No. W873 01 720 04C

INSTRUCTION MANUAL

Soundproof Engine Welder/Generator

MODEL : TLW－450SSWI

⚠ Caution : Do not attempt to operate this machine until you have read and understood completely ALL instructions and guidelines contained.
At all times, keep this manual readily available for operators and service engineers.

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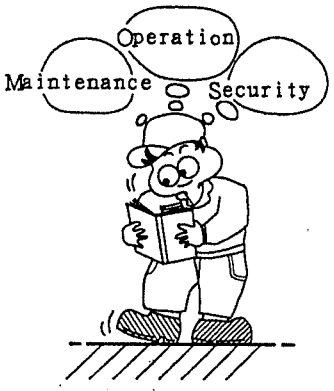
CONTETNS

Please Use the Machine in Accordance with the Following Instructions.

- This " INSTRUCTION MANUAL " gives a detailed description of the operation, routine inspection, maintenance and trouble-shooting of the welder/generator, and other items required for proper operation.
- Please read this manual carefully, especially the contents and caution symbols.
- While the generator is in it's place of operation, please keep the instruction manual in a place readily available to operators and service engineers.
- For the detailed operation and maintenance of the ENGINE, please refer to the "Engine Operation Manual", supplied by the engine manufacturer.

Your Machine ; Model No. : TLW-450SSWI
Serial No. :

[NOTE]: There may be a difference between the specifications detailed in this manual and the actual performance of the machine due to a modifications of the machine.



Symbol mark in this Manual

⚠ DANGER : Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

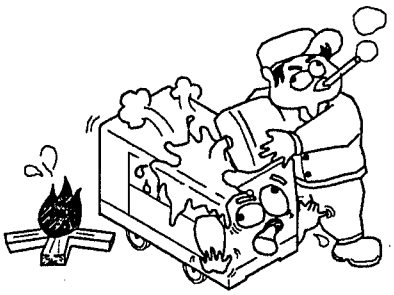
⚠ CAUTION : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property-damage

[NOTICE] : Notice is used to notily people of installation, operation, or maintenance information which is important but not hazard-relanted.

SAFETY PRECAUTIONS

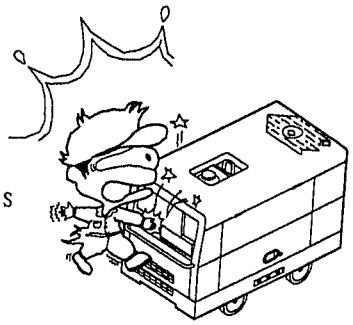
⚠ DANGER : **ENSURE GOOD VENTILATION**

Exhaust from the engine contains substances harmful to the human body. Sufficient change of air is necessary when the machine is used in places with poor ventilation, such as in a tunnel or indoors.
Do not direct exhaust to passers by or houses.



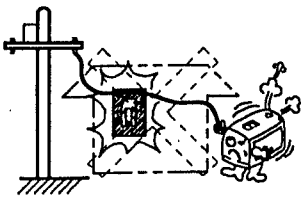
⚠ DANGER : **FIRE PREVENTION**

Fuel and oil are inflammable.
Never fail to keep imflammable material away from the machine, never smoke while refueling and never refuel during operation.



⚠ DANGER : **WATCH OUT FOR ELECTRIC SHOCKS**

Do not touch output terminals during operation. This is extremely dangerous when your hands are wet. Stop the machine when you touch the terminals for connection and other purposes.

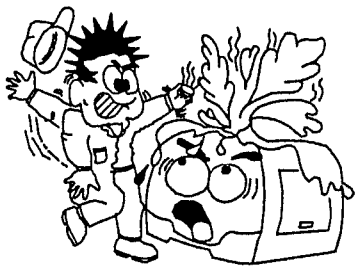


⚠ DANGER : **NO CONNECTION TO HOUSE WIRING**

Connecting to house wiring is illegal and very dangerous because it may cause electric shocks and damage the generator.

⚠ DANGER : **CONFIRM CONNECTION**

Damaged cables and insufficient tightening of connection screws may cause damage to the machine and electric shocks. Repair damaged cables and ensure connections are tight.



⚠ CAUTION : **DURING OPERATING**

Do not open any of the following items while the generator is running and immediately after the generator has stopped.

① Radiator Cap

Only perform these checks when the engine is cold, to avoid injury. Do not, at anytime, when the engine is still hot, remove the radiator cap. Opening the radiator cap when the engine is hot will result in boiling water gushing out of the radiator which will scald nereby people.

② Cooling Water Drain Plug

Opening the cooling water drain plug when the engine is hot will result in boiling water gushing out of the engine which will scald nearby people.

③ Engine Oil Drain Plug

Opening the engine oil drain plug when the engine is hot will result in boiling oil gushing out of the engine which will scald nearby people.

④ Do not touch while operating the generating set, the engine cooling fan and other places of high temperature like the exhaust pipe, engine and radiator. Even when the machine is stopped, take care that the machine has cooled down enough before touching the engine and the like.

⚠ CAUTION : Battery

As the battery contains combustible gas, take extreme care in handling the battery. If you are careless, like dropping the battery, there is a risk that the battery may explode. In carrying out maintenance or inspection check, recharging and using booster cable, extreme care should be taken to ensure safety.

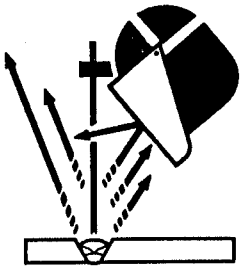
⚠ CAUTION : Strictly Prohibited

Do not expose the battery to naked flames, sparks, cigerettes and like, as the battery contains flammable liquid and gas.

⚠ CAUTION : There is a risk of an explosion if you do not charge the battery as there will be a build-up of combustible gas. The recharging process and handling the battery should be done in an area that is exposed to an air current, to avoid the risk of a dangerous concentration of combustible gas.

⚠ CAUTION : In case the battery liquid (dilute sulphuric acid) happens to come in contact with clothing or skin, you must immediately rinse it out by using a lot of water. If the battery liquid comes into contact with your eyes, wash it out with lot's of water and seek medical attention immediately.

⚠ CAUTION : When welding operation, use a helmet or a hand-shield-mask in order to protect an operator's eyes from arc and to protect his face, neck, and ears from radiant energy directly emanated from arc.
As lens used in a protector, select a proper degree of brightness.



1. Preporations

- This machine has undergone stringent factory tests and inspections to ensure the machine performs in accordance with its specifications, before been shipped to the end user.
- As with any piece of motorized machinery, excessive use of a brand new machine may shorten the life of the machine. Therefore, it is recommended for the initial 50 hours of machine usage, special care is required for this break-in period.
- Upon receipt of the machine, please perform a maintenance check of the machine BEFORE USE, so as to further ensure there are no major malfunctions or damage to the machine that occurred during transit.
- We recommend the machine be placed upon a level surface, where there is not excessive dust or moisture.

1.1 When using the machine in places where there is inadequate ventilation, make sure the following care is taken:

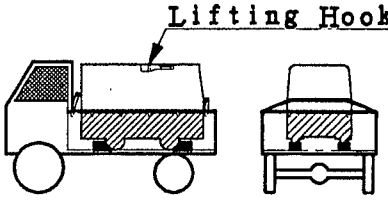
⚠ DANGER : Ensure good ventilation
Exhaust from the engine contains substances harmful to the human body. Sufficient change of air is necessary when the machine is used in places with poor ventilation, such as in a tunnel or indoors.
Do not direct exhaust to passers by or houses.

1.2 Caution in Machine Transporting.

⚠ Caution : In cases where wheels are fixed to the generator, for better mobility, make sure blocks are used to stop the generator from moving when operating and transporting the generator.

⚠ Caution : When transporting and loading (unloading) the machine, you must use the balanced centre-point lifting hook which is situated on the top panel of the machine.

⚠ Caution : Caution should be taken in transporting the machine to a particular job site. It is advisable when lifting the machine to use the balanced centre-point lifting hook. Trucks and the like should be used as a means of transportation. When loaded on a truck be sure to use the bar on the front and back of the machine, as a means to affix the machine during transportation.



1.3 Notice for Installation.

[Notice] : Make sure the generator is placed on a secure and level surface. In case of using the generator on an inclined surface, the allowable inclination angle is up to around 20 degrees.

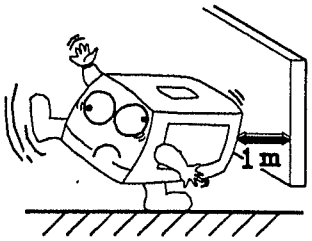
[Notice] : Avoid using the generator in places of high humidity.

[Notice] : Avoid using the generator in places where the surrounding temperature is likely to rise over 40 degrees celsius.

[Notice] : Avoid using the generator in places where there is excessive dust, noxious gases and explosive gases.

[Notice] : Provide adequate space for machine inspection and maintenance.

[Notice] : Do not have any obstacles within a 1 metre from the machine. Failing to do so, may cause the machine to overheat.

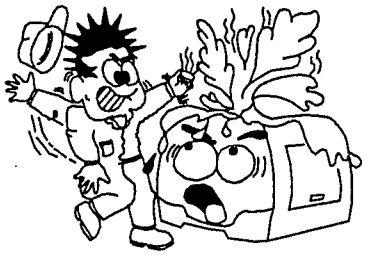


1.4 Caution During Operating.

While operating the welder/generator set, you should check the instruments on the control panel (e.g.:voltmeter, indicator lamp, etc, to make sure the machine is working correctly), on a timely basis.

⚠ CAUTION : DURING OPERATING

Do not open any of the following items while the welder/generator is running and immediately after the welder/generator has stopped.



① Radiator Cap
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Opening the engine oil drain plug when the engine is hot will result in boiling oil gushing out of the engine which will scald nearby people.

④ Do not touch while operating the welding/generating set, the engine cooling fan and other places of high temperature like the exhaust pipe, engine and radiator. Even when the machine is stopped, take care that the machine has cooled down enough before touching the engine and the like.

1.5 Battery.

Proper maintenance of the battery is extremely important to ensure smooth starting and long service life. Check the specific gravity, level of electrolyte and output voltage every 50 hours or once every month.

[Notice] : If the specific gravity is 1.28(at 20 ℃), the battery is adequately charged. If the specific gravity is 1.245 or less, recharging is necesary.

[Notice] : The electrolyte must always cover the plates. If the plates are exposed to air for a long time, damage will result. Apply a thin coat of grease, to ensure a good connection.

⚠ CAUTION : As the battery contains combustible gas, take extreme care in handling the battery. If you are careless, like dropping the battery, there is a risk that the battery may explode.
In carrying out maintenance or inspection check, recharging and and using booster cable, extreme care should be taken to ensure safety.

⚠ CAUTION : Strictly Prohibited
Do not expose the battery to naked flames, sparks, cigerettes and the like, as the battery contains flammable liquid and gas.

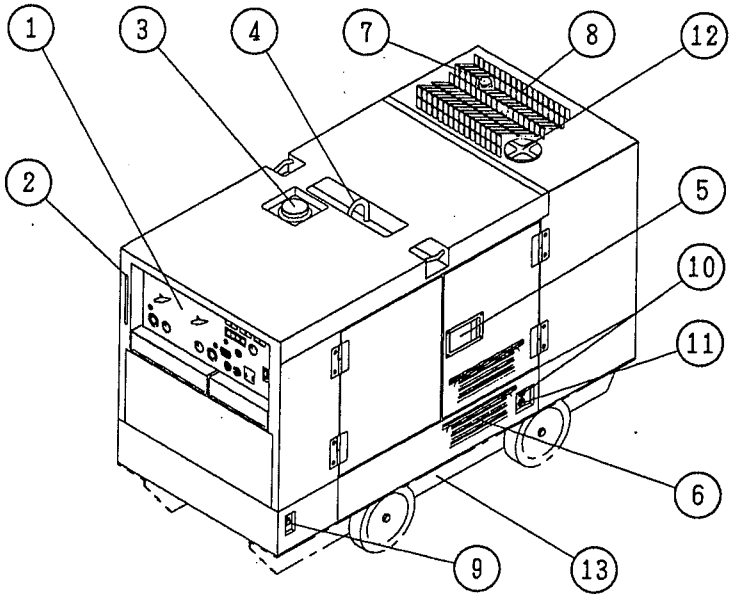
⚠ CAUTION : There is a risk of an explosion if you do not charge the battery as there will be a build-up of combustible gas. The recharging process and handling the battery should be done in an area that is exposed to an air current, to avoid the risk of a dangerous concentration of combustible gas.

⚠ CAUTION : In case the battery liquid (dilute sulphuric acid) happens to come in contact with clothing or skin, you must immediately rinse it out by using a lot of water. If the battery liquid comes into contact with your eyes, wash it out with lot's of water and seek medical attention immediately.

2. Instrumentation Names.

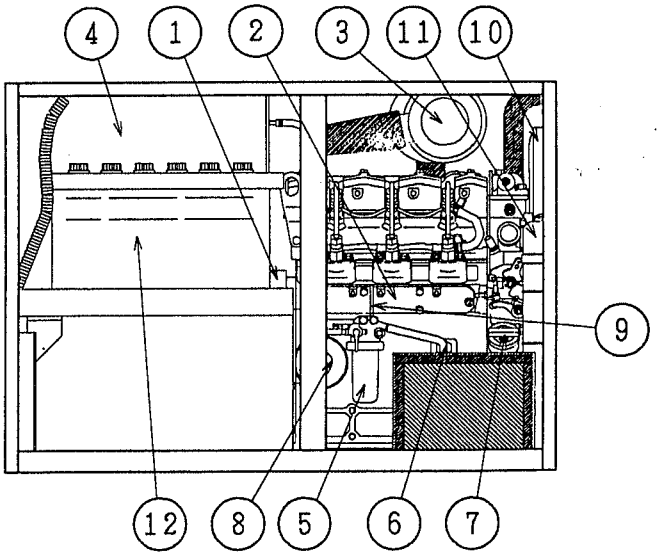
2.1 Outline Drawing and Name of Instrument.

① Control panel
② Fuel level guage
③ Fuel tank inlet
④ Lifting hook/lug
⑤ Door latch
⑥ Air intake
⑦ Exhaust
⑧ Ventilation
⑨ Fuel drain
⑩ Water drain
⑪ Oil drain
⑫ Radiator inlet
⑬ Wheel (option)



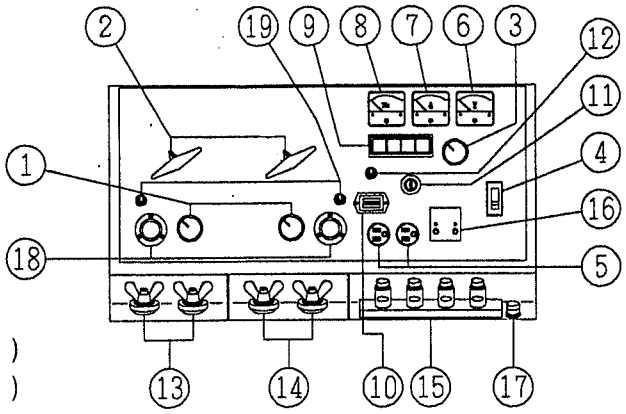
2.2 Name of Components.

① Alternator
② Diesel Engine
③ Air Cleaner
④ Fuel Tank
⑤ Fuel Filter
⑥ Fuel Pump
⑦ Oil Inlet
⑧ Oil Filter
⑨ Oil Level Guage
⑩ Radiator
⑪ Radiator Reserve Tank
⑫ Battery



2.3 Control Panel and Name of Instruments.

① Current Regulator
② Current Range Selector Switch
③ Voltage Reguator
④ Circuit Breaker
⑤ Single Phase Output Receptacle(option)
⑥ A.C. Voltmeter
⑦ A.C. Ammeter
⑧ Frequency Meter
⑨ Indicator Lamp Unit
(oil pressure, cooling water, battery charging. and pre-heat)
⑩ Hour Meter
⑪ Starter Switch
⑫ Idle Control Switch
⑬ DC Welding Output Terminal A (+, -)
⑭ DC Welding Output Terminal B (+, -)
⑮ Three Phase Output Terminal
⑯ Earth Leakage Relay(option)
⑰ Earth Terminal for Earth Leakage Relay(option)
⑱ Remote Control Receptacle(option)
⑲ Remote Control Switch (option)

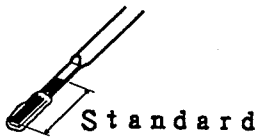


3. **Operating Procedures.**

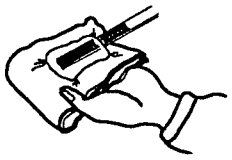
3.1 The following checks before start-up must be undertaken.

(1) Oil Check

◆ Be sure to check the oil level before start-up everyday. The oil level must be maintained between the two notches on the dipstick. If the oil level is below the lower notch, immediately replenish the oil, so that the oil level lies between the two notches on the dipstick. Do not overfill, so that the oil level is greater than the upper notch, as this may cause the oil seals of the engine to fail, causing an oil leak.



◆ When checking the oil level, be sure to check if the oil is clean and viscous. If the oil is not clean, drain the oil by removing the oil drain plug, and then re-fit the oil plug and replenish the oil.



◆ After a specified amount of engine oil is supplied, run the engine for several minutes and then stop it to re-check the oil level again.

Engine Oil Capacity 7.5 litres	Engine Oil Usage 3.7 litres

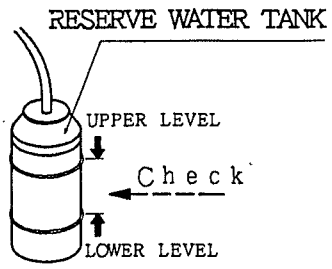
[Notice] : Use only high quality lubicating oil with classisication CC and CD.

[Notice] : Grades of lubricating oil(service classifications).
CA, CB, CC, CD - Diesel Engine Classification .

[Notice] : Selection of engine oil viscosity.
Use oil with viscosity most suitable to the temperature under which the machine is used. For example, SAE30(oil for summertime use), SAE20(oil for wintertime use) and SAE10W-30(oil for all season use). Oil with viscosity not susceptible to temperature are recommended.

(2) Check the Cooling Water.

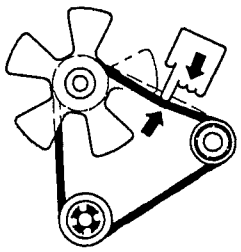
In checking and replenishing the cooling water, make sure that the engine is cold. Check that the reserve water tank (sub-tank) water level is between the high (H) and low (L) lines of the level guage. When the cooling water in the reserve tank is at a low level, immediately refill it. The radiator when it's water level is low will automatically draw on the water from the reserve tank.



[Notice] : When refilling the engine's cooling water, be sure to use tap water. Do not use river or rain water as it may cause trouble for the engine cooling system.

(3) Check the Fan Belt.

Check the belt for tension and elongation and adjust them as required. Concurrently, check that the belt has not been damaged and immediately replace it if any abnormality is noted on the belt. Perform the adjustment and replacement as directed in the "Instruction Manual" provided by the Engine Manufacturer.

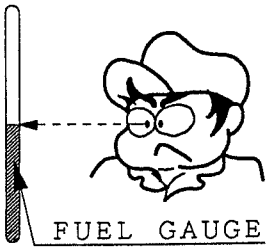


Fan Belt Parts No. : 06020 11406

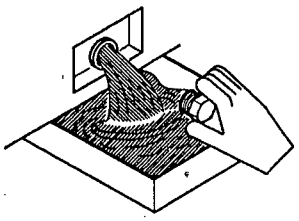
(4) Check the Fuel.

◆ Check the fuel level by looking at the fuel guage. If the level is low refill the fuel tank.

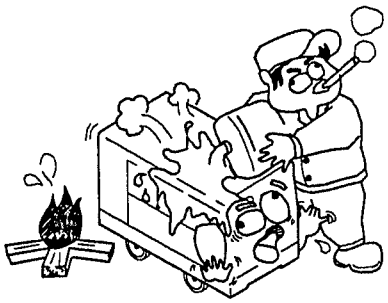
[Notice] : Only use ASTM No. 2 Diesel Fuel or heavy oil which the engine Manufacturer recommends. Do not use substitute oils and kerosene as the quality is unknown and the octane (cetane) number is low. Use JIS Special No. 3 Diesel Fuel for temperatures below -15℃.



◆ From time to time, it is imprortant to drain the fuel tank, as contaminents will build up at the bottom of the fuel tank. Unplug the fuel tank drain at the side of the generator base and replug the drain to refill with a fresh supply of diesel fuel.



[Notice] : The fuel inlet has drain hole for overflow of fuel and rain.
When refueling, be sure to remove dust, mud, etc that will build up around the fuel inlet. If this is not done, the fuel inlet will choke up and there is a greater chance of contaminents entering the fuel tank.



⚠ DANGER : FIRE PREVENTION
Fuel and oil are inflammable.
Never fail to keep imflammable material away from the machine, never smoke while refueling and never refuel during operation.

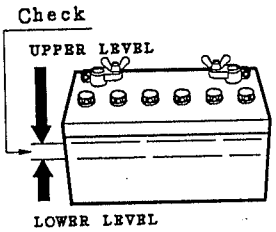
(5) Battery Check.

◆ Always ensure the level of battery fluid is always maintained above the low level mark. If the battery fluid level is low, distilled water should be immediately supplied to the battery.

[Notice] : Do not refill the battery over the upper level mark. Always remember to tighten the battery cap properly after refilling the battery.

(6) Battery Cable Connection.

◆ Make sure the battery cable is properly connected to battery terminal (+) and (-).

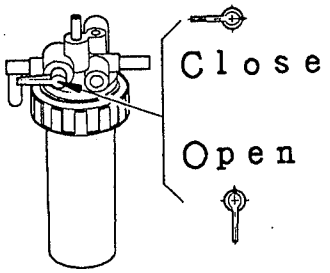


[Notice] : If the cable is connected incorrectly, damage to the electrical parts will result in a short period.

◆ Always check or connect the battery cable connection when the starter key switch is in the off position.

[Notice] : Do not connect the cables to the battery terminal when the starter switch is "ON", because electric sparks will be produced. This may injure the operator and cause damage to the machine's electrical components.

[Notice] : It is recommended that a thin film of grease be applied to the battery terminals to ensure a good connection and the prevention of corrosion of the battery terminals. An insufficient or poor connection may cause poor starting of the machine and other malfunctions to occur.



(7) Fuel Filter Cock.

◆ Turn the fuel filter cock lever from the close position to the open position.

(8) Check the Wiring.

◆ Inspect the wiring to ensure that all wire connections are not loose and that no wires are worn out.
If any worn out or damaged wires or connections are noticed either repair it or replace it immediately.

(9) Check the Piping and Hose Connections.

◆ Check that all piping and hose connections are not loose.
If these connections are loose and not rectified, oil leakages and cooling water leakage may occur during operation. Make sure all loose connections are rectified.

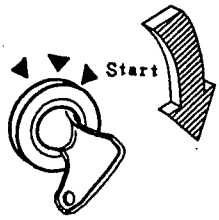
◆ Check that all hoses are not worn out. If a hose is found to be worn out or damaged, repair or replace it immediately.

3. 2 Starting and Operating

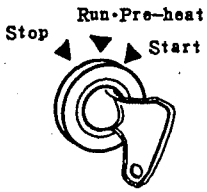
◆ Before starting the machine, the pre-starting safety checks must have been completed. In addition, do a general survey of the area surrounding the machine making sure the area is safe, air vents of the machine are not blocked and the exhaust can freely be discharged.
The machine can be started, once the people surrounding the machine have been notified that the machine is going to be used.

[Notice] : In cold operating conditions, use suitable cooling water and lubricating oil for improved starting and prevention of any troubles. The battery must always be maintained at full charging level.

(1) Insert the key into the "Starter Switch" and turn it to the "Run" position.
When the key is in the "Run" position, the indicator lamp will come on.
During the starting procedure, the indicator lamp acts as a "Pre-heat indicator".



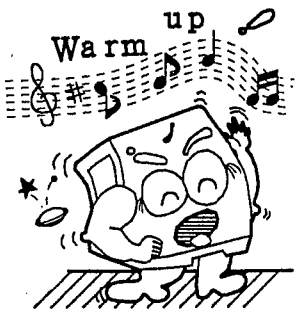
(2) Once the indicator lamp goes off, turn the key to the "Start" position to start the engine.
As soon as the engine starts, release the key whereby the key will automatically return to the "Run" position.



(3) After the engine starts, let the machine idle for 5～10 minutes to warm-up.

[Notice] : After the engine is started, check to see that the oil pressure lamp and battery charging lamp are off.
If one of these lamps are on, check the machine after the engine is turned off. (Refer to the Operation Manual for details)

[Notice] : While the engine is operating, do not turn the starter switch on. Note, if the engine does not start within 10 seconds after the key is turned to the "Start" position, wait for at least 30 seconds and repeat the starting procedure again.



Note : During winter or when the surrounding air temperature is cold, in situations where a load start is required, turn the key to the "Pre-heat position", you must wait until the engine indicator lamp goes off.

[Notice] : After the engine has started, if you continue to hold the key in the start position, damage will be caused to the starter. The key switch must be returned to the "Run" position within 10 seconds of starting the engine.
In situations where the sounds of the engine turning over cannot be heard in trying to start the machine, repeat the starting procedure from the beginning in accordance with the Operational Manual, after about 30 seconds.
If the machine fails to start despite repeating the starting procedure, there is obviously some problem with the machine. Therefore a thorough check is required (e.g.:Fuel has run out, forgetting to turn the fuel cock to the open position, excessive air in the fuel system and battery leakage)

(5) Carefully check the engine for abnormal vibration (noise), oil leakage, fuel leakage, cooling water leakage and air leakage. If the machine is operating normally, set the "Circuit breaker" to the ON position in order to supply electricity to the load.

[Notice] : While the machine is operating, do not have any obstacles within a 1 metre radius from the machine.
Failing to do so, may cause the machine to overheat.

[Notice] : Do not have the any of the doors of the machine open while operating. The main problem with leaving the doors of the machine open during operating, is it will effect the internal cooling air-flow of the machine and alien substances (e.g.:dust and dirt) will be drawn into the machine.

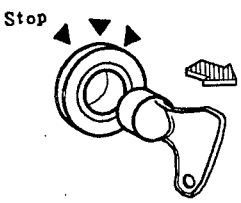
Note : How to Use the Automatic Air Vent Device
When the engine stops due to running out of fuel, take off the fuel filter or fuel piping, and re-start the machine in accordance with the following instructions.

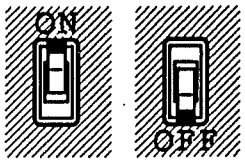
(a) Refuel the fuel tank and open the fuel filter cock.
(b) Turn the starter switch to the "Start" position whereby when the engine starter turns over, the automatic air vent device will expell the air inside the fuel system.
(c) After 10 to 20 seconds of turning the engine over, the automatic air vent device would have expelled all the air out of the fuel system. At this point, the engine will be able to start.

3.3 Stopping the Engine

(1) Turn the load side's circuit breaker to the "OFF" position.

(2) Turn the circuit breaker on the welding/ generating set to the "OFF" position and let the engine idle for five minutes, so as to allow the engine to cool down. After the five minute idling period is over, turn the key to the "OFF" position.





CIRCUIT BREAKER

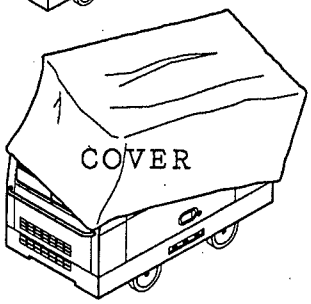
(3) Remove the key out of the starter switch. Make sure the key, when the machine is not use, is kept in a safe.

(4) Turn the fuel filter cock to the "Close" position.

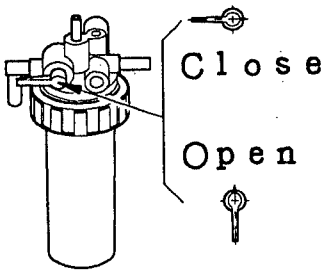
(5) Disconnect the wiring and plug(s) from the AC Power connections.

(6) Make sure the machine is not exposed to moisture. If is important that the machine be kept dry when not in use.

(7) To keep the machine in good working order, do not leave the machine exposed to the elements and cover it using a sheet, when the machine is not been used.



[Notice] : In the unlikely occurrence of the engine not stopping when the key is turned to the "OFF" position, there is a way of stopping the machine. Please refer to the following diagram and explanation.
In order to stop the machine in this of situation, you must turn the fuel filter cock to the "Close" position. Closing the fuel filter cock cuts the supply of fuel to the engine and the engine will take a few minutes to come to a stop.
This should only be done in case of an emergency.



3.4 Operating Precautions

(1) Always read the meters and lamps on the control panel.

◆ While the welding/generating set is running, periodically check the readings of the meters on the control panel. Specifically, check that these meters show the machine is running correctly or not and the alarm lamps are on or not.

◆ When the machine is running correctly, the alarm lamps will show the following.

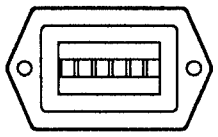
GENERATOR-LOAD	Rated Load	No Load
Alarm Lamp	All	All
Readings	OFF	OFF

[Notice] : If any of the alarm lamps are illuminated or the meters show abnormal readings while operating the machine, immediately stop the engine. Proceed to check and inspect the source of the problem.

(2) Hour meter

◆ Hour meter will always be working as soon as the engine is turned on.

◆ Use the "Hour meter" to plan maintanance for the generator.



HOUR METER

(3) Others

◆ While the generator is running, check the following:

[Notice] : Make a periodic check of the exhaust discharge, which will make the operator aware of any abnormalities in the exhaust dischage.

[Notice] : Check for leakages of lubricant oil, fuel, cooling water and exhaust gases.

[Notice] : Be aware of the noise produced by the machine . If any strange noises/sounds are noticed there may be a problem.

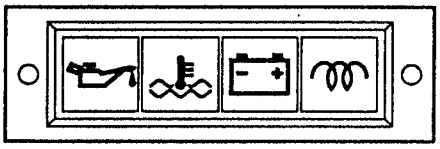
[Notice] : If any abnormalities are noted, immediately stop the machine and investigate the cause of the abnormality.

3.5 Emergency Stop Devices.

This generating set is equipped with the following "Emergency Stop Devices".

◆ When one of the Emergency Stop Devices is activated, the engine will stop automatically and the control panel will indicate where the problem area is. The operator must return the starter switch to the "Stop" position and then proceed to check and repair the problem area of the machine

	ACTIVATED DEVICE	REASONS FOR ENGINE STOPPING
EMERGENCY STOP DEVICE	Charging Alarm Lamp	Battery uncharged, loose battery connections, fan belt loose or broken.
	Engine Oil Pressure switch	If the engine oil pressure is abnormally low, engine is stopped. (below 0.5 kg/cm^2) This indicates there is a shortage of oil.
	Engine Water Temperature Switch	Engine is stopped, when the cooling water temperature is abnormally high. (over 115℃) This indicates the radiator is overheating or there is a blockage.



. OIL WATER CHG. GLOW

Indicator Lamp Unit

◆ FUSE

The engine wiring system has its own fuse. If this fuse has blown, check the wiring to determine if there are any problems.

If there are no apparent problems with the wiring, check to see if there are any alien substances in the wiring system.

Repair any problems found in accordance with the Engine Manufacturer's Operation Manual. After the problem is fixed, replace the blown fuse.

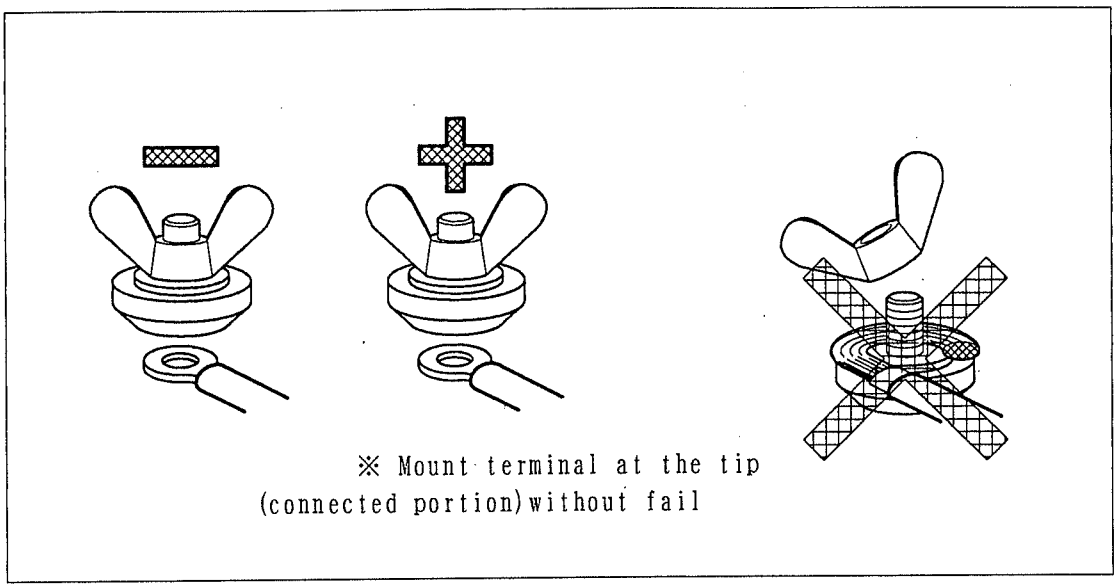
[Notice] : If the engine does not stop despite a blown fuse or another malfunction (with the starter switch in the "OFF" position), turn the fuel filter cock to the close position and the engine will stop.

4. Operation of the Welder.

4.1 Connection and Polarutues of Welding Cable

(1) Connect the cable to the output terminals mounted at the lower parts of the control panel securely. Don't peel off cable sheath to be bare, otherwise the insulator may broken by heating caused by a connection failure, or an unexpected trouble may occur due to its contact to the machine body.

[Notice] : Mount a terminal at the tip (connected portion) without fail.



※ Mount terminal at the tip (connected portion) without fail

The output terminal are marked with (+) and (-) polarities.
Select these polarities according to the work contents.

The following table shows an example of utilizing these polarities.

An example of utilizing the polarities

Polarity	Connection method	Application example
Normal polarity	(+) ··Earth (base metal) (-) ··Electrode holder	Structural steel and thick plate welding
Reverse polarity	(+) ··Electrode holder (-) ··Earth (base metal)	Cladding by welding Arc welding of thin plates Arc welding of stainless steel Air gouging

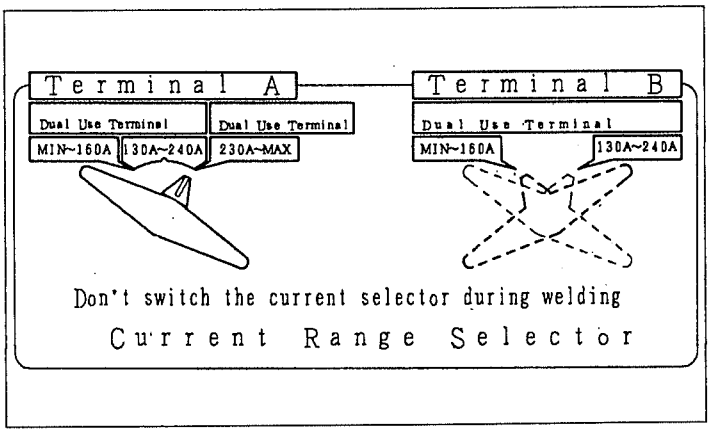
4-2 Selection of Welding Cable

(1) The welding cable should be larger in size as it becomes longer or its current becomes higher. Prepare a cable having a suitable size by selecting it from the follwing table according to the welding current and cable length.

Relation of the cable length and sectional area to suppress a voltage drop of the cable to be lower than 4 V

Cable length (m)		20	30	40	50	60	80	100
Cable size according to welding current (A) (mm^2)	100 (A)	22	22	22	30	30	38	50
	150 (A)	22	22	30	38	50	60	80
	200 (A)	22	30	38	50	60	80	100
	250 (A)	30	38	50	60	80	100	125
	300 (A)	30	50	60	80	100	125	150
	350 (A)	38	60	80	100	125	150	200
	380 (A)	38	60	80	100	125	150	200
	400 (A)	38	60	80	100	125	150	200
	450 (A)	50	60	80	100	125	200	200

4-3 Adjustment of Welding Current



Adjust the welding current by the "current selector" and "welding current control knob".
When welding, you should set the voltage of the voltage regulator in the generator side at the rated voltage (50 Hz 200V /60Hz 220V) or above.

[Notice] : Don't switch the current selector during welding, otherwise a poor contact, a burning failure, or other troubles may occur.

(1) Single Use

Set the current range selector in Terminal A to "Single Use", which ranges from 230 A ~ MAX. current (450 A) with Terminal A.
In this case you cannot use Terminal B.
The tortal current capacity of both the "Welding Current Regulators" on the right and left can be taken with the Terminal A.
In case of 400A output with Terminal A, adjust the both Current Regulators on right and left to be around equal each other as shown in the table below, which is recommended to maximise the machine's useful life and performance.

Terminal A Current	Current Reg. A	Current Reg. B
400 [A]	200 [A]	200 [A]
	180 [A]	220 [A]
	220 [A]	180 [A]
	210 [A]	190 [A]
	190 [A]	210 [A]

[Notice] : When the current Range Selector in Terminal A at "single Use position, the current Range Selector's position in Terminal B, either "MIN.-160 A" or "130A-240A", does not effect the current output with Terminal B.

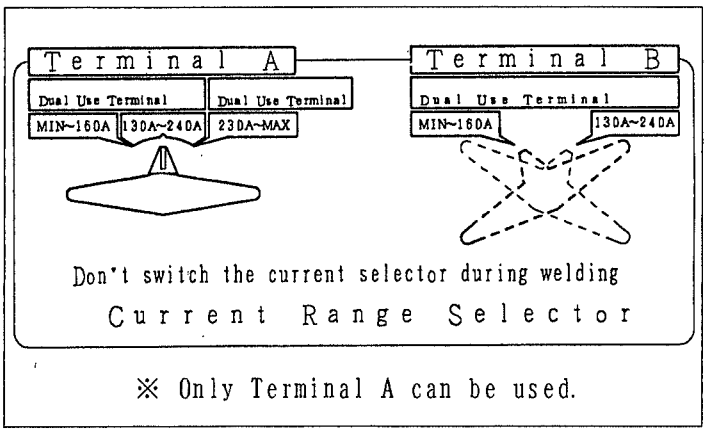
(2) Dual Use - Current Range Selector A positions in 130A-240A
You can use both the Terminal A and the Terminal B.
You take 130A-240A with the Terminal A.
You take either Min.-160A or 130A-240A with the Terminal B to each position.

(3) Dual Use - Current Range Selector A position in MIN.-160A.
You can use both the Terminal A and the Terminal B.
You take 130A-240A with the Terminal A.
You take either Min.-160A or 130A-240A with the Terminal B by switching the Current Range Selector in the Terminal B to each position.
Adjust the Current Range of Terminal A by using "Current Regulator for Terminal A ", and " Current Regulator for Terminal B" respectively .

Relation between the curent range and the electrode

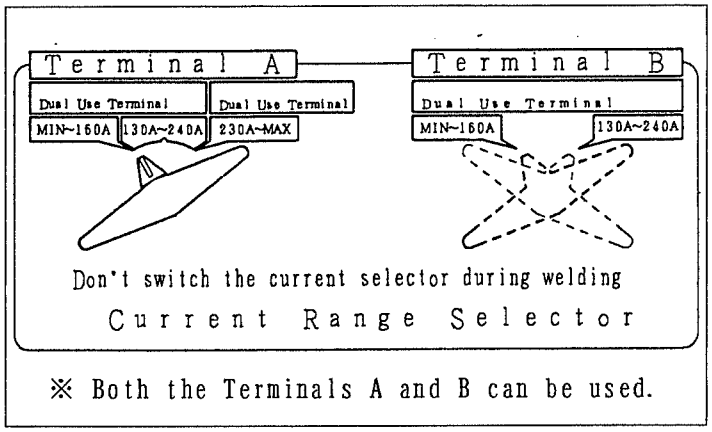
	Dual Use		Single Use
Selector's Position	MIN.～160A	130A～240A	230A～MAX.
Current Range	40A～160A	130A～240A	230A～450A
Electrode	φ2.0～φ4.0	φ2.0～φ4.0	φ2.0～φ4.0

4-4 How to Use Welding Terminals
(1) "Current Range Selector" when Single Operation Use "Termonal A".
("Terminal B" can not be used.)



※ Only Terminal A can be used.

(2) "Current Range Selector" when Dual Operation Use both the Terminals A and B.



※ Both the Terminals A and B can be used.

4-5 Slow down Unit

This unit is mounted for the purpose of preventing noises and saving fuel during a no-load run of the generator machine.

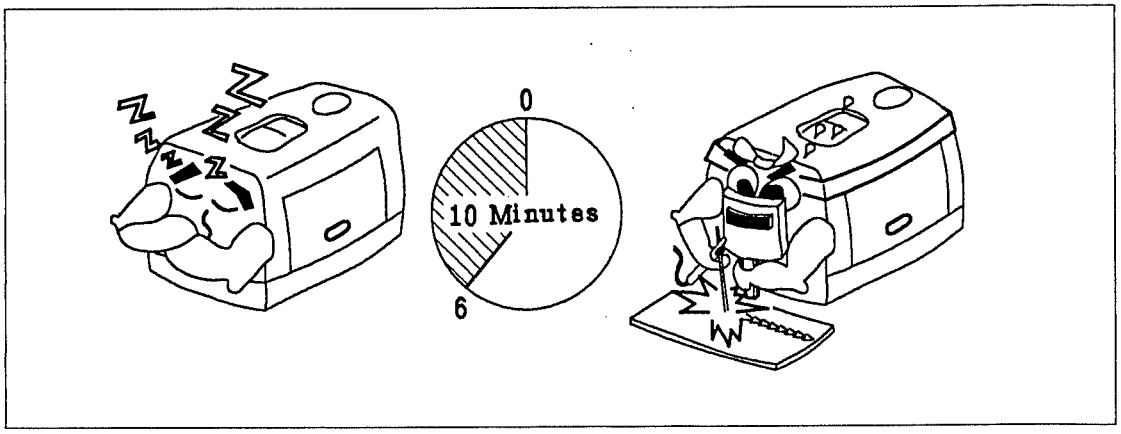
If the load is interrupted halfway for a while when running the generator during the work, the engine is automatically switched the low-speed rotation (2000 min^{-1}) after a certain time (about 9 to 10 sec.). When the load work is started again, the engine is switched to the high-speed rotation (3000 min^{-1} or 3600 min^{-1}) for smooth work.

If an AC load (illumination device, electric tools, water pump, etc.) of higher than 100 W is interrupted simultaneously when the welding work is started, the engine is automatically switched to the low-speed rotation. By turning on the load again, the engine is reset to the high-speed rotation.

- ◆ Turn on the slow down switch when an AC load (illumination device, electric tools, etc.) of higher then 100 W is used as well as during the welding work.
- ◆ Turn on the slow down switch if an AC load of lower than 100 W or an AC load having a magnet switch is used.
- ◆ Turn off the slow down switch when high-grade welding is done.

4-6 Duty Cycle

Everybody will be tired out if he continuous working without any resr. The welder is not designed to be resistible against a continuous use due to its work contents and economy. The duty cycle represents this condition.



The duty cycle is defined as a ratio of the load time in a cycle of 10 minutes.

[Notice] : A duty cycle of 50 %, for example, means that a no-load run is done for 5 minutes after a load run (work) for 5 minutes. The rated duty cycle of this welder is 60 %. However, the duty cycle changes according to the working current as shown below. Be careful not to overload the machine, referring to the following table.

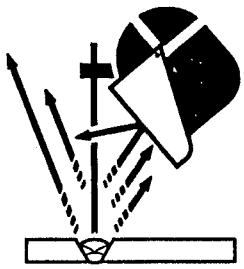
Working current-to-duty cycle relation

Position of Selector SW.	Duty cycle (%)	100 %	80 %	60 %	50 %
Single	Current	300 A	340 A	400 A	450 A
Dual		150 A	170 A	200 A	225 A

4-7 In welding operation

During arc welding or arc cutting operation, an operator must use a hand-shield-mask for his eyes protection. It is very dangerous to operate it without a protector such as mask.

⚠ CAUTION : When welding operation, use a helmet or a hand-shield-mask in order to protect an operator's eyes from arc and to protect his face, neck, and ears from radiant energy directly emanated from arc. As lens used in a protector, select a proper degree of brightness.



- Reference - Numbers of brightness degree of lens

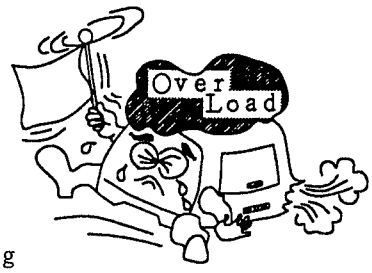
Welding operation	Applied electrode size	No. of brightness degree of lens
Shield arc welding	ϕ1.6 to ϕ4.0 mm 1/16 to 5/32 inches	10
	ϕ5.0 to ϕ6.0 mm 3/16 to 1/ 4 inches	12
	ϕ8.0 to ϕ9.5 mm 5/16 to 3/ 8 inches	14

Quoted from OSHA (Occupational Safety and Health Standards)

4-8 AC power supply

This machine is provided with three-phase & single-phase (option) power supplies in addition to the welding power supply. Mount terminal to each tip (connection part) of the cable and cord without fail, and fasten the screw securely.

⚠ DANGER : Confirm Connrction

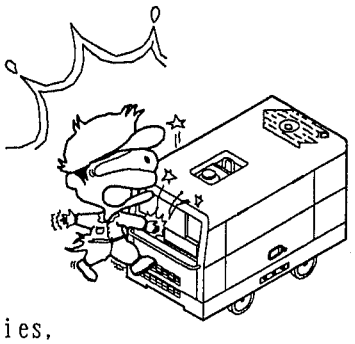


Damaged cables and insufficient tightening of connection screws may cause damage to the machine and electric shocks. Repair damaged cables and ensure connections are tight.

◆ The welding power supply and AC power supplies can be used concurrently in this machine. Use them, referring to Table 2.

(1) When the AC power supplies are used, turn off the circuit breaker first before connecting them to the unit employed. If the AC power supplies are connected without turning off the circuit breaker, it causes an electric shock accident or the damage of a unit to result in a very dangerous accident.

⚠ DANGER : Watch Out for Electric Shocks



Do not touch output terminals during operation. This is extremely dangerous when your hands are wet. Stop the machine when you touch the terminals for connection and other purposes.

(2) Be careful with an overload if the welder and AC power supplies are used concurrently. If an overload failure occurs during the independent use of the AC power supplies, the circuit breaker operates to disconnect the load.

[Notice] : Don't use the welder together with the AC power supplies concurrently when high-grade welding is done.

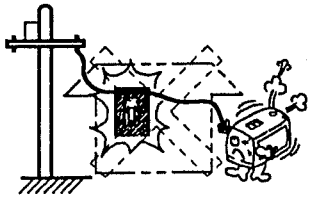
Table 2 : AC power supply capacity when welder and AC power supplies are used concurrently

welding rod	AC power source capacity allowable for simultaneous use
0	Three-Phase 18.0 kVA
φ2.0 in use	15.5 kVA
φ2.6 in use	13.5 kVA
φ3.2 in use	11.8 kVA
φ4.0 in use (φ2.0×2)	9.8 kVA
φ5.0 in use (φ2.6×2)	7.4 kVA
φ6.0 in use (φ3.2×2)	4.8 kVA
φ7.0 in use (φ4.0×2)	1.6 kVA
φ8.0 in use (φ5.0×2)	0

Figures in ( ) dual operation **kVA** : three phase

(3) Do not connect the AC Power output of the generator with commercially available power supplies. Therefore, you must ensure that the generator's output will not come into contact with commercially available power supplies.

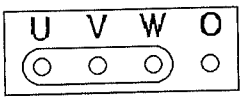
⚠ DANGER : NO CONNECTION TO HOUSE WIRING



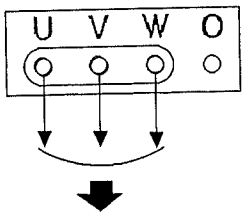
Connecting to house wiring is illegal and very dangerous because it may cause electric shocks and damage the generator.

(4) OPTION PARTS : This welder/generator is equipped with two (2) receptacles for auxiliary power, which have an output capacity of 1.5 kVA each. Note, both receptacles can be used for a particular auxiliary load with a maximum combined output of 3.0 kVA or 1.5 kVA per receptacle. When using both of these receptacles at once, for the best results, it is recommended that each receptacle's output be balanced with each other.

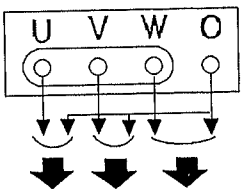
(5) The following diagrams illustrate how to connect 3-phase and Single-phase loads to the generator's output terminal.



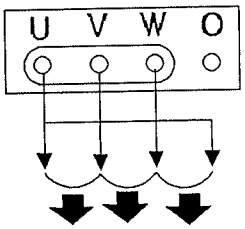
3-Phase 4-Wire Output Terminal 50 Hz or 60 Hz



3-Phase Load
Use U, V, W for 200V/220V/230V/380V/400V/415V



Single Phase Load
Use O.U, O.V, O.W for 115V/127V/133V/220V/230V/240V



Single Phase Load
Use U.V, V.W, W.U for 200V/220V/230V/380V/400V/415V

(6) Refer to Table 3, if the three-phase power supply and single-phase power supply are used concurrently.

Table 3 Maximum power supply capacity of each single-phase output when 3-phase and single-phase power supplies are used concurrently

3-phase	Single-phase
	Receptacle (TOTAL)
18.0 kVA	—
14.5 kVA	1.0 kVA
11.0 kVA	2.0 kVA
7.6 kVA	3.0 kVA

5 Earth Leakage Relay (OPTION PARTS)

(1) General Description

◆ The machine is equipped with an earth leakage relay which has a current sensitivity of 30 mA. The purpose of this relay is to detect any current leakage due to insulation failure of the load for example, while the generator is running. When the earth leakage relay detects a current leakage, it will automatically trip the circuit breaker, thereby shutting down the output to the terminal, in order to guard against the occurrence of electric shock.

◆ It is more important to ensure that the load is properly connected to generator rather than being careless and risk the possibility of current leakage and other problems. We urge the users of this generator to read this Operation Manual throughly.

◆ When the earth leakage relay is activated, the operator should immediately locate the leakage area and repair it. Once the repairs are completed, you should press the reset button on the earth leakage relay or stop the engine and then turn the circuit breaker on again. We recommend that you should equip the earth leakage device with each load equipment for safety reasons.

(2) How to Use and Test the Earth Leakage Relay

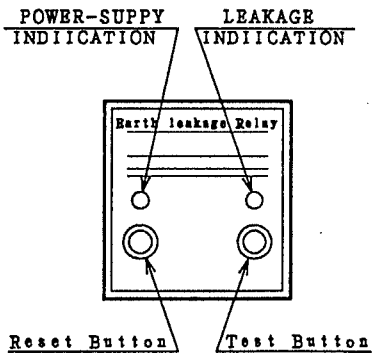
◆ The following descriptions allow you to make sure the earth leakage relay is functioning correctly

① Perform a periodic check on the earth leakage relay to ensure it is operating correctly, in accordance with the following instructions:

◆ Start the engine and adjust the engine to high speed running. Note that the indicator lamp (green colour) on the leakage relay is on.

◆ Turn the circuit breaker on.

◆ Press the "TEST" button (red) on the earth leakage relay. If this causes the leakage lamp to turn red, which activates the leakage relay and trips the circuit breaker, the leakage relay is confirmed to be operating correctly.



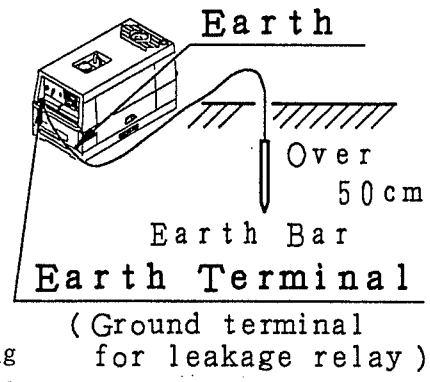
◆ Press the reset button on the earth leakage relay and return the circuit breaker to the off position temporarily. This allows the circuit breaker to be turned on again.

[Notice] : The leakage relay once activated will hold its activation state until the reset button is pressed or the starter switch is turned to the off position.

② Grounding the Generator

◆ To ground the generator, the grounding rod supplied with the generator should be connected to the grounding terminal on the control panel. The grounding rod should be placed into the surface/ground.

⚠ Caution : If the generator set is not grounded, the earth leakage relay will not function. The grounding resistance shall be less than 500 Ω, and the current sensitivity of the earth leakage relay is 30 mA.
The grounding of the generator should be done in accordance with the applicable electrical standards that are in force. In addition, ground the generator case by connecting a grounding conductor to the case grounding terminal provided on the control panel.



③ Grounding the Load Equipment.

◆ As with the generator, the load equipment should be grounded.

⚠ Caution : Installing the earth leakage relay on the generator should not be a justification for not grounding the load equipment.
The load-side grounding is imprortant for the earliest possible detection of any current leakage that may occur.
The absence of such grounding on the load side, requires any current leakage to be detected, the current must flow through the human body.

This is extremely dangerous because the sensitivity of the leakage relay provided with the generator is not sufficient to detect such a small current. In cases where thel load-side grounding is very difficult, but do ground the load-side with the earth leakage relay terminal grounding of the generator.

(3) Earth Terminal for Leakage Relay (Option Part)

① This generator is equipped with a earth terminal for the leakage relay which can be found on the control panel. This earth terminal is connected to the neutral point of the three phase AC wiring of the generator.

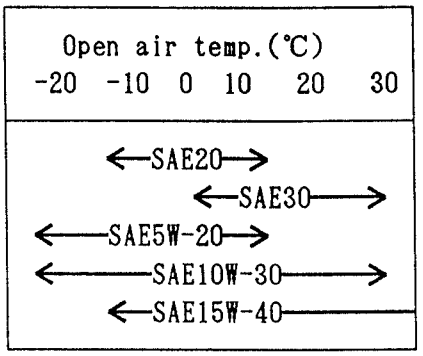
② For grounding of a leakage breaker to the load-side, grounding work on the equipment must be carried out, even if this equipment is connected to the control panel in conjunction with the earth terminal for the generator's earth leakage relay. (If the grounding' is not done for both the generator and the load, the leakage breaker will not be activated.)
The load wire that is to be connected to the grounding rod, must be more than 5.5 mm^2 think for the ground. This wire's grounding resistance should be less than 500 Ω.

[Notice] : It is prohibited to use the earth terminal of the leakage relay for single phase AC output.

6. Lubricating Oil, Cooling Water and Fuel

6.1 Engine Oil

◆ The lubricating oil used influences engine performance, starting characteristic and ultimately the life of the engine.
We recommend that use only the appropriate, good quality, lubricating oil.



(1) We recommend that "CC class" lubricating, oil be used (API service grade).

(2) We recommend the use of SAE 10W-30 all season type of engine oil viscosity.
The viscosity of the oil to be used is dependent on the external temperature. Refer to the below mentioned list.

[Notice] : Do not pour in different kinds of oil as it will change the oil quality which will have a detrimental effect on engine performance. If you want to add in a different type of oil, you must first drain the oil already in the engine completely.

(3) The total oil change capacity is 6.1 litres

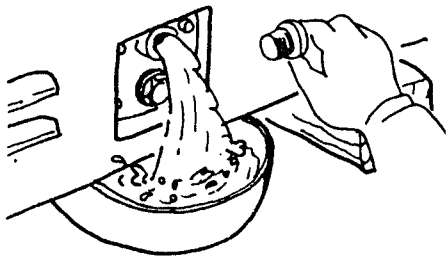
6.2 Engine Cooling Water

(1) Use only soft water only for cooling water. For example, tap water that is of good quality can be used.

(2) If the generator is to be used in cold areas, especially where there is a risk of freezing, long-life, anti-freeze, coolant (LLC) should be used.
(This generator when delivered ex-factory, the radiator cooling water consists of 30 % long life coolant.)

[Notice] : The recommended ratio of LLC to be used is between 30 % - 40 % range.

[Notice] : The folowing is the recommended of LLC to be used for below meutioned temperatures:
- 30 % : down to -15 ℃
- 35 % : down to -20 ℃
- 45 % : down to -30 ℃



[Notice] : The LLC should be changed at least every 2 years.

(3) The total cooling water capacity is 4.0 litres
(This does not include the cooling water reserve tank.)

① For the proper use of LLC carefully follow the instructions given by the LLC manufacturer.

② During cold periods and LLC is not used, the cooling water should be drained, including the reserve tank cooling water before adding in the LLC at the appropriate ratio in relation to the prevailing temperatures.

6.3 Fuel

(1) Use ASTM No.2 Diesel Fuel Only

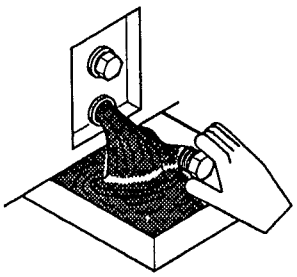
[Notice] : If fuel, other than the fuel that is recommended, is used, it will cause a decline in the engine performance, life and a host of other engine problems will result.

(2) Use only JIS No.3 diesel fuel or JIS special No.3 diesel fuel.
- JIS No.2 Diesel Fuel : down to - 5 ℃
- JIS No.3 Diesel Fuel : down to -15 ℃
- JIS Special No.3 Diesel Fuel : down to -25 ℃

7. Maintenance

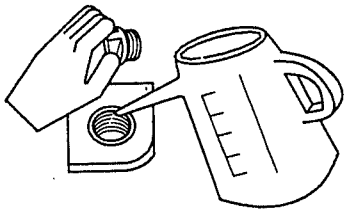
7.1 Required Maintenance for the Initial 50 Hours.

(1) Oil Change



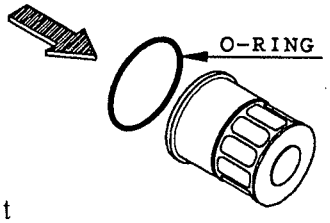
◆ An oil change must be done after the initial 50 hours of operation. Thereafter, an oil change is required for each 250 hours of operation.

① To change the engine oil, take out the engine oil drain plug and wait until the all the old oil has been drained.
Note, the easiest time to drain the oil is when the engine is warm (not hot), because the oil will be in its most fluid state.



② Once the old oil has been completely drained, refit the oil drain plug. Now you can pour in the new oil through the oil filter and continue pour in the oil until the oil tank reads H.
(Refer to Section 3-1 (1) for the approriate instructions)

③ After the oil change has been completed, start the engine and run it for a while. While the engine is running check to see if there are any oil leaks. Stop the engine after this check has been carried out. About 10 - 20 minutes after the engine has stopped, re-check the oil level guage. If the oil level guage reads less than H, refill the oil until the oil tank is full.
(Note : do not overfill the oil tank).



(2) Changing the Engine Oil Filter

① Remove the cartridge (oil filter) using the Filter Wrench.

② Insert the new cartridge.

③ Screw in the cartridge by hand. Once the gasket comes into contact with the face of the seal, tighten the cartridge ($1\frac{1}{4}$ turns) using the filter wrench.

④ Run the engine for a while and check to see if there are any oil leakages. Stop the engine. After the engine has stopped for about 10-20 minutes, check the oil level guage. If there is a shortage of oil, refill the oil.

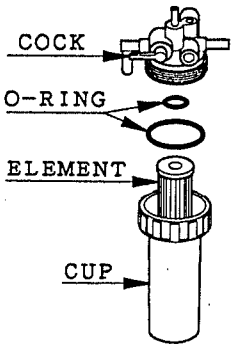
Cartridge : Parts No. 06020 41210

(3) Clean the Fuel Filter Element.

① Turn the fuel filter cock to the close position. Remove the ring screw and take out the filter cup and element.

② Rinse the element using diesel fuel and also, clean the inside of the filter cup using diesel fuel.

③ After cleaning, fit the fuel filter back to its original position. Make sure when the fuel filter is being refitted that it is not overly dusty.

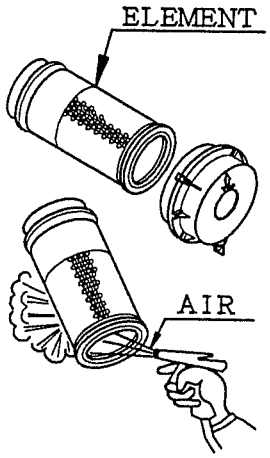


(4) Cleaning the Air Cleaner Element

< The air cleaner needs to be cleaned particularly if it has trapped a lot of dust and dirt >

① Take the air element out. Clean the air element by passing an air current through the air element. If the air cleaner is full of carbon and oil, it is best to use some cleaner to get rid such contanminents.

② Make sure when refitting the air cleaner element to its proper position that you do so in a way that does not allow dust enter into the cleaner.



[Notice] : After cleaning the air element, check to see whether there is any damage to the element. If there is any damage replace the damaged element with a new element.

7.2 Maintenance Check Every 100 Hours of Operation.

7.3 Maintenance Check Every 250 Hours of Operation.

(1) Change the Engine Oil

Engine capacity : 7.0 litres

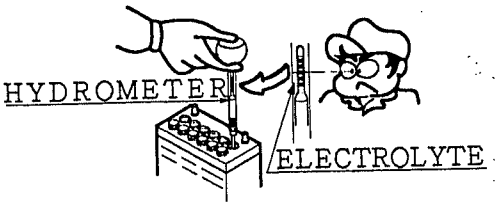
7.4 Maintenance Check Every 300 Hours of Operation.

(1) Check the Battery Gravity

◆ Measure the battery gravity if there is a suspicion that battery leakage has occurred especially where there have been instances where the machine would not start.

◆ The relationship between Battery Gravity and Battery Charging at 20 ℃.

Battery Gravty	Batery Charging
over 1.28	over charged(need adjustment)
1.25 - 1.28	optimal charging
1.24 - 1.25	average
below 1.24	low charged(need adjustment)



Note : In determing the specific grauity at a temperature other than 20 ℃, use the following formula:

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

Where S_{20} : is the calculated specific gravity at 20 ℃.

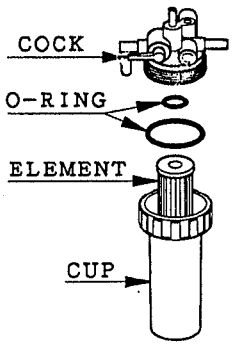
S_t : is the measured specific gravity

t : is the battery solution temperature reading.

7.5 Maintenance Check Every 500 Hours of Operation.

(1) Change the Fuel Filter Element and the O-Ring

[Caution] : Change the fuel filter element as per the description contained in 6.2 (1). The O-Ring to be changed is to the ore that goes with the fuel filter element.



Fuel Filter Element : Parts No. 06020 42174

(2) Change the air element every 500 Hours or 2 years. (Follow the instructions in section 6.2 (2))

In situations where the generator has not been operated for 500 Hours or more, as a general rule, the air cleaner will need to be replaced after it has been cleaned 6 times.

Air Cleaner Element : Parts No. 06020 46371

(3) Change the Oil Filter

Catridge : Patrs No. 06020 41210

7.6 Maintenance Check Every 1000 Hours of Operation.

Clean the inside of the fuel tank.

7.7 Other Checks and Maintenance

(1) Change the nylon or rubber pipes. In cases where the nylon or rubber pipes have become hard, deteriation of the rubber is taking place, replace it. Normally, this needs to be done every 2000 Hours of 3 years.

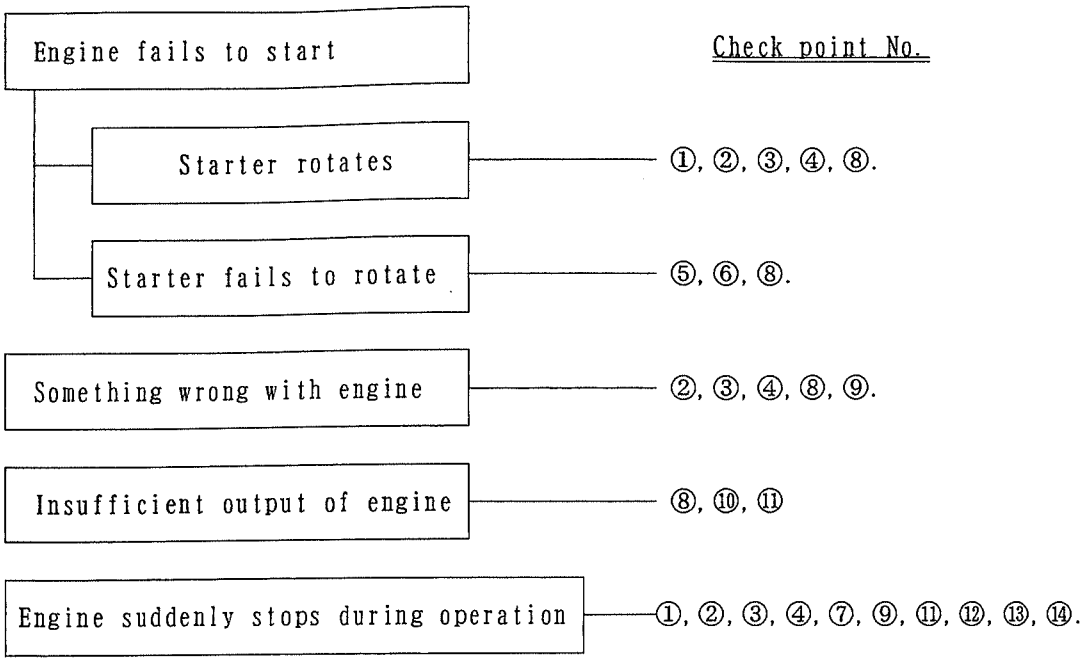
(2) In cases where the acoustic material is extremely dirty (with oil for example) or is starting to tatter, this material will need replacing.

7.8 Maintenance and Check List

key to Symbols: ◇ - check and / or clean ● - routine replacement ★ - replace for 50 hour only

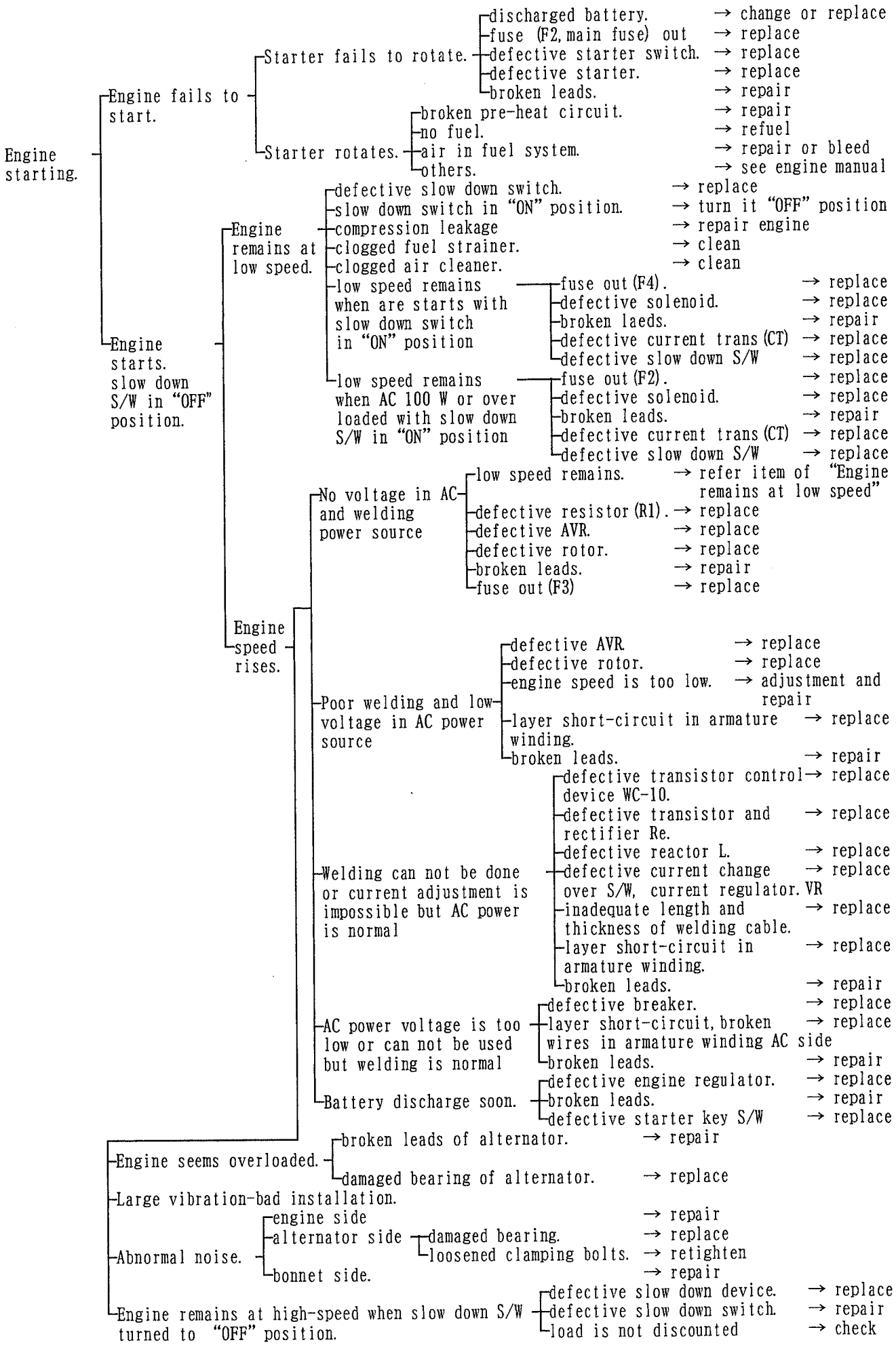
	Daily Check	Intial 50 hour check	Check for every 100 hours	Check for every 250 hours	Check for every 300 hours	Check for every 500 hours	Check for every 1000 hours	Check for every 2000 hours
1. Check for leakage of oil, water and fuel	◇							
2. Check for looseness of pipe connection and signs of wear		◇						
3. Check for looseness of wiring connections and signs of wear.		◇						
4. Check the working order of each control panel instruments and alarm lamps.	◇							
5. Check the air cleaner to see if it is stuck or not.		◇						
6. Clean the air cleaner element			◇					
7. Change the air cleaner element						●		
8. Check the engine oil level and the quality of the engine oil	◇							
9. Check the radiator water level and quality of the water	◇							
10. Check the fuel level	◇							
11. Check the battery liquid level		◇						
12. Drain the water from the fuel tank (Undo drain plug)		◇						
13. Check the tension of the fan belt (change if necessary)			◇					
14. Change the engine oil		★		●				
15. Change the oil filter		★				●		
16. Clean the fuel element		◇						
17. Change the fuel element						●		
18. Check the specific gravity of the battery					◇			
19. Check the engine injection nozzle						◇		
20. Measure the engine compression pressure								●
21. Check the valve clearance								●
22. Change the radiator water (if LLC is used)								●
23. Clean the radiator						◇		
24. Clean the inside of the fuel tank							◇	

8. Troubleshooting



Check point

① No fuel. Fuel strainer is closed.
② Fuel pipe clogged or sucks in air.
③ Water in fuel tank and in fuel system.
④ Clogged fuel strainer.
⑤ Battery cable disconnected.
⑥ Inspect the battery electrolyte level and voltage.
⑦ Check oil level.
⑧ Use an oil with appropriate viscosity, especially in cold ambient temperature.
⑨ Clogged air cleaner.
⑩ Circuit breaker is turned "OFF".
⑪ Generating set is over-loaded.
⑫ No water in the radiator or the water level is too low.
⑬ Fan belt is loosened or broken.
⑭ generating set operates in enclosed or confined area where the free flow of cooling air is restricted


Engine starting.
Engine fails to start.
Starter fails to rotate.
discharged battery. → change or replace
fuse (F2, main fuse) out → replace
defective starter switch. → replace
defective starter. → replace
broken leads. → repair
Starter rotates.
broken pre-heat circuit. → repair
no fuel. → refuel
air in fuel system. → repair or bleed
others. → see engine manual
Engine starts. slow down S/W in "OFF" position.
Engine remains at low speed.
defective slow down switch. → replace
slow down switch in "ON" position. → turn it "OFF" position
compression leakage → repair engine
clogged fuel strainer. → clean
clogged air cleaner. → clean
low speed remains when are starts with slow down switch in "ON" position
fuse out (F4). → replace
defective solenoid. → replace
broken laeds. → repair
defective current trans (CT) → replace
defective slow down S/W → replace
low speed remains when AC 100 W or over loaded with slow down S/W in "ON" position
fuse out (F2). → replace
defective solenoid. → replace
broken leads. → repair
defective current trans (CT) → replace
defective slow down S/W → replace
Engine speed rises.
No voltage in AC and welding power source
low speed remains. → refer item of "Engine remains at low speed"
defective resistor (R1). → replace
defective AVR. → replace
defective rotor. → replace
broken leads. → repair
fuse out (F3) → replace
Poor welding and low voltage in AC power source
defective AVR → replace
defective rotor. → replace
engine speed is too low. → adjustment and repair
layer short-circuit in armature winding. → replace
broken leads. → repair
Welding can not be done or current adjustment is impossible but AC power is normal
defective transistor control device WC-10. → replace
defective transistor and rectifier Re. → replace
defective reactor L. → replace
defective current change over S/W, current regulator. VR → replace
inadequate length and thickness of welding cable. → replace
layer short-circuit in armature winding. → replace
broken leads. → repair
AC power voltage is too low or can not be used but welding is normal
defective breaker. → replace
layer short-circuit, broken wires in armature winding AC side → replace
broken leads. → repair
Battery discharge soon.
defective engine regulator. → replace
broken leads. → repair
defective starter key S/W → replace
Engine seems overloaded.
broken leads of alternator. → repair
damaged bearing of alternator. → replace
Large vibration-bad installation.
Abnormal noise.
engine side → repair
alternator side
damaged bearing. → replace
loosened clamping bolts. → retighten
bonnet side. → repair
Engine remains at high-speed when slow down S/W turned to "OFF" position.
defective slow down device. → replace
defective slow down switch. → repair
load is not discounted → check

9. **Storage of Machine.**

◆ It is very important to carry out the prescribed maintenance and inspection in order to maximise the machine's useful life and performance.

(1) Long Term Storage.

For long term storage of the machine, the battery cable terminal (-) must be disconnected from the battery.

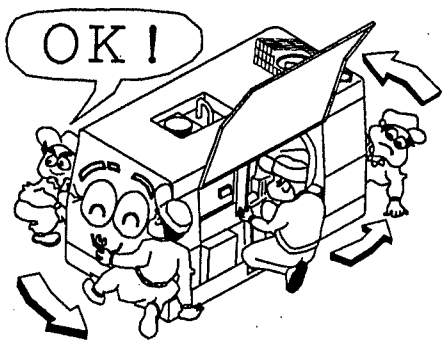
(2) Inspection of Battery Solution Level.

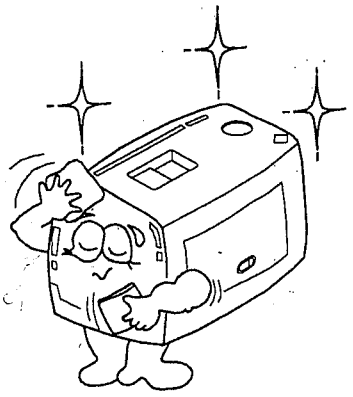
In situations where the battery solution level is low and it is below the required level, supply distilled water to the battery until the required level is reached.

(3) Miscellaneous Checks.

Do routine checks for loose bolts, nuts and other fasteners. Always check for fuel, oil and cooling water leakages.

For the complete routine engine checks refer to the engine manufacturers operation manual.



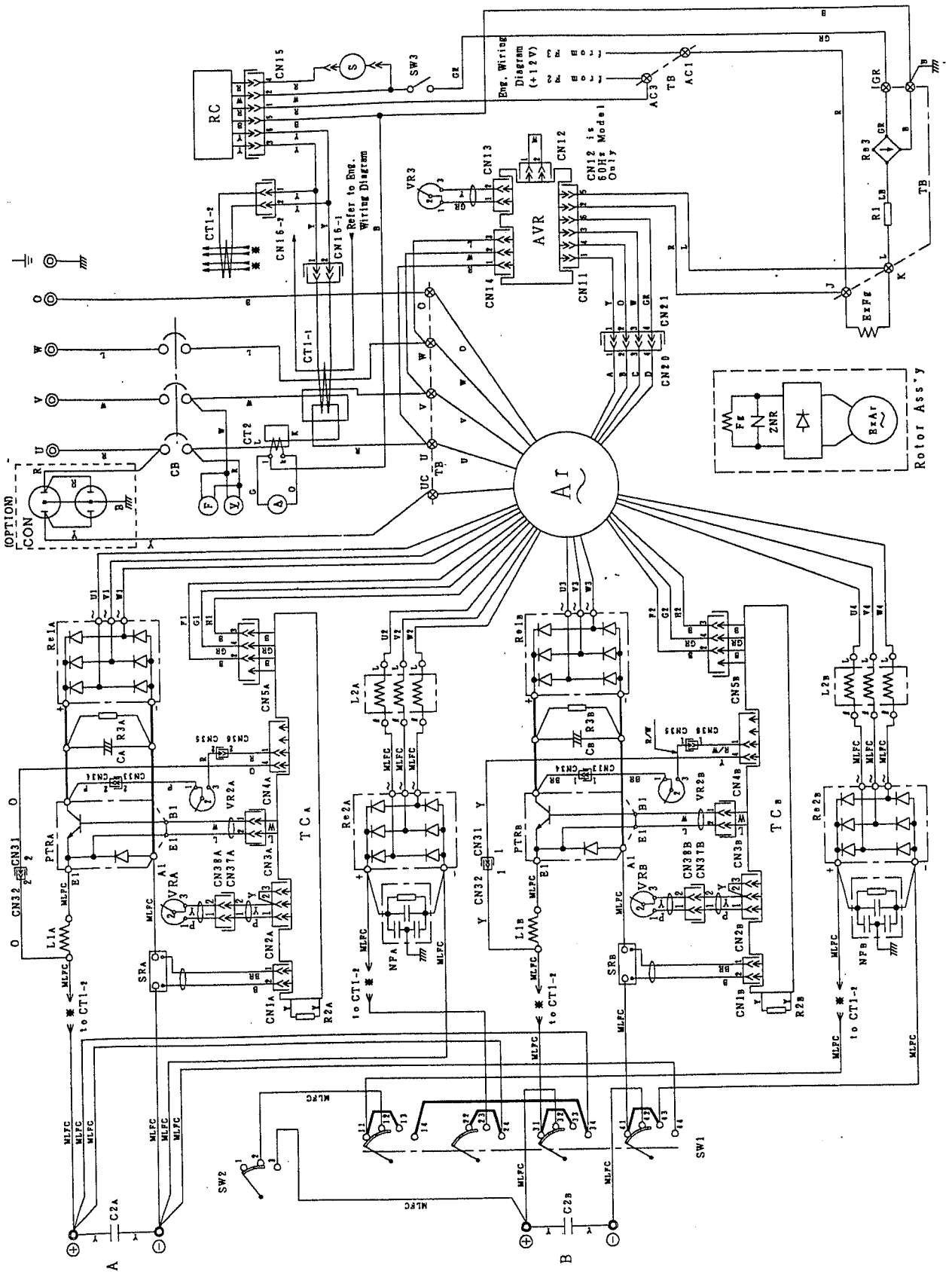


10. MAJOR SPECIFICATIONS

SPEC. ＼ MODEL			TLW-450SSWI							
Frequency (Hz)			50				60			
DC Generator	Welding	Rated Output (kW)	14.4							
		Rated Current (A)	400							
		Rated Voltage (V)	36.0							
		1 Current Range (A)	230 ～ 450							
		1 Electrode (mm)	φ2.6 ～ φ8.0							
		2 Current Range (A)	40 ～ 240							
		2 Electrode (mm)	φ2.0 ～ φ6.0							
		Rated Speed (min^{-1})	3000				3600			
		Duty Cycle (%)	60							
AC Generator	3 Phase	Rated Output (kVA)	18							
		Rated Voltage (V)	200	220	230		380	400	415	
		Rated Current (A)	52.0	47.2	45.2		27.3	26.0	25.0	
		No. of Phase	3 - Phase 4 - wire							
		Power Factor	0.8 (Lag)							
		Excitation	Brushless type(with AVR)							
		No. of poles	2							
		Insulation	Class F							
	Aux. AC Power (option)		Single-phase 3 kVA (1.5×2)							
Engine	Model		ISUZU / 3LD1							
	Type		Vertical, water-cooled, 4-cycle diesel							
	Number of cylinders		3							
	Bore × Stroke (mm)		83.1 × 92							
	Total displacement (L)		1.496							
	Rated output kW(PS)/min^{-1}(rpm)		24.1(32.8) / 3000				26.6(36.2) / 3600			
	Battery		12V - 70Ah × 1 (65D31R)							
	Fuel		DIESEL FUEL ASTM NO.2 or eq.							
	Fuel tank capacity (L)		Approx. 53							
	Lubricant quantity (L)		Approx. 7.5							
	Coolant quantity (L)		Approx. 4.0							
Set	Length (mm)		1650							
	Width (mm)		750							
	Height (mm)		870							
	Dry weight (kg)		600				550			

11. Generator Wiring Diagram

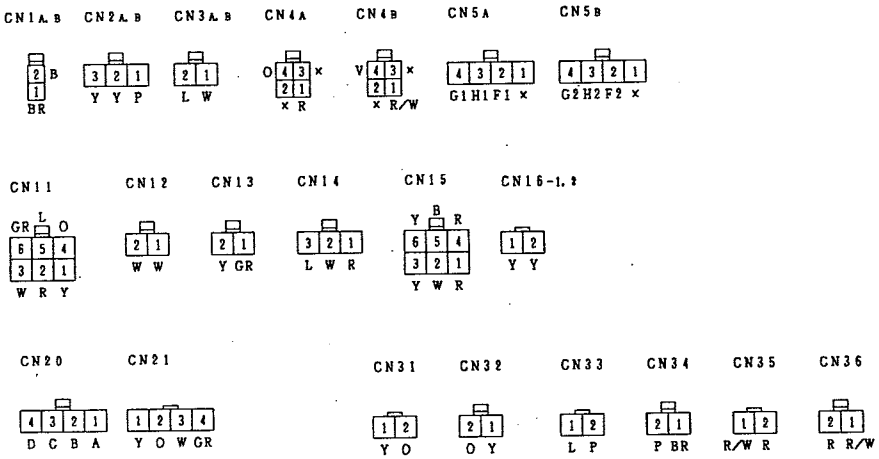
11.1 (200V, CLASS)



Synbol	Parts Name
Ar	Armature Ass'y
U. V. W. O	Output Terminal, AC
CON	Receptacle (option)
CB	Circuilt Breaker
V	AC Voltmeter
A	AC Ammeter
F	Frequency Meter
TB ⊗	Terminal Board
⊕ ⊖	Output Terminal, Welding
L1A. B	DC Reactor
L2A. B	AC Reactor
SW1	Current Renge Selector
SW2	Current Renge Selector
PTRA. B	Transistor
Re1A. B	Rectifier
Re2A. B	Rectifier
Re3	Rectifier
TCA. B	Control Unit, Transistor
CA. B	Condenser
SRA. B	Shunt
VRA. B	Current Regulator
VR2A. B	Rheostat
VR3	Rheostat.
AVR	Automatic Voltage Regulator
RC	Control Unit, idling
CT1-1, 2	Current Transfomer
CT2	Current Transfomer
S	Rotary Solenoid
SW3	Switch, idle control
R1	Resistor
R2A. B	Resistor
R3A. B	Resistor
NFA. B	Surge Filter
C2A. B	Condenser
⏚	Ground Terminal

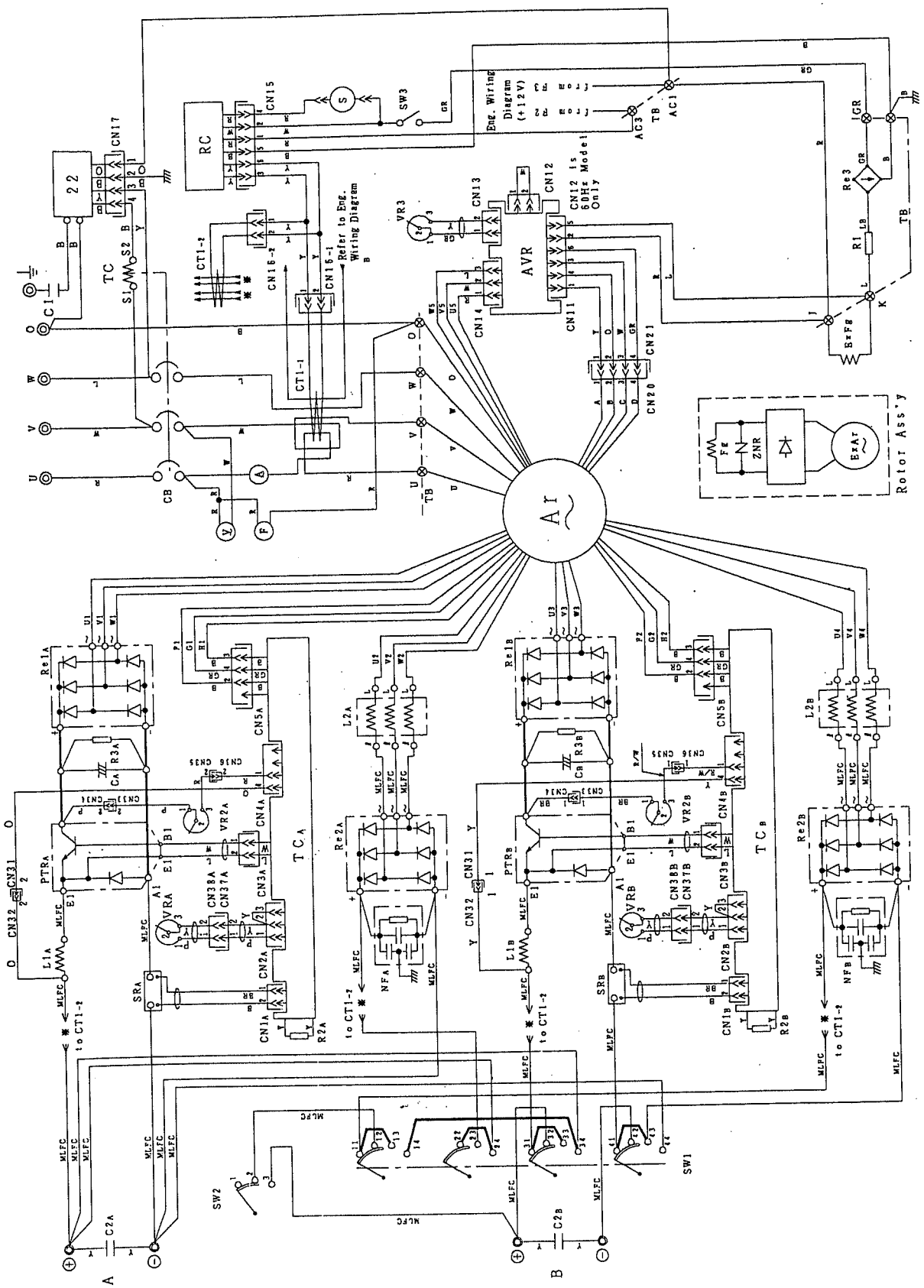
Connector

(View from Inserting Wire side)



WIRING COLOR CODE			
SYMBOL	COLOR	SYMBOL	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		

11. 2 (400V, CLASS)

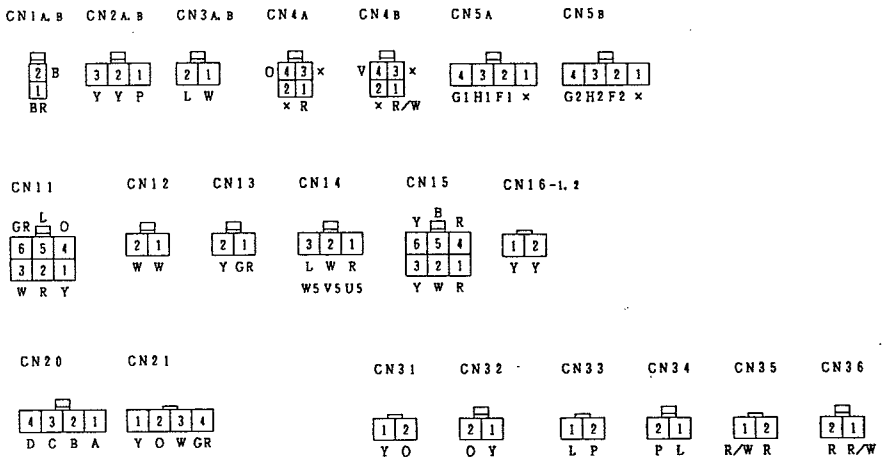


Synbol	Parts Name
Ar	Armature Ass'y
U. V. W. O	Output Terminal, AC
CB	Circuilt Breaker
V	AC Voltmeter
A	AC Ammeter
F	Frequency Meter
TB ⊗	Terminal Board
⊕ ⊖	Output Terminal, Welding
L1A. B	DC Reactor
L2A. B	AC Reactor
SW1	Current Renge Selector
SW2	Current Renge Selector
PTRA. B	Transistor
Re1A. B	Rectifier
Re2A. B	Rectifier
Re3	Rectifier
TCA. B	Control Unit, Transistor
CA. B	Condenser
SRA. B	Shunt
VRA. B	Current Regulator
VR2A. B	Rheostat
VR3	Rheostat
AVR	Automatic Voltage Regulator
RC	Control Unit, idling
CT1-1. 2	Current Transfomer
S	Rotary Solenoid
SW3	Switch, idle control
R1	Resistor
R2A. B	Resistor
R3A. B	Resistor
NFA. B	Surge Filter
22	*Earth Reakage Relay
C1	*Condenser
C2A. B	Condenser
⏚	Ground Terminal

* Option

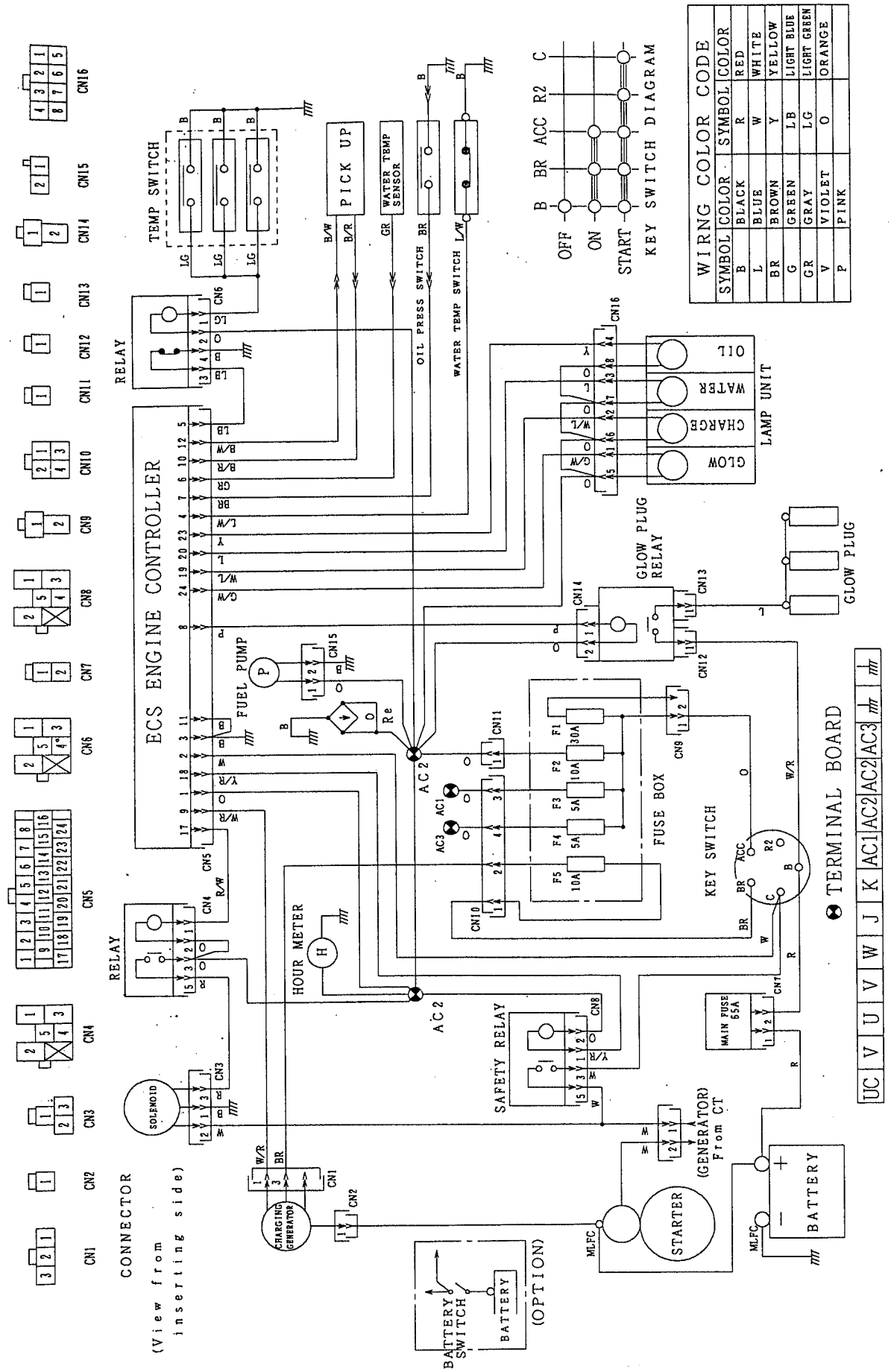
Connector

(View from Inserting Wire side)

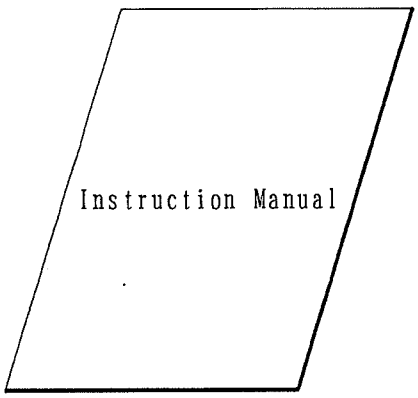


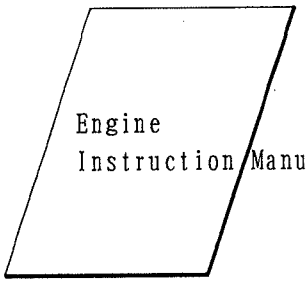
WIRING COLOR CODE			
SYMBOL	COLOR	SYMBOL	COLOR
B	BLACK	R	RED
L	BLUE	W	WHITE
BR	BROWN	Y	YELLOW
G	GREEN	LB	LIGHT BLUE
GR	GRAY	LG	LIGHT GREEN
V	VIOLET	O	ORANGE
P	PINK		

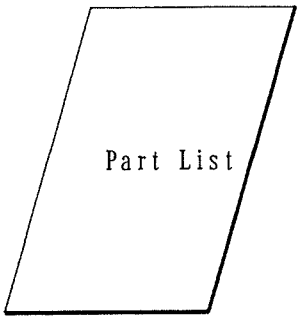
12. Engine Wiring Diagram



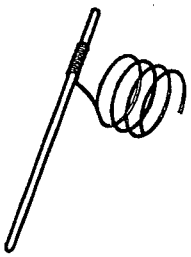
13. Attachment



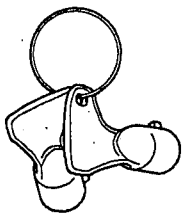




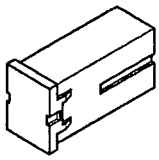
Earth Bar (Option)



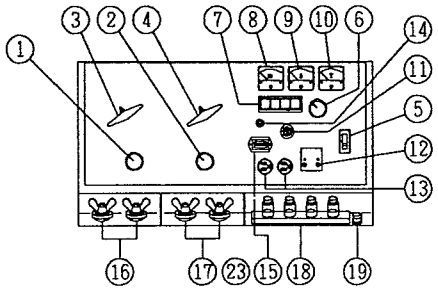
Starter Key



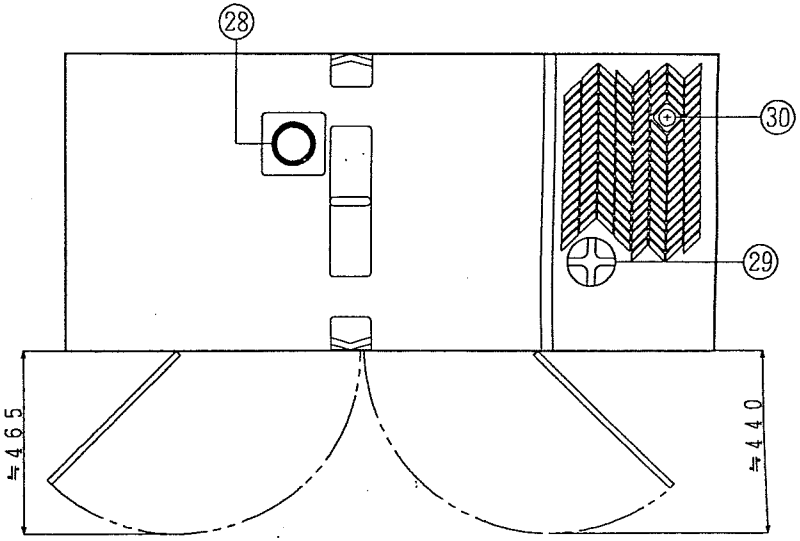
Fuse

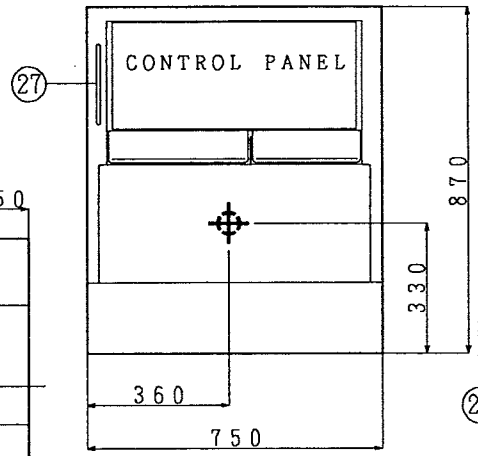


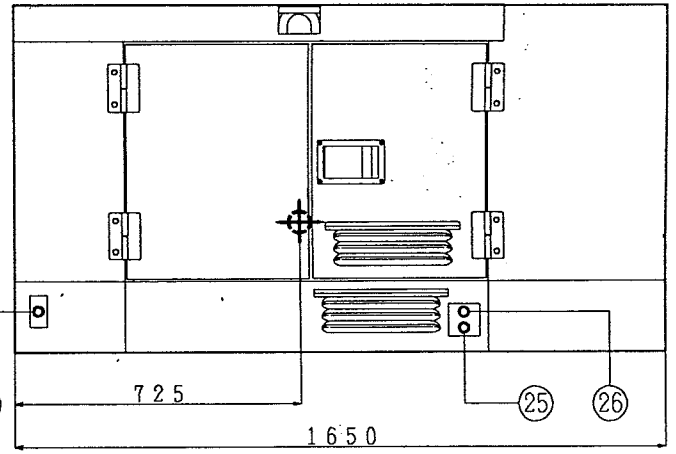
No.	PARTS NAME	No.	PARTS NAME
1	CURRENT FINE REGULATOR (A)	24	FUEL DRAIN
2	CURRENT FINE REGULATOR (B)	25	OIL DRAIN
3	CURRENT RANGE SELETOR (A)	26	WATER DRAIN
4	CURRENT RANGE SELETOR (B)	27	FUEL GAGE
5	AC CIRCUIT BREAKER	28	FUEL TANK (53L)
6	AC VOLTAGE REGULATOR	29	WATER INLET
7	LAMP UNITOIL, WATER, CHARGE, HEAT	30	EXHAUST (φ42.7-t1.6)
8	FREQUENCY METER		
9	AC AMMETER		
10	AC VOLTMETER		
11	STARTER SWITCH		
12	※ EARTH LEAKAGE RELAY		
13	※ AC POWER RECEPTACLES		
14	IDLE CONTROL SWITCH		
15	HOUR METER		
16	DC WELDING OUTPUT TERMINAL (A)		
17	DC WELDING OUTPUT TERMINAL (B)		
18	AC POWER OUTPUT TERMINAL (3-PHASE)		
19	※ TERMINAL, EARTH LEAKAGE RELAY		
	※ OPTION		



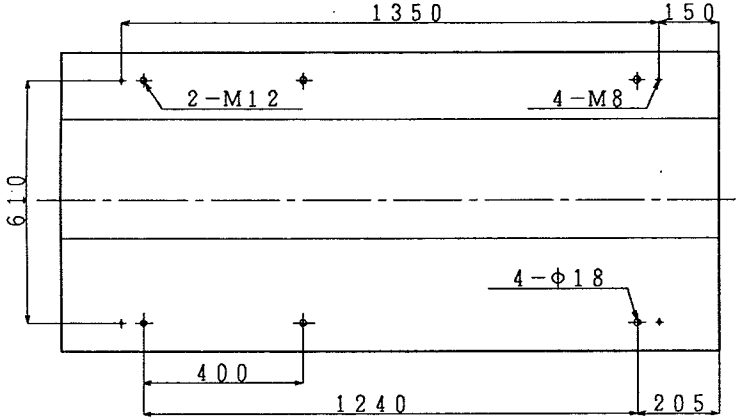
CONTROL PANEL







Rear Side



✣ : C.G

TYPE	ENGINE ISUZU	BATTERY	FUEL TANK (L)	DRY WEIGHT (kg)	
TLW-450SSWI	3LD1	65D31R	53	600 (50Hz)	550 (60Hz)