



R2200 R2800 R3000

SERVICE MANUAL



CHONGQING RATO POWER.CO.,LTD

This manual contains information how to maintain and how to do troubleshooting.


Keep this owner's manual handy, so you can refer to it at any time.


This service manual describes correct method of the maintaining this equipment. As a result of this disregard of our rules caused by person casualty and equipment damaged, our company does not assume any responsibility


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SAFETY MESSAGES

Your safety and the safety of others are very important. We have provided important safety messages in this manual and on the generator. Please read these messages carefully.

A safety message reminds you to potential hazards that could hurt you or others. Each safety message is preceded by a safety alert symbol  and one of three words: DANGER, WARNING, or CAUTION. These mean:

 DANGER You **WILL** be **KILLED** or **SERIOUSLY HURT** if you don't follow instructions.

 WARNING You **CAN** be **KILLED** or **SERIOUSLY HURT** if you don't follow instructions.

 CAUTION You **CAN** be **HURT** if you don't follow instructions.

NOTICE Your generator or other property could be damaged if you don't follow instructions.

CONTENTS

1. PREFACE.....	1
1-1 Component Identification.....	1
1-2 Specifications	2
1-3 Maintenance Standard	3
1-3-1 R2200.....	3
1-3-2 R2800.....	5
1-3-3 R3000.....	7
2. MAINTENANCE.....	10
2-1 Maintenance Schedule.....	10
2-2 Engine Oil	11
2-3 Air Cleaner Service	11
2-4 Fuel Sediment Cup Cleaning.....	12
2-5 Spark Plug Service	13
2-6 Valve Clearance Adjustment	14
2-7 Governor	17
3. TROUBLESHOOTING	20
3-1 Troubleshooting.....	20
3-1-1 Starting Difficult	20
3-1-2 Power Lack	22
3-1-3 Speed Unstable	23
3-1-4 Unable Igniting	23
3-1-5 Gasoline Engine is Overheat.....	24
3-1-6 Abnormal Sound	24
3-1-7 Unable Generating Electricity.....	25
3-1-8 Voltage Too Low	25
3-1-9 No AC Output Voltage	26
3-1-10 No DC Output Voltage.....	26
3-1-11 Stator Iron Core Overheat	26
3-1-12 Stator Winding Overheat.....	27
3-1-13 Rotor Winding Overheat	27
3-2 Safety Precautions	28
3-2-1 Safety	28

CONTENTS

3-2-2 Special Tools 30

3-3 Dismounting Chart 31

3-4 Engines 32

 3-4-1 Recoil Starter 32

 3-4-2 Flywheel..... 35

 3-4-3 Air Cleaner 38

 3-4-4 Carburetor 38

 3-4-5 Cylinder Head/Valve..... 44

 3-4-6 Crankshaft/Piston..... 51

3-5 Generators 58

 3-5-1 Fuel Tank 58

 3-5-2 Muffler 60

 3-5-3 Generators 62

 3-5-4 Control Panel 70

4. WIRING DIAGRAM 73

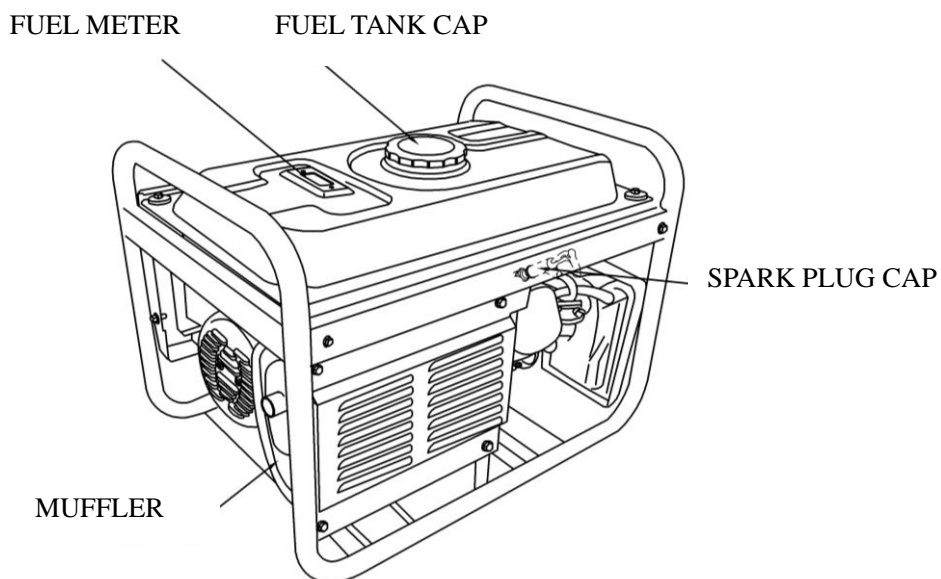
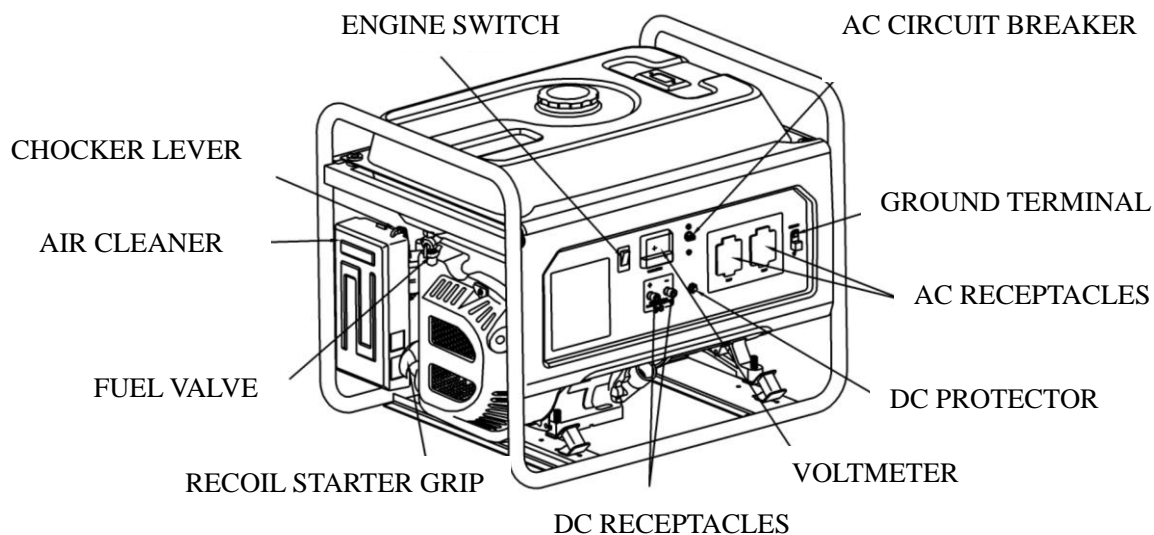
 4-1 Electric Diagram 73

APPENDIX 75

1. PREFACE

1-1 Component Identification

1)



1-2 Specifications

	Item	R2200	R2800	R3000
Engine	Engine Style	R200	R200	R210
	Engine Type	Single Cylinder, 4-Stroke, Forced Air Cooling, OHV		
	Displacement (cc)	196	196	212
	Igniting System	Transistorized Magneto		
	Fuel Volume (L)	15	15	15
	Fuel Consumption(L/hr)	1.25	1.35	1.5
	Continuing Time (hr)	12	11	10
	Oil Capacity (L)	0.6	0.6	0.6
Generator	Charging Voltage (DC) (V)	12		
	Charging Current (DC) (A)	8.3		
	Rated Frequency (Hz)	50		
	Rated Voltage (V)	220/230		
	Rated Output Power (kW)	2	2.5	2.7
	Maximum Output Power (kW)	2.2	2.8	3
Generator Set	Length (mm)	593	593	593
	Width (mm)	440	440	440
	Height (mm)	432	432	432
	Net Weight (kg)	46	49.5	50
	Phase	Single		
General Purpose Accessory	Large Air Cleaner	●	●	●
	Large Muffler	●	●	●
	Large Fuel Tank	●	●	●
	Fuel Gauge	●	●	●
	Voltmeter	●	●	●
	Automatic Voltage Regulator	●	●	●
	Oil Alert System	●	●	●
	Non-fuse Breaker	●	●	●
	Electric Starting Accessory	-	-	-

Remarks: ● means available, - means unavailable

1-3 Maintenance Standard

1-3-1 R2200

- Engine

Parts	Item	Standard	Service Limit
Engine	Maximum Speed (No load)	3150-3180rpm	--
	Cylinder Compression	>1.17Mpa/1400rpm	--
Cylinder Head	Sleeve I.D	68.0mm	68.165mm
Cylinder Head	Warpage	--	0.10mm
Piston	Skirt O.D.	67.985mm	67.845mm
	Piston-to-Cylinder Clearance	0.015-0.05mm	0.12mm
	Piston Pin Bore I.D.	18.002mm	18.048mm
	Piston Pin O.D	18.0mm	17.954mm
	Piston Pin-to-Piston Pin Bore Clearance	0.002-0.014mm	0.06mm
Piston Rings	Ring Side Clearance :	0.015-0.045mm	0.15mm
	Second	--	--
	Ring Enc Gap:	0.2-0.4mm	1.0mm
	Second	0.15-0.35mm	1.0mm
	Ring Width :	1.5mm	1.37mm
Connecting Rod	Small End I.D	18.002mm	18.07mm
	Big End I.D	30.02mm	30.066mm
	Big Oil Clearance	0.040-0.063mm	0.12mm
	Big End Side Clearance	0.1-0.7mm	1.1mm
Crankshaft	Crankshaft Pin O.D	29.98mm	29.92mm

1. PREFACE

Valve	Valve Clearance	IN	0.15±0.02mm	--
		EX	0.20±0.02mm	--
	Stem O.D	IN	5.48mm	5.318mm
		EX	5.44mm	5.275mm
	Guide I.D	IN/EX	5.50mm	5.572mm
	Stem Clearance	IN	0.02-0.044mm	0.1mm
		EX	0.06-0.087mm	0.12mm
	Seat Width		0.8mm	2.0mm
	Spring Free Length		34mm	32.5mm
Camshaft	Cam Height	IN	27.7mm	27.45mm
	Cam Height	EX	27.75mm	27.50mm
	Journal O.D		13.984mm	13.916mm
Crankcase Cover	Camshaft Bracket I.D		14.0mm	14.048mm
Carburetor	Main Jet		#68	--
	Float Height		13.7mm±1.5	--
	Pilot Screw Opening		3 turns 2-1/8 turns	--
Spark Plug	Gap		0.7-0.8mm	--
Spark Plug Cap	Resistance		5kΩ	--
Ignition Coil	Resistance	Primary Coil	0.8-1.0Ω	--
		Secondary Coil	5.9-7.1 kΩ	--
	Air Gap	(at flywheel)	0.4-0.6mm	--

- Generator

Parts	Item		Standard	Service Limit
Stator Winding	Resistance	Stator Winding	$2.2 \pm 5\% \Omega$ at 20°C	--
		Stator Auxiliary Winding	$3.2 \pm 5\% \Omega$ at 20°C	--
Rotor Excitation Winding	Resistance	Excitation Winding	$45.6 \pm 5\% \Omega$ at 20°C	--
Carbon Brush	Carbon Brush Length		10mm	6mm

1-3-2 R2800

- Engine

Parts	Item		Standard	Service limit
Engine	Maximum Speed (No Load)		3150~3180rpm	--
	Cylinder Compression		>1.17Mpa/1400rpm	--
Cylinder Head	Sleeve I.D		68.0mm	68.165mm
Cylinder Head	Warpage		--	0.10mm
Piston	Skirt O.D.		67.985mm	67.845mm
	Piston-to-Cylinder Clearance		0.015-0.05mm	0.12mm
	Piston Pin Bore I.D.		18.002mm	18.048mm
	Piston Pin O.D		18.0mm	17.954mm
	Piston Pin-to-Piston Pin Bore Clearance		0.002-0.014mm	0.06mm
Piston Rings	Ring Side Clearance :		0.015-0.045mm	0.15mm
	Ring Enc Gap:	Second	--	--
			0.2-0.4mm	1.0mm
	Ring Width	Second	0.15-0.35mm	1.0mm
			1.5mm	1.37mm
		Second	2.5mm	2.37mm

1. PREFACE

Connecting Rod	Small End I.D		18.002mm	18.07mm
	Big End I.D		30.02mm	30.066mm
	Big Oil Clearance		0.040-0.063mm	0.12mm
	Big End Side Clearance		0.1-0.7mm	1.1mm
Crankshaft	Crankshaft pin O.D		29.98mm	29.92mm
Valve	Valve Clearance	IN	0.15 ±0.02mm	--
		EX	0.20 ±0.02mm	--
	Stem O.D	IN	5.48mm	5.318mm
		EX	5.44mm	5.275mm
	Guide I.D	IN/EX	5.50mm	5.572mm
	Stem Clearance	IN	0.02-0.044mm	0.1mm
		EX	0.06-0.087mm	0.12mm
	Seat Width		0.8mm	2.0mm
Camshaft	Spring Free Length		34mm	32.5mm
	Cam Height	IN	27.7mm	27.45mm
	Cam Height	EX	27.75mm	27.50mm
Crankcase Cover	Journal O.D		13.984mm	13.916mm
	Camshaft Bracket I.D		14.0mm	14.048mm
Carburetor	Main Jet		#68	--
	Float Height		13.7mm ±1.5	--
	Pilot Screw Opening		3 turns 2-1/8 turns	--
Spark Plug	Gap		0.7-0.8mm	--
Spark Plug Cap	Resistance		5kΩ	--
Ignition Coil	Resistance	Primary Coil	0.8-1.0Ω	--
		Secondary Coil	5.9-7.1 kΩ	--
	Air gap	(at flywheel)	0.4-0.6mm	--

- Generator

Parts	Item		Standard	Service limit
Stator Winding	Resistance	Stator Winding	$1.8 \pm 5\% \Omega$ at 20°C	--
		Stator auxiliary Winding	$3.5 \pm 5\% \Omega$ at 20°C	--
Rotor Excitation Winding	Resistance	Excitation Winding	$51.3 \pm 5\% \Omega$ at 20°C	--
Carbon Brush	Carbon Brush Length		10mm	6mm

1-3-3 R3000

- Engine

Parts	Item	Standard	Service limit
Engine	Maximum Speed (No Load)	3150~3180rpm	--
	Cylinder Compression	>1.17kpa/1400rpm	--
Cylinder head	Sleeve I.D	69.985mm	70.025mm
Cylinder head	Warpage	--	0.10mm
Piston	Skirt O.D.	69.985mm	69.975mm
	Piston-to-Cylinder Clearance	0.015-0.05mm	0.12mm
	Piston Pin Bore I.D	18.002mm	18.048mm
	Piston Pin O.D	18.0mm	17.954mm
	Piston Pin-to-Piston Pin Bore Clearance	0.002-0.014mm	0.06mm

Piston Rings	Ring Side Clearance :		0.015-0.045mm	0.15mm
		Second		--
	Ring Enc Gap:		0.2-0.4mm	1.0mm
		Second	0.15-0.35mm	1.0mm
	Ring Width:		1.5mm	1.37mm
		Second	2.5mm	2.37mm
Connecting Rod	Small End I.D		18.006mm	18.017mm
	Big End I.D		30.215mm	30.225mm
	Big Oil Clearance		0.04-0.063mm	0.12mm
	Big End Side Clearance		0.1-0.7mm	1.1mm
Crankshaft	Crankshaft Pin O.D		30.190mm	30.175mm
Valve	Valve Clearance	IN	0.15±0.02mm	--
		EX	0.20±0.02mm	--
	Stem O.D	IN	5.48mm	5.318mm
		EX	5.44mm	5.275mm
	Guide I.D	IN/EX	5.50mm	5.572mm
	Stem Clearance	IN	0.02-0.044mm	0.10mm
		EX	0.06-0.087mm	0.12mm
	Seat Width		0.8mm	2.0mm
	Spring Free Length		34.0mm	32.5mm
Camshaft	Cam Height	IN	27.7mm	27.45mm
	Cam Height	EX	27.75mm	27.50mm
	Journal O.D		13.984mm	13.916mm
Crankcase cover	Camshaft Bracket I.D		14.0mm	14.048mm
Carburetor	Main Jet		#72	--
	Float Height		13.7mm±1.5	--
	Pilot Screw Opening		3 turns 2-1/8 turns	--
Spark plug	Gap		0.7-0.8mm	--

Spark Plug Cap	Resistance	5k Ω	--
Ignition Coil	Resistance Primary Coil	0.8-1.0 Ω	--
	Secondary Coil	5.9-7.1k Ω	--
	Air gap (at flywheel)	0.4-0.6mm	--

- Generator

Parts	Item		Standard	Service limit
Stator Winding	Resistance	Stator Winding	1.4 \pm 5% Ω at 20 $^{\circ}$ C	--
		Stator Auxiliary Winding	3.9 \pm 5% Ω at 20 $^{\circ}$ C	--
Rotor Excitation Winding	Resistance	Excitation Winding	59.0 \pm 5% Ω at 20 $^{\circ}$ C	--
Carbon Brush	Carbon Brush Length		10mm	6mm

2. MAINTENANCE

2-1 Maintenance Schedule

Good maintenance is essential for safe, economical, and trouble-free operation. It will also help reduce air pollution.

WARNING

Exhaust gas contains poisonous carbon monoxide. Shut off the engine before performing any maintenance. If the engine must be run, make sure the area is well ventilated.

Periodic maintenance and adjustment is necessary to keep the generator in good operating condition. Perform the service and inspection at the intervals shown in the Maintenance schedule below:

REGULAR SERVICE PERIOD		Each use	First month or 20 Hrs.(3)	Every 3 months or 50 Hrs. (3)	Every 6 months or 100 Hrs. (3)	Every year or 300 Hrs. (3)
Engine Oil	Check level	○				
	Change		○		○	
Air Cleaner	Check	○				
	Clean			○(1)		
Sediment Cup	Clean				○	
Electrolyte Level	Check	○				
Spark Plug	Clean				○	renew
Valve Clearance	Check-Adjust					○(2)
Cylinder Head	Clean	Every 300 hours (2)				
Fuel Tank And Strainer	Clean	Every 2 years (2)				
Fuel Line	Replace	Every 2 years (2)				

(1) Service more frequently when used in dusty areas.

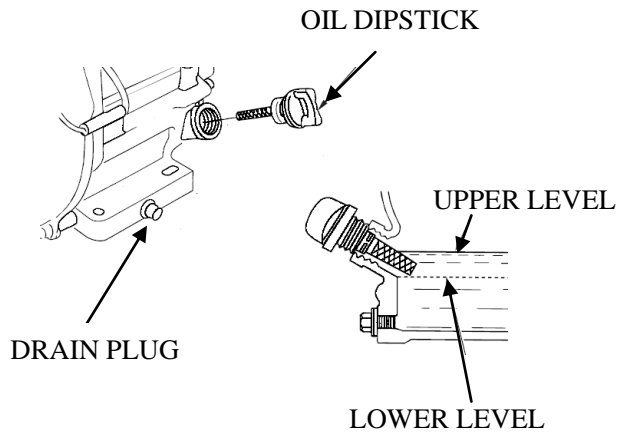
(2) These items should be serviced by an authorized generator dealer.

(3) When more often use, only servicing according to above correct intervals can insure the generator set long-term use.

2-2 Engine Oil

Draining can be performed rapidly and completely while the engine is still warm.

- 1) Remove the oil dipstick and drain plug to drain the oil.
- 2) Reinstall the drain plug, then tighten the plug securely.
- 3) Refill oil and check the oil level.



Oil capacity :

R200: 0.6 L

R210: 0.6 L

⚠ CAUTION

Using engine oil may cause skin cancer if repeatedly let it contact with the skin for prolonged periods. Although this is unlikely that you hardly used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

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

2-3 Air Cleaner Service

A dirty air cleaner will restrict air flow to the carburetor. To prevent carburetor malfunction, service the air cleaner regularly. Service more frequently when operating the generator in extremely dusty areas.

⚠ WARNING

Using gasoline or flammable solvent to clean the filter element can cause a fire or explosion. Only use soapy water or nonflammable solvent.

NOTICE

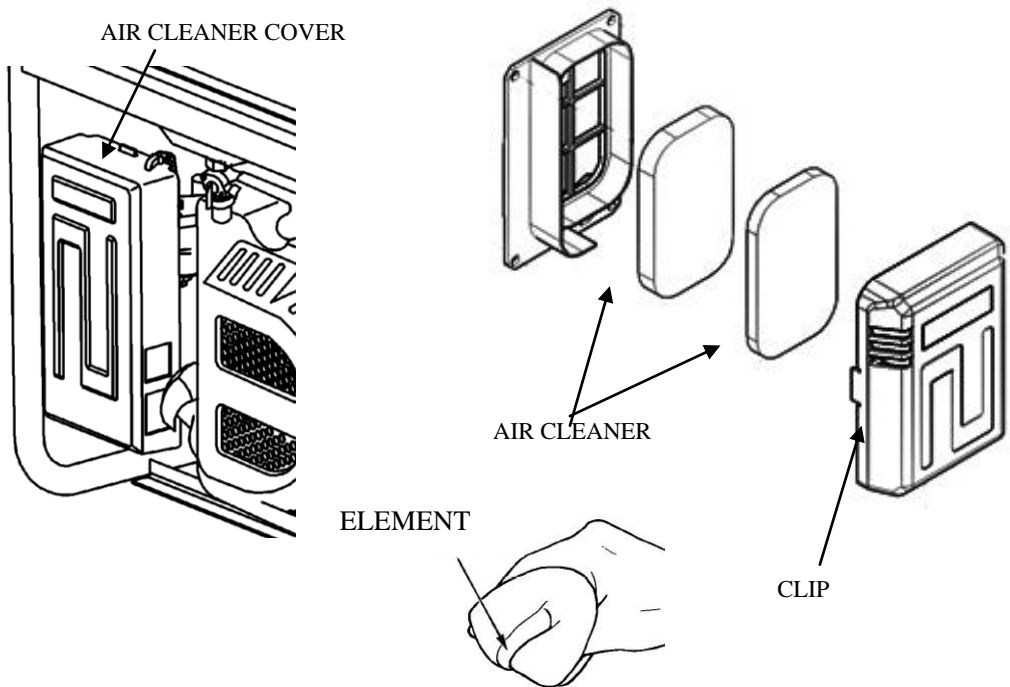
Never run the generator without the air cleaner. Rapid engine wear will result.

- 1) Remove the air cleaner clip or butterfly nut and open the air cover. Check the air cleaner

element for complete and clean.

- 2) If the air cleaner element is dirty, please clean the air cleaner element:

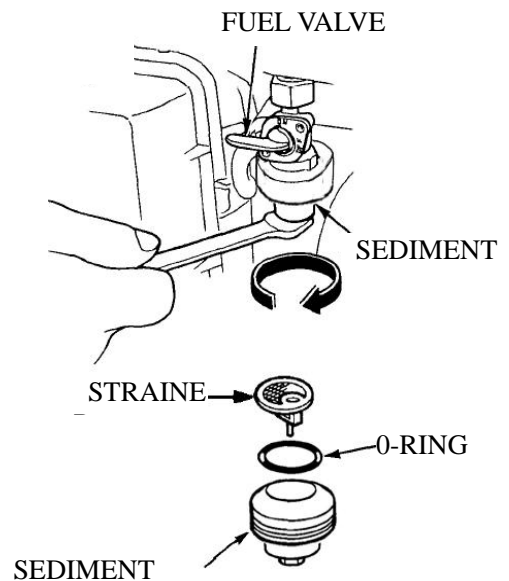
Wash the air cleaner element in a solution of household detergent and warm water, then rinse thoroughly or wash in nonflammable or high flash point solvent: Drop a few points engine oil in, then, squeeze out.



- 3) Reinstall the air cleaner element and the cover.

2-4 Fuel Sediment Cup Cleaning

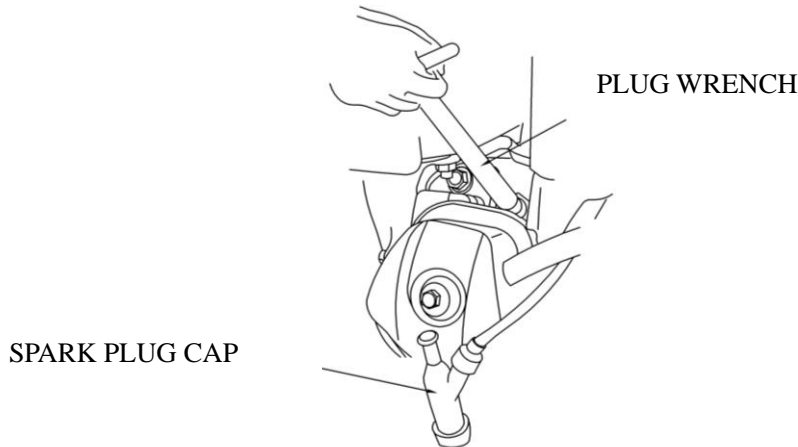
- 1) Turn the fuel valve to the OFF position.
Remove the sediment cup, o-ring and strainer.
- 2) Clean the sediment cup, and o-ring, and strainer in nonflammable or high flash point solvent.
- 3) Reinstall o-ring, and strainer and screw down the sediment cup.
- 4) Turn the fuel valve to the ON and check for leaks.



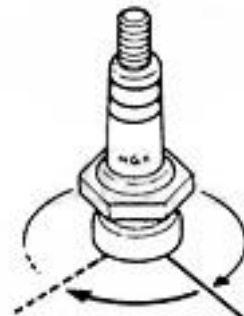
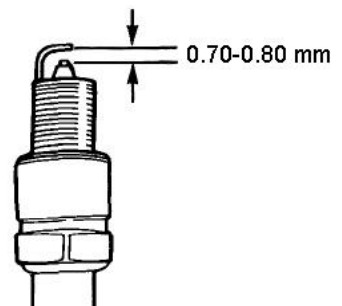
2-5 Spark Plug Service

Recommended spark plugs: F7RTC or other equivalents

- 1) Remove the spark plug cap.
- 2) Clean any dirt around the spark plug base.
- 3) Use the plug wrench to remove the spark plug.

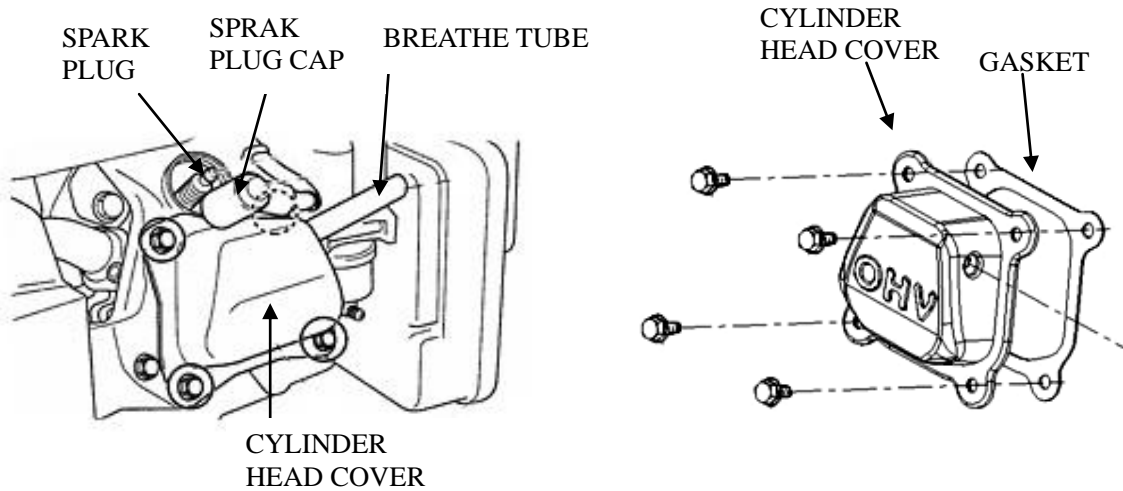


- 4) Visually inspect the spark plug if the insulator is cracked, if cracked, replace with a new spark plug.
- 5) Measure the plug gap with a feeler gauge. Correct as necessary by carefully bending the side electrode.
- 6) The gap should be: 0.70-0.80 mm
- 7) Check that the spark plug washer is in good condition.
- 8) Install the spark plug on and screw down it with plug wrench, compress the plug washer. Cover the spark plug cap on.
 - To avoid cross-threading, first, screw in spark plug by hand, then tighten with a spark plug wrench to compress the gasket.
 - If a new spark plug is used, more twist 1/2 turns after compressing the gasket
 - If reinstalling the used spark plug, just more twist 1/8-1/4 turns.
 - Spark plug torque value : 22 ± 2 N m.

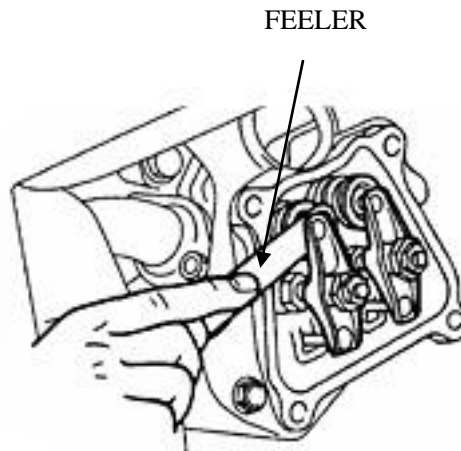


2-6 Valve Clearance Adjustment

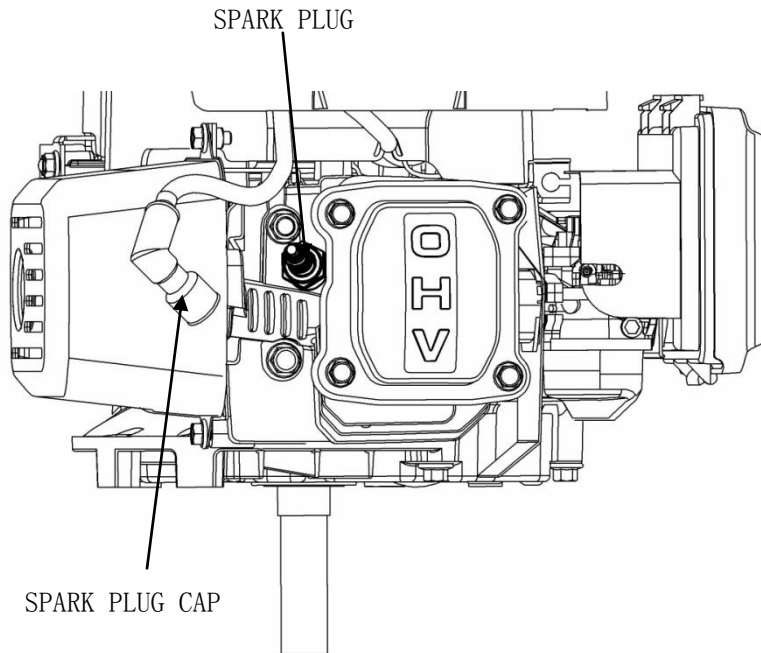
Keep the clearance between engine valve rod end and driving parts for avoiding heat expanding and cold shrinking to effect engine performance. If the valve is too big, it can result in exhausting unsmooth, effecting engine performance and increasing engine noise(valve abnormal), if the valve is too small, the valve will close untight to make the engine operating abnormal and drain valve operating face burn. After operating one year or 1000h, check and adjust the valve.



- Dismount the cylinder head cover, gasket, spark plug, and spark plug cap in order.

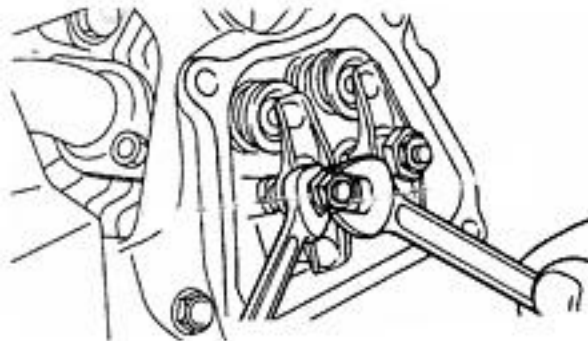
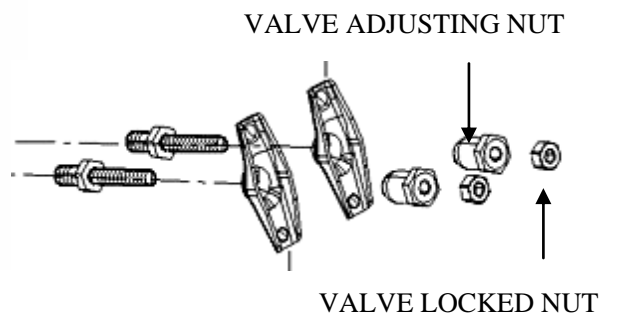
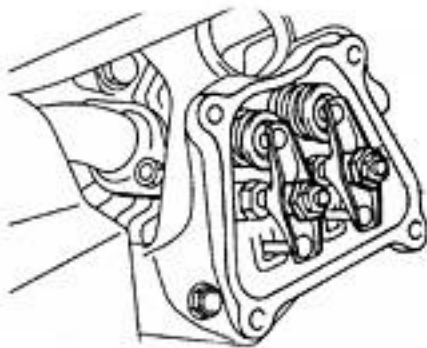


- Light pull the recoil starter rope until the piston compressed to dead point of the stroke.
- Measure the valve clearance
- Adjust if the valve clearance is out of the service limit.



⚠ CAUTION

Measure the valve clearance in the cold the engine state.



- Adjusting valve clearance

Valve clearance adjustment method: Loose the locking nut, turn the adjusting nut to get the correct valve clearance. Screw down the locking nut

Valve clearance	IN	0.15 ±0.02mm
	EX	0.20 ±0.02mm

Adjusting nut	Valve clearance
Screw down	Small
Screw off	Big

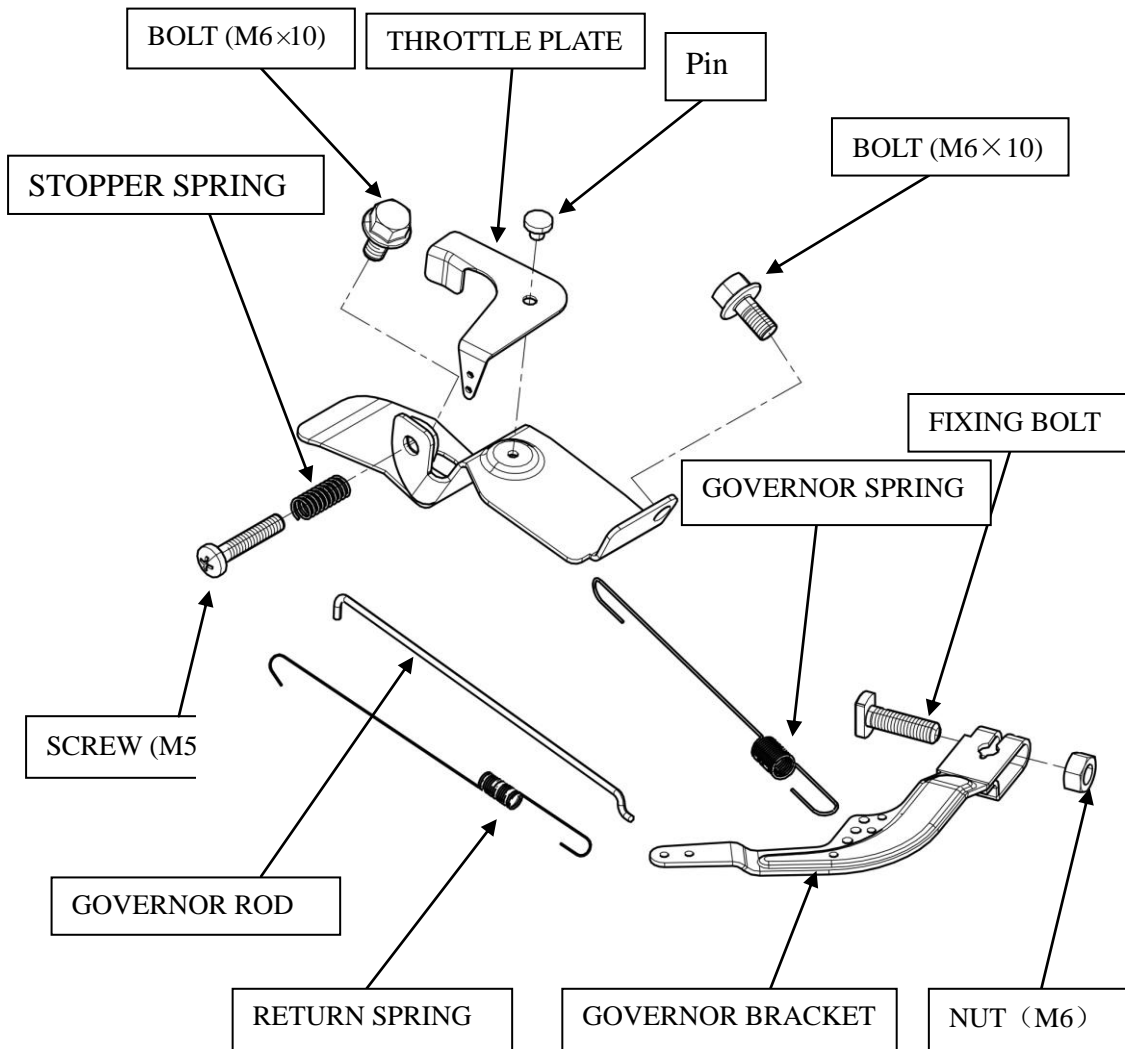
CAUTION:

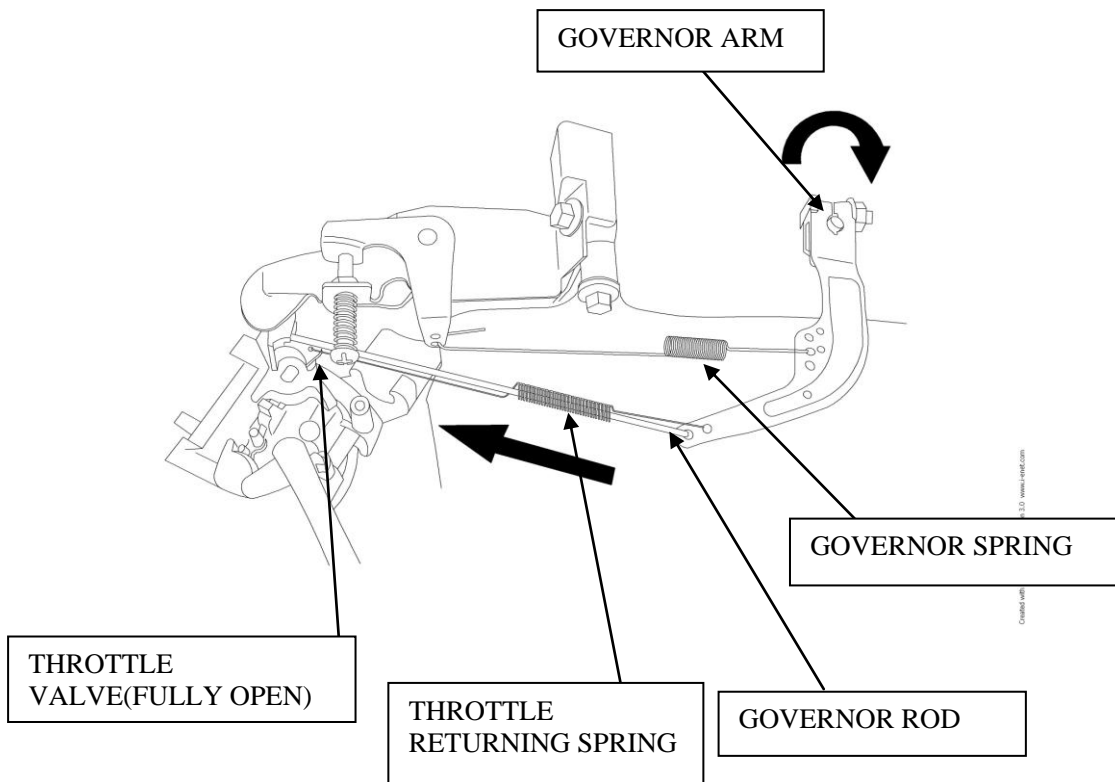
Clearance too big: Intake and exhaust valve opening delay will shorten the intake and exhaust time, lower the opening height of the valve and change normal distributing phase to result in power lowering from the intake lack and exhaust uncomplete. Furthermore, also make valve train parts knock increasing and wearing quick.

Clearance too small: After running, engine parts will be heated to expand and push the valve open, making the engine closing not tight and result in leaking, power lowering, serious carbon deposit or burn on the valve surface, even valve impacting the piston.

2-7 Governor

① Reassembly or disassembly





② Governor adjustment :

- Dismount the fuel tank
- Loosen the nut M6. Be sure that the carburetor throttle valve is fully open
- Rotate the governor arm shaft fully to the right (governor fully closed position), and retighten the nut.

TORQUE VALUE: 10N.m

- Check to see that the governor arm and throttle valve move freely.
- Check the maximum engine speed

③ Maximum speed adjustment:

- Start the engine and allow it to warm up to normal operating temperature.
- If the maximum speed not conforming to specified value, adjust the adjusting bolt M5×25

Engine maximum speed :

Engine maximum speed	3150-3180rpm
Speed too big	Turn the bolt counterclockwise.
Speed too small	Turn the bolt clockwise

3. TROUBLESHOOTING

3-1 Troubleshooting

3-1-1 Starting Difficult

TROUBLE			CAUSE		REMEDY
Normal cylinder compression	Normal spark plug spark	Something wrong with the fuel system.	Fuel supply is not smooth or no fuel supply.	There is no enough fuel in fuel tank and fuel cock is closed.	Fill fuel, open fuel cock.
				Air vent in the fuel filler cap is clogged	Dredge air vent.
				Improper or clogged main oil flow hole.	Readjust or clean, blow to get through.
				Needle valve is not closed properly or start hole is clogged.	Dismantle needle valve and repair, clean, blow to get through.
				Float is damaged or sticking.	Repair float
			Fuel supply is normal.	Fuel is too filthy or deteriorated	Replace
				There is water in fuel.	Replace
				Too much fuel in engine	Drain extra fuel, dry up spark plug electrodes.
				Wrong fuel brand	Select proper fuel brand corresponding with the requirements.
	Normal fuel supply system.	Normal high –tension line spark.	Spark plug is in bad conditions	Too much carbon deposit and dirt around electrodes.	Clear away.
				Electrodes are burn damaged seriously or insulators damaged.	Replace spark plug.
				Improper electrodes gap.	Adjust to proper value.
		High-tension line no spark	Normal spark plug	High –tension line is damaged.	Replace
				Ignition coil is damaged.	Replace
				Magneto loses magnetism.	Replace
				Abnormal gap between the ignition coil and flywheel.	Adjust gap

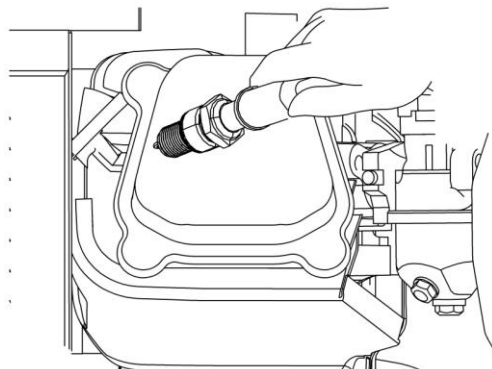
TROUBLE			CAUSE	REMEDY
Abnormal cylinder compression	Normal fuel supply system	Normal ignition system	Piston ring is worn to or even over its wear limit	Replace
			Piston ring is broken.	Replace
			Piston ring is sticking.	Clear up carbon fouling.
			Spark plug is not installed tight or without a gasket.	Tighten with a gasket in.
			Air leakage between cylinder block and cylinder head.	Check cylinder gasket, and the flatness of the surface by which cylinder block contacting with cylinder head
				Tighten cylinder head bolts in stipulated order to stipulated torque.
			Air leakage in the valves	Check valve. Clearance and tightness, repair if necessary.

If still can't starting, have the engine to our authorized dealer for repairing.

Spark plug testing

WARNING:

- When testing the spark plug, never hold the high- tension line of the spark plug with wet hand.
- Make sure there is no spilled fuel outside the engine and that the spark plug isn't dipped with fuel.
- To prevent fire, keep sparks far away from the spark plug mounting hole.



- Turn the fuel cock to “OFF) position, and drain the gasoline of the carburetor.
- Remove the spark plug and spark plug cap.
- Pull the recoil starter grip to drain the gas in the cylinder.

3. TROUBLESHOOTING

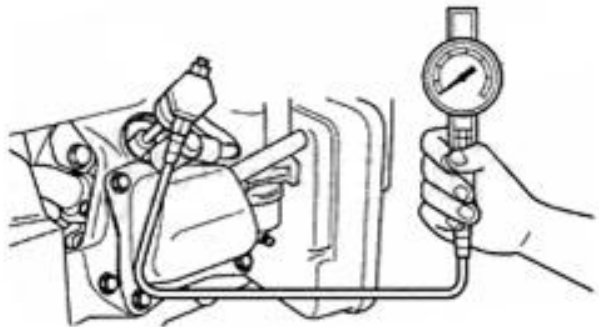
- Install the spark plug cap.
- Turn the engine switch to “ON” position.
- Pass negative pole (thread) of the spark plug through cylinder cover to connect grounding and pull the recoil starter grip to observe the spark.

3-1-2 Power Lack

TROUBLE	CAUSE		REMEDY
When increasing throttle, speed increase slow or even decrease and stop running	Ignition system Fuel supply system	Air in fuel line or fuel line clogged	Exhaust air or dredge fuel line
		Main oil flow hole is not adjusted properly	Readjust
		In carburetor, needle valve hole and main oil flow hole clogged.	Clean and blow to get through
		Fuel cock is clogged up.	Clean, replace damaged part
		Too much carbon deposit in combustng chamber.	Clear away
		Too much car bon fouling in muffler and exhaust pipe.	Clear away
	Poor compression	Air cleaner is clogged up.	Clean air cleaner filter element
		Intake pipe is leaking	Repair or replace
		Piston or cylinder or piston ring is worn	Replace the worn
		Air leakage from the surface by which cylinder block contacting with cylinder head.	Replace cylinder gasket
		Too big or too small valve clearance.	Readjust
		Valve tightness is poor.	Repair

Compression pressure check

- Drain the oil of the fuel tank out.
- Drain the gasoline by loosening the oil drain bolt of the carburetor.
- Remove the spark plug cap and spark plug and install the cylinder pressure meter.
- Forcibly pull the recoil starter several times and measure compression force.



3-1-3 Speed Unstable

TROUBLE	CAUSE	REMEDY
Knocking sound	Piston, cylinder or piston ring is worn excessively.	Replace the worn
	Piston pin and piston pin hole are worn excessively.	Replace piston or piston pin
	Tie rod small head is worn excessively.	Replace tie rod
Abnormal combustion	Engine is too hot	Shoot trouble
	Too much carbon deposit in combustion chamber	Clear away
	Improper gasoline brand or low gasoline quality	Replace with qualified gasoline
Spark lacking	There is water in float chamber	Clean
	improper spark plug electrodes clearance	Adjust
	Something wrong with induced coil, and so on	Check and replace damaged parts

3-1-4 Unable Igniting

TROUBLE	CAUSE		REMEDY
Unable igniting	Fuel supply system	Fuel is finished	Refill fuel
		Carburetor is clogged	Check fuel line and dredge
		Float is leaking	Repair
		Needle valve is stuck	Dismantle float chamber and eliminate it
	Ignition system	Spark plug is punctured, or short-circuited by carbon deposit	Replace spark plug
		Side electrode of spark plug is dropped out	Replace spark plug
		High-tension wire is dropped out	Weld on
		Ignition coil is punctured or short-circuited	Replace ignition coil
		Parking wire is located on engine body	Find out meeting and insulate
	The other	Cylinder is seriously scored and valve dropped out	Repair or replace damaged parts

3. TROUBLESHOOTING

3-1-5 Gasoline Engine is Overheat

TROUBLE	CAUSE	REMEDY
Gasoline engine is overheat	Oil insufficient or wrong oil ratio in the gasoline	Refill engine oil
	Exhaust pipe blocked up	Clean exhaust pipe
	Shroud leaking	Repair damaged part
	Cooling fins blocked by foreign matter	Clear cooling fins
	Cooling fan is loosen and misfunction	Reinstall well
	Connection rod deformation to make piston and cylinder bushing side wear	Replace connection rod
	Cylinder or piston or piston ring is worn to make hunting between cylinder and crankcase	Replace the worn parts
	Improper adjustment of engine governor to produce speed high.	Readjust engine governor

3-1-6 Abnormal Sound

TROUBLE	CAUSE	REMEDY
Beating sound	Piston, piston ring or cylinder is worn	Replace the worn part
	Connection rod or piston pin and piston pin hole are worn	Replace the worn part
	Crankshaft main neck is worn	Replace bearing
	Piston ring is broken	Replace piston ring
Metal beating sound when abnormal combustion occurs	Too much carbon deposit in combusting chamber	Clear away carbon deposit
	Too small electrode clearance of spark plug	Adjust electrode clearance properly
	Engine fuel is too much	Check relative parts such as carburetor
	Improper fuel brand	Replace fuel
	Engine is overheat	Find a cause and eliminate it
The other	Improper valve clearance	Readjust valve clearance properly
	Fly wheel is not connected with crankshaft tightly	Connect tightly

3-1-7 Unable Generating Electricity

TROUBLE	CAUSE	REMEDY
Unable generating electricity	Collector ring and carbon brush contacting poor	Clean the surface of the collector ring and grind the carbon brush arc face.
	Brush pressure abnormal	Replace the spring or adjust it.
	Stator, rotor output leads contacting poor. Panel, meter and socket contacting poor.	Check the adjusting winding for reliable, panel meter, and socket for correct. If needing, replace it.
	Magnetism discharged	Charge magnetism
	Check each winding for connecting to ground or breakdown	Check them one by one and insulate them.
	Check main winding and excitation loop for open circuit.	Check and connect the broken part.
	AVR failure	Replace AVR

3-1-8 Voltage Too Low

TROUBLE	CAUSE	REMEDY
Voltage too low	Engine speed too low	Increase the engine speed.
	Collector ring and brush carbon contacting poor	Clean the collector ring face and grind the carbon brush arc face.
	Brush pressure abnormal	Replace the spring or adjust it.
	Stator, auxiliary winding and excitation loop open circuit	Remove the open circuit or replace coils.
	Stator, main winding and auxiliary winding or excitation loop connection error.	Correct the connection
	AVR output terminal power supply voltage or checking voltage abnormal.	Test the power source voltage or testing voltage.
	AVR failure	Replace AVR

3. TROUBLESHOOTING

3-1-9 No AC Output Voltage

TROUBLE	CAUSE	REMEDY
No AC output voltage	Engine speed abnormal	Check and adjust
	Stator main coil defective	Check and adjust
	Brush defective	Check and adjust
	Excitation voltage too low	Check and adjust
	AVR defective	Check and adjust
	Breaker tripped	Reset breakers
	Plugging part contacting poor or loosen	Replace the plugging parts or replace.

3-1-10 No DC Output Voltage

TROUBLE	CAUSE	REMEDY
No DC output voltage	Breaker tripped	Reset breakers
	Diode burn	Send to our company repairing station
	Wiring connection mistaken or looseness.	Reconnect wiring
	Rectification bridge damaged or DC winding open circuit	Replace the rectification bridge and stator.

3-1-11 Stator Iron Core Overheat

CAUSE	REMEDY
Stator voltage too high operation, and iron core loss increasing results in iron core overheat.	Adjust generator voltage for keep rated voltage operation.
Stator winding temperature high, the heat conduct to the iron core.	If the stator temperature is too high at rated condition, should lower the generator load.
Rotor exciting current is too big, and rotor winding temperature too high, heat conduct to the stator iron core.	Adjust generator load to make the power not out of the specified valve.
Generator operating with load at low speed, and heat dispersion condition poor result in iron core heating.	Adjust engine speed for good ventilation.

Stator and rotor iron core partly friction result iron core heating.	Grind the rotor iron core arc to remove iron friction.
--	--

3-1-12 Stator Winding Overheat

Overload	Adjust the load according to specified load.
Vent is clogged,	Periodically check and remove the foreign matter in the generator for good heat dispersion
Stator winding open circuit and connecting to ground.	Check stator winding for open circuit and check winding for grounding with megohmmeter. If grounding or open circuit, repair or replace the winding.

3-1-13 Rotor Winding Overheat

The engine operating at lower than rated speed, and ventilation condition poor resulting in heat dispersion, speed engine outputting rate voltage at low speed increasing exciting current result in the rotor winding over heat.	Increase the generator speed for running at rated speed
Wind path clogged, and blocked rotor heat dispersion.	Clean the generator
Rotor winding coils open circuit or connecting to ground.	Check winding for connecting to ground with megohmmeter, if connecting to ground, repair or replace for winding,
Stator and rotor iron core partly friction result iron core heating.	Grind the rotor iron core arc to remove iron friction.

3-2 Safety Precautions

3-2-1 Safety

WARNING:

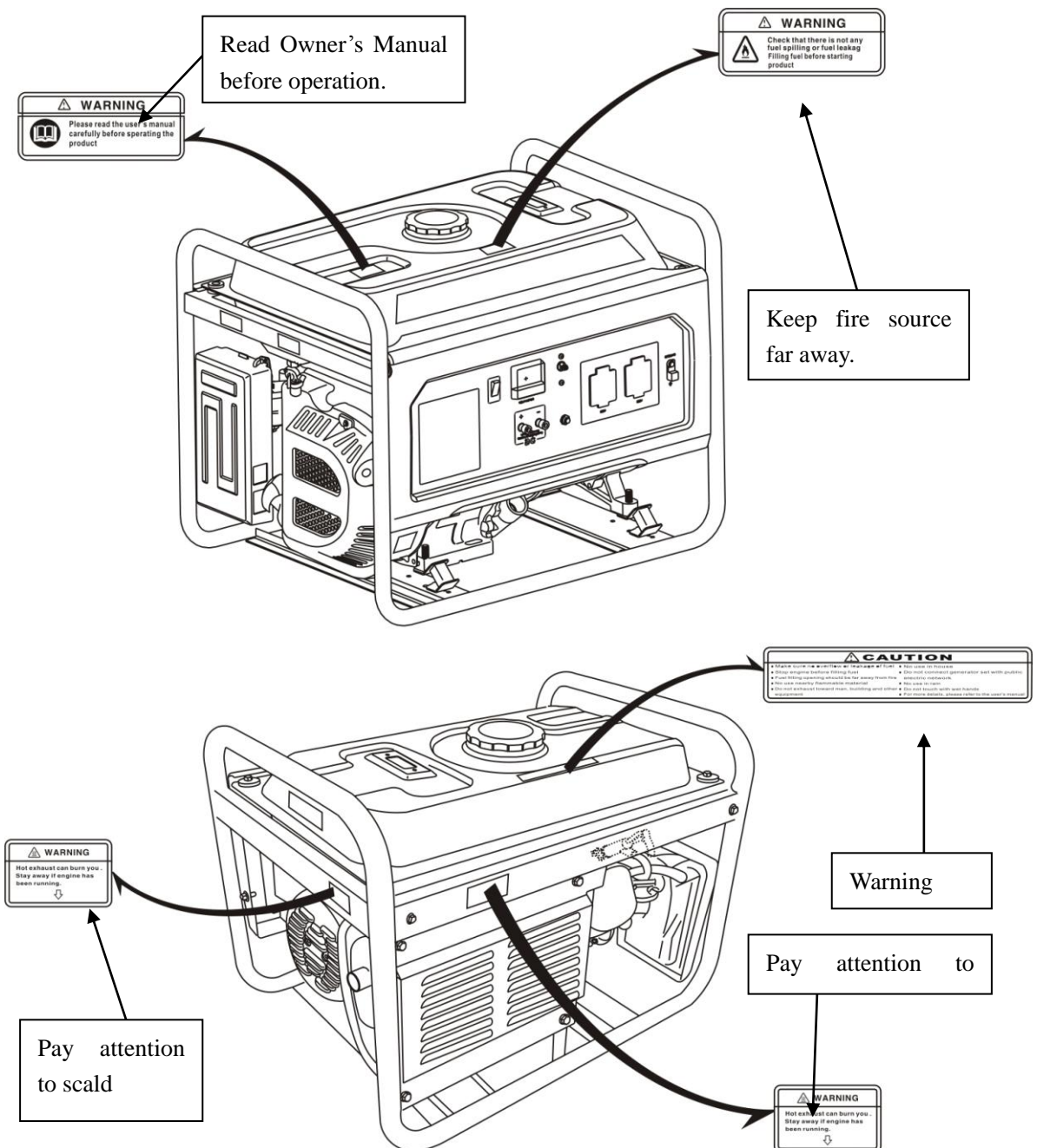
Indicate a possibility of invalid warranty and personal or equipment damage if instructions are not followed.

Please pay special attention to the following:

- 1) Strictly set the engine according to the regulated power on the nameplate. Do not overload, overrun the engine or run it with low load and at low speed in a long time.
- 2) Use regulated brand of gas and diesel. The fuel should be fully deposited and filtrated before use. Keep clean the fuel filler, change the oil periodically.
- 3) Periodically check the installation, connection and the degree of tightness of the fixed bolt. Tighten it if necessary.
- 4) Periodically clean the element of the air cleaner, change it when necessary.
- 5) The engine is air-cooled, so clean the radiator, wind cover and fan in time in order to make the engine cool normally.
- 6) The operator should be familiar with the working principle and structure of the gasoline engine, knowing how to make an emergent stop and the operation of all controlling parts. Any one without training is forbidden to operate the engine. Keep periodical maintenance. Solve problems in time. Do not run the engine in spite of malfunction.
- 7) Running the engine in a well-ventilated place, keep it at least one meter away from building walls or other equipments, keep away from inflammables such as gasoline, matches and so on to avoid possibility of fire.
- 8) Refuel in a well-ventilated area with the engine stopped, and in places refueling or storing gasoline, no smoking and any flames or sparks.
- 9) Refuel the fuel tank not too full so as to avoid fuel's spilling out. If there is spilled fuel around, be sure to clean it thoroughly before starting.
- 10) Do not run the engine in airtight or ill-ventilated places.
- 11) The exhaust muffler is very hot during running the engine even after the engine stops.

Never touch it, or you may get burns. Transport or store the engine with it cooling down entirely.

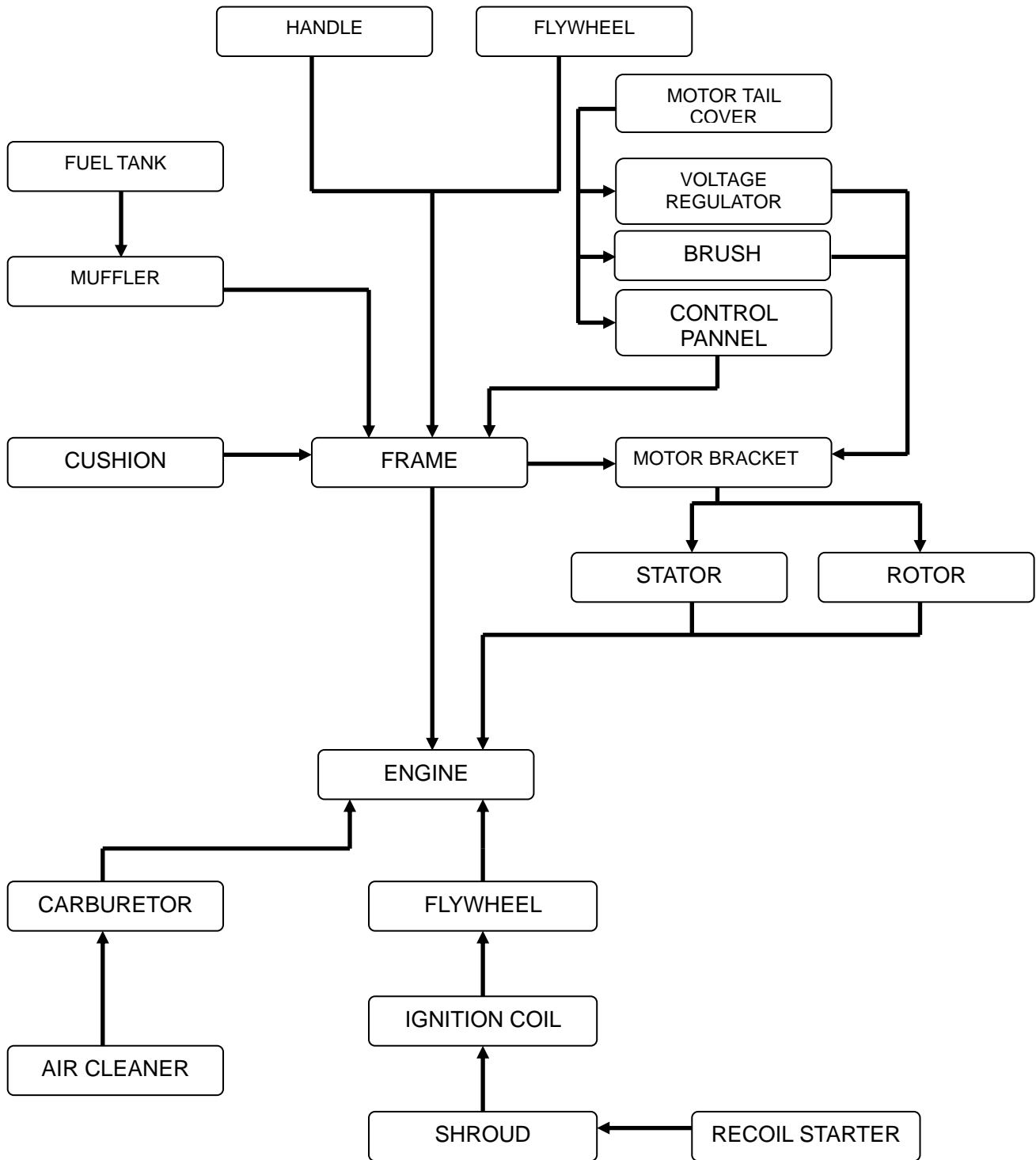
- 12) Safe warning label:
- 13) Please carefully read warning label before operating. Our company will not assume any responsibility, for person hurt, or equipment damaged caused by disregarding this warning label.



3-2-2 Special Tools

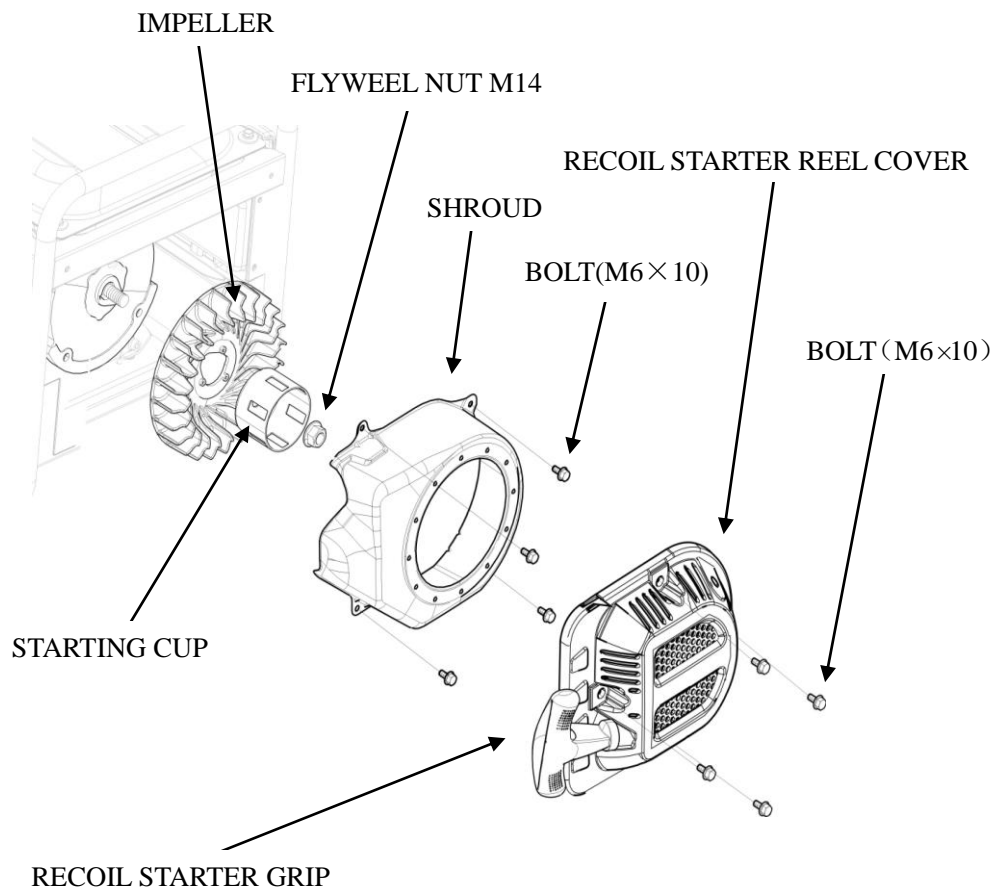
Tool name	Application note
1) Float lever gauge	Carburetor float level inspection
2) Valve guide driver	Valve guide removal, installation.
3) Retainer assembler	Assembling ball bearing
4) Assembler handle	Installing handle and bearing
5) Inner retainer assembler	Assembling ball bearing and time.
6) Diamond lap 45 ⁰	Rectifying valve seat surface.
7) Diamond lap 32 ⁰	Rectifying valve seat surface.
8) Flywheel driver	Dismounting flywheel
9) Bearing extractor	Dismounting flywheel
10) Valve guide reamer	Fine reaming the guide inner hole.

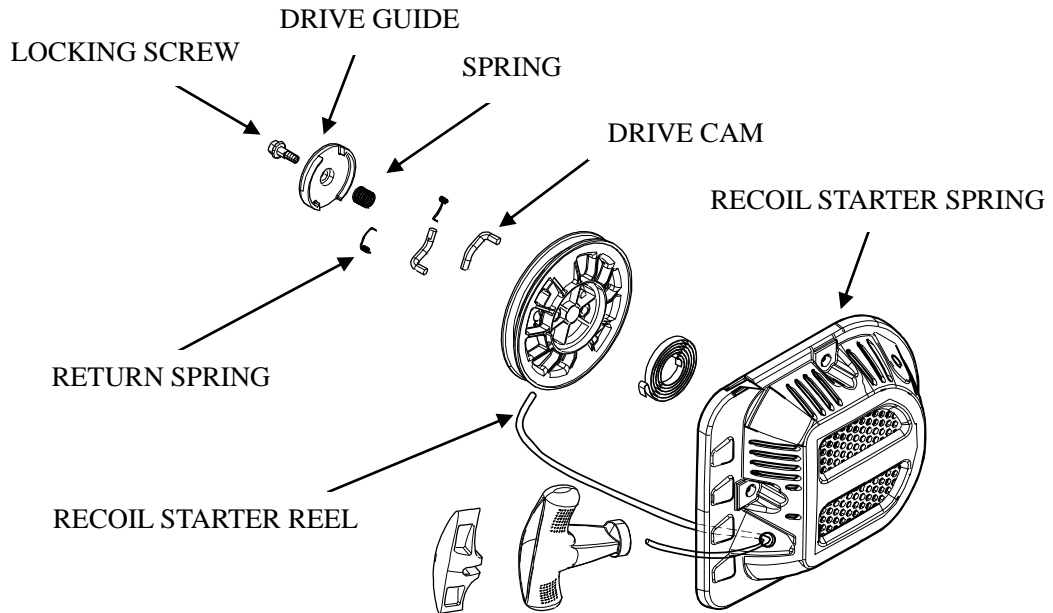
3-3 Dismounting Chart



3-4 Engines

3-4-1 Recoil Starter

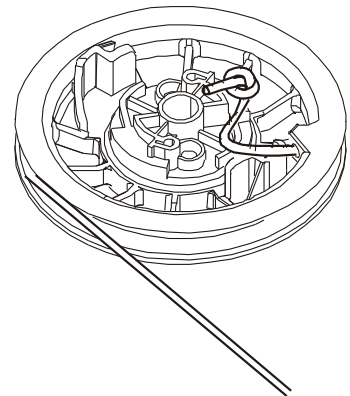


**NOTICE:**

- Take care not to allow the return spring to come out. Wear gloves when operating.
- Check the broken and wearing before installing the rope.

Installation Instruction

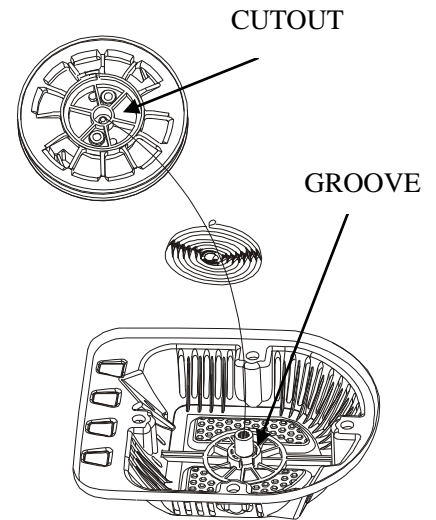
- ① Pass the recoil starter rope through the rope in the recoil starter pulley and make a figure-eight knot at the rope end.



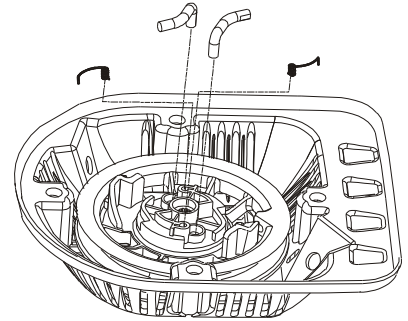
3. TROUBLESHOOTING

② Hang the side hook of the recoil starter spring in the groove of the recoil starter case, set the recoil starter spring into the case with counterclockwise rotating starter spring.

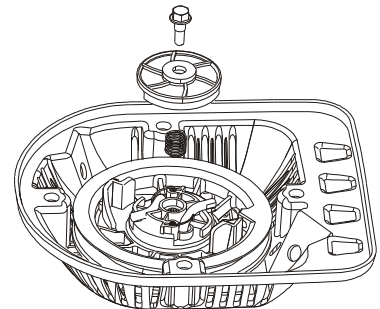
③ Set the recoil starter spring outside hook into the groove of the recoil starter pulley.



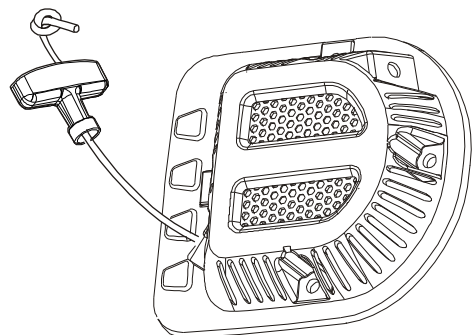
④ Set the starter drive cam on the recoil starter pulley, and install the return spring on the recoil starter pulley while hooking it on the side of the driving cam.



⑤ Install the spring, drive guide and fixing screw in order.

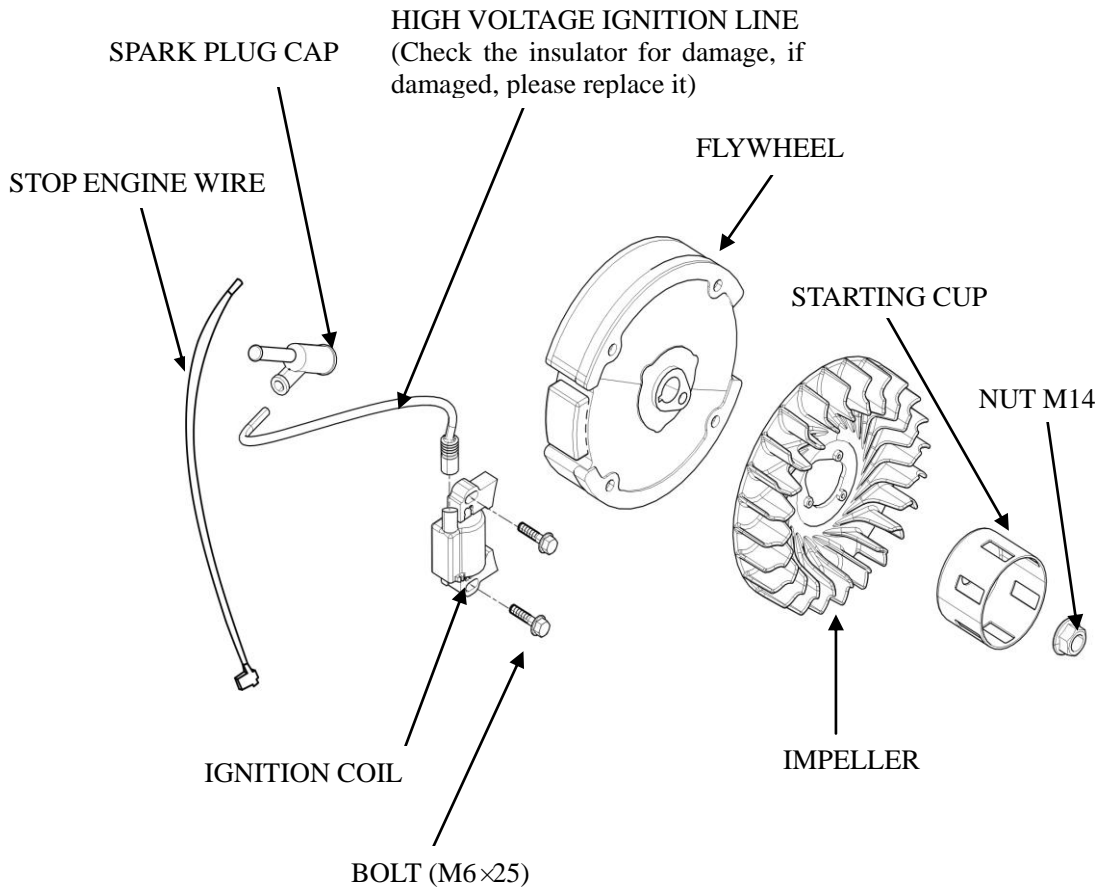


⑥ Pass the recoil starter rope through the recoil starter case and recoil starter grip, and make a figure-eight knot at the rope end.

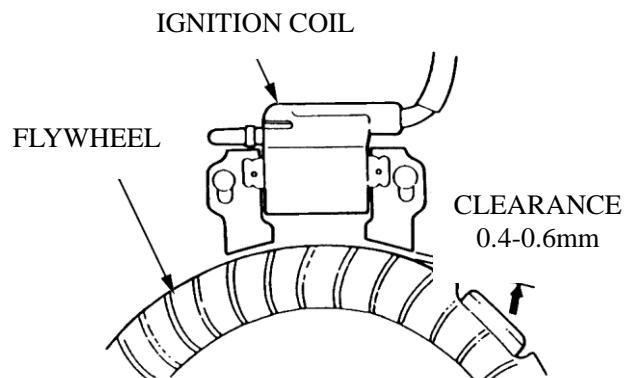


⑦ Pull the recoil starter rope lightly to check the drive cam for function.

3-4-2 Flywheel



- Remove the fuel tank, air cleaner, carburetor and recoil starter assy.
- Measure the clearance between the ignition coil and flywheel with the feeler.
- Adjust the clearance of the ignition and flywheel.
- Adjusting method: Loosen the bolt and move the ignition coil up and down for adjusting the clearance, then, screw down the bolt.

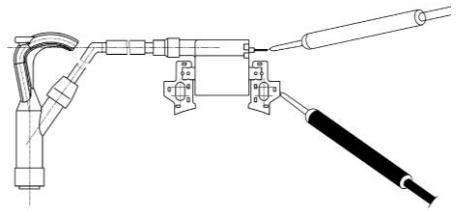


Check the ignition coil

(primary side)

Measure the resistance of the primary coil by attaching one ohmmeter lead to the ignition coil's primary terminal while touching the other tester lead to the iron core.

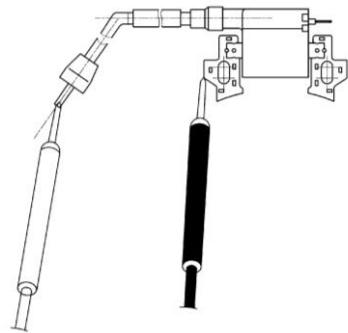
Primary side resistance value : $0.8-1.0\Omega$



(Secondary side)

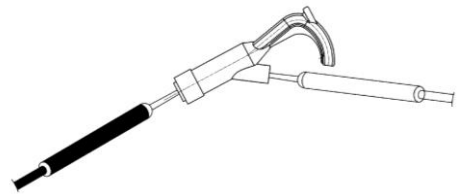
Measure the resistance of the secondary side of the coil with the spark plug cap removed, touching one test lead to the high tension cord while touching the other tester lead to the coil's iron core.

Secondary side resistance value : $5.9-7.1k\Omega$



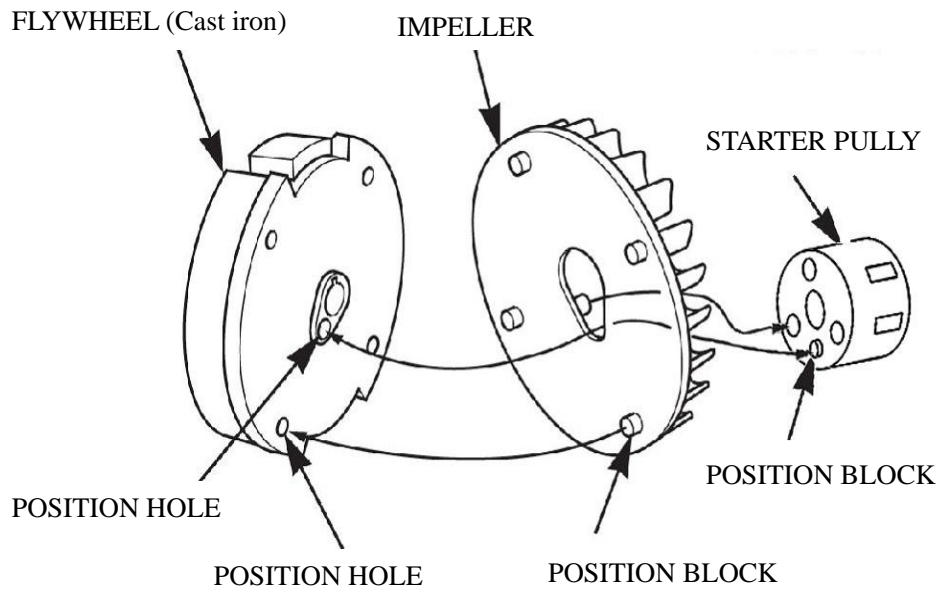
Measure the resistance of the spark plug cap by attaching one ohmmeter lead to the wire end of the plug cap while touching the other tester lead to the spark plug end.

Resistance value : $5k\Omega$

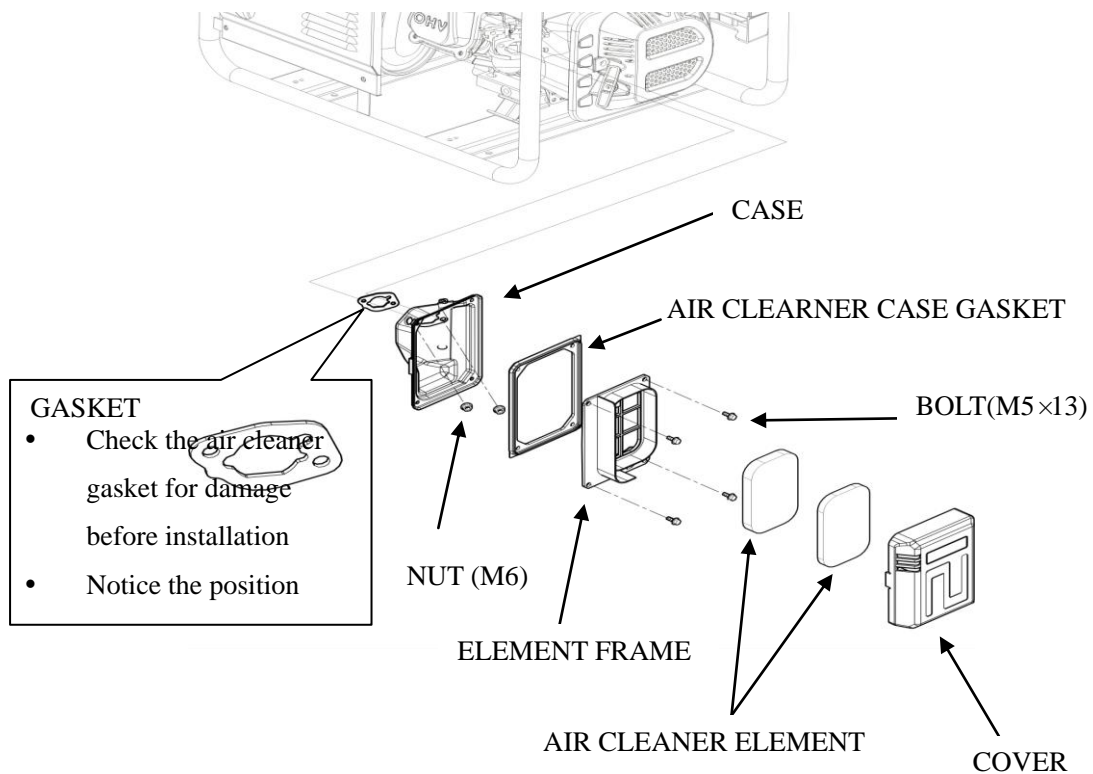


Flywheel

- Align the position block with the four small holes on the rear side of the flywheel
- Align position block with small holes of the centre on the flywheel rear side.



3-4-3 Air Cleaner



NOTICE

- Don't wash the foam element with the gasoline, acidity, alkalic or organic solvent
- Don't pull and wrest the sponge or it will be damaged.

WARNING

Don't start the engine without air cleaner or the engine will be quickly worn.

3-4-4 Carburetor

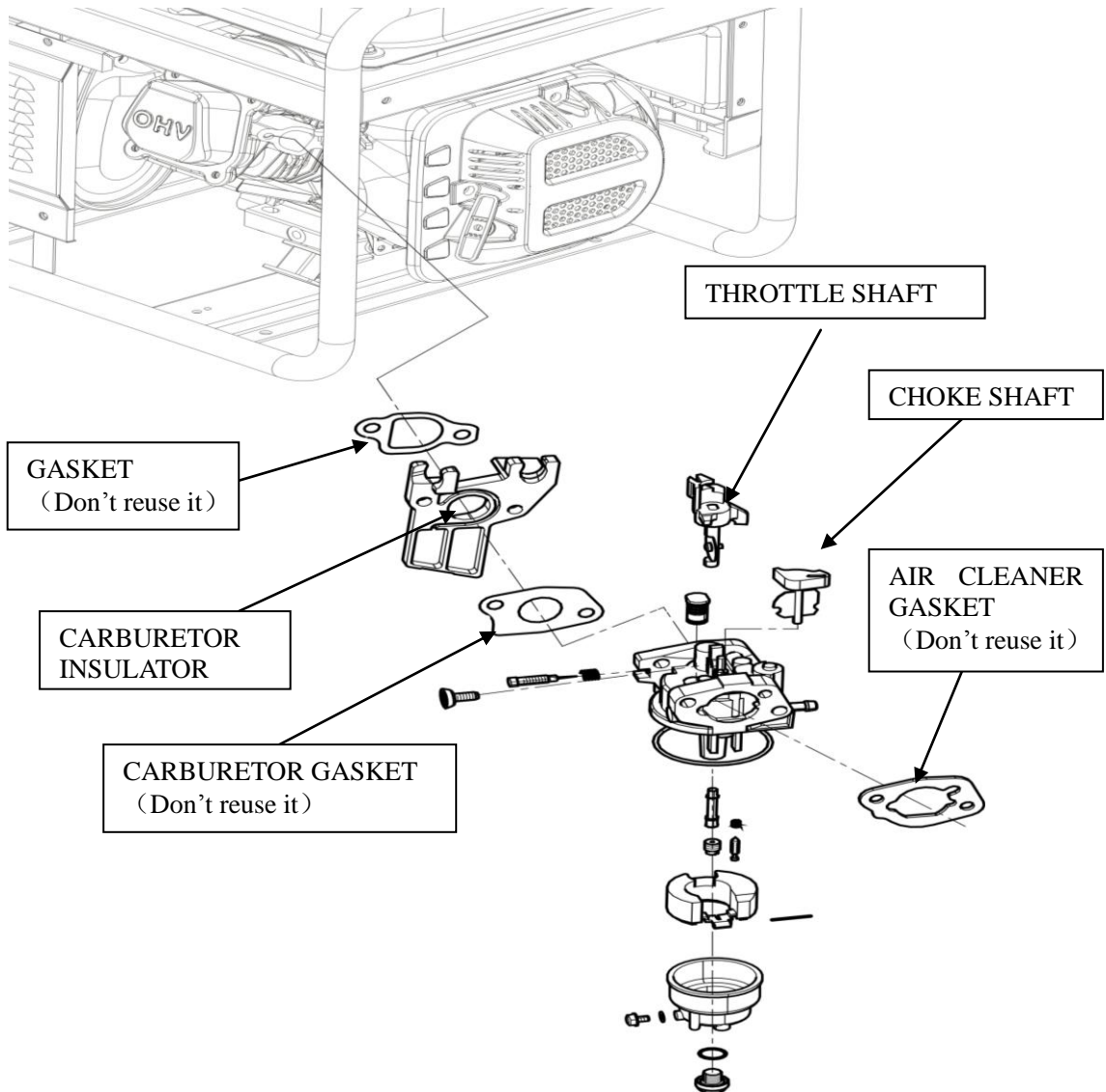
NOTICE

At high altitude, the standard carburetor air-fuel mixture will be excessively rich. Output power will decrease, and fuel consumption will increase. Engine performance can be improved by installing a smaller diameter main fuel jet in the carburetor and readjusting the pilot screw. If you always operate the engine at altitudes higher than sea level 1000 meters over, have our authorized dealer perform this carburetor modification. If not, should lower load power in operating gasoline engine. Even equipped with suitable carburetor, engine horsepower will decrease approximately 3.5% for each 300 meter increase in altitude. The effect of altitude on horsepower will be lowered greater than this if no carburetor

modification is made.

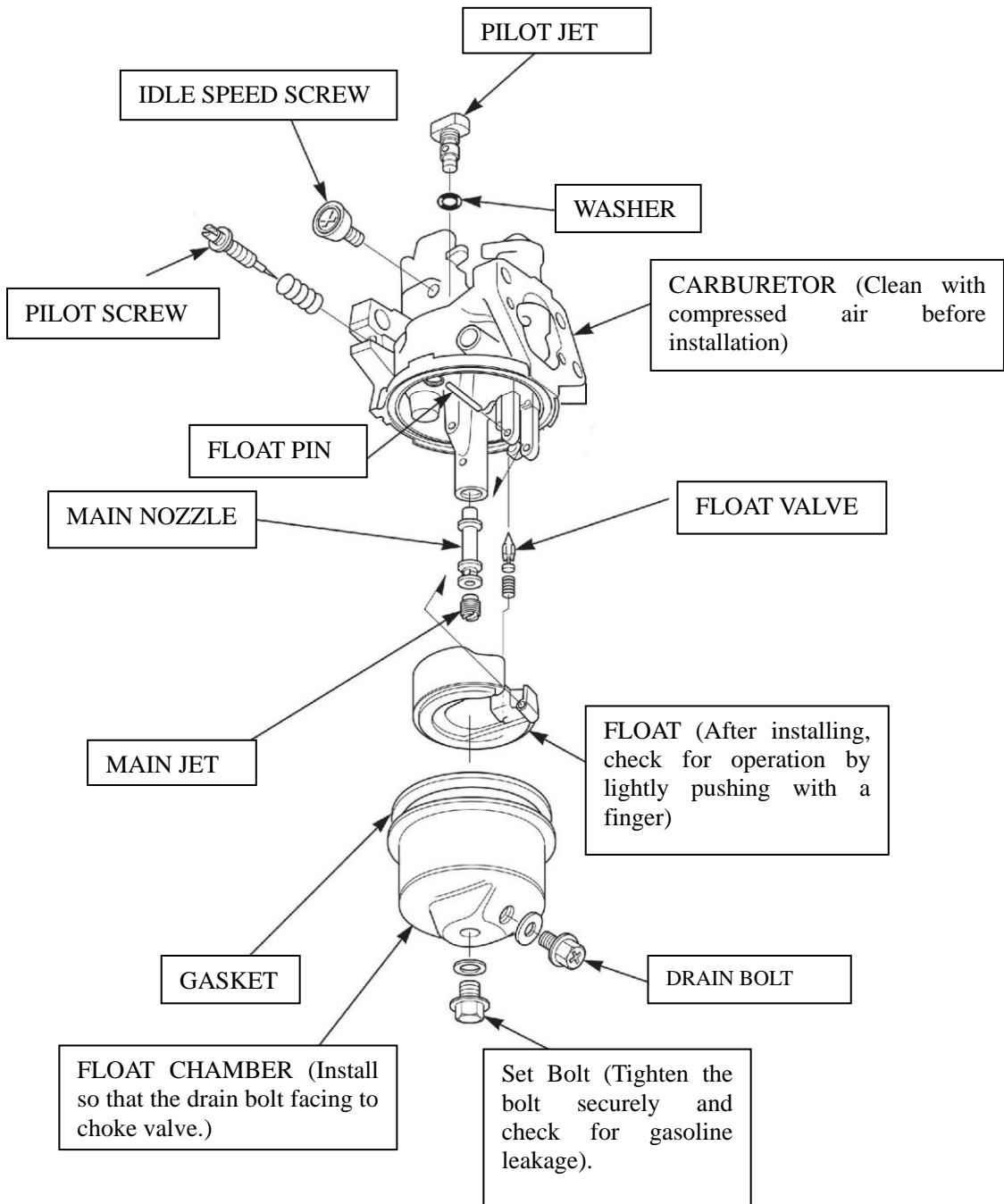
If a carburetor suitable to high altitude is equipped with engine suitable to a lower altitude, the lean air fuel mixture will make engine output power lowering, over-heat and seriously damage.

The gasoline enters into the carburetor from the fuel tank and fuel filter. The fuel filter can filter the foreign matters in the gasoline and oxide out of the fuel tank. If having quality defectiveness, partly foreign matters will enter into the carburetor. Otherwise, the gasoline contains some composition which can form the colloid after long sediment, and attach in the carburetor parts (such as main jet) oil path and float chamber surface. The air enter into the carburetor through air filter, based on the intake can not be too much resistance and other factors to consider, the filter can not be too dense and therefore part of the air in the tiny impurities will enter into the carburetor through the air cleaner.



Wash the carburetor in the clean place, First, clean the outside surface, and wash the inside the parts with special carburetor detergent or industrial gasoline. Exception for washing impurities, also wash the gasoline colloid on the part surface. Blow the washed parts clean with compression air, and don't use cloth and paper against recontamination. Don't use the steel wire and other hard material to open the blocked hole to prevent carburetor performance from changing holes diameter. Use the gasoline and compression air to clean it.

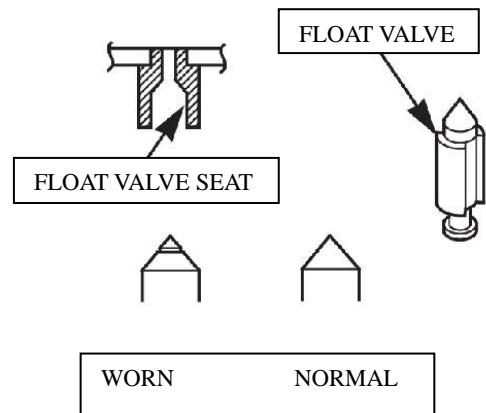
a) Carburetor disassembly :



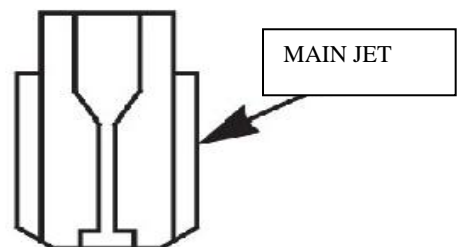
NOTICE

- Loosen the drain bolt and completely drain the fuel out before installing carburetor.
- No fire

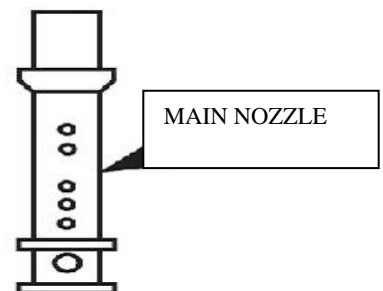
- a) Check the float valve, float seat and float spring for wear.



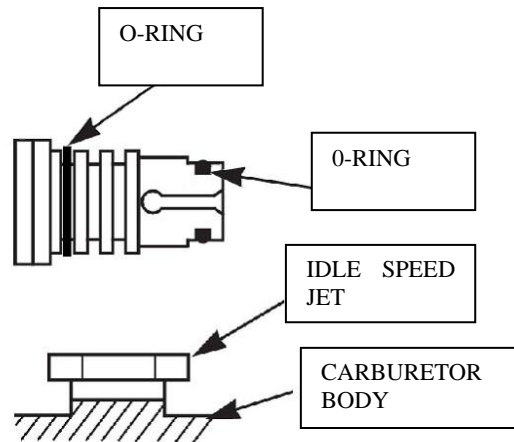
- b) Clean with compressed air before installation



- c) Clean with compressed air before installation.



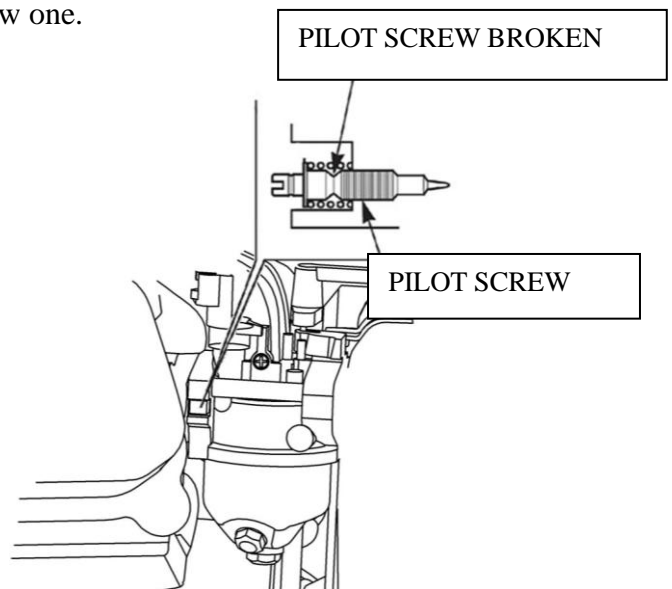
d) Clean with compressed air before installation. Apply light coat of oil to the O-ring to facilitate installation.



e) After washing the carburetor, reset the pilot screw back. Only repairing the carburetor can disassemble it.

If the pilot screw is broken, replace with new one.

- Disassemble the broken pilot screw from the carburetor.
- Put the spring onto the replaced pilot screw and then install it onto the carburetor.
- Turn the pilot screw in until it is lightly seated the bottom of hole, then turn the screw out the specified numbers of the turns.



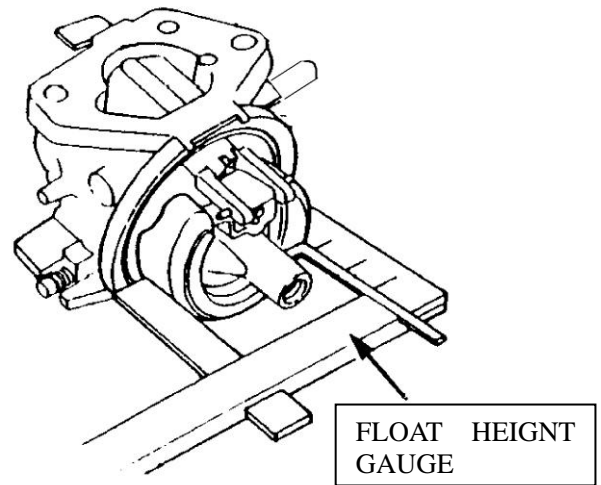
Pilot screw standard opening state	3 turns	2-1/8 turns out
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3. TROUBLESHOOTING

f) Inspection

Float level height

Place the carburetor in the position as shown and measure the distance between the float top and carburetor body when the float just contacts the seat without compressing the valve spring.



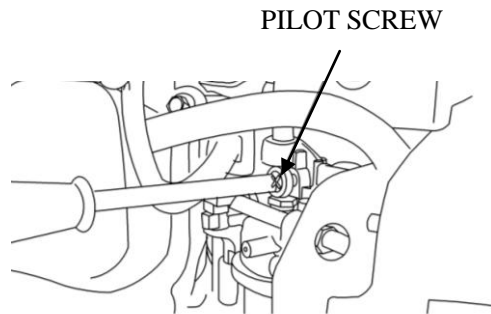
Specified float height	13.7mm±1.5
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If the height is out of specification, replace the float valve and recheck the float height

Tool: Float level gauge

g) Carburetor idle speed adjusting

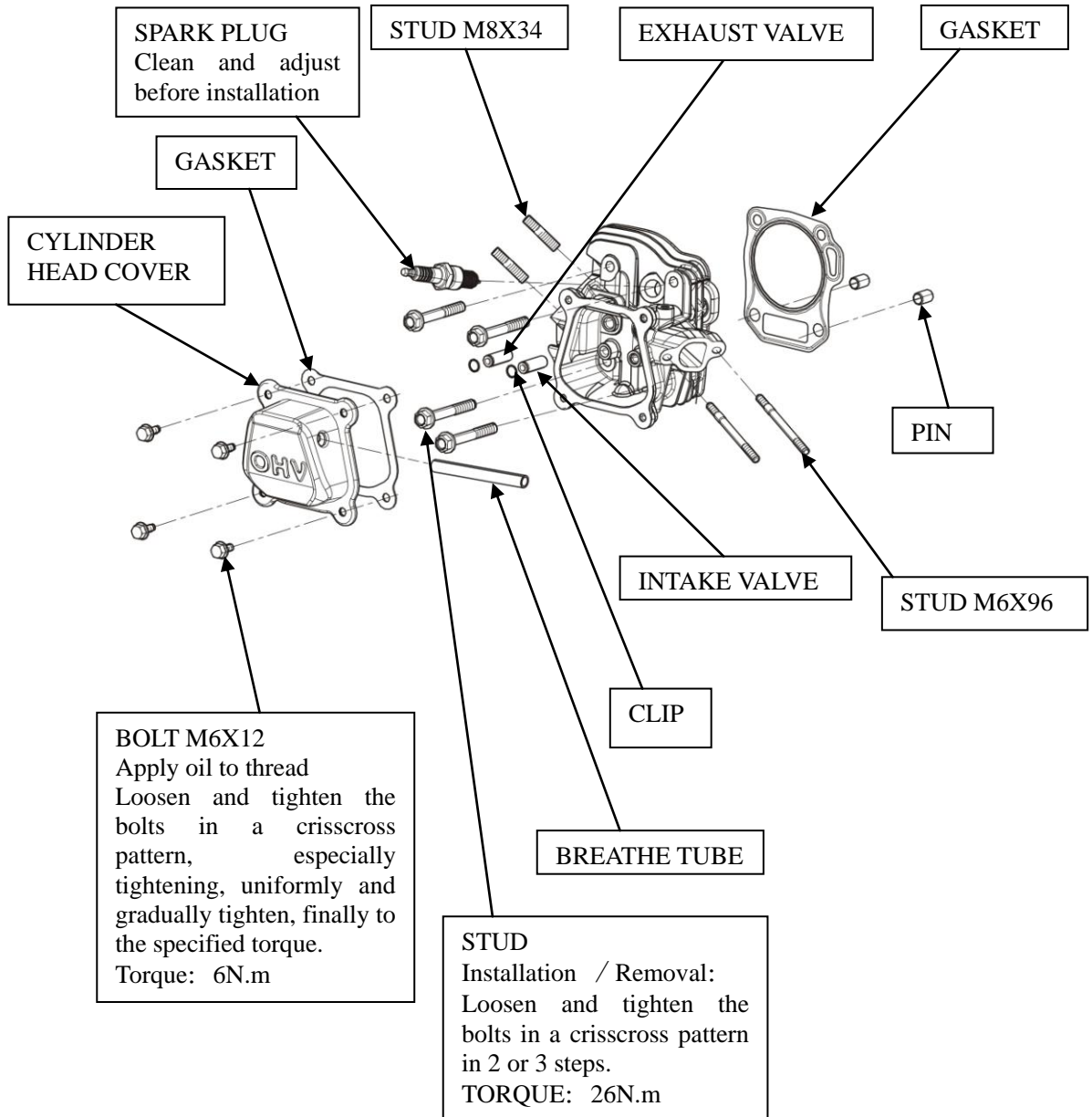
- Start the engine to preheat it to normal running temperature.
- Adjust the pilot screw to specified idle speed.

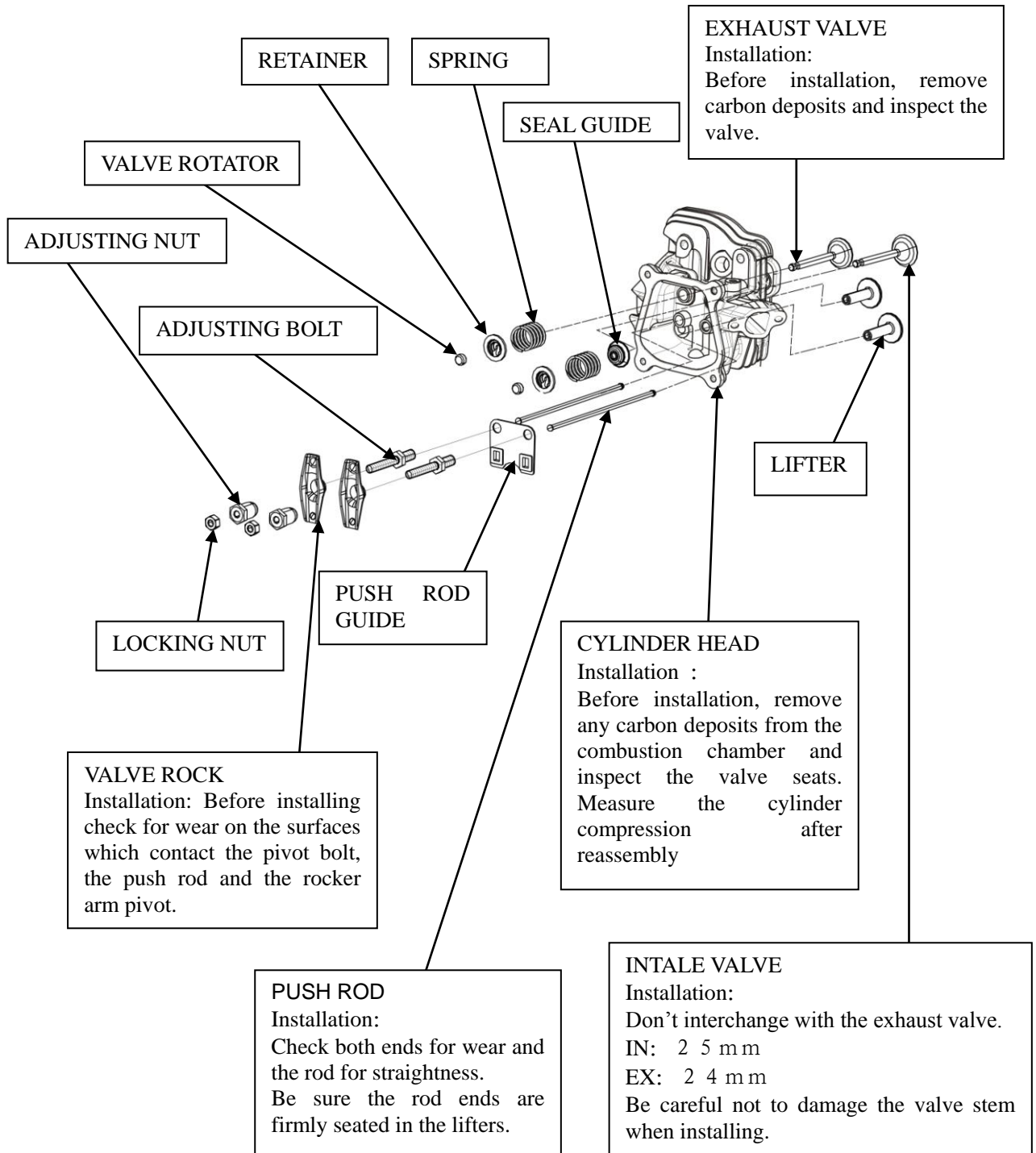


3-4-5 Cylinder Head/Valve

1) Removal / Installation

- ① Remove the muffler
- ② Remove the air cleaner
- ③ Remove the recoil starter and shroud
- ④ Remove the carburetor and insulator

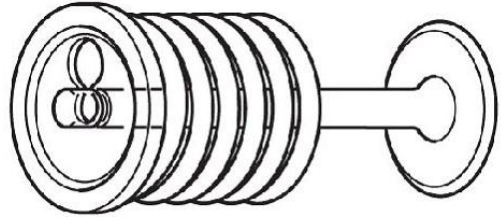




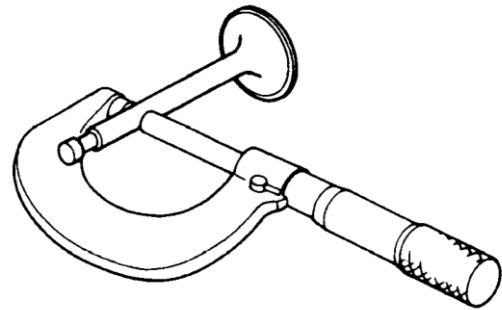
Valve spring retainer :

Push down the valve spring and move the retainer to the side so that valve stem slips through the side hole.

Do not remove the valve spring retainers while the cylinder head is attached to the cylinder, or the valves will drop into the crankcase.

**2) Inspect/ Service/ Repair :****① Valve stem outside diameter**

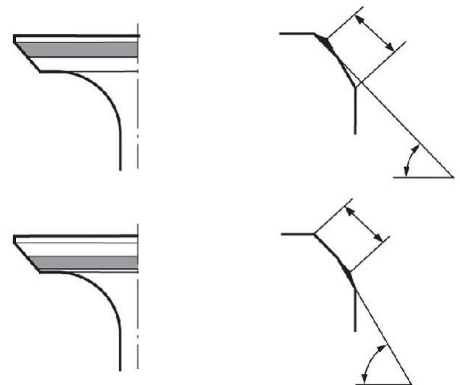
Inspect the valve stem outside diameter with the micrometer, if finding out of the standard or service limit, or if visually inspecting the burn and damaged on the valve face, please replace with new one.



Standard		Service limit	
5.48mm (IN)	5.44mm (EX)	5.318 (IN)	5.275 (EX)

② Valve spring free length

Measure the free length of the valve springs. If out o replace the spring

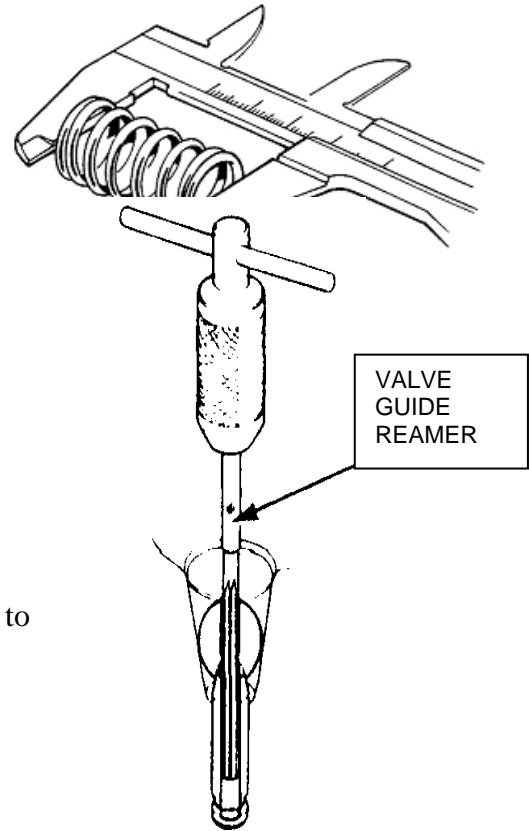


Standard	Service limit
34mm	32.5mm

③ Valve Guide

Inspection :

a) Inspect the valve guide for smooth, scratch and damaged in the inner surface, and matching between the valve guide and cylinder cover for fastness.



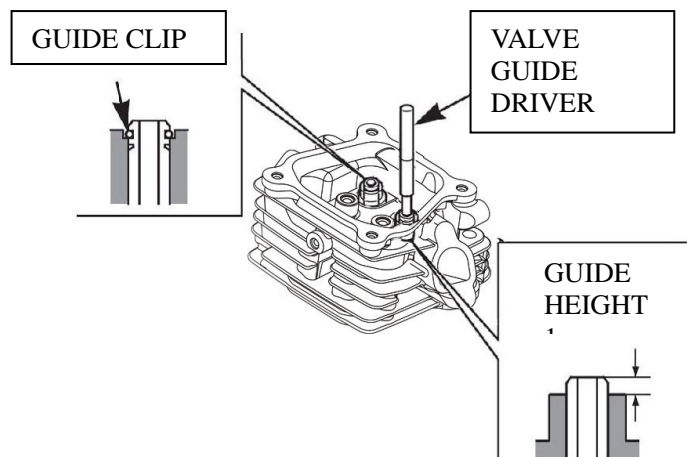
b) Using the valve guide reamer, ream the valve guides to remove any carbon deposits before measuring.

If the valve guide inside diameter is lower than standard or out of the service limit, replace the guide.

STANDARD	SERVICE LIMIT
5.50mm	5.572mm

Replacement:

- Chill the replacement valve guides in the freezer
- section of a refrigerator for about an hour.
- Drive the valve guide out of the combustion
- chamber side using valve guide driver.

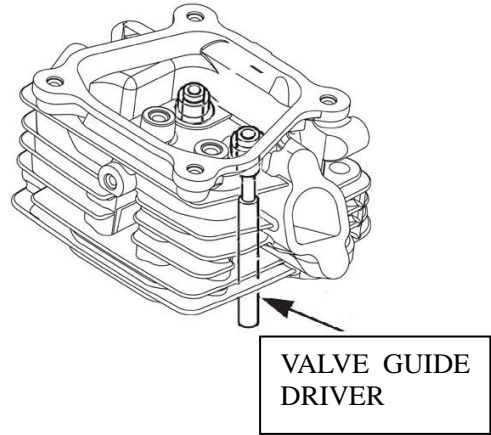


NOTICE: Be careful to avoid damaging the cylinder head when driving out the valve guides.

c) Install the new valve guides from the valve spring side of the cylinder head.

- Exhaust side: Drive the exhaust valve guide until the clip is fully seated (as shown as fig.)
- Intake side: Drive the intake valve guide to the specified height (measured from the top of the valve guide to the cylinder cover as shown as fig.)

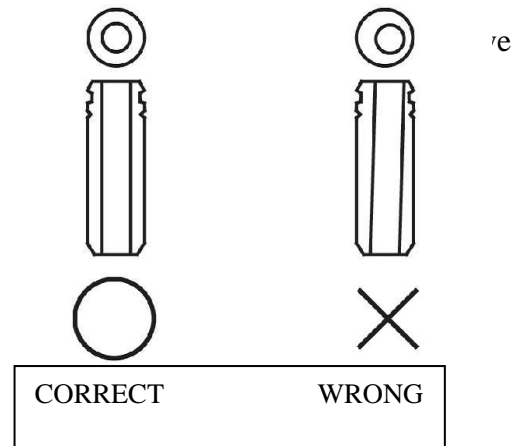
d) After installation, inspect the valve guide for damage, if damaged, please replace.



Reamer

For best results, be sure the cylinder head is a guides.

- Coat the reamer and valve guide with cutting
- Rotate the reamer clockwise through the val
- Continue to rotate the reamer clockwise while



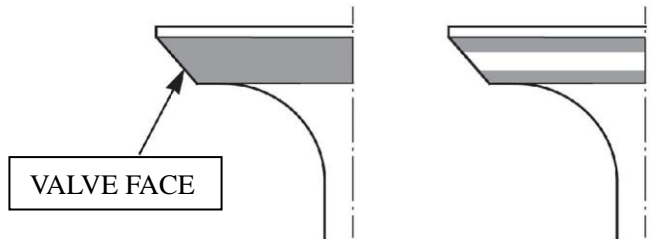
Tools: Valve guide reamer

- Thoroughly clean the cylinder head to remove any cutting residue.
- 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.
- Check the valve stem-to-guide clearance
- The valve stem-to-guide clearance: The vale guide bore detract the valve stem outside diameter to get the clearance between the valve guide and valve stem.
- If the clearance is over the service limit, judge a new guide if it can make the clearance

Conforming to service limit, if conforming to, replace the guide and ream the guide, refinish the valve when replacing the valve.

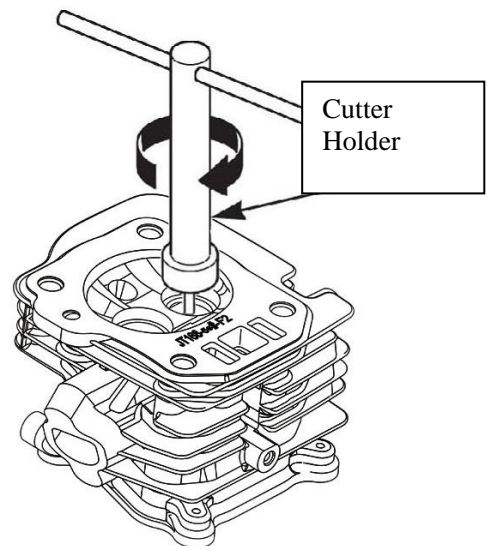
④ Valve seat :

- a) Thoroughly clean the combustion chambers and valve seats to remove carbon deposits. Apply a light coat of red lead powder or erasable color painting to the valve faces.



- b) Insert the valves, and then press the valve several times forcefully. 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.

- d) Using 45 °cutter, remove enough material to produce a smooth and concentric seat.
- e) Turn cutter clockwise, never counterclockwise. Continue to turn the cutter as you lift it from the valve seat.



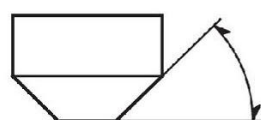
Tool : Valve seat cutter



IN.: 32°

EX.: 32°

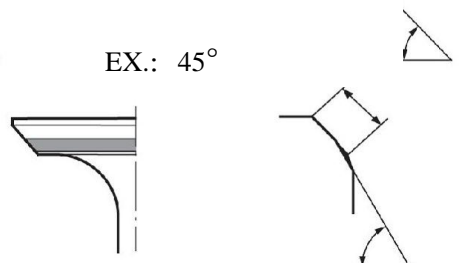
- f) Use the 32 °-45 °cutters to narrow and adjust the valve seat so that it contacts the middle of the valve face.



IN.: 45°

EX.: 45°

---- The 32 °cutter removes



material from the top edge (contact too high).

-----The 45 °cutter removes material from the bottom edge (contact too low).

Be sure that the width of the finished valve seat is within specification.

Standard	Service limit
0.8mm	2.0mm

Make lightly pass with the 45 °cutter to remove any possible burrs at the edges of the seat.

After resurfacing seat, inspect for even valve seating width. Apply colorant to the valve tapered face, insert the valve and press it forcefully several times, be sure the valve does not rotate on the seat. The seating surface, as shown by the transferred marking compound, should have good contact all the way around.

Apply abrasive to the valve seat face, suitable for running in when rotating valve seat with valve seat cutter.

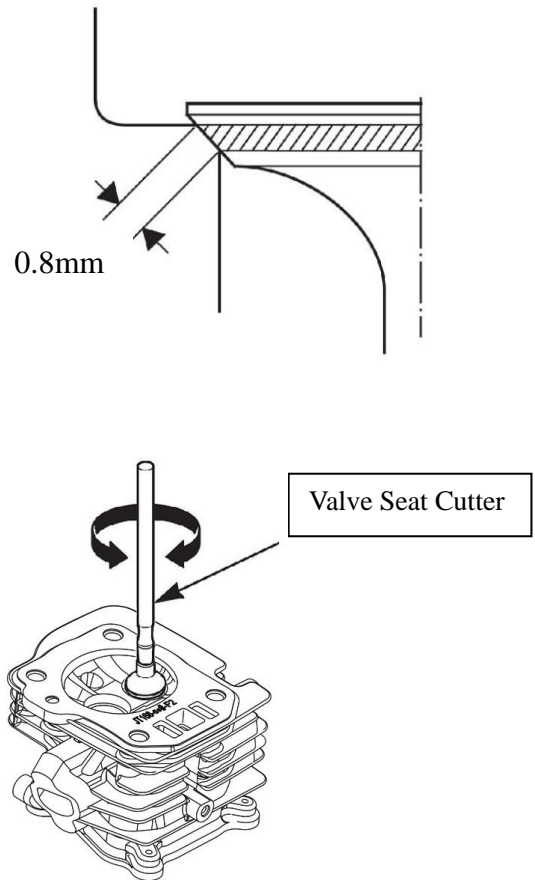
After reassembling, check the valve clearance

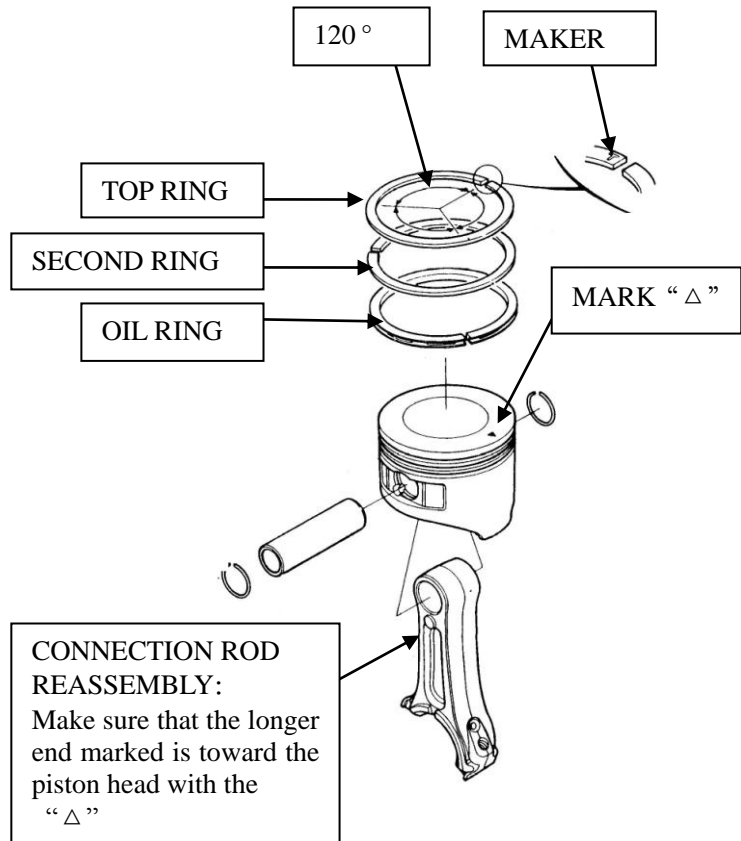
3-4-6 Crankshaft/Piston

① Removal

a) Piston

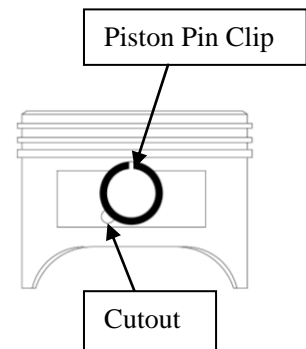
- Install with the maker mark facing upward as shown.
- Do not interchange the top ring and the second ring (top ring with chrome plated)
- After assembly, check for smooth movement of the piston ring.
- Stagger the piston ring end gaps 120 ° apart.





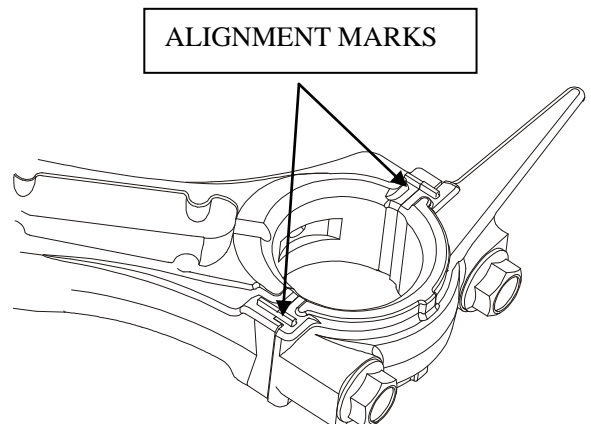
b) Piston pin clip

Install by setting front end of the clip in the piston groove, holding the other end with long nosed pliers, and rotating the clip in. Do not align the end gap of the clip with the cutout in the piston pin bore.



c) Connecting rod cap

Install by aligning the alignment marks on the connecting rod cap.



②Piston check

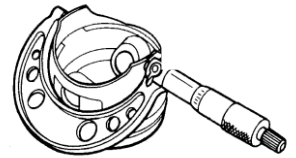
Check the piston and cylinder for contacting, and check the groove for defects, piston top for burn and cracks. If damaged, replace.

Clean the carbon deposit

Clean the deposit round the piston top and cylinder neck before checking, first soak the carbon deposit with kerosene, and then clean with meter scraper or metal brush.

a) Piston skirt O.D

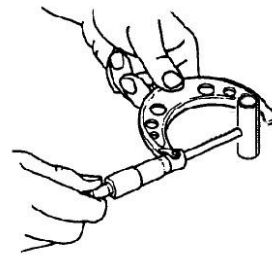
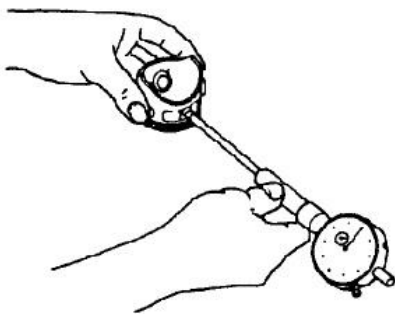
Measure the piston skirt O.D with outside micrometer, if out of the service limit, replace it.



Type	Standard	Service Limit
R2200/R2800	67.985mm	67.845 mm
R3000	69.985mm	69.975 mm

b) Piston pin bore to piston clearance

Separately measure the piston pin bore I.D and O.D with inside micrometer and outside micrometer. Then calculate clearance by measuring results.



Standard	Service Limit
0.002-0.014mm	0.06mm

c) Piston-cylinder clearance

Difference between cylinder maximum diameter and piston skirt should be considered as piston-cylinder clearance.

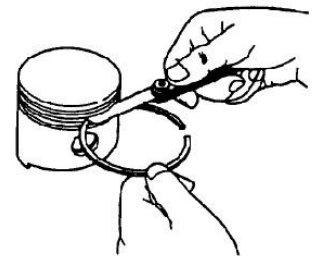
NOTICE: This clearance must be checked before and after repairing.

Check with piston converting in the cylinder, and inserting feeler between piston skirt bearing face and wall, then pull the feeler out, if feeling resistance and smoothly out, the thickness of the feeler shall be considered as piston-cylinder clearance.

Standard	Service Limit
0.015-0.05mm	0.12mm

d) Piston ring side clearance

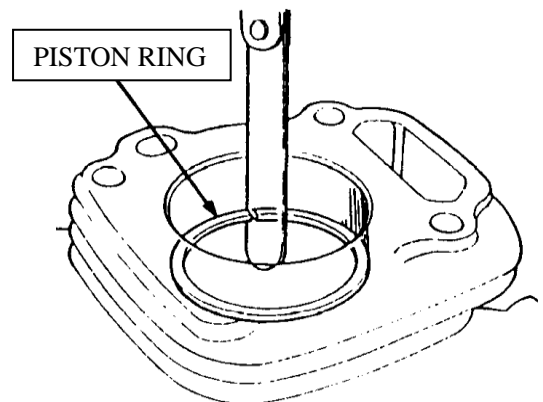
Check with placing each ring into each-self groove. The piston ring should be freely turned without loosening and sticking. Then measure with inserting feeler into clearance of the ring and upper and lower face.



Standard	Service Limit
0.015-0.045mm	0.15mm

e) Piston ring closed clearance

Flatly place the piston into the cylinder with pushing the piston head to working position. Measure the opening clearance with feeler, that clearance not too big or not to small, too big can result in cylinder sealing performance poor while too small can result in piston expanded from heating and blocked in the cylinder, thus causing piston broken and “sticking”. If opening clearance is too small, file the opening with fine flat file. Often check in the cylinder when filing until the proper clearance is got.



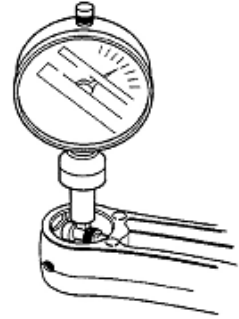
	Standard	Service Limit
Top ring/second ring	0.2-0.4mm	1.0mm
Oil ring	0.15-0.35mm	1.0mm

③ Check connecting rod

If connecting rod bending, twisting or big end shaft bush and small end outer ring movement or crack on one side, should be rejected and replaced with new one.

a) Check small end diameter

If out of the standard or exceed service limit, replace the connecting rod.



Type	Standard	Service Limit
R2200/R2800	18.006mm	18.07 mm
R3000	18.002mm	18.017 mm

b) Check big end diameter

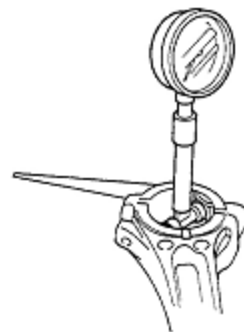
If out of the standard or exceed service limit, replace the connecting rod.

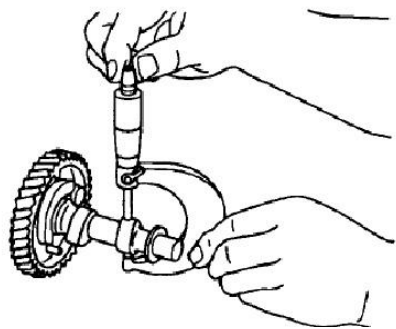
Type	Standard	Service Limit
R2200/R2800	30.02mm	30.066mm
R3000	30.215mm	30.225mm

④ Camshaft check

The camshaft is main driving part of the train valve mechanism, which control the intake and exhaust valves opening and closing.

Feature: The shaft is equipped with cam and journal which can control intake and exhaust. When operating, camshaft operating face and lifter will be badly rubbed from periodically impacting and easily be damaged. So, the camshaft shall be wearable and lubrication well.

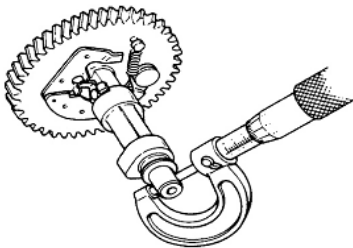




- Visually inspect camshaft face and camshaft height for damaged, and camshaft and bearing for loosening and wearing, replace as required.
- Check camshaft for height dimension, if out of the service limit, replace the camshaft.

	Standard	Service Limit
Camshaft Intake Lift	27.7mm	27.45mm
Camshaft Exhaust Lift	27.75mm	27.50mm

- Check outside diameter of the camshaft, if less than the service limit, replace the camshaft.



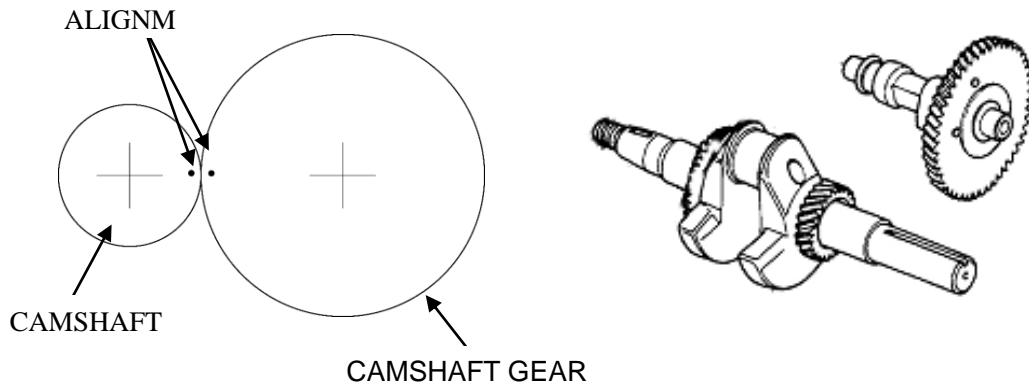
Standard	Service Limit
13.984mm	13.916mm

Camshaft wearing cause and to engine performance influence :

Poor lubrication will result in camshaft abnormal wearing, such as, oil viscosity low, impurity too much, and recycling oil little can't let the camshaft surface forming complete oil film to make the camshaft surface seriously worn in the high speed rubbing stat. Second, installing precision problem, when the matching clearance of the camshaft journal and camshaft seat or bearing is out of the service limit, camshaft rotation precision will lower and contacting with the relative part produce deviation face to make abnormal wearing.

⑥Timing gear

a) Check timing gear for engagement clearance with aligning two side mark on the gear.



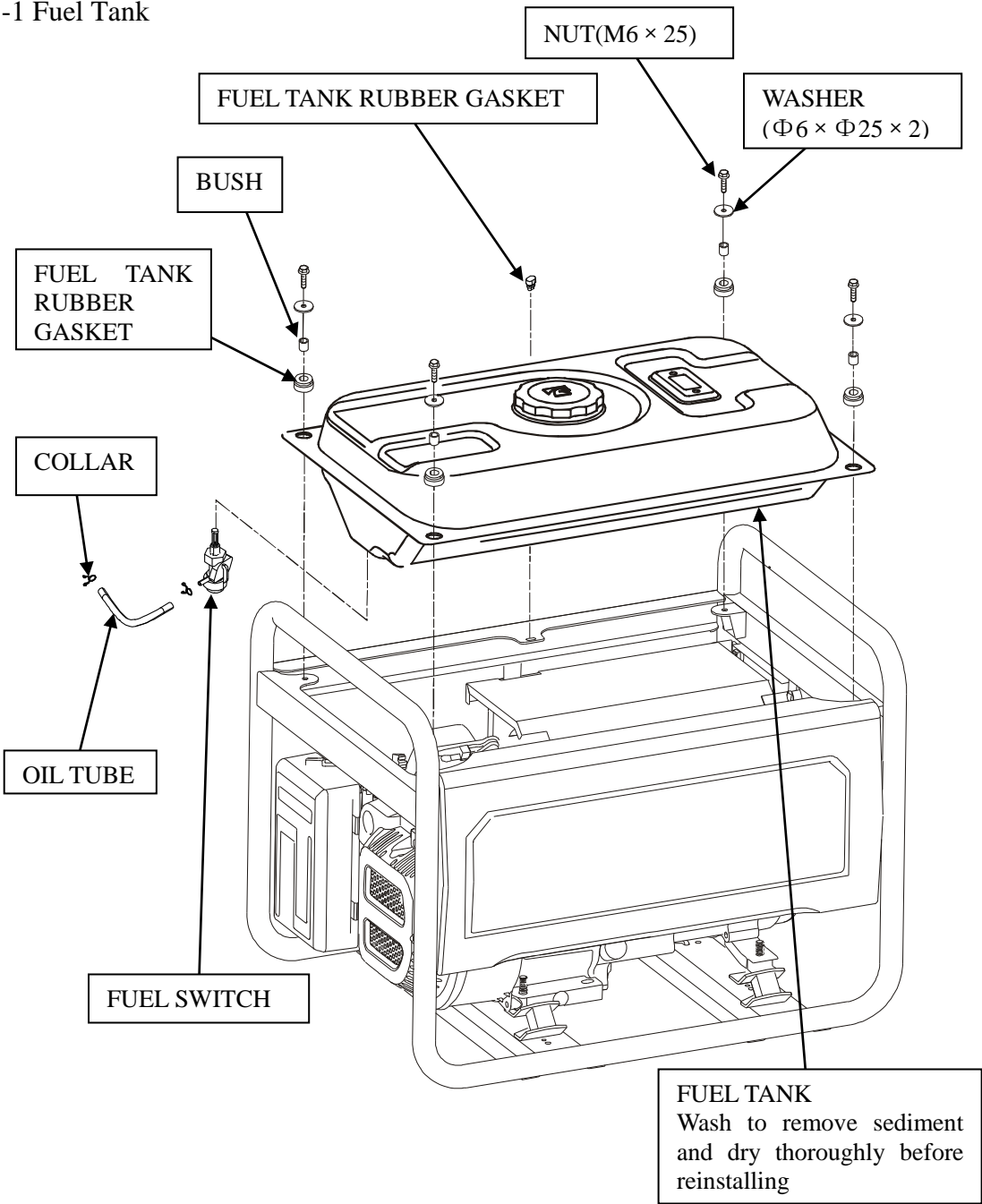
Timing gear will be damaged in gear worn, gear face peeling off, and gear teeth broken. The engagement clearance is bigger due to gear wearing, the noise is bigger.

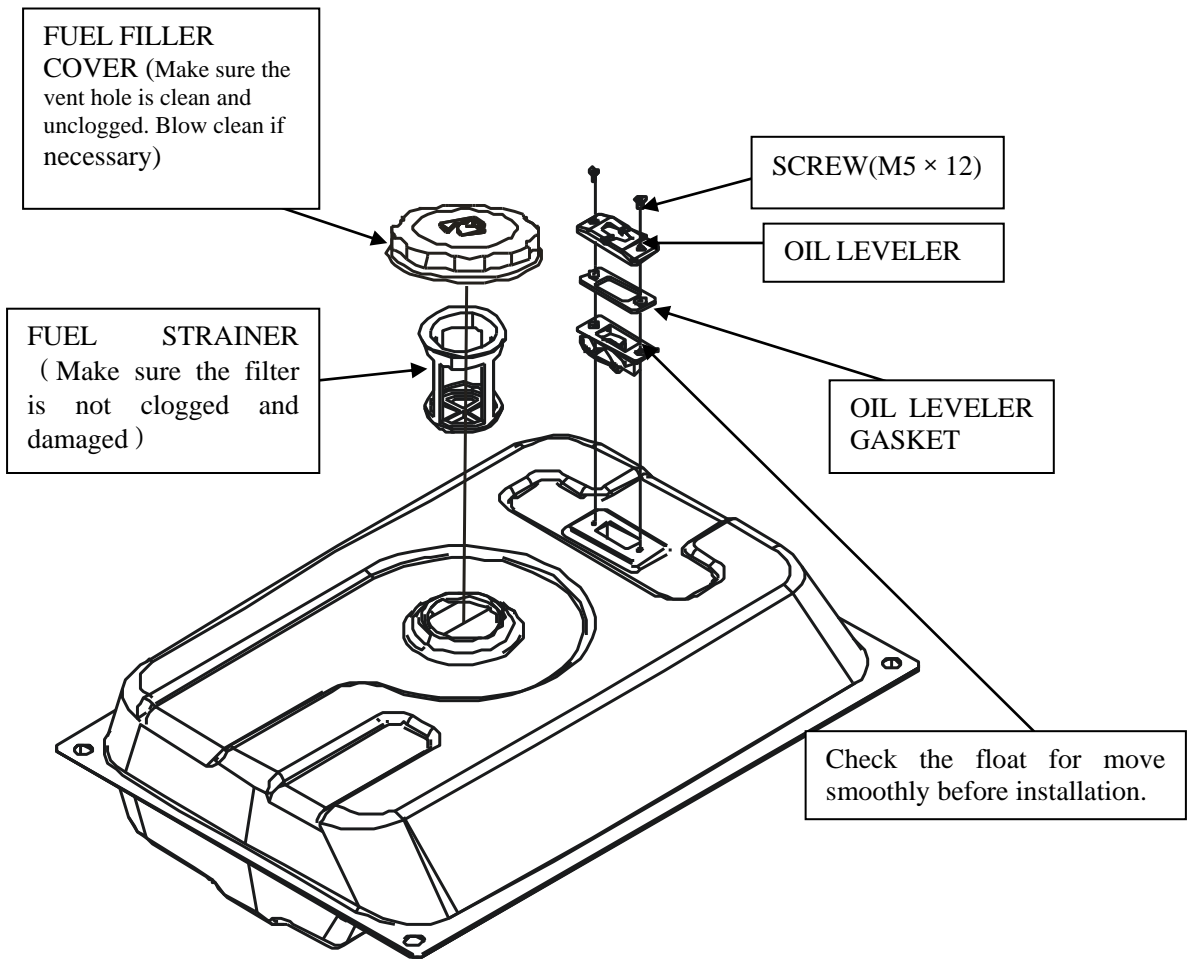
If the timing gear is damaged, please replace with new one.

NOTICE: Please replace the gear with a new set to ensure the engaging face completely engage in.

3-5 Generators

3-5-1 Fuel Tank





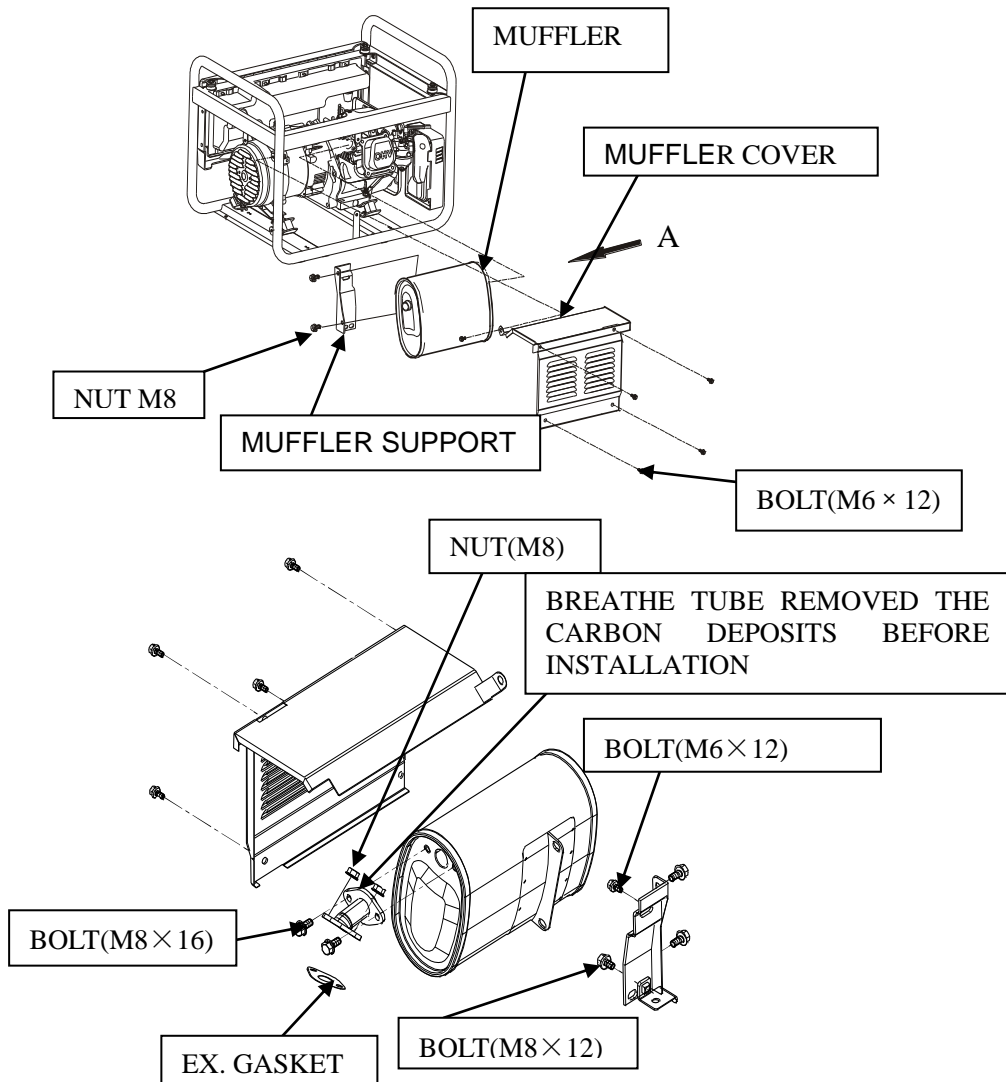
a)Cleansing/ Installation :

- Check the oil tube for damage and leaking.
- Fill the fuel into the container.
- Remove the bolt (M6×25) , washer($\Phi 6 \times \Phi 25 \times 2$), bush, fuel tank rubber gasket
- .Remove the fuel tube, screw the strainer bolt off. Remove the fuel tank.
- Clean the fuel tank and dry it completely.
- After Cleaning, install the strainer on the fuel tank and connect the fuel tube.
- Check for leaking.
- Install the bolt(M6×25) , washer($\Phi 6 \times \Phi 25 \times 2$), bush, fuel tank rubber gasket.
-

b) NOTICE

- Check fuel tank cover vent for blocked ;
- Check the fuel strainer for clogged or broken ;
- Check the fuel hose for aging or cracks ;
- If finding trouble, replace it in time before installation.

3-5-2 Muffler



Disassemble the muffler as shown on the figure.

The muffler can produce carbon deposits in the long time operation and seriously trouble the exhaust system. To get the best performance, the muffler must be periodically removed the carbon deposits.

Lightly tap the muffler and blow it with compressed air in cleaning carbon deposits.

Replace it if the muffler exist in water and is seriously rusted to make noise increasing.

NOTICE: Don't clean with iron wire or the muffler material out to lower the muffler performance. Don't reuse the muffler gasket.

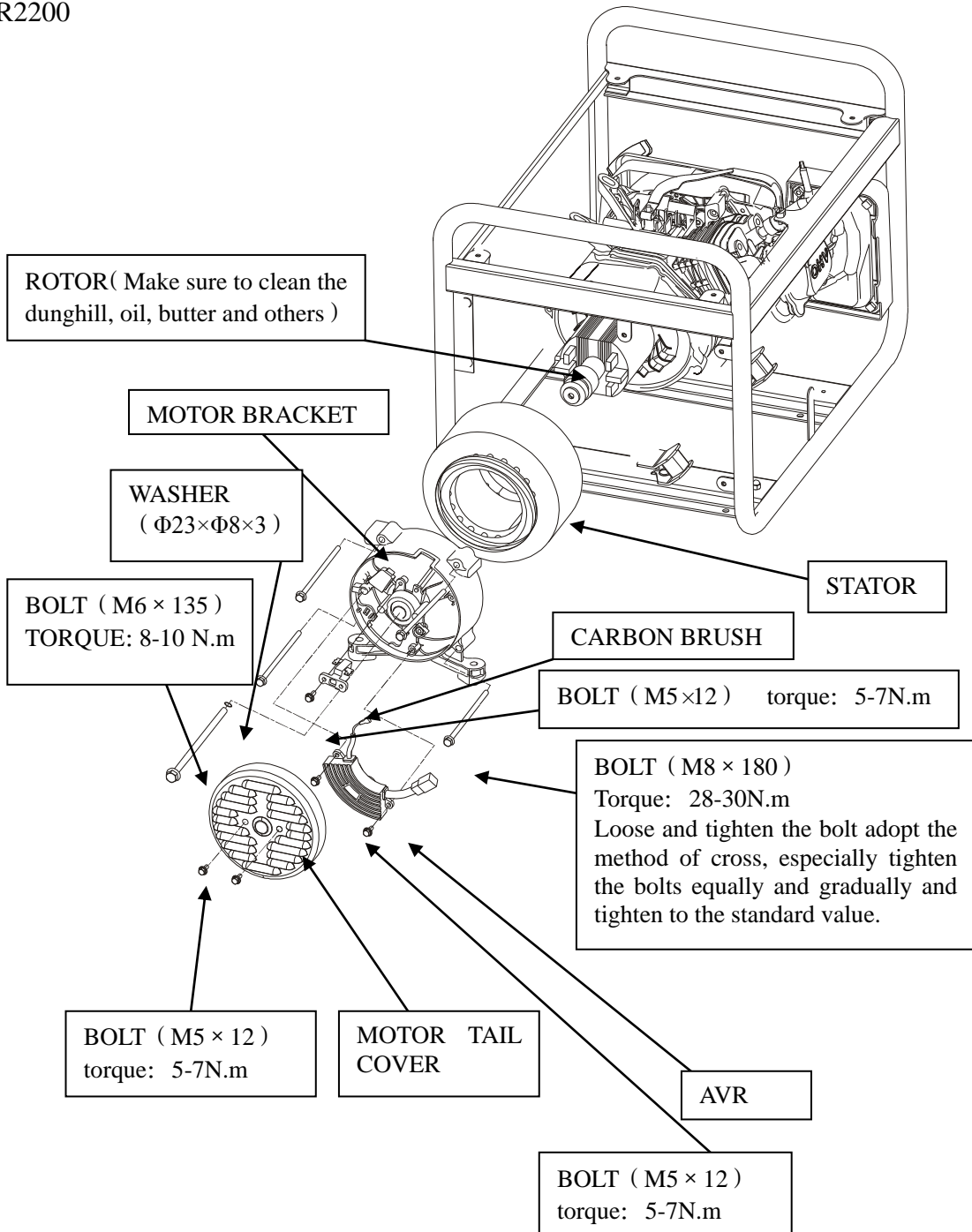
WARNING:

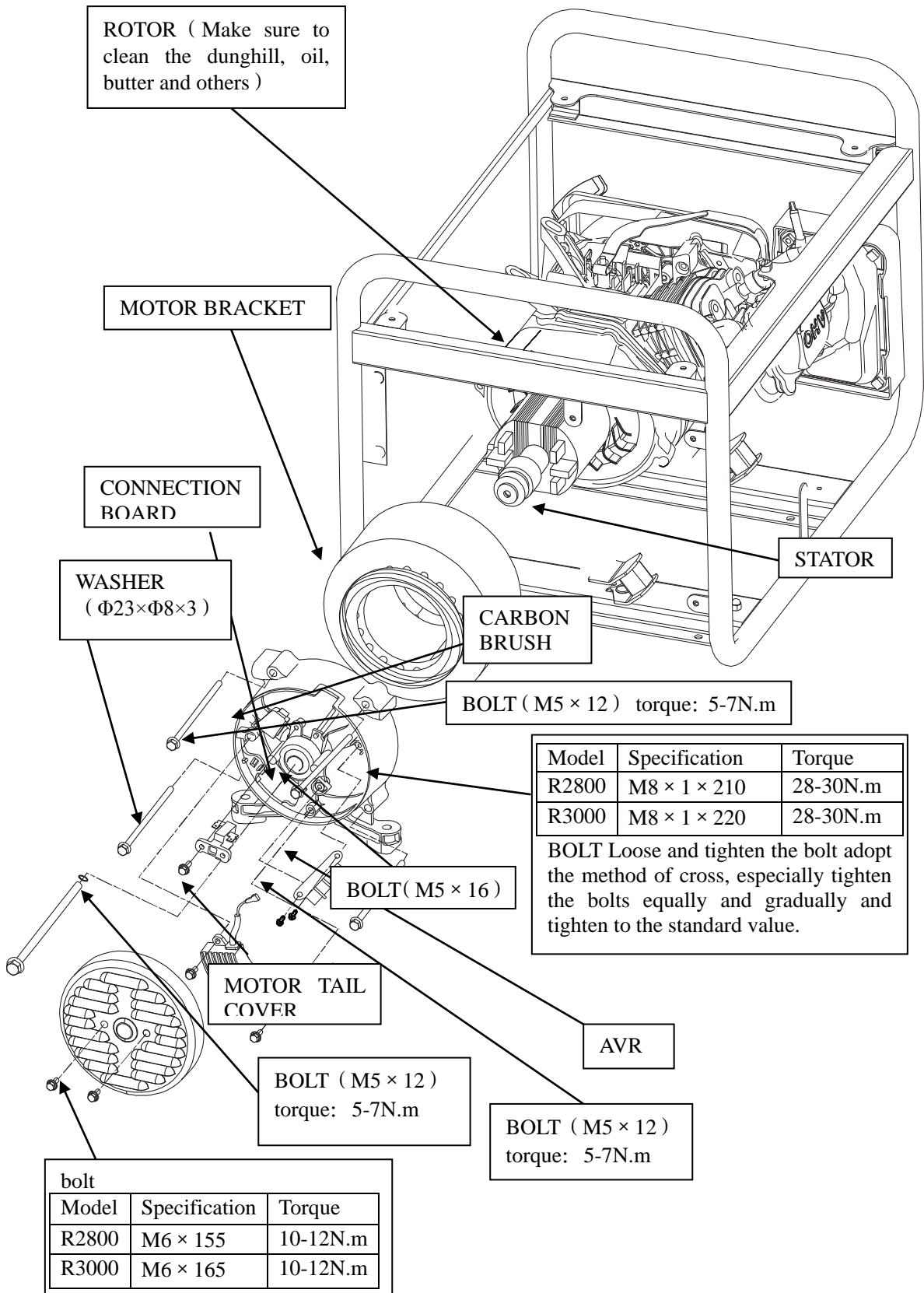
- The muffler can glow heat. Please place the gasoline engine out touch of the passerby and children.
- Don't place the flammable materials near the exhaust vent during operation.

3-5-3 Generators

Removal/Installation :

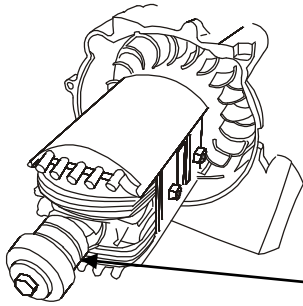
R2200





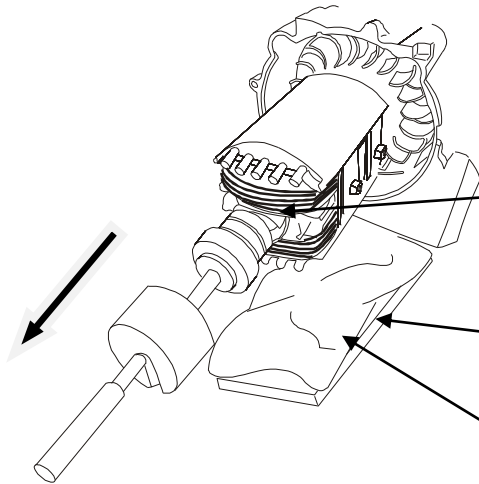
3. TROUBLESHOOTING

2800/R3000 Rotor Removal



COLLECTOR RING

Make sure to clean the foreign matters, oil, butter and others with lent-free cloth if necessary. If the collector ring rust or scrape lightly, remove the rotor and repaired by gauze.



RATOR

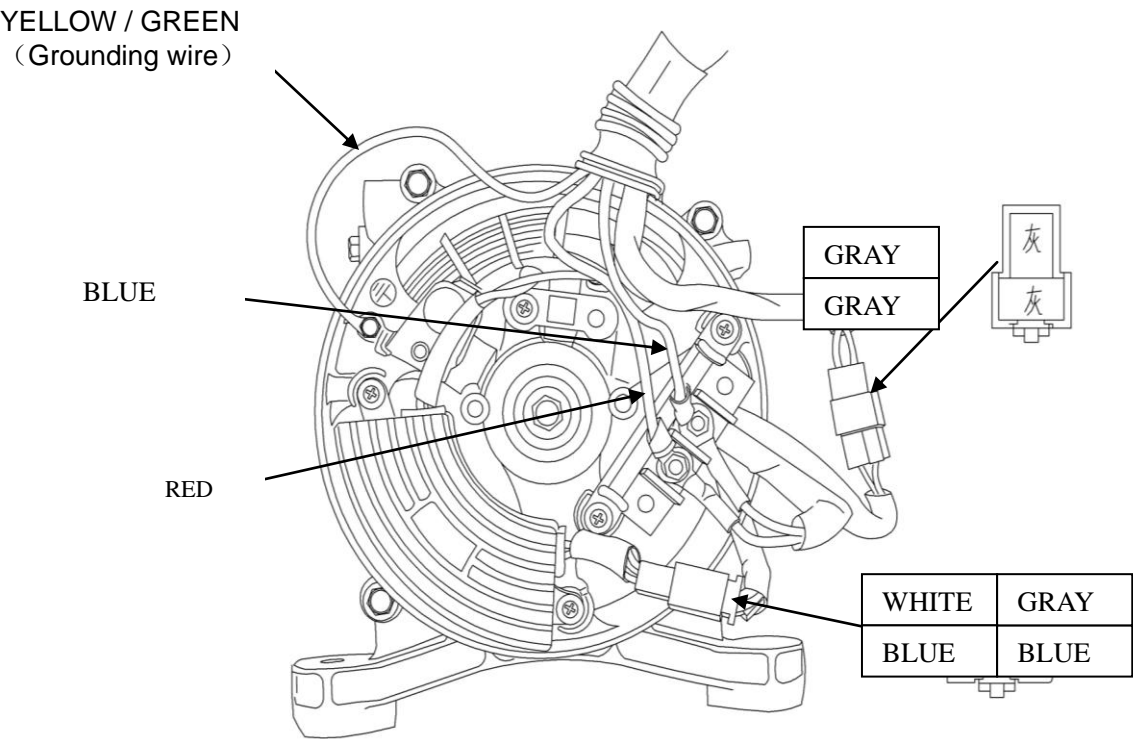
Fill the board and cloth under the rotor to prevent it from dropping.

BOARD

CLOT

If rotating the tool can't remove the rotor, please knock the handle end with hammer in order to remove the rotor.

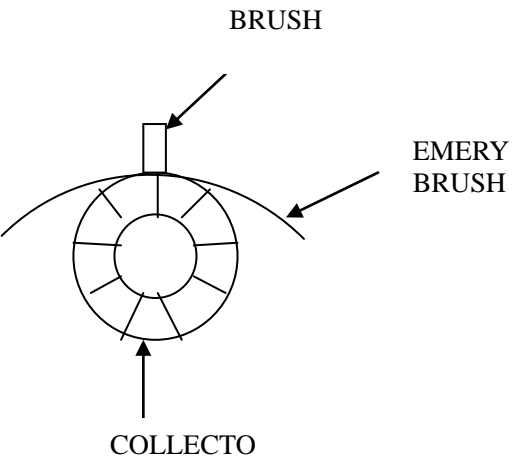
R2800/R3000



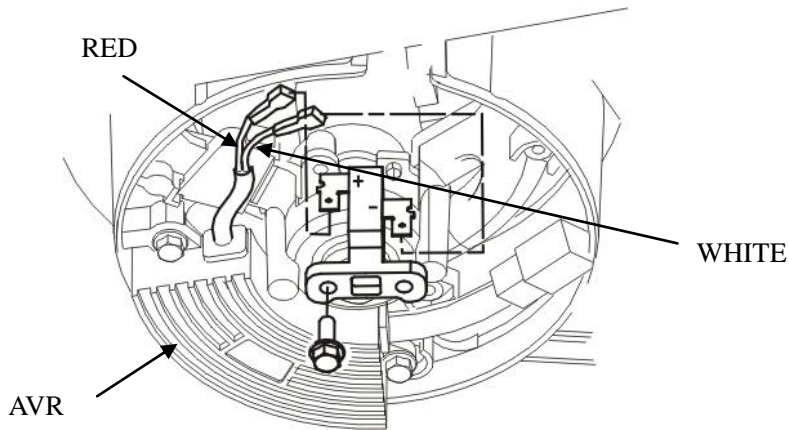
3) Carbon Brush

Carbon Brush Grinding

Check the contacting face between the carbon brush and the collector ring for contacting faceless than 75% of the cross section of the carbon brush after the running about 150hrs, If contacting face less than, grind the carbon brush contacting face. Put the No.00 emery cloth between the carbon brush with the grinding face facing up brush. Pull it come-and-go until up to the standard value.



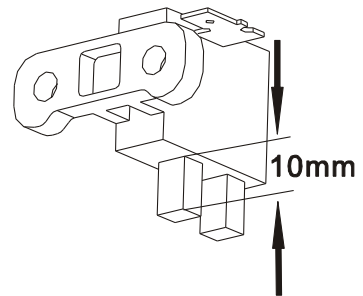
- Carbon brush installation



- The Length of the Carbon Brush

Check the length of the carbon brush for other obvious defective.

If the length less than 6MM, please replace.

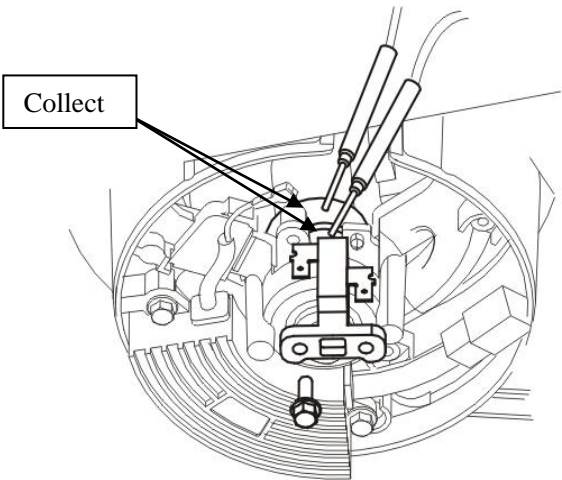


4) Check the Generator

Field Winding

Dismount the carbon brush, measure the resistance of collector ring.

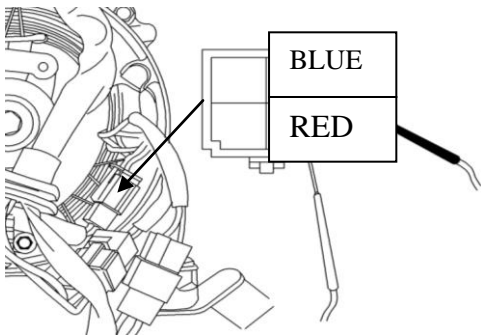
Model	Resistance
R2200	$45.6 \pm 5\% \Omega$ at 20 degrees centigrade
R2800	$51.3 \pm 5\% \Omega$ at 20 degrees centigrade
R3000	$59.0 \pm 5\% \Omega$ at 20 degrees centigrade



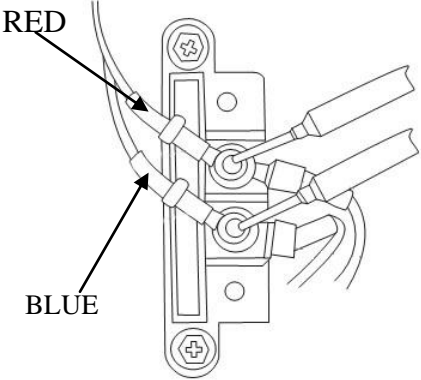
If the result isn't accord with the standard value, please clean the collector ring thoroughly.
Replace the rotor if necessary.

① Main Winding

R2200



R2800/R3000



Test the resistance of alternating current output terminal with ohmmeter.

Model	Resistance
R2200	$2.2 \pm 5\% \Omega$ at 20℃
R2800	$1.8 \pm 5\% \Omega$ at 20℃
R3000	$1.4 \pm 5\% \Omega$ at 20℃

② Engine Insulation Resistance Testing

Insulation resistance means resistance between the engine winding and the grounding. Owing to isolated by insulation material between them, if only the insulation isn't damaged, the resistance is rather high.

WARNING

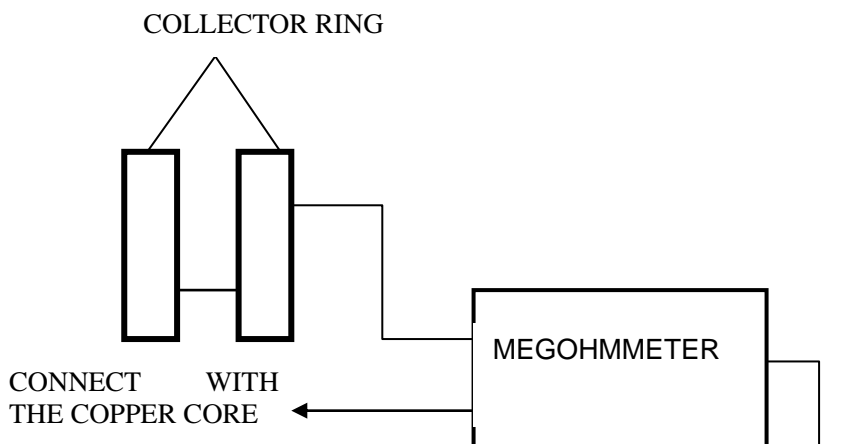
If the insulation resistance decreased obviously, it means that the insulation is damaged. If you don't repair it in time, it will result in creepage and endanger the man and equipment security. Make sure often test the insulation resistance of the winding to understand the insulation instance.

Winding to Grounding Insulation Resistance Testing

- One of the megohmmeter's terminals is connected through the insulation wire with any wire of the tested winding, and another is connected with iron core. Next wave the megohmmeter from slowly to fast, and the meter needle follows wave. When the meter needle is stable, the value indicated by the needle is the winding to ground insulation resistance value.

Collector Ring to Ground Insulation Resistance Testing

- One of the megohmmeter's terminals is connected through the insulation wire with a copper ring of the connecting ring, and another is connected with iron core. Next wave the megohmmeter from slowly to fast, and the meter needle follows wave. When the meter needle is stable, the value indicated by the needle is the insulation value of the tested copper ring.

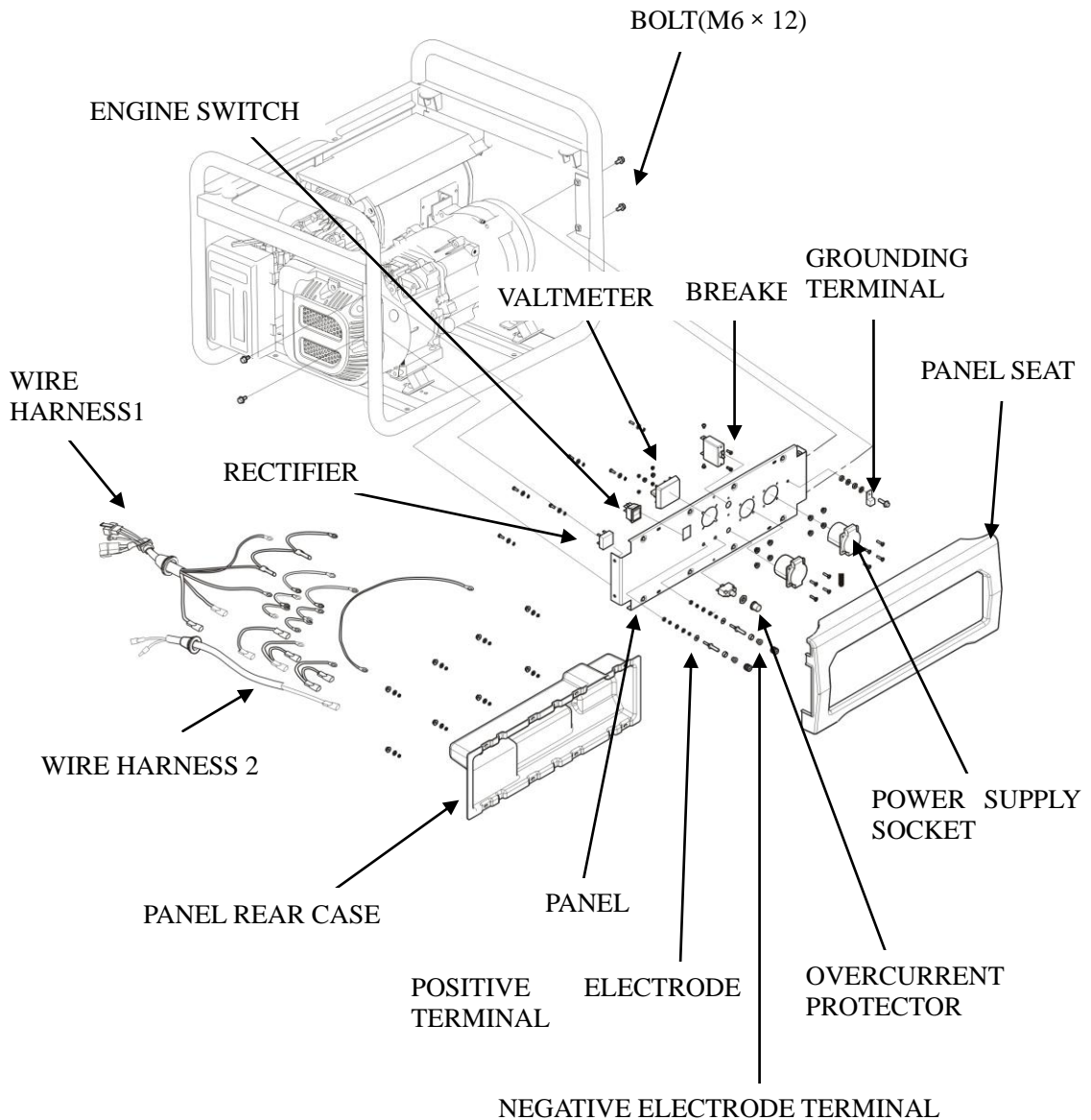


3. TROUBLESHOOTING

- Generator Winding Breaker Circuit Testing

Use the multimeter to test. Put the red pen and the black pen to the winding's terminal. If the meter wave normally, it means the winding isn't broken; if the meter needle is quiet, it means the tested winding is broken.

3-5-4 Control Panel

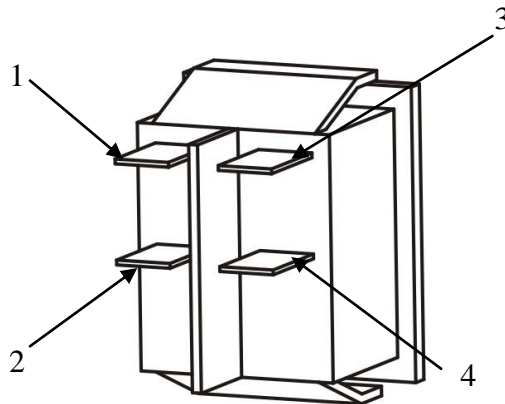


- Remove the wire harness connecting with the motor.

- Remove the bolt(M6×12)
- Remove the control panel.

1) Engine Switch

Remove the wire of the switch terminal. Check for continuity between the terminals with ohmmeter as shown.

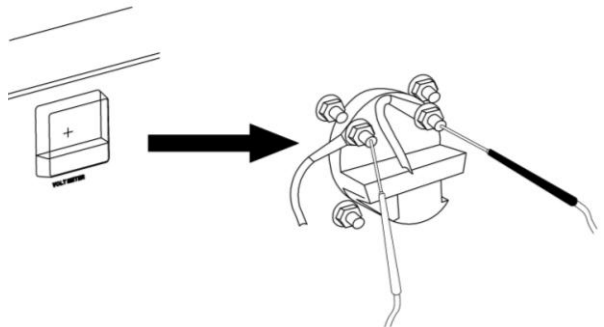


1-2 and 3-4 are connecting when the engine switch to OFF position, while they are not connecting when the engine switch to ON position. Please pay attention to connect the wire correctly.

If the connection of the ohmmeter is abnormal, please replace the switch.

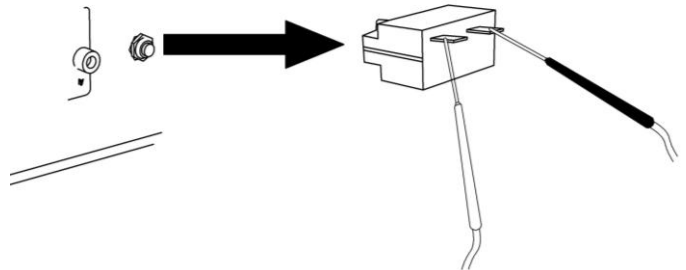
2) Voltmeter

The terminal of the voltmeter should be connected

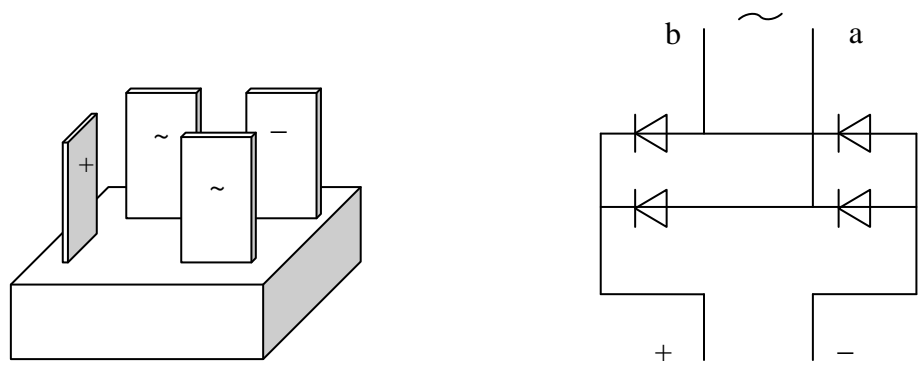


3) Breaker

The breaker should be connected when press it.



4) Rectifier testing

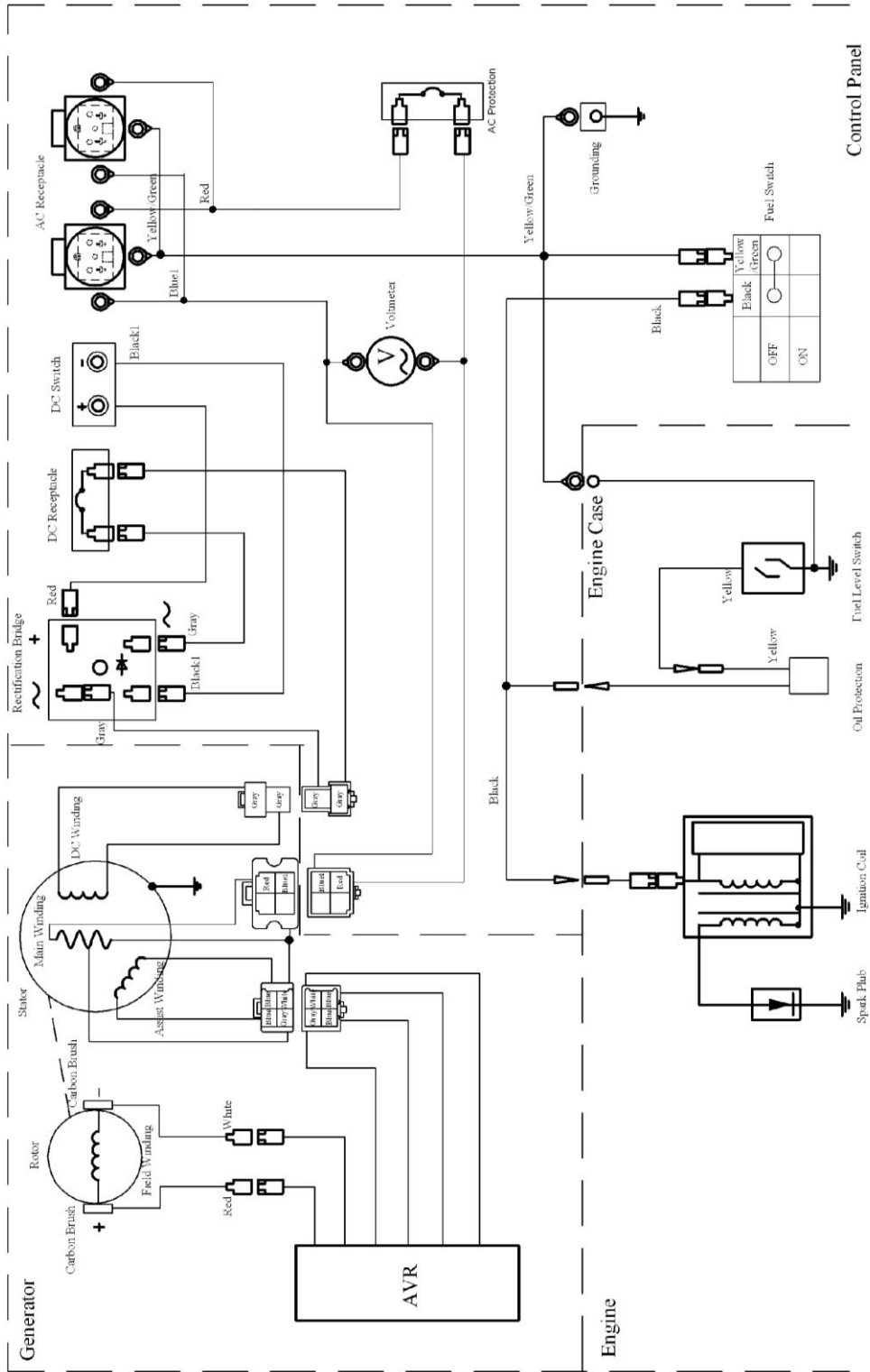


Ser. No.	Multimeter Black/Red Meter Pen Contacting point	Tested parts	Multimeter pointing	Judgment	
1	The Black to “—”, The Red to “a”	Part 1	Meter needle waves clockwise, the resistance value is clock to zero.	Positive continuity	Normal
	The Black to ”a” , The Red to “—”		Meter needle is quiet, the resistance value is infinite.	Not continuity	
	The Black to “—”, The Red to “a”		Meter needle is quiet, the resistance value is infinite.	Not continuity	Open circuit
	The Black to ”a” , The Red to “—”		Meter needle waves clockwise, the resistance value is clock to zero.	Continuity	Open circuit
2	The Black to ”a” , The Red to “+”	Part 2	Meter needle waves clockwise, the resistance value is clock to zero.	Positive continuity	Normal
	The Black to “+”, The Red to a		Meter needle is quiet, the resistance value is infinite.	Not continuity	
	The Black to ”a” , The Red to “+”		Meter needle is quiet, the resistance value is infinite.	Not continuity	Open circuit
	The Black to “+”, The Red to a		Meter needle waves clockwise, the resistance value is clock to zero.	Continuity	Open circuit
3	The same as the No. 1, point b instead of a	Part 3	The multimeter needle indication and judgment is the same as the No.1.		
4	The same as the No.2, point “b “ instead of “a”	Part 4	The multimeter needle indication and judgment is the same as the No.2.		

4. WIRING DIAGRAM

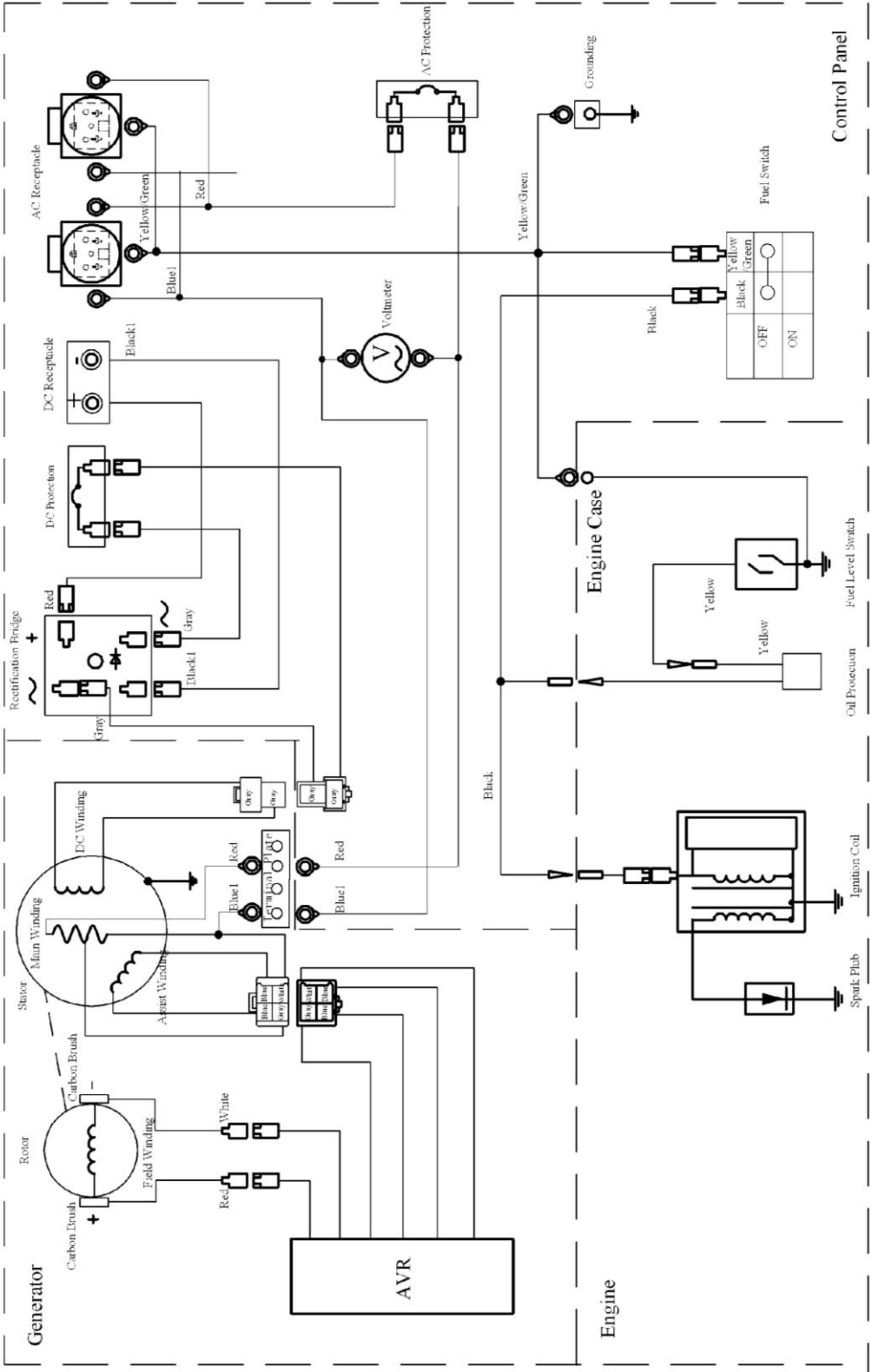
4-1 Electric Diagram

R2200



4. WIRING DIAGRAM

R2800/R3000



APPENDIX

TORQUE

No.	Item	Size	Performance Grade	Torque (N m)
1	Fuel tank Assembly	M6×25	8.8-B	10±2
2	Leveler Assy.oil Assembly	M5×10	8.8-B	6±1
3	Muffler Assy	M8×16	8-A	24±2
4		M8×30	8.8-A	26±2
5	Muffler outer cover	M6×12	8.8-B	10±2
6	Muffler side cover	M6×12	8.8-B	10±2
7	Muffler shield	M6×12	8.8-A	10±2
8	Muffler block	M8×12	8.8-A	20±2
9	Panel Subassembly control	M6×12	8.8-B	10±2
10	Panel control	M4×10	8.8-A	2.5±0.5
11	Case panel rear	M4	8.8-A	2.5±0.5
12	Bracket motor	M6×12	8.8-B	10±2
13	Stator comp.	M6×180	8.8-A	10±2
14	Brush Subassembly carbon	M5×12	8.8-A	5±1
15	Rotor comp.	M10×265	8.8-B	44±2
16	Regulator voltage	M5×12	8.8-A	6±1
17	band	M5×14	8.8-A	5±1
18	Engine	M10	8-A	30±2
19	Cushion Engine frame	M8	8-A	20±2
20	Seat Engine frame shock absorption	M6×10	8.8-B	10±2
21		M6	8.8-B	10±2

STANDARD TORQUE VALUE

Fasteners	Specification	Torque (N m)
Bolt, Nut	5mm Bolt, Nut	4.5-6
	6mm Bolt, Nut	8-12
	8mm Bolt, Nut	18-25
	10mm Bolt, Nut	29-34
	12mm Bolt, Nut	49-59
	4mm Screw	1.5-2.6
	5mm Screw	3.5-5
	6mm Screw	7-11
	5mm Flange Bolt	3.6-6.9
	6mm Screw	7-11
	5mm Flange Bolt	3.6-6.9
	6mm Flange Bolt	10-14
	8mm Flange Bolt	20-26
	10mm Flange Bolt	35-45