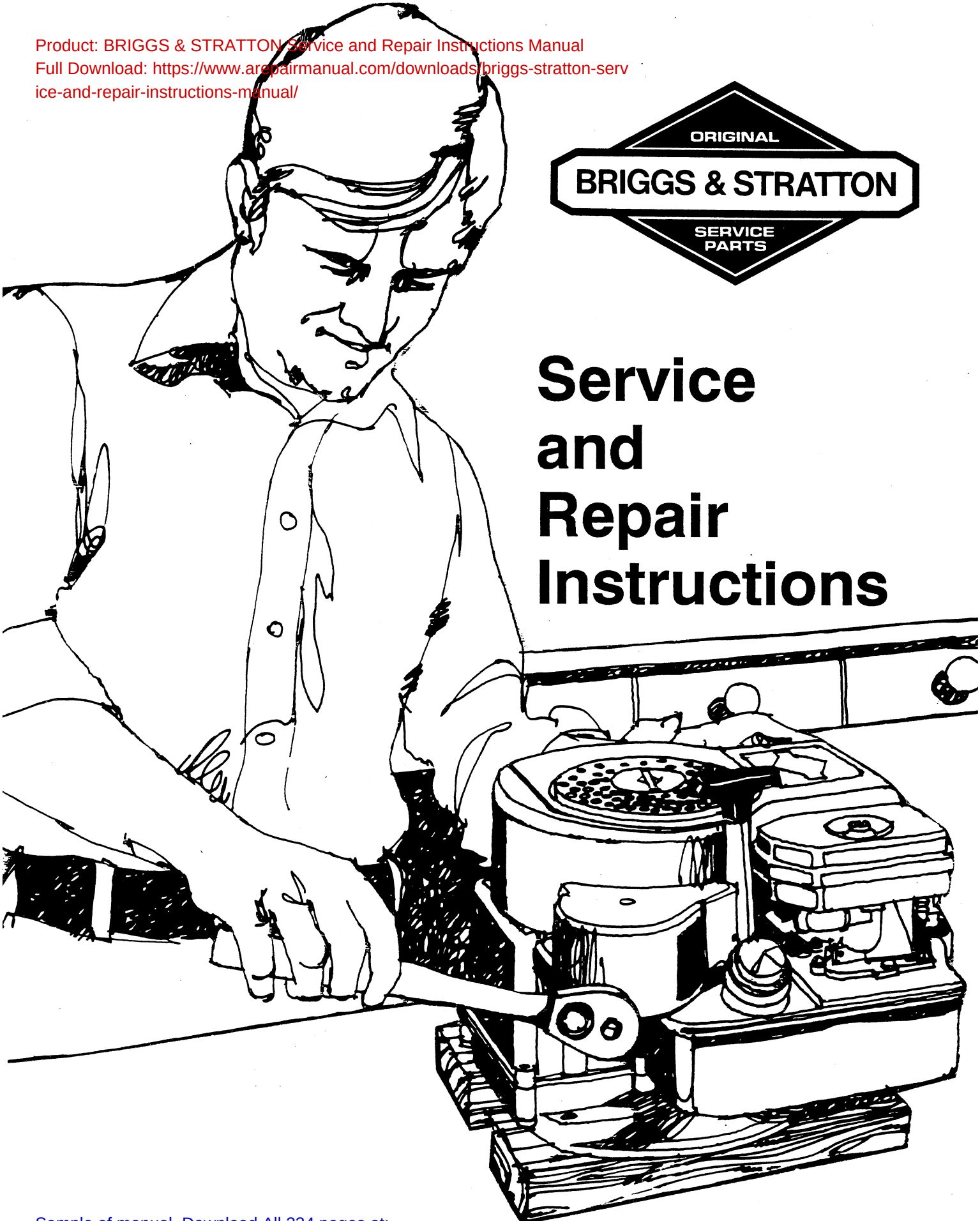
ORIGINAL
BRIGGS & STRATTON
SERVICE PARTS

Service and Repair Instructions



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

Reprinted

FOREWORD

Before attempting an 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 necessity 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.

Always use plug guages wherever possible to eliminate doubt and possible mistakes. You will find plug gauges illustrated in Section 13. Special repair parts, valve guides, valve seat inserts, contact point plunger bushing, etc., are not listed in the regular Parts Lists and part numbers will be found only in this book.

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

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

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

TEST — Analyze with proper testing equipment.

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

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

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COMMON SPECIFICATIONS FOR

1. Spark plug gap: .030 All Models

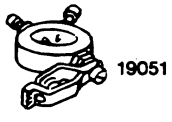
2. Condenser capacity: .18 to .24 MFD. All Models

3. Contact point gap: .020 All Models

	BASIC MODEL SERIES	IDLE SPEED	ARMATURE AIR GAP TWO LEG	ARMATURE AIR GAP THREE LEG	VALVE CLEARANCE INTAKE	VALVE CLEARANCE EXHAUST	VALVE GUIDE REJECT GAGE	TORQUE SPECIFICATIONS FLYWHEEL NUT FT. LBS.	TORQUE SPECIFICATIONS CYLINDER HEAD IN. LBS.	TORQUE SPECIFICATIONS CONN. ROD IN. LBS.
ALUMINUM	6B, 60000	1750	.006 .010	.012 .016	.005 .007	.009 .011	19122	55	140	100
	8B, 80000, 81000, 82000	1750	.006 .010	.012 .016	.005 .007	.009 .011	19122	55	140	100
	92000, 94000	1750	.006 .010		.005 .007	.009 .011	19122	55	140	100
	100000	1750	.010 .014	.012 .016	.005 .007	.009 .011	19122	60	140	100
	110000	1750	.006 .010		.005 .007	.009 .011	19122	55	140	100
	130000	1750	.010 .014		.005 .007	.009 .011	19122	60	140	100
	140000	1750	.010 .014	.016 .019	.005 .007	.009 .011	19151	65	165	165
	170000, 171700•	1750 **	.010 .014		.005 .007	.009 .011	19151	65	165	165
	190000, 191700•	1750 **	.010 .014		.005 .007	.009 .011	19151	65	165	165
	220000, 250000	1750 **	.010 .014		.005 .007	.009 .011	19151	65	165	190
CAST IRON	5, 6, N	1750		.012 .016	.007 .009	.014 .016	19122	55	140	100
	8	1750		.012 .016	.007 .009	.014 .016	19122	55	140	100
	9	1200			.007 .009	.014 .016	19151	60	140	140
	14	1200			.007 .009	.014 .016	19151	65	165	190
	19, 190000, 200000•	1200 **	.010 .014	.022 .026	.007 .009	.014 .016	19151	115	190	190
	23, 230000	1200 **	.010 .014	.022 .026	.007 .009	.017 .019	19151	145	190	190
	243000	1200 **	.010 .014		.007 .009	.017 .019	19151	145	190	190
	300000	1200 **	.010 .014		.007 .009	.017 .019	19151	145	190	190
	320000	1200 **	.010 .014		.007 .009	.017 .019	19151	145	190	190

COMMONLY USED TOOLS FOR SERVICING

19051	Spark Tester, all models
19061	Carburetor jet screwdriver, all models
19062	Carburetor jet screwdriver, all models
19063	Valve spring compressor, all models
† 19161	Starter clutch wrench, use with ½" drive torque wrench
19203	Flywheel Puller, 170000 thru 320000 Aluminum Models & Cast Iron Models

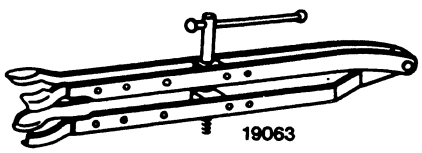

19051

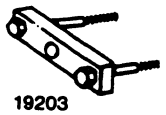

19061


19062


19069


19161


19063


19203

ALL POPULAR ENGINE MODELS

4. Top governed speed: See Briggs & Stratton Service Bulletin No. 467 or Engine Replacement Data

5. Crankshaft End Play: .002-.008 All Models

CRANKSHAFT REJECT SIZE			MAIN BEARING REJECT GAGE	CYLINDER BORE STD. ▲
MAG. JOURNAL	CRANKPIN	P.T.O. JOURNAL		
.8726	.8697	.8726	19166	2.375* 2.374
.8726	.9963	.8726	19166	2.375 2.374
.8726	.9963	.8726	19166	2.5625 2.5615
.8726	.9963	.9976	19166 Mag. 19178 PTO	2.500 2.499
.8726	.9963	.8726	19166	2.7812 2.7802
.8726	.9963	.9976	19166 Mag. 19178 PTO	2.5625 2.5615
.9975	1.090	1.1790	19178	2.750 2.749
.9975 1.1790•	1.090	1.1790	19178	3.000 2.999
.9975 1.1790•	1.122	1.1790	19178	3.000 2.999
1.3760	1.2470	1.3760		3.4375 3.4365
.8726	.7433	.8726	19166	2.000 1.999
.8726	.7433	.8726	19166	2.250 2.249
.9832	.8726	.9832	19117	2.250 2.249
1.1790	.9964	1.1790	19117	2.625 2.624
1.1800	.9964 1.1219•	1.1790	19117	3.000 2.999
1.3769	1.1844	1.3759	19117	3.000 2.999
Ball	1.3094	Ball	Ball	3.0625 3.0615
Ball	1.3094	Ball	Ball	3.4375 3.4365
Ball	1.3094	Ball	Ball	3.5625 3.5615

CARBURETOR TYPE	INITIAL CARBURETOR ADJUSTMENT ALL MODELS TURNS OPEN FROM SEAT NEEDLE VALVE	IDLE VALVE
Pulsa-Jet Vacu-Jet	1½	
Two Piece Flo-Jet	1½	1
One Piece Flo-Jet	2½	1½
One Piece Flo-Jet (6, 7, 8, 10 & 11 H.P Vertical Crankshaft)	1½	1¼
One Piece Flo-Jet (11 H.P. Horizontal Crankshaft)	1½	1

CYLINDER RESIZING

▲ Resize if .003 or more wear or .0015 out of round on C.I. cylinder engines, .0025 out of round on aluminum alloy engines.

Resize to .010, .020 or .030 over Standard.

*Model 6B series and early Models 60000 and 61000 series engines have cylinder bore of 2.3125 - 2.3115.

RING GAP REJECT SIZES

MODEL	COMP. RINGS	OIL RING
Alum. Cylinder Models	.035"	.045"
C.I. Cylinder Models	.030"	.035"

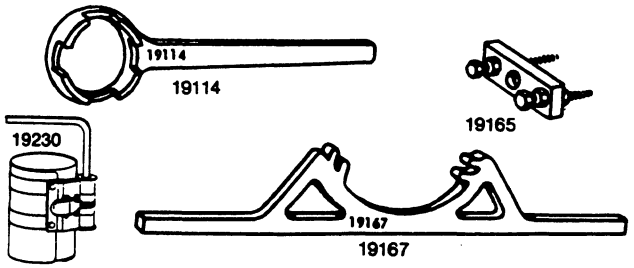
****GOVERNED IDLE**

For Adjustment Procedures, see Service & Repair Instructions 270962, Section 5, for Single Cylinder Models and Repair Instructions MS-7000 or 271172, Section 5, for Twin Cylinder Models.

■ With Valve Springs Installed.

• Synchro-Balance.

BRIGGS & STRATTON ENGINES



Flywheel puller, all models thru 130000	19069
Piston ring compressor, all models	19230
Starter clutch wrench, all rewind starter models	19114
Flywheel Puller, 140000, 170000, 190000 & 250000 Models	19165
Flywheel holder, all models 6B thru 130000	19167

See Section 13 for Complete List of Tools

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INDEX (Continued)

INDEX OF TABLES

Section 1
GENERAL INFORMATION

Briggs & Stratton 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:

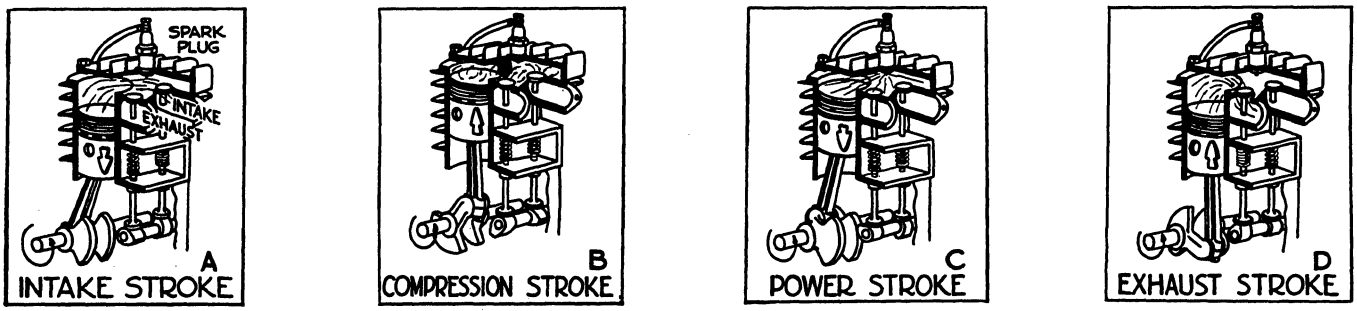


Fig. 1 – The 4-Stroke Cycle

a. INTAKE STROKE: The piston goes down, creating a vacuum in the cylinder which draws gas through open intake valve into the space above piston.

b. COMPRESSION STROKE: The piston comes up with both valves closed, highly compressing the gas into the space left between the top of the piston and cylinder head.

c. POWER STROKE: At this point the magneto sends high tension current to the spark plug, firing or exploding the compressed gas and driving the piston down.

d. EXHAUST STROKE: Exhaust valve opens and the upward stroke of the piston forces out all of the burnt gases, thus completing the power cycle.

CAUTION

Exhaust gases contain carbon monoxide which is odorless and a deadly poison. Proper care must be taken to provide efficient ventilation when running an engine indoors.

Fill the crankcase and air cleaner with proper oil before starting engine. See that oil level is maintained.

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

USE CLEAN GASOLINE

We recommend "regular" grade gasoline for all Briggs & Stratton engines. However, the use of lead-free, or low lead, gasolines will result in reduced combustion deposits and normally will improve engine life. Therefore, lead-free, or low lead, gasoline may be used, where available.

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.

GENERAL INFORMATION

CORRECT LUBRICATION IS IMPORTANT

Any high quality detergent oil having the American Petroleum Institute classification "For Service SC, SD, SE or MS" can be used in Briggs & Stratton engines. Detergent oils keep the engine cleaner and retard the formation of gum and varnish deposits.

SUMMER	WINTER
(Above 40° F.)	(Under 40° F.)
Use SAE 30	Use SAE 5W-20 or SAE 5W-30
If not available,	If not available,
Use SAE 10W-30	Use SAE 10W or SAE 10W-30
or	Below 0° F,
SAE 10W-40	Use SAE 10W or SAE 10W-30
	Diluted 10% with Kerosene

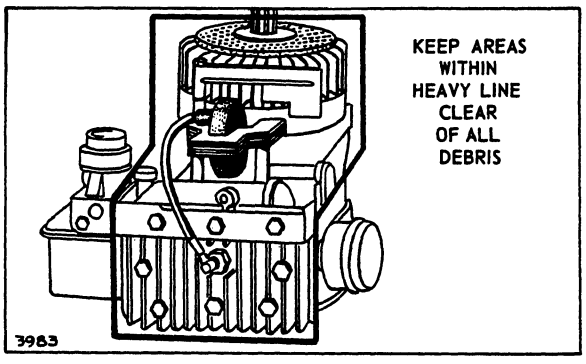
The oil recommendations are the result of extensive testing. No special additives should be used.

OIL SHOULD BE CHANGED AFTER EACH 25 HOURS OF ENGINE OPERATION. (More often under dirty operating conditions). In normal running of any engine, small particles of metal from the cylinder walls, pistons and bearings will gradually work into the oil. Dust particles from the air also get into the oil. If the oil is not changed regularly, these foreign particles cause increased friction and a grinding action which shorten the life of the engine. Fresh oil also assists in cooling, for old oil gradually becomes thick and loses its cooling effect as well as its lubricating qualities.

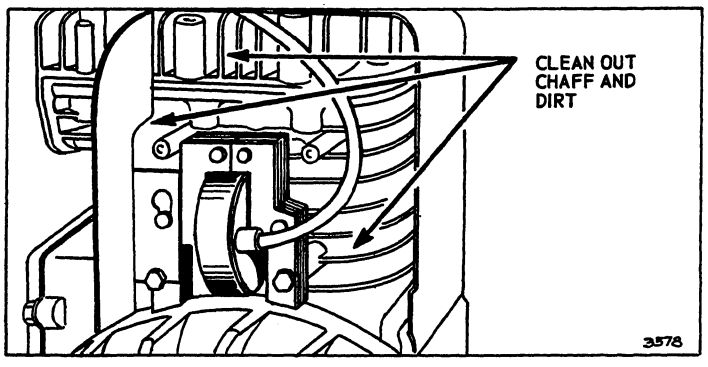
The air cleaner should be serviced every 25 hours of engine operation. Dirty operating conditions require more frequent servicing.

CLEAN COOLING SYSTEM

Grass particles, chaff or dirt may clog the air cooling system, expecially after prolonged service in cutting dry grasses. Continued operation with a clogged cooling system may cause severe overheating and possible engine damage. The figures below show the blower housing removed and area to be cleaned. This should be a regular maintenance Operation.



Vertical Crankshaft



Horizontal Crankshaft

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. (Clean fuel tank and lines if separate from carburetor).
3.	Remove blower housing, inspect rope and rewind assembly and starter clutch.
4.	Clean cooling fins and entire engine. Rock flywheel to check compression.
5.	Remove carburetor, disassemble and inspect for wear or damage. Wash in solvent, replace parts as necessary and assemble. Set initial adjustment.
6.	Inspect crossover tube or intake elbow for damaged gaskets.
7.	Check governor blade, linkage and spring for damage or wear, if mechanical also check adjustment.
8.	Remove flywheel, check for seal leakage, both flywheel and PTO sides. Check flywheel key.
9.	Remove breaker cover and check for proper sealing.

STEP NO.	
10.	Inspect breaker points and condenser. Replace or clean and adjust. Check plunger.
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, use sealer where wires enter.
13.	Install flywheel, time engine if necessary. Set air gap. Check for spark with #19051 tester.
14.	Remove cylinder head, check gasket, remove spark plug, and clean carbon, inspect valves for seating.
15.	Replace cylinder head, torque to specified torque, set spark plug gap or replace plug if necessary.
16.	Replace oil and fuel, check muffler for restrictions or damage.
17.	Adjust remote control linkage and cable if used, for correct operation.
18.	Service air cleaner, check gaskets and element for damage.
19.	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	PAGE NO.	DISASSEMBLY
8	1	Drain oil
3	1	Air cleaner and stud
		Fuel pipe and tank assembly
		Air cleaner elbow or pipe
		Carburetor and linkage
		Carburetor intake elbow
		Muffler
3	18 & 5	Check space between upper and lower carburetor body or carburetor to tank fit
3	18	Check throttle shaft and bushings for wear
		Disassemble carburetor
7	8 to 40	Electric starter (110 V) (12 V)
		Blower housing
6	1	Spin flywheel to check compression
2	1	Spark plug - adjust gap (.030") and clean and wash
		Fuel tank and bracket assembly or carburetor
2	3	Rope starter pulley
		Blower housing
2	6	Check air gap - armature to flywheel
5	1	Governor blade
8	3	Breather or valve cover
6	1	Cylinder head and shield
6	3	Check tappet clearance
6	2 & 3	Valve and springs
2	3	Rope starter pulley or recoil starter clutch
2	3 & 8	Flywheel
2	6	Breaker point cover
2	2 & 5	Check breaker point gap
2	4	Check breaker point plunger hole
2	4 & 7	Test condenser and remove if necessary

SECTION	PAGE NO.	DISASSEMBLY (Continued)
2	6	Test coil and remove if necessary
2	5	Breaker arm assembly and condenser
2	8 & 13	Breaker box
2	13	Breaker shaft
10	4 & 5	Check end play
10	1	Remove burrs from crankshaft extension
10	1	Crankcase cover, base or sump
10	7	Auxiliary drive
11	6	Damage seals
5	1 to 7	Mechanical governor parts
8	4	Inspect oil slinger
10	2	Cam gear
		Tappets
9	1	Connecting rod and piston
10	2	Crankshaft - inspect and check
2	12	Armature assembly and back plate
2	11 & 12	Rotor
2	6, 8, 12 & 13	Test coil or armature - check leads
11	3	Crankcase cover or sump
10	2	Crankshaft - inspect & check
10	2	Cam shaft and gear
10	2	Check automatic spark advance
		Tappets
11	1	Cylinder - check bore, main bearing, valve guides and seats, cylinder bore
9	1	Disassemble connecting rod and piston
9	2 & 3	Check piston, rings, connecting rod, piston pin

REPAIRS

SECTION	PAGE NO.	
		Clean parts
11	1 & 2	Resize cylinder bore to next oversize
6	3 & 4	Replace valve guide - intake or exhaust
6	2	Reface valves and seats and lap
6	4 to 6	Replace valve seat insert
11	3 to 5	Replace main bearings
11	6	Replace oil seal
2	4	Install breaker point plunger, bushing and plunger in cylinder (Internal breaker)
2	9 & 10	Install breaker point plunger bushing and plunger in cylinder (External breaker)
2	6 & 8	Replace armature and governor blade
2	12 & 13	Replace coil or armature or both
10	3	Replace automatic spark advance, weight and spring
3	17 & 18	Replace throttle shaft bushing
3	3 to 26	Repair carburetor
7	1, 2, 5 to 7	Replace rewind starter spring and rope
7	3	Starter clutch
11	3	Remove ball bearing and re-assemble to crankshaft

REASSEMBLE

SECTION	PAGE NO.	
10	3 & 4	Tappets, cam gear, camshaft
	5	Crankshaft and bearing support
	5	Crankshaft, bearing plate - adjust crankshaft end play
9	3 & 4	Piston, piston pin, connecting rod, rings
8	4	Oil Slinger
5	1 to 7	Mechanical governor
10	4	Sump or crankcase cover - adjust crankshaft end play
6	3	Adjust valve tappet clearance
6	2 & 3	Valves, springs, retainer

REASSEMBLE (Continued)

SECTION	PAGE NO.	
2	6 & 8	Coil, armature, governor blade
2	5	Breaker points (Internal system)
2	5	Condenser (Internal system)
2	13	Breaker shaft - Magna-Matic
2	13	Primary wire - Magna-Matic
2	8, 9 & 12	Adjust Armature timing
2	7 & 14	Condenser
2	7 & 14	Adjust and clean breaker points (External)
2	6 & 8	Breaker point cover
2	12	Coil and armature assembly
2	11 & 2	Adjust rotor timing
2	7 & 14	Breaker box cover
2	3	Flywheel and starter pulley or clutch
7	8 to 40	Electric starter (110 V) (12 V)
2	6, 8 & 9	Adjust air gap - armature to flywheel
2	1	Check spark
8	3 & 4	Breather or valve cover
6	1	Cylinder head and shield
2	1	Spark plug
		Muffler
		Intake elbow or carburetor and tank
4	1 to 12	Carburetor and linkage and governor controls
5	1	Check air vane governor
5	2 to 7	Check and adjust mechanical governor
		Blower housing
		Fuel filter parts, tank & line
		Air cleaner elbow or pipe
8	1	Fill crankcase with oil
		Start engine (fill with gas)
2	1	Check spark
6	1	Retighten cylinder head screws
3	7 to 27	Adjust carburetor
5	2, 3 & 6	Set governor to obtain correct engine speed (Remote controls)
3	1	Clean, fill, assembly air cleaner
		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. Kicks back when starting
4. Lack of power
5. Vibration
6. Erratic operation
7. Overheating
8. 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 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

Spin flywheel in reverse rotation (counterclockwise) to obtain accurate compression check. The flywheel should rebound sharply, indicating satisfactory compression.

If compression is poor, look for –

1. Loose spark plug
2. Loose cylinder head bolts
3. Blown head gasket
4. Burnt valves and/or seats
5. Insufficient tappet clearance
6. Warped cylinder head
7. Warped valve stems
8. Worn bore and/or rings
9. Broken connecting rod

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 a new spark plug.

If spark does not occur look for –

1. Incorrect armature air gap
2. Worn bearings and/or shaft on flywheel side
3. Sheared flywheel key
4. Incorrect breaker point gap
5. Dirty or burned breaker points
6. Breaker plunger stuck or worn
7. Shorted ground wire (when so equipped)
8. Shorted stop switch (when so equipped)
9. Condenser failure
10. Armature failure
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 tester between the ignition cable and the spark plug. A spark miss will be readily apparent. While conducting this test on Magna-Matic equipped engines, Models 9, 14, 19 and 23, set the tester gap at .060".

Check Carburetion

Before making a carburetion check, be sure the fuel tank has an ample supply of fresh, clean gasoline. On gravity feed (Flo-Jet) models, see that the shut-off valve is open and fuel flows freely through the fuel line. On all models, inspect and adjust the needle valves. 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 (Flo-Jet carburetor)

If plug is dry, look for –

1. Leaking carburetor mounting gaskets
2. Gummy or dirty screen or check valve (Pulsa-Jet and Vacu-Jet carburetors)
3. Inlet valve stuck shut (Flo-Jet carburetors)
4. Inoperative pump (Pulsa-Jet carburetors)

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 quits, 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 rather than the engine itself. Since many varied types of equipment are powered by Briggs and 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, Kickback, or Will Not Start

1. Loose blade – Blade must be tight to shaft or adaptor.
2. Loose belt – a loose belt like a loose blade can cause a back-lash effect, which will counteract engine cranking effort.
3. Starting under load – See if the unit is disengaged when engine is started; or if engaged, does not have a heavy starting load.
4. Check remote Choke-A-Matic control assembly for proper adjustment.
5. 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. Crankshaft bent – Replace
3. Worn blade coupling – Replace if coupling allows blade to shift, causing unbalance.
4. Mounting bolts loose – Tighten
5. Mounting deck or plate cracked – Repair or replace.

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.

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 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 -	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 Bearing	3 - Electric - 110 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 Starter Only - 12 Volt, Gear Drive
14	6	6 -	6 - Gear Reduction (6 to 1) Reverse Rotation	6 - Alternator Only *
17	7	7 - Vertical Flo-Jet	7 -	7 - Electric Starter, 12 Volt Gear Drive, with Alternator
19	8	8 -	8 - Auxiliary Drive Perpendicular to Crankshaft	8 - Vertical-pull Starter
20	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
23				
24				
25				
30				
32				

EXAMPLES

To identify Model 100202:

10	0	2	0	2
10 Cubic Inch	Design Series 0	Horizontal Shaft - Pulsa-Jet Carburetor	Plain Bearing	Rewind Starter

Similarly, a Model 92998 is described as follows:

9	2	9	9	8
9 Cubic Inch	Design Series 2	Vertical Shaft - Pulsa-Jet Carburetor	Auxiliary Drive Parallel to Crankshaft	Vertical Pull Starter

Repair Instructions IV (Form 4750)

Section 2
IGNITION

Three basic types of ignition systems are used —

1. MAGNETRON™ ignition, a self-contained transistor module (no moving parts) and ignition armature.
2. A flywheel type, having either an internal or external breaker system. Fig. 4 and Fig. 25.
3. The Magna-Matic system, having the armature and rotor behind the flywheel, and an external breaker system. Fig. 44.

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" (4.2 mm) tester gap, you may assume the ignition system is functioning satisfactorily. Fig. 1.

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

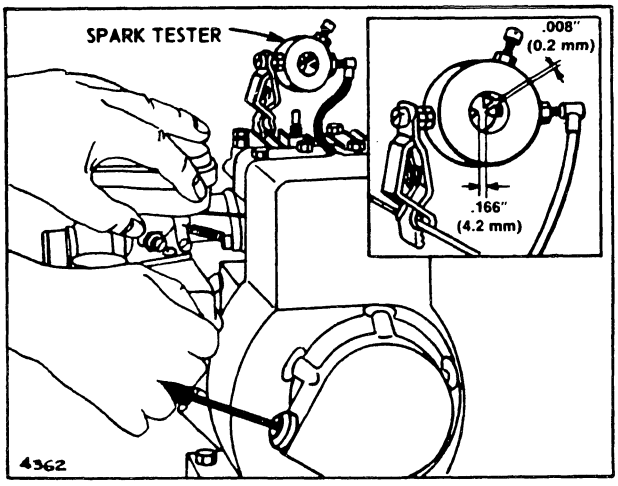


Fig. 1 — Checking Spark

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. While conducting this test on Magna-Matic equipped engines, Models 9, 14, 19 and 23, set the tester gap at .060" (1.5 mm).

SPARK PLUG

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

1-1/2" Plug	2" Plug	Manufacturer's Part Number
CJ-8	J-8	Champion
RCJ-8	RJ-8	Champion Resistor
235	295	Autolite
245	306	Autolite Resistor
WS9E	—	Robert Bosch
3/4"	13/16"	Plug wrench (deep socket)

Spark Plug Cleaning

Clean spark plug with a pen knife or wire brush and solvent and set gap at .030" (0.75 mm) for all models. If electrodes are burned away, or the porcelain is cracked, replace with a new plug. DO NOT USE ABRASIVE CLEANING MACHINES. Fig. 2.

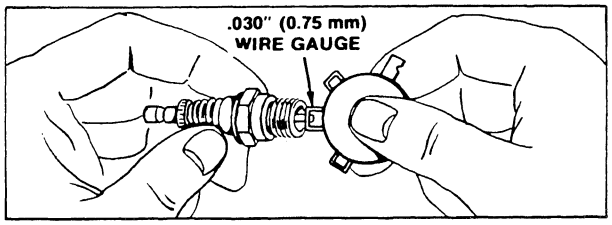


Fig. 2 — Adjusting Spark Plug Gap

Coil and Condenser Testing All Models

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

IGNITION
General

TABLE NO. 1
SPECIFICATIONS FOR ALL POPULAR ENGINE MODELS

1. **Spark plug gap: .030" (0.75 mm)**
2. **Condenser capacity: .18 to .24 M.F.D.**
3. **Contact point gap: .020" (0.50 mm)**

BASIC MODEL SERIES	ARMATURE TWO LEG AIR GAP Inches	ARMATURE TWO LEG AIR GAP Milli-Meter	ARMATURE THREE LEG AIR GAP Inches	ARMATURE THREE LEG AIR GAP Milli-Meter	FLYWHEEL PULLER PART NO.	FLYWHEEL NUT TORQUE Foot Pounds†	FLYWHEEL NUT TORQUE Kilo-gram meter†	FLYWHEEL NUT TORQUE Newton meter†
ALUMINUM CYLINDER								
6B, 60000, 8B	.006 .010	0.15 0.25	.012 .016	0.30 0.41	19069	55†	7.6†	74.6†
80000, 82000, 92000, 93000, 94000, 95000, 110000	.006 .010	0.15 0.25	.012 .016	0.30 0.41	19069	55	† 7.6†	74.6†
100000, 130000	.010 .014	0.25 0.36	.012 .016	0.30 0.41	None	60†	8.3†	81.4†
140000, 170000, 190000, 220000, 250000	.010 .014	0.25 0.36	.016 .019	0.41 0.48	19165 or 19203*	65	† 9.0†	88.1†
CAST IRON CYLINDER								
5, 6, N, 8			.012 .016	0.30 0.41	None	55†	7.6†	74.6†
9					19068 or 19203	60	8.3	81.4
14					19068 or 19203	65	9.0	88.1
19, 190000, 200000	.010 .014	0.25 0.36	.022 .026	0.56 0.66	19068 or 19203	115†	15.9†	155.9†
23, 230000	.010 .014	0.25 0.36	.022 .026	0.56 0.66	19068 or 19203	115†	15.9†	155.9†
240000, 300000, 320000	.010 .014	0.25 0.36			19068 or 19203	145†	20.0†	196.6†

*Use on Model 250000 built after 1975.
†For rewind starter engines, use 19161 clutch wrench.

IGNITION
MAGNETRON™

The flywheel is located on the crankshaft with a special metal key. It is held in place by a Belleville washer and nut or 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 soft metal key, as originally supplied.

The keyway in both flywheel and crankshaft should not be distorted. Flywheels used are made of aluminum, zinc or cast iron.

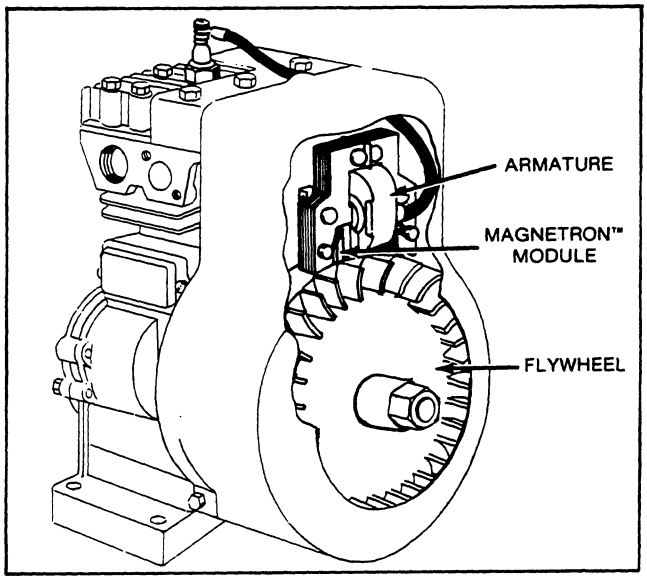


Fig. 3 — MAGNETRON™ Ignition

IGNITION
Flywheel Type — Internal Breaker

The flywheel is located on the crankshaft with a soft metal key. It is held in place by a nut or 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.

The keyway in both flywheel and crankshaft should not be distorted. Flywheels used are made of aluminum, zinc or cast iron.

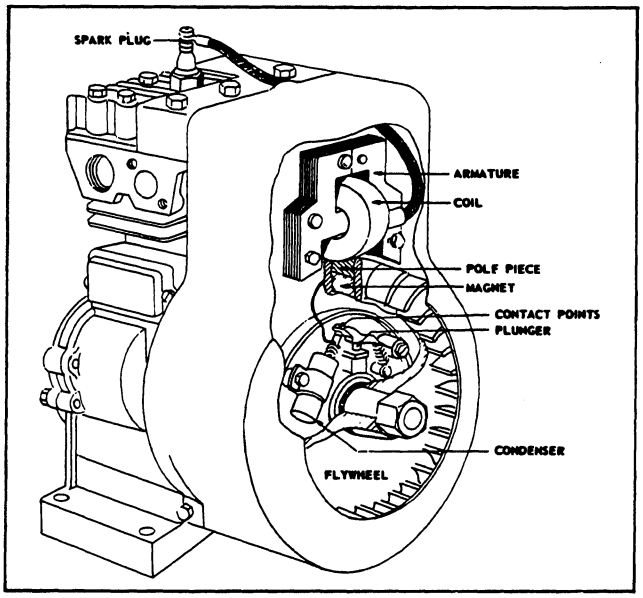


Fig. 4 — Flywheel Ignition Internal Breaker

REMOVING ARMATURE AND MAGNETRON™ IGNITION

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

Remove armature screws and lift off armature. Use breaker point condenser P/N 294628 or 3/16" pin punch to release stop switch wire from MAGNETRON™ module. Fig. 5. Stop switch wire is soldered to module and armature primary wires. Unsolder to disconnect.

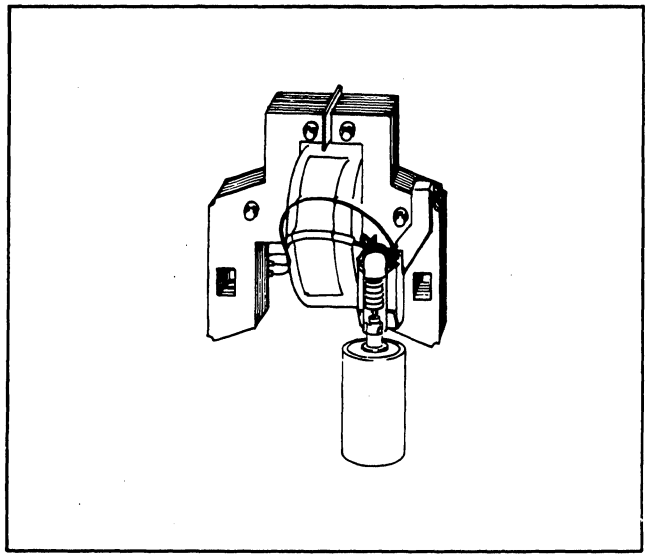


Fig. 5 — MAGNETRON™ Module

REMOVING MAGNETRON™ MODULE

Unsolder armature ground wire from module wire, Fig. 6. 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. 7.

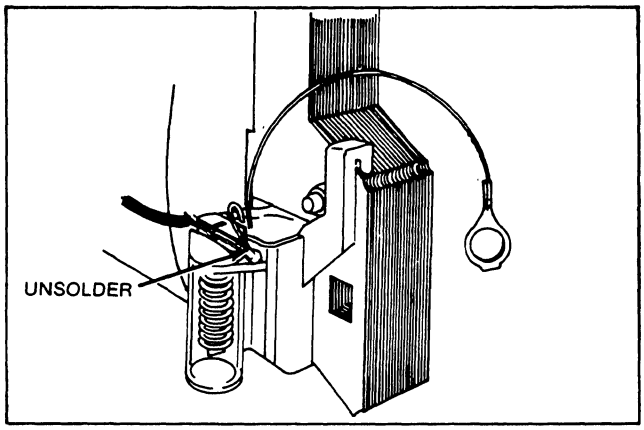


Fig. 6 —

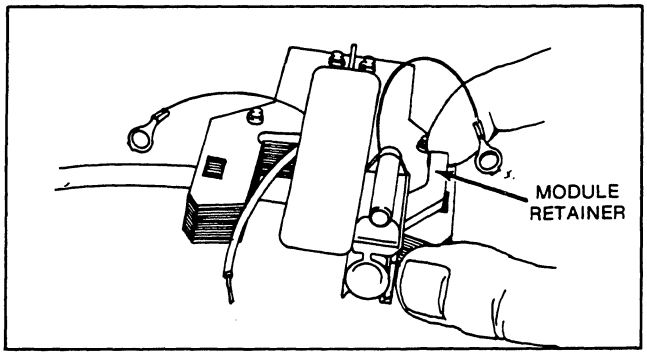


Fig. 7 —

IGNITION
MAGNETRON™

INSTALLING MAGNETRON™ MODULE

Module is installed in reverse order of removal. Note that module retainer must be on back side of coil laminations, Fig. 8. Use Permatex™ or similar sealant to hold ground wires in place, Fig. 8.

Ignition timing is controlled by the location of the flywheel and crankshaft keyways on aluminum engines. On cast iron engines, refer to page 9.

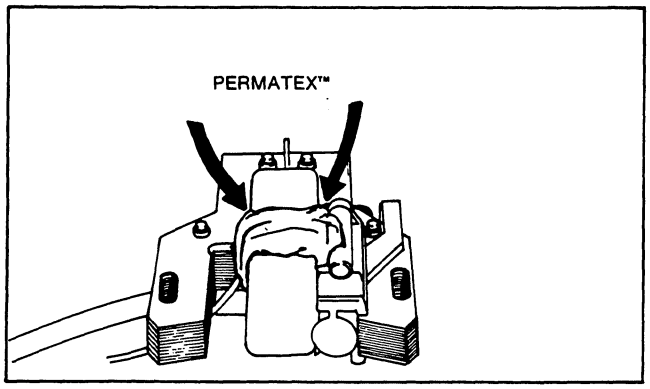


Fig. 8 —

Remove Flywheel Nut or Starter Clutch

On flywheels of 6-3/4" (171 mm) diameter or less, use flywheel holder 19167, to keep flywheel from turning. On rope starter engines, the 1/2" diameter thread flywheel nut is left handed and the 5/8" diameter thread is right handed. Fig. 9. Starter clutch used on rewind and wind-up starter has a right hand thread. Fig. 10. Remove clutch using P/N 19114 starter clutch wrench or P/N 19244 or 19161 1/2" square drive starter clutch wrench.

For flywheels or larger diameter place a block of wood under flywheel fin to prevent flywheel turning while loosening nut or starter clutch. Clamp engine base securely. Fig. 11.

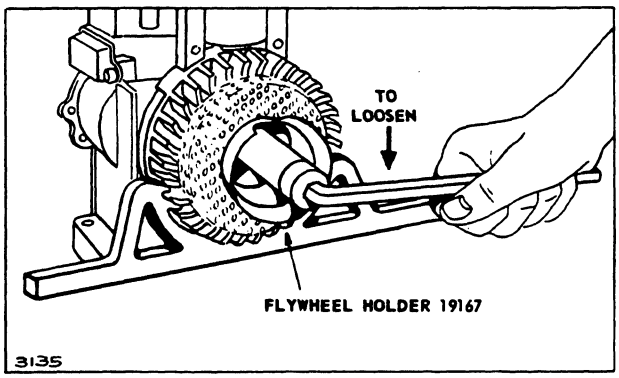


Fig. 9 — Loosen Flywheel, Rope Starter (1/2" Dia. Threads)

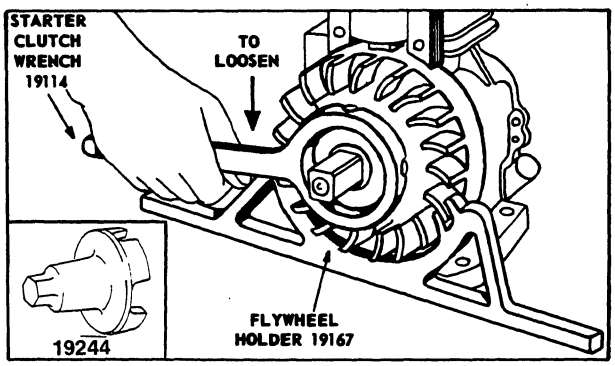


Fig. 10 — Loosening Flywheel Rewind Starter and Wind-Up Starter Engines

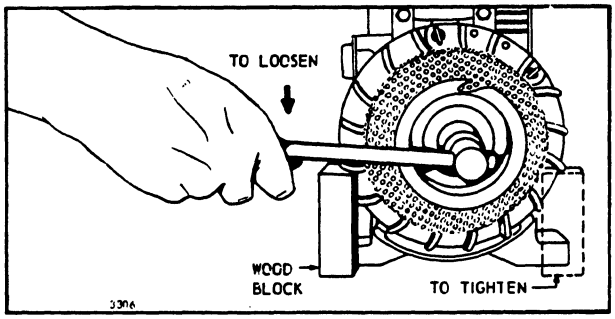


Fig. 11 — Loosening Large Flywheels

Remove Flywheel

Some flywheels have two holes provided for use of a flywheel puller. Use puller shown in Table 1. Leave nut loose on threads of crankshaft for puller to bear against, Fig. 12. Small cast iron flywheels do not require a flywheel puller. See note below.

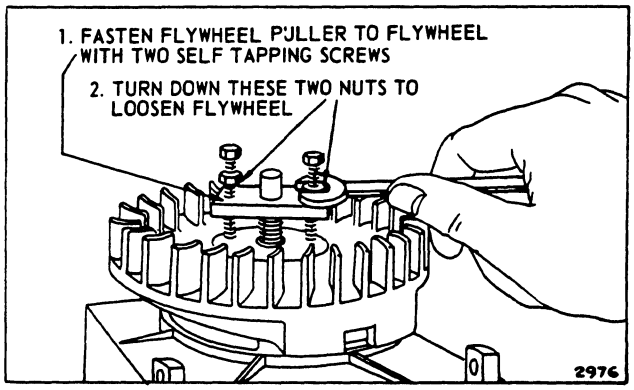


Fig. 12 — Removing Flywheel

NOTE: To remove small cast iron flywheels without puller holes, support the flywheel with a gloved hand, exerting an upward pull. Using a rawhide hammer, strike the outside rim of the flywheel with a sharp blow. Several blows may be required on an extremely tight flywheel.

NOTE: Care is required not to damage the flywheel fins, magnets or ring gear.

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 is .020" (0.5 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 kick back when starting. Points gapped too close retard spark timing and decrease engine power.

Remove Breaker Points

Breaker point assemblies of style shown in Fig. 13 are removed by removing condenser and armature wires from breaker points clip. Loosen adjusting lock screw and remove breaker point assembly.

Breaker point assemblies of style shown in Fig. 14 are removed by loosening the screw holding the post. The condenser on these models also includes the breaker point. The condenser is removed by loosening the screw holding the condenser clamp.

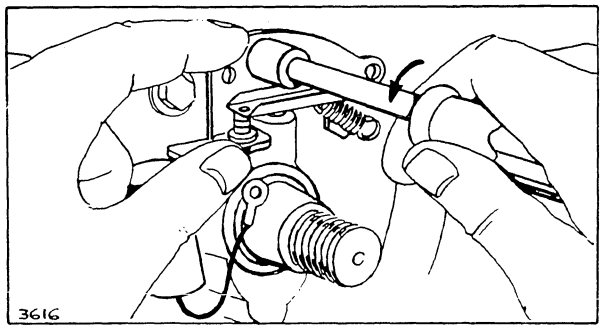


Fig. 13 — Breaker Point Assemblies

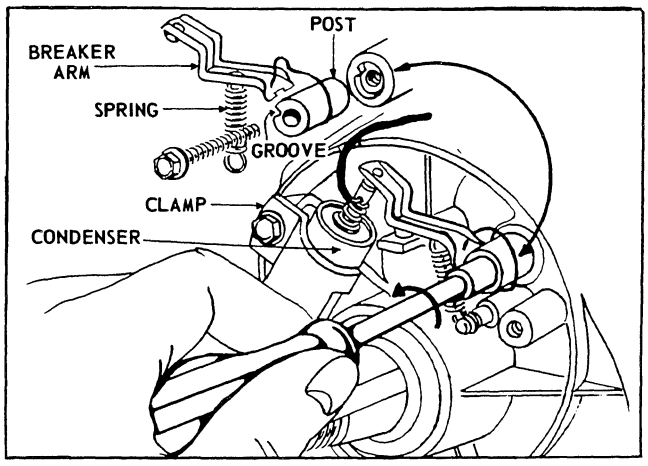


Fig. 14 — Breaker Point Assemblies

Check Breaker Point Plunger Hole

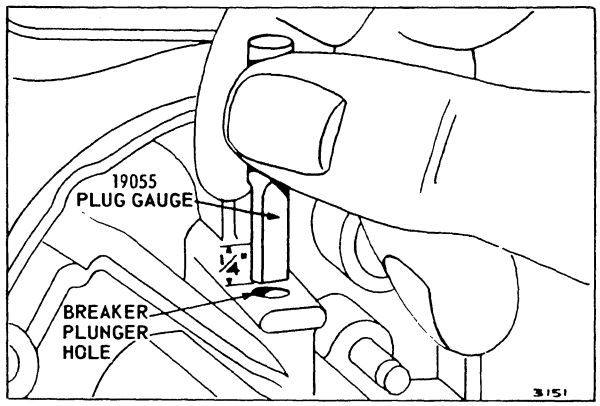


Fig. 15 — Checking Breaker Plunger Hole

If the breaker point plunger hole becomes worn excessively, oil will leak past the plunger and may get on the points, causing burning. To check, loosen breaker point mounting screw and move breaker points out of the way. Remove plunger. If the flat end of the 19055 plug gauge will enter the plunger hole for a distance of 1/4" (6.35 mm) or more, the hold should be rebushed. Fig. 15.

Install Breaker Point Plunger Bushing

To install the bushing, it is necessary that the breaker points, armature, crankshaft and starter be removed. Use reamer 19056, to ream out the old plunger hole. See Fig. 16. This should be done by hand. The reamer should be in alignment with the plunger hole. Drive the bushing 23513, with driver 19057 until the upper end of the bushing is flush with the top of the boss. Fig. 16. Finish ream the bushing with reamer 19058. All reaming chips or dirt must be removed.

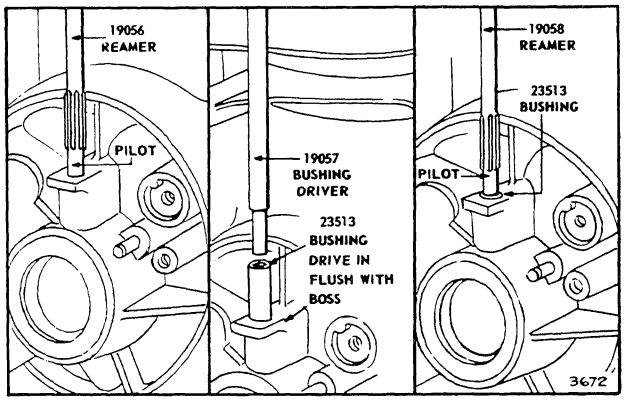
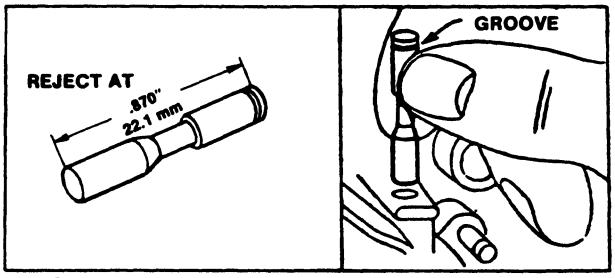


Fig. 16 — Installing Breaker Plunger Bushing

IGNITION
Flywheel Type — Internal Breaker

Breaker Point Plunger

If the breaker point plunger is worn to a length of .870" (22.1 mm) or less, it should be replaced. Plungers must be inserted with groove at the top when installed or oil will enter breaker box. See Fig. 17.



Checking Plunger Inserting Plunger

Fig. 17

Install Breaker Points

Insert breaker plunger into the plunger hole in cylinder. Breaker points as shown in Fig. 14 are installed by placing the mounting post of the breaker arm into the recess in the cylinder so that the groove in the post fits the notch in the recess. Tighten the mounting screw securely. Use a 1/4" spinner wrench if available. Slip the open loop of breaker arm spring through the two holes in the arm, then hook closed loop of spring over the small post protruding from the cylinder. Push flat end of the breaker arm into the groove in the mounting post. This places tension on the spring and pulls arms against the plunger. If condenser post is threaded, attach the coil primary wire (and ground wire if furnished) with the lockwasher and nut. If primary wire is fastened to condenser with spring fastener, compress spring. Fig. 18, and slip primary wire (and ground wire where furnished) into hole in condenser post. Release spring. Lay the condenser in place and tighten the condenser clamp securely.

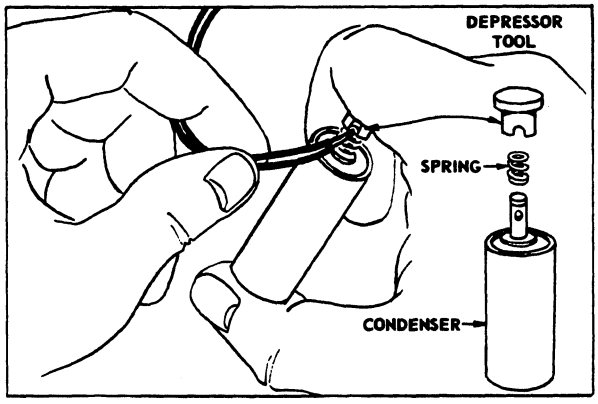


Fig. 18 — Assembling Condenser and Ignition Wires

When installing breaker point assemblies, as shown in Fig. 13, be sure the small boss on the magneto plate enters the hole in the point bracket. Mount points to magneto plate or cylinder with lock screw. Fasten the armature lead wire to the breaker points with the clip and screw. If these lead wires do not have terminals, the bare end of the wires can be inserted into the clip and screw tightened to make a good connection. Do not let the ends of the wire touch the point bracket or magneto plate or ignition will be grounded.

Adjusting Breaker Point Gap

Turn crankshaft until points open to widest gap. When adjusting breaker point assemblies as shown in Fig. 19, move condenser forward or backward with screw driver until a gap of .020" (0.5 mm) is obtained. Breaker points assemblies as shown in Fig. 20, are adjusted by loosening lock screw and moving contact point bracket up or down. Gap is .020" (0.5 mm).

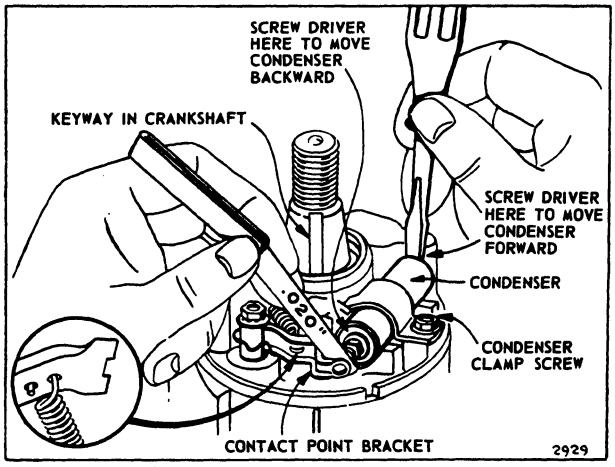


Fig. 19 — Adjusting Breaker Point Gap

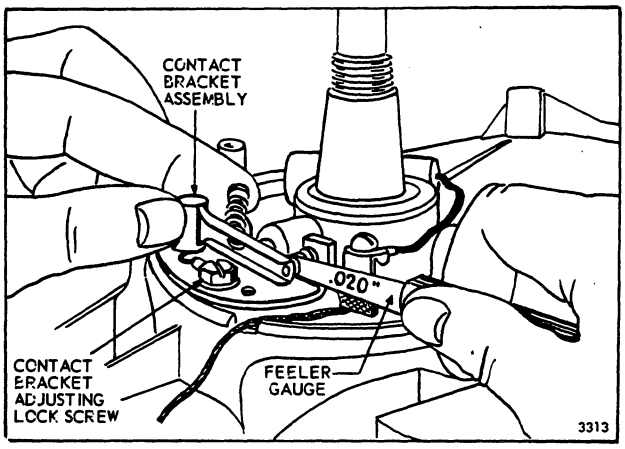


Fig. 20 — Adjusting Breaker Point Gap

NOTE: Always clean breaker points after adjustment. Open the points and insert a piece of lintless paper. Draw the paper through the points. Open points when removing paper so it will not tear, leaving paper between the points.

Breaker Point Cover

The breaker point cover, Fig. 21, protects the points from dirt. The opening for the primary and/or ground wire should be sealed with No. 2 Permatex™ or similar sealer to prevent dirt from entering the breaker box. Cover should not be distorted so as to lose its seal around the outer edge. Replace if damaged.

NOTE: Engines used for winter applications use vented breaker covers. See Engine Parts List.

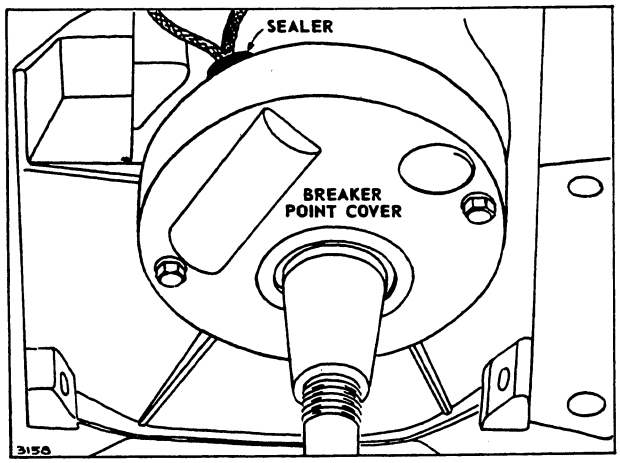


Fig. 21 — Breaker Point Cover

Install Armature

Install governor blade and armature, Fig. 22. The mounting holes in the armature laminations are slotted. Push armature up as far as possible and tighten one mounting screw to hold armature in place.

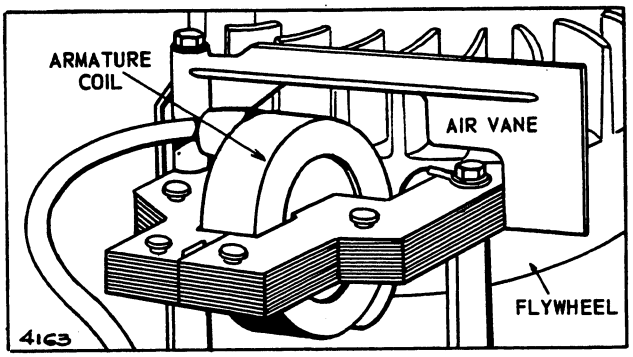
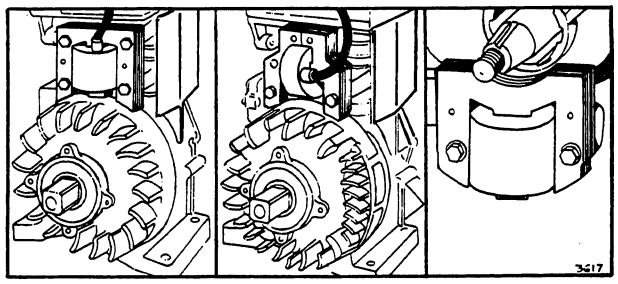


Fig. 22 — Install Armature and Governor Blade

Flywheel Type — Internal Breaker

Adjust Armature Air Gap

Three styles of armatures have been used (Fig. 23, Illus. 1, 2 and 3). Set air gap between the flywheel and armature as shown in Table 1. With armature up as far as possible, and one screw tightened, slip the proper gauge between armature and flywheel. Fig. 24. 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. Then tighten the mounting screws.



Illus. 1 **Illus. 2** **Illus. 3**

Fig. 23 — Armature Style Variations

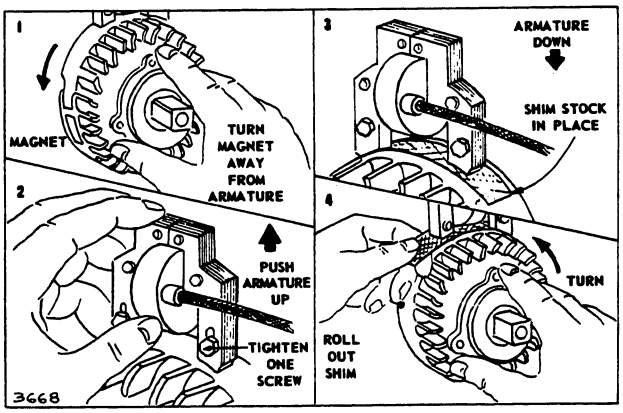


Fig. 24 — Adjusting Armature Air Gap

FLYWHEEL KEY

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

Install Flywheel, Nut and/or Starter Clutch

Remove all oil or grease, clean flywheel hole and tapered end of crankshaft before assembling flywheel to shaft. Insert zinc key into keyway. Slip spring washer over crankshaft with hollow side toward flywheel. To tighten flywheel nut or starter clutch, reverse removal operation. See "Remove Flywheel Nut or Starter Clutch." Torque to specifications listed in Table No. 1.

IGNITION
Flywheel Type — External Breaker
MODEL SERIES 193000, 200000, 230000, 243000, 300000, 320000, 19D, 23D

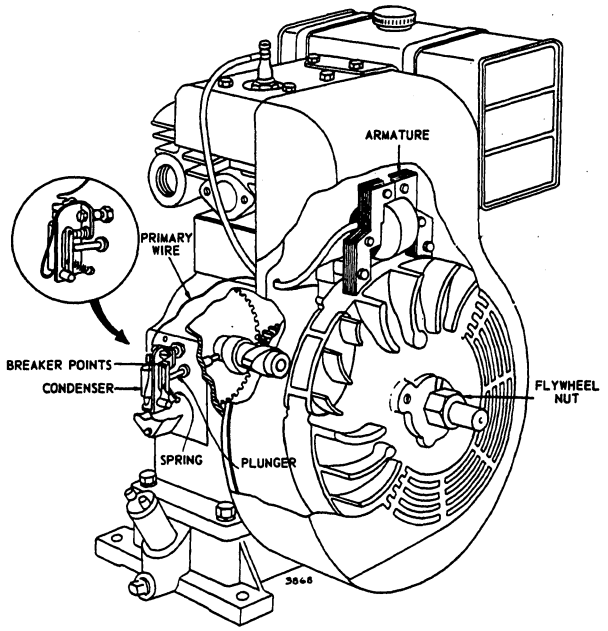


Fig. 25 — Flywheel Ignition External Breaker Models 193000, 200000, 233000, 243000, 300000, 320000

Replace Breaker Points — Model Series 193000, 200000, 230000, 243000, 300000, 320000, 19D, 23D

Turn crankshaft until points open to widest gap. This makes it easier to assemble and adjust points later if crankshaft is not removed. Remove condenser and upper and lower mounting screws. Loosen lock nut and back off breaker point screw. Fig. 26. Reverse process to install.

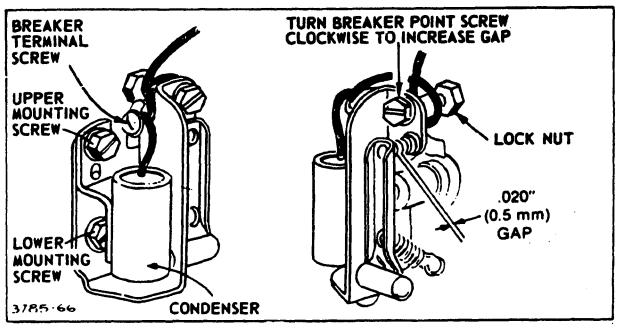


Fig. 26 — Breaker Points

To avoid the possibility of oil leaking past the breaker point plunger or moisture entering the crankcase between plunger and bushing, a plunger seal is now installed on engine models using this ignition system. Fig. 27. These parts may be added to engines in the field if contaminated points are experienced.

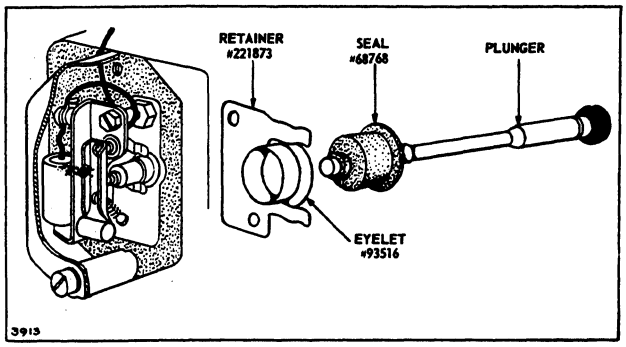


Fig. 27 — Seal Assembly

EXTREME CARE SHOULD BE TAKEN WHEN INSTALLING SEAL ON PLUNGER, OR SEAL MAY BE FRACTURED.

NOTE: Before mounting the breaker-condenser assembly, apply a sealer such as Permatex™ to the threads of both mounting screws and the adjustment screw. The sealer prevents oil from leaking into the breaker point area.

Mount the breaker point assembly, then tighten adjustment screw until the locknut has pushed the ferrule as far as possible toward the head of the adjustment screw. This secures the adjustment screw firmly to the breaker point.

Adjust and Clean Breaker Points

Turn the crankshaft until the points open to their widest gap. Turn breaker point adjusting screw until points open to .020" (0.5 mm). Tighten locknut, while holding adjustment screw, Fig. 26. To clean points turn crankshaft until points are closed. Insert a piece of lintless paper and draw the paper between the points. Open the breaker points to withdraw the paper (so the paper will not tear and allow a small portion to remain between the points).

Apply additional sealer at the point at which the primary wire passes under the breaker cover. This area must be re-sealed to prevent the entry of dust and moisture. See Fig. 28.

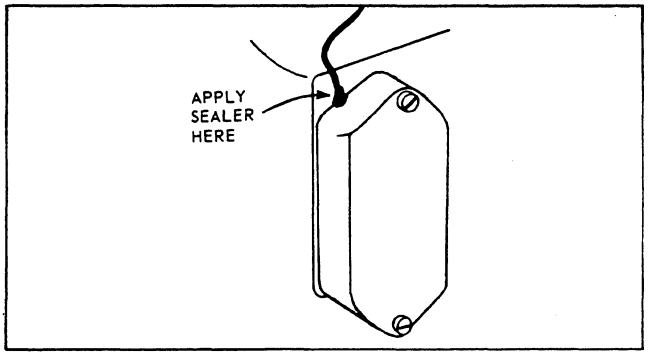


Fig. 28 — Sealing Breaker Cover

TIMING MAGNETRON™ IGNITION

1. Gasoline — Position armature bracket so mounting screws are centered in armature bracket and tighten screws, Fig. 29A.
2. Kerosene — Position armature bracket to the right, as far as it will go and tighten screws, Fig. 29B.

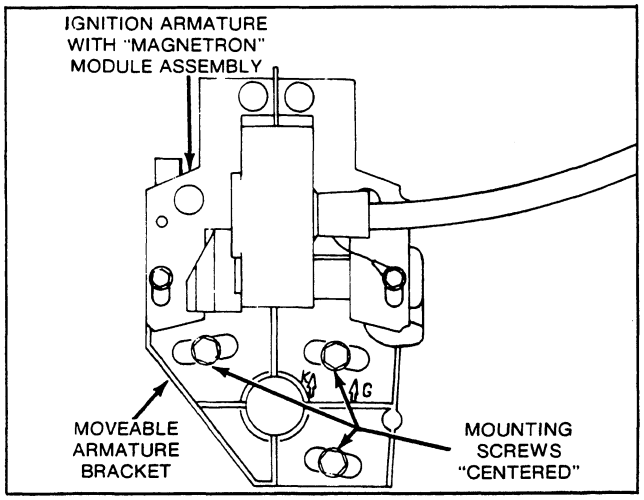


Fig. 29A — Gasoline Operation

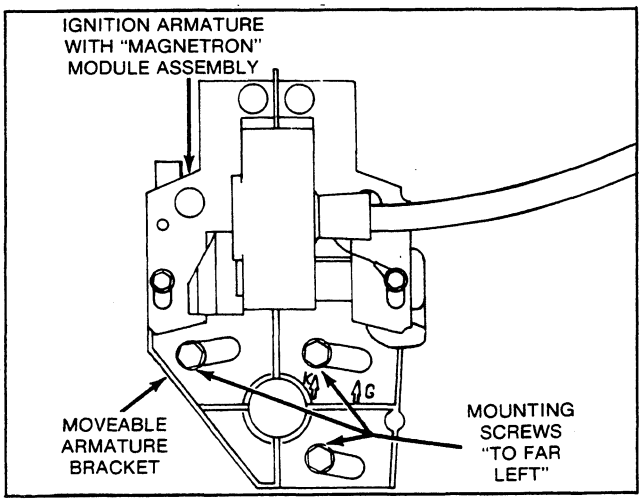


Fig. 29B — Kerosene Operation

ADJUST ARMATURE TIMING WITH BREAKER POINTS

MODEL SERIES 193000, 200000, 230000, 243000, 300000, 320000

Remove Flywheel

Use puller 19203 or 19068, running puller screws into holes tapped into flywheel. Continue to tighten screws until flywheel loosens, Fig. 30.

NOTE: Use flywheel nut to protect crankshaft threads.

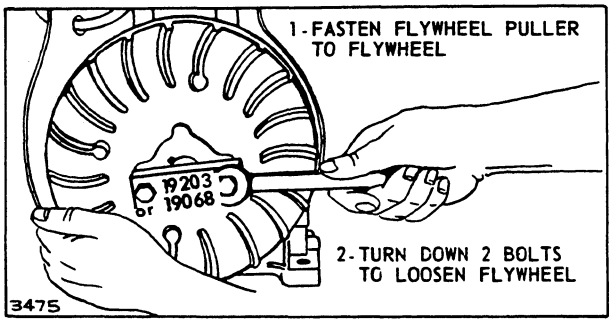


Fig. 30 — Removing Flywheel

Set point gap at .020" (0.5 mm). Position flywheel on crankshaft taper. Slip key in place. Install flywheel nut finger tight. Rotate flywheel and crankshaft clockwise until breaker points are just opening. Use a timing light. When points just start to open, arrow on flywheel should line up with arrow on armature bracket, Fig. 31.

If arrows do not match, slip off flywheel without disturbing crankshaft position. Slightly loosen mounting screws holding armature bracket to cylinder, Fig. 31. Slip flywheel back on crankshaft. Insert flywheel key. Install flywheel nut finger tight. Move armature and bracket assembly to align arrows. Slip off flywheel, tighten armature bracket bolts. Install key and flywheel. Tighten flywheel nut to torque specifications listed in Table No. 1. Set armature air gap at .010" - .014" (0.25 - 0.36 mm), Fig. 32.

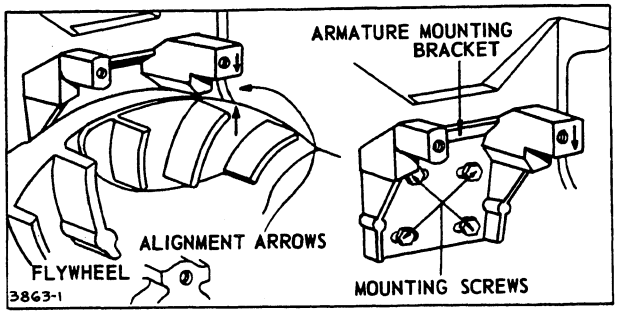


Fig. 31 — Timing Marks

IGNITION
Flywheel Type — External Breaker

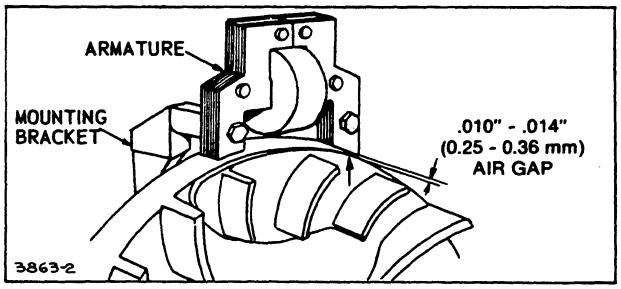


Fig. 32 — Armature Air Gap

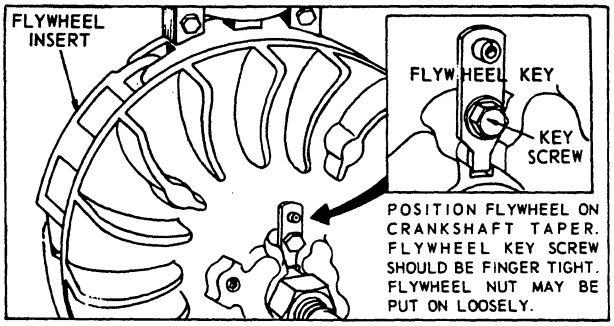


Fig. 34 — Flywheel Key

ADJUST ARMATURE TIMING

Model Series 19D, 23D

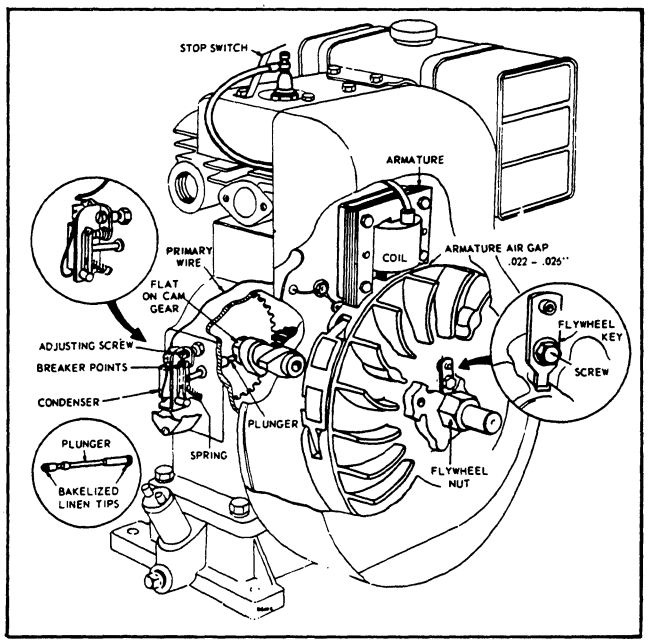


Fig. 33 — Model Series 19D, 23D

Remove Flywheel

Use puller 19203 or 19068, running puller screws into holes tapped into flywheel. Continue to tighten screws until flywheel loosens, Fig. 30.

NOTE: Use flywheel nut to protect crankshaft threads.

Set points at .020" (0.51 mm) gap. Position flywheel on crankshaft taper. Flywheel key screw should be finger tight. Flywheel nut may be put on loosely, Fig. 33.

Rotate flywheel clockwise until breaker points are just opening (flywheel key drives crankshaft while doing this). Fig. 35. Use a timing light.

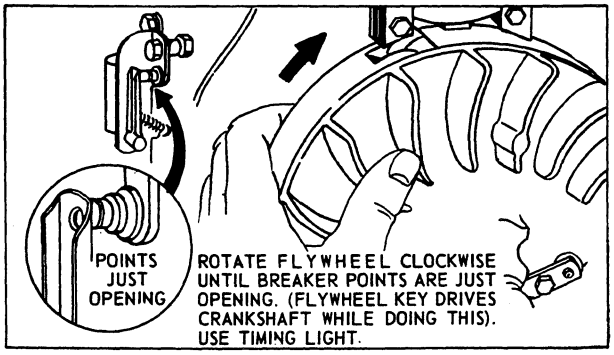


Fig. 35 — Flywheel Timing

Rotate flywheel slightly, counterclockwise, until edge of armature lines up with edge of flywheel insert, Fig. 36. (Crankshaft must not turn while doing this.) Tighten key screw. Tighten flywheel nut. See Table 1. Set armature air gap at .022" - .026" (0.56 - 0.66 mm).

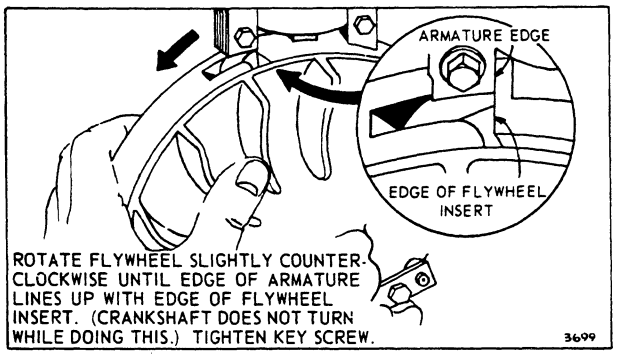


Fig. 36 — Flywheel Timing

REPLACING BREAKER PLUNGER AND BUSHING

Model Series 19D, 23D, 193000, 200000, 230000, 243000, 300000, 320000

Two styles of plunger bushing have been used. Removal and installation is as follows.

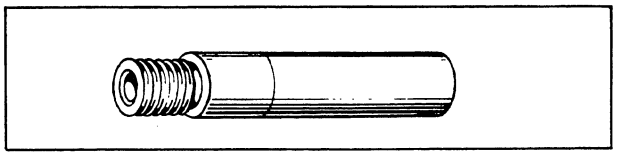
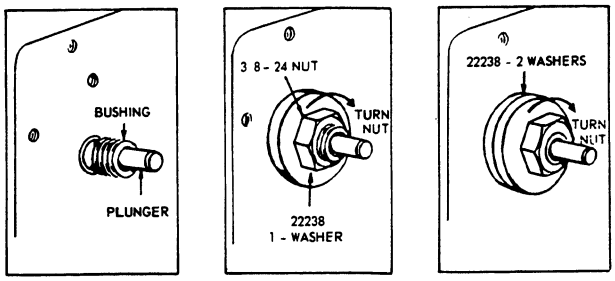


Fig. 37

Remove breaker box cover, condenser and breaker assembly, Fig. 38, Illus. 1.

Place a thick 3/8" inside diameter washer, such as P/N 22238, over the end of bushing and screw on a 3/8-24 nut, as shown in Fig. 38, Illus. 2. Tighten the nut to pull the bushing. After the bushing has moved about 1/8", remove the nut and put on a second thick washer, as shown in Fig. 38, Illus. 3. A total stack of 3/8" of washers (2-22238) will be required to completely remove the bushing. Be sure the plunger does not fall out of the bushing as it is removed.



Illus. 1 Illus. 2 Illus. 3

Fig. 38 — Removing Plunger and Threaded Bushing

Installing Threaded Bushing and Plunger

Place the new plunger in the bushing with the large end of the plunger opposite the threads on the bushing. Screw the 3/8-24 nut onto the threads to protect them. See Fig. 39.

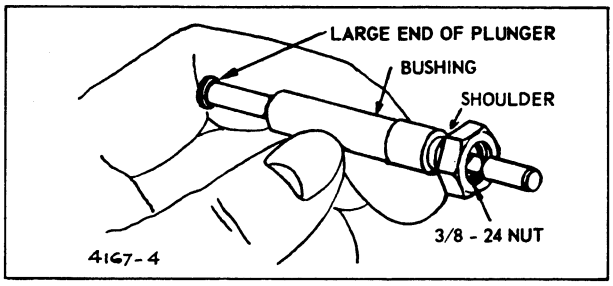


Fig. 39 — Plunger and Bushing

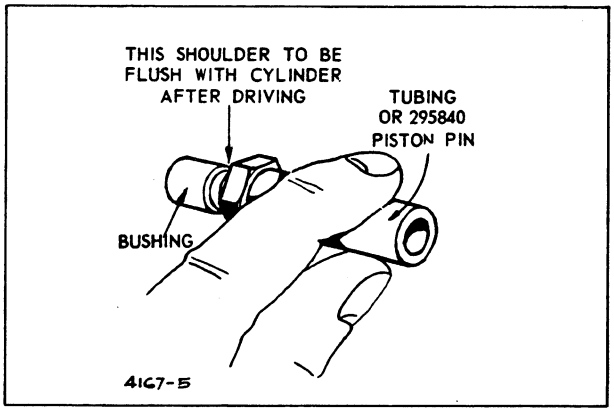


Fig. 40 — Inserting Bushing

Insert bushing into cylinder. Place a piece of tubing such as P/N 295840 piston pin against the nut, as shown in Fig. 40. Use a hammer to drive the bushing into the cylinder until the square shoulder on the bushing is flush with the face of the cylinder. Check to be sure plunger operates freely.

Alternate Design

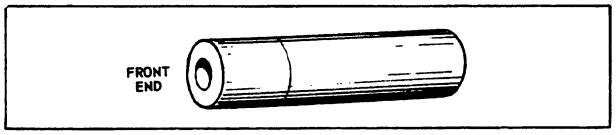
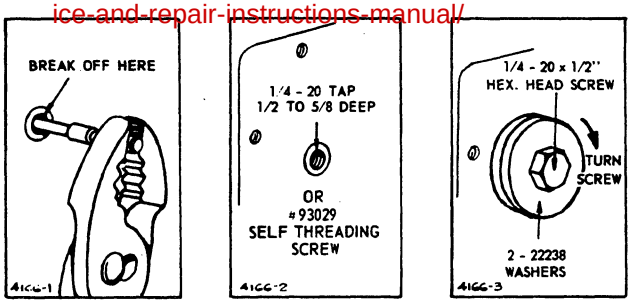


Fig. 41 — To Remove Bushing and Plunger

Pull plunger outward as far as possible. Use a pliers to break plunger off as close to bushing as possible. See Illus. A, Fig. 42. Use a 1/4-20 tap or a 93029 self-threading screw to thread the hole in the bushing to a depth of approximately 1/2 to 5/8" deep, as shown in Illus. B. Use 1/4-20 x 1/2" hex head screw and two spacer washers as shown in Illus. C, to pull the bushing out of the cylinder. The bushing will be free when it has been extracted 5/16". CAREFULLY remove the bushing and the remainder of the broken plunger. Do not allow the plunger or chips to drop into the crankcase.



Illus. A Illus. B Illus. C

Fig. 42 — Removing Bushing and Plunger

To Install Bushing and Plunger

Insert the plunger in the new bushing as shown in Fig. 43.

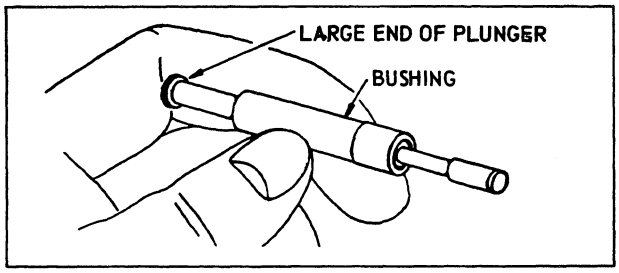


Fig. 43 — Inserting New Plunger in Bushing

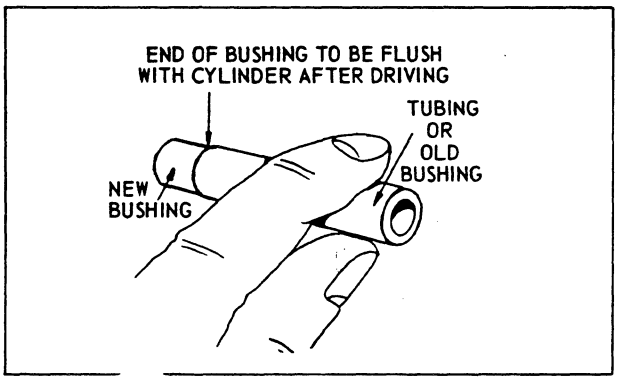


Fig. 44 — Inserting Plunger and Bushing in Cylinder

Insert plunger and bushing into the cylinder. Use a hammer and the old bushing to drive the new bushing into the cylinder until the new bushing is flush with the face of the cylinder. Check to be sure the plunger operates freely. Fig. 44.

MAGNA-MATIC SYSTEM

Engine Models 9-14-19-23-191000-231000

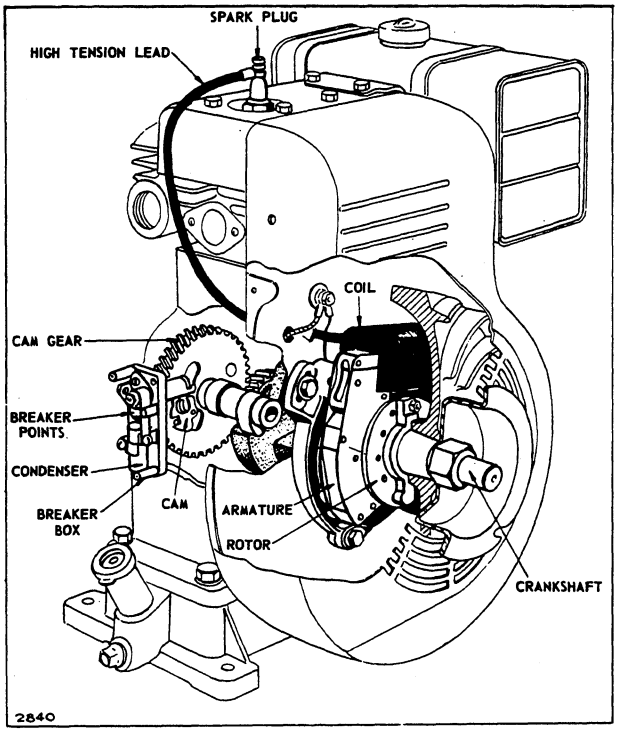


Fig. 45 — Magna-Matic System

Remove Flywheel

Use puller 19203 or 19068, running puller screws into holes tapped into flywheel. Continue to tighten screws until flywheel loosens. Fig. 46.

NOTE: Use flywheel nut to protect crankshaft threads.

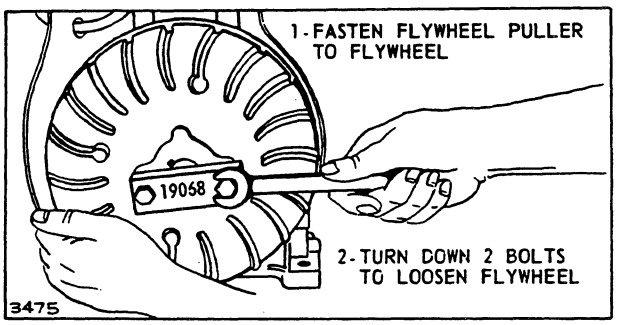


Fig. 46 — Removing Flywheel