6HP
Petrol Engine
E6.01VEL/LC1P70FC

OWNERS MANUAL

Cox Industries (Aust) Pty Ltd www.coxmowers.com.au

PREFACE

This manual covers construction, function and servicing procedures of the Loncin LC1P61FA, LC1P65FA, LC1P70F, LC1P68FA, LC1P70FA gasoline engine. Careful observance of the instruction given herein will result in better, safer service work.

Due to product improving, we can change specification without prior to notice.

LONCIN INDUSTRIES LTD.

CONTENS

1. Service information

1

1.1 General safety

Pay attention to these symbols and their meaning:

WARNING: Indicates a strong possibility of severe personal injury or loss of life if instructions are not followed.

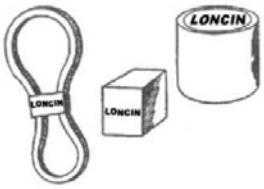
CAUTION: Indicates a possibility of personal injury or equipment damage if instructions are not followed.

WARNING

- Stop the engine before servicing, first stop the engine, and remove the spark plug.
- When the engine is running, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas.
- Don't smoke or fire on operation site due to gasoline extremely flammable and explosive under certain conditions.
- Don't close to revolved or overheat parts or high voltage lead when running.
- Don't maintain until the engine is cooled. Otherwise, burn can happen in the hot state of engine.

1.2 Service rules

1. Use genuine LONCIN or LONCIN-recommended parts and lubrication oil. Parts that don't meet LONCIN's design specifications may damage the device or engine.

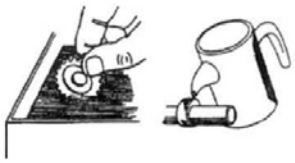


2. Use the special tools designed for this unit.

3. Install new paper gaskets, O-ring when reassembling.

4. When screwing bolts or nuts, begin with larger-diameter inner bolt first, and tighten to the specified torque diagonally unless a particular sequence is specified.

5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.



6. After reassembly, check all parts for proper installation and operation.

Follow the instructions represented by these symbols when maintaining:

: Used oil 

: Used special tool 

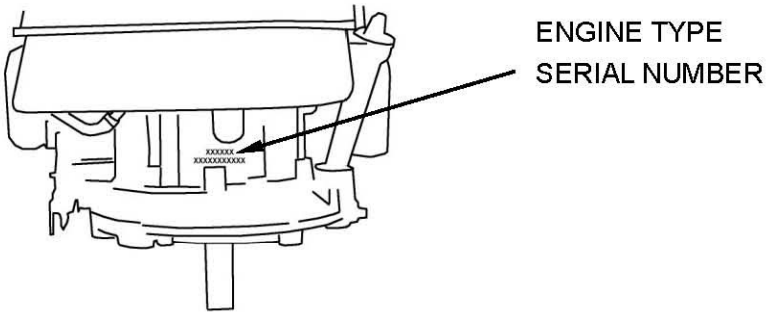
: Used grease

○×○(○): Indicates flange bolt model, length and quantity.

P. : Indicates pages

1.3 Serial number location

The serial number on stamped on the crankcase, as shown on the following drawing when inquiring about engine or ordering parts in order to get correct parts for the unit being serviced by LONCIN INDUSTRIAL CO., Ltd's dealer



1.4 Torque values

Note: For

Item	Screw Thread	Torque (N·m)
cylinder head bolt	M8×1.25	24
connecting rod bolt	M7×1.0	12
flywheel nut	M14×1. 5 special nut)	70-80
Pivot Adjusting Nut	M6×0.5 (special nut)	10
Pivot arm bolt	M8×1.25	24
crankcase cover bolt	M6×1.0	12
	M8×1.25	24
Muffler nut	M6×1.0	9
air cleaner nut	M6×1.0	8.5
Recoil (fan cover) nut	M6×1.0	8.5
oil drain bolt	M10×1.25	18
fuel tank bolt/nut	M6×1.0	10
Governor arm pinch nut	M6×1.0	10
standard torque value	M5 bolt, nut	5.5
	M6 bolt nut	10
	M8 bolt nut	22
	M10 bolt nut	35
	M12	55

unspecified bolts and nuts listed above, refer to the table of standard torque values.

1.5 Maintenance standards

Unspecified unit: mm。 **1P61FA /1P65FA**

Part	Item	Standard		Service Limit	
		1P61FA	1P65FA	1P61FA	1P65FA
Engine	idle speed	1800±150	1800±150	—	—
	compression pressure(kg/cm^2) *	6.0-8.5	6.0-8.5	—	—
cylinder head	Warpage	—	—	0.10	0.10
cylinder	Sleeve (inside diameter)	61.0	65.0	61.165	65.165
piston	skirt outside diameter	60.985	64.985	60.845	64.845
	Clearance to cylinder	0.015-0.05	0.015-0.05	0.12	0.12
	Piston pin bore inside diameter	13.002	13.002	13.048	13.048
	piston – pin clearance	0.002-0.014	0.002-0.014	0.08	0.08
piston pin	Outside diameter	13.0	13.0	12.954	12.954
piston ring	Side clearance (top/ the second)	0.015-0.045	0.015-0.045	0.15	0.15
	End gap (top/ the second)	0.2-0.4	0.2-0.4	1.0	1.0
	Width (top/ second/	1.5	1.5	1.37	1.37
	width (oil ring)	2.5	2.5	2.37	2.37
connecting rod	small end inside diameter	13.02	13.02	13.07	13.07
	big end inside diameter	26.02	26.02	26.07	26.07
	big end oil clearance	0.04-0.063	0.04-0.063	0.12	0.12
	big end side clearance	0.1-0.7	0.1-0.7	1.1	1.1
crankshaft	Crackpin outside diameter	25.98	25.98	25.92	25.92
valve	Clearance(cold) (intake)	0.10+0.02	0.10+0.02	—	—
	Clearance(cold) (exhaust)	0. 15+0.02	0. 15+0.02	—	—
	Stem diameter (intake)	5.48	5.48	5.318	5.318
	Stem diameter (exhaust)	5.44	5.44	5.275	5.275
Valve guide	Inside diameter (intake, exhaust)	5.50	5.50	5.572	5.572
	Stem to guide clearance (intake)	0.01-0.034	0.01-0.034	0.10	0.10
	Stem to guide clearance exhaust)	0.05-0.070	0.05-0.070	0.12	0.12
Valve seat	Seat width	0.8	0.8	2.0	2.0
Valve spring	free length	30.5	30.5	29.0	29.0
Cam shaft	height (intake)	27.7	27.7	27.45	27.45
	height (exhaust)	27.75	27.75	27.50	27.50
	Outside diameter (bearing)	13.984	13.984	13.916	13.916
crankcase cover	hole inside diameter	14.0	14.0	14.048	14.048
spark plug	gap	0.7-0.8	0.7-0.8	—	—
igniter coils	resistance (primary)	0.8-1.0Ω	0.8-1.0Ω	—	—
	resistance (secondary)	5.9-7.1Ω	5.9-7.1Ω	—	—
	gap to flywheel	0.4±0.2	0.4±0.2	—	—

- value at the speed 600rpm of the engine.

Unspecified unit: mm。 **1P68FA /1P70F/1P70FA**

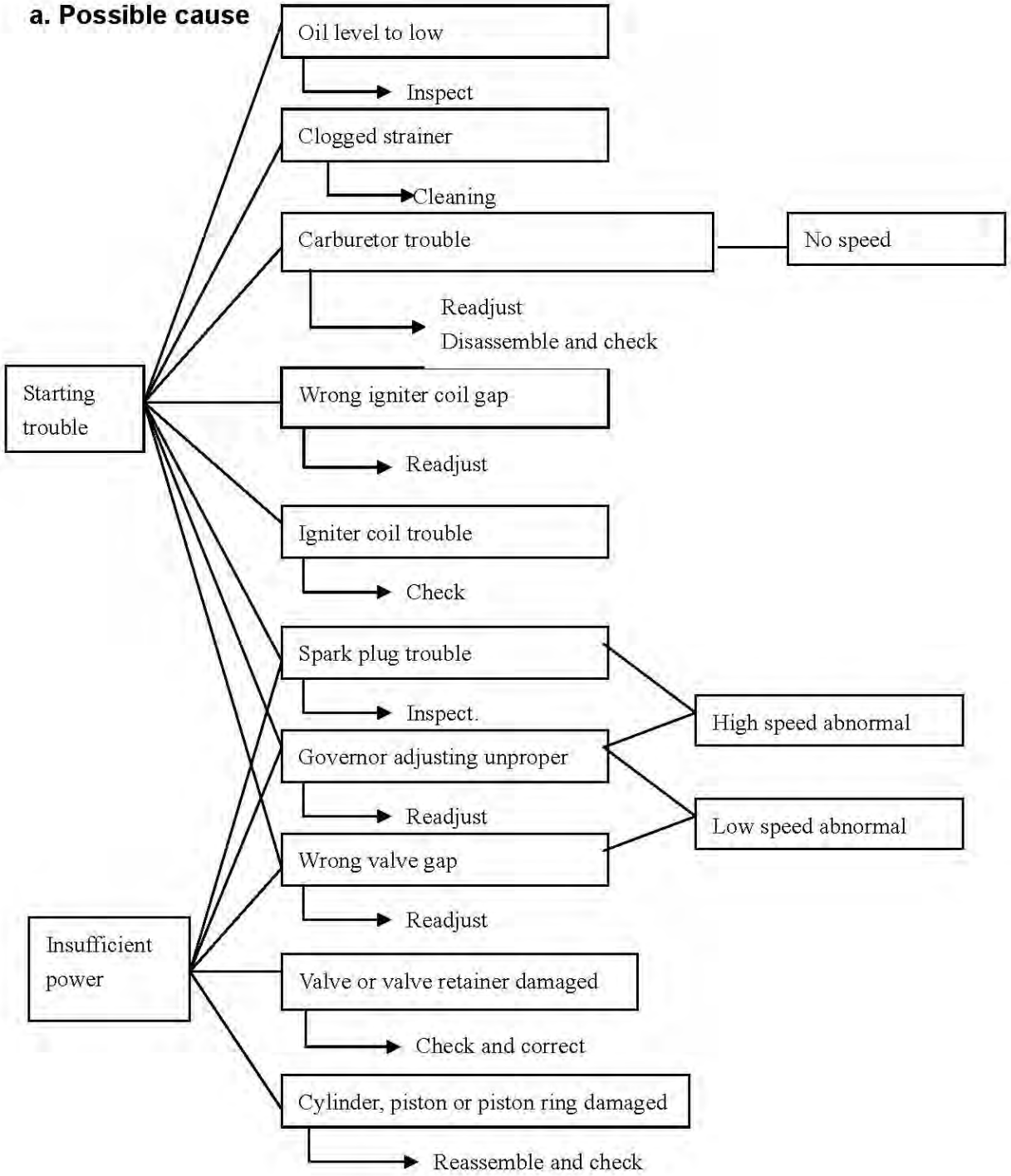
Part	Item	Standard			Service Limit		
		1P68FA	1P70F	1P70FA	1P68FA	1P70F	1P70FA
Engine	idle speed	1800±150	1800±150	1800±150	—		—
	compression pressure(kg/cm^2) *	6.0-8.5	6.0-8.5	6.0-8.5	—		—
cylinder head	Warpage	—	—	—	0.10	0.10	0.10
cylinder	Sleeve (inside diameter)	68.0	70.0	70.0	68.165	70.165	70.165
piston	skirt outside diameter	67.985	69.985	69.985	67.845	69.845	69.845
	Clearance to cylinder	0.015-0.05	0.015-0.05	0.015-0.05	0.12	0.12	0.12
	Piston pin bore inside diameter	18.002	18.002	18.002	18.048	18.048	18.048
	piston – pin clearance	0.002-0.014	0.002-0.014	0.002-0.014	0.08	0.08	0.08
piston pin	Outside diameter	18.0	18.0	18.0	17.954	17.954	17.954
piston ring	Side clearance (top/ the second)	0.015-0.045	0.015-0.045	0.015-0.045	0.15	0.15	0.15
	End gap (top/ the second)	0.2-0.4	0.2-0.4	0.2-0.4	1.0	1.0	1.0
	Width (top/ second/	1.5	1.5	1.5	1.37	1.37	1.37
	width (oil ring)	2.5	2.5	2.5	2.37	2.37	2.37
connecting rod	small end inside diameter	18.005	18.005	18.005	18.052	18.052	18.052
	big end inside diameter	30.02	30.02	30.02	30.07	30.07	30.07
	big end oil clearance	0.04-0.063	0.04-0.063	0.04-0.063	0.12	0.12	0.12
	big end side clearance	0.1-0.7	0.1-0.7	0.1-0.7	1.1	1.1	1.1
crankshaft	Crackpin outside diameter	29.98	29.98	29.98	29.92	29.92	29.92
valve	Clearance(cold) (intake)	0.10+0.02	0.10+0.02	0.10+0.02	—	—	—
	Clearance(cold) (exhaust)	0. 15+0.02	0. 15+0.02	0. 15+0.02	—	—	—
	Stem diameter (intake)	5.48	5.48	5.48	5.318	5.318	5.318
	Stem diameter (exhaust)	5.44	5.44	5.44	5.275	5.275	5.275
Valve guide	Inside diameter (intake, exhaust)	5.50	5.50	5.50	5.572	5.572	5.572
	Stem to guide clearance (intake)	0.02-0.044	0.02-0.044	0.02-0.044	0.10	0.10	0.10
	Stem to guide clearance exhaust)	0.06-0.087	0.06-0.087	0.06-0.087	0.13	0.13	0.13
Valve seat	Seat width	0.8	0.8	0.8	2.0	2.0	2.0
Valve spring	free length	34.0	34.0	34.0	32.5	32.5	32.5
Cam shaft	height (intake)	27.7	27.7	27.7	27.45	27.45	27.45
	height (exhaust)	27.75	27.75	27.75	27.50	27.50	27.50
	Outside diameter (bearing)	13.984	13.984	13.984	13.916	13.916	13.916
crankcase cover	hole inside diameter	14.0	14.0	14.0	14.048	14.048	14.048
spark plug	gap	0.7-0.8	0.7-0.8	0.7-0.8	—	—	—

igniter coils	resistance (primary)	0.8-1.0Ω	0.8-1.0Ω	0.8-1.0Ω	—	—	—
	resistance (secondary)	5.9-7.1Ω	5.9-7.1Ω	5.9-7.1Ω	—	—	—
	gap to flywheel	0.4±0.2	0.4±0.2	0.4±0.2	—	—	—

- value at the speed 600rpm of the engine.

1.6 Troubleshooting

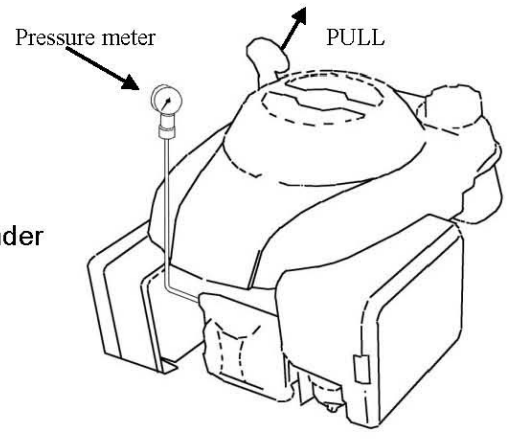
a. Possible cause



b. Starting trouble

1. First, check fuel level
   - No fuel → Add fuel and restart
   - Have fuel
2. Check oil level
   - Oil level low → Add oil to high oil lever
   - Oil level normal
3. Reassemble spark plug and check electrode
   - Dry → Check oil tube or filter clogged. Check carburetor, nozzle tube clogged.
   - Wet → Wash electrode, and check throttle open.
4. Put the spark plug on the cap, connect electrode to grounding then, pull the starter and check igniting.
   - No or weak spark → Replace new spark plug, recheck the igniting state. Check high voltage lead if switching off or broken or creepaging. Check igniter coils.
   - Good spark
5. Inspecting cylinder pressure: Put the pressure meter on the spark plug hole and pull starter, check pressure.
   - Pressure insufficient. → Check valve gap if correct. Check cylinder cover if tightened. Check combustion chamber if damaged. Check pad, valve or valve retainer
6. Assemble spark plug correct, restart engine to test.

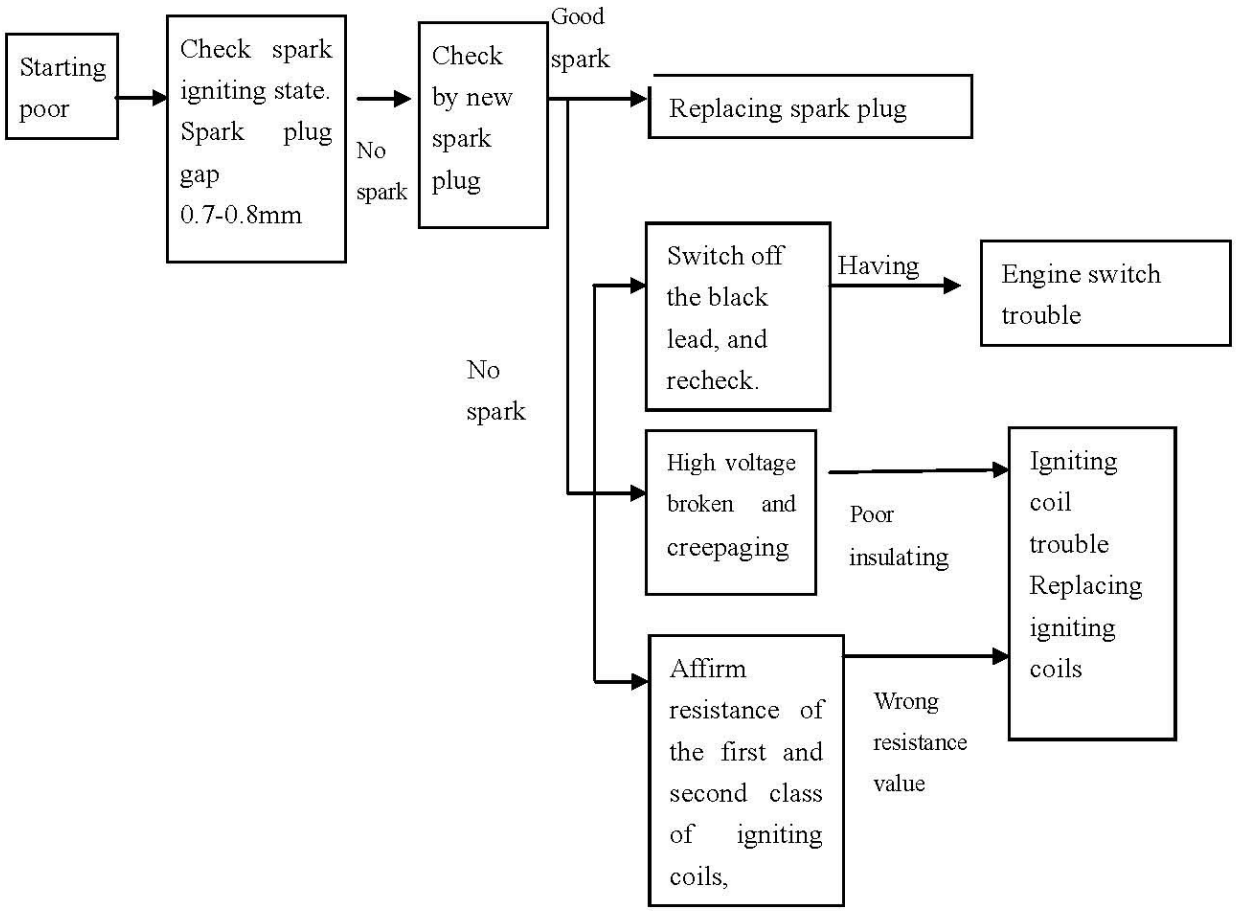
Check cylinder pressure



1) Disassemble spark plug cap and spark plug.
2) Assemble pressure meter in the spark plug hole.
3) Pull recoil starter several times to measure cylinder pressure

Cylinder pressure	At 600rpm, 6.0-8.5 Kgf/cm^2

c. Starting poor



Checking spark

1) Remove spark plug

2) Put the spark plug on the spark cap

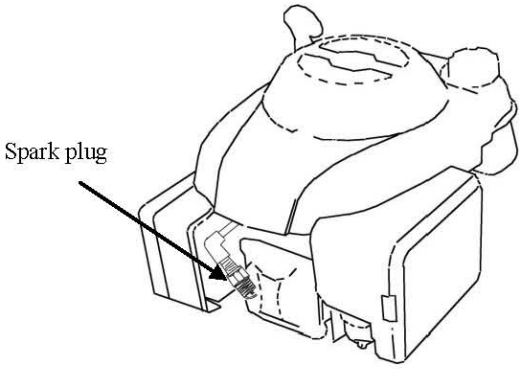
3) Connect （－) electrode of the spark plug（thread）to grounding, pull starter to check if there is spark at the electrode joint.

⚠ WARNING

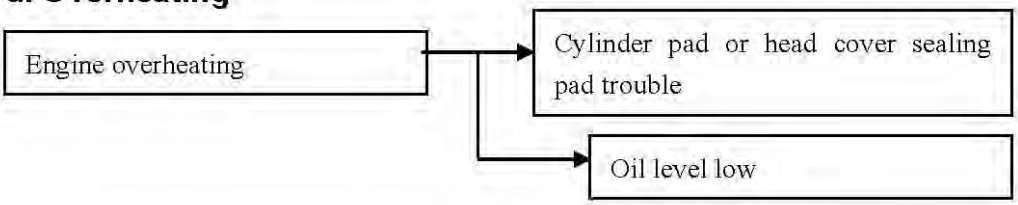
Don't grape spark terminal by wet hand when testing.

If touching the high voltage line by wet hand, pulling starter can produce high voltage electric, being danger.

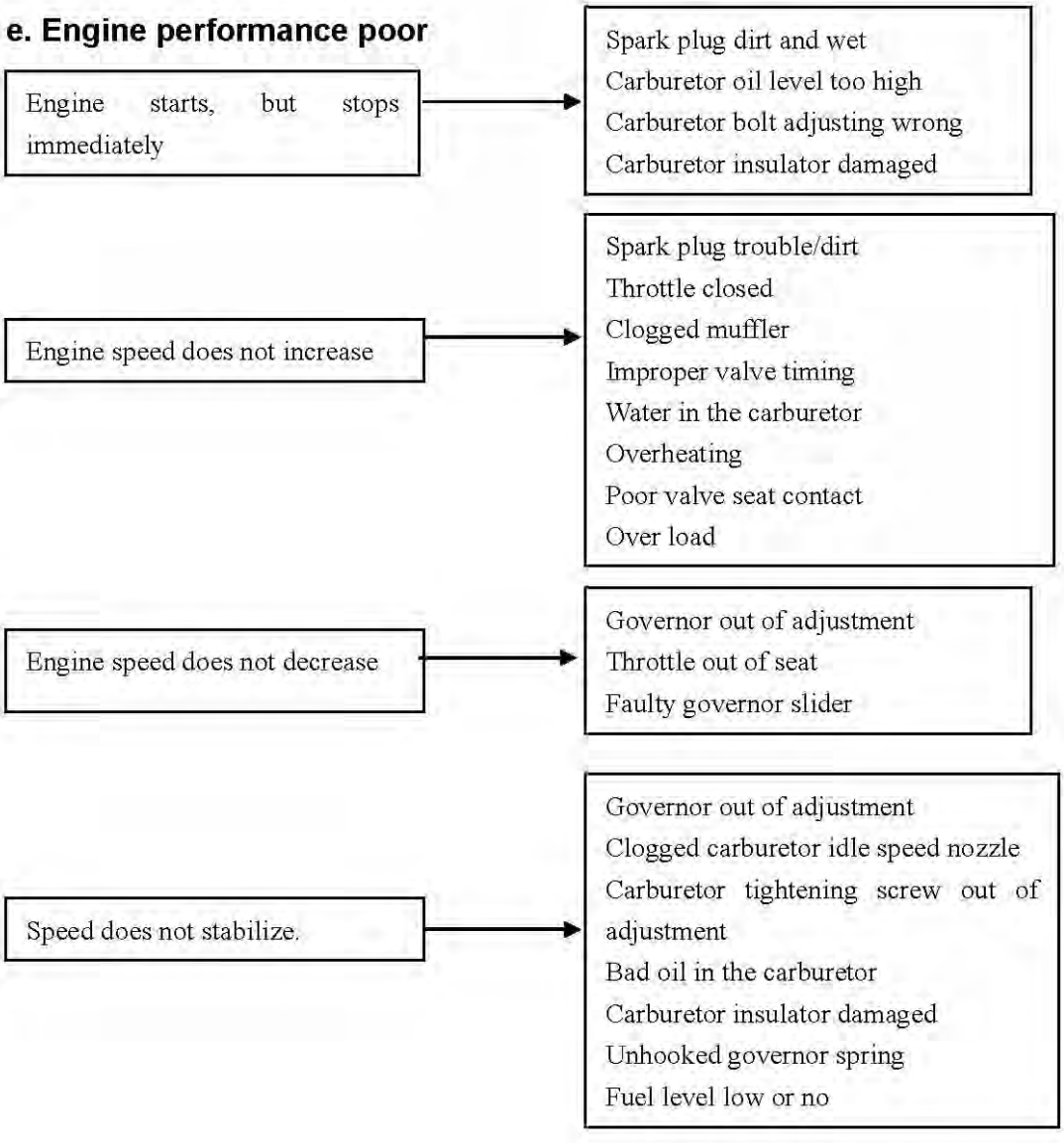
Sprinkled fuel can cause fire around the spark plug. First, clean the fuel, then check. When checking, keep far away from the spark plug hole.



d. Overheating



e. Engine performance poor



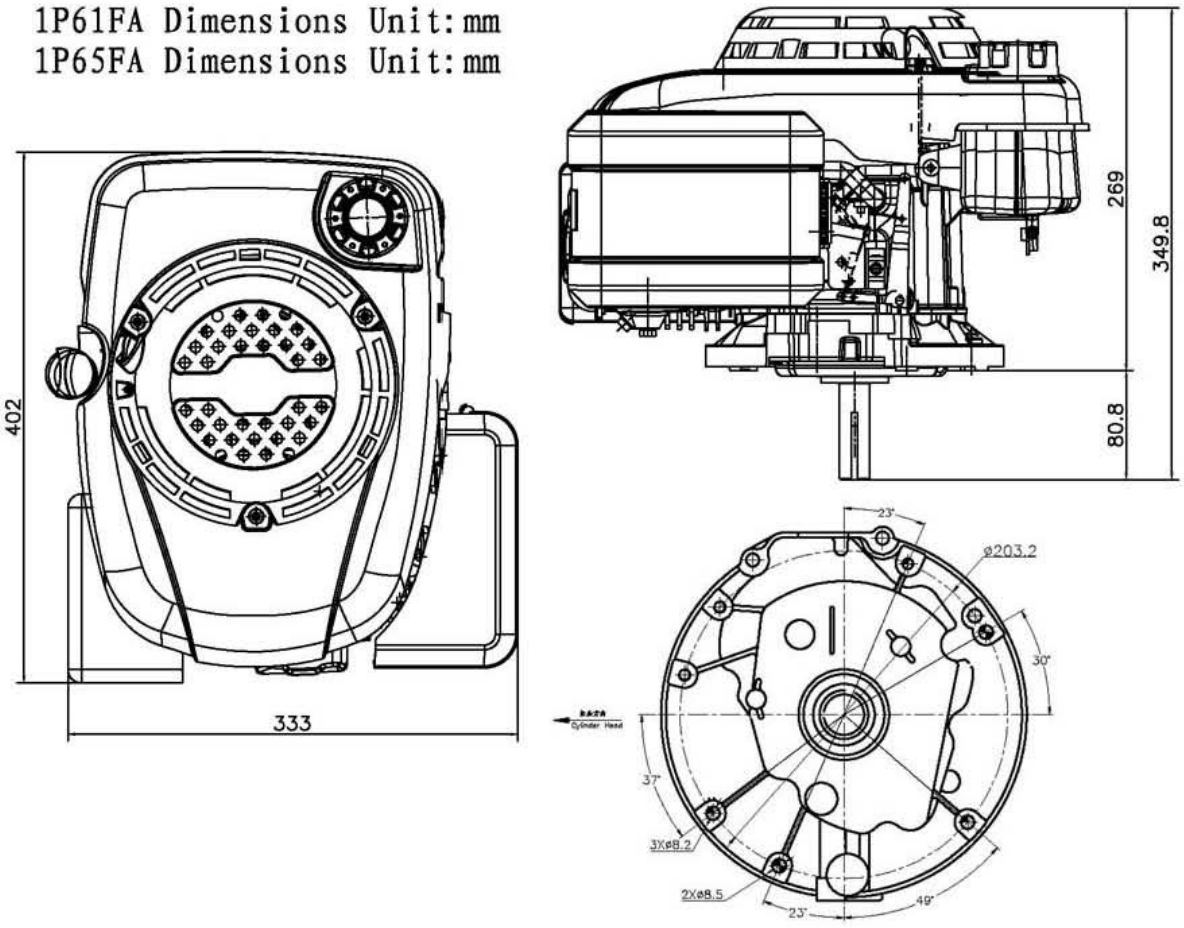
2. Specifications

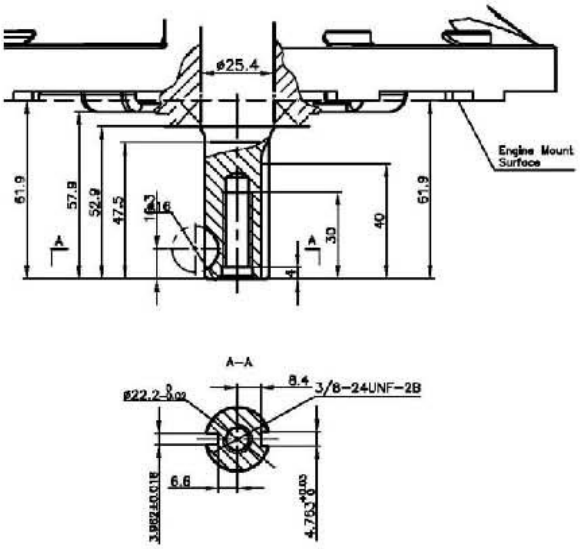
2.1 Specifications

Model	1P61FA	1P65FA	1P68FA	1P70F	1P70FA
Type	Single cylinder, 4-Stroke, Forced Air Cooling, OHV				
Max. power(kW/3600rpm)	2.9	3.7	4.2	4.0	4.4
Max. torque (N·m/rpm)	7.5/2500	8.8/2500	10.4/2500	9.8/2500	11.0/2500
Fuel consumption (g/kW·h)	≤395				
Idle speed	1800±150 rpm				
Bore X Stroke(mm)	61×48	65×48	68×51	70x45	70×51
Displacement(cc)	140	159	185	173	196
Compression Ratio	8 :1				
Lubricating mode	Splash				
Starting Mode	Recoil start				
Rotation	Anti-clockwise(from P.T.O. side)				
Valve Clearance	input valve： 0.10±0.02mm, output valve：0.15±0.02mm				
Spark plug clearance	0.7~0.8mm				
Igniting Mode	Transistorized magneto Ignition				
Air cleaner	2-stage				
Dimension(L×W×H)(mm)	430×380×380		470*390*380		
Net weight (kg)	12.5	12.0	13.4	13.7	13.0

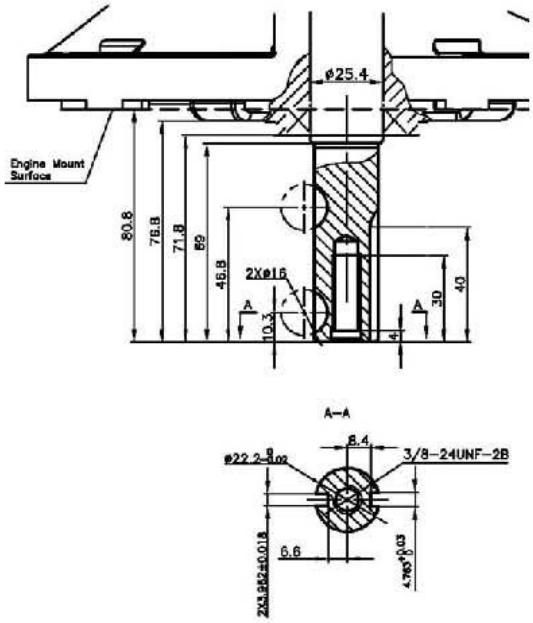
2.2 Dimensional drawings

1P61FA Dimensions Unit: mm
1P65FA Dimensions Unit: mm



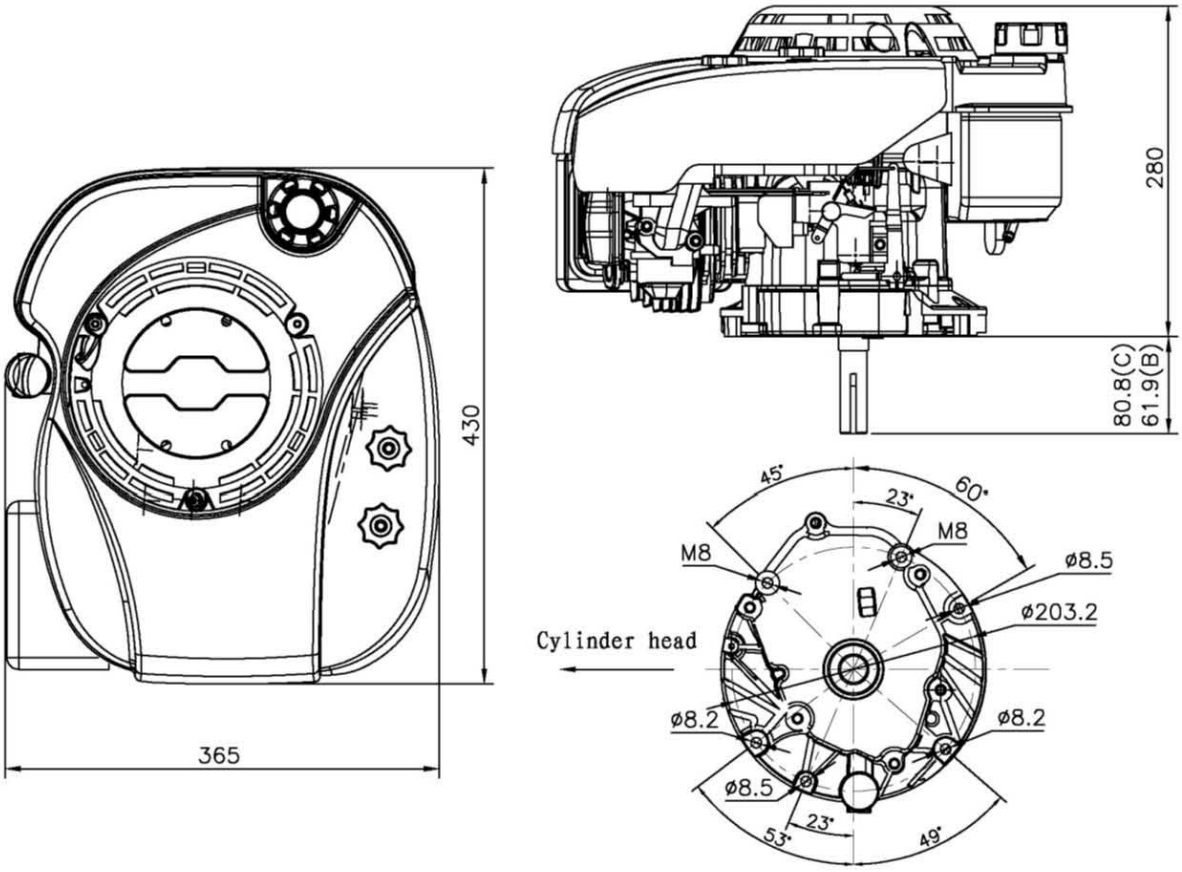


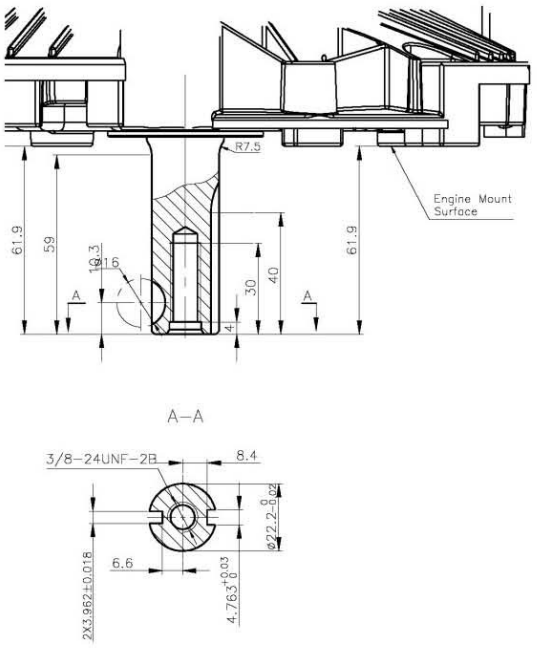
B—type



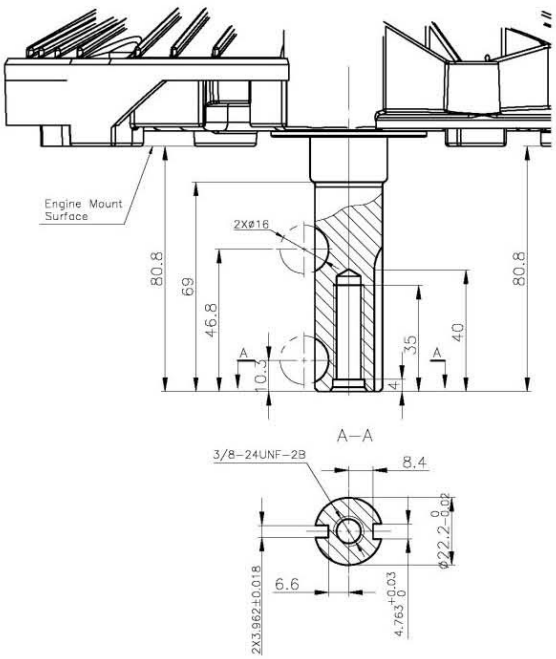
C—type

1P70F/1P68FA/1P70FA unit: mm





B–type



C–type

3 Maintenance

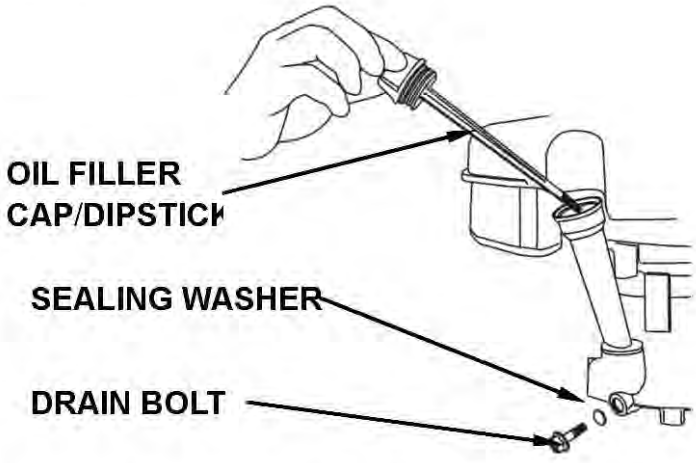
3.1 Maintenance schedule

Maintenance schedule		Each Use	First 1 month or 5 hours	Every 3 months or 25 hours	Every 6 months or 50 hours	Every year or 100 hours
Engine oil	Oil level	○				
	replace		○		○	
Air cleaner element	Check	○				
	Clean			○(1)		
	replace					○(2)
Flywheel brake operation	check			○		
Flywheel brake pad	check				○	
	adjust				○	
Spark plug	Clean-adjust				○	
	Replace					○
Valve clearance	Check-adjust					○
Combustion chamber	clean					○
Fuel tank and filter	Washing	Each 2 years (Replace if necessary)				
Fuel tube	replace	Each 2 years (Replace if necessary)				

(1) Replace paper element only.

(2) Service more frequently when used in the dust areas.

3.2 Engine oil



Drain the oil while the engine is warm to assure rapid and complete draining.

1. clean the area around the oil filler cap/dipstick and oil drain bolt. Remove the oil filler cap/dipstick.
2. drain the engine oil into a suitable container using one of the following methods.

Oil drain bolt method:

a. remove the oil drain bolt and sealing washer and allow the oil to drain into a suitable container.

b. after draining, install the drain bolt with the sealing washer and tighten it securely.

Oil filler tube method:

In certain applications, it may be possible drain the engine oil from the oil filler tube.

a. turn the fuel valve to the OFF position.

b. Remove the oil filler cap/dipstick.

c. Tip the engine (air cleaner side up) and allow the oil to drain from the oil filler tube into a suitable container.

3. Refill the engine with the correct amount of the recommended oil.

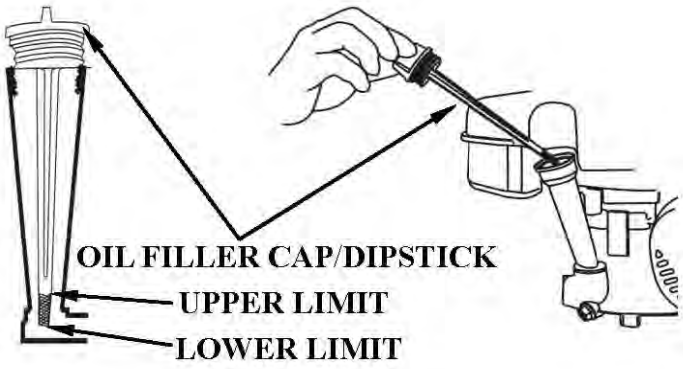
Engine oil capacities: 1P61FA、1P65FA： 0.55L (0.146 US Gal, 0.119 Imp Gal)
1P68FA、1P70F、1P70FA： 0.60L (0.160 US Gal, 0.130 Imp Gal)

Use a high-detergent, premium quality 4-stroke engine oil certified to meet or exceed US.

Automobile manufacturers' requirements for API Service Classification SG, SF.

SAE 15W-40 is recommended for general, all-temperature use. Other viscosities shown in the chart may be used when the average temperature in your area is within the indicated range.

4. insert the oil filler cap/dipstick without screwing it into the oil filler tube. Remove the oil filler cap/dipstick and check the oil level on it. Bring the level to the upper mark on the dipstick.
5. after running the engine, recheck the oil level and adjust if necessary.

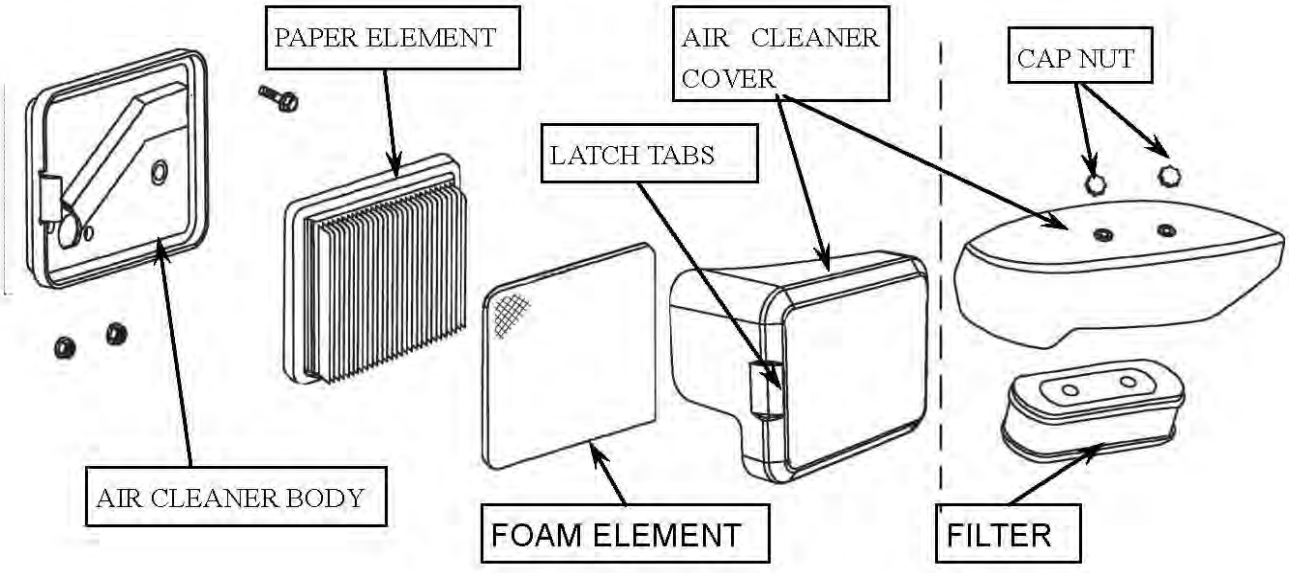


Wash your hands thoroughly with soap and water as soon as possible after contact with used oil which contains carcinogenic substances.

Please dispose of used motor oil and the oil containers in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, or pour it on the ground.

3.3 Air Cleaner

1. Press the latch tabs on the air cleaner cover or remove the cap nuts, and remove the cover. Remove the foam element from the air cleaner cover and the paper element from the air cleaner base.
2. Carefully check each element for holes or tears. Replace any damaged element.



3. Clean the foam element by squeezing it in warm soapy water, rinsing it, and allowing it to dry. You may also use a nonflammable solvent and then allow it to dry.
4. Oil the foam element by dipping it in clean engine oil and squeezing out all excess oil.
5. Clean the paper element by tapping it on a hard surface to knock off dirt or by blowing compressed air (at less than 30 psi) through the filter from the inside. Never try to brush off the dirt. Brushing will force dirt into the filter fibers.
6. Use a damp rag to wipe any dirt from the inside of the air cleaner base and cover. Be careful not to allow dirt into the duct leading to the carburetor.
7. Place the foam element in the air cleaner cover.
   Set the paper element in the air cleaner base making sure that it is positioned evenly.
8. Install the air cleaner cover .

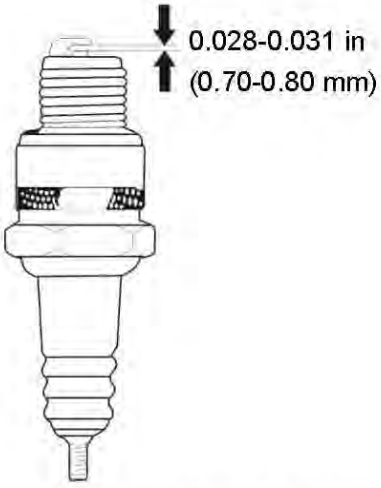
CAUTION: *Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.*

3.4 Spark plug

Recommended types: LD F7RTC, NGK BPR5ES, ND W16EPR-U

NOTICE

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



1. Disconnect the spark plug cap and remove any dirt from around the spark plug area.
2. Remove the spark plug with a spark plug wrench.
3. Inspect the spark plug for excessively worn electrodes, chips or cracks in the insulator, or excessive deposits. Replace the spark plug if you have any doubts about its condition.
4. Measure the electrode gap with a wire gap gauge. Adjust the gap to 0.028-0.031 in (0.7-0.8mm) by carefully bending the ground electrode.
5. use a spark plug wrench to tighten the plug enough to compress the washer. For a used plug, tighten 1/8 to 1/4 of a turn after the spark plug seats. For a new plug, tighten 1/2 turn after the spark plug seats.

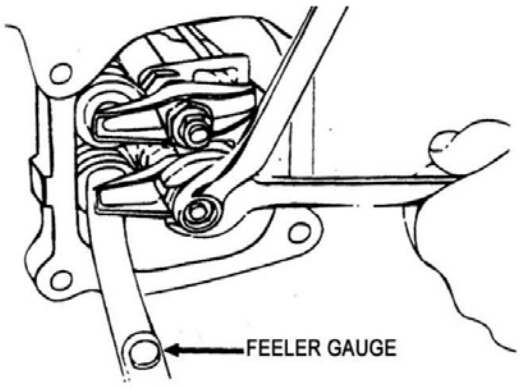
   NOTICE

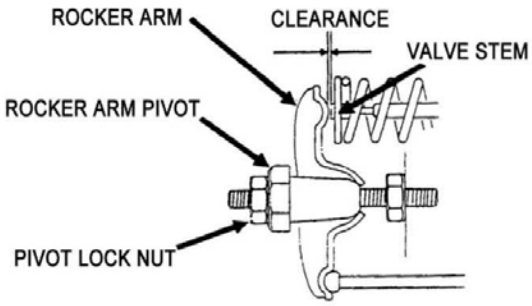
   A loose spark plug can become hot enough to damage the engine. Over tightening a spark plug can damage the threads in the engine.
6. in stall the spark plug cap on the plug.

3.5 Valve clearance

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

1. Remove the cylinder head cover, and set the piston at top dead center of the compression stroke (both valves will be fully closed).
2. Measure the clearance between the rocker arm and the valve stem with a feeler gauge.
   Intake: 0.08-0.12 mm (0.003-0.005 in)
   Exhaust: 0.13-0.17 mm(0.005-0.007 in)
3. To adjust valve clearance, hold the rocker arm pivot and loosen the pivot lock nut.
4. Turn the rocker arm pivot to obtain the specified clearance.
5. Hold the rocker arm pivot and tighten the pivot lock nut.
6. Recheck the clearance and readjust if necessary.
7. Install the cylinder head cover.



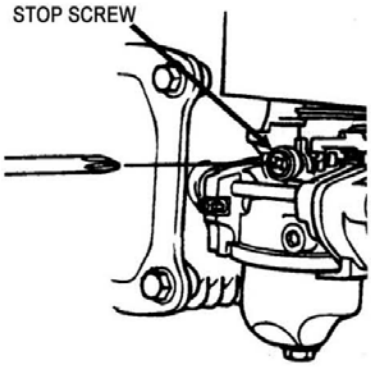


3.6 Carburetor

Idle speed

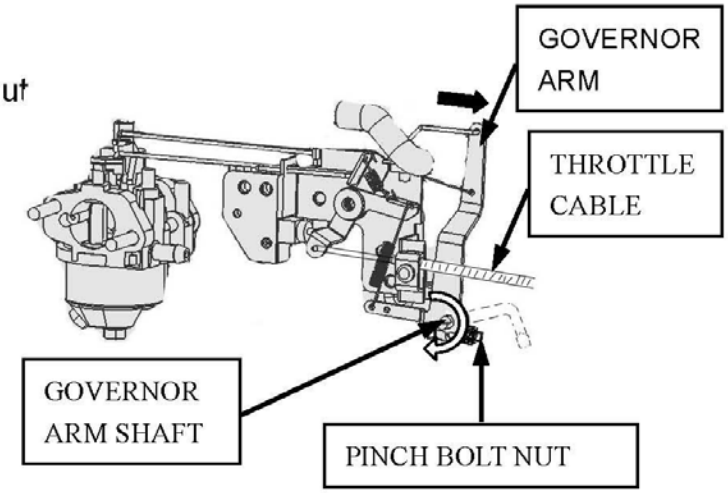
1. Start the engine. And allow the engine to warm to normal operating temperature.
2. With the engine idling, adjust the throttle stop screw to obtain the recommended engine idle speed.

Recommended idle speed: 1800±150 rpm

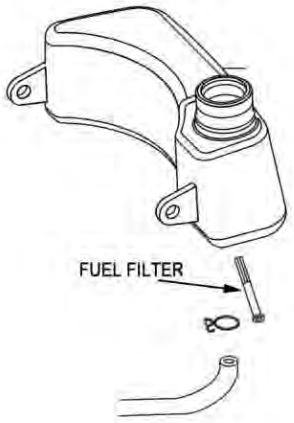


3.7 Governor

1. Loosen the governor arm pinch bolt nut but do not remove it.
2. Move the governor arm rearward to fully open the throttle and hold it in this position.
3. Rotate the governor arm shaft fully clockwise and hold it there with a pair of pliers. Tighten the governor arm pinch bolt nut to 8.0 ft-lb (11N·m) to secure the governor arm to the governor arm shaft.
4. Check to be sure the governor arm and throttle valve move freely.



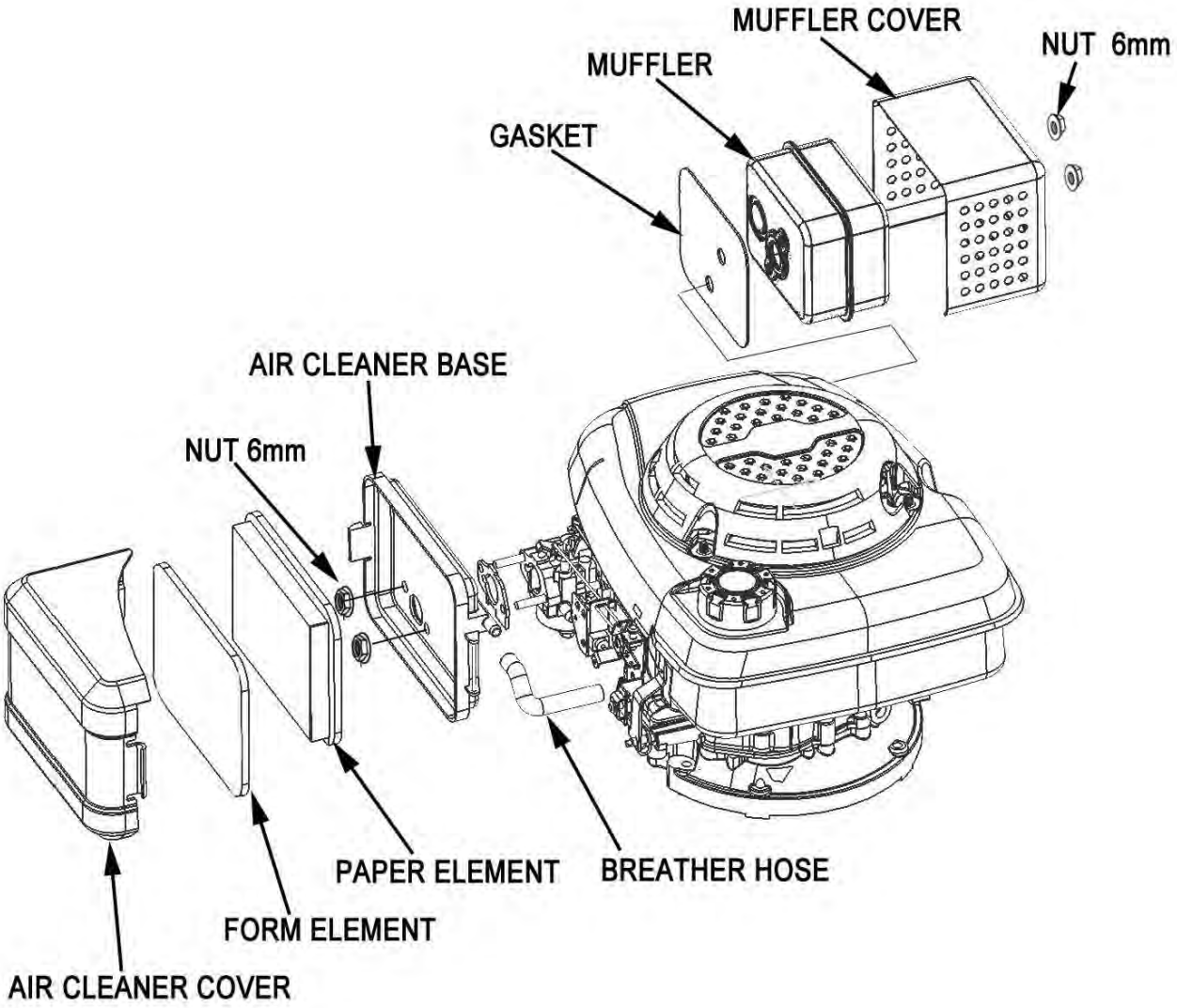
3.8 Fuel filter



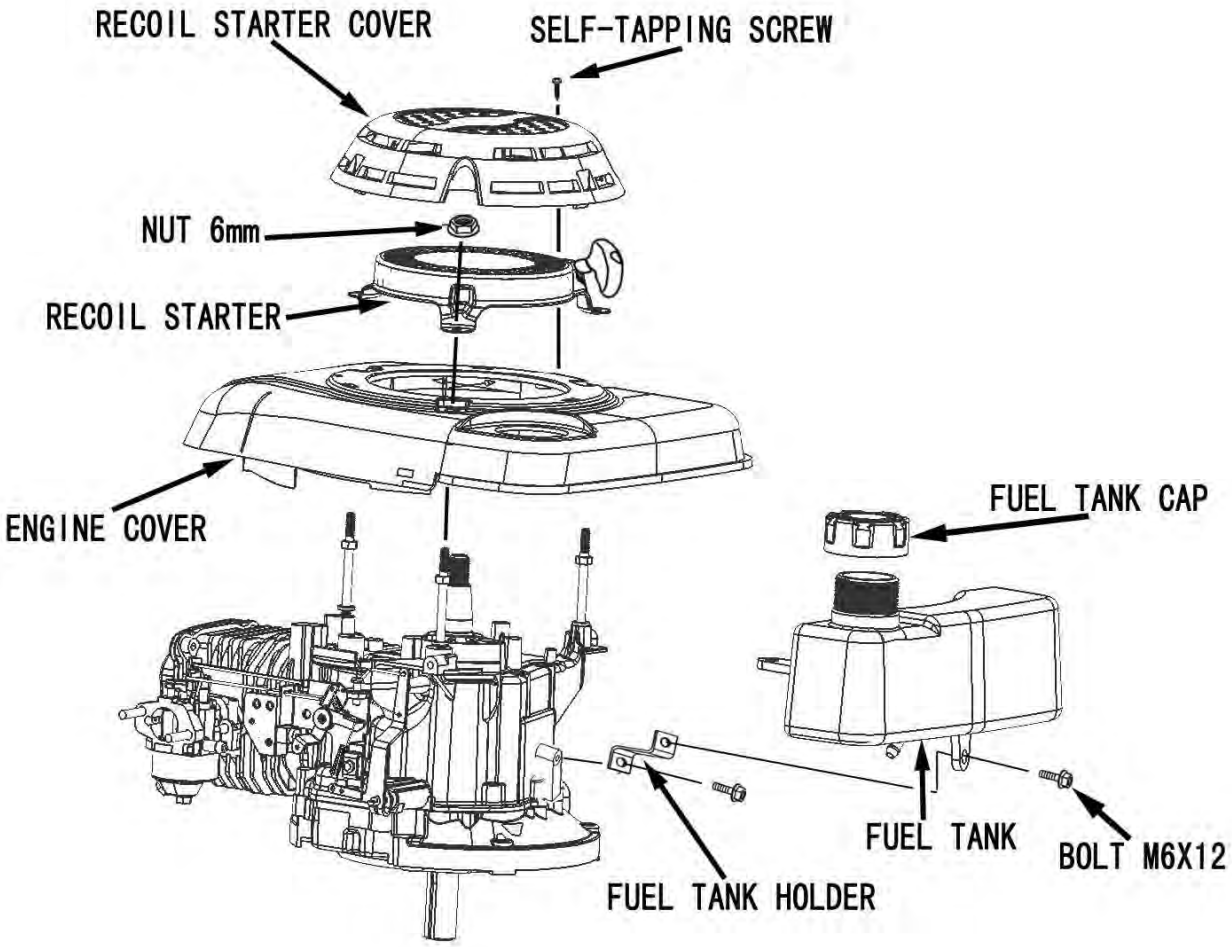
1. Remove the fuel filter from the fuel tank and fuel line.
2. Clean the fuel filter. (Remove dirt which has accumulated on the mesh, and check that the mesh is not broken anywhere.)
3. Reinstall the fuel filter and fuel line.

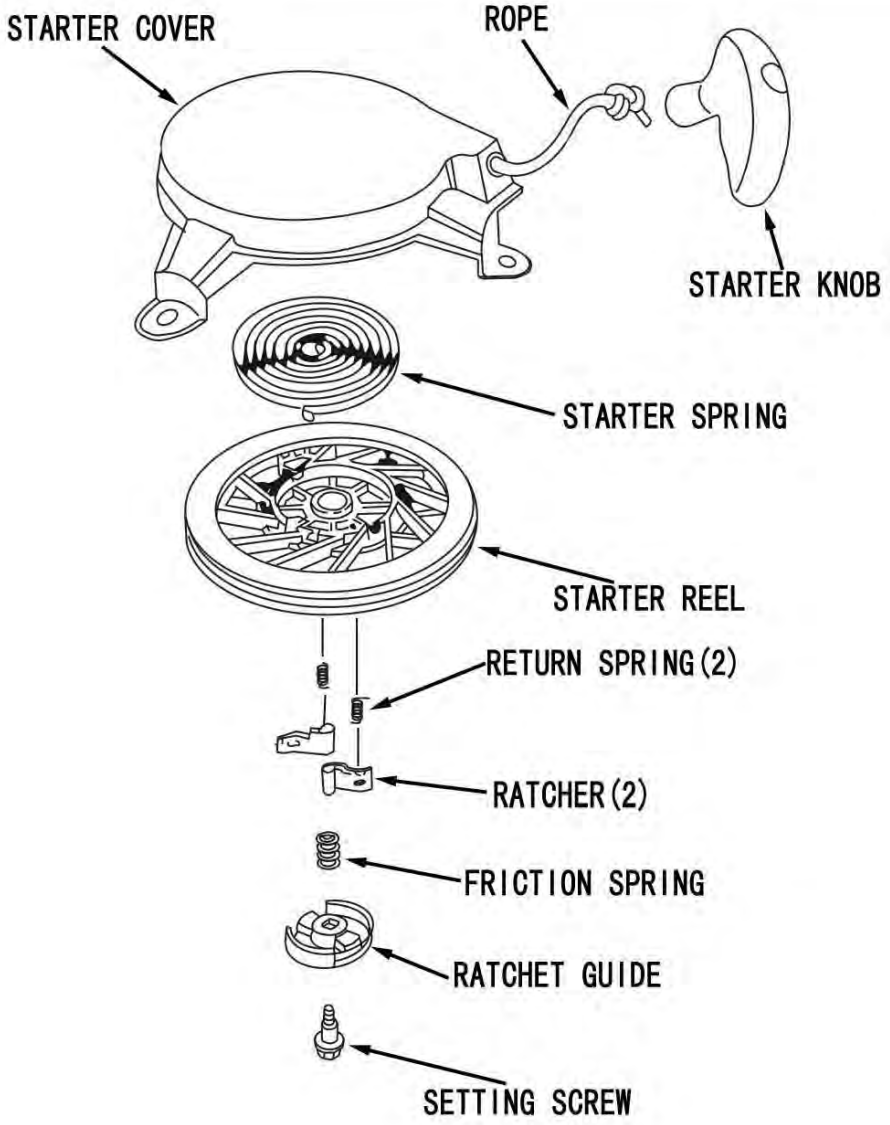
4 Disassembly and service

4.1 Air cleaner & muffler



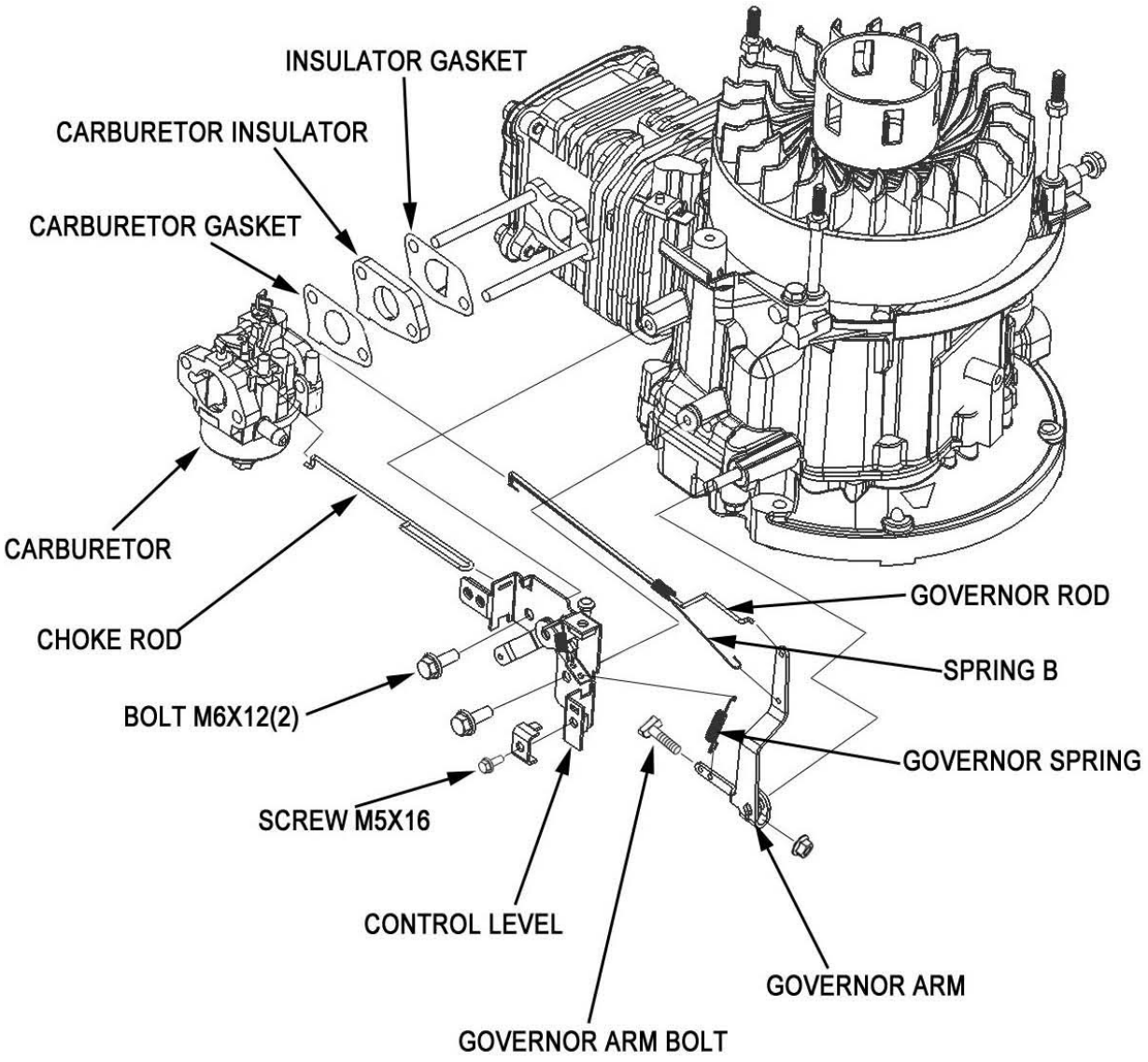
4.2 Recoil starter & engine cover



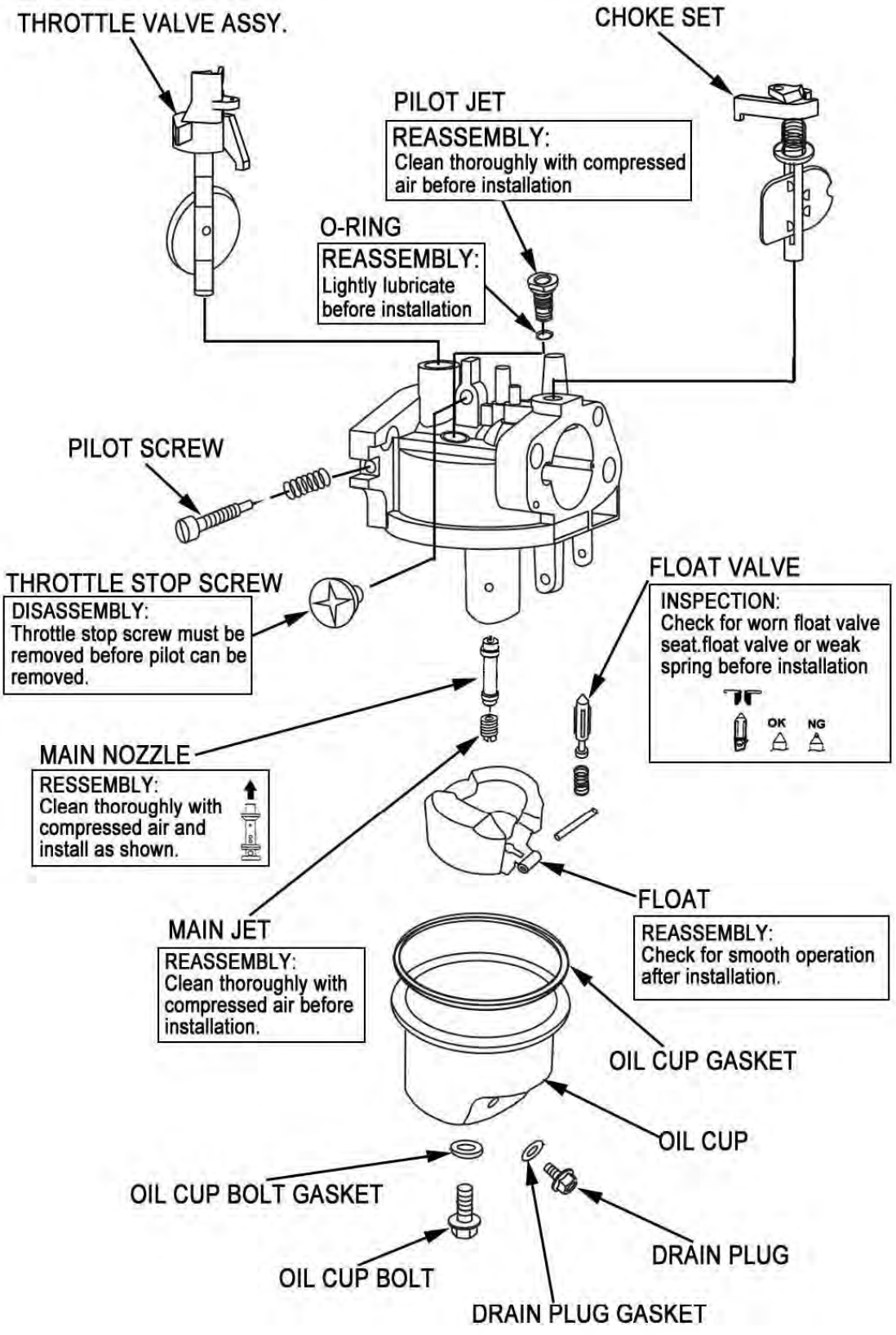

STARTER COVER
ROPE
STARTER KNOB
STARTER SPRING
STARTER REEL
RETURN SPRING(2)
RATCHER(2)
FRICTION SPRING
RATCHET GUIDE
SETTING SCREW

4.3 Control level

Removal / installation



4.4 Carburetor

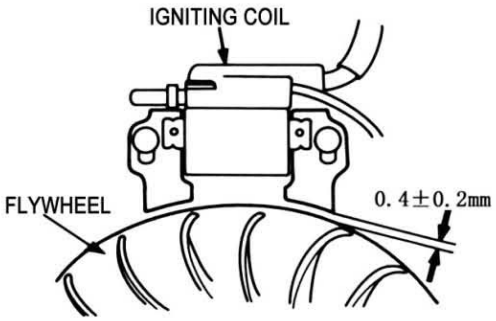


4.5 Ignition coil

Igniting coil gap adjustment

When reassembling igniting coil, adjust the igniting coil gap.

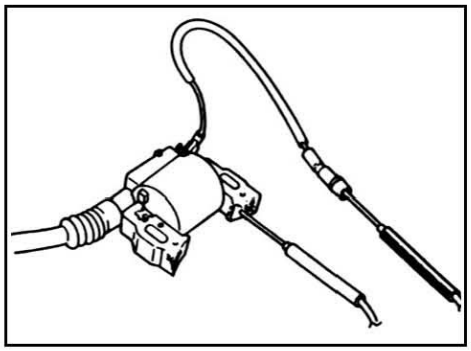
1) Lightly tighten the igniting coil mounting bolt.
2) Insert the feeler gauge or a piece of paper of the same thickness between the flywheel and coil as shown.
3) Push the coil against the flywheel by hand and tighten the two bolts.



Igniting coil gap	0.4±0.2 mm

Notice

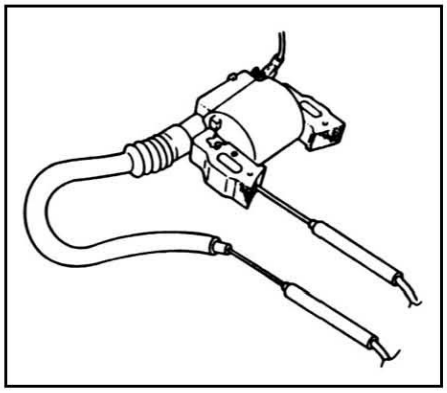
Adjust both ends of the coil to the same gap.
Avoid the magnet portion of the flywheel when adjusting.



c. Inspection

Igniting coil：
<Primary coil>
Put the tester terminal and lead terminal to contact with iron core of coil, and measure the primary coil resistance.

Primary coil resistance	0.8-1.0 Ω



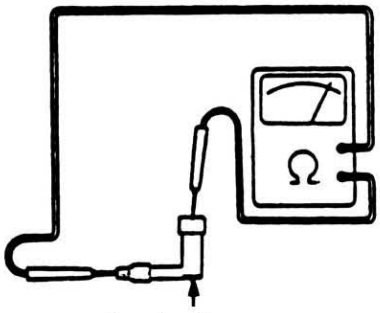
<Secondary coil>
Put the tester terminal and removed spark plug cap's high tension cord to contact with iron cord and measure the secondary coil resistance.

Secondary coil resistance	5.9-7.1 KΩ

Notice

A false reading will result if the spark plug cap is not removed.
Spark plug cap：
Put the tester to contact the two end of the spark plug cap and measure spark plug cap resistance

Resistance	7.5-12.5 KΩ



Spark plug cap

If the resistance is out of the specification, replace the spark plug.

Adjustment

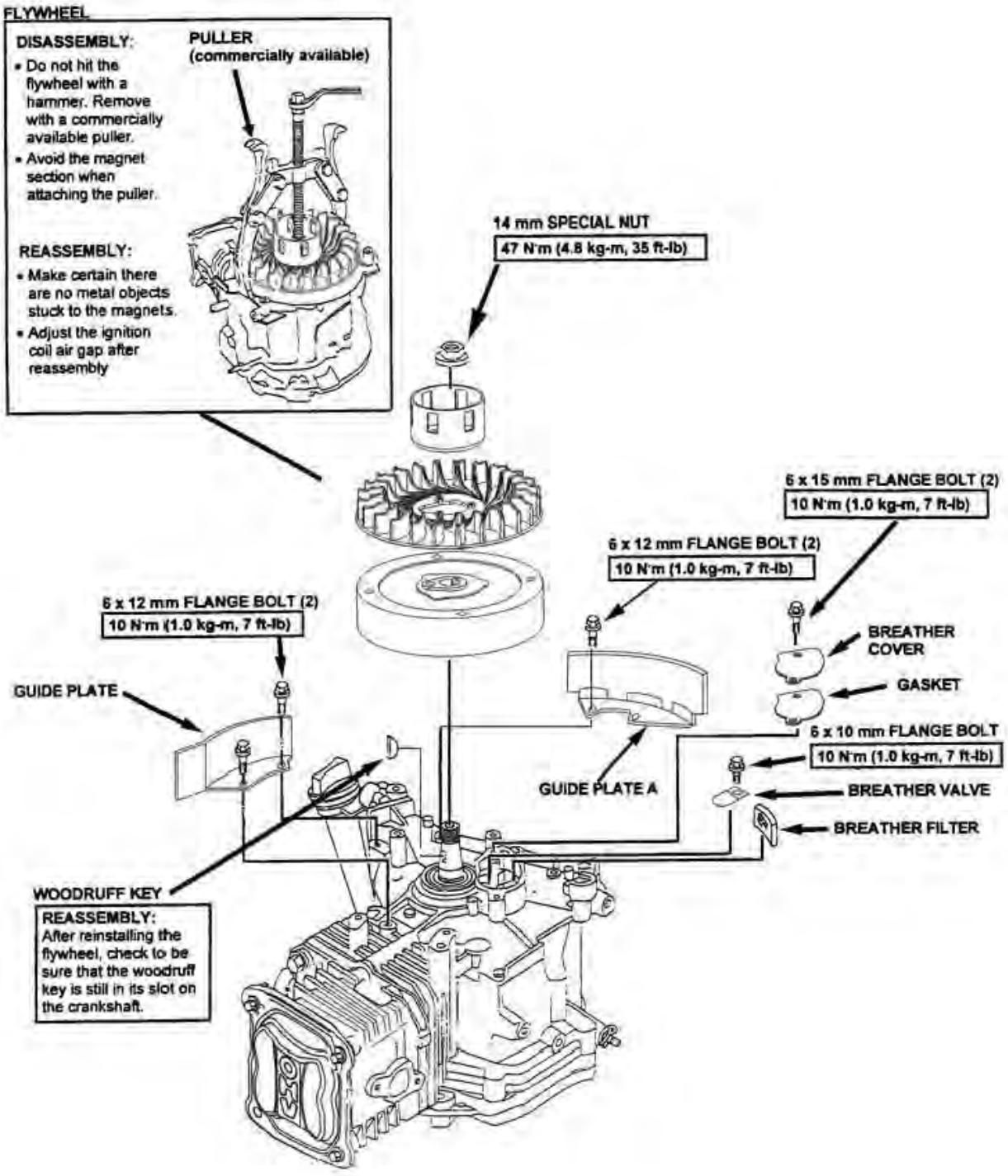
Adjustment is required only when the ignition coil or the flywheel has been removed.

1. Loosen the ignition coil mounting bolts.
2. Insert the thickness gauge or a piece of paper of the proper thickness between the ignition coil and the flywheel, both gaps should be adjusted simultaneously. Avoid the magnet when adjusting the air gap.
3. Push the ignition coil firmly toward the flywheel and tighten the mounting bolts.

Specified clearance	0.20-0.60 mm (0.008-0.020 in)

4.6 Flywheel /breather

Removal / installation

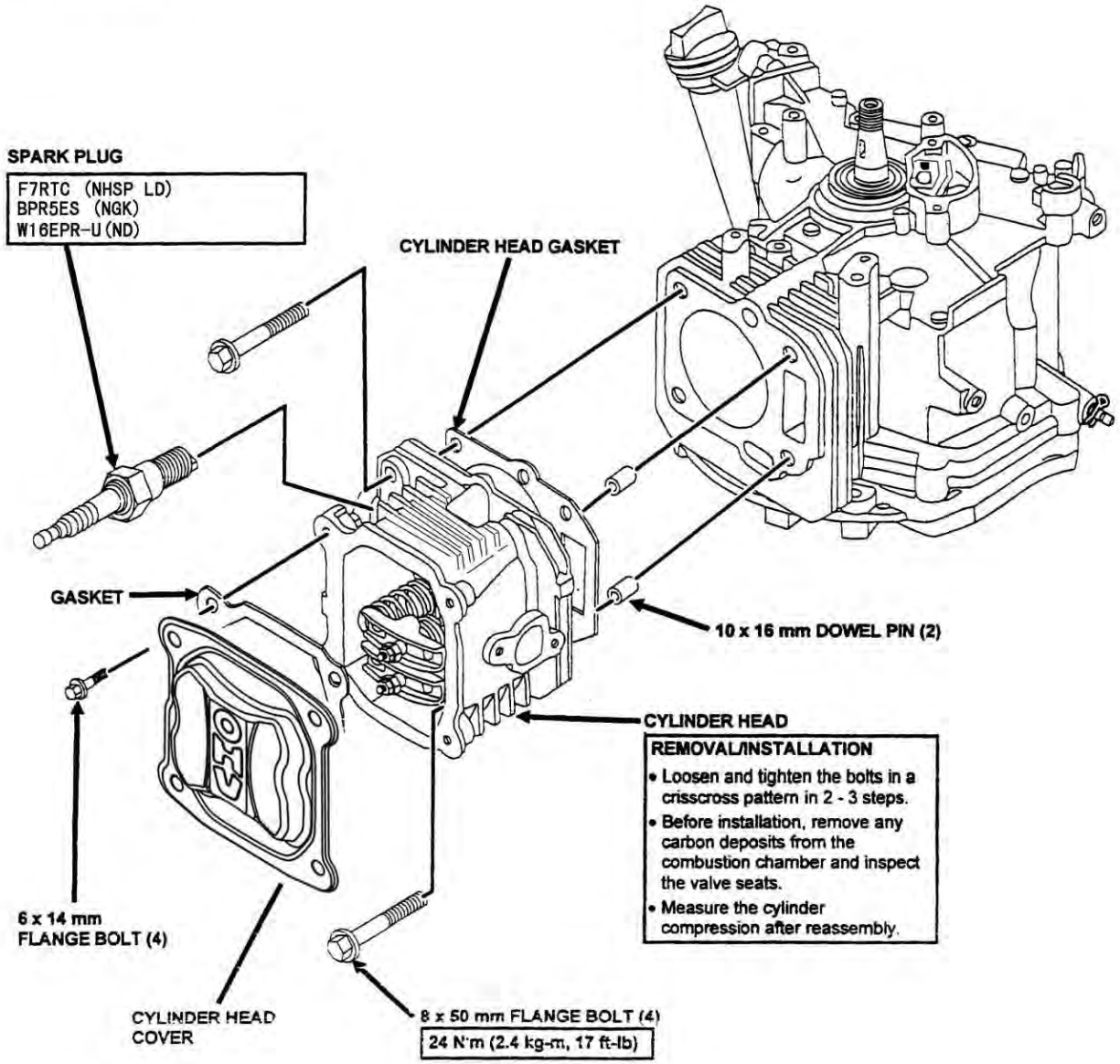


4.7 Cylinder head & valves

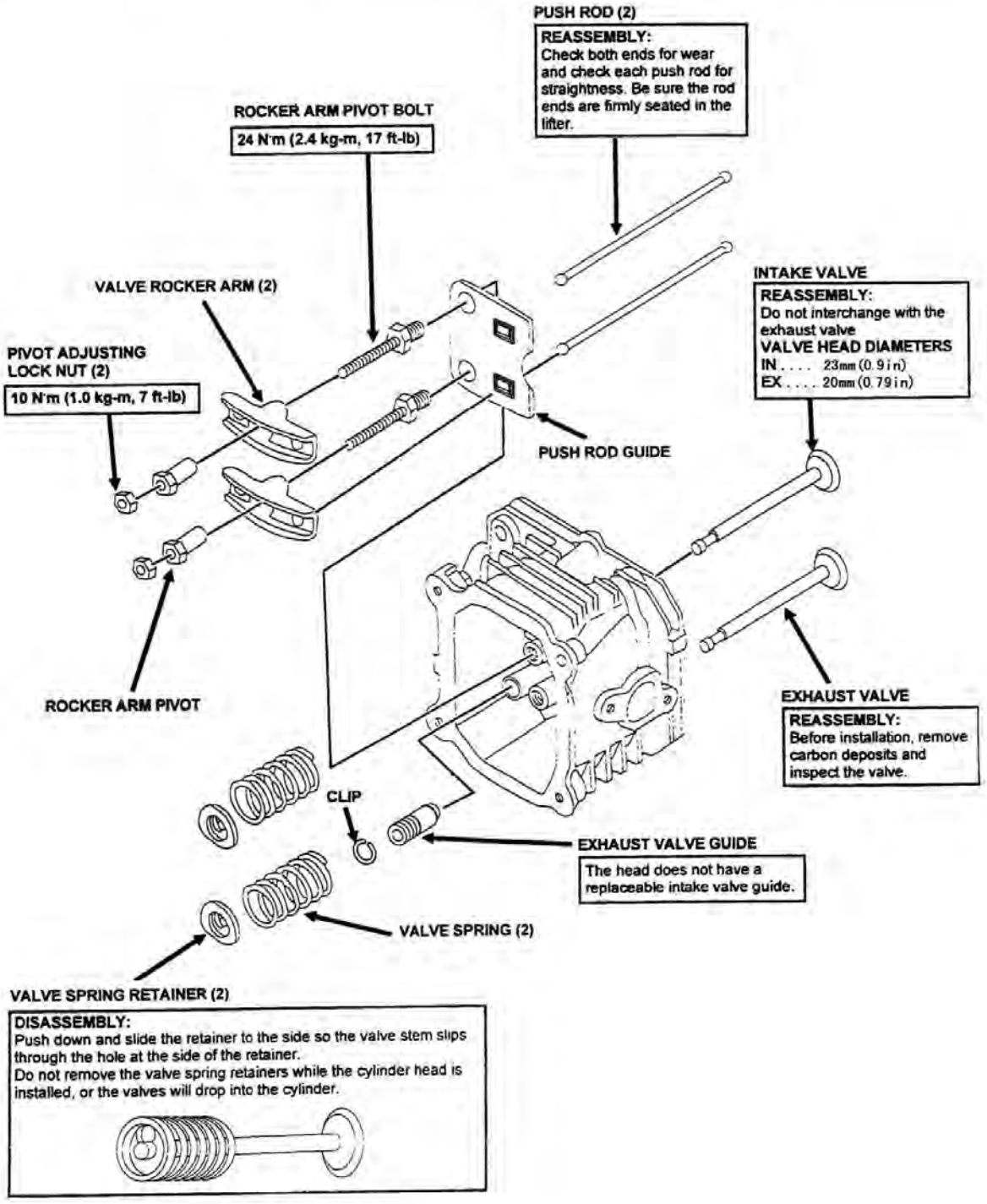
Removal / installation:

Remove the following:

1. muffler
2. engine cover
3. carburetor



Disassembly / reassembly



Inspection

Valve spring free length

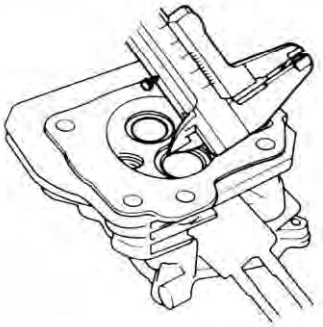
Measure the free length of the valve springs.

Standard	Service limit
30.5 mm (1.20 in)	29.0 mm (1.14 in)

Replace the spring if they shorter than the service limit.

Valve seat width

Remove carbon deposits from the combustion chamber. Inspection the valve seats for pitting or other damage. Measure the valve seat width.



Standard	Service limit
0.8 mm (0.03 in)	2.0 mm (0.08)

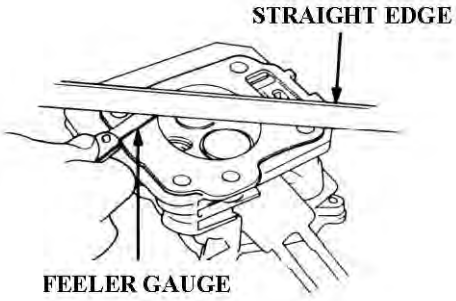
If the valve seat width is under the standard, or over the service limit, recondition the valve seat

Cylinder head

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.

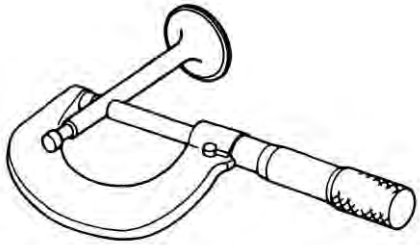


Service limit	0.10 mm (0.004)

Valve stem OD

Inspect each valve for face irregularities, bending or abnormal stem wear. Replace the valve if necessary.

Measure and record each valve stem OD.



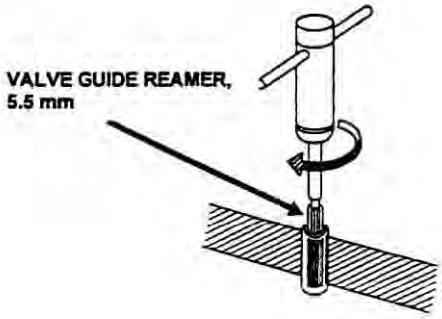
	Standard	Service limit
IN	5.480 mm (0.2160 in)	5.318 mm (0.2094 in)
EX	5.440 mm (0.2140 in)	5.275 mm (0.2077 in)

Replace the valves if their OD is smaller than the service limit.

Valve guide ID

Ream the exhaust valve guide to remove any carbon deposits before measuring.

Measure and record each valve guide ID.



Standard	Service limit
5.500 mm (0.2170 in)	5.572 mm (0.2194)

Stem –to- guide clearance

Subtract each valve stem OD from the corresponding guide ID to obtain the guide-to-stem clearance.

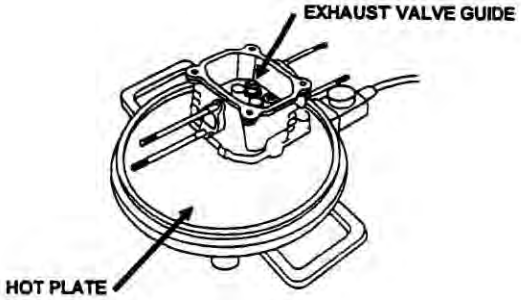
	Standard	Service limit
IN	0.010-0.034 mm (0.0004-0.0013 in)	0.100 mm (0.0040 in)
EX	0.050-0.070 mm (0.0020-0.0028 in)	0.120 mm (0.0050 in)

If the stem-to-guide clearance exceeds the service limit,

determine if the new guide with standard dimensions would bring the clearance within tolerance. If so, replace the guide (or cylinder head) as necessary and ream to fit. If the stem-to-guide clearance exceeds the service limit with new guides, replace the valves as well.
Recondition the valve seat whenever the valve guide is replaced.

Cylinder head service

Exhaust valve guide replacement

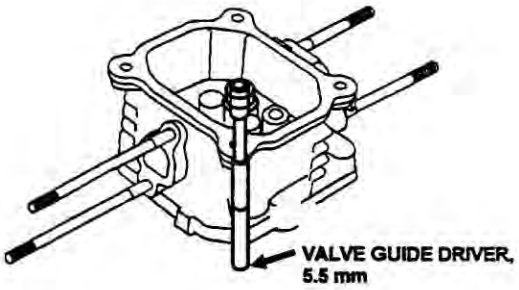


The intake valve guide is not replaceable. If the intake valve guide is worn beyond the service limit,
Replace the cylinder head.
1. chill the replacement exhaust valve guide in the freezer section of a refrigerator for about an hour.
2. use a hot plate or oven to heat the cylinder head evenly to 150℃(330℉)

Check the temperature with a temperature indicating stick (available at welding supply stores) or equivalent.
Wear heavy gloves to prevent burns when handling heated cylinder head.

Notice

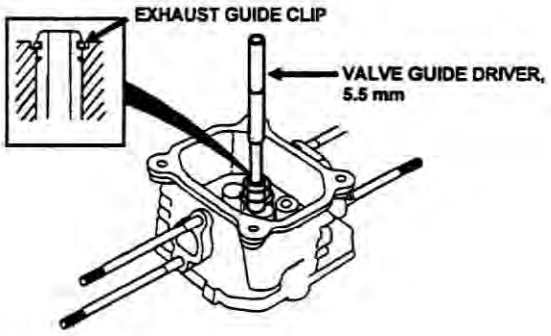
Do not use a torch to heat the cylinder head; warpage of the cylinder head may result
Do not get the head hotter than 150℃(330℉); excessive heat may loosen the valve seats.



3. remove the heated cylinder head from the hot plate and support it with wooden blocks. Drive the exhaust valve guide out of the head from the combustion chamber side.

Notice

When driving the valve guide out, be careful not to damage the head.

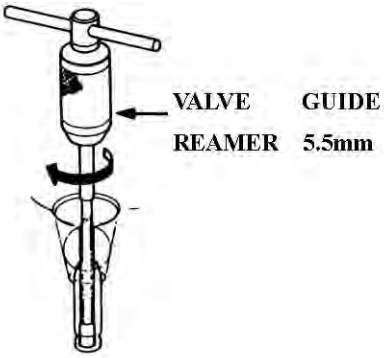


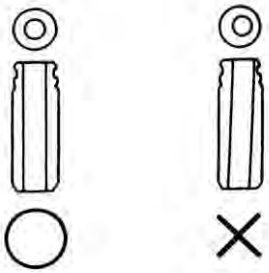
4. remove the new exhaust valve guide from the refrigerator.
5. install the new valve guide from the valve spring side of the cylinder head. Drive the valve guide until the clip is fully seated as shown.
6. after installation, inspect the valve guide for damage. Replace the guide if damaged.

Exhaust valve guide reaming

For best results, be sure the cylinder head is at room temperature before reaming the exhaust valve guide.

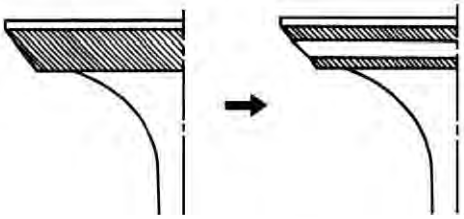
1. coat the reamer and valve guide with cutting oil.
2. rotate the reamer clockwise through the valve guide the full length of the reamer.
3. continue to rotate the reamer clockwise while removing it from the valve guide.
4. thoroughly clean the cylinder head to remove any cutting residue.
5. check the valve guide bore; it should be straight, round and centered in the valve guide. Insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation. Replace the valve guide if it is bent or damaged.
6. check the valve stem-to-guide clearance



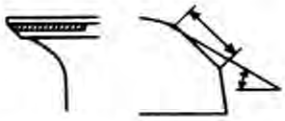


valve seat reconditioning

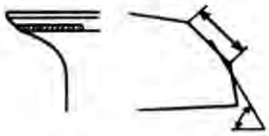
1. thoroughly clean the combustion chambers and valve seats to remove carbon deposits.
2. apply a light coat of Prussian Blue or erasable felt-tipped marker ink to the valve faces.
3. insert the valve, and then lift them and snap them closed against their seats several times. Be sure the valve does not rotate on the seat. The transferred marking compound will show any area of the seat that is not concentric.
4. using a 45°cutter, 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. using the 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. Bu sure that the width of the finished valve seat is within specification.



CONTACT TOO HIGH



CONTACT TOO LOW



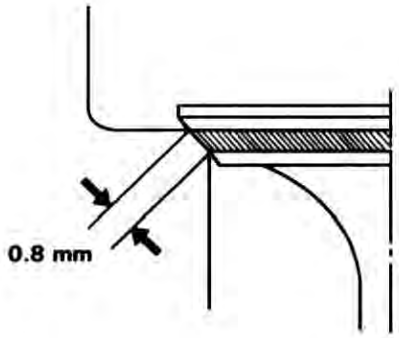
Valve seat width

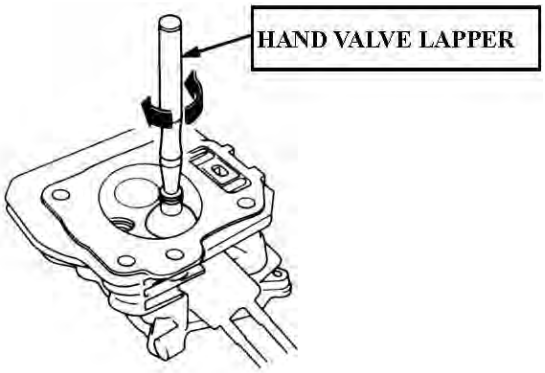
Standard	Service limit
0.8 mm (0.03 in)	2.0 mm (0.08)

1. make a light pass with the 45° cutter to remove any possible burrs at the edges of the seat.
2. after resurfacing the seats, inspection for even valve seating.
3. apply a light coat of Prussian Blue or erasable felt-tipped marker ink to the valve faces.
4. insert the valves, and then lift them and snap them closed against their seats several times. Be sure the valve does not rotate on the seat. The seating surfacing, as shown by the transferred marking compound, should have good contact all the way around.

   Notice

   To avoid severe engine damage, be sure to remove all lapping compound from the head before reassembling.
5. check the valve clearance after reassembly.

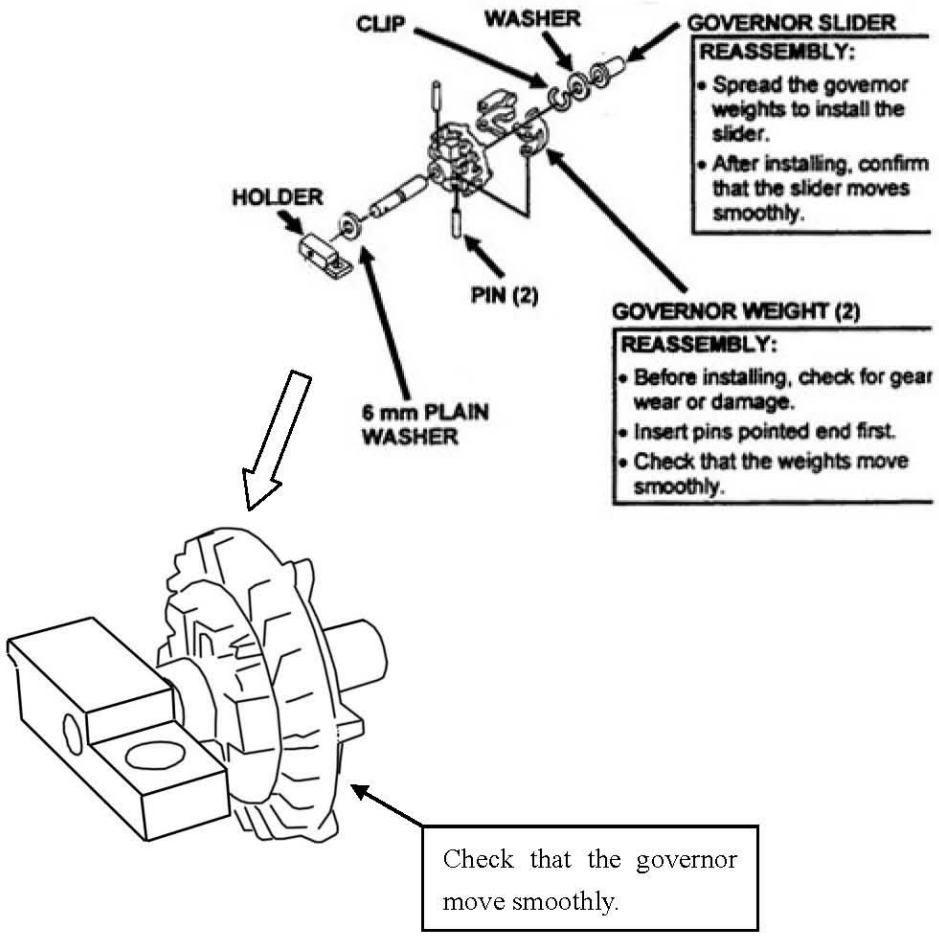


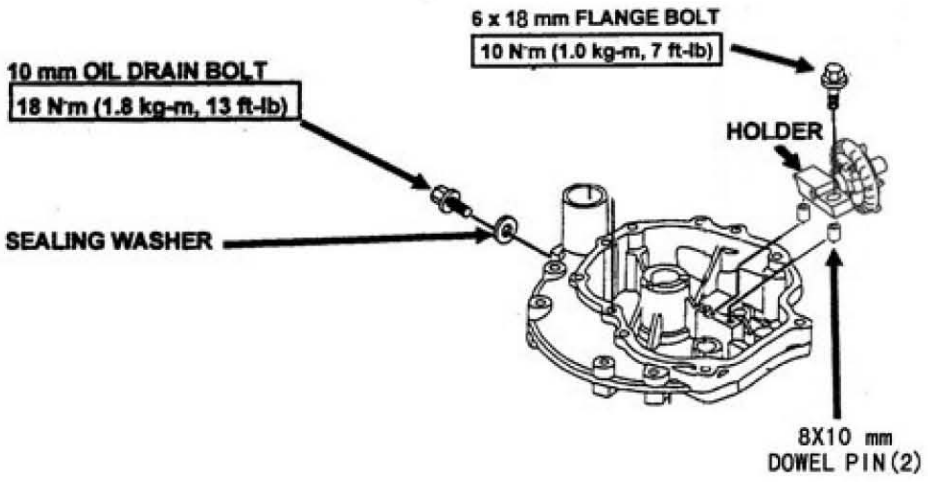


4.8 Crankcase cover / governor

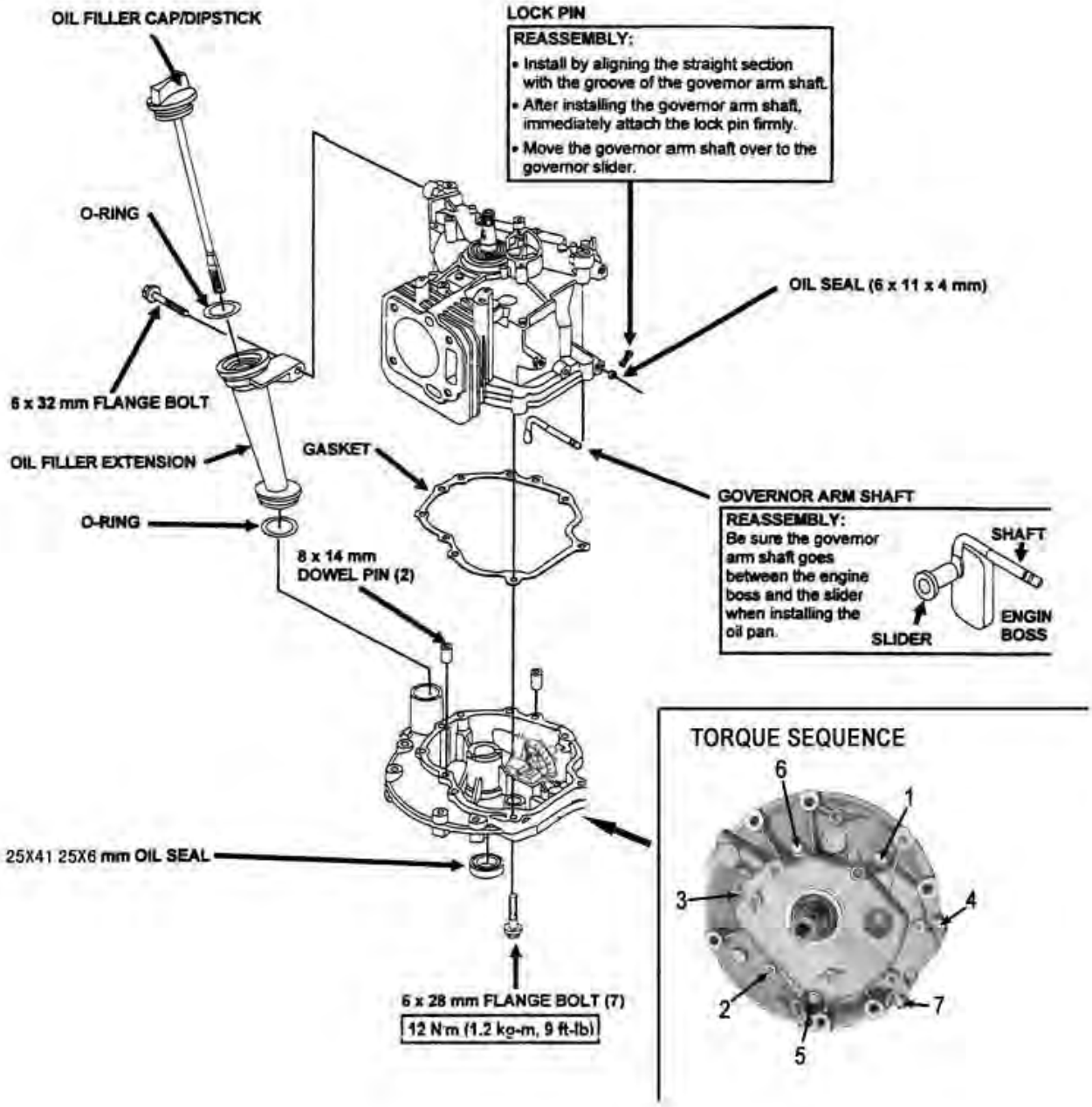
Disassembly / reassembly

Governor



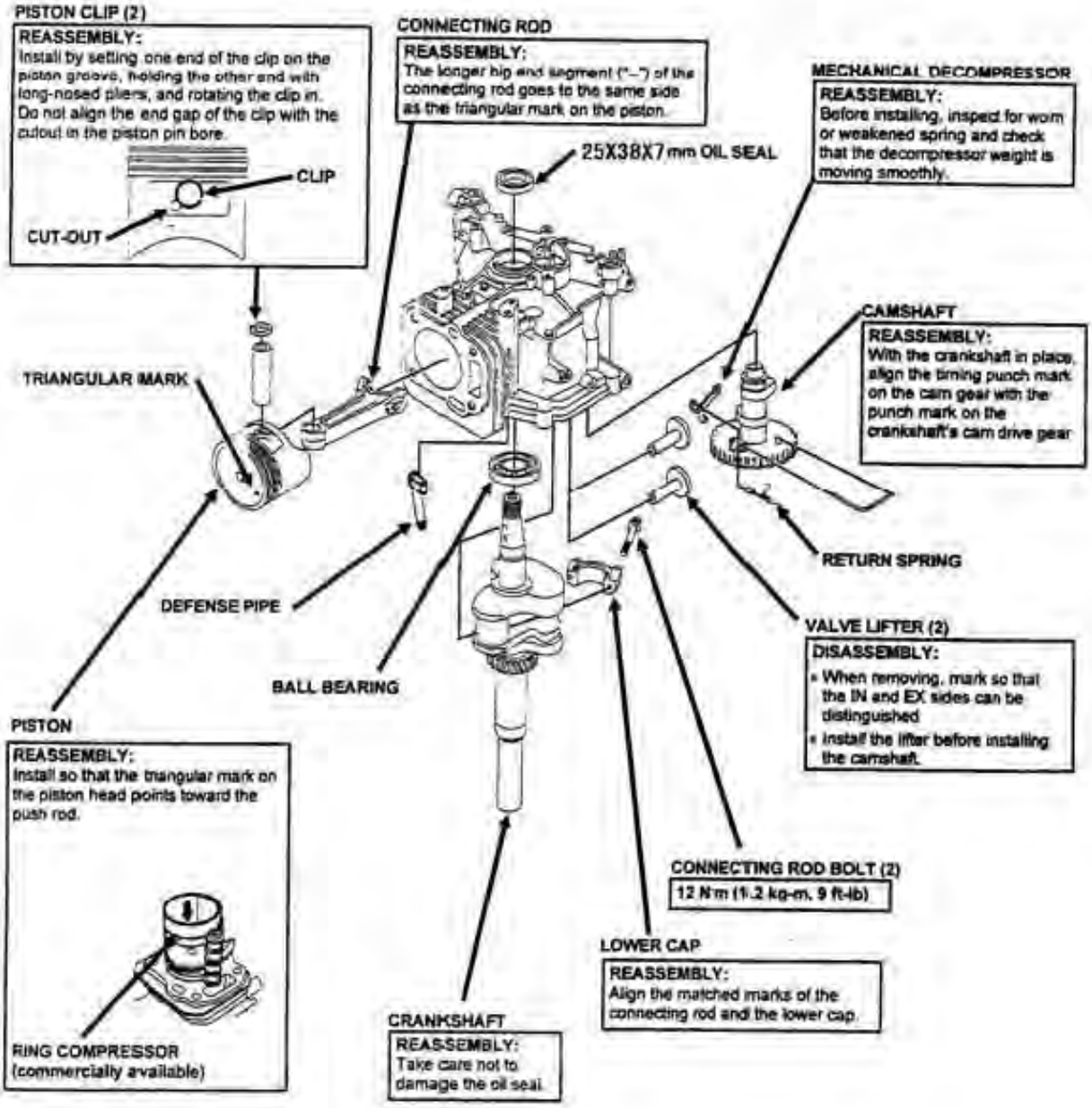


Crankcase cover



4.9 Crankshaft / piston / camshaft

Remove /installation



Disassembly / reassembly

Piston connecting rod

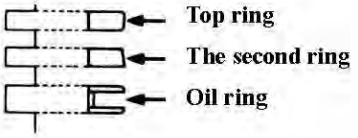
Assembly:

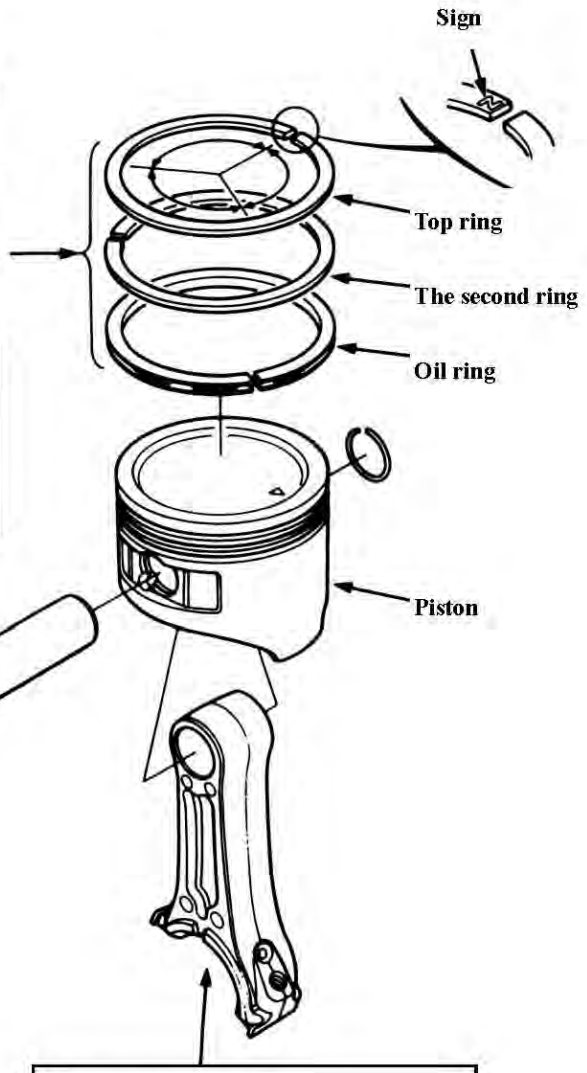
. Put the piston ring sign facing up when assembling.

. Don't wrongly assemble the top ring and the second ring.

. After assembling, be sure the piston can freely move.

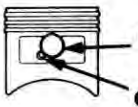
. Stagger the open of the piston to piston pin hole with 120 degree.





Piston ring clip

Assembly: Put the one end into the piston slot, clamp other end by sharp nose pliers and revolve into slot. Don't let the open of clip aiming at the piston pin slot.

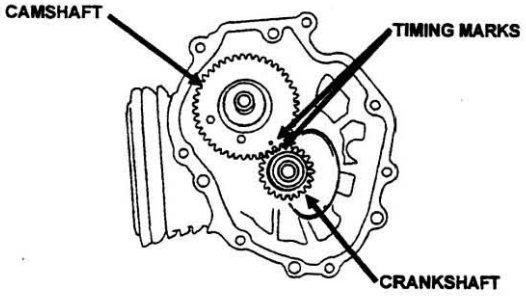


Connecting rod

Assembly: Put the long end of the connecting rod aiming at the triangular mark when assembling.

Valve timing

After installing the crankshaft, install the camshaft
by aligning the marks on the timing gears.



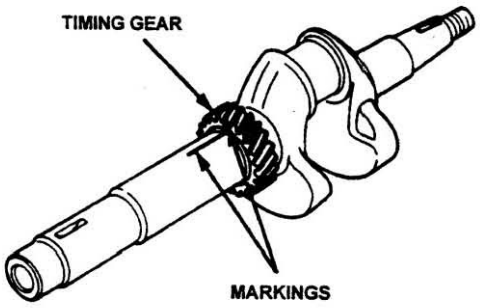
Timing gear

Disassembly:

1. scribe a line on the crankshaft and the timing gear tooth as shown.
2. use a hydraulic press and a commercially available bearing puller to remove the timing gear.

Reassembly:

1. using the old gear for reference, scribe a line at the same position on the new timing gear tooth.
2. use a hydraulic press and the special tool to press the timing gear in with the scribed marks aligned.



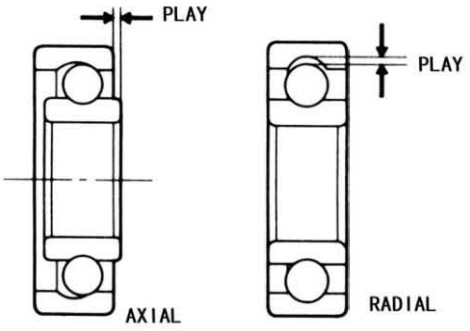
Notice

Do not scribe the crankshaft deeply. Otherwise, oil may seep through the oil seal.

Inspection

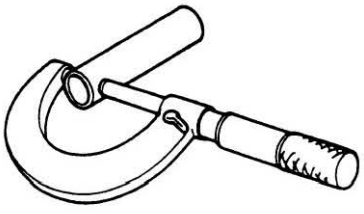
Crankshaft bearing free play

1. clean the bearing in solvent and dry it.
2. spin the bearing by hand and check for play.
   Replace the bearing if it is noisy or has excessive play.



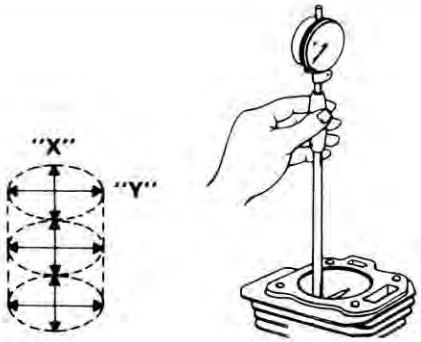
Piston pin OD

Standard	Service limit
12.994-13.000 mm (0.05116-0.5118 in)	12.954 mm (0.5100 in)



Cylinder inside diameter

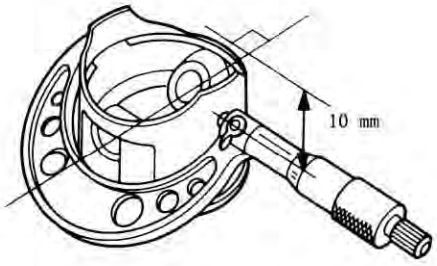
Measure three points on the "X" and "Y" shaft and record cylinder inside diameter（"X" shaft is vertical to crankshaft and "Y" shaft parallel to crankshaft）.
Take maximum reading as the wearing and tapering of the cylinder.



Model	Standard	Service limit
1P61FA	61.0 mm	61.165 mm
1P65FA	65.0 mm	65.165 mm
1P68FA	68.0 mm	68.165 mm
1P70FA	70.0mm	70.165mm

Piston skirt outside diameter

Measure and record the piston skirt outside diameter at the 10mm from piston skirt maximum lower side making 90°to piston pin hole.

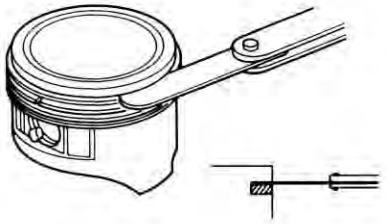


Model	Standard	Service limit
1P61FA	60.985 mm	60.815 mm
1P65FA	64.985 mm	64.815 mm
1P68FA	67.985 mm	67.815 mm
1P70FA	69.985 mm	69.815 mm

Piston- to – cylinder clearance

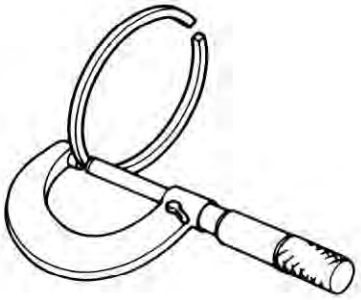
Standard	Service limit
0.015-0.050 mm (0.0006-0.0020 in)	0.120 mm (0.0050 in)

Piston ring side clearance



	Standard	Service limit
Top/ Second	0.015-0.045 mm (0.0006-0.0018 in)	0.15 mm (0.006 in)

Piston ring width

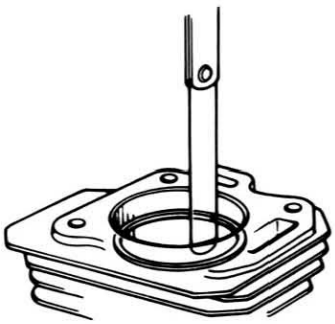


	Standard	Service limit
Top/ Second	1.5 mm (0.059 in)	1.37 mm (0.054 in)

Piston ring end gap

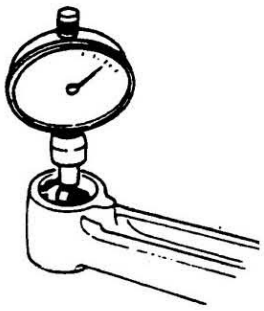
Standard	Service limit
0.2-0.4 mm (0.008-0.016 in)	1.0 mm (0.04 in)

Before measuring end gap, use the piston top to position the ring so it will not be cocked in the cylinder bore.



Connecting rod small end ID

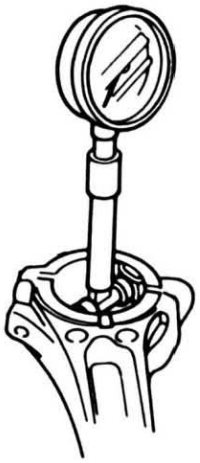
Standard	Service limit
13.005-13.020 mm (0.5120-0.5126 in)	13.07 mm (0.5146)



Connecting rod big end ID

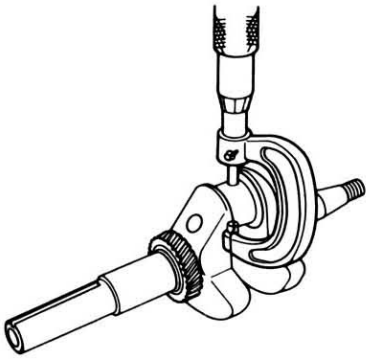
Original size

Standard	Service limit
26.020-26.033 mm (1.0244-1.0249 in)	26.066 mm (1.0260 in)



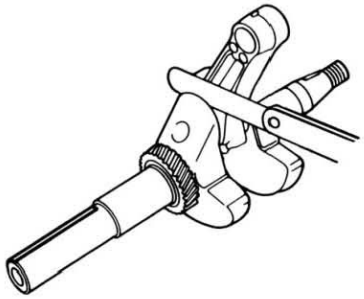
Crankshaft pin OD

Standard	Service limit
25.970-25.980 mm (1.0224-1.0228 in)	25.920mm (1.0205 in)



Connecting rod big end axial clearance

Standard	Service limit
0.10-0.70 mm (0.004-0.028 in)	1.1 mm (0.043 in)

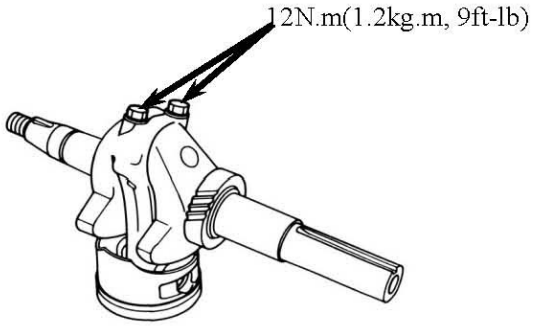


Connecting rod big end oil clearance(Radial)

1) Clean all oil from the crankshaft neck journal and inside side.

2) Place a piece of plastic gauge on the crankshaft neck journal, assemble connecting rod, and tighten the bolts to specified torque.

Bolt torque：12 N·m

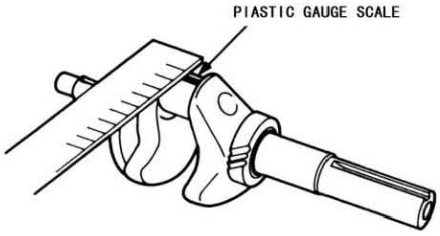


ATTENTION

Do not rotate the crankshaft while the tightening connecting rod bolt

3) Remove the connecting rod and measure the plastic gauge.

Standard	Service limit
0.040-0.063 mm (0.0016-0.0025 in)	0.120 mm (0.0050 in)



4) If the clearance exceeds the service limit, replace the connecting rod and recheck the clearance.

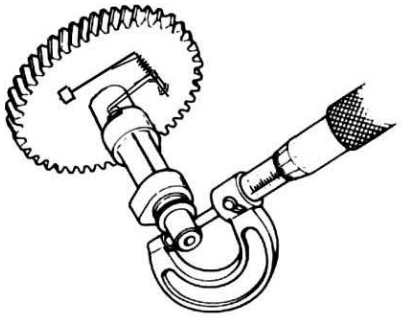
After using new connecting rod, the clearance still exceeds the service limit, lap the neck journal and use a connecting rod lower than standard value.

Camshaft cam height

	Standard	Service limit
IN	27.70 mm (1.091 in)	Replace under 27.45 mm (1.081 in)
EX	27.75 mm (1.093 in)	Replace under 27.50 mm (1.083 in)

Camshaft OD

Standard	Service limit
13.984 mm (0.5506 in)	13.916 mm (0.5479 in)



Note the location of the decompressor mechanism, check to be sure it moves freely.

COX INDUSTRIES POWERBOSS ENGINE WARRANTY POLICY

LIMITED WARRANTY

Cox Industries (Australia) Pty Ltd warrants that, for the period of warranty specified below, it will repair or replace, free of charge any parts found to be defective in materials or workmanship under normal use and operating conditions. Other than for major failure it is at Cox Industries sole discretion as to whether the engine is repaired or replaced. This warranty is effective for and is subject to the conditions and time periods stated below. For warranty service the purchaser must contact an Authorised PowerBOSS Service Dealer and then make the product available to the Authorised PowerBOSS Service Dealer for inspection. Our engines come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure. Nothing in this warranty purports to modify or exclude the conditions, warranties and undertakings, and other legal rights, under the Australian Consumer Law. This warranty gives you additional protection for your engine and identifies a preferred approach to resolving warranty claims which will be the quickest and simplest for all parties, subject to the exclusions, terms and conditions below.

STANDARD WARRANTY TERMS		
ENGINE TYPE	DOMESTIC USE*	COMERCIAL USE**
PowerBOSS LC1P70FC-3 - 6HP	3 years	90 days
PowerBOSS LC1P92F-15HP	3 years or 300 hours, whichever comes first	1 year or 150 hours, whichever comes first
PowerBOSS LC1P91F-18HP	3 years or 300 hours, whichever comes first	1 year or 150 hours, whichever comes first
PowerBOSS LC2P77F-24hp	3 years or 300 hours, whichever comes first	1 year or 150 hours, whichever comes first

* "Domestic use" means for a personal, residential or household (property) purpose.

** "Commercial use" means all other uses other than domestic use, including any use that is income producing, rental, or is in relation to use in schools, by government departments or charity operators.

The warranty period begins on the date of purchase by the first retail (domestic) or commercial consumer.

Save your proof of purchase receipt. If proof of purchase cannot be provided when requesting a warranty repair, then the manufacturing date of the engine will be used to determine the warranty period.

WARRANTY EXCLUSIONS

This limited warranty covers defective materials or workmanship that are engine related only. Not repair, replacement or refund of the equipment it is fitted to. Similarly, warranty ceases to be applicable if the engine is modified or altered, or if the engine serial number has been removed or defaced. This warranty does not include second-hand, used, reconditioned or demonstration equipment. Nor does it cover performance or engine damage caused by the following:

1. The use of non-genuine PowerBOSS replacement parts.
2. The use of incorrect fuel and contaminated or stale fuel. Petrol formulated with ethanol content greater than 10%.
3. Operation of the engine with an incorrect grade, insufficient or contaminated engine lubricating oil.
4. Excessive vibration caused by loose engine mounting, over-speeding, incorrect coupling of equipment to the engine crankshaft PTO, or unbalanced cutter blades.
5. Improper maintenance of the air filtration system allowing dirt to enter the engine.
6. Parts and assemblies associated with the OEM manufacturer that are not genuine PowerBOSS components, such as; transmissions, clutches, equipment controls etc.

7. Striking an object with the cutting assembly of a lawnmower; damaged, worn or improperly installed blades and blade adaptors, impellers or other crankshaft coupled equipment, or excessive tightness of a v-belt.
8. Overheating of the engine due to excessive build-up of grass clippings, dirt and debris. Grass clippings, dirt, debris or other blockages to the aircooling system that would normally be cleared by routine maintenance.
9. Operating the engine without sufficient ventilation.
10. If the engine is not maintained as per the recommended maintenance schedule as outlined in this manual.
11. PowerBoss engines used to re-power equipment must be of be of an equivalent specification to the engine they are replacing. Failure to do so may lead to warranty claims being rejected.

ITEMS AND CONDITIONS NOT COVERED

1. Cost of regular maintenance and related charges for regular maintenance according to the PowerBOSS maintenance schedule such as parts including but not limited to; filters, lubricants and spark plugs.
2. Components failing due to normal wear.
3. Repairs attempted or carried out by anyone other than a PowerBOSS Authorised Dealer.
4. Any damage or defect caused by alteration, modification, fitment of a non-genuine part or attachment not approved by Cox Industries (Australia) Pty Ltd.
5. Any defect caused by misuse, negligence, accidents or failure to carry out proper maintenance procedures.
6. Damage caused by continued operation of the machine after it known to be defective.
7. Transportation, insurance or any other expenses incurred by the customer in making a warranty claim.
8. Costs of rental or related equipment while repairs are in progress.
9. Telephone, facsimile or other related communication expenses.
10. Damage caused by adverse external conditions such as thunderstorm activity, acts of God, acts of terrorism, damage caused by vermin or any other act or circumstance beyond Cox Industries (Australia) Pty Ltd control.
11. Damage caused by exposure to excessive heat, moisture or dampness, or exposure to abnormally corrosive conditions.

TO CLAIM THE WARRANTY

To make a claim under this warranty, please bring or send the Mower to an Authorised PowerBOSS Service Dealer with a copy of your proof of purchase*. A claim under this warranty is not formally made unless and until the proof of purchase is provided. This does not affect your statuary rights.

*If proof of purchase is not provided the manufacturing date of the engine will be used to determine the warranty period.

WARRANTY RERGISTRATION

The online warranty registration form must be completed within 14 days of purchase. It is the purchasers' responsibility to ensure this is carried out.

This warranty is transferable to a subsequent owner of the engine, in the event of the sale of that product, provided that Cox Industries (Australia) Pty Ltd is informed in writing within a reasonable time of the sale of the subsequent owners name and contact details, such notice to be provided to Cox Industries (Australia) Pty Ltd. The notice should identify the name of the previous owner of the engine, place and date of purchase, model and serial number of the engine. The effective transfer of this warranty does not otherwise alter the terms of this warranty in any way.

For the avoidance of any doubt, any and all warranties or conditions which are not guaranteed under Australian Consumer Law or the Australian Competition and Consumer Regulations 2010 and which are not expressly included in this warranty as additional warranties or conditions are excluded.

To the extent applicable by law, Cox Industries (Australia) Pty Ltd will not accept liability for costs of labour, postage, cartage or delivery to replace faulty materials or parts, or for any loss, damage or accident directly, indirectly or consequently suffered by the purchaser, operator or any other person or property as a result of such faults whether due to defective materials or workmanship otherwise.

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