

6. Lubrication, cooling water and fuel

6-1 Engine oil

Use specified engine oil, otherwise, it greatly affects the startup operation and life of the engine.

(1) Kind of oil

Use oil, CD class or higher, classified by API service.

(2) Oil viscosity

Recommended oil viscosity is SAE 10W-30, all-season type.

Use oil according to ambient temperature referring to the table below.

Ambient temperature (°C)						
-30	-20	-10	0	10	20	30
←----- S A E 2 0 -----→						
←----- S A E 3 0 -----→						
←----- S A E 5 W - 2 0 -----→						
←----- S A E 1 0 W - 3 0 -----→						
←----- S A E 1 5 W - 4 0 -----→						

[Note]: Do not mix with different kind of oil, or else, it deteriorates the oil quality.

(3) Quantity of replacement oil

Total oil quantity : including filter capacity (L)					
25SPI-C	8.6 (0.4)	45SPH	16.5 (1.4)	60SPI	19.3 (1.0)
25SPI II	6.3 (0.6)	45SPI	14.0 (0.7)	75SPI	19.3 (1.0)
35SPI	8.3 (0.5)	60SPH	20.0 (1.1)	90SPH	22.5 (1.9)

Value in parentheses is filter capacity.

6-2 Cooling water

(1) Cooling water to be used

Soft water likes with less impurities such as tap water can be used as cooling water.

(2) Cooling water used in cold season

When cooling water is likely to be frozen in a cold season, mix it with Long Life Coolant (LLC).

Mixing rate of LLC should be selected within the range of 30–50%. Standard mixing rate of LLC and operating ambient temperature are as shown below.

30%: -10 °C

40%: -20 °C

50%: -30 °C

In general, LLC needs to be replaced after 2 years of use.

(3) Total quantity of cooling water

Total quantity of cooling water : including reserve tank capacity (L)					
25SPI-C	8.1 (0.9)	45SPH	15.3 (1.0)	60SPI	29.5 (1.0)
25SPI II	11.9 (0.9)	45SPI	25.0 (1.0)	75SPI	27.4 (2.4)
35SPI	15.0 (0.9)	60SPH	18.0 (1.0)	90SPH	22.6 (2.4)

Value in parentheses is reserve tank capacity.

6-3 Fuel

(1) Fuel to be used

#2 Diesel Fuel

[Note]

If other kinds of fuel is used or fuel being used contains water or dust, it deteriorates the engine performance or leads to a serious trouble.

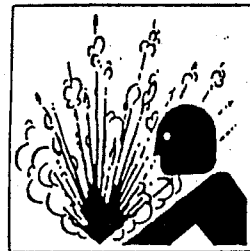
7. Handling of battery

CAUTION

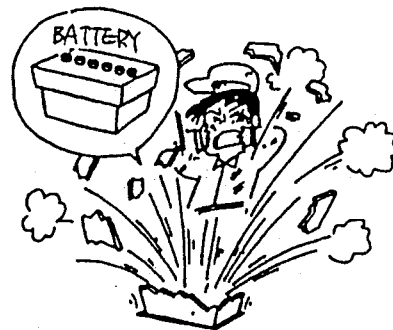
BATTERY

- Battery generates flammable gases.

Improper handling may lead to explosion or serious injury.



- * Battery should be charged in a well ventilated location. Otherwise, flammable gases are accumulated which may be ignited and exploded.
- * When connecting a booster cable, do not jumper the terminals (+ and -). Otherwise, the flammable gases generated from the battery may be ignited and exploded by sparks.
- * For maintenance of the machine, disconnect the cable on the ground side.



- The battery acid is dilute sulfuric acid. Improper handling will cause unexpected burns.

- * When the battery acid gets on your clothes or skin, wash it out with a large volume of water immediately. If it gets in your eyes, wash with a large volume of water immediately and consult your doctor.

— In the worst case, it will put out your eyes.

- For checking or handling of the battery, be sure to stop the engine and turn OFF the battery switch in advance.

7-1 Caution on battery charge

Charging of loaded battery

- * Disconnect the wiring cable from the battery terminals before charging. (Otherwise, the alternator may be damaged due to unusual voltage applied to the alternator)
- * When disconnecting the wiring cables from the battery terminals, remove the ground cable first. (If a tool touches the space between the "+" terminal and the machine, electric spark will occur which is very dangerous)

When connecting the wiring cables to the battery terminals, connect the ground cable last.

- * While the battery is being charged, open all the liquid plugs to discharge the gas.
Keep the battery away from fire to prevent unexpected explosion.
Handle the battery carefully to prevent electric sparks.
- * If the battery is overheated (liquid temperature above 45 °C), stop charging for a while.
- * At the completion of charging, stop charging immediately.
(The relation between battery charge condition and specific gravity See p.57)

If the battery is still charged, the following trouble will occur.

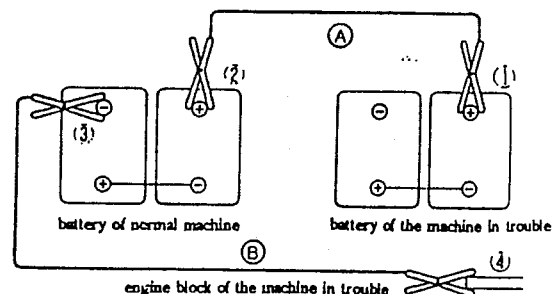
- 1) Battery overheat
 - 2) Decrease in battery acid
 - 3) Deterioration of battery performance
- * Do not connect the battery polarity in reverse (connection of "+" and "-" or "-" and "+") to prevent damage to the alternator or the like.

7-2 Connection of booster cable, and installation

When the engine is started using booster cables, connect the cables as follows.

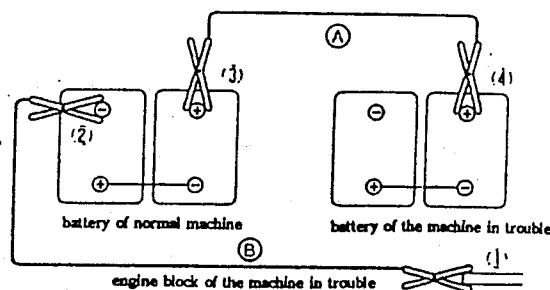
(1) Connection of booster cable

- ① Connect the clip of the booster cable "A" to the terminal "+" of the machine in trouble.
- ② Connect the other clip of the booster cable "A" to the terminal "+" of normal machine.
- ③ Connect the clip of the booster cable "B" to the terminal "-" of normal machine.
- ④ Connect the other clip of the booster cable "B" to the engine block of the machine in trouble.



(2) Removal of booster cable

- ① Remove the clip of the booster cable "B" connected to the engine block of the machine in trouble.
- ② Remove the clip of the booster cable "B" connected to the terminal "-" of normal machine.
- ③ Remove the clip of the booster cable "A" connected to the terminal "+" of normal machine.
- ④ Remove the clip of the booster cable "A" connected to the terminal "+" of the machine in trouble.



(3) Caution on handling of booster cable

- ① Use booster cables and clips of the size that matches the size of battery.
- ② The battery used for normal machine should be the same in capacity as the battery of the machine in trouble.
- ③ After connection, check that clips are firmly connected.
- ④ When connecting booster cables, make sure that the terminal "+" does not touch the terminal "-".
- ⑤ The engine block should be connected at a place more than 30cm away from the battery.

8. Periodical checking and maintenance

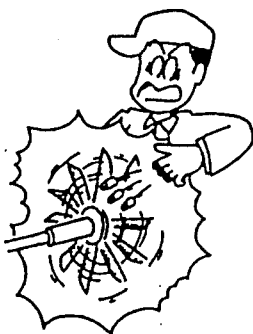
(Read the instruction manual for the engine furnished separately)

WARNING **MOVING PARTS** can cause severe injury.

- Rotary unit which moving parts at a high speed is located in the machine.

Care should be taken during operation.

- * When the machine needs checking or maintenance, be sure to stop it in advance.

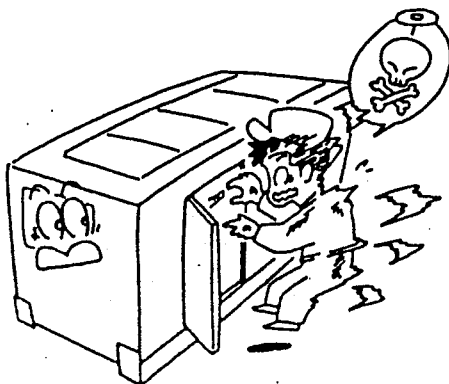
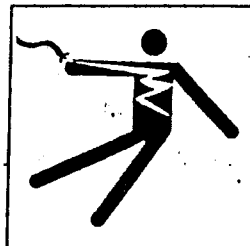


WARNING **ELECTRIC SHOCK** can kill.

- High voltage units are located in the machine.

Care should be taken during operation.

- * When the machine needs checking or maintenance, be sure to stop it in advance.



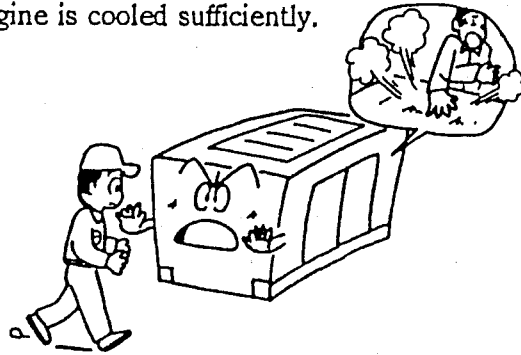
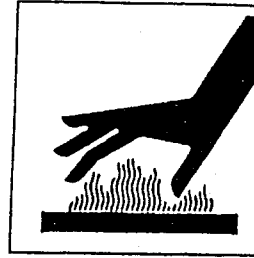
⚠ CAUTION HOT PARTS can burn skin.

- High temperature parts are located in the machine.

Care should be taken during operation.

- * When the machine needs inspection or maintenance, be sure to stop it in advance.
- * Even after the machine stops, the inside of the bonnet is still hot.

Wait until the engine is cooled sufficiently.

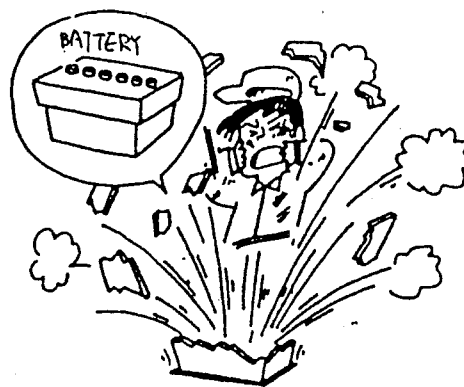
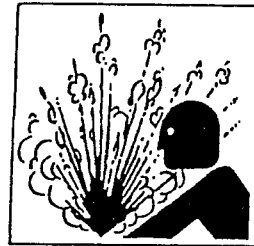


⚠ CAUTION BATTERY

- Battery generates flammable gases.

Improper handling may lead to explosion or serious injury.

- * For maintenance of the machine, disconnect the cable on the ground side.



⚠ CAUTION Sign for maintenance

- * During checking or maintenance, be sure to put up a sign "Under maintenance" at a conspicuous place such as the starter switch to prevent the machine from being operated by other persons.

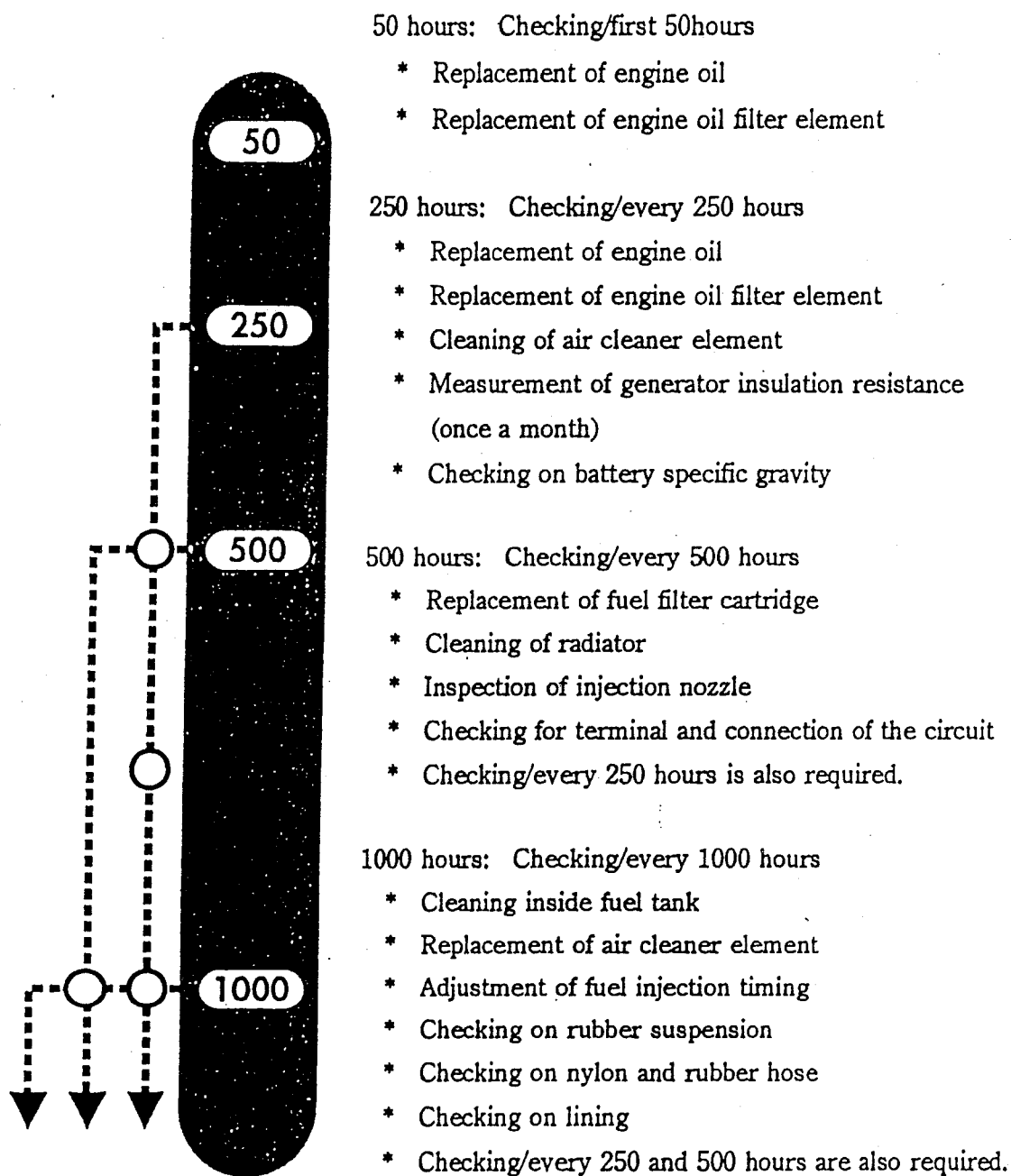
⚠ CAUTION Safety clothes

- * During checking or maintenance, be sure to put on suitable clothes and protectors.
- * Do not put on baggy clothes, necklace, etc., because they are easily caught by projections which may cause injuries.

⚠ CAUTION Handling of waste liquid

- * Waste liquid from the machine should be received in a vessel.
- * Do not dispose of waste liquid recklessly, as it causes environment pollution.
Do not throw it on the ground or in rivers, lakes, sea, etc.
- * Lubrication, fuel, cooling water (coolant) and other harmful objects such as filter, battery, etc., should be disposed of according to the related regulations.

8-1 Maintenance schedule



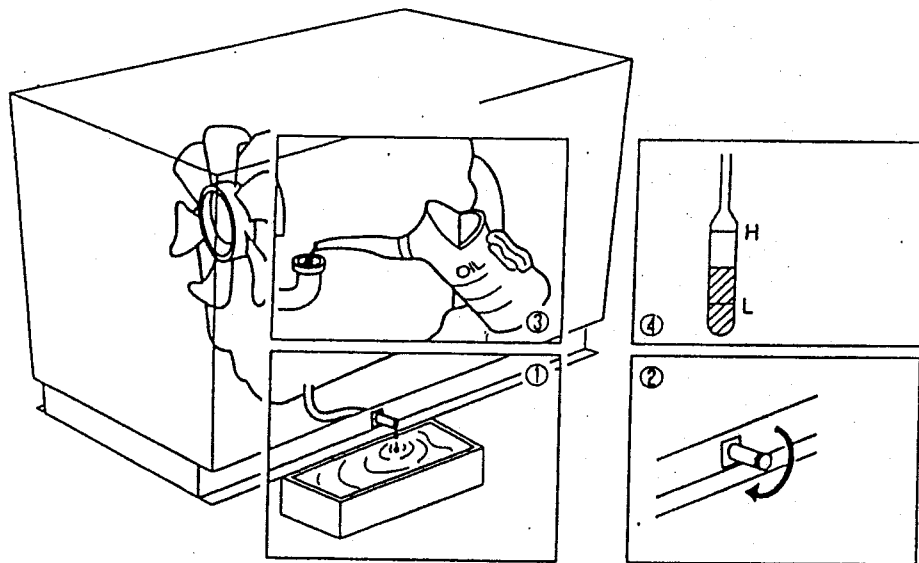
On the engine system, main checking items only are shown in this manual.
For details, refer to the instruction manual for the engine furnished separately.

8-2 Checking/first 50 hours

(1) Replacement of engine oil

Replace the engine oil at 50 hours only first time and every 250 hours after second time.

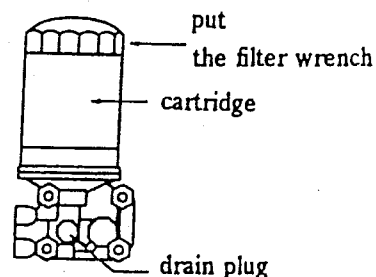
- ① Remove the engine oil drain plug and discharge oil completely. It can be discharged easily when the engine is warm.
- ② After engine oil is discharged, tighten the plug firmly.
- ③ Charge new engine oil from the oil filler until it reaches the notched line of the "H" on the dipstick. For oil quantity, (See p.43)
- ④ After engine oil is supplied, run the engine for a few minutes. Check that oil is supplied to the level between H and L . (See p.32)



(2) Replacement of engine oil filter element

- Cartridge type (Cartridge type is unit of filter case and element.)

In the case of 25SPI II and 35SPI, cartridge is attached upward. Remove the drain plug and discharge oil completely in advance.

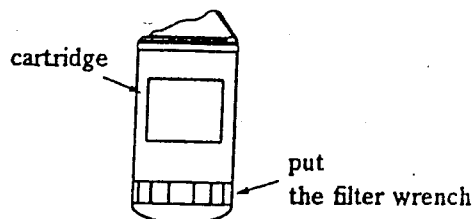


DCA-25SPI II
35SPI

- ① Remove the cartridge type element (cartridge) using filter wrench.

- ② Clean the filter base. Coat the packing of new cartridge with engine oil thin. Then, mount the cartridge.

- When mounting, tighten the cartridge from 3/4 to 1 turn by using filter wrench after the packing is fitted to the seal of the filter base.



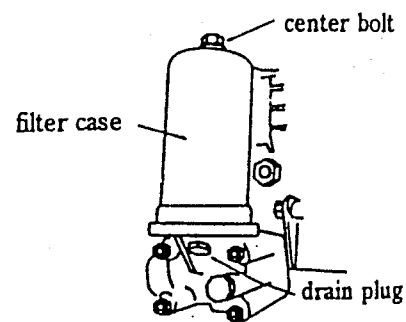
DCA-25SPI-C
45SPH
90SPH

- ③ After the element is replaced, run the engine for a while. Then, check to see that oil is supplied to the level between H and L (See p.32).

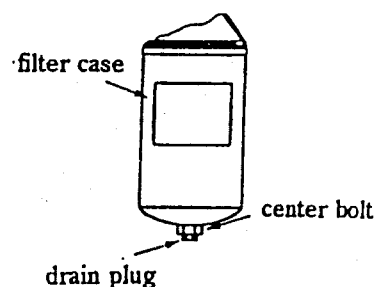
Parts number of oil filter cartridge :			
model	parts number	manufacture	parts number of manufacture
25SPI-C	06020 41210	ISUZU	894456-7411
25SPI II	06020 41175	ISUZU	897024-6070
35SPI	06020 41214	ISUZU	897049-7081
45SPH	06020 41191	HINO	15607-1330
90SPH	06020 41240	HINO	15607-1731

- Element type (Element type separates filter case and element, so replace only the element.)

- ① Loosen the drain plug in the lower part of filter case and discharge the oil completely.
- ② Loosen the center bolt and remove the filter case, element and spring or the like.
- ③ Wash each parts except the element by washing oil.
- ④ Mount the element for replacement and O ring in reverse order. Tighten the center bolt in regulation torque certainly.
- ⑤ After the element is replaced, run the engine for a while. Then, check to see that oil is supplied to the level between H and L (See p.32).



DCA-45SPI



DCA-60SPI
60SPH
75SPI

Parts number of oil filter element :			
model	parts number	manufacture	parts number of manufacture
45SPI	06020 41107	ISUZU	187810-2201
60SPI	06020 41106	ISUZU	187810-0752
60SPH	06020 41195	HINO	15607-1390
75SPI	06020 41106	ISUZU	187810-0752

8-3 Checking/every 250 hours

(1) Replacement of engine oil

Replacement is refer to 「 8-2.(1) Replacement of engine oil See p.52 」 .

(2) Replacement of engine oil filter element

Replacement is refer to 「 8-2.(2) Replacement of engine oil filter element See p.53 」 .

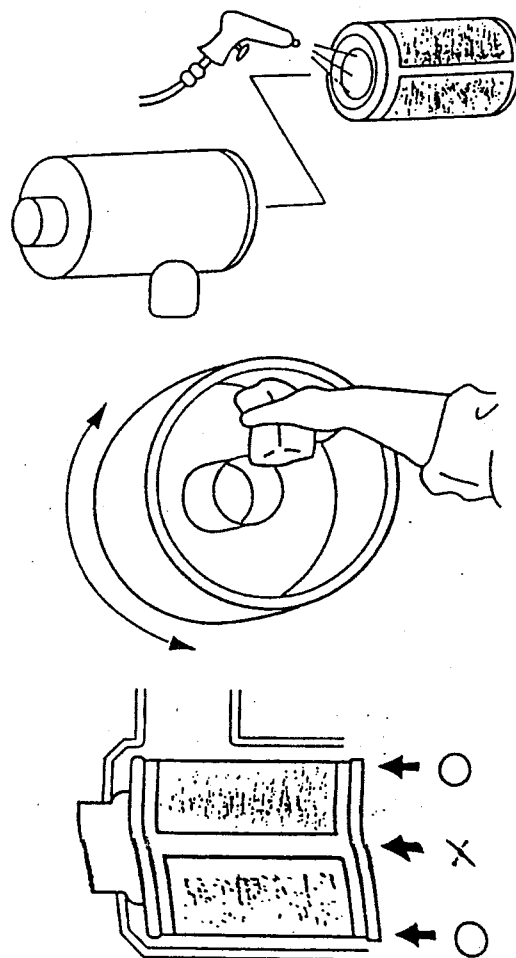
(3) Cleaning of air cleaner element

This element should be cleaned, regardless of operating time, when the warning lamp of "Air filter blinding" goes on.

- Dry dust clings on element -

Remove the air cleaner element and clean the element with dry and clean compressed air.

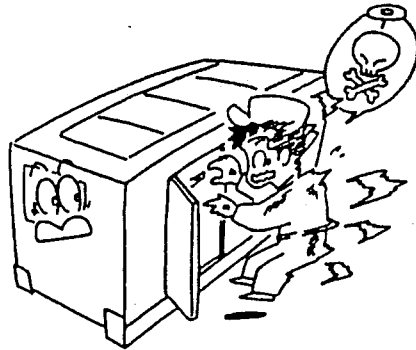
- * While it is being cleaned, check the element for any damage. Replace if necessary.
- * Before installing the air cleaner, wipe off dirt on the element cover.
- * When insert the element, insert the element completely pressing equal edge of element.



(4) Measurement of insulation resistance.

⚠ WARNING ELECTRIC SHOCK can kill.

* Measurement should be made after the machine stops.



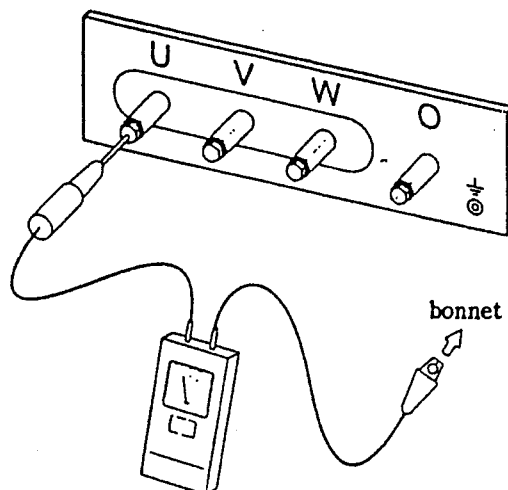
- Using a 500V megger, make a check once a month to ensure that the insulation resistance is more than $1\text{M } \Omega$.

Measurement:

Disconnect the load side cable from the output terminal as shown at below. Turn ON the circuit breaker and measure the insulation resistance between the output terminal bolt and the bonnet.

- If the measured resistance is less than $1\text{M } \Omega$, it may cause electric leakage or fire accident. Wipe off dirt and oil on the output terminals, circuit breakers and generator leads (cables) and dry them thoroughly.

If the insulation resistance is not recovered after cleaning, contact distributor or our office.



(5) Check on battery specific gravity.

If battery is likely to be discharged due to failure in startup of the engine, measure the specific gravity of battery acid.

The relation between battery charge condition (charging rate) and specific gravity is as shown below.

<div>Charging rate (%)</div> <div>Liquid temp. °C</div>	20	0	-10
100	1.28	1.29	1.30
90	1.26	1.27	1.28
80	1.24	1.25	1.26
75	1.23	1.24	1.25

Each value has a deviation of ± 0.01 .

When the charging rate is below 75%, the battery needs to be recharged.

「 7-1. Caution on battery charge See p.46 」

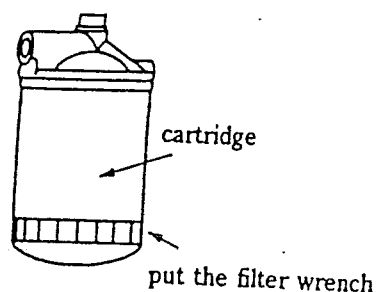
8-4 Checking/every 500 hours

Checking/every 250 hours is also required.

(1) Replacement of fuel filter cartridge.

- Cartridge type (Cartridge type is unit of filter case and element.)

- ① Remove the cartridge type element (cartridge) using filter wrench.
- ② Clean the filter base. Coat the packing of new cartridge with engine oil thin. Then, mount the cartridge.



- When mounting, tighten the cartridge about from 1/2 to 3/4 turn by hand after the packing is fitted to the seal of the filter base.

- ③ After the cartridge is replaced, discharge air in the fuel piping.

- For details, refer to the instruction manual for the engine. A nameplate showing the method of discharging air is also attached to the machine.

Parts number of fuel filter cartridge :			
model	parts number	manufacture	parts number of manufacture
25SPI II	06020 42102	ISUZU	894143-4790
35SPI	06020 42103	ISUZU	894414-7963
45SPH	06020 42195	HINO	23401-1341
45SPI	06020 42407	ISUZU	113240-0791
60SPI	06020 42407	ISUZU	113240-0791
75SPI	06020 42407	ISUZU	113240-0791
90SPH	06020 42195	HINO	23401-1341

- Element type (Element type separates filter case and element, so replace only the element.)

- ① Loosen the drain plug in the lower part of filter case and discharge the oil completely.

In the case of 25SPI-C, there is no drain plug.

- ② Loosen the center bolt and remove the filter case, element and spring or the like.

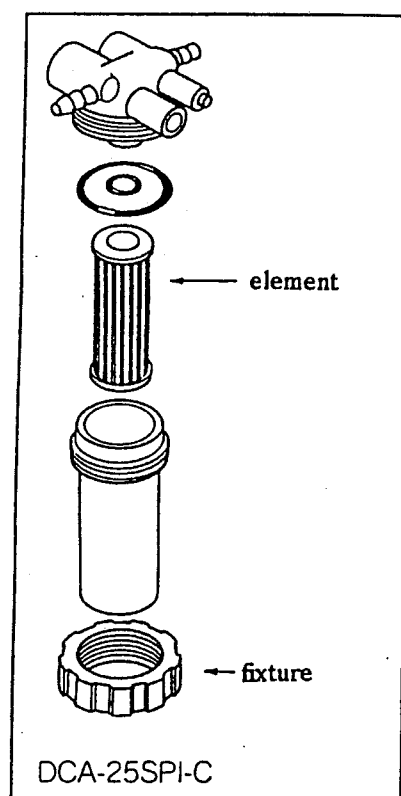
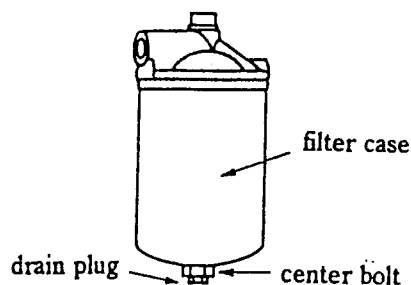
In the case of 25SPI-C, close the cock of fuel filter and loosen the fixture. And remove the cup and take off the element.

- ③ Wash each parts except the element by washing oil.
- ④ Mount the element for replacement and O ring in reverse order.
- ⑤ Tighten the center bolt in regulation torque certainly.

In the case of 25SPI-C, tighten the fixture certainly.

- ⑥ After the cartridge is replaced, discharge air in the fuel piping.

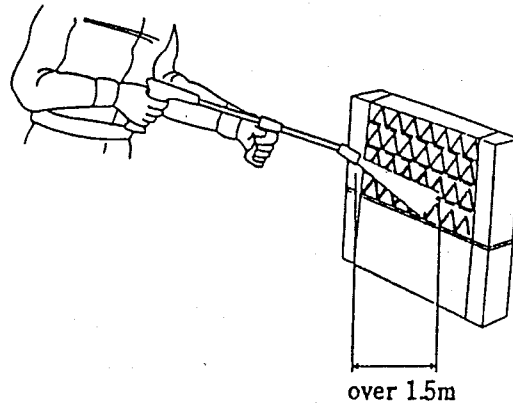
— For details, refer to the instruction manual for the engine. A nameplate showing the method of discharging air is also attached to the machine.



Parts number of fuel filter element :			
model	parts number	manufacture	parts number of manufacture
25SPI-C	06020 42100	ISUZU	897071-3480
60SPH	06020 42163	HINO	23401-1290

(2) Cleaning of radiator

When the fin or tube is blinded, it should be cleaned with steam or high pressure water.



[Note]

When a high pressure washer is used, spray water from a place about 1.5m away to prevent damage to the fin or tube.

(3) Checking for terminal and connection of the circuit.

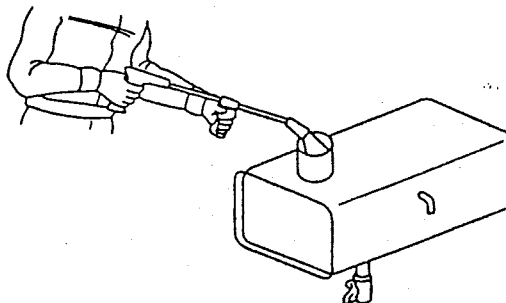
Check for main and sub circuit, whether there are no abnormality such as loosening, corrosion and burning, etc.

8-5 Checking/every 1000 hours

Checking/every 250 and 500 hours is also required.

(1) Cleaning inside fuel tank

Drain the fuel in the fuel tank completely, and wash out deposits and water collected inside the tank.



(2) Replacement of air cleaner element

The element should be replaced referring to "Cleaning of air cleaner element"(See p.55) .

Parts number of air cleaner element :			
model	parts number	manufacture	parts number of manufacture
25SPI-C	06020 40107	DONALDSON	P81-4723
25SPI II	06020 40175	DONALDSON	P10-5629
35SPI	06020 40107	DONALDSON	P81-4723
45SPI	06020 40197	DONALDSON	P10-4873
45SPH	06020 40197	DONALDSON	P10-4873
60SPI	06020 40193	DONALDSON	P10-4972
60SPH	06020 40193	DONALDSON	P10-4972
75SPI	06020 40193	DONALDSON	P10-4972
90SPH	06020 46350	HINO	17801-1491

(3) Checking on rubber suspension

Check on the rubber suspension, whether it is damaged or deformed by the oil. Contact distributor or our office to replace the rubber suspension, if necessary.

(4) Checking on nylon and rubber hose

Check on the nylon and rubber hose, whether they are hardened or deteriorate. Contact distributor or our office to replace the nylon hose and rubber hose, if necessary.

(5) Checking on lining

Check on the lining, whether it deteriorates greatly, or it is stained by clinging of oil or the like, or it is removed. Contact distributor or our office to replace the lining, if necessary.

8-6 Table of periodical maintenance and checking

◇ :Check or Clean ○ :Replacement ☆ :Only first time

	List of maintenance and inspection	daily	first 50h	every 250h	every 500h	every 1000h
Engine	Checking on oil level and stain of oil	◇				
	Checking on cooling water	◇				
	Checking on fan belt	◇				
	Checking on fuel and drain	◇		◇		
	Checking on battery acid level	◇				
	Checking on for water and oil leakage	◇				
	Checking on bolts and nuts for looseness	◇				
	Checking on exhaust color, sound and vibration	◇				
	Checking on meters and warning lamps	◇				
	Replacement of engine oil		☆ ○	○		
	Replacement of engine oil filter		☆ ○	○		
	Clean air cleaner element			◇		
	Checking on specific gravity of battery			◇		
	Cleaning radiator				◇	
	Replacement of fuel filter				○	
	Cleaning fuel tank					◇
	Replacement of air cleaner element					○
	*Inspection of engine valve clearance			☆ ◇		◇
	*Adjust fuel injection nozzle					◇
	*Inspection of timing of fuel injection					◇
	Checking on rubber suspension					◇
	Checking on nylon and rubber hose					◇
	Checking on lining					◇
Generator	Checking on generator case grounding	◇				
	Checking on insulation resistance			◇		
	Checking on terminal and connected section				◇	

※ Contact distributor or our office.

☆ This symbol represent first time of inspection, next time is ordinary schedule.

Inspection time is different by the engine, in detail, please refer "Engine Instruction Manual" furnished separately.

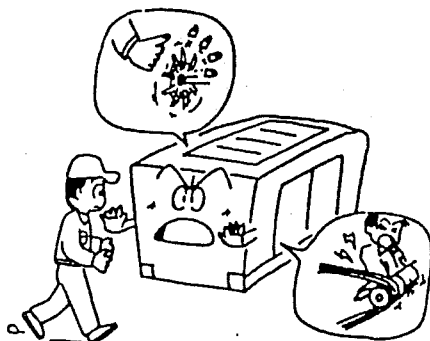
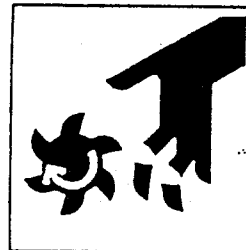
9. Troubleshooting

WARNING **MOVING PARTS** can cause severe injury.

- Rotary unit which moving parts at a high speed is located in the machine.

Care should be taken during operation.

- * When the machine needs checking or maintenance, be sure to stop it in advance.

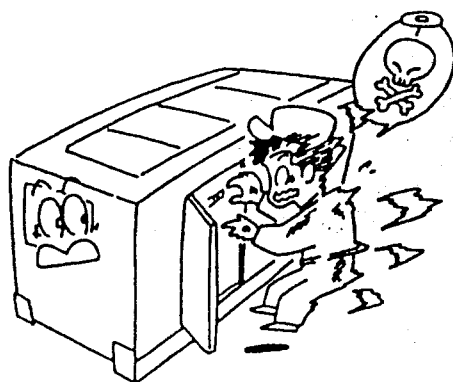


WARNING **ELECTRIC SHOCK** can kill.

- High voltage units are located in the machine.

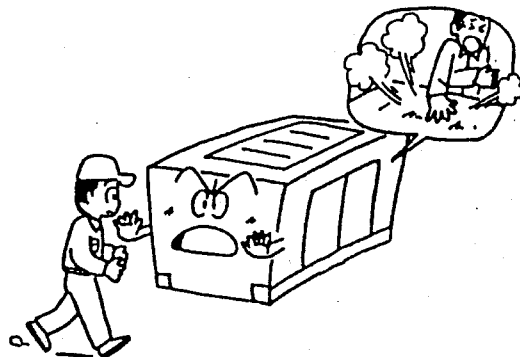
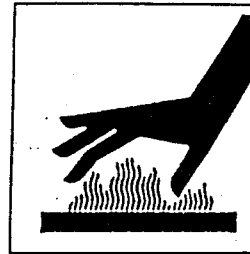
Care should be taken during operation.

- * When the machine needs checking or maintenance, be sure to stop it in advance.



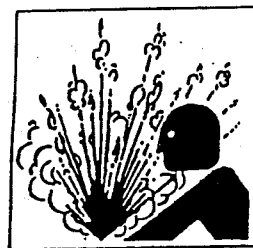
⚠ CAUTION HOT PARTS can burn skin.

- High temperature parts are located in the machine.
Care should be taken during operation.
- * When the machine needs inspection or maintenance,
be sure to stop it in advance.
- * Even after the machine stops, the inside of the
bonnet is still hot.
Wait until the engine is cooled sufficiently.



⚠ CAUTION Handling of BATTERY

- Battery generates flammable gases.
Improper handling may lead to explosion or serious
injury.
- * For maintenance of the machine, disconnect the ground
cable.



Phenomenon		Assumed cause	Action
Engine will not start up	Cell motor will not run or revolution speed is low	Discharged battery	Charge or replace
		Detached or loosened or corroded battery terminal	Repair
		Battery switch set at OFF position	Turn ON
		Improper starter switch	Replace
		Improper starter	Replace
		Broken lead wire	Repair
	Cell motor runs	Fuel shortage	Supply
		Blinded fuel filter	Replace element
		Air in fuel system	Remove
Speed will not rise		Air in fuel system	Remove
		Blinded fuel filter	Replace element
		Compression failure	Repair engine
		Blinded air cleaner	Replace element
Engine stop by oil failure		Oil shortage	Supply
		Oil pressure switch failure	Replace
		Blinded oil filter	Replace element
Over heat (water temperature)		Cooling water shortage	Supply
		Fan belt looseness	Adjust
		Blinded core of radiator	Clean
		Engine thermostat failure	Repair
Voltmeter will not operate		Voltmeter failure	Replace
		AVR failure	Contact distributor or our office
		Burned ZNR	
		Quenched residual magnetism (Except 25SP)	
		Burned rotary rectifier	
		Disconnected rotor wiring	
		Burned generator wiring	
Rated voltage will not be reached		Voltmeter failure	Replace
		AVR failure	Contact distributor or our office
		VR failure	
		Burned rotary rectifier	
		Burned ZNR	
		Burned generator wiring	
		Low speed	Increase

Phenomenon	Assumed cause	Action
Voltage goes too high	Voltmeter failure	Replace
	AVR failure	Contact distributor or our office
	VR failure	
Applied load causes load voltage drop	Burned rotary rectifier	Contact distributor or our office
	AVR failure	
	Burned main field, exciter field wiring	
	Unbalanced load	Balance

10. Long-term storage

When the machine is to be stored for a long period of time, choose a cool place free from moisture and dust, and observe the following points.

- (1) Remove dirt clinged the machine and clean it thoroughly.
If painting is peeled off, it should be repaired.
- (2) Remove the battery from the machine. The battery should be charged completely before it is stored.
 - Battery is discharged of itself. Recharge it once a month.
- (3) If any defects are found, check and repair the machine so that it can be used for future operation.
- (4) For details of handling the engine, refer to the instruction manual for the engine provided separately.

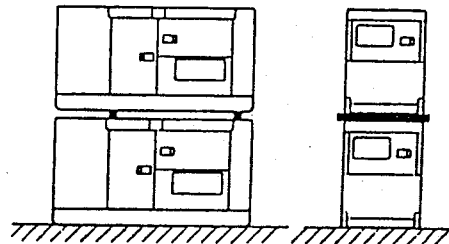
CAUTION

Stacking

- Improper stacking of machines may cause falling or dropping accidents.

When stacking other machines on this machine, be sure to observe the following points.

- * Check that the bonnet of the machine is free from damage and that the fixing bolts are not loosened and missing.
- * Put the machine horizontally on a solid foundation which withstands the weight of stacked machines.
- * Machines can be stacked up to 2 stages. The weight and size of stacked machines should be less than those of this machine.
- * Using square timbers as shown below, put each machine making sure that the weight is even.



- Do not operate the machines in the state of stacking to prevent falling or dropping accidents.

11. Service data

11-1 Specifications

MODEL		DCA-	25SPI-C	25SPIII	35SPI	45SPH	45SPI
MODEL			DF-0270IC	DF-0270I	DB-0391I	DB-0501H	DB-0501I
A C G E N E R A T O R	FREQUENCY		50/60 Hz				
	RATED OUTPUT		20/25 kVA		30/35	37/45	
			16/20 kW		24/28	29.6/36 ...	
	RATED VOLTAGE		200/220 V				
	RATED CURRENT		57.7/65.6 A		86.6/91.9	107/118	
	POWER FACTOR		0.8 (lagging)				
	NO.OF PHASES		Three-phase(four wire)				
	EXCITATION		Brushless type (with automatic voltage regulator)				
	NO.OF POLES		4				
	SPEED		1500 / 1800 min ⁻¹ (rpm)				
	INSULATION		class F				
	SINGLE PHASE OUTPUT	TERMINAL OUTPUT	3 kVA × 1		4 kVA × 2	6 kVA × 2	
		RECEPTACLE	1.5 kVA × 2				
VOLTAGE		100/110 V					
MANUFACTURE		ISUZU	ISUZU	ISUZU	HINO	ISUZU	
MODEL		4LE1	C240	A-4JG2	W04D-F	B-4BG1	
TYPE		4-cycle water cooled diesel engine swirl chamber type			4-cycle water cooled diesel engine direct injection type		
NO.OF CYLINDERS		4-	4-	4-	4-	4-	
BORE×STROKE (mm)		85×96	86×102	95.4×107	104×118	105×125	
TOTAL DISPLACEMENT		2.179 L	2.369	3.059	4.009	4.329	
RATED OUTPUT (1500/1800min ⁻¹)		18.4/22.8 kW		28.7/33.1	34.2/41.9	34.2/41.2	
		25/31 PS		39/45	46.5/57	46.5/56	
BATTERY (DOMESTIC STANDARD)		65D31R×1		95E41R×1	65D31R×2		
FUEL		DIESEL FUEL ASTM No.2 or equivalent					
FUEL TANK CAP.		65 L		100			
ENGINE OIL *1	OVERALL	8.6 L	6.3	8.3	16.5	14.0	
	FILTER	0.4 L	0.6	0.5	1.4	0.7	
COOLANT QUANTITY*2	OVERALL	8.1 L	11.9	15.0	15.3	25.0	
	RESERVE TANK	0.9 L	0.9	0.9	1.0	1.0	
S E T	LENGTH OVERALL		1580 mm	1850	1900	2000	2000
	WIDTH OVERALL		650 mm	750	880	880	880
	HEIGHT		900 mm	1000	1250	1250	1250
	DRY WEIGHT		560 kg	730	990	1190	1180
	TOTAL WEIGHT		635 kg	810	1110	1350	1340

The above specifications and set dimensions are subject to change.

*1 Overall of engine oil contains filter.

*2 Overall of coolant quantity contains reserve tank.

Dry wight : This weight does not contain the cooling water, engine oil and fuel.

Total weight : This weight contains the cooling water, engine oil and fuel.

A C G E N E R A T O R	MODEL DCA-		60SPH	60SPI	75SPI	90SPH
	MODEL DB-		0661H	0661I	0831I	1001H
	FREQUENCY		50/60 Hz			
	RATED OUTPUT		50/60 kVA		65/75	75/90
			40/48 kW		52/60	60/72
	RATED VOLTAGE		200/220 V			
	RATED CURRENT		144/157 A		188/197	217/236
	POWER FACTOR		0.8 (lagging)			
	NO.OF PHASES		Three-phase(four wire)			
	EXCITATION		Brushless type(with automatic voltage regulator)			
	NO.OF POLES		4			
	SPEED		1500 / 1800 min ⁻¹ {rpm}			
	INSULATION		class F			
	SINGLE PHASE OUTPUT	TERMINAL OUTPUT	7.5 kVA × 2		10 kVA × 2	
RECEPTACLE VOLTAGE		1.5 kVA × 2				
		100/110 V				
E N G I N E	MANUFACTURE		HINO	ISUZU	HINO	
	MODEL		W06E-H	A-6BG1	H07D-C	
	TYPE		4-cycle water cooled diesel engine direct injection type			
	NO.OF CYLINDERS		6-	6-	6-	
	BORE×STROKE (mm)		104×118	105×125	110×130	
	TOTAL DISPLACEMENT		6.014 L	6.494	7.412	
	RATED OUTPUT (1500/1800min ⁻¹)		48.5/57.4 kW 66/78 PS	47.1/57.4 64/78	58.8/68.4 80/93	69.9/83.1 95/113
	BATTERY (DOMESTIC STANDARD)		65D31R×2		95E41R×2	
	FUEL		DIESEL FUEL ASTM o.2 or equivalent			
	FUEL TANK CAP.		125 L		155	185
	ENGINE OIL *1	OVERALL	20.0	19.3		22.5
		FILTER	1.1	1.0		1.9
	COOLANT QUANTITY*2	OVERALL	18.0	29.5	27.4	22.6
		RESERVE TANK	1.0	1.0	2.4	2.4
S E T	LENGTH OVERALL		2420 mm	2420	2630	2900
	WIDTH OVERALL		880 mm	880	1000	1100
	HEIGHT		1250 mm	1250	1300	1400
	DRY WEIGHT		1400 kg	1410	1590	1975
	TOTAL WEIGHT		1610 kg	1610	1780	2230

The above specifications and set dimensions are subject to change.

*1 Overall of engine oil contains filter.

*2 Overall of coolant quantity contains reserve tank.

Dry wight : This weight does not contain the cooling water, engine oil and fuel.

Total weight : This weight contains the cooling water, engine oil and fuel.

11-2 AC generator specifications (for custom voltage)

DCA-25SP		50Hz				60Hz			
Rated output	kVA	20	20	20	20	25	25	25	25
	kW	16	16	16	16	20	20	20	20
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		60.8/30.4	28.9	27.8	52.5/26.2	76.0/38.0	72.2/36.1	32.8	60.1/30.1
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	30	30	30	27.3	30	30	27.3	25

DCA-35SP		50Hz				60Hz			
Rated output	kVA	30	30	30	27	31.5	35	35	35
	kW	24	24	24	21.6	25.2	28	28	28
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		91.2/45.6	43.3	41.7	70.9/35.4	95.7/47.9	101/50.5	45.9	84.2/42.1
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	40	40	40	36.4	40	40	36.4	33.3

DCA-45SP		50Hz				60Hz			
Rated output	kVA	37	37	37	33.3	40.5	45	45	45
	kW	29.6	29.6	29.6	26.6	32.4	36	36	36
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		112/56.2	53.4	51.5	87.4/43.7	123/61.5	130/65.0	59.0	108/54.1
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	60	60	60	54.5	60	60	54.5	50

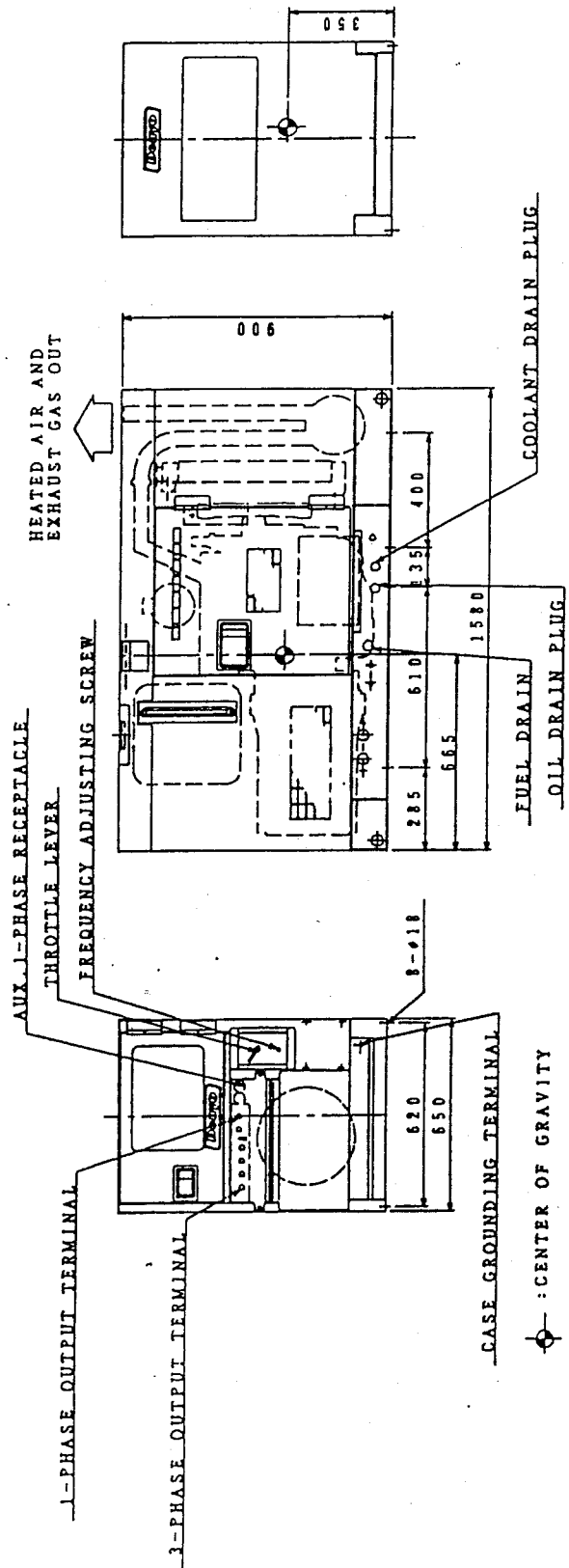
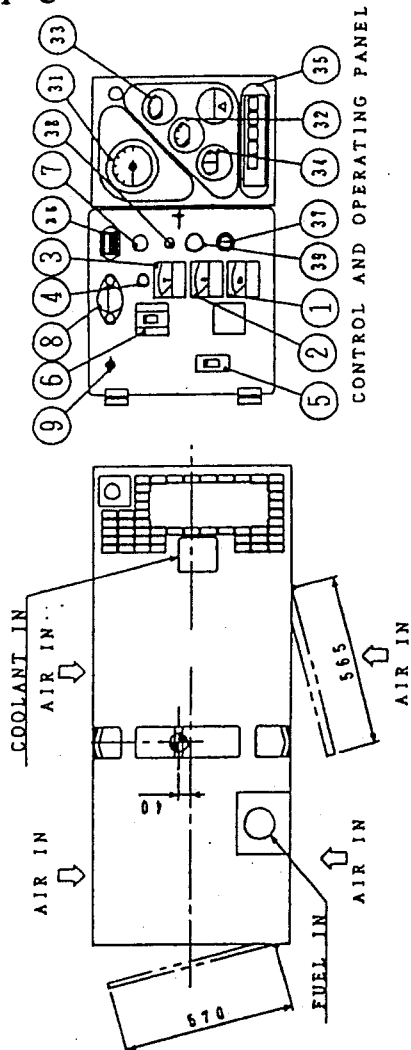
DCA-60SP		50Hz				60Hz			
Rated output	kVA	50	50	50	45	54	60	60	60
	kW	40	40	40	36	43.2	48	48	48
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		152/76.0	72.2	69.6	118/59.0	164/82.0	173/86.6	78.7	144/72.2
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	75	75	75	68.2	75	75	68.2	62.5

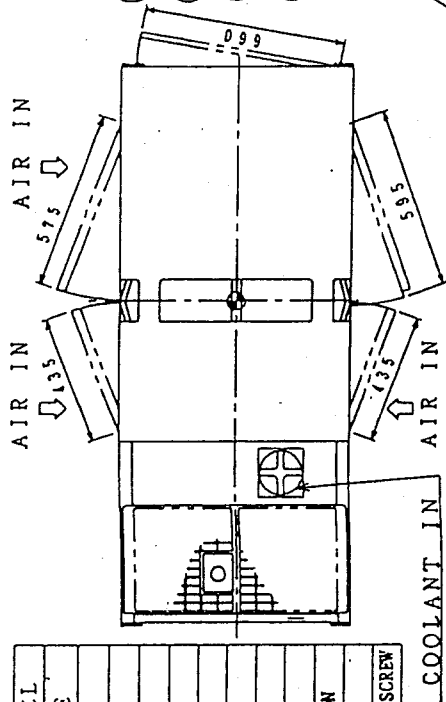
DCA-75SP		50Hz				60Hz			
Rated output	kVA	65	65	65	58.5	67.5	75	75	75
	kW	52	52	52	46.8	54	60	60	60
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		198/98.8	93.8	90.4	154/76.8	205/103	217/108	98.4	180/90.2
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	100	100	100	90.9	100	100	90.9	83.3

DCA-90SP		50Hz				60Hz			
Rated output	kVA	75	75	75	67.5	81	90	90	90
	kW	60	60	60	54	64.8	72	72	72
Rated voltage (V)		190/380	400	415	220/440	190/380	200/400	440	240/480
Rated current (A)		228/114	108	104	177/88.6	246/123	260/130	118	217/108
Single phase output	Voltage (V)	100	100	100	110	100	100	110	120
	Current (A)	100	100	100	90.9	100	100	90.9	83.3

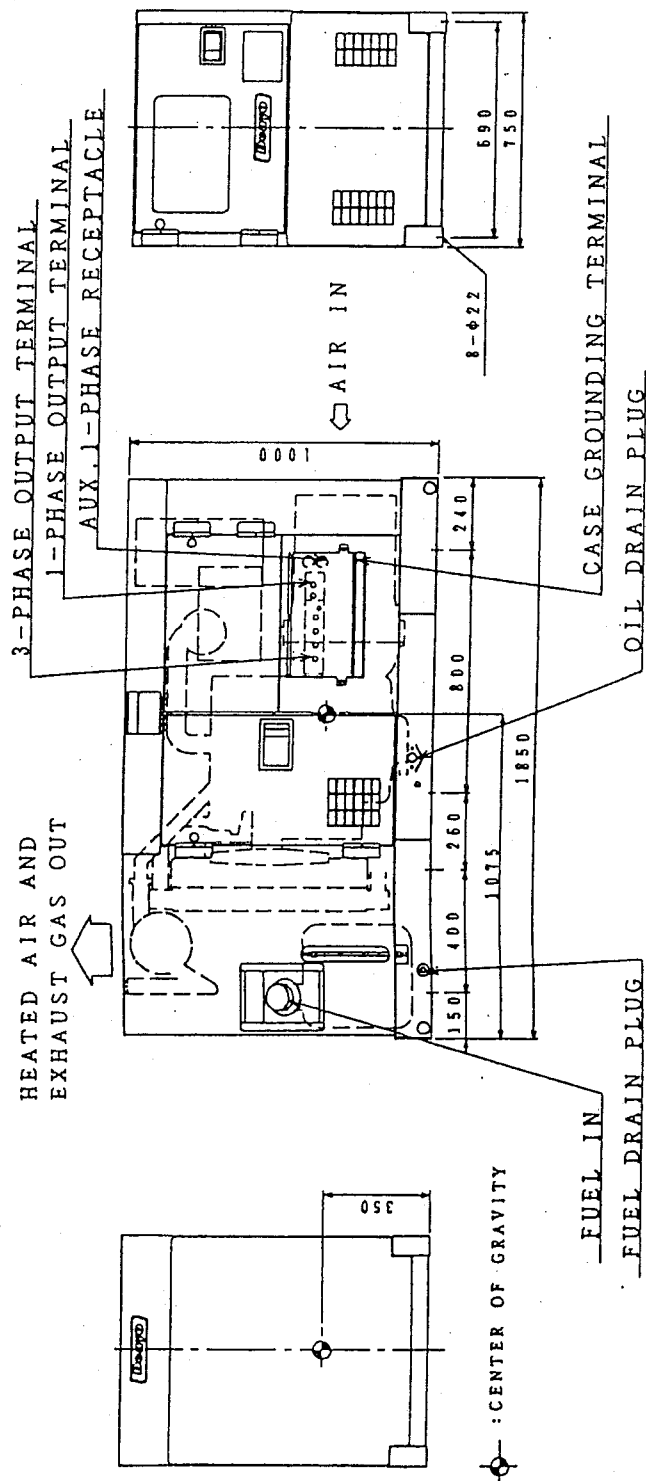
• 25SPI-C

CONTROL AND OPERATING PANEL									
No.	N	A	M	E	No.	N	A	M	E
1	FREQUENCY METER				31	TACHOMETER			
2	AC AMMETER				32	OIL PRESSURE GAUGE			
3	AC VOLT-METER				33	WATER TEMP. GAUGE			
4	PILOT LAMP				34	CHARGING AMMETER			
5	CIRCUIT BREAKER 3-PHASE				35	WARNING LAMP UNIT			
6	CIRCUIT BREAKER 0-PHASE				36	HOOR METER			
7	VOLTAGE REGULATOR				37	STARTER SWITCH			
8	PANEL LIGHT				38	PREHEAT LAMP			
9	PANEL LIGHT SWITCH				39	EMERGENCY STOP BUTTON			

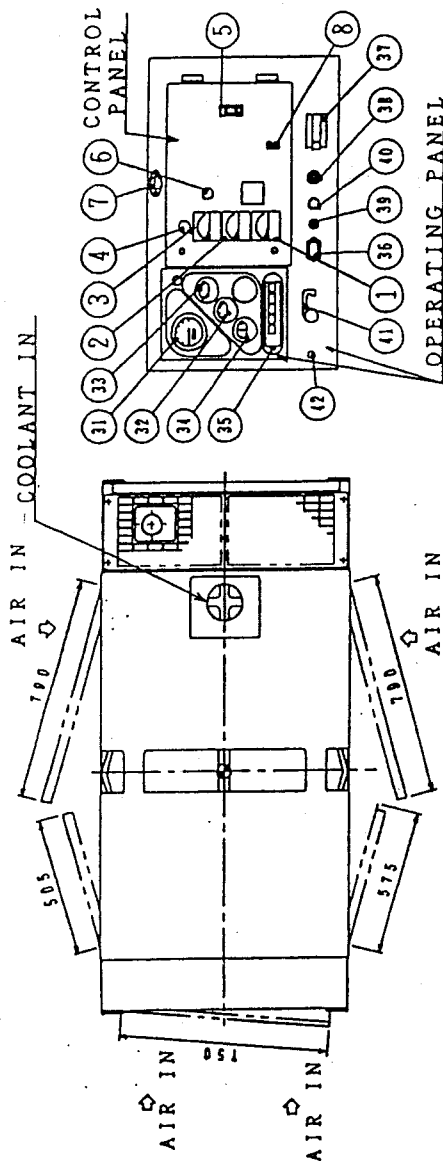




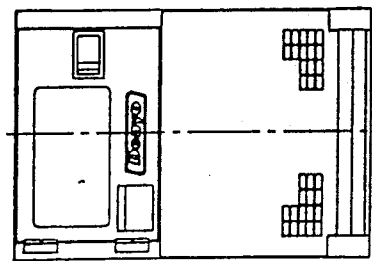
CONTROL PANEL					OPERATING PANEL				
No.	N	A	M	E	No.	N	A	M	E
1	FREQUENCY	METER			31	TACHOMETER			
2	AC	AMMETER			32	OIL PRESSURE	GAUGE		
3	AC	VOLTMETER			33	WATER TEMP.	GAUGE		
4	PILOT	LAMP			34	CHARGING	AMMETER		
5	CIRCUIT BREAKER	G-PHASE			35	WARNING	LAMP UNIT		
6	CIRCUIT BREAKER	U-PHASE			36	BATTERY	SWITCH		
7	VOLTAGE	REGULATOR			37	STARTER	SWITCH		
8	PANEL	LIGHT			38	PREHEAT	LAMP		
9	PANEL	LIGHT	SWITCH		39	EMERGENCY STOP	BUTTON		
					40	THROTTLE	LEVER		
					41	FREQUENCY	ADJUSTING SCREW		



CONTROL PANEL					OPERATING PANEL				
No.	N	A	M	E	No.	N	A	M	E
1					31				
1					31				
2					32				
2					32				
3					33				
3					33				
4					34				
4					34				
5					35				
5					35				
6					36				
6					36				
7					37				
7					37				
8					38				
8					38				
					39				
					40				
					41				
					41				

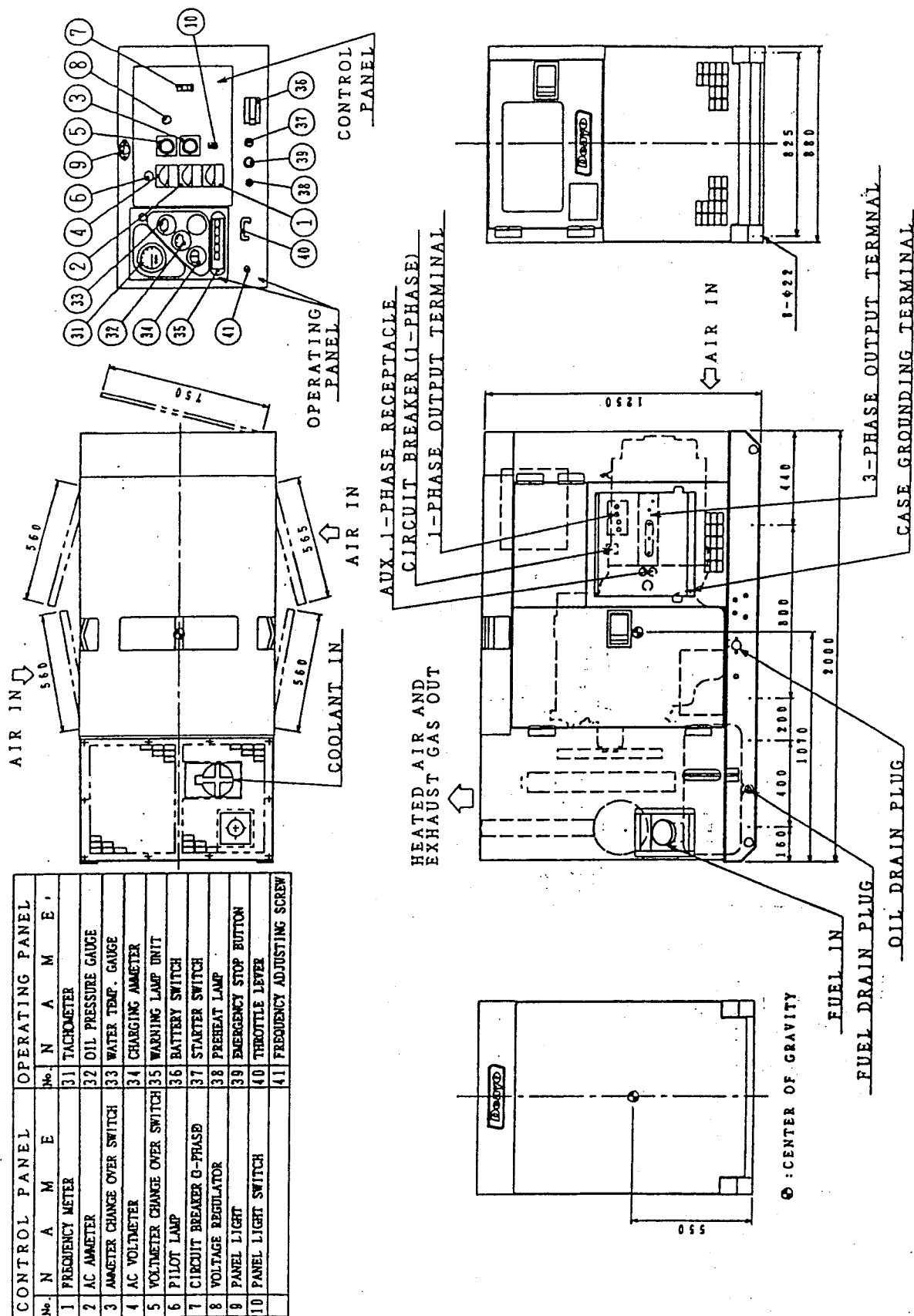


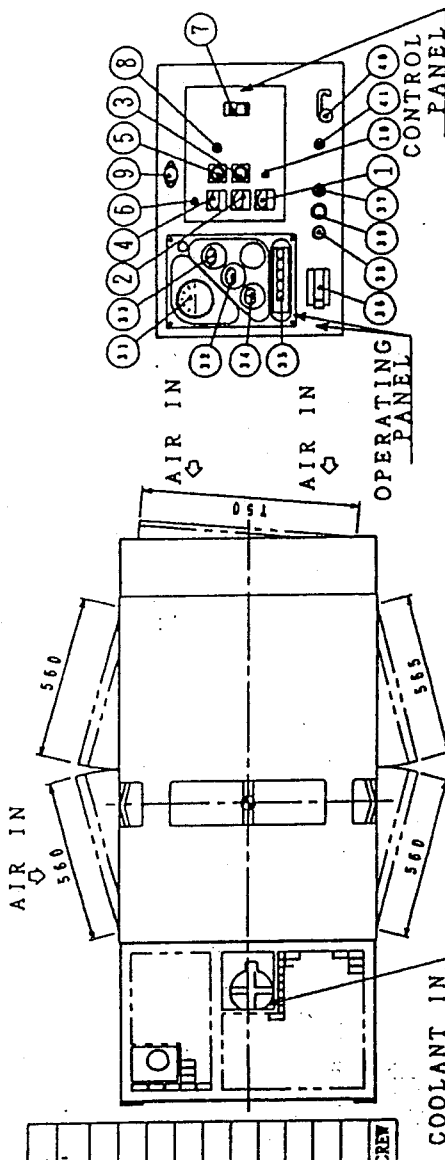
1-PHASE OUTPUT TERMINAL
CIRCUIT BREAKER (1-PHASE)
AUX. 1-PHASE RECEPTACLE



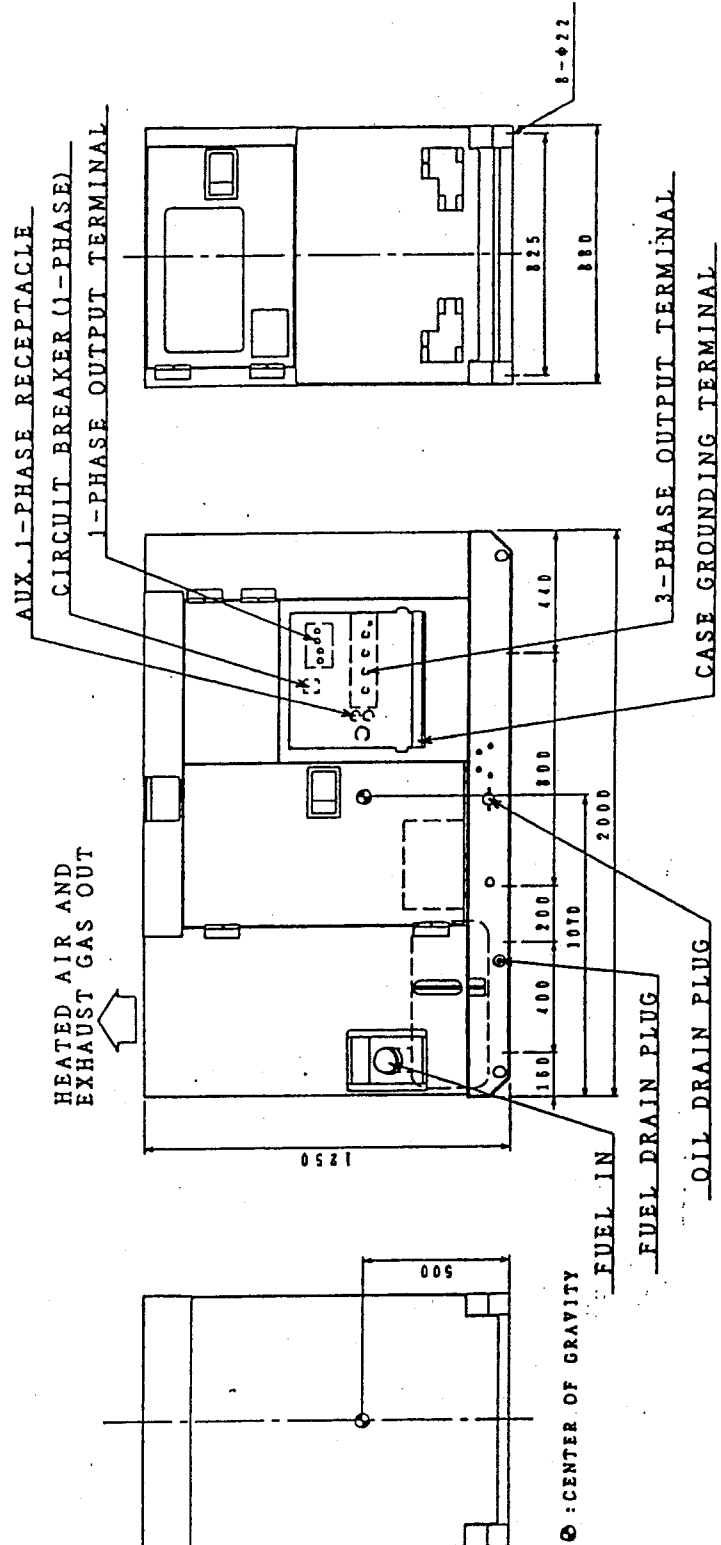
⊙: CENTER OF GRAVITY

3-PHASE OUTPUT TERMINAL
CASE GROUNDING TERMINAL
FUEL IN
FUEL DRAIN PLUG
OIL DRAIN PLUG

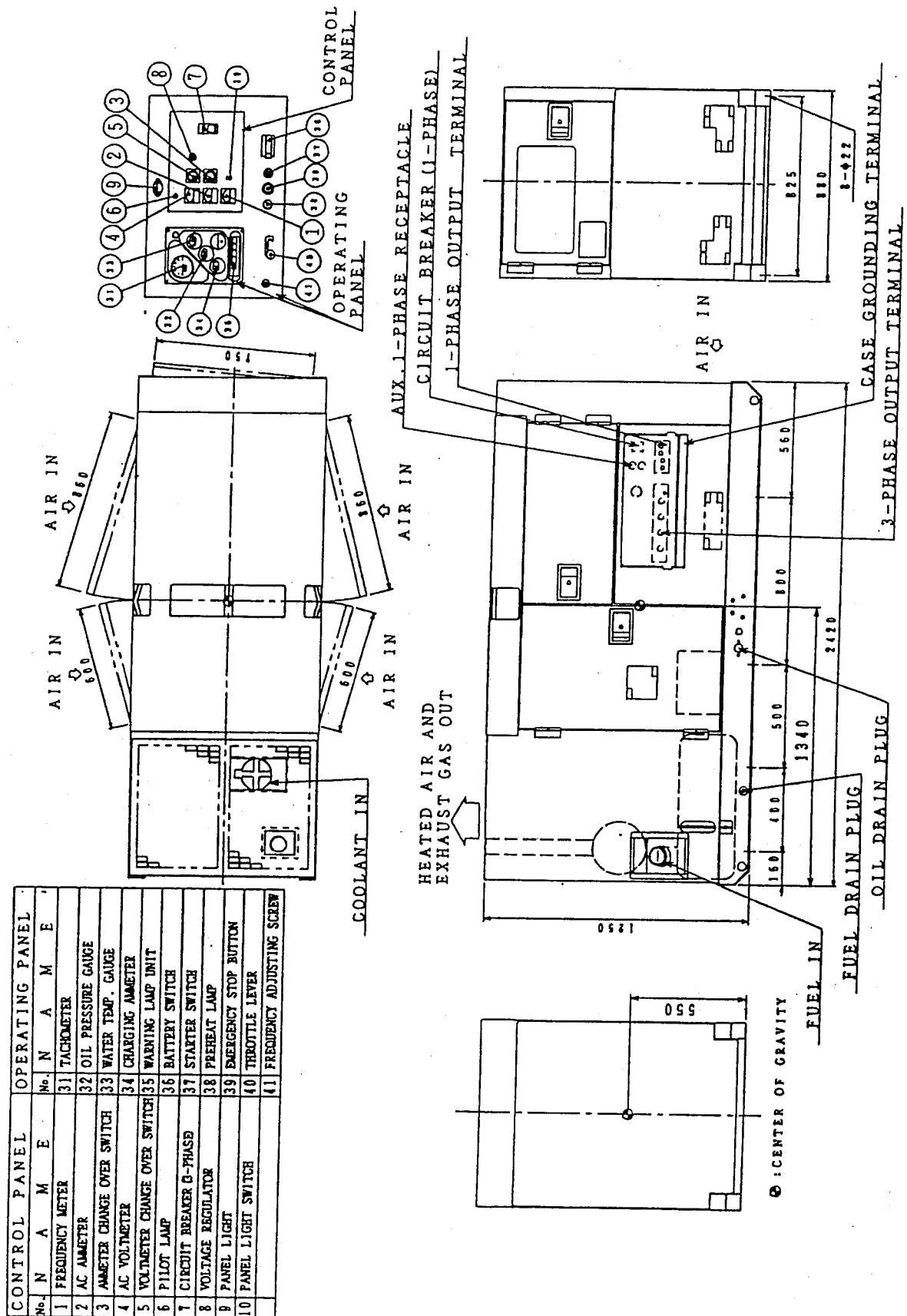


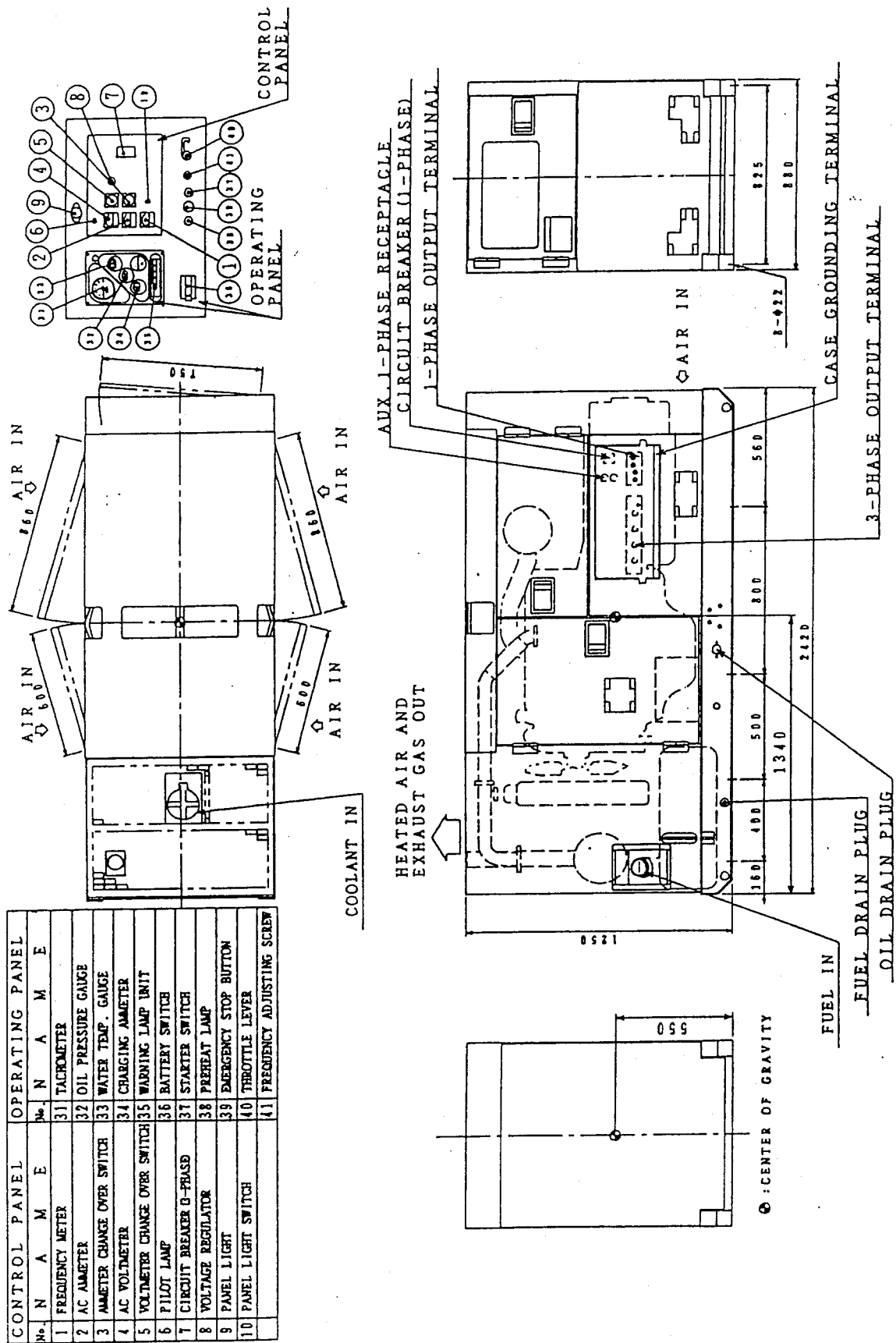


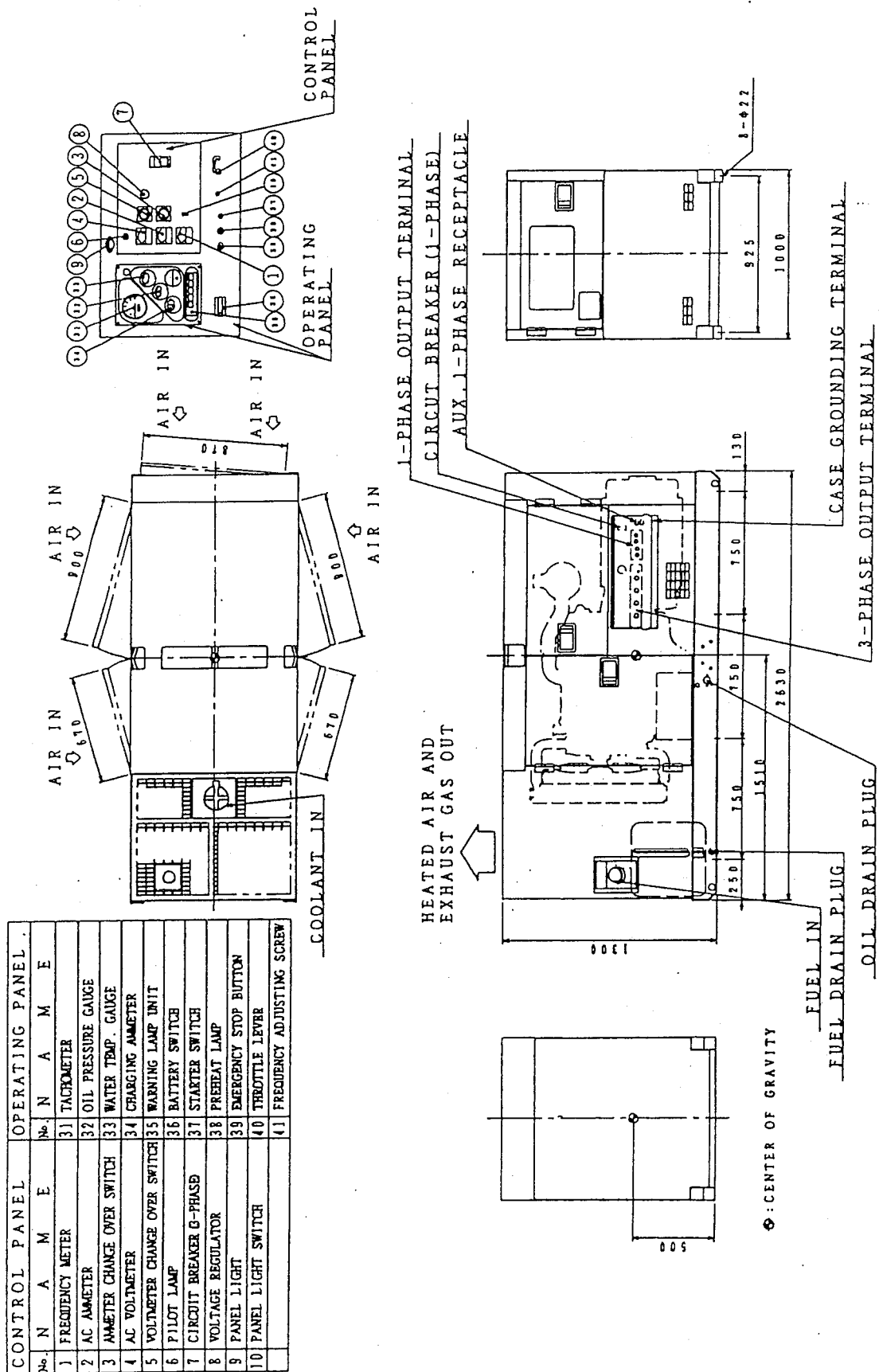
CONTROL PANEL		OPERATING PANEL	
No.	N A M E	No.	N A M E
1	FREQUENCY METER	31	TACHOMETER
2	AC AMMETER	32	OIL PRESSURE GAUGE
3	AMMETER CHANGE OVER SWITCH	33	WATER TEMP. GAUGE
4	AC VOLTMETER	34	CHARGING AMMETER
5	VOLTMETER CHANGE OVER SWITCH	35	WARNING LAMP UNIT
6	PILOT LAMP	36	BATTERY SWITCH
7	CIRCUIT BREAKER 0-PHASE	37	STARTER SWITCH
8	VOLTAGE REGULATOR	38	PREHEAT LAMP
9	PANEL LIGHT	39	EMERGENCY STOP BUTTON
10	PANEL LIGHT SWITCH	40	THROTTLE LEVER
		41	FREQUENCY ADJUSTING SCREW



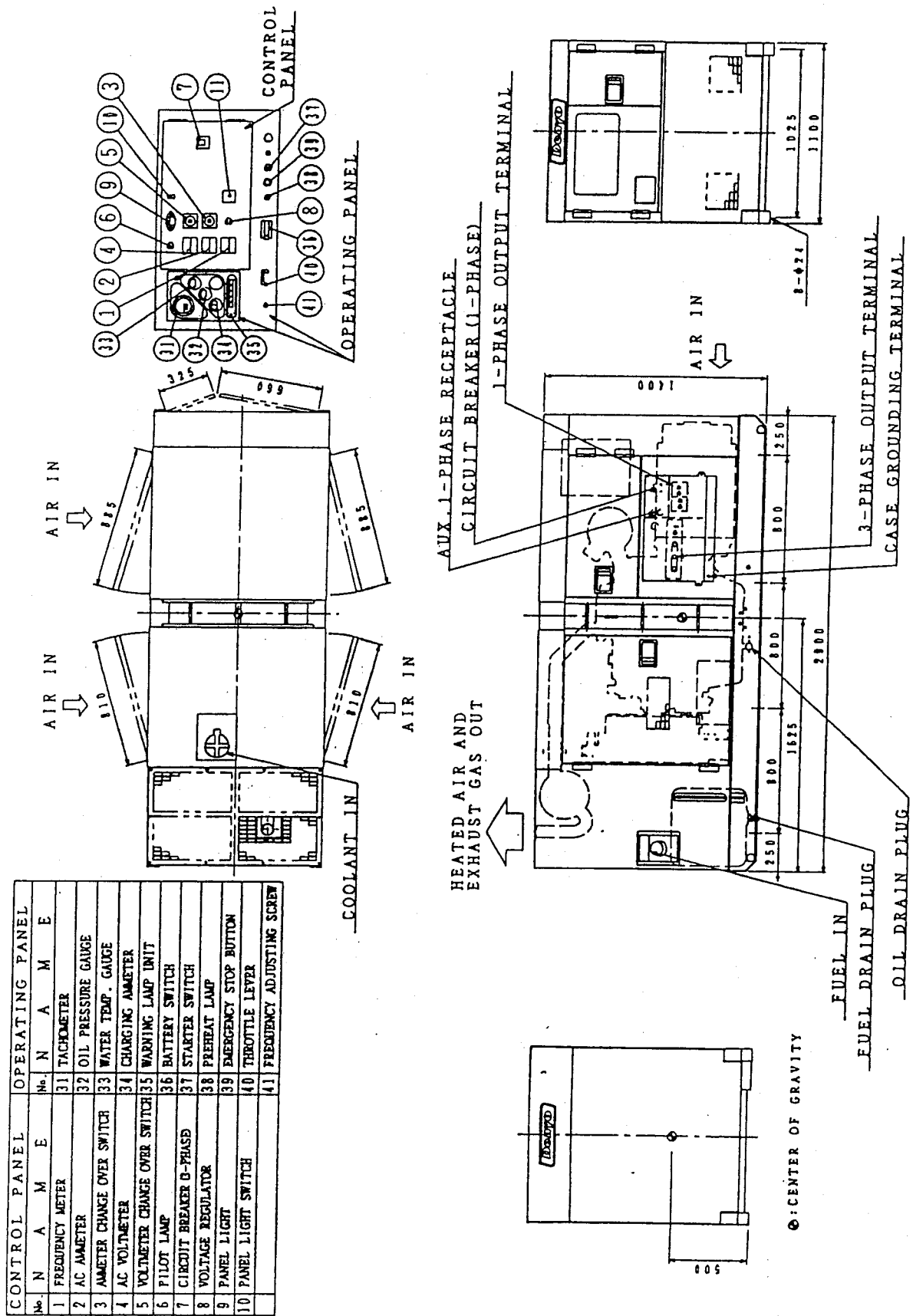
• 60SPH







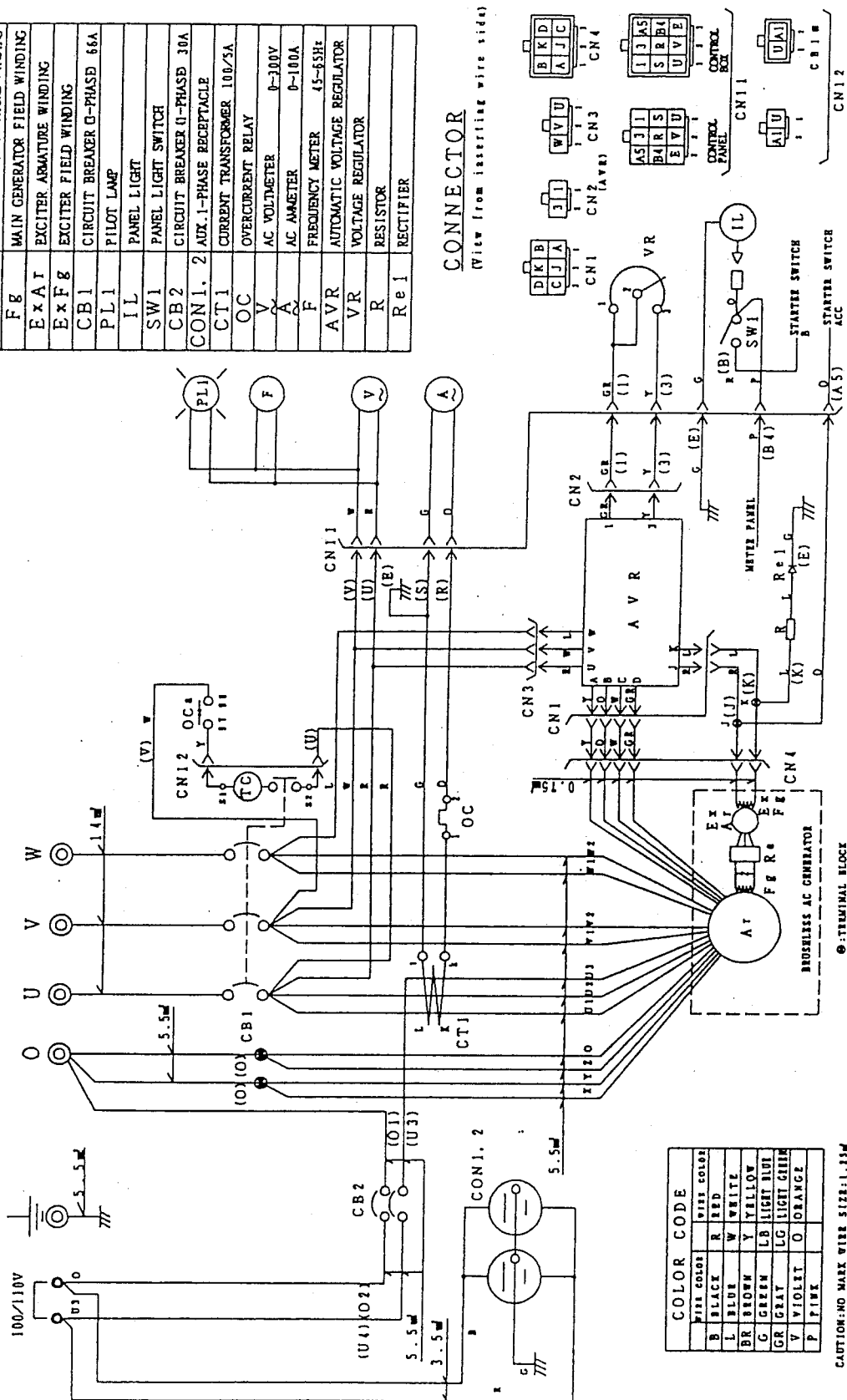
• 90SPH



11-4 Generator connection diagram

25SPI-C

MARK	NAME
A T	MAIN GENERATOR ARMATURE WINDING
F B	MAIN GENERATOR FIELD WINDING
E x A T	EXCITER ARMATURE WINDING
E x F B	EXCITER FIELD WINDING
CB 1	CIRCUIT BREAKER G-PHASE 66A
PL 1	PILOT LAMP
IL	PANEL LIGHT
SW 1	PANEL LIGHT SWITCH
CB 2	CIRCUIT BREAKER I-PHASE 30A
CON 1, 2	AUX. 1-PHASE RECEPTACLE
CT 1	CURRENT TRANSFORMER 100/5A
OC	OVERCURRENT RELAY
V	AC VOLTMETER 0-300V
A	AC AMMETER 0-100A
F	FREQUENCY METER 45-65Hz
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR
R	RESISTOR
Re 1	RECTIFIER

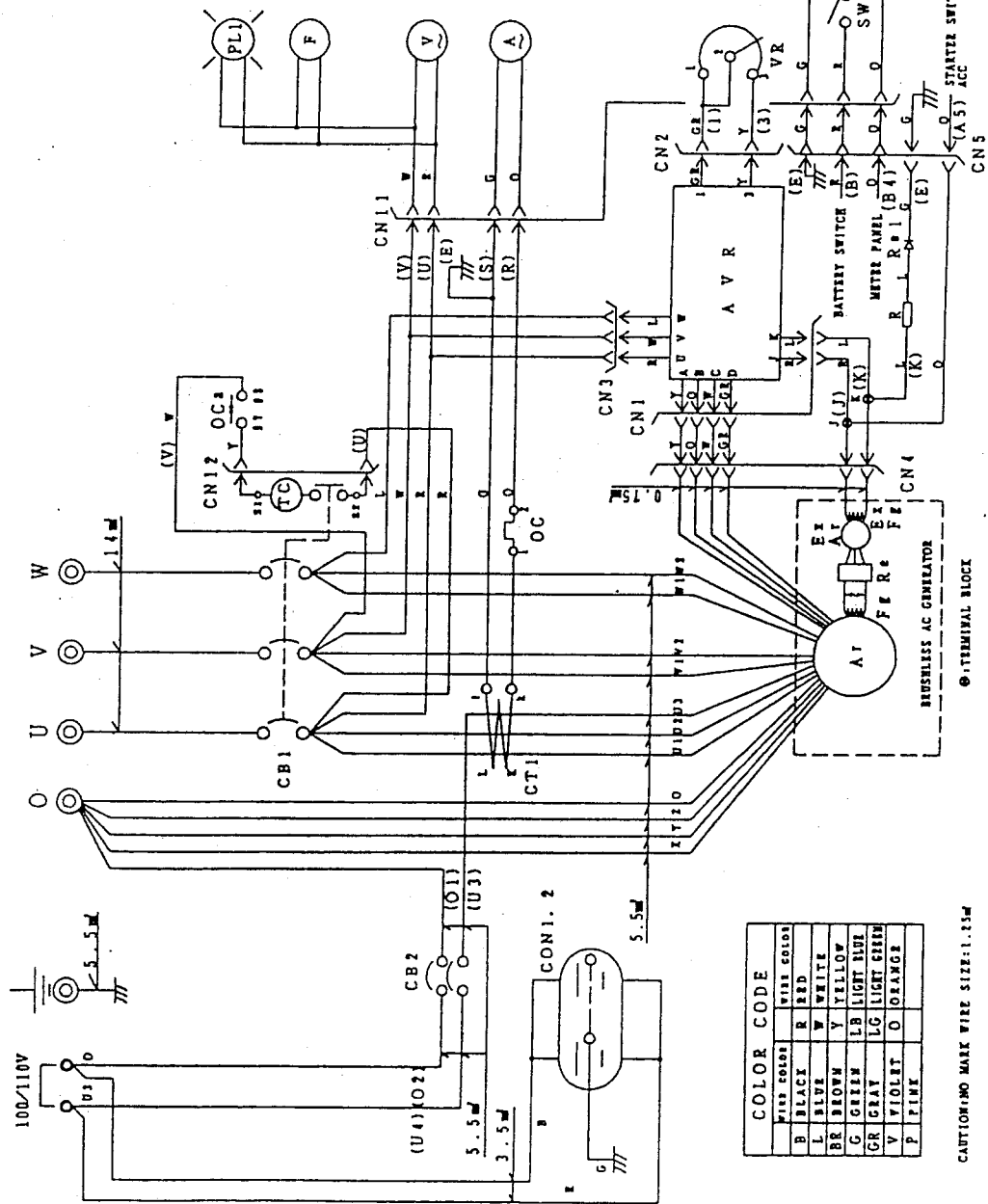


CONNECTOR

View from inserting wire side)

Wire color	Wire color
B BLACK	R RED
L BLUE	W WHITE
BR BROWN	Y YELLOW
G GREEN	LB LIGHT BLUE
GR GRAY	LG LIGHT GREEN
V VIOLET	O ORANGE
P PINK	

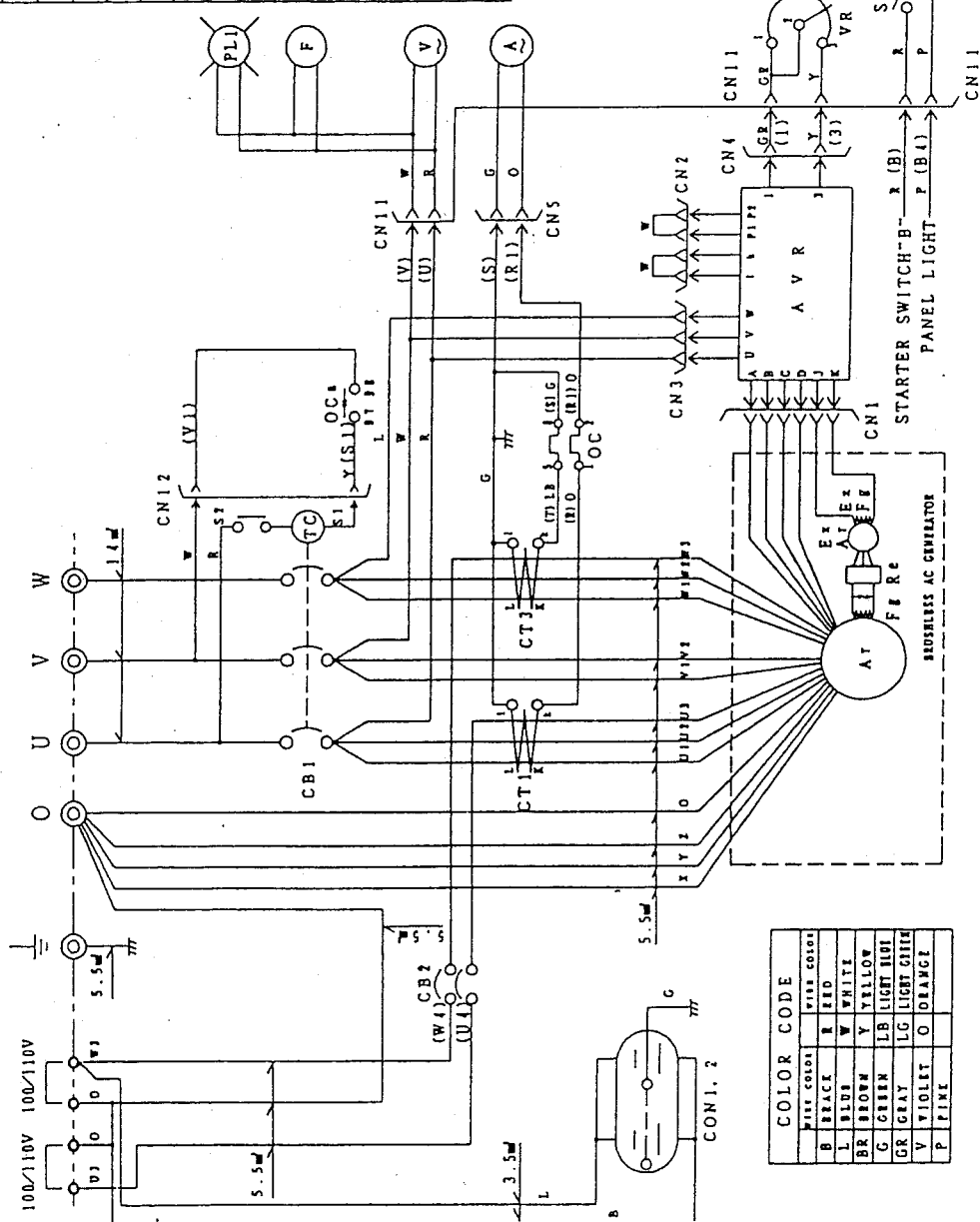
CAUTION: NO MARK WIRE SIZE: 1.15W



COLOR CODE	
WIRE COLOR	WIRE COLOR
B BLACK	R RED
L BLUE	W WHITE
BR BROWN	Y YELLOW
G GREEN	LB LIGHT BLUE
GR GRAY	LG LIGHT GREEN
V VIOLET	O ORANGE
P PINK	

CAUTION, NO MARK WIRE SIZE: 1.25mm

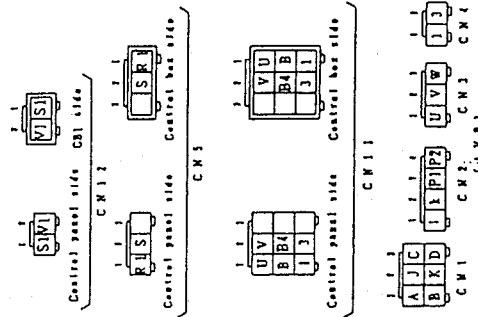
MARK	NAME
AT	MAIN GENERATOR ARMATURE WINDING
Fg	MAIN GENERATOR FIELD WINDING
ExAr	EXCITER ARMATURE WINDING
ExFg	EXCITER FIELD WINDING
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR
Re	RECTIFIER
CT1, 3	CURRENT TRANSFORMER 150/5A
A	AC. AMMETER 0~150A
V	AC. VOLTMETER 0~300V
F	FREQUENCY METER 45~55Hz
PL1	PILOT LAMP
CB1	CIRCUIT BREAKER (3-PHASE) 100A
CB2	CIRCUIT BREAKER (1 PHASE) 40A
CON1, 2	AUX. 1-PHASE RECEPTACLE
SW1	PANEL LIGHT SWITCH
OC	OVER CURRENT RELAY



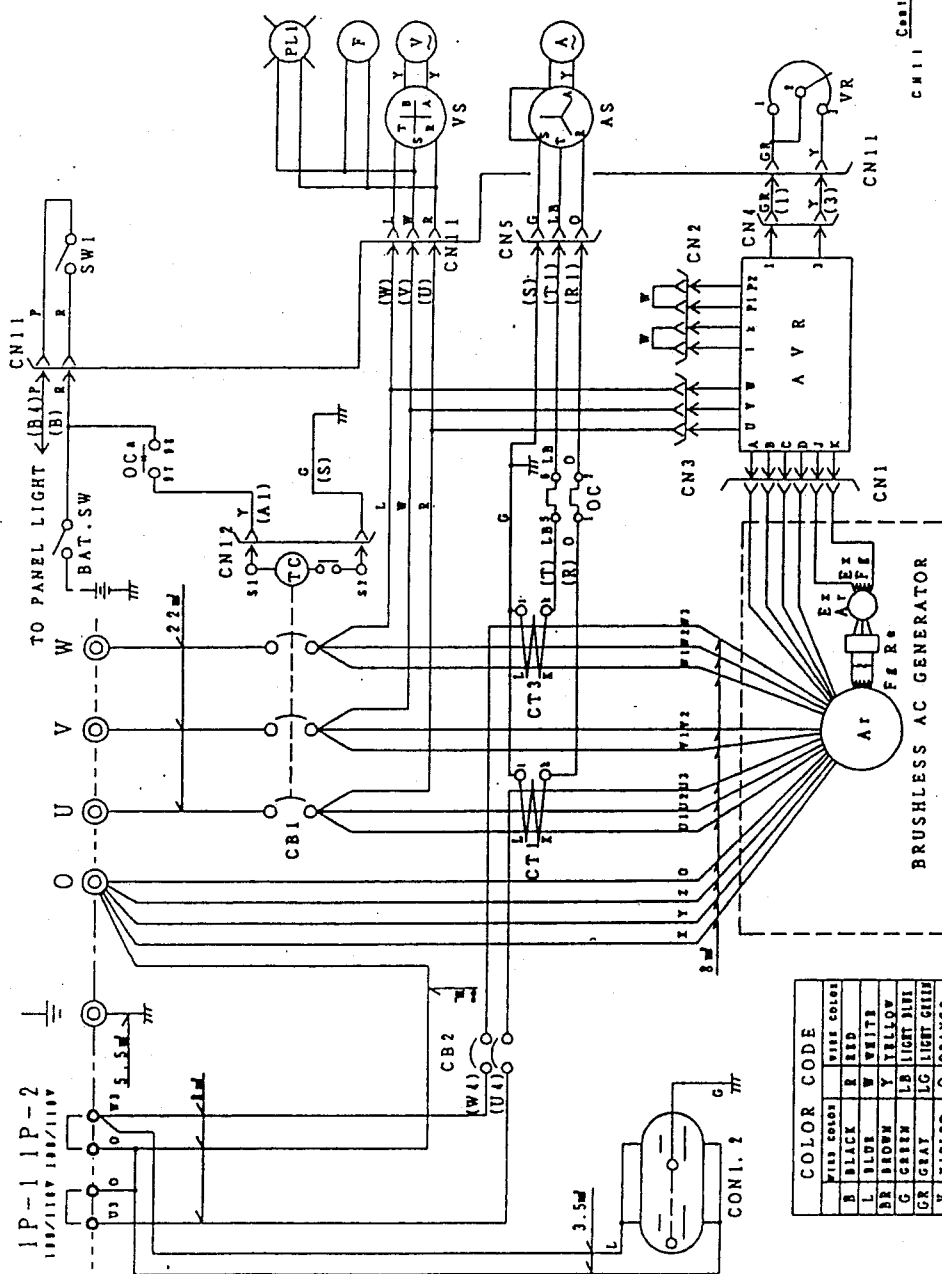
WIRE COLOR	WIRE COLOR
B BLACK	R RED
L BLUE	W WHITE
BR BROWN	Y YELLOW
G GREEN	LB LIGHT BLUE
GR GRAY	LG LIGHT GREEN
V VIOLET	O ORANGE
P PINK	

CAUTION: NO MARK WIRE SIZE: 1.25

CONNECTOR (View from inserting wire side)

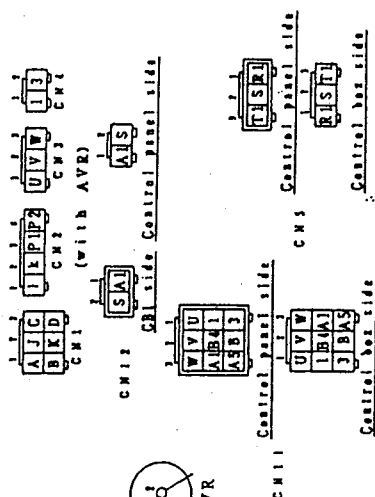


MARK	N	A	M	E
Ar				MAIN GENERATOR ARMATURE WINDING
Ff				MAIN GENERATOR FIELD WINDING
ExAr				EXCITER ARMATURE WINDING
ExFf				EXCITER FIELD WINDING
AVR				AUTOMATIC VOLTAGE REGULATOR
VR				VOLTAGE REGULATOR
Rr				RECTIFIER
CTL. 3				CURRENT TRANSFORMER 150/5A
AS				AMMETER CHANGE OVER SWITCH
A				AC. AMMETER 0~150A
V				AC. VOLT-METER 0~300V
F				FREQUENCY METER 45~65Hz
PLI				PILOT LAMP
CB1				CIRCUIT BREAKER (3-PHASE) 125A
CB2				CIRCUIT BREAKER (1 PHASE) 50A
CONI. 2				AUX. 1-PHASE RECEPTACLE 15A
VS				VOLTMETER CHANGE OVER SWITCH
SW1				PANEL LIGHT SWITCH
OC				OVERCURRENT RELAY



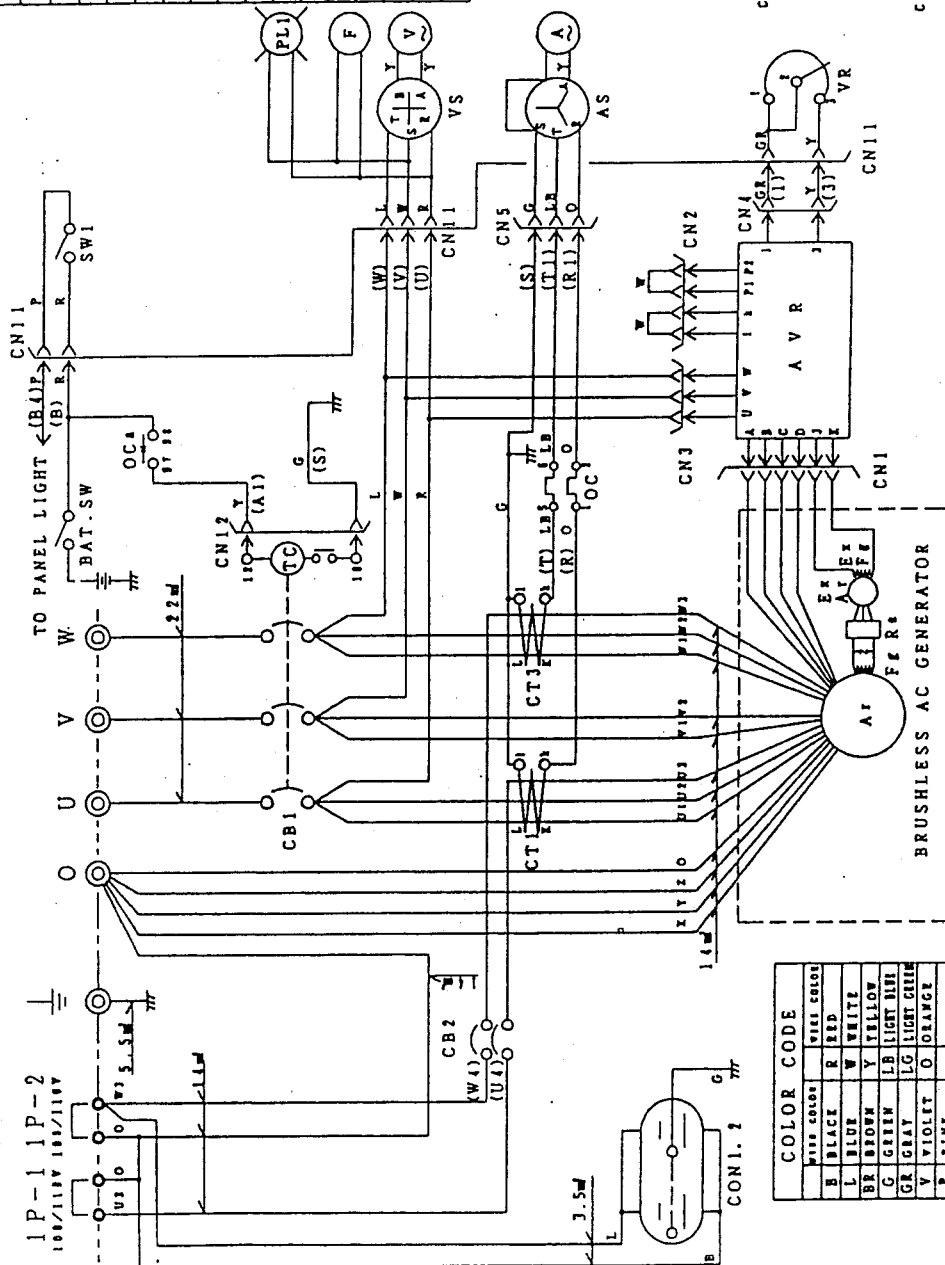
WIRE COLOR	WIRE COLOR
B BLACK	R RED
L BLUE	W WHITE
BR BROWN	Y YELLOW
G GREEN	LB LIGHT BLUE
GR GRAY	LG LIGHT GREEN
V VIOLET	O ORANGE
P PINK	

CAUTION: NO MARK WIRE SIZE: 1.15mm



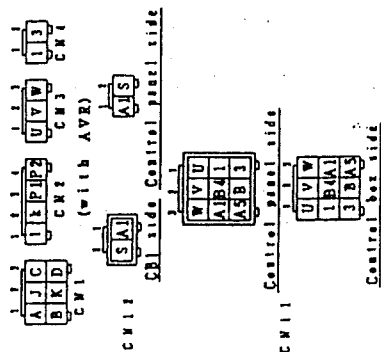
CONNECTOR (View from inserting wire side)

MARK	N	A	M	E
Ar				MAIN GENERATOR ARMATURE WINDING
Fe				MAIN GENERATOR FIELD WINDING
ExAr				EXCITER ARMATURE WINDING
ExFe				EXCITER FIELD WINDING
AVR				AUTOMATIC VOLTAGE REGULATOR
VR				VOLTAGE REGULATOR
Re				RECTIFIER
CT1.3				CURRENT TRANSFORMER 200/5A
AS				AMMETER CHANGE OVER SWITCH
A				AC AMMETER 0~200A
V				AC VOLT METER 0~300V
F				FREQUENCY METER 45~65Hz
PL1				PILOT LAMP
CB1				CIRCUIT BREAKER (3-PHASE) 150A
CB2				CIRCUIT BREAKER (1 PHASE) 15A
CON1.2				AUX. 1-PHASE RECEPTACLE 15A
VS				VOLTMETER CHANGE OVER SWITCH
SW1				PANEL LIGHT SWITCH
OC				OVERCURRENT RELAY

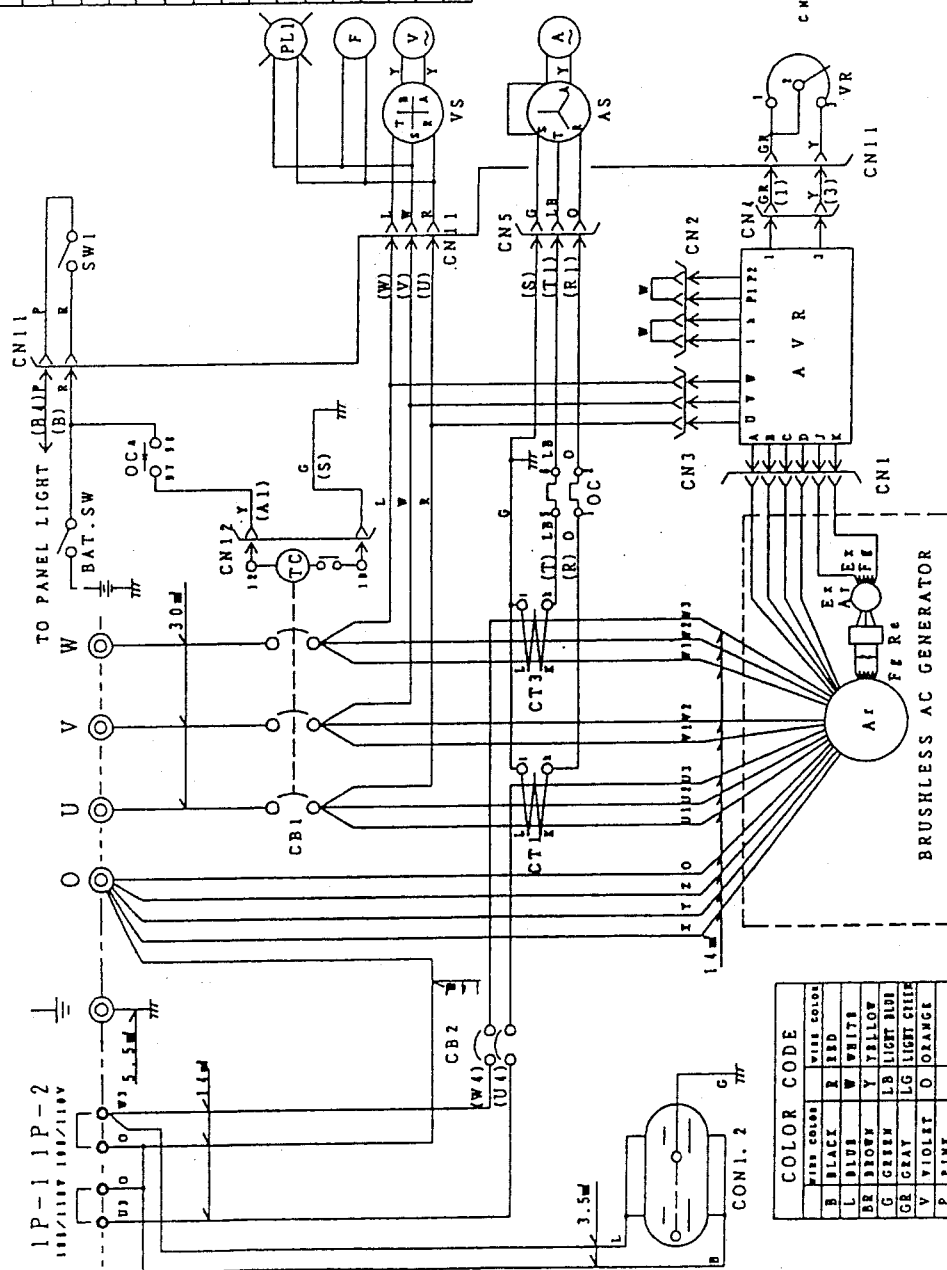


WIRE COLOR	WIRE COLOR
B BLACK	R RED
L BLUE	W WHITE
BR BROWN	Y YELLOW
G GREEN	LB LIGHT BLUE
GR GRAY	LG LIGHT GREEN
V VIOLET	O ORANGE
P PINK	

CAUTION: NO MARK WIRE SIZE: 1.354

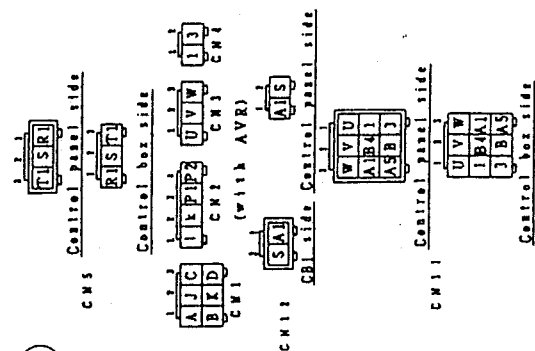


CONNECTOR (View from inserting wire side)



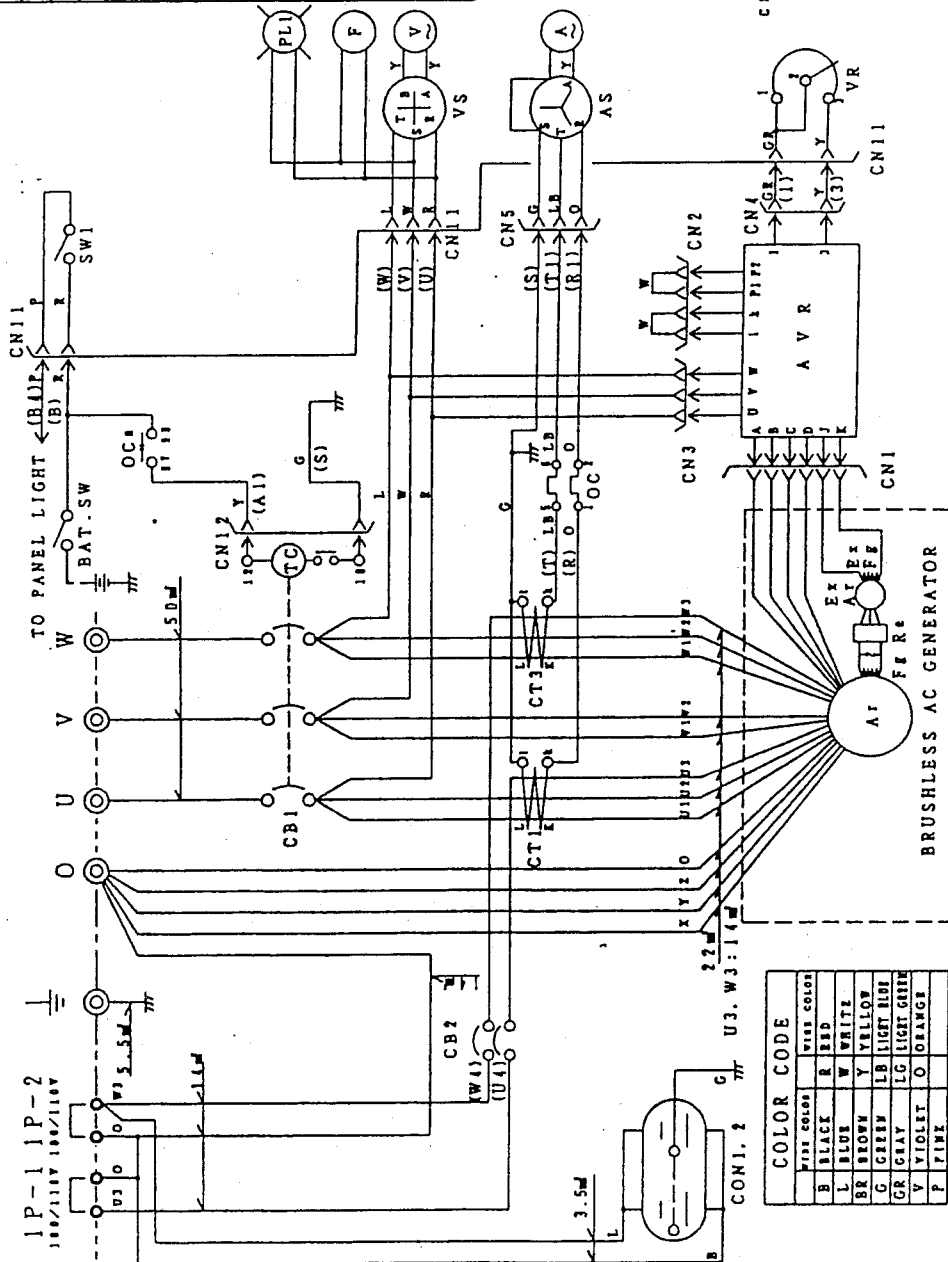
COLOR CODE		
WINE COLOR		WINE COLOR
B BLACK		R RED
L BLUE		W WHITE
BR BROWN		Y YELLOW
G GREEN		LB LIGHT BLUE
GR GRAY		LG LIGHT GREEN
V VIOLET		O ORANGE
P PINK		

CAUTION:NO MARK WIRE SIZE:1-15J



CONNECTOR (view from inserting wire side)

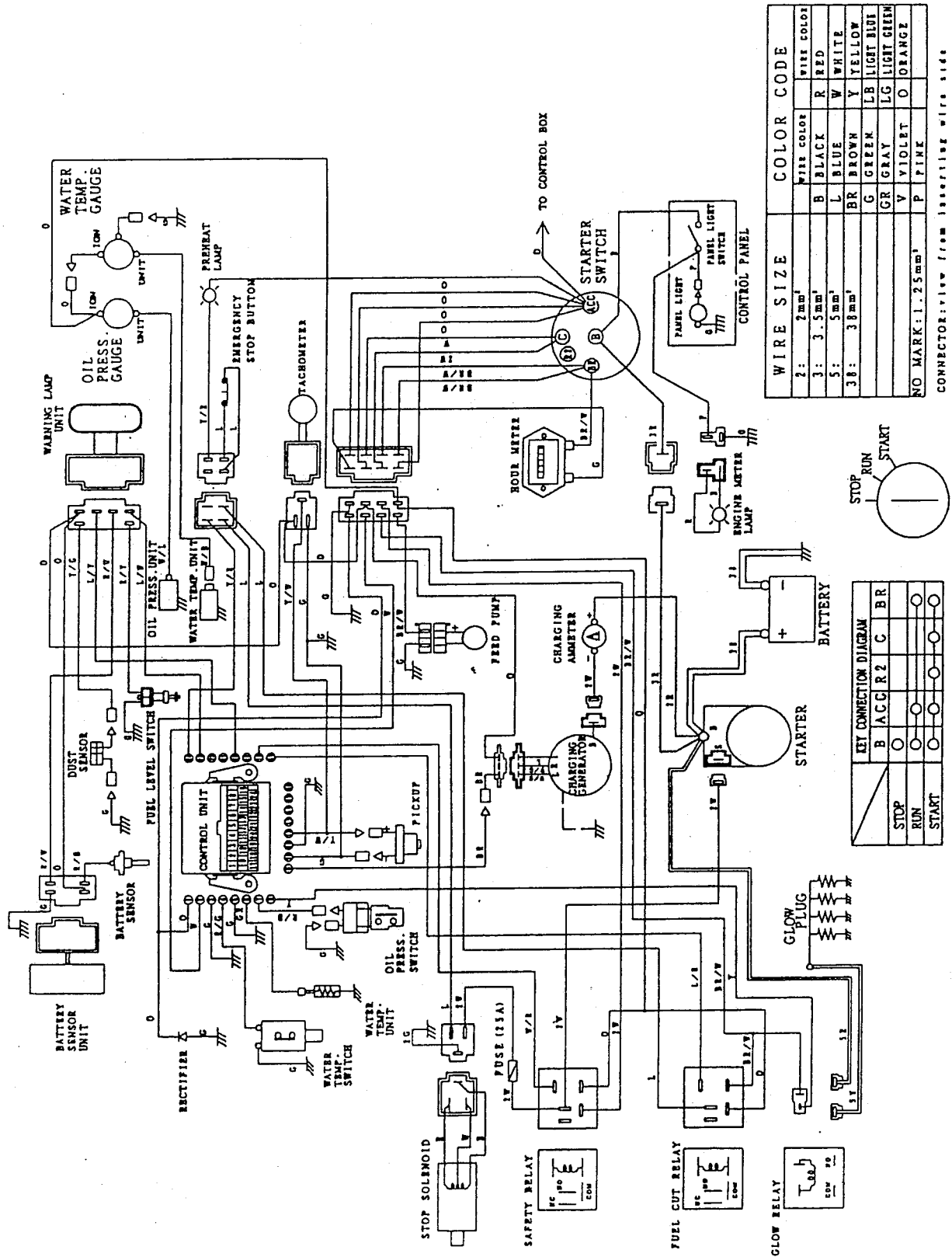
MARK	N	A	M	B
AT				MAIN GENERATOR ARMATURE WINDING
FE				MAIN GENERATOR FIELD WINDING
EA				EXCITER ARMATURE WINDING
EFF				EXCITER FIELD WINDING
AVR				AUTOMATIC VOLTAGE REGULATOR
VR				VOLTAGE REGULATOR
Re				RECTIFIER
CT1, 3				CURRENT TRANSFORMER 300/5A
AS				AMMETER CHANGE OVER SWITCH
A				AC AMMETER 0-300A
V				AC VOLT METER 0-300V
F				FREQUENCY METER 45-65Hz
PL1				PILOT LAMP
CB1				CIRCUIT BREAKER (3-PHASE) 235A
CB2				CIRCUIT BREAKER (1 PHASE) 100A
CON1, 2				AUX. 1-PHASE RECEPTACLE 15A
VS				VOLTMETER CHANGE OVER SWITCH
SW1				PANEL LIGHT SWITCH
OC				OVERCURRENT RELAY

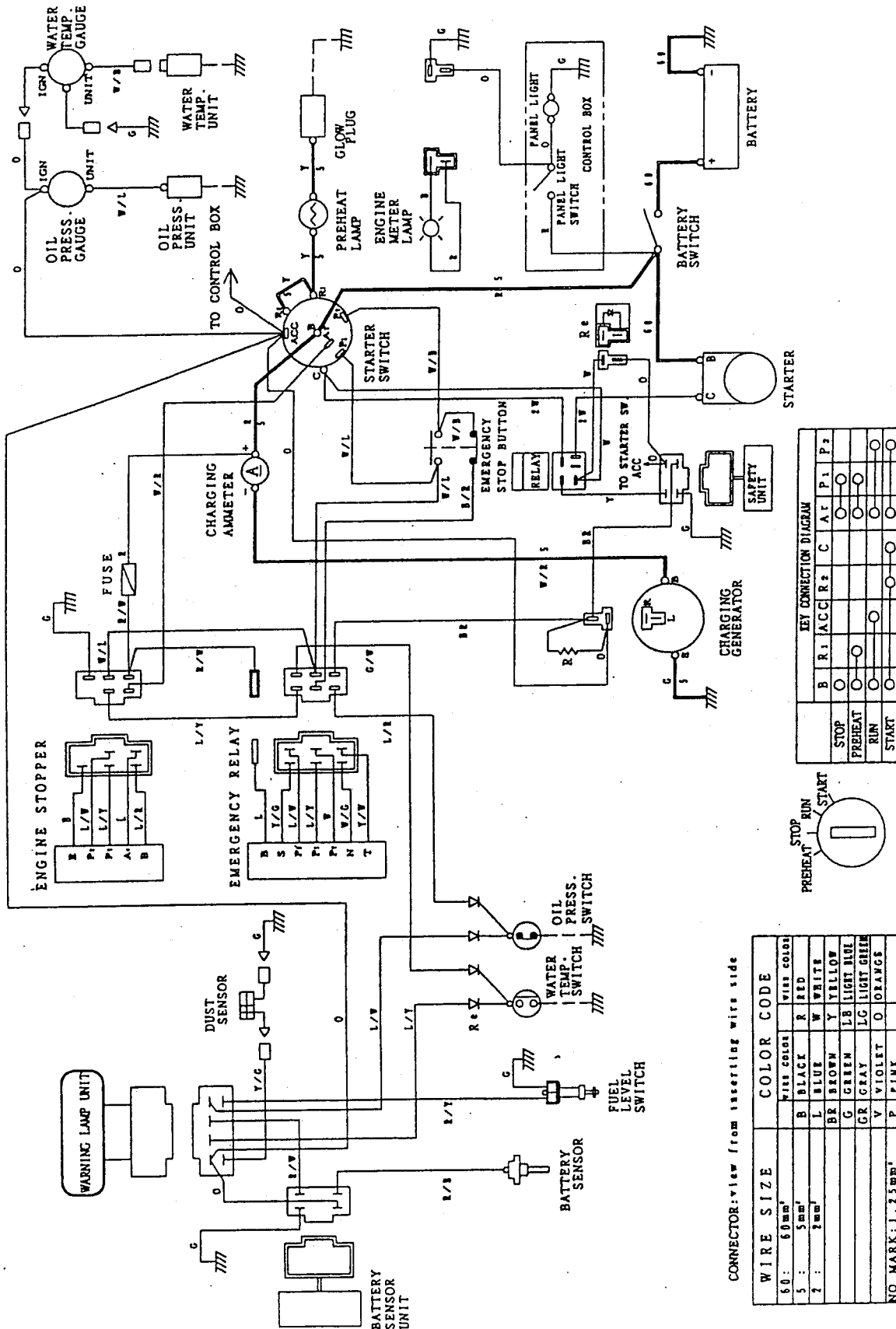


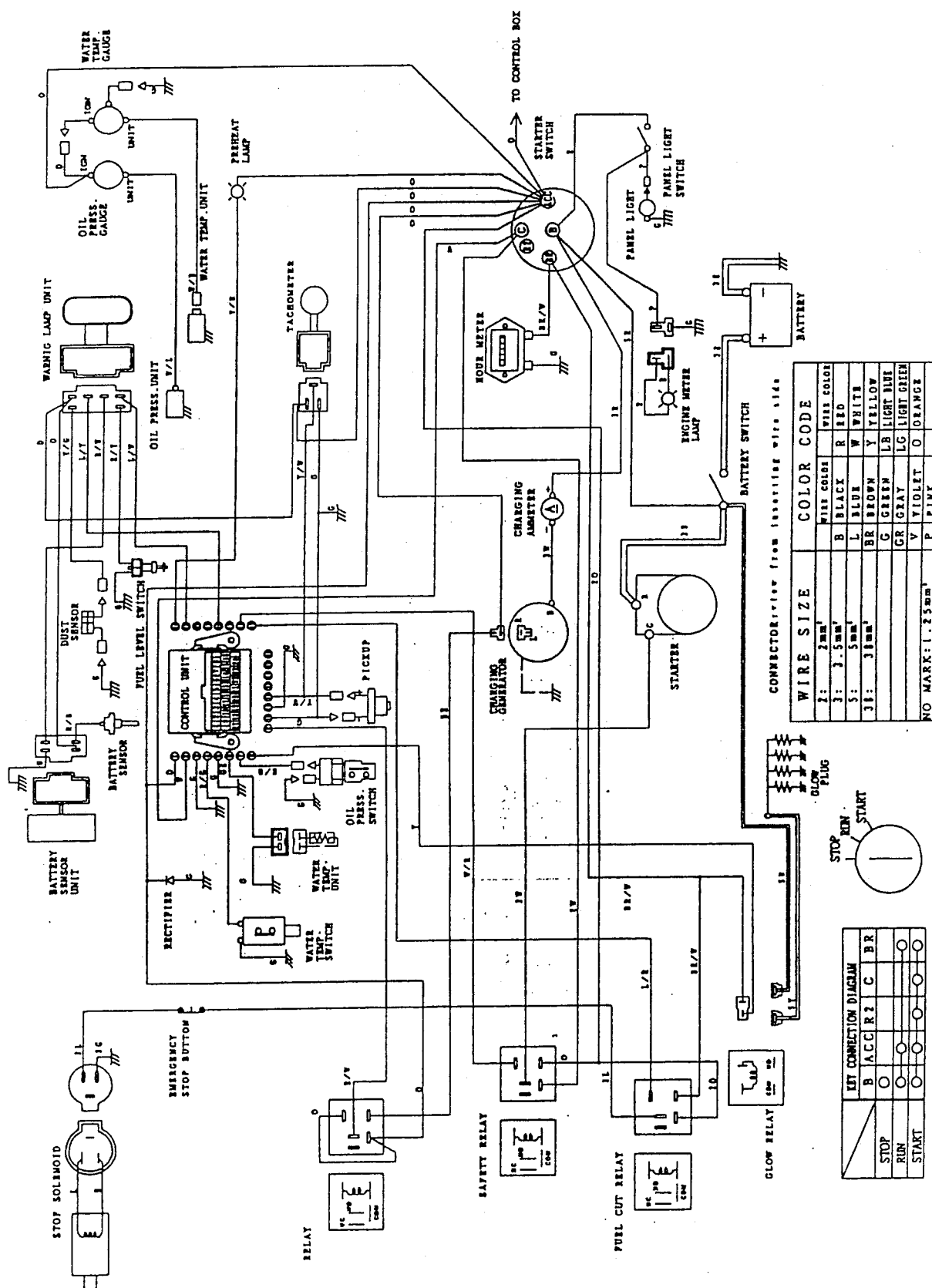
CONNECTOR (view from inserting wire side)

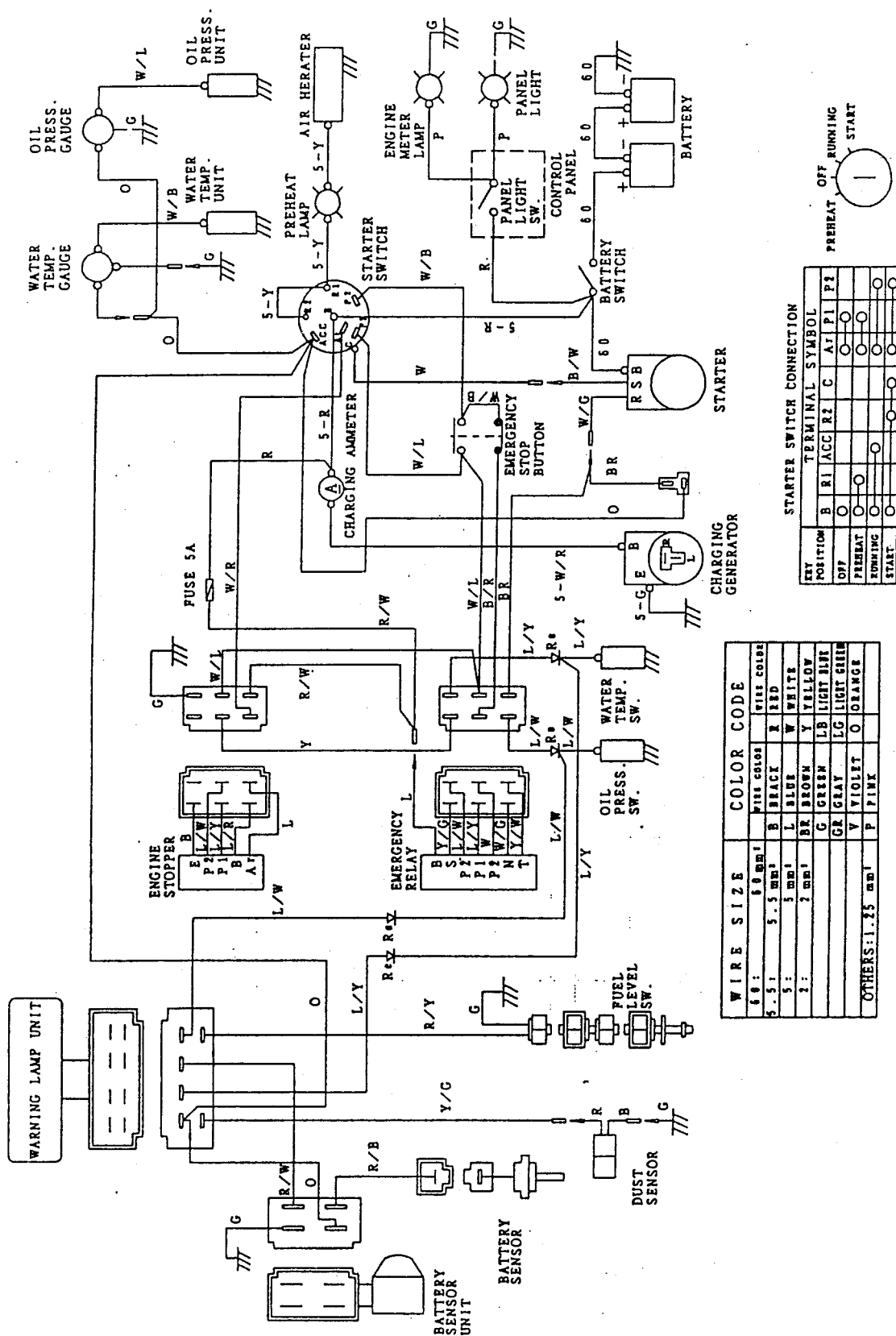
11-5 Engine wiring diagram

• 25SPI-C

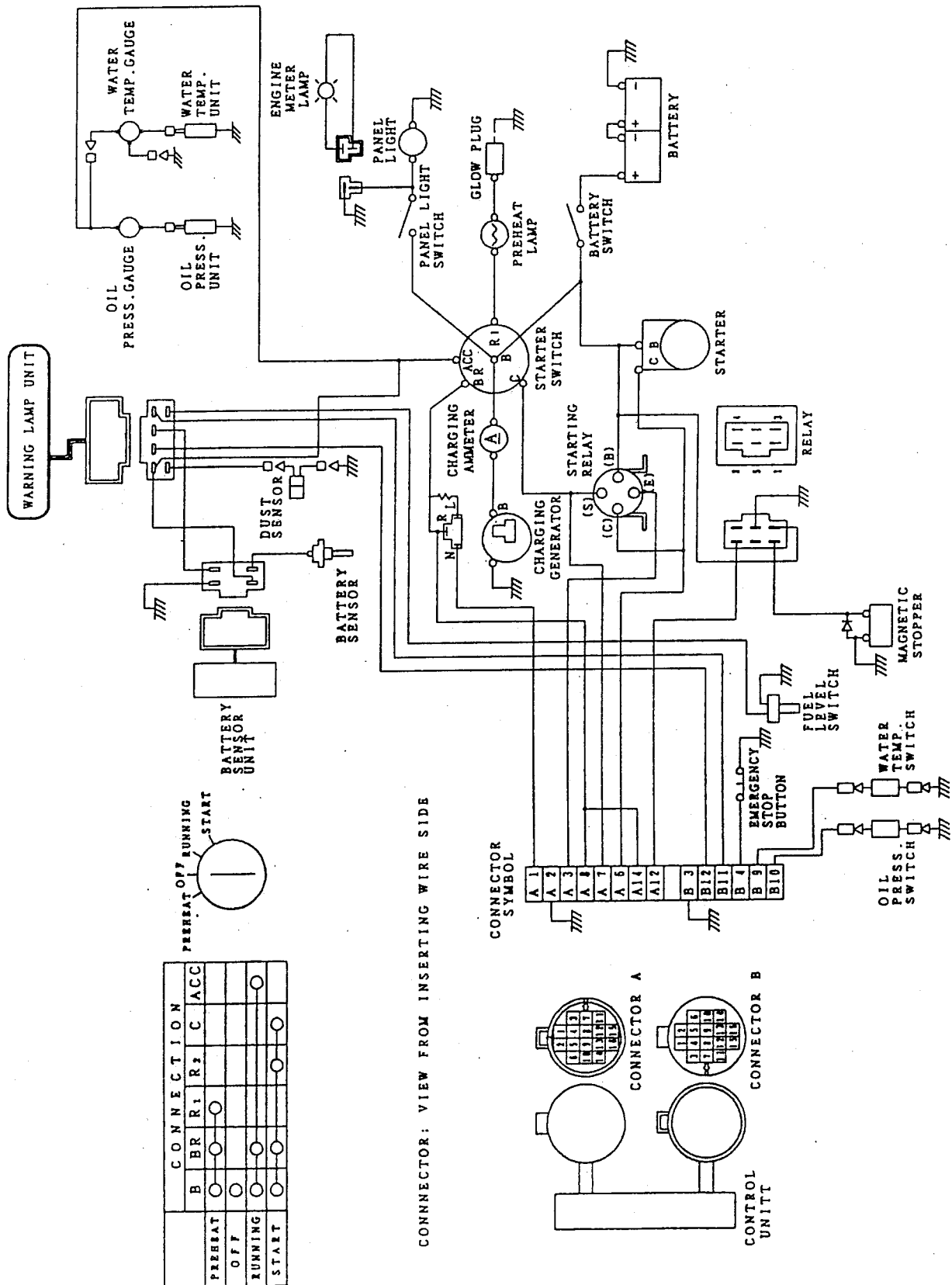


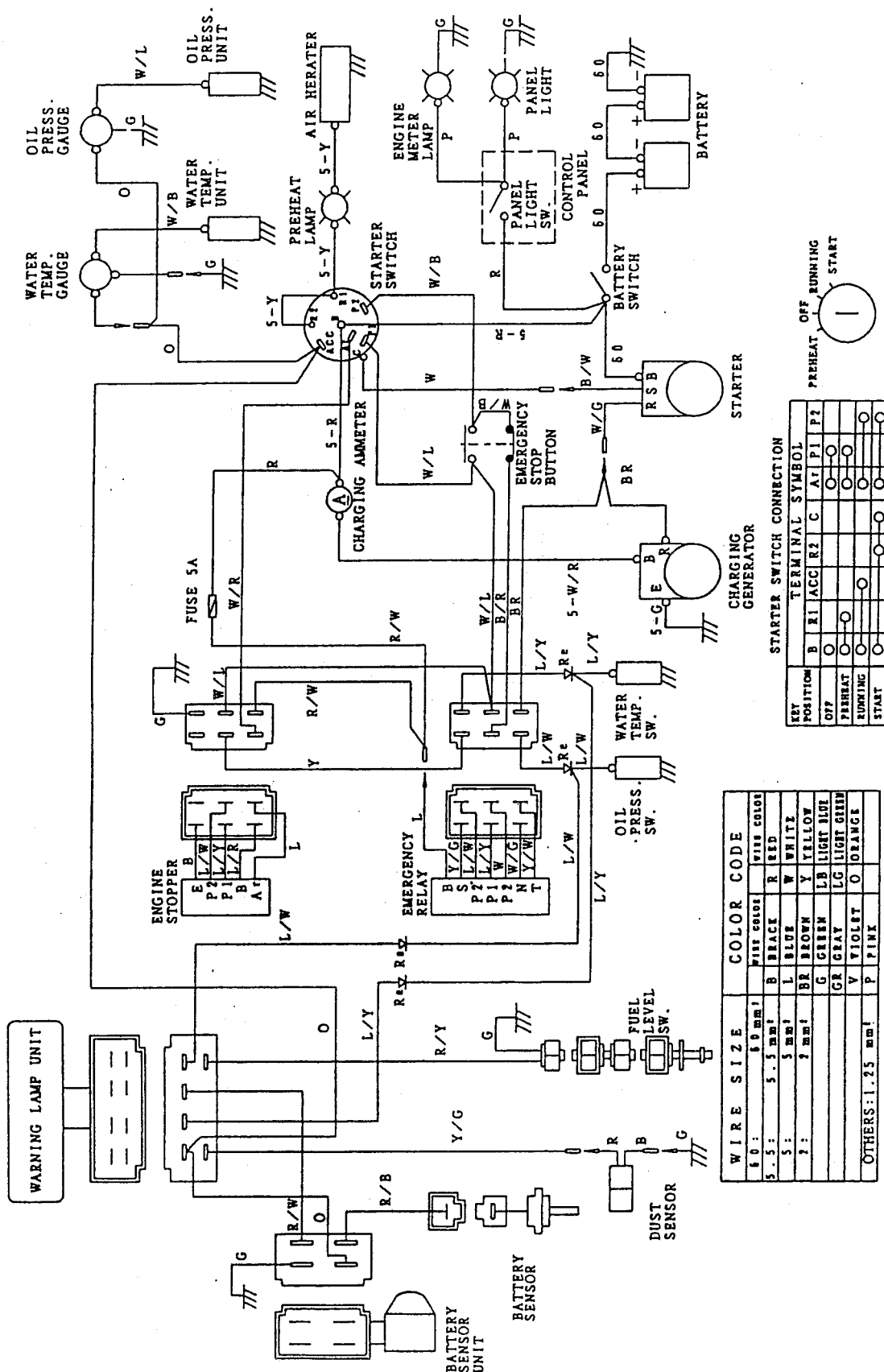


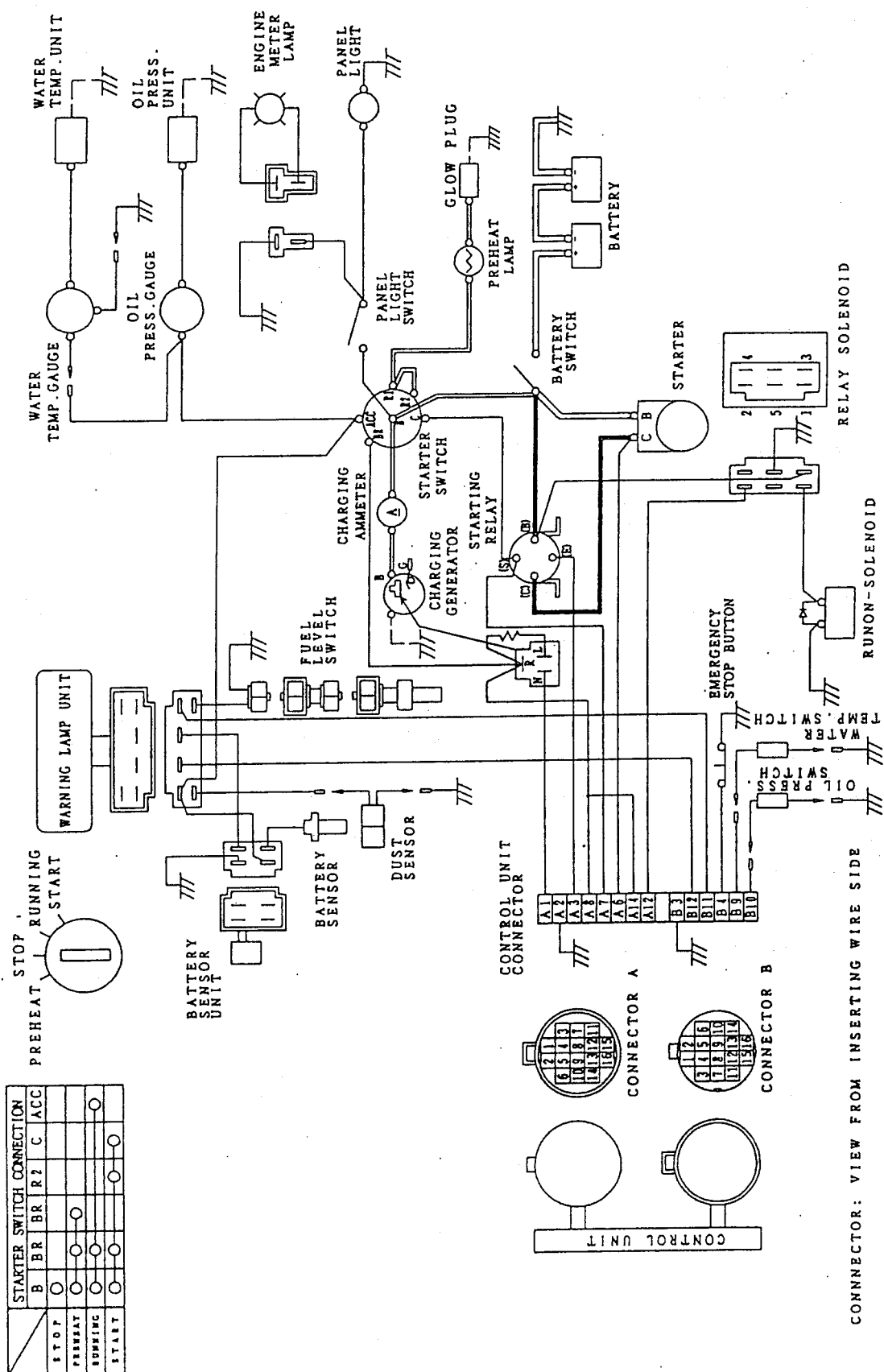




CONNECTOR : view from inserting wire side
R₀ : RECTIFIRE







12. Options instruction manual

If equipment the option device to the machine after the purchase is required, contact distributor or our office.

If the machine is modified on your own, the warranty of manufacturer will become invalid.

12-1 AUTOMATIC OILER

(1) Applicable models

DCA-SP SERIES (Except 25SPI-C)

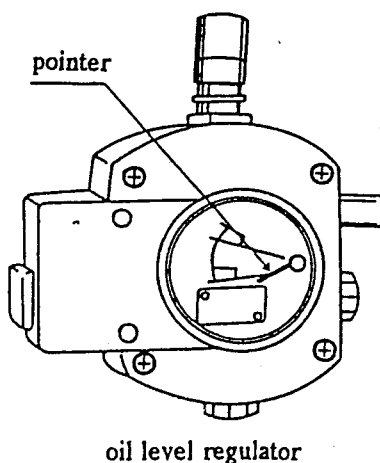
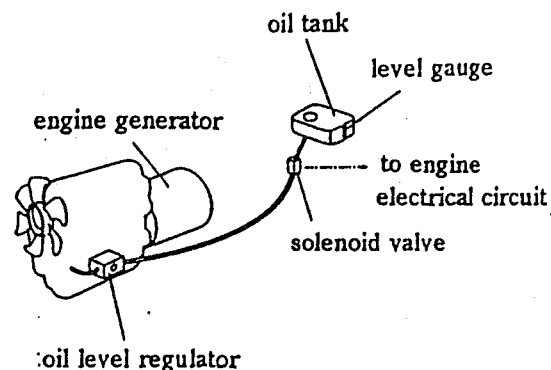
(2) Description of the device

This device is designed to maintain the engine oil consumed during operation at a proper level.

(3) System of the device

- ① This device uses an oil level regulator. This regulator is normally installed on the side of the oil pan. The oil level is controlled by the solenoid valve (valve) and float on the communicating tube.
- ② If oil is consumed and oil level is low, valve opens and supply the oil from oil tank.
- ③ When the machine stops, the oil is not supplied by the valve on the communicating tube. When the machine is running, the valve opens and lubrication is possible.
- ④ The oil level regulator is provided with the pointer, to check the change of oil level in the oil pan.

(Connection of the oiler)



(4) Handling of the device

- ① Supply the oil to the oil tank.
- ② Check the oil level by the oil level gauge of the oil tank as daily checking and supply the oil before oil tank is empty.
- ③ Check the oil level in the oil pan by the dipstick once a week, although this device is equipped. 「 See 5-1 (1) Checking on engine oil p.32 」
- ④ Replacement time and replacement procedure of oil is same as the machine does not equip this device. 「 See 8-2 (1) Replacement of engine oil p.52 」

(5) Precaution in the handling of the device

- ① Oil uses same as in the oil pan.
- ② Install the machine, its inclination is held within 3 degrees.
- ③ Do not change the location of the oil level regulator. Because the oil level in the oil pan is set by the location of the oil level regulator.
- ④ If the piping system is clogged with dust, clean the oil tank drain and piping.

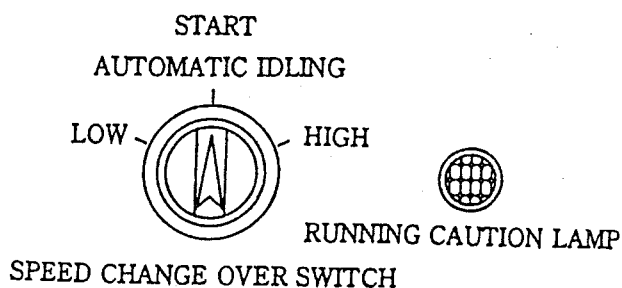
12-2 AUTOMATIC IDLING DEVICE

(1) Applicable models

DCA-SP SERIES (35kVA or larger)

(2) Description of the device

This device is designed to provide for automatic idling of the engine for its warming-up after startup.



(3) Handling of the device

■ For automatic operation

- ① Make preparations for operation according to 「 5-1 Checking prior to operation See p.31 」 .
- ② Turn the speed change over switch on the control panel to the "AUTOMATIC IDLING" position.
- ③ Set the frequency adjusting screw at the desired speed position.
- ④ Be sure to turn the starter and battery switches to the "OFF" position.

Start up the engine according to 「 5-2 Start up See p.37 」 .

When the engine starts up, it automatically idles at a low speed with the lighting up of the "RUNNING CAUTION" lamp.

In about 1 minute, the engine automatically changes from low speed idling to high speed operation at the speed preset with frequency adjusting screw.

- ⑤ If the idling speed is not correct, rectify it according to the following table.

	Frequency (Idling speed)	
Operation at 50Hz	52.5Hz	(1575rpm)
Operation at 60Hz	62.5Hz	(1875rpm)

■ Keeping low-speed operation

Change the speed change over switch on the control panel over to the "LOW" position.

- ① If the above change over is made before startup of the engine, its low-speed operation performed after its startup will continue even after the passage of the idling time until the speed change over switches turned to the "AUTOMATIC IDLING" position.
- ② If this switch change over is made during the operation, the engine will immediately change over to low-speed operation.

■ When low-speed operation is not required

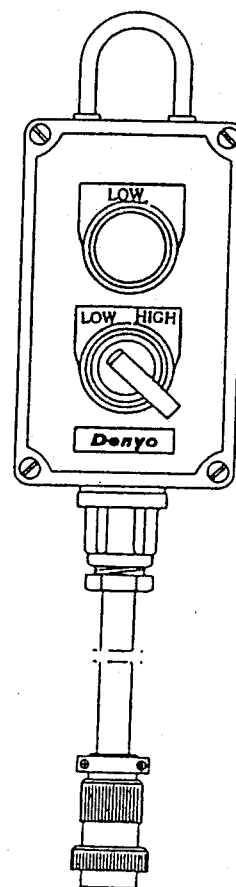
Turn the speed change over switch on the control panel to the "HIGH" position.

This causes the automatic idling device to be inoperative, allowing the engine to always run at a speed set by the frequency adjusting screw.

■ For operation by remote control

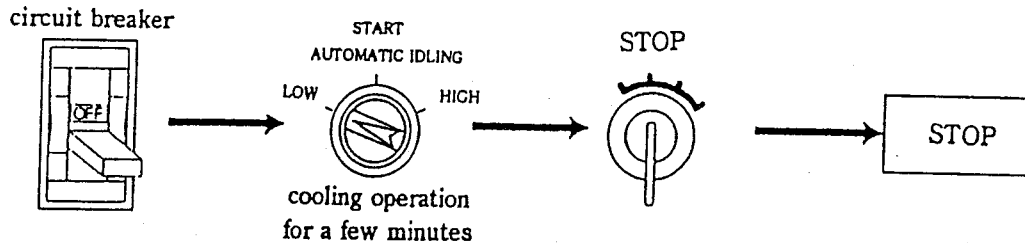
- ① Connect the remote control device to the remote control receptacle on the output terminal block and turn the speed change over switch to the "AUTOMATIC IDLING" position.
- ② When the selector switch on the remote control device is turned to the "LOW" side, the engine immediately change over to low-speed operation with the lighting-up of the "LOW" lamp on remote control device and the "RUNNING CAUTION LAMP" the control panel. If the selector switch is turned to the "HIGH" side, the engine immediately change over to high-speed operation with the lighting-out of the "LOW" lamp on the remote control device.
- ③ When the speed change over switch in the control panel has been set at the "LOW" position, even if the remote control device gives a command that the engine change over to high-speed operation, the engine speed will not change in accordance with the command from the remote control device.

Such a command from the control device can only be executed when the change over switch in the control panel has been set at the "AUTOMATIC IDLING" position.



■ Shutdown

- ① Turn OFF the circuit breaker of the load side and the machine side.
- ② Turn the speed change over switch to "LOW" position and put the machine in cooling operation for a few minutes before turn the starter switch to "OFF" position.
- ③ For emergency stop, keep pushing the "EMERGENCY STOP" button until the engine stops.



■ Precautions during operation

- ① Do not change the speed change over switch in the control panel and selector switch on the remote control device over to the "LOW" side during operation of the load. In addition, do not start up the engine with the generator and load side breakers set up in the "ON" position.

While the engine is idling, it must be noted that the generator voltage and frequency are so low resulting in failure in operation of the load device or any other trouble. When the machine is under such a condition, the "RUNNING CAUTION" lamp stays lit to warn of this condition.

- ② During operation, do not turn off the battery switch not remove the battery.
- ③ When restart the engine after it is stopped by any operation other than turning the starter switch to "STOP" position (including use of "EMERGENCY STOP" button, activation of the emergency stop device, fuel shortage and engine failure), turn the starter switch to the "STOP" position or the battery switch to the "OFF" position before taking the ordinary startup procedure.

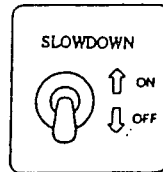
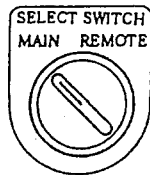
12-3 SLOWDOWN DEVICE

(1) Applicable models

DCA-SP SERIES (45kVA or larger)

(2) Description of the Device

This device is provided with the function for automatic idling of the engine, as the function of detecting whether the machine has been connected to or disconnected from the load, and changes from high speed operation to low speed idling when it has been disconnected from the load. In addition, the device, when connected with the startup remote control device (optionally available), allows the "START-STOP" of the engine and "ON-OFF" of slowdown to be operated by remote control.



IDLING LAMP



IDLING CANCEL BUTTON



(3) Handling of the device

■ For operation on the machine side

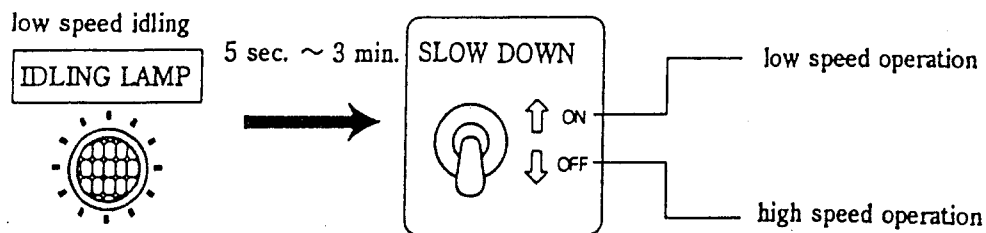
(without use of remote control device)

- ① Make preparations for operation according to 「 5-1 Checking prior to operation See p.32 」 .
- ② Turn the "MAIN-REMOTE" selector switch to the "MAIN" side.
- ③ Set the frequency adjusting screw to the desired speed position.

When the engine starts up, it automatically idles at a low speed with the lighting up the "IDLING LAMP" .

In five seconds to three minutes (according to the water temperature), the engine immediately changes from idling to high speed operation if the "SLOWDOWN" switch has been set the "OFF" position or continues its low speed operation if the "SLOWDOWN" switch is at the "ON" position.

Do not turn ON the load during engine idling. If load running is needed during engine idling by all means, push idling cancel button.

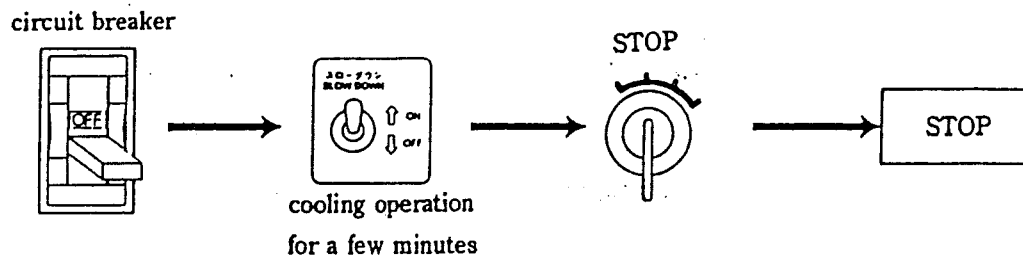


■ Slowdown Function

- ① When the "SLOWDOWN" switch is set at the "ON" position, the device automatically detects whether the engine has been connected to or disconnected from the load. Operation is changed from high speed operation to low speed idling, when the machine is disconnected from the load.
- ② During low speed operation, the voltage stands at a low level. When the load is turned ON, the device automatically detects it and changes the engine over to high speed operation in two or three seconds with the voltage returned to that rated.
- ③ If, during operation of the load, the load is turned off, the device automatically detects the absence of load and changes the engine over to low speed operation in about 10 seconds. (Load detection current :Approx. 1A)

■ Shutdown

- ① Turn OFF the circuit breaker of the load side and the machine side.
- ② Turn the "SLOW DOWN" switch to the ON position and put the machine in cooling operation for a few minutes, before turn the starter switch to OFF position.
- ③ For emergency stop, keep pushing the "EMERGENCY STOP" button until the engine stops.



(4) For operation by remote control device

⚠ CAUTION

- It may lead to death due to electric shock or catching, that start up the machine when someone touch the machine for inspection or maintenance, etc.

For startup by the remote control

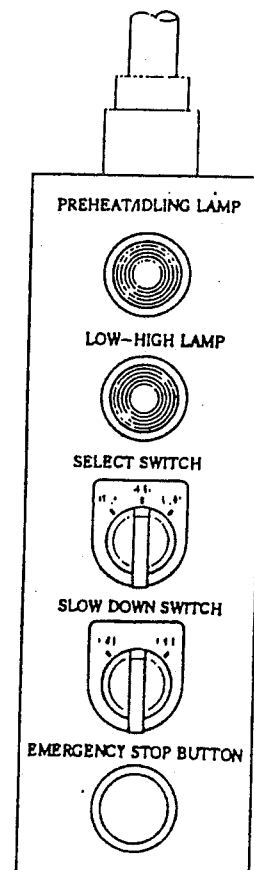
- * Be sure to lock the side door of the machine.
- * Tighten the fixing bolts of the control panel and output terminal cover.
- * Be sure to put up a sign "Startup by Remote Control" at the machine.

For maintenance or inspection

- * Set the starter switch and battery switch in the OFF position.

■ Connection of remote control device

- ① Make sure that the engine is at a stop and the switch on the remote control device set at the "STOP" position, before connect the remote control device to the receptacle for it on the output terminal block.
- ② Make preparations for operation according to 「 5-1 Checking prior to operation See p.31 」 .
- ③ Turn the "MAIN- REMOTE" selector switch on the engine control panel to the "REMOTE" position and set the starter switch in the "RUN" position.



■ Startup by remote control device

- ① Turn the remote control switch to the "START" position.
- ② This operation causes the engine is preheated with the "PREHEAT/IDLING" lamp goes on and off. In preheating the engine, the buzzer attached to the machine sounds to announce that the machine will be soon ready for startup.
- ③ After the engine is preheated for about 20 seconds, the engine starter operates to start up the engine.
- ④ When the engine starts up, the "PREHEAT/IDLING" lamp goes ON and the engine automatically idles at low speed.
- ⑤ After the idling for five seconds to three minutes (according to the engine cooling water temperature), "PREHEAT/IDLING" lamp goes OFF.

When the "SLOWDOWN" switch has been set the "OFF" position, the machine immediately changes from idling to high speed operation.

When the "SLOWDOWN" switch has been set the "ON" position, the device detects whether the machine has been connected to or disconnected from the load. If the machine is disconnected from the load, the machine continues low speed operation.

■ Slowdown by remote control device (ON—OFF)

If the "SLOW DOWN" switch on the remote control device is set in the "ON" position, the slowdown function becomes operative.

During the low—speed operation effected by this slowdown function, the "LOW—HIGH" lamp goes ON and OFF. This lamp stays on during the high speed operation.

■ Shutdown by remote control device

- ① Make sure that all of the loads are stopped and turn the breaker of machine to the "OFF" position.
- ② Turn the switch on the remote control device to the "STOP" position. This causes the "LOW—HIGH" lamp to go off and the "PREHEAT/IDLING" lamp to light up.

During the lighting—up of this lamp, the engine starts idling for cooling and stops in about 30 seconds.

It should be noted, however, that 45SPH, 60SPH and 90SPH are designed that the engine immediately stops when the remote control switch is turned to the "STOP" position. Therefore requiring the "SLOW DOWN" switch to be set in the "ON" position to cause the engine to idle for the specified time with "PREHEAT/IDLING" lamp goes on before turn the remote control switch to the "STOP" position.

- ③ For emergency stop, keep pushing the "EMERGENCY STOP" button until the engine stops.

■ Precautions during operation

- ① Do not operate the "MAIN-REMOTE" selector switch during operation. If the operation of this switch is necessary while the machine is running, pay attention to the following points:

For changing the switch from "MAIN" to "REMOTE"

- Make sure that the remote control switch is at the "RUN" position. This switch change with the remote control switch at the "STOP" position causes the engine to enter its stopping process.
- Make sure that the "SLOW DOWN" switch has been set at the desired position. For example, if the "MAIN-REMOTE" switch change is made during the low speed operation effected by the slowdown function, the engine immediately over to high speed operation when the "SLOWDOWN" switch on the switch changed side is at the "OFF" side.

- ② Note that the switches on the remote control device only function when the "MAIN-REMOTE" selector switch is in the "REMOTE" side and the starter switch is in the "RUN" side.
- ③ Shutdown by the starter switch is irrespective of the setting of the "MAIN-REMOTE" selector switch. However, when starting up the engine, be sure to set the selector switch in the "MAIN" side.
- ④ Do not turn OFF the battery switch while the machine is running. This may result not only in engine alternator or regulator failure, but also malfunction or failure of this device.
- ⑤ When the machine is connected to a motor as the load with an electromagnetic switch used as its starter, the device may fail to detect the connection of the load even if it is turned on with consequent failure to change the machine over to high speed operation.
In such cases, temporarily turn the "SLOWDOWN" switch to the "OFF" position to put the machine in high speed operation for startup of the motor before turning the "SLOWDOWN" switch to the "ON" position. When the load is turned off, the device automatically detects that the machine has been disconnected from the load, changing the machine over to low speed operation.
- ⑥ Note that, even during the slowdown (low speed operation) of the machine, the output voltage is present.

12-4 DOUBLE VOLTAGE

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch the circuit inside the machine during operation to prevent decrease due to electric shock.

- * When open the control panel or the like for changing the output voltage, turn OFF the breaker and stop the machine in advance.



(1) Applicable models

DCA-SP SERIES

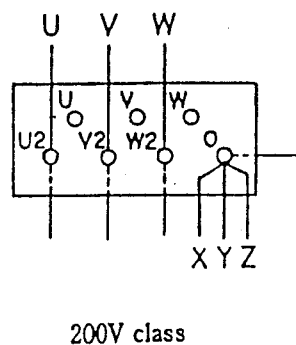
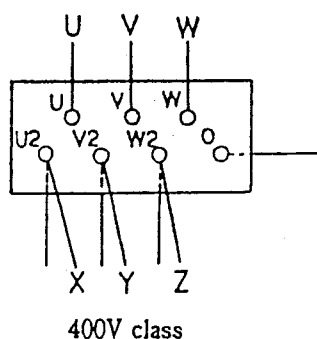
(2) Description

The machine is designed with double voltage specification, which allows the output voltage of 200 V class or 400 V class to be selected with the voltage change over cables.

(3) Method for selecting output voltage

The machine is shipped from the plant with its output voltage normally set at 200/220V unless otherwise specified.

Therefore, select the output the voltage required for work in accordance with the procedure described following :



① In the case of 25SPI-C and 25SPI II , the voltage change over panel is located on the front of the control box and open the control panel first.

In the case of 35SPI, 45SPI, 45SPH, 60SPI, 60SPH, 75SPI and 90SPH, the voltage change over panel is located on the right door of the rear side, and remove the protecting cover first.

② Select the desired output voltage by connecting the change over cables as shown in the figure in the previous page.

③ As the final step, close the control panel on the control box, close the control panel or mount the protecting cover and close the right door of the rear side.

[Note] Improper connection of the change over cables, it may result in burning of the generator.

In changing the output voltage, tighten the locking nuts securely. Note that insecure tightening of the nuts may result in burning.

Close the control panel or mount the protecting cover to prevent the hazard during operation.

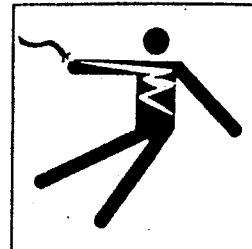
12-5 EARTH LEAKAGE RELAY

⚠ WARNING

ELECTRIC SHOCK by leak can kill.

- Improper grounding may lead to death due to electric shock. Because the device for leakage protection does not operate effectively.

* Grounding terminal for the earth leakage relay, case grounding terminal and case of the load are grounded.



(1) Applicable models

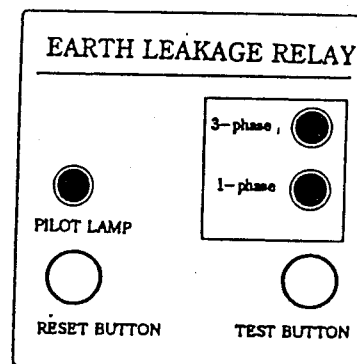
DCA-SP SERIES

(2) Description of the device

The machine is provided with an earth leakage relay to detect any leakage produced due to such trouble as insulation failure of the load during operation and to cut off the circuit for protection against any accident such as electrocution resulting from the trouble.

This relay detects any leakage on either three phase or single phase output and it immediately trips the circuit breaker where that leakage occurs.

The current sensitivity of this relay is 30 mA.



Improper handling of the relay may lead to unsafe condition in comparison with that does not use the relay.

To ensure further safety, install a leakage relay for each load at the position near the load.

(3) Grounding

Ground as following to operate the earth leakage relay certainly.

■ Grounding of the machine

Ground the grounding terminal for earth leakage relay and case grounding terminal according to the below.

① Grounding of the grounding terminal for earth leakage relay

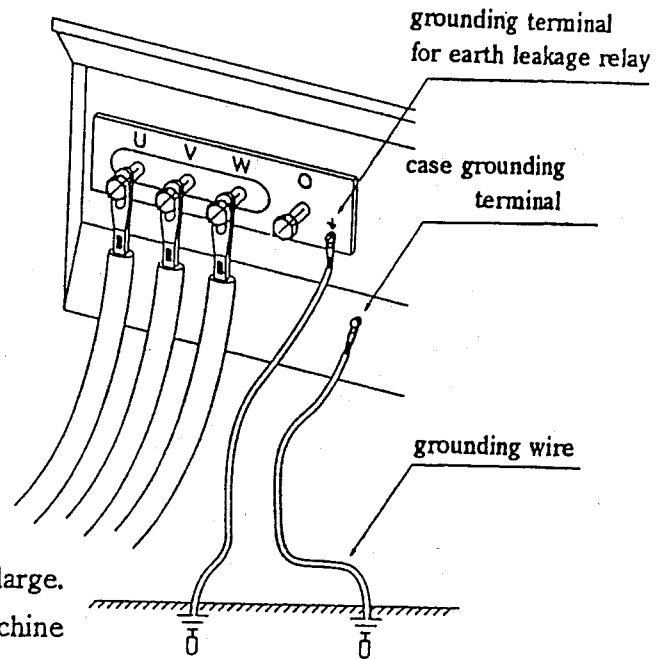
If grounding described below does not comply with the local rule, stricter of the two shall apply.

Use the grounding wire which sectional area is 5.5mm^2 or larger.

Usually it is possible that using attached grounding rod. But if grounding resistance is over $100\ \Omega$, provide the grounding rod which surface area contacted the ground is large.

② Grounding of the case grounding of the machine

Grounding the case grounding of the machine is refer to 「4-3 (1) Case grounding of the machine See p.29」.



■ Grounding of the load equipment

As in the case of the machine, execute grounding work on the load equipment case. Provide the grounding rod to satisfy the grounding resistance which conforms to the local rule.

[Note] The installation of a leakage relay on the machine can not become a reason for elimination of the need for the load side grounding.

The load side grounding is indispensable for earliest possible detection of any leakage caused in the generator. The absence of such grounding requires any leakage to be detected by current flowing through the human body and is very dangerous because the sensitivity of leakage relay provided on the machine is not sufficient for detection of such current.

■ Precaution in grounding

Precaution in grounding is refer to 「 4-3 (3) Precaution in grounding See p.30 」 .

■ Operation check

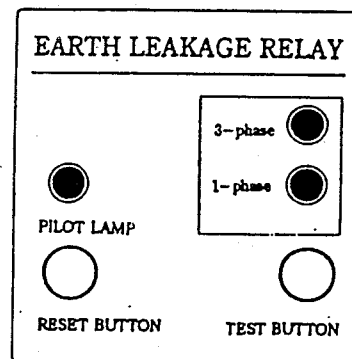
For safety reasons, check on the operation of the leakage relay at the startup of the machine according to the procedure described below:

- ① Start up the machine according to
「 5-2 Startup See p.37 」
- ② Make sure that all breakers of the load side are "OFF".
- ③ Set the breaker of three phase and single phase to "ON".
- ④ Press the TEST button on the leakage relay.

If this causes the LEAK lamp (red) on the leakage relay to go on and the breakers to be activated, the leakage relay can be regarded as operating normally.

- ⑤ Press the RESET button and return the breaker to the "OFF" position. This allows the breaker to be turned to "ON" again.

The leakage relay, once it is activated, holds its activated state until the RESET button is pressed or the machine is stopped.



(4) Action for operation of the leakage relay

When the leakage relay is activated, then stop the engine, and measure the insulation resistance several parts and repair the leak spot before restart the engine.

12-6 FUEL PIPING SELECTOR

(1) Applicable models

DCA-SP SERIES

(2) Description of the device

The "Fuel piping selector" selects the supply of fuel to the engine from the machine loaded fuel tank or directly from the outside machine tank through its change over valve.

(3) Operating procedure

- ① The fuel piping and the change over valve lever are set as shown in Fig.1 (*1) before the machine is shipped. If the fuel is to be supplied from the machine loaded tank, operate the machine with their setting left as such.
- ② If the outside machine tank is to be used for fuel supply, remove the two plugs for connection of the outside machine tank and pipe it as illustrated in Fig.2 (*2), then turn the change over valve in the arrow indicated direction before operating the machine.
- ③ If the outside machine tank is not used with the piping removed from it, be sure to return the change over valve lever to the position as shown in Fig.1 (*1) and screw in the two plugs.

(3) Precaution in piping and operation

- ① For the piping, use an oil resistant pipe with an inside diameter of approximately 8 to 10 mm.
- ② Install the outside machine tank as near to the machine as possible and as the fuel level is within from 0 to +3m for the ground.
- ③ In piping the outside machine tank, leave the position of the change over valve lever as shown in Fig.1 until the piping is complete before turning it to the position as shown in Fig.2 (*1).
- ④ Set the suction pipe 15 to 20mm above the tank bottom to prevent it from drawing in water and/or foreign matter present in the tank. (See Section A in Fig.2 (*2).)
- ⑤ Take good care to avoid entry of water and or foreign matter into outside machine tank.
- ⑥ Improper handling of changing over the lever, it may cause to overflow the fuel from the fuel tank loaded on the machine or connection of outside fuel tank to the outside of the machine, operate the lever in accordance with the figure.

*1 In the case of DCA-25SPI-C, show the Fig.3.

*2 In the case of DCA-25SPI-C, show the Fig.4.

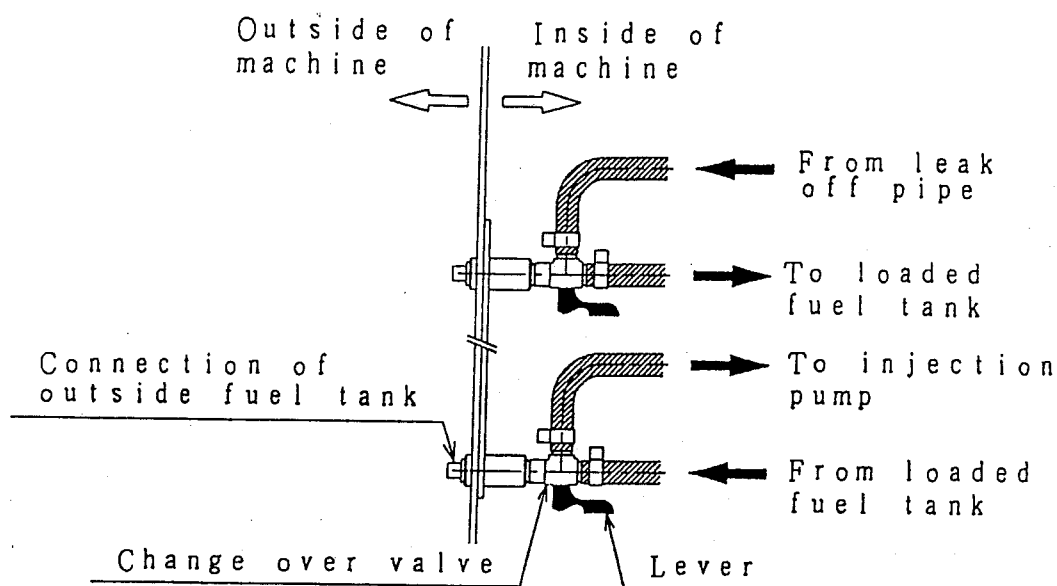


Fig.1 Use of loaded fuel tank

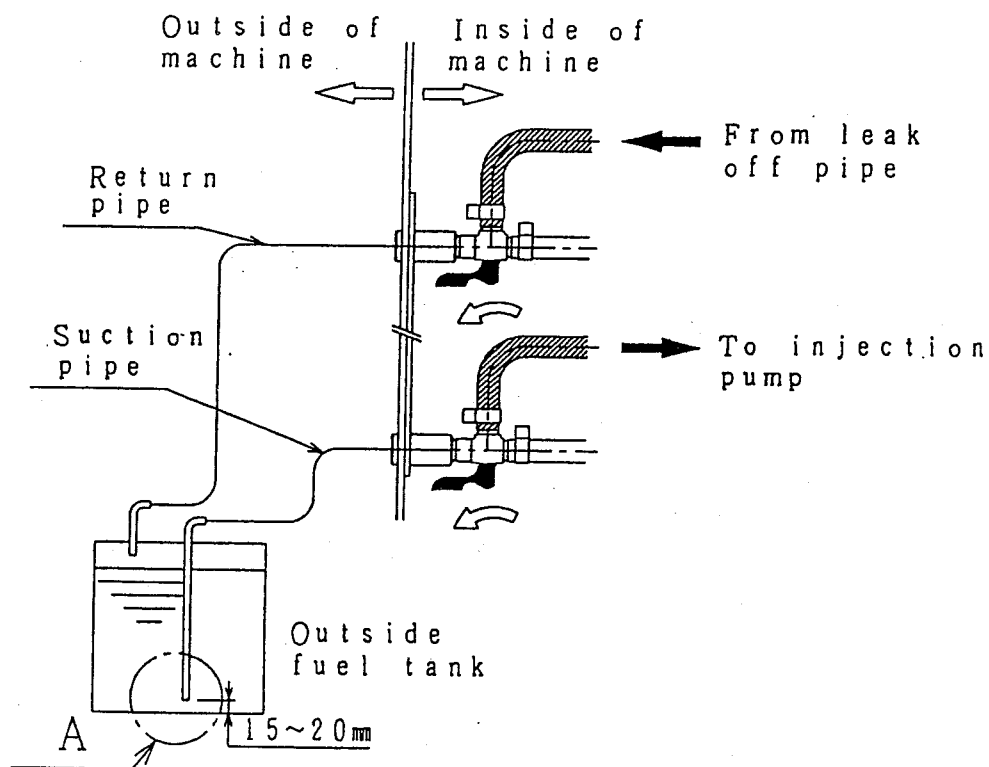


Fig.2 Use of outside fuel tank

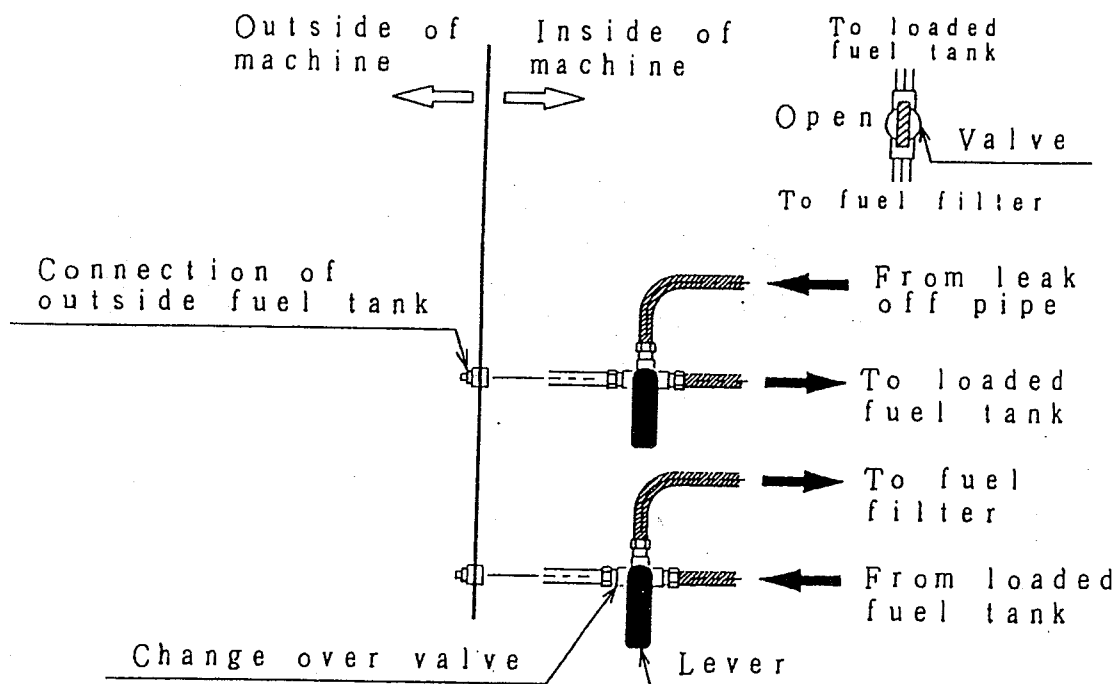


Fig. 3 Use of loaded fuel tank

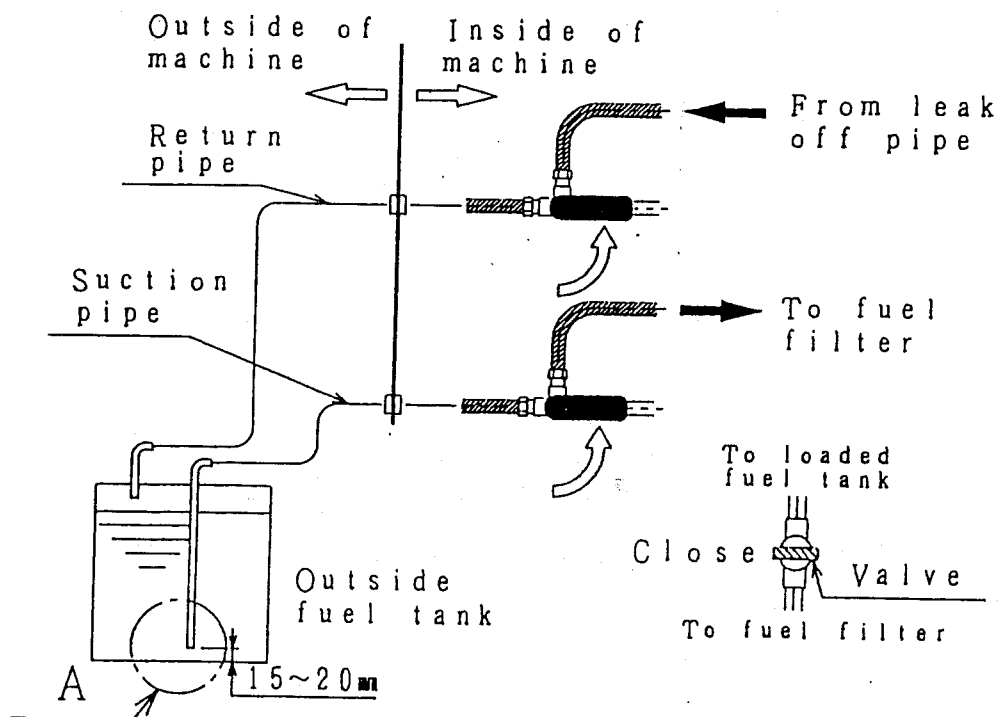


Fig. 4 Use of outside fuel tank