

**Robin**  
**Generator**  
**R1200**



**Technical Data & Overhaul Instructions**  
**SERVICE MANUAL**

## FOREWORD

This manual was compiled for dealers' mechanics and includes descriptions on specifications, items, performance, structure, features, and maintenance procedures of the R1200 Generator.

We ask each dealer to master the contents of this manual and provide users complete service after sales or proper guidance on how to use this generator.

This manual includes only brief descriptions on important points, so we ask you to supplement this with your own experience and determination in practical guidance for your customers. We are also going to have seminars or other events to exchange necessary information to improve our service to customers.

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# 1. SPECIFICATIONS

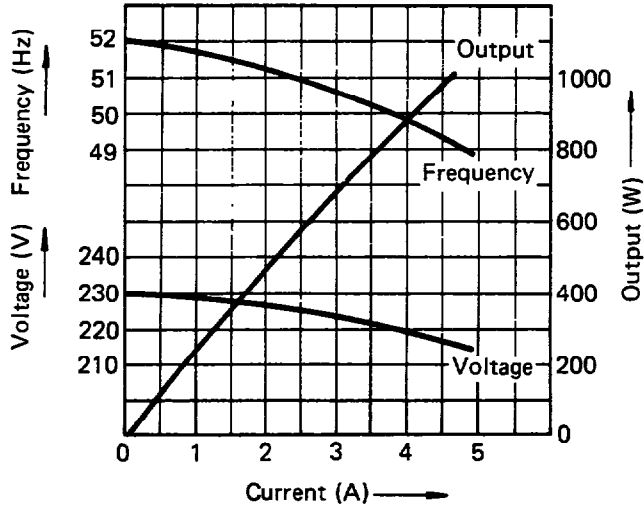
## 1-1 ITEMS

Model		R1200		
Engine:	Type	Forced air-cooled, 4-stroke, side valve, gasoline engine		
	Displacement	143 cc (8.73 cu. in.)		
	Fuel tank capacity	3.5 lit. (0.93 U.S. gal.)		
	Oil pan capacity	600 cc (1.28 U.S. pints)		
	Ignition system	Solid state ignition		
	Starting system	Recoil starter		
	Rated continuous operating hours	Approx. 4 hours	Approx. 3.5 hours	
Generator:	Type	2-pole, revolving field type		
	Exciting system	Self-exciting		
	Voltage regulating system	AVR (Automatic Voltage Regulator)		
	Maximum output	1000 W	1200 W	
	Rated output	800 W	1000 W	
	AC Frequency	50 Hz	60 Hz	
	AC Voltage	110, 220, 230, 240V	110, 120, 220V	
	DC output	12V – 8.3A (100W)		
	AC receptacle	S.T.D type, nema, germany: 2 ea. France, Australia, England, Switzerland: 1 ea.		
	DC receptable	One		
	Over current protection	Circuit breaker		
Voltmeter	Standard equipment			
Dimensions (L x W x H):		486 x 288 x 410 mm (19.1 x 11.3 x 16.1 in.)		
Dry weight		27.5 kg (60.6 lbs)		

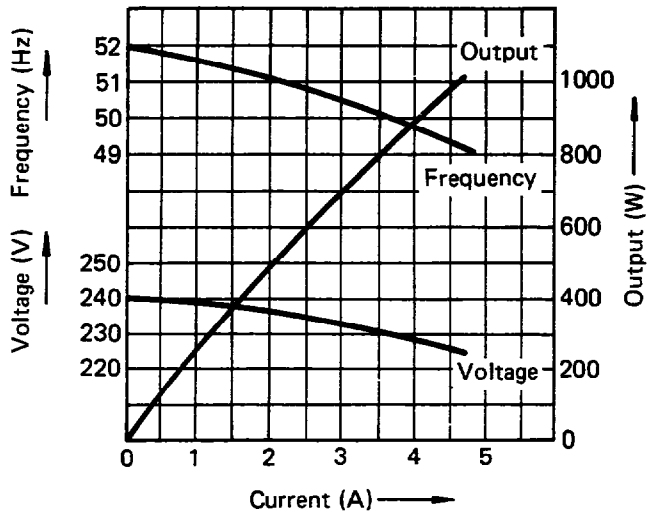
## 1-2 PERFORMANCE CURVES

### AC OUTPUT

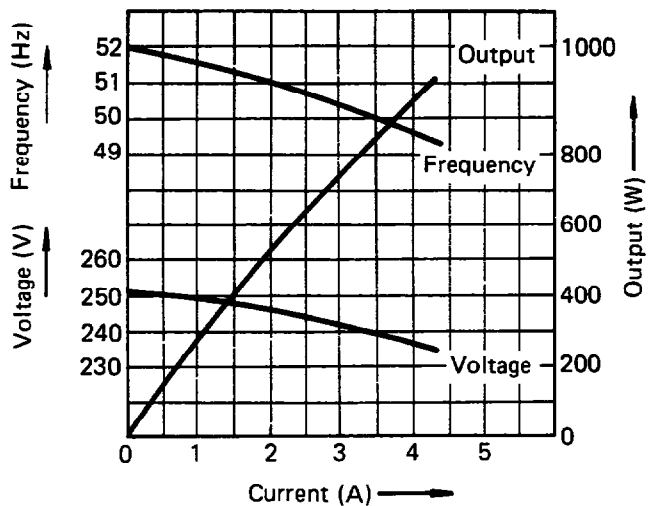
Power Factor ..... 1.0



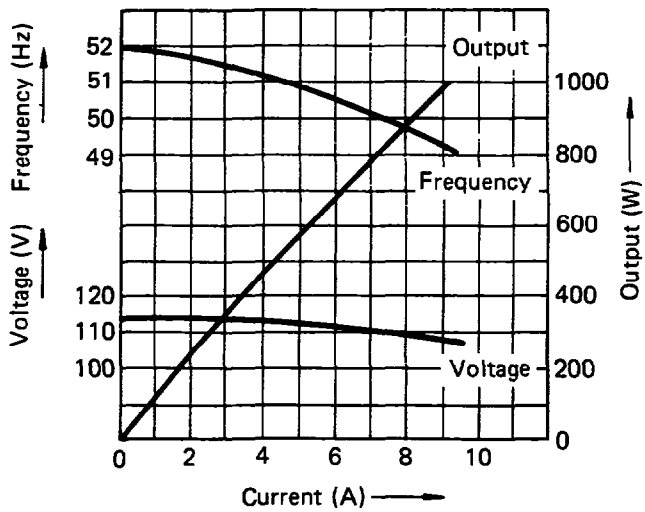
Output Max. .... 1000 W  
 Rated ..... 800 W  
 Frequency ..... 50 Hz  
 Voltage ..... 220 V



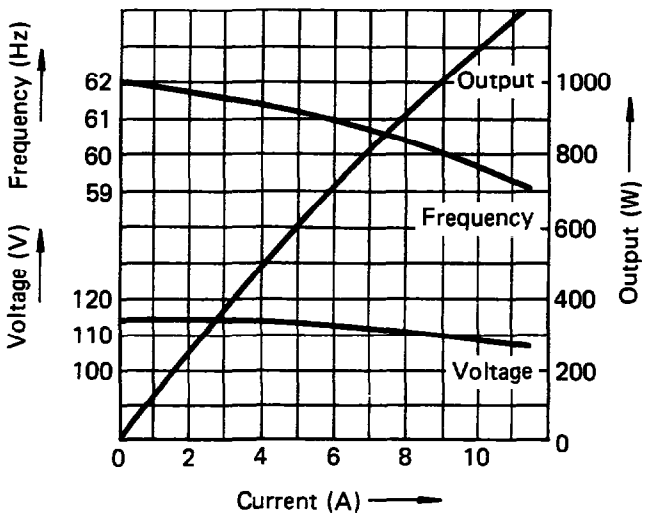
Output Max. .... 1000 W  
 Rated ..... 800 W  
 Frequency ..... 50 Hz  
 Voltage ..... 230 V



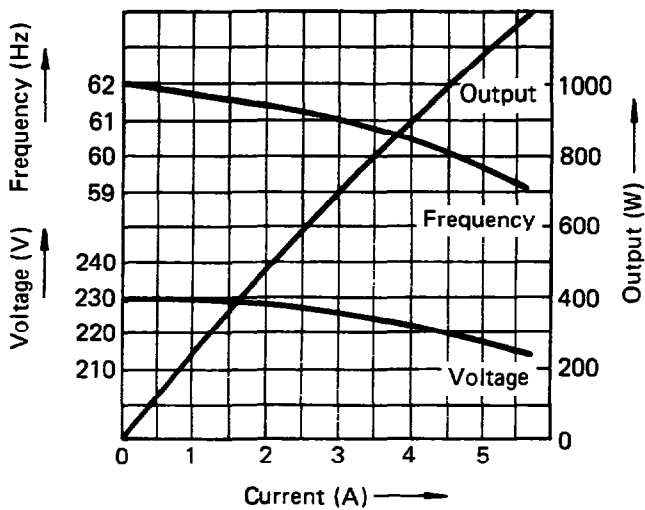
Output Max. .... 1000 W  
 Rated ..... 800 W  
 Frequency ..... 50 Hz  
 Voltage ..... 240 V



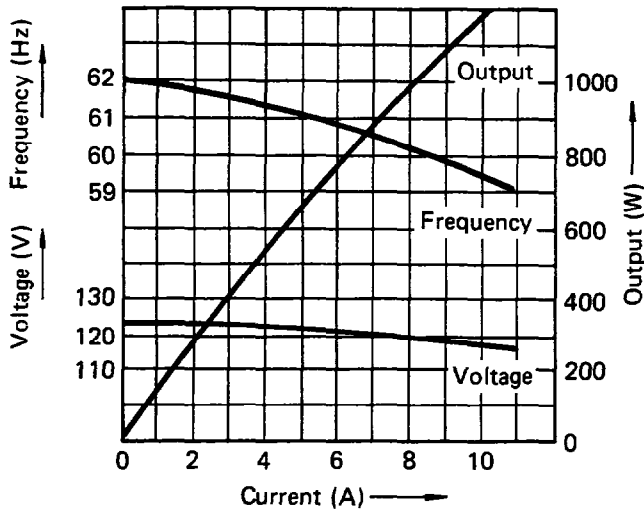
Output Max. .... 1000 W  
 Rated ..... 800 W  
 Frequency ..... 50 Hz  
 Voltage ..... 110 V



Output Max. .... 1200 W  
 Rated ..... 1000 W  
 Frequency ..... 60 Hz  
 Voltage ..... 110 V



Output Max. .... 1200 W  
 Rated ..... 1000 W  
 Frequency ..... 60 Hz  
 Voltage ..... 220 V



Output Max.	.....	1200 W
Rated	.....	1000 W
Frequency	.....	60 Hz
Voltage	.....	120V

### DC Output

DC output from this generator is rated especially for charging batteries. When the rated current (8.3A) flows into a battery the voltage is 12V, but the voltage becomes higher when the load is smaller (or when the current is smaller than the rated one), and lower when the load is bigger (or when the current is bigger than the rated one). Note that the voltage under no load is approximately from 18V up to 25V.



## **2. FEATURES**

- (1) Weight of this compact generator with excellent portability is 27.5 kg, which means that the generator is the lightest one in this class.
- (2) This generator with an excellent high performance engine and a large size 3.5ℓ fuel tank can run continuously for about 4 hours (at the rated load of 50 Hz).
- (3) The operating system is concentrated on the front panel, which enables users to easily handle this generator.
- (4) Operations of choking, running, and stopping the engine can easily be executed with a notch.
- (5) As a circuit breaker based on the push button system is employed in this generator, replacement of a fuse is unnecessary. Troubles which happen in an overload or failure of devices used can easily be resolved.
- (6) Direct current for charging batteries can also be taken out.
- (7) Simultaneous use of DC is possible even when AC is used. However, total AC output and DC output should be within the range of the rated output.
- (8) Voltage fluctuation ratio is below 5% because of employment of AVR (Automatic Voltage Regulator). Accordingly, the stable voltage is always maintained even if the load fluctuates.
- (9) Generally maintenance-free or maintenance is easy because the engine, with a transistor ignition system, has an excellent startability and no point is employed in this generator.
- (10) An ignition plug with a resistor and a plug cap have been employed to prevent electric wave noises.

### 3. COMPONENT IDENTIFICATION

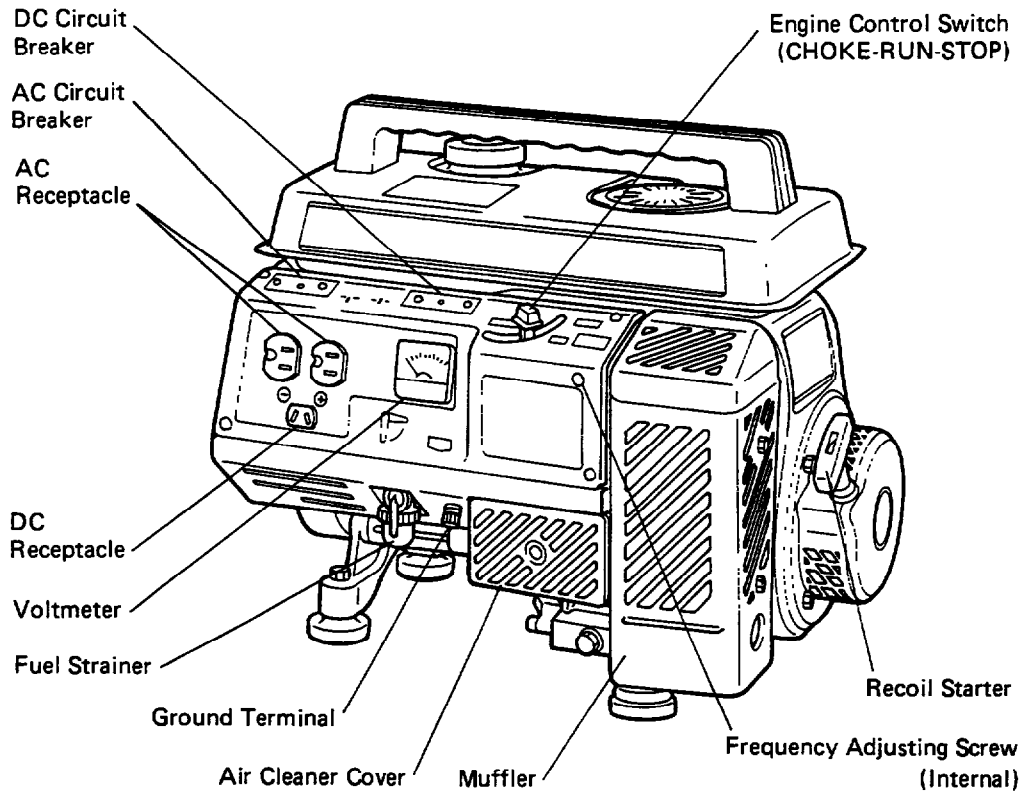


Fig. 3-1

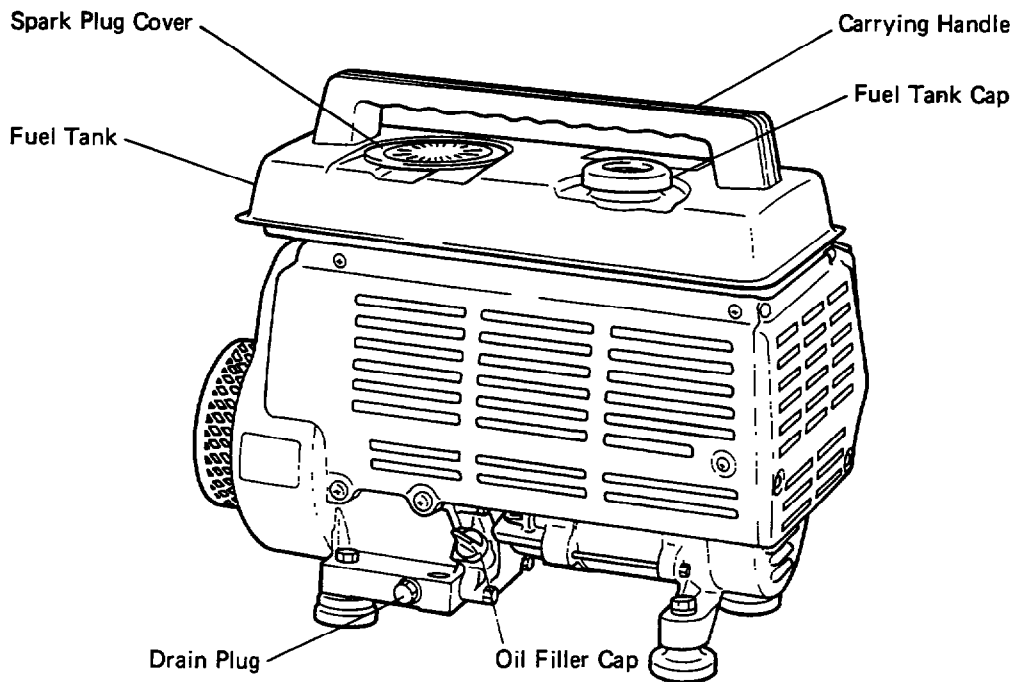


Fig 3-2

## 4. FUNCTION OF EACH COMPONENT

### 4-1 GENERATOR

#### 4-1-1 STATOR

The stator consists of a laminated silicon steel sheet core, and a copper coil wound around the core with a lead wire from which AC and DC output are taken out. The copper wire coil consists of a main coil and a DC coil, and AC output is taken out from the main coil, while DC output is taken out from the DC coil.

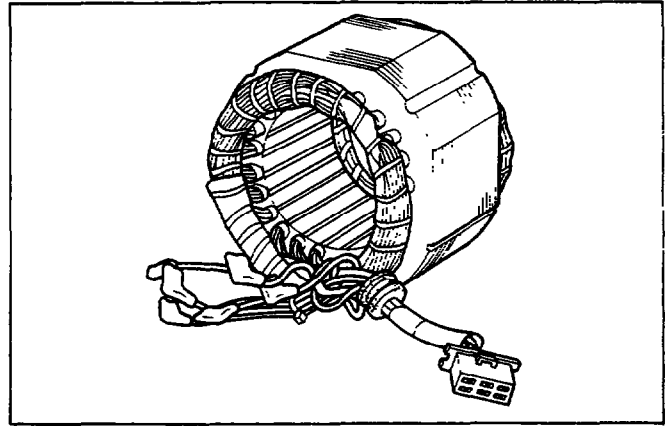


Fig. 4-1-1

#### 4-1-2 ROTOR

The rotor consists of a laminated silicon steel sheet core, a field coil which is wound around the core, and a cooling fan mounted on one end of the shaft, with a slip ring on the opposite end. One end of the lead wire from the field coil is connected to the slip ring. The field coil becomes an electromagnet when DC current flows from the slip ring. The cooling fan is for cooling the generator by inducting cooling air from the slip ring side and discharging it from the fan side.

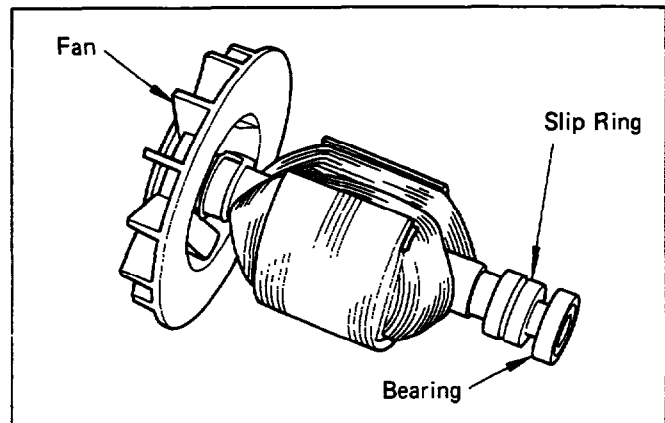


Fig. 4-1-2

#### 4-1-3 BRUSH

Exciting current from the AVR is supplied through this brush to the rotor. The brush is made of carbon, while the brush holder is made of plastic. In order to run the generator efficiently without failures, it is necessary to maintain the contact voltage between the brush and the slip ring within a range, which needs management of the brush length.

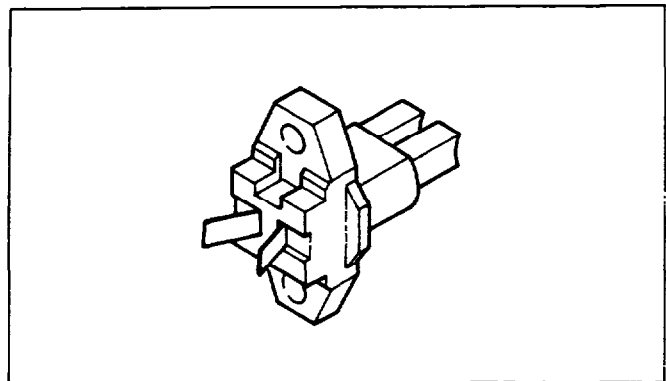


Fig. 4-1-3

#### 4-1-4 AVR (Automatic Voltage Regulator)

This is a device to automatically regulate voltage with an electronic circuit.

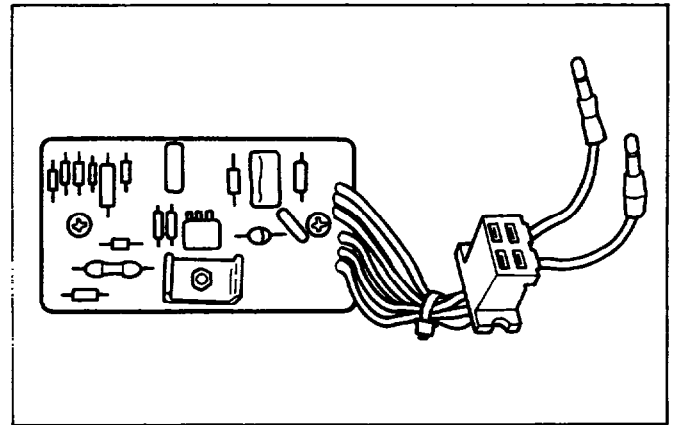


Fig. 4-1-4

#### 4-1-5 CONTROL PANEL

The control panel has a double receptacle with a ground terminal, and AC output is taken out with a male plug.

DC current is taken out from the DC receptacle with a special plug.

The voltmeter displays output voltage from the generator. The circuit breaker for AC and DC in the upper section of the control panel prevents too big an output current from being taken out, or excess current in short circuit.

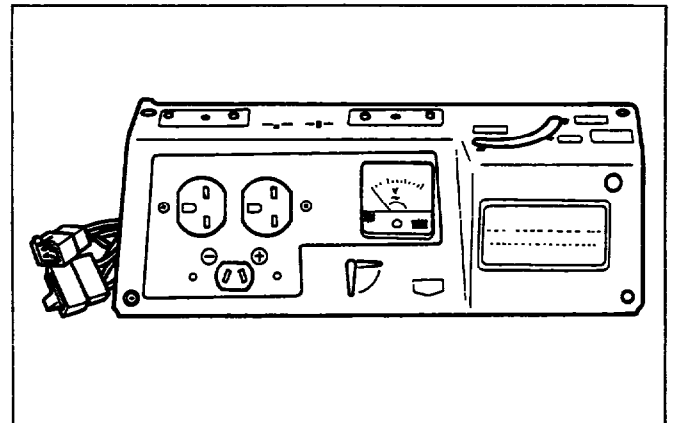


Fig. 4-1-5

## **4-2 ENGINE**

### **4-2-1 CYLINDER AND CRANKCASE**

The cylinder and the crankcase of the engine are of a one-piece aluminum die-cast design. The specific iron cylinder is cast-fitted inside the cylinder. Both the intake and exhaust ports are positioned at the lateral side of the cylinder. These ports are also cast by using a mould with die-cast cores. The crankcase has its joint face located on the generator side, and it is of an assembly structure.

### **4-2-2 MAIN BEARING COVER**

The main bearing cover is aluminum die-cast and is mounted on the generator side. By removing it, the interior of the engine can be inspected.

### **4-2-3 CRANKSHAFT**

The crankshaft is constructed of forged carbon steel, and the crankpin is induction-hardened. A crank gear is pressure-fitted on the generator side of the engine.

### **4-2-4 CONNECTING ROD AND PISTON**

The connecting rod is made of forged aluminum alloy with both the major and minor ends utilized as bearings. An oil scraper is cast on the major end. The aluminum alloy casting piston has slots on which two compression rings and one oil ring can be assembled.

### **4-2-5 CAMSHAFT**

The camshaft is made of special cast iron and has intake and exhaust valve drive cams, each of which engages with the camgear. An exclusive aluminum alloy is used on each end of the camshaft in the place of bearings. (Ball bearings are not used.)

### **4-2-6 VALVE ARRANGEMENT**

The intake valve is arranged in the generator side, while the exhaust valve is arranged in the recoil side.

### **4-2-7 CYLINDER HEAD**

The cylinder head is die-cast aluminum and has a Ricardo type combustion chamber featuring greater volume capacity for improved combustion efficiency. For easier ignition plug maintenance the cylinder head is positioned vertically.

### **4-2-8 GOVERNOR**

The centrifugal weight governor ensures constant engine speed, regardless of load fluctuations (the governor is mechanically linked to the governor drive gear).

### **4-2-9 COOLING SYSTEM**

The cooling system with a cooling fan, which also functions as a flywheel, compulsorily sends cooling air to the cylinder and the cylinder head and cools them. This forced air cooling system has a baffle plate and a head cover.

### **4-2-10 LUBRICATION SYSTEM**

The moving and sliding parts inside the engine are lubricated with the oil scraper fitted on the connecting rod by scraping and splashing oil in the crankcase.

#### 4-2-11 IGNITION SYSTEM

The ignition system is based on a flywheel/magneto system and its ignition timing is set at 23° before top dead center. The magneto consists of a flywheel and an ignition coil. The flywheel (functioning also as a fan) is mounted on the crankshaft, while the ignition coil is mounted on the crankcase.

#### 4-2-12 CARBURETOR

The horizontal suction type carburetor employed here can provide excellent starting, good acceleration, low fuel consumption, and superior output. The carburetor setting is matched to the generator set. (On details concerning the carburetor construction and others, see the paragraph dealing with carburetor construction and disassembly/assembly.)

#### 4-2-13 AIR CLEANER

The air cleaner is a semi-wet type and contains a sponge element.

## 5. DESCRIPTION OF MAIN OPERATIONS

### 5-1 ELECTRONIC IGNITION MECHANISM

The engine has a current chopping contact point-free ignition system in which a power transistor is used as a current control element. This system is called T.I.C. (Transistor Ignitor Circuit).

This electronic ignition system is completely free from ignition failure which generally results from contamination or burning of the contact points, oxydation during storage for a long time, or abrasion of mechanical sections, all of which are typical with contact type ignition systems. The maintenance-free ignition system can maintain proper discharging and is not affected by moisture, oil, dust, or other contaminants.

The T.I.C system consists of a transistor-incorporated ignition coil and a flywheel with a permanent magnet mounted on. The basic principle is shown below.

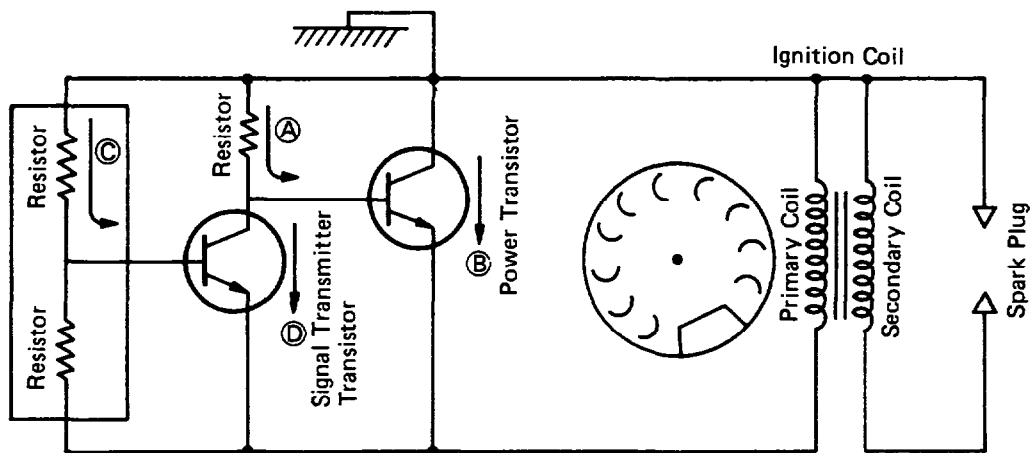


Fig. 5-1

- (1) When the flywheel starts rotating, power is generated in the primary coil of the ignition coil and current flows to the resistor (A). With this current, the power transistor turns on releasing current B. This stage corresponds to the closing of the contact points.
- (2) As rotation of the cooling fan reaches the ignition point, the ignition timing detecting circuit is activated, releasing the current (C). The signal transmitter transistor actuates to release the current (D). When the current (D) starts flowing, current (B), flowing through the power transistor, is cut immediately. As a result, high voltage is generated in the secondary coil by current fluctuation. This voltage is simultaneously applied to the spark plug which ignites the ignition. This stage corresponds to the opening of the contact points.

## 5-2 DESCRIPTION OF GENERATING OPERATION

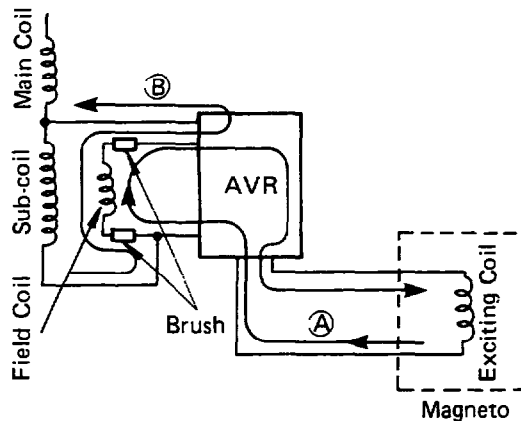


Fig. 5-2-1

### 5-2-1 GENERATION OF NON-LOAD VOLTAGE

When the generator starts turning, the permanent magneto incorporated in the flywheel in the engine side starts rotating, which generates voltage in the exciting coil. The voltage, rectified by the diodes in the AVR, causes the flow of the current (A) through the field coil wound around the rotor in the generator. The rotor is then turned to an electromagnet by the current and at the same time when it starts rotating, voltage is generated in the coils (main coil, sub-coil, and DC coil) of the stator. Then, the voltage generated in the sub-coil is rectified by the AVR, and the current (B) flows so that current in the field coil is increased. This increases magnetic intensity to the rotor. Rated voltage is generated in the main coil and the DC coil by repeating this operation.

### 5-2-2 VOLTAGE REGULATION UNDER LOAD

When a load is connected to an AC receptacle and current is increased, output voltage fluctuates and the voltage fluctuations in the case where an AVR is in the circuit and in the case where no AVR is in the circuit differ as shown in Fig. 5-2-2. The AVR operates as follows.

When AC output is taken out, load is put on the engine. The AC voltage becomes lower because rpm of the engine becomes fewer and the voltage decreases on account of inner resistance of the coil. The AVR detects the voltage decrease and automatically increases the current flowing through the field coil with a thyristor inside the AVR. As a result, magnetic intensity to the rotor is increased while the decreased voltage is raised again by taking out loaded current, which in turn maintains the output voltage at a constant level. When the AC output becomes lower the thyristor provides reverse operation, and in this case, the voltage is also maintained at a constant level.

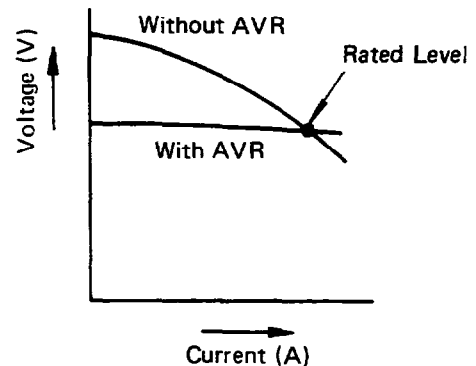


Fig. 5-2-2



### 5-2-3 DC OUTPUT

DC output is taken out from a part of the main 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. 5-2-3.

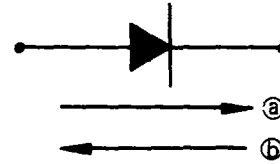


Fig 5-2-3

Fig. 5-2-4 shows the DC output circuit of the generator. DC voltage is generated in the main coil. When the voltage in A is higher than that in B, the current (c) flows in the direction shown in the figure, while no current flows between CF and DE because the current is cut off by the diodes G<sub>4</sub> and G<sub>2</sub>. On the contrary, when the voltage in B is higher than that in A, the current (d) flows in the direction as shown in the figure. No current flows between CD and EF because the current is cut off by the diodes G<sub>1</sub> and G<sub>3</sub>.

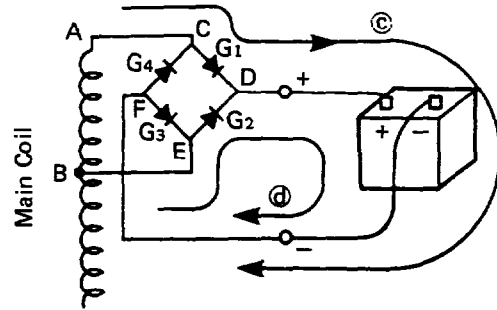


Fig. 5-2-4

As a result, the voltage generated at the output terminal has a waveform with two peaks in one cycle, as in the case of the output waveform shown in Fig. 5-2-5.

Output Waveform

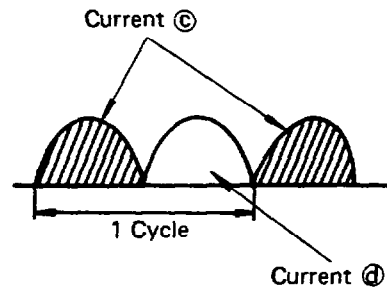


Fig. 5-2-5

## 6. OPERATIONAL LIMITS OF THE GENERATOR

### 6-1 AC OUTPUT

Electric appliances normally have rating levels showing the rated voltage, frequency, power consumption (input power), and other things. The power consumption specified on such a label is required to drive the appliance. However, when an appliance is connected to the generator, the power factor and starting current should also be taken into account.

#### 6-1-1 NET RESISTANCE LOAD

Incandescent lamps, electric heaters etc. can be run on the generator having a capacity equivalent to the total of the respective appliances. Each of these appliances normally has a power factor of 1.0.

Example: The generator having a rated voltage output of 1000 W can provide enough power to operate up to ten 100 W lamps.

#### 6-1-2 ELECTRIC APPLIANCES WITH A POWER FACTOR OF LESS THAN 1.0

Fluorescent lamps and mercury lamps normally have a low power factor, and accordingly, the generator is required to generate approximately 1.2 to 2 times the power consumed by each loaded appliance.

Example: With the generator having a rated voltage output of 1000 W, six to ten 80 W mercury lamps can be operated.

#### 6-1-3 MOTOR LOAD

Generally, motors require a large starting current every time they are started or begin rotating. The motor starting load supplied from the generator becomes the largest when starting a normal operation mode. The rates of power supply, which the generator is required to produce for motor loads, are categorized into two cases, depending on the types of the motor used and load condition at the time of starting.

##### (1) Motors (mainly rectifier motors) used for electric drills and similar devices:

Normally, the motors used for electric drills and similar appliances require the generator to produce approximately 1.2 to 3 times the power consumed at the time of starting.

Example: To drive a 300 W electric drill, a generator with a maximum output of about 400 W to 900 W or more is necessary.

##### (2) Motors (mainly induction motors) used for pumps and compressors:

As pumps and compressors have loads even when they are started, the generator is required to produce 3 to 5 times the power consumed during normal running.

Example: To drive a 200 W submersible pump, a generator with a maximum output of 600 W to 1000 W or more is necessary.

#### 6-1-4 IN THE CASE WHERE POWER CONSUMPTION IS NOT DISPLAYED ON THE RATING PANEL

Sometimes, the rating panel of an electric appliance does not carry its power consumption, but only shows the mechanical equivalent to the power consumption. In this case, it is necessary to

calculate the power consumption of the device involved. The calculated power consumption is adjusted depending on the type of the load, and according to paragraphs from (1) to (3).

$$(\text{Power consumption}) = (\text{Mechanical equivalent of a device}) \div (\text{Efficiency})$$

**Efficiency**

Motors: 0.6 ~ 0.8

Fluorescent lamps: 0.7 ~ 0.8

**Example:** As for a 40 W fluorescent lamp with a lighting output of 40 W, and assuming that the power consumption of this lamp is 0.7, the power consumption can be calculated as follows:

$$40 \div 0.7 = 57 \text{ W}$$

Furthermore, as per paragraph (2), the power consumption is multiplied by a factor of 1.2 to 2, producing a power consumption of 70 to 115 W. Therefore, with a generator having a rated output of 1000 W, 8 to 14 lamps can be used.

**Example:** In the case of a 200 W motor, the mechanical equivalent of the motor is 200 W. Assuming that the efficiency of the motor is 0.7, the power consumption is calculated as  $200 \div 0.7 = 285 \text{ W}$ . Similar to the above, the calculated power consumption is then multiplied as per (3)-①, or (3)-②, taking into account the type of the motor used and the starting condition. The table below shows the range of loads applicable to the generator with 1000 W rated output.

Electric appliance	Range of applicable load	
	50 Hz	60 Hz
Incandescent lamp, electric heater, etc.	Up to 800 W	Up to 1000 W
Fluorescent lamp, mercury lamp, etc.	Up to approx. 500 W	Up to approx. 650 W
Motor-driven tools etc.	Up to approx. 500 W	Up to approx. 600 W
Pump and compressor drive motors	Up to approx. 250 W	Up to approx. 300 W

**Note 1:** With motor-driven tools specified in paragraphs (3) and (4), the generator of the said capacities are required only when starting the motors for the respective appliance. Once the motor has started, power necessary for normal running is only 1.2 to 2 times larger than the rated power, and the surplus capacity of the generator may be used for other electric appliances.

**Note 2:** As for the tools using the motors specified in paragraphs (3) and (4), the power requirement for starting the tools varies according to the types of motor and the load conditions at the time of starting.

## 6-2 DC OUTPUT

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

### 6-2-1 MEASUREMENT OF ELECTROLYTE'S SPECIFIC GRAVITY

The specific gravity of an electrolyte varies according to temperature; so it is converted to one in case of 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)

### 6-2-2 REMAINING CAPACITY ESTIMATED WITH REFERENCE TO THE SPECIFIC GRAVITY

Specific gravity (20°C)	Remaining capacity (%)	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	

### 6-2-3 BATTERY CAPACITY

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

## 6-3 SIMULTANEOUS USE OF AC/DC OUTPUT

With a generating engine of rated 1000 W output, AC and DC are simultaneously available but, in this case, be careful not to exceed the total power consumption.

50 Hz ————— below 700 W

60 Hz ————— below 900 W

Note: Max. DC output is 100 W (12V x 8.3A).

## 6-4 WIRE LENGTH

When long wires are used, resistance in each wire increases while voltage drop occurs. Consequently, the input voltage to an electric appliance declines, often damaging the appliance. The table below shows that the voltage decreases in 100 m wire with different cross sectional areas and varied resistances.

Cross sectional area	Allowable current	No. of conductor/ conductor diameter	Resistance	Current							
				1A	3A	5A	8A	10A	12A	15A	
mm <sup>2</sup>	A	No./mm	$\Omega$ /100m	1A	3A	5A	8A	10A	12A	15A	Voltage Decreases
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	1V	3V	5V	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	

## 7. MEASURING PROCEDURES

### 7-1 METERS

#### 7-1-1 VOLTMETERS

Both AC and DC voltmeters are necessary. Measurable range of the AC voltmeter is as follows.

0 to 150V: For a voltmeter with an output voltage of 110 or 120V

0 to 300V: For a voltmeter with an output of 220, 230, or 240V

Measurable range for the DC voltmeter is from 0 to 20V.

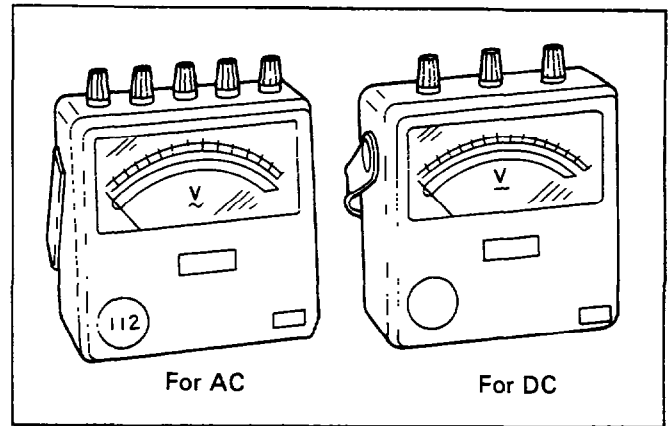


Fig. 7-1-1

#### 7-1-2 AMMETER

Both AC and DC ammeters are necessary. The AC ammeter must have a scale range from 0 to approximately 15A, and the DC ammeter also must have a scale range from 0 to approximately 15A.

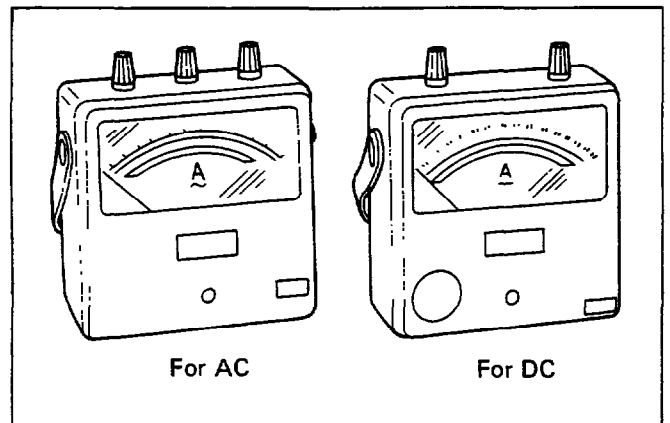


Fig. 7-1-2

#### 7-1-3 FREQUENCY METER

The frequency meter must have a scale range from 45 to approximately 65 Hz.

Note: Note the input voltage range for the frequency meter.

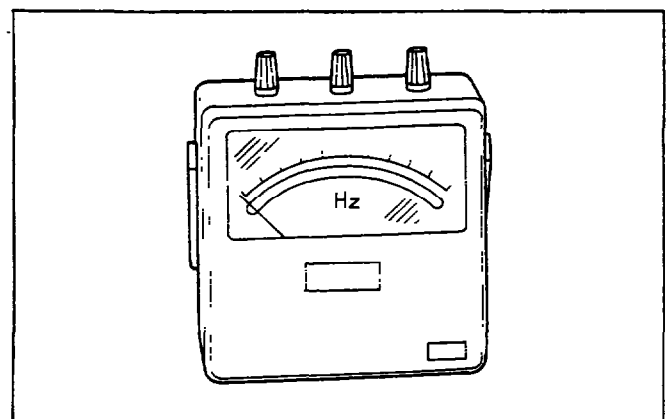
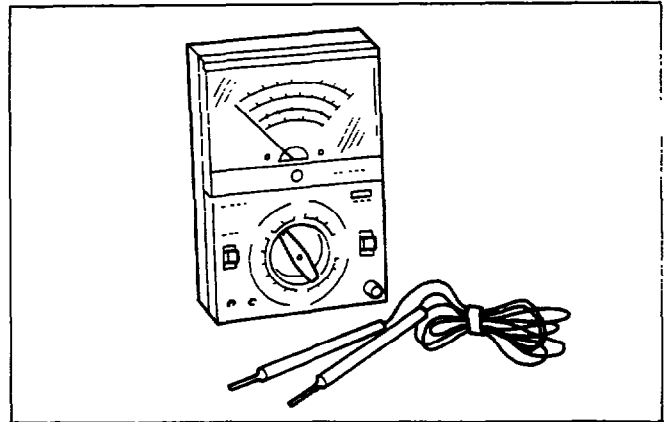


Fig. 7-1-3

#### 7-1-4 CIRCUIT TESTER

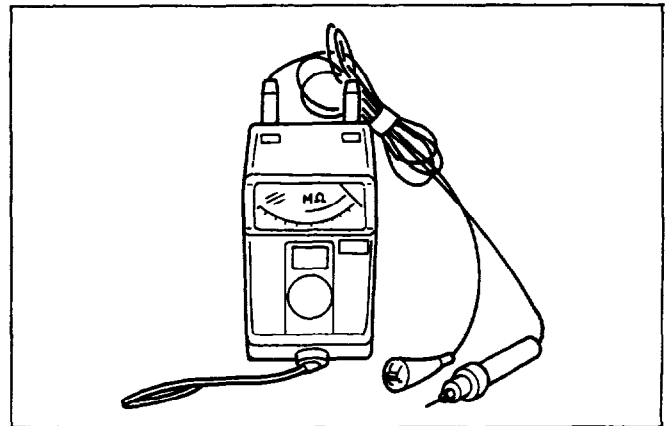
The circuit tester is used for measuring resistance and others.



*Fig. 7-1-4*

#### 7-1-5 MEGGER TESTER

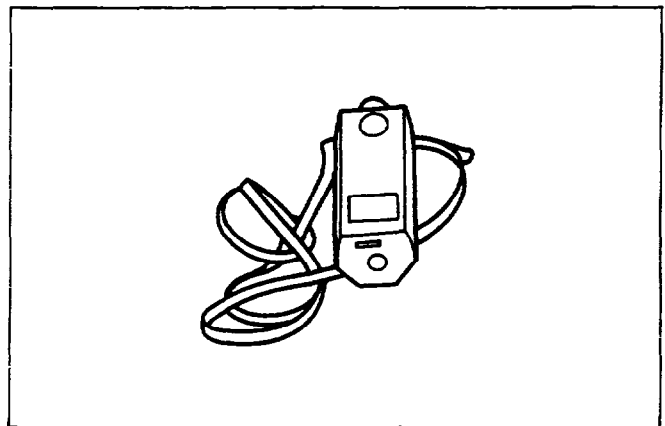
This unit measures insulation resistance of the generator. Use one with voltage capacity of 500V.



*Fig. 7-1-5*

#### 7-1-6 TACHOMETER

Use the contact-less type tachometer.



*Fig. 7-1-6*

## 7-2 MEASUREMENT OF AC OUTPUT

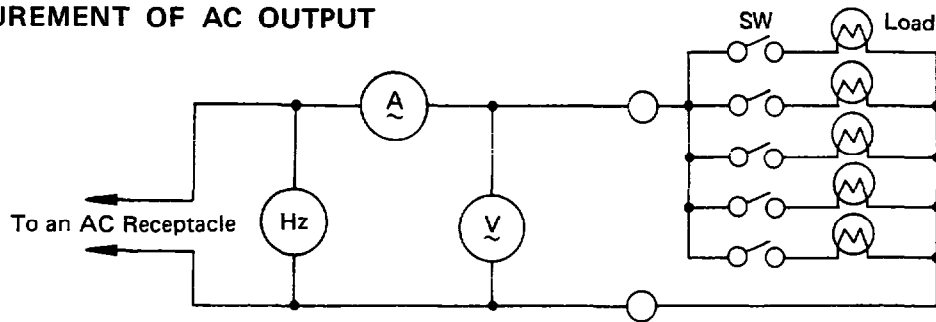


Fig. 7-2

Measurement is executed with the circuit as shown in Fig. 7-2. 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	100V	110V	120V	220V	230V	240V
Voltage range	98 ~ 105V	108 ~ 115V	118 ~ 125V	218 ~ 225V	228 ~ 235V	238 ~ 245V

## 7-3 MEASUREMENT OF DC OUTPUT

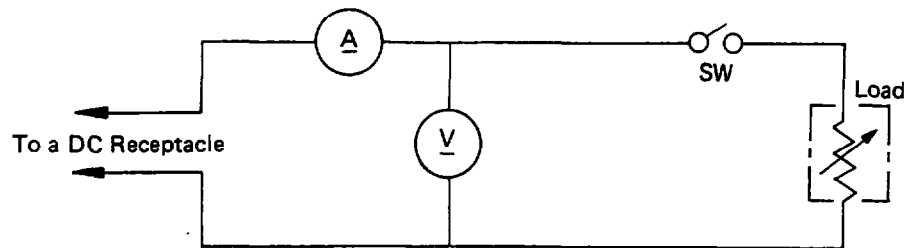


Fig. 7-3

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 10V 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 don't overcharge the battery.

## 7-4 MEASUREMENT OF INSULATION RESISTANCE

7-4-1 TO MEASURE INSULATION RESISTANCE, CONNECT THE MEGGER TESTER ACROSS EITHER ONE OF THE TWO OUTPUT TERMINALS OF THE AC RECEPTACLE AND THE EARTH TERMINAL. Measurement should be executed after the AC circuit breaker is turned ON. When the measured insulation resistance is over  $1M\Omega$ , it is normal (or, over  $10M\Omega$  at the time of shipment). When the measured insulation resistance is below  $1M\Omega$ , disassemble the generator and measure the insulation resistances of the stator, rotor, and control panel for each.

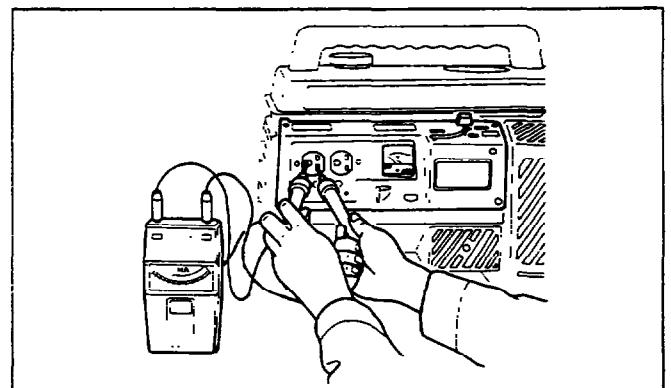


Fig. 7-4-1



#### 7-4-2 STATOR

Measure the resistance between the red or white coupler leading from the stator and the core.

If there is a section where insulation resistance is below  $1M\Omega$ , replace the part because it may cause insulation failure or such accidents as electric shock or leakage.

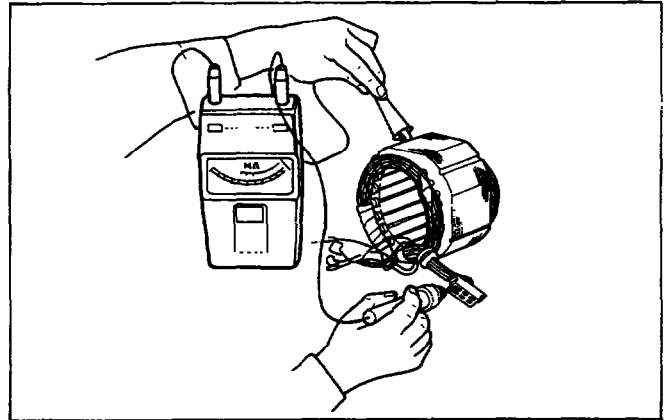


Fig. 7-4-2

#### 7-4-3 ROTOR

Measure the insulation resistance between either one of two slip rings of the rotor and the core.

If there is a section where insulation resistance is below  $1M\Omega$ , replace the part because it may cause insulation failure or such accidents as electric shock or leakage.

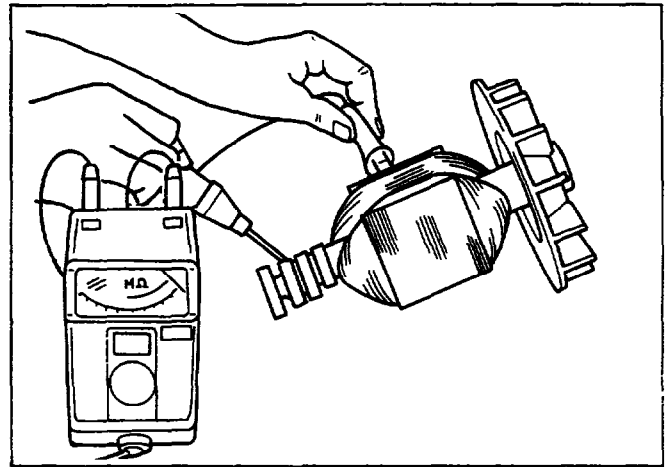


Fig. 7-4-3

#### 7-4-4 CONTROL PANEL

Measure the insulation resistance between the charging section (a part where electric current flows) and the grounded part.

If there is a section where insulation resistance is below  $1M\Omega$ , replace the part because it may cause insulation failure, or such accidents as electric shock or leakage.

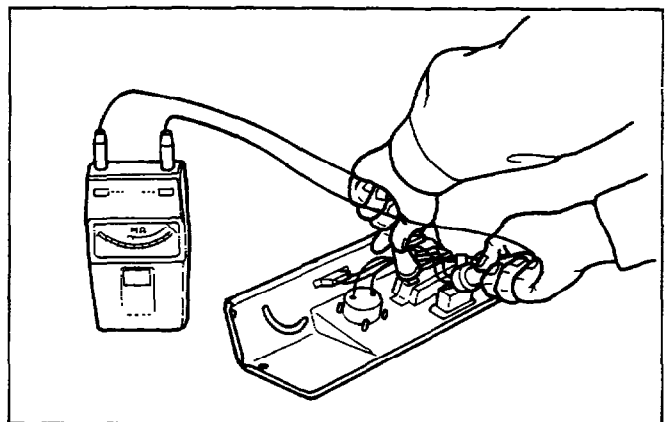


Fig. 7-4-4

## 8. FUNCTIONAL CHECK OF EACH COMPONENT

### 8-1 CONTROL PANEL

#### 8-1-1 AC RECEPTACLES

Check continuity between the two terminals at the rear of the AC receptacles by using a circuit tester under the condition that the receptacle is mounted on the control panel. When continuity between the output terminals is confirmed with a wire connected across the terminals, and is not confirmed if the wire is removed, the AC receptacle is normal.

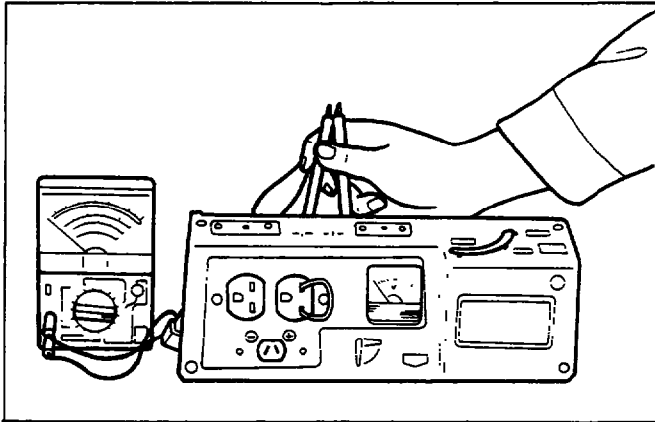


Fig. 8-1-1 (a)

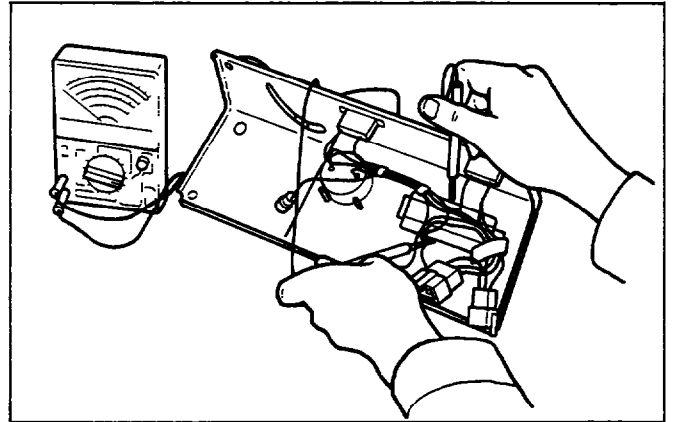


Fig. 8-1-1 (b)

#### 8-1-2 DC RECEPTACLE

Check continuity between the DC terminals at the rear of the receptacle by using a circuit tester, under the condition that the receptacle is mounted on the control panel.

When continuity between the DC terminals of the receptacle is confirmed with a wire connected across the terminals, and is not confirmed if the wire is removed, the DC receptacle is normal.

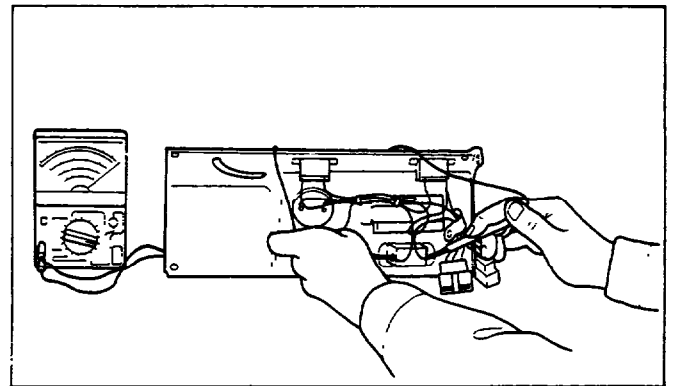


Fig. 8-1-2

#### 8-1-3 CIRCUIT BREAKER

Check continuity between the two terminals at the rear side of the circuit breaker by using a circuit tester under the condition that the circuit breaker 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.

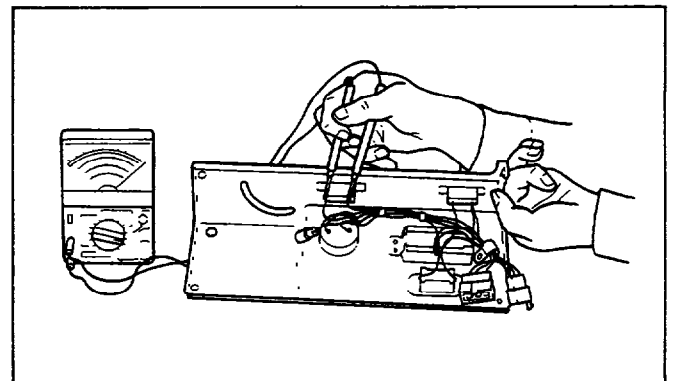


Fig. 8-1-3

### 8-1-4 VOLTMETER

When AC voltage (100V) is loaded between the two terminals on the rear side of the voltmeter, and at the same time, the voltmeter shows the value, the voltmeter is normal.

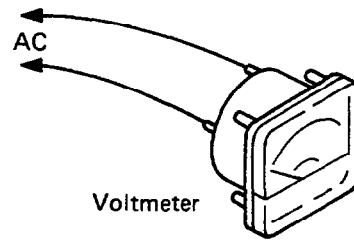


Fig. 8-1-4

### 8-2 DIODE STACK (RECTIFIER)

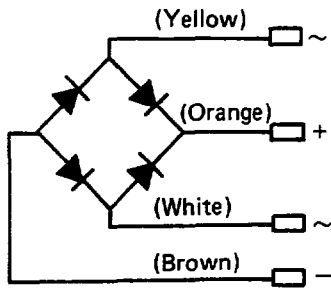


Fig 8-2-1

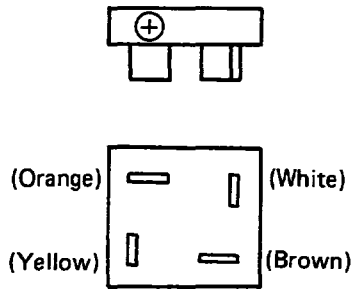


Fig. 8-2-2

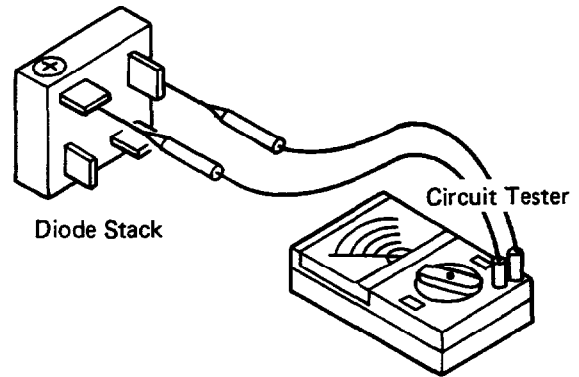


Fig. 8-2-3

Circuit inside the diode stack is as shown in Fig. 8-2-1. Confirm continuity between each terminal by using a circuit tester as shown in Fig. 8-2-3. The rectifier is normal when continuity is confirmed as follows.

		Connect black ⊖ terminal of the circuit tester			
		Yellow	White	Orange	Brown
Connect red ⊕ terminal of the circuit tester	Yellow		No continuity	No continuity	Continuity
	White	No continuity		No continuity	Continuity
	Orange	Continuity	Continuity		Continuity
	Brown	No continuity	No continuity	No continuity	

Table 8-2-1

Note 1: In checking the diode, direction of connection is contrary to the ordinary case because of characteristics of the diode and battery incorporated in the tester.

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 results of the checking indicates failure even in one section, replace with Assy.

### 8-3 AVR

Whether the AVR is defective or normal can be determined by checking the appearance, by measuring the resistance between the lead lines with a circuit tester, or by practically loading it onto the generator.

#### 8-3-1 THE CASE WHERE DETERMINATION ACCORDING TO THE APPEARANCE IS POSSIBLE:

If some electronic part of the AVR is burnt, has become black, or if epoxy resin on the surface has melted down, it can often be said that the AVR is defective.

#### 8-3-2 THE CASE WHERE DETERMINATION BY MEASURING THE RESISTANCE BETWEEN THE LEAD LINE AND THE COUPLER IS POSSIBLE:

Measure the resistance between the coupler terminal and the lead line of the AVR. In the normal case, the measured values should be as shown below.

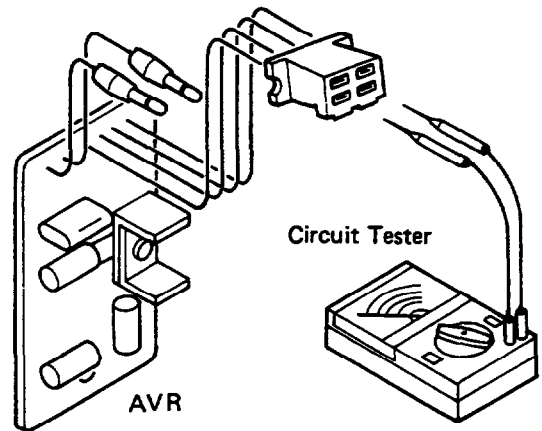
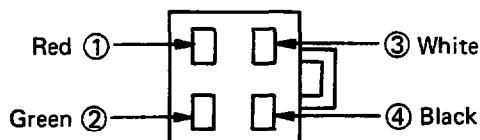


Fig. 8-3

		Connect to the ⊖ terminal of the circuit tester				
Wire color		Yellow	Red	White	Green	Black
Connect to the ⊕ terminal of the current tester	Yellow	∞	600K~1MΩ	75K~120KΩ	0Ω or ∞ according to the porality	7K~10KΩ
		↑	400K~500KΩ	↑	↑	↑
	Red			250K~300KΩ	∞	400K~500KΩ
				120K~130KΩ	↑	200K~220KΩ
	White		250K~300KΩ		∞	45K~50KΩ
			120K~130KΩ		↑	↑
Green		500K~1MΩ	75K~110KΩ			7K~9KΩ
		400K~500KΩ	↑			↑
Black		400K~500KΩ	40K~46KΩ		∞	
		200K~250KΩ	↑		↑	

[Wiring in the 4P coupler]

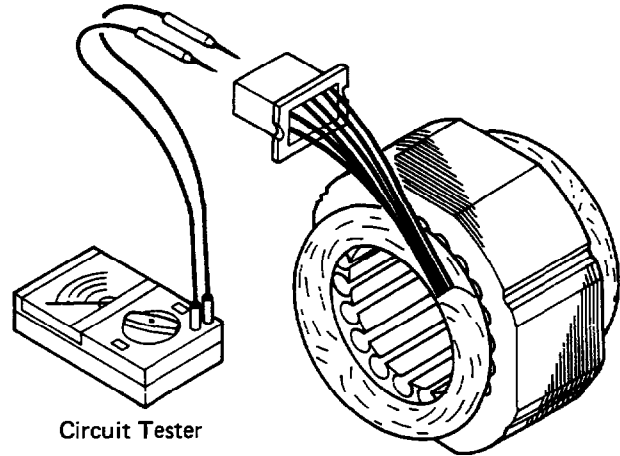


Note 1: Upper section of each column corresponds to the case of 220, 230 or 240V specifications, while the lower section corresponds to 100, 110 or 120V specifications.

Note 2: Sometimes the measured value does not match the values in the table above because errors of a circuit tester are big and influenced peripheral temperature.

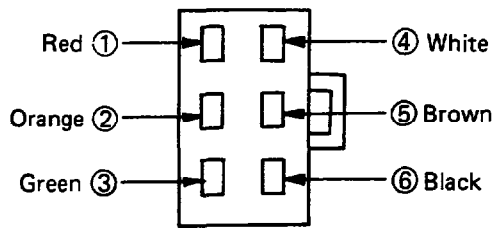
## 8-4 STATOR

Confirm the resistance between the coupler terminals with a circuit tester.



Circuit Tester

Fig. 8-4



Coil name	Main coil	DC coil	Sub-coil
Measurement location	6P coupler	Diode connector	6P coupler
Wiring color	White ④ – Red ①	White – Yellow	White ④ – Green ③
50Hz – 100V	0.9Ω	0.32Ω	4.4Ω
60Hz – 100V	0.6	0.23	3.6
50Hz – 110V	1.2	0.44	4.4
60Hz – 110V	0.9	0.32	3.6
60Hz – 120V	0.9	0.32	3.6
50Hz – 220V	5.0	0.70	4.4
60Hz – 220V	3.5	0.42	3.6
50Hz – 230V	5.0	0.70	4.4
50Hz – 240V	5.0	0.70	4.4

Note: Sometimes the measure values do not match the values shown in the table above because of errors by the circuit tester, unevenness of coil windings, or peripheral temperature.

## 8-5 ROTOR

### 8-5-1 MEASURE RESISTANCE IN THE FIELD COIL OF THE ROTOR WITH A CIRCUIT TESTER

Resistance value
10.7Ω

Note 1: Measure the coil resistance between the two slip rings.

Note 2: Sometimes the measured values do not match the values shown in the table above because of errors by the circuit tester, unevenness of the coil windings, or peripheral temperature.

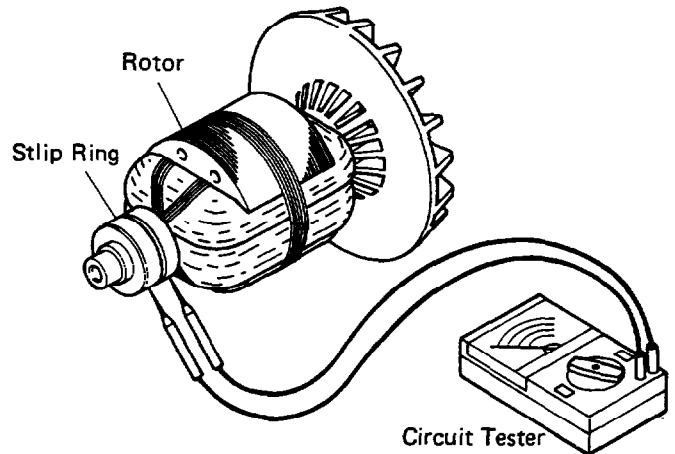


Fig. 8-5-1

### 8-5-2 CLEANING OF SLIP RING

When the surface of the slip ring is smooth it is normal. When it is dirty or abraded, it should be repaired.

When the slip ring is dirty efficiency of the generator may become lower and sufficient voltage and output can not be obtained. In this case, sand around the slip ring with fine sandpaper.

Note: When sandpaper is used, be careful not to damage the coils of the rotor.

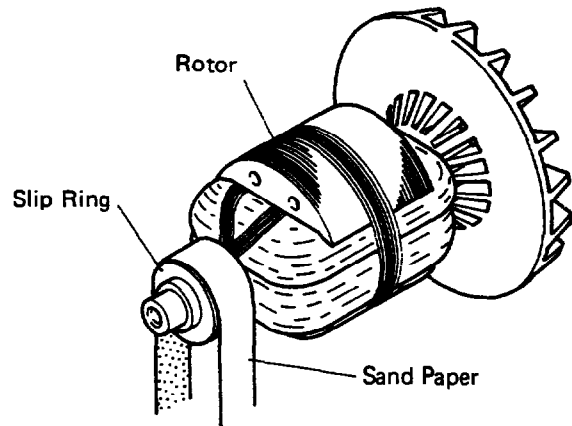


Fig. 8-5-2

## 8-6 BRUSH

If the surface of the brush contacting the slip ring is smooth, it is normal. If not, make it smooth with sandpaper.

Unless the surface is smooth, an arc may be generated between the brush and the slip ring, which may damage the brush and the slip ring.

The brush length should be, as shown in Fig. 8-6, within the range from 1.5 mm to 5 mm. If it is below 5 mm, it should be exchanged with a proper one. When contact voltage between the brush and the slip ring becomes lower, efficiency of the generator also becomes lower and sufficient voltage and output can not be obtained.

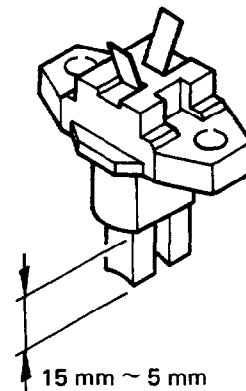


Fig. 8-6

### 8-7 IGNITION COIL

Measure resistance in the coil of the ignition coil unit with a circuit tester.

Resistance	Measurement location
13K $\Omega$	Measure the resistance between the black cord and the high tension cord.

Note: The measured value does not always match the values shown in the table above because of errors by the circuit tester, unevenness of coil winding, or peripheral temperature.

### 8-8 EXCITING COIL

Measure resistance of the exciting coil and voltage at the rated rpm with a circuit tester.

Resistance value	Voltage (AC) at rated rpm	Measurement location
1 ~ 3 $\Omega$	10 ~ 30V	Between the terminals of the exciting coil

Note: The measured value does not always match the values shown in the table above, because of errors by the circuit tester, unevenness of coil winding, or peripheral temperature.

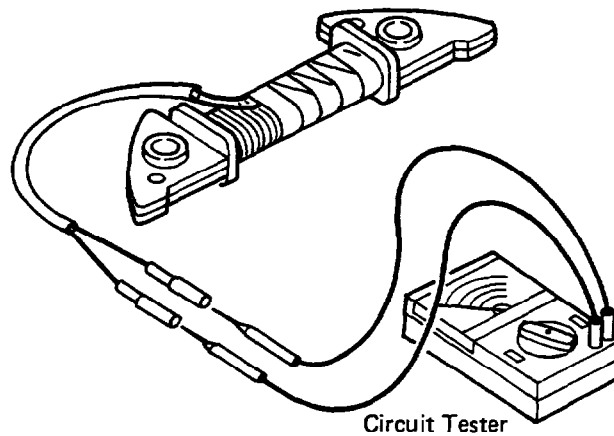


Fig. 8-8

## 9. DISASSEMBLY AND ASSEMBLY

### 9-1 PREPARATION AND REMARKS

- (1) Be sure to remember the locations of individual parts when disassembling the generator so that the generator can be reassembled correctly. Tie tags with the necessary information written in to facilitate easier and smoother reassembly.
- (2) For more convenience, group the related parts and store them in the same box.
- (3) To prevent bolts and nuts from being misplaced or installed incorrectly, place them temporarily at their original positions.
- (4) Handle the disassembled parts with care and clean them before reassembly using neutral cleaning oil. (Be careful not to clean electric parts with neutral cleaning oil.)
- (5) Use proper tools for disassembly/assembly.

### 9-2 SPECIAL TOOLS FOR DISASSEMBLY/ASSEMBLY

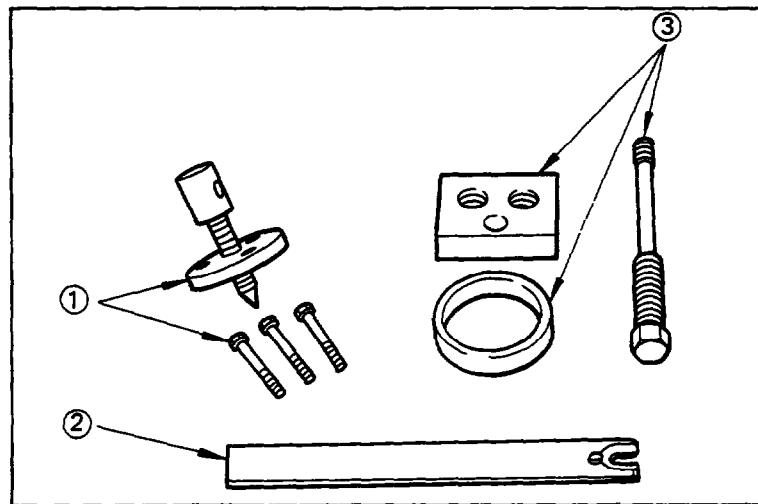


Fig 9-2

No.	Tool No.	Tool name	Description
①	2099500407	Flywheel puller (with bolts)	For pulling out the flywheel
②	2079500307	Valve spring retainer	For attaching valve spring, retainer, retainer lock
③	2279500107	Valve guide puller	For pulling out the valve guide



### 9-3 DISASSEMBLY SEQUENCE

Sequence	Part to remove	Description	Precautions	Necessary tools
1	Side cover	(1) First remove the side cover by unscrewing four M5 x 8 screws.		⊕ Plus screw driver
2	Rear cover	(1) Remove the rear cover by unscrewing three M5 x 8 screws and two M8 x 10 screws.		⊕ Plus driver

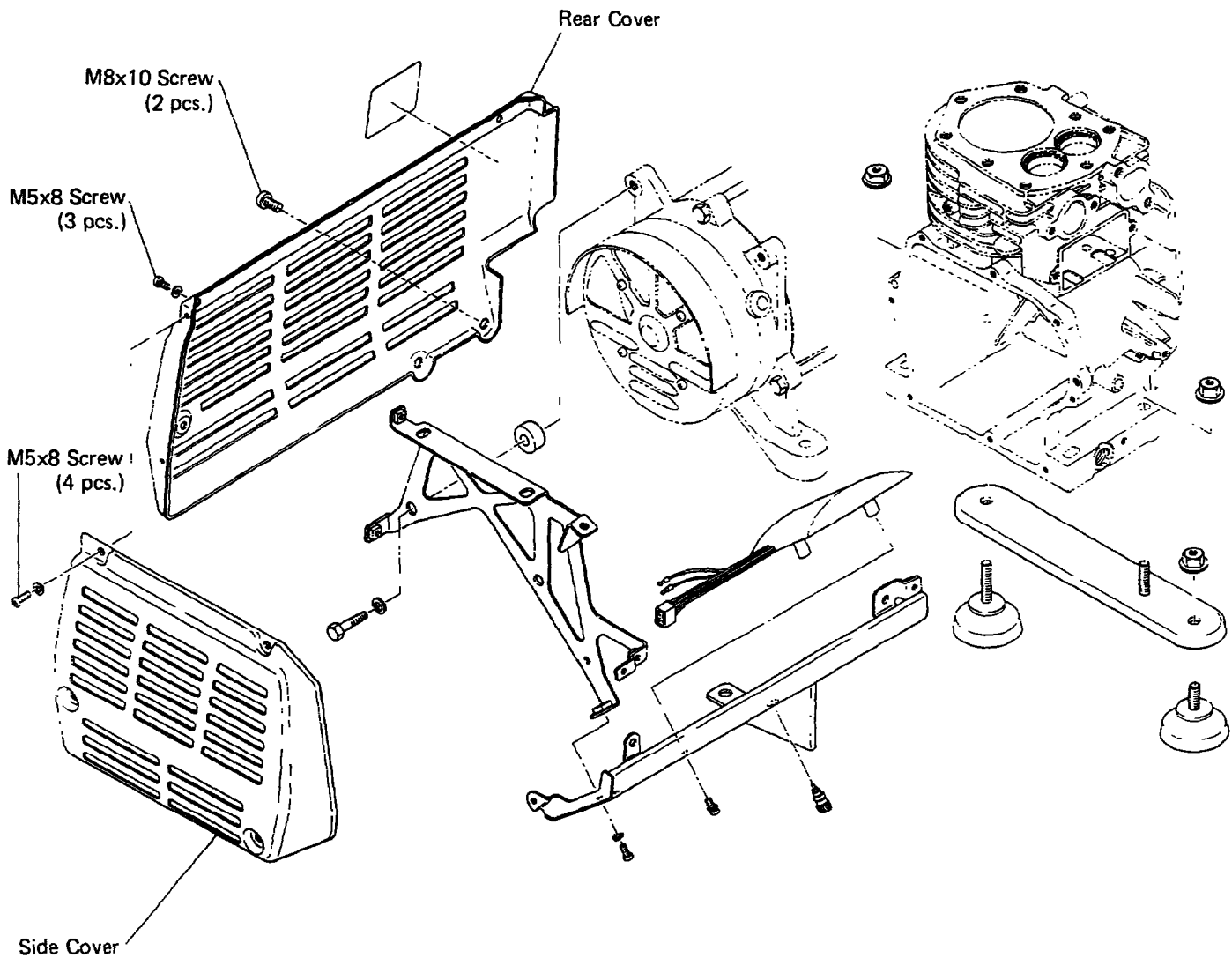


Fig 9-3-1

Sequence	Part to remove	Description	Precautions	Necessary tools
3	Control panel	(1) Pull the knob of the control lever and remove the control panel by unscrewing four M5 x 8 screws.		⊕ Plus driver

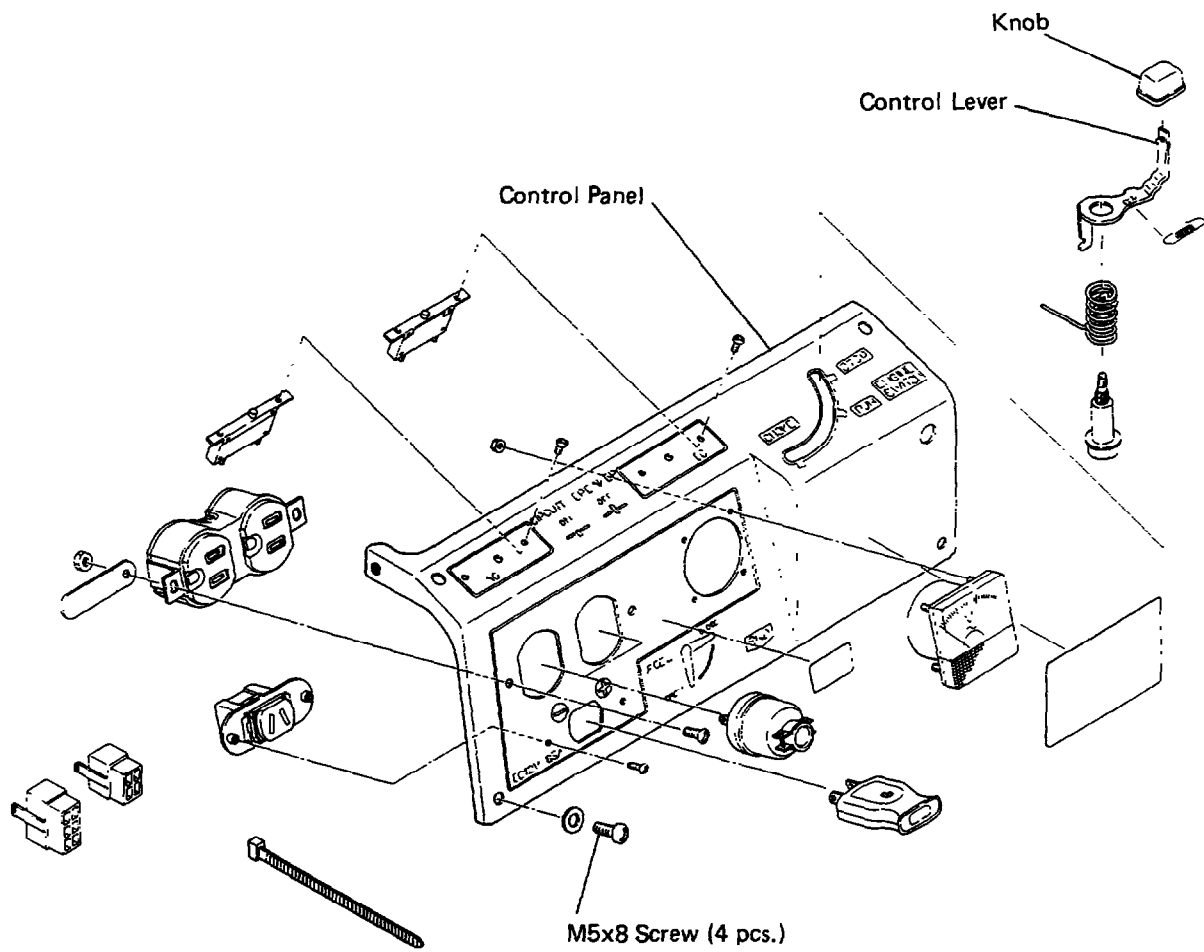
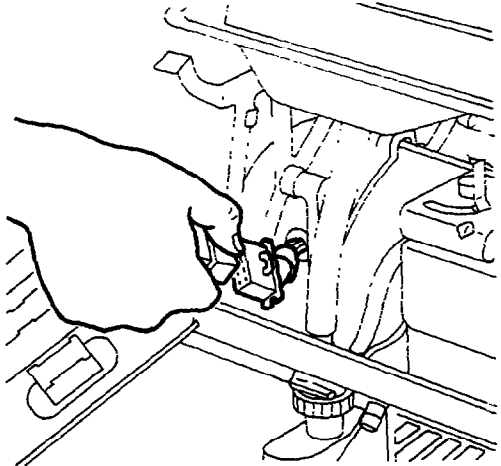
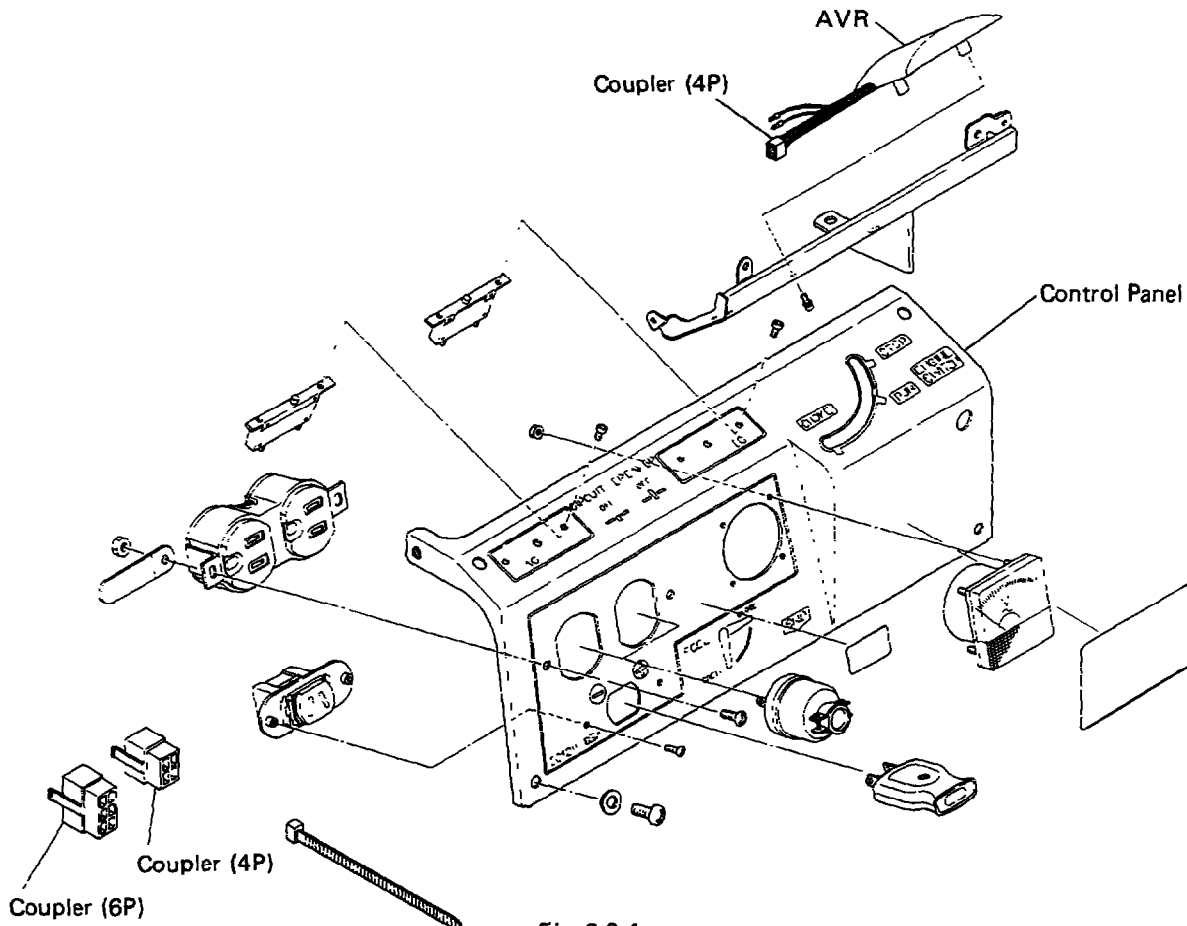


Fig 9-3-2

Sequence	Part to remove	Description	Precautions	Necessary tools
4	Couplers and plugs (Disconnection)	<p>(1) Disconnect the (6P) generator coupler from the other (6P) coupler extending from the control panel.</p> <p>(2) Disconnect the (4P) coupler of the AVR from the (4P) coupler extending from the control panel.</p> <p>(3) Remove the plug for grounding.</p>	Pull the couplers while pushing the retainer claws.	 <p style="text-align: right;"><i>Fig. 9-3-3</i></p>



*Fig. 9-3-4*

Sequence	Part to remove	Description	Precautions	Necessary tools
5	Front cover	(1) Remove the element cover by unscrewing the M6 x 12 screw.		⊖ Driver
		(2) Remove the front cover by unscrewing three M5 x 8 screws.		⊕ Driver

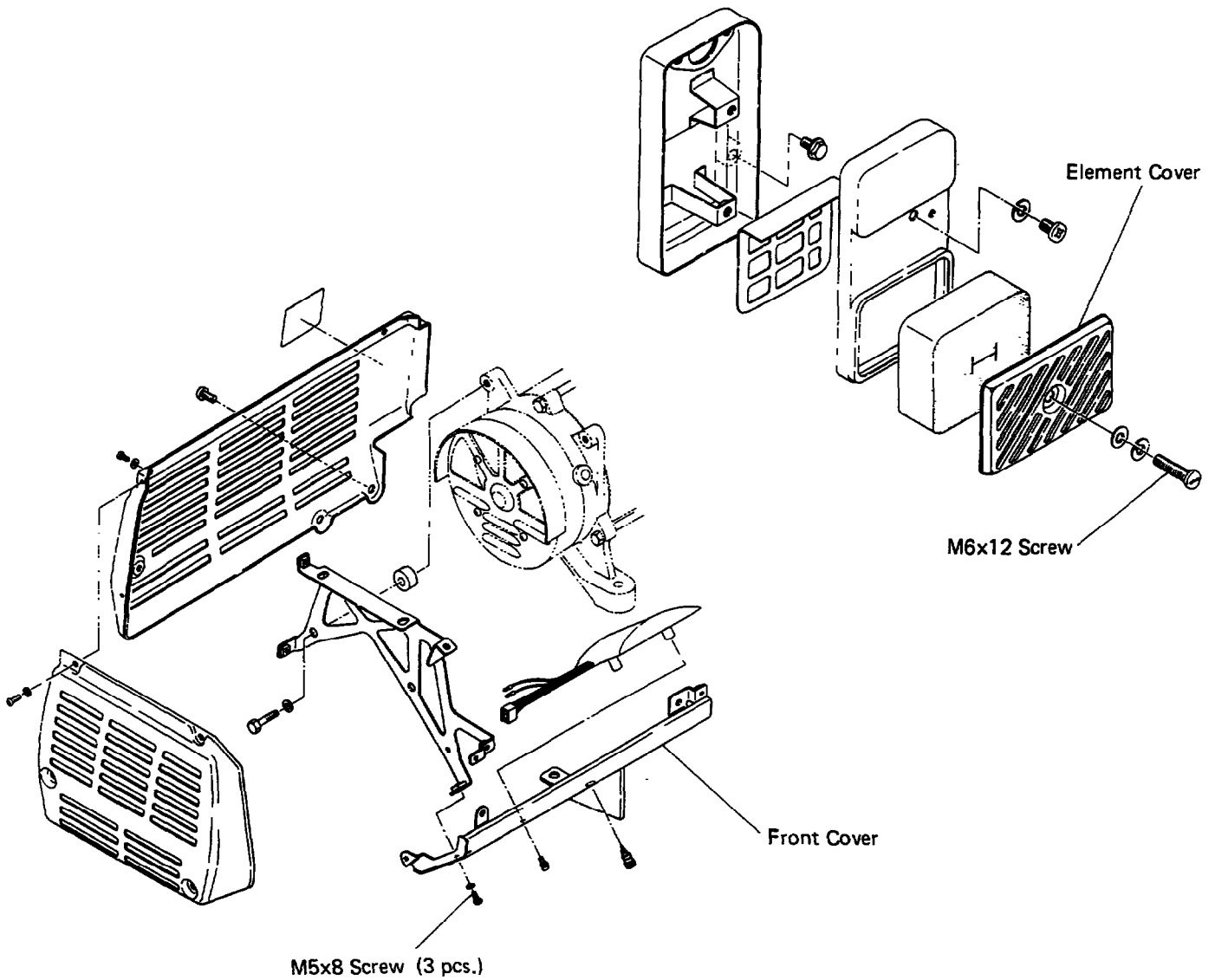


Fig. 9-3-5

Sequence	Part to remove	Description	Precautions	Necessary tools
6	Fuel pipe and plug (Disconnection)	(1) Remove the cap from the fuel strainer and take out the gasoline from inside the fuel tank.		
		(2) With pliers, hold the fuel pipe clamp which is inserted in the fuel strainer and pull it forward to remove the fuel pipe from the strainer.	Be careful not to damage the fuel pipe.	Pliers
		(3) Disconnect the plug receptacle of the engine from the plug of the AVR.		

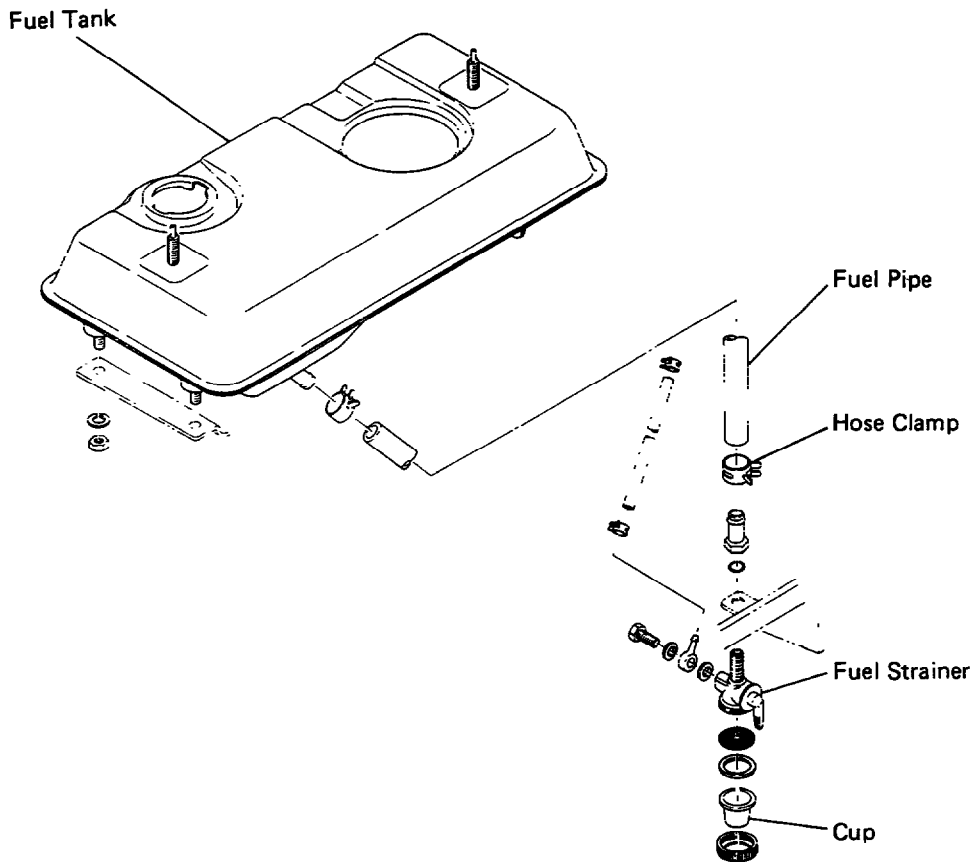


Fig. 9-3-6

Sequence	Part to remove	Description	Precautions	Necessary tools
7	Fuel tank handle	(1) Remove the handle cover by unscrewing the two M3 x 10 screws.	The fuel tank can be removed without disassembling the handle.	⊕ Driver
		(2) Pull out the breather pipe for air ventilation.		
		(3) Remove the handle body by taking off the two M8 nuts.		13 m/m box spanner
8	Fuel tank	(1) Remove the two M6 x 12 flange bolts clamping the blower housing.		10 m/m box spanner
		(2) Remove the fuel tank by taking off the two M8 nuts from the bottom of the tank.		13 m/m box spanner

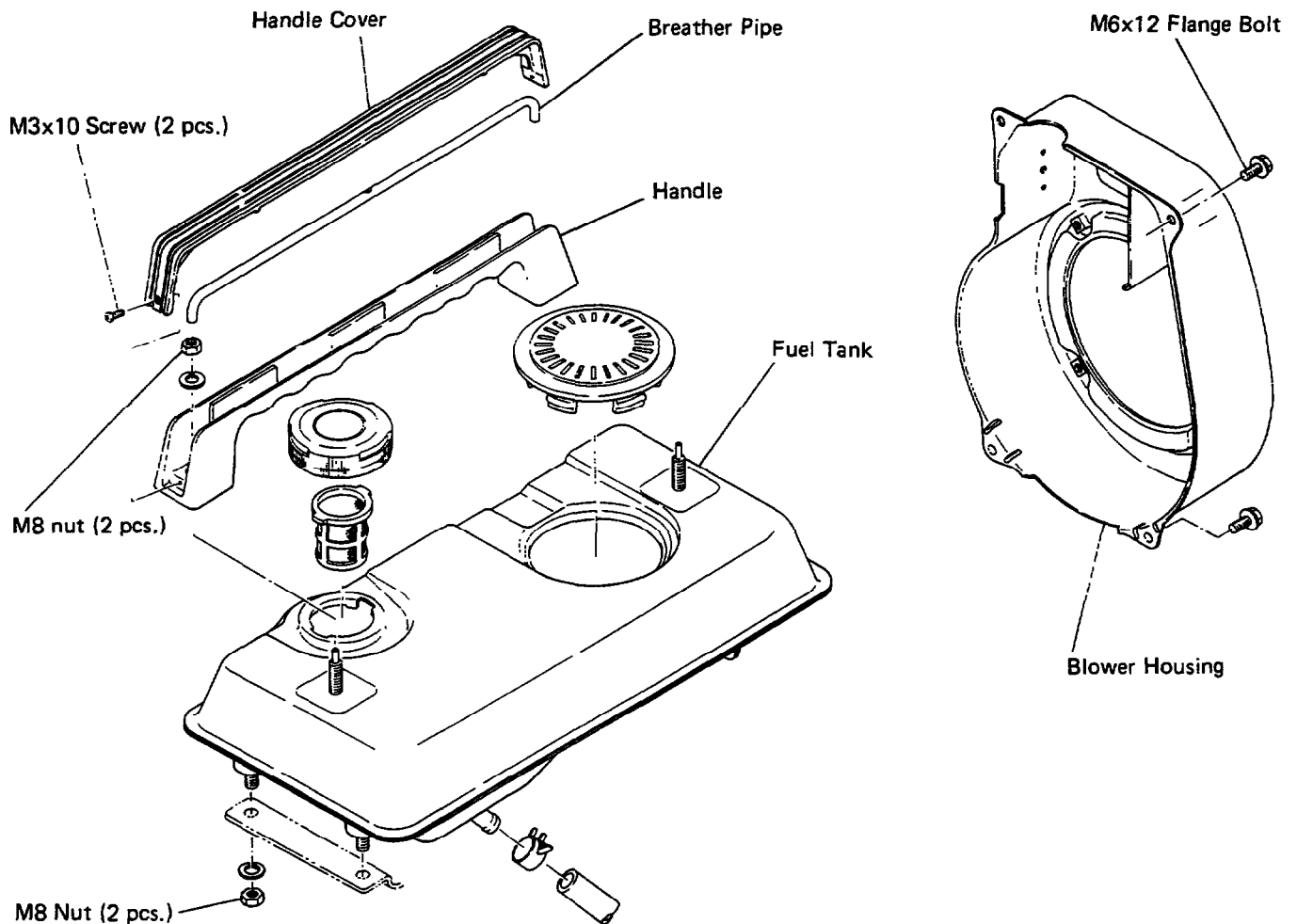


Fig. 9-3-7

Sequence	Part to remove	Description	Precautions	Necessary tools
9	Bracket (Cover)	(1) Remove the bracket cover from the generator by taking out the two M8 x 30 bolts.		13 m/m box spanner
10	End cover	(1) Remove the end cover from the generator by unscrewing the four M5 x 10 screws.		⊕ Driver
11	Brush holder	(1) Remove the brush holder fitted to the brush holder base by unscrewing the two M5 x 20 screws.	If the rear bracket is removed from the generator without removing the brush holder, the brush may break. Always remember to remove the brush holder.	⊕ Driver
		(2) Remove the connector	In assembling, be careful that the wiring is properly connected.	

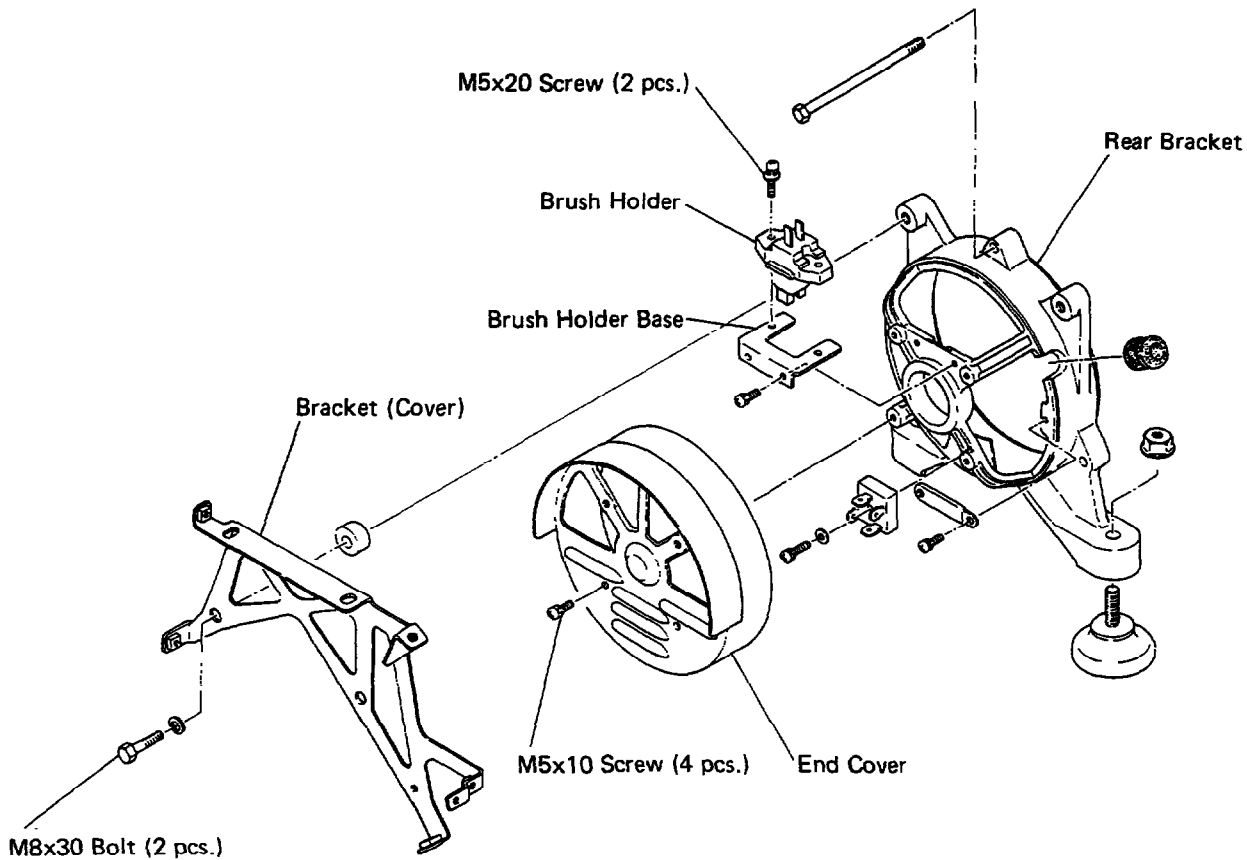


Fig. 9-3-8

Sequence	Part to remove	Description	Precautions	Necessary tools
12	Rear bracket	(1) Loosen and take out the three M6 bracket bolts.		10 m/m box spanner
		(2) Remove the rear bracket, tapping it evenly with a plastic hammer. (See Fig. 9-3-10)		Plastic hammer
		(3) Remove the connector of the diode stack and then remove the lead from the rear bracket clamp.	Be careful to make irregular wiring in assembling.	

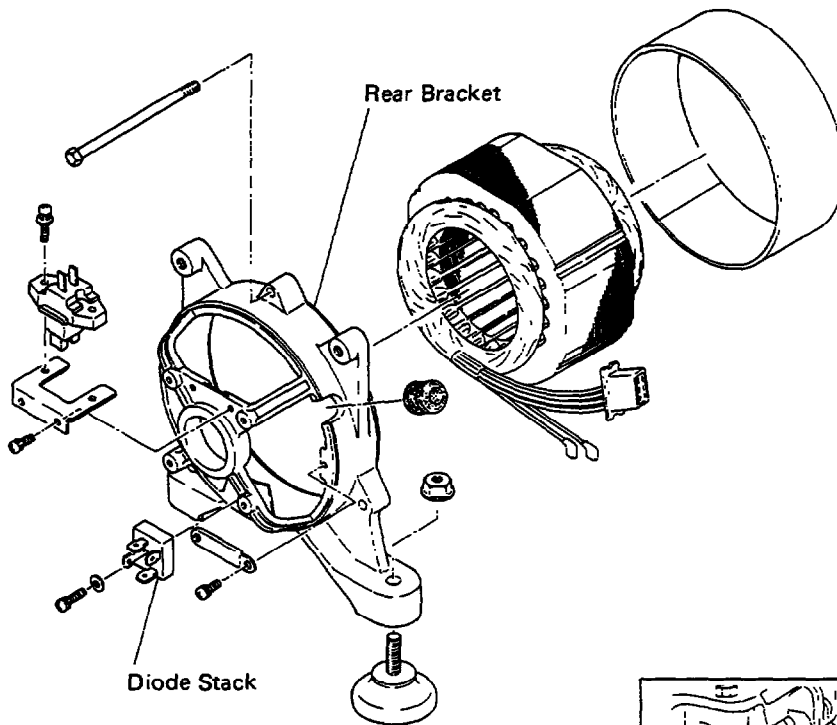


Fig 9-3-9

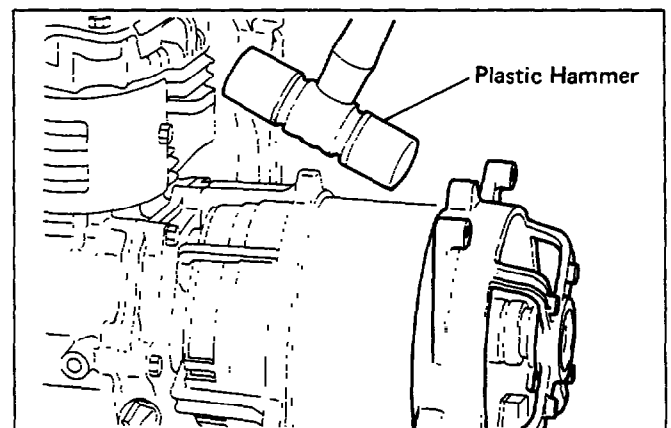


Fig 9-3-10



Sequence	Part to remove	Description	Precautions	Necessary tools
13	Stator	(1) Pull away the stator cover. (2) Pull away the stator from the front cover. If it is impossible, pull it away tapping outside the core with a plastic hammer. (See Fig. 9-3-12.)	Never pat the winding and the lead.	plastic hammer

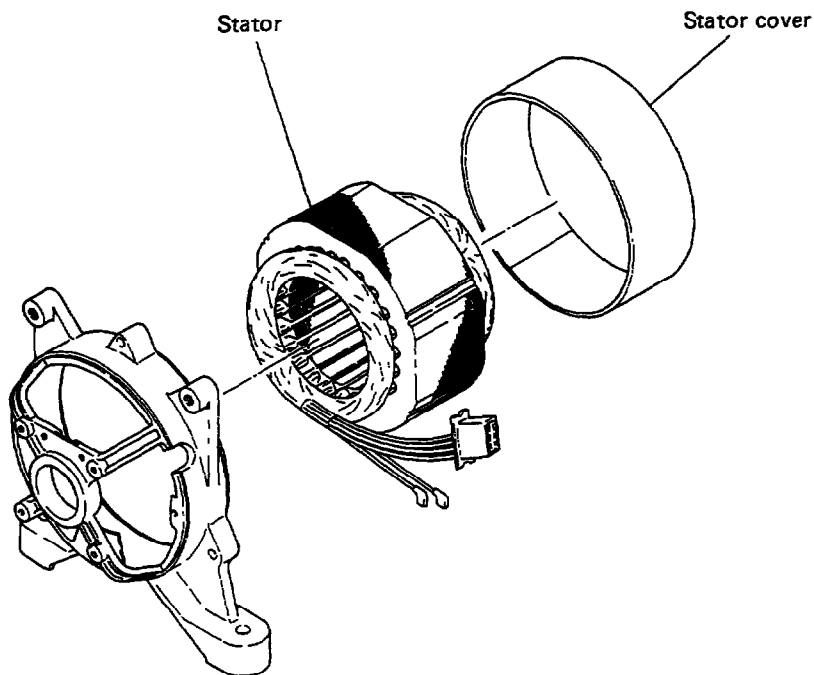


Fig. 9-3-11

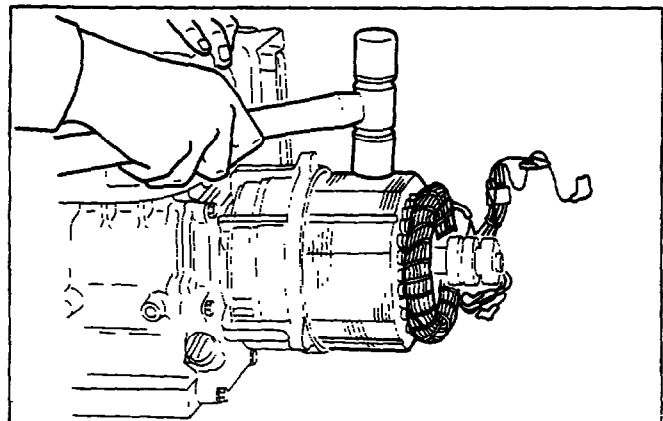


Fig. 9-3-12

Sequence	Part to remove	Description	Precautions	Necessary tools
14	Rotor	<p>(1) Insert a box spanner or a socket wrench between the through bolt and the rotor shaft, and hit it in a clockwise direction with a hammer to loosen the through bolt, thus keeping a 2-3 mm clearance between them. (See Fig. 9-3-14)</p>	<p>Never insert a driver or other tools into the fan of the rotor.</p>	<p>13 m/m box spanner or socket wrench</p>
		<p>(2) Hit the through bolt head with a plastic hammer to loosen the crank shaft and the rotor shaft taper. Then remove the rotor. (See Fig. 9-3-15)</p>	<p>Never hit the slip ring and the winding sections. When hitting the through bolt, hit it straight so as not to bend the bolt.</p>	<p>Plastic hammer</p>

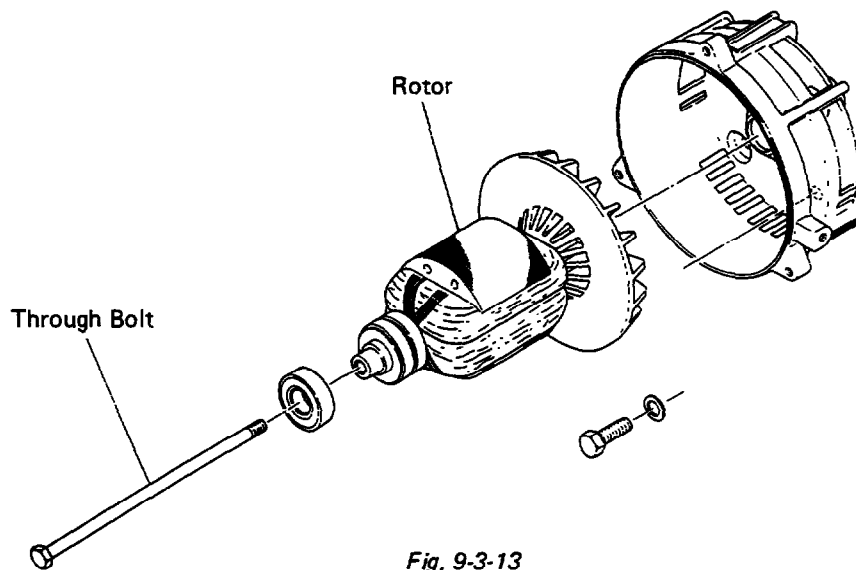


Fig. 9-3-13

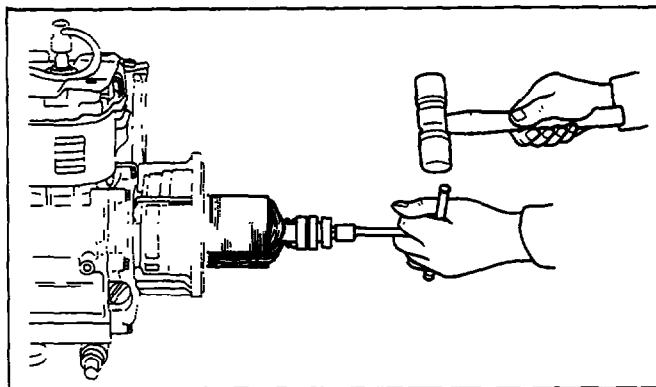


Fig. 9-3-14

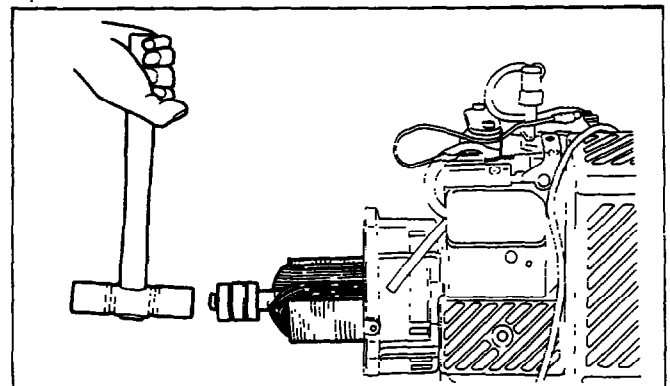


Fig. 9-3-15

Sequence	Part to remove	Description	Precautions	Necessary tools
15	Front bracket	(1) Remove the front bracket, which is mounted on the main bearing cover of the engine, by taking out four M8 x 18 bolts.		13 m/m box spanner

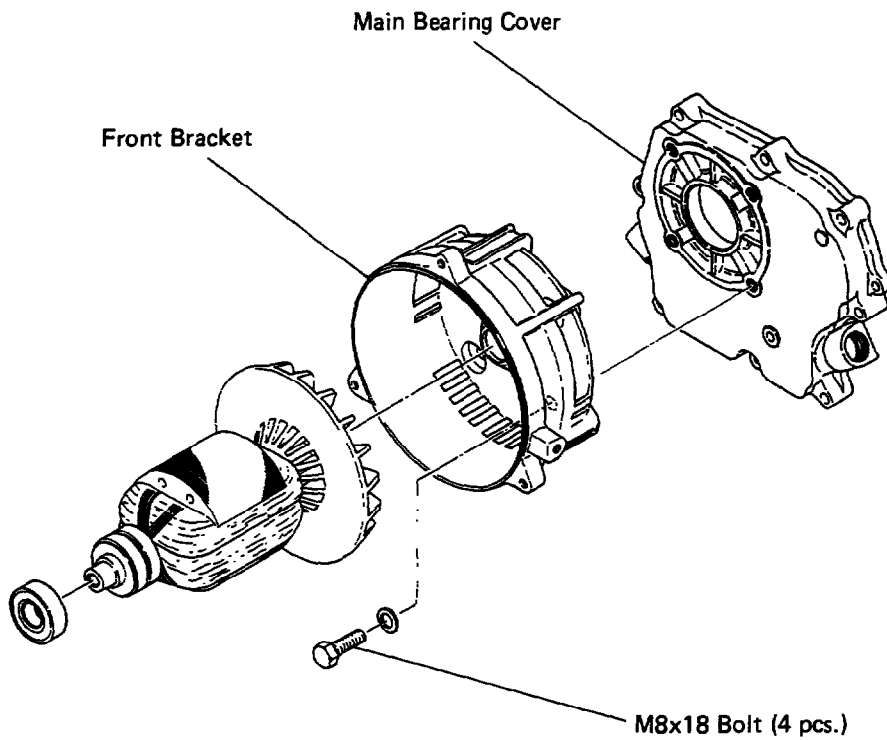


Fig. 9-3-16

Sequence	Part to remove	Description	Precautions	Necessary tools
16	Recoil starter	(1) Remove the recoil starter by taking out the four M6 x 8 flange bolts.		10 m/m box spanner

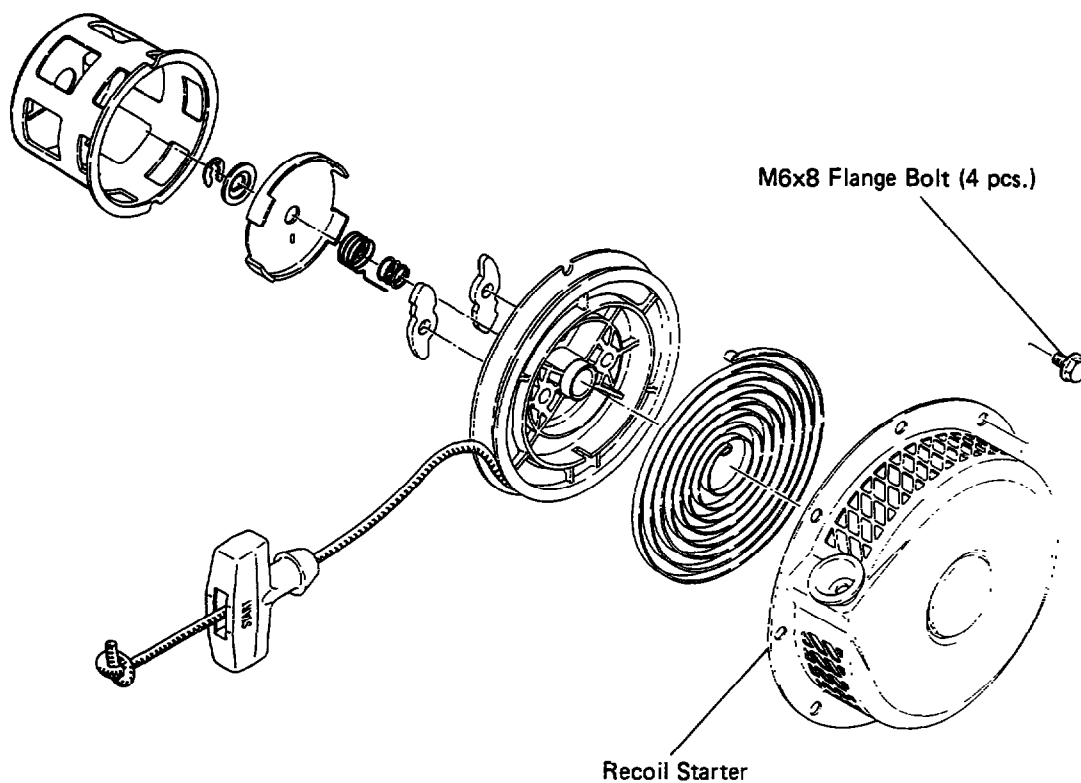


Fig. 9-3-17

Sequence	Part to remove	Description	Precautions	Necessary tools
17	Blower housing	(1) Remove the blower housing from the crank case by taking out the two M6 x 12 flange bolts.	The two flange bolts, taken out when the fuel tank is removed, are not included.	10 m/m box spanner
18	Head cover & cylinder baffle	(1) Remove the head cover from the cylinder head and the cylinder baffle from the cylinder by taking out the two M6 x 8 flange bolts.		10 m/m box spanner

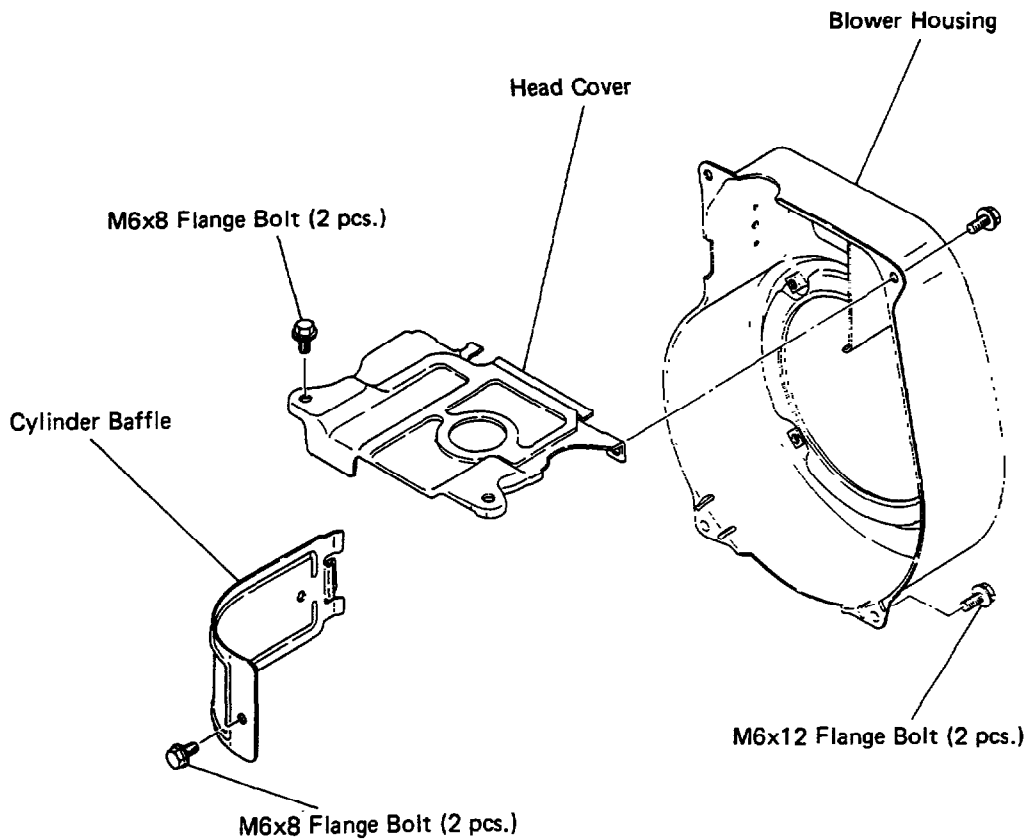


Fig 9-3-18

Sequence	Part to remove	Description	Precautions	Necessary tools
19	Air cleaner	(1) Remove the air cleaner body, elements, and element retainer from the cleaner body, by taking out one M6 x 10 flange bolt.		⊖ Driver
		(2) Remove the air cleaner body from the carburetor by taking out the two M6 x 10 flange bolt.	The air cleaner case and the carburetor are clamped together.	10 m/m box spanner
		(3) Remove the gas exhaust pipe.		

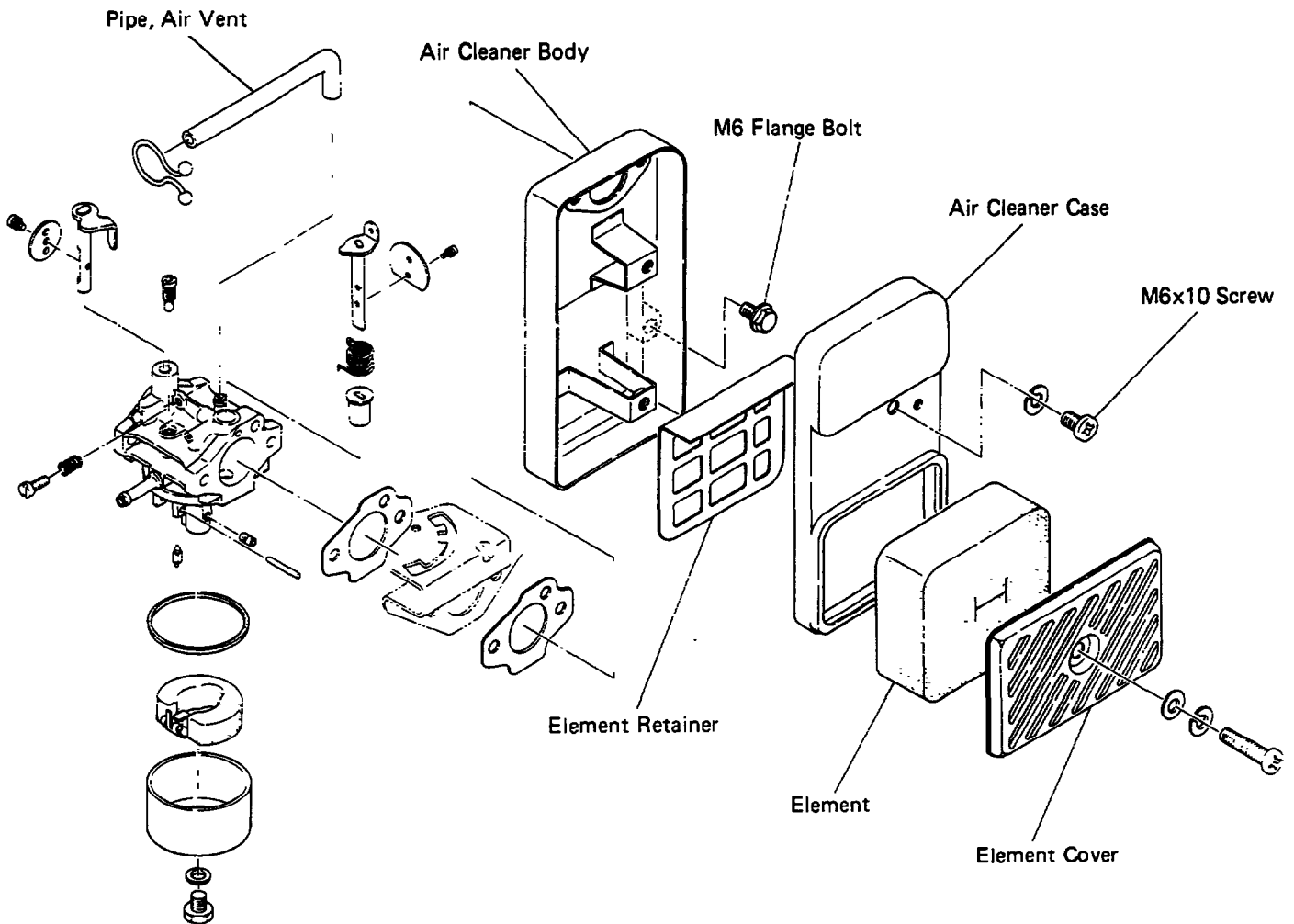


Fig 9-3-19

Sequence	Part to remove	Description	Precautions	Necessary tools
20	Muffler cover	(1) Remove the muffler cover from the muffler by taking out the three M6 x 8 flange bolts.		10 m/m box spanner
21	Muffler	(1) Remove the muffler from the cylinder section of the crank case by taking out the two M8 nuts and one M6 x 12 bolt.	Brace nuts	12 m/m box spanner 10 m/m box spanner

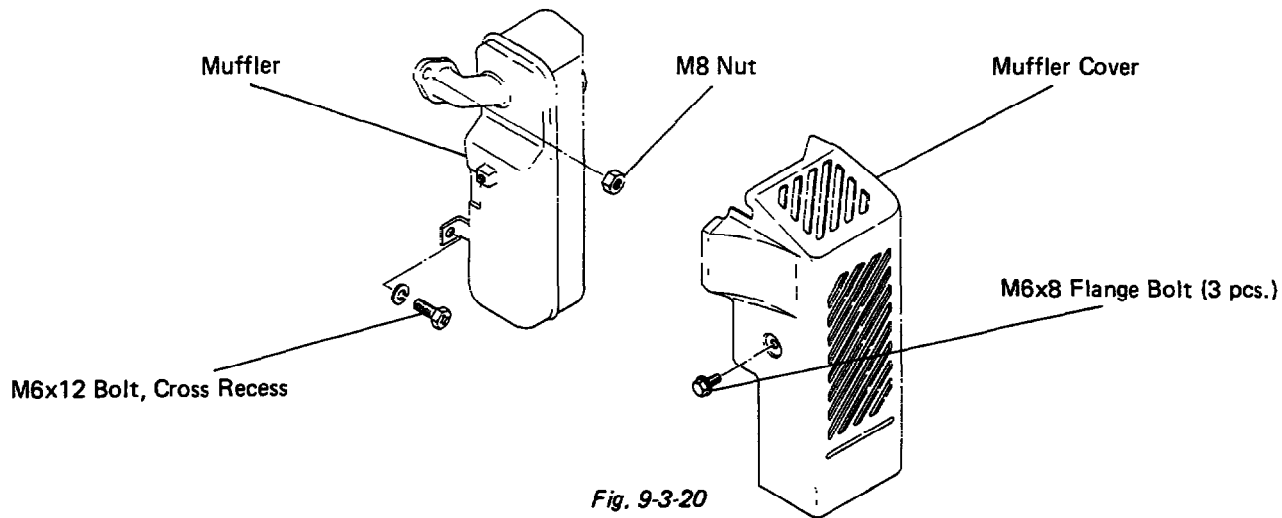


Fig. 9-3-20

Sequence	Part to remove	Description	Precautions	Necessary tools
22	Governor lever and its related parts	(1) Remove the governor lever from the governor shaft, by taking out one M6 x 25 bolt. (2) Remove the governor and the rod spring from the carburetor	The bolt has only to be loosened.	10 m/m box spanner or 10 m/m spanner

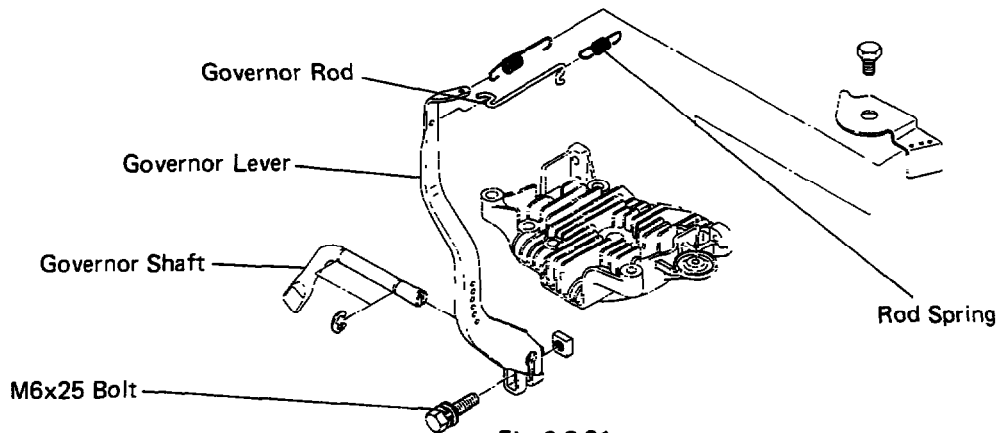


Fig. 9-3-21

Sequence	Part to remove	Description	Precautions	Necessary tools
23	Carburetor	(1) Remove the carburetor from the cylinder section of the crankcase.		
24	Starting pulley	(1) Remove the starting pulley from the flywheel, by taking out one M4 nut. Insert a box spanner or socket wrench into the nuts of the flywheel and strongly hit it with a hammer, thus removing the nuts and the spring washer.	Never insert such tools as driver into the flywheel.  Hit it in a counter-clockwise direction with a hammer.	10 m/m box spanner or socket wrench.
25	Flywheel	(1) Remove the flywheel from the crankshaft.	Assemble the tool to pull out the flywheel magneto as shown in Fig. 9-3-23. To remove the flywheel turn the central bolt counterclockwise.	Flywheel puller
26	Ignition coil	(1) Remove the ignition plug cap from the ignition plug and the ignition coil from the crank case by taking out two M6 x 25 bolts.	Washer built-in bolt	10 m/m box spanner
27	Exciting coil	(1) Remove the two M6x25 bolts from Crankcase	Washer built-in bolt	10 m/m box spanner

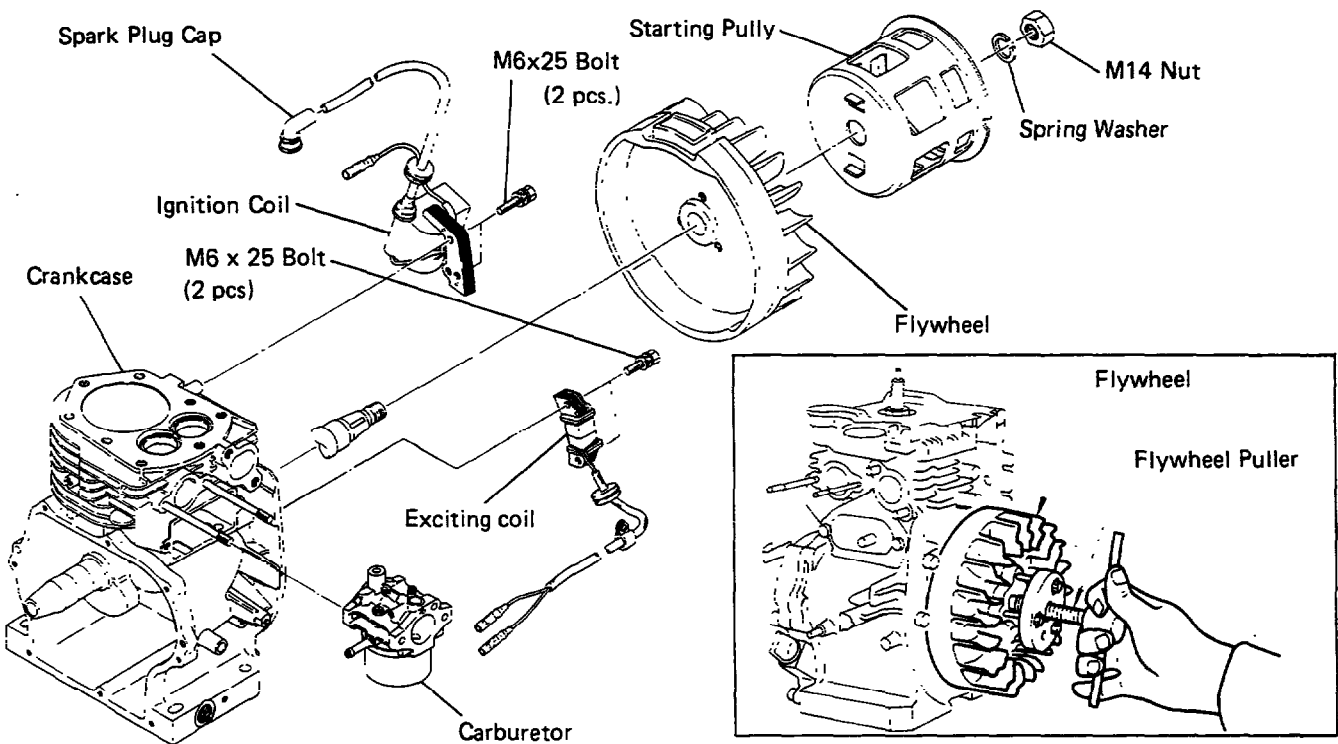
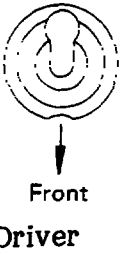


Fig. 9-3-22

Fig. 9-3-23



Sequence	Part to remove	Description	Precautions	Necessary tools
28	Ignition plug	(1) Remove the ignition plug from the cylinder head.		21 m/m box spanner
29	Cylinder head	(1) Remove the cylinder head from the crankcase by taking out the eight M8 x 40 flange bolts.  (2) Remove the cylinder head gasket from the crankcase.		12 m/m box spanner
30	Intake/exhaust valve	(1) Remove the tappet cover and the breather plate from the crankcase by taking out the two M6 x 12 flange bolts.  (2) Pull out the intake valve and the exhaust valve.  (3) Remove the valve spring and the spring retainer.	Be sure to position the notch in the spring retainer's outside periphery to the front and hook the minus driver (medium size) in the recess (lower side) of the retainer. Then pull the spring retainer frontward to remove the valve.	10 m/m box spanner   Front ⊖ Driver
31	Main bearing cover	(1) Remove the main bearing cover locking bolts (eight M6 x 30 bolts) from the crank case.  (2) Remove the cover by tapping it evenly with a plastic hammer.	Washer built-in bolt.  Be careful not to damage the oil seal.	10 m/m box spanner

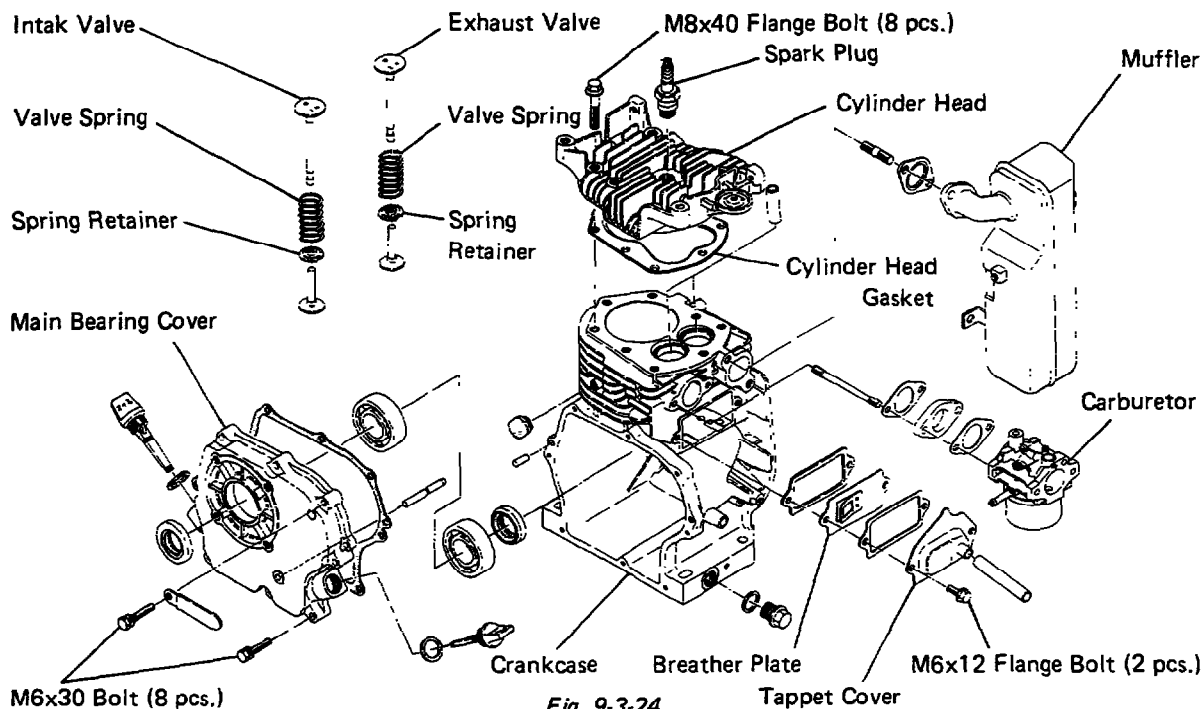


Fig. 9-3-24

Sequence	Part to remove	Description	Precautions	Necessary tools
32	Camshaft	(1) Pull the camshaft away from the crankcase.	Set the crankshaft on its side so that it will not fall and damage the tappets.	
33	Tappet	(1) Remove the tappets from the crankcase.	Put an intake and exhaust mark on the tappets to distinguish them from one another.	

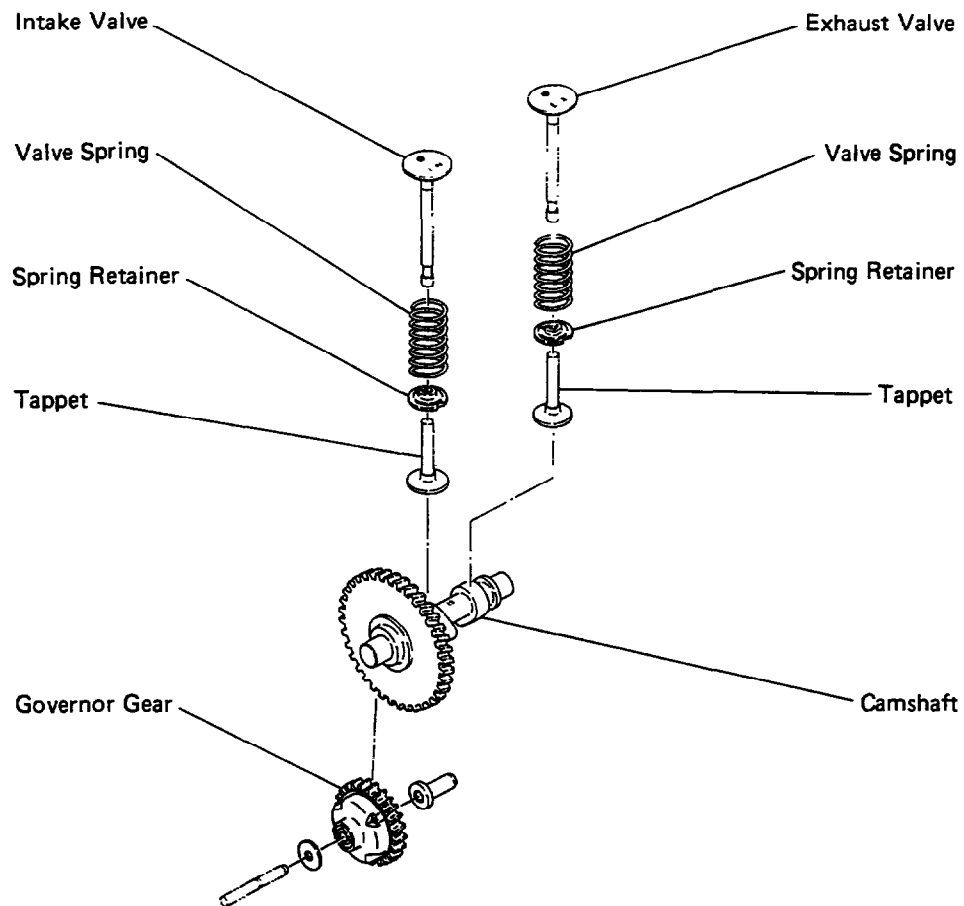


Fig. 9-3-25

Sequence	Part to remove	Description	Precautions	Necessary tools
34	Connecting rod and piston	<p>(1) Scrape off the carbon deposits from the cylinder and piston head. Then, in order to remove the two bolts, open the bending section of the connecting rod lock washer.</p> <p>(2) Remove the oil scraper, lock washer, and connecting rod cap from the crankshaft.</p> <p>(3) Turn the crankshaft until the piston comes to the top position. Then push the connecting rod to remove the piston rod from the cylinder top.</p>		10 m/m box spanner or 10 m/m spanner
35	Piston & Piston ring	<p>(1) Remove the piston from the connecting rod edge by undipping the two piston pin clips.</p> <p>(2) Open the ring joint wide and remove the piston ring from the piston.</p>	<p>Be careful not to damage the inside of the rod edge.</p> <p>Be careful not to open the joint too wide, or it will break.</p>	
36	Crankshaft	<p>(1) Remove the woodruff key (for the magneto).</p> <p>(2) Remove the crankshaft while tapping the magneto tip.</p>	Be careful not to damage the oil seal.	
37	Mount	(1) Remove the four M8 flange nut of engine side & generator side		12 m/m box spanner or 12 m/m spanner

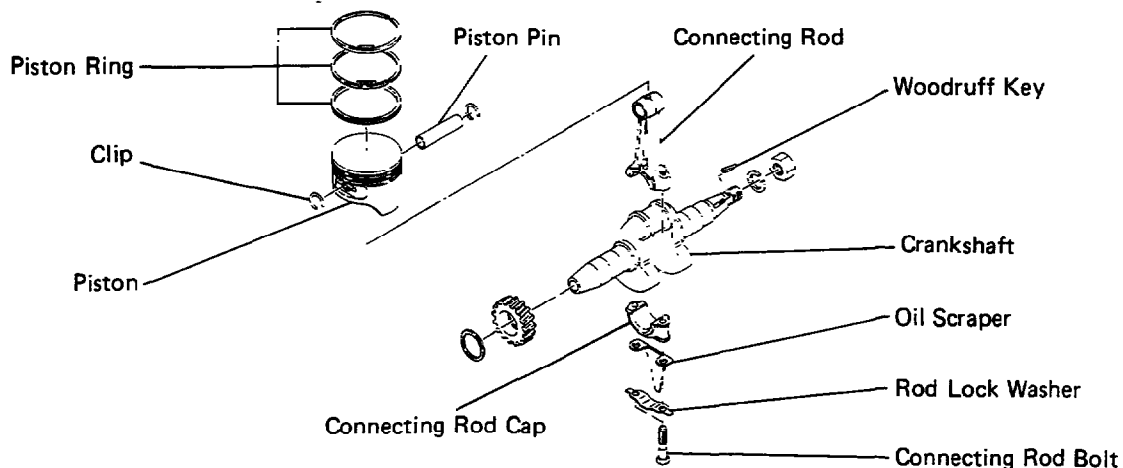


Fig. 9-3-26

## **9-4 ASSEMBLY PROCEDURE**

### **■Precautions in assembly**

- (1) Thoroughly clean each part. When cleaning, take special care with the piston, cylinder, crankshaft, connecting rod, and each bearing.
- (2) Be sure to completely scrape off the carbon deposits on the cylinder head and piston head. Also, thoroughly remove carbon deposits from each piston ring groove.
- (3) Check whether the lip of each oil seal is damaged or not, and if damaged, replace it with a new one. Also, while assembling, apply lubricating oil to the lip of each seal.
- (4) Replace the gaskets and other similar items with new ones.
- (5) Check the keys, pins, bolts, nuts etc., and replace them, if necessary, with new ones.
- (6) Apply torque, according to the specified rate, to those sections where the torque is rated.
- (7) Apply lubricating oil to rotating and sliding parts when they are assembled.
- (8) Check the clearance of each part prior to assembly and adjust them if necessary.
- (9) When each of the main components have been assembled, turn each one by hand and check for smoothness of rotation and unusual noise.

■ Assembly sequence and precautions

9-4-1 CRANKSHAFT

- (1) Fit the crankshaft oil seal guide onto the crankshaft tip and assemble it with the crank case as shown in Fig. 9-4-1.

Note: When the oil seal guide is not used, be careful not to damage the oil seal lip.

- (2) Mount the woodruff key (for the mag-neto).
- (3) Dimensional tolerance of the crankpin.

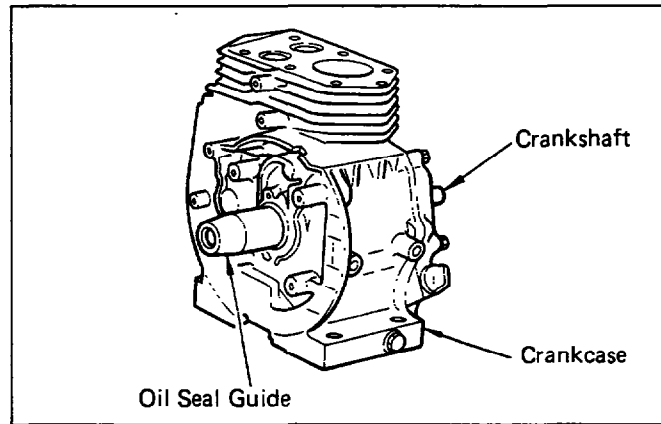


Fig 9-4-1

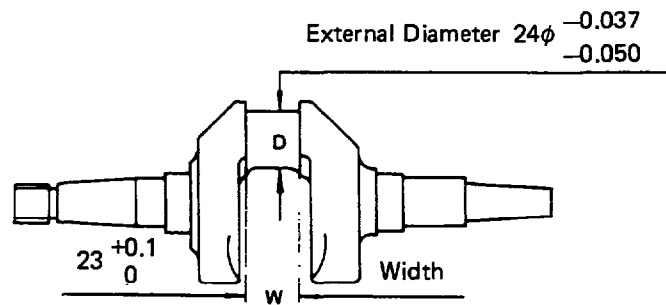


Fig. 9-4-2

■ Tolerances of new installed parts

Thrust directional tolerance between the cylinder and piston skirt		0.020L – 0.059L
Clearance between the piston ring joints		0.2L – 0.4L
Clearance between the piston rings	Top ring	0.090L – 0.135L
	Second ring	0.060L – 0.105L
	Oil ring	0.010L – 0.065L
Clearance between the connecting rod major ring and crank pin	Clearance between the internal and external diameters	0.037L – 0.063L
	Side clearance	0.1L – 0.3L
Clearance between the connecting minor rod edge and piston pin		0.010L – 0.029L
Clearance between the piston pin and piston hole		0.009L – 0.010L

Table 9-4-1

Note: The clearance between the piston and cylinder is checked by measuring the clearance between the piston and cylinder skirt.

## 9-4-2 PISTON AND PISTON RING

- (1) If a ring expander is not available, set the ring joint at the first land of the piston, as shown in Fig. 9-4-4. Then, open the joint wide so that the ring can be slid into the regular groove.

**Note:** Be careful not to twist or expand each ring too excessively. The oil ring is fitted onto the piston, followed by the second ring and top ring.

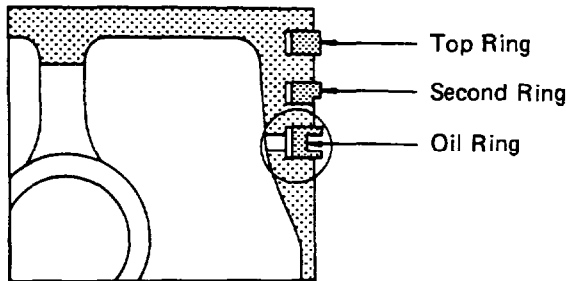


Fig. 9-4-3

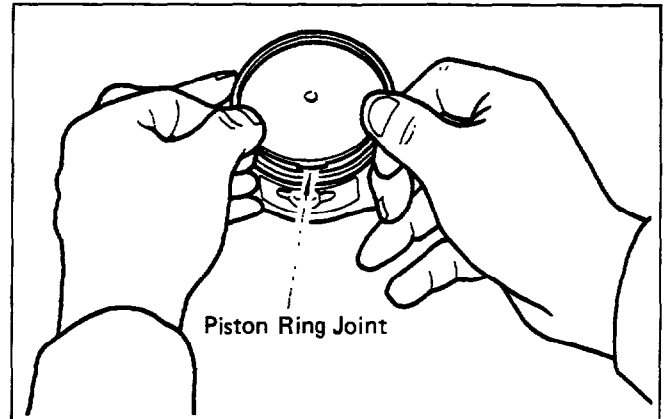


Fig. 9-4-4

- (2) The connecting rod is joined to the piston with the piston pin.

**Note:** Prior to assembly, apply sufficient lubricating oil, to the connecting rod minor edge.

**Note:** Be sure to secure the clips to both sides of the piston pin.

- (3) In setting the connecting rod, hold it with a piston ring guide, as shown in Fig. 9-4-5, (or, if there is no ring guide, tap the piston head with a wooden object pressing the piston ring with a finger tip to push it in). Set it to the position of the  $\odot$  mark or MA mark of the connecting rod in the flywheel magneto side.

**Note:** Prior to assembly, apply sufficient lubricating oil to the piston ring, connecting rod metal, and cylinder wall.

**Note:** Fit the piston with the piston rings arranged 90° from the periphery of the piston.

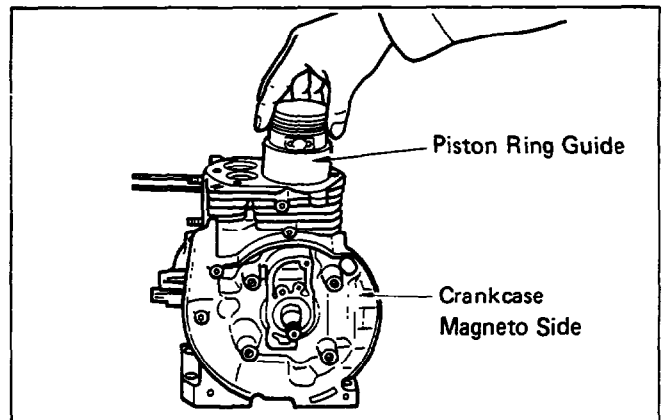


Fig. 9-4-5

### 9-4-3 CONNECTING ROD

- (1) Turn the crankshaft as far as the bottom dead point. Then, set the connecting rod, gently striking the piston head until it touches the crankpin.
- (2) Set the connecting rod cap according to the rod guide mark.
- (3) Set the oil scraper in the magneto side.

**Note:** Be sure to use a new lock washer. Bed the washer carefully and correctly.

**Note:** When the connecting rod cap has been installed, manually turn the crankshaft to confirm that the connecting rod moves smoothly.

**Note:** The specified torque for installing the connecting rod cap is from 90 to 115 kg-cm.

**Note:** For details regarding the clearances between the piston, piston ring, and rod, see Table 9-4-1.

### 9-4-4 TAPPETS AND CAMSHAFT

Install the tappets first, and then the camshaft.

**Note:** Align the timing mark at the base of the cam gear with the timing mark of the crank gear. If the valve timing is set incorrectly, the engine will not operate correctly and sometimes may not run at all. (See Table 9-4-6).

**Note:** If the intake and exhaust valves are set in reverse order the tappet clearance will also be incorrect.

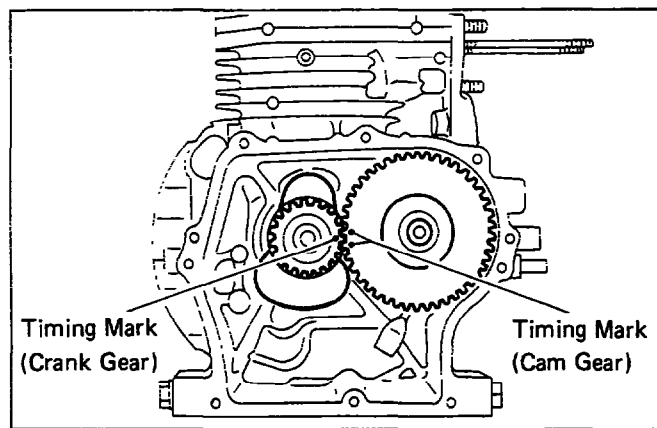


Fig. 9-4-6

### 9-4-5 MAIN BEARING COVER

The main bearing cover is installed in the crankcase.

**Note:** As the governor gear has been mounted on the main bearing cover, it is necessary in setting, to confirm that the governor gear is meshed with the cam gear (See Fig. 9-4-7). If replacement of the oil seal is required, pressure-fit the new oil seal prior to installing the main bearing cover to the specified position.

**Note:** Prior to installation apply lubricating oil to the bearings, oil seal lip, and to the cover face to make a thin oil layer on the surface for the purpose of installing the main bearing cover packing in the specified position. Also cover the oil seal guide over the crankshaft so that the oil seal lip will not be damaged.

Make sure the side clearance of the crankshaft is in the range of 0 to 0.2 mm. Adjust it if necessary, using the adjusting color (See Fig. 9-4-8).

**Note:** Torque for the main bearing cover: 80 - 100 kg-cm

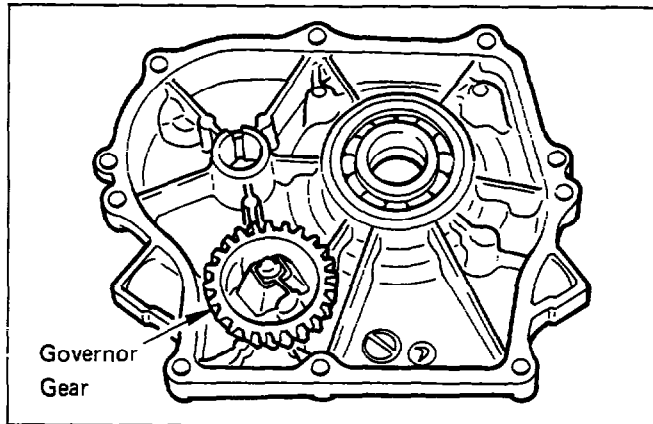


Fig. 9-4-7

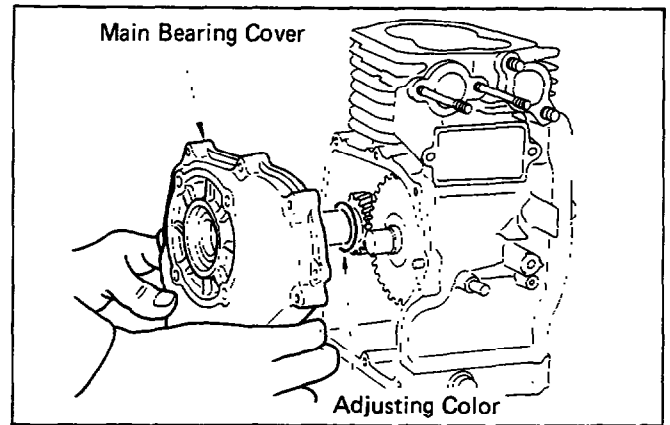


Fig. 9-4-8

\* Fig. 9-4-9 shows an example of the methods to measure the side clearance of the crankshaft. In this case, it is measured by measuring the clearance between the processing face of the crankcase and adjusting color. As the packing is installed on the processing face of the crankcase, determine the clearance by taking into consideration the thickness of this packing which is 0.22 mm.

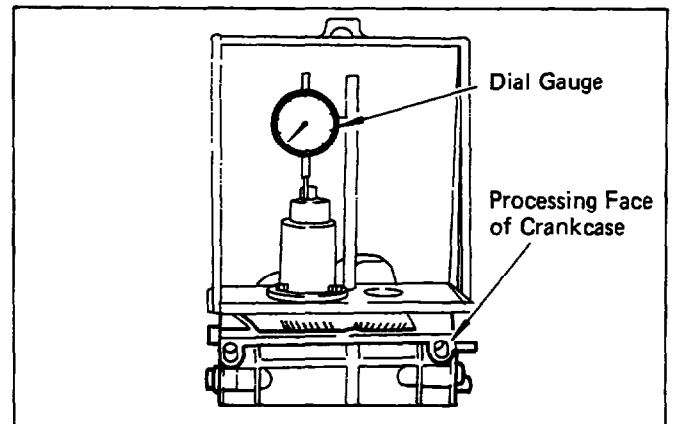


Fig. 9-4-9

#### 9-4-6 INTAKE VALVE AND EXHAUST VALVE

Scrape off deposits such as carbon gum from the valves, valve seat, intake/exhaust ports, and valve guide.

Note: If the valve face is worn, replace the valve with a new one.

Note: If the clearance between the valve guide and valve stem is too large, replace the valve guide with a new one provided by the supplier.

While replacing, pull out the valve guide by using a pull block and a pull bolt and then pressure-fit the new one.

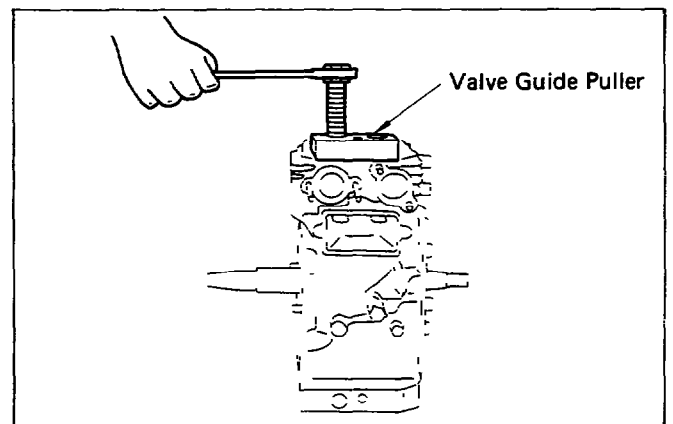


Fig. 9-4-10



■ Valve & valve guide clearance

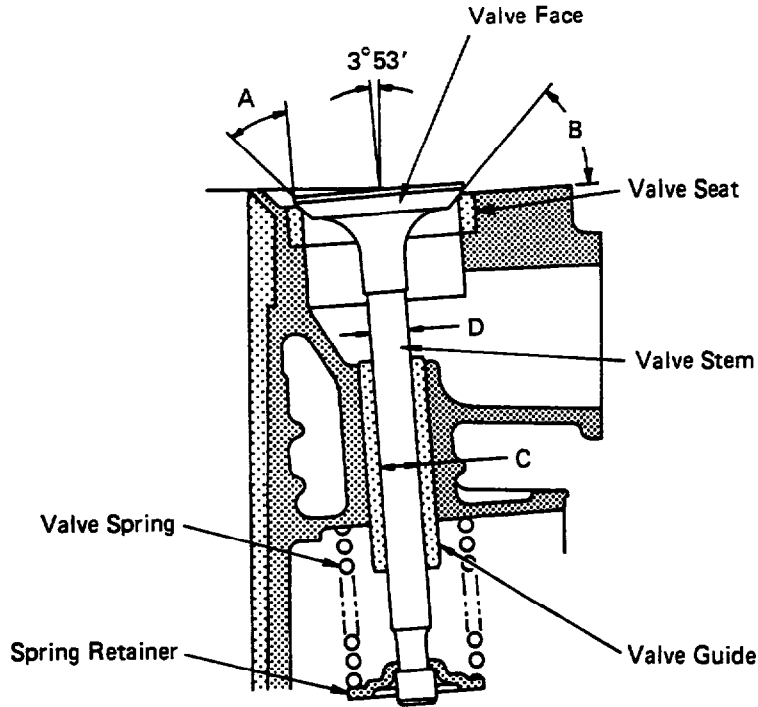


Fig. 9-4-11

A: Valve face angle		45°
B: Valve seat angle		45°
C: Valve guide inside diameter		$6.5\phi \begin{matrix} +0.022 \\ 0 \end{matrix}$
D: Valve stem outside diameter	Intake valve	$6.5\phi \begin{matrix} -0.025 \\ -0.040 \end{matrix}$
	Exhaust valve	$6.5\phi \begin{matrix} -0.056 \\ -0.078 \end{matrix}$
Clearance between the valve guide and valve stem (clearance between C and D)	Intake valve	0.025L ~ 0.062L
	Exhaust valve	0.056L ~ 0.100L

Table 9-4-2

### 9-4-7 TAPPET ADJUSTMENT

Set the tappet at the lowest point and push down the valve. Measure the clearance between the valve and the tappet stem, using a clearance gauge inserted into the clearance (See Fig. 9-4-12).

Note: When the engine is not running, the clearance between the valve and tappet stem must be in the range of  $0.1 \pm 0.02$ . This holds true for both the intake valve and the exhaust valve.

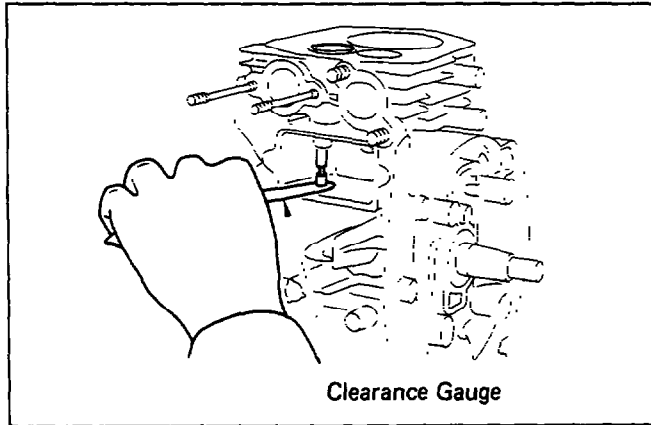


Fig. 9-4-12

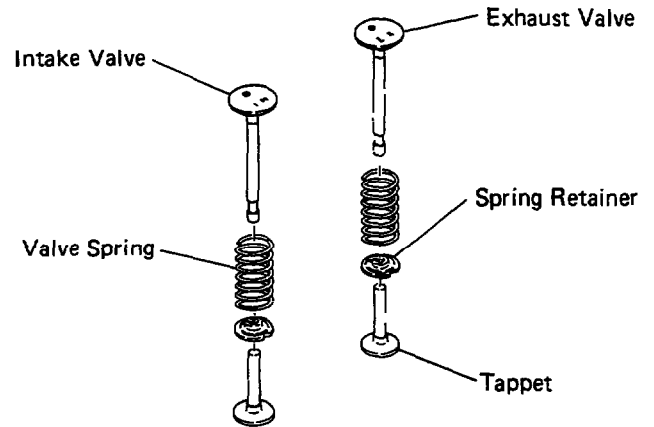


Fig. 9-4-13

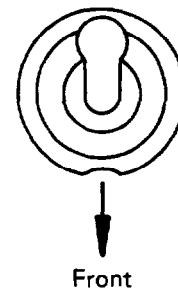
Note: If the clearance is smaller than the specified one, grind down slightly the valve stem tip with a grinder and measure the clearance again.

If the clearance is larger than the specified allowance, replace the valve with a new one and adjust the clearance using some compound etc.

Note: Install the valve spring retainers after completing adjustment of the tappet clearance. Then recheck the clearance.

#### \* Installment of spring retainers

Place the retainer, using a special tool, over the valve stem with the retainer's notch facing towards the front.



### 9-4-8 BREATHER PLATE AND TAPPET COVER

Note: Pay attention to installing procedure of the gaskets and position of the breather valve, which should be located in the intake valve side.

### 9-4-9 CYLINDER HEAD

Before installing the cylinder head, be sure to remove any carbon deposits from the combustion chamber, and scrape off any dust in the section between the cooling fans.

Also check the level of the cylinder head.

Note: Replace the cylinder head gasket with a new one.

Note: Torque for the cylinder head: 190 ~ 230 kg-cm

#### 9-4-10 IGNITION PLUG

- \* Torque for the ignition plug: 230 ~ 250 kg-cm  
(As for a new one (head plug): 120 ~ 150 kg-cm)

#### 9-4-11 IGNITION COIL, EXCITING COIL, FLYWHEEL AND STARTING PULLEY

- (a) Temporarily set the ignition coil and exciting coil in the crankcase and install the flywheel in the crankshaft. Clamp the starting pulley together with the flywheel.

Note: Installment should be done after wiping away any oil from the crankshaft and taper section of the flywheel.

Torque for the flywheel: 600 ~ 650 kg-cm

- (b) Measure air gap between the ignition coil, exciting coil and the flywheel and then clamp the ignition coil.

The air gap is 0.4 ~ 0.5 mm.

#### 9-4-12 CARBURETOR

In the part of crankcase cylinder, install the gasket, insulator, gasket, carburetor, gasket, control bracket, and gasket, in this order. Then install the air cleaner body and secure it with two M6 flange nuts. Also lock the air cleaner body with M16 x 10 flange bolts.

Torque for the air cleaner clamping: 70 ~ 90 kg-cm

Note: Set the control bracket at the position of "RUN", and then mount it onto the air cleaner.

#### 9-4-13 GOVERNOR LEVER

The governor used in the engine of this generator is of centrifugal weight type and is joined with the governor lever. With the governor lever, the throttle valve of the carburetor is automatically regulated, therefore the engine speed is kept constant under load fluctuation.

Regulation procedure is as stated below (See Fig. 9-4-14, and Fig. 9-4-15)

- (1) Join the carburetor throttle lever with the governor lever and install them in the governor shaft.
- (2) Install the speed control in the cylinder head.
- (3) Join the governor and the speed control with the governor spring.

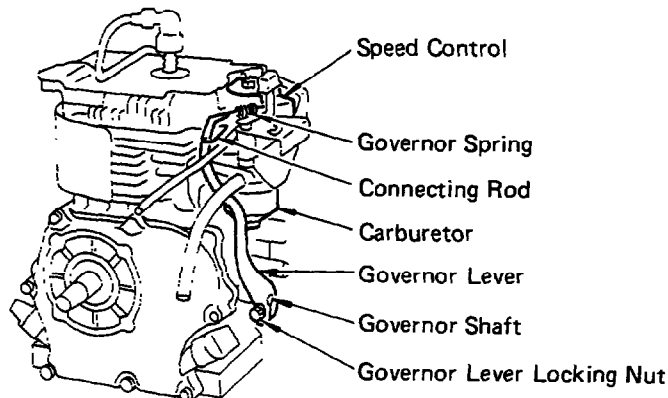


Fig. 9-4-14

■Hanging position of the governor spring

Generally, the governor spring should be hung in 1 (See Fig. 9-4-15).

- (4) Turn the speed control to the high speed side. Check to see that the carburetor throttle valve has been fully opened, and then lock it.
- (5) Insert a driver into the governor shaft groove and turn it clockwise (until the governor shaft becomes unable to turn) to lock the governor shaft and the governor lever with the governor lever's locking bolt.

Torque for the governor lever: 90 ~ 110 kg-cm

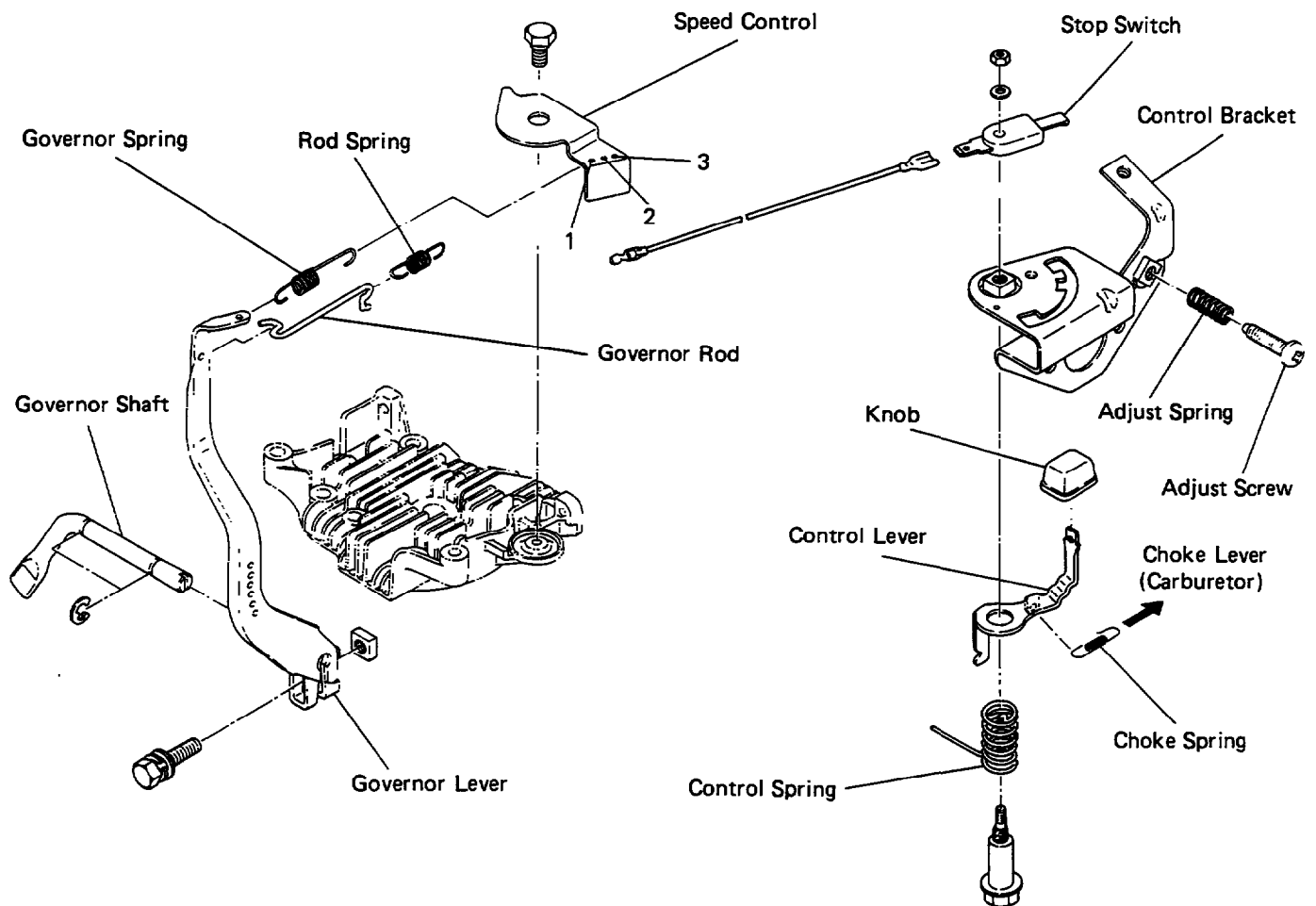


Fig. 9-4-15

#### 9-4-14 MUFFLER AND MUFFLER COVER

- (1) Insert the gasket (exhaust) to the studs of the exhaust flange of the crankcase and then mount the muffler. Install the muffler by securing the muffler flange with two brass nuts and the muffler bracket with one M6 x 12 bolt.
- (2) Secure the muffler cover with three M6 x 8 flange bolts.

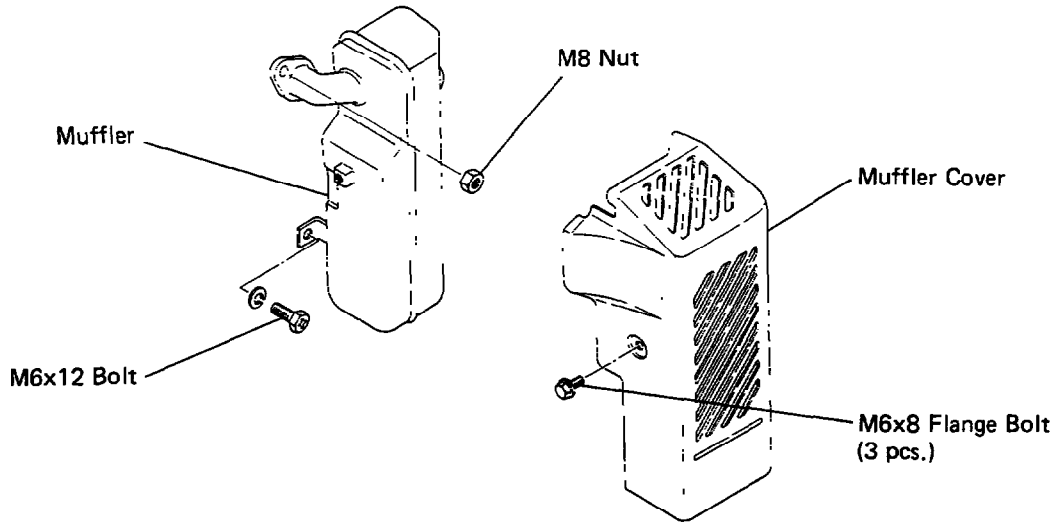


Fig. 9-4-16

#### 9-4-15 AIR CLEANER

In the air cleaner body which is fitted to the carburetor, set the element retainer, element, and cleaner case in this order, and clamp them with M6 x 10 screws.

Note: Installment of the element cover is done after the front cover has been installed.

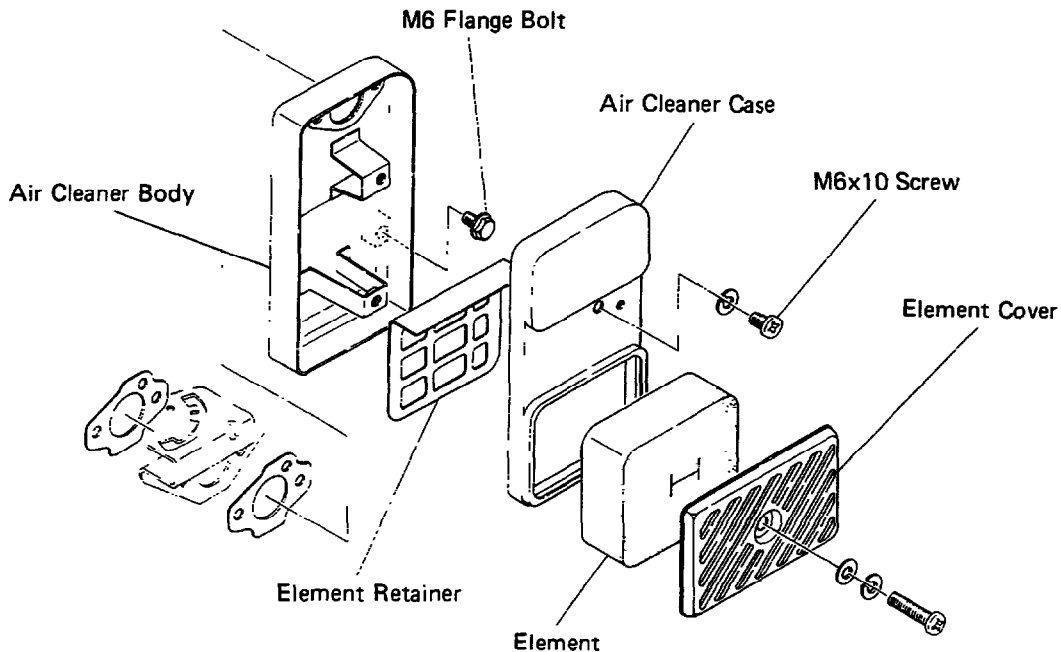


Fig. 9-4-17

### 9-4-16 HEAD COVER AND BLOWER HOUSING

- (1) Set the head cover with the M6 x 8 flange bolts (at two places in the generator side).
- (2) Set the blower housing to the crankcase with M6 x 12 bolts.

Note: The two M6 x 12 flange bolts for clamping the blower housing and head cover are used when the fuel tank is installed.

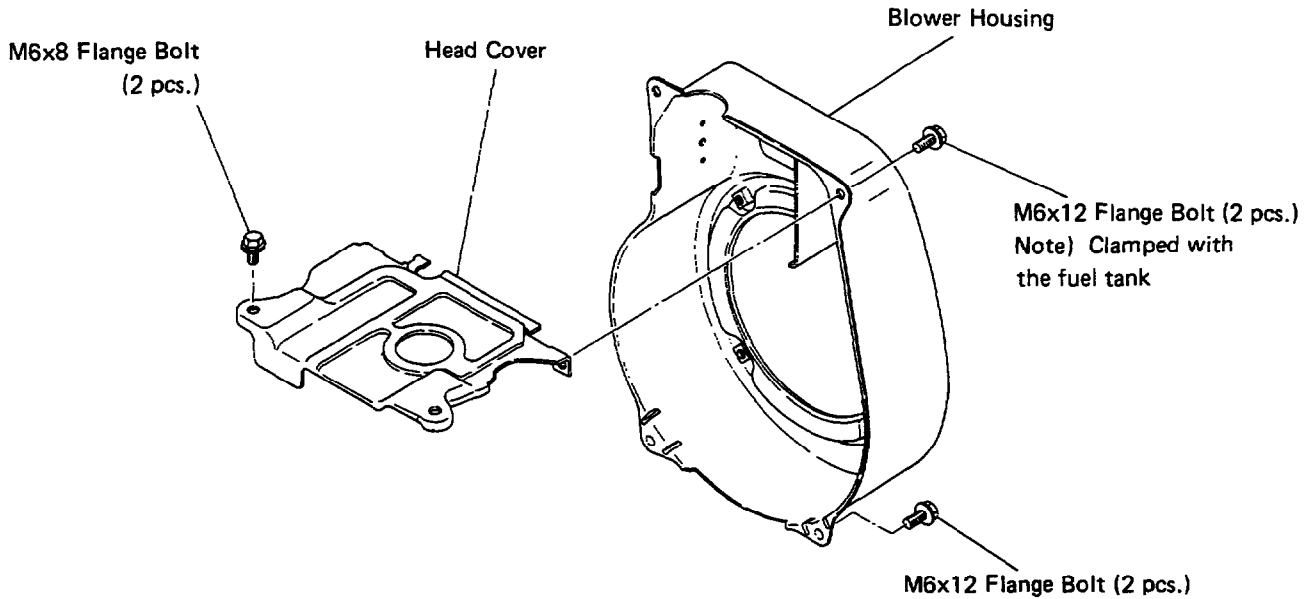


Fig. 9-4-18

### 9-4-17 RECOIL STARTOR

Set the recoil starter with four M6 x 8 flange bolts.

Note: Don't use bolts which are longer than 8mm. If used, they might run against fans of the flywheel.

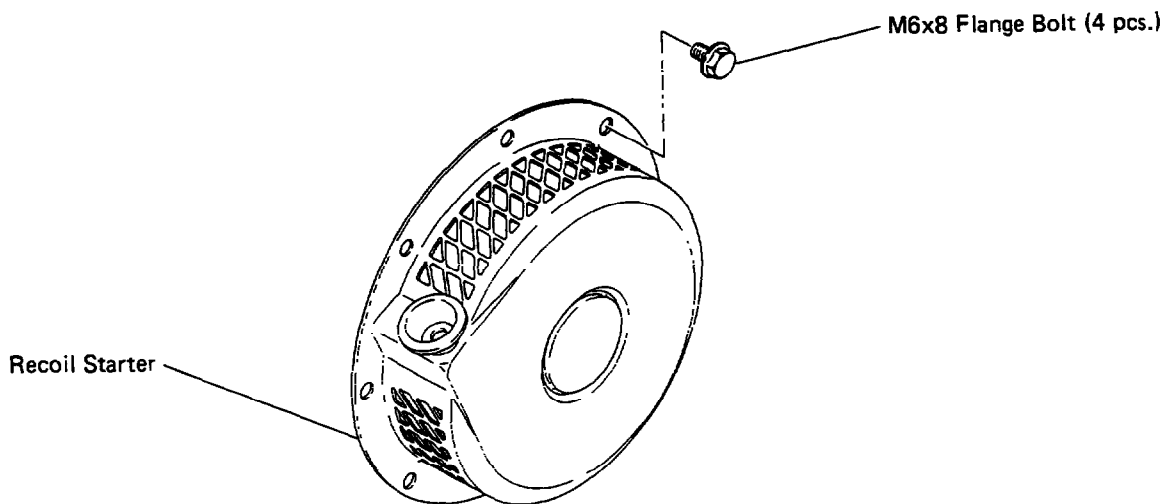


Fig. 9-4-19

### 9-4-18 FRONT BRACKET

Match the mounting hole of the front bracket with the inlet port of the engine's main bearing cover.

Torque for the front bracket: 120 ~ 140 kg-cm

Note: Set the front bracket so that the cooling air outlet window of the generator is positioned in the upper side, and the slit section is positioned in the bottom side.

### 9-4-19 ROTOR

Mount the rotor onto the taper section of the crankshaft and clamp it with through bolts.

Note: Wipe off well oil or stains from the taper section.

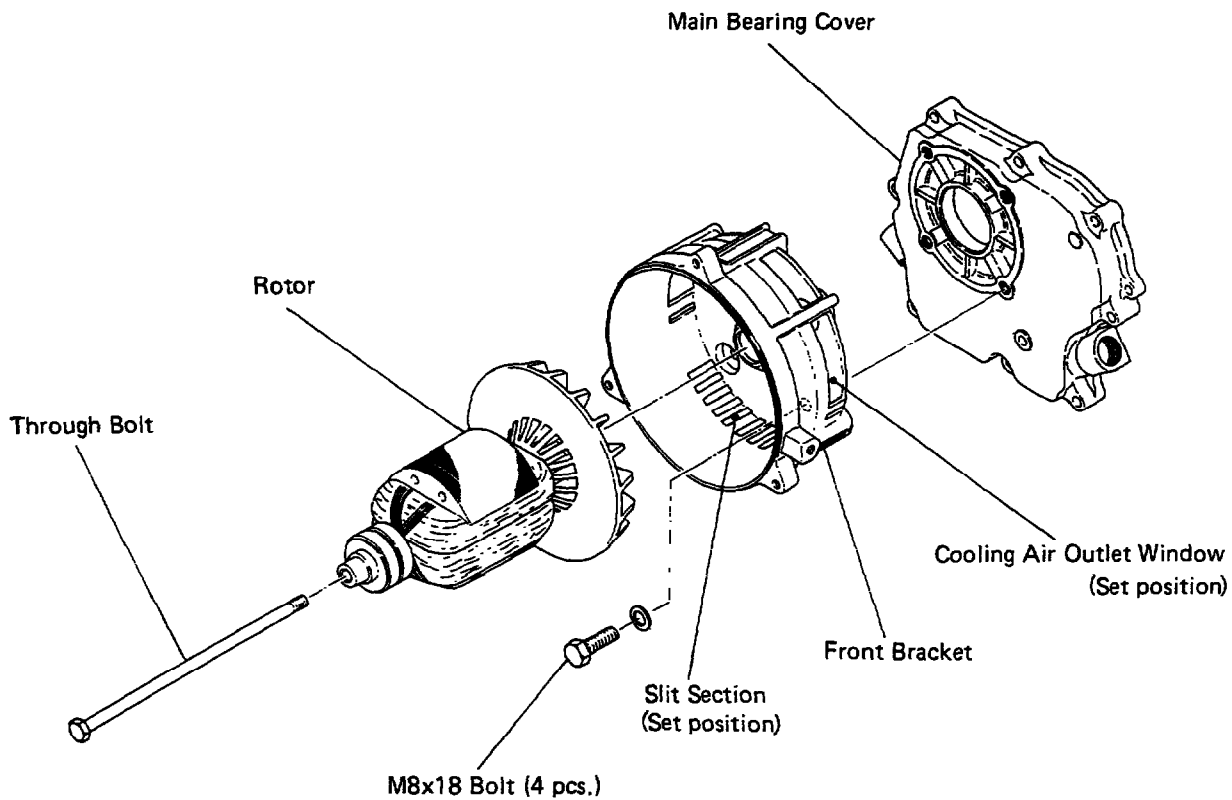


Fig. 9-4-20

#### 9-4-20 REAR BRACKET AND STATOR

Mount the diode stack on the rear bracket and combine them with the stator. Connect the connecting terminals according to the circuit chart.

Note: See 8.2 "Diode stack"

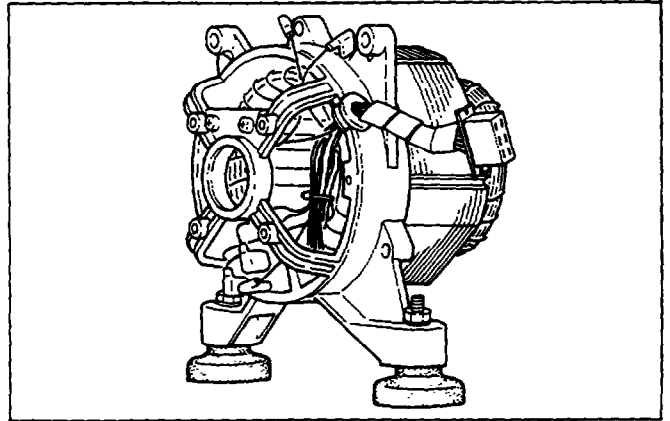


Fig. 9-4-21

#### 9-4-21 STATOR

- (1) Holding the rear bracket and stator, fit them to the inlet port of 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.

Note: Set the cable so that it comes out from the bottom of the stator. Be careful not to position it between the stator and the rear bracket.

- (2) Wind the stator cover around the stator.

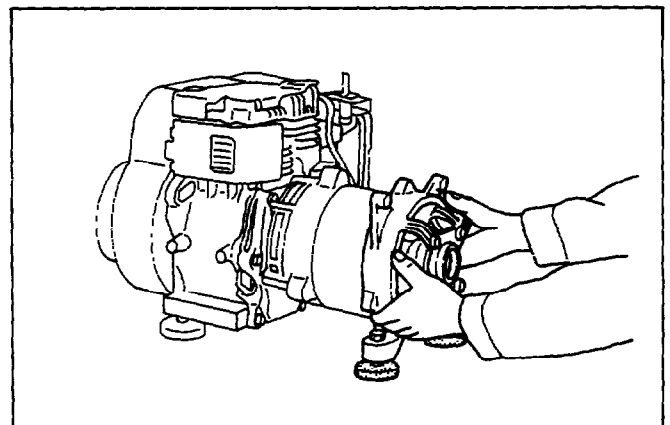


Fig. 9-4-22

- (3) Fit the screw boss, located in three places of the front bracket, with the boss in three points of the rear bracket, and clamp them with three M6 bracket bolts.

Torque for the rear bracket: 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.



## 9-4-22 BRASH HOLDER

- (1) Mount the brush holder base on the rear bracket with M5 x 10 screws.
- (2) To install the brush holder put the M5 x 20 screw through the brush holder, and turn the screw, keeping it vertical against the slip ring. (See Fig. 9-4-23)

**Note:** If the brush holder is inclined to the slip ring, the brush holder may break when the screw is clamped, or the brush itself may break when the engine is started.

After the brush holder has been installed, measure the resistance between the brush terminals, with a circuit tester. If the resistance is from 6 to 13 ohms, it is regular.

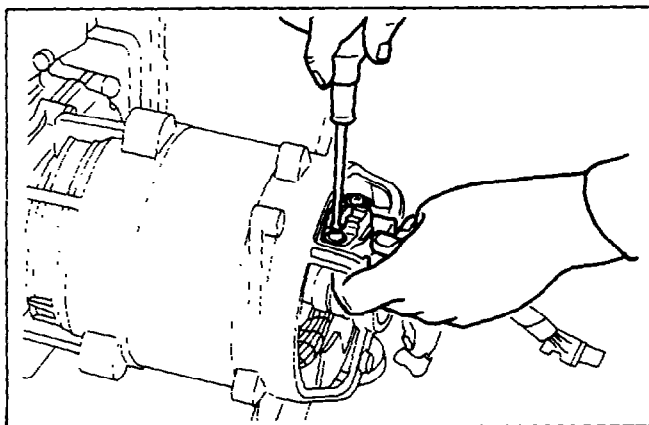


Fig. 9-4-23

- (3) Insert the connecting terminals of the brush holder, as shown in Fig. 9-4-24.

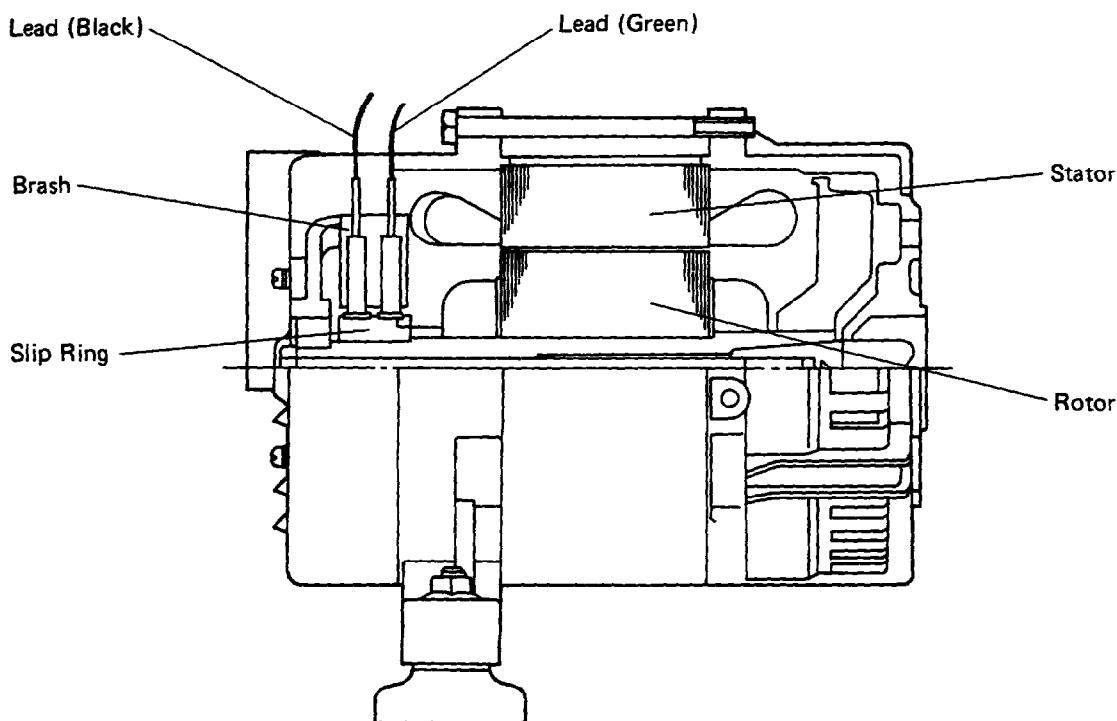


Fig. 9-4-24

9-4-23 END COVER

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

9-4-24 BRACKET (COVER)

Mount the bracket (cover) and the spacer on the rear cover and clamp them with M8 x 30 bolts.

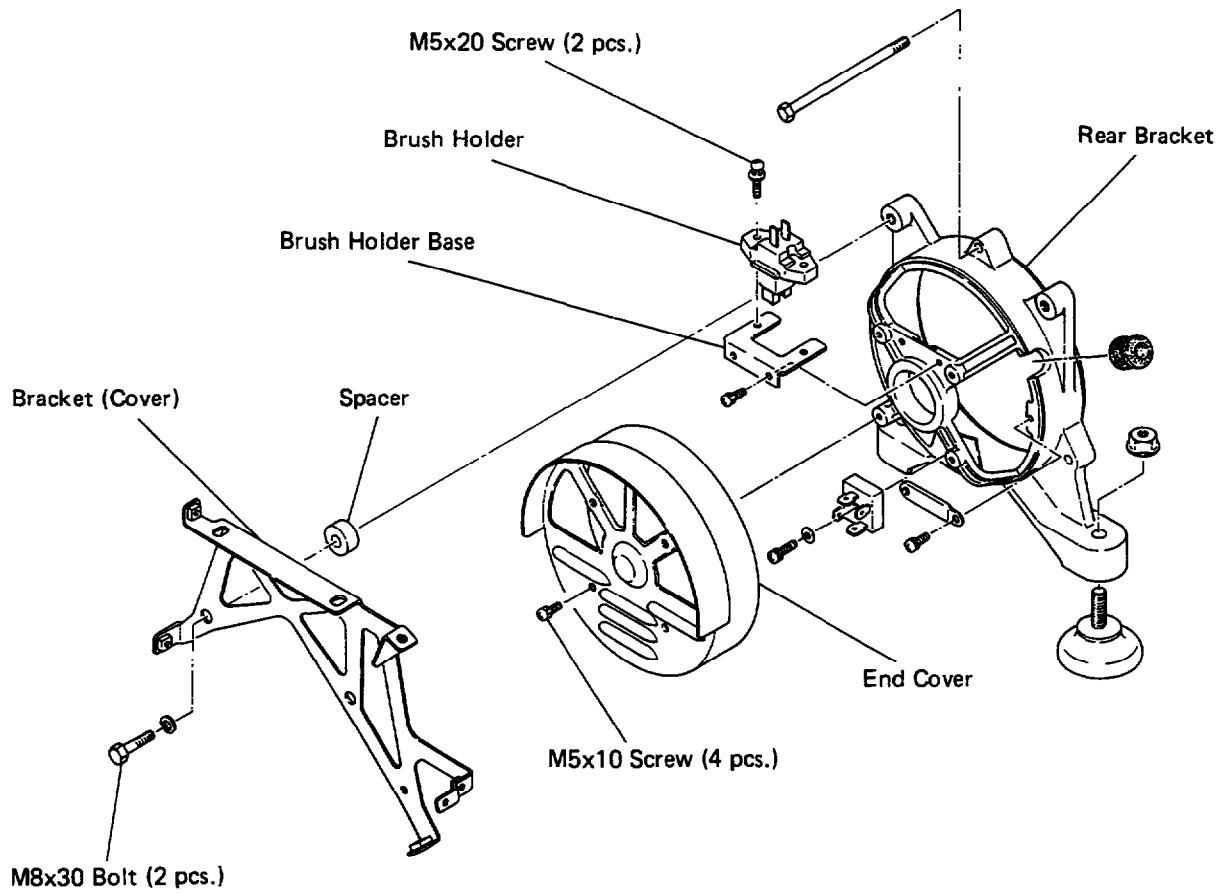


Fig. 9-4-25

### 9-4-25 FUEL TANK

- (1) Insert the fuel pipe into the fuel strainer joint at the bottom of the fuel tank and secure it with a clamp.
- (2) Secure the attaching bracket at the bottom of the fuel tank and the blower housing with M6 x 12 bolts. Insert the attaching bolts into the bracket cover hole and secure it with two M8 nuts.

### 9-4-26 FUEL TANK HANDLE

- (1) Match the handle hole with the bolt on the top of the fuel tank and clamp it with a M8 nut.
- (2) Completely insert the breather pipe over the thrusting section of the bolt.

Note: There is a hole at a center of the rubber pipe for the air bread. Set the rubber pipe so that the hole is positioned in the upper side.

- (3) Fit both edges of the handle cover with M3 x 10 screws.

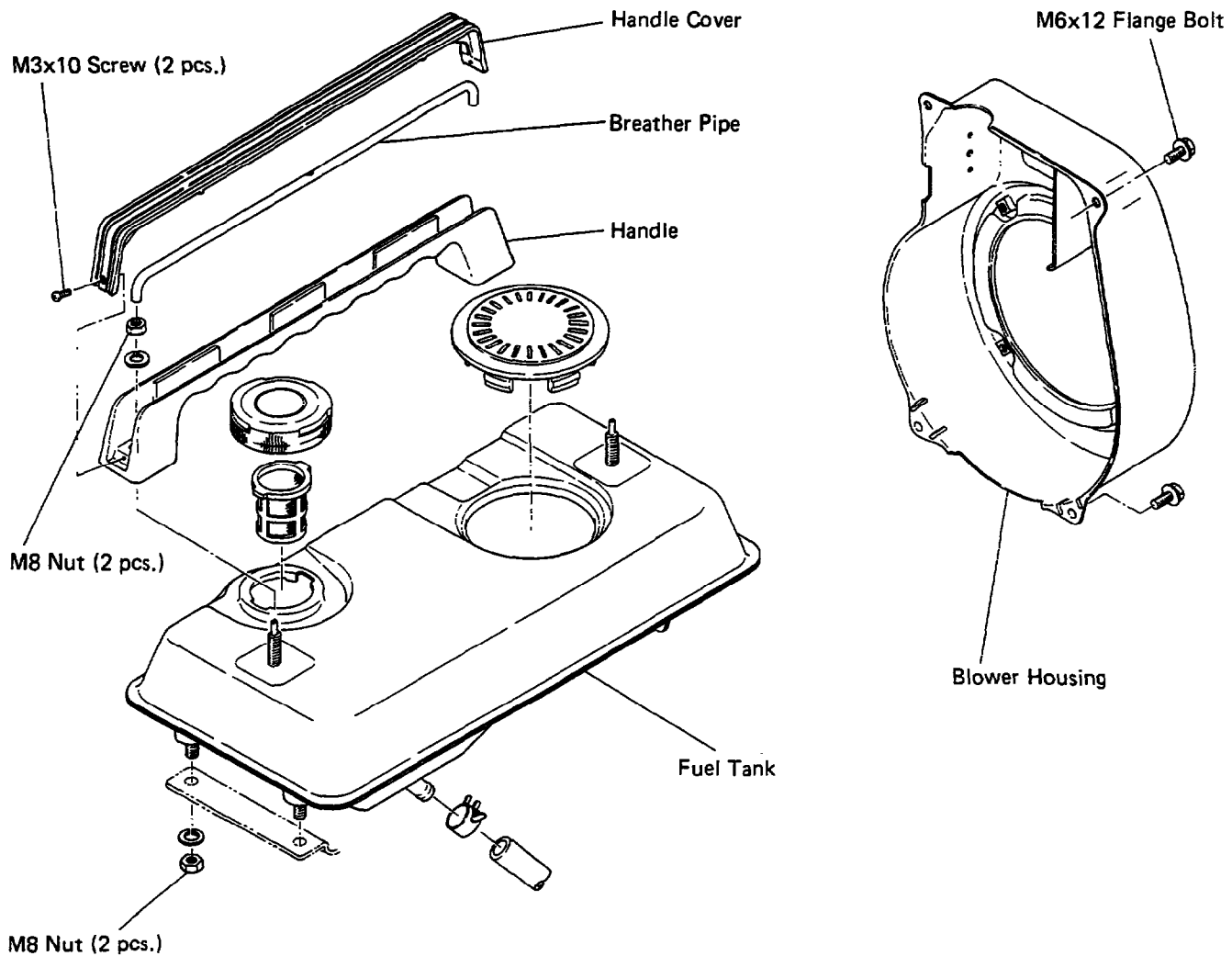


Fig 9-4-26

#### 9-4-27 FUEL PIPE (CONNECTION)

- (1) Mount the fuel strainer on the front cover.

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

- (2) Insert the fuel pipe into the fuel inlet/outlet port of the fuel strainer and secure it with the clamp.

#### 9-4-28 FRONT COVER AND ELEMENT COVER

- (1) Secure the front cover, on which the AVR and fuel strainer have been mounted, with three M5 x 8 screws.
- (2) Secure the element cover with M6 x 12 screws.

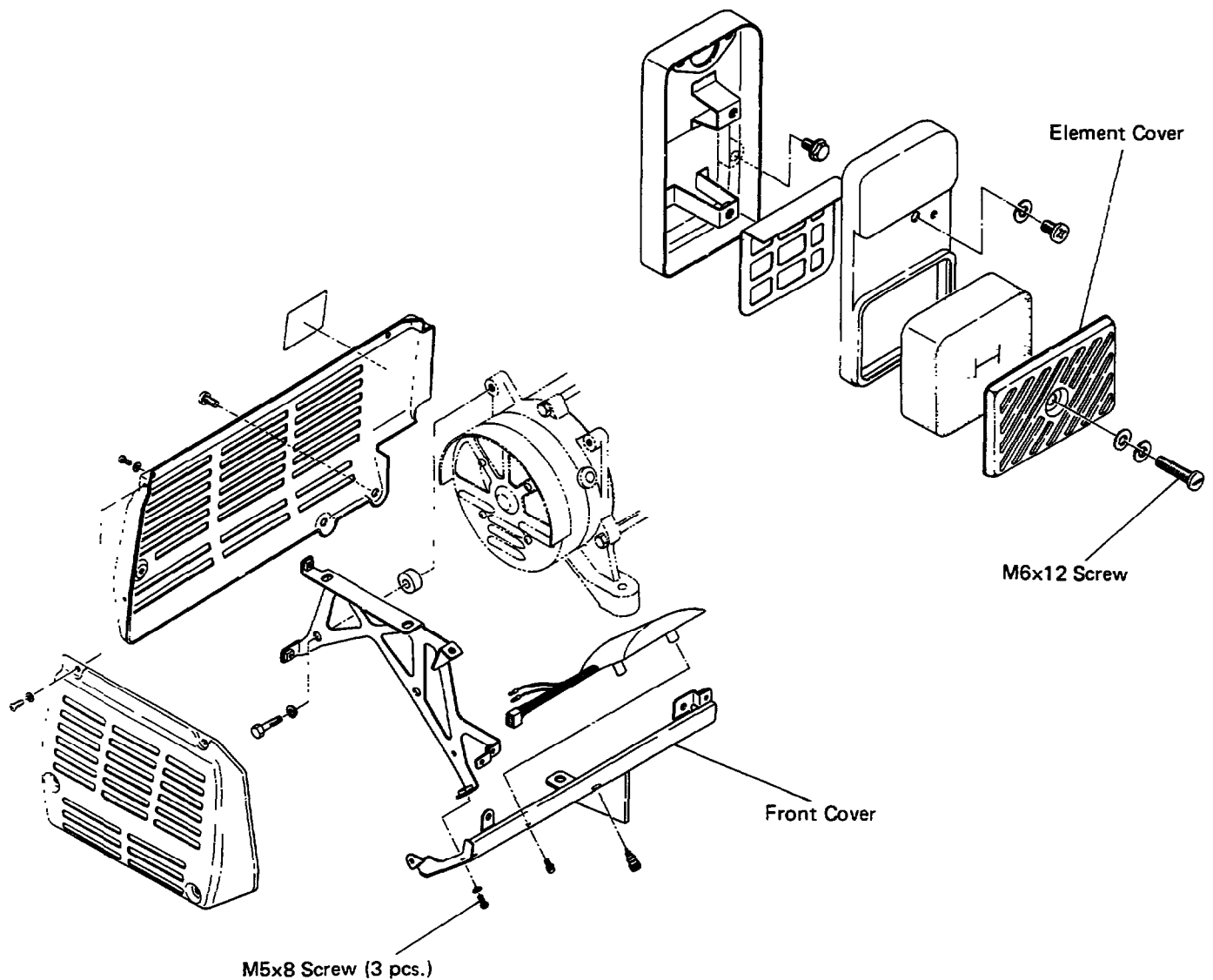


Fig 9-4-27

### 9-4-29 CONNECTION OF COUPLER AND PLUG

- (1) Connect the coupler (6P) from the generator with the coupler thrusting from the control panel.
- (2) Connect the coupler (4P) thrusting from the AVR with the coupler (4P) thrusting from the control panel.
- (3) Connect the plug for grounding.

### 9-4-30 CONTROL PANEL

- (1) Thrust the control lever through the control panel and secure it with four M5 x 8 screws.
- (2) Set the knob on the control lever.

Note: After the coupler and plug have been connected and secured to the control panel, secure the wire with the receptacle clamp on the control panel.

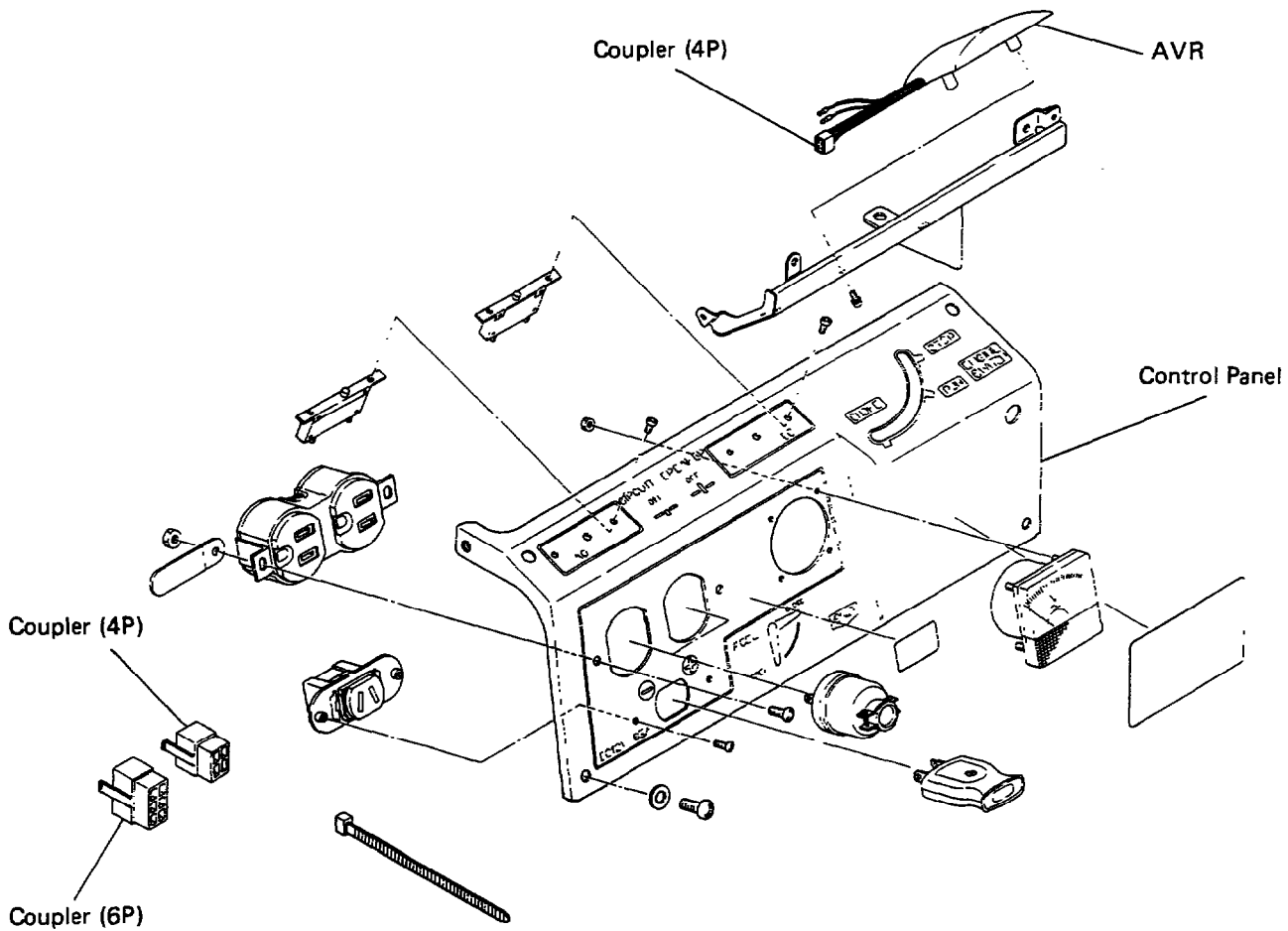


Fig. 9-4-28

9-4-31 REAR COVER

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

9-4-32 SIDE COVER

Secure the side cover with four M5 x 8 screws.

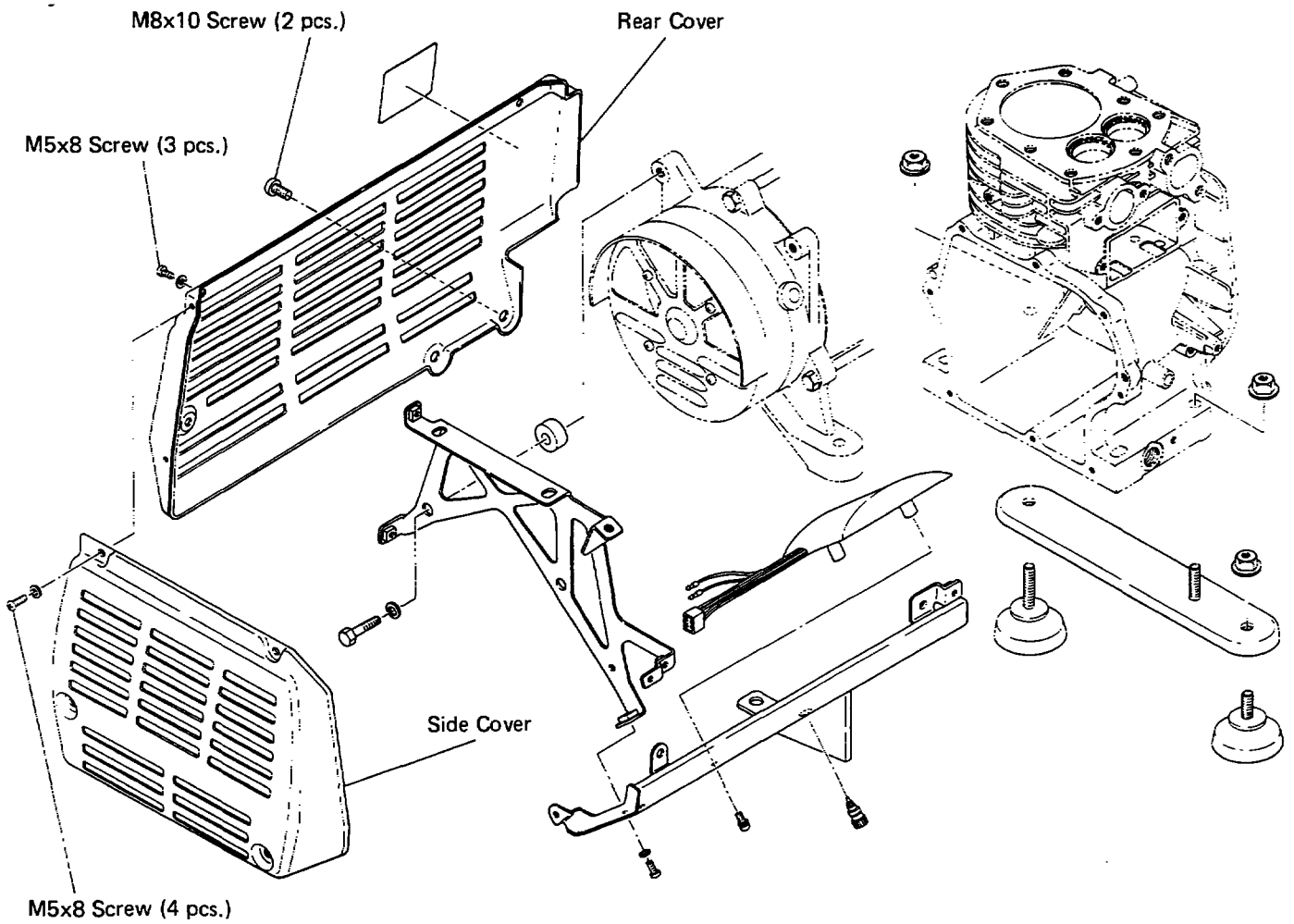


Fig. 9-4-29

## **9-5 CARBURETOR**

### **9-5-1 FUNCTION AND STRUCTURE**

#### **(1) Float System**

The float chamber is located directly under the carburetor. The float and the needle valves maintain a constant fuel level inside the float chamber while the engine is running.

The fuel in the tank flows into the float chamber through the needle valve. When a certain quantity of the fuel enters the chamber the float rises and when the buoyancy of the valve balances with the fuelin-flow pressure the needle valve is interrupted to keep the fuel at the correct level.

#### **(2) Pilot System**

The system controls the fuel supply for engine speeds ranging from idling to low-speed running. The fuel flows through the main jet into the pilot jet where the fuel quantity is measured. Then, the fuel is mixed with air measured in the pilot air jet, and is supplied from the pilot outlet by-pass to the engine. Fuel for idling is supplied mainly from the pilot outlet.

#### **(3) Main System**

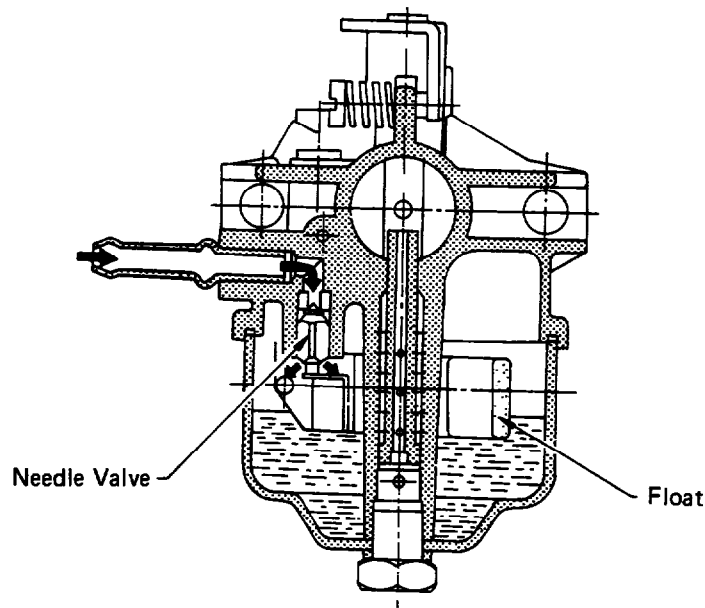
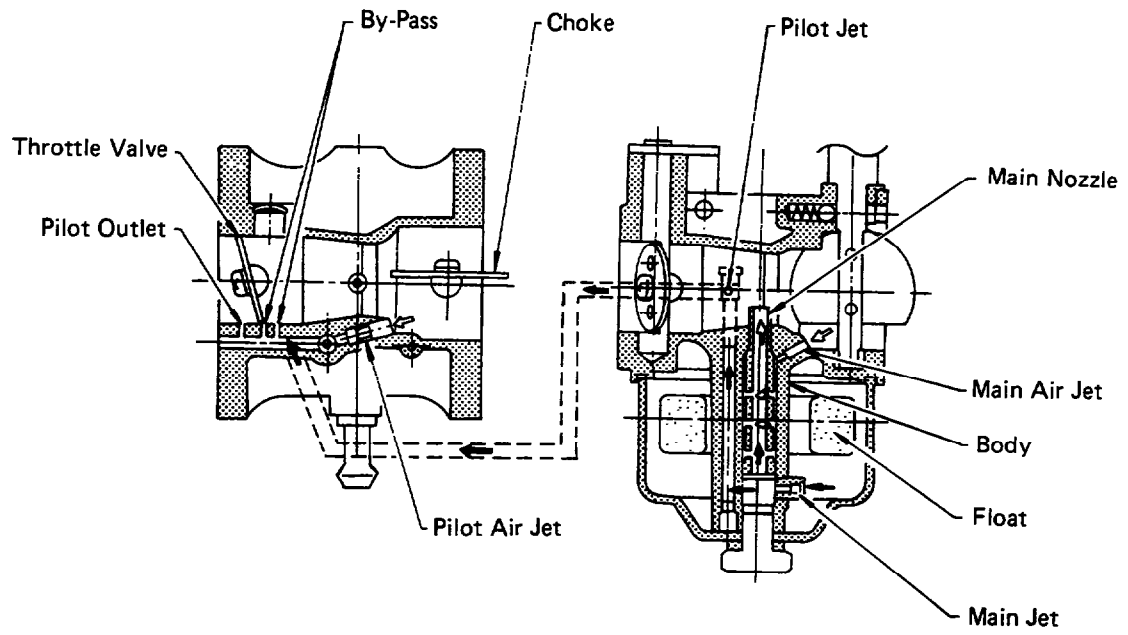
The system supplies fuel for medium and high speed operations. The fuel is measured in the main jet, and then flows into the main nozzle. Air measured in the main air jet mixes with the fuel from the bleed hole of the main nozzle bursting into the main bore in the form of gas mist. Then it is again mixed with air inducted through the air cleaner to get appropriate density, and finally it is supplied to the engine.

#### **(4) Choke System**

The choke system helps start the engine in cold weather.

When the choke is closed and the engine is started, the load to the main nozzle increases and inducts a large quantity of fuel, thus facilitating starting.

**Schematic Diagram of the Fuel System**



*Fig. 9-5-1*



## 9-5-2 DISASSEMBLY AND ASSEMBLY OF CARBURETOR

The most common trouble with the carburetor, apart from mechanical ones, is failure to provide the correct air-fuel mixture. This is generally caused by blockage in the air and fuel channels or fuel level fluctuation. In order to maintain the carburetor in a normal operating condition, it is vital to keep the air and fuel channels always clean so that the fuel flows normally. Disassembling and assembling procedures are as shown below (Refer to Fig. 9-5-2).

### (1) Throttle System

- ① Remove the cross-screw (31), the throttle valve (26), and then pull out the throttle shaft (27).
- ② When the throttle stop screw (29) is removed, the spring (28) will also come off. Be careful when handling the throttle valve not to damage the valve edge.

### (2) Choke System

- ① Remove the cross screw (20), and the choke valve (21), and then pull out the choke shaft (22).
- ② When installing the choke shaft be sure to keep the notch of the choke valve in the main air jet side.

### (3) Pilot System

- ① Remove the pilot jet (30). When removing it, use a proper tool so that the nozzle will not be damaged.
- ② Firmly fix the pilot jet when assembling the carburetor. Otherwise fuel leakage will occur resulting in engine trouble.

### (4) Main System

- ① Remove the bolt (18) and the float chamber body (16).
- ② Remove the main jet (19) from the body (12).
- ③ When assembling, firmly fix the main jet. Otherwise the air-fuel mixture will become too rich, causing engine troubles.
- ④ Torque for the bolt (18) is 70 kg-cm.

### (5) Float System

- ① Pull out the float pin (15), and then remove the float (14) and the needle valve (23). When replacing the needle valve, exchange it with a rubber needle.

\* Don't use a wire or a drill to clean the fuel passages (they may damage the orifice controlling the fuel flow). Use compressed air.

\* The float pin is peen-secured to the carburetor body; the needle valve can be removed from the opposite side of the peen-secured part by slightly striking the float with a thin bar-like object.

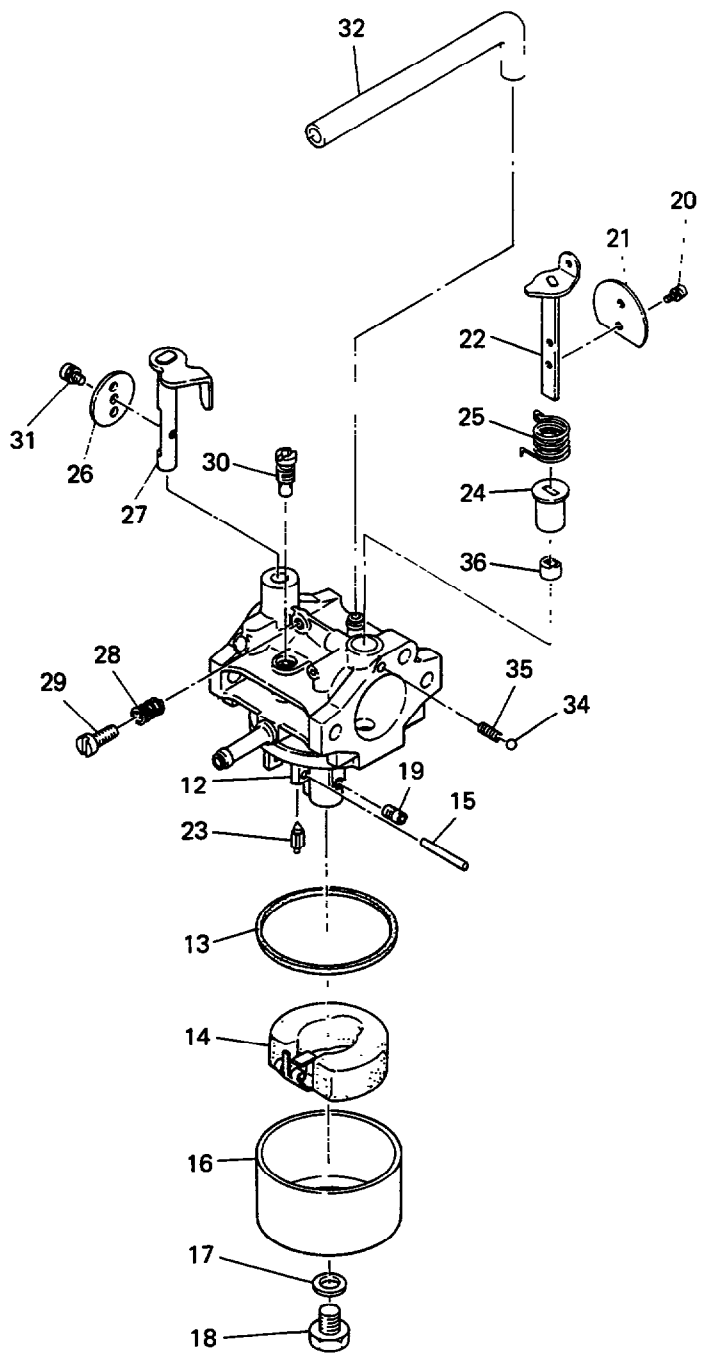


Fig. 9-5-2

## **10. SAFETY PRECAUTIONS**

### **10-1 FIRE PREVENTION**

- (1) Keep the generator away from combustible materials during operations, or ground the generator by making use of its grounding terminal. Take special precautions towards flammable substances.
- (2) Do not run the generator in an inclined position. Avoid moving the generator while it is running. Otherwise, there is a risk of the generator falling or fuel leakage.
- (3) If the generator is enclosed or covered by an object while running, cooling efficiency will become lower, which may result in over-heating of the generator.
- (4) Keep the generator at least 1 m away from a building.
- (5) Be sure to stop the engine before filling the fuel tank. If the fuel is filled while the engine is running, fuel vapor from the fuel tank or spilt fuel may be ignited, thus causing a fire.
- (6) Fuel used in an engine is very volatile and flammable. Take special precautions not to spill the fuel when filling the fuel tank. If the fuel is spilt, wipe it off thoroughly and let it dry before restarting the engine.
- (7) Be sure to fill the fuel only up to the level specified at the fuel supply port.
- (8) When filling the fuel tank, be careful not to smoke or use an open flame.

### **10-2 PRECAUTIONS FOR EXHAUST GASES**

- (1) Don't use the generator in poorly ventilated places such as an office, warehouse, narrow tunnel, well, hold, or tank etc. If the generator is used in such places as mentioned above, the operator may suffer carbon monoxide poisoning.
- (2) Always direct the exhaust port toward the well ventilated open space.

### **10-3 OTHER PRECAUTIONS**

- (1) To prevent electric shock, don't handle the generator with wet hands. When the generator is used to drive a submersible pump or other similar equipment, be sure to connect the earth cord of the generator to the earth cable of the pump.
- (2) Don't splash water over the generator and avoid using the generator in the rain. If the generator gets wet, it may fail to start smoothly and the operator may possibly receive severe electric shock.
- (3) Never connect the generator to the existing indoor cable. If connected, the generator will burn out.
- (4) Don't use the generator with its cover removed as the operator may be injured or receive electric shock.

## 11. TROUBLESHOOTING

Most generator troubles are caused by carelessness in routine handling, insufficient checks, or indifference to a slight trouble. In this section the causes and remedies to the major troubles concerning the generator are introduced. Generally speaking, the causes of the troubles are different case by case. An operator of this engine, when encountered with a trouble, should determine the cause, supplementing the following criteria with his own experiences, and provide complete countermeasures.

### A. Starting Failures

- A-1 Compression is nonexistent.
- A-2 Compression is insufficient, or little.
- A-3 There is no fuel in the fuel tank.
- A-4 The fuel is contaminated by water or dust.
- A-5 The fuel flows only a little, or does not flow at all.
- A-6 The fuel does not enter into the float chamber of the carburetor.
- A-7 The fuel does not flow into the combustion chamber although the fuel exists in the float chamber of the carburetor.
- A-8 The carburetor is overflowed.
- A-9 Sparks do not come out from the tip of the high voltage cord, or the sparks are weak, if any.
- A-10 Sparks do not come out, or are weak, when the ignition plug is connected.

### B. Abnormal Running

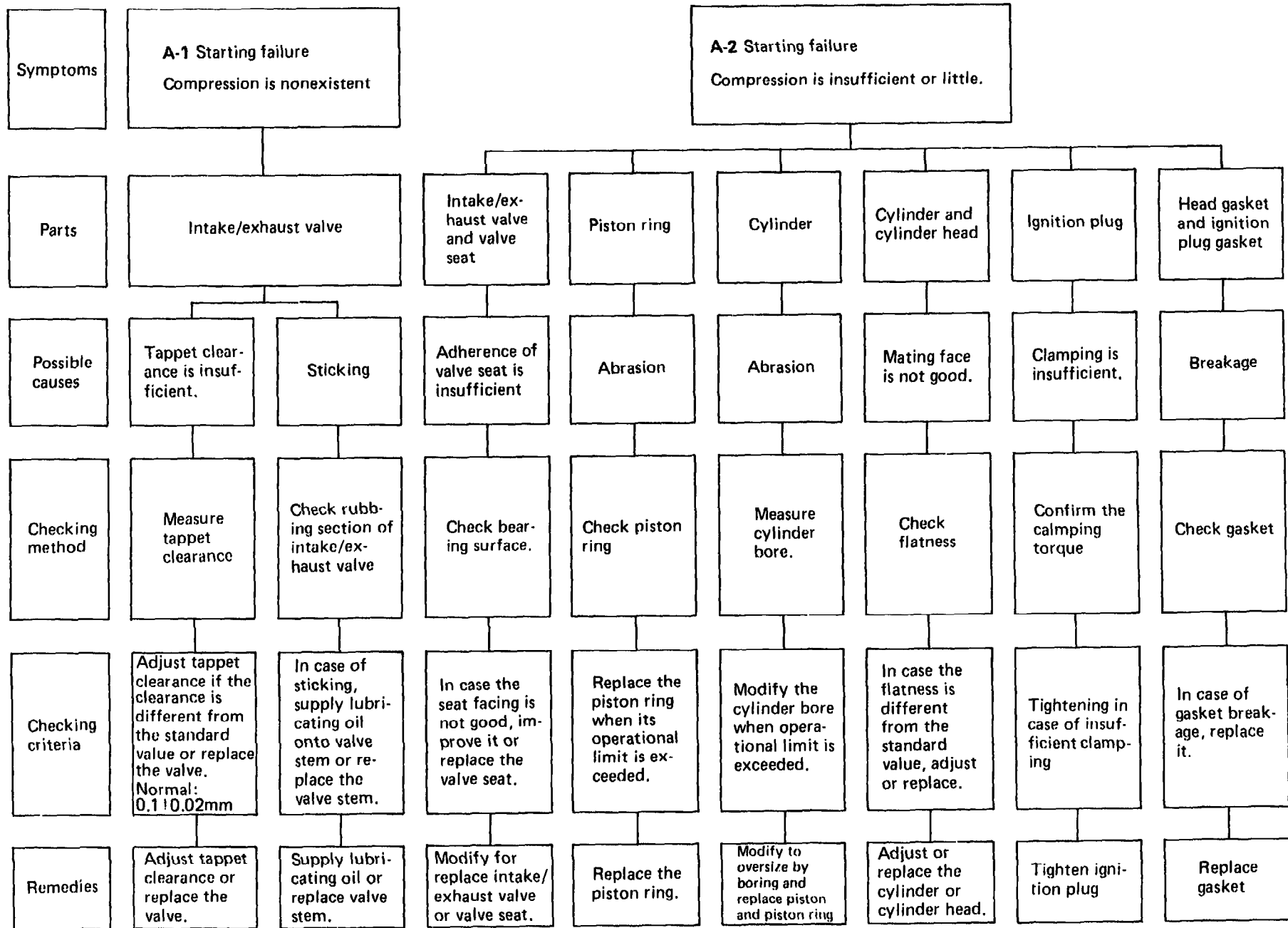
- B-1 Compression is insufficient.
- B-2 Overheating and knocking of the engine
- B-3 Fluctuation in rpm
- B-4 rpm of the engine does not increase.
- B-5 Missfire or explosion outside the tube.
- B-6 Engine lacks power (Air-fuel mixture blow back to the air cleaner).
- B-7 Fuel consumption is too high (Black exhaust gas comes out).
- B-8 Lubricant oil consumption is too high (White exhaust gas comes out).
- B-9 Excessive engine noise
- B-10 Abnormal noise is generated and the engine stops suddenly.
- B-11 The lubricating oil becomes diluted and its consumption rate increases.

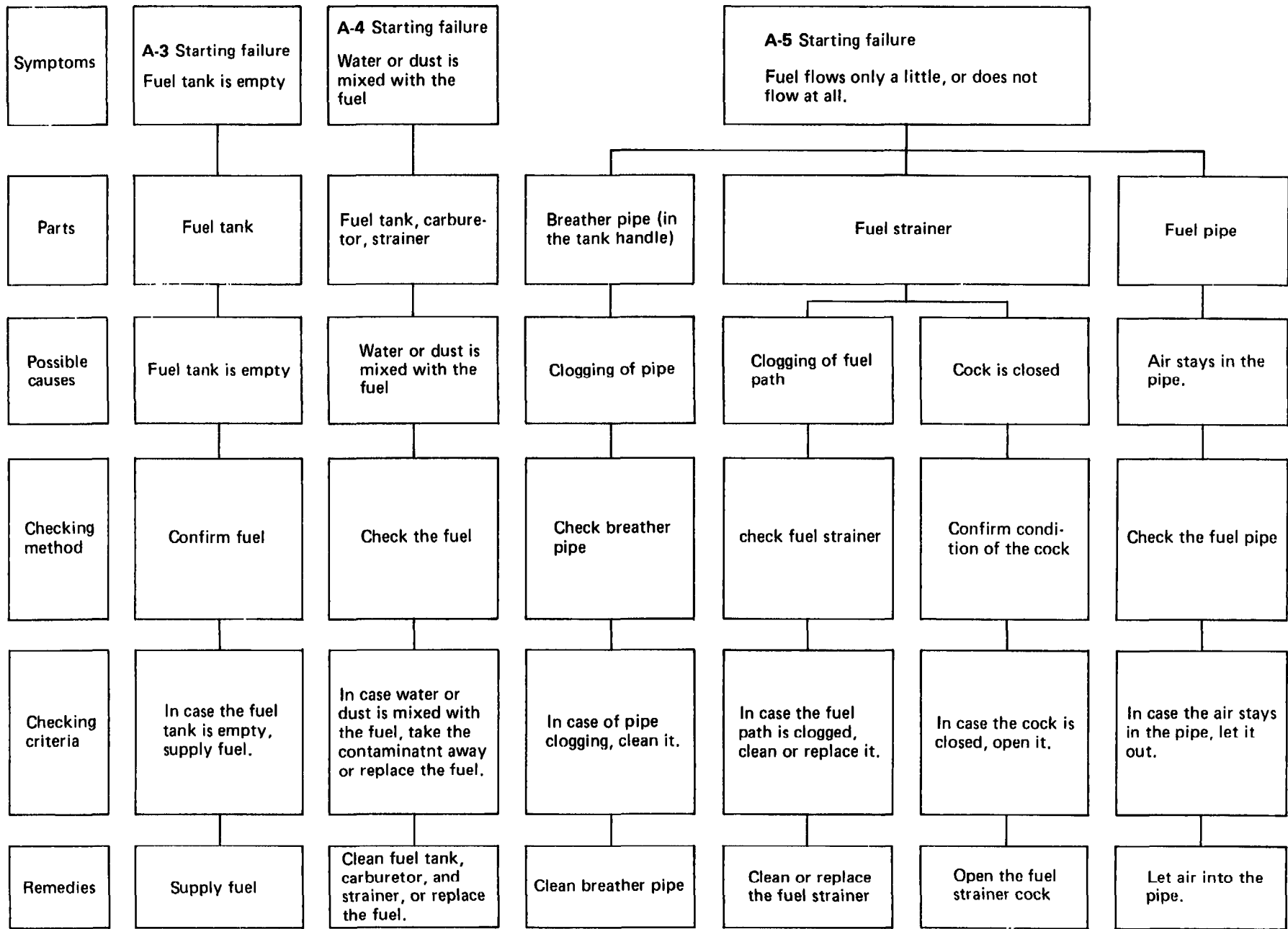
### C. Failure of Indications on the Control Panel

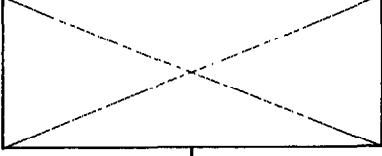
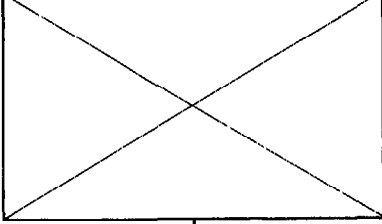
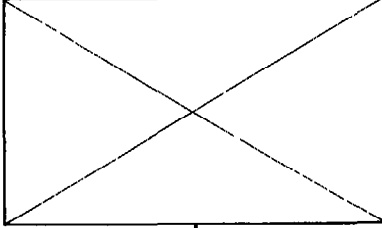
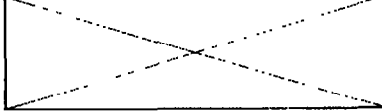
- C-1 No voltage output (1).
- C-2 No voltage output (2).

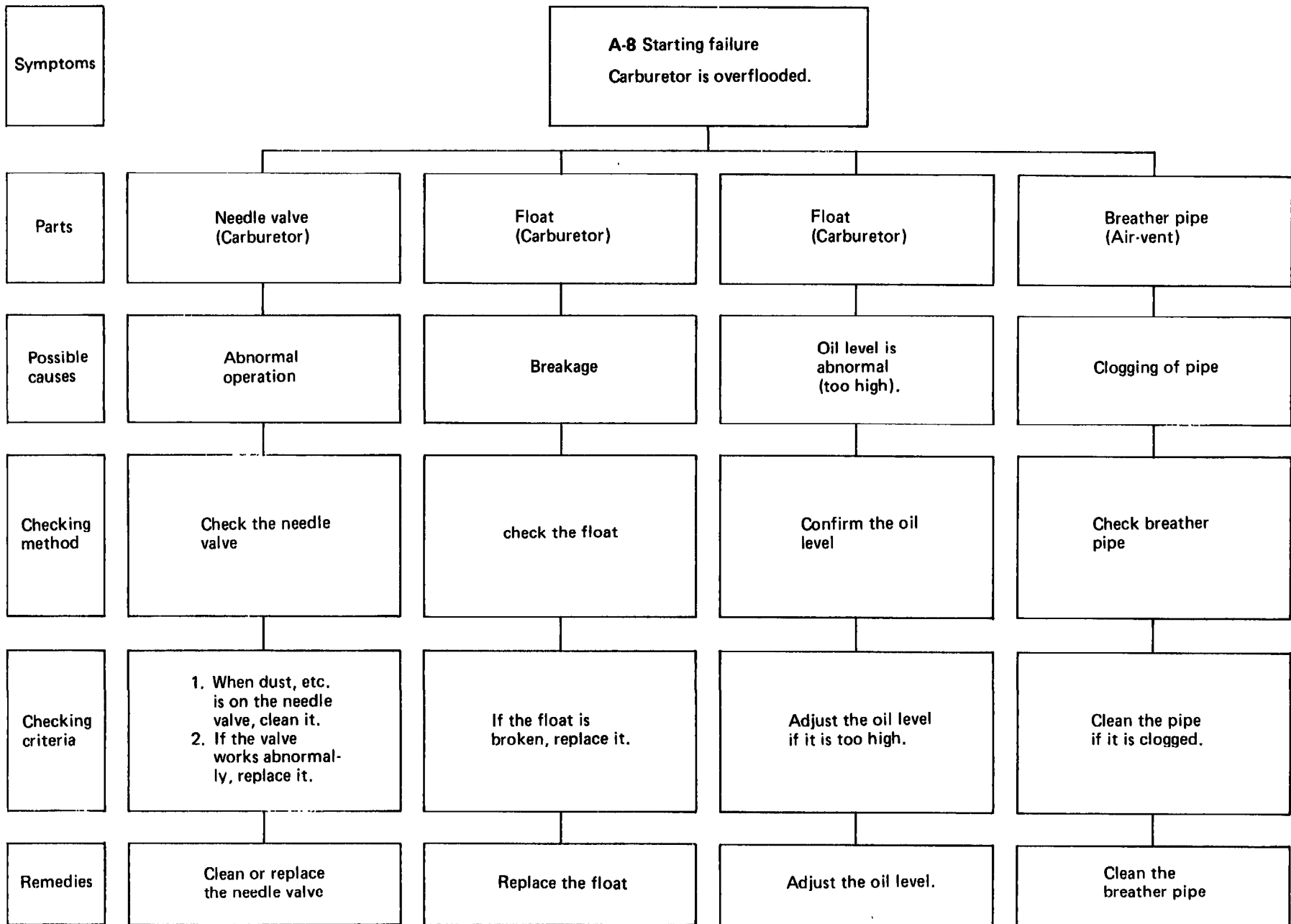
### D. Abnormal Voltage Output

- D-1 No DC voltage output.
- D-2 Voltage is abnormally high.
- D-3 Voltage is abnormally low (1).
- D-4 Voltage is abnormally low (2).

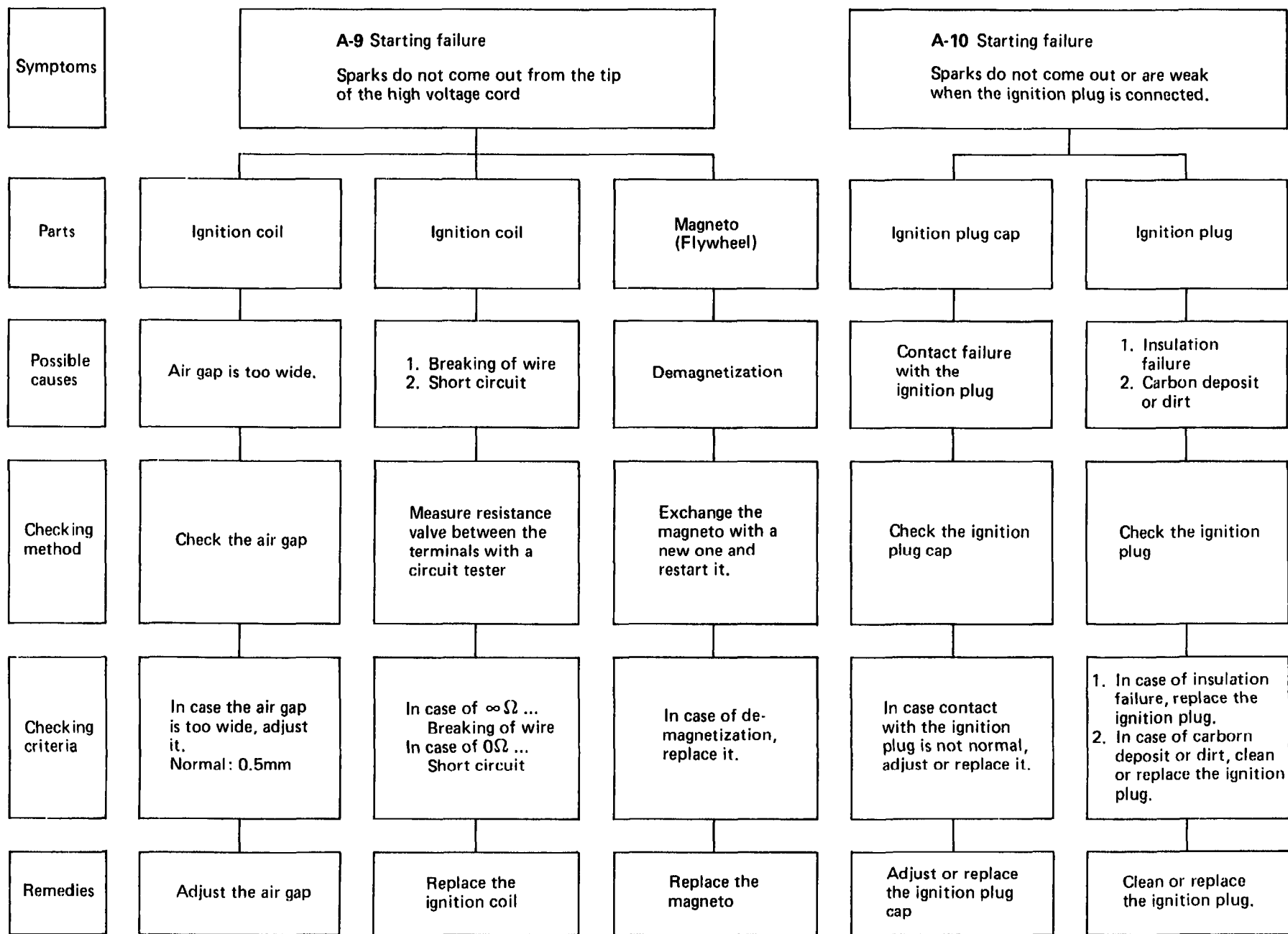


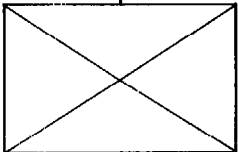
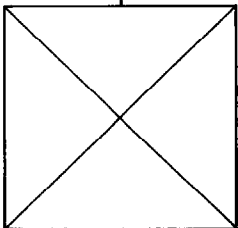
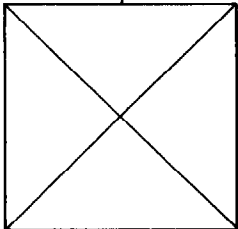
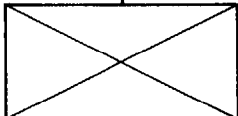


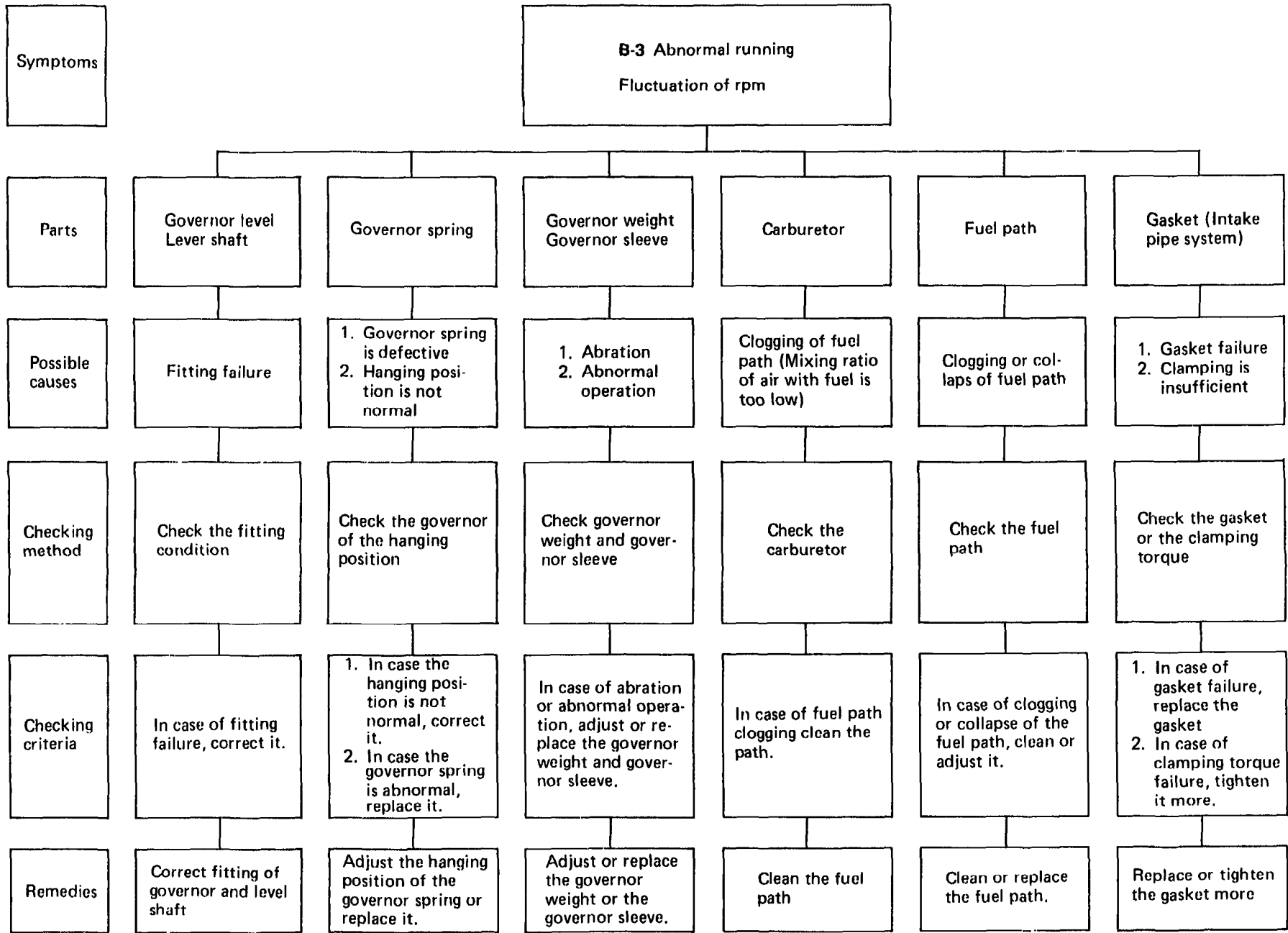
Symptoms	<b>A-6 Starting failure</b> The fuel does not enter into the float chamber of the carburetor	<b>A-7 Starting failure</b> The fuel does not flow into the combustion chamber although the fuel exists in the float chamber of the carburetor.		
Parts	Needle valve (Carburetor)	Fuel path (Carburetor)	Packing (Carburetor)	<b>A-1, A-2</b> Refer to the clause of compression failure
Possible causes	Needle valve does not work well	Clogging of fuel path	1. Packing failure 2. Clamping is insufficient	
Checking method	Check the needle valve.	Check the fuel path	Packing or clamping torque check	
Checking criteria	1. If the needle valve is contaminated with dust, etc., clean it. 2. In case the valve does not work well, replace the valve.	If the fuel path is clogged, clean it.	1. In case of packing failure, replace it. 2. In case of clamping torque failure, tighten it more.	
Remedies	Clean or replace the needle valve.	Clean the fuel path.	Replace the packing or tighten it more.	

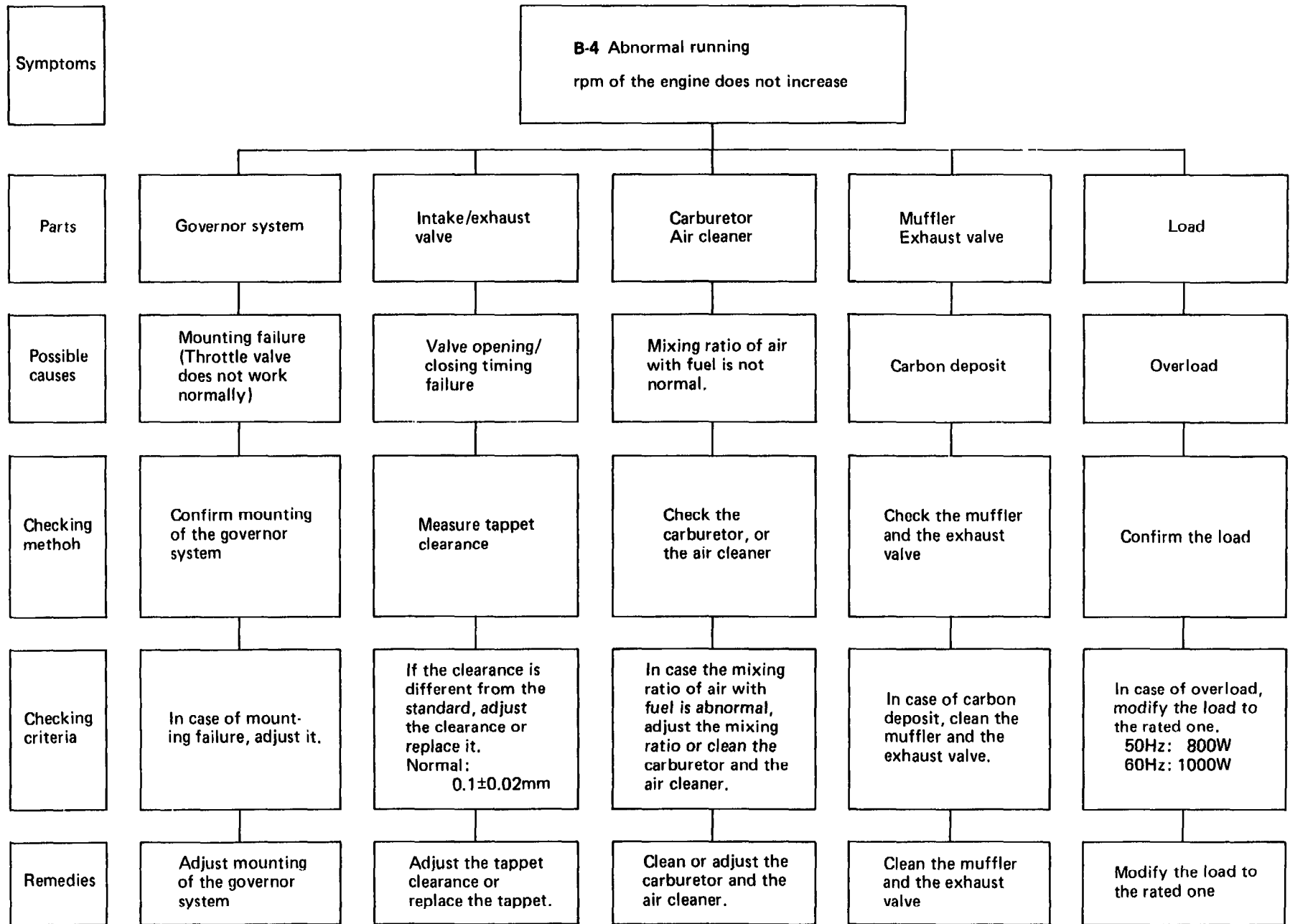


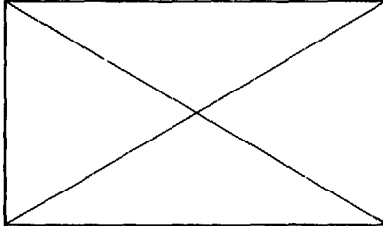
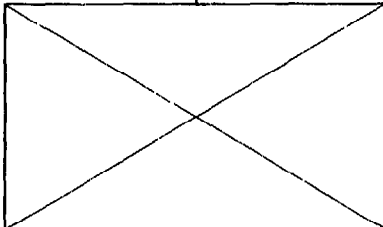
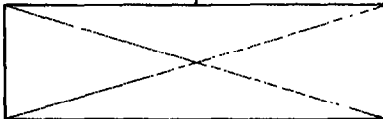


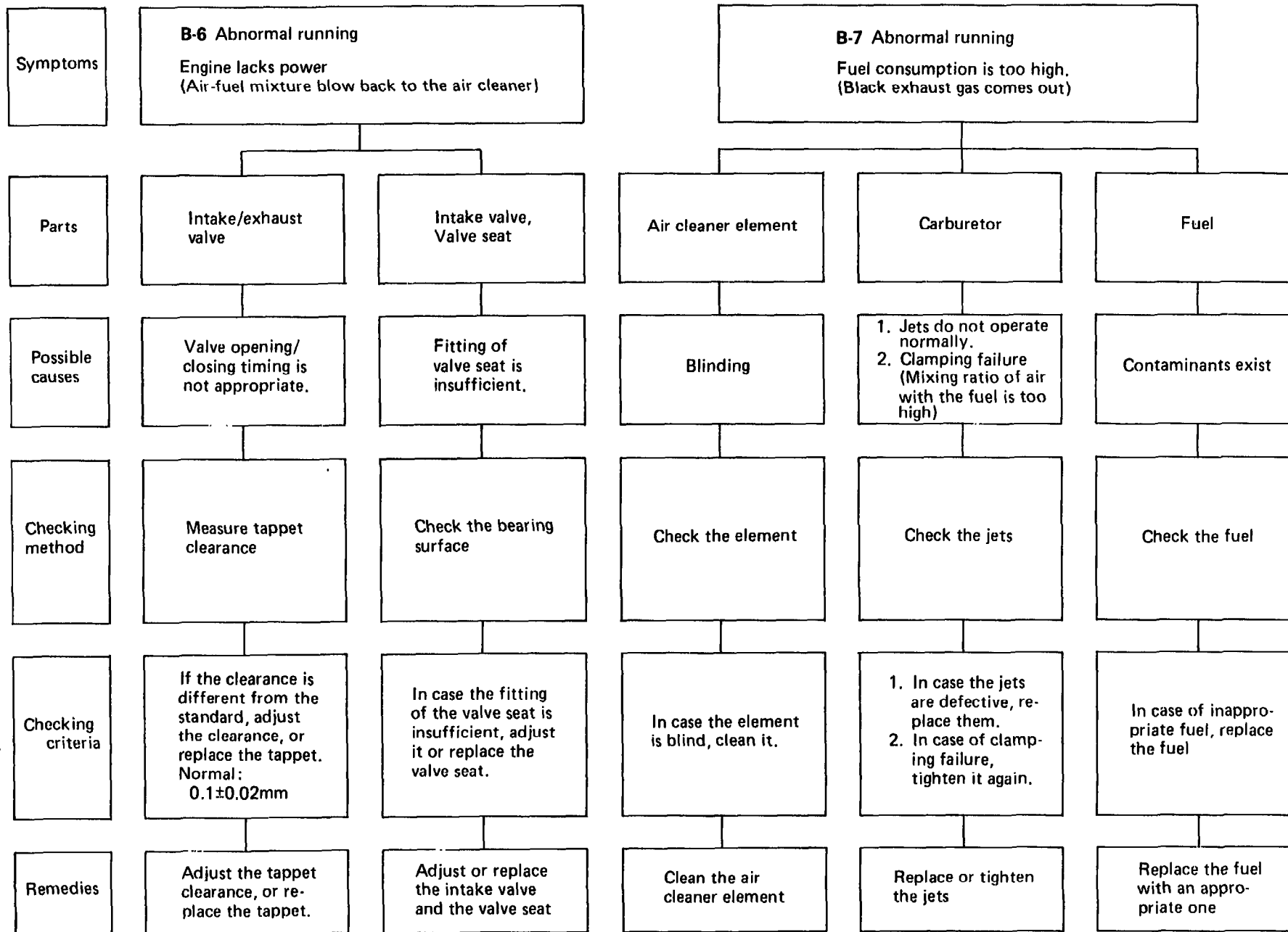


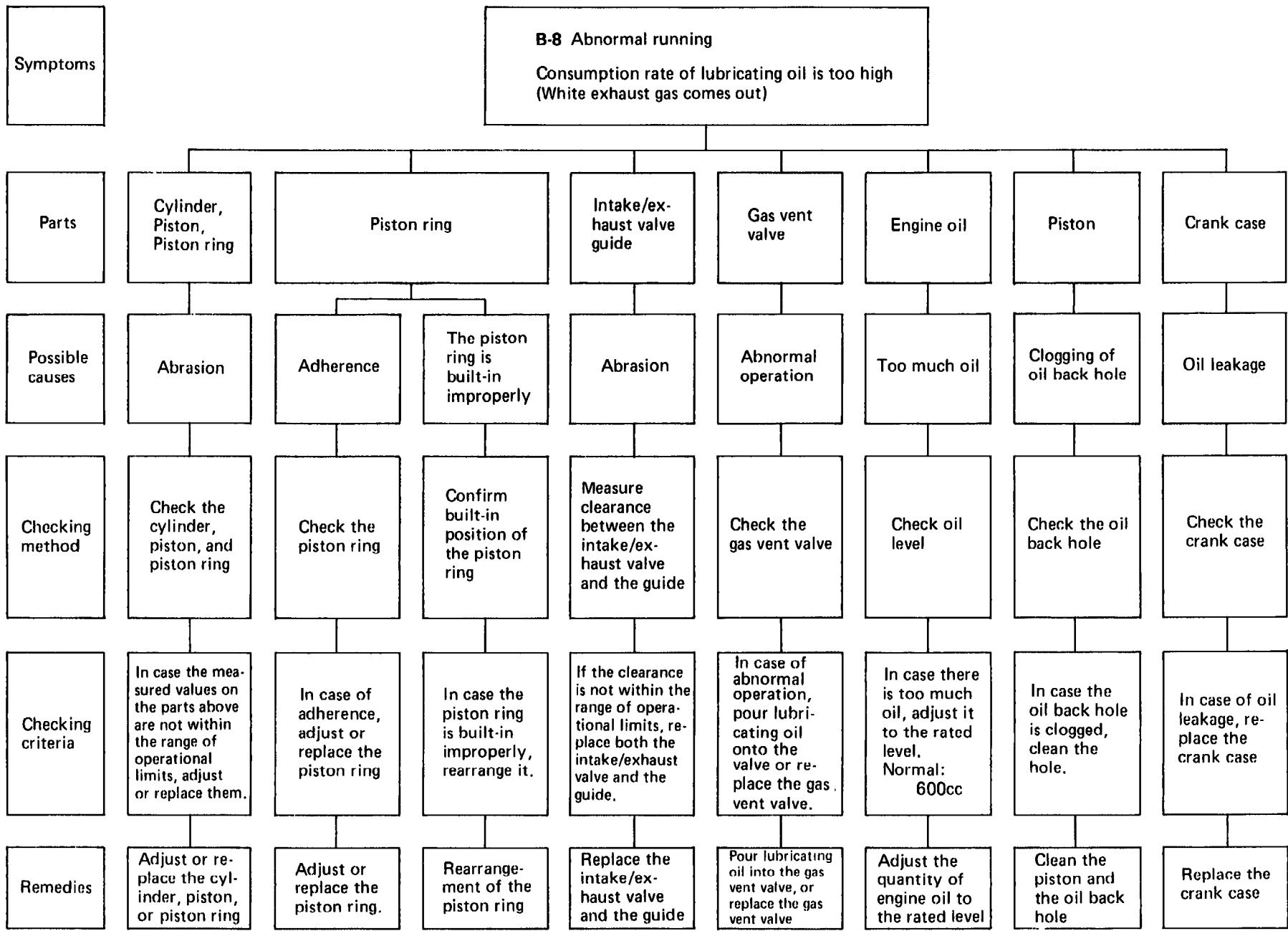
Symptoms	<b>B-1 Abnormal running</b>	<b>B-2 Abnormal failure</b> Overheating and knocking of the engine				
Parts	Refer to A-1 and A-2 (Clauses on compression failure)	Cylinder, Cylinderhead	Cylinder, muffler, exhaust hole	Carburetor	Load	Ignition plug
Possible causes		Dirt in cooling fin	Carbon deposit	Clogging of fuel path (Mixing ratio of air with fuel is too low)	Overload	Heat value is inappropriate
Checking method		Check the cooling fin	Check the cylinder head, muffler, and the exhaust hole.	Check the carburetor	Confirm the load	Confirm the ignition plug
Checking criteria		In case the cooling fin is dirty, clean it.	In case of carbon deposit, clean it.	In case of fuel path clogging, clean it.	In case of overload, modify it to the rated load. 50Hz: 800W 60Hz: 1000W	When an ignition plug not specified is used, exchange it with a specified one.
Remedies		Clean the cooling fin	Clean the cylinder head, muffler, and the exhaust hole.	Clean the fuel path.	Modify the load to the rated one.	Exchange the ignition plug with a specified one.

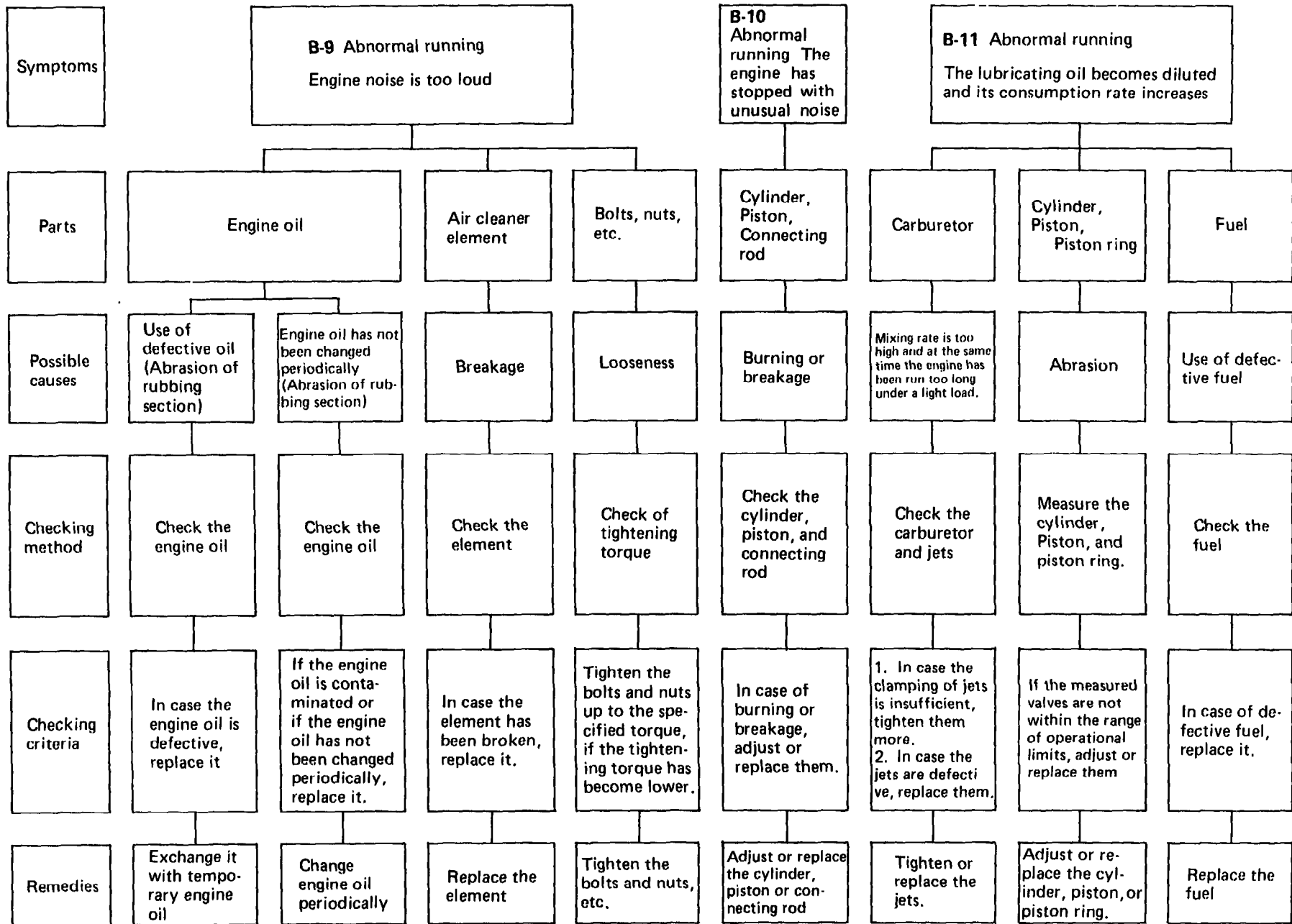




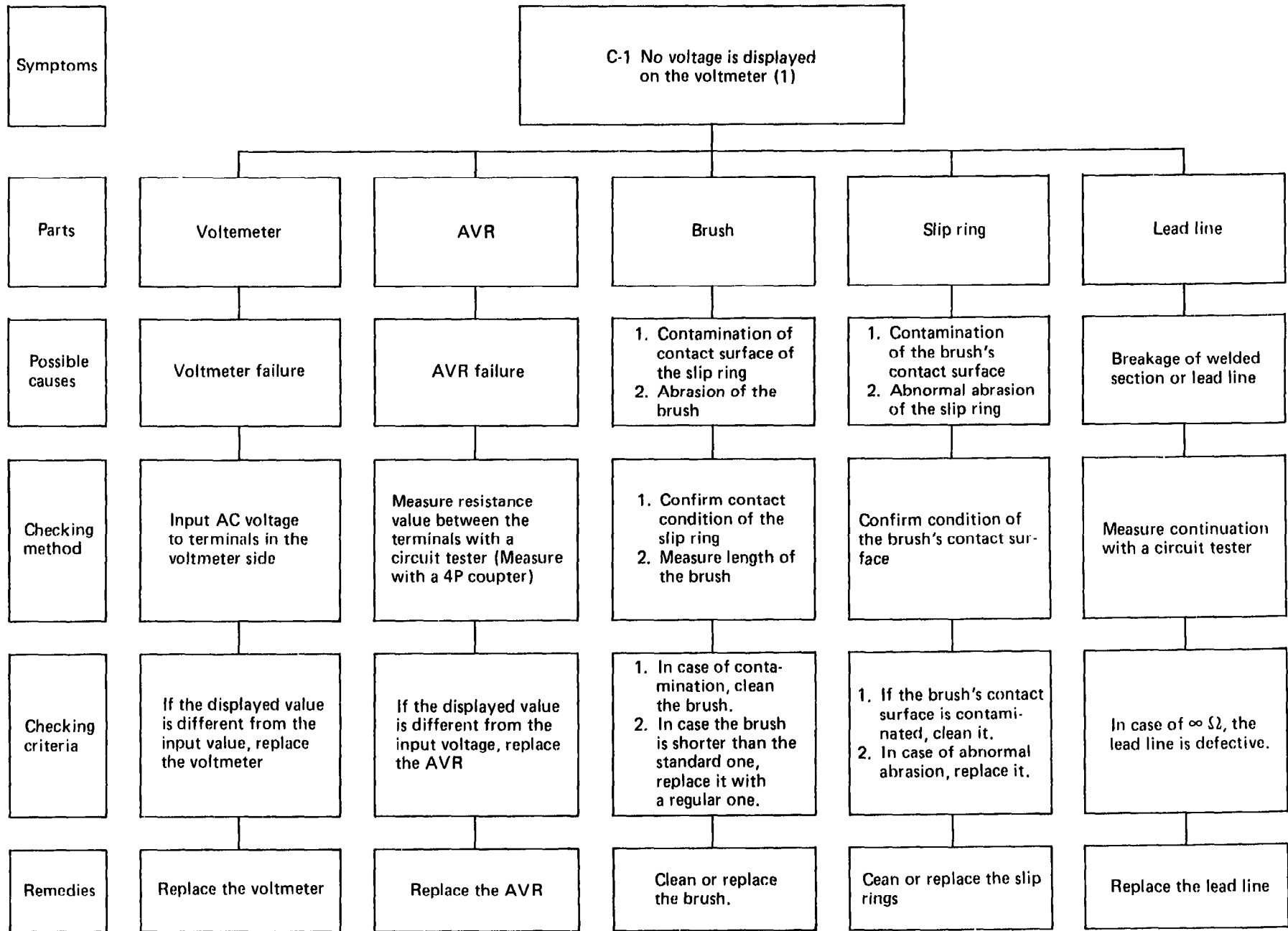
Symptoms	<b>B-5 Abnormal running</b> Missfire or explosion outside the tube			
Parts	Intake/exhaust valve	Carburetor	Ignition coil	Fuel
Possible causes	Valve opening/closing timing is not appropriate.	<ol style="list-style-type: none"> <li>1. Jets do not operate normally</li> <li>2. Clamping failure (Mixing ratio of air with fuel is too high)</li> </ol>	Refer to A-9 "Starting failure"	Water is mixed with the fuel
Checking method	Measure tappet clearance	Check the jets		Check the fuel
Checking criteria	If the clearance is different from the standard, adjust the clearance or replace the tappet Normal: $0.1 \pm 0.02 \text{mm}$	<ol style="list-style-type: none"> <li>1. In case of jets failure, replace them.</li> <li>2. In case of clamping failure, tighten it again.</li> </ol>		In case water is mixed the fuel, replace the fuel
Remedies	Adjust the tappet clearance or replace the tappet.	Replace or tighten the jets.		Replace the fuel.

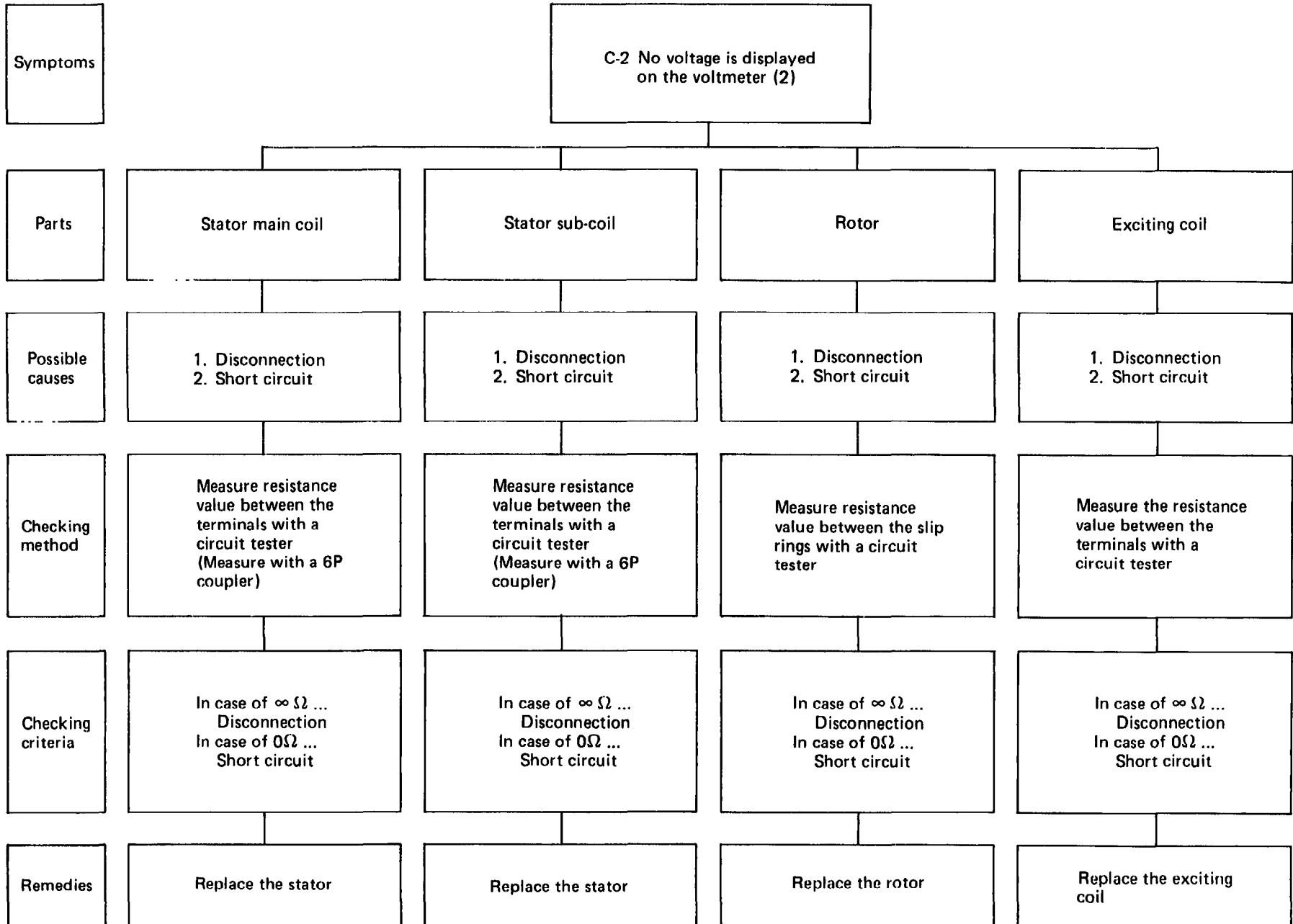


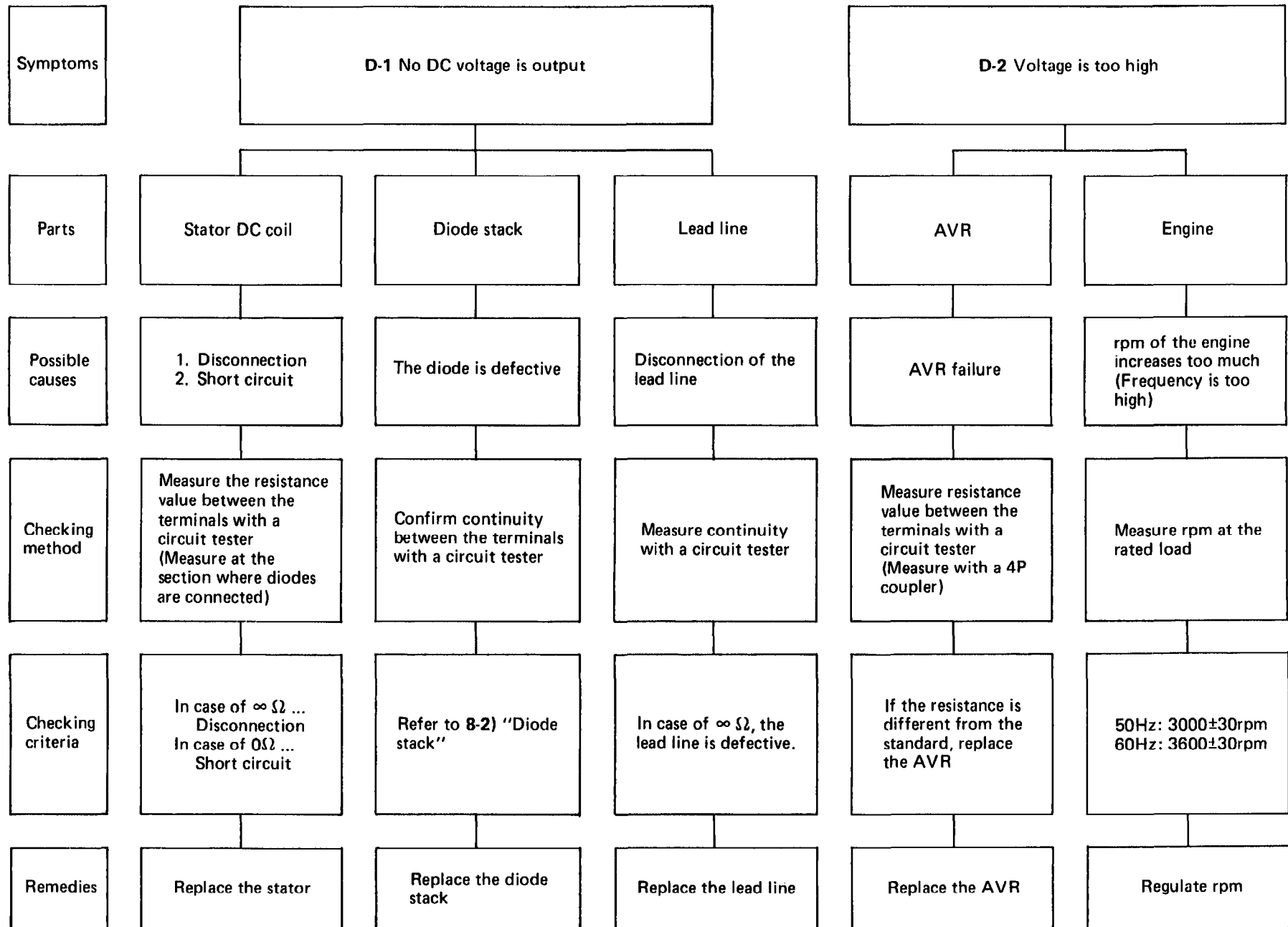


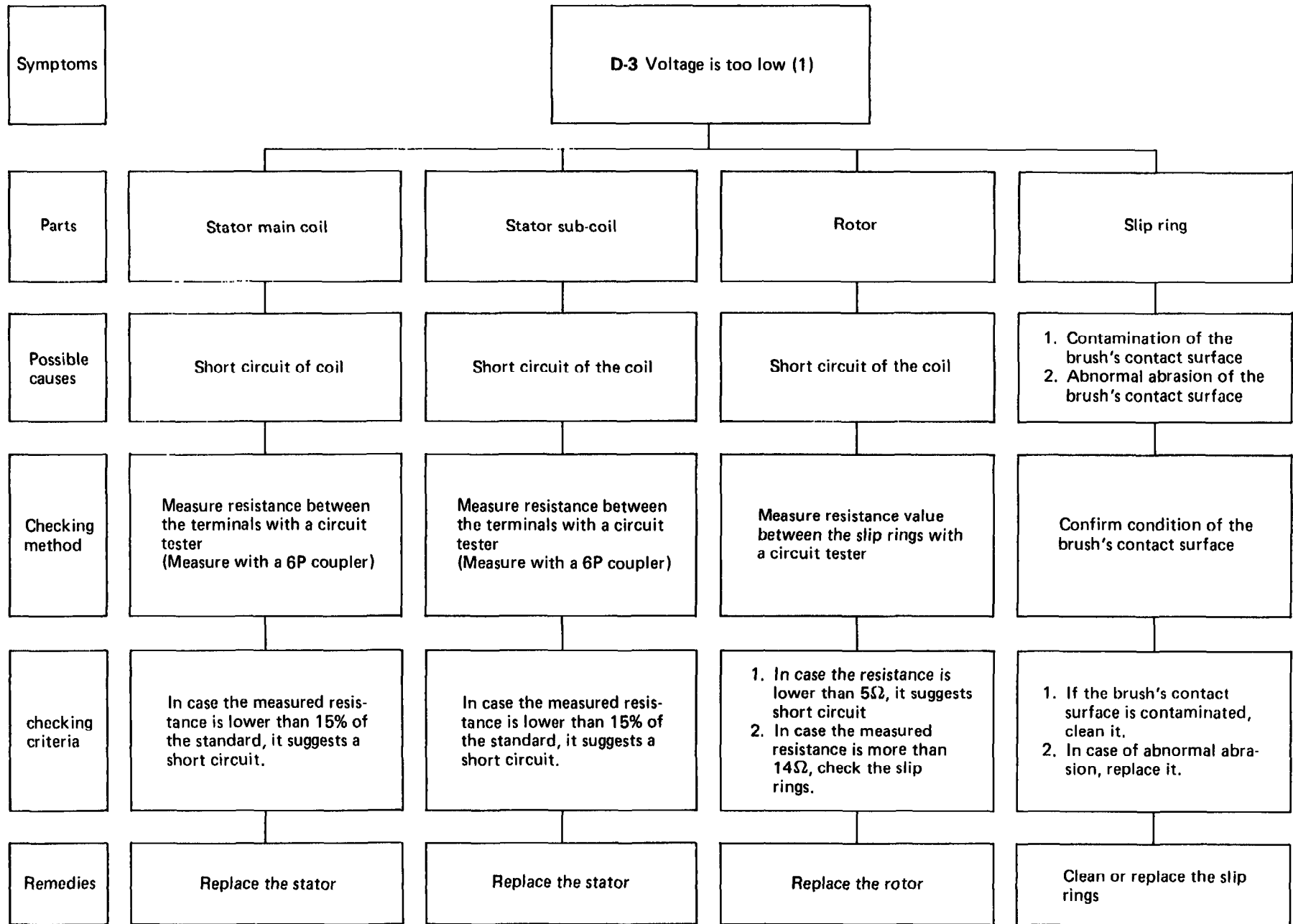


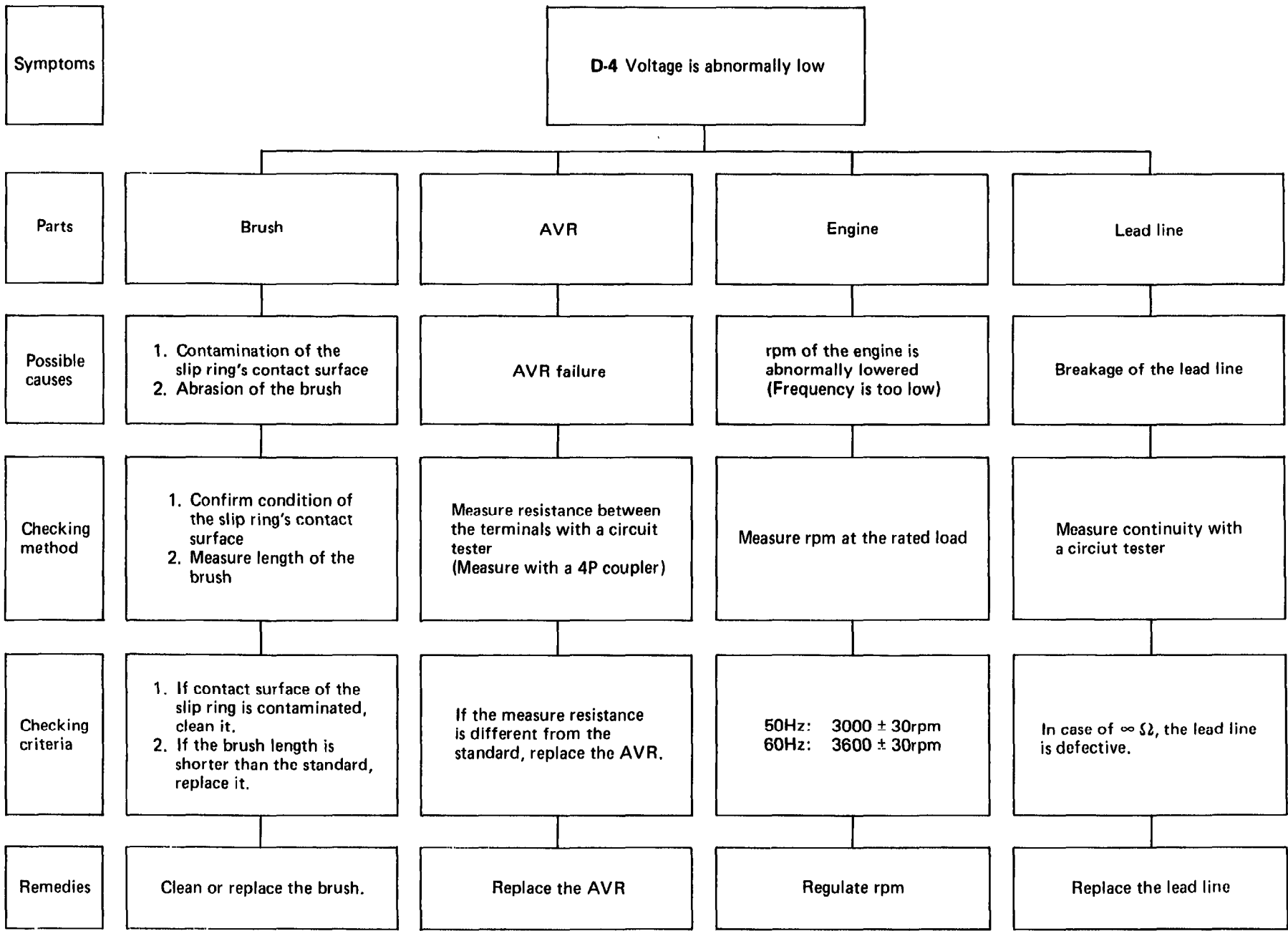












## 12. CRITERIA TABLE FOR ADJUSTMENT

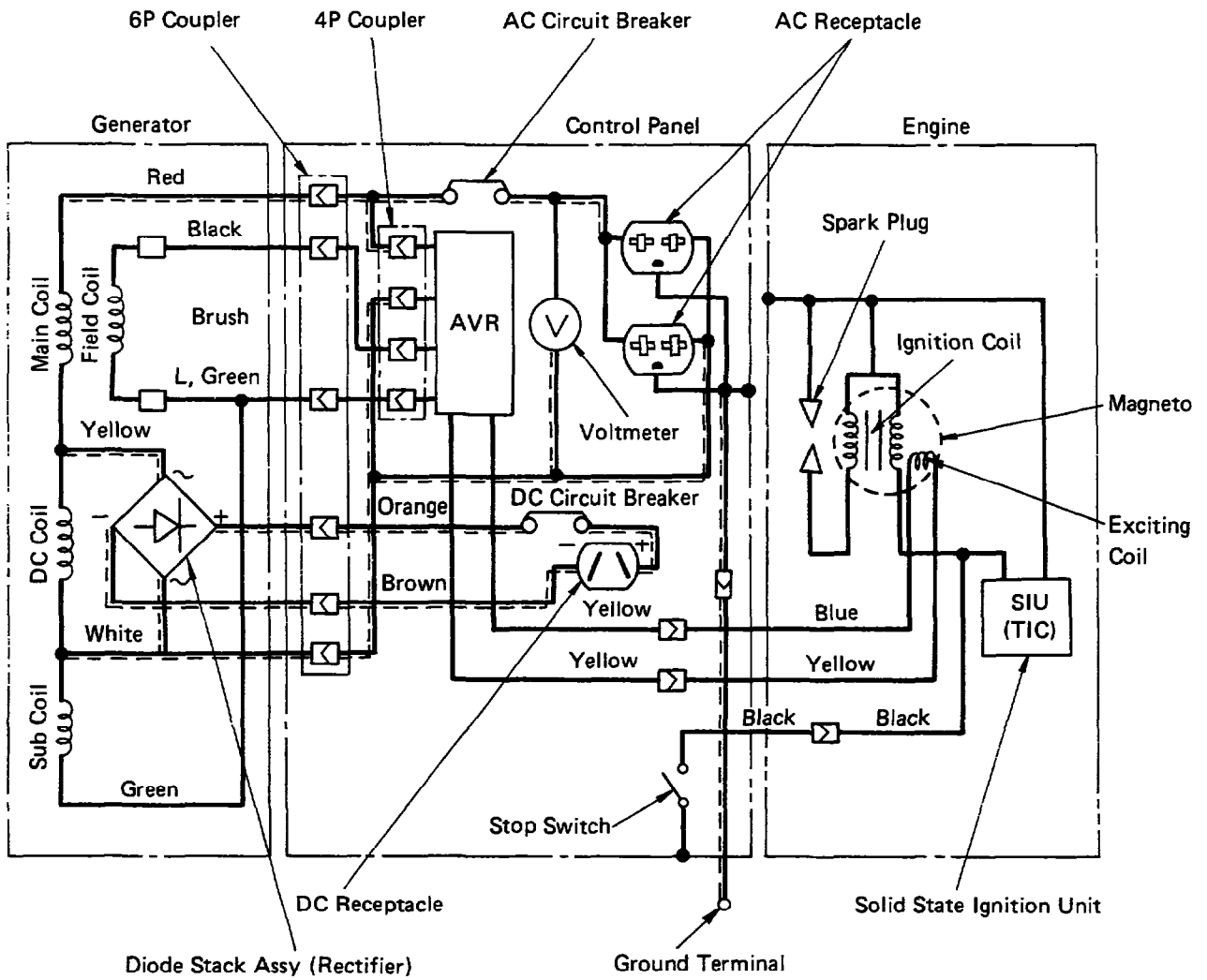
Items of adjustment		Criteria	Limit of application	Description	Tools	Remarks	
Levelness of cylinder head		Below 0.1	0.15		Surface plate and searcher	Repair	
Cylinder	Inside dia.	$63\phi \begin{smallmatrix} +0.019 \\ 0 \end{smallmatrix}$	$63.65\phi$		Cylinder gauge		
	Seat width of intake and exhaust valves		2.5		Slide calipers and cutter	Repair	
	Inside dia. of valve guide	$6.5\phi \begin{smallmatrix} +0.022 \\ 0 \end{smallmatrix}$	$6.65\phi$	Center dia.	Cylinder gauge	Replacement	
Piston	Piston skirt's outside dia. in thrust direction		$62.98\phi \begin{smallmatrix} 0 \\ -0.02 \end{smallmatrix}$	$62.88\phi$		Micrometer	Replacement
	Ring groove width	Top	$2.0 \begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	2.15		Slide calipers	Replacement
		Second	$2.0 \begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	2.15		Slide calipers	Replacement
		Oil	$2.8 \begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	2.95		Slide calipers	Replacement
	Pin hole		$14\phi \begin{smallmatrix} +0.002 \\ -0.009 \end{smallmatrix}$	$14.035$		Cylinder gauge	Replacement
	Clearance between piston skirt and cylinder wall		$0.020 \sim 0.059$	0.25	Oil maximum cylinder dia. and piston skirt bottom in thrust direction	Cylinder gauge and micrometer	Replacement
	Clearance between ring and ring groove	Top	$0.090 \sim 0.135$	0.15		Searcher	Replacement
		Second	$0.060 \sim 0.105$	0.15		Searcher	Replacement
		Oil	$0.010 \sim 0.065$	0.15		Searcher	Replacement
	Clearance between piston and piston pipe		$0.009T \sim 0.010L$	0.06L		Cylinder gauge and micrometer	Replacement
Piston rings	Joint gap	Top	$0.2 \sim 0.4$	1.5		Searcher	Replacement
		Second	$0.2 \sim 0.4$	1.5		Searcher	Replacement
		Oil	$0.2 \sim 0.4$	1.5		Searcher	Replacement
	Width	Top	$0.2 \begin{smallmatrix} -0.09 \\ -0.11 \end{smallmatrix}$	1.9		Micrometer	Replacement
		Second	$0.2 \begin{smallmatrix} -0.06 \\ -0.08 \end{smallmatrix}$	1.9		Micrometer	Replacement
		Oil	$2.8 \begin{smallmatrix} -0.10 \\ -0.30 \end{smallmatrix}$	2.7		Micrometer	Replacement
Piston pin outside dia.		$14\phi \begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	$13.96\phi$		Micrometer	Replacement	
Connecting rod	Inside dia. of large end		$24\phi \begin{smallmatrix} +0.013 \\ 0 \end{smallmatrix}$	$24.1\phi$		Cylinder gauge	Replacement
	Clearance between inside dia. of large end and crankpin		$0.037 \sim 0.063$	0.2		Cylinder gauge and micrometer	Replacement
	Inside dia. of small end		$14\phi \begin{smallmatrix} +0.021 \\ +0.010 \end{smallmatrix}$	$14.08\phi$		Cylinder gauge	Replacement
	Clearance between inside dia. of small end and pistonpin		$0.01 \sim 0.029$	0.12		Cylinder gauge and micrometer	Replacement
	Slide clearance of large rod end		$0.1 \sim 0.3$	1.0		Searcher	Replacement

Items of adjustment		Criteria	Limit of application	Description	Tools	Remarks	
Crankshaft	Crankpin outside dia.	24 $\phi$ $\begin{matrix} -0.037 \\ -0.050 \end{matrix}$	23.5 $\phi$		Micrometer	Replacement	
	Crankshaft journal outside dia.	Magneto side	25 $\phi$ $\begin{matrix} -0.003 \\ -0.012 \end{matrix}$	24.95 $\phi$		Micrometer	Replacement
		Counter-side	25 $\phi$ $\begin{matrix} -0.003 \\ -0.012 \end{matrix}$	24.95 $\phi$		Micrometer	Replacement
Camshaft	Cam crest	24.95 $\pm$ 0.1	24.7		Micrometer	Replacement	
	Camshaft journal outside dia.	Magneto side	15 $\phi$ $\begin{matrix} -0.016 \\ -0.027 \end{matrix}$	14.95 $\phi$		Micrometer	Replacement
		Counter-side	15 $\phi$ $\begin{matrix} -0.016 \\ -0.027 \end{matrix}$	14.95 $\phi$		Micrometer	Replacement
Valve spring	Free length	37	35.5	With all length of valve spring	Slide calipers	Replacement	
	Squareness		1.0		Square	Replacement	
Intake and exhaust valve	Outside dia. of valve stem	Intake	6.5 $\phi$ $\begin{matrix} -0.025 \\ -0.040 \end{matrix}$	6.35 $\phi$		Micrometer	Replacement
		Exhaust	6.5 $\phi$ $\begin{matrix} -0.056 \\ -0.078 \end{matrix}$	6.35 $\phi$		Micrometer	Replacement
	Clearance between valve stem and valve guide	Intake	0.025 ~ 0.062	0.3	At valve guide center	Cylinder gauge	Replacement
		Exhaust	0.056 ~ 0.100	0.3		Cylinder gauge	Replacement
	Tappet clearance	Intake	0.08 ~ 0.12	0.05 ~ 0.25		Searcher	Replacement
		Exhaust	0.08 ~ 0.12	0.05 ~ 0.25		Searcher	Replacement
	Clearance between groove and retainer	Intake	0.1 ~ 0.3	0.5		Slide calipers	Replacement
		Exhaust	0.1 ~ 0.3	0.5		Slide calipers	Replacement
	Valve stem end length	Intake	5.9	4.9		Slide calipers	Replacement
		Exhaust	5.9	4.9		Slide calipers	Replacement
Tappet	Total length	35.6 $\begin{matrix} +0.06 \\ 0 \end{matrix}$	35.1		Slide calipers	Replacement	
	Clearance between stem and guide	0.013 ~ 0.037					
Spark plug	Type	B-6HS					
	Electrode gap	0.6 ~ 0.7	1.0		Searcher	Adjustment or Replacement	
Fuel consumption (l/hr)	50 Hz rating	0.8					
	60 Hz rating	1.0					
Lubricating oil consumption (cc/hr)	50 Hz rating	9	50				
	60 Hz rating	10	50				
Quantity of lubricating oil cc	600						
Applicated lubricating oil	Automotive engine oil of class over SC						
Lubricating oil replacement interval	Initial: 20 hours after start Regular: Every 100 hours						
Compression pressure (kg/cm <sup>2</sup> /rpm)	5/400			Reference value	Puressure guage		

Items of adjustment		Criteira	Limit of application	Description	Tools	Remarks
Connecting rod bolts	kg-cm	90 ~ 115 kg-cm				
Main bearing cover bolts	kg-cm	80 ~ 100				
Cylinder head bolts	kg-cm	190 ~ 230				
Spark plug	kg-cm	230 ~ 250		120 ~ 150 when new one is mounted		
Air cleaner nuts	kg-cm	70 ~ 90				
Governor level nuts	kg-cm	90 ~ 110				
Rotor bolts	kg-cm	100 ~ 150				
Muffler nuts	kg-cm	70 ~ 90				
Front cover bolts	kg-cm	120 ~ 140				
Flywheel nuts	kg-cm	600 ~ 650				
Rear bracket bolts	kg-cm	55 ~ 75				



# 13. WIRING DIAGRAM



Wire code	Cross section of wire
————	0.75 mm <sup>2</sup>
-----	1.25 mm <sup>2</sup>

## 14. MAINTENANCE

The following standard maintenance procedures are necessary to ensure the generator's normal performance under normal conditions. Therefore, it does not always mean that maintenance is not necessary until specified times. For instance, if the generator is operated in a dusty area, the air cleaner must be cleaned, not at the specified intervals, but rather daily.

### 14-1 DAILY CHECKS AND MAINTENANCE (EVERY 8 HOURS)

Checks and maintenance items	Description
(1) Clean away dust from each component	(1) If the joint section of the governor is left in a dusty condition, the governor may fail to function normally.
(2) Check the fuel piping system and related parts for leakage. Should leakage be detected, tighten or replace the defective parts.	(2) Fuel leakage raises fuel costs and increases the risk of fire.
(3) Check each part for looseness and tighten it if necessary.	(3) If the parts are loose, vibration will occur, and may damage the generator.
(4) Check quantity of oil in the crank case and fill oil if necessary.	(4) If the engine is run with a shortage of oil it will burn and damage the generator.

### 14-2 CHECKS AND MAINTENANCE FOR EVERY 20 HOURS

Checks and maintenance items	Description
(1) Change oil in the crank	(1) This procedure removes contamination caused during initial operation.

### 14-3 CHECKS AND MAINTENANCE FOR EVERY 50 HOURS (EVERY 10 DAYS)

Checks and maintenance items	Description
(1) Clean the air cleaner	(1) Otherwise, engine troubles will be caused.
(2) Check the ignition plug. If the plug is contaminated, clean it with gasoline and sand it with sandpaper.	(2) Should the plug be left in a contaminated condition, the engine output will decline, resulting in starting failure.

**14-4 CHECKS AND MAINTENANCE FOR EVERY 200 HOURS (EVERY MONTH)**

Checks and maintenance items	Description
(1) Drain oil from the crankcase and replace with new oil (every 100 hours)	(1) Use of contaminated oil will cause rapid abrasion.
(2) Clean the fuel strainer and the fuel tank.	(2) and (3) Engine troubles, including power output decline, will be caused.
(3) Regulate ignition plug clearance.	

**14-5 CHECKS AND MAINTENANCE FOR EVERY 500 HOURS (SEMI-ANNUALLY)**

Checks and maintenance items	Description
(1) Remove the cylinder head and clean away the carbon deposit.	(1) ~ (4) Engine troubles such as power output decline will be caused.
(2) Disassemble the carburetor and clean each component.	
(3) Check and regulate the valve clearance.	
(4) Replace the ignition plug.	

**14-6 CHECKS AND MAINTENANCE FOR EVERY 1000 HOURS (ANNUALLY)**

Checks and maintenance items	Description
(1) Overhaul the engine for cleaning, adjusting, and replacing parts.	(1) Engine troubles such as power output decline will be caused.
(2) Replace brush of the generator.	(2) and (3) Power output will decline.
(3) Check rotor and stator of the generator.	
(4) Replace the fuel pipe.	(4) Fuel leakage will cause risks such as fire.

**14-7 HOW TO STORE THE GENERATOR FOR A LONG PERIOD**

- (1) Remove the cap of the fuel strainer and open the fuel cock to completely drain fuel in the tank. Then return the cap to the original position and close the fuel cock.
- (2) Start the generator and keep it running until it stops (for about 1 - 2 minutes). The fuel is completely consumed and drains the fuel in the carburetor.
- (3) Replace the lubricating oil with new oil.
- (4) Clean the air cleaner element.

- (5) Remove the ignition plug, and pour 5 - 10 cc oil into the ignition plug hole. Then quietly pull the starting nob of the recoil starter to distribute the oil to everywhere inside the cylinder, and then mount the ignition plug.
- (6) Check bolts and nuts for looseness and tighten them more if necessary.
- (7) Set the engine switch at the "STOP" position.
- (8) Pull the starting nob of the recoil starter, and leave it at the position where some load is felt.
- (9) After cleaning the generator well, wipe it with a cloth and use an anti-rust spray on it.
- (10) Cover the engine with veneer etc., and store it in a place with low humidity.

**Note:** Be careful when draining fuel from the fuel tank. Don't sprinkle water over the engine while cleaning it.



**Robin Generator**



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