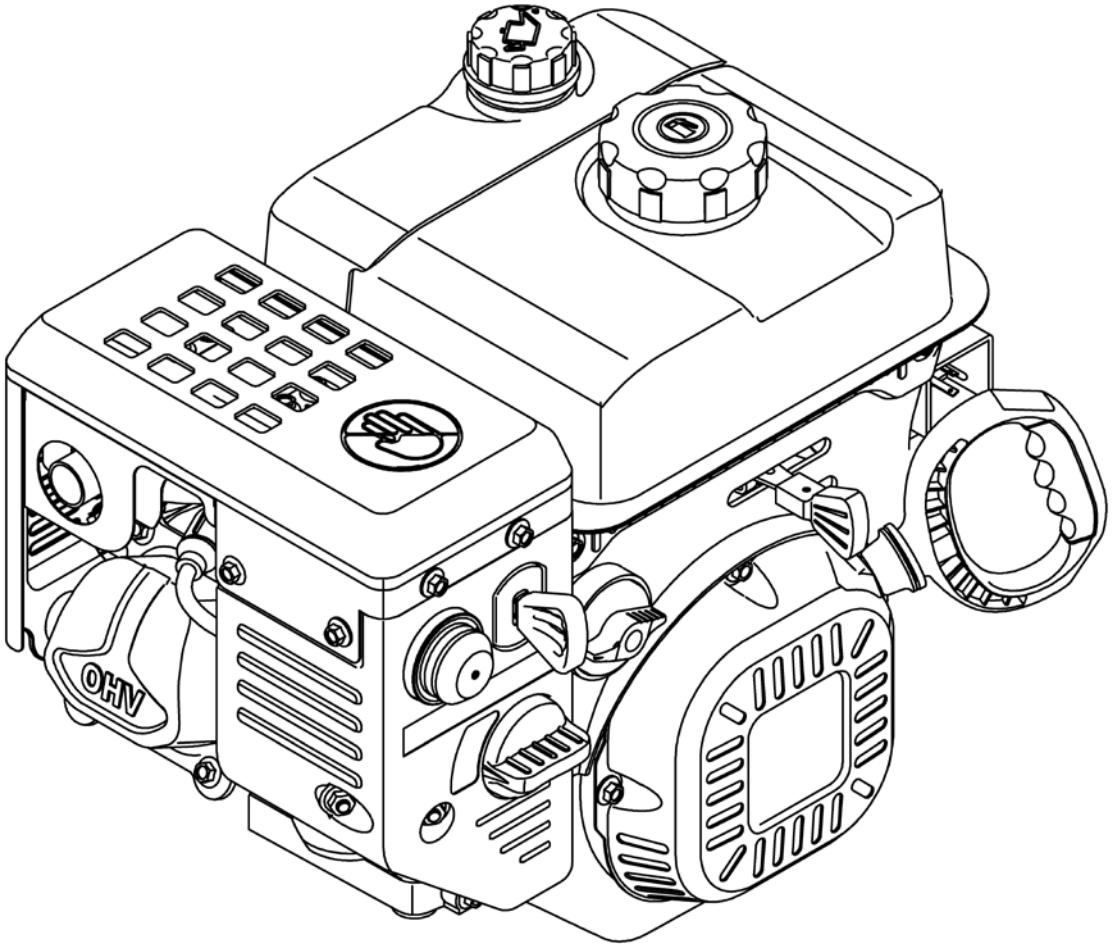
SERVICE MANUAL

165F (D) S-170F (D) S

(Snow engine)



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PREFACE

This manual covers construction, function and servicing procedures of the 165F(D)S、170F(D)S snow engine. Careful observance of the instruction given herein will result in better, safer service work.

Due to product improving, we can change specification ；

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Section 1
Safety and General Information

Safety Precautions

To ensure safe operation please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.

1.1 General safety

Pay attention to these symbols and their meaning:

WARNING: Warning is used to indicate the presence of a hazard that *can* cause *severe* personal injury, death or substantial property damage if the warning is ignored.

CAUTION: Caution is used to indicate the presence of a hazard that *will* or *can* cause *minor* personal injury or property damage if the caution is ignored.

WARNING

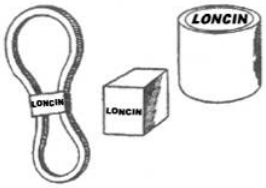
- Stop the engine before servicing, first stop the engine, and remove the spark plug.
- When the engine is running, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas.
- Don't smoke or fire on operation site due to gasoline 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.

NOTE

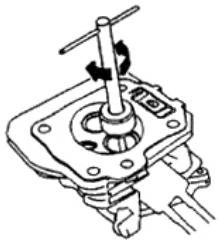
Note is used to notify people of installation, operation, or maintenance information that is important but not hazard-related.

1.2 Service rules

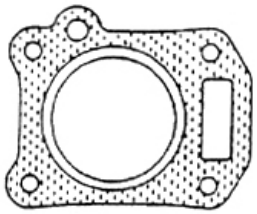
1. Use genuine LONCIN or LONCIN-recommended parts and lubrication oil. Parts that don't meet design specifications may damage the device or engine.



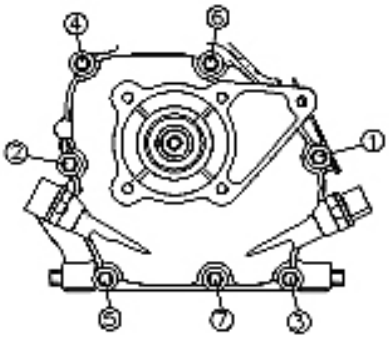
2. Use the special tools designed for this unit.



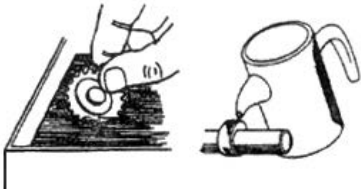
3. Install new paper gaskets, O-ring when reassembling.



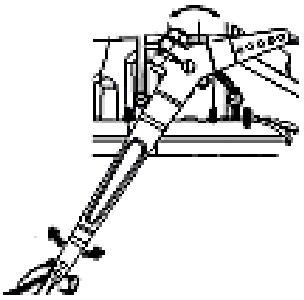
4. When screwing bolts or nuts, begin with larger-diameter inner bolt first, and tighten to the specified torque diagonally unless a particular sequence is specified.



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

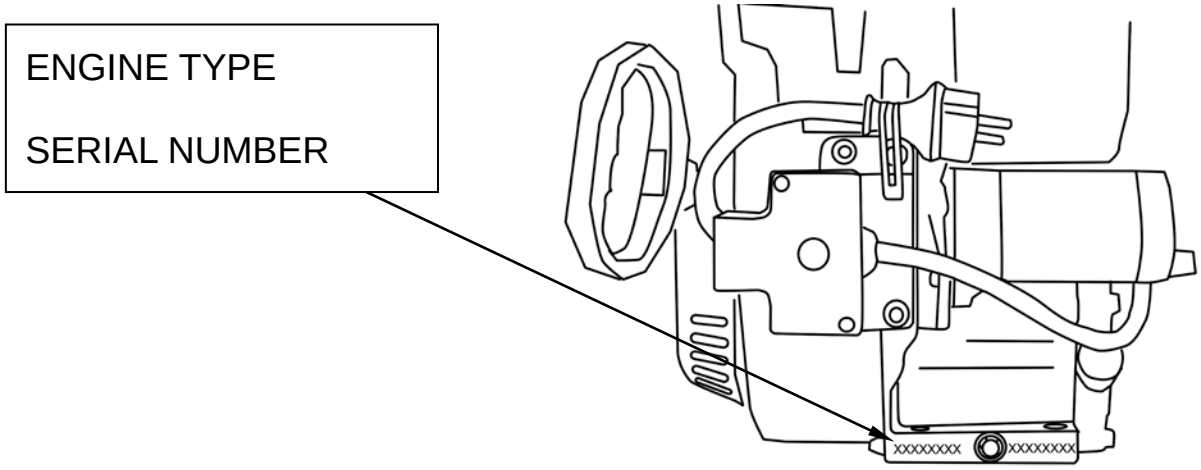
: Used grease

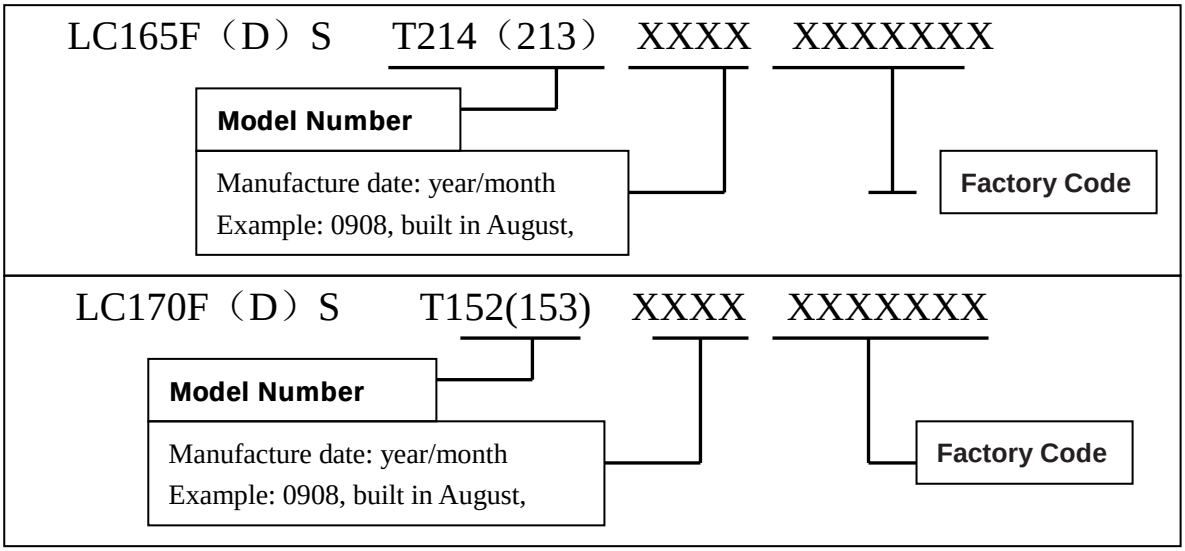
○×○(○): Indicates flange bolt model, length and quantity.

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 Oil Recommendations

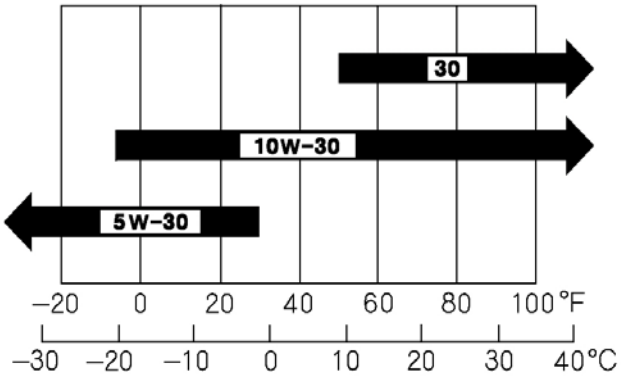
Using the proper type and weight of oil in the engine is extremely important, as is daily checking of oil level oil, or using dirty oil, will cause premature engine wear and failure.

Oil Type

When the ambient temperature is under -25℃, SAE 0W-30/40 is recommended for general use; when the ambient temperature is under -25℃ but above 0℃, SAE 5W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.

The SA oil viscosity and service classification are in the API label on the oil container.

We recommend that you use API SERVICE Category SE or SF oil.



AMBIENT TEMPERATURE

1.5 Torque values AND Other Detail Specs

Note: For ALL bolts and nuts listed above, refer to the table of standard torque values.

Bolts and Nuts

Bolts or Nuts	Specs	Torque (N.m)	Dosage
Cylinder Head Cover Bolts	M6×14	8～12	4
Cylinder Head Bolt	M8×60	32～35	4
Bottom Shroud Bolt	M6×8	8～12	2
Drain Bolts	M10×1.25×15	20～25	2
Connecting Rod Bolts	M7×1	13～15	2
Crankcase Cover Bolts	M8×32	27～30	7
Flywheel Nut	M14×1.5	80～90	1
Coil Bolt	M6×30	8～12	2
Ignition Coil Bolts	M6×30	8～12	2
		8～12	
Starter Bolt	M6×12	8～12	4
Recoil Start Bolts	M6×8	8～12	4
Shroud Bolt	M6×12	8～12	1
Starter Motor Bolt	M6×30	8～12	2
Governor Arm Nut	M6	8～12	1
Air cleaner Nuts	M6	8～12	2
Protector Muffler Bolt2	M6×14	8～12	5
Muffler Hex Nuts	M8	27～30	2

Tank Cover Bolt	M6×14	8～12	4
Fuel Switch Nut	M6	8～12	1
Holder Tank Bolt	M6×14	8～12	4
Fuel tank Cover Nuts	M6	8～12	2
Engine Cover2 Bolt	M6×16	8～12	1
Engine Cover2 Bolt2	M8×20	27～30	1
Engine Cover1 Bolt2	M6×14	8～12	4
Engine Switch Cross Screw	M4×10	1.5～3	1
Fuel Switch Cross Screw	M4×18	1.5～3	1
Start Motor Cross Screw	M4×55	1.5～3	2
EX.Stud	M8×40	27～30	2
IN.Stud	M6×113.5	8～12	2
Valve Adjusting Bolts	M8	26～32	2
Valve Adjusting Nuts	M6	8～12	2
Spark Plug	F7RTC	27～30	1

Note: For ALL Other Detail Specs

Other Detail Specs

Item	Specs	Torque (N.m)
Bolts or Nuts	M4	1.5～3
	M5	4～7
	M6	8～12
	M8	20～28
	M10	35～40
	M12	50～60

1.6 Maintenance standards

Unspecified unit 165F(D)S: mm。

Part	Item	Standard	Service Limit
		LC165F（D）S	LC165F（D）S
Engine	compression pressure(kg/cm^2) *	6.5-8.5	—
cylinder	Sleeve(inside diameter)	65	65.165
piston	skirt outside diameter	64.985	64.845
	Clearance to cylinder	0.015-0.05	0.12
	Piston pin bore inside diameter	13.002	13.048
	piston – pin clearance	0.002-0.014	0.06
piston pin	Outside diameter	13.0	12.954
piston ring	side gap	0.015-0.045	0.15
	open gap (top, the second ring)	0.2-0.4	1.0
	open gap (ring)	0.15-0.35	1.0
	width (top, the second ring)	1.5	1.37
	width (oil ring)	2.5	2.37
connecting rod	small end inside diameter	13.005	13.07
	big end inside diameter	30.22	30.246
	big end oil clearance	0.04-0.063	0.12
	big end side clearance	0.1-0.7	1.1
crankshaft	neck diameter	30.16	30.1
valve	Clearance(cold) (intake)	0.15+0.02	—
	Clearance(cold) (exhaust)	0. 20+0.02	—
	Stem diameter (intake)	5.48	5.318
	Stem diameter (exhaust)	5.44	5.275
Valve guide	Inside diameter (intake, exhaust)	5.50	5.572
	Stem to guide clearance (intake)	0.02-0.044	0.10
	Stem to guide clearance exhaust)	0.06-0.087	0.12
Valve seat	Seat width	0.8	2.0
Valve spring	free length	30.5	29.5
Cam shaft	height (intake)	27.7	27.45
	height (exhaust)	27.75	27.50
	Outside diameter (bearing)	13.984	13.916
crankcase cover	Camshaft hole diameter	14.0	14.048
spark plug	gap	0.7-0.8	—
igniter coils	resistance (primary)	0.8-1.1 Ω	—
	resistance (secondary)	5.9-7.1 Ω	—
	gap to flywheel	0.4±0.2	—

Unspecified unit 170F(D)S: mm。

Part	Item	Standard	Service Limit
		LC170F（D）S	LC170F（D）S
Engine	compression pressure(kg/cm^2) *	6.5-8.5	—
cylinder	Sleeve(inside diameter)	70	70.165
piston	skirt outside diameter	69.985	69.845
	Clearance to cylinder	0.015-0.05	0.12
	Piston pin bore inside diameter	18.002	18.048
	piston – pin clearance	0.002-0.014	0.06
piston pin	Outside diameter	18.0	17.954
piston ring	side gap	0.015-0.045	0.15
	open gap (top, the second ring)	0.2-0.4	1.0
	open gap (ring)	0.15-0.35	1.0
	width (top, the second ring)	1.2	1.07
	width (oil ring)	2.0	1.87
connecting rod	small end inside diameter	18.002	18.07
	big end inside diameter	30.22	30.246
	big end oil clearance	0.04-0.063	0.12
	big end side clearance	0.1-0.7	1.1
crankshaft	neck diameter	30.16	30.1
valve	Clearance(cold) (intake)	0.15+0.02	—
	Clearance(cold) (exhaust)	0. 20+0.02	—
	Stem diameter (intake)	5.48	5.318
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Valve guide	Inside diameter (intake, exhaust)	5.50	5.572
	Stem to guide clearance (intake)	0.02-0.044	0.10
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Valve seat	Seat width	0.8	2.0
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Cam shaft	height (intake)	27.7	27.45
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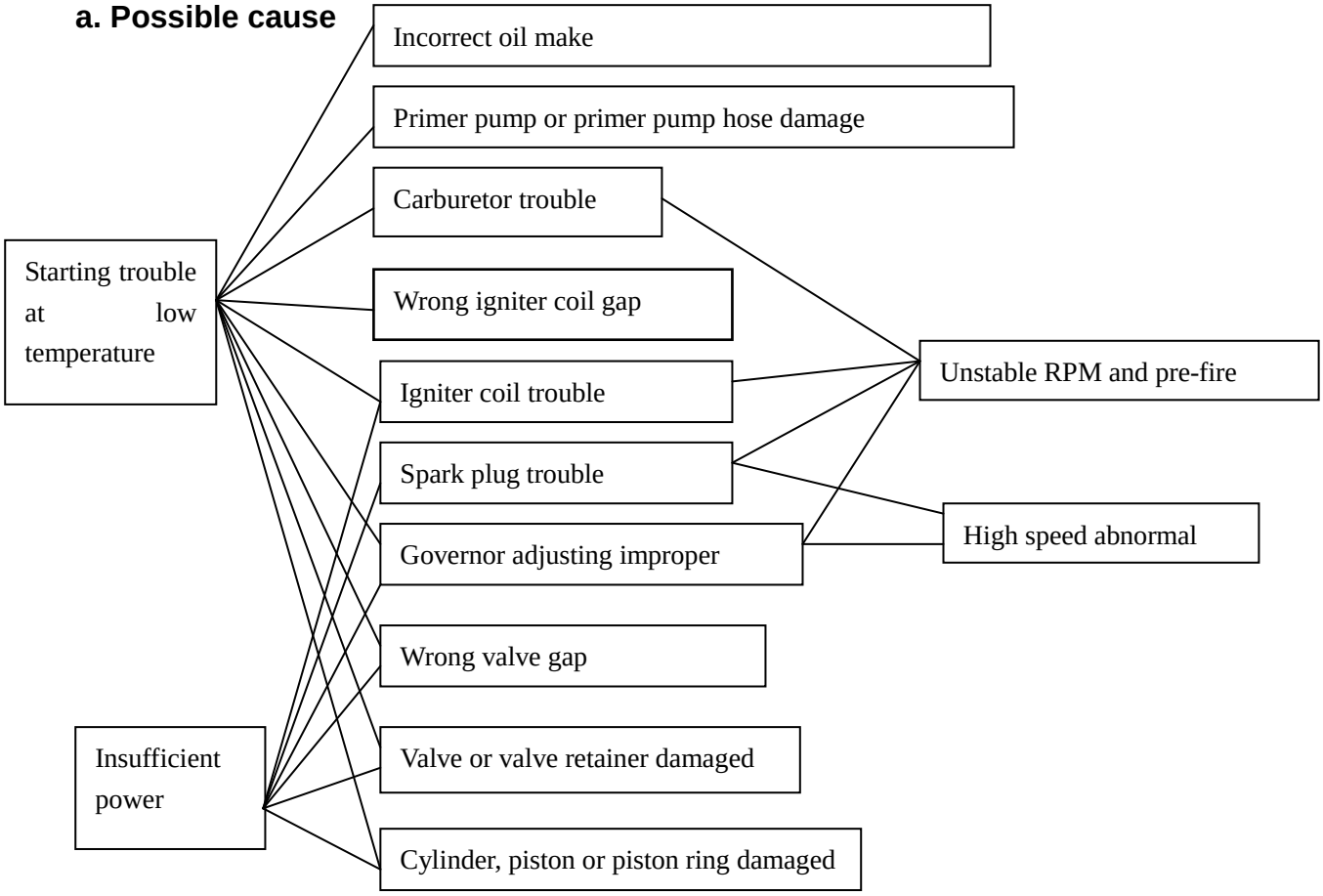
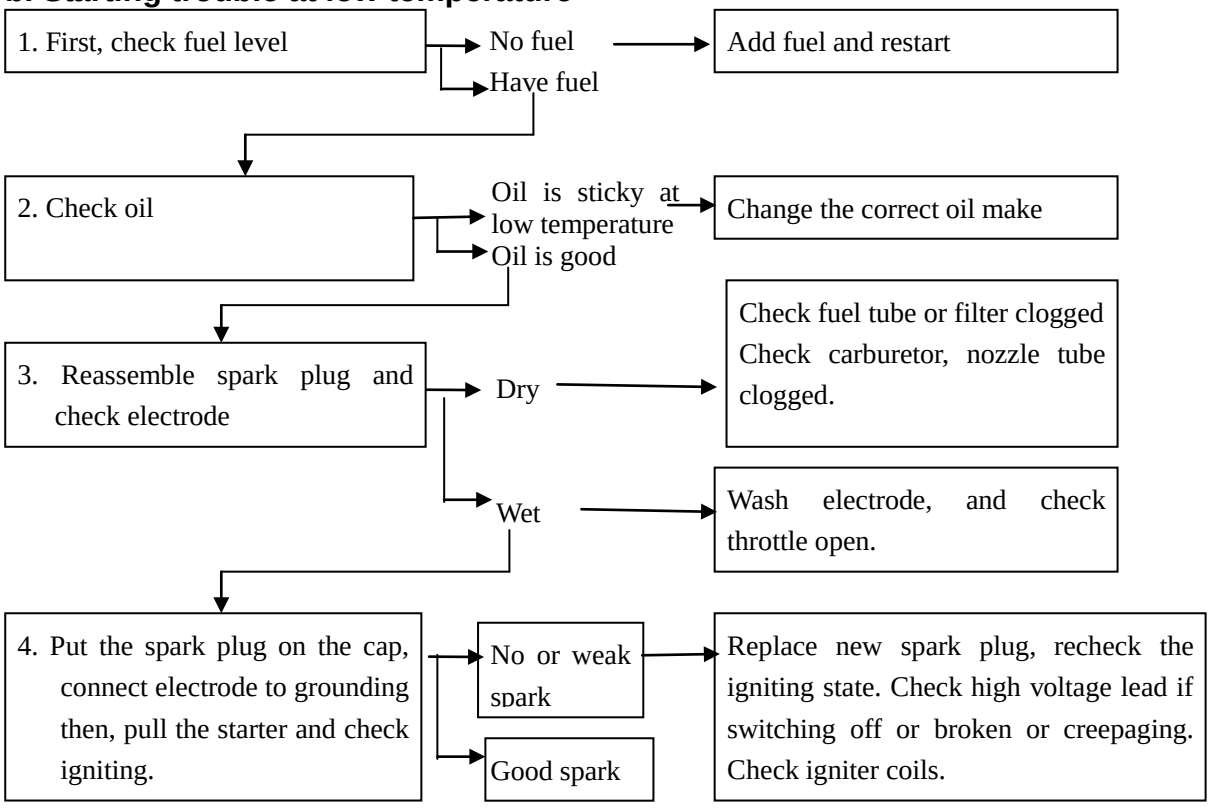
	Outside diameter (bearing)	13.984	13.916
crankcase cover	Camshaft hole diameter	14.0	14.048
spark plug	gap	0.7-0.8	—
igniter coils	resistance (primary)	0.8-1.1Ω	—
	resistance (secondary)	5.9-7.1Ω	—
	gap to flywheel	0.4±0.2	—

1.7 Troubleshooting

a. Possible cause



b. Starting trouble at low temperature



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

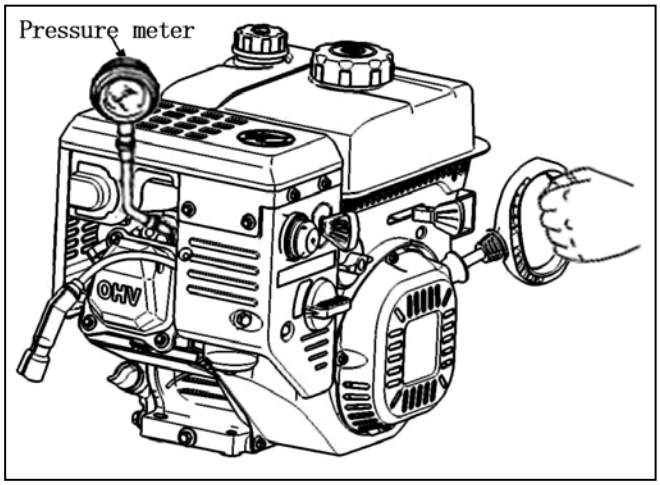
6. Assemble spark plug correct, restart engine to test.

7. Pressing the primer pump in awrong way

Press the pump with thumb quickly less than 3 times

※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

Starting poor

Check spark igniting state. Spark plug gap 0.7-0.8mm

No spark

Check by new spark plug

Good spark

Replacing spark plug

No spark

Switch off the black lead, and recheck.

Having

Engine switch trouble

High voltage broken and creepaging

Poor insulating

Igniting coil trouble Replacing igniting coils

Affirm resistance of the first and second class of igniting coils

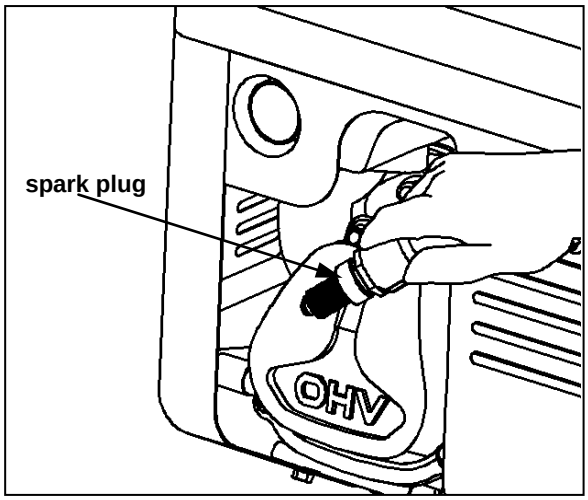
Wrong resistance value

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 grab 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.

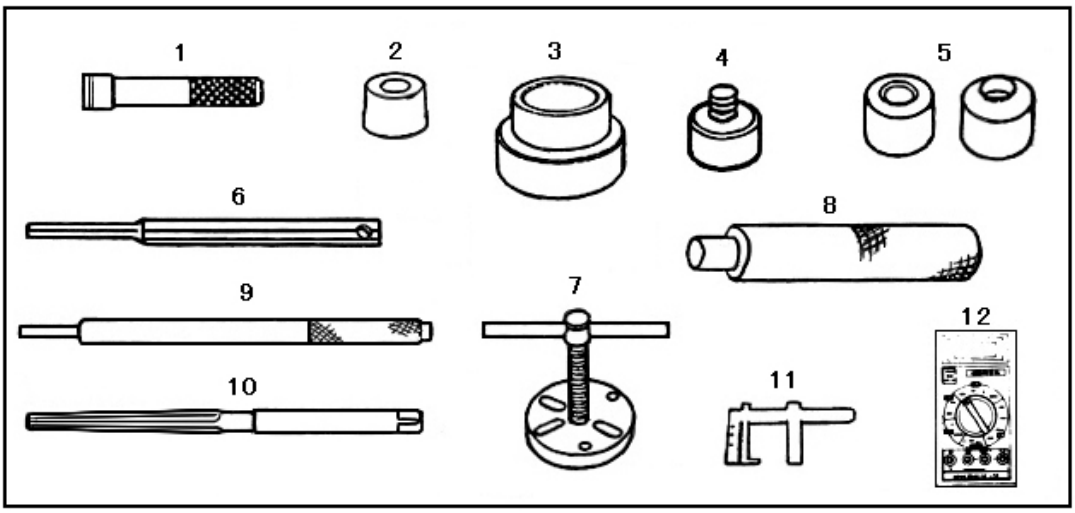
d. Overheating

Engine overheating	Cylinder pad or head cover sealing pad trouble
	Oil level low

e. Engine performance poor

Engine starts, but stops immediately	Spark plug dirt and wet Carburetor fuel level too high Carburetor bolt adjusting wrong Carburetor insulator damaged
Engine speed does not increase	Spark plug trouble/dirt Throttle closed Clogged muffler Improper valve timing Water in the carburetor Overheating Poor valve seat contact Over load
Engine speed does not decrease	Governor out of adjustment Throttle out of seat Faulty governor slider
Speed does not stabilize.	Governor out of adjustment Clogged carburetor idle speed nozzle Carburetor tightening screw out of adjustment Bad oil in the carburetor Carburetor insulator damaged Unhooked governor spring Fuel level low or no

1.8 Special tool



Ser.	Description	Note
1	Driver lever，40 mm	6、7、8 lever
2	42×47 mm outside retainer	6204 bearing assembly
	52×55 mm outside retainer driver	6205、62/22 bearing assembly
3	30 mm inside retainer driver	timing gear
	35 mm inside retainer driver	governor driving gear assembly
4	22 mm assistant driver	62/22 bearing assembly
	20 mm assistant driver	6204 bearing assembly
	25 mm assistant driver	6205 bearing assembly
	30 mm assistant driver	6206 bearing assembly
5	Diamond grinder 45° Φ24.5	grinding exhaust valve seat face
	Diamond grinder 45° Φ27.5	grinding intake valve seat face
	Diamond grinder 32° Φ25	rinding exhaust valve seat face
	Diamond grinder 32° Φ28	grinding intake, valve seat face
	Diamond grinder 60° Φ30	grinding intake, exhaust valve seat face
6	Grinder lever	Grinding valve seat face
7	Flywheel dismounter	Dismounting flywheel
8	Driver lever	2、3、4 lever
9	Valve guide dismounter	Dismounting and assembling guide
10	Valve guide reamer	Guide precision reaming
11	Float height gauge	Carburetor oil height
12	Digit multimeter	Electric testing

Section 2 Specifications

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2.3 P.T.O Dimensional drawings ----------2－5

Section 2 Specifications

2.1 Parameter

LONCIN SNOW ENGINE SPECIFICATION		
MODEL	**LC165F (D) S**	**LC170F (D) S**
ENGINE TYPE	OHV SINGLE CYLINDER, FOUR STROKE, FORCED AIR COOLING	
DISPLACEMENT(cc)	182	212
Bore×Stroke(mm)	65×55	70×55
COMPRESSION RATIO	9.5：1	8.5：1
MAX.POWER（KW)	4	4.4
MAX.TORQUE（N.m/rpm)	10.8/2500	12.5/2500
No LOAD SPEED（rpm）	3650±50	
OIL CAPACITY(L)	0.6	
FUEL CAPACITY (L)	3	
FUEL CONSUMPTION (g/Kw.h)	≤395	
Idle speed(rpm)	2000±200 rpm	
SpeedFluctuating Ratio	≤10%	
Noise(≤)	70db(A)	
Rotation	Anti-clockwise(from P.T.O. side)	
FUEL TYPE	REG.UNLEADED	
IGNITION SYSTEM	T.C.I TRANSISTORIZED MAGNETO	
LUBRICATION SYSTEM	SPLASH	
STARTING SYSTEM	RECOIL/ELECTRIC START	
DRY WEIGHT(Kg)	18.5（20.5）	18（20）

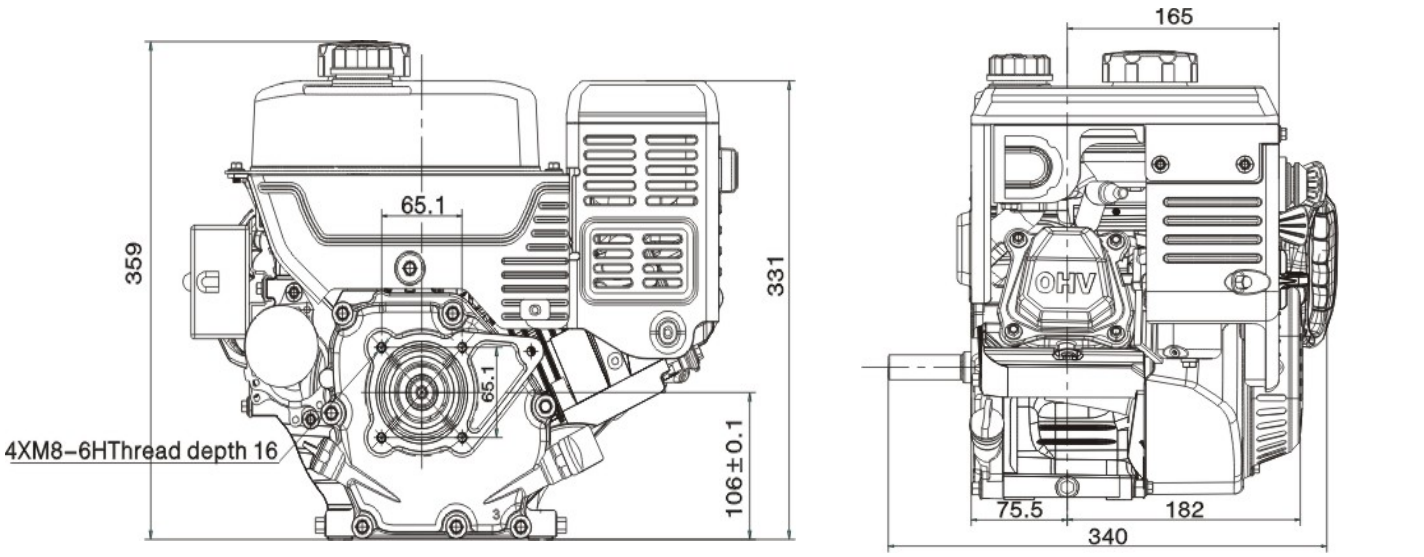
SNOW ENGINE SPECIFICATION	
GOVERNOR	MECHANICAL. SET AT NO LOAD 3650±50RPM
	FIXED SPEED
VALVES	OHV INTAKE: MARTENSITE STEEL 4Cr10Si2Mo GB/T1221-1992
	OHV EXHAUST: AUSTENITIC STEEL 5Cr21Mn9Ni4N GB/T1221-1992
VALVE SEAT	OHV INTAKE: IRON ALLOY INSERT
	OHV EXHAUST: IRON ALLOY INSERT
CRANKSHAFT	EXTENSION:PER CUSTOMER REQUIREMENTS
	KEY:PER CUSTOMER REQUIREMENTS
CYLINDER	ALUMINUM W/CAST IRON BORE ADC12, P-V Casting Iron

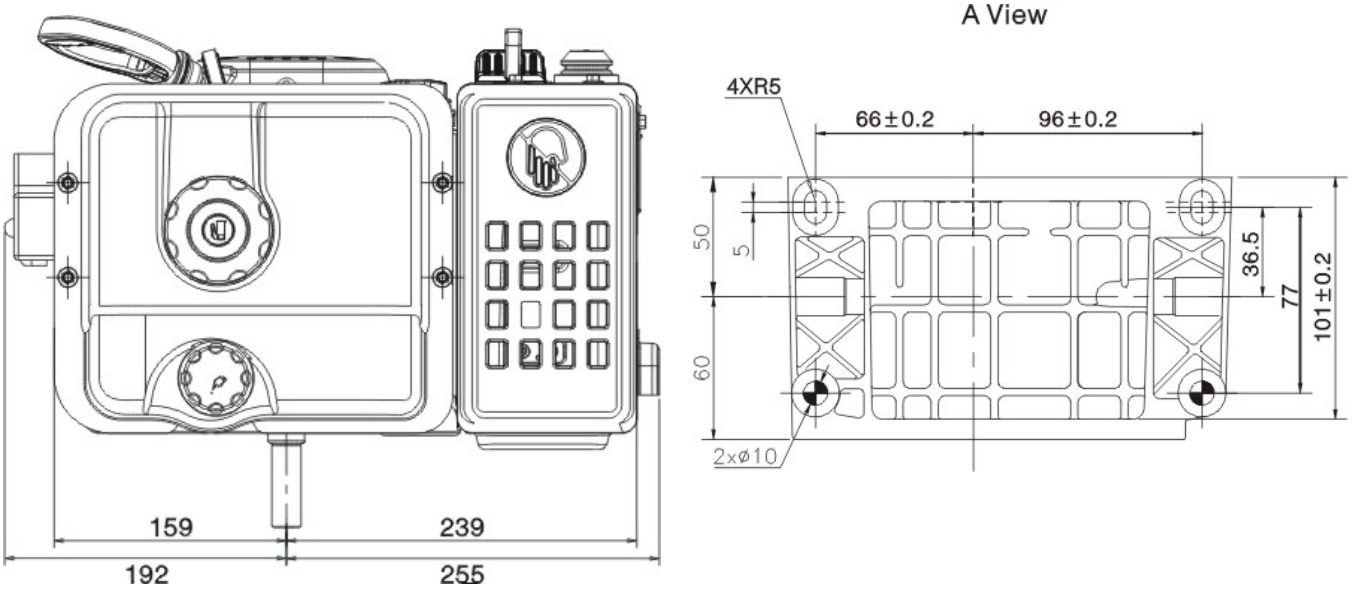
LONCIN SNOW ENGINE SPECIFICATION

MODEL	LC165F (D) S	LC170F (D) S
CONNECTING ROD	ALUMINUM 51K	
MAIN BEARINGS	BALL BEARING 6205	
	BALL BEARING 6205	
CHOKE	MANUAL CLICK-CLICK-CLICK	
SPARK PLUG	F7RTC(RESISTOR TYPE)	
CARBURETOR	FLOAT W/CHOKE AND PNEMATIC PRIMER, DUSTPROOF CAP, Limited Mixture Adjustment	
	Huayi/Ruxin	
FILLER LOCATION	STANDARD LOW MOUNT. W/DIPSTICK. Only one at the cylinder head side.	
DRAIN LOCATION	FRONT, UNDER THE CYLINDER HEAD. Standard.	
PISTON RINGS	1,COMPRESSION	
	2,COMPRESSION	
	3,OIL CONTROL	
STARTER	RECOIL AT 2 O'CLOCK POSITION	
FUEL TANK	NO FULE TANK	
FLYWHEEL	WITH RING GEAR	
OIL SEAL	NJK	
AIR CLEANER	WITHOUT FILTER	
CYLINDER Shield	ADDED SHIELD	
MUFFLER	ONLY	
ENGINE KILL SWITCH	KILL SWITH	
DECALS	EPA/CARB DECAL, LONCIN LOGO, EXTRA ONE	

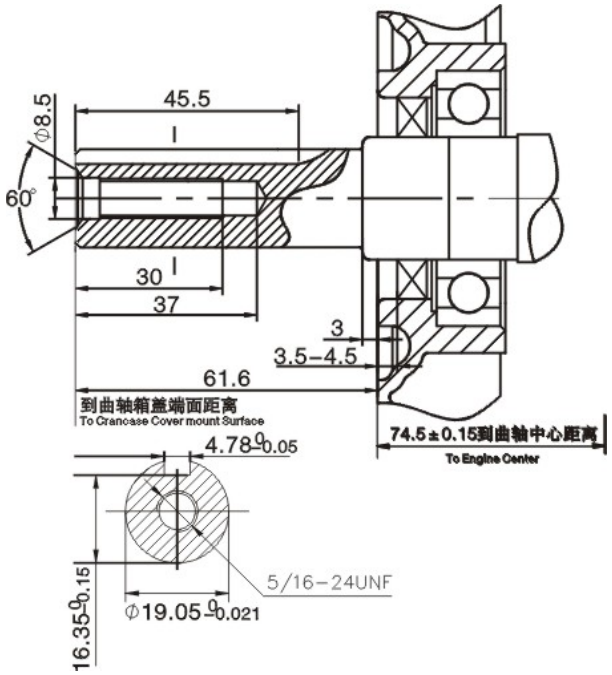
2.2 Dimensional drawings

LC165F(D)S \ LC170F(D)S

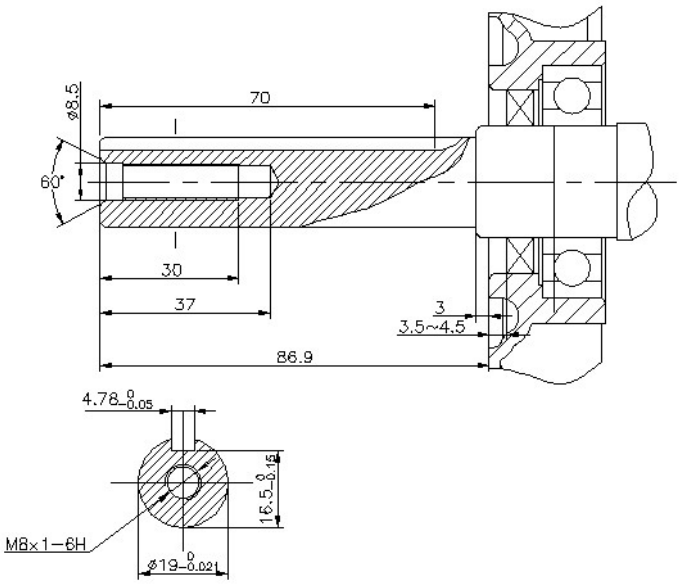




2.3 P.T.O Dimensional drawings



R轴 / Type R



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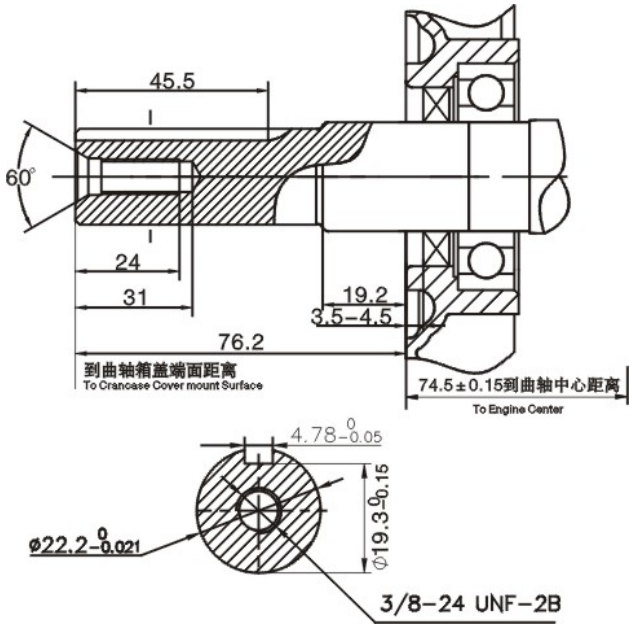
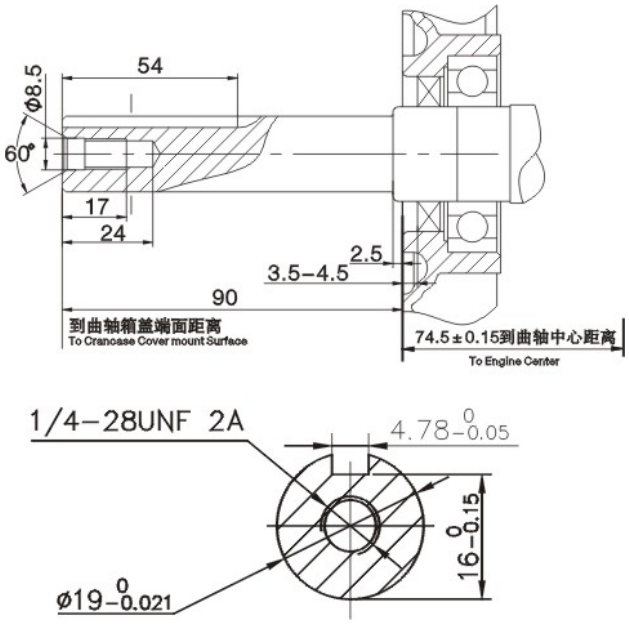


A45轴 / Type A45



A62轴 / Type A62

Section 3 Maintenance

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Section 3 Maintenance

3.1 Maintenance schedule

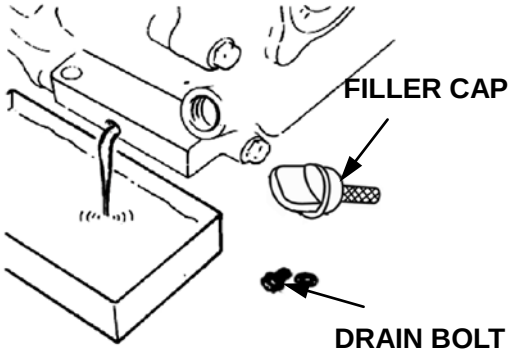
REGULAR SERVICE PERIOD Performed at every indicated month or operating hour interval, whichever comes first.			Each use	First month or 20 Hrs.	Every 3 months or 50 Hrs.	Every 6 months or 100 Hrs.	Every year or 150Hrs.
ITEM							
•	Engine oil	Check level	○				
		Change		○		○	
•	Sediment Cup	Clean				○	
•	Spark plug	Check-Clean				○	
		Replace				○	
•	Idle speed	Check-Adjust					○(1)
•	Valve clearance	Check-Adjust				○(1)	○(1)
•	Fuel Tank	Clean					○(1)
•	Fuel Filter	Replace				○(1)	
•	Combustion chamber	Clean	After every 150 Hrs. (1)				
•	Fuel line	Check	Every 2 years (Replace if necessary) (1)				

(1) 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.

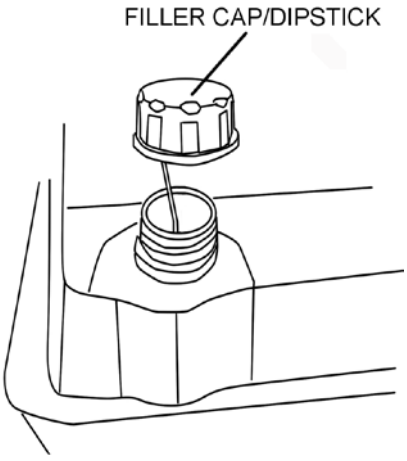
Oil filler tube method:

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

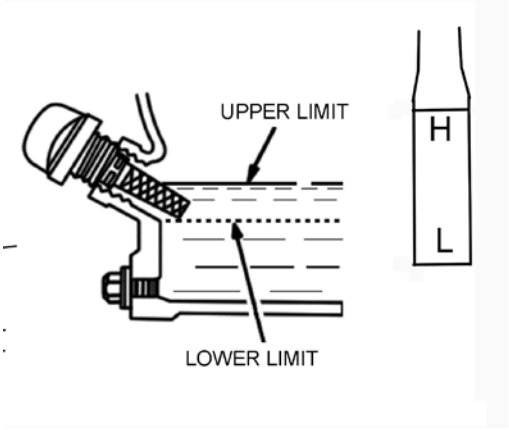
a. turn the fuel valve to the OFF position.

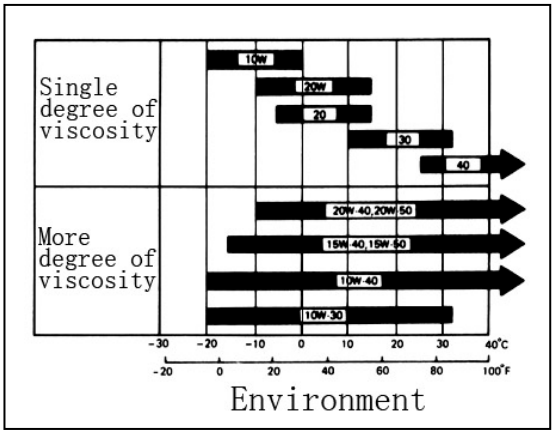
b. Remove the oil filler cap/dipstick.

c. Tip the engine 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: 0.6 L
   Use a high-detergent, premium quality 4-stroke engineoil certified to meet or exceed US.Automobile manufacturers' requirements for API Service Classification SG, SF.SAE 5W-30 or 0W-30(at different ambient temperatures) 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.



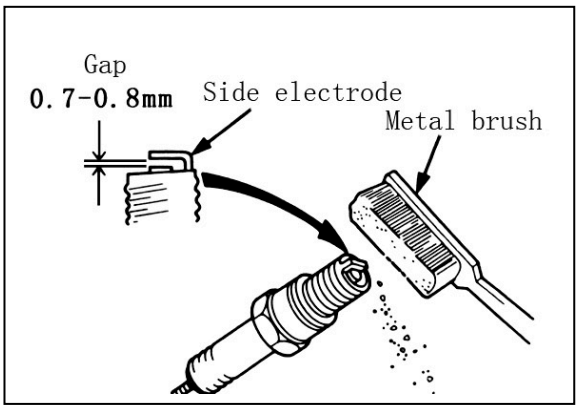


WARNING

Don't fill oil excessive.

Put the engine level when checking. Contacting engine oil can cause cancer, so you should wash it immediately with soap and water

3.3 Spark plug



Recommended types: LD F7RTC

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 0.7-0.8mm by carefully bending the ground electrode.

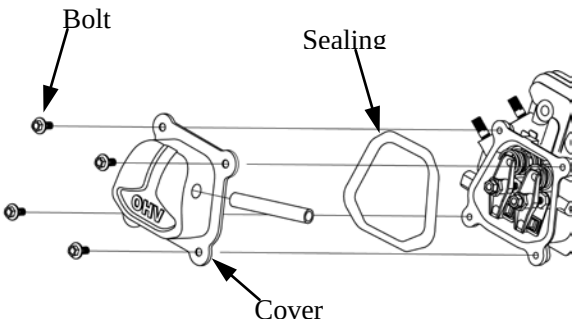
5. use a spark plug wrench to tighten the plug enough to compress the washer. For a used plug, tighten 1/8 to 1/4 of a turn after the spark plug seats. For a new plug, tighten 1/2 turn after the spark plug seats.

   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.

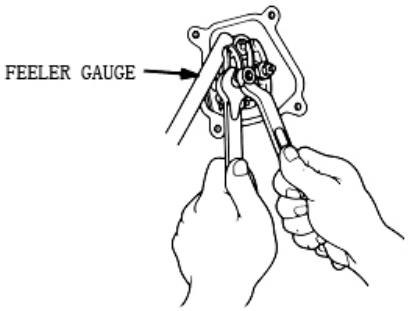
3.4 Valve clearance



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

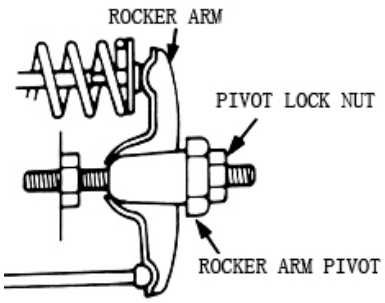
Remove the cylinder head cover, and set the piston at top dead center of the compression stroke (both valves will be fully closed).

1. Measure the clearance between the rocker arm and the valve stem with a feeler gauge.
   Intake: 0.10-0.15 mm
   Exhaust: 0.15-0.20mm
   To adjust valve clearance, hold the rocker arm pivot and loosen the pivot lock nut.



2. Turn the rocker arm pivot to obtain the specified clearance.

3. Hold the rocker arm pivot and tighten the pivot lock nut.



4. Recheck the clearance and readjust if necessary.

5. Install the cylinder head cover.

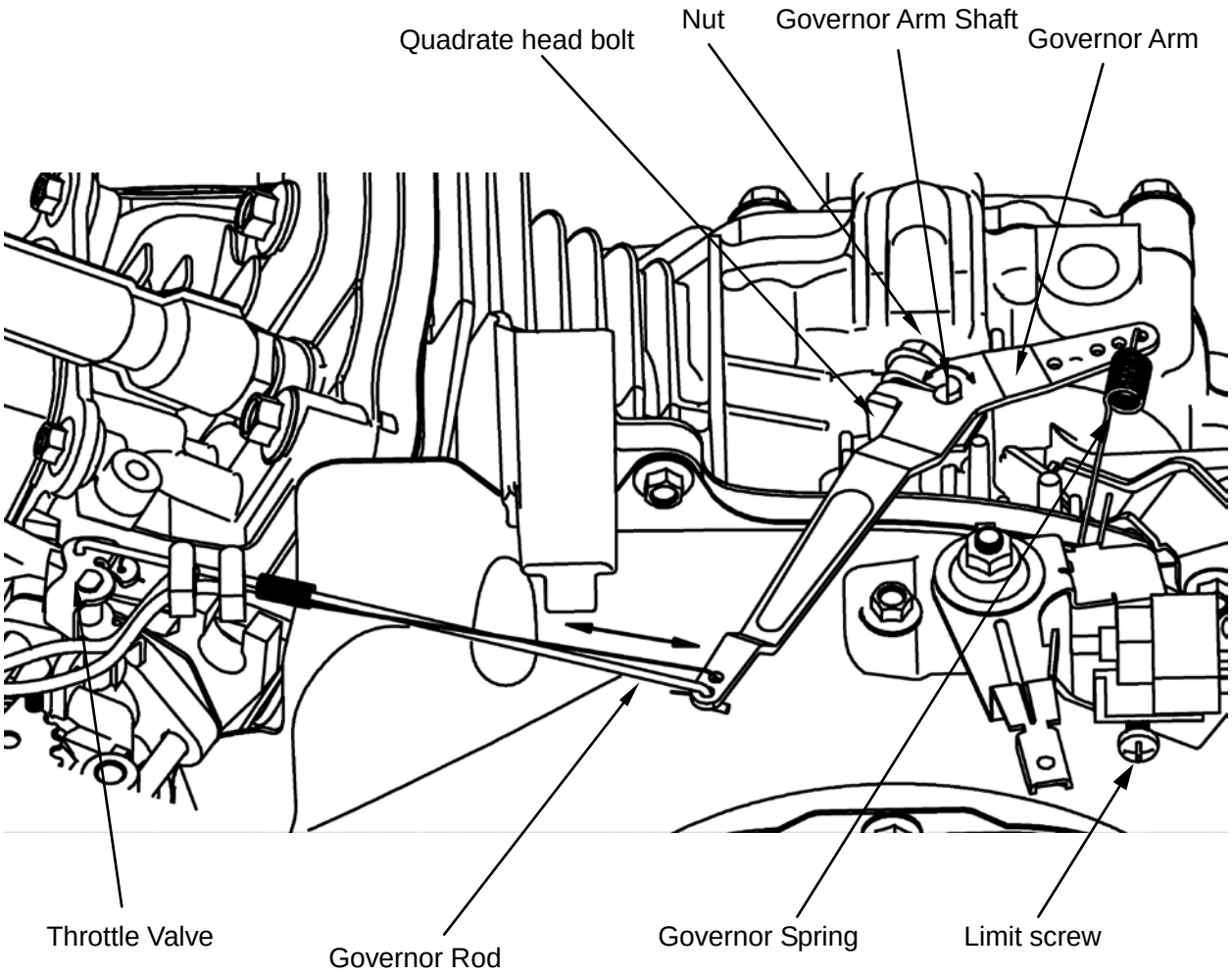
3.5 Governor

1.Loosen the governor bracket nut, wave the bracket to make throttle full open.

2.Turn the governor arm right to make governor full closed (same direction with throttle full open), tighten the nut。

3.Check governor arm and throttle if moving freely,

4.Start engine, and allow it to warm up to the normal operating temperature. Move lever to make engine at maximum speed. Adjust throttle lever screw to make the throttle lever not to exceed this position.(let speed out maximum speed)



3.6 Fuel filter

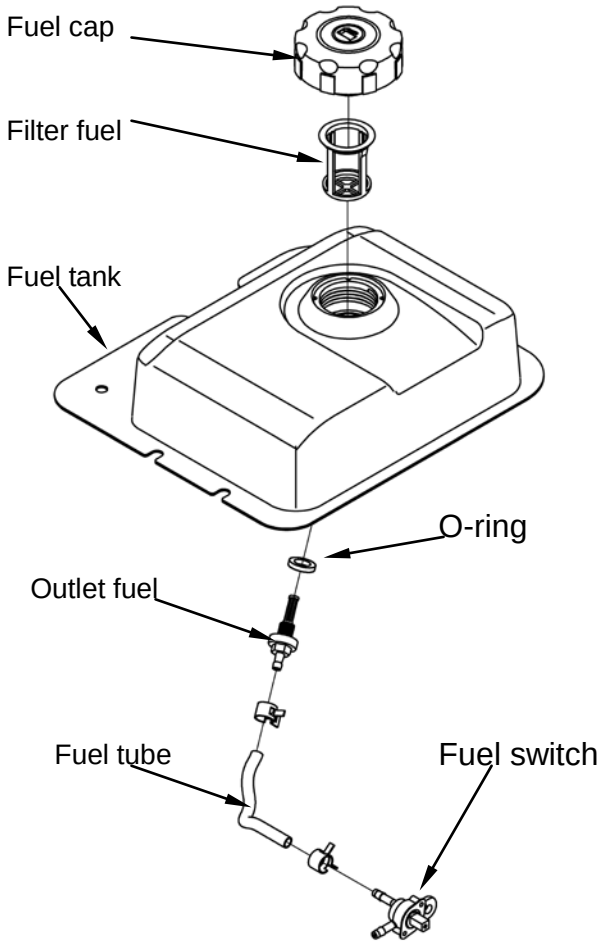
WARNING

Gasoline is extremely flammable and explosive. Don’t smoke and fire on the working site.Don’t allow the gasoline overflowing.

1.Drain the fuel in the fuel tank thoroughly out and remove the fuel tank.

2.Remove the fuel tube, and remove filter from the fuel tank.

3.Wash the filter with solvent and check strainer if there is damaged, put the O-ring on the filter, reassemble the filter and tighten to specified ： 2 N • m. After that, check if there is leaking.

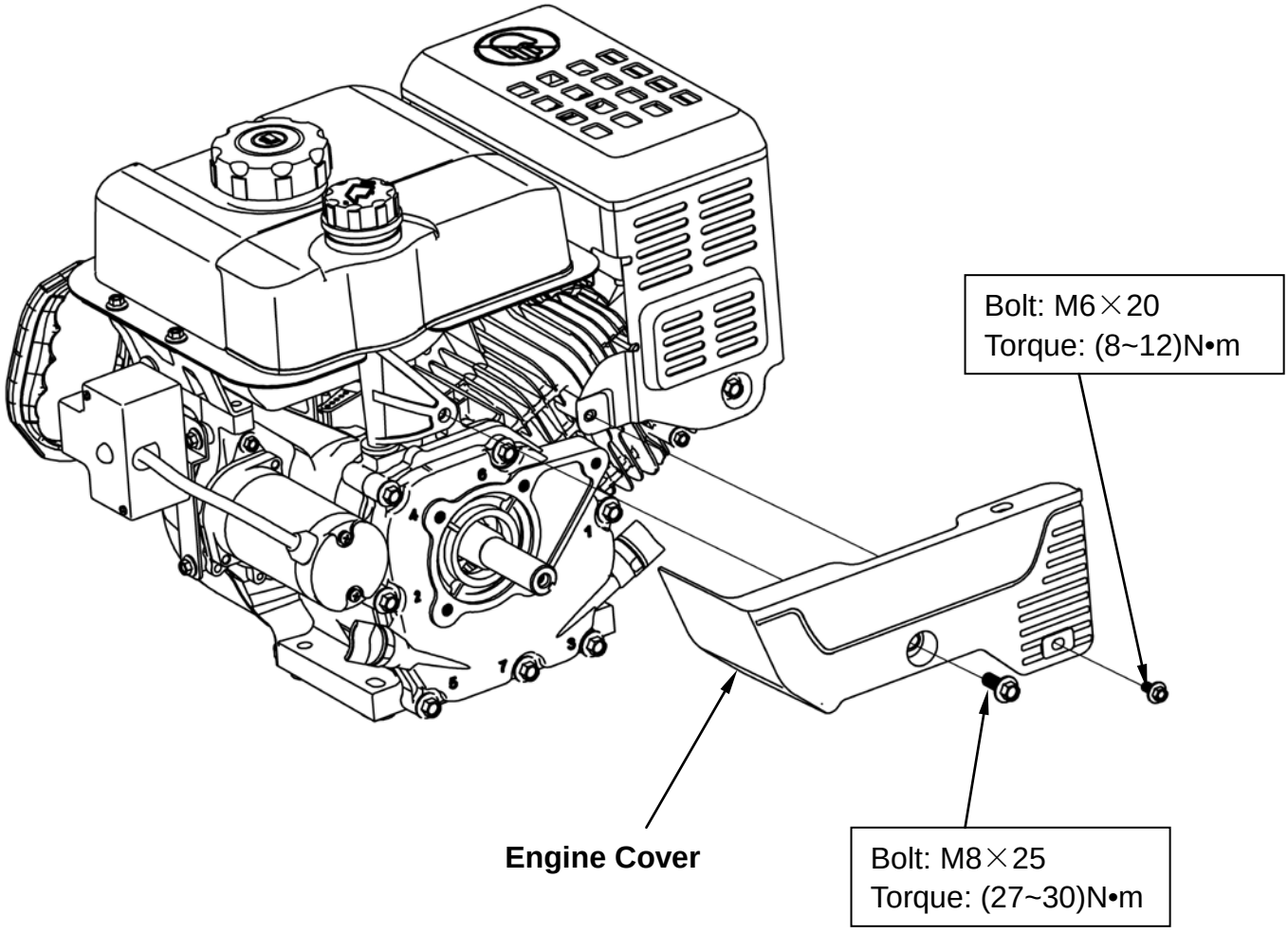


4.1 Engine cover ----------4－2
4.2 Fuel tank ----------4－3
4.3 Engine cover and Fuel tank holder----------4－4
4.4 Muffler ----------4－5
4.5 Air Cleaner ----------4－6
4.6 Carburetor ----------4－7
4.7 Governor bracket and throttle control assy ----------4－10
4.8 Recoil starter----------4－11
4.9 Flywheel, ignition coil ----------4－14
4.10 Cylinder head & valves ----------4－17
4.11 Crankshaft / piston / camshaft ----------4－23
4.12 Governor ----------4－31

Section 4 Disassembly and service

4.1 Engine cover

Disassembly/Reassembly

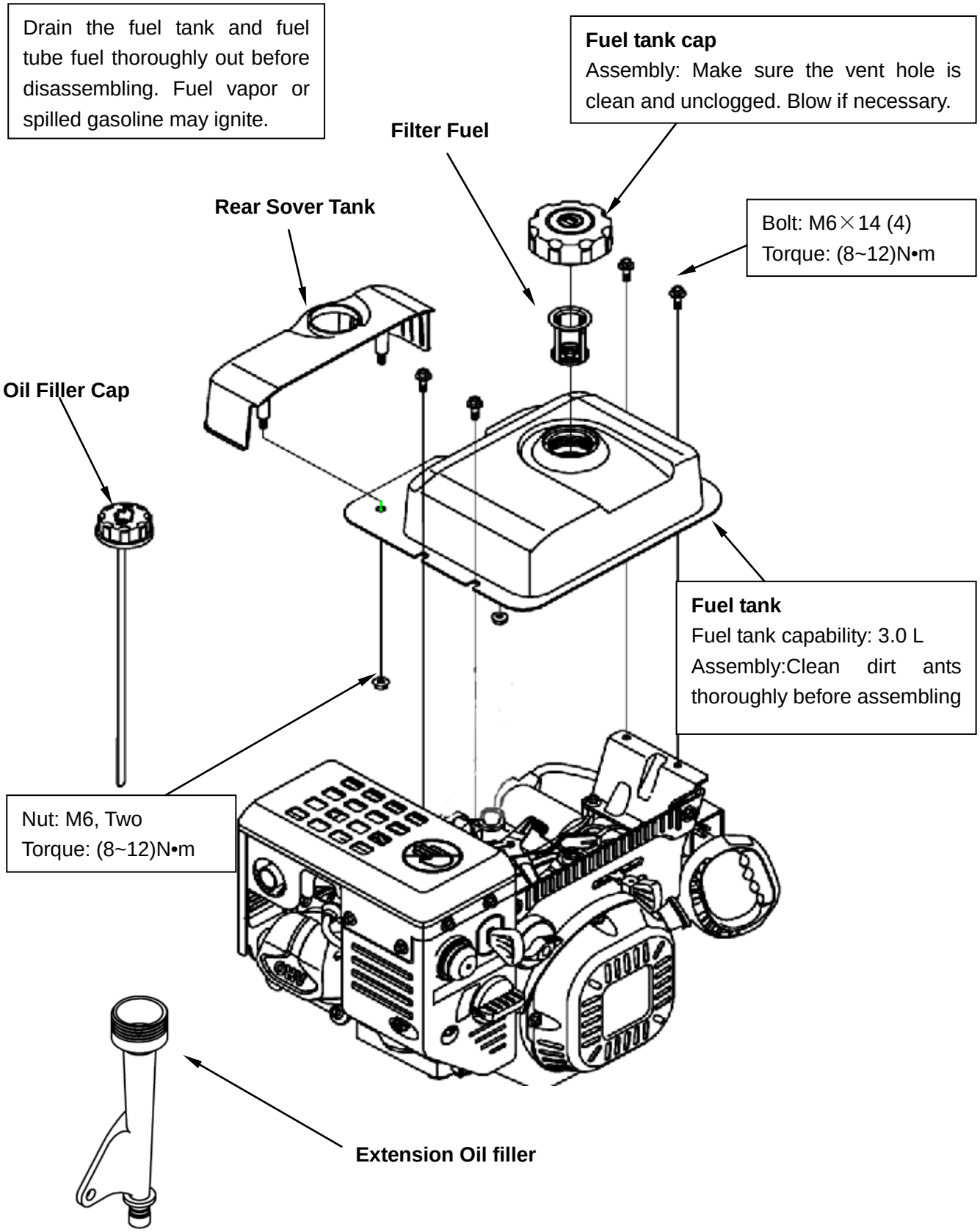


4.2 Fuel tank

Disassembly/Reassembly

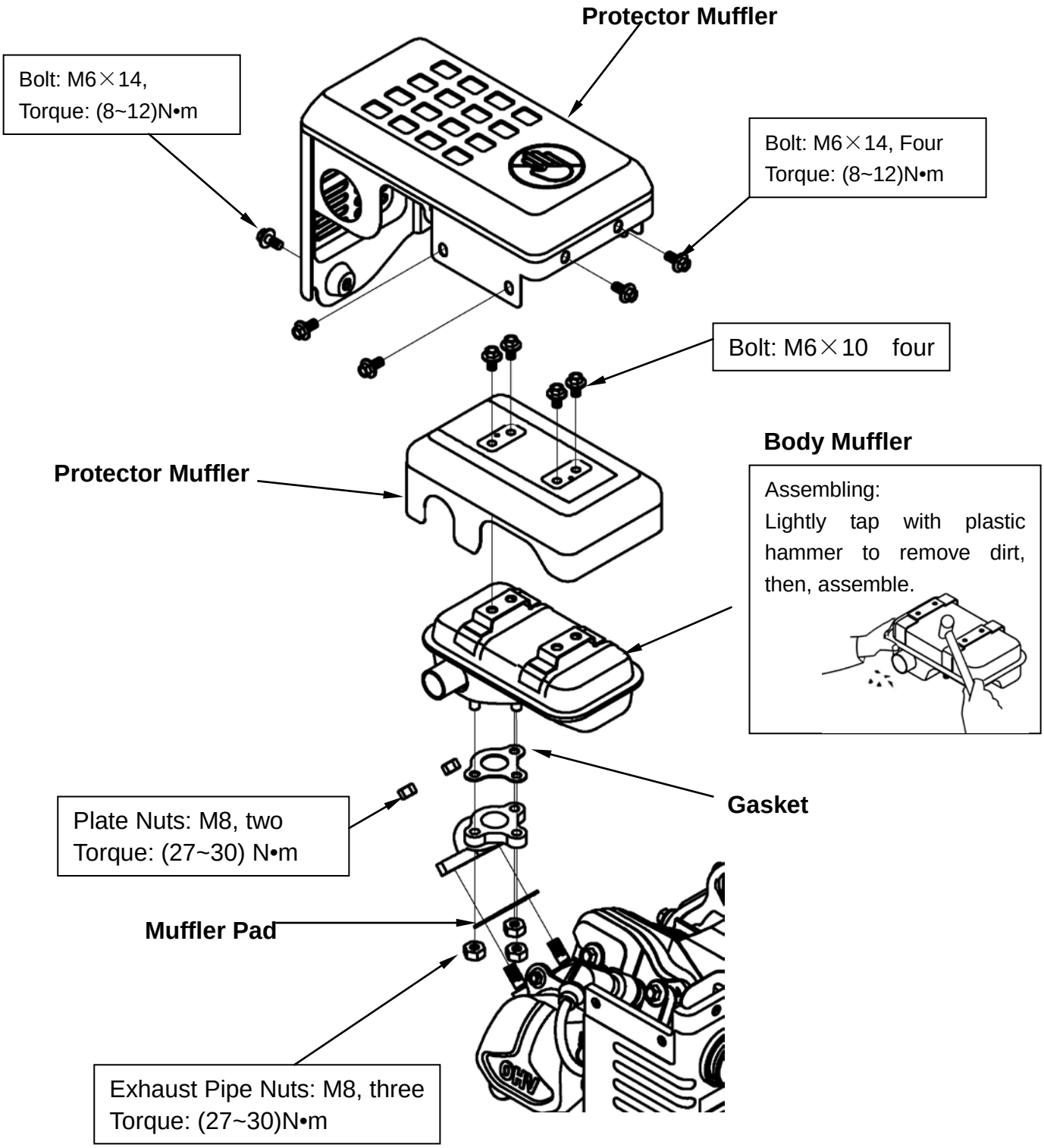
WARNING

Drain the fuel tank and fuel tube fuel thoroughly out before disassembling. Fuel vapor or spilled gasoline may ignite.



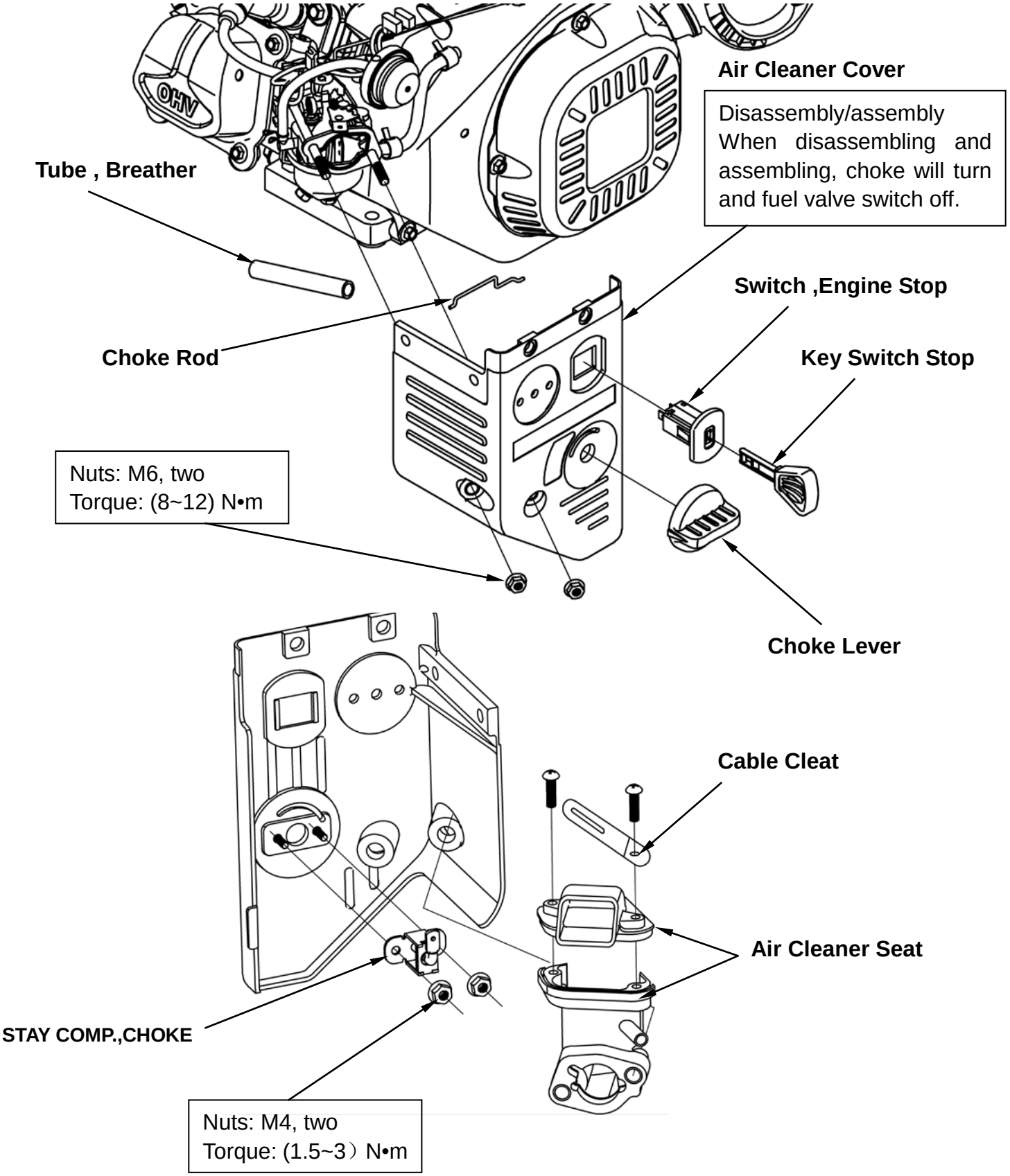
4.3 Muffler

Disassembly/Reassembly



4.4 Air cleaner

Disassembly/Reassembly

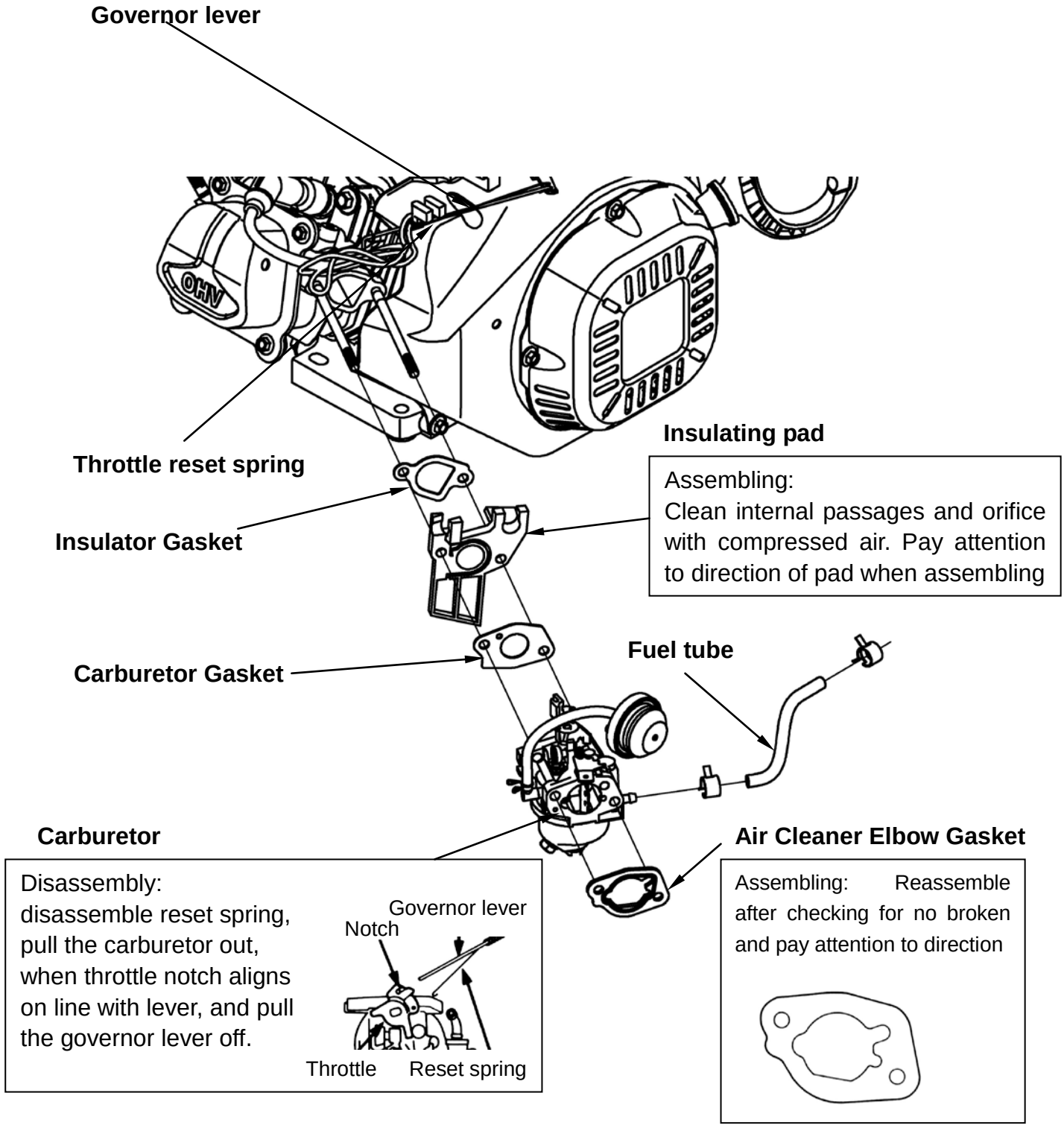


4.5 Carburetor

a、Disassembly/Reassembly

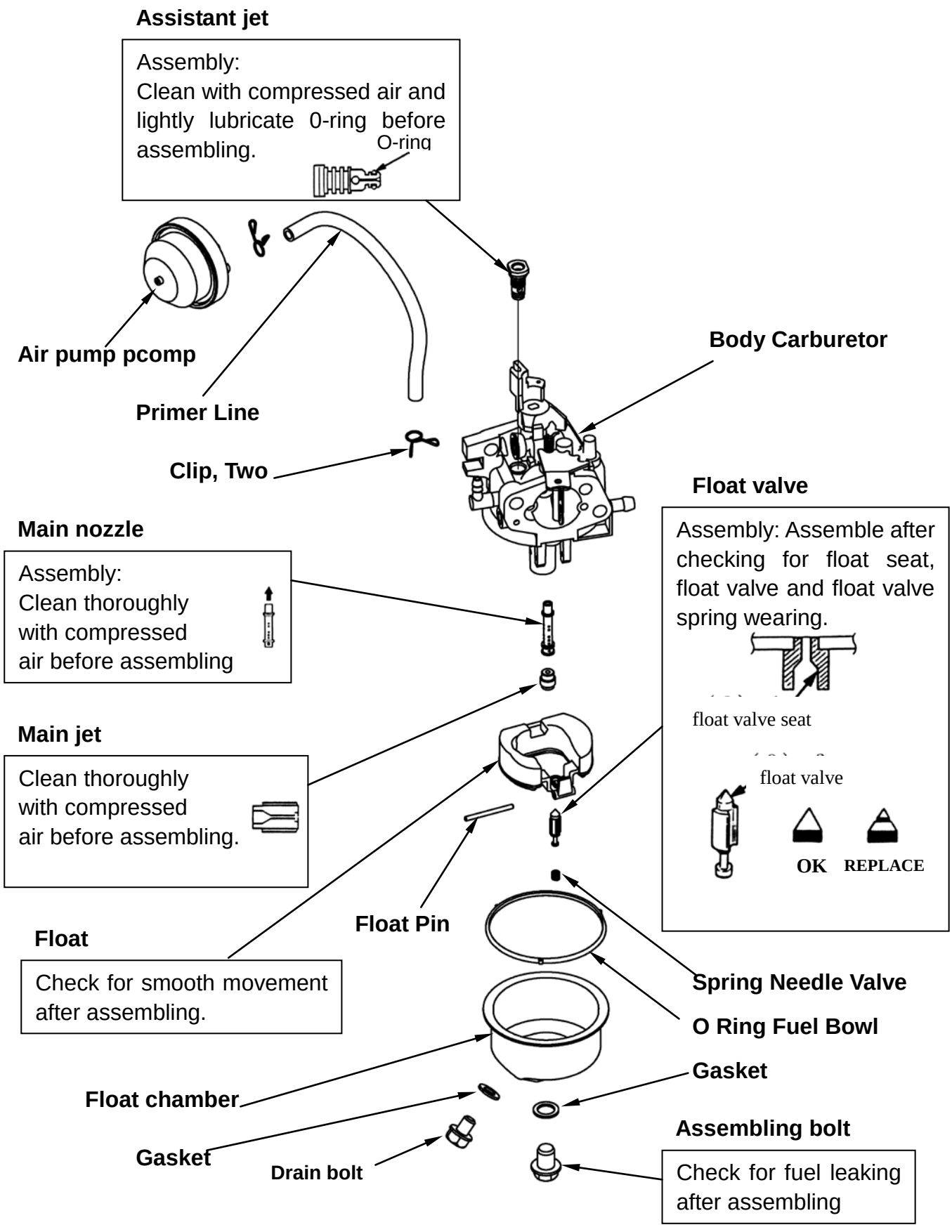
WARNING

Loosen the drain bolt and drain the carburetor before disassembling. Fuel vapor or spilled fuel may ignite.

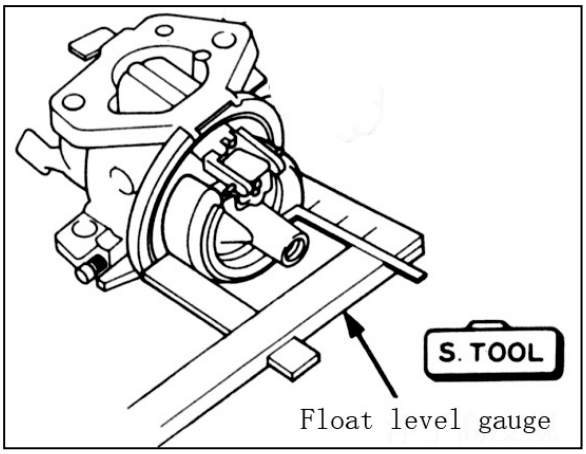


b、 Disassembly/Reassembly

Note：Clean the carburetor before disassembling.



c、Inspecting float height



Place the carburetor as shown on the drawing. Measure the distance between the float top and carburetor body when the float just contacts the float valve

Standard height	13.7 mm

If the float height is not within specification, replace float valve and recheck the float height

Washing carburetor

WARNING

In order to avoid injury, please wear safety eyeglasses or other eye protector when using compressed air.

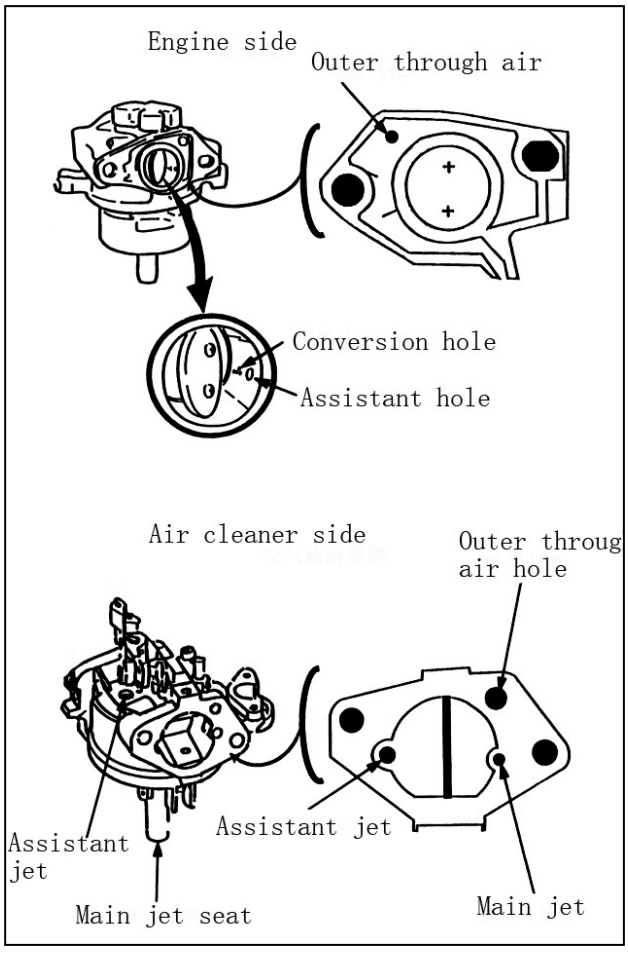
ATTENTION

Some chemical solvent has strong causticity which can damage plastic parts, such as, O-ring, and float valve seat. Please carefully read vessel manual. If you don't affirm, don't use this solvent to wash carburetor. Too maximum air pressure can damage carburetor, please use proper pressure to wash passage and tube mouth.

1) Use detergent to wash the carburetor.
2) Use low pressure air to clean passage, air hole, assistant screw hole, assistant jet hole , assistant air jet hole , main air jet hole and assistant hole.

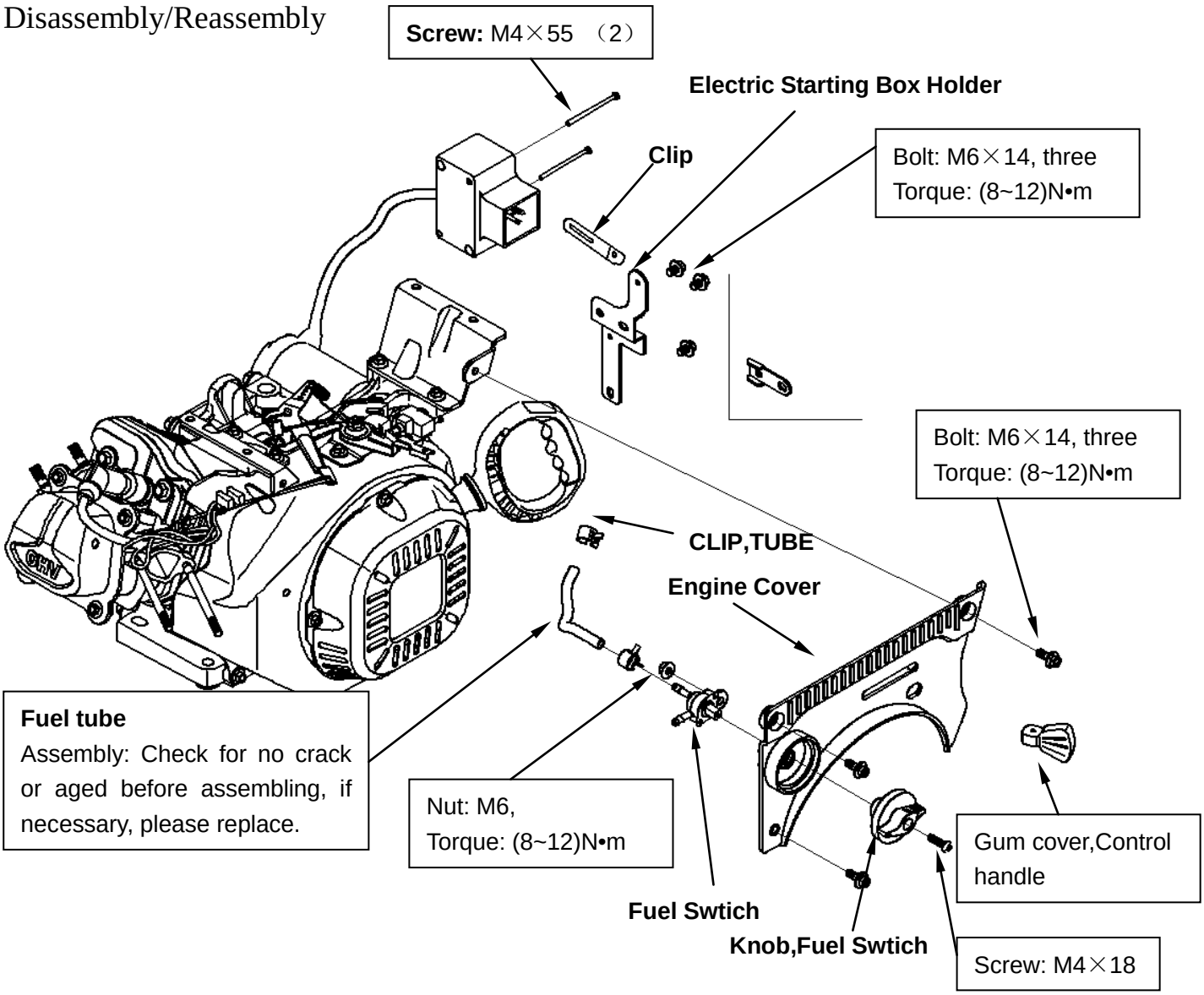
Note ：

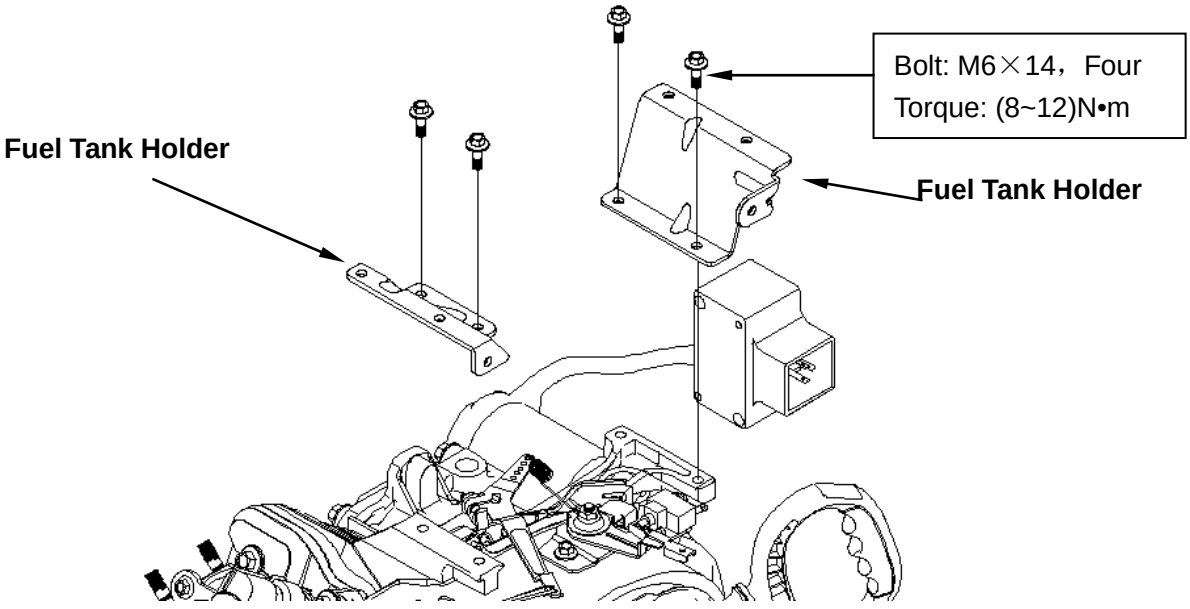
The carburetor has inner through and outer through air holes. For outer through hole, it passes through to carburetor oil cup, as well as inner through air hole is closed. For inner through hole, it passes through to carburetor oil cup, as well as outer through air hole is closed.



4.6 Engine cover and Fuel tank holder

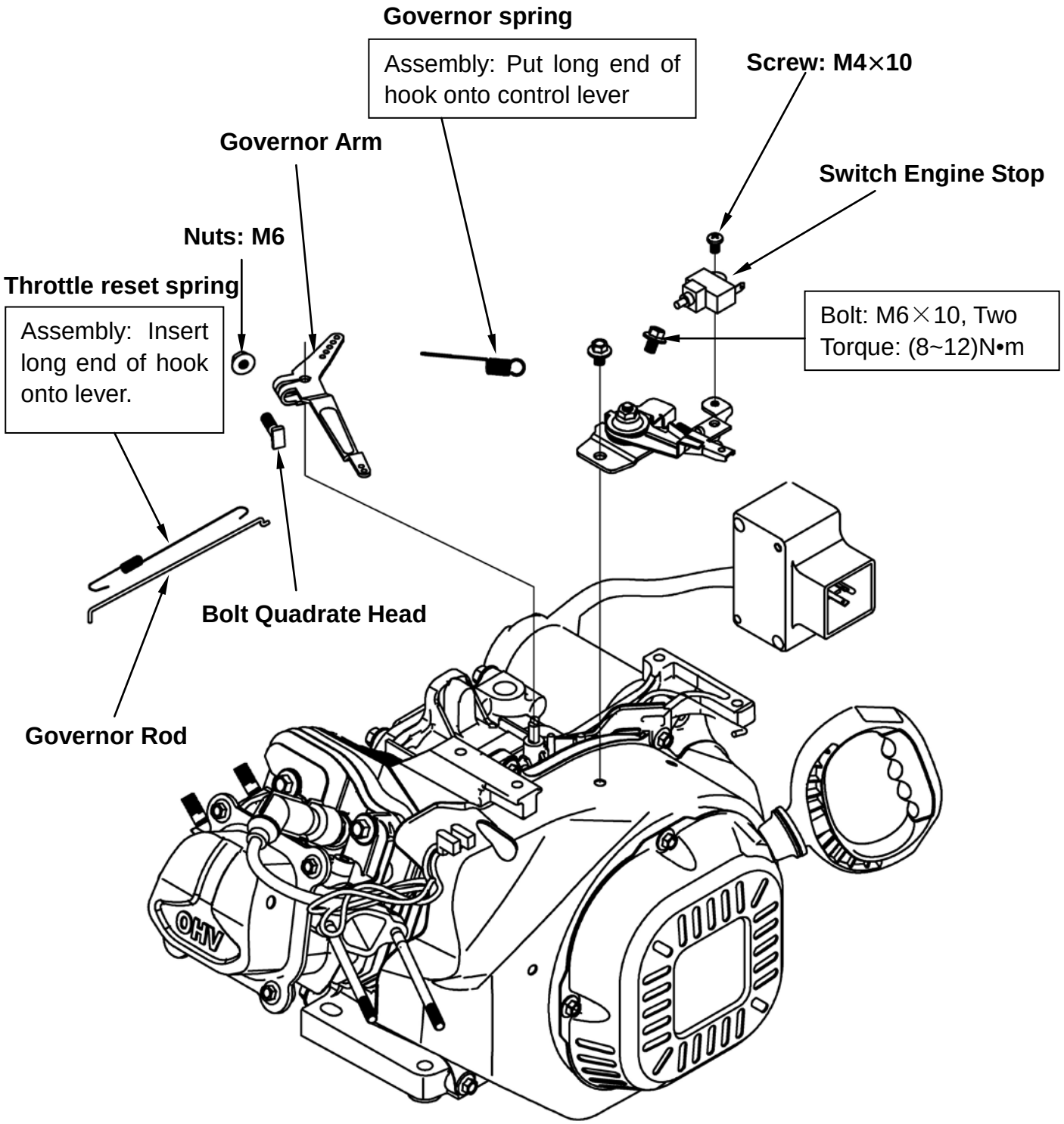
Disassembly/Reassembly





4.7 Governor bracket and throttle control assy

Disassembly/Reassembly



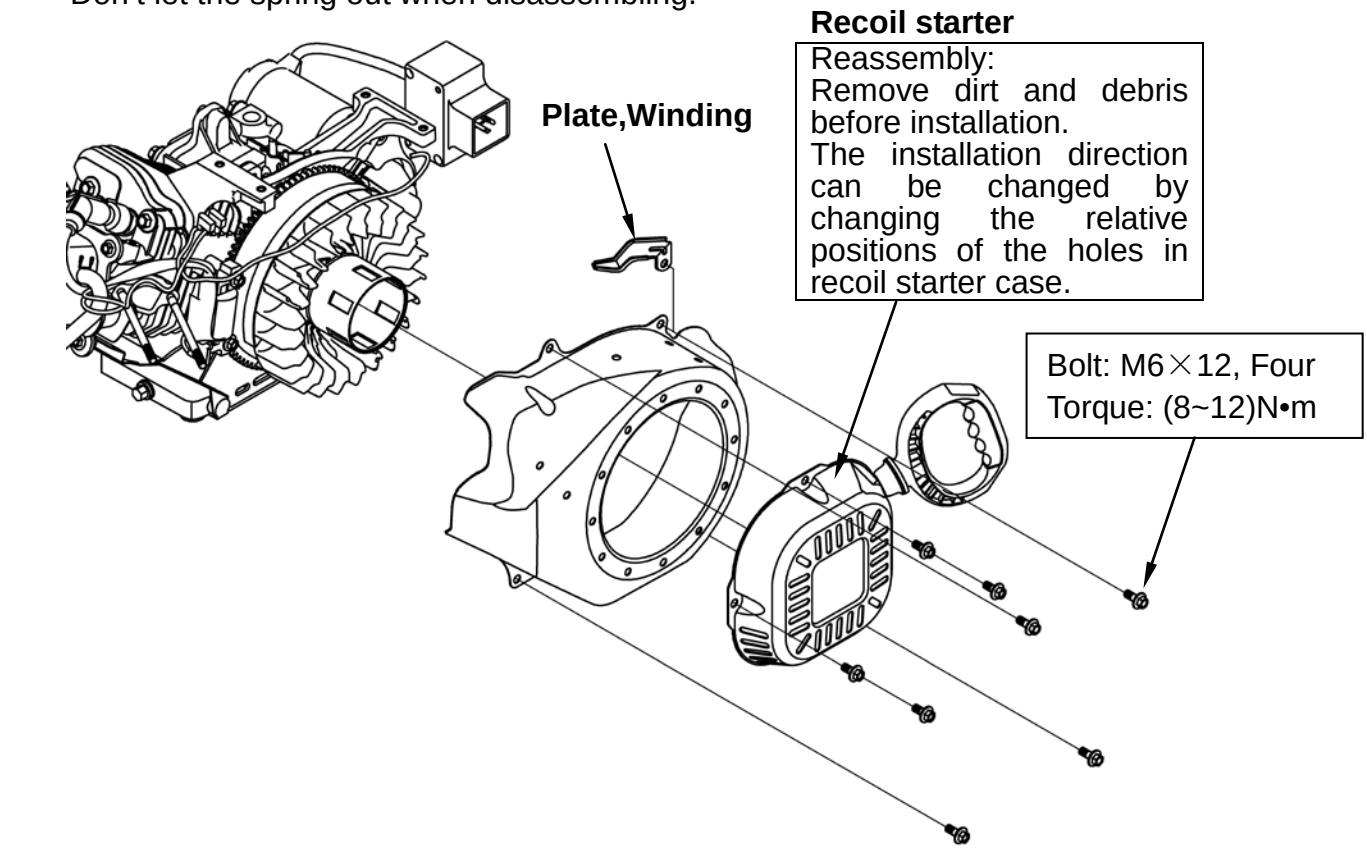
4.8 Recoil starter

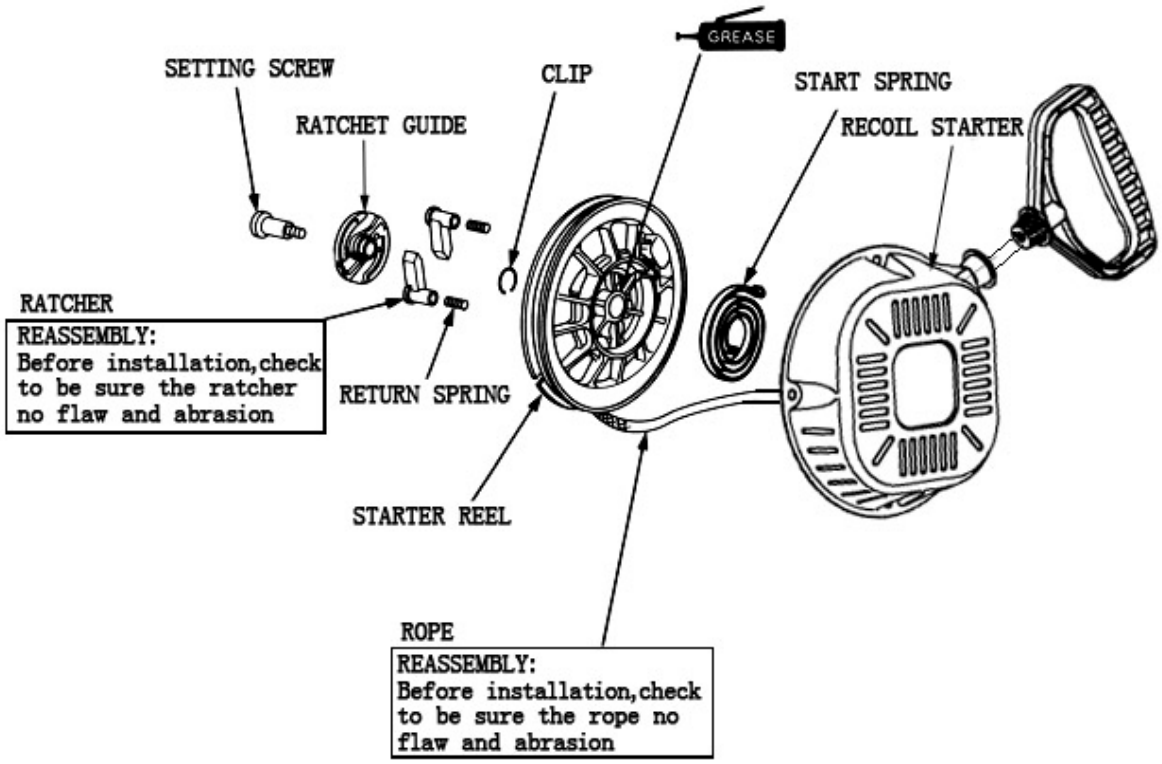
a、Disassembly/Reassembly

WARNING

Wear gloves and eye protectors.

Don't let the spring out when disassembling.



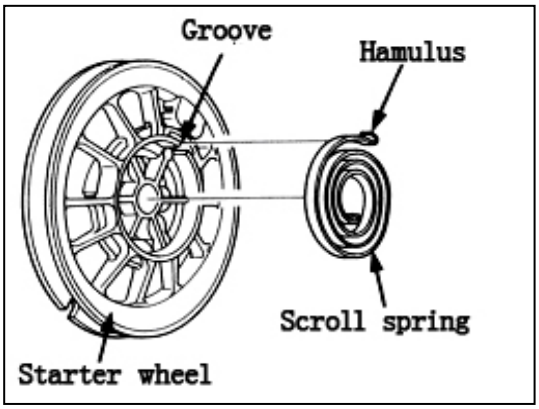


b、Recoil starter assembly

WARNING

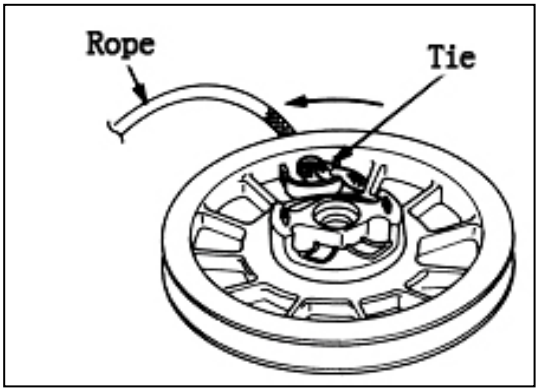
Wear gloves and eye protectors.
Don't let the spring out when disassembling.

Insert the hook on the outer side of the scroll spring into the hole of the starter

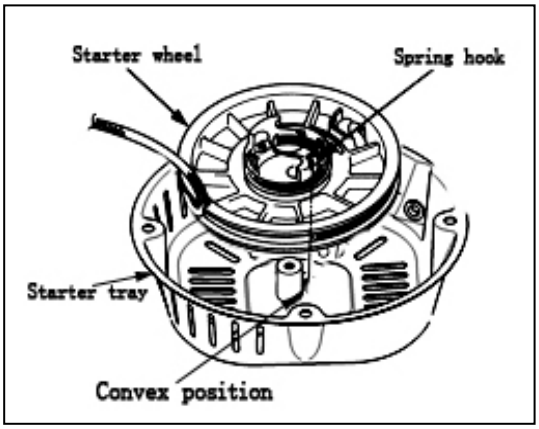


Pass the rope through the hole of the starter wheel and tie the end of rope (shown on drawing), wind the rope onto the reel in the arrowed direction , and remain about 30cm outside the starter wheel.

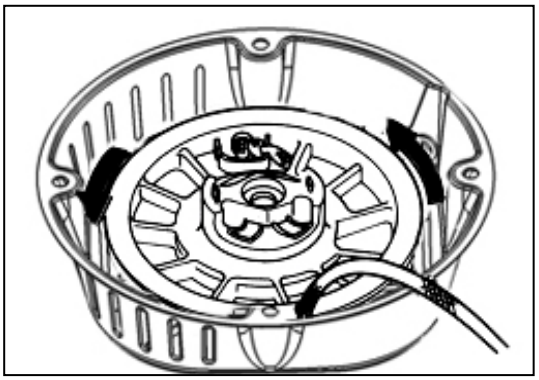
Note： Make sure remaining about 30cm rope outside the starter wheel.



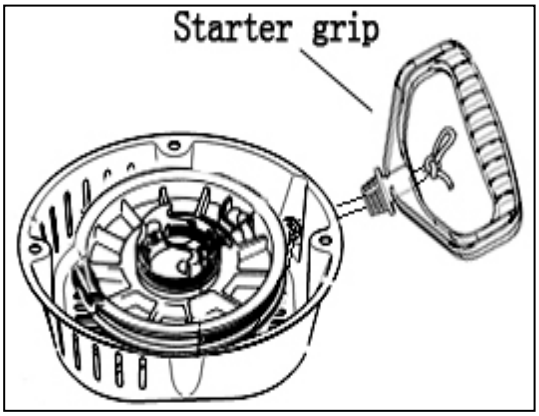
Assemble the starter wheel on the starter reel, insert the hook on the inner side of scroll spring on the convex position of starter dray.



Grasp the starter grip and pre-turn starter wheel two turns as shown as arrow direction.



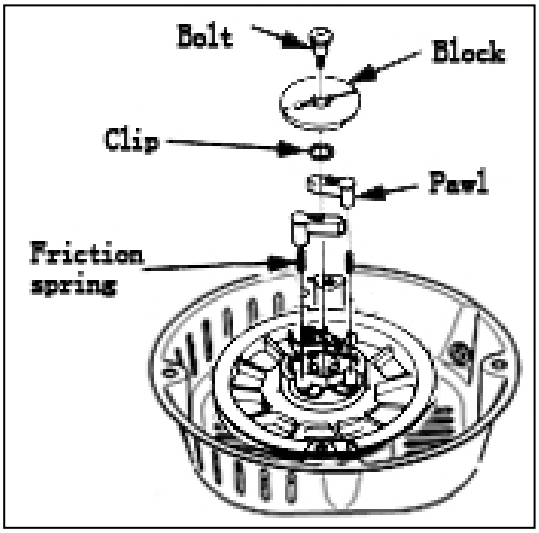
Pass the starter rope through the starter tray, and tie as shown as drawing.



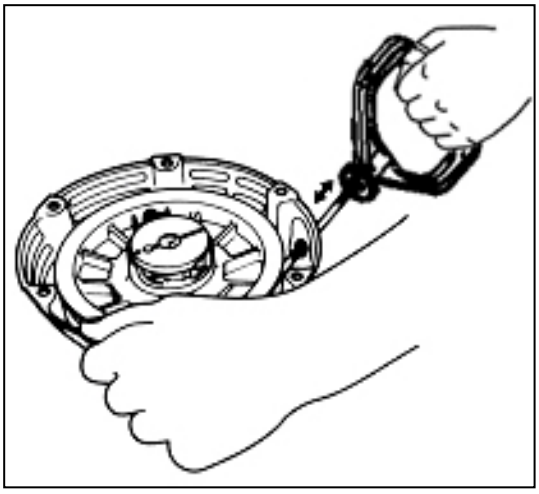
⚠ WARNING

Don't allow the starter wheel leaving off the starter tray, otherwise, the spring fly out to injure person.

Assemble the pawl and friction spring together on the starter wheel, tighten the bolt of bolt.



Pull the starter rope several times to make sure if the pawl moves correctly.



4.9 Flywheel, ignition coil

a、Disassembly/Reassembly

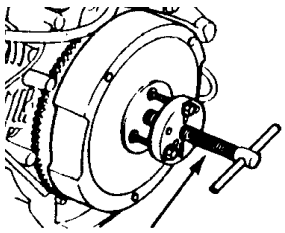
Starting motor type:
Start the motor, and measure motor operation performance, if the operation performance is not within the maintenance, disassemble

	U.S	EU
Starting voltage	120v AC	230v
Starting speed	800 (rpm)	800 (rpm)

Bolt: M6×30, Two
Torque: (8~12)N•m

Flywheel

<Starting motor>
. Remove the igniting coil before removing flywheel
. Don't hit the flywheel with a hammer. Remove as shown on the drawing with a special tool.



Flywheel puller

Reassembly: Degrease the crankshaft taper face and flywheel hole. then assemble.

Woodruff key

After assembling, check to be sure that the woodruff key is still in its slot on the crankshaft.

Bolt: M6×30,Two
Torque: (8~12)N•m

M14 hexagon flange nut
80-90N.m (Apply engine oil on the thread.)
Disassembly/reassembly:
Insert a screwdriver or another tool into the hole of starter pulley to prevent flywheel from rotating.

Spark plug

Lighting coil

High-tension cord

Assembly:
Check for cracked or damaged insulation, replace if necessary.

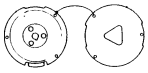
Igniting coil

6×25㎜（2）

Fuel Line Restrlct Board

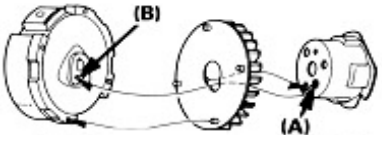
Cooling fan

Caution: When servicing, take care not to damage the fan blades.
Reassembly: Assemble the fan, aligning the four lugs on the back of the fan with the small holes in the flywheel.

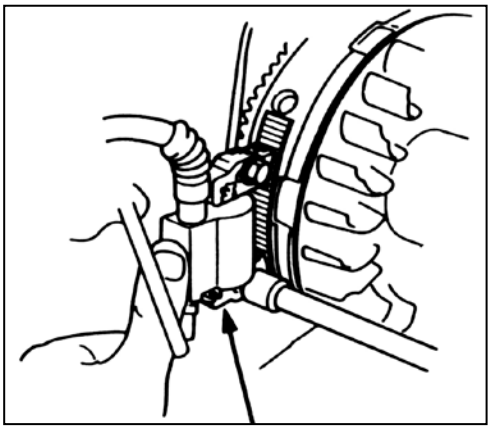


Starter Pulley

Assemble, aligning the lugs on the starting cup with the small holes in the flywheel center



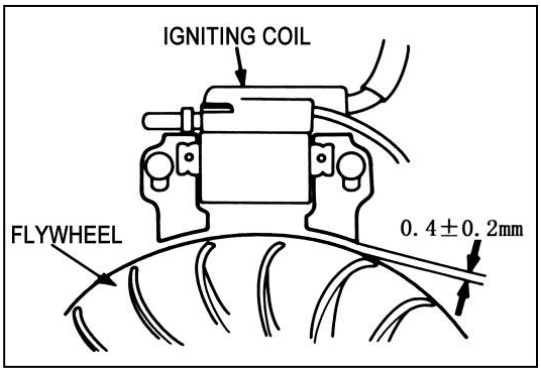
b、Igniting coil gap adjustment



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

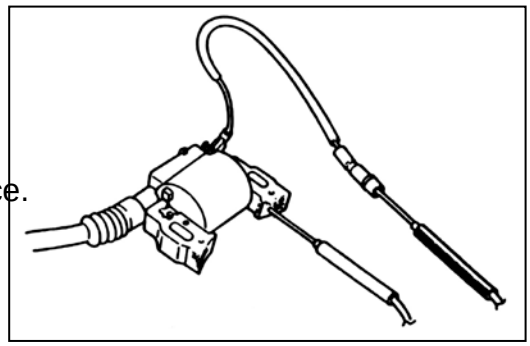


Notice

Adjust both ends of the coil to the same gap.

Avoid the magnet portion of the flywheel when adjusting.

Inspection



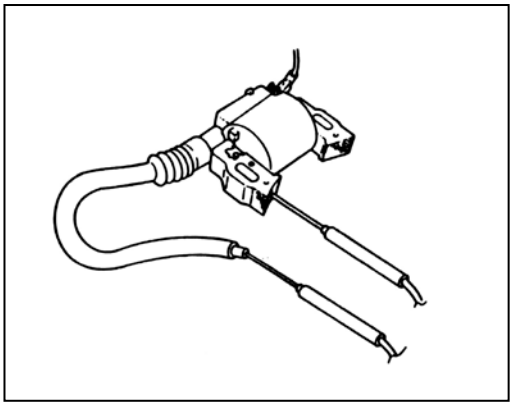
Igniting coil：

<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

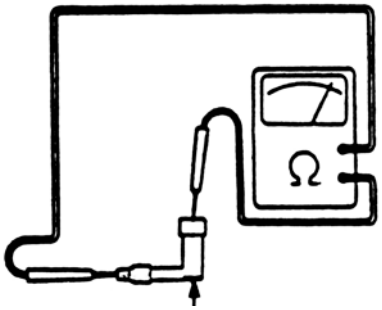
A false reading will result if the spark plug cap is not removed.

C、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

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



Spark plug cap

.

Adjustment

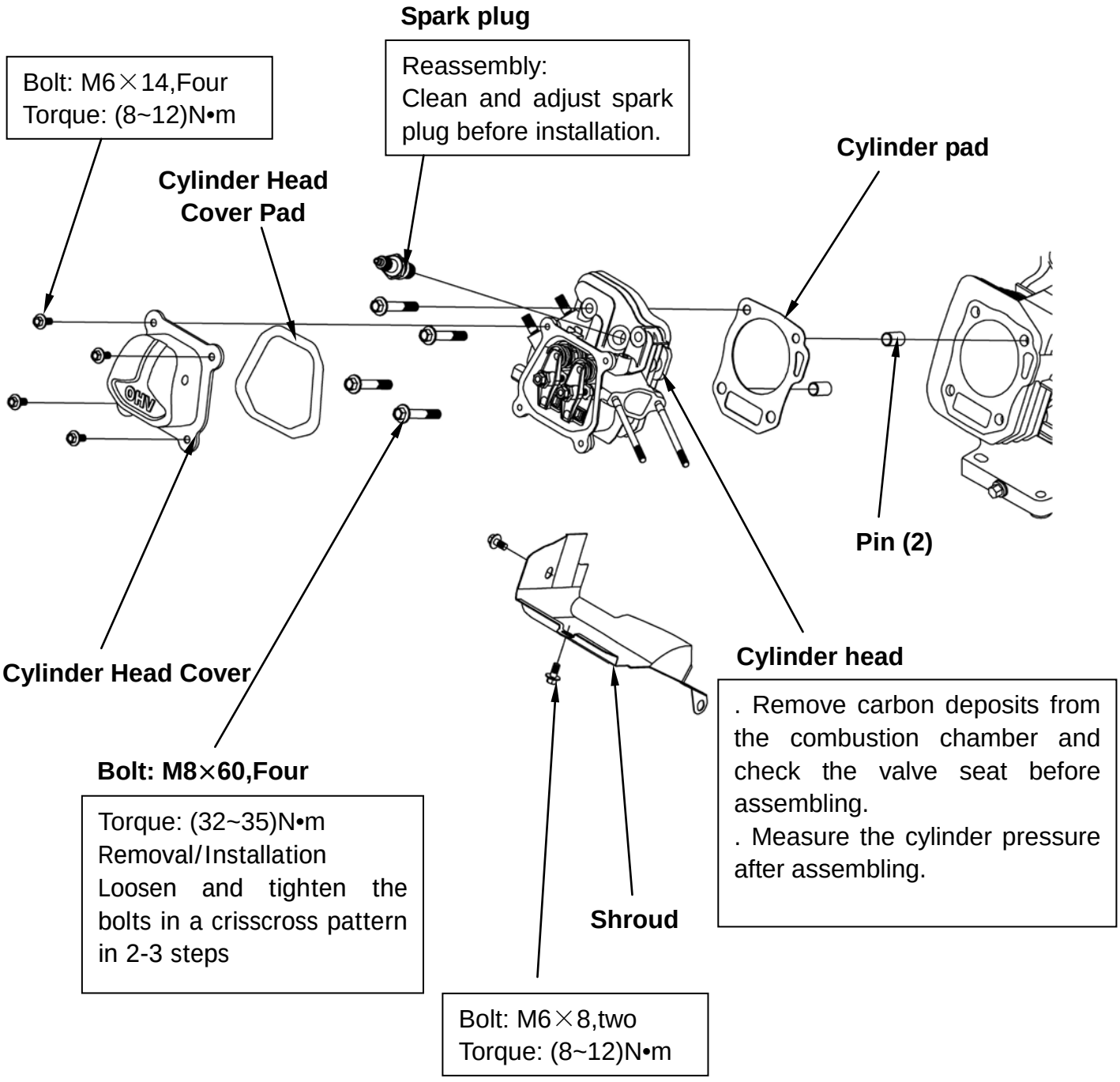
Adjustment is required only when the ignition coil or the flywheel has been removed.

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)

4.10 Cylinder head & valves

Disassembly/reassembly



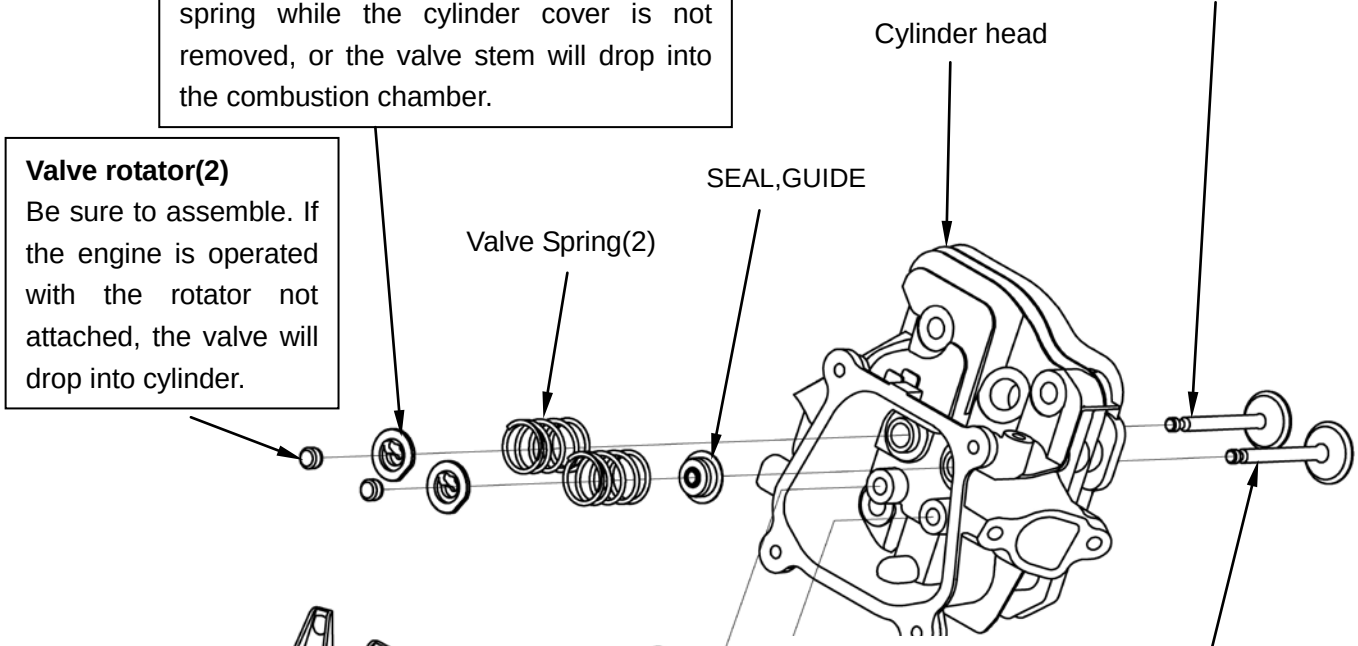
Disassembly / reassembly

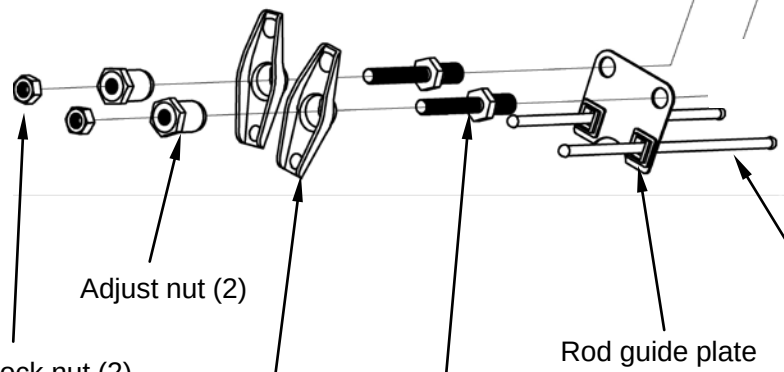
Valve spring retainer(2)
Disassembly: Push down the spring retainer and move the retainer to the small hole so that the valve stem slips through the small hole.
The exhaust valve retainer has a larger groove than the intake valve retainer so that it can accept the valve rotator.

Caution: don't disassemble the valve spring while the cylinder cover is not removed, or the valve stem will drop into the combustion chamber.

Exhaust valve:
Assembly: Check exhaust valve taper face for chipping or excessive carbon deposits before assembling.

Valve rotator(2)
Be sure to assemble. If the engine is operated with the rotator not attached, the valve will drop into cylinder.





Intake valve
Assembly: Don't interchange the exhaust and intake valves.

Torque: 10 N•m

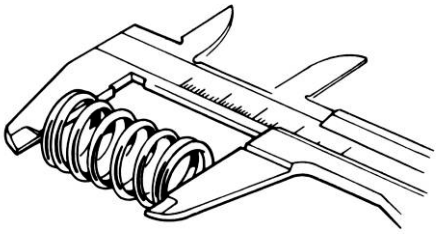
Torque:27N•m

Push rod (2)
Assembly:
Check the two ends of the push rod for wearing and push rod for straightening. Be sure that two ends of push rod completely seat on the lifter and rocker seat.

Rocker (2)
Assembly: Check the contacting face of rocker with adjust nut and push rod for wearing before assembling.

Valve spring free length

Measure the free length of the valve springs.

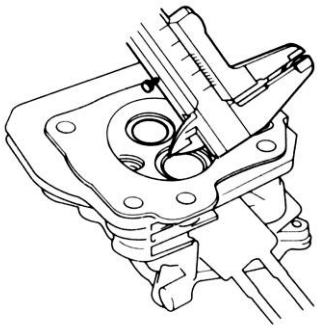


Standard	Service limit
30.5 mm	29.5 mm

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	2.0 mm

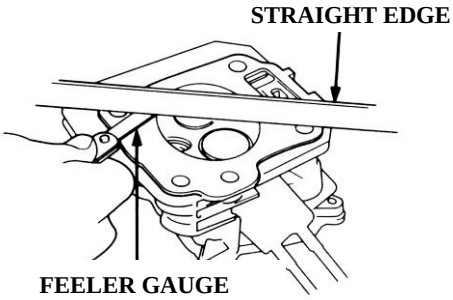
If the valve seat width is under the standard, or over the service limit, recondition the valve seat

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.

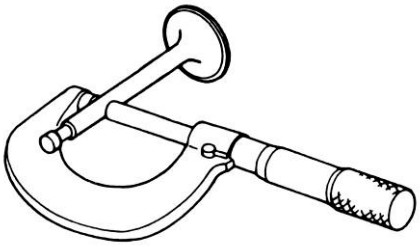


Service limit	0.10 mm

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.



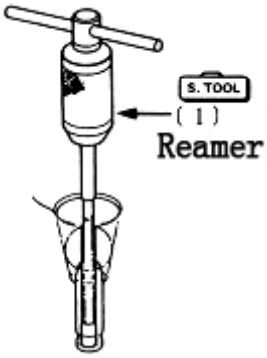
	Standard	Service limit
IN	5.480 mm	5.318 mm
EX	5.440 mm	5.275 mm

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.

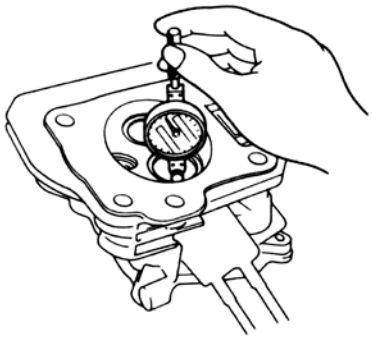
Measure and record each valve guide ID.



Standard	Service limit
5.500 mm	5.572 mm

Stem –to- guide clearance

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

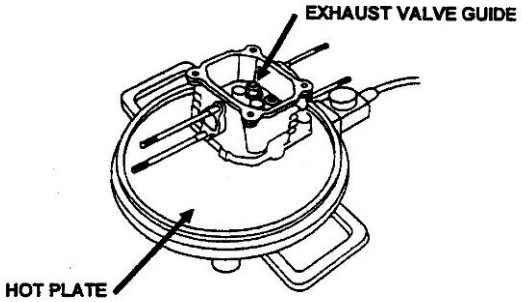


	Standard	Service limit
IN	0.02-0.044 mm	0.10 mm
EX	0.06-0.087 mm	0.12 mm

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



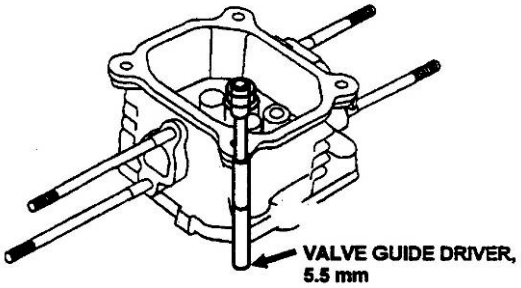
The intake valve guide is not replaceable. If the intake valve guide is worn beyond the service limit,

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.

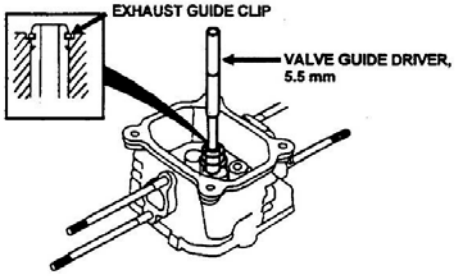


Notice

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

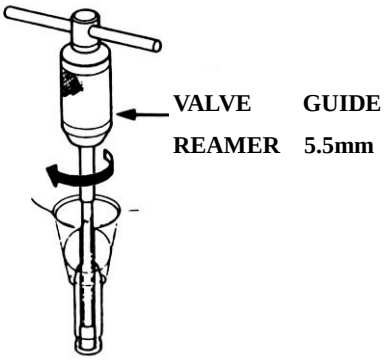
When driving the valve guide out, be careful not to damage the head.

4. remove the new exhaust valve guide from the refrigerator.

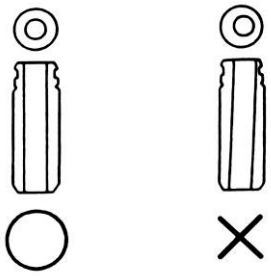
5. install the new valve guide from the valve spring side of the cylinder head. Drive the valve guide until the clip is fully seated as shown.
6. after installation, inspect the valve guide for damage. Replace the guide if damaged.

Exhaust valve guide reaming

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

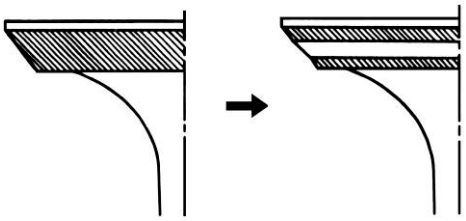


1. coat the reamer and valve guide with cutting oil.
2. rotate the reamer clockwise through the valve guide the full length of the reamer.
3. continue to rotate the reamer clockwise while removing it from the valve guide.
4. thoroughly clean the cylinder head to remove any cutting residue.
5. check the 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

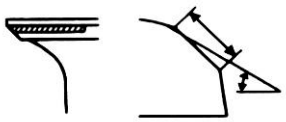


valve seat reconditioning

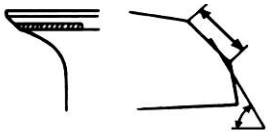
1. thoroughly clean the combustion chambers and valve seats to remove carbon deposits.
2. apply a light coat of Prussian Blue or erasable felt-tipped marker ink to the valve faces.
3. insert the valve, and then lift them and snap them closed against their seats several times. Be sure the valve does not 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



CONTACT TOO HIGH



CONTACT TOO LOW



material from the bottom edge. Bu sure that the width of the finished valve seat is within specification.

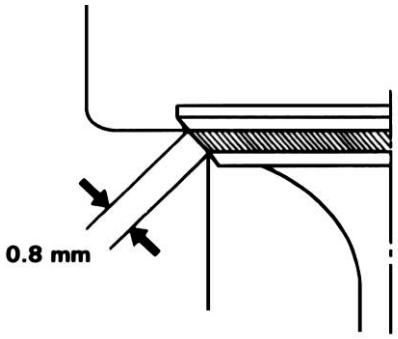
Valve seat width

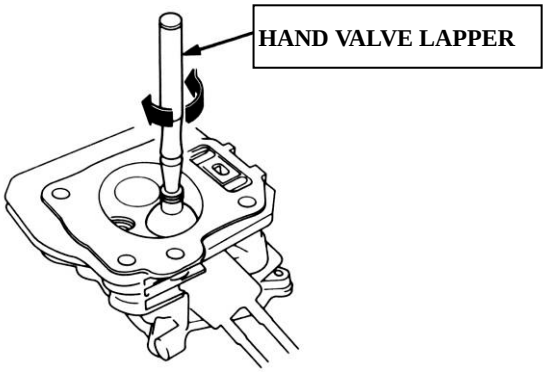
Standard	Service limit
0.8 mm (0.03 in)	2.0 mm (0.08)

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

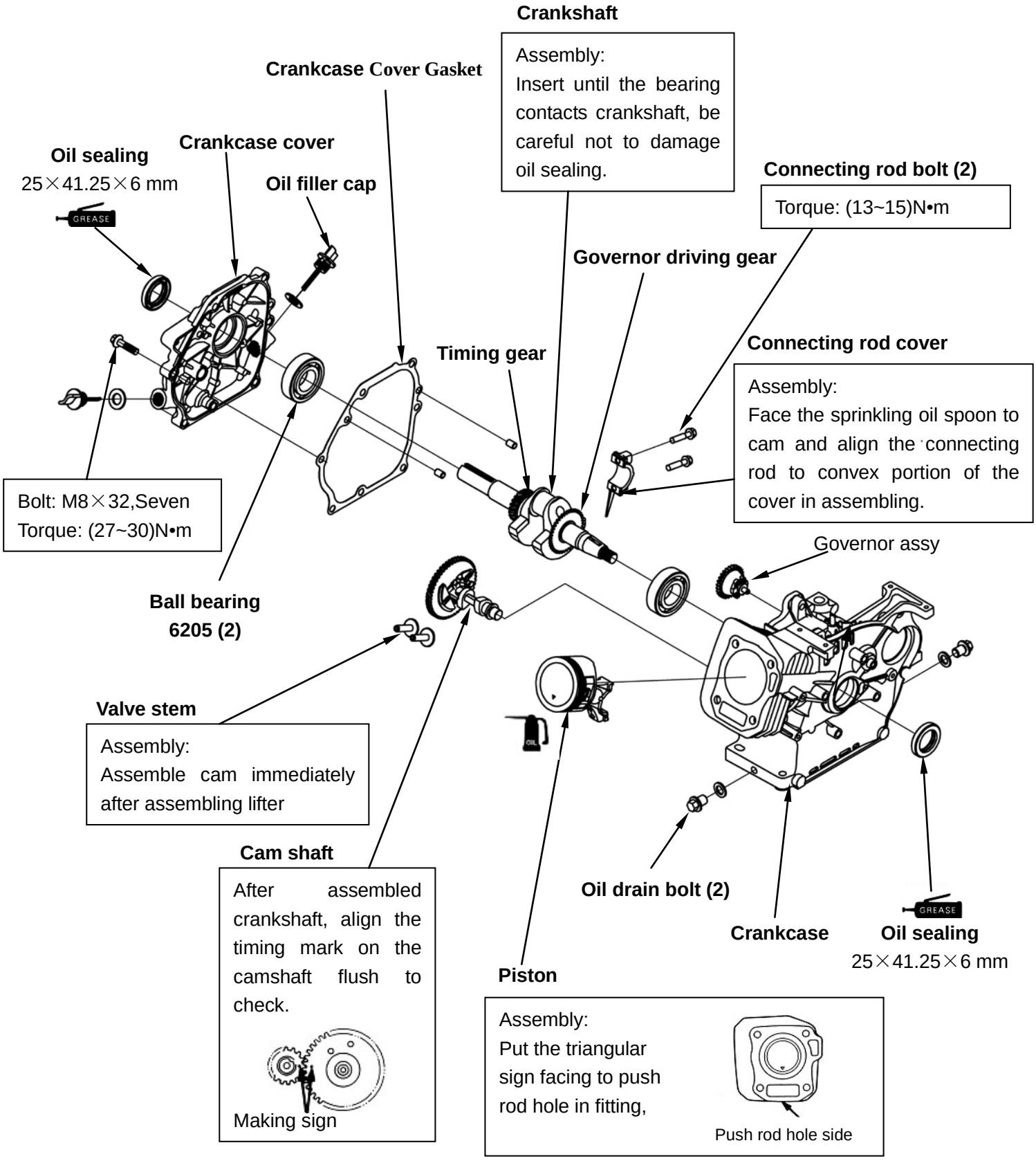
   To avoid severe engine damage, be sure to remove all lapping compound from the head before reassembling.
5. check the valve clearance after reassembly.





4.11 Crankshaft / piston / camshaft

Disassembly / reassembly



Crankshaft bearing

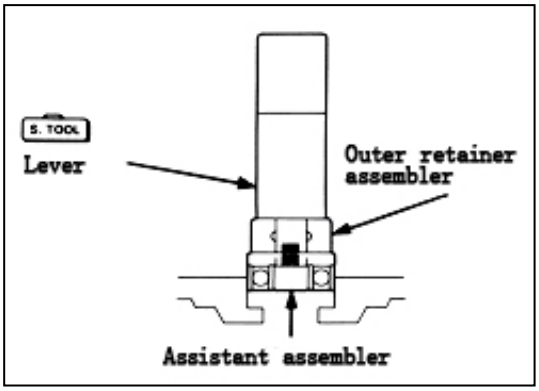
Assembly：

Assemble the bearing in with following the tool after applying engine oil.

Assembly lever

52×55 mm outer retainer assembler

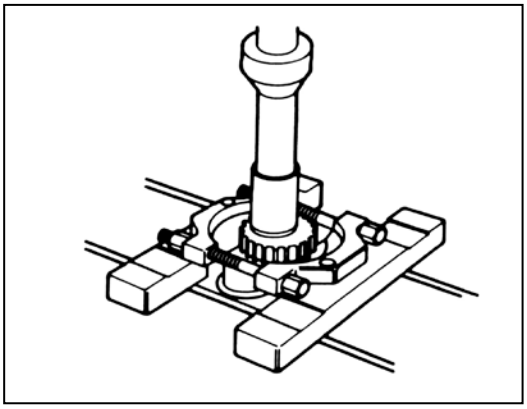
Assistant assembler



Gear on the crankshaft

Disassembly：

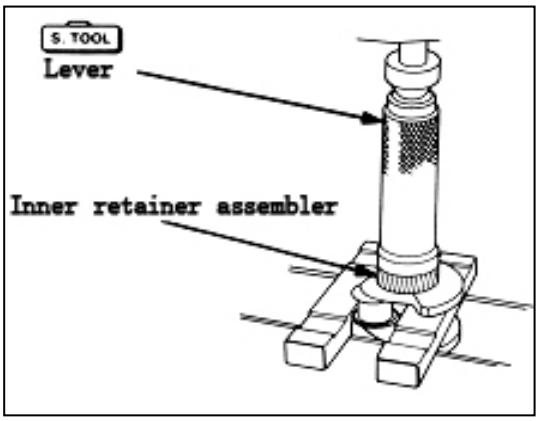
Mark a line on the crankshaft and a timing gear. Set the commercial available bearing puller plate on the lower part to the governor drive gear and remove the crankshaft and timing gear by manual compressor. Disassemble the governor drive gear in the same way.



Assembly：

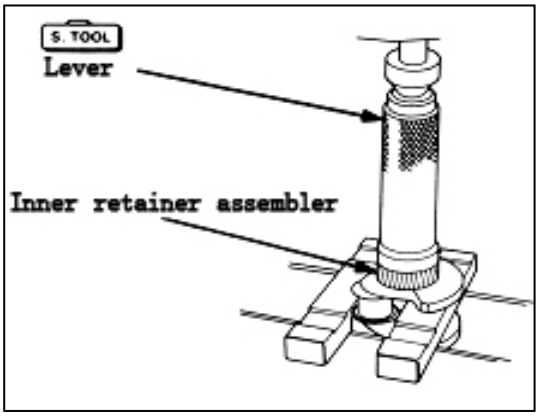
Timing gear

Using the old gear for reference, make a mark at the same position on the new gear. Using a hydraulic press, lever and inner retainer assembler (the special tools shown,), press the timing gear onto the crankshaft after aligning old and new gears mark flush.



Governor drive gear

Use a hydraulic press lever and inner retainer assembler (special tool) to press in a new governor drive gear.



Disassembly / reassembly

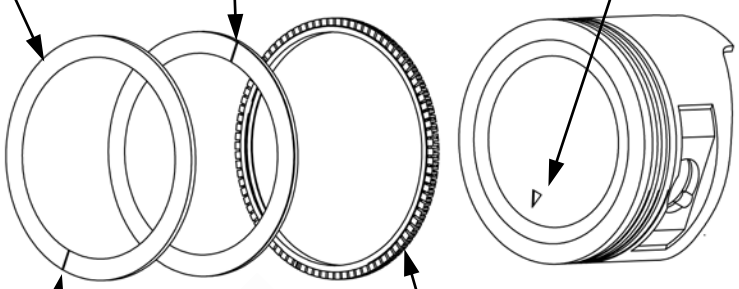
Piston connecting rod

Second Ring

First ring

Second Ring Open

Piston Rotation Arrow



Open of First Ring

Oil Rings

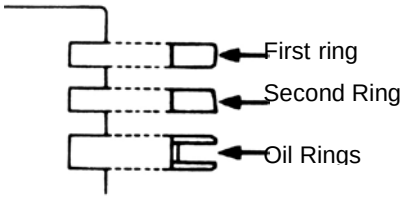
Assembly:

. 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.



Attention:

First and Second Rings are stagger 150° ~210°

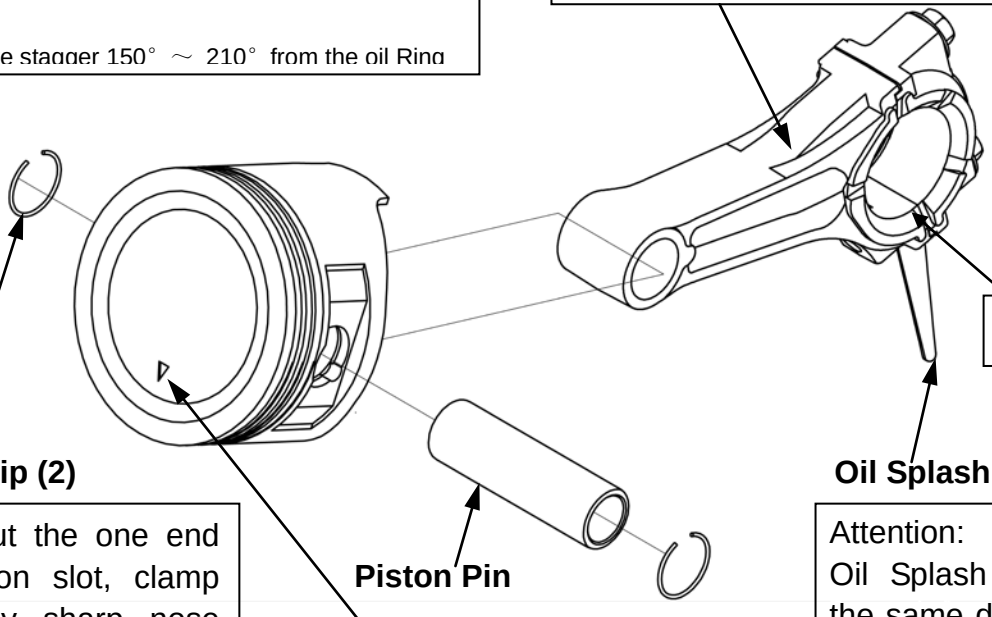
Attention:

Scrape Rings are stagger 150° ~ 210° from the oil Ring

Connecting Rod

Connecting rod

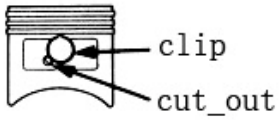
Assembly: Put the long end of the connecting rod aiming at the triangular mark when assembling



Big hole end

Piston Pin Clip (2)

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.



Piston Pin

Oil Splash Spoon

Attention:

Oil Splash Spoon point the same direction of the Piston Rotation Arrow

Attention: Piston Rotation Arrow should point at Valve Lifter

Timing gear

Disassembly:

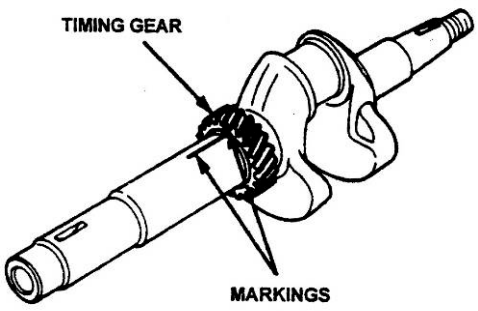
1. scribe a line on the crankshaft and the timing gear tooth as shown.
2. use a hydraulic press and a commercially available bearing puller to remove the timing gear.

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

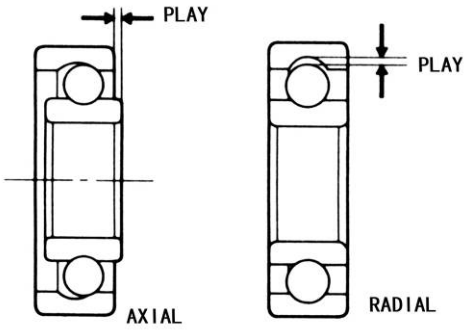
Do not scribe the crankshaft deeply. Otherwise, oil may seep through the oil seal.



Inspection

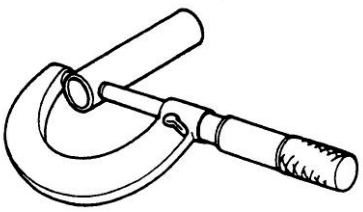
Crankshaft bearing free play

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.



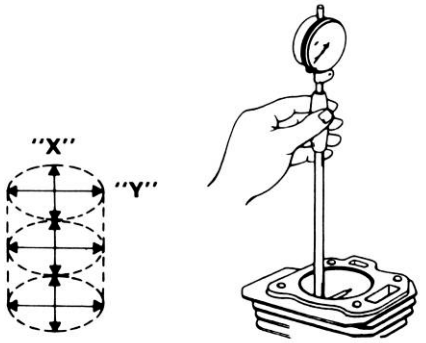
Piston pin OD

Model	Standard	Service limit
LC165F(D)S	13.0 mm	12.954 mm
LC170F(D)S	18.0 mm	17.954 mm



Cylinder inside diameter

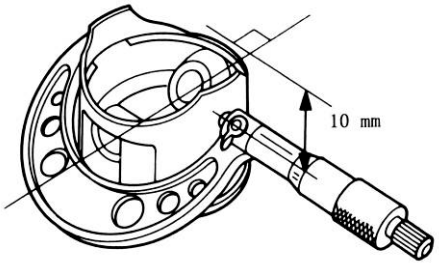
Measure three points on the “X” and “Y” shaft and record cylinder inside diameter（“X” shaft is vertical to crankshaft and “Y” shaft parallel to crankshaft）. Take maximum reading as the wearing and tapering of the cylinder.



Model	Standard	Service limit
LC165FDS	65.0 mm	65.165 mm
LC170FDS	70.0 mm	70.165 mm

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.

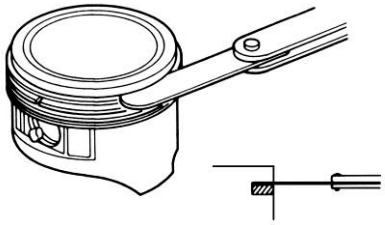


Model	Standard	Service limit
LC165F(D)S	64.985 mm	64.845 mm
LC170F(D)S	69.985 mm	69.845 mm

Piston- to – cylinder clearance

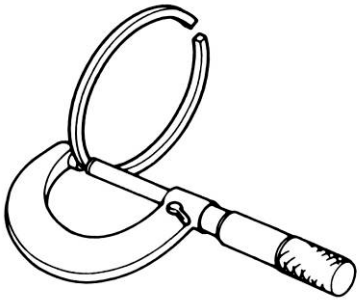
Standard	Service limit
0.015-0.050 mm	0.120 mm

Piston ring side clearance



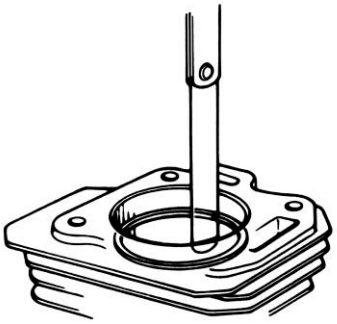
	Standard	Service limit
Top/Second/ Oil	0.015-0.045 mm	0.15 mm

Piston ring width



	Model	Standard	Service limit
Top/Second	LC165F(D)S	1.5 mm	1.37 mm
Top/Second	LC170F(D)S	1.2 mm	1.07 mm

Piston ring end gap



Parts	Standard	Service limit
Top/second	0.2-0.4 mm	1.0 mm

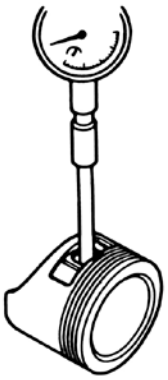
Before measuring end gap, use the piston top to position

the ring so it will not be cocked in the cylinder bore.

Piston pin hole ID

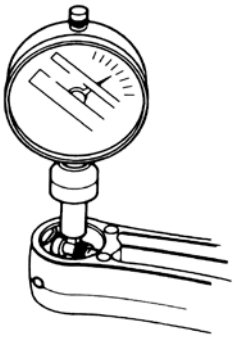
4-27

Model	Standard	Service limit
LC165F(D)S	13.002 mm	13.048 mm
LC170F(D)S	18.002 mm	18.048 mm



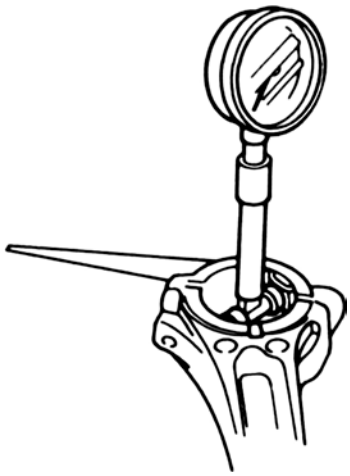
Piston pin to Piston hole gap

Standard	Service limit
0.002-0.014 mm	0.06 mm



Connecting rod small end ID

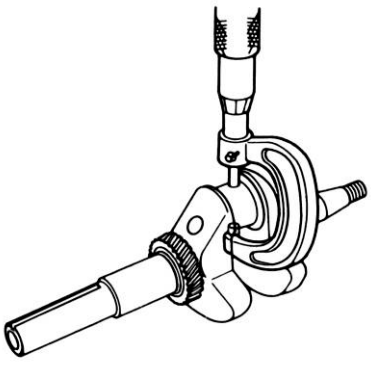
Model	Standard	Service limit
LC165F(D)S	13.005 mm	13.07 mm
LC170F(D)S	18.002 mm	18.07 mm



Connecting rod big end ID

Original size

Standard	Service limit
30.22 mm	30.246 mm

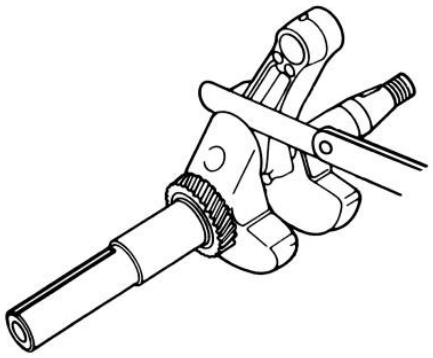


Crankshaft pin OD

Standard	Service limit
30.16	30.1

Connecting rod big end axial clearance

Standard	Service limit
0.10-0.70 mm	1.1 mm

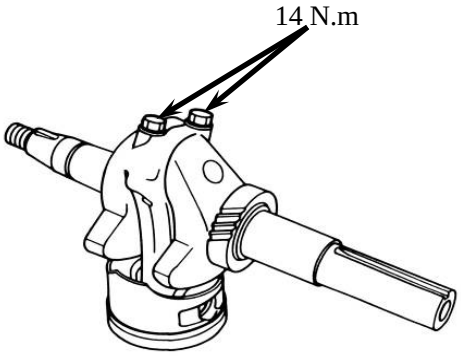


Connecting rod big end oil clearance(Radial)

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：14 N·m

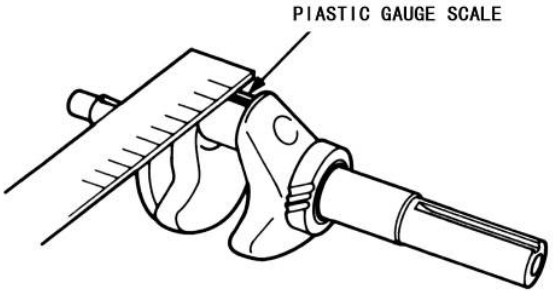


ATTENTION

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	0.12 mm

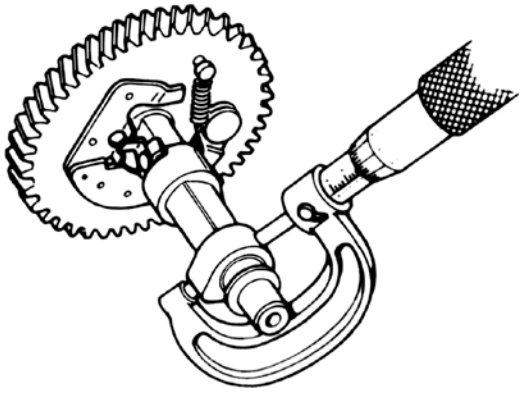


4) If the clearance exceeds the service limit, replace the connecting rod and recheck the clearance.

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

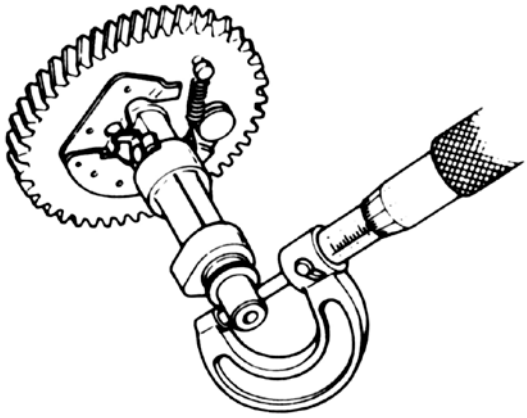
	Standard	Service limit
IN	27.70 mm	Replace under 27.45 mm
EX	27.75 mm	Replace under 27.50 mm



Camshaft OD

Standard	Service limit
13.984 mm	13.916 mm

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



Camshaft axletree ID

Standard	Service limit
14.0 mm	14.048 mm

4.12 Governor

Disassembly / reassembly

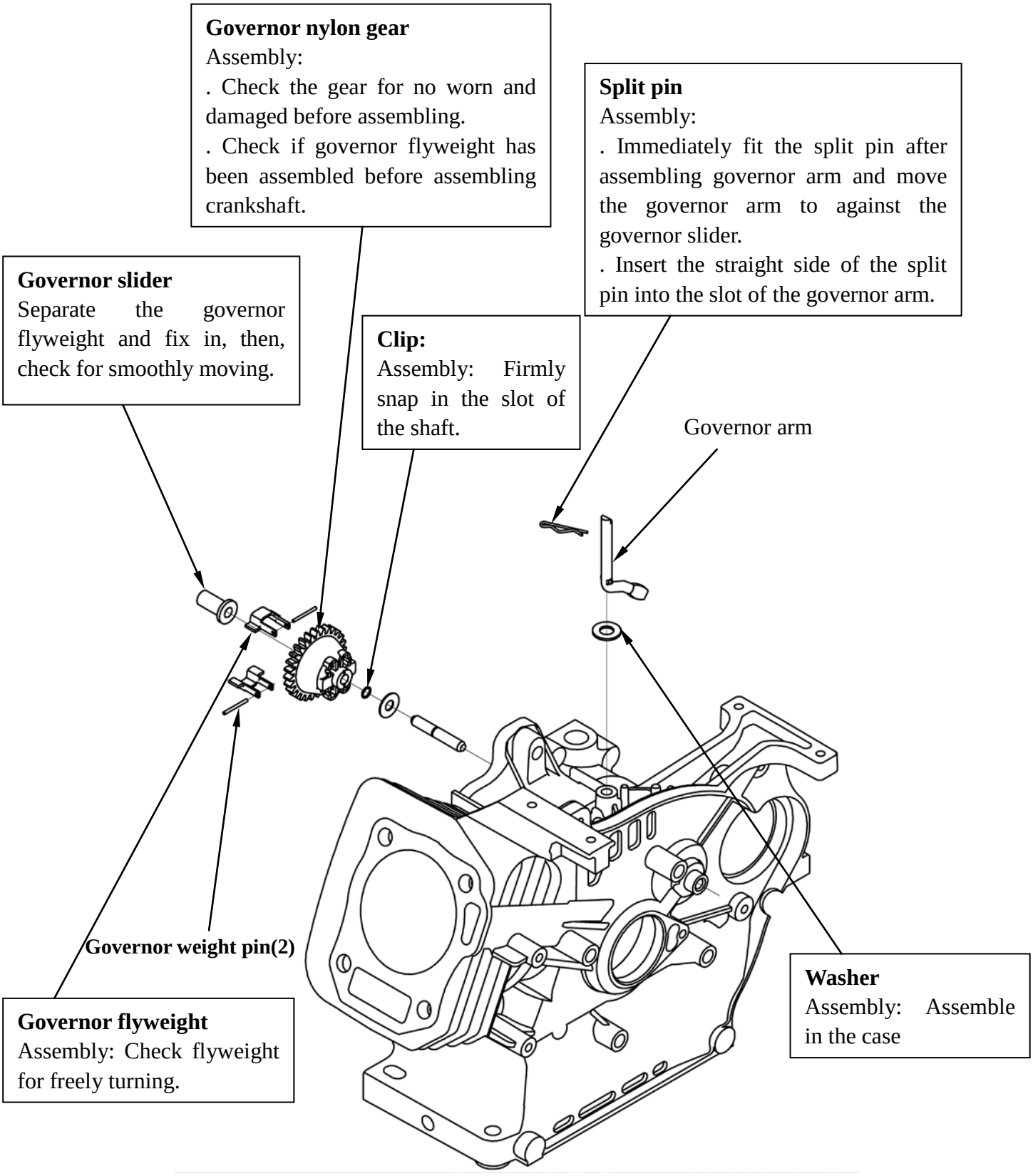
Governor nylon gear
Assembly:
. Check the gear for no worn and damaged before assembling.
. Check if governor flyweight has been assembled before assembling crankshaft.

Split pin
Assembly:
. Immediately fit the split pin after assembling governor arm and move the governor arm to against the governor slider.
. Insert the straight side of the split pin into the slot of the governor arm.

Governor slider
Separate the governor flyweight and fix in, then, check for smoothly moving.

Clip:
Assembly: Firmly snap in the slot of the shaft.

Governor arm



Governor weight pin(2)

Governor flyweight
Assembly: Check flyweight for freely turning.

Washer
Assembly: Assemble in the case