



OWNER'S AND OPERATOR'S MANUAL

Diesel Engine Generator **DG1000MIM**

Vertical, Water-Cooled 4-Cycle Diesel Engine



CAUTION

Do not operate the Generator, or any other appliance, before you have read and understood the instructions for use and keep near for ready use.

DG1000MIM/ANZ
X753-009 30 2
X753800-330 2

Introduction

Thank you for purchasing this Shindaiwa soundproof diesel engine generator.

- This manual has been created to ensure safe usage of this generator. Be sure to read this manual before operation. Improper operation/handling of this generator will result in an accident or malfunction.
 - Handling/Operation of this generator can only be performed by persons who understand the contents of this manual and can handle/operate the generator in a safe manner. Persons who suffer from an illness, are taking medicine or not feeling well such that safe operation would be negatively affected must not operate this generator.
 - Work performed using this generator and handling/operation of this generator must be in accordance with corresponding laws and regulations based on such laws. Consult with the authorized distributor where this generator was purchased if you have any inquiries regarding the corresponding laws.
 - Always be sure to include this manual when loaning out this generator and instruct operating personnel to read this manual before operation.
 - Store this manual in a specified location where it will be secure and available for consulting at any time. Order another copy from the authorized distributor where this generator was purchased if this manual becomes dusty, grimy or torn.
 - Consult with the authorized distributor where this generator was purchased if you have any inquiries regarding any points related to this generator and manual.
When inquiring about this generator, be sure to provide the model name and serial number.
 - If disposing of this generator, do so in a manner that is in compliance with laws related to industrial waste. Contact the authorized distributor where the generator was purchased if you have any inquiries regarding proper disposal.
- Caution notice ranks in this manual are classified as follows.

 **WARNING :** Indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

 **CAUTION :** Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury and property damage.

< Note > : Other types of cautions and indications.

- Note that  **CAUTION** items can also lead to major accidents under some circumstances if not correctly followed.
All caution notices are important. Be sure to follow all of them.

Table of Contents

1. Safety Instructions	2
2. Specifications	5
2-1. Specifications	5
2-2. Ambient Conditions	6
3. Applications	6
4. Part Names	6
4-1. External View/Part Names	6
4-2. Operation Panel Part Names	8
4-3. Main Terminal Board	8
5. Equipment	9
5-1. Controller.....	9
5-2. Switches.....	11
5-3. Voltage Regulator and Throttle Lever.....	13
5-4. Fuel Piping Switch (3Way Fuel Valve).....	14
6. Transporting/Installing	15
6-1. Transport Procedures.....	15
6-2. Installation Procedures.....	16
7. Load Connections	17
7-1. Load Cable Selection	17
7-2. Connecting Load Cables	18
7-3. Earth Leakage Relay and Grounding	19
8. Pre-Operation Inspection.....	22
8-1. Checking Engine Oil.....	22
8-2. Checking Coolant.....	23
8-3. Checking the Fan Belt.....	25
8-4. Checking the Fuel	26
8-5. Checking for Fuel, Oil and Coolant Leaks	27
8-6. Checking the Battery	27
9. Operating Procedures	29
9-1. Initial Startup/Pre-Check	29
9-2. Procedures during Operation	31
9-3. Stopping Operation	32
9-4. Protective Functions.....	33
9-5. Connecting with External Fuel Tank	34
10. Inspection/Maintenance	35
11. Long-Term Storage.....	43
12. Troubleshooting.....	44
13. Generator Circuit Diagram.....	48
14. Engine Electrical Circuit Diagram	49

1. Safety Instructions

WARNING : SUFFOCATION FROM EXHAUST FUME

- Do not operate the generator in poorly ventilated areas such as indoors or tunnels, as the exhaust gas of the engine contains substances that are harmful to human health.
- Do not direct exhaust fumes at pedestrians or buildings.

WARNING : ELECTRIC SHOCK

- Before connecting or disconnecting the load cables to/from the output terminal, always turn the output circuit breakers to the OFF position, stop the engine, and turn the Power Switch to the OFF position.
- Close the output terminal cover before operating.
- Do not insert a pin, wire or other metal object into the electrical outlet.
- Do not touch the generator if the Alternator or casing becomes wet during operation.
- Do not touch output terminals or internal electric parts while the generator is operating.
- 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 bonnet 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.
- Grounding should be made after the engine is stopped.
- Whenever the Earth leakage breaker is activated, you should always repair the leaking place first of all.

WARNING : INJURY

- Close all doors and lock them during operation.
 - Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.
 - Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.
 - Use the lifting hook to lift the machines, and do not lift up the unit using tie-downs. Use of such could result in the generator falling.
 - Do not lift any additional weight such as fuel tanks or trailers.
 - No persons should be under a lifted generator.
 - Before turning the circuit breaker to ON position, ensure that the breaker or the switch of loads are positioned to OFF.
- Operate the circuit breaker, well-communicating with the electrician by the load side.

CAUTION : EYE/SKIN INJURY

- Wear rubber gloves and other protective wear to protect eyes, skin and clothing from the battery fluid which contains diluted sulfuric acid. If the battery fluid contacts eyes or skin, wash out immediately with a sufficient amount of clean water. Be sure to receive medical treatment, especially if the fluid contacts the eyes.

CAUTION : EXPLOSION

- Never use or recharge the battery if the fluid level is below the minimum level.
- Do not create sparks or bring flame near the battery as it generates flammable gas.

CAUTION : FIRE

- Do not bring flammable items (such as fuel, gas and paint) or items that are highly combustible near the generator as the muffler, exhaust gas and other parts become extremely hot.
- Keep this generator 1m or more from walls or other hindrances, and on a level surface.
- Do not connect the generator output to indoor wiring.
- This generator uses diesel fuel. Always be sure to stop the engine and not bring flames close when inspecting fuel or refueling. Wait until the engine has cooled before performing such procedures.
- Do not use this equipment when leak is found, and repair the leaking location before operating.
- Always be sure to wipe up any spilled fuel or oil.
- Allow the generator to cool before covering with the protective cover.
- Never allow flame to come close to the generator.

CAUTION : BURNS

- Do not touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.
- Do not open the radiator cap immediately after stopping the engine, to avoid sustaining burns from hot vapor.
- Hot steam gushes out from the coolant sub-tank if the generator overheats. Do not touch the coolant sub-tank.
- Always be sure to stop the engine and allow the engine to cool when performing inspection or maintenance of engine oil. Opening the oil level indicator or oil filler cap during operation will result in hot oil cause personal injury.

CAUTION : INJURY

- Always be sure to use lifting hooks when moving the generator, and lift it slowly at a completely vertical angle.
- Personnel performing lifting work must wear protective gear such as helmets, safety shoes and gloves.
- Remove the wood ties if using anchors to secure the generator.
- Position the generator on a level stable surface so that it cannot slide or move in any manner.
- Before starting operation, always be sure to turn off all switches of equipment using the generator and all breakers to OFF.
- Do not move the generator during operation.
- Do not operate the generator if it has been modified or any parts have been removed.

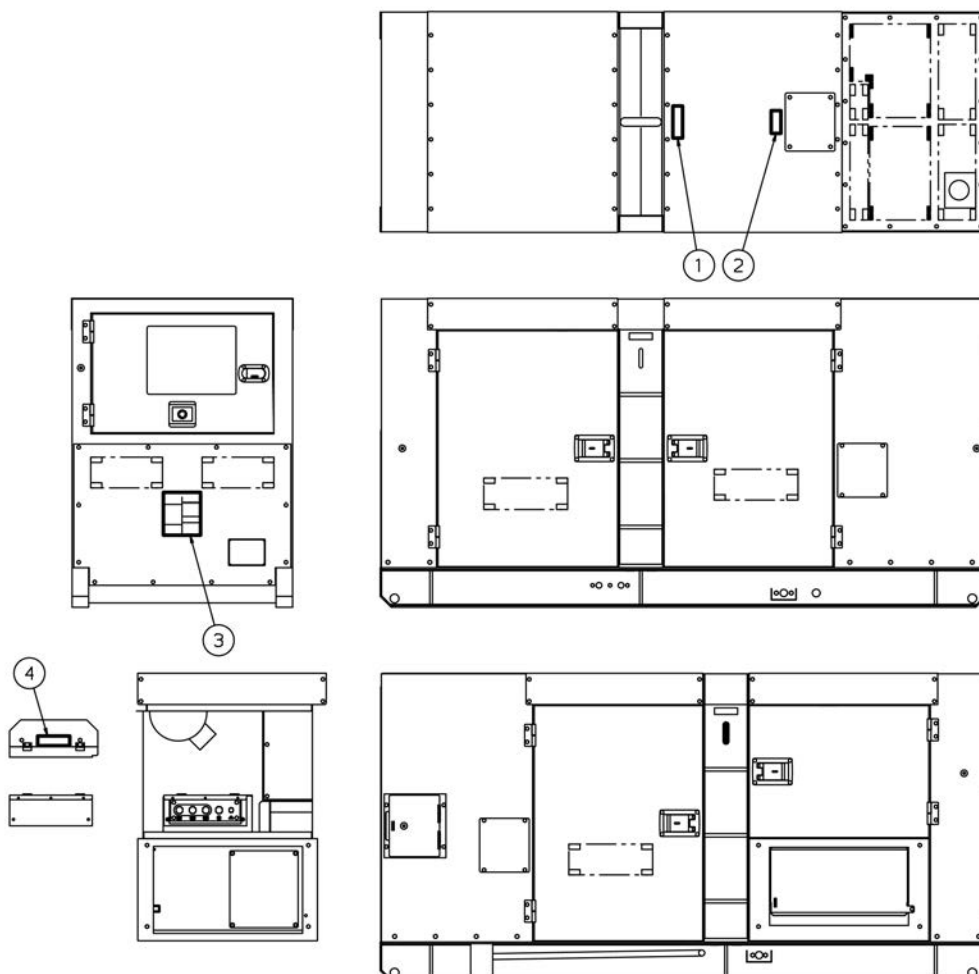
⚠ CAUTION : PROPERTY DAMAGE

- If using this generator for medical equipment, check before use with the medical equipment manufacturer, doctor, hospital or similar entity.
- Check that the generator output setting, output terminal connection and load power source are consistent.
- Cable burnout can occur due to generated heat if the load current exceeds the allowable current of the cable.
- The voltage drop between cables is large if the cable is excessively long or thin, resulting in decreased input voltage to equipment using the generator, thereby causing decreased performance, faulty operation and malfunction.

■ Warning/Caution Label Locations

If warning or caution labels become damaged and difficult to read, replace with new labels in the indicated locations. Order labels using part number indicated in the parenthesis.

- | | |
|--------------------------|-------------------------|
| ① Injury | (Part no. :X505-004630) |
| ② Caution: gm spec LLC | (Part no. :X505-004650) |
| ③ Warning caution | (Part no. :X564-001310) |
| ④ Danger: Electric Shock | (Part no. :X505-004640) |



2. Specifications

2-1. Specifications

Model		Unit	DG1000MIM/ANZ
Alternator	Generating Type	-	Rotating Filed, Brushless 3-Phase Synchronous Alternator
	Rated Output	kVA	80
		kW	64
	Rated Voltage	V	415
	Rated Current	A	111
	Rated Frequency	Hz	50
	Winding	-	3-phase, 4-wire
	Power factor	%	80
	Insulation class	-	H
	Excitation	-	Self-Excitation (Brushless)
	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
		PS	99.4
	Rated speed	min ⁻¹	1500
	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
Unit	Length	mm	2750
	Width	mm	1000
	Height	mm	1400
	Dry Weight	kg	1800
	Installed Weight	kg	2041

2-2. Ambient Conditions

Use this generator in ambient conditions as described below. Failure to provide these conditions can result in problems such as malfunction, insufficient output and reduced durability.

- Ambient temperature: -15 to 40 degree Celsius
- Relative humidity: 80% or less
- Elevation: 300 m or less

3. Applications

- Power source for submerged pumps and similar civil engineering equipment
- Power source for lighting and similar equipment
- Power source for electrical tools and household appliances

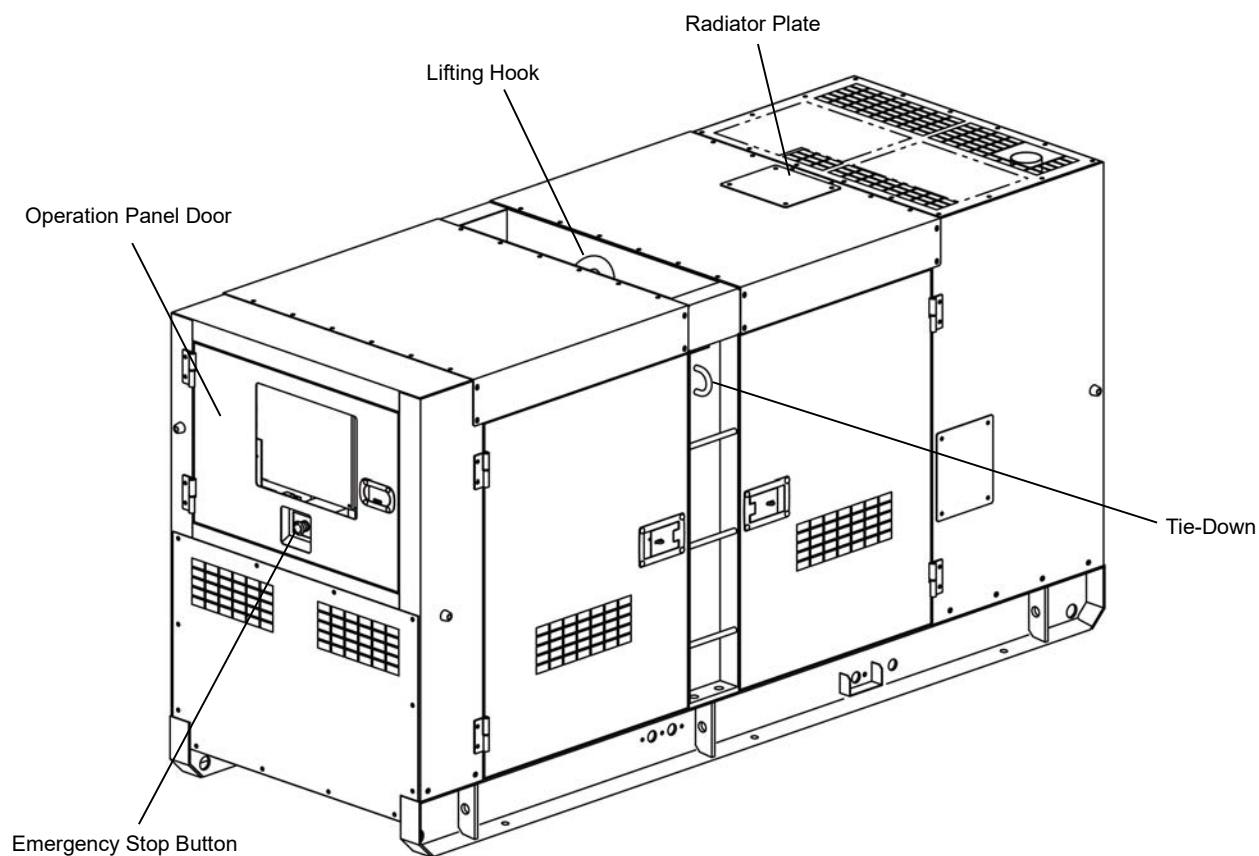


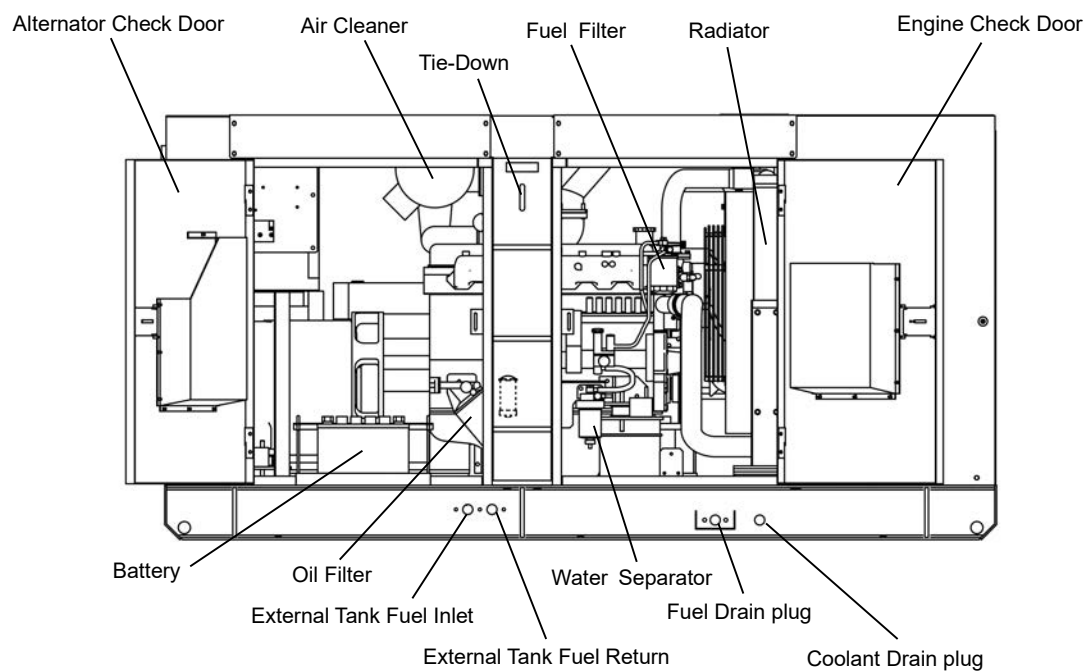
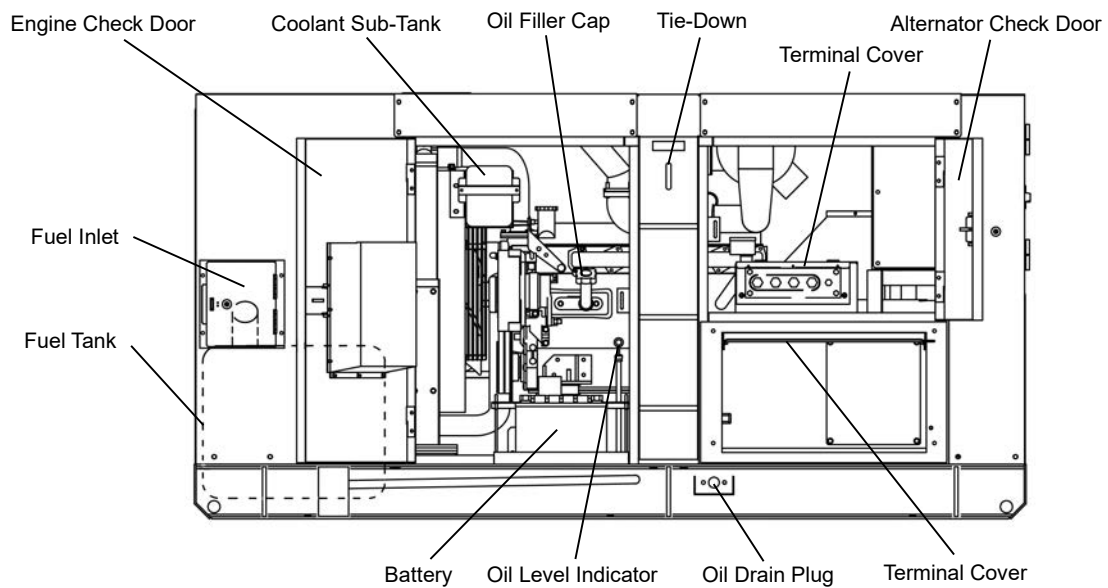
CAUTION : PROPERTY/SECONDARY DAMAGE

- Do not use for any application other than those listed above.
- If using this generator for medical equipment, check before use with the medical equipment manufacturer, doctor, hospital or similar entity.

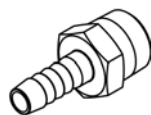
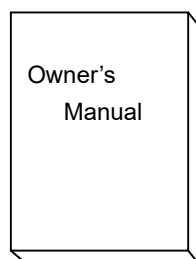
4. Part Names

4-1. External View/Part Names

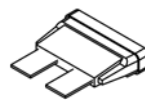




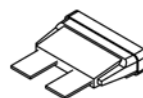
Accessories



Nipple (2 pieces)

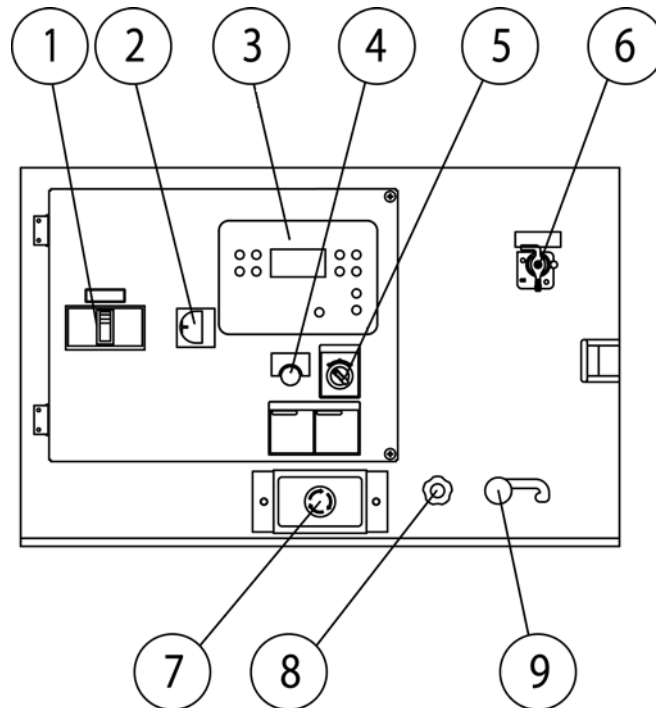


Fuse (3A)



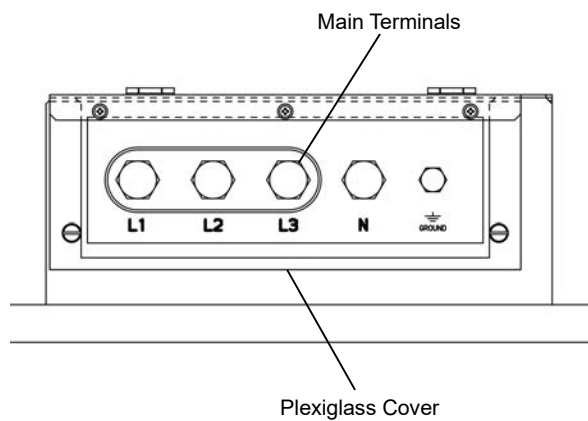
Fuse (10A)

4-2. Operation Panel Part Names



①	Circuit Breaker
②	Earth Leakage Relay
③	Controller
④	Voltage Regulator
⑤	Power Switch / Air Bleeding
⑥	Battery Isolator
⑦	Emergency Stop Button
⑧	Frequency Adjusting Screw
⑨	Throttle Lever

4-3. Main Terminal Board

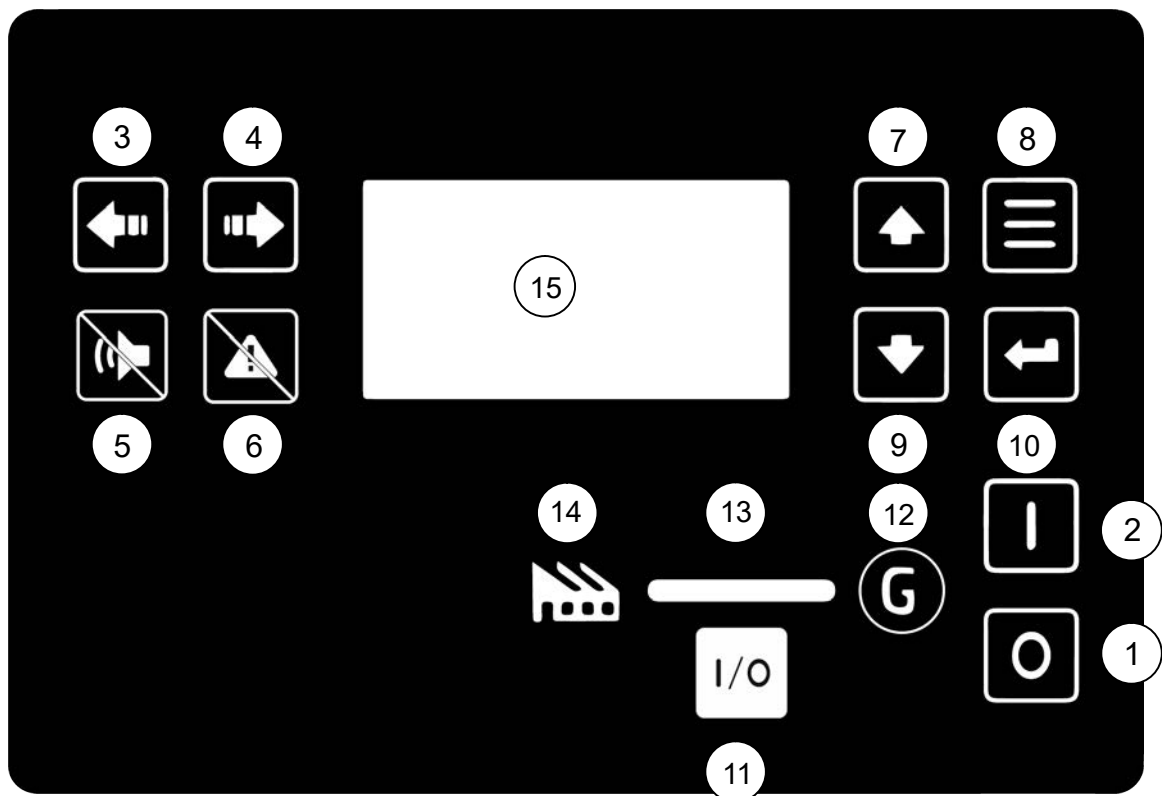


5. Equipment

5-1. Controller

This generator has a Controller which is used for starting or stopping the power generator or the engine, for monitoring. If you turn the Power Switch to ON position, the status Screen appears.

(1) Front panel elements



① **STOP button**

Press this button to initiate the stop sequence of the gen-set.

② **START button**

Press this button to initiate the start sequence of the engine.

③ **LEFT button**

Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed.

④ **RIGHT button**

Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed.

⑤ **HORN RESET button**

Use this button deactivate the horn output without acknowledging the alarms.

⑥ **FAULT RESET button**

Use this button to acknowledge alarms and deactivate the horn output. Inactive alarm will disappear immediately and status of active alarms will be changed to “confirmed” so they will disappear as soon as their reasons dismiss.

⑦ **UP button**

Use this button to move up or increase value.

⑧ **PAGE button**

Use this button to switch over display pages.

⑨ **DOWN button**

Use this button to move down or decrease value.

⑩ **ENTER button**

Use this button to finish editing a setpoint or moving right in the history page.

⑪ **GCB button**

No use.

⑫ **GENERATOR status indicator**

There are two states – Gen-set OK (indicator is green) and Gen-set failure (indicator is red). Green LED is on if the generator voltage is present and within limits.

Red LED starts flashing when gen-set failure occurs. After FAULT RESET button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active).

⑬ **GCB on**

No use.

⑭ **Load**

No use.

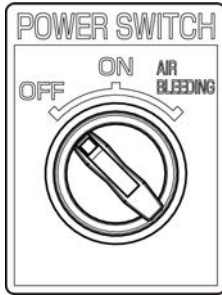
⑮ **Operation Display**

< Note >

- The displayed information is structured into “pages” and “screens”. USE PAGE button to switch over the pages.

5-2. Switches

(1) Power Switch / Air Bleeding

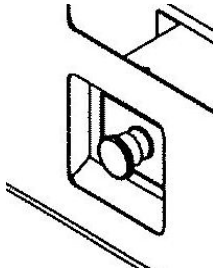


This is the main Power Switch of the generator.

When the Power Switch turned to OFF position, the Controller is OFF.

When the Power Switch turned to AIR BLEEDING position, automatically starts air-bleeding device.

(2) Emergency Stop Button

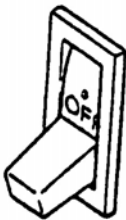


This button is used to stop the engine in emergency.

By inserting the button, the engine stops.

Be sure to restore the Power Switch to OFF and re-set the button, turning clockwise after using the emergency stop button.

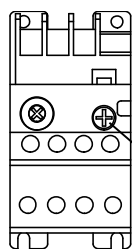
(3) Circuit Breaker



By turning this circuit breaker on the control panel to ON, Power will be transferred to the output receptacles and to the load side.

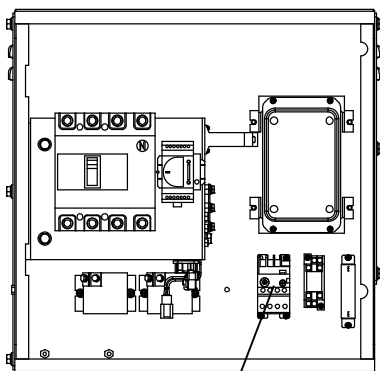
The breaker trips to OFF, either overload or short-circuit.

(4) Thermal Relay



Reset Button

This relay sends the signal to the circuit 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;



Thermal Relay

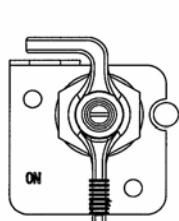
- ① Stop the engine.
- ② Open the control panel and push the reset button of the thermal relay.

You can recover the breaker to the ON position.

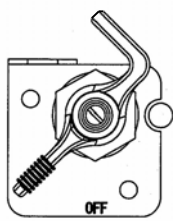
< Note >

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

(5) Battery Isolator



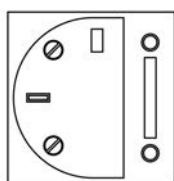
OFF position



ON position

When turning the switch to OFF, the engine electric circuit does not activate due to no battery power.

(6) Earth Leakage Relay Unit



Sensing the earth leakage current, the unit (relay) send a signal to the 3-phase breaker to trip-off in order to shut-off the circuit to the terminals (loads).

(Refer to section “7-3. Earth Leakage Relay and Grounding”.)

5-3. Voltage Regulator and Throttle Lever

(1) Voltage Regulator

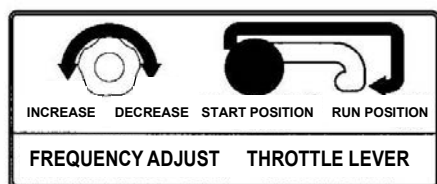
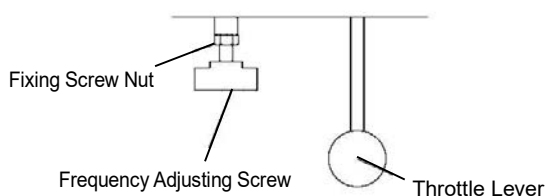


The dial adjusts generator output voltage.

By turning the dial clockwise, an operator can increase the voltage.

By turning the dial counter-clockwise, an operator can decrease the voltage.

(2) Throttle Lever



① Throttle Lever

The lever is to adjust the engine speed.

Set it to <START POSITION> when the engine starts and warms-up or cools down.

When the rated power is used, set it to <RUN POSITION> (50Hz).

② Frequency Adjusting Screw

Set the throttle lever to <RUN POSITION> and loosen the fixing Screw nut.

Turn the screw to <INCREASE> to get high frequency and to <DECREASE> to low frequency.

< Note >

- The equipment is set it at 50Hz and delivered.
- You can get the frequency of 50Hz 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)

5-4. Fuel Piping Switch (3Way Fuel Valve)

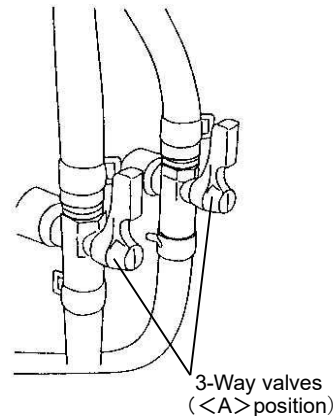
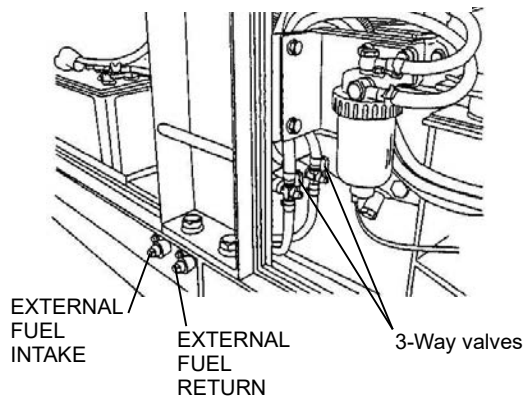
CAUTION:

- Always make sure that the engine is stopped when working on fuel line.
- Always be sure to wipe up any spilled fuel.
- After working on the piping, check that there is no Diesel fuel leakage.

By switching three-way fuel valve fuel will be supplied from the external tank. In that case, the built-in tank will not be used.

(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.



< Note >

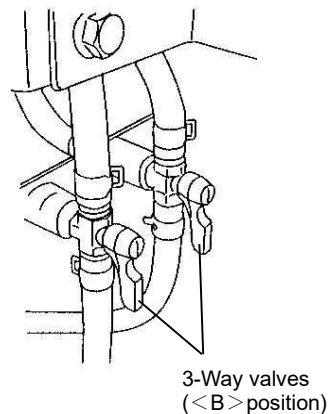
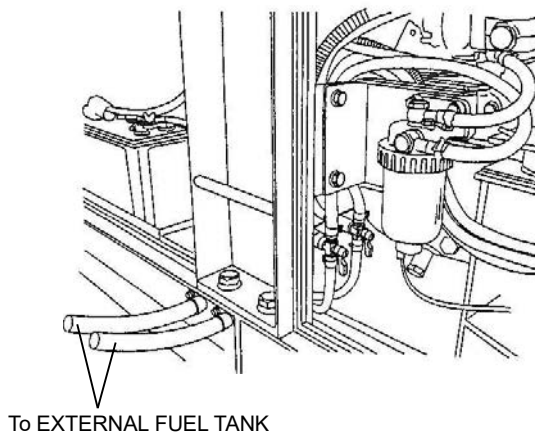
- Always set the lever for 3-way valve back to **A** position and cover the external fuel intake and return port with the supplied plugs, after the hoses are removed.

(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 “9-5. Connecting with External Fuel Tank”.



6. Transporting/Installing

6-1. Transport Procedures

⚠ WARNING : INJURY

- Use the lifting hook to lift the machines, and do not lift up the unit using tie-downs. Use of such could result in the generator falling.
- No persons should be under a lifted generator.

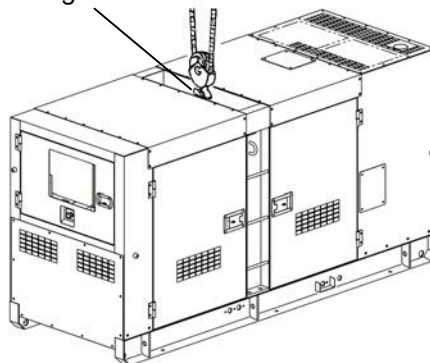
⚠ CAUTION : INJURY

- Always be sure to use lifting hooks when lifting up the generator, and raise it slowly at a completely vertical angle.
- Personnel performing lifting work must wear protective gear such as helmets, safety shoes and gloves.
- Do not move the generator during operation.

(1) Lifting Procedures

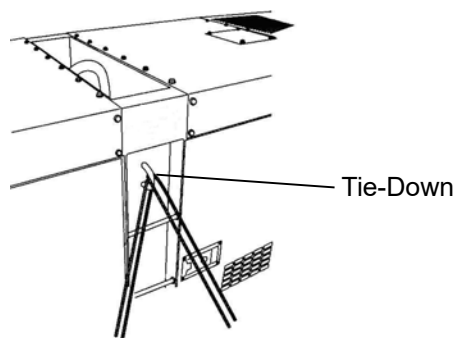
Always be sure to use lifting hooks when lifting up the generator, and raise it slowly at a completely vertical angle.

Lifting Hook



(2) Transport

When transporting this generator, tie rope to the left and right tie-downs, and securely fix the generator.



< Note >

- Handle this generator with extreme care when raising, lowering and transporting. Rough handling of this generator may result in damage or malfunction.

6-2. Installation Procedures



WARNING : SUFFOCATION FROM EXHAUST FUME



- Do not operate the generator in poorly ventilated areas such as indoors or tunnels, as the exhaust gas of the engine contains substances that are harmful to human health.
- Do not direct exhaust fumes at pedestrians or buildings.



CAUTION : FIRE



- Do not bring flammable items (such as fuel, gas and paint) or items that are highly combustible near the generator as the muffler, exhaust gas and other parts become extremely hot.
- Keep this generator 1m or more from walls or other hindrances, and on a level surface.
- Remove the wood ties if using anchors to secure the generator.
- Do not connect the generator output to indoor wiring.

- If installing this generator, set up barriers or fencing completely around the boundary line of the construction area and take measures to prevent persons not involved in the construction from entering the area.
- Always set the generator on a hard, flat and leveled surface that serves as the foundation.
- Keep the generator 1 m or more from walls or other hindrances so that the operation panel door and left/right check doors are accessible for internal inspection/maintenance.

< Note >

- 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. Load Connections

7-1. Load Cable Selection

CAUTION : PROPERTY DAMAGE

- Cable burnout can occur due to generated heat if the load current exceeds the allowable current of the cable.
- The voltage drop between cables is large if the cable is excessively long or thin, resulting in decreased input voltage to equipment using the generator, thereby causing decreased performance, faulty operation and malfunction.

Select cable for use that has sufficient thickness and an allowable current possible for use, giving consideration to the distance from the generator to the equipment using the generator.

< Note >

- Select cable with a thickness that ensures that the voltage drop across the cable will be within 5% of the rated voltage.

■ Expedient Formula: the voltage drop of cables

- 3-Phase 3-Wire

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

- 1-Phase 2-Wire

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

7-2. Connecting Load Cables

WARNING : ELECTRIC SHOCK

- Before connecting or disconnecting the load cables to/from the output terminal, always turn the output circuit breakers to the OFF position, stop the engine.
- Close the output terminal cover before operating.
- Do not touch the generator if the Alternator or casing becomes wet during operation.

CAUTION : FIRE

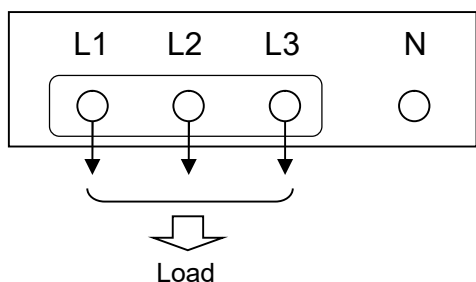
- Do not connect the generator output to indoor wiring.

< Note >

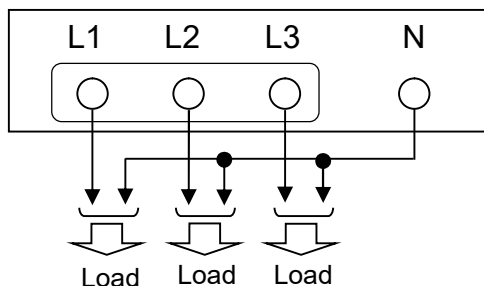
- When connecting a load, check that the generator output setting, output terminal connection position, and load power source are all matching.
- If using the N terminal, be careful that the currents of each phase are uniformed.
- If using three-phase output simultaneously with a single-phase three-wire type output, use in a range where the total current does not exceed the rated current.
- If using three-phase output simultaneously with a single-phase three-wire type output, be careful as it is possible for the outputs to mutually affect each other.
- Use proper tools when connecting a load to sufficiently tighten the connection. Failure to sufficiently tightened will result in cable burnout.
- Terminal cover must remain closed during operation or breaker will be tripped.

■ Three-Phase Output Terminal

- For three-phase load:
 - Terminal voltage is 415 V at 50Hz.



- For single-phase load:
 - Terminal voltage is 240 V at 50Hz.



7-3. Earth Leakage Relay and Grounding

⚠ WARNING : ELECTRIC SHOCK

- Ground the every grounding terminal to the earth as set in the manual.
- If even one of all is unconnected by mistake or accident, it will be much more dangerous for human than the NO-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 bonnet grounding terminal should be grounded to the earth.
- Grounding should be made after the engine is stopped.
- Whenever the Earth leakage breaker 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 0.04 second.

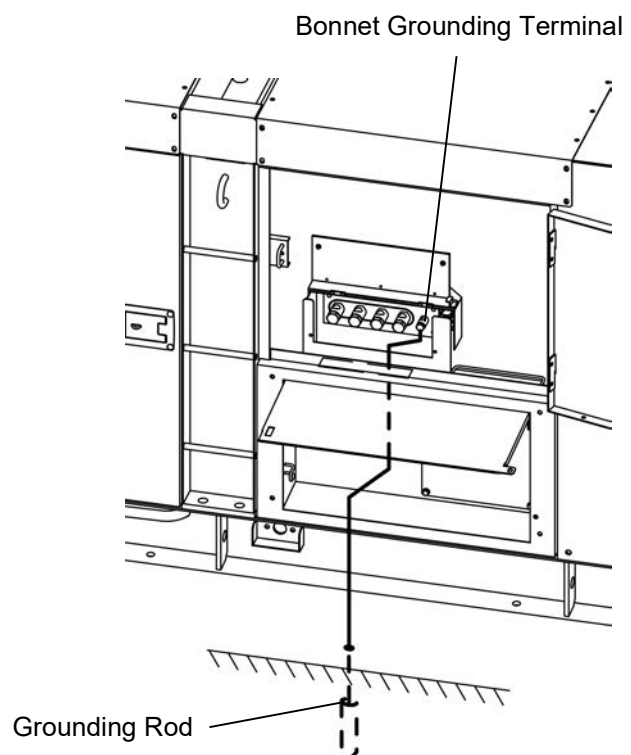
(1) Grounding Work

The qualified electrician should perform the grounding of the following 2 points (500Ω or below).

- The Bonnet grounding terminal of the generator.
- The Bonnet of the load.

< Note >

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



(2) Operation Check



WARNING : ELECTRIC SHOCK

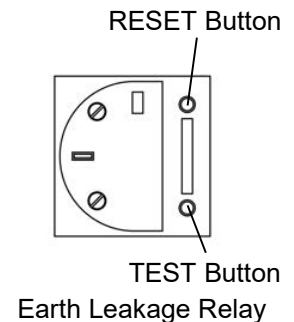
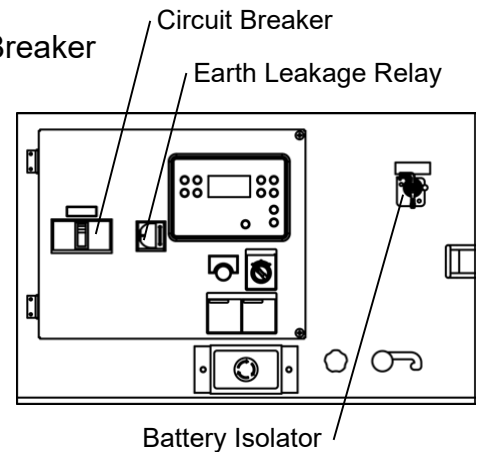


- Before turning the circuit breaker to ON position, ensure that the breaker or the switch of loads are positioned to OFF.
- Operate the circuit breaker, well-communicating with the electrician by the load side.

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

■ Actuation test of the Earth Leakage Relay and Breaker

- 1 Ensure that the breaker and the switches of loads are positioned to OFF.
- 2 Ensure that the circuit breaker positioned to OFF.
- 3 Following the procedure in “9-1, Initial Starup / Pre-Check”, start an engine.
- 4 Turn (Push-up) the circuit breaker (lever) to ON position.
- 5 Push the test button 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 turns OFF subsequently.
- 7 Turn (Push-down) the circuit breaker (lever) to OFF position.



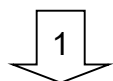
In the event you cannot complete every step of the above procedure to the end, the device is out of order. Consult with our authorized distributor or our engineering section and ask to repair.

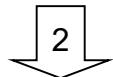
(3) The earth leakage breaker relay has activated

In the event the earth leakage breaker relay has activated, the earth leakage indicating lamp Turns ON and the Circuit 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 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 Circuit breaker (lever) to OFF position.

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

8. Pre-Operation Inspection

WARNING : ELECTRIC SHOCK/INJURY

- Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.
- 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 surrounding components immediately after stopping the equipment, while temperature can reach extremely high.

CAUTION : FIRE

- Always be sure to wipe up any spilled fuel or oil.

8-1. Checking Engine Oil

CAUTION : BURNS

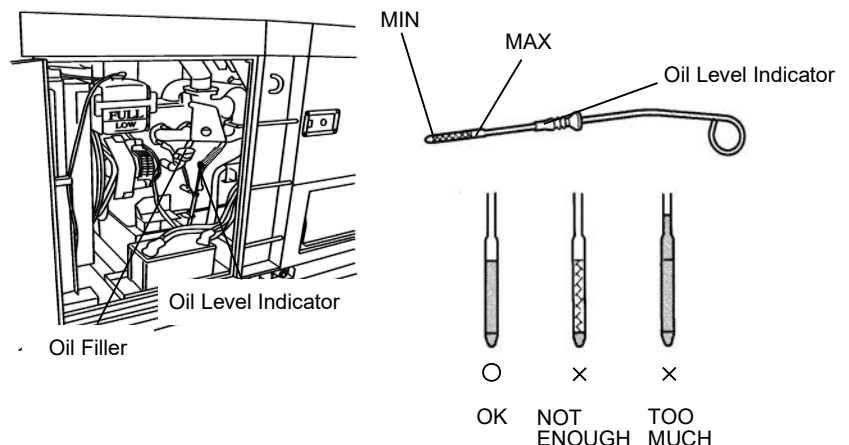
- Always be sure to stop the engine and allow the engine to cool when performing inspection or maintenance of engine oil. Opening the oil level indicator or oil filler cap during operation will result in hot oil cause personal injury.

To check the engine oil, keep the equipment leveled, remove oil level indicator to be wiped, and then re-insert the dipstick fully. Prior to start the engine, make sure to fill the engine oil through the oil filler until it reaches below from MAX line.

< Note >

- Check engine oil volume IN 10-20 MINUTES LATER, always after stopping engine or replenishing fuel.
- An accurate oil level reading cannot be obtained if the generator is not leveled.
- Do not overfill the engine oil.

Excessive amount of engine oil will damage the engine.



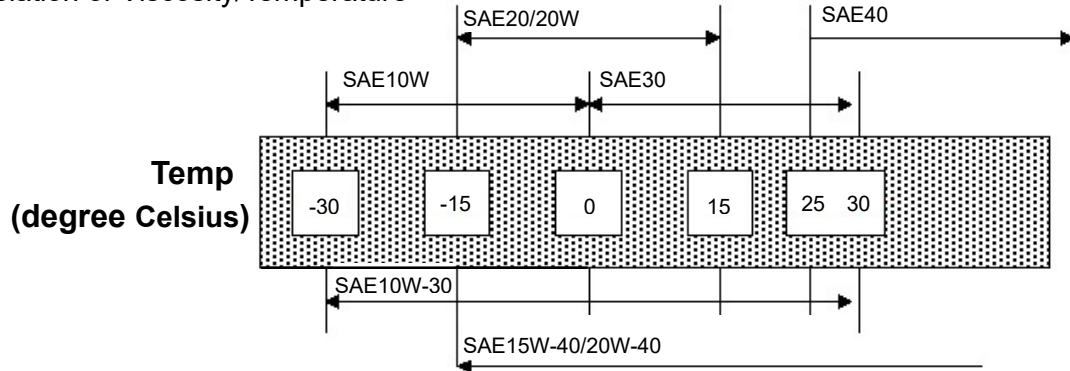
(1) Types of Engine Oil

Use the API class CD grade or higher.

(2) Engine Oil Viscosity

Use a diesel engine oil with an appropriate viscosity corresponding to the ambient temperature (refer to the table).

○ Relation of Viscosity/Temperature



(3) Engine Oil Replacement Amount

(Unit:L)	
Total Lubrication Oil Amount	
22 (2.0)	

Value in parenthesis is the filter capacity.

8-2. Checking Coolant

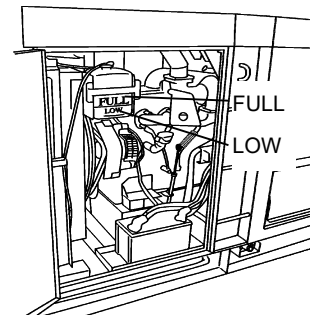
⚠ CAUTION : BURNS

- Do not open the radiator cap immediately after stopping the engine, to avoid sustaining burns from hot vapor.
- Hot steam gushes out from the coolant sub-tank if the generator overheats. Do not touch the coolant sub-tank.

Check that the sub-tank coolant level is in between FULL and LOW. If the sub-tank coolant is lower than the LOW level, add coolant to the sub-tank and radiator.

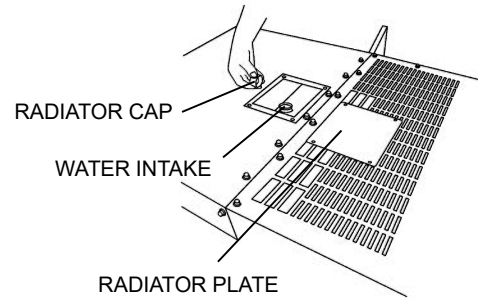
(1) Filling the Sub-Tank

- 1 Remove the sub-tank cap.
- 2 Fill the sub-tank with coolant until it reaches the FULL line.
- 3 Re-attach the cap.



(2) Filling the Radiator

- 1 Remove the radiator plate.
- 2 Remove the radiator cap.
- 3 Fill with coolant through the filler neck until the radiator is full.
- 4 Re-attach and tighten the radiator cap.
- 5 Attach the radiator plate.



< Note >

- Use Long Life Coolant (30% LLC) for engine coolant.
- Always use potable water when mixing the coolant.
- Use same type of coolant with identical mixture ratio for the reservoir tank.
- Mixture ratio of the LLC should be based on the outside temperature, as per below chart.
- Replace LLC every 2 years or 1000 hours.

Long Life Coolant Mixture ratio (for reference only)

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

(3) Coolant Amount

(Unit:L)

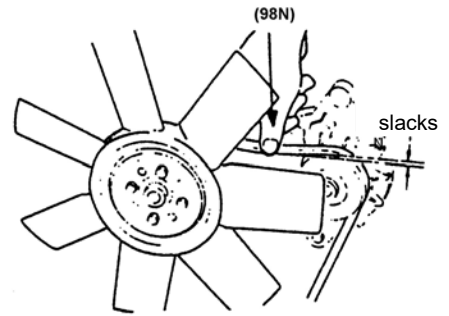
Total Coolant Amount
22.8 (1.5)

Value in parenthesis is the sub-tank capacity.

8-3. Checking the Fan Belt

(1) Fan Belt 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.



(2) Fan Belt Condition

Check the fan belt for damage and replace if any damage or other fault is found.

(3) Replacing the Fan Belt

Request the authorized distributor where the generator was purchased to replace the fan belt.

< Note >

- Use of a loose or damaged fan belt could result in overheating or insufficient charging.
- Refer to the User's manual for Engine for adjusting and replacing of the fan belt.

8-4. Checking the Fuel

CAUTION : FIRE

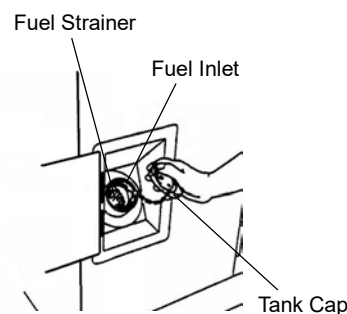
- This generator uses diesel fuel. Always be sure to stop the engine and turn the Power Switch to the OFF position. Wait until the engine has cooled before performing inspection or periodical maintenance.
- Always wipe any drip of Diesel fuel or oil.
- Do not use this equipment when leak is found.
Repair the equipment before use.

Check if there is a sufficient amount of fuel and add fuel if insufficient.

The Controller on the control panel will only display the fuel level for the internal fuel tank.

< Note >

- Use Diesel fuel, ASTM D975 No.2-D in the event ambient temperature reaches down to –5 degree Celsius.
- Always use the Diesel Fuel Strainer.
- Fill the fuel tank slightly less than the FULL tank level.
- 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 No.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 degree Celsius, 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” No.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 for Fuel, Oil and Coolant Leaks

CAUTION : FIRE

- Do not use this equipment when leak is found, and repair the leaking location before operating.

Open the check door and check for fuel, oil and coolant leakage from fuel piping connections and similar locations.

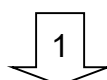
8-6. Checking the Battery

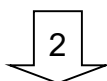
CAUTION : EYE/SKIN INJURY

- Wear rubber gloves and other protective wear to protect eyes, skin and clothing from the battery fluid which contains diluted sulfuric acid. If the battery fluid contacts eyes or skin, wash out immediately with a large amount of water. Be sure to receive medical treatment, especially if the fluid contacts the eyes.

CAUTION : EXPLOSION

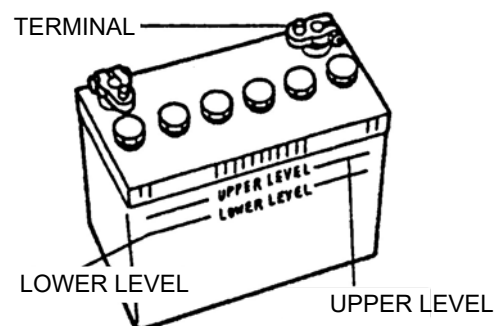
- Never use or recharge the battery if the fluid level is below the minimum level.
- Do not create sparks or bring flame near the battery as it generates flammable gas.

 1 Check the fluid level, and add distilled water when it is near the lower level until it reaches the upper level.

 2 Check the terminals for looseness and tighten if loose.

< Note >

- It is necessary to recharge the battery when the specific gravity of the battery fluid is 1.23 or less. Request the authorized distributor where the generator was purchased to recharge the battery.



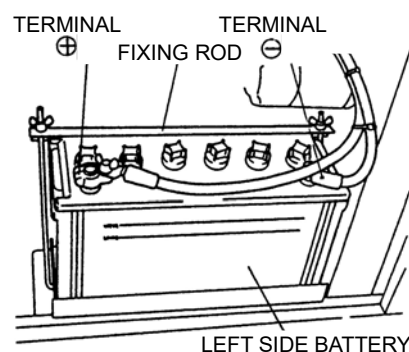
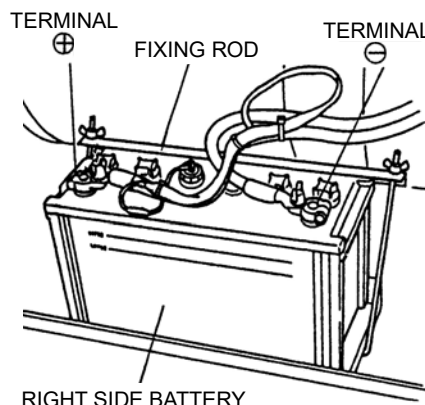
■ Replacing the Battery

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.

(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.

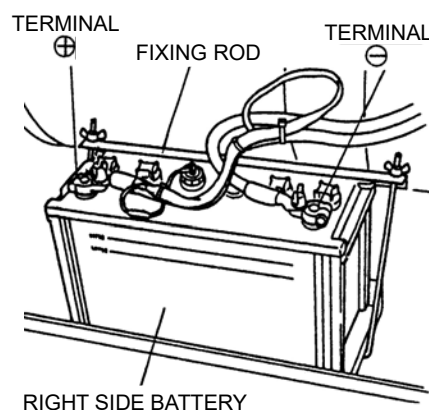
※ Reinstall the new battery in the reverse order (always install the cable to the **positive (+)** post of the new battery first).



(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).



< Note >

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

9. Operating Procedures

9-1. Initial Startup/Pre-Check



WARNING : SUFFOCATION FROM EXHAUST FUME



- Do not operate the generator in poorly ventilated areas such as indoors or tunnels, as the exhaust gas of the engine contains substances that are harmful to human health.
- Do not direct exhaust fumes at pedestrians or buildings.



WARNING : INJURY



- Before turning the circuit breaker to ON position, ensure that the breaker or the switch of loads are positioned to OFF.
- Operate the circuit breaker, well-communicating with the electrician by the load side.
- Close all doors and lock them during operation.



CAUTION : FIRE



- Do not bring flammable items (such as fuel, gas and paint) or items that are highly combustible near the generator as the muffler, exhaust gas and other parts become extremely hot.
- Position this generator 1m or more from walls or other hindrances, and on a level surface.



CAUTION : INJURY

- Do not operate the generator if it has been modified or any parts have been removed.
- Position the generator on a level stable surface so that it cannot slide or move in any manner.
- Before starting operation, always be sure to turn off all switches of equipment being used and all breakers to OFF.

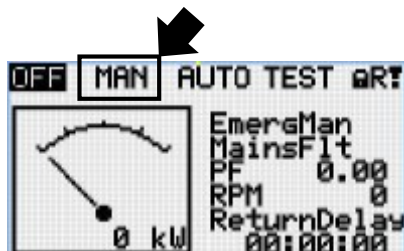
1 Turn every circuit breaker to OFF position.

2 Turn the Throttle Lever to <START POSITION>.

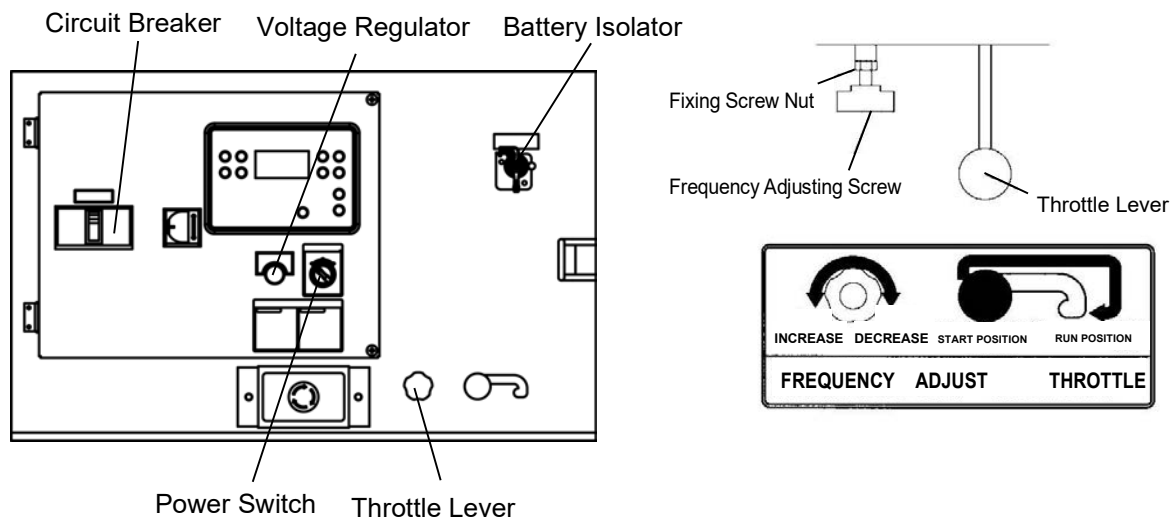
3 Turn the Battery Isolator to ON position.

4 Turn the Power Switch to ON position.

5 Check MAN mode.



6 Press the Start button to start the engine.



< Note >

- If you need to restart, wait at least 30 seconds before the retry.

- 7 Let engine idles for approximately 5 minutes.
- 8 Turn the Throttle Lever to <RUN POSITION>.
- 9 Ensure that the controller shows the following frequency at no load.

	No Load Frequency (Revolving Speed)
50Hz RUN	52.5Hz (about) (1575min ⁻¹)

- 10 Adjust the voltage regulator dial to the specified voltage.

50Hz RUN	415V
----------	------

- 11 Turn the breakers to ON to start power transmission.

⚠ WARNING : ELECTRIC SHOCK/INJURY

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

9-2. Procedures during Operation

(1) Checks after Startup

- Make sure that the controller is in normal status.
- Check that there is no abnormal vibration or noise.
- Check that the exhaust gas color is normal. When operation is normal, the exhaust gas should be colorless or slightly bluish.

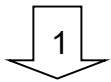
< Note >

- If abnormal, stop using this generator and request the authorized distributor where the generator was purchased to repair the generator.

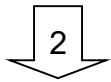
(2) Adjustment during Operation

During load operation, check the voltage on the Operation Display and finely adjust the voltage using the voltage regulator dial.

- Extracting the air out of the fuelling system for engine stop due to no fuel.



Add fuel to the generator.



Turn the Power Switch to AIR BLEEDING position. It will take approximately 30 seconds to extract the air out.



Press the Start Button, and confirm the engine has started properly.

< Note >

- Turn the throttle lever to START POSITION, start the engine and check that the air is completely bled from the system. If air bleeding is not complete, engine rotation will not be stable. In that case, repeat the air bleeding operation.

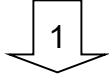
9-3. Stopping Operation



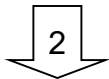
CAUTION : BURNS



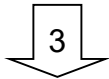
- Do not touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.



Turn the switches and breakers on the load side to OFF.



Turn the circuit breaker on the operation panel to OFF.



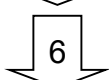
Turn the Throttle Lever to <START POSITION>.
The engine cools down for approximately three minutes.



Press the Stop button to shut off the engine.



Turn the Power Switch to OFF.



Turn the Battery Isolator to OFF.

9-4. Protective Functions



WARNING : INJURY



- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.
- Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.



CAUTION : BURNS



- Do not touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.
- Hot steam gushes out from the coolant sub-tank if the generator overheats. Do not touch the coolant sub-tank.

This generator is equipped with functions to automatically stop operation when there is a fault/malfunction during operation, and this is to warn the operator of the fault location by use of the Operation Display. Check the fault location when the engine is automatically stopped or appear warning on the Operation Display.

Protection Feature List

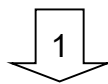
No.	Symptoms	Action			Cause
		Circuit Breaker OFF	Automatic Engine Shutoff	Controller display	
1	High Coolant temperature	--	○	○	Engine coolant temperature is too high (default at 105 degrees Celsius)
2	Oil pressure drop	--	○	○	Engine oil pressure dropped (default at 0.98 x 100kPa) (1.0kg/cm ²)
3	Insufficient 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
6	Fail to Start	--	--	○	The engine fails to start three times
7	Fuel Level Low	--	○	○	The amount of fuel is small

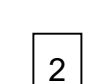
○ indicate the automatic feature

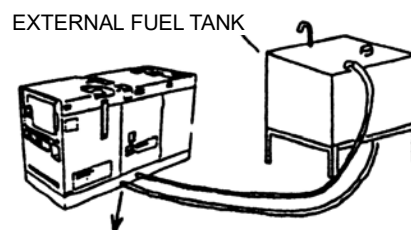
9-5. Connecting with External Fuel Tank

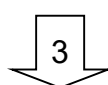
CAUTION : FIRE

- Always make sure that the engine is stopped when working on the fuel line.
- Always be sure to wipe up any spilled Diesel fuel.
- After working on the piping, check that there is no Diesel fuel leakage.

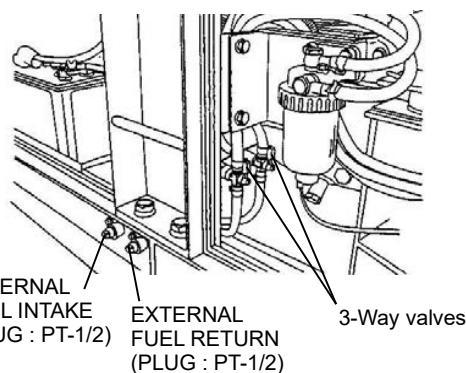
 1 Turn the 3way fuel valve lever to the “A” side.
(Position for using the internal tank.)

 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.



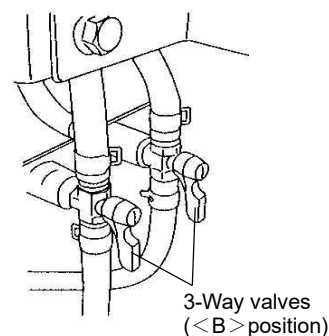
 3 Turn the 3way fuel valve lever to the “B” side.
(Position for using the external tank.)

 4 Bleed air from the external tank connecting hose. Fuel can be supplied from the external tank after completing the above procedures.



< Note >

- If using a hose for the piping, use oil-resistant hose with an internal diameter of 8 to 10 mm.
- Set the fuel level of the external fuel tank 0 to 3m above from the bottom of this generator. The fuel level of the external fuel tank being lower than this generator will result in poor engine operation or shut-off.
- Turn the 3way fuel valve lever to the “A” side in order to prevent fuel from flowing out from the external tank fuel inlet/return.
- Turn the lever completely as far as possible. If the lever is not completely pressed to either side, it might not be possible to supply fuel causing the engine to stop.
- Set the supply side so that it is 15 to 20 mm. above the underside of the tank in order to prevent foreign material or water from being suctioned from inside the external fuel tank.
- Set the external fuel tank return side at the same height as the supply side in order to prevent poor engine operation due to air mixed in with the fuel.
- Refer to section “9-2. Procedures during Operation” for air bleeding.
- Some air may remain in hoses or pipes immediately after connecting the external fuel tank resulting in unstable engine speed and engine stoppage.
- Do not leave the generator unattended for unmanned operation until you have confirmed that the engine speed is stable.



10. Inspection/Maintenance



WARNING : ELECTRIC SHOCK/INJURY



- Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.
- Do not touch the generator if the Alternator or casing becomes wet during operation.
- Do not operate the equipment, if the equipment or you are wet.
- Do not lift up using tie-downs. Use of such could result in the generator falling.
- No persons should be under a suspended generator.



CAUTION : FIRE



- Always be sure to wipe up any spilled fuel or oil.



CAUTION : BURNS



- Do not touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.
- Do not open the radiator cap immediately after stopping the engine, to avoid sustaining burns from hot vapor.
- Always be sure to stop the engine and allow the engine to cool when performing inspection or maintenance of engine oil. Opening the oil level indicator or oil filler cap during operation will result in hot oil cause personal injury.



CAUTION : INJURY

- Personnel performing lifting work must wear protective gear such as helmets, safety shoes and gloves.
- Always be sure to use lifting hooks when moving the generator, and lift it slowly at a completely vertical angle.

Perform periodic inspection and maintenance according to the following table in order to constantly maintain this generator in good working condition.

< Note >

- All procedures except for pre-operation inspection should be performed by specialized technicians.
- Request the authorized distributor where the generator was purchased to perform the procedures in the table with a "●".
- 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 be sure to use genuine parts or those indicated specifically for replacement parts.
- Use a container to catch fluid bled from this generator that is large enough to prevent the fluid from spilling on the ground.

Dispose of oil, fuel, coolant (LLC), filter, battery and other hazardous materials according to laws and regulations concerning industrial waste.

Contact the authorized distributor where the generator was purchased if you have any inquiries regarding proper disposal.

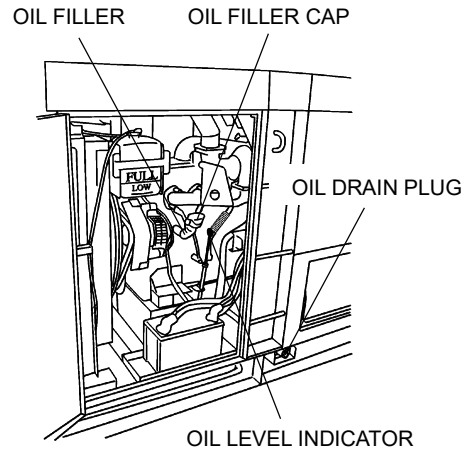
- When check doors are open during maintenance, take measures so that unrelated personnel cannot accidentally come close to the generator. Close all doors and covers if you are going to be away from this generator.
- In the event you are using Fuel Oil (A) as a fuel, the interval of replacing engine oil, oil filter and fuel filters and the inspection of fuel injection nozzle will be more frequently at every half the hours shown in the matrix.

Description	Startup check	Every 200hrs	Every 250hrs	Every 500hrs	Every 1000hrs	Remarks
Engine Side						
Clean each parts / tightening	○					
Engine oil checks / add oil	○					
Engine oil change (1 st time at 50 hr mark)			○			
Oil Filter change				○		
Coolant level check / add coolant	○					
Exhaust color check	○					
Coolant change					○ or 2 yr.	
Drain excess water and sediments in the water separator	○					
Replace fuel filter				○		
Drain water from fuel tank		○				
Clean gauze filter in water separator				○		
Clean gauze filter in engine feed pump					○	
Change filter in the magnet pump for air extraction in fuel line					○	
Clean inside fuel tank					●	
Leak check (fuel, oil, and coolant)	○					
Replacing hoses (fuel, oil, coolant, and air) and Anti-Vibration Rubber						● Every 2 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				●		
Alternator side						
Indicator, Gauges Alarms check	○					
Operation check of earth leakage relay	○					
Grounding resistance check	○					
Insulation test		○				

(1) Engine Oil Replacement

First Time	50 hours
Thereafter	Every 250 hours

- 1 Remove the oil filler cap.
- 2 Remove the oil drain plug and drain the engine oil.
- 3 Reinstall the drain plug.
- 4 Add oil through the oil filler until it is at the maximum level while checking the fuel level using the oil level indicator.
- 5 Attach the oil filler cap.



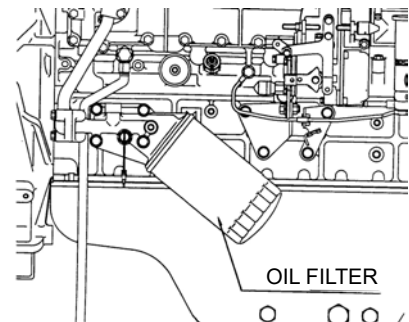
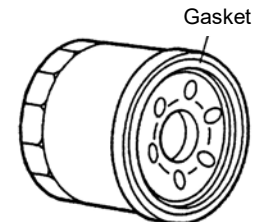
< Note >

- Refer to section “8-1. Checking Engine Oil” for engine oil replacement amounts and types.
- After reinserting the oil drain plug and shortly after starting the engine, be sure to always check that there is no oil leakage.

(2) Replacing the Oil Filter

Replace	Every 500 hours
---------	-----------------

- 1 Drain the engine oil. (Refer to section “(1) Engine Oil Replacement”.)
- 2 Remove the oil filter using a filter wrench.
- 3 Spread a thin layer of oil on a new oil filter gasket.
- 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 engine oil to the generator.
- 6 Shortly after starting the engine, always be sure to check that there is no oil leaking from the seal surface.



< Note >

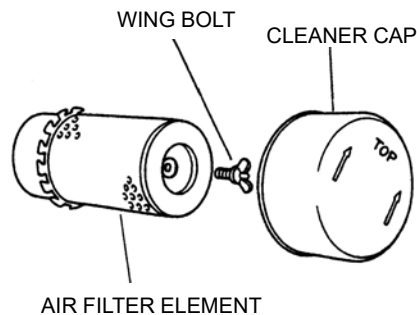
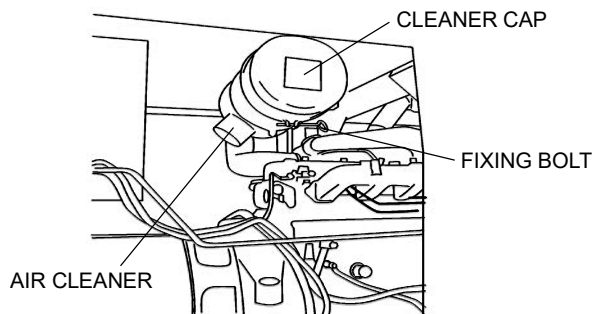
- Request the authorized distributor where the generator was purchased to perform this procedure if you do not have a filter wrench.
- Oil filter :

ISUZU Part No.
8983758600

(3) Air Filter Element Cleaning/Replacement

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 bolt and remove the filter element.
- 3 Clean or replace the filter element, and reinstall it in reverse order.



< Note >

- 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

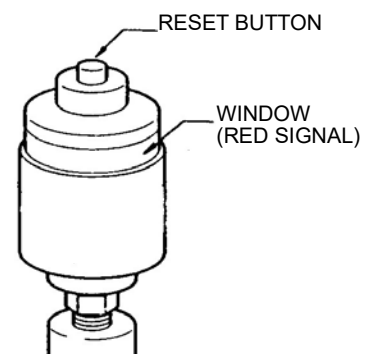
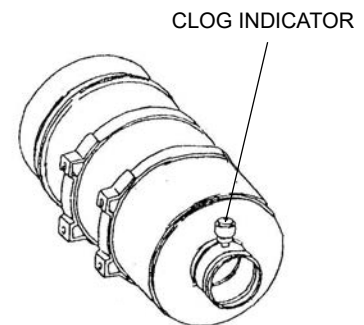
■ To clean the air filter element:

- 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.



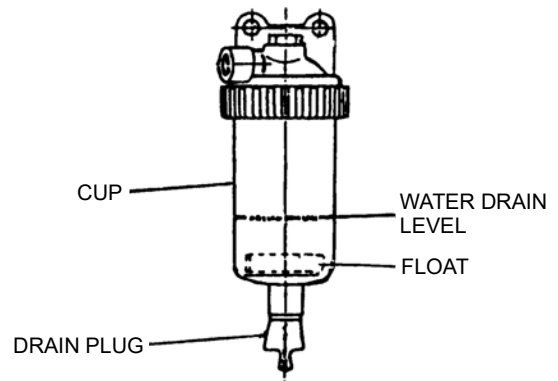
(4) Draining Water from the Water Separator

Drain water when the float (red) inside the cup floats to the water draining position.

- 1 Loosen the drain plug and drain water.
- 2 Screw the drain plug, when finishing drain.

< Note >

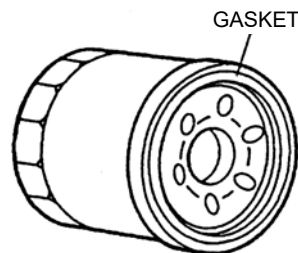
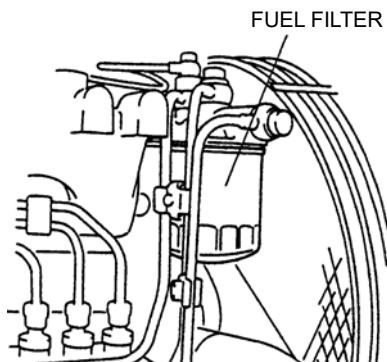
- After draining finishes, extract the air in fuel line.
(Refer to “9-2. Procedures during Operation”.)



(5) Changing Fuel Filter

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.



< Note >

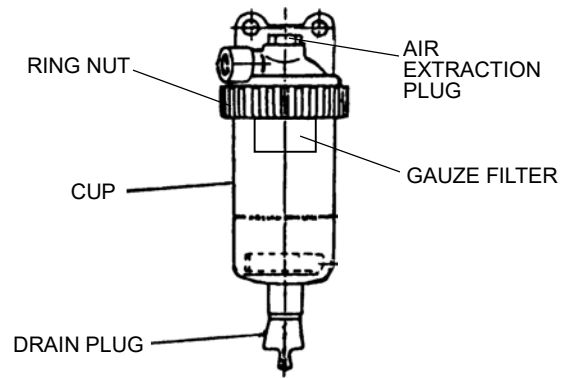
- After replacing the filter, always air out the fuel system.
(Refer to “9-2. Procedures during Operation”.)
- Fuel filter element :

ISUZU Part No.
8980366540

(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}

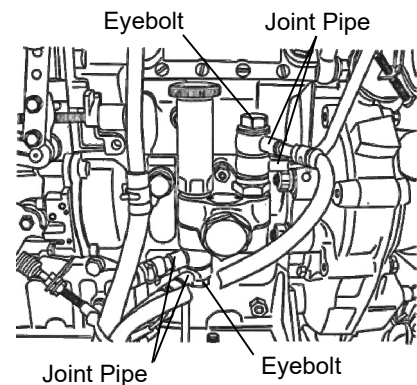
< Note >

- 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 loosening the lever.
- Extract the air in fuel line after gauze filter washing finishes.
(Refer to “9-2. Procedures during Operation”.)
- Ensure that there is no fuel leakage after reinstallation.

(7) Clean gauze filter in engine feed pump

Clean	Every 1000 hours
-------	------------------

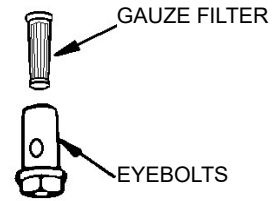
- 1 Remove eyebolts.
- 2 Remove gauze filter in eyebolts.
- 3 Wash gauze filters in Diesel fuel and reinstall in the reverse order.



Eyebolt tightening torque	44Nm{4.5kgfm}
---------------------------	---------------

< Note >

- Put a tray under the lever in order to catch spilled fuel when loosening 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 “9-2. Procedures during Operation”.)
- Ensure that there is no fuel leakage after reinstallation.
- Eyebolt (Gauze filter included):

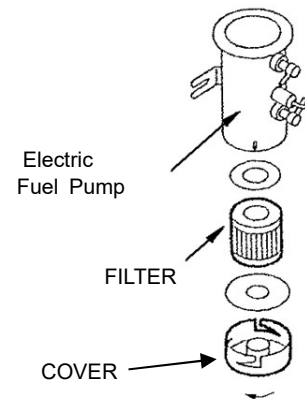


ISUZU Part No.	8970631550
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(8) Electric Fuel Pump Filter Replacement

Replace	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.



< Note >

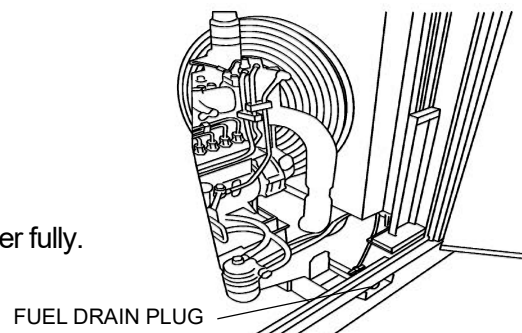
- Put a tray under the lever in order to catch spilled fuel when changing filter.
- Extract the air in fuel line after filter changing finishes.
(Refer to “9-2. Procedures during Operation”.)
- Ensure that there is no fuel leakage after reinstallation.
- Filter :

ISUZU Part No.	8943370220
----------------	------------

(9) Draining Water from Fuel Tank

Drain water	Every 200 hours
-------------	-----------------

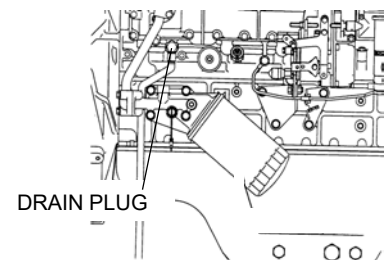
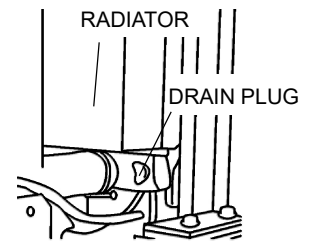
- 1 Unscrew the Fuel drain plug.
- 2 Reinstall the drain plug, after draining water fully.



(10) Changing Coolant / Water

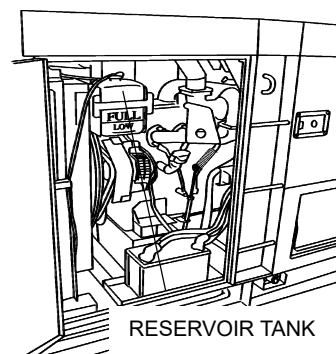
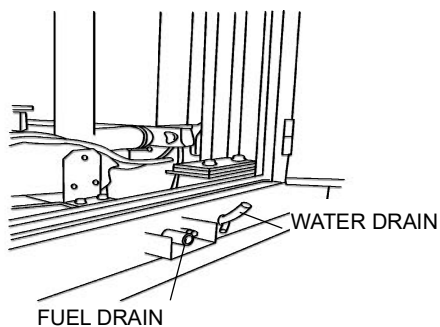
Replace	Every 0.5 years or 1000 hours
---------	-------------------------------

- 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 Reinstall the radiator cap cover.



< Note >

- Refer Coolant to "8-2. Checking Coolant".



11. Long-Term Storage

WARNING : INJURY

- Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.

CAUTION : FIRE

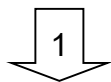
- Always be sure to wipe up any spilled fuel or oil.
- Allow the generator to cool before covering with the protective cover.

CAUTION : BURNS

- Do not touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.

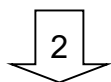
(1) Storage Procedures

Perform the following maintenance procedures before storing this generator if it is not going to be used for two months or more.



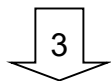
Remove the battery.

(Refer to section “**8-6. Checking the Battery Replacing the Battery**”.)



Replace the engine oil.

(Refer to section “**10. Inspection/Maintenance (1) Engine Oil Replacement**”.)



Drain the fuel from the fuel tank and filter.

(Refer to section “**10. Inspection/Maintenance (5) Changing Fuel Filter**”.)

(Refer to section “**10. Inspection/Maintenance (9) Draining Water from Fuel Tank**”.)



Store in a secure location.



Clean up all generator components, and store in a dry and dust-free location.
Also cover when storing so that rain cannot enter through the suction or exhaust ports.

< Note >

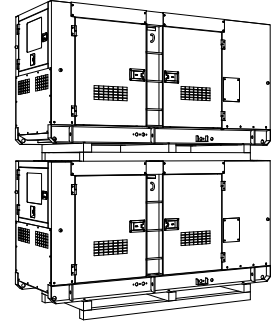
- Adjust the fluid of the removed battery to the appropriate level and recharge approximately every month.

(2) Double-Stacking Procedures

WARNING : INJURY

Always be sure to observe the following items when double stacking this generator in a warehouse or similar location.

- Check that the Top cover of this generator is not dented, and that bolts are not loosen or missing.
- Set in a location with a flat hard floor capable of withstanding the double-stacking weight.
- Always be sure to use lifting hooks when lifting this generator.
- Insert wood ties of the same size and that are wider than this generator between each generator, and set another generator on top of the ties.
- Never stack more than two levels, and do not set a generator on top that is larger in weight/size than that on the bottom.
- Do not operate the generator when it is double stacked.



12. Troubleshooting

WARNING : ELECTRIC SHOCK/INJURY

- Do not touch output terminals or internal electric parts while the generator is operating.
- Close all doors and place locks during operating this equipment, to avoid injuries by unintentionally touching cooling fan and fan belt.
- Before performing any equipment check or maintenance, stop the engine, and turn the Power Switch to the OFF position.

CAUTION : FIRE

- Never allow flame to come close to the generator.

CAUTION : BURNS

- Do not touch the engine and muffler after stopping the engine while temperature can reach extremely high.

Inspect this generator when operation is poor to determine the fault/malfunction. Request the authorized distributor where the generator was purchased to perform maintenance if you cannot find any faults/malfunctions during inspection.

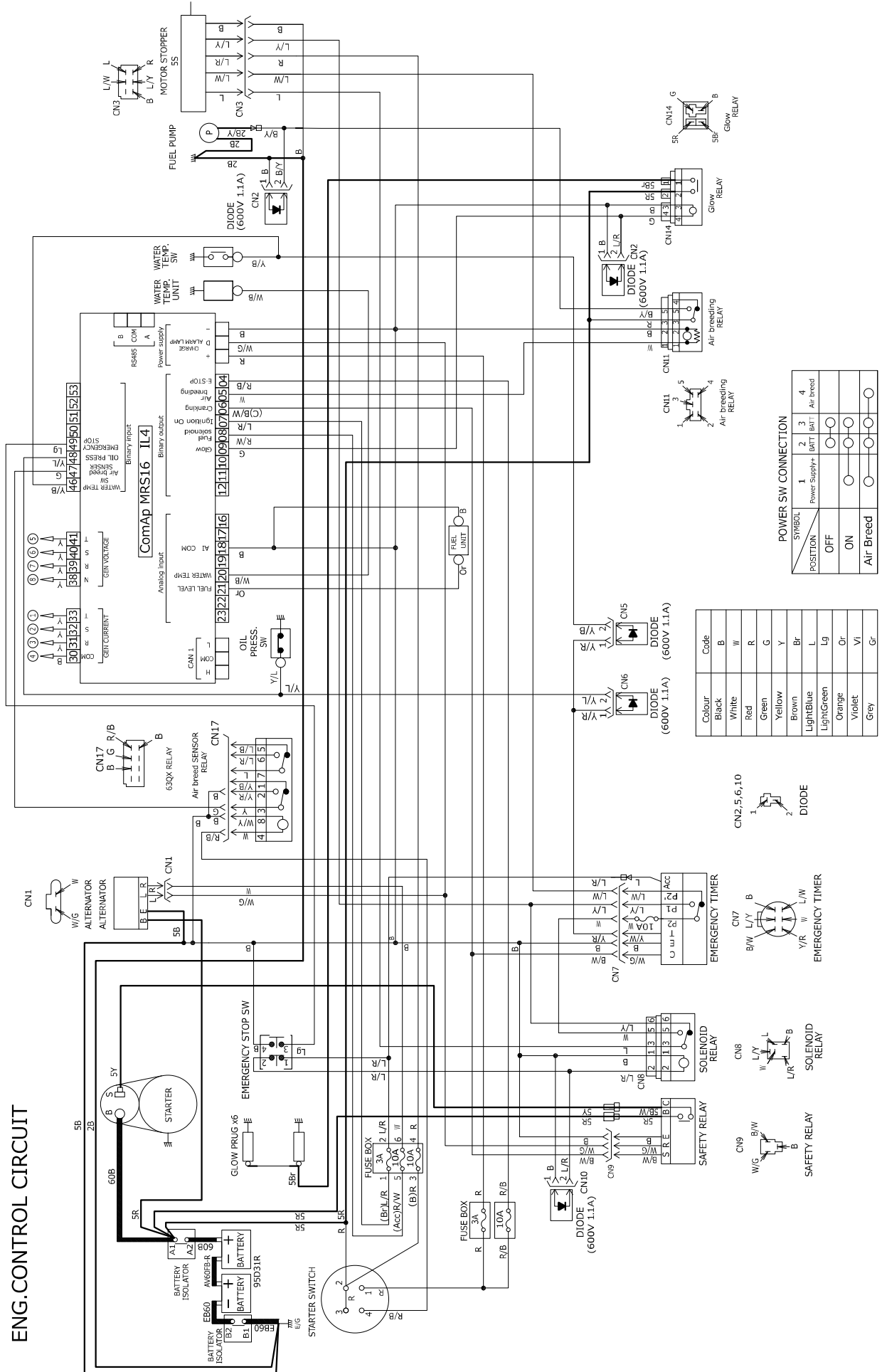
Problem		Suspected cause	Action
Engine does not start	Starter motor does not drive or speed is low	1. Battery Isolator is OFF 2. Battery output is weak 3. Battery is deteriorated 4. Battery terminal is OFF or loose 5. Battery terminal is corroded 6. Power Switch or relay is defective 7. Starter motor is defective	1. Turn Battery Isolator to ON 2. Check/ battery liquid/ or Charge 3. Change battery 4. Fix/Tighten terminal 5. Clean terminal 6. Ask our distributor to repair 7. 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
	<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. Wrong oil is used	1. Supply lubricant oil 2. Change oil filter 3. Ask our distributor to repair 4. Change to proper kind and viscosity oil

Overheated	1. Engine thermostat is defective 2. Water temp sensor is defective 3. Controller 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
Voltage value does not change	1. Controller 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
The voltage does not rise to the rated voltage	1. Controller is defective 2. AVR is defective 3. Voltage regulator dial is defective 4. Frequency is low 5. Frequency Adjusting Screw 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 Adjusting Screw correct
The voltage value exceed the rated voltage	1. Controller 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. Loads total exceeds the rated current 4. Frequency Adjusting Screw is set wrong	1. Ask our distributor to repair 2. Balance the loads sharing to each terminal 3. Decrease the loads to meet the rated output 4. Set the Adjusting Screw 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
Controller does not turn on	1. Battery output is weak 2. Battery is deteriorated 3. Battery terminal is OFF or loose 4. Battery terminal is corroded 5. Fuse is blown 6. Disconnected circuit, loose terminal or departed 7. Controller or Power Switch is defectiv	1. Check/ battery liquid/ or Change 2. Change battery 3. Fix/Tighten terminal 4. Clean terminal 5. Check/Change fuse 6. Ask our distributor to repair 7. Ask our distributor to repair

14. Engine Electrical Circuit Diagram

ENG.CONTROL CIRCUIT



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