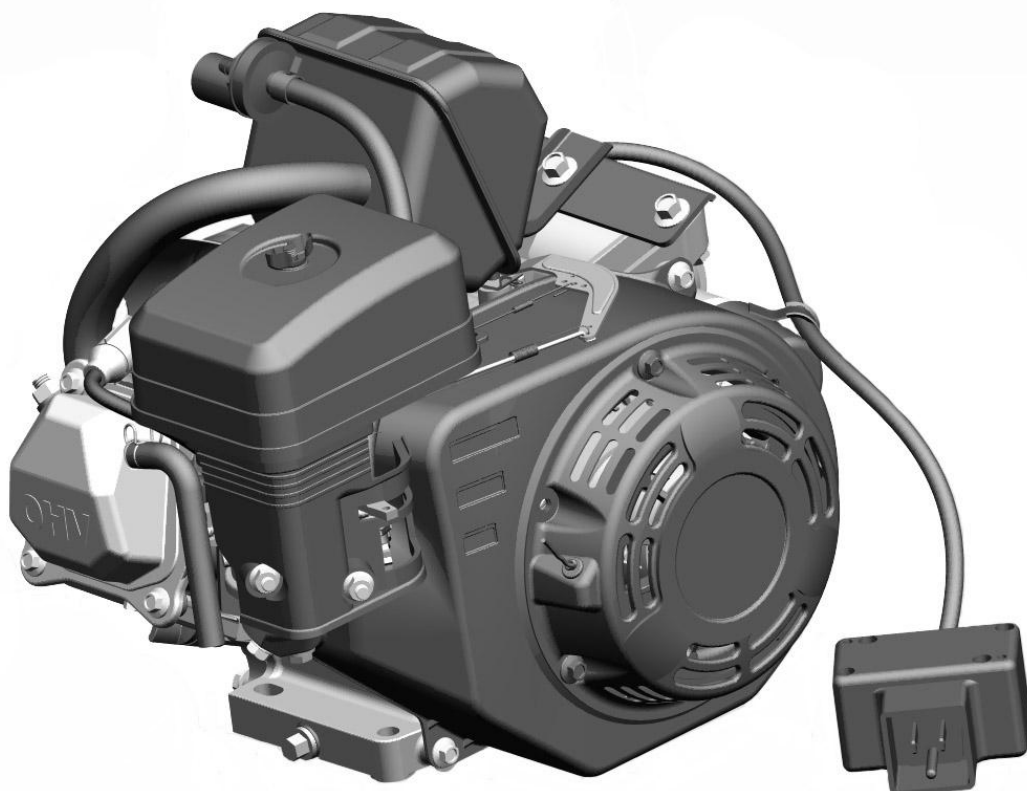




RESIDENTIAL PRODUCTS

SINGLE STAGE SNOW ENGINE SERVICE MANUAL

LC168F / LC168FD (163cc)



About this Manual

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct. Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual. An electronic version of this service manual is available on the Toro Dealer Portal. We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company

Residential and Landscape Contractor Service Training Department

8111 Lyndale Avenue South

Bloomington, MN 55420

Chapter 1 – General Service Information	1
Chapter 2 - Engine Service / Maintenance	2
Chapter 3 - Engine Disassembly and Service	3
Chapter 4 - Electrical	4

NOTES:

Chapter 1 – General Service Information

1

Safety	2
Service Rules	3
Engine Model / Serial Number Location	3
Engine Fastener Torque Specification	4
General Specifications	5
Engine Specifications	5
Troubleshooting	6

Safety

Safety Information



This symbol means **WARNING or PERSONAL SAFETY INSTRUCTION** – read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the Toro engine. The Toro operator's manual contains safety information and operating tips for safe operating practices.

Avoid Unexpected Engine Start - Turn off engine and disconnect the spark plug before servicing engine.

Avoid Lacerations and Amputations - Stay clear of all moving parts while the engine is running.

Avoid Burns - Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid Fires and Explosions - Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants.

Avoid Asphyxiation - Never operate an engine in a confined area without proper ventilation.

Avoid Injury From Batteries - Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid Injury Due To Inferior Parts - Use only original equipment parts to ensure that important safety criteria are met.

Avoid Injury To Bystanders - Always clear the area of bystanders before starting or testing power equipment.

Avoid Injury Due To Projectiles - Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the power equipment.

Avoid Modifications - Never alter or modify any part unless it is a factory approved procedure.

Service Rules

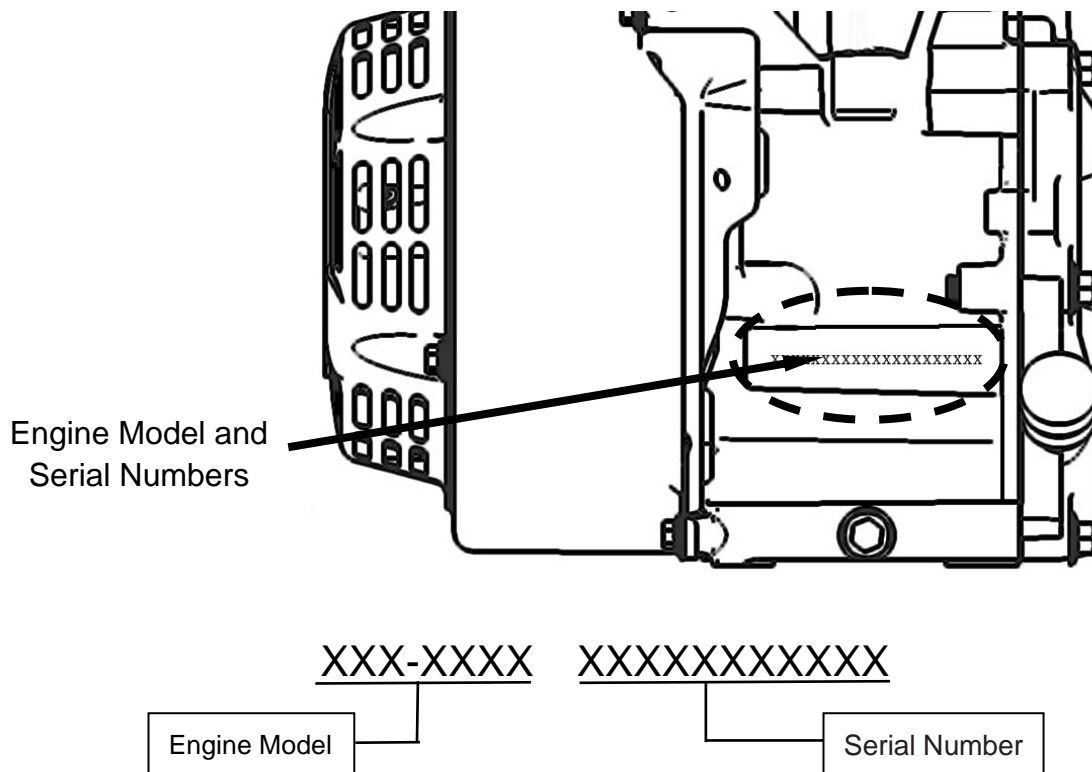
1

1. Only use genuine Toro parts and lubrication products.
2. Always install new gaskets, O-rings and seals when assembling engine.
3. Always torque fasteners to specification and in sequence.
4. Always lubricate friction components with clean engine oil or engine assembly lube when assembling engine.

Engine Model / Serial Number Location

2010-2011 - The engine model and serial number are stamped into the crankcase near the electric starter mounting position on the side of the engine towards the front of machine (shown below).

2012 - The engine model and serial number are stamped into the crankcase near the rear of the machine.



Engine Fastener Torque Specifications

Item	Torque Specification
Oil Drain Plug	17 ft-lbs (23 Nm)
Connecting Rod Bolts	8.5 ft-lbs (12 Nm)
Crankcase & Cover Bolts	17.5 ft-lbs (24 Nm)
Valve Lash Lock Nut	11 ft-lbs (15 Nm)
Rocker Arm Studs	22 ft-lbs (30 Nm)
Spark Plug	22 ft-lbs (30 Nm)
Valve Cover Bolts	7 ft-lbs (10 Nm)
Starter Bolts	7 ft-lbs (10 Nm)
Recoil Mounting Bolts	7 ft-lbs (10 Nm)
Cylinder Head Bolt	25 ft-lbs (34 Nm)
Heater Box Nuts	7 ft-lbs (10 Nm)
Flywheel Nut	62.5 ft-lbs (85 Nm)
Ignition Coil Bolts	7 ft-lbs (10 Nm)
Throttle Control Bolts	7 ft-lbs (10 Nm)
Governor Arm Nut	7 ft-lbs (10 Nm)
Muffler / Exhaust to Cylinder Nuts	22 ft-lbs (30 Nm)
Muffler Mounting Plate Bolts	7 ft-lbs (10 Nm)
Standard Torque Values	
M5 Bolt / Nut	4.5 ft-lbs (6 Nm)
M6 Bolt / Nut	7.5 ft-lbs (10 Nm)
M8 Bolt / Nut	19 ft-lbs (26 Nm)
M10 Bolt / Nut	28 ft-lbs (38 Nm)
M12 Bolt / Nut	41 ft-lbs (55 Nm)

General Specifications

1

MODEL	LC168F-1 (Recoil Start)	LC168FD-1 (Electric Start)
Engine Type	OHV Single Cylinder, Four Stroke, Forced Air Cooling	
Displacement (cc)	163	
Bore x Stroke (mm)	68 x 45	
Compression Ratio	8.5:1	
Engine Operating RPM	3550 - 3850 RPM	
Oil Capacity	20 oz. (0.6 l)	
Fuel Type	Unleaded Gasoline, 87 Octane	
Ignition System	T.C.I Transistorized Magneto	
Lubrication System	Splash	
Cylinder	Aluminum with Cast Iron Bore	

Engine Specifications

Spark Plug	Gap	0.0275 - 0.0314" (0.7-0.8 mm)
Valve Clearance	Intake Cold	0.0059" (0.15 mm)
	Exhaust Cold	0.0078" (0.20 mm)
Ignition Coil	Resistance (primary)	1-1.6 Ω
	Resistance (secondary)	15.5K Ω \pm 15%
	Gap to Flywheel	0.011- 0.019" (.3-.5 mm)

NOTE: The only internal parts available for this engine are gaskets and seals.

Troubleshooting

Hard Starting / Poor Running

- Incorrect Fuel (Level, Age, Octane, Ethanol Content)
- Fuel System Contamination and / or debris in Carburetor
- Incorrect Oil Level
- Spark Plug (Incorrect Gap, Fouled, Loose or Faulty)
- Air Intake System Leaks
- Ignition Coil to Flywheel Gap Incorrect
- Weak / No Spark
- Choke / Linkage
- Operating RPM Incorrect
- Governor Adjustment Incorrect
- Engine Valve Clearance out of Specification
- Low Compression or Excessive Leakdown

Overheating

- Incorrect Oil Level
- Cylinder Head Gasket Leak
- Debris Build-Up Restricting Air Flow

Chapter 2 - Engine Service / Maintenance

2

Engine Oil Change Procedure	8
Spark Plug Service	9
Valve Clearance Inspection and Adjustment	10
Engine Governor – Zero Point Setting	11
Engine RPM Adjustment	11
Fuel Filter Replacement	12

Engine Oil Change Procedure

1. Run engine to warm engine oil.

2. Remove the ignition key.

NOTE: Ensure fuel system contains no fuel to prevent leakage when engine is tipped.

3. Position oil drain pan under oil drain plug.

4. Remove the oil fill / check cap.

5. Remove the oil drain plug. If necessary, replace drain plug gasket.

6. Tip engine slightly backwards (if necessary) to completely drain the engine oil.

7. Install the oil drain plug - torque to **17 ft-lbs (23 Nm)**.

8. Add oil through the oil check / fill hole. Wipe the dipstick clean and insert it into the dipstick hole.

NOTE: DO NOT fully install / screw in the dipstick to check the oil.

9. Remove the dipstick and check the oil level – Add oil if needed until the proper oil level is reached.

NOTE: DO NOT overfill the engine oil

10. Fully install and tighten the dipstick.

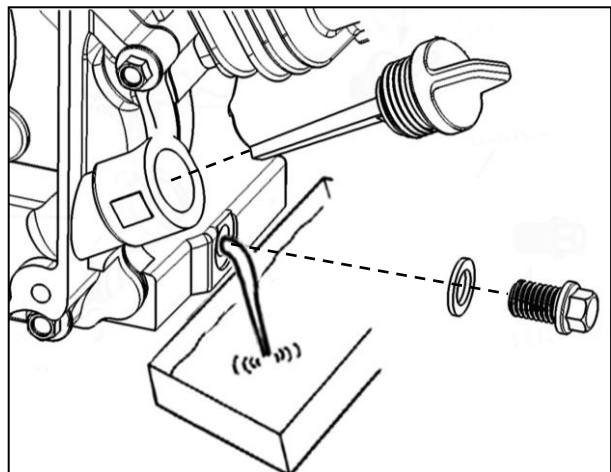
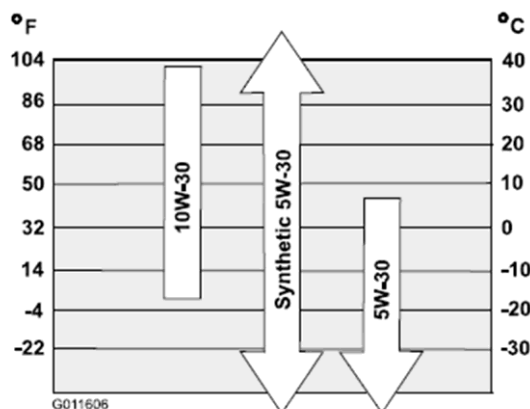
11. Properly dispose of the used engine oil.

Engine Oil Capacity:

20 oz. (0.6 l)

Engine Oil Type:

API classification of SF,SG, SH, SJ, SL, or higher.



Spark Plug Service

2

NOTE: Spark plugs of the wrong size or incorrect heat range can cause severe engine damage.

NOTE: The shrouding, discharge chute and handle may need to be removed to access the spark plug.



High Voltage Ignition Systems can be Dangerous - Use Caution when Servicing Ignition Systems

1. Disconnect the spark plug boot and thoroughly clean the spark plug area.
2. Remove the spark plug from the engine.
3. Inspect the spark plug for excessively worn electrodes, chips or cracks in the insulator, or excessive deposits.
4. Measure the electrode gap and adjust if necessary. **Spark Plug Gap: 0.0275 - 0.0314" (0.7-0.8 mm)**
5. Install spark plug and torque to specification - **22 ft-lbs (30 Nm)**.
6. Fully install the spark plug boot on the plug.

NOTE: Be sure breather tube is routed above the spark plug wire.

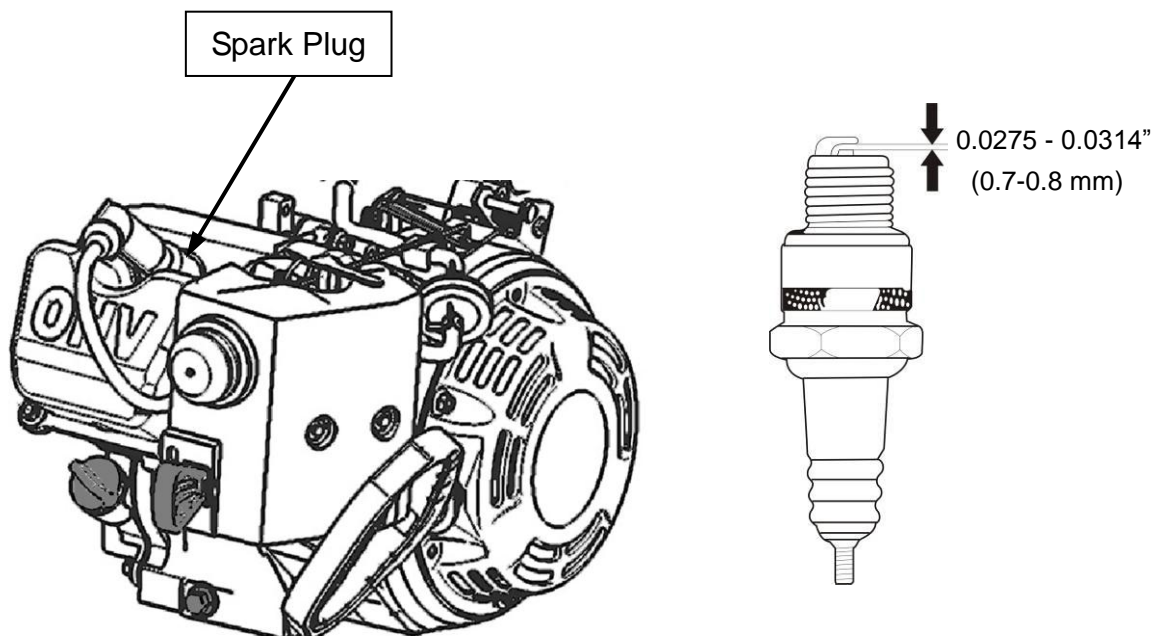


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Valve Clearance Inspection and Adjustment

NOTE: Valve clearance inspection and adjustment must be done with the engine cold.

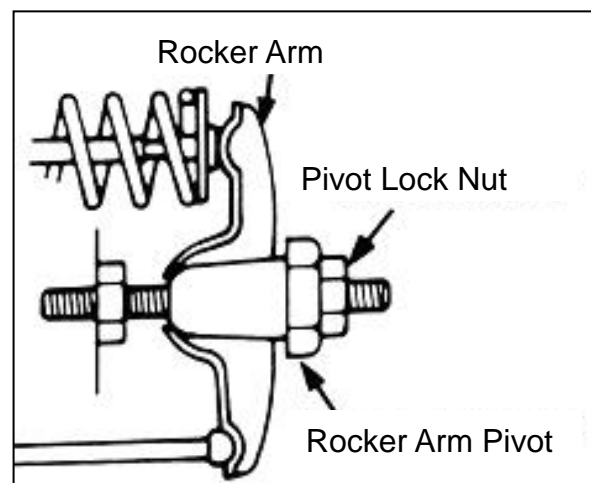
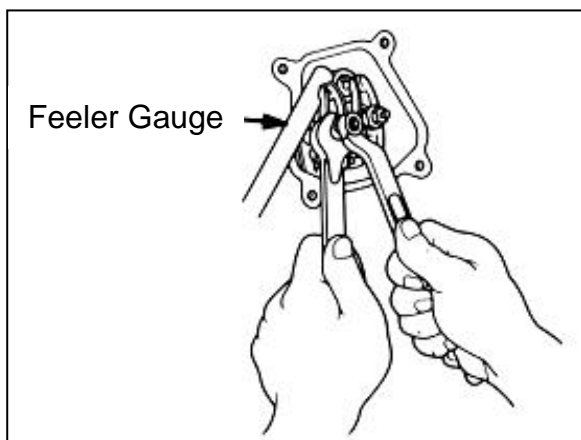
1. Rotate engine to TDC (top-dead-center) of the compression stroke.
2. Remove the valve cover. Be sure both valves are completely closed and the decompression arm is not holding the valve open.
3. Measure the clearance between the rotator and the valve stem with a feeler gauge.

NOTE: Be sure feeler gauge blade is not opening the valve while measuring valve clearance

Intake: 0.0059" (0.15 mm)

Exhaust: 0.0078" (0.20 mm)

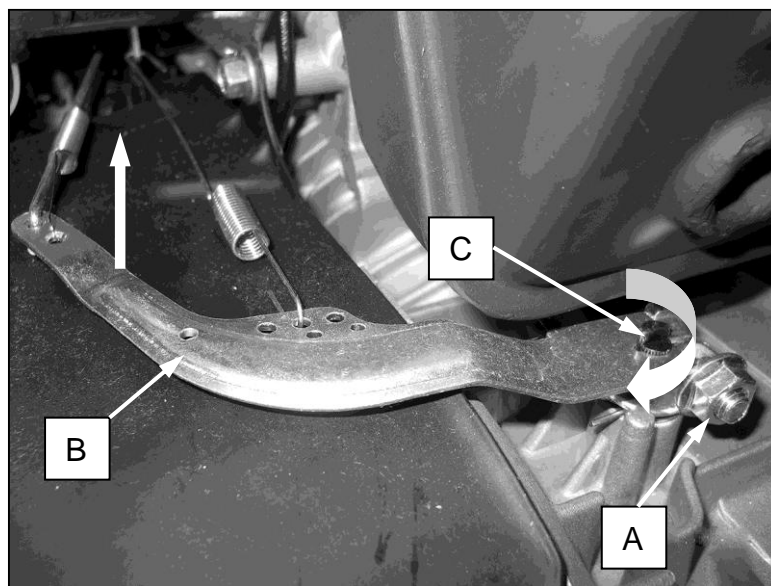
4. To adjust valve clearance:
 - Hold the rocker arm pivot and loosen the pivot lock nut.
 - Turn the rocker arm pivot to obtain the specified clearance.
 - Hold the rocker arm pivot and tighten the pivot lock nut to specification - **11 ft-lbs (15 Nm)**.
5. Recheck the clearance and readjust if necessary.
6. Inspect the valve cover gasket and replace if necessary. Install the cylinder head cover and torque fasteners to specification - **7.5 ft-lbs (10 Nm)**.



Engine Governor – Zero Point Setting

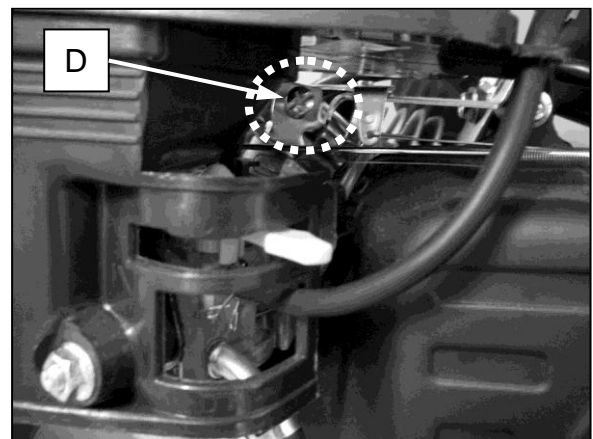
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1. Loosen but do not remove the governor pinch bolt nut (A).
2. Move the governor arm (B) towards the carburetor to fully open the throttle valve. Firmly hold the governor arm in this position.
3. Rotate the governor arm shaft (C) fully clockwise and secure it in this position with a pair of pliers.
4. Tighten the governor arm pinch bolt (A) and nut to specification - **7.5 ft-lbs (10 Nm)**.
5. Verify that the governor arm and throttle valve move freely.
6. Start and warm engine.
7. Verify the engine operating RPM is set between **3550 - 3850 RPM**.



Engine RPM Adjustment

1. Properly set the governor zero point as shown in this manual.
2. Start and warm engine.
3. Attached an appropriate tachometer to the engine.
4. Adjust engine RPM by turning the High Speed Setting Screw (D) located above the carburetor asm.



Engine Operating RPM - 3550 - 3850 RPM

Fuel Filter and Hose Replacement

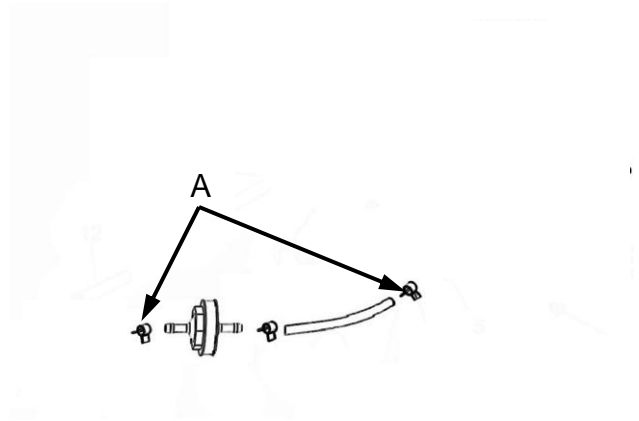


- **Fuel is Extremely Flammable** - Use Extreme Caution When Servicing Fuel System

1. Drain the fuel tank into an approved container.

NOTE: Ensure fuel system contains no fuel to prevent leakage when the fuel filter is replaced.

2. Release the fuel filter / fuel hose clamps (A) and slide them away from the fittings.
3. Remove the fuel filter / hose asm. from the engine.
4. Properly install new fuel filter / hose asm. and hose clamps (A).
5. Re-fill tank with fresh fuel.
6. Verify hose routing and check for leaks.
7. Properly dispose of any unused fuel.



Engine Service – Upper End **14-23**

Muffler / Heat Shield Exploded View	14
Heater Box Exploded View	15
Carburetor Mounting	16
Carburetor Exploded View	17
Recoil Asm. Exploded View	18
Starter / Flywheel / Coil Exploded View	19
Cylinder Head Exploded View and Service Information	20
Cylinder Head / Valves Exploded View and Service Information	21
Cylinder Head Specifications	22
Valve Seat Reconditioning	23

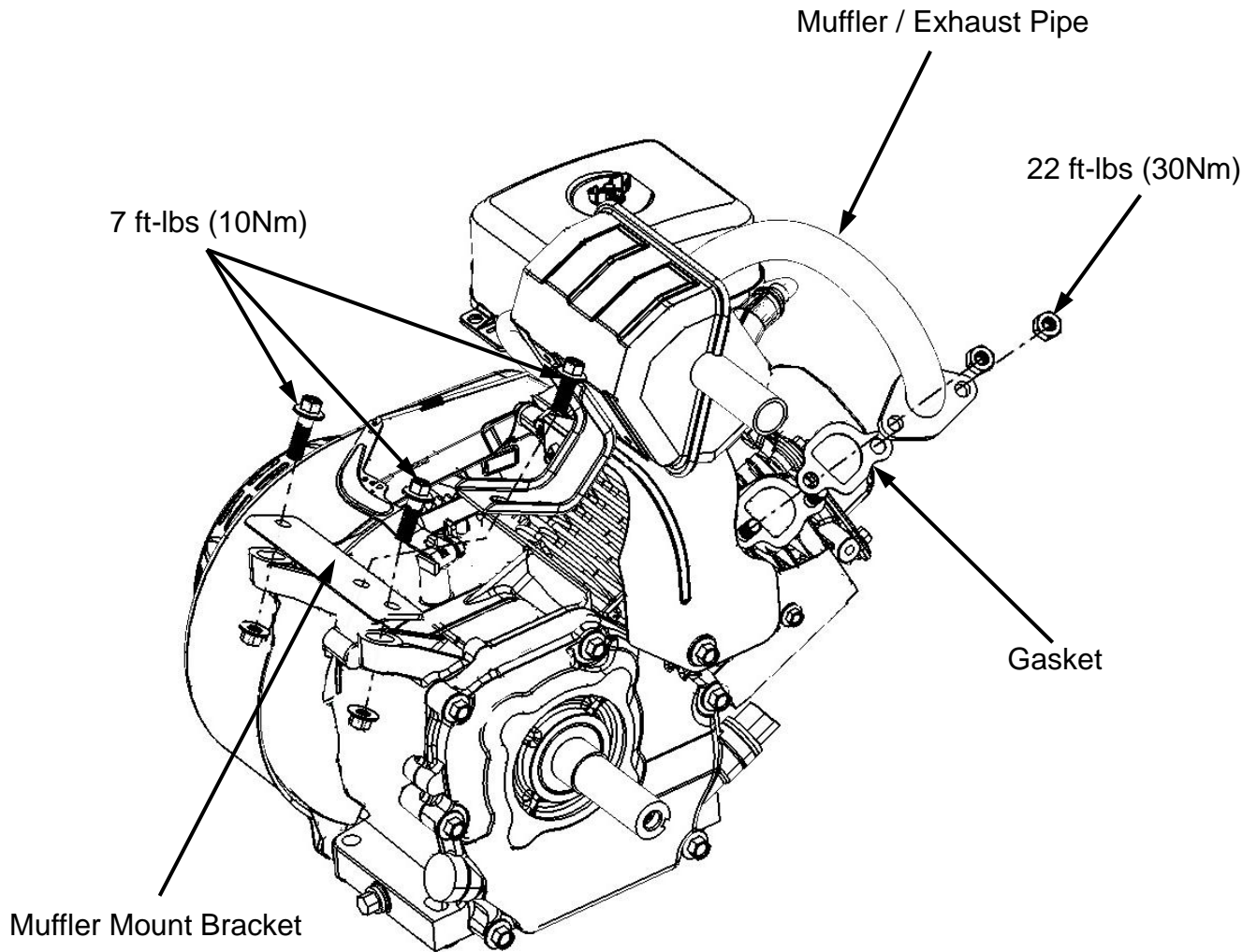
Engine Service – Lower End **24-27**

Crankcase Exploded View and Information	24
Governor Exploded View	25
Piston / Connecting Rod Exploded View and Information	26
Valve Timing	27

NOTE: The only internal parts available for this engine are gaskets and seals.

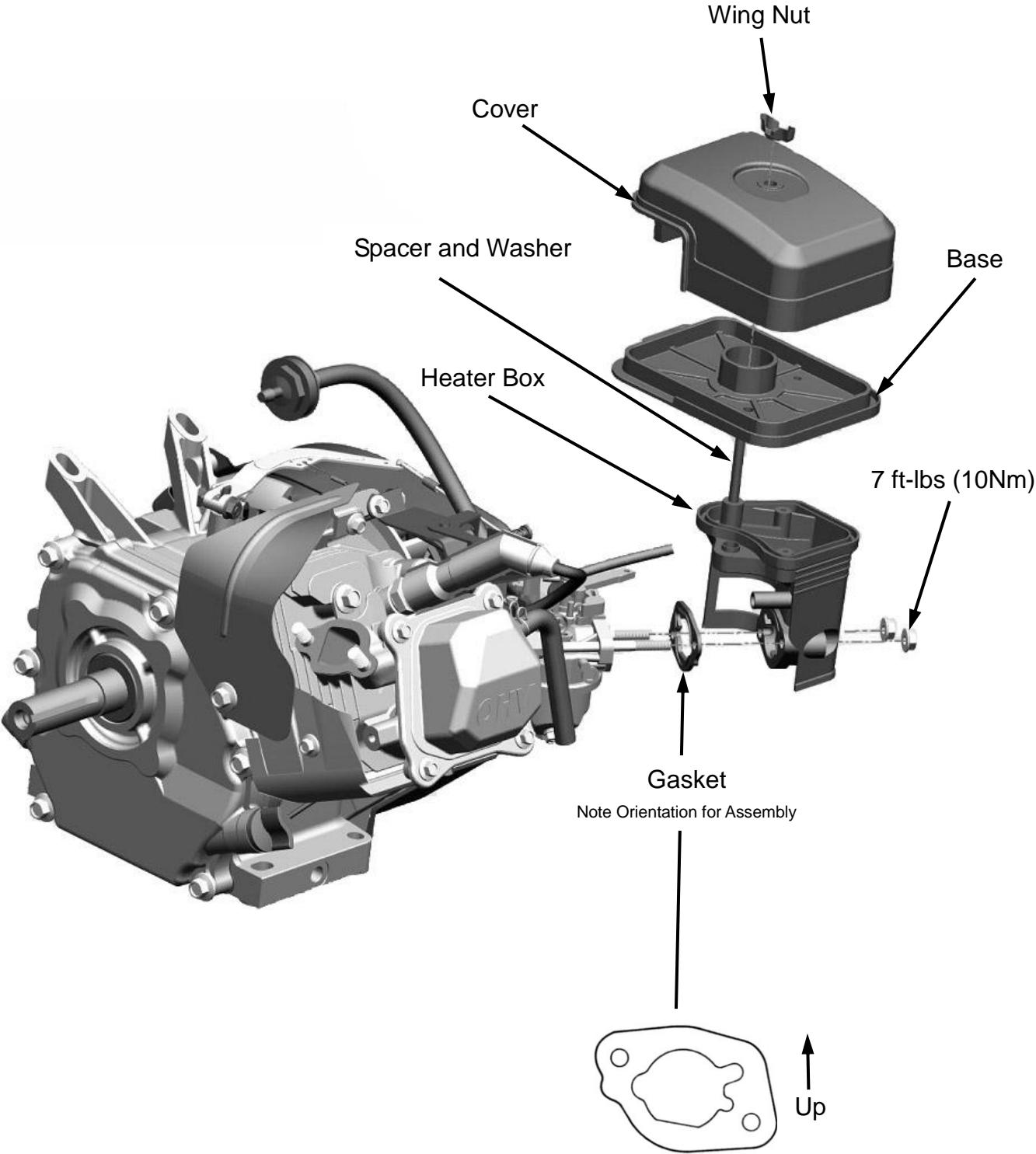
Engine Service – Upper End

Muffler / Heat Shield Exploded View

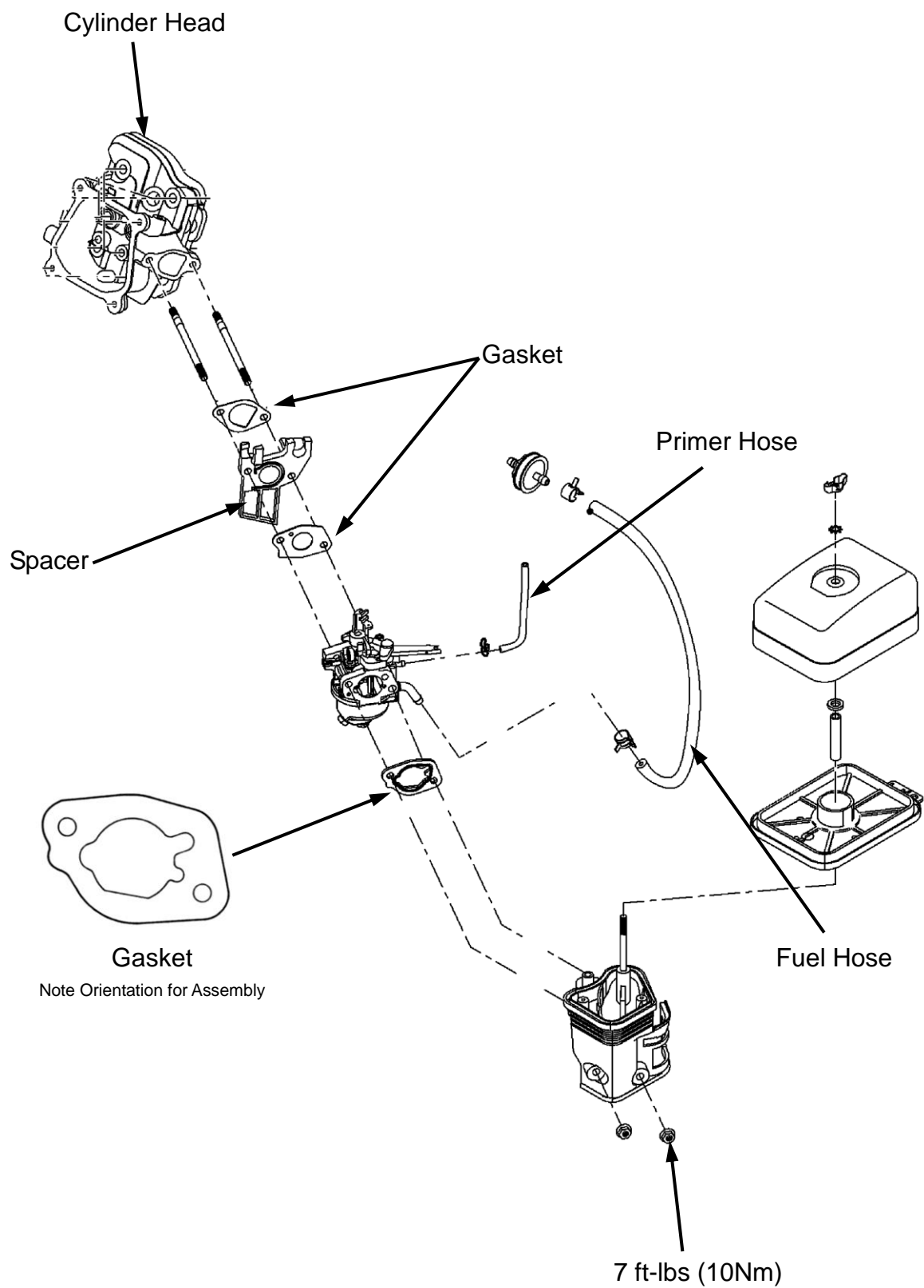


Heater Box Exploded View

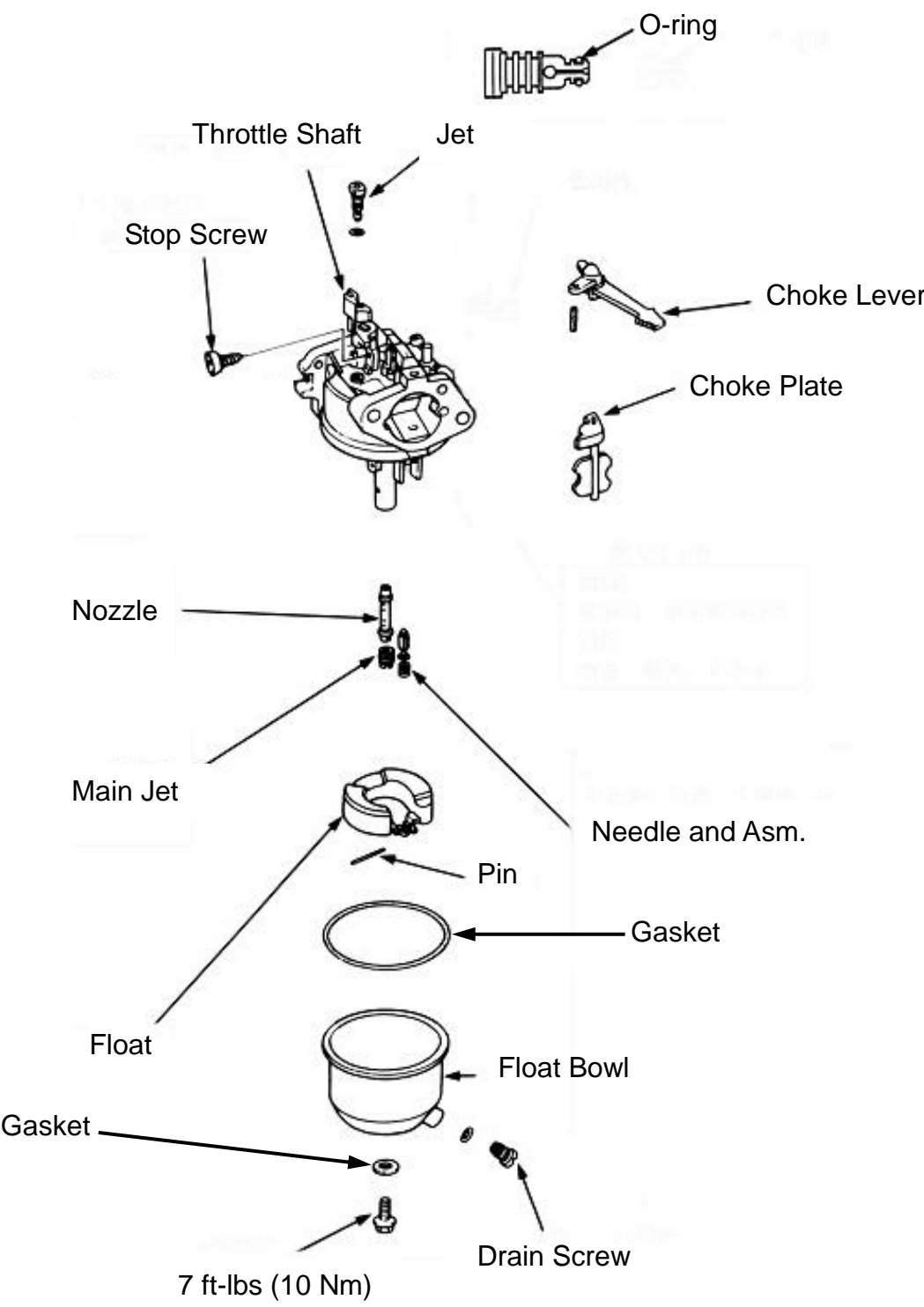
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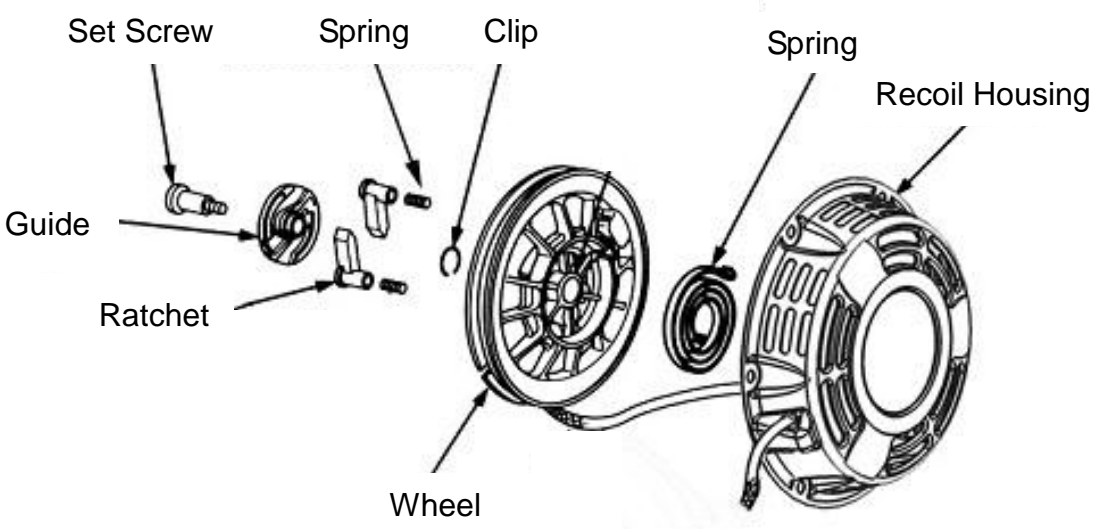
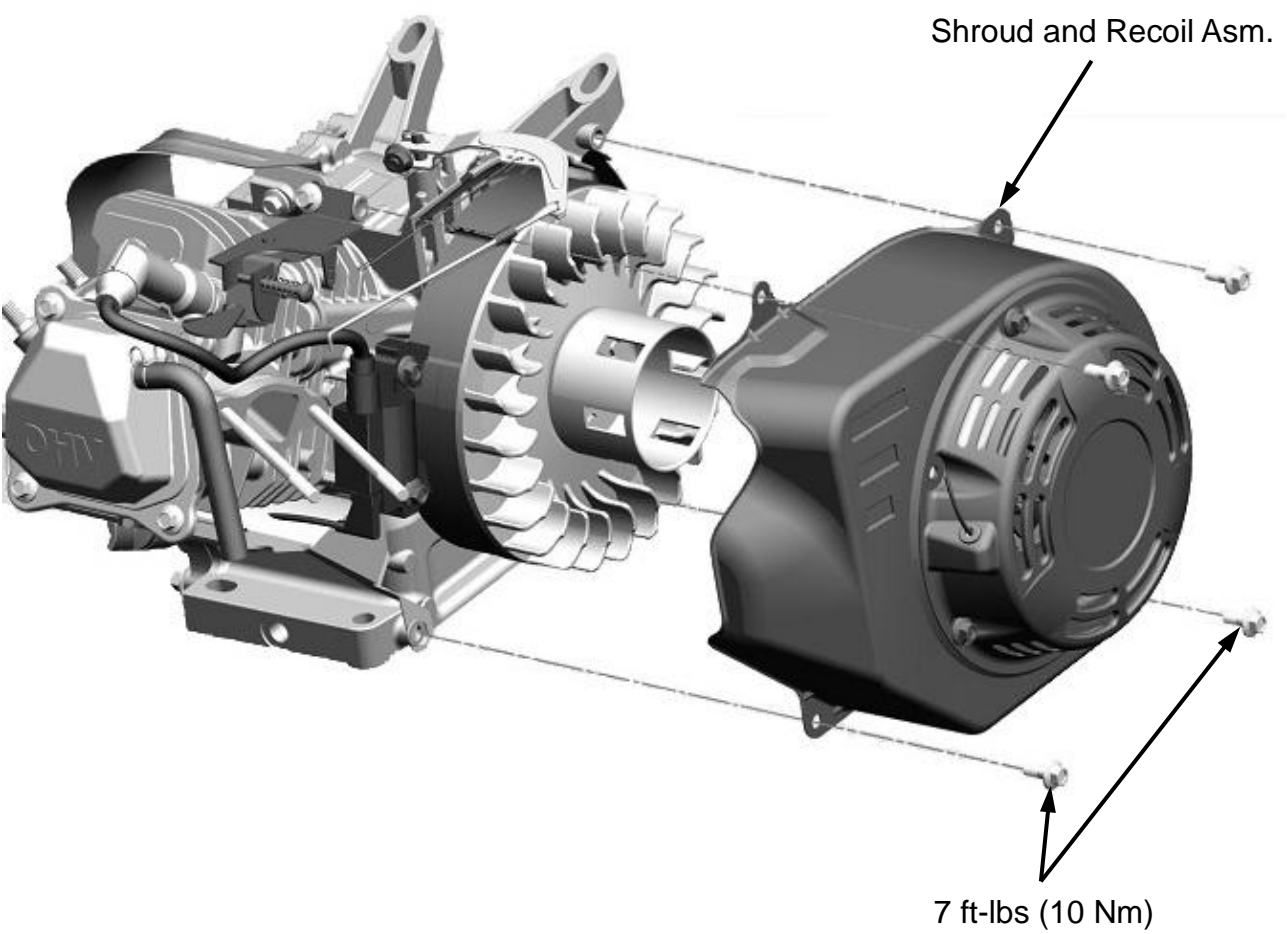
Carburetor Mounting



Carburetor Exploded View



Recoil Asm. Exploded View



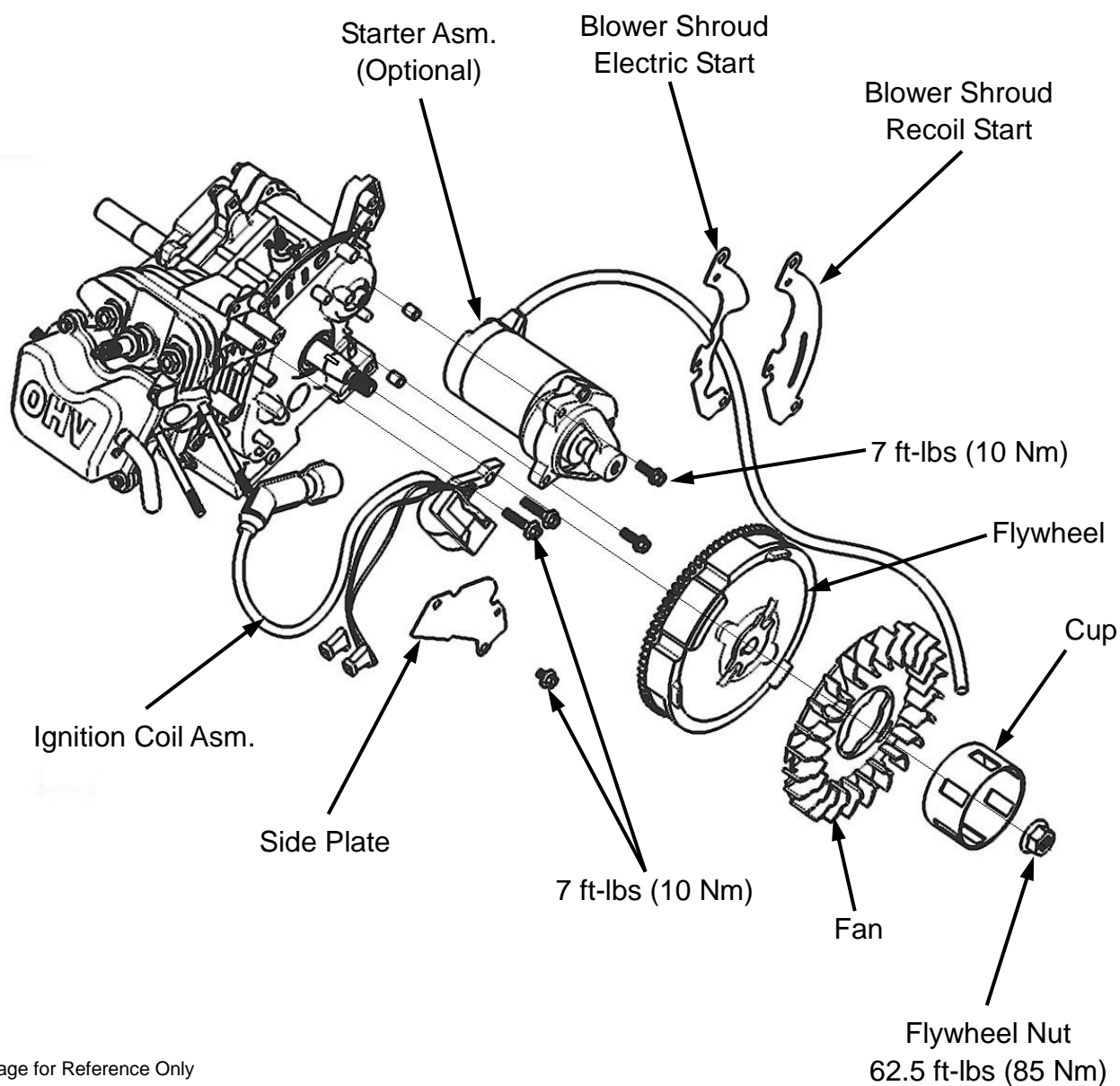


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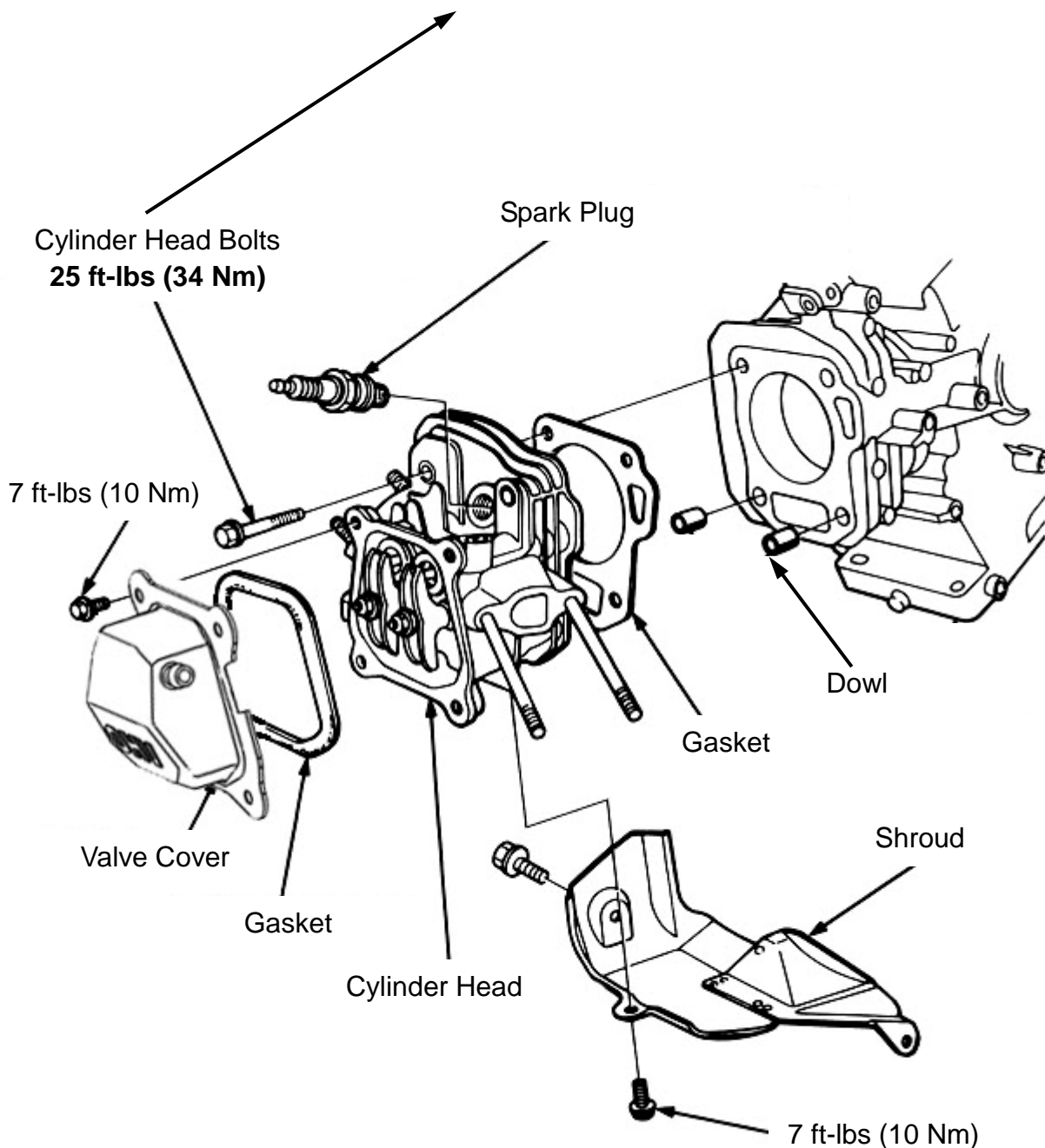
Starter Removal

1. Remove recoil and shroud asm.
2. Remove flywheel with an appropriate puller.
3. Remove the fasteners securing the starter motor to the engine and remove starter asm.

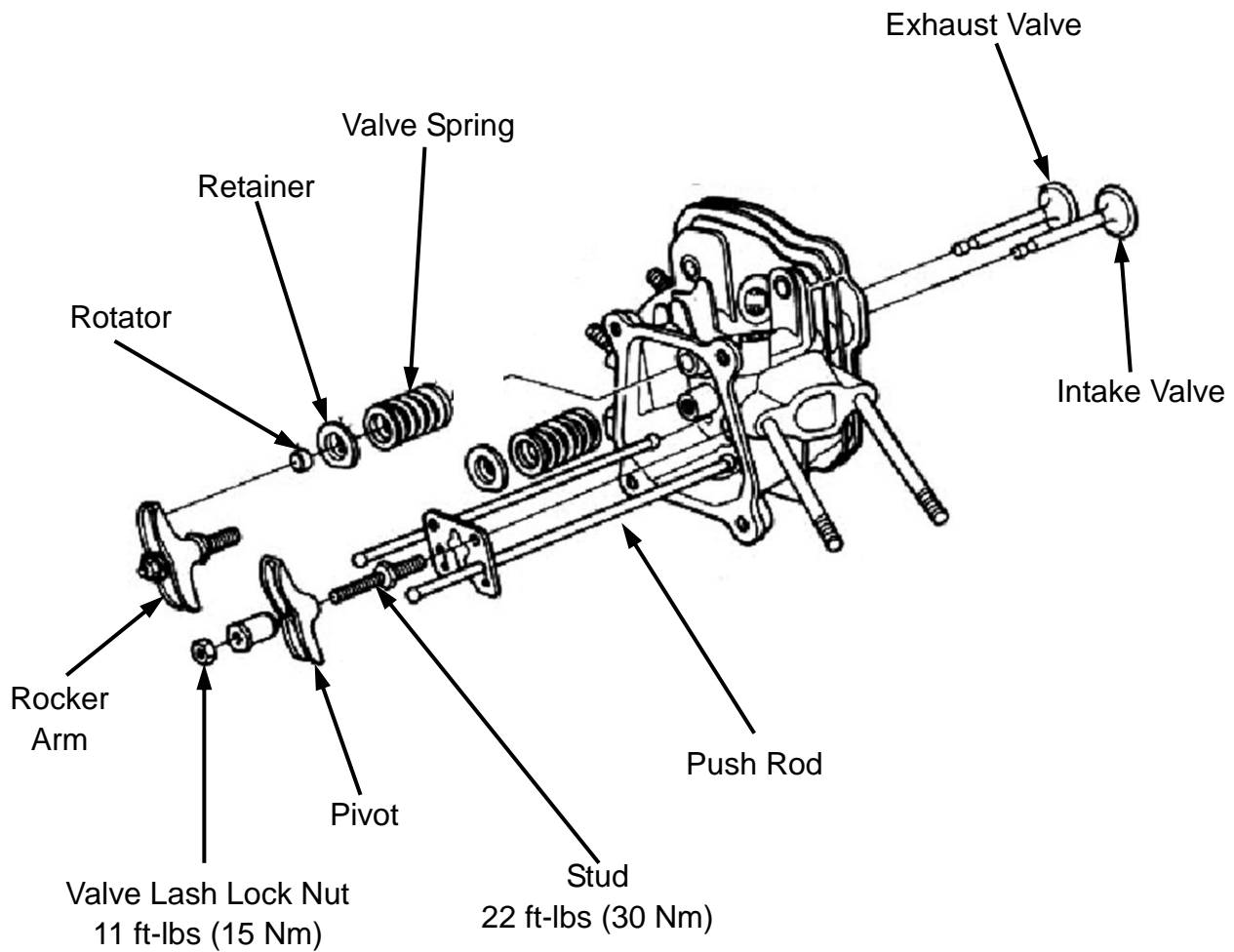
Cylinder Head Exploded View and Service Information

Cylinder Head Bolt Torque Sequence:

1. Initially Torque the (4) Cylinder Head Bolts in a Crisscross Pattern to **10 ft-lbs (14 Nm)**.
2. Evenly Torque the (4) Cylinder Head Bolts in a Crisscross Pattern to **25 ft-lbs (34 Nm)**.



NOTE: The only internal parts available for this engine are gaskets and seals.

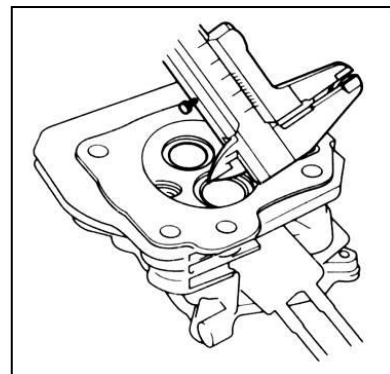


NOTE: The only internal parts available for this engine are gaskets and seals.

Valve Seat Width Inspection

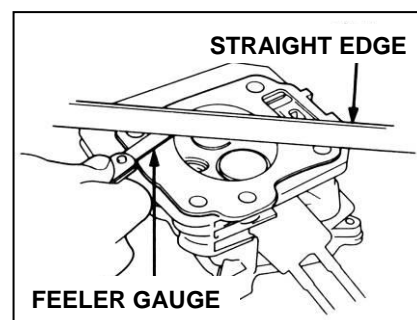
Remove carbon deposits from the combustion chamber. Inspect the valve seats for pitting or other damage.

Standard	Service limit
0.03149" (0.8mm)	0.07874" (2.0mm)



Cylinder Head Warp Inspection

- Remove carbon deposits from the combustion chamber.
- Clean off any gasket material from the cylinder head surface.
- Check the spark plug hole and valve areas for cracks.
- Check the cylinder head for warpage with a straight edge and a feeler gauge as shown.



Service Limit	0.00393" (0.10 mm)
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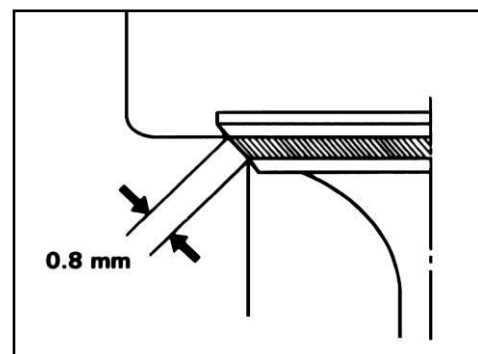
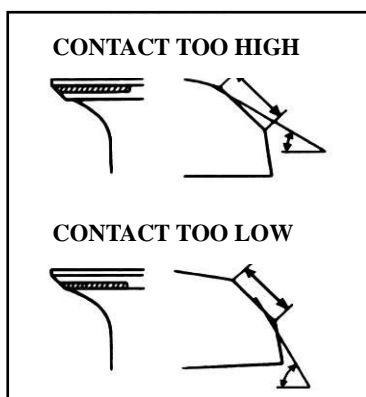
NOTE: If this measurement is out of specification, complete engine replacement is required.
The only internal parts available for this engine are gaskets and seals.

Valve Seat Reconditioning

1. Thoroughly clean the combustion chamber and valve seats to remove carbon deposits.
2. Apply a light coat of Prussian Blue or erasable felt-tipped marker ink to the valve faces.
3. Properly install valves, springs and keepers. Manually open the valves, then and snap them closed against their seats several times. Be sure the valves do not rotate on the seat. Remove the valve assemblies. The transferred marking compound will show any area of the seat that is not concentric.
4. Use a 45°cutter to remove enough material to produce a smooth and concentric seat. Follow the valve seat cutter manufacture's instructions. Turn the cutter clockwise, never counterclockwise. Continue to turn the cutter as you lift it from the valve seat.
5. Use a 30°~32° and 60° cutter to narrow and adjust the valve seat so that it contacts the middle of the valve face. The 30°~32° cutter removes material from the top edge. The 60° cutter removes material from the bottom edge. Be sure that the width of the finished valve seat is within specification.
6. Lap valves in accordance with valve lapping kit instructions.
7. Clean valve and seat of all lapping compound.

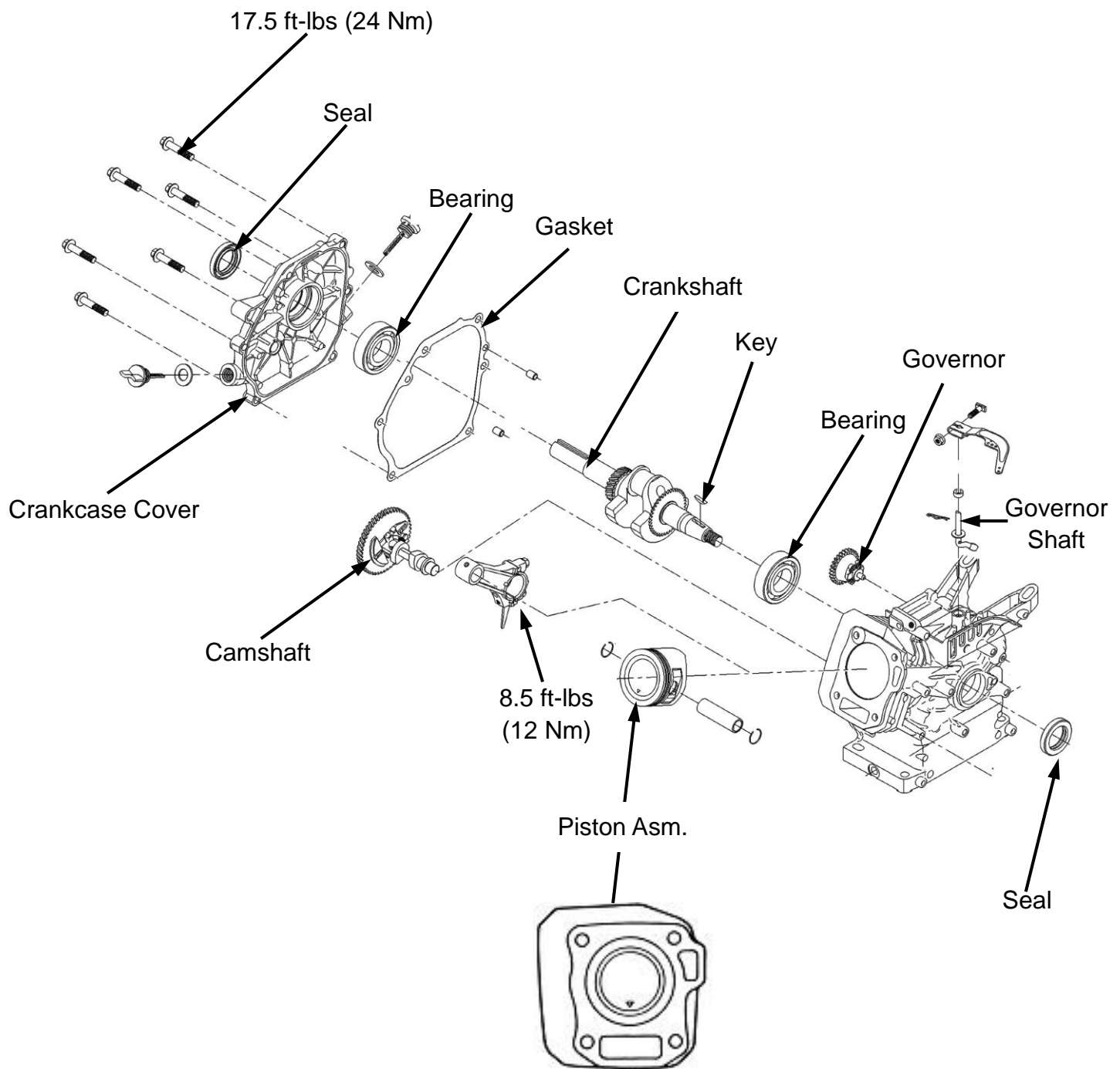
Valve Seat Width

Standard	Service Limit
0.03149" (0.8mm)	0.07874" (2.0mm)



Engine Service – Lower End

Crankcase Exploded View and Service Information

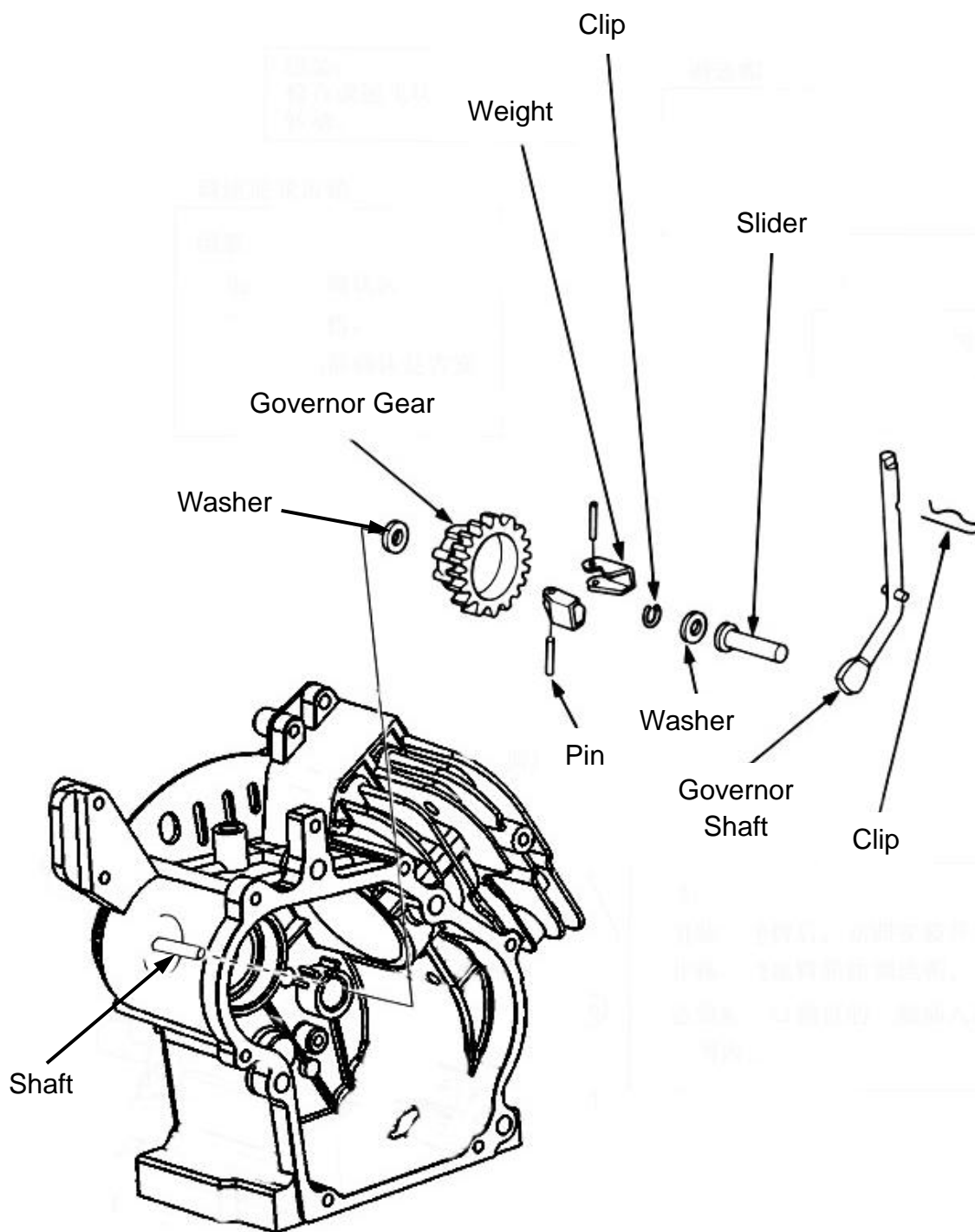


Triangular Mark to Face Down

NOTE: The only internal parts available for this engine are gaskets and seals.

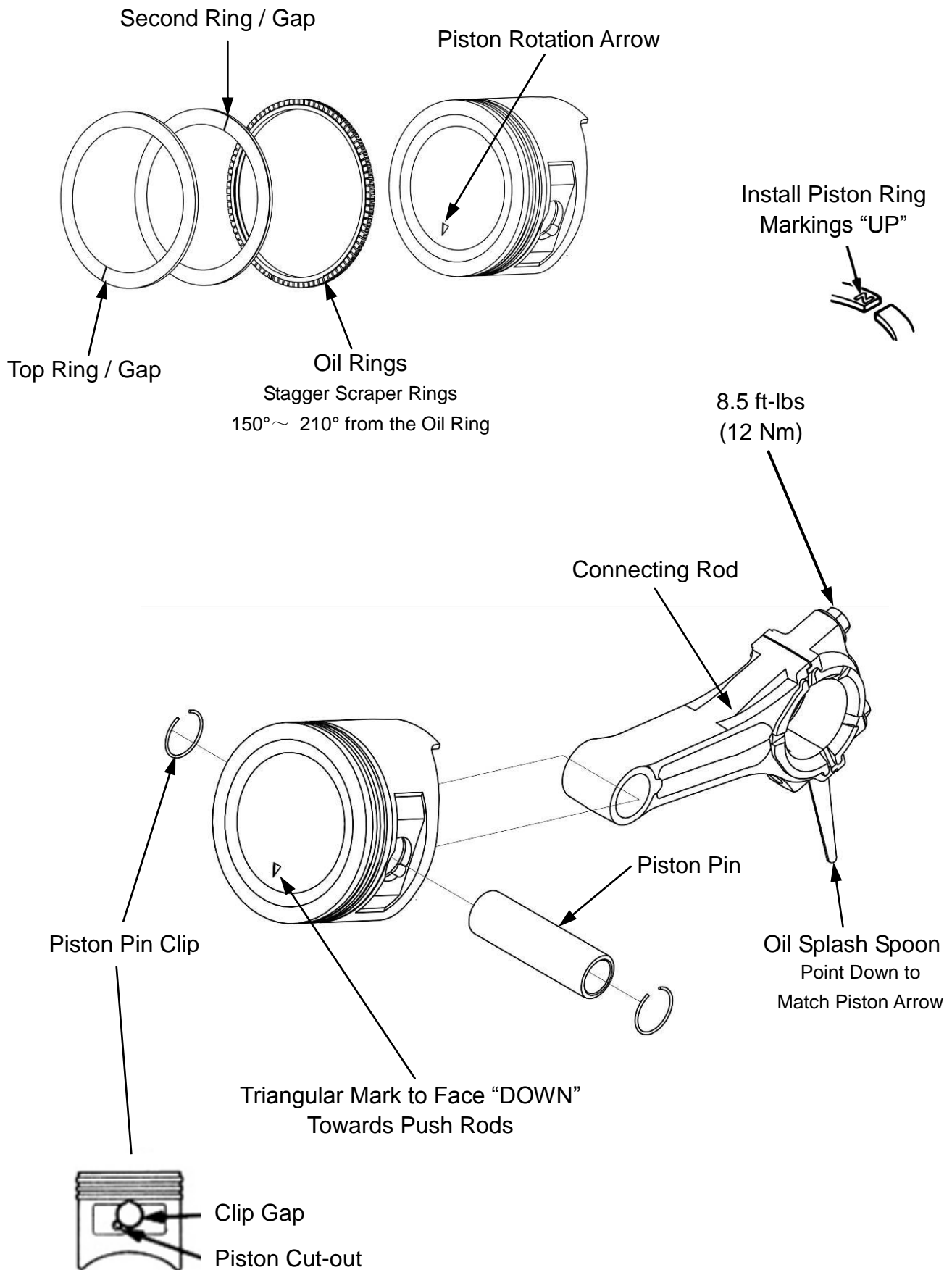
Governor Exploded View

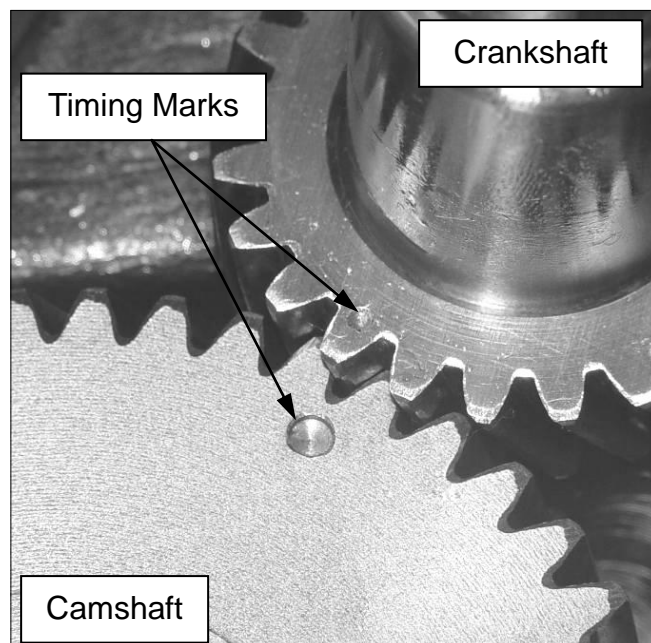
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NOTE: The only internal parts available for this engine are gaskets and seals.

Piston / Connecting Rod Exploded View and Service Information





NOTES:

Chapter 4 – Electrical System Information

4

Ignition Coil Gap Adjustment	31
Ignition Coil Resistance Inspection	32
Spark Testing	32

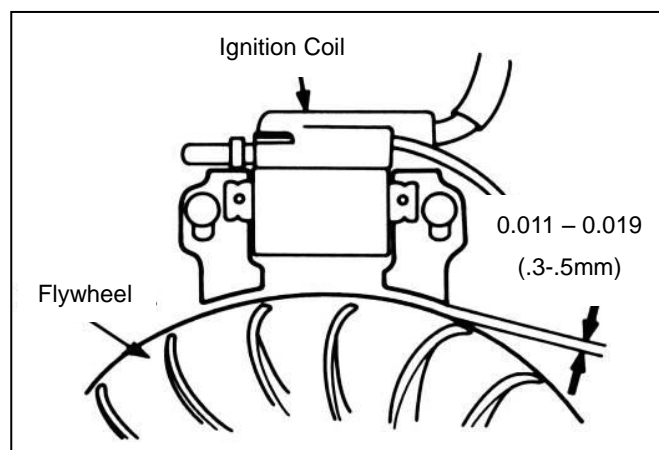
Ignition Coil Gap Adjustment



High Voltage Ignition Systems can be Dangerous - Use Caution when Servicing Ignition Systems

1. Install the ignition coil and lightly tighten the ignition coil mounting bolts.
2. Rotate engine so ignition coil is aligned with the magnet portion of the flywheel.
3. Insert the feeler gauge between the flywheel and coil.
4. Adjust the ignition coil gap at both side of the coil.
5. Torque the ignition coil mounting fasteners to specification - **7 ft-lbs (10 Nm)**

Ignition Coil Gap	0.011- 0.019" (.3-.5 mm)
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Ignition Coil Resistance Inspection

4

Primary Coil

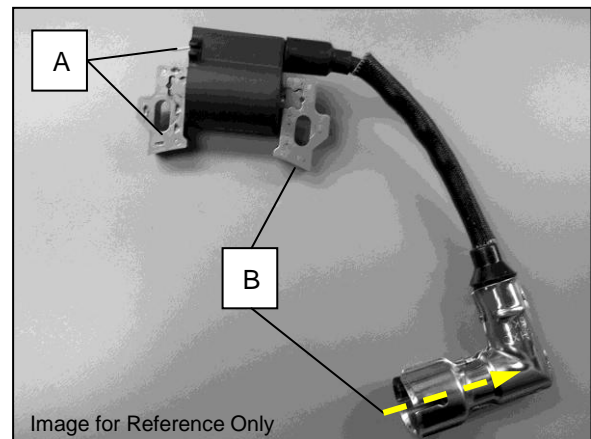
Place Ohm meter leads between the harness connection lead and the exposed metal coil leg.

A - Primary Coil Resistance	1.0-1.6 Ω
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Secondary Coil

Place Ohm meter leads between exposed metal coil leg and the spark plug terminal connection.

B - Secondary Coil Resistance	15.5 K Ω +/- 15%
--------------------------------------	-------------------------



Spark Testing



- **Fuel is Extremely Flammable** - Use Extreme Caution When Servicing the Fuel System
- **High Voltage Ignition Systems can be Dangerous** - Use Caution when Servicing Ignition Systems

1. Remove spark plug boot from the spark plug.
2. Remove the spark plug from the engine.
3. Connect the negative (-) electrode of the spark plug (threaded area) to ground (cylinder head cover).
4. Crank the engine and view the electrode gap. Spark should be present when engine is turning over.
5. Reinstall the spark plug and torque to specification - **22 ft-lbs (30 Nm)**.
6. Properly install the spark plug boot.



RESIDENTIAL PRODUCTS

Form Number: 492-9230