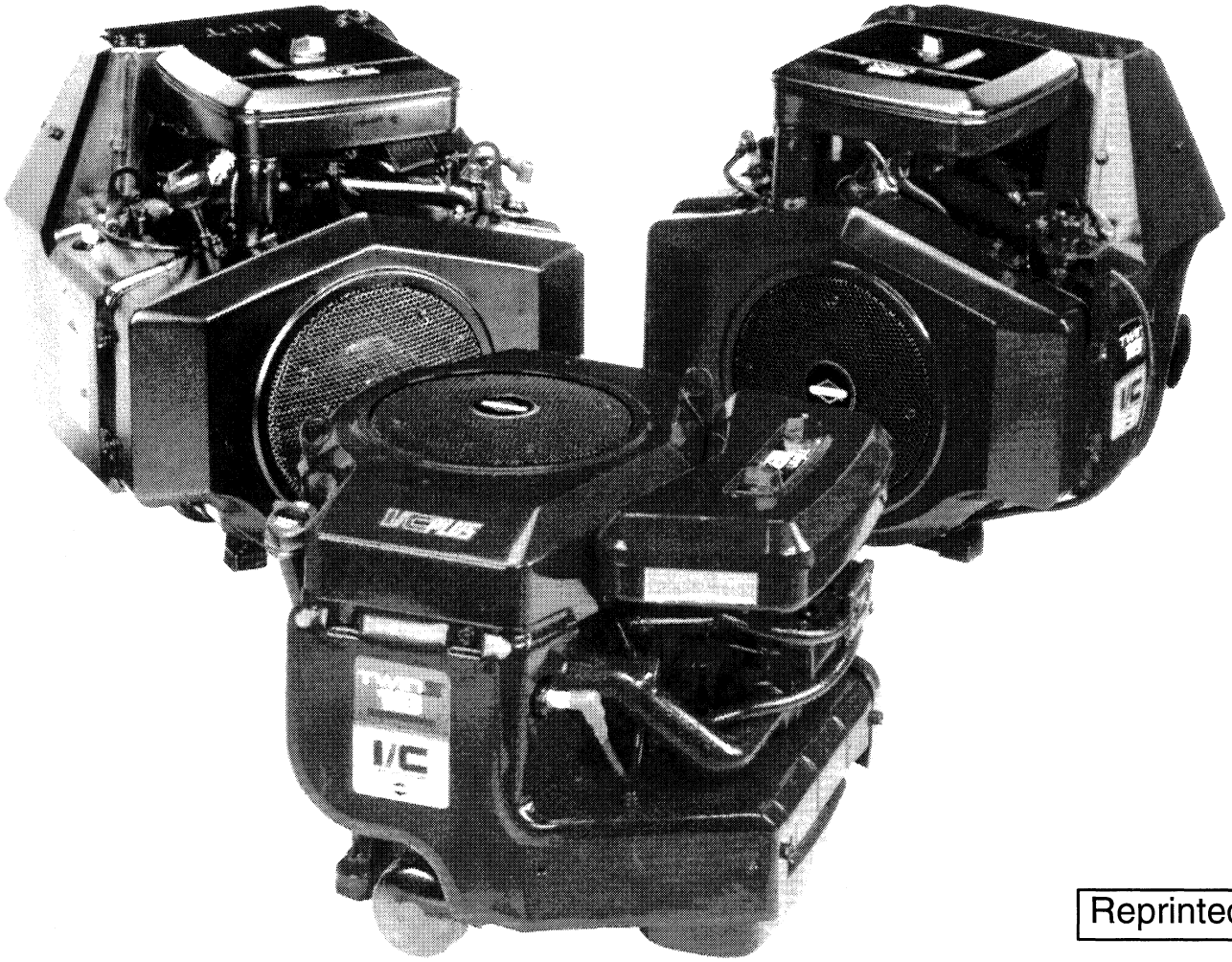
ORIGINAL
BRIGGS & STRATTON
SERVICE PARTS

# Twin Cylinder Repair Instructions

**40546100**



Reprinted



BRIGGS & STRATTON CORP., Milwaukee, Wis. 53201, U.S.A.

# FOREWORD

Before attempting a twin cylinder engine overhaul or a 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 book will serve as a guide in performing the various steps necessary to do a complete and satisfactory job.

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

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

You will find special repair parts, valve guides, valve seat inserts, etc., are not listed in the regular Parts Lists. These part numbers will be found only in this book or MS-4750.

The terms "Inspect", "Check", "Test" and "Replace" are used as follows:

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

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

TEST — Analyze with proper testing equipment.

REPLACE — This usually means to take off the old part and 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.

## TABLE OF CONTENTS

## 1. Spark Plug Gap: .030 All Models
## 2. Crankshaft End Play: .002 - .008 All Models

| Basic Model Series | Idle Speed RPM | Armature Air Gap | | Valve Clearance | | Valve Guide Reject Gauge | Torque Specifications | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Breaker Points | Magnetron® | Intake ● | Exhaust ● | | Flywheel Ft. Lbs. | Cylinder Head In. Lbs. | Connecting Rod In. Lbs. |
| 400400 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 400700 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 401400 AB | 1200 ** | .010" .014" | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 401700 AB | 1200 ** | .010" .014" | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 402400 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 402700 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 421400 AB | 1200 ** | .010" .014" | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 421700 AB | 1200 ** | .010" .014" | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 422400 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |
| 422700 SB | 1200 ** | — | .008" .012" | .006" .008" | .009" .011" | 19151 | 150 | 160 | 190 |

● Without Valves Springs Installed. With Valve Springs Installed, Intake .004" - .006", Exhaust .007" - .009".

** Governed Idle RPM. For adjustment procedure, see Sec. 5, this Manual.

**Miscellaneous Torque Specifications**

Governor Lever Lock Nut: 100 In. Lbs., All Models
Spark Plugs: 200 In. Lbs., All Models
Starter Mounting Bolts: 160 In. Lbs., All Electric Start Models

AB - Aluminum Bore
SB - Sleeve Bore

# ALL TWIN CYLINDER ENGINE MODELS

## 3. Top Governed Speed: See Briggs & Stratton Service Engine Sales Manual MS-4052 or MS-6225

| Torque Specifications (cont'd.) | | | | | Crankshaft Reject Sizes | | | Main Bearing Reject Gauge | Std. Bore Size |
|---|---|---|---|---|---|---|---|---|---|
| Crankcase Cover In. Lbs. | Crankcase Cover Steel In. Lbs. | Crankcase Cover Aluminum In. Lbs. | Base In. Lbs. | Sump In. Lbs. | Mag. Journal | Crankpins | P.T.O. Journal | | |
| 225 | — | — | 325 | — | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| — | 250 | — | — | 225 | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| 225 | — | — | 325 | — | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| — | 250 | — | — | 225 | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| 225 | — | — | 325 | — | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| — | 250 | 325 | — | 225 | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| 225 | — | — | 325 | — | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| — | — | 325 | — | 225 | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| 225 | — | — | 325 | — | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |
| — | — | 325 | — | 225 | 1.376" | 1.622" | 1.376" | 19219 | 3.4375" |

### Cylinder Resizing

Resize if .003" or more wear. Resize if out of round .0025" or more for Aluminum Bore, .0015" or more for Sleeve Bore. Resize .010", .020", .030" over Standard Bore.

### Piston Ring Reject Sizes

| | Comp. Rings | Oil Ring |
|---|---|---|
| Aluminum Bore | .035" | .045" |
| Sleeve Bore | .030" | .035" |

### Metric Equivalents

#### Torques

| In. Lbs. | Kgm Kpm | NM |
|---|---|---|
| 100 | 1.15 | 11.30 |
| 160 | 1.84 | 19.07 |
| 190 | 2.19 | 21.47 |
| 200 | 2.30 | 22.60 |
| 225 | 2.59 | 25.42 |
| 250 | 2.88 | 28.24 |
| 325 | 3.74 | 36.72 |
| 150# | 20.80 | 203.40 |

#### Dimensions

| In. | Mill. | In. | Mill. |
|---|---|---|---|
| .0005" | .012 mm | .0110" | .28 mm |
| .0015" | .04 mm | .0120" | .30 mm |
| .0020" | .05 mm | .0140" | .36 mm |
| .0025" | .06 mm | .0200" | .51 mm |
| .0030" | .08 mm | .0300" | .76 mm |
| .0040" | .10 mm | .0350" | .89 mm |
| .0060" | .15 mm | .0450" | 1.14 mm |
| .0070" | .18 mm | 1.3760" | 34.95 mm |
| .0080" | .20 mm | 1.6220" | 41.20 mm |
| .0090" | .23 mm | 3.4375" | 88.31 mm |

# - Ft. Lbs.

# INDEX

# INDEX of TABLES

# Section 1
# GENERAL INFORMATION

Briggs & Stratton twin cylinder engines are of the same basic 4 stroke cycle design used in automobiles, aircraft, trucks and tractors. As the name indicates, there are four strokes to one complete power cycle;

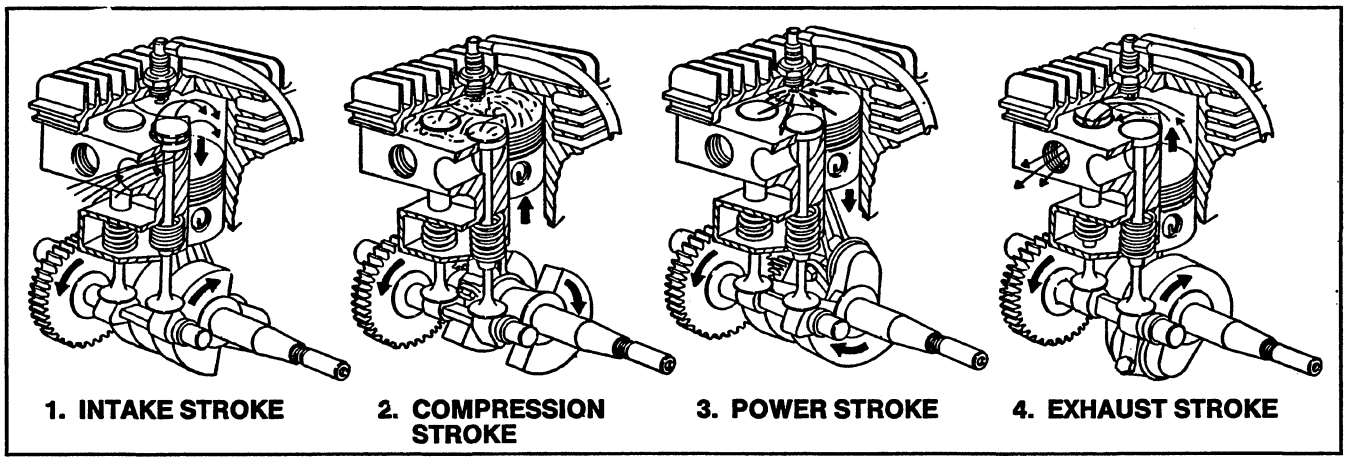



**Fig. 1. — The 4-Stroke Cycle**

1. INTAKE STROKE: As the piston moves down, a vacuum occurs in the cylinder. The intake valve has been opened by the cam gear. Atmospheric pressure pushes the air/fuel mixture through the open intake valve into the cylinder above the piston. At the bottom of the stroke the intake valve closes. The exhaust valve stays closed.

2. COMPRESSION STROKE: As the piston moves up with both valves closed, the air/fuel mixture becomes highly compressed in the space left between the top of the piston and the cylinder head.

3. POWER STROKE: Just before the compression stroke ends, the magneto produces a high voltage arc across the spark plug gap igniting the air/fuel mixture. The rapidly burning mixture produces very high pressure to push the piston down.

4. EXHAUST STROKE: As the piston begins to go up, the cam gear opens the exhaust valve and the piston pushes out the burned gases completing the fourth cycle and begins the first stroke again.

**⚠ WARNING**

Exhaust gases contain CARBON MONOXIDE which is an odorless and deadly poison. Proper care must be taken to provide adequate ventilation when running an engine indoors.

Do not fill the fuel tank while the engine is running. Avoid spilling gasoline on a hot engine. This can cause an explosion and serious injury.

**⚠ CAUTION**

Fill the crankcase with proper oil before starting engine. See that oil level is maintained at the proper level.

# GENERAL INFORMATION

## FUEL AND OIL RECOMMENDATIONS
## GASOLINE

Briggs & Stratton Twin Cylinder engines will operate satisfactorily on any gasoline intended for automotive use. A minimum of 77 octane is recommended. DO NOT MIX OIL WITH GASOLINE.

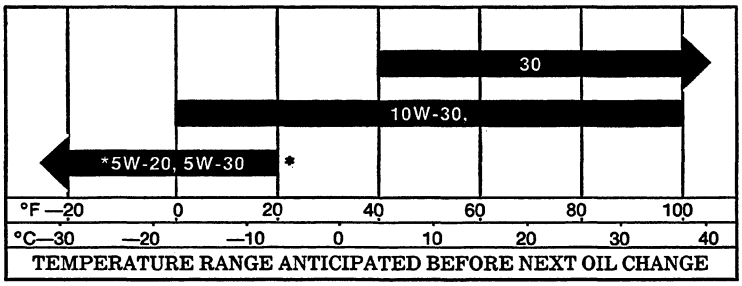
We recommend the use of clean, fresh, lead-free gasoline and the use of Briggs & Stratton Gasoline Additive, part no. 5041. Purchase fuel in quantity that can be used within 30 days. This will assure fuel freshness and volatility tailored to the season. Leaded gasoline may be used if lead-free is not available. The use of lead-free gasoline results in fewer combustion deposits and longer valve life.

**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.

### ENGINE OIL

We recommend the use of a high quality detergent oil classified "For Service SF, SE, SD, SC," such as Briggs & Stratton high quality detergent oil 10W/30 (part no. 272001) or 30 weight (part no. 100005). Detergent oils keep the engine cleaner and retard the formation of gum and varnish deposits. No special additives should be used with recommended oils.

**RECOMMENDED SAE VISCOSITY GRADES**




*If not available, a synthetic oil may be used having — 5W-20, 5W-30 or 5W-40 viscosity.

NOTE: 10W-40 oil may be used if 10W-30 is not available.

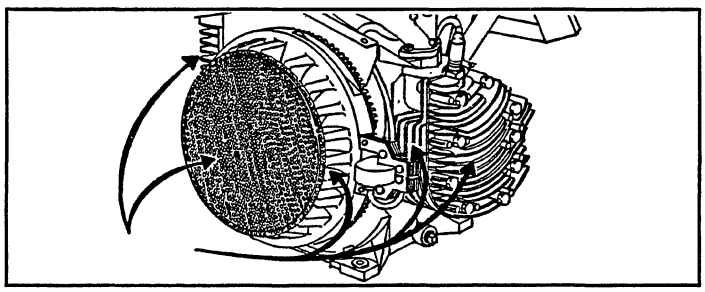
CHANGE OIL after first 5 hours of operation. Thereafter, change oil every 25 hours of operation. Change oil more often if engine is operated under heavy load, or in high ambient air temperatures.

Models 402770, 422770, 402440 and 422440 are equipped with a full pressure lubrication system and oil filter. Change oil after first 5 hours or operation. Thereafter, change oil every 50 hours of operation. Change oil more often if engine is operated under heavy load, or in high ambient air temperatures. Replace oil filter, Part #491056, every 100 hours.

During normal operation, small particles of metal from the cylinder walls, pistons, bearings and combustion deposits will gradually contaminate the oil. Dust particles from the air also contaminate the oil. If oil is not changed regularly, these foreign particles can cause increased friction and a grinding action which shortens the life of the engine. Fresh oil also assists in cooling. Old oil gradually becomes thick and loses its cooling ability as well as its lubricating qualities.

### CLEAN COOLING SYSTEM

Grass particles, chaff or dirt can clog the air cooling system, especially after prolonged service in cutting dry grass or very dirty air. Continued operation with a clogged cooling system can cause severe overheating and possible engine damage. The figure shows the blower housing removed and areas to be cleaned. This should be a regular maintenance operation, performed yearly or every 100 hours, whichever comes first.



# TUNE-UP PROCEDURE

A "Tune-Up", see the steps listed below, would normally be performed on relatively new engines brought in for minor difficulties. By performing these steps you will either be sure that the engine is functioning properly or will know what major repairs should be made.

The steps are also covered in the Overhaul Procedure and will normally be performed as a part of the complete overhaul.

| STEP NO. | |
|---|---|
| 1. | Remove air cleaner, check for proper servicing. |
| 2. | Check oil level and drain oil. (Clean fuel tank and lines.) |
| 3. | Remove blower housing, inspect rewind assembly and starter clutch, when so equipped. |
| 4. | Clean cooling fins and entire engine. |
| 5. | Remove carburetor, disassemble and inspect for wear or damage. Wash in solvent. Replace parts as necessary and assemble. Set initial adjustment. |
| 6. | Inspect intake manifold for damaged gaskets. |
| 7. | Check governor, linkage and springs for damage, wear, also check adjustment. |
| 8. | Remove flywheel. Check for oil seal leakage, both flywheel and PTO sides. Check flywheel key. |
| 9. | Remove breaker cover (if so equipped) and check for proper sealing. |

| STEP NO. | |
|---|---|
| 10. | Inspect breaker points and condenser. Replace or clean and adjust. Check plunger, if so equipped. |
| 11. | Check coil. Inspect all wires for breaks, damaged insulation. Be sure lead wires do not touch flywheel. Check stop switch and lead. |
| 12. | Replace breaker cover and gasket, (if so equipped). Use sealer where wires enter. |
| 13. | Install flywheel, set air gap. Check for spark with #19051 tester. |
| 14. | Remove cylinder head. Check gaskets. Remove spark plugs, and clean carbon. Inspect valves for seating. |
| 15. | Replace cylinder heads. Torque to specified torque. Set spark plug gaps or replace plugs if necessary. |
| 16. | Replace oil and fuel. |
| 17. | Adjust remote control linkage and cable if used, for correct operation. |
| 18. | Service air cleaner. Check gaskets, element and cartridge for damage. |
| 19. | Check muffler for restrictions or damage. |
| 20. | Run and adjust mixture and top speed. |

## OVERHAUL PROCEDURE

The Overhaul Procedure which follows is intended to help you to become accustomed to a systematic method of repairing Briggs & Stratton engines. Naturally these steps could be rearranged in different order but efficiency is obtained when the repair operations are performed in the same sequence every time. The exact procedure will vary according to the engine model being repaired.

The Overhaul Procedure can also be used as an index. For information on how to perform most operations listed, refer to the page number or operation. Be careful to locate the instructions covering the specific model being repaired.

| SECTION | DISASSEMBLY |
|---|---|
| 8 | Drain oil |
| 8 | Remove Oil Filter (if so equipped) |
| 3 | Air cleaner assembly Intake manifold, carburetor and linkage |
| 12 | Muffler |
| 3 | Check throttle shaft and bushings for wear |
| 3 | Disassemble carburetor |
| 2 | Rope starter pulley (if so equipped) |
| 7 | Electric starter (12 V) Blower housing |
| 6 | Check compression |
| 2 | Spark plug. Adjust gap (.030") clean and wash |
| 2 | Check air gap - armature to flywheel |
| 8 | Breather or valve cover |
| 6 | Cylinder heads and shields |
| 6 | Check tappet clearance |
| 6 | Valves and springs |
| 2 | Flywheel nut or starter clutch (if so equipped) |
| 2 | Flywheel |
| 2 | Breaker point cover (if so equipped) |
| 2 | Check breaker point gap (if so equipped) |

| SECTION | DISASSEMBLY (Continued) |
|---|---|
| 2 | Check breaker point plunger hole (if so equipped) |
| 2 | Test condenser and remove if necessary |
| 2 | Test coil or armature - check leads |
| 2 | Breaker arm assembly and condenser (if so equipped). |
| 2 | Breaker plunger |
| 10 | Check end play |
| 10 | Remove burrs from crankshaft extension |
| 10 | Crankcase cover, base or sump |
| 11 | Damaged seals |
| 5 | Mechanical governor parts |
| 8 | Inspect oil slinger |
| 10 | Cam gear and tappets |
| 9 | Connecting rods and pistons |
| 10 | Crankshaft - inspect and check |
| 2 | Armature assembly and back plate |
| 8 | Remove & Inspect Oil Pump (Pressure Lube) |
| 8 | Remove & Inspect Oil Filter Adapter & Pressure Relief Valve (Pressure Lube) |
| 10 | Crankshaft - inspect & check |
| 10 | Cam gear |
| 11 | Cylinder - check bore, main bearing, valve guides and seats, cylinder bore |
| 9 | Disassemble connecting rods and pistons |
| 9 | Check pistons, rings, connecting rods, piston pins |

| SECTION | REPAIRS |
|---|---|
| | Clean parts |
| 11 | Resize cylinder bore to next oversize |
| 6 | Replace or repair valve guide - intake or exhaust |
| 6 | Reface valves and seats and lap |
| 6 | Replace valve seat insert |
| 11 | Replace main bearings |
| 11 | Replace oil seal |
| 2 | Replace armature |
| 3 | Replace throttle shaft bushing |
| 3 | Repair carburetor |
| 7 | Replace rewind starter spring and rope (if so equipped) |
| 7 | Starter clutch (if so equipped) |
| 11 | Replace ball bearing (if so equipped |

| SECTION | REASSEMBLE |
|---|---|
| 10 | Tappets, cam gear, crankshaft |
| 10 | Crankshaft |
| 9 | Pistons, piston pins, connecting rods and rings |
| 8 | Oil slinger |
| 5 | Mechanical governor |
| 8 | Assemble oil pump (pressure lube) |
| 8 | Assemble pressure relief valve & install oil filter adapter (pressure lube) |
| 10 | Sump or crankcase cover - check end play |
| 6 | Adjust valve tappet clearance |
| 6 | Valves, springs, retainer |

| SECTION | REASSEMBLE (Continued) |
|---|---|
| 2 | Armature |
| 2 | Condenser (if so equipped) |
| 2 | Adjust and clean breaker points (if so equipped) |
| 2 | Breaker point cover (if so equipped) |
| 2 | Breaker box cover (if so equipped) |
| 2 | Flywheel and starter or clutch (if equipped) |
| 7B | Electric starter (12 V) |
| 2 | Adjust air gap - armature to flywheel |
| 2 | Check spark |
| 8 | Breather or valve cover |
| 6 | Cylinder heads and shields |
| 2 | Spark plugs |
| 12 | Mufflers |
| 3 | Intake manifold and carburetor |
| 4 | Linkage and governor controls |
| 5 | Check and adjust mechanical governor |
| 2 | Blower housing |
| 3 | Fuel filter parts, tank and line |
| 3 | Clean & assemble air cleaner |
| 8 | Fill crankcase with oil<br>Start engine (fill with gas) |
| 6 | Retighten cylinder head screws |
| 3 | Adjust carburetor |
| 5 | Set governor to obtain correct engine speed (remote controls) |
| | Spray engine and apply decals |

## CHECK-UP

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

1. Will not start
2. Hard starting
3. Lack of power
4. Vibration
5. Overheating
6. High oil consumption

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 out 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

See Section 6 page 1, for proper procedure.

If compression is poor, look for —

1. Loose spark plug (s)
2. Loose cylinder head bolts
3. Blown head gasket (s)
4. Burned valves, valve seats and/or loose valve seats
5. Insufficient tappet clearance
6. Warped cylinder head (s)
7. Warped valve stems
8. Worn bore and/or rings
9. Broken connecting rods

### Check Ignition (With Engine Starter)

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

Attach a 19051 tester to each spark plug lead and ground the other end of the testers to the engine block. Spin the flywheel with the engine starter. If spark jumps the .166" tester gaps, you can assume the ignition system is performing satisfactorily. See Section 2 for additional information.

If spark does not occur look for —

1. Incorrect armature air gap
2. Sheared flywheel key (Breaker points only)
3. Incorrect breaker point gap (when so equipped)
4. Dirty or burned breaker points
5. Breaker plunger stuck or worn
6. Shorted ground wire (when so equipped)
7. Shorted stop switch (when so equipped)
8. Condenser failure (Breaker points only)
9. Armature failure
10. Worn cam bearings and/or cam gear (Breaker points only)
11. Improperly operating interlock system

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 testers between the ignition cable and the spark plugs. A spark miss will be readily seen. See Sec. 2.

### Check Carburetion

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

1. Overchoking
2. Excessively rich fuel mixture
3. Water in fuel
4. Float needle valve stuck open

If plug is dry, look for —

1. Leaking carburetor mounting gaskets
2. Gummy or dirty carburetor
3. Float needle valve stuck shut
4. Inoperative fuel pump

A simple check to determine if the fuel is getting to the combustion chamber through the carburetor is to remove either 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 conditions as for a dry plug.

### Equipment - Affecting Engine Operation

Frequently, what appears to be a problem with engine operation, such as hard starting, vibration, etc., may be the fault of the equipment powered 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. Loose belt — a loose belt like a loose blade can cause a backlash effect, which will counteract engine cranking effort.
2. Starting under load — See if the unit is disengaged when engine is started; or if engaged, does not have a heavy starting load.
3. Check remote control assembly for proper adjustment.
4. Check interlock system for shorted wires, loose or corroded connections, or defective modules or switches.

### Vibration

1. Cutter blade bent or out of balance — Remove and balance.
2. Mounting bolts loose — tighten.

### Power Loss

1. Bind or drag in unit—If possible, disengage engine and operate unit manually to feel for any binding action.
2. Grass cuttings build-up under deck.
3. No lubrication in transmission or gear box.
4. Excessive drive belt tension may cause seizure.

### Noise

1. Cutter blade coupling or pulley — an oversize or worn coupling can result in knocking, usually under acceleration. Check for fit, or tightness.
2. No lubricant in transmission or gear box.

# GENERAL INFORMATION

## BRIGGS & STRATTON 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, AUXILIARY DRIVE, or PRESSURE LUBRICATION.

E. The last digit indicates the TYPE OF STARTER.

| CUBIC INCH DISPLACEMENT | FIRST DIGIT AFTER DISPLACEMENT<br>BASIC DESIGN SERIES | SECOND DIGIT AFTER DISPLACEMENT<br>CRANKSHAFT, CARBURETOR GOVERNOR | THIRD DIGIT AFTER DISPLACEMENT<br>BEARINGS, REDUCTION GEARS & AUXILIARY DRIVES | FOURTH DIGIT AFTER DISPLACEMENT<br>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 | | | |
| 10 | 3 | 2-Horizontal Pulsa-Jet | 2-Replaceable Bearing | 2-Rewind Starter |
| 11 | 4 | | | |
| 13 | 5 | 3-Horizontal Flo-Jet Pneumatic Governor | 3-Flange Mounting Ball Bearing | 3-Electric-120 Volt, Gear Drive |
| 17 | 6 | | | |
| 19 | 7 | 4-Horizontal Flo-Jet Mechanical Governor | 4-Pressure Lube Horizontal | 4-Electric Starter-Generator-12 Volt, Belt Drive |
| 22 | 8 | | | |
| 23 | 9 | | | |
| 24 | | 5-Vertical Vacu-JEt | 5-Gear Reduction (6 to 1) | 5-Electric Starter Only-12 Volt, Gear Drive |
| 25 | | | | |
| 28 | | 6- | 6-Gear Reduction (6 to 1) Reverse Rotation | 6-Alternator Only* |
| 29 | | | | |
| 30 | | | | |
| 32 | | 7-Vertical Flo-Jet | 7-Pressure Lube Vertical | 7-Electric Starter-6 or 12 Volt, Gear Drive, with Alternator |
| 40 | | | | |
| 42 | | | | |
| | | 8- | 8-Auxiliary Drive Perpendicular to Crankshaft | 8-Vertical Pull Starter |
| | | 9-Vertical Pulsa-Jet | 9-Auxiliary Drive Parallel to Crankshaft | *Digit 6 formerly used for "Wind Up" Starter on 60000, 80000 and 92000 Series. |

To identifiy Model 401417.

| 40 | 1 | 4 | 1 | 7 |
|---|---|---|---|---|
| 40 Cubic Inch | Design Series 1 | Horizontal Shaft-Flo-Jet Carburetor Mechanical Governor | Flange Mounting Plain Bearing | Electric Starter-12 Volt Gear Drive with Alternator |

Similarly, A Model 401707 is described as follows:

| 40 | 1 | 7 | 0 | 7 |
|---|---|---|---|---|
| 40 Cubic Inch | Design Series 1 | Vertical Shaft-Flo-Jet Carburetor | Plain Bearing | Electric Starter 12 Volt Gear Drive with Alternator |

# Section 2
# IGNITION

Briggs & Stratton Twin Cylinder engines use two types of ignition systems:

1. Magnetron® — Consisting of a self-contained transistor module (no moving parts) mounted on the ignition armature, and a flywheel with magnets, Fig. 1.

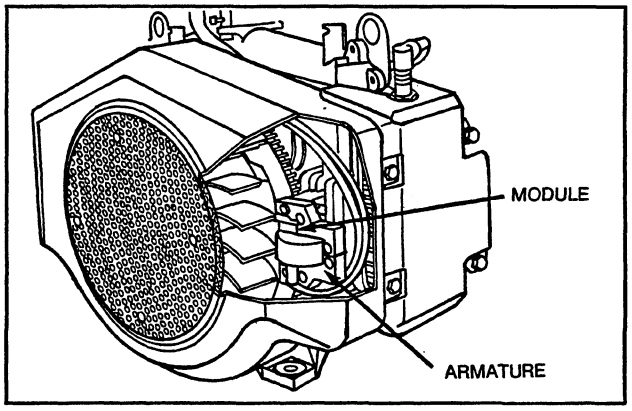



**Fig. 1 — Magnetron® Ignition**

2. A Flywheel magneto system consisting of external breaker points and condenser mounted under the breaker box, ignition armature, and a flywheel with magnets, Fig. 2.

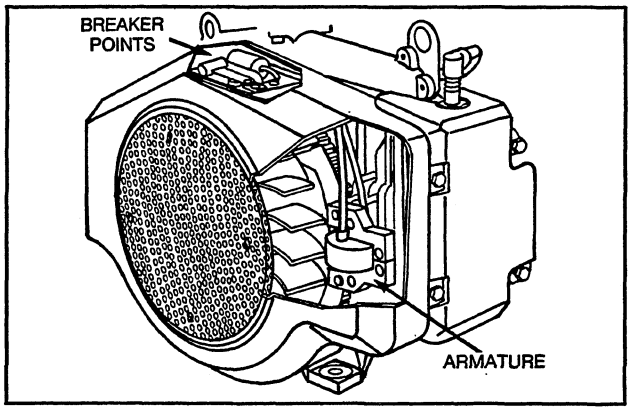



**Fig. 2 — Breaker Point Ignition**

## CHECK IGNITION (With Engine Starter)

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

With spark plugs installed, attach Tool #19051 tester to each spark plug lead and ground the other end of the tester as shown in Fig. 3. Spin the flywheel rapidly with engine starter. If spark jumps the .166" tester gaps, you may assume the ignition system is functioning satisfactorily.

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

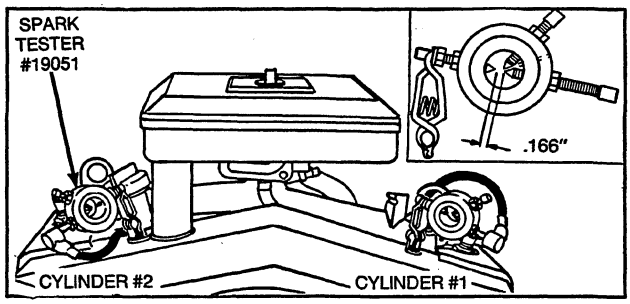



**Fig. 3 — Checking Spark**

## CHECK IGNITION (Engine Running)

If engine runs but misses during operation, a quick check to determine if ignition is or is not at fault can be made by installing Tool #19051 tester between the ignition cable and each spark plug, Fig. 4. A spark miss will be readily apparent.

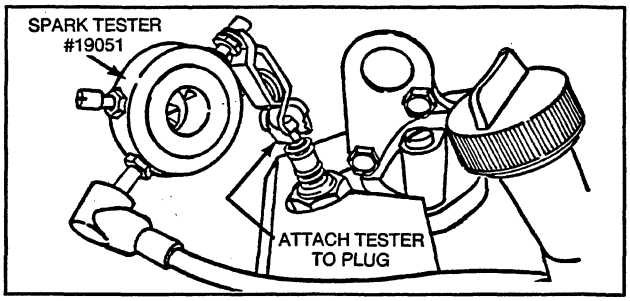



**Fig. 4 — Running Check**

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

# IGNITION
# Testing

## CHECK IGNITION
## (Fouled Plug or Other Causes)

To check for a fouled spark plug or a nonfunctioning cylinder, start engine and set speed at approximately 3000 RPM. Then ground one spark plug, Fig. 5. The engine should continue to run on the other cylinder. Repeat this test with the other cylinder. If the engine will not continue to run when making this test, the cylinder that is not grounded is not functioning and/or the spark plug is fouled. A fouled spark plug may indicate that carburetor is out of adjustment. See section 3. Install a new spark plug (Part #394539) before proceeding.

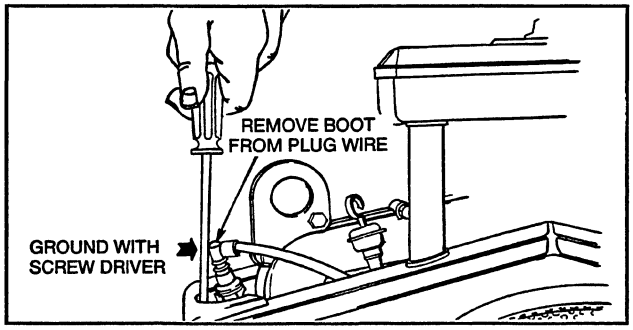



**Fig. 5 — Checking for Fouled Plugs or Other Causes**

## SPARK PLUG

The spark plugs recommended for Briggs & Stratton twin cylinder engines are as follows:

| | Manufacturer's Part No. |
|---|---|
| Champion<br>Auto-Lite | RJ-12<br>308 |

## SPARK PLUG CLEANING

Clean spark plug with a pen knife or wire brush and solvent and set gap at .030" for all models, Fig. 6. If electrodes are burned away, or the porcelain is cracked, replace with a new plug. DO NOT USE ABRASIVE CLEANING MACHINES.

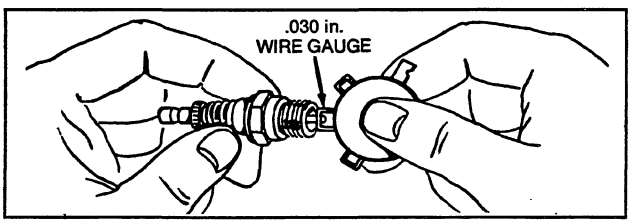



**Fig. 6 — Adjusting Spark Plug Gap**

## COIL AND CONDENSER TESTING

Use an approved tester to test coils and condensers. Specifications are supplied by the tester manufacturer, or refer to MS-7862, Instruction Book, Testing Briggs & Stratton Ignition Coils.

## REMOVE ARMATURE
## All Models

The armature is located inside the blower housing. With the blower housing removed, armature can be tested either on engine or removed for bench testing. NOTE: On engines with debris guard or booster fan it is necessary to remove these items before blower housing can be removed, Fig. 7, Fig. 8.

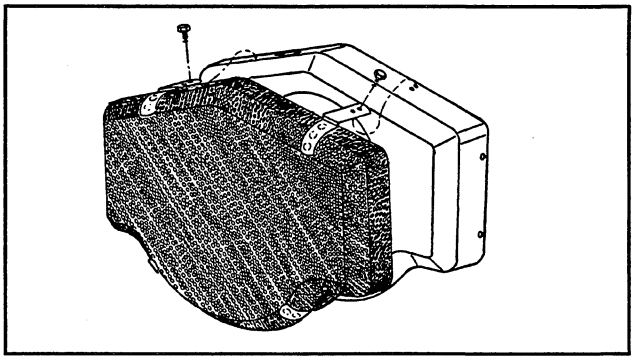


**Fig. 7 — Debris Guard (Typical)**

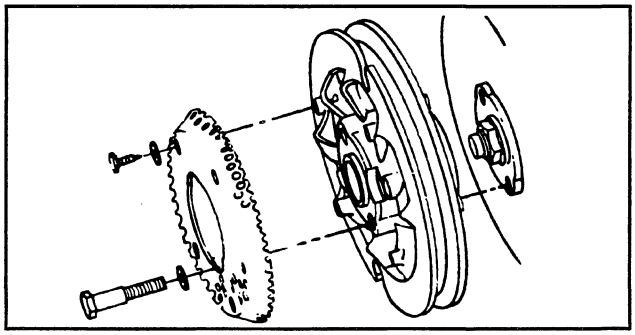


**Fig. 8 — Booster Fan**

The armature is attached by two screws to the armature mounting posts. Current Magnetron® armatures have a separate ground wire screw, Fig. 11. On engines with Magnetron® ignition remove stop switch wire from stop switch terminal, Fig. 9.

Engines with breaker point ignition use one armature mounting screw to secure ground wire(s). Remove breaker point primary wire before removing armature, Fig. 10.



NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION

## TABLE NO. 1
## SPECIFICATIONS FOR ALL TWIN CYLINDER ENGINE MODELS

| BASIC MODEL SERIES | ARMATURE AIR GAP | FLYWHEEL PULLER PART NO. | FLYWHEEL NUT TORQUE | | |
|---|---|---|---|---|---|
| | | | FT. LBS. | MKP MKG | NM |
| 400000, 420000 | With Magnetron®- .008 to .012<br>With Breaker Points- .010 to .014 | 19203 | 150 | 20.8 | 203.4 |
| Spark plug gap: .030 - all models | | | | | |

**Breaker Point Ignition** 1. Contact point gap: .020
2. Condenser capacity: .18 to .24 M.F.D.

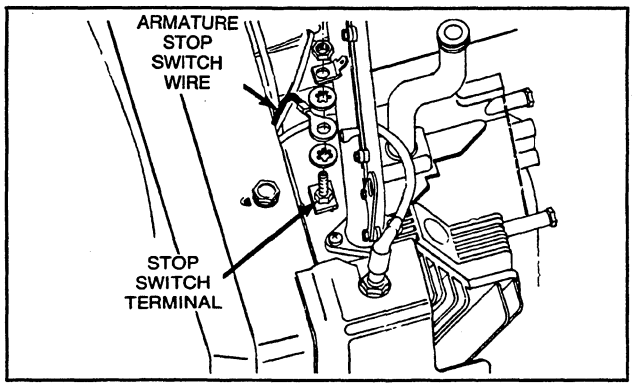



**Fig. 9 — Stop Switch Terminal**

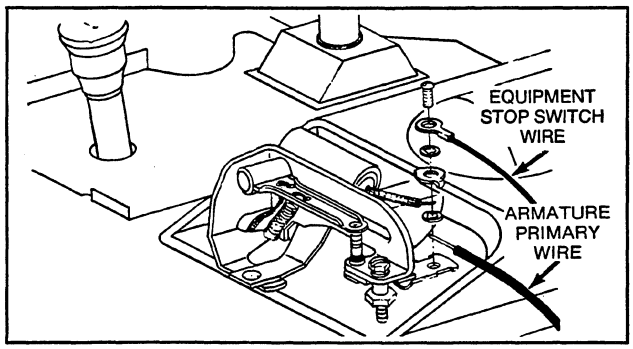



**Fig. 10 — Remove Primary Wire**

NOTE: On engines with breaker points, it may be necessary to remove carburetor or carburetor and intake manifold. See Section 3 for removal procedure.

## MAGNETRON® ARMATURE TESTING

Use an approved tester to test armature. Specifications are supplied by the tester manufacturer or refer to MS-7862, Testing Briggs & Stratton Coils, instruction book.

## REMOVE MAGNETRON® ARMATURES

Removal of Magnetron® armature does not require removal of the flywheel, except to inspect flywheel key and keyways on crankshaft and flywheel.

Remove armature mounting screws and lift off armature. Remove stop switch wire by depressing spring and retainer with a 3/16" inch diameter pin punch or an old condenser from breaker point set Part #294628, Fig 11, 12.

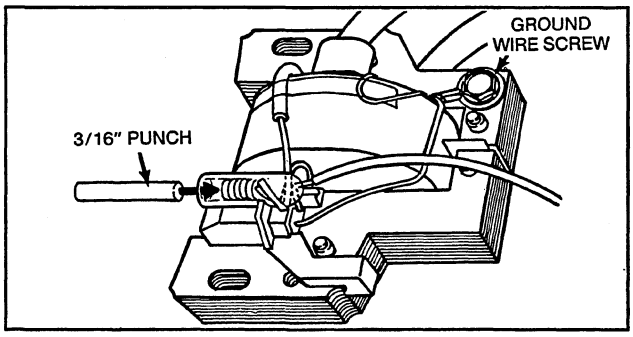



**Fig. 11 — Remove Armature Stop Wire**

## REMOVE MAGNETRON® MODULE

Remove sealant and or tape holding armature wires to armature. Remove ground wire screw. With wires removed, spring and retainer clip can be removed, unsolder and separate remaining wire, Fig. 12.

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

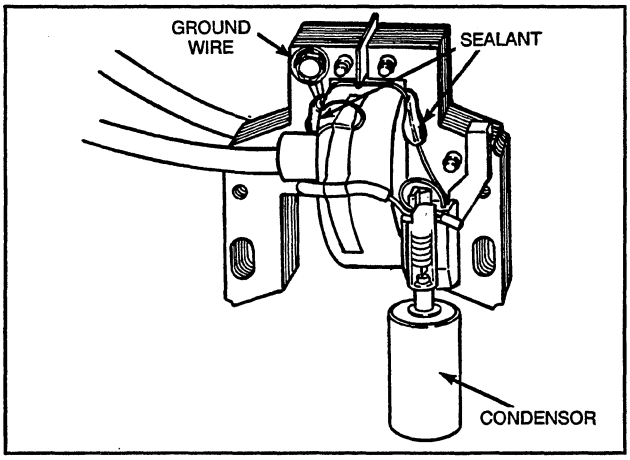



**Fig. 12 — Armature Wire Removal**

NOTE: Avoid damaging armature and module when unsoldering or soldering.

Move all wires so module will clear armature and laminations. Pull module retainer away from laminations and push module off laminations, Fig. 13.

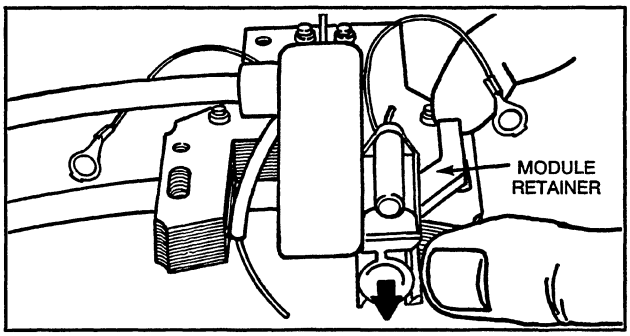



**Fig. 13 — Removing Module**

## INSTALL MAGNETRON® MODULE

NOTE: Module can only be installed on armatures originally equipped with Magnetron®.

The armature has a front side identified by the large rivet heads. The module is installed with the retainer on the back side, Fig. 14, small rivet ends.

NOTE: Modules may have white, clear yellow or black cases.

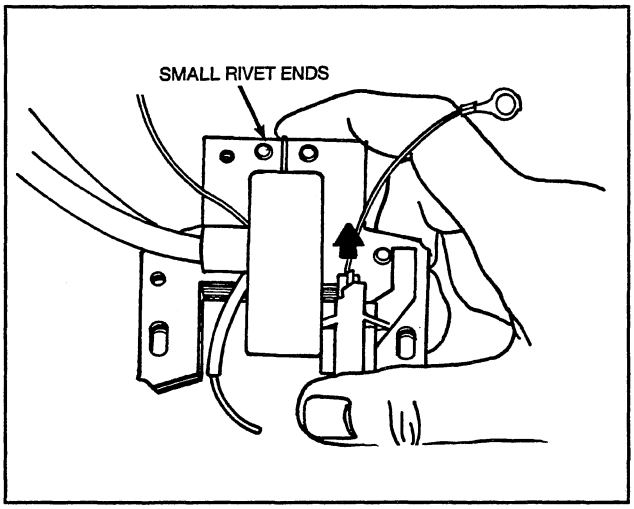



**Fig. 14 — Install Module**

NOTE: Make sure module retainer snaps over armature laminations.

Install armature primary wire, module wire, and stop switch wire under hook of wire retainer, Fig. 15. Use a 3/16" inch punch or an old condenser from breaker point set Part #294628 to compress retainer spring. Twist three wires together and solder with 60/40 Rosin core solder.

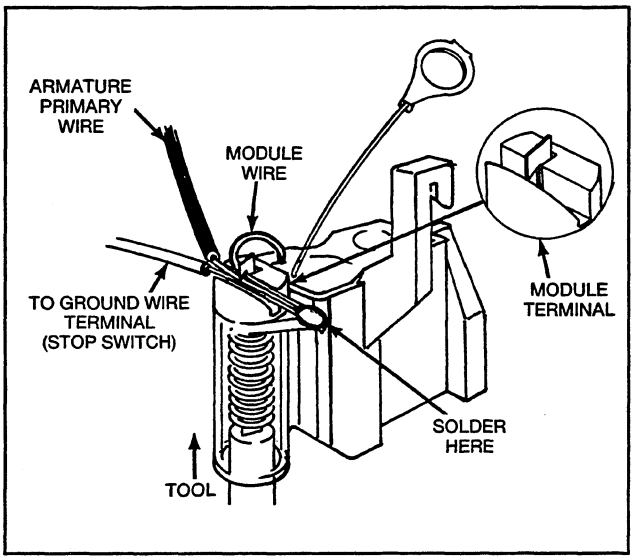



**Fig. 15 — Install Wire in Module**

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

Seal wires to armature with Permatex® No. 2 or similar sealer to prevent wires from vibrating and breaking, Fig. 16.

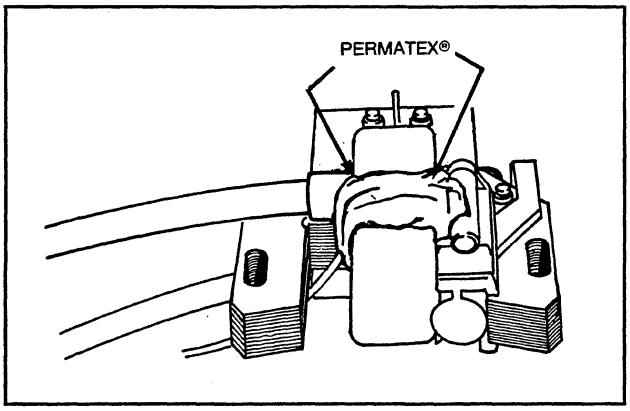



**Fig. 16 — Sealing Wires**

## INSTALL ARMATURE

### Magnetron® or Breaker Point Ignition

Rotate flywheel so magnet is away from armature. Install armature on engine as shown in Fig. 17, Magnetron® ignition, or Fig. 18, for breaker point ignition. Push armature away from flywheel and tighten one screw to hold armature away from flywheel. The right hand mounting screw holds the ground lead(s) on older ignition systems. Current Magnetron® armatures have a separate ground wire screw.

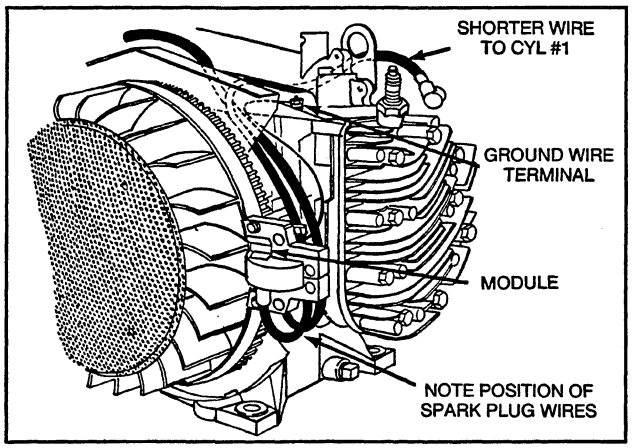



**Fig. 17 — Armature, Magnetron®**

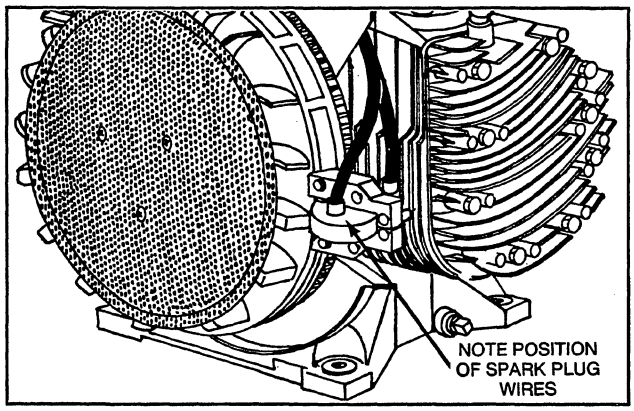



**Fig. 18 — Armature, Breaker Points**

## ADJUST ARMATURE AIR GAP

Rotate flywheel until magnet is under armature laminations. Place thickness gauge, .008" to .012" Magnetron®, .010" to .014" breaker point ignition, between magnet and armature laminations, Fig. 19. Loosen mounting screw(s) so magnet will pull armature down against thickness gauge. Tighten both mounting screws. Rotate flywheel to remove thickness gauge.

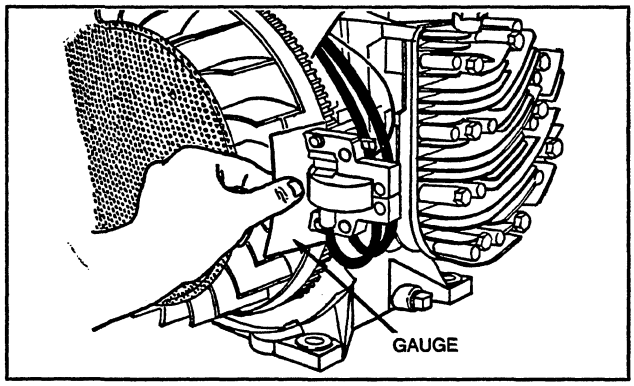



**Fig. 19 — Adjust Air Gap**

## IGNITION WIRE ROUTING

The ignition armature is mounted on No. 1 cylinder. The short spark plug wire goes through opening between #1 breather and back plate, Fig. 20, under intake manifold and around to #1 spark plug. Stop switch wire, Magnetron® or armature primary wire (breaker points) uses same opening to stop switch terminals. Long spark plug wire is for #2 cylinder. Route up through breather opening and under intake manifold to #2 spark plug, Fig. 20.

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

# IGNITION
## Breaker Point

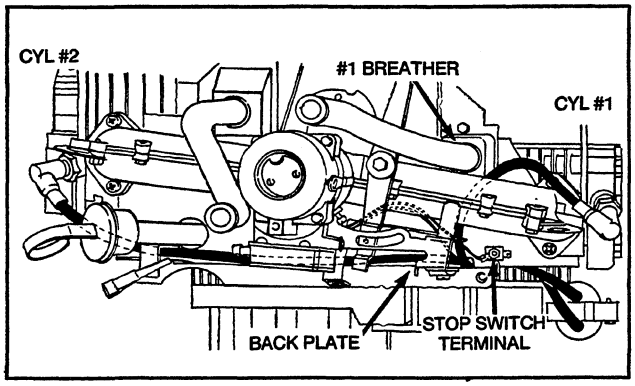



**Fig. 20 — Typical Wire Routing**

### REMOVE BREAKER POINTS

NOTE: On engine with breaker points, it may be necessary to remove carburetor or carburetor and intake manifold. See Section 3 for removal procedure.

Breaker points and condenser are held by one (1) mounting screw and a breaker point adjusting screw and lock nut, Fig. 21. Remove mounting screw holding condenser and mounting bracket. Loosen lock nut counterclockwise and then turn breaker point adjusting screw counterclockwise until breaker points and condenser can be removed as an assembly.

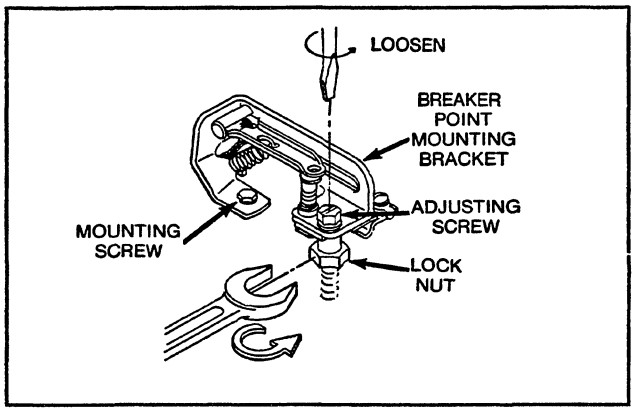



**Fig. 21 — Remove Condenser and Points**

### BREAKER POINT PLUNGER

To avoid the possibility of oil leaking past the breaker point plunger or moisture entering the crankcase between plunger and plunger hole, a plunger seal is used, Fig. 22.

If breaker point plunger is worn to length of 1.115" or less, it must be replaced. Breaker Plunger should be installed with fiber tip up as shown in Fig. 22. If fiber tip is loose, replace plunger.

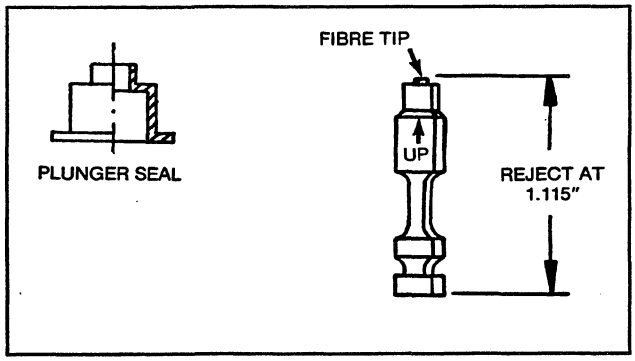



**Fig. 22 — Checking Plunger**

### INSTALL PLUNGER AND SEAL

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING SEAL ON PLUNGER OR SEAL MAY BE FRACTURED. DO NOT INSTALL A DAMAGED OR USED SEAL.

Install new plunger seal on breaker plunger first. Make sure it is attached securely and that small diameter of breaker plunger is up. Install breaker plunger into breaker plunger hole, and slide seal over plunger boss until edge of seal comes in contact with base, Fig. 23.

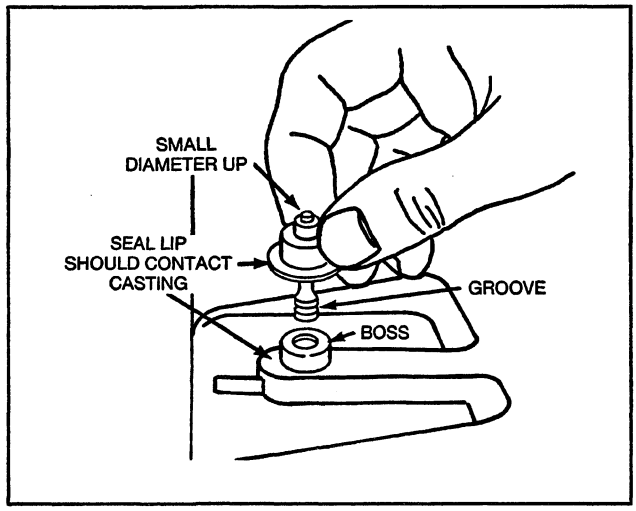



**Fig. 23 — Installing Plunger and Seal**

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

## INSTALL BREAKER POINTS AND CONDENSER

For ease of assembly, install stop switch wire, condenser wire and armature primary wire to point terminal before installing points, Fig. 24. Turn locknut counterclockwise on adjusting screw until finger tight.

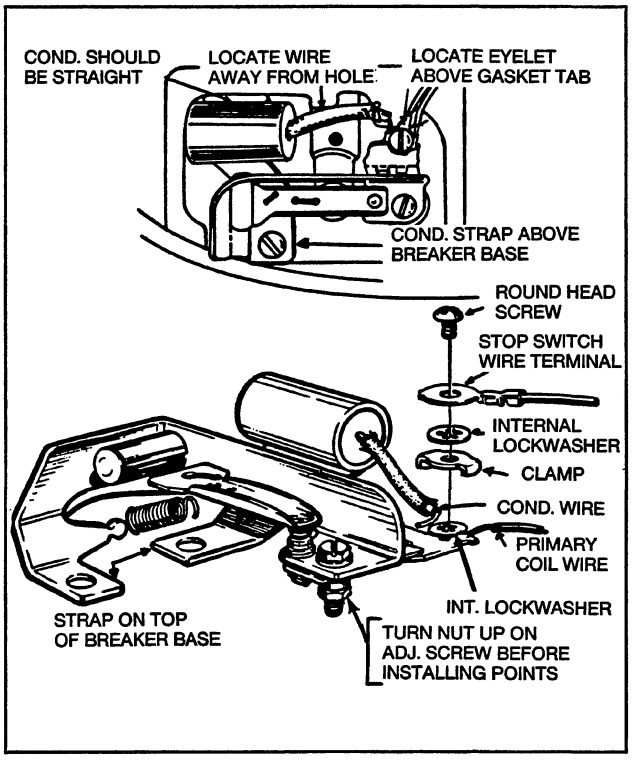



**Fig. 24 — Install Wires**

Place breaker point cover gasket on engine with tab to right of breaker plunger boss, Fig. 25.

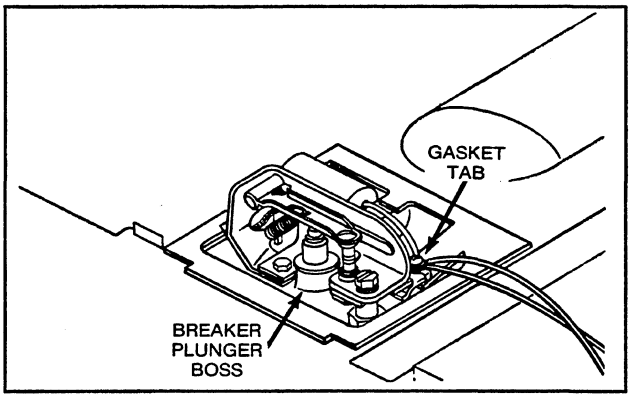



**Fig. 25 — Cover Gasket**

Turn breaker point adjustment screw clockwise until locknut touches cylinder block. Then install condenser and mounting screw. Fig. 26.

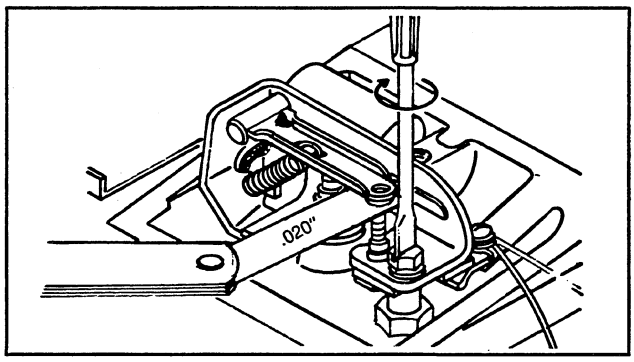



**Fig. 26 — Adjustment Point Gap**

## ADJUST BREAKER POINTS

Rotate crankshaft until points are at widest opening. Turn breaker point adjusting screw clockwise to increase or counterclockwise to decrease point gap. Set point gap at .020". Tighten locknut and recheck gap, Fig. 26. To prolong breaker point life, clean points as follows: with points open, place a piece of clean lintless paper between the points. Rotate crankshaft until points close on paper. Pivot paper on points, Fig. 27, then turn crankshaft until points open. Repeat procedure until paper comes out clean. Should you pull paper out while points are closed, you will pull dirt off paper onto points.

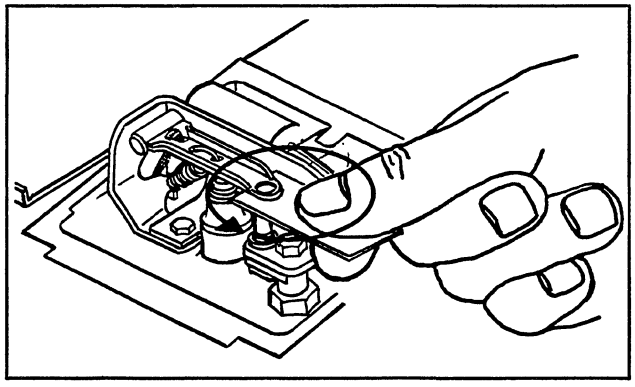


**Fig. 27 — Clean Points**

## INSTALL BREAKER POINT COVER

Place sealant (Permatex® or equivalent) under coil primary wire and stop switch wire on breaker point cover, Fig. 28. Then put sealant on wires. Install breaker point cover, being sure wires are in notch of breaker point cover.

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

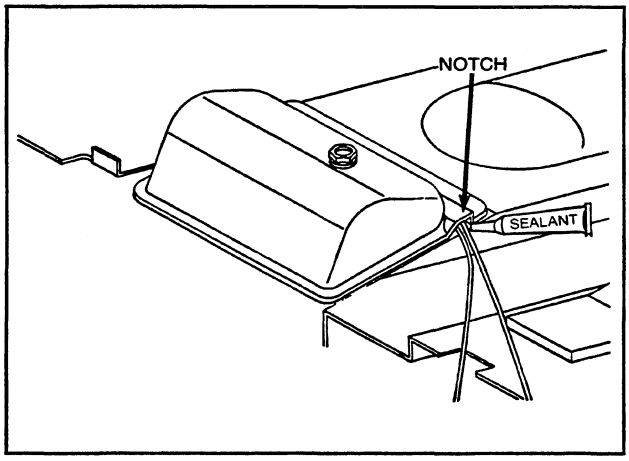



Fig. 28 — Install Sealant and Cover

NOTE: Refer to Section 3 for procedure to install carburetor or carburetor and manifold.

## REMOVE FLYWHEEL — TWIN II (TYPE NO'S. 1100 & ABOVE)

Remove debris guard, or booster fan, if so equipped. Remove blower housing and rotating screen. Place flywheel holder tool #19321, on fan retainer with lugs of flywheel holder engaging the slots of the fan retainer. Remove flywheel nut with 1-1/4" socket and wrench, Fig. 29, or rewind starter clutch with starter clutch wrench tool #19244, Fig. 30.

NOTE: Nylon fan can be damaged if pried on or if flywheel removal procedure is not followed.

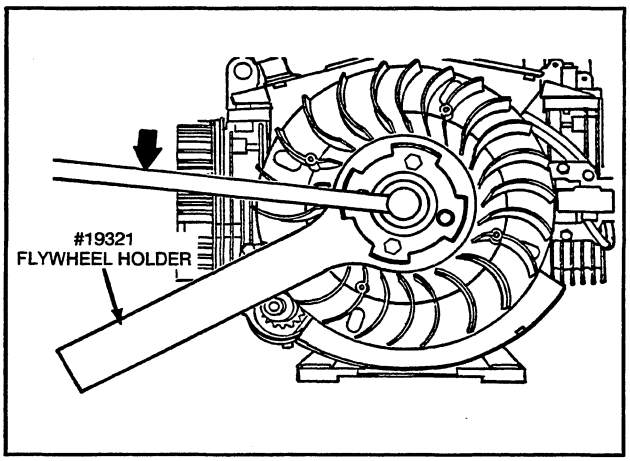



Fig. 29 — Remove Flywheel Nut

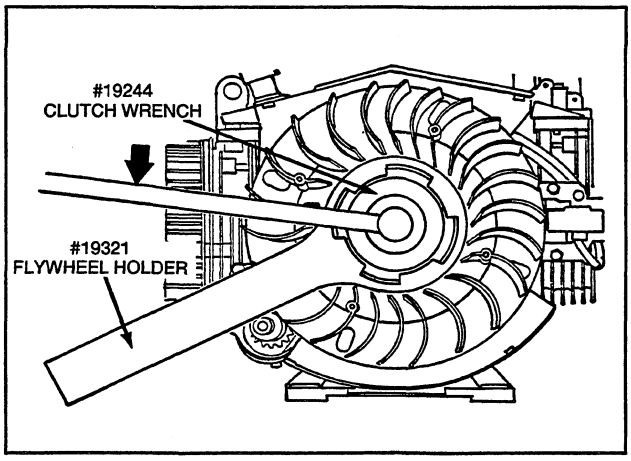



Fig. 30 — Remove Starter Clutch

Remove two screws and fan retainer. Remove fan and flat washer. Use flywheel nut, #230674 to protect crankshaft threads by turning nut down flush with top of threads. Install flywheel puller, tool #19203, turning puller screws into flywheel puller holes evenly. Continue to tighten puller screws evenly until flywheel loosens, Fig. 31.

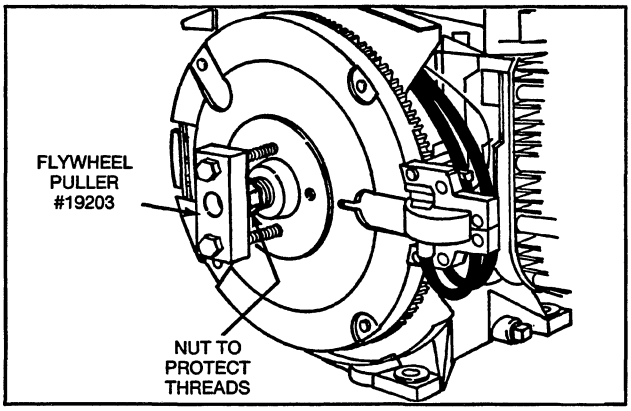



Fig. 31 — Pulling Flywheel

## INSPECT FLYWHEEL KEY AND KEYWAYS, FLYWHEEL AND CRANKSHAFT

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

## INSTALL FLYWHEEL

Clean flywheel taper and crankshaft taper removing all oil, dirt or grease. Slide flywheel on to crankshaft and align both keyways. Insert flywheel key.

NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION

Install fan and retainer. Torque fan retainer screws to 150 in./lbs. Install flat washer and flywheel nut or rewind starter clutch. Place tool #19321 on fan retainer with lugs of flywheel, holder engaging the slots of the fan retainer. Torque nut or clutch to 150 ft./lbs. Fig. 32 or Fig. 33.

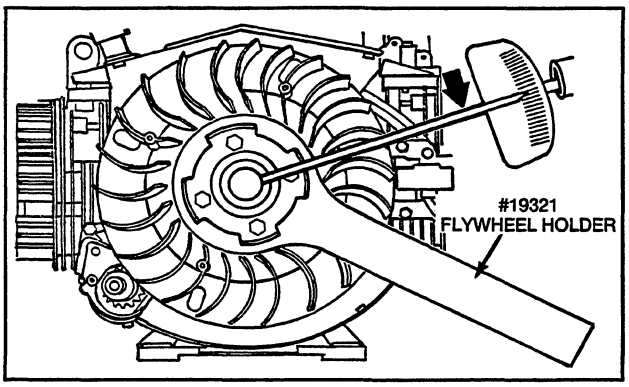



**Fig. 32 — Torque Flywheel Nut**

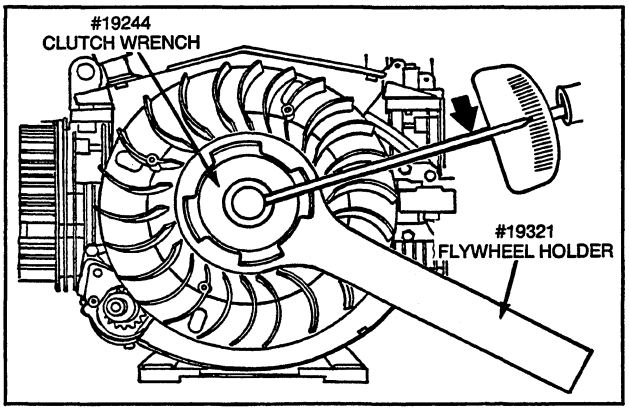



**Fig. 33 — Torque Starter Clutch**

## REMOVE FLYWHEEL — Early Style (TYPE NO'S. UNDER 1100)

Remove debris guard or booster fan, if so equipped. Remove blower housing and rotating screen.

Remove flywheel nut with 1-1/4" socket, Fig. 34 or rewind starter clutch with starter clutch wrench tool #19244, Fig. 35.

NOTE: Wood block must be placed under cast iron flywheel fin. Do not place wood block under aluminum fin on flywheel magnet.

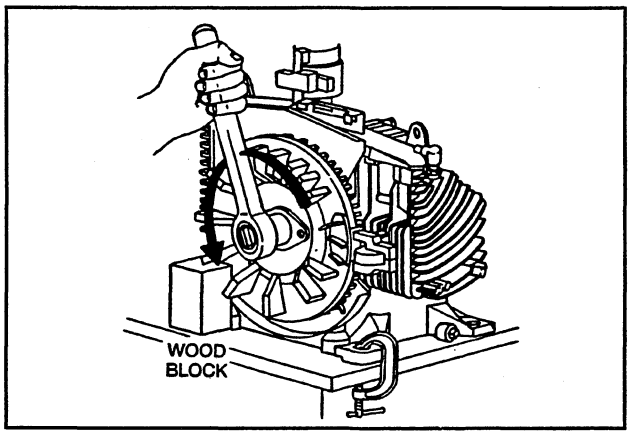



**Fig. 34 — Remove Flywheel Nut**

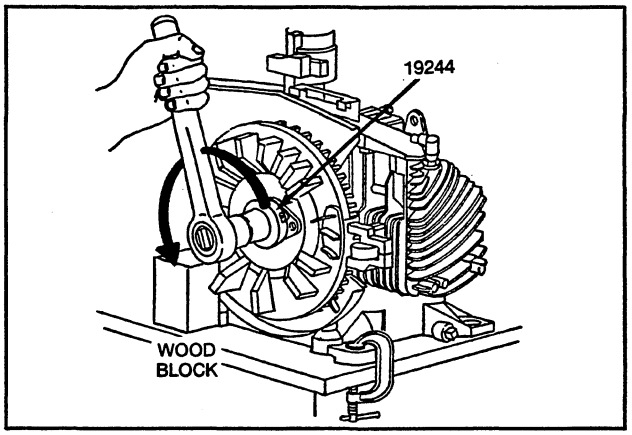



**Fig. 35 — Remove Starter Clutch**

Remove "flywheel" washer. Use flywheel nut part #230674 to protect crankshaft threads by turning nut down flush with top of threads. Install flywheel puller, Tool #19203, turning puller screws into flywheel puller holes evenly. Continue to tighten puller screws equally until flywheel loosens, Fig. 36.

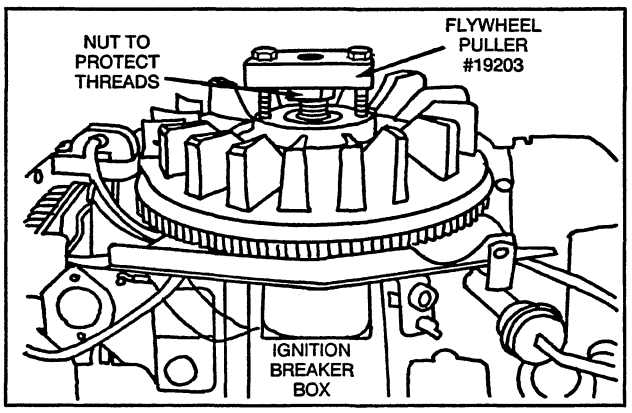



**Fig. 36 — Pulling Flywheel**

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

# IGNITION
## Flywheels

### INSPECT FLYWHEEL, FLYWHEEL KEY & CRANKSHAFT

Flywheel should be inspected for cracks, broken flywheel fins, burrs on taper or keyway and distortion of keyway. Also check taper of crankshaft for burrs, rust or other damage to taper. If damaged replace with new parts.

### INSTALL FLYWHEEL

Clean flywheel taper and crankshaft taper removing all oil, dirt or grease. Slide flywheel on to crankshaft and align both keyways. Insert flywheel key.

Install screen cup, when used, "Belleville" washer and flywheel nut or rewind starter clutch. Torque nut or clutch to 150 ft./lbs. Fig. 37 or Fig. 38.

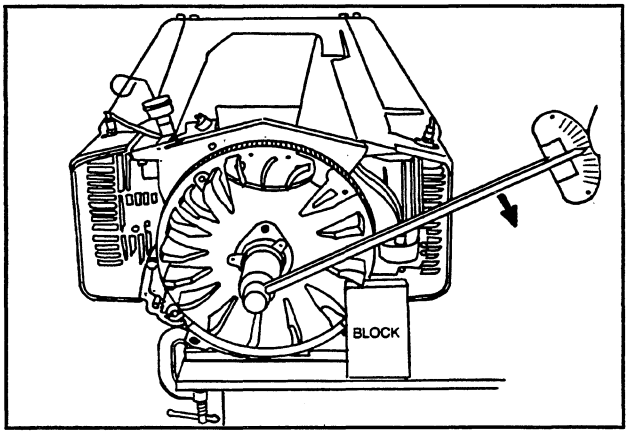



**Fig. 37 — Torque Flywheel Nut**

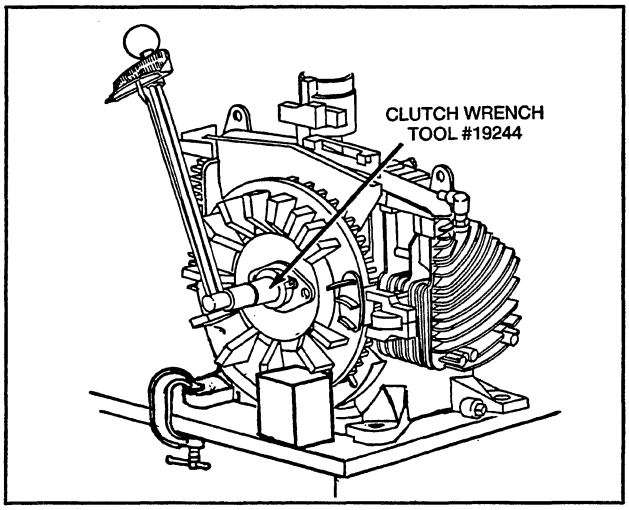



**Fig. 38 — Torque Starter Clutch**

### STOP SWITCHES

Various key and toggle stop switches have been provided by the Briggs & Stratton Corporation to meet various equipment manufacturers needs. Fig. 39.

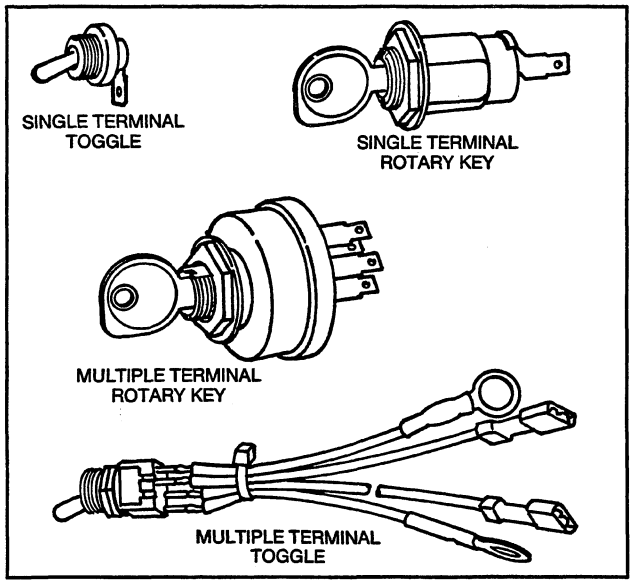



**Fig. 39 — Stop Switches**

### EQUIPMENT TO TEST STOP SWITCHES

The following equipment is recommended to test the various stop switches.

### VOLT/OHM/AMPERE (V.O.A.) METER

The V.O.A. meter is available from your Briggs & Stratton source of supply. Order as Tool #19236. The meter may be used to measure Volts, Ohms, or Amperes, Fig. 40.

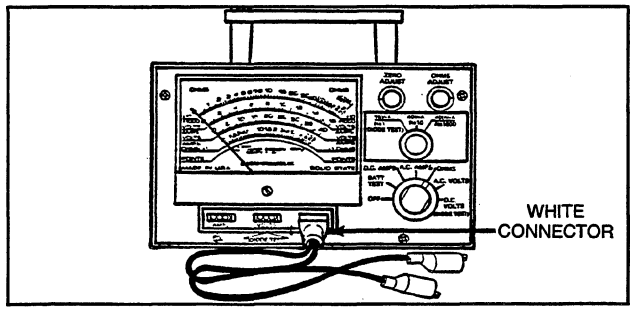



**Fig. 40 — V.O.A. Meter 19236**

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

1. Insert the white connector into the OHMS receptacle on the meter.
2. Set the meter selector switch to OHMS postion.
3. Set the range switch to RX1 position.

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

## CHECK SINGLE TERMINAL TOGGLE SWITCH

Disconnect stop switch wire from spade terminal. Connect V.O.A. meter, Tool #19236, to spade terminal and to switch mounting surface or ground. Mounting surface must be free of paint, rust or dirt.

With switch in "OFF" position there should be continuity. Move switch to "ON" position. There should be no continuity, Fig. 41.

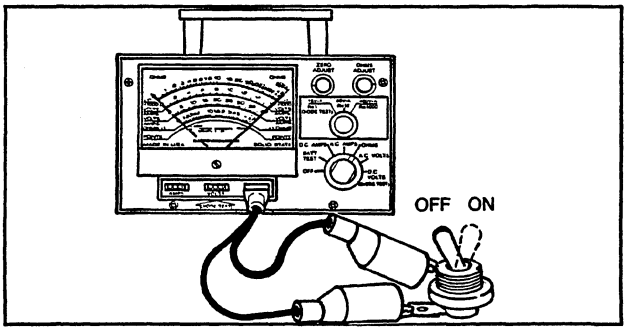



**Fig. 41 — Checking Toggle Stop Switch**

To test carburetor Anti-Afterfire solenoid switch, disconnect solenoid wire from carburetor spade terminal. Connect V.O.A. meter, Tool #19236 to carburetor solenoid wire terminal and to starter switch terminal, Fig. 42. Contact surfaces must be free of paint, rust, or dirt.

With switch in "ON" position there should be continuity. Move switch to "OFF" position. There should be no continuity , Fig. 42.

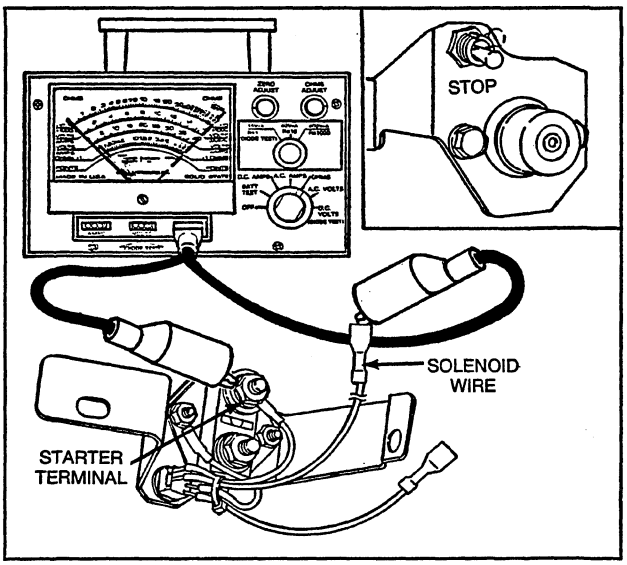



**Fig. 42 — Checking Anti-Afterfire Solenoid Switch**

To test stop switch disconnect wire from stop switch spade terminal. Connect V.O.A. meter, Tool #19236 to stop switch wire terminal and to ground wire lead attached to left starter switch mounting screw, Fig. 43. Contact surfaces must be free of paint, rust, or dirt.

With switch in "ON" position there should be no continuity. Move switch to "OFF" position there should be continuity, Fig. 43.

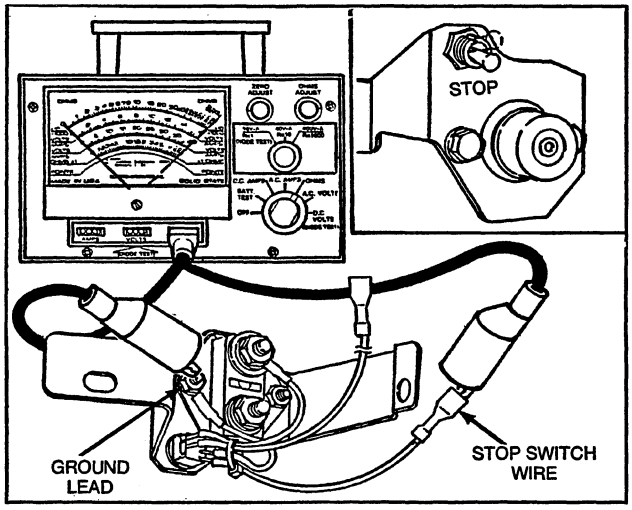



**Fig. 43 — Checking Stop Switch**

## CHECK SINGLE TERMINAL ROTARY KEY SWITCH

Disconnect stop switch wire from spade terminal. Connect V.O.A. meter, Tool #19236 to spade terminal and switch mounting surface. Mounting surface must be free of paint, rust, or dirt.

With key in "OFF" position. There should be continuity. Move key to "ON" position. There should be no continuity, Fig. 44.

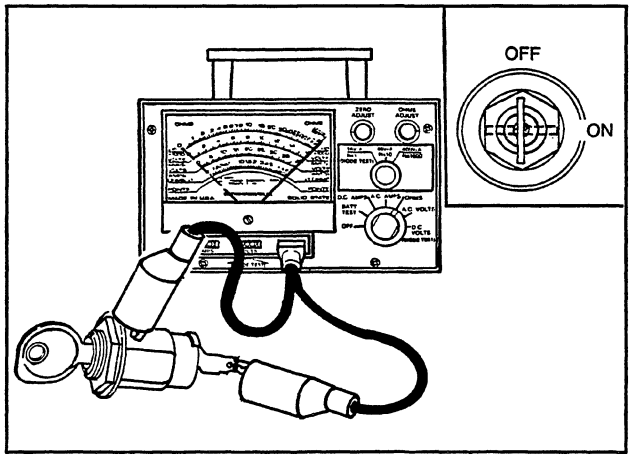



**Fig. 44 — Check Rotary Stop Switch**

**NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION**

## CHECK MULTIPLE TERMINAL ROTARY KEY SWITCH

Disconnect equipment wiring harness from rotary key switch.

To test carburetor Anti-Afterfire solenoid switch connect V.O.A. meter, Tool #19236 to battery terminal (B) and carburetor solenoid terminal, (L or S) Fig. 45. Contact surfaces must be free of paint, rust, or dirt.

With key in "OFF" position there should be no continuity. With key in "RUN" and "START" position there should be continuity, Fig. 45.

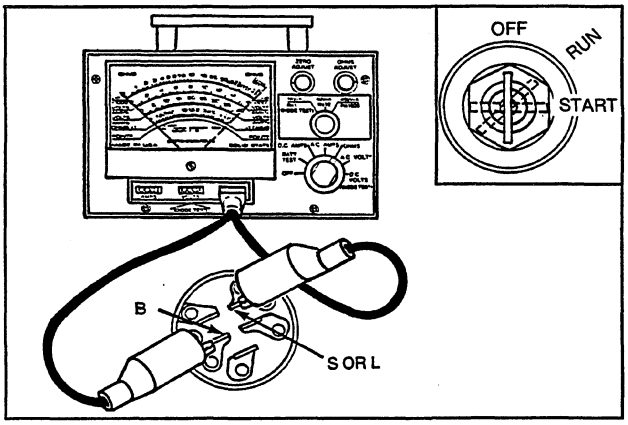



**Fig. 45 — Checking Anti-Afterfire Solenoid Switch**

To test stop switch, connect V.O.A. meter, Tool #19236, to stop switch terminal (M) and ground. If key switch is mounted to an insulated panel use ground terminal (G). Fig. 46. Contact surfaces must be free of paint, rust or dirt.

With key in "OFF" position there should be continuity. With key in "RUN" and "START" position there should be no continuity, Fig. 46.

NOTE: Ground terminal (G) is grounded to switch case. If meter shows continuity when key is in "RUN" and "START" position, switch is defective.

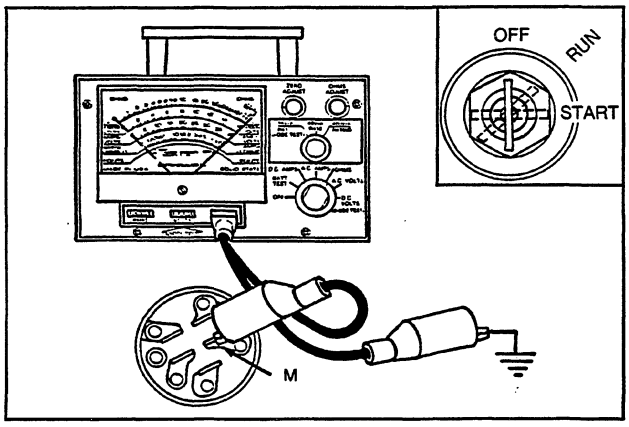



**Fig. 46 — Checking Stop Switch**

## CHECK STATIONARY STOP SWITCH

Stationary stop switch is located on governor control bracket. Push down on wire retainer and remove stop switch wire.

Connect V.O.A. meter, Tool #19236 to engine ground and stop switch wire retainer. Fig. 47. Contact surfaces must be free of paint, rust or dirt.

Move control lever to "RUN" position. There should be no continuity. Move control lever to "STOP" position. There should be continuity, Fig. 47.

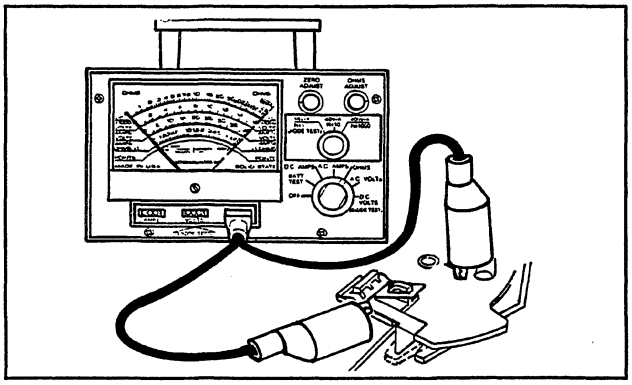


**Fig. 47 — Checking Stop Switch**

### METRIC EQUIVALENTS

| Decimal | Millimeter |
|---|---|
| .008" | .20mm |
| .010" | .25mm |
| .012" | .30mm |
| .014" | .36mm |
| .020" | .51mm |
| .030" | .76mm |
| .166" | 4.20mm |
| 1.115" | 28.32mm |

| Fractional | |
|---|---|
| 5/32" | 3.96mm |

| Torque | | |
|---|---|---|
| Ft. Lbs. | Kgm<br>Kpm | NM |
| 150 | 20.8 | 203.4 |



NOTE: METRIC EQUIVALENTS ARE LISTED ON PAGE 12 OF THIS SECTION