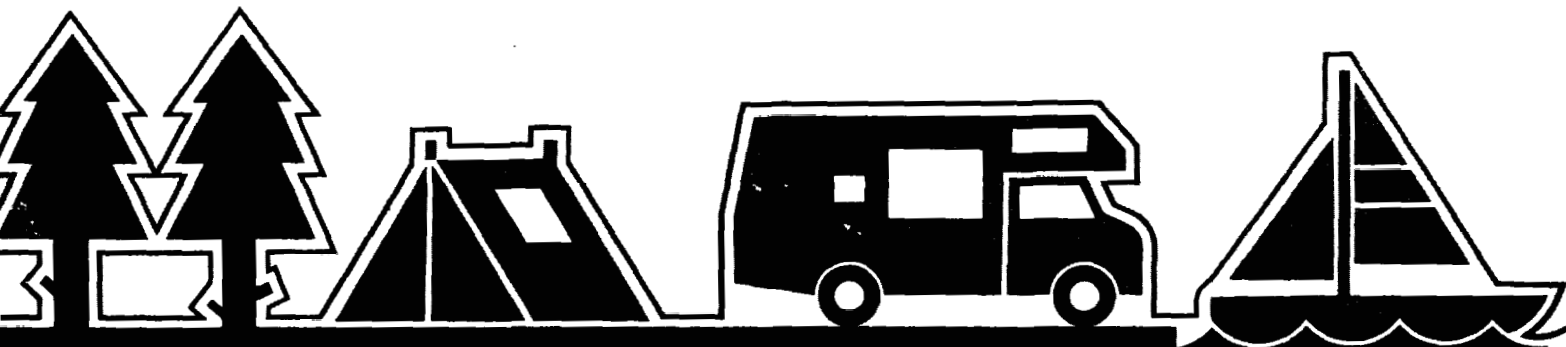




Robin Generator

Model R 600



Technical Data & Overhaul Instructions
SERVICE MANUAL

ISSUE EMD-GS0002

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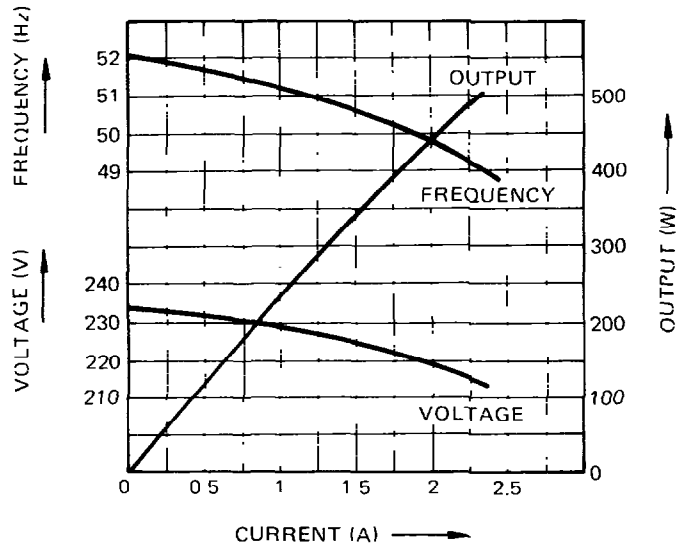
1. SPECIFICATIONS

Model		R600	
Engine:	Type	Forced air-cooled, 4-stroke, side valve, gasoline engine	
	Displacement	78 cc (4.76 cu.in.)	
	Fuel tank capacity	2 lit. (0.53 U.S. gal.)	
	Oil pan capacity	350 cc (0.75 U.S. pints)	
	Ignition system	Solid state ignition	
	Starting system	Recoil starter	
	Rated continuous operating hours	Approx. 4 hours (50 Hz) Approx. 3.5 hours (60 Hz)	
Generator:	Type	2-pole, revolving field type	
	Exciting system	Self-exciting	
	Voltage regulating system	Condenser type	
	Maximum output	500 W	600 W
	Rated output	400 W	500 W
	AC Frequency	50 Hz	60 Hz
	AC Voltage	110, 220, 230, 240V	110, 120, 220V
	DC output	12V – 100 W (8.3 A)	
	AC receptacle	Standard: 2 ea. (special: 1 ea.)	
	DC terminal	Two	
	Over current protection	Circuit breaker	
	Frequency meter	Standard equipment	
	Pilot light	Standard equipment	
Dimensions (L x W x H):	370 x 265 x 345 mm (14.6 x 10.4 x 13.6 in.)		
Dry weight	18.5 kg (40.7 lbs)		

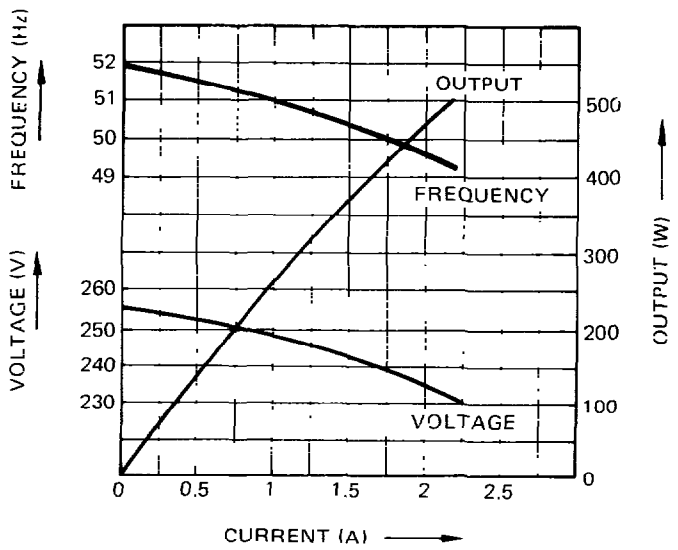
2. PERFORMANCE CURVES

2-1 AC OUTPUT

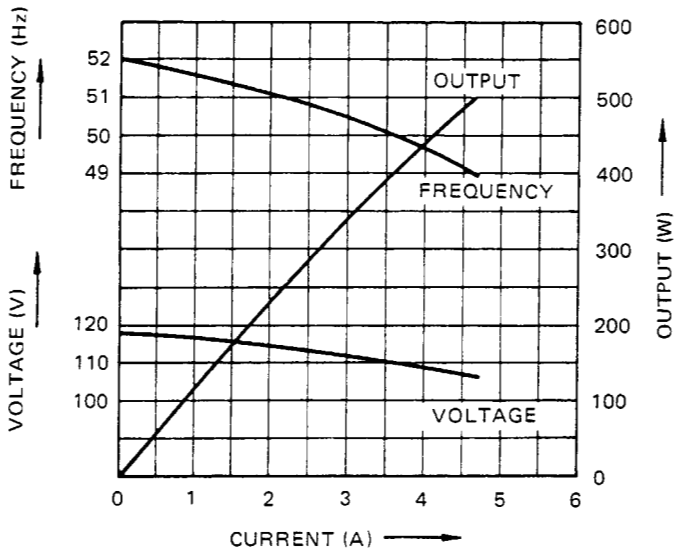
Power Factor 1.0



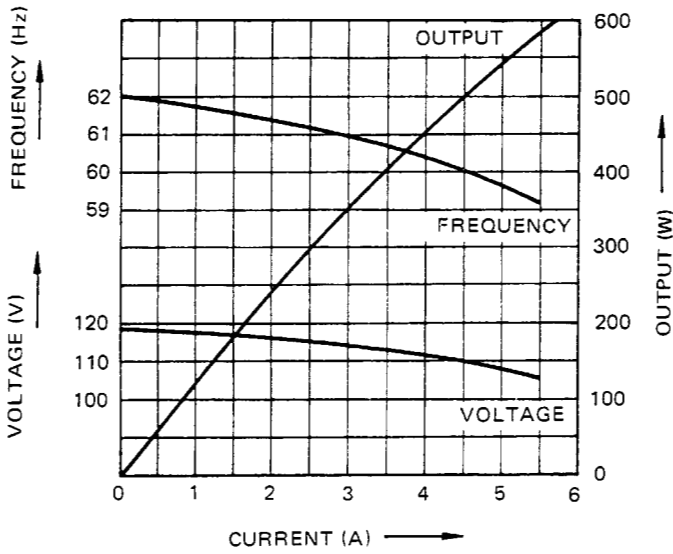
Output Max. 500W
 Rated 400W
 Frequency 50 Hz
 Voltage 220V



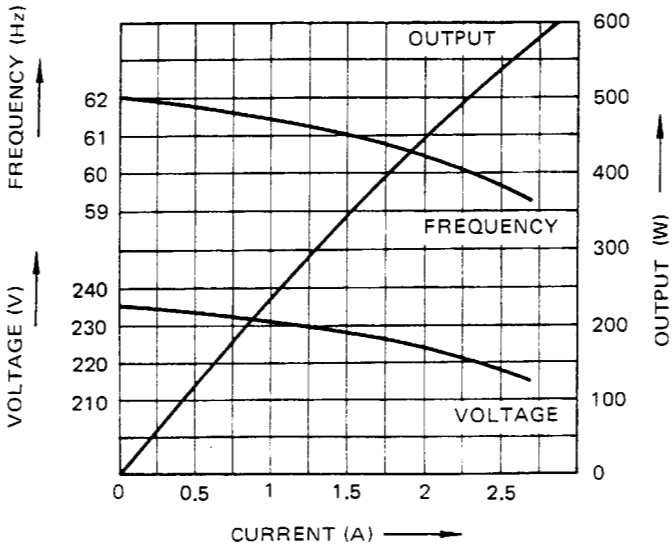
Output Max. 500W
 Rated 400W
 Frequency 50 Hz
 Voltage 230V, 240V



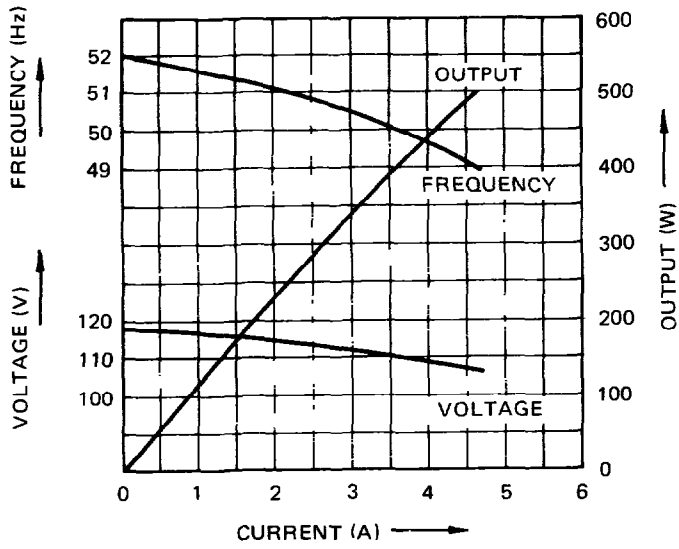
Output Max. 500W
 Rated 400W
 Frequency 50 Hz
 Voltage 110V



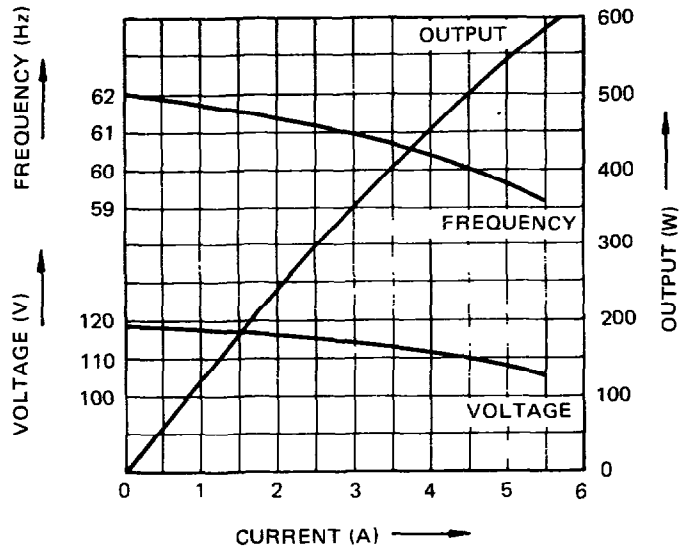
Output Max. 600W
 Rated 500W
 Frequency 60 Hz
 Voltage 110V



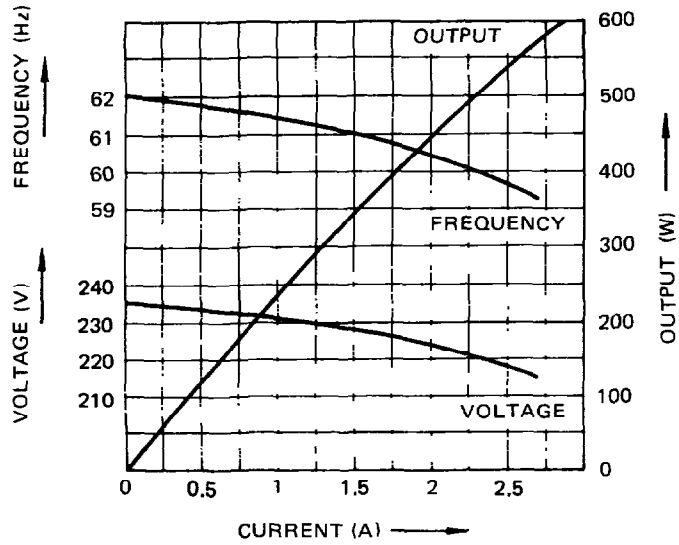
Output Max. 600W
 Rated 500W
 Frequency 60 Hz
 Voltage 220V



Output Max. 500W
 Rated 400W
 Frequency 50 Hz
 Voltage 110V



Output Max. 600W
 Rated 500W
 Frequency 60 Hz
 Voltage 110V



Output Max. 600W
 Rated 500W
 Frequency 60 Hz
 Voltage 220V

3. FEATURES

- **Robin Exhaust Fan Cooling System** for low body temperatures, low noise, longer engine life and reliable performance.
- **Large 78cc 4-Stroke Engine** provides enough power for constant 500W (at 60 Hz) rated output.
- **Simple One-Touch Engine Control Switch** with the engine and fuel on/off levers and choke all integrated into one switch.
- **Easy and Reliable Starting** with pointless ignition. This generator is also a brush-less type generator for maintenance-free operation.
- **Simple Design** for a clean appearance and easy maintenance.
- **Compact and Lightweight** with an easy one-hand carrying handle grip. This generator also offers a high power-to-weight ratio and economical operation.
- **Circuit Breaker Protection** for safe operation. Replacement of fuses is not necessary in case of an overload.
- **Unique Dual Output Design** so that two separate A.C. and D.C. electrical appliances can be used at the same time.

4. SERIAL and SPECIFICATION NUMBER LOCATION

The serial number is stamped on the crankcase at the opposite side of the carburetor.

The specification and specification number are shown on the nameplate located on the rear cover.

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

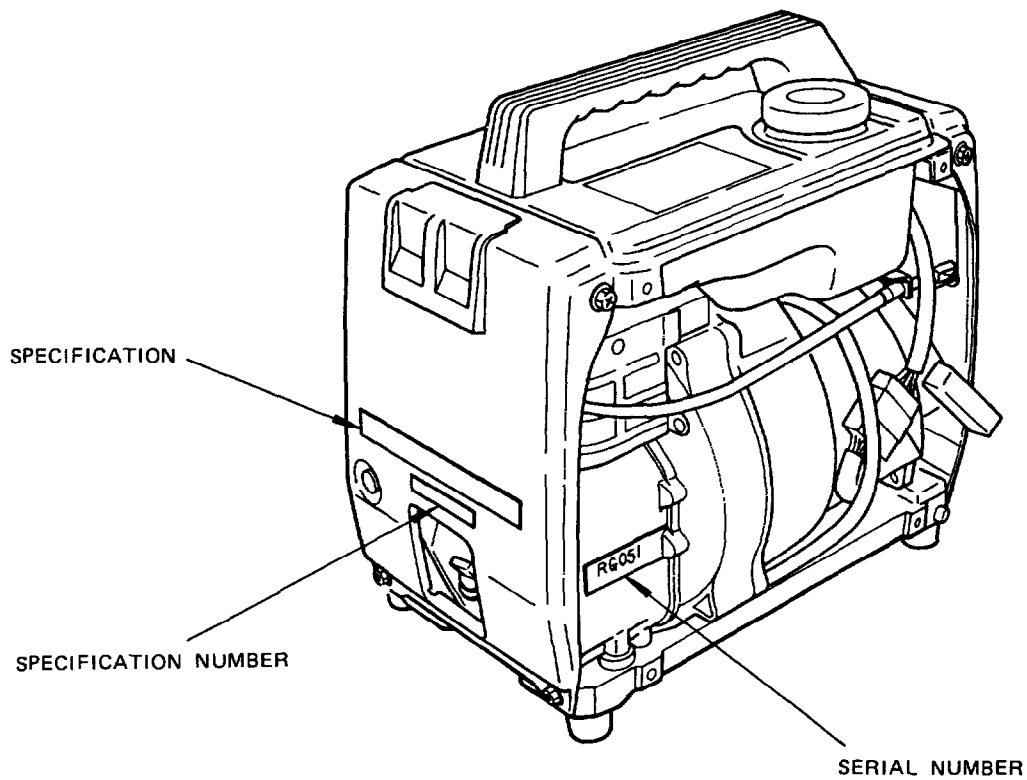


Fig. 4-1

5. SAFETY PRECAUTIONS

5-1 FIRE PREVENTION

- 1) Keep the generator away from combustible materials during operation. Take special precautions with flammable substances.
- 2) Do not run the generator in a incline position or while it is slanted at an angle. Avoid moving the generator while it is in operation to prevent the generator from falling over or leaking fuel.
- 3) Do not place a carton or similar object over the generator while the generator is running. If covered, cooling will be diminished and cause the generator to overheat.
- 4) Operate the generator at least 1m away from a building or wall.
- 5) Be sure to stop the engine before filling fuel into the fuel tank.
If fuel is filled while the engine is running, fuel vapors may rise from the fuel tank resulting in a potential fire hazard.
- 6) Fuel used in engine operation is very volatile and highly flammable. Take special precautions not to spill fuel when filling the fuel tank. If fuel is spilt, wipe it off thoroughly and let dry before starting the engine.
- 7) Do not overfill the fuel tank and always be sure to fill fuel only up to the level specified at the fuel supply port.
- 8) Do not smoke or use open flame when filling the fuel tank.

5-2 PRECAUTIONS for EXHAUST GASES

- 1) Avoid operating the generator in poorly ventilated locations such as an office, warehouse, narrow tunnel, well, hold, tank, etc.. If the generator is run continuously in such poorly ventilated areas, the operator may suffer carbon monoxide poisoning.
- 2) Always operate the generator with the exhaust port directed toward the open air or where good ventilation is assured.

5-3 OTHER PRECAUTIONS

- 1) To prevent electric shock, do not touch the generator with wet hands. For example, when the generator is used to drive a submersible pump, be sure to connect the earth cord of the generator to the earth cable of the pump.
- 2) Do not splash water over the generator during operation. And also avoid operating the generator in the rain. If the generator gets wet, it may fail to start or short-circuit, and the operator may possibly receive a severe electric shock.
- 3) Do not connect the generator to existing power lines which have been originally installed as the power supply system of a building. If connected, the generator will burn out.
- 4) Avoid running the generator with its cover removed.

6. COMPONENT IDENTIFICATION

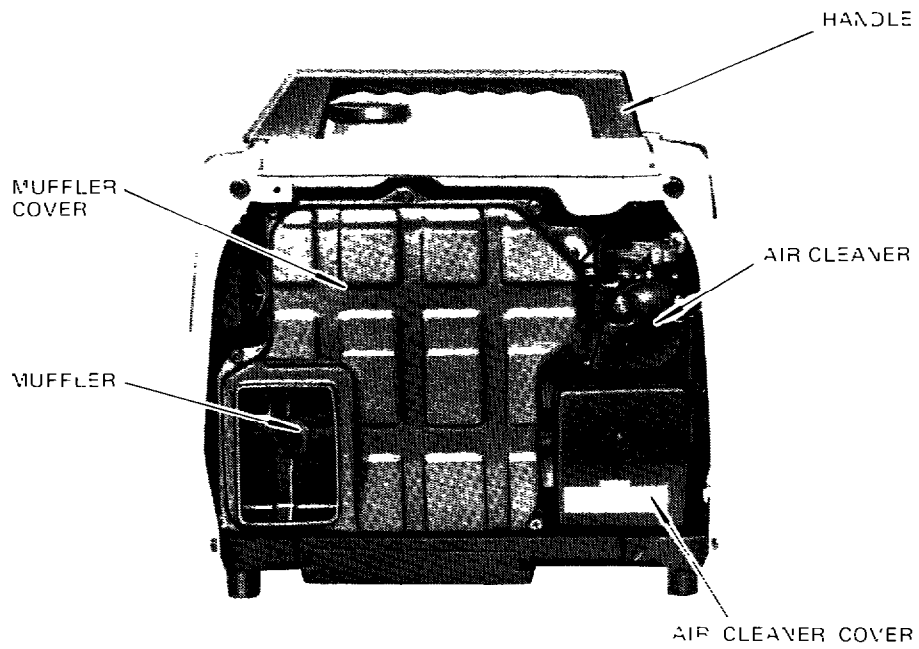


Fig. 6-1

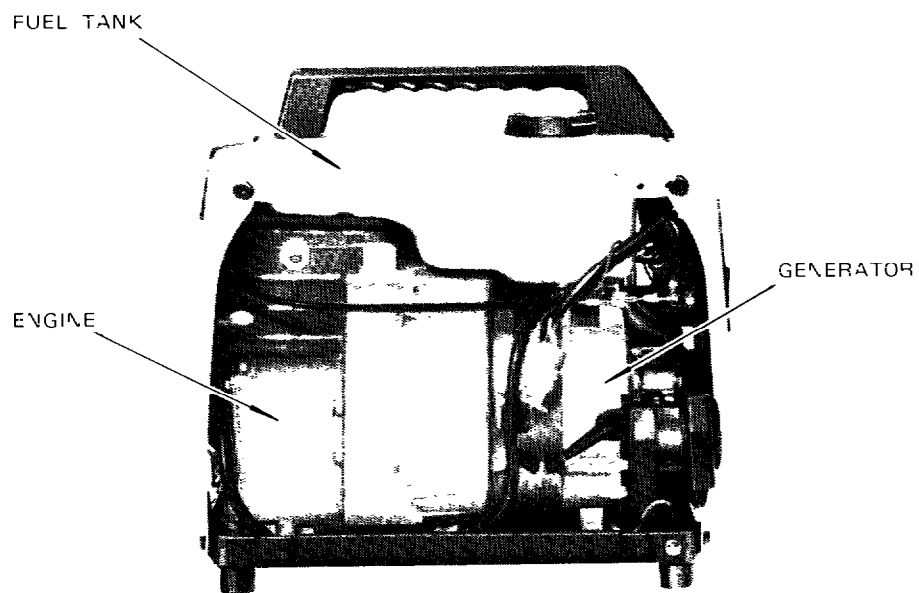


Fig. 6-2

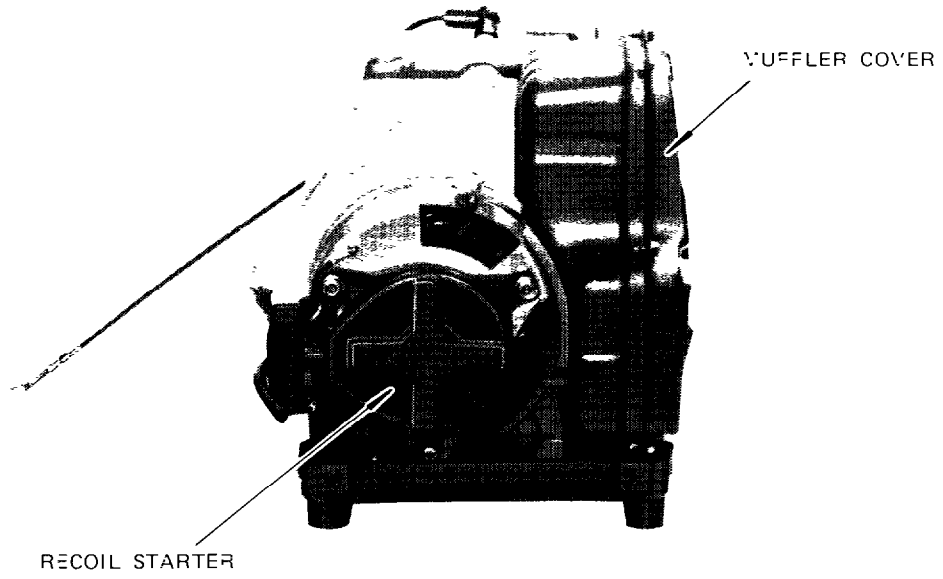


Fig. 6-3

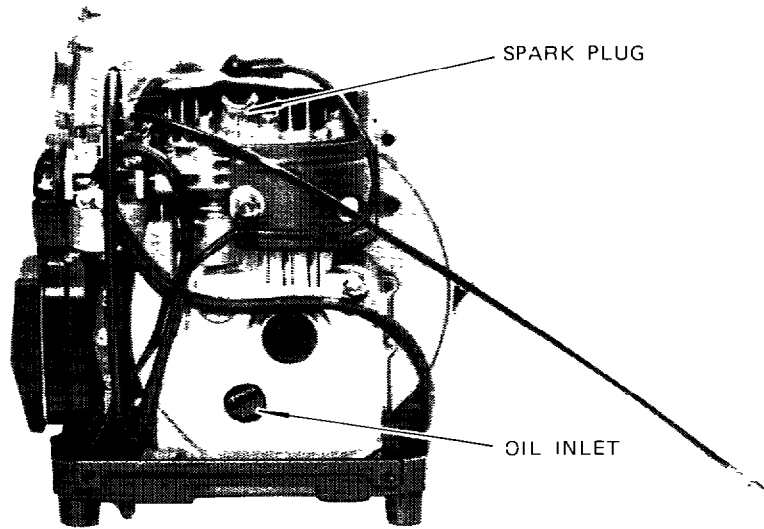


Fig. 6-4

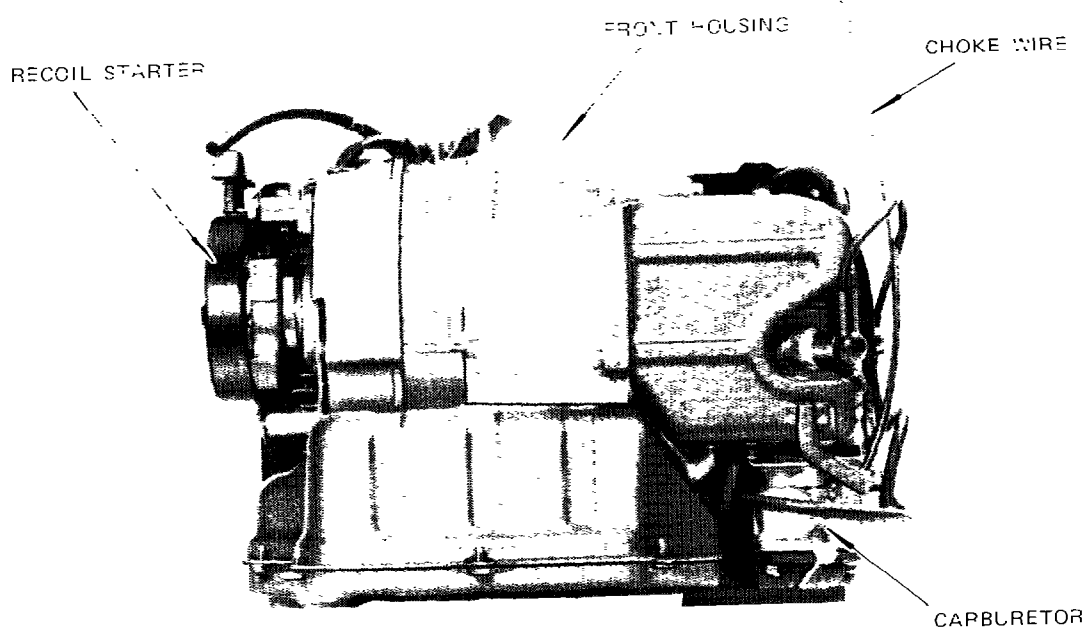


Fig. 6-5

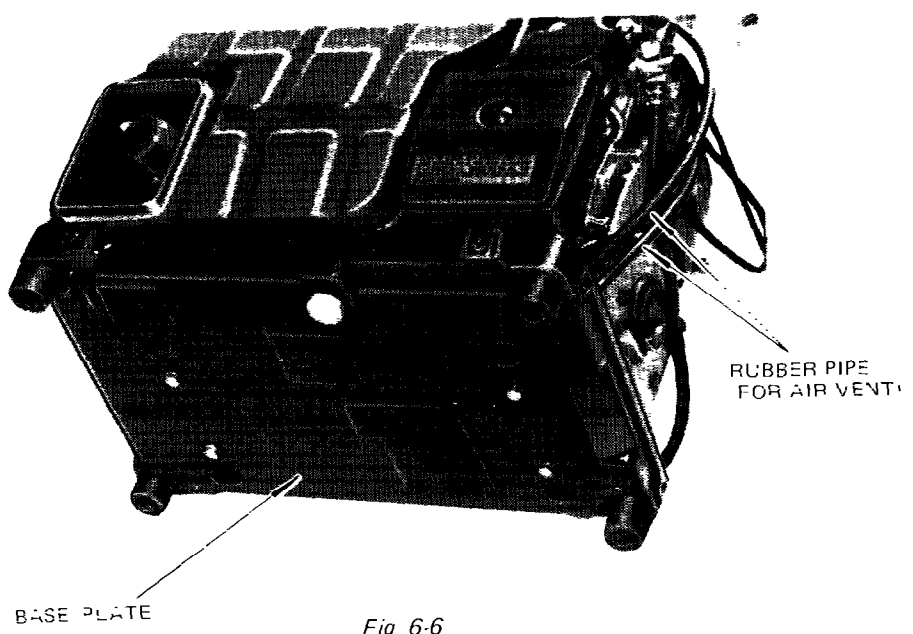


Fig. 6-6

7. FUNCTION of EACH COMPONENT

7-1 GENERATOR

7-1-1 STATOR

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

AC and DC output are taken out from the main coil. (DC output is taken out from the part of main coil which is in the middle of the main coil.)

The condenser coil excites the stator field coil which generates AC output in the main coil.

7-1-2 CONDENSER

The condenser is mounted on the rear housing and is connected to the condenser coil which is wound in the stator. The condenser coil magnetizes the rotor which increases the density of magnetic flux.

7-1-3 RECTIFIER

The rectifier is also mounted on the rear housing and it converts AC current output from the main coil to DC current. The DC output from the diode of this rectifier is connected to the DC terminal.

7-1-4 ROTOR

The rotor consists of a lamination silicon steel sheet core and field coil which is wound over the core.

DC current in the field coil magnetizes the steel sheet core. Two permanent magnets are provided at 90 degrees from the poles for the primary exciting action.

A securely mounted fan is pressure-fitted on the end of the rotor shaft to cool the individual coils, iron cores, rectifier, and other integral parts.

Cooling air from the fan is drawn in from the ventilation vents in the rear housing, and is discharged from the exhaust port in the front housing.

7-1-5 CONTROL PANEL

The panel on the front of the housing has a receptacle with a ground terminal and AC output is taken out with a male plug.

The frequency meter is provided to see if the frequency of generated power shows 50 Hz (or 60 Hz). DC output is taken out from the red (positive, +) and black (negative, -) terminals.

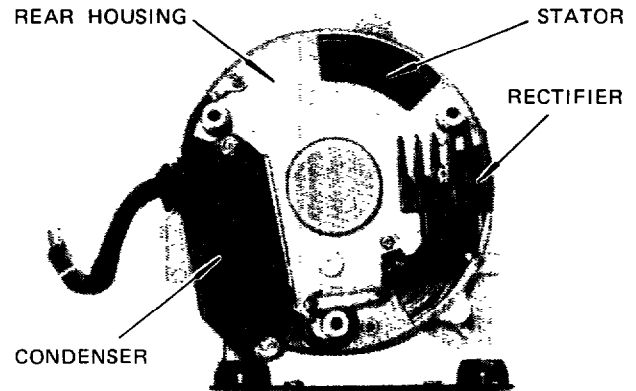


Fig. 7-1

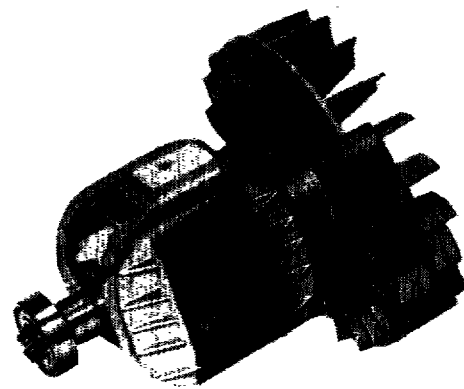


Fig. 7-2



Fig. 7-3

7-2 ENGINE

7-2-1 CYLINDER and CRANKCASE

The cylinder and the crankcase of the engine are of an one-piece aluminum die-cast design. The cast iron cylinder liner is cast-fitted inside the cylinder. Both the intake and exhaust ports are positioned at the lateral side of the cylinder and these ports are formed by using a mold with die-cast cores. The crankcase has its joint face located on the generator side.

7-2-2 MAIN BEARING COVER

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

7-2-3 CRANKSHAFT

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

7-2-4 CONNECTING ROD and PISTON

The connecting rod is constructed of forged aluminum alloy with both the major and minor ends utilized as bearings. The oil scraper and cap for the major end are cast together. The aluminum alloy casting piston has two compression rings and one oil ring.

7-2-5 CAMSHAFT

The camshaft is constructed of special cast iron and has intake and exhaust valve drive cams, each of which engages with the cam gear. An exclusive aluminum alloy is used on each end of the camshaft in the place of bearings.

7-2-6 VALVE ARRANGEMENT

The intake valve is installed at the oil port side and the exhaust valve at the generator side.

7-2-7 CYLINDER HEAD

The cylinder head is die-cast aluminum and has Ricardo type combustion chamber featuring greater volume capacity for improved combustion efficiency. For easier spark plug maintenance, the cylinder head is positioned at an angle to allow greater access.

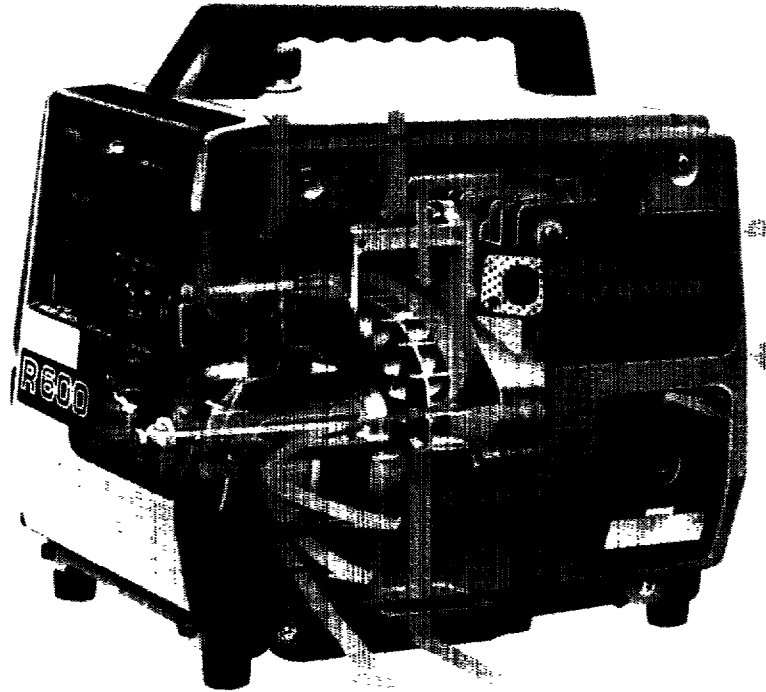
7-2-8 GOVERNOR

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

7-2-9 EXHAUST FAN COOLING SYSTEM

Instead of blowing outside air on the engine, the Exhaust Fan Cooling System of this generator intakes the cool air and forces the hot air outside from one outlet.

This keeps the body temperature lower for greater safety and extends service life.



7-2-10 LUBRICATION SYSTEM

The moving and sliding parts inside the engine are lubricated with the oil scraper fitted on the connecting rod. As the crankshaft rotates, the connecting rod moves up and down and the oil scraper moves in conjunction with the connecting rod movements to scrape up oil in the crankcase and splash it over the surfaces of the moving and sliding parts.

7-2-11 IGNITION

A flywheel/magneto ignition system is employed with the ignition timing set at 23° before top dead center. The magneto is composed of the flywheel and ignition coil with the flywheel mounted on the rotor shaft. The ignition coil is fitted to the front housing.

7-2-12 CARBURETOR

The horizontal suction type carburetor is adjusted so that the engine will provide excellent starting, good acceleration, low fuel consumption, and superior output [for details concerning carburetor construction, see the paragraph dealing with carburetor construction and disassembly/assembly (Page-49)]

7-2-13 AIR CLEANER

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

8. DESCRIPTION OF MAIN COMPONENTS OPERATION

8-1 ELECTRONIC IGNITION SYSTEM (Solid State Ignition System)

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

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

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

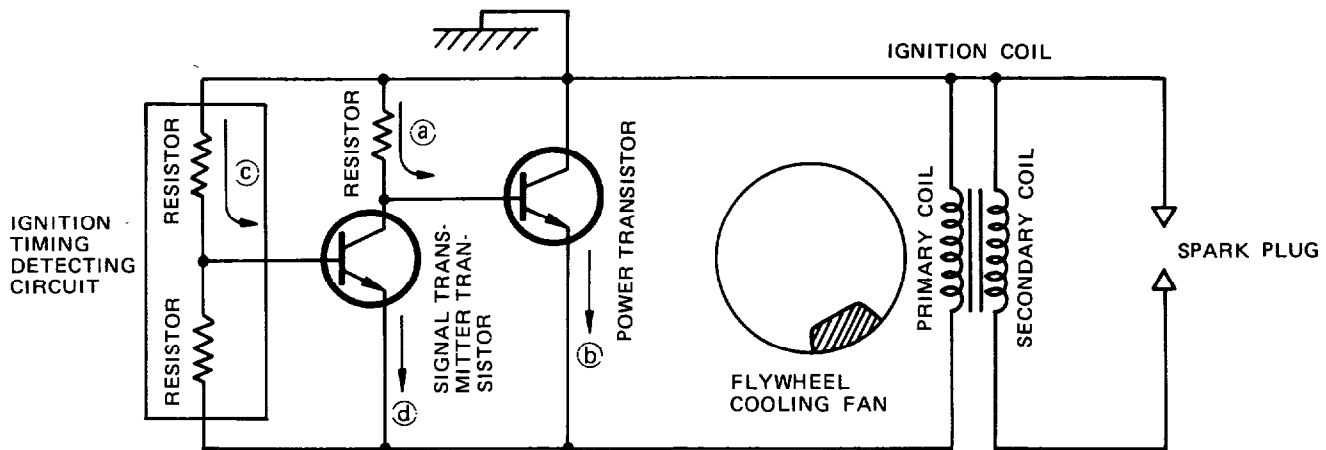


Fig. 8-1

1) When the permanent magneto built-in flywheel starts rotating, power is generated in the primary coil of the ignition coil and current flows to the resistor (a).

From the resistor, current flows to the power transistor. With this current, the power transistor turns on, releasing current (b). This stage corresponds to the closing of contact points.

2) As the flywheel comes to the point of ignition, the ignition timing detecting circuit is activated while the current (c) is flowing through the circuit.

When the ignition timing detecting circuit is activated, the signal transmitter transistor actuates with current (d) flowing. When current (d) starts flowing, current (b) flowing through the power transistor is cut quickly. As a result, high voltage is produced in the secondary coil and this voltage is applied simultaneously to the spark plug which ignites for ignition. This stage corresponds to the opening of contact points.

8-2 GENERATOR OPERATION

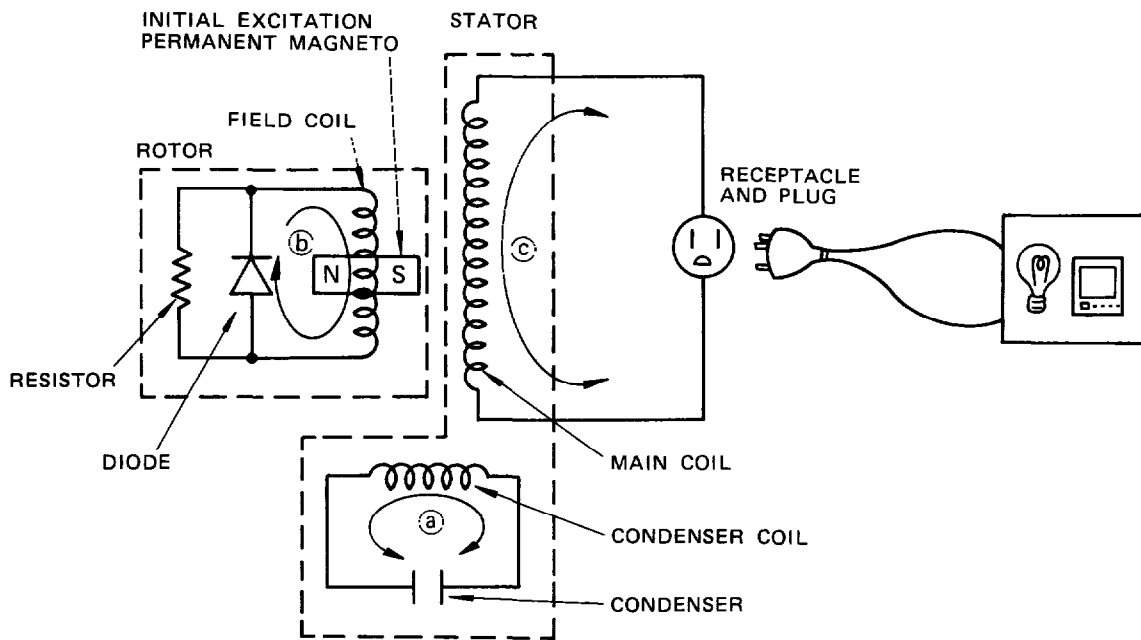


Fig. 8-2

8-2-1 GENERATION of NO-LOAD VOLTAGE

- 1) When the generator starts turning the permanent magnet built-in to the flywheel generates \textcircled{a} 1 to 2V of AC voltage in the main coil and also generates 2 to 4 of AC voltage in the condenser coil.
- 2) The capacitor coil is connected to a capacitor so when a voltage is applied to the condenser coil, minimum current \textcircled{a} flows in the condenser coil. At this time, minimum flux is produced, with which the magnetic force of the rotor's magnetic pole is intensified. When this magnetic force is intensified, the respective voltages in the main coil and condenser coil rise. Current \textcircled{a} flowing in the condenser coil increases, with the magnetic flux density of the rotor's magnetic pole increasing further. Also, the main coil voltage and condenser coil voltage increases. These voltages continue rising as this process is repeated.
- 3) As current flows in the condenser coil, the magnetic flux density changes. DC voltage is induced in the field coil when the magnetic flux density varies. Successively, DC current is rectified by the rectifiers connected to both ends of the field coil, and DC current \textcircled{b} flows in the field circuit. With this current, the rotor core is magnetized, allowing the generator to output steady voltage.
- 4) When generator speed reaches 2000 to 2300 rpm (50 Hz specification) or 3000 to 3300 rpm (60 Hz specification), the current in the condenser coil and field coil increases suddenly. This acts to stabilize the respective coil output voltages. If generator speed further rises to the rated value, the generator output voltage will reach the rated value.

8-2-2 VOLTAGE FLUCTUATIONS UNDER LOAD

When load current \textcircled{c} flows from the electric equipment to the generator, the magnetic flux which is produced as current \textcircled{c} flows in the main coil, this serves to increase current \textcircled{a} flowing in the capacitor coil. With current \textcircled{a} increased, the magnetic flux density across the rotor core rises. As a result, the current flowing in the field coil increases, and the generator output voltage is prevented from decreasing.

8-2-3 DC OUTPUT

DC output is taken out from the main coil and is fed to the diode at which time the output undergoes full-wave rectification prior to being supplied to the load connected to the generator. The diode rectifier works to allow the current to flow in (a) direction but does not allow the current to flow in (b) direction as shown in Fig. 8-3.

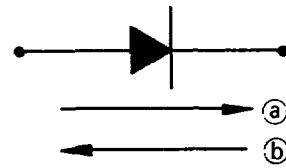


Fig. 8-3

Fig. 8-4 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 C, current (c) flows in the direction shown in the figure while no current flows between C and B because current is cut off by the diode D2. Contrary to the aforementioned, if the voltage in C is higher than that in A, current (d) flows in the direction as shown in the figure, with no current flowing between A and B. This is because the diode D1 cuts off the current between A and B. As a result, voltage generated between the DC terminals has a waveform with two peaks in one cycle, as in the case of the output waveform shown in Fig. 8-5.

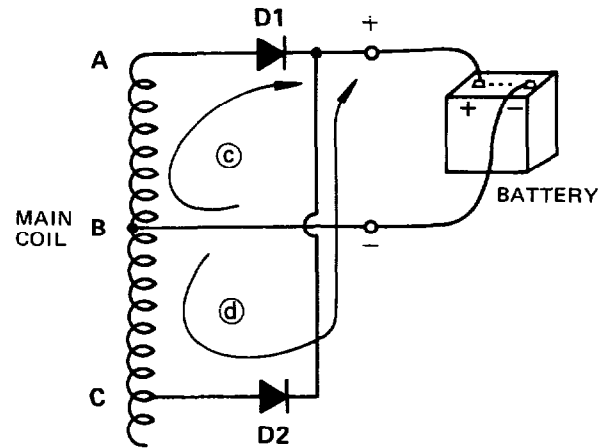


Fig. 8-4

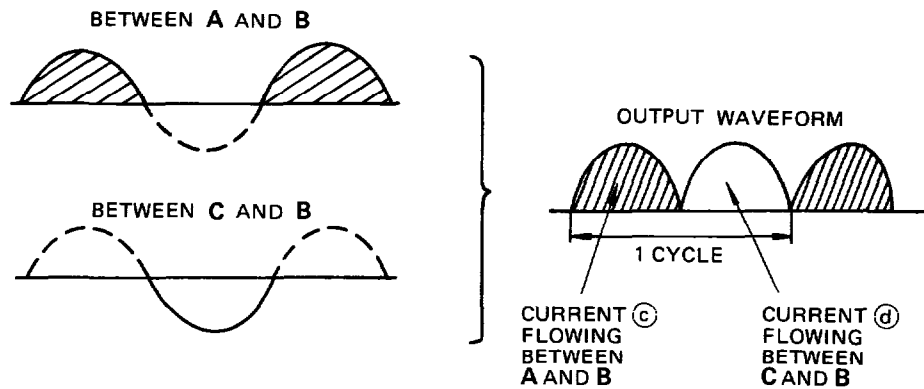


Fig. 8-5

9. OPERATIONAL LIMITS OF THE GENERATOR

9-1 AC OUTPUT:

Electric appliances normally have rating labels, showing the rated voltage, frequency, power consumption (input power), and other listings.

The input power specified on such labels is what is required to drive the appliance.

When an appliance is to be connected to the generator, the power factor, starting current, and other factors of the appliance must be taken into account.

9-1-1 NET RESISTANCE LOAD:

Incandescent lamps, electric heaters, etc., can be run off the generator if its capacity matches the total of the respective appliances. Each of these appliances normally have a power factor of 1.0.

Example: This generator can provide enough power to operate five 100W incandescent lamps.

9-1-2 ELECTRIC APPLIANCES WITH A POWER FACTOR LESS THAN 1.0:

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

Example: With this generator, three to five 80W mercury lamps can be operated.

9-1-3 MOTOR LOAD:

Generally, motors require a large starting current every time they are started. Therefore, when the generator is used to run a motor, the greatest motor starting load is applied.

The rates of power supply which the generator is required to produce for motor loads, are categorized into two sections, depending on the types of motor and load conditions at 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 time of starting.

Example: To drive a 200W electric drill, a generator with capacity of about 300 to 600W is necessary.

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

Pump and compressor drive motors require the generator to produce 3 to 5 times the power consumed when they are running, at time of starting. This is because these motors have loads when they start.

Example: To drive a 200W submersible pump, a generator with a capacity of approximately 600 to 1000W is necessary.

9-1.4 IN THE SITUATION THAT POWER CONSUMPTION IS NOT SHOWN ON THE RATING PANEL:

Occasionally, the rating panel of an electric appliance does not carry its power consumption but only shows the mechanical equivalent to the power consumption. In such a situation, it is necessary to calculate the power consumption of the device involved. Depending on the types of load, the calculated power consumption is adjusted according to paragraphs 9-1-1 through 9-1-3 above.

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

Efficiency

Motors: 0.6 ~ 0.8

Fluorescent lamps: 0.7 ~ 0.8

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

$$40 \div 0.7 = 57W$$

Further, as per paragraph 9-1-2, the said power consumption is multiplied by a factor of 1.2 to 2, producing a power consumption of 70 to 115W. Therefore, with this generator, four to seven 40W fluorescent lamps can be used.

Example: In the case of a 200W motor, the mechanical equivalent of the motor is 200W. Assuming that the efficiency of the motor is 0.7, the power consumption is calculated as $200 \div 0.7 = 285W$. Similar to the above, the calculated power consumption is then multiplied as per paragraphs 3-1) or 3-2), taking into account the types of motor and starting conditions. The table below shows the range of loads applicable to this generator.

Electric devices	Range of workable loads	
	50 Hz	60 Hz
Incandescent lamp, electric heater, etc.	Up to 400W	Up to 500W
Fluorescent lamp, mercury lamp, etc.	Up to approx. 300W	Up to approx. 400W
Motor-driven tools etc.	Up to approx. 300W	Up to approx. 350W
Pump and compressor drive motors	Up to approx. 150W	Up to approx. 200W

Table 9-1

NOTE 1: With motor-driven tools and the motor-driven pumps and compressors specified in paragraphs 9-1-3 and 9-1-4, the generators of the said capacities are required only when starting the motors of the respective appliance. Once the motor has started, the power which the generator is required to supply to the motor decreases thereafter to a level approximately 1.2 to 2 times the rated power consumption.

Therefore, the surplus capacity of the generator may be used for other electric appliances.

NOTE 2: As for the motor-driven devices specified in paragraph 9-1-3 and 9-1-4, the power requirement for starting varies according to the types of motor and the load conditions at time of starting.

9-2 DC OUTPUT

When the generator is employed to recharge batteries, care must be exercised about the specific gravity of electrolyte in each battery case.

9-2-1 MEASURING THE SPECIFIC GRAVITY OF ELECTROLYTE:

The specific gravity changes with temperature; therefore, it is converted to another corresponding to 20°C.

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

where

S_{20} = Specific gravity corresponding to 20°C

S_t = Measured value

t = Temperature at time of measurement

9-2-2 REMAINING CAPACITY ESTIMATED WITH REFERENCE TO THE SPECIFIC GRAVITY OF ELECTROLYTE:

Specific gravity (20°C)	Remaining battery (%)	Remarks
1.260	100	Good charged condition
1.240	87	
1.220	75	Charging is necessary.
1.200	62	Immediate charging is necessary.
1.180	50	
1.160	37	
1.140	25	

Table 9-2

9-2-3 BATTERY CAPACITY:

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

9.3 SIMULTANEOUS USE THE AC/DC OUTPUT

If you use the AC/DC output simultaneously in this generator, be careful not to exceed the total power consumption.

50 Hz ————— below 200W

60 Hz ————— below 300W

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

9.4 WIRE LENGTH

When long wires are used between the generator and a load, the resistance of each wire increases and a voltage drop occurs. Consequently, the input voltage to the load declines and occasionally damages the load.

Exercise caution when deciding on wire length. For reference, the table below shows the voltage decreases that occur in 100 m (300 ft) long wires with different cross sectional areas and varied resistances.

Cross sectional area	Allowable current	No. of conductors/ conductor diameter	Resistance	Current							
				1A	3A	5A	8A	10A	12A	15A	
mm ²	A	No./mm	Ω/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	

Table 9-3

10. MEASURING PROCEDURES

10-1 METERS

10-1-1 VOLTMETERS

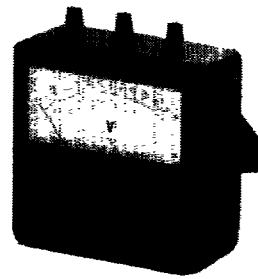
Both AC and DC voltmeters are necessary.

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

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

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

AC VOLTMETER



DC VOLTMETER

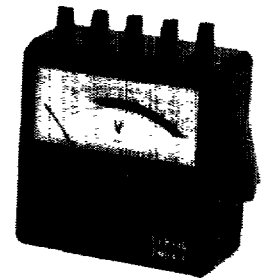


Fig. 10-1

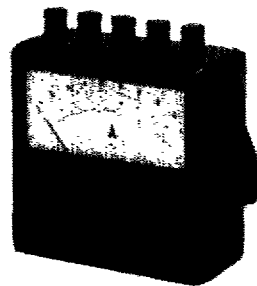
10-1-2 AMMETER

Both AC and DC ammeters are necessary.

The AC ammeter must have a scale range from 0 to approximately 10A.

The DC ammeter must have a scale range from 0 to approximately 15A.

AC AMMETER



DC AMMETER

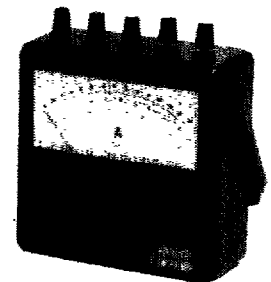


Fig. 10-2

10-1-3 FREQUENCY METER

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

NOTE: Note the range of input voltage of the frequency meter.

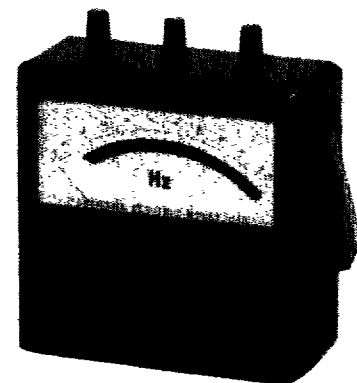


Fig. 10-3

10-1-4 CIRCUIT TESTER

A circuit tester is used for measuring resistances and others.

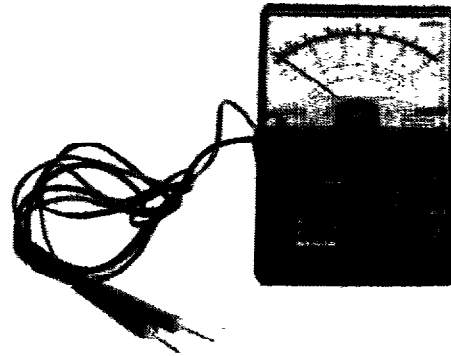


Fig. 10-4

10-1-5 MEGGER TESTER

To measure the insulation resistance of the generator. Use voltage capacity of 500V.

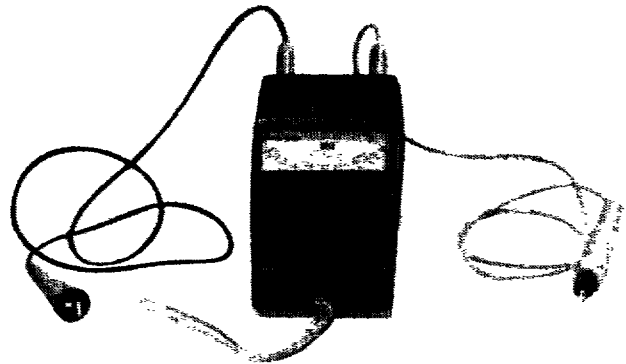


Fig. 10-5

10-1-6 TACHOMETER

Use the contact-less type tachometer.

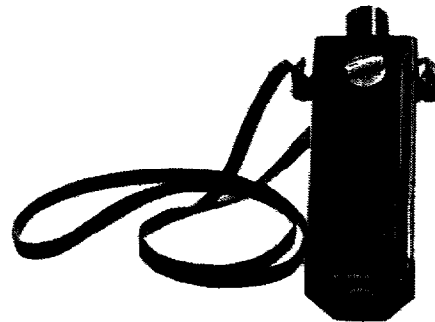


Fig. 10-6

10-2 MEASURING AC OUTPUT

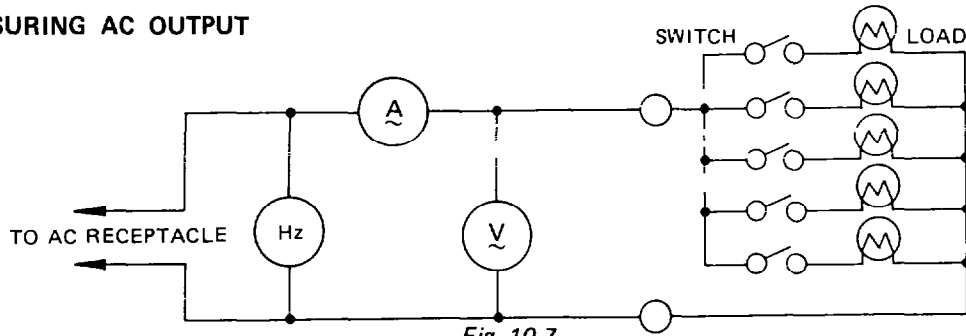


Fig. 10-7

With the circuit shown in Fig.10-7, measurement is made of the AC output of the generator. An electric heater or an incandescent lamp with a power factor of 1.0 is suitable as a load for the generator.

When the measured AC output of the generator is confirmed to be within the voltage range specified in the table below, over its voltage rating, the AC output is normal.

Measurement must be made under rated load and at rated speed; sometimes, load and speed adjustments are necessary.

Voltage rating	110V	120V	220V	230, 240V
Range of voltage	108 ~ 120V	118 ~ 130V	218 ~ 240V	235 ~ 260V

Table 10-1

10-3 MEASURING DC OUTPUT

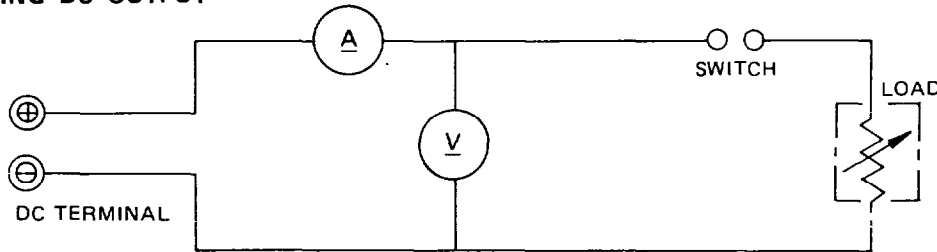


Fig. 10-8

Measurement is made of the DC output of the generator with the switch shown in the above circuit turned on while the generator is kept running at its rated speed. The DC output should be within 11 to 14V, with the current regulated at 8.3A by adjusting the load connected to the generator.

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

10-4 MEASURING INSULATION RESISTANCE

To measure insulation resistance, connect the megger tester across either one of the two output terminals of the socket and the earth terminal. When the measured insulation resistance of the generator is over $1M\Omega$, it is normal (over $10M\Omega$ at time of shipment).

(Be sure to turn on the circuit breaker when measuring insulation resistance.)

If the insulation resistance is less than $1M\Omega$, disassemble the generator, and measure the respective resistances of the stator, rotor and control panel.

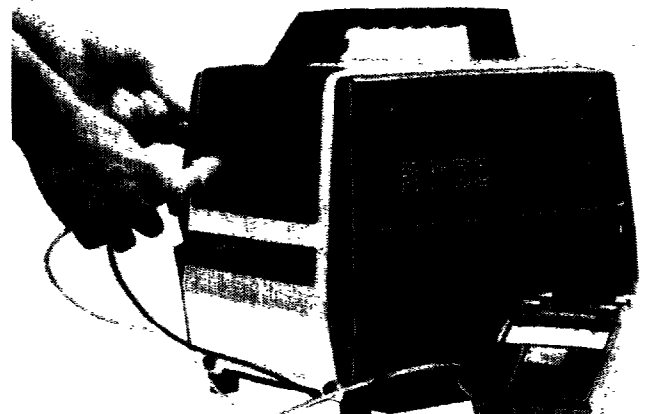


Fig. 10-9

10-4-1 STATOR

Measure the resistances between red coupler leading from the stator and the core.

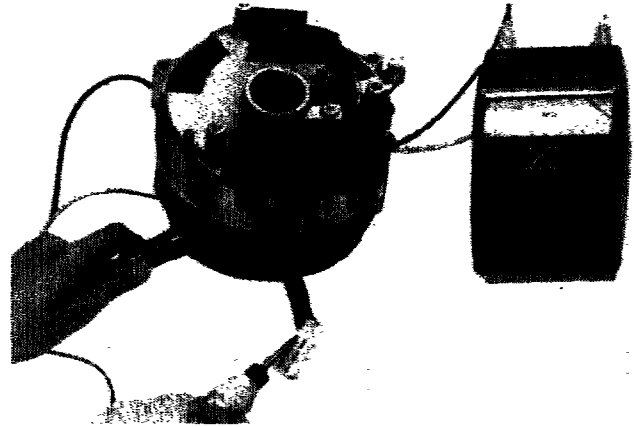


Fig. 10-10

10-4-2 ROTOR

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

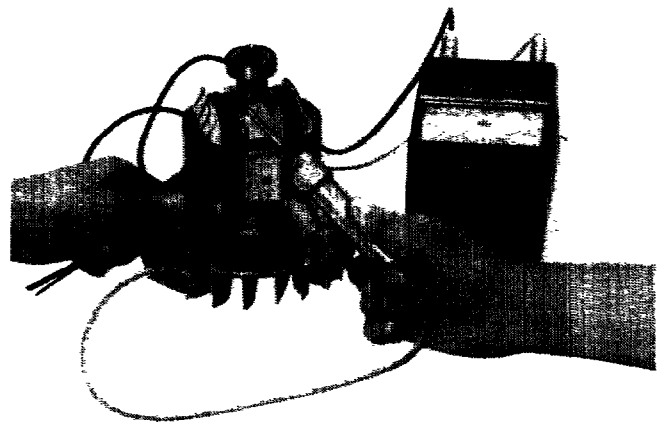


Fig. 10-11

10-4-3 CONTROL PANEL

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

If the measured resistance of a component is below $1M\Omega$, the insulation is defective.

Promptly replace the defective component because there may be leakage of current from the generator and a potential danger of electrical shock.

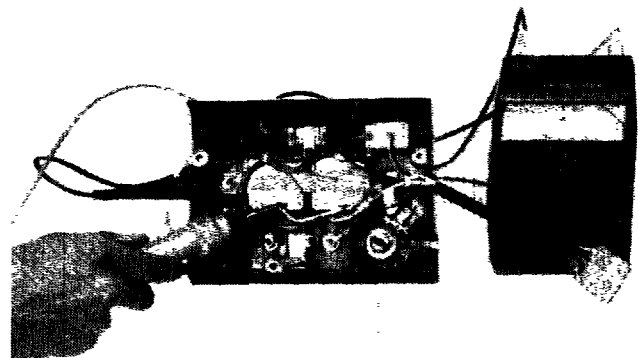


Fig. 10-12

11. FUNCTIONAL CHECK of EACH COMPONENT

11-1 CONTROL PANEL

11-1-1 ENGINE SWITCH

Using the circuit tester, check continuity across the black and green top terminals of the 6P coupler.

When continuity between the terminals is confirmed with the engine switch turned off, the switch is normal. It is also normal if there is no continuity between these terminals, when the engine switch is set at RUN or CHOKE position.

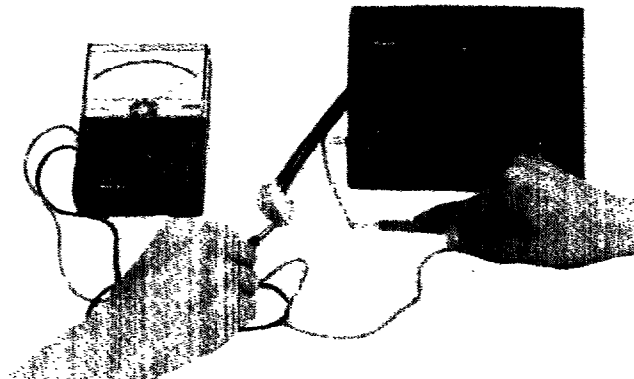


Fig. 11-1

11-1-2 FREQUENCY METER

Also check with the circuit tester, the continuity across the yellow and blue top terminals of the 6P coupler. If continuity is confirmed between these terminals, the frequency meter is normal.

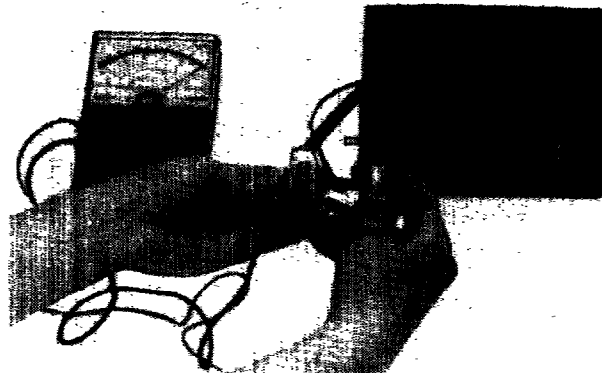


Fig. 11-2

11-1-3 PILOT LIGHT

Using the circuit tester, check continuity between the red and yellow top terminals of the 6P coupler.

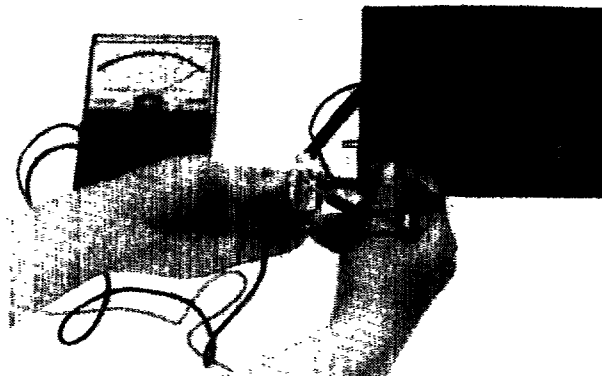


Fig. 11-3

11-1-4 AC RECEPTACLES

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

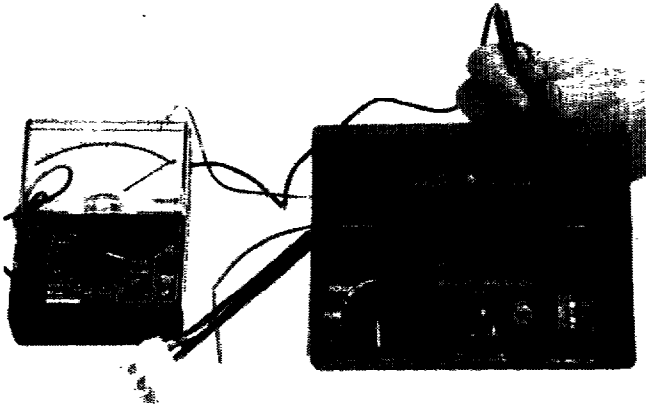


Fig. 11-4(A)

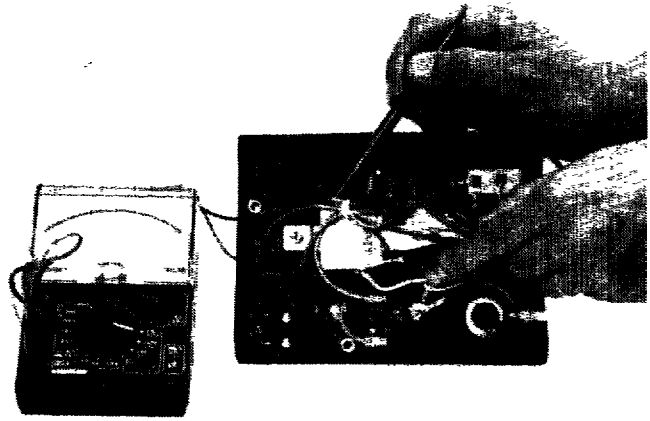


Fig. 11-4(B)

11-1-5 DC TERMINALS

Using the circuit tester, check continuity between the DC terminals at the rear side of the control panel while they are mounted on the panel.

When continuity is confirmed between the DC terminals with a wire connected across these terminals, the DC terminals are normal. When the wire is removed and no continuity is confirmed between these terminals, the terminals are also normal.

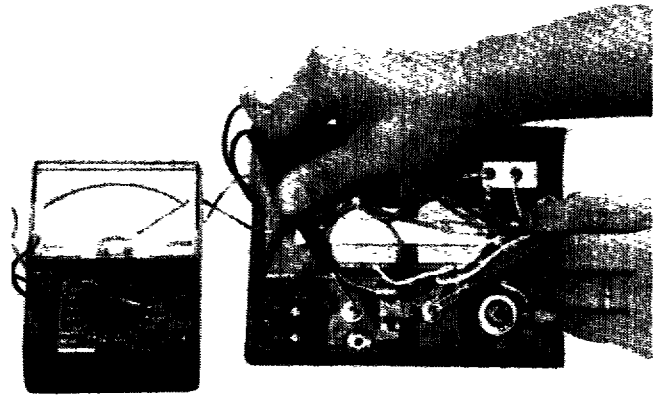
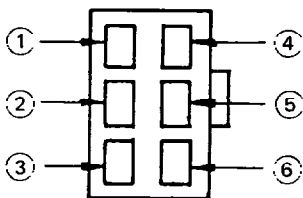


Fig. 11-5

11-1-6 CIRCUIT BREAKER

Check continuity between each of two terminals at the rear of the circuit breaker while it is mounted on the control panel. Normally, there is continuity between each of the two when the circuit breaker is on while there is no continuity when the circuit breaker is off.

[6P coupler wiring]



- ① DARK BLUE
- ② YELLOW
- ③ RED
- ④ BLACK
- ⑤ BROWN
- ⑥ WHITE

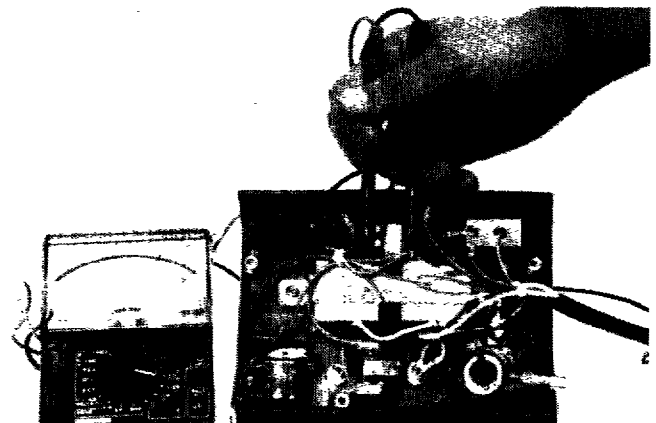


Fig. 11-6

11-2 STATOR

Measure the resistance of each stator coil using the circuit tester.

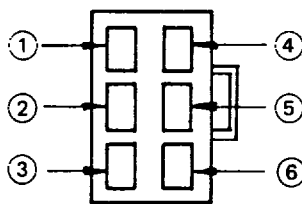
Classified coil	Main coil			Condenser coil	Cord color of (C)
	AC coil	For use with the frequency meter	DC coil	Condenser coil	
Measurement location	6P coupler	6P coupler	Rectifier connector	Between connectors	
50 Hz – 110V	3.4Ω	0.22Ω	1.1Ω	8.9Ω	White/Green
60 Hz – 110V	2.6	0.16	0.9	7.6	White/Red
50 Hz – 120V	3.3	0.22	1.1	8.9	Brown
60 Hz – 120V	2.7	0.16	0.9	7.6	Blue
50 Hz – 220V	13.9	0.22	1.1	8.9	Gray
60 Hz – 220V	11.4	0.16	0.9	7.6	Pink
50 Hz – 230V	15.2	0.22	1.1	8.9	Orange
50 Hz – 240V	15.2	0.22	1.1	8.9	Orange

Table 11-1

(at 21°C)

NOTE: If the circuit tester is not sufficiently accurate, it may not show the values given and may give erroneous readings. Erroneous readings will also occur when there is a wide variation of resistance among coil windings or when measurement is performed at ambient temperatures different from the values specified in the space directly upper the table.

[6P coupler wiring]



- ① DARK BLUE
- ② YELLOW
- ③ RED
- ④ BLACK
- ⑤ BROWN
- ⑥ (C)

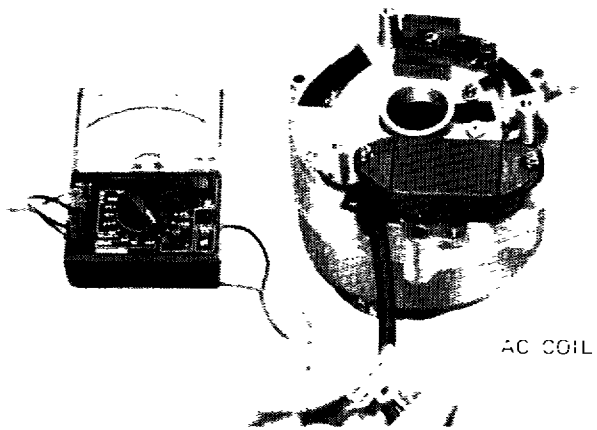


Fig. 11-7

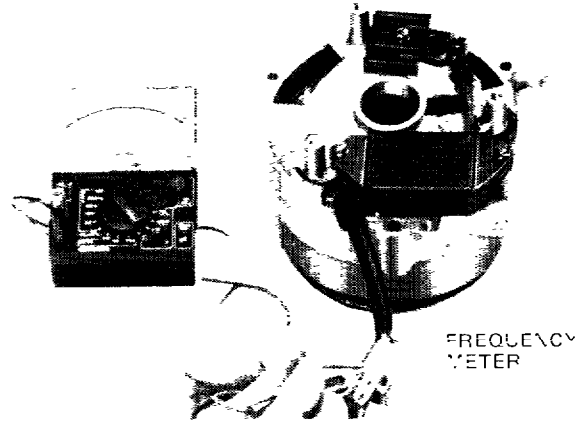


Fig. 11-8

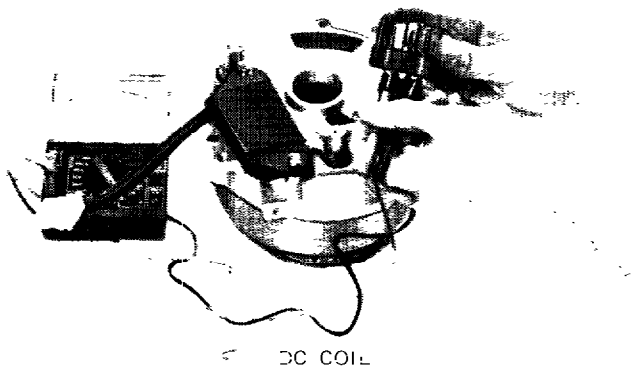


Fig. 11-9

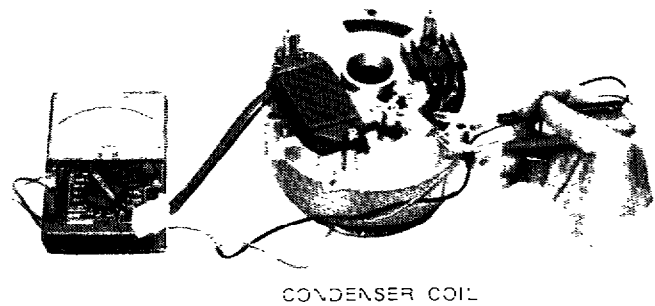


Fig. 11-10

11-3 ROTOR

- Using the circuit tester, measure the resistance of the field coil.

Resistance
11.5Ω

Table 11-2

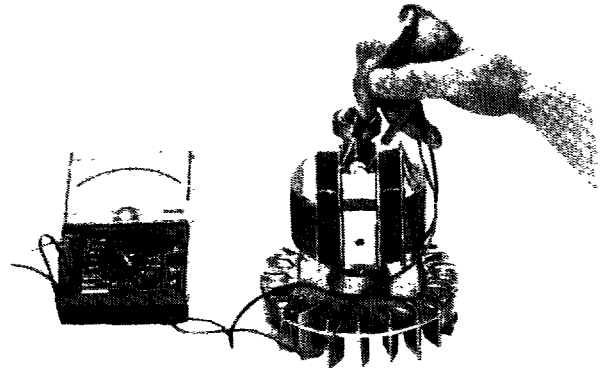


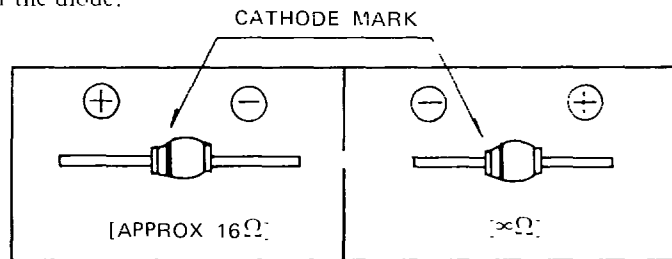
Fig. 11-11

NOTE 1: Measure the resistance of each coil winding while the diode and each resistor are disconnected with their solder removed.

NOTE 2: If the circuit tester is not sufficiently accurate, it may not show the values given and may give erroneous readings.

Erroneous readings will also occur when there is a wide variation of resistance among coil windings or when measurement is performed at ambient temperatures different from the values specified in the space directly below the table.

- Measure the resistance of each resistor. Normal resistance is 15KΩ.
- Measure the resistance of the diode.



11-4 IGNITION COIL

Using the circuit tester, measure the resistance of the coil in the ignition coil unit

	Resistance value	Measurement location
Primary coil	0.61Ω	Between the core and the green cord
Secondary coil	7.5Ω	Between the green cord and the high-tension cord

Table 11-3

11-5 CONDENSER

Measurement of capacity substitutes for checking the condenser. The capacity of the condenser cannot be measured by using the circuit tester. Therefore, the generator is run with a new condenser to see whether or not the generator performs normally. If the generator performs normally, the condenser is normal.

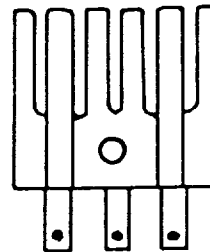
Reference: If an instrument is available for measuring the capacity of the condenser, the total capacity range should be 10 to 11 μ F (at 20°C).

When the condenser displays its total capacity within this range, it is normal.

11-6 RECTIFIER

Using the circuit tester, measure the resistance between each of the two terminals of the rectifier. The rectifier is considered normal when the respective resistances have the values specified below.

NOTE: Each of the given values changes with the polarity of the circuit tester.



Green	Red	White (C)	
	+	-	... 16 Ω
-	+		... 16 Ω
	-	+	... $\infty\Omega$
+	-		... $\infty\Omega$

The polarity of the circuit tester

Table 11-4

12. DISASSEMBLY and ASSEMBLY

12-1 PREPARATION and PRECAUTIONS

- 1) Be sure to remember the locations of individual parts when disassembling the generator so that the generator can be reassembled correctly. Tie tags noted with the necessary information to facilitate easier and smoother reassembly.
- 2) For more convenience, divide the parts into several groups and store them in boxes.
- 3) To prevent bolts and nuts from being misplaced or installed incorrectly, place them temporarily back at their original positions.
- 4) Handle disassembled parts with care; clean them before reassembly using a neutral cleansing fluid.
- 5) Use all disassembly/assembly tools properly, and use the right tool for each specific job.

12-2 SPECIAL TOOLS for DISASSEMBLY and ASSEMBLY

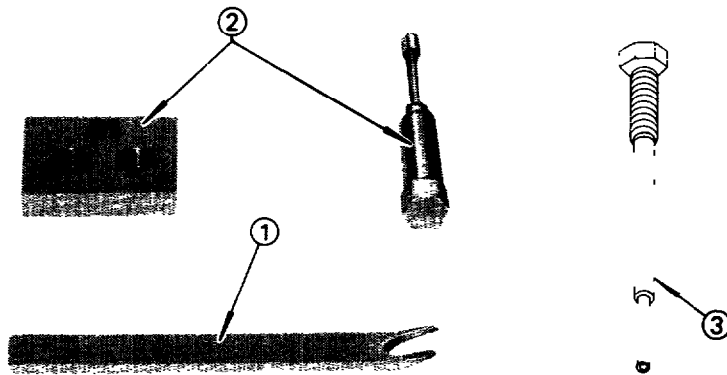


Fig. 12-1

No.	Tool No.	Name of tool	Description
1	2309500107	Valve spring retainer	For disassembling and assembling the intake and exhaust valves
2	2309500207	Valve guide puller	To pull out the valve guide
3	3589500107	Rotor puller	To pull out the rotor

Table 12-1

12-3 DISASSEMBLY SEQUENCE

Sequence	Part to remove	Description	Precautions	Necessary tools
1	Side cover (L) and (R)	(1) Remove both the left and right covers, by taking out eight M5 flange screws.		⊕ Plus screw-driver
2	Couplers (dis-connection)	(1) Disconnect the (6P) coupler of the generator from the other (6P) extending from the control panel.	Pull them under while pressing down the retainer claws. (See Fig. 12-2.)	
3	Choke cable	(1) Set the engine control to STOP, and remove the screw from the tip of the choke cable to disconnect the choke cable from the dial plate. (2) Disconnect the outer cable of the choke cable from the fuel tank bracket. (3) Loosen the M4 screw of the carburetor choke lever swivel to pull out the inner wire from the choke cable.		⊖ Minus screw-driver 10mm box spanner ⊕ Plus screw-driver
4	Fuel line	(1) Hold the fuel line clamp inserted inside the felt strainer using pliers, and pull it backward to remove the fuel line from inside the strainer.	Be careful not to damage the hose.	Pliers
5	Fuel tank handle	(1) Push up the end of the cover fitted to the handle with finger. (2) Pull out the rubber tube used as the air vent pipe. (3) Remove two bolts (tank), and remove the handle.		10mm box spanner



Fig. 12-2

Sequence	Part to remove	Description	Precautions	Necessary tools
6	Rear cover	(1) Remove the rear cover at the opposing side of the control panel by unscrewing the four M6 flange bolts.		10mm box spanner
7	Fuel tank	(1) Loosen the set screw of the strainer shaft at the rear of the engine control switch. (2) Remove two M5 flange bolts clamping the front cover and tank bracket together, and tank bracket together, and then remove the fuel tank.	(See Fig. 12-3.)	⊕ Plus screwdriver 10mm box spanner
8	Front cover	(1) Remove two M5 flange bolts clamping the front cover to the base to remove the front cover.		10mm box spanner
9	Fuel hose	(1) Using pliers, hold the fuel line clamp at the fuel support joint of the carburetor (L-joint directed downward) to pull it aside. Then, pull out the line.	Be careful not to damage the fuel line.	Electricians' pliers
10	Choke cable	(1) Insert the tip of a screwdriver (flat-headed type) in the groove of the choke cable bracket protruding from the head cover.		⊖ Minus screwdriver
11	Muffler cover and muffler	(1) Remove the outer cover; this is done by removing seven M5 tapping screws. (2) Remove one M6 x 12 flange bolt of the muffler bracket, and two M6 nuts from the muffler flange. Then, remove the flange. (3) Remove four M5 x 8 lock screws from inside the muffler to remove the inner cover.	Take care not to drop the removed screws down into the cooling air channel. (See Fig. 12.4.)	⊕ Plus screwdriver 10mm box spanner ⊖ Minus screwdriver

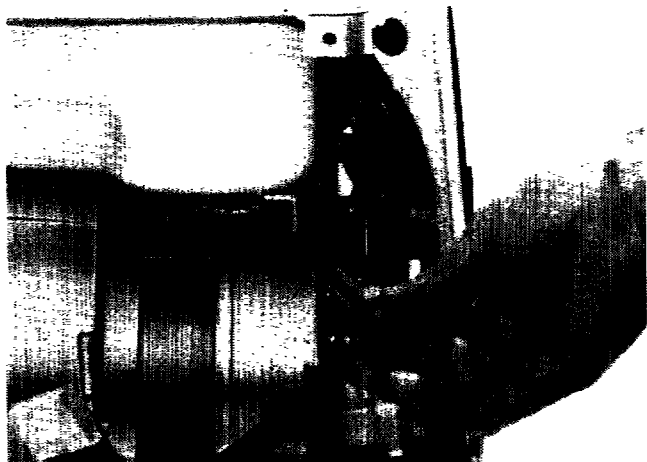


Fig. 12-3

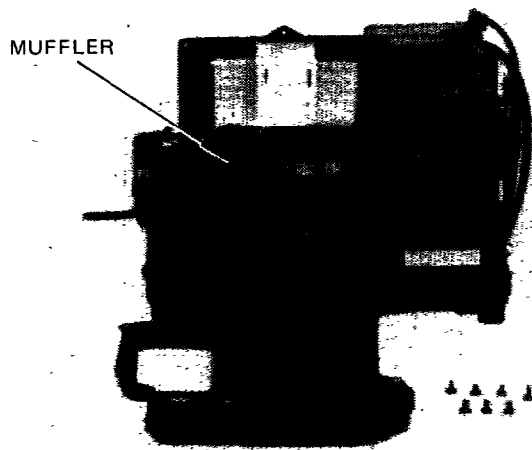


Fig. 12-4

Sequence	Part to remove	Description	Precautions	Necessary tools
12	Base plate	(1) Remove one set screw of the earth wire which grounds the rear housing and base plate together (200V system only). (2) Remove four M5 x 10 bolts from under the base plate.		⊕ Plus screw-driver 8mm box spanner
13	Recoil starter	(1) Remove the recoil starter from the rear housing, by removing three M6 x 8 flange bolts.	(See Fig. 12-5.)	10mm box spanner
14	Starter pulley	(1) Turn the starter pulley by hand to set the piston to the compression stroke limit (where the pulley becomes heavy). Using a hammer strike the box wrench set over the head of the through bolt to remove the bolt. Then remove the pulley.	(See Fig. 12-6.)	12mm box spanner Handle hammer

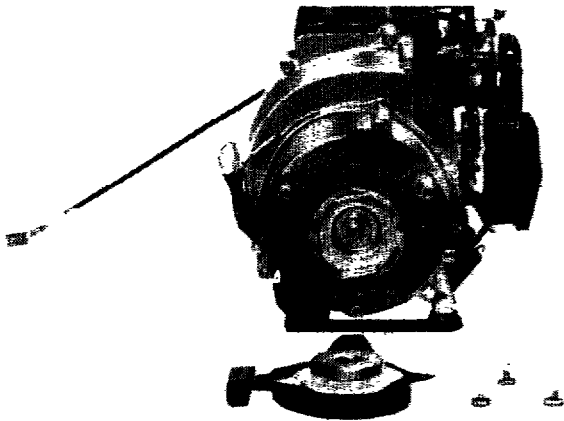


Fig. 12-5

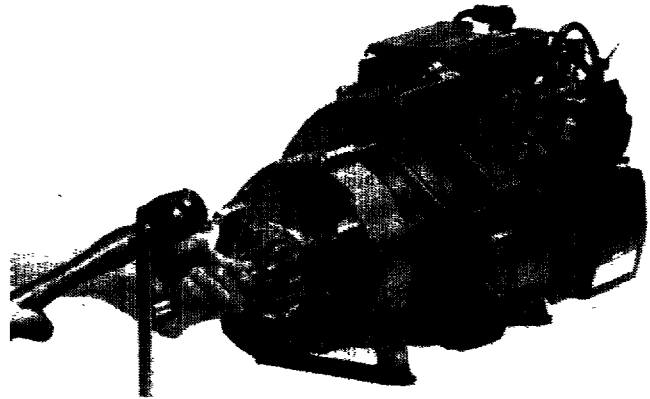


Fig. 12-6

Sequence	Part to remove	Description	Precautions	Necessary tools
15	Stator assembly	(1) Remove three M6 x 85 bolts clamping the rear housing of the stator assembly, and the front housing together. (2) Remove the stator assembly from the front housing. The stator and rear housing are removed together by using a plastic hammer to lightly strike the boss of the rear housing. (3) Remove the lead from the clamp by taking out one M4 x 8 screw. (4) Remove both the capacitor and diode from the rear housing by removing three M5 x 20 screws. (5) Remove the wiring between the stator and rear housing. Disconnect three terminals from the diode, two terminals from the capacitor, and the ground wire from the rear housing.	(See Fig. 12-7.)	10mm box spanner Plastic hammer ⊕ Plus screw-driver ⊕ Plus screw-driver

Sequence	Part to remove	Description	Precautions	Necessary tools
16	Rotor assembly	(1) Fit the rotor puller to the rotor shaft, and drive it into place to remove the rotor from the engine shaft.		Rotor puller Plastic hammer
17	Plug cap	(1) Remove the plug cap from the spark plug in advance. (2) Remove the clamp of the high-voltage power cable.		
18	Front housing and center baffle	(1) Remove the front housing and center baffle from the engine main bearing, by removing three M6 x 25mm bolts and one M5 x 55mm bolt.	(See Fig. 12.8.)	10mm box spanner



Fig. 12-7

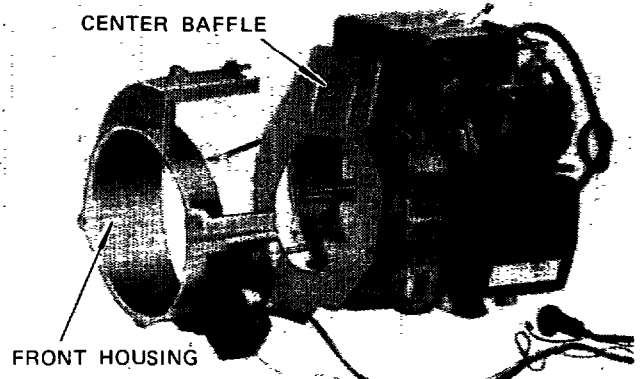


Fig. 12-8

Sequence	Part to remove	Description	Precautions	Necessary tools
19	Air cleaner	(1) Remove the center screw of the air cleaner cover to remove the cleaner cover, filter element, and element retainer. (2) Remove the M5 screw at the lower right inside the element chamber. (3) Remove two M6 flange nuts clamping the air cleaner and the carburetor together to remove the air cleaner.	(See Fig. 12-9.)	⊖ Minus screw-driver ⊕ Plus screw-driver 10mm box spanner

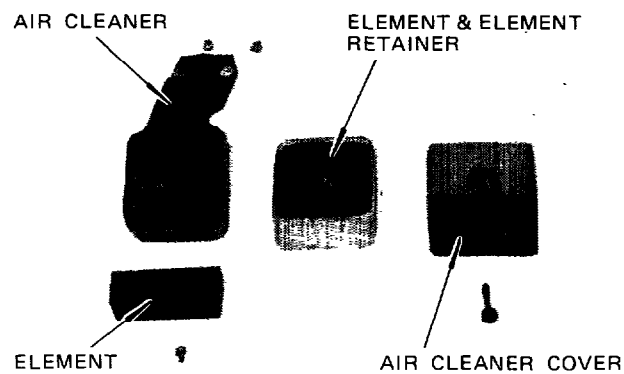
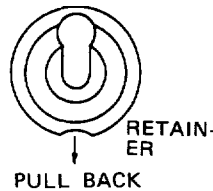


Fig. 10-9

Sequence	Part to remove	Description	Precautions	Necessary tools
20	Governor and related parts	(1) Remove the governor lever from the governor shaft. (2) Remove the governor rod, rod spring, and governor spring.	Loosen the bolt (unnecessary to remove it)	10mm box spanner
21	Carburetor	(1) Remove the carburetor from the stud area of the intake side flange of the crankcase.		
22	Head cover	(1) Remove two M5 screws from the lateral side of the head cover to remove the head cover.		⊕ Plus screw-driver
23	Cylinder baffle	(1) Remove the M6 bolt from the crankcase and the M5 bolt from the main bearing cover to remove the cylinder baffle.		10mm box spanner ⊕ Plus screw-driver
24	Spark plug	(1) Remove the spark plug from the cylinder head.		19mm box spanner
25	Cylinder head	(1) Remove seven M6 x 32 bolts to remove the cylinder head. (2) Remove the head gasket.	Mark the head gasket with its mounting position accurately matching the cylinder head, also mark the gasket mounting face of the cylinder head.	10mm box spanner
26	Intake valve	(1) Remove both the inner and outer tappet chamber covers from the crankcase, by removing two M6 x 12 bolts. (2) Remove both the intake and exhaust valves. (3) Remove the valve spring and retainer.	Be sure to position the notch in the spring retainer's outside periphery to the front and hook the minus screw-driver (medium side) in the recess (lower side) of the retainer. Then pull the spring retainer backward to remove it.	10mm box spanner ⊖ Minus screw-driver
				
27	Main bearing cover	(1) Remove the Woodruff key from the crankshaft. (2) Remove five M6 x 25 bolts locking the main bearing cover from the crankcase. (3) Using a plastic hammer or a similar tool, strike the main bearing cover uniformly around its periphery to remove the cover.	Be careful not to damage the lip of the oil seal.	10mm box spanner Plastic hammer

Sequence	Part to remove	Description	Precautions	Necessary tools
28	Camshaft	(1) Pull out the camshaft from the crankcase.	Set the crankcase sideways so that it will not fall and damage the tappets.	
29	Tappets	(1) Remove the tappets from the crankcase.	Be sure to mark the tappets to distinguish them from each other; one for the intake valve and the other for the exhaust valve.	
30	Connecting rod and piston	(1) Scrape off the carbon deposits from the cylinder and piston head. Push open the bend of the connecting rod lock washer, and remove two bolts. (2) Remove the lock washer and connecting rod cap from the crankshaft. (3) Turn the crankshaft until the piston comes to its top position, and push the piston from the upper part of the cylinder.	Confirm the mounting direction of the oil scraper.	⊖ Minus screwdriver Pliers 10mm box spanner
31	Piston and piston rings	(1) Remove two clips from the piston pin and take out the piston pin. Remove the piston from the connecting rod. (2) Each of the piston rings can be removed from the piston by opening wide the ring joint.	(1) Replace these clips with new ones; do not reuse them. (2) Be careful not to damage the minor rod end. (3) Be careful not to open the ring joint excessively.	
32	Crankshaft	(1) Pull out the crankshaft from the crankcase. If unable to pull it out by hand, use a plastic hammer to gently strike the main bearing joint face, and pull the crankshaft pulled out.		
33	Governor shaft	(1) Remove the clip of the governor shaft, and pull out the governor shaft from the crankcase.		

12-4 ASSEMBLY PROCEDURE

● Precautions in Assembly

- 1) Thoroughly clean each part. When cleaning, take special care for the piston, cylinder, crankshaft, connecting rod, and bearings.
- 2) Be sure to completely remove the carbon deposits on the cylinder head and piston head. Also, thoroughly clean and remove carbon deposits from each piston ring groove.
- 3) Apply lubricating oil to the lip of each seal. Confirm that the lip of each oil seal is not damaged. If damaged, replace with new one.
- 4) Replace the gaskets and similar items with new ones; do not reuse old gaskets.
- 5) Replace the keys, pins, bolts, nuts, etc., with new ones if necessary.
- 6) Do not apply torque exceeding the specified value.
- 7) Apply lubricating oil to both moving and sliding parts when they are assembled.
- 8) Prior to assembly, check the clearance of each part, and adjust it if necessary.
- 9) When each of the main components are assembled, turn it by hand to check for smoothness of rotation and unusual noise.

● Assembly Sequence and Precautions

12-4-1 GOVERNOR SHAFT

Put the governor shaft into crankcase, then drive the clip into position to secure the governor shaft.

12-4-2 CRANKSHAFT

- 1) Insert the crankshaft into the ball bearings of the crankcase.
- 2) Fig. 10-4-1 shows the dimensional tolerance of the crankpin.

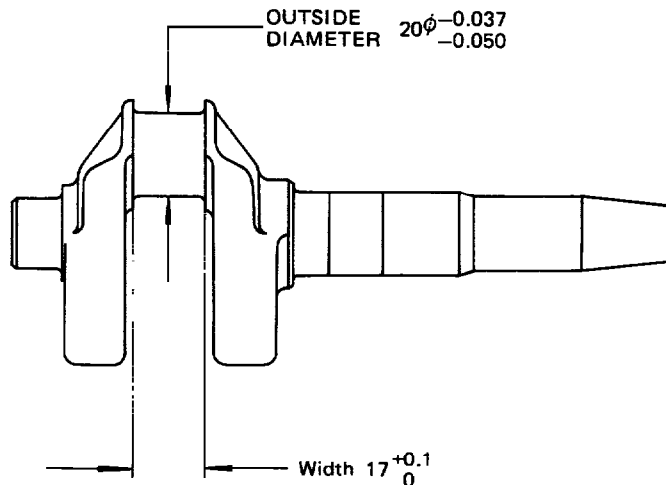


Fig. 12-10

● Tolerances of Newly Installed Parts

Thrust directional tolerance between the cylinder and piston skirt		0.008L ~ 0.047L	
Clearance of piston ring joint	Top ring	0.2L ~ 0.4L	
	Second ring	0.2L ~ 0.4L	
	Oil ring	0.05L ~ 0.25L	Spare rings
Clearance between piston ring	Top ring	0.090L ~ 0.135L	
	Second ring	0.060L ~ 0.105L	
	Oil ring	0.010L ~ 0.065L	Spare rings
Clearance between connecting rod major end and crankpin	Inside and outside diameter clearance	0.037L ~ 0.063L	
	Side clearance	0.1L ~ 0.7L	
Clearance between connecting rod minor end and piston pin		0.010L ~ 0.029L	
Clearance between piston pin and piston pin hole		0.009T ~ 0.010L	

L = Loose T = Tight

Table 12-2

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

12-4-3 PISTON and PISTON RINGS

- 1) If a ring expander is not available, set the ring joint at the first land of the piston, as shown in Fig. 12-11 so that the ring can be slid into its groove.

NOTE: Be careful not to twist or expand excessively each ring. The oil ring is fitted first on to the piston, followed by the second ring and top ring.

The top and second rings must be fitted with their marked sides kept upward.

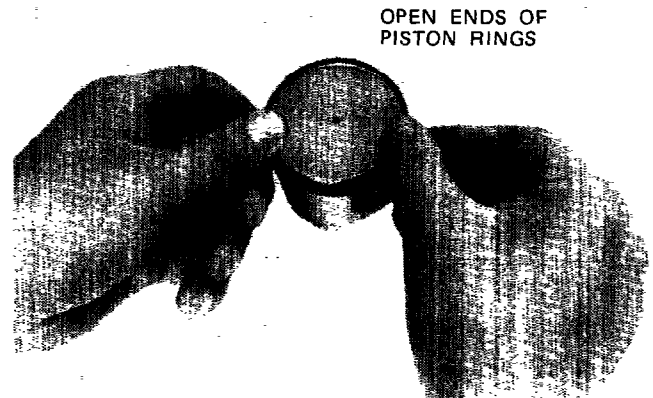


Fig. 12-11

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

NOTE: Before assembly, apply sufficient lubricating oil to the connecting rod minor end.

NOTE: Be sure to fit the clips to both sides of the piston pin.

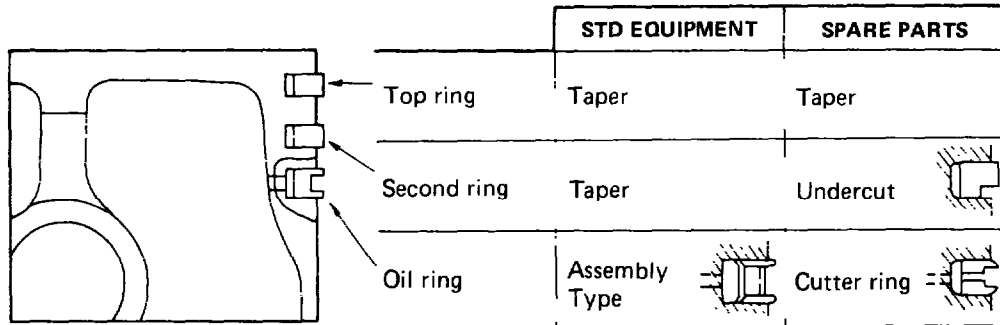



Fig. 12-12

12-4-4 INSTALLING THE CRANKCASE

- 1) The connecting rod is put into the cylinder while holding it with the piston ring guide, as shown in Fig. 10-13 (in the case that a piston ring guide is not available, press rings inward with fingers and at the same time, strike down the piston, using a wooden block). The connecting rod must be mounted in place with its  and MA marks directed to the ball bearing side of the crankcase.

NOTE: Apply a sufficient quantity of oil to the piston rings, connecting rod surfaces, and cylinder.

NOTE: The top, second and oil rings are fitted to the piston with their ring joints arranged 90° off each adjacent joint.

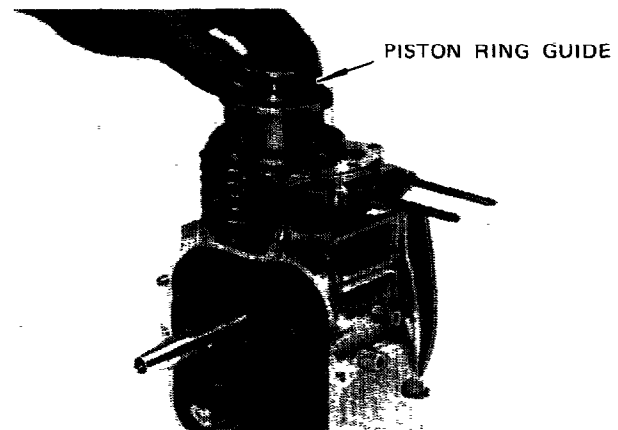


Fig. 12-13

12-4-5 INSTALLING THE CONNECTING ROD MAJOR END CAP

- 1) Manually turn the crankshaft until the piston reaches top dead center. Gently strike down the piston head until the connecting rod touches the crankpin to install the connecting rod major end cap.
- 2) The cap is installed with the oil scraper positioned right-downward. (See Fig. 12-14.)

NOTE: Be sure to use a new lock washer; and carefully bend the washer correctly.

NOTE: When the cap has been installed, turn the crankshaft to see if the connecting rod moves smoothly.

NOTE: The correct torque for installing the connecting rod major end cap is 60 to 80 kg-cm.

NOTE: See Table 12-2 for details regarding the clearances between the piston, piston rings, and connecting rod and their counterparts.

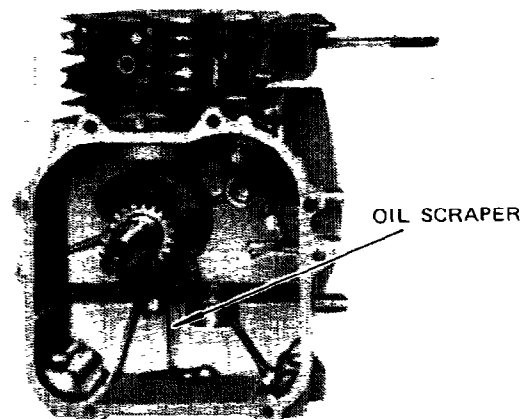


Fig. 12-14

12-4-6 INSTALLING THE TAPPETS and CAMSHAFT

Install the tappets, 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 run or operate properly. (See Fig. 12-15.)

NOTE: If the intake and exhaust valves are installed in reverse order, tappet clearance will be incorrect.

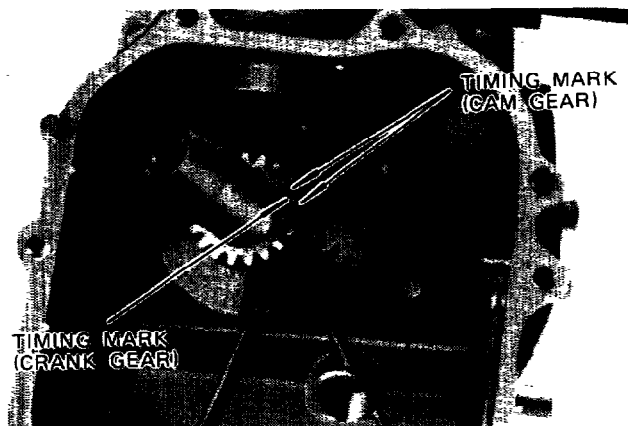


Fig. 12-15

12-4-7 INSTALLING THE MAIN BEARING COVER

Install the main bearing cover to the crankcase.

NOTE: The governor gear is already mounted to the bearing cover; therefore, it is necessary to confirm that the governor gear is meshed with the cam gear. (See Fig. 12-16.)

If the oil seal requires replacement, pressure-fit the new oil seal in position before installing the main bearing cover.

NOTE: Prior to installation, apply oil to the bearing and oil seal. Apply a small amount of oil to the cover fitting face, as specified, in preparation for installing the bearing cover packing. Place the oil seal guide over the crankshaft so that the oil seal lip will not be damaged during installation. Make sure that the side clearance of the crankshaft is within 0 to 0.2mm. If necessary, adjust the clearance, using the adjusting collar. (see Fig. 12-17.)

NOTE: Torque for the main bearing cover: 80 ~ 100 kg-cm.

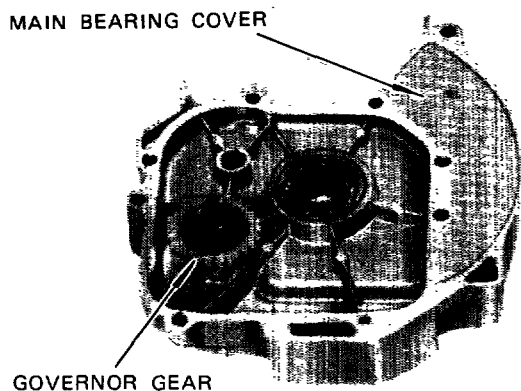


Fig. 12-16

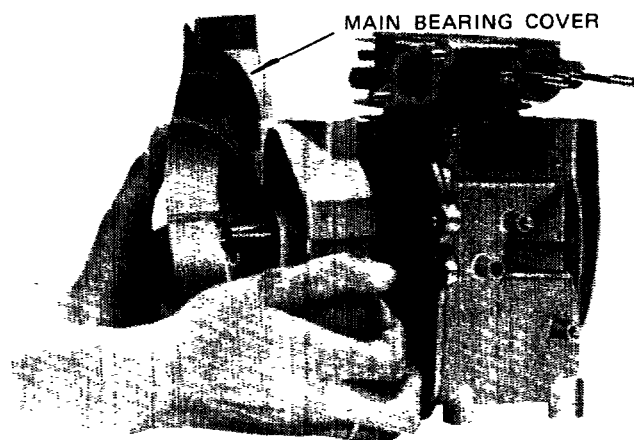


Fig. 12-17

*Shown in Fig. 12-18. is the method to measure the side clearance of the crankshaft. According to this method, measure the clearance between the machined face of the crankcase and the adjusting collar. The machined face of the crankcase is mounted with packing so it is necessary to set the clearance properly by allowing for a packing thickness of 0.22mm.

- M6 x 25mm bolt 8 pcs.
- M6 x 55mm bolt 1 pc.

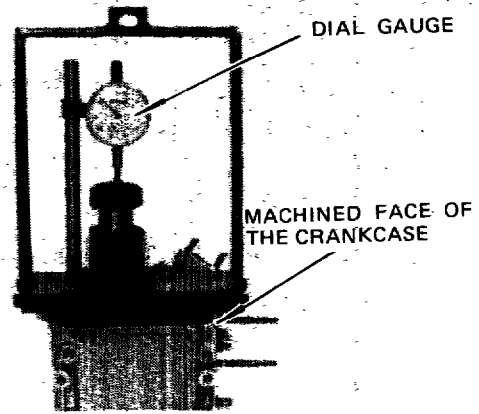


Fig. 12-18

12-4-8 INSTALLING THE INTAKE and EXHAUST VALVES

Prior to installing, remove carbon and gum deposits, from the valve, valve seat, intake and 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 excessively large, replace the valve guide with a new one.

Replace the valve guide by using a pull block and pull bolt as shown in Fig. 12-20.

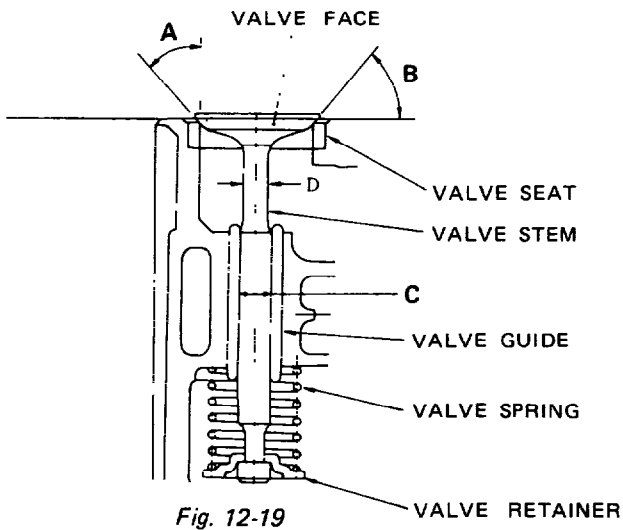


Fig. 12-19

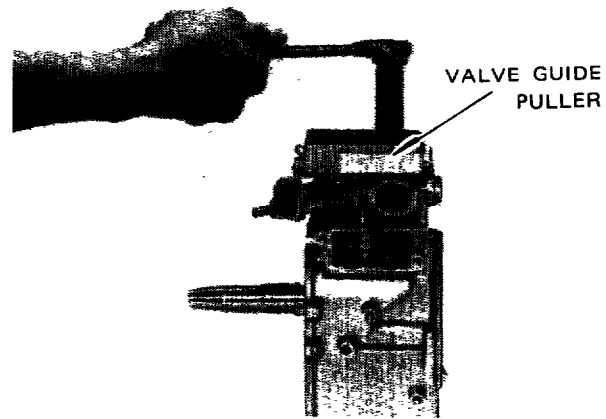


Fig. 12-20

A: Valve face angle		45°
B: Valve seat angle		45°
C: Valve guide inside diameter		5.5φ ^{+0.018} / ₀
D: Valve stem outside diameter	Intake valve	5.5φ ^{-0.020} / _{-0.032}
	Exhaust valve	5.5φ ^{-0.056} / _{-0.074}
Clearance (clearance between C and D) between valve guide and valve stem	Intake valve	0.020L ~ 0.050L
	Exhaust valve	0.056L ~ 0.072L

Table 12-3

L: LOOSE

12-4-9 TAPPET ADJUSTMENT

Set the tappet at the lowest position to depress the valve. Then measure the clearance between the valve and tappet stem, using a clearance gauge inserted into the clearance. (See Fig. 12-21.)

NOTE: As with the intake and exhaust valves, the clearance between the valve and tappet stem must be within 0.1 ± 0.02 .



Fig. 12-21

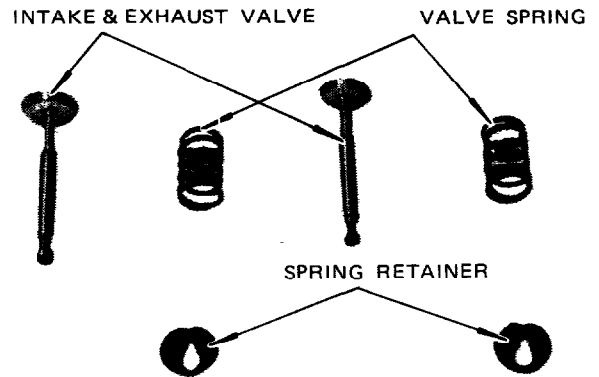


Fig. 12-22

NOTE: If the clearance is smaller than that specified, slightly grind down the valve stem end using a grinder, then measure the clearance.

If the clearance is larger than that specified, replace the valve with a new one. Spot the valve seat and use some compound to adjust the clearance.

NOTE: After completing adjustment of tappet clearance, install the valve spring retainers, and then recheck the tappet clearance.

*Installing the valve spring retainer:

Using the special tool, place the retainer over the valve stem with the notch in the outside periphery of the retainer kept toward the front.

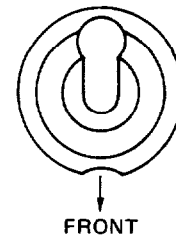


Fig. 12-23

12-4-10 INSTALLING THE CYLINDER HEAD

Before reinstalling the cylinder head, be sure to remove carbon deposits from the combustion chamber, and clean between the cooling fins. Also check the cylinder head for levelness.

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

The cylinder head is installed using seven M6 x 32mm bolts.

NOTE: Torque for each cylinder head lock bolt: 90 ~ 110 kg-cm

12-4-11 INSTALLING THE SPARK PLUG

Torque for spark plug: 120 ~ 150 kg-cm

12-4-12 INSTALLING THE CYLINDER BAFFLE

The cylinder baffle is installed to the crankcase, using the M6 x 20mm screw and to the main bearing cover, using the M5 x 10mm screw.

The cylinder baffle and fuel line clamp are installed, together to the crankcase.

12-4-13 INSTALLING THE HEAD COVER

The head cover is installed over each of the left and right parts of the cylinder head, using the M5 x 10mm screws.

12-4-14 INSTALLING THE GOVERNOR and RELATED PARTS

Model EY08D has a centrifugal weight type governor which is installed while engaged with the governor gear. With the governor, the throttle valve of the carburetor is controlled automatically by using a lever link mechanism. Therefore, engine speed is constantly maintained even under load variations.

- 1) Using two M6 x 10mm bolts, install the speed control assembly to the crankcase.
- 2) Temporarily install the carburetor with two M6 flange nuts.
- 3) Join the throttle lever of the carburetor to the governor rod and rod spring.
- 4) Insert the governor lever into the governor shaft.
- 5) Insert a minus screwdriver into the groove of the governor shaft, and turn the screwdriver fully in the counterclockwise direction. Push the governor lever clockwise (at this time, the throttle valve is fully opened) and fasten the governor lever with the lock bolt.

Torque for the governor lever: 70 ~ 90 kg-cm

- 6) Link the governor lever and speed controller with the governor spring, one end of which is inserted into the center hole (of the three) of the governor lever and the remaining end inserted into the hole of the speed controller.

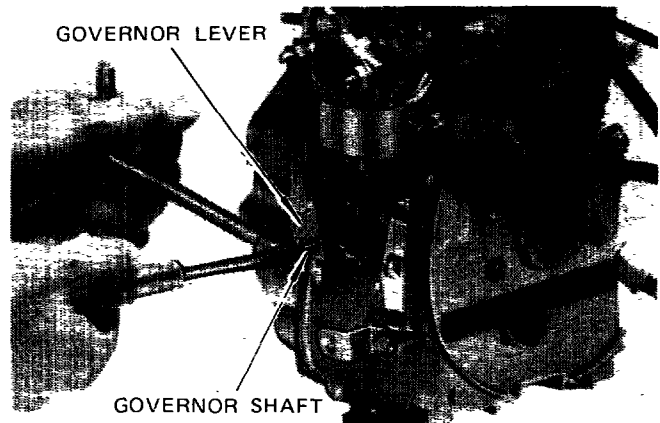


Fig. 12-24

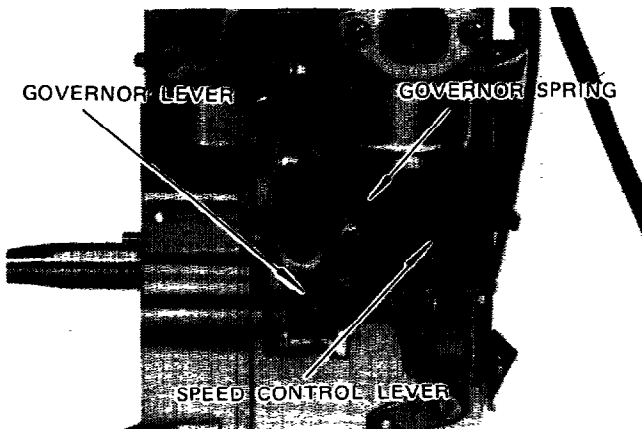


Fig. 12-25

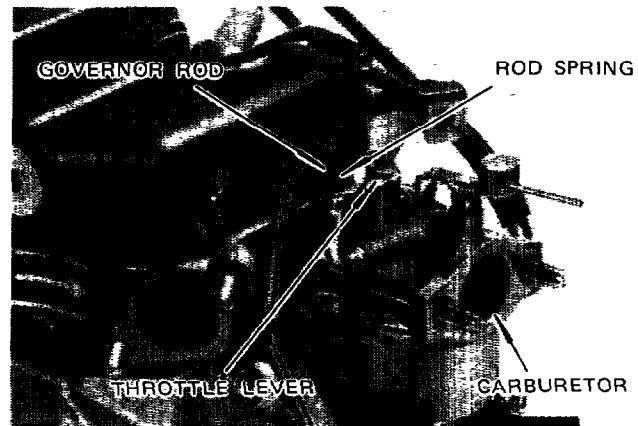


Fig. 12-26

12-4-15 INSTALLING THE CARBURETOR and AIR CLEANER

Place the carburetor gasket, insulator, gasket, and carburetor in the correct positions. Next, fit the air cleaner gasket and air cleaner case, and install them, using the M6 flange nut and M5 x 10mm screw. Set the element (small type), element retainer, element, and cleaner cover, and tighten them with screws (slot head type).

Torque for installing the carburetor and air cleaner: 50 ~ 60 kg-cm

NOTE: See page 10-26 for details concerning disassembly and assembly of the carburetor.

12-4-16 INSTALLING THE CENTER BAFFLE and FRONT HOUSING

- 1) Set the knock hole of the front housing to the knock of the main bearing cover and assemble them together. During assembly, place the center baffle between the main bearing cover and front housing.

Torque for the front housing: 80 ~ 100 kg-cm

12-4-17 INSTALLING THE IGNITION COIL

- 1) Install the ignition coil and grommet (IG-COIL) to the front housing. Simultaneously, temporarily set the generator rotor in position. And assemble the ignition coil and magnet together while adjusting the air gap between the two to 0.4 to 0.5 mm.

Firmly bond the grommet to the front ensuring that there is no residual clearance. (use CEMEDINE 575).

- 2) Fit the plug cap on the spark plug.

12-4-18 INSTALLING THE ROTOR ASSEMBLY

Install the rotor assembly to the taper of the crankshaft with their keyways in line.

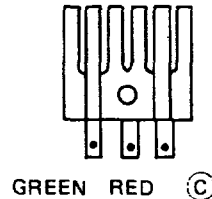
NOTE: Thoroughly clean the tapers (both male and female tapers) of oily substances.

12-4-19 INSTALLING THE STATOR ASSEMBLY

- 1) Install the stator correctly into the recess of the rear housing. Note the leads and their positions.
- 2) Install the wiring between the stator and rear housing.

Connect the wires from the stator to the capacitor (with these wires joined to two black top terminals).

Also connect the wires from the stator to the rectifier (with these wires joined to three terminals).



Refer to paragraph 9-2 for **(C)**.

Connect the ground cord to the rear housing, using one M6 x 8mm screw.

- 3) Install the stator assembly correctly into the recess of the front housing. If necessary, softly strike the rear housing with a plastic hammer (be careful not to strike the capacitor and diode).
- 4) Fasten the front housing to the rear housing of the stator assembly, using three M6 bolts, while the three bosses of the front housing are set to their counterparts of the rear housing.

Torque for each bolt: 65 ± 10 kg-cm

- 5) Clamp the lead of the 6P x coupler and the lead from the ignition coil to the bolts specified in paragraph d above, using the wire bands.

12-4-20 INSTALLING RUBBER MOUNT (A)

- 1) Fit rubber mount (A) to the bosses (two) at the lower center of the crankcase.
- 2) Also fit another rubber mount (A) to the bosses at the lower part of the stator assembly of the generator.

12-4-21 INSTALLING THE STARTER PULLEY

Install the starter pulley to the rotor shaft using the rotor through bolt.

Torque for the through bolt: 100 ~ 150 kg-cm

12-4-22 INSTALLING THE RECOIL STARTER

Install the recoil starter to the rear housing using the M6 flange bolt.

12-4-23 RUBBER TUBES for USE as AIR VENTS

Connect two rubber tubes to the air vent connectors of the carburetor. Keep these rubber tubes suspended downward from the air vent connectors.

12-4-24 INSTALLING THE BASE FRAME

- 1) Install the base frame with its rear side facing the welded nut area of rubber mount (A). Match the rubber mount (A) which is fitted to the lower part of the engine and generator. Base frame is installed using four M5 bolts.
- 2) Insert each rubber tube from the air vent connector of the carburetor into the hole in the base frame.
- 3) Fasten the ground terminal of the 200V power system to the rear housing using the M6 bolt.



Fig. 12-27

12-4-25 INSTALLING THE MUFFLER and MUFFLER COVER

- 1) Fit the gasket (for the muffler cover) to the studs of the exhaust flange of the crankcase.
- 2) Using the M5 screws, install the muffler cover in place.
NOTE: Be careful not to drop the screws into the cooling air channel.
- 3) Set the gasket (for the exhaust port) on the studs of the exhaust port flange. Then, mount the asbestos sheets to the upper and lateral sides of the muffler. The muffler is installed while secured to the muffler flange using two M6 nuts, and also to the muffler bracket by using one M6 bolt.
- 4) Install the outer muffler cover place using seven M5 tapping screws.
Torque: 70 ~ 90 kg-cm

12-4-26 INSTALLING THE CHOKE CABLE

- 1) Insert the inner wire of the choke cable into the swivel of the choke lever.
- 2) Insert the outer end of the choke cable into the wire bracket of the head cover; temporarily tighten the outer end so that it will not slip out of the wire bracket.
NOTE: The inner wire is installed later. Leave it loose in the swivel.

12-4-27 INSTALLING THE FUEL LINE

- 1) Connect the fuel line to the line connector at the fuel supply port of the carburetor. Then, fasten the line so that it will not come off the line connector.
- 2) Secure the fuel line with the clamp of the cylinder baffle.

12-4-28 INSTALLING THE FRONT COVER

Using two M6 x 8mm flange bolts, install the front cover installed with the control panel to the base plate. Keep the engine switch set at STOP.

12-4-29 INSTALLING THE FUEL TANK

- 1) Keep the strainer shaft at the lower part of the fuel tank in a position that will allow the setscrews to be tightened from the opposite direction of the muffler.
- 2) Insert the flexible shaft extending from the rear side of the engine switch which is mounted on the control panel into the square hole of the strainer shaft.

- 3) Align the mounting holes at the lateral side of the front cover with those in the bracket which are bolted to the fuel tank. Then, install the fuel tank, using two M6 x 8mm flange bolts.
- 4) Make sure that the flexible shaft on the control dial side is inserted in the square hole of the strainer shaft, then fasten the flexible shaft.

12-4-30 INSTALLING THE REAR COVER

Align the mounting holes at the lateral side of the rear cover with those in the fuel tank bracket. Then install the rear cover, using two M6 x 8mm flange bolts. Also align the holes at the lower part of the rear cover with those in the base plate, and install the rear cover by two M6 x 8mm flange bolts.

12-4-31 INSTALLING THE FUEL TANK HANDLE

- 1) Set the bolt (to secure the tank handle) in the handle and assemble the O-ring to this bolt from the opposite side. Then, tighten the bolt to install the handle to the fuel tank.

NOTE: Be sure to direct the less slanted part of the handle toward the front cover.

- 2) Insert the rubber tube end over the protrusion of the bolt (for the fuel tank) and push it down to the base of the protrusion.

NOTE: Be sure to keep the air bleed hole at the center of the rubber tube directed upward.

- 3) Place the handle cover over the handle.

12-4-32 INSTALLING THE FUEL LINE

Insert the fuel line end over the fuel strainer joint (be sure to push the line end down to the joint base), and secure it with the clamp.

12-4-33 INSTALLING THE CHOKE CABLE

- 1) Insert the choke cable adjusting screw in its hole on the fuel tank bracket.
- 2) Secure this adjusting screw with the M6 nut and tighten to the midway point of the threaded part.
- 3) Set the dial of the control panel to **STOP**, and connect the locknut of the choke cable end to the panel.
- 4) Pull the inner wire of the choke cable to clamp the wire to the choke lever, using the setscrew.

12-4-34 CONNECTING THE COUPLERS TOGETHER

Connect the coupler (6P) from the generator to the coupler (6P) extending from the control panel. Also connect the stop wire (green) as required.

12-4-35 INSTALLING THE LEFT and RIGHT SIDE COVERS

Using the M5 flange screws, install the left and right side covers in place.

12-5 CARBURETOR

12-5-1 FUNCTION and COMPONENTS (See Fig. 12-28)

1) Float system

The float chamber is located directly under the carburetor. Flat and needle valves, maintain a constant fuel level inside the float chamber.

The fuel in the tank flows into the float chamber from the needle valve. When a certain quantity of fuel enters the chamber, the float rises. When the buoyancy of the flat valve balances with the fuel in-flow pressure of the needle valves, the valves close to keep the fuel at the correct level.

Schematic diagram of the fuel system

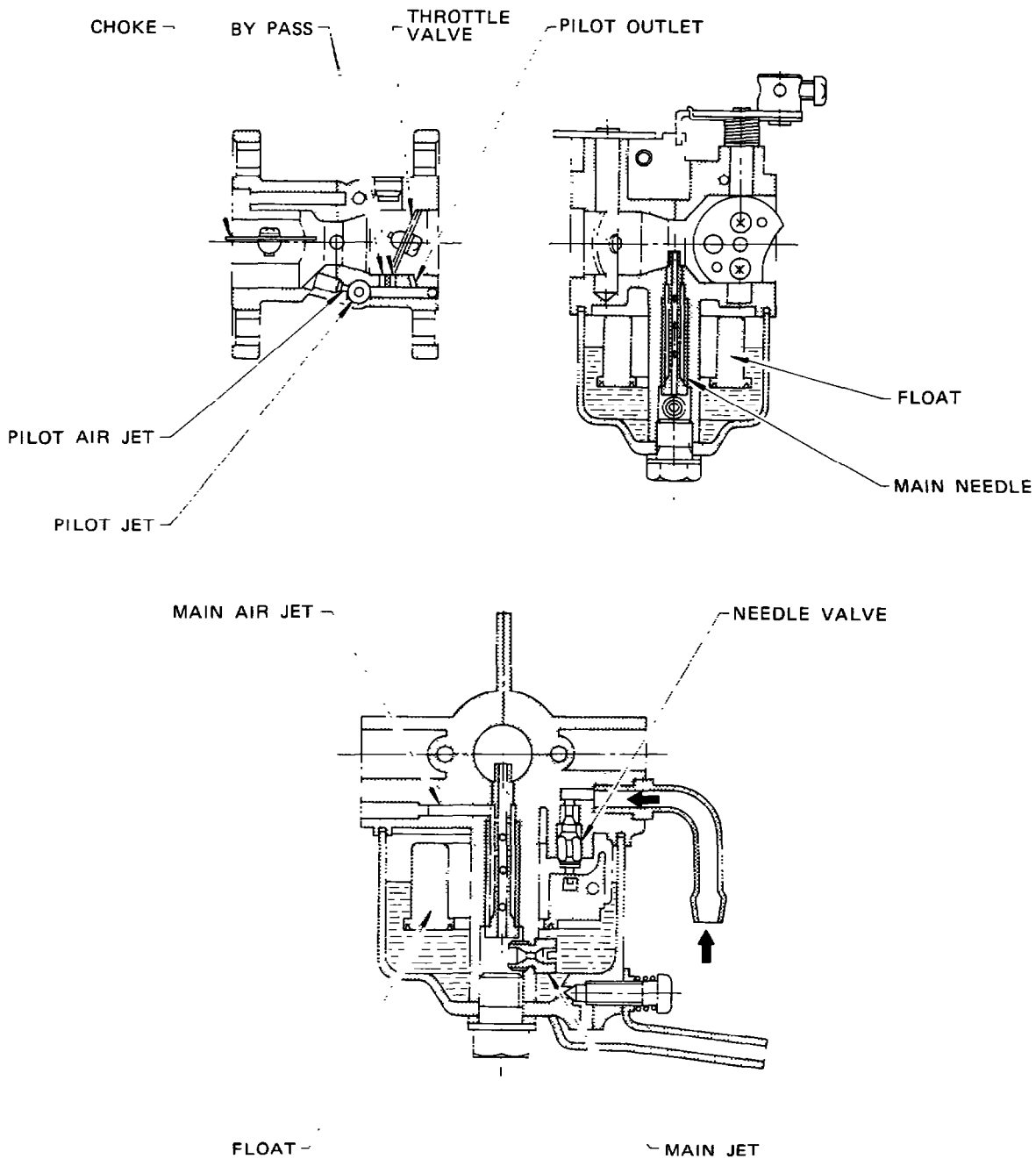


Fig. 12-28

2) Pilot jet nozzle system

The pilot jet nozzle system controls the fuel supply for engine speeds ranging from idle to low-speed running. The system operates with the fuel flowing through the main jet nozzle and up to the pilot jet nozzle where the fuel is measured. When the fuel is mixed with air, the volume of the air-fuel mixture is also measured by the pilot air jet. From this stage, the mixture is supplied to the engine from the pilot outlet and bypass. During idle, fuel is supplied mainly from the pilot outlet.

3) Main jet nozzle system

The main jet nozzle system supplies fuel for middle and high speed operation. The fuel flows to the main jet nozzle where the fuel quantity is measured, and then flows to the main nozzle. Air volume, which is measured by the main air jet, enters from the bleed hole of the main nozzle and mixes with fuel to form a gas mist.

The gas mist flows out of the main bore and is again mixed with air from the air cleaner. From this stage, the correct air-fuel mixture is supplied to the engine.

4) Choke

The choke helps in starting the engine in cold weather.

When the engine is started with the choke valve closed, negative pressure applied to the main nozzle rises, allowing most of fuel to flow through the main nozzle.

A mixture with a high gasoline concentration is fed to the engine resulting in easier engine starting.

12-5-2 DISASSEMBLY and ASSEMBLY of CARBURETOR

The most common trouble with the carburetor is failure to provide the correct air-fuel mixture. This is generally caused by blockage in the air and fuel channels, at other times it is caused by fuel level fluctuations in the float chamber. In order to maintain the carburetor in normal operating condition, it is vital that the air and fuel channels be kept clean. The following descriptions are the procedures for carburetor disassembly and assembly. (See Fig. 12-29.)

1) Throttle mechanism

- a) Remove Philips-head screw (27), throttle valve (28), and pull out the throttle shaft (29).
- b) When removing the throttle stop screw, a spring (31) will also come off. Be careful when handling the throttle valve to prevent the valve edge from damage.

2) Choke

- a) Remove Philips-head screw (22), choke valve (23), and pull out choke shaft (24).
- b) Be sure to keep the notch of the choke valve positioned forward the main air jet side when the choke shaft is installed.

3) Pilot jet nozzle

- a) Remove pilot jet nozzle (21). When removing, use a proper tool so that the nozzle will not be damaged.
- b) Firmly secure the jet nozzle when the carburetor is assembled. Otherwise, fuel will leak from the nozzle and cause engine trouble.

4) Main jet nozzle

- a) Remove bolt (15), and float chamber body (13).
- b) Remove main jet nozzle (19) from carburetor body (9).
- c) Firmly secure the main jet nozzle when assembling. Otherwise, air-fuel mixture will become excessively rich and the engine will not operate properly.
- d) Torque for bolt (15) is 70 kg-cm.

5) Float system

Pull out float pin (12) and remove float (11) and needle valve (20).

- * Avoid using a drill or a wire to clean the fuel passages (they may damage the orifice of the pilot and main jet nozzles). Use compressed air.
- * The float pin is peen-secured to the carburetor body; the needle valve and float can be removed out from the opposite side of the peen-secured part by lightly striking the float pin with a thin bar-like object.

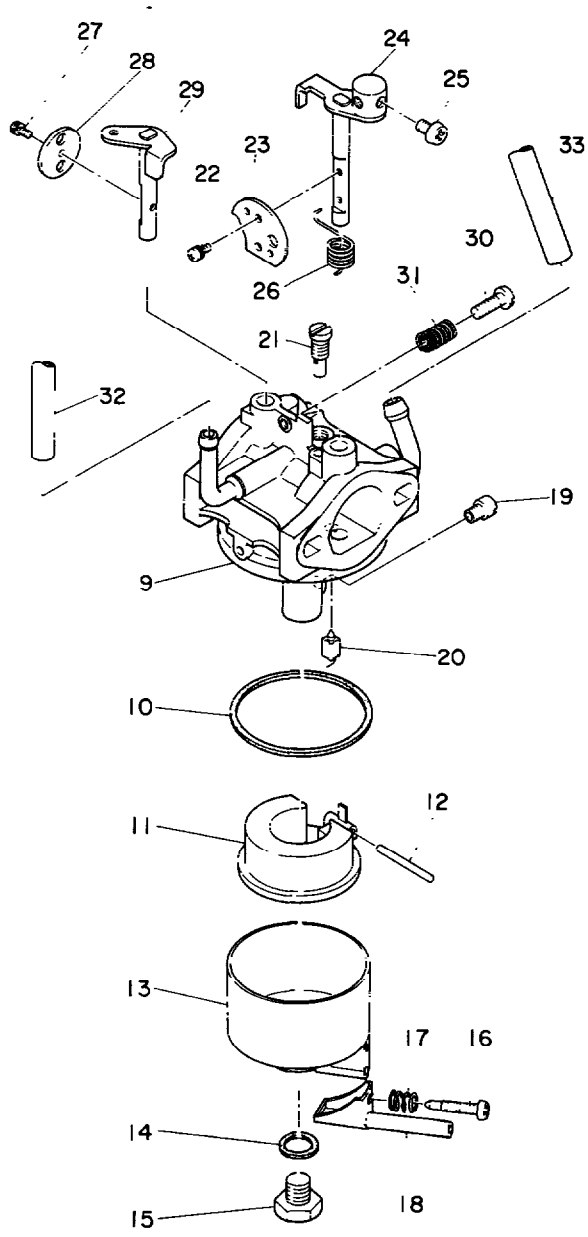


Fig. 12-29

13. TROUBLESHOOTING

DIAG: DIAGNOSIS

■ DIAGNOSIS BY THE CUSTOMER

- 1) DIAG. 01 Engine fails to start.
- 2) DIAG. 02 Electricity not generated.

If the generator doesn't perform properly or fails to run after troubleshooting, ask a qualified service dealer to check it.

■ DIAGNOSIS BY THE SHOP

A. Fails to start

- 3) DIAG. 11 The fuel tank is empty
- 4) DIAG. 12 Contaminated by water or dirt
- 5) DIAG. 13 Spark is weak of wire harness
- 6) DIAG. 14 Spark is strong of wire harness
- 7) DIAG. 15 Compression is insufficient
- 8) DIAG. 16 Compression is nonexistent
- 9) DIAG. 17 Clogged fuel pipe
- 10) DIAG. 18 The fuel doesn't enter into the carburetor (No flow from the pipe)
- 11) DIAG. 19 The fuel doesn't enter into the float chamber (Flow from the pipe)
- 12) DIAG. 20 The fuel doesn't enter into the combustion chamber (Fuel exists in the float)
- 13) DIAG. 21 Carburetor flooded

B. Engine defective

- 14) DIAG. 31 Excessive noise (Improper maintenance) Check oil element
- 15) DIAG. 32 Oil consumption increases (gets thin)
- 16) DIAG. 33 Excessive noise occurs and engine suddenly stops
- 17) DIAG. 34 Black exhaust fumes (Excessively large fuel consumption)
- 18) DIAG. 35 White fumes produced (Excessively large lubricating oil consumption)

C. Control Panel

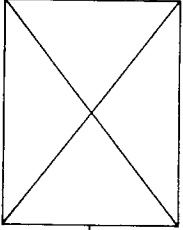
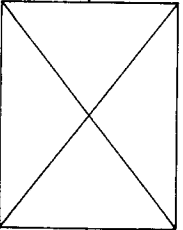
- 19) DIAG. 36 Pilot light fails to light up
- 20) DIAG. 37 The frequency meter fails to show any reading, with the needle resting at zero

D. Engine operates but voltage is not normal

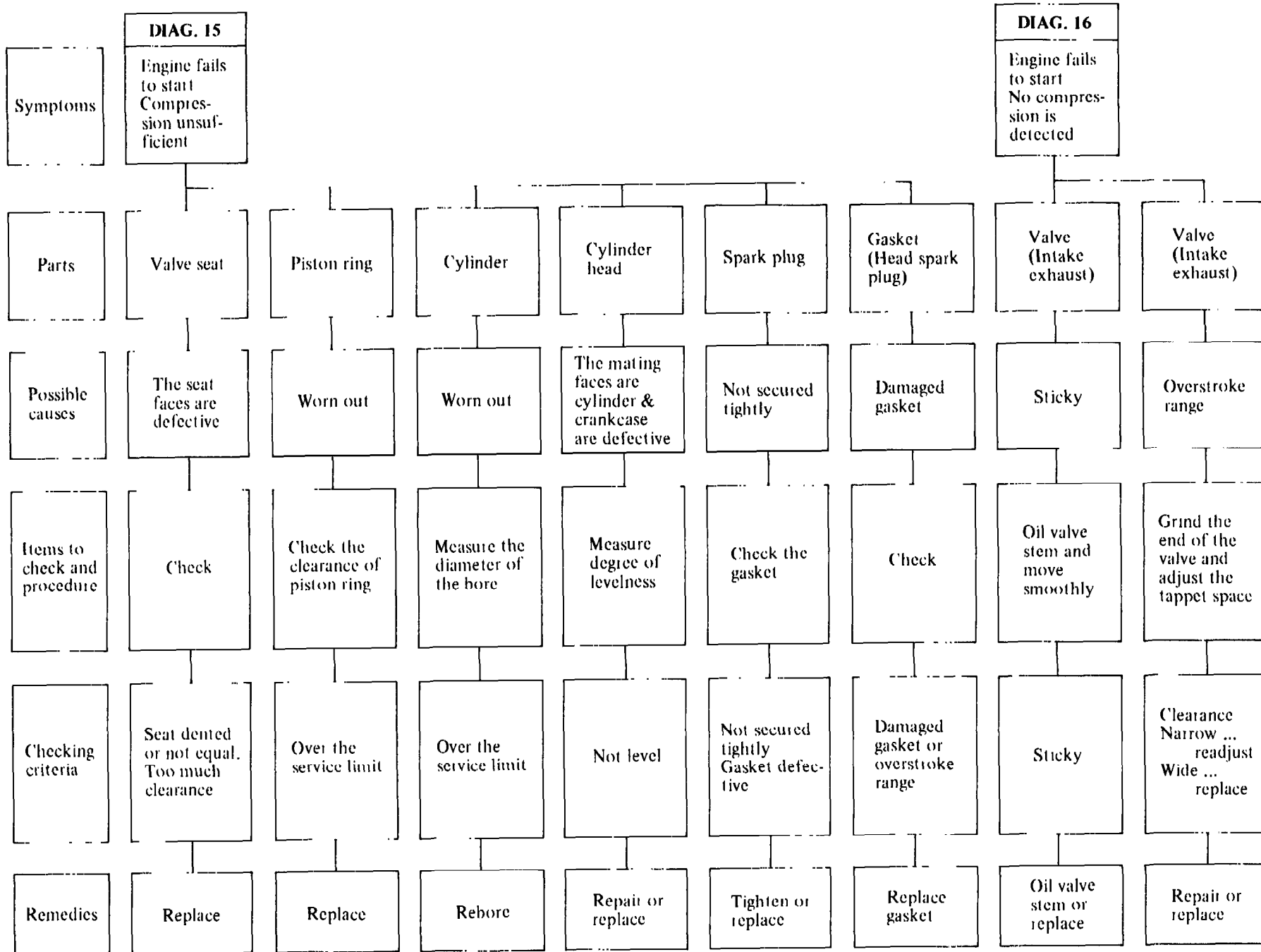
- 21) DIAG. 41 No AC voltage is output (Resistance load)
- 22) DIAG. 42 No DC voltage is output (Resistance load)
- 23) DIAG. 43 No DC voltage is output
- 24) DIAG. 44 The DC output voltage is only 50% of the rated value
- 25) DIAG. 45 130% higher or more DC is output
- 26) DIAG. 46 No AC voltage is generated
- 27) DIAG. 47 AC output voltage is only 20% of the rated value

E. Power lacking and performance poor

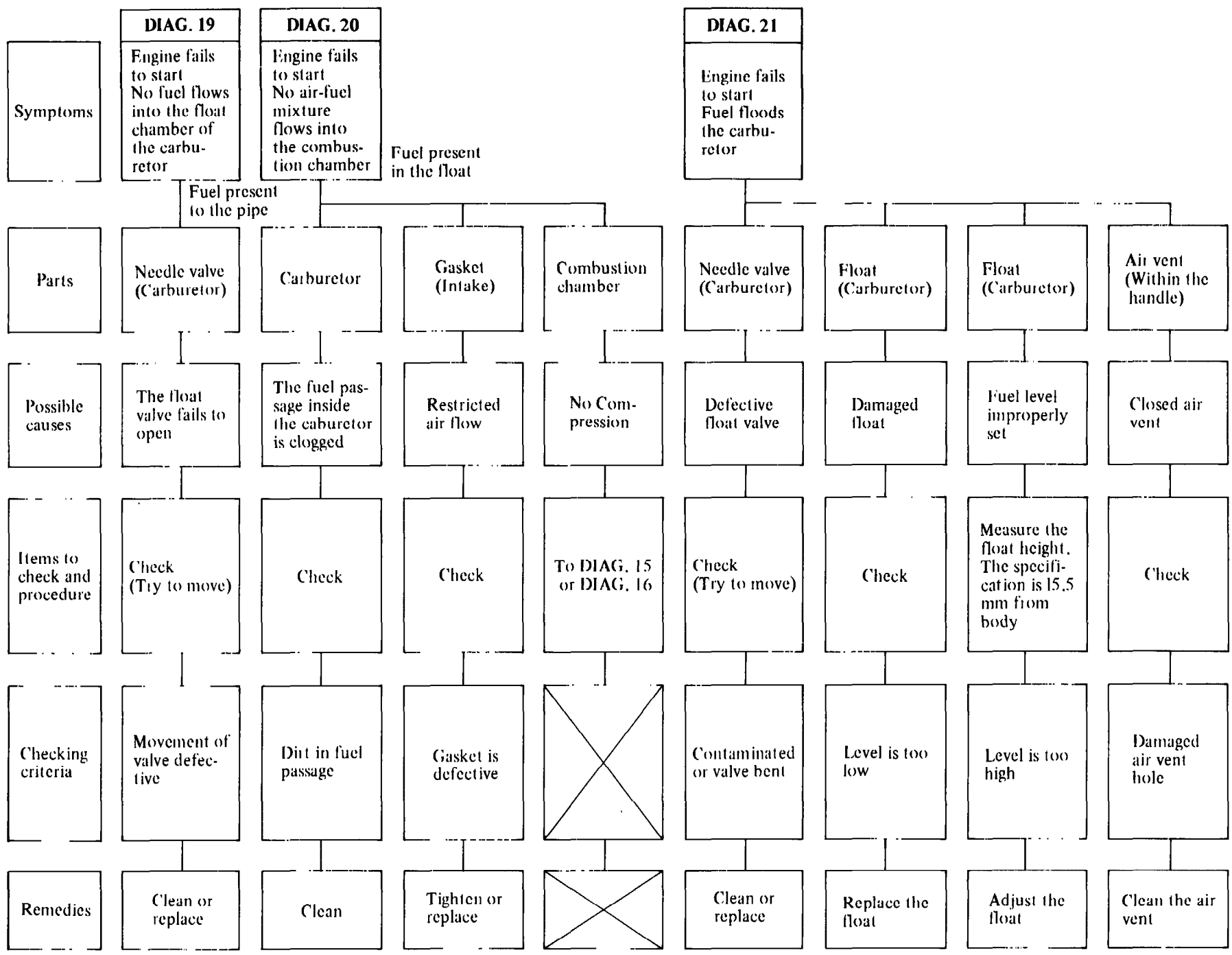
- 28) DIAG. 51 Poor operating condition
- 29) DIAG. 52 Engine speed does not increase
- 30) DIAG. 53 Knocking, engine overheats
- 31) DIAG. 54 Failure to generate output, no compression
- 32) DIAG. 55 Poor performance (Backfire)
- 33) DIAG. 56 Misfire or combustion outside the combustion chamber

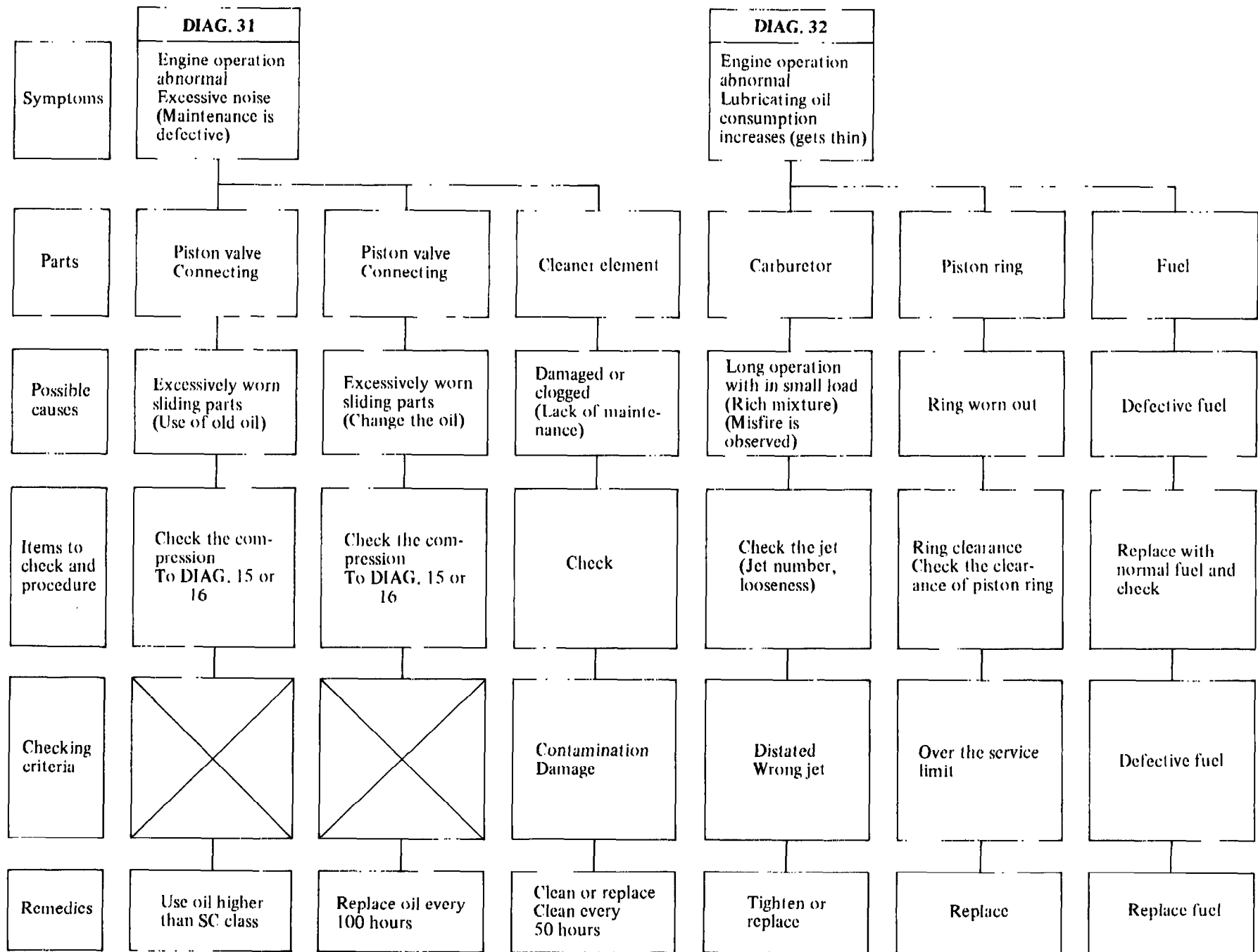
	DIAG. 11	DIAG. 12	DIAG. 13	Spark is too weak of wire harness			DIAG. 14	Spark is too strong of wire harness	
Symptoms	Engine fails to start Check fuel quantity	Engine fails to start Check fuel quality	Engine fails to start Check spark				Engine fails to start Check spark		
Parts	Fuel tank	Fuel tank Fuel strainer	Ignition coil	Ignition coil	Rotor	High voltage code	Plug cap	Spark plug	
Possible causes	Empty fuel tank	Moisture or dust in the fuel	Air gap is too wide	Coil is shorted or wire broken	Weak magnet	Coil is shorted or wire broken	High voltage code and contact trouble	Insulation trouble-accumulation of turbon	
Items to check and procedure	Check	Check	Check the air gap Searcher	Measure the coil resistance Circuit tester	Without special equipment, it doesn't work		Check	Clean plug	
Checking criteria	No fuel	Moisture or dust exists	Air gap is too wide Standard is 0.4~0.5	$\infty\Omega$: Wire broken 0Ω : Short Standard first: 0.61Ω second: $7.5k\Omega$	Weak magnet		Plug cap contact defective	Dirt present Insulation trouble	
Remedies	Fill with fuel	Replace fuel	Adjust and reform	Replace	Replace the rotor	Repair or replace	Repair or replace	Clean or replace	

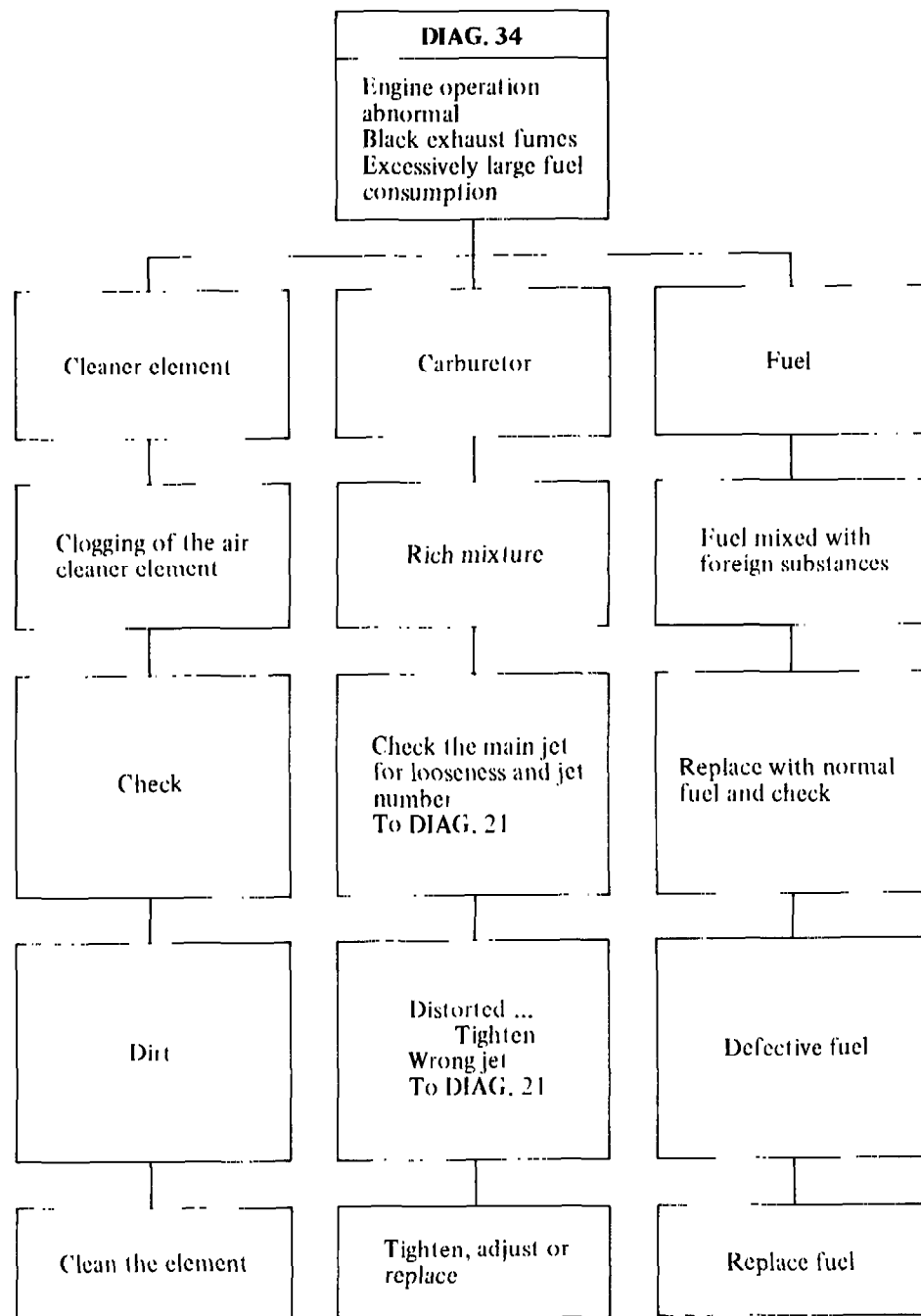
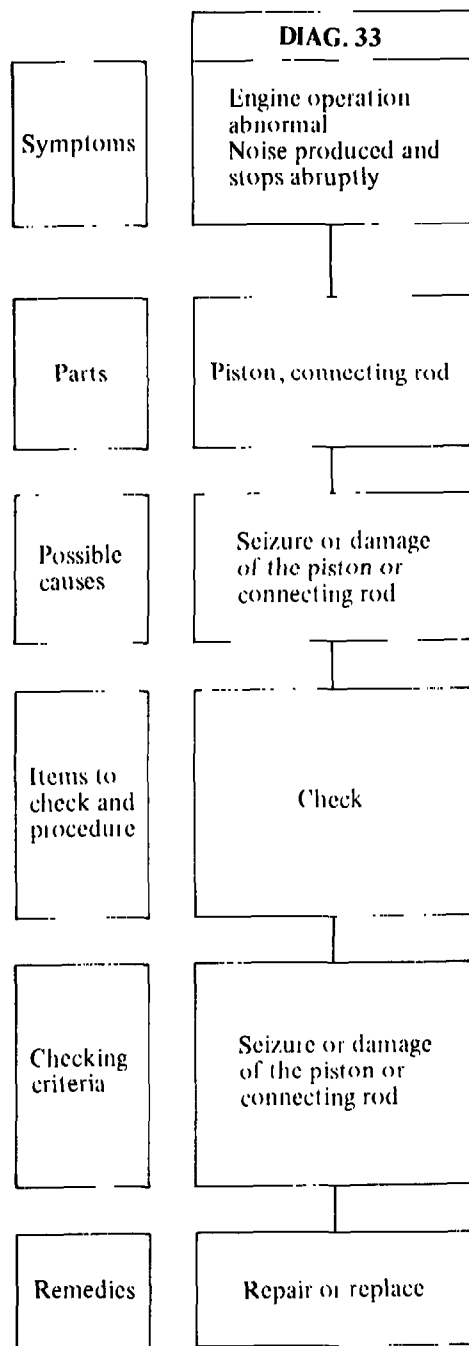
Comment to the Customer

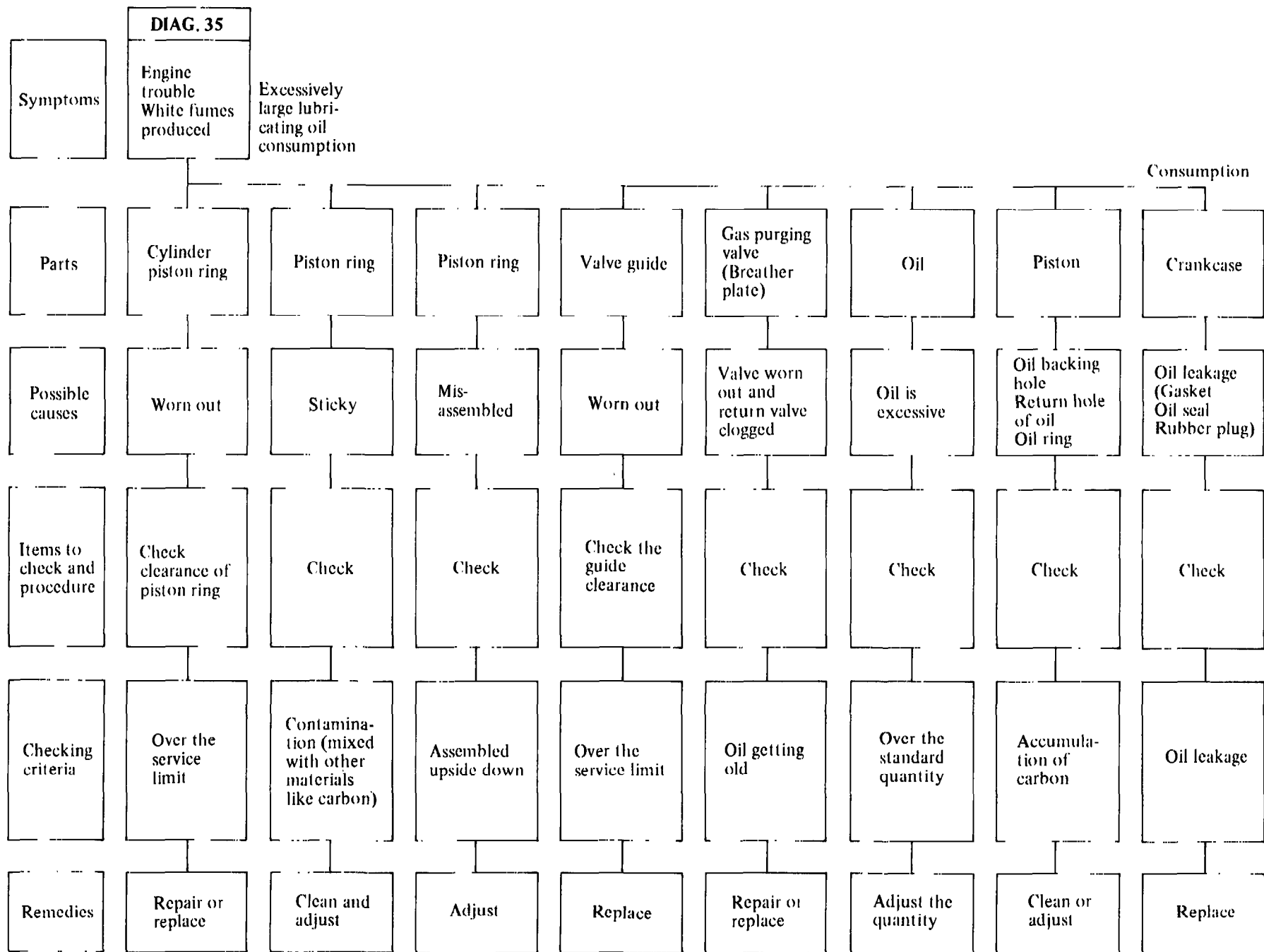


	DIAG. 17				DIAG. 18
Symptoms	Engine fails to start Check if fuel pipe clogged?	No fuel flows out even when the fuel pipe is disconnected from the carburetor			Engine fails to start Fuel does not enter into the carburetor
Parts	Air bleed (Fuel tank)	Fuel strainer and filter	Fuel strainer	Fuel pipe	Fuel filter
Possible causes	The air bleed is clogged	The air bleed is clogged	Closed position	Accumulation of air	Defective fuel filter
Items to check and procedure	Check the bolt of rubber pipe in the handle EXAM 31	Check	Check	Check	Check
Checking criteria	The air bleed is clogged	Damaged	Closed position	Air bubble exists	Defective fuel filter
Remedies	Clean	Clean or replace	Set in the closed position	Vent the air	Clean the filter element or replace the strainer

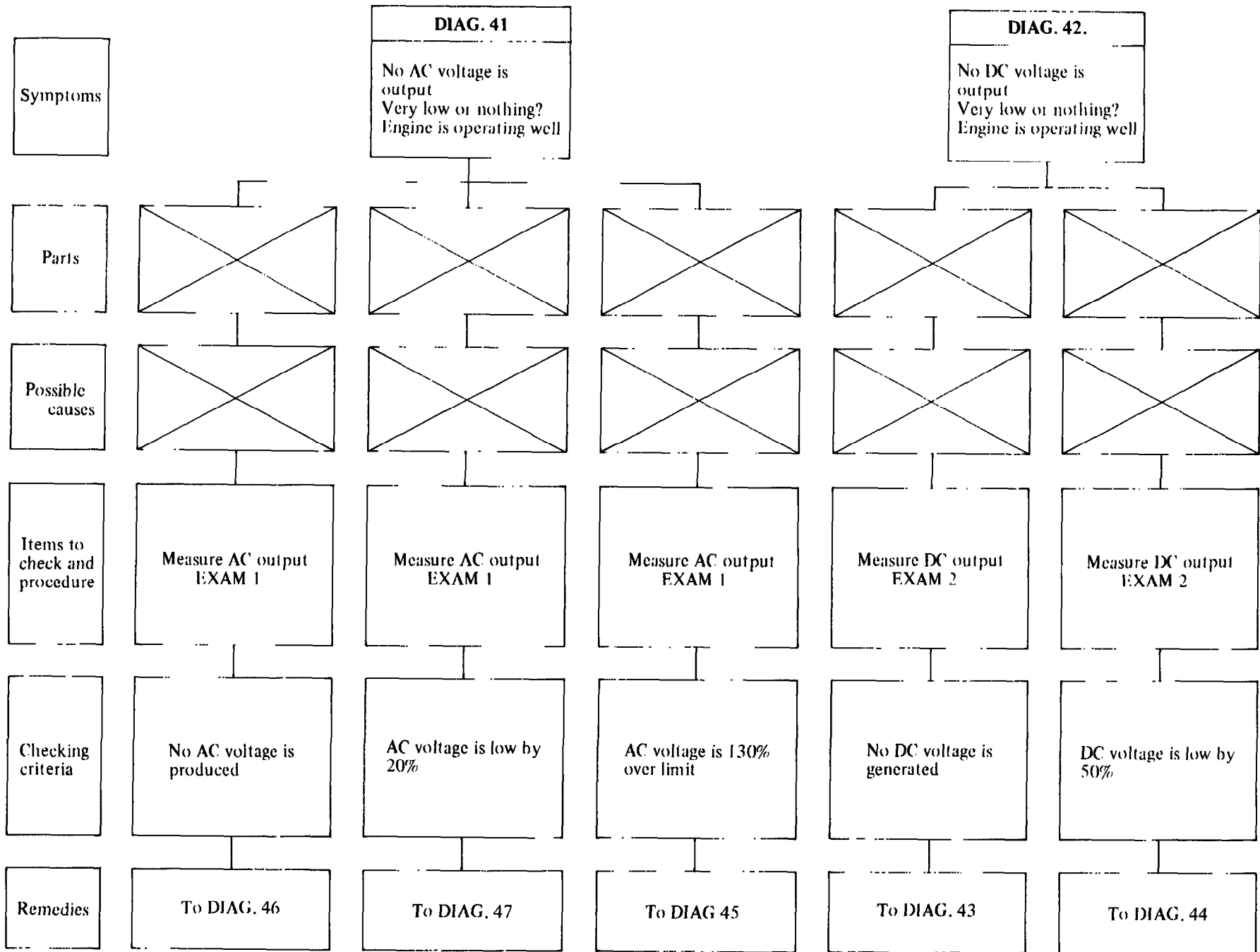


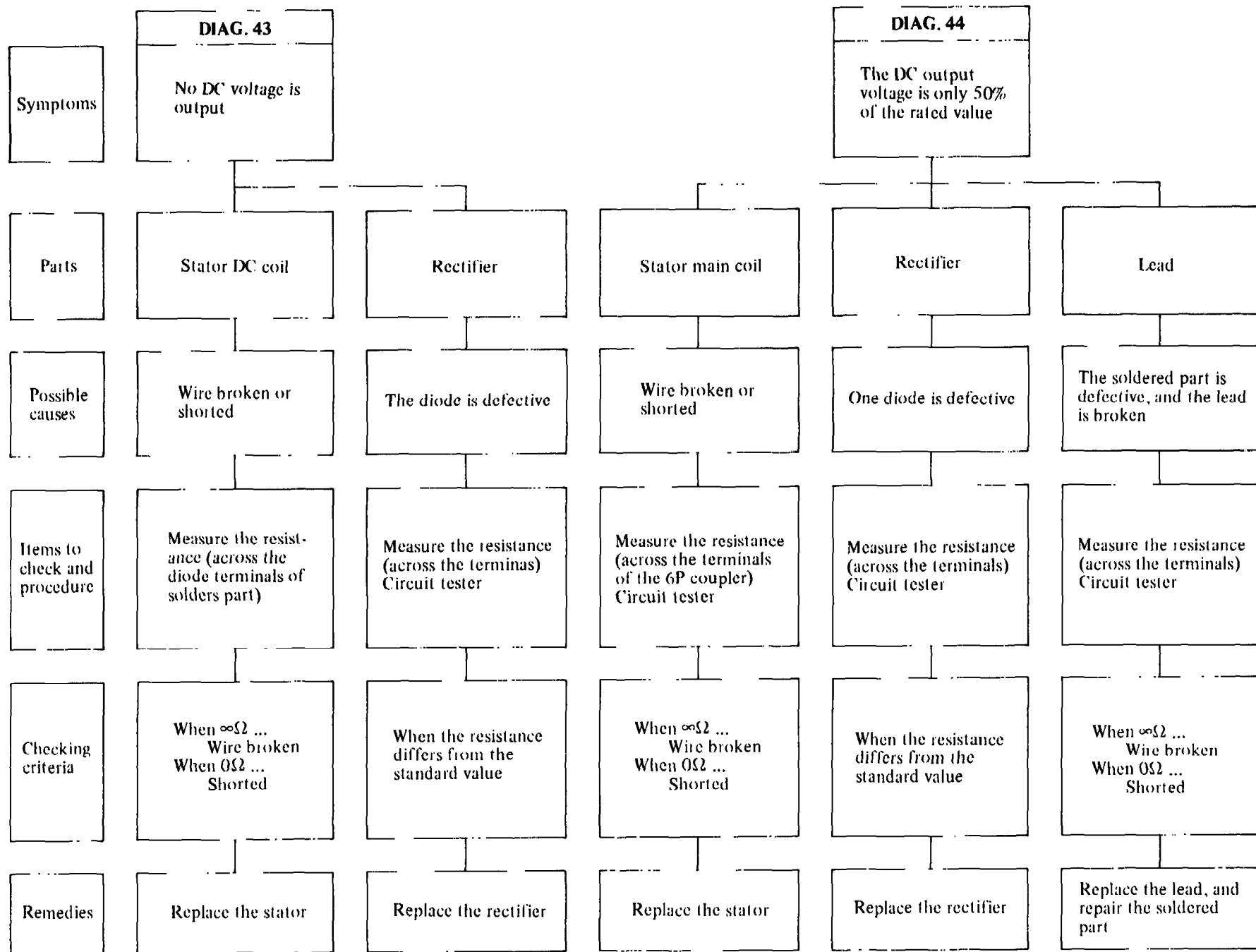


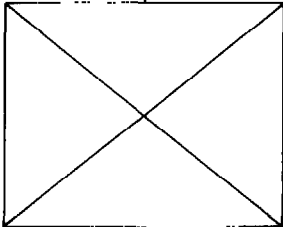
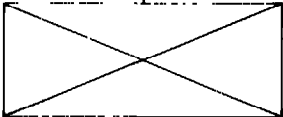


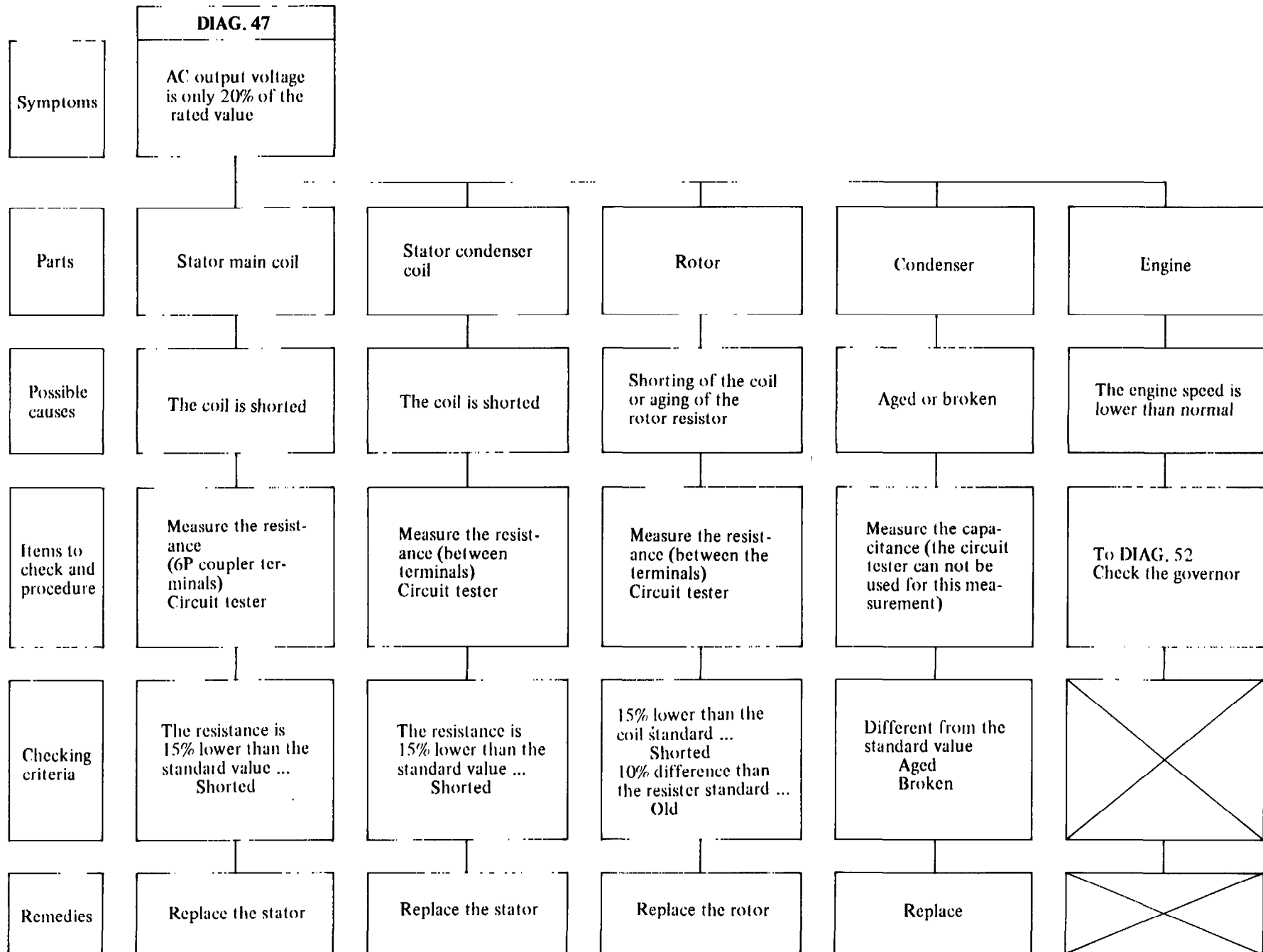


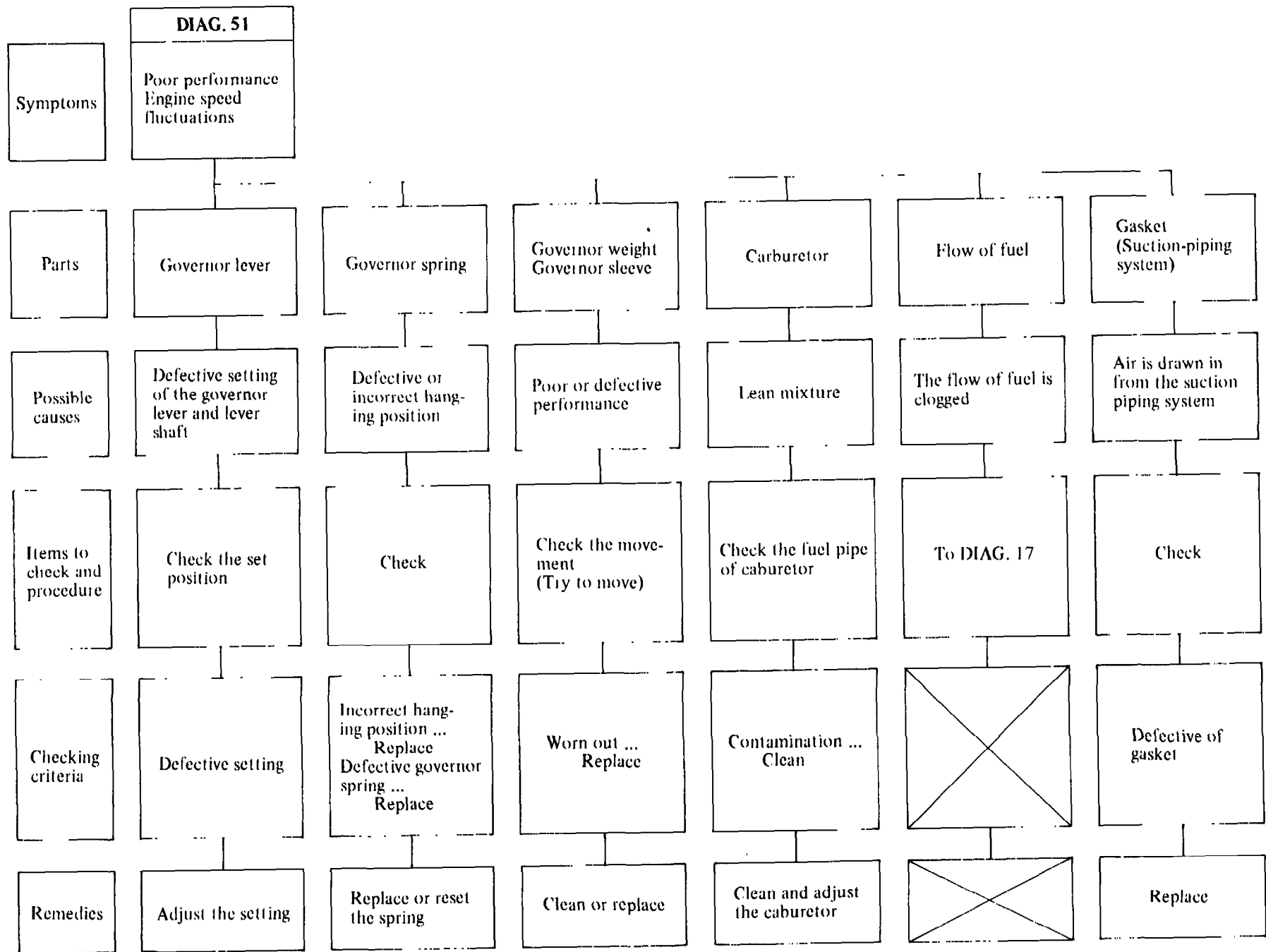
	DIAG. 36				DIAG. 37	
Symptoms	Control panel The pilot light fails to light up.				Control panel The frequency meter fails to show any reading, with the needle resting at zero	
Parts	Stator DC coil	Rectifier	Light	Lead wire	Stator main coil for the frequency meter	Frequency meter
Possible causes	Wire broken or shorted	The diode is defective	The filament is broken	Defective solder, and lead broken	Wire broken or shorted	Wire breakage
Items to check and procedure	Measure the resistance (6P coupler)	Measure the resistance (Across the terminals) Circuit tester	Measure the resistance (Across the terminals) Circuit tester	Check the soldered part Circuit tester	Measure the resistance (across the terminals) Circuit tester	Check the frequency meter for electrical continuity
Checking criteria	When $\infty\Omega$... Wire broken When 0Ω ... Shorted	Measure the resistance (across the terminals) Circuit tester	When $\infty\Omega$... Wire broken	When $\infty\Omega$... the reading of the circuit tester ∞ , the lead and solder are defective	When $\infty\Omega$... Wire broken When 0Ω ... Shorted	When $\infty\Omega$... Wire broken
Remedies	Replace the stator	Replace the rectifier	Replace the light	Replace the lead, and repair the soldered part	Replace the stator	Replace the frequency meter

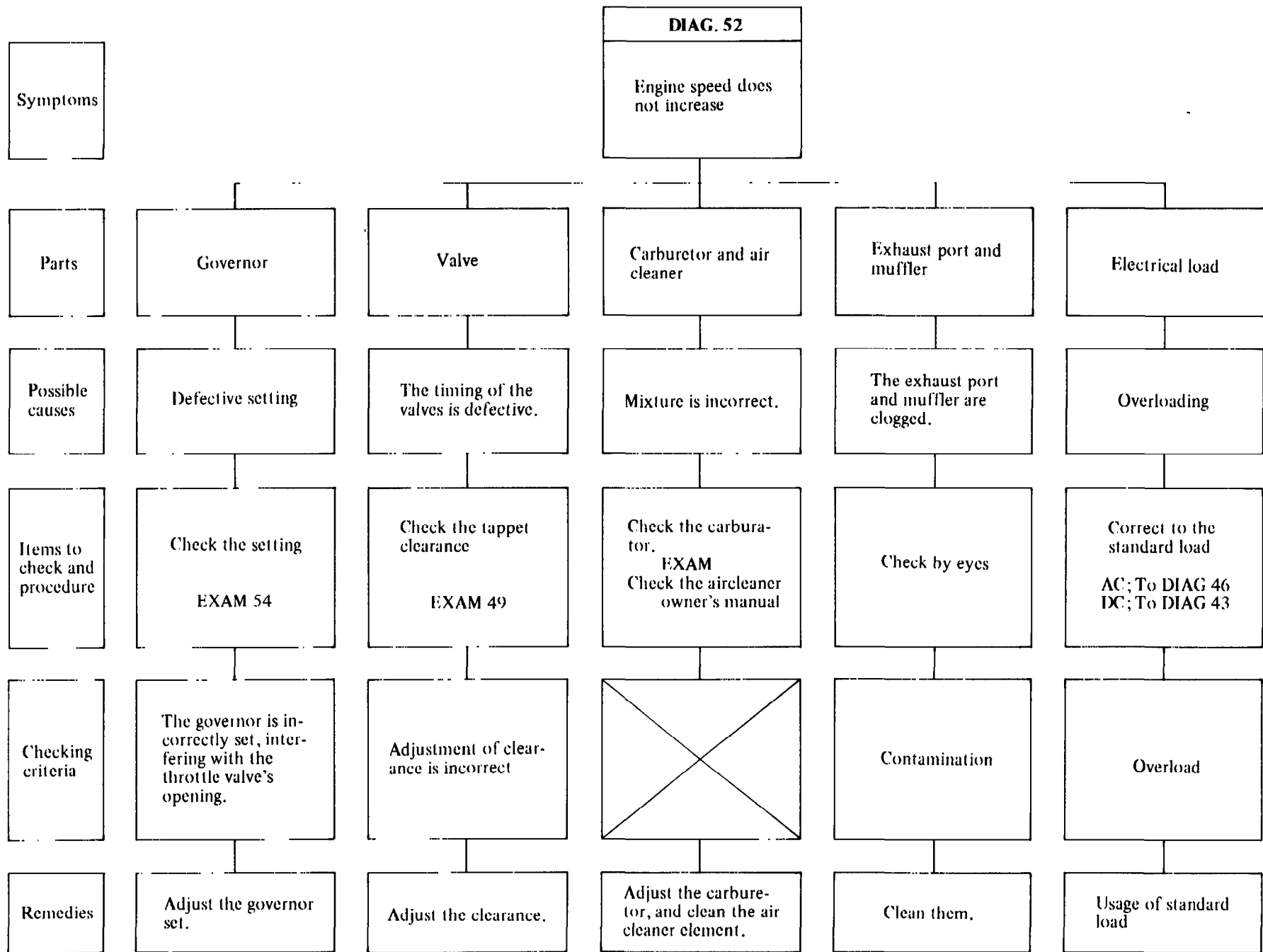


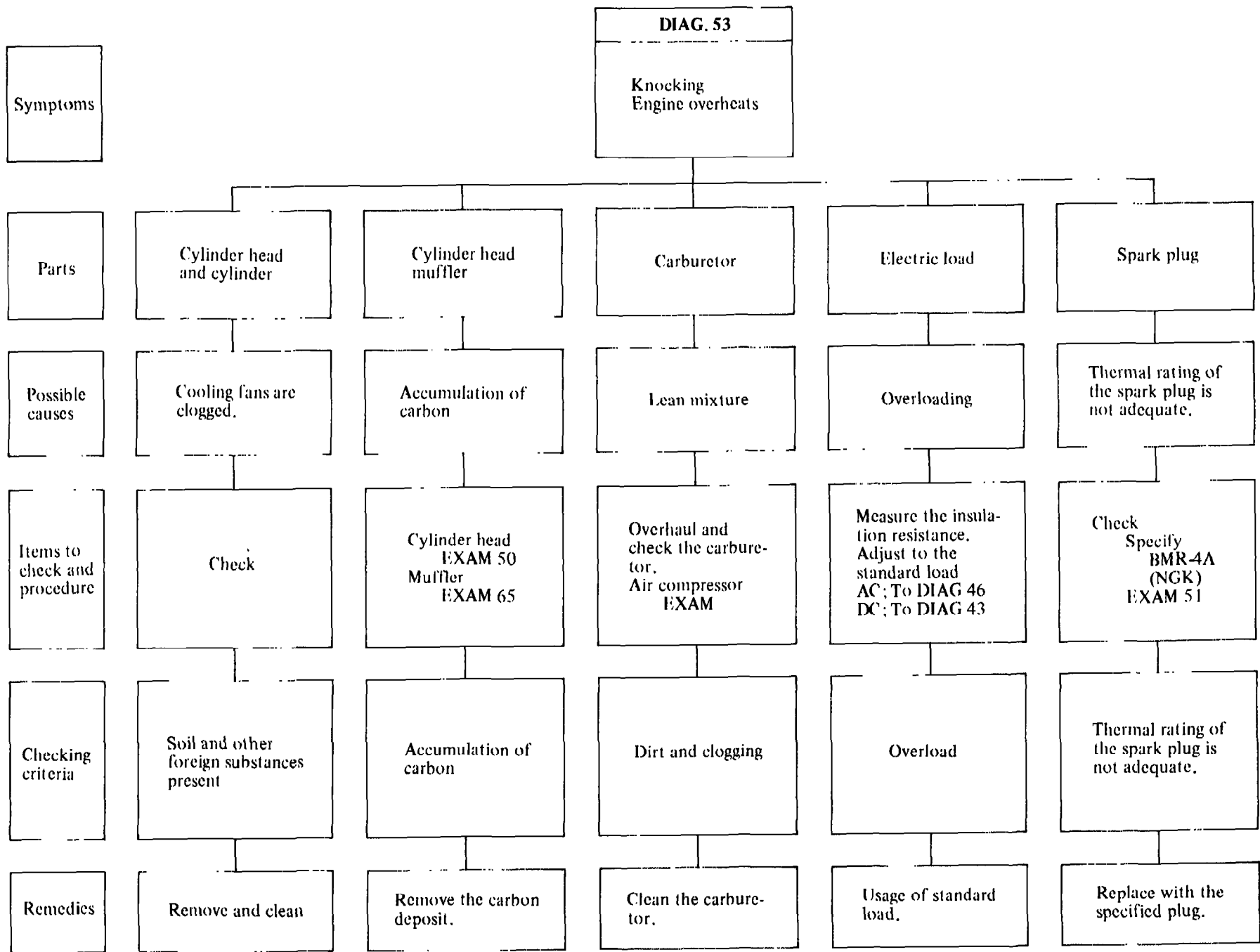


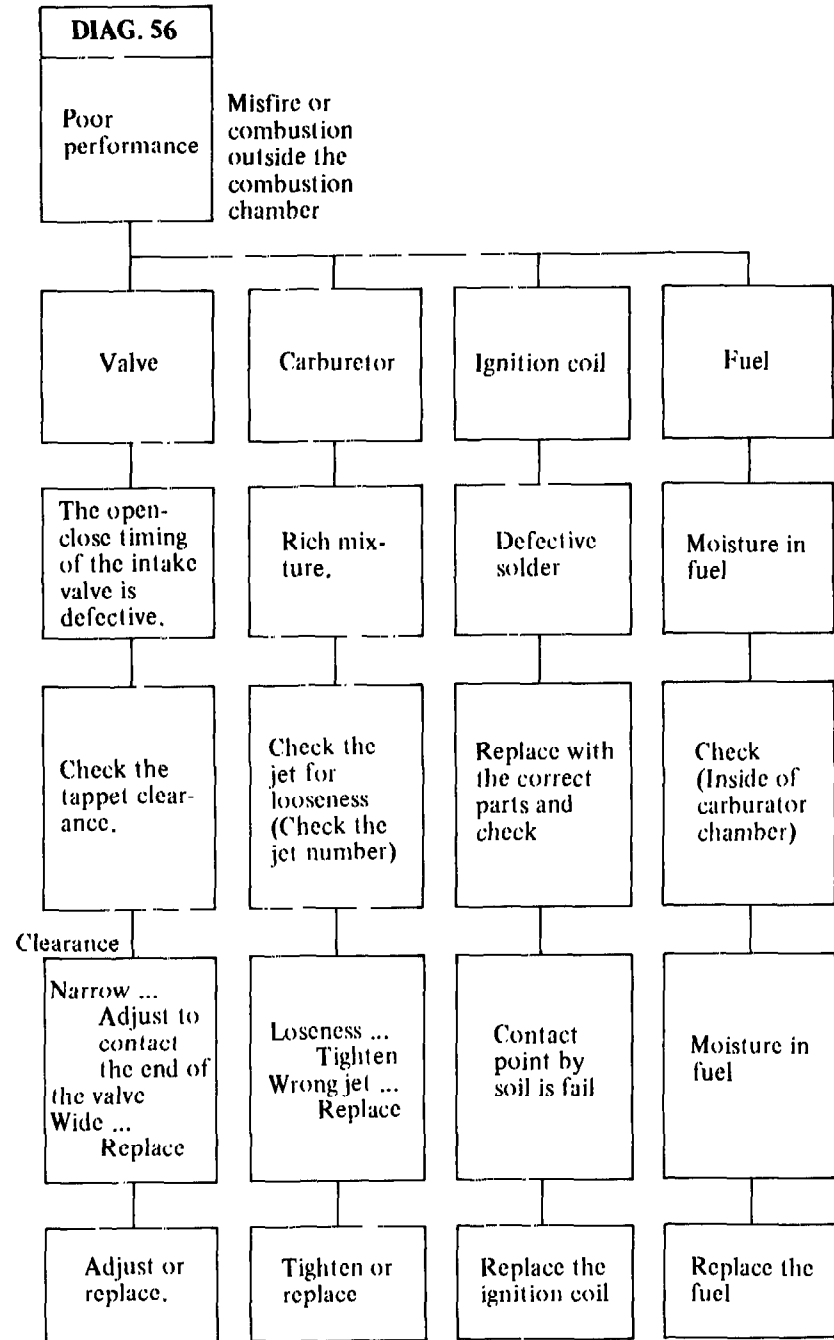
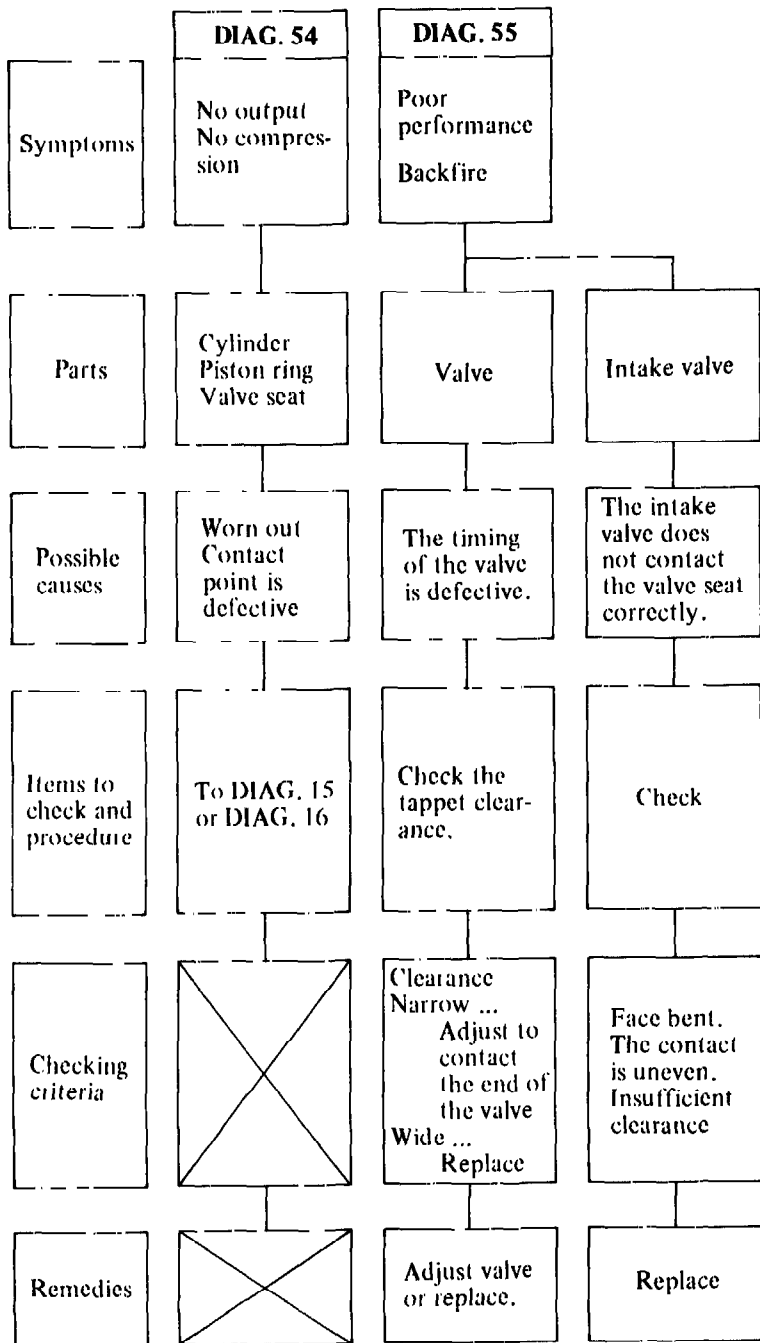
	DIAG. 45	DIAG. 46			
Symptoms	130% higher or more DC is output Engine running speed is high	No AC voltage is generated			
Parts	Engine	Condenser	Stator main coil	Stator condenser coil	Rotor
Possible causes	The engine running speed is higher than normal	Aged, broken, or defective joint of condenser's joint connector	Wire broken or shorted	Wire broken or shorted	1. Wire broken shorted 2. Rotor resistor is defective 3. Rotor diode is defective
Items to check and procedure	To DIAG. 52 Check the governor	Measure the capacity (circuit tester can not be used for this measurement)	Measure the resistance (between the terminals) The circuit tester	Measure the resistance (between the terminals) The circuit tester	Measure the resistance across the resistors, with solder removed. Measure the resistance of the rotor resistor, and check the diode for normalcy
Checking criteria		Different from the standard value	When $\infty\Omega$... Wire broken When 0Ω ... Shorted	When $\infty\Omega$... Wire broken When 0Ω ... Shorted	1) When $\infty\Omega$... Wire broken When 0Ω ... Shorted 2) The resistance differs by as much as 10% from the standard value
Remedies		Replace the condenser	Replace the stator	Replace the stator	Replace the rotor











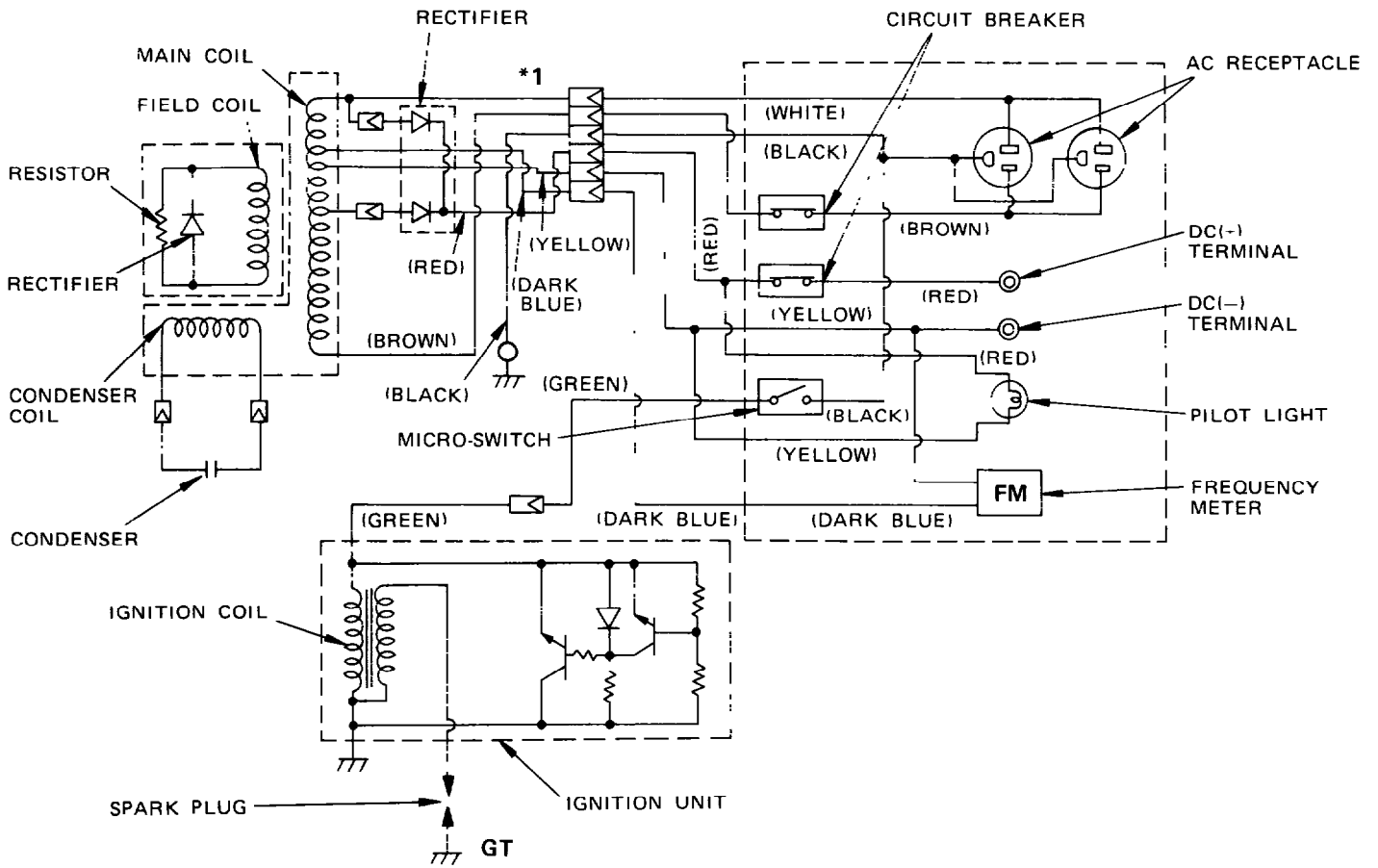
14. CRITERIA TABLE for ADJUSTMENT

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.	$510 \begin{smallmatrix} +0.019 \\ 0 \end{smallmatrix}$	51.06ϕ		Cylinder gauge		
	Seat width of intake and exhaust valves	0.5	1.0		Slide calipers and cutter	Repair	
	Inside dia. of valve guide	$5.5\phi \begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	5.65ϕ	Center dia.	Cylinder gauge	Replacement	
Piston	Piston skirt's outside dia. in thrust direction	$50.9920 \begin{smallmatrix} 0 \\ -0.02 \end{smallmatrix}$	50.92		Micrometer	Replacement	
	Ring groove width	Top	$1.5 \begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	1.65		Slide calipers	Replacement
		Second	$1.5 \begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	1.65		Slide calipers	Replacement
		Oil	$2.5 \begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	2.65		Slide calipers	Replacement
	Pin hole	$11\phi \begin{smallmatrix} +0.002 \\ -0.009 \end{smallmatrix}$	11.035		Cylinder gauge	Replacement	
	Clearance between piston skirt and cylinder wall		0.008 ~ 0.047	0.14		Cylinder gauge and micrometer	Replacement
	Clearance between ring and ring groove	Top	0.090 ~ 0.135	0.26	Spare rings	Searcher	Replacement
		Second	0.060 ~ 0.105	0.23		Searcher	Replacement
		Oil	0.010 ~ 0.065	0.19		Searcher	Replacement
	Clearance between piston and piston pin		0.009T ~ 0.010L	0.06L		Cylinder gauge and micrometer	Replacement
Piston rings	Joint gap	Top	0.2 ~ 0.4	1.5	Searcher	Replacement	
		Second	0.2 ~ 0.4	1.5	Spare rings	Searcher	Replacement
		Oil	0.02 ~ 0.25	1.5		Searcher	Replacement
	Width	Top	$1.5 \begin{smallmatrix} -0.09 \\ -0.11 \end{smallmatrix}$	1.3		Micrometer	Replacement
		Second	$1.5 \begin{smallmatrix} -0.06 \\ -0.08 \end{smallmatrix}$	1.33	Spare rings	Micrometer	Replacement
		Oil	$2.5 \begin{smallmatrix} -0.010 \\ -0.030 \end{smallmatrix}$	2.38		Micrometer	Replacement
Piston pin outside dia.		$11\phi \begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	10.06ϕ		Micrometer	Replacement	
Connecting rod	Inside dia. of large end	$20\phi \begin{smallmatrix} +0.013 \\ 0 \end{smallmatrix}$	20.05ϕ		Cylinder gauge	Replacement	
	Clearance between inside dia of large end and crankpin		0.037 ~ 0.063	0.13		Cylinder gauge and micrometer	Replacement
	Inside dia. of small end	$11\phi \begin{smallmatrix} +0.021 \\ -0.010 \end{smallmatrix}$	11.08ϕ		Cylinder gauge	Replacement	
	Clearance between inside dia of small end and piston pin		0.01 ~ 0.029	0.12		Cylinder gauge and micrometer	Replacement
	Slide clearance of large rod end		0.1 ~ 0.7	1.0		Searcher	Replacement

Items of adjustment		Criteria	Limit of application	Description	Tools	Remarks	
Crankshaft	Crankpin outside dia.	20 ϕ $\begin{matrix} -0.037 \\ -0.050 \end{matrix}$	19.92 ϕ		Micrometer	Replacement	
	Crankshaft journal outside dia.	Generator side	20 ϕ $\begin{matrix} -0.003 \\ -0.012 \end{matrix}$	19.95 ϕ		Micrometer	Replacement
		Counter-side	17 ϕ $\begin{matrix} -0.003 \\ -0.011 \end{matrix}$	16.95 ϕ		Micrometer	Replacement
Camshaft	Cam crest	18.4 \pm 0.1	18.15		Micrometer	Replacement	
	Camshaft journal outside dia.	Generator side	10 ϕ $\begin{matrix} -0.013 \\ -0.028 \end{matrix}$	9.95 ϕ		Micrometer	Replacement
		Counter-side	10 ϕ $\begin{matrix} -0.013 \\ -0.028 \end{matrix}$	9.95 ϕ		Micrometer	Replacement
Valve spring	Free length	25	24		Slide calipers	Replacement	
	Squareness		1.0		Square	Replacement	
Intake and exhaust valve	Outside dia. of valve stem	Intake	5.5 ϕ $\begin{matrix} -0.020 \\ -0.032 \end{matrix}$	5.44 ϕ		Micrometer	Replacement
		Exhaust	5.5 ϕ $\begin{matrix} -0.056 \\ -0.074 \end{matrix}$	5.40 ϕ		Micrometer	Replacement
	Clearance between valve stem and valve guide	Intake	0.02 ~ 0.05	0.2	At valve guide center	Cylinder gauge	Replacement
		Exhaust	0.056 ~ 0.092	0.2		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	3.5	2.5		Slide calipers	Replacement
		Exhaust	3.5	2.5		Slide calipers	Replacement
Tappet	Total length	20.8 $\begin{matrix} +0.06 \\ 0 \end{matrix}$	20.3		Slide calipers	Replacement	
	Clearance between stem and guide	0.01 ~ 0.03					
Spark plug	Type	BMR-4A (NGK)					
	Electrode gap	0.6 ~ 0.7	1.0		Searcher	Replacement	
Fuel consumption (l/hr)	50 Hz rating	0.5					
	60 Hz rating	0.6					
Lubricating oil consumption (cc/hr)	50 Hz rating	4	20				
	60 Hz rating	5	20				
Quantity of lubricating oil cc	350						
Application 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 ² /rpm)	4/800				Pressure guage		

Items of adjustment (Tightening torque)	Criteria	Limit of application	Description	Tools	Remarks
Connecting rod bolts	60 ~ 80 kg-cm				
Main bearing cover bolts	80 ~ 100				
Cylinder head bolts	90 ~ 110				
Spark plug	120 ~ 150				
Air cleaner nuts	50 ~ 60				
Governor lever nuts	70 ~ 90				
Front housing bolts	80 ~ 100				
Rotor bolts	100 ~ 150				
Muffler nuts	70 ~ 90				
Front cover bolts	55 ~ 75				

15. WIRING DIAGRAM



AC lead wire color code

Voltage	Code	*1
110V 50 Hz		White, green
110V '60 Hz		White, red
120V 60 Hz		Blue
220V 50 Hz		Gray
220V '60 Hz		Pink
230V 50 Hz 240V 50 Hz		Orange

16. MAINTENANCE

The following standard maintenance procedures are necessary to ensure the generator's normal performance under normal operating conditions. Therefore, the instructions described below are for reference only and vary depending on how the generator is operated. For instance, if the generator is operated in a dusty area the air cleaner must be cleaned daily which differs from the interval specified below.

16-1 DAILY CHECKS and MAINTENANCE (every 8 hours)

Check and maintenance items	Description
(1) Clean each component of dust	(1) If the joint 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 part.	(2) If fuel leakage is not corrected, fuel economy will be reduced and there is a potential of fire.
(3) Check each part for looseness. Tighten if necessary.	(3) If the parts are loose, vibrations will occur, and may subject the generator to trouble.
(4) Check the quantity of oil inside the crankcase; fill oil as necessary.	(4) If the engine is run with an insufficient quantity of oil, the piston and other moving parts will be damaged.
(5) Check equipments of control panel, when found damages, replace them.	(5) Can't obtain any output which is needed.

16-2 CHECKS and MAINTENANCE for EVERY 20 HOURS

Check and maintenance items	Description
(1) Drain the oil from the crankcase.	(1) Replace with new oil. The oil used after the initial period of operation is likely to be heavily contaminated with fine metal powder and other foreign substances from various engine parts.

16-3 CHECKS and MAINTENANCE for EVERY 50 HOURS (every 10 days)

Check and maintenance items	Description
(1) Clean the air cleaner at the prescribed interval.	(1) If the air cleaner is continually used in contaminated condition, it may lead to engine trouble.
(2) Check the spark plug for carbon contamination. If found dirty, clean it with gasoline, followed by sandpaper.	(2) Should the plug be left in contaminated condition, an engine output will decline or it may fail to start.

16-4 CHECKS and MAINTENANCE for EVERY 200 HOURS (monthly)

Check and maintenance items	Description
(1) Drain the oil from the crankcase and replace with new oil. (every 100 hours)	(1) The use of contaminated oil will subject parts to excessive wear.
(2) Clean the fuel strainer and the fuel tank interior.	(2) If the contaminated fuel strainer and fuel tank are used continually, engine performance will be lessened and may led to engine trouble.

16-5 CHECKS and MAINTENANCE for EVERY 500 HOURS (semi-annually)

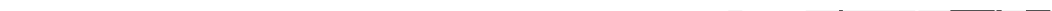
Check and maintenance items	Description
(1) Remove the cylinder head, and remove carbon deposits.	(1) If the engine is run with the cylinder head contaminated with carbon, it may led to engine trouble.
(2) Disassembly and cleaning of engine carburetor.	(2) If the engine is run with the cylinder head contaminated with carbon, it may led to engine trouble.
(3) Check the switch of engine and flexible shaft.	(3) If the engine is run with the cylinder head contaminated with carbon, it may led to engine trouble.

16-6 CHECKS and MAINTENANCE for EVERY 1000 HOURS (annually)

Check and maintenance items	Description
(1) Overhaul the engine for cleaning, adjustment and parts replacement.	(1) If the engine is used continually without an annual overhaul, it may led to engine trouble.
(2) Replace the piston rings.	(2) If the engine is used continually without an annual overhaul, it may led to engine trouble.
(3) Replace the fuel pipe.	(3) An old fuel pipe is likely to leak.
(4) Check all the relative parts of the generator.	(4) Can't obtain any output which is needed.

16-7 WHEN THE GENERATOR IS NOT USED for PROLONGED PERIODS:

- 1) Be sure to check the generator daily as instructed in 16-1 above and it is required that the generator receive the 20-hour check and maintenance detailed in 16-2.
- 2) Drain the fuel from the tank and from the float chamber of the carburetor.
- 3) To prevent the cylinder wall from rusting, remove the spark plug and lubricate the interior at the cylinder. Then, pull the recoil starter knob two or three times, and replace the spark plug.
- 4) Keep the piston stationary at the position where the piston stroke feels the heaviest.
- 5) Clean the engine exterior, using an oil impregnated cloth, and then place a vinyl cover or other cloth over the generator in a dry place where it will not be subject to high humidity.



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