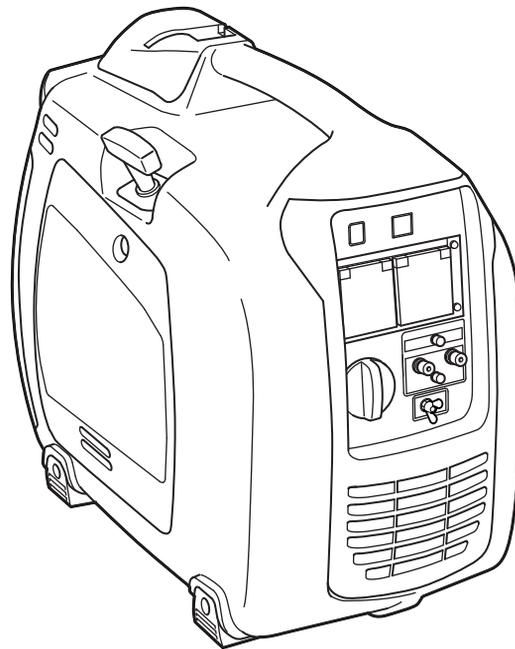


**Robin**  
SUBARU

# Generator

## R1100



# SERVICE MANUAL

Technical Data & Overhaul Instructions

FUJI HEAVY INDUSTRIES LTD.

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# 1. SPECIFICATIONS

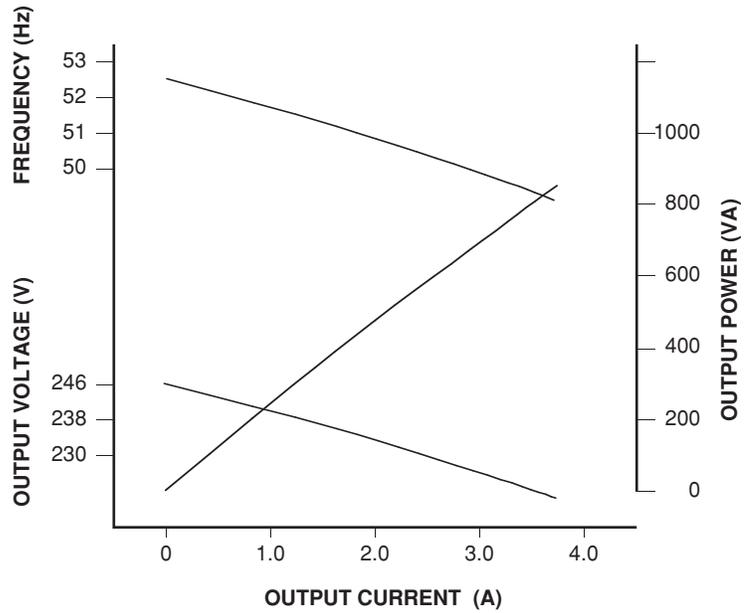
## 1-1) SPECIFICATIONS

MODEL		R1100			
Alternator	Type	2-Pole, Revolving Field type Self Exciting, Single Phase AVR type			
	Frequency	Hz	50	50	60
	Alternating electric current (AC)				
	Maximum output	VA	850	850	1100
	Rated output	VA	700	700	900
	Rated voltage	V	230	240	120
	Rated current	A	3.0	2.9	7.5
	Rated power factor		1.0		
	Direct Current (DC)				
	Output	W	100		
	Voltage	V	12		
	Power Current	A	8.3		
Engine	Model		EH09-2D		
	Type		Forced air-cooled, 4-cycle, OHV Gasoline Engine		
	Displacement	mL(cc)	85.8		
	Fuel		Automotive Unleaded Gasoline		
	Fuel tank capacity	L	3.5		
	Rated continuous operation [Approx.] (at Rated output)		hours	3.8	3.7
	Oil pan capacity	L	0.4		
	Ignition System		Solid-state flywheel magneto		
	Spark plug		NGK BMR4A		
	Starting system		Recoil starter		
	Equipment	Alternating electric current output		Receptacle (15A x 2)	Receptacle (15A x 2)
Direct Current Output		Terminal			
Over current protector					
Alternating electric current (AC) output		Current breaker			
Direct Current (DC) output		Current breaker			
Oil Sensor		STD			
Output Lamp		STD			
Oil Warning Lamp		STD			
Dimension					
Length x Width x High		mm	480 x 295 x 445		
Dry weight		kg	25.5		

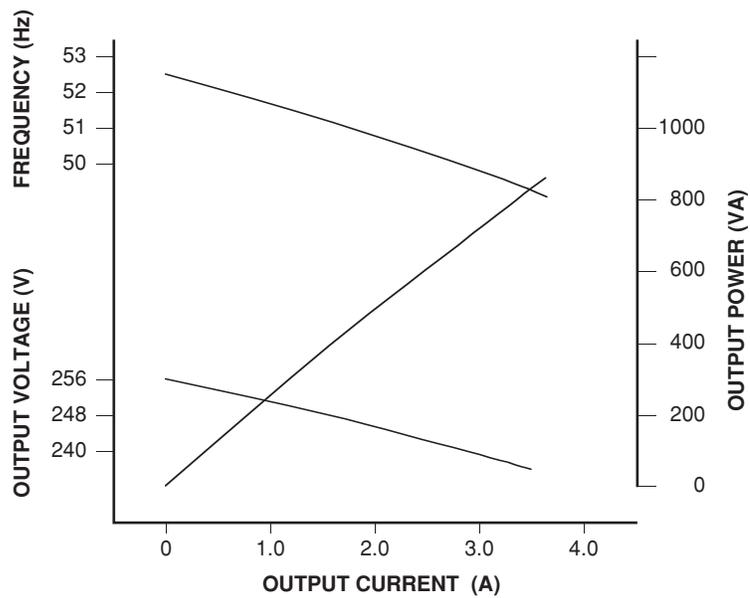
Specifications are subject to change without notice.

## 1-2) PERFORMANCE CURVES

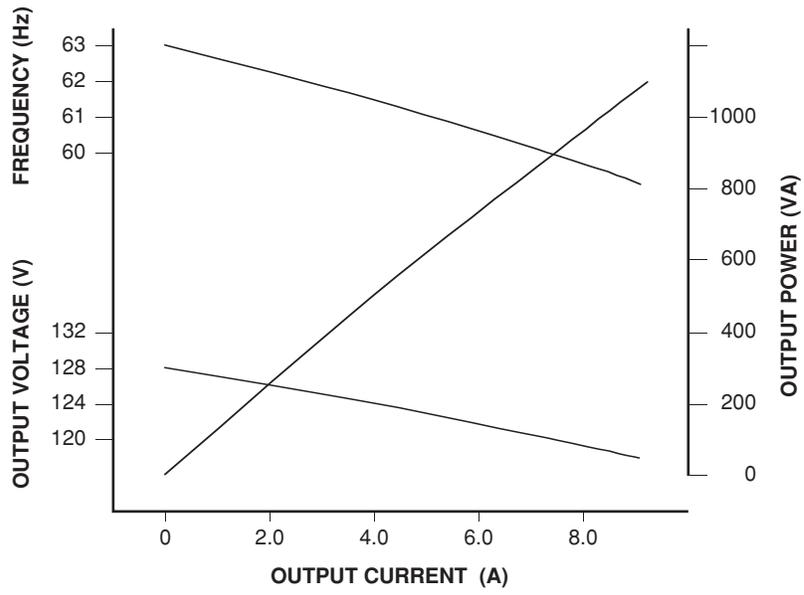
50Hz - 230V



50Hz - 240V

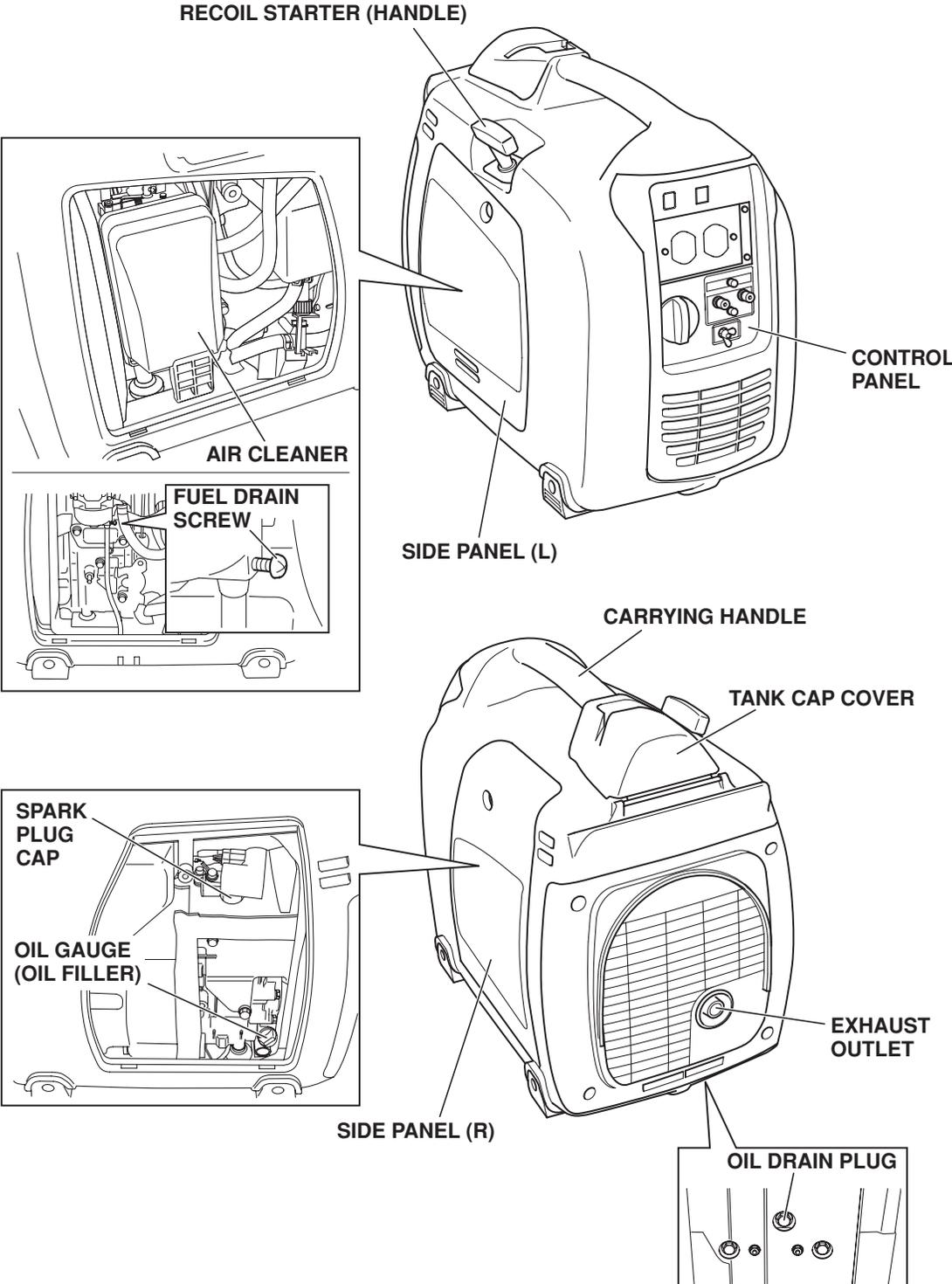


60Hz - 120V

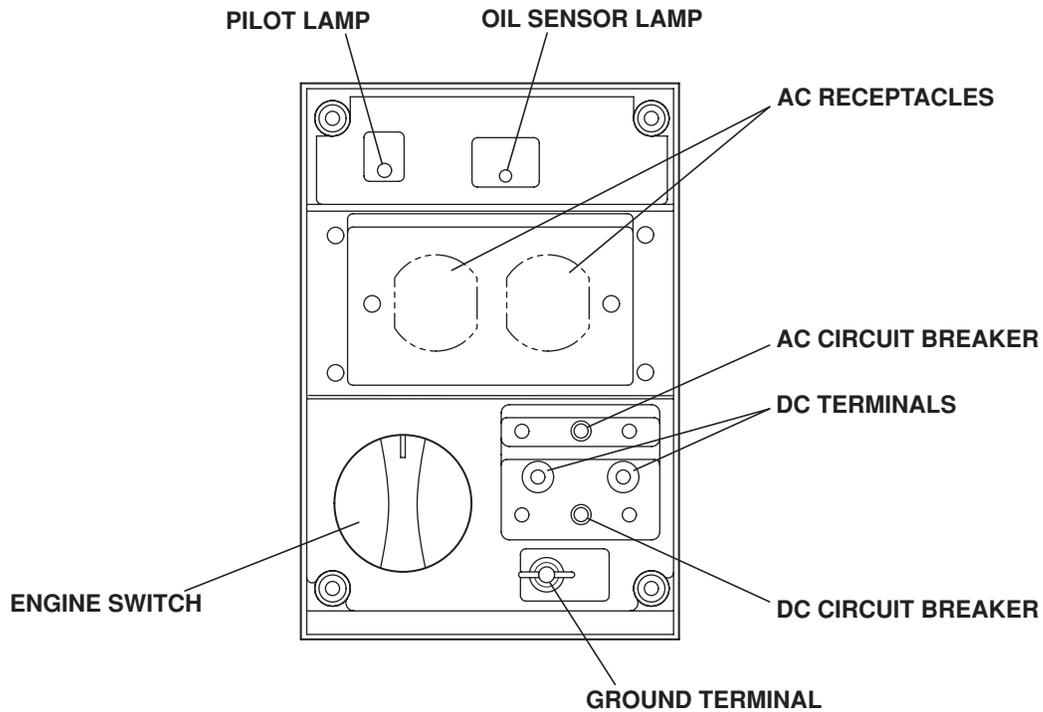


# 2. GENERAL DESCRIPTION

## 2-1) EXTERNAL VIEW



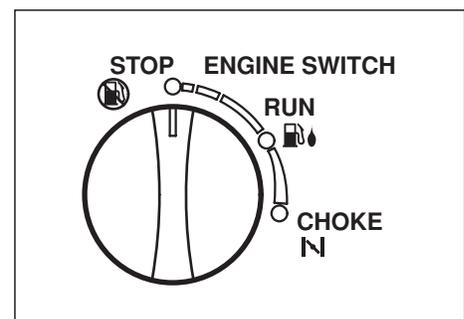
## 2-2) CONTROL PANEL



### (1) ENGINE SWITCH

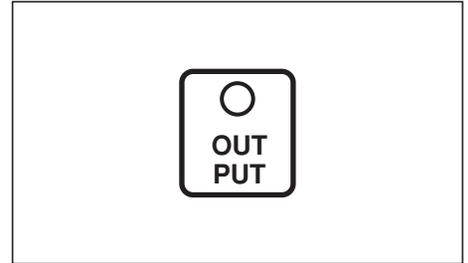
The engine switch is designed for easy operation with the interlocking mechanism between the fuel cock and the choke furnished.

 <b>(CHOKE)</b>	To start the engine, turn the knob to the position. (Choke valve is closed.)
 <b>"   " (RUN)</b>	Keep the knob in this position after the engine starts. (The engine can be started with the knob at this position when the engine is warm.)
 <b>" O " (STOP)</b>	To stop the engine, return the knob to the position. (The fuel cock is closed as well.)



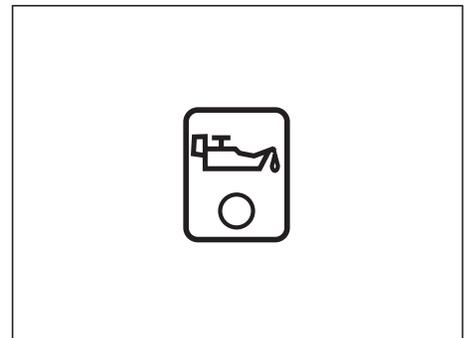
## (2) OUTPUT LAMP

Green light . . . . . Indicates that the generator is generating.  
Unlit . . . . . The generator is not generating.



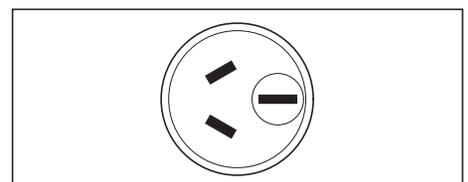
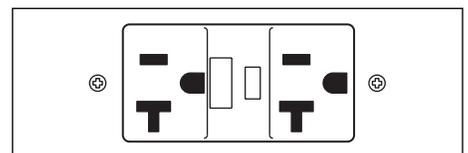
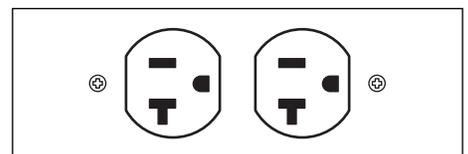
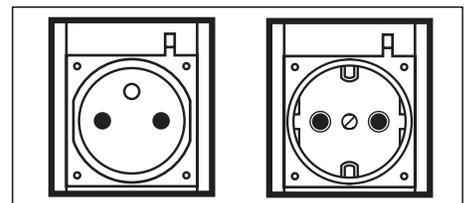
## (3) OIL SENSOR LAMP

When the level of the engine oil falls below the prescribed value, the alarm lamp lights up and the engine stops automatically. When the engine stops due to oil shortage, it can not be started anymore even by pulling the start knob (just the alarm lamp flickers). In such a case, replenish engine oil up to the mouth of the oil filling port.



## (4) AC RECEPTACLES

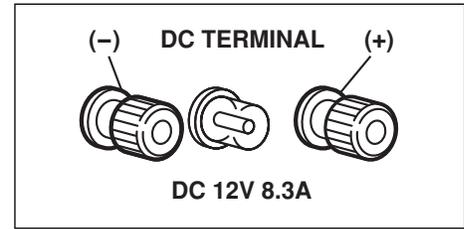
AC electric power is available through this receptacle.  
Use a ground type, three-leg plug.



### (5) DC TERMINALS

DC electric power for battery charge is available.

- Red is positive (+) terminal.
- Black is negative (-) terminal.

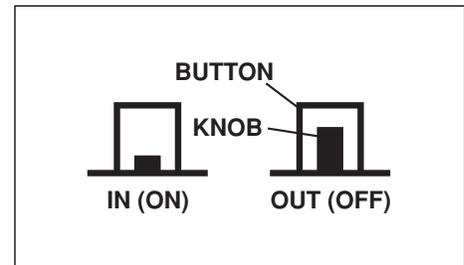


### (6) DC CIRCUIT BREAKER

DC circuit breakers shut off electric current when the current exceeds its limit.

Check for excessive current consumption. After making sure everything is in order, push the button to the " ON " position.

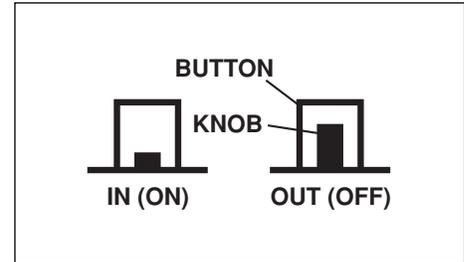
Fully discharged battery of large capacity may cause over-current in DC output circuit.



### (7) AC CIRCUIT BREAKER

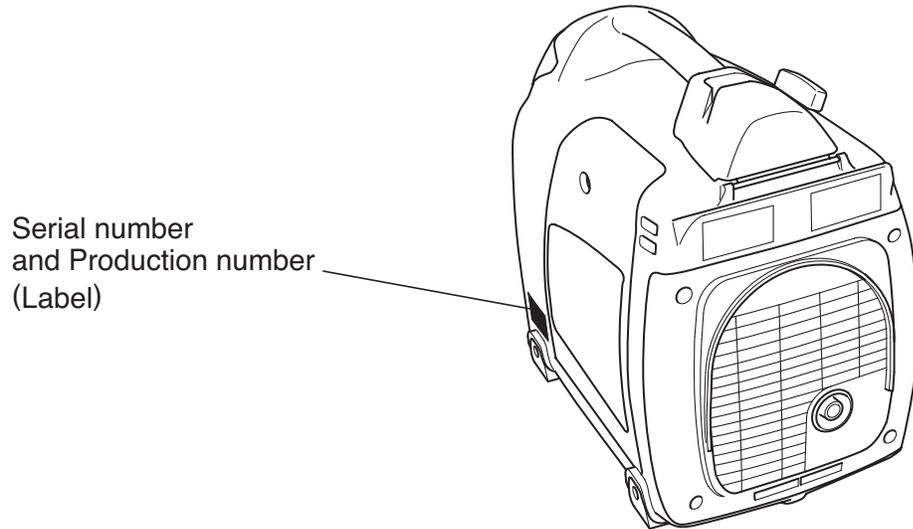
AC circuit breaker will cut off electric current when the current exceeds its limit or a malfunction occurs in the connected appliances.

Check for excessive current consumption or defects in the appliances. After making sure everything is in order, push the circuit breaker button.



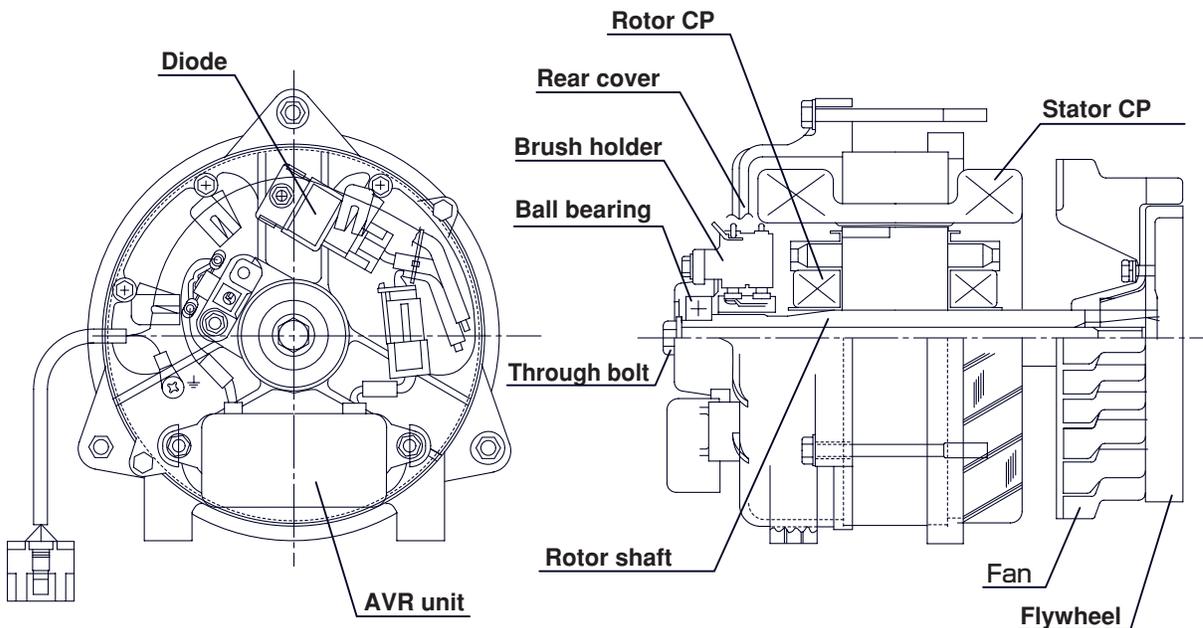
## 2-3) LOCATION OF SERIAL NUMBER (SER No.), PRODUCTION NUMBER (PROD No.)

The serial number and production number are located on right side cover of the generator operation panel.



*NOTE : Please specify these numbers when inquiring about the generator or ordering spare parts.*

## 2-4) ALTERNATOR



### 3. RANGE OF APPLICATIONS

---

Generally, the power rating of an electrical appliance indicates the amount of work that can be done by it. The electric power required for operating an electrical appliance is not always equal to the output wattage of the appliance. The electrical appliances generally have a label showing their rated voltage, frequency, and power consumption (input wattage). The power consumption of an electrical appliance is the power necessary for using it. When using a generator for operating an electrical appliance, the power factor and starting wattage must be taken into consideration.

In order to determine the right size generator, it is necessary to add the total wattage of all appliances to be connected to the unit.

Refer to the followings to calculate the power consumption of each appliance or equipment by its type.

#### **(1) Incandescent lamp, heater, etc. with a power factor of 1.0**

Total power consumption must be equal to or less than the rated output of the generator.

**Example :** A rated 3000W generator can turn thirty 100W incandescent lamps on.

#### **(2) Fluorescent lamps, motor driven tools, light electrical appliances, etc. with a smaller power factor**

Select a generator with a rated output equivalent to 1.2 to 2 times of the power consumption of the load. Generally the starting wattage of motor driven tools and light electrical appliances are 1.2 to 3 times larger than their running wattage.

**Example :** A rated 250 W electric drill requires a 400 W generator to start it.

*NOTE 1: If a power factor correction capacitor is not applied to the fluorescent lamp, the more power shall be required to drive the lamps.*

*NOTE 2: Nominal wattage of the fluorescent lamp generally indicates the output wattage of the lamp. Therefore, if the fluorescent lamp has no special indication as to the power consumption, efficiency should be taken into account as explained in Item (5) on the following page.*

#### **(3) Mercury lamps with a smaller power factor**

Loads for mercury lamps require 2 to 3 times the indicated wattage during start-up.

**Example :** A 400 W mercury lamp requires 800 W to 1200 W power source to be turned on. A rated 3000 W generator can power two or three 400 W mercury lamps.

#### **(4) Initially loaded motor driven appliances such as water pumps, compressors, etc.**

These appliances require large starting wattage which is 3 to 5 times of running wattage.

**Example :** A rated 900 W compressor requires a 4500 W generator to drive it.

*NOTE 1: Motor-driven appliances require the aforementioned generator output only at the starting. Once their motors are started, the appliances consume about 1.2 to 2 times their rated power consumption so that the excess power generated by the generator can be used for other electrical appliances.*

*NOTE 2: Motor-driven appliances mentioned in items (3) and (4) vary in their required motor starting power depending on the kind of motor and start-up load. If it is difficult to determine the optimum generator capacity, select a generator with a larger capacity.*

**(5) Appliances without any indication as to power consumption**

Some appliances have no indication as to power consumption; but instead the work load (output) is indicated. In such a case, power consumption is to be worked out according to the numerical formula mentioned below.

$$\frac{\text{(Output of electrical appliance)}}{\text{(Efficiency)}} = \text{(Power consumption)}$$

Efficiencies of some electrical appliances are as follows :

Single-phase motor . . . . .0.6 to 0.75 (The smaller the motor, the lower the efficiency)

Fluorescent lamp . . . . .0.7 to 0.8

**Example 1:** A 40W fluorescent lamp means that its luminous output is 40W. Its efficiency is 0.7 and accordingly, power consumption will be  $40 \div 0.7 = 57W$ . As explained in **Item (2)**, multiply this power consumption value of 57W by 1.2 to 2 and you will get the figure of the necessary capacity of a generator. In other words, a generator with a rated output of 1000W capacity can light nine to fourteen 40W fluorescent lamps.

**Example 2 :** Generally speaking, a 400W motor means that its work load is 400W. Efficiency of this motor is 0.7 and power consumption will be  $400 \div 0.7 = 570W$ . When this motor is used for a motor-driven tool, the capacity of the generator should be multiplied by 1.2 to 3 and 570W as explained in the **Item (3)**.

The power consumption of electrical appliances is shown below for reference, use this as a measuring guide when choosing electrical appliances and which generator to use.

Electrical Appliances			
Electrical appliances	Starting wattage	Electrical appliances	Power Consumption (W)
Household Appliances	One of power consumption	Rice Cooker	300 to 1000
		Coffee Maker	450
		Electric grill	800 to 1400
		Color TV	100
		Hair dryer	1200
	1.2 to 2 times of power consumption	Air conditioner	1200
		Microwave	800 to 1200
		Lawn mower	400
	3 to 5 times of power consumption	Refrigerator	100 to 260
		Vacuum cleaner	1100
		Washer	500
		Air Cooler	600
		Deep well pump	600
		Mercury lamp	40 to 400

Electrical Appliances			
Electrical appliances	Starting wattage	Electrical appliances	Power Consumption (W)
Electrical tools /Architecture	One of power consumption	Soldering iron	300 to 1000
		Lighting for young sardines	600
	1.2 to 2 times of power consumption	Drill	350 to 600
		Disc Grinder	500 to 1200
		Electrical hammer	1000
		Chain saw	1200
		Impact wrench	1200
		Vibrator	800 to 1200
	3 to 5 times of power consumption	Drill for shiitake	400
		Air compressor	1000 to 2600
		Winch	1100
		water pump	500

NOTES : Wiring between generator and electrical appliances

1. Allowable current of cable

Use a cable with an allowable current that is higher than the rated input current of the load (electrical appliance). If the input current is higher than the allowable current of the cable used, the cable will become excessively heated and deteriorate the insulation, possibly burning it out. The table below shows cables and their allowable currents for your reference.

2. Cable length

If a long cable is used, a voltage drop occurs due to the increased resistance in the conductors decreasing the input voltage to the load (electrical product). As a result, the load can be damaged. The table below shows voltage drops per 30 meters of cable.

Cross sectional mm <sup>2</sup>	Allowable Current A	Cable Resistance Ω/100m	Voltage drops per 30 meters of cable					
			5A	10A	15A	20A	25A	30A
1.25	12	1.486	4.5V	8.9V	*	*	*	*
2.0	17	0.952	2.8V	5.7V	8.6V	*	*	*
3.5	23	0.517	1.6V	3.1V	4.7V	6.2V	*	*
5.5	35	0.332	1.0V	2.0V	3.0V	4.0V	5.0V	6.0V

Voltage drop indicates as  $V = \frac{1}{100} \times R \times I \times L$

R : Resistance (Ω/100m)  
 I : Electric current (A)  
 L : Length (m)

The length of wire (L) indicates round length, which is the length from the generator to the electrical tools and back.

<Example> R : Resistance 1.25mm<sup>2</sup>=1.48Ω/100m  
 I : Electric current 10A  
 L : Length 30m

The voltage drop of the case described above

$$V = \frac{1.48\Omega \times 10A \times (30m \times 2)}{100} \div 8.9 (V)$$

## 4. MEASURING AND CHECKING PROCEDURES

### 4-1) INSTRUMENTS

#### (1) VOLTMETER

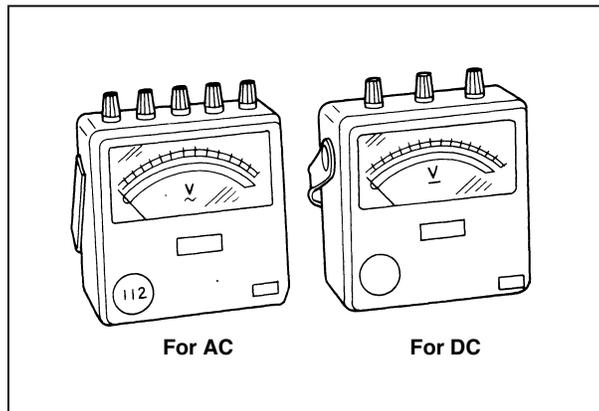
AC voltmeter is necessary.

The approximate AC voltage ranges of the voltmeters to be used for various types of generators are as follows :

0 to 150 V : Type with an output voltage of 110 or 120 V

0 to 300 V : Type with an output voltage of 220, 230 or 240 V

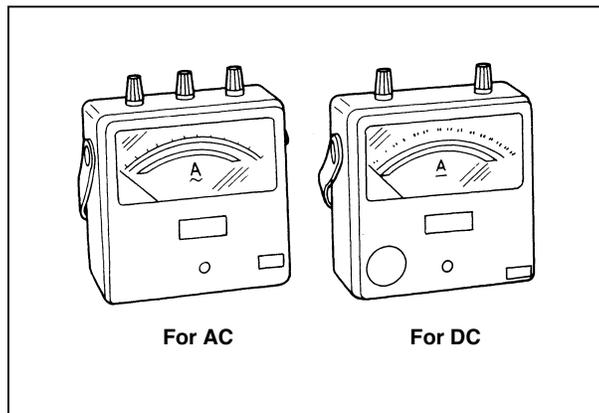
0 to 150 V, 0 to 330 V : Dual voltage type



#### (2) AMMETER

AC ammeter is necessary.

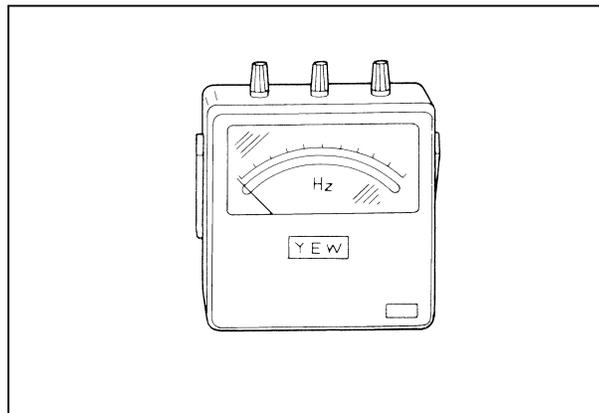
An AC ammeter with a range that can be changed according to the current rating of a given generator is most desirable. (About 10 A, 20 A, 100 A)



#### (3) FREQUENCY METER

Frequency range : To cover 45 to 65Hz

*NOTE : Be careful of the frequency meter's input voltage range.*

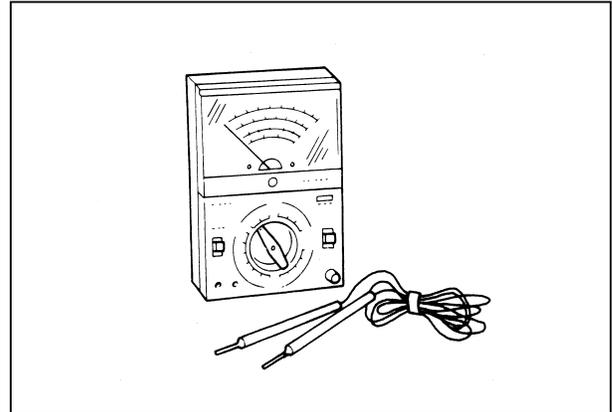


(4) CIRCUIT TESTER

For measuring resistance, etc.

*NOTE : The ordinary circuit tester may cause erroneous readings due to their measuring method.*

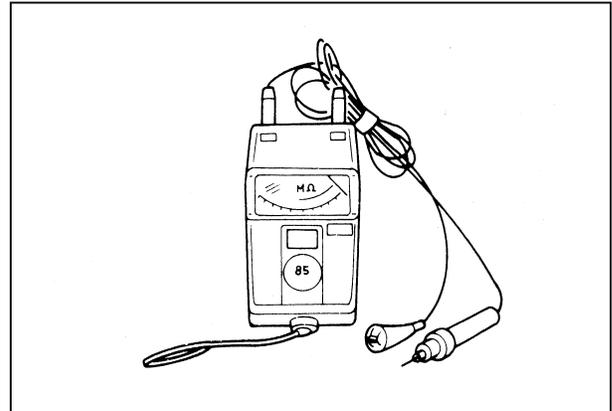
*Use a high-grade, precise circuit tester to check the generator components.*



(5) MEAGER TESTER

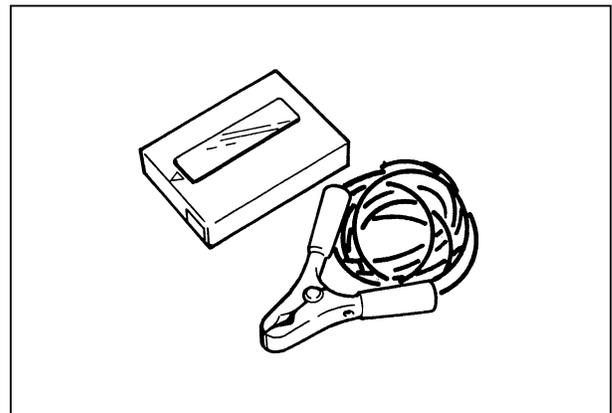
Used for measuring generator insulation resistance.

Select the one with testing voltage range of 500V.



(6) TACHOMETER

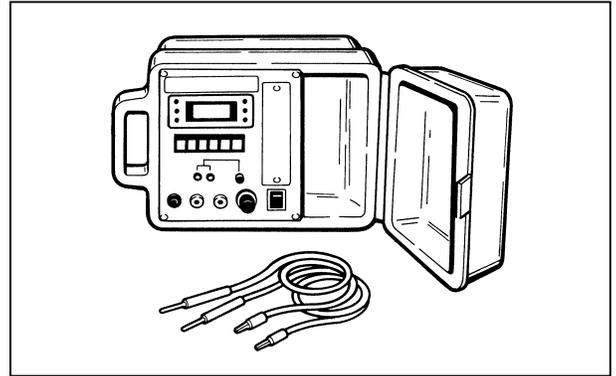
Use the contactless type tachometer for checking engine speed.



(7) "Dr.Robin" GENERATOR TESTER

The "Dr.Robin" generator tester is exclusively designed for fast, easy diagnosis and repair of Robin generators. The "Dr.Robin" has the following features :

- 1) Functions of voltmeter, frequency meter, megger tester, capacitance meter and circuit tester are combined in one unit.
- 2) Fast and easy readout by digital indicator.
- 3) Built-in automatic battery checker indicates the time to change batteries.
- 4) Tester and accessories are installed in a handy, sturdy case for easy carrying.



SPECIFICATIONS

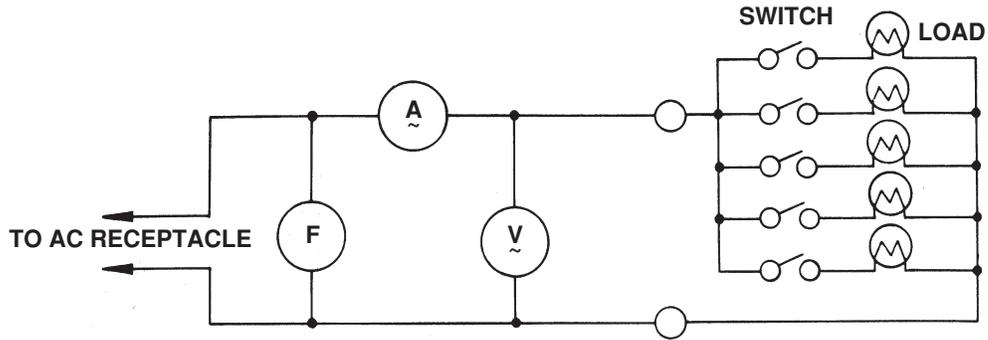
MODEL		Dr.Robin
Part Number		388-47567-08
Measuring Range	Voltage	0 to 500 V AC
	Frequency	25 to 70 Hz
	Resistance	0.1 to 1,999 $\Omega$
	Condenser Capacity	10 to 100 $\mu$ F
	Insulation Resistance	3M $\Omega$
Circuit Protector		Fuse
Power Source		2 x 6F44P (006P) Dry Cell Battery
Accessories		Test leads with needle probes ... 1 set Test leads with jack plugs ... 1 set
Dimensions (L x W x H)		285 mm x 200 mm x 110 mm
Weight		1.6 kg

The "Dr.Robin" generator tester can be ordered from Robin generator distributors by the following part number.

**Dr.Robin Part Number : 388-47565-08**

If you do not have a "Dr.Robin" generator tester, use the instruments described in the following section for checking generator parts.

## 4-2) AC OUTPUT MEASURING

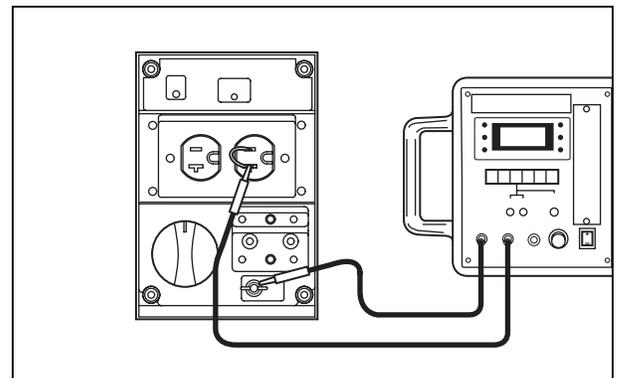


Use a circuit above for measuring AC output. A hot plate or lamp with a power factor of 1.0 may be used as a load. Adjust the load and rpm, and check that the voltage range is as specified in the following table at the rated amperage and rated rpm.

Rated voltage	60Hz-120V	50Hz-230V	50Hz-240V
Voltage range	120-128	230-246	240-256

## 4-3) MEASURING INSULATION RESISTANCE

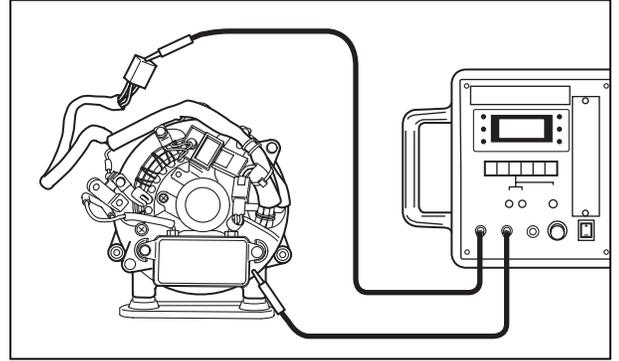
- Connect the megger tester across either one of the two output terminals of the AC receptacle and ground terminal to measure the insulation resistance. Measure it with the AC breaker on. An insulation resistance of 1 MΩ or more is normal. (Original insulation resistance at the time of shipment from the factory is 10 MΩ or more.) If it is less than 1 MΩ, disassemble the generator and measure the insulation resistance of the stator, rotor and control panel individually.



(2) ALTERNATOR

Measure insulation resistance between each terminal (Black or White) of 6-P connector from the stator and the stator core.

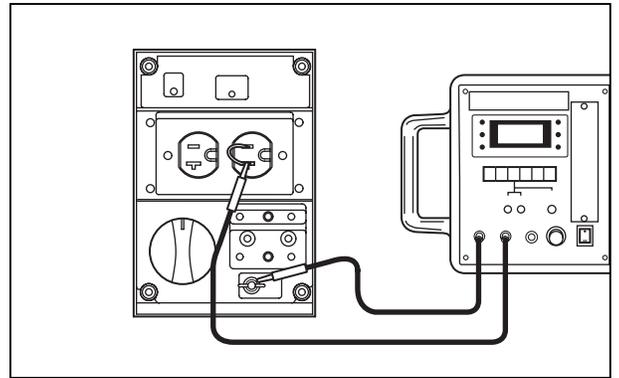
If there is a wire which has insulation resistance less than  $1\text{ M}\Omega$ , replace the stator. Insulation failure cause electrical leak which may result in electrocution.



(3) CONTROL PANEL

With AC breaker turned ON, measure insulation resistance between each portion of electrical parts and earth (grounding) terminal or control panel itself. Measure with the AC breaker on.

If there is a spot where insulation resistance less than  $1\text{ M}\Omega$ , replace the part. Insulation failure may result in electrification, or an electrical leak.

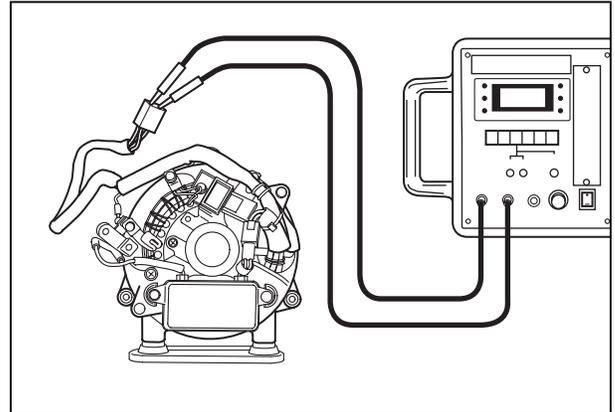


## 4-4) CHECKING FUNCTIONAL MEMBERS

### (1) STATOR

Measure the winding wire resistance. Check the resistance of the wires that comes out from the stator using a tester, referring to the following table.

*NOTE: When measuring according to the numerical value shown in the chart, tolerance should be considered because of the inaccuracy of the tester. If an accurate value is needed, measure by electric resistance using an Ohm-meter. While doing this, use caution to avoid contact resistance.*



Generator wire resistance		Unit ; $\Omega$		
	Color of the wires	AC 120V Specification	AC 230V Specification	AC 240V Specification
<b>Main coil</b>	Black-White	1.7	7.4	7.7
<b>Exciter coil</b>	Yellow-Yellow	2.7	3.1	3.1
<b>DC coil</b>	Brown-Brown	1.2	1.2	1.2

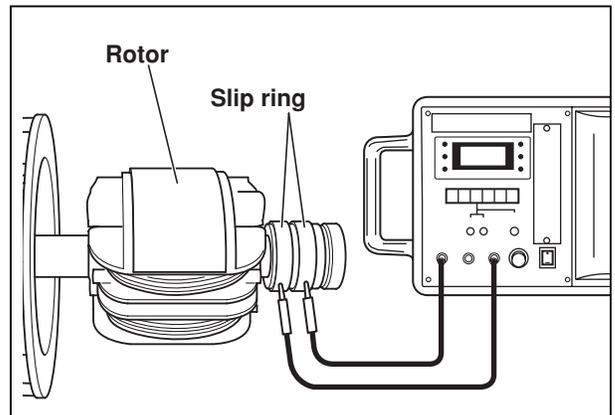
### (2) ROTOR ASSEMBLY

#### 1) Field coil

Measure resistance between the slip rings.

	Resistance ( $\Omega$ )
<b>Field coil</b> (Between two Slip rings)	35

*NOTE : When measuring, tolerance should be considered because of the tester inaccuracy, winding number variation, ambient temperature etc.*



#### 2) Cleaning Slip rings

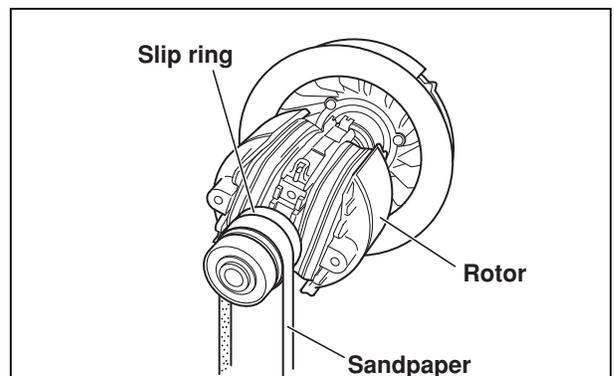
The slip ring surfaces must be uniformly bright.

Slip rings showing black spots, excessive wear, or uneven wear must be repaired.

A stained slip ring lowers generator efficiency and output voltage.

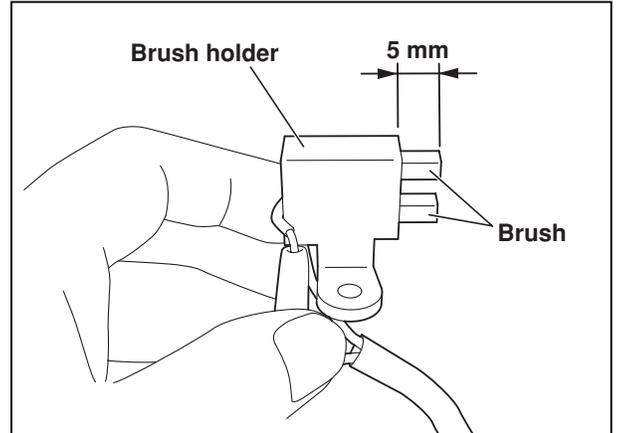
Polish the slip rings with fine sandpaper while turning the rotor until rough spots disappear.

*NOTE : Care should be taken not to touch the rotor coils with the sandpaper.*



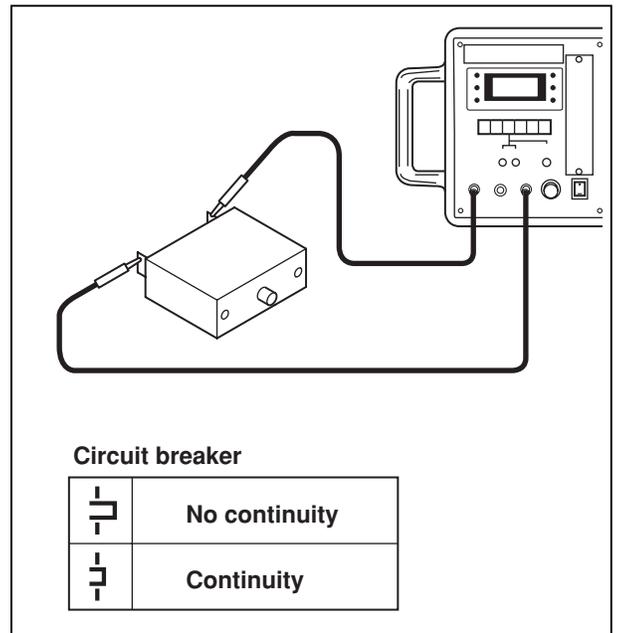
(3) BRUSH

The brushes must be smooth where they contact the slip rings. If not, polish smooth the brushes with sandpaper. A brush that is not smooth produces arcs between the brush and slip ring leading to possible damage. A brush shorter than 5 mm must be replaced because decreased contact pressure between the brush and slip ring lowers generator efficiency and output voltage.



(4) AC CIRCUIT BREAKER

Check continuity between each of two terminals at the rear of the AC circuit breaker while it is mounted on the control panel.



(5) DC CIRCUIT BREAKER

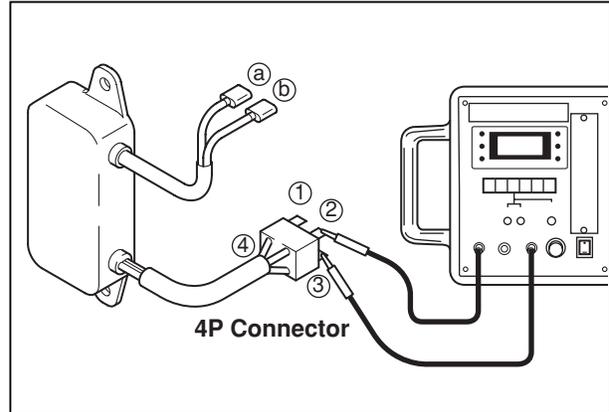
Check that there is continuity between the two terminals of DC circuit breaker when its push button is pressed.

(6) A.V.R (AUTOMATIC VOLTAGE REGULATOR)

1) Features

This AVR operates to control the field current in order to maintain the output voltage for the AC current, which generated by the magnetic flux by the field coil.

2) A.V.R. trouble may be identified by simply looking at the A.V.R., or by the inter-lead resistance with a tester, or actually mounting it in the generator and operating it.



(a) A.V.R. TROUBLE IDENTIFICATION by APPEARANCE

If an A.V.R. electronic part is burnt dark, or the surface epoxy resin melted, it often indicates A.V.R. trouble.

(b) IDENTIFYING A.V.R. TROUBLE by CHECKING INTER-LEAD RESISTANCE

Check the inter-lead resistance of the A.V.R. with a tester, referring to the following table.

If the tester readings very greatly from the values specified in the table, the A.V.R. is faulty.

		Apply black ⊖ needle of the circuit tester					
		a Orange	b Orange/Green	①	②	③	④
Apply red ⊕ needle of the circuit tester	a Orange	—	No continuity				
	b Orange/Green	—		No continuity			
	①	No continuity		—	No continuity		
	②	No continuity		—		No continuity	
	③	No continuity		No continuity		—	No continuity
	④	No continuity					—

(c) IDENTIFYING A.V.R. TROUBLE by MOUNTING and OPERATING in THE GENERATOR

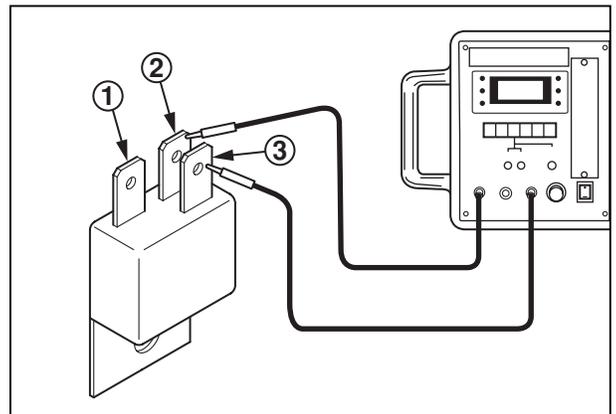
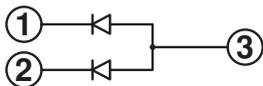
SCR or transistor damage cannot be detected by simply looking at the A.V.R. or checking the lead resistance. Check it by mounting the suspectedly faulty A.V.R. in a normal generator, or mount a normal A.V.R. in a generator which fails to generate voltage.

(7) DIODE RECTIFIER

The internal circuit of the diode rectifier is shown in the figure below.

Check the continuity between each terminal using a circuit tester.

If the continuity is as charted below, the diode rectifier is normal.



**Checking table for analogue circuit tester**

Analogue circuit tester		Apply black ⊖ needle of the circuit tester		
		①	②	③
Apply red ⊕ needle of the circuit tester	①	—	No continuity	Continuity
	②	No continuity	—	Continuity
	③	No continuity	No continuity	—

**Checking table for digital circuit tester**

Digital circuit tester (Dr.Makita)		Apply red ⊕ needle of the circuit tester		
		①	②	③
Apply black ⊖ needle of the circuit tester	①	—	No continuity	Continuity
	②	No continuity	—	Continuity
	③	No continuity	No continuity	—

(8) RECEPTACLE, AC PLUG

Check burn marks in the areas where electric current flows, such as wire and plastic parts of AC receptacle.

(9) OIL SENSOR

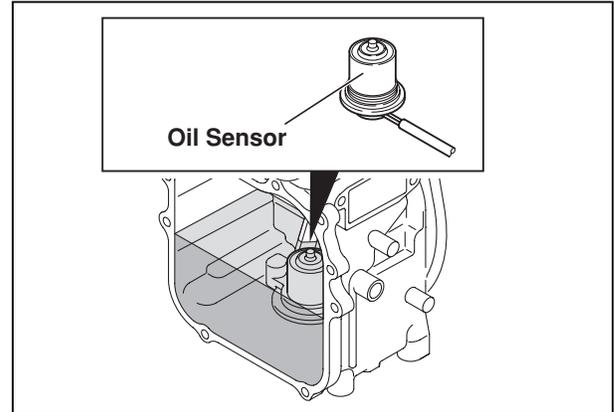
Confirm that there is a sufficient amount of oil. Measure continuity between the wires of oil sensor and the crankcase using a circuit tester.

**Below the lower level : ON (continuity)     $0\Omega$**

**Above the lower level : OFF(non-continuity)     $\infty$**

Use 4-stroke automotive detergent oil of API service class SE or higher Grade (SG, SH or SJ is recommended).

**Oil capacity : 0.4 liters**



## 5. ASSEMBLY AND DISASSEMBLY

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### 5-1) PRECAUTIONS

- (1) Be sure to memorize the location of each part when disassembling the generator so that the generator can be correctly reassembled. Tag the disassembled parts with the necessary information to facilitate easier and smoother reassembling.
- (2) For greater convenience, divide the parts into several groups and store them in boxes.
- (3) To prevent bolts and nuts from being misplaced or installed incorrectly, place them temporarily back at their original position.
- (4) Handle disassembled parts with care; wash them with clean oil.  
(Do not clean electrical parts with oil nor water.)
- (5) Use proper tools correctly for each specific job.
- (6) Please be sure to glue the sponge inside the cover. Please replace the sponge if it is deformed, peeled, or damaged, with a new one. The generator performance may be negatively affected by the lack of a sponge or deformed, peeled or damaged sponge.
- (7) Tie the electric wires and fuel pipe with wire bands as necessary.

※Please refer to Robin Engine Service Manual EH09 for the assembly and disassembly of the engine.

### 5-2) SPECIAL TOOLS

Use the proper, specialized tools for disassembly and assembly.

By using the proper, specialized tools, maintenance trouble and damage of the equipment can be avoided.

Parts No.	Name of the tool	Form	Use method
33K9990001	Rotor puller		To remove Flywheel with Rotor

### 5-3) DISASSEMBLY PROCEDURES

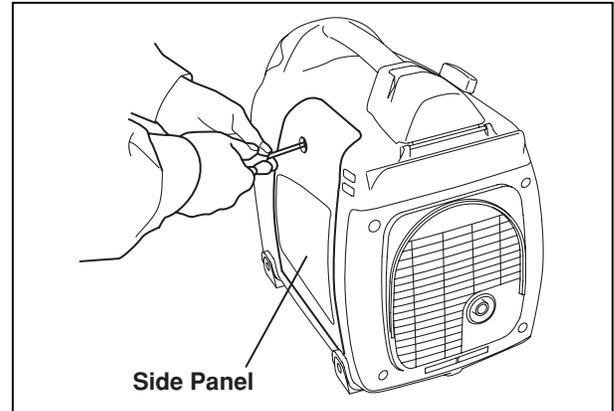
Please disassemble in the order of the procedure below.

#### 5-3-1 Remove the side panels (Left, Right)

Remove the side panels.

M6 x 16.5mm Bolt : 2 pcs.

Tools : Screw driver

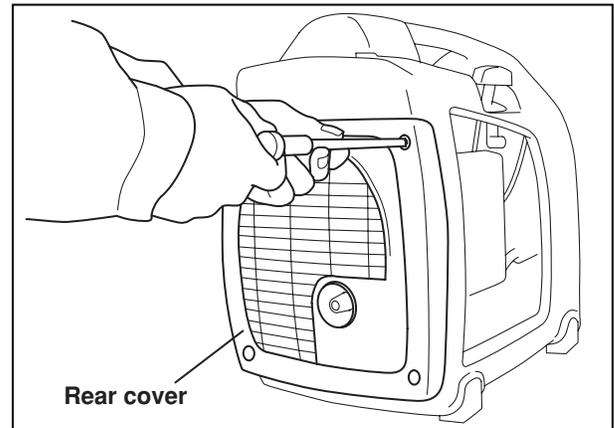


#### 5-3-2 Remove the rear cover

Remove the rear cover by unscrewing the four screws.

M6 x 20mm Screw and Washer : 4pcs.

Tools : Screw driver

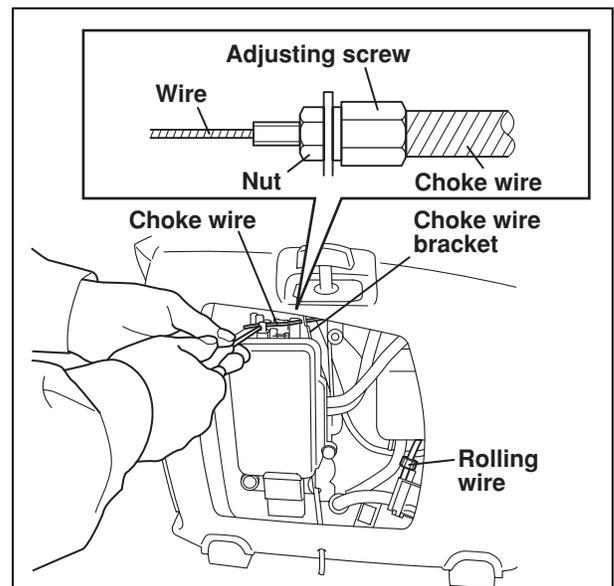


#### 5-3-3 Remove rolling wire, choke wire

Remove chock lever swivel screw fixing chock wire.  
Untighten adjusting screw nut, remove adjust screw from chock wire bracket, and then take out choke wire from swivel.

Unwind the rolling wire by hand or pliers, and pull up.

Tools : Screw driver, pliers



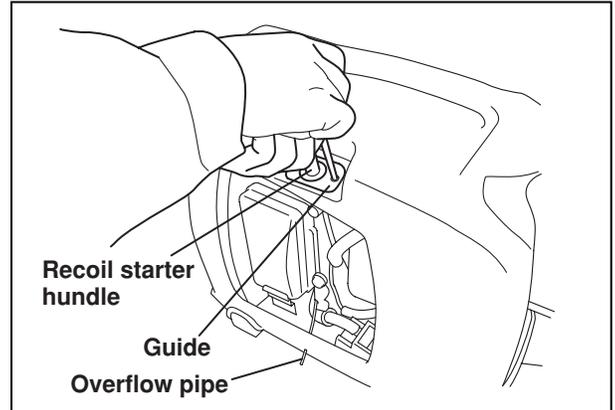
#### 5-3-4 Remove the recoil starter handle

Remove the recoil starter guide connected to the case body (left).

Push the guide and the starter handle through the hole which the case body (left) guide was attached.

M4 x 10mm Tapping screw : 1pce.

Tools : Screw driver



#### 5-3-5 Remove the control panel (1)

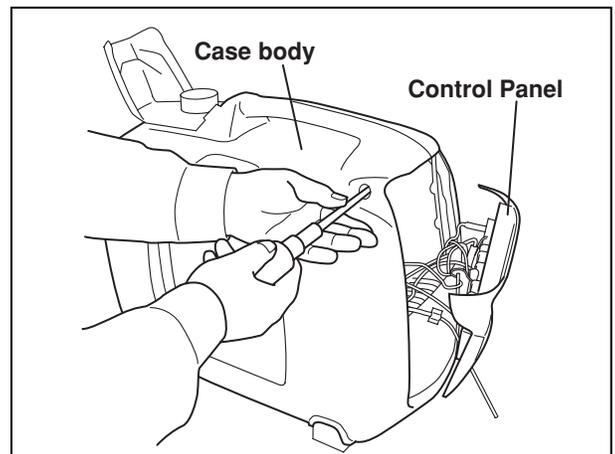
Remove the control panel from the case body.

M4 x 14mm Screw : 4pcs.

M5 x 8mm Screw : 4pcs.

Tools : Screw driver

*NOTE: At this point, the couplers of electrical wires are connected to the control panel. Instead of removing the control panel forcibly, remove it after disassembling the case body and fuel tank.*



#### 5-3-6 Remove the case body (Left, Right)

Remove the case body (Left, Right)  
Remove the plastic pipe from the case body.  
(Overflow pipe)

##### Upper part of the case body

M6 x 25mm Screw and Washer : 2pcs.

M6 x 20mm Screw and Washer : 1pce.

M4 x 110mm Screw : 1pce.

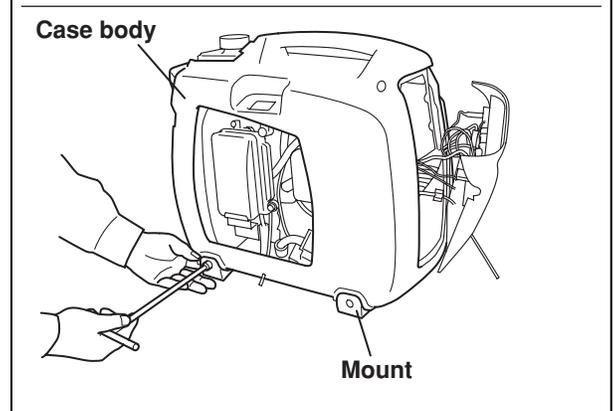
Tools : Screw driver

##### Bottom part of the case body

Remove the case with the mount still fastened to it.

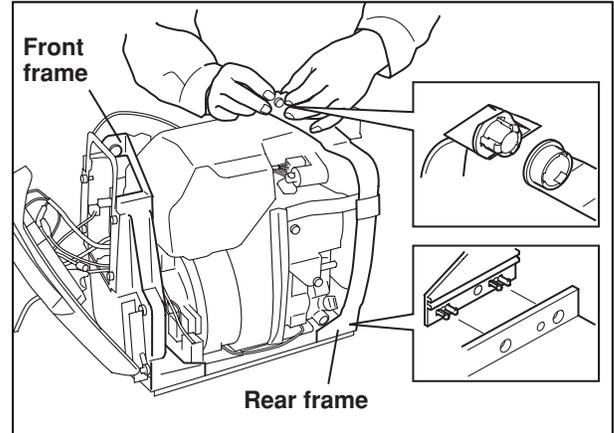
M6 x 18mm Flange bolt : 4pcs.

Tools : 10mm Box wrench



### 5-3-7 Remove rear frame

Remove the rear frame.



### 5-3-8 Remove fuel cock bracket

Remove the fuel cock bracket.

M6 x 12mm Flange bolt : 1pce.

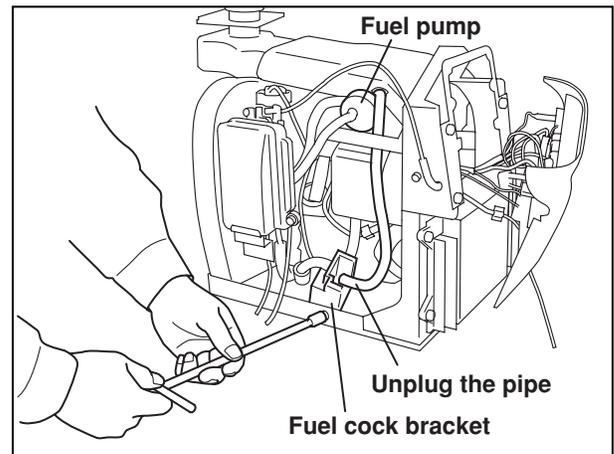
M6 Nut : 1pce.

Tools : 10mm Box wrench

*NOTE 1: Be sure to close the fuel cock before removing the fuel pipe.*

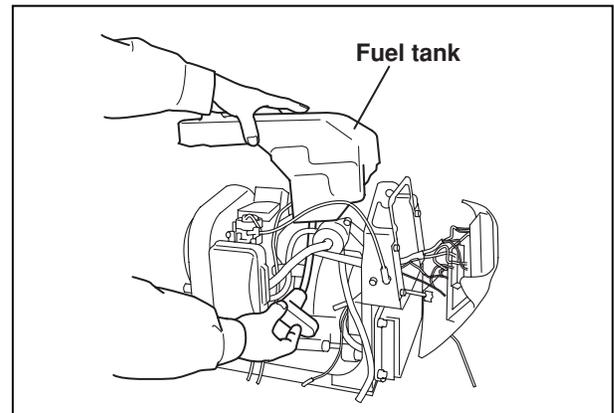
*(Engine switch in the off position)*

*NOTE 2: A little fuel comes out from the fuel pump when unplug the pipe.*



### 5-3-9 Remove the fuel tank

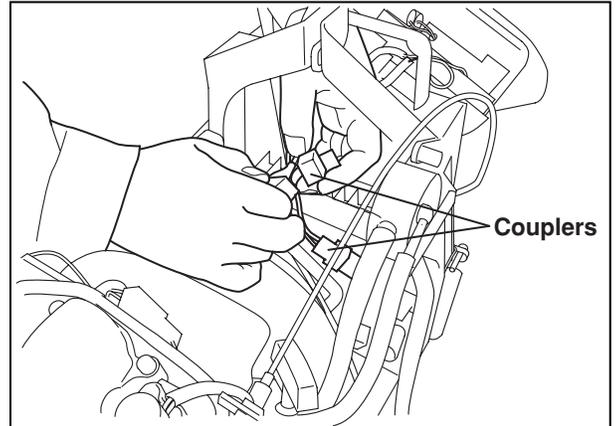
Remove the fuel tank with the fuel cock still connected.



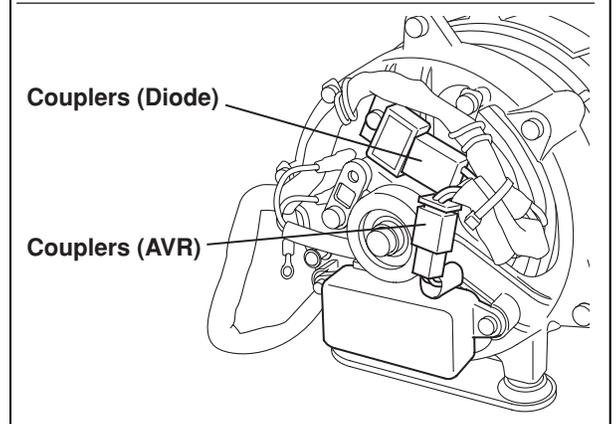
### 5-3-10 Remove the control panel (2)

Remove the control panel by pulling off the three couplers.

Remove the choke wire bracket from the front frame.



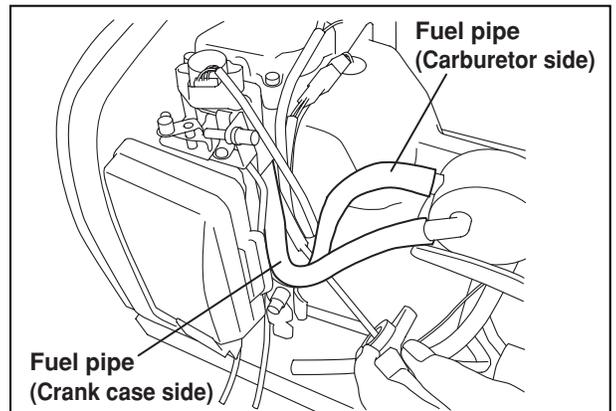
Disconnect AVR coupler and Diode coupler.



### 5-3-11 Remove the fuel pipes

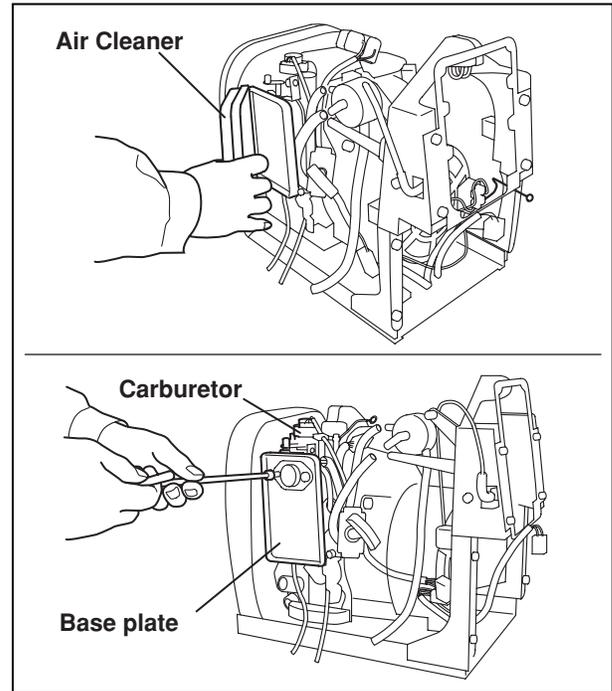
Remove the fuel pipe from the fuel pump to carburetor and the fuel pipe on crank case side.

Tools : Pliers



### 5-3-12 Remove the air cleaner and carburetor

Unhook the catch on the right side of the air cleaner.  
Then remove the air cleaner cover and elements.



Loosen the two nuts and bolt to remove the base plate of the air cleaner.

Then remove the carburetor.

M6 x 18mm Flange bolt : 1pce.

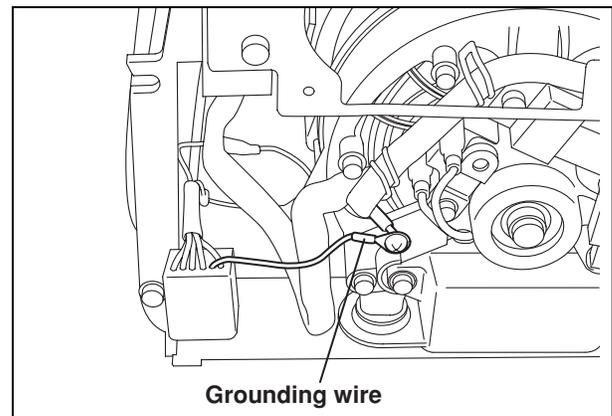
M6 Flange nut : 2pcs.

Tools :10mm Box wrench

### 5-3-13 Grounding wire

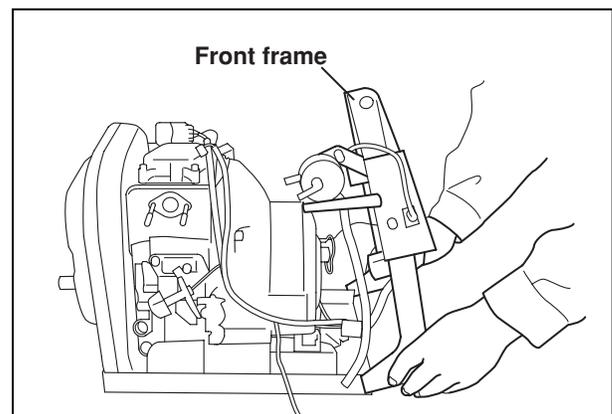
Remove the grounding wire.

Tools : Screw driver



### 5-3-14 Remove the front frame

Remove the front frame.



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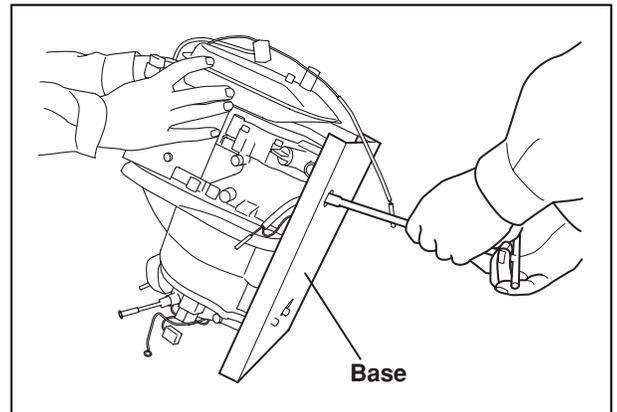
### 5-3-15 Remove the Base

Remove the Base.

M6 nut : 4 pcs, also

M8 x 16 Bolt and washer : 4pcs.

Tools : 12mm Box wrench

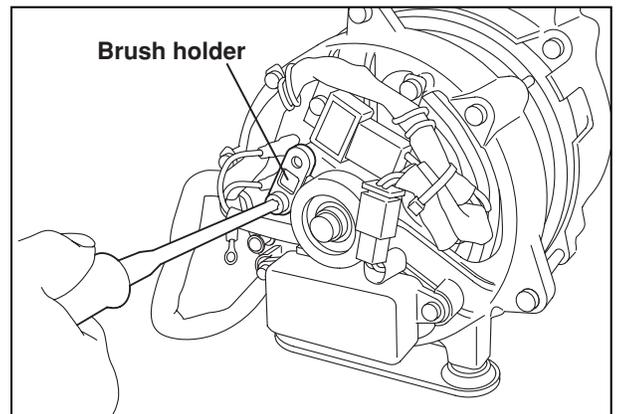


### 5-3-16 Remove the Brush holder

Remove the Brush holder.

M5 x 14mm Screw : 1pce.

Tools : Screw driver



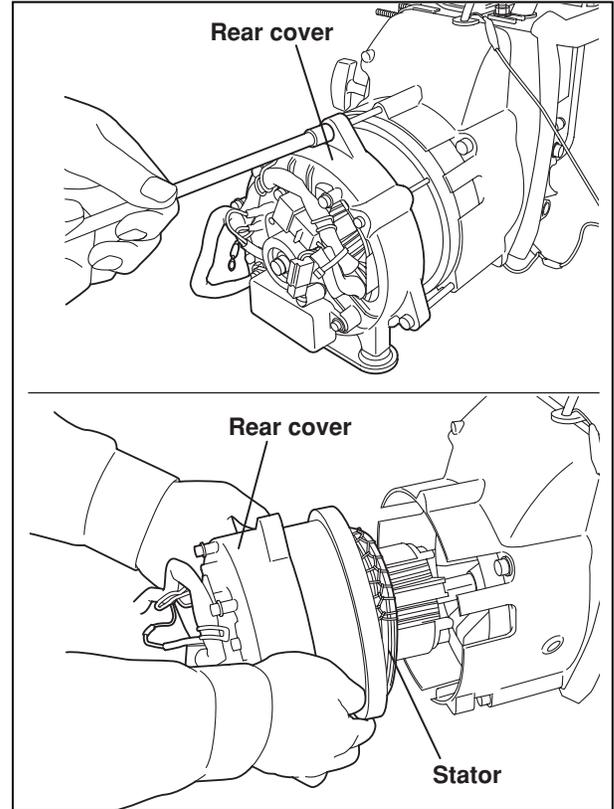
### 5-3-17 Remove the Stator / Rear cover

Remove the Stator / Rear cover.

M6 x 25mm Flange bolt : 3pcs.

Tools : 10mm Box wrench

*NOTE : The stator is attached to the rear cover, both can be removed together.*



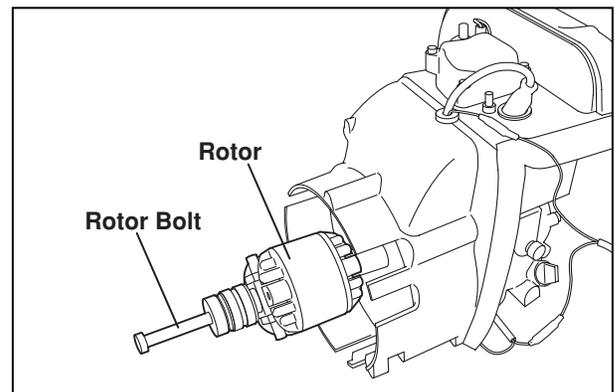
### 5-3-18 Remove the rotor and Flywheel

Remove the rotor and Flywheel.

M8 x 195mm Rotor bolt : 1pce.

Tools : 12mm Box wrench

*NOTE : Flywheel can be removed with Rotor at the same time.*



### 5-3-19 Remove Blower housing

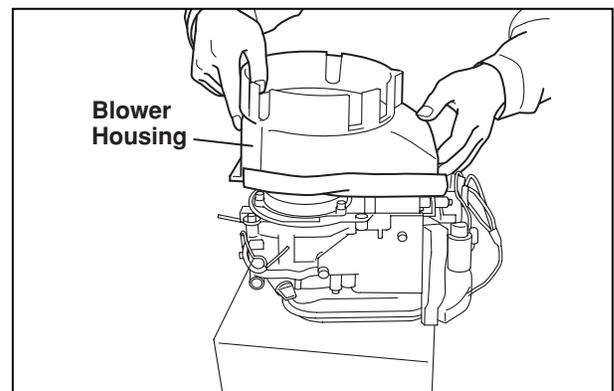
Remove the blower housing.

M8 x 55mm Flange bolt : 1pce.

M8 x 90mm Flange bolt : 3pcs.

Tools : 12mm Box wrench

*NOTE : The pipe knock is attached to two places.*



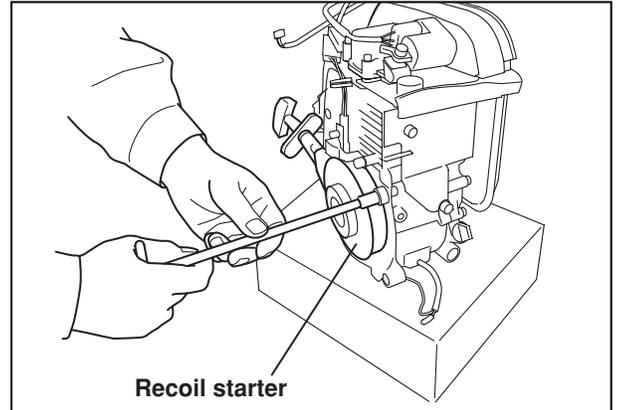
### 5-3-20 Remove recoil starter

Remove the recoil starter.

M6 x 20mm AY Bolt : 3pcs.

Tools : 10mm Box wrench

*NOTE: For the maintenance of recoil starter, please refer to item "5-5) Disassembly and assembly of the recoil starter".*



### 5-3-21 Remove the muffler

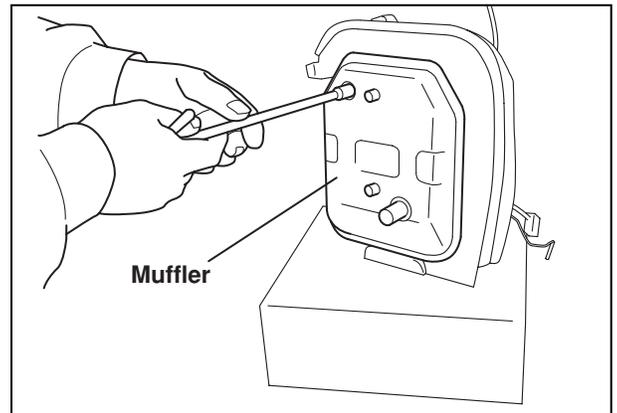
Remove the muffler.

M8 x 80mm Flange bolt : 1pce.

M6 Flange nut : 2pcs.

Tools : 10mm Box wrench

12mm Box wrench

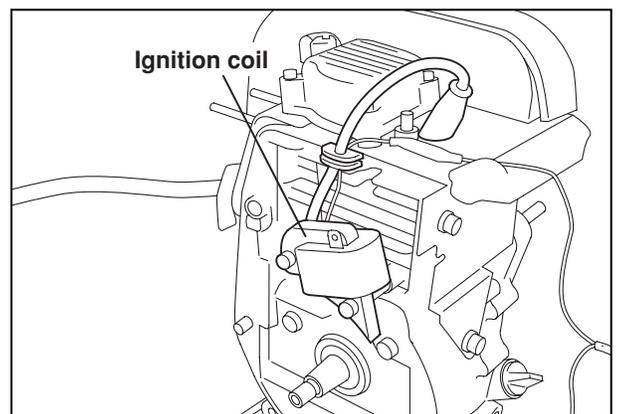


### 5-3-22 Remove the ignition coil

Remove the ignition coil.

M6 x 14mm Flange bolt : 2pcs.

Tools : 10mm Box wrench



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### 5-3-23 Remove the cylinder baffle

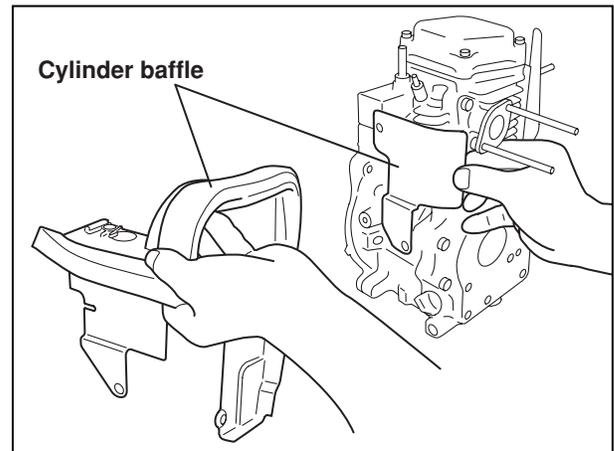
Remove the cylinder baffle.

M8 x 16mm Flange bolt : 3pcs.

M6 x 12mm Flange bolt : 1pce.

Tools : 10mm Box wrench

12mm Box wrench



By performing the above steps, only a bare engine remains.

Please refer to EH09 Service manual for further disassembly and service procedures of the engine.

## 5-4) REASSEMBLY PROCEDURES

### 5-4-1 Cylinder baffle

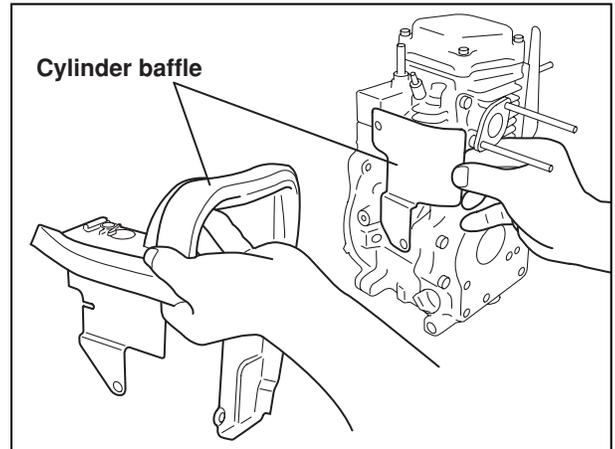
Install the cylinder baffle. (Tighten together)

M8 x 16mm Flange bolt : 3pcs.

<b>Tightening torque : 11.0-13.0</b>	<b>N · m</b>
<b>110-130</b>	<b>kgf · cm</b>
<b>(8.1-9.6)</b>	<b>ft · lbs)</b>

M6 x 12mm Flange bolt : 1pce.

<b>Tightening torque : 7.0-9.0</b>	<b>N · m</b>
<b>70-90</b>	<b>kgf · cm</b>
<b>(5.2-6.6)</b>	<b>ft · lbs)</b>



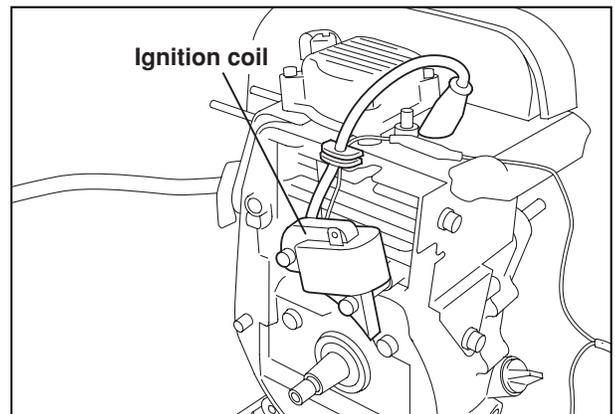
### 5-4-2 Ignition coil

Install the ignition coil into the ignition coil bracket and attach it to the engine.

**Ignition coil bracket tightening torque**

M6 x 14mm Flange bolt : 2pcs.

<b>Tightening torque : 7.0-9.0</b>	<b>N · m</b>
<b>70-90</b>	<b>kgf · cm</b>
<b>(5.2-6.6)</b>	<b>ft · lbs)</b>



### 5-4-3 Muffler

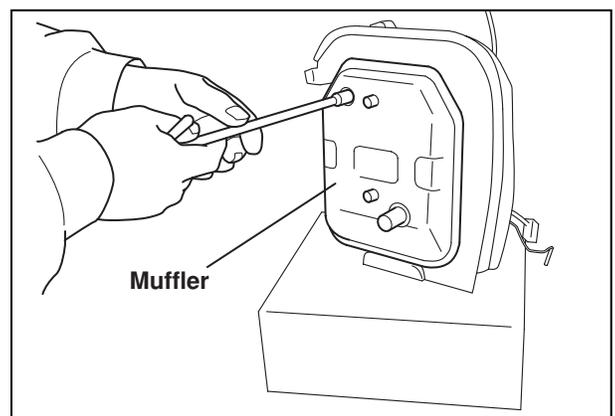
Install the muffler.

M8 x 80mm Flange bolt : 1pce.

<b>Tightening torque : 11.0-13.0</b>	<b>N · m</b>
<b>110-130</b>	<b>kgf · cm</b>
<b>(8.1-9.6)</b>	<b>ft · lbs)</b>

M6 Flange nut : 2pcs.

<b>Tightening torque : 7.0-9.0</b>	<b>N · m</b>
<b>70-90</b>	<b>kgf · cm</b>
<b>(5.2-6.6)</b>	<b>ft · lbs)</b>

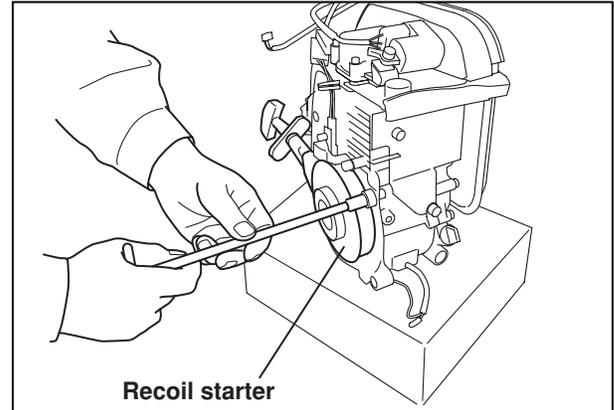


#### 5-4-4 Recoil starter

Attach the recoil starter to the crankcase.

M6 x 18mm Flange bolt : 3pcs.

<b>Tightening torque : 7.0-9.0</b>	<b>N · m</b>
<b>70-90</b>	<b>kgf · cm</b>
<b>(5.2-6.6)</b>	<b>ft · lbs)</b>



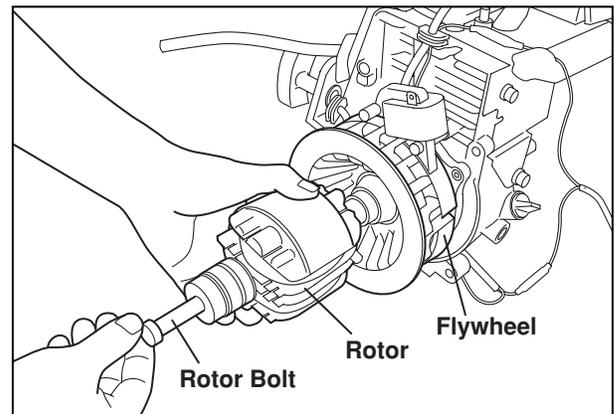
#### 5-4-5 Rotor and Flywheel

Install the Rotor and Flywheel.

M8 x 195mm Rotor bolt : 1pce.

<b>Tightening torque : 19.0-21.0</b>	<b>N · m</b>
<b>190-210</b>	<b>kgf · cm</b>
<b>(14.0-15.5)</b>	<b>ft · lbs)</b>

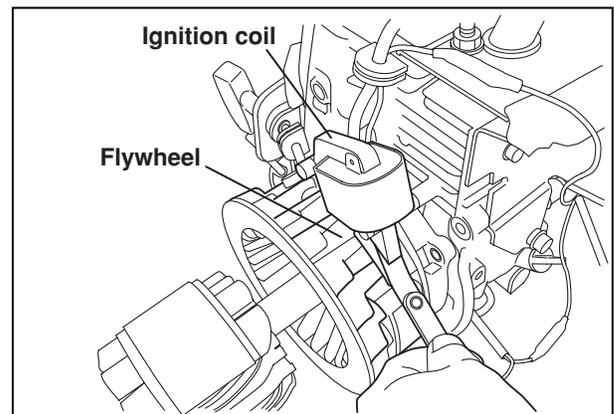
*NOTE : Wipe off any oil from the tapered shaft and hole before assembling.*



#### 5-4-6 Air gap adjustment of flywheel and Ignition coil

Adjust the air gap between flywheel and Ignition coil to 0.5mm with a feeler gauge. Attach the Ignition coil to the engine.

<b>Air gap : 0.5 mm</b>
-------------------------



### 5-4-7 Ignition coil and harness

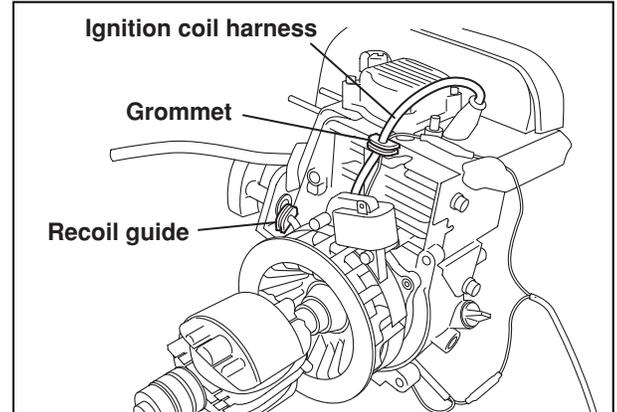
Tighten the bolt in place, making adjustments according to 5-4-6.

M6 x 4mm Flange bolt : 2pcs.

<b>Tightening torque : 3.0-5.0</b>	<b>N · m</b>
<b>30-50</b>	<b>kgf · cm</b>
<b>(2.2-3.7)</b>	<b>ft · lbs)</b>

Place the Ignition coil harness along the groove of the grommet and recoil guide to make it easier to assemble the blower housing.

*Caution : Do not forget to put the 2 pieces of pipe knock.*



### 5-4-8 Blower housing

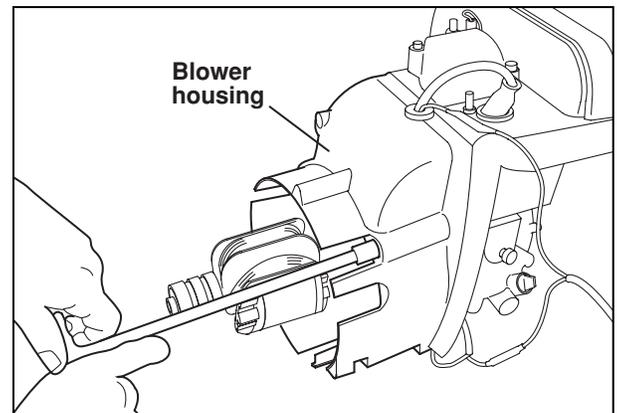
Install the blower housing

M8 x 55mm Flange bolt : 1pce.

M8 x 90mm Flange bolt : 3pcs.

<b>Tightening torque : 18.0-20.0</b>	<b>N · m</b>
<b>180-200</b>	<b>kgf · cm</b>
<b>(13.3-14.8)</b>	<b>ft · lbs)</b>

*NOTE: Insert the grommet (Ignition coil harness) and recoil guide into the blower housing securely.*



### 5-4-9 Rear cover, stator

Install the rear cover of the generator and stator into the blower housing.

Install the rear cover to the blower housing.

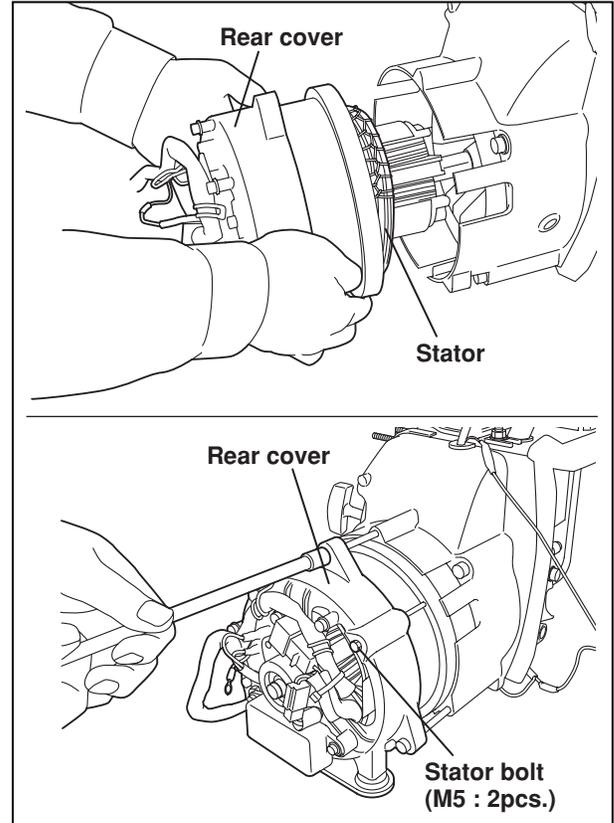
M6 x 25mm Flange bolt : 3pcs.

<b>Tightening torque : 10.0-11.0 N · m</b>
<b>100-110 kgf · cm</b>
<b>(7.4-8.1 ft · lbs)</b>

**NOTE: Make sure of the direction of rear cover during installation.**

Tighten Stator bolts (M5 : 2 pcs.) to the specified tightening torque, after installing Rear cover onto Blower housing.

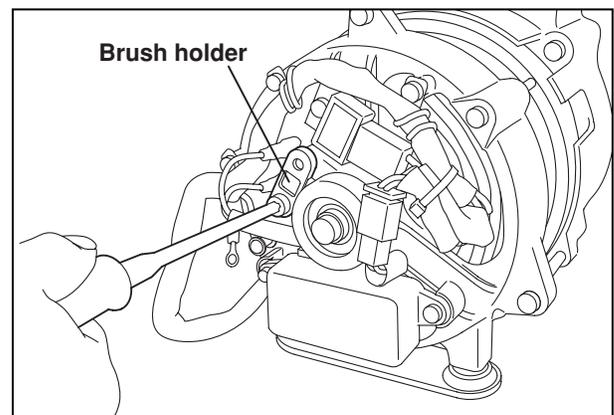
<b>Tightening torque : 3.0-5.0 N · m</b>
<b>30-50 kgf · cm</b>
<b>(2.2-3.7 ft · lbs)</b>



### 5-4-10 Rear cover, stator

Install the Brush holder.

M5 x 14mm Screw : 1pce.



#### 5-4-11 Base

Install the Base into the engine main body.

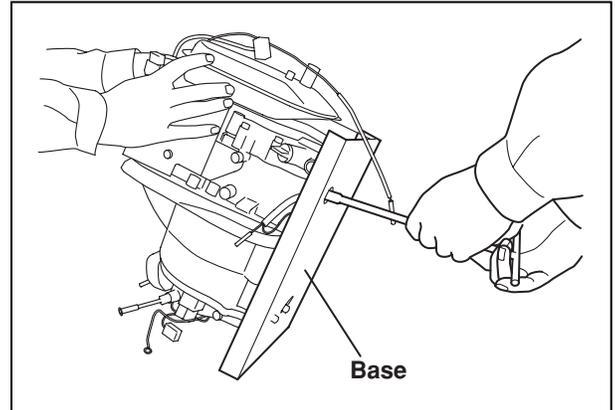
M8 x 20 Bolt and washer : 4pcs.

<b>Tightening torque : 18.0-20.0 N · m</b>
<b>180-200 kgf · cm</b>
<b>(13.3-14.8 ft · lbs)</b>

M6 Flange nut : 4pcs.

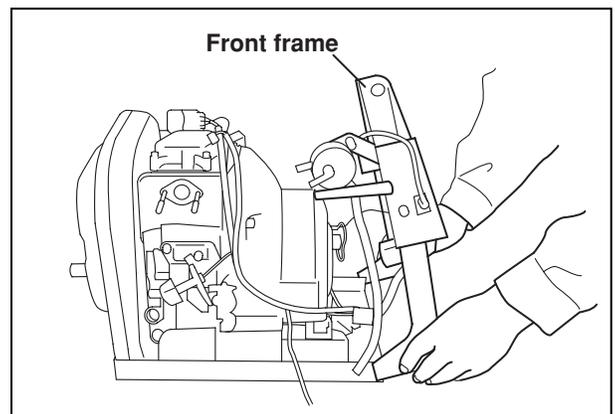
<b>Tightening torque : 9.0-11.0 N · m</b>
<b>90-110 kgf · cm</b>
<b>(6.6-8.1 ft · lbs)</b>

**NOTE: Avoid cutting your hand by the sharp edge of the base.**



#### 5-4-12 Front frame

Install the front frame (L) and (R) onto the Base.



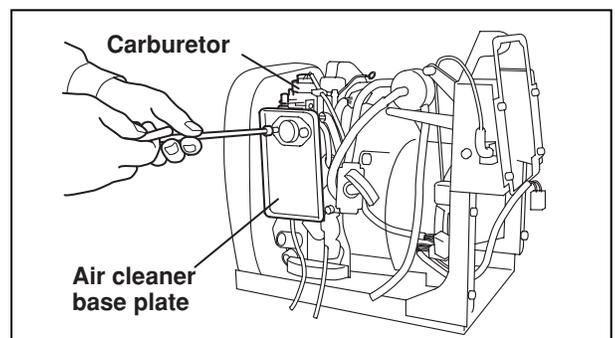
#### 5-4-13 Air cleaner bottom plate and carburetor

Install the insulator, gaskets, carburetor, baffle stay, and air cleaner base plate into the cylinder head.

M6 Flange nut : 2pcs.

<b>Tightening torque : 7.0-9.0 N · m</b>
<b>70-90 kgf · cm</b>
<b>(5.2-6.6 ft · lbs)</b>

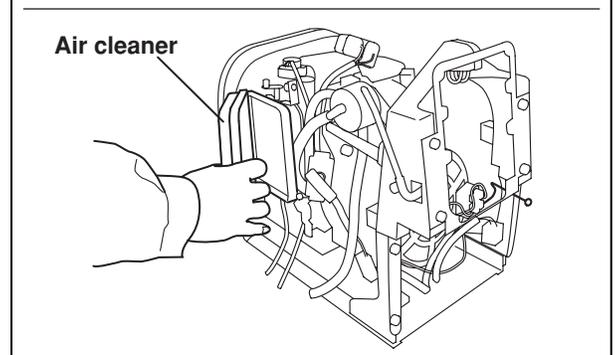
**NOTE: Please do not forget to install the gasket.**



#### 5-4-14 Air cleaner

Install the element and air cleaner cover onto the air cleaner base plate.

M6 x 18mm Flange bolt : 1pce.

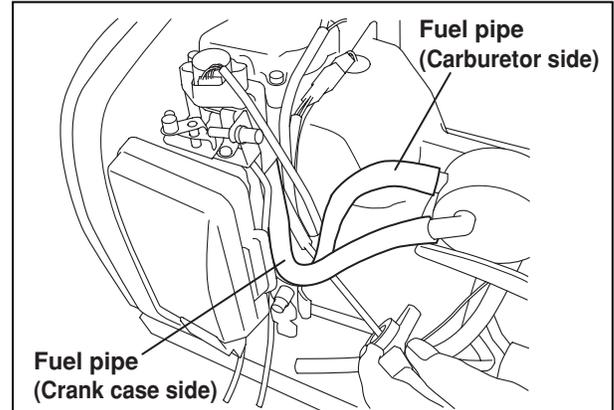


### 5-4-15 Fuel pipe

Connect the fuel pipes from the fuel pump to the crankcase and carburetor and fasten with a hose clamp.

*NOTE: Assemble with care.*

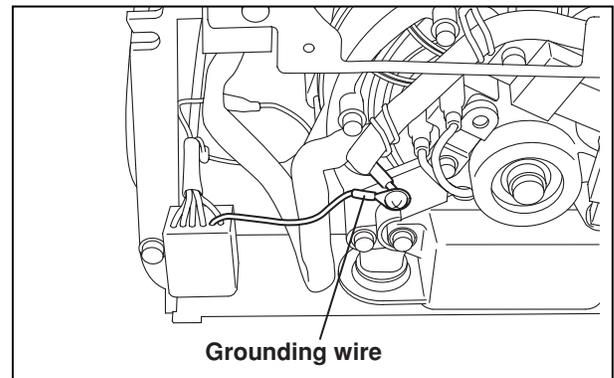
*Avoid mis-connection of fuel pipes.*



### 5-4-16 Grounding wire

Fasten the ground wire.

<b>Tightening torque : 3.0-4.0 N · m</b>
<b>30-40 kgf · cm</b>
<b>(2.2-2.9 ft · lbs)</b>

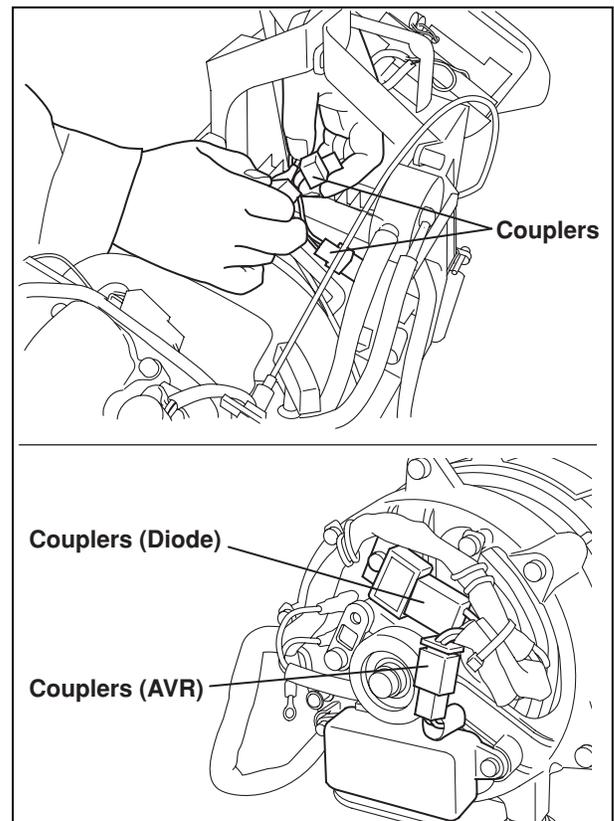


### 5-4-17 Installing coupler

Connect the harness of the control panel.

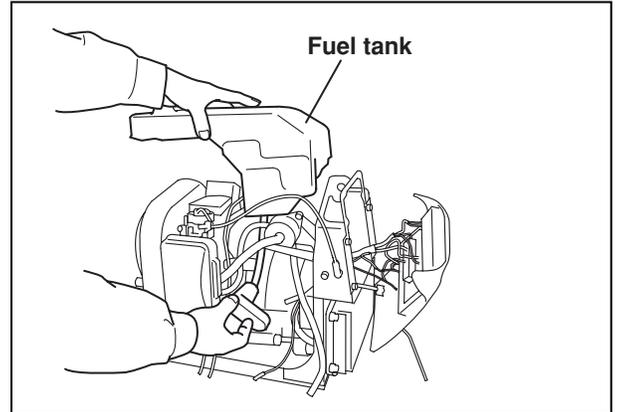
Be sure to securely fasten the couplers of the harness before installing the control panel.

*NOTE: When fastening, make sure there are no mis-wiring of harness, or forgotten wiring.*



### 5-4-18 Fuel tank

Attach the fuel tank and the fuel cock.  
After the fuel tank is installed, connect the fuel line  
between fuel cock and fuel pump.



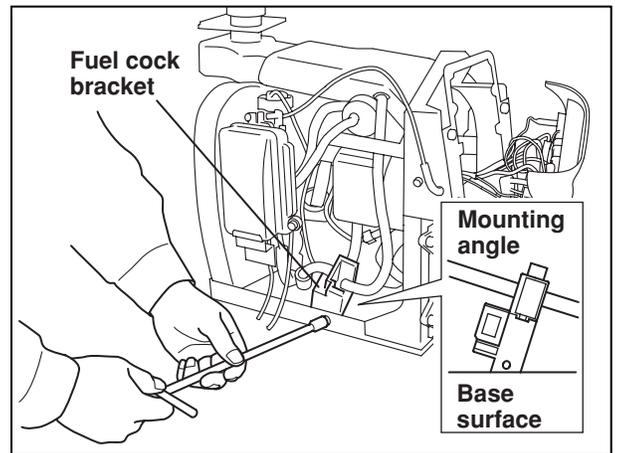
### 5-4-19 Fuel cock bracket

Install the fuel cock bracket into the base.  
(Install the rubber pipe with the hose clamp  
while the fuel cock is closed.)

M6 x 12mm Flange bolt : 1pce.

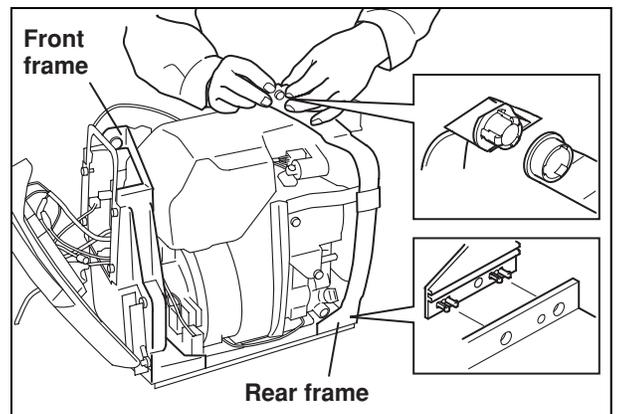
M6 Nut : 1pce.

<b>Tightening torque : 3.0-4.0 N · m</b>
<b>30-40 kgf · cm</b>
<b>(2.2-2.9 ft · lbs)</b>



### 5-4-20 Rear frame

Attach the rear frame (L) and (R) to the Base.



### 5-4-21 Case body, control panel

Attach the case body (left and right). Install the bottom part of the case body and the mount together.

M6 x 18mm Flange bolt : 4pcs.

<b>Tightening torque : 3.0-4.0 N · m</b>
<b>30-40 kgf · cm</b>
<b>(2.2-2.9 ft · lbs)</b>

*NOTE: Install the bottom part of the case body correctly.*

Attach the upper part of the case body.

M6 x 25 Screw and Washer : 2pcs.

M6 x 20 Screw and Washer : 1pce.

M4 x 110 Screw : 1pce.

<b>Tightening torque : 3.0-4.0 N · m</b>
<b>30-40 kgf · cm</b>
<b>(2.2-2.9 ft · lbs)</b>

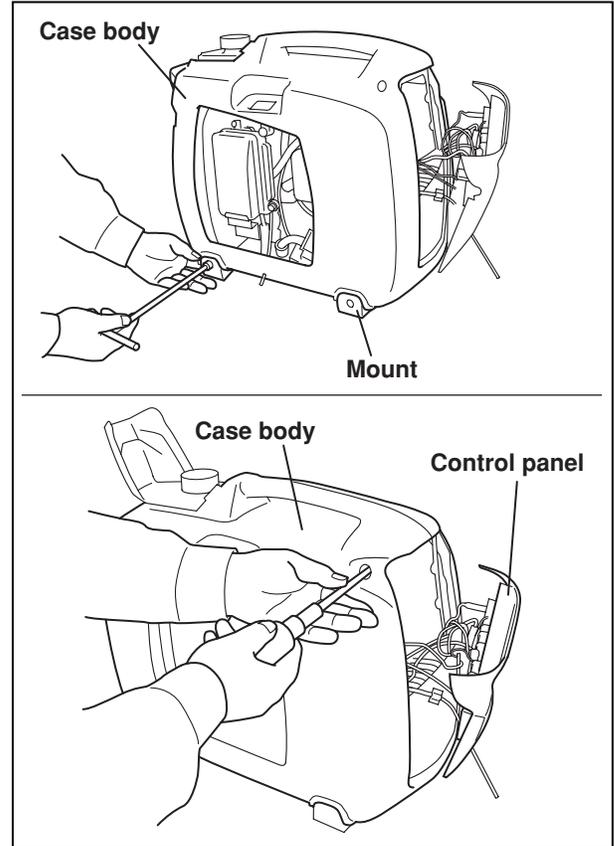
*NOTE: Avoid gaps in the upper part of the case body when installing.*

Install the control panel into the case body.

M4 x 14mm Screw : 4pcs.

M5 x 8mm Screw : 4pcs.

<b>Tightening torque : 2.0-3.0 N · m</b>
<b>20-30 kgf · cm</b>
<b>(1.5-2.2 ft · lbs)</b>



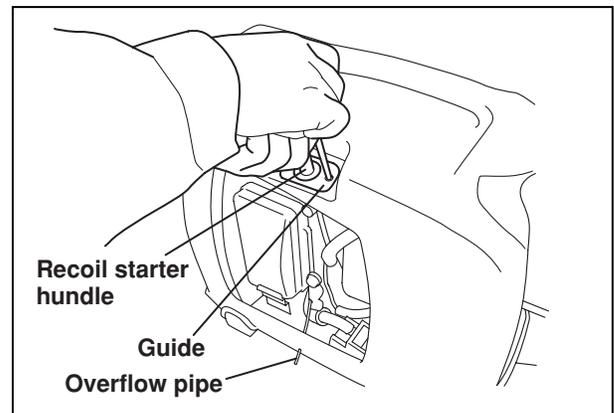
### 5-4-22 Recoil starter and guide

Install the guide of the starter hundle.

Install the guide and starter hundle after they are pushed through the mounting hole from inside of the case body.

M4 x 10mm Tapping screw : 1pcs.

Insert the overflow pipe through the hole in the bottom of the case body.

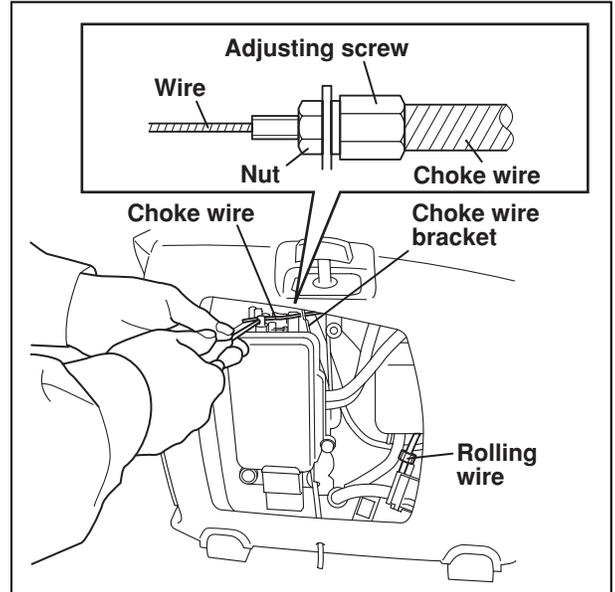


#### 5-4-23 Choke wire and rolling wire

Set adjusting screw onto Choke wire bracket and fix nut.  
Fit choke wire with screw at choke lever swivel.

**NOTE: Make sure the carburetor chock is closed when turning the engine switch into CHOKE position.  
Also make sure the choke is fully opened when turning the engine switch into RUN position.**

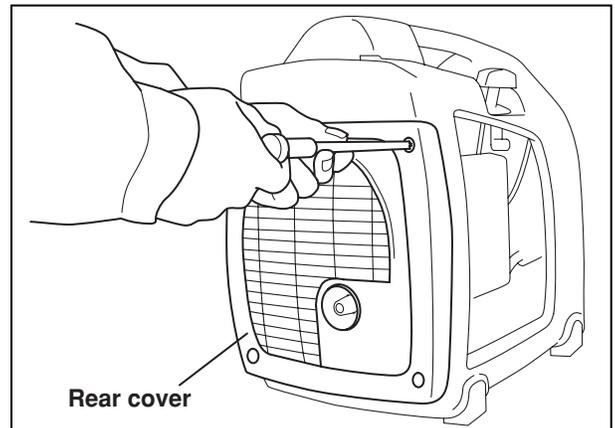
Install the rolling wire into the wire plate and fuel cock behind the control panel.



#### 5-4-24 Rear cover

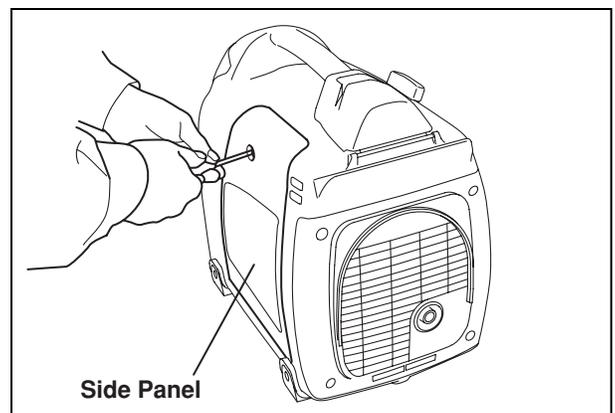
Attach the rear cover to the case body.  
M6 x 30 Screw and Washer : 4pcs.

<b>Tightening torque : 3.0-4.0 N · m</b>
<b>30-40 kgf · cm</b>
<b>(2.2-2.9 ft · lbs)</b>



#### 5-4-25 Side panels (left and right)

Attach the side panel (left and right) to the case body.  
M6 x 16.5mm Bolt : 2pcs.



This is the end of assembly procedures.

## 5-5) RECOIL STARTER

**Tools used :** Long-nose pliers, retaining-ring pliers, protective goggles

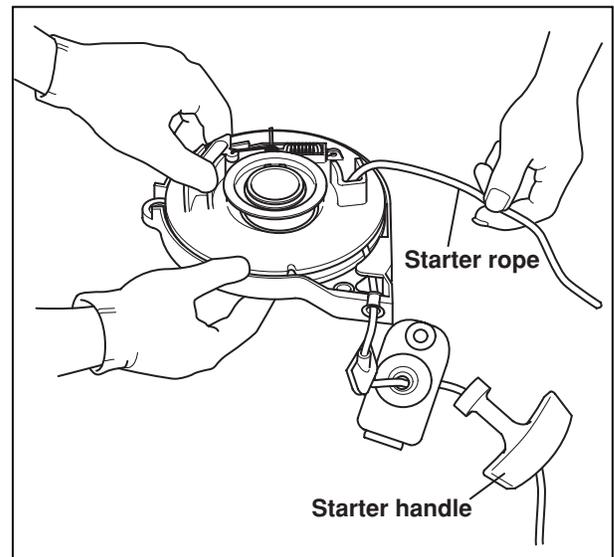
**Caution :**

Please wear protective goggles before starting disassembly

### 1) Disassembly procedures

(1) Unhook the spring.

- 1 Hold the starter handle, and pull out the starter rope.
- 2 Pull out all of the rope, and align the rope guide and the knot of the rope inside the reel.
- 3 Be sure to hold the reel with both thumbs so your fingers do not become be entangled.
- 4 Pull the knot of the rope out from the reel, loosen the knot, then pull it up from the starter handle side (this should be done by two people).
- 5 Slowly rewind the rope until the reel stops while controlling the reel with both thumbs.

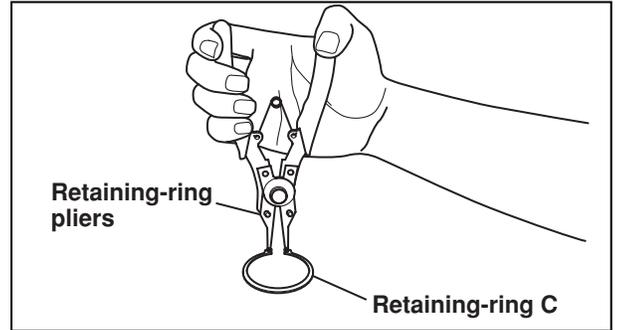


**Caution :**

The pull of the spring is maximized while the rope is fully pulled out. Please do not release it suddenly, or relax your grip.

(2) Remove the small parts.

- 1 Hold the case, and remove the retaining-ring C with the ring pliers.
- 2 Beginning at the top, remove the retaining-ring, friction plate, and ratchet.

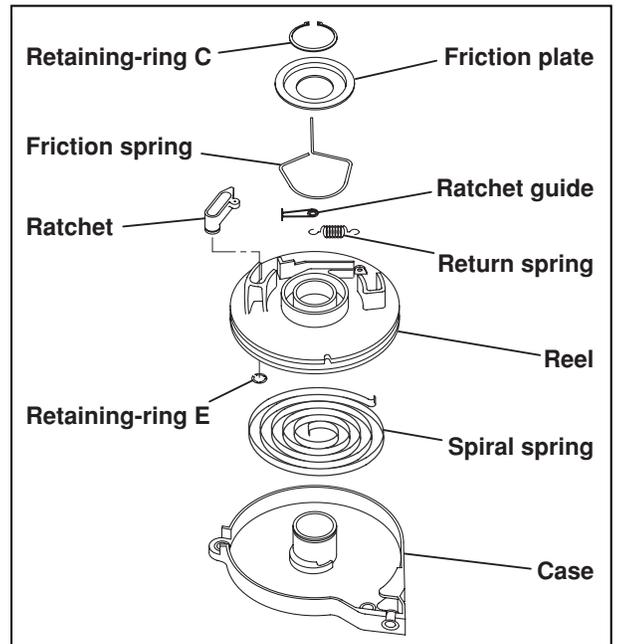


(3) Remove the reel.

- 1 Move the reel to left and right at a 1/4 turns several times until it moves smoothly, gently holding it down.
- 2 Slowly lift the reel, removing it from the case.
- 3 Repeat (3) 1 and (3) 2 if the spring assembled in the reel sticks out.

**Caution :**

The reel is disassembled with the spring still assembled, so place it on a flat table without dropping, or shaking.



Disassembly is completed.

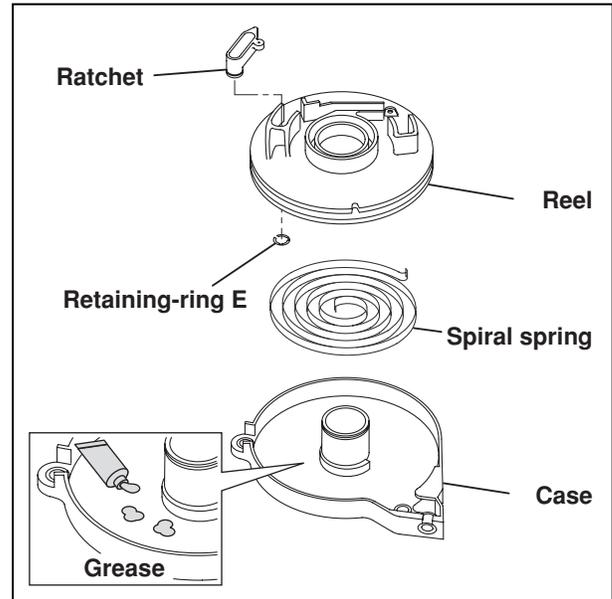
**Caution:**

Please wear protective goggles before starting assembly.

**2) Assembly procedure**

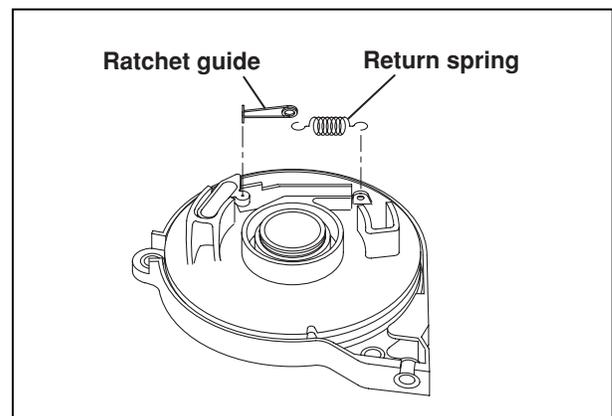
(1) Assemble the reel into the case.

- 1 Install the ratchet, and fasten it with retaining ring E.
- 2 Install the spiral spring in the reel.
- 3 Apply grease to the case.
- 4 Properly orient the inner end of the spring installed in the reel.
- 5 Hold the reel so that the shaft and hook part can be caught on the inner end of the spring, and softly drop into the case from the top.
- 6 Move the reel gently in the counter-clockwise direction, making sure that the spring catches.



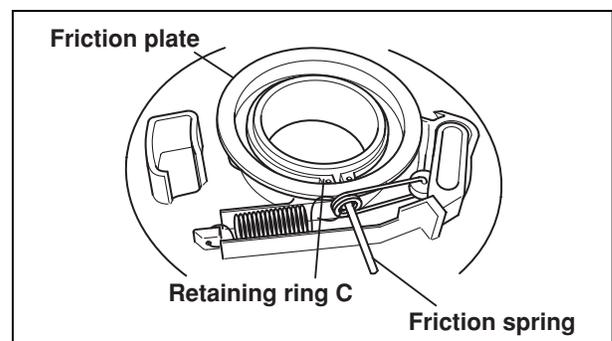
(2) Install the small parts.

- 1 Install the ratchet guide and return spring into the reel.



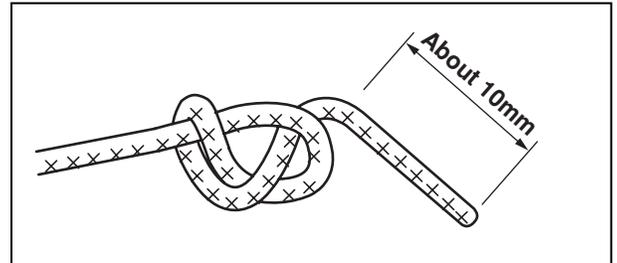
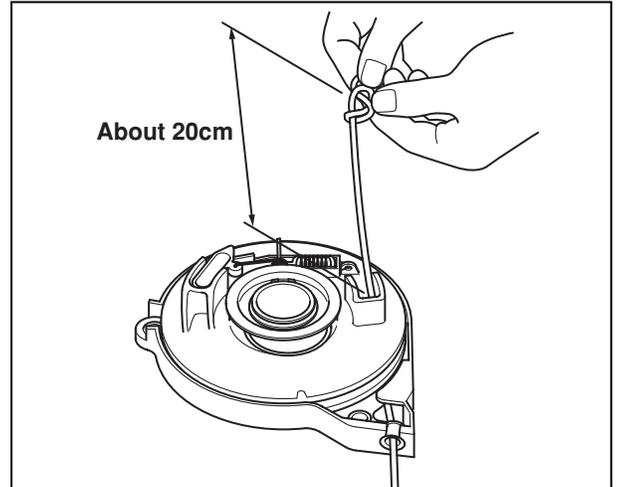
(3) Installing friction plate, retaining ring C

- 1 Install by putting the friction spring end into the spring part of the ratchet guide.  
Align the cut of the friction plate to the cut of the recoil starter main body, and fasten with the retaining ring C.  
Be sure that the retaining ring is fitted into the grooves.



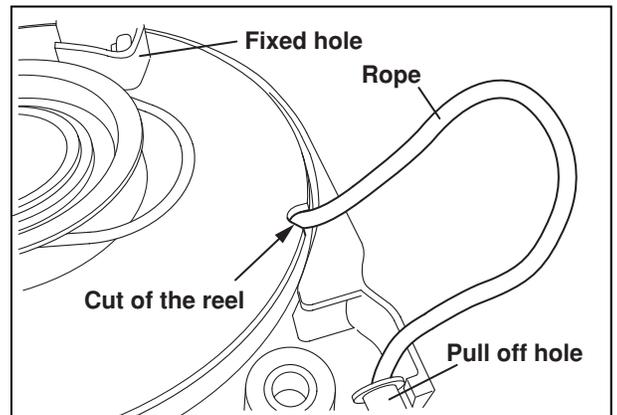
(4) Inserting the rope. (this should be done by two people)

- 1 Thread the rope through the reel where the rope hole on the reel and rope guide are aligned.
- 2 Thread the rope end through the rope guide and the rope hole of the reel, and pull 20cm out from the reel.
- 3 Tight the end of the rope.



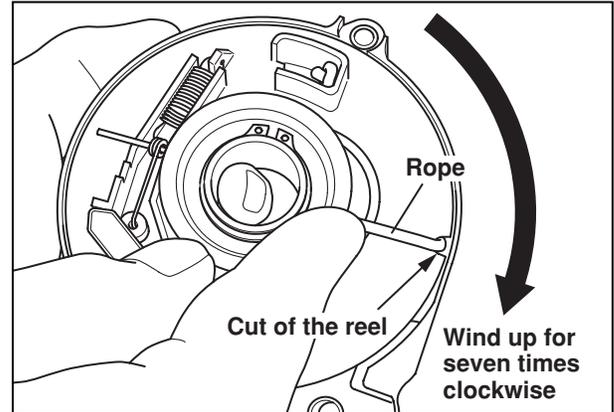
(5) Keep pressure on the spring

- 1 Feed the rope (the length of one rotation of the reel) from the attached hole of the reel and pull it out from the hole of the case. On the reel side, let the rope that was pulled out hang over the notch of the reel.



- 2 Wind the rope clockwise seven times with the rope hanging from the reel.  
Gently wind the rope onto the reel while removing any kinks in the rope from the knob side.

Assembly is completed.



※These are the disassembly and assembly procedures, please be sure to review the following item checklist to insure that the parts securely installed.

### 3) Checking items after assembly

(1) Try to pull the starter handle for 2 to 3 times.

- 1 When the starter handle is difficult to pull, please make sure the parts, etc., are installed in the right direction.
- 2 When the ratchet does not operate, please re-check if there are any missing parts such as the spring.

(2) Pull the starter handle and try to pull the starter rope out to the limit.

- 1 When the starter rope remains in the rope groove of the reel, pressure is put on the spring. Pull out 30cm of the starter rope, holding the reel firmly with your thumb, and then pull the starter rope out towards of the recoil starter. Next, rewind it 1~2 times, controlling reel rotation.
- 2 When the starter rope does not return smoothly, or the starter handle is hangs down loosely, please add grease or mobile oil in the rotating and friction parts.  
If it still does not work, rewind 1~2 times.  
(In that case, confirm that the spring is not under pressure by following the previous procedure.)

- 3 Please re-assemble from the beginning if there was the sound when the spring was removed and the starter rope does not re-winded into the reel.

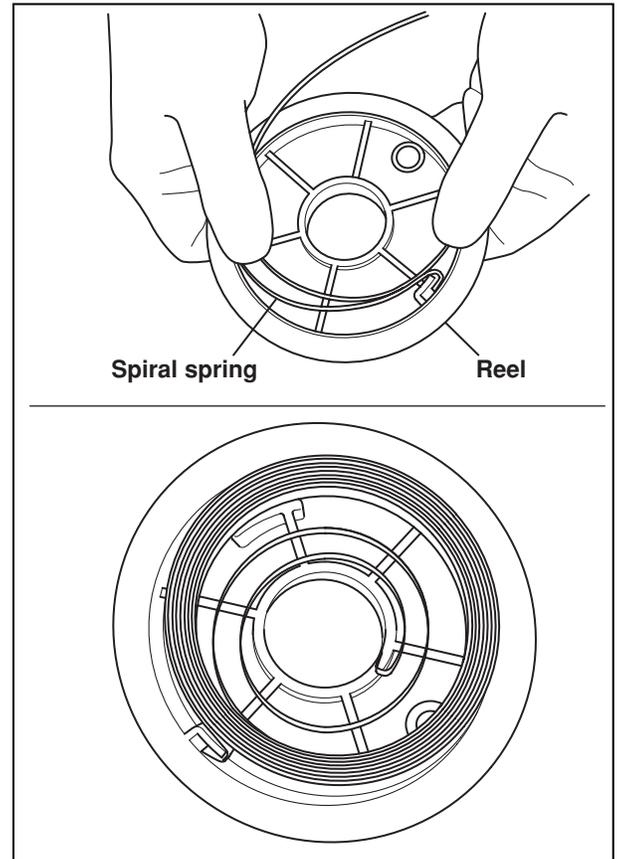
#### 4) When . . .

(1) The spring pops out

-1 Hook the end hook of the spring to the notched part of the reel, and attach the spring, applying pressure with your fingers so that it isn't released from the groove. **(Please wear gloves)**

-2 Hook the inside hook of the spring to the claw of the starter case while turning.

※ Please refer to assembly procedures.

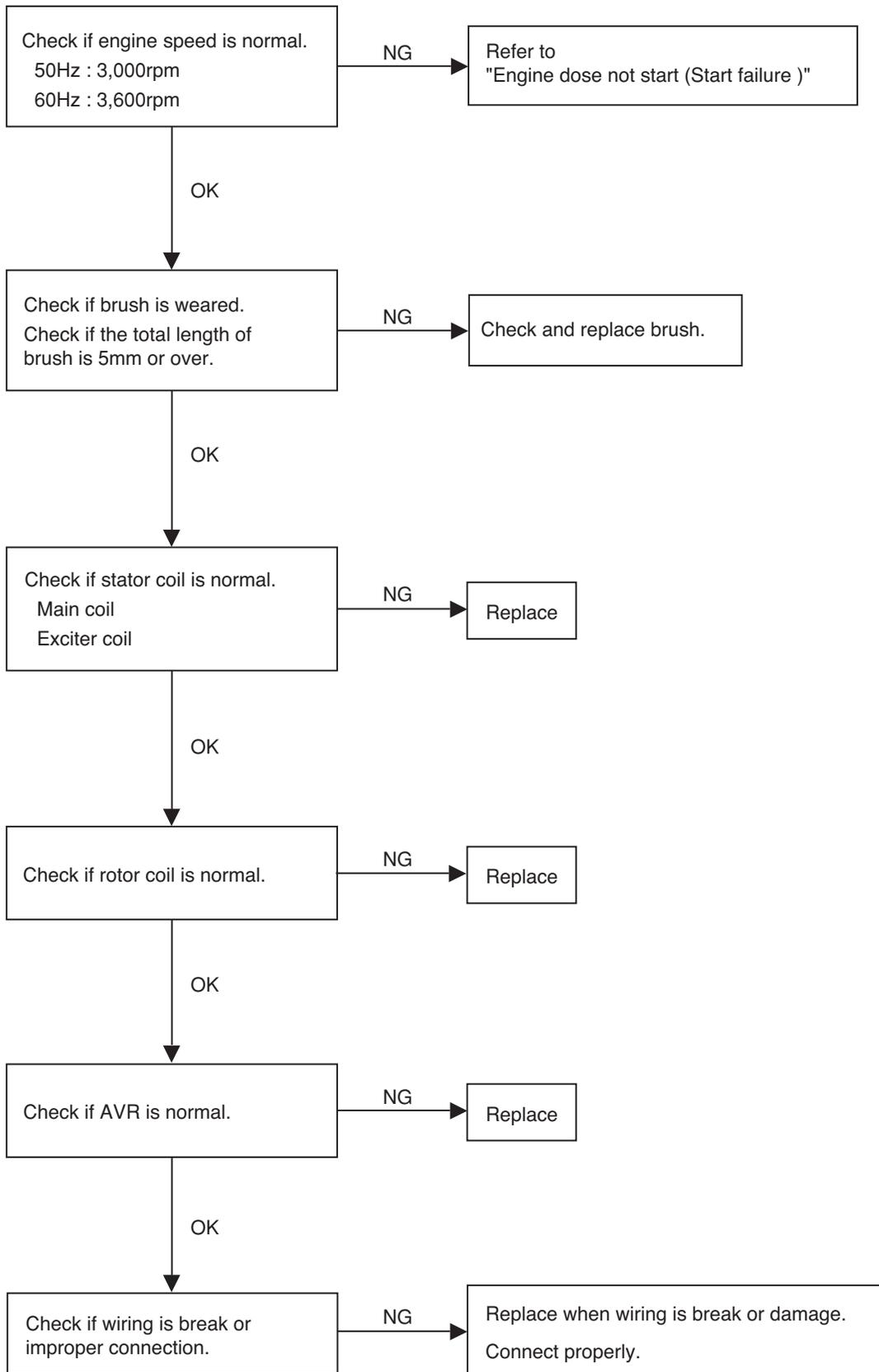


(2) Oil refill

At the end of the season or when disassembling, add grease (preferably one that is heat resistant, if possible) or mobile oil to rotation parts, friction parts, and the spring.

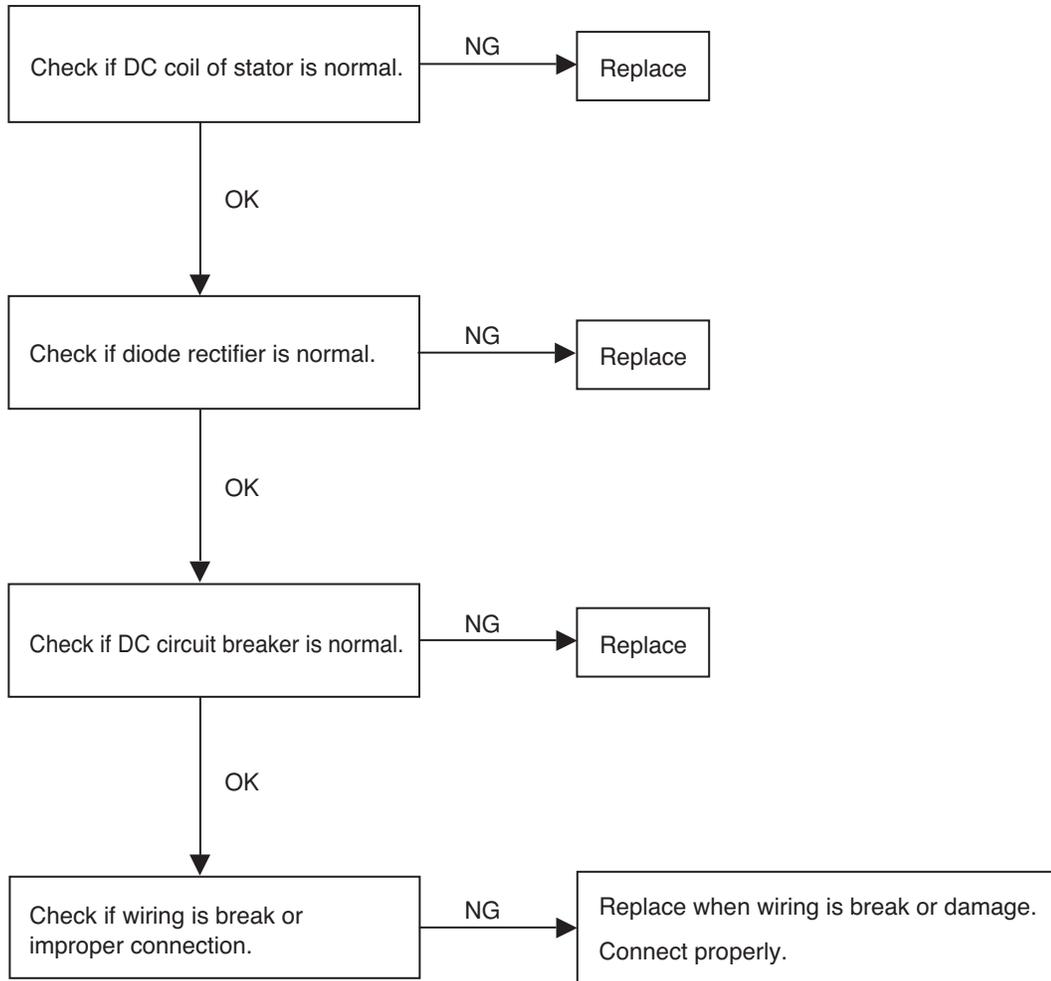
## 6.TROUBLESHOOTING

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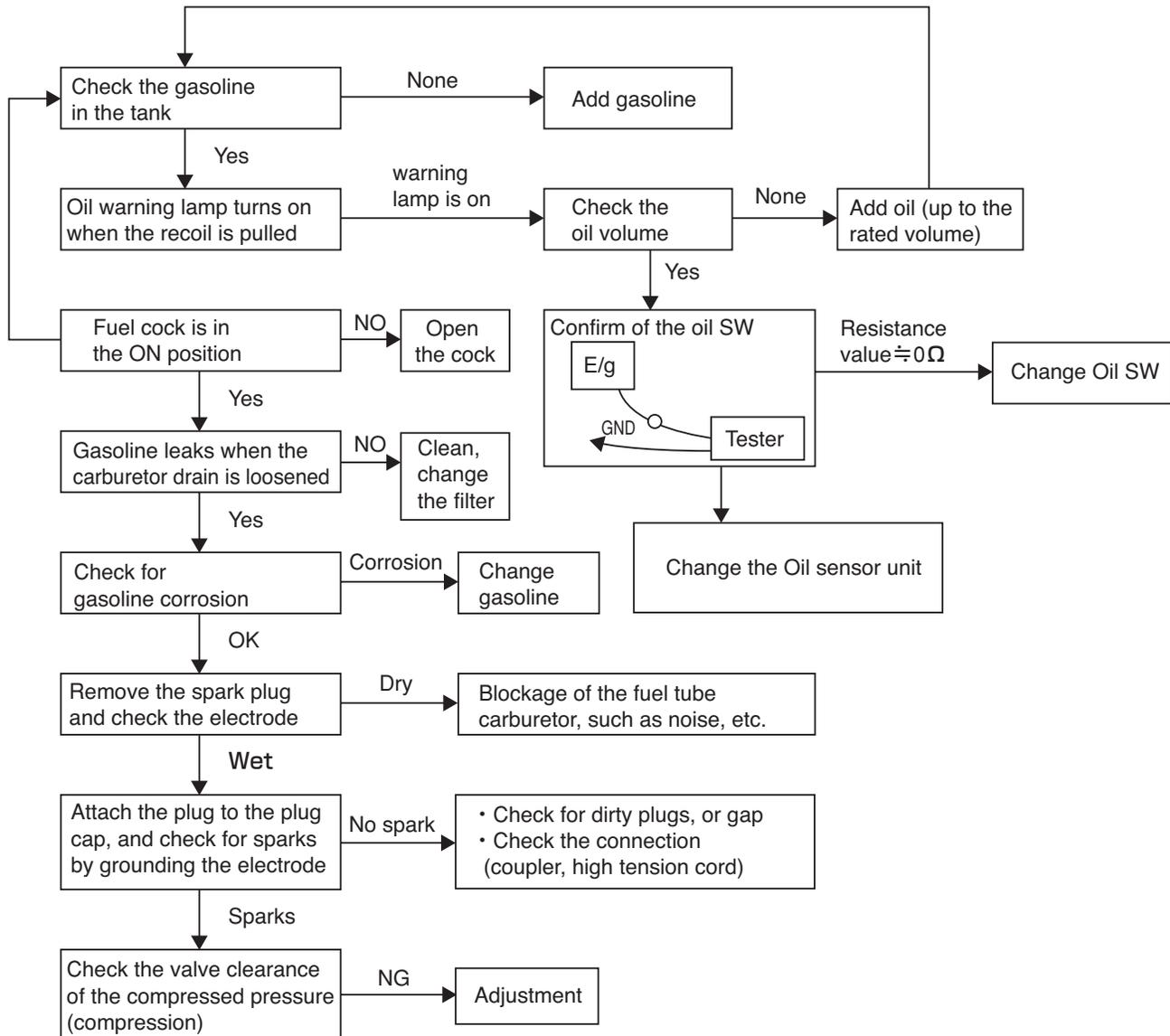


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## No DC current

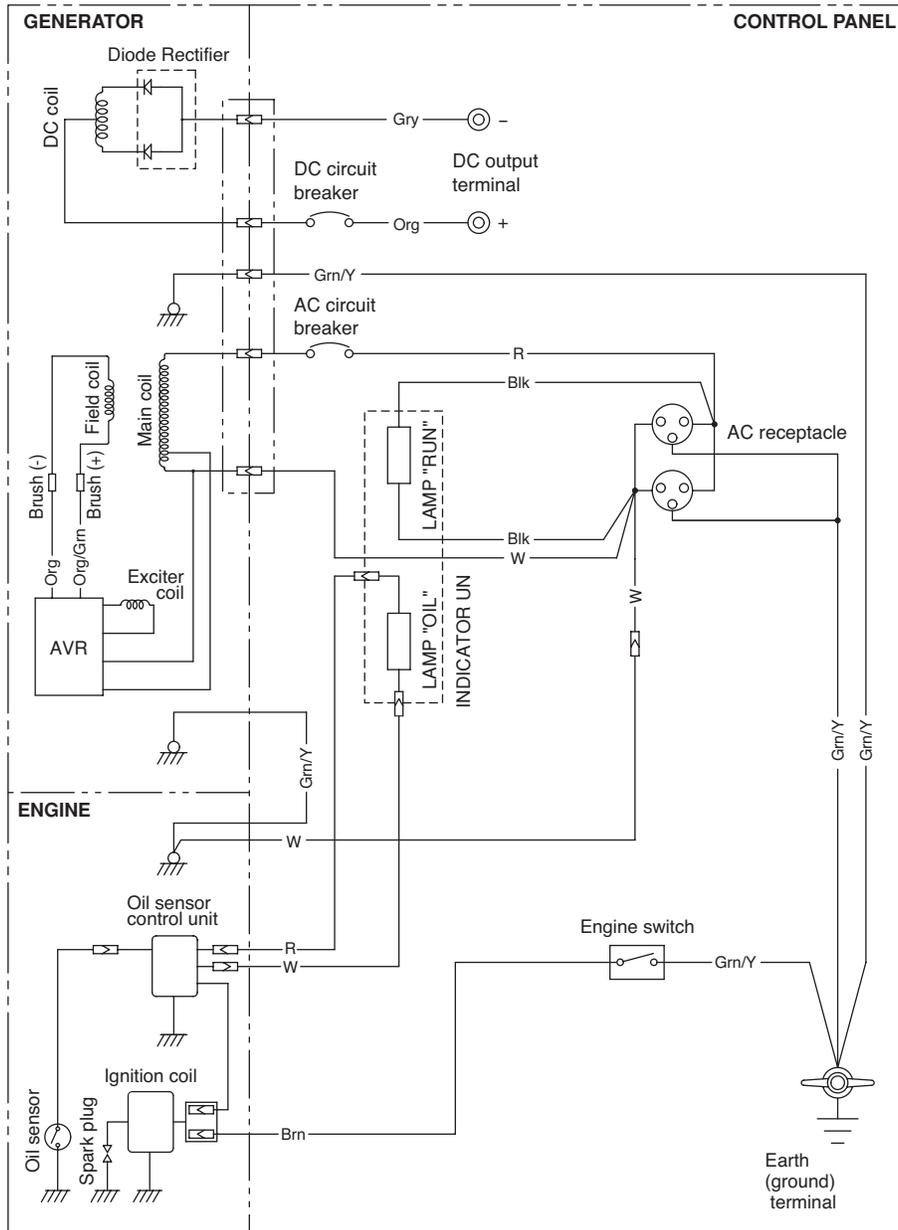


## Engine does not start (Start failure)



# 7. WIRING DIAGRAM

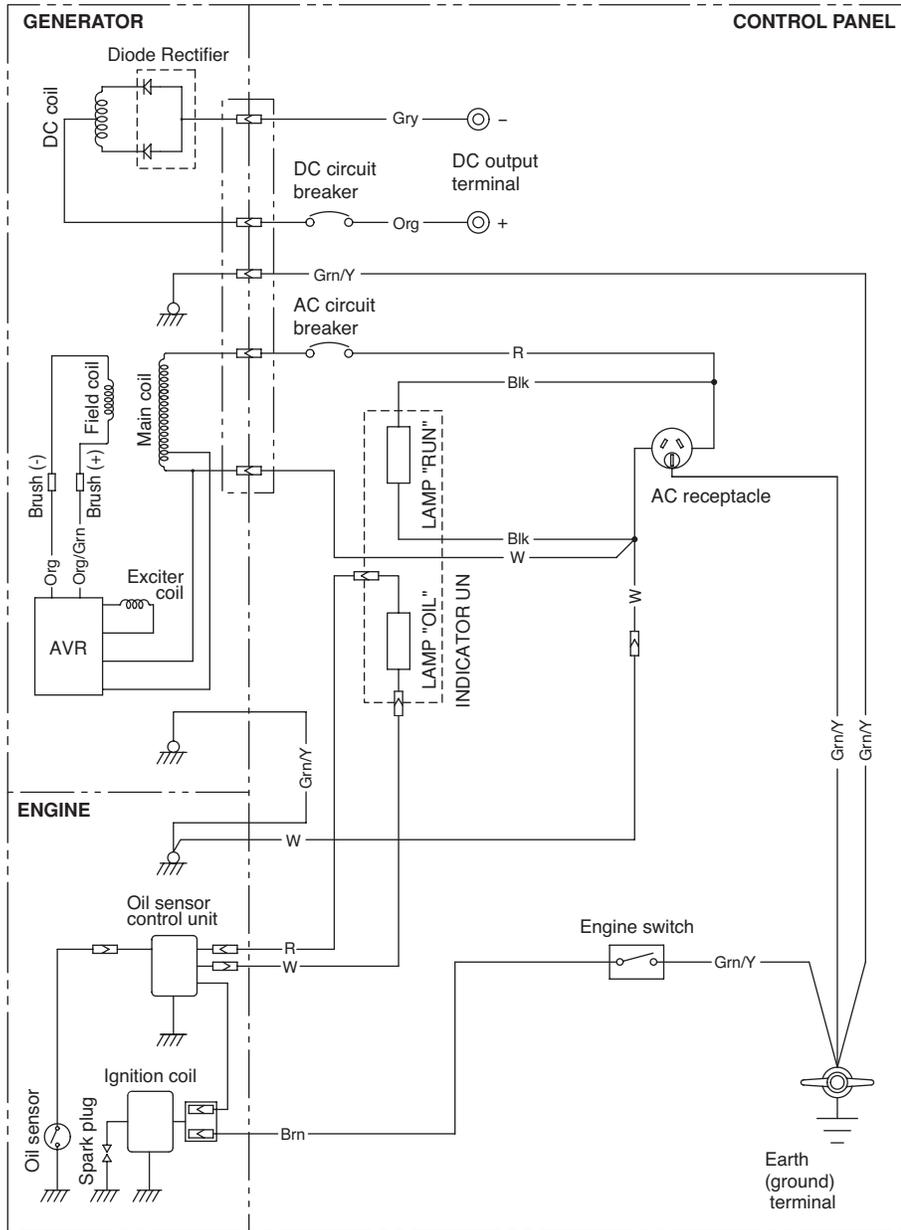
50Hz-230V



**Wiring color code**

Blk : Black	LBlu : Light blue	Grn : Green	Gry : Gray	Y : Yellow	Pur : Purple
Blk/W : Black/White	Brn : Brown	Grn/W : Green/White	R : Red	W/Blk : White/Black	Org/Grn : Orange/Green
Blu : Blue	Brn/W : Brown/White	Org : Orange	W : White	Grn/Y : Green/Yellow	

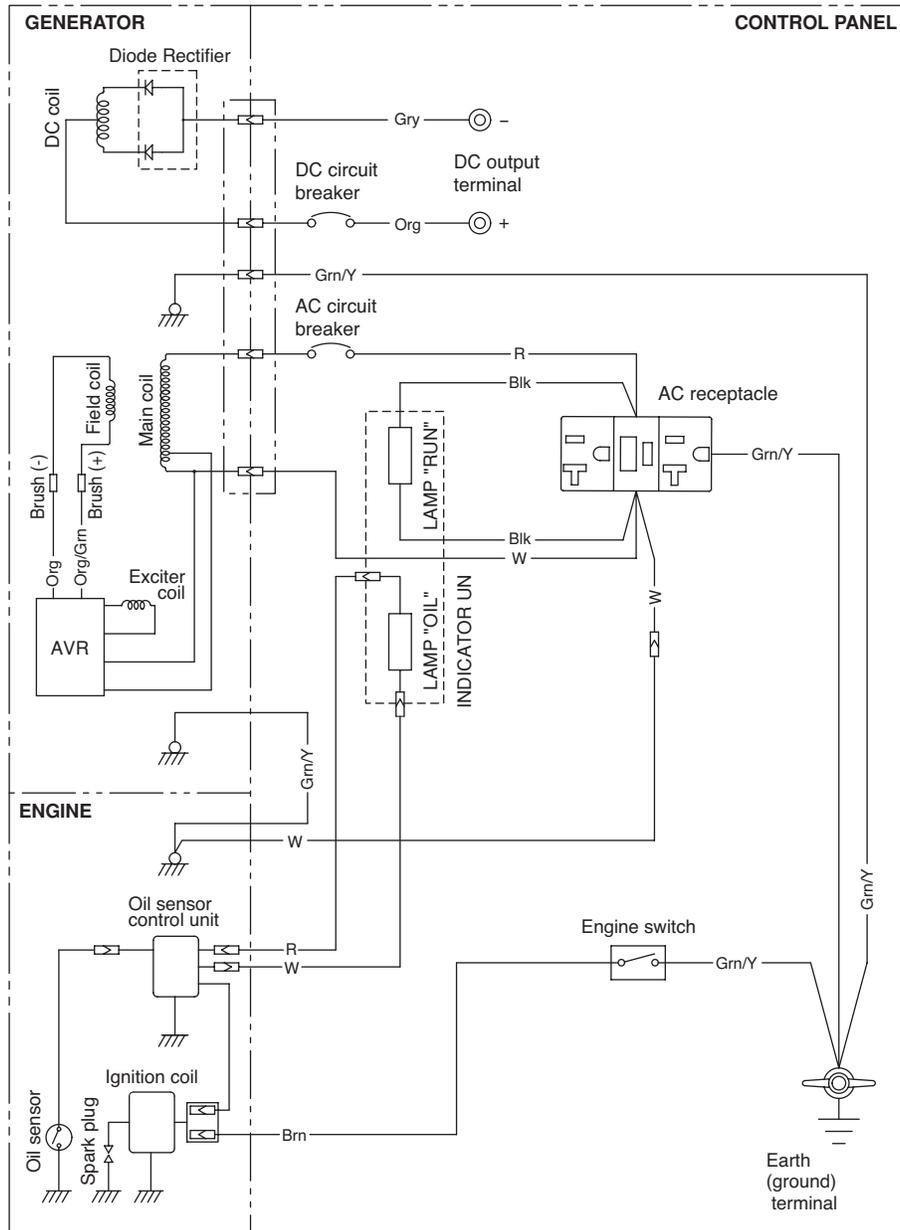
50Hz-240V



**Wiring color cord**

Blk : Black	LBlu : Light blue	Grn : Green	Gry : Gray	Y : Yellow	Pur : Purple
Blk/W : Black/White	Brn : Brown	Grn/W : Green/White	R : Red	W/Blk : White/Black	Org/Grn : Orange/Green
Blu : Blue	Brn/W : Brown/White	Org : Orange	W : White	Grn/Y : Green/Yellow	

# 60Hz-120V



**Wiring color cord**

Blk : Black	LBlu : Light blue	Grn : Green	Gry : Gray	Y : Yellow	Pur : Purple
Blk/W : Black/White	Brn : Brown	Grn/W : Green/White	R : Red	W/Blk : White/Black	Org/Grn : Orange/Green
Blu : Blue	Brn/W : Brown/White	Org : Orange	W : White	Grn/Y : Green/Yellow	

ISSUE EMD-GS2490



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Printed in Japan  
2007.12