ISO 9001
CERTIFIED

shindaiwa

OWNER'S AND OPERATOR'S MANUAL

Sound Proof
Diesel Engine Generator

DG1000MI

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⚠ CAUTION : Do not operate the Generator, or any other appliance, before you have read and understood the instructions for use.

DG1000MI-400
X750800-3700

Introduction

Thank you for purchasing Shindaiwa Sound Proof Diesel Engine Generator.

- This user's manual was created to ensure the safe operation of this equipment. Therefore, the manufacturer of this equipment strongly recommends that the user follow the instructions herein, to avoid unnecessary accidents and repairs.
- Please operate this equipment after thoroughly reviewing and understanding the contents of this manual.
- Please attach this manual, if the equipment will be sub-leased.
- Please store this manual near the equipment for easy reference.

Following convention will be used throughout the manual to indicate the degree of cautions.	
Danger	***Can cause severe injuries or death.***
Caution	***Can cause minor injuries or damage to the equipment or other properties***
<Caution>	***Other types of caution***

- Even some of the items noted in ***Caution*** may lead to severe injuries. Please read all items and follow all the safety guidelines.

1 Safety Guidelines

Danger

:Suffocation from exhaust fume

- Exhaust fume from the engine contains many elements harmful to human. Do not operate this equipment in poorly ventilated area, such as inside a room or in a tunnel

Danger

:Electrical Shock

- Do not touch the output terminals during operation.
- Be sure to place covers over the output terminals and fasten with fasteners.
- Do not insert metal objects (such as pin or wire) into plug-in receptacles.
- Do not touch wiring or any electronic parts inside equipment during operation.
- Ground the every earth grounding terminal to the earth as set out in the manual.
- If even one of all is unconnected by mistake or accident, it will be much more dangerous for human body than the NO RELAY case, because leaking current inevitably goes through the body.
- Even though all the earth terminals of the loads have been grounded to the earth, the earth grounding terminal and the outer bonnet (canopy) grounding terminal should be grounded to the earth.
- There is always a danger of being electrocuted by short-circuit. Be sure to test generator's insulation resistance periodically.
- Before connecting or disconnecting a load cable to/from output terminals, always turn a circuit breaker to OFF position, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.
- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

Danger

:Injuries

- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.

Caution

:Suffocation from exhaust fume

- Do not point the exhaust fume toward pedestrians or building.

Caution **:Injuries to eyes and skin**

- Battery fluid contains diluted sulfuric acid. Avoid contact with eyes, skin or on clothing. If the acid comes in contact, especially with eyes, flush with a lot of water, and contact your physician immediately.

Caution **: Explosion**

- Do not use the equipment or charge the battery, in the case the battery fluid level is lower than the LOWER level.
- Battery may emit some combustible gas, so keep it away from fire and sparks.

Caution **:Fire**

- This equipment uses Diesel Oil as a fuel. When refueling, always stop the engine, and keep away from fire. Moreover, always wait until the engine cools down before refueling.
- Always wipe any drip of Diesel fuel or Lubrication oil. Do not use this equipment when a leak is found. Repair the equipment before use.
- Temperature around muffler and exhaust can get extremely high. Keep any inflammable items (such as fuel, gas, paint, etc.) away from the equipment.
- Battery may emit some combustible gas, so keep it away from fire and sparks.
- Always operate this equipment on flat surface and, at least 1 meter away from any objects (wall, box, etc.).
- Do not connect AC output to any indoor wiring.
- Always wait until the equipment cools down, before placing any covering materials for storage.

Caution **:Burns**

- Do not open the radiator cap while operating this equipment or immediately after stopping the equipment, to avoid sustaining burns from hot vapor.
- Do not touch the engine and muffler during operation and immediately after stopping the equipment, for the temperature can reach extremely high.
- When checking engine oil or changing oil, always stop the engine, and wait until the engine cools down. If you open either the oil gauge or the oil filler cap during operation, hot oil may cause some injury.

Caution

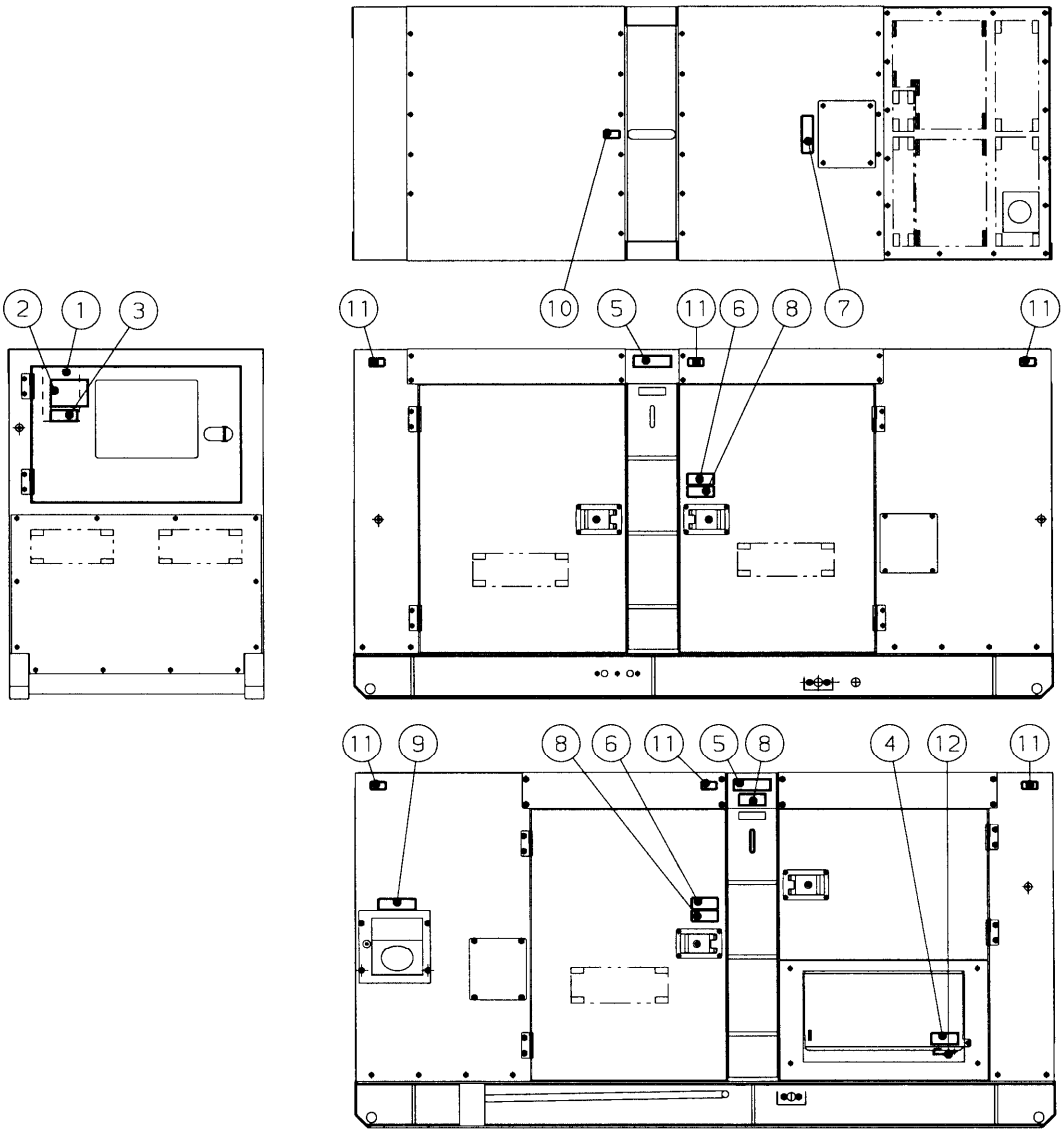
:Injuries

- When lifting the equipment, always use a lift hook.
- Do not use Side rope-through, for it may cause equipment to drop.
- Always place the equipment on a flat and stable surface, to keep the equipment from sliding.
- When starting the engine, turn off the connected equipment and set the circuit breaker to OFF position.
- Do not move the equipment during operation.
- When performing equipment check and maintenance, always stop the engine.
- Do not operate the equipment, if the equipment is being modified or if the parts are removed.

■ Location of Warning labels

When the warning labels become unreadable or damaged, place new labels on the appropriate location, as specified in the following figure. When ordering the label, use following part numbers.

1	**Operational Instruction**	**Part Number 19401-00361**
2	**Safety Instruction**	**Part Number 19402-00188**
3	**Suffocation from exhaust fume**	**Part Number 19402-00161**
4	**Electrical Shock**	**Part Number 19402-00163**
5	**Injuries**	**Part Number 19402-00167**
6	**Injuries**	**Part Number 19402-00162**
7	**Burns**	**Part Number 19402-00165**
8	**Burns**	**Part Number 19402-00164**
9	**Fire**	**Part Number 19402-00166**
10	**Lift points**	**Part Number 19401-00153**
11	**Tie (Sleeper) Marker**	**Part Number 19401-00207**
12	**Bonnet Grounding Terminal**	**Part Number 19401-00206**



2 Specifications

2.1 Specification Matrix

Name of Generator			DG1000MI-400	
Alternator	Type	Unit	Blushless, Rotating Field, 3-Phase, 4-Pole, Synchronous AC Generator	
	Rated Output	kVA	80	100
		kW	64	80
	Rated Voltage (or the below)	V	200	220
	Rated Current (or the below)	A	231	262
	Rated Voltage	V	400	440
	Rated Current	A	115	131
	Frequency	Hz	50	60
	Rated speed	min^{-1}	1500	1800
	Winding	-	3-phase, 4-wire, Star with neutral	
	Power factor	%	80	
	Insulation class	-	H	
	Excitation	-	Self-excitation with AVR	
	No. of poles	-	4	
Engine	Types	-	Vertical Water-cooled 4-cycle Diesel Engine	
	Model (Manufacturer)	-	DD-6BG1T(ISUZU)	
	No. of Cylinders (bore x stroke)	mm	6 (105 x 125)	
	Continuous rated output	kW	73.1	91.2
		PS	99.4	124
	Rated speed	min^{-1}	1500	1800
	Displacement	L	6.494	
	Combustion system	-	Direct Fuel Injection with Turbo Charger	
	Cooling method	-	Radiator	
	Lubricating method	-	Forced lubrication	
	Starting method	-	Electric start	
	Fuel	-	Diesel Fuel （ASTM No. 2-D）	
	Lubricant oil	-	CD class	
	Fuel tank capacity	L	219	
	Lubricant volume (Full)	L	22	
	Cooling water volume	L	22.8	
	Starting motor capacity	V-kW	24 - 4.5	
	Charging dynamo capacity	V-A	24 - 30	
	Battery	-	95D31R x 2	
Operation Device	Volt/Freq/Amp meter	-	O	
	Voltage regulator	-	O	
Protection Device	Oil pressure, Water temp.	-	Lamp indication (Engine stops)	
	Battery charge	-	Lamp indication	
Control Panel	Hour meter	-	O	
		-		
Unit	Dimensions (L x W x H)	mm	2750 x 1000 x 1400	
	Dry weight	kg	1800	

2.2 Ambient Condition

Use the equipment under the following ambient condition. The other condition may cause trouble, insufficient output power or deterioration of durability.

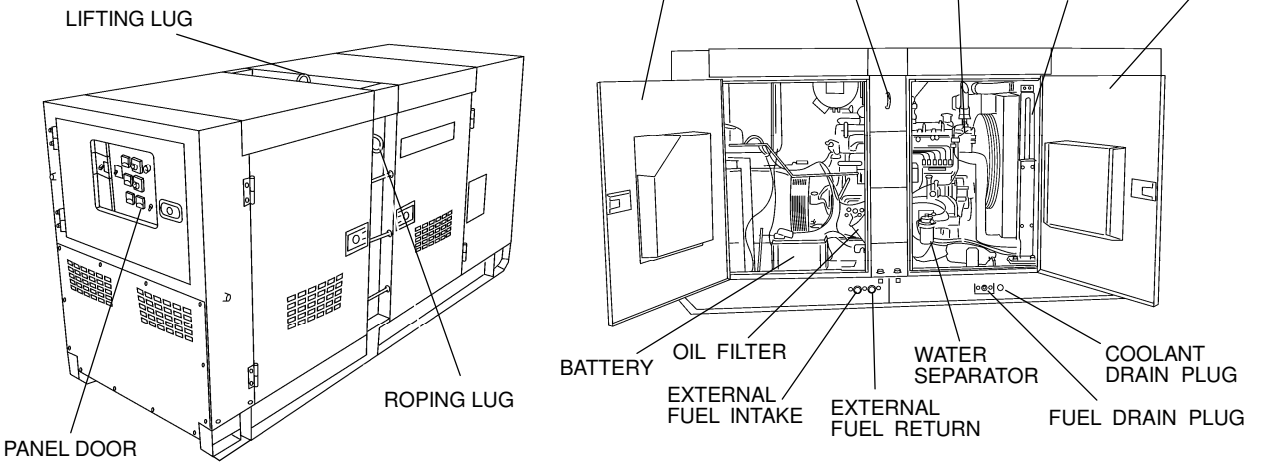
- ■ Ambient Temperature : -15ºC ~ 40ºC
- ■ Humidity : less than 80%
- ■ Altitude : less than 300m

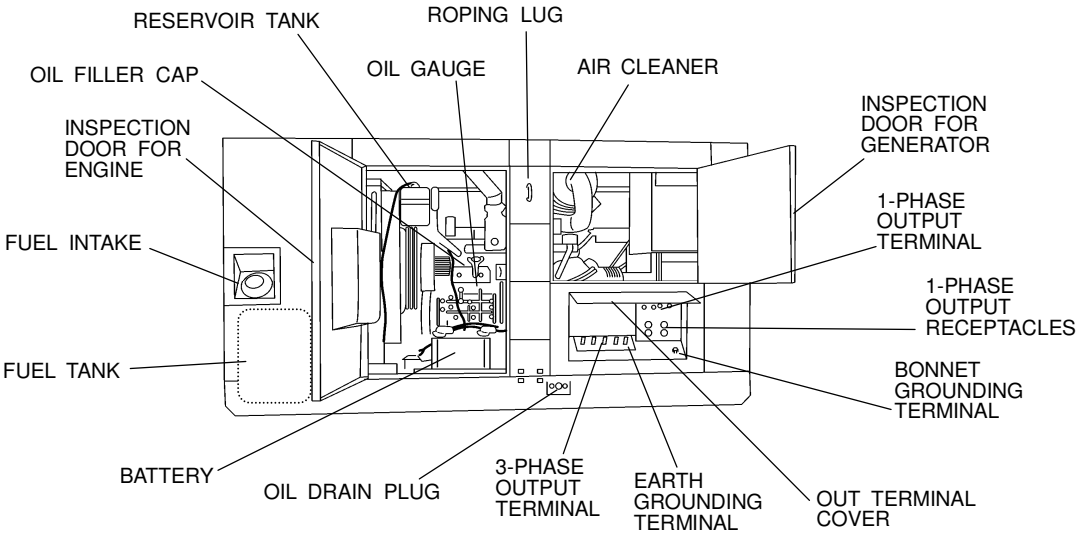
3 Use

- Power source for construction –use equipment, such as submersible pump
- Power source for lighting
- Power source for electric tools and home appliances

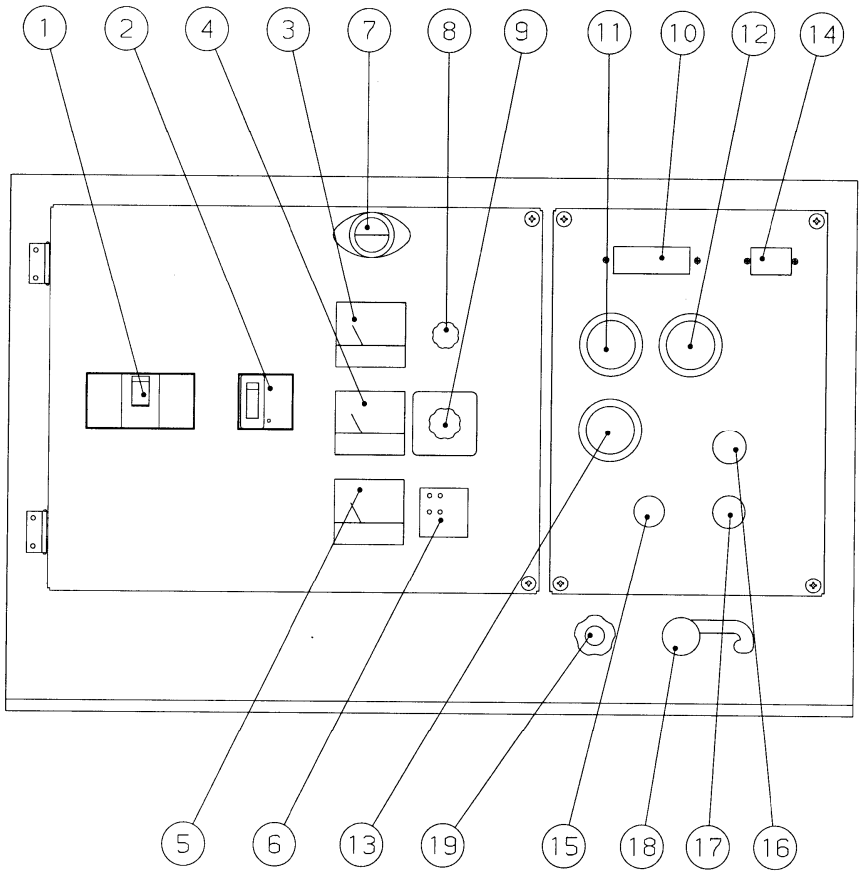
4 Parts

4.1 External view





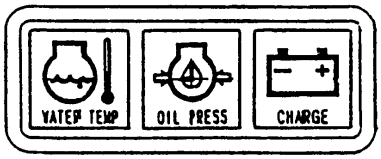
4.2 Control panel



No.	Name	No.	Name
1	3-phase circuit breaker	11	Water Temperature Gauge
2	1-phase circuit breaker	12	Oil Pressure Gauge
3	Voltage Meter	13	Fuel Gauge
4	Amp Meter	14	Hour Meter
5	Frequency Meter	15	Emergency Stop Button
6	Earth Leakage Relay	16	Preheat Lamp
7	Panel Light & Generating Lamp	17	Starter Switch
8	Voltage Regulator	18	Throttle Lever
9	Ammeter Change-Over Switch	19	Frequency Adjusting Screw
10	Monitor Display		

5 Equipment

5.1 Monitor Display



This generator is equipped with monitoring function for water/coolant temperature, oil pressure, battery charge, air filter flow, battery fluid level, and fuel level.

When the equipment is started under normal condition, Oil Pressure and Battery Charge lamps will flash when the Starter Switch is turned from STOP to OPERATING, and all lamps will go off, immediately after the engine is started.

When the abnormality is detected either in water temperature or in oil pressure, the corresponding monitor lamp will flash, and the automatic shutoff shall be engaged.

When the automatic shutoff is engaged, turn the starter switch to STOP position, then restart the engine. When the automatic shutoff is engaged next time, check all parts of the corresponding alarm.

5.1.1 Water Temperature Monitoring Lamp (for temperature High)

Danger **: Injuries**

- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.

Caution **: Burns**

- Do not open the radiator cap while operating this equipment or immediately after stopping the equipment, to avoid sustaining burns from hot vapor.
- Do not touch the engine and muffler during operation and immediately after stopping the equipment, for the temperature can reach extremely high.

WATER TEMP

When the water temperature reaches 105 degrees Celsius during operation, the water temperature-monitoring lamp will flash, and the automatic shutoff will be engaged.

When this occurs, check the Coolant reservoir tank, and replenish if needed (refer to *8-2 Checking coolant / water level*).

If the water level is normal, check for loose fan belt or possible water leak in the cooling system, after the engine is cooled down.

<Caution>

- If the water level is too low, the sensor cannot detect the water temperature.
  Be sure to check the water level in the radiator and the Coolant reservoir tank prior to operating the equipment.

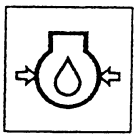
5.1.2 Engine Oil Monitoring Lamp (for oil pressure low)

Danger
: **Injuries**

- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.

Caution
: Burns

- Do not touch the engine and muffler during operation and immediately after stopping the equipment, for the temperature can reach extremely high.
- When checking engine oil or changing oil, always stop the engine, and wait until the engine cools down. If you open either the oil gauge or the oil filler cap during operation, hot oil may cause some injury.



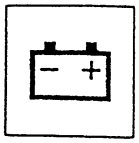
When the engine oil pressure drops below 0.98 x 100kPa (1kgf/cm^2) during operation, the oil pressure monitoring lamp will flash, and the automatic shutoff will be engaged.

When this occurs, check the engine oil level, and replenish to the maximum level if needed

<Caution>

- The engine oil pressure monitor cannot detect the degradation of engine oil itself. Please check the engine oil periodically, and change if needed
  (refer to *8-1 Checking Engine Oil*).

5.1.3 Battery Charge Monitoring Lamp (charge lamp)



CHARGE

When the battery is not able to be charged during operation, the battery charge-monitoring lamp will flash.

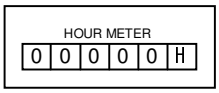
In the event this occurs, stop the engine consult with the authorized distributor or our engineering section.

<Caution>

- Battery Charge Monitor cannot detect the degradation of battery life nor the battery fluid level (refer to *8-6 Checking Battery*)

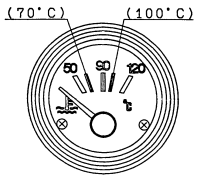
5.2 Gauges

5.2.1 Hour Meter (built into the Tachometer)



Hour Meter keeps track of utilization time. Use this meter to schedule your Preventative Maintenance. Note that the Hour Meter will operate, as long as the start switch is in RUN position, regardless of whether the engine is operating or stopped.

5.2.2 Water Temperature Gauge

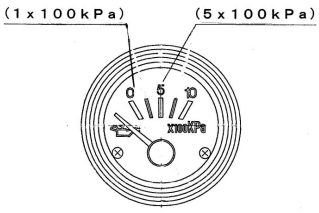


Water Temperature Gauge displays the temperature of engine coolant. Normal temperature may vary depending on the environment, but it should be between 75 to 90 degree Celsius.

<Caution>

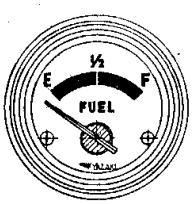
- If the temperature exceeds normal value, disconnect the load, idle the engine at 1000min^{-1}, and wait until the reading falls to the normal temperature range.

5.2.3 Oil Pressure Gauge



Oil Pressure Gauge displays the pressure of engine oil. Normal pressure may vary depending on the environment, but it should display 0.98 – 4.9 x 100kPa (1-5kgf/cm^2). However, under cold weather, the pressure gauge may displays higher reading. Continue idling until the pressure falls to normal range.

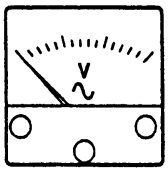
5.2.4 Fuel Gauge



It shows the volume in the fuel tank. When filled up, it shows 『F』.
When the hand is approaching to 『E』, the volume is coming to empty.
Replenish fuel enough promptly.

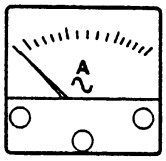
5.2.5 Generator Gauges

5.2.5.1 Voltage Meter



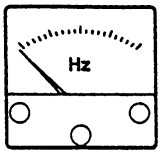
Voltage Meter displays the output voltage (Phase to Phase) from the generator.
Please check and confirm it showing 200V (400V) at 50Hz and 220V (440V) at 60Hz during operation.

5.2.5.2 Amp Meter



Amp Meter displays the electrical (Phase) current output from the generator.

5.2.5.3 Frequency Meter



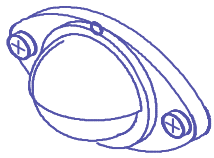
Frequency meter will display the frequency of the generator.
Please check it showing 50Hz or 60Hz during operation.

5.2.6 Lamp

5.2.6.1 Preheat Lamp

When the start switch is turned to <*Pre-heating*> position, the Preheat (Status) Lamp will be turned on in 25 seconds, indicating that the preheating is completed.

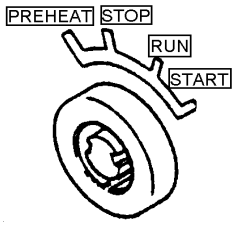
5.2.6.2 Panel Light / Pilot Lamp



Pilot Lamp indicates whether or not generator is generating electricity, when the engine is driving.

5.2.7 Switch

5.2.7.1 Starter Switch



①STOP

When the switch is set to this position, all power will be off.
The switch must be set to this position to remove the key.

②RUN

The switch must be set to this position during operation.

<Caution>

- Do not leave the switch to this position, while the engine is stopped.A battery discharges.

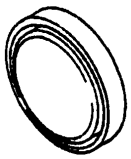
③START

This position will allow user to start the engine. When a user release the key, the setting will automatically return to <RUN> position.

④PREHEAT

This position will allow generator to preheat the glow plug during startup in cold environment

5.2.7.2 Emergency Stop button

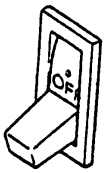


This button is used to stop the engine in emergency. Keep pressing the button until the engine comes to complete halt.

<Caution>

- Keep pressing the button until the engine stops in several seconds. After the engine stops, be sure to return the starter switch to the ＜STOP＞Position.

5.2.7.3 Circuit Breaker

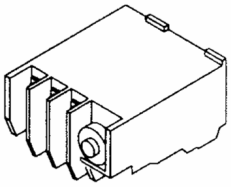


By turning this circuit breaker switch to ON position, power will be transferred to the output terminal and to the load side. By turning to OFF position, it will shut down all power to the load side, preventing overload and short-circuit, and also breaking the earth leakage.

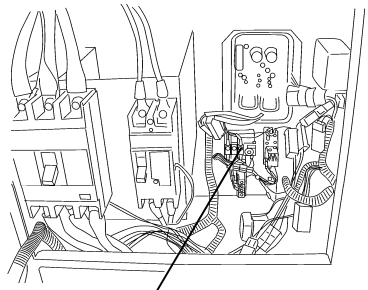
<Caution>

- Do not use this breaker as the ON/OFF switch to the load.

5.2.7.4 Thermal Relay



This relay sends the signal to the 3-Phase circuit breaker and the 1-Phase breaker to trip-off when over-current flows in the circuits.
When the breaker trips-off, it is set at the middle of ON and OFF. In the case, please recover the breaker, according to the following procedure;

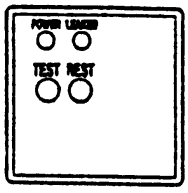


① Stop the engine.
② Open the control panel and push the reset button of the thermal relay.
You can recover the breaker to the ON position.

<Caution>

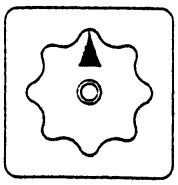
- Do not change the preset value of the thermal relay.

5.2.7.5 Earth Leakage Relay Unit



Sensing the earth leakage current, the unit (relay) send a signal To the 3-phase and the 1-phase breaker to trip-off in order to shut-off The circuit to the terminals (loads).
(refer to.*7-3 Earth Leakage Relay Unit and Grounding*)

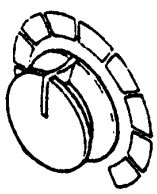
5.2.7.6 Amp Meter Changeover Switch



Using this switch, the current between the phases (R.S.T) will be displayed on the Amp meter.

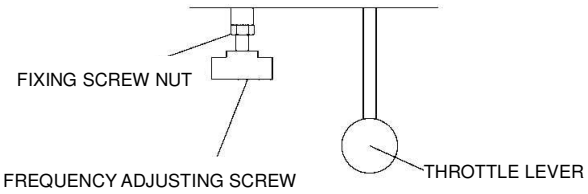
5.2.8 Voltage Regulator and Throttle Lever

5.2.8.1 Voltage Regulator



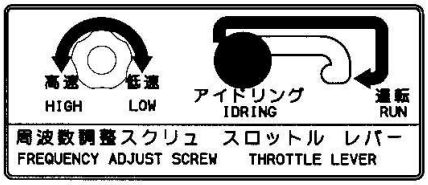
The dial adjusts output voltage.
By turning the dial clockwise, an operator can increase the voltage.
By turning the dial counter-clockwise, an operator can decrease the voltage.

5.2.8.2 Throttle Lever



①Throttle Lever

The lever is to adjust the engine speed.
Set it to ＜IDLING＞when the engine starts and warms-up or cools down.
When the rated power is used, set it to ＜RUN＞ (50 or 60Hz).



②Frequency Adjusting Screw

Set the throttle lever to ＜RUN＞and loosen the fixing Screw nut.
Turn the screw to＜HIGH＞to get high frequency and to＜LOW＞to low frequency.

<Caution>

- The equipment is set it at 50Hz and delivered.
  Re-set it to 60Hz according to the above procedure
- You can get the frequency of 50Hz or 60Hz under the rated output load in case adjusting it as per the following frequency under no load.

	No-load frequency(Revolution)
50Hz Operation	52.5Hz（1575min^{-1}）
60Hz Operation	63.0Hz（1890min^{-1}）

5.3 Fuel Line Changeover Valve (3-way valve)

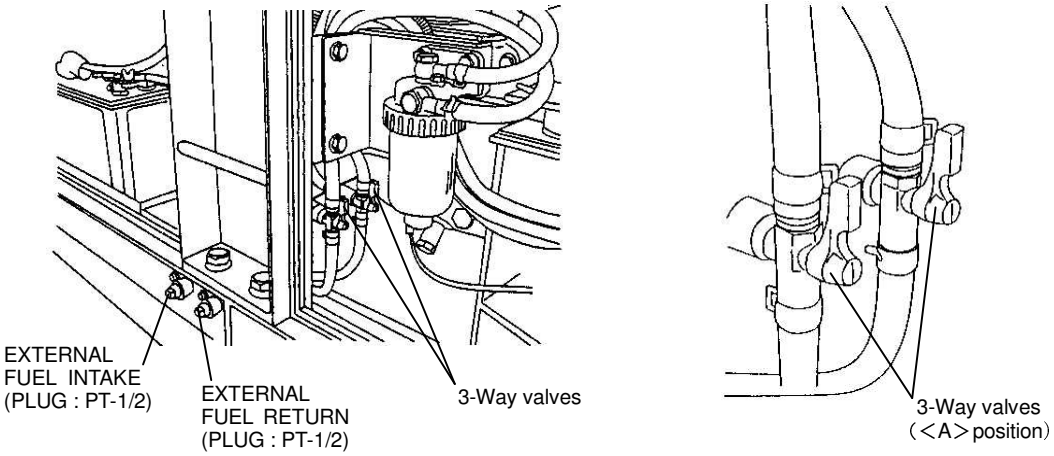
Caution **:Burns**

- Always stop the engine when performing any work on the fuel line.
- Always wipe any drip of Diesel fuel or engine oil. Do not use this equipment, when leak is found. Repair the equipment before use.

By switching the 3-way valve, you can use fuel from external fuel tank.
In this case, the Diesel fuel in the built-in tank will not be used.

5.3.1 Using fuel from built-in fuel tank

The lever for 3-way valve is set to **A** when the equipment is shipped. In addition, both the external fuel intake and the external fuel return are safeguarded with PT-1/2 plugs. Do not remove the plugs, when using the built-in fuel tank.

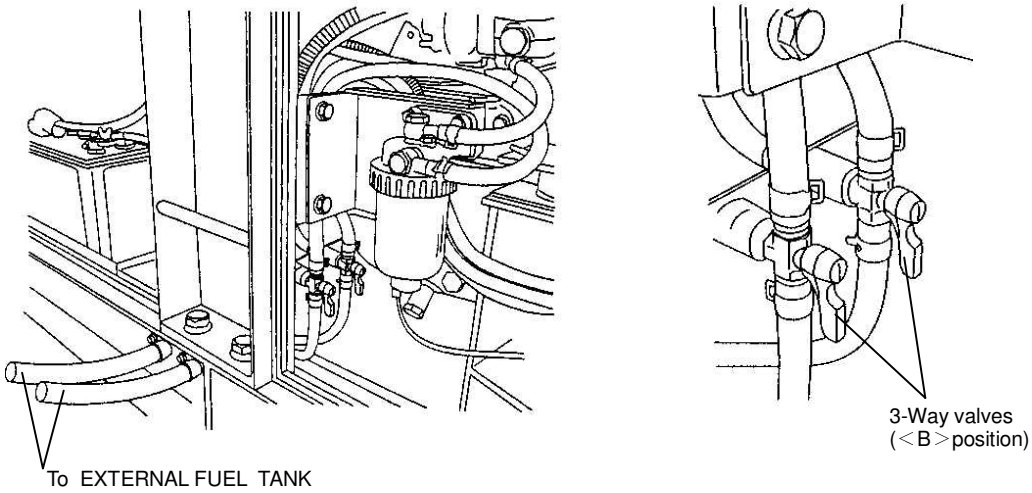


<Caution>

- Always set the lever for 3-way valve back to **A** position and cover the external fuel intake and return port with the supplied plugs, after the hoses are removed.

5.3.2 Using fuel from external fuel tank

Connect hoses from the external fuel tank to the external fuel intake and the external fuel return ports, and set the lever for 3-way valve to **B** position. You can now supply the fuel from the external fuel tank. For detail instruction, refer to *9-6 Connecting to the external Fuel tank*



6 Transport and Installation

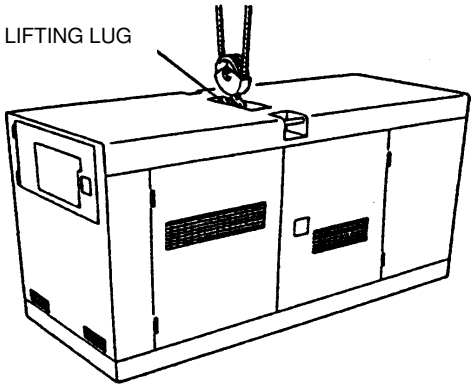
6.1 Transportation

Danger
:Injuries

- When lifting the equipment, always use a lift hook.
- Do not use Side rope-through to attach your lift hook, for it may cause equipment to drop.

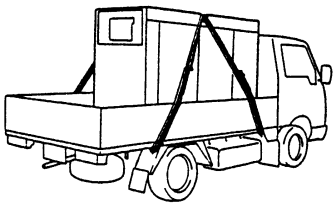
6.1.1 Lifting Equipment

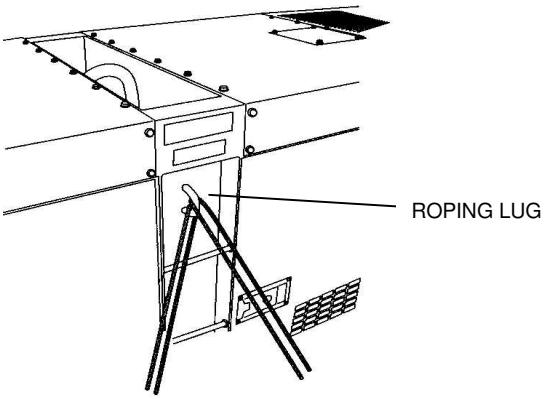
Always use a Lift Hook, when lifting the equipment for transportation.



6.1.2 Transportation

When transporting this equipment, make sure that the equipment is secured properly with ropes tied to the Side Rope Through.





<Caution>

- Always use extreme care when loading, unloading, and transporting the equipment.

Failure to do so may result in damages and malfunction of the equipment.

6.2 Installation

Danger
:Suffocation from exhaust fume

- Exhaust fume from the engine contains many elements harmful to human. Do not operate this equipment in poorly ventilated area, such as inside a room or in a tunnel

Caution
:Suffocation from exhaust fume

- Do not point the exhaust fume toward pedestrians or building.

Caution **:Fire**

- Always operate this equipment on flat surface and, at least 1 meter away from any objects (wall, box, etc.).
- Temperature around muffler and exhaust can get extremely high. Keep any inflammable items (such as fuel, gas, paint, etc.) away from the equipment.

- Always set the equipment on hard, flat surface.
- Keep the equipment at least 1m from a wall or any obstacles, to allow workable space to access the control panel and opening of the panel door.

<Caution>

- This equipment must be operated on hard and flat surface. Operating under any other conditions may result in malfunctions.
- Do not block the airflow from radiator vent or muffler exhaust. It may result in reduced engine performance, overheating, or damage to the electrical parts.
- Operating in dusty area or salty air (by the ocean), or any other particulate environment may result in clogged radiator, which may cause overheating, other malfunctions and insulation deterioration. Use extreme care, frequent checks and maintenance.

7 Connection

7.1 Selecting Cable

Select the cable with proper gauge, based on its allowable amperage and the distance between the generator and the machinery to be connected.

Caution **:Electrical damages**

- If the load exceeds the allowable amperage, the overheating may damage the cable.
- If the cable is either too long or too small a gauge, there will be greater voltage drop to loads, which may result in reduced performance in the connected loads, malfunction, or damages.

<Caution>

- It is recommended to select the proper gauge and length of cable, with consideration of the maximum 5% marginal drop only for the rated voltage, between the terminals of loads and generator via the cables.

■ Expedient Expression : the voltage drop of cables

3-Phase 3-Wire

$$\text{Voltage Drop (V)} = \frac{1}{58} \times \frac{\text{Length(m)}}{\text{Gauge(mm}^2\text{)}} \times \text{Current (A)} \times \sqrt{3}$$

1-Phase 2-Wire

$$\text{Voltage Drop (V)} = \frac{1}{58} \times \frac{\text{Length(m)}}{\text{Gauge(mm}^2\text{)}} \times \text{Current (A)} \times 2$$

■ Selection of cable

(Example) 220V and Voltage Drop 11V

3-Phase 3-Wire Cap Tire Cable, Single Core (Unit: mm^2)

Length / Current	50m or below	75m	100m	125m	150m	200m
50A	8	14	14	22	30	30
100A	14	22	30	38	50	60
200A	38	50	60	80	100	125
300A	50	60	100	100	125	150

(Example) 100V and Voltage Drop 5V

1-Phase 2-Wire Cap Tire Cable, Single Core

Length / Current	50m or below	75m	100m
10A	5.5	5.5	8
20A	8	14	22
30A	14	22	22
50A	22	30	30
100A	30	50	60

(Unit: mm^2)

7.2 Connecting Cable

Danger

:Electrical Shock

- Before connecting or disconnecting a load cable from output terminals, always turn a circuit breaker to OFF position, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

Caution

:Fire

- Do not connect AC output to any indoor wiring.

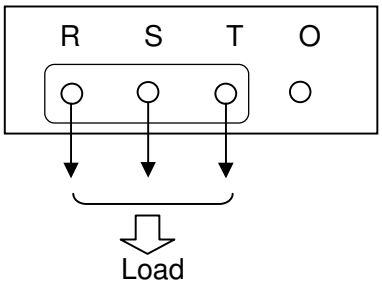
<Caution>

- Divide loads into 3 circuits proportionally as possible, when using the maximum output power especially, and connect them to each phase (R,S,T) respectively.
- Be careful to limit the current under the rated current per the phase .
- The 1-Phase terminals and receptacles output power are originated from the R and T Phase output powers.

7.2.1 Load Connection Terminal Plate (3-Phase)

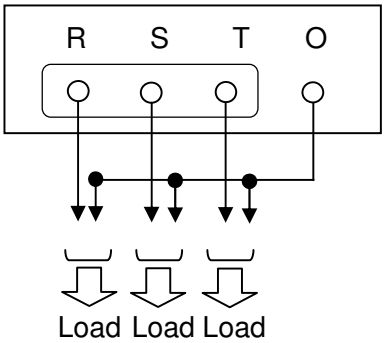
7.2.1.1 For 3-Phase Load

Terminal Voltage: 200V/220V (or 400V/440V) at 50Hz/60Hz



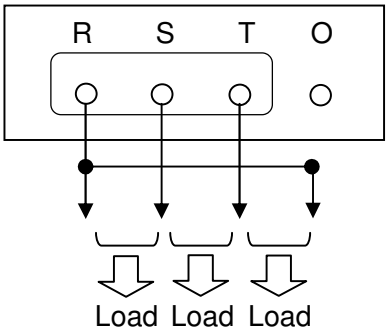
7.2.1.2 For 1-Phase Load(1)

Terminal Voltage: 115V/127V (or 230V/254V) at 50Hz/60Hz



7.2.1.3 For 1-Phase Load(2)

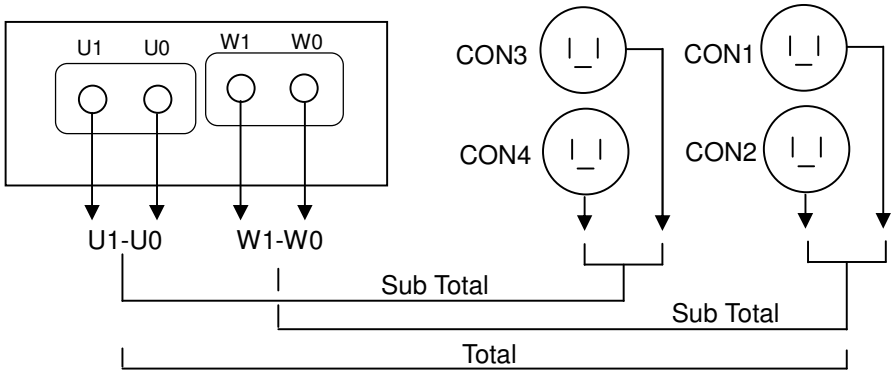
Terminal Voltage: 200V/220V (or 400V/440V) at 50Hz/60Hz



7.2.2 1-Phase Output Terminals & Receptacles

The terminal Voltage: 100V/110V at 50Hz/60Hz only

In the case of no use of 3-Phase output power, refer to the Following drawing and chart.



Voltage (100V/110V) only (Unit: kVA)

U1-U0	W1-W0	CON1	CON2	CON3	CON4	Sub Total	Total
5 / 5.5	5 / 5.5	1.5/1.65	1.5/1.65	1.5/1.65	1.5/1.65	5 / 5.5	10 / 11

7.3 Earth Leakage Relay and Grounding

Danger
:Electrical Shock

- Ground the every earth grounding terminal to the earth as set out in the manual. If even one of all is unconnected by mistake or accident, it will be much more dangerous for human body than the –relay case, because leaking current inevitably goes through the body.
- Even though all the bonnets of the loads have been grounded to the earth, the earth grounding terminal and the outer bonnet (canopy) grounding terminal should be grounded to the earth.
- Grounding should be made after the engine is stopped.
- Whenever the earth leakage breaker relay is activated, you should always repair the leaking place first of all.

The generator is provided with the earth leakage breaker relay to detect any leakage Produced due to such the trouble as insulation failure of the load while the generator is running and to cut off the circuit for protection against any accident such as electrical shock resulting from the trouble.

The specification of the earth leakage relay;

- Rated Sensitive Current: 30mA (or below) (Grounding resistance: 500Ω or below)
- Sensitive time: Within 0.1second

<Caution>

- Different sensitivity relay is available to change. But, in the case, consult with our Engineering Section, because the value each of grounding resistance and grounding condenser will be different accordingly.

  In the event bigger value sensitive relay (100, 200, 500mA, etc.) than 30mA will be used in the device, they are too high in value to prevent from electrical shock. Therefore, install each load with the 30mA (or below) relay separately.

  The detailed information about sensitive current selection is prepared to give by the Article No.151.2 In Earth Leakage Breaker – Selection of The Wiring Regulations issued by Japan Electric Association.

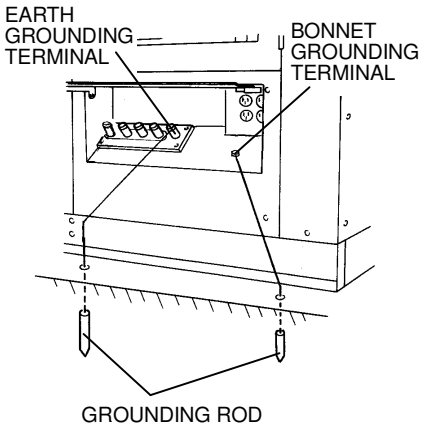
7.3.1 Grounding Work

The qualified electrician should perform the grounding of the following 3 points (500Ω or below).

- The earth grounding terminal in the output terminal block
- The Outer Bonnet (Canopy) grounding terminal of the generator
- The Outer Bonnet of the load

<Caution>

- In the event you cannot ground the generator to the earth, consult with the authorized distributor or our engineering section

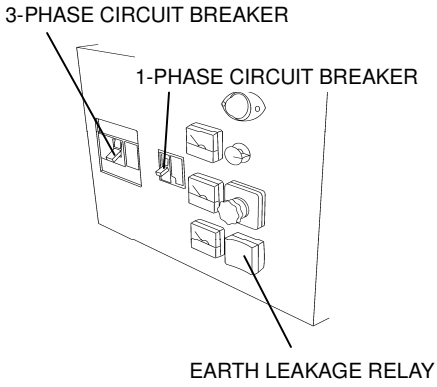


7.3.2 Operation Check

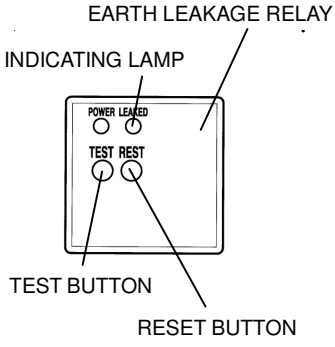
Danger
:Electrical Shock

- Before turning the 3-Phase circuit breaker to ON position, ensure that the breaker or the Switch of loads are positioned to OFF. Operate the 3-Phase circuit breaker, well-communicating with the electrician by the load side.

Before operating the generator, check always if the device can work.



① Ensure that the breakers and the switches of load(s) are positioned to OFF.
② Ensure that the 3-Phase circuit breaker and the 1-Phase circuit breaker are positioned to OFF.
③ Following the procedure in *9-1, Initializing/Preparation*, start an engine.
④ Turn (Push-up) the 3-Phase circuit breaker (lever) and the 1-Phase circuit breaker (lever) to ON position.
⑤ Push the test button (red) in the earth leakage relay unit. When the button is pushed, the earth leakage indicating lamp turns ON and circuit breakers are positioned in the middle between ON and OFF positions simultaneously, the device works normally.
⑥ Push the reset button. The earth leakage indicating lamp (red) turns OFF subsequently.
⑦ Turn (Push-down) the 3-Phase circuit breaker (lever) and the 1-Phase circuit breaker (lever) to OFF position.



In the event you cannot complete every step of the above procedure to the end, the device is out of order. Consult with our authorized distributor or our engineering section and ask to repair.

7.3.3 The earth leakage breaker relay has activated

In the event the earth leakage breaker relay has activated, the earth leakage indicating lamp Turns ON and the 3-Phase earth leakage breaker (lever) trips off to be positioned in the middle between ON and OFF positions.

In the above condition, even though you stop the engine once and start it again, the 3-Phase Circuit breaker (lever) does not restore to ON or OFF, and the reset button does not function, because the device keeps detecting current leakage.

Stop the engine promptly and find the leakage point to repair. After repairing the leakage point(s), proceed with the following restoration steps. (In the case the earth leakage indicating lamp does not turn to ON simultaneously, the cause is Over-Loaded or Short-Circuit.)

① Push the reset button or stop the engine.

② Restore (Push-down) the 3-Phase circuit breaker (lever) and the 1-Phase circuit breaker (lever) to OFF position.

By the above procedure, you can reset the breakers to ON positions.

8 Initialization and pre-check

Danger

:Electrical Shock • Injuries

- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

Caution

:Fire • Burns

- When checking engine, always stop the engine, and keep away from fire. Wait until the engine cools down, before performing any checks.

Caution

:Fire

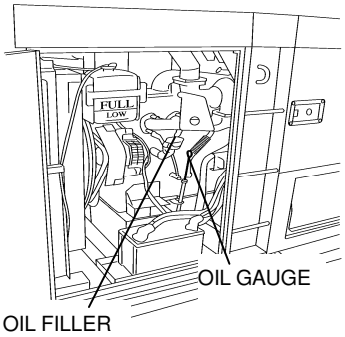
- Always wipe any drip of fuel or oil. Do not use this equipment when a leak is found. Repair the equipment before use.

8.1 Checking Engine Oil

Please refer to the user's manual for Engine separately

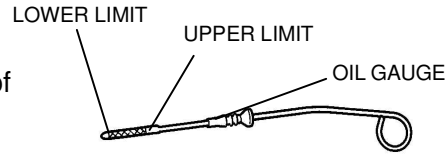
When checking for engine oil, be sure to keep the equipment leveled, and insert the oil gauge all the way.

Prior to starting the equipment, make sure to fill the engine oil to the MAX line through the oil filler.



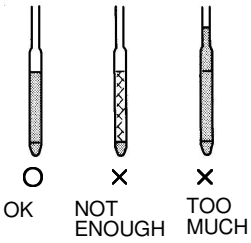
<Caution>

- Check engine oil volume IN 10-20 MINUTES LATER, always after stopping engine or replenishing fuel.
- If the equipment is not leveled, you cannot obtain accurate oil level.
- Do not overfill the engine oil. The excessive amount of engine oil may damage the engine.



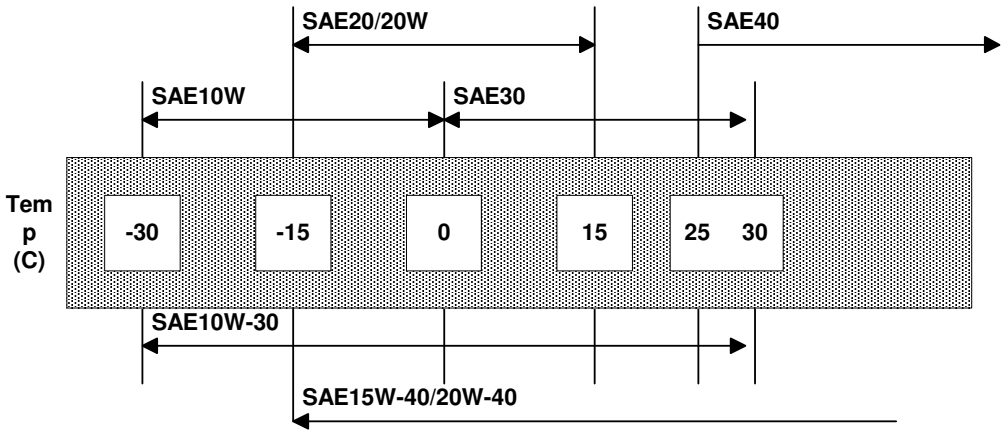
8.1.1 Selecting proper engine oil

Use the API class CD grade or higher.



8.1.2 Use the engine oil for Diesel engine with proper viscosity, based on the temperature (refer to the chart below).

- Viscosity and temperature



8.1.3 Engine Oil Capacity

(Unit:L)

Lubrication Oil (including the oil in filter)
22 (2)

Value in ( ) shows the oil in filter

8.2 Checking Coolant/water

※ Also refer to *the User's Manual for Engine*

Danger

:Injuries

- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

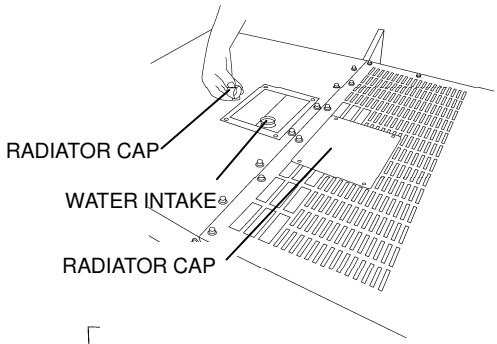
Caution

:Burns

- Do not open the radiator cap while operating this equipment or immediately after stopping the equipment, to avoid sustaining burns from hot vapor.
- Do not touch the engine and muffler during operation and immediately after stopping the equipment, for the temperature can reach extremely high.
- Check the radiator and coolant reservoir tank for water and add water in case of shortage.

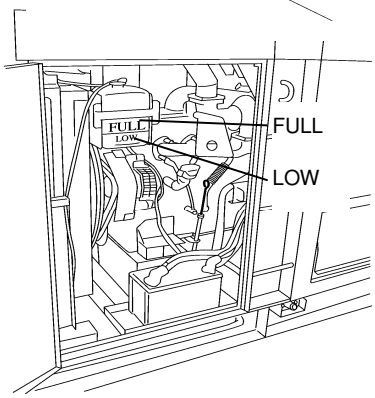
8.2.1 Checking Radiator / Adding water

① Remove the radiator cap cover
② Remove the radiator cap
③ Fill up the radiator up to the top
④ Install the cap back and tighten
⑤ Reinstall the radiator cap cover



8.2.2 Checking Coolant reservoir tank / Adding coolant

① Check to see if the coolant level is between MIN and MAX line
② Fill up to the MAX line, if the coolant level is low



<Caution>

- Use soft water, such as tap water
- If the outside temperature is near freezing, use Long Life Coolant (LLC)(30% mixture LLC is used, when shipped from factory)
- Use same type of coolant with identical mixture ratio for the reservoir tank
- Mixture ratio of the coolant should be between 30 to 45%, depending on the outside temperature

- Replace LLC every 2 years or 1000 hours

Mixture ratio (for reference only) :

Ambienr temperature (Celsius)	-15℃	-20℃	-30℃
Mixture ratio	30%	35%	45%

8.2.3 Coolant Capacity

(Unit: L)

Total Coolant Volume (including reservoir tank)
22.8 (1.5)

The value of ( ) shows the reservoir tank`s volume.

8.3 Checking Fan Belt

※Also refer to *the user's manual for Engine* separately

Danger **:Injuries**

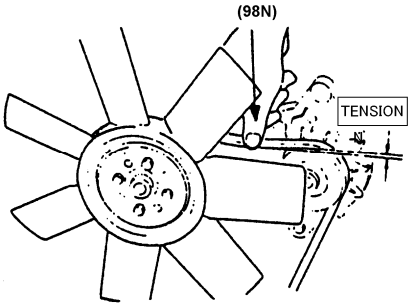
- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.
- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.

Caution **:Burns**

- Do not touch the engine and muffler during operation and immediately after stopping the equipment, for the temperature can reach extremely high

8.3.1 Tension

Tension should be optimum when the fan belt has 10 to 15mm slacks, when applying finger pressure (about 98N{approximately 10kgf}) at midpoint between fan pulley and alternator pulley.



8.3.2 Condition

Check for any damage on the fan belt. Replace if necessary.

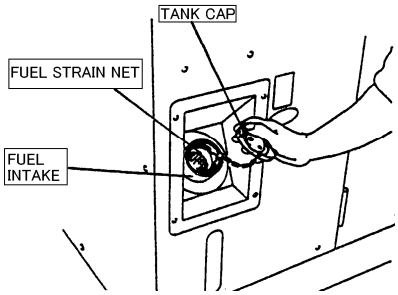
<Caution>

- Refer to *the User's manual for Engine* for adjusting and replacing of the fan belt.

8.4 Checking Fuel

> ***Caution*** **:Fire**
>
> - Always wipe any drip of Diesel fuel or oil. Do not use this equipment when a leak is found. Repair the equipment before use.

Check for the fuel level in the tank. Add if necessary.



<Caution>

- Use Diesel fuel, ASTM D975 No.2-D in the event ambient temperature reaches down to –5□.
- Always use the Diesel fuel strainer
- Fill the fuel tank slightly less than the FULL tank,
- Fuel requirements:

> ***NOTICE****: The fuel injection pump, injector or other parts of the fuel system and engine can be damaged if you use any fuel or fuel additive other than those specifically recommended by Isuzu.*
> *Such damage is not our responsibility, and is not covered by the Warranty. To help avoid fuel system or engine damage, please heed the following:*
> - *Some service stations mix used engine oil with diesel fuel. Some manufacturers of large diesel engines allow this; however, for your diesel engine, do not use the diesel fuel which has been contaminated with engine oil. Besides causing engine damage, such fuel can also affect emission control. Before using any diesel fuel, check with the service station operator to see if the fuel has been mixed with engine oil.*
> - *Do not use any fuel additive. At the time this manual was printed, no other fuel additive was recommended. (See your authorized dealer to find out if this has changed.)*

The engine is designed to use either Number 1-D or No. 2-D diesel fuel. However, for better fuel economy, use No. 2-D diesel fuel whenever possible. At temperatures less than –7 °C (20° F), No.2-D fuel may pose operating problems (see "Cold Weather Operation" which follows). At colder temperatures, use No.1-D fuel (if available) or use a "winterized" Number 2-D (a blend of No. 1-D and No. 2-D). This blended fuel is usually called No. 2-D also, but can be used in colder temperatures than No.2-D fuel which has not been "winterized". Check with the service station operator to be sure you can get the properly blended fuel. Note that diesel fuel may foam during a fill-up. This can cause the automatic pump nozzle to shut off even though your tank is not full.

Notice: *Do not use home heating oil or gasoline in your diesel engine; either may cause engine damage.*

8.5 Checking Fuel, Engine Oil, and Water leakage

Caution

:Fire

- Do not use this equipment when a leak is found. Repair the equipment before use.

Be sure to check for any fuel leak at the hose connection, and oil and coolant leak by opening side doors.

8.6 Checking Battery

Caution

:Injuries to eyes and skin

- Battery fluid contains diluted sulfuric acid. Avoid contact with eyes, skin or on clothing. If the acid comes in contact, especially with eyes, flush with a lot of water, and contact your physician immediately.

Caution

:Fire

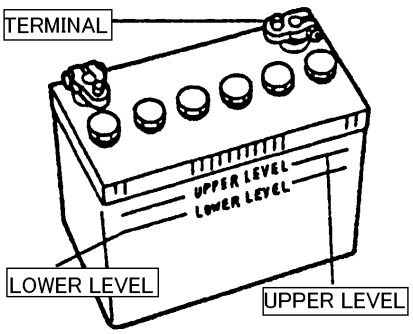
- Do not use the equipment or charge the battery, in the case the battery fluid level is lower than the LOWER level.
- Battery may emit some combustible gas, so keep it away from fire and sparks.

① Check the fluid level. If the level is near or lower than the MIN level, add distilled water until the fluid level reaches the MAX limit.

② Make sure that the battery cables are firmly secured to the posts. Tighten the clamps if necessary.

<Caution>

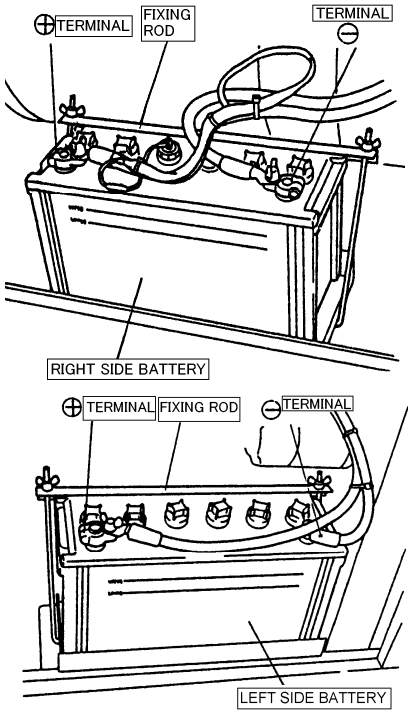
- Check the hydrometer of the battery fluid. If it falls below 1.23, the battery requires recharging.Please call our authorized distributor or our engineering section.



■ **Replacing the battery**

Two batteries are connected in series order. Whenever you replace battery or disconnect cables, always proceed with the following steps, otherwise battery may short-circuit.

8.6.1 Replacing the battery installed on the left side toward the control panel:



① Remove the clamp and cable from negative **(-)** post from the battery on the **right** side (always remove negative side first)

② Remove the clamp and cable from **positive (+)** post from the battery on the **right** side

③ Remove the clamp and cable from **negative (-)** post from the battery on the **left** side (always remove negative side first)

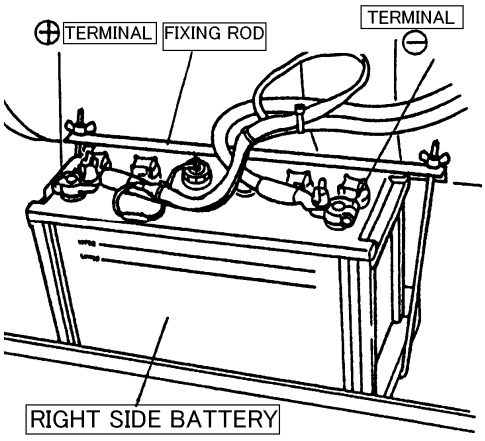
④ Remove the hold-down clamp from the battery on the left side

⑤ Remove the clamp and cable from **positive (+)** post from the battery on the **left** side

⑥ Remove the **left** side battery from the seat

※Reinstall the new battery in the reverse order (always install the cable to the **positive (+)** post of the new battery first).

8.6.2 Replacing the battery installed on the right side toward the control panel:



① Remove the clamp and cable from **negative (-)** post from the battery on the **right** side (always remove negative side first)

② Remove the hold-down clamp from the battery on the right side

③ Remove the clamp and cable from **positive (+)** post from the battery on the **right** side

④ Remove the **right** side battery from the seat

※Reinstall the new battery in the reverse order (always install the cable to the positive (+) post of the new battery first.

<Caution>

- Make sure that the removed cable does not come in contact with the battery post.

9 Operation

9.1 Initializing / preparation

:Suffocation from exhaust fume

- Exhaust fume from the engine contains many elements harmful to human.
  Do not operate this equipment in poorly ventilated area, such as inside a room or in a tunnel

Caution **:Suffocation from exhaust fume**

- Do not point the exhaust fume toward pedestrians or building.

Caution **:Fire**

- Temperature around muffler and exhaust can get extremely high. Keep any inflammable items (such as fuel, gas, paint, etc.) away from the equipment.
- Always operate this equipment on flat surface and, at least 1 meter away from any objects (wall, box, etc.).

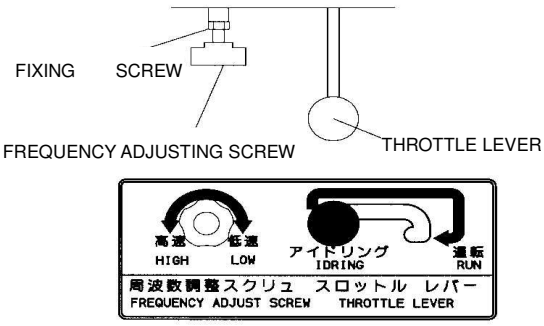
Caution **:Injuries**

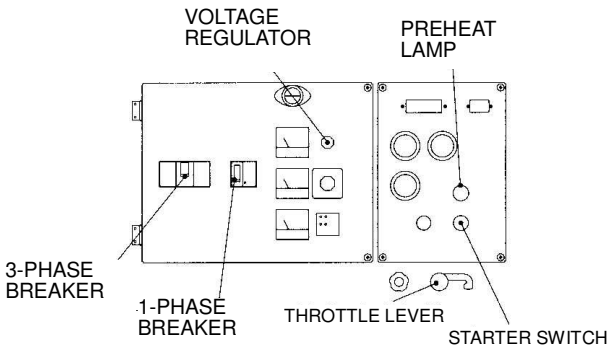
- Always place the equipment on a flat and stable surface, to keep the equipment from sliding.
- When starting the engine, turn off the connected equipment and set the circuit breaker to OFF position.

① Turn the circuit breaker for single-phase and 3-phase on the control panel to OFF position

② Set the Throttle Lever to IDLING position.

③ Turn the starter switch to <START> position, and start the engine. In cold environment, turn the starter switch to <Pre-heating> position, wait until the pre-heating status lamp comes on, and start the engine





<Caution>

- Do not drive the starter motor for more than 10 seconds successively
- If you need to restart, wait at least 30 seconds before the retry.

④ Release the starter switch, as soon as the engine is started
⑤ Keep the engine idle for at least 5 minutes
⑥ Set the throttle lever to RUN. Ensure that the frequency meter shows the following frequency at no load.

	No-load frequency(Revolution)
50Hz Operation	52.5Hz（1575min^{-1}）
60Hz Operation	63.0Hz（1890min^{-1}）

<Caution>

- In either case of incorrect frequency or frequency change, adjust the frequency by FREQUENCY ADJUST SCREW.
- By setting frequency to the above frequency under no load, 50 or 60Hz(almost) will be obtained at the rated output load.

⑦ Adjust to the required voltage by adjusting Voltage regulator.

50Hz Operation	200V
60Hz Operation	220V

⑧ Turn the circuit breaker to ON position to send power to the load side.

Danger

:Electrical Shock ● Injuries

- Before turning the circuit breaker to ON position to send power to the load side, always ensure that any circuit breaker and switch of loads are positioned to OFF.
- In the case the generator and the load are away from each other, proceed with the Above steps, communicating well with the other person by the load in order to prevent from accident.

9.2 200/400 Voltage Changeover - Dual Voltage System

The generator is incorporated with dual voltage system.
So, you can easily change 400/440V to 200/220V or adversely.
You can get 200V or 400V by changing the combination of output terminals with bus plates

Danger

:Electrical Shock

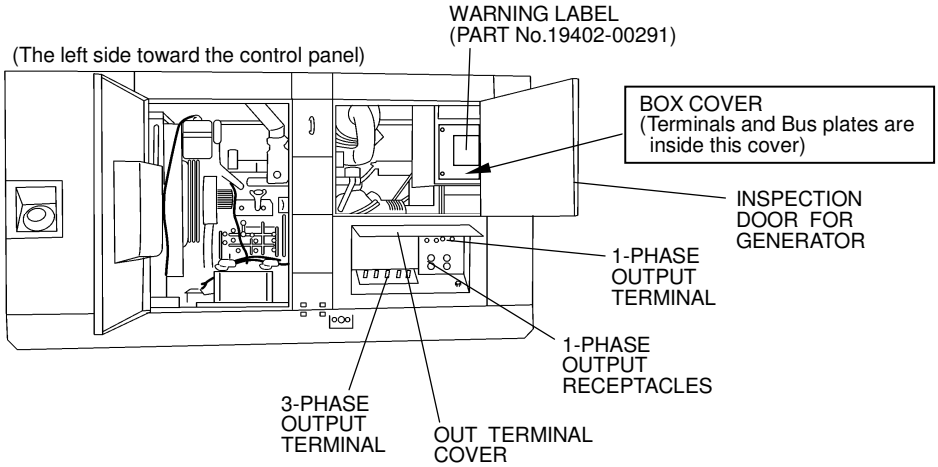
- Be sure to set the circuit breaker OFF and stop operation before setting.

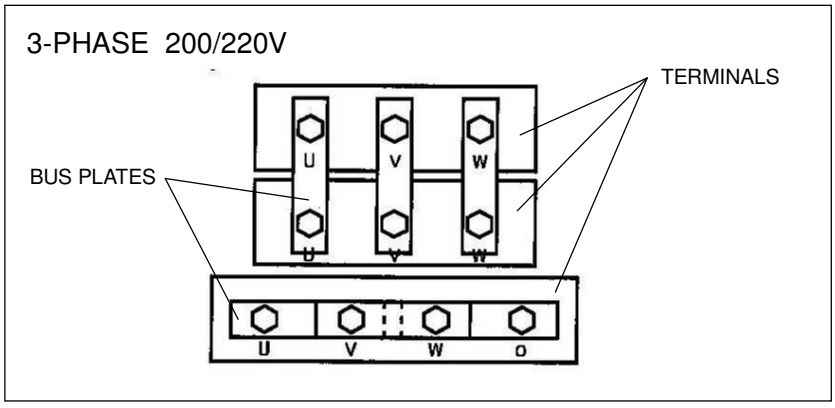
Caution

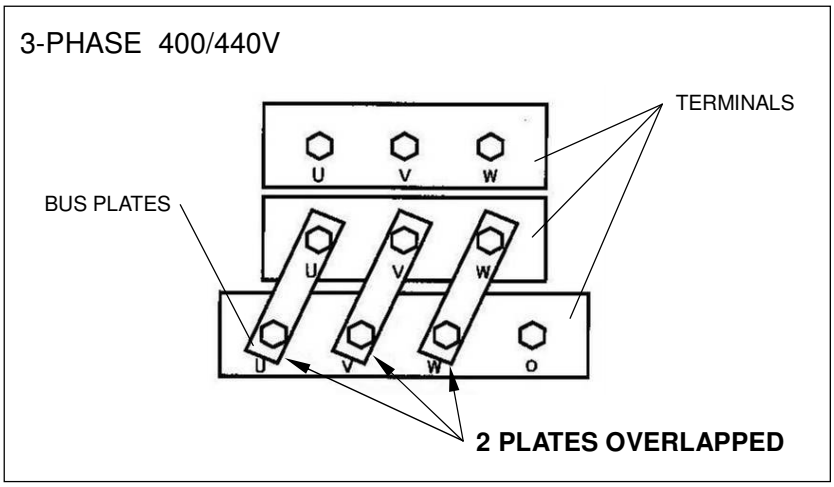
: Damages to the property

- Be sure to set the bus plates at the right positions and screw them securely.
- Always ensure that the bus plate combination is correct (200V or 400V), connections of cables to the output terminals are correct and the voltage of loads is correct to use.

① Turn off the both 3-Phase and 1-Phase breakers to OFF.
② Open the box cover next to the control box and change the 6 bus plates connected to the output terminals to the required voltage combination.







③ The 3-phase voltage is energized to the 3-phase output terminals.
Refer to *7-2. Connecting cable*

④ Starting the engine and turning the 3-phase breaker to ON, the 3-phase current is sent to the 3-phase output terminals.

9.3 During Operation

9.3.1 Post startup check

- Make sure that all meters (gauges) and displays are working properly
  (refer to *5. Equipment*)

- Check for any unusual vibration or noise
- Check for any unusual color from the exhaust. Under normal condition, the exhaust fume has no color or light bluish color.

<Caution>

- If finding out abnormality, consult with the distributor or our engineering section in order to repair, without using the machine.

9.3.2 During operation

- Make minor adjustment to voltage and speed using the Frequency Adjusting Screw and Voltage Regulator, by monitoring frequency meter, and voltage meter

■ Vacuuming the air out of the fuelling system in event of no fuel

※Refer to the *User's manual for Engine*.

This generator is equipped with automatic vacuuming feature. Thus if the engine stops due to running out of fuel, follow the next steps to vacuum the air out.

Caution
:Fire

- Always wipe any drip of gasoline or oil.

① Add fuel to the fuel tank

② Turn the starter switch to <RUN> position. It will take approximately 30 seconds to vacuum the air out.

<Caution>

- Ensure that all the air is completely extracted from fuel line, by setting the throttle lever to IDLING and start the engine. In the case air is in the fuel line, the engine speeds is unstable, and proceed with the vacuuming steps again.

9.4 Stopping the Generator

① Turn the switch and the circuit breaker for the load equipment to OFF

② Turn the circuit breaker for single-phase and 3-phase on the control panel to OFF position

③ Set the throttle lever to IDLING

④ Keep the engine idle (cooling down) for at least 3 minutes

⑤ Turn the starter switch to STOP position

9.5 Protection Features

This generator is equipped with automatic shutdown feature and display of the location of alarm, in event of any alarm situation. In event of the automatic shutdown or alarm lamp flashing, turn off the engine and investigate the alarm.

Protection Feature List

No.	Symptoms	Action			Cause
		Circuit Breaker OFF	Automatic Engine Shutoff	Alarm Lamp Flash	
1	High Coolant temperature	--	○	○	Engine coolant temperature is too high (default at 105 degrees Celsius)
2	Oil pressure drop	--	○	○	Engine oil pressure dropped (default at 0.98 x 100kPa) ($1.0kg/cm^2$)
3	Insufficient battery charge	--	--	○	When the battery can no longer hold charge
4	Current leaks to the earth	○	--	○	When current leaks to the earth
5	Overload	○	--	--	When the circuit overloads

○ indicate the automatic feature

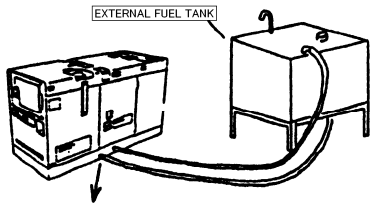
9.6 Connecting to External Fuel Tank

Caution
:Fire

- Always stop the engine, when working on the fuel line.
- Always wipe any drip of Diesel fuel or oil. Do not use this equipment when a leak is found. Repair the equipment before use.
- Ensure that there is no fuel leakage on the fuel line after the fuel line working finished.

① Turn the lever for 3-way valve to **A** position

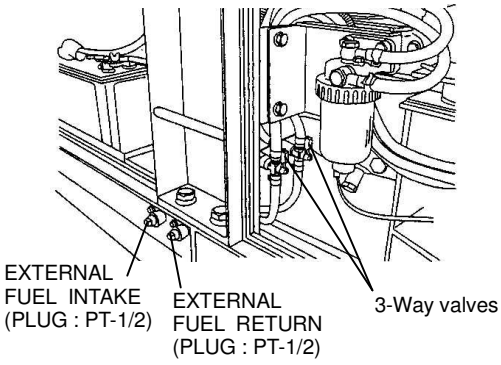
② Disconnect the PT-1/2 plugs from both the external fuel intake and an external fuel return, and connect the hoses from an external fuel tank, as shown below.



③ Turn the lever for 3-way valve to **B** position.

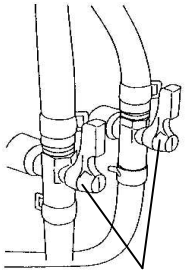
④ Vacuum out the air from connected hoses.

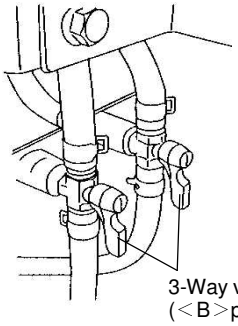
This will allow the use of the fuel from an external fuel tank.



<Caution>

- To vacuum out the air from the fuel line, refer to *9.3 During Operation* section.
- Use always oil-proof hose in 8-10mm inner diameter as connecting hose.
- The fuel level in the external fuel tank should be 0 to 3m higher than the bottom of the generator.
- To avoid any leaks from the external fuel intake and an external fuel return ports, always turn the lever for 3-way valve to **A** position.
- Use extreme caution when connecting the hoses. If the lever position is not set properly, the fuel may leak from either the built-in fuel tank or an external fuel tank.
- Set the fuel intake position 15-20mm above from the external fuel intake bottom line, otherwise water or garbage in the tank may come into the fuel line.
- In order to avoid engine malfunction due to air suction, set the fuel return at the same level as the fuel intake level in the external tank.
- Just after having connected to external fuel tank, there may be a case that engine speed is unstable and engine stops due to insufficient air extraction. Therefore, be sure to confirm that the air is extracted completely and the engine speeds keeps stable before leaving the equipment under people-less operation.





10 Maintenance

Danger

:Electrical Shock • Injuries

- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

Caution

:Fire • Burns

- When checking engine, always stop the engine, and keep away from fire. Wait until the engine cools down, before performing any checks.

Caution **:Fire**

- Always wipe any drip of gasoline or oil. Do not use this equipment when a leak is found. Repair the equipment before use.

To optimize the use of this generator, we recommend the periodical equipment checks and maintenance, based on following maintenance matrix. Use the hour meter as a guide for the operating time.

<Caution>

- The authorized technicians should perform all maintenance work, except for the pre-startup checks.
- Request for the maintenance items with ●mark to the authorized dealer or our engineering section.
- This chart only covers the simple checks and maintenance for the engine. For more detailed guide, please refer to the User's Manual for the engine.
- Always use our genuine replacement parts.
- In the event you are using Heavy Oil A as a fuel, you should change engine oil, oil filter and fuel filters and the inspection of fuel injection nozzle in shorter time, at every half the hours shown in the matrix.

Description	Startup check	Every 200hrs	Every 400hrs	Every 500hrs	Every 1000hrs
Engine Side					
Clean each parts / tightening	○				
Engine oil checks / add oil	○				
Engine oil change (*1st time at 50 hr mark*)	○	○			
Oil Filter change (*1st time at 50 hr mark)*	○		○		
Coolant level check / add coolant	○				
Exhaust color check	○				
Coolant change					○ or 2 yr.
Drain excess water and sediments in the water separator	○				
Drain water from fuel filter or replace		○ Clean		○ Replace	
Drain water from fuel tank		○			
Clean water separator and clean gauze filter in engine feed pump				○ Clean	
Change filter in the magnet pump for air extraction in fuel line					○ Replace
Clean inside fuel tank					●
Leak check (fuel, oil, and coolant)	○				
Replacing fuel hose					● or 1 yr.
Clean or replace air cleaner element		○ Clean		○ Replace	
Battery fluid level check	○				
Battery hydrometer check				○	
Fan belt check	○				
Radiator Flush Cleaning				●	
Check and adjust engine valve clearance					●
Compression check					●
Fuel injection nozzle check			●		
Fuel injection timing check					●
Generator side					
Various meter and alarm lamps check	○				
Operation check of earth leakage relay	○				
Grounding resistance check	○				
Insulation test		○			

10.1 Oil Change

First time	50 hour mark
From second time	Every 200 hours

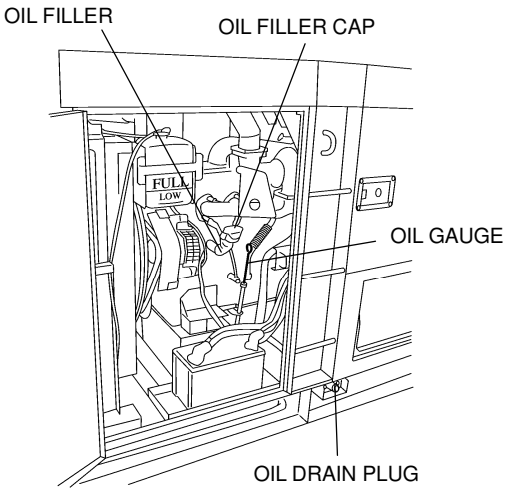
① Remove Oil Filler cap

② Loosen the engine oil drain plug and allow the oil to drain fully

③ Reinstall the drain plug

④ Add oil from oil filler and fill up to the MAX level.
You should check the oil level on the oil gauge

⑤ Reinstall the filler cap hand-tight

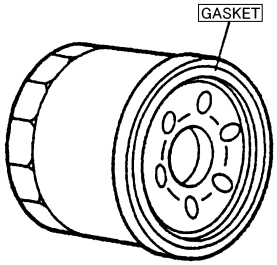


<Caution>

- For the types of engine oil to use and volume to replace, refer to *8-1 Checking Engine Oil*

10.2 Oil Filter Change

First time	50 hour mark
From second time	Every 400 hours



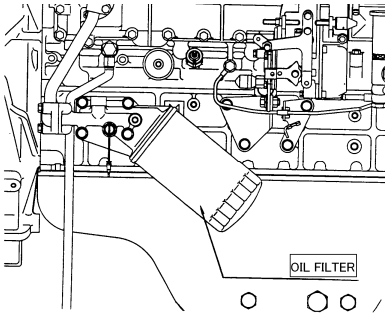
① Drain the engine oil fully, as described in 10.1

② Loosen and remove the oil filter, using an oil filter wrench

③ Smear a little engine oil on the rubber gasket of the new oil filter

④ Screw the new filter into place and tighten it by hand until the gasket contacts the seat. Then, give it additional 3/4 - 1 turn to seat the filter, using an oil filter wrench

⑤ Add oil and install filler cap



<Caution>

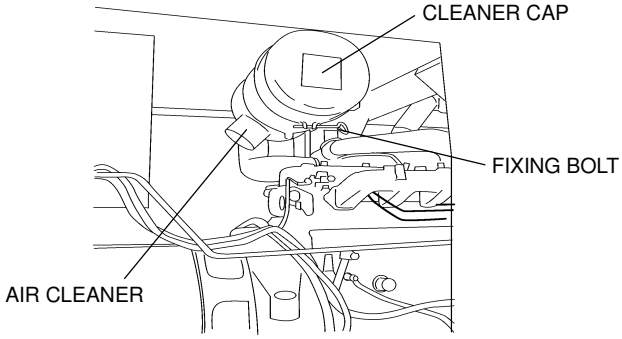
- If an oil filter wrench is not available, contact our authorized distributor or our engineering section.
- Oil filter

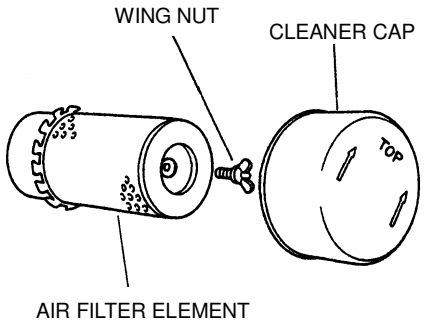
ISUZU Part No.
1132402321

10.3 Cleaning / Changing Air Filter Element

Clean	Every 200 hours
Replace	Every 500 hours

① Loosen the bolt that is holding the air cleaner and remove the cleaner cap
② Unscrew the wing nut and remove the filter element
③ Clean or replace the filter element, and reinstall it in reverse order

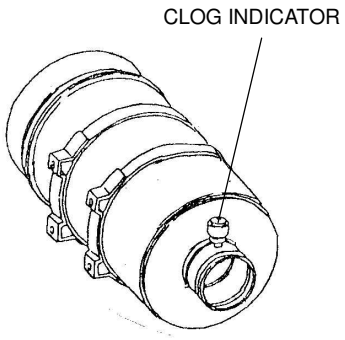




<Caution>

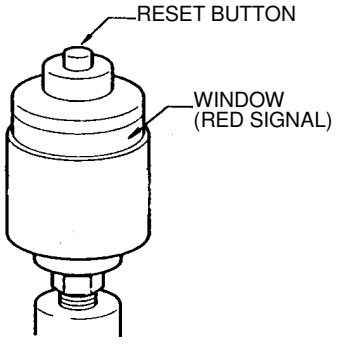
- Always make sure that the arrow mark on the cleaner cap is pointing upward
- Clean more frequently, if used in dusty environment
- Air filter element:

ISUZU Part No.
9142151321



■ To clean the air filter element:
- If the element has dried contaminants, it may be cleaned by blowing compressed air from the inside.
- If the element has carbon or grease, it should be replaced with new element.

■ Clog Indicator
The clog indicator to display clog in the air filter element is incorporated to air filter unit.
- Whenever RED SIGNAL appears in the indicator window, clean or change element regardless of operation hour.
- After cleaning or changing finishes, push the reset button to release the RED SIGNAL.

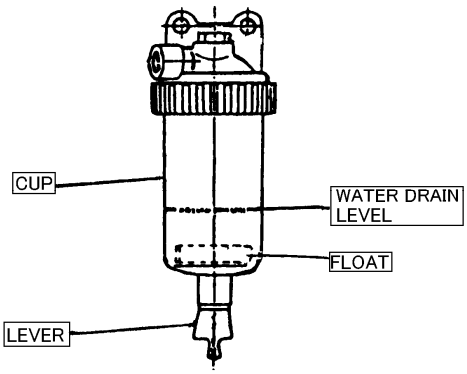


10.4 Draining Water from Water Separator

When a float (red) is at drain level, drain water.

① Loosen the drain plug and drain water.

② Screw the drain plug, when finishing drain.



<Caution>

- After draining finishes, extract the air in fuel line. (Refer to *9-3 During operation.*)

10.5 Cleaning / Changing Fuel Filter

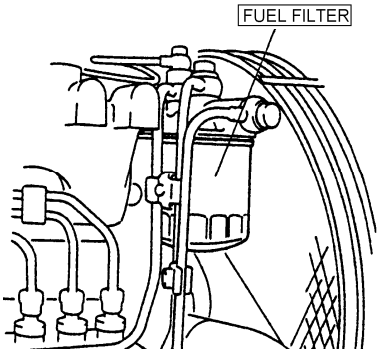
Clean	Every 200 hours
Replace	Every 500 hours

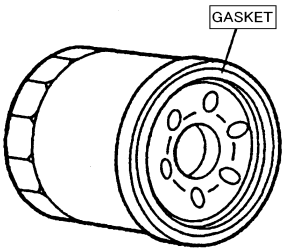
① Loosen and remove the fuel filter, using an oil filter wrench

② Drain all the water in the fuel filter

③ Smear a little fuel on the rubber gasket of the new fuel filter

④ Screw the new filter into place and tighten it until the gasket contacts the seat. Then, give it additional 2/3 turn to seat the filter, using an oil filter wrench





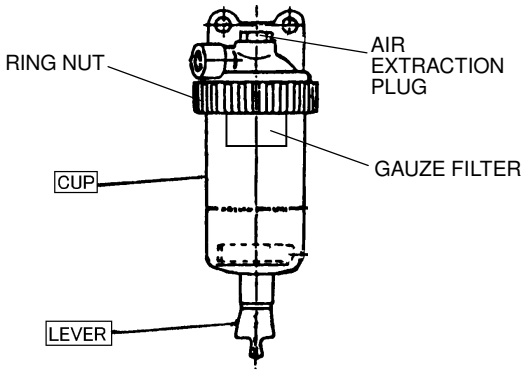
<Caution>

- After replacing the filter, always air out the fuel system (refer to *9-2. During Operation*)
- Fuel filter element:

ISUZU Part No.
1132400791

10.6 Clean gauze filter in water separator

Clean	Every 500 hours



① Loosen the lever and then loosen the air extraction plug.
② Turn the ring nut counter-clockwise to remove the cup and the gauze filter after the fuel inside does not come out from the lever.
③ Wash the gauze filter in Diesel fuel and reinstall the unit in the reverse order.

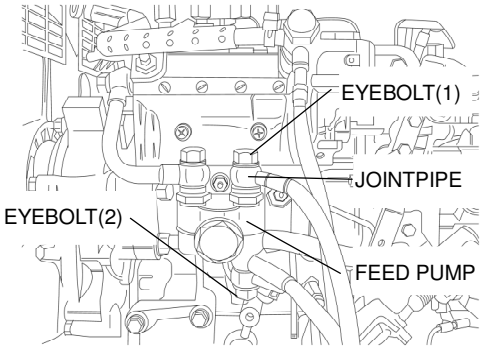
Tightening Torque	
Ring Nut	15Nm{1.5kgfm}
Air Extraction Plug	10Nm{1.0kgfm}

<Caution>

- Clean the filter more frequently as gauze filter is clogged in shorter period when using the fuel from the fuel drum than other fuel source.
- Put a tray under the lever in order to catch spilled fuel when loosing the lever.
- Extract the air in fuel line after gauze filter washing finishes.
  (Refer to *9-3. During operation.)*
- Ensure that there is no fuel leakage after reinstallation.

10.7 Clean gauze filter in engine feed pump

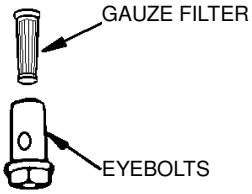
Clean	Every 500 hours



① Remove eyebolts.
② Remove gauze filter in eyebolts.
③ Wash gauze filters in Diesel fuel and reinstall in the reverse order

Eyebolt tightening torque	44Nm{4.5gfm}

<Caution>



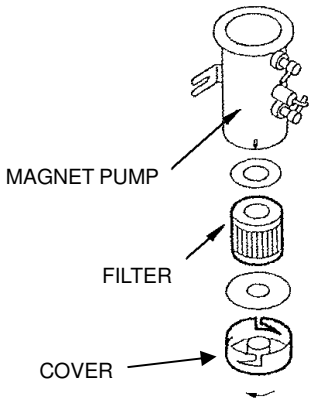
- Put a tray under the lever in order to catch spilled fuel when loosing the lever.
- Gaskets are attached to both ends of joint pipe. Be careful not to lose and
  install them in the unit without fail.
- Change both gauze filter and eyebolt when gauze filter is damaged.
- Extract the air in fuel line after gauze filter washing finishes.
  (Refer to *9-3. During operation*.)
- Ensure that there is no fuel leakage after reinstallation.
- Eyebolt Part No. (Gauze filter included)

ISUZU Part No.	8970631550

10.8 Change filter in the magnet pump for automatic fuel extraction

Change	Every 1000 hours

① Turn the cover, located at the bottom of pump, counter-clockwise and remove filter.
② Reinstall a replacing filter in the reverse order.



<Caution>

- Put a tray under the lever in order to catch spilled fuel when changing filter.
- Extract the air in fuel line after filter changing finishes.
  (Refer to *9-3. During operation*.)
- Ensure that there is no fuel leakage after reinstallation.
- Filter Part No.

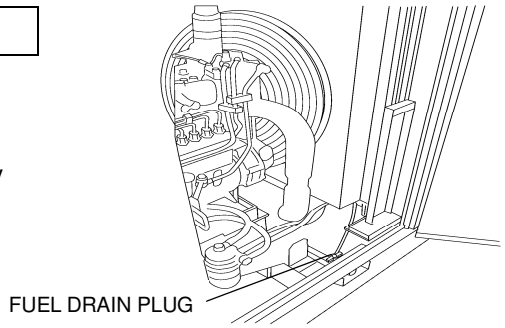
Isuzu Part No.	8943370220

10.9 Draining Water from Fuel Tank

Drain water	Every 200 hours

① Unscrew the Fuel drain plug

② Reinstall the drain plug, after draining water fully



10.10 Changing Coolant / Water

Replace	Every 2 years or 1000 hours

① Remove the radiator cap cover

② Remove the radiator cap

③ Loosen the draining plug on both the engine and radiator

④ After draining all the water, tighten the draining plug on both the engine and radiator

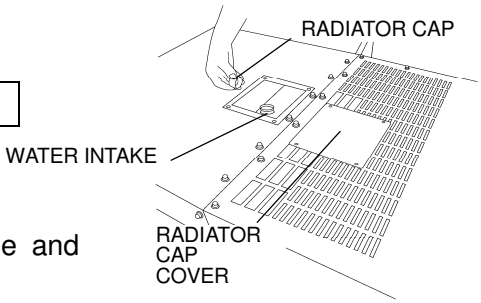
⑤ Loosen the fastener that holds the reservoir tank, and drain all the water

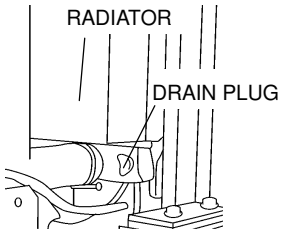
⑥ Install the reservoir tank back, and fill the coolant /water to the MAX level.

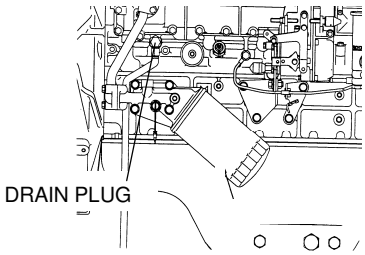
⑦ Fill the radiator with coolant/water to the top

⑧ Reinstall the radiator cap

⑨ Reinstsll the radiator cap cover

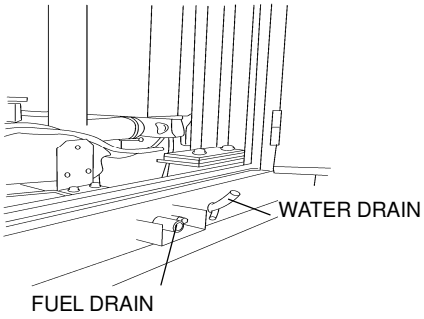


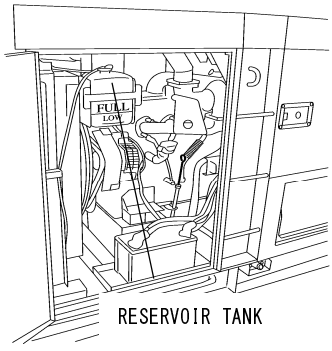




<Caution>

- For the types of engine oil to use, refer to *8-2 Checking Coolant/Water*





11 long-term Storage

Danger

:Electrical Shock ● Injuries

- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. A person performing the maintenance should always keep the key.

Caution

:Fire ● Burns

- Temperature around muffler and exhaust can get extremely high. Keep any inflammable items (such as fuel, gas, paint, etc.) away from the equipment.
- When checking engine, always stop the engine, and keep away from fire. Wait until the engine cools down, before performing any checks.
- Always wipe any drip of Diesel fuel or oil. Do not use this equipment when a leak is found. Repair the equipment before use.

11.1 Storage Procedures

If the generator will not be used for more than two months, perform the following maintenance and storage procedures.

① Remove battery
② Change engine oil
③ Drain fuel from fuel tank and fuel filter
④ Clean all parts, cover the generator, and keep it in the storage, away from dust and humidity.

<Caution>

- Recharge the removed battery once a month.
- Refer to the user's manual for the care of the engine.

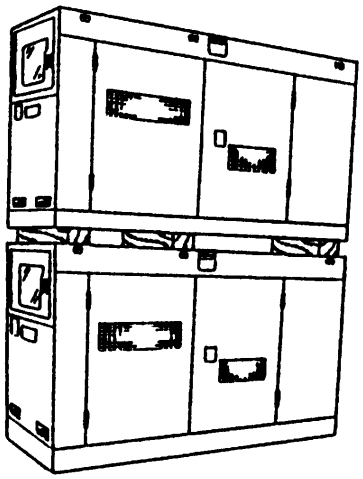
11.2 Stacking

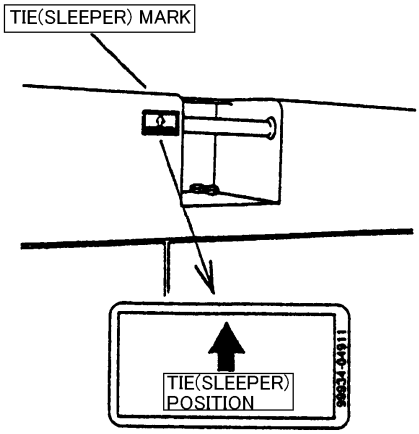
Danger

:Injuries

- If you have to stack two generators in warehouse, always proceed with the following steps.

- Ensure that there is no dent on bonnet, loosing bolt or no bolt in the generators.
- Always place the generators on a flat and stable surface, to keep the equipment from sliding,
- And to be endurable for the total weight.
- When lifting the equipment, always use a lift hook.
- Always place ties (sleepers) on the marked points in the lower generator firstly and then stack the upper generator on it. All the ties should be the same size (dimension) and longer than the width of the lower generator.
- Do not stack more than 2 units. The lower generator should be bigger than the upper generator in size and weight.
- Do not operate the stacking/stacked generators.





12 Troubleshooting

Danger

:Electrical Shock

- Do not operate the equipment, if the equipment or you are wet.
- Before performing any equipment check or maintenance, stop the engine.

Caution

:Injuries

- When performing equipment check and maintenance, always stop the engine.

Caution

:Fire • Burns

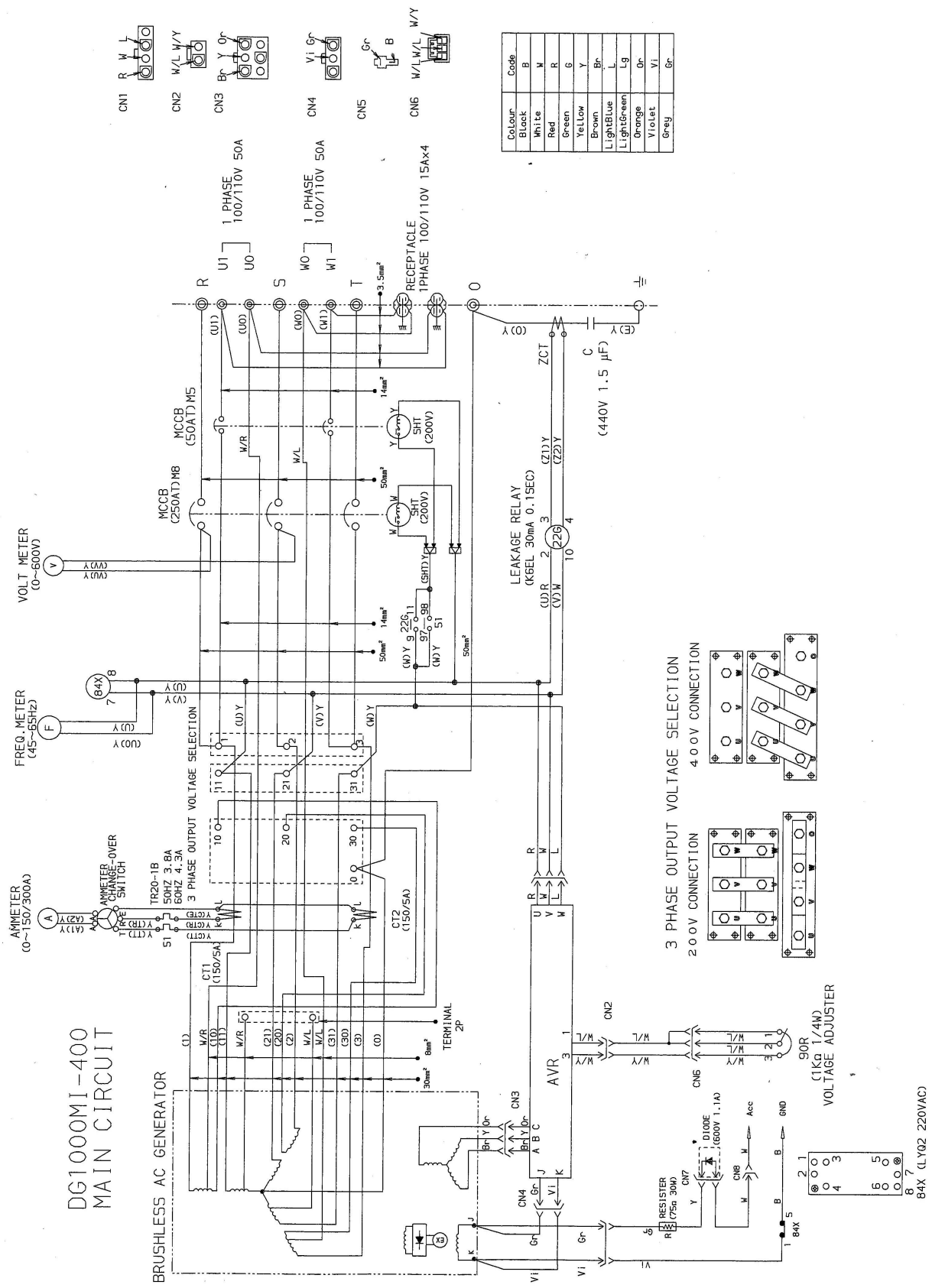
- Battery may emit some combustible gas, so keep it away from fire and sparks.
- Temperature around muffler and exhaust can get extremely high. Keep any inflammable items (such as fuel, gas, paint, etc.) away from the equipment.
- When checking engine oil or changing oil, always stop the engine, and wait until the engine cools down. If you open either the oil gauge or the oil filler cap during operation, hot oil may cause some injury.

Follow the guideline below, when performing any troubleshooting. If you cannot resolve the problems by this troubleshooting guide, contact the authorized distributor or our engineering section to request the repair.

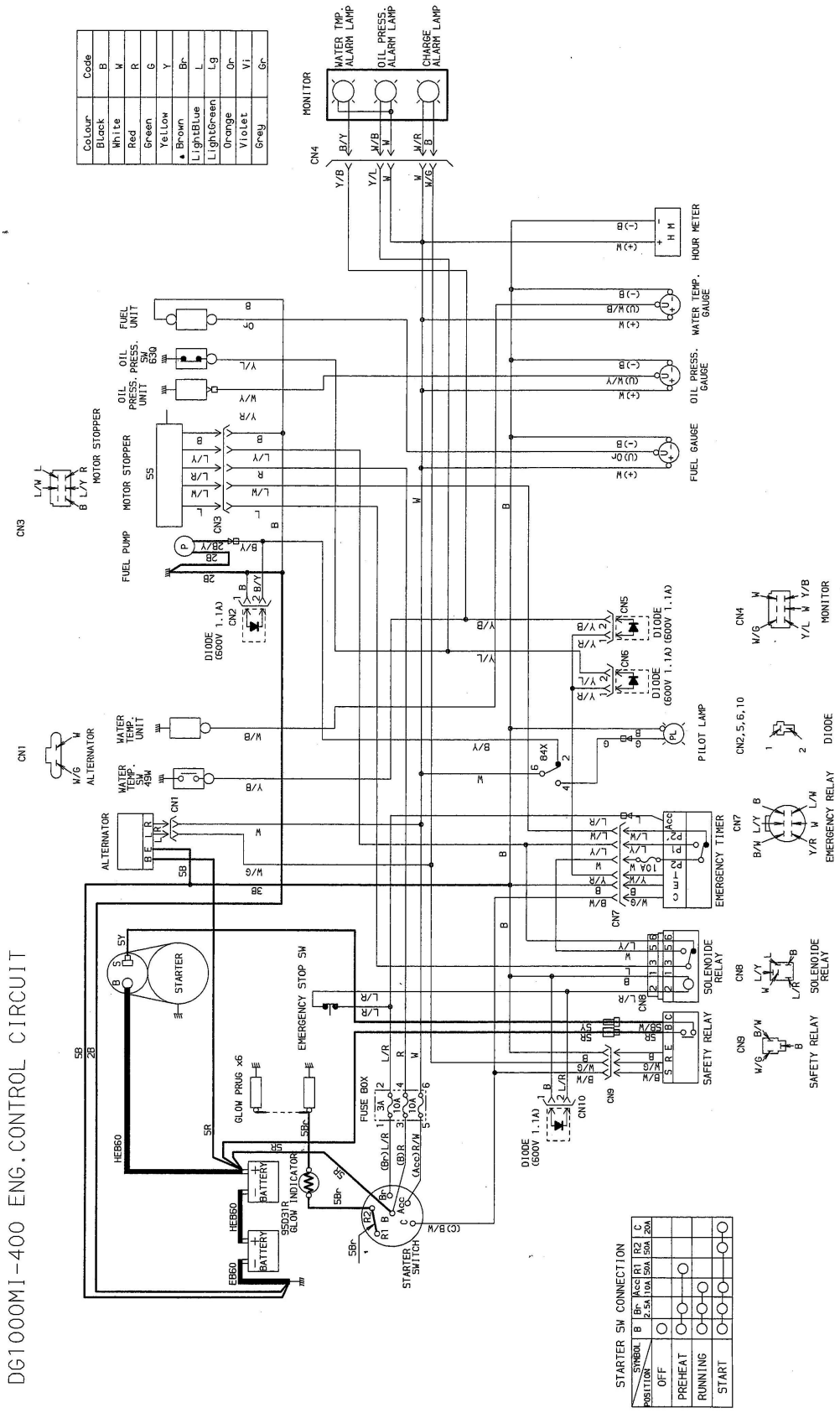
Symptom		Presumable Cause	Action
Engine does not start	Starter motor does not drive or speed is low.	1. Battery output is weak 2. Battery is deteriorated 3. Battery terminal is OFF or loose 4. Battery terminal is corroded 5. Starter switch or relay is defective 6. Starter motor is defective	1. Check/ battery liquid/ or Charge 2. Change battery 3. Fix/Tighten terminal 4. Clean terminal 5. Ask our distributor to repair 6. Ask our distributor to repair
	Starter motor drives but engine does not start	1. Fuel is insufficient 2. Fuel filter is clogged 3. Gauze filter is clogged 4. Water is interfused in fuel line 5. Air is interfused in fuel line 6. Poor piping connection to external fuel tank 7. Fuel tank selector lever (3-way valve) position is wrong 8. Fuel cut solenoid (motor) does not work	1. Add fuel 2. Clean/Change fuel filter 3. Clean/Change gauze filter 4. Drain water in water separator, fuel filter or fuel tank 5. Extract the air 6. Check piping connection 7. check lever (3-way valve) 8-1. Check/Change fuse 8-2. Check/Change fuel cut solenoid
	<Ambient temperature falls down below zero>	1. Fuel is frozen 2. Water in fuel line is frozen 3. Pre-heater is defective	1. Use winterized fuel 2. Drain water in fuel line 3. Ask our distributor to repair
Engine starts but stalls immediately		1. Fuel filter is clogged 2. Gauze filter is clogged 3. Water is interfused in fuel line 4. Air is interfused in fuel line 5. Poor piping connection to external fuel tank 6. Air filter element is clogged 7. Lubricant oil is insufficient	1. Clean/Change fuel filter 2. Clean/Change gauze filter 3. Drain water in water separator, fuel filter or fuel tank 4. Extract the air 5. Check piping connection 6. Check/Change air filter element 7. Supply lubricant oil
Engine oil pressure is low		1. Lubricant oil is insufficient 2. Oil filter is clogged 3. Oil Pressure switch is defective 4. Oil pressure meter is defective 5. Wrong oil is used	1. Supply lubricant oil 2. Change oil filter 3. Ask our distributor to repair 4. Ask our distributor to repair 5. Change to proper kind and viscosity oil

Overheated	1. Engine thermostat is defective 2. Water temp sensor is defective 3. Water temp meter is defective 4. Fan belt tension is weak 5. Coolant is insufficient 6. Radiator core is clogged	1. Ask our distributor to repair 2. Ask our distributor to repair 3. Ask our distributor to repair 4. Check/Adjust fan belt 5. Check/Supply coolant 6. Clean radiator core
Black smoke comes out from muffler	1. Air filter element is clogged 2. Fuel injection nozzle is defective 3. Improper fuel is used	1. Check/Change air filter element 2. Ask our distributor to repair 3. Change to clean fuel
White smoke comes out from muffler	1. Too much or too little oil to cylinder 2. Water is interfused in fuel line 3. Fuel injection nozzle is defective 4. Coolant temperature is too low 5. Engine thermostat is defective	1. Ask our distributor to repair 2. Drain water in water separator, fuel filter or fuel tank 3. Ask our distributor to repair 4. Warm-up driving is needed 5. Ask our distributor to repair
Pointer (hand) does not move in voltage meter	1. Voltage meter is defective 2. AVR is defective 3. Disconnected circuit, loose terminal or departed 4. Initial exciter is defective 5. Alternator is defective	1. Ask our distributor to repair 2. Ask our distributor to repair 3. Ask our distributor to repair 4. Ask our distributor to repair 5. Ask our distributor to repair
Pointer (hand) does not goes up to the rated voltage	1. Voltage meter is defective 2. AVR is defective 3. Voltage regulator dial is defective 4. Frequency is low 5. Frequency selector switch is set wrong	1. Ask our distributor to repair 2. Ask our distributor to repair 3. Ask our distributor to repair 4. Ask our distributor to repair 5. Set the switch correct
Pointer exceeds the rated voltage	1. Voltage meter is defective 2. AVR is defective	1. Ask our distributor to repair 2. Ask our distributor to repair
The voltage drops drastically when connecting to load	1. AVR is defective 2. Unbalanced loads sharing to each terminal 3. Wrong frequency is used 4. Loads total exceeds the rated current 5. Frequency selector switch is set wrong	1. Ask our distributor to repair 2. Balance the loads sharing to each terminal 3. Set the switch to the load frequency 4. Decrease the loads to meet the rated output 5. Set the selector switch correct
Cannot turn the breaker to ON	1. The breaker positions at between ON and OFF 2. Short circuit on the load 3. Earth Leakage Relay activates 4. The thermal relay activates	1. Once turning the lever to OFF, turn it to ON 2. Check the load circuit 3. Repair the leaked point 4. Reset the thermal relay

13 Generator Wiring Diagram



14 Engine Wiring Diagram



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