

R80-R420 Type V Horizontal Axis Maintenance Manual



Chongqing RATO Technology Co., Ltd.

This Manual covers specifications that shall be followed in the process of regular maintenance and troubleshooting of general-purpose gasoline engines.

Make sure the equipment's maintenance staff can refer to this Manual at any time.

This Manual describes correct methods to repair this equipment. The Company does not undertake any liability for any personal casualty and equipment damage caused due to ignoring these rules.

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Safety Warnings

The personal and property safety of you and others is very important. Please carefully read the three kinds of extremely important safety warnings that we have described in the Maintenance Manual and on the decals of the gasoline engines. There is the symbol \bigwedge in front of each safety warning. Details are as follows:

ADANGER Failure to follow instructions will lead to extremely serious injuries.

A WARNING Failure to follow instructions may lead to very serious injuries.

A CAUTION Failure to follow instructions may lead to minor injuries.

NOTICE Failed to follow instructions, your gasoline engine and other properties may be damaged.

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Part I Introduction

1-1 Components of general-purpose gasoline engine



1-2 Parameters

Model Parameters	R80-V			
L×W×H	310×290×310 mm			
Net weight	10	kg		
Type of gasoline engine	Four-stroke, overhead	valve, single-cylinder		
Displacement	78.5	Jcm ³		
Compression ratio	9.():1		
Cylinder diameter x stroke	52×3	7 mm		
Maximum output power	1.8kw / 1	3600rpm		
Maximum torque	4N.m / 2	2500rpm		
Cooling system	Forced a	ir cooling		
Ignition system	Breakerless transistori	zed coil ignition (TCI)		
Spark plug	E4	TC		
Lubrication system	Splash type			
Power take-off shaft direction	Counterc	lockwise		
Model Parameters	R210-V	R300-V		
L×W×H	390×320×345mm	420×395×430mm		
Net weight	16.5 kg	26kg		
Type of gasoline engine	Four-stroke, overhead	valve, single-cylinder		
Displacement	212 cm ³	301 cm ³		
Compression ratio	9.0 : 1	8.5 : 1		
Cylinder diameter x stroke	70×55 mm	80×60 mm		
Maximum output power	5.0 kw / 3600rpm	7.0 kw / 3600rpm		
Maximum torque	13.5 N.m / 2500rpm	21 N.m / 2500rpm		

Cooling system	Forced air cooling		
Ignition system	Breakerless transistorized coil ignition (TCI)		
Spark plug	BPR6ES(NGK), NH	HSP LD F7RTC, F7TC	
Lubrication system	Spla	ish type	
Power take-off shaft direction	Counter	rclockwise	
Model Parameters	R420-V		
L×W×H	465×415×440 mm		
Net weight	28kg		
Type of gasoline engine	Four-stroke, overhead valve, single-cylinder		
Displacement	420cm ³		
Compression ratio	8.5: 1		
Cylinder diameter x stroke	90×66mm		
Maximum output power	9.5kw / 3600rpm		
Maximum torque	28N.m / 2500rpm		
Cooling system	Forced	air cooling	
Ignition system	Breakerless transistorized coil ignition (TCI)		
Spark plug	BPR6ES(NGK), NHSP LD F7RTC, F7TC		
Lubrication system	Splash type		
Power take-off shaft direction	Counter	rclockwise	

1-3 Maintenance standards

1-3-1R80-V

Part	Item	Standard	Service limit
Gasoline	Maximum no-load speed	3850rpm	
engine	Cylinder pressure	≥0.9Mpa (1400rpm)	

Cylinder	Cylinder bore diameter	52-52.015mm	52.165
Cylinder head cover	Warping		0.1
	Outer diameter of piston skirt	51.975-51.985mm	51.9
	Piston-cylinder clearance	0.015-0.04mm	0.12
Piston	Inner diameter of piston pinhole	10 .002-10.008mm	10.048
	Outer diameter of piston pin	9.992-9.998mm	9.954
	Piston pin-piston pinhole clearance	0.004-0.016mm	0.03
	Piston ring side clearance: top ring/ring 2 Oil ring Piston ring closing clearance: top	0.03-0.07 mm 	0.15
Piston ring	ring/ring 2 Oil ring Piston ring width: top ring/ring 2/oil ring	0.15-0.3mm 0.1-0.6mm 1.5mm 2.5mm	1 1 1.37 2.37
	Inner diameter of small end	10.011-10.022mm	10.05
Connecting	Inner diameter of big end	23.02-23.03mm	23.05
rod	Big end oil film clearance	0.035-0.055mm	0.12
	Small end side clearance	0.1-0.7mm	1.1
Crankshaft	Outer diameter of main journal	22.975-22.985mm	22.945
Valve	Valve clearanceIntakeCuter diameter ofIntakevalve stemExhaustIntake/exhaustIntake/exhaust	0.15±0.02mm 0.20±0.02 mm 5.465-5.48mm 5.445-5.46mm	 5.318 5.275
	Conduit inner	5.50-5.512mm	5.572

	diameter	Intake	0.015-0.052mm	0.1
	Lifter clearance Ex	thaust	0.015-0.052mm	0.12
			0.8mm	2.0
	Valve seat contact width		25.0mm	24
	Free length of spring			
	Cam height Intake		29.4mm	29.2
Camshaft	Exhaust		29.4mm	29.2
	Outer diameter of journal		12.966-12.986mm	12.91
Crankcase cover	Inner diameter of camshaft bore	;	13.0-13.018mm	13.048

1-3-2 R210-V

Part	Item	Standard	Service limit
Gasoline	Maximum no-load speed	3750-3810rpm	
engine	Cylinder pressure	≥1.17Mpa (1400rpm)	
Cylinder	Cylinder bore diameter	70.0mm	70.165mm
Cylinder head cover	Warping		0.10mm
	Outer diameter of piston skirt	69.985mm	69.845mm
Piston	Piston-cylinder clearance	0.015-0.05mm	0.12mm
	Inner diameter of piston pinhole	18 .002mm	18.048mm
	Outer diameter of piston pin	18.0mm	17.954mm
	Piston pin-piston pinhole clearance	0.002-0.014mm	0.06mm

Piston ring	Piston ring side clearance: top ring/ring 2 Oil ring Piston ring closing clearance: top ring/ring 2 Oil ring Piston ring width: top ring/ring 2/oil ring	0.015-0.045mm 0.2-0.4mm 0.15-0.35mm 1.5mm 2.5mm	0.15mm 1.0mm 1.0mm 1.37mm 2.37mm
Connecting rod	Inner diameter of small end Inner diameter of big end Big end oil film clearance Small end side clearance	18.011mm 30.02mm 0.040-0.063mm 0.1-0.7mm	18.07mm 30.066mm 0.12mm 1.1mm
Crankshaft	Outer diameter of main journal	29.98mm	29.92mm
Valve	Valve clearanceIntakeOuter diameter of valve stemIntakeOuter diameter of valve stemIntakeConduitinnerIntakeConduitinnerIntakeConduitinnerExhaustLifter clearanceExhaustValve seat contact widthIntakeFreelength ofIntake	0.15±0.02mm 0.20±0.02 mm 5.48mm 5.44mm 5.50mm 0.02-0.044mm 0.06-0.087mm 0.8mm 34.0mm	 5.318mm 5.275mm 5.572mm 0.1mm 0.12mm 2.0mm 32.5mm

	Cam height Intake	27.7mm	27.45mm
Camshaft	Exhaust	27.75mm	27.50mm
	Outer diameter of journal	13.984mm	13.916mm
Crankcase cover	Inner diameter of camshaft bore	e 14.0mm	14.048mm
	Master nozzle	0.85	
Carburetor	Float height	13.7±1.5mm	
	Turning circle of adjusting scr mixing ratio	rew of 2-1/8 circle	
Spark plug	Clearance	0.7-0.8mm	
Spark plug cap	Resistance	7.5-12.5kΩ	
	Resistance Primary	side 0.8-1.0Ω	
Ignition coil	Ignition coil side	5.9-7.1kΩ	
	clearance	0.4-0.6mm	

1-3-3 R300-V

Part	Item	Standard	Service limit
Gasoline	Maximum no-load speed	3750-3850rpm	
engine	Cylinder pressure	≥1.1Mpa (1400rpm)	
Cylinder	Cylinder bore diameter	80.0-80.015mm	80 .17mm
Cylinder head cover	Warping		0.10mm
	Outer diameter of piston skirt	79.975-79.985mm	79.85mm
D	Piston-cylinder clearance	0.015-0.04mm	0.12mm
Piston	Inner diameter of piston pinhole	15 .002-15.008mm	15.242mm
	Outer diameter of piston pin	14.992-14.998mm	14.95mm

	Piston pin-piston pinhole clearance	0.004-0.016mm	0.08mm
	Piston ring side clearance: top ring/ring 2	0.025-0.06mm	0.15mm
	Oil ring	0.20.0.40	1.0
	Piston ring closing clearance top ring	0.20-0.40mm	1.0mm
Piston ring	Ring 2	0.30-0.50mm	1.0 mm
	Scraping ring	0.2-0.7mm	1.0mm
	Piston ring width: top ring / ring 2	2.8-3.0mm	1.37mm
	Oil ring	2.45-2.75mm	2.0mm
		1.5.011.15.000	15.05
	Inner diameter of small end	15.011-15.022mm	15.27mm
Connecting	Inner diameter of big end	33.025-33.039mm	33.07mm
rod	Small end oil film clearance	0.013-0.03mm	0.12mm
	Big end side clearance	0.25-0.65mm	1.0mm
Crankshaft	Outer diameter of main journal	32.975-32.985mm	32.92mm
	Valve clearance Intake		
	Exhaust	0.10-0.15mm	
	Outer diameter of Intake	0.15-0.20mm	
	valve stem Exhaust	5.468-5.48mm	5.34mm
	Intake/ex	5.43-5.445mm	5.3mm
Valve	Conduit inner haust	5.485-5.5mm	5.56mm
	diameter Intake	0.005-0.032mm	0.10mm
	Valve stem clearance Exhaust	0.04-0.07mm	0.12mm
	Valve seat contact	0.8-1.0mm	2.0mm
	width	38.5-39.5mm	37.5mm
	Free length of spring		
Com-h-f	Cam height Intake	6.045mm	5.95mm
Camsnatt	Exhaust	5.766mm	5.65mm

	Outer diameter of jour	nal	16.166-16.184mm	16.12mm
Crankcase cover	Inner diameter of camshaft bore		16.2-16.218mm	16.248mm
	Master nozzle		Φ2	
Carburetor	Float height		1-3mm	
	Turning circle of adjusting screw of mixing ratio		2-7/8 circle	
Spark plug	g Clearance		0.7-0.8mm	
Spark plug cap	Resistance		9.5-10.5kΩ	
	Resistance	Primary		
Ignition coil		side	0.6-0.9Ω	
	Ignition coil	Secondary	5.6-6.9kΩ	
	clearance	side	0.3-0.5mm	

1-3-4 R420-V

Part	Item	Standard	Service limit	
Gasoline	Maximum no-load speed	3750-3850rpm		
engine	Cylinder pressure	≧1.2 Mpa (1400 rpm)	-	
Cylinder	Cylinder bore diameter	90-90.015mm	90.17mm	
Cylinder	Worning		0.10	
head cover	warping		0.1011111	
	Outer diameter of piston skirt	89.96-89.97 mm	89.85mm	
Piston	Piston-cylinder clearance	0.03-0.055 mm	0.27mm	
	Inner diameter of piston pinhole	20.002-20.008 mm	20.042mm	
	Outer diameter of piston pin	19.992-19.998 mm	19.95mm	
	Piston pin-piston pinhole clearance	0.004-0.016 mm	0.08mm	
Piston ring	Piston ring side clearance: top	0.02-0.06 mm	0.15mm	

	ring/ring 2		
	Oil ring	0.2-0.4 mm	1.0mm
	Piston ring closing clearance: top	0.2-0.7 mm	1.0mm
	ring/ring 2	3.7-3.9 mm	1.37mm
	Oil ring	2.95-3.15 mm	2.0mm
	Piston ring width: top ring/ring 2/oil		
	ring		
	Inner diameter of small end	20.011-20.022 mm	20.07mm
Connecting	Inner diameter of big end	36.025-30.039 mm	36.07mm
rod	Big end oil film clearance	0.25-0.65 mm	0.12mm
	Small end side clearance	0.013-0.03 mm	1.0mm
Crankshaft	Outer diameter of main journal	35.975-35.985 mm	35.92mm
	Valve clearance Intake		
	Exhaust	0.013-0.017 mm	
	Outer diameter of Intake	0.018-0.022 mm	
	valve stem Exhaust	6.565-6.580 mm	6.44mm
	Conduit inner Intake/exhaust	6.545-6.560 mm	6.4mm
Valve	diameter	6.6-6.615 mm	6.66mm
	Lifter clearance	0015-0.055mm	0.11mm
	Valve seat contact	0.015-0.055mm	0.13mm
	width	0.65-0.95	2.0mm
	Free length of	38.8-39.2mm	37.5mm
	spring		
	Cam height Intake	6.59 mm	33.58mm
Camshaft	Exhaust	6.07 mm	32.88mm
	Outer diameter of journal	15.966-15.984 mm	15.92mm
Crankcase	Inner diameter of camshaft bore	16-16.018	16.048mm

Part I Introduction

cover				
Carburetor	Master nozzle Float height Turning circle of adjus mixing ratio	sting screw of	Φ2 1-3 	
Spark plug	Clearance		0.7-0.8mm	
Spark plug cap	Resistance		9.5-10.5kΩ	
Ignition coil	Resistance Ignition coil clearance	Primary side Secondary side	0.6-0.9Ω 5.6-6.9kΩ 0.3-0.5mm	

Part II Dimension and Torque

- 2-1 Dimensions of general-purpose gasoline engine
- 2-1-1 R80-V



2-1-2 R210-V





2-1-2 R300-V





2-1-3 R420-V







2-2 Torque parameters

2-2-1

Serial No.	Fastening position	Model	Fastener name	Specifications & model	Torque value	Connecting components
1	Fuel drain bolt	R80-V R210-V R300- R420-V	Hexagon flange bolt	M10×1.5×15 8.8-A M10×1.5×15 8.8-A M12×1.5×18 8.8-A	22 ± 2	Fuel drain bolt - flat washer - crankcase
2	Oil sensor	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×14 8.8-A M6×14 8.8-A M6×16 8.8-A	8±2	Oil sensor -
2	On sensor	R80-V R210-V R300- R420-V	Hexagon flange nut	M10×1.5 8-A	7 ± 1	crankcase
3	Connecting rod	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×25 10.9-A M7×32 10.9-A M8×35 10.9-A	12±1 13±1 15±1	Connecting rod cover - crankshaft components - connecting rod
4	Crankcase cover	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×25 8.8-A M8×32 8.8-A M8×32 8.8-A	11±2 28±2 28±2	Crankcase cover - crankcase gasket - crankcase
5	Flywheel assembly	R80-V R210-V R300- R420-V	Hexagon flange nut	M12×1.25 8-A M14×1.5 8-A M16×1.5 8-A	55±4 75±4 95±4	Starter cup - impeller - flywheel assembly - crankshaft components
6	Ignition coil	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×20 8.8-A M6×25 8.8-A M6×28 8.8-A	11±1	Ignition coil - crankcase
7	Cylinder head assembly	R80-V R210-V	Hexagon flange bolt	M6×20 10.9-A M8×32 10.9-A	32±2 32±2	Cylinder head assembly - cylinder head

		R300- R420-V		M8×35 10.9-A	42±2	gasket - crankcase
8	Rocker arm shaft bolt	R80-V R210-V R300- R420-V	Hexagon flange bolt	M8×1.25 8.8-A M8×1.25 8.8-A M8×1.25 8.8-A	24±2	Rocker arm shaft bolt - cylinder head assembly
9	Cylinder head cover assembly	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×12 8.8-A M6×12 8.8-A 	10 ± 1	Cylinder head cover assembly - cylinder head cover gasket - cylinder head assembly
10	Spark plug	R80-R440- V	Provided thread	M14×1.25	28±2	Spark plug - cylinder head assembly
11	Air director of cylinder block	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×10 8.8-A M6×8 8.8-A M6×12 8.8-A	10±2	Air director of cylinder block - cylinder head assembly
12	Lower cover	R80-V R210-V R300- R420-V	Hexagon flange bolt	 M6×16 8.8-A 	10±2	Lower cover - crankcase
13	Oil protector	R80-V R210-V R300- R420-V	Hexagon flange bolt	 M6×12 8.8-A M6×12 8.8-A	8±2	Oil protector - crankcase
14	Air director	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×12 8.8-A M6×12 8.8-A M6×12 8.8-A	10±2	Air director - crankcase
15	Hand starter components	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×8 8.8-A M6×8 8.8-A M6×8 8.8-A	10±2	hand starter components - air director
16	Air filter	R80-R420	Hexagon flange nut	M6 8-A	10±2	Air filter - air filter gasket -

						carburetor -
17	Accelerator control assembly	R80-V R210-V R300- R420-V	Hexagon flange bolt	M6×8 8.8-A M6×12 8.8-A M6×12 8.8-A	10±2	Accelerator control assembly - crankcase - cylinder head assembly
18	Governing bracket assembly	R80-R420	Hexagon flange nut	M6 8-A	8±1	Governing bracket assembly - governing arm - governing bracket assembly
19	Charging coil assembly	R80-V R210-V R300- R420-V	Hexagon flange bolt	 M6×28 8.8-A M6×32 8.8-A	10±2	Charging coil assembly - crankcase
20	Pressing plate of charging coil	R80-V R210-V R300- R420-V	Hexagon flange bolt	 M6×10 8.8-A M6×10 8.8-A	10±2	Pressing plate of charging coil - crankcase
21	Starter motor components	R80-V R210-V R300- R420-V	Hexagon flange bolt	 M6×35 8.8-A M6×30 8.8-A	11±1	Starter motor components - crankcase

2-3 Standard torque parameters

Item	Thread diameter	Tightening torque		
		N·m	kg∙m	
Standard Torque	5 mm bolts and nuts	5.5	0.55	
	6 mm bolts and nuts	10	1.0	
	8 mm bolts and nuts	21	2.1	
	10 mm bolts and nuts	37.5	3.75	
	12 mm bolts and nuts	55	5.5	

Part III Maintenance

3-1 Maintenance list

Good maintenance is the best guarantee to realize safe, economical and zero-fault operation. It is also conducive to environmental protection.

A WARNING The exhaust gas of the generator contains toxic carbon monoxide. Please shut down the gasoline engine for maintenance. If maintenance needs to be carried out while the generator is running, you should make sure that the work area is well ventilated.

Regular maintenance can ensure that the generator works in good condition. The maintenance schedule is as follows:

Inspection iter	nspection time	Operation inspection	First 20 hours	Operating for every 50 hours	Operating for every 100 hours	Operating for every 300 hours or every year
Inspection of gasoline engine oil		0				
Replacement of gasoline engine oil			0		0	
Inspection of air filter element		0				
Cleaning of air filter element				0		
Cleaning of fuel filter					0	
Spark plug	Cleaning Adjustment				0	
Valve clearance	inspection Adjustment					0
Cleaning of fuel tank and fuel filter element						0
Fuel nine	inspection			Every 2 ye	ears	
Fuel pipe	Replacement	Every 4 years				

* When used in dusty places, the air filter should be cleaned every 10 hours or every day.

3-2 Oil

• Replacement of gasoline engine oil

1) Remove the filling inlet cover and the fuel drain

bolt to drain the dirty oil.

2) Tighten the fuel drain bolt.

Tightening torque: see Tab. 2-2-1.

3) Fill clean oil from the filling inlet.



Oil capacity of R80-V gasoline engine	0.35L
Oil capacity of R210-V gasoline engine	0.6L
Oil capacity of R300-R420 gasoline engine	1.1L

	General purpose oil SAE15W-40 SJ, or SAE10W-30 gasoline engine oil equivalent to
Recommended	API SJ.
gasoline	X At low temperatures (below 10° C), use (SAE10W-30) >.
engine oil	※ In cold weathers (below -15℃), use cold area oil SAE5W-30, or SAE5W-30
	gasoline engine oil equivalent to API SJ.



4) Check the oil level after filling. In case of low oil level, fill oil to upper limit.

NOTICE If the gasoline engine operates at a too low level, it will be damaged.

3-3 Air filter

Combined type

NOTICE

- 1) Remove the nut, the air filter cover and the butterfly nut, as well as the filter elements made of polyurethane and paper.
- 2) Clean the polyurethane filter element with cleaning agent. Then, blow dry it with compressed air or wring it out. Next, soak it in clean oil. Finally, wring it out and put it back.
- 3) Blow the paper filter element from the inside with compressed air, or gently knock it to remove dust. Replace it if it is too dirty.

If there is too much oil in the polyurethane filter element, the filter holes will be blocked.



Oil bath type

1) Clean the oil pan with cleaning oil and dry it.

2) Fill the clean gasoline engine oil to the specified level and install the oil pan.

3) Clean the polyurethane filter element with cleaning oil. Then, blow dry it with compressed air or wring it out forcibly. Next, soak it in clean oil. Finally, wring it out and put it back.



3-4 Cleaning of fuel filter

110	TIOE
NIC	

• Fireworks are strictly prohibited during cleaning.

• After tightening, it should be confirmed that there is no fuel leakage.

Set the fuel switch to the "OFF" position and tighten the filter

oil cup. Tightening torque: 7N.m.

3-5 Cleaning and adjustment of spark plug

1) Use the spark plug cleaner or wire brush to remove the carbon deposits on electrodes.

Check whether the sealing washer is damaged.

2) Use the spark plug gauge to check the clearance between the central electrode and the side electrode.

Bend the side electrode to adjust the clearance in case of an unsatisfactory clearance.



Filter oil cup



F7RTC (Nande).....for EWI suppression

Clearance of spark plug	0.7 - 0.8 mm
	BP6ES (NGK)
Standard an arls also	F7TC (Nande)
Standard spark plug	BPR6ES (NGK)for EWI suppression

3-6 Adjustment of valve clearance

NOTICE The valve clearance should be adjusted in the state of the gasoline engine cooler.

1) Remove the cylinder head cover bolt, the cylinder head cover and the cylinder head cover gasket.

NOTICE Please note that there will be oil leakage when the cylinder head cover is disassembled.



2) Place the piston at the upper dead point of compression.

3) Insert the feeler gauge into the clearance between the rocker arm and the valve to measure the valve clearance.



Value al correra a	Intake: 0.15±0.02 mm	
valve clearance	Exhaust: 0.20±0.02mm	

4) If necessary, carry out adjustment in the following order.

a. Fix the valve rocker arm shaft with the wrench and loosen the lock nut.

b. Loosen the valve rocker arm shaft and adjust the valve clearance to the specified one.

c. Fix the rocker arm shaft with the wrench, and then tighten the lock nut.

d. After tightening the lock nut, check the valve clearance again.



3-7 Governor

- 1) Remove the fuel tank.
- Loosen the fastening nut of the governing bracket. At this time, check whether the carburetor throttle is fully open (turns to the left to the end).
- 3) Turn the governing bracket to the right to the end (the position where the governor is completely closed), and tighten the bolt and the nut.
- 4) Check whether the governing bracket and the throttle move smoothly.
- 5) Install the fuel tank.

Start the gasoline engine and turn the adjusting screw of maximum screw to adjust the maximum speed of the gasoline engine.

Maximum speed	3780±50rpm
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Part IV Disassembly and Maintenance

4-1 Fault judgement

4-1-1 Start difficulty

Phenomenon		Cause		Remedy	
		nal tk Abnormal ne fuel tk system g	Impeded fuel flow or no fuel flow	No fuel in fuel tank	Refuel
Ν				Clogged venthole of fuel tank cap	Dredge
				Main measuring hole is improperly adjusted or blocked	Re-adjust or clean, blow through
	Normal spark			Float needle valve hole is blocked	Remove needle valve for repairing, cleaning and blowing through
	of the spark plug			The float is stuck or damaged	Repair the float
	P108		Unobstructed fuel flow	Fuel is too dirty or deteriorated	Replace fuel
				There is water in fuel	Replace fuel
Normal cylinder compression Norn fue supj syste				There is excessive fuel in the cylinder	Drain the fuel, and wipe and dry spark plug electrode
				Fuel label is incorrect	Use the fuel according to specified label
			Spark plug is poor	Electrode is dirty with carbon deposit	Remove the dirt and carbon deposit
		Spark of HV wire is normal		Insulator is damaged. Electrode is severely ablated.	Replace the spark plug
	Normal fuel			Electrode clearance is incorrect	Adjust electrode clearance
	supply system	pply stem HV wire has no spark	Spark plug is normal	HV wire is damaged	Replace the HV wire
	5			Ignition coil is damaged	Replace the ignition coil
				Magnet is demagnetized	Replace the flywheel
				The clearance between ignition coil and flywheel is abnormal	Adjust the clearance between ignition coil and flywheel

Phenomenon		1	Cause	Remedy
			Piston ring wear exceeds the limit	Replace it with complete set of new ring
			Piston ring is broken	Replace it with complete set of new ring
Cylinder Supply compression is poor is system normal plug system	Piston ring is stuck	Clear carbon deposit		
	Ignition Normal spark of the spark plug	The spark plug is not provided with sealing gasket or is not tightened	Mount the gasket and tighten it	
		Air leakage of joint face	Check the flatness of joint face of cylinder pad and cylinder body and cylinder cover	
		system	the cylinder cover	And tighten cylinder cover bolts according to specified torque and sequence
			Valve leakage	Check valve clearance and valve tightness, repair when necessary

If gasoline engine is still unable to be started, please send it to authorized dealer of the RATO Power for overhaul.

• Spark detection

A WARNING

- Ensure that there is no spilled fuel outside the gasoline engine and the spark plug is not soaked by fuel.
- In order to prevent fire, keep sparks away from spark plug hole.
- When doing testing to the spark plug, it is strictly prohibited to hold the spark plug

HV wire with wet hand.



- When operating, put the fuel switch in the "OFF" position, and drain off the fuel in the carburetor.
- Remove the spark plug cap and spark plug.

- Pull the starter handle to release unburned gas out of the cylinder.
- Assemble spark plug cap.
- Turn the gasoline engine switch to the "ON" position.
- Ground the negative electrode (threaded part) of spark plug via the cylinder head cover, pull the starter handle to observe the spark condition.

4-1-2 Underpower

Phenomenon	Cause		Remedy
	Fuel supply system	There is air in oil way or the oil way is blocked	Exhaust and dredge oil way
		The main measuring hole is improperly adjusted	Adjust the main measuring hole again.
		Needle valve hole and main hole are blocked in the carburetor	Clean, and blow through
		Fuel tank switch is clogged	Clean and replace damaged part
When raising the accelerator, the speed		Carbon deposit in the muffler and exhaust pipe	Clear carbon deposit
increases slowly, and the speed decreases		Blockage of air filter	Clean filter element
or the engine shuts		Leakage of air intake pipe	Repair or replace
down in severe cases	Poor compression	Wear of piston, cylinder and piston ring	Replace worn parts
		Air leakage of joint face between the cylinder body and the cylinder cover	Replace the cylinder pad
		Valve clearance is too large (too small)	Readjust
		Valve seal is not tight.	Repair

Compression pressure inspection

- Drain the fuel from the fuel tank.
- Loosen the fuel drain bolt of the carburetor to drain the gasoline.
- Remove the spark plug cap and the spark plug, and install the cylinder pressure gauge at the spark plug hole.
- Pull the starter for several times and measure the compression pressure. (≥ 0.4 MPa)



4-1-3 Unstable speed

Phenomenon	Cause	Remedy
	Excessive wear of piston, cylinder and piston ring	Replace worn parts
There is knocking	Excessive wear of piston pin and pin hole	Replace the piston or piston pin
noise in the gasoline engine	Excessive wear of small end of connecting rod	Replace the connecting rod
	Wearing of rolling bearing of crankshaft crank journal	Replace the bearing
Deflagration	Gasoline engine overheating	Find the cause and eliminate the fault
	There is carbon deposit in the combustion chamber.	Clear carbon deposit
	Unqualified gasoline	Replace with qualified gasoline
Misfire of gasoline engine	There is water in float chamber	Clean the float chamber
	Electrode clearance of spark plug is improper	Adjust electrode clearance
	Ignition coil failure, etc.	Check and replace damaged parts

4-1-4 Starter motor's failure to start

Inspection item	Possible causes	Remedy
1. Check the battery connection.	Incorrect connection	Carry out connection correctly
2. Check the battery.	Gasoline engine's failure to charge the battery or insufficient battery charging; battery plate vulcanization and corrosion because the battery is not used for a long time.	Check or replace the rectifier bridge circuit, and then use a special charger for charging fully; replace the battery.
3. Abnormal operation of starter motor	Fault of starter motor or starting relay, looseness or shedding of wires, fault of starting switch.	Check to eliminate the circuit fault of the starter or replace the faulty parts.

4-1-5 Abnormal exhaust gas color

Phenomenon	Cause	Remedy
Black smoke	Excessive wear of piston, cylinder and piston ring	Replace worn parts
	Gasoline engine overheating	Find the cause and eliminate the fault
	There is carbon deposit in the combustion chamber.	Clear carbon deposit
	Unqualified gasoline	Replace with qualified gasoline
	Blockage of air filter	Clean filter element

4-1-6 Unable to ignite

Phenomenon	Reason		Remedy
	Fuel supply system	Fuel used up	Refuel
		Carburetor is clogged	Check oil way and dredge it
		Fuel leakage of float chamber	Repair float needle valve
Unable to ignite		Needle valve is stuck	Disassemble the float chamber, and remedy the trouble
	Ignition system	Spark plug is broken through with carbon deposit and short circuit	Replace the spark plug
		The side electrode of the spark plug fell off	Replace the spark plug, and remove fallen object
		Falling-off of HV wire	Re-welding
		Breakdown and short circuit of ignition coil	Replace the ignition coil
		Shutdown line is placed on the body	Find short circuit point and re-insulate
	Others	Severe cylinder scraping, falling-off of the valve	Repair and replace damaged parts

4-1-7 Failure of oil alarm system

Check the oil alarm system as follows.

- In the operating state of the gasoline engine, disconnect the yellow wire on the telephone switch of the gasoline engine and ground it through the gasoline engine. Make sure that the alarm indicator lights up and the gasoline engine stops.
- In the closing state of the gasoline engine, disconnect the oil level switch wire when the oil meets the requirements. Check the conductivity between yellow and green wires. It is

normal if it is not conductive between wires.

3) When turning off the gasoline engine, drain off the oil, disconnect the oil level switch wire, and check the conductivity between yellow and green wires. It is normal if it is conductive between wires.



4-1-8 Overheating of general-purpose gasoline engine

Phenomenon	Cause	Remedy
	Insufficient oil	Fill sufficient oil
	Exhaust port is blocked	Clean exhaust port
	Leakage of air director	Repair damaged place
	Sundries blockage in the middle of cooling fins	Clean cooling fins
Gasoline engine overheating	Deformation of connecting rod causes the wears of the piston and cylinder liner edge	Replace the connecting rod
	Wears of cylinder, piston and piston ring causes air leakage between cylinder and crankcase	Replace worn parts
	Gasoline engine governor is improperly adjusted, causing the speed to be too high	Re-adjust the governor
	Crankshaft main bearing burning	Replace the main bearing

4-2 Pre-maintenance Preparations

4-2-1 Safety factors

A WARNING Failure of observing the following precautions will cause the void of warranty commitment provided with gasoline engine, and it may damage the gasoline engine or cause personal injury. Therefore, before operating gasoline engine, the user shall pay special attention to following points:

1) Carry out the matching in strict accordance with the nominal power. It is strictly forbidden to operate under overload and over-speed condition or low load and low speed for a long term.

2) Apply the specified fuel and oil, which must be fully precipitated and filtered before use. Refueling appliance shall be maintained clean, and the oil shall be replaced regularly.

3) Check the tightness of fastening bolts of the gasoline engine regularly, and tighten them in time.

4) Clean the air filter element regularly and replace it if necessary.

5) This engine is air-cooled gasoline engine, so the debris and dirt on cooling fins, air directors and other components shall be removed in time to ensure normal cooling of the gasoline engine.

6) The operator shall be familiar with the working principle and structure of the gasoline engine, and understand how to operate emergency shut-down and all control components. Adhere to regular maintenance and service, and eliminate the fault found in time, and prohibit continuous operation of gasoline engine after the failure.

7) When operating, please make sure that the gasoline engine shall be at least one meter away from the building and other equipment, and maintain good ventilation. Do not place flammable materials (such as gasoline and matches) nearby the gasoline engine or close to running gasoline engine to avoid fire.

8) Refuel at a well-ventilated place. The engine shall be shut down when refueling. Do

not smoke or make naked flame or spark in the place where gasoline engine is fueled or in fuel storage site.

9) Do not overfill the fuel tank to cause overflowing of fuel. If there is fuel spilling, it must be thoroughly removed, and gasoline engine shall not be started until spilled fuel is volatilized.

10) Do not operate the gasoline engine in a confined place or poorly ventilated place.

11) When the gasoline engine is running and within a period of time after it is shut down, it is strictly forbidden to touch the muffler to avoid scalding. In order to avoid getting burnt or fire, the gasoline engine shall not be handled or stored until it cools down.

12) Safety warning label

Please read the warning label carefully before operating the engine; our company will not be liable for the personal injury or equipment damage caused by ignoring the warning label. (The decal label is shown in the figure below)

1. Label of paying attention to the fuel



2. Use warning label


3. Displacement labels (those of some models are not listed because of page restriction.

Displacement labels of different models are the same except the number on the label)



4. Trademark label



5. Accelerator label



6. Air filter maintenance label



7. Label of choke switch and fuel switch



8. Oil listing label



9. Oil filling label





4-2-2 Special tools

Serial No.	Tool name	Application location Remarks
1	Float height gauge	Inspection of oil level of the carburetor
2	Valve guide replacer	Disassembly and installation of valve guide
3	Outer seat ring assembler	Assembly of the ball bearing
4	Assembler handle	Installation of the handle on the assembler and installation of the bearing
5	Inner seat ring assembler	Assembly of the ball bearing and the timing gear
6	Diamond grinder 45°	Correction of intake and exhaust valve seat surface
7	Diamond grinder 32°	Correction of intake and exhaust valve seat surface
8	Flywheel puller	Disassembly of flywheel
9	Bearing puller	Disassembly of the ball bearing
10	Valve guide reamer	Finish reaming of inner diameter of valve guide

4-3 Disassembly chart



4-4 Gasoline engine (electric starting type is taken as an example in the following figure.

manual starting type is installed with different parts, and disassembled in a similar manner)

Disassembly and assembly



4-4-1 Hand starter components



NOTICE

When disassembling, be careful not to make the starter coil spring pop out, and wear gloves.

Installation instructions

① Pass the drawstring through the starter drawstring coil, and make a "8" knot at the drawstring end.

②. Hook the inner side of the starter coil spring in the groove of the drawstring coil cover, and rotate the coil spring counterclockwise to retract the coil spring into the shell.



③. Hook the outer side of the starter coil spring installed in the drawstring coil cover in the groove of the starter drawstring coil.

(4). Install the driving cam on the starter drawstring coil, then install the return spring in the hole on the starter drawstring coil and hook its other end on the driving cam.



(5). Install the spring, the drive guide plate and the guide

plate fastening screw in sequence.



(6). Pull the drawstring out of the drawstring coil cover, and make a "8" knot at the drawstring end.



⑦ Gently pull the starter drawstring handle to check the performance of the driving cam.

4-4-2 Flywheel



- a) Disassembly: fuel tank; air filter; carburetor; starter assembly.
- b) Use a thickness gauge to measure the clearance between ignition coil and flywheel.
- c) Adjustment: clearance between ignition coil and flywheel.
- d) Adjustment steps: loosen the bolts, adjust clearance by moving the ignition coil up and down, and tighten the bolts



e) Check the ignition coil

(Primary side)

Make contact between tester terminal and wire terminal and coil core, to measure the resistance value of coil primary.

The resistance of primary coil: 1.0-1.5 Ω (recommended value)



(Secondary side)

Remove the cap of spark plug, to connect one end of the tester to HV harness, and make contact between the other end and coil core, to measure resistance value on the secondary side of the coil.

The resistance value of secondary coil: 5-7 $k\Omega$



Make the tester touch both ends of the spark plug cap to measure the resistance value of the spark plug cap.

Resistance value: $5k\Omega\pm5\%/10k\Omega\pm5\%$ (recommended)



Flywheel

- Align the four locating blocks on the impeller with the four holes on the rear side of the flywheel.
- Align the locating block of the starter cup with the hole in the center of the flywheel.



4-4-3 Air filter





4-4-4 Carburetor

a. Disassembly and assembly



b. Disassembly and assembly

- Before the disassembly of the carburetor, the fuel drain bolt must be unscrewed to drain off the fuel inside.
- No Open Flames.



c. Inspection

• Float height

Place the carburetor as shown in the figure, and push the float in with fingers. Measure the size (float height) between the float and the shell at the position where the foot of the float valve starts to act.

Specified float height	See Tab. 1-3
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Replace the float in case of inconsistency between the float height and the specified value.



4-4-5 Cylinder head/valve

1) Disassembly\assembly

1 Remove the fuel tank 2 Remove the air filter

③ Remove the starting system and air guide cover ④ Remove the carburetor and heat insulation pad



After removal of the cylinder head cover, scrap off the sealant on the inside of the cylinder head cover and the cylinder head with the plastic art knife or other blunt instrument.



Apply the sealant evenly on the inside of the cylinder head cover, without breaking before installation. The width of the sealant line: 2/3 width of the inner cover + 2/3 width of the outer cover, should not exceed the width of the inner and outer covers. Flat sealing silicone rubber is recommended.



Valve spring retainer:

Move the front end of the valve stem horizontally in the central hole of the spring retainer and remove it.

If the cylinder head is assembled on the cylinder, the spring retainer may fall into the cylinder, which should be noted.

2) Inspection/maintenance/adjustment:

① Outside diameter of valve lifter

Use a micrometer to check the outside diameter of valve lifter. If the diameter is lower than standard or exceeds the maintenance limit, or the valve surface has visible ablation or cracks, replace it with a new valve.



Standard	Maintenance limit
See Tab. 1-3	See Tab. 1-3

② Free length of valve spring

Measure free length of valve spring.

If it is below the standard or exceeds service limits, replace the spring.



Standard	Maintenance limit
See Tab. 1-3	See Tab. 1-3

③ Valve guide

Inspection:

a) Check if the inner surface of valve guide is smooth without scratches and scuffing; and if the fitting between valve guide and cylinder cover is solid.



b) Before measuring the inner diameter of the valve guide pipe, remove carbon deposit inside valve guide pipe by valve guide reamer.

If the inner diameter of the valve guide pipe is below the standard or exceeds the maintenance limit, the guide pipe should be replaced.

Standard	Maintenance limit
See Tab. 1-3	See Tab. 1-3

Replacement:

a) Put the valve guide to be replaced in the freezer of the refrigerator to freeze it for about 1 hour.

b) Use the valve guide puller to remove the valve guide from the combustion chamber side.



NOTICE When removing the valve guide, be careful not to damage the cylinder

head.

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

• Exhaust valve side: knock the exhaust valve guide until the retainer ring fully contacts the

cylinder cover (as shown in the figure).



• Intake valve side: knock the intake valve guide to the specified height (measured from the top of the valve guide to the surface of the cylinder cover) (as shown in the figure).



d) After installation, check whether the valve guide is damaged, and replace it if it is damaged.

Reamer:

When reaming preciously valve guide with a reamer, be sure to be at room temperature to get good result.

a) Apply a layer of cutting grease to the valve reamer and valve guide. Screw into the reamer clockwise until the reamer is fully screwed into the air valve guide pipe. Continue to rotate clockwise to pull out the valve reamer from the valve guide.

Tool: valve guide reamer

b) Thoroughly remove dirt and debris from cylinder cover.

c) Inspect the hole of valve guide pipe, which shall be in the center of valve guide pipe and shall be straight and unobstructed, and insert the valve to inspect whether the action is smooth. If not, the valve guide may have been bent during assembly. If it is bent or damaged, replace the valve.

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

e) Clearance between the valve stem and the valve guide pipe: Subtract outer diameter of valve stem from corresponding inner diameter of valve guide pipe to obtain the clearance between valve guide pipe and valve stem.

f) If the clearance between valve stem and valve guide exceeds maintenance limit, replace a new guide, to judge if the clearance can be within maintenance limit. If so, replace valve guide and stick valve guide. Re-trim valve seat when replacing the valve guide pipe.



④ Valve seat:

a) Thoroughly remove carbon deposit out of combustion chamber and valve seat, and apply a thin layer of red lead powder on the surface of valve, or other adhesive color paints easy to be wiped.

b) Insert the valve and press the valve with effort a few times, but do not rotate the valve on the valve seat. If the valve seat is stained with paint, it indicates that it is in close contact with the valve; otherwise, it fails to contact. This indicates that the valve and the valve seat are not concentric.



c) Grind the valve seat by 45° grinder to create a smooth valve seat being concentric with the valve guide, rotate it clockwise and not it is not allowed to rotate counterclockwise.

Tool: valve grinder



d) Use 32° and 45° grinders to reduce and adjust the valve seat, to make it be in contact with middle part of valve cone face.

- Grind top edge of valve seat by 32° grinder (contacting too high).
- Grind bottom edge of the valve by 45° grinder (contacting too low).



Make sure that the contact width of valve seat completed is within specified range.

Standard	Maintenance limit
See Tab. 1-3	See Tab. 1-3

e) Slightly grind by 45° grinder to remove any burr on the edge of valve seat.

f) After reshaping the valve seat, check the width of valve seat. Use only the colorant on valve cone face, insert the valve and press the valve several times with effort, but ensure that the valve does not rotate on the valve seat. If the valve seat cone face is evenly stained with colorant, as shown in the figure, it means that the valve is in good contact with the valve seat cone face.



g) Apply abrasive to valve seat cone surface, and rotate valve grinding tool to grind the valve seat.



h) Check valve clearance after assembly.

4-4-6 Crankshaft/Piston





① Installation

a) Piston

• Make manufacturer's mark face up when assembling. Be careful not to confuse the ring 1 with the ring 2 (the ring 1 is chrome plated).

- Make sure that piston ring moves freely after assembling.
- Make openings of various piston rings keep away from the direction of piston pin and scatter by 120 $^\circ.$



b) Snap ring of piston pin

Jack the front end at the piston groove, to clamp the other end with a nose plier, and mount it in the groove while turning.

Make the opening of snap ring be away from the notch of piston.



c) Connecting rod cover

Align connecting rod with the edge of the connecting rod cover when assembling.



② Piston inspection

Inspect the contact between the piston and cylinder, ring groove defect, top ablation and cracking, etc. If it is seriously damaged, such as broken, it shall be replaced.

Remove carbon deposits

Carbon deposit is accumulated on the top of piston and the edge of upper port of the cylinder. Carbon deposits shall be cleared up before the inspection. Soak the carbon deposit with kerosene first, and then remove it with a blunt scraper or metal brush.

a) Outer diameter of piston skirt

Measure the outer diameter of the piston skirt by outer diameter micrometer, to replace it if it exceeds the service limit.



Standard	Service limit
See Tab. 1-3	See Tab. 1-3

b) The clearance between piston pin hole and piston pin

Use the inside micrometer and the outside micrometer to measure the inner diameter of the piston pin seat hole and the outer diameter of the piston pin respectively. And then calculate its clearance value based on measured result.



Standard	Service limit
See Tab. 1-3	See Tab. 1-3

c) Piston-cylinder clearance

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

NOTICE This clearance must be inspected before and after repair.

During inspection, put the piston upside down in the cylinder, put a thickness gauge with appropriate thickness between the pressure bearing surface of the piston skirt and the cylinder wall, and then pull out the thickness gauge. If you feel some resistance, but you can 62

pull it out smoothly, the thickness of the gauge at this time is the clearance between the cylinder and the piston.

Standard	Service limit
See Tab. 1-3	See Tab. 1-3

d) Clearance of piston ring side

During inspection, place each ring in its respective piston ring groove. Piston rings shall rotate freely, to be neither loose nor sluggish. Then measure by inserting a thickness gauge into the clearance between upper and lower planes of the ring and slot.

Standard	Service limit
See Tab. 1-3	See Tab. 1-3



e) Piston ring closing clearance

Put piston ring horizontally into the cylinder, push the ring to working position with piston head, and then measure its opening clearance by thickness gauge. This clearance shall be neither too great, nor too small. Too great clearance may make cylinder sealing performance get bad, while, too small clearance will cause the piston ring to be stuck in the cylinder due to thermal expansion during operation, causing piston ring breaking or even "cylinder scraping". Ring opening clearance is small, the opening can be filed by thin flat file. It shall be placed into the cylinder for inspection while filing, until the clearance is proper.



	Standard	Service limit
Ring 1/ring 2	See Tab. 1-3	See Tab. 1-3
Oil ring	See Tab. 1-3	See Tab. 1-3

③ Inspection of connecting rod

When the connecting rod is bent or twisted, or its big end hole or small end hole is severely grooved, or there is a crack on one side, it shall be scrapped and replaced with new one.

a) Inspection of inner diameter of small end

If it is below the criterion or exceeds the maintenance limit, the connecting rod should be replaced.



Standard	Service limit
See Tab. 1-3	See Tab. 1-3

b) Inspection of inner diameter of big end

If it is below the criterion or exceeds the maintenance limit, the connecting rod should be replaced.



Standard	Service limit
See Tab. 1-3	See Tab. 1-3

c) Big-end oil-film clearance

- Wipe oil off crankshaft pin and connecting rod bearing pad surfaces.
- Set a plastic feeler gauge outside the crankshaft pin, install the connecting rod, and tighten the bolt to the specified torque.



Torque: see Tab. 1-2.

NOTICE

Place the plastic feeler gauge radially.

- Remove the connecting rod cap and measure with a plastic feeler gauge.
- If the clearance of the bearing pad exceeds the maintenance limit, replace the connecting rod and measure the clearance again.

Standard	Service limit
See Tab. 1-3	See Tab. 1-3



④ Inspection of camshaft

The camshaft is main driving part of valve train of gasoline engine, which controls intake and exhaust valves to open or close.

Its structural feature is: On the shaft, there are the cam and supporting journal meeting the requirements for controlling air intake and exhaust. When the cam is working, it bears the periodic impact load, and the cam working surface and the lifter have intense friction, which is easy to wear or scratch. Therefore, the cam is required to have wear resistance and good lubricity.

- Visually inspect cam surface and cam height for damage, and the camshaft and bearing for being loose or worn, and if so, replace the whole group.
- Inspect the height dimension of the cam. When the dimension of cam height is less than the service limit, replace the camshaft.



	Standard	Maintenance limit
Camshaft intake lift	See Tab. 1-3	See Tab. 1-3
Camshaft exhaust lift	See Tab. 1-3	See Tab. 1-3

• Inspect the outer diameter of the camshaft. When it is less than the service limit, the camshaft should be replaced.



Standard	Maintenance limit
See Tab. 1-3	See Tab. 1-3

Analysis on causes of camshaft wear and its impact on the performance of whole gasoline engine:

The main cause for abnormal camshaft wear of the camshaft is poor lubrication, Factors such as low oil viscosity, many impurities and small circulating oil volume is unable to form complete oil film on the camshaft surface, to cause it to be in a state of high-speed dry friction, resulting in serious wear on the cam surface. The second is assembly accuracy of the camshaft. When matching clearance between camshaft journal and camshaft seat or bearing is out of tolerance, rotation accuracy of the camshaft will decrease, and the contact with related parts will generate deviation plane t cause abnormal wear.

⁽⁵⁾ Timing gear

a) Inspect meshing clearance of the timing gear, which shall align marks of gears on both sides.
Alignment between crankshaft and camshaft



Alignment between crankshaft and balance shaft



The main damage of timing gear is the wear of gear tooth, tooth face peeling or roughness, gear deflection, gear tooth breakage, etc. Due to the wear of gear teeth, the greater the meshing clearance is, the greater the noise will be.

If gear face of timing tooth is bruised or damaged or rupture angle, it shall be replaced with a new one for any case.

NOTICE

CE When replacing new parts, it is better to replace the whole part to ensure that there is a more consistent meshing surface.
4-4-7 Starting control box

a. Disassembly and assembly

(Only for automatic starter specification)



b. Inspection

• Gasoline engine switch

Check the conduction performance between the wire and the fan guard.

Position of the gasoline engine switch	Conductivity
ON	Not conductive
OFF	Conductive



• Gasoline engine switch (with oil alarm device)

Check the conduction performance between the black wire and the gasoline engine switch body.

Position of the gasoline engine switch	Conductive	
ON	Not conductive	
OFF	Conductive	



• Combination switch (with automatic starter)

When the switch is in each position, check the conduction performance between the wires.

Wire color Switch position	Black/red	(Grounding)	Black/white	White
OFF	0	0		
ON Grounding				
START			0	0

Inspection shall be carried out with the fuse connected.



• Oil alarm indicator

Connect on the black/red and yellow wires of the oil alarm device. 6V battery or dry battery, make sure that the alarm indicator is on. Black/red - (+) of the battery Yellow - (-) of the battery

X Never use batteries above 6V. Otherwise, the bulb will be blown.



Yellow wire

• Silicon rectifier

Check the conductivity between the two terminals.

It is normal in case of being conductive in forward direction and not conductive in the reverse direction.



• Reset switch

With the switch in the "ON" state, confirm the conductivity between the two terminals.





4-5 Electrical schematic diagram (electric starting type)

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