



REPAIR MANUAL

130600, 131600, 13R200, 13U100, 13U200
SINGLE CYLINDER OHV
AIR COOLED ENGINES



Not for
Reproduction

Foreword

This manual was written to assist engine technicians and service personnel with the maintenance and repair procedures for Briggs & Stratton® engines. It assumes that persons using this manual have been properly trained and are familiar with the service procedures for these products, including the proper use of required tools and the application of appropriate safety practices. Persons untrained or unfamiliar with these procedures or products should not attempt to perform such work.

Proper maintenance and repair is important to safe, reliable operation of all engines and engine-driven systems. The maintenance, troubleshooting, and repair procedures described in this manual are appropriate for the Briggs & Stratton engines described herein. Alternative methods or procedures may pose risks to both personal safety and engine reliability and are not endorsed or recommended by Briggs & Stratton.

All information, illustrations, and specifications contained in this manual were based on the data available at the time of publication. Briggs & Stratton Corporation reserves the right to change, alter, or otherwise improve the product or the product manuals at any time without prior notice.

Briggs & Stratton offers two complementary publications to enhance understanding of engine technology, maintenance, and repair. However, neither publication is a substitute for a recognized training program for engine technicians.

- For consumers, *Small Engine and Equipment Maintenance Guide* (Part No. CE8155) provides a comprehensive overview of how small air-cooled engines work, basic troubleshooting, and step-by-step maintenance procedures.
- For engine technicians and consumers alike, an in-depth study of engine theory and operation can be found in the textbook *Small Engines* (Part No. CE8020).

Both publications can be purchased at BRIGGSandSTRATTON.COM or through a local Briggs & Stratton Authorized Service Dealer.

Copyright © 2017 Briggs & Stratton Corporation.

All rights reserved.

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or recording by any information storage and retrieval system, without prior written permission from Briggs & Stratton Corporation.

This engine repair manual includes the following engine models:

- MODEL 130G00
- MODEL 131G00
- MODEL 13R200
- MODEL 13U100
- MODEL 13U200

NOTE: Some models have limited service parts. Review the *Illustrated Parts List* for part availability before conducting any service work.

NOTE: The images in this document are representative and may differ according to model.

HOW TO USE THIS MANUAL

Besides describing the service maintenance tasks and the intervals at which they are to be performed, two basic levels of service are presented in this manual: engine top end service and engine bottom end service. The manner in which these instructions are used depends upon the tasks to be performed and the level of disassembly required.

Remove External Assemblies

To prepare the engine for service, whether top or bottom end, first see *SECTION 4 - REMOVE EXTERNAL ASSEMBLIES* to remove the air cleaner, fuel tank, carburetor, etc. The order in which the topics are presented is the order in which the assemblies are most easily removed from the engine.

NOTE: A few exceptions to this rule do exist, such as the muffler and rewind starter, which may be serviced without having to remove other external assemblies.

Top End Service

If servicing only cylinder head components, see *SECTION 5 - DISASSEMBLE ENGINE, TOP END DISASSEMBLY*, and then proceed to *SECTION 6 - SERVICE ENGINE SUBASSEMBLIES, CYLINDER HEAD*. When cylinder head service is complete, see *SECTION 7 - ASSEMBLE ENGINE, TOP END ASSEMBLY*.

Bottom End Service

If servicing bottom end components, such as the piston, connecting rod, crankshaft, etc., first see *SECTION 5 - DISASSEMBLE ENGINE, TOP END DISASSEMBLY*, and then proceed to *BOTTOM END DISASSEMBLY* in the same section. When finished, move to *SECTION 6 - SERVICE ENGINE SUBASSEMBLIES*, and see *PISTON AND CONNECTING ROD; FLYWHEEL, CRANKSHAFT AND CAMSHAFT*; and *CRANKCASE AND CRANKCASE COVER*, for all service instructions. When bottom end service is complete, see *SECTION 7 - ASSEMBLE ENGINE, BOTTOM END ASSEMBLY*, and then proceed to *TOP END ASSEMBLY* in the same section.

Install External Assemblies

When the top and bottom ends of the engine are assembled, see *SECTION 8 - INSTALL EXTERNAL ASSEMBLIES* to complete the project. The order in which the topics are presented is the order in which the assemblies are most easily installed on the engine. These instructions also include any cleaning, inspection, or adjustments that may be recommended.

Not for
Reproduction

SECTION 1 – SAFETY AND GENERAL INFORMATION

SECTION 2 – MAINTENANCE

SECTION 3 – TROUBLESHOOTING/SPECIAL TOOLS

SECTION 4 – REMOVE EXTERNAL ASSEMBLIES

SECTION 5 – DISASSEMBLE ENGINE

SECTION 6 – SERVICE ENGINE SUBASSEMBLIES

SECTION 7 – ASSEMBLE ENGINE

SECTION 8 – INSTALL EXTERNAL ASSEMBLIES

SECTION 9 – SPECIFICATIONS

Not for
Reproduction

1

2

3

4

5

6

7

8

9

Not for
Reproduction

SECTION 1 – SAFETY AND GENERAL INFORMATION

SAFETY -----4

- Safety Alert Symbol and Signal Words -----4
- Hazard Symbols and Meanings -----4
- General Safety Messages -----4

GENERAL INFORMATION -----7

- Engine Identification -----7
- Fuel Recommendations -----7
- High Altitude -----7
- Oil Recommendations -----7
- Storage -----8

Not for
Reproduction


SAFETY


1


This manual contains safety information that will:


- Make you aware of hazards associated with engines.
- Inform you of the risk of injury associated with those hazards.
- Instruct you how to avoid or reduce the risk of injury.

Safety Alert Symbol and Signal Words

The safety alert symbol  is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.














 **DANGER** indicates a hazard which, if not avoided, **will result in death or serious injury**.

 **WARNING** indicates a hazard which, if not avoided, **could result in death or serious injury**.

 **CAUTION** indicates a hazard which, if not avoided, **could result in minor or moderate injury**.

NOTICE indicates an situation that **could result in damage to the product**.

Hazard Symbols and Meanings

| Symbol | Meaning | Symbol | Meaning |
|---|--|---|---|
|  | Safety information about hazards that can result in personal injury. |  | Read and understand the Operator's Manual before operating or servicing the unit. |
|  | Fire hazard |  | Explosion hazard |
|  | Shock hazard |  | Explosion hazard |
|  | Hot surface hazard |  | Toxic fume hazard |
|  | Amputation hazard - moving parts |  | Chemical hazard |
|  | Kickback hazard |  | Thrown object hazard - wear eye protection |
|  | Amputation hazard - entanglement | | |

General Safety Messages

Prior to work, read and understand the section(s) of this manual that pertain to the job. Follow all safety warnings.

- Always use fresh gasoline. Stale fuel can cause gum deposits in the carburetor and cause leakage, flow restrictions, or other problems.
- Check fuel lines and fittings frequently for cracks or leaks and replace if necessary.

WARNING

Before attempting to service this equipment, read and understand this manual and the operating instructions of the engine and the equipment.

WARNING

Failure to follow instructions could result in serious injury (including paralysis) and even death.

WARNING

Battery post, terminals, and related accessories contain lead and lead compounds - chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

WARNING

Certain components in this product and its related accessories contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. Wash hands after handling.

WARNING

Briggs & Stratton Engines are not designed for and are not to be used to power: fun-karts; go-karts; children's, recreational, or sport all-terrain vehicles (ATVs); motorbikes; hovercraft; aircraft products; or vehicles used in competitive events not sanctioned by Briggs & Stratton. For information about competitive racing products, see www.briggsracing.com. For use with utility and side-by-side ATVs, please contact Briggs & Stratton Power Application Center, 1-866-927-3349. Improper engine application may result in serious injury or death.

WARNING

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



Fuel and its vapors are extremely flammable and explosive which could cause burns, fire or explosion resulting in death or serious injury.

When Adding Fuel

- Turn engine OFF and let engine cool at least 2 minutes before removing the fuel cap. Loosen cap slowly to relieve pressure in tank.
- Fill fuel tank outdoors or in well-ventilated area.
- Do not overfill fuel tank. To allow for expansion of the fuel, do not fill above the bottom of the fuel tank neck.
- Keep fuel away from sparks, open flames, pilot lights, heat, and other ignition sources.
- Check fuel lines, tank, cap, and fittings frequently for cracks or leaks. Replace if necessary.
- If fuel spills, wait until it evaporates before starting engine.
- Do not light a cigarette or smoke.

When Starting Engine

- Ensure that spark plug, muffler, fuel cap and air cleaner (if equipped) are in place and secured.
- Do not crank engine with spark plug removed.
- If engine floods, set choke (if equipped) to OPEN / RUN position, move throttle (if equipped) to FAST position and crank until engine starts.

When Operating Equipment

- Do not operate this product inside any building, carport, porch, mobile equipment, marine applications, or enclosure.
- Do not tip engine or equipment at angle which causes fuel to spill.
- Do not choke the carburetor to stop engine.
- Never start or run the engine with the air cleaner assembly (if equipped) or the air filter (if equipped) removed.

When Changing Oil

- If you drain the oil from the oil fill hole (not recommended), the fuel tank must be empty or fuel can leak out and result in a fire or explosion.

When Tipping Unit for Maintenance

- When performing maintenance that requires the unit to be tipped, the fuel tank, if mounted on the engine, must be empty or fuel can leak out and result in a fire or explosion.

When Transporting Equipment

- Transport/move/repair with fuel tank EMPTY or with fuel shutoff valve OFF.

- Do not tip engine or equipment at angle which causes fuel to spill.
- Disconnect spark plug wire.

When Storing Fuel or Equipment with Fuel In Tank

- Store away from furnaces, stoves, water heaters, clothes dryers, or other appliances that have pilot lights or other ignition source because they could ignite fuel vapors.



Starting engine creates sparking which could ignite nearby flammable gases causing explosion or fire resulting in death or serious injury.

- If there is natural or LP gas leakage in the area, do not start engine.
- Do not use pressurized starting fluids because vapors are flammable.



POISONOUS GAS HAZARD. Engine exhaust contains carbon monoxide, a poisonous gas that could kill you in minutes. You CANNOT see it, smell it, or taste it. Even if you do not smell exhaust fumes, you could still be exposed to carbon monoxide gas. If you start to feel sick, dizzy, or weak while using this product, get to fresh air RIGHT AWAY. See a doctor. You may have carbon monoxide poisoning.

- Operate this product ONLY outside far away from windows, doors and vents to reduce the risk of carbon monoxide gas from accumulating and potentially being drawn towards occupied spaces.
- Install battery-operated carbon monoxide alarms or plug-in carbon monoxide alarms with battery back-up according to the manufacturer's instructions. Smoke alarms cannot detect carbon monoxide gas.
- DO NOT run this product inside homes, garages, basements, crawlspaces, sheds, or other partially-enclosed spaces even if using fans or opening doors and windows for ventilation. Carbon monoxide can quickly build up in these spaces and can linger for hours, even after this product has shut off.
- ALWAYS place this product downwind and point the engine exhaust away from occupied spaces.



Starter cord kickback (rapid retraction) will pull hand and arm toward engine faster than you can let go which could cause broken bones, fractures, bruises, or sprains resulting in serious injury.

- When starting engine, pull the starter cord slowly until resistance is felt and then pull rapidly to avoid kickback.
- Remove all external equipment / engine loads before starting engine.
- Direct-coupled equipment components such as, but not limited to, blades, impellers, pulleys, sprockets, etc., must be securely attached.



Rotating parts could entangle hands, feet, hair, clothing, or accessories resulting in serious injury.

- NEVER operate equipment without protective housing or covers in place.
- DO NOT wear loose clothing, jewelry or anything that could become entangled in the equipment.
- Tie up long hair and remove jewelry.
- Keep hands and feet away from rotating parts.



Running engines produce heat. Engine parts, especially mufflers, become extremely hot which could cause severe thermal burns or catching fire to combustible debris, such as leaves, grass, brush, etc., resulting in serious injury.

- Allow muffler, engine cylinder and fins to cool before touching.
- Remove accumulated debris from muffler area and cylinder area.
- It is a violation of California Public Resource Code, Section 4442, to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order. Other states or federal jurisdictions may have similar laws. Contact the original equipment manufacturer, retailer, or dealer to obtain a spark arrester designed for the exhaust system installed on this engine.



Unintentional sparking could cause fire or electric shock resulting in death or serious injury.

Unintentional start-up could result in entanglement, traumatic amputation, or laceration.

Before performing adjustments or repairs:

- Disconnect the spark plug wire and keep it away from the spark plug.
- Disconnect battery at negative terminal (only engines with electric start.)
- Use only correct tools.
- Do not tamper with governor spring, links or other parts to increase engine speed.
- Replacement parts must be of the same design and installed in the same position as the original parts. Other parts may not perform as well, may damage the unit, and may result in injury.
- Do not strike the flywheel with a hammer or hard object because the flywheel may later shatter during operation.

When testing for spark:

- Use approved spark plug tester.
- Do not check for spark with spark plug removed.



Charging batteries produce hydrogen gas which could cause explosion resulting in death or serious injury.

- Do not store or charge a battery near an open flame or device that utilizes a pilot light or can create a spark.



Damaged, worn, or loose fuel components can leak fuel which could cause explosion or fire resulting in death or serious injury.

- All fuel components should be in good condition and properly maintained.
- Repairs should only be made with factory approved parts.
- Repair work should be done by a qualified technician.
- Flexible supply lines should be checked regularly to make sure they are in good condition.



Prolonged or repeated contact with used motor oil could cause injury.

- Used motor oil has been shown to cause skin cancer in certain laboratory animals.
- Thoroughly wash exposed areas with soap and water.

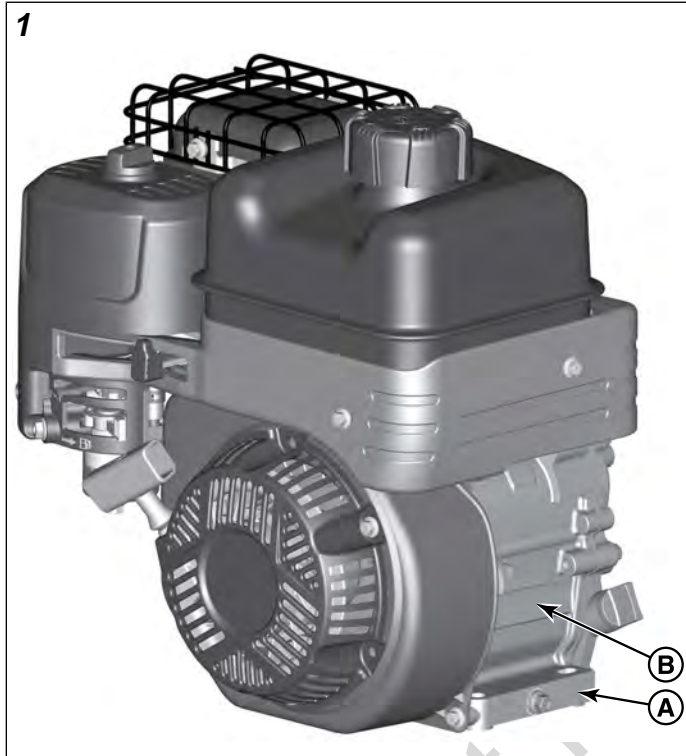
NOTICE

Failure to follow instructions could result in property damage.

GENERAL INFORMATION

Engine Identification

See (A) or (B) in Figure 1 for location of engine identification.



High Altitude

At altitudes over 5,000 feet (1524 meters), a minimum 85 octane / 85 AKI (89 RON) gasoline is acceptable.

For carbureted engines, high altitude adjustment is required to remain emissions compliant. Operation without this adjustment will cause decreased performance, increased fuel consumption, and increased emissions. Contact a Briggs & Stratton Authorized Service Dealer for high altitude adjustment information. Operation of the engine at altitudes below 2,500 feet (762 meters) with the high altitude adjustment is not recommended.

For Electronic Fuel Injection (EFI) engines, no high altitude adjustment is necessary.

Oil Recommendations

Oil Capacity: See the *Specifications* section.

NOTICE

This engine was shipped from Briggs & Stratton without oil. Equipment manufacturers or dealers may have added oil to the engine. Before you start the engine for the first time, make sure to check the oil level and add oil according to the instructions in this manual. If you start the engine without oil, it will be damaged beyond repair and will not be covered under warranty.

Fuel Recommendations

Fuel must meet these requirements:

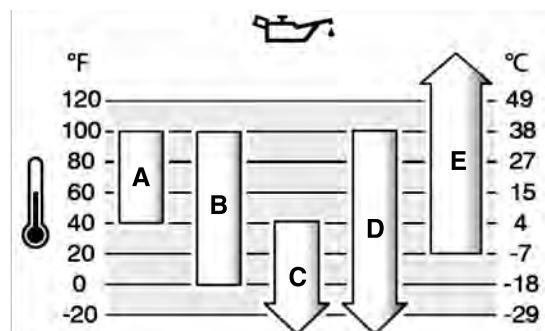
- Clean, fresh, unleaded gasoline.
- A minimum of 87 octane / 87 AKI (91 RON). For high altitude use, see below.
- Gasoline with up to 10% ethanol (gasohol) is acceptable.

NOTICE Do not use unapproved gasolines, such as E15 and E85. Do not mix oil in gasoline or modify the engine to run on alternate fuels. Use of unapproved fuels will cause damage to engine components, **which will not be covered under warranty.**

To protect the fuel system from gum formation, mix a fuel stabilizer into the fuel. See **Storage**. All fuel is not the same. If starting or performance problems occur, change fuel providers or change brands. This engine is certified to operate on gasoline. The emissions control system for this engine is EM (Engine Modifications).

We recommend the use of Briggs & Stratton Warranty Certified oils for best performance. Other high-quality detergent oils are acceptable if classified for service SF, SG, SH, SJ or higher. Do not use special additives.

Outdoor temperatures determine the proper oil viscosity for the engine. Use the chart to select the best viscosity for the outdoor temperature range expected. Engines on most outdoor power equipment operate well with 5W-30 Synthetic oil. For equipment operated in hot temperatures, Vanguard™ 15W-50 Synthetic oil provides the best protection.



| | |
|---|---|
| A | SAE 30 - Below 40 °F (4 °C) the use of SAE 30 will result in hard starting. |
| B | 10W-30 - Above 80 °F (27 °C) the use of 10W-30 may cause increased oil consumption. Check oil level more frequently. |
| C | 5W-30 |
| D | Synthetic 5W-30 |
| E | Vanguard™ Synthetic 15W-50 |

Storage

Fuel can become stale when stored over 30 days. Stale fuel causes acid and gum deposits to form in the fuel system or on essential carburetor parts. To keep fuel fresh, use **Briggs & Stratton® Advanced Formula Fuel Treatment & Stabilizer**, available wherever Briggs & Stratton genuine service parts are sold.

There is no need to drain gasoline from the engine if a fuel stabilizer is added according to instructions. Run the engine for 2 minutes to circulate the stabilizer throughout the fuel system before storage. If gasoline in the engine has not been treated with a fuel stabilizer, it must be drained 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.

Not for
Reproduction

SECTION 2 – MAINTENANCE

| | |
|--|----|
| MAINTENANCE | 10 |
| Maintenance Schedule | 10 |
| Change Engine Oil/Check Engine Oil Level | 10 |
| Clean Muffler, Rewind Starter Finger Guard, and Controls | 11 |
| Clean/Replace Air Filter and Pre-Cleaner | 11 |
| Dual Element Oval Air Filter | 12 |
| Oil Bath Air Filter | 12 |
| Foam Low Mount Air Filter | 13 |
| Foam Large Panel Air Filter | 13 |
| Paper Air Filter | 14 |
| Clean/Inspect Muffler and Spark Arrester | 14 |
| Change 6:1 Gear Reduction Oil (If Equipped) | 15 |
| Clean/Gap/Replace Spark Plug | 15 |
| Clean/Replace In-Tank Fuel Filter | 16 |
| Clean Carburetor Sediment Bowl | 17 |
| Clean Air Cooling System | 17 |
| Check/Adjust Valve Clearance | 18 |

Not for
Reproduction

MAINTENANCE

Maintenance Schedule

| After First 5 Hours |
|---|
| <ul style="list-style-type: none"> Change Engine Oil |
| Every 8 Hours or Daily |
| <ul style="list-style-type: none"> Check Engine Oil Level Clean Muffler, Rewind Starter Finger Guard, and Controls |
| Every 25 Hours or Annually |
| <ul style="list-style-type: none"> Clean Air Filter and Pre-Cleaner † |
| Every 50 Hours or Annually |
| <ul style="list-style-type: none"> Change Engine Oil Clean/Inspect Muffler and Spark Arrester |
| Every 100 Hours or Annually |
| <ul style="list-style-type: none"> Change 6:1 Gear Reduction Oil (If Equipped) |
| Annually |
| <ul style="list-style-type: none"> Replace Air Filter and Pre-Cleaner Clean/Gap/Replace Spark Plug Clean/Replace In-Tank Fuel Filter Clean Carburetor Sediment Bowl Clean Air Cooling System † Check/Adjust Valve Clearance ‡ |

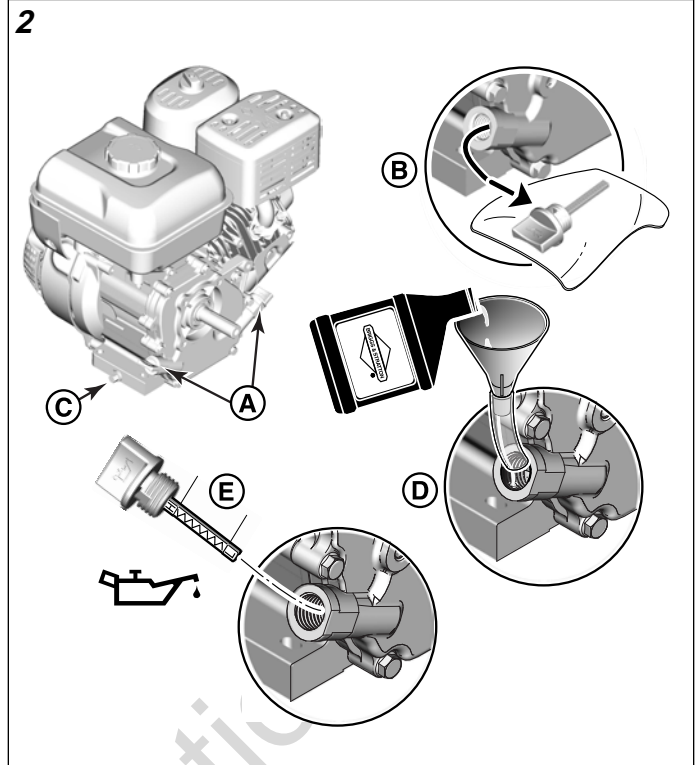
† Clean more often in dusty conditions or when airborne debris is present.

‡ Not required unless engine performance problems are noted.

Change Engine Oil/Check Engine Oil Level

- Place engine on a flat, level surface.
- Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
- See Figure 2. Thoroughly clean area around dipstick oil plug (A) of all dirt and debris.
- Remove dipstick oil plug and wipe dipstick with a clean, lint free cloth (B).
NOTE: Proceed to step 8 if only checking engine oil level.
- Remove oil drain plug(s) with sealing washer(s) at base of engine (C) and drain oil into an approved container.
- Install oil drain plug(s) with sealing washer(s) and tighten as follows.

| Oil Drain Plug | |
|------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 140-200 lb-in (15.8-22.6 N-m) |
| 13U100, 13U200 | 248-266 lb-in (28-30 N-m) |



- Using a funnel and a short length of plastic tubing, slowly pour **19-22 ounces** (550-650 ml) of the recommended type of oil into the oil plug opening (D). See *Section 1 - Safety and General Information, General Information, Oil Recommendations*. DO NOT overfill.
- Slowly insert dipstick oil plug until lightly seated on threads, but do not tighten.
NOTE: The most accurate oil level readings are obtained when the engine is cold.
- Allow a few seconds to elapse, and then slowly remove dipstick oil plug.
- Verify that oil level (E) is on the cross hatch pattern at or near the H(igh) mark.
NOTE: Observe oil level on both sides of the dipstick. The lower level of the two readings is the correct oil level measurement.
- Add oil as necessary until oil level is correct.
- Install dipstick oil plug and tighten as follows.

| Dipstick Oil Plug | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 10-30 lb-in (1.1-3.4 N-m) |
| 13U100, 13U200 | 18-27 lb-in (2-3 N-m) |

13. Install spark plug wire onto spark plug terminal.
14. Start and run engine for one minute. Check for oil leaks while engine is running.
15. Dispose of used oil at a proper waste disposal or recycling center.

Clean Muffler, Rewind Starter Finger Guard, and Controls

NOTE: Proper cleaning reduces the risk of engine damage due to overheating and ignition of accumulated debris.

NOTE: Avoid using high pressure compressed air, which can force dirt and debris deeper into engine cavities and crevices. Do not use a pressurized water spray as water intrusion can contaminate both oil and fuel systems and lead to corrosion.

1. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
2. Remove air cleaner cover and air filter. See *Clean/Replace Air Filter and Pre-Cleaner* in this section.
3. See Figure 3. Remove three hex flange screws to release rewind starter (A) from blower housing.

NOTE: Note orientation of the rewind starter before removal.

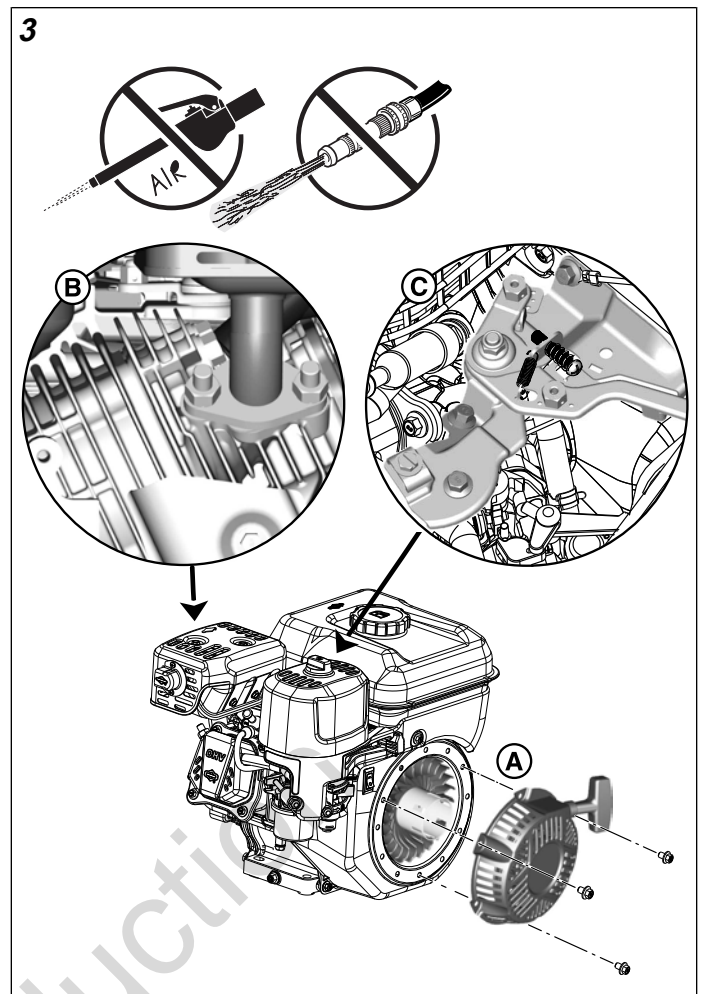
4. Thoroughly clean rewind starter finger guard and muffler (B). Carefully clean governor link, springs, and controls (C). Proceed as follows:

- A. Remove all loose debris by hand.
 - B. Remove dust and dirt with a soft bristle brush and a portable hand held vacuum.
 - C. Gently scrape away stubborn accumulations of dirt and other deposits using a plastic putty knife or stiff bristle brush.
 - D. Apply a light solvent to bristle brush to loosen and remove grit and oily residue, if necessary.
5. Verify that all combustible debris is removed from area around and behind muffler.
 6. Verify that governor link, springs, and controls move freely without sticking, binding, or contacting blower housing or fuel tank.
 7. Orient rewind starter as noted before removal.

NOTE: Rewind starter may be installed in the 2 o'clock, 8 o'clock, 10 o'clock, or 12 o'clock positions.

8. Loosely install three hex flange screws to fasten rewind starter to blower housing.

NOTE: To ensure that pawls evenly engage flywheel starter cup, pull starter rope, tighten hex flange screws until snug, and then release starter rope.



9. Alternately tighten three hex flange screws as follows.

| Rewind Starter Screws | |
|------------------------|-------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 25-35 lb-in (2.8-4 N-m) |
| 13U100, 13U200 | 71-89 lb-in (8-10 N-m) |

10. Install air filter and air cleaner cover. See *Clean/Replace Air Filter and Pre-Cleaner* in this section.

Clean/Replace Air Filter and Pre-Cleaner

NOTE: Starting or running the engine with the air filter or air cleaner assembly removed can cause engine damage.

Refer to one of the following configurations:

- Dual Element Oval Air Filter
- Oil Bath Air Filter
- Foam Low Mount Air Filter
- Foam Large Panel Air Filter
- Paper Air Filter

Dual Element Oval Air Filter

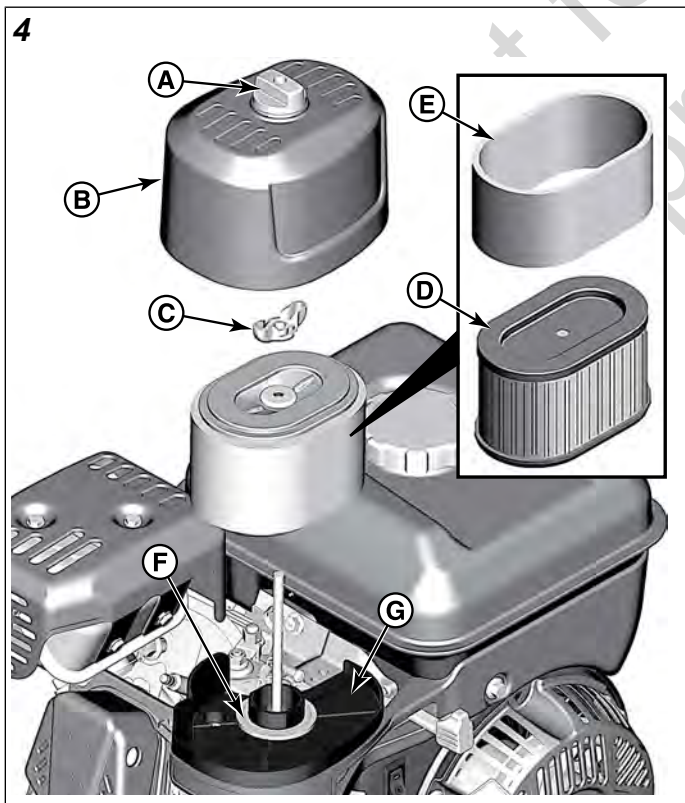
1. See Figure 4. Remove knob (A) to release air cleaner cover (B).
2. Remove wing nut (C) to release air filter cartridge (D) with foam pre-cleaner (E).

NOTE: Exercise care to keep dust and dirt out of carburetor. Inadequate precautions can result in engine damage.

3. Remove seal washer (F) from air cleaner base (G). Inspect seal washer for damage or general deterioration. Replace if necessary.
4. Remove foam pre-cleaner from air filter cartridge.
5. Gently tap air filter cartridge on a hard surface to loosen dirt and debris. Carefully brush and/or vacuum air filter cartridge as necessary.

NOTE: Use of pressurized air or solvents will damage foam pre-cleaner and air filter cartridge.

6. Gently wash foam pre-cleaner in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely.
7. Carefully inspect foam pre-cleaner and air filter cartridge. Replace parts if they cannot be adequately cleaned or if any damage is observed.
8. Install foam pre-cleaner onto air filter cartridge.
9. Install seal washer onto air cleaner base.



10. Place air filter cartridge with foam pre-cleaner onto air cleaner base. Install wing nut, but do not over-tighten.

11. Install air cleaner cover. Install knob, but do not over-tighten.

Oil Bath Air Filter

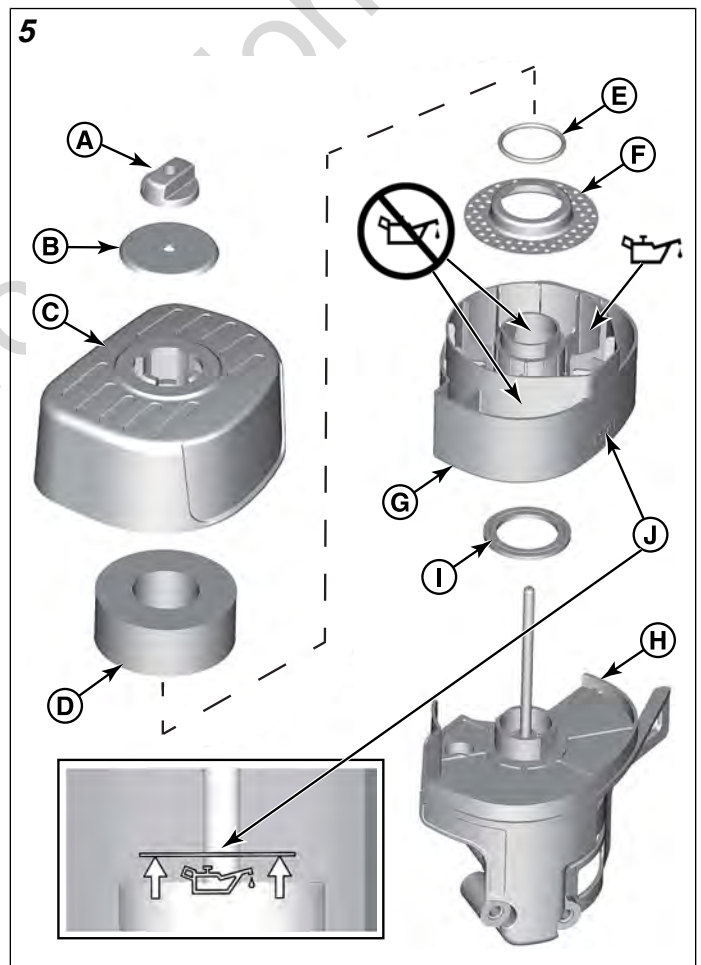
1. See Figure 5. Remove knob (A) and flat washer (B) to release air cleaner cover (C).

NOTE: Exercise care to keep dust and dirt out of carburetor. Inadequate precautions can result in engine damage.

2. Remove foam filter (D) from air cleaner cover.
3. Gently wash foam filter in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely.

NOTE: Use of pressurized air or solvents will damage foam filter.

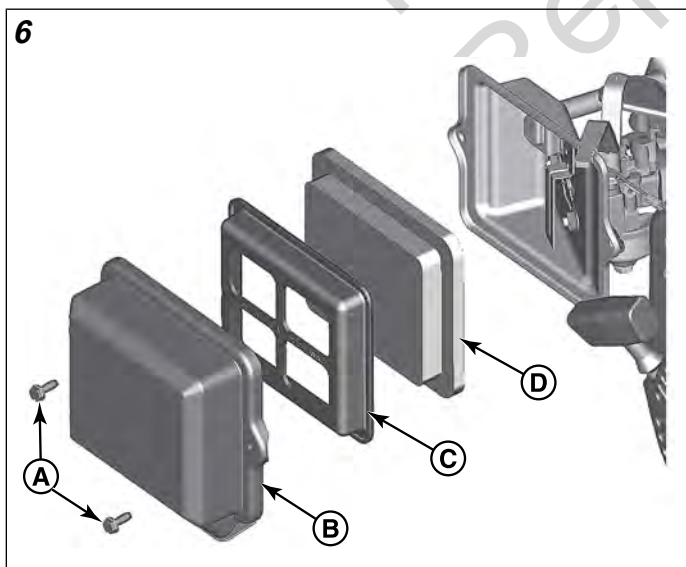
4. Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.



- Apply a small amount of clean SAE 30 engine oil to foam filter. Gently squeeze foam filter until engine oil is evenly distributed. Squeeze foam filter in a clean cloth to remove excess oil.
- Remove O-ring (E) and baffle screen (F) from bath bowl (G).
- Remove bath bowl from air cleaner base (H). Empty used oil into an approved container.
- Remove seal washer (I) from air cleaner base. Inspect seal washer for damage or general deterioration. Replace if necessary.
- Wash bath bowl and air cleaner cover in warm, soapy water. Wipe dry with a clean cloth.
- Install seal washer and bath bowl onto air cleaner base.
- Add clean SAE 30 engine oil to bath bowl until level is even with horizontal line (J). Do not overfill.
- Install baffle screen and O-ring onto bath bowl.
- Install foam filter into air cleaner cover.
- Install air cleaner cover.
- Install flat washer and knob, but do not over-tighten.
- Dispose of used oil at a proper waste disposal or recycling center.

Foam Low Mount Air Filter

- See Figure 6. Remove two hex flange screws (A) to release air cleaner cover (B).
- NOTE:** Exercise care to keep dust and dirt out of carburetor. Inadequate precautions can result in engine damage.
- Remove retainer (C) and foam filter (D) from air cleaner cover.

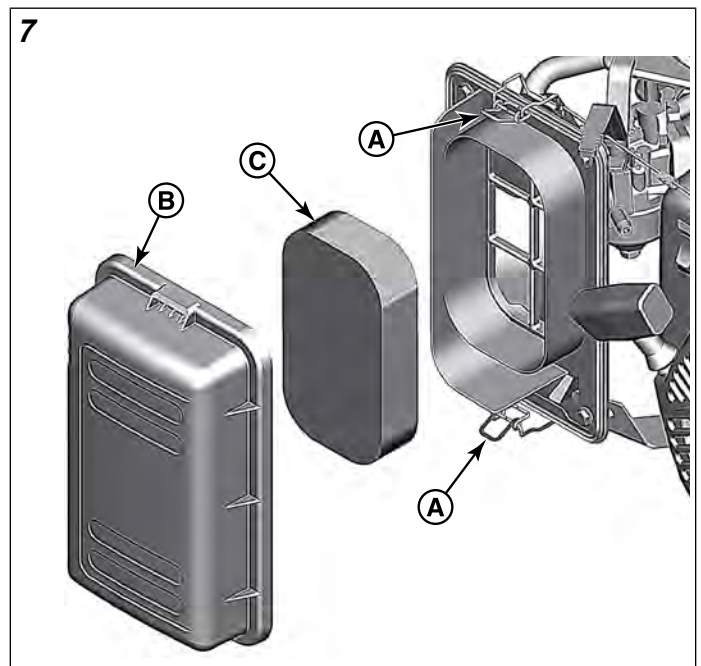


- Gently wash foam filter in warm, soapy water. Thoroughly rinse with clean water. Squeeze foam filter in a clean cloth until dry.
- NOTE:** Use of pressurized air or solvents will damage foam filter.
- Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.
 - Saturate foam filter with clean engine oil. Gently squeeze foam filter in a clean cloth to remove excess oil.
 - Install foam filter and retainer into air cleaner cover.
 - Install air cleaner cover and start two hex flange screws. Tighten screws to **9-12 lb-in** (1-1.4 N-m).

Foam Large Panel Air Filter

- See Figure 7. Disengage two retaining clips (A) to release air cleaner cover (B) and foam filter (C).
- NOTE:** Exercise care to keep dust and dirt out of carburetor. Inadequate precautions can result in engine damage.
- Gently wash foam filter in warm, soapy water. Thoroughly rinse with clean water. Squeeze foam filter in a clean cloth until dry.

- NOTE:** Use of pressurized air or solvents will damage foam filter.
- Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.
 - Saturate foam filter with clean engine oil. Gently squeeze foam filter in a clean cloth to remove excess oil.



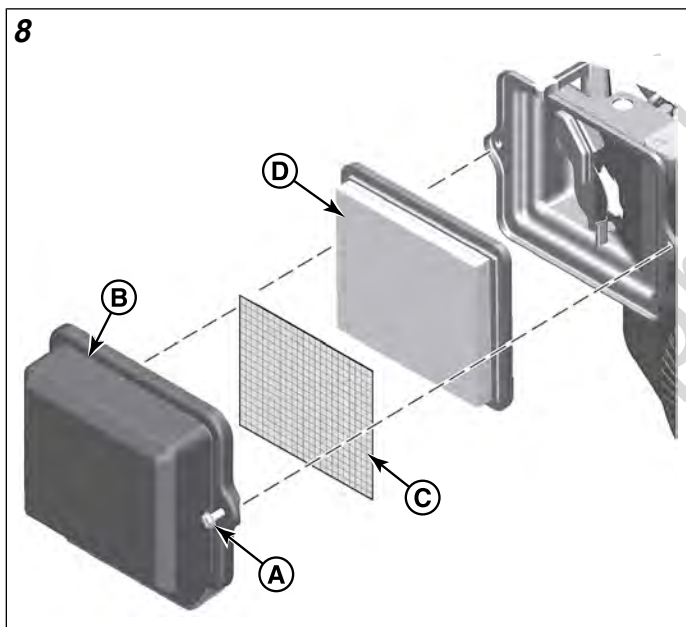
5. Install foam filter into air cleaner cover.
6. Install air cleaner cover and engage two retaining clips to secure.

Paper Air Filter

1. See Figure 8. Loosen two hex flange screws (A) to release air cleaner cover (B).
2. Remove pre-cleaner (C), if equipped, and filter (D).
3. Gently tap filter on a hard surface to loosen dirt and debris. Carefully brush and/or vacuum as necessary.

NOTE: Use of pressurized air or solvents will damage pre-cleaner and filter.

4. Gently wash pre-cleaner in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely. **Do not** oil pre-cleaner.
5. Carefully inspect pre-cleaner and filter. Replace parts if they cannot be adequately cleaned or if any damage is observed.
6. Install pre-cleaner and filter.
7. Install air cleaner cover and start two hex flange screws. Tighten screws to **9-12 lb-in** (1-1.4 N-m).



Clean/Inspect Muffler and Spark Arrester

NOTE: Avoid using high pressure compressed air, which can force dirt and debris deeper into engine cavities and crevices. Do not use a pressurized water spray as water intrusion can contaminate both oil and fuel systems and lead to corrosion.

1. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent contact with spark plug terminal.

2. Clean area around and behind muffler. Proceed as follows:
 - A. Remove all loose debris by hand.
 - B. Remove dust and dirt with a soft bristle brush and a portable hand held vacuum.
 - C. Gently scrape away stubborn accumulations of dirt and other deposits using a plastic putty knife or stiff bristle brush.
 - D. Apply a light solvent to bristle brush to loosen and remove grit and oily residue, if necessary.
3. Remove three hex flange screws to release wire guard or stamped guard from muffler.
4. Inspect muffler for holes, split seams, cracked welds, loose internal parts, corrosion, and other damage.
5. Inspect muffler tube and mounting flange for cracked welds, breakage, and other damage.
6. Install three hex flange screws to fasten wire guard or stamped guard to muffler. Tighten wire guard screws to **30-50 lb-in** (3.4-5.7 N-m). Tighten stamped guard screws as follows.

| Muffler Stamped Guard Screws | |
|------------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 27-44 lb-in (3-5 N-m) |

7. Verify that two hex nuts on muffler studs are tightened as follows.

| Muffler Stud Nuts | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 195-266 lb-in (22-30 N-m) |

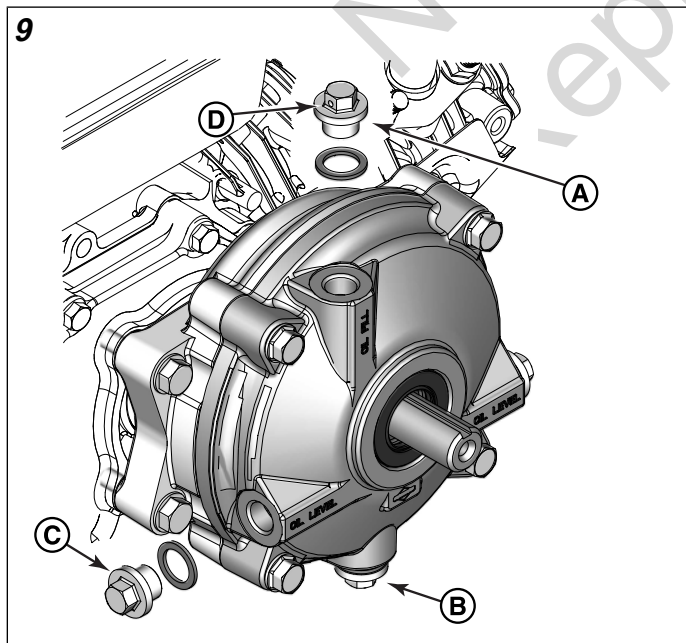
8. Inspect spark arrester for dirt, debris, and carbon buildup. Proceed as follows:
 - A. Remove screw(s) to release spark arrester from muffler/muffler guard. Note orientation of spark arrester before removal.
 - B. Remove screening element from spark arrester.
 - C. Gently clean screening element with a stiff bristle brush. If carbon buildup is present, soak or spray with Carburetor Cleaner (Part No.'s 100041 or 100042). Blow dry from the inside-out with low pressure compressed air. Exercise caution to avoid bending or puncturing screening element. Replace screening element if it cannot be adequately cleaned or if any damage is observed.
 - D. Install screening element into spark arrester.
 - E. Orient spark arrester as noted before removal, and install screw(s) to fasten to muffler/muffler guard. Tighten screw(s) as follows.

| Stamped/Wire Guard Spark Arrester Screw(s) | |
|--|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 71-124 lb-in (8-14 N-m) |
| 13U100, 13U200 | 27-44 lb-in (3-5 N-m) |

NOTE: Spark arrester is installed in either the 9 o'clock or the optional 6 o'clock position.

Change 6:1 Gear Reduction Oil (If Equipped)

1. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
2. Place engine on a flat, level surface.
3. See Figure 9. Remove oil fill/vent plug (A) with sealing washer from the gear case cover.
4. Remove oil drain plug (B) with sealing washer and drain oil into an approved container.
5. Install oil drain plug with sealing washer and tighten to **180-210 lb-in** (20.3-23.7 N-m).
6. Remove oil level plug (C) with sealing washer.
7. Slowly add the appropriate oil into the oil fill hole until oil begins to run out of the oil level hole (approximately 4 ounces).
 - Use SAE 80W-90 above 40° F (10° C)
 - Use SAE 10W-30 below 40° F (10° C)
8. Install oil level plug with sealing washer. Install oil fill/vent plug with **copper** washer. Tighten each plug to **180-210 lb-in** (20.3-23.7 N-m).



NOTE: Verify that vent hole (D) of oil fill/vent plug is facing outside.

9. Dispose of used oil at a proper waste disposal or recycling center.

Clean/Gap/Replace Spark Plug

NOTE: Spark plugs have different thread lengths and heat ranges. Always use the specified replacement spark plug or engine damage can occur.

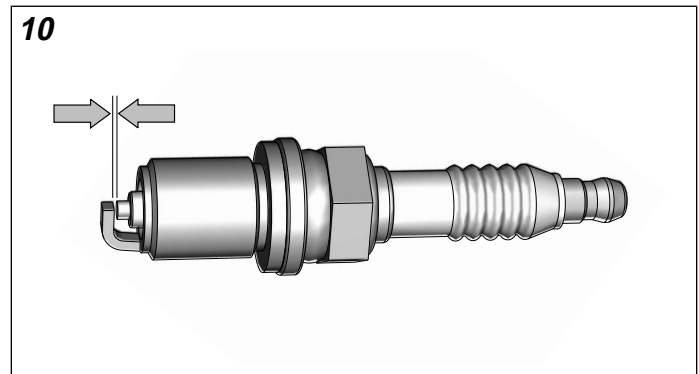
NOTE: Some localities require use of a special resistor type spark plug to suppress ignition noise. If the engine was originally equipped with a resistor type spark plug, be sure to use the same replacement spark plug.

1. Remove spark plug wire from spark plug terminal.
2. Thoroughly clean area around spark plug to keep dirt and debris out of combustion chamber.
3. Remove spark plug from cylinder head using the 5/8 inch Spark Plug Wrench (Part No. 19576S).
4. Check condition of threads in cylinder head. If necessary, soften deposits with penetrating oil and clean out with a thread chaser.
5. Clean spark plug using a wire brush and commercial solvent. Do not bead blast spark plug. Obtain **new** spark plug if electrode is pitted or burned, or if porcelain is cracked.
6. See Figure 10. Using a feeler gauge, verify spark plug gap is as follows. If necessary, adjust gap by carefully bending ground electrode.

| Models | Spark Plug Gap |
|------------------------|--------------------------------------|
| 130G00, 131G00, 13R200 | 0.027-0.033 in (0.69-0.83 mm) |
| 13U100, 13U200 | 0.028-0.035 in (0.70-0.90 mm) |

7. Finger tighten spark plug into cylinder head, and then tighten as follows.

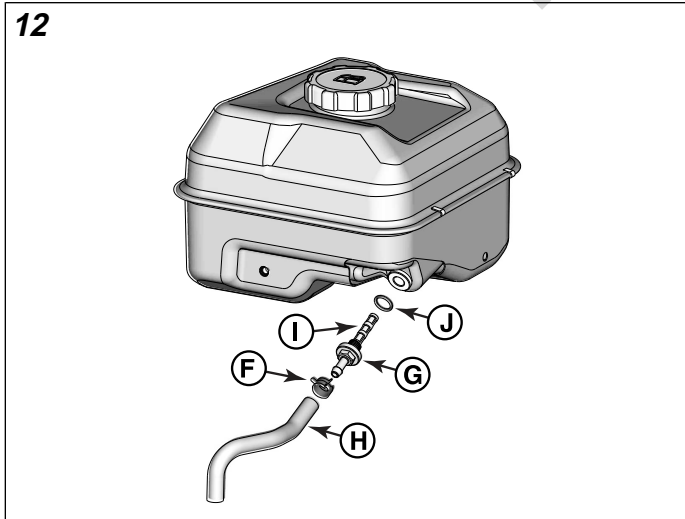
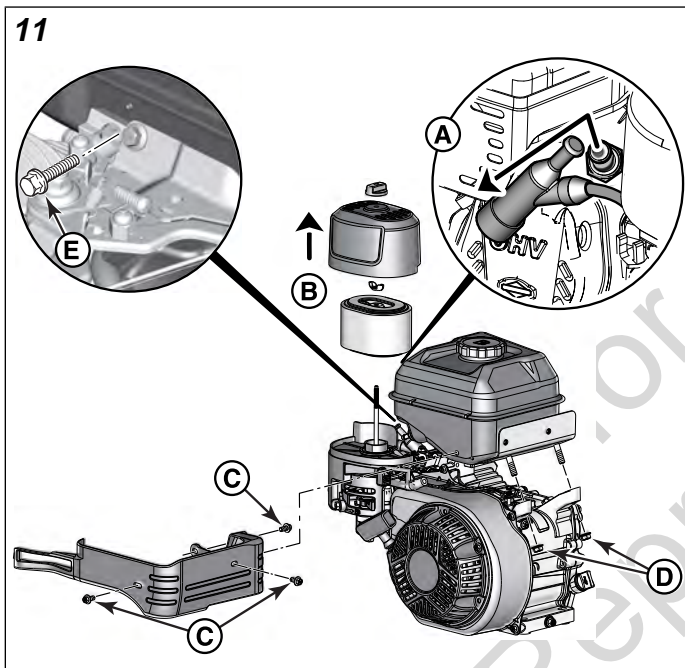
| Spark Plug | |
|------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 140-200 lb-in (15.8-22.6 N-m) |
| 13U100, 13U200 | 230-319 lb-in (26-36 N-m) |



8. Install spark plug wire onto spark plug terminal.

Clean/Replace In-Tank Fuel Filter

1. Start and run engine until fuel tank is empty.
2. See Figure 11. Remove spark plug wire from spark plug terminal (A). Secure spark plug wire to prevent unintentional contact with spark plug terminal.
3. Remove air cleaner cover and air filter (B). See *Clean/Replace Air Filter and Pre-Cleaner* in this section.
4. Remove plastic knob from throttle control lever.
5. If equipped, remove hex flange screw to release high oil fill tube flange from control panel trim.
6. Remove three hex flange screws (C) to release control panel trim from fuel tank. Disengage control panel trim from slot in air cleaner base.



7. Remove two hex flange nuts (D) from fuel tank studs.
8. On opposite side of fuel tank, remove hex flange screw (E) to release fuel tank from crankcase flange.

NOTE: For best access to screw, move throttle control lever left to the FAST position and use a 8 mm socket with extension.

NOTE: Exercise care to avoid dropping screw between engine and blower housing. A dropped screw may be caught by the flywheel magnet where further disassembly would be required to retrieve it.

9. See Figure 12. Squeeze tangs and move hose clamp (F) away from fuel filter fitting (G).
10. Remove hose (H) from fuel filter fitting. For best results, use Fuel Hose Remover (Part No. 19620).
11. Using hex, remove fuel filter fitting from fuel tank.
12. Unthread fuel filter (I) and remove O-ring (J) from fuel filter fitting.
13. Inspect fuel filter for dirt and debris. Clean or replace as necessary.
14. Inspect O-ring for cuts, tears, or general deterioration. Replace as necessary.
15. Install O-ring onto fuel filter fitting. Verify O-ring is fully seated in groove.
16. Thread fuel filter into fuel filter fitting.
17. Install fuel filter fitting into fuel tank. Tighten fitting as follows.

| Fuel Filter Fitting | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 60-70 lb-in (6.8-7.9 N-m) |
| 13U100, 13U200 | 62-71 lb-in (7-8 N-m) |

18. Inspect hose for cuts, nicks, cracks, or general deterioration. Replace hose if necessary.
19. Place fuel tank onto engine.
20. Install hex flange screw to fasten fuel tank to crankcase flange. Tighten screw as follows.

| Fuel Tank Screw | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 75-95 lb-in (8.5-10.7 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

21. On opposite side, install two hex flange nuts onto fuel tank studs. Alternately tighten nuts as follows.

| Fuel Tank Nuts | |
|------------------------|-------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 90-110 lb-in (10.2-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

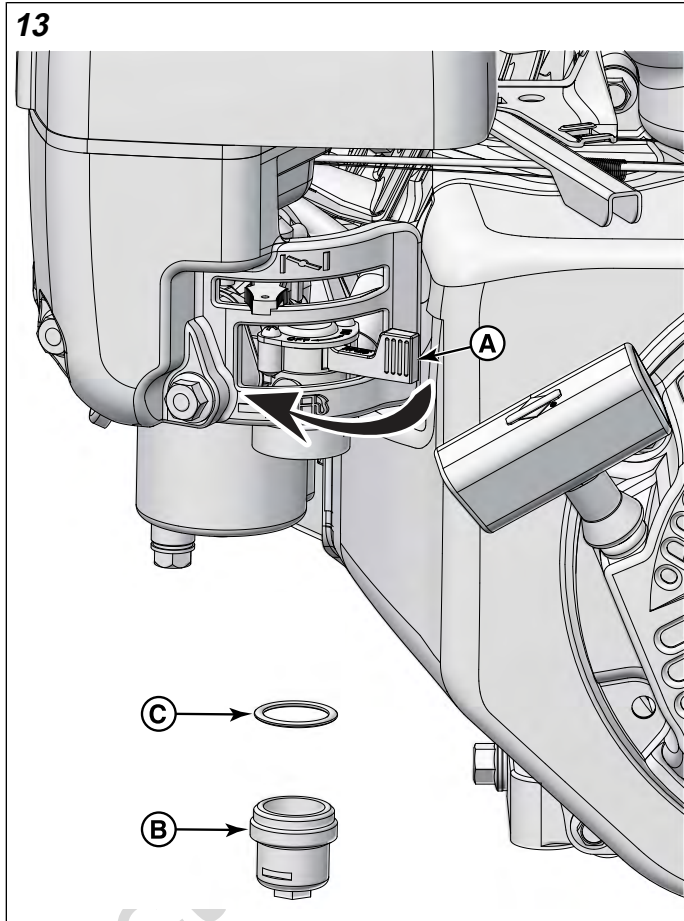
22. Install hose with clamp onto fuel filter fitting. Squeeze tangs and move hose clamp about **1/8 inch** (3 mm) from end of hose with tangs pointing upward for best access.
23. Start three hex flange screws to fasten control panel trim to fuel tank. Engage end of control panel trim in slot of air cleaner base. Starting with screw above rewind starter, tighten screws to **20-40 lb-in** (2.3-4.5 N-m).
24. If equipped, install hex flange screw to fasten high oil fill tube flange to control panel trim. Tighten screw to **5-15 lb-in** (0.6-1.6 N-m).
25. Install plastic knob onto throttle control lever.
26. Install air filter and air cleaner cover. See *Clean/Replace Air Filter and Pre-Cleaner* in this section.
27. Install spark plug wire onto spark plug terminal.

Clean Carburetor Sediment Bowl



Wrap shop towel around sediment bowl to catch any fuel leakage. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions can result in death or serious injury. Always observe the following precautions when working with fuel system components:

- Wear proper eye protection.
 - Be sure there is no open flame or potential ignition sources in the area.
 - Keep a dry chemical fire extinguisher on hand in case of emergencies.
 - Thoroughly wipe up any spilt fuel immediately.
 - Collect any fuel and/or shop towels in approved containers and dispose of properly.
1. Start and run engine until fuel tank is empty.
 2. See Figure 13. Position fuel valve (A) to OFF.
 3. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
 4. Remove sediment bowl (B) with O-ring (C) from carburetor body.
 5. Thoroughly clean sediment bowl of sediment, gum or varnish deposits. Use Carburetor Cleaner (Part No.'s 100041 or 100042), if necessary.
 6. Inspect O-ring for cuts, tears, or general deterioration. Replace as necessary.
 7. Install sediment bowl with O-ring. Tighten sediment bowl to **49-80 lb-in** (5.5-9 N-m).
 8. Install spark plug wire onto spark plug terminal.



Clean Air Cooling System

NOTE: Avoid using high pressure compressed air, which can force dirt and debris deeper into engine cavities and crevices. Do not use a pressurized water spray as water intrusion can contaminate both oil and fuel systems and lead to corrosion.

1. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
2. Remove three hex flange screws to release rewind starter from blower housing.

NOTE: Note orientation of the rewind starter before removal.
3. Remove three hex flange screws to release cylinder heat shield from crankcase and cylinder head.
4. Clean cylinder cooling fins, the inside of the rewind starter, and the flywheel fan as follows:
 - A. Remove all loose debris by hand.
 - B. Remove dust and dirt with a soft bristle brush and a portable hand held vacuum.

- C. Gently scrape away stubborn accumulations of dirt and other deposits using a plastic putty knife or stiff bristle brush.
- D. Apply a light solvent to bristle brush to loosen and remove grit and oily residue, if necessary.
5. Install three hex flange screws to fasten cylinder heat shield to crankcase and cylinder head.

| Cylinder Heat Shield Screws | |
|-----------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 40-60 lb-in (4.5-6.8 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

NOTE: Hex flange screw to engine base captures both heat shield and blower housing.

6. Orient rewind starter as noted before removal.

NOTE: Rewind starter may be installed in the 2 o'clock, 8 o'clock, 10 o'clock, or 12 o'clock positions.

7. Loosely install three hex flange screws to fasten rewind starter to blower housing.

NOTE: To ensure that pawls evenly engage flywheel starter cup, pull starter rope, tighten hex flange screws until snug, and then release starter rope.

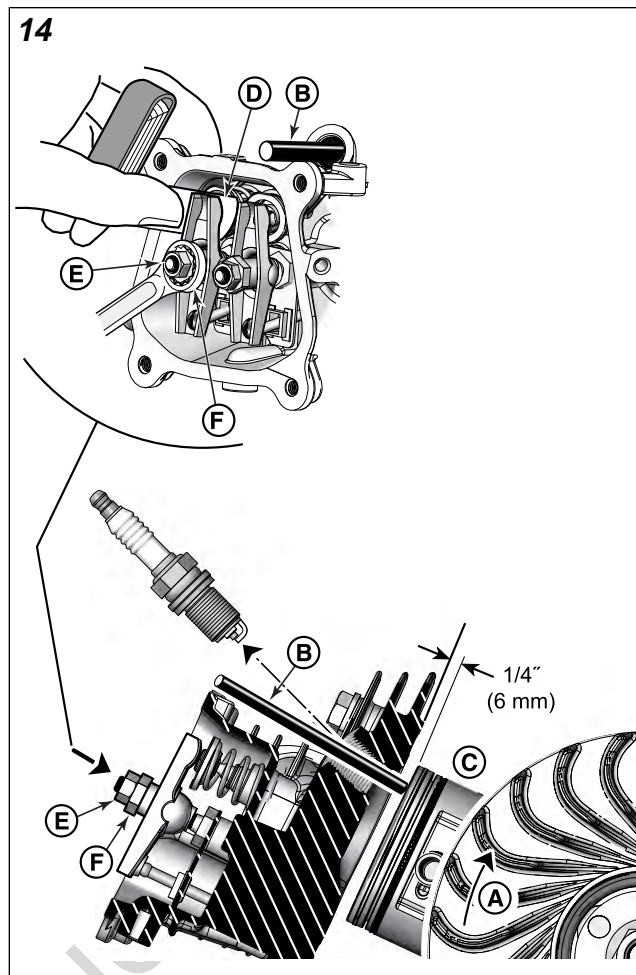
8. Alternately tighten three hex flange screws as follows.

| Rewind Starter Screws | |
|------------------------|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 25-35 lb-in (2.8-4 N-m) |
| 13U100, 13U200 | 71-89 lb-in (8-10 N-m) |

Check/Adjust Valve Clearance

NOTE: For best results, check valve clearance with the engine cold.

- Remove spark plug wire from spark plug terminal.
- Thoroughly clean area around spark plug to keep dust and dirt out of the combustion chamber.
- Remove spark plug from cylinder head using the 5/8 inch Spark Plug Wrench (Part No. 19576S).
- Remove four hex flange screws to release valve cover.
- Move piston **1/4 inch** (6 mm) past Top Dead Center (TDC) of the compression stroke. Proceed as follows:
 - See Figure 14. While rotating flywheel end of crankshaft (A) by hand in the direction of engine rotation, watch the rocker arms to determine the action of the valves. After the exhaust valve closes, the intake valve begins to open.



- When the intake valve closes (so that both valves are closed with the rocker arms loose), insert a wooden dowel (B) through the spark plug hole until seated at the top of the piston (C).
- Rotate engine in the same direction until the piston pushes the wooden dowel to its highest point. This is TDC of the compression stroke.
- Place a mark on the wooden dowel that is even with the machined surface at the top of the spark plug hole. Make a second mark **1/4 inch** (6 mm) above the first.
- Rotate engine in the same direction until the second mark on the wooden dowel is even with the machined surface at the top of the spark plug hole. Remove wooden dowel.
- Insert feeler gauge between rocker arm and exhaust valve stem (D). Verify that exhaust valve clearance is as follows.

| Models | Exhaust Valve Clearance |
|------------------------|--------------------------------------|
| 130G00, 131G00, 13R200 | 0.006-0.008 in (0.15-0.20 mm) |
| 13U100, 13U200 | 0.005-0.007 in (0.13-0.18 mm) |

7. If adjustment is necessary, proceed as follows:
 - A. Loosen locknut (E) and turn rocker ball nut (F) as necessary.
 - B. Holding rocker ball nut to prevent rotation, tighten locknut as follows.

| Rocker Ball Locknut | |
|------------------------|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 60-80 lb-in (6.8-9 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

- C. Check valve clearance again to verify that rocker ball did not move when locknut was tightened.
8. Insert feeler gauge between rocker arm and intake valve stem. Verify that intake valve clearance is as follows. If adjustment is necessary, see step 7.

| Models | Intake Valve Clearance |
|------------------------|--------------------------------------|
| 130G00, 131G00, 13R200 | 0.004-0.006 in (0.10-0.15 mm) |
| 13U100, 13U200 | 0.005-0.007 in (0.13-0.18 mm) |

9. Remove old gasket material from valve cover and cylinder head flanges. Gasket material left on sealing surfaces will cause leaks.
10. Install **new** valve cover gasket into valve cover.
11. Start four hex flange screws to fasten valve cover to cylinder head. Using a crosswise pattern, alternately tighten screws as follows.

| Valve Cover Screws | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 70-90 lb-in (7.9-10.2 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

12. Install spark plug into cylinder head and finger tighten until snug. Tighten spark plug as follows.

| Spark Plug | |
|------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 140-200 lb-in (15.8-22.6 N-m) |
| 13U100, 13U200 | 230-319 lb-in (26-36 N-m) |

13. Install spark plug wire onto spark plug terminal.

Not for
Reproduction

SECTION 3 – TROUBLESHOOTING/SPECIAL TOOLS

| | |
|-----------------------------------|----|
| TROUBLESHOOTING | 22 |
| Check Ignition | 22 |
| Check Carburetion | 23 |
| Check Compression | 23 |
| Check Low Oil Sensor System | 24 |
| Check Breather Valve | 24 |
| SPECIAL TOOLS | 25 |

Not for
Reproduction

TROUBLESHOOTING

General Complaints

Most complaints concerning engine operation include one or more of the following:

- Will not start
- Hard starting
- Lack of power
- Runs rough
- Vibration
- Overheating
- High oil consumption

Equipment Check

What often appears to be a problem with the engine may actually be the result of faulty equipment.

No Start or Hard Start

- Loose belt or blade
- Cranking under load
- Misadjusted controls
- Improperly operating low oil sensor system

Engine Will Not Stop

- Equipment stop switch not functioning
- Engine ground wire damaged or disconnected

Vibration

- Bent cutter blades
- Loose spindles and couplings
- Bent/broken deck or weldments
- Bent crankshaft
- Loose equipment mounting bolts
- Damaged or worn belts and pulleys
- Out of balance impeller

Power Loss

- Bind or drag in moving parts of equipment
- Grass build-up under deck
- No lubrication in equipment gear box
- Excessive belt tension

Systems Check

Once equipment sources are ruled out, most symptoms can be traced to one or more of the following. Perform these checks in the order listed.

1. Ignition
2. Carburetion
3. Compression

Check Ignition

1. Move to step 2 if engine does not start. If engine runs, but misses, move to step 9.

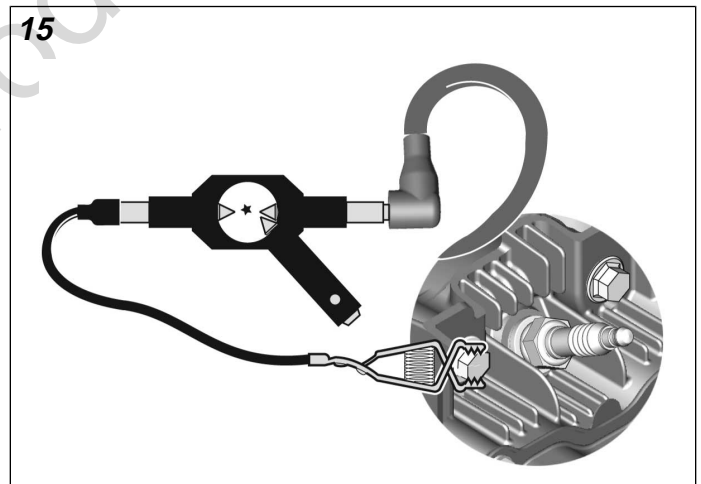
Engine Does Not Start

2. Verify that engine oil level is within the cross hatch pattern on the dipstick.
3. Obtain Ignition Tester (Part No. 19368).
4. Remove spark plug wire from spark plug terminal.
5. See Figure 15. Install free end of spark plug wire onto inline tester prong. Install tester alligator clip onto good engine ground.



Be sure there is no fuel or fuel vapors present which, if spark ignited, can cause a fire or explosion resulting in death or serious injury.

6. Move throttle control lever to FAST.
7. Pull rewind starter rope (or activate electric starter, if equipped). If spark jumps the tester gap, the ignition system is functioning satisfactorily.
8. If spark is not present, move to step 15.



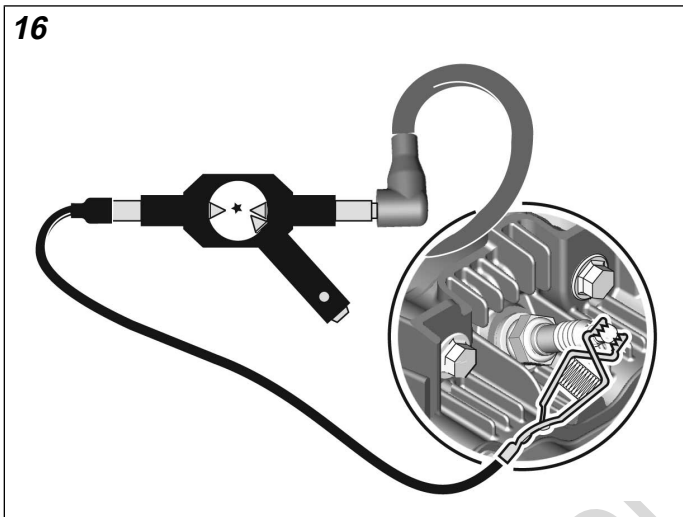
Engine Runs But Misses

9. Obtain Ignition Tester (Part No. 19368).
10. Remove spark plug wire from spark plug terminal.
11. See Figure 16. Install free end of spark plug wire onto inline tester prong. Install tester alligator clip onto spark plug terminal.



Be sure there is no fuel or fuel vapors present which, if spark ignited, can cause a fire or explosion resulting in death or serious injury.

12. Move throttle control lever to FAST.
13. Pull rewind starter rope (or activate electric starter, if equipped). If spark jumps the tester gap, install a **new** spark plug.
14. If spark is not present, move to step 15.



15. If spark is not present, look for:
 - Improperly operating low oil sensor system
 - Shorted equipment or engine stop switch wire
 - Incorrect armature air gap
 - Armature failure

Check Carburetion

1. Verify that fuel tank has an ample supply of fresh, clean gasoline.
2. Verify that fuel valve is positioned to ON, if equipped, and that fuel flows freely through the fuel line. If fuel flow is slow or fails to flow, check for plugged fuel cap vent, fuel line restriction, or plugged fuel filter.
3. Verify that throttle and choke controls are clean and properly adjusted.
4. If engine cranks, but will not start, remove and inspect the spark plug.
5. A wet spark plug may indicate:
 - Over choking
 - Excessively rich fuel mixture
 - Water in fuel
 - Carburetor float needle valve stuck open

- Plugged air cleaner
- Fouled spark plug

6. A dry spark plug may indicate:

- Leaking carburetor or intake manifold gaskets
- Gummy or dirty carburetor, fuel filter, fuel lines, or fuel tank
- Carburetor float needle valve stuck closed

NOTE: To determine if the fuel is getting to the combustion chamber through the carburetor, remove the spark plug and pour a small quantity of gasoline through the spark plug hole. Install the spark plug and crank the engine. If the engine fires a few times and then stops, look for the same conditions as those listed for a dry spark plug.

3

Check Compression

Engine Does Not Start

1. Obtain Leakdown Tester (Part No. 19545).
2. Follow the instructions provided with the tester to check the sealing capabilities of compression components.

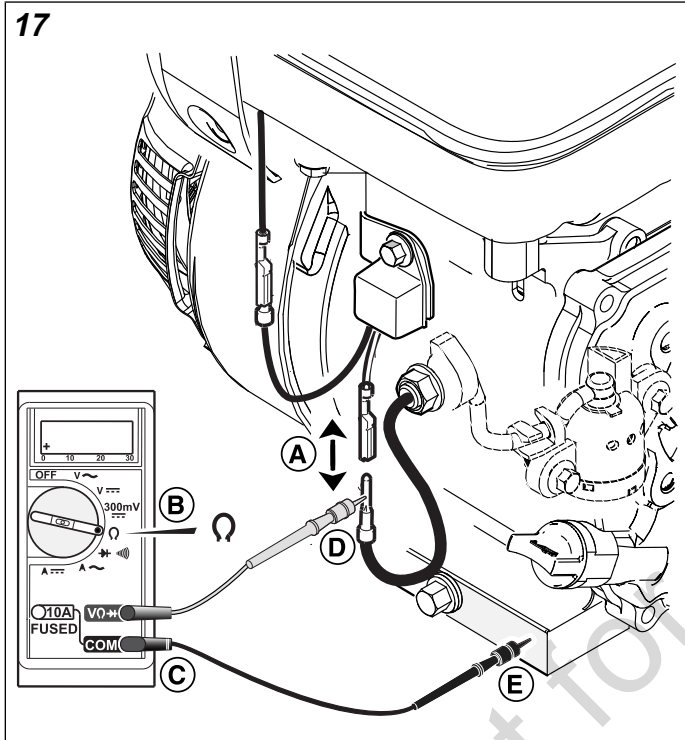
NOTE: Any air leaks at the tester connections and fittings will adversely affect test results.

3. The sound of air flow:
 - between the cylinder and cylinder head indicates the cylinder head gasket is leaking.
 - from the carburetor indicates air is leaking past the intake valve and valve seat.
 - from the exhaust system indicates air is leaking past the exhaust valve and valve seat.
 - from the breather tube or oil fill dipstick tube indicates air is leaking past the piston rings.
4. The likely causes of poor compression are:
 - Loose cylinder head screws
 - Damaged cylinder head gasket
 - Burned valves, burned valve seats, and/or loose valve seats
 - Insufficient tappet clearance
 - Warped cylinder head
 - Warped valve stems
 - Worn cylinder bore and/or piston rings
 - Broken connecting rod

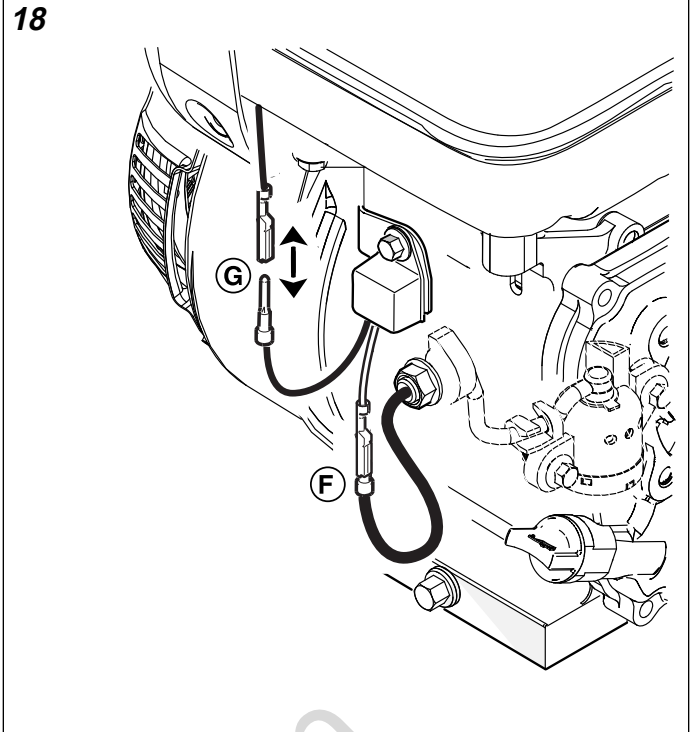
Check Low Oil Sensor System

Engine Does Not Start

1. Verify that engine oil level is within the cross hatch pattern on the dipstick.
2. See Figure 17. If engine oil level is satisfactory, disconnect one-place wire connector between oil sensor module and oil sensor in crankcase (A).



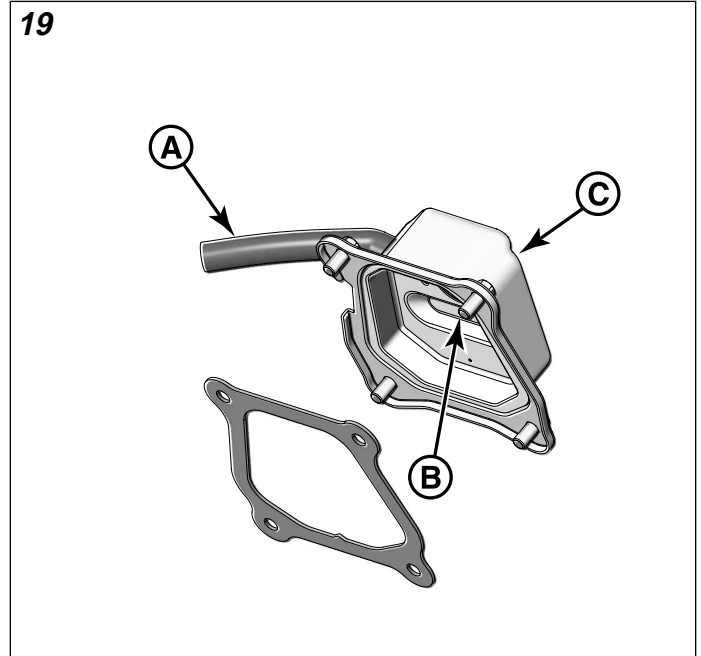
3. Obtain Digital Multimeter (Part No. 19602), and set to read ohms (B).
4. Insert RED meter test lead into V Ω receptacle, and BLACK meter test lead into COM receptacle (C).
5. Connect red meter test lead to oil sensor wire (D), and black meter test lead to engine base (E).
6. Measure resistance. Replace sensor in crankcase if continuity is obtained. Proceed to next step if meter reads infinity.
7. See Figure 18. Connect one-place wire connector between oil sensor module and oil sensor in crankcase (F).
8. Disconnect one-place wire connector between oil sensor module and armature coil (G).
9. Start engine. Verify that oil sensor module wire is not touching ground.
10. Replace oil sensor module if engine starts. If engine does not start, check oil sensor module wiring for shorts to ground.



Check Breather Valve

Engine Does Not Start

1. See Figure 19. Gently blow air into breather hose (A) to verify that there is no air flow through valve.
2. Apply vacuum or draw air out through breather hose to verify that air flows freely through valve.
3. If air flow has no resistance when blowing or is restricted under vacuum, the breather valve (B) is faulty. Replace the valve cover (C).



SPECIAL TOOLS

1. Piston Ring Compressor (Part No. 19070)
2. Valve Lapping Tool (Part No. 19258)
3. Piston Ring Expander (Part No. 19340)
4. Ignition Tester (Part No. 19368)
5. Torque Wrench (Part No. 19393)
6. Strap Wrench (Part No. 19433)
7. Telescoping Gauge (Part No. 19485)
8. Dial Bore Gauge (Part No. 19487)
9. Leakdown Tester (Part No. 19545)
10. Master Seat Cutter Kit (Part No. 19547)
11. Spark Plug Wrench (Part No. 19576S)
12. Digital Tachometer/Hour Meter (Part No. 19598)
13. Digital Multimeter (Part No. 19602)
14. Dial Caliper (Part No. 19609)
15. Fuel Hose Remover (Part No. 19620)
16. Valve Lapping Compound (Part No. 94150)
17. Carburetor Cleaner (Part No. 100041)
18. Carburetor Cleaner (Part No. 100042)
19. Armature Air Gap Gauge (Part No. CE5121)

3

20



Not for
Reproduction

SECTION 4 – REMOVE EXTERNAL ASSEMBLIES

| | |
|-------------------------------------|----|
| REMOVE EXTERNAL ASSEMBLIES | 28 |
| Preliminary Instructions | 28 |
| Air Cleaner | 28 |
| Dual Element Oval Air Filter | 28 |
| Oil Bath Air Filter | 28 |
| Foam Low Mount Air Filter | 29 |
| Foam Large Panel Air Filter | 29 |
| Paper Air Filter | 29 |
| Starter Motor (If Equipped) | 30 |
| Fuel Tank | 31 |
| Governor Bracket/Lever | 32 |
| Carburetor | 33 |
| Muffler | 33 |
| Rewind Starter | 33 |
| Blower Housing | 34 |
| Low Oil Sensor Module (If Equipped) | 34 |
| Armature | 35 |
| Gear Reduction Unit (If Equipped) | 35 |
| 6:1 Gear Reduction Unit | 35 |
| 2:1 Gear Reduction Unit | 36 |

REMOVE EXTERNAL ASSEMBLIES

Preliminary Instructions

1. Start and run engine until fuel tank is empty.
2. Remove spark plug wire from spark plug terminal. Secure spark plug wire to prevent unintentional contact with spark plug terminal.
3. Remove oil drain plug(s) with sealing washer(s) at base of engine and drain oil into an approved container.

4

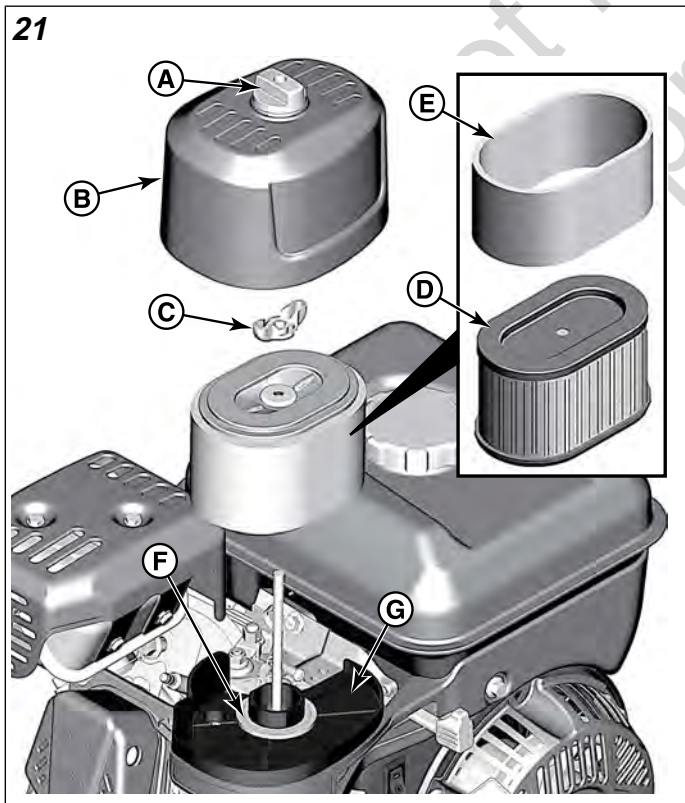
Air Cleaner

Refer to one of the following configurations:

- Dual Element Oval Air Filter
- Oil Bath Air Filter
- Foam Low Mount Air Filter
- Foam Large Panel Air Filter
- Paper Air Filter

Dual Element Oval Air Filter

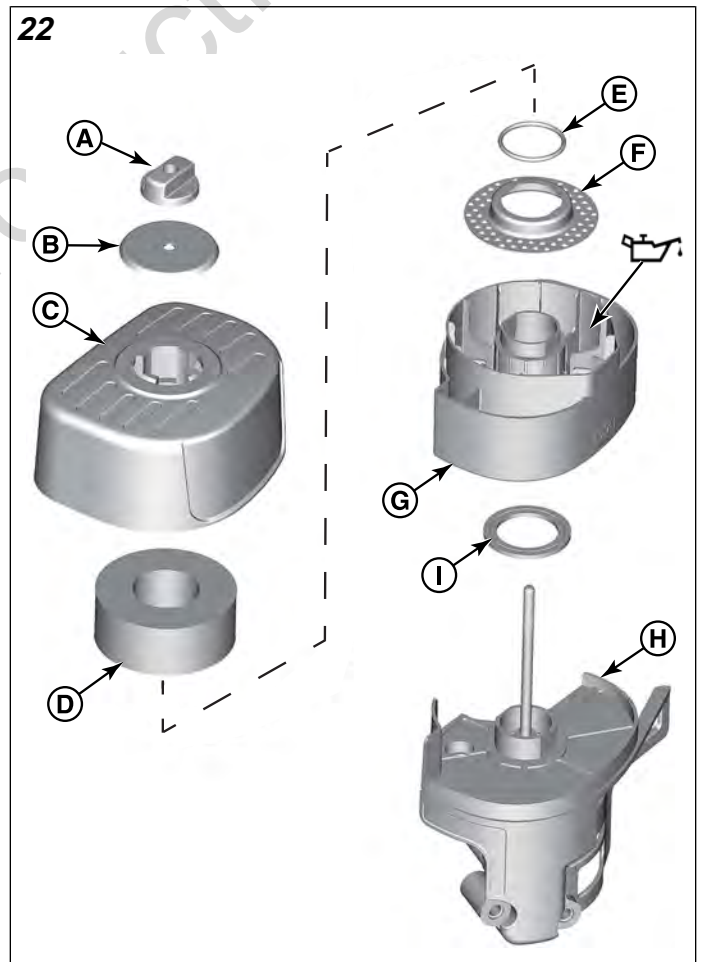
1. See Figure 21. Remove knob (A) to release air cleaner cover (B).
2. Remove wing nut (C) to release air filter cartridge (D) with foam pre-cleaner (E).



3. Remove seal washer (F) from air cleaner base (G).
4. Remove plastic knob from throttle control lever.
5. If equipped, remove hex flange screw to release high oil fill tube flange from control panel trim.
6. Remove three hex flange screws to release control panel trim from fuel tank. Disengage control panel trim from slot in air cleaner base.
7. Remove breather hose from port on air cleaner base.
8. Remove top hex flange screw to release air cleaner base from governor bracket.
9. Remove two hex flange nuts to release air cleaner base from carburetor mounting studs.

Oil Bath Air Filter

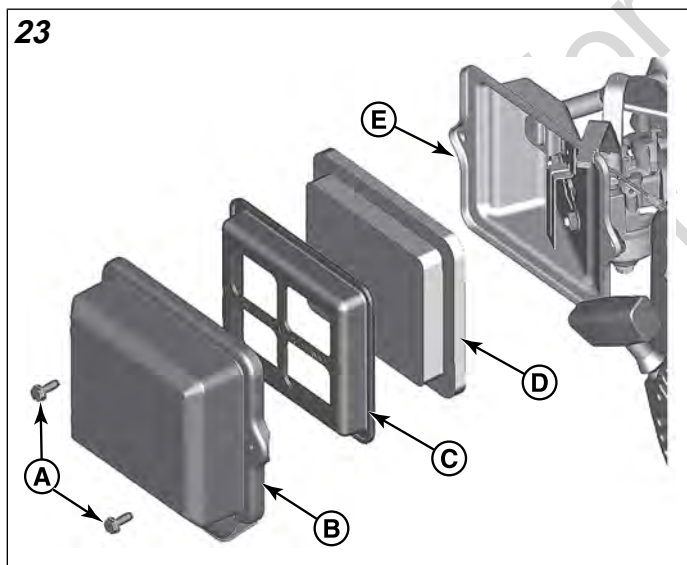
1. See Figure 22. Remove knob (A) and flat washer (B) to release air cleaner cover (C).
2. Remove foam filter (D) from air cleaner cover.
3. Remove O-ring (E) and baffle screen (F) from bath bowl (G).



- Remove bath bowl from air cleaner base (H). Empty used oil in bath bowl into an approved container.
- Remove seal washer (I) from air cleaner base.
- Remove plastic knob from throttle control lever.
- If equipped, remove hex flange screw to release high oil fill tube flange from control panel trim.
- Remove three hex flange screws to release control panel trim from fuel tank. Disengage control panel trim from slot in air cleaner base.
- Remove breather hose from port on air cleaner base.
- Remove top hex flange screw to release air cleaner base from governor bracket.
- Remove two hex flange nuts to release air cleaner base from carburetor mounting studs.

Foam Low Mount Air Filter

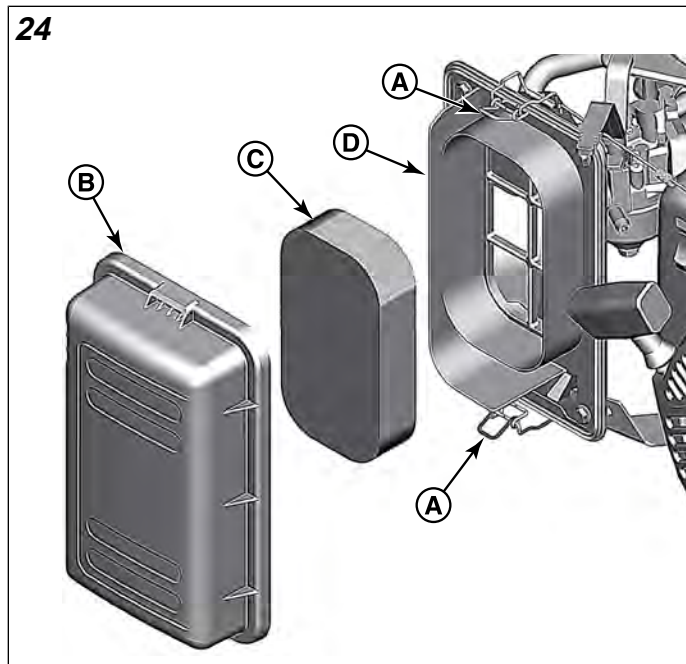
- See Figure 23. Remove two hex flange screws (A) to release air cleaner cover (B).
- Remove retainer (C) and foam filter (D) from air cleaner cover.
- Remove two hex flange nuts to release air cleaner base (E) from carburetor mounting studs.
- Remove breather hose from port on air cleaner base.



Foam Large Panel Air Filter

- See Figure 24. Disengage two retaining clips (A) to release air cleaner cover (B) and foam filter (C).
- Remove two hex flange nuts to release air cleaner base (D) from carburetor mounting studs.
- Remove breather hose from port on air cleaner base.

24

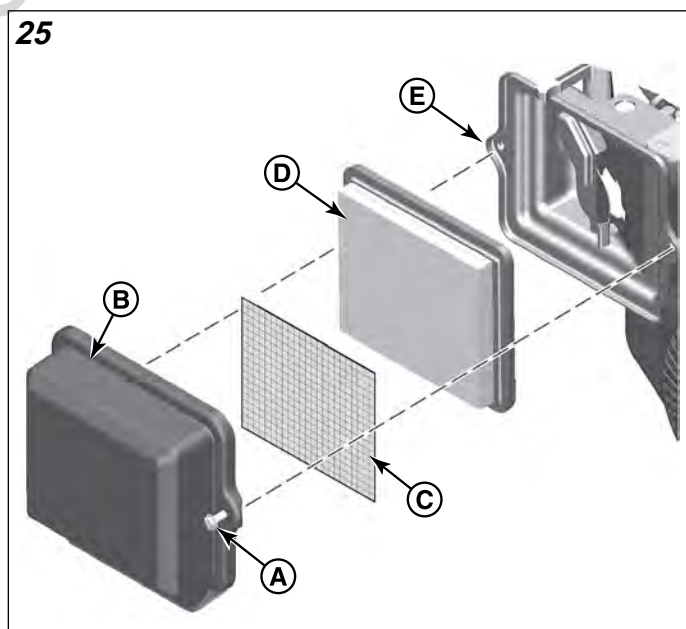


4

Paper Air Filter

- See Figure 25. Loosen two hex flange screws (A) to release air cleaner cover (B).
- Remove pre-cleaner (C), if equipped, and foam filter (D).
- Remove two hex flange nuts to release air cleaner base (E) from carburetor mounting studs.
- Remove breather hose from port on air cleaner base.

25



Starter Motor (If Equipped)

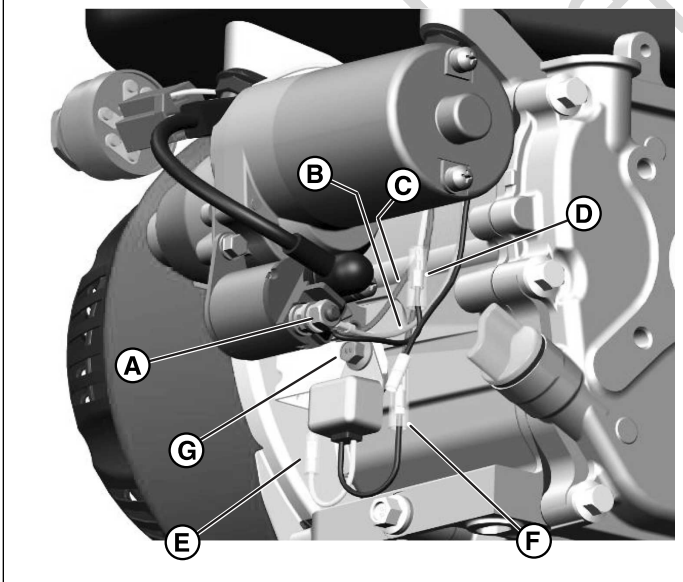
1. See Figure 26. Remove hex nut , lock washer, and flat washer (A) from starter solenoid post.
2. Remove orange key switch wire ring terminal (B) from starter solenoid post.
3. If stator wires terminate in a ring terminal, move to step 4. If stator wires terminate in a 2-place jumper wire connector, proceed as follows:

NOTE: Ring terminal supersedes 2-place jumper wire connector on late model engines.

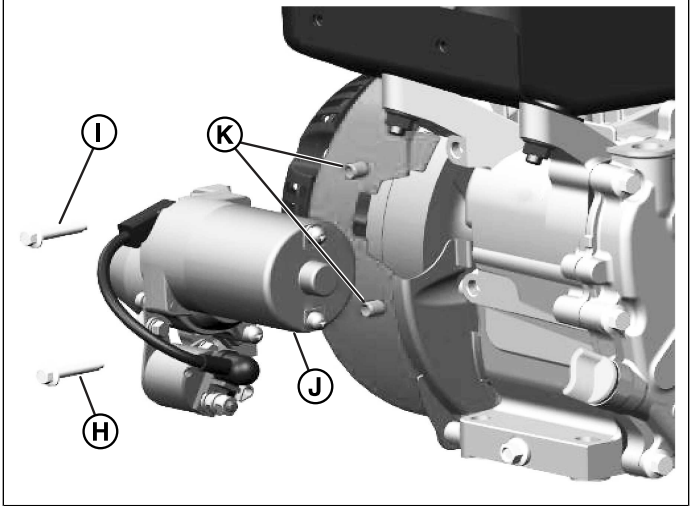
- A. Disconnect 2-place jumper wire connector between stator and starter solenoid post.
 - B. Remove red jumper wire (C) ring terminal and flat washer from starter solenoid post.
 - C. Remove extra length of jumper wire from behind starter motor.
 - D. Move to step 5.
4. Remove red stator wire (C) ring terminal and flat washer from starter solenoid post.
 5. Disconnect yellow key switch wire terminal from starter solenoid black wire terminal (D).
 6. If equipped, remove low oil sensor module as follows:
 - A. Disconnect one-place wire connector (E) between oil sensor and oil sensor module.
 - B. Disconnect one-place wire connector (F) between oil sensor module and key switch spade contact.
 - C. Remove hex flange screw (G) to release oil sensor module bracket from flywheel guard.

4

26



27



7. See Figure 27. Remove bottom starter motor screw (H) from crankcase.
8. Remove top starter motor screw (I) to release starter motor (J) and brown key switch ground wire ring terminal from crankcase.
9. Remove locating pins (K) from holes in crankcase.
10. Remove spade terminal and connector from key switch to release trim panel.

Fuel Tank

1. See Figure 28. Remove two hex flange nuts (A) from fuel tank studs.
2. On opposite side of fuel tank, remove hex flange screw (B) to release fuel tank from crankcase flange.

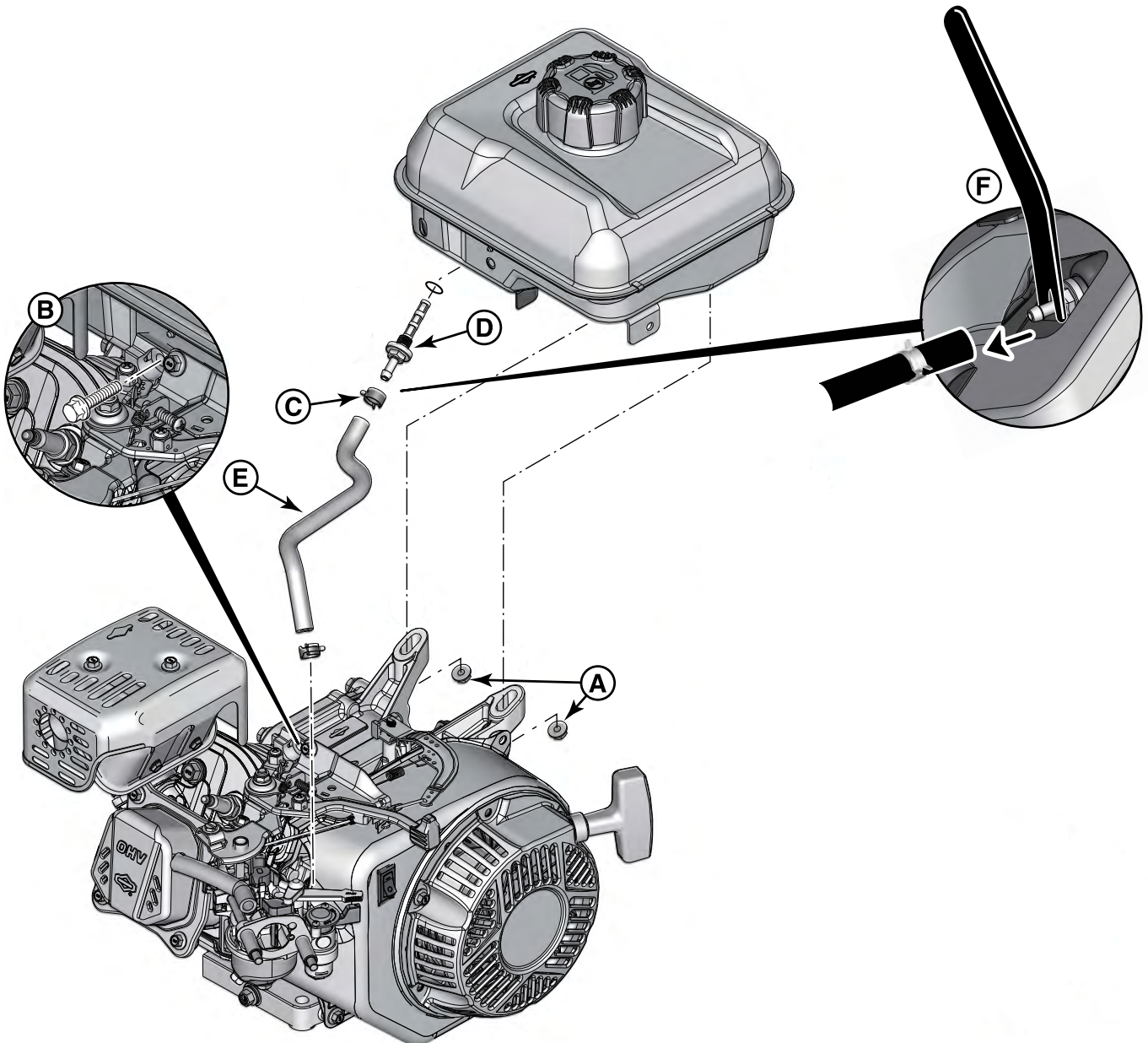
NOTE: For best access to screw, move throttle control lever left to the FAST position and use a 8 mm socket with extension.

NOTE: Exercise care to avoid dropping screw between engine and blower housing. A dropped screw may be caught by the flywheel magnet where further disassembly would be required to retrieve it.

3. Squeeze tangs and move hose clamp (C) away from fuel tank (or in-tank fuel filter) fitting (D).
4. Remove hose (E) from fitting. For best results, use Fuel Hose Remover (Part No. 19620) (F).

28

4



Governor Bracket/Lever

1. See Figure 29. Remove outside hex flange screw (A) to release governor bracket (B) from crankcase.
2. Remove inside hex flange screw (C) with red wire ring terminal (stop switch ground) to release governor bracket from crankcase fuel tank flange.
3. Remove Nyloc nut (D) and flat washer from square-head screw (E) on governor lever (F). Use a flat blade screwdriver to pry apart clamp end of governor lever and remove from governor crank.

NOTE: Clamp end of governor lever is distorted during installation and removal. Discard governor lever, Nyloc nut, flat washer, and square-head screw.

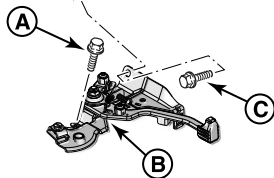
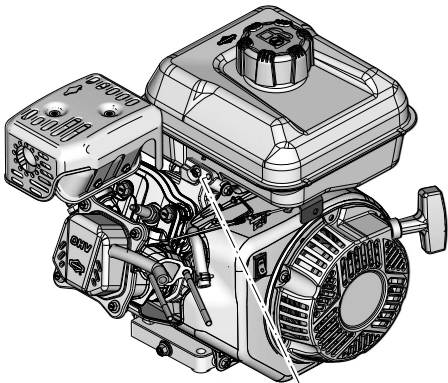
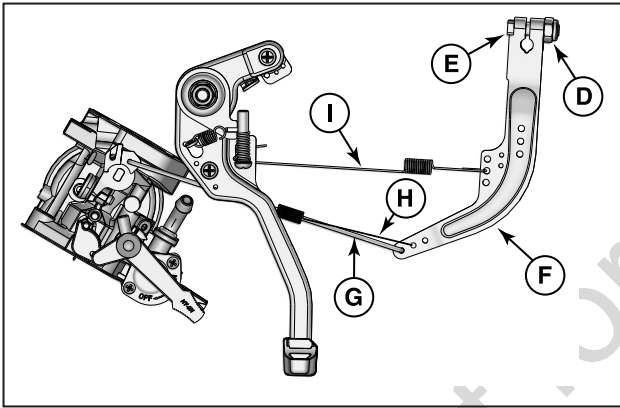
4. Slowly slide carburetor down mounting studs until governor link (G) is inline with slot in throttle lever. Remove governor link from hole in throttle lever.

NOTE: Exercise care to avoid bending, kinking, or stretching link and springs.

5. Remove opposite end of governor link from first hole in governor lever.
6. Remove governor link spring (H) from hole in throttle lever.
7. Remove opposite end of governor link spring from second hole in governor lever.
8. Remove governor spring (I) from eyelet at bottom of governor bracket.
9. Remove opposite end of governor spring from hole in governor lever.

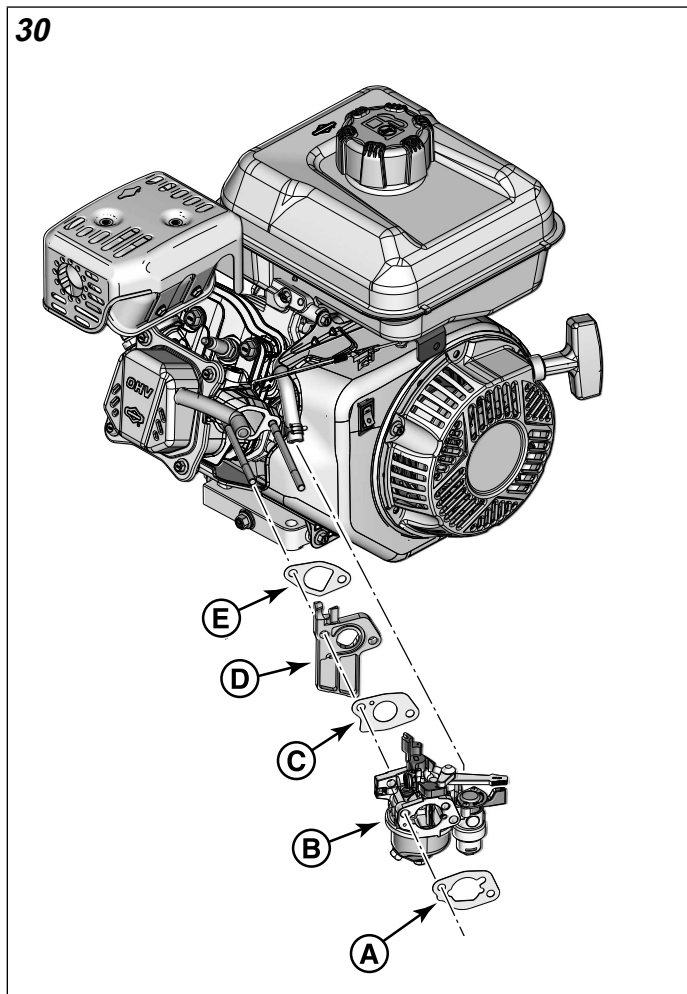
NOTE: If different from that shown, mark or take note of holes from which link and springs are removed to ensure proper assembly when new governor lever is installed.

29



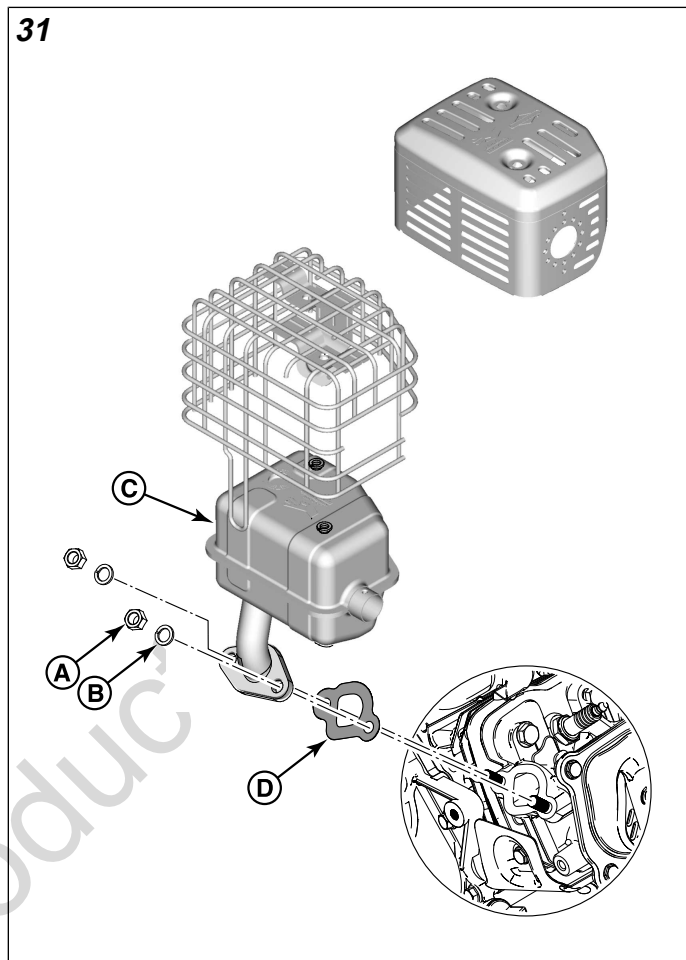
Carburetor

1. See Figure 30. Remove carburetor gasket (A) and carburetor (B) from carburetor mounting studs. Discard carburetor gasket.
2. Remove spark plug wire from slot in carburetor adapter.
3. Remove carburetor adapter gasket (C), carburetor adapter (D), and second carburetor adapter gasket (E) from mounting studs. Discard carburetor adapter gaskets.



Muffler

1. See Figure 31. Remove two hex nuts (A) with lock washers (B) to release muffler (C) from studs.
2. Remove and discard gasket (D).



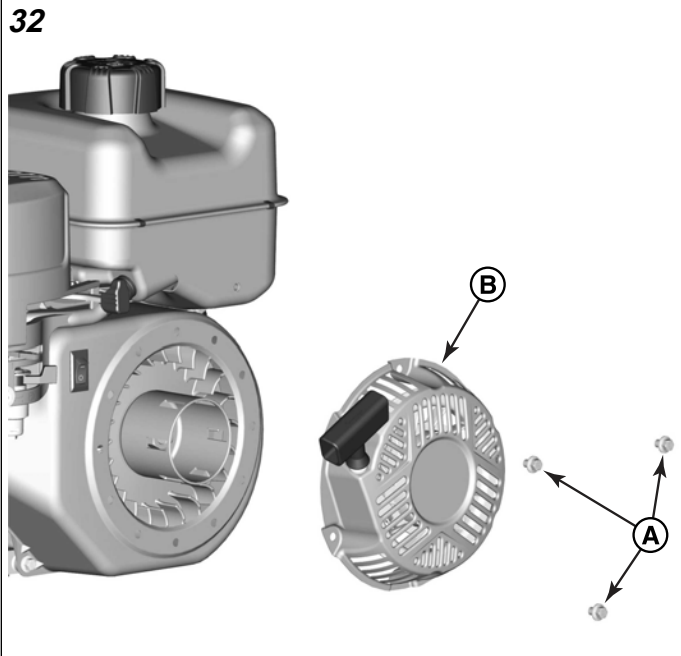
4

Rewind Starter

1. See Figure 32. Remove three hex flange screws (A) to release rewind starter (B) from blower housing.

NOTE: Note orientation of the rewind starter before removal. Rewind starter may be installed in the 2 o'clock, 8 o'clock, 10 o'clock, or 12 o'clock positions.

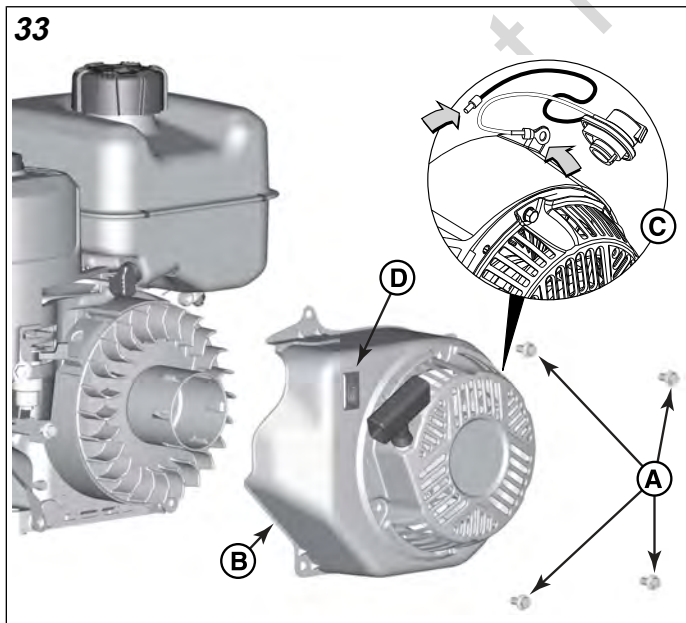
NOTE: While removal of the rewind starter is not required for removal of the blower housing, it is recommended for cleaning and inspection purposes.



Blower Housing

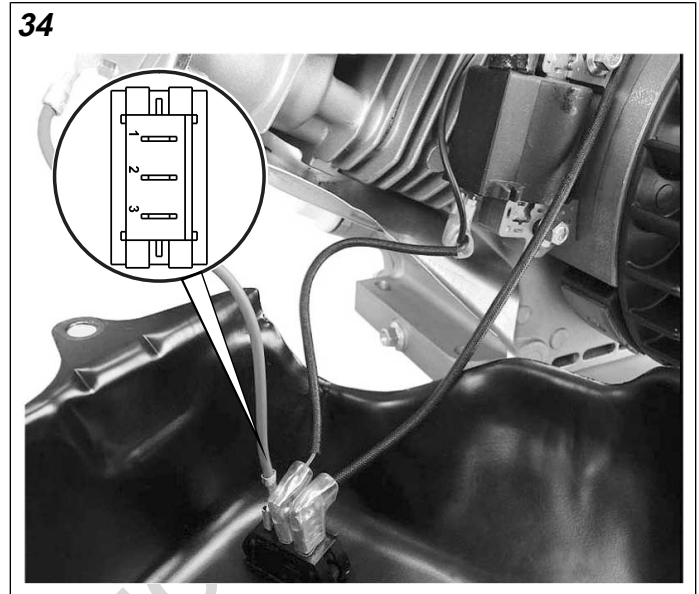
1. See Figure 33. Remove four hex flange screws (A) to release blower housing (B) from crankcase.

NOTE: Bottom screw on cylinder head side also captures cylinder heat shield. Bottom screw on crankcase side also captures flywheel guard.



2. If equipped with rotary stop switch (C), release ground wire ring terminal from top blower housing screw on crankcase side and disconnect one-place wire connector between stop switch and armature.

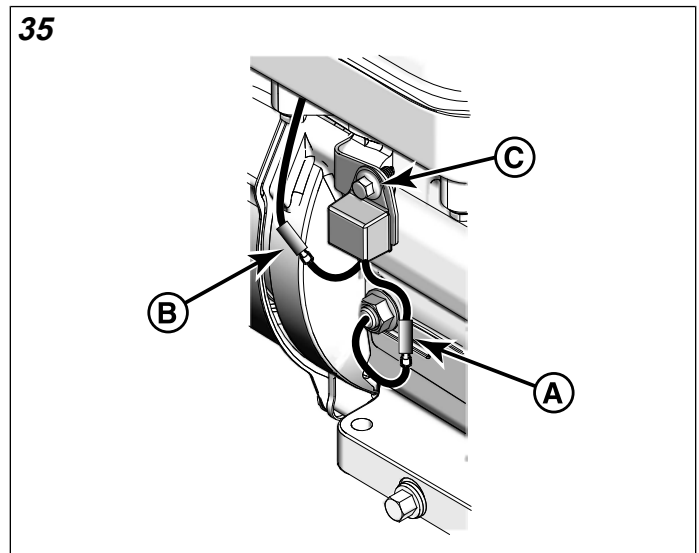
3. If equipped with rocker stop switch (D), pull blower housing away from crankcase just far enough to access stop switch spade terminals and proceed as follows:
 - A. See Figure 34. Disconnect socket of red wire ring terminal (stop switch ground) from terminal 1.
 - B. Disconnect socket of armature/remote magneto stop terminal wire from terminal 2.
 - C. If equipped, disconnect socket of low oil sensor module wire from terminal 3.



Low Oil Sensor Module (If Equipped)

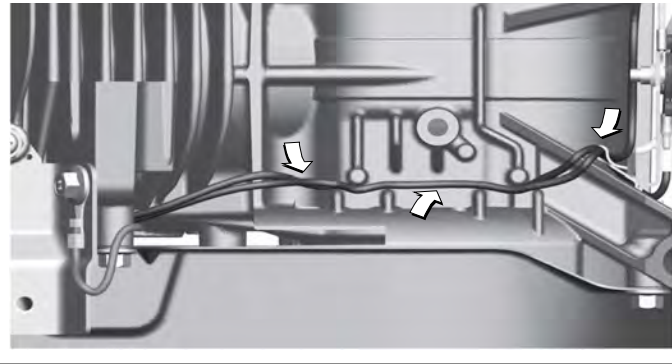
NOTE: If engine is equipped with electric start, oil sensor module is removed with starter motor.

1. See Figure 35. Disconnect one-place wire connector (A) between oil sensor and oil sensor module.



2. Disconnect one-place wire connector (B) between oil sensor module and either armature or rocker stop switch spade contact.
3. Remove hex flange screw (C) to release oil sensor module bracket from flywheel guard.
4. See Figure 36. Release wire from clip on flywheel guard and pull from between ribs at top of crankcase.

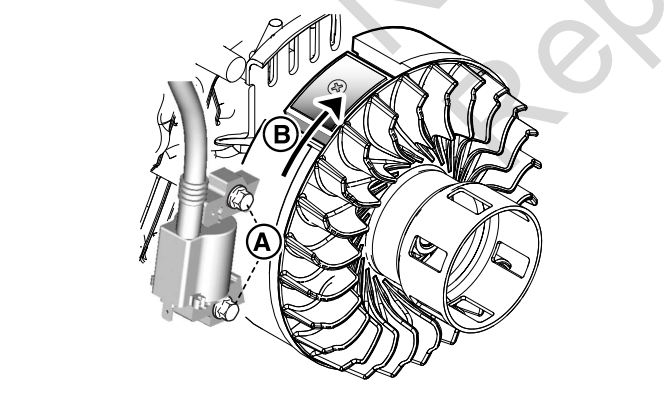
36



Armature

1. See Figure 37. Loosen two hex flange screws (A) and rotate flywheel to move magnet (B) away from armature legs.
2. Remove hex flange screws to release armature from crankcase.
3. See Figure 36. Release remote magneto stop terminal wire from clip on flywheel guard and pull from between ribs at top of crankcase.

37

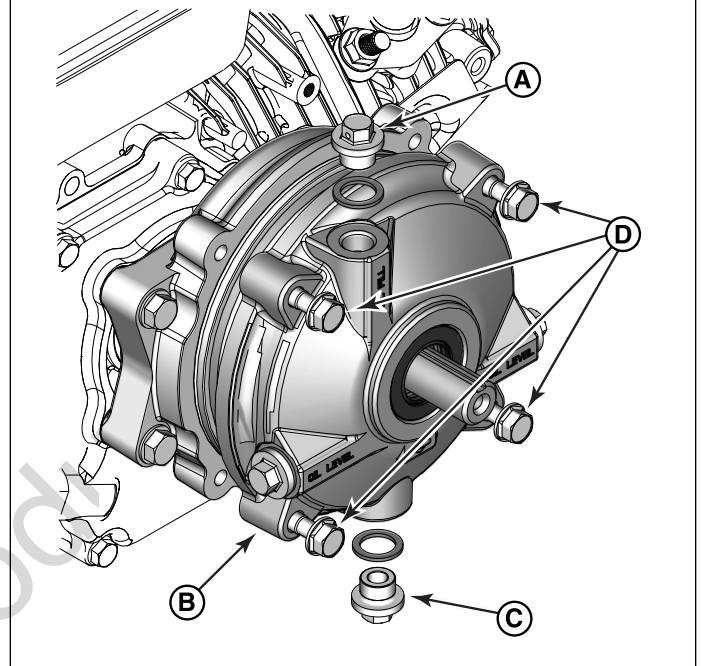


Gear Reduction Unit (If Equipped)

6:1 Gear Reduction Unit

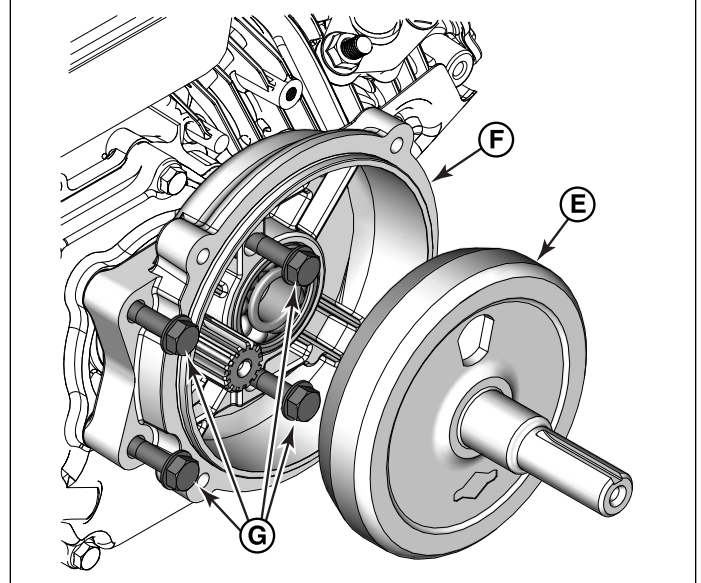
1. See Figure 38. Remove oil fill/vent plug (A) with sealing washer from gear case cover (B).
2. Remove oil drain plug (C) with sealing washer and drain oil into an approved container.
3. Remove four hex flange screws (D) to release gear case cover from gear case.
4. See Figure 39. Remove drive shaft gear assembly (E) from gear case (F).

38



4

39



5. Remove O-ring seal from gear case. Discard O-ring seal.
 6. Note orientation of gear case before removal.
- NOTE:** Gear case is installed in the 3 o'clock, 9 o'clock, or 12 o'clock positions.
7. Remove four hex flange screws (G) to release gear case from crankcase cover.
 8. Remove gasket from crankcase cover. Discard gasket.

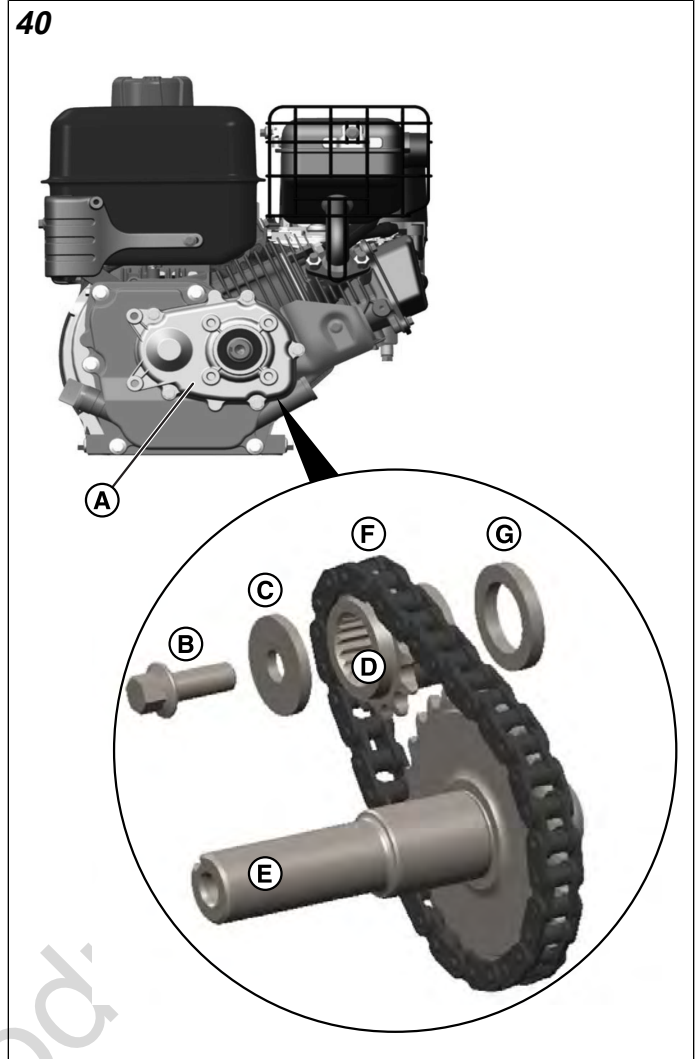
2:1 Gear Reduction Unit

1. See Figure 40. Remove five screws to release gear cover (A) from crankcase cover.

4

NOTE: If gear cover sticks, use a soft hammer to lightly tap area adjacent to two locating pins (6 o'clock and 12 o'clock positions).

2. Remove gear cover gasket from locating pins.
3. Remove two locating pins from crankcase cover flange and set aside.
4. Remove hex flange screw (B) with flat washer (C) from end of crankshaft.



5. Slide sprocket (D) from crankshaft while pulling output shaft (E) from crankcase cover bore.
6. Remove chain (F) from sprocket and output shaft.
7. Remove spacer (G) from crankshaft.

SECTION 5 – DISASSEMBLE ENGINE

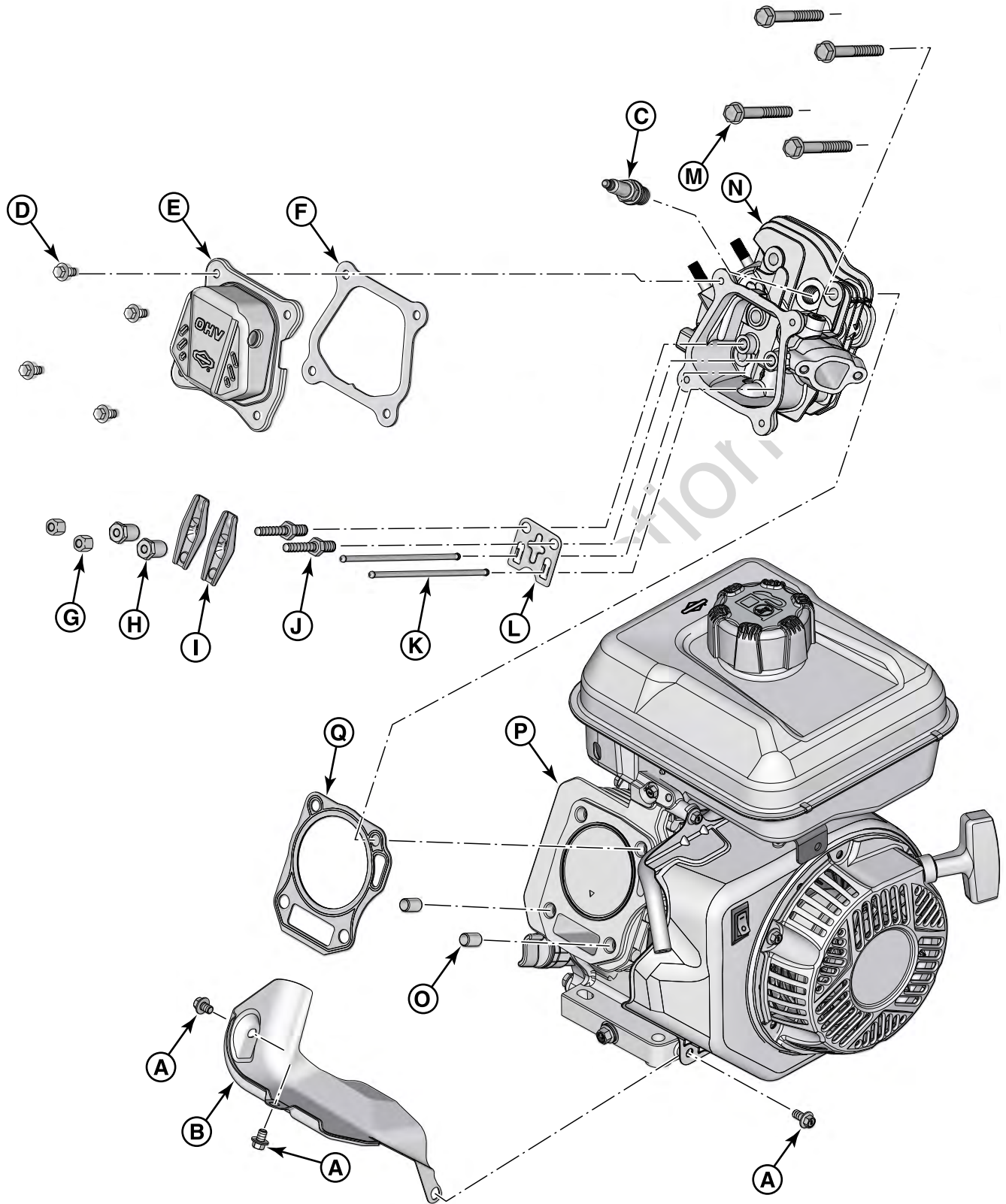
TOP END DISASSEMBLY -----38
BOTTOM END DISASSEMBLY -----40

Not for
Reproduction

TOP END DISASSEMBLY

41

5



1. See *SECTION 4 - REMOVE EXTERNAL ASSEMBLIES*.
2. See Figure 41. Remove two hex flange screws (**A**) to release heat shield (**B**) from crankcase and cylinder head.

NOTE: A third hex flange screw to the engine base is removed with the blower housing.

3. Thoroughly clean exterior surfaces of engine prior to disassembly. Proceed as follows:

NOTE: Dirt caked on cooling fins and other areas can fall into cylinder bore or stick to subassemblies as parts are removed. Abrasive particles can damage machined surfaces and plug oil passageways.

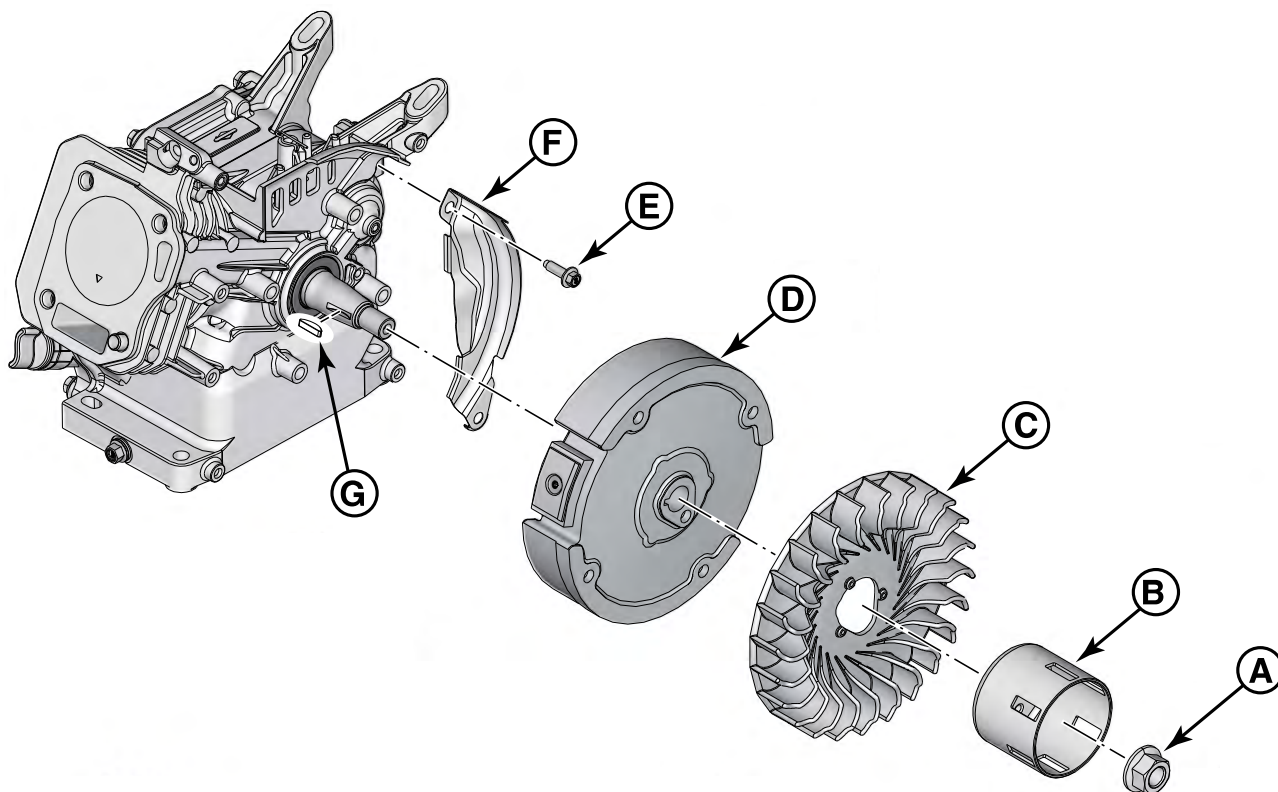
- A. Remove all loose debris by hand.
 - B. Remove dust and dirt with a soft bristle brush and a portable hand held vacuum.
 - C. Gently scrape away stubborn accumulations of dirt and other deposits using a plastic putty knife or stiff bristle brush.
 - D. Apply a light solvent to bristle brush to loosen and remove grit and oily residue, if necessary.
4. Thoroughly clean area around spark plug to keep dirt and debris out of combustion chamber.
 5. Remove spark plug (**C**) from cylinder head using the 5/8 inch Spark Plug Wrench (Part No. 19576S).
 6. Remove four hex flange screws (**D**) to release valve cover (**E**) from cylinder head.
 7. Remove and discard valve cover gasket (**F**).
 8. Move piston **1/4 inch** (6 mm) past Top Dead Center (TDC) of the compression stroke. Proceed as follows:

NOTE: Disassembly with the valve train loaded can result in bent push rods.

- A. While rotating flywheel end of crankshaft by hand in the direction of engine rotation, watch the rocker arms to determine the action of the valves. After the exhaust valve closes, the intake valve begins to open.
 - B. When the intake valve closes (so that both valves are closed with the rocker arms loose), insert a wooden dowel through the spark plug hole until seated at the top of the piston.
 - C. Rotate engine in the same direction until the piston pushes the wooden dowel to its highest point. This is TDC of the compression stroke.
 - D. Place a mark on the wooden dowel that is even with the machined surface at the top of the spark plug hole. Make a second mark **1/4 inch** (6 mm) above the first.
 - E. Rotate engine in the same direction until the second mark on the wooden dowel is even with the machined surface at the top of the spark plug hole. Remove wooden dowel.
9. Remove locknuts (**G**), rocker balls (**H**), and rocker arms (**I**) from rocker arm studs (**J**).
 10. Remove the intake and exhaust push rods (**K**).
 11. Remove rocker arm studs and push rod guide plate (**L**).
 12. Remove cylinder head screws (**M**) from cylinder head (**N**).
 13. Remove cylinder head from two locating pins (**O**) in downside of cylinder deck (**P**).
 14. Remove and discard the cylinder head gasket (**Q**).
 15. Remove locating pins from cylinder deck and set aside.
 16. See *SECTION 6 - SERVICE ENGINE SUBASSEMBLIES, CYLINDER HEAD*.

BOTTOM END DISASSEMBLY

42



5

1. See *TOP END DISASSEMBLY* in this section.
2. See Figure 43. Obtain Strap Wrench (Part No. 19433), 21 mm socket, and breaker bar. Proceed as follows:

NOTE: DO NOT use an air impact wrench to loosen flywheel nut or thread damage may occur.

- A. Fit loop of strap around flywheel and tighten until snug.
- B. Pinch strap between heel of wrench and flywheel as shown.
- C. Holding tool down by the handle, loosen flywheel nut using breaker bar and 21 mm socket.
- D. Remove strap wrench from flywheel.

43



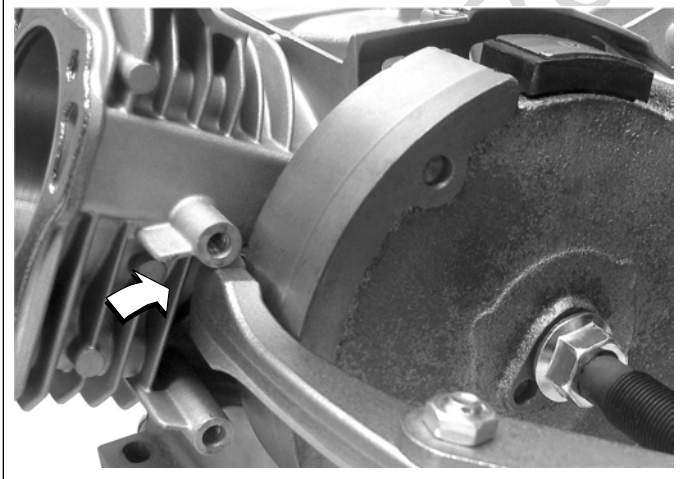
3. See Figure 42. Remove flywheel nut (A) from crankshaft.
4. Remove starter cup (B) and flywheel fan (C).
5. Remove flywheel (D) from crankshaft. Proceed as follows:

- A. Obtain standard 8 inch claw-type gear puller as shown in Figure 44.
 - B. Install flywheel nut, so that it is flush with end of crankshaft.
 - C. To avoid breaking or chipping flywheel magnet, rotate flywheel until magnet is at the 12 o'clock position.
 - D. Place forcing screw at end of crankshaft engaging arms of puller tool on inside edge of flywheel at the 3 o'clock and 9 o'clock positions.
 - E. Tighten forcing screw to lock tool in position. Verify that tool is square, and not slanting or leaning.
 - F. See Figure 45. Slowly turn forcing tool in a CW direction until left arm of puller tool contacts crankcase boss.
 - G. Continue turning forcing screw in the same direction until flywheel is free.
 - H. Remove puller tool.
6. Remove flywheel nut and flywheel.

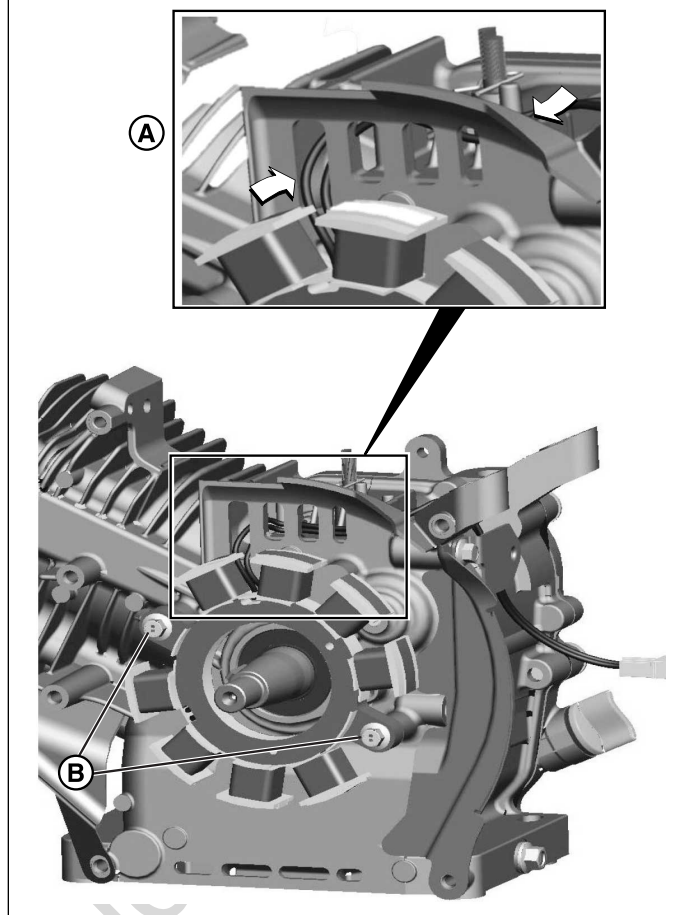
44



45



46



7. If **not** equipped with stator, move to step 8. If stator equipped, proceed as follows:
 - A. See Figure 46. Pull stator wires from between ribs and then through opening at top of crankcase (A).
 - B. Remove two hex flange screws (B) to release stator.
8. See Figure 42. Remove hex flange screw (E) to release flywheel guard (F) from crankcase.

NOTE: A second hex flange screw to the engine base was removed with the blower housing.

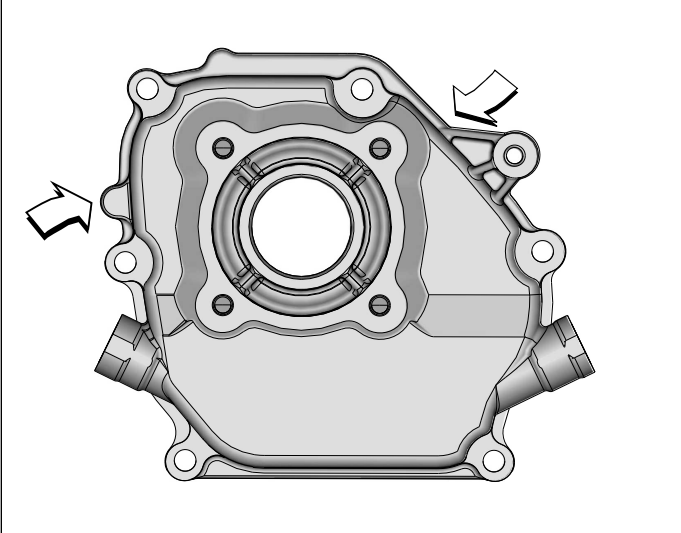


CAUTION

The edges of the crankshaft keyway are sharp. Wear appropriate safety gloves and exercise care to avoid hand injury.

9. Remove key (G) from keyway on crankshaft taper.
10. If equipped, remove hex flange screw to release high oil fill tube flange from crankcase cover.
11. Remove dipstick oil plugs from crankcase cover.

47



5

12. Remove six hex flange screws to release crankcase cover.

NOTE: See Figure 47. If crankcase cover sticks, use a soft hammer to lightly tap area adjacent to two locating pins.

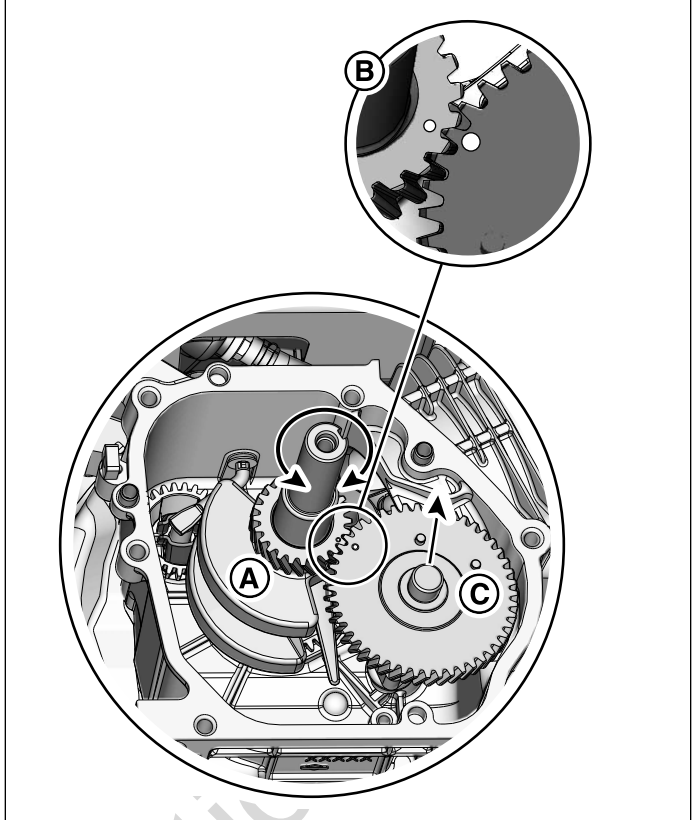
13. Remove and discard crankcase cover gasket.
 14. Remove locating pins from crankcase and set aside.
 15. See Figure 48. Rotate crankshaft (A) to align timing marks (B) on crankshaft gear tooth and camshaft gear root.

NOTE: Valve tappets are now clear of the camshaft lobes.

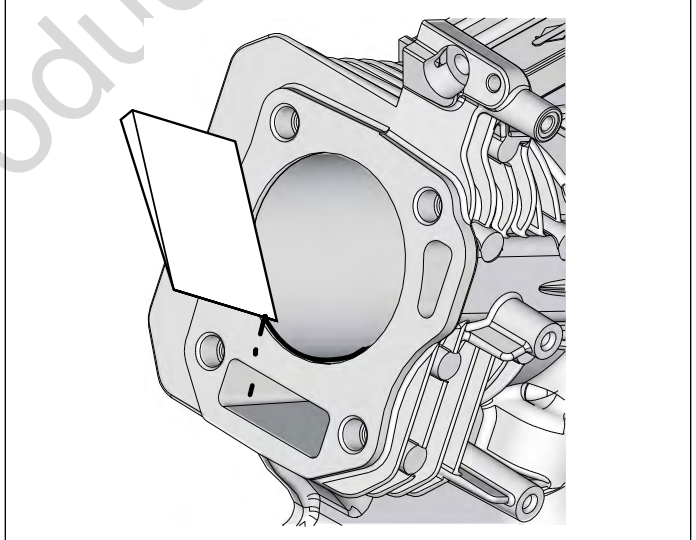
16. Remove camshaft (C) from bearing bore in crankcase.
 17. Remove valve tappets from crankcase. Tag each tappet as it is removed, so that it can be installed in its original location when the engine is assembled.
 18. Rotate crankshaft until piston is at the bottom of its stroke.
 19. See Figure 49. Use a plastic scraper to carefully remove carbon ridge at top of cylinder bore.

NOTE: Failure to remove carbon ridge can result in piston ring breakage.

48

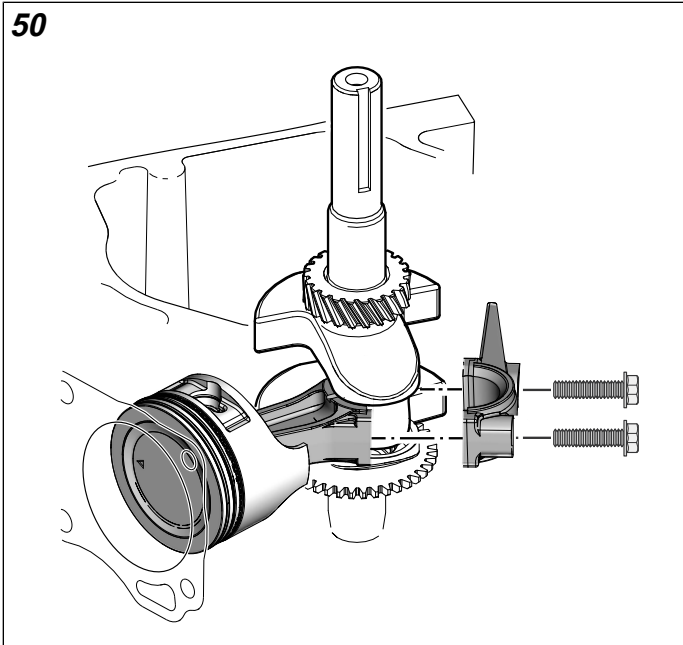


49



20. Rotate crankshaft as necessary to obtain best access to connecting rod cap screws.
 21. See Figure 50. Remove two hex flange screws to release connecting rod cap from connecting rod.

50



22. Remove connecting rod and piston assembly from cylinder bore.
23. Remove crankshaft from crankcase.
24. See the following topics under *SECTION 6 - SERVICE ENGINE SUBASSEMBLIES*:
 - *PISTON AND CONNECTING ROD*
 - *FLYWHEEL, CRANKSHAFT AND CAMSHAFT*
 - *CRANKCASE AND CRANKCASE COVER.*

Not for
Reproduction

Not for
Reproduction

SECTION 6 – SERVICE ENGINE SUBASSEMBLIES

| | |
|-------------------------------------|----|
| CYLINDER HEAD | 47 |
| Disassembly | 47 |
| Cleaning | 47 |
| Inspection | 47 |
| Cylinder Head | 47 |
| Valve Guides | 48 |
| Valve Seats | 48 |
| Valves | 48 |
| Valve Springs | 50 |
| Valve Spring Retainers | 50 |
| Tappets, Push Rods, and Rocker Arms | 50 |
| Carburetor and Muffler Studs | 50 |
| Assembly | 51 |
| PISTON AND CONNECTING ROD | 53 |
| Disassembly | 53 |
| Cleaning | 53 |
| Piston | 53 |
| Connecting Rod | 54 |
| Inspection | 54 |
| Piston and Pin | 54 |
| Piston Rings | 55 |
| Connecting Rod | 55 |
| Assembly | 56 |
| FLYWHEEL, CRANKSHAFT AND CAMSHAFT | 58 |
| Cleaning | 58 |
| Inspection | 58 |
| Flywheel | 58 |
| Crankshaft | 58 |
| Camshaft | 59 |
| CRANKCASE AND CRANKCASE COVER | 60 |
| Disassembly | 60 |
| Crankcase | 60 |
| Governor Crank | 60 |
| Low Oil Sensor (If Equipped) | 60 |
| MAG Bearing/Oil Seal | 60 |

| | |
|-------------------------------------|----|
| Crankcase Cover | 60 |
| PTO Bearing/Oil Seal | 60 |
| Cleaning | 61 |
| Inspection | 61 |
| Deglaze (Recondition) Cylinder Bore | 62 |
| Hone (Resize) Cylinder Bore | 63 |
| Clean Crankcase and Cylinder Bore | 63 |
| Assembly | 64 |
| Crankcase | 64 |
| MAG Bearing/Oil Seal | 64 |
| Low Oil Sensor (If Equipped) | 65 |
| Governor Crank | 65 |
| Crankcase Cover | 65 |
| PTO Bearing/Oil Seal | 65 |

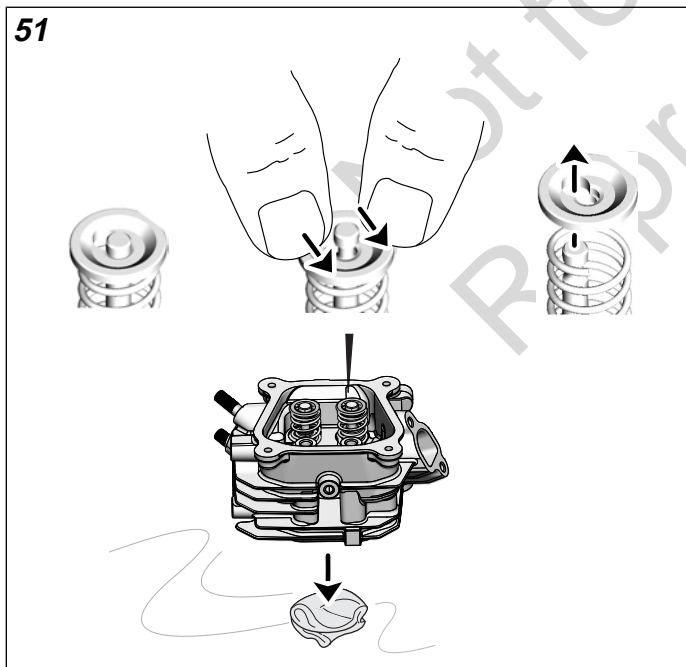
Not for
Reproduction

CYLINDER HEAD

Disassembly

1. Pack shop towels into the combustion chamber and place cylinder head on bench with the combustion chamber side down.
2. Remove valve cap from exhaust valve.
3. See Figure 51. Using thumb pressure, press down on valve spring retainer to disengage from valve stem groove. Guide valve stem into larger offset hole in valve spring retainer and then relieve valve spring tension.
4. Remove valve spring retainer and valve spring.
5. Slide exhaust valve from valve guide.
6. Mark the bottom of the valve to indicate the valve guide from which it was removed. Tag the valve cap, valve spring retainer, and valve spring, so that they are installed on the same valve at time of assembly.
7. Repeat steps 2-6 on the intake valve.
NOTE: Valve cap is not present on 13U100 and 13U200 models.
8. Remove valve stem seal/washer from cylinder head. Discard valve stem seal/washer.
NOTE: Models 13U100 and 13U200 use a different style valve stem seal. Remove and discard.

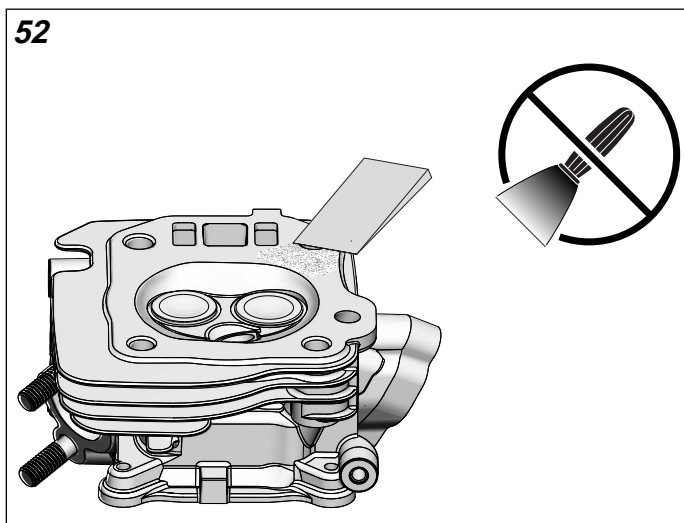
51



Cleaning

1. See Figure 52. Using a plastic scraping tool, carefully remove old gasket material from the cylinder head. Gasket material left on sealing surfaces will cause leaks.

52



2. Remove all carbon deposits from combustion chamber and machined surfaces of cylinder head. Exercise caution to avoid removing any metal material. For best results, use an air tool with a **worn** fine wire brush. Scraping may result in scratches or nicks.
3. To soften stubborn deposits, soak the cylinder head in a suitable chemical solution or other carbon and gum dissolving agent. Repeat steps 2-3 as necessary.

NOTE: Do not use glass or sand to bead blast surfaces exposed to the engine oil. Bead blasting materials become lodged in the pores of the casting where they cannot be removed through ordinary cleaning methods. Only after the engine is put to use will heat expansion cause this material to be released, and the resulting oil contamination will accelerate wear and lead to engine failure.

4. Thoroughly clean the cylinder head, valves, valve springs, valve spring retainers, valve caps, tappets, pushrods, and rocker arms in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water. Blow dry with low pressure compressed air.

Inspection

Cylinder Head

1. Check for scratches and nicks on all gasket sealing surfaces.
2. Check condition of spark plug threads. If necessary, soften deposits with penetrating oil and clean out with a thread chaser.

6

3. Check the cylinder head to cylinder mating surface for warpage or distortion. Discard the cylinder head if any low spot is **0.004 inches** (0.10 mm) or more. Proceed as follows:
 - A. See A of Figure 53. With the combustion chamber side facing up, set a straightedge diagonally across the length of the cylinder head gasket surface.
 - B. Slide a feeler gauge beneath the straightedge to check for warpage.
 - C. Check the opposite diagonal to verify that the gasket surface is flat.
 - D. See B of Figure 53. Set a straightedge vertically across the length of the cylinder head gasket surface. Use feeler gauge to check for warpage. Repeat step on opposite side.
 - E. See C of Figure 53. Set a straightedge horizontally across the length of the cylinder head gasket surface. Use feeler gauge to check for warpage. Repeat step on opposite side.
4. Repeat the 6 point check outlined under step 3 to check for warpage or distortion of the cylinder head to valve cover mating surfaces. Be sure to check both the cylinder head and valve cover. Discard the cylinder head or valve cover if any low spot is **0.004 inches** (0.10 mm) or more.
5. Visually inspect the cylinder head for cracks or discoloration due to excessive heat. Replace cylinder head if either of these conditions are found.
6. Verify that breather hole, and intake and exhaust ports are clean and open.

Valve Guides

1. Inspect external surface of valve guides for cracks (particularly the combustion chamber side). Replace the cylinder head if cracks are found.
2. To verify cleanliness, lightly hone bore using a suitable valve guide hone and then scrub with a valve guide cleaning brush to remove any dirt or debris.
3. Measure the inside diameter using an inside ball micrometer or plug gauge. Replace the cylinder head if the measurement is **0.220 inches** (5.58 mm) or more.

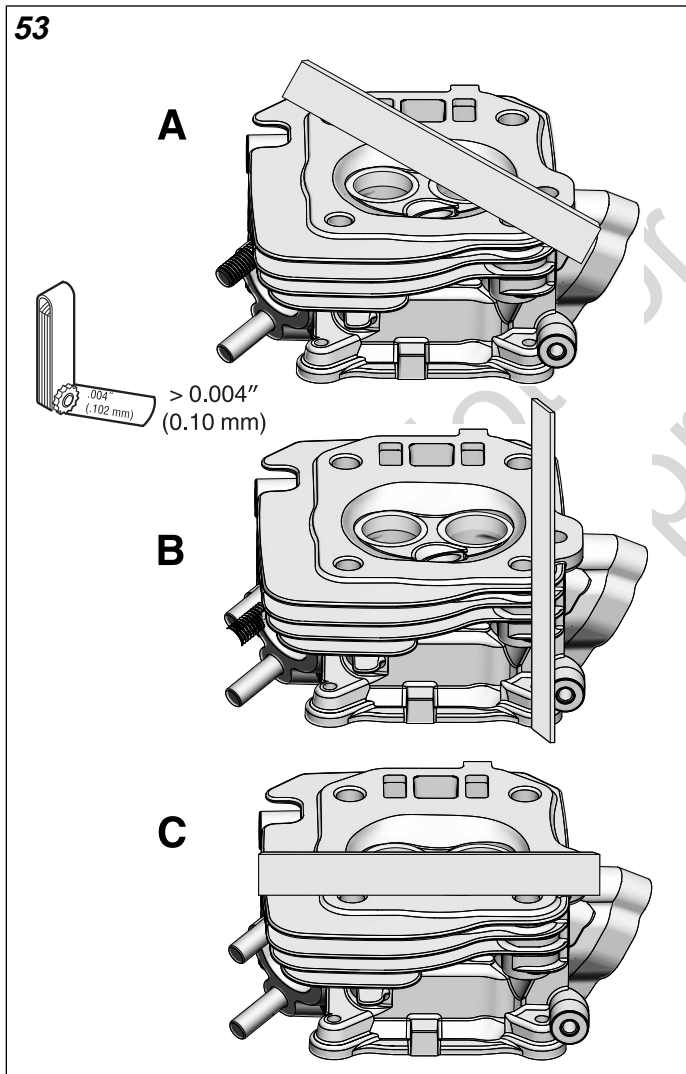
Valve Seats

1. Inspect valve seats for cracking, chipping or burning. Replace cylinder head if any of these conditions are found or if either valve seat is loose.

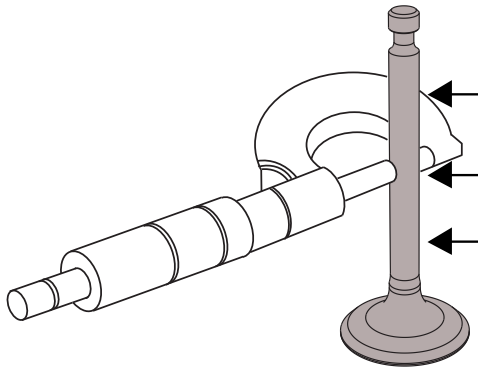
Valves

1. Replace the valve if bent or if there is evidence of burning or cracking.
2. Inspect the end of the valve stem for pitting or uneven wear. Replace the valve if either of these conditions are found.
3. Inspect the valve stem retainer groove for burrs, damage or excessive wear. Remove burrs with a fine tooth file if found.
4. Polish the valve stem with fine emery cloth or steel wool to remove carbon buildup.
5. See Figure 54. Measure the top, center and bottom of the intake valve stem using an outside micrometer. Replace the intake valve if any measurement is at the reject size shown.

6



54



| Intake Valve Stem Diameter | |
|----------------------------|----------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.208 in (5.28 mm) or less |
| 13U100, 13U200 | 0.210 in (5.32 mm) or less |

6. Measure the top, center and bottom of the exhaust valve stem. Replace the exhaust valve if any measurement is at the reject size shown.

| Exhaust Valve Stem Diameter | |
|-----------------------------|----------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.210 in (5.32 mm) or less |
| 13U100, 13U200 | 0.208 in (5.28 mm) or less |

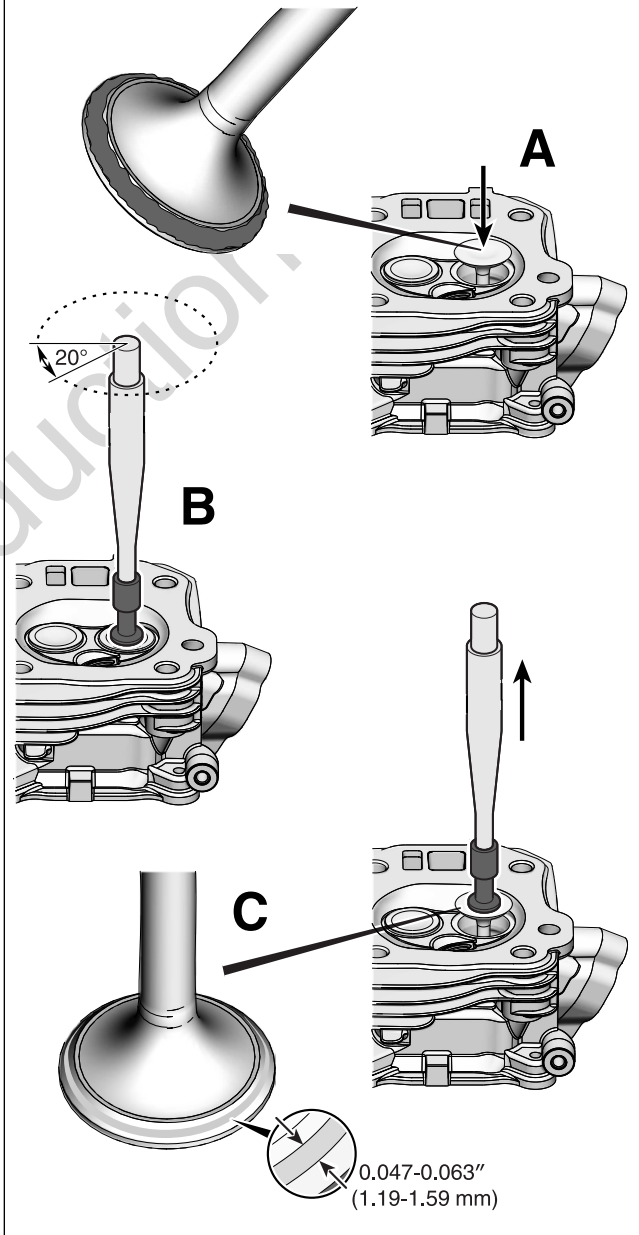
7. Hold each valve against a worn wire wheel in a bench grinder to remove all carbon deposits from the valve head and face, but exercise caution to avoid removing any metal material.
8. Inspect intake valve face and seat. If only minimal wear is found, lap the valve face and seat as follows:
- Obtain fine Valve Lapping Compound (Part No. 94150).
 - Apply lapping compound sparingly around the entire valve face and valve seat.
 - Lightly lubricate the valve guide and valve stem with clean engine oil.
 - See A of Figure 55. From the bottom of the cylinder head, insert the valve stem into the valve guide.
 - Push on bottom of valve until it contacts the valve seat.
 - Obtain the Valve Lapping Tool (Part No. 19258).
 - See B of Figure 55. Attach suction cup at end of tool to valve head. Holding shank of tool between the palms of both hands, oscillate the tool approximately 20° back and forth a few times.
 - Remove valve from the cylinder head and thoroughly clean the valve face and valve seat of

any lapping compound. Use a clean rag dipped in mineral spirits for good results.

- See C of Figure 55. Carefully inspect the seating surface on the valve face. A properly lapped valve shows a gray, frosty seating surface located near the center of the valve face. Verify that the lapped surface extends evenly and completely around the entire valve face with a contact area **0.047-0.063 inches** (1.19-1.59 mm) wide.

Carefully inspect the seating surface on the valve seat. The valve seat should also show an unbroken lapped finish of uniform width.

55



6

9. If the desired results are not observed, obtain the Master Seat Cutter Kit (Part No. 19547) and proceed as follows:

NOTE: Carefully read manufacturer's directions for proper assembly and use of tool.

- A. Install the proper sized pilot in the valve guide.

NOTE: Do not drop the cutter onto the valve seat during installation or removal, as the blades may cause seat damage that requires additional cutting.

NOTE: Applying too much pressure or rotating the cutter too fast will produce chatter marks that adversely affect sealing integrity. Rotate the cutter slowly, so that it takes about three seconds to make one complete rotation.

- B. See Figure 56. Install the 60° cutter on the pilot to make the bottom-narrowing cut. Rotate the cutter three or four turns, so that it cuts all the way around the valve seat.

- C. Install the 31° cutter to make the top-narrowing cut.

- D. Install the 46° base angle cutter and cut the seat contact area until it is approximately **0.047-0.063 inches** (1.19-1.59 mm) wide.

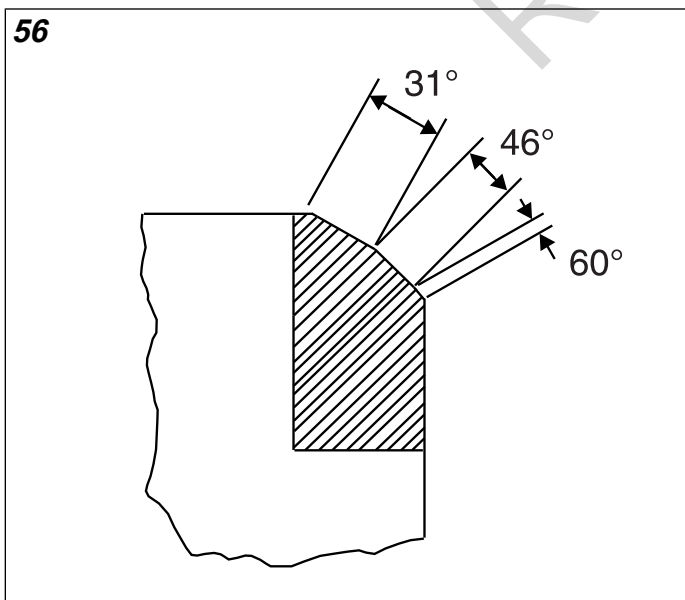
- E. Use low pressure compressed air to thoroughly remove all cutting chips and metal shavings. Remove pilot from valve guide.

- F. Lap the valve face and seat a second time to verify location and width of the seat contact area.

- G. If the seat contact area is too narrow, recut using the 46° base angle cutter.

- H. If the seat contact area is too wide, repeat steps 9(B) and 9(C).

10. Perform steps 8-9 on the exhaust valve.



Valve Springs

1. Inspect valve springs for broken or discolored coils. Replace springs if either of these conditions are found.
2. Set the intake and exhaust valve springs on a level surface and use a straightedge to check for proper squareness and equivalent height. Too much height may correspond to a reduction in spring pressure which results in sluggish valve action.

Valve Spring Retainers

1. Inspect parts for rust pits or corrosion. Replace as necessary.
2. Inspect inside diameter for damage or excessive wear. Center must be well defined without distortion.

Tappets, Push Rods, and Rocker Arms

1. Inspect tappet sockets for signs of scuffing, pitting or general wear.
2. Tappet faces may appear to have smooth surfaces, but still have concave wear. Hold a straight edge across the tappet face. Any concave wear found on the tappet faces may also indicate worn camshaft lobes.
3. Roll push rods on a flat surface to determine if they are bent. Replace push rods that are bent, dented, broken or discolored. Replace the push rod if the ball ends show signs of excessive wear or damage. For best practices, replace push rods in pairs.
4. Check the push rod guide plate for cracks or other damage. Replace if necessary.
5. Check rocker arms for uneven wear or pitting where contact is made with the valve stem tips. Check for concave wear where rocker arms contact the push rod ends. Replace the rocker arm if excessive wear is found at either location, or if pitted, deformed, or scored.

Carburetor and Muffler Studs

1. Inspect carburetor and muffler studs. Replace studs if broken, bent, or if severe thread damage is observed.
2. Replace a carburetor stud as follows:
 - A. Retrieve the two hex flange nuts removed from the studs during air cleaner removal.
 - B. Thread first nut onto stud upside down.
 - C. Thread second nut onto stud right-side up until it makes firm contact with the first.
 - D. Rotate inside nut in a counter-clockwise direction until stud is loose.

NOTE: If stud is difficult to remove, apply suitable penetrating oil to threads, and then work stud in and out until it moves freely.

- E. Remove stud from cylinder head. Remove hex flange nuts from stud.
- F. Install **new** stud, so that the stepped side goes into the cylinder head.
- G. Repeats steps 2(B) and 2(C).
- H. Rotating outside nut in a clockwise direction, tighten stud as follows.

| Carburetor Stud | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 50-70 in-lbs (5.7-7.9 N-m) |
| 13U100, 13U200 | 44-62 lb-in (5-7 N-m) |

3. Replace a muffler stud as follows:

- A. Retrieve the two hex nuts removed from the studs during muffler removal.
- B. Thread first nut onto stud.
- C. Thread second nut onto stud until it makes firm contact with the first.
- D. Rotate inside nut in a counter-clockwise direction until stud is loose.

NOTE: If stud is difficult to remove, apply suitable penetrating oil to threads, and then work stud in and out until it moves freely.

- E. Remove stud from cylinder head. Remove hex nuts from stud.
- F. Install **new** stud, so that the side with the shorter threads goes into the cylinder head.
- G. Repeats steps 3(B) and 3(C).
- H. Rotating outside nut in a clockwise direction, tighten stud as follows.

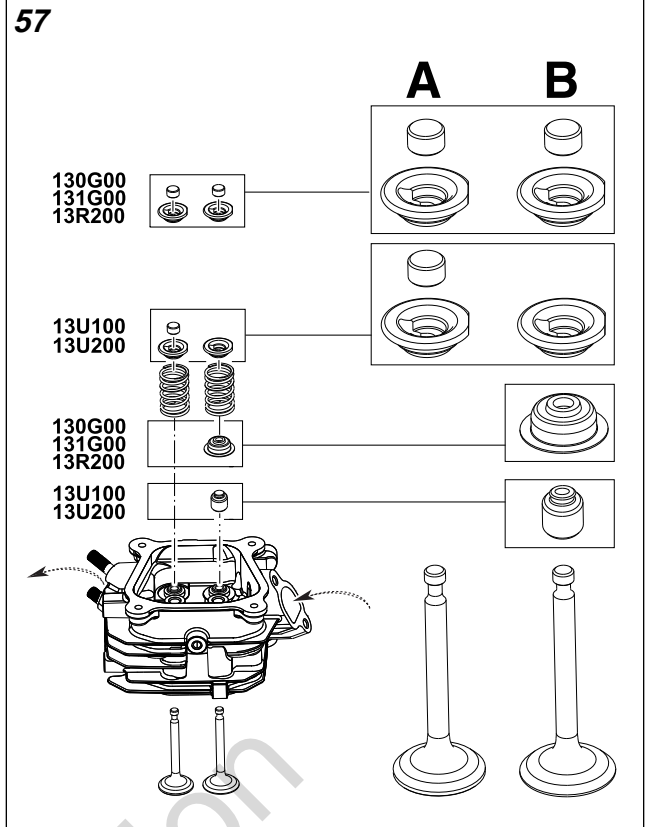
| Muffler Stud | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 40-60 in-lbs (4.5-6.8 N-m) |
| 13U100, 13U200 | 35-62 lb-in (4-7 N-m) |

Assembly

1. See A of Figure 57. Install exhaust valve assembly as follows:

- A. Apply a suitable engine assembly lube to the valve stem.

NOTE: If the valves were not tagged during disassembly, remember that the exhaust valve always has the smaller valve face diameter.



- B. From the bottom of the cylinder head, insert the valve stem into the valve guide.
 - C. To distribute the assembly lube evenly around the valve stem and guide, hand spin the valve as it is installed. Work the valve back and forth in the bore to verify that it slides smoothly and seats properly.
 - D. Using denatured alcohol or other suitable degreaser, thoroughly clean valve face, valve seat, valve guide, and end of valve stem of any excess assembly lube.
 - E. Install valve spring over the valve stem and valve guide.
 - F. Set the valve spring retainer on top of the valve spring. Using thumbs to compress valve spring, guide the end of the valve stem through the larger offset hole in the valve spring retainer. Continue pressing down until the smaller center hole engages the valve stem groove.
 - G. Verify that the axis of the valve spring is parallel to the valve stem. A cocked valve spring will result in premature valve guide wear.
 - H. Lightly tap the end of the valve stem once or twice with a soft mallet to ensure that valve spring retainer is tightly seated in the valve stem groove.
 - I. Install valve cap on end of valve stem.
2. See B of Figure 57. Install intake valve assembly as follows:

- A. Apply a suitable engine assembly lube to the valve stem.
- B. From the bottom of the cylinder head, insert the valve stem into the valve guide.
- C. To distribute the assembly lube evenly around the valve stem and guide, hand spin the valve as it is installed. Work the valve back and forth in the bore to verify that it slides smoothly and seats properly.
- D. Using a suitable degreaser, thoroughly clean valve face, valve seat, valve guide, and end of valve stem of any excess assembly lube.
- E. Cover the valve stem retainer groove with black electrical tape. Apply a thin film of clean engine oil to tape.

NOTE: Inadequate precautions may cause the valve stem seal to catch the edge of the valve stem retainer groove. The resulting damage may lead to leakage around the valve stem causing increased oil consumption and possible valve sticking.

- F. Lightly lubricate inside diameter of **new** valve stem seal/washer with clean engine oil.
- G. Slide valve stem seal/washer down valve stem until contact is made with machined surface of cylinder head. Remove black electrical tape and discard.

NOTE: Models 13U100 and 13U200 use a different style valve stem seal. Lightly lubricate inside diameter, and slide over valve stem to install.

- H. Install valve spring over the valve stem and valve guide.
 - I. Set the valve spring retainer on top of the valve spring. Using thumbs to compress valve spring, guide the end of the valve stem through the larger offset hole in the valve spring retainer. Continue pressing down until the smaller center hole engages the valve stem groove.
 - J. Verify that the axis of the valve spring is parallel to the valve stem. A slanting or leaning valve spring will result in premature valve guide wear.
 - K. Lightly tap the end of the valve stem once or twice with a soft mallet to ensure that valve spring retainer is tightly seated in the valve stem groove.
 - L. Install valve cap on end of valve stem.
- NOTE:** On models 13U100 and 13U200, valve cap is not installed on intake valve.
- 3. Cover the cylinder head to protect it from dust and dirt until time of installation.

Not for
Reproduction

PISTON AND CONNECTING ROD

Disassembly

1. Insert small pick into pick lock groove and pull piston pin lock ring out of pin boss groove on one side of piston. Discard lock ring.



CAUTION

Always wear proper eye protection when removing piston pin lock ring. Slippage can propel the ring with enough force to cause eye injury.

2. Push piston pin toward open pin boss to remove from piston and upper connecting rod.
3. Obtain the Piston Ring Expander (Part No. 19340).

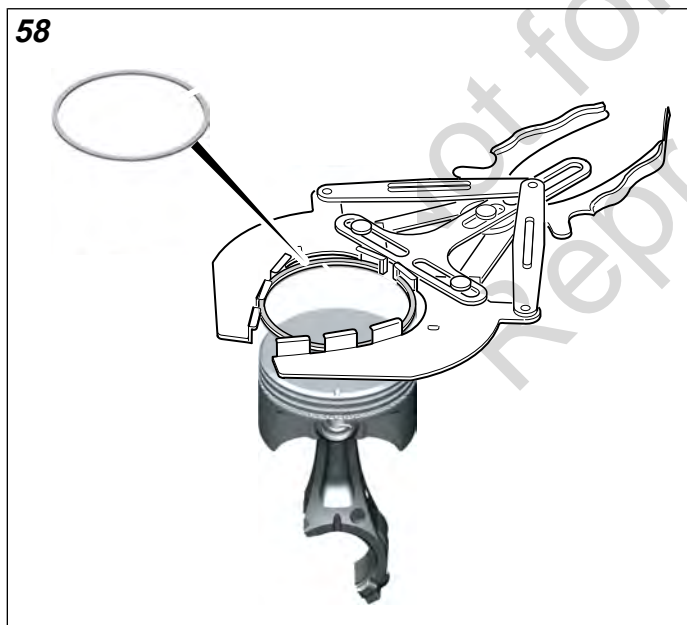


CAUTION

Always wear proper eye protection when removing compression and oil wiper rings. Slippage may propel the ring with enough force to cause eye injury.

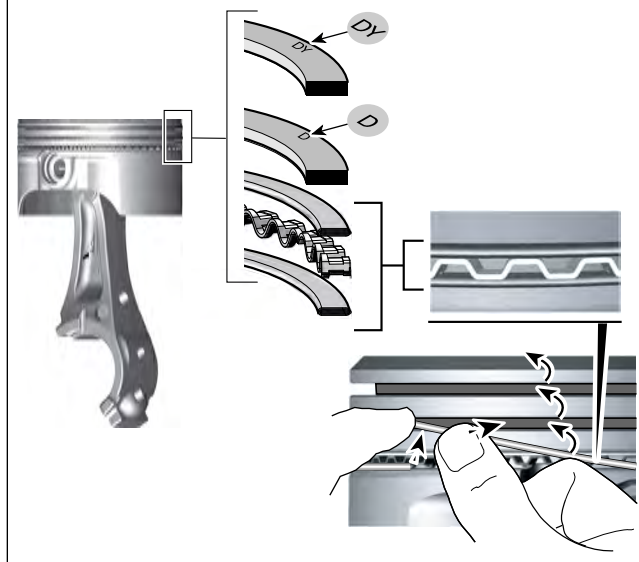
4. See Figure 58. Remove compression ring from the top ring groove.

58



5. Remove oil wiper ring from the middle ring groove.
6. Remove oil control ring from the bottom ring groove. Proceed as follows:
 - Remove the expander spring.

59



- See Figure 59. Spiral or wind the upper steel rail from the bottom ring groove into the middle ring groove. Repeat action to move the rail into the top ring groove and then off the piston.
- Repeat above step to remove the lower steel rail.

Cleaning

Piston

1. Do not sand blast or glass bead blast piston. Bead blasting rounds the ring lands and will result in high oil consumption and blow-by of exhaust gases. Blow-by of exhaust gases contaminates the engine oil supply, and reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.
2. To remove all carbon and combustion deposits, soak the piston in a special detergent that will not corrode aluminum. Maintain the temperature of the cleaning solution well below 212° F. (100° C.).
3. Thoroughly rinse the piston and dry with moisture free compressed air.
4. Thoroughly clean the three piston ring grooves of all carbon deposits. A broken compression ring properly ground to a sharp chisel-like edge can be used for this purpose.
5. Verify that the piston pin lock ring groove is clean and free of dirt and grime.
6. Clean oil drain back holes leading from the oil control ring groove to the underside of the piston crown. Use a soft bristle brush and compressed air to ensure

cleanliness. Do not use a wire brush or the holes may be enlarged.

7. If present, verify that set of oil drain back holes at top of piston skirt are clean and open.

Connecting Rod

1. Thoroughly clean parts in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water.
2. Blow dry with low pressure compressed air.
3. Verify that oil holes in connecting rod shank and at top of piston pin bore are clean and open.

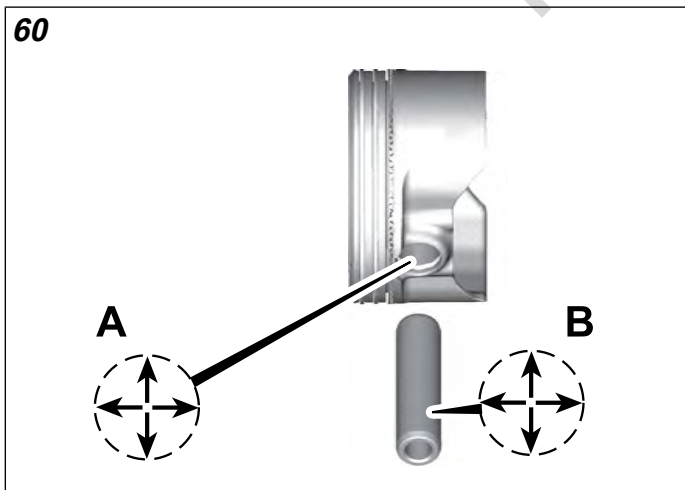
Inspection

Piston and Pin

1. Carefully inspect the piston for damage or excessive wear. Proceed as follows:
 - A. Inspect the piston for cracks. Pay special attention to the area around the pin bores and oil drain back holes beneath the piston crown.
 - B. Check piston for cracked, broken or bent ring lands.
 - C. Check piston skirt for cracks, gouges, deep scratches or heavy scoring.
 - D. Check piston head for evidence of burning, etching or melting.
 - E. Look for marks or imprints caused by contact with valves.

NOTE: A piston with superficial wear marks, minor scratching or mild scoring may continue to be used.

2. Lightly oil a good piston pin and insert it into the piston pin bore to feel for proper fitment. The pin should slide in and out without binding, but also without pivoting or rocking.



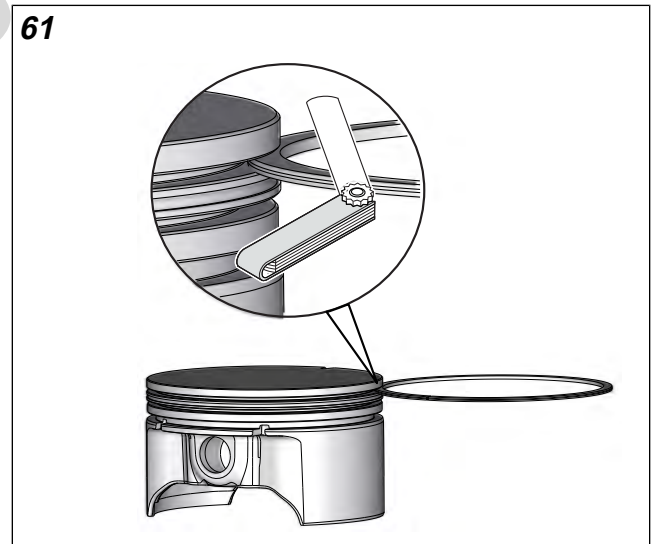
3. See A of Figure 60. Using an inside micrometer or dial vernier caliper, measure the piston pin bore diameter at two locations- parallel and perpendicular to the crankshaft. Replace the piston if either measurement is **0.711 inches** (18.06 mm) or more.
4. See B of Figure 60. Using an outside micrometer, measure the outside diameter of the piston pin at two locations- parallel and perpendicular to the crankshaft. Replace piston pin if either measurement is at the reject size shown below.

| Piston Pin Diameter | |
|------------------------|------------------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.707 in (17.96 mm) or less |
| 13U100, 13U200 | 0.708 in (17.97 mm) or less |

5. Run your index finger around the edge of the piston crown to feel for dings, nicks or burrs. Lightly file the edge of the crown to remove any defects.
6. Measure the piston ring side clearance as follows:

NOTE: Worn ring grooves result in high oil consumption and blow-by of exhaust gases. Blow-by of exhaust gases contaminates the engine oil supply, and reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.

- A. See Figure 61. Insert the edge of a **new** compression ring into the top piston ring groove. Insert a feeler gauge between the upper surface of the ring and the ring land.



- B. Since the grooves wear unevenly, repeat this check at several locations around the piston ring groove circumference.
- C. Discard the piston if any measurement is **0.009 inches** (0.23 mm) or more.

NOTE: Only the top compression ring side clearance needs to be checked.

Piston Rings

NOTE: Always use **new** piston rings. Recondition (deglaze) or resize (hone) cylinder before installing new rings.

- Before placing each ring on the piston, perform the following check.

NOTE: Insufficient ring end gap may cause the ends to abut at engine operating temperatures, resulting in ring breakage, cylinder scuffing and/or piston seizure. Excessive ring end gap results in high oil consumption and blow-by of exhaust gases. Blow-by of exhaust gases contaminates the engine oil supply, and reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.

- Obtain **new** top compression ring.
- See Figure 62. Insert ring approximately one inch (25.4 mm) into cylinder bore.
- Square ring in the bore using the top of the piston.
- Measure the ring end gap with a feeler gauge.
- Do not use the top compression ring if the end gap is at the reject size shown below.

| Top Compression Ring End Gap | |
|------------------------------|-----------------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.040 in (1.01 mm) or more |
| 13U100, 13U200 | 0.037 in (0.94 mm) or more |

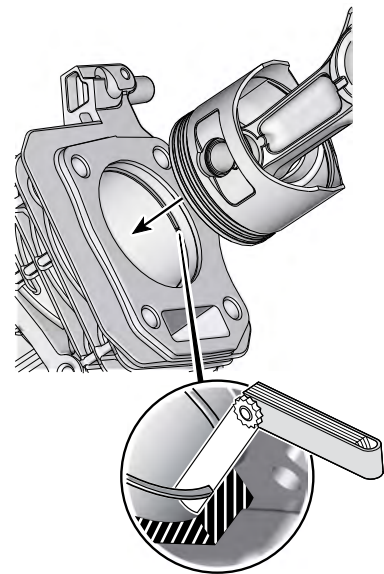
- Repeat steps 1(B) thru 1(D) using **new** middle oil wiper ring. Do not use the ring if the end gap is at the reject size shown below.

| Middle Oil Wiper Ring End Gap | |
|-------------------------------|-----------------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.044 in (1.11 mm) or more |
| 13U100, 13U200 | 0.047 in (1.19 mm) or more |

- Repeat steps 1(B) thru 1(D) using rails of **new** oil control ring. Do not use the ring if the end gaps are at the reject size shown below.

| Oil Control Ring End Gap | |
|--------------------------|-----------------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 0.055 in (1.39 mm) or more |
| 13U100, 13U200 | 0.053 in (1.34 mm) or more |

62



Connecting Rod

- Inspect the connecting rod for cracks, twisting or bending.
- Inspect bearing surfaces for scratches or scoring.
- Inspect dipper on connecting rod cap for bending, chipping, or cracking.

NOTE: Replace connecting rod and cap if any of the above conditions are found. Always replace connecting rod and cap as an assembly.

- Start two hex flange screws to fasten connecting rod cap to connecting rod. Alternately tighten screws as follows.

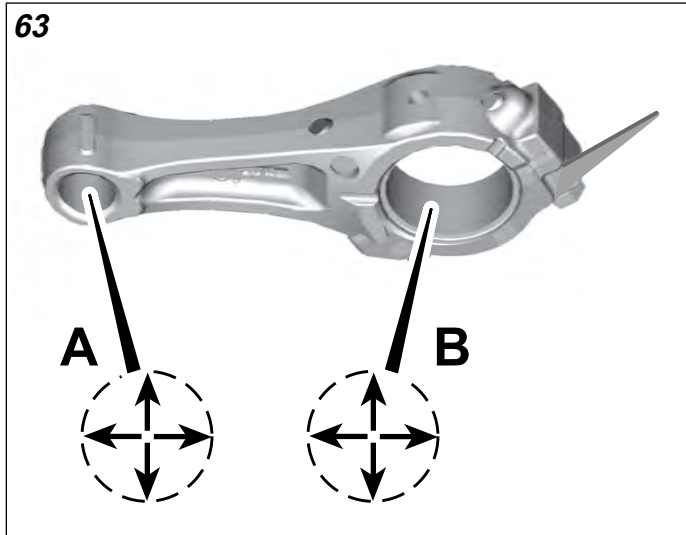
| Connecting Rod Cap Screws | |
|---------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 110-140 lb-in (12.4-15.8 N-m) |
| 13U100, 13U200 | 124-142 lb-in (14-16 N-m) |

NOTE: Install connecting rod cap, so that match marks on connecting rod cap and shank are aligned.

- Obtain Telescoping Gauge (Part No. 19485) and inside micrometer or plug gauge.
- See A of Figure 63. Measure piston pin bearing bore diameter at two locations- parallel and perpendicular to the crankshaft. Replace connecting rod if either measurement is **0.711 inches** (18.06 mm) or more.
- See B of Figure 63. Measure the crank pin bearing bore diameter at two locations- parallel and perpendicular to the crankshaft. Replace the connecting rod if either measurement is at the reject size shown below.

| Crank Pin Bearing Bore Diameter | |
|---------------------------------|-----------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 1.185 in (30.10 mm) or more |
| 13U100, 13U200 | 1.184 in (30.07 mm) or more |

- Remove two hex flange screws to release connecting rod cap.



Assembly

- Apply clean engine oil to piston pin, piston pin bosses, and upper connecting rod bearing.
- See Figure 64. Place piston over connecting rod end, so that arrow stamped on piston crown points toward oil hole in connecting rod shank.



- Insert piston pin through piston pin bore and upper connecting rod bearing. Push pin until it contacts installed lock ring in opposite pin boss.

NOTE: Do not reuse piston pin lock ring after it has been removed. The lock ring may weaken or become distorted during removal causing it to break or dislodge during engine operation.

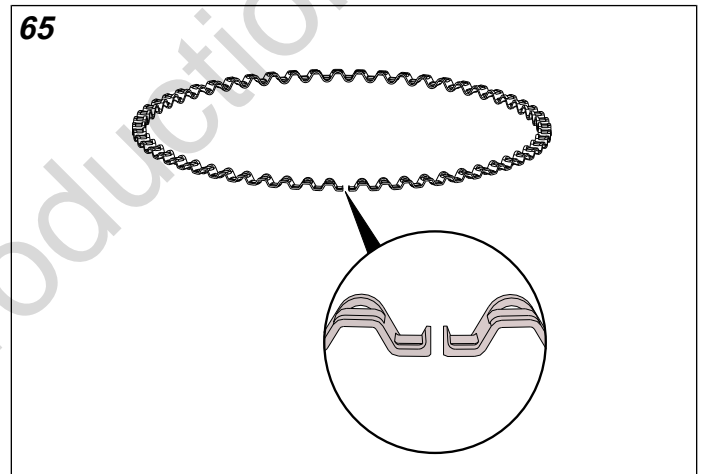
- Install **new** piston pin lock ring into pin bore groove, so that end of the lock ring is 90° from the pick lock groove. Exercise care to avoid kinking, stretching, or distorting lock ring. Verify that lock ring is fully seated in the groove.



CAUTION

Always wear proper eye protection when installing piston pin lock ring. Slippage can propel the ring with enough force to cause eye injury.

- Use compressed air to remove any dirt or dust that may have settled in the oil drain back holes and piston ring grooves.
- Apply clean engine oil to three piston ring grooves.
- Install the oil control ring into the bottom ring groove. Proceed as follows:
 - See Figure 65. Install expander spring, so that the gap ends point toward the piston crown.
 - See Figure 66. Spiral bottom oil rail into space below expander spring.
 - Spiral top oil rail into space above expander spring.



- Obtain the Piston Ring Expander (Part No. 19340).

NOTE: Always use the piston ring expander to prevent excessive ring twist and expansion. Over expansion may cause the ring to crack opposite the ring gap. Damaged or distorted rings result in blow-by of exhaust gases, increased oil consumption, and lower service life of valves and other components.



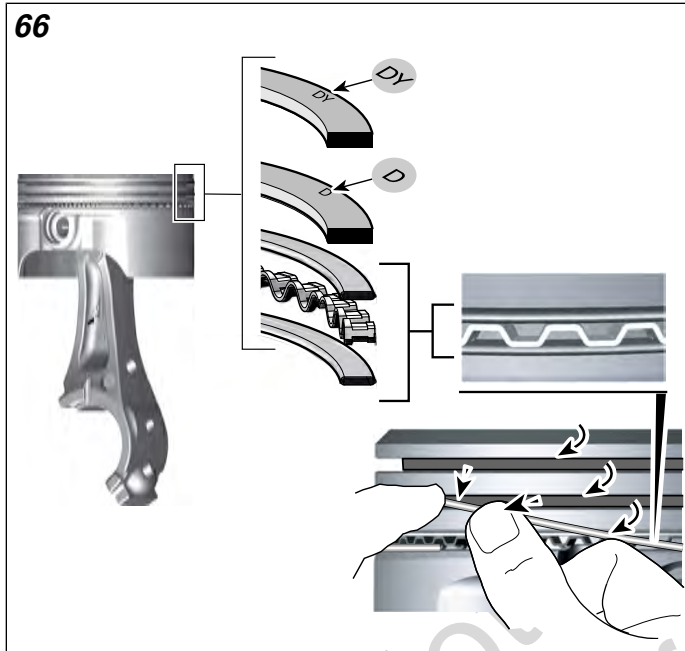
CAUTION

Always wear proper eye protection when installing compression and oil wiper rings. Slippage may propel the ring with enough force to cause eye injury.

9. See Figure 66. Carefully install the oil wiper ring into the middle ring groove, so that the "D" stamp near the ring gap faces the piston crown.

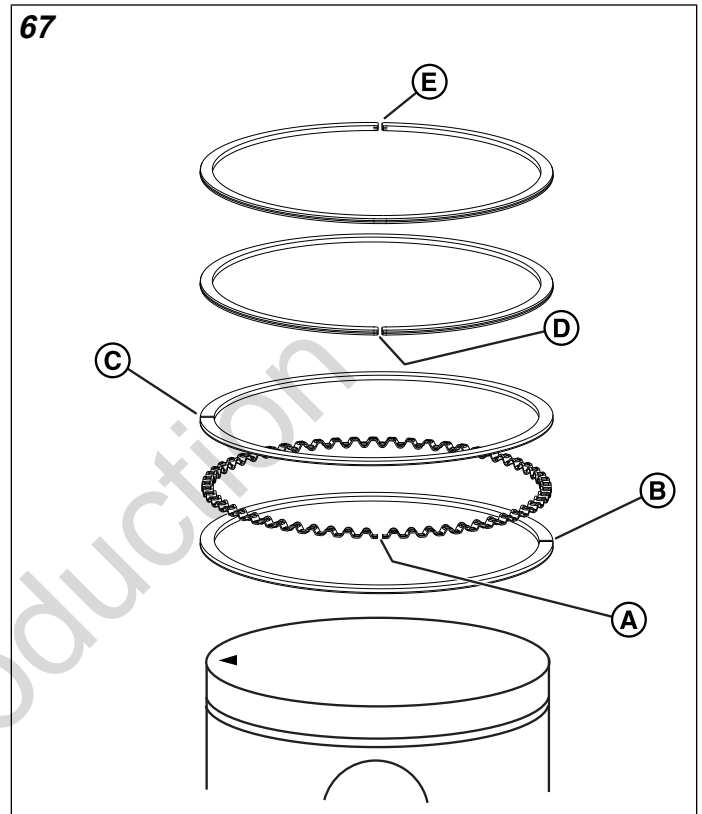
NOTE: Installing the oil wiper ring upside down will cause oil to be scraped up into the combustion chamber resulting in excessive oil consumption and lower service life on valves and other components.

10. Carefully install the compression ring into the top ring groove, so that the "DY" stamp near the ring gap faces the piston crown.
11. Rotate piston rings using the palms of both hands. Verify that the rings rotate freely without sticking.



12. Stagger the ring gaps around the piston. Proceed as follows:

- A. See Figure 67. Rotate expander spring, so that the gap is positioned at the front of the piston (A).
- B. Rotate bottom oil rail to position the gap 90° from the gap in the expander spring (B).
- C. Rotate top oil rail to position the gap 180° from the gap in the bottom oil rail (C).
- D. Rotate the middle oil wiper ring to align the gap with the gap in the expander spring (D).
- E. Rotate the top oil compression ring to position the gap 180° from the gap in the oil wiper ring (E).



FLYWHEEL, CRANKSHAFT AND CAMSHAFT

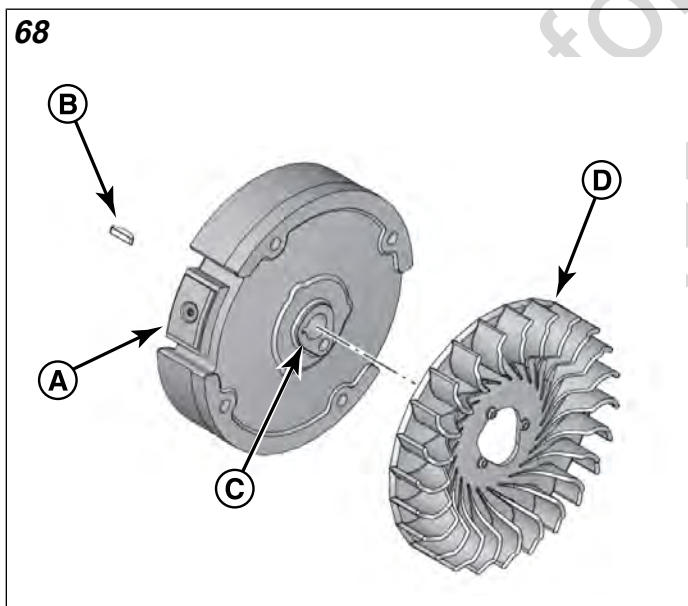
Cleaning

1. Thoroughly clean parts in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water.
2. Blow dry with low pressure compressed air.

Inspection

Flywheel

1. See Figure 68. Inspect flywheel magnet (A) for cracks, chips, or other damage. Check magnet for looseness.
2. If engine is equipped with electric start, check flywheel ring gear for worn, cracked, chipped, or missing teeth.
3. Inspect flywheel key (B) for partial or complete shearing. Replace key if any damage is found.
4. Inspect flywheel keyway (C) for damage or distortion.
5. Inspect flywheel taper for scoring, scratches, cracks, or burrs. Remove any slight burrs with a fine-tooth file.
6. Inspect flywheel fan (D) for bent, cracked, chipped, or broken fins.

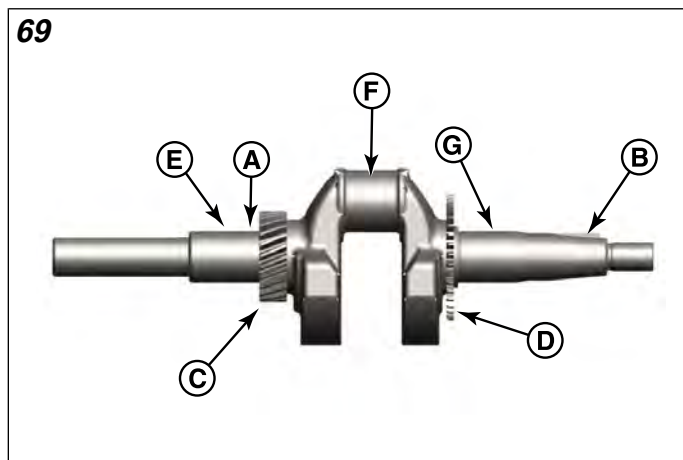


Crankshaft

1. See Figure 69. Carefully remove crankshaft end play shims (A), if present. Count shims as they are removed to be sure of installing the correct number when the engine is assembled. Inspect shims for tears, holes, or other damage. Replace shims as necessary.
2. Inspect keyway (B) for damage or distortion.
3. Check camshaft gear (C) and governor gear (D) for worn, cracked, chipped, or missing teeth.
4. Inspect crankshaft for straightness. DO NOT attempt to straighten bent crankshafts.
5. Inspect crankshaft taper for burrs, rust or other damage. Remove any slight burrs with a fine-tooth file.
6. Inspect crankshaft PTO bearing journal (E), crankpin journal (F), and MAG bearing journal (G) for scoring.
7. Using an outside micrometer, measure the crankpin journal diameter. Replace the crankshaft if measurement is at the reject size shown below.

| Crankpin Journal Diameter | |
|---------------------------|-----------------------------|
| Models | Reject Size |
| 130G00, 131G00, 13R200 | 1.179 in (29.95 mm) or less |
| 13U100, 13U200 | 1.178 in (29.93 mm) or less |

8. Measure the MAG bearing and PTO bearing journal diameters. Replace the crankshaft if either measurement is **0.982 inches** (24.95 mm) or less.

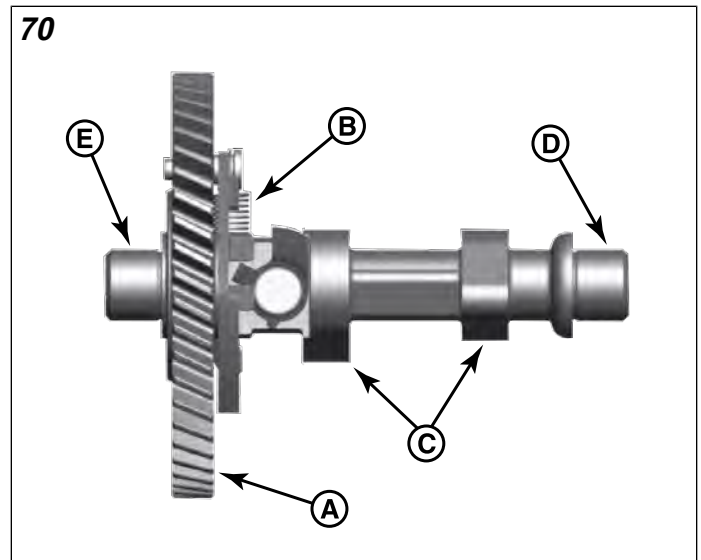


Camshaft

1. See Figure 70. Check camshaft gear (A) for worn, cracked, chipped, or missing teeth.
2. Check operation of yoke on Mechanical Compression Release (MCR) mechanism (B).

NOTE: Press yoke to the OPEN position, and then verify that it returns to the fully CLOSED position when released.

3. Check camshaft lobes (C) for scratching, scoring, or excessive wear.
4. Check MAG side bearing journal (D) and PTO side bearing journal (E) for scratching or scoring.
5. Using an outside micrometer, measure the MAG side bearing journal and PTO side bearing journal diameters. Replace the camshaft if either measurement is **0.548 inches** (13.93 mm) or less.



Not for
Reproduction

CRANKCASE AND CRANKCASE COVER

Disassembly

Crankcase

Governor Crank

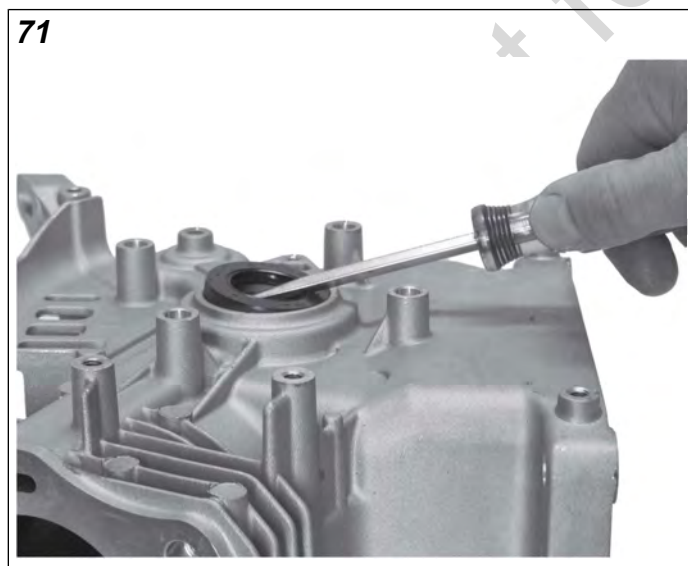
1. Remove spring clip from groove in governor crank.
2. Remove governor crank with flat washer from crankcase.
3. Remove governor cup and flat washer from governor gear shaft.

Low Oil Sensor (If Equipped)

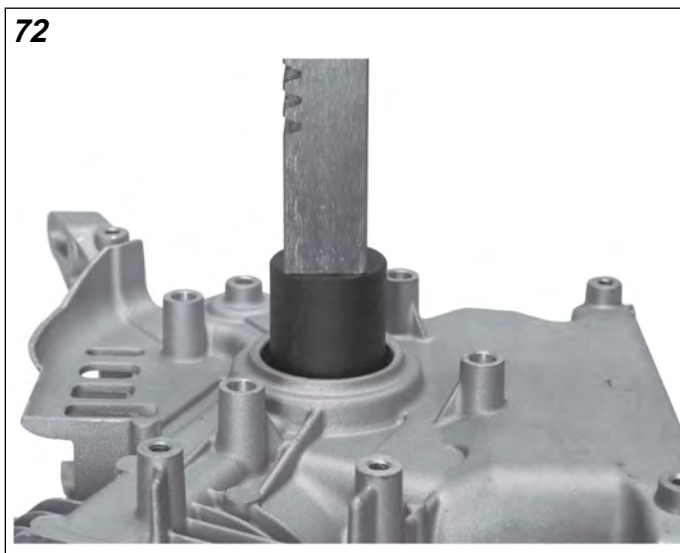
1. Remove hex flange nut to release oil sensor fitting from hole in crankcase.
2. Remove two hex flange screws to release oil sensor from inside crankcase.

MAG Bearing/Oil Seal

1. See Figure 71. Remove and discard oil seal from crankcase bearing bore. Exercise care to avoid scratching bearing bore during removal.



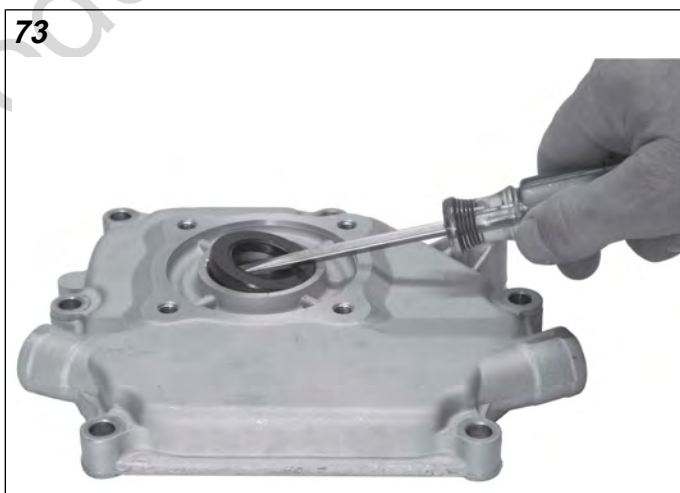
2. With the outside facing upward, support crankcase on wooden blocks on deck of arbor press.
3. Place suitable bearing driver on outer race of bearing.
4. Center bearing driver under ram.
5. See Figure 72. Apply pressure to bearing driver until bearing is free. Discard bearing.



Crankcase Cover

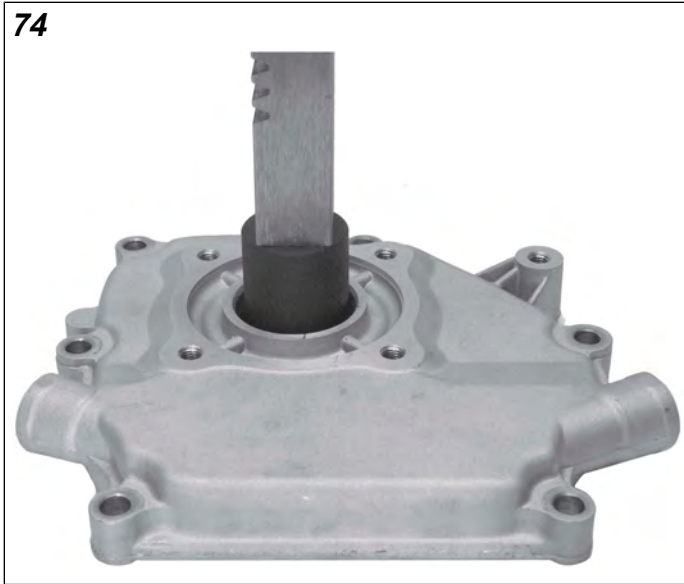
PTO Bearing/Oil Seal

1. See Figure 73. Remove and discard oil seal from crankcase cover bearing bore. Exercise care to avoid scratching bearing bore during removal.



2. With the outside facing upward, support crankcase cover on wooden blocks on deck of arbor press.
3. Place suitable bearing driver on outer race of bearing.
4. Center bearing driver under ram.
5. See Figure 74. Apply pressure to bearing driver until bearing is free. Discard bearing.

74



Cleaning

1. Tape over governor gear to keep out dirt and debris.
2. Using a plastic scraping tool, carefully remove old gasket material from the crankcase and crankcase cover flanges. Gasket material left on sealing surfaces will cause leaks.
3. Remove all carbon deposits from machined surfaces. Exercise caution to avoid removing any metal material. For best results, use an air tool with a **worn** wire brush. Scraping may result in scratches or nicks.
4. To soften stubborn deposits, soak the crankcase and crankcase cover in a suitable chemical solution or other carbon and gum dissolving agent. Repeat steps 2-3 as necessary.
5. Thoroughly clean the crankcase and crankcase cover in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water. Blow dry with low pressure compressed air.

Inspection

1. Inspect governor gear as follows:

NOTE: Governor gear damage requires crankcase replacement.

- A. Inspect governor gear for worn, cracked, chipped, or missing teeth.
- B. Use your index finger to manually rotate the governor gear in both directions. Verify that gear rotates freely without roughness, sticking, or unusual noise.
- C. Spin governor gear to verify that flyweights move freely.

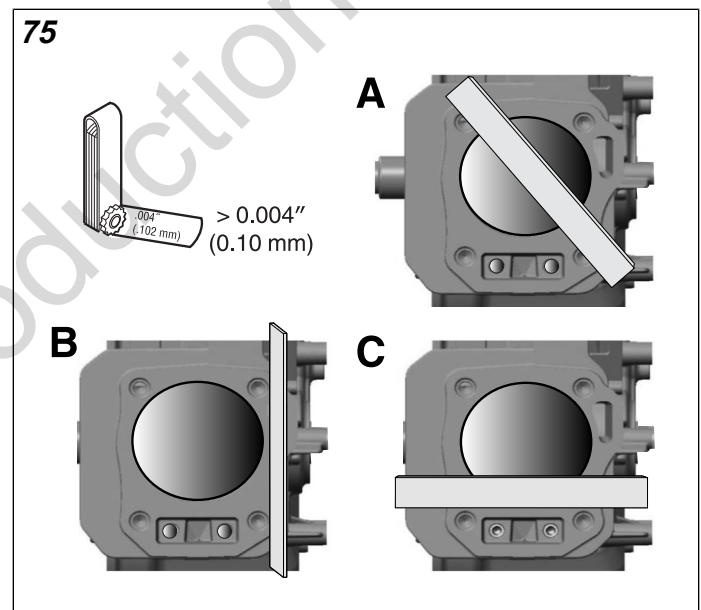
2. Using an inside micrometer, check the crankcase and the crankcase cover camshaft bearing bores for wear. Replace either part if measurement is **0.553 inches** (14.05 mm) or more.
3. Check the crankcase for cracks or broken cooling fins. Check the crankcase cover for cracks. Replace parts as necessary.
4. Check for scratches and nicks on all gasket sealing surfaces. Use a fine-tooth file to carefully remove any nicks or burrs found.
5. Check the crankcase and crankcase cover for stripped threads.

NOTE: Stripped threads can sometimes be repaired using a helicoil, but replace parts if thread damage is severe or present at multiple locations.

6. Inspect the cylinder bore for defects or damage in the ring travel area. Replace crankcase if the cylinder is severely scored, scuffed, scratched, burnt, or gouged.
7. Using Magnaflux Dye Penetrant, inspect the cylinder bore for cracks. If no cracks are found, thoroughly wash cylinder to remove traces of dye.

6

75



8. Check the cylinder to cylinder head mating surface for warpage or distortion. Discard the crankcase if any low spot is **0.004 inches** (0.10 mm) or more. Proceed as follows:
 - A. See A of Figure 75. Set a straightedge diagonally across the length of the cylinder intersecting the upper and lower corners of the gasket surface.
 - B. Slide a feeler gauge beneath the straightedge to check for warpage.
 - C. Check the opposite diagonal to verify that the gasket surface is flat.

- D. See B of Figure 75. Set a straightedge vertically across the length of the cylinder gasket surface. Use feeler gauge to check for warpage. Repeat step on opposite side.
 - E. See C of Figure 75. Set a straightedge horizontally across the length of the cylinder gasket surface. Use feeler gauge to check for warpage. Repeat step on opposite side.
9. Repeat the 6 point check outlined under step 7 to check for warpage or distortion of the crankcase to crankcase cover mating surfaces. Be sure to check both crankcase and crankcase cover. Discard the crankcase or crankcase cover if any low spot is **0.004 inches** (0.10 mm) or more.
10. Obtain the Dial Bore Gauge (Part No. 19487) to check the cylinder bore for out-of-round and taper. Proceed as follows:

NOTE: If the Dial Bore Gauge is not available, use the Telescoping Gauge (Part No. 19485) and Dial Caliper (Part No. 19609).

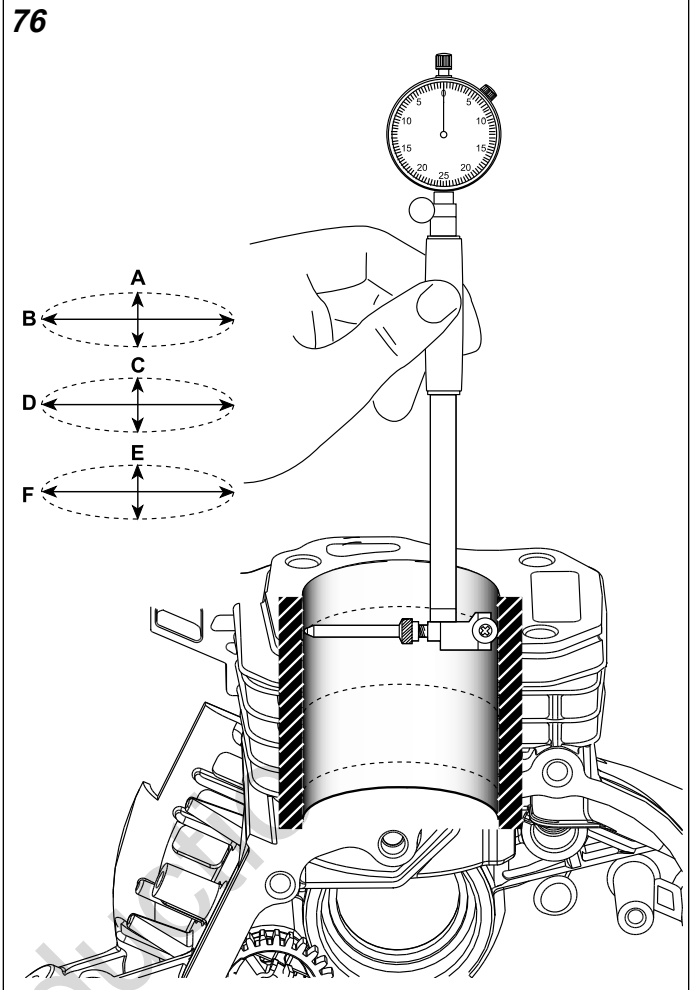
6

- A. See Figure 76. At the top of the piston ring travel zone, measure the cylinder bore diameter at two locations- parallel and perpendicular to the crankshaft (A-B). Write the readings down.
- B. Repeat the two measurements at the center of the piston ring travel zone (C-D).
- C. Repeat the two measurements again at a point below the piston ring travel zone (E-F).
- D. If the two measurements at the top, middle or bottom of the bore vary by more than **0.0015 inches** (0.04 mm), then the cylinder is out-of-round.
- E. If the top, middle and bottom bore diameters, either parallel (A-C-E) or perpendicular (B-D-F) to the crankshaft, vary by more than **0.003 inches** (0.08 mm), then the cylinder is excessively worn (or tapered).
- F. If cylinder is not worn beyond the service limits described under step 10(D) and 10(E), see *DEGLAZE (RECONDITION) CYLINDER BORE*.
- G. If cylinder is worn beyond the service limits described under step 10(D) and 10(E), see *HONE (RESIZE) CYLINDER BORE*.

Deglaze (Recondition) Cylinder Bore

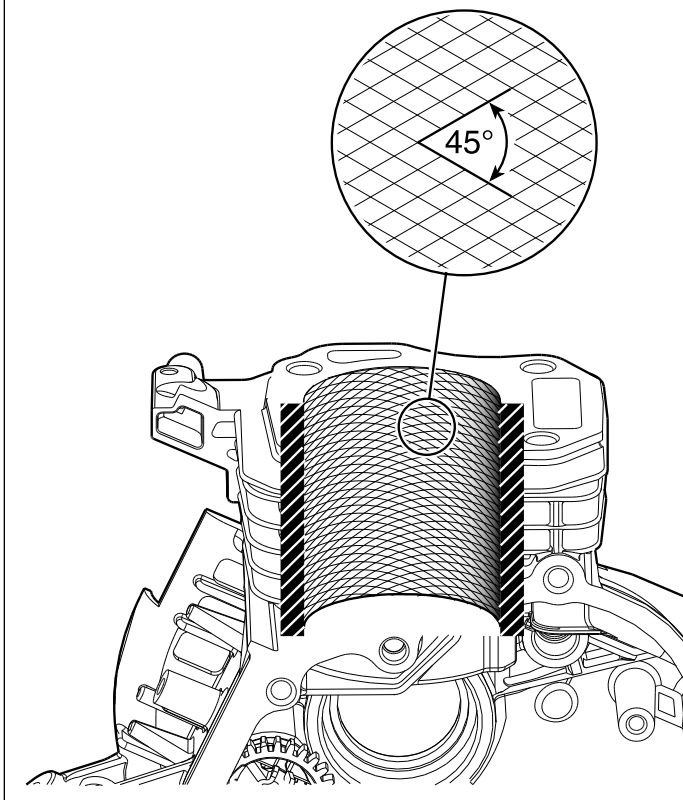
NOTE: While also restoring the proper 45° cross hatch pattern, deglazing removes wear patterns, minor scuff marks and scratches without enlarging the bore diameter.

1. Tape over governor gear to keep out honing grit and other debris.



2. To prevent damage to finishing stones, check the top and bottom of the cylinder bore for burrs. Remove any burrs with a fine-tooth file.
3. Obtain a three blade rigid hone with 320 grit aluminum oxide finishing stones.
4. Place hone drive shaft in chuck of portable, variable speed drill and tighten.
5. Using a suitable honing oil, liberally lubricate cylinder bore and finishing stones.
6. Hone cylinder bore using a drill speed of approximately 200 RPM at 40-60 strokes per minute.
7. See Figure 77. Stop frequently to examine the cylinder bore. A precise 45° cross hatch pattern in the piston travel area is the most important.

NOTE: The angular cross hatch pattern ensures an even flow of oil onto the cylinder walls and promotes longer cylinder, piston and ring life. An improper cross hatch pattern will result in insufficient oil retention and possible piston seizure and/or high oil consumption.



Hone (Resize) Cylinder Bore

NOTE: If lacking the necessary tools, skills, or experience, take crankcase to a qualified machine shop for cylinder boring.

NOTE: Resize the cylinder bore if worn **0.003 inches** (0.08 mm), or is **0.0015 inches** (0.04 mm) out-of-round. Always resize exactly **0.020 inches** (0.51 mm) larger than the standard bore diameter to ensure service oversize piston and rings have the proper clearances.

1. Tape over governor gear to keep out honing grit and other debris.
2. Obtain a three blade rigid hone with 220 grit aluminum oxide stones.
3. To prevent damage to stones, check the top and bottom of the cylinder bore for burrs. Remove any burrs with a fine-tooth file.
4. Securely fasten cylinder to a heavy iron bracket or suitable honing fixture and place on level floor.
5. Place hone drive shaft in chuck of portable, variable speed drill and tighten.
6. Using a suitable honing oil, liberally lubricate cylinder bore and stones.
7. Place hone in middle of cylinder bore.
8. Tighten adjusting knob until stones fit snugly against cylinder wall.
9. Activate drill and move hone up and down lower end of cylinder bore. The cylinder is not worn at the bottom,

so it will help to keep hone straight in the bore. As the bottom of the bore increases in diameter, gradually increase each stroke until hone travels the full length of the bore.

NOTE: Hone cylinder bore with a drill speed of 300 to 700 RPM maximum at 40-60 strokes per minute.

NOTE: Do not extend hone more than **3/4-1 inches** (19.05-25.4 mm) from either end of the bore or stones may be damaged.

10. As cutting tension decreases, stop hone and tighten adjusting knob.
11. Frequently stop to examine the cylinder bore and take measurements.

NOTE: Hone cylinder bore about **0.0005 inches** (0.01 mm) larger than the desired size to allow for contraction as the cylinder cools.

12. Lubricate hone frequently to prevent build up on stones.
13. Stop frequently to examine the cylinder bore and take measurements.
14. When cylinder is resized to within **0.0015 inches** (0.04 mm) of the desired size, use finishing stones to achieve the final size and produce the correct cross hatch pattern. See *Deglaze (Recondition) Cylinder Bore*, steps 3-7.

NOTE: An improper cross hatch pattern or too fine a hone will result in insufficient oil retention and possible piston seizure and/or high oil consumption.

Clean Crankcase and Cylinder Bore

1. Thoroughly wash crankcase and cylinder bore with a non-volatile cleaning solution or solvent.
2. To loosen all abrasive particles and residual grit, thoroughly scrub cylinder bore with a stiff bristle brush using liquid dishwashing soap and hot water.
3. Thoroughly rinse cylinder bore with hot running water.
4. Repeat washing and rinsing until all traces of honing grit are gone. Continue cleaning until a clean cloth shows no evidence of dirt or debris.

NOTE: Honing grit, which appears as a grey residue, is highly abrasive and will cause rapid cylinder, piston and ring wear resulting in premature engine failure.

5. Hot rinse the crankcase and dry with moisture free compressed air.
6. Verify that breather passage, intake and exhaust ports, and governor gear assembly are completely clean and free of dirt and grit.
7. Verify that oil hole between the tappet bores is clean and open.
8. Lightly lubricate cylinder bore with clean engine oil.

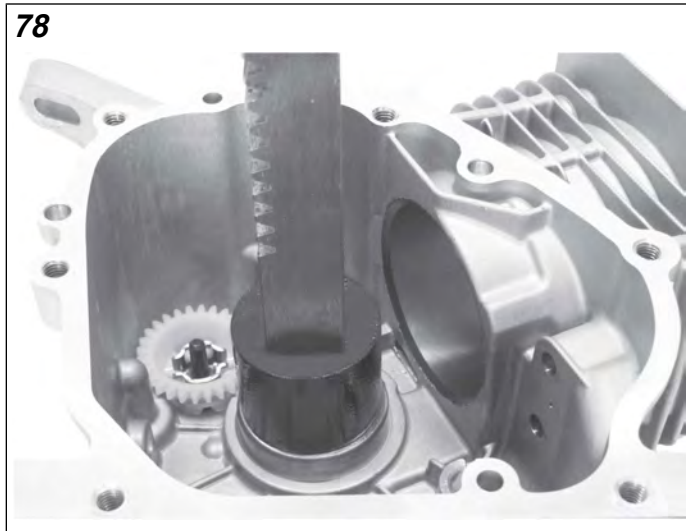
Assembly

Crankcase

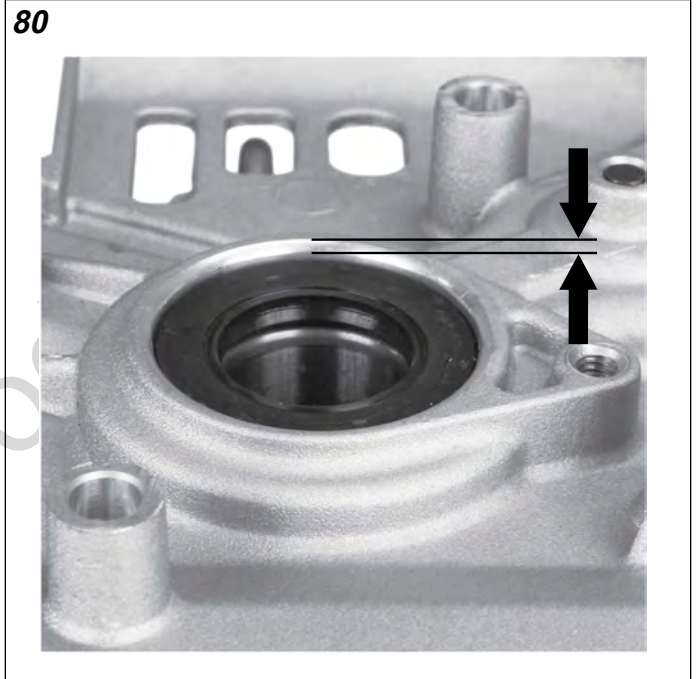
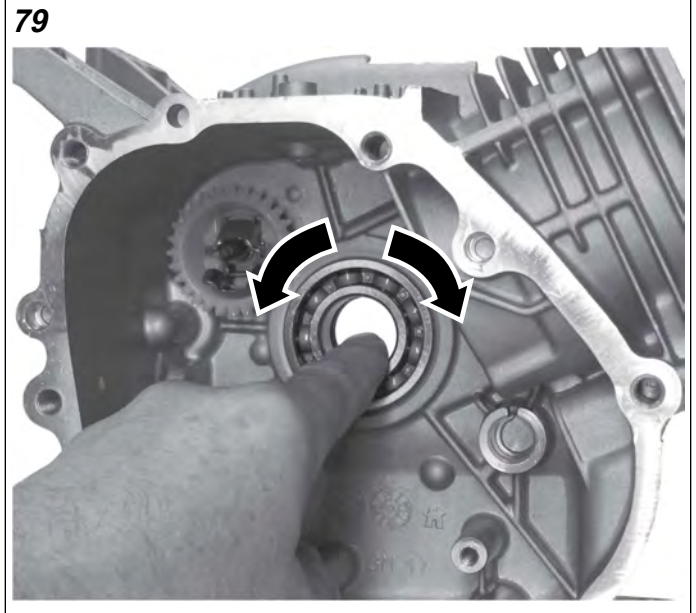
MAG Bearing/Oil Seal

1. Feel bearing bore for smoothness. Use fine steel wool or crocus cloth to remove any burrs or minor imperfections.
2. Apply a thin film of clean engine oil to bearing bore and OD of **new** bearing.
3. With the inside facing upward, support crankcase on wooden blocks on deck of arbor press.
4. With the bearing manufacturer's identification facing the inside of the crankcase, place bearing into bearing bore.
5. Place suitable bearing driver on outer race of bearing.
6. Center bearing driver under ram.
7. Verify that assembly is square, so that bearing is not damaged during installation.
8. See Figure 78. Apply pressure to bearing driver until bearing is fully seated in bore.

6



- NOTE:** Exercise care to avoid any contact with the governor gear. Damage to the governor gear requires crankcase replacement.
9. Inspect the bearing for damage or distortion.
 10. See Figure 79. Use your index finger to manually rotate the bearing in both directions. Verify that bearing rotates freely without roughness, sticking, or unusual noise.
 11. With the outside facing upward, support crankcase on wooden blocks on deck of arbor press.
 12. Apply a thin film of clean engine oil to oil seal bore and OD of **new** oil seal.



13. Verify that oil seal lip garter spring is not broken or missing.
14. Place oil seal into bearing bore.
15. Place suitable oil seal driver on outside edge of oil seal.
16. Center oil seal driver under ram.
17. See Figure 80. Slowly apply pressure to oil seal driver until oil seal is at the depth shown below.

| Models | MAG Bearing Oil Seal Depth |
|------------------------|-------------------------------|
| 130G00, 131G00, 13R200 | 0.049-0.069 in (1.25-1.75 mm) |
| 13U100, 13U200 | 0.059-0.071 in (1.5-1.8 mm) |

Low Oil Sensor (If Equipped)

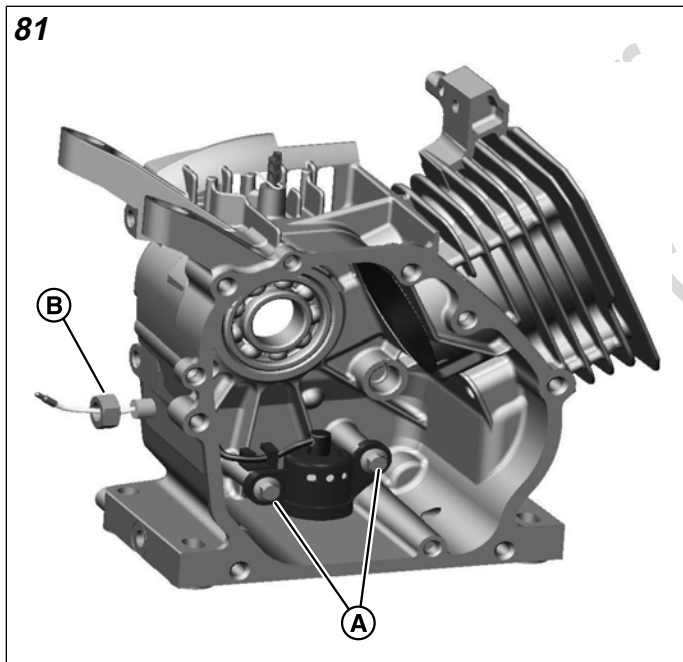
1. Inspect low oil sensor for damage. Verify that float mechanism moves freely without sticking.
2. Inspect rubber washer on oil sensor fitting for cuts, tears, or signs of deterioration. Replace as necessary.
3. Route oil sensor wire and fitting through crankcase hole.
4. See Figure 81. Install two hex flange screws (A) to fasten oil sensor to threaded bosses inside crankcase. Tighten screws as follows.

| Low Oil Sensor Screws | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 50-70 lb-in (5.7-7.9 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

5. From outside crankcase, install hex flange nut (B) on fitting. Tighten nut as follows.

| Low Oil Sensor Nut | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 30-50 lb-in (3.4-5.7 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

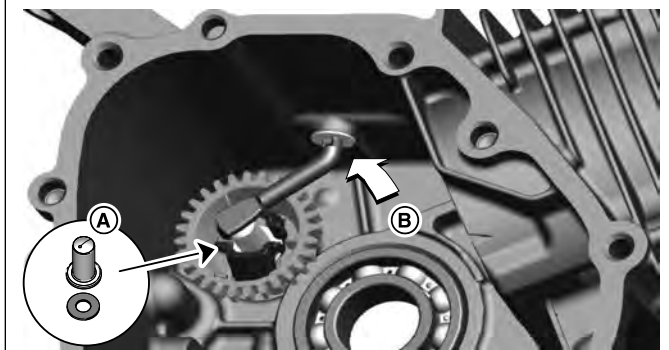
81



Governor Crank

1. Verify cleanliness of governor gear. If cylinder was reconditioned or resized, be sure all honing grit has been removed.
2. Manually rotate governor gear in both directions to verify that it moves freely without roughness or sticking.
3. See Figure 82. Install governor cup with flat washer onto governor gear shaft (A).

82



83



4. From inside crankcase, insert governor crank with flat washer thru hole at top of crankcase (B).
5. See Figure 83. Install spring clip, so that the straight leg engages groove in governor crank (C).
6. Verify that governor crank rotates freely without sticking.

Crankcase Cover

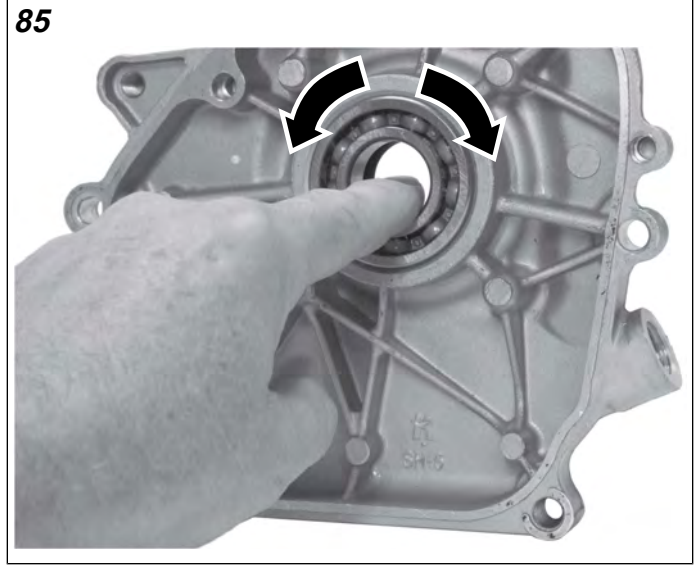
PTO Bearing/Oil Seal

1. Feel bearing bore for smoothness. Use fine steel wool or crocus cloth to remove any burrs or minor imperfections.
2. Apply a thin film of clean engine oil to bearing bore and OD of **new** bearing.
3. With the inside facing upward, support crankcase cover on wooden blocks on deck of arbor press.
4. With the bearing manufacturer's identification facing the inside of the crankcase cover, place bearing into bearing bore.
5. Place suitable bearing driver on outer race of bearing.
6. Center bearing driver under ram.
7. Verify that assembly is square, so that bearing is not damaged during installation.

8. See Figure 84. Apply pressure to bearing driver until bearing is fully seated in bore.
9. Inspect the bearing for damage or distortion.
10. See Figure 85. Use your index finger to manually rotate the bearing in both directions. Verify that bearing rotates freely without roughness, sticking, or unusual noise.
11. With the outside facing upward, support crankcase cover on wooden blocks on deck of arbor press.

NOTE: Do not install oil seal into crankcase cover if engine is equipped with 2:1 or 6:1 gear reduction unit.

12. Apply a thin film of clean engine oil to oil seal bore and OD of **new** oil seal.
13. Verify that oil seal lip garter spring is not broken or missing.
14. Place oil seal into bearing bore.
15. Place suitable oil seal driver on outside edge of oil seal.
16. Center oil seal driver under ram.



17. See Figure 86. Slowly apply pressure to oil seal driver until oil seal is at the depth shown below.

| Models | PTO Bearing Oil Seal Depth |
|------------------------|-----------------------------|
| 130G00, 131G00, 13R200 | 0.157-0.177 in (4.0-4.5 mm) |
| 13U100, 13U200 | 0.118-0.130 in (3.0-3.3 mm) |



6



SECTION 7 – ASSEMBLE ENGINE

| | |
|---------------------------|----|
| BOTTOM END ASSEMBLY | 68 |
| TOP END ASSEMBLY | 73 |

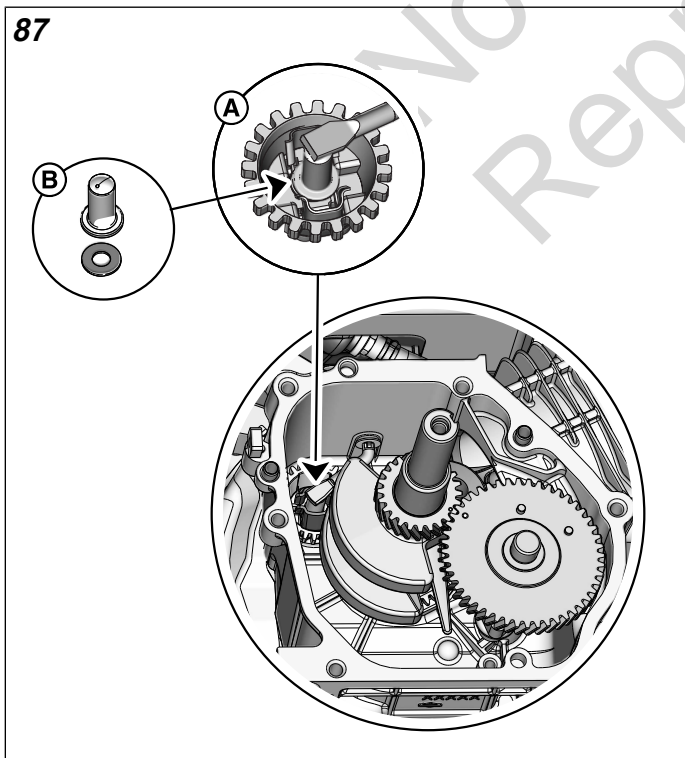
Not for
Reproduction

BOTTOM END ASSEMBLY

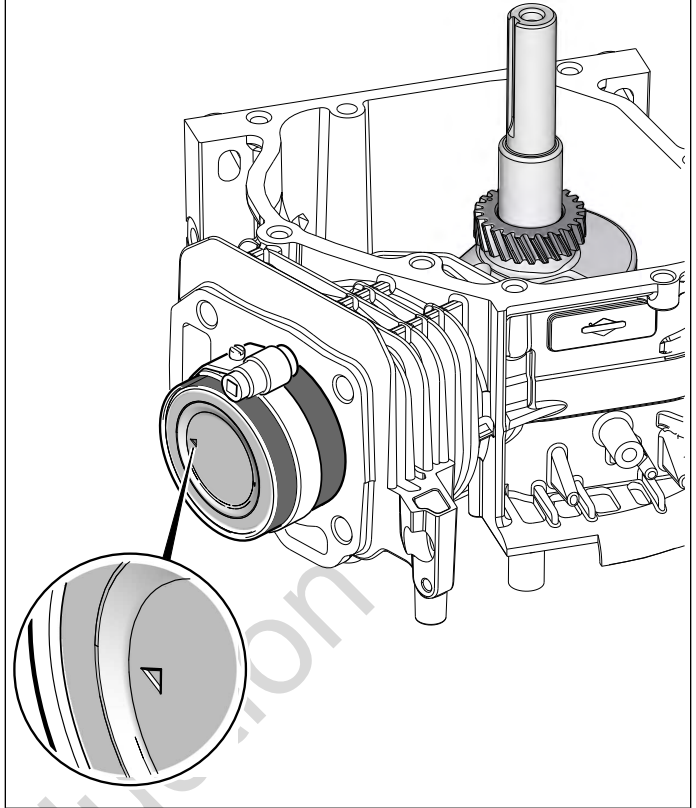
1. Apply a thin film of clean engine oil to MAG bearing oil seal lip.
2. See Figure 87. Rotate governor crank (A), so that paddle is in contact with governor cup and washer (B).
3. Verify end play shims are installed on crankshaft, if used.
4. Thoroughly lubricate crankshaft MAG bearing journal and PTO bearing journal with clean engine oil.
5. Lubricate crank pin with General Lithium Grease.
6. Install oil seal protector sleeve over crankshaft taper.

NOTE: Use black electrical tape if oil seal protector sleeve is not available.

7. Carefully install crankshaft into crankcase positioning MAG bearing journal in MAG bearing.
8. Verify that crankshaft gear meshes with governor gear.
9. Remove oil seal protector sleeve (or black electrical tape) from crankshaft taper.
10. Verify that paddle of governor crank is still in contact with governor cup.
11. Rotate crankshaft until crank pin journal is near the top of its stroke.
12. Verify that piston ring end gaps are properly staggered. See *SECTION 6 - SERVICE ENGINE SUBASSEMBLIES, PISTON AND CONNECTING ROD ASSEMBLY*, step 12.



88



13. Obtain the Piston Ring Compressor (Part No.19070), and proceed as follows:



CAUTION

The edges of the piston ring compressor are sharp. Wear appropriate safety gloves and exercise care to avoid hand injury.

- A. Using tool wrench, unwind sleeve of piston ring compressor. Do not unwind sleeve too far or tool damage will occur.
- B. Apply clean engine oil to piston rings, piston skirt, cylinder bore, and inside wall of Piston Ring Compressor.
- C. See Figure 88. With arrow on piston crown pointing toward the push rod bores, start piston and connecting rod assembly into cylinder bore.
- D. Slide compressor sleeve over piston, and using tool wrench, tighten to compress piston rings into piston ring grooves.
- E. Verify that all piston rings are captured and compressed, but that compressor sleeve is still loose enough to be rotated.

- F. Gently tap on the top edge of the compressor sleeve to be sure the bottom edge is in full contact with cylinder deck.
- G. Apply steady pressure to piston crown to slide piston from compressor sleeve into cylinder bore.

NOTE: Do not hammer piston into cylinder bore or piston rings may be damaged. If piston travel is stopped before it completely enters the cylinder bore, then retract the piston, reset the piston ring compressor sleeve, and try again.

- 14. With connecting rod positioned on crank pin journal, install connecting rod cap, so that oil dipper points in the same direction as arrow on piston crown.

NOTE: Verify that match marks on connecting rod cap and shank are aligned as shown in Figure 89.

89

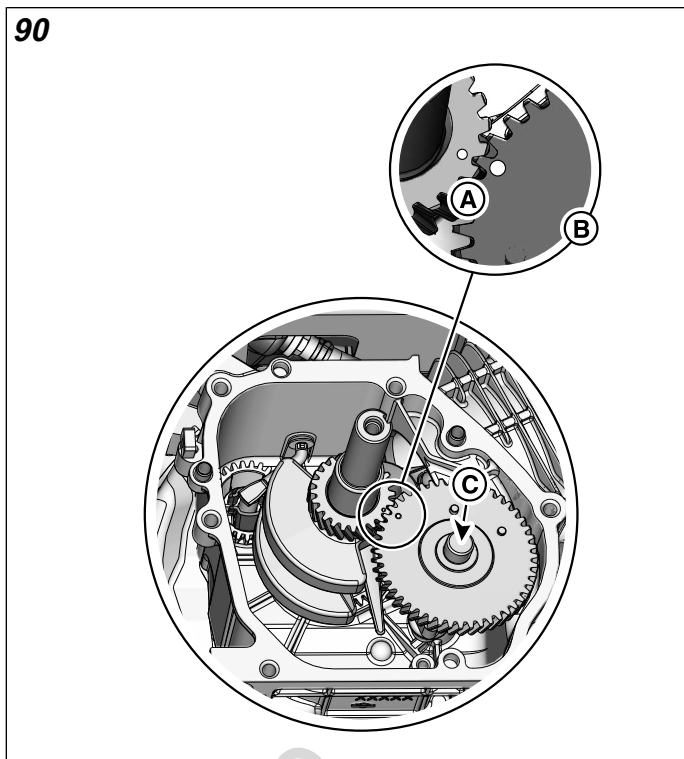


- 15. Start two hex flange screws to fasten connecting rod cap to connecting rod. Starting with the screw closest to the piston (side opposite oil dipper), tighten screws as follows.

| Connecting Rod Cap Screws | |
|---------------------------|-------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 110-140 lb-in (12.4-15.8 N-m) |
| 13U100, 13U200 | 124-142 lb-in (14-16 N-m) |

- 16. Rotate crankshaft two revolutions to be sure crankshaft, connecting rod, and piston move freely without binding.
- 17. Move connecting rod sideways to verify clearance on each side of crankpin journal.
- 18. Check operation of yoke on Mechanical Compression Release (MCR) mechanism on camshaft gear.

90



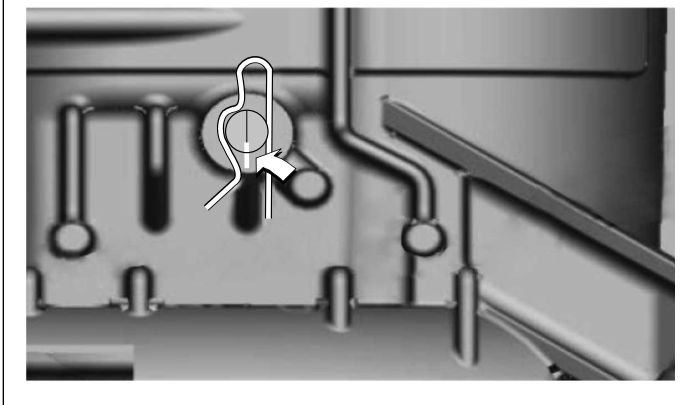
NOTE: Press yoke to the OPEN position, and then verify that it returns to the CLOSED position when released.

- 19. Thoroughly lubricate tappet bores and tappet shafts with clean engine oil.
- 20. Install tappets into tappet bores. Be sure to install each tappet in the same bore from which it was removed.
- 21. Lubricate MAG side camshaft bearing journal, camshaft lobes, and camshaft bearing bore in crankcase with clean engine oil.
- 22. See Figure 90. Verify that valve tappets are clear of camshaft lobes, and install camshaft into bearing bore aligning timing mark on camshaft gear root with timing mark on crankshaft gear tooth (A).
- 23. Lubricate the camshaft and crankshaft gear mesh (B) with clean engine oil.
- 24. Lubricate the PTO side camshaft bearing journal (C), and camshaft bearing bore in crankcase cover with clean engine oil.
- 25. Verify that mating surfaces of crankcase and crankcase cover are clean and dry. Any dust or dirt left on mating surfaces can cause leaks.
- 26. Verify two locating pins are present on crankcase flange. Install **new** locating pins if damaged or missing.
- 27. Install **new** crankcase cover gasket onto locating pins.
- 28. Install oil seal protector sleeve on crankshaft.

NOTE: Use black electrical tape if oil seal protector sleeve is not available.

7

91



29. Apply a thin film of clean engine oil to PTO bearing oil seal lip.
30. Verify that paddle of governor crank is still in contact with governor cup. Since this observation cannot be made after installation of the crankcase cover, hold governor crank as described and paint a line across crankcase boss and governor crank as shown in Figure 91.

NOTE: Keep the paint marks aligned until after installation of the governor lever to ensure that governor cup (and washer) do not drop off the governor shaft.

31. Install crankcase cover onto locating pins.
32. Remove oil seal protector sleeve (or black electrical tape) from crankshaft.
33. Start six hex flange screws to fasten crankcase cover to crankcase. Proceed as follows:

NOTE: Verify cleanliness of crankcase cover screws. Friction caused by dirt will result in a false torque reading.

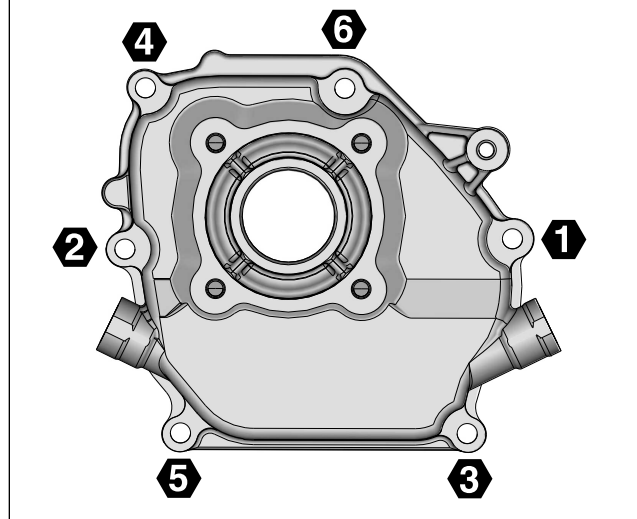
- A. Using the sequence shown in Figure 92, tighten screws as follows.

| First Step | |
|------------------------|-------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 5-7 lb-ft (6.8-9.5 N-m) |
| 13U100, 13U200 | 6-7 lb-ft (8-9 N-m) |

- B. Using the sequence shown, tighten screws as follows.

| Second Step | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 10-14 lb-ft (13.6-19 N-m) |
| 13U100, 13U200 | 12-13 lb-ft (16-17 N-m) |

92



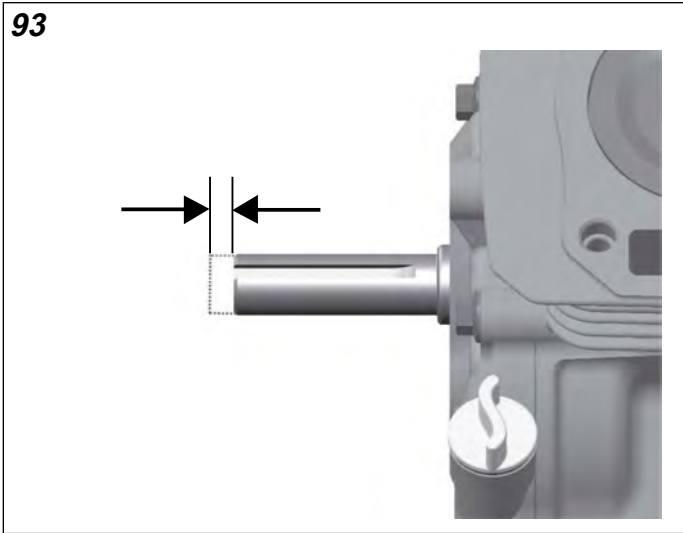
- C. Using the sequence shown, final tighten screws as follows.

| Third Step | |
|------------------------|-----------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 16-21 lb-ft (21.5-28.3 N-m) |
| 13U100, 13U200 | 18-19 lb-ft (24-26 N-m) |

NOTE: Failure to step-torque screws in the proper sequence may result in gasket leaks or cause the crankcase cover to warp.

34. Rotate crankshaft to check for binding.
35. See Figure 93. Check crankshaft end play as follows:
 - A. Mount base of dial indicator to crankcase or crankcase cover.
 - B. Set the indicator contact point on the end of the crankshaft.
 - C. Firmly push opposite end of crankshaft as far as it will go while rotating it back and forth.
 - D. While still pushing on crankshaft, zero dial indicator gauge.
 - E. Firmly pull crankshaft as far as it will go while rotating it back and forth.
 - F. While still pulling on crankshaft, note the reading of the dial indicator gauge.
 - G. Verify that end play is **0.003-0.030 inches** (0.09-0.75 mm), or **0.002-0.009 inches** (0.05-0.23 mm) if engine is used in a pump application.
 - H. Repeat the procedure to verify the reading.
 - I. If end play is not within specification, replace the crankcase cover. If engine is used in a pump application, remove crankcase cover and add or remove shims as necessary.

93



36. Install dipstick oil plugs into crankcase cover and tighten as follows.

| Dipstick Oil Plugs | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 10-30 lb-in (1.1-3.4 N-m) |
| 13U100, 13U200 | 18-27 lb-in (2-3 N-m) |

37. If equipped, lubricate O-rings with clean engine oil and install high oil fill tube into crankcase cover. Install hex flange screw to fasten flange to crankcase cover and tighten to **20-40 lb-in** (2.3-4.5 N-m).
38. If **not** equipped with stator, move to step 39. If stator equipped, proceed as follows:

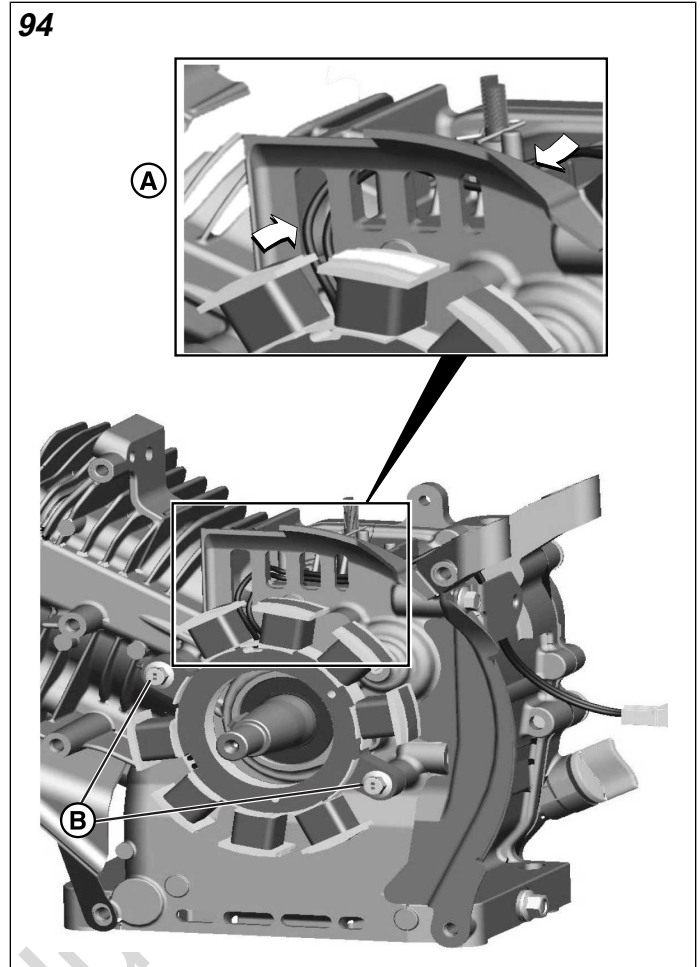
- A. See Figure 94. Orient stator, so that wires are at the top and facing the crankcase. Route wires through opening (A) in crankcase.
- B. Start two hex flange screws (B) to fasten stator to crankcase. Alternately tighten screws as follows.

| Stator Screws | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

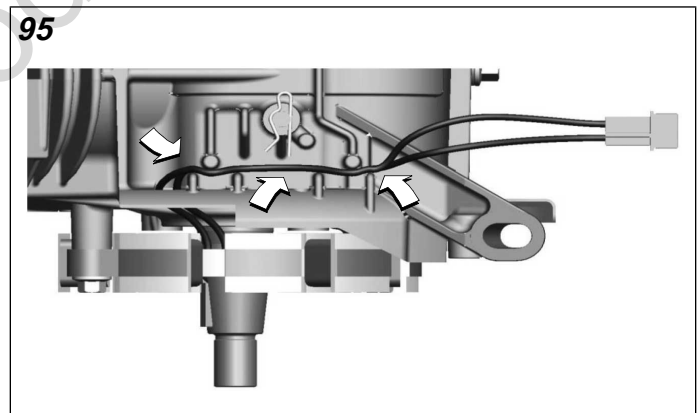
- C. See Figure 95. Tightly pull stator wires through opening in crankcase, and then keeping wires tight, route between ribs at top of crankcase. Push down on wires, so that they are snugly seated against casting.

NOTE: Through contact with the governor lever, link, or springs, loose wires can interfere with governor operation.

94



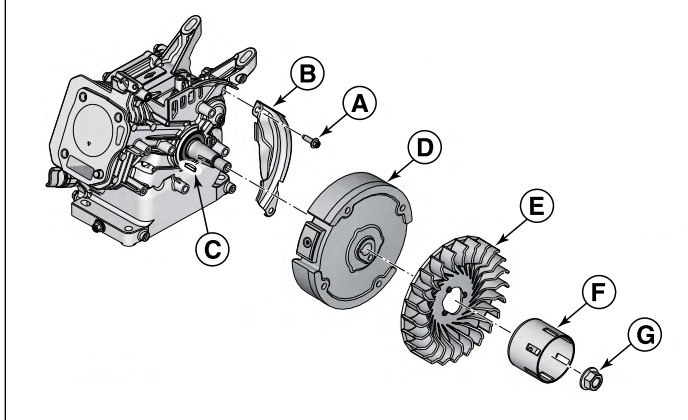
95



39. See Figure 96. Install top hex flange screw (A) to fasten flywheel guard (B) to crankcase. Tighten screw as follows.

| Flywheel Guard Screws | |
|------------------------|-----------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 60-110 lb-in (6.8-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

96



NOTE: A second hex flange screw to engine base also captures blower housing, so do not install at this time.

40. Verify that flywheel and crankshaft tapers are free of grease, oil, dust, and dirt. Verify that keyways are clean and completely free of dirt and grit.



CAUTION

The edges of the crankshaft keyway are sharp. Wear appropriate safety gloves and exercise care to avoid hand injury.

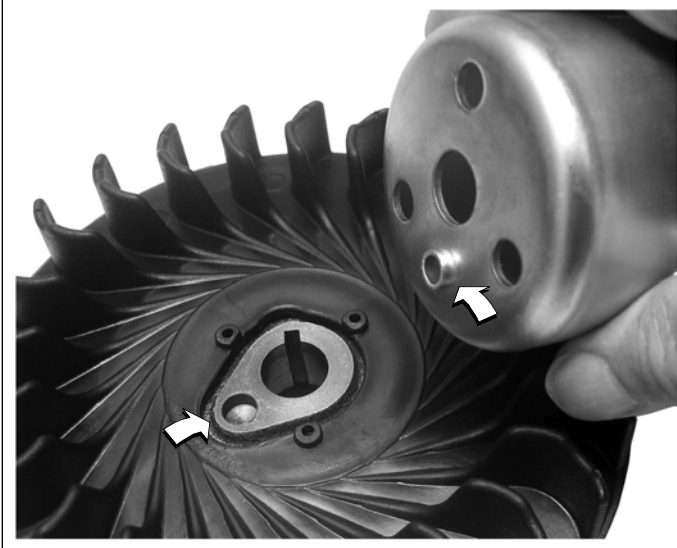
7

41. Install key (C) into keyway on crankshaft taper.
42. Install flywheel (D) engaging keyway with installed key on crankshaft taper. Verify that flywheel fits tightly without wobbling.
43. Install flywheel fan (E) onto flywheel. Rotate flywheel fan slightly to ensure that four pegs fully engage blind holes in flywheel. See Figure 97.

97



98



44. Install starter cup (F). Be sure that extrusion on starter cup engages blind hole in flywheel, while three holes engage pegs on flywheel fan. See Figure 98.
45. Install flywheel nut (G). Hand tighten flywheel nut, so that flywheel, flywheel fan, and starter cup remain fully engaged.
46. See Figure 99. Obtain Strap Wrench (Part No. 19433), torque wrench, and 21 mm socket. Proceed as follows:
 - A. Fit loop of strap around flywheel and tighten until snug.
 - B. Pinch strap between heel of wrench and flywheel.
 - C. Holding tool down by the handle, tighten flywheel nut as follows.

| Flywheel Nut | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 53-71 lb-ft (72.3-96 N-m) |
| 13U100, 13U200 | 54-59 lb-ft (73-80 N-m) |

- D. Remove strap wrench from flywheel.

99



47. See *TOP END ASSEMBLY* in this section.

TOP END ASSEMBLY

1. Verify that mating surfaces of cylinder and cylinder head are clean and dry. Any dust or dirt left on mating surfaces can cause leaks.
2. Verify that two locating pins are present on downside of cylinder deck. Install **new** locating pins if damaged or missing.
3. Install **new** cylinder head gasket onto locating pins.
4. Install cylinder head onto locating pins.
5. Start four cylinder head screws and hand tighten until snug.

NOTE: Verify cleanliness of cylinder head screws. Friction caused by dirt will result in a false torque reading.

6. Tighten cylinder head screws as follows:
 - A. Using the sequence shown in Figure 100, tighten screws as follows.

| First Step | |
|------------------------|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 5-7 lb-ft (6.8-9.5 N-m) |
| 13U100, 13U200 | 6-7 lb-ft (9-10 N-m) |

- B. Using the sequence shown, tighten screws as follows.

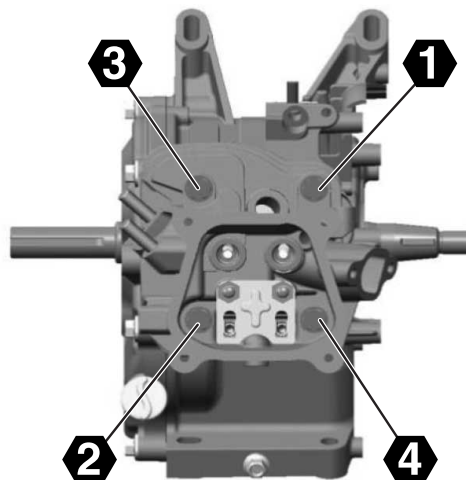
| Second Step | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 10-14 lb-ft (13.6-19 N-m) |
| 13U100, 13U200 | 14-15 lb-ft (19-20 N-m) |

- C. Using the sequence shown, final tighten screws as follows.

| Third Step | |
|------------------------|------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 15-20 lb-ft (20.3-27.1 N-m) |
| 13U100, 13U200 | 21-22 lb-ft (28-30 N-m) |

NOTE: Failure to step-torque screws in the proper sequence may result in gasket leaks or cause the cylinder head to warp.

100



7. Install push rod guide plate and rocker arm studs in cylinder head. Verify that tangs on push rod guide plate are facing down as shown in Figure 101. Tighten rocker arm studs as follows.

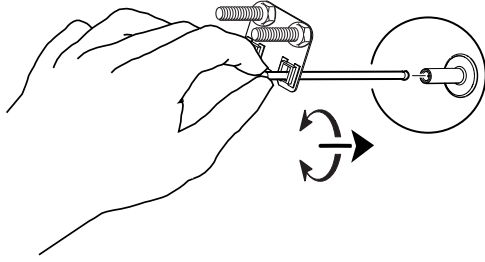
| Rocker Arm Studs | |
|------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 110-140 lb-in (12.4-15.8 N-m) |
| 13U100, 13U200 | 177-266 lb-in (20-30 N-m) |

101



7

102



8. See Figure 102. Insert push rods through guide plate to engage valve tappets. Rotate push rods to be sure that ball ends are seated in valve tappet sockets.
9. Install rocker arms, rocker balls, and locknuts onto rocker arm studs.
10. Tighten rocker ball nuts to obtain zero clearance between rocker arms and valve stem tips.
11. Slowly rotate crankshaft to verify proper movement of push rods and rocker arms.
12. Adjust valve clearance. See *SECTION 2 - MAINTENANCE, CHECK/ADJUST VALVE CLEARANCE*, steps 5-8.
13. Verify that mating surfaces of cylinder head and valve cover are clean and dry. Any dust or dirt left on mating surfaces can cause leaks.
14. See Figure 103. Install **new** valve cover gasket into valve cover.

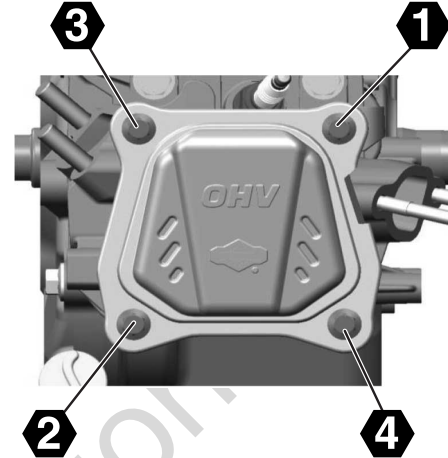
103



15. Start four hex flange screws to fasten valve cover to cylinder head. Using the sequence shown in Figure 104, alternately tighten screws as follows.

| Valve Cover Screws | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 70-90 lb-in (7.9-10.2 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

104



16. Install spark plug into cylinder head and finger tighten until snug. Using the 5/8 inch Spark Plug Wrench (Part No. 19576S), tighten spark plug as follows.

| Spark Plug | |
|------------------------|--------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 140-200 lb-in (15.8-22.6 N-m) |
| 13U100, 13U200 | 230-319 lb-in (26-36 N-m) |

NOTE: Do not install spark plug wire onto spark plug terminal at this time.

17. Install two hex flange screws to fasten cylinder heat shield to crankcase and cylinder head. Tighten screws as follows.

| Cylinder Heat Shield Screws | |
|-----------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 40-60 lb-in (4.5-6.8 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

NOTE: A third hex flange screw to engine base also captures blower housing, so do not install at this time.

18. See *SECTION 8 - INSTALL EXTERNAL ASSEMBLIES*.

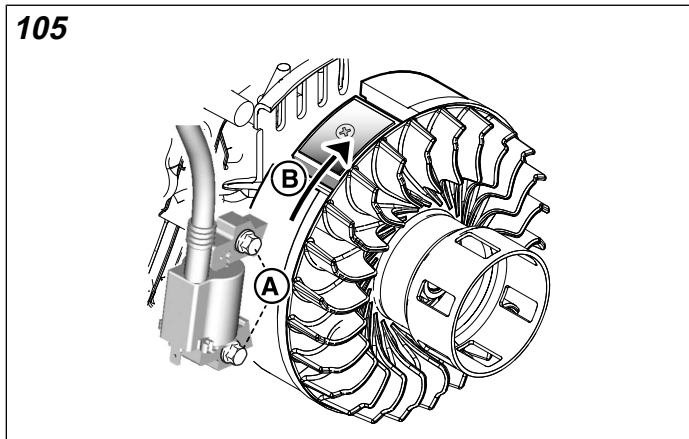
SECTION 8 – INSTALL EXTERNAL ASSEMBLIES

| | |
|---|----|
| INSTALL EXTERNAL ASSEMBLIES | 76 |
| Armature | 76 |
| Low Oil Sensor Module (If Equipped) | 77 |
| Blower Housing | 77 |
| Rewind Starter | 78 |
| Replace Rewind Starter Rope | 78 |
| Carburetor | 79 |
| Overhaul Carburetor | 79 |
| Governor Bracket/Lever | 81 |
| Muffler | 82 |
| Fuel Tank | 85 |
| Starter Motor (If Equipped) | 86 |
| Air Cleaner | 87 |
| Dual Element Oval Air Filter | 87 |
| Oil Bath Air Filter | 87 |
| Foam Low Mount Air Filter | 88 |
| Foam Large Panel Air Filter | 88 |
| Paper Air Filter | 89 |
| Gear Reduction Unit (If Equipped) | 90 |
| 6:1 Gear Reduction Unit | 90 |
| 2:1 Gear Reduction Unit | 91 |
| Final Instructions | 92 |
| Adjust Idle Speed | 92 |
| Adjust Top No-Load Speed | 92 |
| Adjust Remote Choke Control (Carburetor Mounted) | 93 |
| Adjust Remote Throttle Control (Governor Bracket Mounted) | 93 |
| Non-Adjustable Remote Throttle Control (Carburetor Mounted) | 93 |

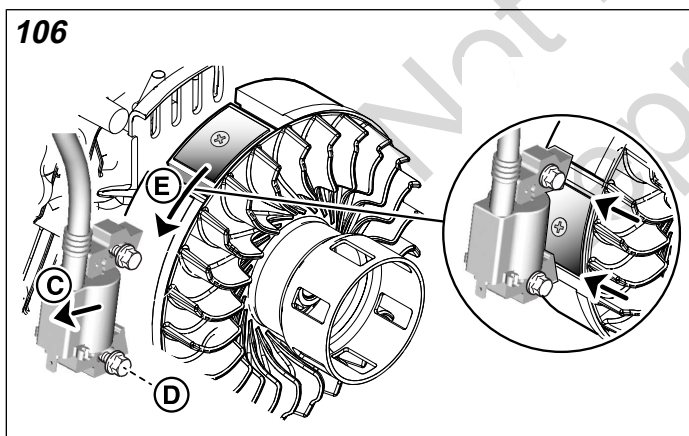
INSTALL EXTERNAL ASSEMBLIES

Armature

1. See Figure 105. Loosely install two hex flange screws (A) to fasten armature to crankcase.
2. Rotate flywheel to move magnet away from armature legs (B).



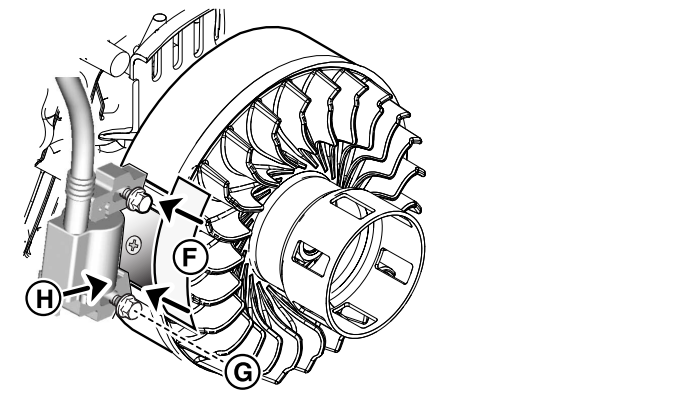
3. See Figure 106. Slide armature (C) away from flywheel.
4. Tighten bottom hex flange screw (D) until snug.
5. Rotate flywheel, so that magnet is aligned with armature legs (E).



6. See Figure 107. Insert feeler gauge (F) or Armature Air Gap Gauge (Part No. CE5121) between flywheel and armature legs. Loosen bottom hex flange screw (G) and push armature legs (H) tight against gauge to set air gap as follows.

| Models | Armature Air Gap |
|------------------------|-------------------------------|
| 130G00, 131G00, 13R200 | 0.010-0.014 in (0.25-0.35 mm) |
| 13U100, 13U200 | 0.008-0.016 in (0.20-0.40 mm) |

107

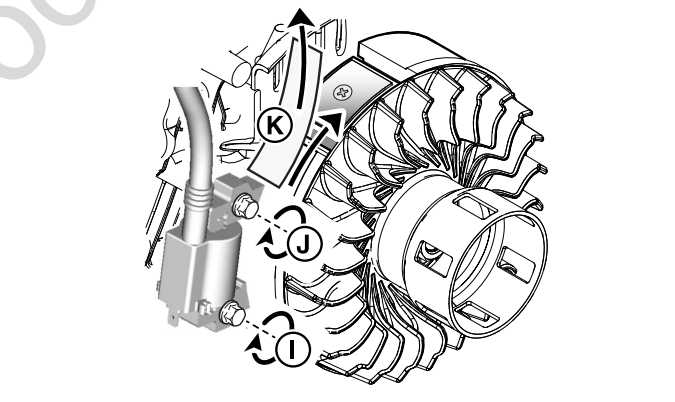


7. See Figure 108. Tighten bottom hex flange screw (I) and then top hex flange screw (J) as follows.

| Armature Screws | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

8. Rotate flywheel to remove gauge (K).

108



9. See Figure 109. Route remote magneto stop terminal wire between ribs at top of crankcase. First pull wire tight and then push down firmly, so that it is snugly seated against casting. Capture wire in clip on flywheel guard.

NOTE: Through contact with governor lever, link, or springs, loose wires can interfere with governor operation.

Low Oil Sensor Module (If Equipped)

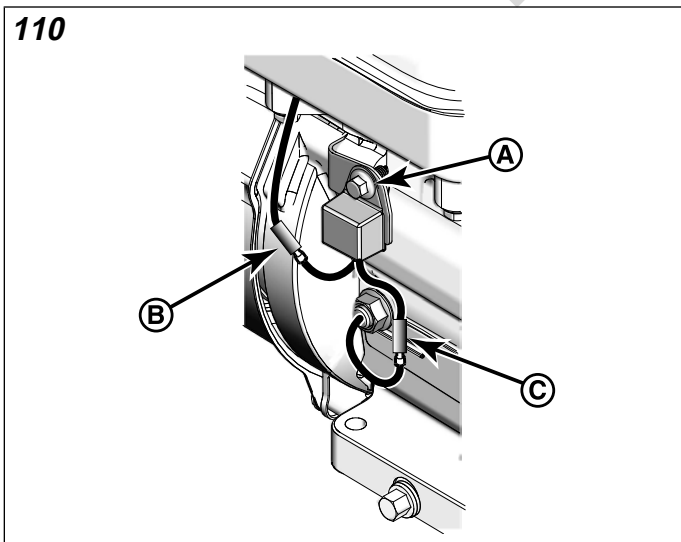
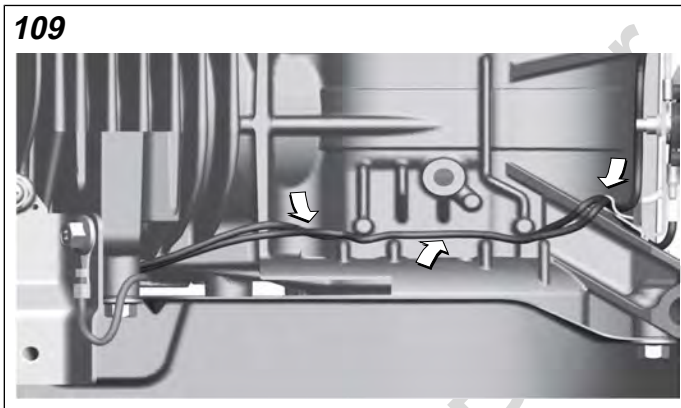
1. See Figure 109. Route wire from either armature or rocker stop switch between ribs at top of crankcase. First pull wire tight and then push down firmly, so that it is snugly seated against casting. Capture wire in clip on flywheel guard.

NOTE: Through contact with governor lever, link, or springs, loose wires can interfere with governor operation.

2. See Figure 110. Install hex flange screw (A) to fasten oil sensor module bracket to flywheel guard. Tighten screw as follows.

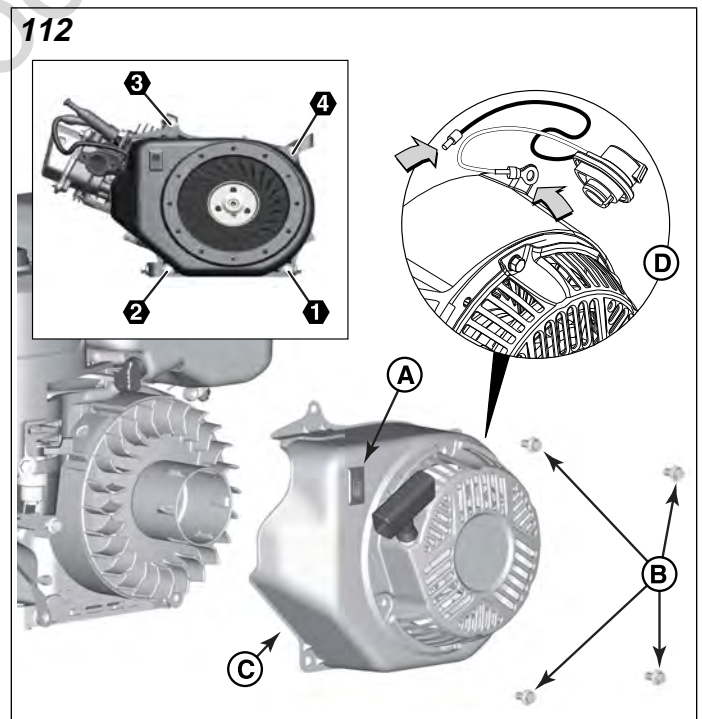
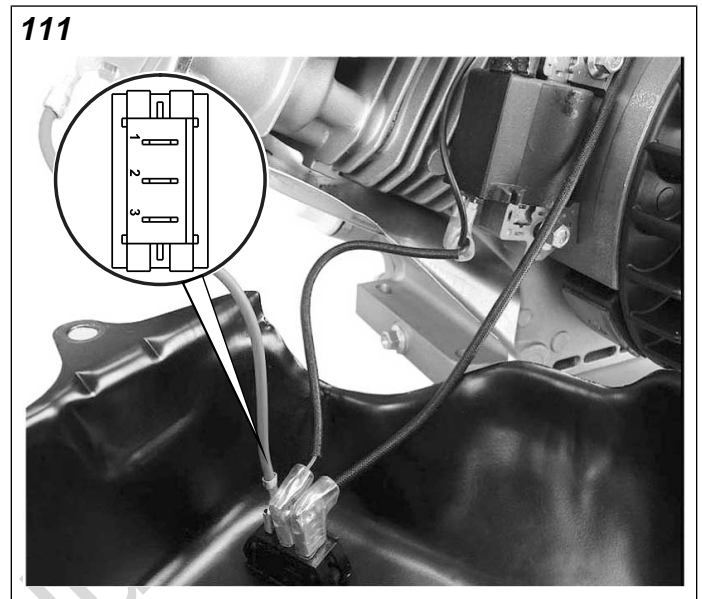
| Low Oil Sensor Module Screw | |
|-----------------------------|-------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 30-80 lb-in (3.4-9 N-m) |
| 13U100, 13U200 | 35-71 lb-in (4-8 N-m) |

3. Connect one-place wire connector (B) between oil sensor module and either armature or rocker stop switch.
4. Connect one-place wire connector (C) between oil sensor module and oil sensor.



Blower Housing

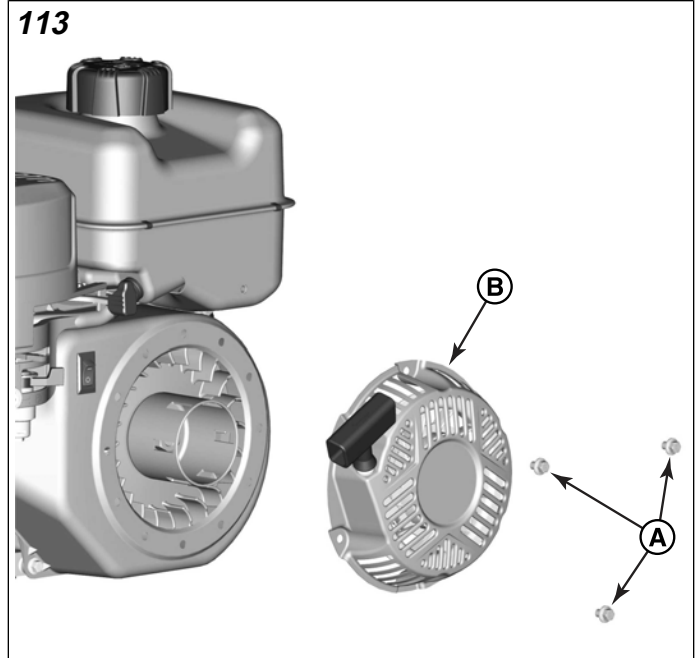
1. See Figure 112. If equipped with rocker stop switch (A), connect wires to spade terminals as follows:
 - A. See Figure 111. If equipped, connect socket of low oil sensor module wire to terminal 3.
 - B. Connect socket of armature/remote magneto stop terminal wire to terminal 2.
 - C. Connect socket of red wire ring terminal (stop switch ground) to terminal 1.



2. See Figure 112. Start four hex flange screws (B) to fasten blower housing (C) to crankcase. Exercise care to avoid pinching armature, stop switch or stator wires.
3. If equipped with rotary stop switch (D), capture ground wire ring terminal on inside of blower housing when installing top screw on crankcase side, and connect one-place wire connector between stop switch and armature.
4. Using the sequence shown in inset of Figure 112, tighten screws as follows. Verify that bottom of blower housing is above or flush with bottom of engine base.

| Blower Housing Screws | |
|------------------------|-----------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 60-110 lb-in (6.8-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

NOTE: Bottom screw on cylinder head side also captures cylinder heat shield. Bottom screw on crankcase side also captures flywheel guard.



Rewind Starter

1. Inspect rewind starter as follows:
 - A. Pull rope to verify that pulley moves freely in both directions.
 - B. Verify that tension increases when rope is pulled and decreases when rope is released.

NOTE: If rope is broken, verify that tension increases when pulley is rotated by hand in a counter-clockwise direction.

 - C. Verify that the rope eyelet in the rewind starter housing is in good condition (without burrs or excessive wear).
 - D. Inspect rope for cuts, breaks, or fraying. If rope replacement is necessary, see *Replace Rewind Starter Rope*.

2. Orient rewind starter as noted before removal.

NOTE: Rewind starter may be installed in the 2 o'clock, 8 o'clock, 10 o'clock, or 12 o'clock positions.

3. See Figure 113. Loosely install three hex flange screws (A) to fasten rewind starter (B) to blower housing.

NOTE: To ensure that pawls evenly engage flywheel starter cup, pull starter rope, tighten hex flange screws until snug, and then release starter rope.

4. Alternately tighten three hex flange screws as follows.

| Rewind Starter Screws | |
|------------------------|-------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 25-35 lb-in (2.8-4 N-m) |
| 13U100, 13U200 | 71-89 lb-in (8-10 N-m) |

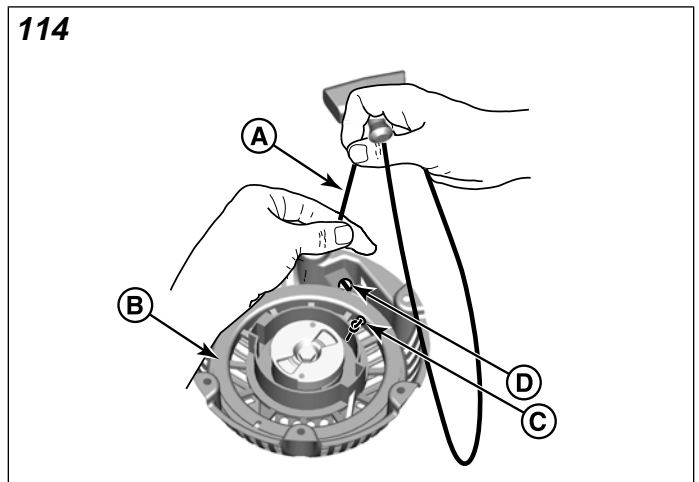
Replace Rewind Starter Rope

NOTE: Consult the *Illustrated Parts List* for the required length and diameter of rope.

1. See Figure 114. Firmly hold rewind starter assembly and pull out rope (A) until pulley (B) stops rotating.

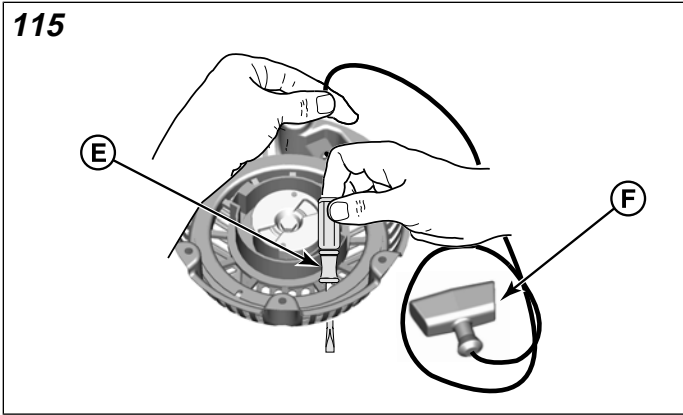
NOTE: Spring tension in pulley increases as rope is pulled out. If the rope is broken, turn pulley in a counter-clockwise direction until spring is tightly wound.

2. Rotate pulley in a CW direction to align pulley hole (C) and rope eyelet (D) in housing.



3. See Figure 115. Secure pulley with a screwdriver (E) to prevent further rotation.
4. Cut rope and remove one piece from pulley and the other from handle (F).

115

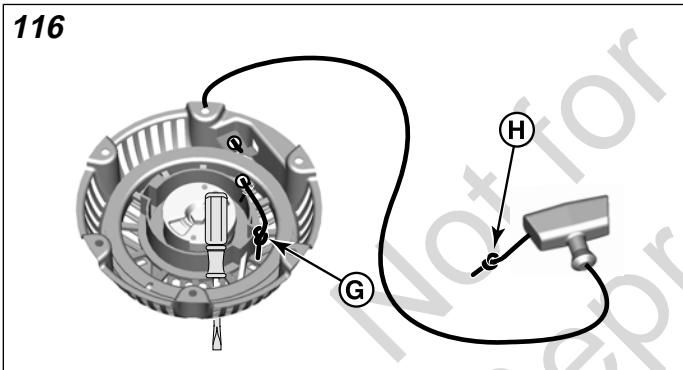


5. Insert end of **new** rope through pulley hole and rope eyelet in housing.

NOTE: For ease of installation and also to prevent fraying, either melt the rope ends or use a suitable rope whipping compound.

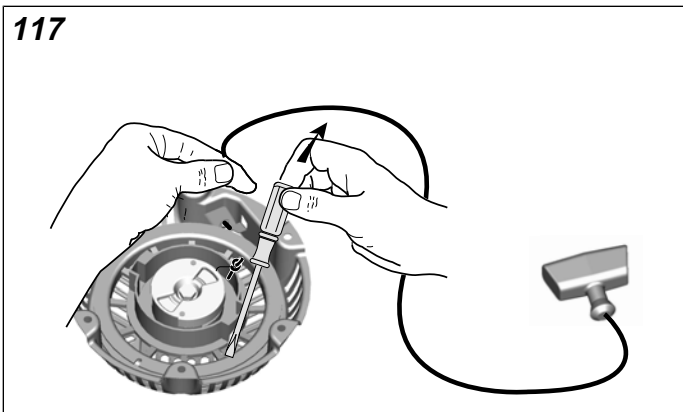
6. See Figure 116. Tie a knot at end of rope on pulley hole side (G). Fit knot into pulley recess.
7. Insert opposite end of rope into handle and tie a knot (H). Fit knot into opening of handle.

116



8. See Figure 117. Remove screwdriver while firmly holding onto rope. Allow pulley to slowly rewind rope.

117

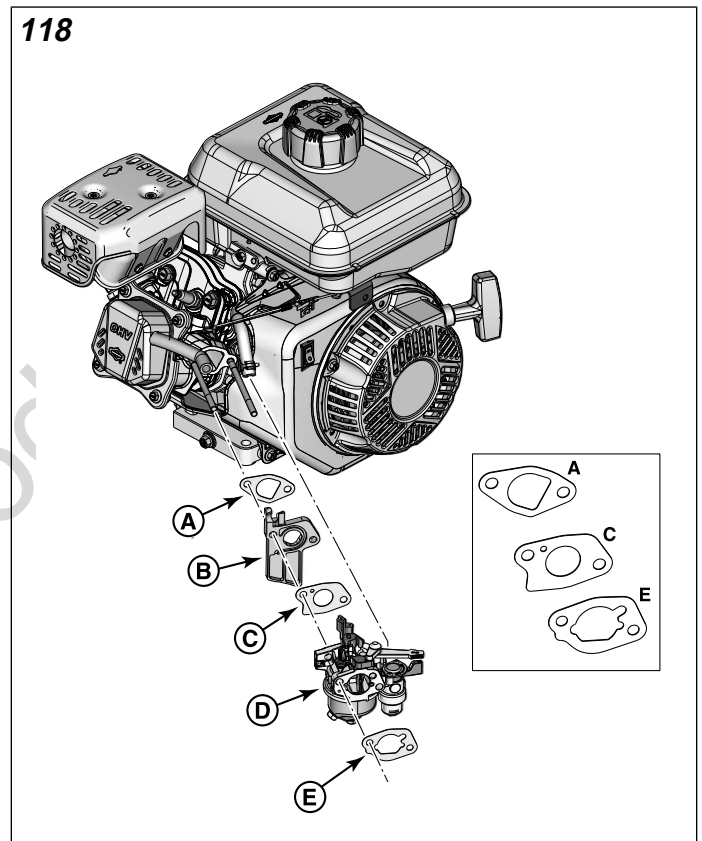


Carburetor

NOTE: See *Overhaul Carburetor* for disassembly, cleaning, inspection, and assembly instructions.

1. See Figure 118. Install carburetor adapter gasket (A), carburetor adapter (B), and second carburetor adapter gasket (C) onto carburetor mounting studs. Always use **new** carburetor adapter gaskets.
2. Capture spark plug wire in slot of carburetor adapter.
3. Install carburetor (D) and **new** carburetor gasket (E) onto carburetor mounting studs.
4. If removed, install hose with clamp onto carburetor fuel inlet fitting.
5. Squeeze tangs and move hose clamp about **1/8 inch** (3 mm) from end of hose with tangs pointing upward for best access.

118



8

Overhaul Carburetor

Disassembly

NOTE: Consult the *Illustrated Parts List* to obtain the correct carburetor overhaul kit.



Gasoline is extremely flammable and highly explosive. Inadequate safety precautions can result in death or

serious injury. Always observe the following precautions when working with fuel system components:

- Wear proper eye protection.
 - Be sure there is no open flame or potential ignition sources in the area.
 - Keep a dry chemical fire extinguisher on hand in case of emergencies.
 - When removing fuel hose, drain plug, float bowl, sediment bowl, etc., cover with a shop towel to catch any residual fuel leakage.
 - Thoroughly wipe up any spilt fuel immediately.
 - Collect any fuel and/or shop towels in approved containers and dispose of properly.
1. Squeeze tangs and move hose clamp away from fuel inlet fitting. Remove hose from fitting. For best results, use Fuel Hose Remover (Part No. 19620).
 2. See Figure 119. Remove drain plug (A) with flat washer (B) from float bowl and drain any residual gasoline into an approved container.
 3. Remove hex screw (C) with flat washer (D) to release float bowl (E) from carburetor body.
 4. Remove rubber seal (F) from groove in carburetor body.

5. Remove hinge pin (G) from pedestals to release float (H) from carburetor body.
6. Remove needle valve (I) and spring (J) from slot on float hinge.
7. Using a small flat blade screwdriver, remove main jet (K) from passage in carburetor body.
8. Turn carburetor right side up to drop out emulsion tube (L) from same passage.
9. Remove sediment bowl (M) and O-ring (N) from carburetor body.
10. Remove choke shaft (O).

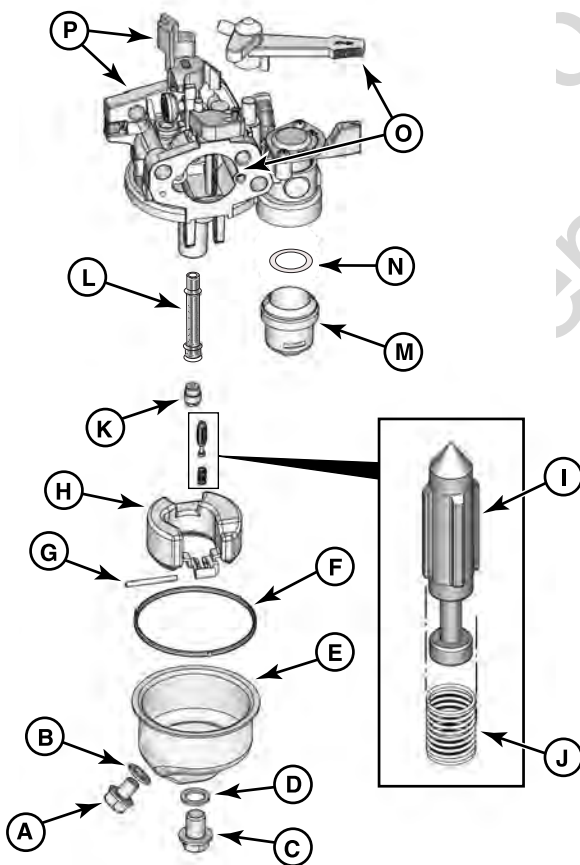
Cleaning and Inspection

1. Obtain Carburetor Cleaner (Part No.'s 100041 or 100042).

NOTE: Remove and set aside all rubber parts or those that have rubber components, such as the needle valve, O-rings, and fuel hose, as these can be damaged by the carburetor cleaner.

2. Inspect carburetor body and float bowl for sediment, gum or varnish deposits. Spray parts and then wipe away cleaning solution with a clean cloth. Repeat step until clean cloth shows no evidence of dirt or debris.
 3. Inspect carburetor body and float bowl for cracks or other damage. Replace carburetor if either condition is observed.
 4. Locate each fuel and air passageway in the carburetor body. Look for the brass or bronze beads in the casting, which point out where the cross drillings of the passageways are located.
 5. Spray carburetor cleaner into the entrance of each passageway and look for the solution to exit from one or more passageways.
 6. Use carburetor cleaner and compressed air to ensure that each passageway is clean and open.
- NOTE:** Avoid use of wires or pointed tools as they can scratch or damage surfaces, enlarge holes, and push grit and dirt deeper into carburetor.
7. Look through the main jet while holding it up to the light. The hole should appear round and unobstructed. Thoroughly clean with carburetor cleaner and compressed air.
 8. Hold emulsion tube up to the light to verify cleanliness. Verify that all orifices at sides of emulsion tube are clean and open.
 9. Check emulsion tube/main jet passageway for discoloration, dirt, and debris. Clean passageway with a soft bristle gun cleaning brush.
 10. Use compressed air to clean atmospheric vent holes and air/fuel jets embedded in the carburetor body.

119



11. Inspect the needle valve, spring, and seat. Check tip of needle valve for wear or grooves. Check spring for damage or distortion. Replace parts as necessary.
12. Inspect float for distortion, dents, cracks, or holes. Submerge float in a glass of water to verify that it is water tight. Replace float if damaged or if it cannot be adequately cleaned.
13. Spray choke shaft and valve (O) and then wipe using a clean cloth. Inspect for damage or wear.
14. Spray throttle shaft and valve (P) and then wipe using a clean cloth. Inspect for damage or wear.
15. Thoroughly dry all parts with compressed air.

Assembly

1. Install O-ring (N) and sediment bowl (M) onto carburetor body. Tighten sediment bowl to **49-80 lb-in** (5.5-9 N-m).
2. Install emulsion tube (L) into main jet passage in carburetor body.
3. Install main jet (K). Tighten securely using a small flat blade screwdriver, but do not over-tighten.
4. Install needle valve (I) and spring (J) into slot on float hinge.
5. Place float (H) onto carburetor body and install hinge pin (G) into pedestals. Verify that float is level.

NOTE: Avoid turning carburetor sideways as the hinge pin may slide out of pedestal holes.

6. Install rubber seal (F) into groove in carburetor body.
7. Install hex screw (C) with flat washer (D) to fasten float bowl to carburetor body. Tighten screw to **49-80 lb-in** (5.5-9 N-m).
8. Install drain plug (A) with flat washer (B) into float bowl. Tighten drain plug to **49-80 lb-in** (5.5-9 N-m).
9. Install choke shaft (O).

Governor Bracket/Lever

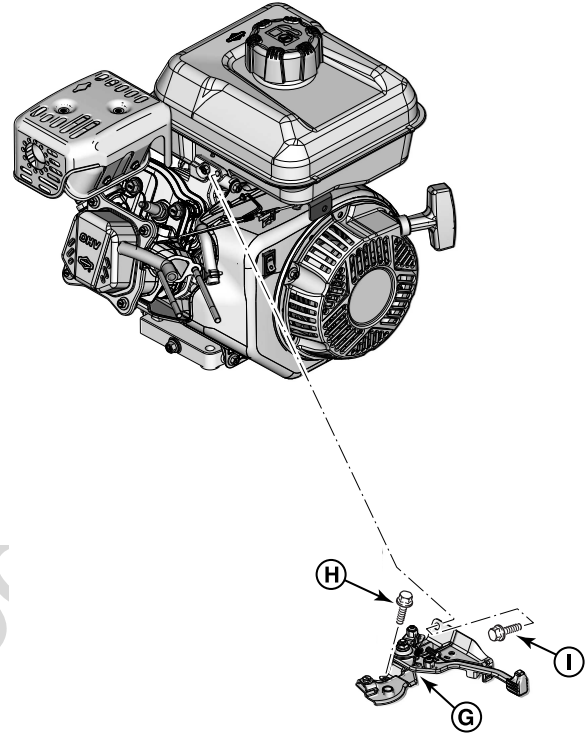
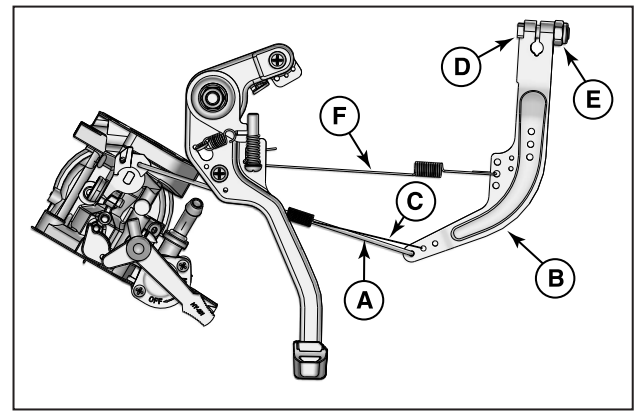
NOTE: Exercise care to avoid bending, kinking, or stretching link and springs.

1. See Figure 120. Install governor link (A) into hole in throttle lever with the L-hook end pointing down.
2. Install opposite end of governor link into first hole in **new** governor lever (B) with the Z-bend end at the bottom.

NOTE: Clamp end of governor lever is distorted during installation and removal. Always install **new** governor lever if it is removed from the governor crank.

3. Install governor link spring (C) into hole in throttle lever with the hook end pointing down.
4. Install opposite end of governor link spring into second hole in governor lever with the hook end pointing down.

120



5. Install square-head screw (D) onto governor lever and start Nyloc nut (E) with flat washer.
6. Install governor lever onto governor crank, so that top of lever is below step on governor crank. Do not tighten Nyloc nut at this time.
7. Install governor spring (F) into eyelet at bottom of governor bracket (G) with the hook end pointing toward the cylinder.
8. Install opposite end of governor spring into hole in the governor lever with the hook end pointing down. Use the same hole from which it was removed.
9. Start outside hex flange screw (H) to fasten governor bracket to crankcase.
10. Start inside hex flange screw (I) with red wire ring terminal (stop switch ground) to fasten governor bracket to crankcase fuel tank flange.

11. Alternately tighten two hex flange screws as follows.

| Governor Bracket Screws | |
|-------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

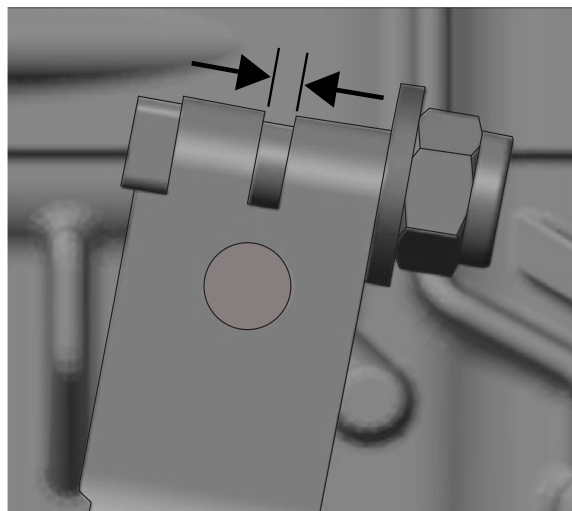
12. See Figure 121. Move throttle control lever to FAST (A).
13. While holding governor lever (B) in the Wide Open Throttle position, use channel lock to rotate governor crank (C) in a clockwise direction until it stops (about 1/8 turn).
14. Holding governor lever and governor crank to prevent movement, tighten Nyloc nut (D) as follows.

| Governor Lever Nut | |
|------------------------|---------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 50-60 lb-in (5.7-6.8 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

NOTE: Static governing can only be set once. If governor needs to be reset, the governor lever must be replaced.

15. See Figure 122. Verify that the governor lever has not collapsed during assembly. A gap must exist after tightening as shown.

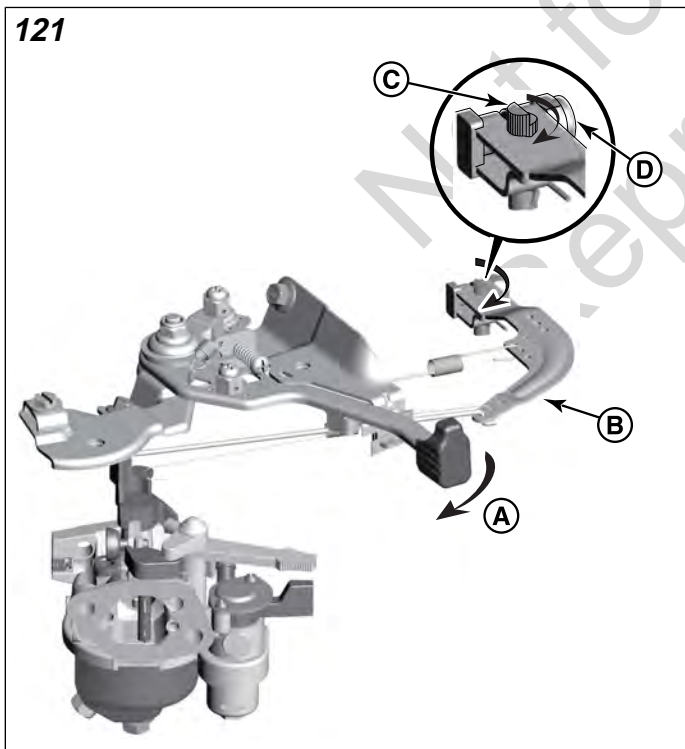
122



16. Manually exercise governor lever. Verify that governor lever, link, and springs move freely without binding, sticking, or contacting blower housing.

8

121



Muffler

- If equipped, inspect spark arrester for dirt, debris, and carbon buildup. Proceed as follows:
 - Note orientation of spark arrester before removal.
 - See Figure 123. If stamped guard (A), remove two screws (B) to release spark arrester (C) and muffler adapter (D).
 - If wire guard (E), remove single screw (F) to release spark arrester (G).
 - Remove screening element from spark arrester.
 - Gently clean screening element with a stiff bristle brush. If carbon buildup is present, soak or spray with Carburetor Cleaner (Part No.'s 100041 or 100042). Blow dry from the inside-out with low pressure compressed air.

NOTE: Exercise care to avoid bending or puncturing screening element. Replace screening element if it cannot be adequately cleaned or if any damage is observed.
- If equipped, inspect muffler deflector for dirt, debris, and carbon buildup. Proceed as follows:
 - Note orientation of muffler deflector before removal.
 - If stamped guard, remove two screws (H) to release muffler deflector (I).
 - If wire guard, remove single screw (J) to release muffler deflector (K).
 - Remove all dirt and debris with a bristle brush.

- E. Inspect parts for holes, cracks, or breakage. Replace as necessary.
- 3. Remove three hex flange screws (L) to release wire guard or stamped guard from muffler (M).
- 4. Remove all dirt and debris with a bristle brush.
- 5. Inspect muffler for holes, split seams, cracked welds, loose internal parts, corrosion, and other damage. Replace as necessary.
- 6. Inspect muffler tube and mounting flange for cracked welds, breakage, and other damage. Replace as necessary.
- 7. Verify that mating surfaces of muffler and cylinder head are clean and dry. Any dust or dirt left on mating surfaces can cause exhaust leaks.
- 8. Install **new** gasket (N) onto studs.
- 9. Install muffler on studs.
- 10. Install two hex nuts (O) with lock washers (P) onto studs. Alternately tighten hex nuts as follows.

| Muffler Stud Nuts | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 195-266 lb-in (22-30 N-m) |

- 11. Install three hex flange screws to fasten wire guard or stamped guard to muffler. Tighten wire guard screws to **30-50 lb-in** (3.4-5.7 N-m). Tighten stamped guard screws as follows.

| Muffler Stamped Guard Screws | |
|------------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 80-110 lb-in (9-12.4 N-m) |
| 13U100, 13U200 | 27-44 lb-in (3-5 N-m) |

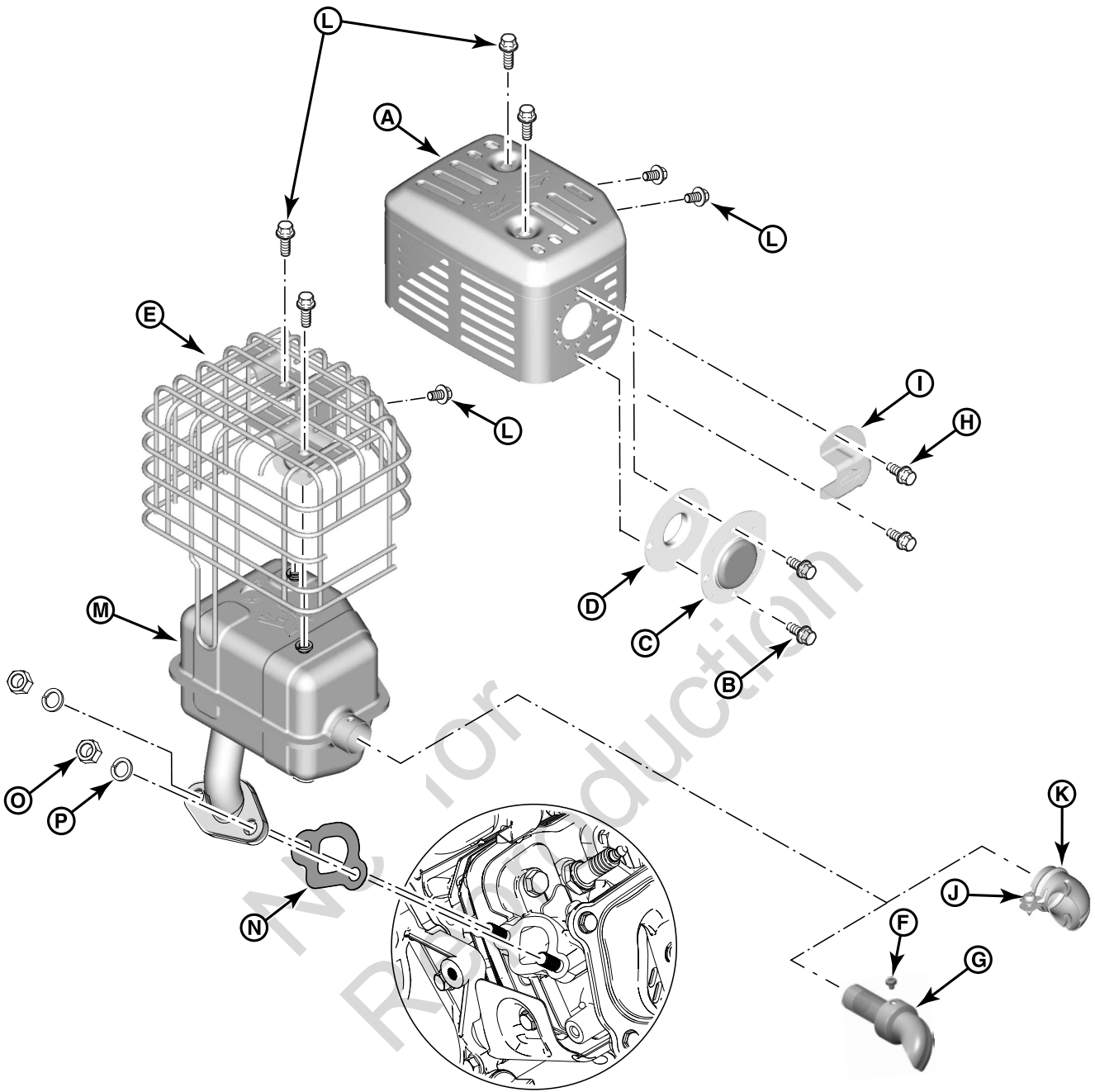
- 12. If equipped, install spark arrester as follows:
 - A. Install screening element into spark arrester.
 - B. Orient spark arrester as noted before removal.
 - NOTE:** Spark arrester is installed in either the 9 o'clock or the optional 6 o'clock position.
 - C. If stamped guard, start two screws to install spark arrester and muffler adapter.
 - D. If wire guard, install single screw to fasten spark arrester to muffler.
 - E. Tighten screw(s) as follows.

| Stamped/Wire Guard Spark Arrester Screw(s) | |
|--|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 71-124 lb-in (8-14 N-m) |
| 13U100, 13U200 | 27-44 lb-in (3-5 N-m) |

- 13. If equipped, install muffler deflector as follows:
 - A. Orient muffler deflector as noted before removal.
 - NOTE:** Muffler deflector is installed in either the 9 o'clock or the optional 6 o'clock position.
 - B. If stamped guard, start two screws to install muffler deflector. Tighten screws as follows.

| Stamped Guard Muffler Deflector Screws | |
|--|--------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 25-35 lb-in (2.8-4 N-m) |
| 13U100, 13U200 | 27-44 lb-in (3-5 N-m) |

- C. If wire guard, install single screw to fasten muffler deflector to muffler. Tighten screw to **8-12 lb-in** (0.9-1.4 N-m).



Fuel Tank

1. Inspect the fuel tank for damage and corrosion. Replace as necessary.
2. Remove fuel cap, if installed.
3. Remove filler neck filter, if equipped. Replace filter if damaged or if it cannot be adequately cleaned.
4. Check fuel cap and filler neck for proper seals and vents.
5. Direct the beam of a small flashlight into the fuel tank. Look for sludge, debris, dirt, and other contaminants. Thoroughly clean dirty or gummy fuel tanks with Carburetor Cleaner (Part No.'s 100041 or 100042).
6. With the beam of the flashlight directed into the fuel tank, inspect the external surface area for light that would indicate the presence of pin holes or small cracks.
7. Install filler neck filter and fuel cap.
8. See Figure 124. If equipped with in-tank fuel filter, proceed as follows:

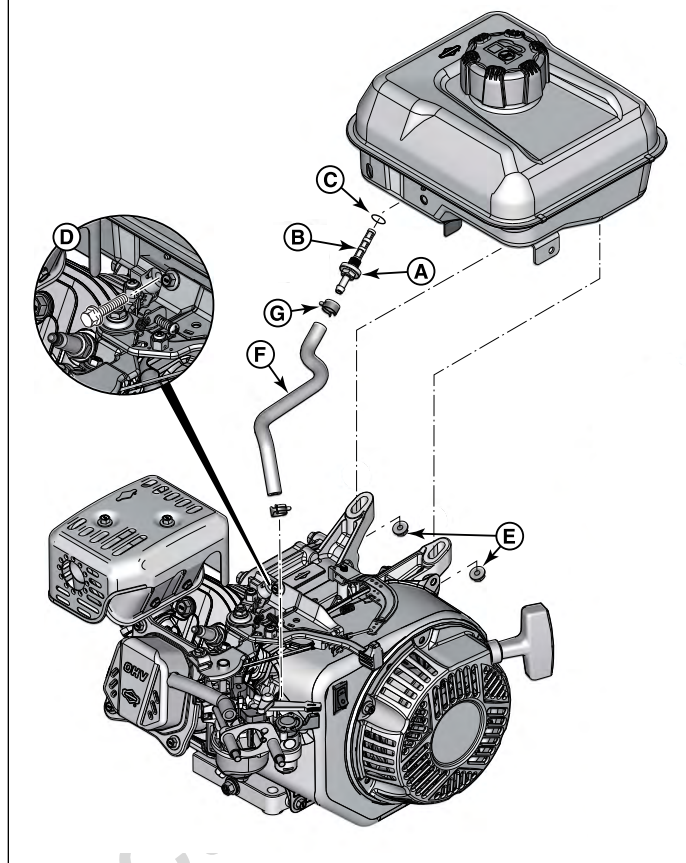
- A. Using hex, remove fuel filter fitting (A) from fuel tank.
- B. Unthread fuel filter (B) and remove O-ring (C) from fuel filter fitting.
- C. Inspect fuel filter for dirt and debris. Clean or replace as necessary.
- D. Inspect O-ring for cuts, tears, or general deterioration. Replace as necessary.
- E. Install O-ring onto fuel filter fitting. Verify O-ring is fully seated in groove.
- F. Thread fuel filter into fuel filter fitting.
- G. Install fuel filter fitting into fuel tank. Tighten fitting as follows.

| Fuel Filter Fitting | |
|------------------------|----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 60-70 lb-in (6.8-7.9 N-m) |
| 13U100, 13U200 | 62-71 lb-in (7-8 N-m) |

9. Place fuel tank onto engine.
10. Install hex flange screw (D) to fasten fuel tank to crankcase flange. Tighten screw as follows.

| Fuel Tank Screw | |
|------------------------|-----------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 75-95 lb-in (8.5-10.7 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

124



NOTE: For best access to screw, move throttle control lever left to the FAST position and use a 8 mm socket with extension.

NOTE: Exercise care to avoid dropping screw between engine and blower housing. A dropped screw may be caught by the flywheel magnet where disassembly would be required to retrieve it.

11. On opposite side, install two hex flange nuts (E) onto fuel tank studs. Alternately tighten nuts as follows.

| Fuel Tank Nuts | |
|------------------------|-------------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 90-110 lb-in (10.2-12.4 N-m) |
| 13U100, 13U200 | 71-124 lb-in (8-14 N-m) |

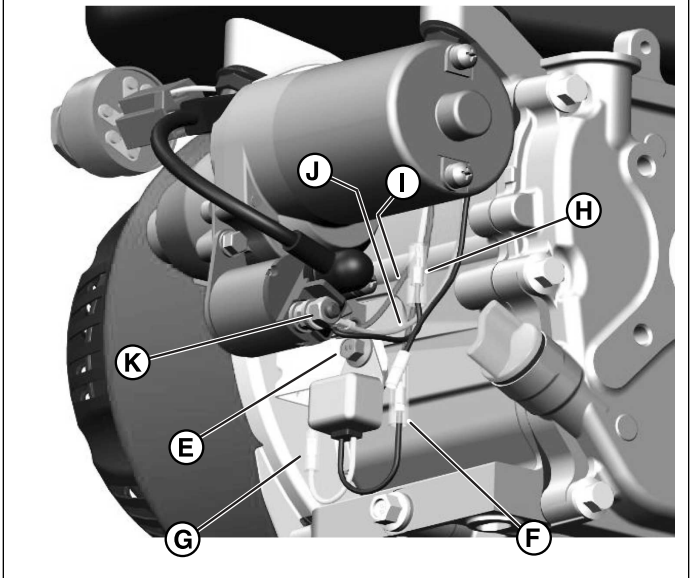
12. Inspect hose (F) for cuts, nicks, cracks, hardness, or general deterioration. Replace if necessary.
13. Install hose with clamp (G) onto fuel tank (or in-tank fuel filter) fitting. Squeeze tangs and move hose clamp about **1/8 inch** (3 mm) from end of hose with tangs pointing upward for best access.
14. Manually exercise governor lever. Verify that governor lever, link, and springs move freely without binding, sticking, or contacting fuel tank.

Starter Motor (If Equipped)

1. Install connector and spade terminal to key switch on trim panel.
2. See Figure 125. Install two locating pins (A) into holes in crankcase.
3. With the stator wires routed over the top of the starter motor, install starter motor (B) onto locating pins.
4. Install top starter motor screw (C) capturing brown key switch ground wire ring terminal, and tighten to **80-110 lb-in** (9-12.4 N-m).
5. Install bottom starter motor screw (D) and tighten to **80-110 lb-in** (9-12.4 N-m).
6. See Figure 126. If equipped, install low oil sensor module as follows:
 - A. Install hex flange screw (E) to fasten oil sensor module bracket to flywheel guard. Tighten screw to **30-80 lb-in** (3.4-9 N-m).
 - B. Connect one-place wire connector (F) between oil sensor module and key switch spade contact.
 - C. Connect one-place wire connector (G) between oil sensor module and oil sensor.
7. Route yellow key switch wire and orange key switch wire behind starter motor to area of starter solenoid.
8. Connect yellow key switch wire terminal to starter solenoid black wire terminal (H).
9. If stator wires terminate in a ring terminal, move to step 10. If stator wires terminate in a 2-place jumper wire connector, proceed as follows:

NOTE: Ring terminal supersedes 2-place jumper wire connector on late model engines.

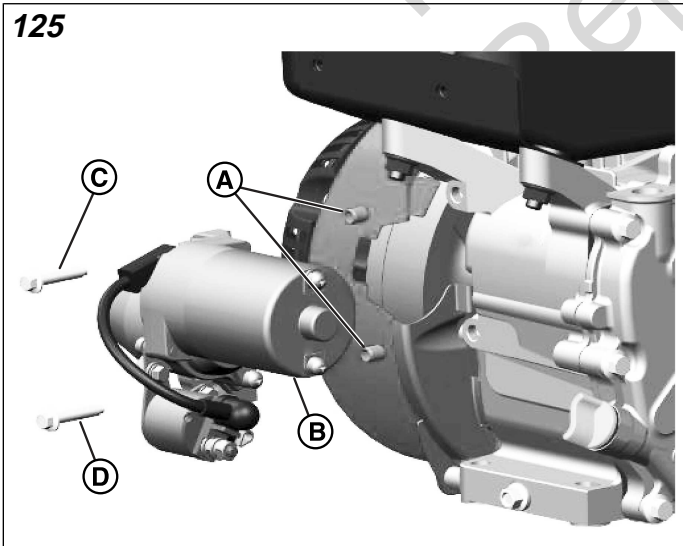
126



- A. Install flat washer and red jumper wire (I) ring terminal onto starter solenoid post.
- B. Coil extra length of jumper wire behind starter motor.
- C. Connect 2-place jumper wire connector between stator and starter solenoid post.
- D. Move to step 11.
10. Install flat washer and red stator wire ring terminal (I) onto starter solenoid post.
11. Install orange key switch wire ring terminal (J) onto starter solenoid post.
12. Install flat washer, lock washer, and hex nut (K) onto starter solenoid post. Tighten hex nut to **30-40 lb-in** (3.4-4.5 N-m).

8

125



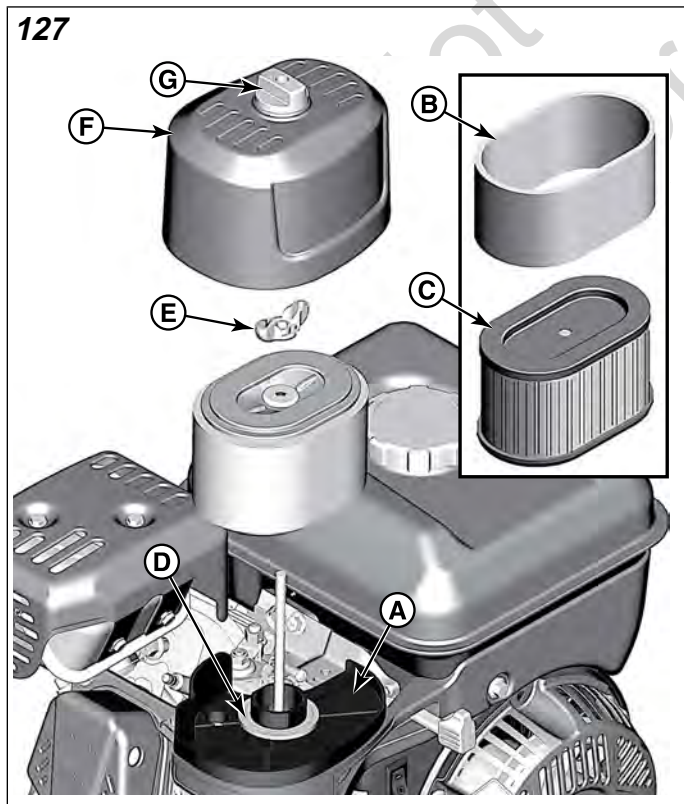
Air Cleaner

Refer to one of the following configurations:

- Dual Element Oval Air Filter
- Oil Bath Air Filter
- Foam Low Mount Air Filter
- Foam Large Panel Air Filter
- Paper Air Filter

Dual Element Oval Air Filter

1. See Figure 127. Install air cleaner base (A) onto carburetor mounting studs.
2. Install top hex flange screw to fasten air cleaner base to governor bracket. Tighten screw to **40-60 lb-in** (4.5-6.8 N-m).
3. Install two hex flange nuts onto carburetor mounting studs. Tighten nuts to **30-50 lb-in** (3.4-5.7 N-m).
4. Install breather hose to port on air cleaner base.
5. Start three hex flange screws to fasten control panel trim to fuel tank. Engage end of control panel trim in slot of air cleaner base. Starting with screw above rewind starter, tighten screws to **20-40 lb-in** (2.3-4.5 N-m).
6. If equipped, install hex flange screw to fasten high oil fill tube flange to control panel trim. Tighten screw to **5-15 lb-in** (0.6-1.6 N-m).
7. Install plastic knob onto throttle control lever.

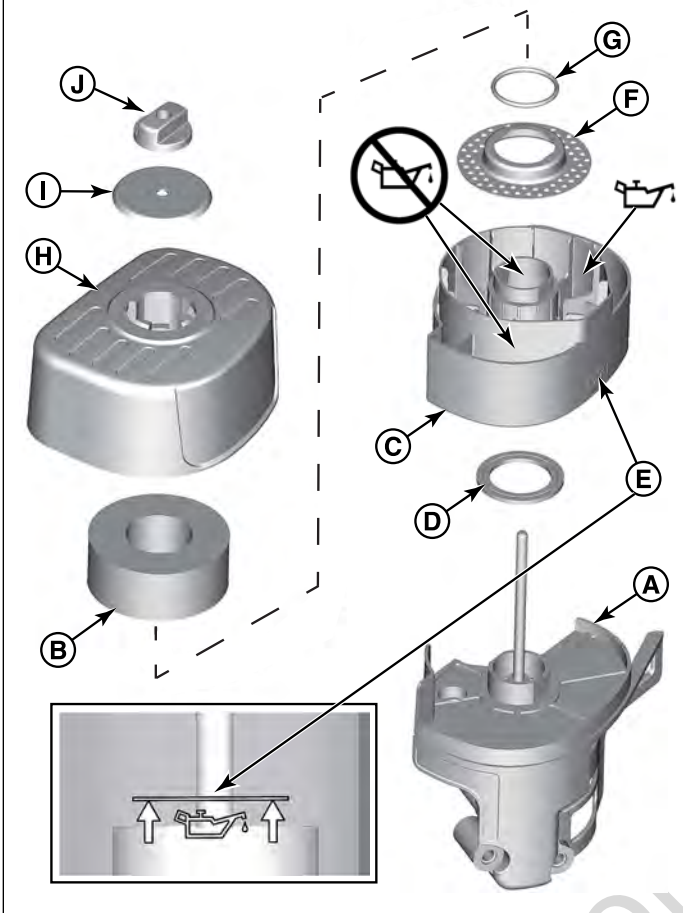


8. Remove foam pre-cleaner (B) from air filter cartridge (C).
9. Gently tap air filter cartridge on a hard surface to loosen dirt and debris. Carefully brush and/or vacuum air filter cartridge as necessary.
NOTE: Use of pressurized air or solvents will damage foam pre-cleaner and air filter cartridge.
10. Gently wash foam pre-cleaner in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely.
11. Carefully inspect foam pre-cleaner and air filter cartridge. Replace parts if they cannot be adequately cleaned or if any damage is observed.
12. Install foam pre-cleaner onto air filter cartridge.
13. Inspect seal washer (D) for damage or general deterioration. Replace if necessary.
14. Install seal washer onto air cleaner base.
15. Place air filter cartridge onto air cleaner base. Install wing nut (E), but do not over-tighten.
16. Install air cleaner cover (F). Install knob (G), but do not over-tighten.

Oil Bath Air Filter

1. See Figure 128. Install air cleaner base (A) onto carburetor mounting studs.
2. Install top hex flange screw to fasten air cleaner base to governor bracket. Tighten screw to **40-60 lb-in** (4.5-6.8 N-m).
3. Install two hex flange nuts onto carburetor mounting studs. Alternately tighten nuts to **30-50 lb-in** (3.4-5.7 N-m).
4. Install breather hose from valve cover to port on air cleaner base.
5. Start three hex flange screws to fasten control panel trim to fuel tank. Engage end of control panel trim in slot of air cleaner base. Starting with screw above rewind starter, tighten screws to **20-40 lb-in** (2.3-4.5 N-m).
6. If equipped, install hex flange screw to fasten high oil fill tube flange to control panel trim. Tighten screw to **5-15 in-lbs** (0.6-1.6 N-m).
7. Install plastic knob onto throttle control lever.
8. Gently wash foam filter (B) in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely.
NOTE: Use of pressurized air or solvents will damage foam filter.
9. Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.

128



8

10. Apply a small amount of clean SAE 30 engine oil to foam filter. Gently squeeze foam filter until engine oil is evenly distributed. Squeeze foam filter in a clean cloth to remove excess oil.
11. Wash bath bowl (C) and air cleaner cover in warm, soapy water. Wipe dry with a clean cloth.
12. Inspect seal washer (D) for damage or general deterioration. Replace if necessary.
13. Install seal washer and bath bowl onto air cleaner base.
14. Add clean SAE 30 engine oil to bath bowl until level is even with horizontal line (E). Do not overfill.
15. Install baffle screen (F) and O-ring (G) onto bath bowl.
16. Install foam filter into air cleaner cover.
17. Install air cleaner cover (H).
18. Install flat washer (I) and knob (J), but do not over-tighten.

Foam Low Mount Air Filter

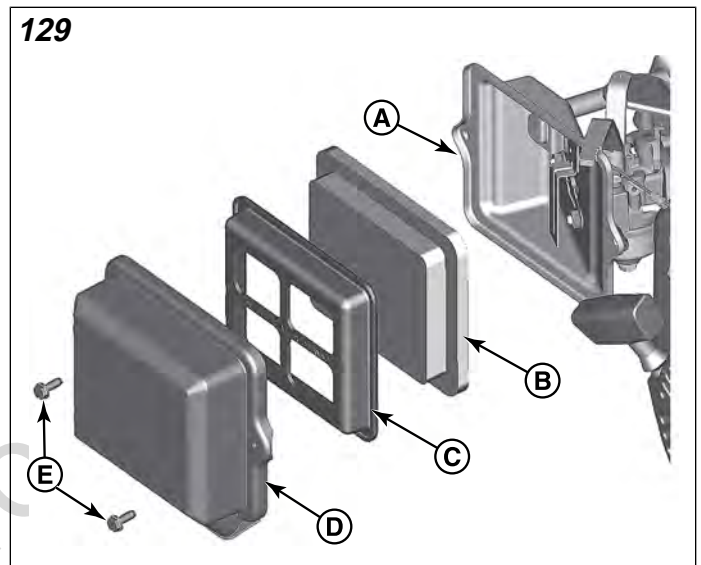
1. See Figure 129. Install air cleaner base (A) onto carburetor mounting studs.
2. Install two hex flange nuts onto carburetor mounting studs. Alternately tighten nuts to **30-50 lb-in** (3.4-5.7 N-m).

3. Install breather hose from valve cover to port on air cleaner base.
4. Gently wash foam filter (B) in warm, soapy water. Thoroughly rinse with clean water. Squeeze foam filter in a clean cloth until dry.

NOTE: Use of pressurized air or solvents will damage foam filter.

5. Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.
6. Saturate foam filter with clean engine oil. Gently squeeze foam filter in a clean cloth to remove excess oil.
7. Install foam filter and retainer (C) into air cleaner cover (D).
8. Install air cleaner cover and start two hex flange screws (E). Tighten screws to **9-12 lb-in** (1-1.4 N-m).

129



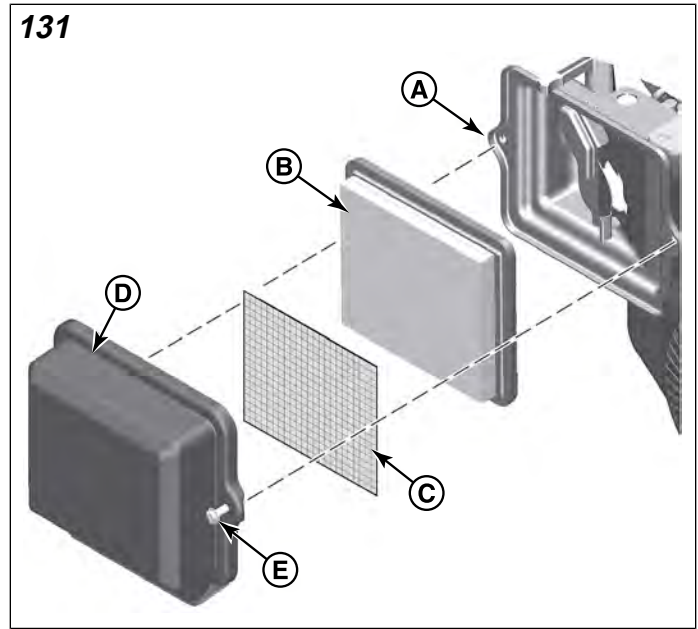
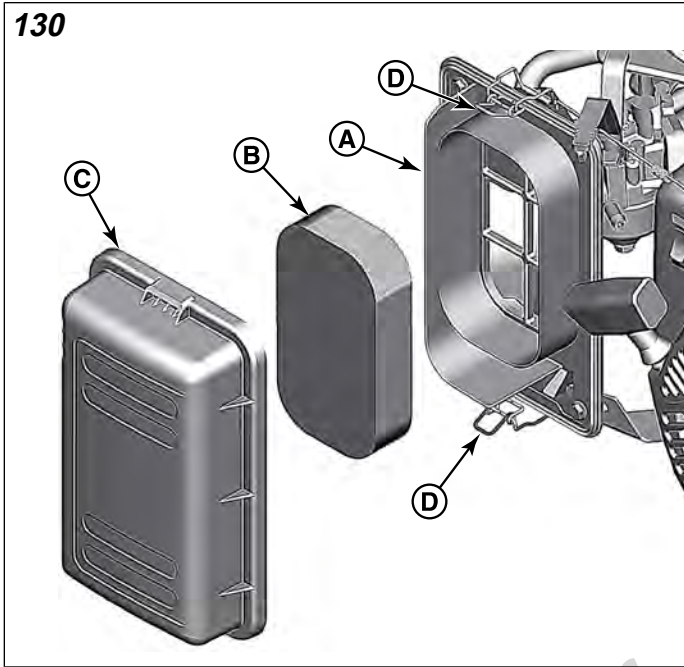
Foam Large Panel Air Filter

1. See Figure 130. Install air cleaner base (A) onto carburetor mounting studs.
2. Install two hex flange nuts onto carburetor mounting studs. Alternately tighten nuts to **30-50 lb-in** (3.4-5.7 N-m).
3. Install breather hose from valve cover to port on air cleaner base.
4. Gently wash foam filter (B) in warm, soapy water. Thoroughly rinse with clean water. Squeeze foam filter in a clean cloth until dry.

NOTE: Use of pressurized air or solvents will damage foam filter.

5. Carefully inspect foam filter. Replace if it cannot be adequately cleaned or if any damage is observed.

6. Saturate foam filter with clean engine oil. Gently squeeze foam filter in a clean cloth to remove excess oil.
7. Install foam filter into air cleaner cover (C).
8. Install air cleaner cover and engage two retaining clips (D) to secure.



Paper Air Filter

1. See Figure 131. Install air cleaner base (A) onto carburetor mounting studs.
2. Install two hex flange nuts onto carburetor mounting studs. Alternately tighten nuts to **30-50 lb-in** (3.4-5.7 N-m).
3. Install breather hose from valve cover to port on air cleaner base.
4. Gently tap filter (B) on a hard surface to loosen dust and dirt. Replace if it cannot be adequately cleaned or if any damage is observed.
5. If equipped, wash pre-cleaner (C) in warm, soapy water. Thoroughly rinse with clean water and allow to air dry completely. **Do not** oil pre-cleaner.
6. Install pre-cleaner and filter.
7. Install air cleaner cover (D) and start two hex flange screws (E). Alternately tighten screws to **9-12 lb-in** (1-1.4 N-m).

Gear Reduction Unit (If Equipped)

6:1 Gear Reduction Unit

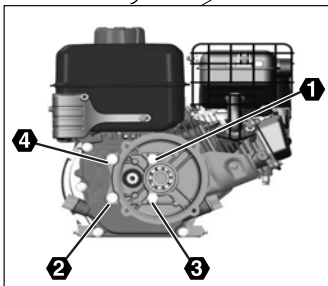
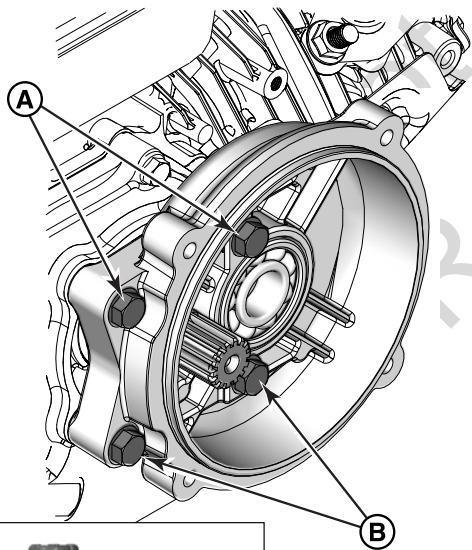
1. If replacing bearings and seals, be sure that:
 - Bearing manufacturer's identification faces inside.
 - Lip of gear case oil seal faces outside.
 - Lip of gear case cover oil seal faces inside.

2. Verify that PTO bearing oil seal is **NOT** installed in crankcase cover.
3. Orient gear case as noted before removal.

NOTE: Gear case is installed in the 3 o'clock, 9 o'clock, or 12 o'clock positions.

4. See Figure 132. Insert two hex flange screws (A) through top holes in gear case.
5. Place **new** gasket onto installed screws, so that the sealing bead faces the crankcase cover.
6. Slide gear case over crankshaft and hand tighten screws into crankcase cover.
7. Insert two remaining hex flange screws (B) through bottom holes in gear case and hand tighten into crankcase cover.
8. Alternately tighten screws to **175-225 lb-in** (19.8-25.4 N-m) using the sequence shown.

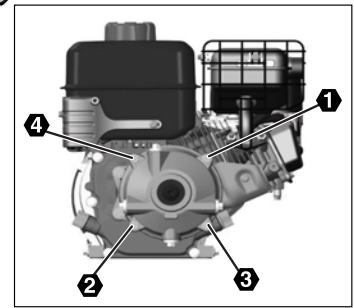
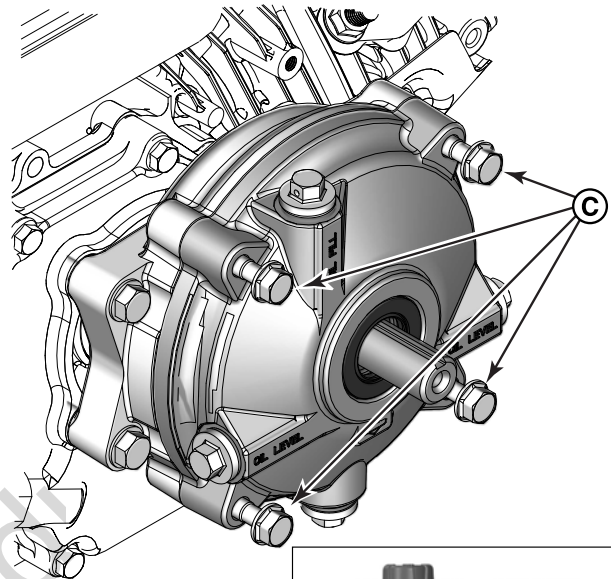
132



9. Lubricate o-ring seal with clean engine oil and install into groove in gear case.
10. Align gear teeth and slide drive shaft assembly into gear case bearing.
11. Slide gear case cover over drive shaft assembly.
12. See Figure 133. Install four hex flange screws (C) to fasten gear case cover to gear case. Alternately tighten screws to **175-225 lb-in** (19.8-25.4 N-m) using the sequence shown.

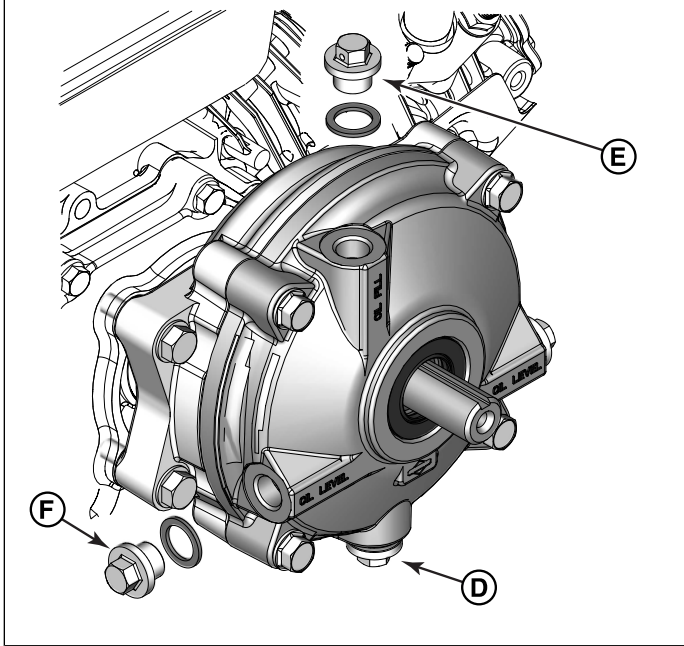
NOTE: Always orient gear case cover, so that the oil fill/vent plug hole is at the top.

133



13. See Figure 134. Install oil drain plug (D) with sealing washer at bottom of gear case cover. Tighten plug to **180-210 lb-in** (20.3-23.7 N-m).
14. Place engine on a flat, level surface.
15. Remove oil fill/vent plug (E) and oil level plug (F) with sealing washers, if installed.
16. Slowly add the appropriate oil into the oil fill hole until oil begins to run out of the oil level hole (approximately 4 ounces).
 - Use SAE 80W-90 above 40° F (10° C)
 - Use SAE 10W-30 below 40° F (10° C)

134



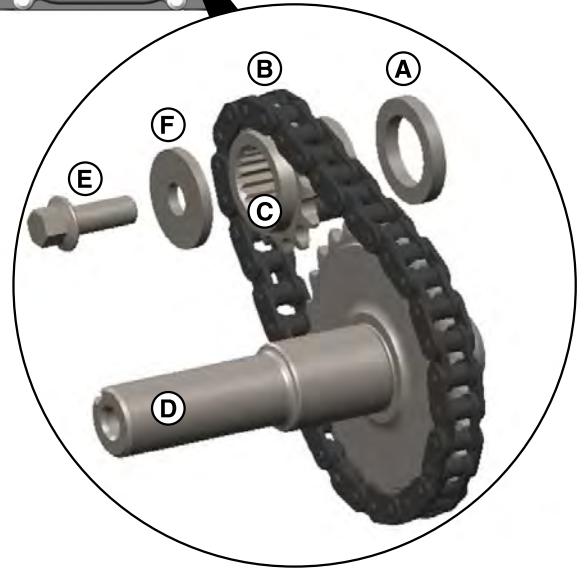
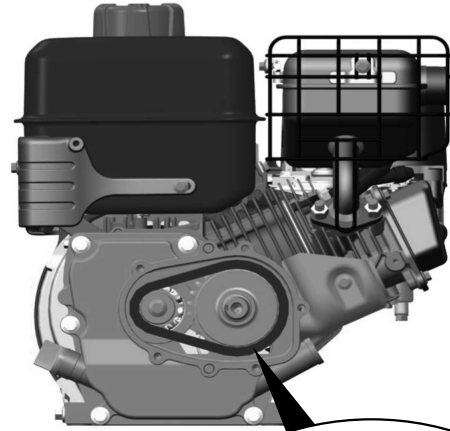
17. Install oil level plug with sealing washer. Install oil fill/vent plug with **copper** washer. Tighten each plug to **180-210 lb-in** (20.3-23.7 N-m).

NOTE: Verify that vent hole of oil fill/vent plug is facing outside.

2:1 Gear Reduction Unit

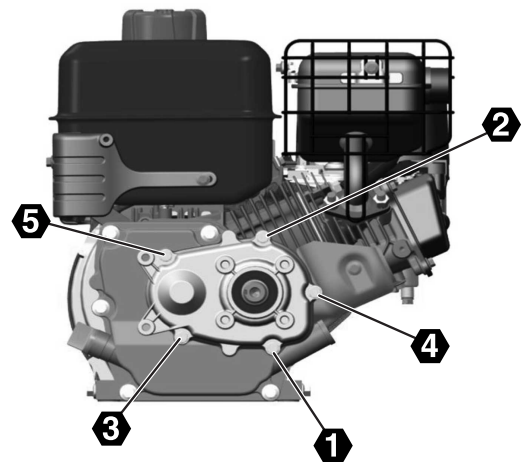
1. Verify that PTO bearing oil seal is **NOT** installed in crankcase cover.
2. See Figure 135. Install spacer (A) onto crankshaft.
3. Install chain (B) on sprocket (C) and output shaft (D).
4. Slide sprocket over crankshaft while fitting output shaft into crankcase cover bore.
5. Start hex flange screw (E) with flat washer (F) into crankshaft. Tighten screw to **255-315 lb-in** (28.8-35.6 N-m).
6. Install two locating pins at the 6 o'clock and 12 o'clock positions on the crankcase cover flange.
7. Place **new** gear cover gasket onto locating pins.
8. See Figure 136. Start five screws to fasten gear cover to crankcase cover. Alternately tighten screws to **75-95 lb-in** (8.5-10.7 N-m) using the sequence shown.

135



8

136



Final Instructions

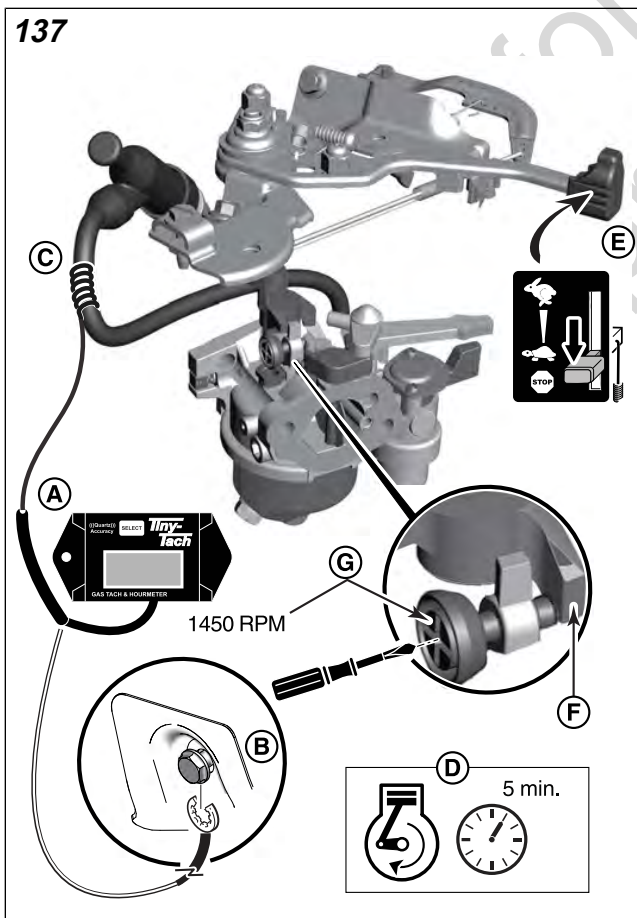
1. Install oil drain plug(s) with sealing washer(s) and tighten as follows.

| Oil Drain Plug | |
|------------------------|-------------------------------|
| Models | Torque |
| 130G00, 131G00, 13R200 | 140-200 lb-in (15.8-22.6 N-m) |
| 13U100, 13U200 | 248-266 lb-in (28-30 N-m) |

2. Add engine oil. See *SECTION 2 - MAINTENANCE, CHANGE ENGINE OIL/CHECK ENGINE OIL LEVEL*, steps 7-12.
3. Fill fuel tank with fresh gasoline.
4. Route spark plug wire forward under breather hose, and then upward to install onto spark plug terminal.
5. Start and run engine. Check for oil and fuel leaks while engine is running.

Adjust Idle Speed

1. See Figure 137. Obtain Digital Tachometer and Hour Meter (Part No. 19598) (A). Proceed as follows:
 - A. Insert solder lug of white wire under engine or frame bolt for suitable ground (B).



- B. Tightly coil red wire over an insulated section of the spark plug wire using three to four turns (C).

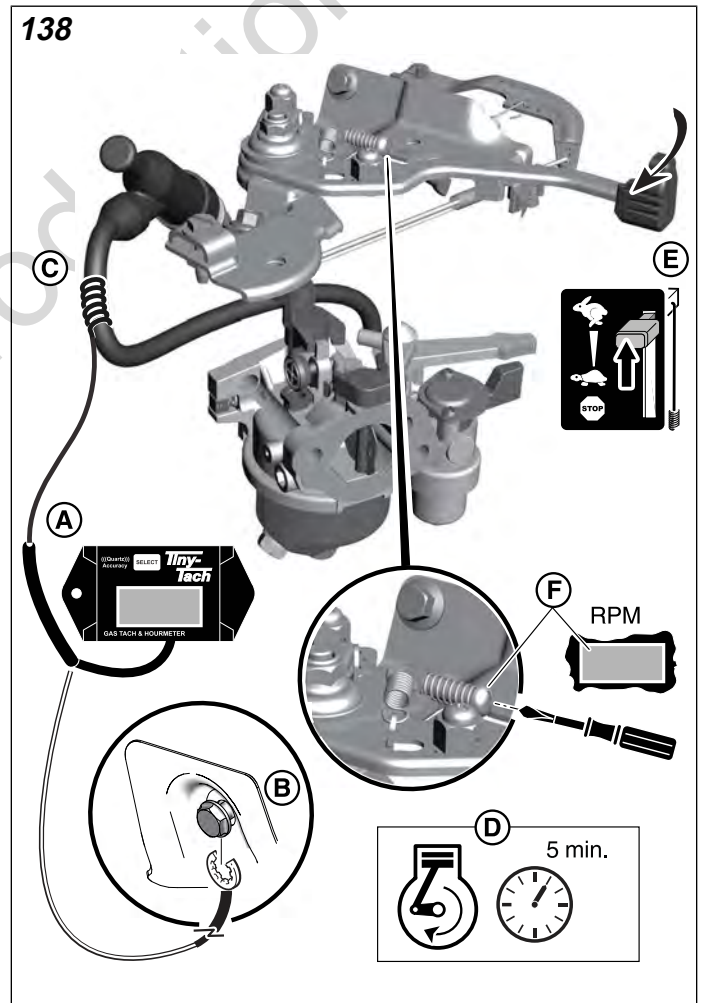
NOTE: Keep wires away from hot or moving engine parts.

2. Start and run engine for five minutes (D).
3. Move throttle control lever to SLOW (E).
4. Hold throttle lever (F) against idle screw (G) and adjust idle screw to obtain 1450 RPM.
5. Stop engine and remove Digital Tachometer and Hour Meter.

Adjust Top No-Load Speed

1. Obtain the Top No-Load Speed for the engine. Proceed as follows:
 - A. **Dealers:** See www.thepowerportal.com.
 - B. **Consumers:** Contact your local Briggs & Stratton authorized service dealer.

NOTE: Have your complete model-type-trim number and code number in hand.



2. See Figure 138. Obtain Digital Tachometer and Hour Meter (Part No. 19598) (A). Proceed as follows:
 - A. Insert solder lug of white wire under engine or frame bolt for suitable ground (B).
 - B. Tightly coil red wire over an insulated section of the spark plug wire using three to four turns (C).

NOTE: Keep wires away from hot or moving engine parts.
3. Start and run engine for five minutes (D).
4. Move throttle control lever to FAST (E).
5. Adjust Top No-Load Speed adjustment screw (F) to the value obtained in step 1.
6. Stop engine and remove Digital Tachometer and Hour Meter.

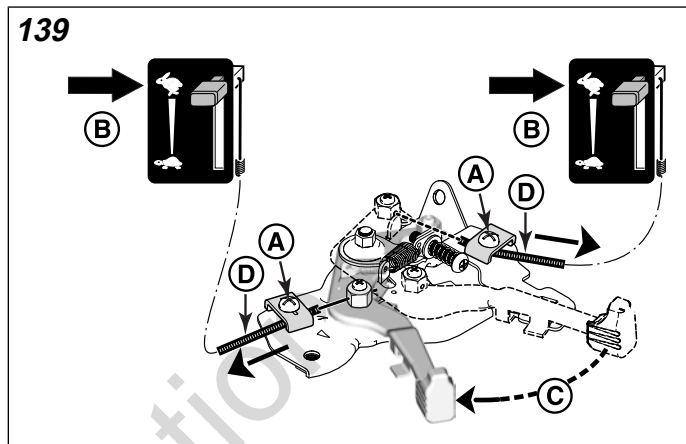
Adjust Remote Choke Control (Carburetor Mounted)

1. Loosen choke control wire casing screw on remote choke mounting bracket.
2. Move equipment choke control lever or knob to CHOKE.
3. Move engine choke control lever to CHOKE.
4. Move choke control wire and casing to close choke completely.
5. Securely tighten casing clamp screw.
6. Operate choke control to confirm proper operation.

Adjust Remote Throttle Control (Governor Bracket Mounted)

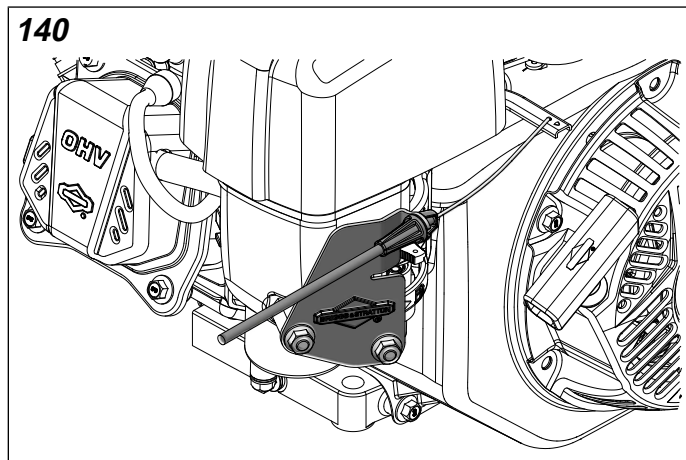
NOTE: Choose one of two locations for mounting the remote cable to the governor bracket. See Figure 139.

1. Loosen throttle control wire casing screw (A).
2. Move equipment throttle control lever to FAST (B).
3. Move engine throttle control lever to FAST (C).
4. Move throttle control wire and casing (D) in the direction of the arrow until it stops.
5. Securely tighten casing clamp screw.



Non-Adjustable Remote Throttle Control (Carburetor Mounted)

See Figure 140. The carburetor mounted remote throttle control is not adjustable.



Not for
Reproduction

SECTION 9 – SPECIFICATIONS

| | |
|-------------------------------------|-----|
| MODELS 130G00, 131G00, 13R200 | 96 |
| Engine Specifications | 96 |
| Torque Specifications | 96 |
| Standard/Reject Sizes | 97 |
| MODELS 13U100, 13U200 | 99 |
| Engine Specifications | 99 |
| Torque Specifications | 99 |
| Standard/Reject Sizes | 100 |

Not for
Reproduction

MODELS 130G00, 131G00, 13R200

Engine Specifications

| ENGINE | |
|--|-------------------------------|
| Bore | 2.76 in (70 mm) |
| Stroke | 2.13 in (54 mm) |
| Displacement | 12.69 ci (208 cc) |
| Compression Ratio | 8:5:1 |
| Crankshaft End Play | 0.003-0.030 in (0.09-0.75 mm) |
| Crankshaft End Play (Pump Applications) | 0.002-0.009 in (0.05-0.23 mm) |
| Oil Capacity | 19-22 oz (550-650 ml) |
| Fuel Tank Capacity | 3.17 qt (3.0 L) |
| Ignition Timing | 24° BTDC |
| Armature Air Gap | 0.010-0.014 in (0.25-0.35 mm) |
| Spark Plug Gap | 0.027-0.033 in (0.69-0.83 mm) |
| Valve Clearance - Intake | 0.004-0.006 in (0.10-0.15 mm) |
| Valve Clearance - Exhaust | 0.006-0.008 in (0.15-0.20 mm) |
| Crankcase MAG Bearing Oil Seal Depth | 0.049-0.069 in (1.25-1.75 mm) |
| Crankcase Cover PTO Bearing Oil Seal Depth | 0.157-0.177 in (4.0-4.5 mm) |

Torque Specifications

| FASTENER | TORQUE |
|---|-------------------------------|
| Air Cleaner Cover Screw (Foam Low Mount Air Filter) | 9-12 lb-in (1-1.4 N-m) |
| Air Cleaner Cover Screw (Paper Air Filter) | 9-12 lb-in (1-1.4 N-m) |
| Air Cleaner Base to Governor Bracket Screw | 40-60 lb-in (4.5-6.8 N-m) |
| Air Cleaner Base Nut | 30-50 lb-in (3.4-5.7 N-m) |
| Armature Screw | 80-110 lb-in (9-12.4 N-m) |
| Blower Housing Screw | 60-110 lb-in (6.8-12.4 N-m) |
| Carburetor Stud | 50-70 lb-in (5.7-7.9 N-m) |
| Carburetor Drain Plug | 49-80 lb-in (5.5-9 N-m) |
| Carburetor Float Bowl Screw | 49-80 lb-in (5.5-9 N-m) |
| Carburetor Sediment Bowl Nut | 49-80 lb-in (5.5-9 N-m) |
| Connecting Rod Cap Screw | 110-140 lb-in (12.4-15.8 N-m) |
| Control Panel Trim Screw | 20-40 lb-in (2.3-4.5 N-m) |
| Crankcase Cover Screw * | 16-21 lb-ft (21.5-28.3 N-m) |
| Cylinder Head Screw * | 15-20 lb-ft (20.3-27.1 N-m) |
| Cylinder Heat Shield Screw | 40-60 lb-in (4.5-6.8 N-m) |
| Flywheel Guard Screw | 60-110 lb-in (6.8-12.4 N-m) |
| Flywheel Nut | 53-71 lb-ft (72.3-96 N-m) |
| Fuel Tank Screw | 75-95 lb-in (8.5-10.7 N-m) |
| Fuel Tank Nut | 90-110 lb-in (10.2-12.4 N-m) |
| Fuel Tank Fuel Filter Fitting | 60-70 lb-in (6.8-7.9 N-m) |
| Governor Bracket Screw | 80-110 lb-in (9-12.4 N-m) |
| Governor Lever Nut (Nyloc) | 50-60 lb-in (5.7-6.8 N-m) |
| Low Oil Sensor Module Screw | 30-80 lb-in (3.4-9 N-m) |
| Low Oil Sensor Screw | 50-70 lb-in (5.7-7.9 N-m) |

| FASTENER | TORQUE |
|--|-------------------------------|
| Low Oil Sensor Nut | 30-50 lb-in (3.4-5.7 N-m) |
| Muffler Stud | 40-60 lb-in (4.5-6.8 N-m) |
| Muffler Stud Nut | 80-110 lb-in (9-12.4 N-m) |
| Muffler Stamped Guard Screw | 80-110 lb-in (9-12.4 N-m) |
| Muffler Stamped Guard Spark Arrester Screw | 71-124 lb-in (8-14 N-m) |
| Muffler Stamped Guard Muffler Deflector Screw | 25-35 lb-in (2.8-4 N-m) |
| Muffler Wire Guard Screw | 30-50 lb-in (3.4-5.7 N-m) |
| Muffler Wire Guard Spark Arrester Screw | 71-124 lb-in (8-14 N-m) |
| Muffler Wire Guard Muffler Deflector Screw | 8-12 lb-in (0.9-1.4 N-m) |
| Oil Drain Plug | 140-200 lb-in (15.8-22.6 N-m) |
| Dipstick Oil Plug | 10-30 lb-in (1.1-3.4 N-m) |
| High Oil Fill Tube Screw to Crankcase Cover | 20-40 lb-in (2.3-4.5 N-m) |
| High Oil Fill Tube Screw to Control Panel Trim | 5-15 lb-in (0.6-1.6 N-m) |
| Remote Throttle Bracket Stud | 30-50 lb-in (3.4-5.7 N-m) |
| Remote Throttle Bracket Stud Nut | 30-50 lb-in (3.4-5.7 N-m) |
| Rewind Starter Screw | 25-35 lb-in (2.8-4 N-m) |
| Rocker Arm Stud | 110-140 lb-in (12.4-15.8 N-m) |
| Rocker Ball Locknut | 60-80 lb-in (6.8-9 N-m) |
| Spark Plug | 140-200 lb-in (15.8-22.6 N-m) |
| Stator Screw | 80-110 lb-in (9-12.4 N-m) |
| Starter Motor Screw | 80-110 lb-in (9-12.4 N-m) |
| Starter Solenoid Post Nut | 30-40 lb-in (3.4-4.5 N-m) |
| Valve Cover Screw | 70-90 lb-in (7.9-10.2 N-m) |
| 6:1 Gear Reduction Gear Case Screw | 175-225 lb-in (19.8-25.4 N-m) |
| 6:1 Gear Reduction Gear Case Cover Screw | 175-225 lb-in (19.8-25.4 N-m) |
| 6:1 Gear Reduction Gear Case Cover Plug | 180-210 lb-in (20.3-23.7 N-m) |
| 2:1 Gear Reduction Sprocket Screw | 255-315 lb-in (28.8-35.6 N-m) |
| 2:1 Gear Reduction Gear Cover Screw | 75-95 lb-in (8.5-10.7 N-m) |

* Use step torque procedure per instructions.

Standard/Reject Sizes

| ITEM | STANDARD SIZE | REJECT SIZE |
|--------------------------------|--------------------|-----------------------------|
| CRANKCASE/CYLINDER | | |
| Camshaft Bearing Bore Diameter | 0.551 in (14 mm) | 0.553 in (14.05 mm) or more |
| Cylinder Bore Out-Of-Round | 0.002 in (0.05 mm) | 0.0015 in (0.04 mm) or more |
| Cylinder Bore Diameter | 2.76 in (70 mm) | |
| CYLINDER HEAD | | |
| Intake | | |
| Valve Seat Angle | 45° | |
| Valve Seat Width | 0.028 in (0.71 mm) | |
| Valve Stem Diameter | 0.214 in (5.43 mm) | 0.208 in (5.28 mm) or less |
| Valve Guide Bore Diameter | 0.217 in (5.50 mm) | 0.220 in (5.58 mm) or more |
| Exhaust | | |
| Valve Seat Angle | 45° | |
| Valve Seat Width | 0.028 in (0.71 mm) | |
| Valve Stem Diameter | 0.215 in (5.47 mm) | 0.210 in (5.32 mm) or less |
| Valve Guide Bore Diameter | 0.217 in (5.50 mm) | 0.220 in (5.58 mm) or more |

| ITEM | STANDARD SIZE | REJECT SIZE |
|--|---------------------|-----------------------------|
| CRANKCASE COVER | | |
| Camshaft Bearing Bore Diameter | 0.551 in (14 mm) | 0.553 in (14.05 mm) or more |
| CRANKSHAFT | | |
| Crank Pin Journal Diameter | 1.181 in (30 mm) | 1.179 in (29.95 mm) or less |
| MAG Side Journal Diameter | 0.984 in (25 mm) | 0.982 in (24.95 mm) or less |
| PTO Side Journal Diameter | 0.984 in (25 mm) | 0.982 in (24.95 mm) or less |
| CAMSHAFT | | |
| MAG Side Journal Diameter | 0.550 in (13.98 mm) | 0.548 in (13.93 mm) or less |
| PTO Side Journal Diameter | 0.550 in (13.98 mm) | 0.548 in (13.93 mm) or less |
| CONNECTING ROD | | |
| Crank Pin Bearing Bore Diameter | 1.183 in (30.05 mm) | 1.185 in (30.10 mm) or more |
| Piston Pin Bearing Bore Diameter | 0.709 in (18.01 mm) | 0.711 in (18.06 mm) or more |
| PISTON | | |
| Piston Pin Diameter | 0.708 in (17.99 mm) | 0.707 in (17.96 mm) or less |
| Piston Pin Bore Diameter | 0.709 in (18.01 mm) | 0.711 in (18.06 mm) or more |
| Top Compression Ring End Gap | 0.010 in (0.25 mm) | 0.040 in (1.01 mm) or more |
| Middle Oil Wiper Ring End Gap | 0.014 in (0.35 mm) | 0.044 in (1.11 mm) or more |
| Bottom Oil Control Ring End Gap | 0.020 in (0.50 mm) | 0.055 in (1.39 mm) or more |
| Top Compression Ring Side Clearance ** | 0.002 in (0.05 mm) | 0.009 in (0.23 mm) or more |

** Only top ring side clearance needs to be checked.

Not for
Reproduction

MODELS 13U100, 13U200

Engine Specifications

| ENGINE | |
|--|-------------------------------|
| Bore | 2.76 in (70 mm) |
| Stroke | 2.13 in (54 mm) |
| Displacement | 12.69 ci (208 cc) |
| Compression Ratio | 8:5:1 |
| Crankshaft End Play | 0.003-0.030 in (0.09-0.75 mm) |
| Crankshaft End Play (Pump Applications) | 0.002-0.009 in (0.05-0.23 mm) |
| Oil Capacity | 19-22 oz (550-650 ml) |
| Fuel Tank Capacity | 3.17 qt (3.0 L) |
| Ignition Timing | 24° BTDC |
| Armature Air Gap | 0.008-0.016 in (0.20-0.40 mm) |
| Spark Plug Gap | 0.028-0.035 in (0.70-0.90 mm) |
| Valve Clearance - Intake | 0.005-0.007 in (0.13-0.18 mm) |
| Valve Clearance - Exhaust | 0.005-0.007 in (0.13-0.18 mm) |
| Crankcase MAG Bearing Oil Seal Depth | 0.059-0.071 in (1.5-1.8 mm) |
| Crankcase Cover PTO Bearing Oil Seal Depth | 0.118-0.130 in (3.0-3.3 mm) |

Torque Specifications

| FASTENER | TORQUE |
|--|---------------------------|
| Air Cleaner Cover Screw (Paper Air Filter) | 4-13 lb-in (0.5-1.5 N-m) |
| Air Cleaner Base to Governor Bracket Screw | 71-124 lb-in (8-14 N-m) |
| Air Cleaner Base Nut | 35-71 lb-in (4-8 N-m) |
| Armature Screw | 71-124 lb-in (8-14 N-m) |
| Blower Housing Screw | 71-124 lb-in (8-14 N-m) |
| Carburetor Stud | 44-62 lb-in (5-7 N-m) |
| Carburetor Drain Plug | 49-80 lb-in (5.5-9 N-m) |
| Carburetor Sediment Bowl Nut | 49-80 lb-in (5.5-9 N-m) |
| Connecting Rod Cap Screw | 124-142 lb-in (14-16 N-m) |
| Crankcase Cover Screw * | 18-19 lb-ft (24-26 N-m) |
| Cylinder Head Screw * | 21-22 lb-ft (28-30 N-m) |
| Cylinder Heat Shield Screw | 71-124 lb-in (8-14 N-m) |
| Flywheel Guard Screw | 71-124 lb-in (8-14 N-m) |
| Flywheel Nut | 54-59 lb-ft (73-80 N-m) |
| Fuel Tank Screw | 71-124 lb-in (8-14 N-m) |
| Fuel Tank Nut | 71-124 lb-in (8-14 N-m) |
| Fuel Tank Fuel Filter Fitting | 62-71 lb-in (7-8 N-m) |
| Governor Bracket Screw | 71-124 lb-in (8-14 N-m) |
| Governor Lever Nut (Nyloc) | 71-124 lb-in (8-14 N-m) |
| Low Oil Sensor Module Screw | 35-71 lb-in (4-8 N-m) |
| Low Oil Sensor Screw | 71-124 lb-in (8-14 N-m) |
| Low Oil Sensor Nut | 71-124 lb-in (8-14 N-m) |
| Muffler Stud | 35-62 lb-in (4-7 N-m) |
| Muffler Stud Nut | 195-266 lb-in (22-30 N-m) |

| FASTENER | TORQUE |
|---|---------------------------|
| Muffler Stamped Guard Screw | 27-44 lb-in (3-5 N-m) |
| Muffler Stamped Guard Spark Arrester Screen Screw | 27-44 lb-in (3-5 N-m) |
| Muffler Stamped Guard Muffler Deflector Screw | 27-44 lb-in (3-5 N-m) |
| Oil Drain Plug | 248-266 lb-in (28-30 N-m) |
| Dipstick Oil Plug | 18-27 lb-in (2-3 N-m) |
| Remote Choke Bracket Stud | 35-71 lb-in (4-8 N-m) |
| Remote Choke Bracket Stud Nut | 35-71 lb-in (4-8 N-m) |
| Rewind Starter Screw | 71-89 lb-in (8-10 N-m) |
| Rocker Arm Stud | 177-266 lb-in (20-30 N-m) |
| Rocker Ball Locknut | 71-124 lb-in (8-14 N-m) |
| Spark Plug | 230-319 lb-in (26-36 N-m) |
| Stator Screw | 71-124 lb-in (8-14 N-m) |
| Valve Cover Screw | 71-124 lb-in (8-14 N-m) |

* Use step torque procedure per instructions.

Standard/Reject Sizes

| ITEM | STANDARD SIZE | REJECT SIZE |
|----------------------------------|---------------------|-----------------------------|
| CRANKCASE/CYLINDER | | |
| Camshaft Bearing Bore Diameter | 0.552 in (14.01 mm) | 0.554 in (14.06 mm) or more |
| Cylinder Bore Out-Of-Round | 0.002 in (0.05 mm) | 0.0015 in (0.04 mm) or more |
| Cylinder Bore Diameter | 2.76 in (70 mm) | |
| CYLINDER HEAD | | |
| Intake | | |
| Valve Seat Angle | 45° | |
| Valve Seat Width | 0.031 in (0.80 mm) | |
| Valve Stem Diameter | 0.216 in (5.47 mm) | 0.210 in (5.32 mm) or less |
| Valve Guide Bore Diameter | 0.217 in (5.51 mm) | 0.220 in (5.59 mm) or more |
| Exhaust | | |
| Valve Seat Angle | 45° | |
| Valve Seat Width | 0.031 in (0.80 mm) | |
| Valve Stem Diameter | 0.214 in (5.43 mm) | 0.208 in (5.28 mm) or less |
| Valve Guide Bore Diameter | 0.217 in (5.51 mm) | 0.220 in (5.59 mm) or more |
| CRANKCASE COVER | | |
| Camshaft Bearing Bore Diameter | 0.552 in (14.01 mm) | 0.554 in (14.06 mm) or more |
| CRANKSHAFT | | |
| Crank Pin Journal Diameter | 1.180 in (29.98 mm) | 1.178 in (29.93 mm) or less |
| MAG Side Journal Diameter | 0.984 in (24.99 mm) | 0.982 in (24.94 mm) or less |
| PTO Side Journal Diameter | 0.984 in (24.99 mm) | 0.982 in (24.94 mm) or less |
| CAMSHAFT | | |
| MAG Side Journal Diameter | 0.550 in (13.98 mm) | 0.548 in (13.93 mm) or less |
| PTO Side Journal Diameter | 0.550 in (13.98 mm) | 0.548 in (13.93 mm) or less |
| CONNECTING ROD | | |
| Crank Pin Bearing Bore Diameter | 1.182 in (30.02 mm) | 1.184 in (30.07 mm) or more |
| Piston Pin Bearing Bore Diameter | 0.709 in (18.01 mm) | 0.711 in (18.06 mm) or more |
| PISTON | | |
| Piston Pin Diameter | 0.708 in (18.00 mm) | 0.708 in (17.97 mm) or less |
| Piston Pin Bore Diameter | 0.709 in (18.00 mm) | 0.711 in (18.05 mm) or more |
| Top Compression Ring End Gap | 0.007 in (0.18 mm) | 0.037 in (0.94 mm) or more |

| ITEM | STANDARD SIZE | REJECT SIZE |
|--|----------------------|----------------------------|
| Middle Oil Wiper Ring End Gap | 0.017 in (0.43 mm) | 0.047 in (1.19 mm) or more |
| Bottom Oil Control Ring End Gap | 0.018 in (0.45 mm) | 0.053 in (1.34 mm) or more |
| Top Compression Ring Side Clearance ** | 0.002 in (0.04 mm) | 0.009 in (0.22 mm) or more |

** Only top ring side clearance needs to be checked.

Not for
Reproduction

This page is intentionally left blank.

Not for
Reproduction

Not for
Reproduction

This page is intentionally left blank.

This page is intentionally left blank.

Not for
Reproduction

Not for
Reproduction

This page is intentionally left blank.



 *the* **PowerPortal**



Part No. 381573EN (Rev -)

BRIGGS&STRATTON
CORPORATION

POST OFFICE BOX 702
MILWAUKEE, WI 53201 USA
414 269 5333
BRIGGSandSTRATTON.COM
©2017 Briggs & Stratton Corporation

