

Robin Power Equipment®

SERVICE MANUAL

Model

R1300

Generator

WITH EMISSION CERTIFIED ENGINE

PUB-GS1185
Rev. 4/98

Robin
SUBARU

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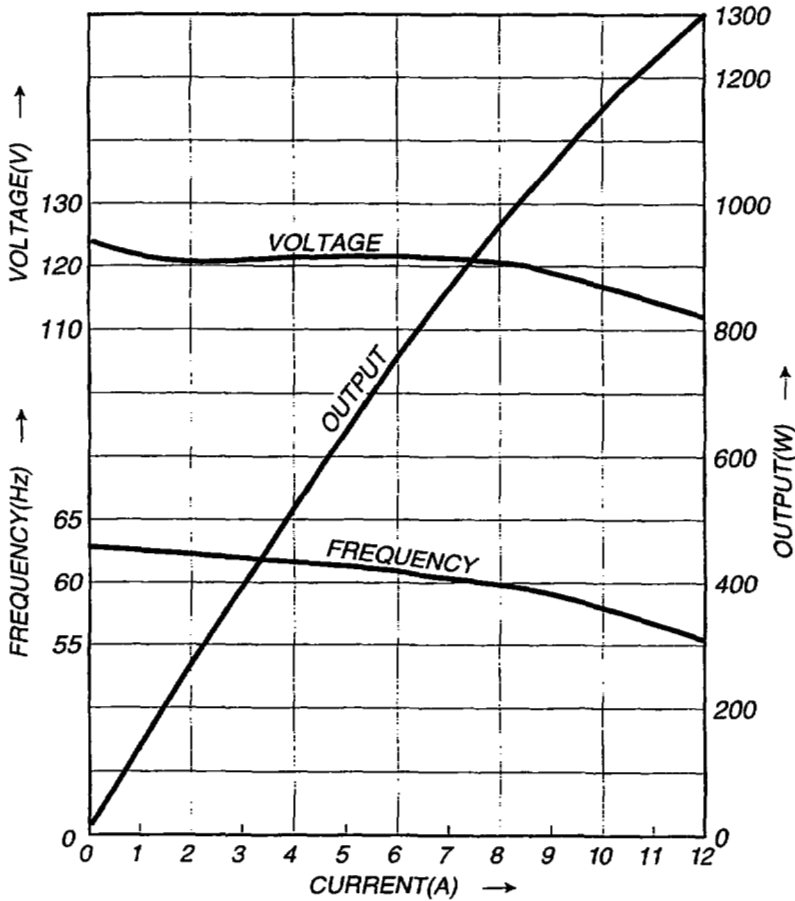
1. SPECIFICATIONS

Generator	Type	Brushless, self-exciting, 2-pole, single phase, revolving field	
	Frequency	60 Hz	
	AC Voltage (Rated current)	120V (8.3 A)	
	AC Output	Max.	1300 W
		Rated	1000 W
	DC Output	12V – 8.3A (100 W)	
Voltage regulation system	Condenser system		
Engine	Type	Forced Air-cooled, 4-Stroke, Side Valve, Gasoline Engine	
	Displacement	8.73 cu. in (143 cm ³)	
	Bore × Stroke	2.48 × 1.81 in (63 × 46 mm)	
	Fuel	Automotive Gasoline (unleaded)	
	Fuel tank capacity	0.9 U.S. gal (3.5 liters)	
	Oil pan capacity	1.3 U.S. pints (600 cc)	
	Continuous operating hours per tank	Approx. 3.6 hours	
	Ignition system	Solid state ignition	
	Starting system	Recoil starter	
Dimensions (L × W × H)		19.3 × 11.3 × 16.1in (490 × 288 × 410mm)	
Dry weight		60.6 lbs. (27.5 kg)	

Specifications are subject to change without notice.

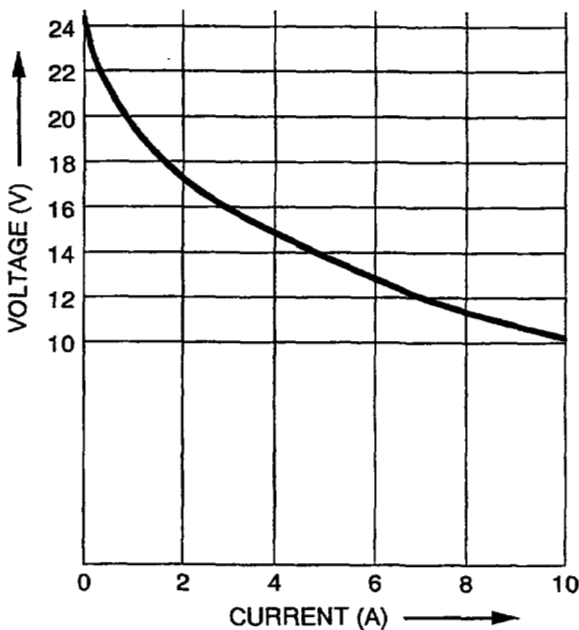
2. PERFORMANCE CURVES

2-1 AC OUTPUT



Output Max. 1300W
 Rated 1000W
 Frequency 60Hz
 Voltage 120V
 60Hz • 120V • 8.3A

2-2 DC OUTPUT



DC Voltage 12V
 DC Ampere 8.3A
 DC output 100W

The voltage curve shown in the left indicates the characteristic of DC output when charging a battery. The voltage may be decreased by 20% when the resistance load is applied.

3. FEATURES

- **LOW-NOISE**

Mounting of Air-cooled, 4-Cycle, Super Side Valve ROBIN Engine (EY15D-SSVR) and introduction of a larger muffler into the machine realized low-noise operation.

- **LIGHT-WEIGHT • COMPACT**

The machine is easy to carried about due to its light-weight (27.5kg) and compact design.

- **HIGH OUTPUT (Increased maximum output)**

The 1300W output is an increase of 100W over the 60Hz maximum output of the current R1210.

- **EASY OPERATION**

The one-touch engine control switch integrates the engine on/off switch and the choke. All controls are conveniently located on the front panel.

- **LONG OPERATION**

The large 0.9 U.S. gal. (3.5 liter) fuel tank allows about 3.6 hours of continuous operation at 60Hz rated load.

- **MINIMAL MAINTENANCE**

The brushless design and condenser voltage regulator system ensure maintenance free operation.

- **FUNCTIONAL FEATURES**

- The AC/DC push button circuit breaker allows for easy and safe operation when an overload occurs or when the machine is not functioning properly.
- Equipped with voltmeter for reading AC output voltage.
- DC output can be obtained for the re-chargeable battery.

- **NOISE PREVENTION**

Resistor spark plug prevent electric-wave noise for radio, T.V., etc.

- **OIL SENSOR (optional)**

The oil sensor detects when oil decreases below the designated level, stopping the engine and preventing engine damage.

4. GENERAL DESCRIPTION

4-1 EXTERNAL VIEW of GENERATOR

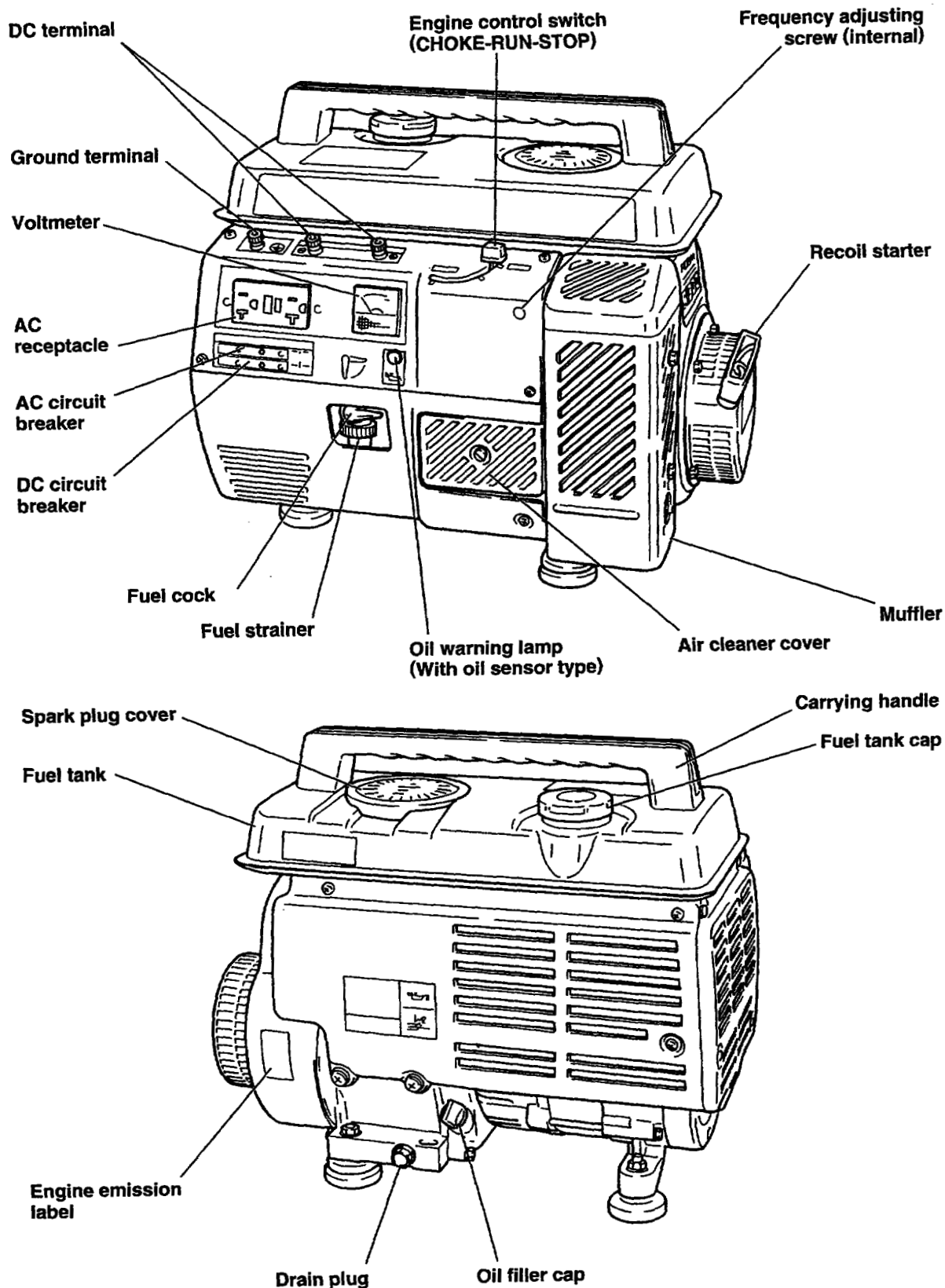


Fig. 4-1

4-2 LOCATION of SERIAL NUMBER and SPECIFICATION NUMBER

Serial number and specification number are stamped on the LABEL (MODEL NAME) stuck on the fuel tank.

NOTE: Always specify these numbers when inquiring about the generator or ordering spare parts in order to get correct parts and accurate service.

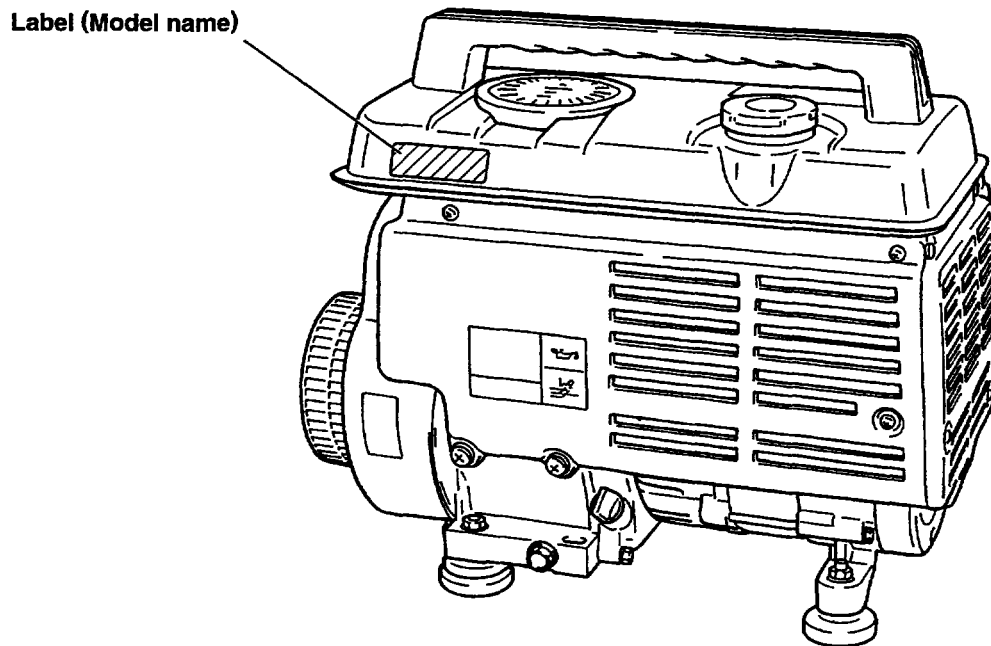


Fig. 4-2

5. CONSTRUCTION AND FUNCTION

5-1 CONSTRUCTION

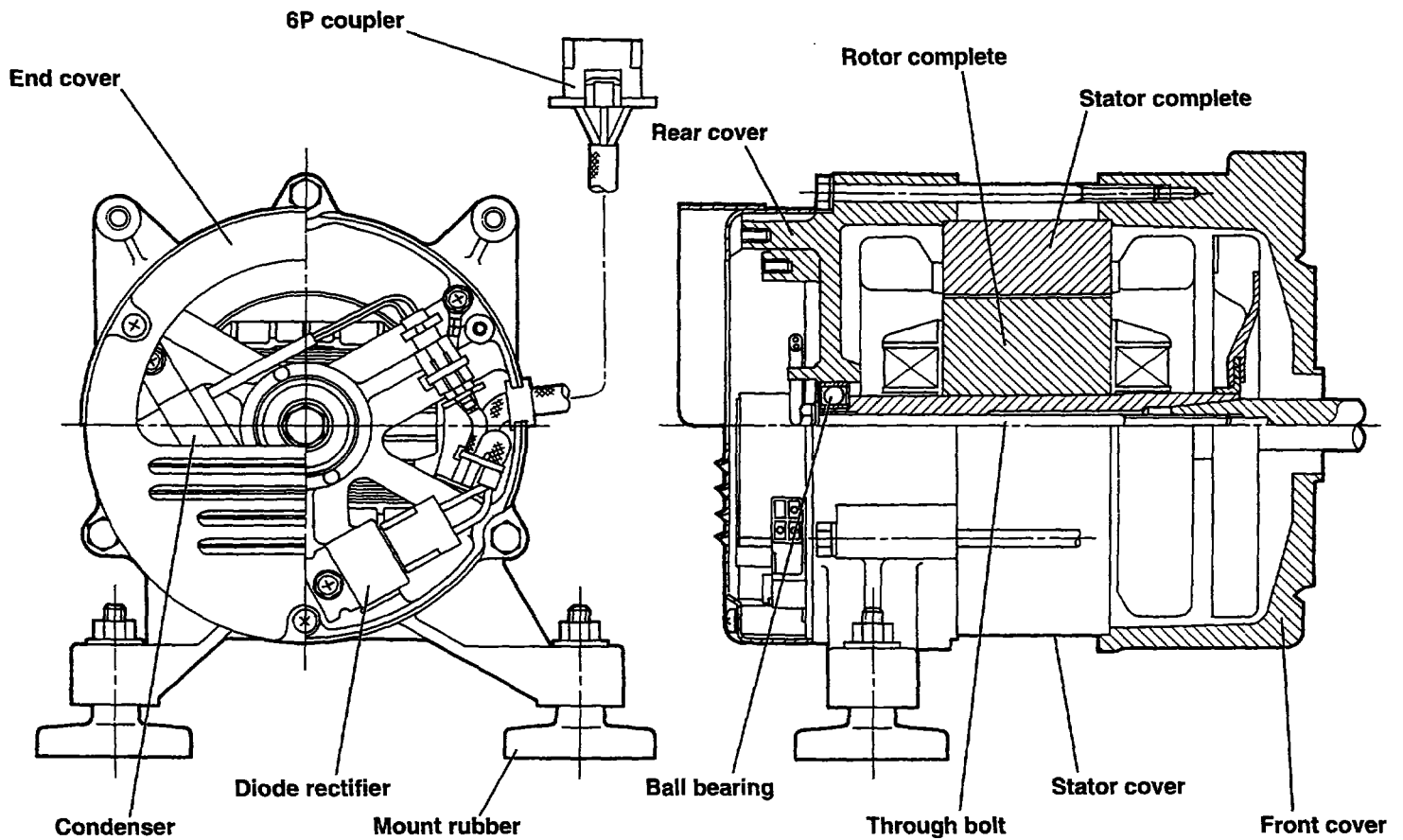


Fig. 5-1

5-2 FUNCTION

5-2-1 STATOR

The stator consists of a laminated silicon steel sheet core, a main coil and a condenser coil which are wound in the core slots.

The condenser coil excites the rotor field coil which generates AC voltage in the main coil.

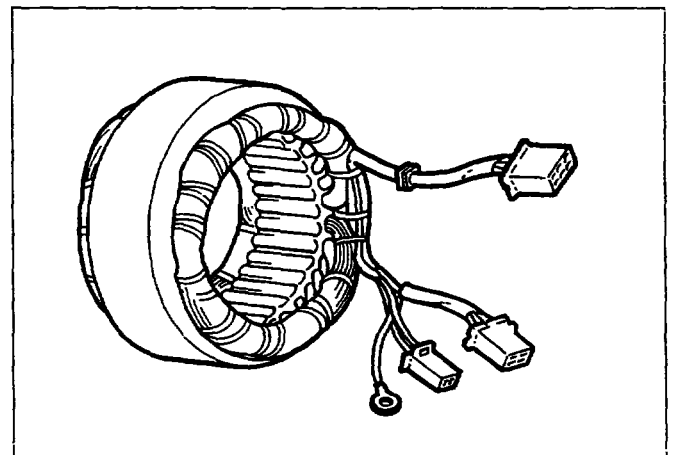


Fig. 5-2

5-2-2 CONDENSER

A condenser is mounted on the rear cover and is connected to the condenser coil which is wound on the stator. This condenser and condenser coil regulate the output voltage.

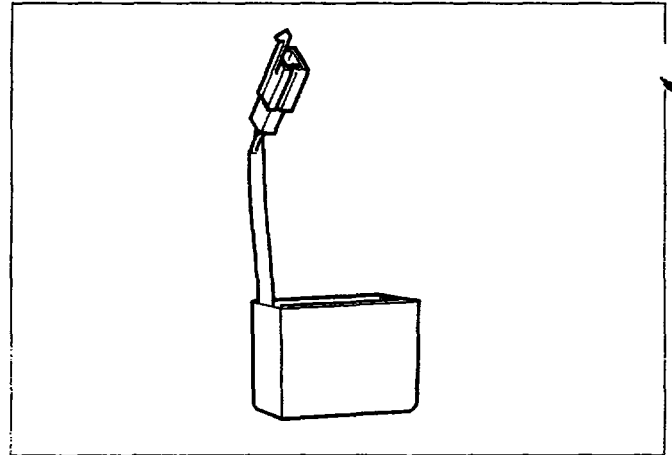


Fig. 5-3

5-2-3 ROTOR

The rotor consists of a laminated silicon steel sheet core and field coil which is wound over the core. DC current in the field coil magnetizes the steel sheet core. Two permanent magnets are provided for the primary exciting action. A cooling fan is pressure-fitted on the end of the rotor shaft to cool the coils, cores, rectifier, and other generator parts. (See Fig. 5-4)

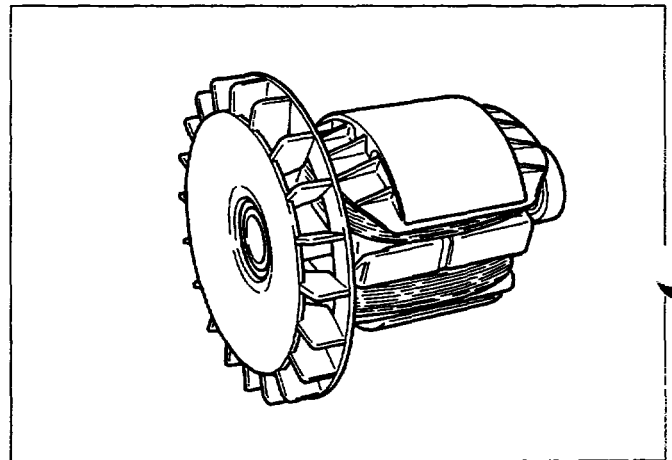


Fig. 5-4

A diode rectifier and resistor are mounted inside of the insulator. (See Fig. 5-5)

Cooling air is sucked by the rotor fan through the slits of the rear cover and is expelled through the outlets of the front cover.

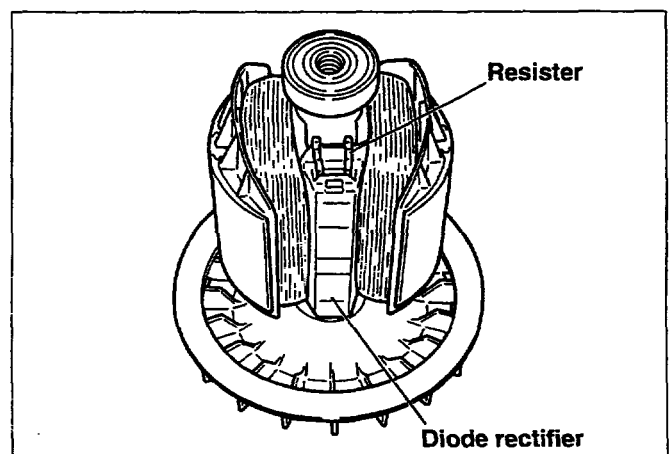


Fig. 5-5

5-2-4 CONTROL PANEL

The control panel has a double AC receptacle with a ground terminal, and DC terminals.

The voltmeter displays output voltage of the generator. The circuit breaker for AC and DC protects the generator from getting damages caused by overloading or defective appliance.

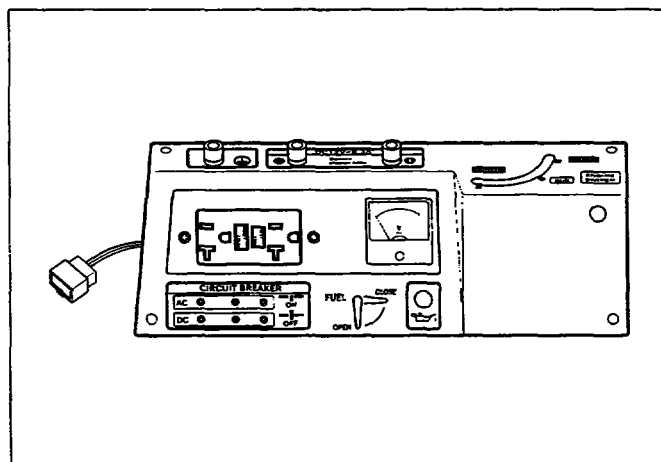


Fig. 5-6

5-3 GENERATOR OPERATION

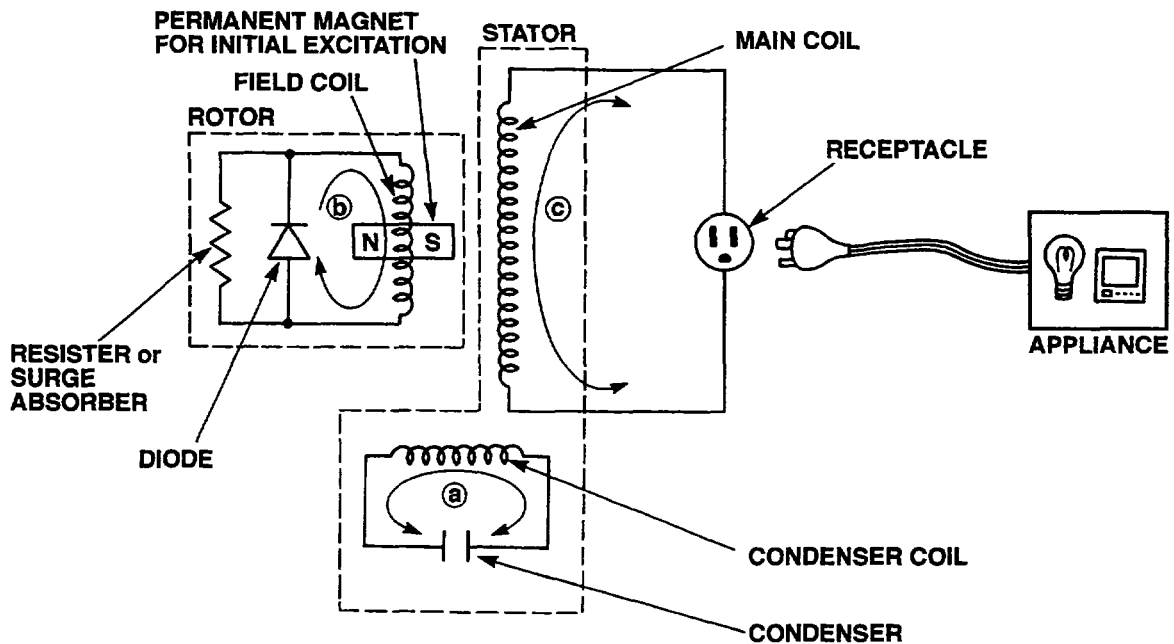


Fig. 5-7

5-3-1 GENERATION of NO-LOAD VOLTAGE

- (1) When the generator starts running, the permanent magnet built-in to the rotor generates 3 to 6V of AC voltage in the main coil and condenser coil wound on the stator.
- (2) As one or two condensers are connected to the condenser coil, the small voltage at the condenser coil generates a minute current \textcircled{a} which flows through the condenser coil. At this time, a small flux is produced with which the magnetic force at the rotor's magnetic pole is intensified. When this magnetic force is intensified, the respective voltages in the main coil and condenser coil rise up. As the current \textcircled{a} increases, the magnetic flux at the rotor's magnetic pole increases further. Thus the voltages at the main coil and condenser coil keep rising by repeating this process.
- (3) As AC current flows through the condenser coil, the density of magnetic flux in the rotor changes. This change of magnetic flux induces AC voltage in the field coil, and the diode rectifier in the field coil circuit rectifies this AC voltage into DC. Thus a DC current \textcircled{b} flows through the field coil and magnetizes the rotor core to generate an output voltage in the main coil.
- (4) When generator speed reaches 3000 to 3300 r.p.m. , the current in the condenser coil and field coil increases rapidly. This acts to stabilize the output voltage of each coils. If generator speed further increases to the rated value, the generator output voltage will reach to the rated value.

5-3-2 VOLTAGE FLUCTUATIONS UNDER LOAD

When the output current \textcircled{c} flows through the main coil to the appliance, a magnetic flux is produced and serves to increase current \textcircled{a} in the condenser coil. When current \textcircled{a} increases, the density of magnetic flux across the rotor core rises. As a result, the current flowing in the field coil increases and the generator output voltage is prevented from decreasing.

5-3-3 DC OUTPUT

DC output is taken out from the DC coil and is fed to the diode stack (rectifier) where the output undergoes full-wave rectification and is then supplied to the load. The diode works to allow the current to flow in the direction (a), but does not allow the current to flow in the direction (b), as shown in Fig. 5-8-1.

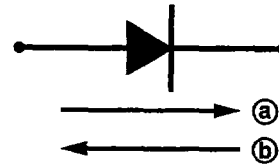


Fig. 5-8-1

Fig. 5-8-2 shows the DC output circuit of the generator. DC voltage is generated in the DC coil. When the voltage in A is higher than that in C, the current (c) flows in the direction shown in the figure, while no current flows between B and C because the current is cut off by the diodes D₁.

On the contrary, when the voltage in C is higher than that in A, the current (d) flows in the direction as shown in the figure. No current flows between A and B because the current is cut off by the diodes D₁.

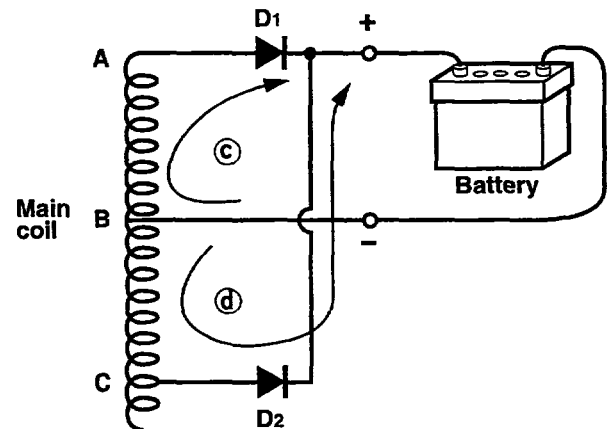


Fig. 5-8-2

As a result, the voltage generated at the output terminal has a wave form with two peaks in one cycle, as in the case of the output wave form shown in Fig. 5-8-3.

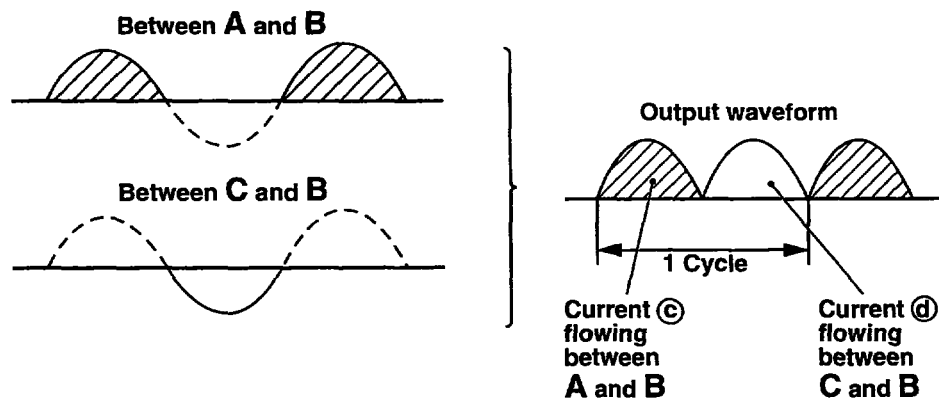


Fig. 5-8-3

CAUTION : Do not use DC and AC output simultaneously.

Due to a characteristic of the condenser voltage regulation, simultaneous use of DC and AC output creates voltage drop in DC output resulting in incapability for charging batteries.

5-4 ELECTRONIC IGNITION SYSTEM

The electronic ignition system features a power transistor as the current control element. Therefore, the ignition system is an electronic contact point-free type that operates with the power transistor impulses controlling the current. This system is also called TIC (transistor igniter circuit) and is virtually free of ignition failure which generally results from contamination of the contact points, a typical problem with contact type ignition systems.

Because this ignition system has no contact points, it is not affected by moisture, oil, dust, or other contaminants. As a result, this electronic ignition system ensures sure and positive ignition with reduced maintenance.

The TIC mechanism consists of a transistor-incorporated ignition coil and a permanent magneto built-in flywheel which is press-fitted on the rotor shaft of the generator.

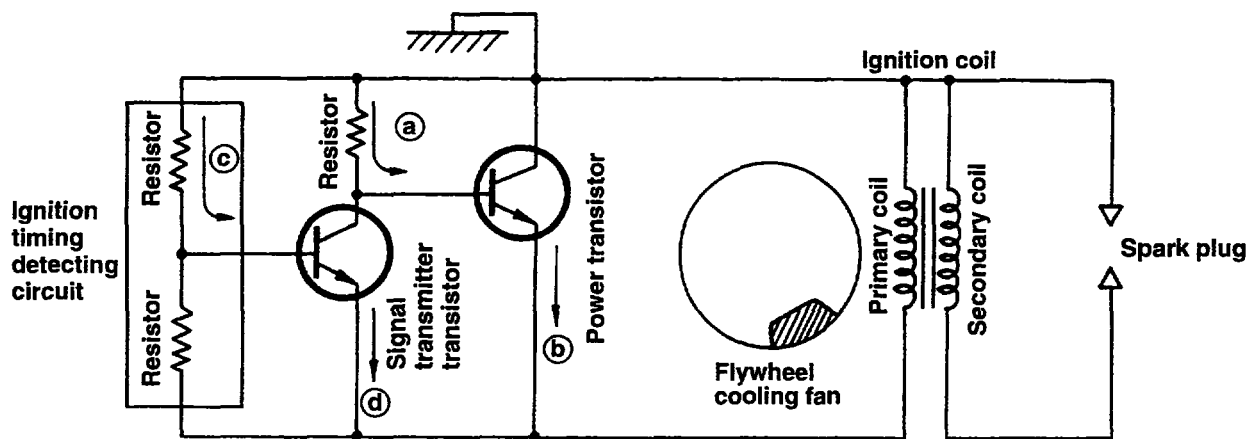


Fig. 5-9

- (1) When the permanent magneto built-in flywheel start rotating, power is generated in the primary coil of the ignition coil and current flows to the resistor (a). From the resistor, current flows the power transistor. With this current, the power transistor turns on, releasing current (b). This stage corresponds to the closing of contact points.
- (2) As the flywheel comes to the point of ignition, timing detecting circuit is activated while the current (c) is flowing through the circuit. When the ignition timing detecting circuit is activated, the signal transmitter transistor actuates with current (d) flowing. When current (d) starts flowing, current (b) flowing through the power transistor is cut quickly. As a result, high voltage is produced in the secondary coil and this voltage is applied simultaneously to the spark plug which ignites for ignition. This stage corresponds to the opening of contact points.

5-5 OIL SENSOR (OPTION)

5-5-1 DESCRIPTION

- The oil sensor mainly functions to detect position of the surface of engine oil in the crankcase of engines for general use and to stop the engine automatically when the oil level goes down below the lower limit specified.

This prevents seizure of engine from occurring due to insufficient amount of oil in the crankcase.

- Since the sensor has been designed to consume a part of power supplied to the igniter to energize its electronic circuit, any other external power supply is not necessary so that it can be mounted at the oil filler port.

Introduction of newly developed sensing principle features super durability and no change with the passage of time as it does not use any moving part.

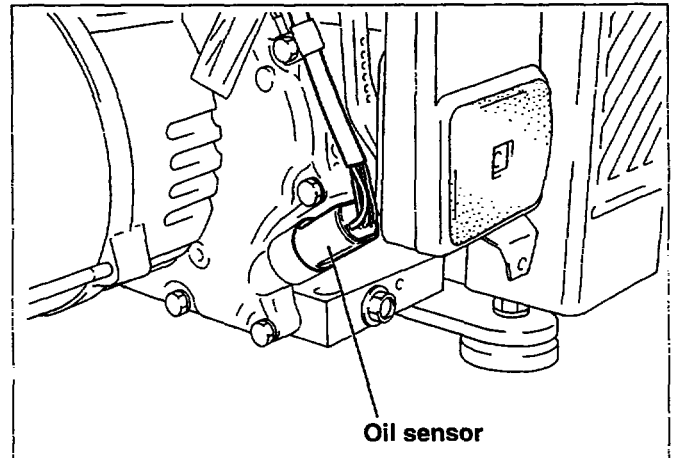


Fig. 5-10

Merits due to introduction of electrical conductivity detection are as follows;

- ① It has resistance to mechanical shocks and property of no change with the passage of time as sensing element consists simply of electrodes having no moving parts.
- ② At the same time, it is capable of detecting the oil level stably as it is not influenced by engine vibrations.
- ③ No error occurs due to foam and flow of the oil.
- ④ Influence against the ignition system or the electronic units can be neglected because an electric current supplied to the sensor can be decreased.

5-5-2 PRINCIPLE OF SENSING OIL LEVEL

There is a great difference between electric resistance of air and that of oil.

Since the resistance of air is far higher than that of oil, more electric current passes through the oil than through the air, although absolute value of the current is very small.

The sensor detects this current difference and make use of it.

The sensor judges the oil quantity, by comparing a current flowing across a pair of electrodes (inner and outer) with the reference, in such a way that if a current flows between the electrodes more than the reference, sufficient oil is in the crankcase, on the other hand, if a current flows less than the reference, oil is not sufficient.

Since an electric current is flown to detect oil quantity, this is called the "electrical conductivity detection" type of sensor.

The oil level to be detected is determined by the length of electrodes and their mounting positions with the engine.

5-5-3 HOW IT OPERATES

[Power supply]

The sensor makes use of a part of primary power source for ignition of the engine (igniter) to drive the sensor circuit. Power to the sensor can usually be derived from the "stop button" by branching wires out.

[Judgement of oil level]

When sufficient oil is in the crankcase, both of inner and outer electrodes are immersed in the oil through which current flows across the electrodes. The sensor judges that oil in the crankcase is sufficient.

When oil level goes down and the inner electrode is exposed to the air due to consumption of oil, no current flow between the electrodes as air is considered to be electrically non-conductive.

The sensor in this case judges that oil is insufficient.

[Decision of oil shortage]

Oil level at the electrodes may go down momentarily probably due to the engine being slanted or affected by vibration even if a sufficient oil is in the crankcase.

For that reason, the sensor has an electronic timer circuit to prevent it from interpreting as short of oil when amount of oil is sufficient. The sensor has been designed so that the engine is to be stopped only when oil-shortage is detected for 5 seconds uninterrupted.

The timer employs an integration circuit and it is to be reset when the inner electrode is soaked in the oil again before the sensor decides it as oil-shortage.

The oil level where the sensor decides as oil-shortage, when oil level goes down gradually, is called "threshold level".

[Automatic stop of engine]

When the sensor decides as oil-shortage, it makes the engine to stop running automatically for protection of engine.

Once the stopping circuit is activated, it keeps functioning until it confirms that the engine has made a complete stop, then the circuit stops functioning automatically.

5-5-4 BLOCK DIAGRAM OF THE CIRCUIT

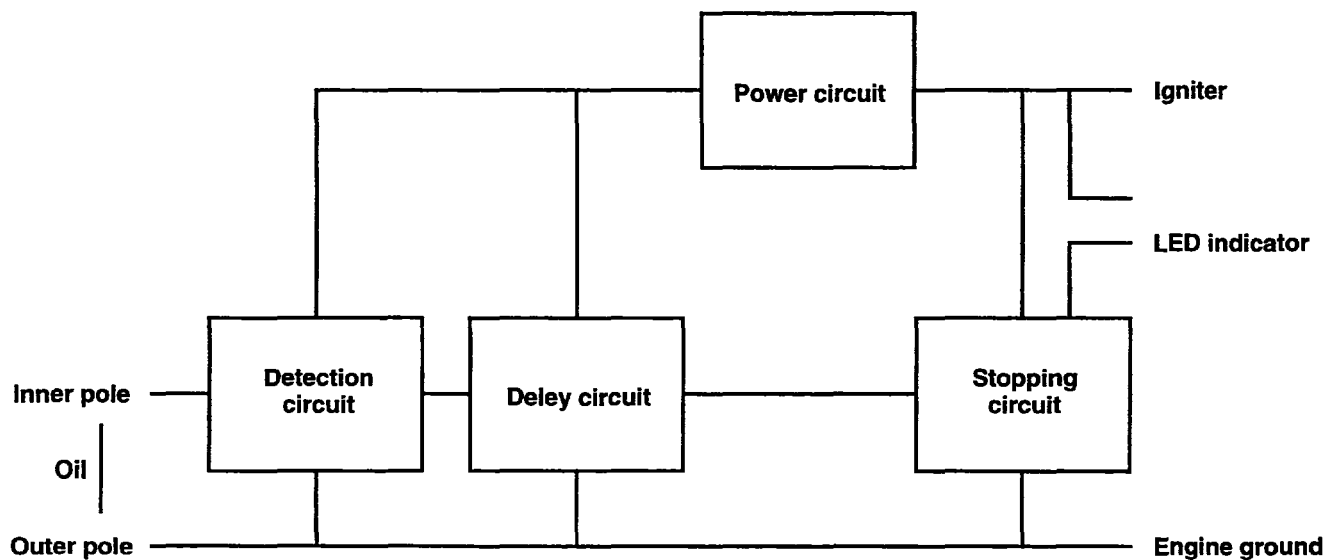


Fig. 5-11

- ① Power circuit.....This rectifies a part of power to the igniter and regulates it to supply the stabilized power to necessary circuits.

- ② Detection circuit.....This detects quantity of oil, sufficient or not, according to difference of electric resistance across inner and outer electrodes.
- ③ Delay circuitThis prevents the sensor from making an unnecessary stop of the engine by momentary lowering of the oil level due to the engine being slanted or affected by vibration in spite of sufficient oil in the crankcase.
- ④ Stopping circuit.....This automatically stops the engine running.
Also, the LED indicator for warning can be lit while the engine is being stopped. We have the wires to be connected to LED available.

5-5-5 CAUTIONS TO BE TAKEN ON HANDLING THE SENSOR

(1) Oil sensor unit

- ① Be sure not to damage each wire.
Broken or short-circuited power supply wires and/or a grounding wire in particular may lead to malfunction or breakdown.

(2) Mounting and wiring of oil sensor unit

- ① Although this has been designed to have enough anti-noise properties in practical use, do not route the sensor wirings in the vicinity of noise-generating sources such as ignition plugs or high voltage cords. This may cause malfunction or breakdown.
- ② Since capacity of power source is limited, current flow in the electronic circuit of the sensor is kept as low as possible.
Be sure to use terminals with a high contact reliability of more than that of tinned terminals.

(3) Operation of oil sensor

- ① If operating with the engine kept tilted, oil surface inside of the engine varies and the correct oil level can not be detected which in turn obstructs the preventing function of engine seizure.
Operate the engine by keeping it level.
- ② When starting the engine with an insufficient oil in the crankcase, engine starts once then it stops automatically after it runs for about 5 seconds.
- ③ When the engine has been stopped by the oil sensor, voltage remained in the electronic circuit prevents the sensor from being re-started for 3 seconds after the engine stop.
Try to re-start the engine after 3 seconds or more.

6. SAFETY PRECAUTIONS

1. Use extreme caution near fuel. A constant danger of explosion or fire exists.

Do not fill the fuel tank while the engine is running. Do not smoke or use open flame near the fuel tank. Be careful not to spill fuel when refueling. If spilt, wipe it and let dry before starting the engine.

2. Do not place inflammable materials near the generator.

Be careful not to put fuel, matches, gunpowder, oily cloth, straw, and any other inflammables near the generator.

3. Do not operate the generator in a room, cave or tunnel.

Always operate in a well-ventilated area.

Otherwise the engine may overheat and also, the poisonous carbon monoxide contained in the exhaust gases will endanger human lives. Keep the generator at least 1 m (4 feet) away from structures or facilities during use.

4. Operate the generator on a level surface.

If the generator is tilted or moved during use, there is a danger of fuel spillage and a chance that the generator may tip over.

5. Do not operate with wet hands or in the rain.

Severe electric shock may occur. If the generator is wet by rain or snow, wipe it and thoroughly dry it before starting.

Don't pour water over the generator directly nor wash it with water.

If the generator is wet with water, the insulations will be adversely affected and may cause current leakage and electric shock.

6. Do not connect the generator to the commercial power lines.

This may cause a short-circuit or damage to the generator.

Never connect the generator to the existing house wiring. If connected, the generator will burn out when the commercial power source is recovered.

7. Don't operate the generator with its cover removed.

The operator may be injured or suffer electric shock.

CAUTION; If the circuit breaker tripped off as a result of using an electrical appliance, the cause can be an overload or a short-circuit.

In such a case, stop operation immediately and carefully check the electrical appliance and plugs for faulty wiring.

7. RANGE OF APPLICATIONS

7-1 AC OUTPUT

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 1000W generator can turn ten 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 250W electric drill requires a 400W 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 lamp.

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 400W mercury lamp requires 800W to 1200W power source to be turned on.

A rated 1000W generator can power one 400W mercury lamp

(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 900W compressor requires a 4500W 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 ~ 0.75	} The smaller the motor, the lower the efficiency.
Three-phase motor 0.65 ~ 0.9	
Fluorescent lamp 0.7 ~ 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 ~ 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)**.

Appliance	Applicable wattage
	60Hz
Incandescent lamp, hot plate	up to 1000W
Fluorescent lamp, mercury lamp , Electric tool	up to about 800W
Pump, compressor	up to about 250W

Table 7-1

NOTES: Wiring between generator and electrical appliances

1. Allowable current of cable

Use a cable with an allowable current that is larger than the rated input current of the load (electrical appliance). If the input current is larger than the allowable current of the cable used, the cable will become excessively heated and deteriorate the insulation, possibly burning it out.

Table 7-2 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 appliance). As a result, the load can be damaged.

Table 7-2 shows voltage drops per 100 meters of cable.

Sectional area mm ²	Allowable current A	Gauge No./ wire element No./mm	Resistance Ohm/100 m	Voltage drop per 100 m							
				1A	3A	5A	8A	10A	12A	15A	
0.75	7	30/0.18	2.477	2.5V	8V	12.5V					
1.25	12	50/0.18	1.486	1.5V	5V	7.5V	12V	15V	18V		
2.0	17	37/0.26	0.952	1.0V	3V	5.0V	8V	10V	12V	15V	
3.5	23	45/0.32	0.517		1.5V	2.5V	4V	5V	6.5V	7.5V	
5.5	35	70/0.32	0.332		1V	2V	2.5V	3.5V	4V	5V	

Table 7-2

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

R means resistance (Ω /100 m) on the above table.

I means electric current through the wire (A).

ℓ means the length of the wire (m).

The length of wire indicates round length, it means twice the length from generator to electrical tools.

7-2 DC OUTPUT

NOTE : Do not use DC and AC output simultaneously.

Due to a characteristic of the condenser voltage regulation, simultaneous use of DC and AC output creates voltage drop in DC output resulting in incapability for charging batteries.

When the generator is employed to charge batteries, attentions should be paid to the specific gravity of electrolyte in the battery.

7-2-1 SPECIFIC GRAVITY OF BATTERY ELECTROLYTE

The specific gravity of electrolyte varies by temperature ; so it must be converted to the one at 20°C.

$$S_{20} = S_t + 0.0007 (t-20)$$

where

S_{20} : The specific gravity at 20°C

S_t : Measured value

t : Temperature at the time of measurement (Electrolyte)

7-2-2 SPECIFIC GRAVITY OF BATTERY ELECTROLYTE AND CHARGING CONDITION

Specific gravity (20°C)	Charging condIntion	Remarks
1.260	100	Charging is not necessary.
1.240	87	
1.220	75	Charging is necessary.
1.200	62	Immediate Charging is necessary.
1.180	50	
1.160	37	
1.140	25	

Table 7-3

7-2-3 BATTERY CAPACITY

The battery capacity is expressed in the unit of AH (ampere-hour). One AH stands for the capacity capable of one ampere current for one hour.

8. MEASURING PROCEDURES

8-1 MEASURING INSTRUMENTS

8-1-1 "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.

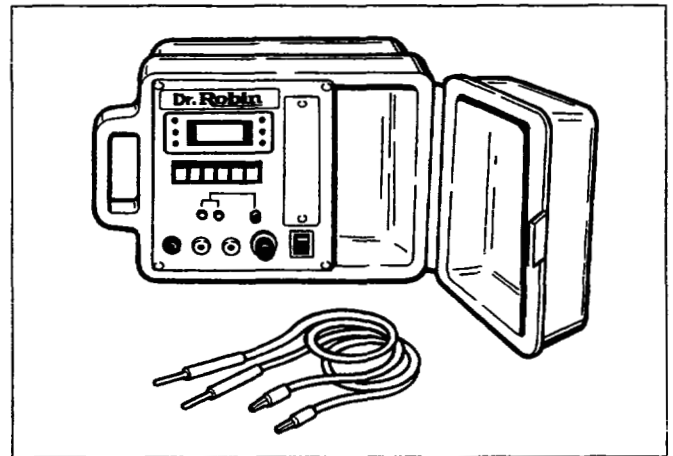


Fig. 8-1

● SPECIFICATIONS

Model		Dr. Robin
Part Number		388-47565-08
Measuring Range	Voltage	0-500V AC
	Frequency	25-70Hz
	Resistance	0.1-1,999 Ω
	Condenser Capacity	10-100 μ F
	Insulation Resistance	3M Ω
Circuit Protector		Fuse
Power Source		2 \times 6F44P (006P) Dry Cell Battery
Accessories		Test leads with needle probes . . . 1 set Test leads with jack plugs 1 set
Dimensions (L \times W \times H)		285 mm \times 200 mm \times 110 mm
Weight		1.6kg

Table 8-1

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.

8-1-2 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 150V: Type with an output voltage of 110 or 120V

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

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

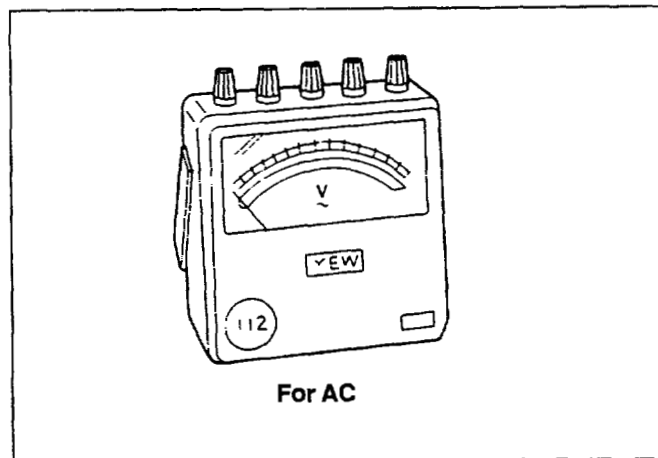


Fig. 8-2

(2) AMMETERS

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 10A, 20A, 100A)

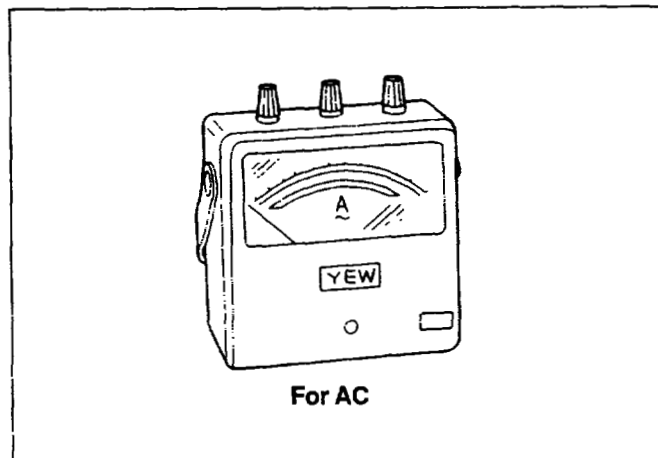


Fig. 8-3

(3) FREQUENCY METER

Frequency range : About 45 to 65Hz

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

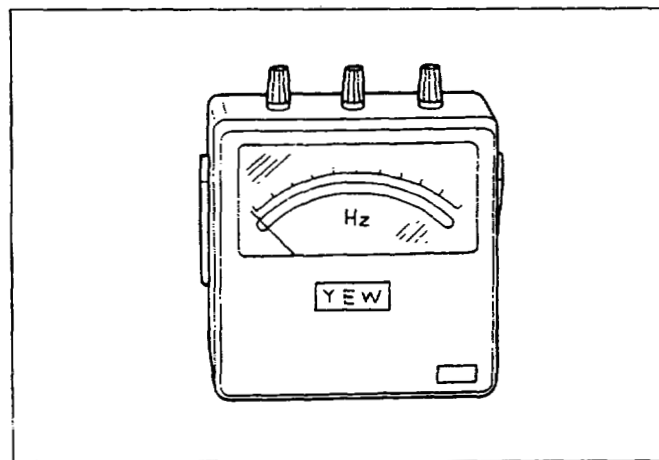


Fig. 8-4

(4) CIRCUIT TESTER

This circuit tester is used for measuring resistance, etc.

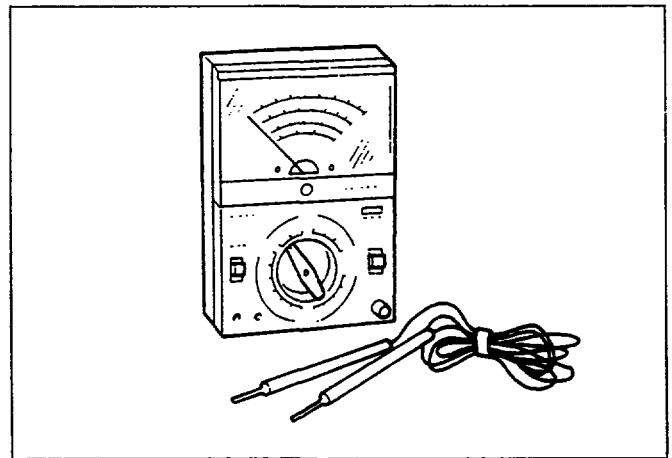


Fig. 8-5

(5) MEGGER TESTER

Used for measuring generator insulation resistance.

Select one with testing voltage range of 500V.

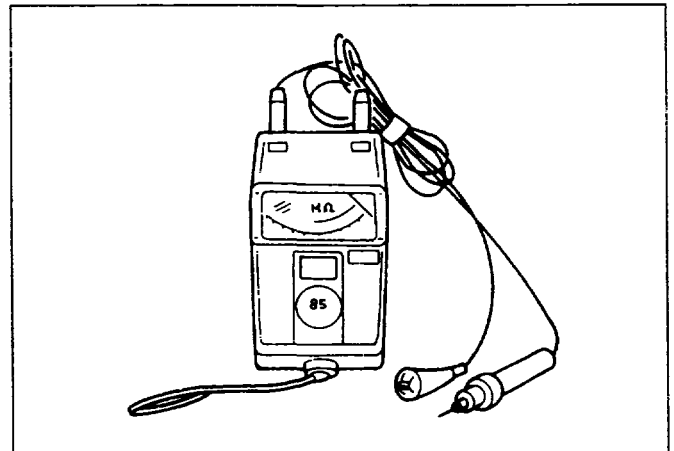


Fig. 8-6

(6) ENGINE TACHOMETER

There are various types of tachometers, such as contactless type, contact type, and strobe type. The contact type can be used only when the generator and engine have been disassembled. The contactless type is recommended.

The PET-2100E engine tachometer is available from your Robin distributors.

Please inquire by the part number PET-2100E.

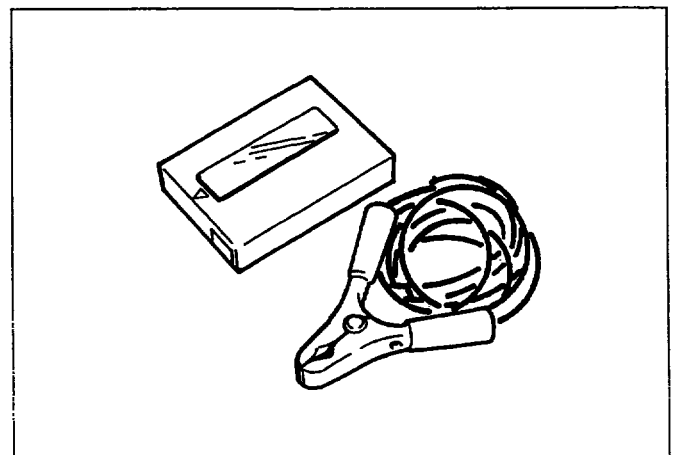


Fig. 8-7

8-2 AC OUTPUT MEASURING

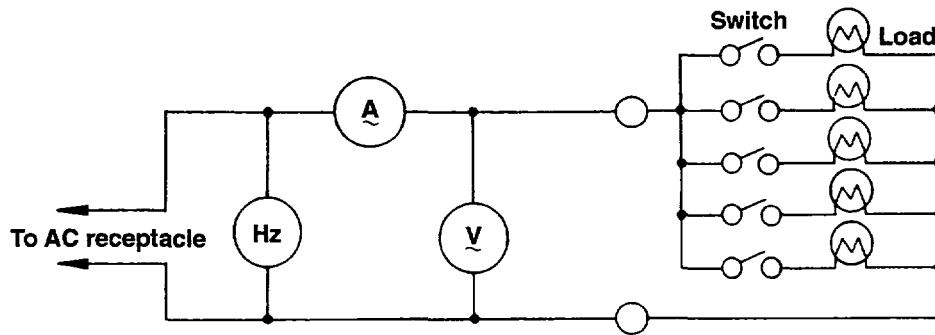


Fig. 8-8

Measurement is executed with the circuit as shown in Fig. 8-8. An electric heater or an incandescent lamp with a power factor of 1.0 is suitable as a load for the generator. When the AC output measured at the rated load and rated speed is confirmed to be within the voltage range specified in the table below, the AC output is normal.

Rated voltage	120V
Voltage range	117~130V

Table 8-2

8-3 DC OUTPUT MEASURING

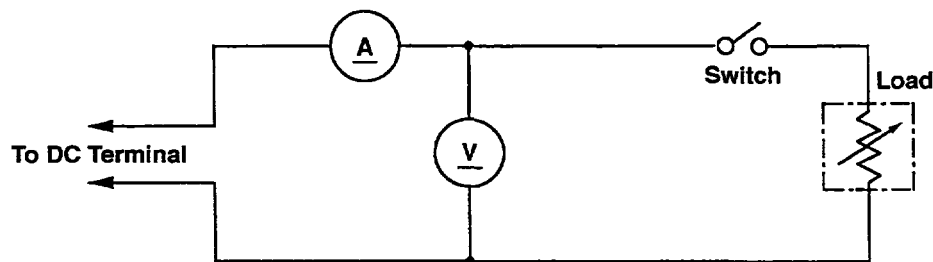


Fig. 8-9

Measurement of DC output is executed with the switch turned ON while the current is regulated at 8.3A by adjusting the load to the generator. If the voltage is within the range from 6V to 14V, the voltage output is normal.

Note : If a battery is connected as a load to the generator, the DC output voltage will increase by approximately 1 to 2V. Therefore, carefully observe the electrolyte level and do not overcharge the battery.

8-4 MEASURING INSULATION RESISTANCE

Use a "Dr. Robin" generator tester in megger tester mode or use a megger tester to check the insulation resistance. Connect a megger tester to one of receptacle output terminals and the ground terminal, then measure the insulation resistance. An insulation resistance of 1 megohm or more is normal. (The original insulation resistance at the time of shipment from the factory is 10 megohm or more.)

If it is less than 1 megohm, disassemble the generator and measure the insulation resistance of the stator, rotor and control panel individually.

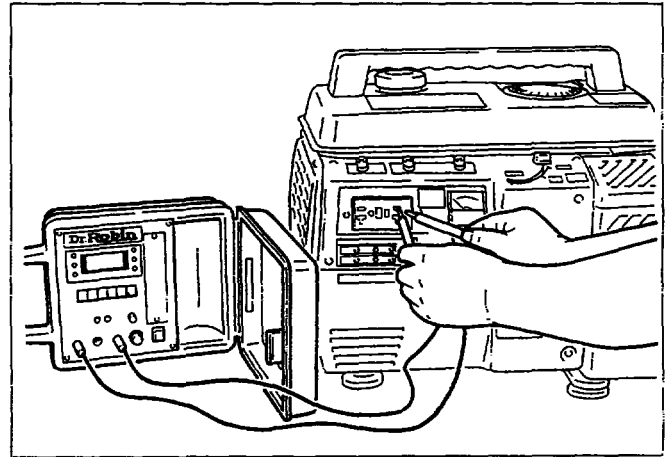


Fig. 8-10

● STATOR

- (1) Measure the insulation resistance between BROWN lead and the core.
- (2) Measure the insulation resistance between YELLOW lead and the core.
- (3) Measure the insulation resistance between BLACK lead and the core.

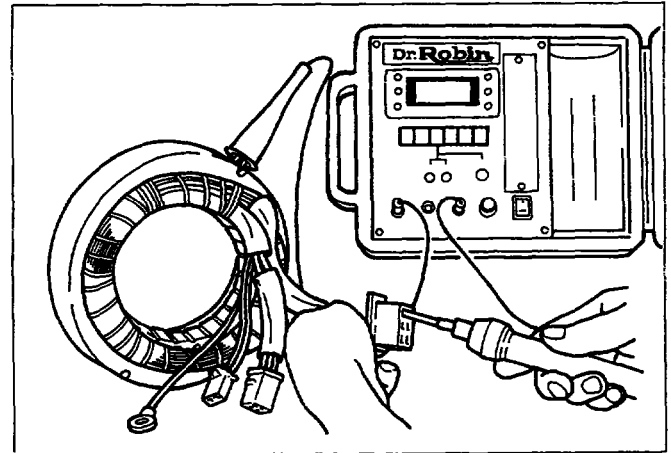


Fig. 8-11

● ROTOR

Measure the insulation across one of the soldered terminals of the rotor and the core.

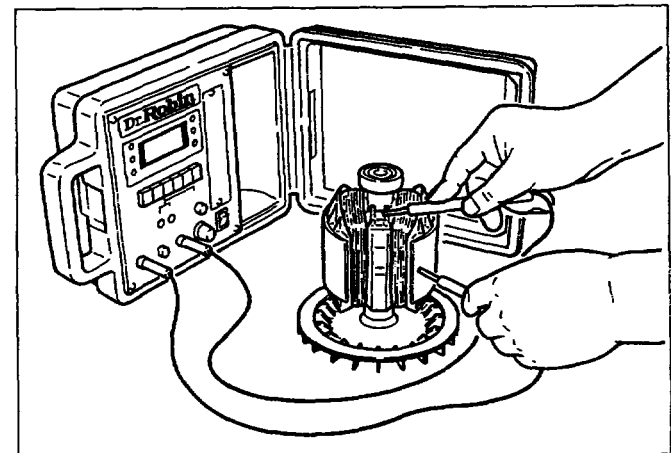


Fig. 8-12

● **CONTROL PANEL**

Measure the insulation resistances between the live parts and the grounded parts.

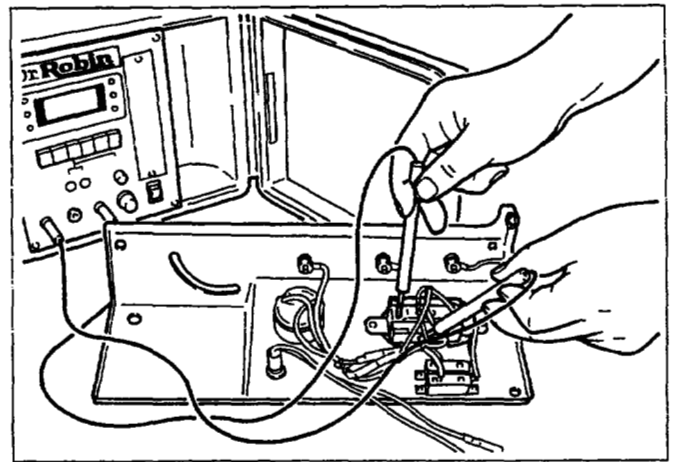


Fig. 8-13

Any part where the insulation resistance is less than $1M\Omega$ has faulty insulation, and may cause electric leakage and electric shock.

Replace the faulty part.

9. CHECKING FUNCTIONAL MEMBERS

9-1 CONTROL PANEL

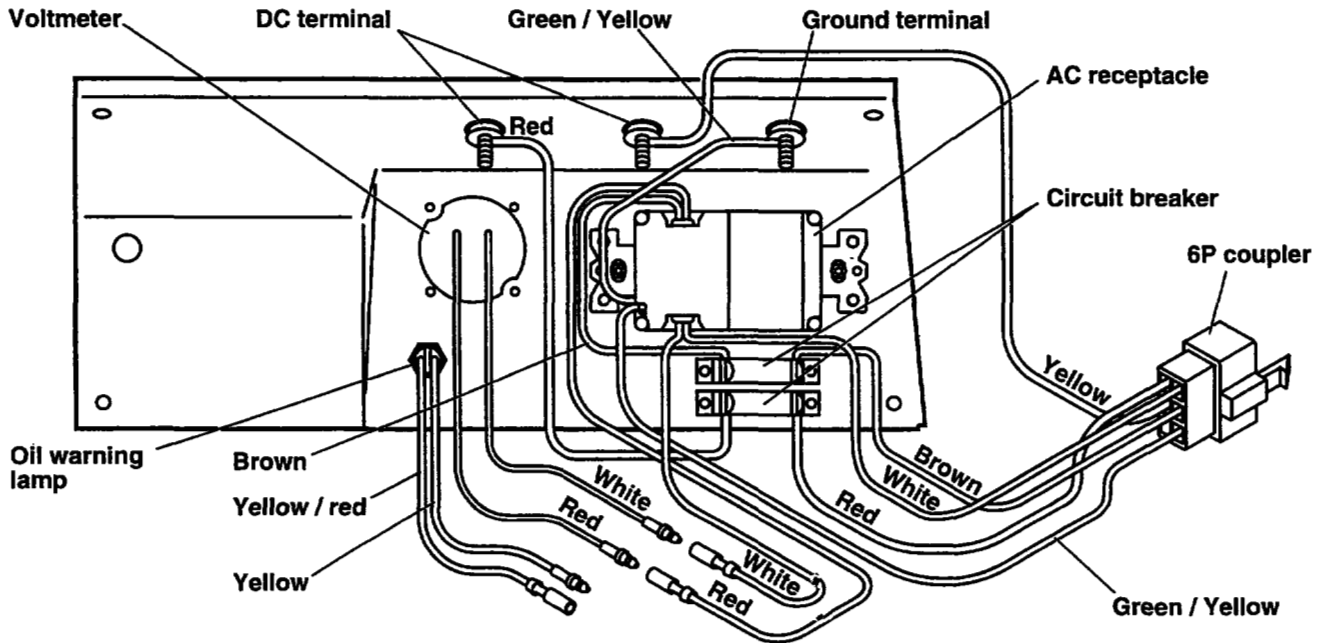


Fig. 9-1

9-1-1 AC RECEPTACLES

Using a "Dr. Robin" or a circuit tester, check continuity between the two terminals at the rear of the AC receptacles while the receptacle is mounted on the control panel. When continuity is found between the output terminals of the receptacle with a wire connected across these terminals, the AC receptacle is normal. When the wire is removed and no continuity is found between these terminals, the receptacles are also normal.

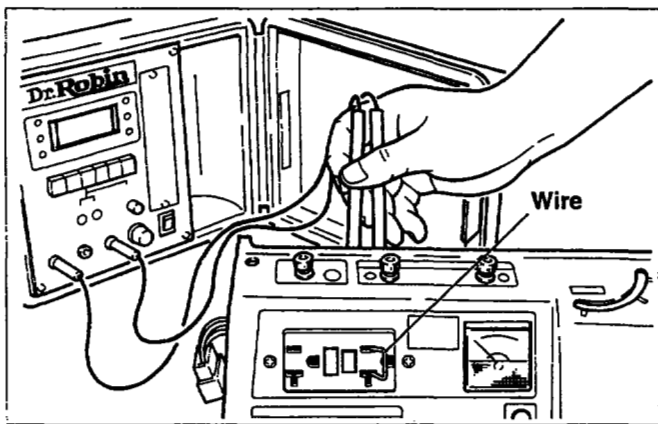


Fig. 9-2A

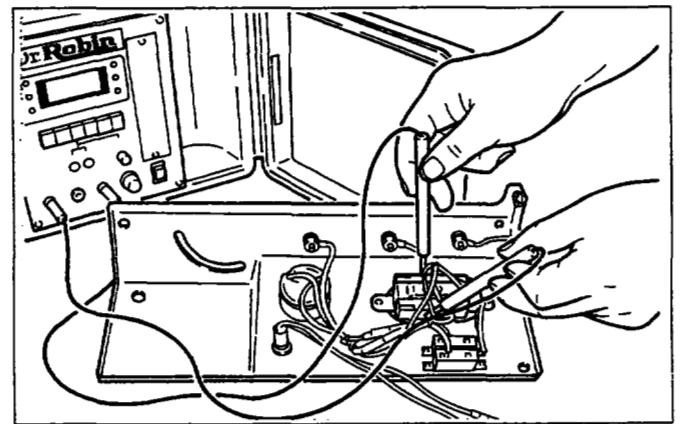


Fig. 9-2B

9-1-2 DC TERMINAL

Check continuity between the DC terminals at the rear of the control panel using a circuit tester, under the condition that the DC terminals is mounted on the control panel. (See Fig. 9-1.)

When continuity between the DC terminals is confirmed with a wire connected across the terminals, and is not confirmed if the wire is removed, the DC terminals are normal. (See Fig. 9-1.)

9-1-3 CIRCUIT BREAKER

Check continuity between the two terminals at the rear side of the circuit breaker using a circuit tester while it is mounted on the control panel.

If continuity is confirmed when the breaker is ON, and no continuity is confirmed when the breaker is OFF, the circuit breaker is normal.

9-1-4 VOLTMETER

Check the voltmeter if it operates correctly by applying specified voltage. Voltmeters cannot be checked with a circuit tester because its internal resistance is too large.

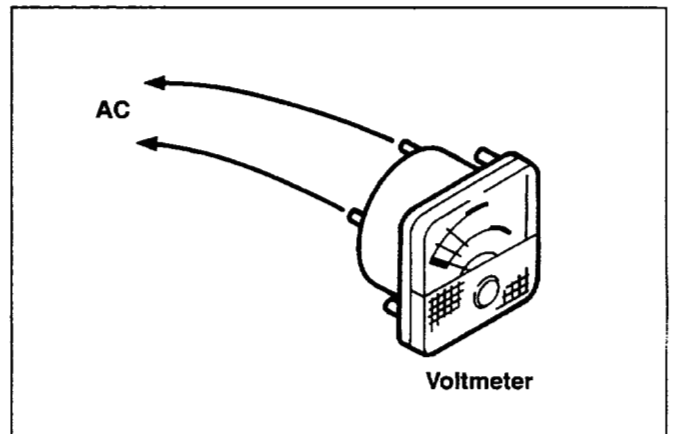


Fig. 9-3

9-2 STATOR

Disengage connectors on the wires from stator and check the resistance between wires with a "Dr. Robin" or a circuit tester referring to the following table.

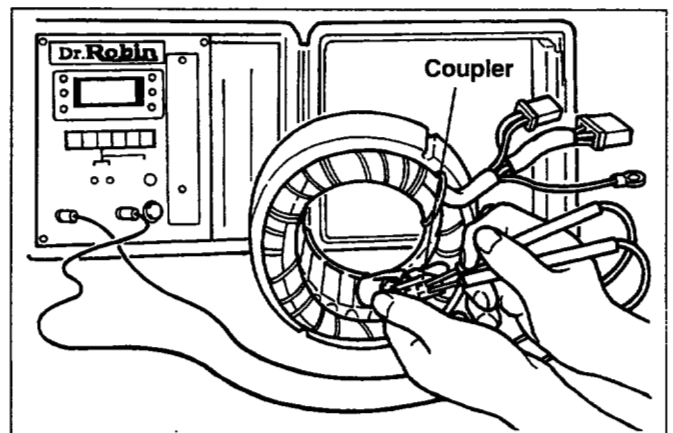


Fig. 9-4

(R × 1 Ω ± 10%)

Specification		AC Winding	DC Winding	Condenser Winding
Hz	Voltage	Brown / White	Green / Green	Black / Black
60	120V	1.4 Ω	0.62 Ω	4.8 Ω

Table 9-1

NOTE: If the circuit tester is not sufficiently accurate, it may not show the values given and may give erroneous readings.

Erroneous reading will also occur when there is a wide variation of resistance among coil windings or when measurement is performed at ambient temperatures different from 20°C (68°F).

9-3 ROTOR

- 1) Using the "Dr. Robin" or a circuit tester, measure the resistance of the field coil.
(See Fig. 9-5.)

(R × 1 Ω ± 10%)

Resistance
6.3 Ω

NOTE 1: Because a diode is soldered to the coil ends at the terminals, resistance may be measured only when tester probes touch the terminals in one combination of polarity. Therefore, if no resistance reading appears, try checking in reverse polarity.

NOTE 2: If the circuit tester is not sufficiently accurate, it may not show the values given and may give erroneous readings. Erroneous reading will also occur when there is a wide variation of resistance among coil windings or when measurement is performed at ambient temperatures different from 20°C (68°F).

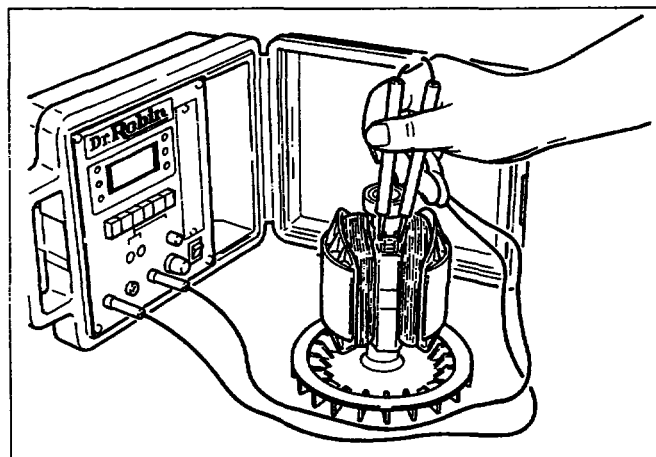


Fig. 9-5

- 2) Measure the resistance of the resistor.

Normal resistance
5.1 kΩ

9-4 CONDENSER

- Use a "Dr. Robin" in capacitance meter mode to check the capacity of condensers. (See Fig. 9-6.)

NOTE: Be sure to discharge condensers by shorting condenser leads each other before checking their capacitance, or the accurate reading cannot be obtained.

Normal Capacity of Condenser
10 μ F

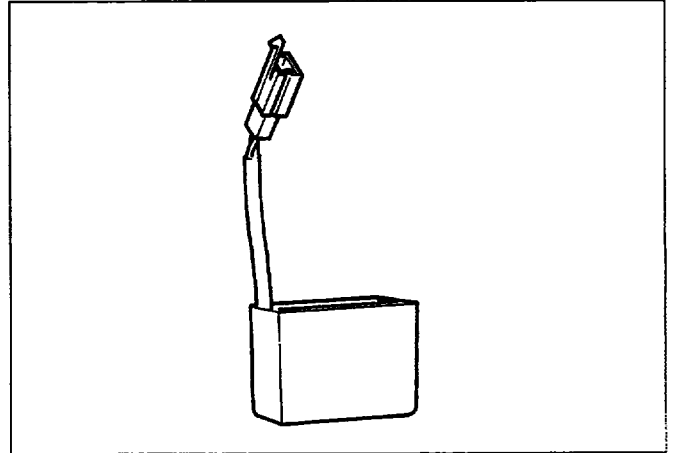


Fig. 9-6

- If such an instrument is unavailable, the condenser can be checked by replacing with a new one. If the generator performs good with new condenser, the cause of trouble is defect in original condenser.

9-5 DIODE RECTIFIER

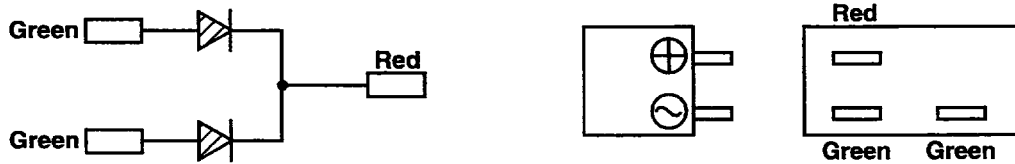


Fig. 9-7

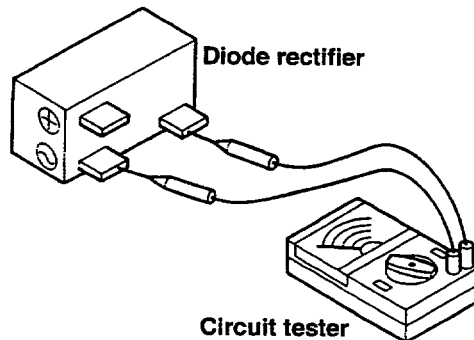


Fig. 9-8

The internal circuit of the diode rectifier is as shown in Fig. 9-7. Check continuity between each terminal using a circuit tester as shown in Fig. 9-8.

■ Checking table for analogue circuit tester.

Analogue circuit tester		Apply black \ominus needle of the circuit tester		
		Green	Green	Red
Apply red \oplus needle of the circuit tester	Green		No continuity	No continuity
	Green	No continuity		
	Red	Continuity	Continuity	

Table 9-2-1

■ Checking table for digital circuit tester.

Digital circuit tester		Apply red \oplus needle of the circuit tester		
		Green	Green	Red
Apply black \ominus needle of the circuit tester	Green		No continuity	No continuity
	Green	No continuity		
	Red	Continuity	Continuity	

Table 9-2-2

NOTE 1: Because of the difference of measuring method between the analogue circuit tester and the digital circuit tester, polarity of tester needles should be reversed.

NOTE 2: "Continuity" means forward direction characteristics of the diode, and different from short circuit condition (in which a pointer of the tester goes out of its normal scale), shows resistance to some extent. When result of the checking indicates failure even in one section, replace with a new one.

NOTE 3: "Simpson" brand analogue testers have the characteristic as same as the digital circuit tester.

9-6 OIL SENSOR (OPTION)

1. Disconnect two (2) wires coming from the sensor at the connection.
2. Loosen the sensor to remove it from the engine.
3. Plug the opening of oil filler hole (created after sensor is removed) with suitable means such as oil gauge.
4. Connect the removed wires again with the oil sensor.
5. Start the engine with the oil sensor removed and confirm if;
 - a. Engine stops after 5 seconds which is normal, or
 - b. Engine does not stop after more than 10 seconds which is unusual.

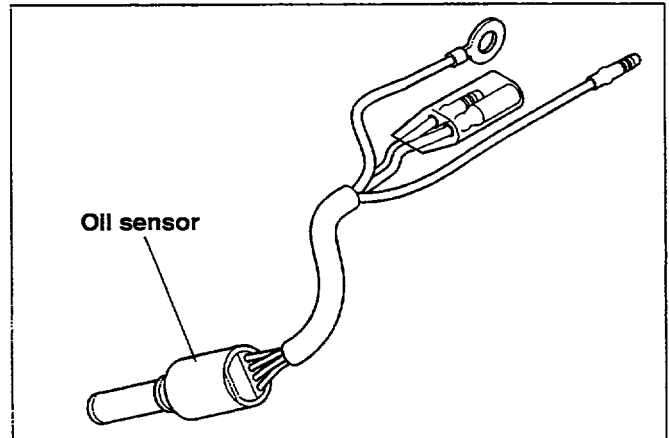


Fig. 9-9

NOTE : *The sensor will not operate properly when wire is broken or poorly connected. Check the wires for correct connection. If it fails to stop within 5 seconds after the wirings have checked, the sensor is wrong. Replace the sensor with new one.*

10. DISASSEMBLY AND ASSEMBLY

10-1 PREPARATION and PRECAUTIONS

- 1) Be sure to memorize the location of individual parts when disassembling the generator so that the generator can be reassembled correctly. Tag the disassembled part with the necessary information to facilitate easier and smoother reassembling.
- 2) For more 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; clean them before reassembly using a neutral cleaning fluid.
- 5) Use all disassembly/assembly tools properly, and use the proper tool for each specific job.

10-2 DISASSEMBLY PROCEDURES

Step	Part to remove	Description	Remarks	Tool
1.	Side cover	(1) Remove the side cover by unscrewing four M5 × 8 screws. (See Fig. 10-1.)		(+) Plus screw driver
2.	Rear cover	(1) Remove the rear cover by unscrewing three M5 × 8 screws and two M8 × 10 screws. (See Fig. 10-2.)		(+) Plus driver

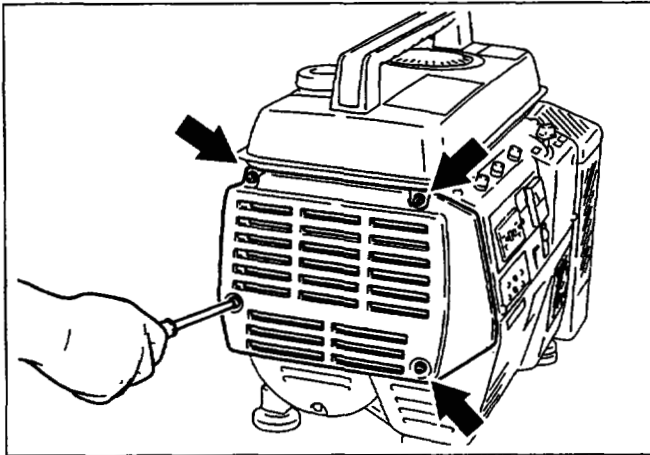


Fig. 10-1

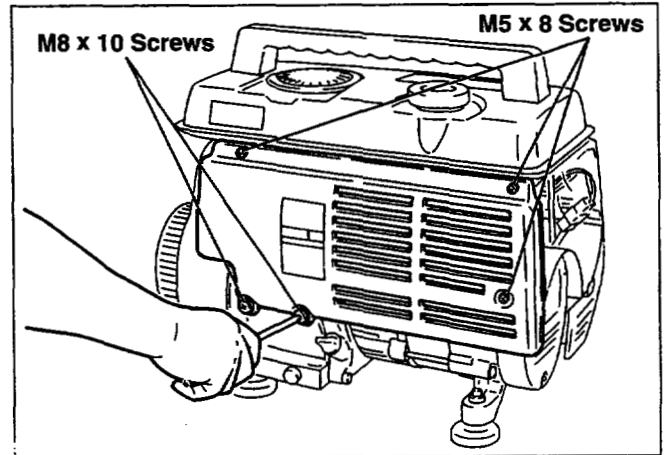
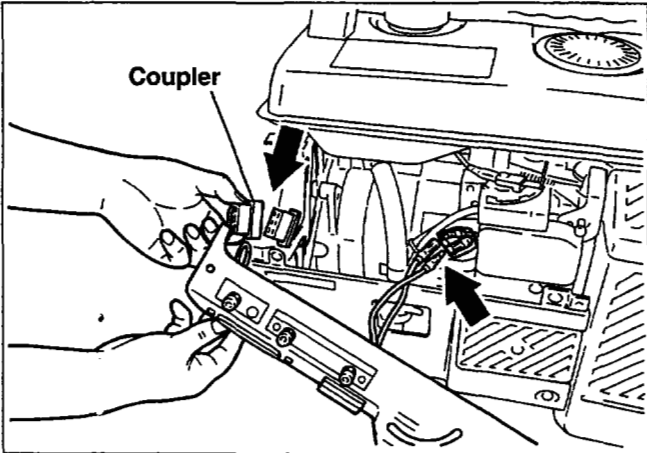
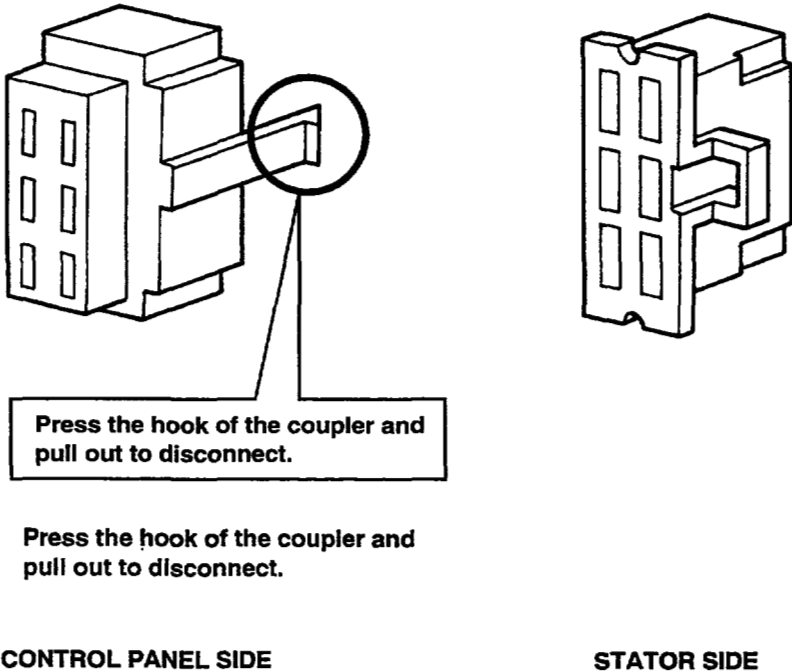
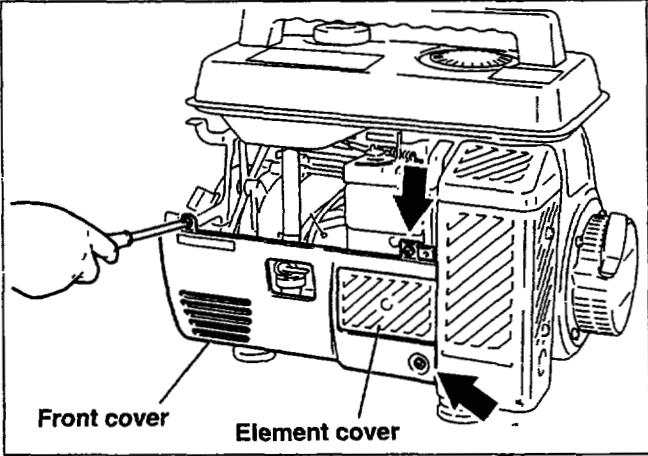
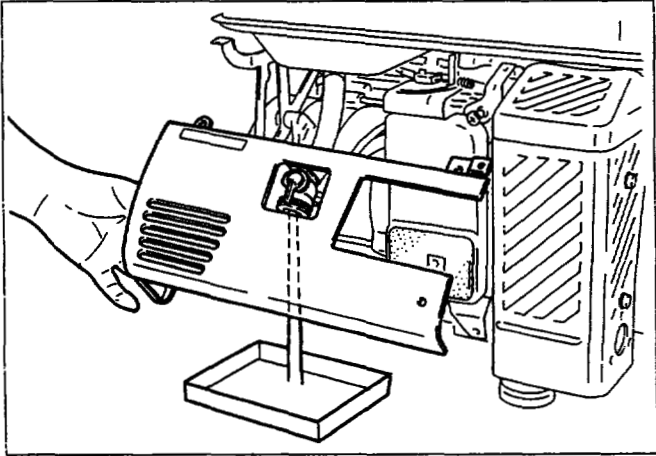
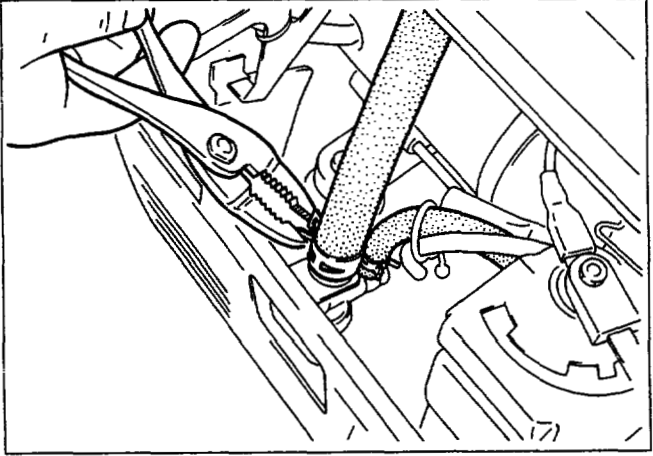


Fig. 10-2

3.	Control panel	(1) Pull the knob off the control lever and remove the control panel by unscrewing four M5 × 8 screws. (See Fig. 10-3.)		(+) Plus driver
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Fig. 10-3

Step	Part to remove	Description	Remarks	Tool
4.	Couplers and plugs (Disconnection)	<p>(1) Disengage the couplers of stator wires from the wires of control panel. 6P couplers (Yellow, Red, Green/Yellow, Brown, White) (See Fig. 10-4.)</p> <p>(2) Disengage the connectors of oil warning lamp (option) (See Fig. 10-5.)</p>	Pull the couplers while pushing the locking hook.	
		 <p style="text-align: center;">Fig. 10-4</p>		
		 <p style="text-align: center;">Fig. 10-5</p>		

Step	Part to remove	Description	Remarks	Tool
5.	Front cover	(1) Remove the element cover by unscrewing M6 × 12 screw. (See Fig. 10-6.)		(-) Driver
		(2) Remove the front cover by unscrewing three M5 × 8 screws. (See Fig. 10-6.)  <p style="text-align: center;">Fig. 10-6</p>		(+) Driver
6.	Fuel pipe and plug (Disconnection)	(1) Discharge fuel from the tank. 1. Shut the fuel strainer. 2. Remove the strainer cup. 3. Put a vessel to receive fuel under the strainer and open the fuel cock to discharge fuel. (See Fig. 10-7.) 4. Attach the strainer cup to the strainer body	Use utmost care about fire hazard. Wipe off spilt fuel thoroughly. Do not lose the filler screen.	
		(2) Disconnect fuel hose from the strainer. Loosen the hose clamp on top of the strainer and pull out the fuel hose from the strainer. (See Fig. 10-8.)		Pliers
 <p style="text-align: center;">Fig. 10-7</p>		 <p style="text-align: center;">Fig. 10-8</p>		

Step	Part to remove	Description	Remarks	Tool
7.	Fuel tank handle	<p>(1) Remove the handle cover by unscrewing the two M3 ×10 screws.</p> <p>(2) Pull off the breather pipe.</p> <p>(3) Remove the handle body by taking off the two M8 nuts.</p>	The fuel tank can be removed without disassembling the handle.	<p>(+) Driver</p> <p>12mm box wrench</p>

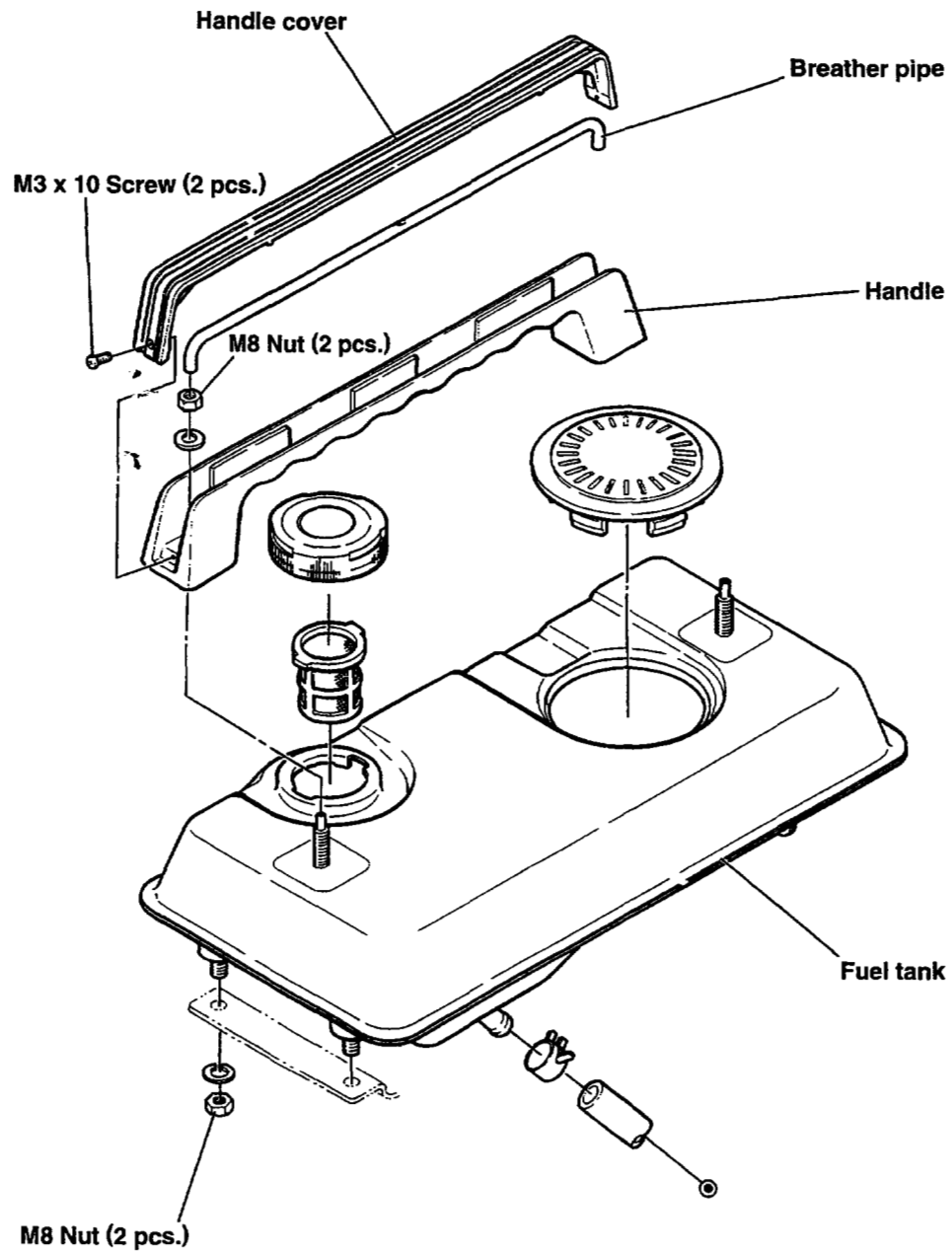
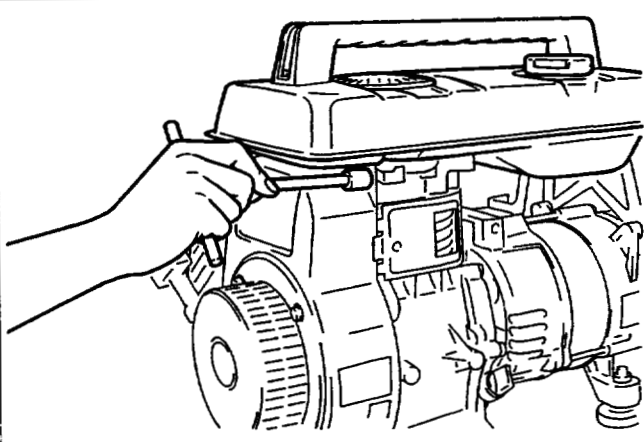
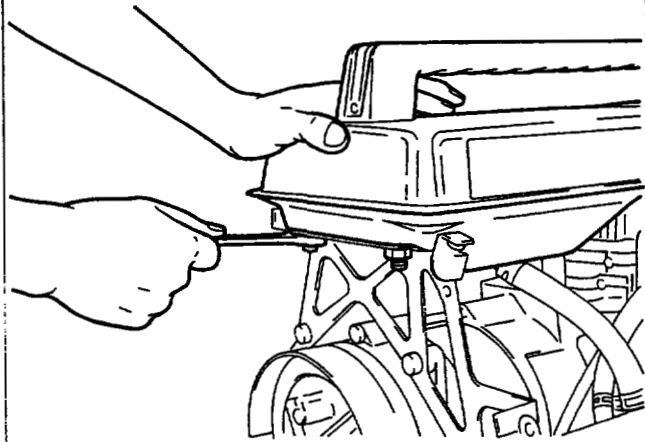
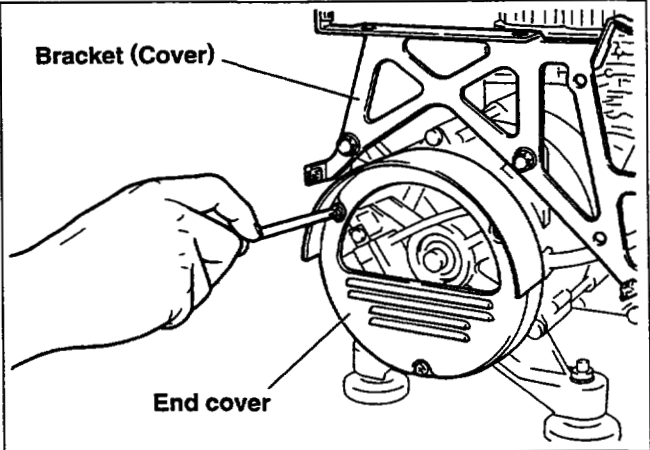


Fig. 10-9

Step	Part to remove	Description	Remarks	Tool
8.	Fuel tank	(1) Remove the two M6×12 flange bolts from the blower housing. (See Fig. 10-10.) (2) Remove the fuel tank by taking off the two M8 nuts from the bottom of the tank. (See Fig. 10-11.)		10mm box wrench 12mm box wrench
				<p>Fig. 10-10</p> <p>Fig. 10-11</p>
9.	Bracket (Cover)	(1) Remove the bracket cover from the generator by loosening the two M8 × 30 bolts. (See Fig. 10-12.)		12mm box wrench
10.	End cover	(1) Remove the end cover from the generator by unscrewing the four M5 × 10 screws. (See Fig. 10-12.)		(+) Driver
		<p>Fig. 10-12</p>		

Step	Part to remove	Description	Remarks	Tool
11.	Rear bracket	<p>(1) Loosen and take out the three M6 cover bolt. (See Fig. 10-13.)</p> <p>(2) Remove condenser from rear bracket.</p> <p>(3) Remove the connector of the diode rectifier and then remove the earth cable terminal from the rear bracket. (See Fig. 10-14.)</p>		<p>10mm box wrench</p> <p>Box spanner</p> <p>Box spanner and screw driver (+)</p>

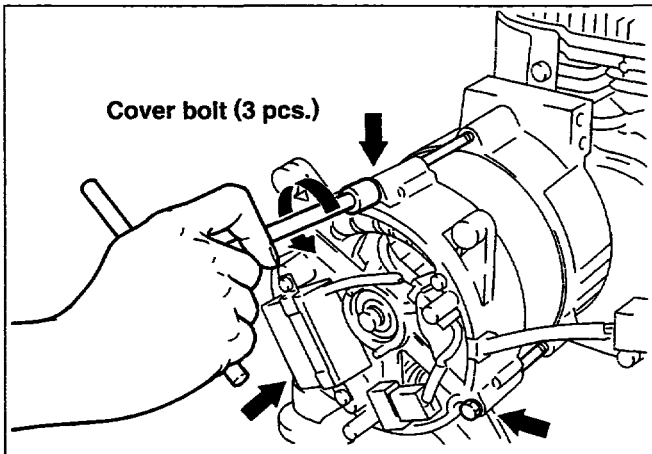


Fig. 10-13

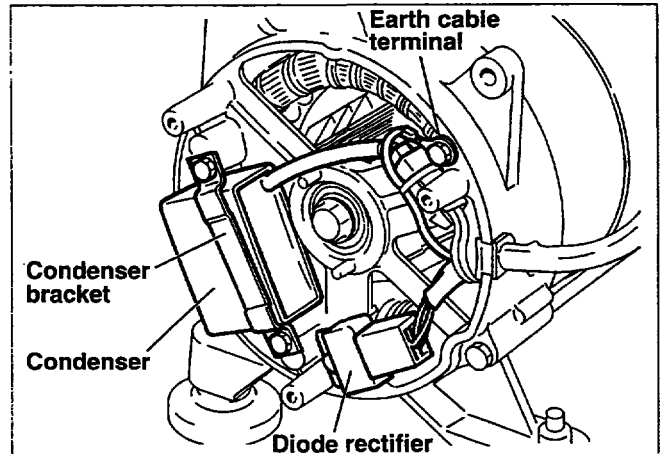


Fig. 10-14

		<p>(4) Remove the rear bracket, tapping it evenly with a plastic mallet. (See Fig. 10-15.)</p> <p>(5) Remove mount rubbers from rear cover. (See Fig. 10-16.)</p>		<p>Plastic mallet</p> <p>Wrench</p>
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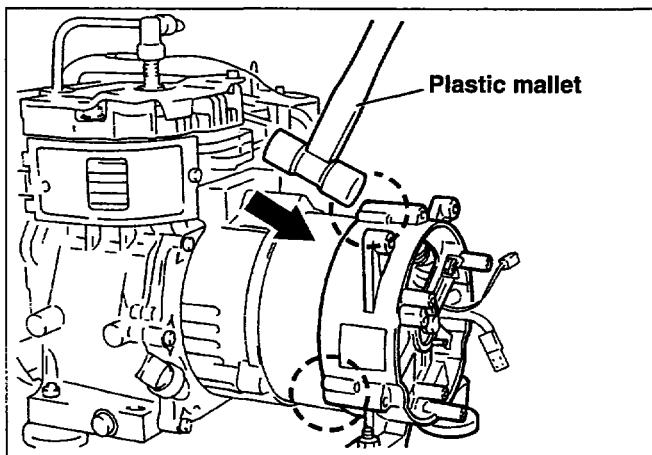


Fig. 10-15

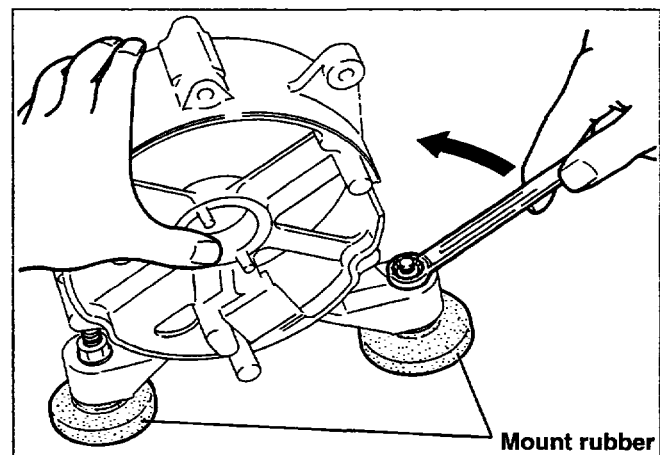


Fig. 10-16

Step	Part to remove	Description	Remarks	Tool
12.	Stator	(1) Remove the stator cover. (See Fig. 10-17.) (2) Pull off the stator from the front cover tapping the core with a plastic mallet. (See Fig. 10-18.)	Never tap on the winding and the lead.	Plastic mallet

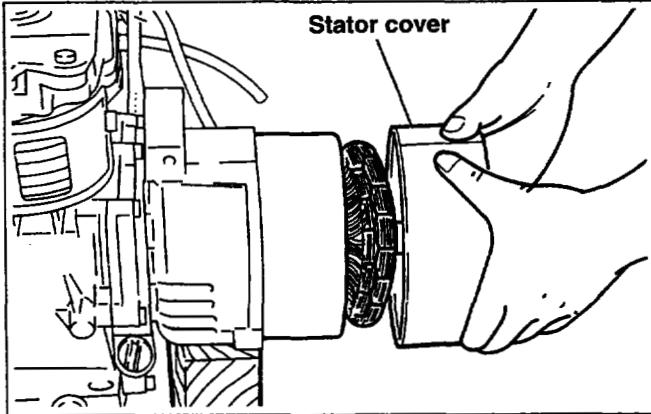


Fig. 10-17

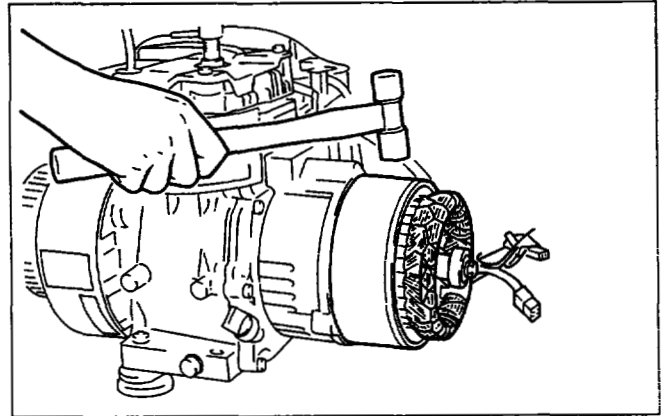


Fig. 10-18

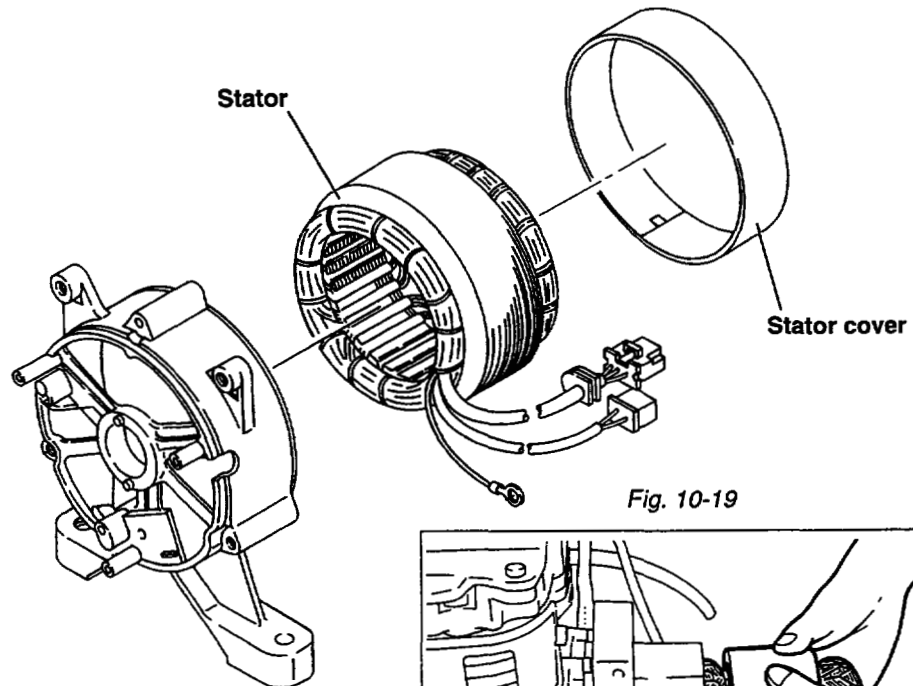


Fig. 10-19

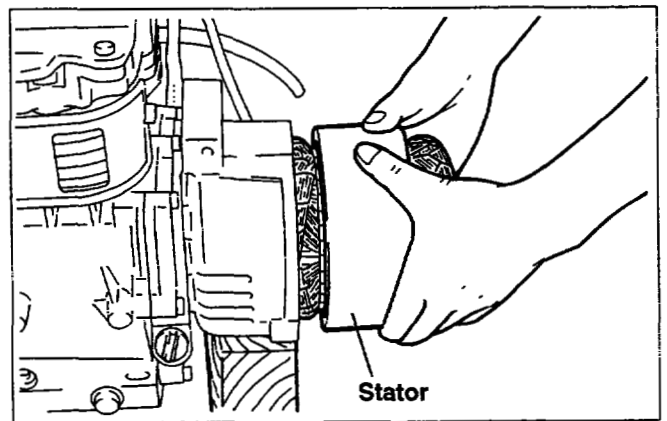
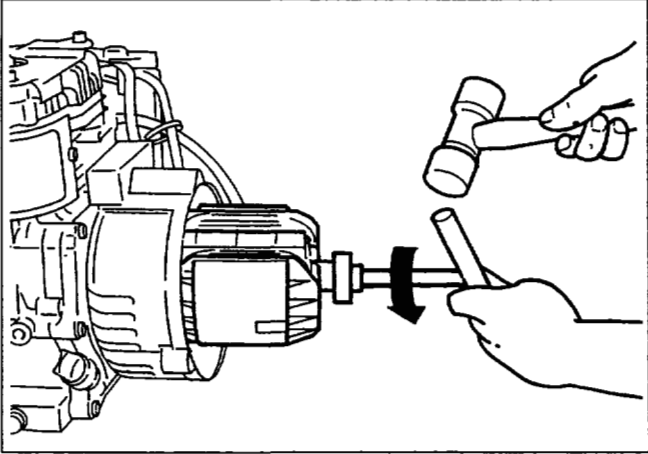


Fig. 10-20

Step	Part to remove	Description	Remarks	Tool
13.	Rotor	<p>(1) Take off the through bolt. Apply a box wrench on the head of through bolt. Hit the wrench handle with a hammer counter-clockwise to loosen.</p>  <p style="text-align: center;"><i>Fig. 10-21</i></p>		Box wrench Plastic hammer
		<p>(2) Put the engine on the working table recoil starter side down.</p>		
		<p>(3) Use a bolt and oil as a tool for pulling out rotor in the following procedures :</p> <ol style="list-style-type: none"> 1. Pour engine oil into the center hole of rotor shaft. Fill with oil to the shaft end. (See Fig. 10-22.) 2. Prepare a bolt with the following thread size : M8 × P 1.25 3. Apply a few turns of seal tape around the tip of the bolt. (See Fig. 10-23.) 		

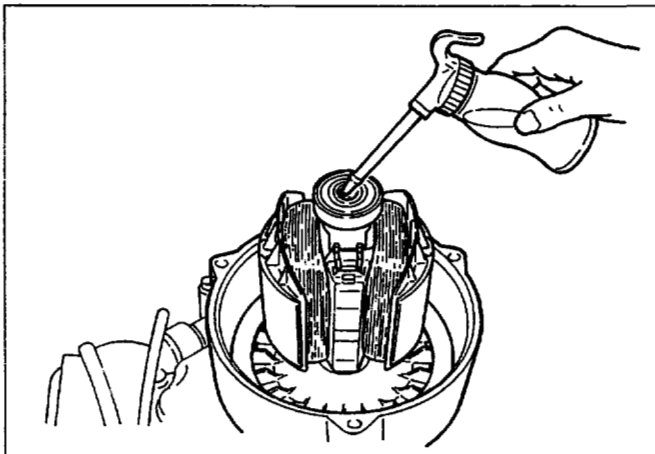


Fig. 10-22

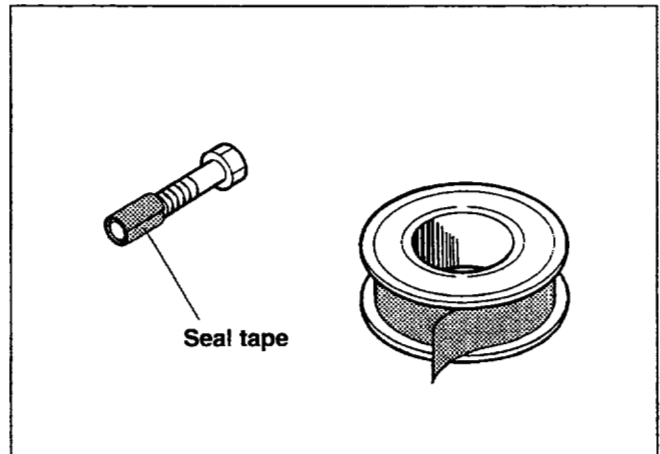


Fig. 10-23

Step	Part to remove	Description	Remarks	Tool
13.	Rotor	<p>4. Screw the bolt into the thread of the rotor shaft.</p> <p>5. Torque the bolt using a socket wrench until the rotor comes off loose.</p> <p>* The hydraulic pressure inside the rotor shaft takes apart the rotor from the engine shaft.</p> <p>(4) Wipe off oil thoroughly from rotor shaft and engine PTO shaft.</p> <div data-bbox="529 644 1174 1066" data-label="Image"> <p>The diagram shows a hand holding a socket wrench to tighten a bolt on the top of a rotor assembly. A curved arrow indicates the direction of rotation for the wrench. The rotor is mounted on a shaft, and the assembly is shown in a cross-sectional view.</p> </div> <p data-bbox="797 1081 911 1108">Fig. 10-24</p>		12mm box spanner or Socket wrench
14.	Front bracket	<p>(1) Remove the front bracket, which is mounted on the main bearing cover of the engine, by taking out four M8 × 18 bolts. (See Fig. 10-25.)</p> <div data-bbox="537 1423 1182 1842" data-label="Image"> <p>The diagram shows a hand using a socket wrench to remove a bolt from the front bracket of an engine. The front bracket is a circular component with six bolts around its perimeter. The engine's main bearing cover is visible in the background.</p> </div> <p data-bbox="805 1857 919 1885">Fig. 10-25</p>		12mm box spanner

Step	Part to remove	Description	Remarks	Tool
15.	Mount rubbers	<p>(1) Remove mount bracket from engine. Remove mount rubbers from mount bracket. 8 ϕ Nut : 3pcs. or 2pcs.</p> <div data-bbox="496 391 1143 846" data-label="Image"> </div>		12 mm wrench

10-3 ASSEMBLY PROCEDURES

10-3-1 FRONT BRACKET

Install the front bracket on the main bearing cover of the engine, engaging the faucet joint.

(See Fig. 10-27.)

M8 × 18mm bolt and washer assy 4pcs.

TIGHTENING TORQUE
8.7 ~ 10.1 ft • lbs.
1175 ~ 1370 N • cm
120 ~ 140 kg • cm

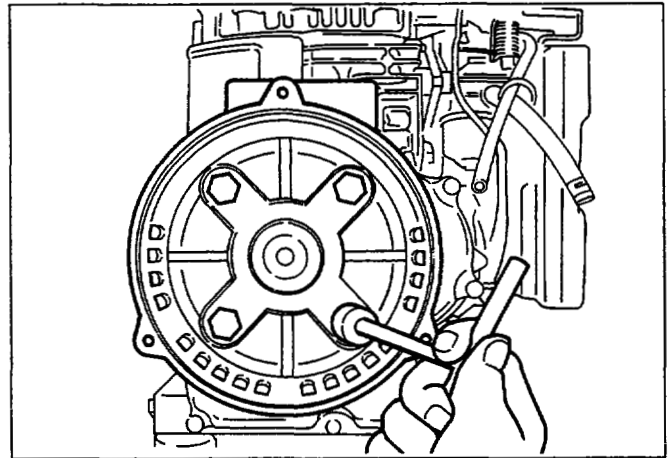


Fig. 10-27

10-3-2 ROTOR

1) Wipe off oil from the tapered portion of engine shaft and matching tapered hole of rotor shaft.

(See Figs. 10-28 and 10-29.)

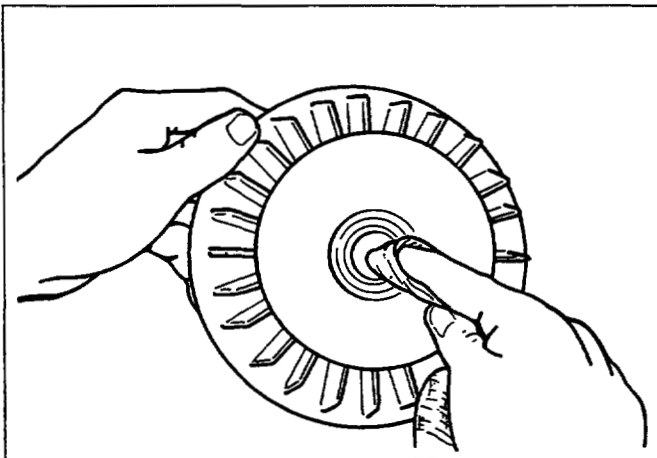


Fig. 10-28

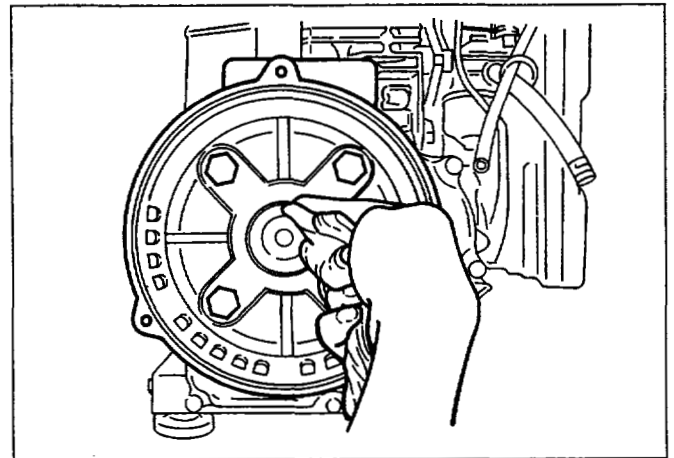


Fig. 10-29

2) Install rotor on the engine shaft and tighten the through-bolt.

Apply a wrench on the head of through bolt and hit wrench handle clockwise with a hammer to tighten. (See Fig. 10-30.)

If an impact wrench is available, use it.

TIGHTENING TORQUE
8.7 ~ 10.1 ft • lbs.
1175 ~ 1370 N • cm
120 ~ 140 kg • cm

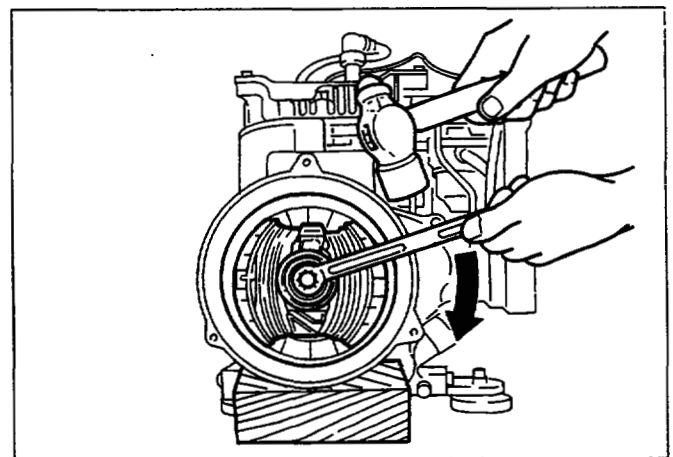


Fig. 10-30

10-3-3 STATOR

- (1) Holding the rear bracket and stator, fit them to the front bracket. Match the mounting hole of the rear bracket and that of the rotor bearing, and softly strike the outside periphery of the rear bracket with a plastic hammer. (See Fig. 10-31.)
- (2) Attach the stator cover around the stator.

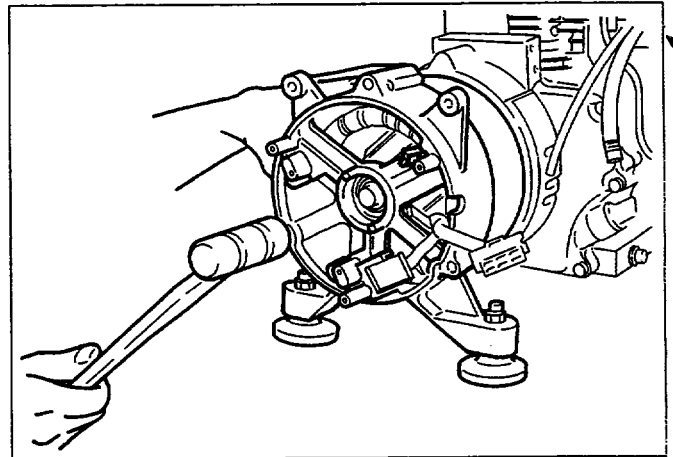


Fig. 10-31

- (3) Tighten the three M6 bolts to fix the rear bracket to the front bracket .

TIGHTENING TORQUE	
4.0 ~	5.4 ft · lbs.
535 ~	735 N · cm
55 ~	75 kg · cm

- (4) Put the grommet in the groove of the rear bracket and secure the wire.

Note : Fix the wire from the stator and diode stack with the clamp at the bottom of the groove.

10-3-4 CONDENSER

Put condenser to rear cover.

5 ϕ × 10 mm tapping screw 2 pcs.

TIGHTENING TORQUE	
2.4 ~	4.0 ft · lbs.
325 ~	535 N · cm
33 ~	55 kg · cm

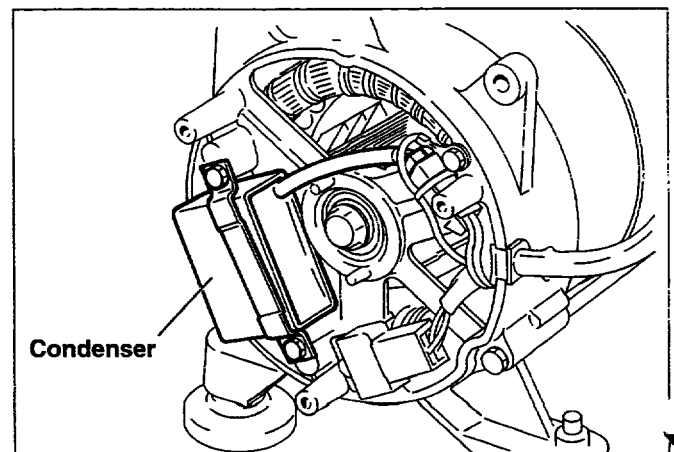


Fig. 10-32

10-3-5 END COVER

Set the end cover on the rear bracket with four M5 × 10 screws.

10-3-6 BRACKET (COVER)

Mount the bracket (cover) on the rear bracket and secure them with M8 × 30 bolts.

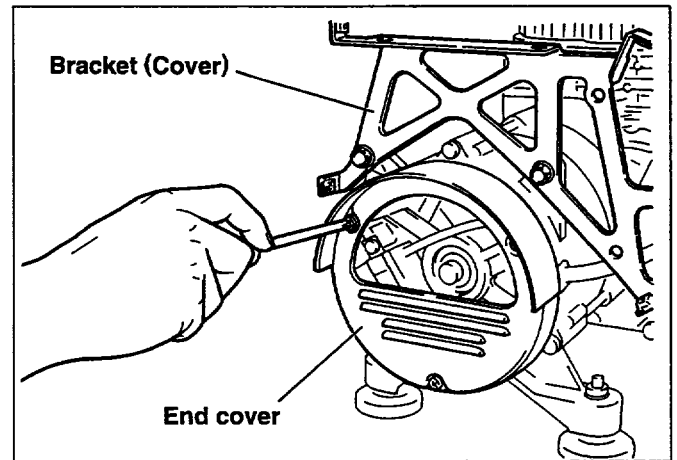


Fig. 10-33

10-3-7 FUEL TANK AND FUEL PIPE (CONNECTION)

- (1) Connect the rubber pipe to the engine carburetor and fasten it with a hose clamp. Attach the banjo to the opposite end of the rubber pipe, tighten it with a hose clamp, and fasten the pipe to the fuel strainer with the banjo bolt.

Note : Mount the fuel strainer with the banjo outlet upward.

- (2) Fasten the strainer to the front bracket with the joint nuts.
- (3) Secure the mounting tab on the bottom of the fuel tank and the blower housing with M6 × 12 bolts. Insert the attaching bolts on the other end of tank into the mount bracket hole and secure it with two M8 nuts.
- (4) Connect the rubber pipe
First, fit the hose clamp on the rubber pipe, connect the strainer and fuel tank, then fasten the rubber pipe with the hose clamps.

Note : Apply a drop of oil to the rubber pipe so that it may easily be connected to the strainer and the fuel tank.

10-3-8 FUEL TANK HANDLE

- (1) Match the handle hole with the bolt on the top of the fuel tank and secure it with M8 nuts.
- (2) Completely insert the breather pipe over the bolt.

Note : There is a hole at the center of the breather pipe for air bleeding. Set the breather pipe so that the hole is directed upward.

- (3) Fix both ends of the handle cover with M3 × 10 screws.

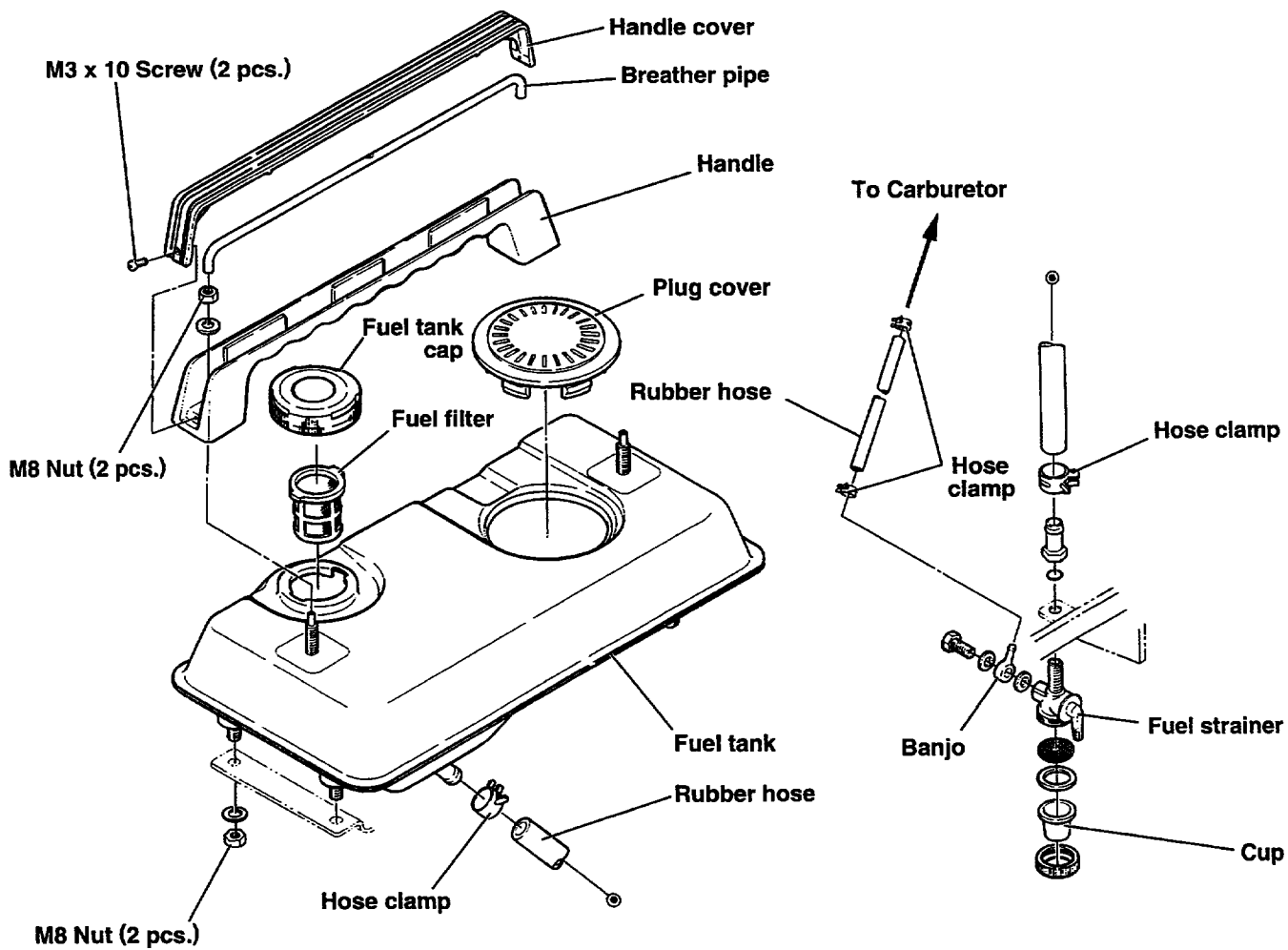


Fig. 10-34

10-3-9 FRONT COVER AND ELEMENT COVER

- (1) Secure the front cover, on which fuel strainer have been mounted, with three M5 × 8 screws. (See Fig. 10-35.)
- (2) Secure the element cover with M6 × 12 screws. (See Fig. 10-35.)

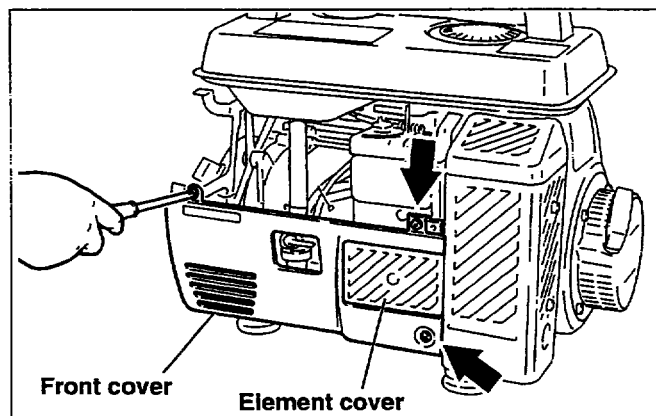


Fig. 10-35

10-3-10 CONNECTION OF WIRES

- (1) Connect the wires drawn out from the stator to the wires from the control box.
(See Fig. 10-36.)
- (2) Press the couplers until the locking hook engages securely.
- (3) Connect the oil warning lamp (option) wire. (See Fig. 10-36.)

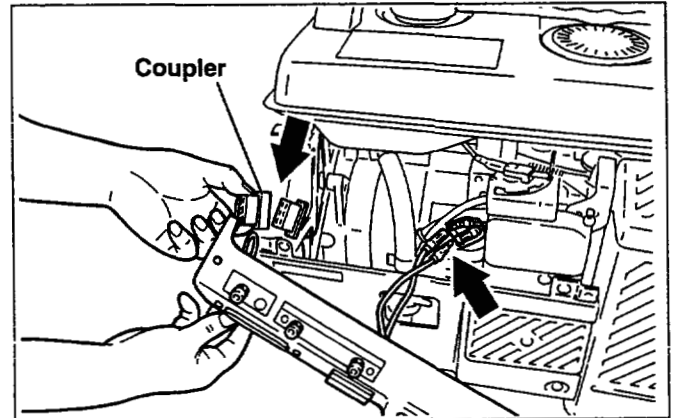
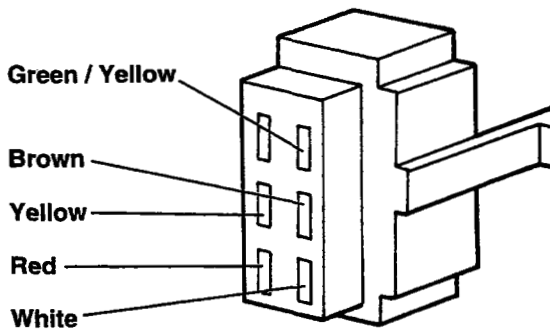


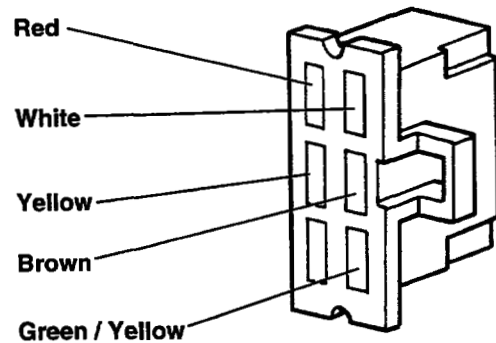
Fig. 10-36

[WIRE CONNECTIONS BETWEEN CONTROL PANEL AND STATOR]

6P coupler Wire color : Yellow, Red, Green/Yellow, Brown, White



CONTROL PANEL SIDE



STATOR SIDE

10-3-11 CONTROL PANEL

- (1) Put the control panel over the control lever and secure it with four M5 screws.
- (2) Attach the knob to the control lever.

Note : After the couplers and connectors have been connected and secured to the control panel, secure the wires with a wire band to the control panel.

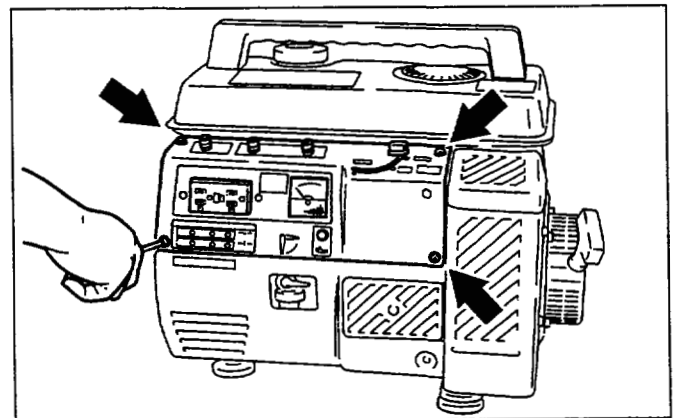


Fig. 10-37

10-3-12 REAR COVER

Secure the rear cover with three M5×8 screws and two M8 ×10 screws.

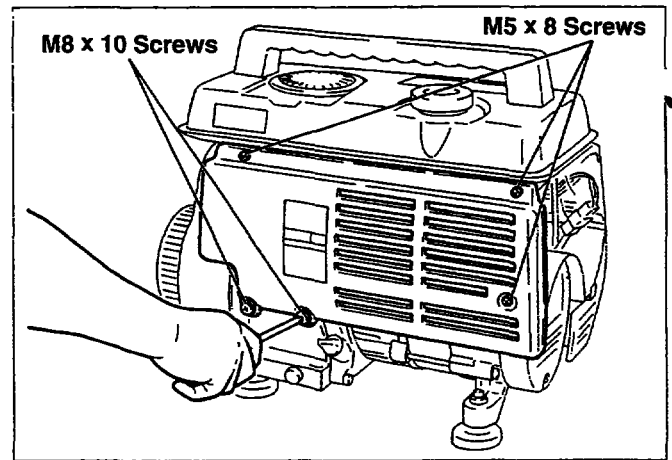


Fig. 10-38

10-3-13 SIDE COVER

Secure the side cover with four M5×8 screws.

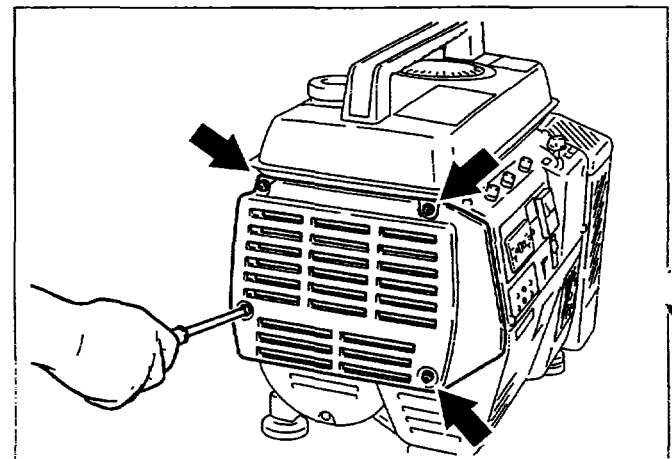


Fig. 10-39

11. TROUBLESHOOTING

11-1 NO AC OUTPUT

11-1-1 CHECKING STATOR

- 1) Remove control panel and disconnect couplers on wiring.
- 2) Measure the resistance between terminals on stator leads.
Refer to Table 9-1 (page 28) for normal resistance.

[Remedy]

If stator is defective, replace with new one.

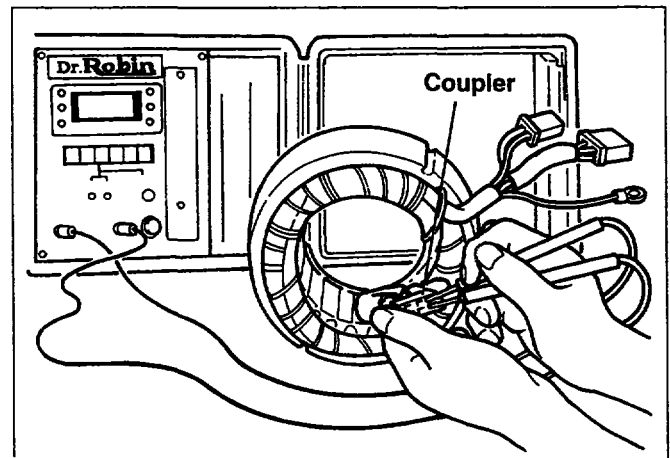


Fig. 11-1

11-1-2 CHECKING CONDENSER

- If an instrument (Q.C.-meter or C-meter) for measuring capacity of condenser is available, check the capacity of condenser.

NORMAL CAPACITY OF CONDENSER
10 μ F

- If you do not have such an instrument, you can check condenser by replacing with new one and test running.
If the generator perform normally with new condenser, the cause of trouble is defect in original condenser.

11-1-3 CHECKING ROTOR

- 1) Remove rear cover and stator.

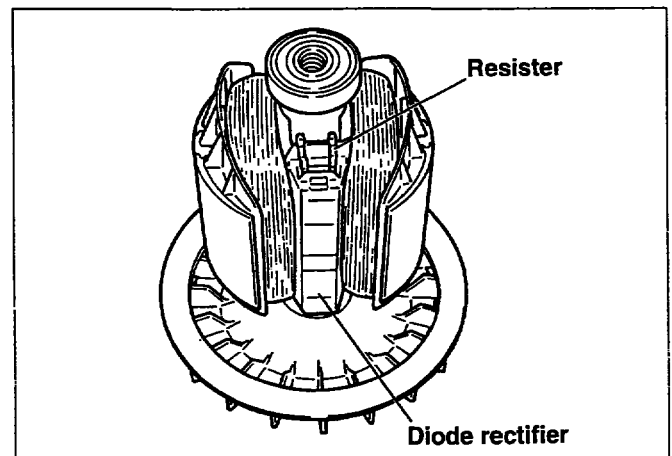


Fig. 11-2

2) Measure the resistance of field coil with a circuit tester. (See Fig. 11-3.)

(R × 1Ω ± 10%)

NORMAL RESISTANCE
6.3 Ω

[Remedy]

- If the resistance is not normal, replace rotor with new one.

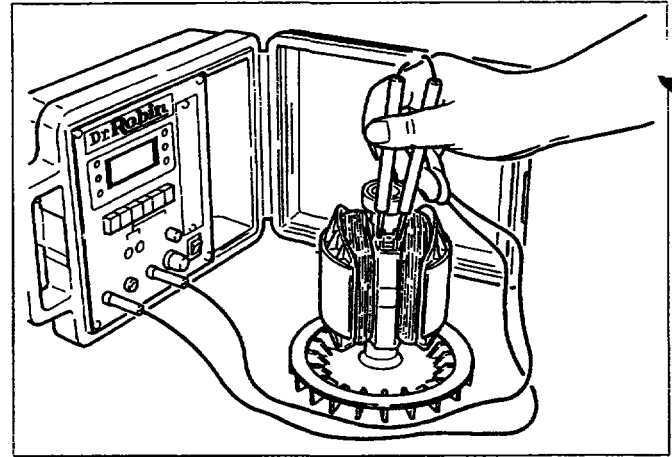


Fig. 11-3

3) Check the magnetic force of magnets molded in the rotor.

[Remedy]

1. If the magnetic force is weak, replace the rotor with a new one.
2. If the diode or the resistor is faulty, replace rotor assembly with new one.
When all removed these parts are good, assemble them and then solder.

11-2 AC VOLTAGE IS TOO HIGH OR TOO LOW

11-2-1 CHECKING ENGINE r.p.m. .

If the engine r.p.m. is too high or too low, adjust it to the rated r.p.m. .

[How to adjust engine r.p.m. .]

- Loosen the nut on the adjusting screw.
- Turn the adjusting screw clockwise to in decrease engine speed or counter-clockwise to increase engine speed.

Normal engine speed at no load is :
3750 ~ 3800 r.p.m.

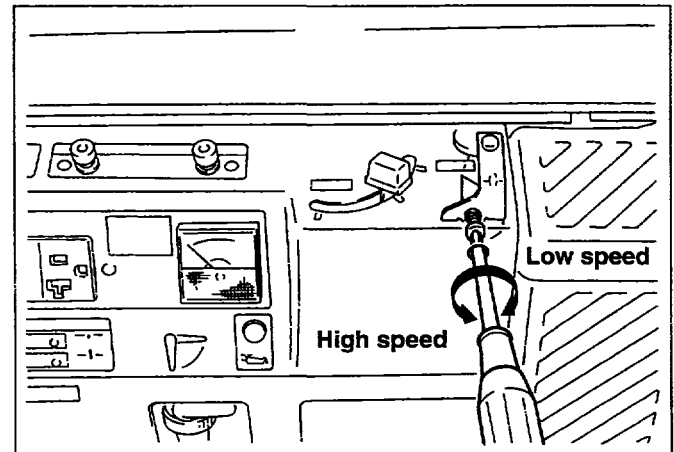


Fig. 11-5

11-2-2 CHECKING STATOR

Check stator referring to Step 11-1-1.

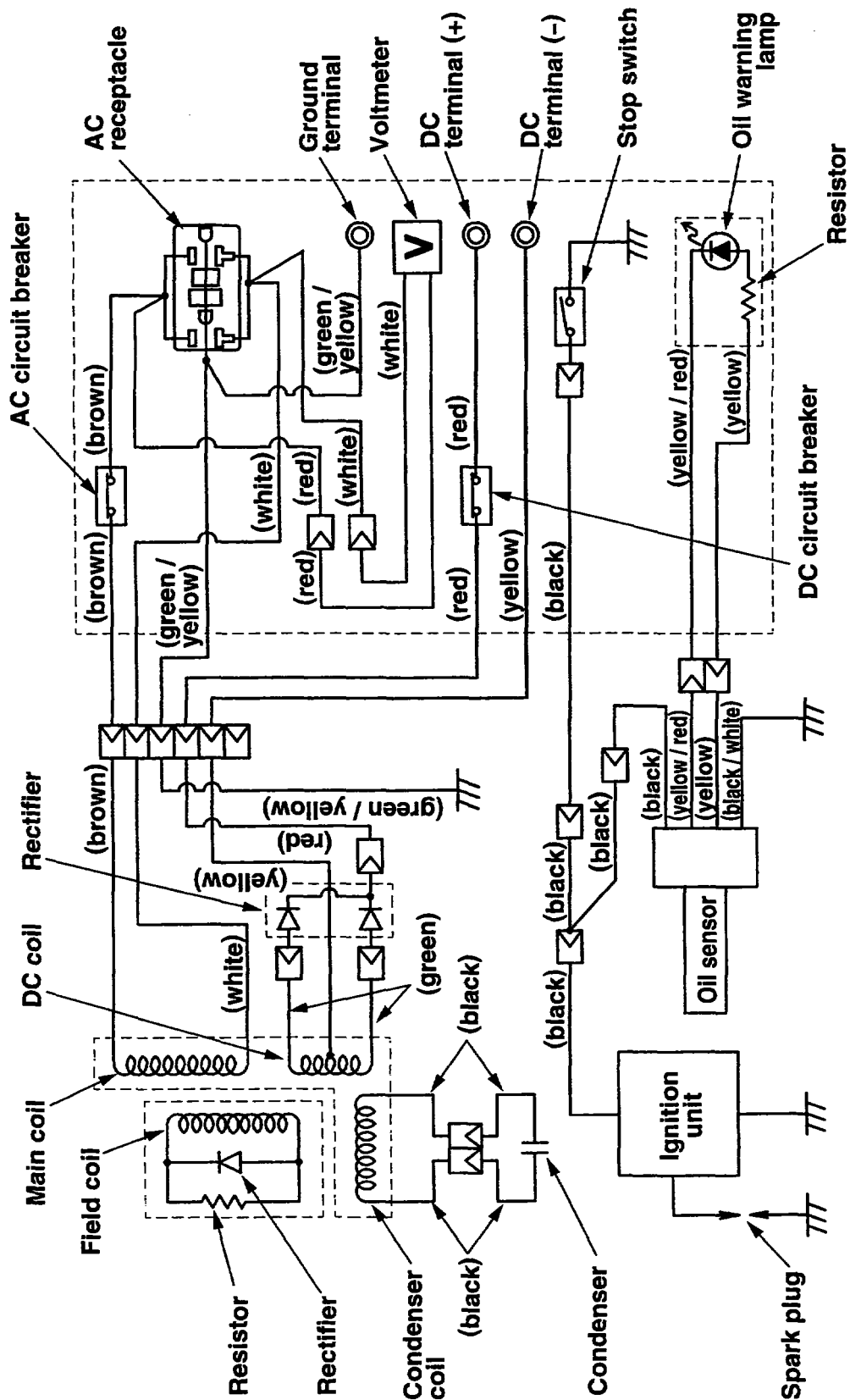
11-2-3 CHECKING CONDENSER

Check condenser referring to Step 11-1-2.

11-2-4 CHECKING ROTOR

Check rotor referring to Step 11-1-3.

12. WIRING DIAGRAM



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