LONCIN

LC3500i

Maintenance Manual

LONCIN MOTOR CO., LTD.

Safety Precautions

Please carefully read the Manual before operating the generator unit. Safe operation and optimum performance will only be achieved when the the equipment is operated and maintained correctly.

Following marks will be found throughout the Manual to remind you that there may be danger for the operator, maintenance personnel and equipment.

⚠ DANGER ***Remind you that there may be imperative danger that may cause severe personal injury or death.***

⚠ WARNING ***Remind you that there may be dangerous situation that may cause severe personal injury or death or unsafe operation.***

⚠ CAUTION ***Remind you that there may be dangerous situation that may cause personal injury, equipment damage or property loss or unsafe operation.***

Electricity, fuel oil, exhaust emissions, moving parts and batteries may cause dangers, and safety precautions for them must be followed to prevent severe personal injury or death.

Exhaust Emissions may Cause Death.

 The electric generator can only be operated outdoors and the operator shall keep away from it.

Exhaust port.

- Ensure that exhaust emissions from the generator unit will not enter windows, doors, air vents or air inlets of adjacent buildings, vehicles or vessels.
- The generator unit is not allowed to be used in residences, garages, basements, granary, wigwam, cabins, vessels, vessel houses, entertainment vehicles or tents, closed outdoor spaces (e.g. alleys, irrigation canals and ditches, parking garages or courtyards) or any other spaces where exhaust emissions may accumulate. It shall be noted that even though the unit is placed indoors with all windows and doors opened and the air blower turned on, the concentration of carbon monoxide, which is harmful, in exhaust emissions from the engine will also accumulate.

The Gasoline is Inflammable/Explosive.

- The fuel oil can only be filled outdoors.
- Electrostatic sparks caused by the fuel oil flowing through the nozzles of oil pumps of gasoline stations may ignite the gasoline. Nozzles of oil pumps of gasoline stations are not allowed for filling fuel oil to the generator unit. Instead, the fuel oil shall be filled to a explosion-proof fuel tank placed on the ground first, and then to the generator unit slowly.
- The fuel oil shall not be filled to the generator during operation. The engine of high temperature may ignite the fuel oil.
- To prevent fire resulted from fuel oil leakage, fuel valves must be closed and the generator unit must be cooled down before transporting the generator unit or preserving it in a closed space.
- Smoking and open fire are strictly prohibited adjacent to the generator unit. Flame, sparks, electric switches, pilot torches, electric arcs, equipment generating electric arc as well as any other ignition sources must be kept away from the generator unit.

The Voltage of Generator Unit may Cause Death.

- It is not allowed to connect the generator unit to the electric system of buildings directly. The feedback current may cause death of electric power circuit workers due to electric shock and equipment damages. An approved switchgear must be used to prevent the connection with generator unit. Under circumstances of using the generator unit as power supply for emergencies, trained and experienced electricians must be selected to conduct electrical connection.

  Make sure your clothes, shoes and skin are dry when operating electrical equipment.

  It is strictly prohibited to operate the generator unit in rains or snows or on wet ground.

Moving Parts may Cause Severe Personal Injury or Death.

- The spark plug wire shall be disconnected before any maintenance for the generator unit.
- Both of your hands must keep away from moving parts.

Safety Precautions

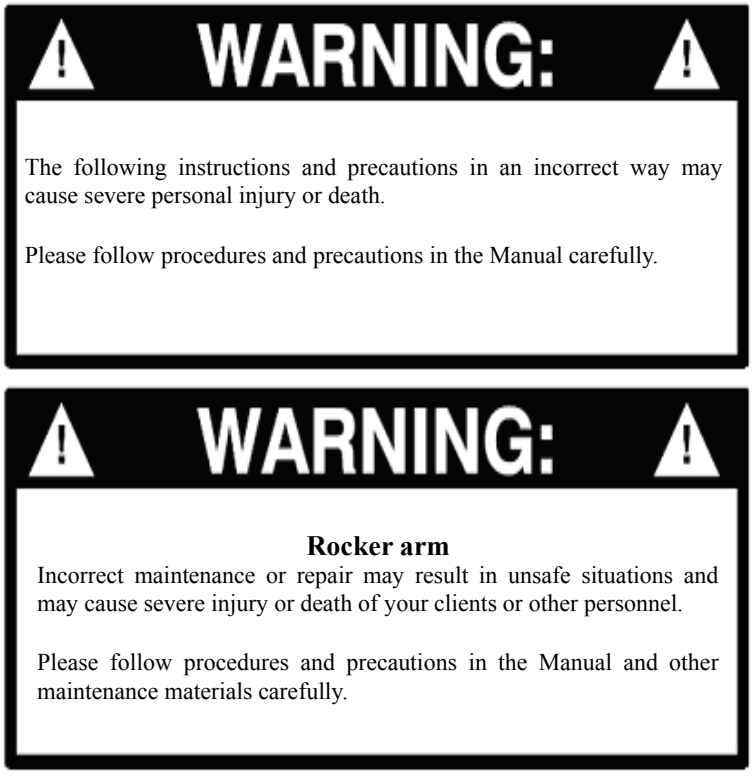
- It is not allowed to repair the generator unit with loose clothes or jewelry as they may be caught into moving parts. The jewelry may cause short circuit of electric terminals, sparks, flame and electric shock.
- Make sure fasteners and fixtures on the generator unit are securely installed. Shields of fans, rotors, etc. shall be installed in place.

The Gas Emitted by Batteries is Explosive.

- Protective glasses shall be worn when repairing batteries.
- Smoking shall not be allowed.
- To reduce electric arcs generated from disconnecting or reconnecting cables of batteries, negative (-) electrodes of batteries must be disconnected in advance and connected at last for re-connection.

General Precautions

- Make sure that children are away from the generator unit.
- Hearing protective devices must be worn when getting close to the generator unit under operation.
- A multi-class (ABC) fire extinguisher shall be placed near hand. The class-A fire is caused by general inflammables such as wood and cloth. The class-B fire is caused by inflammable and explosive liquid and gas fuels. And the class-C fire is caused by live equipment (refer to NFPA NO. 10).

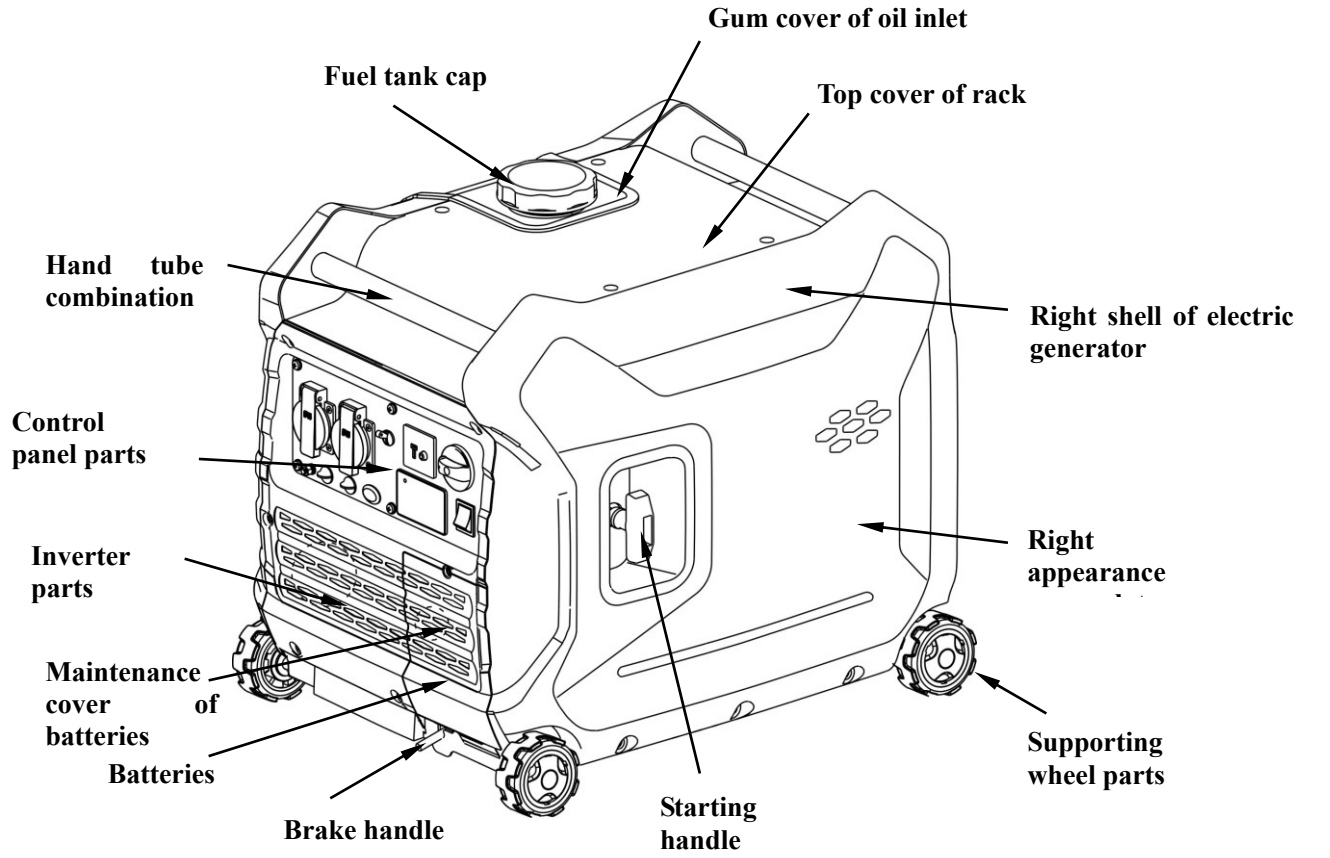


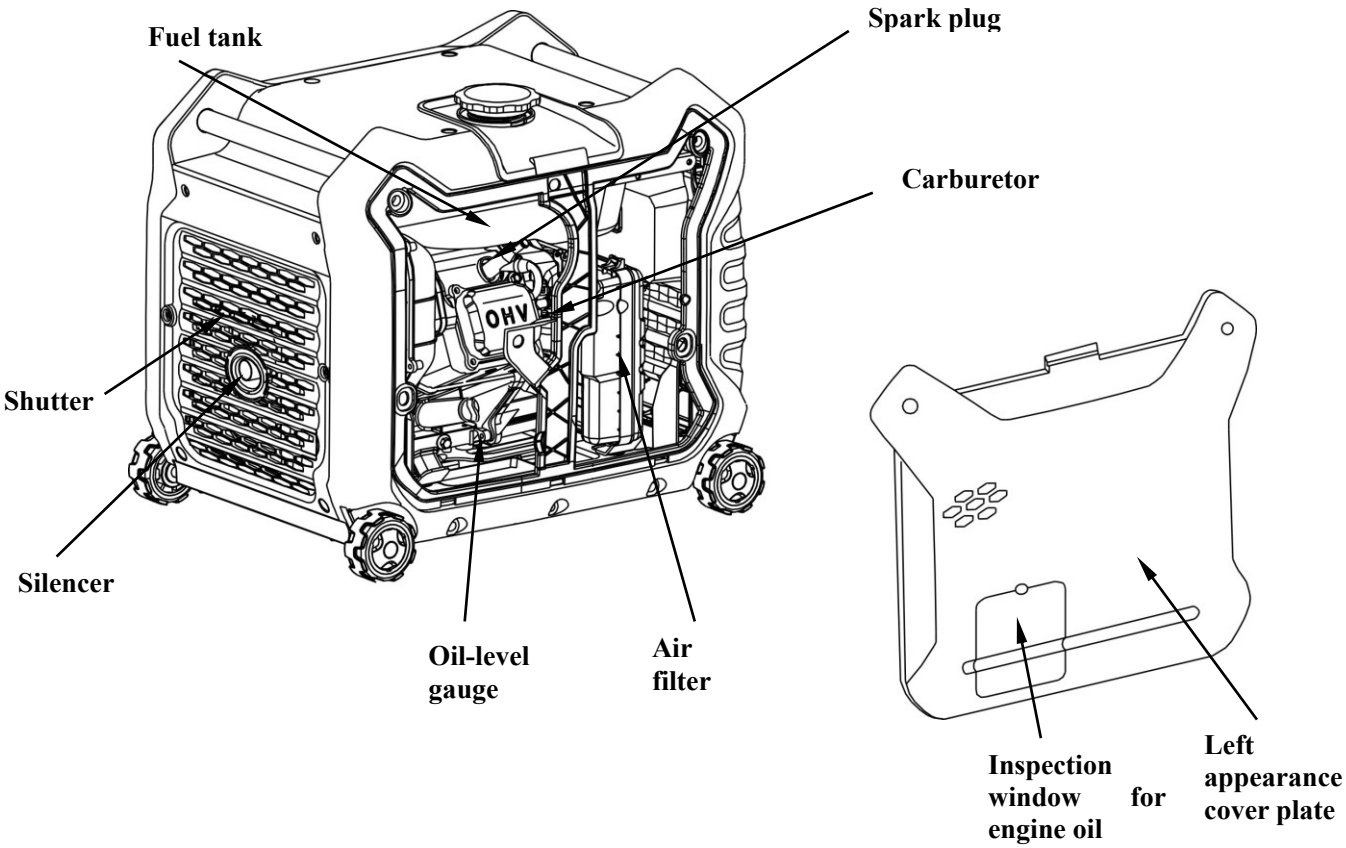
Contents

Contents

Chapter I Introduction

1-1 Structure of electric generator





Chapter I Introduction

1-2 Technical specifications

Unit Model			LC3500i
Electric Generator	Type		Variable frequency
	Frequency/Hz		50/60
	Nominal voltage/V		100/120/230
	Maximum power output/kVA		3.3
	Rated power output/kVA		3.0
	Power factor		1.0
	Quality of AC output		ISO8528 G2
	Waveform deviation factor/%		≤ 5
	Noise acoustical power (3/4 load)		87.5
	DC output/V-A		12-8
	Overload protection	DC	No fuse overcurrent protector
		AC	Controlled by the overcurrent protection program of inverter
Engine	Model of engine		LC170FD-3
	Type of engine		Single-cylinder, four-stroke-cycle, forced-air cooling and overhead valve
	Displacement/cc		212
	Type of fuel oil		Unleaded gasoline
Engine	Fuel tank capacity/L		9
	Continuous operating period/h (rated output)		6
	Capacity for engine oil/mL		600 ml
	Model of spark plug		E6TC/E6RTC BPR6ES/BP6ES (NGK)
	Starting mode		Hand starting
External Dimensions	L × W × H/mm		578 * 440 * 510
Net Weight/kg			45

Chapter II Repair Standards

2-1 Standards for engine repair

Unspecified unit: mm

Part	Item	Standard	Service limit
Engine	Maximum no-load speed Cylinder pressure	5,000 rpm ≧ 1.17 Mpa (1,400 rpm)	6,000 rpm --
Cylinder	Inner diameter of cylinder	70	70.165
Piston	Skirt O.D.	69.985	69.845
	Piston-to-cylinder clearance	0.015-0.05	0.12
	Piston pin bore ID	18.002	18.048
	Piston -to-piston pin bore clearance	0.002-0.014	0.06
Piston pin	Outside diameter	18.0	17.954
Piston rings	Ring side clearance (Top/Second)	0.015-0.045	0.15
	Ring end gap (Top/Second)	0.2-0.4	1.0
	Ring end gap(Oil ring)	0.15-0.35	1.0
	Ring width (Top/Second)	1.0	0.88
	Ring width (Oil ring)	2.5	2.37
Connecting rod	Small end I.D.	18.002	18.07
	Big end I.D.	30.02	30.066
	Big end oil clearance	0.04-0.063	0.12
	Big end side clearance	0.1-0.7	1.1
Crankshaft	Crankshaft O.D.	29.98	29.92
Valves	Clearance(cold) (IN)	0.10~0.15	—
	Clearance(cold) (EX)	0. 10~0.15	—
	Stem O.D. (IN)	5.48	5.318
	Stem O.D. (EX)	5.44	5.275
Valve guide	I.D. (IN,EX)	5.50	5.572
	Stem-to-guide clearance (IN)	0.02-0.044	0.10
	Stem-to-guide clearance (EX)	0.06-0.087	0.12
Valve seat	Seat width	0.8	2.0
Valve spring	Free length	30.5	29.5
Camshaft	Cam height (IN)	27.7	27.45
	Cam height (EX)	27.75	27.50
	O.D. (bearing section)	13.984	13.916
Crankcase cover	Camshaft holder I.D.	14.0	14.048
Carburetor	Main nozzle	0.65	—
	Float height	13.7±1.5	—
	Number of turning circles of mixture adjusting screw	2-1/8 circles	—
Spark plug	Gap	0.7-0.8	—
Ignition coil	Air gap (at flywheel)	0.4±0.05	—

Chapter II Repair Standards

2-2 Standards for electric generator repair

The resistance among windings of 230 V 2 KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	2.0-2.4 Ω
Power supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

The resistance among windings of 120 V 2 KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	0.75-0.85 Ω
Power supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

The resistance among windings of 100 V 2 KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	0.57-0.67 Ω
Power supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

2-3 Torque parameters of fasteners

Fastening Item	Fastening Parts	Fastening Torque (N.m)
Fastening bolt of connecting-rod	M7 × 1	12-14
Fastening bolt of cylinder head	M8 × 1.25	32-35
Fastening bolt of flywheel	M8 × 1.5	30-36
Fastening bolt of crankcase cover	M8 × 1.25	26-32
Seal screw plug (crankcase-body oil drain plug)	M10 × 1.25	20-25
Mounting nut of air filter	M6 × 1	8-12
Mounting nut of silencer	M8 × 1.25	27-30
Fastening nut of speed-regulating support	M6 × 1.0	9-13
Fastening bolt of starting motor	M6 × 1.25	8-12
Spark plug		27-30

2-4 Torque parameters of standard parts

	Fastening Parts	Fastening Torque (N.m)
Standard Torque Value	5 mm Bolt and nut	4-7
	6 mm Bolt and nut	8-12
	8 mm Bolt and nut	20-28
	10 mm Bolt and nut	35-40
	12 mm Bolt and nut	50-60

Chapter III Maintenance

3-1 Maintenance schedule

Favorable maintenance is the best guarantee to achieve the safe, economical and zero fault operation. In addition, it also contributes to the environmental protection. When operating in hot or dusty environment, the frequency of some maintenance shall be increased as specified in notes below the table.

The data of maintenance and operation shall be recorded. Maintenance records will help you to conduct periodic maintenance and provide evidence for your warranty requirement.

⚠WARNING ***Accidental starting of the generator unit during maintenance may cause severe personal injury or death. The spark plug wire must be disconnected prior to maintenance.***

⚠WARNING ***The generator unit of high temperature may cause severe scald. Maintenance or repair must be conducted after the generator unit is completely cooled down.***

Periodic Maintenance Schedule

Periodic Maintenance Schedule		Time of Use	20 H or the First Month of Initial Use (3)	50 H or Every 3 Months (3)	100 H or Every 6 Months (3)	300 H or Every Year (3)
Engine oil	Check the oil level	○				
	Replacement		○		○	
Air filter	Check	○				
	Clear			○(1)		
Fuel filter	Clear				○	
Spark canceller	Clear				○	
Spark plug	Clear				○	Replacement
Valve clearance	Readjustment					○(2)
Cylinder head	Wash	Every 500 h (2)				
Fuel tank & strainer	Wash	Every 2 years (2)				
Oil pipe	Replacement	Every 2 years (2)				

(1) Maintenance intervals shall be shortened when it is used in a place full of dusts.

(2) These maintenance items shall be conducted with supports from LONCIN franchised dealers.

(3) Under circumstances of frequent use, long-term use can only be guaranteed through maintenance with correct intervals specified above.

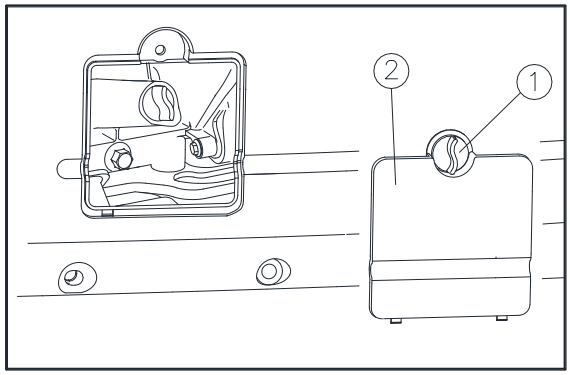
Chapter III Maintenance

3-2 Change engine oil

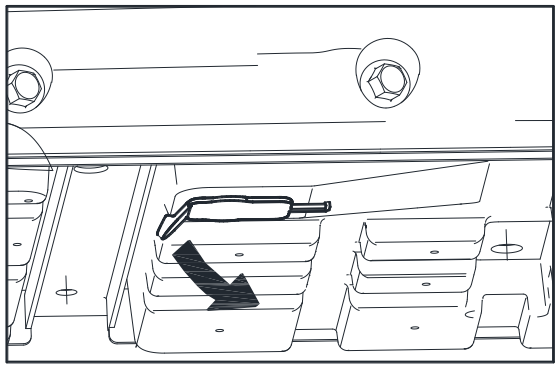
Note: the engine oil shall be discharged under the circumstance of heat engine, so that the discharge can be conducted rapidly and completely. Do not discharge the engine only immediately after the electric generator is powered off. As the temperature of engine oil is extremely high, please be careful to prevent scald during operation.

1) Please place the electric generator onto the level plane.

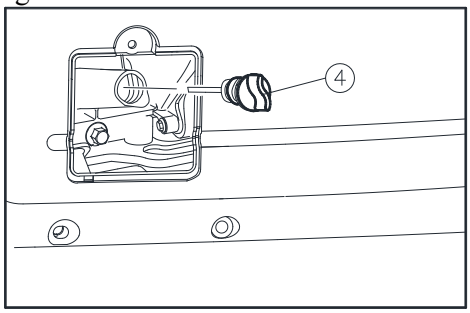
2) Loosen the hand-rotary type unloosening screw ① and remove the inspection window for engine oil ②



3) Uplift and tilt the machine, remove the end cap on the baseplate ③.

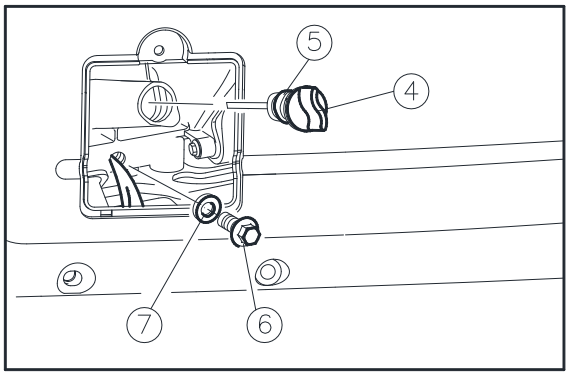


4) Open the oil-filling cover ④ and pour out the engine oil in the crankcase.



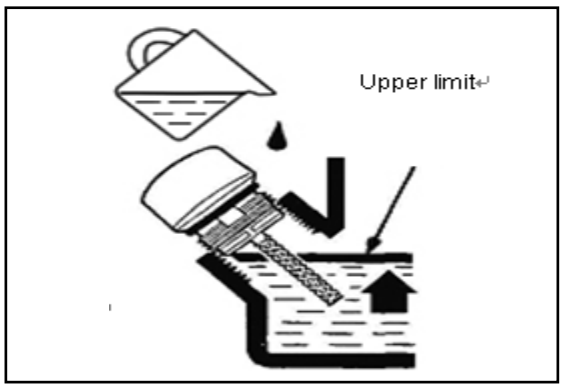
5) Place the oil basin below the baseplate of machine, remove the oil drain plug ⑥ and the the engine oil will be discharged from the fuel tank.

6) Check the oil level gauge ④, seal ring ⑤, drain plug ⑥ and seal gasket ⑦. If any damages are observed, please replace them at once.



7) Re-install the oil drain plug and seal gasket.

8) Place the engine onto a level position in halt status and fill new engine oil till the oil level reaches the upper limits of the gauge. Screw the oil-filling cover.



9) Re-install the inspection window for engine oil and fasten the screw; re-install the drain end cap.

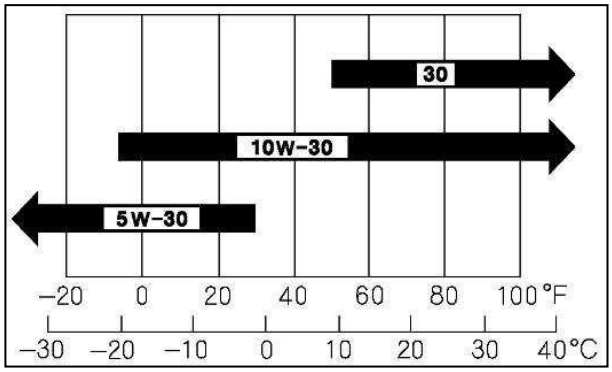
Note: prior to each use, please place the electric generator onto a level plane and check the engine oil level in halt status of the engine.

1. Remove the oil level gauge and wipe out the engine oil.

2. Insert the oil level gauge into the oil-filling hole but do not screw it up, then check the oil level.

3. If the oil level is too low, fill the recommended engine till it reaches the upper limits indicated by the oil level gauge.

Chapter III Maintenance



Recommended engine oil:
SAE 10W -30
Recommended engine oil level:
API standard SE or higher level
Capacity for the engine oil:
0.6 L (0.72US qt, 0.6 lmp qt)

⚠WARNING Skin cancer may be caused by the long-term and frequent contact with engine oil. Though it is not inevitable, we still recommend washing your skin contacted the engine oil clean with soap and water.

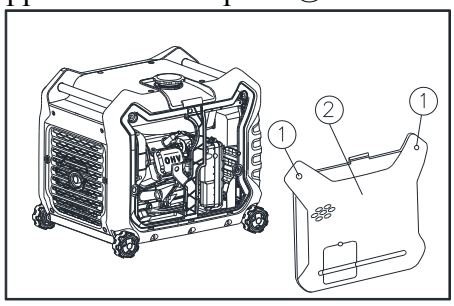
3-3 Air filter

⚠CAUTION Air filterAir inflow will be affected and the power of engine will be reduced after the filter cartridge gets dirty. If the operation area is full of dust, the maintenance shall be conducted more frequently.

⚠WARNING Washing the filter cartridge with gasoline or inflammable solvent may case fire or explosion. Only soap water or nonflammable solvent can be used.

⚠WARNING It is strictly prohibited to operate the electric generator without air filter, or the abrasion process of engine will be accelerated.

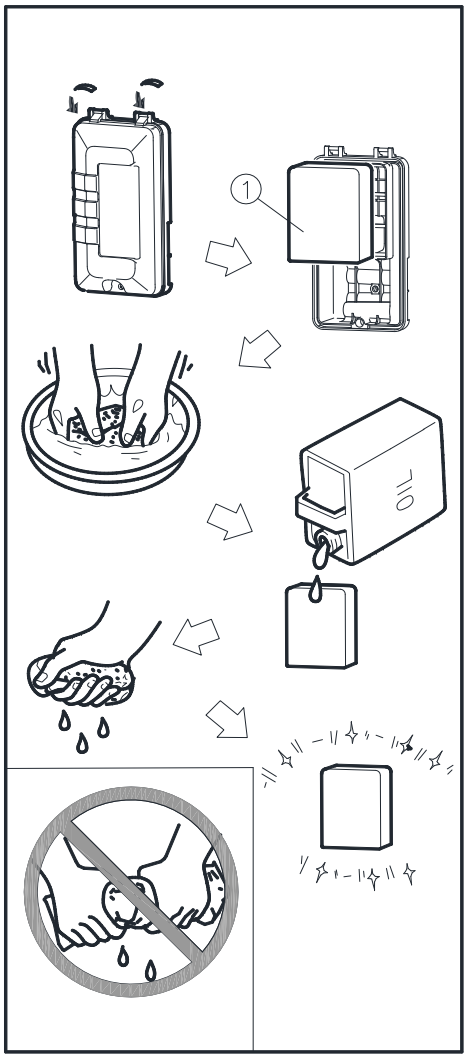
1) Remove the unloosening screw ① and the appearance cover plate ②.



2) Remove the air filter cover and foam filter cartridge ①

3) Wash the foam filter cartridge with solvent and dry it

4) Drop clean engine oil into the foam filter cartridge and knead it till even, edge out redundant engine oil and make it be distributed evenly in the filter cartridge. Do not twist the foam filter cartridge hard to avoid damage.



5) Place the foam filter cartridge into the air filter.

Hint

Please confirm that the surface of foam filter cartridge is cling to the air filter without any interspaces for air leakage

Do not start the engine without air filter as the excessive poison gas and abrasion of the fuel tank

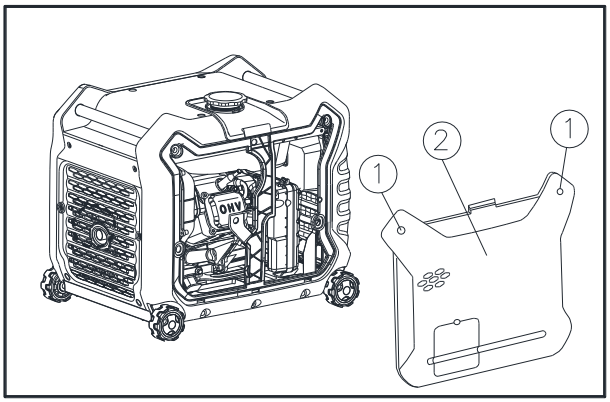
will be caused.

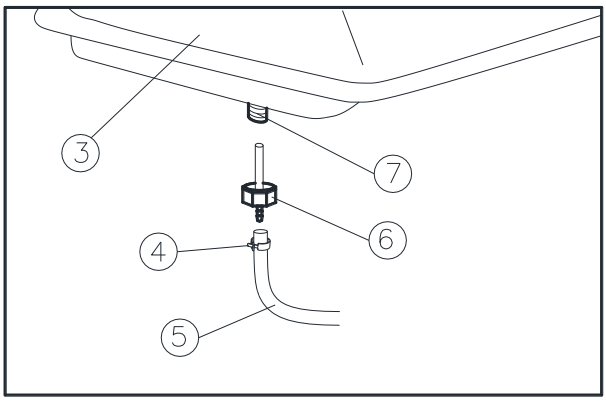
6) Install the filter cover to its original position.

3-4 Cleaning of the fuel filter

The fuel filter cup is to prevent the dust or water from entering into the carburetor. The filter cup shall be cleaned after long time without operation of the engine.

1) Remove the unloosening screw ① and the appearance cover plate ②, then pour out the fuel oil in the fuel tank ③.
2) Hold the clamp ④ and move it down, then pull out the oil tube ⑤ connected to the fuel tank downward.
3) Take out the fuel filter ⑥.
4) Wash the fuel filter with gasoline.
5) Wipe out the fuel filter, install it onto the oil nozzle ⑦ of fuel tank and screw it down, then place the oil tube onto the oil nozzle and install the clamp.
6) Install the oil tube back as well as the clamp, switch on the fuel valve and check if there is any leakage.
7) Install the appearance cover plate back.





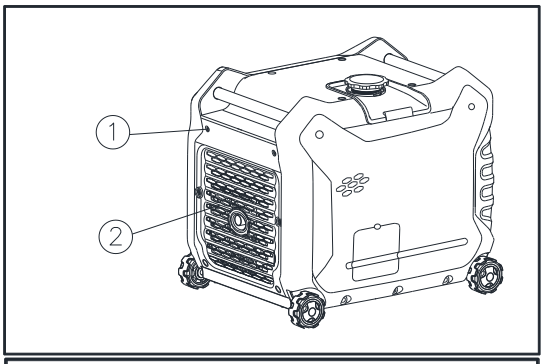
⚠WARNING The gasoline is extremely inflammable and explosive. Smoking, open fire and sparks are strictly prohibited in the operation area.

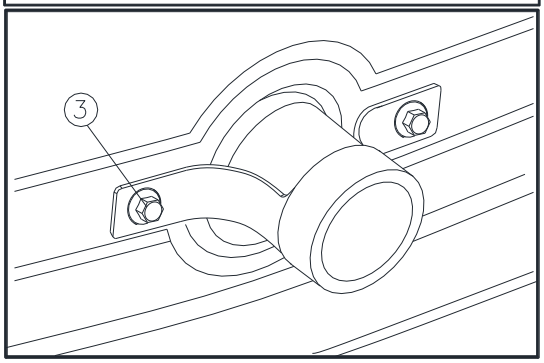
⚠WARNING After the re-installation is completed, the operator shall check if there is any fuel leakage and make sure the operation area is dry prior to starting the engine.

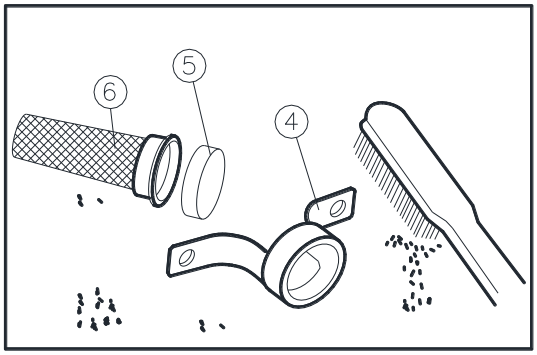
3-5 Spark canceller

⚠WARNING The silencer of high temperature may cause severe scald. The generator unit shall be cooled down prior to the maintenance of silencer.

Please refer to the "Maintenance Schedule" for the cleaning of spark canceller. Remove the mesh of spark canceller after the electric generator is cooled. Check if there are any damages and change damaged one. Sweep away the carbon deposition accumulated on the mesh with wire brush. Re-install the spark canceller and fasten the screws.







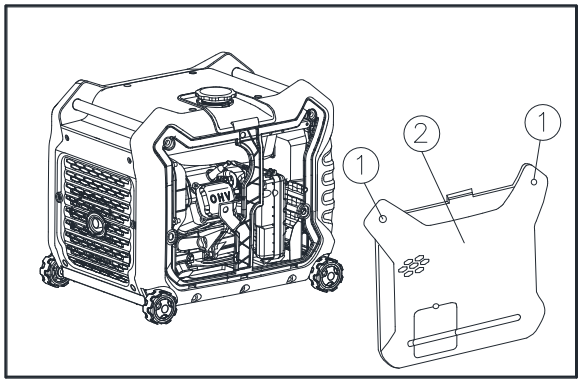
Chapter III Maintenance

3-6 Spark plug

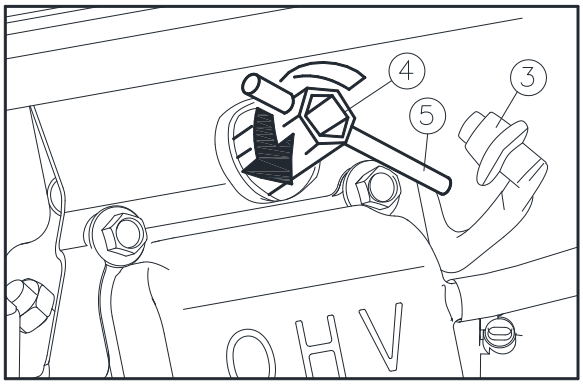
The use of spark plug with incorrect models or heat values may reduce the engine performance or damage the engine.

The spark plug and silencer will be overheated under the continuous operation of the engine. Take care not to touch the silencer or spark plug.

1) Loosen the unloosening screw ① and remove the left appearance cover plate ②.



2) Remove the spark plug cap ③, place the sleeve ④ onto a proper position on the spark plug.
3) Insert the driver ⑤ into the sleeve and rotate it along anti-clockwise direction to remove the spark plug.

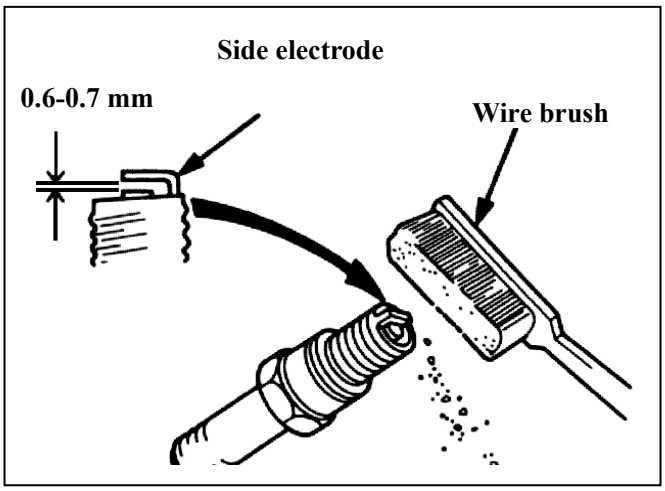


4) Check the spark plug.Model of the spark plug:
   E7RTC/F7TC
   BPR6ES / BP6ES (NGK)

If the machine is required to meet the EMC certification, only the E6RTC spark plug can be used.

The spark plug shall be replaced under circumstances of damaged electrodes and insulators. If it can be further used, sweep away the impurities including carbon deposition, etc. accumulated on the spark plug with wire brush.

5) Measure the clearance of spark plug with thickness gauge. Adjust the clearance through bending the side electrodes carefully. The clearance between electrodes shall be 0.60-0.70 mm.



6) Check the status of gasket of spark plug. Screw in the spark plug with hands during the installation of spark plug to prevent incorrect match of screw threads.
7) After pressing the gasket with spark plug, impact them tightly with the socket spanner of spark plug.

   When installing new spark plug, screw 1/2 circle more after the gasket is impacted. When re-installing the used spark plug, screw 1/8-1/4 circle more after the gasket is impacted.

Spark plug torque value: 20.0 N*m (2.0 kgf*m, 14.8 lbf*ft)

⚠CAUTION The spark plug must be securely fastened, or the engine may be damaged.

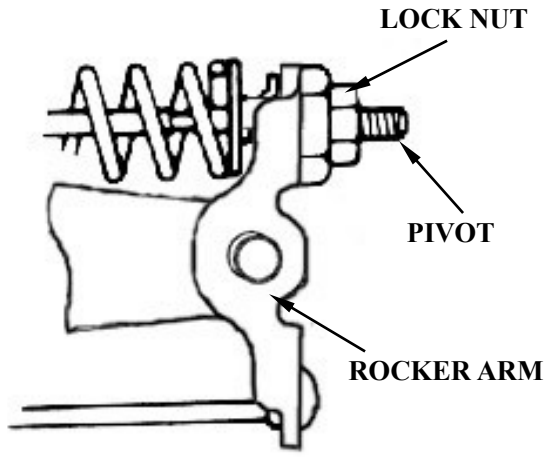
⚠CAUTION Please use the recommended or equivalent spark plug.Spark plug of improper heat values shall be prohibited.

3-7 Adjustment of valve clearance

⚠CAUTION The check and adjustment of valve clearance must be conducted when the engine is cold.

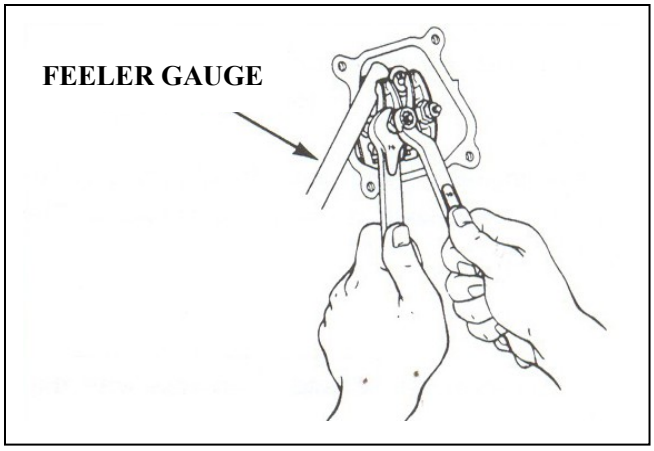
1) Take apart the cylinder-head cover, pull the starting handle until you feel the obvious resistance to make the piston reach nearby upper dean center of compression stroke. At this time, both inlet and exhaust valves are in the closed status.
2) Insert the thickness gauge into the clearance between the rocker arm and valve to measure the valve clearance.

Standard Valve Clearance	Inlet	0.10 ~ 0.15 mm
	Exhaust	0.10 ~ 0.15 mm



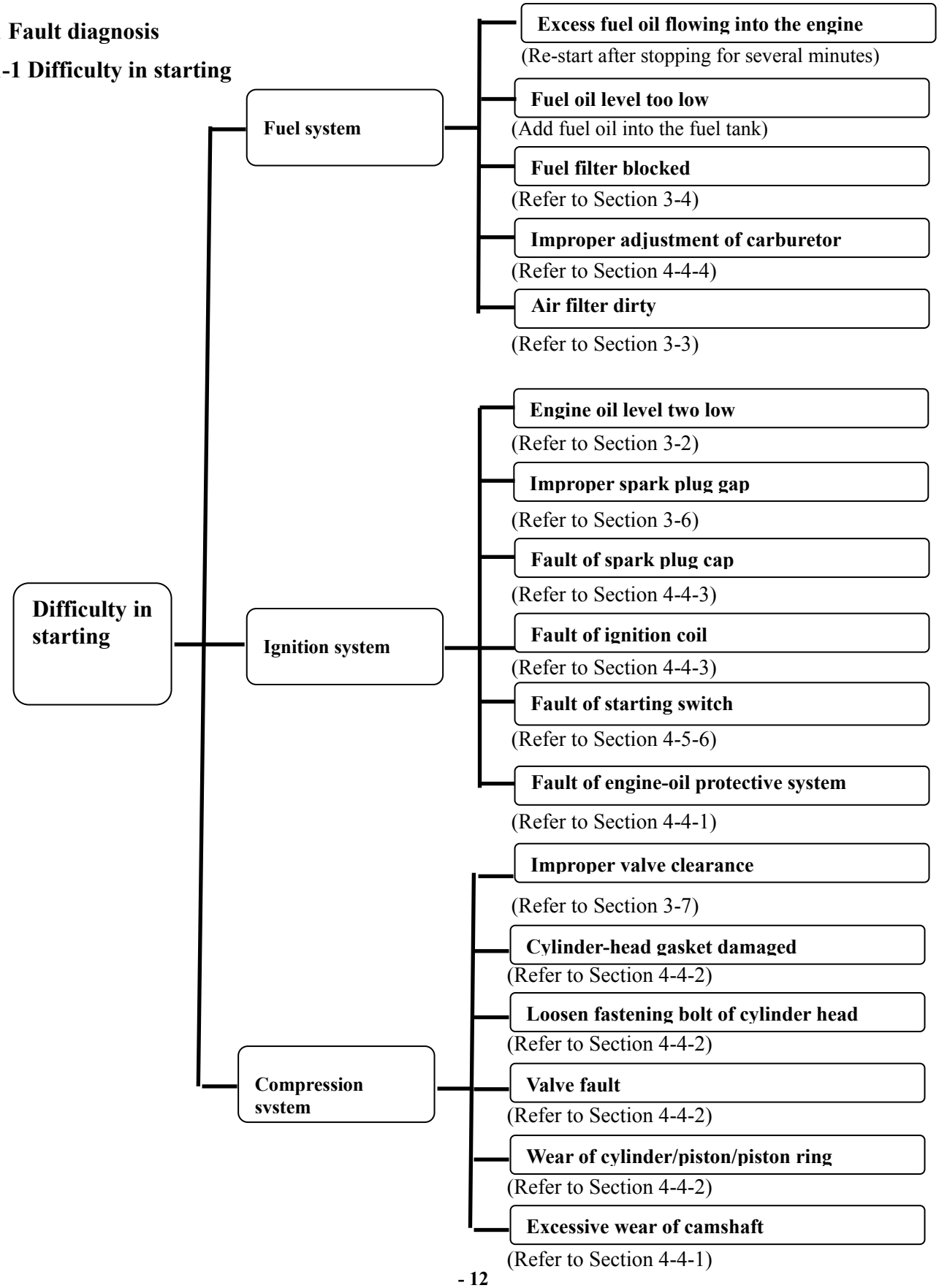
To increase valve clearance, screw out the pivot
To decrease valve clearance, screw in the pivot

3) Operate as per the following steps if the adjustment is required:
   a) Fix the valve-adjusting screw with a clamp and unscrew the valve lock nut with a spanner.
   b) Rotate the valve-adjusting screw and adjust it to the specified valve clearance.
   c) Fix the valve-adjusting screw with a clamp and fasten the valve lock nut.
   d) Re-check the valve clearance after fastening the lock nut.

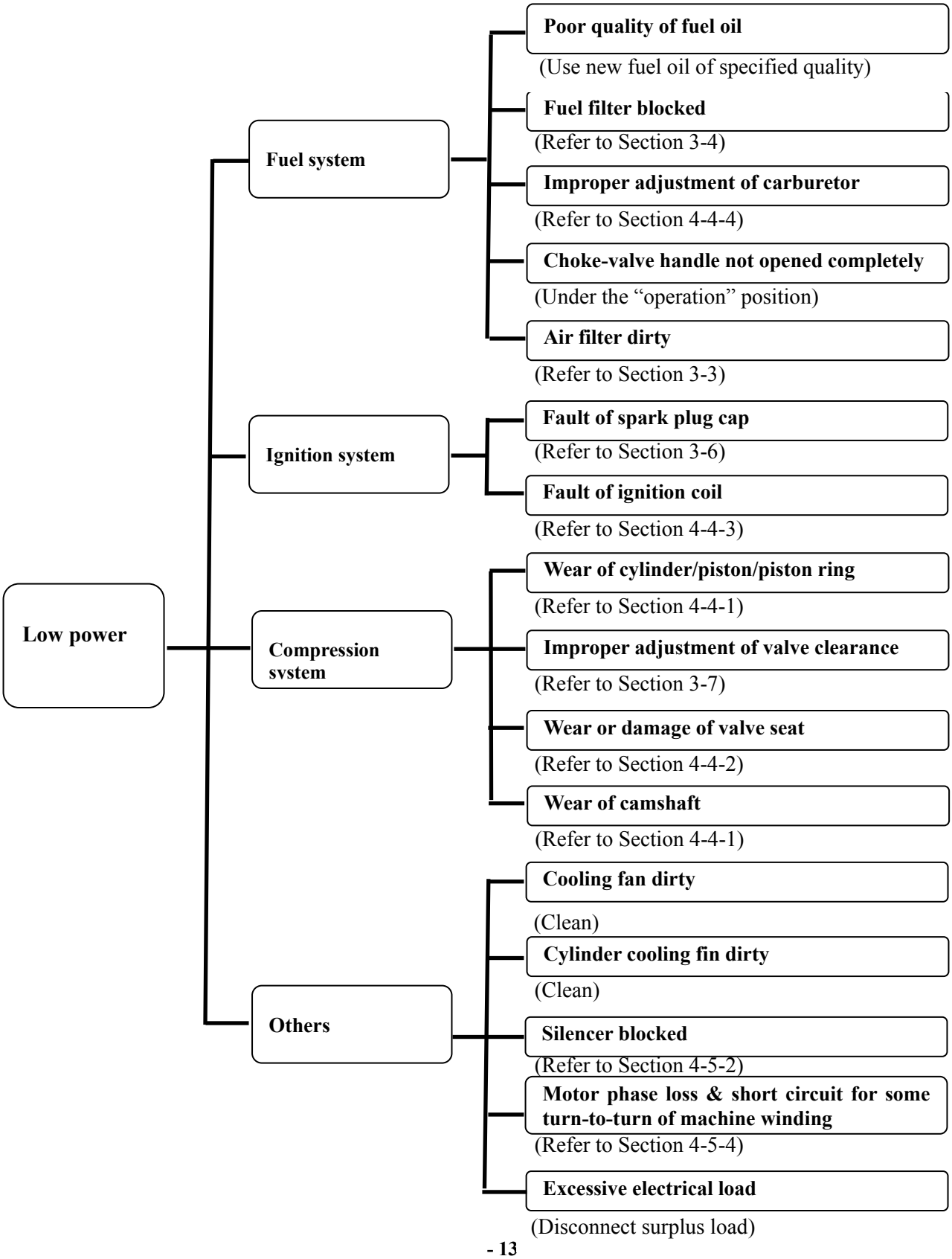


4-1 Fault diagnosis

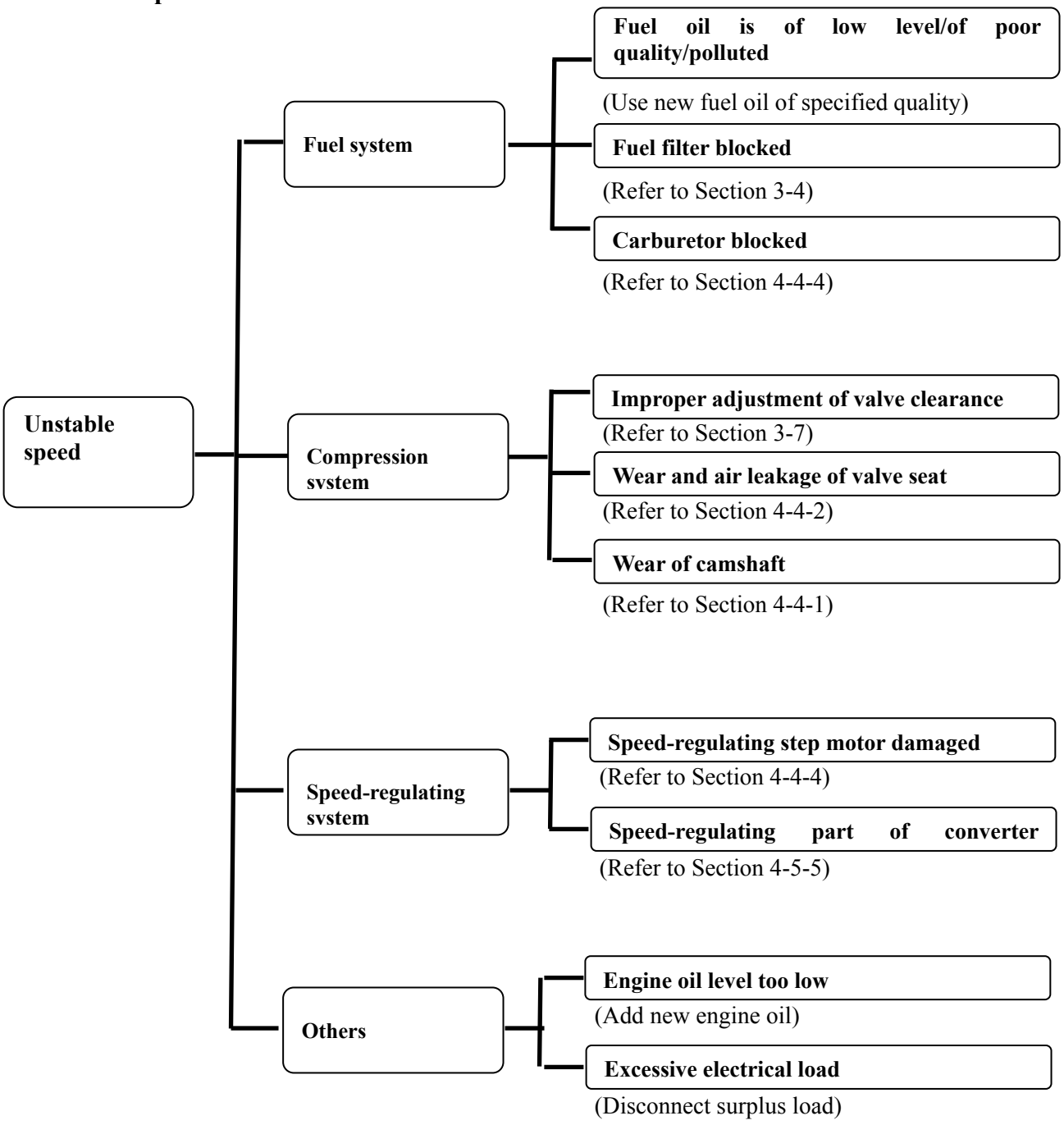
4-1-1 Difficulty in starting



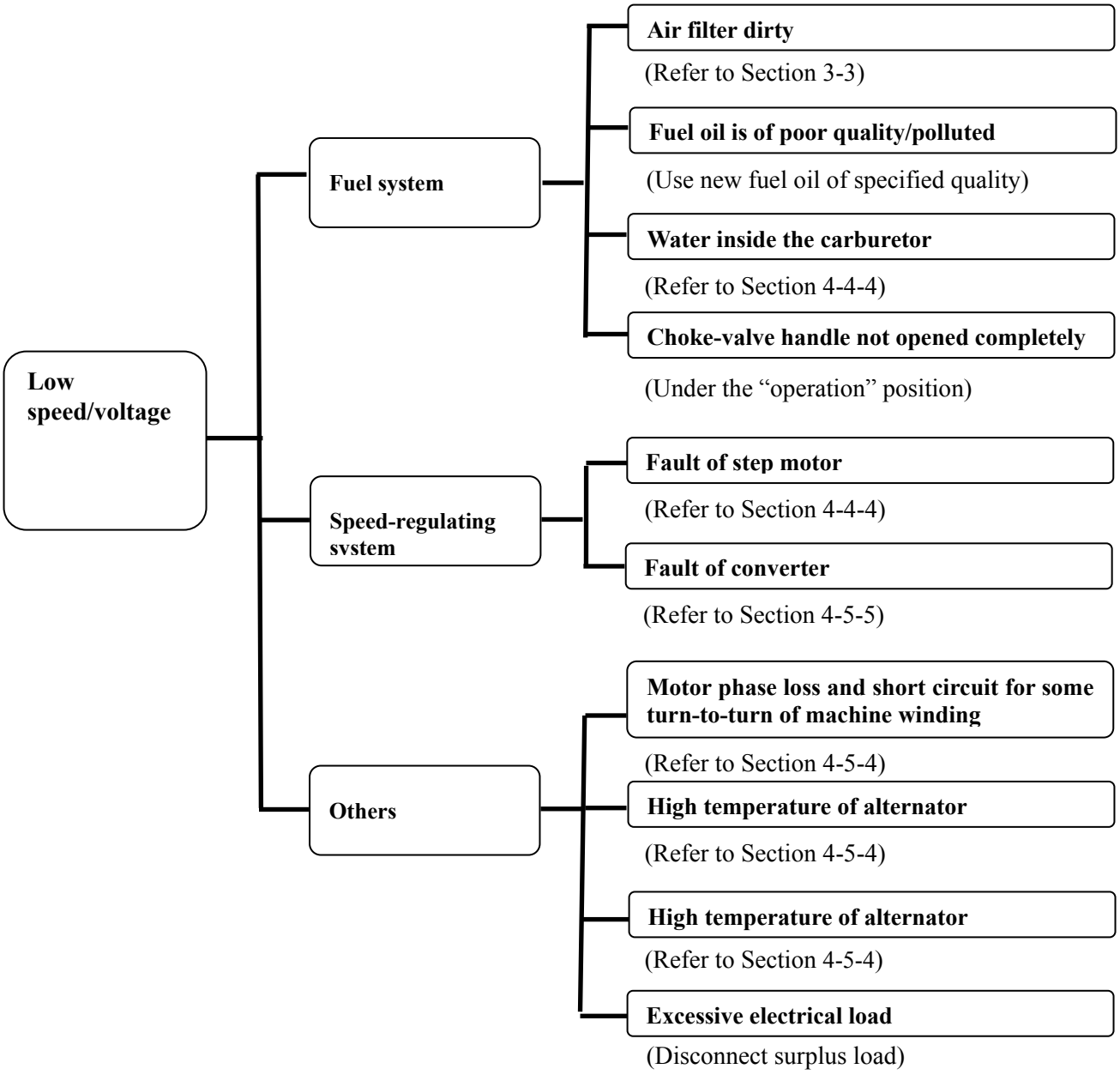
4-1-2 Low power



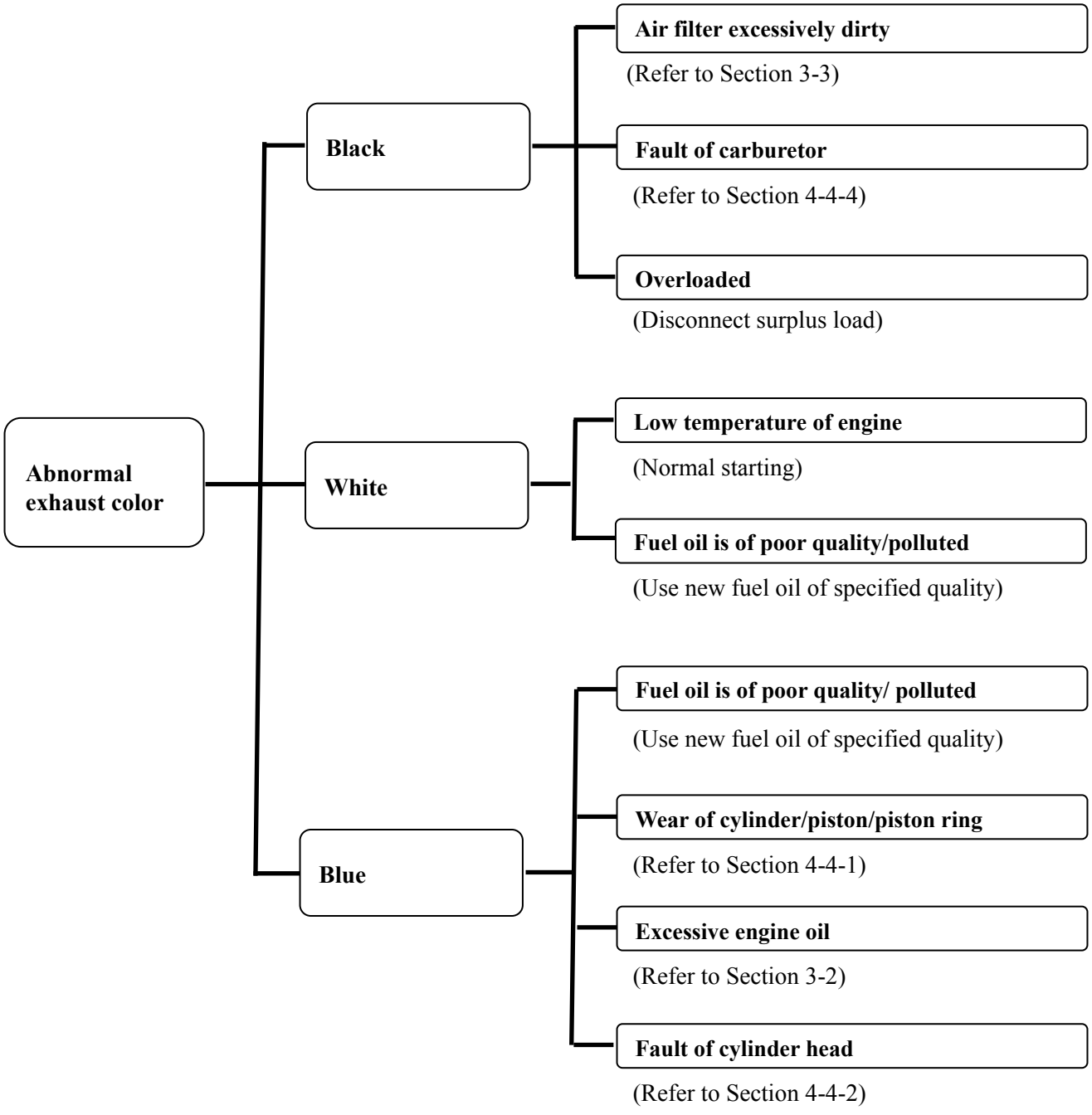
4-1-3 Unstable speed



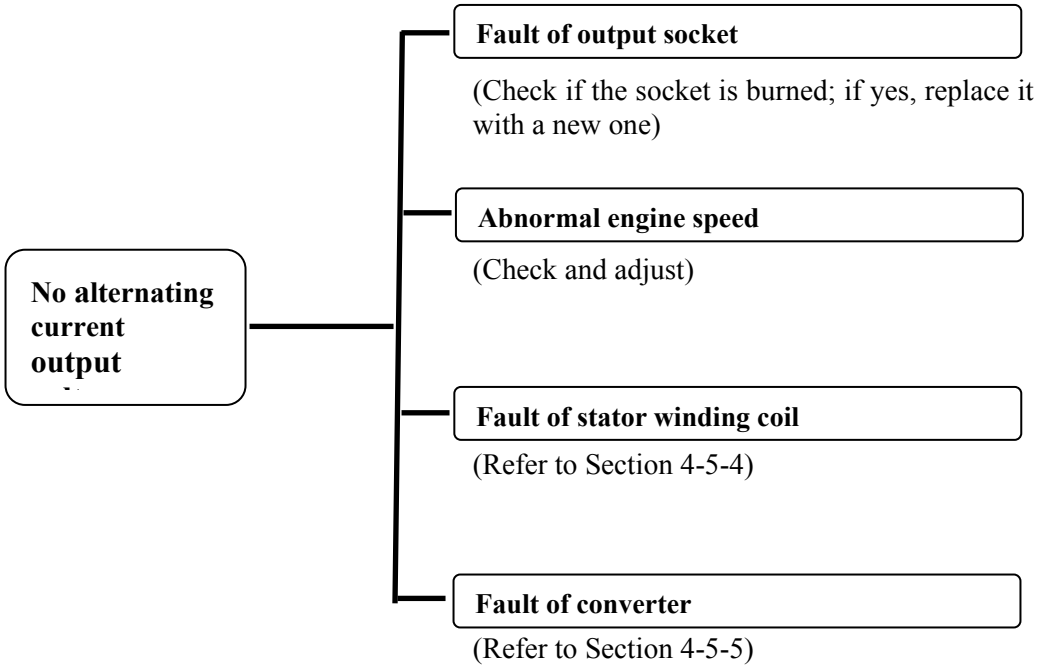
4-1-4 Low speed/voltage



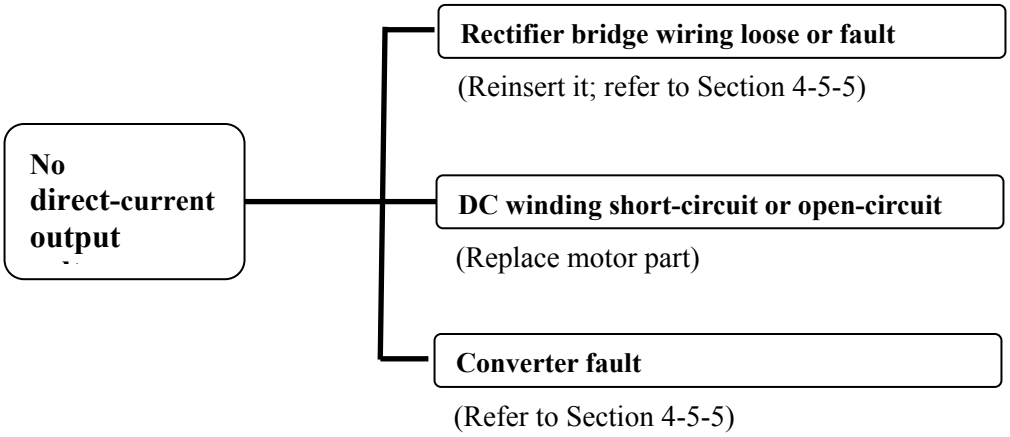
4-1-5 Abnormal exhaust colors



4-1-6 No alternating current output voltage



4-1-7 No direct-current output voltage



Chapter IV Disassembly & Repair

4-2 Prepare for repairs

4-2-1 Safety Precautions

There will be dangers during repairing the generator unit. Read safety precautions carefully and be familiar with the dangers listed in Table 4-1. Note the safety measures and methods of the following danger preventions.

- ***Use personal protective equipment***: wear proper safety protective equipment, such as safety shoes and protective glasses.

- Do not wear earrings or jewelry; do not wear loose or wet clothes as they may be caught in the equipment or cause electric shock.

- ***Reduce risk***: a safe workshop in order and under good maintenance can reduce potential risks. The protective equipment and shield of machinery shall be installed in place and be kept at normal position so as to keep equipment be under the good operation. Flammable liquid shall be stored in approved container, and be kept away from open fire, sparks, pilot torches, switch, equipment generating electric arcs as well as other ignition sources. The workshop must be kept clean with sufficient lighting and adequate ventilation.

- ***Develop the habit of safe operation***: unsafe behavior will cause equipment and machinery accidents. Be familiar with equipment and the methods how to use them safely. Use correct tools during operation and check the status before starting. Follow the warnings mentioned in the Manual and take special precautions when working near electrical equipment. If possible, do not work alone and take risks.

- ***Be prepared for dealing with accidents***: prepare a fire extinguisher and safety equipment at the place near yourself. Red Cross and public safety agencies have provided some courses in term of first aid, CPR and fire control. Make use of these materials to prepare well to deal with accidents. Learn how to possess safety consciousness and treat safety rules as a part of routine work.

Table 4-1 Danger and Danger Sources

Fire and explosion	• Fuel leakage or spill • Hydrogen emitted from batteries • Inappropriate storage of cloth pieces with oil • Inappropriate storage of flammable liquid
Burns	• Exhaust pipe of high temperature • Engine and engine surface of high temperature
Toxic waste gas	• Operate the electric generator in unventilated area or indoors
Electric shock (AC)	• Incorrect wiring of generator • Line fault • Operate in humid environment • Metal objects contact with electrical elements
Rotating machinery	• Without fan shield installed
Extremely smooth surface	• Leaked or spilled engine oil
Heavy stuffs	• Disassemble the generator unit from vehicle • Disassemble heavy elements.

4-2-2 Special tools

Engine

To repair engine, a complete set of standard metric special tools is required.

Control device and generator

To the repair control device and generator, a complete set of standard metric workshop tools is required. In addition, following tools are also required:

- Plumb bob or soft-surface plastic hammer
- Torque wrench
- Multimeter
- Frequency meter
- Armature tester
- Load box
- Rotor puller

Chapter IV Disassembly & Repair

4-3 Diagram for disassembly

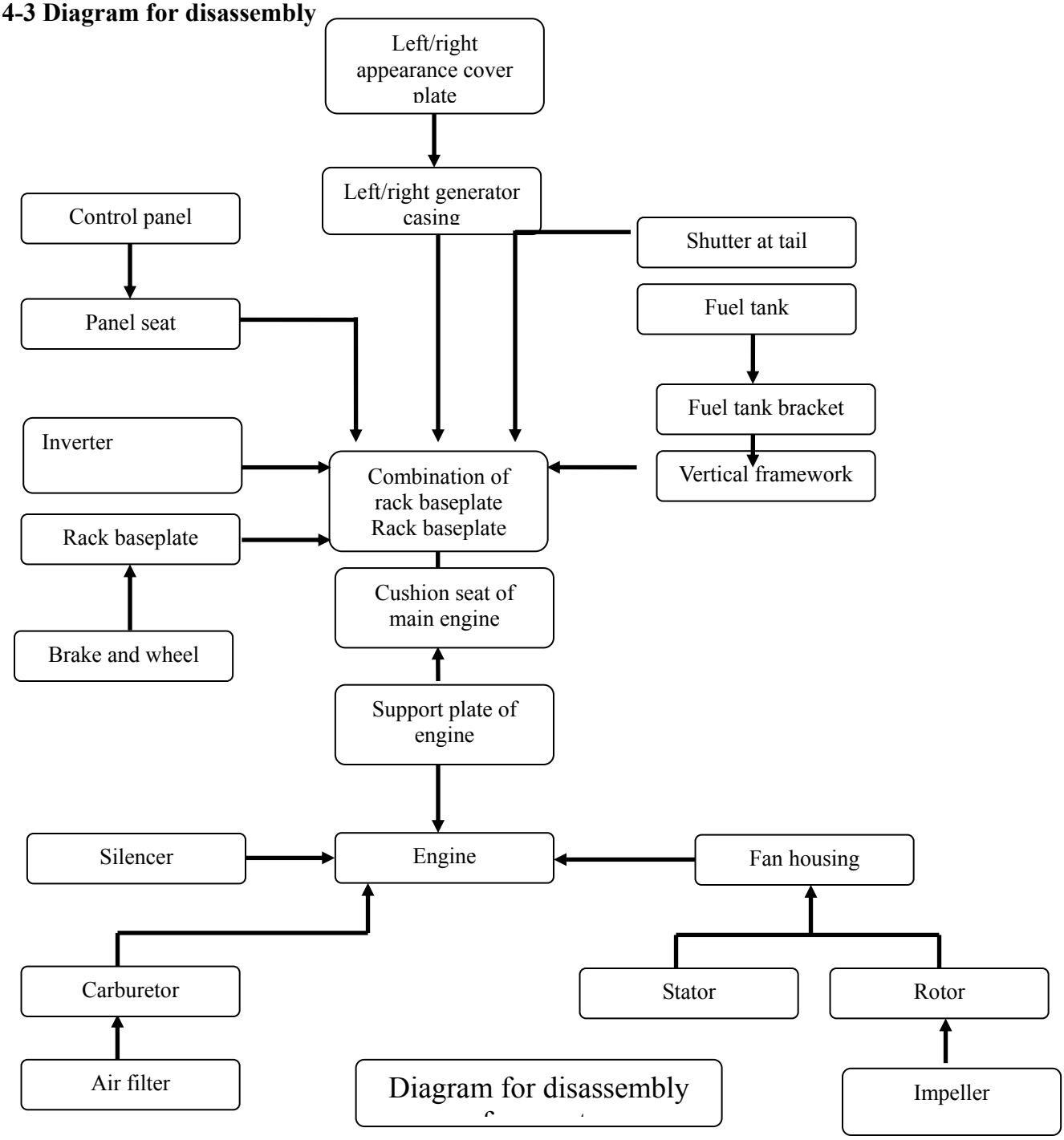


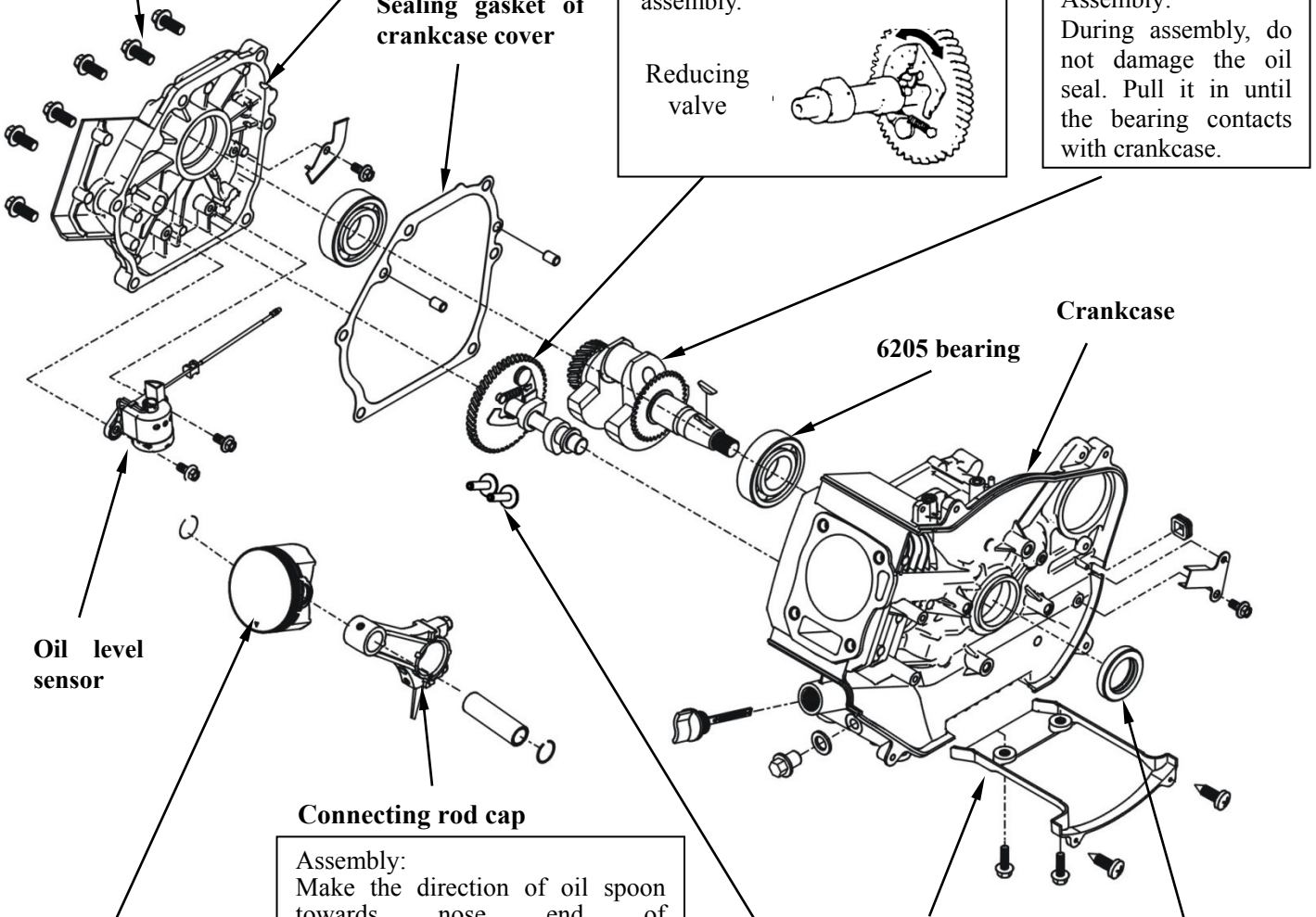
Diagram for disassembly

The above diagram is for quick reference for disassembling products. In order to operate better and more safely, please ensure to follow above-mentioned orders.

4-4 Engine

4-4-1 Crankshaft/piston

a. Disassembly/assembly



Bolt: M8 × 32
Torque: (26 ~ 32) N•m

Crankcase cover

Sealing gasket of crankcase cover

Camshaft

Assembly:
Check if the spring is worn and out of elasticity to ensure the decompression hammer can operate flexibly, then align to the timing mark for assembly.

Reducing valve

Crankshaft parts

Assembly:
During assembly, do not damage the oil seal. Pull it in until the bearing contacts with crankcase.

Crankcase

6205 bearing

Oil level sensor

Connecting rod cap

Assembly:
Make the direction of oil spoon towards nose end of speed-regulating arm, and align the connecting rod to the lug boss of connecting rod cap for assembly.

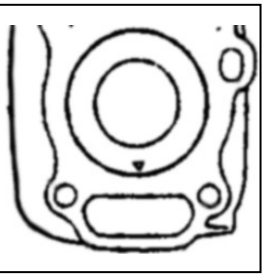
Wind scooper

Oil seal 25 × 41.25 × 6

Assembly:
When passing through the crankshaft, do not roll up the edge of oil seal.

Piston

Assembly:
During assembly, make the direction of piston top arrow as same as that of oil spoon of connecting rod.



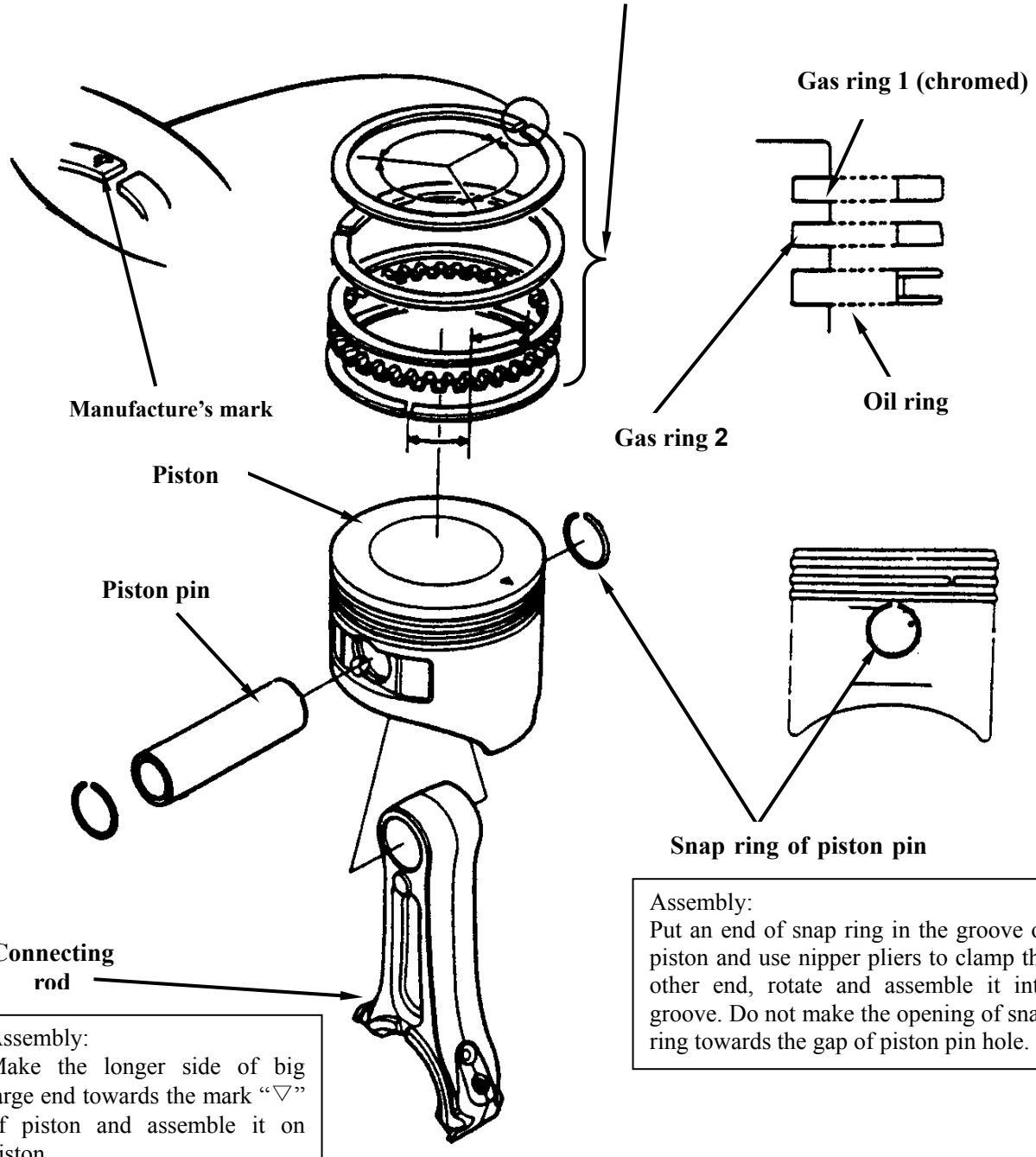
Valve lifter

Assembly:
Assemble the camshaft immediately after the tapper is assembled.

b. Piston/piston ring

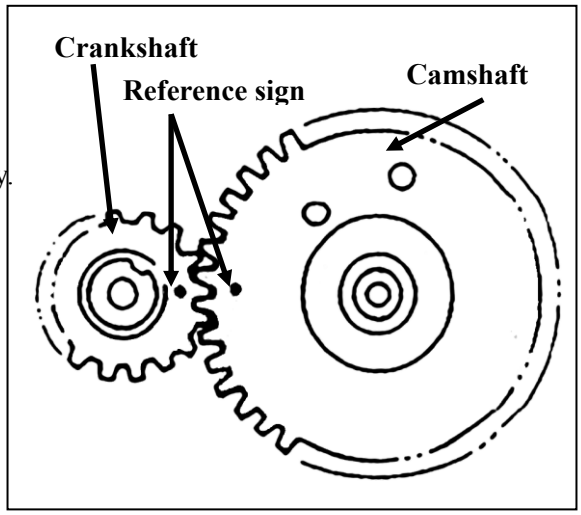
Piston ring

Assembly:
1) Put upward the manufacturer's mark during assembly.
2) Do not misplace the gas rings 1 (chromed) and 2.
3) Check if the piston ring can rotate flexibly after installation.
4) Avoid the direction of piston ring for each opening of piston ring by staggering for 150° ~ 210°.



Assembly:
Make the longer side of big large end towards the mark "▽" of piston and assemble it on piston.

Assembly:
Put an end of snap ring in the groove of piston and use nipper pliers to clamp the other end, rotate and assemble it into groove. Do not make the opening of snap ring towards the gap of piston pin hole.



c. Camshaft/crankshaft

When assembling camshaft, align the camshaft gear wheel to the Reference sign of timing gear (pinion of crankshaft) for assembly.

d. Check

Check of piston

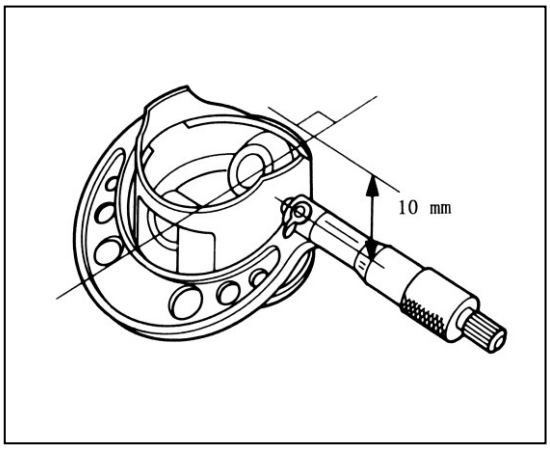
Check the contact between piston and cylinder, defects of ring groove, erosion at the top, crack, etc. It shall be replaced for severe damages (e.g. crack).

Remove carbon deposition

Carbon deposition accumulates at the edge of the top of piston and upper opening of cylinder.

Remove carbon deposition prior to detection.

Wet the carbon deposition with kerosene, and then remove it with blunt scraper or metallic brush.



1) Outer diameter of piston skirt

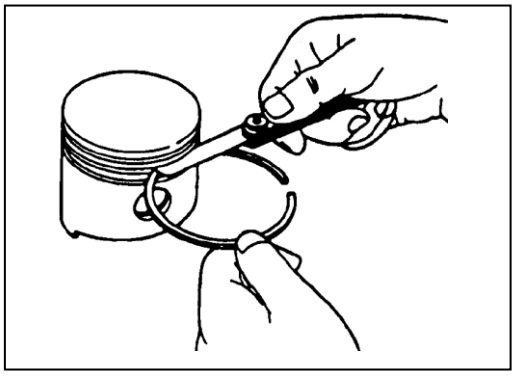
Measure the outer diameter of piston skirt with outside micrometer. Replace the piston skirt if it exceeds the use limit.

Standard	Maintenance Limit
69.985 mm	69.845 mm

2) Clearance between piston and cylinder

The difference between the maximum diameter of cylinder and the diameter of the piston skirt is the clearance between piston and cylinder.

Standard	Maintenance Limit
0.015-0.050 mm	0.12 mm

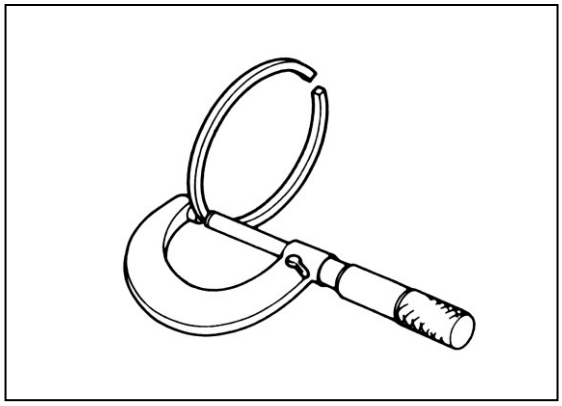


3) Clearance to the side of the piston ring

When checking, put each ring in corresponding piston ring slot. The piston shall be able to rotate

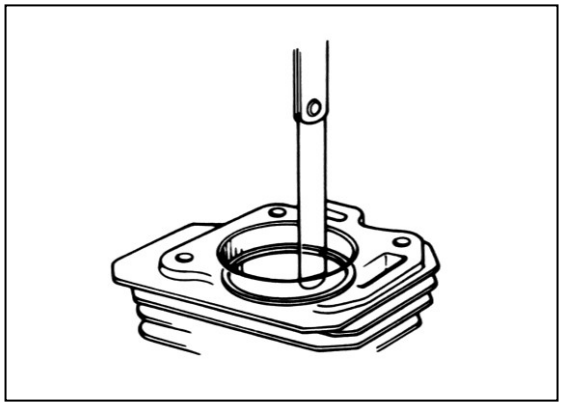
freely, neither loose nor inflexible. Then insert feeler gauge into the clearance between the ring and the slot to measure the clearance.

Standard	Maintenance Limit
0.015-0.045 mm	0.15 mm



4) Thickness of piston ring

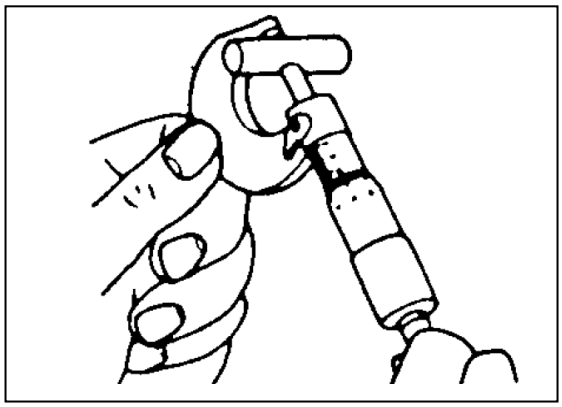
	Standard	Maintenance Limit
Ring 1/2	1.0 mm	0.88 mm



5) Clearance to the end of piston ring

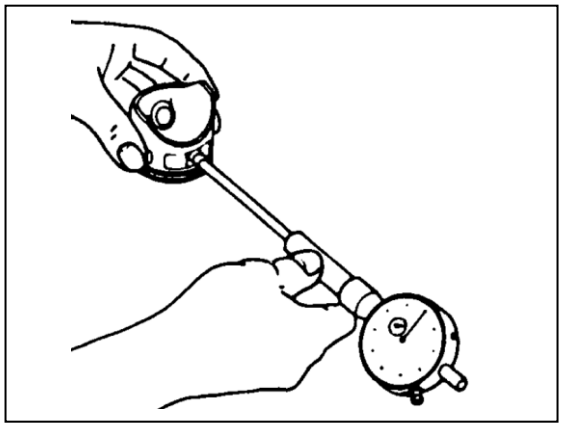
	Standard	Maintenance Limit
Ring 1/2	0.02-0.04 mm	1.0 mm

Before measuring the clearance, the piston ring shall be assembled on piston correctly, then put the piston in cylinder. And rings 1 and 2 shall be also replaced for the use of oil rings.



6) Outer diameter of piston pin hole

Standard	Maintenance Limit
18.0 mm	17.954 mm



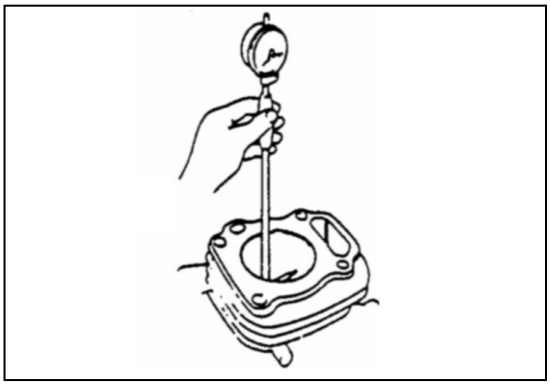
7) Inner diameter of piston pin hole

Standard	Maintenance Limit
18.002 mm	18.048 mm

8) Clearance between piston pin hole and piston pin

Measure the inner diameter of piston pin hole and the outer diameter of piston pin with inside micrometer and outside micrometer. Then calculate the clearance value based on the measured result. Replace the piston or piston pin if it exceeds the use limit.

Standard	Maintenance Limit
0.002-0.014 mm	0.06 mm



9) Inner diameter of cylinder

Standard	Maintenance Limit
70 mm	70.165 mm

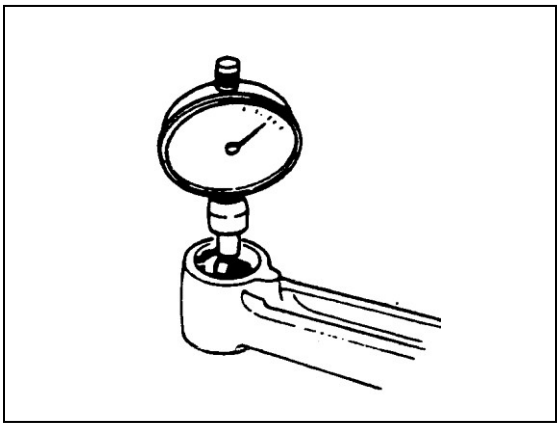
Detection of connecting rod

The connecting rod shall be scrapped to change a new one when it is bent, warped, or the out ring of its bearing bush in big end and the shaft sleeve in the small end is moving, or has crack.

1) Inner diameter of the small end of connecting rod

Replace the connecting rod if the inner diameter is less or more than maintenance limit.

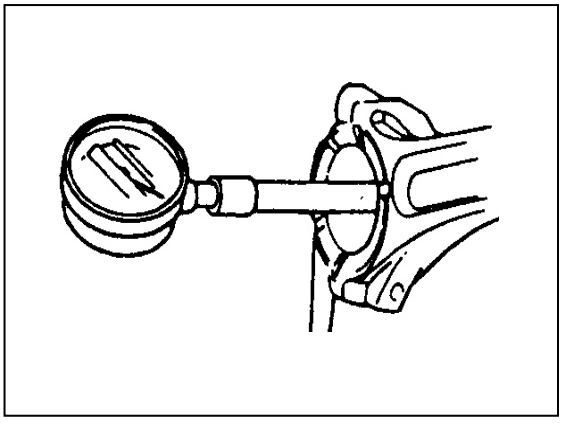
Standard	Maintenance Limit
18.002 mm	18.07 mm



2) Detect the inner diameter of big end

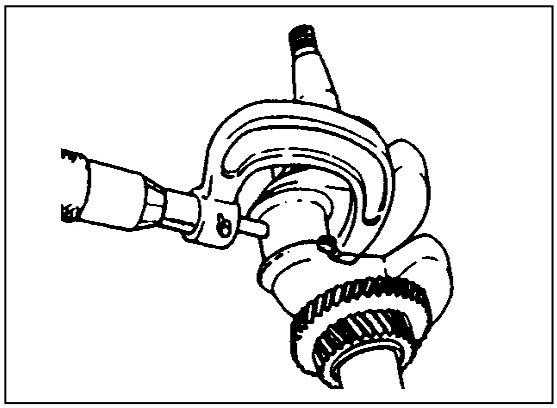
Replace the connecting rod if the inner diameter is less or more than maintenance limit.

Standard	Maintenance Limit
30.02 mm	30.066 mm



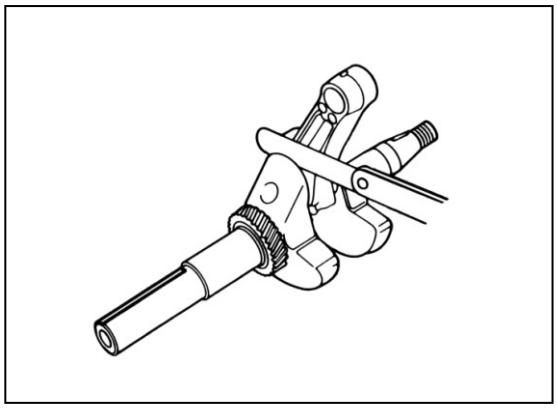
3) Outer diameter of crankshaft journal

Standard	Maintenance Limit
29.98 mm	29.92 mm



4) Side clearance of the big end of connecting rod

Standard	Maintenance Limit
0. 1-0.7mm	1.1mm



5) Oil-film clearance of big end of connecting rod (radial direction)

a) Wipe away the engine on the surface of crankshaft journal.

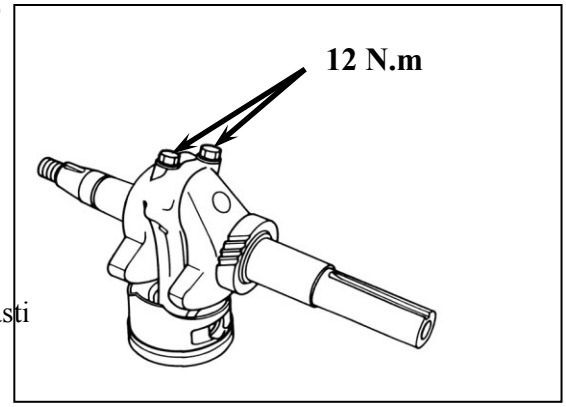
b) Set plastigauge on crankshaft journal then assemble connecting rod,Fasten the bolt as per the specified torque.

Fastening torque: 12-14 N.m

Note: do not make the crankshaft rotate when fastening the bolt.

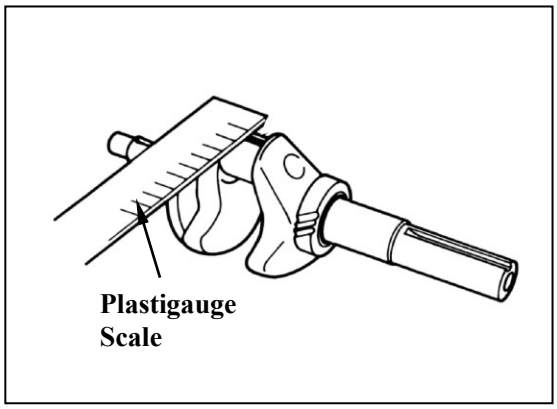
c) Disassemble the connecting rod and measure the thickness of plasti

d) Check the connecting rod when the clearance exceeds maintenance limit,and re-check the clearance.



If the clearance still exceeds the maintenance limit after a new connecting rod is used, grind the crankshaft journal and use the connecting rod with the clearance less than the standard value.

Standard	Maintenance Limit
0.04-0.063 mm	0.12 mm

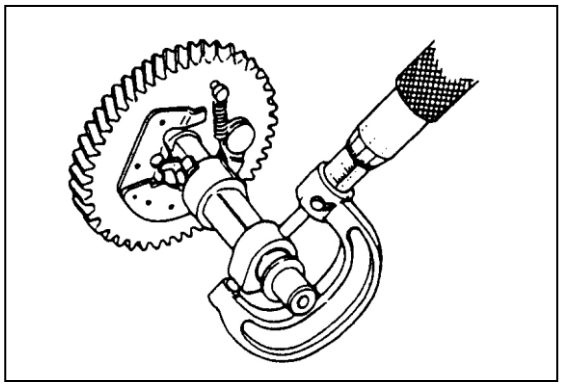


Detection of camshaft

The camshaft is the main engine drive element of valve mechanism of gasoline engine, controlling inlet or exhaust valve to open or close in a regular manner. For appearance, check whether the cam surface and the height is damaged, whether the camshaft and bearing is loose and worn. If yes, change the whole unit.

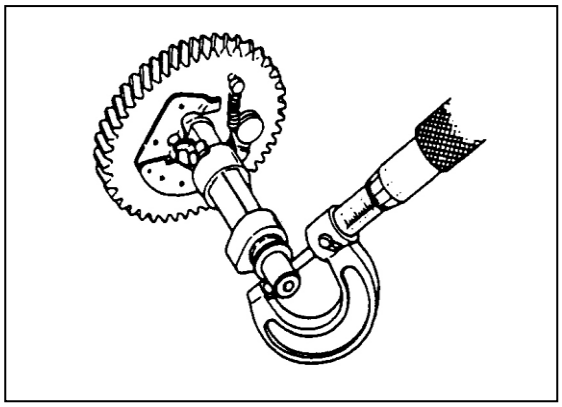
1) Cam height of camshaft

	Standard	Maintenance Limit
Inlet	27.7 mm	27.45 mm
Exhaust	27.75 mm	27.50 mm



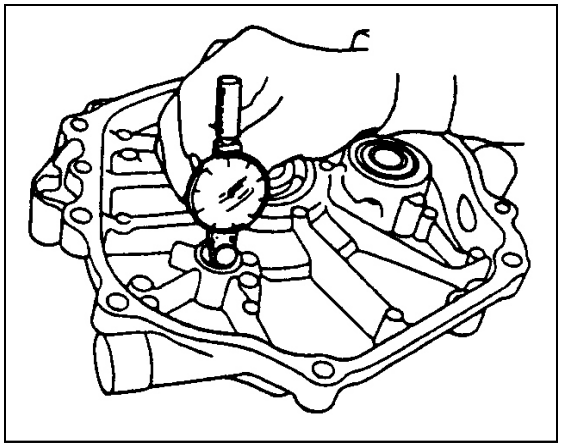
2) Outer diameter of camshaft

Standard	Maintenance Limit
13.984 mm	13.916 mm



3) Inner diameter of camshaft hole

Standard	Maintenance Limit
14.0 mm	14.048 mm

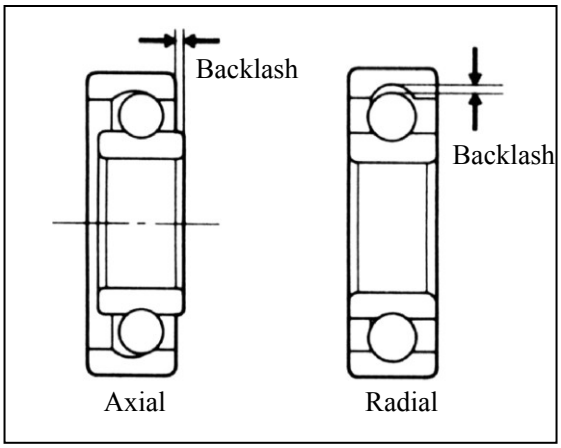


Chapter IV Disassembly & Repair

Check of bearing

Clean and dry the bearing.

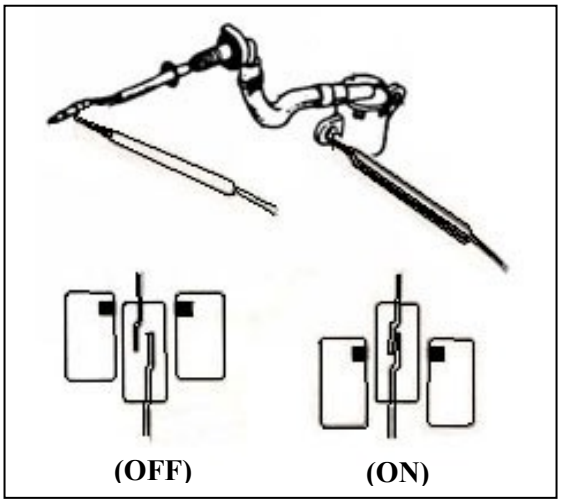
Rotate the bearing with hands and check the backlash. Replace it in case of abnormal noise or movement.



Oil-level sensor

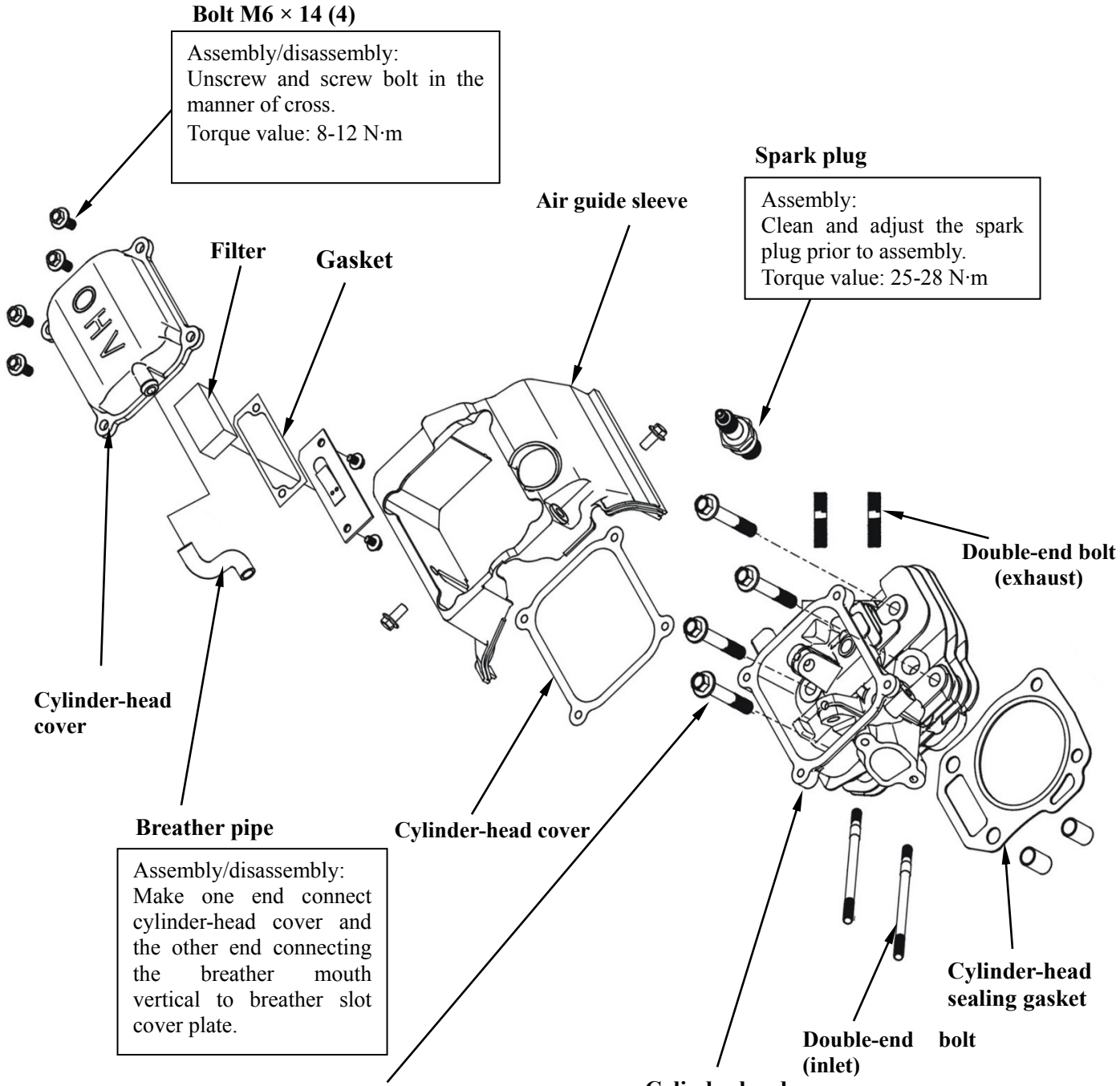
Measure the conductivity of senor with ohmmeter.

When the engine oil in tank is insufficient or empty, the black wire of sensor is conductive with the earth wire; otherwise the black wire of sensor is not conductive with the ground, which means the sensor is under normal status.

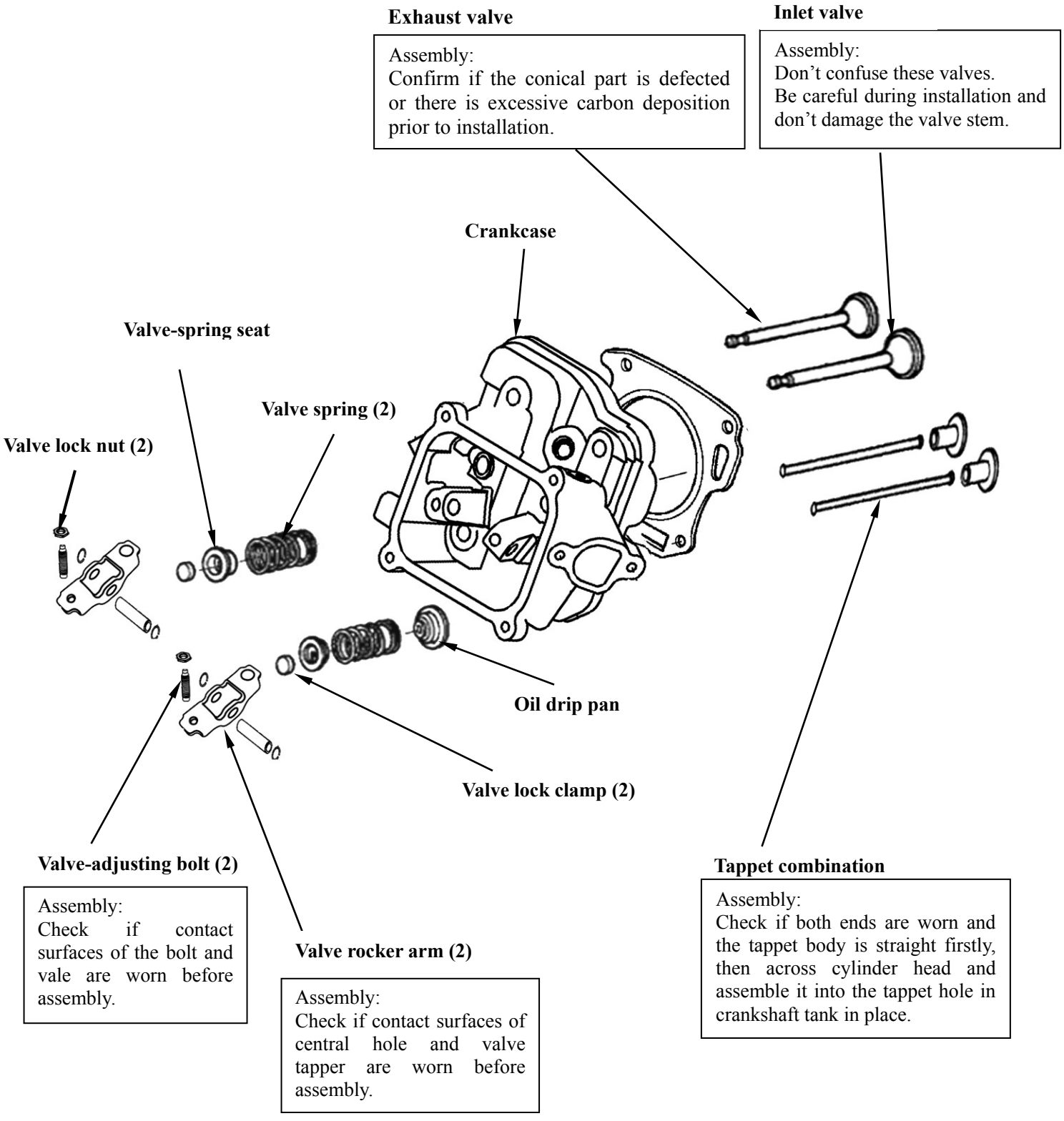


4-4-2 Cylinder head/valve

a. Disassembly/assembly



b. Disassembly/assembly

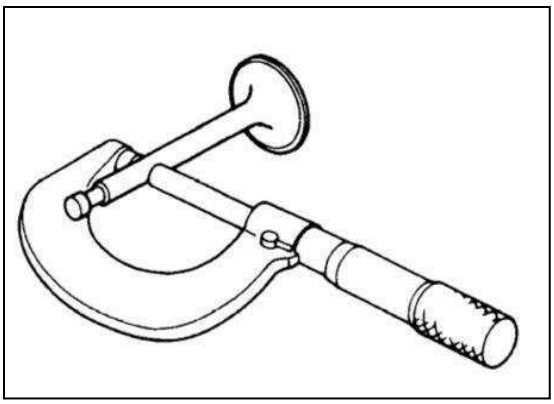


c. Check

1) Outer diameter of valve stem

Check outer diameter of valve stem with micrometer.

Replace a new valve when the diameter is less or more than maintenance limit or there are the visible ablation or crack on valve surface with naked eyes.

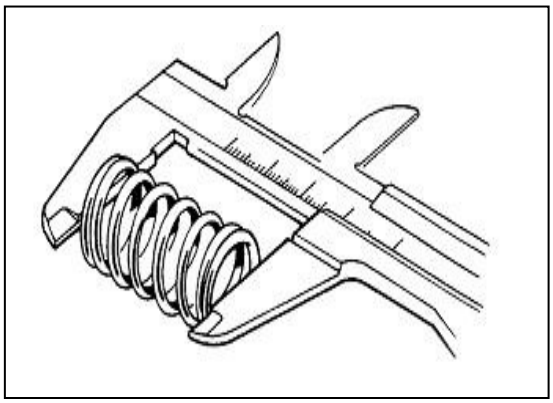


	Standard Value	Maintenance Limit
Inlet	5.48 mm	5.318 mm
Exhaust	5.44 mm	5.275 mm

2) Free length of valve spring

Measure the free length of valve spring.

Replace the spring if the inner diameter is less or more than maintenance limit.



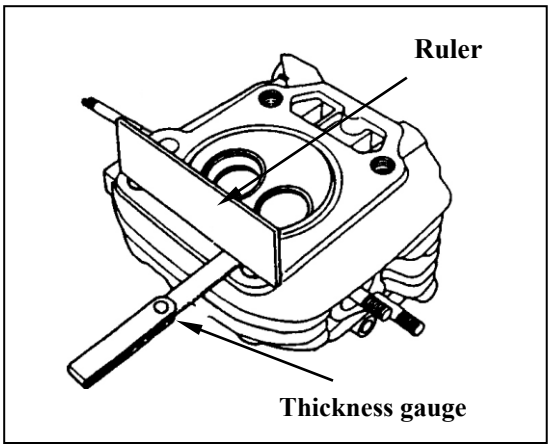
Standard	Maintenance Limit
30.5 mm	29.5 mm

3) Cylinder head

Remove the carbon deposition in combustor and gasket residues attached on the cylinder head.

Check whether there are cracks on spark plug hole valve seat surface and valve guide.

Check whether the cylinder block is deformed with ruler and feeler gauge.

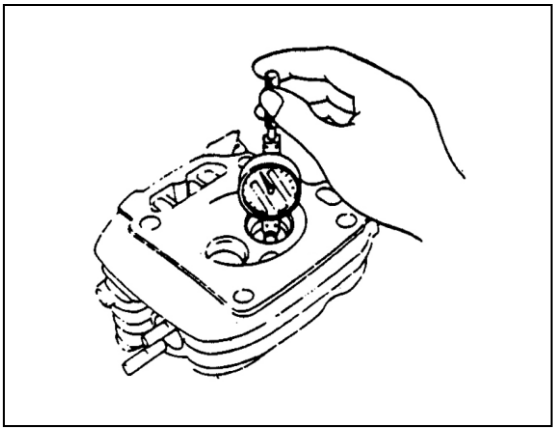


Maintenance Limit	Replace it in case of exceeding 0.10 mm

4) Valve guide

Check:

a) Check whether the internal surface of the valve guide is smooth and clean, with scratch and strain; whether the coordination between valve guide and cylinder

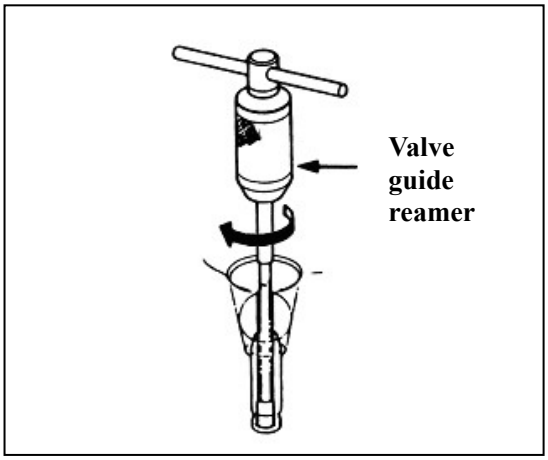


cover is fixed.

b) Remove the carbon deposition in valve guide with valve guide rimer before measuring the inner diameter of valve guide.

Replace the guide if the inner diameter is less or more than the maintenance limit.

Standard	Maintenance Limit
5.50 mm	5.072 mm

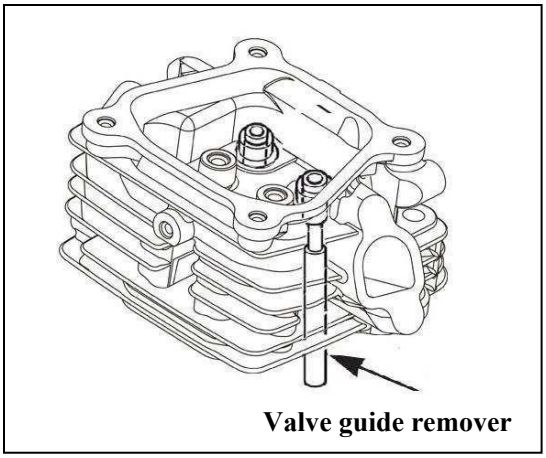


Replace:

a) Freeze the valve guide to be replaced.

in freezing chamber for about 1 h.

b) Disassemble the valve guide from the combustor side with a valve guide remover.



NOTICE

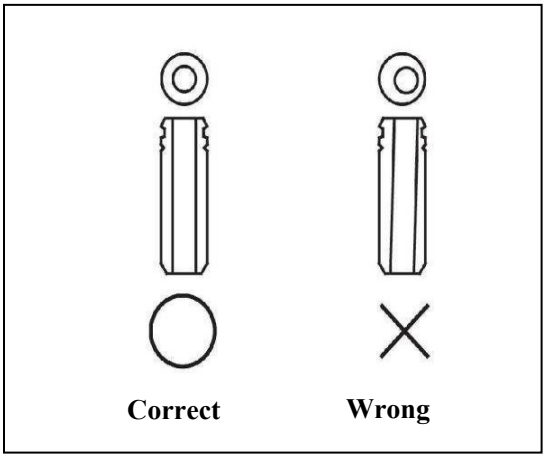
Be careful not to damage the cylinder head when disassembling The valve guide.

c) Assemble the new valve guide from the valve spring side of cylinder head.

Exhaust valve side: tap the exhaust valve guide until the retainer ring contacts with cylinder head completely.

Inlet valve side: tap the inlet valve guide until it reaches specified height (measure from the top of inlet valve guide to the surface of cylinder)

d) check whether the there are damages on guide after assembling and replace the valve guide in case of damages.



Trim:

Finish ream with reamer on valve guide must be conducted at room temperature so as to achieve good effect.

a) Coat a layer of cutting oil on valve reamer and guide.

Screw the reamer clockwise until it is screwed in valve

guide completely. Continue to unscrew clockwise the valve reamer from valve guide.

Tool: valve guide reamer

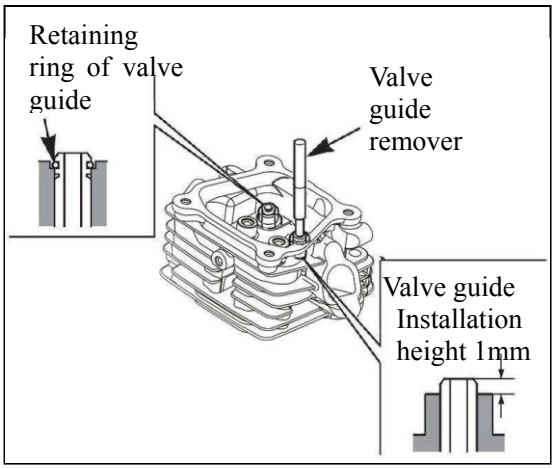
b) Remove the dirt and scraps on cylinder head thoroughly.

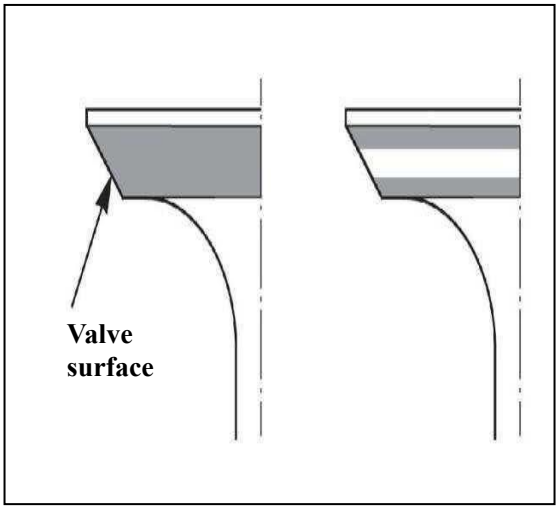
c) Check the valve guide hole. The hole shall be at the central of valve guide and straight and unobstructed. Insert the valve and check whether the operation is unobstructed. If not, the valve guide may have been bent when being assembled. If it has been bent or damaged, replace it.

d) Check the clearance between the valve stem and guide.

e) The clearance between valve stem and guide: the clearance between valve stem and guide is calculated by corresponding inner diameter of valve guide minus the outer diameter of valve stem.

f) If the clearance between the valve stem and guide exceeds the maintenance limit, judge whether to replace it with a new guide can make the clearance in maintenance. If yes, change the valve guide and stick the valve guide. When replacing valve guide, please re-repair the valve seat.





5) Valve seat:

a) Remove the carbon deposition in combustor and on valve seat. Coat a layer of red lead power or other colorful painting which is easy to scrub and stick.

b) Insert valve and press it for several times, and ensure not to rotate it on the valve seat. Valve seat coated with painting indicates it contacts with valve tightly; otherwise, it does not contact with valve, which means that the valve is not concentric to valve seat.

c) Grind the valve seat with a 45° grinder to make a smooth concentric valve seat, clockwise rotation is allowed only. And the counterclockwise rotation is prohibited.

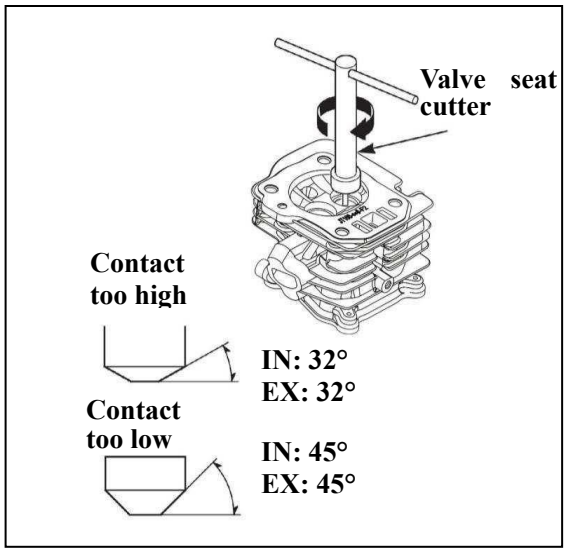
Tool: valve grinder

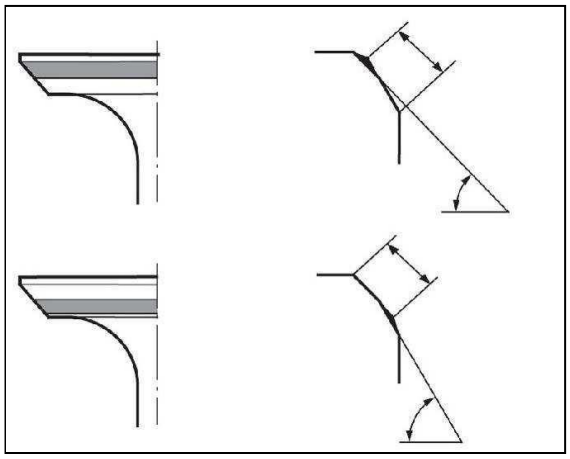
d) Narrow and adjust the valve seat with a 32°-45° grinder to

make it contact with the central part of the conical surface of valve.

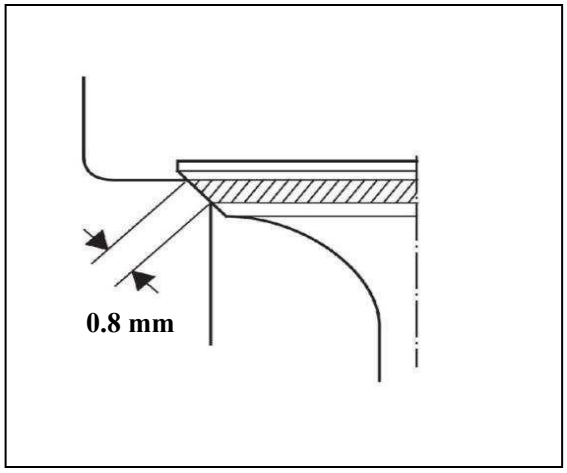
Grind the top edge of valve seat with a 32° grinder (the contact is too high).
Grind the top edge of valve seat with a 45° grinder (the contact is too low).
Ensure that the contact width of completed valve is withing the specified range.

Standard	Maintenance Limit
0.8 mm	2.0 mm



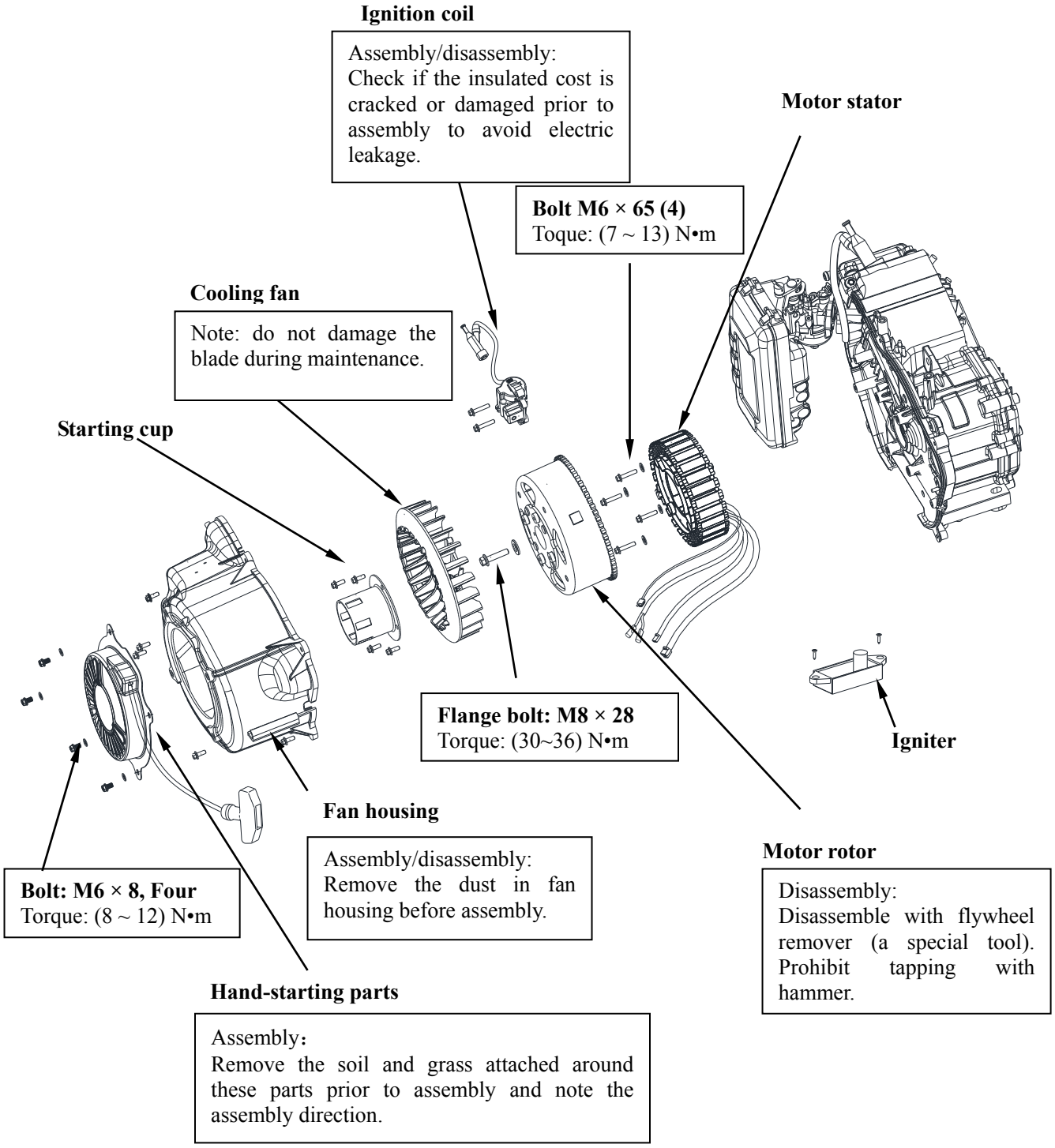


e) Grind slightly with a 45° grinder to remove all burrs on the edge of valve seat.
f) Check the width of valve seat after re-repairing the valve seat. Coat colorant on the conical surface of valve, insert the valve and press it for several times, and ensure that it does not rotate it on the valve seat. Where the conical surface of valve is coated the colorant uniformly as shown as figure, it indicates the valve contacts with the conical surface of valve seat well.
g) Coat abradant on the conical surface of valve seat and abrade the valve seat by rotating valve abrasive tool.
h) Check the valve clearance after assembly.



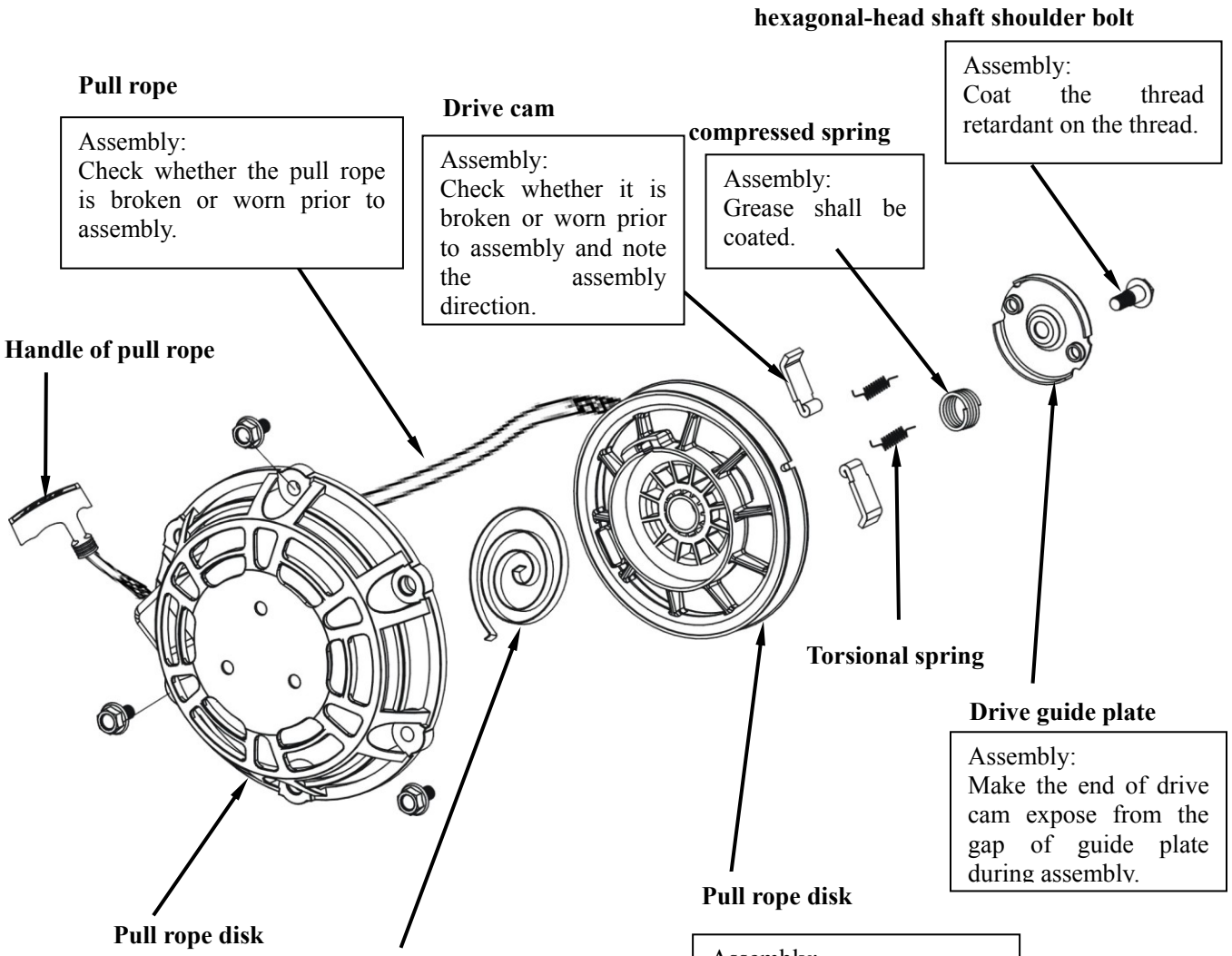
4-4-3 Flywheel/ignition coil/igniter/hand starter

a. Disassembly/assembly



c. Disassembly/assembly (starter assembly)

WARNING The maintenance of hand-starting parts may cause personal injury accident, so please wear protective glasses and do not make the starting return spring popup.



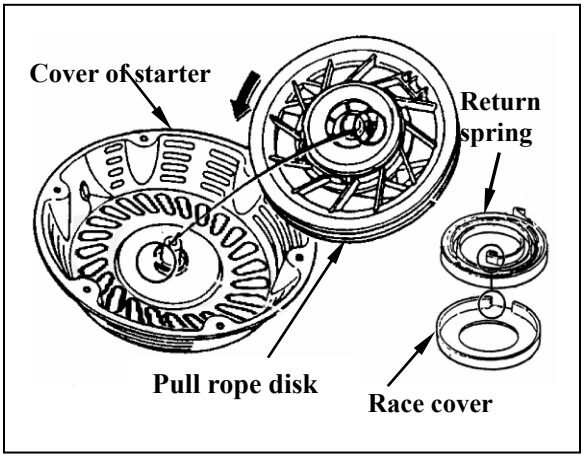
Chapter IV Disassembly & Repair

Assembly of hand starting parts

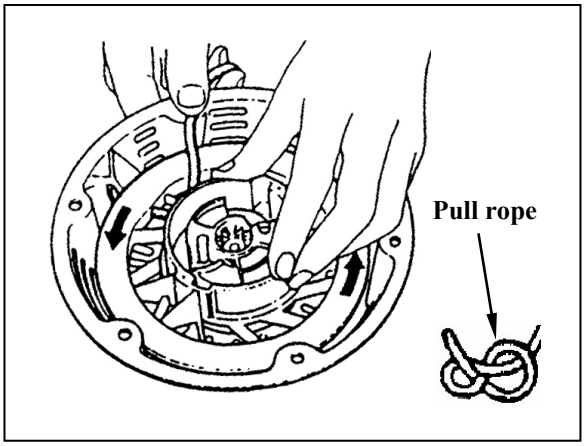
⚠WARNING Wear gloves and goggles to protect your hands and eyes.

⚠WARNING Do not make the starting return spring popup.

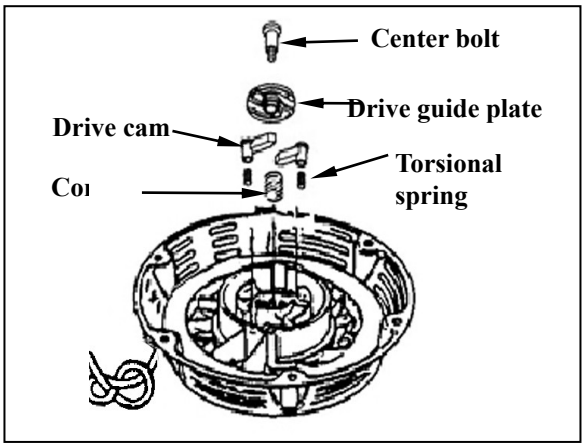
1) Put the return spring in the seat cover, hang the hook outside the return spring at the gap of seat cover fixedly and make it align to the slot of pull rope disk, then assemble to seat cover unit to pull rope disk. Coat grease on the jack catch of starter cover, rotate it toward the left and assemble it, and to hang the hook inside the return spring at the jack catch of starter cover.



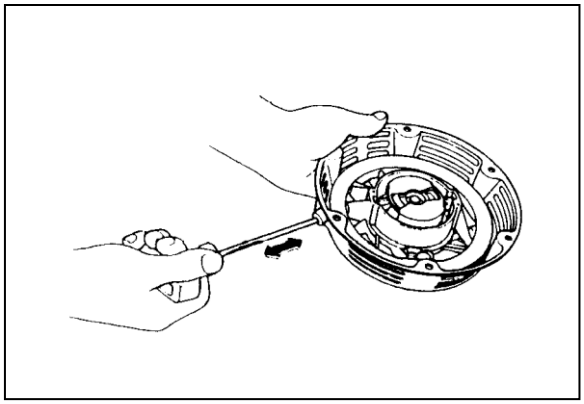
2) Tie a knot at one end of the pull rope, and tread the other end from the pull rope hole of pull rope disk. Then twine the pull rope disk for 5 circles anticlockwise.
Tread the starting pull rope from the hole of starter cover and tie a 8-knot at the end of pull rope.



3) Assemble dirve cam, torsional spring and drive guide plate and fasten the center bolt.

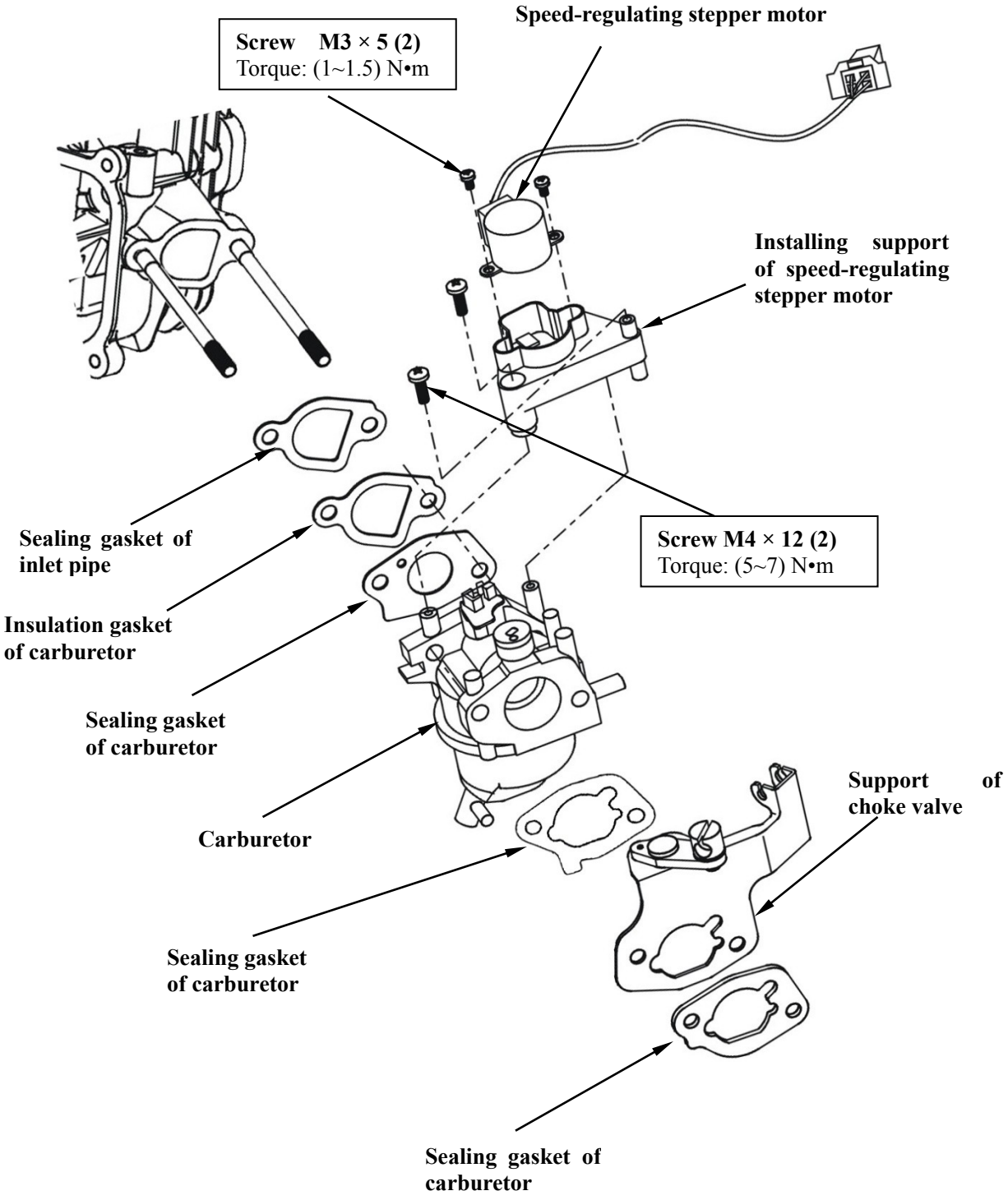


4) Pull the pull rope of starter for several times and check the return status of drive cam.



4-4-4 Carburetor

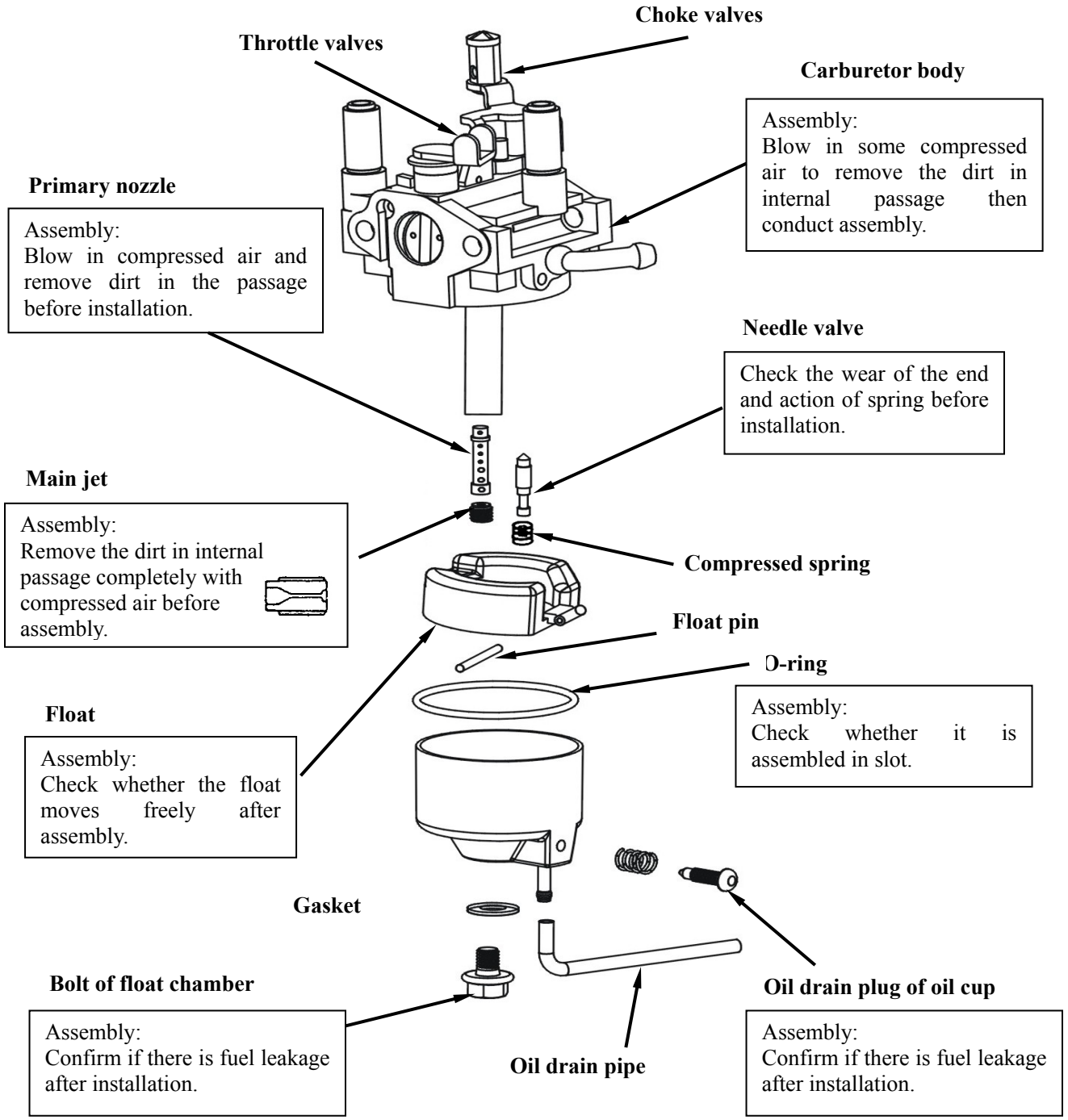
a. Disassembly/assembly



Chapter IV Disassembly & Repair

b. Disassembly/assembly

⚠WARNING The gasoline is flammable and explosive. The fuel valve must be closed before repairing carburetor and drain fuel in the carburetor. And no open flames.



c. Check

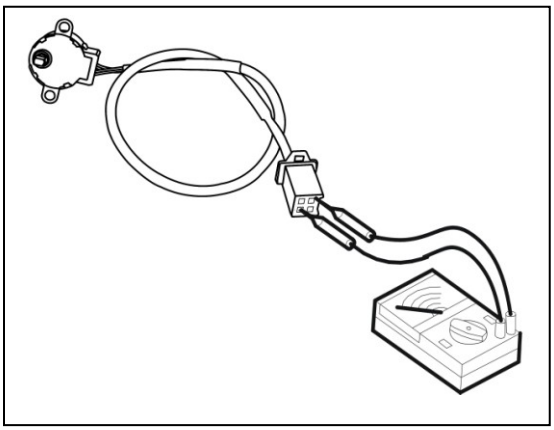
Speed-regulating stepper motor

Check the resistance of the 2 diagonals in the socket of stepper motor. The resistance shall be 50±1 Ω.

Replace the stepper motor in case of exceeding limit.

Rotate the center shaft of motor in case of stepper motor. The center shaft shall not get stuck or loose.

Replace the stepper motor in case of the above problems.



Chapter IV Disassembly & Repair

4-5 Generator

4-5-1 Fuel tank

Disassembly/assembly

⚠WARNING The Gasoline is inflammable and explosive. The oil in fuel tank and pipe shall be drained prior to disassembly. The fuel oil spilled shall be wiped clean immediately.

Fuel tank cover

Assembly:
Make sure the venthole is clean and not blocked. Clean it with compressed air if necessary.

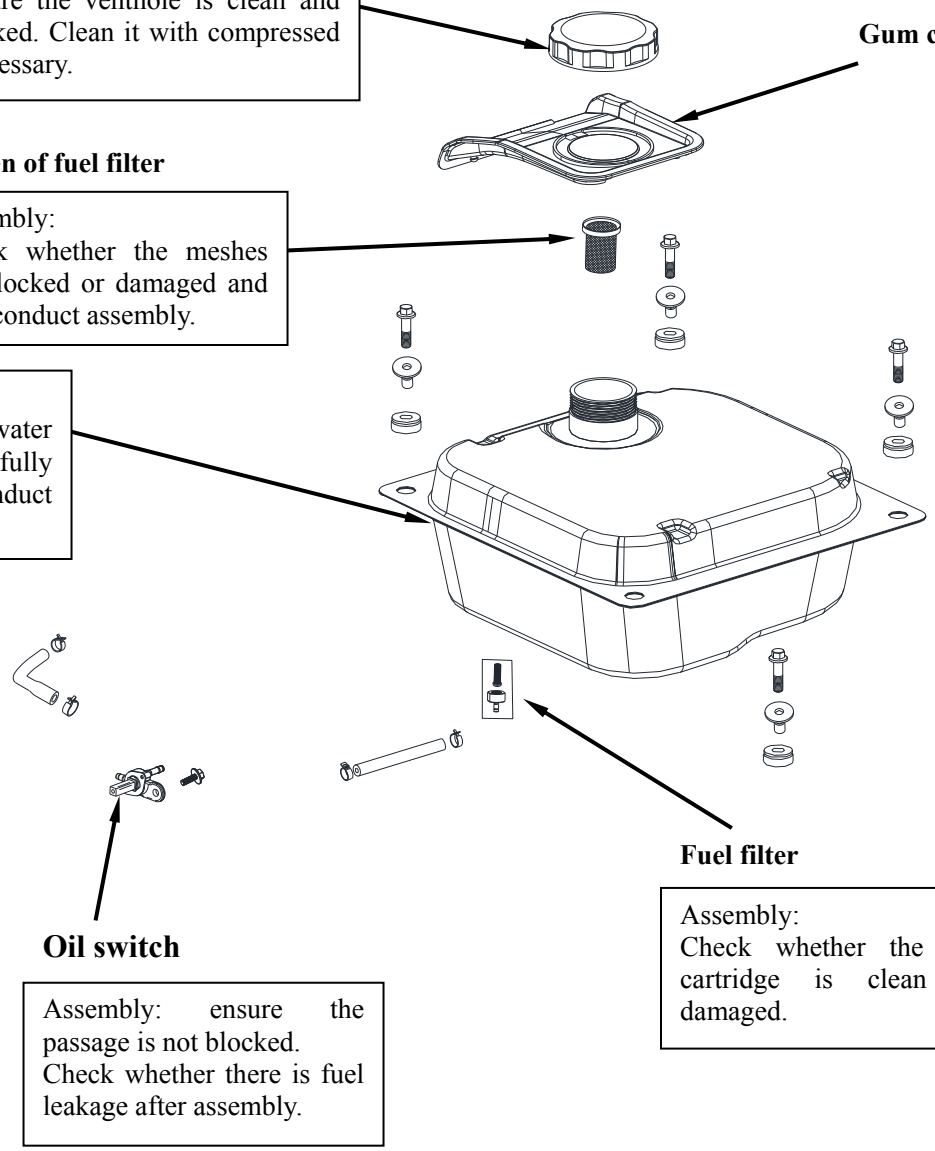
Gum cover of oil inlet

Screen of fuel filter

Assembly:
Check whether the meshes are blocked or damaged and then conduct assembly.

Fuel tank

Assembly:
Remove the dirt or water on the bottom, dry it fully and then conduct assembly.



Fuel filter

Assembly:
Check whether the filter cartridge is clean and damaged.

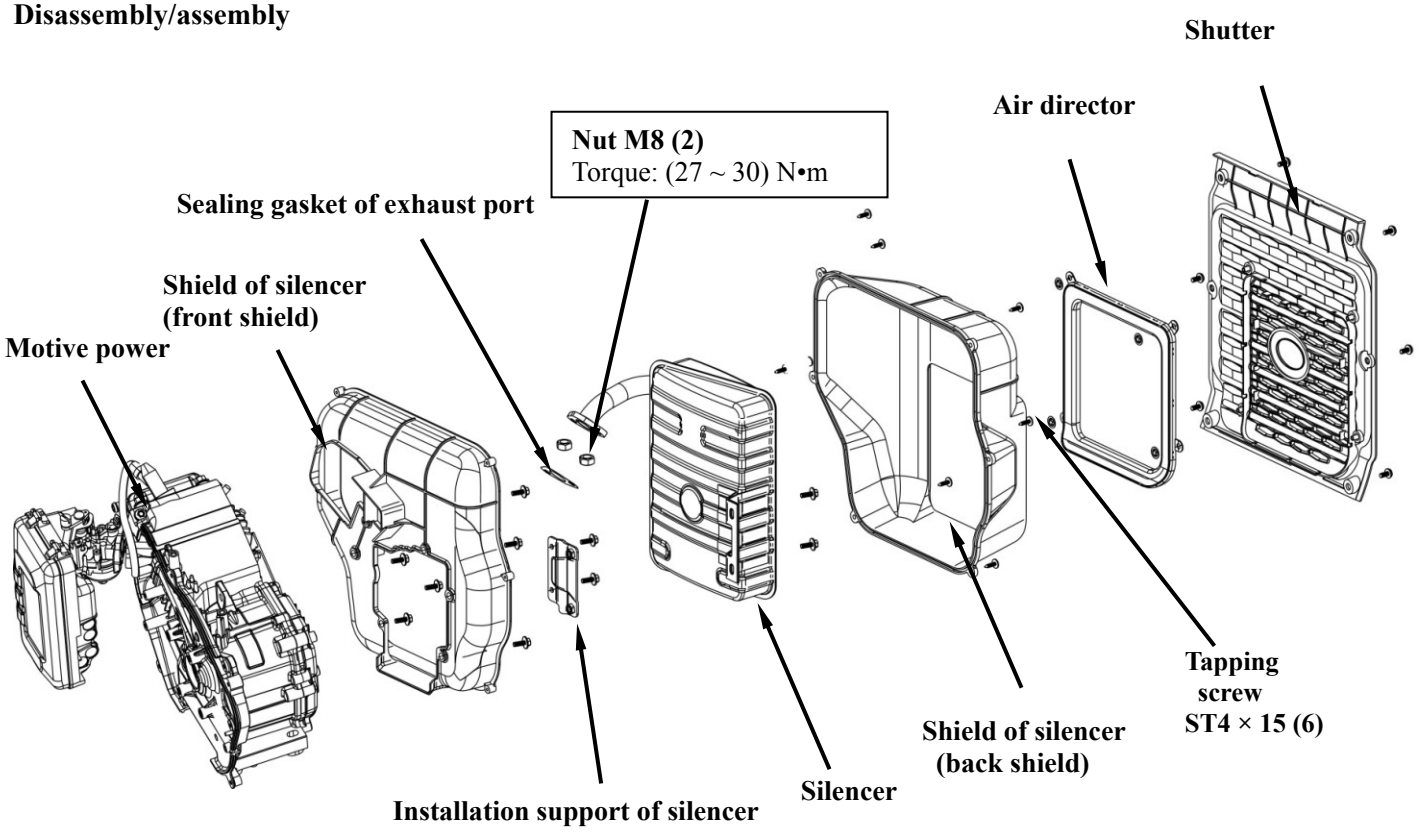
Oil switch

Assembly: ensure the passage is not blocked.
Check whether there is fuel leakage after assembly.

Chapter IV Disassembly & Repair

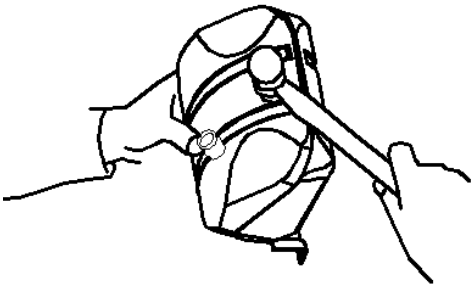
4-5-2 Silencer

Disassembly/assembly



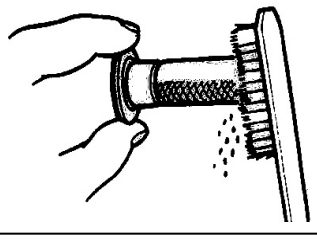
Silencer

Assembly:
Tap the silencer with plastic hammer to remove the carbon deposition inside and then conduct assembly.



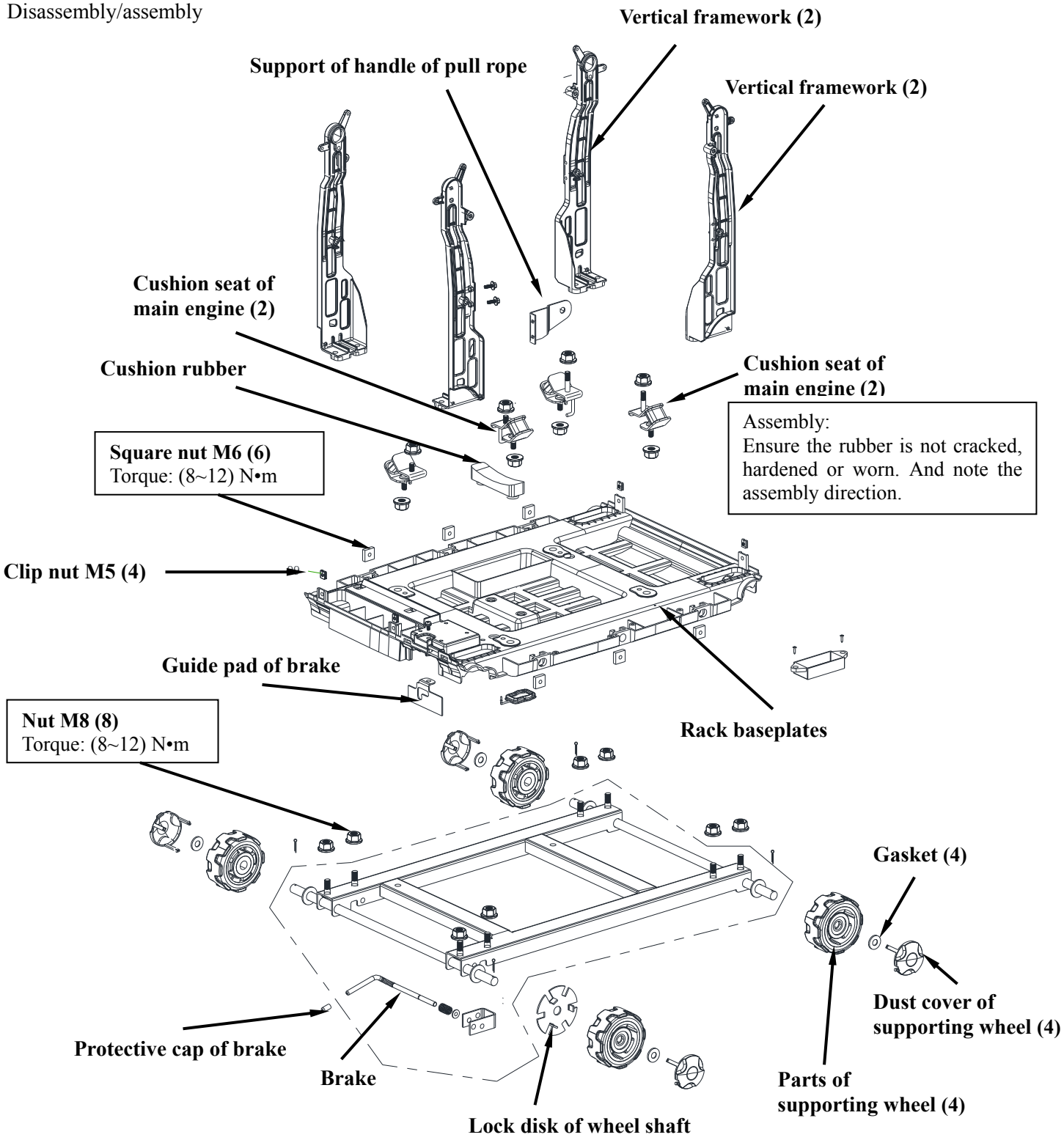
Spark canceller

Assembly:
Use wire brush to remove the carbon deposition and then conduct assembly.



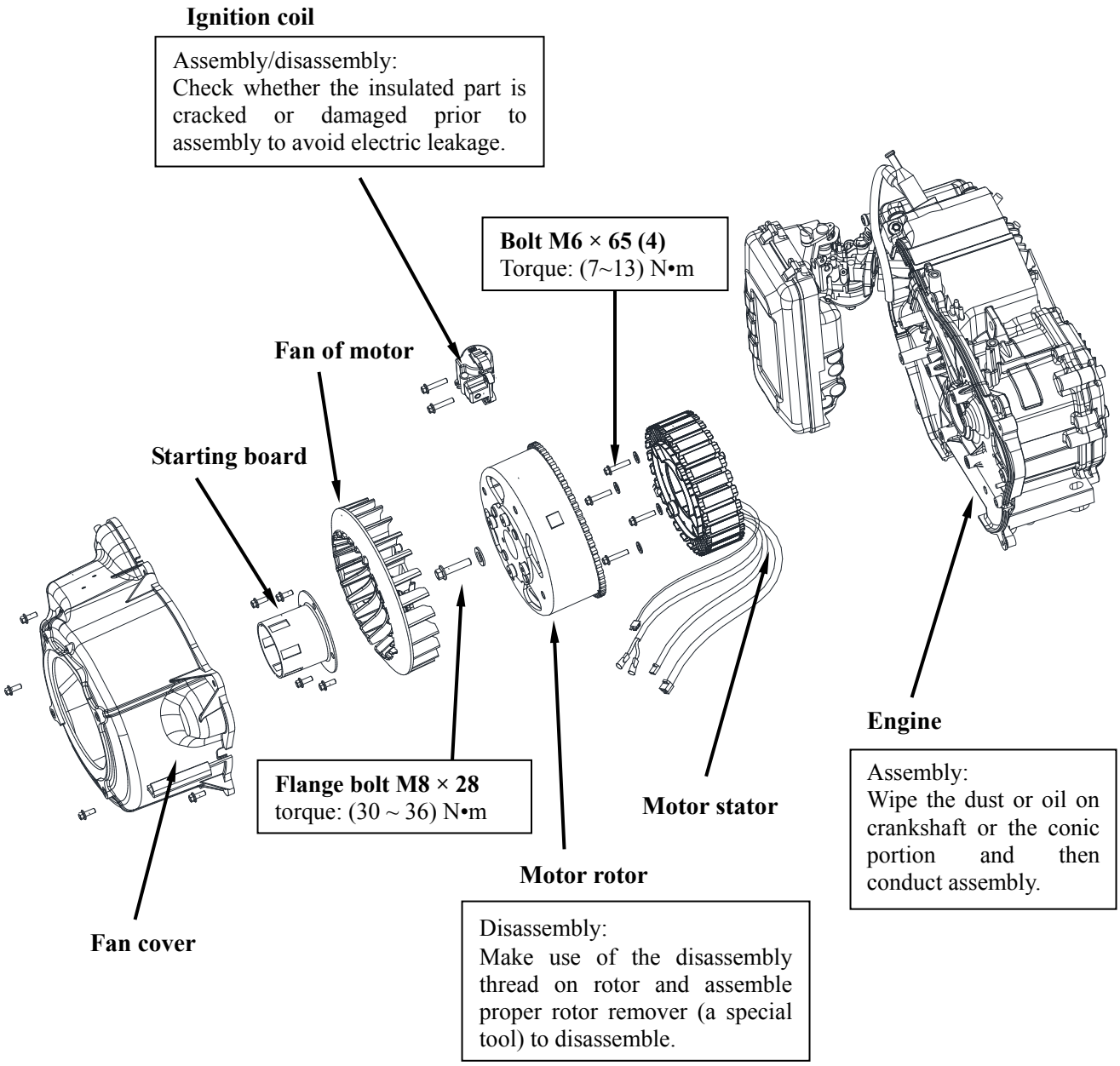
4-5-3 Rack baseplates

Disassembly/assembly

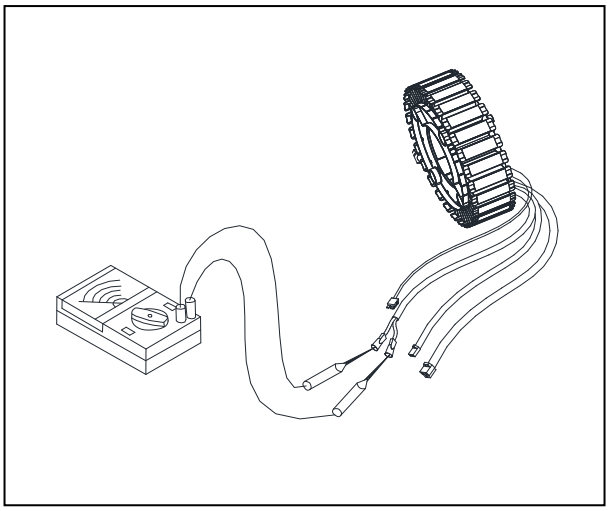


4-5-4 Motor parts

a. Disassembly/assembly



b. Check



Main winding/power-supply winding/DC winding

If there is not DC voltage output, check if the DC over-current protector trips and the DC receptacle are damaged. If yes, replace the receptacle.

If there is no AC voltage output, check if the AC receptacle is damaged. If yes, replace the receptacle.

Check if there is voltage between the motor stator and power-supply winding. If yes, replace the converter. Otherwise replace the stator.

The resistance among windings of 230 V 2 KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	2.0-2.4 Ω
Power-supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

The resistance among windings of 120 V 2 KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	0.75-0.85 Ω
Power -supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

The resistance among windings of 100V 2KW is as follows:

	Color of Guide Line	Resistance
Main winding	Brown	0.57-0.67 Ω
Power-supply winding	Orange	0.50-0.55 Ω
DC winding	Blue	0.19-0.21 Ω

Replace the stator if the resistance is zero or infinite.

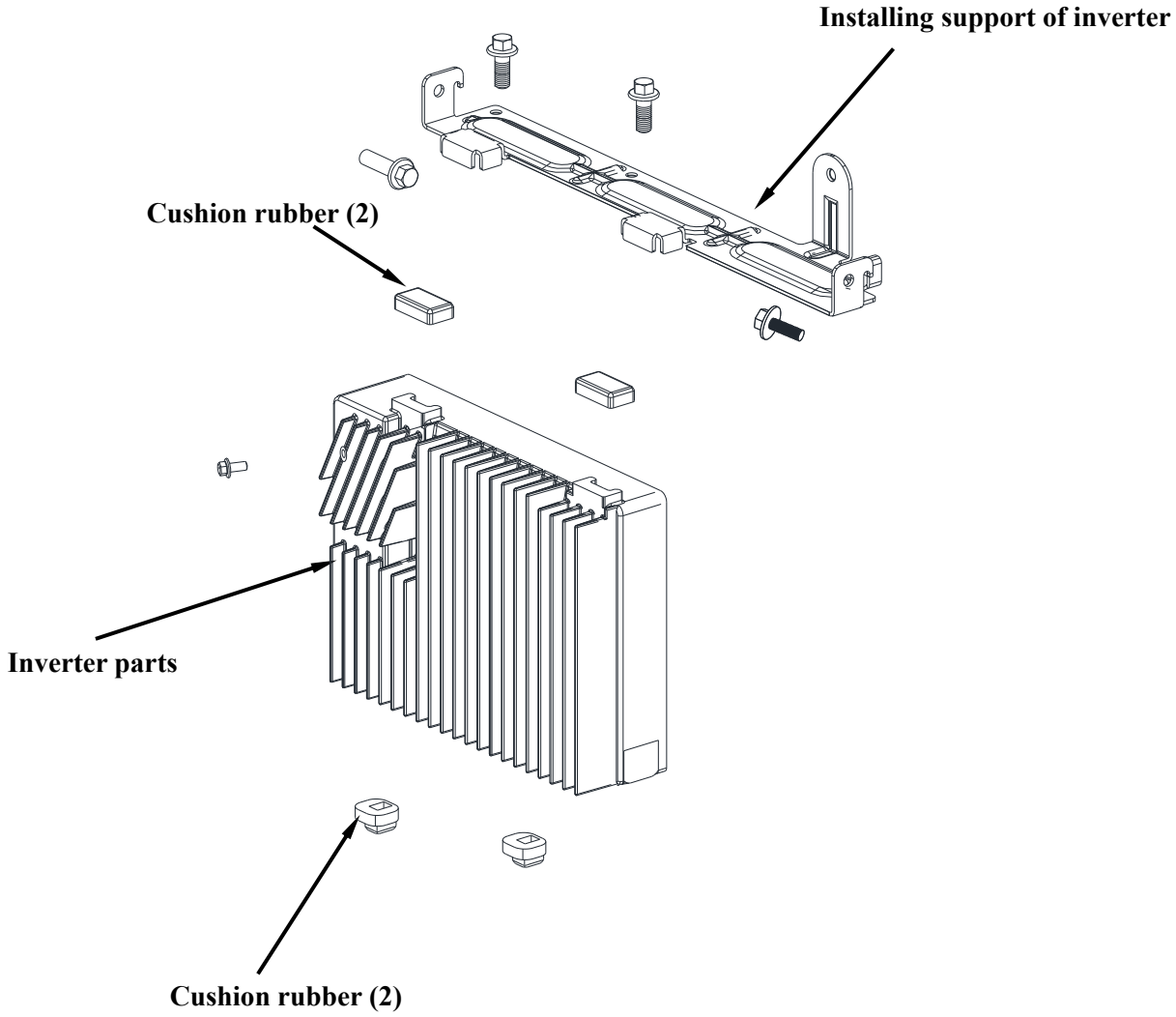
Disassemble the stator from motor.

Check if there is obvious damage on the varnished wire of each winding and the insulating layer of guide line. If yes, replace the stator.

Note: be careful not to damage the varnished wire of each winding and the insulating layer of guide line when disassembling and assembling stator.

4-5-5 Inverter parts

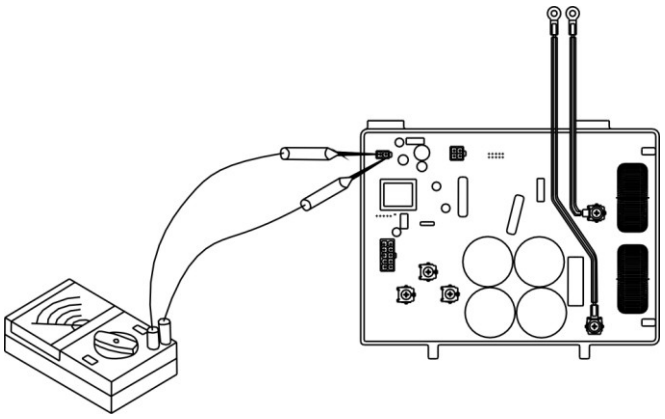
a. Disassembly/assembly



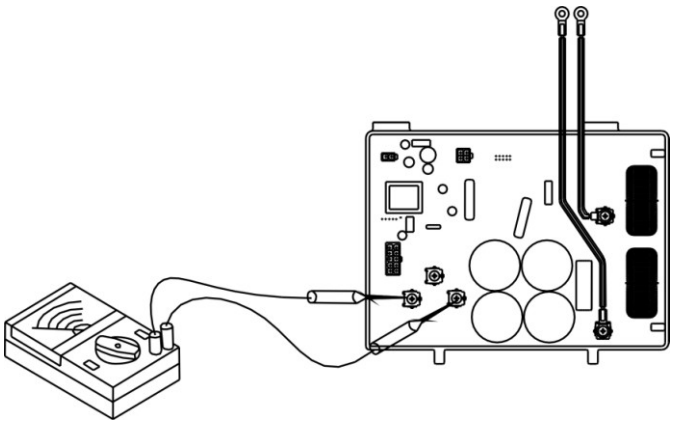
Chapter IV Disassembly & Repair

Inverter parts (detection)

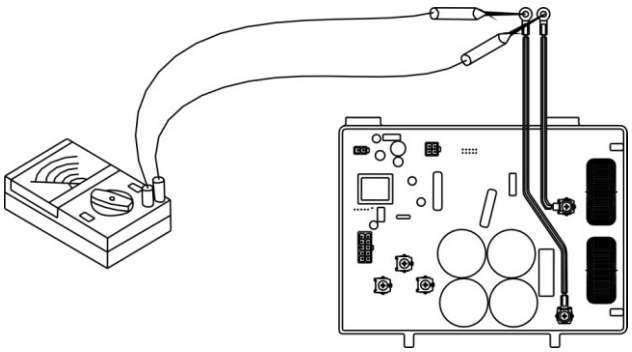
Check if the color of the wire of inverter changes, if the resin filled in inverter has bullate bulge, and if all electrical apparatus elements, connectors and wiring on inverter have visible color or damage.



Input shorted (low voltage): when the red light is on while the green light is off, there is no output. Resistance grade detects the low-voltage connector. Replace the converter if the resistance is zero or infinite.

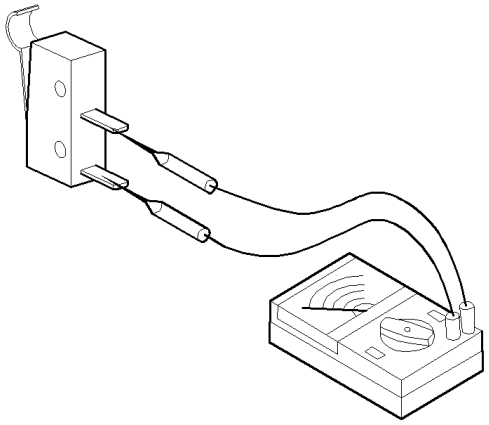


Input shorted (three phase): the green light is always on while the red light flashes (when loading). Resistance grade detects the three-phase connector (each resistance between every two connectors is required for detection). Replace the converter if the resistance is zero or infinite.



Output shorted: when the green light is off while the red light is on resistance grade detects the output end. Replace the converter if the resistance is zero or infinite.

Microswitch

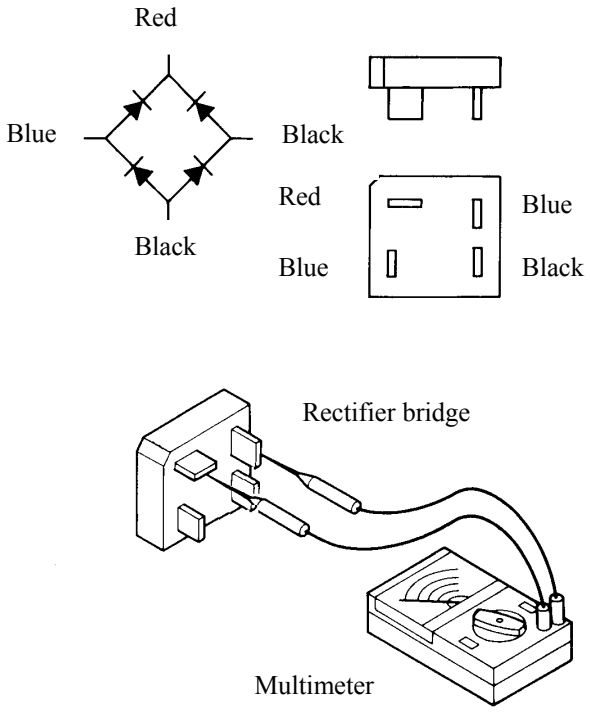


When the leaf spring is in the bouncing status, measure the resistance between two output terminals with ohmmeter. Replace the microswitch if the resistance is zero.

When the leaf spring is in hold-down status, measure the resistance between two output terminals with ohmmeter. Replace the microswitch if the resistance is infinite.

Chapter IV Disassembly & Repair

Rectifier bridge



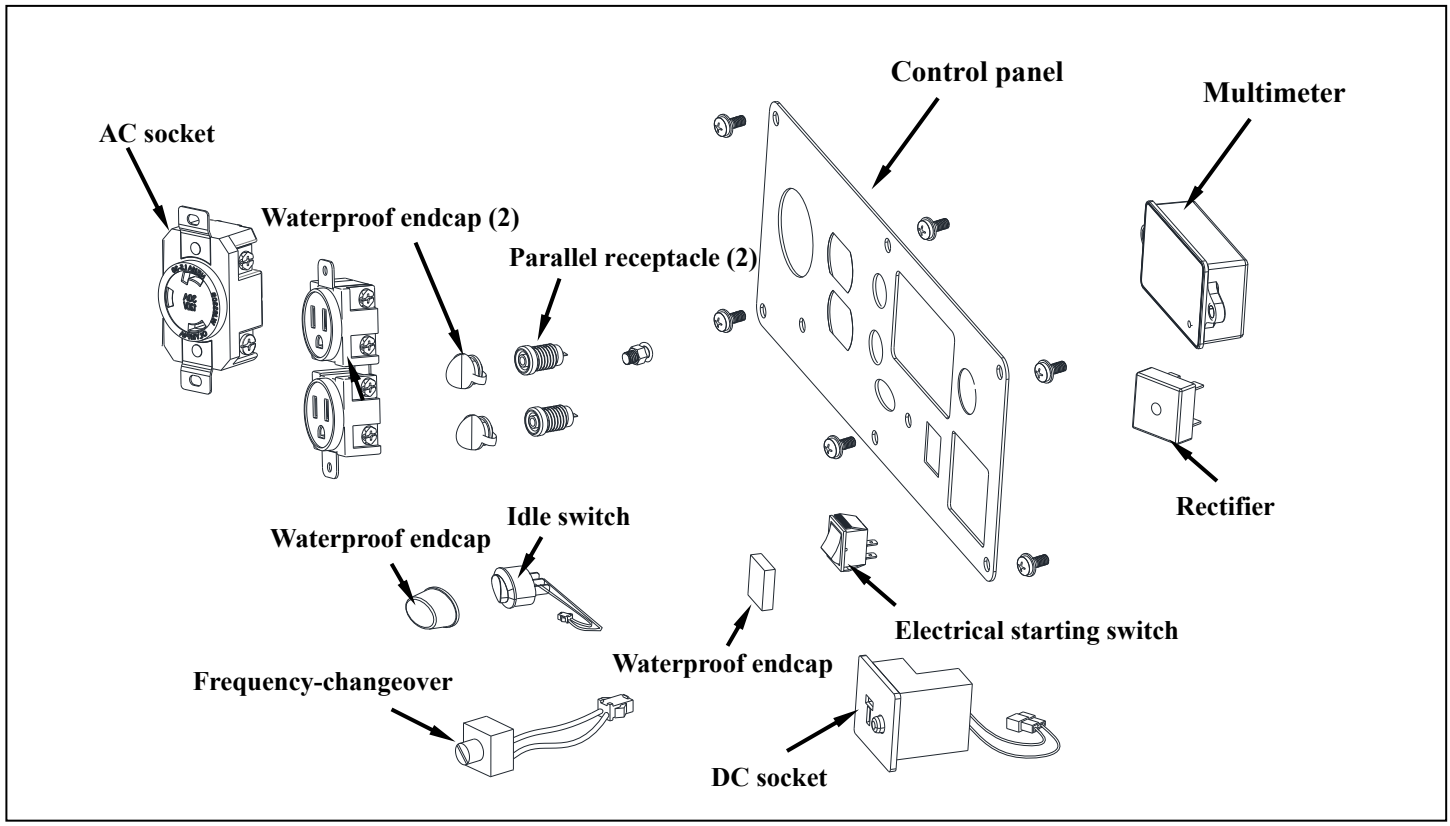
The internal circuit of rectifier bridge is shown as above. Detect the switching of each terminal of rectifier bridge with multimeter.

When the switching of rectifier bridge is shown as below, the rectifier bridge is under the normal status:

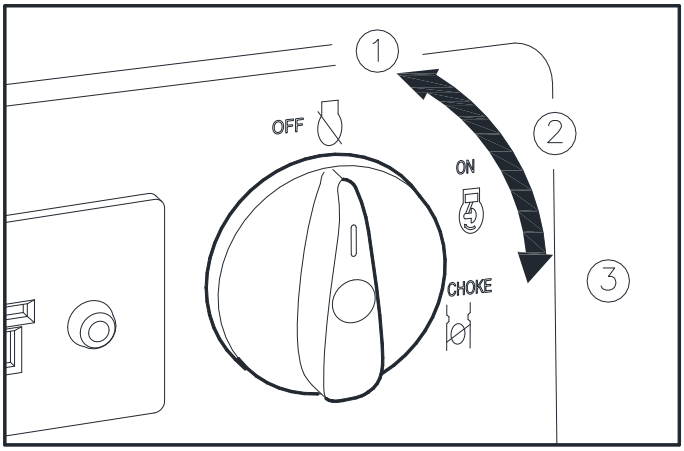
Digital Multimeter		Test with Red ⊕ Needle			
		Blue	**Blue**	**Red**	**Black**
Test with Black ⊖ Needle	**Blue**		Not conductive	Not conductive	Conductive
	Blue	Not conductive		Not conductive	conductive
	Red	Conductive	Conductive		Conductive
	Black	Not conductive	Not conductive	Not conductive	

Tip 1: "Switching" means the conductivity feature of diode and differs from short circuit. When the check of each section fails, replace with a new rectifier bridge.

4-5-6 Control panel parts



a. Disassembly/assembly



Combination switch

When the combination switch is at corresponding positions, check the state of ignition circuit, fuel switch and choke-valve switch.

When the combination switch is "OFF", ignition circuit is under the off status, that is to say, the two output terminals of microswitch are conductive and the ignition wire is grounded; when the oil switch is off, the engine cannot operate.

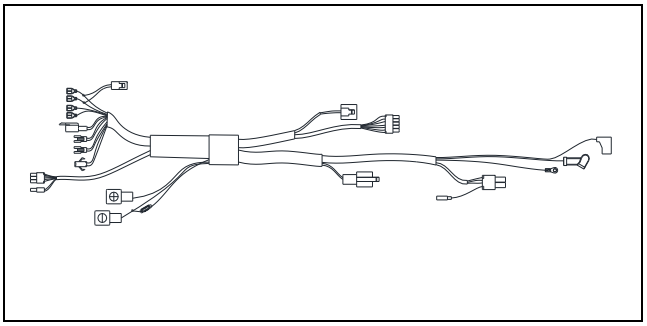
When the combination switch is "ON", ignition circuit is under the working status, that is to say, the two output terminals of microswitch are disconnected; the oil switch is on; choke valve is under the fully open state, the engine can operate normally.

When the combination switch is "CHOKE", the ignition circuit is under the working status, that is to say, the two output terminals of microswitch are disconnected; the oil switch is on; the choke valve is under the closed status;

When the switch is at corresponding position, check the conductivity of switch terminal.

Chapter IV Disassembly & Repair

Wire harness

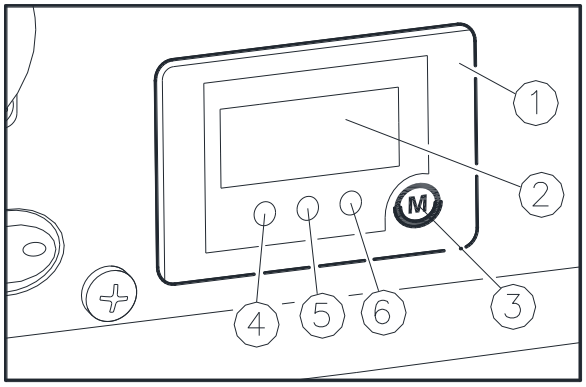


Remove the wire harness from panel, rectifier bridge and converter. Check if there is obvious damage on the insulating layer of guide line.If yes, replace the wire harness.

Check the switching of each guide line with ohmmeter and confirm each guide line is of conductivity. Replace the wire harness if the resistance is infinite.

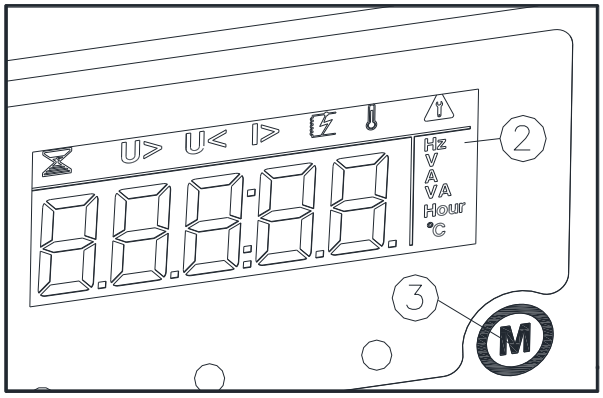
Note: disassemble and assemble wiring harness with a clamp. Take proper force to avoid damaging guide line and its connector clips.

Multimeter



① Multimeter
② LCD
③ Operational key
④Oil warning indicator light
⑤Fault indicator light
⑥AC indicator light

LCD



Normal operation:

Under normal operation, the operational key ③ is used to switch the display content circularly:

Voltage - current - power - cumulative time - current time.

Under operation in fault

U>. Display AC overvoltage, as well as character AC (display AC and numbers alternately);

a. Display DC overvoltage, as well as character dc (display dc and numbers alternately);

U<. Display AC undervoltage, as well as character AC (display AC and numbers alternately);

a. Display DC undervoltage, as well as character dc (display dc and numbers alternately);

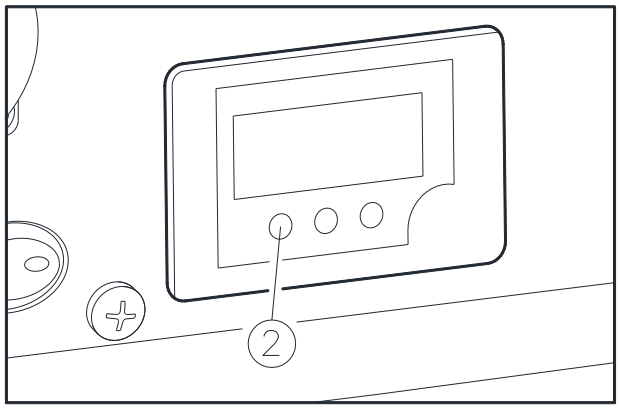
I> Output overcurrent of generator;

Output short circuit of generator;

Generator overheating;

Service time;

Oil-warning indicator light (red)



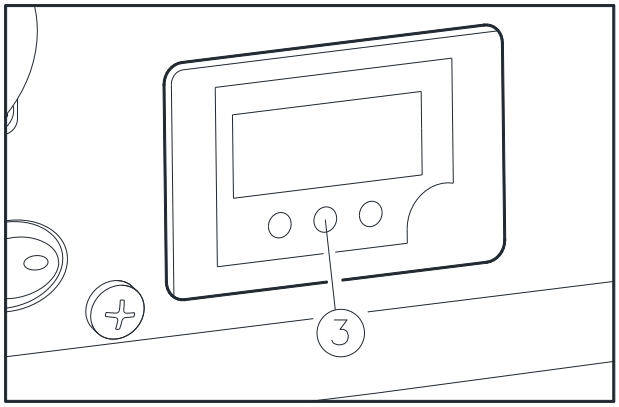
When the oil in crankcase reduces to less than safety line, the oil protection system will automatically turn off the engine and the oil-warning indicator light will be on; fill oil up to oil level, the engine will re-start.

Tip: when the engine flames out or cannot be started, screw the rotary knob of power switch to "ON" position, then pull the starting handle.

When the oil warning indicator light flashes for several seconds, it means the oil volume is insufficient, fill oil to make it re-start.

Check the indicator light with ohmmeter and confirm its conductivity. Replace the indicator light if the resistance is infinite.

Overload indicator light (red)



When the overload indicator light is on, the generator can detect that the output of its connecting electrical equipment has been overload, which will cause inverter overheating or AC voltage increase. At this time, AC protector operates, to stop the generation of the generator so as to protect the generator and its electrical equipment. AC indicator light (green) will be off while the overload indicator light (red) will be on; however, the engine will not stop operation.

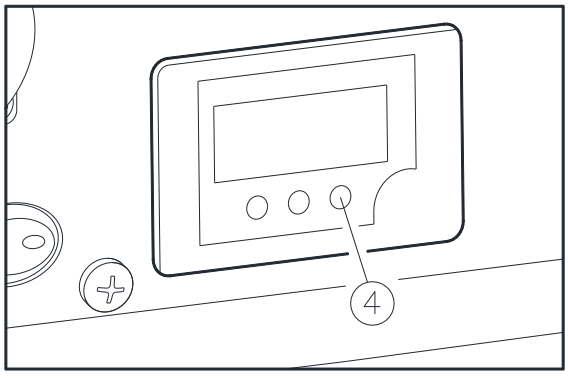
When the overload indicator light is on and generator unit has no output, please take following countermeasures:

1. Shut down all connecting electrical equipment and stop the engine.
2. Reduce the total power of connecting electrical equipment to the range of rated output.
3. Check if the inlet of cool air is blocked with foreign matters and whether related control parts are normal. If yes, eliminate the problems immediately.
4. Re-start the engine after check.

Tip: when using the electrical equipment with relatively high starting current (such as compressor and submersible pump), the overload indicator light may be on for several seconds at the beginning, but this is not the fault aforesaid.

Check the indicator light with ohmmeter and confirm its conductivity. Replace the indicator light if the resistance is infinite.

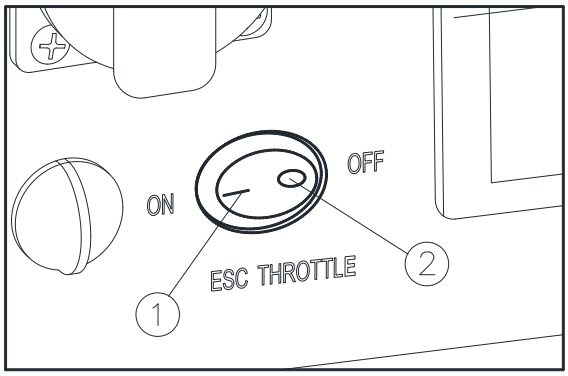
AC indicator light (green)



When the engine starts and operate normally, the AC indicator light will be on.

Check the indicator light with ohmmeter and confirm its conductivity. Replace the indicator light if the resistance is infinite.

ESC switch



① "ON"

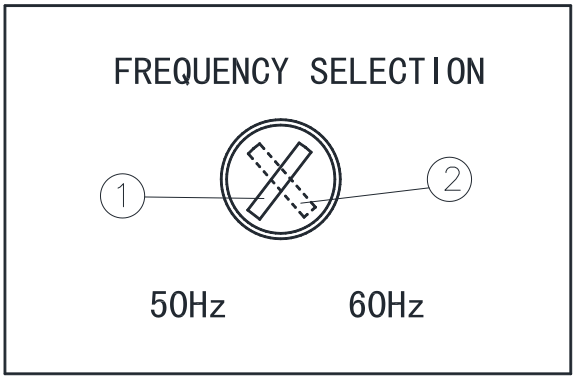
When the ESC switch is placed at the "ON' position, energy-efficient equipment will control the engine speed as per the connected load, so as to obtain better fuel consumption and low noise.

② "OFF"

When the ESC switch is placed at the "OFF' position, the engine will operate in rate speed (2,600 r/min) whether it is connected load.

Tip: when using following devices, such as air compressor and sinking water pump, ESC must be closed as relatively large starting current is required.

Frequency switching switch



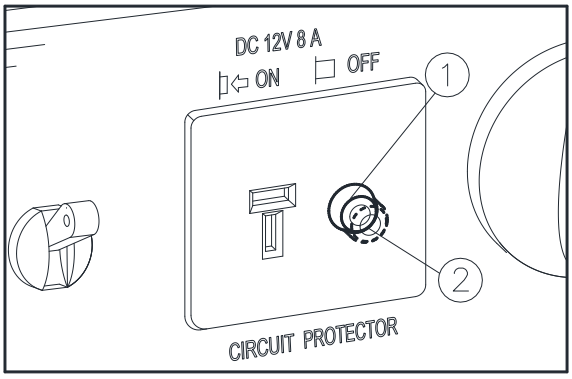
① "ON"

② "OFF"

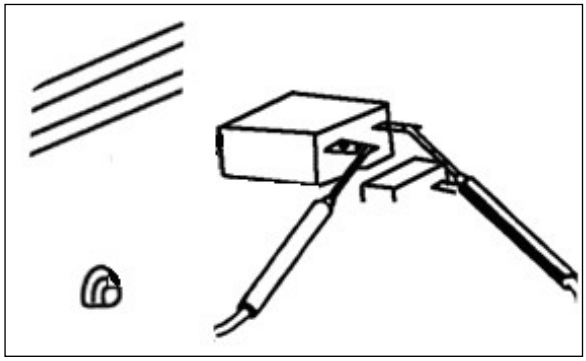
If it is required to switch the output frequency of generator, please stop the generator first, then use flat bottle opener to adjust the position of frequency switching switch.And then re-start the generator.

Notice Only when generator is under the stopping status, the frequency switching switch can achieve functional frequency switching. The output frequency will not change if the frequency is switched during when the generator operates.

DC breaker protector



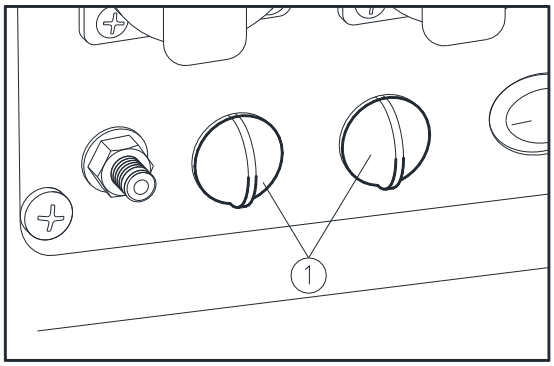
When the electronic equipment connects to generator operates, if the current exceeds the rate current, the DC switch will automatically turn to the "OFF" position. Please turn the DC switch to "ON" position when re-operating the generator,



Check the conductivity between terminals of DC breaker protector with multimeter.

When the button of breaker protector is pressed, the breaker protector shall be conductive.

Parallel terminal

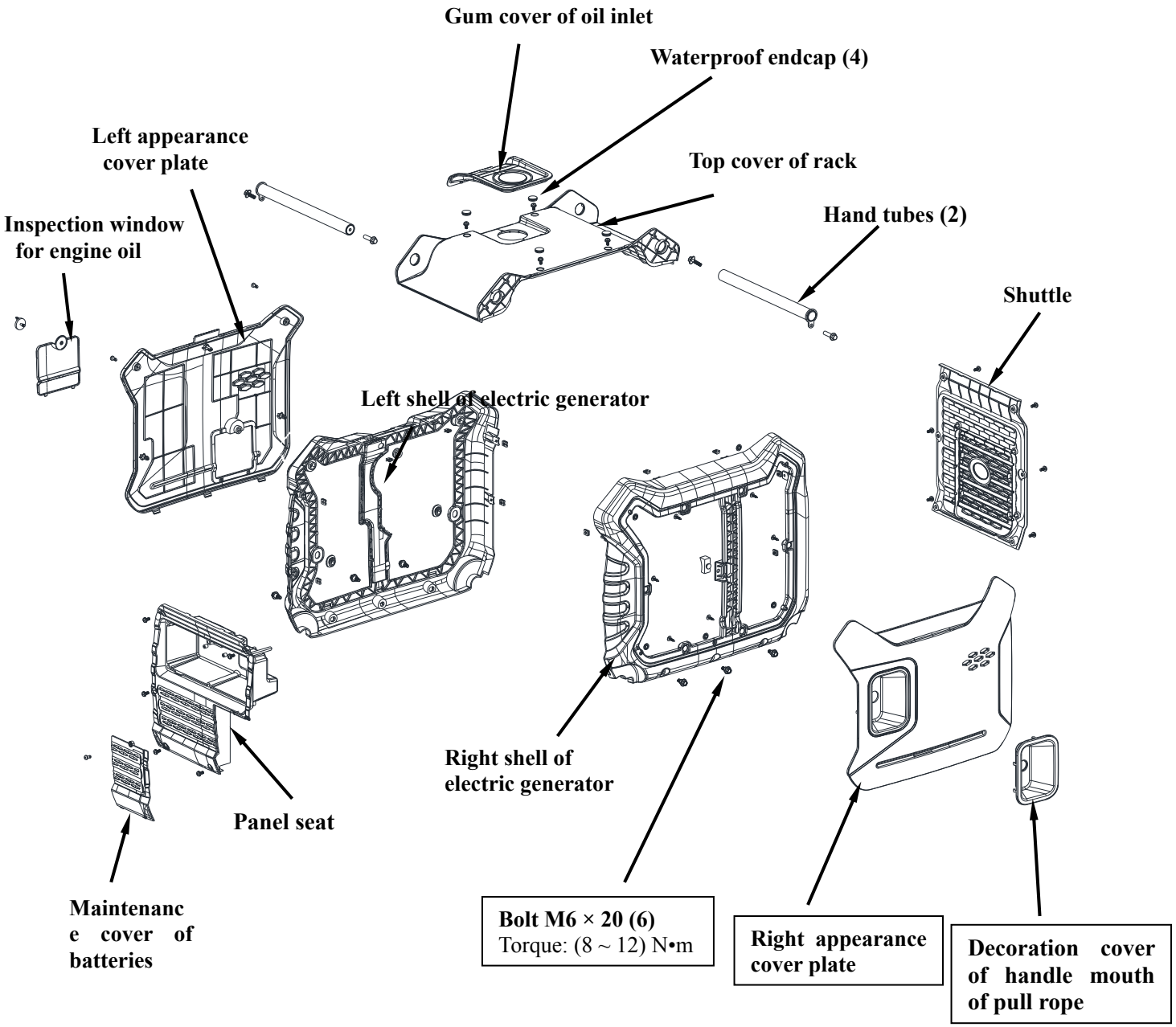


The parallel terminal ① is used to connect the two special LC3500i cables under parallel operation. Parallel operation requires two LC3500i equipment and special cable. (The rated output power of parallel operation is 6 KVA, the rated current of 100 V generator is 60 A, the rated current of 120V generator is 50A and the rated current of 230 V generator is 26 A.)

Operation program and related precautions are detailed in the part of parallel cable system. For related matters about parallel cable system, please consult Loncin dealer.

4-5-7 Appearance assembly

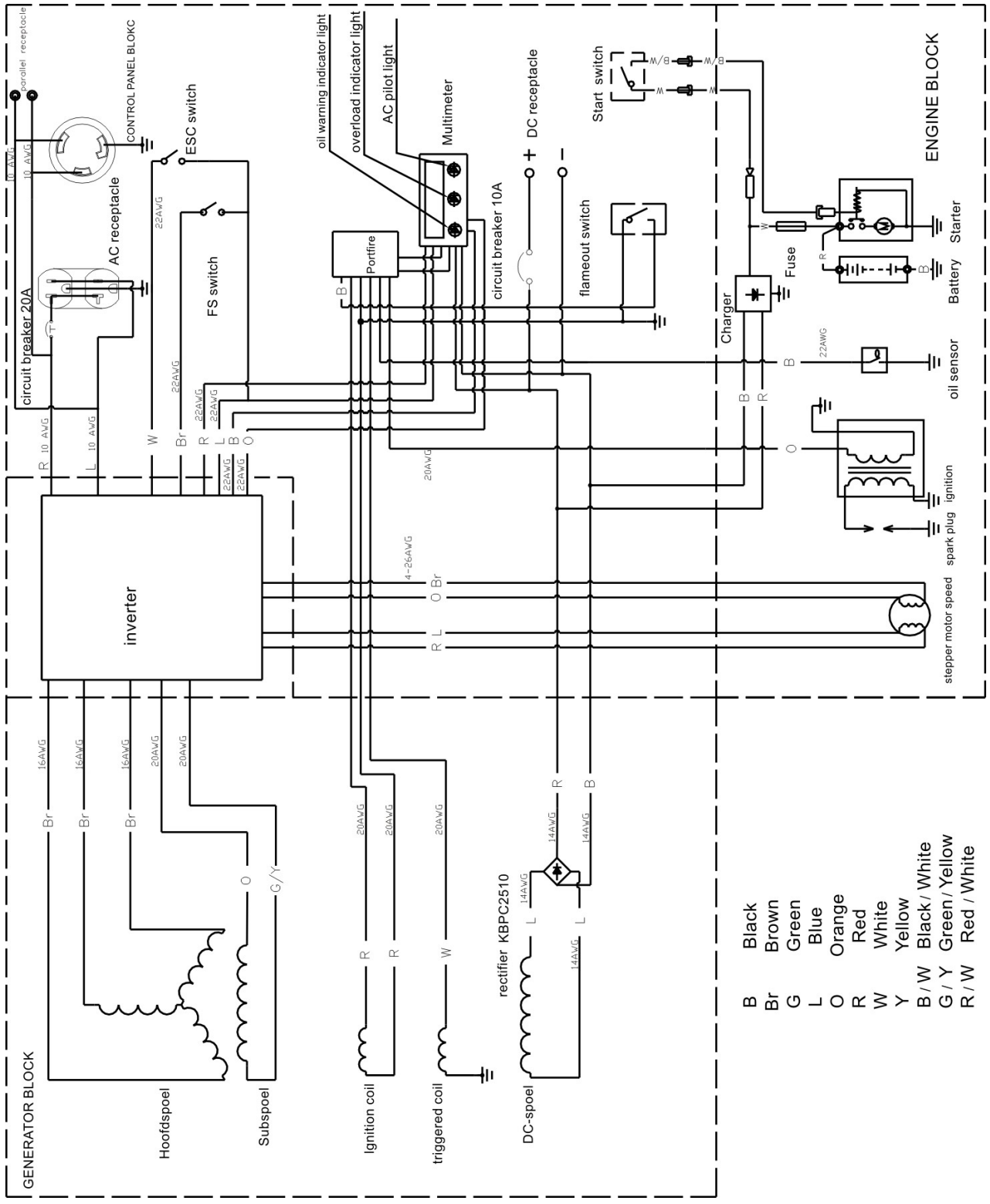
a. Disassembly/assembly



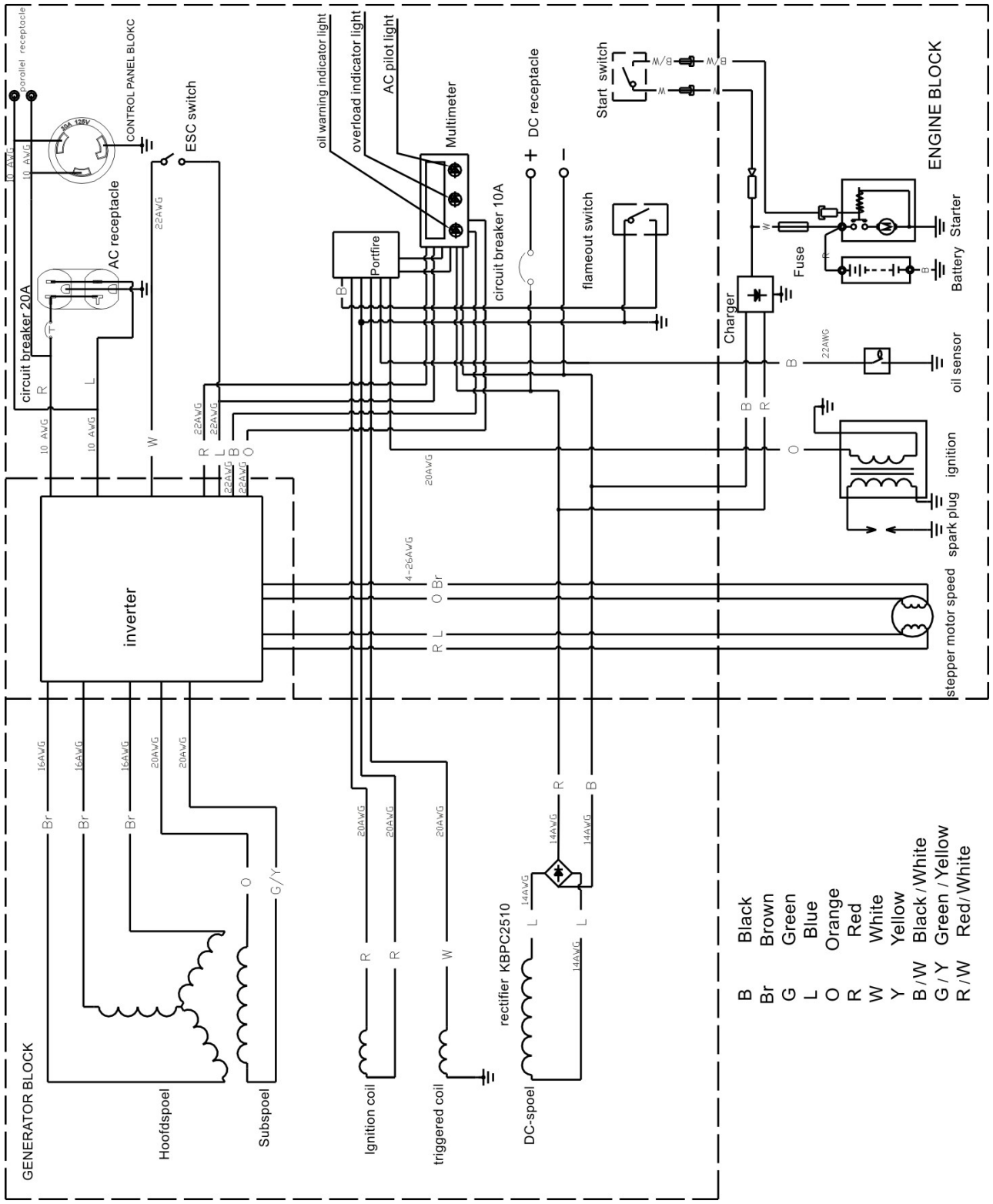
Chapter III Maintenance

5-1 LC3500i Circuit diagram

100V



120 V


parallel receptacle
CONTROL PANEL BLOKC
ESC switch
oil warning indicator light
overload indicator light
AC pilot light
Multimeter
DC receptacle
Start switch
ENGINE BLOCK
AC receptacle
circuit breaker 20A
Portfire
circuit breaker 10A
flameout switch
Fuse
Starter
Battery
Charger
oil sensor
ignition
spark plug
inverter
stepper motor speed
GENERATOR BLOCK
Hoofdspoel
Subspoel
Ignition coil
triggered coil
DC-spoel
rectifier KBPC2510
B Black
Br Brown
G Green
L Blue
O Orange
R Red
W White
Y Yellow
B/W Black/White
G/Y Green/Yellow
R/W Red/White

Chapter III Maintenance

50 Hz, 230 V with parallel receptacle