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VANGUARD™ SINGLE CYLINDER OHV AIR-COOLED ENGINES

1/07

ENGINE MAINTENANCE

Fuel and Oil Recommendations

Fuel

Fuel must meet these requirements:

- Use clean, fresh unleaded gasoline.
- A minimum of 87 octane / 87 AKI (91 RON). For high altitude use, see "High Altitude" below.
- Gasoline with up to 10% ethanol (gasohol) or up to 15% MTBE (Methyl Tertiary Butyl Either) is acceptable.

CAUTION: Do not use unapproved gasoline such as E85. Do not mix in gasoline or modify the engine to run on alternate fuels. This will damage the engine components and **void the engine warranty.**

To protect the fuel system from gum formation, mix a fuel stabilizer into the gasoline see "Storage" below. All fuel is not the same.

If starting or performance problems occur:

- Change fuel providers or change brands.

High Altitude

At altitudes over 5000 feet (1524 meters), a minimum of 85 octane / 85 AKI (89 RON) gasoline is acceptable. To remain emissions compliant, high altitude adjustment is required. Operation without this adjustment will cause decreased performance, increased fuel consumption and increased emissions.

At altitudes below 2500 feet (762 meters), high altitude adjustment is **not** recommended.

Storage

Fuel can become stale when stored over 30 days. Stale fuel causes acid and gum deposits to form in the fuel system and/or on essential carburetor parts. To keep fuel fresh, use Briggs & Stratton FRESH START™ **(#5041)** fuel stabilizer, available as a liquid additive or a drip concentrate cartridge.

There is no need to drain gasoline from the engine before storage if fuel stabilizer is added according to instructions. Run the engine for two minutes to circulate the stabilizer throughout the system. The engine and fuel can then be stored for up to 24 months.

If gasoline has not been treated with a fuel stabilizer prior to storage, it must be drained from the engine into an approved container. Run the engine until it stops from lack of fuel. The use of a fuel stabilizer in the storage container is recommended to maintain freshness.

CAUTION: Some fuel, called "oxygenated" or "reformulated" gasoline, is gasoline blended with alcohol or ether. Excessive amounts of these blends can damage the fuel system or cause performance problems. If any undesirable operating symptoms occur, use gasoline with a lower percentage of alcohol or ether.

Oil

Oil has four purposes:

- It cools
- It cleans
- It seals
- It lubricates

During normal operation, small particles of metal from the cylinder walls, pistons, bearings as well as normal combustion deposits will gradually contaminate the oil. Dust particles from the air also contaminate the oil. This forms an abrasive mixture that can cause wear to the internal 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.

Use a high quality detergent oil classified "For Service SF, SG, SH, SJ" or higher. Use synthetic oil such as Briggs & Stratton **(#100074)** or equivalent. If synthetic oil is not available, Briggs & Stratton non-synthetic 30 weight oil **(#100005 or #100028)** is an acceptable substitute. Do not use special additives with recommended oils.

Do not mix oil with gasoline.

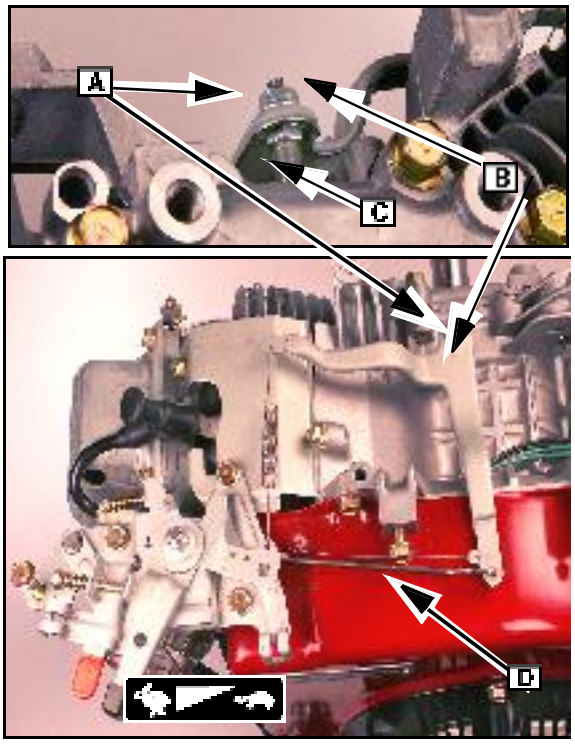

Fig. 23

4. Rotate the governor shaft in direction noted in previous step, until it stops.
5. While holding governor crank, torque the governor lever nut (left hand thread)(Fig.2.)

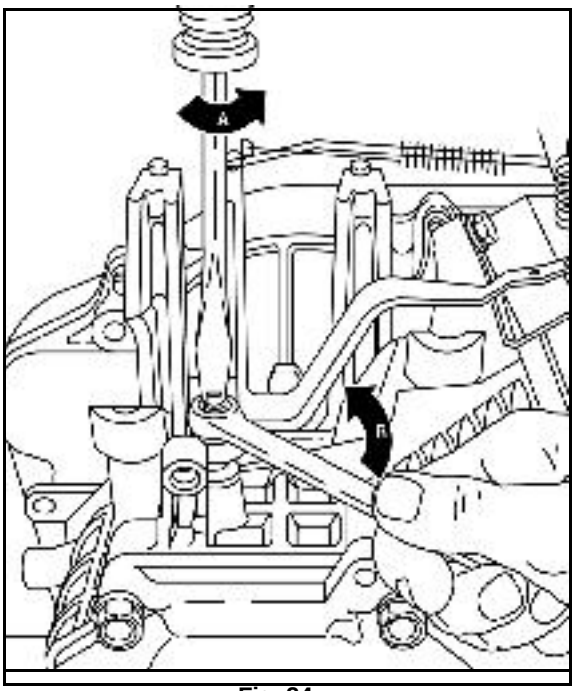

Fig. 24

Static Governor Adjustment
(161400, 104700, 260700, 261700, 28Q700)

1. Loosen nut holding governor lever ([**A**] Fig. 25) to governor crank.
2. Rotate throttle linkage from idle to wide open throttle. Note the direction of rotation of the governor arm attached to the throttle linkage.
3. Place and hold the throttle in high speed position.
4. While holding the throttle plate, rotate the governor shaft ([**B**] Fig. 25) until it stops in the direction noted in step 2.
5. While holding the governor shaft, torque the govemor lever nut to listed value.

SEE SECTION 14- ENGINE SPECIFICATIONS.

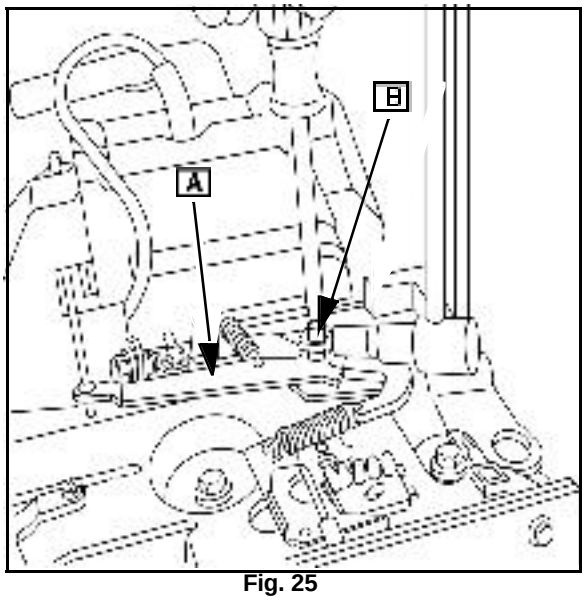

Fig. 25

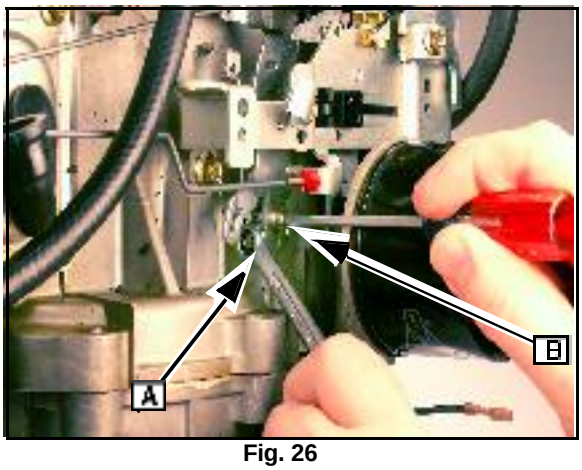

Fig. 26

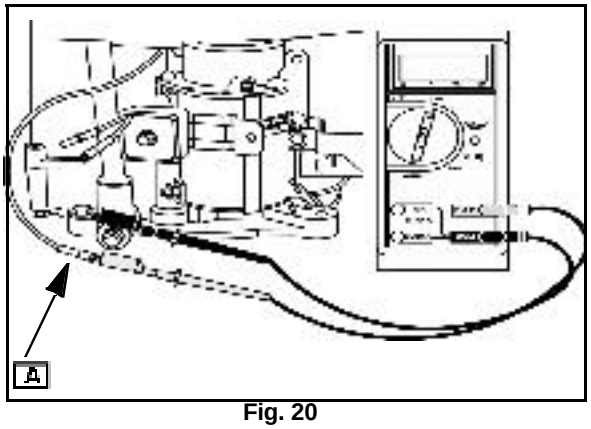

Fig. 20

3. Attach BLACK test lead clip to engine ground.

AC output should be no less than 40VAC @3600 RPM.

If no or low output is found:

- Replace stator.

9 Amp DC Output Test

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.

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

1. Set meter. See Figure 11.
2. Attach RED test lead clip to DC output terminal ([**A**] Fig. 21) on regulator–rectifier.

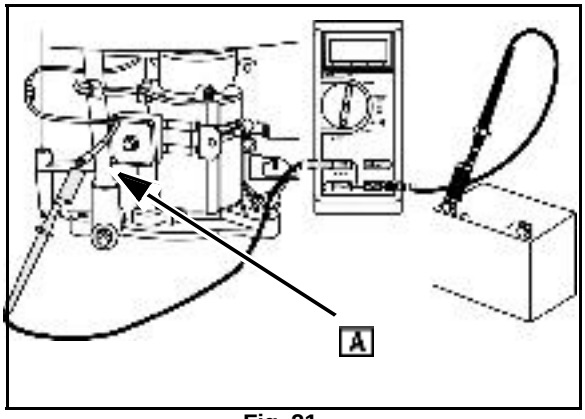

Fig. 21

3. Attach BLACK test lead clip to positive (+) battery terminal.
4. Start Engine.

Output should be 3 – 9 Amps @ 3600 RPM.

10 AMP Regulated Alternator

Model 185400

To test alternator output, engine's electrical system must be connected to a fully charged 12 volt battery.

1. Adjust governor to 3600 RPM for test.
2. Disconnect battery ground cable from battery negative (-) terminal.
3. Set meter. See Figure 11.
4. Place DC Shunt **#19468** on negative battery post.
5. Install battery ground cable to DC shunt battery terminal. See Fig. 22
6. Connect multimeter test leads to DC shunt terminals, RED to RED and BLACK to BLACK.
7. Start engine.

Output should be approximately 3 amps @ 3600 RPM.

2. Operate rocker switch and observe meter readings.
3. The meter should show maximum or very low resistance as the switch is moved back and forth. Replace the switch if it remains open or closed in both positions.

NOTE: (**185430-0099-01**) is wired with components supplied by the OEM. Contact the OEM for wiring diagrams and service information.

Stop Switch Adjustments (161400)

1. Move remote speed control to the **FAST** position.
2. The governor control lever should not ([**A**] Fig. 42) make contact with the stop switch tang.

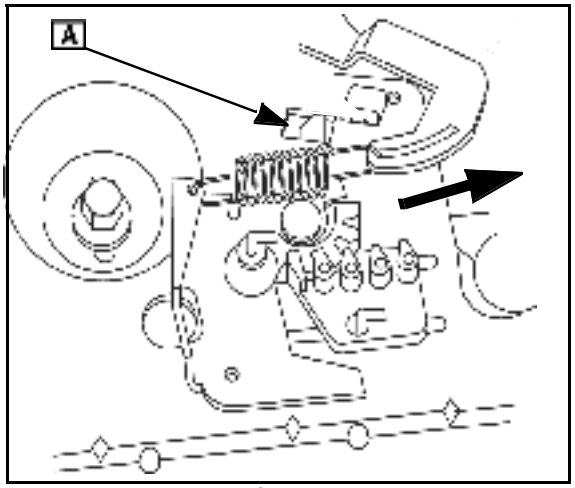

Fig. 42

3. Move the remote to the **STOP** position. The engine governor control lever tab should be contacting the stop switch tang ([**B**] Fig. 43).

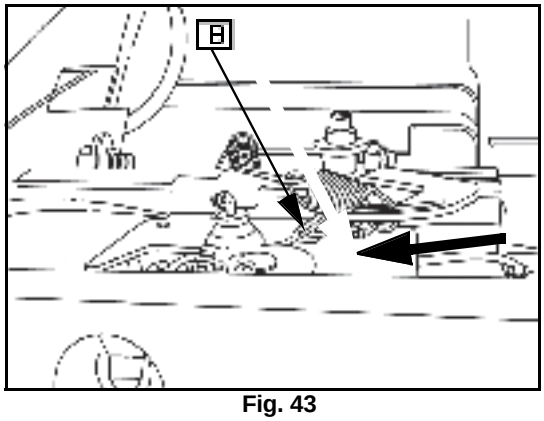

Fig. 43

If control lever does not contact stop switch tang:

- Check control cable for adjustment or binding. Adjust as required or replace worn parts as needed.
- Be sure the stop switch is firmly anchored in control bracket. Replace switch if it cannot be anchored securely.

Key & Interlock Switches

Troubleshooting Interlock Switch (104700)

1. Disconnect interlock switch wires from spade terminals of switch.
2. Set meter to read Ohms. See Figure 8.
3. Connect test leads to two spade terminals ([**A**] Fig. 44) of switch. There should be no continuity.

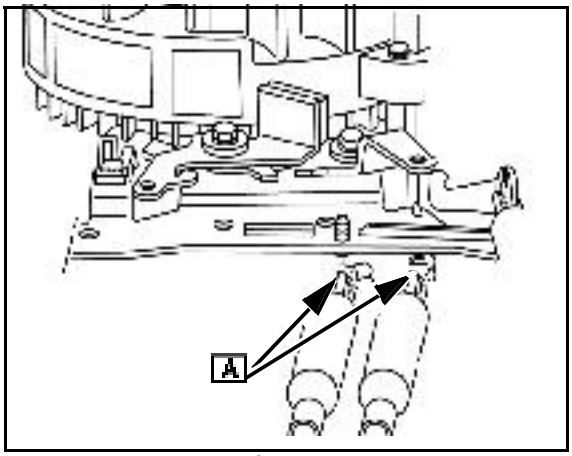

Fig. 44

4. Push switch lever in until switch clicks. Meter should read continuity.

Troubleshooting Five-Terminal Key Switch

1. Disconnect wires from key switch.
2. Set meter to test for continuity. See Figure 8.
3. Check continuity between terminals with switch in **OFF, RUN** and **START** positions per Key Switch Continuity Chart.

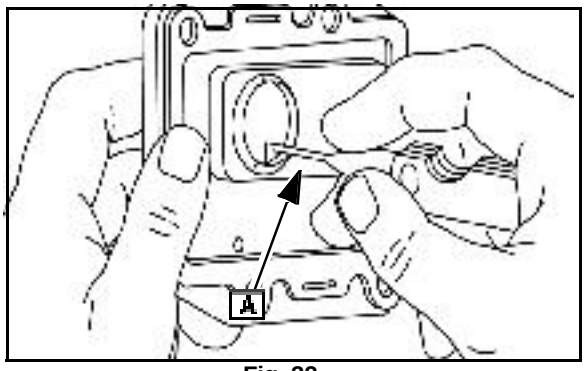

Fig. 32

2. Install new disc valve and retainer assembly. Torque screws to listed value. **SEE SECTION 14- ENGINE SPECIFICATIONS.**

3. Install cover ([**A**] Fig. 33) with new gasket. Torque screws to listed value.

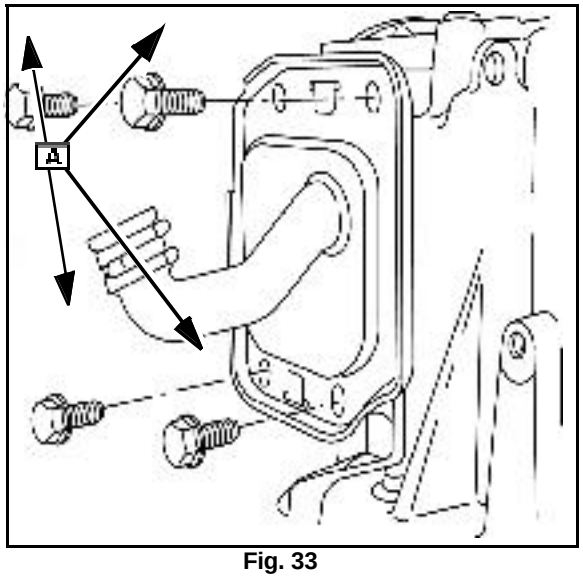

Fig. 33

Breather System (28Q700)

NOTE: There is a 0.120 in. (3.0 MM.) diameter plastic plug installed in the elbow on the 28Q700 engine where the breather mounts. If it gets plugged the oil will get sucked out of the engine. Clean the plug any time there is service performed in that area.

1. Remove breather tube from breather.
2. Remove two screws holding breather. Remove breather and gasket and discard gasket.
3. A 0.045 in. (1.14 MM.) wire gauge (**A**) should *not* enter the space between the fiber disc valve (**B**) and the body (**C**). The breather holes ([**D**] Fig. 34) must be open.
4. Check as shown in. Fig. 34.

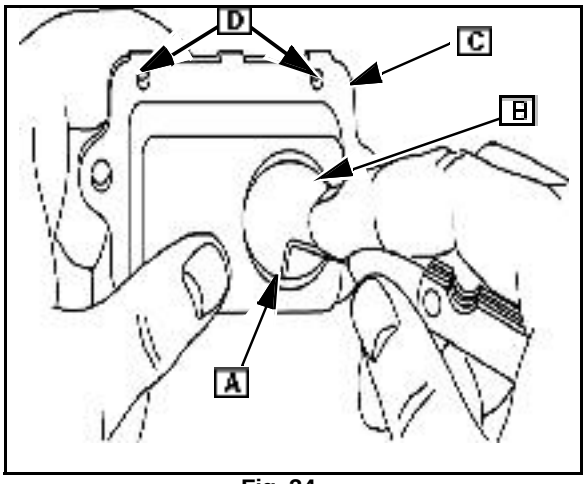

Fig. 34

Replace the breather if the fiber disc valve is stuck or binding.

CAUTION: The fiber disc valve is held in place by an internal bracket that will distort if pressure is applied to the valve. Do not apply force when checking valve.

5. Place new breather gasket and breather on cylinder. Gaskets do not require sealant.
6. Install two screws. Torque screws to listed value. **SEE SECTION 14-ENGINE SPECIFICATIONS.**

Install breather tube to breather.

To install the 104700 muffler system:

NOTE: Use **(#93963)** valve lubricant on all exhaust system threads to prevent galling of the threads and ease future disassembly.

1. Position new gasket, exhaust elbow and screws ([**A**] Fig. 10).
2. Torque screws to listed values.
3. Place the exhaust elbow shield in position and secure with the two mounting screws ([**A**] Fig. 10). Torque screws to listed values**.**

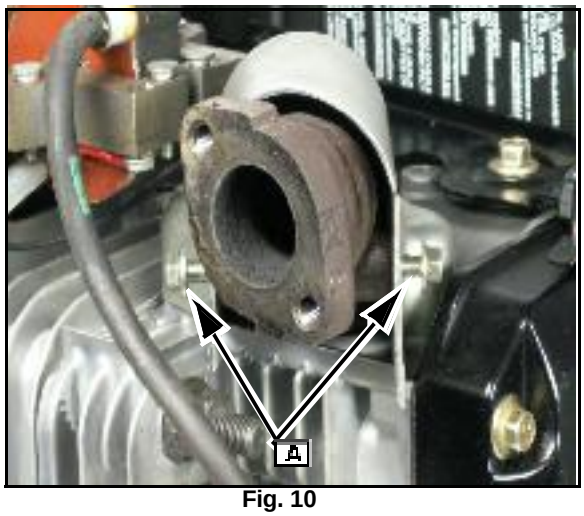

Fig. 10

4. Slide muffler mounting screws through lock plate and push screws through muffler.
5. Place new gasket on mating surface of muffler and insert screws through back plate.
6. Position second new gasket on the back plate and fit assembly into place on exhaust elbow.
7. Torque muffler mounting screws to listed values. **SEE SECTION 14- ENGINE SPECIFICATIONS.**
8. Bend the screw lock tabs against the flat of the muffler mounting screw heads.
9. Install muffler shield (if equipped). Torque screws to listed values.

REMOVE/INSTALL EXHAUST SYSTEM (161400)

Fig. 11

To remove muffler from model 161400:

1. Remove carburetor heat shield ([**A**] Fig. 12).

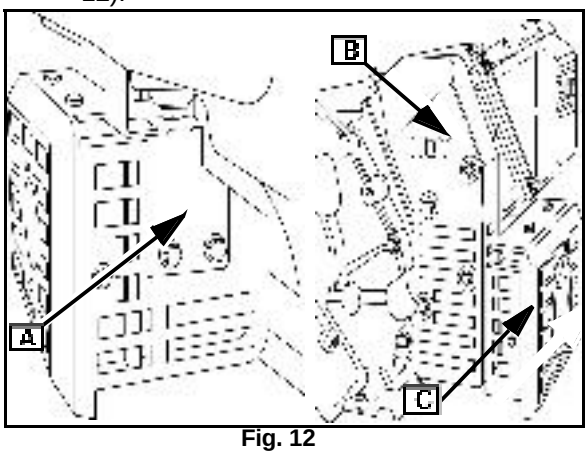

Fig. 12

2. Remove muffler guard (**B**) and manifold guard ([**C**] Fig. 12).

FUEL TANKS, FITTINGS AND LINES

Fuel System (050000, 118400)

Removal

1. Disconnect breather hose ([**A**] Fig. 1) at rocker cover and remove air cleaner assembly.
2. Release clamp and disconnect tank hose at fuel shut-off valve ([**B**] Fig. 1).
3. Place hose in appropriate container and allow fuel to completely drain from tank.

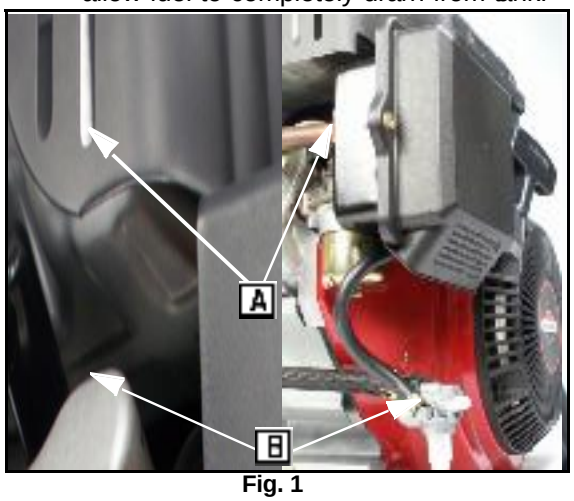

Fig. 1

1. Open carburetor bowl drain screw and drain remaining fuel into appropriate container.
2. Close bowl drain screw.
3. If equipped, remove the remote throttle control bracket (**A**).

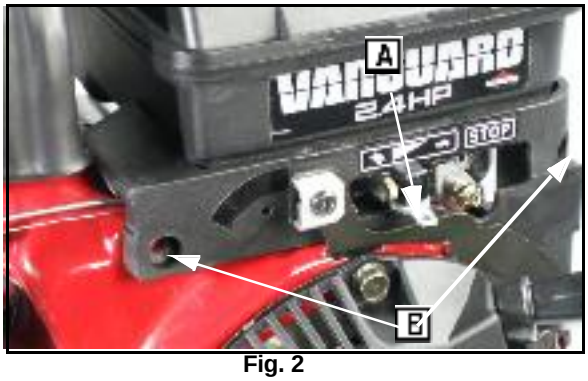

Fig. 2

4. Remove throttle control knob.
5. Remove phillips screws ([**B**] Fig. 2) and trim plate.
6. Remove tank mounting bolts.Keep hoses with tank.
7. Open hose clamp and remove hose from tank outlet fitting and set aside.
8. Remove shut-off valve and bracket if necessary.

Installation

For torque values: **SEE SECTION 14- ENGINE SPECIFICATIONS.**

1. Install valve bracket on side of blower housing and torque screws to values listed.
2. Install shut-off valve and hose on valve bracket. Clamp hose to carburetor fitting.
3. Install new hose and clamp on tank outlet fitting. Connect other end of hose and clamp to shut-off valve fitting.

Route tank hose through retainer on crankcase cover, then position tank on engine.

4. Start all screws, then torque each to values listed.
5. Position trim plate and install phillips screws to values listed.
6. Install throttle control knob.
7. If equipped, install the remote throttle control bracket and rewind assembly, and torque screws to values listed.
8. Connect breather hose to valve cover, then install air cleaner assembly.
9. Add small amount of fuel to tank, open shut-off valve and check for leaks.
10. Start engine and check for leaks again.

Fuel System (085400, 115400, 117400, 138400, 185400, 235400, 245400)

Removal

1. Open hose clamp and disconnect tank hose at fuel shut-off valve.
2. Place hose in appropriate container and allow fuel to completely drain from tank.

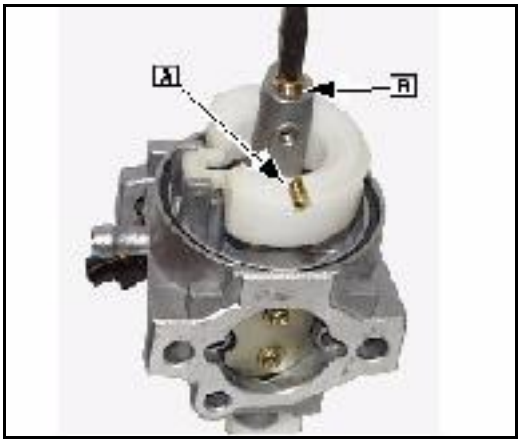

Fig. 29

The float hinge pin ([**A**] Fig. 30) is a wedge fit.

5. Tap the small end of the pin (**B**) with a center punch until it is loose.
6. Remove pin (**A**) and remove the float ([**C**] Fig. 30) and inlet needle assembly.

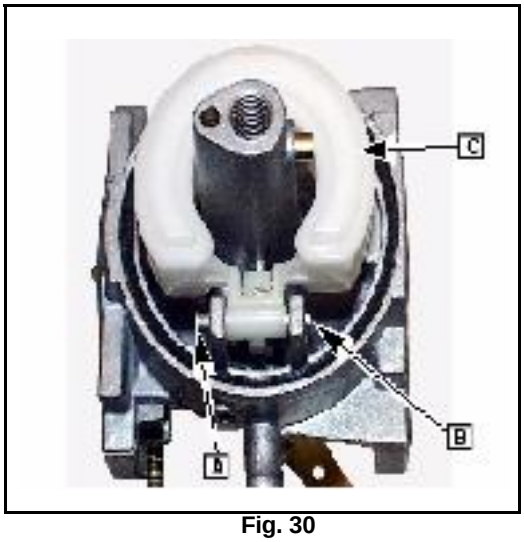

Fig. 30

7. Remove pilot jet (**A**) with Screwdriver # *19062*.
8. Pry off the idle mixture valve limiter (**B**), if used. Remove the idle mixture screw and spring ([**C**] Fig. 31).

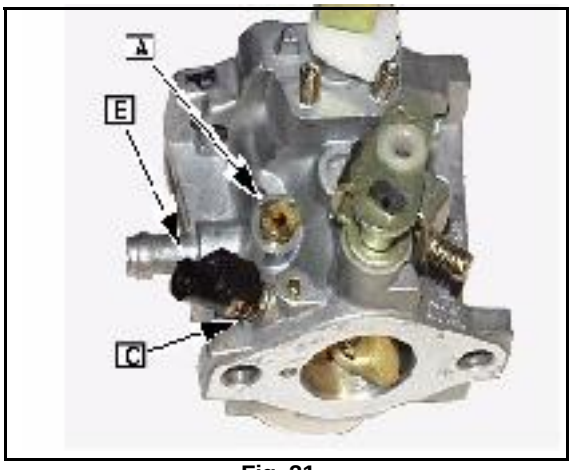

Fig. 31

9. Remove screws (**A**) holding choke plate ([**B**] Fig. 32) and remove.

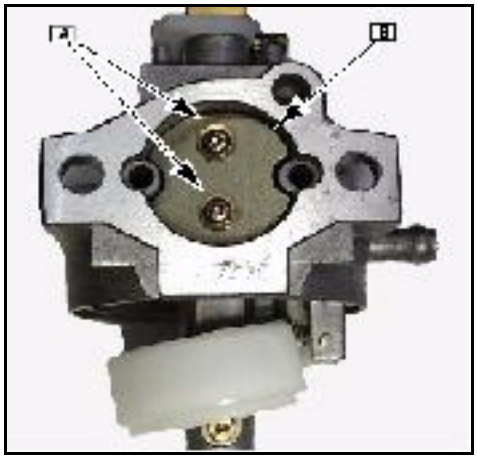

Fig. 32

10. Lift out choke shaft (**A**) with upper (**B**) and lower ([C] Fig. 33) choke shaft bushings.

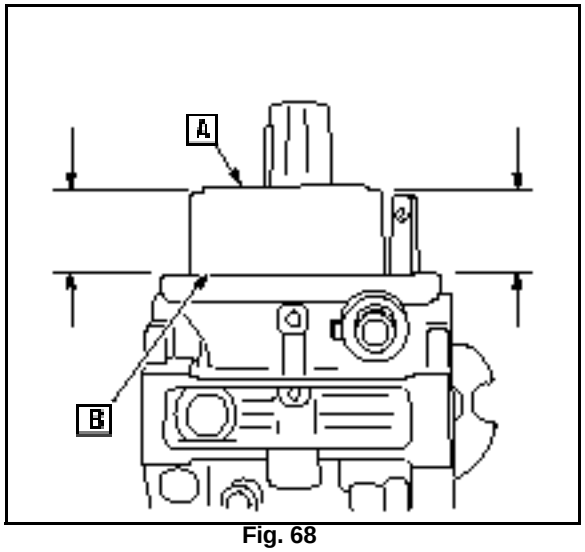

Fig. 68

If not parallel:

- Replace the fuel inlet valve, float and hinge pin.

5

19. Install the emulsion tube (**A**) and then the main jet ([**B**] Fig. 69).

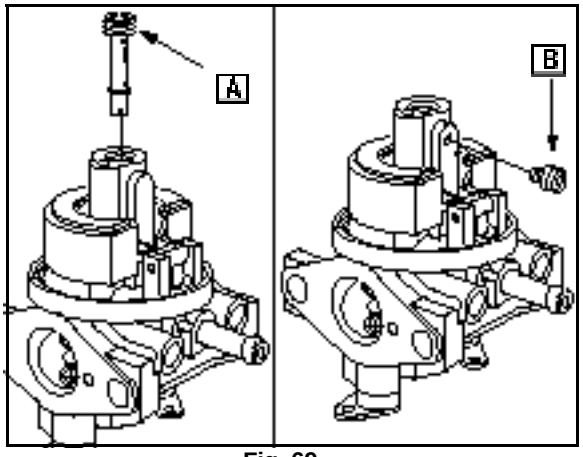

Fig. 69

20. Position bowl drain (**A**) as shown, Fig.69.

21. Install float bowl (**B**), washer (**C**), and mounting screw (**D**), to carburetor.
22. Tighten screw ([**D**] Fig. 70) securely.

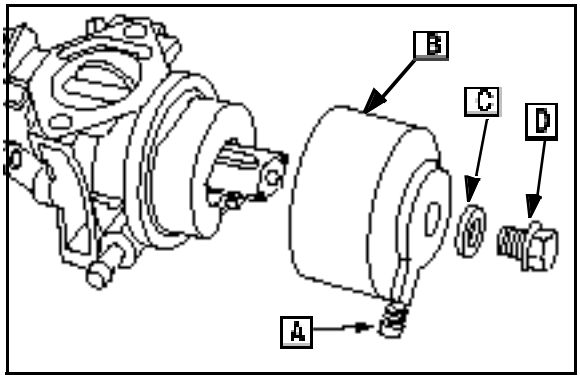

Fig. 70

Identifying Main Jets (104700)

Model Series	Standard Jet	High Altitude Jet
Before 90091033	100	92.5
After 90090933	107.5	102.5

Carburetor Service - Mikuni (161400)

CAUTION: Do not use wires, drills or other devices to clean out metering holes and passages.

NOTE: Use compressed air at a moderate pressure setting (5-7 PSI). Blow in both directions to clean out all openings and passages.

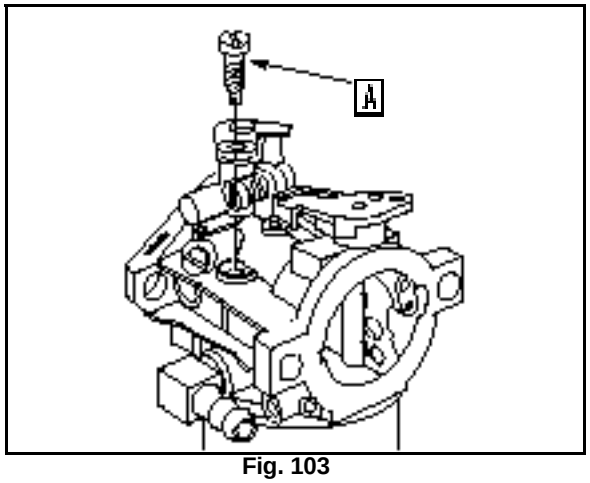

Fig. 103

15. Using carburetor nozzle screwdriver # *19280*, remove main carburetor emulsion tube ([**A**] Fig. 104).

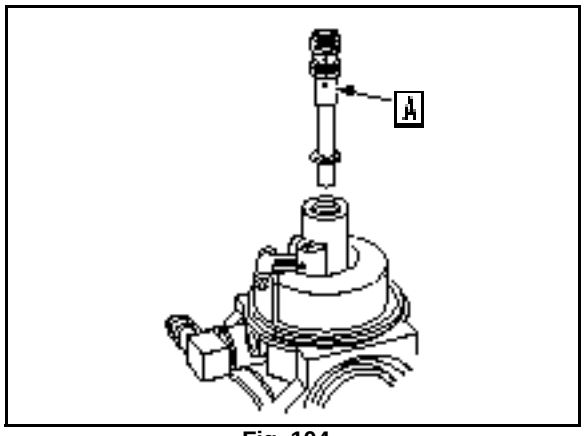

Fig. 104

TO CLEAN CARBURETOR: SEE SECTION 5- FUEL SYSTEMS AND CARBURETION.

Assembly

1. Assemble retainer ([**A**] Fig. 105) on choke shaft (**B**).
2. Place choke shaft spring (**C**) on shaft and hook small hook in notch on choke lever
3. Assemble washer (**D)**, and retainers (**E**) to choke shaft.
4. Insert choke shaft assembly into carburetor body. Engage large end of return spring (**C**) on boss.
5. If the carburetor has a spring detent, guide the detent spring into the slot on the choke shaft lever.
6. Place choke plate (**F**) on shaft, single notch on edge towards fuel inlet. Two half moon dimples position the plate on the shaft. Secure with two screws ([**G**] Fig. 105).

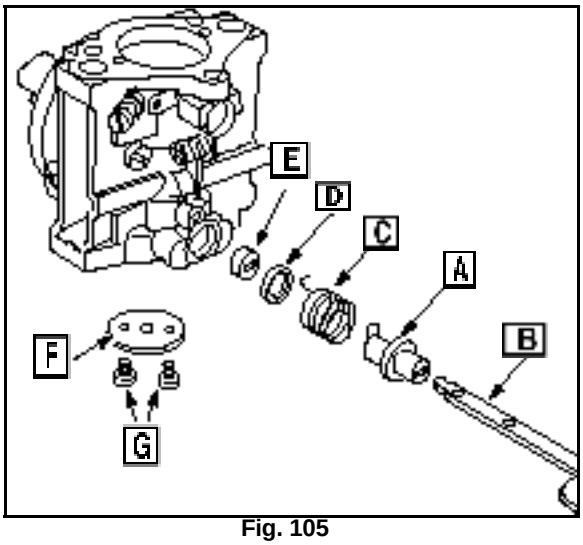

Fig. 105

1. Install throttle shaft seal (**A**) to carburetor body. Install seal with grooved side out.
2. Place plastic throttle shaft seal (**B**) on throttle shaft ([**C**] Fig. 106).
3. Install throttle shaft to carburetor body.

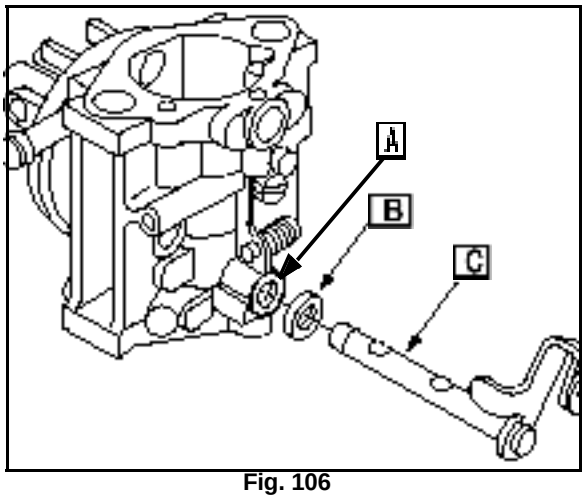

Fig. 106

4. Rotate throttle shaft until the flat side of the shaft is facing out.
5. Lay the throttle plate (**A**) on the shaft with the stamped numbers ([**B**] Fig. 107) to the left. Install two screws with lock washers.

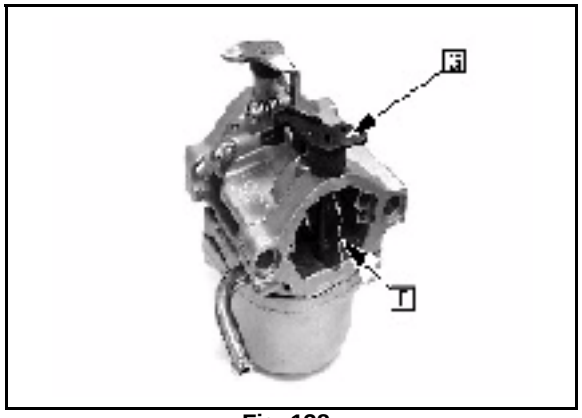

Fig. 138

CAUTION: This carburetor has pressed-in jets that are not serviceable. Do not attempt to remove the jets.

5

To clean carburetor:

SEE SECTION 5- FUEL SYSTEM AND CARBURETION.

14. Insert jumper wires to the connectors ([**A**] Fig. 139) on the end of the solenoid.
15. Connect other end of jumper wires to a new 9 volt transistor battery.

The plunger needle ([**B**] Fig. 139) should retract into the solenoid body.

If not:

- Replace the solenoid.

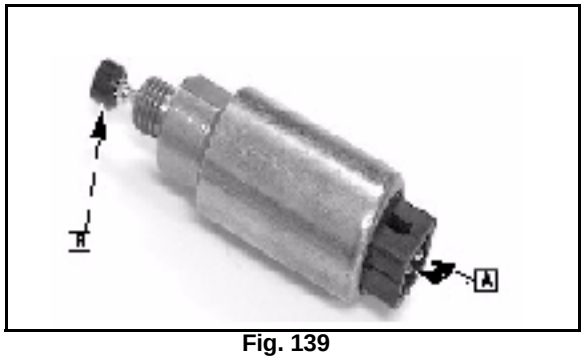

Fig. 139

Assembly

1. If separated, place the throttle return spring ([**A**] Fig. 140) inside the large foam seal (**B**).
2. Slide the seal and spring on to the choke shaft (**C**) with the top of the spring (**D**) contacting the choke shaft lever ([**E**] Fig.140).
3. Turn the choke shaft ccw while gently pushing it into the carburetor body until the bottom end of the spring (**A**) rests on the back of the spring perch ([**F**] Fig. 140).

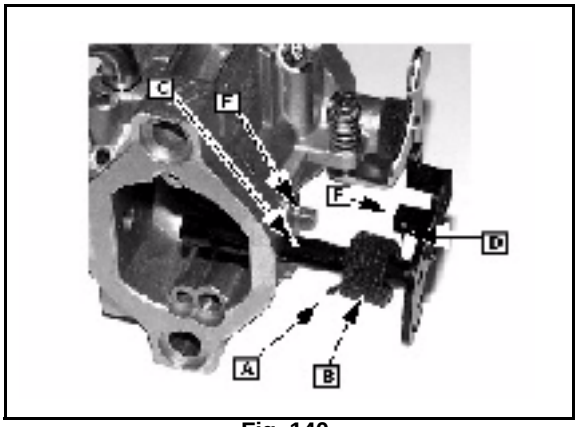

Fig. 140

4. Lift the choke shaft up slightly and continue turning ccw until the stop (**E**) on the lever clears the spring perch ([**F**] Fig.141).
5. Push the shaft inward.
6. When released, the choke shaft lever should rest on the spring perch as shown (Fig. 141.)

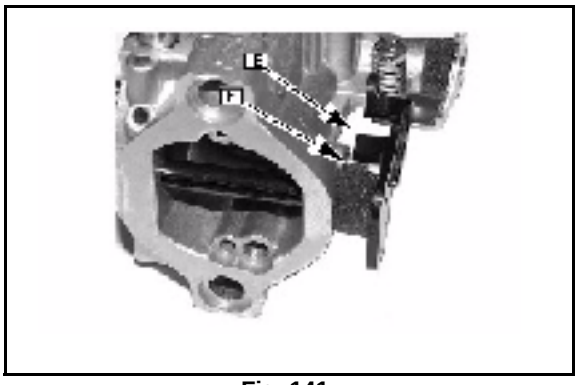

Fig. 141

7. Insert the choke plate (**G**) into the choke shaft (**H**) with the dimples ([**I**] Fig. 142) toward the air inlet side of the carburetor.

10. Remove thrust washer.

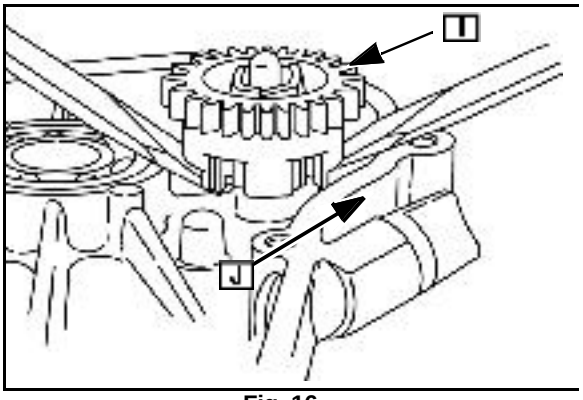

Fig. 16

Governor Component Inspection

See SECTION 6- GOVERNOR SYSTEMS.

Governor Gear Shaft - Remove and Replace

1. Press governor gear shaft (**K**) out of cylinder cover from outside, Fig. 17.

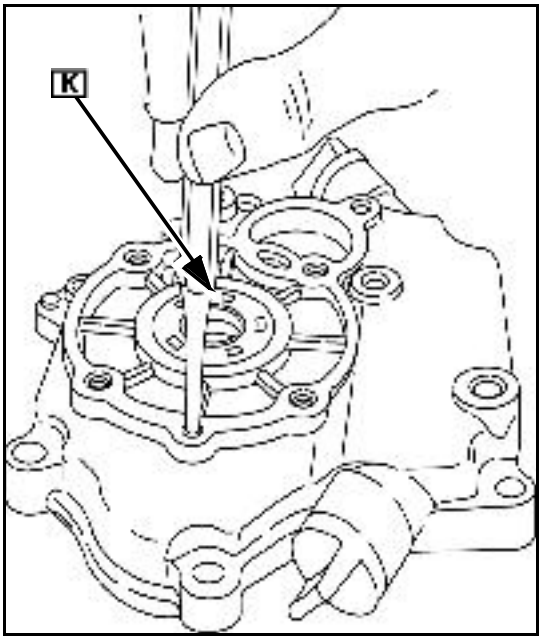

Fig. 17

2. Press either end of the new governor gear shaft (**K**) into the inside of cylinder cover from the inside until shaft is **1.220 - 1.222 in. (30.99 - 31.04 mm)** high (**L**) from boss, Fig. 18.

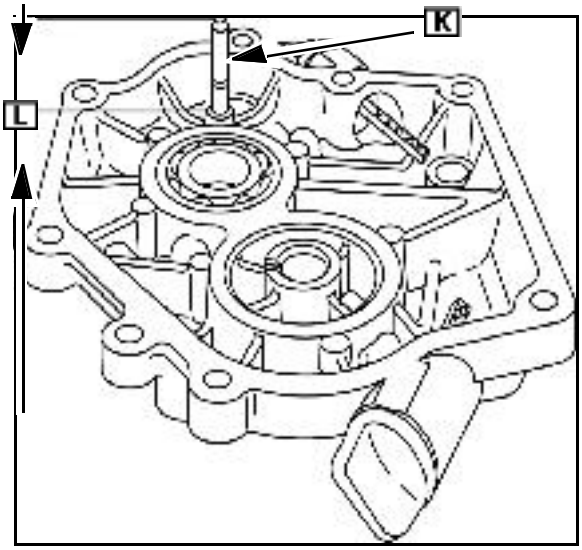

Fig. 18

Governor Component Installation

1. Place thrust washer on governor gear shaft.
2. Place governor gear weights (if removed) in governor cup and place assembly on governor gear shaft.
3. Push assembly down until gear snaps into groove on governor gear shaft.
4. Position the crankshaft and other components as required for clearance to install the governor crank.
5. Install E-ring (if equipped) in groove on governor crank (**F**). (Refer to Fig. 11).
6. Push governor crank up through cylinder housing.
7. Place felt seal (**G**) (if equipped) and thrust washer (**E**) on crank. Insert spring clip (**D**) in governor crank (**F**),Fig. 19.
8. Install camshaft (if removed).

NOTE: Orientation and location of spring clip (**D**) is shown in Fig.12.

VALVES

Remove Valves (050000, 086400, 118400, 104700)

1. Place cylinder head on a solid and flat work surface.
2. Bundle a rag under the face of the valve being removed.
3. With a small socket mounted on a drive handle, push the valve retainer down from the direction of the open slot as shown in ([**A**] Fig. 9).
4. Follow the sequence shown ([**B** & **C**] Fig.9).

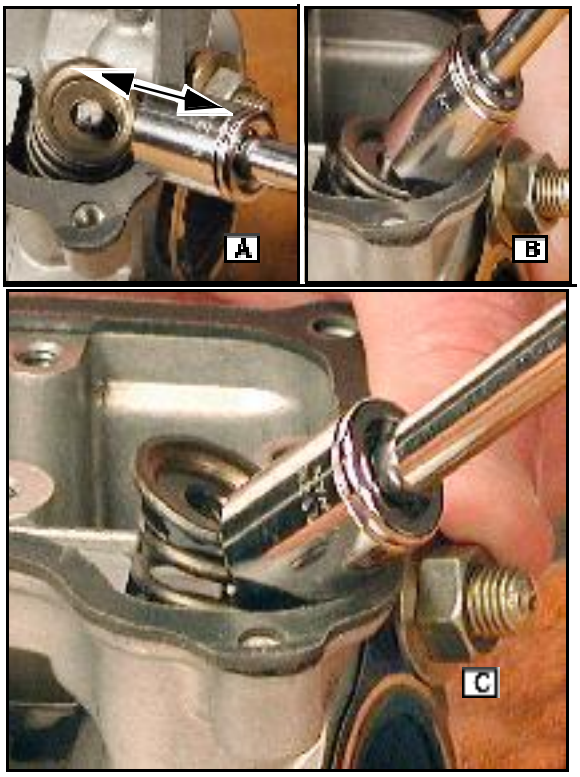

Fig. 9

5. Allow valve to slide out of guide
6. Repeat this process for the remaining valve.
7. Remove oil splash guard (if equipped) and set aside.

Remove Valves (085400, 086400, 115400, 117400, 138400, 185400, 161400, 260700, 261700, 28Q700)

1. Place cylinder head on a solid and flat work surface.
2. Bundle a rag under the face of the valve being removed.
3. Install rocker arm nuts ([**A**] Fig. 10) and studs in cylinder head. Do not tighten.
4. Slip end of Valve Spring Compressor **#19347** (**B**), under nut and over valve spring.
5. Press down on tool handle to compress valve spring and remove split retainer.
6. Gradually release pressure on tool to remove retainer ([**C**] Fig. 10), spring, and seal(s).
7. Discard the seals.

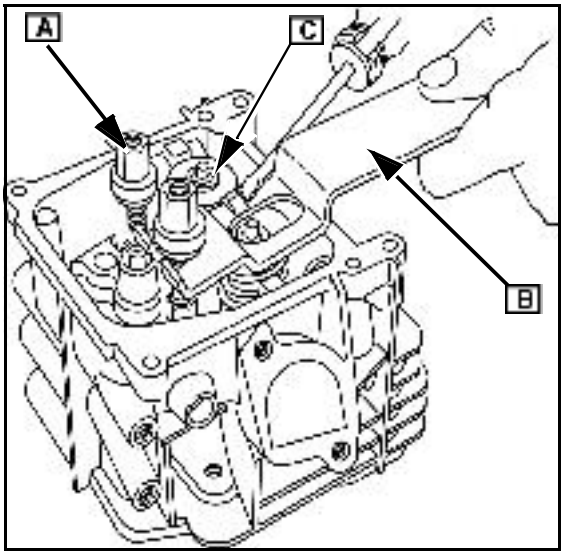

Fig. 10

7

4. Install pawls (**A**), pawl springs (**B**), and brake spring ([**C**] Fig. 26).

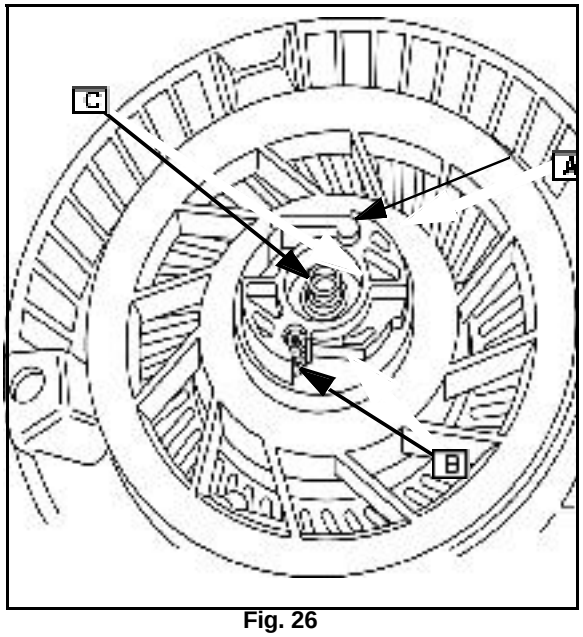

Fig. 26

5. Place retainer (**A**) on brake spring and partially tighten retainer screw ([**B**] Fig. 27. Pierced holes on retainer must be between pawls and stop on pulley.

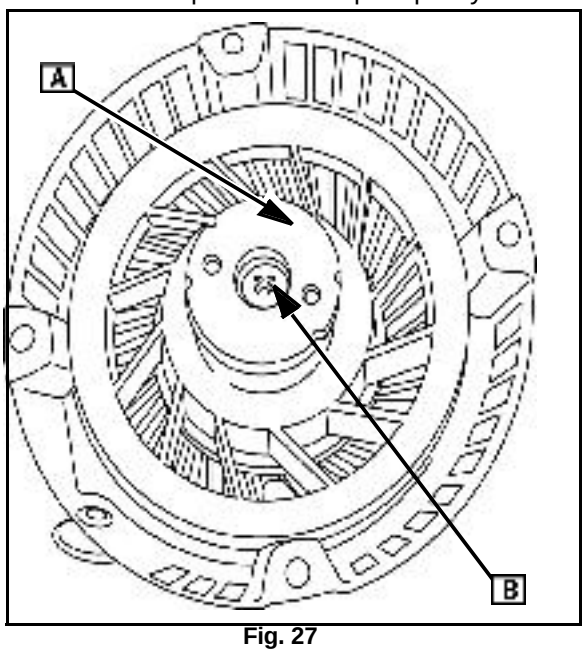

Fig. 27

6. Torque retainer screw ([**B**] Fig. 433) to **listed value. See SECTION 14- ENGINE SPECIFICATIONS.**
7. Rotate pulley counterclockwise until spring is tight.
8. Lock pulley with screwdriver.
9. Insert rope through housing and hole in pulley.
10. Secure rope to pulley with overhand knot. **See SECTION 8- FIG. 3.**
11. Remove pulley lock and allow spring to slowly retract rope into rewind starter assembly.

Disassemble Rewind Starter (28Q700)

NOTE: If problems are encountered with the clutch, replace the entire clutch unit. Remove starter clutch from crankshaft pilot with tool **(#19244)**.

1. Cut knot at starter pulley and remove rope.
2. Grasp outer end of rewind spring ([**A**] Fig. 28) with pliers. Pull out of housing as far as possible.
3. Turn spring 1/4 turn. Remove from pulley or bend up one of the tangs with Tang Bender **#19480**. Lift out starter pulley to disconnect spring.

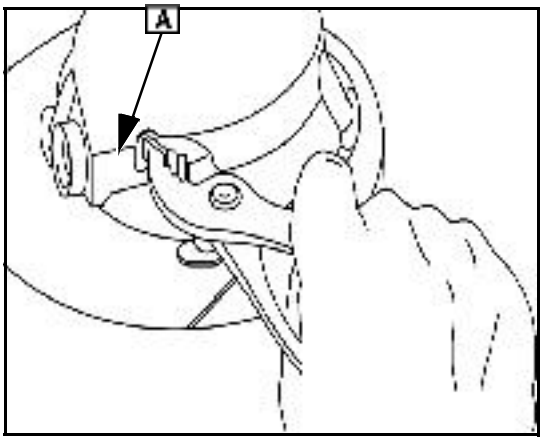

Fig. 28

4. Clean rewind housing, pulley and rewind spring in solvent. Wipe clean with cloth.

Pressure Lubrication (104700, 260700, 261700)

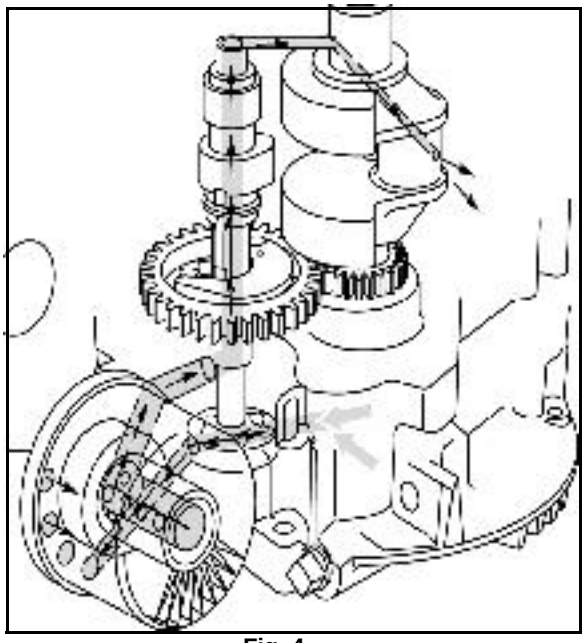

Fig. 4

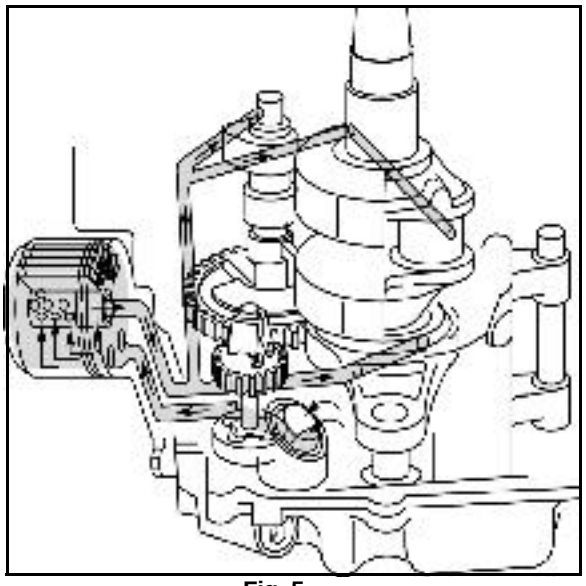

Fig. 5

Pressure Filtration

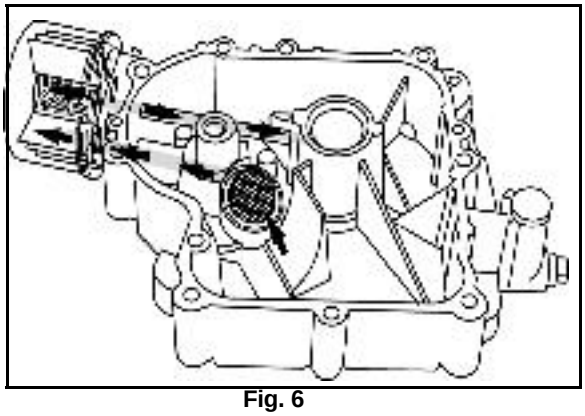

Fig. 6

OIL PUMP SERVICE

Oil Pump & Screen Removal/ Installation (104700, 260700, 261700)

The oil pump can be accessed from the outside of the sump.

Oil Pump Removal/Installation (104700)

1. Remove the three screws that hold the oil pump cover to the sump.

The O-ring that seals the cover is held in a channel machined into the sump ([**A**] Fig. 7).

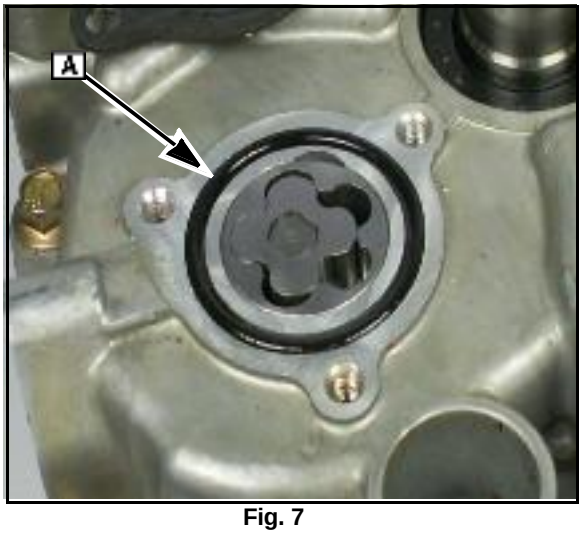

Fig. 7

Use the following plug gauges to check cam bearings:

- 161400 - Gauge **#19383**
- 104700 - Gauge **#19164** (Magneto-Side)
- 260700, 261700 - Gauge **#19383**
- 28Q700 - Gauge **#19164**

Insert the gauge ([**A**] Fig. 3) into the bearing at several locations.

If the plug gauge can be inserted 1/4 in. (6.35 mm) or more:

- Replace cylinder, cover or sump.

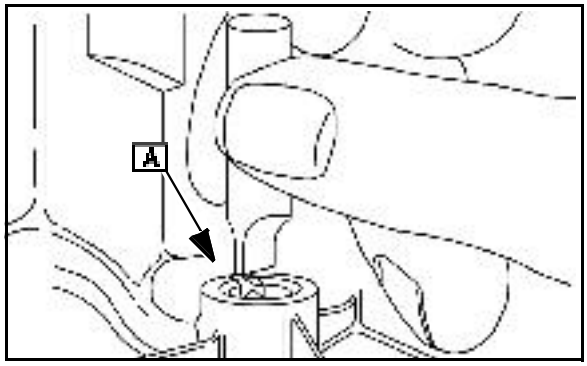

Fig. 3

Ball Bearing Service (050000)

Removal: Magneto And PTO Side Ball Bearing

1. Set the cylinder or cover on an appropriate fixture in an arbor press.
2. Use a press die that fits through the seal opening and carefully apply pressure from the inside until the bearing comes free of the housing.

NOTE: The seal for the crankshaft PTO and the flywheel end are the same. However, the inner diameter of the bearings are not. If bearing replacement is necessary, replace both bearings as a set and be sure to order the bearings by individual part number.

Installation: Magneto And PTO-Side Ball Bearing

Press a new bearing into a housing or cover from the outside in. Be sure that the bearing goes into the channel straight and that the bearing is completely seated into its machined opening.

Ball Bearing Service (085400, 086400)

Removal: Magneto-Side Ball Bearing

Bearing Removal Tools: (Refer to Fig. 4)

- Puller Screw ([**A**] #19318)
- Washer ([**B**] #225136)
- Adapter/Driver ([**C**] #19397)
- Bushing ([**D**] #19454)

1. Remove oil seal.
2. Assemble washer (**B**) to puller screw and insert through adapter/driver (**C**).
3. Place bushing (**D**) against ball bearing.
4. Insert puller screw (**A**) with driver adapter into ball bearing and thread into bushing (**D**).
5. Tighten puller screw until ball bearing comes free of cylinder.

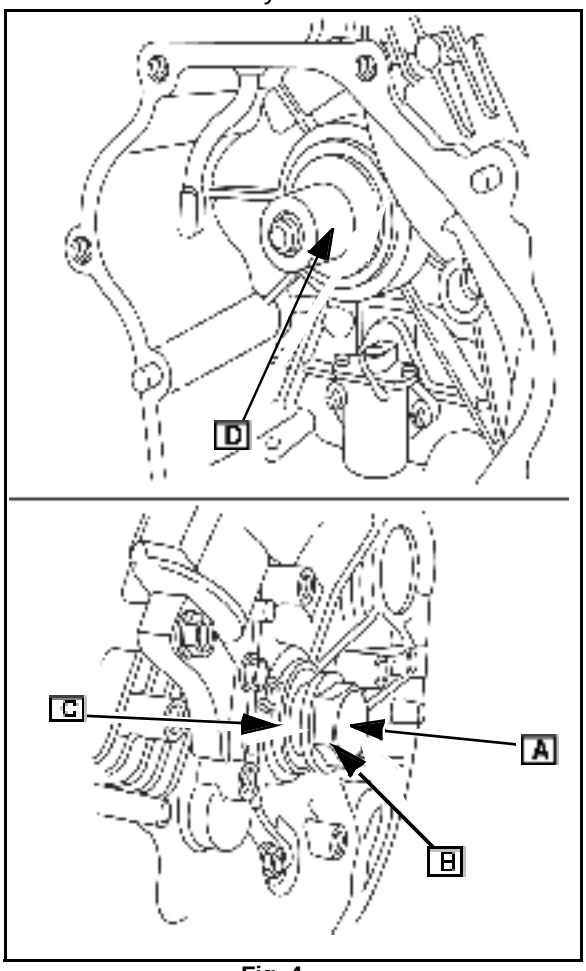

Fig. 4

PTO-Side Ball Bearing

If the measurement obtained from the sump cover bearing exceeds limitations:

- Replace sump.

INSTALLING COVERS AND SUMPS

Seal Protectors (All Models)

Use a seal protector to prevent damage to oil seals when installing covers or sumps.

Tool#	Color	Size
19334/1	White	.787 (19.99mm)
19334/2	Red	.875 (22.23mm)
19334/3	Blue	.984 (24.99mm)
19334/4	Orange	1.00 (25.40mm)
19334/5	Brown	1.062 (26.97mm)
19334/6	Green	1.181 (30.00mm)
19334/7	Yellow	1.378 (35.00mm)
19356/8	Purple	1.317 (33.45mm)
19356/9	Black	1.503 (38.18mm)

Installation: Cylinders and Covers And Sumps (All Models)

Make sure the mating surfaces of the cylinder and cover or sump are clean.

1. Place the gasket ([**A**] Fig. 33) on the mating surface of the cylinder.

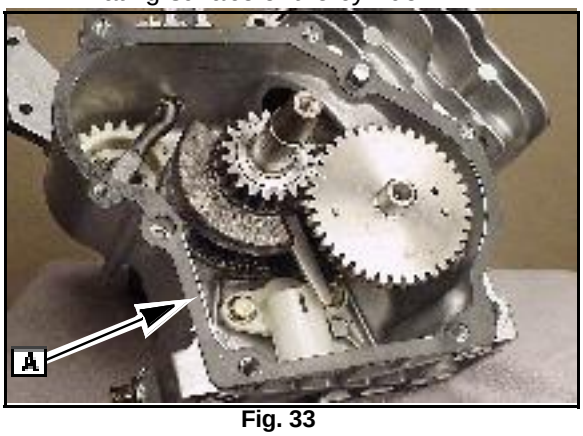

Fig. 33

2. Place the cover or sump on top of the gasket and install the cover mounting bolts finger tight.

NOTE: It may be necessary to rotate crankshaft and camshaft to get oil pump (when equipped) to engage drive slot in camshaft. For counter-balanced engines, it may be necessary to rotate the counterweight shaft to mesh with timing gear when installing cover.

- Do not force cover.
- Make sure mechanical governor gear and oil pump (if used) is engaged with camshaft.
- For adjustment procedure for crankshaft end play, **see Page 207.**

3. Follow the torque sequence shown for the engine you are working on:

Inspecting Compression Release (050000, 085400, 115400, 117400, 118400, 138400, 185400, 235400, 245400)

When inspecting the compression release mechanism, ensure that all parts move freely.

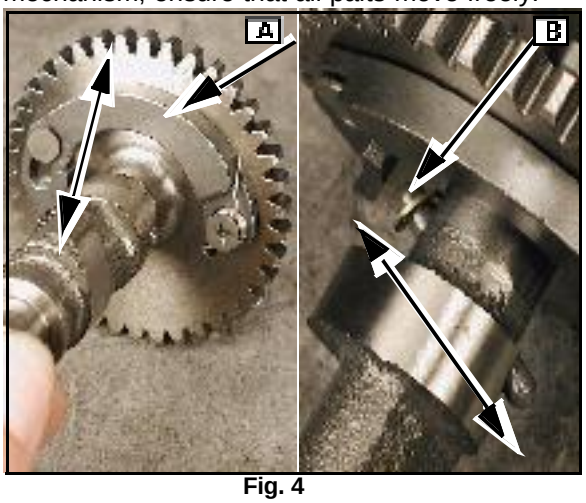

Fig. 4

1. Rotate the weight (**A**) against the spring and move the decompression pin ([**B**] Fig. 4) back and forth. Pin should slide easily through camshaft.
2. The weight should return with spring pressure.

If weight binds, pivot pin is worn, or spring is broken:

- Replace complete camshaft assembly.

Inspecting Compression Release (104700, 161400, 260700, 261700, 28Q700)

Check compression release mechanism ([**A**] Fig. 5) for wear, nicks, and freedom of movement.

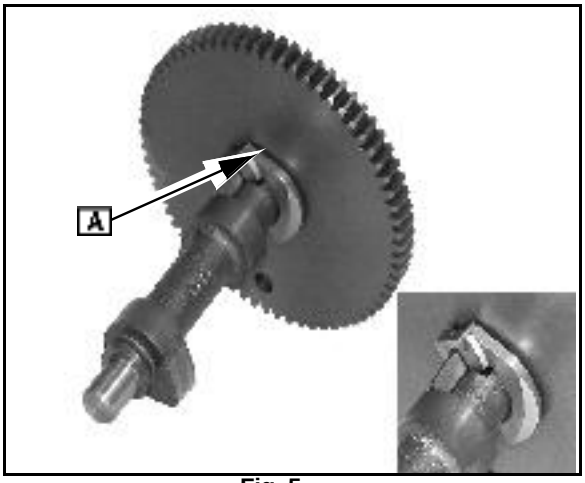

Fig. 5

If any discrepancies are found:

- Replace complete camshaft assembly.

Inspecting Valve Tappets (All Models)

Inspect valve tappets for wear on the tappet surface. Replace if worn or damaged.

Inspecting Crankshaft

Refer to Fig. 6 to check wear points on crankshaft.

1. Measure the diameters of the PTO journal (**A**), crank pin (**B**) and mag journal (**C**).
2. Check keyways (**D**) for wear and spreading.
3. Check timing gear ([**E**] Fig. 6**)** for chipped or cracked teeth and for wear in the keyway. Replace crankshaft and gear if worn or damaged.

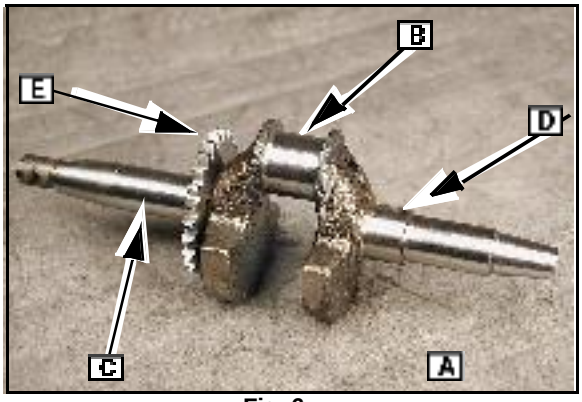

Fig. 6

4. Polish crankshaft journals for smooth lubricating surface. Use crocus cloth until polish lines are uniform over entire journal.

Direction of polish lines must be as shown in ([**A**] Fig. 7).

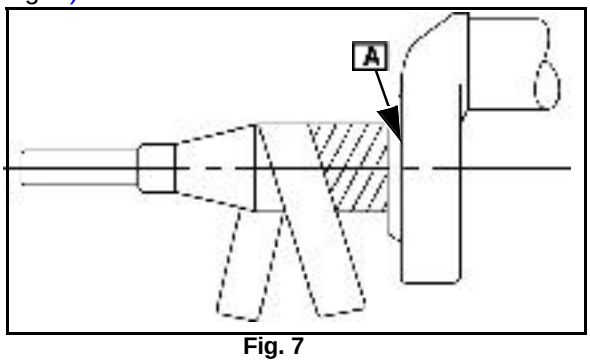

Fig. 7

5. Wash journal with a solvent such as kerosene to remove residue.

12

17. Connect breather hose and install air filter housing (**A**) and trim ([**B**] Fig. 37).

Fig. 37

18. Install air filter and cover.

MODELS 260700, 261700

1. Mount the governor lever (**A**) on the governor shaft as shown in Fig. 38.

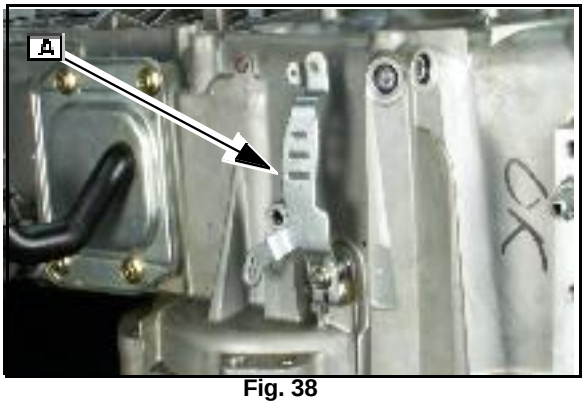

Fig. 38

2. Install the control bracket (Fig. 39).

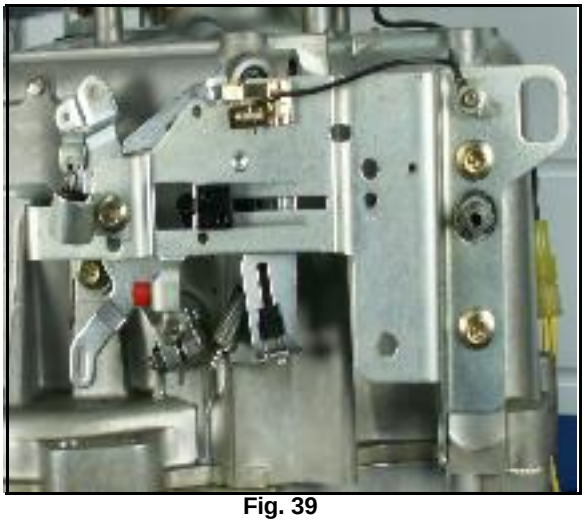

Fig. 39

3. Connect the main governor spring ([**A**] Fig. 40).

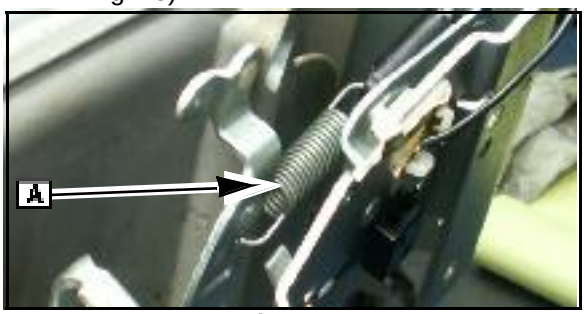

Fig. 40

4. Connect the idle control spring ([**A**] Fig.41).

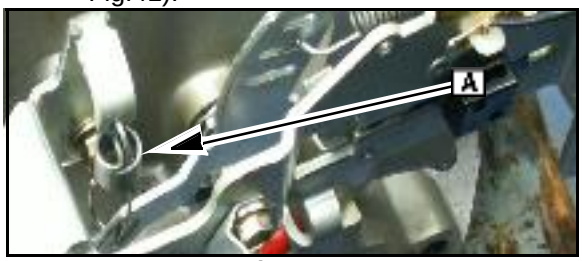

Fig. 41

5. Install the alternator.

Engine Specifications (085400 & 086400)

Armature Air Gap	.012 -.020 in. (.30 -.50 mm)
Bolt Circle (1)	3.625 in. (92.08 mm)
Bore	2.441 in. (62.0 mm)
Crankshaft End Play	.001 -.008 in. (.03 -.20 mm)
Displacement	7.69 cu. in. (126 cc)
Fuel Tank Capacity	3.2 qt. (3.0 liter)
Oil Capacity - No Filter	20 oz. (.6 liter)
Spark Plug Gap	.030 in. (.76 mm)
Stroke	1.653 in. (42.0 mm)
Valve Clearance - Intake	.002 -.004 in. (.05 -.10 mm)
Valve Clearance - Exhaust	.002 -.004 in. (.05 -.10 mm)

Fastener Torque Specifications (085400 & 086400)	Tool Size	Torque
Air Cleaner Base / Backplate	10 mm	45 lb-in. (5 Nm)
Air Cleaner Cover	Wing Nut	N/A
Air Cleaner Support Bracket	10 mm	45 lb-in. (5 Nm)
Armature	10 mm	30 lb-in. (3 Nm)
Blower Housing	10 mm	45 lb-in. (5 Nm)
Carburetor Bowl Screw	12 mm	85 lb-in. (10 Nm)
Connecting Rod	10 mm	90 lb-in. (10 Nm)
Control Bracket	10 mm	45 lb-in. (5 Nm)
Control Panel Trim	10 mm	45 lb-in. (5 Nm)
Cylinder Cover	12 mm	175 lb-in. (20 Nm)
Cylinder Head	12 mm	220 lb-in. (25 Nm)
Cylinder Shield	10 mm	45 lb-in. (5 Nm)
Flywheel Nut	21 mm	44 lb-ft. (60 Nm)
Fuel Shut-Off Valve	10 mm	70 lb-in. (8 Nm)
Fuel Tank	10 mm	90 lb-in. (10 Nm)
Governor Lever Nut	10 mm	60 lb-in. (7 Nm)
Muffler	12 mm	175 lb-in. (20 Nm)
Muffler Guard	Phillips	90 lb-in. (10 Nm)
Oil Drain Plug	12 mm	175 lb-in. (20 Nm)
Oil Fill Cap	Wing Nut	45 lb-in. (5 Nm)
Oil Guard Module	8 mm	35 lb-in. (4 Nm)
Oil Guard Float Switch	Phillips	45 lb-in. (5 Nm)
Rewind Starter	10 mm	45 lb-in. (5 Nm)
Rocker Arm Pivot	14 mm	N/A
Rocker Arm Stud	12 mm	175 lb-in. (20 Nm)
Rocker Ball Set Screw or Nut	10 mm	35 lb-in. (4 Nm)
Spark Plug	5/8 in.	180 lb-in. (20 Nm)
Valve Cover	10 mm	35 lb-in. (4 Nm)

Fastener Torque Specifications (138400)	Tool Size	Torque
Rocker Arm Pivot	14 mm	N/A
Rocker Arm Stud	12 mm	175 lb-in. (20 Nm)
Rocker Ball Set Screw or Nut	10 mm	35 lb-in. (4 Nm)
Spark Plug	5/8 in.	180 lb-in. (20 Nm)
Starter Contactor	10 mm	45 lb-in. (5 Nm)
Starter Key Switch Panel	10 mm	45 lb-in. (5 Nm)
Starter Motor Bracket	12 mm	140 lb-in. (16 Nm)
Starter Motor Thorough Bolts	7 mm	50 lb-in. (6 Nm)
Stator	10 mm	45 lb-in. (5 Nm)
Valve Cover	10 mm	35 lb-in. (4 Nm)
Voltage Regulator / Rectifier	10 mm	45 lb-in. (5 Nm)

Reject Dimensions (138400)	Standard Size	Reject Size
Cylinder (138400)		
Magneto Bearing	Ball	N/A
Camshaft Bearing	.5909 in. (15.01 mm)	.5917 in. (15.03 mm)
Bore Diameter	2.8346 in. (72.0 mm)	2.8358 in. (72.03 mm
Bore Out-Of-Round	N/A	.0015 in. (.04 mm)
Cylinder Head (138400)	**Standard Size**	**Reject Size**
Intake Valve Seat Angle	45°	N/A
Intake Valve Seat Width	3/64-4/64 in. (1.19-1.59 mm)	N/A
Intake Valve Stem Diameter	.2346 in. (5.96 mm)	.2338 in. (5.94 mm)
Intake Valve Guide	.2368 in. (6.02 mm)	.2378 in. (6.04 mm)
Exhaust Valve Seat Angle	45°	N/A
Exhaust Valve Seat Width	3/64-4/64 in. (1.19-1.59 mm)	N/A
Exhaust Valve Stem Diameter	.2346 in. (5.96 mm)	.2338 in. (5.94 mm)
Exhaust Valve Guide	.2368 in. (5.50 mm)	.2378 in. (6.04 mm)
Cylinder Cover (138400)		
PTO Bearing	Ball	N/A
Camshaft Bearing	.5909 in. (15.01 mm)	.5917 in. (15.03 mm)
Crankshaft (138400)		
Crank Pin Journal	1.1811 in. (30.0 mm)	1.1803 in. (29.98 mm
Mag-Side Journal	1.1811 in. (30.0 mm)	1.1803 in. (29.98 mm
PTO-Side Journal	.9842 in. (25.0 mm)	.9835 in. (24.98 mm)

Reject Dimensions (161400)	Standard Size	Reject Size
Cylinder Cover (161400)		
PTO Bearing	Ball	N/A
Camshaft Bearing	.6255 in. (15.89 mm)	.6275 in. (15.94 mm)
Counterweight Bearing	.6255 in. (15.98 mm)	.6275 in. (15.94 mm)
Crankshaft (161400)		
Crank Pin Journal	1.43 in. (36.32 mm)	1.429 in. (36.3 mm)
Mag-Side Journal	1.5 in. (38.10 mm)	1.4973 in. (38.03 mm)
PTO-Side Journal	Ball	N/A
Camshaft (161400)		
Mag-Side Journal	.6250 in. (15.88 mm)	.6230 in. (15.82 mm)
PTO-Side Journal	.6250 in. (15.88 mm)	.6230 in. (15.82 mm)
Intake Lobes	N/A	1.2183 in. (30.94 mm)
Exhaust Lobes	N/A	1.2183 in. (30.94 mm)
Compression Release Lobe	N/A	.022-.028 in. (.56-.71 r
Counterweight Shaft (161400)		
Mag-Side Journal	.6250 in. (15.88 mm)	.6230 in. (15.82 mm)
PTO-Side Journal	.6250 in. (15.88 mm)	.6230 in. (15.82 mm)
Connecting Rod (161400)		
Crank Pin Bearing	1.4303 in. (36.33 mm)	1.4331 in. (36.40 mm)
Piston Pin Bearing	.8009 in. (20.34 mm)	.8013 in. (20.35 mm)
Piston (161400)		
Piston Pin Diameter	.8005 in. (20.33 mm)	.80 in. (20.32 mm)
Piston Pin Bore	.8009 in. (20.34 mm)	.8013 in. (20.35 mm)
Ring End Gap (Top)	.006-.014 in. (.15-.35 mm)	.030 in. (.76 mm)
Ring End Gap (Middle)	.006-.014 in. (.15-.35 mm)	.030 in. (.76 mm)
Ring End Gap (Oil Control)	.014-.028 in. (.35-.70 mm)	.065 in. (1.65 mm)
Ring Land Clearance (Top)	.001-.003 in. (.03-.07 mm)	.004 in. (.10 mm)
Ring Land Clearance (Middle)	.001-.003 in. (.03-.07 mm)	.004 in. (.10 mm)
Ring Land Clearance (Oil Control)	.001-.003 in. (.03-.07 mm)	.008 in. (.20 mm)
Starter Rope (161400)		
Rope Size	#5 1/2 in. (4.37 mm)	N/A
Rope Length	62 in. (1.6 mm)	N/A