

shindaiwa®

OWNER'S AND OPERATOR'S MANUAL

Diesel Engine Generator

DGK150D

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.

DGK150D/01
X750-022 26 4
X750801-390 4

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 way 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.

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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 remove the engine key.
- 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.
- 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.

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 remove the engine key. A person performing the maintenance should always keep the key.
- Always be sure to use lifting hooks when lifting up the generator. The other thing could result in the generator falling.
- This lifting hook is designed to lift only the generator. Do not lift any additional added weight such as fuel tanks and/or trailers with this lifting hook.
- 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.
- Always keep environmental contaminants such as dust and moisture from building up on the terminal block and generator control box or arcing from the terminals to the generator control box or terminal block mounting screws may result.

⚠ 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.

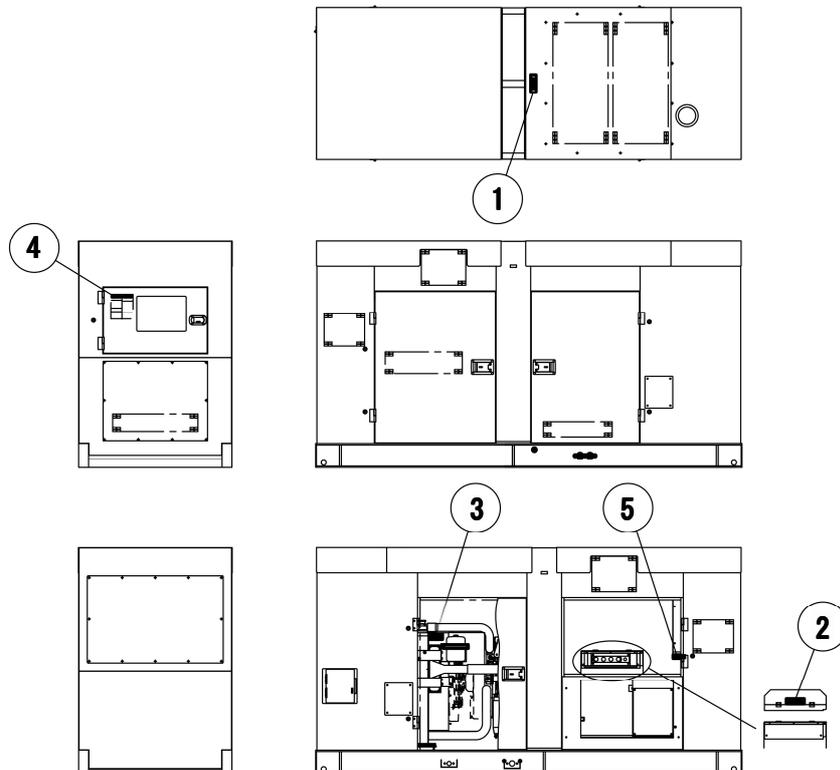
⚠ CAUTION : PROPERTY DAMAGE

- 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 | Warning : Injury | (Part no. : X505-007550) |
| ② | Warning : Electric Shock | (Part no. : X505-007560) |
| ③ | Caution : GM Spec LLC | (Part no. : X505-004650) |
| ④ | Warning/Caution | (Part no. : X505-007571) |
| ⑤ | Warning : Keep Terminal | (Part no. : X505-007580) |



2. Specifications

2-1. Specifications

Model		Unit	DGK150D/01
Alternator	Generating Type	-	Rotating Filed, Brushless 3-Phase Synchronous Alternator
	Rated Output	kVA	120 / 150
		kW	96 / 120
	Rated Voltage	V	415 / 480
	Rated Current	A	167 / 180
	Rated Frequency	Hz	50 / 60
	Winding	-	3-phase, 4-wire
	Power factor	%	80
	Insulation class	-	F
	Excitation	-	Self-Excitation(Brushless)
No. of poles	-	4	
Engine	Types	-	Vertical Water-cooled 4-cycle Diesel Engine
	Model (Manufacturer)	-	6HK1 (ISUZU)
	No. of Cylinders (bore x stroke)	(mm)	6 (115 x 125)
	Continuous rated output	kW	119 / 142
		PS	162 / 193
	Rated speed	min ⁻¹	1500 / 1800
	Displacement	L	7.790
	Combustion system	-	Direct Fuel Injection with Turbo Charger
	Cooling method	-	Radiator
	Lubricating method	-	Forced lubrication
	Starting method	-	Electric start
	Fuel	-	Diesel
	Lubricant oil	-	CD class
	Fuel tank capacity	L	280
	Lubricant volume (Full)	L	38
	Cooling water volume	L	23.8
	Starting motor capacity	V-kW	24 – 5.0
	Charging dynamo capacity	V-A	24 - 50
Battery	-	105E41R x 2	
Battery capacity	V-AH	12(V) – 100AH	
Unit	Length	mm	3450
	Width	mm	1240
	Height	mm	1850
	Dry Weight	kg	2950
	Installed Weight	kg	3260

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: 85% or less
- Elevation: 1000 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

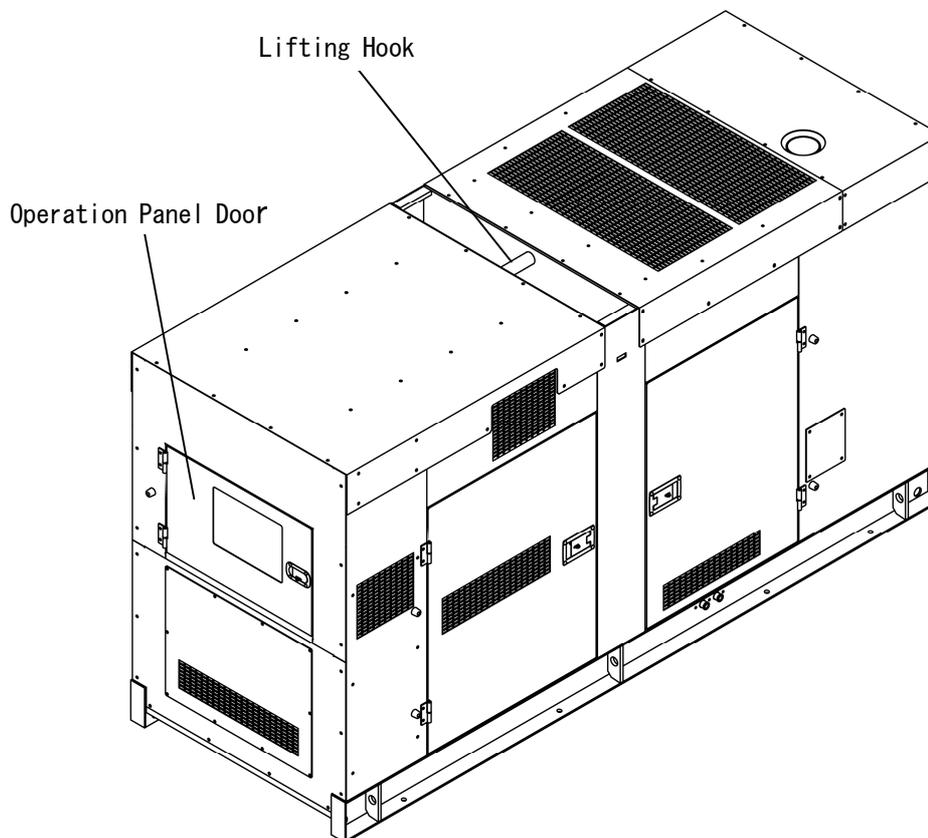


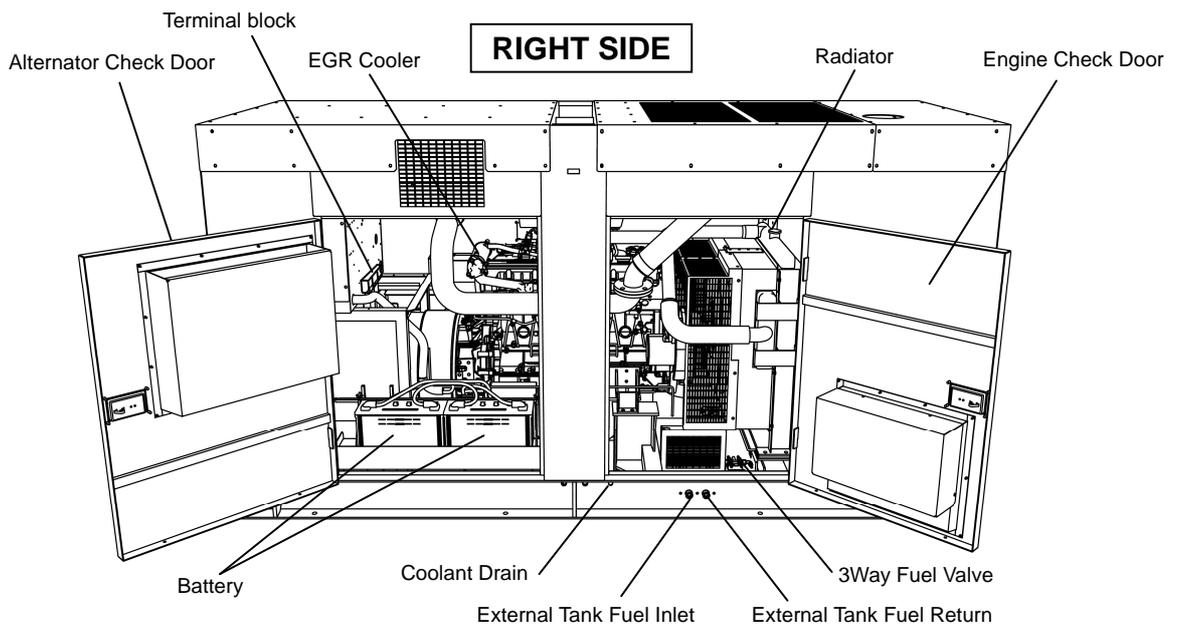
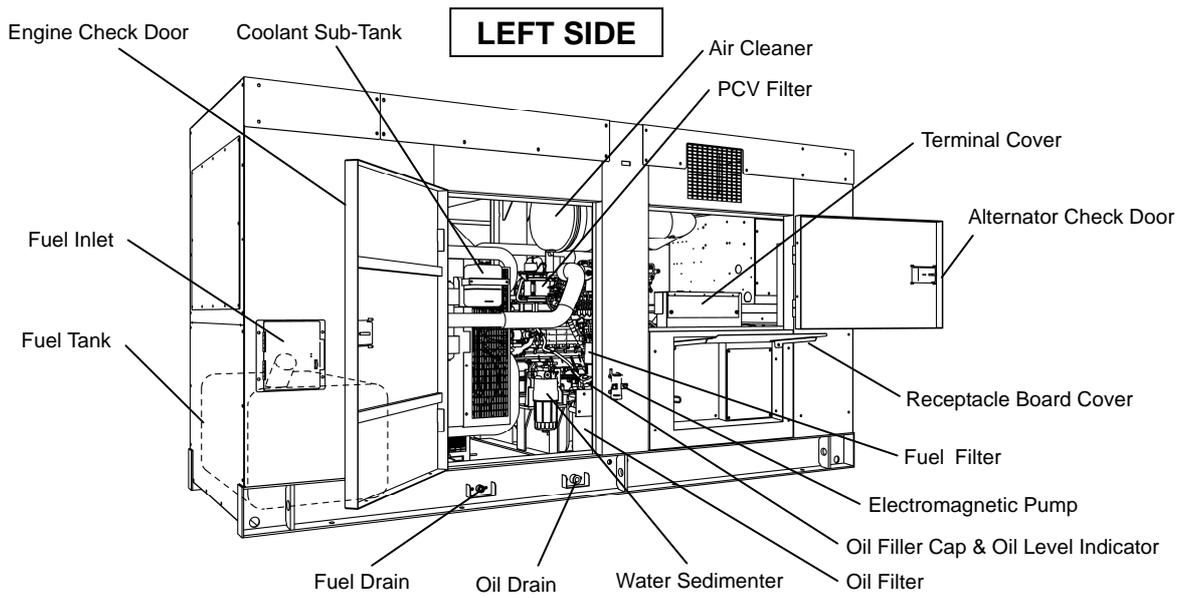
CAUTION : PROPERTY/SECONDARY DAMAGE

- 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





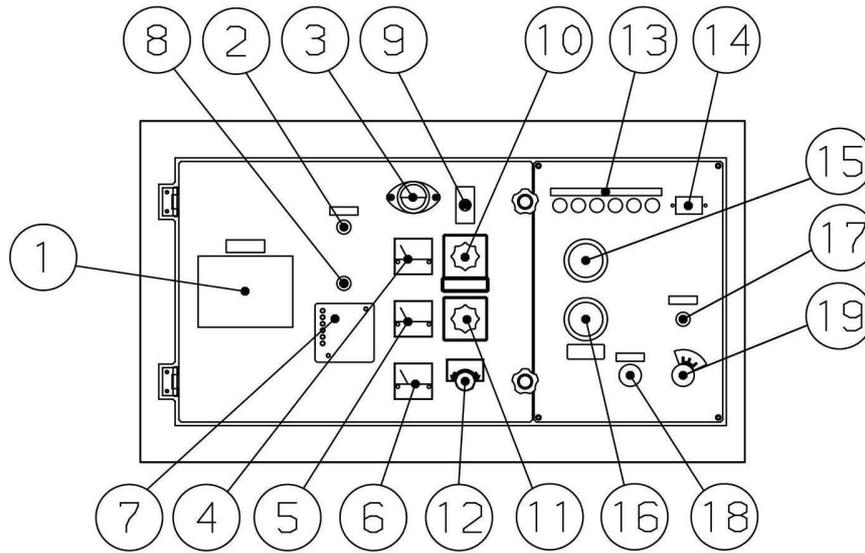
Accessories

Owners
Manual



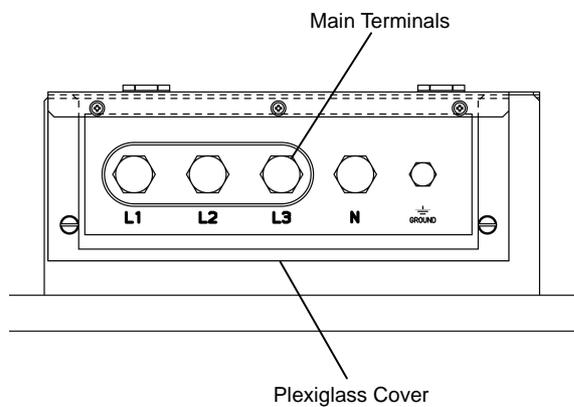
Engine Key (2 pieces)

4-2. Operation Panel Part Names



①	Circuit Breaker	⑪	Ammeter Selector Switch
②	Pilot Lamp	⑫	Voltage Adjust Regulator
③	Panel Light	⑬	Monitor Lights
④	Voltmeter	⑭	Hour Meter
⑤	Ammeter	⑮	Water Temperature Gauge
⑥	Frequency Meter	⑯	Fuel Gauge
⑦	Auto start Panel (Optional)	⑰	Glow Lamp
⑧	Auto start Switch (Optional)	⑱	Emergency Stop Button
⑨	Panel Light Switch		
⑩	Voltmeter Selector Switch		

4-3. Main Terminal Board



5. Equipment

5-1. Warning Indicators



WARNING : INJURY



- Close all doors and place locks during operation, to avoid injuries by unintentionally contact with moving parts such as the cooling fan and fan belt.
- 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 touch the engine and surrounding components immediately after stopping the equipment, while temperature can reach extremely high.

DIAG BOOST CHARGE OIL PRESS OVER HEAT OVER SPEED



This generator is equipped with the following warning indicators "DIAG" (diagnostic), "BOOST" (boost temperature), "CHARGE" (battery charging), "OIL PRESS" (oil pressure), "OVER HEAT" (water temperature), and "OVER SPEED" (engine overspeed).

Warning indicators light up if some fault occurs during operation and the engine might be automatically stopped depending on the type of fault.

Under normal operating conditions these monitoring lamps will come on momentarily when the engine is first started but will go off very shortly thereafter.

(1) WATER TEMP (Coolant Temperature) Warning Indicator (High Water Temp)

⚠ 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.

When the water temperature reaches 105 degree celsius, the coolant/water temperature monitor lamp will flash, and the automatic shutoff will be engaged.

When this occurs, check the coolant/water reservoir tank, and replenish if needed.

(Refer to “**8-2. Checking Coolant**”)

If the water level is normal, there may be a possibility of loose fan belt or water leakage in coolant lines. Check it after the engine cools down.

< NOTE >

- The coolant temperature cannot be detected if the coolant level is excessively low. Always be sure to check the coolant level in the radiator coolant sub-tank before starting work.

(2) OIL PRESS (engine oil pressure) Warning Indicator (Low Oil Press)

⚠ 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 gauge or oil filler cap during operation will result in hot oil cause personal injury.

When the engine oil pressure drops below 100 kPa { 1.02 kgf/cm² (14.5 psi) } during operation, the oil pressure monitor lamp will flash, and the automatic shutdown will be engaged.

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

< NOTE >

- This oil pressure warning indicator cannot detect oil deterioration. Change the engine oil periodically. (Refer to section “**8-1. Checking Engine Oil**”)

(3) BATTERY (Battery Charge) Warning Indicator (Low Battery Voltage)

The BATTERY warning indicator lights up when charging is not possible during operation.

If this occurs, contact the authorized distributor where the generator was purchased.

< NOTE >

- This battery charging warning indicator cannot detect battery deterioration or insufficient battery fluid. (Refer to section “**8-6. Checking the Battery**”)

(4) Diagnosis Indicator



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 gauge or oil filler cap during operation will result in hot oil cause personal injury.

If the electronic control module detects a fault that could affect engine operation it will flash the diagnosis lamp to indicate that further diagnosis as to the source of fault is necessary.

This will not shut the engine down.

If this occurs, contact the authorized distributor where the generator was purchased.

< NOTE >

- This battery charging warning indicator cannot detect battery deterioration or insufficient battery fluid. (Refer to section “**8-6. Checking the Battery**”)

(5) Boost Indicator



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 gauge or oil filler cap during operation will result in hot oil cause personal injury.

If the inlet temperature to the inlet manifold exceeds 85 degree celsius the boost temperature lamp will flash but will not shut the engine down.

If this occurs, contact the authorized distributor where the generator was purchased.

(6) Over Speed Indicator



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 gauge or oil filler cap during operation will result in hot oil cause personal injury.

This generator is equipped with this function that automatically stops the engine if some fault occurs in the engine causing the engine speed to increase a considerable amount. If the engine speed increases to 2,070 rpm / 60Hz and 1,725 rpm / 50Hz or more during operation, the overspeed and engine malfunction indicators light up, and the engine is automatically stopped.

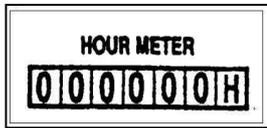
When this occurs, it is probable that there is some internal malfunction of the engine.

If this occurs, contact the authorized distributor where the generator was purchased.

5-2. Meters and Gauges

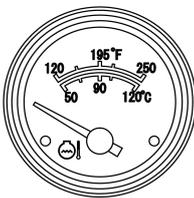
Engine Meters and Gauges

(1) Hour Meter



Displays the operating time. Use this to schedule periodic inspection. Be careful as the hour meter operates when the starter switch is at RUN regardless of whether the engine is running or stopped.

(2) Water Temperature Gauge

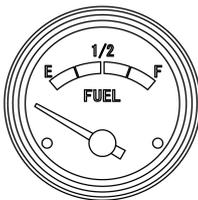


Water Temperature Gauge displays the temperature of engine coolant. Normal temperature may vary depending on the environment, but it should be between 75 to 90 degrees Celsius.

< NOTE >

- If the needle of the water temperature meter exceeds the standard value, immediately stop the equipment being used, allow the generator to cool by idling the engine, and wait until the water temperature decreases.

(3) Fuel Gauge



It shows the volume in the fuel tank.

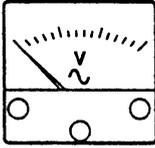
When filled up, it shows 『F』.

When the indicator is approaching to 『E』, the amount of fuel is close to empty.

Replenish fuel enough promptly.

Generator Meters and Gauges

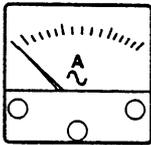
(1) Voltmeter



Voltmeter displays the output voltage (Phase to Phase) from the generator.

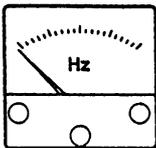
Please check and confirm it showing 415V at 50Hz and 480V at 60Hz during operation.

(2) Ammeter



Ammeter displays the output current (Phase) from the generator.

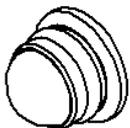
(3) Frequency Meter



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

Lamps

(1) Glow Lamp



When the start switch is turned to the Run/Preheat position, the Glow Lamp will light to indicate that the glow plugs are energized and preheating the engine cylinders.

When the preheating is completed, the lamp will go off, indicating that the engine is ready to be started.

Preheating time may vary from 1 to 15 seconds, depending on the coolant temperature.

(2) Pilot Lamp

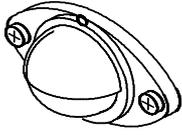


The pilot lamp is located on the generator control panel and indicates whether or not the engine is running.

When the lamp is lit the engine is running.

When the lamp is not lit the engine is not running.

(3) Panel Light

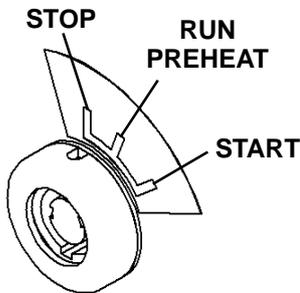


The panel light is located on the generator control panel and is used to illuminate the generator and engine control panels.

This light is turned on and off with the panel light toggle switch which is also located on the generator control panel next to the panel light. This light can only be energized when the engine is running.

Switches

(1) Starter Switch



① Stop

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.

② Run / Preheat

The switch must be in this position during operation. This position also is used to begin the engine preheat cycle and to remove air from the fuel system.

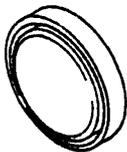
< NOTE >

Do not leave the switch to this position, while the engine is stopped. Otherwise the battery is discharged.

③ Start

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

(2) Emergency Stop Button



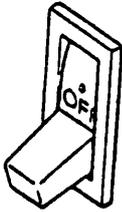
This button is used to stop the engine in emergency. Keep pressing the button until the engine comes to complete stop.

< NOTE >

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.

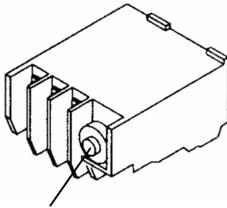
(3) Circuit Breaker



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, when overload or short-circuit occur.

(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 in between ON and OFF position.

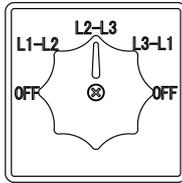
Reset the breaker, to the ON position according to the following procedure;

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

< NOTE >

Do not change the preset value of the thermal relay.

(5) Voltmeter Selector Switch



The voltmeter selector switch is a 5 position switch located on the control panel to the left of the voltmeter.

The voltmeter selector switch selects which phase voltage is displayed on the voltmeter.

Positions:

Off:

There are two off positions on the voltmeter selector switch. One at the full clockwise position and one at the full counter-clockwise position of the switch.

In either off position the voltmeter will not display any voltage.

L1-L2:

In the L1-L2 position the voltmeter will display the phase voltage between L1 and L2.

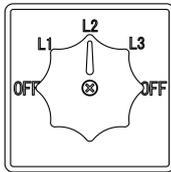
L2-L3:

In the L2-L3 position the voltmeter will display the phase voltage between L2 and L3.

L3-L1:

In the L3-L1 position the voltmeter will display the phase voltage between L3 and L1.

(6) Ammeter Selector Switch



The ammeter selector switch is a 5 position switch located on the control panel to the left of

the ammeter. The ammeter selector switch selects which phase current is displayed on the ammeter.

Positions:

Off:

There are two off positions on the ammeter selector switch. One at the full clockwise position and one at the full counter-clockwise position of the switch. In either off position the ammeter will not display any amps.

This switch must be in the L1 or L3 position to read single phase current.

L1:

In the L1 position the ammeter indicates the 3-Phase amps for L1 and single-Phase amps for L1.

L2:

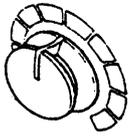
In the L2 position the ammeter indicated the 3-Phase amps for L2.

L3:

In the L3 position the ammeter indicates the 3-Phase amps for L3 and single-Phase amps for L3.

Voltage Regulator

■ Voltage Regulator



The dial adjusts generator output voltage.
Turn the dial clockwise to increase, or counter-clockwise to decrease the voltage.

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

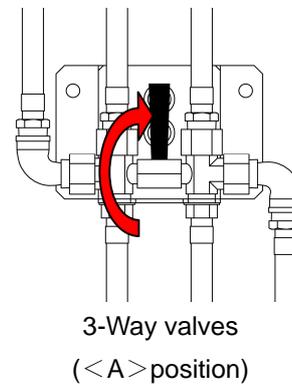
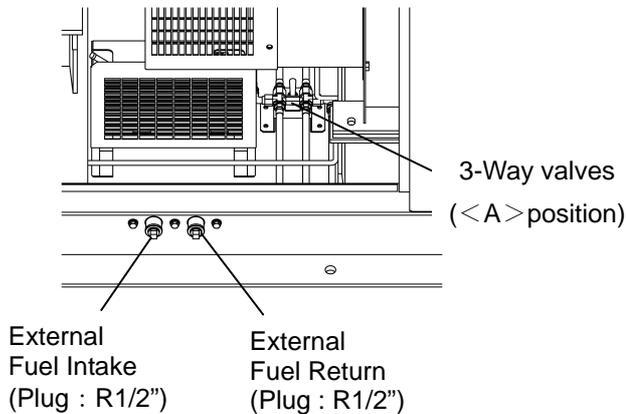
CAUTION: 

- 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 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 R1/2" plugs. Do not remove the plugs, when using the built-in fuel tank.



< NOTE >

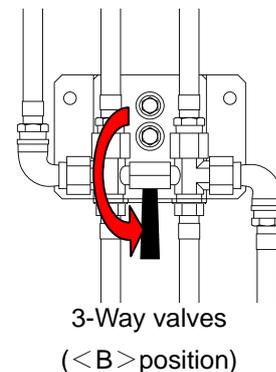
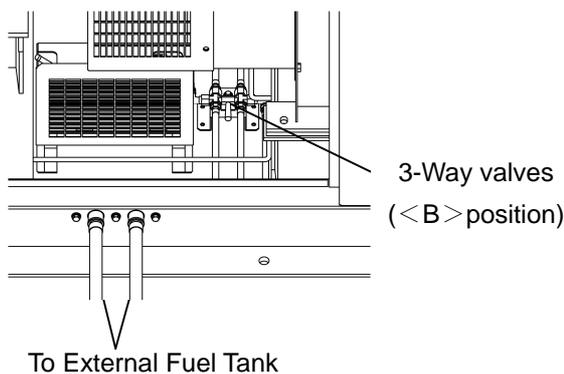
Always set the lever for 3-way valve back to **A** position and cover the external fuel intake and return port with the supplied plugs, after the hoses are removed.

(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

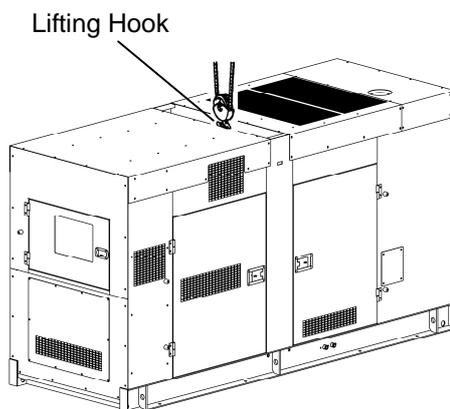
- Always be sure to use lifting hooks when lifting up the generator. The other thing could result in the generator falling.
- This lifting hook is designed to lift the generator only. Do not lift any additional added weight such as fuel tanks and/or trailers with this lifting hook.
- No persons should be under a lifted generator.

⚠ CAUTION : INJURY

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

■ Lifting Procedures

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



< 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.

< **Caution** >

- This equipment must be operated on hard and flat surface. Operating under any other conditions may result in a fault or 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, and remove the engine key.
The person performing the maintenance should always keep the key.
- Close the output terminal cover before operating.
- Do not touch the generator if the Alternator or casing becomes wet during operation.

⚠ CAUTION : FIRE

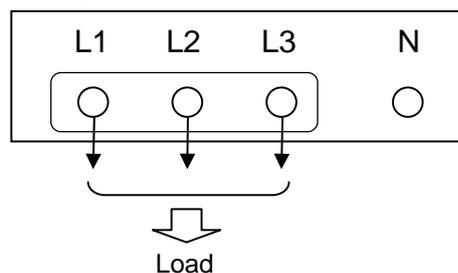
- Do not connect the generator output to indoor wiring.

< NOTE >

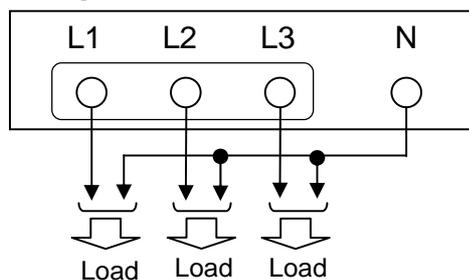
- When connecting a load, check that the generator output setting, output terminal connection position, and load power source are all matching.
- If using the N terminal, be careful that the currents of each phase are uniformed.
- If using three-phase output simultaneously with a single-phase three-wire 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 415V / 480V at 50Hz / 60Hz.



- For single-phase load:
 - Terminal voltage is 240V / 277V at 50Hz / 60Hz.



8. Pre-Operation Inspection

⚠ WARNING : ELECTRIC SHOCK/INJURY

- 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 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

- Be sure to also read the separate Engine Instruction Manual.

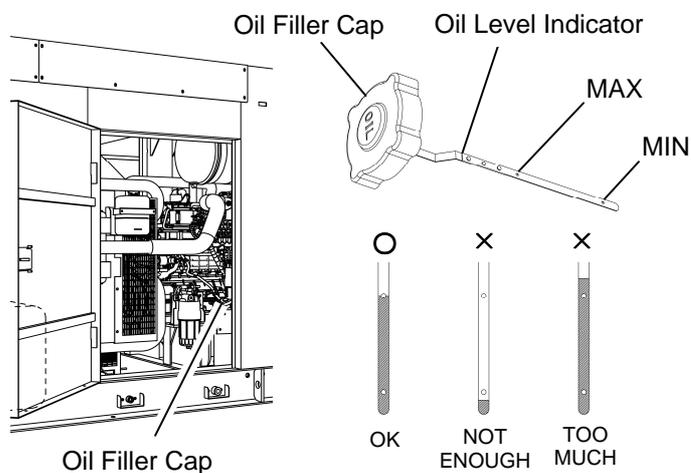
⚠ CAUTION : BURNS

- 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.



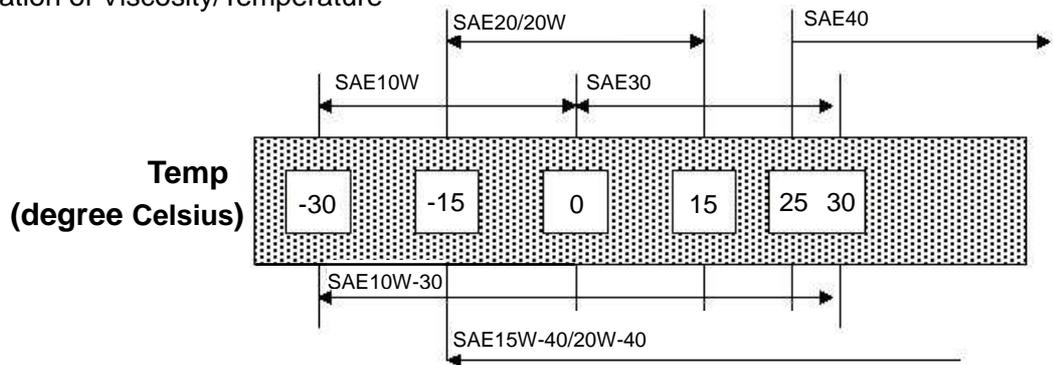
(1) Types of Engine Oil

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
38.0

8-2. Checking Coolant

- Be sure to also read the separate Engine Instruction Manual.

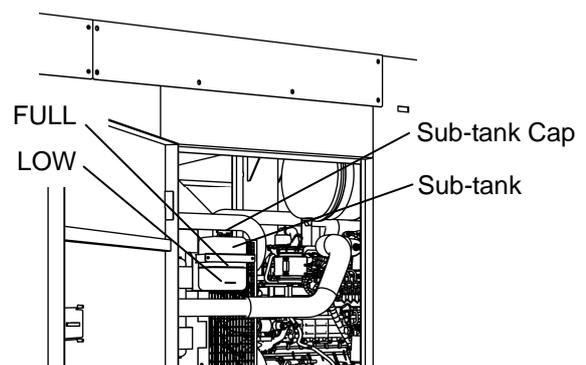
⚠ CAUTION : BURNS

- 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.

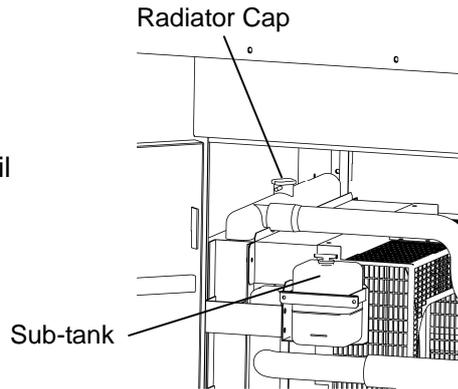
(1) Filling the Sub-Tank

- 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 cap.
- 2 Fill with coolant through the filler neck until the radiator is full.
- 3 Re-attach and tighten the radiator cap.



< 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
- Do not use a high LLC mixing rate unless absolutely necessary. Doing so could result in overheating or malfunction.
- Replace LLC every 1 years or 1,000 hours

Long Life Coolant Mixture ratio (for reference only)

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

(3) Coolant Amount

(Unit:L)

Total Coolant Amount
23.8 (1.5)

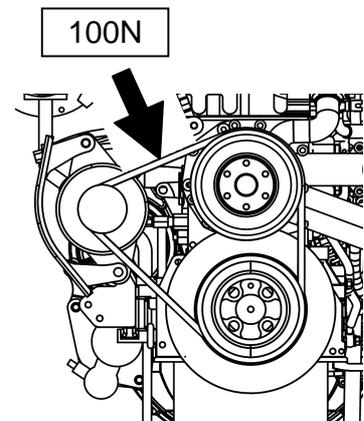
Value in parenthesis is the sub-tank capacity.

8-3. Checking the Fan Belt

- Be sure to also read the separate Engine Instruction Manual.

(1) Fan Belt Tension

Tension should be optimum when the fan belt has 6 to 8mm slacks, when applying finger pressure (about 100N {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

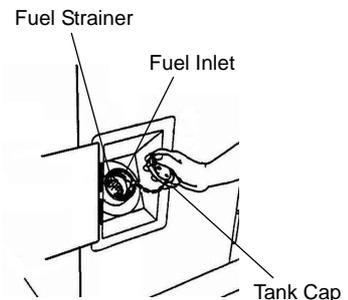
- This generator uses diesel fuel. Always be sure to stop the engine and remove engine key. Wait until the engine has cooled before performing inspection or periodical maintenance.
- Always wipe any drip of Diesel fuel or oil.
- Do not use this equipment when leak is found.
Repair the equipment before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

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

The fuel meter 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 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 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” 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 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.



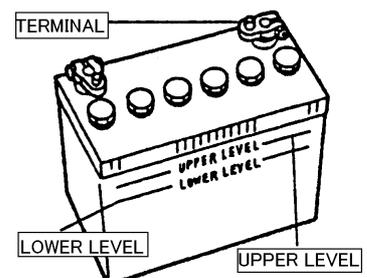
Check the fluid level, and add distilled water when it is near the lower level until it reaches the upper level.



Check the terminals for looseness and tighten if loosen.

< NOTE >

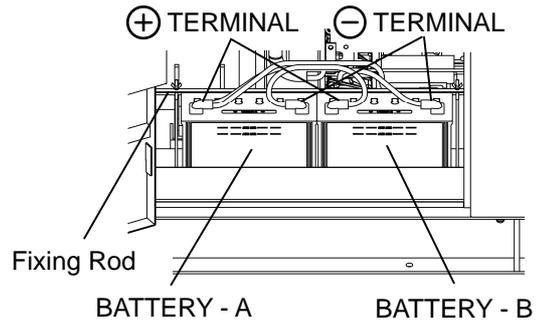
- It is necessary to recharge the battery when the specific gravity of the battery fluid is 1.23 or less. Request the authorized distributor where the generator was purchased to recharge the battery.



■ Replacing the Battery

< NOTE >

- 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) BATTERY - A

- 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) BATTERY - B

- 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.



Turn every circuit breaker to OFF position.

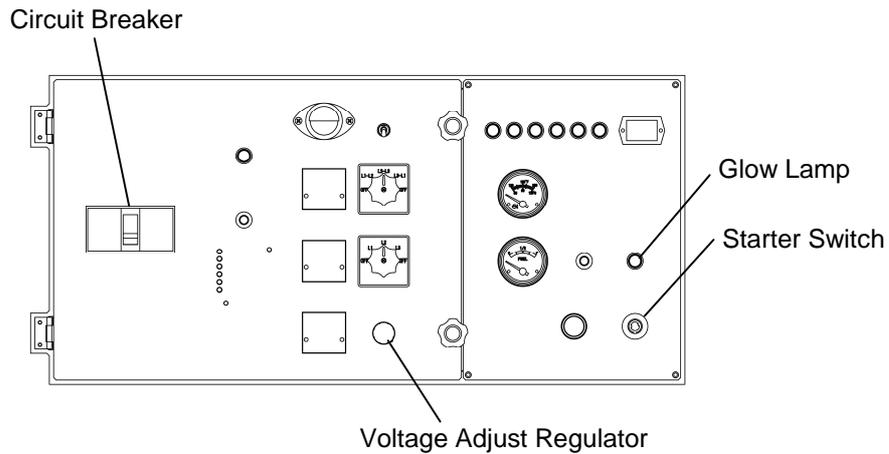


Turn the starter switch to the <START> position.

If the temperature is cold, turn the starter switch to <PREHEAT> and the pre-heating indicator lights up. The light turns off after preheating is completed. After the light turns off, start the engine.

< NOTE >

- The preheating time varies depending on the coolant temperature but generally is completed in approximately one to fifteen seconds.
- Do not continuously operate the starter motor for 10 sec. or more.
- If repeating starter switch operation, wait 30 sec. or more between operating.
- Be aware that smoke might be generated when the engine is started.



- 3 After starting the engine, remove your hand from the starter switch.
- 4 Allow the engine to run, with no load, for at least 10 minutes.
- 5 Adjust the voltage regulator dial to the specified voltage.

For three-phase load	50Hz / 60Hz	415V / 480V
For single-phase load	50Hz / 60Hz	240V / 277V

- 6 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 all meters and indicators are in normal status.
(Refer to section “5. Equipment”)
- 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 abnormality is found, 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 voltmeter and properly adjust the voltage using the voltage regulator dial.

- Bleeding air from the fuel system when the engine stops due to running out of fuel, this generator is equipped with an automatic air bleeding mechanism. Perform the following procedures when the engine stops to bleed the air automatically.

↓
1 Add fuel to the generator.

↓
2 Turn the starter switch will be RUN. Air bleeding is completed in approximately 30 seconds.

< NOTE >

- 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.

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

↓
2 Turn the circuit breaker on the operation panel to OFF.

↓
3 The engine cools down for approximately three minutes.

↓
4 Turn the starter switch to STOP.

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 remove the engine key. A person performing the maintenance should always keep the key.

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 automatic shutdown feature and display of the fault location or any malfunction. In event of the automatic shutdown or alarm lamp flashing, turn off the engine and investigate the fault location.

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 100kPa (14.5 psi))
3	Insufficient battery arge	--	--	○	When the battery can no longer hold charge.
4	Diagnosis	--	△	○	Operates if some fault affecting the engine is detected.
5	Hight Boost Temp	--	--	○	Operates if the intake-air temperature of the intake manifold is excessively high. (default at 85 degrees Celsius)
6	Engine Over speed	--	○	○	Operates if the engine speed is excessively high during operation. (default at 2,070 rpm / 60 Hz and 1,725 rpm / 50 Hz)

○ indicate the automatic feature.

△ indicate the function might operate.

9-5. Connecting with External Fuel Tank

CAUTION : FIRE

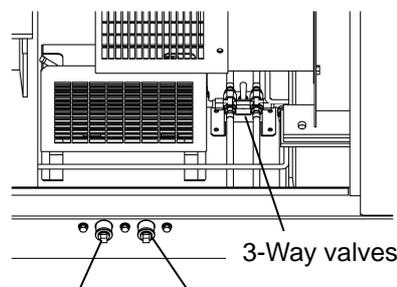
- Always make sure that the engine is stopped when working on the fuel line.
- Always be sure to wipe up any spilled Diesel fuel.
- After working on the piping, check that there is no Diesel fuel leakage.

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

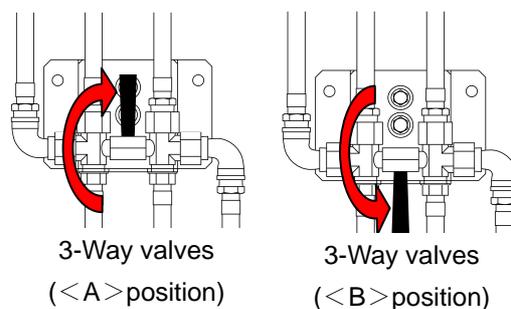
2 Disconnect the R1/2” plugs from both the external fuel intake and an external fuel return, and connect the hoses from an external fuel tank, as shown below.

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.



External Fuel Intake (Plug : R1/2”) External Fuel Return (Plug : R1/2”)

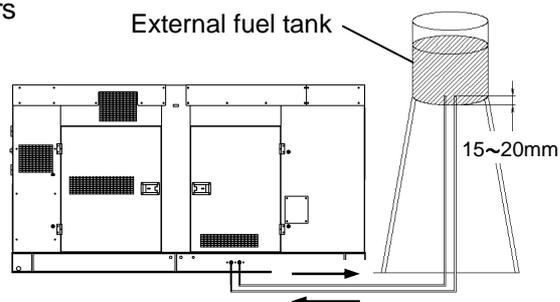


3-Way valves (<A> position)

3-Way valves (position)

< NOTE >

- If using a hose for the piping, use oil-resistant hose with an internal diameter of 9 to 10 mm.
- Set the fuel level of the external fuel tank 0 to 3 meters 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 remove the engine key. A person performing the maintenance should always keep the key.
- 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. Use the hour meter as a reference for the operating time.

< 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.

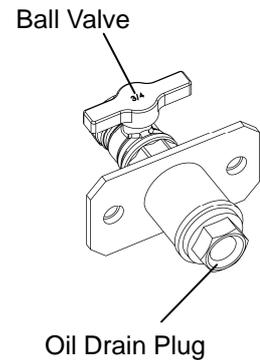
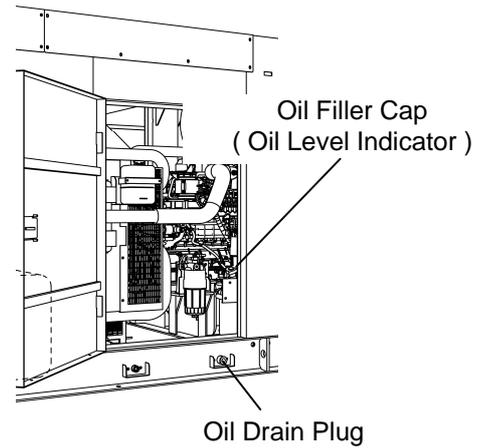
- When check doors are open during maintenance, take measures so that unrelated personnel cannot accidentally come close to the generator. Close all doors and covers if you are going to be away from this generator.
- In the event you are using Fuel Oil (A) as a fuel, the interval of replacing engine 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	Daily check	Every 250hrs	Every 500hrs	Every 1000hrs
Engine Side				
Clean each parts / tightening	○			
Engine oil checks / add oil	○			
Engine oil and Oil Filter change	○ <i>(1st time at 50 hr mark)</i>		○	
PCV Filter change	○ <i>(1st time at 50 hr mark)</i>		○	
Coolant level check / add coolant	○			
Exhaust color check	○			
Coolant change / bleeding EGR				○ or 1 yr.
Drain excess water and sediments in the fuel filter and water sedimenter	○	○ Clean		
Clean or replace fuel filter element and water sedimenter element		○ Clean	○ Replace	
Drain water from fuel tank		○		
Clean gauze filter in engine feed pump			○ Clean	
Change filter in the electromagnetic pump for air extraction in fuel line			○ Clean	
Clean inside fuel tank				●
Leak check (fuel, oil, and coolant)	○			
Replacing fuel hose				● or 1yr.
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				●
Alternator side				
Various meter and alarm lamps check	○			

(1) Engine Oil Replacement

First Time	50 hours
Thereafter	Every 500 hours

- 1 Remove the oil filler cap.
- 2 Remove the oil drain plug, and turn the spigot counterclockwise to open the ball valve and drain the engine oil.
- 3 After the oil has been completely drained, turn the spigot clockwise to close the ball valve, and tighten the oil 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.



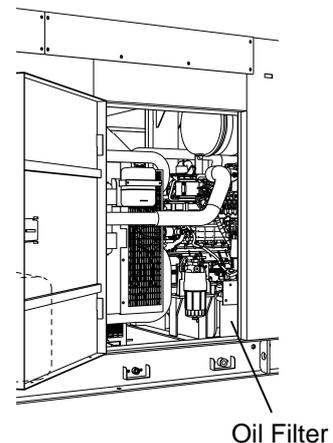
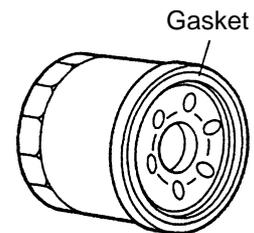
< NOTE >

- 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

First Time	50 hours
Thereafter	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 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.



- Oil filter tightening torque: $63.7 \pm 4.9 \text{ Nm}$ ($6.5 \pm 0.5 \text{ kgfm}$)

< NOTE >

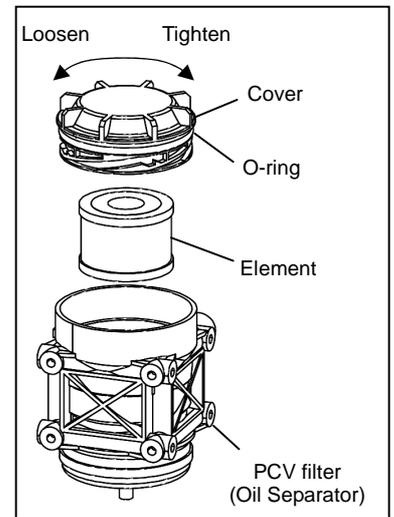
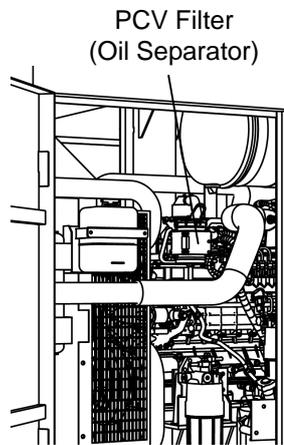
- Request the authorized distributor where the generator was purchased to perform this procedure if you do not have a filter wrench.
- Oil filter part no

ISUZU Part No.
113240-2322

(3) Replacing the PCV(Oil Separator) Filter

Thereafter	Every 500 hours
------------	-----------------

- 1 Wipe clean around the PCV filter cap taking care so that no foreign particles entry. Remove the PCV filter cap.
- 2 Remove the PCV filter element.
- 3 Install the new PCV filter element.
- 4 Install the PCV filter cap.



< NOTE >

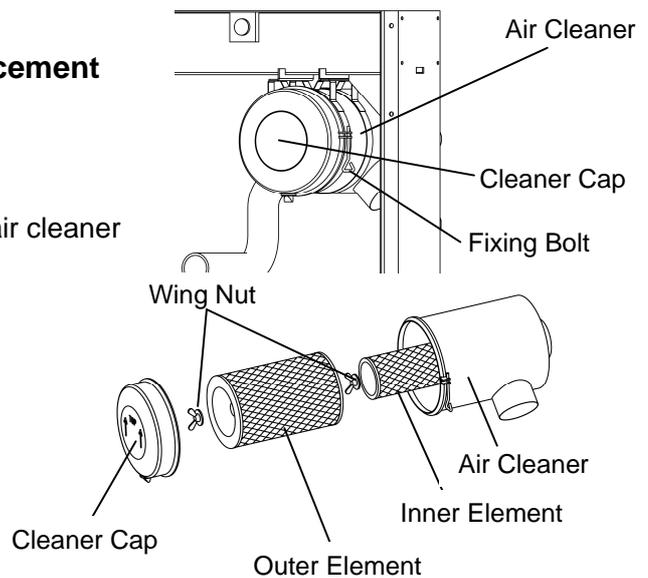
- PCV filter element:

ISUZU Part No.
898030-5320

(4) Air Filter Element Cleaning/Replacement

Clean	Every 250 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



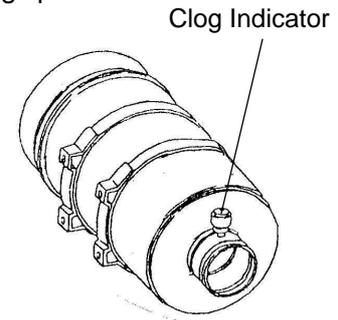
< NOTE >

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

ISUZU Part No.
114215-1880

- Inner element :

ISUZU Part No.
114215-0340



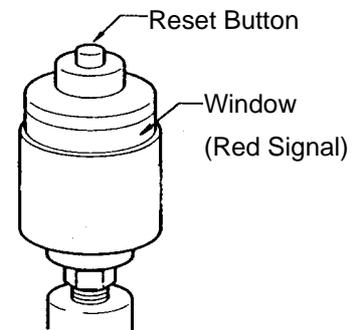
■ To clean the air filter element:

- 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.

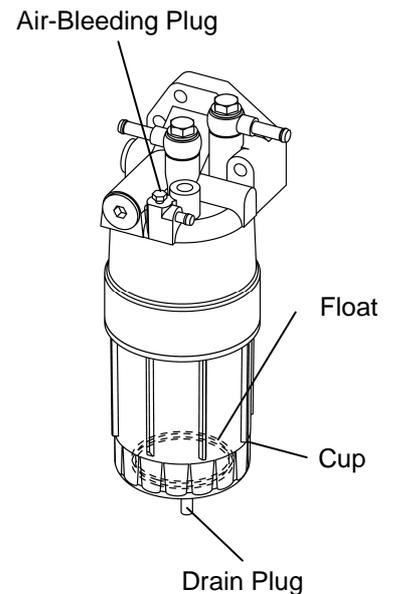


(5) Draining Water from the Fuel Filter and Water Sedimenter

Inspect	Pre-Operation
Clean	Every 250 hours

Drain water when the float (red) inside the cup has come up to the bottom part of the filter element.

- 1 Loosen the air-bleeding plug.
- 2 Loosen the drain plug on the bottom to drain the water.
- 3 When water draining is completed, tighten the drain plug on the bottom.
- 4 Tighten the air-bleeding plug.



- Drain plug tightening torque: 1.5 to 2.5 Nm (0.15 to 0.25 kgfm)
- Air-bleeding plug tightening torque: 7.9 to 11.7 Nm (0.8 to 1.2 kgfm)

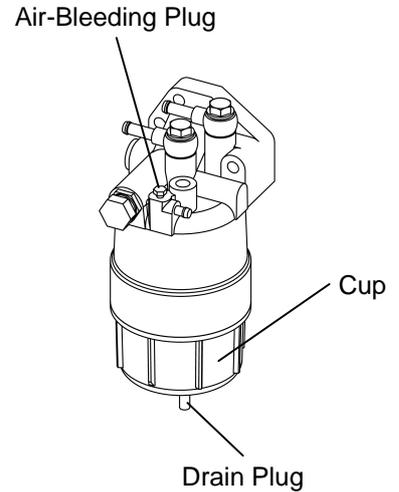
< NOTE >

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

(6) Cleaning / Changing Fuel Filter and Water Sedimenter

Clean	Every 250 hours
Replace	Every 500 hours

- 1 ↓ Loosen the air-bleeding plug.
- 2 ↓ Loosen the drain plug on the bottom to drain the fuel.
- 3 ↓ Remove the outer case of the filter using the specified filter wrench.
- 4 ↓ Remove the fuel filter element and water sedimenter element.
- 5 ↓ Install a new fuel filter element and water sedimenter element.
- 6 ↓ Replace the O-ring of the outer case.
- 7 ↓ Fill the case with clean fuel so that it is easy to bleed air from the fuel lines.
- 8 ↓ Tighten the outer case using the specified filter wrench.



- Drain plug tightening torque: 1.5 to 2.5 Nm (0.15 to 0.25 kgfm)
- Outer case tightening torque: 29.4 Nm (3.0 kgfm)
- Air-bleeding plug tightening torque: 7.9 to 11.7 Nm (0.8 to 1.2 kgfm)

< NOTE >

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

- Fuel filter element :

ISUZU Part No.
898143-0410

- Water Sedimenter element :

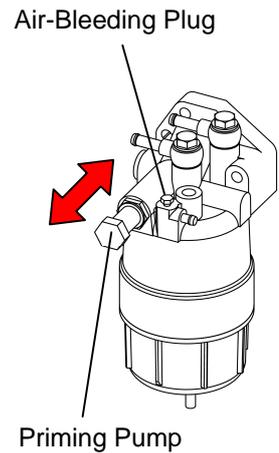
ISUZU Part No.
898074-2880

(7) Fuel System Air Bleeding

The entry of air into the fuel system will cause hard engine starting or engine malfunction.

When performing maintenance such as emptying the fuel tank, draining for the water sediment, and the fuel filter element is done, be sure to conduct air bleeding procedure.

- 1 Loosen the air bleeding screw located on top of the main fuel filter housing.
- 2 Turn the starter switch to the "RUN" position but do not start the engine to operate electromagnetic pump.
- 3 Operate the manual priming pump on fuel filter to bleed remaining air.
- 4 Tighten the air bleeding plug of fuel filter.
- 5 After tightening all the air bleeding plugs, operate the manual priming pump until resistance is felt.
- 6 Secure the priming pumps at the original position and then start the engine. If the engine does not Start, repeat the procedure.

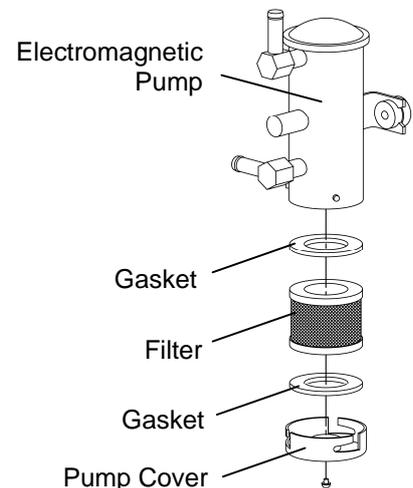


- Air-bleeding plug tightening torque: 7.9 to 11.7 Nm (0.8 to 1.2 kgfm)

(8) Electromagnetic Pump Filter Cleaning

Clean	Every 500 hours
-------	-----------------

- 1 Remove the wirings attached on the pump cover. Rotate the cover with a wrench and remove it.
- 2 Turn the cover, located at the bottom of pump, counter-clockwise and remove filter.
- 3 Clean the filter with the compressed air and rinse it in the fuel oil before installing the filter and the gasket.
- 4 Reinstall 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.

- Electromagnetic Pump Filter element :

ISUZU Part No.
898071-4010

- Electromagnetic Pump Gasket :

ISUZU Part No.
898071-4040

(9) Clean Strainer in Engine Feed Pump (Fuel Supply Pump)

Clean	Every 500 hours
-------	-----------------

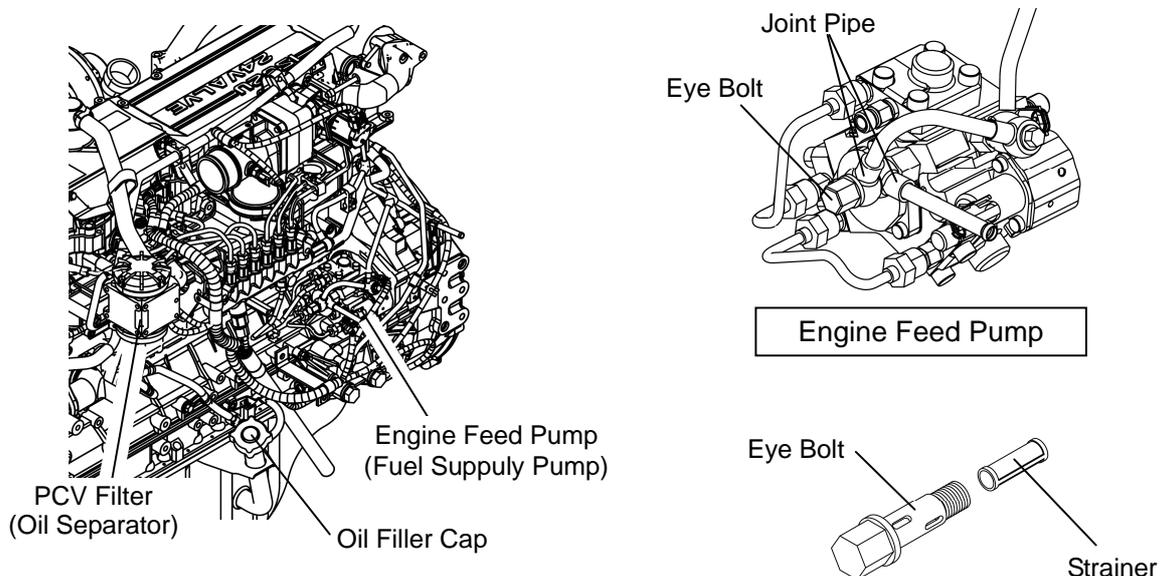
- 1 Remove eyebolts.
- 2 Remove strainer in eyebolts.
- 3 Clean the strainer with the compressed air and rinse it in the fuel oil and reinstall in the reverse order.

< 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.

- Engine Feed Pump Strainer :

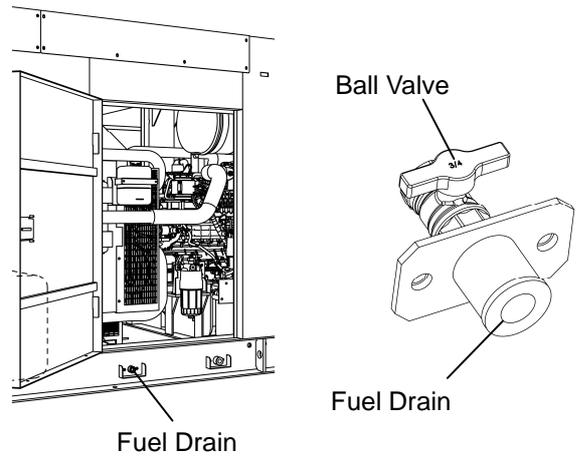
ISUZU Part No.
898074-9550



(10) Draining Water from Fuel Tank

Drain water	Every 250 hours
-------------	-----------------

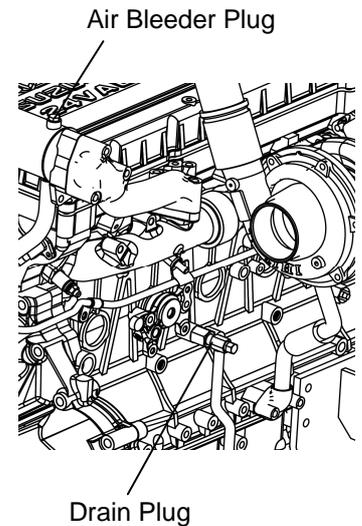
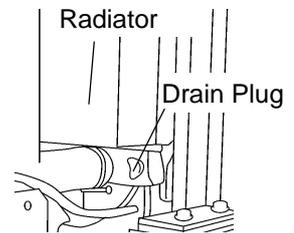
- 1 Turn the spigot counterclockwise to open the ball valve and drain the water.
- 2 After the water has been completely drained, turn the spigot clockwise to close the ball valve.



(11) Changing Coolant / Water

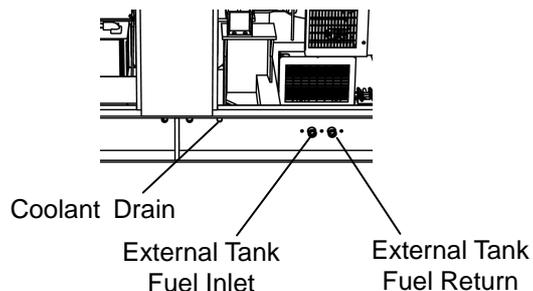
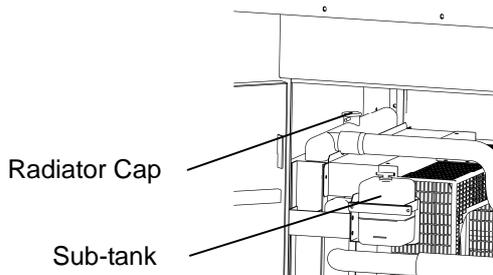
Replace	Every 1 years or 1000 hours
---------	-----------------------------

- 1 Remove the radiator cap.
- 2 Loosen the draining plug on both the engine and radiator.
- 3 After draining all the water, tighten the draining plug on both the engine and radiator.
- 4 Loosen the fastener that holds the sub tank, and drain all the water.
- 5 Install the sub tank back, and fill the coolant / water to the MAX level.
- 6 Fill the radiator with coolant/water to the top.
- 7 Reinstall the radiator cap.



< NOTE >

- For the types of engine oil to use, refer to “8-2. Checking Coolant”



(12) Bleeding air from EGR cooler

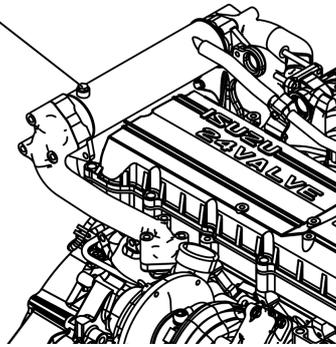
Bleeding air	Every after coolant change
--------------	----------------------------

↓₁ Loosen the air release plug of the EGR cooler in order to bleed air from within the EGR and improve cooling performance.

↓₂ When coolant flows out from the air release plug, tighten the air release plug.

- Air bleeder plug tightening torque: 24.5 to 30.5 Nm (2.5 to 3.1 kgfm)

Air Bleeder Plug



11. Long-Term Storage

WARNING : INJURY

- 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

- 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**”)



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 (6) Cleaning / Changing Fuel Filter and Water Sedimenter**”)
(Refer to section “**10. Inspection/Maintenance (10) Draining Water from Fuel Tank**”)



Remove the starter key and 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 >

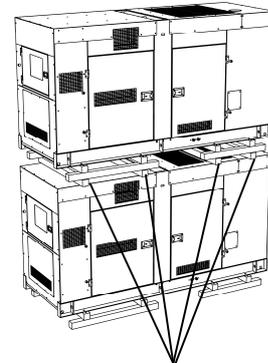
- Adjust the fluid of the removed battery to the appropriate level and recharge approximately every month.

(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.



Insert wood ties

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 remove the engine key. A person performing the maintenance should always keep the key.

⚠ CAUTION : FIRE

- Never allow flame to come close to the generator.

⚠ CAUTION : BURNS

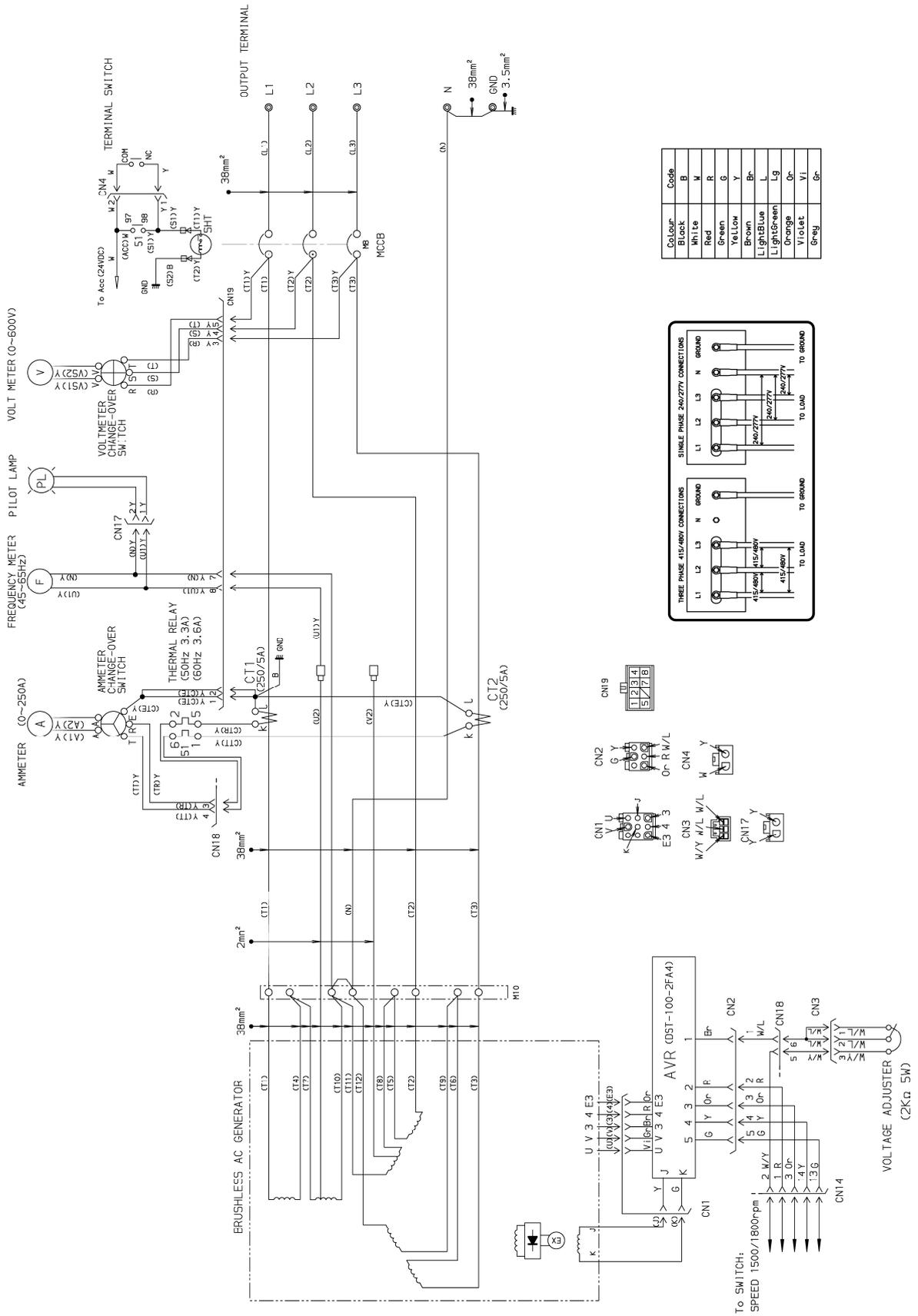
- Do not touch the engine and muffler after stopping the engine while temperature can reach extremely high.

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.

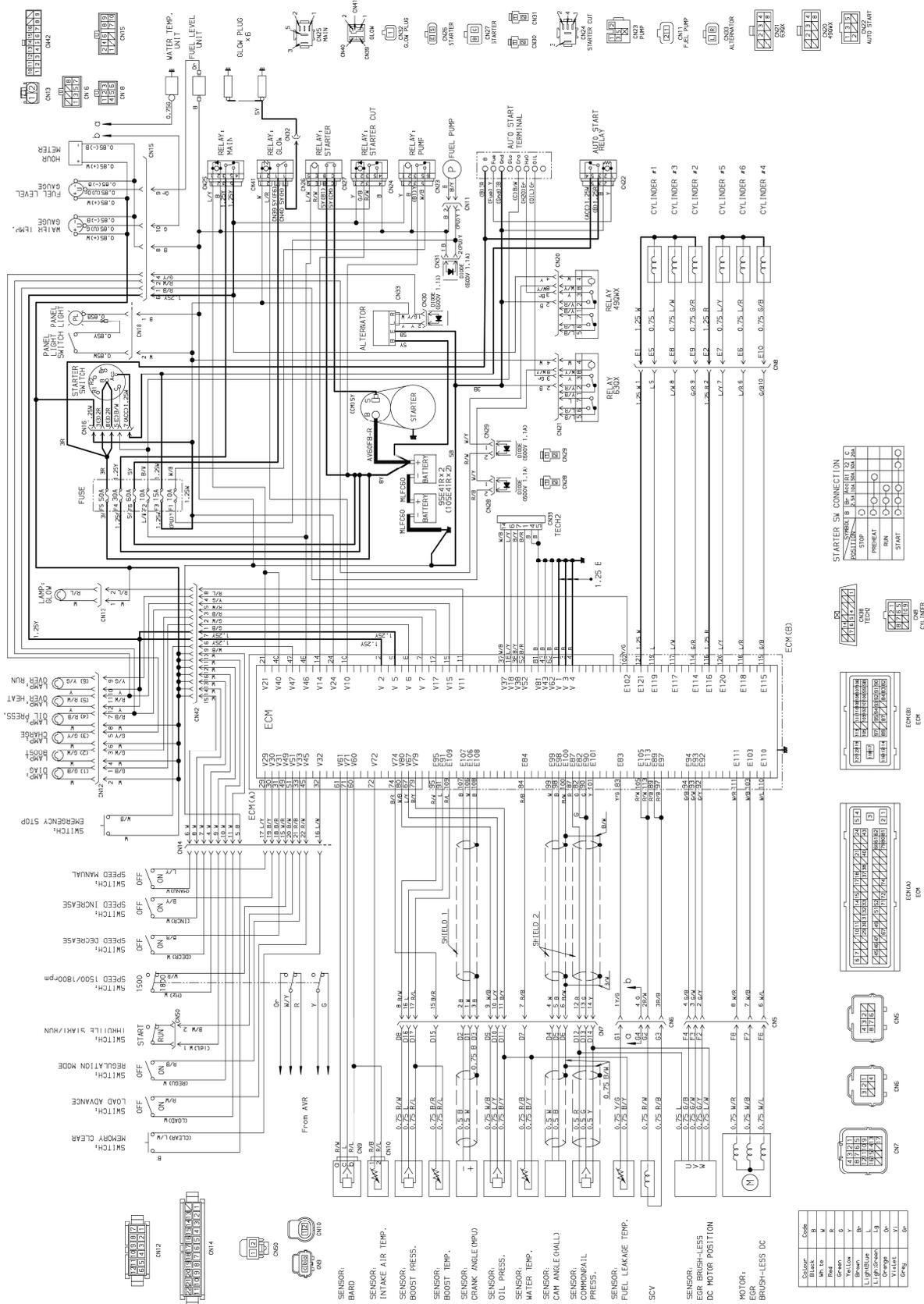
Problem		Suspected cause	Action
Engine does not start	Starter motor does not drive or speed is low.	<ol style="list-style-type: none"> 1. Battery output is weak 2. Battery is deteriorated 3. Battery terminal is OFF or loose 4. Battery terminal is corroded 5. Starter switch or relay is defective 6. Starter motor is defective 	<ol style="list-style-type: none"> 1. Check/ battery liquid/ or Charge 2. Change battery 3. Fix/Tighten terminal 4. Clean terminal 5. Contact your distributor to repair 6. Contact your distributor to repair
	Starter motor drives but engine does not start	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Add fuel 2. Clean/Change fuel filter 3. Clean/Change gauze filter 4. Drain water in water sedimenter, 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>	<ol style="list-style-type: none"> 1. Fuel is frozen 2. Water in fuel line is frozen 3. Pre-heater is defective 	<ol style="list-style-type: none"> 1. Use winterized fuel 2. Drain water in fuel line 3. Contact your distributor to repair
Engine starts but stalls immediately	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Clean/Change fuel filter 2. Clean/Change gauze filter 3. Drain water in water sedimenter, 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	<ol style="list-style-type: none"> 1. Lubricant oil is insufficient 2. Oil filter is clogged 3. Oil Pressure switch is defective 4. Wrong oil is used 	<ol style="list-style-type: none"> 1. Supply lubricant oil 2. Change oil filter 3. Contact your distributor to repair 4. Change to proper kind and viscosity oil 	
Overheated	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Contact your distributor to repair 3. Contact your distributor to repair 4. Check/Adjust fan belt 5. Check/Supply coolant 6. Clean radiator core 	

Black smoke comes out from muffler	<ol style="list-style-type: none"> 1. Air filter element is clogged 2. Fuel injection nozzle is defective 3. Improper fuel is used 	<ol style="list-style-type: none"> 1. Check/Change air filter element 2. Contact your distributor to repair 3. Change to clean fuel
White smoke comes out from muffler	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Drain water in water sedimenter, fuel filter or fuel tank 3. Contact your distributor to repair 4. Warm-up driving is needed 5. Contact your distributor to repair
Indicator does not move in voltage meter	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Contact your distributor to repair 3. Contact your distributor to repair 4. Contact your distributor to repair 5. Contact your distributor to repair
Indicator does not goes up to the rated voltage	<ol style="list-style-type: none"> 1. Voltage meter is defective 2. AVR is defective 3. Voltage regulator dial is defective 4. Frequency is low 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Contact your distributor to repair 3. Contact your distributor to repair 4. Contact your distributor to repair
Indicator exceeds the rated voltage	<ol style="list-style-type: none"> 1. Voltage meter is defective 2. AVR is defective 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Contact your distributor to repair
The voltage drops drastically when connecting to load	<ol style="list-style-type: none"> 1. AVR is defective 2. Unbalanced loads sharing to each terminal 3. Total loads exceeds the rated current 4. Frequency Speed Switch set is wrong 	<ol style="list-style-type: none"> 1. Contact your distributor to repair 2. Balance the loads sharing to each terminal 3. Decrease the loads with in the rated output 4. Set the Speed Switch correct
Cannot turn the breaker to ON position	<ol style="list-style-type: none"> 1. The breaker positions stays between ON and OFF 2. Short circuit on the load 3. Terminal cover opened 4. The thermal relay activates 	<ol style="list-style-type: none"> 1. Turning the lever to OFF first then turn it to ON position 2. Check the load circuit 3. Close terminal cover 4. Reset the thermal relay

13. Generator Circuit Diagram



14. Engine Electrical Circuit Diagram



MEMO

MEMO

MEMO

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