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(For Section Reference, See Pages II through IV.)

SECTION REFERENCE
(By Subject) SECTION

SECTION REFERENCE (Continued)

SECTION REFERENCE (Continued)

English to Metric Conversion Table

Fraction	Decimal	mm		Fraction	Decimal	mm
1/64	0.0156	0.3969		33/64	0.5156	13.0969
1/32	0.0312	0.7938		17/32	0.5312	13.4938
3/64	0.0469	1.1906		35/64	05469	13.8906
1/16	0.0625	1.5875		9/16	0.5625	14.2875
5/64	0.0781	1.9844		37/64	0.5781	14.6844
3/32	0.0938	2.3812		19/32	0.5938	15.0812
7/64	0.1094	2.7781		39/64	0.6094	15.4781
1/8	0.1250	3.1750		5/8	0.6250	15.8750
9/64	0.1406	3.5719		41/64	0.6406	16.2719
5/32	0.1562	3.9688		21/32	0.6562	16.6688
11/64	0.1719	4.3656		43/64	0.6719	17.0656
3/16	0.1875	4.7625		11/16	0.6875	17.4625
13/64	0.2031	5.1594		45/64	0.7031	17.8594
7/32	0.2188	5.5562		23/32	0.7188	18.2562
15/64	0.2344	5.9531		47/64	0.7344	18.6531
1/4	0.2500	6.3500		3/4	0.7500	19.0500
17/64	0.2656	6.7469		49/64	0.7656	19.4469
9/32	0.2812	7.1438		25/32	0.7812	19.8438
19/64	0.2969	7.5406		51/64	0.7969	20.2406
5/16	0.3125	7.9375		13/16	0.8125	20.6375
21/64	0.3281	8.3344		53/64	0.8281	21.0344
11/32	0.3438	8.7312		27/32	0.8438	21.4312
23/64	0.3594	9.1281		55/64	0.8594	21.8281
3/8	0.3750	9.5250		7/8	0.8750	22.2250
25/64	0.3906	9.9219		57/64	0.8906	22.6219
13/32	0.4062	10.3188		29/32	0.9062	23.0188
27/64	0.4219	10.7156		59/64	0.9219	23.4156
7/16	0.4375	11.1125		15/16	0.9375	23.8125
29/64	0.4531	11.5094		61/64	0.9531	24.2094
15/32	0.4688	11.9062		31/32	0.9688	24.6062
31/64	0.4844	12.3031		63/64	0.9844	25.0031
1/2	0.5000	12.7000		1	1.0000	25.4000

Drill Size – Decimal Equivalent In Inches

60——.040	39——.0995	20——.161	1——.228	Q——.332
59——.041	38——.1015	19——.166	A——.234	R——.339
58——.042	37——.104	18——.1695	*15/64*–.2344	*11/32*–.3438
57——.043	36——.1065	*11/64*–.1719	B——.238	S——.348
56——.0465	*7/64*—.1094	17——.173	C——.242	T——.358
55——.052	35——.110	16——.177	D——.246	*23/64*–.3594
54——.055	34——.111	15——.180	E, *1/4*–.250	U——.368
53——.0595	33——.113	14——.182	F——.257	*3/8*——.375
1/16 —.0625	32——.116	13——.185	G——.261	V——.377
52——.0635	31——.120	*3/16*—.1875	*17/64*–.2656	W——.386
51——.067	*1/8*——.125	12——.189	H——.266	*25/64*–.3906
50——.070	30——.1285	11——.191	I——.272	X——.397
49——.073	29——.136	10——.1935	J——.277	Y——.404
48——.076	28——.1405	9——.196	K——.281	*13/32*–.4062
5/64 —.0781	*9/64*—.1406	8——.199	*9/32*—.2812	Z——.413
47——.0785	27——.144	7——.201	L——.290	*27/64*–.4219
46——.081	26——.147	*13/64*–.2031	M——.295	*7/16*—.4375
45——.082	25——.1495	6——.204	*19/64*–.2969	*29/64*–.4531
44——.086	24——.152	5——.2055	N——.302	*15/32*–.4688
43——.089	23——.154	4——.209	*5/16*—.3125	*31/64*–.4844
42——.0935	*5/32*—.1562	3——.213	O——.316	*1/2*——.500
3/32—.0938	22——.157	*7/32*—.2188	P——.323	
41——.096	21——.159	2——.221	*21/64*–.3281	
40——.098				

Section 1
GENERAL INFORMATION

Section Contents

In the Interest of Safety

1

This safety alert symbol indicates that this message involves personal safety. Words danger, warning and caution indicate degree of hazard. Death, personal injury and/or property damage may occur unless instructions are followed carefully.

You are not ready to operate this engine if you have not read and understood the following safety items. Read this entire owner's manual and the operating instructions of the equipment this engine powers.

The Briggs & Stratton engine is made of the finest material in a state-of-the-art manufacturing facility. Please understand that Briggs & Stratton sells engines to original equipment manufacturers. It also sells to others in the distribution chain who may sell to the ultimate consumer, an equipment manufacturer, another distributor or a dealer. As a result, Briggs & Stratton does not necessarily know the application on which the engine will be placed. For that reason, carefully read and understand the operating instructions of the equipment before you repair or operate it.

You should also understand that there are equipment applications for which Briggs & Stratton does not approve the use of its engines. Briggs & Stratton engines are not to be used on vehicles with less than 4 wheels. They include motor bikes, aircraft products and All Terrain Vehicles. Moreover, Briggs & Stratton does not approve of its engines being used in competitive events. F0R THAT REASON, BRIGGS & STRATTON ENGINES ARE NOT AUTHORIZED FOR ANY OF THESE APPLICATIONS. Failure to follow this warning could result in death, serious injury (including paralysis) or property damage.

DO NOT run engine in an enclosed area. (Exhaust gases contain carbon monoxide, an odorless and deadly poison.)

DO NOT remove fuel tank cap nor fill fuel tank while engine is hot or running. DO NOT refuel indoors or in an unventilated area. (Allow engine to cool 2 minutes before refueling.)

DO NOT place hands or feet near moving or rotating parts.
DO NOT store, spill, or use gasoline near an open flame, nor near an appliance like a stove, furnace, or water heater that uses a pilot light or can create a spark.
DO NOT refuel indoors or in an unventilated area.
DO NOT operate or tip engine/equipment at such a severe angle that causes gasoline spillage.
DO NOT operate engine if gasoline is spilled or when smell of gasoline is present or other explosive conditions exist. (Move equipment away from spill and avoid any ignition until gasoline has evaporated.)
DO NOT transport engine with fuel in tank or fuel shut-off valve open.
DO NOT choke carburetor to stop engine, especially in an enclosed vehicle. (Whenever possible, gradually reduce engine speed before stopping.)
DO NOT tamper with governor springs, links or other parts to increase engine speed. (Run engine at speed set for equipment manufacturer.)
DO NOT check for spark with spark plug removed. (Use an approved tester.)
DO NOT run engine without blower housing or other safety shields removed when doing repairs.
DO NOT crank engine with spark plug removed. (If engine is flooded, place throttle in FAST and crank until engine starts.)
DO NOT strike flywheel with a hammer or hard object as this may cause flywheel to shatter in operation. (To remove flywheel, use Briggs & Stratton approved tools and proceedures only.)
DO NOT operate engine without a muffler. (Inspect periodically and replace if worn or leaking. If engine is equipped with muffler deflector, inspect periodically and replace if necessary. Replacement parts must be same as on original equipment.)
DO NOT operate engine with an accumulation of grass, leaves or other combustible material in muffler area.
DO NOT use this engine on any forest covered, brush covered, or grass covered unimproved land unless a spark arrester is installed on muffler. The spark arrester must be maintained in working order by the owner and/or operator. In the State of California the above is required by law (Section 4442 of the California Public Resources Code). Other states may have similar laws. Federal laws apply on federal lands.
DO NOT touch hot muffler, cylinder, or fins which can cause burns.
DO NOT start engine with air cleaner or air cleaner cover removed (or cover over carburetor air intake, if Sno/Gard engine).
DO NOT attempt to start engine with cutting blade loose or removed. (Blade must be tight, otherwise a kickback may occur.)

✓Prior to work, read and understand the section(s) of this manual that pertain to the job. Follow all safety warnings.
✓PULL starter cord slowly until resistance is felt. Then pull cord rapidly to avoid kickback and prevent hand or arm injury.
✓WEAR suitable eye protection (safety glasses, goggles or face shield when performing repair procedures).

- ✓ PREVENT ACCIDENTAL STARTING by removing spark plug wire from spark plug when servicing engine or equipment. Disconnect negative wire from battery terminal if equipped with electric starting system.
- ✓ REMOVE blower housing periodically and clean engine. Keep cylinder fins and governor parts free of dirt, grass and other debris which can affect engine speed.
- ✓ USE fresh gasoline. Stale fuel can gum carburetor and cause leakage.
- ✓ CHECK fuel lines and fittings frequently for cracks or leaks. Replace if necessary.
- ✓ USE ONLY Genuine Briggs & Stratton Parts or their equivalent. The use of replacement parts which are not of equivalent quality may damage the engine.

⚠ WARNING: ⚠

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

BRIGGS & STRATTON NUMERICAL NUMBER SYSTEM

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

Model	Type	Code
405777	0125 01	99052115

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

CUBIC INCH DISPLACEMENT	FIRST DIGIT AFTER DISPLACEMENT BASIC DESIGN SERIES	SECOND DIGIT AFTER DISPLACEMENT CRANKSHAFT, CARBURETOR, GOVERNOR	THIRD DIGIT AFTER DISPLACEMENT PTO BEARING, REDUCTION GEAR, AUXILIARY DRIVE, LUBRICATION	FOURTH DIGIT AFTER DISPLACEMENT TYPE OF STARTER
6	0	0 – Horizontal Shaft Diaphragm Carburetor Pneumatic Governor	0 – Plain Bearing/DU Non-Flange Mount	0 – Without Starter
8	1	1 – Horizontal Shaft Vacu-Jet Carburetor Pneumatic Governor	1 – Plain Bearing Flange Mounting	1 – Rope Starter
9	2	2 – Horizontal Shaft Pulsa-Jet Carburetor Pneumatic or Mechanical Governor	2 – Sleeve Bearing Flange Mounting Splash Lube	2 – Rewind Starter
10	3	3 – Horizontal Shaft Flo-Jet Carburetor Pneumatic Governor	3 – Ball Bearing Flange Mounting Splash Lube	3 – Electric Starter Only 120 Volt Gear Drive
11	4	4 – Horizontal Shaft Flo-Jet Carburetor Mechanical Governor	4 – Ball Bearing Flange Mounting Pressure Lubrication on Horizontal Shaft	4 – Electric Starter/Generator 12 Volt Belt Drive
12	5	5 – Vertical Shaft Vacu-Jet Carburetor Pneumatic or Mechanical Governor	5 – Plain Bearing Gear Reduction (6 to 1) CW Rotation Flange Mounting	5 – Electric Starter Only 12 Volt Gear Drive
13	6	6 – Vertical Shaft	6 – Plain Bearing Gear Reduction (6 to 1) CCW Rotation	6 – Alternator Only
16	7	7 – Vertical Shaft Flo-Jet Carburetor Pneumatic or Mechanical Governor	7 – Plain Bearing Pressure Lubrication on Vertical Shaft	7 – Electric Starter 12 Volt Gear Drive With Alternator
17	8	8 – Vertical Shaft Flo-Jet Carburetor Mechanical Governor	8 – Plain Bearing Auxiliary Drive (PTO) Perpendicular to Crankshaft	8 – Vertical Pull Starter or Side Pull Starter
18	9	9 – Vertical Shaft Pulsa-Jet Carburetor Pneumatic or Mechanical Governor	9 – Plain Bearing Auxiliary Drive Parallel to Crankshaft	9 – Mechanical Starter
19	A to Z			
20				
22				
23				
24				
25				
26				
28				
29				
30				
31				
32				
35				
38				
40				
42				
43				
44				
46				
52				
58				

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

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

Example: 99052115

A. The first two digits, 99, indicate the calendar year, 1999.

B. The second two digits, 05, indicate the calendar month, May.

C. The third two digits, 21, indicate the calendar month day.

D. The last two digits, 15, indicate the assembly line or manufacturing plant.

MAINTENANCE

Maintenance Schedule	5 Hours or Daily	25 Hours or Every Season	50 Hours or Every Season	100 Hours or Every Season	500 Hours
Check oil level♦	●				
Change oil			● Note 1		
Change oil filter				● Note 1	
Change air cleaner pre-cleaner		● Note 2			
Change air cleaner cartridge				● Note 2	
Clean cooling system				● Note 2	
* Inspect/clean spark arrester (optional accessory)			●		
Replace spark plugs				●	
Replace in-line fuel filter				●	
Remove combustion chamber deposits					●

♦ Change oil after first 8 hours, then after every 50 hours or every season.

* Exhaust system supplied by equipment manufacturer.

Note 1 Change oil every 25 hours when operating under heavy load or in high temperatures.

Note 2 Clean more often under dusty conditions or when airborne debris is present. Replace air cleaner parts, if very dirty.

FUEL AND OIL RECOMMENDATIONS

Gasoline

We recommend the use of clean, fresh, lead-free gasoline, and the use of BRIGGS & STRATTON GASOLINE ADDITIVE, PART #5041. Leaded gasoline may be used if it is commercially available and if lead-free is not available. A minimum of 85 octane is recommended. The use of lead-free gasoline results in fewer combustion deposits and longer valve life.

NOTE: Some fuels, called oxygenated or reformulated gasolines, are gasolines blended with alcohols or ethers. Excessive amounts of these blends can damage the fuel system or cause performance problems. Do not use gasoline which contains Methanol.

If any undesirable operating symptoms occur, use gasoline with a lower percentage of alcohol or ether. We also recommend gasoline be purchased in small quantities, not more than a 30 day supply. FRESH gasoline minimizes gum deposits, and also will ensure fuel volatility tailored for the season in which the engine will be operated.

Lubrication

Oil has four purposes. It cools, cleans, seals and lubricates. 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 forming an abrasive mixture which can cause wear to all of the internal moving parts of the engine, if the oil is not changed regularly. Fresh oil also assists in cooling. Old oil gradually becomes thick and loses its cooling ability as well as its lubricating qualities.

Briggs & Stratton Intek™ OHV V-Twin engines are lubricated with a gear-driven oil pump.

Oil Recommendations

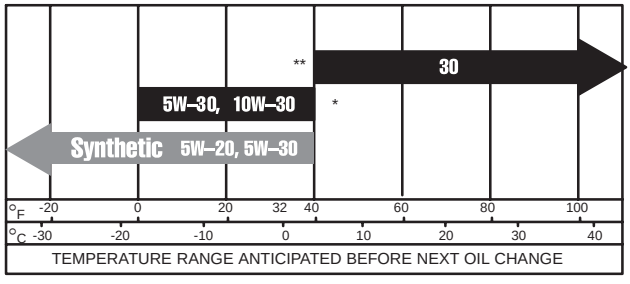
We recommend the use of a high quality detergent oil classified “For Service SE, SF, or SG” such as Briggs & Stratton 30 Weight Oil Part #100005 or #100028. Detergent oils keep the engine cleaner and retard the formation of gum and varnish deposits. No special additives should be used with recommended oils.

Change Oil

The crankcase capacity of Intek™ OHV V-Twin cylinder engines is approximately:

4 Pints (1.9 liters) with filter
3-3/4 Pints (1.8 liters) without filter

RECOMMENDED SAE VISCOSITY GRADES
4-Cycle Intek™ V-Twin OHV Gasoline Engines



* Air cooled engines run hotter than automotive engines. Use of multi-viscosity oils (10W-30, etc.) above 4°C (40°F) will result in high oil consumption and possible engine damage. Check oil level more frequently if using these types of oils.

** SAE 30 oil, if used below 4°C (40°F), will result in hard starting and possible engine bore damage due to inadequate lubrication.

IMPORTANT: DO NOT OVERFILL. Check and maintain oil level regularly. Change oil after first eight (8) hours of operation.

Thereafter, change oil every fifty (50) hours of operation. Change oil more often if engine is operated in dirty or dusty conditions or if engine is operated under heavy loads or in high ambient air temperatures.
Remove oil drain plug and drain oil while engine is still warm, Fig. 1. Replace drain plug.
Remove dipstick and refill slowly with new oil of proper service classification and viscosity grade. Refill to full mark on dipstick. When checking oil level, dipstick must be screwed all the way in for accurate readings. Start and run engine to check for oil leaks.

Change Oil Filter

Replace oil filter every 100 hours. Before installing new filter, lightly oil filter gasket with fresh clean engine oil. Screw filter on by hand until gasket contacts filter adapter. Tighten 1/2-3/4 turn farther, Fig. 1.
Start and run engine at idle for 30 seconds and stop engine. Recheck oil level and add if required. Restart engine and check for oil leaks.

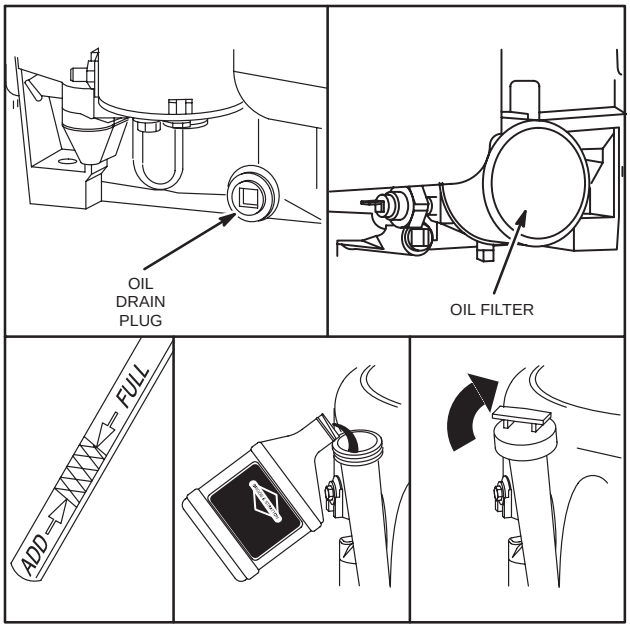


Fig. 1

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.
Remove rotating screen and blower housing, Fig. 2. Cover intake elbow to prevent dirt entering carburetor. Clean all debris and dirt from rotating screen, cooling fins, flywheel, cylinder and cylinder shields.
This should be a regular maintenance operation, performed yearly or every 100 hours, whichever comes first.

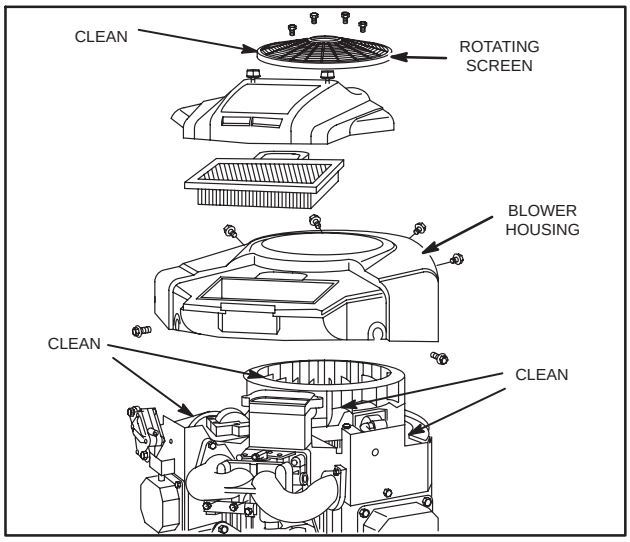


Fig. 2

Replace Spark Plugs

Replace spark plugs every 100 hours of operation or every season, whichever occurs first. Replace spark plugs if electrodes show signs of wear, or the porcelain is cracked. Set spark plug gap at .76 mm (.030") for all models, Fig. 3. Torque spark plugs to 20 Nm (180 in. lbs.).
Spark plugs recommended by Briggs & Stratton for OHV Twin engines are:

Spark Plug Type	B&S Part No.	Champion
Resistor Plug	491055	RC12YC
Resistor Plug	496018	RC14YC

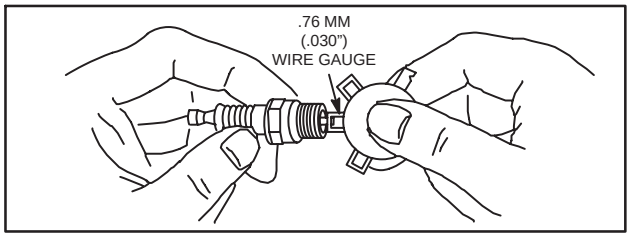


Fig. 3 – Checking Plug Gap

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

Air Cleaner Maintenance

WARNING: NEVER operate engine with air cleaner assembly or air cleaner cartridge removed. fire may result.

A properly serviced air cleaner protects internal parts of the engine from dirt and dust particles in the air. If air cleaner instructions are not carefully followed, dirt and dust, will be drawn into the engine. These particles are highly abrasive and will cause the piston rings and cylinder bore to wear quickly. As the rings and cylinder bore become worn, these abrasive particles enter the crankcase and contaminate the oil, forming an abrasive mixture which will cause wear on all of the internal moving parts.

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

NOTE: Replace air cleaner gaskets and mounting gaskets that are worn or damaged, to prevent dirt and dust entering engine due to improper sealing.

Service Dual Element Air Cleaners

Remove and service foam pre-cleaner every 25 hours or every season, whichever occurs first. Service cartridge every 100 hours or every season, whichever occurs first.

To Service Pre-Cleaner

Remove air cleaner cover, Fig. 4.

a. Remove cartridge and foam pre-cleaner.
b. Wash pre-cleaner in liquid detergent and water.
c. Squeeze it dry in a clean cloth.
d. Saturate it in engine oil. Wrap it in clean absorbent cloth and squeeze to remove excess oil.
e. Reinstall pre-cleaner with mesh screen up.
f. Reinstall air cleaner cartridge.
g. Reinstall air cleaner cover.

NOTE: Be sure tabs on blower housing are engaged in slots on air cleaner cover.

To Service Cartridge

Remove air cleaner cover, Fig. 4.

a. Remove and inspect cartridge. Replace if damaged or dirty.
b. NOTE: DO NOT use petroleum solvents, such as kerosene, to clean paper cartridge. They may cause cartridge to deteriorate. DO NOT oil paper cartridge. DO NOT use pressurized air to clean or dry paper cartridge.
c. Reinstall cartridge and air cleaner cover, Fig. 4.

NOTE: Be sure tabs on blower housing are engaged in slots on air cleaner cover.

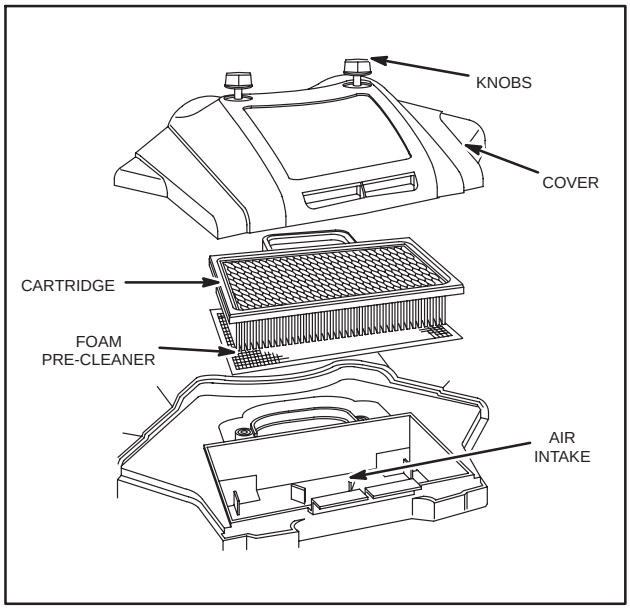


Fig. 4 – Dual Element Air Cleaner

Remove Combustion Chamber Deposits

Combustion chamber deposits should be removed every 500 hours or whenever cylinder heads are removed. See Section 2 for removal procedure.

Remove combustion chamber deposits from combustion chamber and around valves using a soft, hand wire brush or scraper. With piston at Top Dead Center, remove combustion chamber deposits from top of piston. Use care to prevent combustion chamber deposits from entering push rod or oil return cavity in cylinder.

Take care not to damage cylinder, top of piston, cylinder head and cylinder head gasket surfaces.

NOTE: Remove only the combustion chamber deposits. It is not necessary to remove the discoloration marks on the piston, valves and cylinder head. These marks are normal and will not affect engine operation.

Remove the loose deposits from around the top ring land area using compressed air or a soft bristle brush.

WARNING: To prevent eye injury always wear eye protection when using compressed air.

TROUBLESHOOTING

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. Runs rough
5. Vibration
6. Overheating
7. High oil consumption

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.

Systematic Check

If the engine will not start and the cause of malfunction is not readily apparent, perform a systematic check in the following order:

1. Ignition
2. Carburetion
3. Compression

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. The basic check-up procedure is the same for all engine models, while any variation, by model, will be shown under the subject heading.

Check Ignition (With Electric Starter)

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

With spark plugs installed, attach a #19368 ignition tester to each spark plug lead and ground the other end of the tester as shown in Fig. 5. Spin the flywheel rapidly with engine starter. If spark jumps the tester gaps, you may assume the ignition system is functioning satisfactorily.

WARNING: ON MAGNETRON® EQUIPPED ENGINES, spark will still occur with a sheared flywheel key. A severe shock or kickback hazard may exist.

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

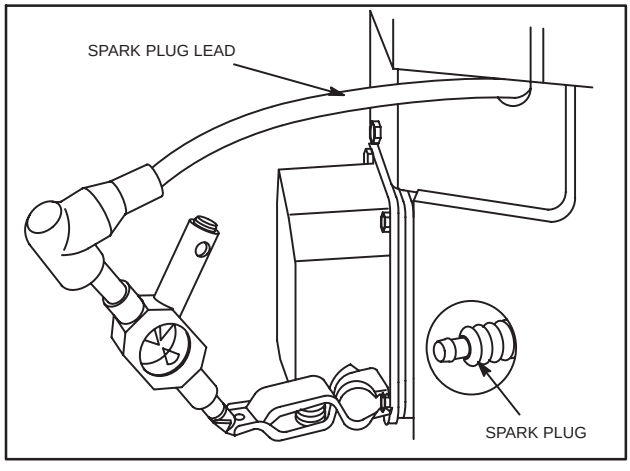


Fig. 5 – Checking for Spark

If spark does not occur look for –

Improperly operating interlock system

Shorted equipment stop switch wire

Two closed diodes in ground wire harness

Incorrect armature air gap

Armature failure

Check Ignition (Engine Running)

If engine runs but misses during operation, a quick check to determine if ignition is or is not at fault can be made by installing Tool #19368 tester between the spark plug lead and each spark plug, Fig. 6. A spark miss will be readily apparent when the engine is running. If spark is good but engine misses, check for a fouled spark plug.

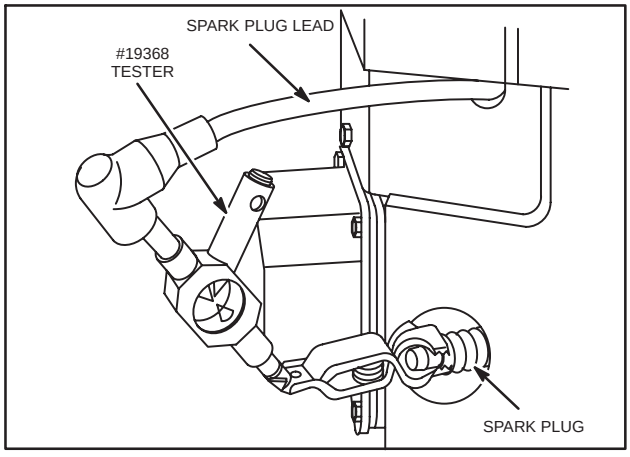


Fig. 6 – Running Check

Check Ignition (Fouled Plug or Other Causes)

To check for a fouled spark plug or a non-functioning cylinder, attach Tool #19368 tester between the spark plug lead and each spark plug. Start and run engine at top no load speed. Now ground one spark plug, Fig. 7. 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. Install a new spark plug before proceeding. If miss continues, problem may be carburetion or compression. See Check Carburetion, Check Compression. Also see Cylinder Balance Test.

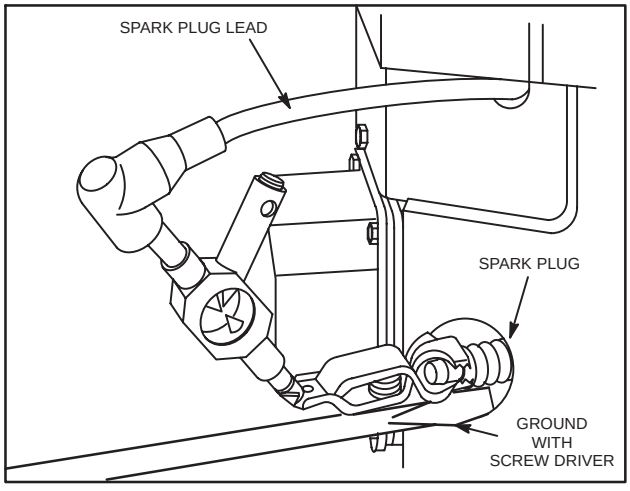


Fig. 7 – Checking For Fouled Plugs

Check Carburetion

Before making a carburetion check, be sure the fuel tank has an ample supply of fresh, clean gasoline. Be sure that the shutoff valve, if equipped, is open and fuel flows freely through the fuel line before starting engine. Inspect and adjust the idle needle valve. 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 –

Overchoking

Plugged air cleaner

Excessively rich fuel mixture

Water in fuel

Float needle valve stuck open

If plug is dry, look for –

Inoperative anti-afterfire solenoid.

Gummy or dirty carburetor, fuel line or tank

Float needle valve stuck shut

Inoperative fuel pump

Leaking carburetor mounting gaskets

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.

Check Compression

Briggs & Stratton does not publish any compression pressures, as it is extremely difficult to obtain an accurate reading without special equipment.

It has been determined through testing, a simple and accurate indication of compression can be made as follows:

Remove both spark plugs and insert a compression gauge into either cylinder (one cylinder at a time). Turn engine over with engine starter until there is no further increase in pressure. Record this reading. Repeat procedure on other cylinder and record that reading. The difference between both cylinders should not exceed 25%. More than 25% indicates loss of compression in the cylinder with lower pressure. See example.

Example:

	Cyl. #1	Cyl. #2	Diff.	% Diff.
Eng. #1	65 PSI	60 PSI	5 PSI	7.6%
Eng. #2	75 PSI	55 PSI	20 PSI	26.7%

If compression is poor, look for –

Loose cylinder head bolts

Blown head gasket

Burned valves, valve seats and/or loose valve seats

Insufficient valve clearance

Warped cylinder head

Warped valve stems

Worn bore and/or rings

Broken connecting rods

Cylinder Leakdown Test

The cylinder leakdown tester, Tool # 19545, may be used to test the sealing capability of the compression components of each cylinder and quickly identify the problem component.

Cylinder Balance Test

If the engine is hard starting, runs rough, misses or lacks power, perform a cylinder balance test to determine whether both cylinders are operating to their full potential.

Tools Required

1. Tachometer, Tool #19200 or 19389
2. Two #19368 Ignition Testers
3. Screwdriver with insulated handle

Attach ignition tester, Tool #19368 between the spark plug lead and each spark plug, Fig. 8.

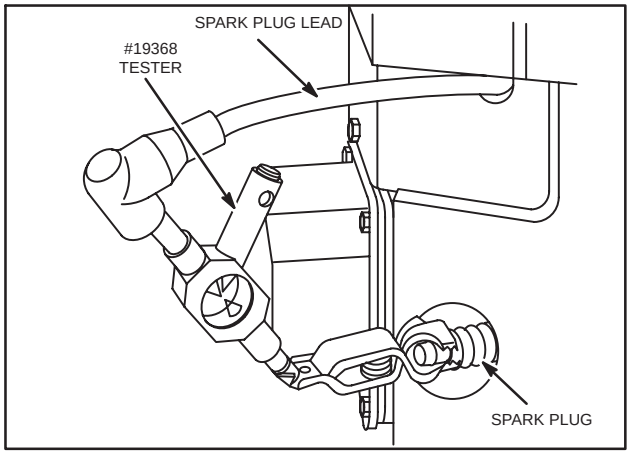


Fig. 8

Start and run engine running at top no load speed and note spark at ignition testers. If the spark is equal at both ignition testers, the problem is not ignition related. A spark miss will be readily apparent. Now note RPM of engine. Ground out one cylinder with screwdriver by contacting alligator clip on ignition tester and a good ground on engine, Fig. 9. Note RPM loss. Then ground out the other spark plug and note the RPM loss. If the difference between the two cylinders does not exceed 75 RPM, the amount of work the two cylinders are doing should be considered equal.

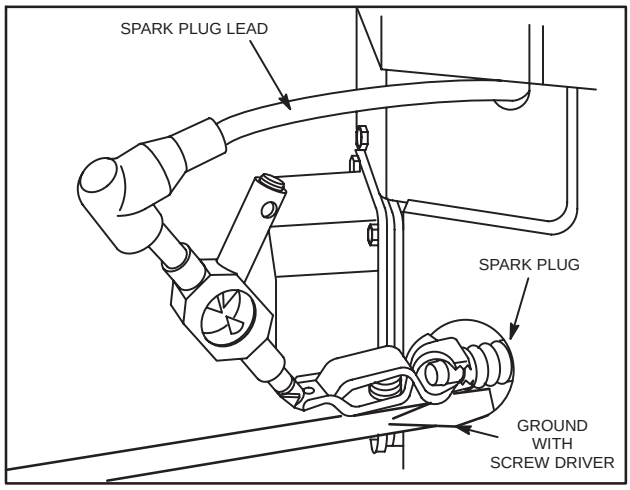


Fig. 9 – Cylinder Balance Test

Things Which Affect Both Cylinders

1. Carburetion
2. Crankcase vacuum
3. Ignition timing
   a. A partially sheared flywheel key will effect ignition timing and engine performance.

If the RPM loss is greater than 75 RPM this indicates that the cylinder with the least RPM loss is the weakest of the two cylinders. Look to that cylinder for a problem. See Example.

Example:

Engine RPM – Both Cylinders = 3400 RPM
Engine RPM – #1 Cylinder Grounded = 3300 RPM
Engine RPM – #2 Cylinder Grounded = 3100 RPM
Conclusion: #1 cylinder is weakest of the two cylinders.

Things Which Affect One Cylinder

1. Spark plug
   a. A fouled spark plug may indicate that carburetor is out of adjustment.
2. Leak in spark plug wire
3. Head gasket
4. Intake manifold
   a. A leak at either end of the intake manifold will only affect one cylinder, not both.
5. Valves
6. Rings
7. Piston
8. Cylinder

The cylinder balance test will also detect a cylinder that is not functioning. When grounding out one cylinder there will be no RPM loss. When the other cylinder is grounded out the engine will stop.
NOTE: A twin cylinder engine will run well on one cylinder as long as the power required for the application does not exceed the power produced by the one cylinder.

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 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, should 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.

Engine Won't Stop

1. Check equipment ignition stop switch.
2. Check for loose or disconnected equipment stop switch wire.
3. Check ground wire harness.
   a. See Section 3 for test procedure.

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.

Fastener Specifications

Description	Wrench/Socket Size	Torque
Alternator (stator)	1/4”	20 in. lbs. (2.0 Nm)
Armature	5/16”	25 in. lbs. (3.0 Nm)
Back Plate (to cylinder)	3/8”	100 in. lbs. (11.0 Nm)
Blower Housing	3/8”	80 in. lbs. (9.0 Nm)
Breather	3/8”	55 in. lbs. (6.0 Nm)
Carburetor (to manifold)	E-5	65 in. lbs. (7.0 Nm)
Connecting Rod	5/16”	100 in. lbs. (11.0 Nm)
Cylinder Shield	3/8”	80 in. lbs. (9.0 Nm)
	5/16”	45 in. lbs. (5.0 Nm)
Exhaust Manifold	1/2”	140 in. lbs. (16.0 Nm)
Fan Retainer	1/2”	140 in. lbs. (16.0 Nm)
Fuel Pump (to bracket)	3/8”	80 in. lbs. (9.0 Nm)
Fuel Pump Bracket (to cyl. shield)	3/8”	80 in. lbs. (9.0 Nm)
Flywheel	1-1/4”	150 ft. lbs. (203.0 Nm)
Governor Control Bracket	3/8”	80 in. lbs. (9.0 Nm)
Governor Nut	7/16”	130 in. lbs. (15.0 Nm)
Head Bolts	1/2”	220 in. lbs. (25.0 Nm)
Intake Air Horn	7/16”	45 in. lbs. (5.0 Nm)
Intake Manifold (to cyl. head)	3/8” (T-30)	80 in. lbs. (9.0 Nm)
Oil Drain Plug	3/8” Square Drive (internal)	125 in. lbs. (14.0 Nm)
Oil Pump Cover	T-30	50 in. lbs. (6.0 Nm)
Rocker Arm.	8 mm	100 in. lbs. (11.0 Nm)
Rocker Arm Lock Nut	13 mm	60 in. lbs. (7.0 Nm)
Rocker Arm Adjustment Screw	T-40	
Rotating Screen	5/16”	20 in. lbs. (2.0 Nm)
Spark Plugs	5/8” mm Deep	180 in. lbs. (20.0 Nm)
Starter Motor	1/2” (T-40)	140 in. lbs. (16.0 Nm)
Starter Thru Bolts	5/16”	50 in. lbs. (6.0 Nm)
Sump	1/2”	200 in. lbs. (23.0 Nm)
Valley Cover	5/16”	45 in. lbs. (5.0 Nm)
Valve Cover	3/8”	100 in. lbs. (11.0 Nm)

Common Specifications

Model Series	Bore	Stroke	Displacement
405777	2.970” (75.44 mm)	2.890” (73.40 mm)	40.0 cu. in. (656 cc)
445777	3.120” (79.25 mm)	2.890” (73.40 mm)	44.2 cu. in. (724 cc)

Armature Air Gap	.008” – .012” (0.20 – 0.30 mm)
Crankshaft End Play	.002” – .030” (0.05 – 0.76 mm)
**Governed Idle Speed (all models)	1750 RPM
Spark Plug Gap	.030” (0.76 mm)
Valve Clearance (Cold) – Int. – Exh.	.004” – .006” (0.10 – 0.15 mm)

**Top Governed Speed: See Briggs & Stratton Service Engine Sales Manual Microfiche MS-6255 or Sales Manual MS-4052

Standard and Reject Dimensions

Description	Standard Dimension	Reject Dimension
Cylinder		
Bore		
- Model 405777	2.969” – 2.970” (75.41 – 75.44 mm)	2.973” (75.51 mm)
- Model 445777	3.119” – 3.120” (79.22 – 79.25 mm)	3.1235 (79.33 mm)
Out of round - All:		.0015” (0.04 mm)
Main Bearing (Magneto)	1.379” – 1.3805” (35.02 – 35.06 mm)	1.383” (35.12 mm)
Cam Bearing (Magneto)	.6255” – .626” (15.88 – 15.90 mm)	.6275” (15.93 mm)
Cylinder Head		
Valve Guide	.2374” – .2383” (6.03 – 6.05 mm)	.240” (6.09 mm)
Valve Stem	.2345” – .235” (5.97 – 5.98 mm)	.233” (5.92 mm)
Sump		
Main Bearing (PTO)	1.6268” – 1.6275” (41.32 – 41.34 mm)	1.629” (41.37 mm)
Cam Bearing (PTO)	.6255” – .626” (15.88 – 15.90 mm)	.6275” (15.93 mm)
Crankshaft		
Crankpin	1.4982” – 1.499” (38.05 – 38.07 mm)	1.4965” (38.01 mm)
Magneto Journal	1.3776” – 1.3784” (34.99 – 35.01 mm)	1.376” (34.95 mm)
PTO Journal	1.6241” – 1.6249” (41.25 – 41.27 mm)	1.623” (41.22 mm)
Cam Shaft		
Journals	.624” – .625” (15.85 – 15.87 mm)	.623” (15.82 mm)
Lobes		
Intake	1.228” – 1.231” (31.19 – 31.26 mm)	1.225” (31.15 mm)
Exhaust	1.226” – 1.229” (31.14 – 31.21 mm)	1.223” (31.06 mm)
Connecting Rod		
Crankpin Bearing	1.500” – 1.5006” (38.10 – 38.11 mm)	1.5015” (38.13 mm)
Piston Pin Bearing	.6727” – .673” (17.08 – 17.09 mm)	.6745” (17.13 mm)
Piston Pin	.6721” – .6726” (17.07 – 17.08 mm)	.6718” (17.06 mm)
Piston Pin Bearing (Piston)	.673” – .6735” (17.09 – 17.10 mm)	.6745” (17.13 mm)
Piston Ring		
Ring End Gap – Top	.005” – .013” (0.13 – 0.33 mm)	.030” (0.76 mm)
Center	.014” – .022” (0.35 – 0.56 mm)	.030” (0.76 mm)
Oil	.005” – .017” (0.13 – 0.43 mm)	.030” (0.76 mm)
Ring Side Clearance (All)	.002” – .003” (0.05 – 0.07 mm)	.005” (0.12 mm)

Section 2
IGNITION

Section Contents

SPECIFICATIONS FOR ALL INTEK™ OHV V-TWIN CYLINDER ENGINE MODELS

Basic Model Series	Armature Air Gap	Flywheel Holder Part No.	Flywheel Puller Part No.	Flywheel Nut Torque	
				Ft. Lbs.	Nm
405777	.008” to .012” (.20 to .30 mm)	19489 or 19433	19203	150	203.0

See Section 1 For Spark Plug Maintenance And Specifications

GENERAL INFORMATION

Briggs & Stratton OHV V-Twin engines use MAGNETRON® ignition: an ignition armature with a self-contained transistor module (no moving parts). Two MAGNETRON® ignition armatures are used, with a flywheel containing a permanent magnet.

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

ARMATURES

Armature Testing

The condition of the ignition armatures can accurately diagnosed using ignition tester, Tool #19368 as described in “Troubleshooting” in Section 1.

Removing Armatures

1. Remove spark plug leads and spark plugs.
2. Remove rotating screen and blower housing.
3. Remove armature screws and lift off armature(s), Fig. 1.
   a. Disconnect stop switch wires at armatures.

Note: The flywheel does not need to be removed to service MAGNETRON® ignition except to check the flywheel key.

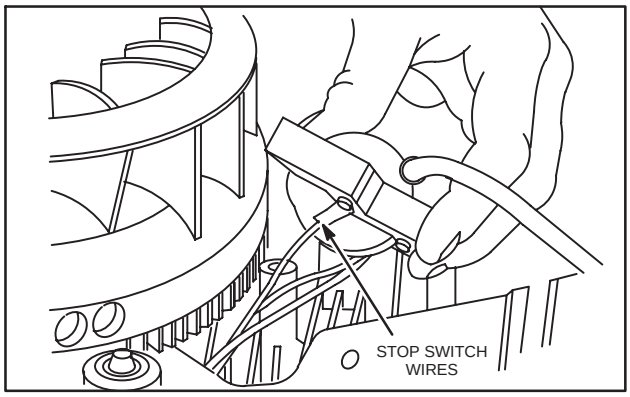


Fig. 1 – Removing Armature

Install Armatures

1. Turn flywheel so magnet is away from armature.
2. Install ground wire onto tab terminal on armature.
   Note: Make sure wires are routed over armature mounting posts and away from flywheel.
3. Assemble armature to engine, Fig. 2.
   a. Mounting holes in armature are slotted. Push armature away from flywheel as far as possible and tighten one screw to hold armature in place.
4. Repeat for second armature.

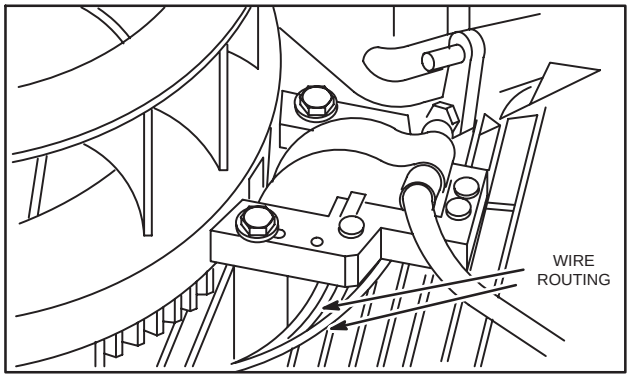


Fig. 2 – Installing Armature

Adjust Armature Air Gap

1. Rotate flywheel until magnet is under armature laminations.
2. Place thickness gauge, .008”-.012” (0.20-.30 mm) between magnet and armature laminations, Fig. 3.
3. Loosen mounting screw so magnet will pull armature down against thickness gauge.
   a. Torque screws to 25 in. lbs. (3.0 Nm).
4. Rotate flywheel to remove thickness gauge.
5. Repeat for second armature.
   Note: Route armature ground wire between breather tube and air horn.

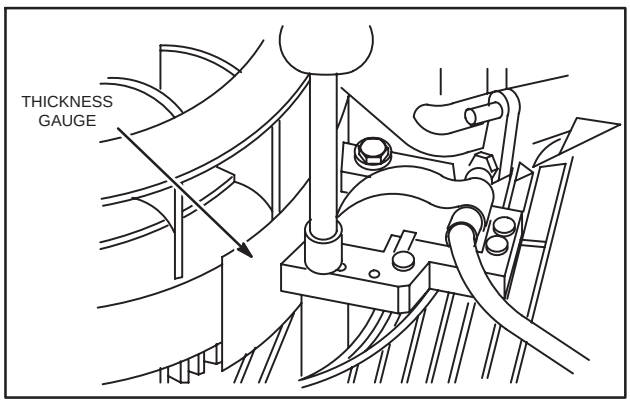


Fig. 3 – Adjusting Air Gap

FLYWHEEL
Remove Flywheel

Note: For engines not equipped with fan retainer use flywheel holder Tool # 19433. First remove armatures.

1. Place flywheel holder, Tool #19489 on fan retainer with lugs of flywheel holder engaging slots on the fan retainer, Fig. 4.
2. Remove flywheel nut and washer.
3. Remove fan retainer and fan.

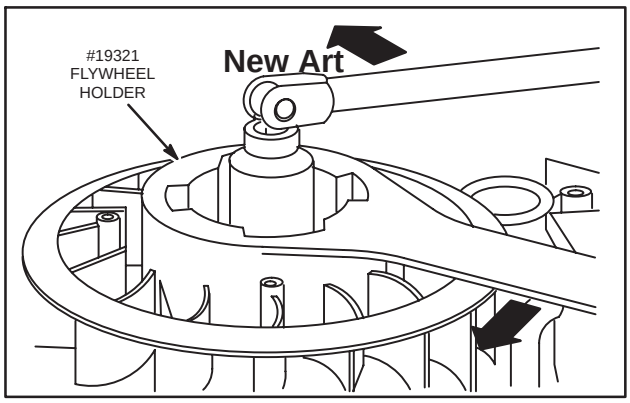


Fig. 4 – Removing Flywheel Nut

4. Reinstall flywheel nut. Turn nut down flush with top of threads.
5. Install flywheel puller, Tool #19203.
6. Tighten puller screws equally until flywheel loosens, Fig. 5.

DO NOT strike flywheel with a hard object or a metal tool as this may cause flywheel to shatter in operation. Always use approved flywheel removal tools.

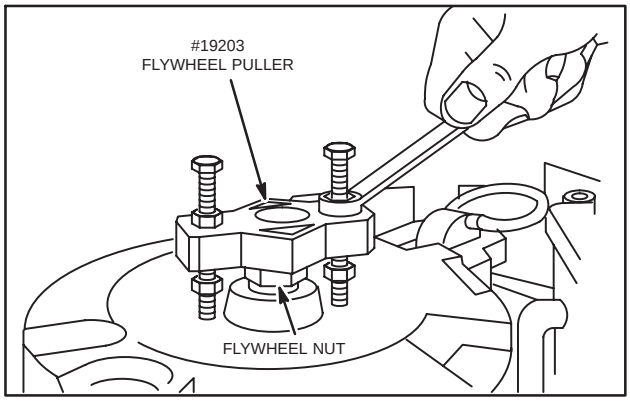


Fig. 5 – Removing Flywheel

Inspect Flywheel Key, Keyways, Flywheel and Crankshaft

Check flywheel key for damage. Check flywheel for cracks, broken fins or keyway damage. Also check crankshaft keyways and taper for damage, Fig. 6. Replace crankshaft, if damaged.

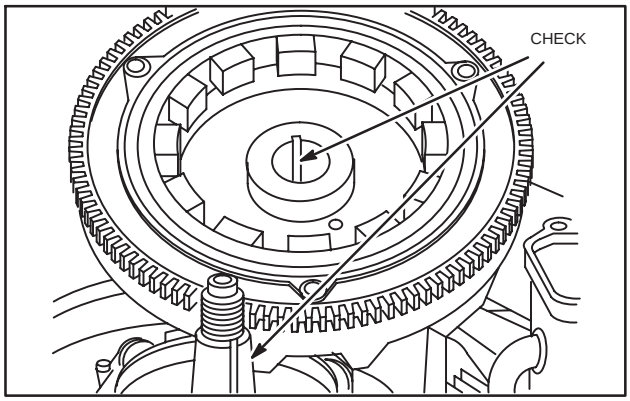


Fig. 6 – Check Flywheel And Crankshaft

Install Flywheel

CLEAN flywheel and crankshaft taper removing all oil, dirt or grease.

1. Assemble flywheel to crankshaft and align keyways.
2. Insert flywheel key into crankshaft.
3. Assemble fan and retainer to flywheel, Fig. 7.
   a. Torque screws to 140 in. lbs. (16.0 Nm).

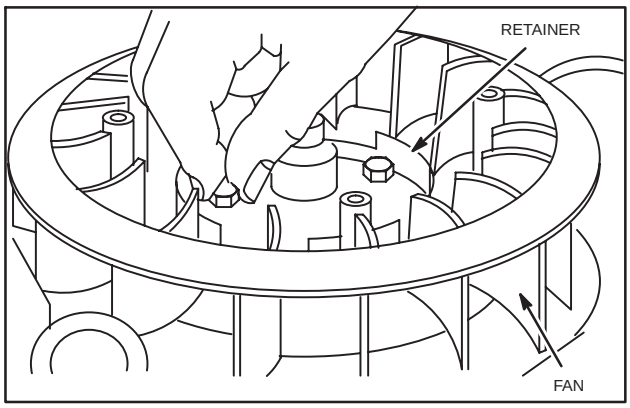


Fig. 7 – Installing Flywheel And Fan

4. Install washer and flywheel nut.
5. Assemble flywheel holder, Tool #19489 to retainer, Fig. 8, or use fllywheel holder Tool # 19433.
   a. Torque flywheel nut to 150 ft. lbs. (203.0 Nm).

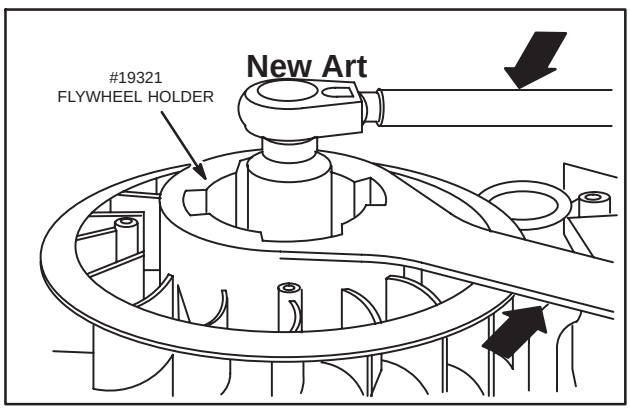


Fig. 8 – Torquing Flywheel Nut

ENGINE WIRING HARNESS

The engine wiring harness consists of a ground wire with a diode for each armature and a separate wire for the carburetor solenoid, Fig. 9. The engine wiring harness is connected to the wiring harness provided by the equipment manufacturer. A raised rib on the polarized connector indicates the ground side.

See engine wiring harness diagram, page 5.

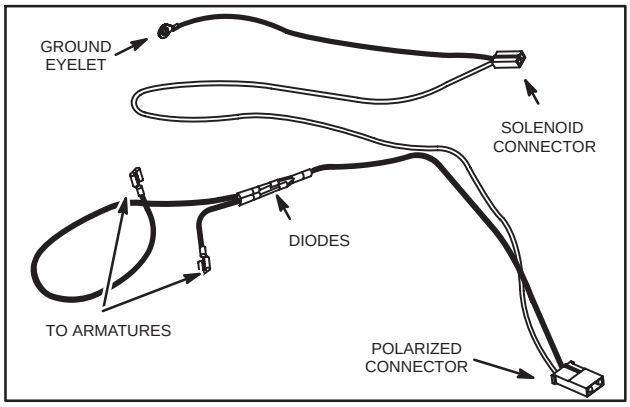


Fig. 9 – Engine Wiring Harness

Testing Ground Wires

The Digital Multimeter, Tool #19464 is recommended to test the ground wires, Fig. 10. The digital multimeter is available from your Briggs & Stratton source of supply.

The following test will be made with the meter in the ⊣◀))) (Diode Test) position.

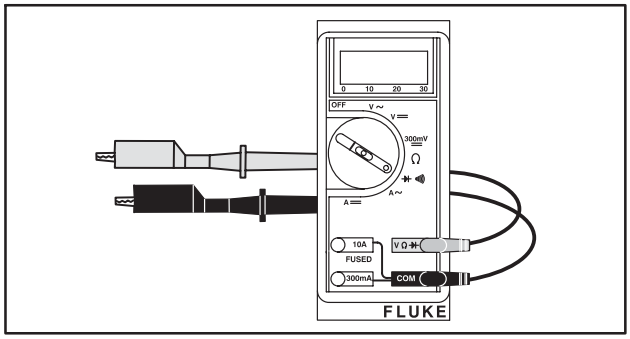


Fig. 10 – Digital Multimeter – Tool #19357 or #19390

In the Diode Test position, the meter will display the forward voltage drop across the diode(s). If the voltage drop is less than 0.7 volts, the meter will "Beep" once as well as display the voltage drop. A continuous tone indicates continuity (shorted diode) An incomplete circuit (open diode) will be displayed as "OL."

1. Insert RED test lead into **V** Ω ⊣◀ receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to ⊣◀))) (Diode Test) position.
4. Insert RED test lead clip into connector "A" (black wire), Fig. 11. Leave attached for remainder of test.
5. Touch BLACK test lead probe to terminal "B."
   a. If meter "Beeps" once, diode is OK.
   b. If meter makes a continuous tone, diode is defective (shorted). Replace ground harness.
   c. If meter displays "OL," diode is defective (open). Replace ground harness.
6. Now repeat test for terminal ''C." Results must be the same.

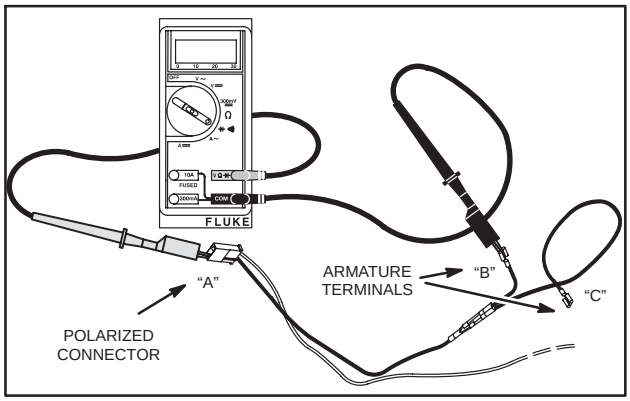
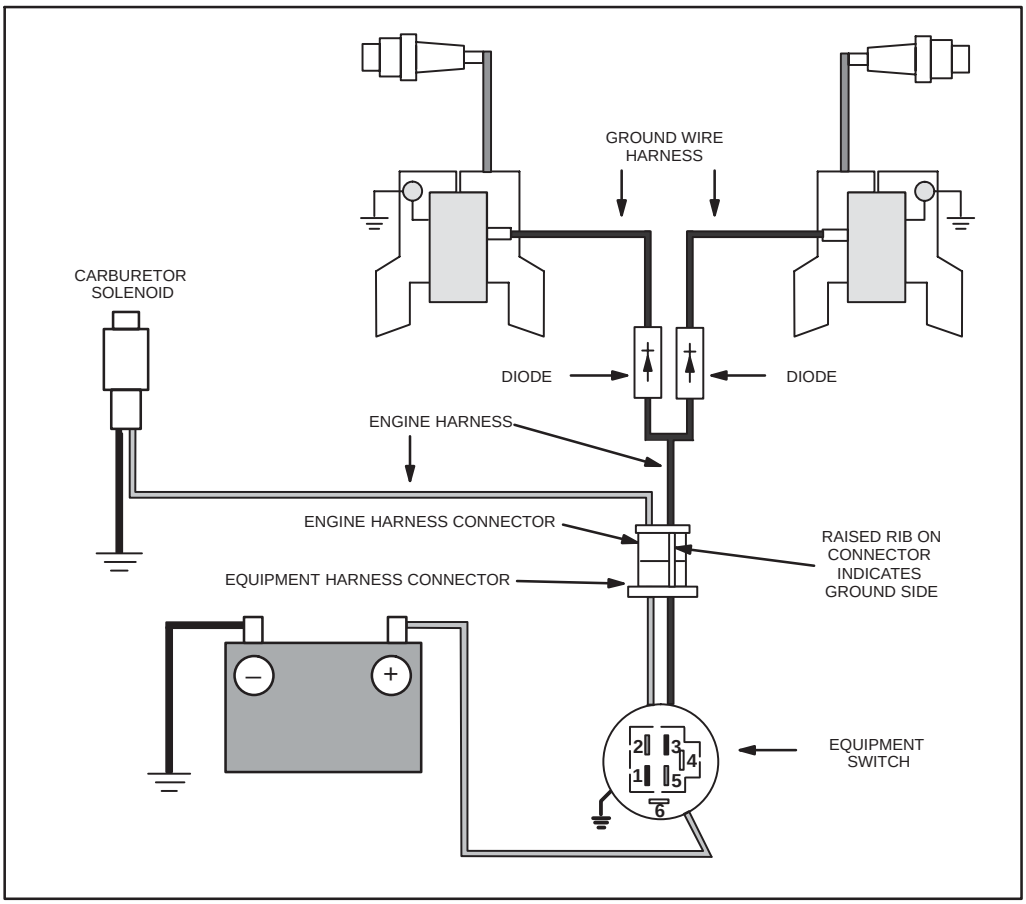


Fig. 11 – Testing Ground Wire

See Diode Failure Diagnosis on page 5.

ENGINE WIRING HARNESS DIAGRAM

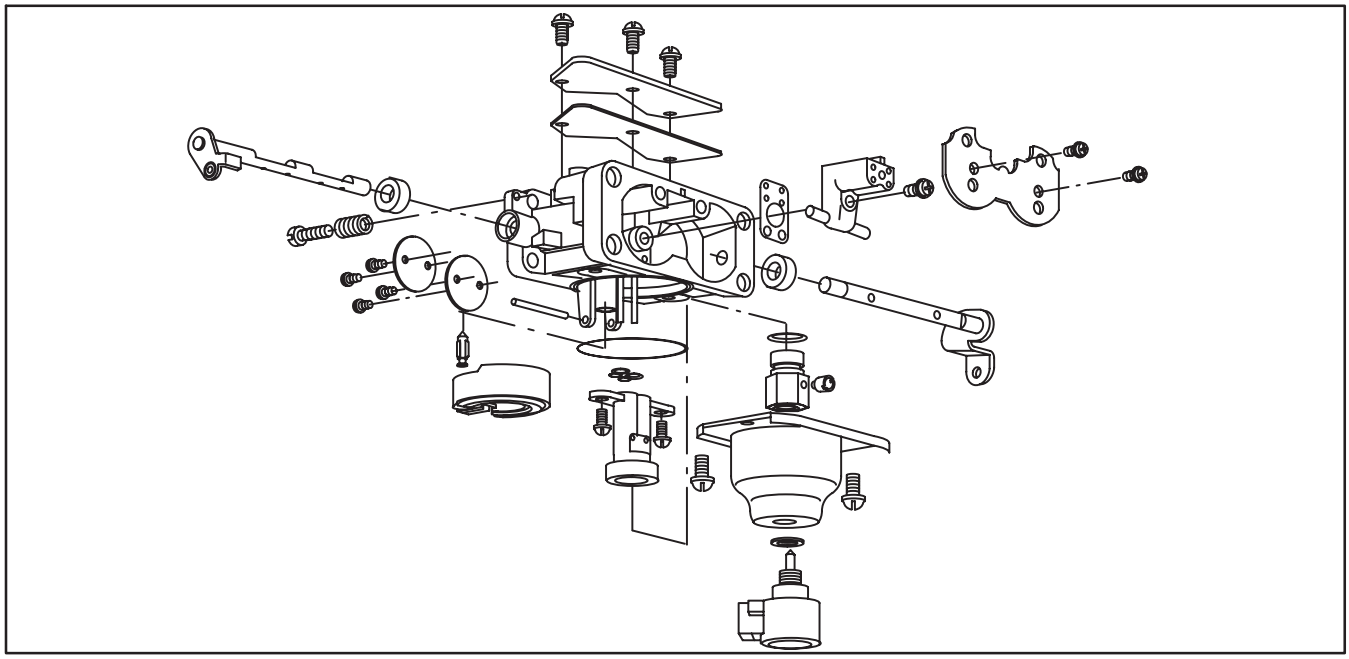


DIODE FAILURE DIAGNOSIS

SWITCH ON	SWITCH OFF	CAUSE
Engine Runs On 1 Cylinder	Shuts Off OK	1 Closed Diode
Engine Runs (Both Cylinders)	Only One Cylinder Shuts Off	1 Open Diode
Won't Run (No Spark)		2 Closed Diodes
Engine Runs (Both Cylinders)	Engine Won't Shut Off	2 Open Diodes

Section 3
Carburetion

Section Contents



SEE SECTION 1 FOR AIR CLEANER MAINTENANCE PROCEDURES.

GENERAL INFORMATION

The Intek™ OHV V-twin utilizes a fixed jet, two barrel, side draft, flo-jet carburetor. Except for idle speed, the carburetor is non-adjustable. The carburetor incorporates a fuel shut off solenoid which controls fuel flow to the fuel metering system. The solenoid is controlled by the ignition switch.

REMOVE INTAKE MANIFOLD AND CARBURETOR

1. Disconnect choke and throttle control cables.
2. Remove air cleaner cover, cartridge and pre-cleaner.
3. Remove rotating screen and blower housing.
   a. Disconnect breather tube at air horn.

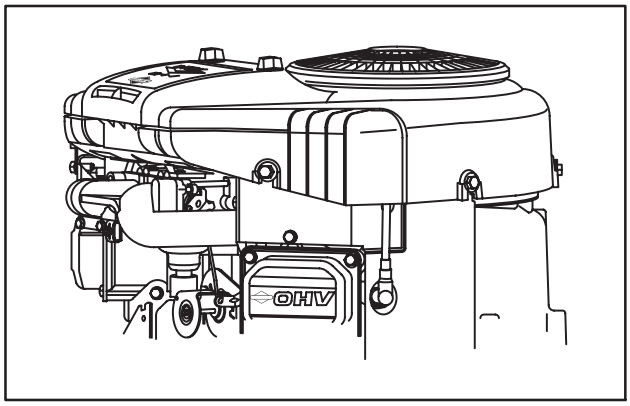


Fig. 1 – Remove Blower Housing

4. Disconnect fuel line at carburetor.
5. Disconnect wiring connector at solenoid.
6. Remove intake manifold screws.
   a. Disconnect governor link from governor lever.
   b. Remove intake manifold and carburetor assembly.
   c. Discard gaskets.

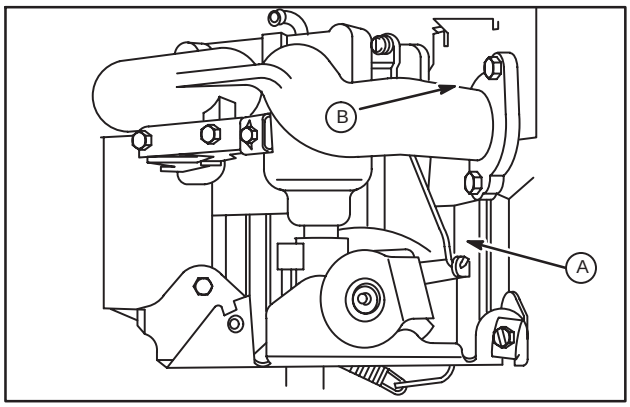


Fig. 2 – Remove Intake Manifold

7. Remove four nuts and air horn.
   a. Discard gasket.
8. Use Torx® socket, Tool #19455 and remove carburetor mounting studs, carburetor and spacer.
   a. Discard gaskets.

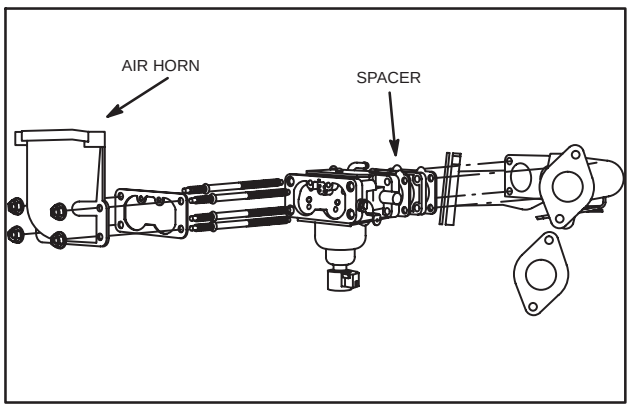


Fig. 3 – Remove Carburetor

DISASSEMBLE CARBURETOR

1. Remove two screws and float bowl.
   a. Discard O-ring.

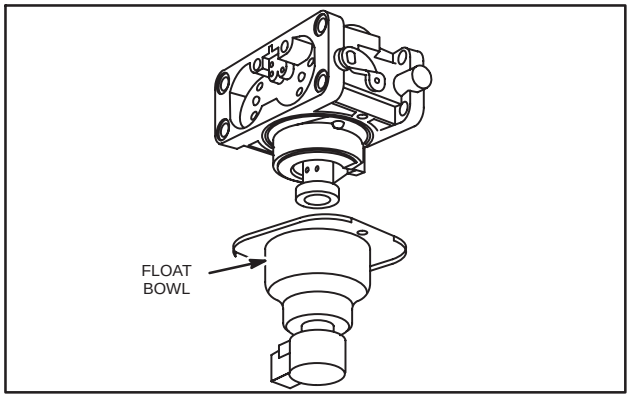


Fig. 4 – Remove Float Bowl

2. Disassemble fuel solenoid from float bowl. Discard gasket.
   a. Use 1/2" thin profile wrench and carburetor socket, Tool #19458 (14 mm) or 19459 (16 mm).
   b. Remove fixed main jet.

   Note: Use care when removing solenoid to prevent damage to fixed main jet and housing.

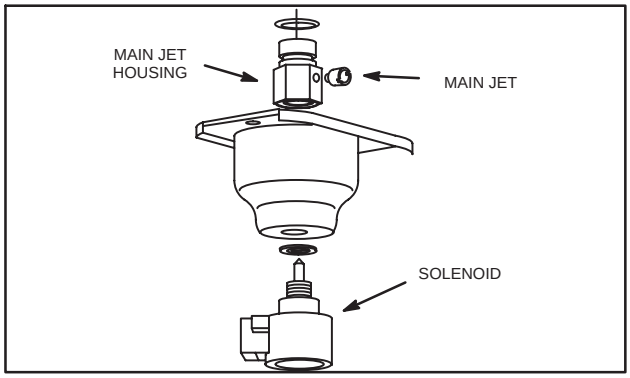


Fig. 5 – Remove Fuel Solenoid

3. Remove float hinge pin, float and inlet needle.

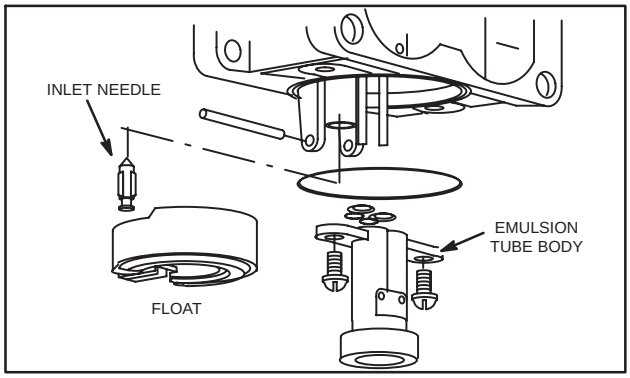


Fig. 6 – Remove Float

4. Remove emulsion tube body and gasket. Discard gasket.

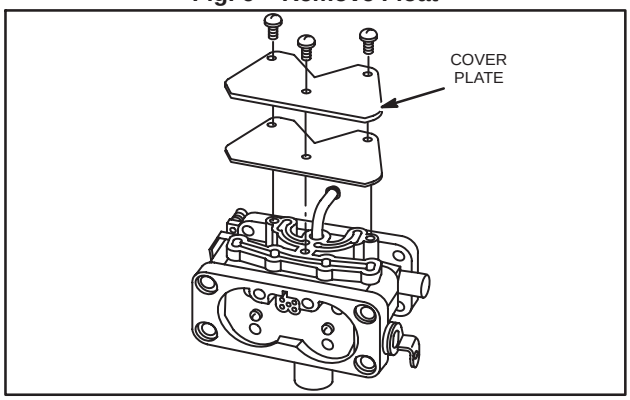


Fig. 7 – Remove Cover Plate

Remove cover plate. Discard gasket.

5. Remove screws and choke plate.
   a. Remove choke shaft. Discard seal.

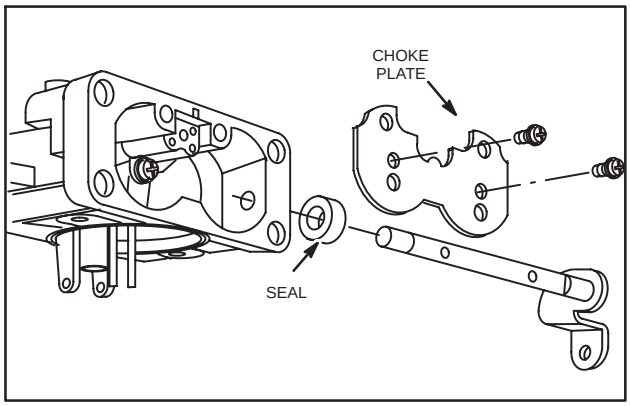


Fig. 8 – Remove Choke Shaft

6. Remove nozzle body. Discard gasket.

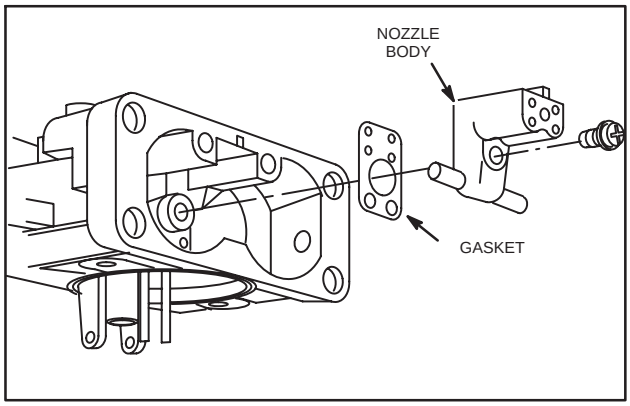


Fig. 9 – Remove Nozzle Body

7. Mark throttle plates before removing so that they may be re-installed in the same position. Sides of throttle plate are beveled.
8. Remove screws, throttle plates and throttle shaft with seal.
   a. Discard seal.

This completes the carburetor disassembly procedure.

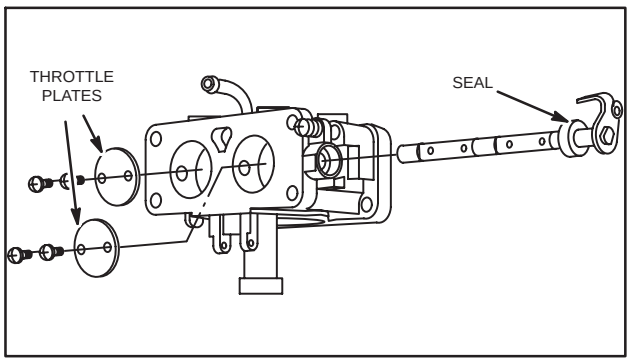


Fig. 10 – Remove Throttle Shaft

CARBURETOR CLEANING RECOMMENDATIONS

WEAR suitable skin protection when using cleaners. **FOLLOW** instructions on container.

1. Disassemble carburetor.
2. Remove and discard all old gaskets, seals and sealing material.
3. Use commercial carburetor cleaning solvents (such as Briggs & Stratton Spray Cleaner, Part #100041 or 100042) to clean carburetor parts and body.
4. When cleaning non-metallic parts (plastic, nylon, Minlon™, etc.), do not leave in commercial carburetor cleaner more than 15 minutes.

Note: Parts containing rubber, such as seals, “O” rings, inlet needles, seats or pump diaphragms should never be placed in commercial carburetor cleaner.

To prevent eye injury, always wear eye protection when using compressed air.

5. Use only compressed air (blowing in both directions) to clean out all openings and passages.

Note: **Do not** use wires, drills or any other devices to clean out metering holes or passages.

Check Throttle, Choke Shaft And Body For Wear

1. Lay carburetor on flat surface and check throttle and choke shaft clearance as shown in Fig. 11.

Throttle shaft and choke shaft clearance must not exceed .010” (.25 mm).

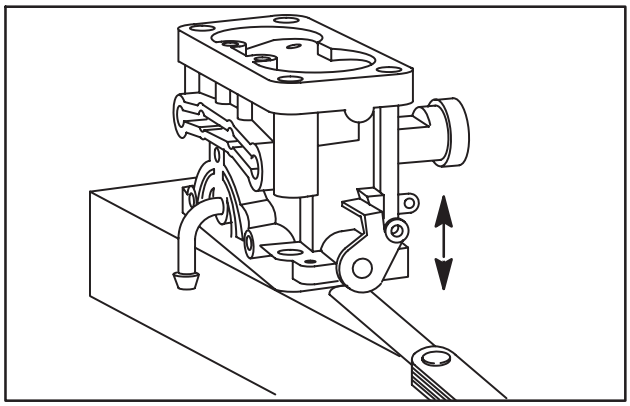


Fig. 11 – Checking Clearance

2. Inspect throttle shaft and choke shaft for wear, Fig. 12. Replace if worn.

If carburetor body is worn, replace carburetor.

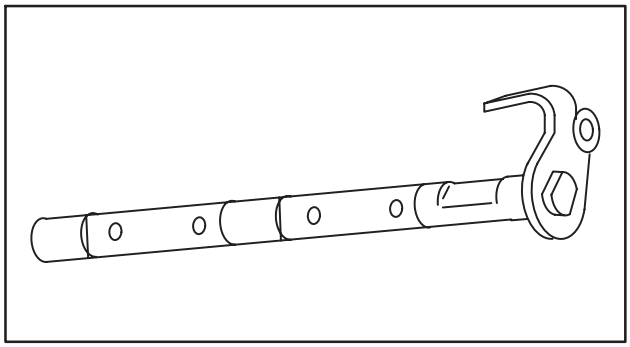


Fig. 12 – Checking Throttle And Choke Shaft

ASSEMBLE CARBURETOR

When assembling carburetor, use new seals and gaskets.

1. Assemble new seal to throttle shaft and insert into carburetor body.

Important: Install one throttle plate at a time. Check throttle shaft for freedom of operation before installing other throttle plate.

Note: Use LOCTITE® 222 on screw threads.

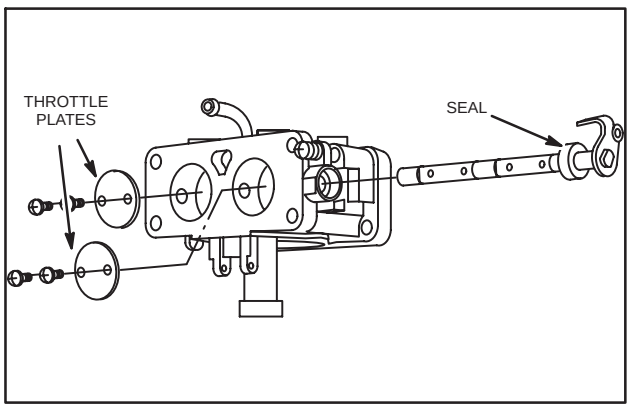


Fig. 13 – Install Throttle Shaft

2. Install cover plate with new gasket.

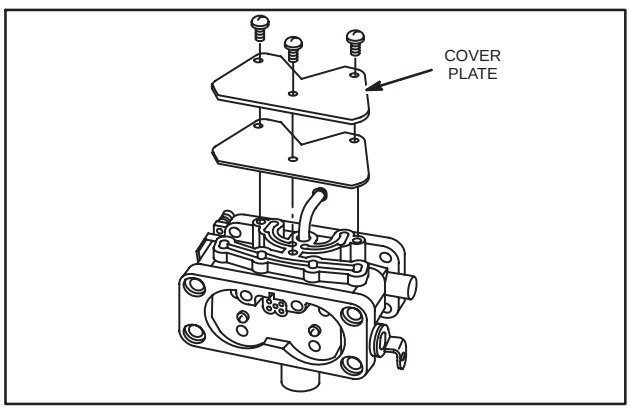


Fig. 14 – Install Cover Plate

3. Install nozzle body with new gasket.
   a. Tighten screw securely.

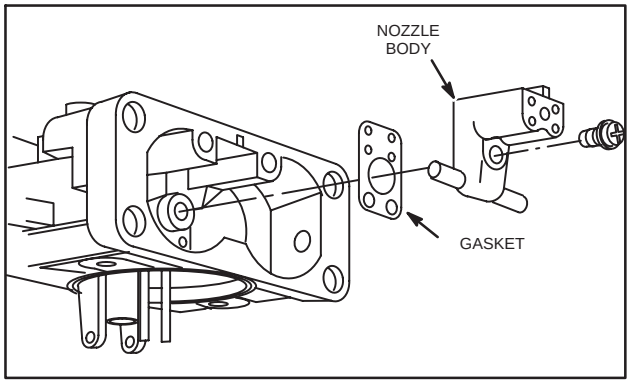


Fig. 15 – Install Nozzle Body

4. Assemble new seal to choke shaft and insert into carburetor body.
   a. Install choke plate.
   Note: Use LOCTITE® 222 on screw threads.

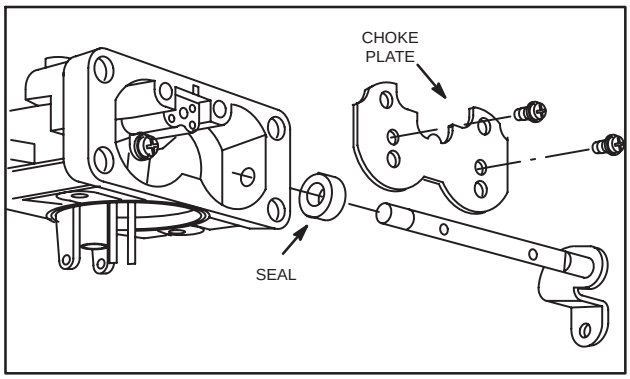


Fig. 16 – Install Choke Shaft

5. Install emulsion tube body with new gasket.
   a. Tighten screw securely.

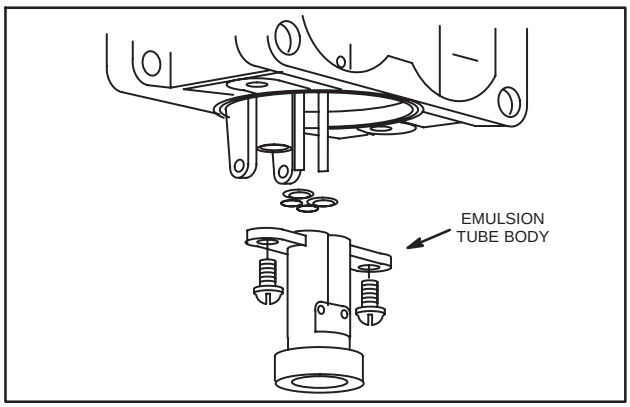


Fig. 17 – Install Emulsion Tube Body

6. Assemble inlet needle to float and install float.
   a. Assemble bowl gasket to body.

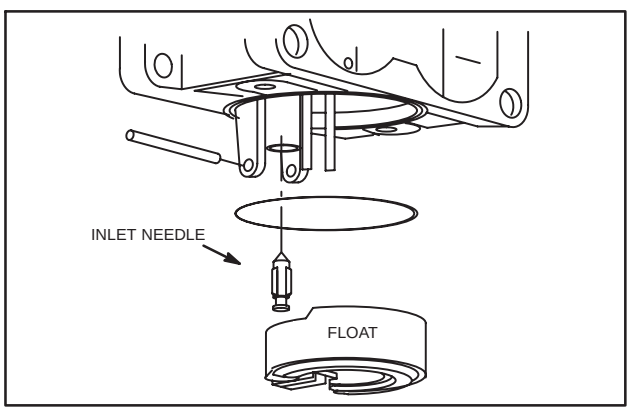


Fig. 18 – Install Float

7. Install fixed main jet, according to engine model.

Main Jet Identification

Model 405770	**No. 132**
Model 445770	**No. 140**

8. Assemble fuel solenoid to float bowl and main jet housing.
9. Position main jet housing so that main jet is opposite float hinges.
   a. Use 1/2" thin profile wrench and carburetor socket, Tool #19458 (14 mm) or 19459 (16 mm).

   Note: Use care when tightening solenoid to prevent damage to fixed main jet and housing.

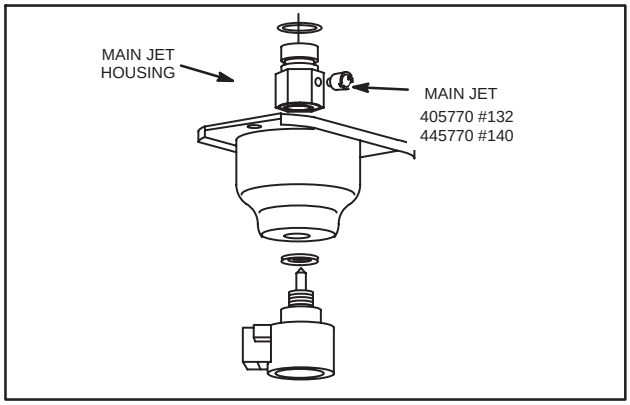


Fig. 19 – Assemble Fuel Solenoid

10. Assemble governor link to throttle lever on carburetor from inside out.
11. Assemble choke link to choke lever on carburetor from outside in.

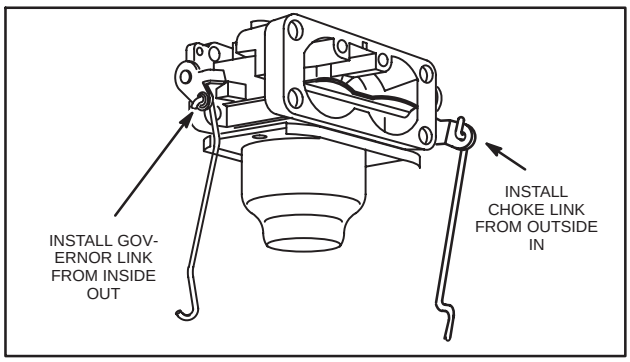


Fig. 20 – Assemble Governor And Choke Link

ASSEMBLE CARBURETOR TO INTAKE MANIFOLD

1. Connect choke link to choke lever and assemble carburetor and spacer to intake manifold with new gaskets.
   a. Use Torx® socket, Tool #19455 and torque studs to 65 in. lbs. (7.0 Nm).
2. Assemble air horn to carburetor with new gasket.
   a. Torque nuts to 45 in. lbs. (5.0 Nm).

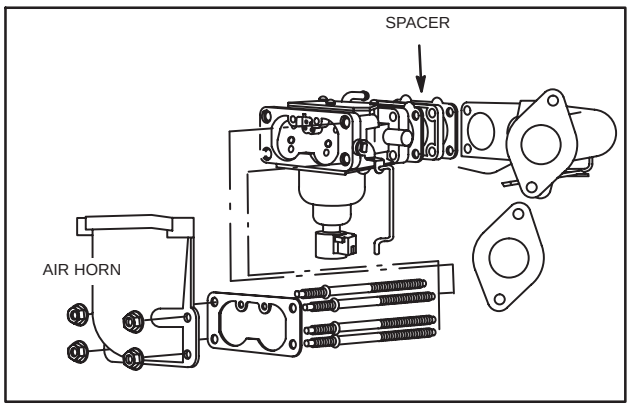


Fig. 21 – Assemble Carburetor To Manifold

INSTALL INTAKE MANIFOLD AND CARBURETOR

1. Connect wiring at solenoid.
2. Connect governor link to governor lever.
3. Assemble intake manifold and carburetor to engine with new gaskets.
   a. Torque screws to 80 in. lbs. (9.0 Nm).
   b. Connect breather tube to air horn.

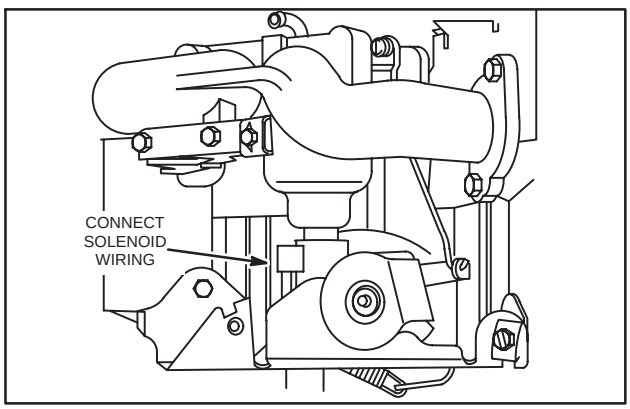


Fig. 22 – Install Intake Manifold And Carburetor

4. Connect fuel line to carburetor.Install clamp with tabs facing to sides or down.
5. Install blower housing.
   a. Torque screws to 80 in. lbs. (9.0 Nm).
6. Install rotating screen.
   a. Torque screws to 20 in. lbs. (2.0 Nm).

Assemble air cleaner.

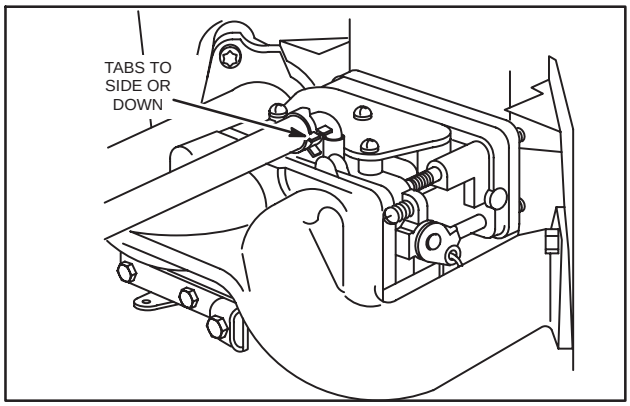


Fig. 23 – Install Fuel Line

ADJUST GOVERNOR

WARNING: IF carburetor and manifold are removed, static governor adjustment should be checked! Misadjustment could result in engine overspeeding which could cause engine damage, property damage or personal injury.

Static Governor Adjustment

1. Loosen governor lever nut. Rotate governor control swivel counter-clockwise as far as it will go (wide open throttle) and hold in this position.
2. Rotate governor shaft clockwise as far it will go, Fig. 24.
   a. Torque governor nut to 130 in. lbs. (15.0 Nm).
3. Install throttle and choke control cables and check for proper operation.

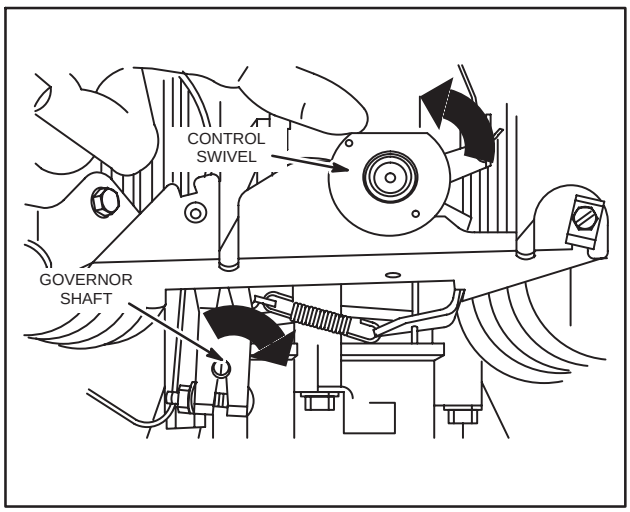


Fig. 24 – Adjust Governor

Dynamic Governor Adjustment

ALL ADJUSTMENTS MUST BE MADE WITH AIR CLEANER ASSEMBLY INSTALLED.

The following tools are required when making governor adjustments, Fig. 25:

1. Tachometer, Tool #19200 or #19389.
2. Tang bender, Tool #19480.

Start and run engine for approximately 5 minutes to allow engine to warm up.

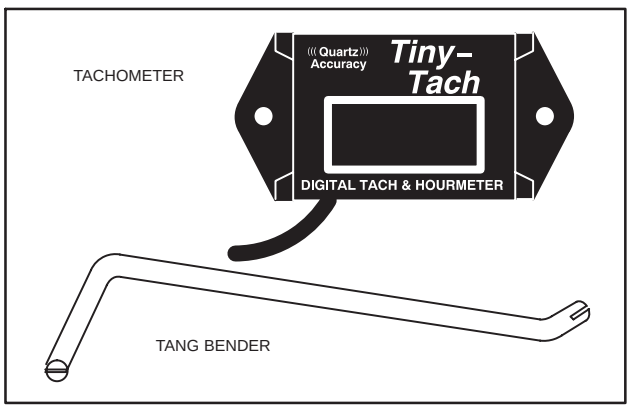


Fig. 25 – Governor Adjustment Tools

Governed Idle Adjustment

Perform adjustments exactly in order shown.

1. Move equipment control lever to SLOW position.
2. Hold throttle lever against idle speed adjustment screw and adjust idle speed to 1200 RPM, Fig. 26. Release throttle lever.

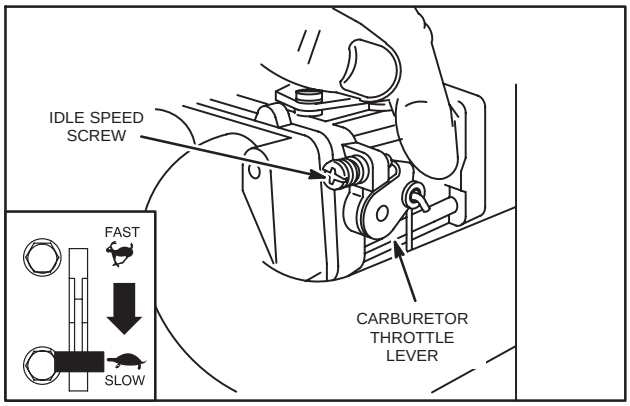


Fig. 26 – Adjusting Idle Speed

3. Bend governed idle tang to obtain 1750 RPM, Fig. 27.

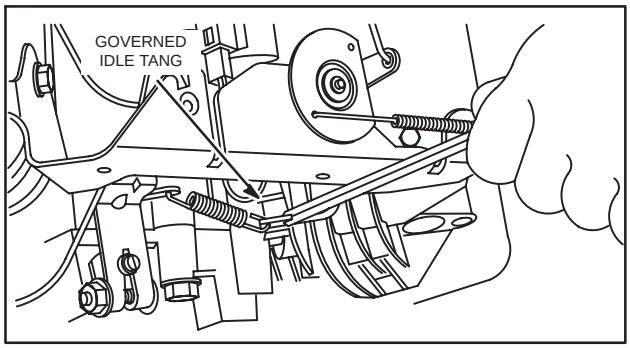


Fig. 27 – Adjusting Governed Idle

4. With engine running at governed idle RPM, bend throttle restrictor tang so that tang just contacts governor lever, Fig. 28.

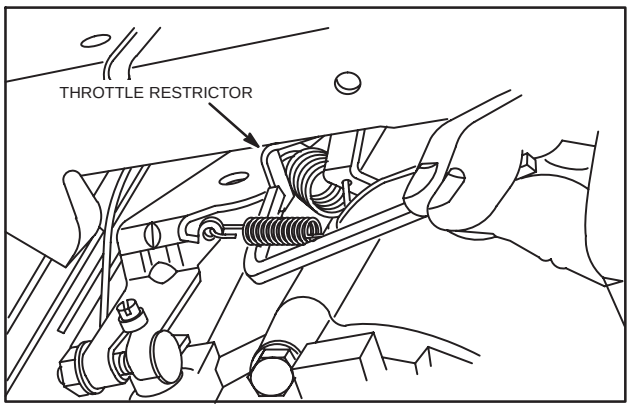


Fig. 28 – Adjusting Throttle Restrictor

Adjust Top No Load Speed

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

1. Move equipment control to FAST position and check RPM.
   a. Bend tang to obtain correct RPM, Fig. 29.

   Note: Governor spring tension adjustment must not exceed ± 200 RPM, or the governor spring must be replaced.

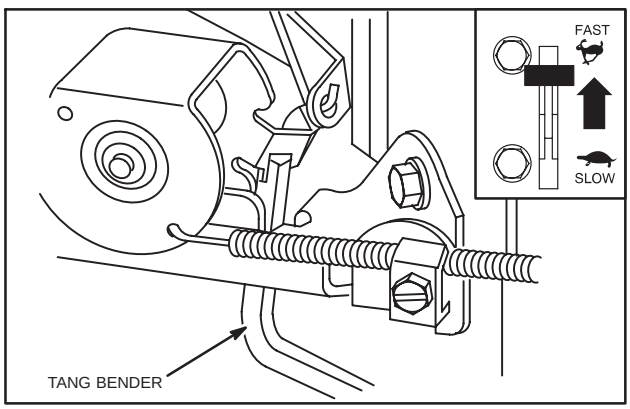


Fig. 29 – Adjusting Top No Load Speed

FUEL SHUT OFF SOLENOID

The fuel shut off solenoid is controlled by the equipment ignition switch. When the equipment switch is in the “Off” position, the solenoid valve plunger closes, stopping fuel flow through the fixed main jet. When the switch is in the “On” and “Start” position, the solenoid valve opens, allowing normal fuel flow. Solenoid is operating properly if a click is heard when equipment ignition switch is turned “On” and “Off.”

Note: Anti-afterfire solenoid requires a minimum of 9 volts DC to function.

3

TESTING SOLENOID

If solenoid does not click, the problem may be in equipment wiring, engine wiring harness or solenoid. To determine whether problem is with wiring or solenoid, perform the following tests in the order shown.

Test Equipment

The digital multimeter, Tool #19390 is required to test the solenoid equipment wiring.

The following tests will be performed with the meter in the V ⎓ (DC volts) position, Fig. 30.

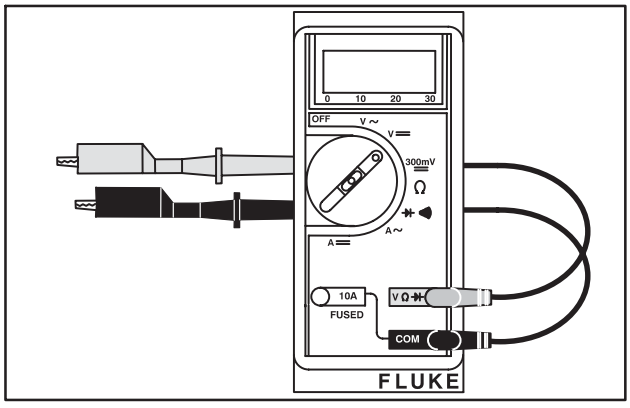


Fig. 30

TESTING EQUIPMENT WIRING

1. With keyswitch in OFF position, disconnect equipment wiring harness connector from engine wiring harness.
2. Attach red meter test lead into equipment wiring harness connector. (**side opposite raised rib**)
3. Attach black test lead to a good ground, Fig. 31.
4. Turn keyswitch to ON position.
   a. Meter should display battery voltage at connector.

If meter does not display battery voltage, problem is with wiring harness. Check for loose or broken wire. If meter displays battery voltage, test engine wiring harness.

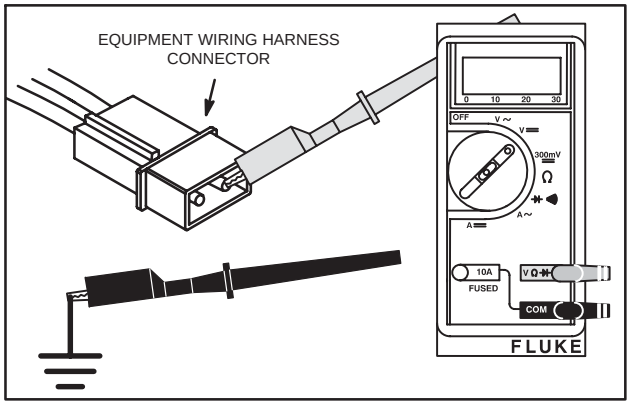


Fig. 31 – Checking Wiring

TESTING ENGINE WIRING

1. With keyswitch in OFF position, re-connect equipment wiring harness to engine wiring harness and disconnect harness at solenoid.
2. Insert red meter test lead into GRAY wire in solenoid connector.
3. Attach black test lead to a good ground, Fig. 32.
4. Turn keyswitch to ON position.
   a. Meter should display battery voltage at connector.

If meter does not display battery voltage, problem is with engine wiring harness. Replace. If meter displays battery voltage, problem is with solenoid. Replace solenoid.

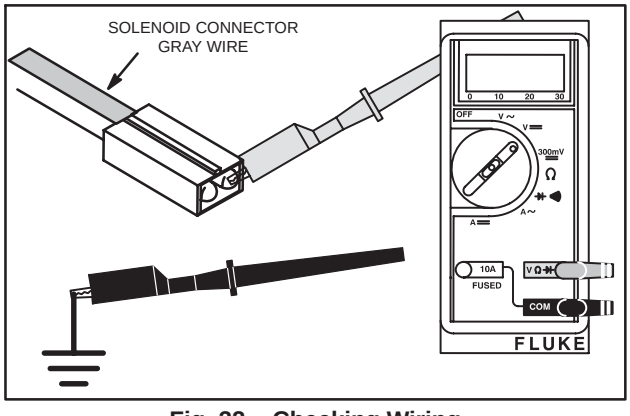


Fig. 32 – Checking Wiring

FUEL PUMP

The fuel pump, mounted on the No. 1 cylinder shield, allows remote fuel tank installations. The fuel pump will prime at 12" (30.5 cm) maximum lift. Fuel pump pressure is 1.5 psi (0.1 Bar). The pump is operated by pulsating crankcase vacuum from the engine. The vacuum pulse line is installed on the No. 1 cylinder valve cover, Fig. 33.

Note: Fuel pump is available as an assembly only.

Replace fuel lines and vacuum pulse line if stiff and brittle.

Note: An air leak at the fuel pump pulse line hose connections will result in improper fuel flow.

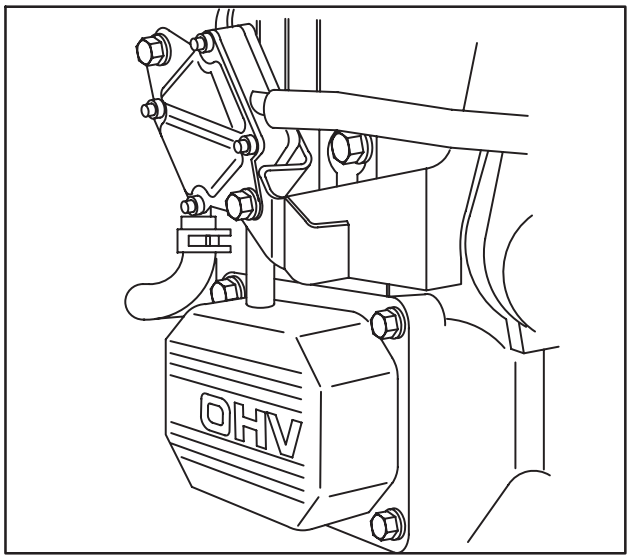


Fig. 33 – Fuel Pump

Inline Fuel Filter Service

Replace inline fuel filter yearly or every 100 hours, whichever occurs first. Replace filter if dirt or water are present. See illustrated parts list for correct fuel filter.

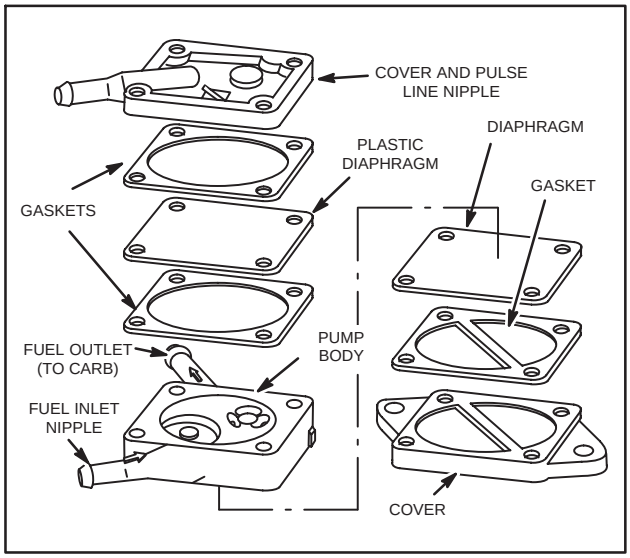


Fig. 34 – Exploded View

Section 4
GOV. CONTROLS & GOVERNOR

Section Contents

GENERAL INFORMATION

The purpose of the governor is to maintain, within certain limits, a desired engine speed, even though loads may vary. The governor spring tends to pull the throttle open. The force of the counterweights, which are operated by centrifugal force, tends to close the throttle. The engine speed at which these two forces balance is called the governed speed. The governed speed can be varied by changing the governor spring or governor spring tension. Governor spring tension adjustment must not exceed ± 200 RPM, or the governor spring must be replaced. If a governor spring must be replaced, consult the appropriate Illustrated Parts List. Select the proper governor springs by engine type number.

WARNING: AFTER A NEW GOVERNOR SPRING IS INSTALLED, CHECK ENGINE TOP GOVERNED SPEED WITH AN ACCURATE TACHOMETER.

REMOTE GOVERNOR CONTROLS

Briggs & Stratton Intek™ OHV V-Twin engines are equipped for remote governor controls.

Speed Regulation

Remote governor controls (supplied by equipment manufacturer) control engine speed by increasing or decreasing tension on governor spring(s) to obtain desired engine speed at all positions, Fig. 1.

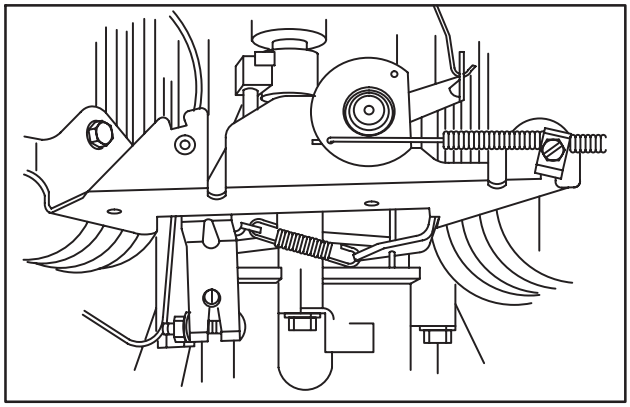


Fig. 1 – Remote Governor Control

Governed Idle

Intek™ OHV Twin cylinder engines have a governed idle system. A throttle restrictor permits the engine to maintain engine speed when a light load is applied with the equipment control in the SLOW position, Fig. 2.

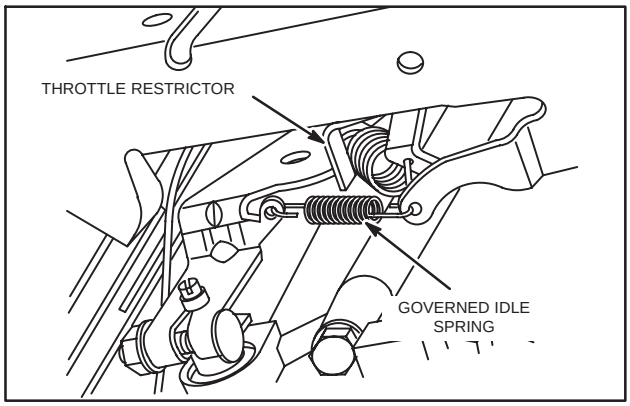


Fig. 2 – Throttle Restrictor

4

Remote Control Wire Travel

In order to make proper remote control adjustments, the travel of the remote control wire must not be less than 35 mm (1-3/8”) with controls mounted in equipment, Fig. 3.

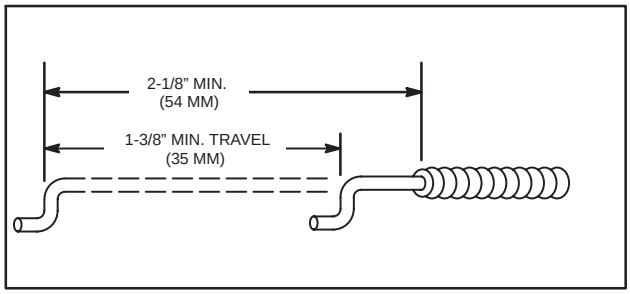


Fig. 3 – Control Wire Dimensions

Speed Control Wire Adjustment

1. Loosen control casing clamp at governor control bracket,
2. Move speed control lever to ‘‘FAST” position.
3. Move control casing and wire in direction shown by arrow until governor control swivel is at end of travel, Fig. 4.
4. Tighten casing clamp screw.

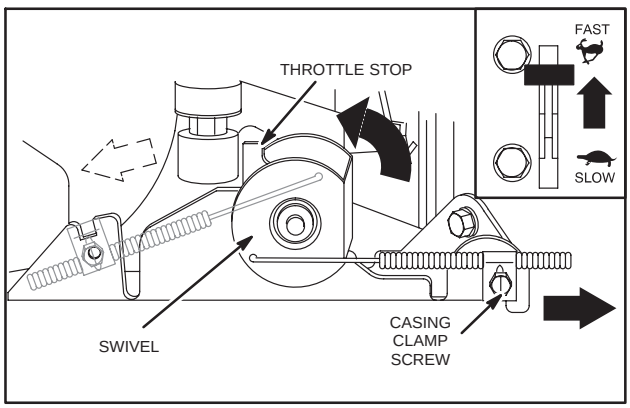


Fig. 4 – Control Wire Adjustment

Choke Control Adjustment

Place choke control lever on equipment in “CHOKE” position. Loosen control casing clamp screw. Move control casing and wire until choke is completely closed. Tighten casing clamp screw, Fig. 5.

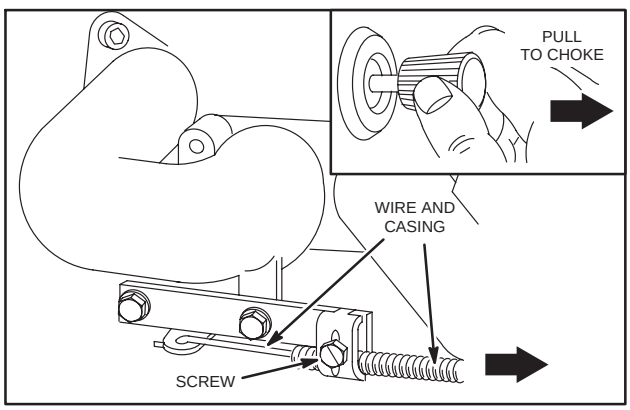


Fig. 5 – Choke Control Adjustment

GOVERNOR

Disassemble

Drain oil and remove engine from equipment. Remove spark plugs. Remove valve covers, depress springs and remove push rods. Mark push rods so that they may be reassembled in their original position. If push rods are mixed, it may be necessary to readjust valve clearances.

Note: Intake push rods are aluminum.

1. Loosen governor lever nut.
   a. Remove governor lever from shaft, Fig. 6.

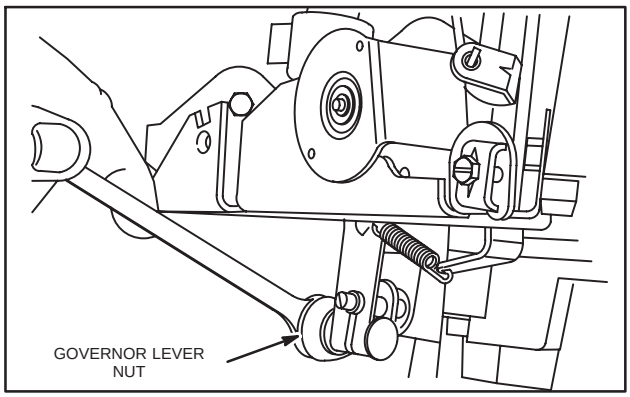


Fig. 6 – Remove Governor Lever

2. Remove oil pump. Fig. 7.
   a. Remove oil pump cover.
   b. Remove inner rotor.
   c. Remove outer rotor.
   d. Remove drive shaft.

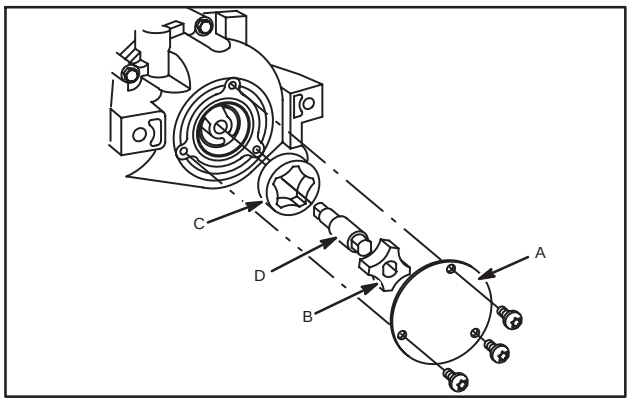


Fig. 7 – Remove Oil Pump

3. Remove sump and discard gasket, Fig. 8.
   a. Remove governor gear and thrust washer

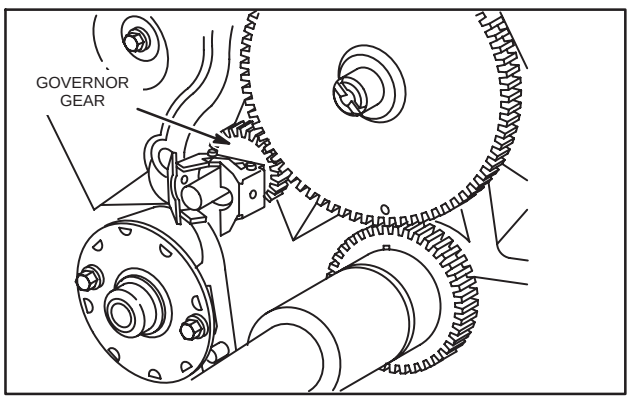


Fig. 8 – Remove Sump

4. Remove governor shaft from sump, Fig. 9.
   a. Remove lower E-ring.
   b. Rotate governor paddle clockwise and slide governor shaft out of bushing.
   c. Remove and discard oil seal.

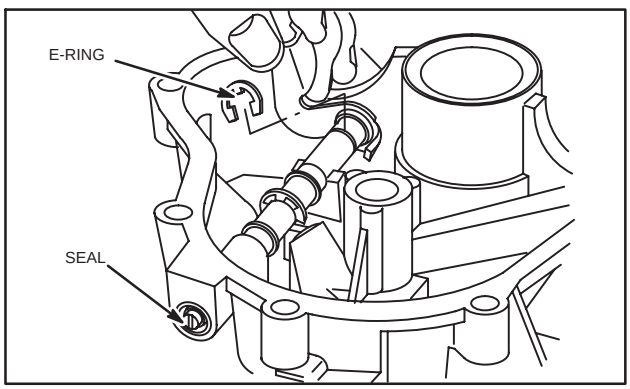


Fig. 9 – Remove Governor Shaft

5. The following tools are required to remove the governor shaft bushing, Fig. 10.
   a. 3/8” drive 5/8” socket.
   b. 1/4” flat washer.
   c. 1/4 – 20 screw and nut from #19165 flywheel puller.
   d. #94349 flat washer.

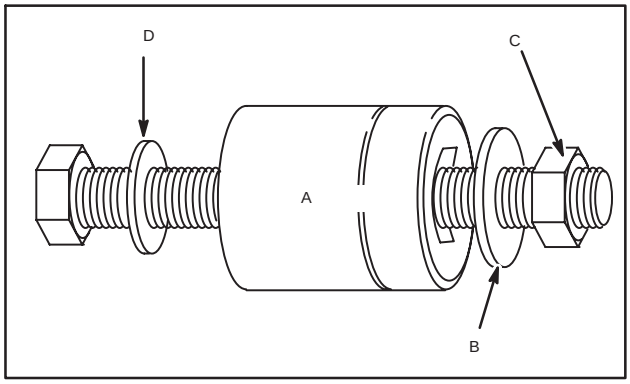


Fig. 10 – Bushing Removal Tools

4

Assemble tools as shown.
   a. Tighten nut until bushing is removed, Fig. 11.

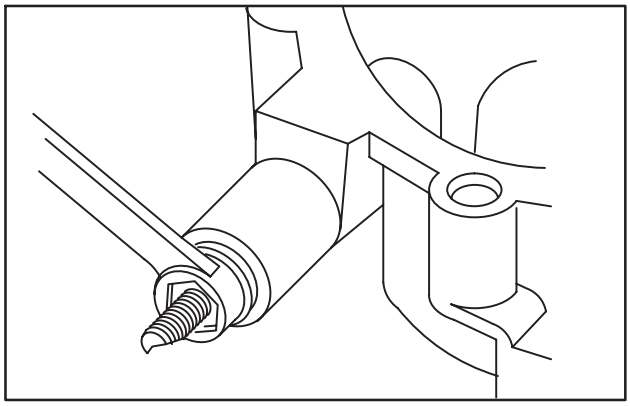


Fig. 11 – Remove Governor Shaft Bushing

Check Governor Gear And Governor Gear Shaft

1. Check governor gear for burrs or nicks, Fig. 12.
2. Check flyweights for damage or wear.
3. Check governor cup and thrust washer for damage or wear.
4. Check governor gear shaft and bearings for damage or wear.

Replace as required.

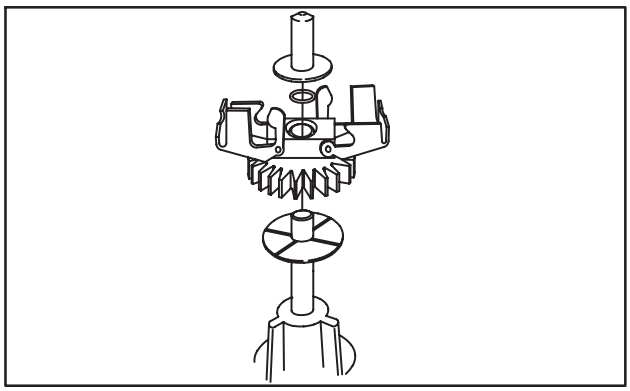


Fig. 12 – Check Governor Gear And Shaft

Install Governor Shaft Bushing

Lubricate new bushing and governor shaft with engine oil.

1. Assemble governor shaft to sump to act as a pilot for bushing.

Do not install lower E-ring.

2. Using Tool #19129 press in bushing until it bottoms, Fig. 13.
3. Install lower E-ring.
   a. Install new oil seal.

Governor shaft must rotate freely.

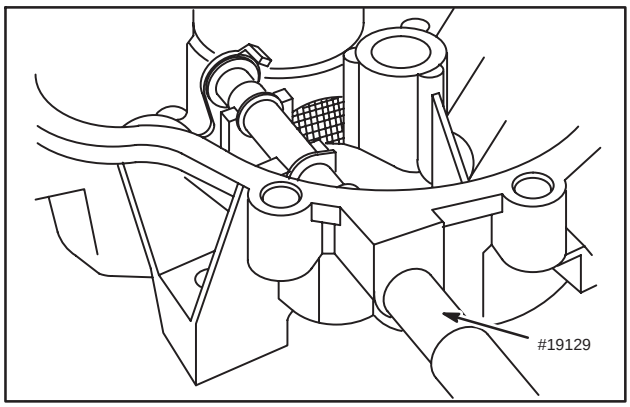


Fig. 13 – Install Governor Shaft Bushing

Reassemble

1. Lubricate thrust washer, governor gear and governor cup with engine oil and assemble to shaft, Fig. 14.

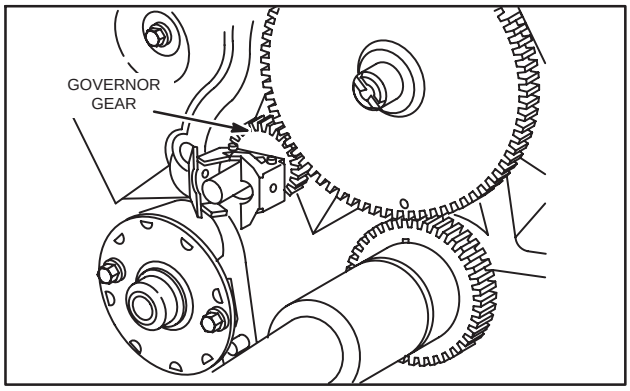


Fig. 14 – Install Governor Gear

2. Install sump with new gasket, Fig. 15.
   a. Torque screws in sequence shown to 200 in. lbs. (23.0 Nm).

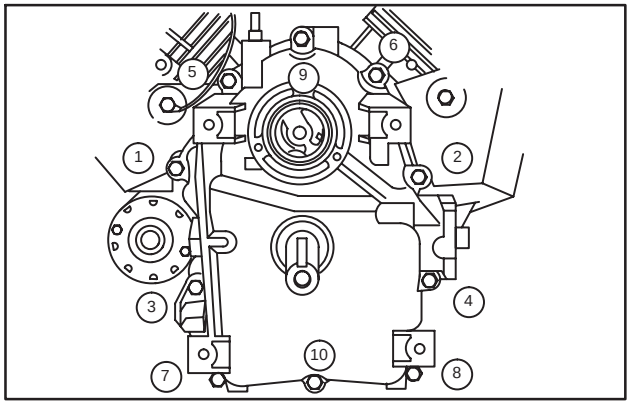


Fig. 15 – Install Sump

3. Lubricate oil pump components with engine oil and assemble to sump, Fig. 16. Make sure drive shaft is engaged in camshaft.
   a. Install drive shaft.
   b. Install inner rotor.
   c. Install outer rotor.
   d. Install oil pump cover with new O-ring.
   e. Torque screws to 50 in. lbs. (6.0 Nm).

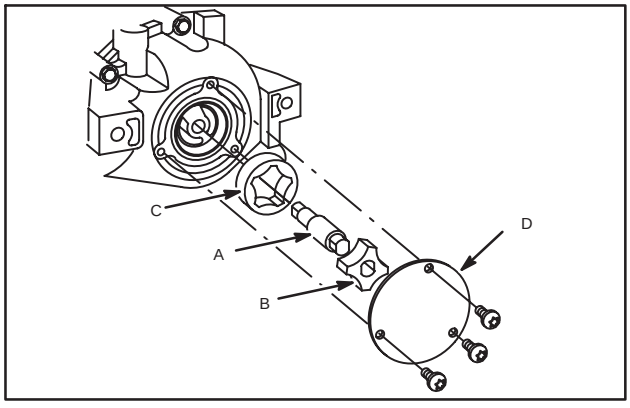


Fig. 16 – Install Oil Pump

4. Reassemble governor lever to governor shaft, Fig. 17. **DO NOT** tighten nut at this time.

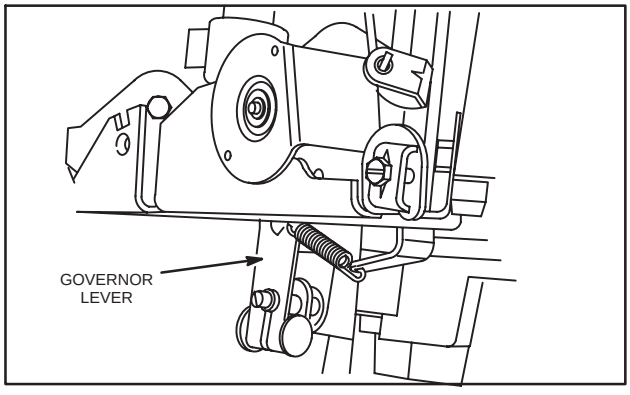


Fig. 17 – Install Governor Lever

5. Install push rods in their original positions.
   a. Compress valve springs and insert push rods into recess in rocker arm adjustment screws, Fig. 18.

Note: Intake push rods are aluminum.

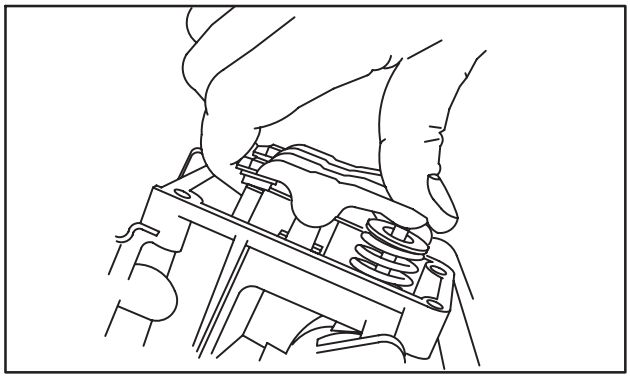


Fig. 18 – Install Push Rods

4

Install valve covers with new gaskets, Fig. 19.
   a. Torque screws to 100 in. lbs. (11.0 Nm).

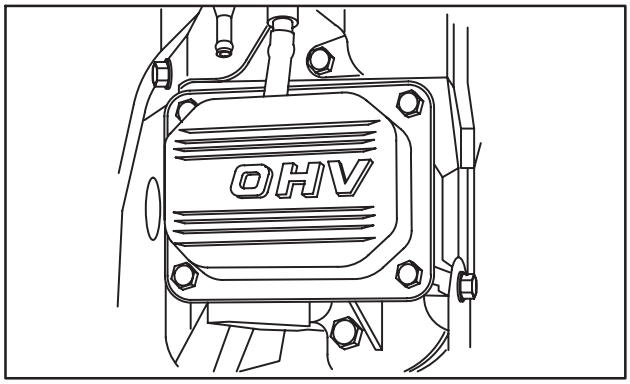


Fig. 19 – Install Valve Covers

ADJUST GOVERNOR

WARNING: BEFORE STARTING or running engine, static adjustment of the governor must be completed! Failure to make the static adjustments first could result in engine overspeeding which may result in engine damage, property damage or personal injury.

Static Governor Adjustment

1. With governor lever nut loose, rotate governor control swivel counter-clockwise as far as it will go (wide open throttle) and hold in this position.
2. Rotate governor shaft clockwise as far it will go, Fig. 20.
   a. Torque governor nut to 130 in. lbs. (15.0 Nm).

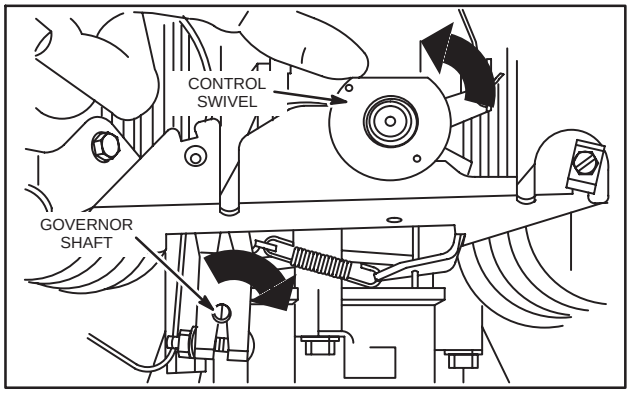


Fig. 20 – Adjust Governor

Dynamic Governor Adjustment

ALL ADJUSTMENTS MUST BE MADE WITH AIR CLEANER ASSEMBLY INSTALLED.

Assemble remote controls and check for proper adjustment.

The following tools are required when making governor adjustments, Fig. 21:

1. Tachometer, Tool #19200 or #19389.
2. Tang bender, Tool #19480.

Start and run engine for approximately 5 minutes to allow engine to warm up.

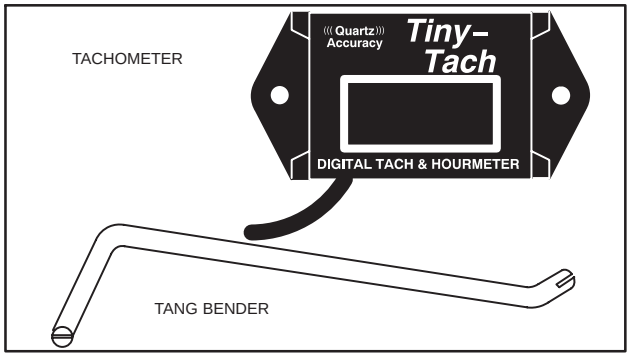


Fig. 21 – Governor Adjustment Tools

Governed Idle Adjustment

Perform adjustments exactly in order shown.

1. Move equipment control lever to SLOW position.
2. Hold throttle lever against idle speed adjustment screw and adjust idle speed to 1200 RPM, Fig. 22. Release throttle lever.

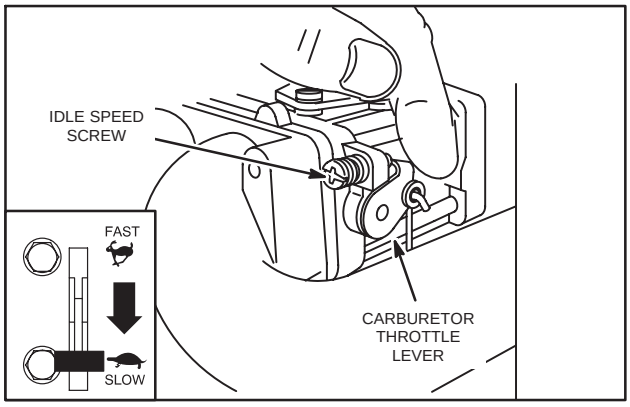


Fig. 22 – Adjusting Idle Speed

3. Bend governed idle tang to obtain 1750 RPM, Fig. 23.

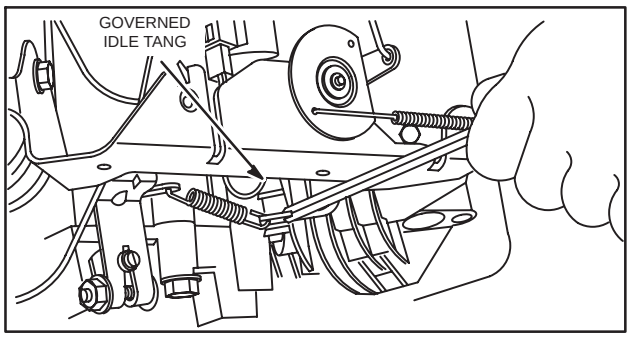


Fig. 23 – Adjusting Governed Idle

4. With engine running at governed idle RPM, bend throttle restrictor tang so that tang just contacts governor lever, Fig. 24.

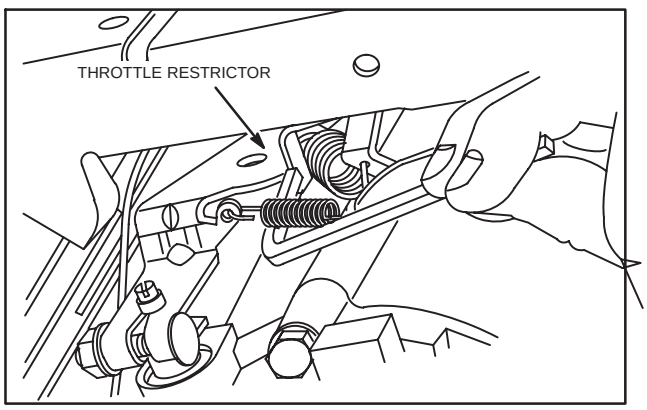


Fig. 24 – Adjusting Throttle Restrictor

Adjust Top No Load Speed

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

1. Move equipment control to FAST position and check RPM.
   a. Bend tang to obtain correct RPM, Fig. 25.

Note: Governor spring tension adjustment must not exceed ± 200 RPM, or the governor spring must be replaced.

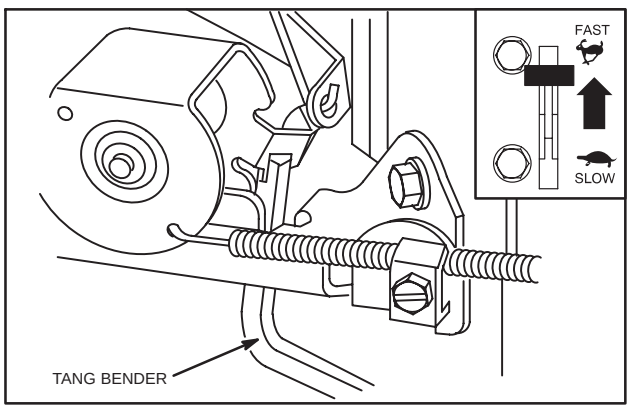


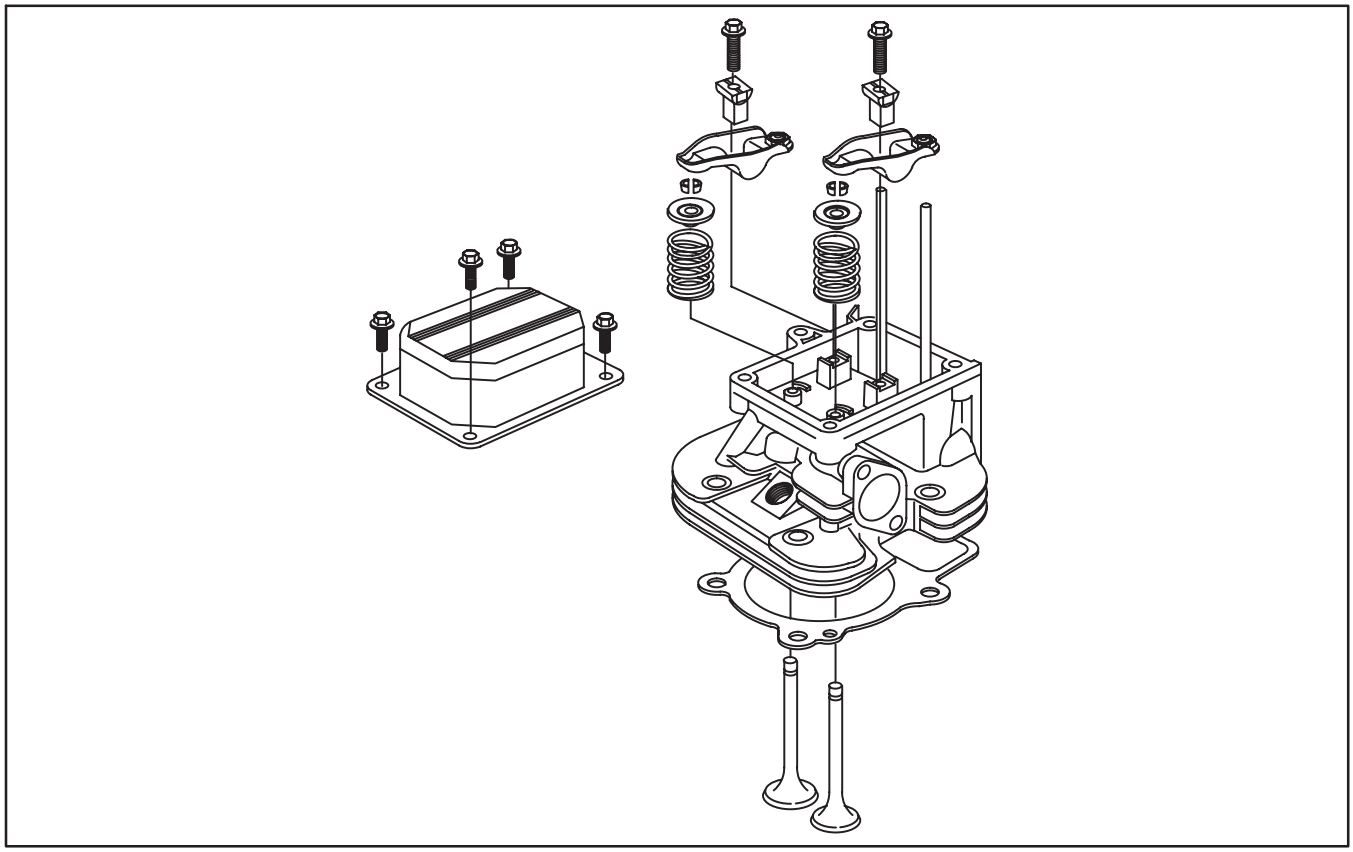
Fig. 25 – Adjusting Top No Load Speed

Section 5
Cylinder Head and Valves

Section Contents

5

Overhead Valve Train



REMOVE CYLINDER HEADS

Disconnect exhaust system from cylinder heads and disconnect choke and throttle control cables.

1. Remove the following parts from engine, Fig. 1:
   a. Air cleaner cover, cartridge and pre-cleaner.
   b. Rotating screen.
   c. Blower housing.
   d. Spark plugs.

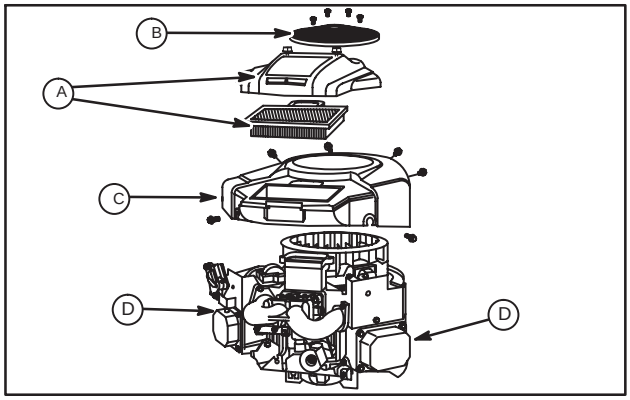


Fig. 1 – Remove Blower Housing

2. Disconnect fuel line at carburetor and breather tube at air horn.
   a. Disconnect fuel solenoid wires at carburetor
   b. Remove intake manifold and carburetor.
   c. Disconnect governor link from governor lever.

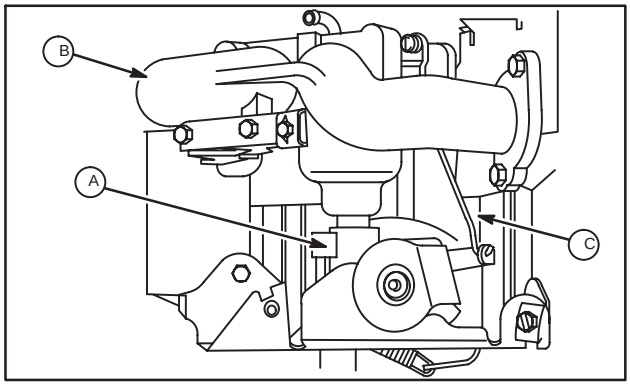


Fig. 2 – Remove Intake Manifold And Carburetor

3. Loosen governor lever nut.
4. Remove governor control bracket and governor lever.

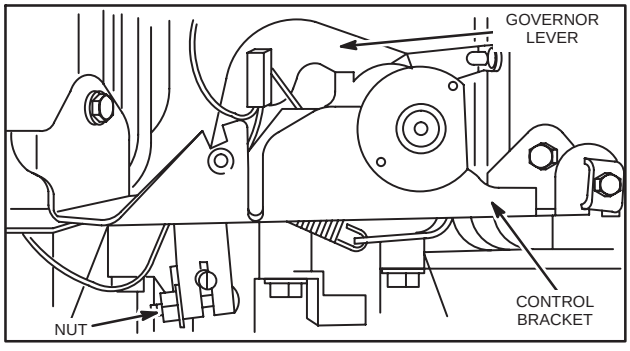


Fig. 3 – Remove Governor Lever And Control Bracket

5. Remove No. 1 cylinder shield with fuel pump and bracket.

   Note: Lower cylinder shield screw (#10-24), also used to attach fuel solenoid ground wire.

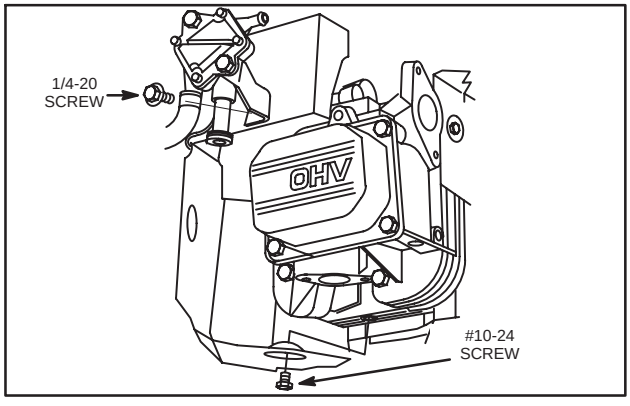


Fig. 4 – Remove Cylinder Shield

6. Remove No. 2 cylinder shield.

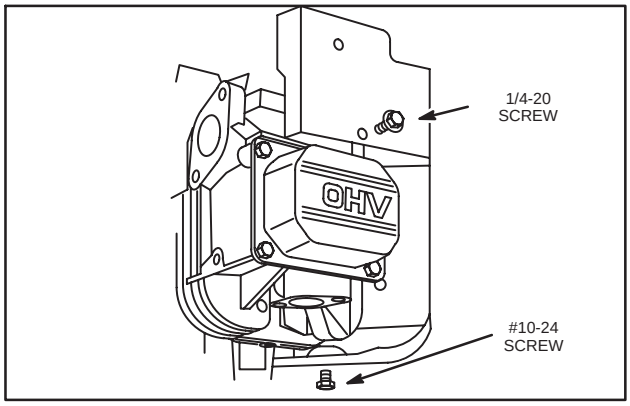


Fig. 5 – Remove Cylinder Shield

7. Remove valve covers and discard gaskets.

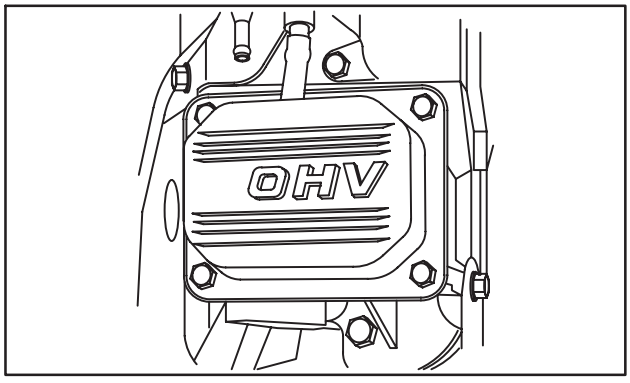


Fig. 6 – Remove Valve Covers

8. Remove rocker arms and push rods, Fig. 7.

Note: Mark push rods so that they may be reassembled in their original position. Intake valve push rods are aluminum.

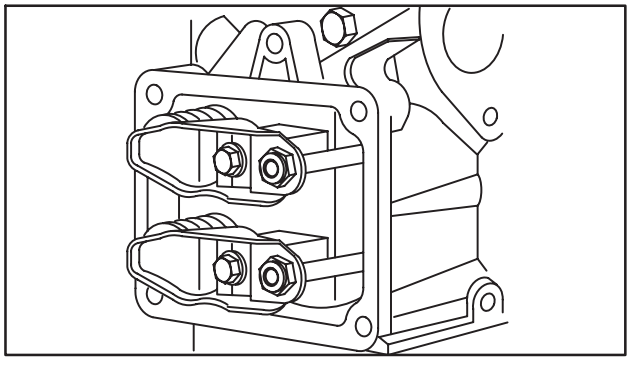


Fig. 7 – Remove Rocker Arms And Push Rods

9. Remove cylinder heads and discard gaskets, Fig. 8.

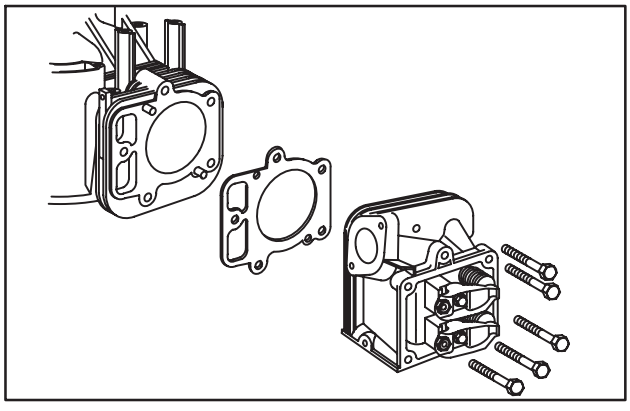


Fig. 8 – Remove Cylinder Head

DISASSEMBLE CYLINDER HEAD

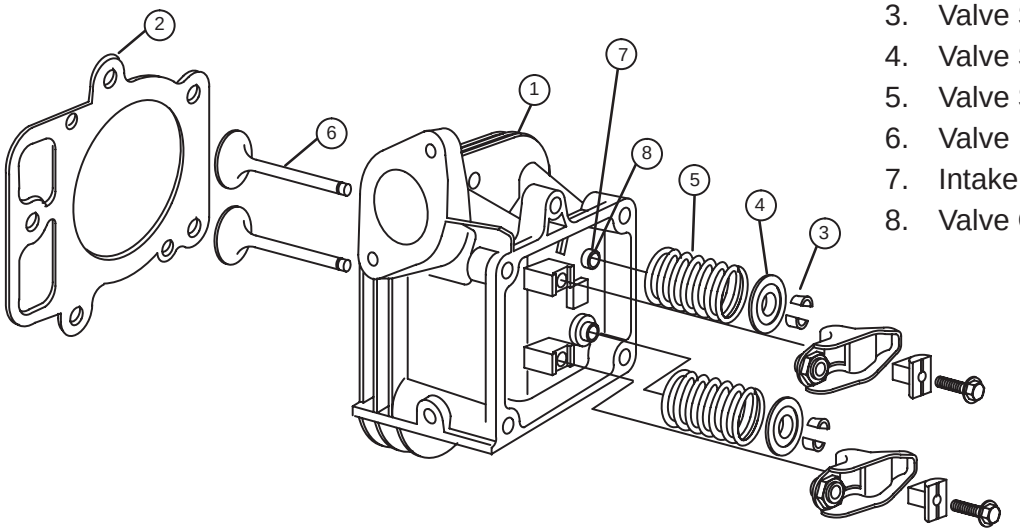


Fig. 9 – Cylinder Head Components

1. Remove valves, Fig. 10.

Note: Place a shop rag or short section of rubber fuel line under valves inside combustion chamber to hold valve in place while compressing spring.

Thread rocker arm support screw into cylinder head a few turns and compress spring with valve spring compressor, Tool #19347. Remove the following:

a. Valve spring retainer locks
b. Valve spring retainer
c. Valve spring
d. IN and EX valve

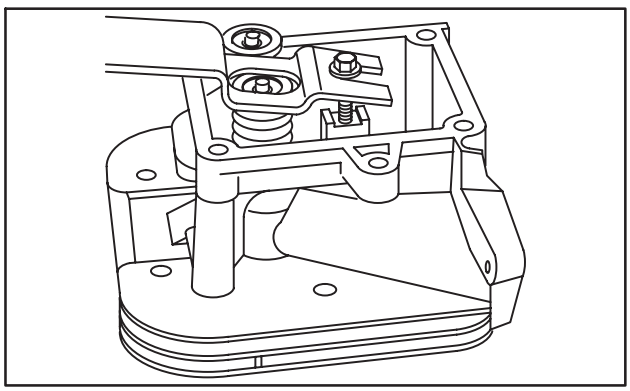


Fig. 10 – Remove Valves

2. Remove and discard intake valve stem seals, Fig. 11.

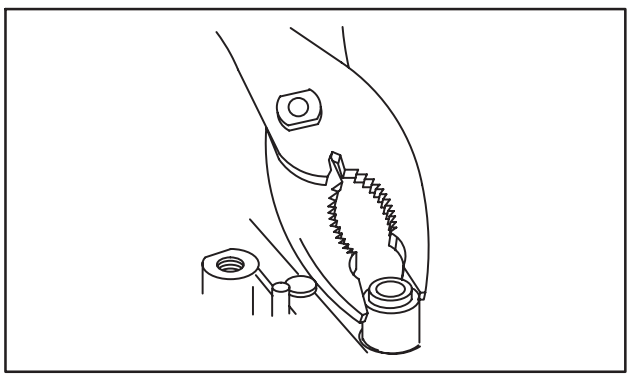


Fig. 11 – Remove Valve Stem Seal

INSPECT AND REPAIR

1. Check cylinder head, Fig. 12.

Be sure all gasket material is removed from surfaces before checking. Use a gasket scraper if necessary.

a. Inspect cylinder head for cracks or damage.
b. Use a surface plate or straight edge and check cylinder head mounting surface for distortion.

If mounting surfaces are distorted more than .004" (0.1 mm), the cylinder head must be replaced.

It is not recommended that cylinder head mounting surfaces be resurfaced.

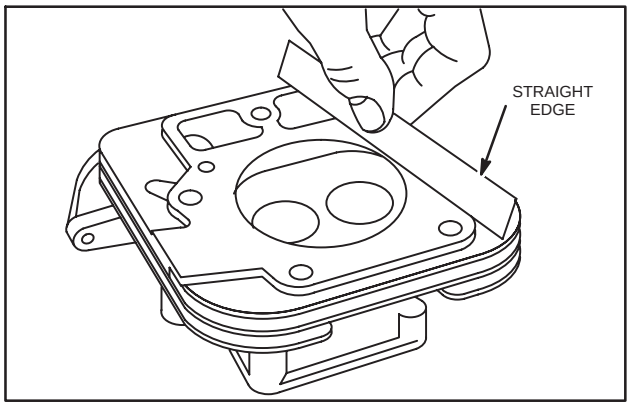


Fig. 12 – Check Cylinder Head For Distortion

2. Check valve guide bushings for wear using reject gauge, Tool #19381, Fig. 13.

If valve guides are worn, the cylinder head must be replaced.

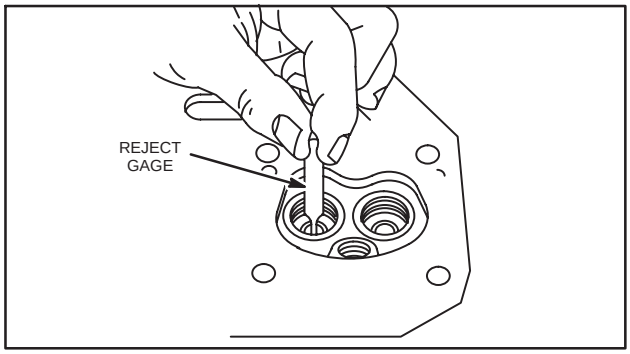


Fig. 13 – Check Valve Guide Bushing

3. Valve seats may be reconditioned using valve seat cutter tool #19547.

If valve seat is wider than dimension shown in Fig. 14, a narrowing cutter should be used to ensure that contact area of valve seat is centered on face of valve.

a. Use a 60° cutter to narrow seat from bottom and a 15° cutter to narrow seat from top, Fig. 18.

Note: If valve seat is loose or cracked, replace cylinder head.

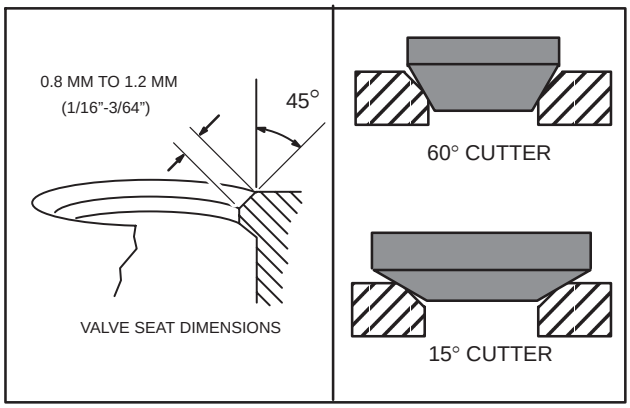


Fig. 14 – Valve Seat Dimensions

4. Valve faces may be resurfaced to 45°. See Fig. 15 for dimensions for valves. Lap valves and seats with valve lapping tool, #19258 and valve lapping compound, tool #94150.

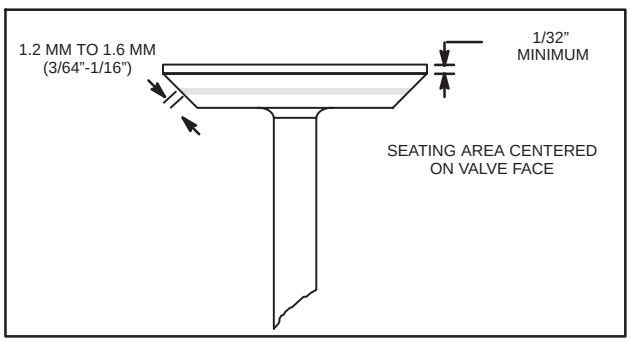


Fig. 15 – Valve Dimensions

5. Measure valve stem diameter at specified distance from end of valve, as shown in Fig. 16.

Replace if less than .233” (5.92 mm).

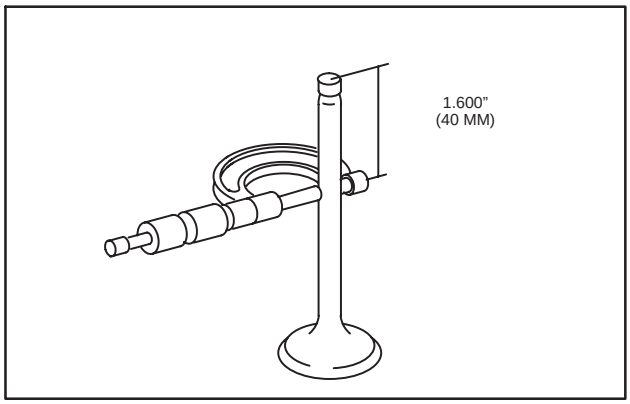


Fig. 16 – Measure Valve Stem Diameter

ASSEMBLE CYLINDER HEAD

1. Cylinder Head
2. Cylinder Head Gasket
3. Valve Spring Retainer Locks
4. Valve Spring Retainer
5. Valve Spring
6. Valve
7. Valve Stem Seal
8. Rocker Arm
9. Rocker Arm Support
10. Rocker Arm Support Screw
11. Push Rod

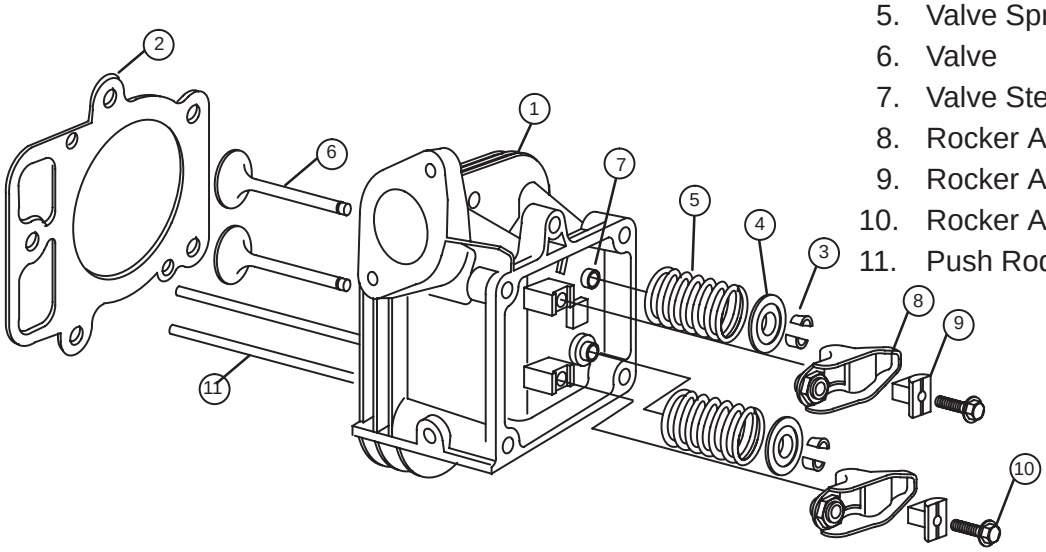


Fig. 17 – Cylinder Head Components

1. Use valve guide driver, Tool #19416 and install new intake valve stem seal.
   a. Oil inner surface and lip of valve stem seal.
   b. Press seal on to valve guide bushing until it bottoms, Fig. 18.

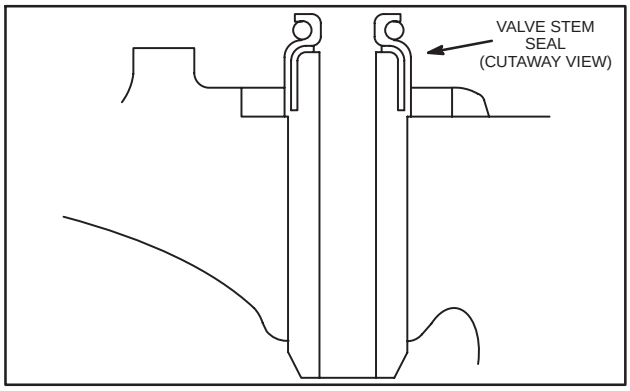


Fig. 18 – Install Valve Stem Seals

2. Install valves.

Note: Lightly coat valve stems with Valve Guide Lubricant #93963 before installing valves.

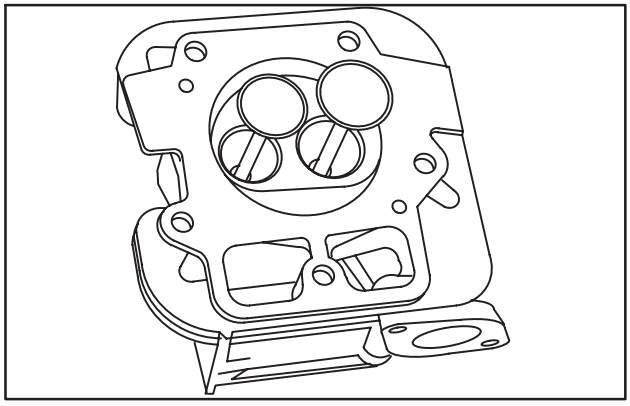


Fig. 19 – Install Valves

3. Install valve springs with valve spring compressor, Tool #19347, Fig. 20.

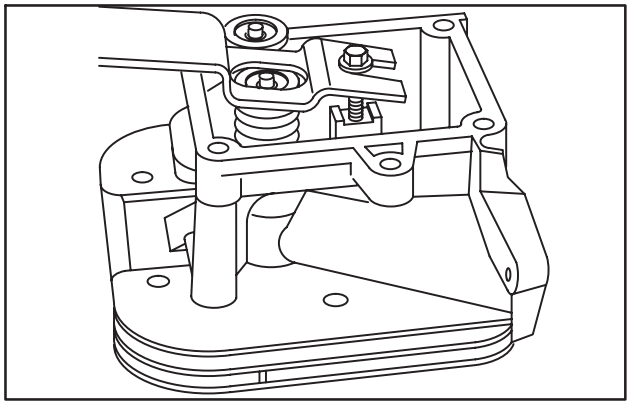


Fig. 20 – Install Valve Springs

4. Assemble rocker arms and supports to cylinder head, Fig. 21. Apply Loctite® 242 or similar sealant to threads.
   a. Torque screws to 100 in. lbs. (11.0 Nm).

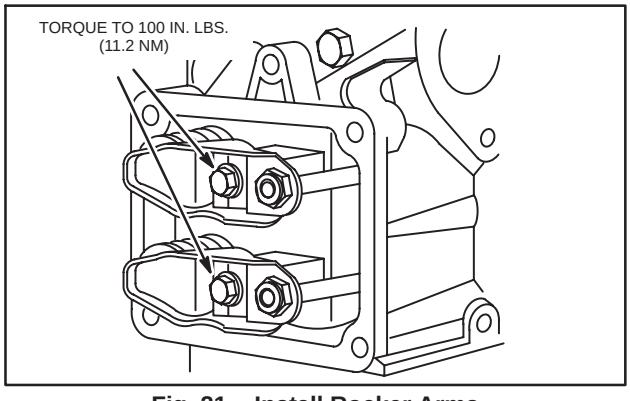


Fig. 21 – Install Rocker Arms

INSTALL CYLINDER HEAD

1. Place cylinder head gasket over alignment dowels on cylinder block, Fig. 22.

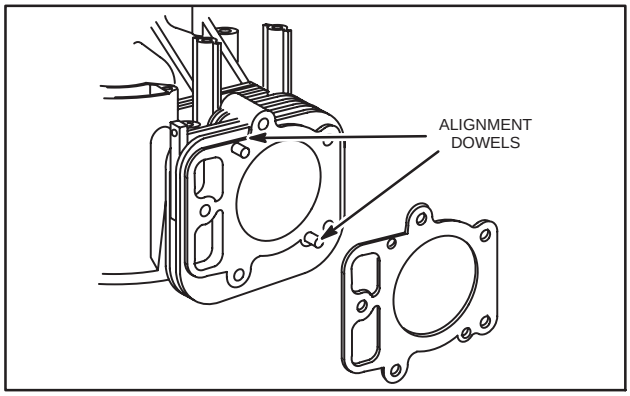


Fig. 22 – Install Cylinder Head Gasket

2. Install cylinder head assembly, Fig. 23.
   a. Torque head bolts in sequence shown to 220 in. lbs. (25.0 Nm).
3. Install push rods. Make sure push rods are inserted in recess in tappets.
   Note: Intake push rods are aluminum.

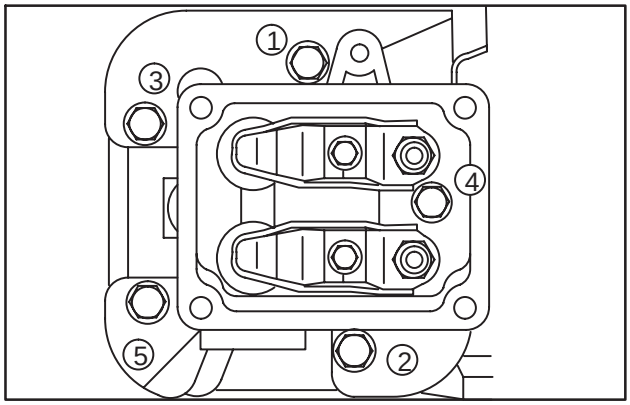


Fig. 23 – Install Cylinder Head Assembly

4. Compress valve springs and insert push rods into recess in rocker arm adjustment screws, Fig. 24.

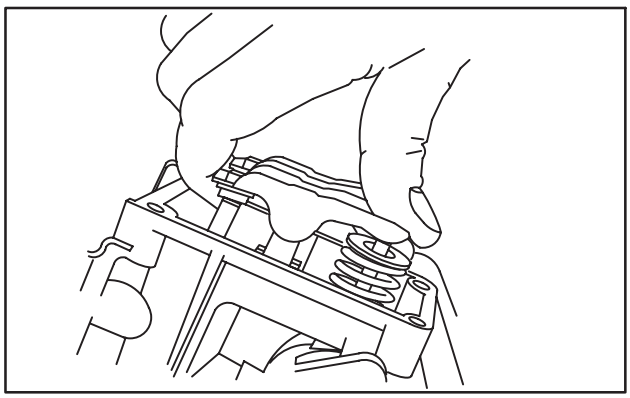


Fig. 24 – Install Push Rods

ADJUST VALVES

1. Set No. 1 cylinder at 1/4" (6.4mm) past TDC, compression stroke.
   a. Adjust valves and check, Fig. 25.

Valve Clearance (cold) IN and **EX** .005" (0.13 mm)

   b. Torque jam nut and adjusting screw to 60 in. lbs. (7.0 Nm).
2. Set No. 2 cylinder at 1/4" (6.4mm) past TDC, compression stroke.
   a. Repeat for No. 2 cylinder.

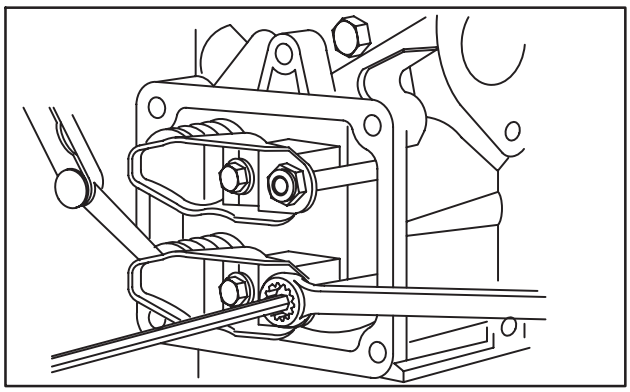


Fig. 25 – Adjust Valve Clearances

3. Install valve covers with new gaskets, Fig. 26.
   a. Torque screws to 100 in. lbs. (11.0 Nm)

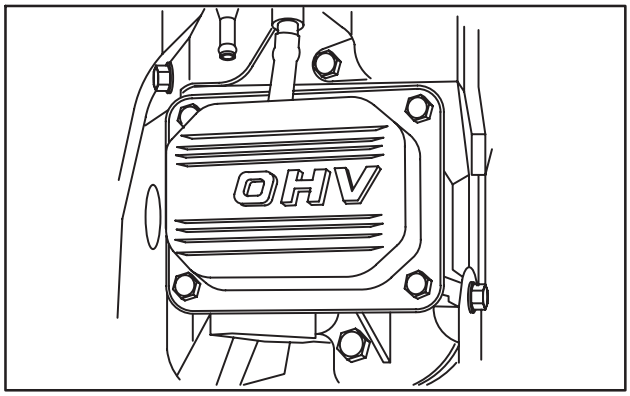


Fig. 26 – Install Valve Covers

REASSEMBLE

1. Install No. 1 cylinder shield and fuel pump assembly, Fig. 27.
   a. Torque 1/4-20 screw to 80 in. lbs. (7.0 Nm).
   b. Assemble solenoid harness ground wire to #10-24 screw and torque to 45 in. lbs. (5.0 Nm).

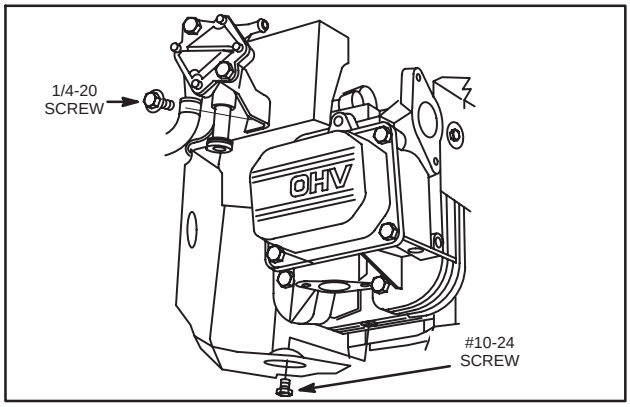


Fig. 27 – Install Cylinder Shield

2. Install No. 2 cylinder shield, Fig. 28.
   a. Torque 1/4-20 screw to 80 in. lbs. (7.0 Nm).
   b. Torque #10-24 screw to 45 in. lbs. (5.0 Nm).

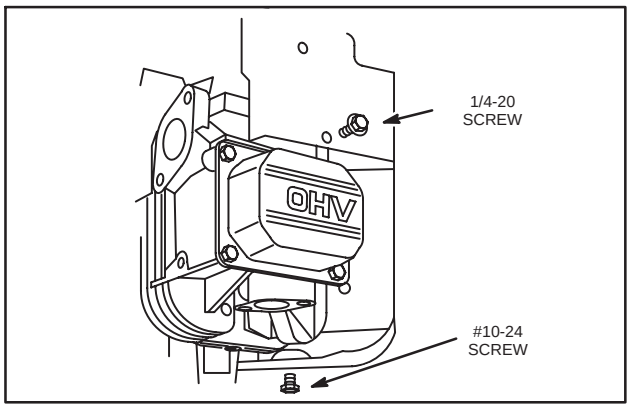


Fig. 28 – Install Cylinder Shield

3. Install governor control bracket and assemble governor lever to governor shaft. **DO NOT** tighten nut at this time.
   a. Torque control bracket screws to 80 in. lbs. (7.0 Nm).

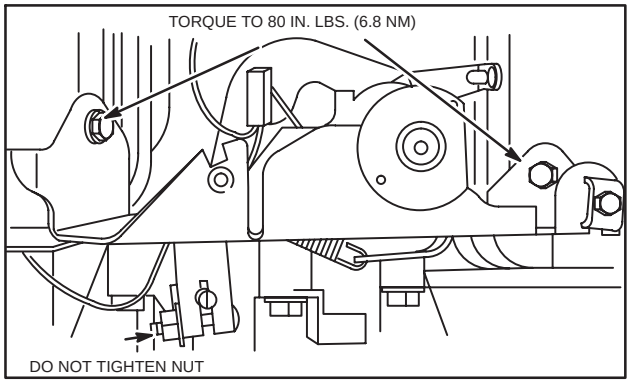


Fig. 29 – Install Governor Control Bracket

4. Install intake manifold and carburetor assembly, using new gaskets, Fig. 30.
   a. Assemble governor link to governor lever.
   b. Torque screws to 80 in. lbs. (9.0 Nm).
   c. Connect solenoid wire to solenoid.
   d. Connect breather tube to air horn.

   Note: Route armature ground wire between breather tube and air horn.

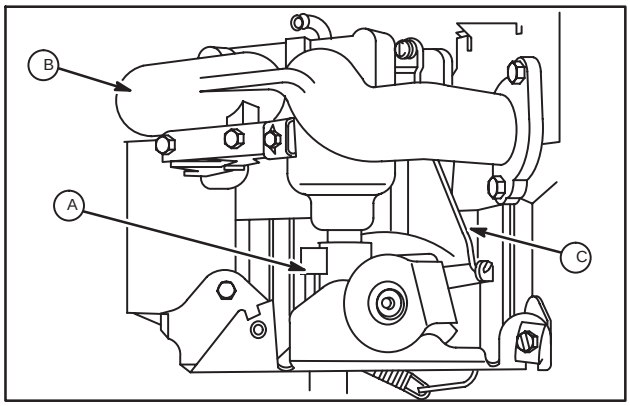


Fig. 30 – Install Intake Manifold And Carburetor

5. Assemble blower housing to engine.
   a. Torque screws to 80 in. lbs. (9.0 Nm).
6. Install rotating screen.
   a. Torque screws to 20 in. lbs. (2.0 Nm).

Assemble air cleaner and install spark plugs.

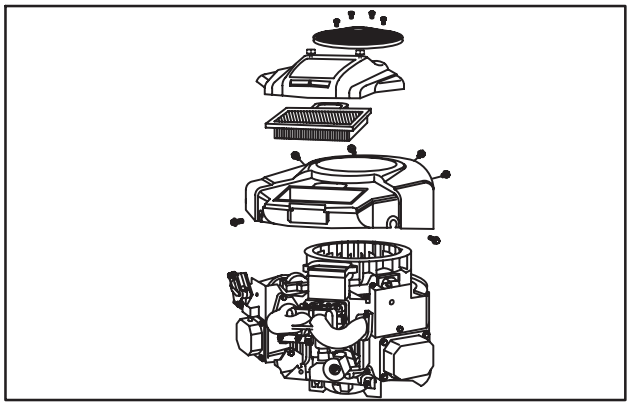


Fig. 31 – Install Blower Housing

ADJUST GOVERNOR

WARNING: BEFORE STARTING or running engine, static adjustment of the governor must be completed! Failure to make the static adjustments first could result in engine overspeeding which may result in engine damage, property damage or personal injury.

Static Governor Adjustment

1. Rotate governor control swivel counter-clockwise as far as it will go (wide open throttle) and hold in this position.
2. Rotate governor shaft clockwise as far it will go.
   a. Torque governor nut to 130 in. lbs. (15.0 Nm).

Install throttle and choke control cables and check for proper operation.

Install exhaust manifold.

   b. Torque screws to 140 in. lbs. (16.0 Nm).

   Note: Exhaust manifold and exhaust system supplied by equipment manufacturer.

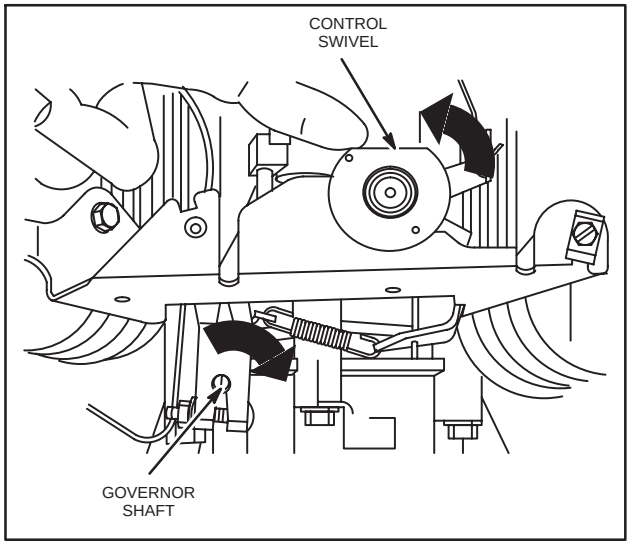


Fig. 32 –Adjust Governor

Section 6
Electric Starters

Section Contents

GENERAL INFORMATION

The starter motor uses a gear type engagement method, similar to an automobile starter. When the starter motor is activated, the pinion gear engages a ring gear attached to the engine flywheel and cranks the engine.

The pinion gear and flywheel ring gear are replaceable.

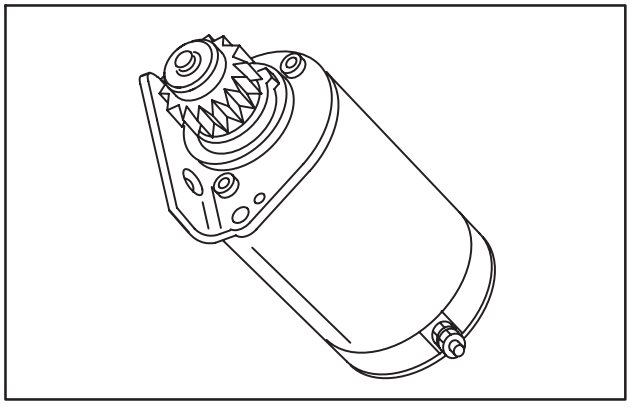


Fig. 1 – Starter Motor

TROUBLESHOOTING

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

WARNING: DO NOT ROTATE ENGINE WITH ELECTRIC STARTER WITH SPARK PLUGS REMOVED. ARCING AT THE SPARK PLUG ENDS MAY IGNITE THE GASOLINE VAPOR EXITING THE SPARK PLUG HOLE.

Engine Cranks Slowly –

a. Additional load affecting performance (see note above).
b. Discharged battery.
c. Faulty electrical connection (battery circuit).
d. Discharged battery (see alternators).
e. Dirty or worn starter motor commutator, bearing, weak magnets, etc.
f. Worn brushes or weak brush spring.
g. Wrong oil viscosity for temperature expected.
h. Battery leads too long or wire too small.
i. Battery too small.

Engine Will Not Crank –

a. Faulty safety interlocks.
b. Discharged or defective battery.
c. Faulty electrical connections.
d. Faulty starter motor switch (open circuit).
e. Open circuit in starter motor.
f. Brushes sticking, etc.
g. Faulty solenoid.

Starter Motor Spins But Does Not Crank Engine –

a. Sticking pinion gear due to dirt.
b. Damaged pinion or ring gear.
c. Starter clutch slipping.
d. Battery faulty or damaged.
e. Incorrect rotation due to reversed motor polarity—all motors rotate counterclockwise viewed from pinion gear.

Starter Motor Spins But Will Not Stop –

a. Defective starter switch.

TEST EQUIPMENT

The following is a list of equipment recommended to test and repair starter motors.

Digital Multimeter

The Digital Multimeter is available from your Briggs & Stratton source of supply. Order as Tool #19357 or #19390. The meter may be used to read volts, ohms, amperes and test diodes (rectifiers), Fig. 2.

The Digital Multimeter will withstand DC input of 10-20 Amps for up to **30** seconds. When checking current draw of 12 volt starter motors, the DC Shunt, Tool #19359, is required.

NOTE: The Digital Multimeter is equipped with two fuses to prevent damage to the meter in the event that the input limits are exceeded. If the meter displays a reading of 0.00 when testing DC output, check fuses in meter. Refer to FLUKE Operators Manual for procedure for checking fuses. Replacement fuse is available from your Briggs & Stratton source of supply. Order Part No. 19449.

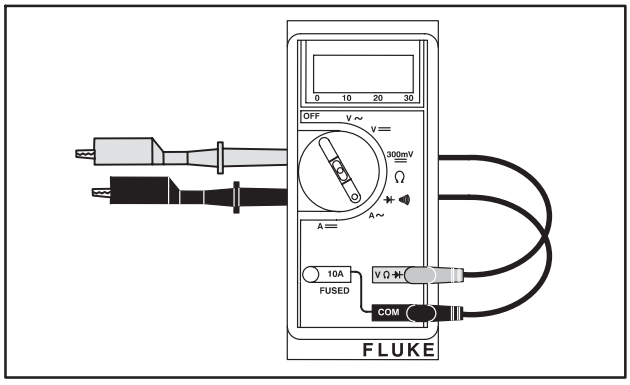


Fig. 2 – Digital Multimeter

DC Shunt

Use with Digital Multimeter. The DC Shunt is required when checking starter motor current draw on 12 volt starter motors. Order as Tool #19359, Fig. 3.

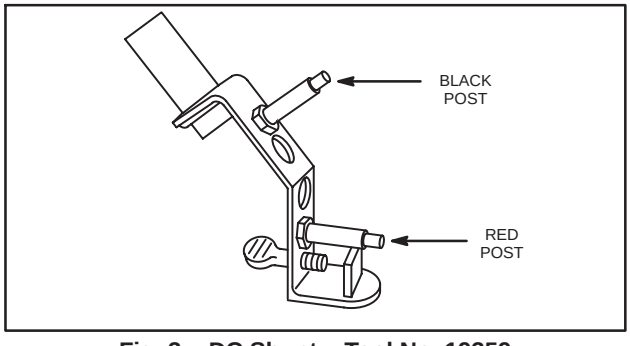


Fig. 3 – DC Shunt – Tool No. 19359

A tachometer is available from your Briggs & Stratton source of supply. Order as Tool #19200. The tachometer measures from 800 to 50,000 RPM, Fig. 4.

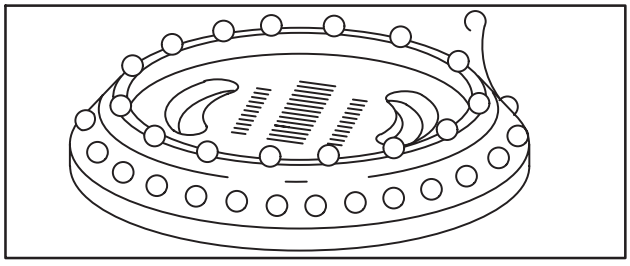


Fig. 4 – Tachometer

Test Bracket

A starter motor test bracket may be made as shown in Fig. 5.

A growler or armature tester is available from an Automobile Diagnostic service supplier.

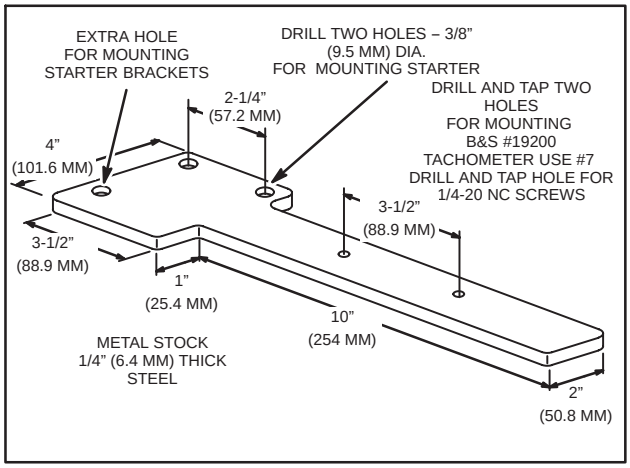


Fig. 5 – Test Bracket

TEST STARTER MOTOR

Remove Starter Motor

It is recommended that the starter motor be removed from the engine when testing starter motor performance. Remove rotating screen and blower housing. Remove two starter motor mounting screws. Assemble starter to test bracket and clamp test bracket in vise, Fig. 6.

IMPORTANT: DO NOT clamp motor housing in a vise or strike with a steel hammer. Starter motors contain two ceramic magnets which can be broken or cracked if the motor housing is hit, deformed or dented.

Testing Starter Motor

A fully charged 12 volt battery is required.

1. The DC Shunt **MUST** be installed on the **negative** (**-**) battery terminal as shown in Fig. 6.
2. Insert RED test lead into V Ω ⊣⊢ receptacle in meter and connect to RED post terminal on shunt.
3. Insert BLACK test lead into **COM** receptacle in meter and connect to BLACK post terminal on shunt.
4. Rotate selector to **300mV** ⎓ position.
5. Activate the starter motor and note reading on meter and tachometer (RPM).
   Note: Take reading after meter stabilizes (approximately 2 - 3 seconds).
6. A starter motor in good condition will be within specifications listed.

Starter Motor Specifications

Minimum RPM:	**6500**
Maximum Amperes:	**35**

If 12 volt starter motor does not perform satisfactorily, see Conditions Affecting Starter Motor Performance.

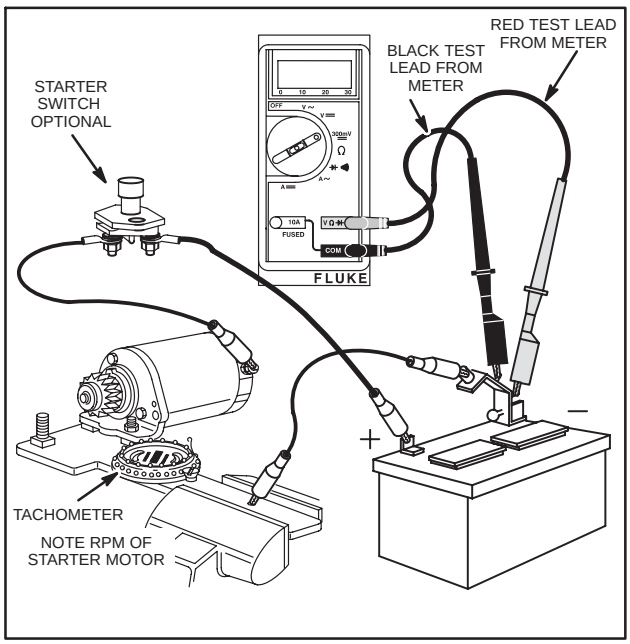


Fig. 6 – Testing Starter Motor

Conditions Affecting Starter Motor Performance

1. A binding or seizing condition in the starter motor bearings.
2. A shorted, open or grounded armature.
   a. Shorted, armature (wire insulation worn and wires touching one another). Will be indicated by low or no RPM.
   b. Open armature (wire broken) will be indicated by low or no RPM and excessive current draw.
   c. Grounded armature (wire insulation worn and wire touching armature lamination or shaft). Will be indicated by excessive current draw or no RPM.
3. A defective starter motor switch.
4. Broken, damaged or weak magnets.
5. Starter drive dirty or binding.

STARTER DRIVE

Checking Starter Motor Drive

When the starter motor is activated, the pinion gear should engage the flywheel ring gear and crank the engine. If the starter motor drive does not react properly, inspect the helix and pinion gear for freedom of operation, Fig. 7.

The pinion gear should be inspected for damaged teeth. Pinion gear must move freely on helix. The parts may be washed in a solvent such as Stanisol® or Varsol®.

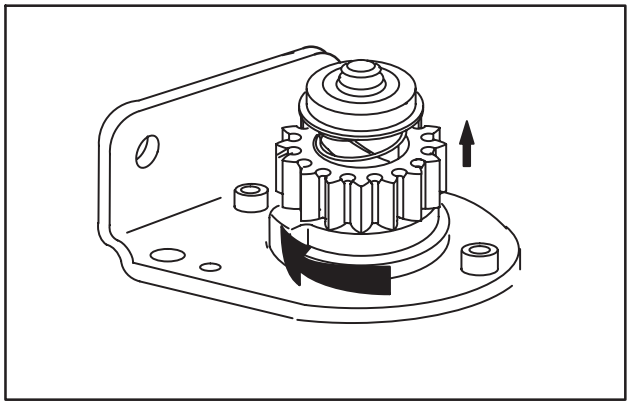


Fig. 7 – Starter Drive

Disassemble Starter Motor Drive

WARNING: TO PREVENT EYE INJURY always wear eye protection when removing C-ring.

1. Place counterbore side of Tool #19436 over retainer and align drive pins with open end of C-Ring, Fig. 8.

Important: If retainer has a notch as shown, **DO NOT** align drive pins with notch. If necessary, rotate notch away from open end of C-Ring.

2. Place palm of hand over tool and push down evenly on tool to compress spring washer.
3. While applying pressure, turn knurled knob clockwise until C-Ring pops off. Discard C-Ring.
4. Remove retainer, return spring, spring washer, pinion gear, and starter clutch.

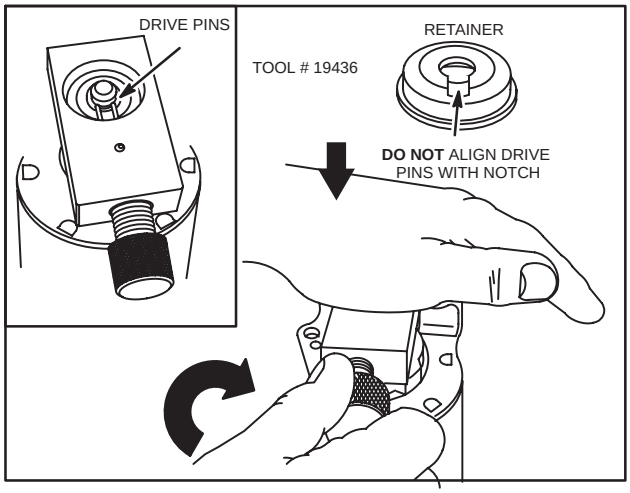


Fig. 8 – Removing C-Ring

Assemble Starter Drive

1. Assemble clutch drive to starter shaft and rotate clutch until it drops into place, Fig. 9.
2. Install pinion gear with beveled side of teeth up. Then install return spring making sure spring is in recess of starter gear.
3. Install spring washer with concave side up. Install retainer.

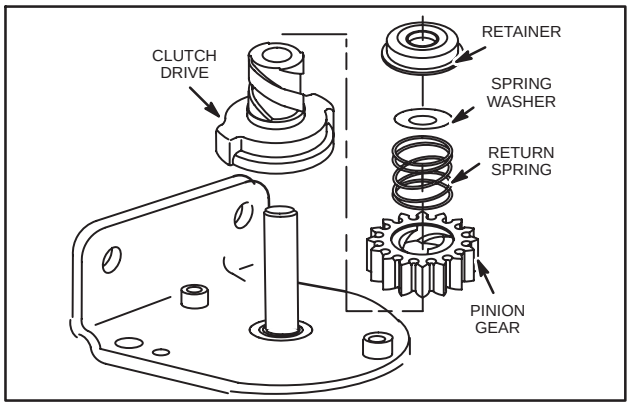


Fig. 9 – Assemble Starter Drive

4. Place C-Ring over chamfered end of shaft. Align one of the slots of Tool #19435 with open end of C-Ring.
5. Press or drive C-Ring on until it snaps into groove in shaft, Fig. 10.

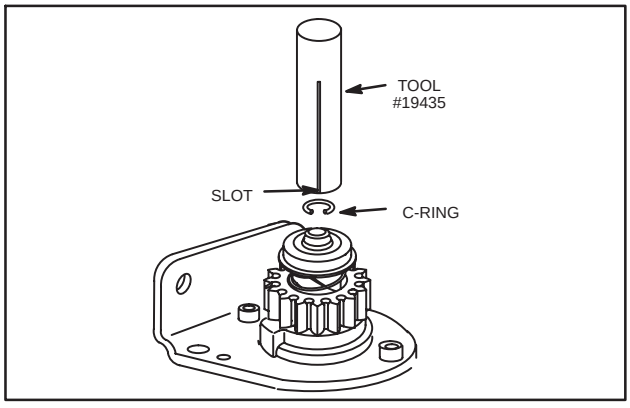


Fig. 10 – Install C-Ring

DISASSEMBLE STARTER MOTOR

See Fig. 11 for exploded view of starter motor.
To aid in reassembly, scribe a mark on drive end cap and starter housing for alignment purposes.

1. Remove thru bolts.
2. Remove drive end cap assembly

Replace drive end cap if bushing is worn or damaged.

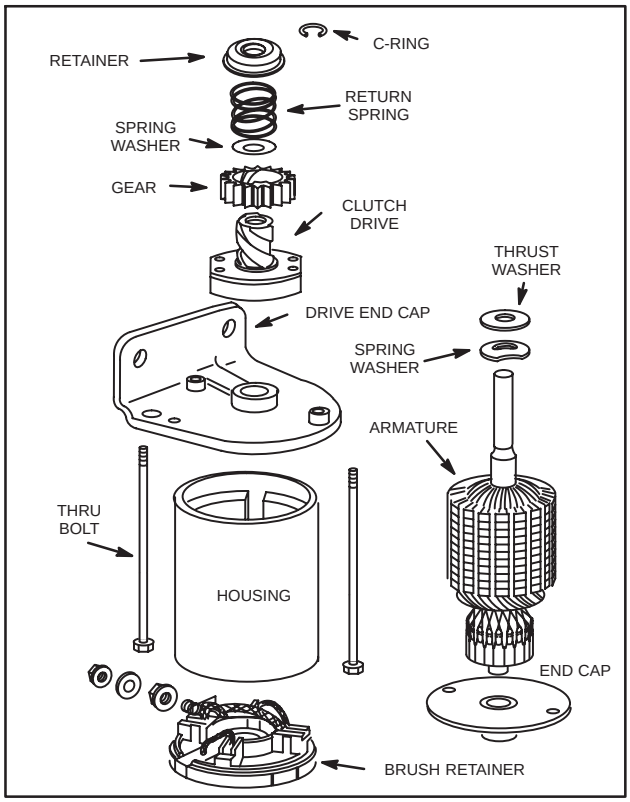


Fig. 11 – Exploded View

3. Hold the armature and commutator end cap against a work surface while sliding housing off the armature, Fig. 12.

NOTE: This allows the brush retainer to remain assembled to commutator for inspection of brush to commutator contact.

4. Remove end cap and brush retainer with brushes.

Replace end cap if bushing is worn or damaged.

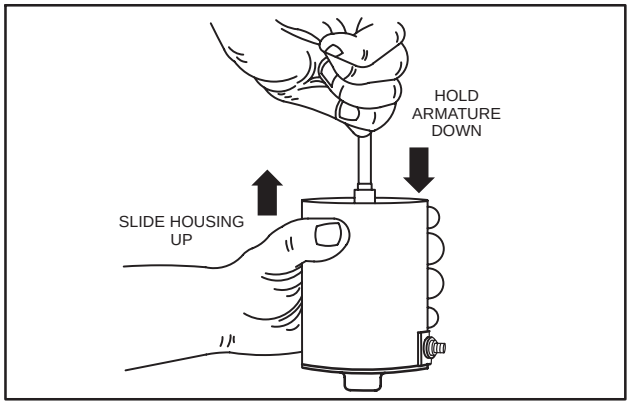


Fig. 12 – Removing Armature

Inspect Armature Commutator

The armature commutator may be cleaned with fine sandpaper. **DO NOT** use emery cloth. Commutator may be machined to no less than 1.230" (31.24 mm), Fig. 13.

Slots between commutator bars should be cleaned with a hack saw blade after cleaning or machining, Fig. 13. The slots can also be cleaned using an aerosol carburetor cleaner or compressed air.

The armature should be checked for shorts with a growler.

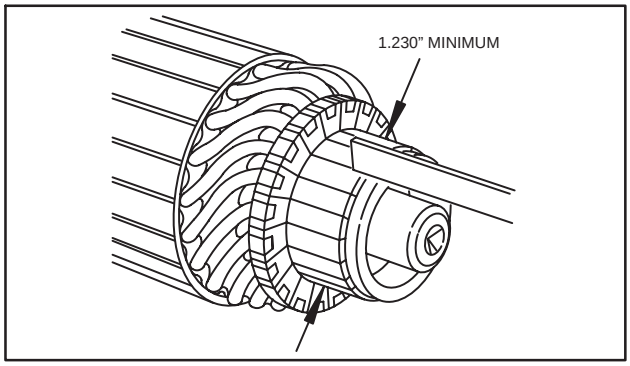


Fig. 13 – Inspect Commutator

Inspect Brushes

The brushes should be checked for proper seating, weak brush springs, dirt, oil or corrosion. Brush spring pressure should be strong enough to ensure good brush contact with armature. Check to be sure brushes are not sticking in their holders.

Minimum brush dimension is 1/4" (6 mm), Fig. 14.

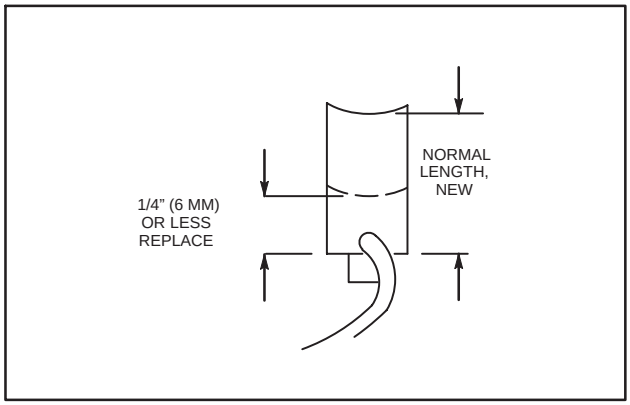


Fig. 14 – Inspect Brushes

ASSEMBLE STARTER MOTOR

1. Assemble brushes in their proper holders.

Note: Brush retainers may made using Part. No, 26634 control wire as shown in Fig. 15.

2. Assemble brush retainer to commutator and remove brush retainers.
   a. Assemble end cap to armature shaft.

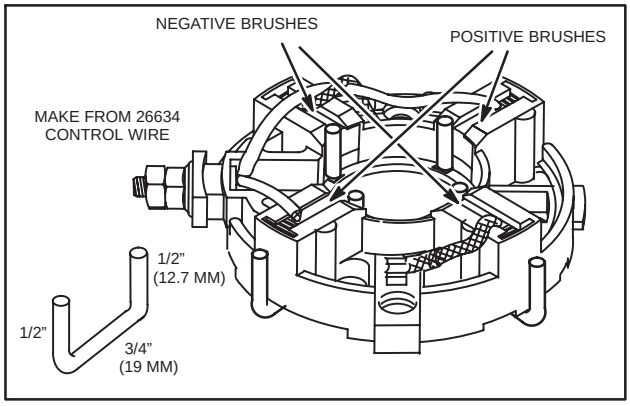


Fig. 15 – Assemble Brushes

3. Hold armature and end cap against work surface.
4. Slide housing over armature, aligning notch in housing with terminal on brush retainer, Fig. 16.

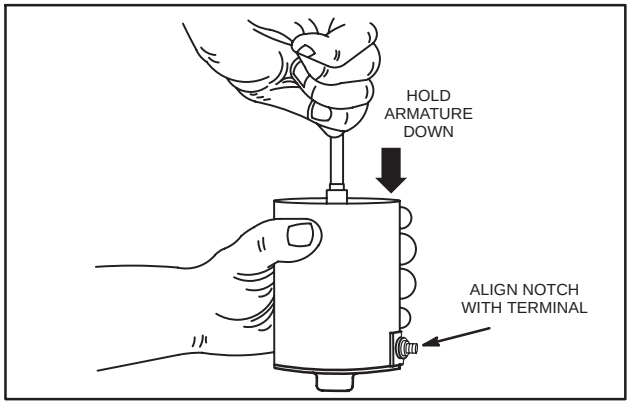


Fig. 16 – Install Starter Housing

5. Assemble spring washer and thrust washer to armature shaft and install drive end cap, Fig. 17.
   a. Torque thru bolts to 50 in. lbs. (6.0 Nm).
6. Install starter drive.

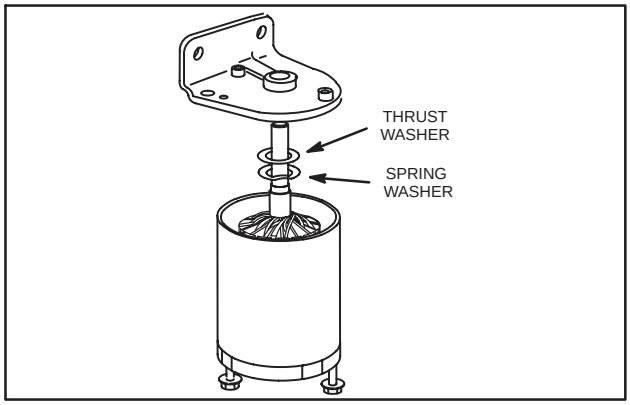


Fig. 17 – Install Drive End Cap

Install Starter Motor

Install starter motor and torque screws to 140 in. lbs. (16.0 Nm).

REPLACE RING GEAR

File or grind off rivet heads from top side of flywheel, Fig. 18. Then, drive out rivets with 3/16" punch. Pry off old ring gear.

Carefully align holes in ring gear with holes in flywheel. Use a flat plate and press on new ring gear. Then fasten new ring gear to flywheel using screws and locknuts provided with new gear, Fig. 18.

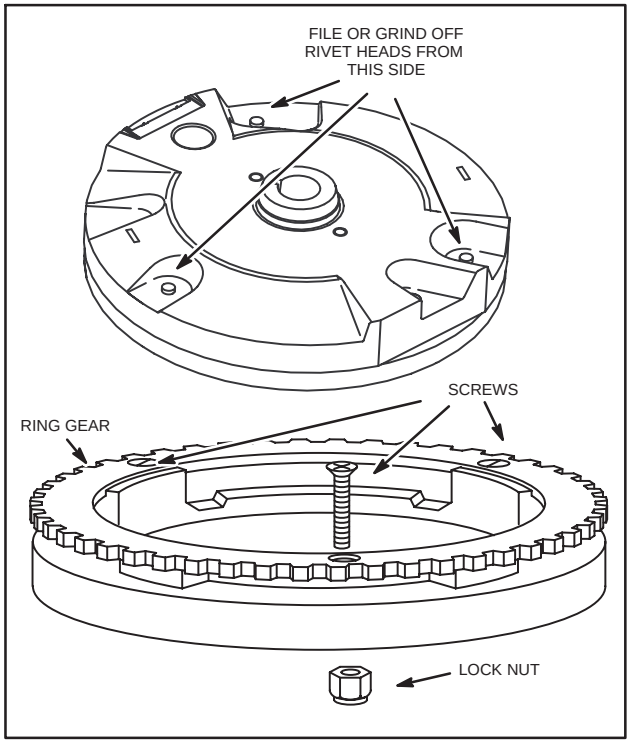


Fig. 18 – Replacing Ring Gear

BATTERY INFORMATION

The battery used to operate starter motors on Briggs & Stratton Twin Cylinder engines is 12 volt, lead acid, wet cell type. This type is available as a wet charge or dry charge battery. The wet charged maintenance-free battery is filled with electrolyte and sealed at the time of manufacture. The level of electrolyte cannot be checked.

The dry charge battery is manufactured with fully charged plates. Electrolyte must be added at the time that the battery is placed in service. Before activating a dry charge battery, read and follow the manufacturer's recommended procedure.

WARNING: WEAR EYE PROTECTION when servicing the battery! Avoid skin contact! If contact does occur, flush with cold water and consult a physician.

CAUTION: BEFORE SERVICING BATTERY, disconnect negative (-) battery cable first, then positive (+) cable second. Arcing can occur when improperly disconnecting cables which could cause a fire.

WARNING: BATTERIES PRODUCE HYDROGEN, AN EXPLOSIVE GAS! Do not store or charge a battery near an open flame or devices which utilize a pilot light or can create a spark igniting a fire or explosion.

Installation:

1. Before installing battery, connect all equipment to be operated.
2. Place battery in holder with flat base. Tighten holder down evenly until snug. DO NOT overtighten.
3. Connect positive terminal to positive post FIRST to prevent sparks from accidental grounding. Tighten connectors securely.
4. Install protective cover over positive battery terminal ends.
5. Then, connect negative terminal to negative battery terminal. Tighten connectors securely.

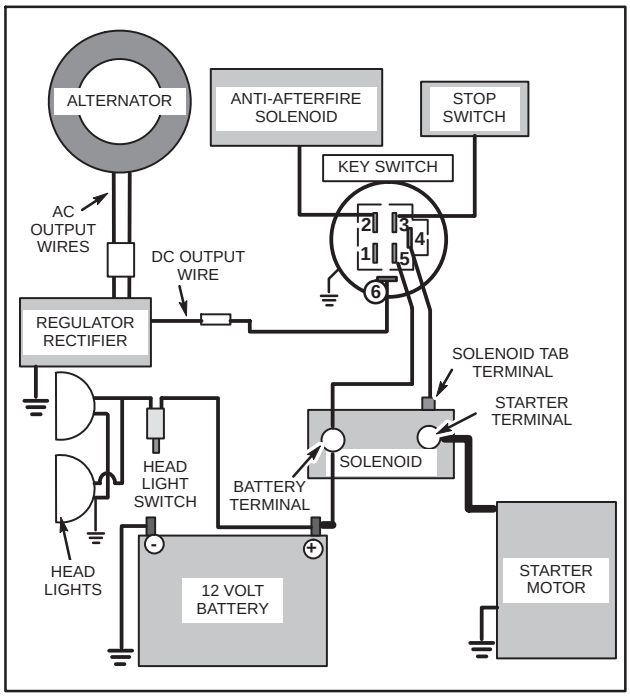


Fig. 19 – Typical 12 V Wiring Diagram

Checking Battery

1. Physical check – clean if necessary.
   a. Corrosion
   b. Dirt
   c. Terminal and clamps (secure – good condition)
2. Bring battery to full charge.

DO NOT EXCEED CHARGE RATE of 1/10 AMPERE for every ampere of battery rating! CONSULT BATTERY MANUFACTURER for CHARGE RECOMMENDATIONS. Overcharging may cause battery failure.

   a. Use a taper charge (automatically reduces charge rate).
   b. Fill battery cells with distilled water or tap water after charging (for batteries that have been in service).

NOTE: If battery gets "Hot" to the touch or is spitting acid (gassing) excessively, unplug charger periodically.

3. With battery fully charged, check specific gravity readings of each cell with a Battery Hydrometer and record readings (Fig. 20). All readings should be above 1.250 (compensating for temperature). If specific gravity readings varied .50 or if all cells read less than 1.225, replace battery.

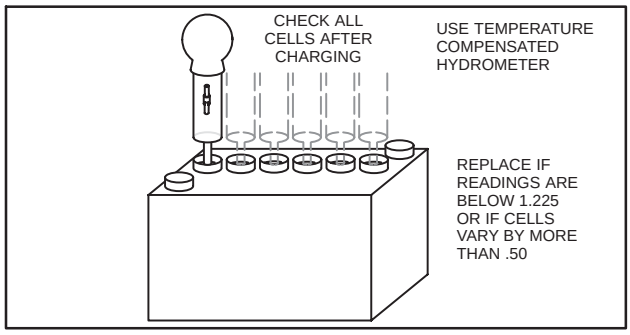


Fig. 20 – Checking 12 V Battery Cells (Lead Acid, Wet Cell,With Fill Caps)

Testing Battery

Use Digital Multimeter, Tool #19464.
Set meter to read DC Volts.
Attach RED meter test clip to positive (+) battery terminal. Attach BLACK meter test lead to negative (-) battery terminal. With ignition switch "OFF," press starter button. If ignition switch and starter switch are the same switch, disconnect wires from spark plugs and ground ignition using two Ignition Testers, Tool #19368. Turn switch to "START." METER SHOULD DISPLAY 9 VOLTS OR MORE WHILE CRANKING ENGINE. If less than 9 volts, replace battery.

DO NOT CRANK STARTER for more than 15 SECONDS without allowing starter to COOL at least 2 MINUTES. The starter motor could be damaged.

Battery Recommendations

These battery size recommendations are based on minimum temperature expected and correct weight of oil being used. See Section 1.

30 Amp. Hr. +20° F (–6° C) or higher
40 Amp. Hr. -5° F (–20° C) or higher
50 Amp. Hr. -15° F (–26° C) or higher

Battery Cable Recommendations

These cable sizes are based on total length of cable from battery positive post to starter switch or solenoid, and to starter plus ground return to battery negative post.

#6 AWG – 4 ft. (1.21 m) or less
#5 AWG – 5 ft. (1.52 m) or less
#4 AWG – 6 ft. (1.82 m) or less

Section 7
ALTERNATORS

Section Contents

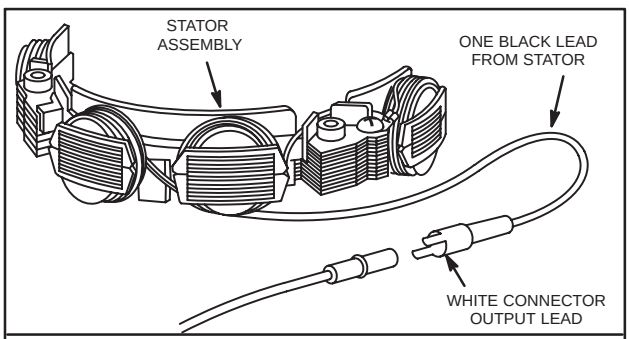
The alternator systems installed on Briggs & Stratton Intek™ OHV-Twin Cylinder Engines can easily be identified by the color of the stator output wires and the connector.

Table No. 1 provides a means of identifying the various alternator systems. Note: All output figures are rated at 3600 RPM.

TABLE NO. 1

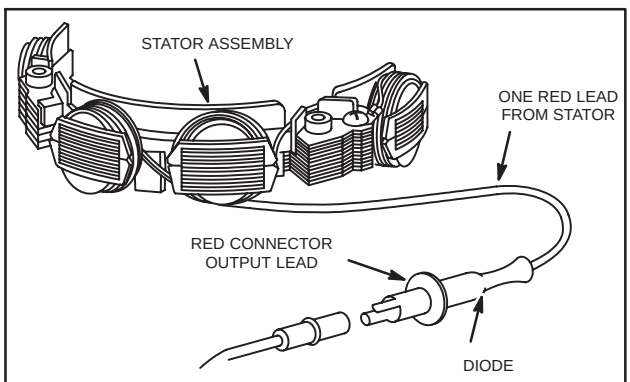
Fig.	Alternator Type	Stator Output Wire(s) Color	Connector Color	Alternator Output (at 3600 RPM)	Test Page
1	AC Only	Black	White	14 Volts AC (Lights) Unregulated	6
2	DC Only	Red	Red	2 – 4 Amps + DC (Charging) Unregulated	6
3	Dual Circuit	Red Black	White	2 – 4 Amps + DC (Charging) Unregulated 14 Volts AC (Lights) Unregulated	7
4	Tri-Circuit	Black	Green	5 Amps + DC (Charging) 5 Amps – DC (Lights)	9
5	Regulated 5 Amp	Black	Green	* 1-5 Amps + DC (Charging) Regulated	10
5	Regulated 9 Amp	Black	Green	* 1-9 Amps + DC (Charging) Regulated	10
6	Regulated 10 Amp	2-Black	Yellow	* 1-10 Amps + DC (Charging) Regulated	11
6	Regulated 16 Amp	2-Black	Yellow	* 1-16 Amps + DC (Charging) Regulated	12

* Alternator output is determined by flywheel alternator magnet size.



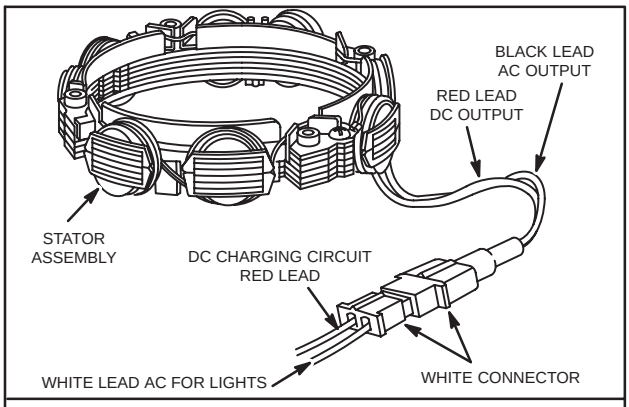
- 14 Volts AC for lighting circuit.
- One black lead from stator.
- White connector output lead.

Fig. 1 – AC Only Stator



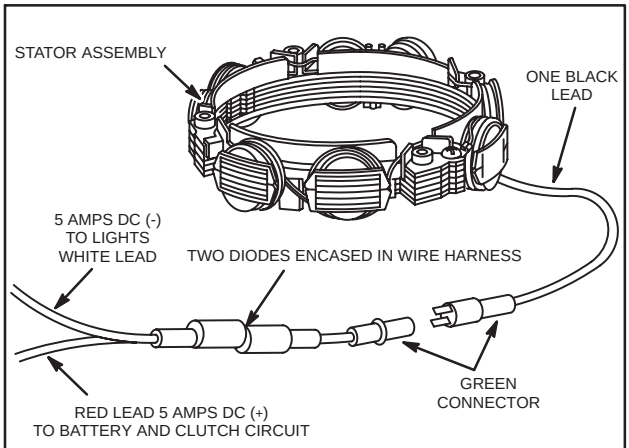
- 3 amp DC unregulated for charging battery.
- One red lead from stator.
- Diode encased at connector.
- Red connector output lead.

Fig. 2 – DC Only Stator



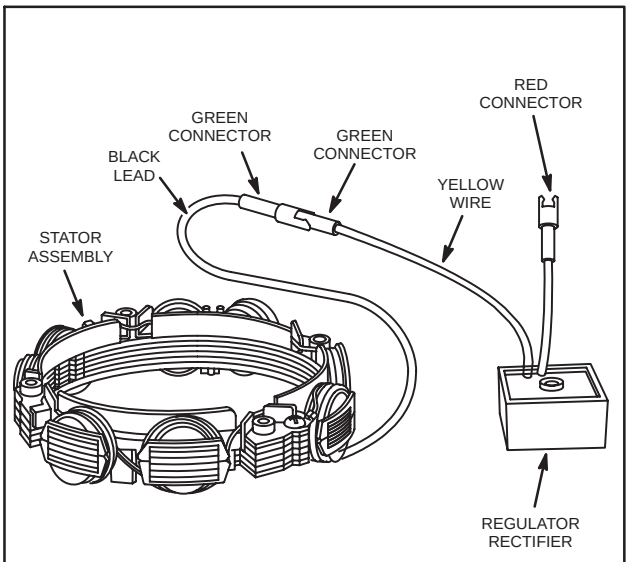
- 3 amp DC unregulated for charging battery (ONE red lead from stator).
- 14 Volts AC for lighting circuit (ONE black lead from stator).
- Diode encased at connector.
- White connector with two pin terminals.

Fig. 3 – Dual Circuit Stator



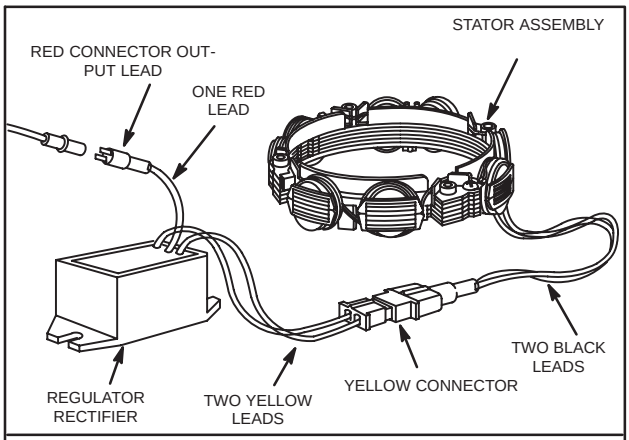
- 10 amp AC.
- One black lead from stator.
- Green connector.
- Two diodes encased in wire harness.
- Red and white output leads.

Fig. 4 – Tri-Circuit Stator



- 5 or 9 amp DC regulated for charging battery.
- Alternator output (5 or 9 amp) is determined by fly-wheel alternator magnet size.
- Uses same stator as Tri-Circuit system.
- One black lead from stator.
- Green connector.

Fig. 5 – 5 or 9 Amp Regulated Stator



- 10 or 16 amp DC regulated for charging battery.
- Two black leads from stator.
- Yellow connector with two pin terminals.
- Two yellow leads to regulator-rectifier.
- One red lead from regulator-rectifier to red connector output lead.
- 10 and 16 amp system use the same stator, color coding and regulator-rectifier.
- Alternator output is determined by the flywheel alternator magnet size.

Fig. 6 – 10 or 16 Amp Regulated Stator

Flywheel Identification

Intek™ OHV-Twin Cylinder Flywheels have a single ring of magnets which provide the magnetic field for the various alternator systems. There are two (2) sizes of alternator magnets. The size of the magnet determines the alternator output Fig. 7.

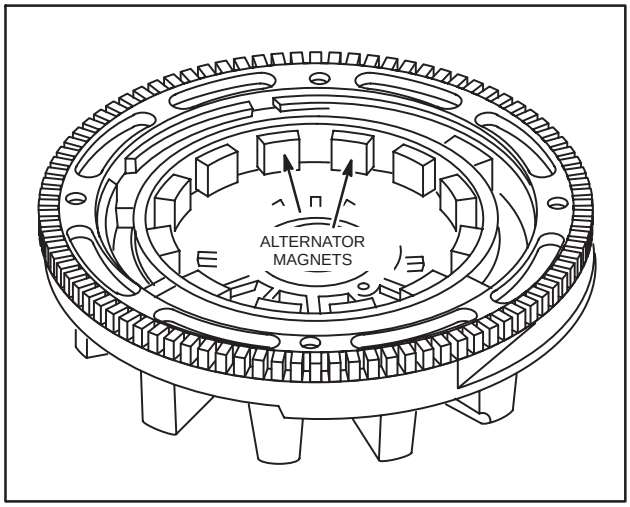


Fig. 7 – Alternator Magnets

Small Magnet **22 mm x 17 mm (7/8” x 21/32”)**

Large Magnet **22 mm x 23 mm (7/8” x 29/32”)**

Table 2 identifies the magnet size to be used with a specific alternator system.

TABLE NO. 2

Alternator	Small Magnet	Large Magnet
AC Only	●	
DC Only	●	
Dual Circuit	●	
Tri-Circuit	●	
Regulated 5 AMP	●	
Regulated 9 AMP		●
Regulated 10 AMP	●	
Regulated 16 AMP		●

NOTE: Large magnet flywheels cannot be used with the AC only, DC only, Dual Circuit and Tri-Circuit alternator systems.

The following list is provided to aid you in diagnosing problems with alternator systems.

TROUBLESHOOTING

COMPLAINT	POSSIBLE CAUSES
"Battery not charging"	• Engine RPM too low. • Inline fuse "blown" (if equipped). • Defective battery. • Loose, pinched, or corroded battery ground leads. • Loose, pinched, or corroded battery charge leads. • Open, shorted, or grounded wires between output connector and battery. • Defective diode (open or shorted). • Defective or improperly grounded regulator-rectifier. • Diode installed incorrectly (reversed). • Damaged battery (shorted battery cells). • Excessive current draw from accessories. • Low magnetic flux or damaged alternator magnets.
"Battery in state of overcharge"	• Severe battery vibration (missing or broken tie-down straps). • Battery rate of charge not matched to alternator output. • Damaged battery (shorted battery cells). • Defective regulator. • One OHM resistor shorted or grounded (Tri-Circuit system only).
"Headlamps not working"	• Inline fuse "blown" (if equipped). • Defective headlamps. • Loose or corroded wires. • Open, shorted or grounded wires between output connector and headlamps. • Light switch defective. • Defective diode Tri-Circuit system (open or shorted – white output lead side). • Low magnetic flux or damaged alternator magnets.
"Electric clutch not working" (Tri-Circuit Alternator)	• Inline fuse "blown" (if equipped). • Loose or corroded wires. • Open, shorted or grounded wires between output connector and electric clutch. • Defective diode (open or shorted-red output lead side). • NOTE: Battery will also not charge. • Defective electric clutch switch. • Open, shorted or grounded clutch circuit. • Low magnetic flux or damaged alternator magnets.

7

TEST EQUIPMENT

The following equipment is recommended to test and repair alternators.

Digital Multimeter

The Digital Multimeter is available from your Briggs & Stratton source of supply. Order as Tool #19464. The meter may be used to read volts, ohms or amperes, and test diodes, when leads are inserted in the appropriate receptacle, Fig. 8.

The Digital Multimeter will withstand DC input of 10-20 amps for up to **30** seconds. When checking DC output on 16 and 20 amp regulated system, use the DC shunt, Tool #19468, to avoid blowing fuse in meter, Fig. 9.

NOTE: The Digital Multimeter is equipped with two fuses to prevent damage to the meter in the event that the input limits are exceeded. If the meter displays a reading of 0.00 when testing DC output (**A** ⎓), check fuses in meter. Refer to FLUKE Operators Manual for procedure for checking fuses. Replacement fuse is available from your Briggs & Stratton source of supply. Order Part No. 19449 or 19571.

Testing Alternator Output

When checking alternators, make the tests in the following sequence.

1. Test alternator output.
2. Test diode(s) or regulator, rectifier (if equipped).

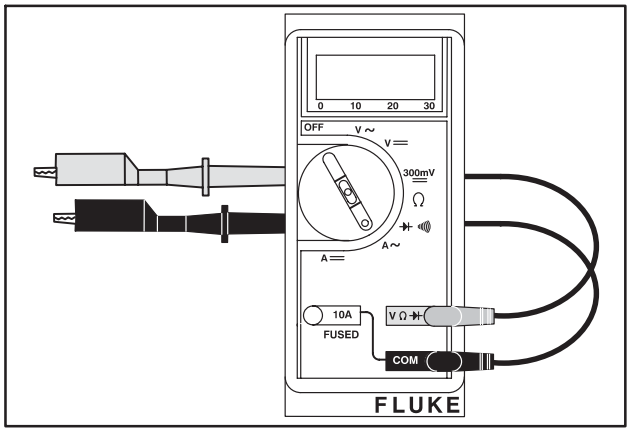


Fig. 8 – Digital Multimeter

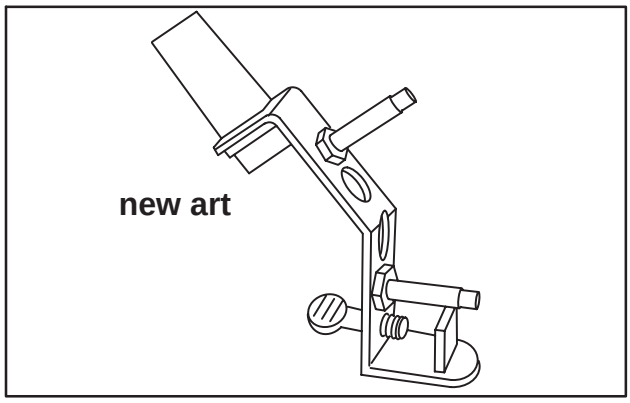


Fig. 9 – DC Shunt – Tool No. 19468

NOTE: Before testing the alternator's output (volts, amps), first use an accurate tachometer and temporarily adjust the engine speed to 3600 RPM.

WARNING: UPON COMPLETION of the alternator output test, always readjust the engine rpm to its correct top no load governed speed! Otherwise engine may exceed safe operating speed which could cause personal injury. Correct speed is found in the Service Engine Sales Manual Microfiche, MS-6225 or the Service Sales Manual, MS-4052.

AC ONLY ALTERNATOR

The AC alternator provides current for headlights only. Current for the lights is available as long as the engine is running. The output depends upon engine speed. 12 volt lights with a total rating of 60 to 100 watts may be used. With lights rated at 70 watts, the voltage rises from 8 volts at 2400 RPM to 12 volts at 3600 RPM, so the brightness of the light changes with the engine speed.

AC Output Test

1. Insert RED test lead into V Ω ⊣| receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to V ~ (AC volts) position.
4. Attach RED test lead clip to AC output terminal, Fig. 10.

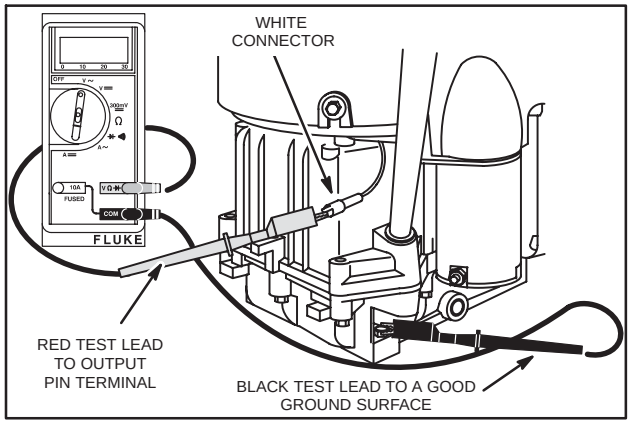


Fig. 10 – Testing AC Output

5. Attach BLACK test lead clip to engine ground.
6. With engine running at 3600 RPM, AC output should be no less than 14 volts.
7. If no or low output is found, replace the stator.

DC ONLY ALTERNATOR

The DC alternator provides DC current for charging a 12 volt battery. The current from the alternator is unregulated and is rated at 3 amps. The output rises from 2 amps at 2400 RPM, to 3 amps at 3600 RPM.

Recommended battery sizes range from 30 ampere hour for warm temperature service to 50 ampere hour in coldest service.

WHEN CHECKING ALTERNATOR COMPONENTS, MAKE THE TEST IN THE FOLLOWING SEQUENCE:

Alternator Output Test

1. Insert RED test lead into 10 A receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to A ⎓ (DC amps) position.
4. Attach RED test lead clip to DC output terminal, Fig. 11.
5. Attach BLACK test lead clip to positive (+) battery terminal.
6. With engine running at 3600 RPM, output should be between 2-4 amps DC.
   a. Output will vary with battery voltage. If battery voltage is at its maximum, output will be approximately 2 amps.
7. If no or low output is found, test diode.

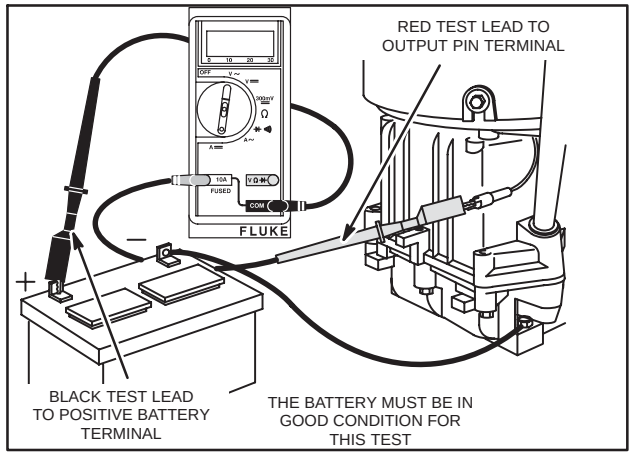


Fig. 11 – Testing DC Output

Diode Test

In the Diode Test position, the meter will display the forward voltage drop across the diode(s). If the voltage drop is less than 0.7 volts, the meter will "Beep" once as well as display the voltage drop. A continuous tone indicates continuity (shorted diode). An incomplete circuit (open diode) will be displayed as "OL."

1. Insert RED test lead into V Ω ⊣| receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to ⊣|))) (Diode Test) position.
4. Attach RED test lead clip to point "A" and BLACK test lead clip to point "B," Fig. 12. (It may be necessary to pierce wire with a pin as shown.)
   a. If meter "Beeps" once, diode is OK.
   b. If meter makes a continuous tone, diode is defective (shorted). Replace diode.
   c. If meter displays "OL," proceed to step 5.
5. Reverse test leads.

a. If meter “Beeps” once, diode is installed backwards. Replace diode.
b. If meter still displays “OL,” diode is defective (open). Replace diode.

6. If diode tests OK, check stator for bare wires or other obvious defects. If grounded leads are not visible, replace the stator.

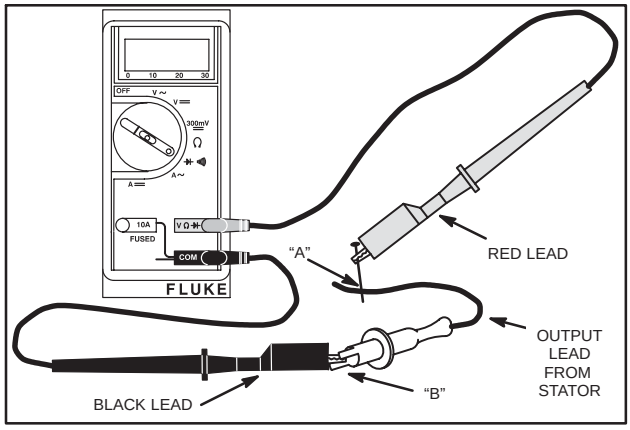


Fig. 12 – Testing Diode

NOTE: Service replacement diode harnesses are available. Use Resin Core solder when installing new harness. Use shrink tubing or tape all connections. DO NOT USE CRIMP CONNECTORS.

DUAL CIRCUIT ALTERNATOR

Dual circuit alternators use a single polarized plug with two pins. One pin is for charging the battery and the second is for the AC light circuit.

The dual circuit alternator provides DC current for battery charging and an independent AC circuit for headlights. The battery is not used for lights, so lights are available even if battery is disconnected or removed.

Current for lights is available as long as the engine is running. The output depends upon engine speed, so brightness of the lights changes with engine speed. 12 volt lights with a total rating of 60 to 100 watts may be used. With lights rated at 70 watts, the voltage rises from 8 volts at 2400 RPM to 12 volts at 3600 RPM.

The current from the DC side of the alternator is unregulated and is rated at 3 amps. The output rises from 2 amps at 2400 RPM to 3 amps at 3600 RPM.

Alternator Output Test

1. Insert RED test lead into 10 A receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to **A ⎓** (DC amps) position.
4. Attach RED test lead clip to DC output pin in connector, Fig. 13.

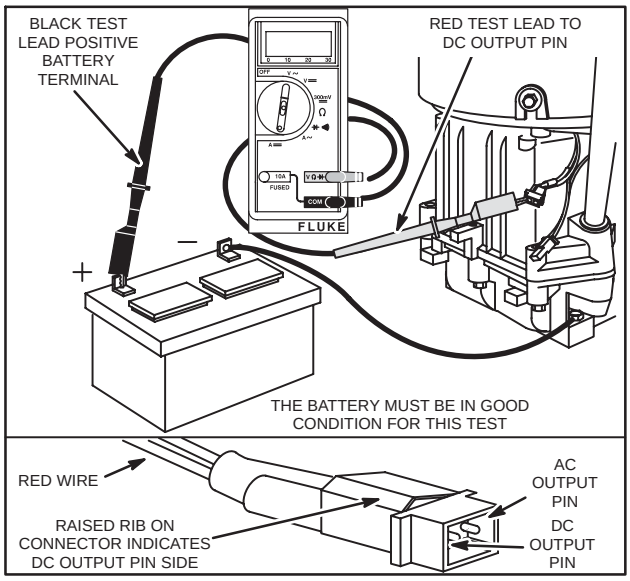


Fig. 13 – Testing DC Output

5. Attach BLACK test lead clip to positive (+) battery terminal.
6. With engine running at 3600 RPM output should be between 2-4 amps DC.
   a. Output will vary with battery voltage. If battery voltage is at its maximum, output will be approximately 2 amps.
7. If no output or low output is found, test diode.

Diode Test

In the Diode Test position, the meter will display the forward voltage drop across the diode(s). If the voltage drop is less than 0.7 volts, the meter will “Beep” once as well as display the voltage drop. A continuous tone indicates continuity (shorted diode) An incomplete circuit (open diode) will be displayed as “OL.”

1. Insert RED test lead into **V Ω ⊣◀** receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to ⊣◀ (Diode Test) position.
4. Attach RED test lead clip to point “A” and BLACK test lead clip to point “B,” Fig. 14. (It may be necessary to pierce wire with a pin as shown.)
   a. If meter “Beeps” once, diode is OK.
   b. If meter makes a continuous tone, diode is defective (shorted). Replace diode.
   c. If meter displays “OL,” proceed to step 5.
5. Reverse test leads.
   a. If meter “Beeps” once, diode is installed backwards. Replace diode.
   b. If meter still displays “OL,” diode is defective (open). Replace diode.

6. If diode tests OK, check stator for bare wires or other obvious defects. If grounded leads are not visible, replace the stator.

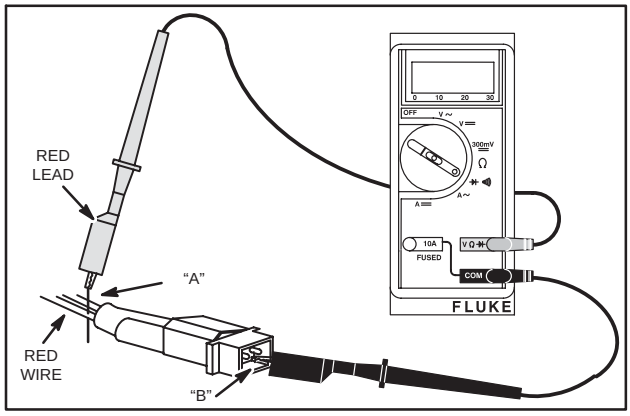


Fig. 14 – Testing Diode

NOTE: Service replacement diode harnessers are available. Use Resin Core solder when installing new harness. Use shrink tubing or tape all connections. DO NOT USE CRIMP CONNECTORS.

AC Output Test

1. Insert RED test lead into V Ω ⊣⊢ receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to V ~ (AC volts) position.
4. Attach RED test lead clip to AC output terminal, Fig. 15.

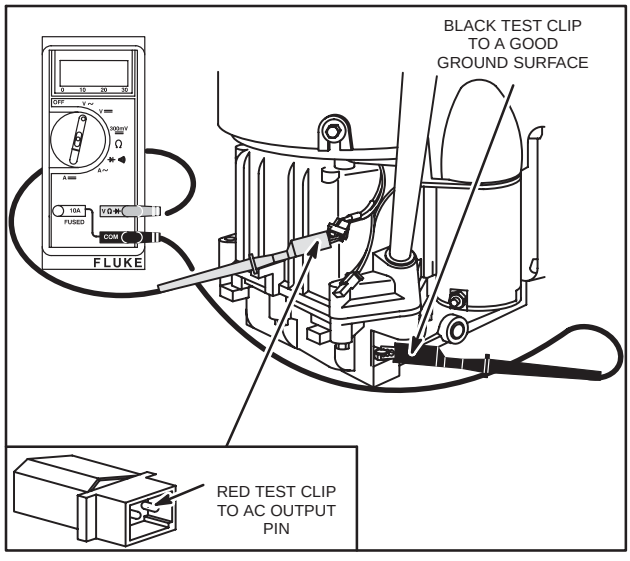


Fig. 15 – Testing AC Output

5. Attach BLACK test lead clip to engine ground.
6. With engine running at 3600 RPM output should be no less than 14 volts AC.
7. If no output or low output is found, replace stator.

TRI-CIRCUIT ALTERNATOR

The tri-circuit alternator provides alternating current through a single output lead and connector to a wiring harness containing two diodes.

One diode rectifies the AC current to 5 amps negative (-) DC for lights. The second diode rectifies the AC current to 5 amps positive (+) DC for battery charging and external loads, such as an electric clutch.

NOTE: Some equipment manufacturers supply the diodes as an integral part of the equipment wiring harness.

Some equipment manufacturers use a 1 OHM 20 WATT resistor placed in series with (+) DC charging lead, limiting the charging current to approximately 3 amps when the clutch is not engaged. When the clutch is engaged the resistor is bypassed allowing full output to the battery and clutch.

NOTE: The 1 OHM 20 WATT resistor is supplied by the equipment manufacturer.

The battery is not used for the lights, so lights are available even if the battery is disconnected or removed. Current for the lights is available as long as the engine is running. The output depends upon engine RPM, so the brightness of the lights changes with engine speed.

Alternator Output Test

1. Insert RED test lead into V Ω ⊣⊢ receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to V ~ (AC volts) position.
4. Attach RED test lead clip to output terminal, Fig. 16.

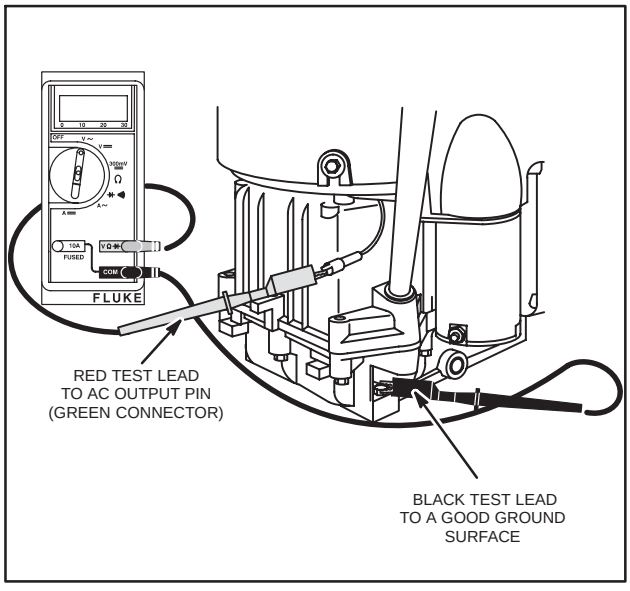


Fig. 16 – Testing Alternator Output

5. Attach BLACK test lead clip to engine ground.
6. With engine running at 3600 RPM, output should be no less than 28 volts AC.
7. If no output or low output is found, replace stator.
8. If alternator output is good, test diodes located in wiring harness.

Diode Test

NOTE: One diode is for the charging circuit and the other diode is for the lighting circuit.

In the Diode Test position, the meter will display the forward voltage drop across the diode(s). If the voltage drop is less than 0.7 volts, the meter will "Beep" once as well as display the voltage drop. A continuous tone indicates continuity (shorted diode) An incomplete circuit (open diode) will be displayed as "OL."

Charging Circuit (Red Wire)

1. Insert RED test lead into V Ω ⊣| receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to ⊣|))) (Diode Test) position.
4. Attach BLACK test lead clip to point “A,” (red wire) Fig. 17. (It may be necessary to pierce wire with a pin as shown.)
5. Insert RED test lead probe into harness connector.
   a. If meter “Beeps” once, diode is OK.
   b. If meter makes a continuous tone, diode is defective (shorted). Replace harness.
   c. If meter displays “OL,” proceed to step 6.
6. Reverse test leads.
   a. If meter “Beeps” once, diode is installed backwards. Replace harness.
   b. If meter still displays “OL,” diode is defective (open). Replace harness.

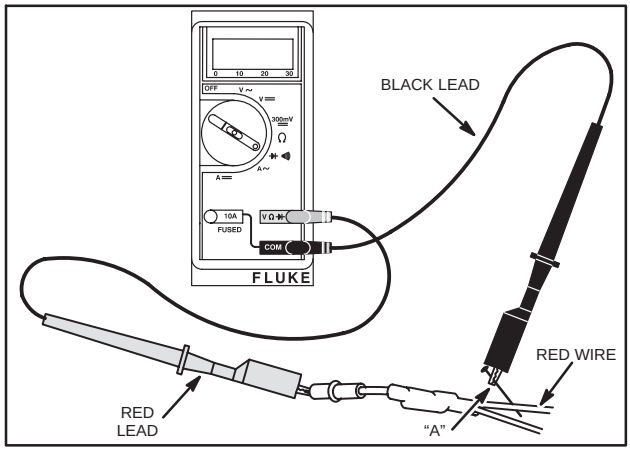


Fig. 17 – Diode Testing – Charging Circuit

Lighting Circuit (White Wire)

1. Insert RED test lead into V Ω ⊣| receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to ⊣|))) (Diode Test) position.
4. Attach RED test lead clip to point “A,” (white wire) Fig. 18. (It may be necessary to pierce wire with a pin as shown.)
5. Insert BLACK test lead probe into harness connector.
   a. If meter “Beeps” once, diode is OK.
   b. If meter makes a continuous tone, diode is defective (shorted). Replace harness.
   c. If meter displays “OL,” proceed to step 6.
6. Reverse test leads.
   a. If meter “Beeps” once, diode is installed backwards. Replace harness.
   b. If meter still displays “OL,” diode is defective (open). Replace harness.

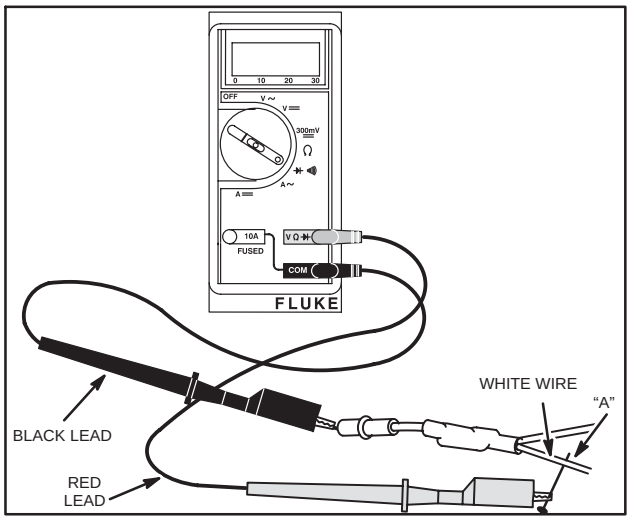


Fig. 18 – Diode Testing – Lighting Circuit

NOTE: Service replacement diode harnesses are available.

5 & 9 AMP REGULATED ALTERNATOR

The 5 & 9 amp regulated alternator systems provide AC current through a single lead to the regulator-rectifier. The regulator-rectifier converts the AC current to DC and regulates current to the battery. The charging rate will vary with engine RPM and temperature.

Alternator output (5 or 9 amp) is determined by the flywheel alternator magnet size. The stator and regulator-rectifier are the same for the 5 and 9 amp system.

The 5 & 9 amp regulated system and the Tri-Circuit system use the same stator.

WHEN CHECKING ALTERNATOR COMPONENTS, MAKE TESTS IN THE FOLLOWING SEQUENCE:

Alternator Output Test

Temporarily, disconnect stator wire harness from regulator-rectifier.

1. Insert RED test lead into V Ω ⊣| receptacle in meter.
2. Insert BLACK test lead into COM receptacle in meter.
3. Rotate selector to V ~ (AC volts) position.
4. Attach RED test lead clip to output terminal, Fig. 19.

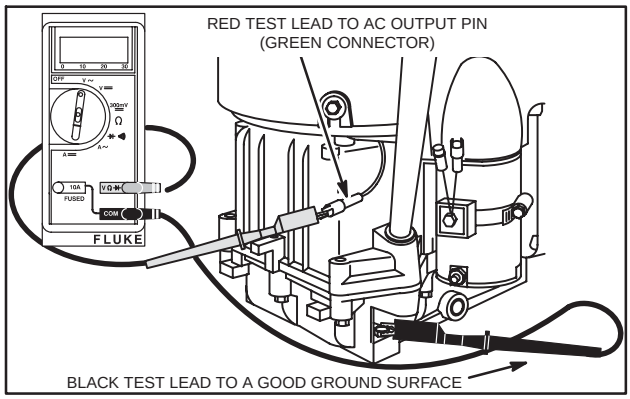


Fig. 19 – Testing AC Output

5. Attach BLACK test lead clip to engine ground.
6. With the engine running at 3600 RPM, AC output should be no less than:

28 Volts AC – 5 Amp System
40 Volts AC – 9 Amp System

7. If no or low output is found, replace the stator.

Test Regulator-Rectifier

NOTE: Regulator-rectifier will not function unless it is grounded to engine. Make sure the regulator-rectifier is securely mounted to engine.

When testing regulator-rectifier for amperage output, a 12 volt battery with a minimum charge of 5 volts is required. There will be no charging output if battery voltage is below 5 volts.

NOTE: Connect test leads before starting engine. Be sure connections are secure. If a test lead vibrates loose while engine is running, the regulator-rectifier may be damaged. Connect stator wire harness to regulator-rectifier.

1. Insert RED test lead into 10 A receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to **A ⎓** (DC amps) position.
4. Attach RED test lead clip to red DC output terminal on regulator-rectifier, Fig. 20.

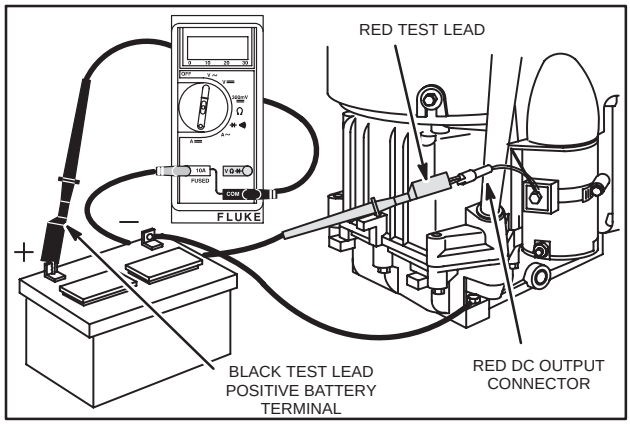


Fig. 20 – Testing Regulator-Rectifier

5. Attach BLACK test lead clip to positive (+) battery terminal.
6. With the engine running at 3600 RPM. The output should be:

*** 3 – 5 Amps – 5 Amp System**
*** 3 – 9 Amps – 9 Amp System**

* Depending upon battery voltage. For example, if the battery voltage was below 11 volts, the output reading would be 5 or 9 amps, depending upon the alternator system being tested. If battery voltage is at its maximum, the amperage will be less.

7. If no or low output is found, be sure that regulator- rectifier is grounded properly and all connections are clean and secure. If there is still no or low output, replace the regulator-rectifier.

10 & 16 AMP REGULATED ALTERNATOR

The 10 or 16 amp regulated alternator system provides AC current through two output leads to the regulator-rectifier. The regulator-rectifier converts the AC current to DC, and regulates the current to the battery. The charging rate will vary with engine RPM and temperature.

Alternator output (10 or 16 amp) is determined by flywheel alternator magnet size. Therefore, stator and regulator-rectifier are the same for the 10 and 16 amp system.

WHEN CHECKING THE ALTERNATOR COMPONENTS, MAKE THE TESTS IN THE FOLLOWING SEQUENCE:

Alternator Output Test

Temporarily, disconnect stator wire harness from regulator-rectifier.

1. Insert RED test lead into **V Ω ⊣|** receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to **V ∼** (AC volts) position.
4. Insert RED and BLACK test lead probes into output terminals in yellow connector, as shown in Fig. 21. (Meter test clip leads may be attached to either terminal.)

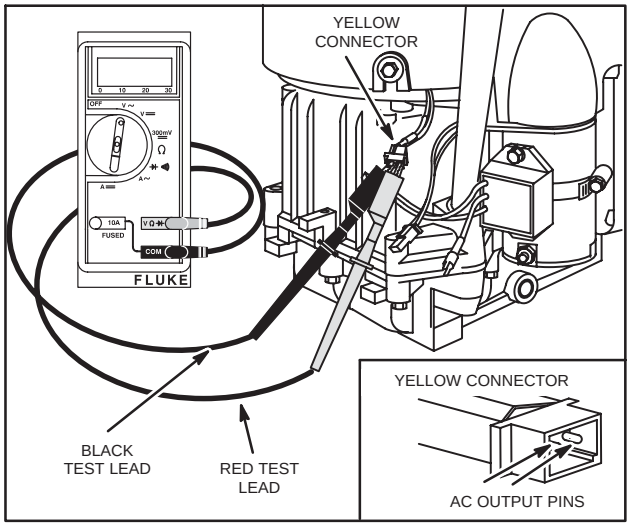


Fig. 21 – Testing AC Output

5. With the engine running at 3600 RPM output should be no less than:

20 Volts – 10 Amp System
***30 Volts – 16 amp System**

*****If alternator output test indicates a 16 amp system, see special instructions for testing regulator-rectifier.

6. If no or low output is found. check for bare wires or any other obvious defects. If “shorted” leads are not visible, replace the stator.

Test Regulator-Rectifier

NOTE: The Digital Multimeter will withstand DC input of 10-20 amps for up to **30** seconds. When checking DC output on 16 amp regulated system, use DC Shunt, Tool #19468, to avoid blowing fuse in meter. See special instructions for installation procedure on 16 amp system.

NOTE: Regulator-rectifier will not function unless it is grounded to engine. Make sure the regulator-rectifier is securely mounted to engine.

When testing regulator-rectifier for amperage output, a 12 volt battery with a minimum charge of 5 volts is required. There will be no charging output if battery voltage is below 5 volts.

NOTE: Connect test leads before starting engine. Be sure connections are secure. If a test lead vibrates loose while engine is running, the regulator-rectifier may be damaged.

Testing Regulator-Rectifier 10 Amp System

Connect stator wire harness to regulator-rectifier.

1. Insert RED test lead into 10 A receptacle in meter.
2. Insert BLACK test lead into **COM** receptacle in meter.
3. Rotate selector to **A** ⎓ (DC amp) position.
4. Attach RED test lead clip to red DC output terminal on regulator-rectifier, Fig. 22.

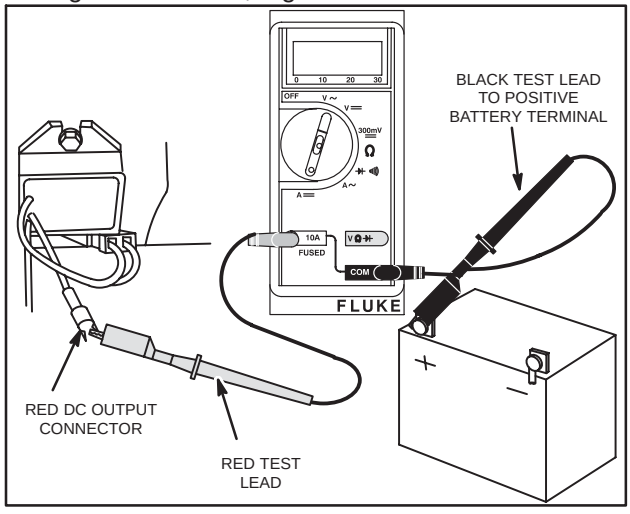


Fig. 22 – Testing Regulator-Rectifier

5. Attach BLACK test lead clip to positive (+) battery terminal.
6. With the engine running at 3600 RPM. The output should be:

*** 3 – 10 Amps – 10 Amp System**

*Depending upon battery voltage. For example, if the battery voltage was below 11 volts, the output reading would be 10 amps. If battery voltage is at its maximum, the amperage will be less.

7. If no or low output is found, be sure that regulator-rectifier is grounded properly and all connections are clean and secure. If there is still no or low output, replace the regulator-rectifier.

Testing Regulator-Rectifier – 16 Amp System

To avoid blowing fuse in meter when testing DC output of 16 amp system the DC Shunt, Tool #19468 is required.

The DC Shunt **must** be installed on the **negative** (-) terminal of the battery, Fig. 23. All connections must be clean and tight for correct amperage readings.

Connect stator wire harness to regulator-rectifier.

1. Install shunt on negative battery terminal.
2. Insert RED test lead into **V** Ω ⊣⊢ receptacle in meter and insert into RED terminal on shunt, Fig. 23.
3. Insert BLACK test lead into **COM** receptacle in meter and insert into BLACK terminal on shunt.
4. Rotate selector to **300mV** ⎓ position.

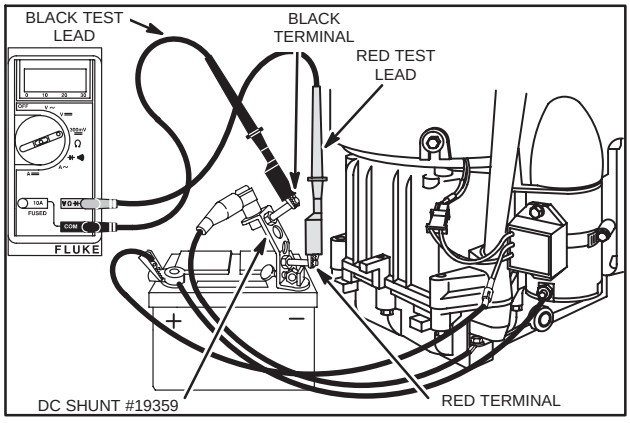


Fig. 23 – Testing Regulator-Rectifier 16 Amp System With DC Shunt

5. With the engine running at 3600 RPM, the output should be:

*** 3 – 16 Amps – 16 Amp System**

* Depending upon battery voltage. For example, if the battery voltage was below 11 volts, the output reading would be 16 amps. If battery voltage is at its maximum, the amperage will be less.

6. If no or low output is found, be sure that regulator-rectifier is grounded properly and all connections are clean and secure. If there is still no or low output, replace the regulator-rectifier.

Regulator-Rectifier With Charge Indicator

Regulator-rectifier Part #493219, Fig. 24, is used by some equipment manufacturers that have a charging indicator light instead of an ammeter. In addition to the red DC output wire, the regulator-rectifier is equipped with a blue wire which is used to activate a charging indicator light when battery voltage is below 12 volts.

The charging indicator light should light when the key switch is in the ON position; engine not running. With engine running, the charging indicator light should go out, indicating that the charging circuit is operating, providing that battery voltage is above 12 volts.

The charge indicator light and all wiring is supplied by the equipment manufacturer. See typical wiring diagram, page 13.

DC charging output values and test procedures are the same as those listed for the 10 amp or 16 amp system.

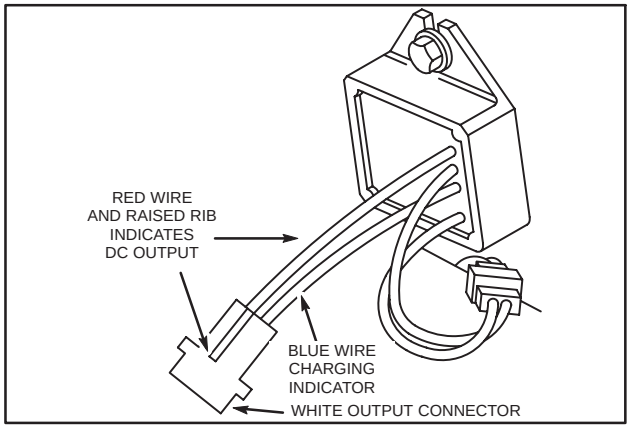
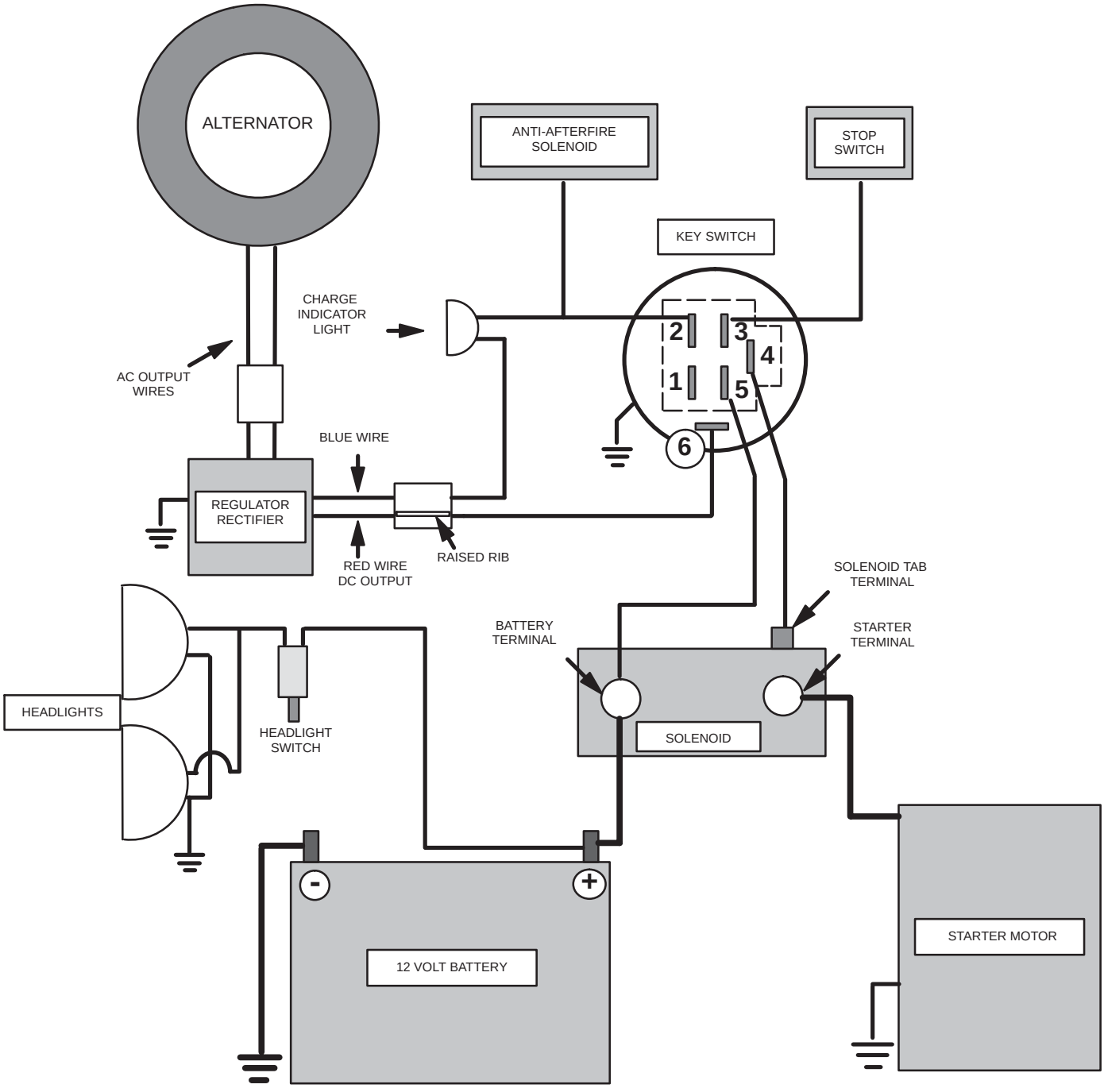


Fig. 24 – 493219 Regulator/ Rectifier

7

TYPICAL 16 AMP REGULATED ALTERNATOR WIRING DIAGRAM – 6 POLE SWITCH WITH CHARGE INDICATOR LIGHT



Key Switch Test

Switch Position	Continuity
1. OFF	*1 + 3 + 6
2. RUN	2 + 5 + 6
3. START	2 + 4 + 5

* TERMINAL 1 GROUNDED INTERNALLY TO KEY SWITCH CASE

Terminal No.	Function
1	To Ground (used only with insulated panel)
2	To Carburetor Solenoid
3	To Stop Switch Terminal On Engine
4	To Solenoid (tab terminal)
5	To Battery (battery terminal on solenoid)
6	To Alternator (DC Output)

Testing Charge Indicator

It is important that the test procedure be done in a systematic manner to identify whether the problem is related to the regulator/rectifier or the charging indicator wiring system. Follow test procedure in the sequence listed.

A known good battery is required for this test.

BEFORE TESTING THE CHARGING INDICATOR SYSTEM, TEST THE ALTERNATOR AND REGULATOR/RECTIFIER FOR CORRECT OUTPUT.

NOTE: Output values are the same as the 10 amp and 16 amp system.

Symptom: Charge Indicator Light Will Not Light Key Switch On – Engine Not Running

A jumper wire is required for this test.

Make sure key switch is in OFF position before connecting jumper wire.

IMPORTANT: Before disconnecting output harness from connector, mark or identify the charging indicator wire in the output harness. If jumper wire contacts charging output wire during test, while key switch is in ON position, wiring harness may be damaged.

1. Disconnect output harness at white connector.
2. Attach one end of jumper wire to a good ground.
3. Attach other end of jumper wire to charge indicator terminal in harness connector, Fig. 25.
   a. Turn keyswitch to ON position.
   b. If bulb lights, charge indicator wiring system is OK. Replace regulator/rectifier.
   c. If bulb does not light, replace bulb.
   d. If new bulb does not light, the problem must be a broken wire (open circuit) in charging indicator circuit. Refer to typical wiring diagram, page 13.

7

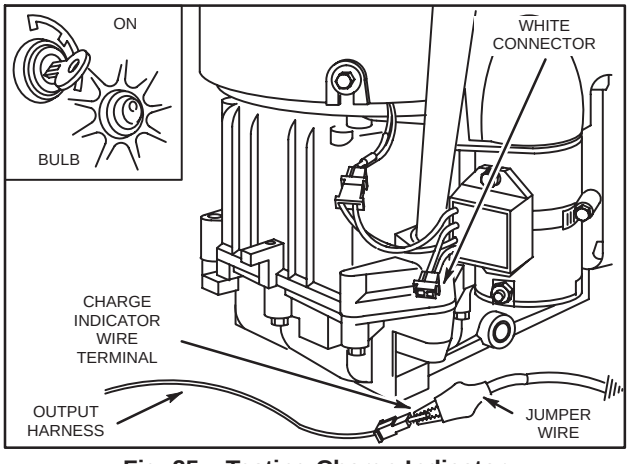


Fig. 25 – Testing Charge Indicator

Symptom: Charge Indicator Light Stays On – Engine Running

NOTE: Indicator light will remain on if battery voltage is below 12 volts.

1. Check indicator light wiring.
   a. If wiring is grounded, light will remain on when engine is running.
   b. If wiring is OK, replace regulator/rectifier.

BATTERIES

The battery is of the 12 volt, lead acid, wet cell type. This type is available as a maintenance free or a dry charged battery.

The maintenance-free battery is filled with electrolyte at the time of manufacture. The level of electrolyte cannot be checked, Fig. 26.

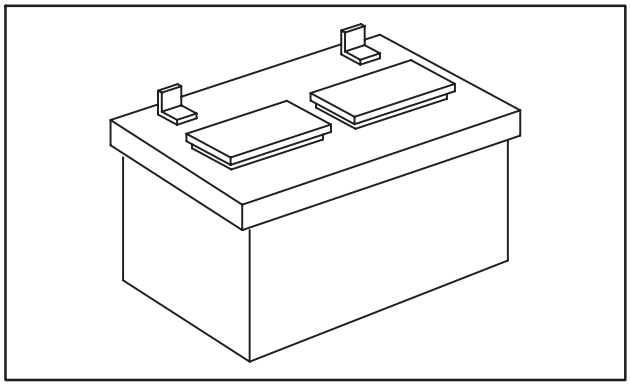


Fig. 26 – Typical Wet Charge Battery

The dry charged battery is manufactured with fully charged plates. Electrolyte must be added at the time that the battery is placed in service. Before activating a dry charged battery, read and follow the manufacturer's recommended procedure.

Recommended battery sizes range from a minimum 30 ampere hour for warm temperature service to 50 ampere hour in coldest service.

WARNING: BATTERIES PRODUCE HYDROGEN, AN EXPLOSIVE GAS. Do not store, charge or use a battery near an open flame or devices which utilize a pilot light or can create a spark.

Installation

1. Before installing battery, connect all equipment to be operated. Fig. 27.
2. Place battery in holder with a flat base. Tighten hold downs evenly until snug. DO NOT overtighten.
3. Connect positive terminal to positive post FIRST to prevent sparks from accidental grounding. Tighten connectors securely.
4. Install protective cover over positive battery terminal ends.
5. Connect negative terminal to negative battery terminal. Tighten connectors securely.

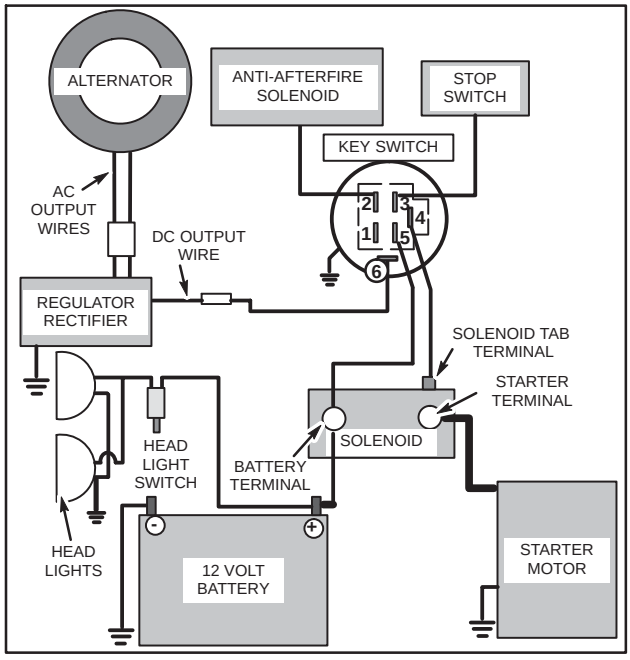


Fig. 27 – Typical 12 V Wiring Diagram

Checking Battery

1. Physical check – clean if necessary.
   a. Corrosion
   b. Dirt
   c. Terminal and clamps (secure – good conditions)
2. Bring battery to full charge.

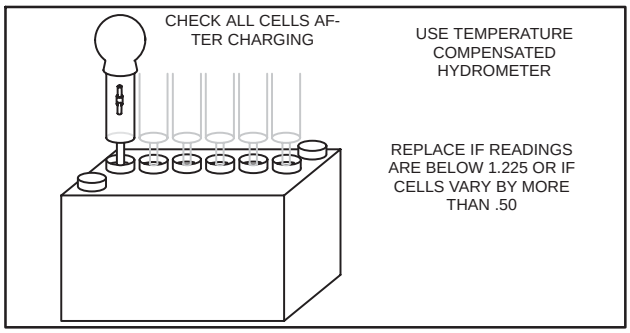


Fig. 28 – Checking 12 V Battery Cells (Lead Acid, Wet Cell, With Fill Caps)

DO NOT EXCEED CHARGE RATE OF 1/10 AMPERE FOR EVERY AMPERE OF BATTERY RATING. Consult battery manufacturer for charging recommendations. Overcharging may cause battery failure.

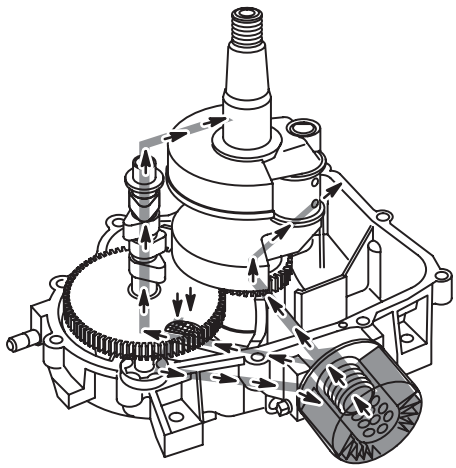
   a. Use a taper charger (automatically reduces charge rate).
   b. Fill battery cells with distilled water or tap water (unless maintenance free type) after charging (for batteries that have been in service). NOTE: If battery gets “hot” to the touch or is spitting acid (gassing) excessively, unplug charger periodically.

3. With battery fully charged, check specific gravity readings (unless maintenance free type) of each cell with a Battery Hydrometer and record readings (Fig. 28).

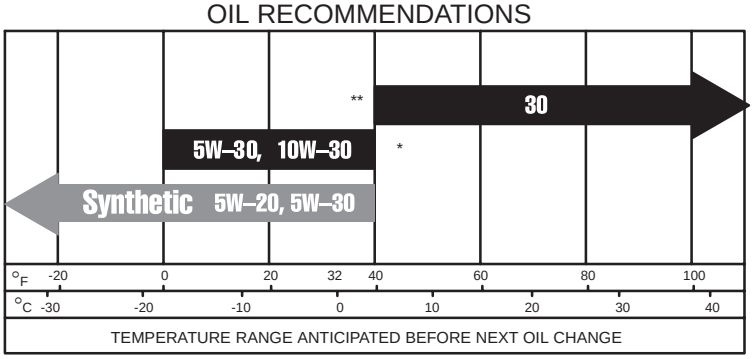
All readings should be above 1.250 (compensating for temperature). If specific gravity readings varied .50 or if ALL cells read less than 1.225, replace battery.

Section 8
Lubrication System

Section Contents



OIL RECOMMENDATIONS



Use a high quality detergent oil classified ‘‘For Service SE’’ or higher. Use no special additives with recommended oils.

8

DESCRIPTION

Briggs & Stratton Intek™ OHV V-Twins use a full pressure lubrication system with an oil filter. The gear driven oil pump draws oil from a screened oil pickup in the sump and pumps the oil through the oil filter.

The filtered oil flows through oil galleries in the sump and is distributed to the main bearings, connecting rod bearings and camshaft bearings. Engine oil pressure will vary with oil viscosity, ambient air temperature differences, operating temperatures and engine load. Follow the oil recommendation on page 1 of this section.

Oil Pressure – @ 70° F (21° C): 15 ~ 50 psi (1.0 ~ 3.5 Bar)

A pressure relief valve limits the maximum oil pressure in the system.

An optional oil pressure switch is available. The switch may be used to activate a warning device if oil pressure drops below approximately 5 psi (0.07 Bar) The warning device and all wiring is supplied by the equipment manufacturer.

CHANGE OIL

Change oil and filter after first 8 hours of operation. Thereafter, change oil and filter every 50 hours of operation. Change oil and filter more often if engine is operated in dusty or dirty conditions or if engine is operated under heavy loads or high ambient air temperatures.

Remove oil drain plug and drain oil while engine is still warm, Fig. 1. Install and torque drain plug to 125 in. lbs. (14.0 Nm).

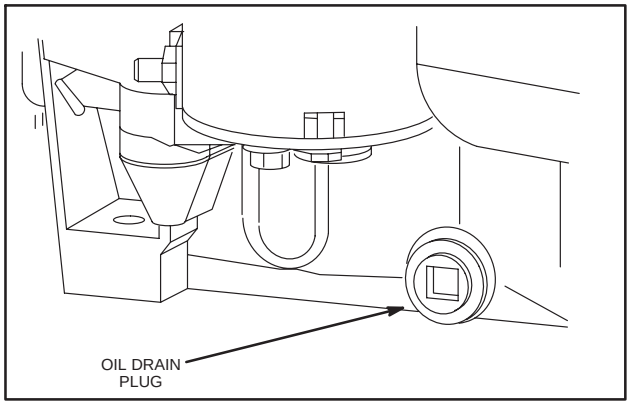


Fig. 1 – Oil Drain Plug

Remove oil fill cap and refill with oil of recommended grade and viscosity. See page 1.

Oil Capacity: 4.0 pints (1.9 liters) with filter
3-3/4 pints (1.8 liters) without filter

Fill to FULL mark on dipstick, Fig. 2. DO NOT OVERFILL. Overfilling sump can cause a smoking or overheating condition due oil foaming.

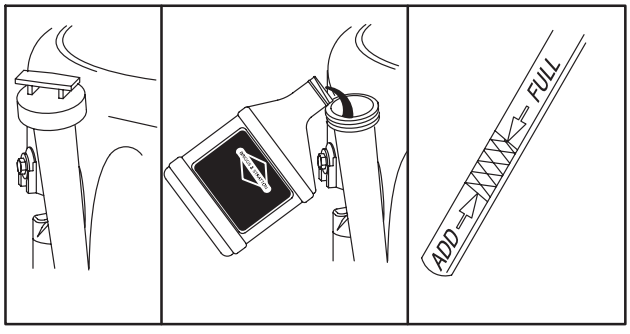


Fig. 2 – Oil Fill

CHANGE OIL FILTER

Change oil filter every 100 hours of operation or every season.

Before installing new filter, lightly oil filter gasket with fresh clean engine oil.

Note: Hand tighten 1/2 turn after gasket contacts mounting surface.

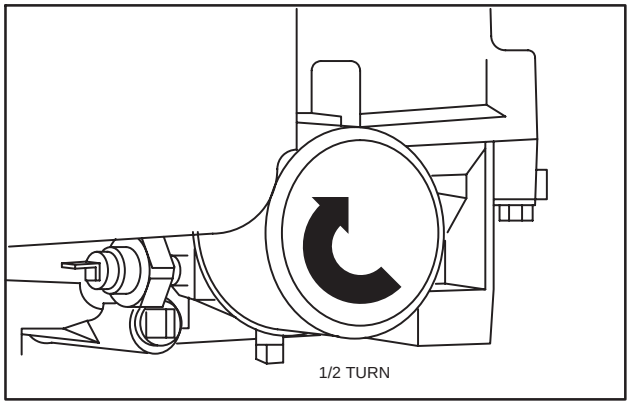


Fig. 3 – Replacing Oil Filter

OIL FILL TUBE AND DIPSTICK

The oil fill tube and the dipstick are equipped with an "O"-ring for proper sealing, Fig. 4.

Note: a leak at the seal between the tube and sump, or at the seal at the upper end of the dipstick, can result in a loss of crankcase vacuum and a discharge of oil or smoke through the muffler.

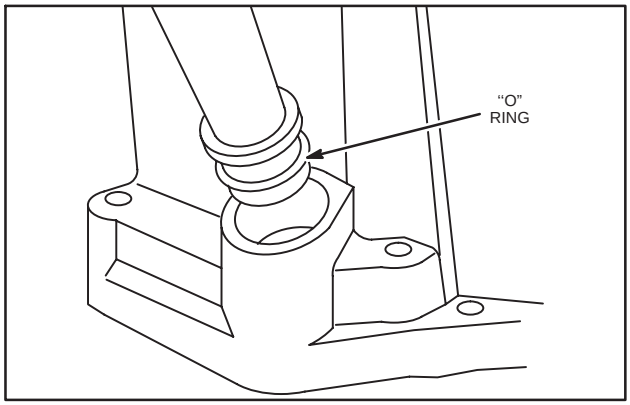


Fig. 4 – Oil Fill Tube And Dipstick

CHECK PRESSURE SWITCH

Use Digital multimeter, Tool #19464. Set meter to test for continuity.

Remove pressure switch for testing. Connect one continuity tester lead to the switch terminal and the other tester lead to the metal body of the switch, Fig. 5. The tester should indicate continuity when no pressure is applied to the switch. The switch should open (no continuity) when approximately 4.5 PSI (0.3 Bar) is applied. Replace the switch if test results are not to specification.

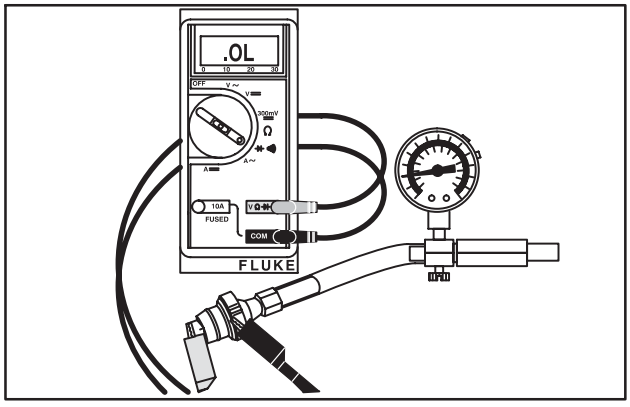


Fig. 5 – Checking Pressure Switch

CHECK OIL PRESSURE

1. Oil level must be between the LOW and FULL mark on dipstick. If oil level is low, check for leaks and add to FULL mark.
2. Remove pressure switch or 1/8" NPTF plug in oil filter adapter.
3. Install oil pressure gauge, Fig. 6.
4. Start and run engine for approximately 5 minutes.
5. Check oil pressure at 3000 RPM.

Oil Pressure @ 70° F (21° C): 15 ~ 50 psi (1.0 ~ 3.5 Bar)

See chart below for troubleshooting guide.

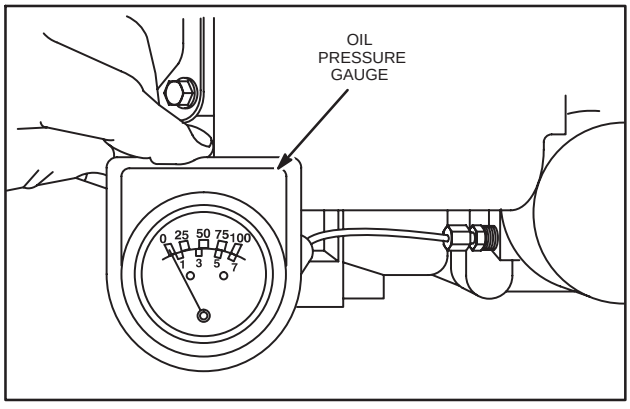


Fig. 6 – Checking Oil Pressure

Low Oil Pressure
Engine RPM Too Low
Wrong Viscosity or Diluted Oil
Low Oil Level
Broken Pressure Relief Spring
Missing Pressure Relief Plunger
Worn Bearings
Damaged Or Defective Oil Pump

High Oil Pressure
Wrong Viscosity Oil
Plugged Oil Galleries
Stuck Pressure Relief Plunger

CRANKCASE BREATHER

The crankcase breather is equipped with a reed valve to control and maintain a partial vacuum in the crankcase. The breather is vented to the intake elbow.

The breather chamber contains a removable oil vapor collector. Oil vapor is condensed on the collector material and drains back into the crankcase, which minimizes the amount of oil vapor entering the breather.

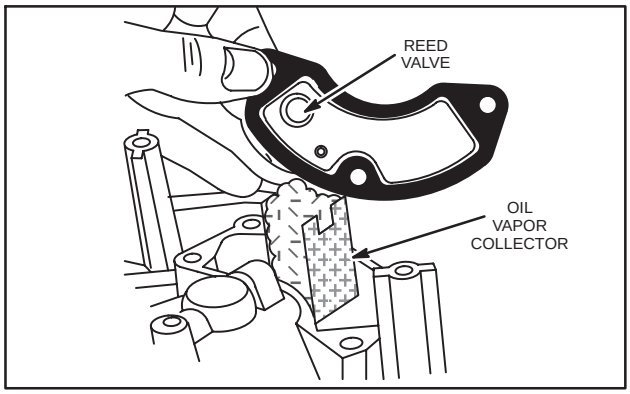


Fig. 7 – Crankcase Breather

CHECK BREATHER

Remove rotating screen, blower housing and flywheel. See Section 2.

1. Disconnect breather tube from intake elbow, remove three screws and breather. Discard gasket.
2. Check to see that reed valve is not deformed, Fig. 8.
   Note: Reed valve must make a complete seal around vent hole.
3. Remove oil vapor collector and retainer.
4. Check collector for deterioration and replace if necessary.

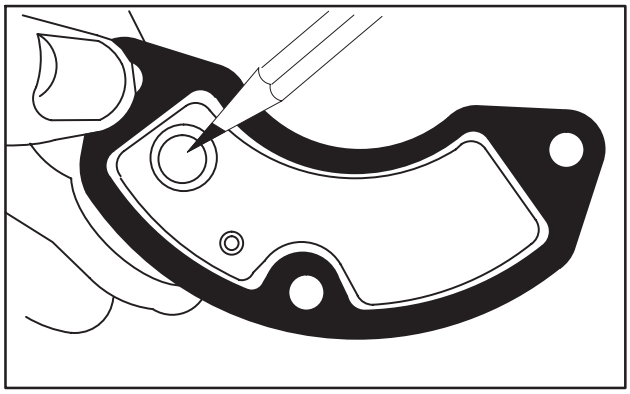


Fig. 8 – Checking Breather

INSTALL BREATHER

1. Install oil vapor collector and retainer.
   Note: Push oil vapor collector and retainer in until it bottoms.
2. Install breather with new gasket, Fig. 9.
   a. Torque screws to 55 in. lbs. (7.0 Nm).
   b. Assemble breather tube to intake elbow.

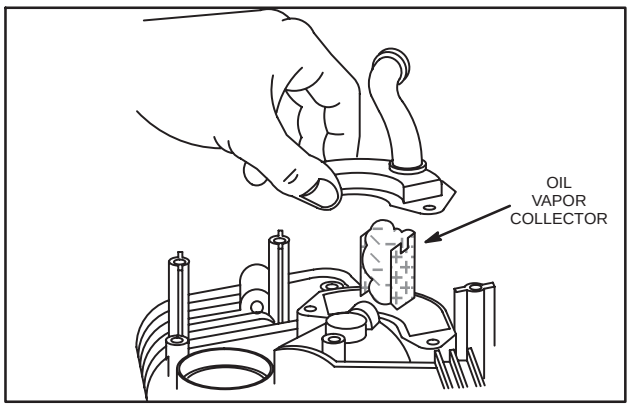


Fig. 9 – Install Breather

DISASSEMBLE OIL PUMP

Drain oil and remove oil filter. Remove engine from equippment. Remove spark plugs.

The oil pump can be inspected or replaced without removing the sump.

1. Remove the following parts, Fig. 10.
   a. Remove oil pump cover
   b. Remove inner rotor.
   c. Remove outer rotor.
   d. Remove shaft.
   e. Remove and discard O-ring

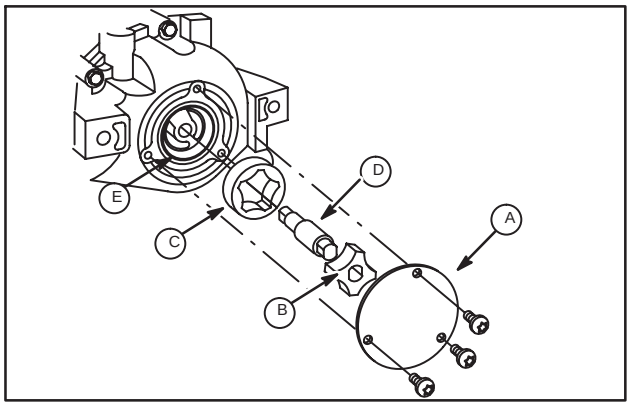


Fig. 10 – Remove Oil Pump

2. Check rotors and shaft for any obvious wear and/or damage, Fig. 11. Replace as necessary.

If pump housing is worn or damaged the sump must be replaced.

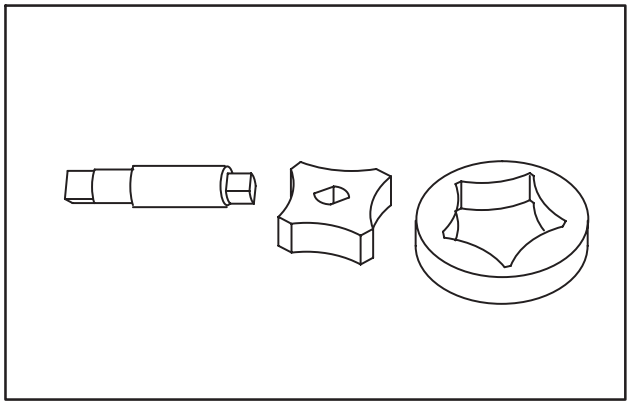


Fig. 11 – Checking Oil Pump

ASSEMBLE OIL PUMP

1. Lubricate oil pump components with engine oil and assemble to sump, Fig. 12. Make sure drive shaft is engaged in camshaft.
   a. Install drive shaft.
   b. Install inner rotor.
   c. Install outer rotor.
   d. Install new O-ring.
   e. Install oil pump cover.
2. Torque screws to 50 in. lbs. (6.0 Nm).

The oil pump is virtually trouble free and requires very little maintenance.

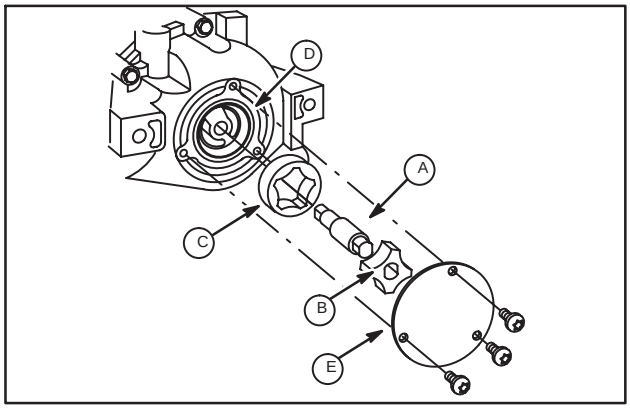
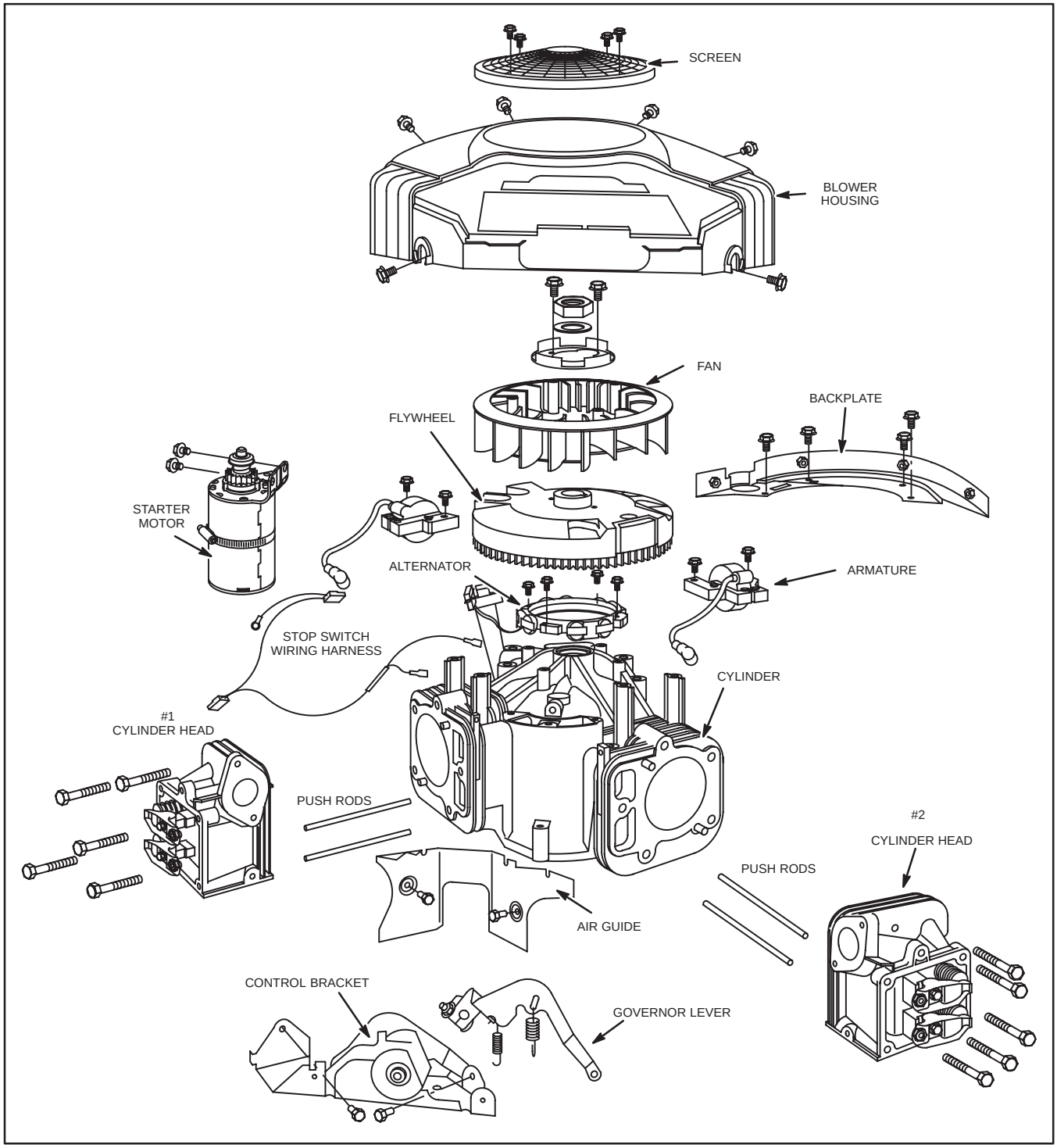
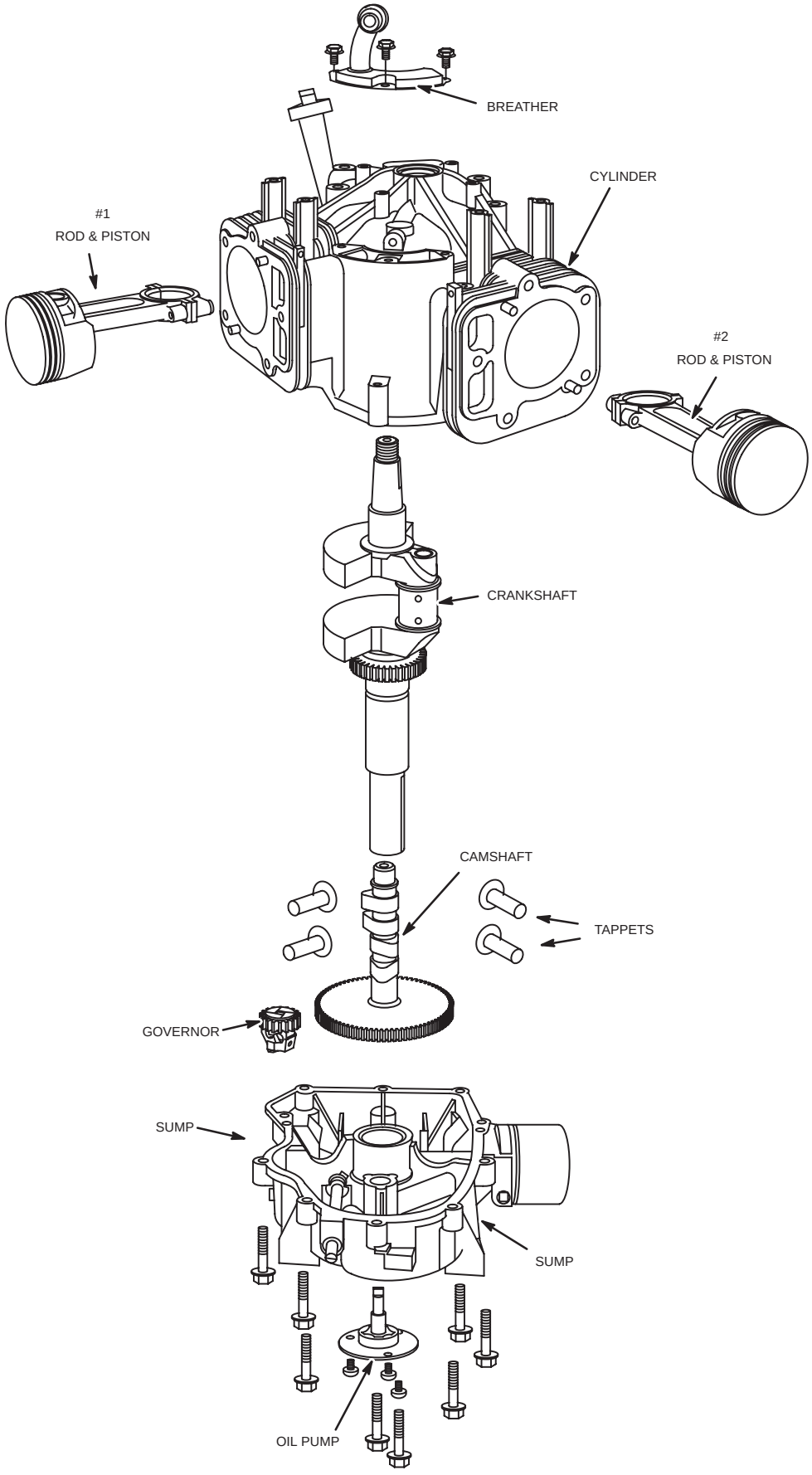


Fig. 12 – Assembling Oil Pump

Section 9
Engine Disassembly




BREATHER
CYLINDER
#1
ROD & PISTON
#2
ROD & PISTON
CRANKSHAFT
CAMSHAFT
TAPPETS
GOVERNOR
SUMP
SUMP
OIL PUMP

9

ENGINE DISASSEMBLY

Drain oil, remove oil filter and remove engine from equipment. Remove spark plugs. Remove cylinder heads. See Section 5. Remove flywheel, disconnect stop switch wires at armatures and remove armatures. See Section 2.

1. Remove the following parts, Fig. 1.
   a. Back plate
   b. Air guide
   c. Starter motor
   d. Oil filltube and dipstick
   e. Stop switch wiring harness
   f. Breather and oil vapor collector
   g. Alternator

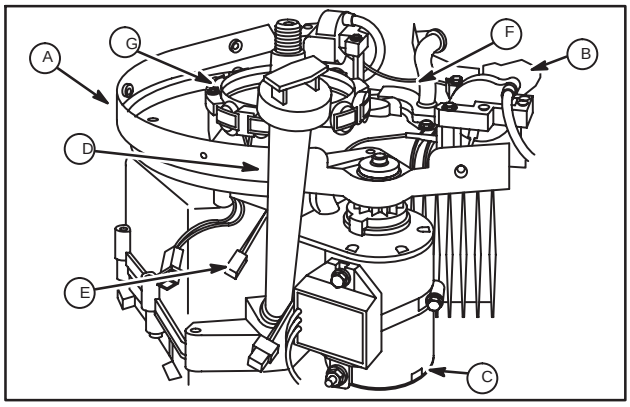


Fig. 1 – Remove Back Plate And Starter Motor

2. Remove oil pump. Fig. 2.
   a. Oil pump cover
   b. Inner rotor
   c. Outer rotor
   d. Drive shaft

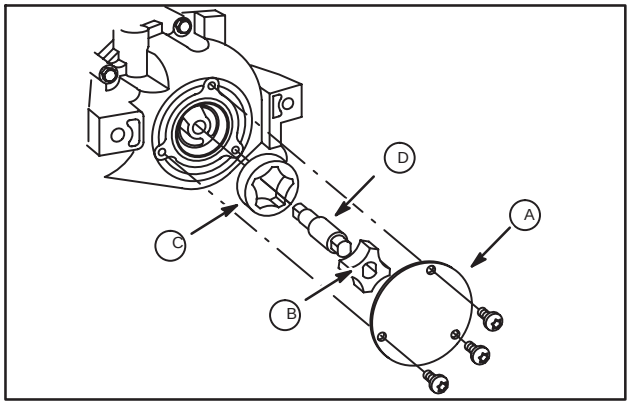


Fig. 2 – Remove Oil Pump

3. Remove sump and discard gasket, Fig. 3.
   a. Remove governor gear and thrust washer.

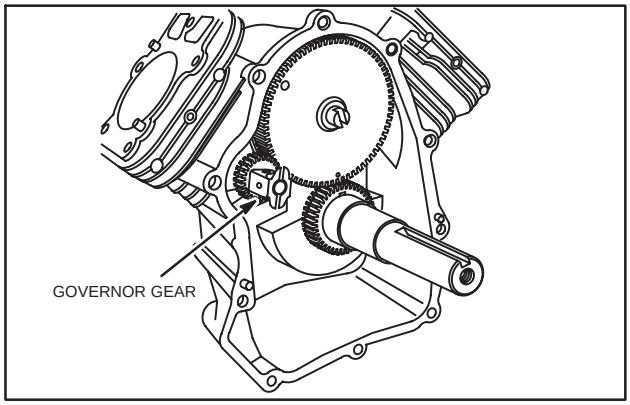


Fig. 3 – Remove Sump

4. Rotate crankshaft and camshaft until timing marks align and remove camshaft, Fig. 4.
   a. Remove tappets.

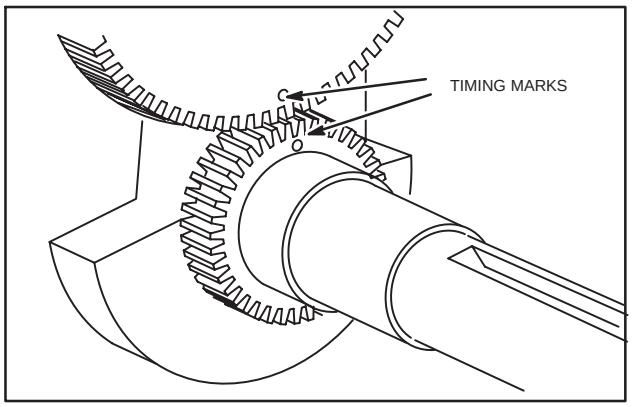


Fig. 4 – Align Timing Marks

Note: Remove any carbon or ridge at the top of cylinder bores to prevent breaking rings when removing piston and connecting rod assemblies.

5. Remove No. 2 connecting rod cap and push connecting rod and piston assembly out of cylinder.
   a. Reassemble cap to rod to prevent interchanging.
6. Repeat for other cylinder.

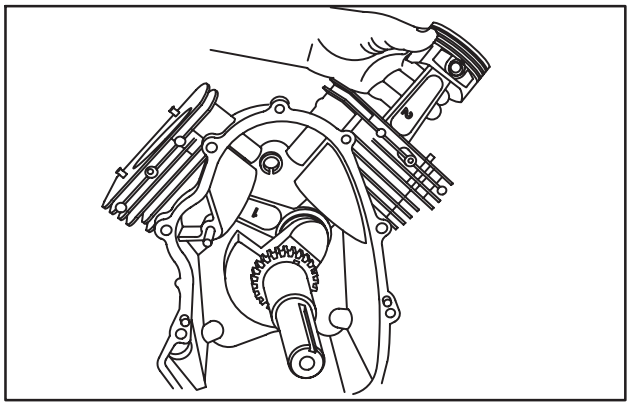


Fig. 5 – Remove Piston And Connecting Rod

7. Remove crankshaft.

CLEAN ALL SURFACES OF GASKET MATERIAL. REMOVE OIL SEALS AND THOROUGHLY CLEAN COMPONENTS IN SOLVENT. ORGANIZE COMPONENTS, KEEPING PARTS WHICH ARE AN ASSEMBLY TOGETHER.

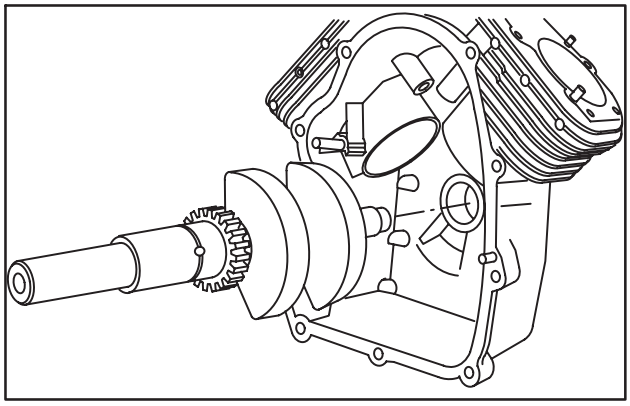


Fig. 6 – Remove Crankshaft

Section 10
Cylinder And Crankcase Cover Inspection And Repair

Section Contents **Page**

Check cylinder for cracks, stripped threads or broken fins. Check cylinder bores for damage or scoring.

1. Check cylinder head mounting surface for distortion with a straight edge, Fig. 1.

If mounting surfaces are distorted more than .004" (0.1 mm), the cylinder must be replaced.

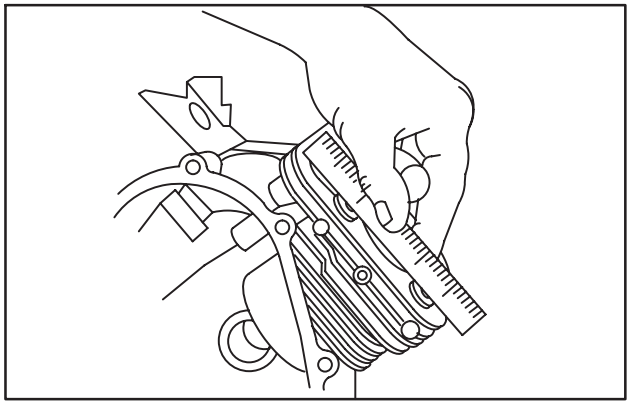


Fig. 1 – Checking Cylinder

2. Check cylinder bores for wear using telescoping gauge, Tool #19404 and dial caliper, Tool #19199.

Standard Bore Size
Model 405770: 2.969"-2.970" (75.41-75.43 mm)
Model 445770: 3.119"-3.120" (79.22-79.25 mm)

   a. Measure cylinder bore in 6 points at right angles as shown, Fig. 3.
   b. If cylinder bore is worn more than .003" (0.075 mm) or more than .0015" (0.035 mm) out of round, it must be resized.

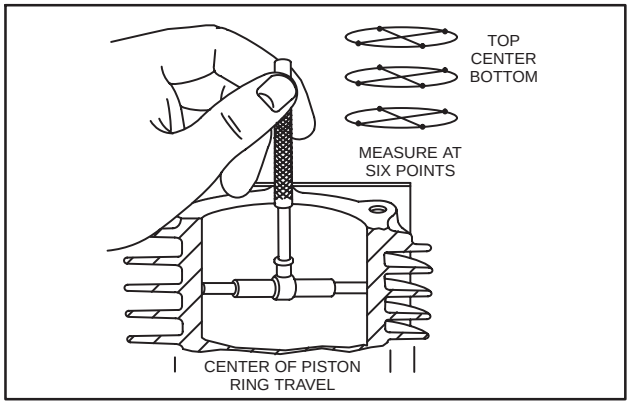


Fig. 2 – Check Cylinder Bore

Note: If cylinder bores are within specification and show no signs of scoring or other damage, new piston rings may be installed providing the cylinder bores are reconditioned using a rigid hone with finishing stones, to restore the proper cross hatch angle in the cylinder bores. The proper cylinder cross hatch ensures proper lubrication and piston ring break in.

Refer to Page 2, “Cylinder Finish” (Cross Hatch) for correct procedure for installing cross hatch.

Resizing

Always resize to exactly .010” (25 mm) or .020” (.51 mm) or .030” (.76 mm) over standard bore size. If this is done accurately, the service oversize rings and pistons will fit perfectly and proper clearances will be maintained.

Cylinders can be quickly resized with a good hone such as Briggs & Stratton Tool #19205. Contact your Briggs & Stratton source of supply. Use the stones and lubrication recommended by the hone manufacturers to produce the correct cylinder cross hatch.

NOTE: Automatic transmission fluid is an acceptable honing oil. Another acceptable honing oil can be made by mixing 4 parts No. 30 weight oil with 1 part kerosene.

If a boring bar is used, a hone must be used after the boring operation to produce the proper cylinder cross hatch.

Honing is done with a variable speed 1/2”, portable drill and a honing fixture. See page 5 for dimensions to make your own honing fixture.

Use three crankcase cover mounting screws and fasten cylinder to a honing fixture, Fig. 3.

Clamp honing fixture and cylinder securely in a vise at a convenient work height. Place hone drive shaft in chuck of portable drill and tighten.

Cut a wood block and place inside cylinder to prevent hone from extending further than 3/4” to 1” (19 mm to 25 mm) below cylinder bore.

Place hone in middle of cylinder bore. Tighten adjusting knob with finger until stones fit snugly against cylinder wall. DO NOT FORCE. Connect drive shaft to hone. Be sure that cylinder and hone are centered and aligned with drive shaft and drill spindle.

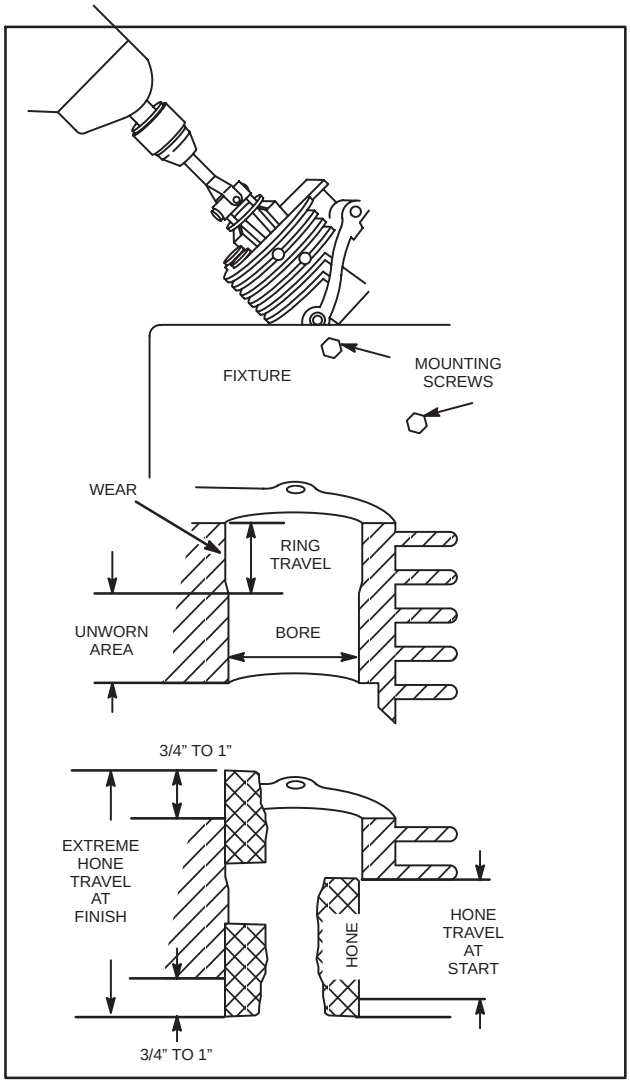


Fig. 3

Lubricate hone as recommended by hone manufacturer. The recommended drill speed is 300 to 700 RPM MAXIMUM and 40-60 strokes per minute. Because cylinder bores normally wear only in the area of ring travel, the cylinder bore will be round above and below ring travel, Fig. 3. Start drill and, as hone spins, move it up and down at the bottom of the cylinder bore. Gradually increase the length of the strokes until hone travels full length of cylinder bore, and no more than 3/4” to 1” above cylinder bore, Fig. 3. Lubricate hone frequently to prevent build up on stones.

As cutting tension decreases, stop hone and tighten adjusting knob following hone manufacturer’s recommendations. Check cylinder bore frequently.

Cylinder Finish (Cross Hatch)

The finishing stones are used after the cylinder bore has been resized to within.0015" (.04 mm) of the desired size or when reconditioning a cylinder bore. The finishing stones will produce the correct cross hatch necessary for proper lubrication. The correct cross hatch angle is approximately 45 degrees, Fig. 4.

It is recommended that the cylinder bores be reconditioned to restore the cross hatch when new piston rings are to be installed in a cylinder that is within specification. Be careful not to hone oversize or it will be necessary to resize the cylinder.

NOTE: To produce the proper cross hatch finish use a drill speed of approximately 200 RPM and 40-60 strokes per minute. Lubricate hone liberally to prevent build up on finishing stones.

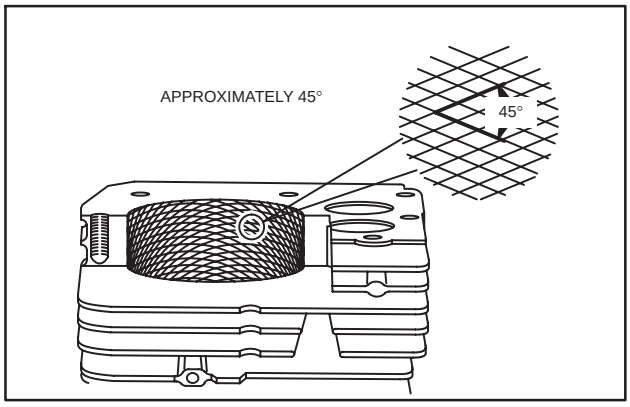


Fig. 4 – Cylinder Cross Hatch

Cleaning

IT IS MOST IMPORTANT THAT THE ENTIRE CYLINDER AND CRANKCASE BE THOROUGHLY CLEANED AFTER HONING. First wash the cylinder and crankcase carefully in a solvent such as kerosene or commercial solvent. Then thoroughly wash cylinder and crankcase using a stiff brush with soap and hot water. Rinse thoroughly with hot running water. Repeat washing and rinsing until all traces of honing grit are gone.

Honing grit is highly abrasive and will cause rapid wear to all of the internal components of the engine unless it is completely removed.

NOTE: When cylinder and crankcase have been thoroughly cleaned, use a clean white rag or napkin and wipe the cylinder bore. If honing grit is present it will appear as a gray residue on rag. If any honing grit is evident, re-wash and rinse entire cylinder and crankcase and check again. When there is no trace of honing grit on rag, the cylinder is properly cleaned. Then oil cylinder bore to prevent rusting.

BEARINGS

Check Mag Bearing

Check DU magneto bearing for damage. Check for wear using plug gauge Tool #19219, Fig. 5. Try gauge at several locations. If plug gauge is not available see reject dimension below.

Reject Dimension: 1.383" (35.12 mm)

Replace bearing if damaged or worn.

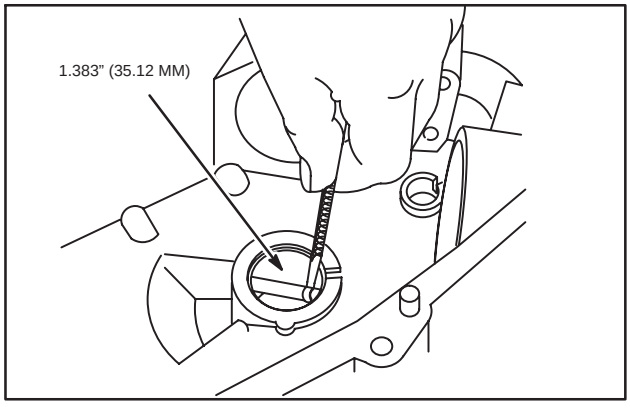


Fig. 5 – Check Mag Bearing

Remove Mag Bearing

Insert bushing driver, Tool #19226 into bearing from oil seal side. Place a reference mark on driver to indicate proper depth of bushing when installing new bushing.

1. Place cylinder on cylinder support, Tool #19227 with large opening facing DU bearing, Fig. 6.
2. Press out bearing with bushing driver, Tool #19226.

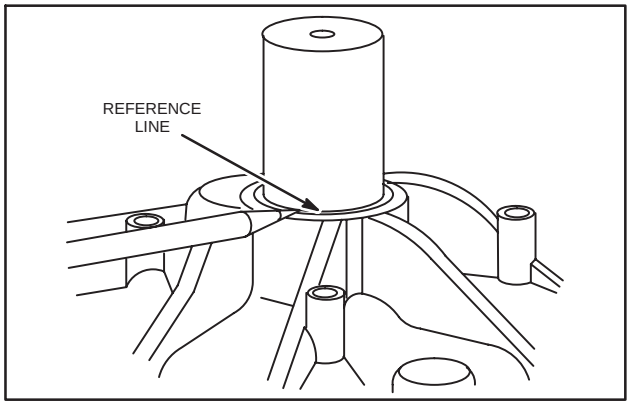


Fig. 6 – Remove Mag Bearing

Install Mag Bearing

1. Place cylinder on cylinder support, Tool #19227 with large opening facing bearing, Fig. 7.
2. Align oil hole in DU bearing with oil hole in cylinder.
3. Press in new bearing to correct depth with bushing driver, Tool #19226.

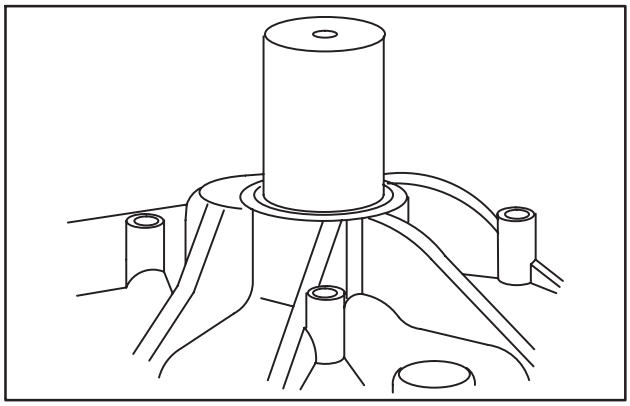


Fig. 7 – Install Mag Bearing

4. Stake bearing from both sides with 1/4" round punch to prevent bearing from turning, Fig. 8.
   a. Install new oil seal with sealing lips facing in.
   b. Use cylinder support, Tool #19227 and press oil seal until flush with cylinder.

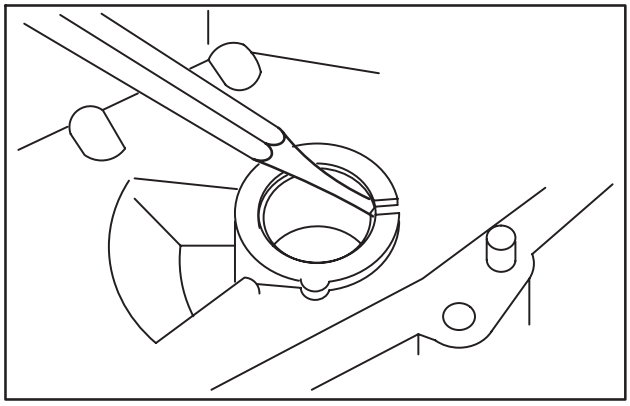


Fig. 8 – Stake Bearing

Check Camshaft Bearings

Check camshaft bearings in cylinder and sump for damage or wear.

Reject Dimension: .6275" (15.93 mm)

If bearings are damaged or worn the cylinder or crankcase cover must be replaced.

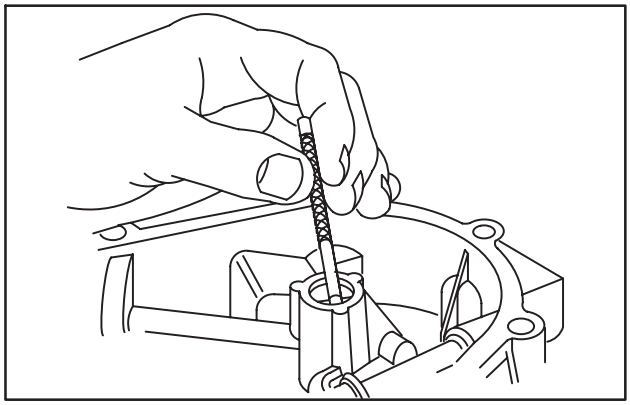


Fig. 9 – Check Cam Bearings

Check PTO Bearing

Check PTO bearing for damage or wear.

Reject Dimension: 1.629" (41.37 mm)

If PTO bearing is damaged or worn the sump must be replaced.

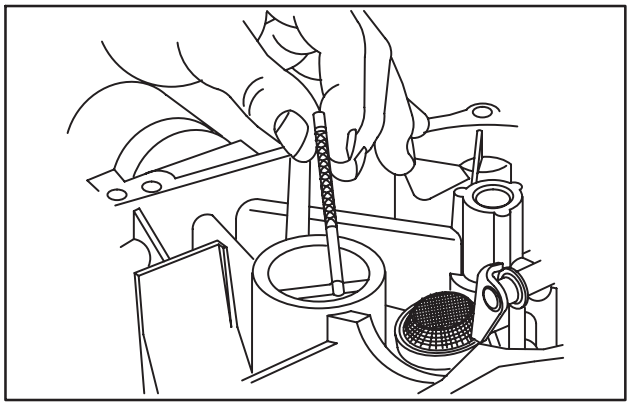


Fig. 10 – Check PTO Bearing

Install PTO Oil Seal

Always install new oil seals whenever engine is disassembled for major servicing.

When installing new PTO oil seal, use cylinder support, Tool #19227 and press oil seal slightly below mounting surface.

Always lubricate sealing lips with engine oil to prevent damaging seal when installing crankshaft.

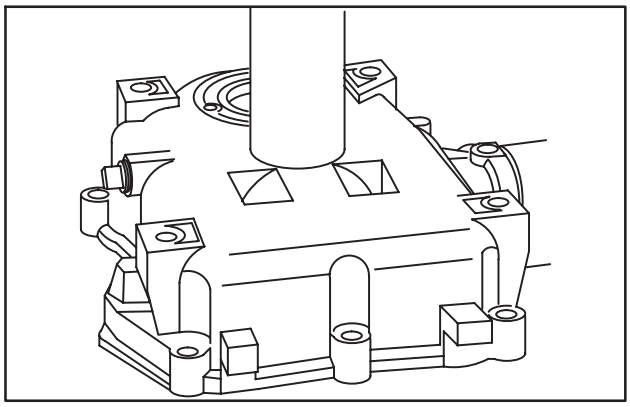
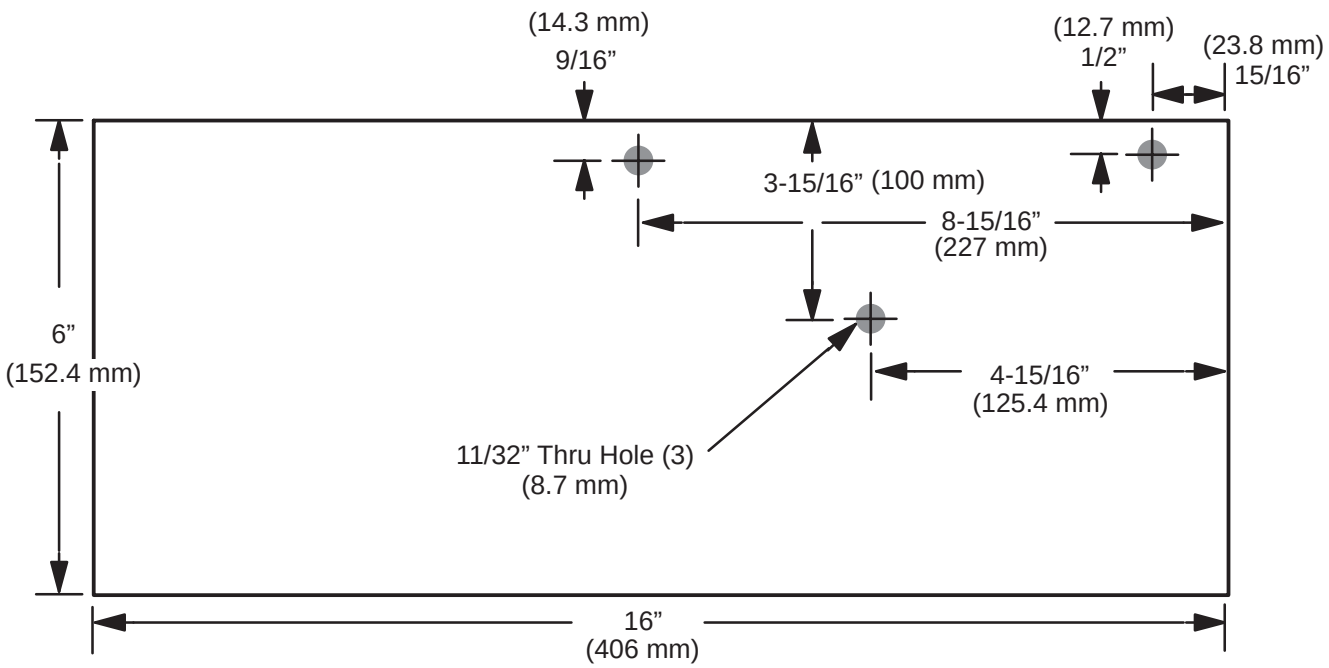


Fig. 11 – Install Oil Seal

Honing Fixture



Material: Wood 2”x6”x16” Long

Cylinder Mounting
Hardware Fasteners Required: 3 Crankcase Cover Screws & 3 Flat Washers 5/16” I.D.

Section 11
Crankshaft And Camshaft

Section Contents

Checking Crankshaft

Inspect crankshaft threads and keyways for damage or wear. If threads or keyways are damaged or worn, replace crankshaft. Check journals for scoring. If journals are scored, replace crankshaft. Check journals for wear. See crankshaft reject sizes.

Crankshaft Reject Sizes

Model Series	PTO Journal	Mag. Journal	Crankpin Journal
405770	1.623” (41.22 mm)	1.376” (34.95 mm)	1.4965” (38.01 mm)

Check oil galleries for blockage or obstructions. Check timing gear for damaged teeth. Timing gear is replaceable. See illustrated parts list.

Crankshaft crankpin may re-ground for .020” undersize connecting rods, Fig. 2. See illustrated parts list for part number. See crankshaft grinding dimensions.

Crankshaft Grinding Dimensions

Dim. A	Dim. R	Dim. T
1.4782/1.479” (37.54/37.56 mm)	.170/.180” (4.32/4.57 mm)	1.4435/1.4465 (36.66/36.74 mm)

Checking Cam Shaft

Inspect gear teeth, lobes and journals for wear and nicks, Fig. 3. Check oil galleries for blockage or obstructions. Camshaft journal and lobe reject sizes are shown below. Replace cam gear if not to specification.

Camshaft Reject Size

Journals (Mag & PTO)	Intake Lobes	Exhaust lobes
.623” (15.82 mm)	1.225” (31.15 mm)	1.223” (31.06 mm)

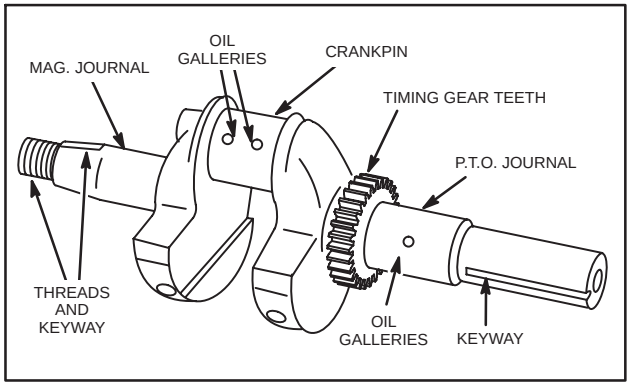


Fig. 1 – Checking Crankshaft

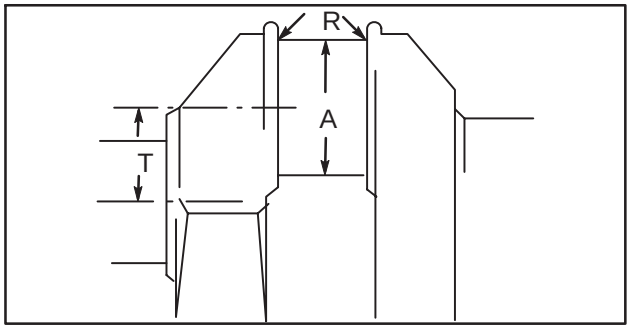


Fig. 2 – Crankshaft Dimensions

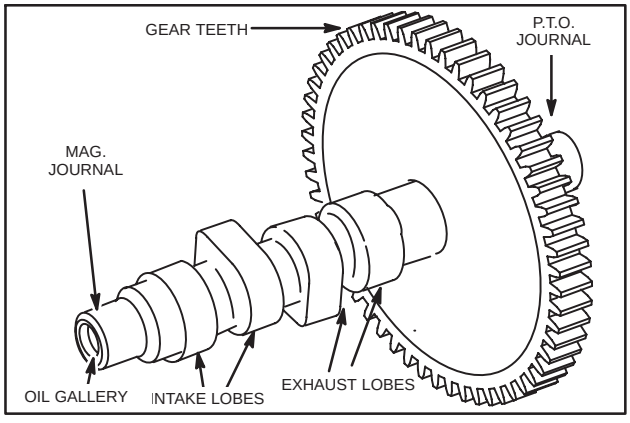


Fig. 3 – Checking Camshaft

Section 12
Piston, Rings And Connecting Rod Inspection And Assembly

Section Contents

GENERAL INFORMATION

It is recommended that new piston rings be installed whenever the engine is disassembled for major servicing or overhaul, providing that cylinder bores are within specification.

Remove any carbon or ridge at the top of the cylinder bore. This will prevent breaking the rings when removing the piston and connecting rod from the engine. Remove the connecting rod cap. Push the piston and connecting rod out through the top of the cylinder.

Measure cylinder bores before checking pistons and rings. See Section 10. If cylinder bore(s) require re-sizing it will not be necessary to check pistons and rings since a new oversized piston assembly will be used.

If the cylinder bore is more than .08 mm (.003”) oversize, or .04 mm (.0015”) out of round, it must be resized.

DISASSEMBLE PISTON AND CONNECTING ROD

1. Remove piston rings using ring expander, Tool #19340, Fig. 1.
   a. Then remove coil expander.

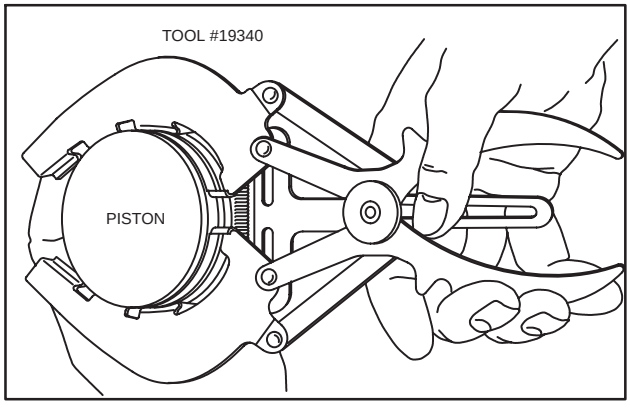


Fig. 1 – Remove Rings

2. Disassemble piston from connecting rod, Fig. 2.
   a. Remove piston pin locks.
   b. Piston pin is a slip fit in piston and connecting rod.

Keep pistons and connecting rods together as an assembly. Do not mix.

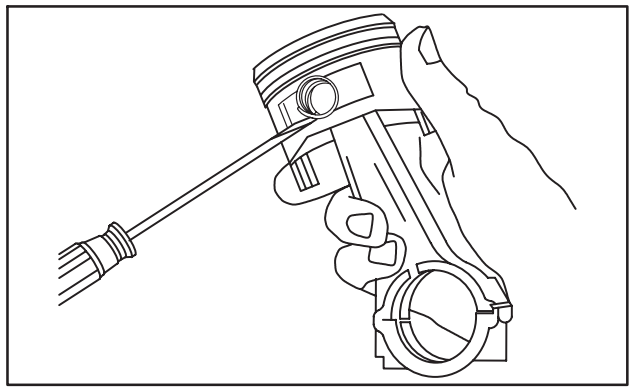


Fig. 2 – Remove Piston Pin Locks

CHECKING PISTON AND RINGS

If the cylinder is not going to be resized and the piston shows no signs of scoring, the piston should be checked.

1. Check side clearance of ring grooves using NEW rings, Fig. 3. If a .005" (0.12 mm) feeler gauge can be inserted, the ring groove is worn. The piston must be replaced.

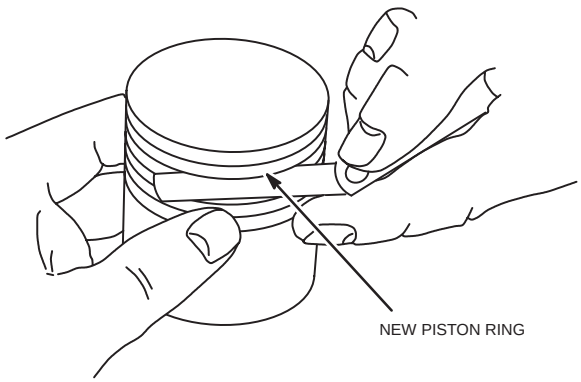


Fig. 3 – Check Ring Grooves

2. Check ring end gap, Fig. 4.
   a. Clean carbon from end of rings and insert approximately 1" (25 mm) into cylinder.

Reject Dimension (all): .030" (0.76 mm)

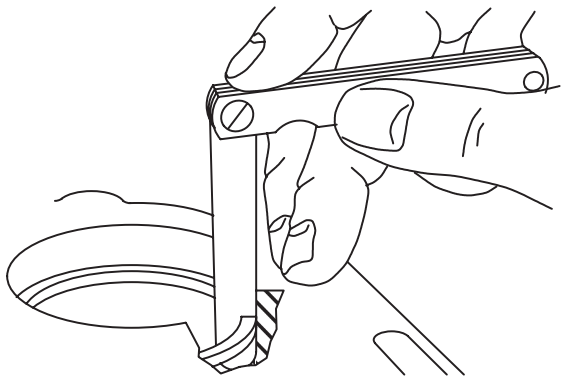


Fig. 4 – Checking Ring End Gap

12

Check piston pin bore, Fig. 5.
   a. **Replace** if greater than **.6745" (17.13 mm)** or **.0005" (.01 mm)** out of round.

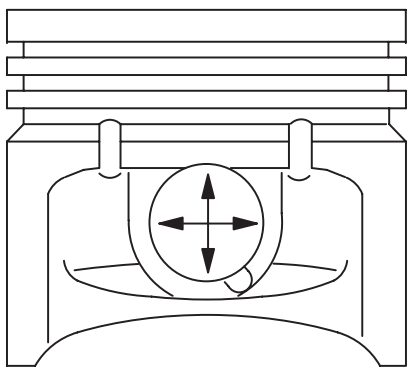


Fig. 5 – Check Piston Pin Bore

CHECKING PISTON PIN AND CONNECTING ROD

1. Check piston pin, Fig. 6.
   a. **Replace** if less than **.6718" (17.06 mm)** or **.0005" (.01 mm)** out of round.

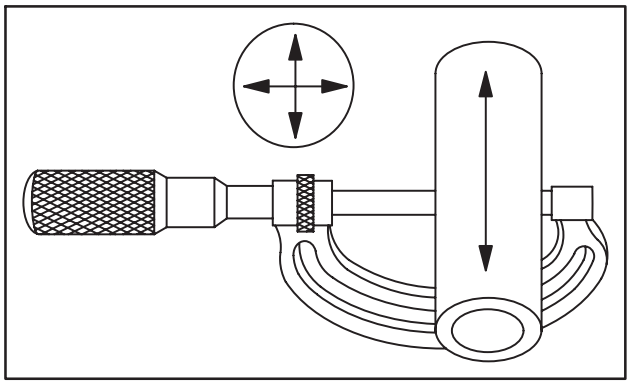


Fig. 6 – Check Piston Pin

2. Check connecting rod bearings.

Note: If crankpin bearing is scored or worn the connecting rod must be replaced.

Connecting Rod Reject Size	
Crankpin Bearing	**Piston Pin Bearing**
1.5015" (38.13 mm)	.6745" (17.13 mm)

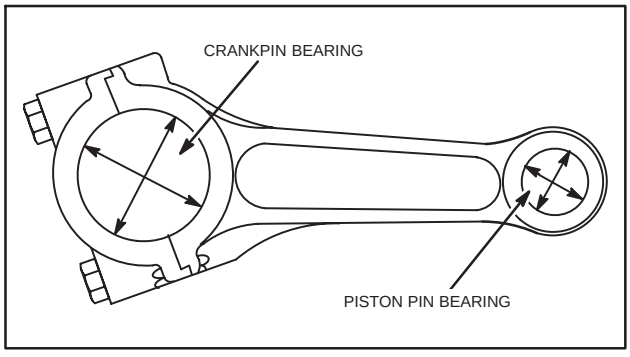


Fig. 7 – Check Rod Bearings

Note: .020" undersize connecting rods are available for use on a reground crankpin journal. See illustrated parts list.

ASSEMBLE PISTON AND CONNECTING ROD

Lubricate parts with engine oil and assemble #1 piston and connecting rod, Fig. 8.

1. Arrow on piston must face flywheel side.
2. Number "1" on connecting rod must face PTO side (opposite arrow on piston).
   a. Install piston pin locks with needle nose pliers.

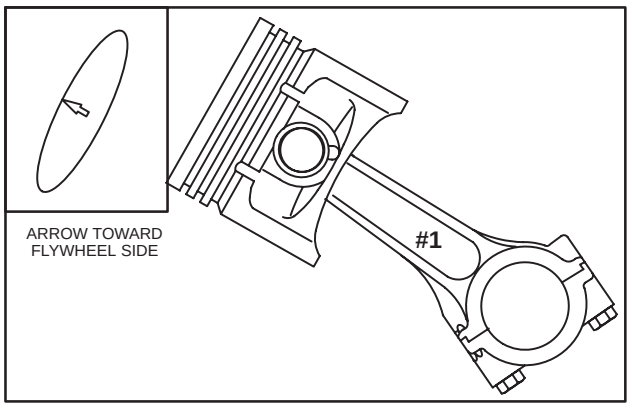


Fig. 8 – Assemble #1 Rod And Piston

Lubricate parts with engine oil and assemble #2 piston and connecting rod, Fig. 9.

1. Arrow on piston must face flywheel side.
2. Number "2" on connecting rod must face PTO side (opposite arrow on piston).
   a. Install piston pin locks with needle nose pliers.

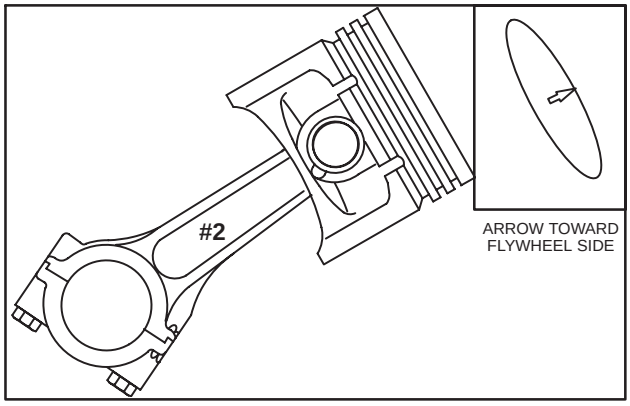


Fig. 9 – Assemble #2 Rod And Piston

ASSEMBLE PISTON RINGS TO PISTON

Models 405700

1. Install piston rings using ring expander, Tool #19340, Fig. 10.
   a. Install oil ring coil expander making sure wire is inserted fully into coil.
   b. Install oil ring.
   c. Install center compression ring then, top compression ring.

   Note: Top compression ring may be installed with either side up.

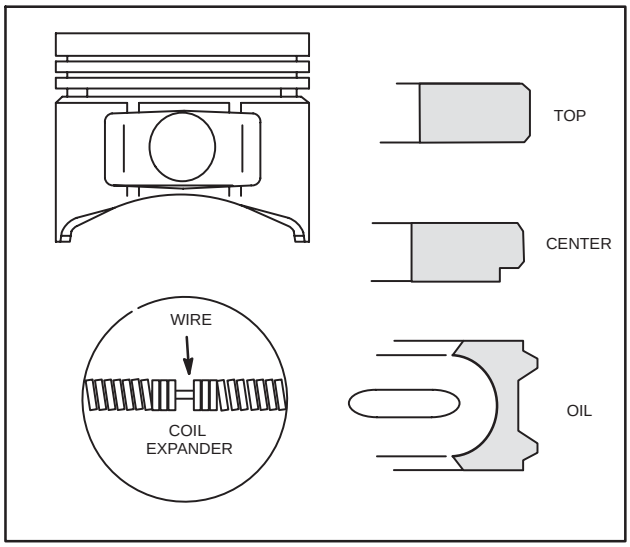


Fig. 10 – Piston Ring Installation – Model 405700

ASSEMBLE PISTON RINGS TO PISTON

Models 445700

1. Install piston rings using ring expander, Tool #19340, Fig. 11.
   a. Install oil ring coil expander making sure wire is inserted fully into coil.
   b. Install oil ring.
   c. Install center compression ring then, top compression ring with ID mark up.

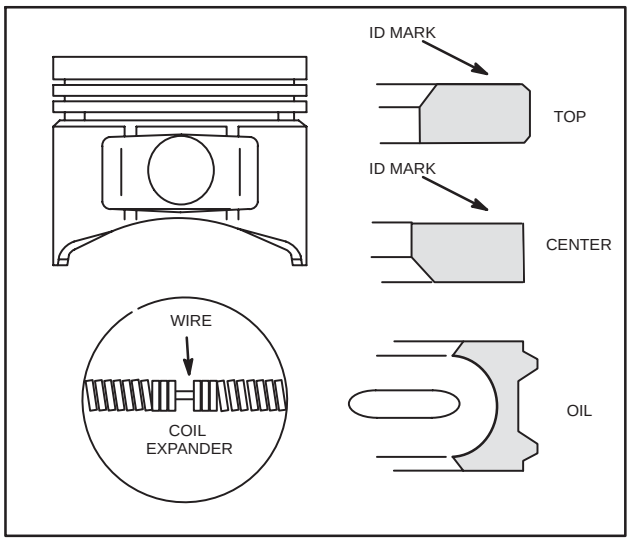


Fig. 11 – Piston Ring Installation – Model 445700

Section 13
Engine Assembly

Section Contents

INSTALL CRANKSHAFT

Lubricate mag bearing and lips of oil seal with engine oil and install crankshaft.

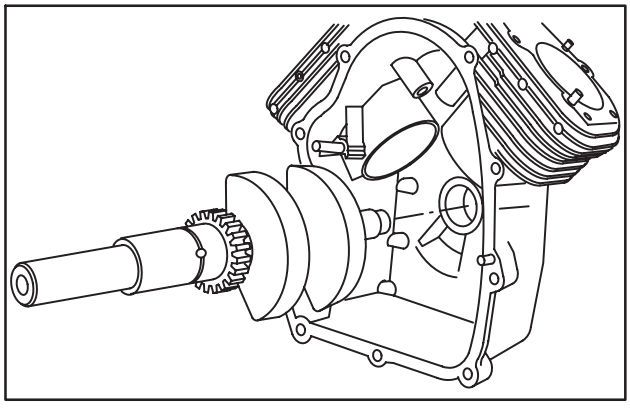


Fig. 1 – Installing Crankshaft

INSTALL PISTON AND CONNECTING ROD

Note: Install #1 piston and connecting rod first.

1. Oil piston rings, piston skirt, and compress rings with Ring Compressor Tool #19070, Fig. 2.
   a. Place piston and ring compressor upside down on bench with projections on compressor facing up.
   b. Tighten ring compressor evenly until rings are fully compressed.
   c. Then loosen ring compressor very slightly so that compressor can be rotated on piston skirt while holding connecting rod, Fig. 2.

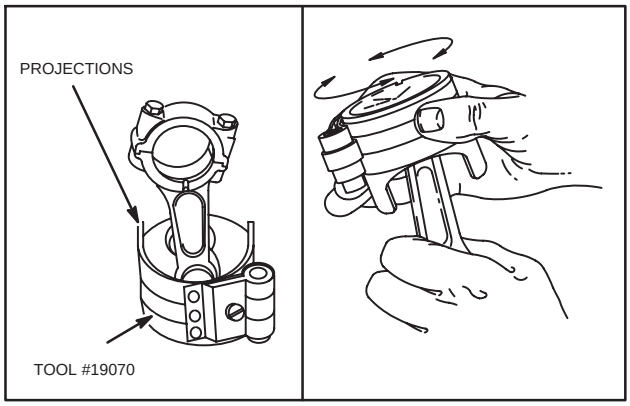


Fig. 2 – Compressing Rings

2. Lubricate cylinder bores and crankpin and rotate crankshaft until it as at bottom of stroke.

3. Install #1 piston with arrow towards flywheel side, Fig. 3.
   a. Push piston down by hand until connecting rod is seated on crankpin.

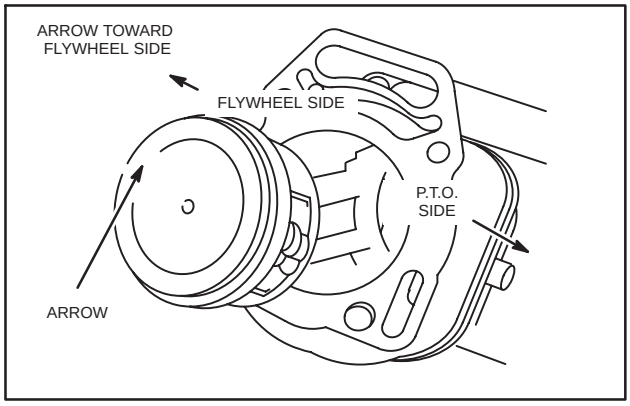


Fig. 3 – Installing Piston And Connecting Rod

4. Assemble connecting rod cap to rod with match marks aligned, Fig. 4.
   a. Torque screws to 100 in. lbs. (11.0 Nm).
5. Rotate crankshaft two revolutions to check for binding. Rod should also be free to move sideways on crankpin.

Repeat for #2 cylinder.

Note: The number 1 on #1 connecting rod and the number 2 on #2 connecting rod must be facing PTO side.

I**mportant:** Failure to use a torque wrench can result in loose connecting rod screws causing breakage or tight connecting rod screws causing scoring.

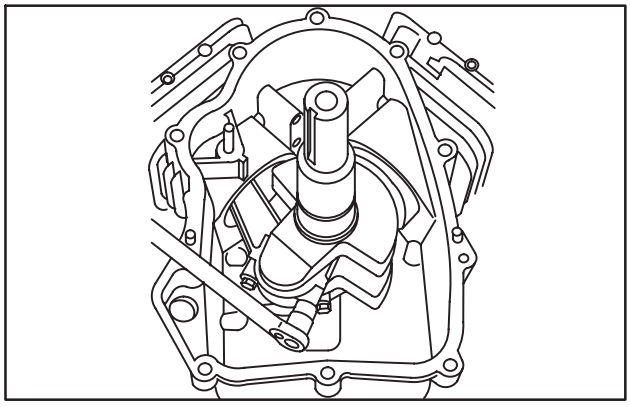


Fig. 4 – Torque Connecting Rods

INSTALL CAM SHAFT

Lubricate tappets, cam shaft journals and lobes with engine oil. Assemble timing gear to crankshaft.

1. Install tappets.
2. Align timing marks on cam shaft and crankshaft gear and install cam shaft, Fig. 5.
   Lubricate thrust washer, governor gear and governor cup and assemble to shaft.

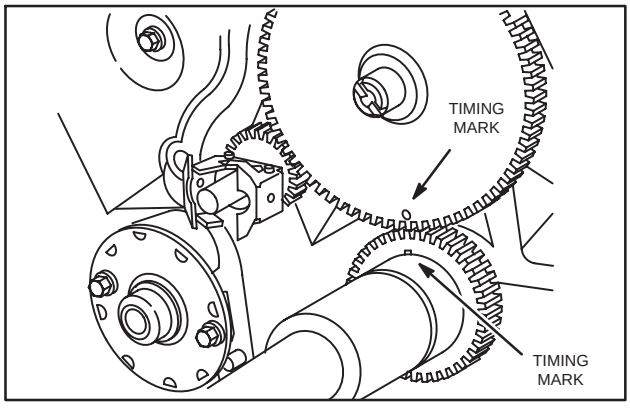


Fig. 5 – Installing Camshaft

INSTALL SUMP

Lubricate PTO and cam shaft bearing.

1. Install sump with new gasket.
   a. Torque screws in sequence shown to 200 in. lbs. (23.0 Nm), Fig. 6.
2. Check crankshaft end play.

Specification: .002”-.030” (0.020-0.30 mm)

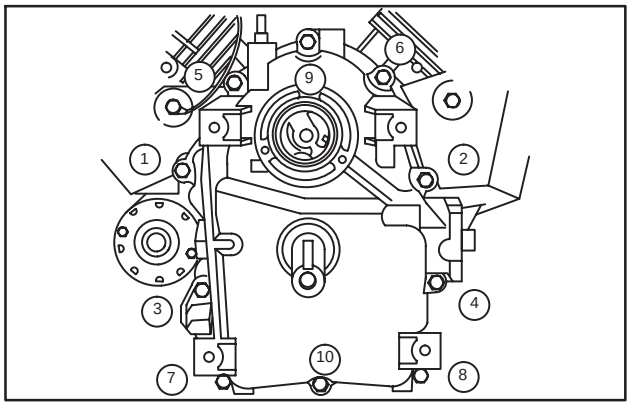


Fig. 6 – Installing Crankcase Cover

3. Lubricate oil pump components with engine oil and assemble to sump, Fig. 7. Make sure drive shaft is engaged in camshaft.
   a. Install drive shaft.
   b. Install inner rotor.
   c. Install outer rotor.
   d. Install oil pump cover with new O-ring.
   e. Torque screws to 50 in. lbs. (6.0 Nm).

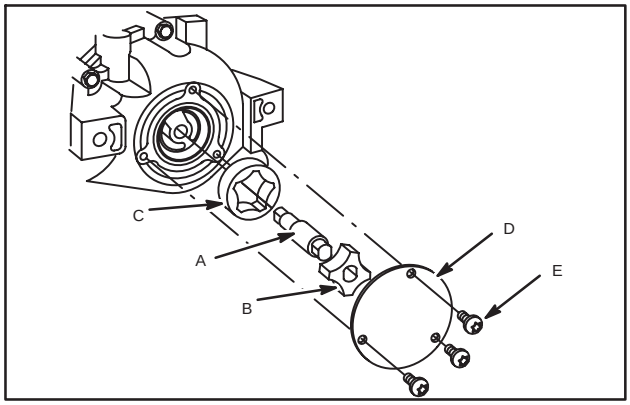


Fig. 7 – Assemble Oil Pump

GENERAL ASSEMBLY

1. Install armatures and ground wire assembly.
   Note: Push armatures away from crankshaft as far as they will go and temporarily tighten screws.
2. Install air guide.
   a. Torque screws to 45 in. lbs. (5.0 Nm).
3. Install alternator.
   a. Torque screws to 20 in. lbs. (2.0 Nm).

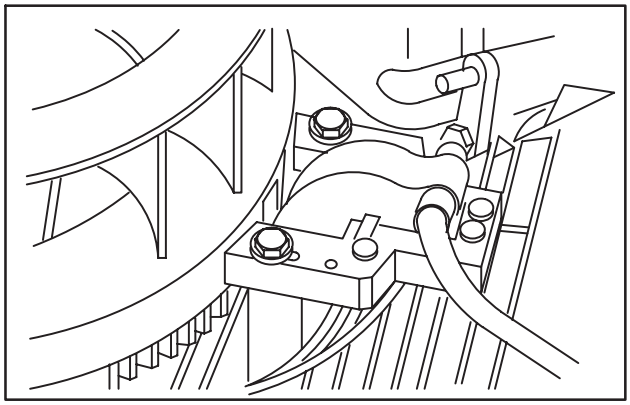


Fig. 8 – Install Armatures

4. Assemble oil fill tube to cylinder and crankcase cover, Fig. 9.
   a. Route alternator wires between oil fill tube mounting boss on cylinder and oil fill tube bracket.
   b. Route wiring harness between oil fill tube and cylinder.

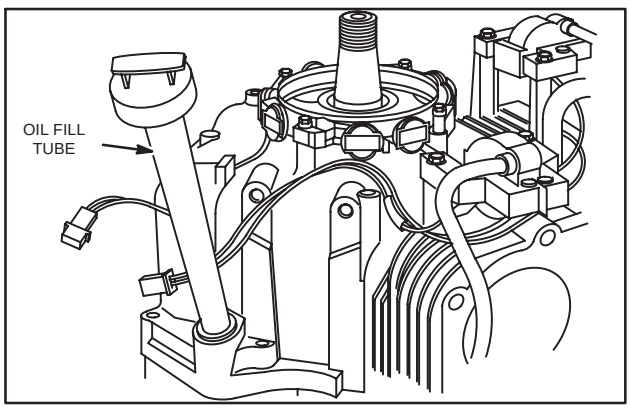


Fig. 9 – Route Wires

5. Install back plate.
   a. Torque screws to 100 in. lbs. (11.0 Nm).
   Note: Route armature ground wire under back plate and between starter motor mounting bosses on cylinder as shown, Fig. 10.

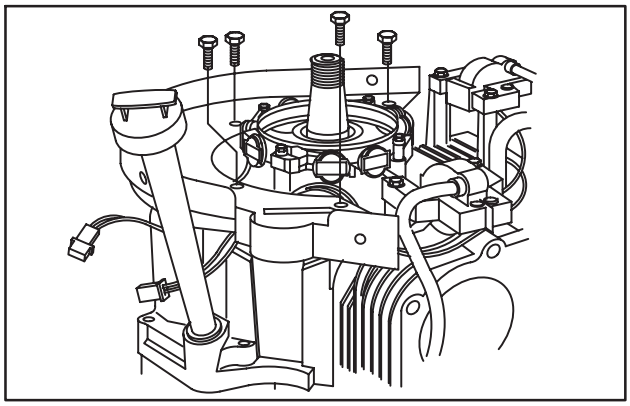


Fig. 10 – Route Armature Ground Wire

6. Install starter motor.
   a. Torque screws to 140 in. lbs. (16.0 Nm).
7. Install oil vapor collector and retainer.
8. Install breather.
   a. Torque screws to 55 in. lbs. (6.0 Nm).

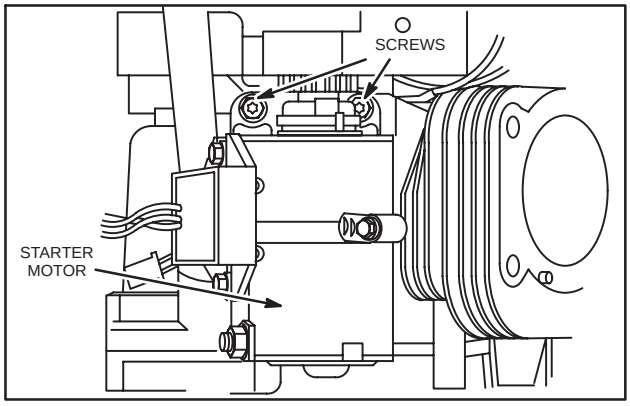


Fig. 11 – Install Starter Motor

INSTALL FLYWHEEL

CLEAN flywheel and crankshaft taper removing all oil, dirt or grease.

1. Assemble flywheel to crankshaft and align keyways.
2. Insert flywheel key into crankshaft.
3. Assemble fan and retainer to flywheel, Fig. 12.
   a. Torque screws to 140 in. lbs. (16.0 Nm).

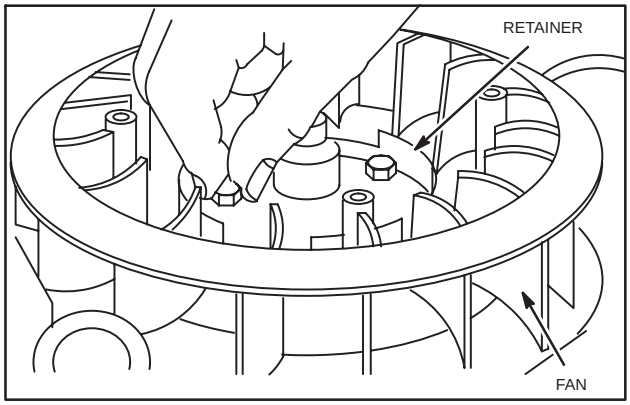


Fig. 12 – Install Fan And Retainer

4. Install washer and flywheel nut.
5. Assemble flywheel holder, Tool #19321 to retainer, Fig. 13.
   a. Torque flywheel nut to 150 ft. lbs. (203.0 Nm).

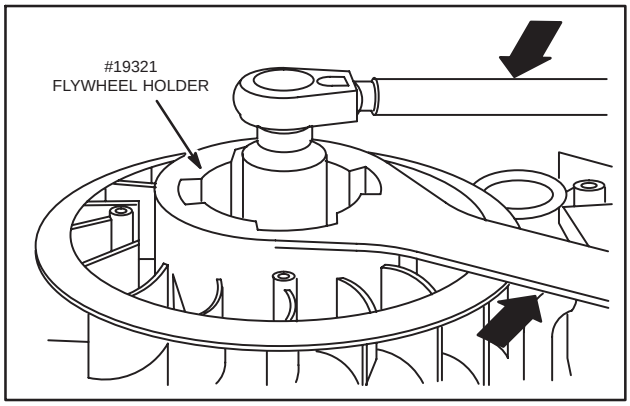


Fig. 13 – Install Flywheel

13

ADJUST ARMATURE AIR GAP

1. Rotate flywheel until magnet is under armature laminations.
2. Place thickness gauge, .008”-.012” (0.20-.30 mm) between magnet and armature laminations, Fig. 14.
3. Loosen mounting screw so magnet will pull armature down against thickness gauge.
   a. Torque screws to 25 in. lbs. (3.0 Nm).
4. Rotate flywheel to remove thickness gauge.
5. Repeat for second armature.

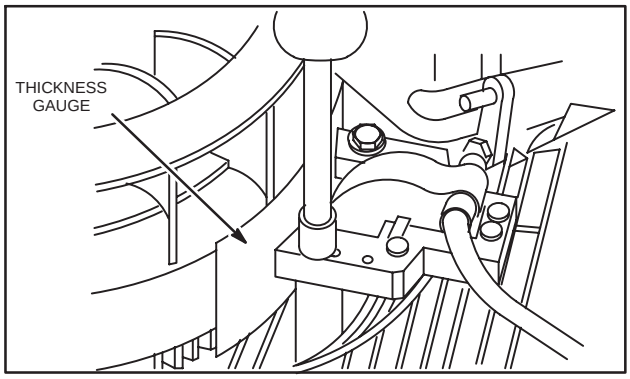


Fig. 14 – Adjust Armature Air Gap

INSTALL CYLINDER HEADS

1. Place cylinder head gasket over alignment dowels on cylinder block.
2. Install cylinder head assembly, Fig. 15.
   a. Torque head bolts in sequence shown to 220 in. lbs. (25.0 Nm).
3. Install push rods. Make sure push rods are inserted in recess in tappets.
   Note: Intake push rods are aluminum.

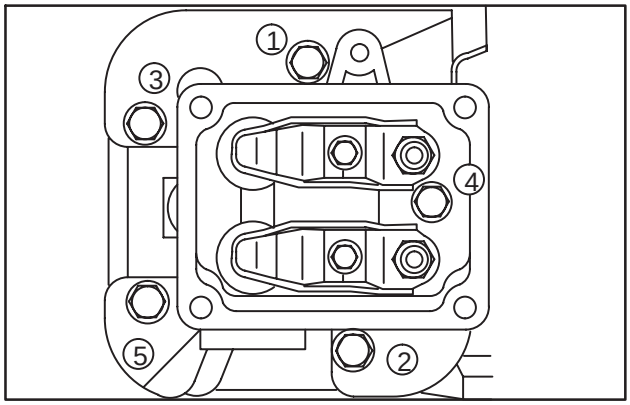


Fig. 15 – Install Cylinder Head

4. Compress valve springs and insert push rods into recess in rocker arm adjustment screws, Fig. 16.

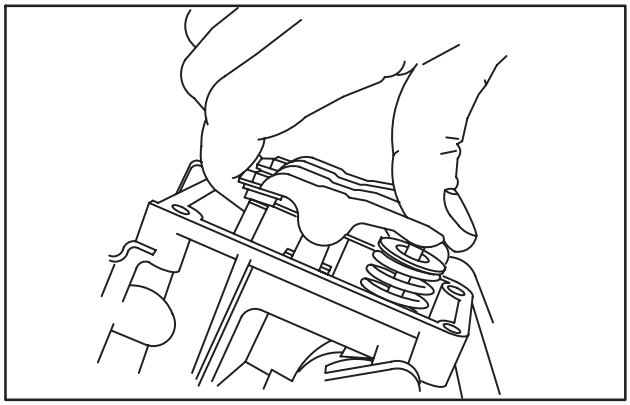


Fig. 16 – Insert Push Rods

ADJUST VALVES

1. Set No. 1 cylinder at 1/4” (6.4mm) past TDC, compression stroke.
   a. Adjust valves and check, Fig. 17.

Valve Clearance (cold) IN and **EX** .005” (0.13 mm)

   b. Torque adjusting screws and jam nuts to 60 in. lbs. (7.0 Nm).
2. Set No. 2 cylinder at TDC, compression stroke.
   a. Repeat for No. 2 cylinder.

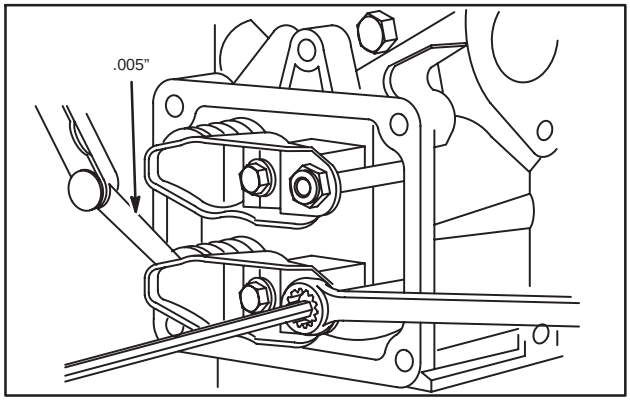


Fig. 17 – Adjust Valves

3. Install valve covers with new gaskets, Fig. 18.
   a. Torque screws to 100 in. lbs. (11.0 Nm).

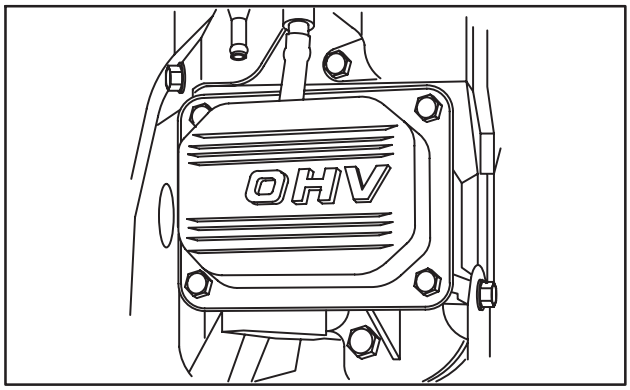


Fig. 18 – Install Valve Covers

INSTALL CYLINDER SHIELDS

1. Install No. 1 cylinder shield and fuel pump assembly, Fig. 19.
   a. Torque 1/4-20 screw to 80 in. lbs. (7.0 Nm)
   b. Assemble solenoid harness ground wire to #10-24 screw and torque to 45 in. lbs. (5.0 Nm).
2. Install No. 2 cylinder shield.
   a. Torque 1/4-20 screw to 80 in. lbs. (7.0 Nm).
   b. Torque #10-24 screw to 45 in. lbs. (5.0 Nm).

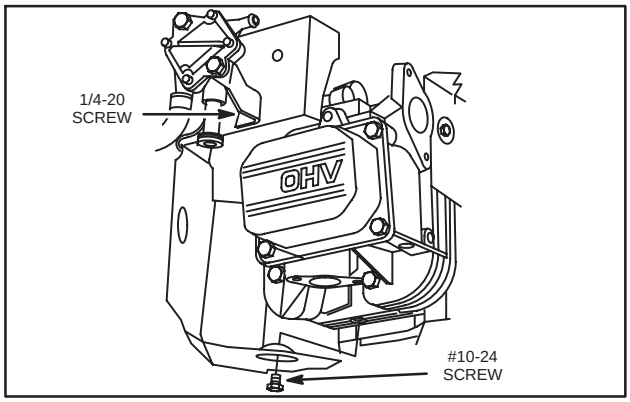


Fig. 19 – Install Cylinder Shields

INSTALL GOVERNOR CONTROL BRACKET

1. Install governor control bracket and assemble governor lever to governor shaft, Fig. 20. **DO NOT** tighten nut at this time.
   a. Torque control bracket screws to 80 in. lbs. (7.0 Nm).

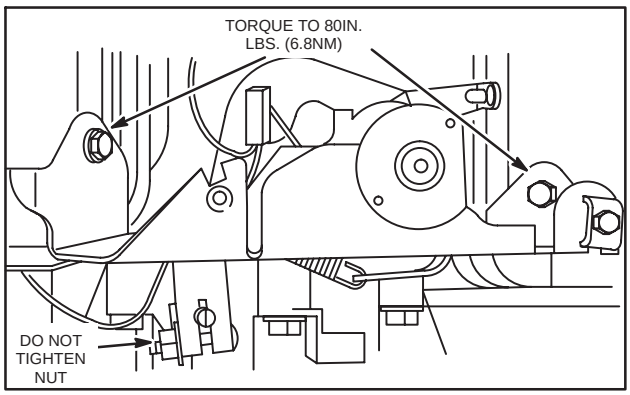


Fig. 20 – Install Governor Control Bracket

INSTALL INTAKE MANIFOLD AND CARBURETOR ASSEMBLY

1. Install intake manifold and carburetor assembly, using new gaskets, Fig. 21.
   a. Torque screws to 80 in. lbs. (9.0 Nm).
   b. Assemble governor link to governor lever.
   c. Connect solenoid wire to solenoid.
   d. Connect breather tube to air horn.

   Note: Route armature ground wire between breather tube and air horn.

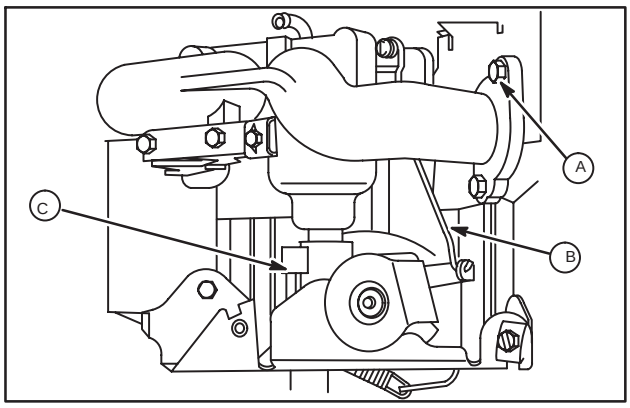


Fig. 21 – Install Intake Manifold And Carburetor

INSTALL BLOWER HOUSING

1. Assemble blower housing to engine.
   a. Torque screws to 80 in. lbs. (9.0 Nm).
2. Install rotating screen.
   a. Torque screws to 20 in. lbs. (2.0 Nm).

Assemble air cleaner and install spark plugs.

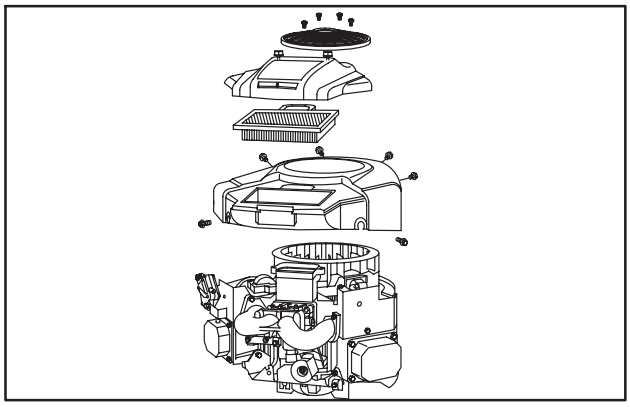


Fig. 22 – Install Blower Housing

ADJUST GOVERNOR

WARNING: BEFORE STARTING OR RUNNING ENGINE, static adjustment of the governor must be completed! Failure to make the static adjustments first could result in engine overspeeding which may result in engine damage, property damage or personal injury.

Static Governor Adjustment

1. With governor lever nut loose, rotate governor control swivel counter-clockwise as far as it will go (wide open throttle) and hold in this position.
2. Rotate governor shaft clockwise as far it will go, Fig. 23.
   a. Torque governor nut to 130 in. lbs. (15.0 Nm).
3. Install throttle and choke control cables and check for proper operation.
4. Install exhaust manifold.
   a. Torque screws to 140 in. lbs. (16.0 Nm).

   Note: Exhaust manifold and exhaust system supplied by equipment manufacturer.

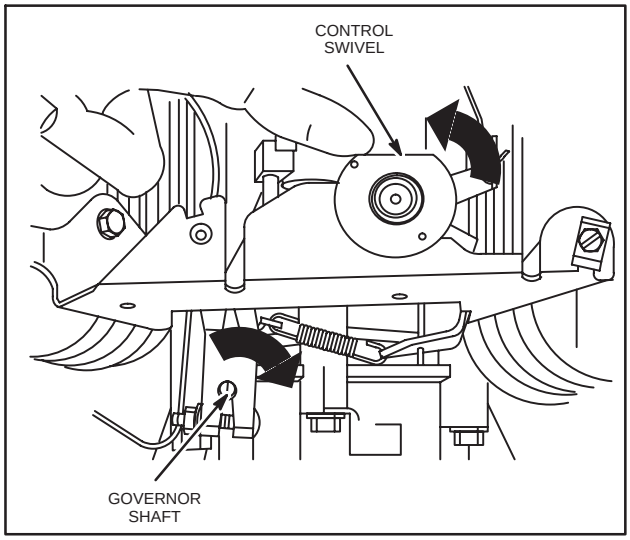


Fig. 23 – Adjust Governor – Static

Dynamic Governor Adjustment

ALL ADJUSTMENTS MUST BE MADE WITH AIR CLEANER ASSEMBLY INSTALLED.

The following tools are required when making governor adjustments, Fig. 24:

1. Tachometer, Tool #19200 or #19389.
2. Tang bender, Tool #19480.

Start and run engine for approximately 5 minutes to allow engine to warm up.

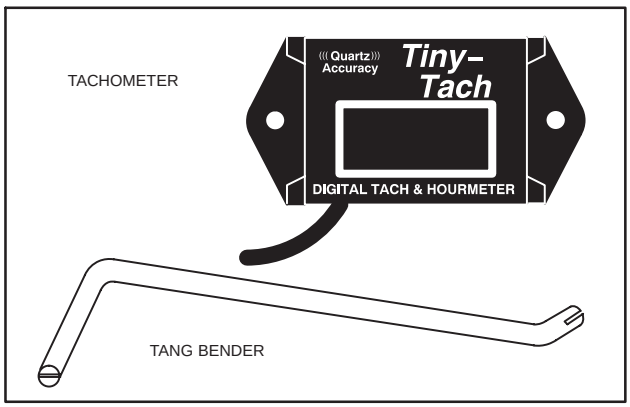


Fig. 24 – Tools

Governed Idle Adjustment

Perform adjustments exactly in order shown.

1. Move equipment control lever to SLOW position.
2. Hold throttle lever against idle speed adjustment screw and adjust idle speed to 1200 RPM, Fig. 25. Release throttle lever.

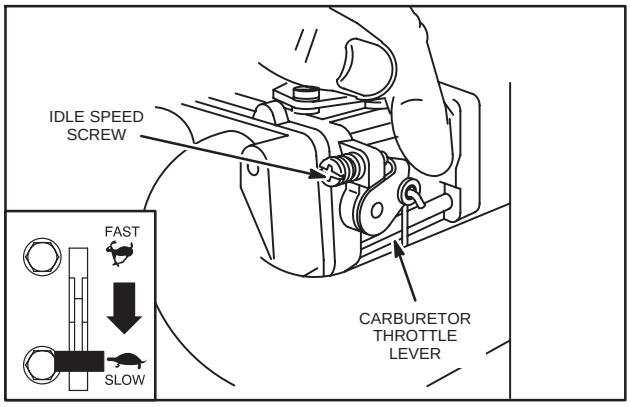


Fig. 25 – Adjust Idle Speed

3. Bend governed idle tang to obtain 1750 RPM, Fig. 26.

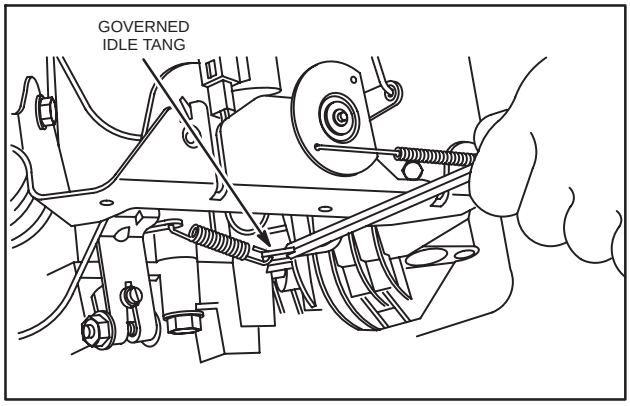


Fig. 26 – Adjust Governed Idle

4. With engine running at governed idle RPM, bend throttle restrictor tang so that tang just contacts governor lever, Fig. 27.

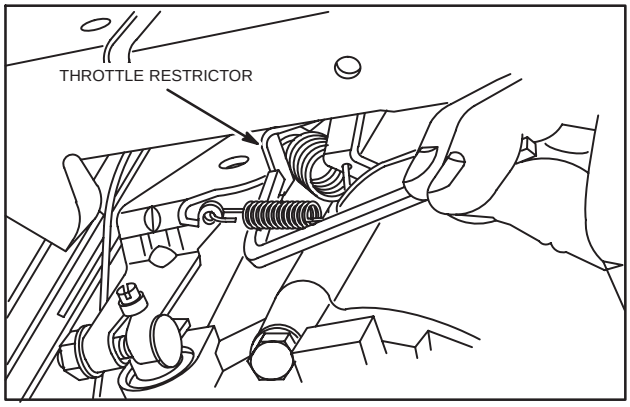


Fig. 27 – Adjust Throttle Restrictor

Adjust Top No Load Speed

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

1. Move equipment control to FAST position and check RPM.
   a. Bend tang to obtain correct RPM, Fig. 28.

Note: Governor spring tension adjustment must not exceed ± 200 RPM, or the governor spring must be replaced.

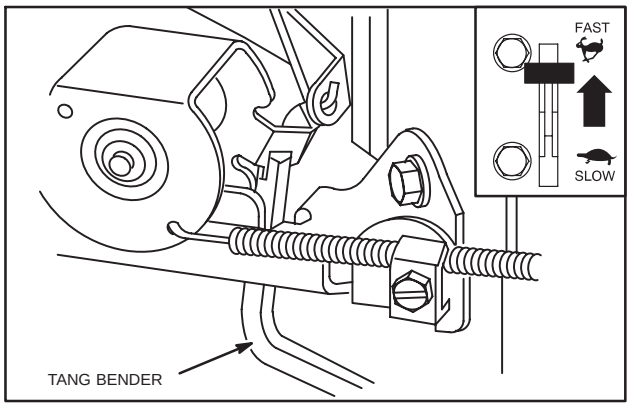


Fig. 28 – Adjust Top No Load Speed