Adjusting Armature Air Gap

2 Cycle Repair Instructions (Form 7879)

Section 3
CARBURETION

Briggs & Stratton 2 cycle engines use a diaphragm carburetor with integral fuel pump. Provision is provided for priming the carburetor. Fig. 1.

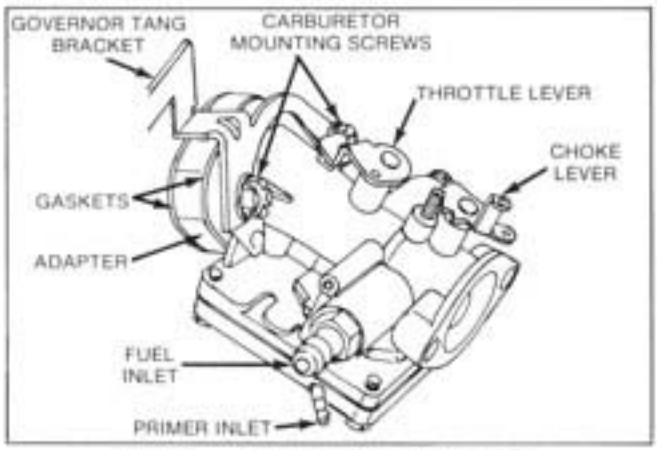


Fig. 1 — Diaphragm Carburetor

OPERATION OF CARBURETOR

Pushing on primer, supplied by equipment manufacturer, forces air pressure to raise regulator diaphragm and open fuel inlet needle. Releasing primer permits the diaphragm spring to lower diaphragm and close fuel inlet needle. This pumping action will draw fuel from the equipment fuel tank through the fuel pump check valve and fill diaphgram chamber with fuel-oil mixture. The last push on primer will push fuel past mixture needle and through venturi metering hole into carburetor venturi. Fig. 2.

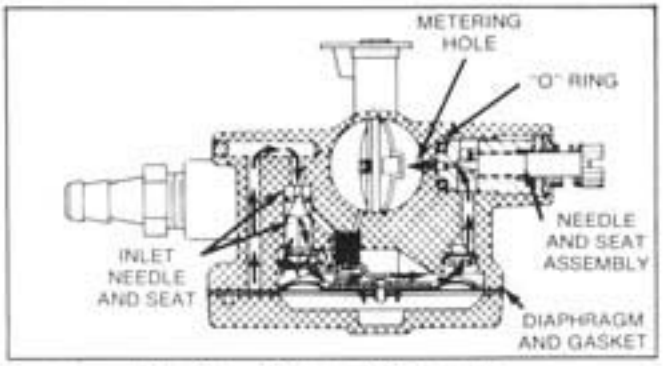


Fig. 2 — Priming Carburetor

The fuel pump portion of the diaphragm is operated by changes in crankcase pressure. When piston is on the compression stroke, the pressure in the crankcase drops pulling fuel pump portion of diaphragm down to compress spring and cup, drawing fuel from equipment fuel tank. When piston skirt opens third (intake) port, crankcase pressure increases and pump, spring and cup push diaphragm up, closing pump inlet valve and opening pump outlet valve. Fig. 3.

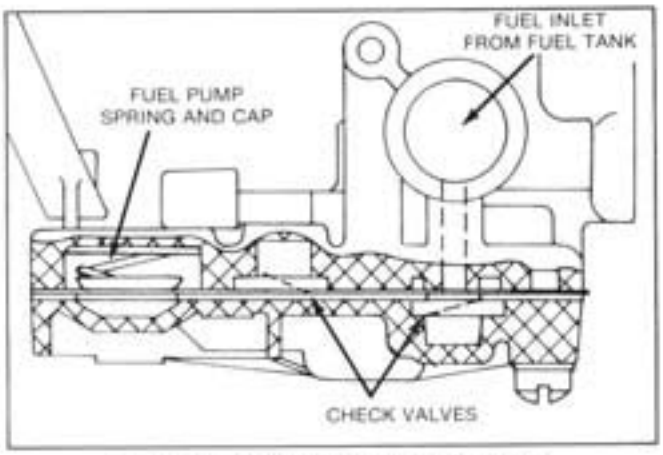


Fig. 3 — Operation of Carburetor

The regulator portion of the diaphragm controls rate of fuel-oil mixture flow in relation to throttle opening. When the throttle is almost closed, the diaphragm will open fuel flow needle valve slightly and when throttle is wide open, fuel flow needle will open wider. Ratio of fuel-oil mixture to air is controlled by needle valve adjustment. Fig. 4A and 4B.

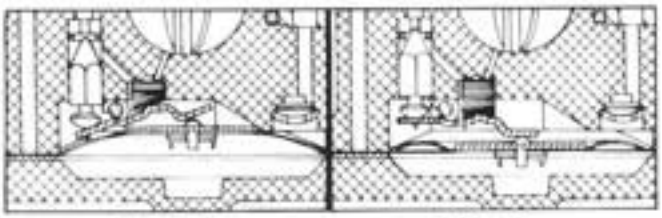


Fig. 4A **Fig. 4B**

CARBURETION
Remove and Disassemble

REMOVE CARBURETOR

Loosen casing clamp screw, "A", Fig. 5 and remove remote control from choke lever. Disconnect primer tube at primer barb. Remove fuel line from carburetor after shutting off fuel supply. If fuel tank does not have a shutoff valve, plug fuel line after disconnecting. Remove two carburetor mounting screws. With carburetor loose, carefully unhook governor link and spring from throttle lever taking care not to bend governor link.

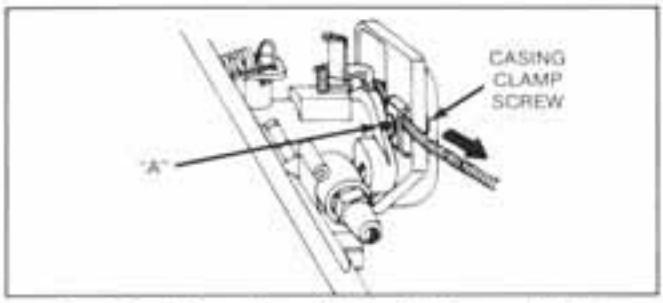


Fig. 5 — Removing Choke Casing and Wire

DISASSEMBLE CARBURETOR

Remove five screws from diaphragm cover and remove cover. When lifting off cover, be careful not to lose pump valve spring, Fig. 6. Remove diaphragm and second valve spring plus pump cup and spring. Remove screw holding hinge pin and lift out inlet lever hinge, hinge pin, spring and inlet needle, Fig. 7.

NOTE: Some carburetors did not have pump valve springs.

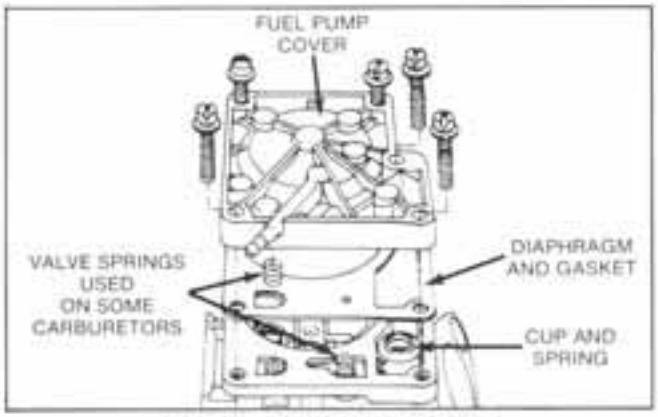


Fig. 6 — Removing Cover

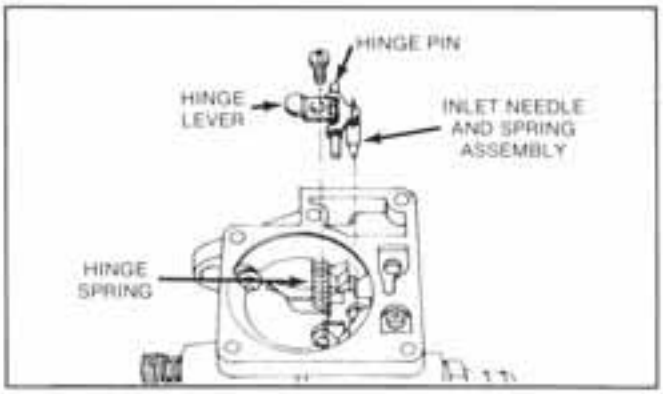


Fig. 7 — Removing Inlet Needle

Use a small hook, such as an automatic choke link, to remove "C" ring. Use a smaller hook to remove inlet seat, Fig. 8.

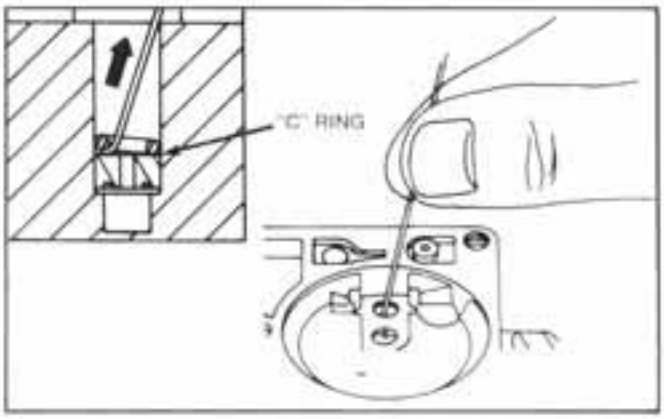


Fig. 8 — Removing "C" Ring and Inlet Seat

REMOVING CHECK VALVE

Use a 1/16 "Allen Wrench" or 1/16 pin punch to pry out check valve seat. With check valve retainer removed, you can remove the rubber check valve, Fig. 9.

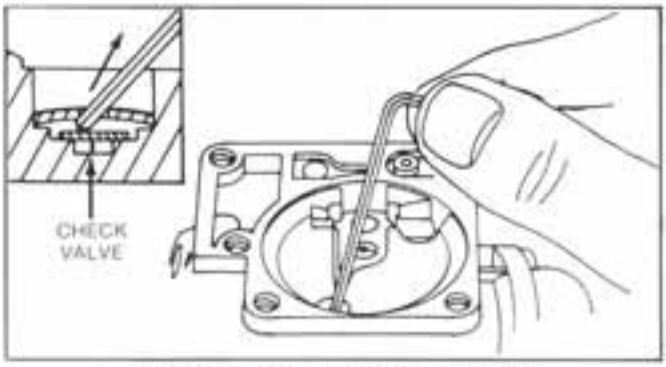


Fig. 9 — Remove Check Valve

REMOVE NEEDLE VALVE ASSEMBLY

Turn needle valve counterclockwise approximately 4 to 5 turns and then pull on needle valve assembly, Fig. 2. Use small hooked tool to remove "O" ring. . NOTE: With carburetor disassembled this far, it is now practical to clean the carburetor in carburetor cleaner.

INSPECT CARBURETOR

Check for worn or damaged parts and replace as needed. Check carburetor body for warpage, Fig. 10. Replace body if a feeler gauge larger than .003" (.076 mm) can be inserted. Check in two directions, Fig. 10.

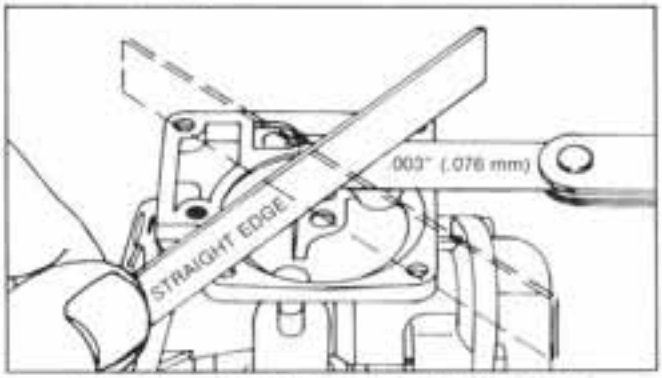


Fig. 10 — Checking for Body Warpage

ASSEMBLE CARBURETOR

Insert new viton seat with grooved side to bottom of cavity. Insert "C" ring 5/16" (7.92 mm) as shown, Fig. 11.

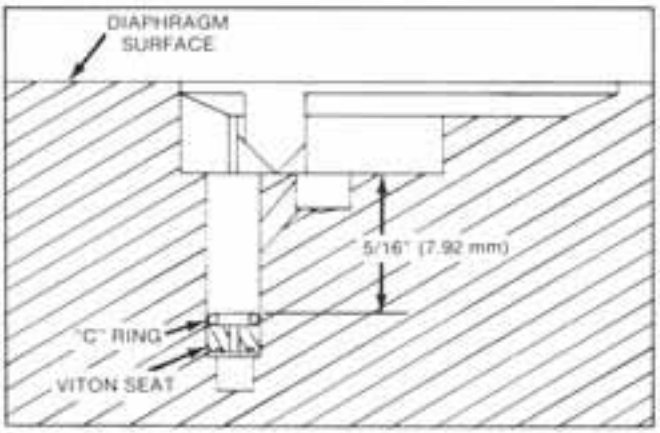


Fig. 11

INSTALL AND ADJUST INLET NEEDLE AND HINGE ASSEMBLY

Place hinge lever spring in pocket, Fig. 12A. Assemble hinge pin, inlet needle lever and inlet needle and spring assembly, making sure spring holds needle against lever, Fig. 12B. Install assembly in carburetor body making sure spring is centered on dimple on lever and install screw.

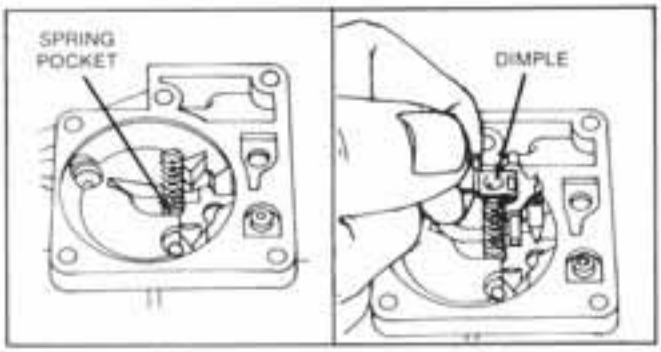


Fig. 12

Set height of hinge lever as shown in Fig. 13A. If bending is required, support needle end of lever to raise lever, Fig. 13B. To lower, bend as shown, Fig. 13C.

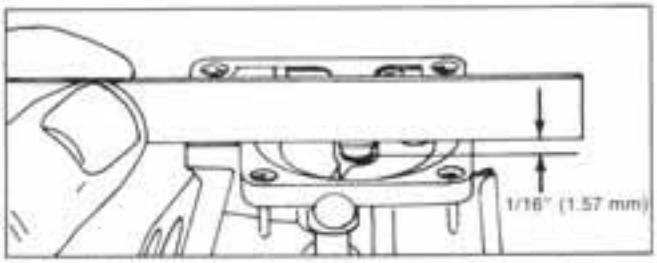


Fig. 13A — Adjusting Diaphragm Hinge Lever

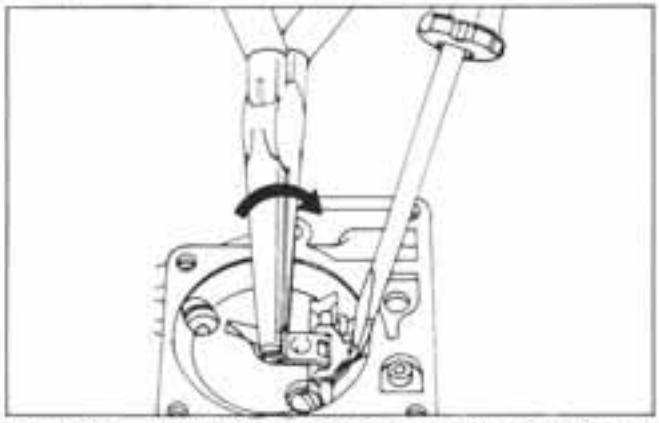


Fig. 13B — Adjusting Diaphragm Hinge Lever (Raise)

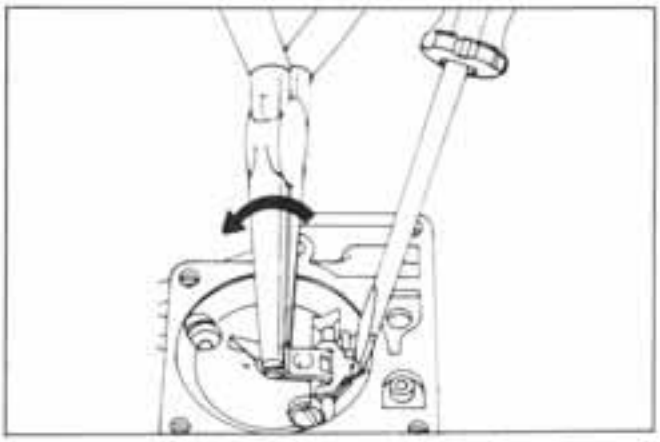


Fig. 13C — Adjusting Diaphragm Hinge Lever (Lower)

CARBURETION
Assembly

INSTALL CHECK VALVE AND RETAINER

Place check valve in pocket, Fig. 14. Then start check valve retainer. Use 1/4 "round punch" to seat and set retainer. One light tap with a hammer is all that is required. Check valve operation by blowing and sucking through needle valve opening while blocking metering holes. If check valve is working correctly, blowing will seat the check valve and sucking will allow air to flow.

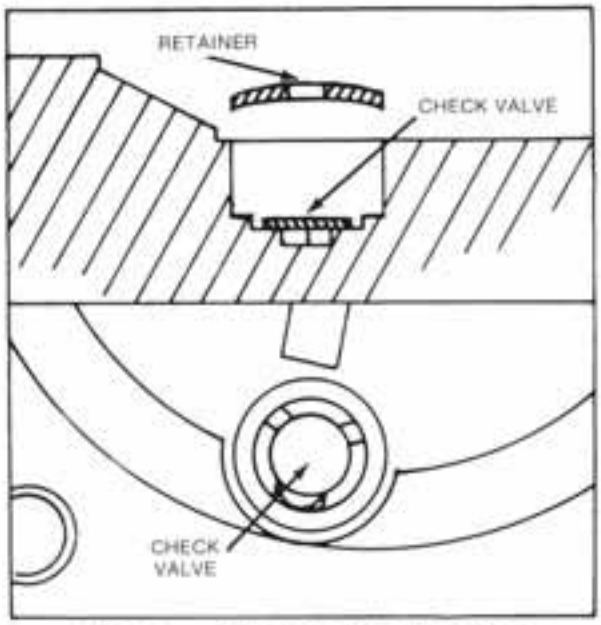


Fig. 14 — Check Valve Installation

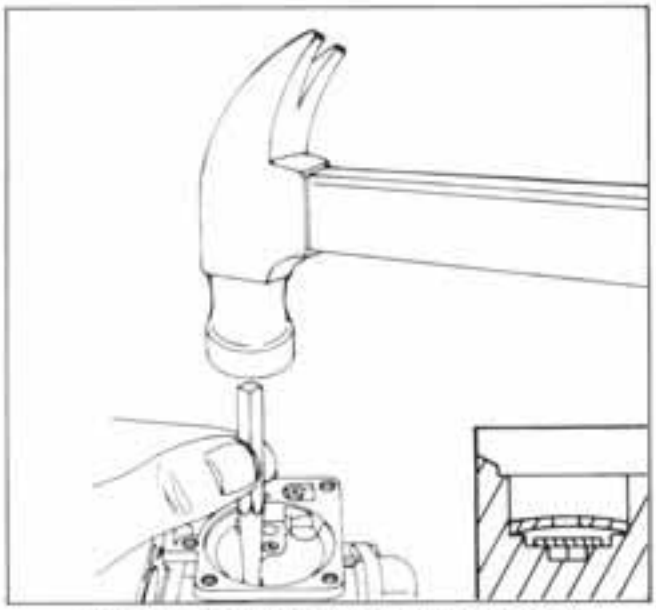


Fig. 15 — Setting Check Valve Retainer

INSTALL DIAPHRAGM AND COVER

Place fuel pump spring and cup in pocket, Fig. 16A. Place one check valve spring in pocket, Fig. 16B. Place diaphragm and gasket on carburetor body and center second check valve spring on check valve, Fig. 16C. Lower cover on to carburetor and start cover screws. Tighten diaphragm cover screws firmly in sequence shown in Fig. 16D.

NOTE: Some carburetors did not use check valve springs.

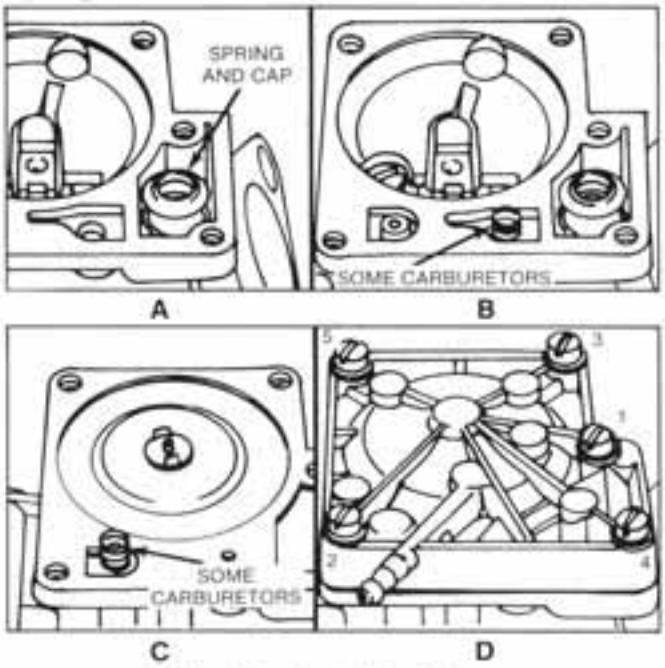


Fig. 16 — Installing Cover

ASSEMBLE THROTTLE AND THROTTLE SHAFT

Place throttle shaft into throttle shaft bore. Using a pencil, Fig. 17A, place throttle valve on throttle shaft. Install screw, checking throttle valve alignment, Fig. 17B. Check operation for freedom of movement.

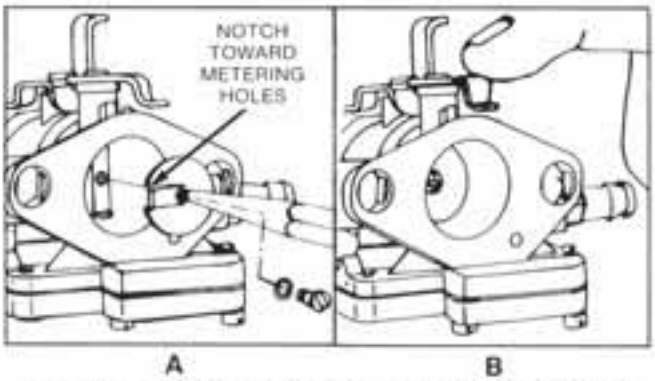


Fig. 17 — Installing Throttle and Throttle Shaft

ASSEMBLE CHOKE SHAFT AND CHOKE PLATE

Slide choke shaft in the choke shaft bore, moving detent spring to clear choke lever detent. Place choke plate on shaft, Fig. 18, with dimples facing in. Tighten screw and check for freedom of movement.

Two styles of choke plates have been used.

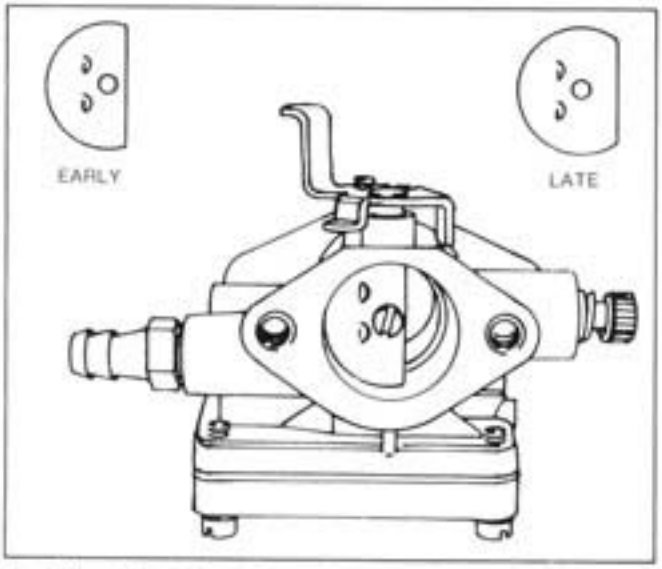


Fig. 18 — Installing Choke Shaft and Plate

ASSEMBLE NEEDLE AND SEAT

Place "O" ring on shoulder of seat and assemble needle spring, sealing washer and metal washer, Fig. 19. Turn needle valve in until sealing washer just touches the seat. Install seat assembly into needle and seat bore aligning flat on the seat with flat in seat bore. Use oil fill tube, part #280131 to firmly seat the assembly, Fig. 20.

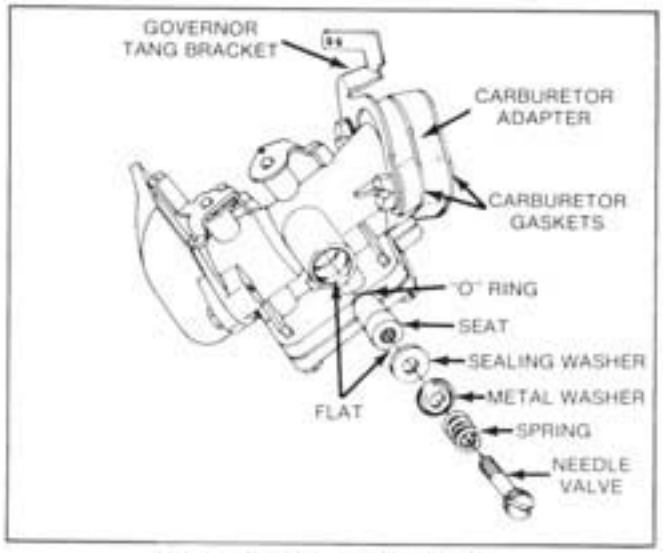


Fig. 19 — Seat Assembly

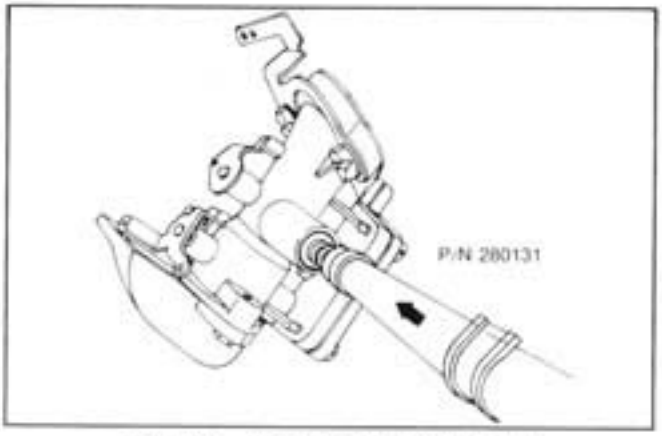


Fig. 20 — Install Seat Assembly

3

INSTALL CARBURETOR

Because the fuel pump uses crankcase vacuum to operate, it is necessary that carburetor spacer and gaskets be installed with the impulse holes in line, Fig. 21.

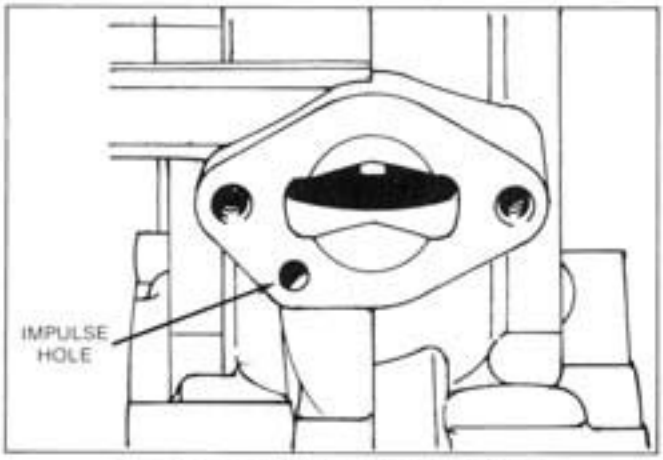


Fig. 21 — Impulse Hole Location

Assemble carburetor to engine as follows:

1. Hook governor link into throttle lever, Fig. 2, Sec. 4, page 1.
2. For ease of assembly to cylinder, pre-assemble governor tang bracket, carburetor gaskets and carburetor adapter using carburetor mounting screws to keep parts in line. Be sure impulse holes are in line, Fig. 19.
3. Mount carburetor and subassembled parts on cylinder. Torque screws to 100 in. lbs. (1.15 mkp, 11.29 nm).
4. Install governor spring as shown, Fig. 2, Sec. 4, page 1.

CARBURETION
Adjustment

CARBURETOR ADJUSTMENTS

Minor carburetor adjustments may be required to compensate for differences in fuel, temperature, altitude or load.

Carburetor adjustments should be made at the same temperature in which operation is expected.

Adjust carburetor — turn needle valve clockwise until it JUST closes.

CAUTION: Needle valve may be damaged by turning it in too far.

Now open needle valve 1-1/2 turns counterclockwise. This initial adjustment will permit the engine to be started and warmed up prior to final adjustment.

3

FINAL ADJUSTMENT

Turn needle valve slowly clockwise (lean) until engine runs smoothly. Now turn needle valve slowly counterclockwise (rich) until engine starts to sputter. This position will provide the best performance.

CAUTION: Needle valve must never be adjusted leaner than 1-1/4 turns open.

ADJUST REMOTE CONTROL CHOKE

Place remote control lever on equipment in choke position. Install control wire and choke lever and loosely install casing clamp screw. Move casing and wire in direction shown by arrow to place carburetor in full choke position, Fig. 22. Tighten casing clamp screw. Operate remote control lever or knob to assure full travel of choke from full open to full choke.

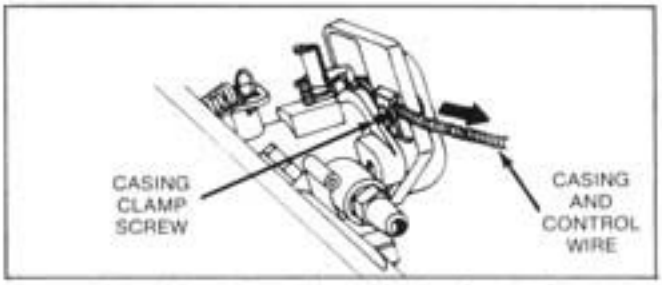


Fig. 22 — Installing Choke Control

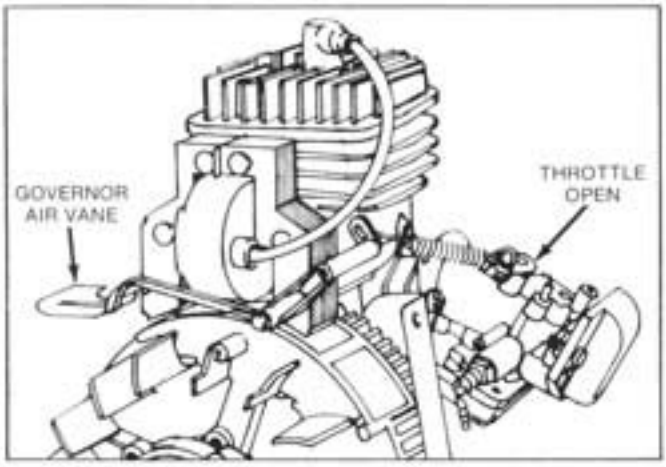
2 Cycle Repair Instructions (Form 7879)

Section 4
GOV. CONTROLS & CARB. LINKAGE

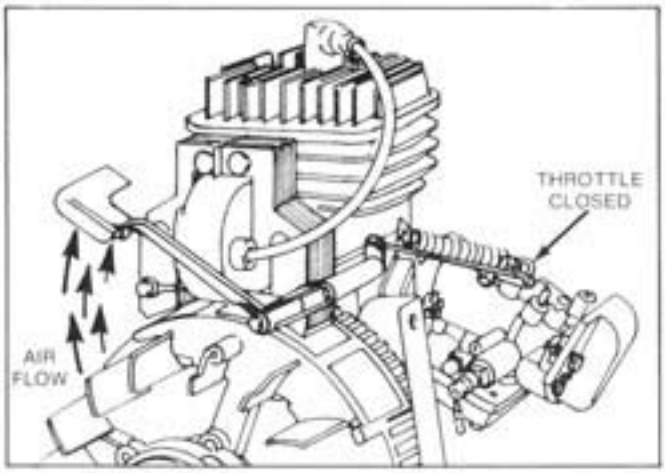
THE PURPOSE OF THE GOVERNOR IS TO MAINTAIN WITHIN CERTAIN LIMITS, A DESIRED ENGINE SPEED, EVEN THOUGH THE LOAD MAY VARY.

AIR VANE GOVERNOR

The governor spring tends to open the throttle. Air pressure against the air vane 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, Fig. 1 and Fig. 2.



Throttle Open



Throttle Closing

Fig. 1

CHECKING

Worn linkage or damaged governor springs should be replaced to insure proper governor operation. If spring or linkage is changed, check and adjust top no load R.P.M., Fig. 2, with engine assembled and running.

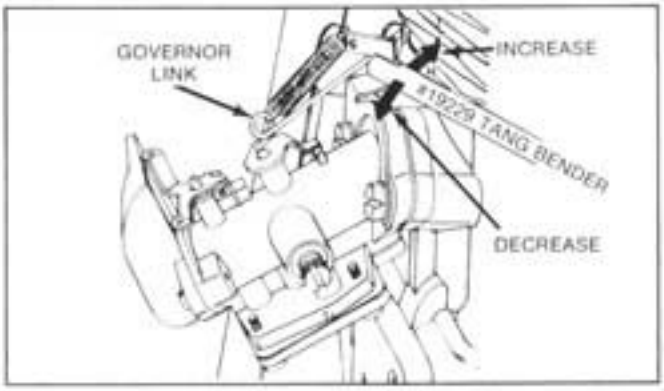


Fig. 2 — Adjusting Top No Load R.P.M.

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 manufacturers machine can effect engine speeds. Therefore, the top governed speed should be checked with an accurate tachometer when the engine is operated on a completely assembled machine.

SPEED LIMITS AND REPAIR

If a service replacement engine is used, check the top governed speed using an accurate tachometer, with the engine operating on a completely assembled machine. If necessary, adjust the top speed limit device so the engine will not exceed the recommended speed. See Fig. 2 for adjustment procedures.

GOV. CONTROLS & CARB. LINKAGE

General

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.

Run engine at half throttle to allow the engine to reach normal operating temperature on engines with remote throttle control or at normal operating speed before measuring with a tachometer. NOTE: For correct no load R.P.M. by model and type, see Engine Sales Manual, engine R.P.M. tables.

REMOTE CONTROL

For proper remote control adjustments, refer to Carburetor Section, page 5.

2 Cycle Repair Instructions (Form 7879)

Section 5
CYLINDERS, CRANKSHAFT, BEARINGS, PISTONS AND RINGS

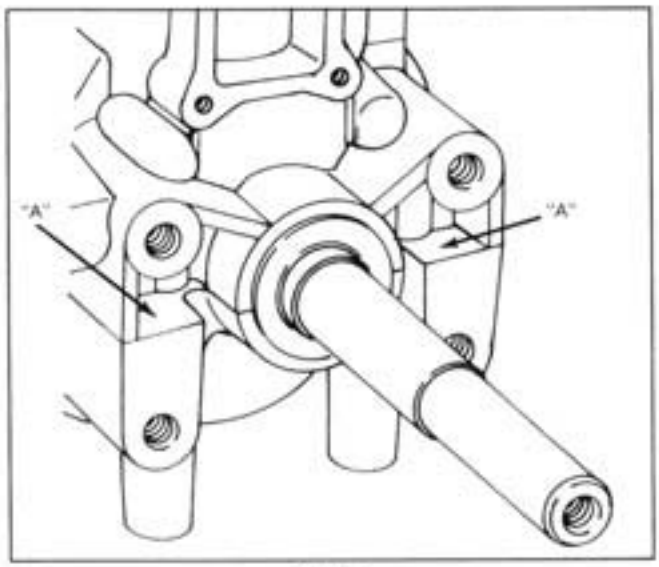
COMPRESSION CHECK

To determine condition of cylinder bore, piston and rings, check compression as follows: Remove spark plug and ground armature wire to engine. Install accurate compression gauge in spark plug hole and crank engine using rewind starter or 120 volt starter. Continue cranking until gauge registers no further increase in pressure. Readings should be approximately 90 ,o 110 P.S.I. (6.32 to 7.73 kp/cm²) for engines without compression release or 80 to 90 P.S.I. (5.62 to 6.32 kp/cm²) for engines with compression release. release.

These values will vary with altitude.

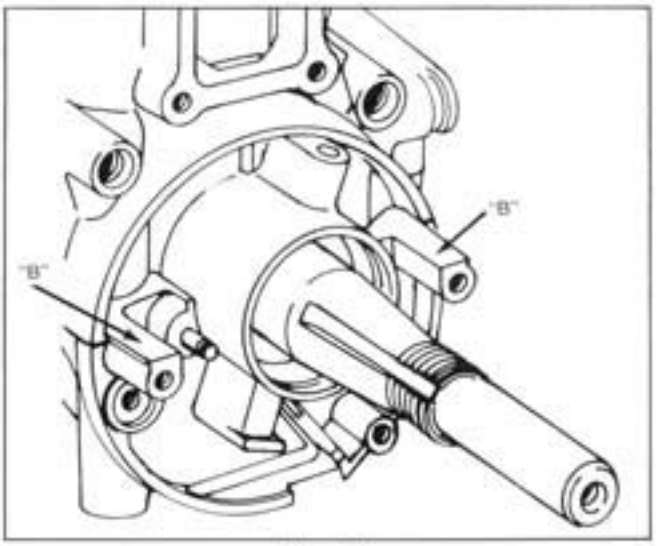
REMOVE CRANKSHAFT

Remove back plate and crankcase cover screws. To separate crankcase cover from cylinder, use a soft face hammer at "A," Fig. 1, Illus. I and at "B,", Fig. 1, Illus. II. DO NOT DRIVE OUT DOWEL PINS! DO NOT PRY BETWEEN COVER AND CYLINDER!



Illus. I

Fig. 1 — Separating Cover From Cylinder



Illus II

Fig. 1 — Separating Cover From Cylinder

5

Crankshaft can now be removed as a complete assembly with piston, rings, connecting rod and all bearings, Fig. 2.

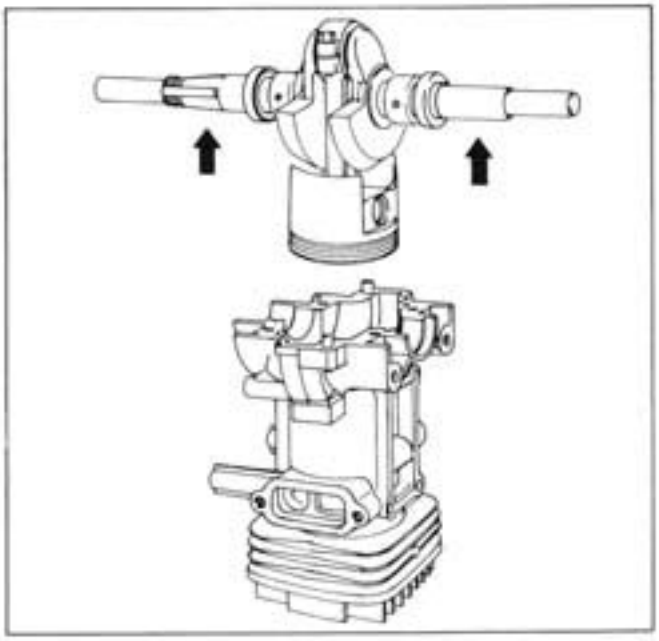


Fig. 2 — Removing Crankshaft Assembly

Disassemble and Inspect

DISASSEMBLE PISTON AND CONNECTING ROD

Use a 1/4 "6 point socket or nut driver" to remove connecting rod screws. Lay crankshaft and rod assembly on a shop rag while disassembling. Because rod needles are loose the shop rag will catch the needles when the rod cap is removed.

REMOVE CONNECTING ROD

To remove connecting rod from piston, remove piston pin lock with thin nose pliers. Piston pin is hollow to facilitate removal of lock. Fig. 3. Remove piston rings. Remove rings one at a time as shown in Fig. 4, slipping them over the ring land. Use a piston ring expander to prevent damage to rings and pistons.

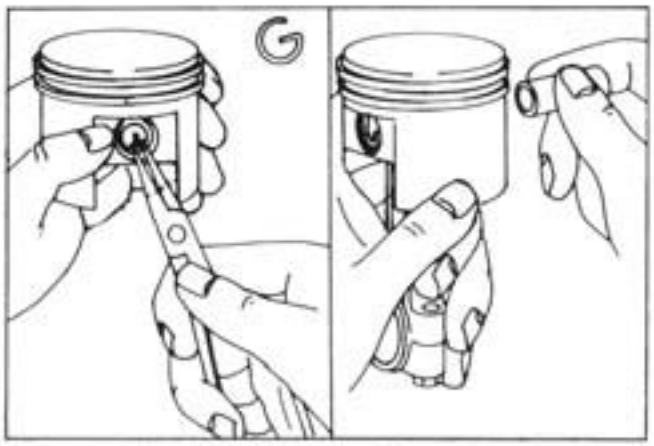


Fig. 3 — Removing Piston Pin

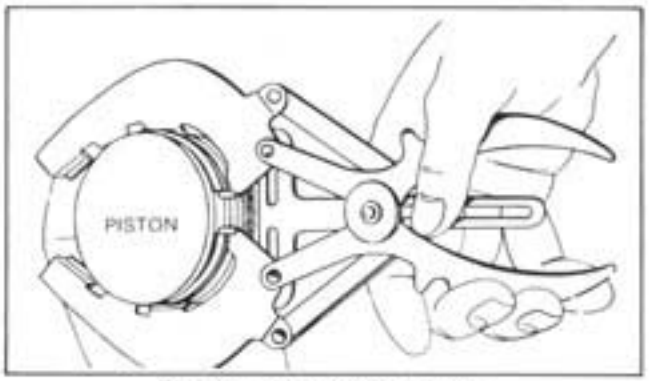


Fig. 4 — Removing Rings

CHECK CRANKSHAFT

Check crankshaft journals for wear, Fig. 5. Reject if more than .0005" (.01 mm) out of round or less than dimensions shown in Common Specifications, page II.

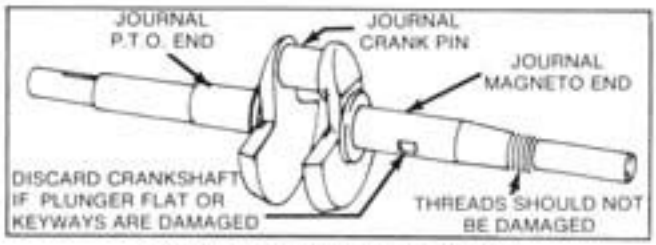


Fig. 5 — Inspect Crankshaft

Inspect all journal surfaces for discoloration and brinelling, Fig. 6.

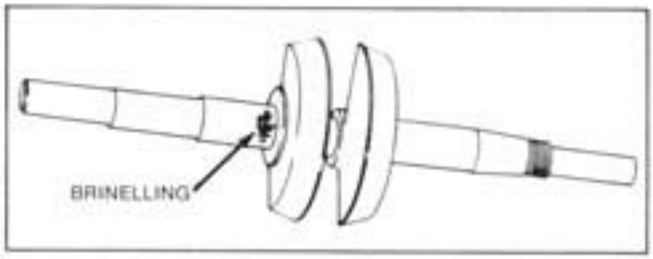


Fig. 6 — Typical Brinelling

CHECK PISTON

Piston is hard chrome-plated. If chrome is worn off any portion of piston, replace piston. Check piston pin. Replace if piston pin is worn below .499 (12.67 mm).

CHECK CONNECTING ROD

Use new piston pin to check pressed-in needle bearing. There should be no noticeable movement of piston pin vertically or horizontally, Fig. 7. Rotate piston pin in bearing. If bearing feels rough, replace connecting rod.

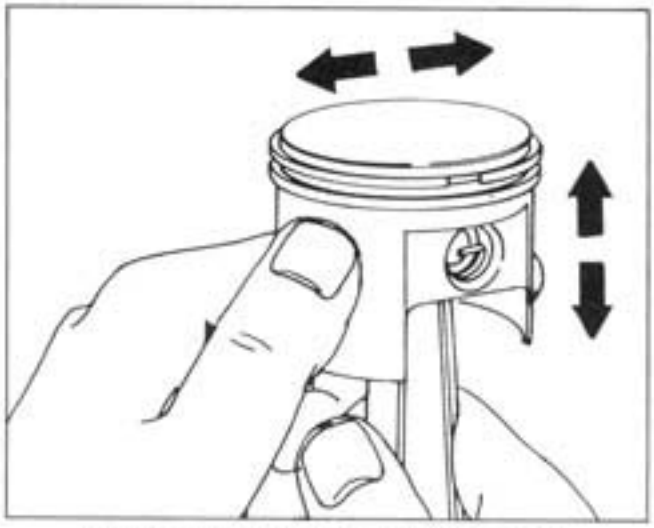


Fig. 7 — Checking Piston Pin Bearing

CHECK CYLINDER

Check all ports for burrs, nicks or foreign material. Use only hard wood to clean carbon deposits out of exhaust port when piston is at bottom dead center. Standard bore is 2.124 - 2.125 (53.95 - 53.97 mm). To check bore size, use inside micrometer or telescoping gauge and micrometer or dial caliper, Fig. 8. Check bore at top, center and bottom of ring travel in two directions, Fig. 8. Replace cylinder if worn .003" (.076 mm) or more than .0025" (.063 mm) out of round).

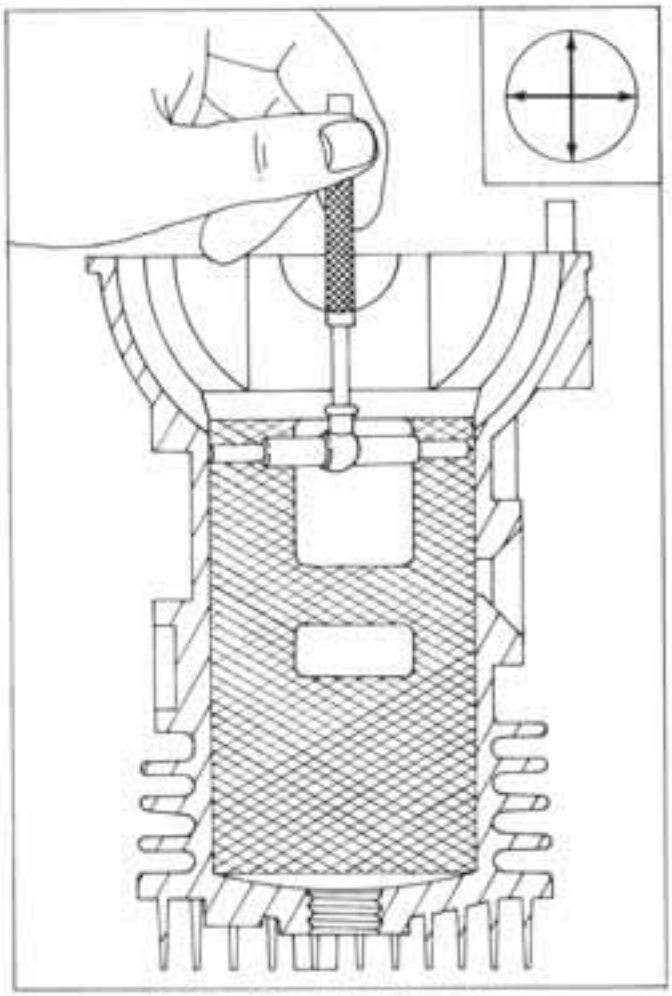


Fig. 8 — Checking Bore Wear

CHECK COMPRESSION RELEASE

Compression release cavity, bi-metallic valve and cover, should be free of all foreign material. Ports should be clear, Fig. 9.

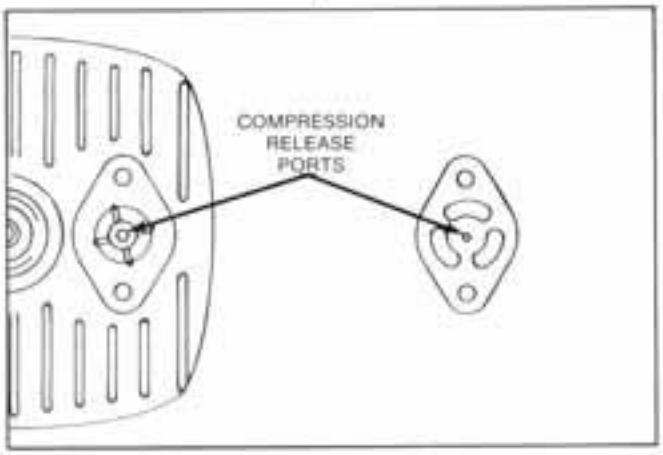


Fig. 9 — Compression Release

ASSEMBLE COMPRESSION RELEASE

Place bi-metallic valve in recess with letters down. Place small band of sealant on cover (avoid excess sealant), Fig. 10. See table I, page 5 for sealants. Torque two (2) screws to 30 in./lbs. (.35 mkp, 3.38 nm).

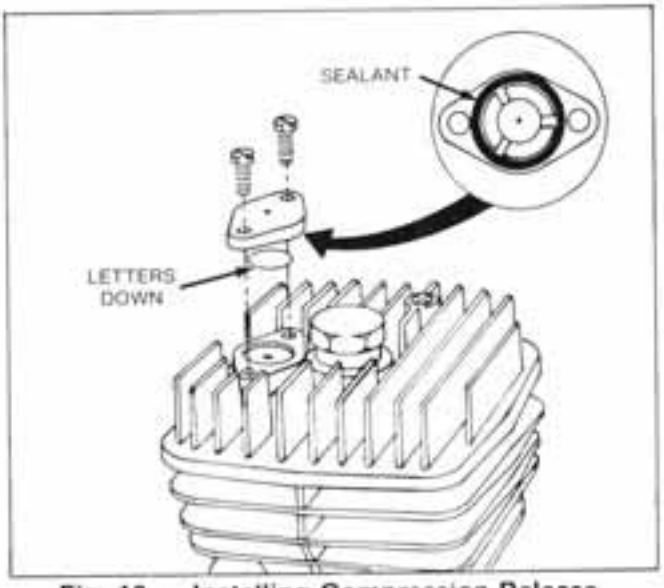


Fig. 10 — Installing Compression Release

ASSEMBLE CYLINDER

DO NOT DEGLAZE CYLINDER BORE WHEN INSTALLING NEW PISTON RINGS.

Clean all parts thoroughly and wipe dry. Install piston rings on piston using piston ring expander. Both compression rings are identical and can be installed in either groove. There is no top or bottom to the ring. Common practice has ring gaps spaced 180° apart but this is not essential to maintain good compression. With rings installed, lightly oil piston rings and ring grooves with BIA certified oil for service TC-W.

ASSEMBLE PISTON AND CONNECTING ROD

Install one piston pin lock in piston pin hole groove. Slide piston pin from opposite side, while holding connecting rod in place until piston pin touches piston pin lock. Install second piston pin lock, Fig. 11.

NOTE: Care should be taken, when installing piston pin because needles can come out of the piston pin bearing on connecting rod.

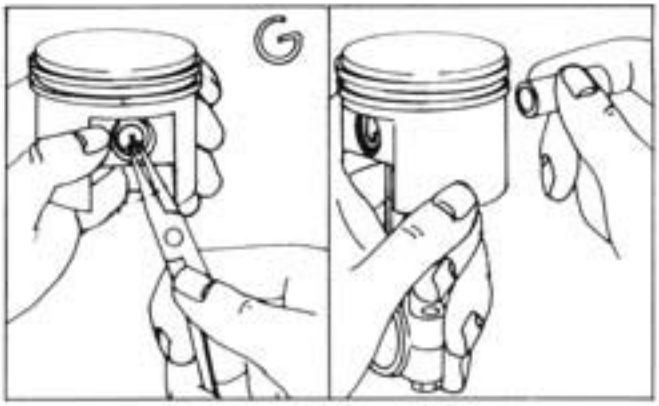


Fig. 11 — Installing Piston Pin

ASSEMBLE CRANKSHAFT, PISTON AND ROD ASSEMBLY

Connecting rod has match marks on rod and rod cap, Fig. 12. Rod cap has locator hole for pierced locating tab in rod cap liner, Fig. 12. IMPORTANT: Install rod liner so "V" will fit into notch in rod cap liner.

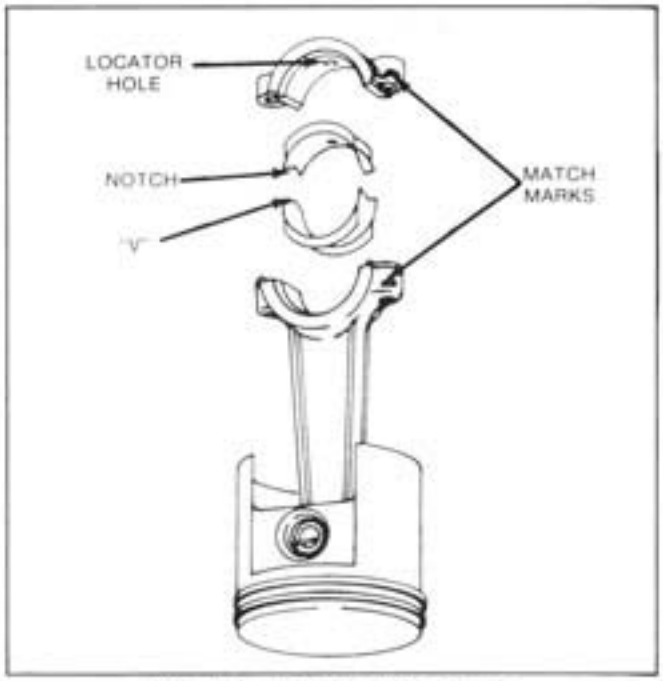


Fig. 12 — Rod Match Marks

If a new needle set is used, the set will come on a strip of paper and needles coated with wax on one side. Remove paper and wrap needles around crank pin with wax toward crank pin. Wax will hold needles in place until rod is installed, Fig. 13.

When reusing needles, coat crank pin with a thin coat of grease. Install needles (33 to a set), Fig. 13.

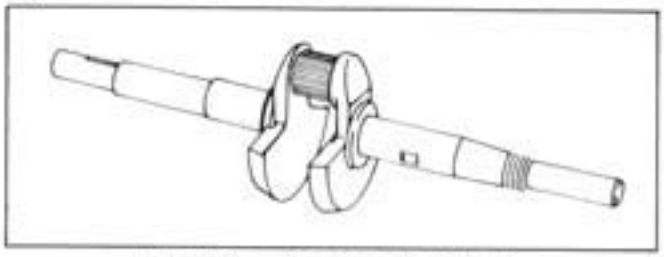


Fig. 13 — Needles Installed

Place crankshaft with needles on piston and rod assembly. Put rod cap on with match mark in line with rod match mark and install connecting rod screws. Torque to 55 inch pounds (.63 kpm, 6.21 nm) Fig. 14. Lubricate needles with BIA certified oil for service TC-W. The oil will soften and dissolve the wax or grease.

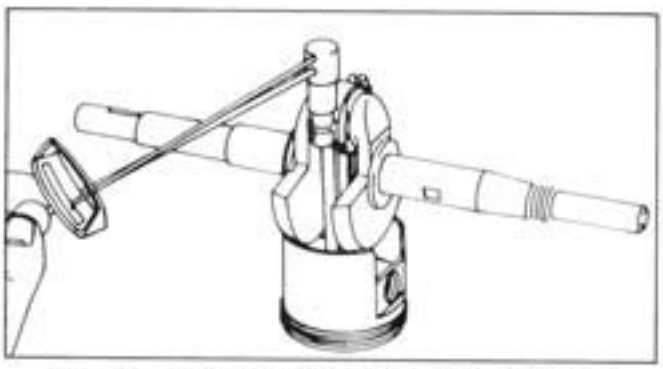


Fig. 14 — Torquing Connecting Rod Screws

ASSEMBLE CYLINDER AND CRANKSHAFT ASSEMBLY

Main bearings are full compliment needles held in a steel case with pierced locator tab. Slide bearings on crankshaft assembly, Fig. 15. Do not install seal at this time. Because cylinder has a machined taper, Fig. 16, a ring compressor is not required. Stand cylinder on cylinder head with magneto side of cylinder to the left. Lubricate taper and cylinder bore. Rotate main bearings to position shown, Fig. 15, and lower crankshaft and rod assembly down into cylinder bore. If resistance occurs, use blunt instrument to start rings down taper. With crankshaft and rod assembly in place, pierced locator tab will be in NOTCHES on cylinder parting line, Fig. 17.

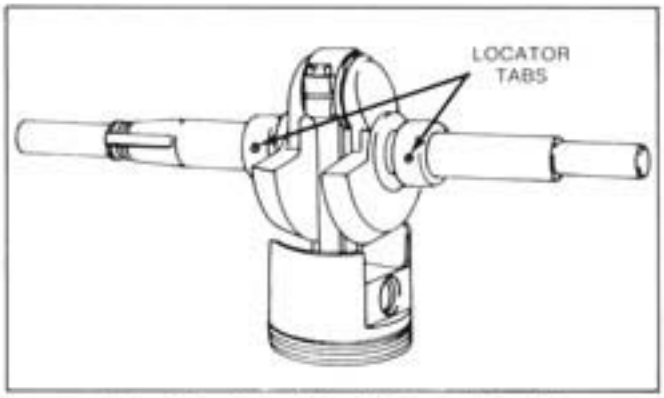


Fig. 15 — Crankshaft Assembly with Bearings Installed

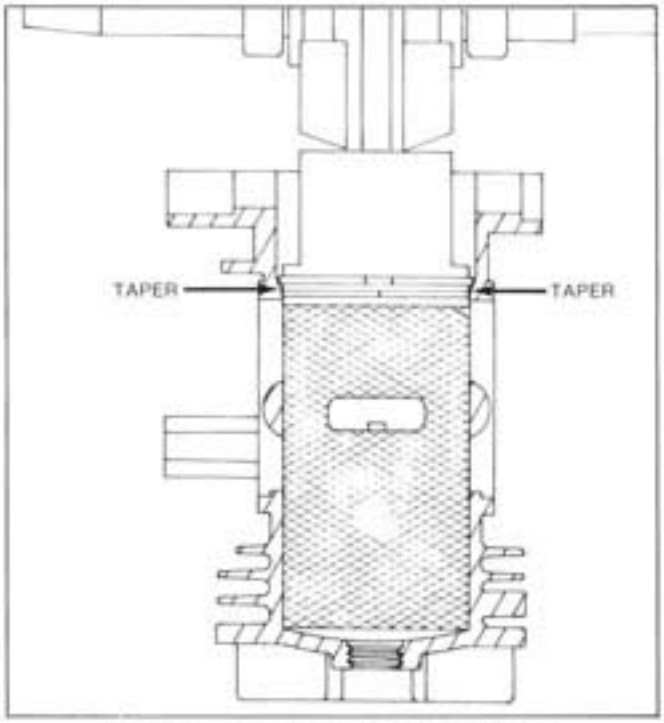


Fig. 16 — Installing Crankshaft and Piston Assemble

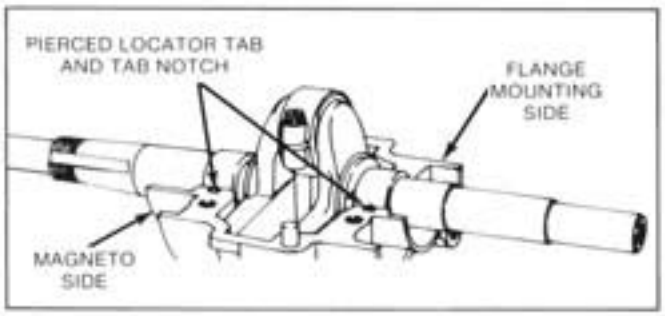


Fig. 17 — Crankshaft and Piston Assembly Properly Installed

ASSEMBLE CRANKCASE COVER AND SEALS

Parting line on cylinder and crankcase cover must be free of oil when putting a thin film of sealant on parting line. Avoid placing sealant in screw holes or bearing bore. See Fig. 18. Approved sealants are listed below:

TABLE I

Manufacturer	Sealant Name	Manufacturer's Part No.
Loctite	#515 Gasket Eliminator	#51531
Permatex	Silicone Form-A-Gasket	6BR
General Electric	RTV Silmate	RTV-1473
Duro	Silicone Gasket	SGC-1

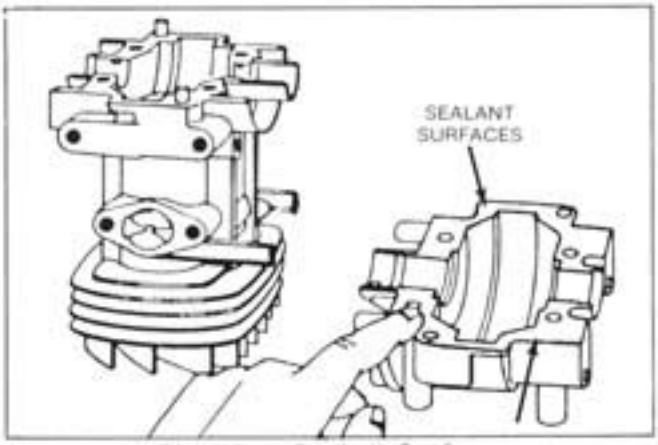


Fig. 18 — Sealant Surfaces

Slide crankcase cover down on dowel pins. Cover should go on without driving cover down. Hand pressure only is required.

Install back plate and crankcase cover screws. Torque to 90 inch pounds (1.04 kpm, 6.21 m). Fig. 19. Check crankshaft end play (.002"-.013") (.050-.330 mm)

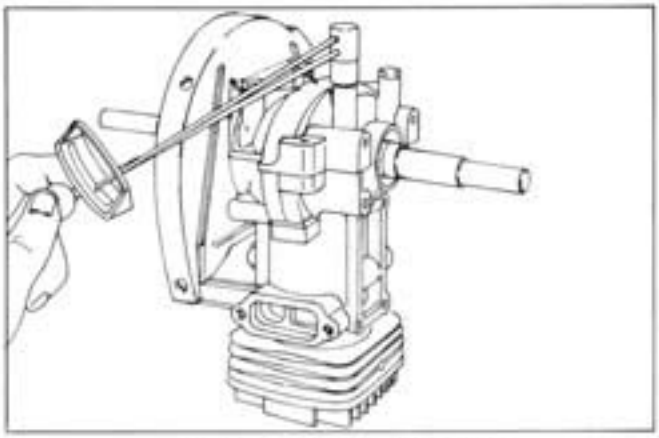
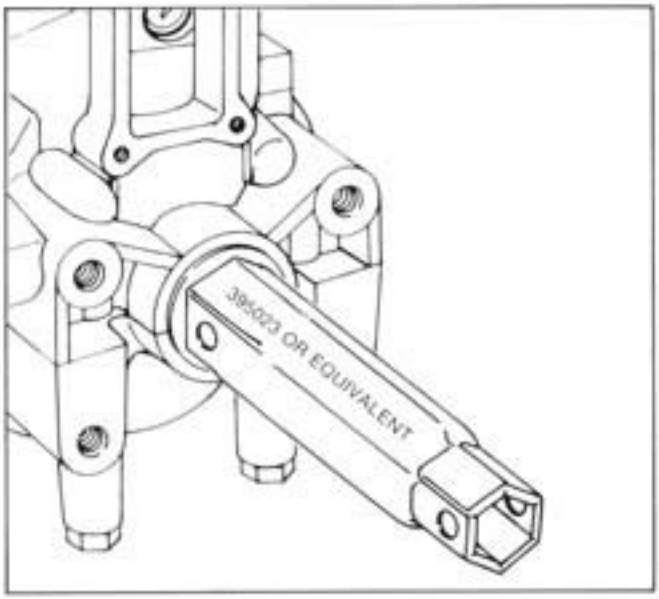
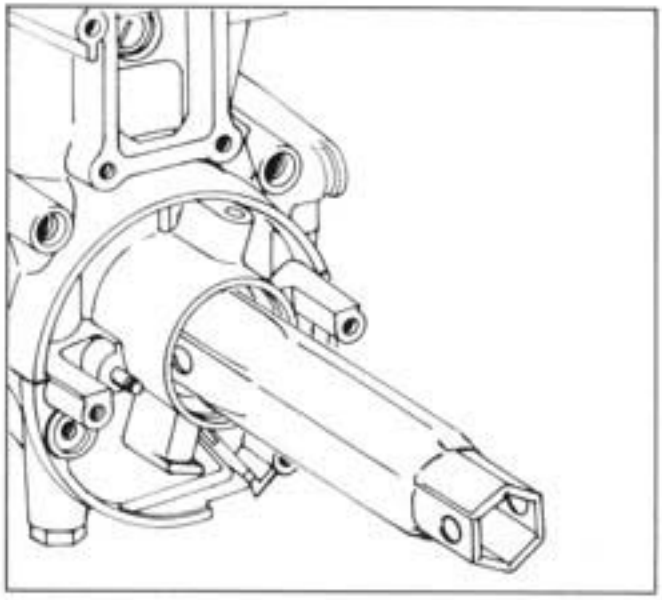


Fig. 19 — Torquing Cover



A — PTO



B — Mag

Fig. 20 — Installing Crankshaft Seals

INSTALLING CRANKSHAFT SEALS

Crankshaft seals are installed with garter spring facing in, Fig. 20A. Drive P.T.O. seal in until flush with flange mounting surface, drive magneto seal until it bottoms, Fig. 20B. Using new gaskets, install power takeoff and magneto transfer port covers. Tab on magneto transfer port cover holds coil primary wire to prevent flywheel contact, Fig. 21. Check complete cylinder and crankshaft assembly by rotating crankshaft to check for any bindings. If binding exists, disassemble to find cause of binding.

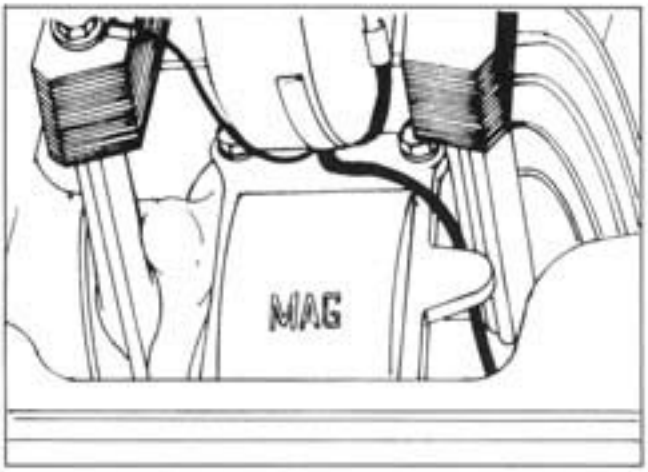


Fig. 21 — Primary Wire Routing

INSTALL TRANSFER PORT COVERS

The transfer port covers are marked MAG and PTO, Fig. 21, and are not interchangeable. Install covers and screws with new gaskets. Torque screws to 20 in. lbs. (.23 mkp, 2.25 nm).

2 Cycle Repair Instructions (Form 7879)

Section 6
STARTERS

Fig. 1 shows a typical rewind starter used on Briggs & Stratton 2 cycle engines. Stud on blower housing is optional.

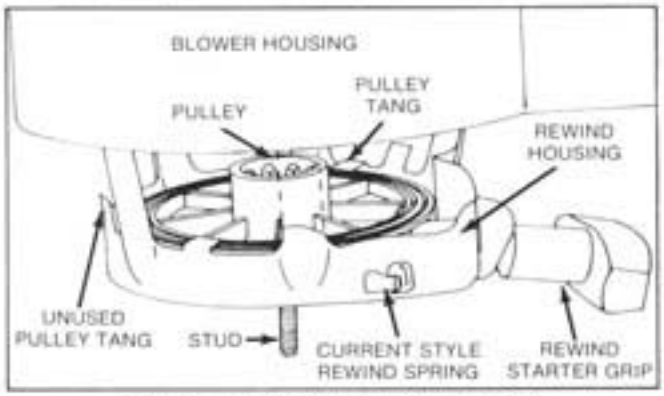


Fig. 1 — Typical Rewind Starter

REPLACE SPRING

Remove Spring

Cut knot at starter pulley to remove rope. With rope removed, grasp outer end of rewind spring with pliers, see Fig. 2, and pull out of housing as far as possible. Turn spring 1/4 turn and remove from pulley or bend one of the tangs up and lift out starter pulley to disconnect spring. Tool #19229 Tang Bender can be used.

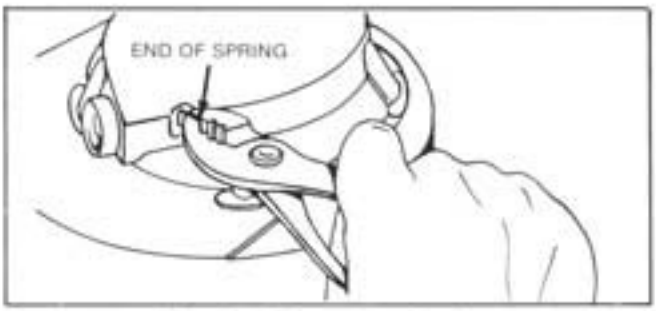


Fig. 2 — Removing Spring

Install Spring

Clean rewind housing, pulley and rewind spring in solvent. Wipe clean with cloth. Straighten spring to allow easier installation and restore tension. Oil spring. Insert either end of spring into blower housing slot and hook into pulley, Fig. 3.

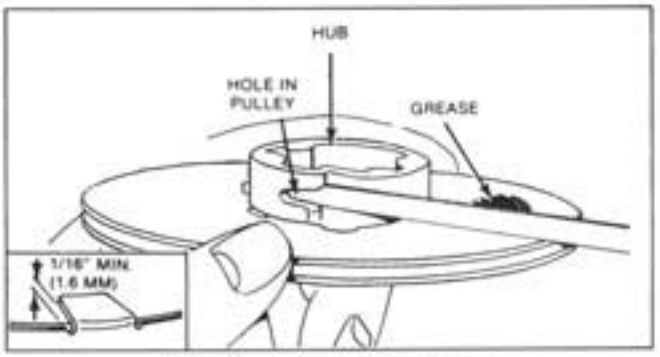


Fig. 3 — Installing Spring

Place a dab of grease on pulley. Set pulley into housing and bend tang down. See Fig. 3 insert. Adjust tang gap as shown. Pulley must be depressed fully into rewind housing when measuring tang gap. Tool #19229 tang bender can be used.

Wind Spring

Place a 3/4" square piece of stock into center of pulley hub or make rewind tool similar to one shown in Fig. 4. GRASPING STOCK WITH A WRENCH, WIND PULLEY COUNTERCLOCKWISE UNTIL SPRING IS WOUND TIGHT. Then back off pulley one turn or until hole in pulley for rope knot and eyelet in blower housing are in alignment. See Fig. 8.

Spring should be securely locked in smaller portion of tapered hole. See Fig. 5.

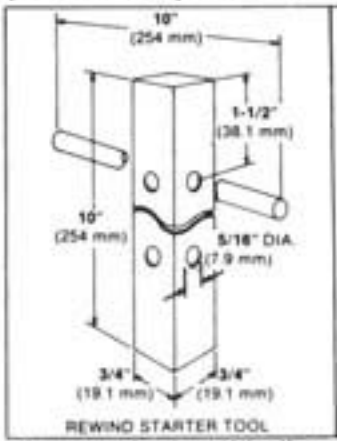


Fig. 4 — Spring Winding Tool

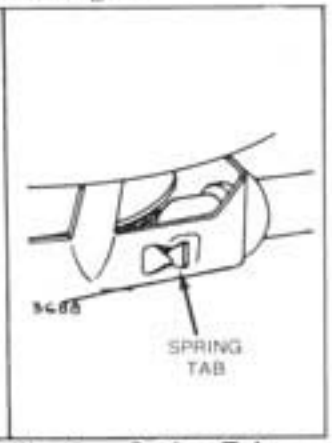


Fig. 5 — Spring Tab Properly Installed

6

STARTERS
Rewind

Install Rope

Inspect rope. Replace if frayed. Insert rope through handle and tie a figure eight knot. Insert pin through knot and pull tightly into handle, Fig. 6. ALWAYS SEAL BOTH ENDS OF KNOT.

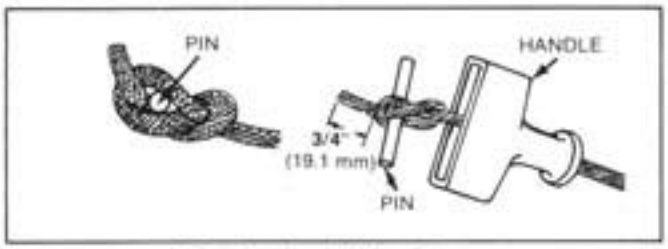


Fig. 6 — Installing Rope

If re-using old rope, burn pulley end of rope with a match. Wipe with waste cloth, using caution, while it is still hot, to prevent swelling and unravelling.

NOTE: WHEN INSTALLING A NEW ROPE, CHECK PARTS LIST TO BE SURE CORRECT DIAMETER AND LENGTH ROPE IS USED.

A rope inserter tool may be made by using a piece of music wire or spring wire, and forming it as shown in Fig. 7.

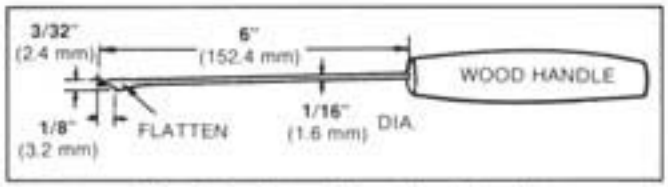


Fig. 7 — Rope Inserting Tool

Thread wire and rope through rope eyelet in housing and out pulley hole, Fig. 8.

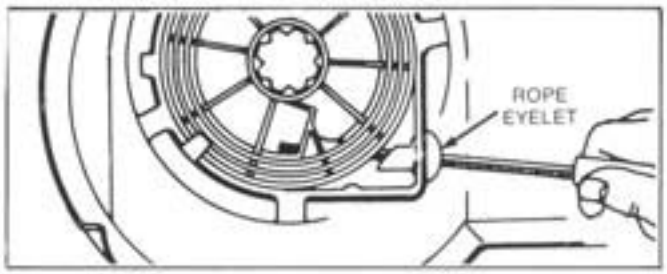


Fig. 8 — Inserting Rope

Tie a knot in rope and pull tight. Manipulate knot so it can be pulled down into knot cavity, Fig. 9.

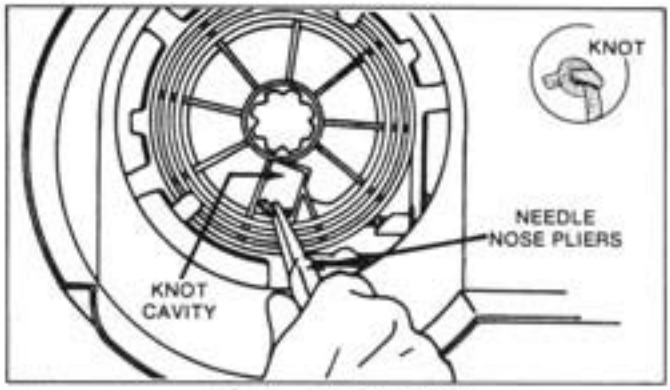


Fig. 9 — Tying Knot

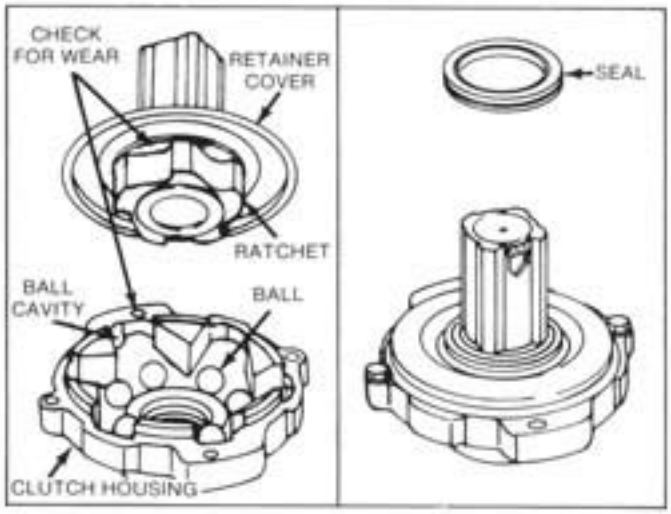


Fig. 10 — Sealed Starter Clutch

If necessary, the sealed clutch can be disassembled by using a screwdriver or wedge to pry the retainer cover from the housing, as shown in Fig. 11. Place one drop of engine oil on end of crankshaft before replacing clutch assembly on crankshaft. Tighten clutch to torque noted on specification sheet for your model engine. DO NOT run engine without screws assembled to clutch.

NOTE: Clean ratchet by wiping with cloth only.

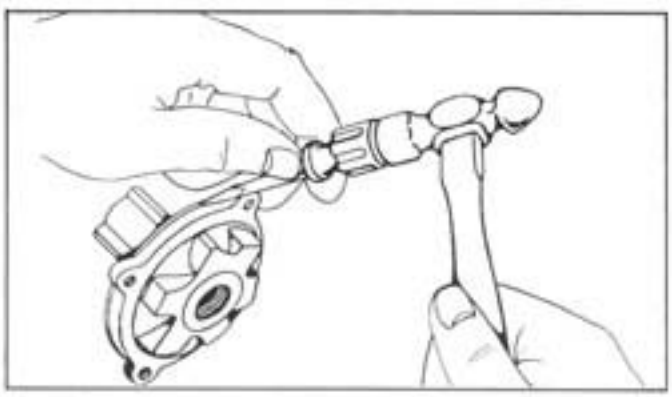


Fig. 11 — Disassembling Sealed Clutch

TEST EQUIPMENT

EQUIPMENT TO TEST STARTER MOTORS

The following equipment is recommended for test and repair of starter motors.

Volt/Ohm/Amperage (VOA) Meter. The recommended VOA meter is available from your Briggs & Stratton source of supply. Order as part #19236. The meter may be used to read volts, ohms or amperes when leads are attached to appropriate connector. Fig. 12.

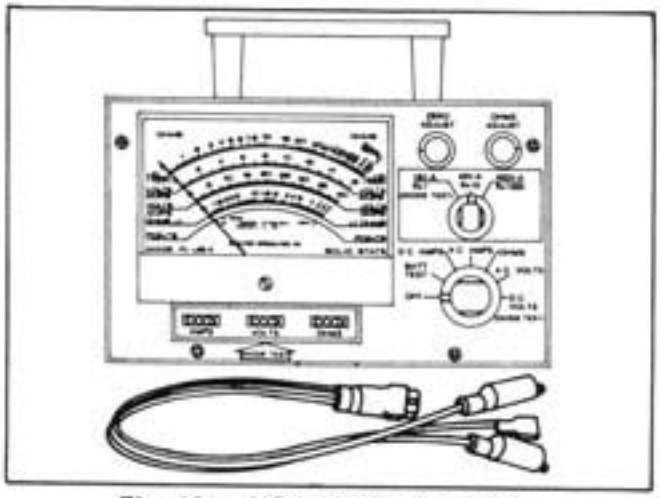


Fig. 12 — VOA Meter P/N 19236

120 Volt Accessory Adaptor is available through your Briggs & Stratton source of supply. Order as part #19242. The 120 volt adaptor is used in conjunction with the VOA meter part #19236 to test 120 volt starters. Fig. 13.

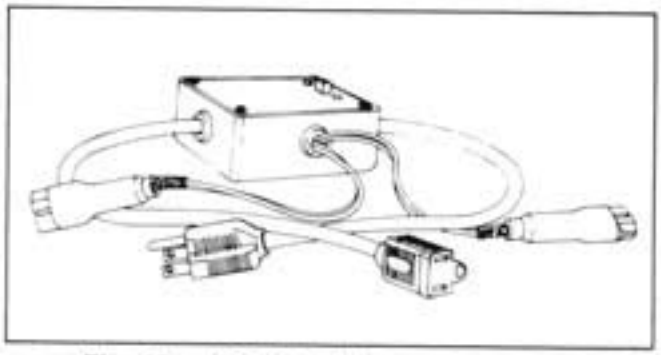


Fig. 13 — 120 Volt Adaptor P/N 19242

A growler or armature tester is available from automotive diagnostic service suppliers.

A Trysit Sirometer is available from your Briggs & Stratton source of supply. Order as part #19200. The sirometer measures from 800 to 25,000 revolutions per minute (R.P.M.). Fig. 14.

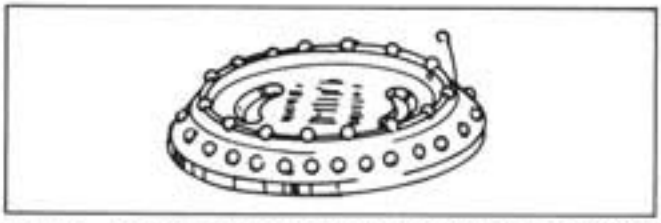


Fig. 14 — Trysit Sirometer (Tachometer) - P/N 19200

Retainers may be made from scrap pieces of rewind starter springs as shown in Fig. 15.

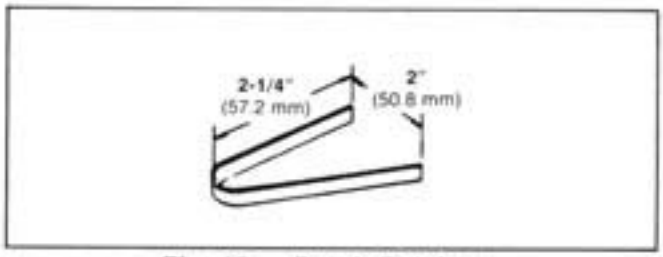


Fig. 15 — Brush Retainers

TROUBLESHOOTING 120 VOLT STARTER SYSTEMS

The following list is given to aid in diagnosing problems for 120 volt starter systems.

NOTE: If a starter problem is encountered, the engine itself should be thoroughly checked to eliminate it as the cause of starting difficulties. It is a good practice to check the engine for freedom of rotation by removing the spark plug and turning the crankshaft over by hand, to be sure it rotates freely.

1. Engine cranks slowly.
   a. Additional load effecting performance (see note).
   b. Faulty electrical connections (extension cord).
   c. Dirty or worn starter motor commutator, bearings, weak magnets, etc.
   d. Worn brushes or weak brush springs.
   e. Extension cord longer than 25 feet.

2. Engine will not crank.
   a. Faulty electrical connections.
   b. Faulty starter motor switch (open circuit).
   c. Open circuit in starter motor.
   d. Defective rectifier assembly.
   e. Brushes sticking, etc.
   f. Power source inoperative (wall outlet).
3. Starter motor spins; but does not crank engine.
   a. Sticking pinion gear due to dirt.
   b. A damaged pinion or ring gear.
   c. Incorrect rotation due to reversed motor polarity — all motors rotate counterclockwise viewed from pinion gear end.
4. Starter motor blows fuses.
   a. Shorted starter motor switch.
   b. Shorted rectifier assembly.
   c. Shorted 120 volt extension cord to rectifier switch box.
   d. Armature shorted.
   e. Overloaded circuit.
5. Motor spins; will not stop.
   a. Defective motor switch.

Manufacturer	Motor Identification	Voltage
Redmond	PE2631W	120

Fig. 16

120 VOLT STARTER

This starter incorporates a permanent magnet motor with gear drive engagement similar to an automotive starter. When starter switch is activated, starter helix drives pinion gear into engagement with integral flywheel ring gear and cranks the engine. When engine starts, starter pinion returns to its normal position. Fig. 17.

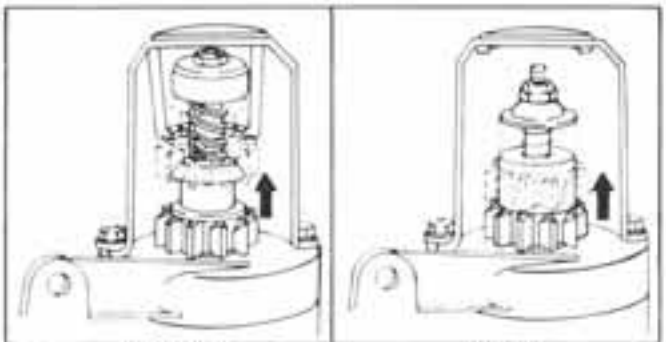


Fig. 17 — Starter Drive Operation, All

REMOVE STARTER, ALL

Remove three screws holding the starter switch, Fig. 18. Remove two screws holding starter mounting bracket. NOTE: It may be necessary to loosen carburetor mounting screws, Fig. 19, two turns.

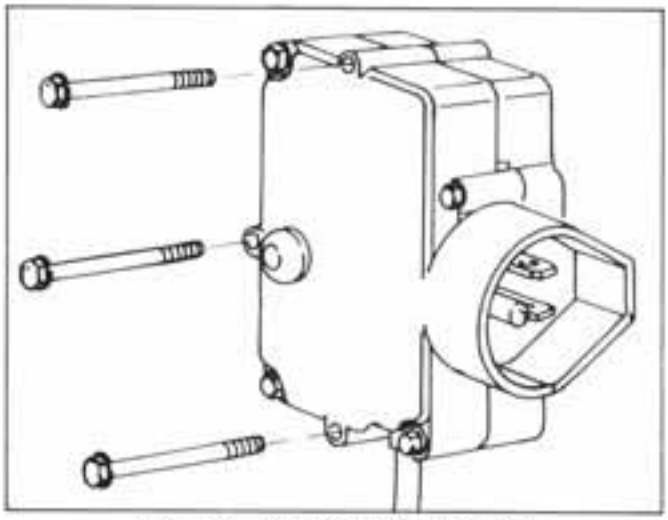


Fig. 18 — Switch Removal, All

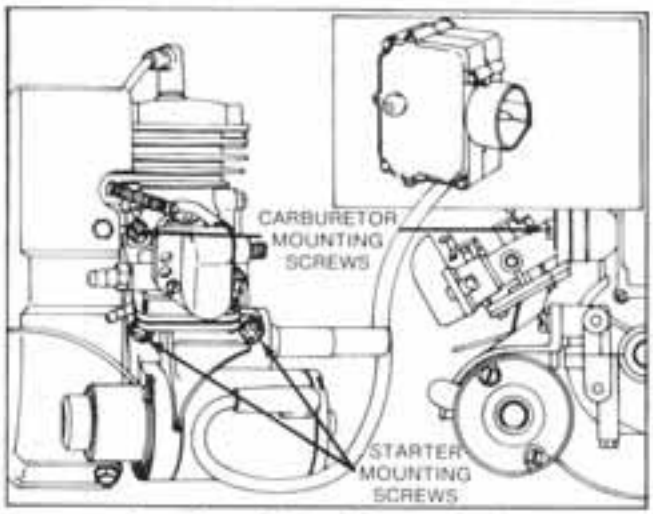


Fig. 19 — Starter Removal, All

DISASSEMBLE STARTER DRIVE (ENGINES WITHOUT COMPRESSION RELEASE)

Remove two hex head screws and starter drive shroud, Fig. 20. Rotate pinion gear against pinion stop. While holding armature at point "A," remove stop nut. Stop washer, stop cushion. Cushion elastic cup and pinion can now be removed.

DISASSEMBLE STARTER DRIVE (ENGINES WITH COMPRESSION RELEASE)

Two methods are used to hold pinion stop, elastic stop nut or roll pin. Refer to Fig. 20 for removal of elastic stop nut. Remove roll pin by supporting end of armature shaft while driving out roll pin. Then remove rest of drive.

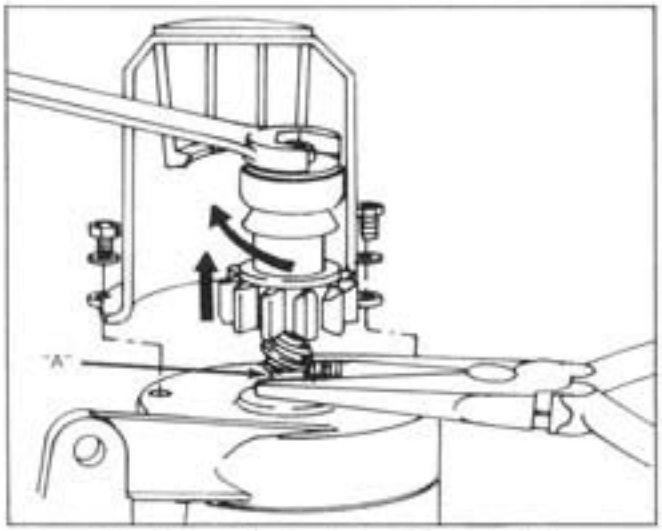


Fig. 20 — Starter Drive Disassembly

INSPECT STARTER DRIVE, ALL

Check for damaged or chipped pinion teeth, burrs on pinion insert and cracked or split parts. Replace damaged parts as required.

ASSEMBLE STARTER DRIVE (ENGINES WITHOUT COMPRESSION RELEASE)

Do not lubricate pinion, except with dry silicone spray. Assemble starter drive in reverse order of disassembly. Torque elastic stop nut to 30-35 inch pounds (.35 - .40 mkp, 3.39 - 3.95 nm), Fig. 21. Install starter shroud and hex head screws loosely. Center shroud on starter pinion cone and tighten screws, Fig. 22. Do not reuse stop nut. Always use a new stop nut.

ASSEMBLE STARTER DRIVE (ENGINES WITH COMPRESSION RELEASE)

Do not lubricate pinion, except with dry silicone spray. Assemble drive in reverse order of disassembly. On drives with elastic stop nut, torque to 30-35 inch pounds (.35 - .40 mkp, 3.39 - 3.95 nm), Fig. 21.

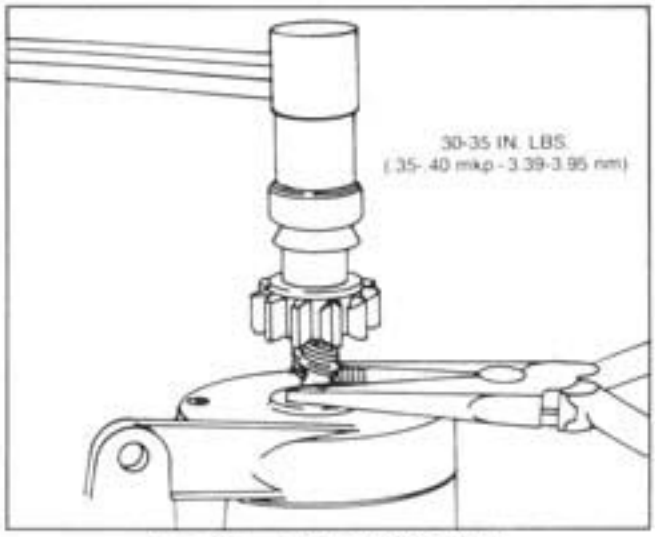


Fig. 21 — Torque Stop Nut

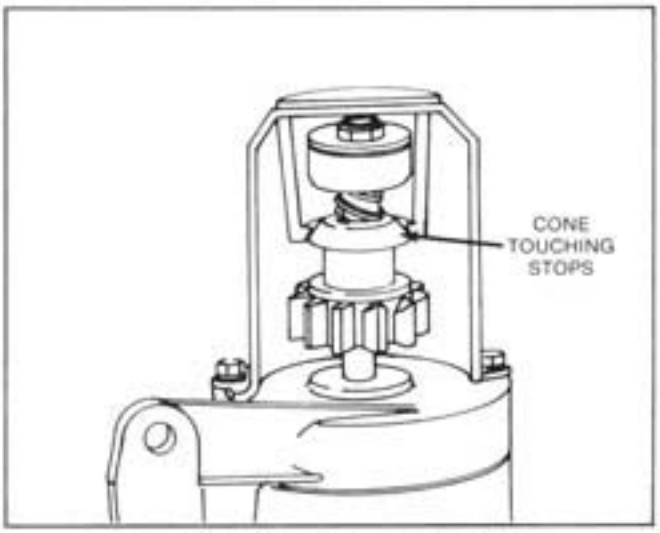


Fig. 22 — Align Starter Shroud

TESTING 120 VOLT STARTER MOTOR AND RECTIFIER SWITCH BOX

Connect starter motor to VOA meter part #19236 and 120 volt adaptor #19242.

DANGER: IT IS RECOMMENDED THAT STARTER MOTOR BE HIGH-POT TESTED AFTER FINAL REASSEMBLY.

CAUTION: The performance test of this starter requires the use of the equipment listed above or an ammeter and tachometer, with the ammeter connected in the 120 volt AC line cord. Extreme care should be used in making this test to minimize the hazard of electrical shock.

STARTERS
Electric, 120V, Gear Drive

Plug the electrical cord into a 120 volt outlet and test the starter per the instructions included with the VOA meter part #19236 and 120 volt adaptor part #19242. Note the readings of the tachometer and the specified meter readings. A starter motor in good condition will be within the following specifications, Fig. 23.

Minimum R.P.M.	Maximum Amperes No Load
7000	1.4

Fig. 23

If starter motor does not perform satisfactorily, the following should be checked and corrected if necessary.

1. A binding or seizing condition in the starter motor bearings.
2. Starter motor brushes sticking in brush holders.
3. A dirty or worn commutator or brushes.
4. A short, open or grounded armature.
   a. Shorted armature (wire insulation worn and wires touching one another). Will be indicated by low or no R.P.M. and excessive current draw.
   b. Open armature (wire broken). Will be indicated by low or no R.P.M.
   c. Grounded armature (wire insulation worn and wire touching armature laminations on shaft). Will be indicated by excessive current or no R.P.M.
5. A defective starter motor switch.
6. A defective starter motor rectifier.
7. Weakened magnets.

DISASSEMBLY OF STARTER MOTOR

Study Fig. 24 prior to starter motor disassembly.

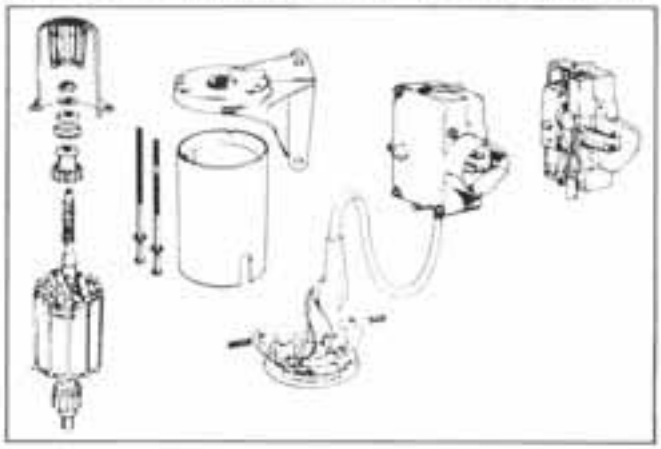


Fig. 24 — Typical Starter

Remove thru bolts. The starter mounting bracket can now be removed.

Inspect bushing for wear. If worn, replace starter mounting bracket assembly, Fig. 24.

NOTE: MATCH MARKS AND THRU BOLTS MUST BE PLACED IN THE SAME POSITION AS WHEN REMOVED OR INTERFERENCE MAY RESULT. **CAUTION:** Do not clamp the motor housing in a vise or strike the motor housing with a hammer. These motors contain two powerful ceramic magnets which can be broken or cracked if the motor housing is deformed or dented.

Stand armature, brush end cap and housing on bench as shown in Fig. 25. Pull up on housing while holding armature shaft down to remove armature and drive end cap. While sliding housing up, exercise care to hold grommet and power cord down on the brush end cap.

Fig. 25 — Removal of Shell, All

Clean all dirt or corrosion accumulations from the armature, brush end cap, drive end cap, etc. The bearings, motor housing and armature should not be soaked in a cleaning solution. The armature commutators may be cleaned with a fine sandpaper or commutator paper. Do not use emery cloth, as emery will embed in the commutator and cause rapid brush wear. If it is suspected the armature is defective, a new armature should be tried in the motor. If proper testing equipment is available, check the suspected armature to determine if it is defective.

Starter motors armatures have very low resistance, usually below detection on available multimeter (volt, ohm, ampere). To check for a shorted armature, a tool known as a "growler" may be used.

The brushes should be checked for proper seating, weak brush springs, dirt, oil or corrosion, Fig. 26.

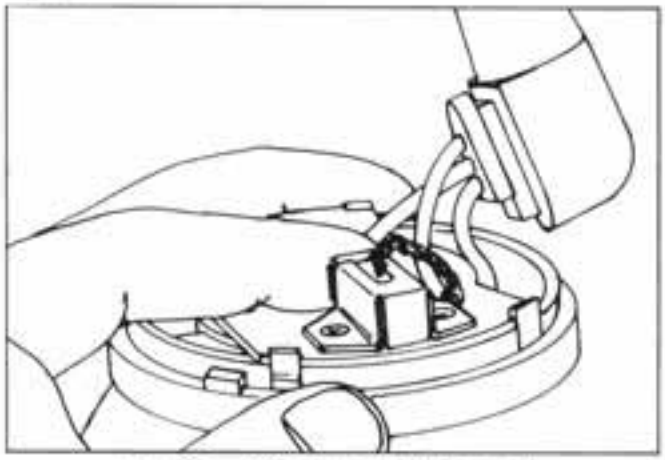


Fig. 26 — Checking Brushes, All

If the magnets are suspect, a new motor housing should be tried to test motor performance, Fig. 23.

ASSEMBLY OF STARTER MOTOR

When all parts have been thoroughly inspected, lightly lubricate the bearings with #20 machine oil, and reassemble in the following manner.

Insert the brushes in their respective holders. NOTE: A brush holding tool such as shown in Fig. 15 should be used to hold the brushes clear of the armature commutator. Place spacer washers on brush end cap bearing and insert armature. Remove brush retainer.

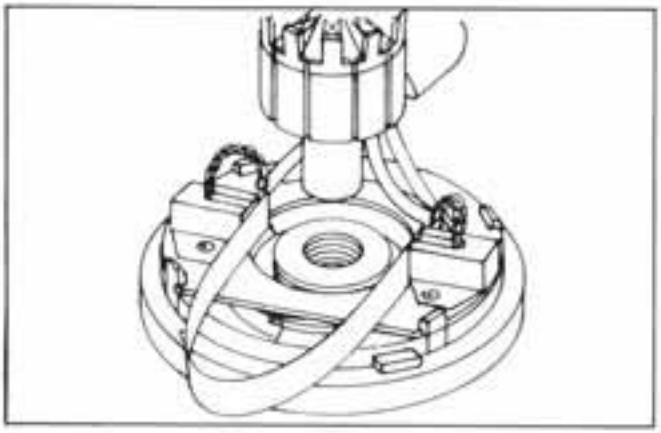


Fig. 27 — Assemble Armature in Brush End Cap, All

Place brush end cap and armature assembly on bench, Fig. 27. Slide housing down on armature while guiding power cord and grommet into grommet slot. Make sure housing is aligned with match marks in brush end cap and housing, Fig. 28.

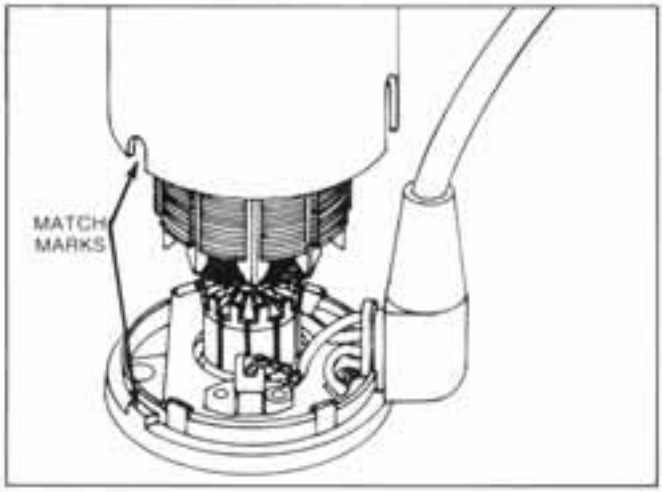


Fig. 28 — Assemble Housing, All

Place thrust washer on armature P.T.O. shaft, put two drops of Loctite™ in tapped holes. Install drive end cap and thru bolts, align drive end cap and housing match marks correctly, Fig. 29. Tighten screws. Tap edge of drive end cap with a soft face hammer to align motor bearings if required. Fig. 30. Check armature shaft for end play (.005"-.025") (.127-.635 mm). Armature should rotate freely.

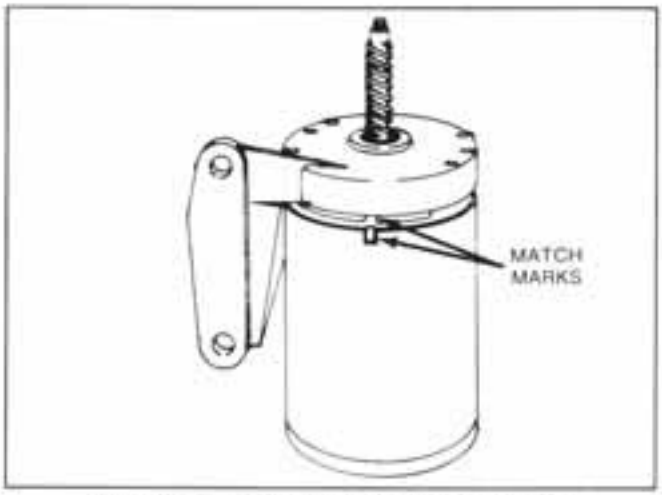


Fig. 29 — Install Drive End Cap, All

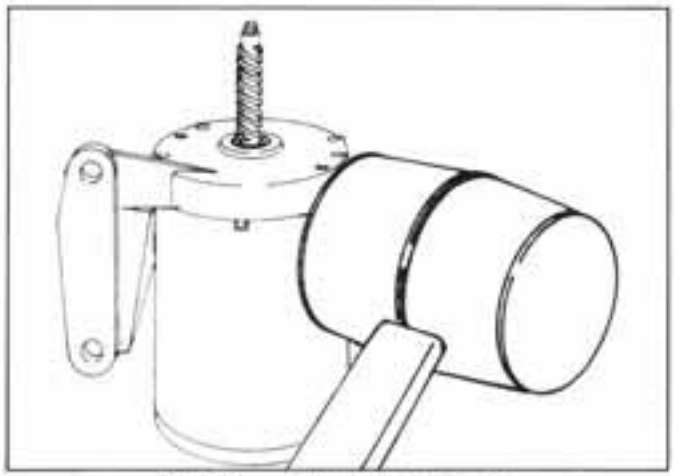


Fig. 30 — Align Bearing, All

Test performance of starter motor after reassembly. Refer to Fig. 23 for starter performance specifications. If starter motor tests as specified, continue assembly.

HIGH-POTENTIAL TESTS (HIGH-POT)

WARNING: The high potential tests of the 120 volt AC starter motor must be conducted prior to installation of starter motor on engine.

DANGER: HIGH VOLTAGE IS USED IN THIS TEST. EXERCISE EXTREME CARE TO MINIMIZE THE HAZARD OF ELECTRICAL SHOCK.

If test equipment is not available, take starter motor to a local electrical motor repair shop for test. Failure to perform this test may result in an electrical hazard. If starter motor tests are positive continue assembly.

6

CHECKING RECTIFIER SWITCH CONTROL ASSEMBLY

The rectifier switch control assembly consists of a switch, rectifier, cord connections from the starter motor cord set and an AC receptacle for 120 volt AC power. Procedures listed below are for checking the individual components of the rectifier control assembly.

DISASSEMBLY OF RECTIFIER SWITCH CONTROL ASSEMBLY

DANGER: DISCONNECT EXTENSION CORD FROM OUTLET BEFORE DISASSEMBLYING RECTIFIER SWITCH ASSEMBLY.

With rectifier control assembly removed from the equipment, remove the four screws holding the rectifier control assembly cover. Lift off cover to expose internal components.

Disconnect wires from rectifier. Test rectifier as shown in Fig. 31. With one probe on positive plus terminal, test three remaining terminals with other probe. Reverse procedure. Place other probe on positive terminal and touch three terminals with probe. The test should not indicate a reading in one direciton and give a reading in the opposite direction when the leads are reversed. Repeat this procedure for the second negative (minus) terminal in the same procedure.

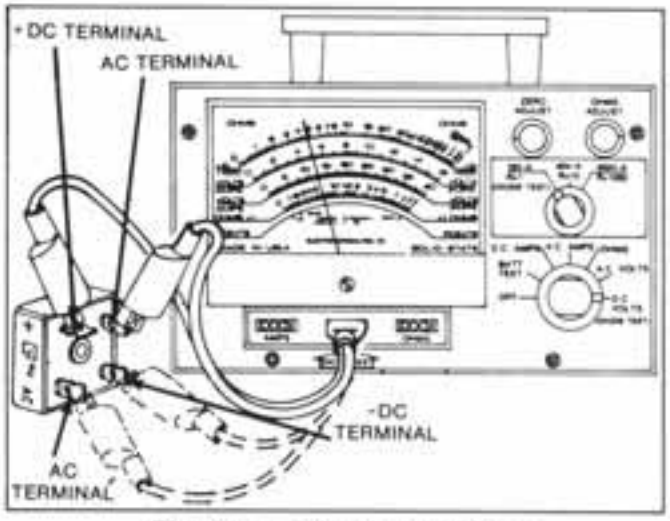


Fig. 31 — Checking Rectifier

Test switch assembly as shown in Fig. 32.

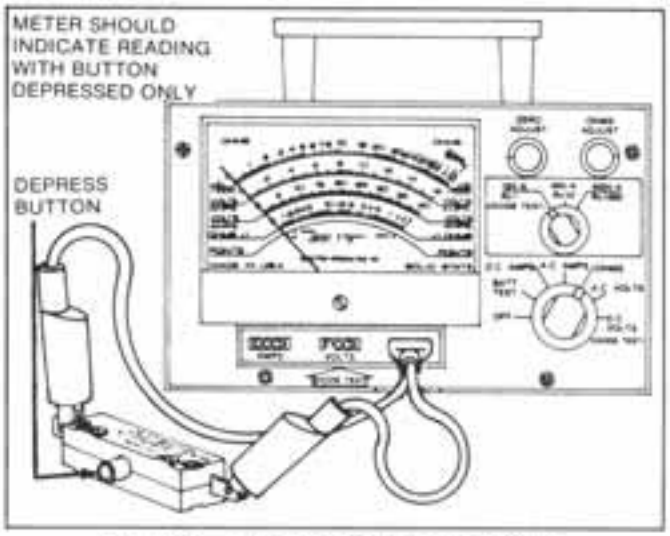


Fig. 32 — Testing Switch Assembly

Cord assembly can be tested utilizing the VOA meter listed on page 3.

ASSEMBLE RECTIFIER SWITCH CONTROL ASSEMBLY

Connect wires using diagram shown in Fig. 33. **CAUTION:** Incorrect assembly of black and white wires from cord assembly will cause starter motor to run backwards.

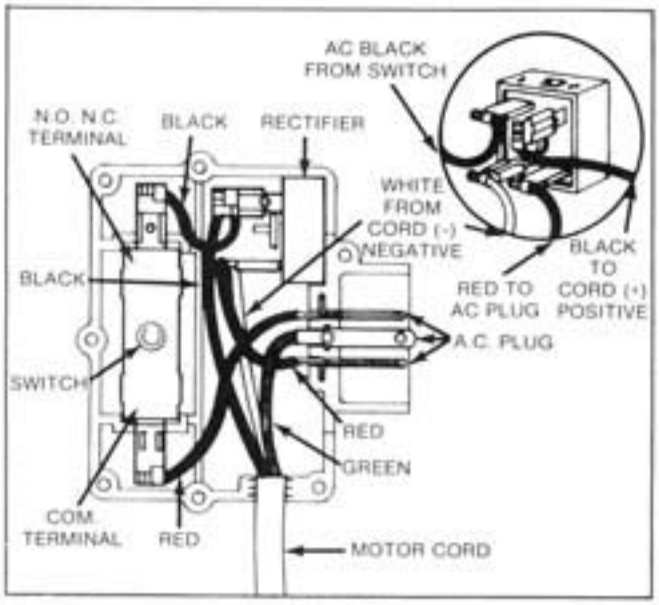


Fig. 33

Reassemble rectifier switch control assembly to housing. Fig. 34.

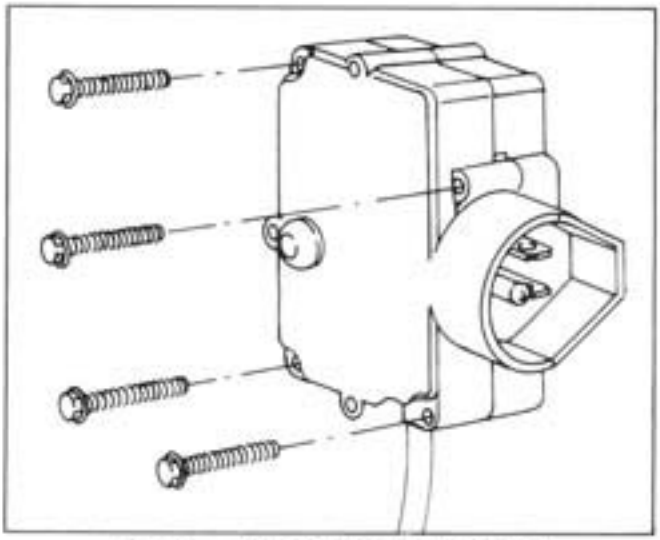


Fig. 34 — Assembly of Switch Box

6

2 Cycle Repair Instructions (Form 7879)

Section 7
MUFFLERS

MUFFLER

The standard muffler is a compact sound reducing muffler equipped with standard Briggs & Stratton exhaust deflectors.

REMOVING MUFFLER

Use a small punch to bend down retainer tabs and 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 holes and exhaust ports for any exhaust deposits. If deposits are removed, use a small wood stick to prevent damage to the piston, rings and port. If deposits are being removed, have the piston at bottom dead center to try to keep deposits out of cylinder bore. After deposits are removed, rotate piston half way over the exhaust ports to close off transfer ports, and use compressed air to remove the particles from the combustion chamber with the spark plug removed.

CAUTION: WEAR SAFETY GLASSES.

INSTALLING MUFFLER

When installing a new or used muffler, use a new gasket. Lubricate screw threads with anti-seize lubricant, part number 93963. Torque both screws to 115 inch pounds (1.32 kpm, 13.0 nm). Set lock tabs to retain muffler screws.

2 Cycle Repair Instructions (Form 7879)

Section 8
TROUBLESHOOTING

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 checkout should adjustments or disassembly be attempted.

B. TWO-STROKE-CYCLE ENGINE FAILS TO START OR STARTS WITH DIFFICULTY

PROBABLE CAUSE	POSSIBLE REMEDY
No fuel in tank.	Fill tank with the correct fuel-oil mixture.
Fuel shut-off valve closed.	Open the shut-off valve.
Fuel filter clogged (if supplied).	Service the fuel filter.
Obstructed fuel line.	Remove the fuel line and replace it with a new line or blow it clean.
Tank vent hole closed.	Open the tank vent hole.
Engine flooded.	Close the fuel shut-off valve, remove the spark plug and crank the engine. Dry and reinstall the plug. Open the shut-off valve and crank engine until it starts (do not choke or prime).
Too much oil in fuel.	Drain the fuel tank and fill it with the correct mixture.
Water or ice in fuel.	Drain the fuel tank, lines, carburetor, filter (if included), and fuel pump, and fill the system with correct mixture.
Engine over- or under-choked.	When starting, close the choke all the way if the engine is cold, half way if the engine is warm. Open the choke when engine has started.
Carburetor adjustment incorrect.	Adjust the carburetor.
Carburetor throttle plate not opening.	Check governor linkage. Be sure that it is free. Clean, adjust it so that the throttle plate opens. On snow throwers, check for frozen snow or ice.
Fuel pump diaphragm leaks.	Replace the diaphragm.
Fuel valve sticks.	Clean the fuel screen and the valve (in carburetor).
Governor faulty.	Check the governor operation. Repair or replace parts. Check the linkage; adjust or repair it as necessary.

PROBABLE CAUSE	POSSIBLE REMEDY
Carburetor jet clogged.	Overhaul and clean the carburetor. Drain the fuel system and fill it with clean fuel mixture of oil and gasoline. Service the air cleaner. Reassemble.
Damp breaker points or spark plug points.	Dry the points. Check for a moisture source.
Flywheel-to-armature air gap incorrect.	Adjust the air gap.
Fuel vapor lock.	Allow the engine to cool. Supply ventilation; check cooling.
Loose or defective ignition wiring.	Tighten the connections or replace the leads.
Faulty ignition.	Repair or replace the ignition; check for defective parts and replace such parts.
Breaker points not adjusted properly.	Adjust the breaker point gap. Replace the points if worn or pitted; clean if oil coated.
Spark plug fouled.	Clean and regap the spark plug or replace spark plug.
Gaskets at carburetor defective.	Replace the gaskets.
Gaskets at transfer ports leak.	Replace gaskets.
Poor compression.	Disassemble the engine to find the reason for the leak. Check pistons, rings and cylinders. Repair or replace all worn and faulty parts.
Defective ignition stop-switch on engine or equipment.	Replace the ignition stop-switch.
Compression release leaks.	Clean and reseal.

C. TWO STROKE-CYCLE ENGINE MISSES.

PROBABLE CAUSE	POSSIBLE REMEDY
Spark plug fouled.	Clean and regap the spark plug.
Spark plug defective.	Replace the spark plug.
Spark plug gap incorrect.	Regap the spark plug.
Dirt or water in fuel line.	Drain the fuel system. Fill the tank with the correct grade and mixture of oil and fuel.
Dirt or water in carburetor.	Drain the fuel system. Fill the tank with the correct grade and mixture of oil and fuel. If this does not correct the problem, overhaul and clean the carburetor.
Carburetor adjusted incorrectly.	Adjust the carburetor.
Breaker points out of adjustment.	Adjust the breaker point gap. Replace the points if worn or pitted; clean if oil coated.
Breaker points pitted or burned.	Clean and dress or replace the points. Check the condenser capacity; replace the condenser if incorrect. Adjust the point gap.
Faulty condenser or coil.	Replace the faulty parts.
Crankcase seals or gaskets leaking.	Replace the leaking seals and gaskets.

D. TWO-STROKE-CYCLE ENGINE LACKS POWER.

PROBABLE CAUSE	POSSIBLE REMEDY
Fuel filter clogged.	Service the fuel filter.
Carburetor adjusted incorrectly.	Adjust the carburetor.
Muffler clogged.	Clean or replace the muffler.
Exhaust port clogged.	Clean the exhaust ports and check the muffler.
Choke partially closed.	Open the choke.
Fuel tank vent clogged.	Clean the tank vent.
Fuel level low.	Fill the tank.
Vapor lock in fuel line.	Stop the engine and allow it to cool. Provide proper ventilation.
Fuel pump diaphragm leaking.	Replace the diaphragm.
Carburetor throttle does not open.	Check governor linkage. Clean. Repair or replace the broken or bent parts. Adjust so throttle plate opens.
Fuel valve sticking.	Repair the faulty fuel valve.
Fuel system dirty.	Drain and clean the fuel system. Replace with a clean mixture of oil and gasoline.
Governor faulty or linkage binding.	Check the governor linkage. Check and repair a faulty governor.
Worn piston or rings.	Replace the worn piston or rings. Check the cylinder.
Condenser faulty.	Check the condenser; replace it if faulty.
Spark plug gap incorrect.	Regap the spark plug.
Improper amount of oil in fuel mixture.	Drain the fuel system. Fill the tank with the correct proportion and grade of oil and gasoline.
Carburetor jet clogged.	Clean the carburetor.
Crankcase seals or gaskets leaking.	Replace the leaking seals or gaskets.
Poor compression.	Disassemble the engine to find the reason for the leak. Check pistons, rings, cylinders, valves and gaskets. Repair or replace all worn and faulty parts.
Ignition breaker points improperly adjusted.	Adjust the breaker point gap. Replace the points if worn or pitted; clean if oil coated. Check the spring tension.
Worn or binding connecting rod.	Overhaul the engine. Replace the worn parts.
Compression release leaks.	Clean and reseal.

E. TWO-STROKE-CYCLE ENGINE KNOCKS OR IS NOISY.

PROBABLE CAUSE	POSSIBLE REMEDY
Carbon in combustion chamber.	Clean the cylinder and piston head.
Loose or worn connecting rod.	Replace the connecting rod. Check the bearings; replace them if necessary. Check crankpin for wear, replace crankshaft if worn.
Loose flywheel.	Check for a sheared or partially sheared key. Replace the worn parts. Tighten starter clutch to proper torque.
Worn piston rings.	Replace the rings.
Bent blower housing.	Remove the housing; straighten or replace it.
Worn main bearings.	Replace main bearings. Check main journals for wear, replace crankshaft, if worn.

2 Cycle Repair Instructions (Form 7879)

Section 9
TOOLS

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

The following tachometers have been found to work well on Briggs & Stratton engines:

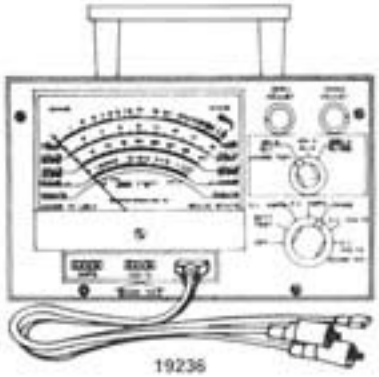
TYPE	NAME	RPM RANGE	SOURCE
Vibration	Trysit Sirometer	800-25000	Order from your Briggs & Stratton Source of Supply — Part No. 19200.
Vibration	Frahm #2516	1000-4000	James G. Biddle Company Plymouth Meeting, PA 19462
Electronic	Merc-O-Tronic Model 67-100T	1000-5000 1000-10000	Merc-O-Tronic Instruments Corp. 215 Branch Street Almont, MI

DESCRIPTION	RANGE OR TYPE	SOURCE
Torque Wrench	0-200 in. lbs. — Part No. 19197	Briggs & Stratton Source
Dial Caliper	0-4 in. — Part No. 19199	Briggs & Stratton Source
Telescope Gauge	2-1/8-3-9/16" — Part No. 19198	Briggs & Stratton Source
VOA Meter	#19236 Volts Scale — Reads 0 to 400 AC or DC volts. Ohms Scale — Reads 0 to 500,000 ohms. Amps Scale — Reads 0 to 40 and 400 DC amps amps with shunt. Reads 0 to 16 AC amps.	Briggs & Stratton Source
120 V. Adapter	#19242 Used with #19236 to Check 110-120 V. AC Starters	Briggs & Stratton Source


19197


19199


19198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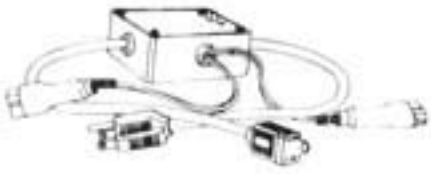
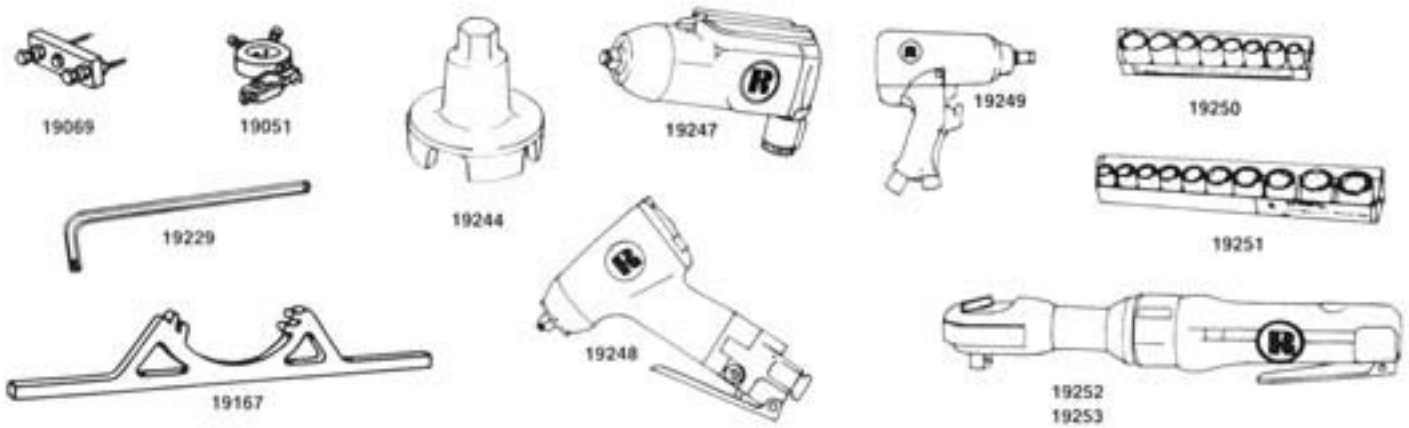

19242

BRIGGS & STRATTON REPAIR TOOLS

PART NO.	DESCRIPTION	MODELS SERIES
	FLYWHEEL PULLER	
19069	Removal of Flywheel	62000
	SPARK TESTER	
19051	For Testing Ignition Spark	62000
	FLYWHEEL HOLDER	
19167	To hold Flywheel while loosening or tightening nut	62000
	TANG BENDING TOOL	
19229	Governor Tang Bending Tool	62000
	STARTER CLUTCH WRENCH	
19244	Remove and Install Starter Clutch (To be used with 1/2" square drive wrench or torque wrench)	62000
	AIR TOOLS AND SOCKETS	
19247	3/8" Drive Butterfly Impact Wrench	62000
19248	3/8" Drive Angle Head Impact Wrench	62000
19249	1/2" Drive Impact Wrench	62000
19250	3/8" Drive Impact Socket Set (8 sockets 5/16" to 3/4")	62000
19251	1/2" Drive Impact Sockets Set (10 sockets 7/16" to 1")	62000
19252	3/8" Drive Air Ratchet Wrench	62000
19253	1/4" Drive Air Ratchet Wrench	62000
93693	Anti-Seize Lubricant Compound	62000

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