

AIRMAN

SG

INSTRUCTION MANUAL

ENGINE GENERATOR

SDG220S-8E1

[ENVIRONMENTAL CONTAINMENT
BASE TANK TYPE]

Please be sure to read this manual
before using this machine.

HOKUETSU INDUSTRIES CO., LTD.

Preface/Table of Contents

Thank you for choosing “AIRMAN”


- ◆ Keep this manual at hand and refer to it as necessary.
- ◆ If this manual is missing or damaged, order a new copy from our office or your nearest dealer.
Make sure that the manual is included with the machine when it is handed over to another user.
- ◆ The contents of this manual may differ from the machine as a result of design changes. If anything is unclear please contact our office or your nearest dealer for clarification.
- ◆ Refer to the Engine Operation Manual for engine handling, maintenance, and safety information.

— Table of Contents —




1. Major Components	1-1
1.1 Internal Components	1- 1
2. Transportation and Installation	2-1
2.1 Transporting Machine	2- 1
2.2 Conditions of Installation	2- 2
2.3 Grounding	2- 4
2.4 Selecting Cable	2- 6
2.5 Fuel Pipe Selector Valve	2- 7
3. Operation	3-1
3.1 Operation Panel	3- 1
3.2 Connecting Loads	3- 3
3.3 Engine Oil · Coolant · Fuel · DEF	3- 7
3.4 Before Starting the Unit	3- 9
3.5 Operating Procedure	3-15
3.6 Emergency Stop	3-22
3.7 SCR Cleaning	3-23
3.8 SCR Inducement	3-25
4. Failures and Troubleshooting	4-1
4.1 Protection device	4- 1
4.2 Troubleshooting	4- 4
5. Periodic Inspection	5-1
5.1 Important Items at Periodic Inspection and Maintenance	5- 1
5.2 Periodic Inspection and Maintenance Schedule	5- 2
5.3 Periodic Replacement Parts	5- 3
5.4 Maintenance Items	5- 4
6. Storage and Disposal	6-1
6.1 Preparation for Long-term Storage	6- 1
6.2 Disposal of Product	6- 1
7. Specifications	7-1
7.1 Specifications	7- 1
7.2 Outline drawing	7- 2
7.3 Generator Wiring Diagram	7- 4
7.4 Engine Wiring Diagram	7- 5
7.5 Piping Diagram	7- 6

Safety

This section explains safety precautions for operation, inspection, maintenance, installation, movement and transportation. Read these safety requirements carefully and fully understand the contents before starting the machine.


For better understanding of the precautions in this manual and on this machine, safety precautions are classified into "DANGER", "WARNING" and "CAUTION" messages with a warning symbol  marked, according to the degree of hazard.

When one of these messages is found, please take preventive measures for safety and carry out "SAFE OPERATION AND PROPER MAINTENANCE OF THE MACHINE".

 DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
IMPORTANT	IMPORTANT indicates important caution messages for the performance or durability of the machine, which has no concern to injury or accident of or to a human body.

This manual does not describe all safety items. We, therefore, advise you to pay special attention to all items (even though they may not be described in the manual) for your safety.

PROPOSITION 65 WARNING

 WARNING
<p>Breathing engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.</p> <ul style="list-style-type: none"> ● Always start and operate the engine in a well-ventilated area. ● If in an enclosed area, vent the exhaust system. ● Do not modify or tamper with the exhaust system. ● Do not idle the engine except as necessary <p>For more information, go to www.P65warnings.ca.gov/diesel</p>

Safety

- ◆ If you have any questions about the machine, please contact our office or your nearest dealer. Be sure to have your machine's serial number to assist in providing the correct information for you. A plate stamped with the model and serial number is attached to side of the machine.

ENGINE GENERATOR	
MODEL	<input type="text"/>
SER. NO.	<input type="text"/>
GEN. OUTPUT	<input type="text"/> kVA
VOLTAGE	<input type="text"/> V
FREQUENCY	<input type="text"/> Hz
POWER FACTOR	80% PHASE 3
RULE	JEM 1398
NET DRY MASS	<input type="text"/> kg
OPERATING MASS	<input type="text"/> kg
AIRMAN USA CORPORATION ASSEMBLED IN USA	

※ Each illustrated figure (Fig.) has a number (for instance, A180077) at the right bottom. This number is not a part number, it is an internal reference number.

A180077

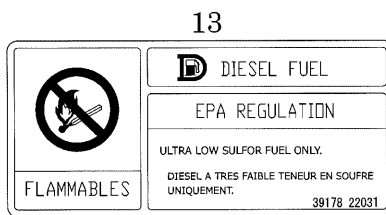
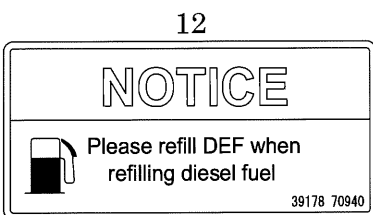
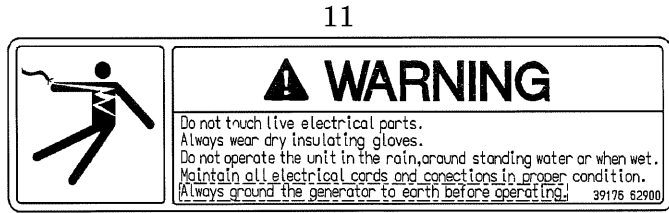
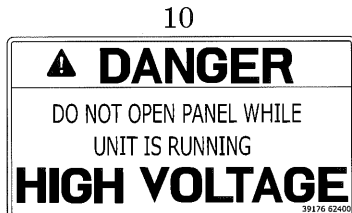
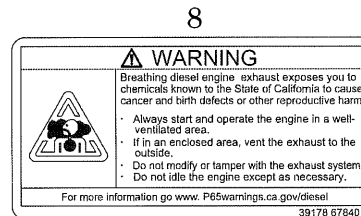
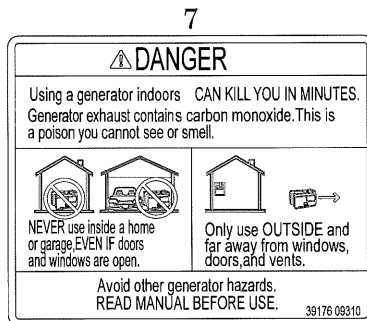
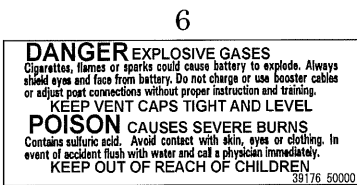
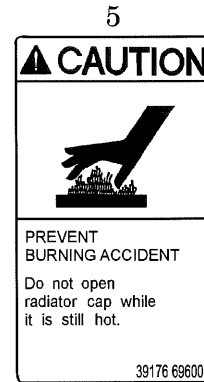
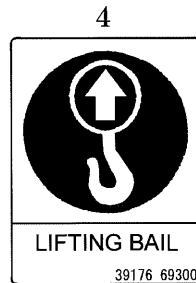
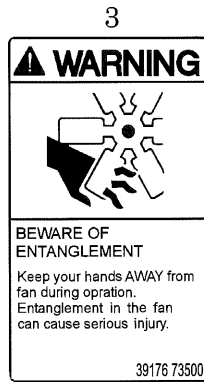
Safety

[Safety Warning Labels]

Following labels are attached to the machine.

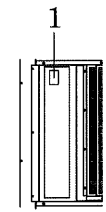
Keep them clean at all times. If they are damaged or missing, immediately place an order with your nearest dealer for replacement. Part numbers are indicated on the lower right corner of the label.

Adhere a new one to the original location.

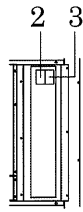


Safety

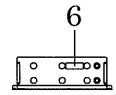
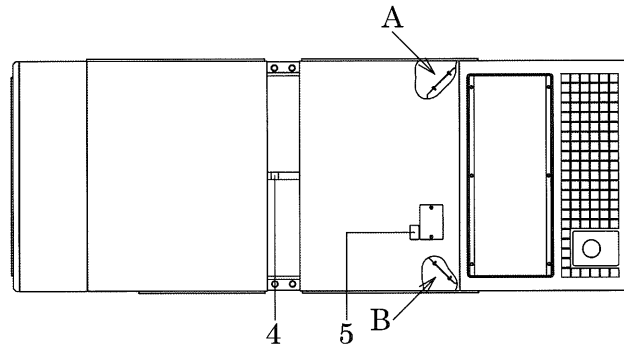
- The locations of the safety warning labels are as follows.



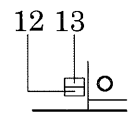
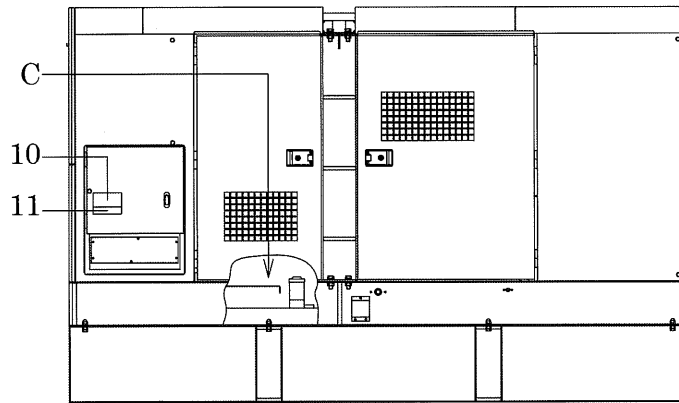
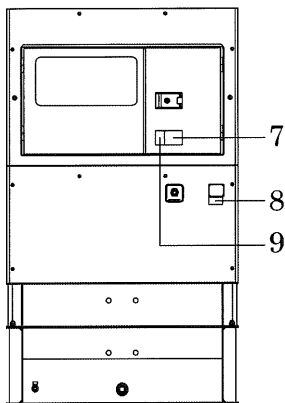
VIEW A



VIEW B



Battery

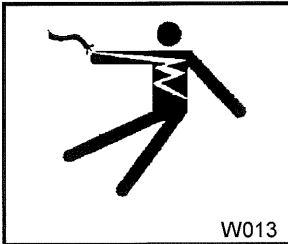


VIEW C

A210278

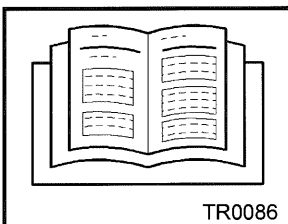
Safety

DANGER

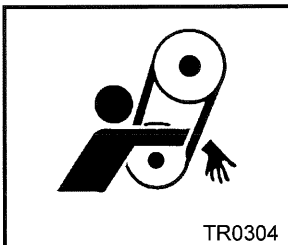


- Never touch the control panel during operation. Be aware that a voltage of several hundred volts is applied to the control panel.
- Be sure to stop the engine and turn control power switch OFF whenever the control panel has to be checked or operated. Disconnect the negative battery terminal during checking and maintenance.

WARNING



- Read each instruction plate which is displayed in the manual or on the machine carefully, understand its content and follow the indications thereof.
- Do not modify the machine without prior approval. The safety may be compromised, functions may be deteriorated, or machine life may be shortened.
- Never use the machine for the other purposes than power supply. Otherwise, serious accidents may occur.



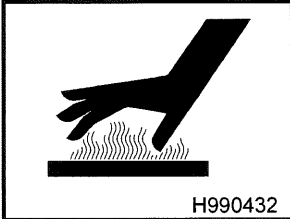
- Keep hands away from the rotating machinery or belts during operation. These pose the risk of serious injuries to hands if touched.



- When cleaning dust accumulated in devices such as filters, etc., with compressed air, wear safety glasses, etc. to protect your eyes

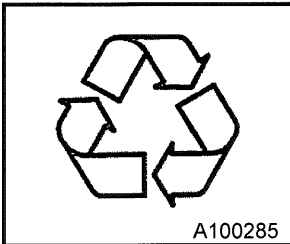
Safety

CAUTION



- Be sure to stop the engine and let the coolant water sufficiently cool down before draining it.
- If the drain valve is opened before the coolant water is cool enough, hot scalding water could jet out, causing burns.

- When washing the machine, cover the control panel, generator and its electric parts to prevent them from being exposed to splashing water and avoid possible decrease in electrical insulation or other troubles to the machine.
- Dust, sand and dirt accumulated inside control panel could cause malfunction or issues with the instrumentation. Clean them using compressed air.

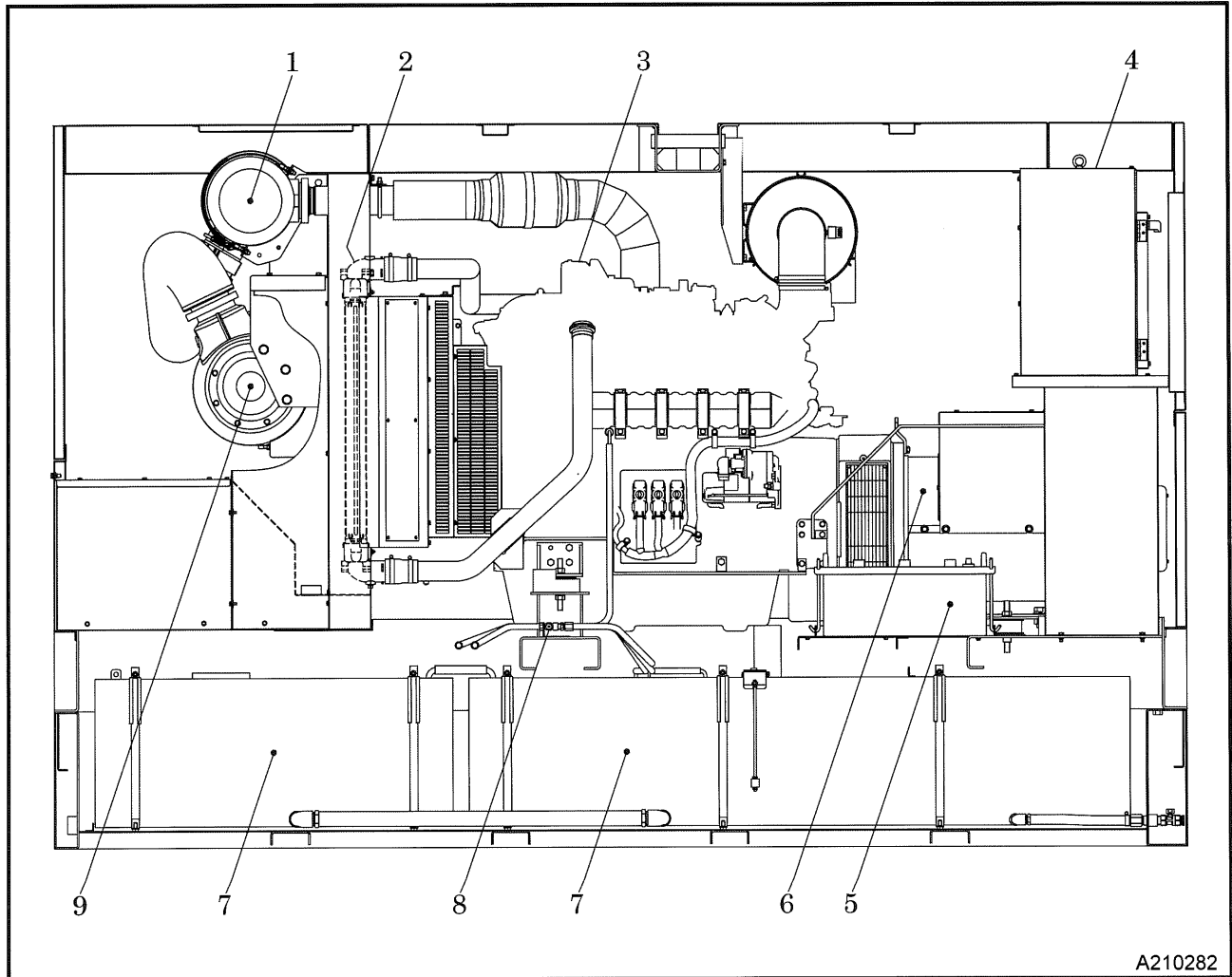


- Waste liquid from the machine contains harmful material. Do not discharge it onto the ground or into the river, lake or sea. Such material will pollute the environment.
- Be sure to use a container to hold waste liquid from the machine.
- Be sure to follow the designated regulations when disposing of oil, fuel, coolant (antifreeze), filter, battery or other harmful materials.

- The engine of this machine contains many electrical and electronic parts. Before welding, be sure to disconnect all electronic control equipment (specifically the ECM). Failure to do so could result in equipment malfunction due to excessive current.

1. Major Components

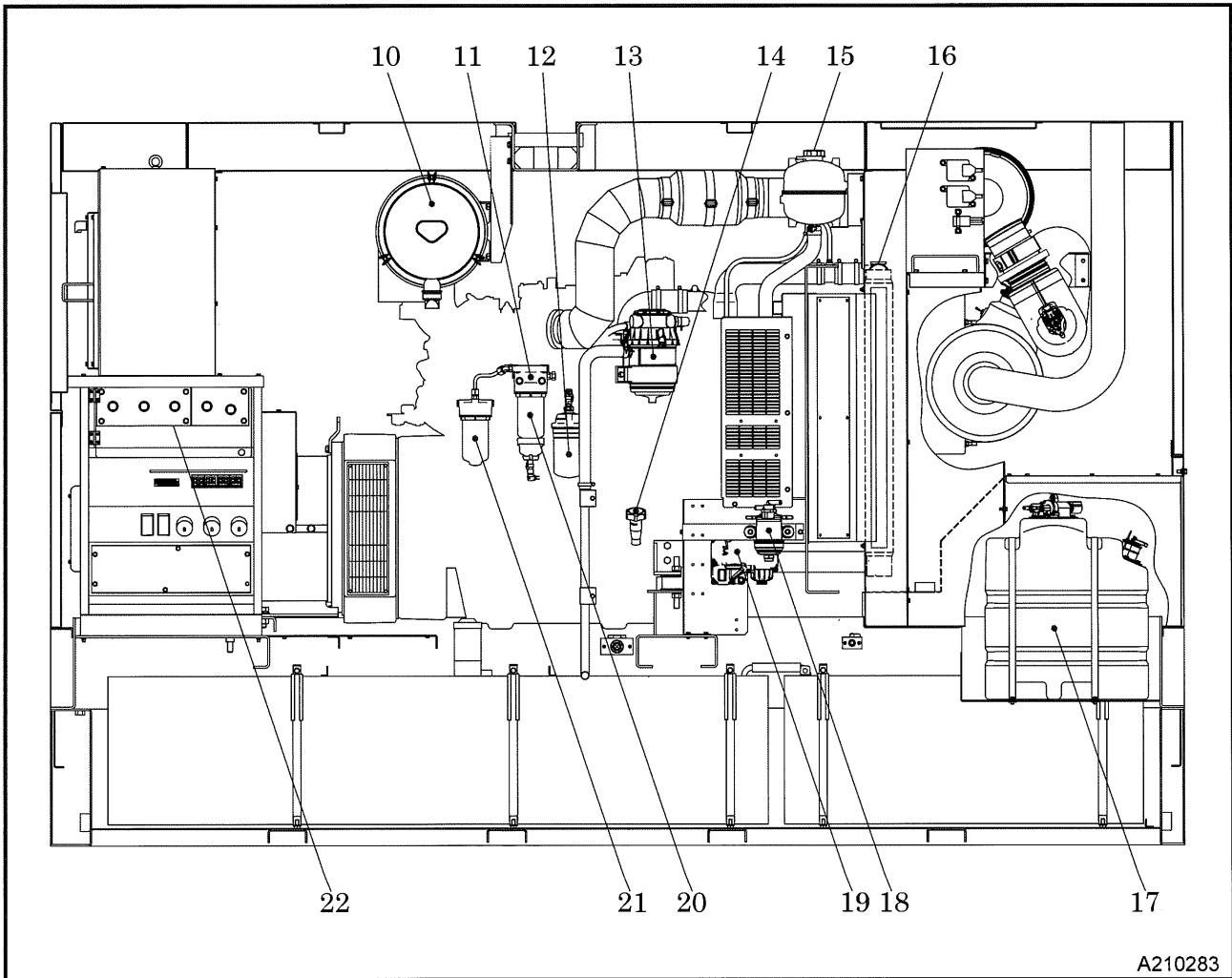
1.1 Internal Components



A210282

No.	Part Name	Function
1	DOC (Diesel Oxidation Catalyst)	Catalyst for oxidizing exhaust gas
2	Intercooler	Cools the air compressed by the engine supercharger
3	Engine	Drives the generator
4	Control Panel (Operation Panel)	Controlling device; various meters and controls
5	Battery	Power source to start the engine
6	Alternator	Generates the electricity supplied to the load
7	Fuel Tank	Vessel for storing fuel
8	Fuel Pipe Selector Valve	Switches to external fuel tank supply
9	SCR (Selective Catalytic Reduction)	Selective reduction-type catalyst that uses DEF as a reducing agent

1. Major Components



A210283

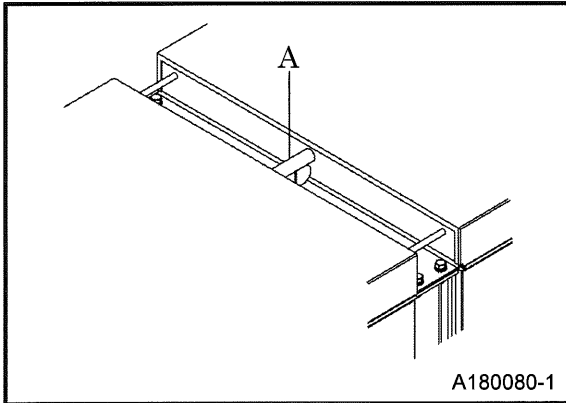
No.	Part Name	Function
10	Air Filter	Filters dust from intake air.
11	Fuel air-bleeding electromagnetic pump	Device that automatically bleeds air from the fuel lines
12	Engine Oil Filter	Filters engine oil
13	Breather / OCV (Open Crankcase Ventilation)	Vents gas from engine crankcase
14	Engine Oil Filler Port (Oil Level Gauge)	Port for supplying / replenishing engine oil (Also for checking the engine oil level and contamination)
15	Surge Tank	For checking & replenishing coolant
16	Radiator	Cools the engine coolant
17	DEF Tank	Container for DEF
18	DEF Filter	Filters foreign matter & particulate mixed in DEF
19	Supply Module	Pump to move DEF fluid within the system
20	Fuel Pre-Filter	Removes dust and water mixed in fuel
21	Fuel Filter	Filters foreign matter & particulate mixed in fuel
22	Output Terminal Board	Outlet ports for AC power

2. Transportation and Installation

2.1 Transporting Machine

- When loading and unloading the machine, be sure to use the lifting bail [A] provided on the center of the machine top.

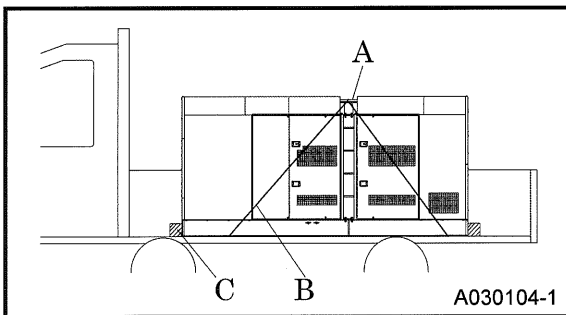
2.1.1 Lifting



<Procedures>

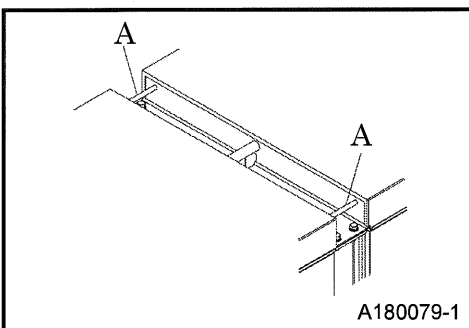
1. Before lifting the unit up, make sure to check the lifting bail [A] for any cracks or loosened bolts.
 2. Connect the hook of the crane or shackle with the lifting bail fitted at the top center of the unit, and make sure that there is no person standing near the unit. Then perform hoisting operation.
- Select an appropriate crane or truck by referring to the mass and dimensions mentioned in "Specifications".
 - Only a qualified crane operator is allowed to operate a crane.

2.1.2 Fastening to a truck bed



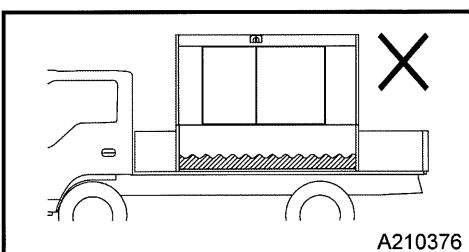
- When moving or removing the machine from the work site, load it onto a truck and secure it to the truck with ropes [B] using the supplied tie points [A] on both sides of the cover, and be sure to install a chocking block [C] on the bed of the truck as well.

WARNING Transportation



- Never step underneath the unit when it is suspended. It is very dangerous.
- When moving or removing the unit from the work site, load it onto a truck and use the supplied rope tie points [A] to secure it firmly to the truck bed.
- Do not lift the unit while it is running. Otherwise, a fatal or serious accident may occur.

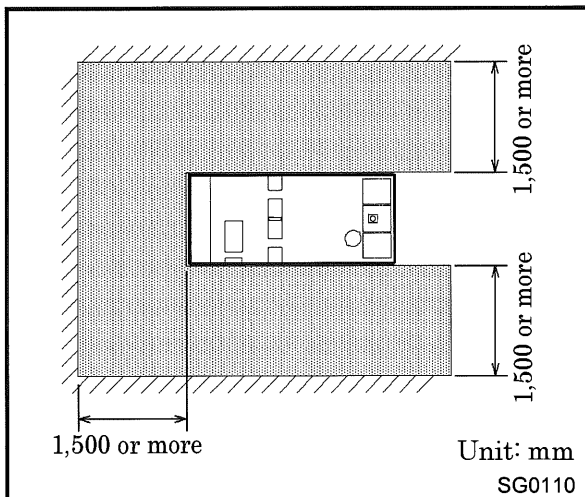
CAUTION



- Before transporting, check if there is condensate (fuel, oil and coolant) inside the oil fence, and if so drain it. (See 3.4.10)
- When transporting with condensate (fuel, oil and coolant) accumulated inside the oil fence, the condensate may flow out of the machine.

2. Transportation and Installation

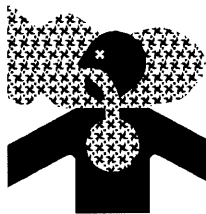
2.2 Conditions of Installation



- The machine should be operated in the following conditions:
Using the machine outside the above conditions may cause serious failure.
- **Ambient temp: 5°F to 104°F (-15°C to 40°C)**
- **Humidity: Less than 85%**
- **Altitude: Lower than 1,000m above sea level**
- The machine has to be installed on a dry, firm, and level area.
- If more than two units are placed parallel in operation, keep enough distance so that exhaust air from the one does not affect the other one.
- Keep enough space around the unit for inspection and maintenance access.

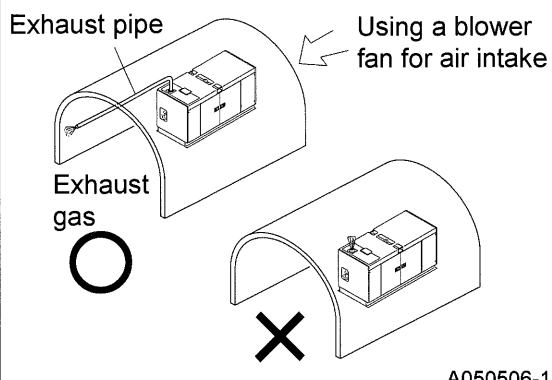


WARNING Exhaust Gas Warning

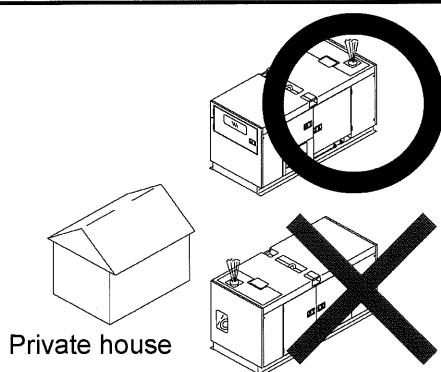


PC002

- Exhaust gas from the engine is poisonous. Exhaust gas can cause death or serious injury upon inhalation.
Avoid using the machine in an insufficiently ventilated building or a tunnel.
- Do not position the exhaust gas outlet in the direction of a person or a house.



- If the unit is installed inside a tunnel, make sure to provide fresh air and ventilate it.
- In this case, make sure to extend the exhaust fume pipe outdoors, and also make sure to prevent any leak from any connecting pipes.



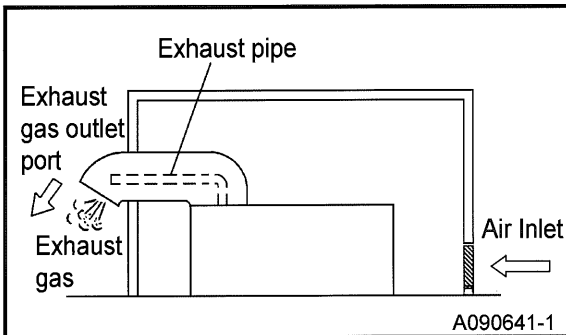
- Never position the unit with the exhaust muffler facing any private house.
- As the exhaust gas from the engine is poisonous, never direct it at people passing by..

2. Transportation and Installation



WARNING

In case that the machine is installed indoors

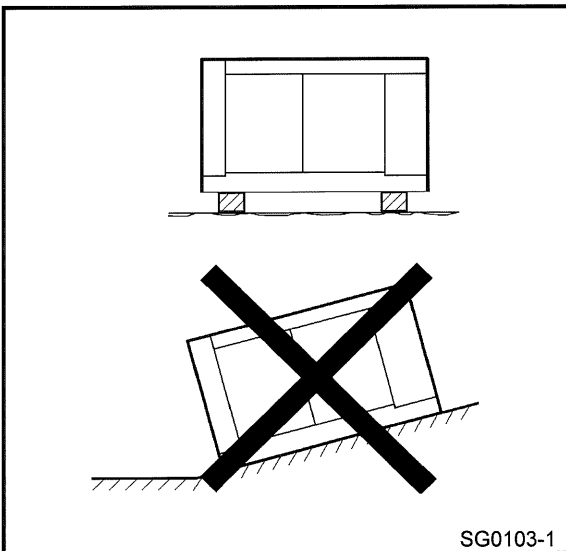


- In case that the unit is installed for indoor operation, an intake air port and exhaust fume outlet port should be provided for better air ventilation.
- Make sure to secure enough space in front of the air intake port and to secure it after exhaust fume outlet port so that the engine will not get overheated.
- An exhaust pipe or the like should be provided at the exhaust outlet port so as to send exhaust fumes outdoors.
- The cooling air outlet port of the radiator should have access to the outside air through a duct or the like for air ventilation.



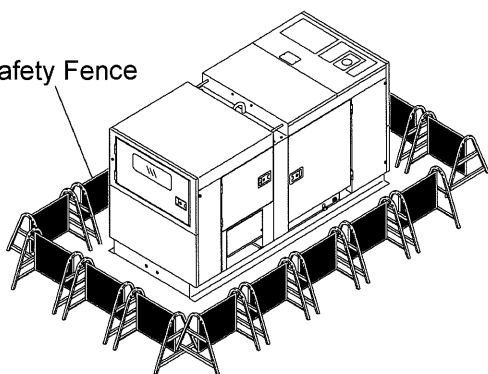
CAUTION

Installation Precautions



- The machine should be installed within 5° degree inclination.
- If installation site is not flat, put square bar under the machine in order to install it horizontally.
- Avoid installing the unit in a damp place or a place where water collects. Such an installation could cause electric shock.
- If the unit is installed on the coast, do not allow seawater to come in direct contact with the unit, as this may degrade the insulation inside the unit and control panel.
- When installing the unit at a sandy location, make sure the exhaust from the generator or radiator does not blow the sand into the air or into the machine.

Safety Fence

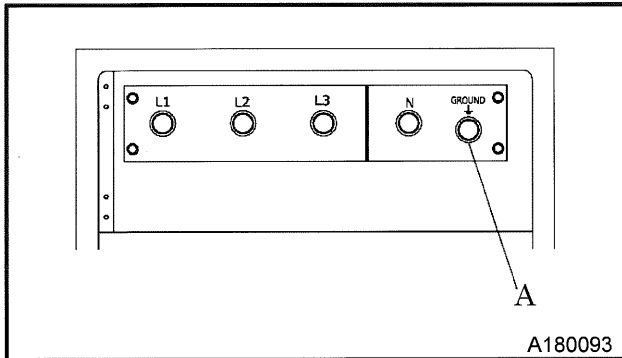


- In order to prevent any persons other than those engaged in the job site from using or interacting with the machine, please prepare safety fences around the unit as necessary.

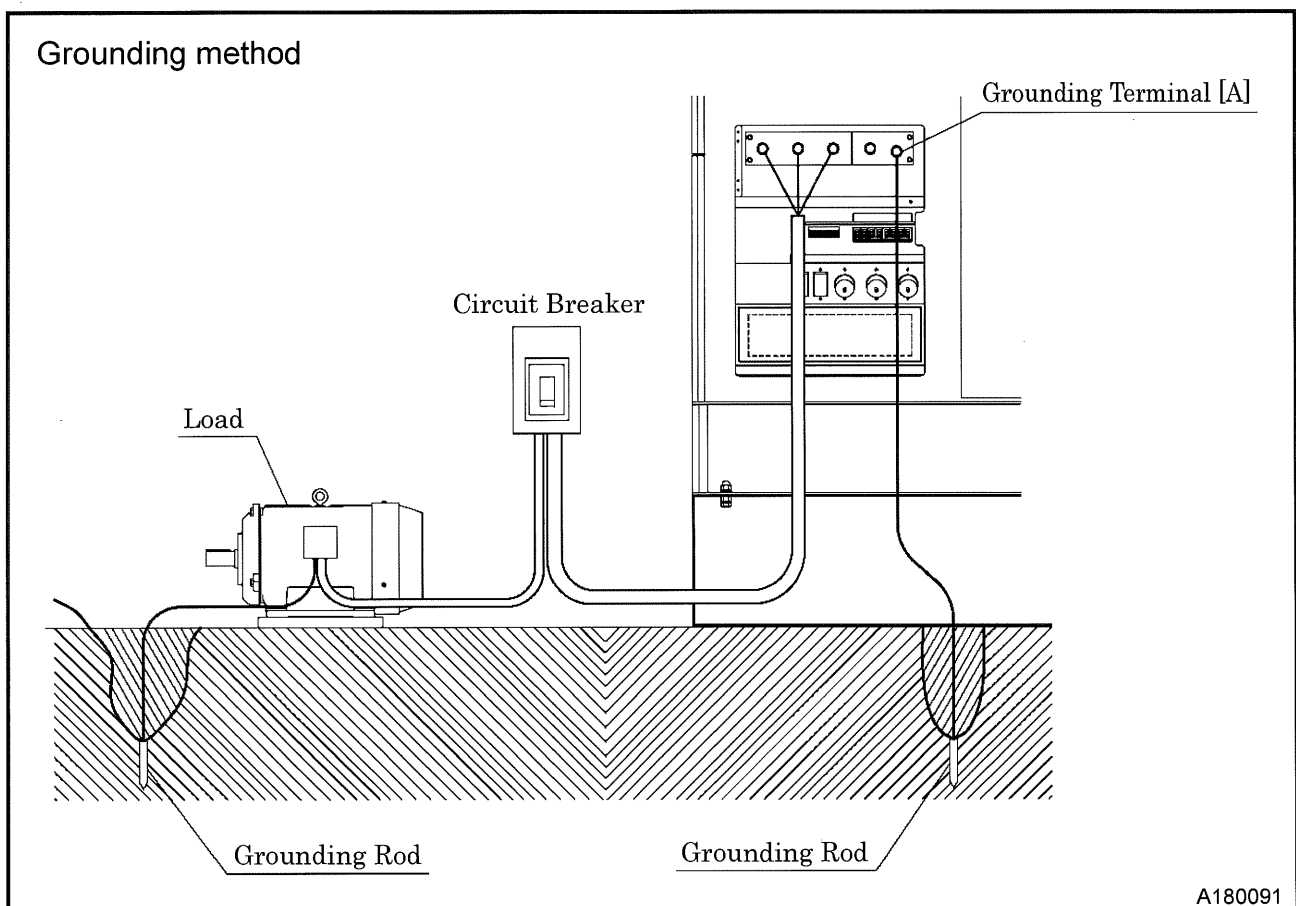
2. Transportation and Installation

2.3 Grounding

2.3.1 Ground Terminal



- The ground terminal [A] on the AC output terminal board is connected to the ground of this unit and to the ground terminals of each outlet.



2.3.2 Grounding System

AIRMAN's generators have a system ground that connects generator frame components to the ground terminals in the AC output receptacles. The AC neutral wire (N) is connected to the system ground.

2. Transportation and Installation

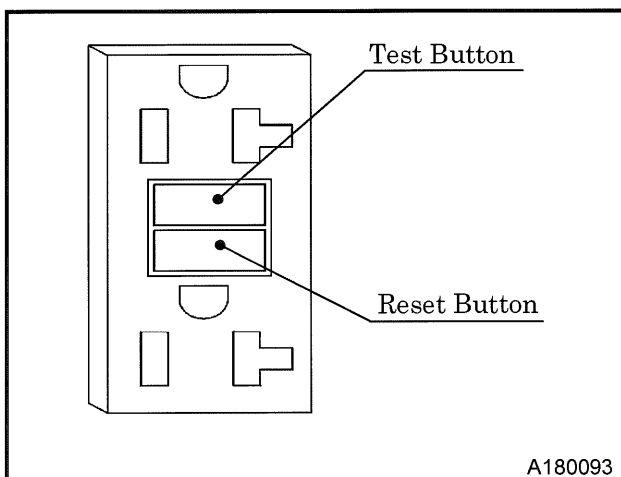
2.3.3 GFCI Receptacles

- All of the 20 ampere 120 volt receptacles on the generator are protected by a GFCI (Ground-fault circuit interrupter) for protection against the hazards of ground fault currents. An example of ground-fault current is the current which would flow through a person who is using an appliance with faulty insulation and, at the same time, is in contact with an electrical ground such as a plumbing fixture, wet floor, or earth.
- The ground-fault circuit interrupter will not protect against short circuits or overloads. The circuit breaker in the control panel which supplies power to the circuit provides that protection.
- The ground-fault circuit interrupter can be identified by the TEST and RESET buttons. The receptacles on the GFCI can be tested with the TEST and RESET buttons.

TEST BUTTON: To test, depress the "TEST" button. (Power is turned off)

RESET BUTTON: To restore power, depress the "RESET" button.

- Perform this test monthly or every 250 hours operation, whichever comes first, in order to ensure proper operation of the GFCI receptacle. If the generator is stored outdoors, unprotected from the weather, test the GFCI receptacle before each use. Record your test on the GFCI test card provided on the control panel.



CAUTION

- Using the generator in rain, snow or near water can lead to death from electric shock. Keep the generator dry.

2.3.4 Connections to a Building's Electrical System

- Connections for standby power to a building's electrical system must be made by a qualified electrician. The connection must isolate the generator power from utility power and must comply with all applicable laws and electrical codes.

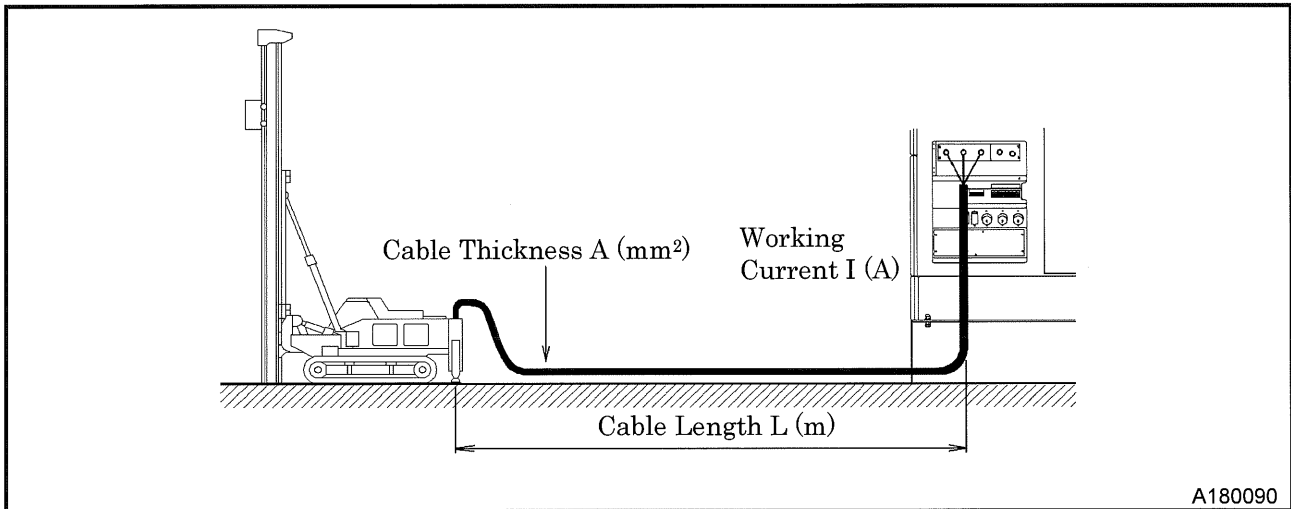
CAUTION

- Improper connections to a building's electrical system can allow electrical current from the generator to backfeed into the utility lines. Such backfeed may electrocute utility company workers or others who are in contact with the lines during a power outage. For more information please consult with the utility company or a qualified electrician.
- Improper connections to a building's electrical system can allow electrical current from the utility company to backfeed into the generator. When utility power is restored, the generator may explode, burn, or cause a fire in the building's electrical system.

2. Transportation and Installation

2.4 Selecting Cable

- Select a cable with sufficient diameter by considering the permissible current on the cable and the distance from the generator to the load.
- If the current flowing to the load exceeds the permissible current of the cable, resultant overheating may burn the cable. Similarly, if the cable is too small in thickness to the length, the input voltage to the load will fall to cause the load input power to drop, as a result, the performance of the machine cannot be displayed.



- Simplified formula to seek voltage drop or cross-sectional area of the cable from cable length and working current. Select such a cable length and thickness so that the voltage drop will remain within 5%.

Output system	Voltage drop	Cross-sectional area of the cable	e : Voltage drop(V) e' : Voltage drop between an outside line or one line of each phase, and a neutral line (V) A : Cable thickness (mm²) L : Cable length (m) I : Working current (A)
Three-phase 3-wire Type	$e = \frac{30.8 \times L \times I}{1,000 \times A}$	$A = \frac{30.8 \times L \times I}{1,000 \times e}$	
Three-phase 4-wire Type	$e' = \frac{17.8 \times L \times I}{1,000 \times A}$	$A = \frac{17.8 \times L \times I}{1,000 \times e'}$	

- The following tables show the relations between the cable length and the cable thickness (nominal cross-sectional area) suited to the working current. (Based on the condition that working voltage is 200 V, with voltage drop of 10V.)

Single-Conductor Cable

(Unit: mm²)

Length Current	165ft (50m)	246ft (75m)	328ft (100m)	410ft (125m)	492ft (150m)	656ft (200m)
150A	38	38	50	60	80	100
200A	60	60	60	80	100	125
300A	100	100	100	125	150	200
400A	125	150	150	200	200	250

Three-Conductor Cable

(Unit: mm²)

Length Current	165ft (50m)	246ft (75m)	328ft (100m)	410ft (125m)	492ft (150m)	656ft (200m)
150A	22×2	22×2	38×2	38×2	50×2	50×2
200A	38×2	38×2	38×2	50×2	50×2	60×2
300A	60×2	60×2	60×2	60×2	80×2	100×2
400A	60×2	60×2	60×2	80×2	100×2	125×2

2. Transportation and Installation

2.5 Fuel Pipe Selector Valve

2.5.1 Overview

This valve is designed to feed fuel directly from an external fuel tank or from the installed fuel tank as described below.

2.5.2 Operation method

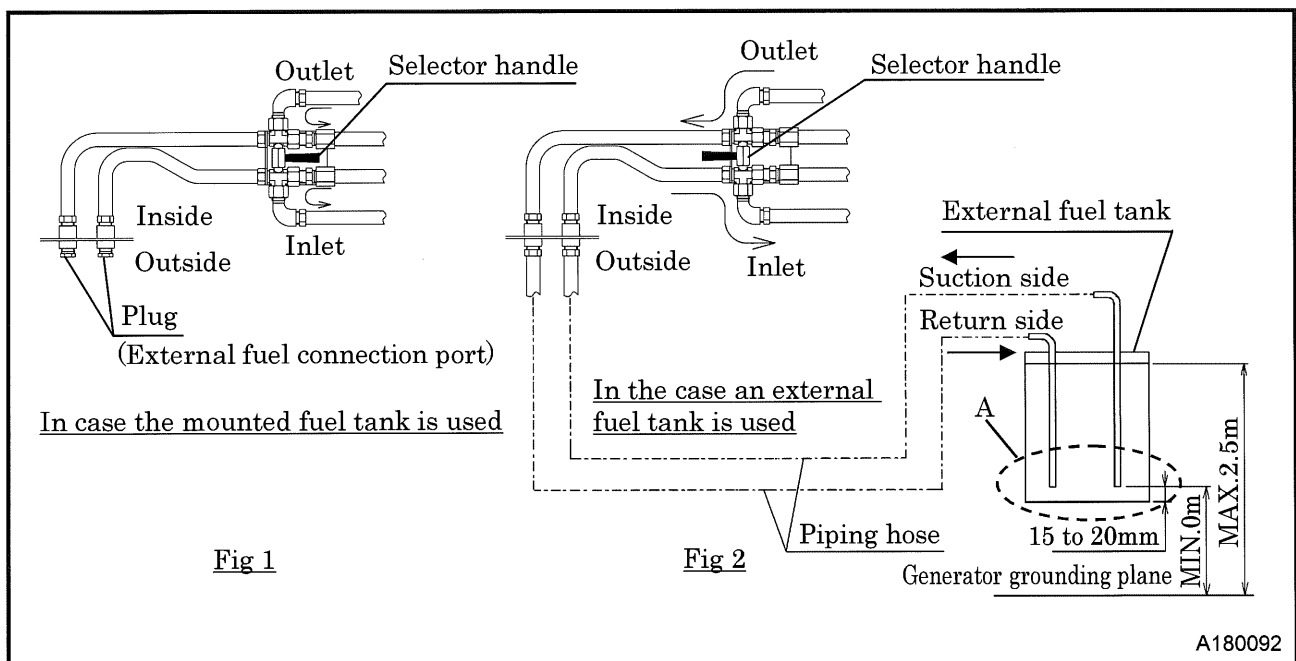
<Procedures>

1. The machine is delivered from the factory with fuel line piping and selector valves set as shown in the following Fig.1. When operating the machine with the installed fuel tank, run the machine with the fuel line piping and the handles of selector valves as set from the factory.
2. When using an external fuel tank, remove the plug fitted at the connections to the external tank and set the piping as shown in Fig.2. And then turn the handles of the selector valve as shown in Fig.2.
3. When removing the external tank piping connection, make sure to return the handles to the original positions shown in Fig.1 and install the plugs.

2.5.3 Installation of Separate Storage Fuel tank and piping method

<Procedures>

1. Use oil resistant hoses with an inside diameter of 8mm to 10mm.
2. Install the fuel tank so that the fuel level of the tank is between 0 and 2.5m high from the machine installation level.
3. In order to avoid suction of water and sediment together, install the suction pipe so that the inlet port of suction pipe may be kept between 15mm and 20mm higher than the bottom line of the tank. Also install the outlet port of the return pipe inside the tank. (See Fig.2·A)
4. When refueling the tank, take caution to prevent water and particulate ingress.



2. Transportation and Installation

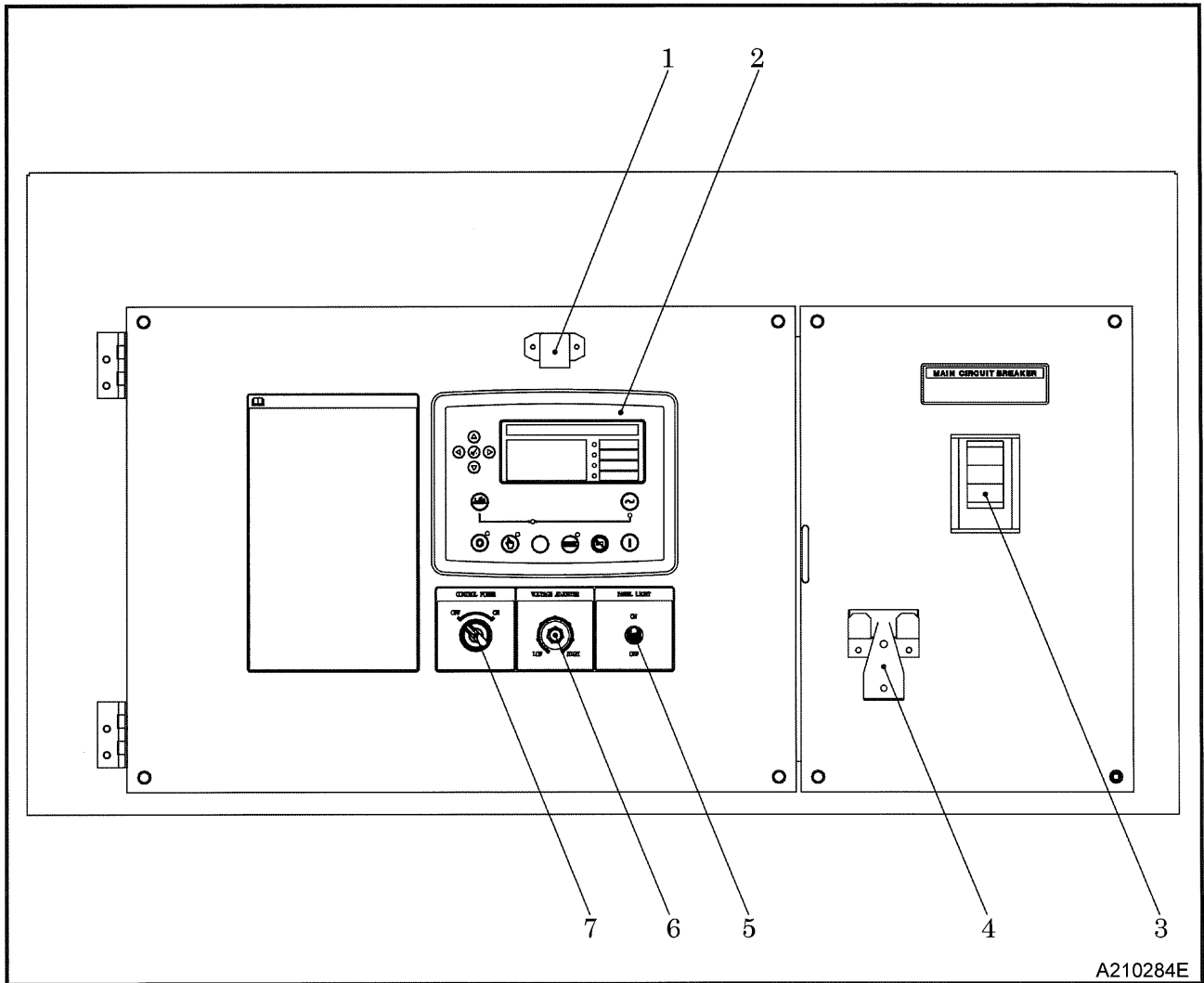


CAUTION

- Always watch the fuel supply conditions when supplying fuel from an external fuel tank.
- When using an external fuel tank, take care to ensure that the DEF tank is also refilled as needed.
- Make sure to return the handles of the selector valves to the predetermined positions. If you make a mistake in turning the handles, it may cause fuel pipe rupture and cause overflowing from the fuel tanks.
- Take great care not to use excessive force on the selector valve handle. It may cause damage or fuel leakage.
- When using the external fuel tank, the Fuel Level displayed on the monitor will not provide an accurate measurement.

3. Operation

3.1 Operation Panel

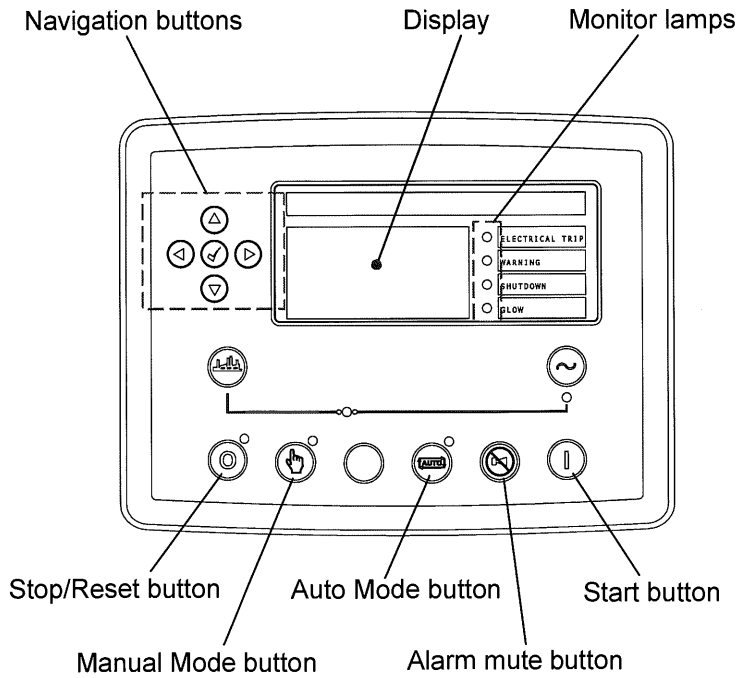


A210284E

- 1. Panel Light
- 2. Control Panel
- 3. Circuit Breaker
- 4. Circuit Breaker Handle
- 5. Panel Light Switch
- 6. Voltage Adjuster
- 7. Control Power Switch

3. Operation

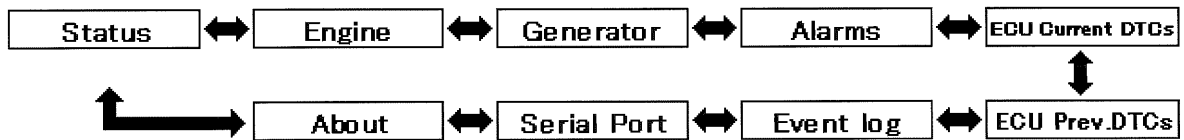
Control Panel



A180097E

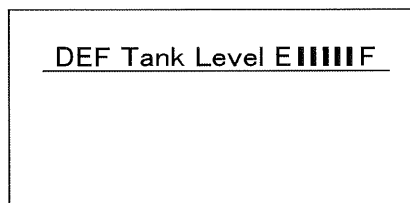
[How to switch between display screens]

1. Items show below can be selected by pressing the Left or Right arrow buttons (◀ ▶).



2. Use the Up and Down buttons (▲ ▼) to view details and parameters within a category.

3. The panel will return to main screen if no buttons are pressed for 3 minutes.



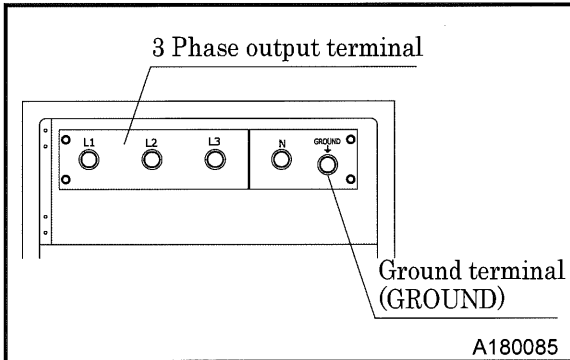
Main Screen

A210286E

3. Operation

3.2 Connecting Loads

Select a cable with sufficient diameter by considering the load capacity and the distance from the generator to the load. Use terminals for connection and securely fasten them. **(See 2.4)**

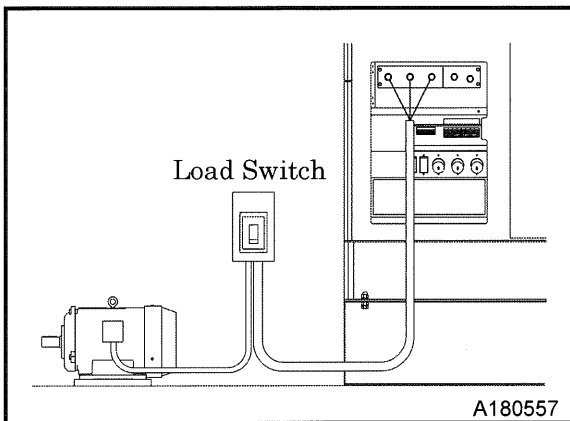


- After checking phase number and voltage of the required load, make sure to connect them correctly.

— Terminal Size —

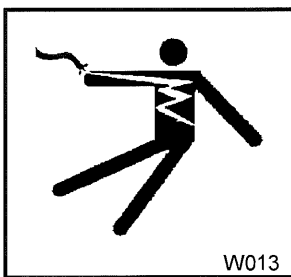
3 Phase output (L1 · L2 · L3 · N) : M16

Ground terminal (GROUND) : M16



- Install a load switch between the output terminal and the load.
Do not use the generator's circuit breaker to directly switch the load [ON – OFF]. It may cause damage to the circuit breaker.
- Connect the connecting cable to the load so that the output terminals do not touch each other.

WARNING

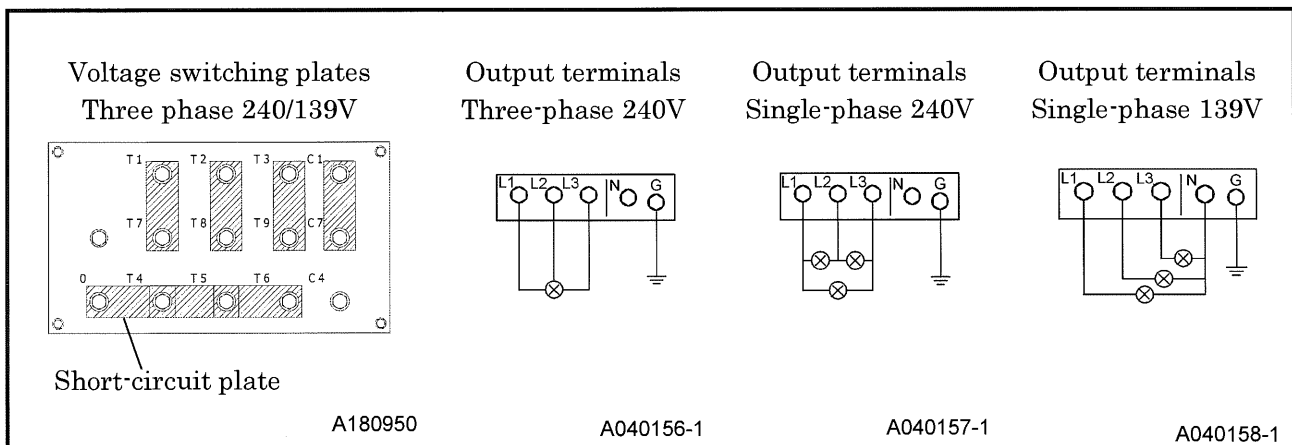
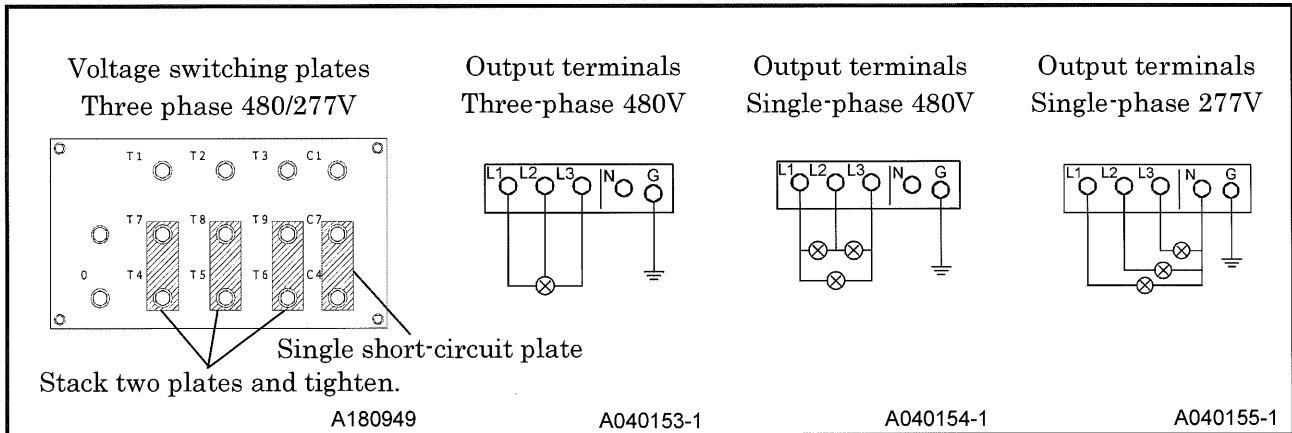


- When removing or attaching a connecting cable for changing load, be sure to switch OFF the generator's circuit breaker as well as removing the key to ensure the unit is stopped before performing work.
- When attaching a connecting cable to a load, do not use a cable with damaged sheath nor an inappropriate insulation cable to the voltage. Secure connections between each cable terminal and input/output terminal. Otherwise, it may become loose during operation and cause a fire or an electrical shock accident.

3. Operation

3.2.1 How To Switch Voltages

- Open the operation panel and connect the terminal bars as shown in the diagrams below to achieve desired voltage.
- For the 480/277V configuration, stack 2 bars for each connection.



WARNING

- It is possible to select 3-phase 4 wire 240 volt or 3 phase 4 wire 480 volt.
- Before starting the unit, be certain to confirm the voltage set for the machine is correct for the load. If any load is connected to the machine with the wrong voltage set, it may result in damage or cause the load to burn.
- When switching voltages, make sure to stop the machine.

3. Operation

3.2.2 Auxiliary AC Power

Single phase/120V power from GFCI receptacles is available, independent of the position of short-circuit plate on the control panel.

Single-phase 120V GFCI Receptacles Circuit Breaker

Single-phase 208/120V Aux. Outlet Circuit Breaker

Aux. receptacles can be used for 240/139V independent of the position of the short-circuit plate.

GFCI RECEPTACLES. 120V 20AMPS AUX.RECEPTACLES 208/120V 50AMPS A180087

A040270

A040271

<Instructions for Use>

1. After starting the unit, adjust three-phase voltage with the voltage adjuster on the control panel according to the table below.
2. Set the circuit-breaker on the control panel to the [ON] position.
3. Switch the breaker for the GFCI or Aux. receptacle to the [ON] position.

Voltage Switching Plates	Three-phase Voltage (L-L-L)	Single Phase Voltage		
		GFCI RECEPTACLES. 20AMPS	AUX.RECEPTACLES 50AMPS	
			L-L	L-N
Three phase 240/139V	208V	120V	208V	120V
	240V	※ 139V	240V	※ 139V
Three phase 480/277V	416V	120V	208V	120V
	480V	※ 139V	240V	※ 139V

※ Not Available for Use

CAUTION

- When adjusting the three-phase voltage, the single-phase voltage will also change. If the three-phase voltage is not adjusted, the single-phase voltage will exceed 120V, which may damage equipment.

3. Operation

3.2.3 The Maximum Combined Simultaneous Power Consumption

The table below shows the allowable load capacity that can be taken from a GFCI outlet (single-phase 120V) when using a three-phase (208/416V) output terminal. (The current values for GFCI outlets are per outlet.)

[Allowable load capacity of GFCI at three phase]

Three Phase (208/416V)	GFCI Receptacle
kVA	A
191	0
187	5
183	10
180	15
176	20

CAUTION

- When using (208/416V) three-phase output terminal and a GFCI outlet (single-phase 120V) at the same time, do not exceed the allowable load capacity of the above GFCI outlets

3. Operation

3.3 Engine Oil • Coolant • Fuel • DEF

3.3.1 Engine Oil

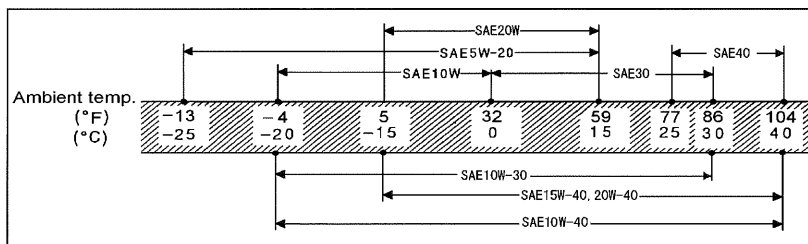
Use engine oil recommended below. Be sure to use CJ class or higher engine oil or superior class. (Using engine oil with poor quality may shorten the life of the engine).

Classification	API service classification CJ class or higher
Viscosity	SAE15W-40

IMPORTANT

- Viscosity of engine oil greatly affects starting, performance, and oil consumption of the engine, as well as wear of the moving parts. Choose appropriate oil based upon the table below according to the outside air temperature.

Ambient temperature range and oil viscosity (SAE)



A200331E

- Do not mix oils. If two or more different brands of oil are mixed, its performance can be deteriorated.
- When the machine is operating under a light load (20% or less) for a prolonged period of time, check the viscosity of the engine oil and other fluids, and replace oil early using about half of the regular replacement time as a guide.
- Use genuine engine oil (John Deere Plus-50™ II).
- Dispose of oil in accordance with local laws and regulations.

3.3.2 Coolant

Be sure to always use mixture of LLC (antifreeze) and soft water (like tap water) of good quality.

IMPORTANT

- If you use hard water such as well water (underground water), or water mixed with soil, sand, or particulate, water stains will easily accumulate in the cooling channels of the engine and radiator, causing the coolant temperature to rise.
- If the coolant freezes, the engine and radiator may be damaged. Adjust the mixing ratio of LLC (antifreeze) in the range of 30-60% depending on the outside temperature. If the mixing ratio exceeds 60%, the effectiveness of the anti-freeze compounds will decrease. Note that the coolant is filled with a 35% mixture ratio when shipped from the factory.

Mixing ratio of LLC (antifreeze) (reference)

Outside temperature (°F)	5	-4	-13	-22	-31	-40	-49
Outside temperature (°C)	-15	-20	-25	-30	-35	-40	-45
Mixing ratio (%)	30	35	40	45	50	55	60

- Dispose of LLC (Antifreeze) in accordance with local laws and regulations.

3. Operation

3.3.3 Fuel

IMPORTANT

- Never use fuel with sulfur content greater than 0.0015% (15 ppm).
- Use only ultra-low sulfur fuel.
- Use such diesel fuel which conforms to either EN590 or ASTM D975 standard.
- **Dispose of fuel in accordance with local laws and regulations.**



CAUTION

- Diesel fuel is required to meet the following characteristics:
 - Free from even fine dust particulate
 - Appropriate viscosity grade
 - High cetane number (greater than 45)
 - High fluidity even at low temperature
 - Low carbon residue content

3.3.4 DEF

DEF (AdBlue or equivalent) is a transparent, colorless, and non-hazardous. In some circumstances, DEF will put off odor, but this is normal and not indicative of any problems.

IMPORTANT

- Only use DEF which conforms to API standards.
- Store DEF in a sealed container away from direct sunlight to prevent water evaporation.
- The use period of DEF changes depending on the temperature. Refer to the engine instruction manual for more information.
- **If a substantial quantity of DEF is not within specification, contact the DEF supplier for assistance with disposal.**



CAUTION

- DEF is harmless to the human body even if touched, However, it may cause inflammation in rare circumstances depending on its constitution. In such cases, take the following actions.
 - Avoid prolonged contact with skin. In case of accidental contact, wash skin immediately with soap and water.
 - Do not ingest DEF. In the event DEF is ingested, contact a physician immediately.
 - Avoid contact with eyes. In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes.

3. Operation

3.4 Before Starting the Unit

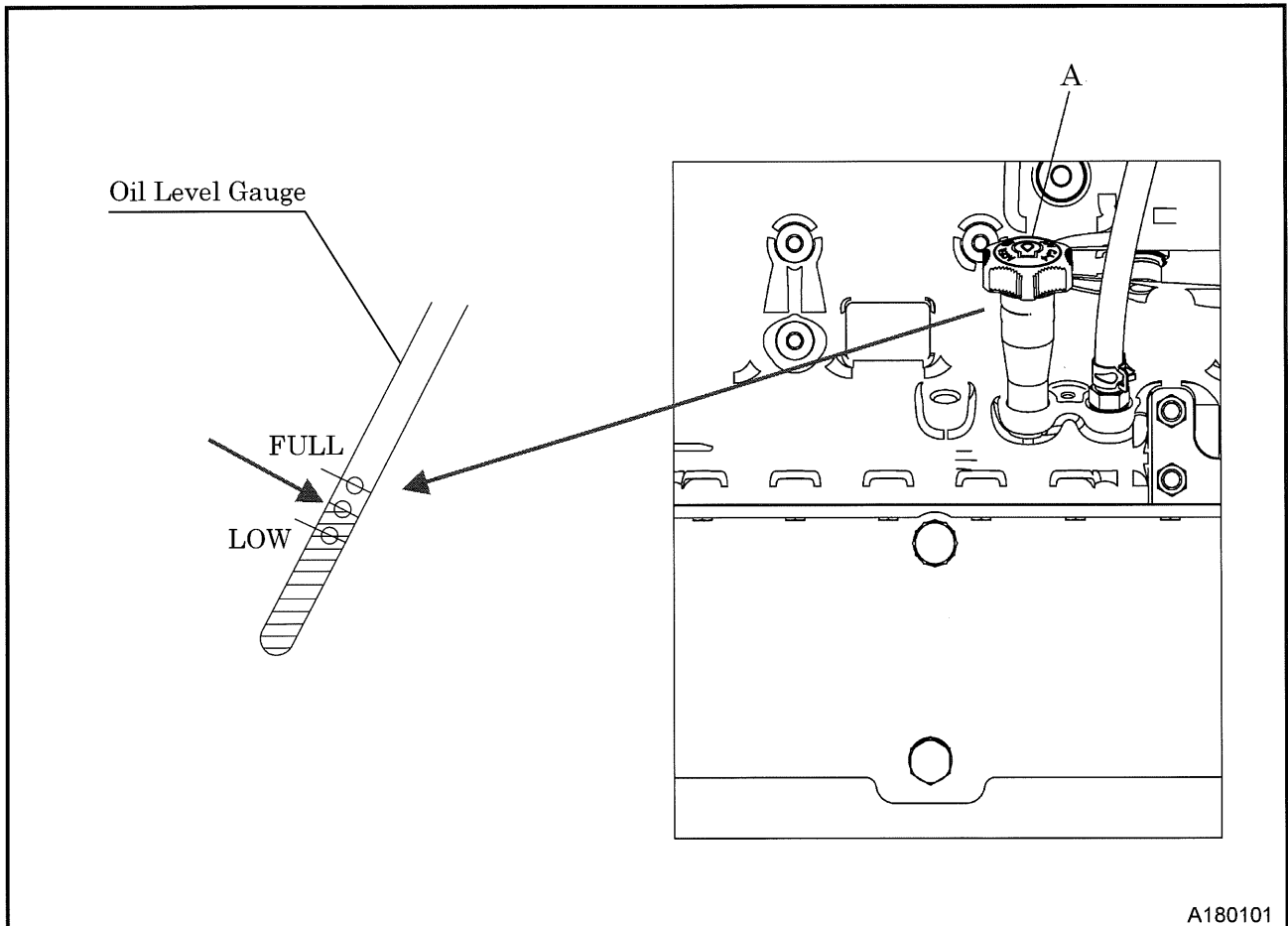
Be sure to check the unit before operation. When any abnormality is found, be sure to repair it before starting. Be sure to make daily check before operation. If the unit is operated without prior check and without noticing its abnormality, such operation could cause seizure of components or may even cause fire.

3.4.1 Check Engine Oil Level

The unit should be level before the checking oil level. When you checking the oil level after you have operated the unit, wait more than 10 minutes after stopping the engine before checking the oil level.

<Procedures>

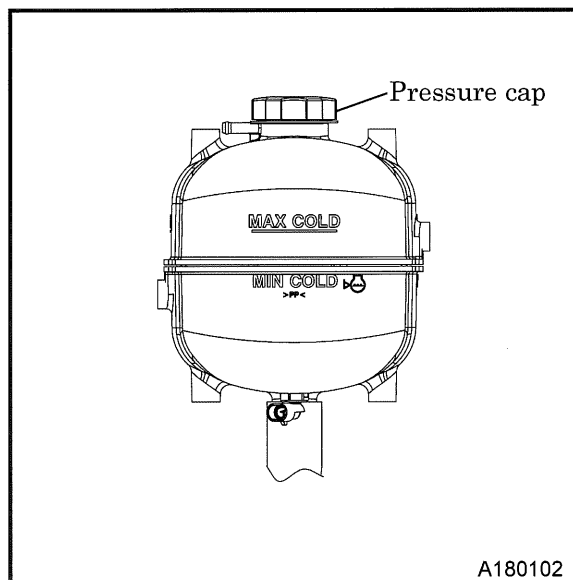
1. Pull out the engine oil level gauge and wipe it with a clean cloth.
 2. Re-insert the engine oil level gauge fully and pull it out again. If the gauge shows the oil level between LOW and FULL limits, it is normal.
 3. When the oil level is below its LOW, add engine oil from engine oil filler port [A].
- If the oil is found to be dirty or contaminated, change the oil. **(See 5.4.1)**
 - To prevent engine output reduction when oil level is too high, do not put more oil in than FULL.



A180101

3. Operation

3.4.2 Check Coolant Level



- Verify the coolant level in the surge tank is above [MIN COLD].
- If the coolant level is lower than [MIN COLD], remove the pressure cap and supply coolant up to the center between [MIN COLD] and [MAX COLD]. If too much coolant is poured into the surge tank, it may overflow during operation.

IMPORTANT

- Running the engine with insufficient coolant may cause engine damage.

3. Operation

3.4.3 Check fuel

Prior to operating the unit, ensure there is sufficient fuel remaining to prevent shortage during operation.

If necessary, drain condensate accumulated at the bottom of the fuel tank.

- Refueling should be done outdoors or in a well-ventilated place.
- **Do not fill fuel up to the filler level.**

When the fuel tank is filled up to the filler level, the expansion volume of the tank is too small and may lead to problems with fuel flow and containment. Furthermore, fuel may spill from the fuel tank due to vibration caused during movement or transportation of the unit.

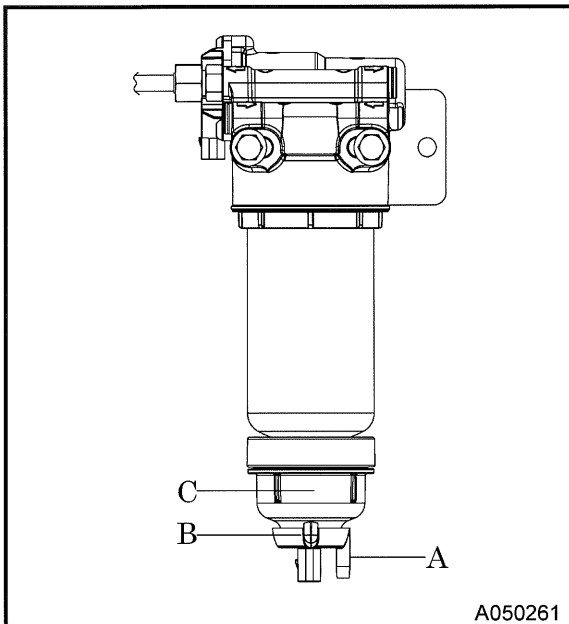
CAUTION



- Do not, under any circumstance, bring lit cigarettes and/or matches near the fuel.
- The fuel is extremely flammable and dangerous. Be aware of fire sources that can easily ignite the fuel.
- Refuel only after stopping the engine, and never leave open fuel cans near the machine. Do not spill. It is a fire hazard. When spills occur, wipe up thoroughly.
- Never use an alcohol-based cleaning fluid. When it adheres to plastic parts, it may cause cracking that will lead to visible degradation of the liquid surface, and worst case the cracks may result in fuel leaks.

3.4.4 Check Fuel Pre-Filter Drain

If there is water in the fuel pre-filter, the monitor lamp will light up. Drain the water in this case.



<Procedures>

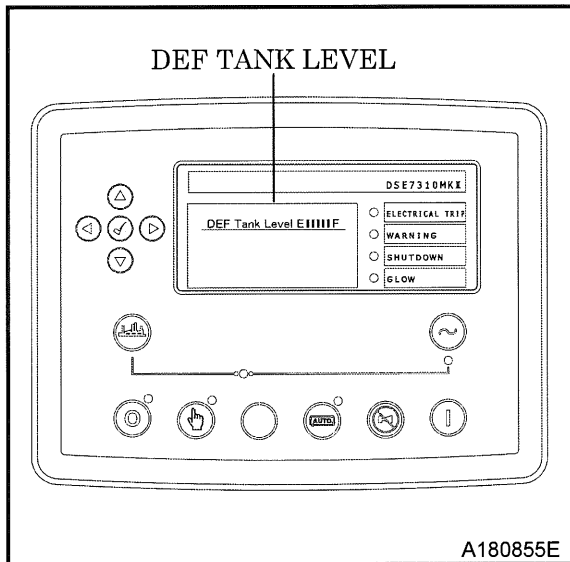
1. Prepare a drainage receptacle and slide the drain discharge lever [B] to drain from the outlet [A].
 - The cup of the filter contains fuel [C], so remove it carefully to avoid spillage in the interior.
2. After draining any water that has accumulated inside, clean and reinstall the cup [C].
3. Finally, return the drain lever [B] to its original position.
 - Drain the condensate into a container, and then dispose of condensate according to the designated regulations.

CAUTION

- Do not use alcohol-based parts cleaners for cleaning during inspections. Alcohol-based parts cleaner may adhere to the surface of plastic parts, causing cracks, or in the worst case, result in fuel leaks that may cause the fluid levels to drop.

3. Operation

3.4.5 Check DEF Level



- If DEF tank level is below 10%, warning lamps will illuminate and symbols will be displayed as shown below. When the DEF is refilled, the lamp and icon will turn off and return to normal state.
- When the DEF tank level reaches 0% and operation is continued without refilling DEF, the engine will stop. After replenishing the DEF, the engine can be started again.
- Do not forget to refill DEF when using external fuel supply.
- ※ **When refilling diesel fuel, refill DEF as well.**

DEF Tank level display

State Description	DEF Level	Over 10%	Below 10%	Below 5%	0%	10 min after from 0%
Monitor screen display	Icon (DEF Level)	(OFF)	(ON)	(Blinking)	(Blinking)	(Blinking)
	Icon (ECU Amber Alarm)	(OFF)	(ON)	(ON)	(ON)	(ON)
Monitor Lamps	WARNING	● OFF	ON	ON	ON	ON
	ELECTRICAL TRIP	● OFF	● OFF	● OFF	● OFF	ON
	SHUTDOWN	● OFF	● OFF	● OFF	● OFF	ON

3.4.6 Check Interior

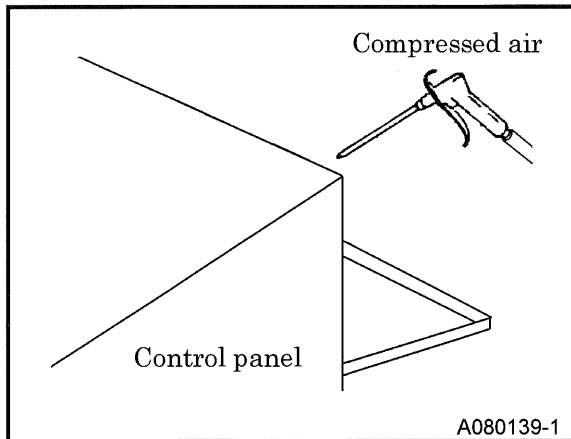
Periodically check the inside of the generator for dust and flammables

CAUTION

- Please wear personal protective equipment, such as a helmet, safety glasses, earplugs, safety shoes, gloves, and a mask as appropriate to the work environment.
- The DOC, SCR, and exhaust pipes are subject to high temperatures, so if there are flammable materials such as wood chips, dead leaves, or paper scraps in the vicinity, remove them.
- Keep a fire extinguisher on hand near the machine in case of fire hazards.
- It is advisable to have a list of phone numbers of doctors, ambulance and the fire department available in case of emergency.

3. Operation

3.4.7 Control Panel Instrumentation Cleaning



- Before starting operation, open the control panel and check each breaker, terminal plate and all controllers for any dust, sand, or dirt accumulation.
- If the machine is operated with dust, sand, or dirt in the instrumentation, it may cause malfunction or damage. When necessary, clean the inside of the panel with compressed air. Wear protective eyewear when cleaning.

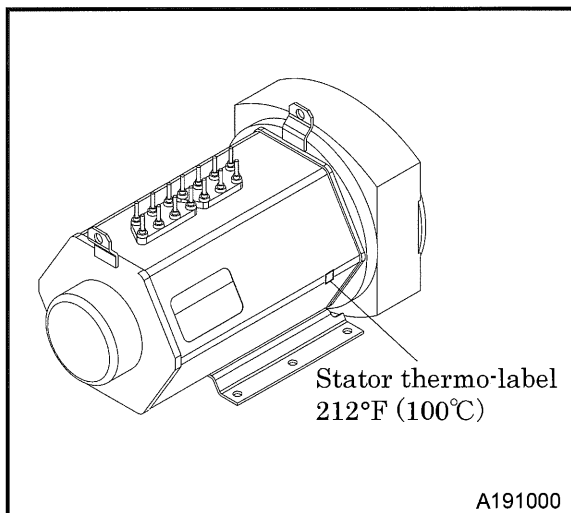
3.4.8 Check Belt Tension

The belt features an auto-tensioning system, so it is not necessary to adjust manually, but visually confirm there is tension before starting the engine.

Inspect the belt for cracks and wear.

3.4.9 Check Thermo-Label of Alternator

Thermo-label on the stator irreversibly changes its color from white to brown when reaching or exceeding 212°F (100°C), that signalize overload during operation. If it has discolored, there is a possibility that an abnormality has already occurred in the generator end, immediately reduce the load and contact your nearest dealer.

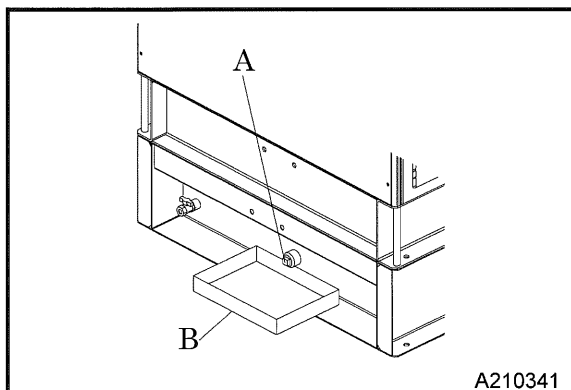


- Use compressed air to remove accumulated debris and dust from inside the generator end.
- If the thermo label has discolored and after all abnormalities have been resolved, replace with a new thermo label.
- For replacement, contact your nearest dealer.

3. Operation

3.4.10 Check Oil Fence Condensate

The oil fence drain ports are located on the operating side and front side (two locations).



<Procedures>

1. Remove the drain plug [A] at the drain opening of the oil fence, and drain the condensate that has accumulated inside.
 2. Check that all condensate is drained, and then re-install the drain plug.
- Drain the condensate into a container [B], and then dispose of condensate according to the designated regulations.

CAUTION

- If the drain contains fuel, oil, or coolant, inspect each part for leaks.

3.4.11 Check Doors

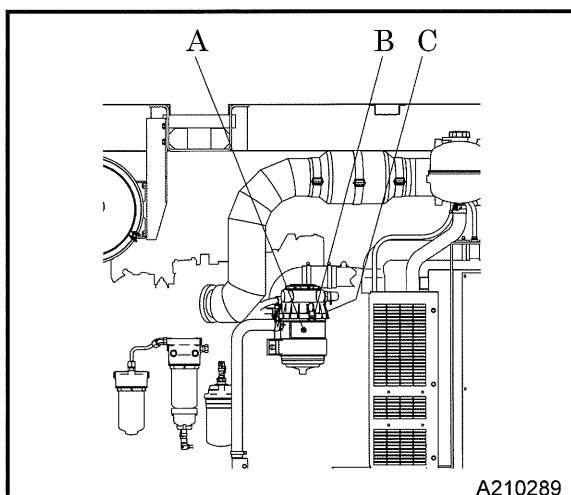
Pull the handle forward to open the door. When closing the door, be sure to close firmly and ensure the latch is secure.

WARNING



- Keep the door closed and locked while running the machine.
- When opening the door unavoidably, be careful not to touch the moving parts and hot parts. Scalding burns or serious injury may result.

3.4.12 Check Engine Breather Piping



- Open the latch [B] on the OCV filter [A] and remove the cap [C], then remove the filter from inside and inspect the inside for clogs. If the inside is clogged, the internal pressure of the engine will increase and engine oil may be released into the atmosphere through the hose installed in the engine head. Especially in cold weather, there is a risk freezing in the breather piping causing clogs, so check for moisture or other buildup.
- See Section 5.4.18 for more information on OCV filter replacement.

3. Operation

3.5 Operating Procedure

Make sure that all enclosure doors are closed before starting.

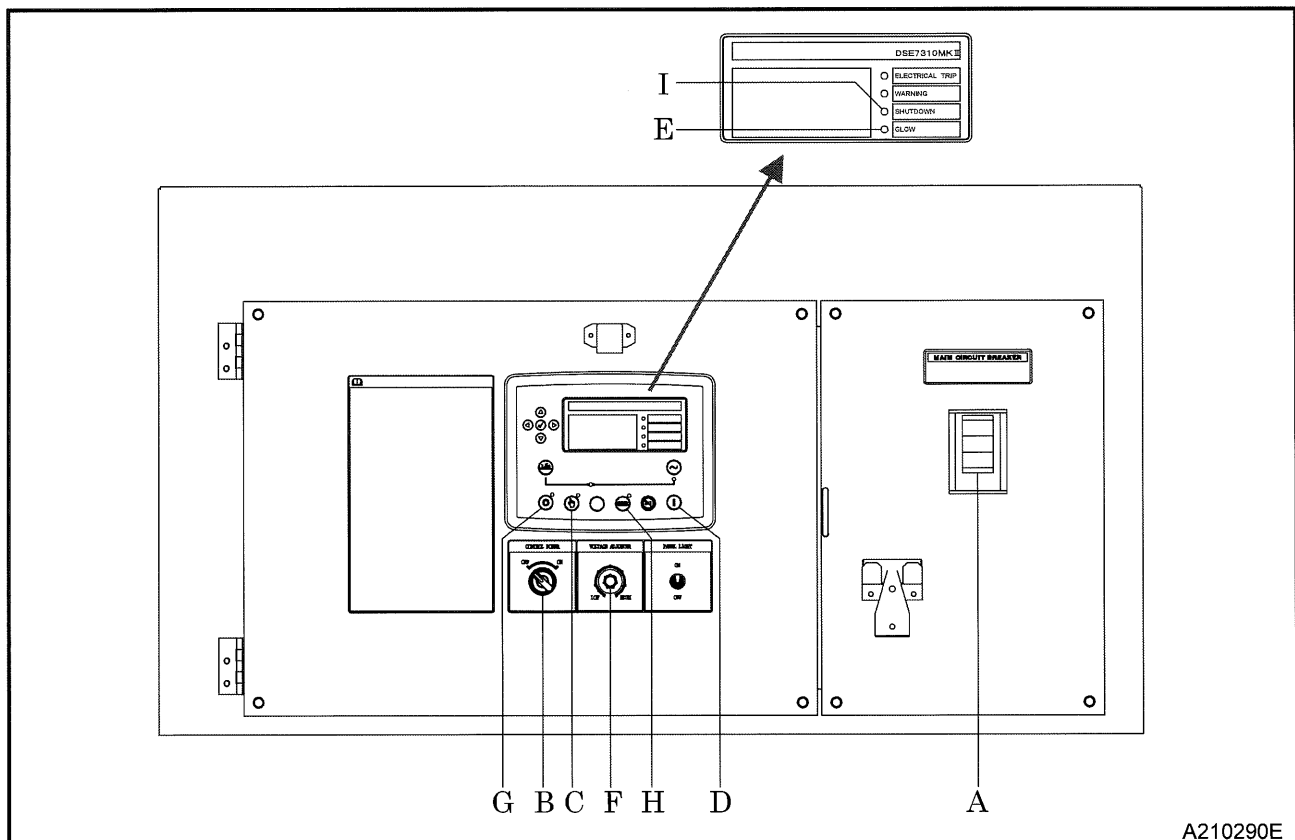
3.5.1 Starting Procedure

To start, please follow the procedure below.

Manual Mode

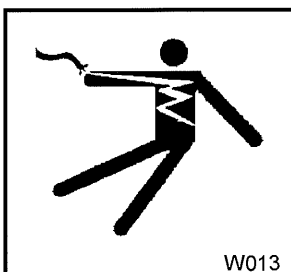
<Procedures>

1. Set the circuit breaker [A] on the instrument panel to [OFF] position.
2. Set the selector switch [B] to [ON] position.
3. Push the manual mode button [C].
4. Push the start button [D] to run the engine.
(Preheating is started automatically in cold weather. After the glow lamp [E] turns off, the engine starts.)
5. Once engine has started, let it warm up approximately 5 minutes at no-load condition.



A210290E

WARNING



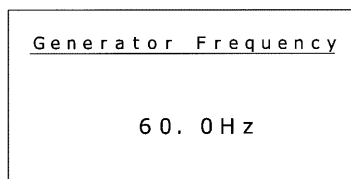
- Keep the output terminal cover shut and locked whenever the machine is running. Note that a voltage of several hundred volts is applied to the output terminal and control board. When opening the output terminal cover is unavoidable, be careful not to touch the output terminal. Electric shock or serious injury could result.

3. Operation

Check frequency and voltage

<Procedures>

1. After the warm-up operation, from the **Generator** screen and press \triangle ∇ to switch to the frequency screen, and make sure the frequency is set to 60Hz. (See 3-2)



Display Screen

2. Next press \triangle ∇ to switch to the voltage screen, and while watching the monitor turn the voltage regulator knob [F] until the reading matches the rated voltage.

Generator Voltage	
L1-L2	480V
L2-L3	480V
L3-L1	480V

Display Screen



Voltage Adjuster

Load Operation

<Procedures>

1. Set the circuit breaker [A] to [ON] and supply power to the load.
 - During operation, check and confirm whether the generator functions properly. (See. 3.5.2)
 - ※ Before starting to supply power to the load, make sure that the voltage is in accordance with the load.

IMPORTANT

- After the engine starts up, warm it up unloaded for approx. 5 minutes.
- Warming up after starting up is necessary for smooth operation of the engine. Do not operate the engine at full load immediately after it starts up. This will shorten the equipment life.
- During the warm-up operation, examine the different parts of the equipment for any looseness, leakage of water, oil, fuel, and other irregularities. Also, make sure that the monitor lamps are off.
- Be sure to operate the generator at the rated frequency, irrespective of the load capacity. If the machine is operated at a frequency lower than the rated frequency, it may cause the generator end to burn.

Stop

<Procedures>

1. Stop the load.
2. Set the circuit-breaker [A] to [OFF] position.
3. After about 5 minutes cooling down operation, push the stop button [G] to stop the engine.
4. Set the power control switch [B] to [OFF] position.

IMPORTANT

- The engine controller is on for a few minutes after the engine has stopped. Do not remove the battery cables, etc., during this period.

3. Operation

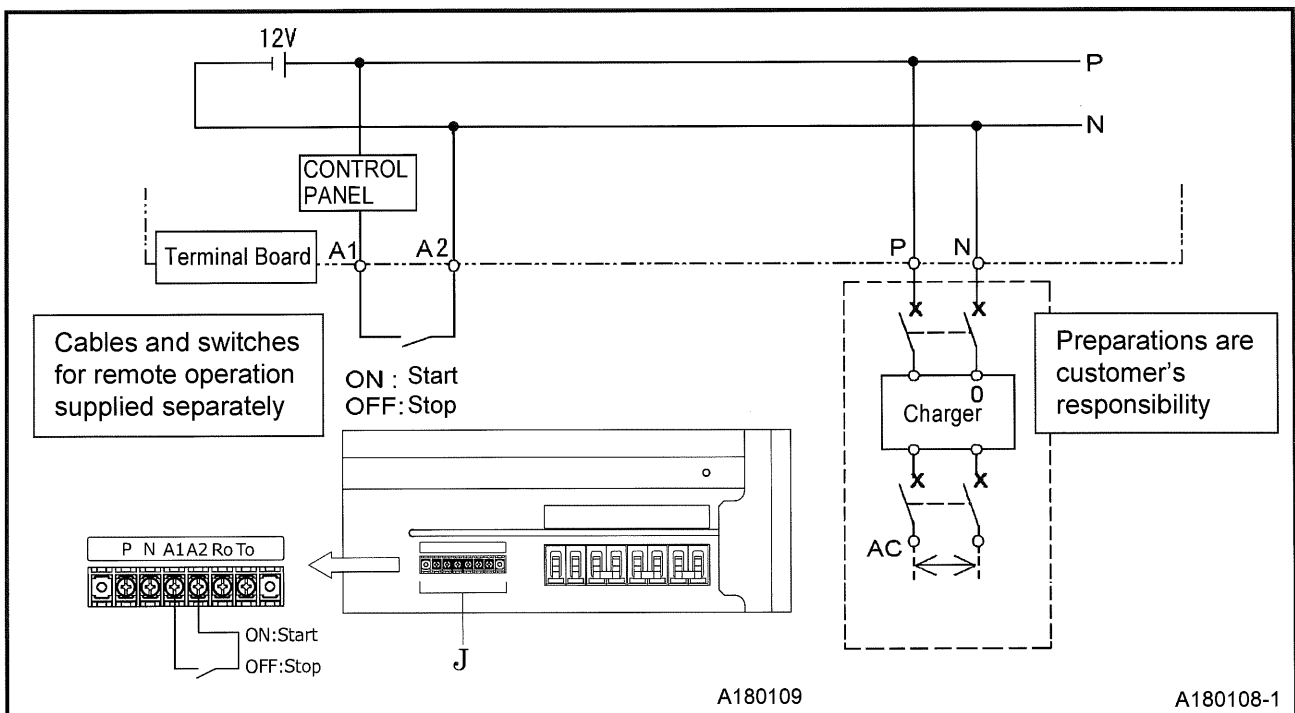
Auto Mode

1. Cable connection method for a remote control switch.

- Connect the cable to the remote control terminal [A1-A2] of the remote operation terminal block [J], and install the remote operation switch between [A1-A2]. Prior to connecting this cable be sure the (-) battery cable is disconnected.
- Connect the battery charger to the battery charging terminal [P-N] on the remote operation terminal block [J].

<Procedures>

1. Adjust rated voltage in manual mode and stop the engine.
2. Push the auto mode button [H].
3. Set the circuit breaker [A] to the [ON] position.
4. Set the remote operation switch between the [A1-A2] terminals to [ON] to start the engine. (Preheating is started automatically in cold weather. After the glow lamp [E] turns off, the engine starts.)
5. To stop the engine, set the remote operation switch to between [A1-A2] to [OFF].



CAUTION

Inspection and maintenance prohibited during auto mode



PK0028

- While auto mode is active, refrain from touching inside of the machine as it may start without warning.
- When performing inspection and maintenance, make sure to hang an "Under inspection and maintenance" tag on the remote switch.
- Disconnect the (-) terminal of the main battery.

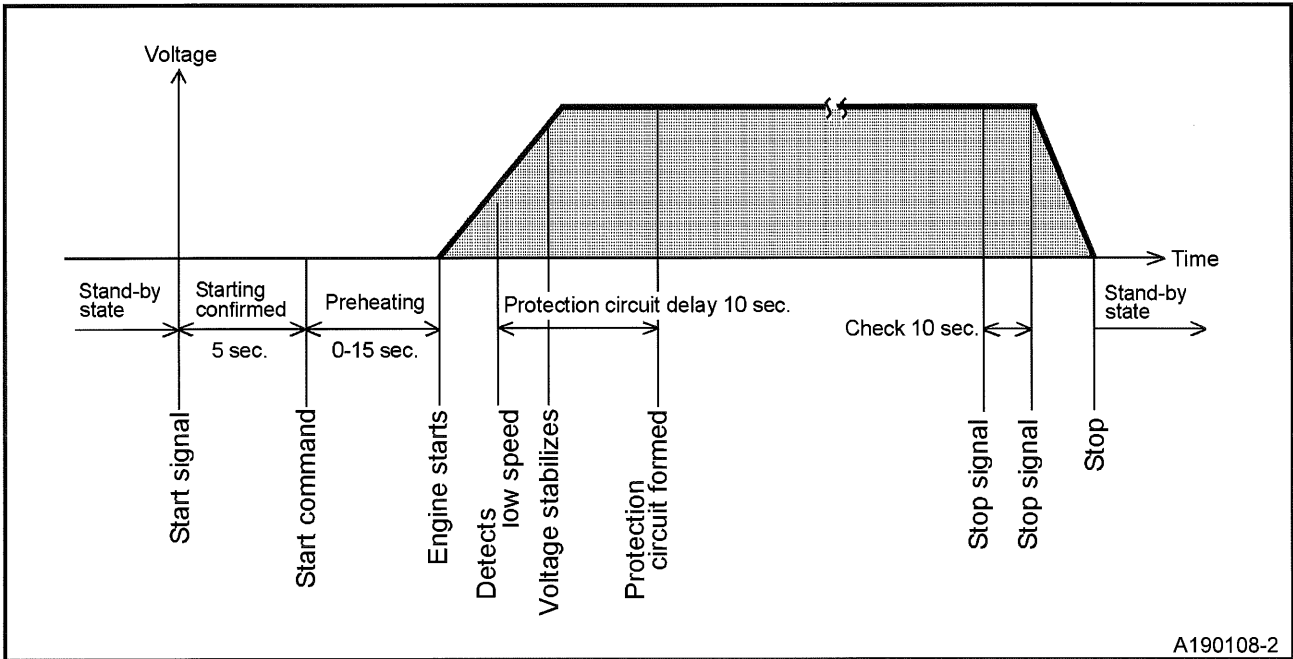
IMPORTANT Install a battery charger

- When the controller is left in auto mode, battery discharge will occur. Make sure to install a charger to charge the battery.

3. Operation

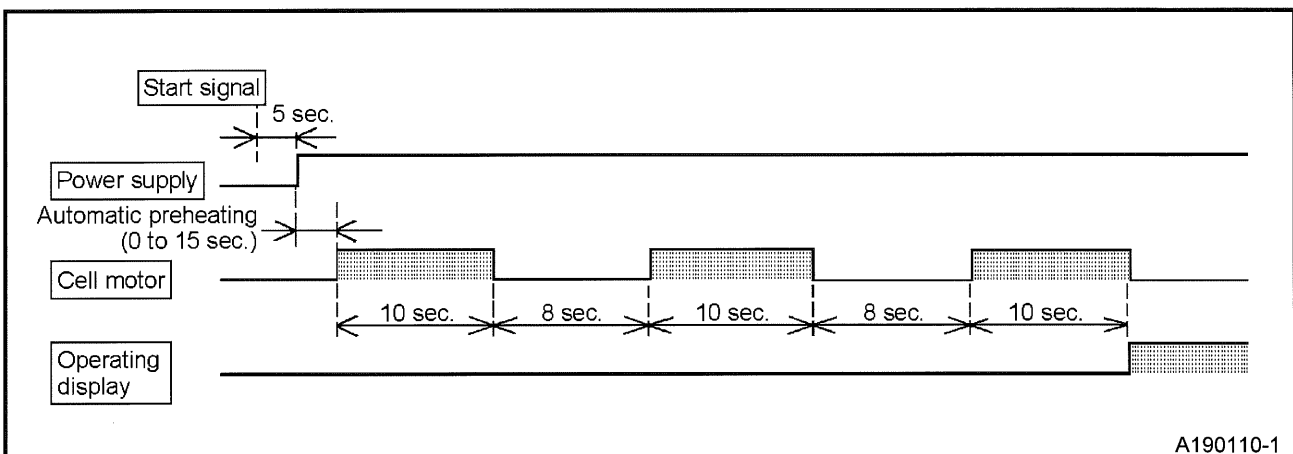
2. Function

- When the start signal activates in stand-by mode, it starts the unit. (This includes preheating.)
When the stop signal activates, the unit will continue to operate for 10 seconds to cool down, then the unit stops and is placed again in stand-by mode.



3. Starting Action

- If the engine will not start after cranking for 10 seconds, stop it for 8 seconds before trying again. If the engine will not start even after cranking is repeated three times, the SHUTDOWN lamp [I] will illuminate due to Fail to Start error.
- If the engine will not start and the SHUTDOWN lamp [I] is illuminated, troubleshoot the cause of engine failure before proceeding.



IMPORTANT Perform periodic inspection and maintenance of the generator

- To check performance, run the unit for 5 to 10 minutes once a week.

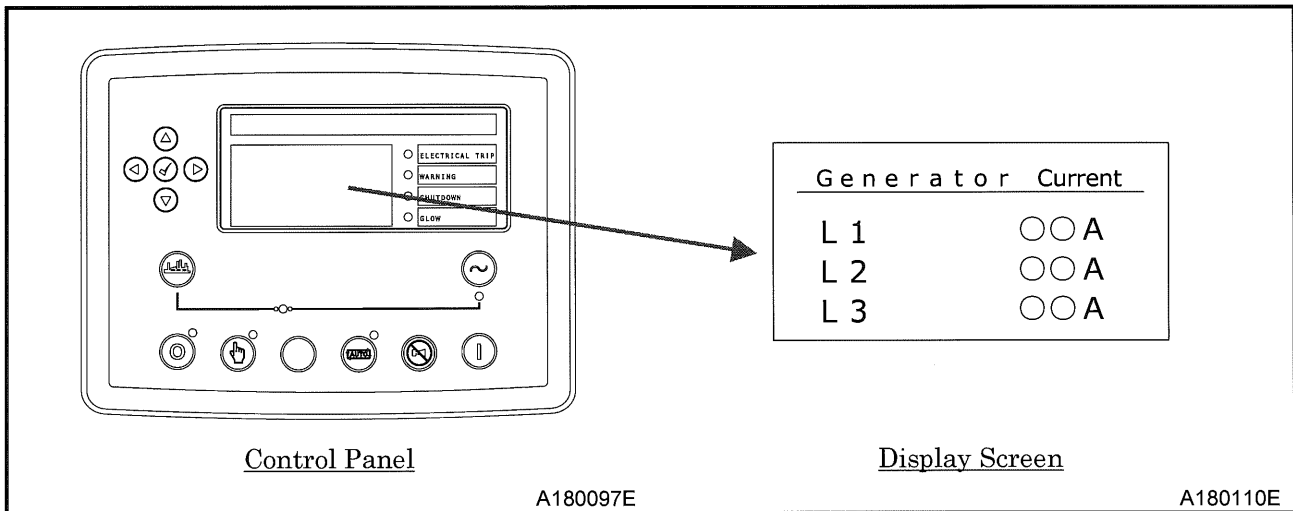
3. Operation

3.5.2 Meters and indicator lights during operation

During normal operation, each indication of instruments is shown in the table below. Refer to the table for daily checks.

Note: The values marked * vary with location of the voltage selector plate.

		Voltage Display (V)	Frequency Display (Hz)	Current Display (A)	Monitor lamps			
					ELECTRICAL TRIP	WARNING	SHUTDOWN	GLOW
Before Start	CONTROL POWER switch (ON)	0	0	0	● OFF	● OFF	● OFF	● OFF
During operation		* 240 480	60	Less than rated current	● OFF			



- Be sure to frequently check meters and indicators for proper operation, or any machine water, oil, fuel leaks, etc.
 - The above table gives standard values. They may vary slightly depending on operating conditions and other factors.
 - If you are operating a single-phase load, display the Generator screen, press \triangle ∇ to switch to the [Generator Current] screen, and check the current flowing in each phase (L1, L2, and L3) on the monitor. Each current should be balanced if unbalanced. Change load connections so the current of L1, L2, and L3 is equally balanced. Make sure that the current of each phase does not exceed the rated one.
- ※ Keeping a record of machine operation and service checks in the Operation Log will help with discovering any underlying issues or problems with the machine before they become severe.

3. Operation

CAUTION



PK0028

- Do not under any circumstance, open the portions below during operation.
- Coolant condensate drain valve
- Engine oil condensate drain valve



H990432

- Never work nearby hot portions of the machine while it is running.
- Do not touch hot portions of the machine while inspecting during operation.
- Specifically, parts such as the engine, exhaust manifold, exhaust pipe, DOC, SCR, radiator, and intercooler are extremely hot. Never touch these parts, it will cause burning.
- Coolant water and engine oil are also very hot and dangerous to touch. Avoid checking or refilling them while the machine is running.

- If the circuit breaker repeatedly functions during operation, reduce the load.
- When running a single-phase load, check the current of each phase and try to keep the load of each phase consistently average.
- If you continue to operate the generator while ignoring or neglecting these cautions, it could cause overheating and result in fire. Furthermore, should operation continue at a lower level than the standard rated frequency, it could burn the generator and any motors of the attached load.

3.5.3 Panel Light Operation

- The panel is equipped with an LED light. Turn the panel light switch [ON] to use.
- When illumination is not necessary, turn the light [OFF]. If the machine is always operated with the lamp switched [ON], the lamp life will be reduced.

3.5.4 Operating procedures when engine fails to start up on first attempt

If the engine repeatedly fails to start, the following causes are suspected. Check the following:

- No fuel
- Clogging of the fuel filter
- Battery discharge (Low cranking speed)

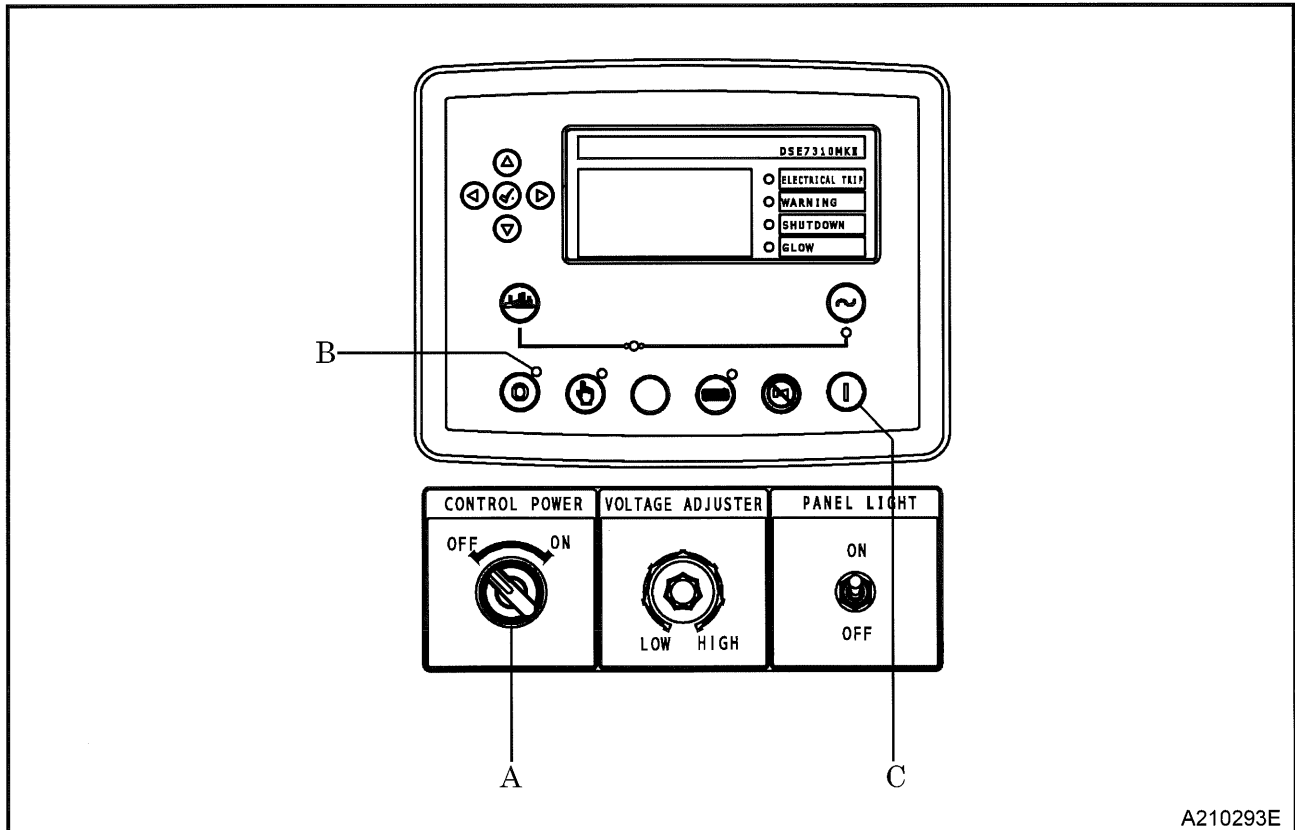
3. Operation

3.5.5 Fuel line air bleeding device

If the machine runs out of fuel, bleed the air, according to the following procedures.

<Procedure>

1. Refuel.
2. Set the control power switch [A] to [ON] position.
3. With the stop mode indicator lamp [B] lit, press the start button [C].
4. The electromagnetic pump operates automatically to discharge any air from the fuel line.
5. Air bleeding is completed in about one minute.



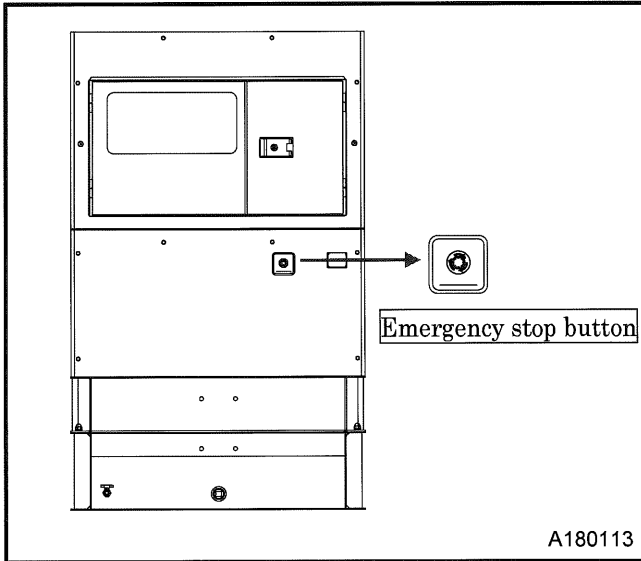
3.5.6 How to check engine information

By pressing the start button [C] when the stop mode indicator lamp [B] is lit, the key can be turned ON without starting the engine, and the remaining urea level, water temperature, etc. can be checked. After 2 minutes, the system will automatically return to the key OFF state.

3. Operation

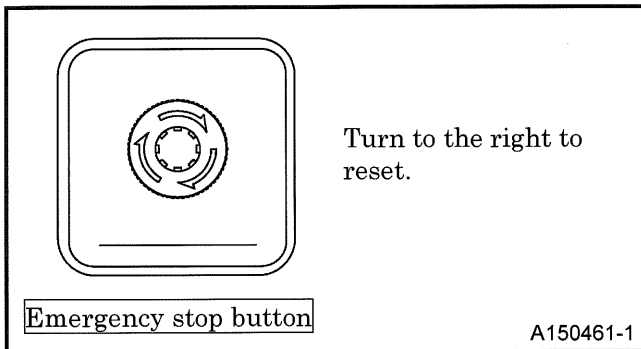
3.6 Emergency Stop

3.6.1 Emergency stopping procedures



- If it is necessary to stop the generator for an emergency, press the Emergency Stop button located below the control panel. When pressing the emergency stop button, the machine will stop immediately.

3.6.2 Resetting the emergency stop button



- After emergency stopping, be sure to carry out an investigation of the problem which caused you to use the emergency stop and take appropriate countermeasures. Release emergency stop button only after resolving the problem that required an emergency stop. To reset the button, turn the button head in the direction of the arrow.

※ If it is not reset, the machine cannot restart.

3. Operation

3.7 SCR Cleaning

3.7.1 Natural Cleaning

- The exhaust temperature is periodically raised to automatically clean a small amount of sediment in the SCR. No operator intervention is required. During this cleaning, nothing is displayed on the monitor.
- While cleaning, you can continue to use the load. During SCR cleaning, the engine fan may rotate at high speed to cool the engine, but this is expected.

3.7.2 Automatic Cleaning

- As deposits accumulate in the SCR, the exhaust temperature rises in order to automatically clean the SCR. No operator intervention is required. During cleaning, the unit will operate normally. It usually takes about 15 minutes to complete.
- During this time the HEST (High Exhaust System Temperature) symbol [↔] will be displayed on the monitor. This is normal during this type of cleaning.



WARNING

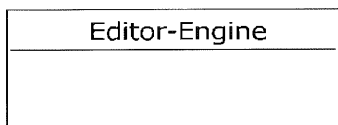
- During automatic or manual cleaning operations, the SCR and exhaust air temperatures will be high. Beware of flames.


3.7.3 Manual Cleaning

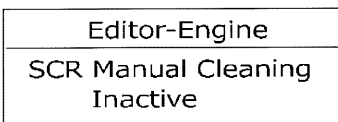
- If manual cleaning is required, the SCR symbol [≡] will be displayed on the monitor. To set “SCR Manual Cleaning” from “Inactive” to “Active”, you need to perform the following steps.




<Procedure>

1. Press and hold the tick  button to access the Running Editor.
2. Press the right arrow  button until “Editor – Engine” is displayed.



3. Press the  button to display “SCR Manual Cleaning”.



4. Press the  button, then press the  button to set it to “Active”, then press the  button.
5. SCR cleaning takes about 40-50 minutes.
6. During cleaning, the SCR symbol [≡] will blink and the HEST symbol [↔] will light up.
7. When the cleaning process is complete, the manual cleaning setting will automatically return to “Inactive” and the indicator will turn off.

CAUTION










- During manual cleaning, the engine will only support 50% output. The unit cannot be used at its rated output during this time, so if necessary switch the circuit breaker to "OFF" and stop supplying power to the load.
- Except in an emergency, do not stop the machine until cleaning is complete.

3. Operation

3.7.4 Service Cleaning

- If the manual cleaning process is unable to successfully finish, the engine will eventually stop. If you experience this condition, please contact your local dealer.



3.7.5 SCR Cleaning Monitor Display

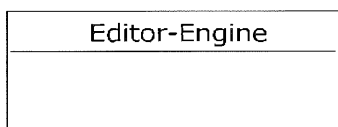
State Description	SCR Cleaning	NATURAL	AUTO	MANUAL	SERVICE
	ENG.OUTPUT	100%	100%	50% De-rate	-
Monitor screen display	Icon (SCR symbol)	(OFF)	(OFF)	 (ON)	 (ON)
	Icon (ECU Alarm)	(OFF)	(OFF)	 (ON)	 (ON)
	Icon (HEST symbol)	(OFF)	 (ON)	 (ON)	(OFF)
Monitor Lamps	WARNING	● OFF	● OFF	 ON	 ON
	SHUTDOWN	● OFF	● OFF	● OFF	 ON


3.7.6 Automatic Cleaning Inhibit

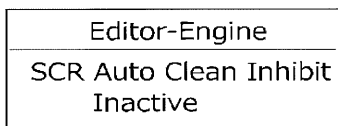
- In situations where the high temperature of the exhaust air may be dangerous, automatic cleaning may be disabled.




<Procedures>

1. Press and hold the tick  button to access the Running Editor.
2. Press the right arrow  button until "Editor – Engine" is displayed.



3. Press the right arrow  button until "SCR Auto Cleaning Inhibit" is displayed.



4. Press the  button (Inactive will start flashing), press the  button to change to "Active", then press the  button (Active will stop flashing).




















- Disabling automatic cleaning is not recommended. The Auto-clean inhibit setting should always be set to "Inactive" unless necessary.

3. Operation


3.8 SCR Inducement

- The warnings below will be indicated before the situation become critical when sensing problems such as no DEF supply, use of poor quality DEF, DEF injection issues, or disconnection of sensors etc.
- If no action is performed, the engine will shutdown 2 hours later.
- If the engine stops in this condition, contact your nearest dealer as special service tool is required to restore operation.

[Monitor display during SCR inducement]

State Description	-	Detect	0.5Hr From detect	1.0Hr From detect	1.5Hr From detect	2.0Hr From detect	
	Warning Level	Normal	Initial Notification	1 st Warning	2 nd Warning	3 rd Warning	Final inducement Warning
	ENG. OUTPUT	100%	100%	100%	100%	100%	-
Monitor screen display	Icon (SCR system malfunction)	(OFF)	 (ON)	 (ON)	 (ON)	 (ON)	 (ON)
	Icon (ECU Alarm)	(OFF)	 (ON)	 (ON)	 (ON)	 (ON)	 (ON)
Monitor lamps	WARNING	● OFF	 ON	 ON	 ON	 ON	 ON
	ELECTRICAL TRIP	● OFF	● OFF	● OFF	● OFF	● OFF	 ON
	SHUTDOWN	● OFF	● OFF	● OFF	● OFF	● OFF	 ON

CAUTION

- If the SCR system failure symbol [] appears on the monitor during normal operation, stop the engine immediately and contact the nearest dealer.

4. Failures and Troubleshooting

4.1 Protection devices

To prevent issues during operation, this machine is equipped with various protection devices.

4.1.1 List of protective devices, warning lamps, and monitor alarms


This machine is equipped with protective devices, and indicates the type of issue with lamps and messages on the monitor display as shown in the table below. Shown below are the typical items.

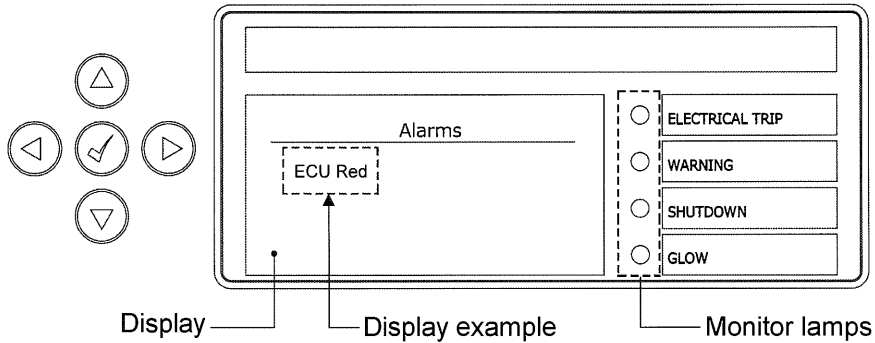
Item	Control Panel					Function
	Monitor Lamps			Display Screen		
	ELECTRICAL TRIP	WARNING	SHUTDOWN	Alarms	ECU Current DTCs	
Low Engine Oil Pressure	● OFF	☀ ON	● OFF	ECU Amber	Engine Oil Pressure Low	Warning: lower than 26PSI (180kPa)
	☀ ON	● OFF	☀ ON	ECU Red	Engine Oil Pressure Low	Engine Shutdown: 23PSI(160kPa)
High Coolant Temp	● OFF	☀ ON	● OFF	ECU Amber	Coolant Temperature High	Warning: 237°F(114°C)
	☀ ON	● OFF	☀ ON	ECU Red	Coolant Temperature High	Engine Shutdown: 240°F(116°C)
Low Coolant Level	● OFF	☀ ON	● OFF	ECU Amber	Coolant Level Low	Warning: Coolant has fallen below the minimum level required in the surge tank
	☀ ON	● OFF	☀ ON	ECU Red	Coolant Level Low	Shutdown: Coolant has fallen below the safe level of operation for the engine
Overspeed	☀ ON	● OFF	☀ ON	Engine Speed High	-	Shutdown: 2070RPM(69Hz)
Clogging Air Filter	● OFF	☀ ON	● OFF	Air Filter	-	The lamp illuminates when the air filter is clogged and requires cleaning or replacement.
Oil Fence liquid level rising	● OFF	☀ ON	● OFF	Containment Level	-	When more than 52gal (200L) of condensate (fuel, oil, coolant) accumulates the lamp will light
☆ Low Fuel Level	● OFF	☀ ON	● OFF	Low Fuel Level	-	When remaining fuel tank capacity is less than 5% the lamp will light
Over Current/ Short Circuit	☀ ON	● OFF	● OFF	Over Current	-	Occurs during overload and short conditions
High Voltage	☀ ON	● OFF	☀ ON	Over Voltage	-	Shutdown: When voltage exceeds 108%
Other Engine Trouble	※	※	※	※	※	※

☆ : Not functional when using an external fuel tank.

※ : Please contact your nearest dealer.

4. Failures and Troubleshooting

When ECU Red or ECU Amber is displayed, press the  button once to change screen to ECU current DTCs and check screen.

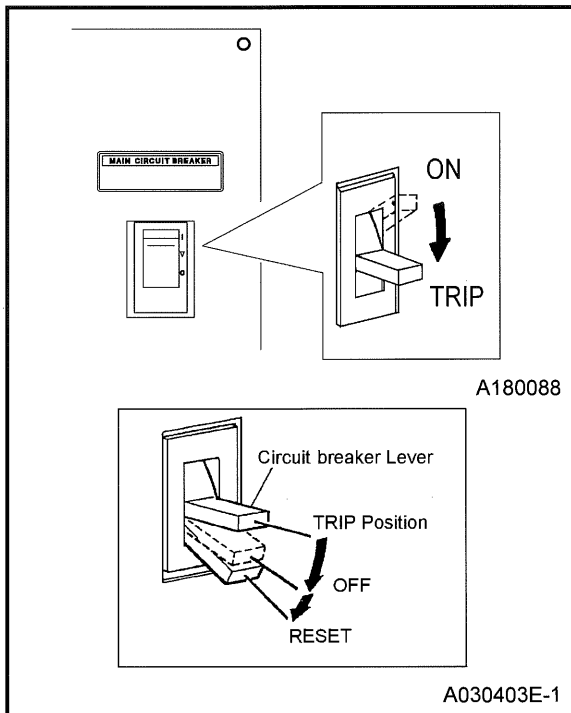


A180100E

CAUTION

- If the protective device operates and the engine stops or the circuit breaker trips, refer to the cause of the failure and take countermeasures to remedy the issue and then restart operation.

4.1.2 Circuit Breaker



- In case of an overload or short-circuited wire connection, the circuit-breaker trips.
- When the breaker is tripped, stop the machine immediately and reset the circuit breaker after resolving the cause of the trouble.

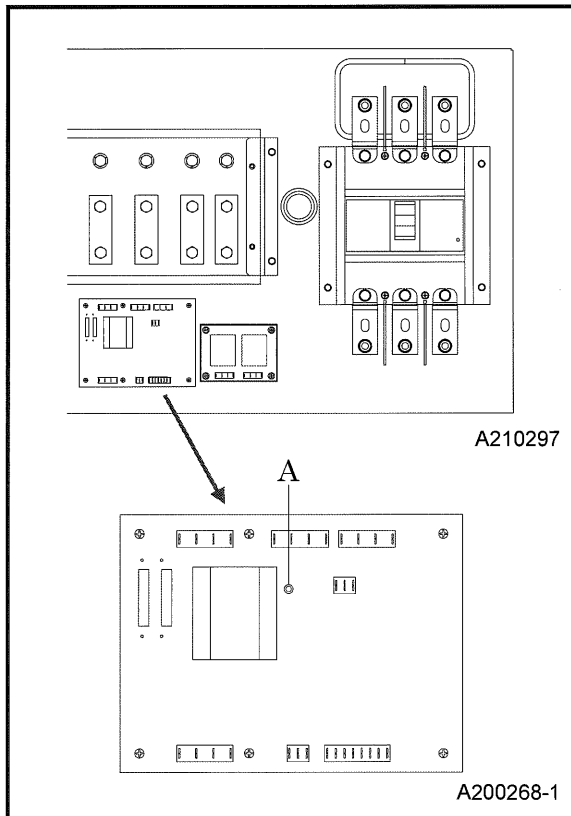
<How to reset>

- In order to reset the lever of circuit breaker, press the lever downward firmly until the lever “clicks” into place.

4. Failures and Troubleshooting

4.1.3 Circuit protector (CP) for AVR protection

A VR is equipped with a circuit protector (CP) for protection against over current. It will activate under the following conditions:



- When an excessive load is applied while the engine RPM is low.
- When the output voltage of the machine is increased above the specified voltage.

<Symptoms>

- When the CP activates, the following effects occur.
 - (1) The voltage will not reach rated voltage.
 - (2) The voltage is usable, but voltage fluctuation is great and voltage restoration under load is slower.

<How to reset>

- Stop the unit completely, and then start the unit. Bring the unit to its rated speed. If no voltage issues persist, the indicator lamp [A] on the AVR will turn off.

4. Failures and Troubleshooting

4.2 Troubleshooting

Should any trouble occur during operation, do not leave it. Investigate the cause and take appropriate measures. Read the manual carefully and fully understand what to do in case of trouble.

- The better you understand the construction and function of the machine, the faster you can find the problem and solution.
- This chapter describes the state, cause and countermeasures of important troubles in detail:

Symptom	Cause	Countermeasures						
Starter does not rotate. Low starter RPM when starting.	(1) Battery malfunction (2) Charging malfunction (3) Alternator malfunction (4) Starter malfunction	<table style="border: none; width: 100%;"> <tr> <td style="border: none;">]</td> <td style="border: none;">Check Battery→Charge</td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;">Change</td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;">Change</td> </tr> </table>]	Check Battery→Charge		Change		Change
]	Check Battery→Charge							
	Change							
	Change							
Starter rotates normally but engine does not start up.	(1) No diesel fuel (2) Air in fuel lines (3) Clogging of the fuel filter (4) Clogged nozzle (5) Controller malfunction	Refuel Bleed air Disassemble/Clean and Change Disassemble and clean Check fuse Check connectors Check controllers						
※ “Engine Oil Pressure Low” is displayed on the screen.	(1) Engine oil shortage (2) Clogged engine oil filter (3) Looseness, disconnection of wiring or connectors (4) Oil pressure switch malfunction	Refuel Change Check/Tighten Change						
※ “Coolant Temperature High” is displayed on the screen.	(1) Coolant shortage (2) Belt slippage (3) Clogged radiator (4) Faulty thermostat (5) Looseness, disconnection of wiring or connectors (6) Faulty coolant temperature switch	Replenish coolant Adjust tension Clean Change Check/Tighten Change						
※ “Air Filter” is displayed on the screen.	(1) Clogged air filter	Clean						
※ “Containment Level” is displayed on the screen.	(1) The condensate (fuel, engine oil and coolant) is accumulated in the oil fence. (2) Oil fence liquid level sensor is not functioning.	Drain the condensate Check/Change						

※ Refer to section 4.1.1 for monitor lamp and display.

4. Failures and Troubleshooting

Symptom	Cause	Countermeasures
Circuit breaker trips.	(1) Overloaded (2) Load side short-circuit	Reduce the load Get rid of cause of short-circuiting.
No voltage or too low voltage generated when operated at rated frequency.	(1) Poor tightening of each terminal (2) Broken or shorted to the exciter field winding (3) Faulty exciter (4) AVR protection function is activated (5) Faulty AVR (6) Broken or short-circuited winding of generator end (7) Faulty silicon rectifier (mounted on generator end rotor) (8) Faulty control panel	Check/Tighten Repair Repair Reset Change Repair Change Change
Too high voltage generated when set at the rated frequency. Voltage will not drop even when the voltage regulator control dial is turned.	(1) Loose or disconnected wiring, or connectors to the AVR (2) Broken wire or poor contact of AVR variable resistor (3) Faulty AVR	Check/Tighten Repair or change Change
Unstable voltage generation	(1) Poor tightening of each terminal (2) AVR protection function is activated (3) Faulty AVR	Check/Tighten Reset Change

- Contact your nearest dealer if you find it difficult to repair by yourself.
- For details on engine troubleshooting not listed on these pages please refer to the engine operation manual.

5. Periodic Inspection

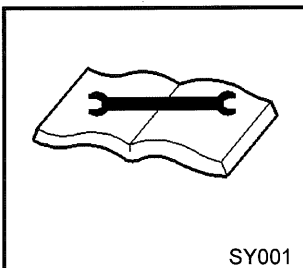
5.1 Important Items at Periodic Inspection and Maintenance

This manual shows the inspection and maintenance intervals under normal operating conditions, not the warranty period. When using under severe environmental conditions or operating conditions, shorten the maintenance interval.

- Be sure to use appropriate tools for inspection and maintenance work. Inappropriate tools could cause unexpected injury.
- Please wear personal protective equipment such as a helmet, safety glasses, earplugs, safety shoes, gloves, and a mask as appropriate to the work environment
- Take care not to touch hot portions of the machine while inspecting during operation. Specifically, parts such as the engine, exhaust manifold, exhaust pipe, DOC, SCR, radiator, inter cooler, generator, and pipe are extremely hot. Never touch these parts, doing so will result in burns.

WARNING

Hang an “Under Maintenance” tag



- Before starting inspection, set the machine's circuit breaker to OFF, and then attach the “Under Inspection” label to an easy-to-see location.
- Remove the negative (-) side cable from the battery. If the above procedure is neglected, and another person starts operating the machine during check or maintenance, it could cause serious injury.

IMPORTANT

Uninstructed/unspecified work prohibited

- Be sure to use recommended fuel, DEF, oil, grease, or LLC (antifreeze).
- Do not disassemble or adjust engine, generator or part(s) for which inspection or maintenance is not referred to in this manual.
- Use genuine parts for replacement.
- Any breakdown, caused by using unapproved parts or by wrong handling, will be out of the scope of “WARRANTY”.
- Do not pour water or steam on electrical components.
- Place a container or a pan underneath the oil port to receive waste liquid so that such liquid does not spill on the floor or inside the machine.
- Be sure that no waste liquid is disposed of on the ground. Waste on the ground, river or lake will cause serious environmental contamination. Be sure to follow the local regulations. If harmful material such as oil, antifreeze solution or filters are disposed of incorrectly, the responsible person can be punished by the appropriate authorities.
- Observe local regulations when disposing of such toxic materials as oil, fuel, LLC (antifreeze), filters, and battery etc.

5. Periodic Inspection

5.2 Periodic Inspection and Maintenance Schedule

Items marked with a ○ are to be performed by the customer. For the following items or clauses marked with a ●, contact your nearest dealer because they require expert technical knowledge to perform.

The following table shows the intervals of inspection and maintenance under normal operation conditions. Inspection and maintenance should be done at either the hours or the period mentioned in the remarks column, whichever comes earlier.

(This table is a guide only, it does not represent the warranty period. Please change maintenance interval according to usage load and environmental conditions.)

Maintenance Items	Daily	Every 100 hours	Every 250 hours	Every 500 hours	Every 1,000 hours	Ref.	Remarks	
Generator	Control panel instrumentation cleaning	○				3-13	Clean as required.	
	Check thermo-label of alternator	○				3-13		
	Check control panel	○				3-19		
	Check GFCI receptacles			○		5-8	Every month	
	Check insulation resistance			○		5-9	Every 2 months	
	Check thermo label on the bearing			○		5-10	Every 2 months	
Engine related	Check engine oil level	○				3-9		
	Check coolant level	○				3-10		
	Check fuel	○				3-11		
	Check fuel pre-filter drain	○				3-11		
	Check DEF level	○				3-12		
	Check belt tension	○				3-13	If too loose replace	
	Check engine breather piping	○				3-14		
	Change engine oil		○ (First-time Only)		○		5-4	
	Change engine oil filter		○ (First-time Only)		○		5-5	
	Check battery electrolyte			○		5-5		
	Check and clean air filter elements			○		5-7		
	Check carbon accumulation in exhaust system			○		5-8		
	Drain fuel tank condensate			○		5-10		
	Check specific gravity of battery electrolyte.				○	5-5		
	Change fuel filter element				○	5-10		
	Change fuel pre-filter element				○	5-11		
	Clean outside of radiator and intercooler				○	5-11	Clean as required.	
	Drain intercooler condensate				○	5-11		
	Check flexible exhaust pipe				○	5-12	Every 4 months	
	Change air filter element					○	5-13	
Change coolant (LLC)						5-15	Every 2 years	
Clean fuel tank interior						●		

5. Periodic Inspection

Maintenance Items		Daily	Every 100 hours	Every 250 hours	Every 500 hours	Every 1,000 hours	Ref.	Remarks
Others	Check interior	○					3-12	
	Check oil fence condensate	○					3-14	
	Check Terminal and Wirings				○		5-12	Every 4 months
	Check anti-vibration rubber					○	5-14	Once a year
	Check each rubber hose					○	5-14	Once a year
	Clean oil fence interior and check for rust					●	5-14	Once a year

The above intervals of inspection and maintenance are respectively based on the operation time of 125 hours of used per month and of 1,500 hours of use per year.

Maintenance Items		Every 1,500 hours	Every 4,500 hours	Every 8,000 hours	Ref.	Remarks
Engine body	Change OCV filter	○			5-13	
	Change DEF Dosing Unit filter		○		5-16	
	Change Inline DEF filter			○	5-16	
	Clean DEF TANKT					Clean as required.

5.3 Periodic Replacement Parts

Part numbers change upon modification. For replacement of parts, contact your nearest dealer to verify the part number is correct or applicable.

Part Name	Part Number	Qty
Air Filter Element	32143 15100	1
Engine Oil Filter	JOHN DEERE RE539279	1
Fuel Pre-Filter Element	JOHN DEERE RE551507	1
Fuel Filter Element	JOHN DEERE RE560681	1
Belt	JOHN DEERE R529383	1
OCV filter	JOHN DEERE RE553703	1
DEF Dosing unit filter	JOHN DEERE RE554498	1
DEF filter kit	JOHN DEERE DZ110513	1

5. Periodic Inspection

5.4 Maintenance Items

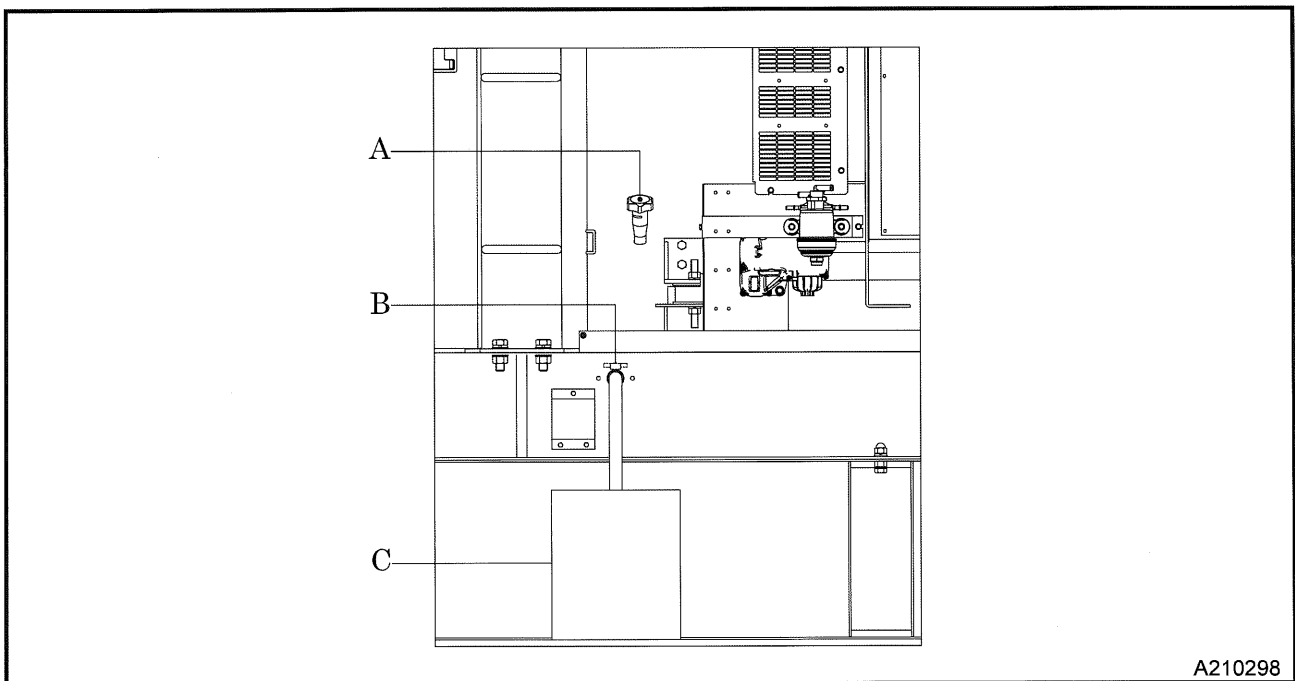
5.4.1 Change Engine Oil

At 100 Hours for the first change and every 500 Hours thereafter

When checking, replenishing, and draining the engine oil, be sure to wait more than 10 minutes after engine stops to allow it to cool down. When draining oil, remove the plug from the drain outlet, and prepare a drain joint (R3/4), drain hose (about 300 mm long), and drain receptacle.

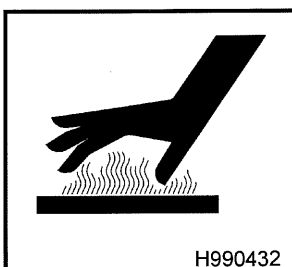
<Procedures>

1. Remove the oil supply cap [A] (which also serves as an oil level gauge), and then open the drain valve [B] inside the machine to drain the engine oil.
 2. After you have finished draining the engine, close the drain valve [B] and refill the engine with engine oil from the oil supply port. [Oil capacity: approx. 8.7gal(33L)]
 3. When you are finished refilling the engine, tighten the cap of the oil supply port (which doubles as an oil level gauge) securely.
 4. Remove the cap of the oil supply port (also used as an oil level gauge) and check that the engine oil level is normal.
 5. Tighten the dipstick securely.
- Drain the condensate into a container [C], and then dispose of condensate according to the designated regulations.



CAUTION

Caution in filling or draining engine oil

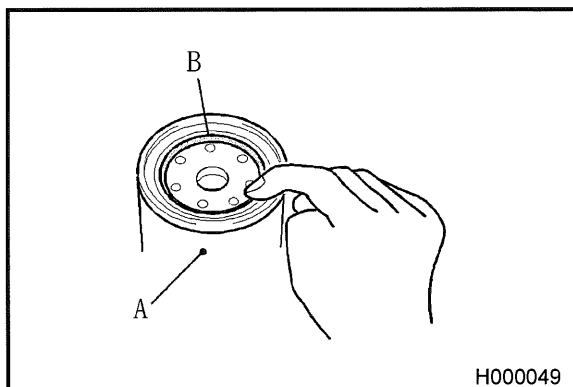


- Engine oil is very hot and highly pressurized during and just after operating. Hot oil may spray out and cause injury.
- Never overfill the engine oil above the proper level. Too much oil can cause white smoke out of the exhaust, and it can damage and harm the engine.

5. Periodic Inspection

5.4.2 Change Engine Oil Filter

At 100 Hours for the first change and every 500 Hours thereafter



<Procedures>

1. Take out the oil filter [A] using a filter wrench.
2. After thinly applying oil on the new gasket [B], screw it in.

(For part number, See 5.3)

3. After the seal touches the sealing face, tighten another $2/3$ turn with a filter wrench.
4. After installing the oil filter, check for any leak during operation.

5.4.3 Check Battery

Battery electrolyte : every 250 Hours

Specific gravity of battery electrolyte : every 500 Hours

If there is an engine starting issue due to battery discharge, follow the procedure below.

● Ordinary type battery:

Check the amount of battery fluid and if it is not within spec., add distilled water. Measure the specific gravity of the battery electrolyte, and if it shows below 1.24, recharge the battery immediately.

(See 5.4.4)

● Enclosed type battery:

Check the indicator on top of the battery.

If the indicator shows that charge is needed, recharge the battery immediately.



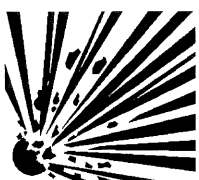

If specific gravity of battery electrolyte does not rise despite replenishing distilled water or charging battery, replace battery with a new one quickly.

5. Periodic Inspection

5.4.4 Maintenance of Battery

Battery may generate hydrogen gas and can explode. Therefore, recharging should be done in a well-ventilated place.

- Do not check the battery by short circuiting the positive and negative terminals with a piece of metal.
- Never operate the machine nor charge the batteries with low battery liquid.
Continuing operation at this lower level will cause deterioration of some parts, reduction of battery life, and also it may cause explosions. Add distilled water so that the liquid level is between the “UPPER LEVEL” and “LOWER LEVEL” if the level is too low.
- Wear protective gloves and safety glasses when handling the battery.
 - If battery electrolytes contact your clothes or skin, wash it away with a large amount of water immediately.
 - If the battery electrolytes get into your eyes, flush them immediately with plenty of water and see a doctor at once. Severe damage to eyes and vision may result.

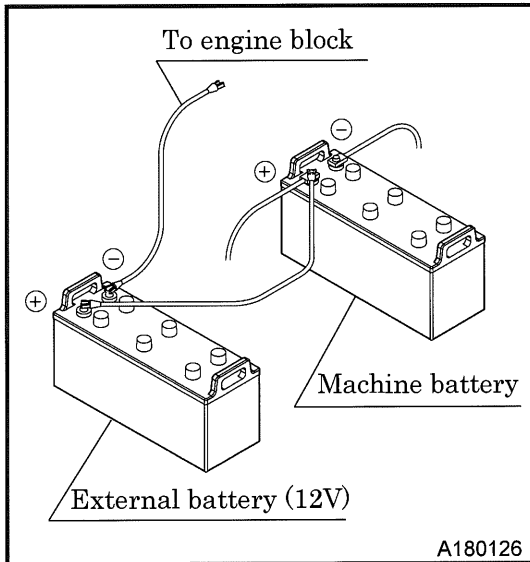
 WARNING Handling the Battery	
 D004	<ul style="list-style-type: none">● Keep flames away from battery.● Keep sparks, matches, cigarettes, and other fire sources away from the battery.● Do not charge a frozen battery as it may explode. If the battery is frozen, warm it up until the battery temperature becomes 61°F to 86°F (16°C to 30°C), and then recharge.● Battery electrolyte is diluted sulfuric acid. In case of mishandling, it could cause skin burning.● Dispose of battery observing local regulations.
 W010	
 TR0093	

[Charge battery]

- Use the battery charger after you confirm whether it is in good operating condition and ready for use.
- Disconnect the cable between battery and the machine, and charge the battery with a 12V battery charger.
- Be sure not to connect (+) and (-) terminals backwards.

5. Periodic Inspection

[How to use booster cable]



<Procedures>

1. Stop the engine.
2. Connect one end of the (+) booster cable to the (+) terminal of the machine battery.
3. Connect the other end of the (+) booster cable to the (+) terminal of the external battery.
4. Connect one end of the (-) booster cable to the (-) terminal of the external battery.
5. Connect the other end of the (-) booster cable to the engine block of the machine.
6. Start up the engine.
7. Disconnect the booster cable by following the procedure back in the reverse order.



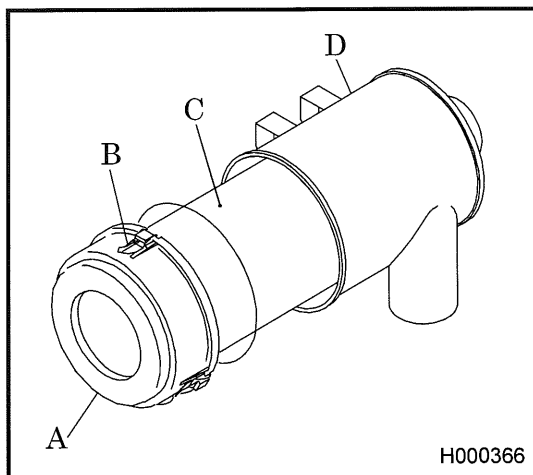
CAUTION

Do not reverse the cable connection

- When a booster cable has to be used or when cables are connected again after a battery is replaced, be careful not to connect (+) and (-) terminals backwards. A backwards connection will cause sparking and damage to each component.

5.4.5 Check and Clean Air Filter Elements

Every 250 Hours



Clean the air filter when [Air filter] is displayed on the screen.

<Procedures>

1. After removing the cap [A] by loosening its cap fixing latch [B], clean its interior properly.
 2. Remove the outer element [C], and clean it.
 3. When installing the cap after finishing the cleaning job, push the element into the case [D] firmly by hand, and then make sure that the cap fixing latches attach securely to the case. Lastly, tighten the latches.
- If the element is found heavily dusty, replace it with a new one. **(For part number, See 5.3)**

IMPORTANT

- When an element that is clogged or has holes or cracks is used, dust or foreign material will get in the engine. This causes accelerated wear in moving parts within the engine. Be sure to perform daily checks and appropriate cleaning so that the life of the engine will not be shortened.

5. Periodic Inspection

5.4.6 Check Carbon Accumulations in Exhaust System

Every 250 Hours

When a diesel engine driven generator is continuously operated with less than 30% load or no load for a long time, carbon will be stuck inside the exhaust pipes, DOC, SCR, and engine body. Unburned fuel may also come out from connected portions of exhaust pipe and exhaust outlet. If it is continuously operated under the conditions, the fuel which comes out could ignite and cause a fire.

Further, wet-stacking and carbon accumulation could cause power drop in the engine as well as overheating, resulting a serious damage to the engine. If this occurs, eliminate the carbon accumulation by burning it under full load operation (to increase exhaust heat) until the exhaust gas becomes almost clear.

(For load current, refer to the following table as a standard value.)

Frequency	Hz	60	
Rated voltage	V	240	480
Load current	A	420	210

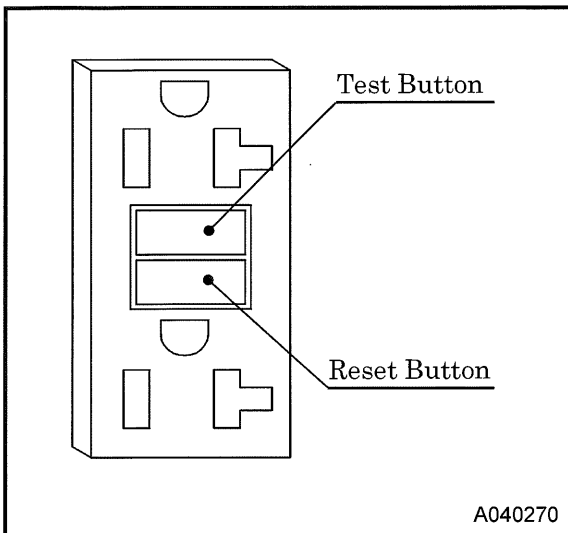
CAUTION

- When loading, increase load factor step by step while checking the conditions of the exhaust. Do not place flammables nearby, as it may cause sparks from the exhaust pipe.

5.4.7 Check GFCI Receptacles

Every 1 months or 250 Hours

Periodically, check the GFCI operation for safety.



<Procedures>

1. Unplug all appliances from the generator.
2. Start the engine.
3. Turn [ON] the breaker on the operation panel of this machine.
4. Press the test button.
5. Press the reset button:
 - The reset button should extend with a click.
 - If the reset button does not extend, contact your nearest dealer.
6. When the reset button extends during operation.
 - Unplug all appliances from the GFCI protected receptacles.
 - Press the reset button:

If the GFCI cannot be reset: The GFCI is faulty. Contact your nearest dealer.

If the GFCI resets properly: Check the appliance or the power cord.

DANGER

- If the generator is stored outdoors, unprotected from the weather, test the GFCI receptacle before each use.
- When the GFCI trips investigate the cause and correct it.

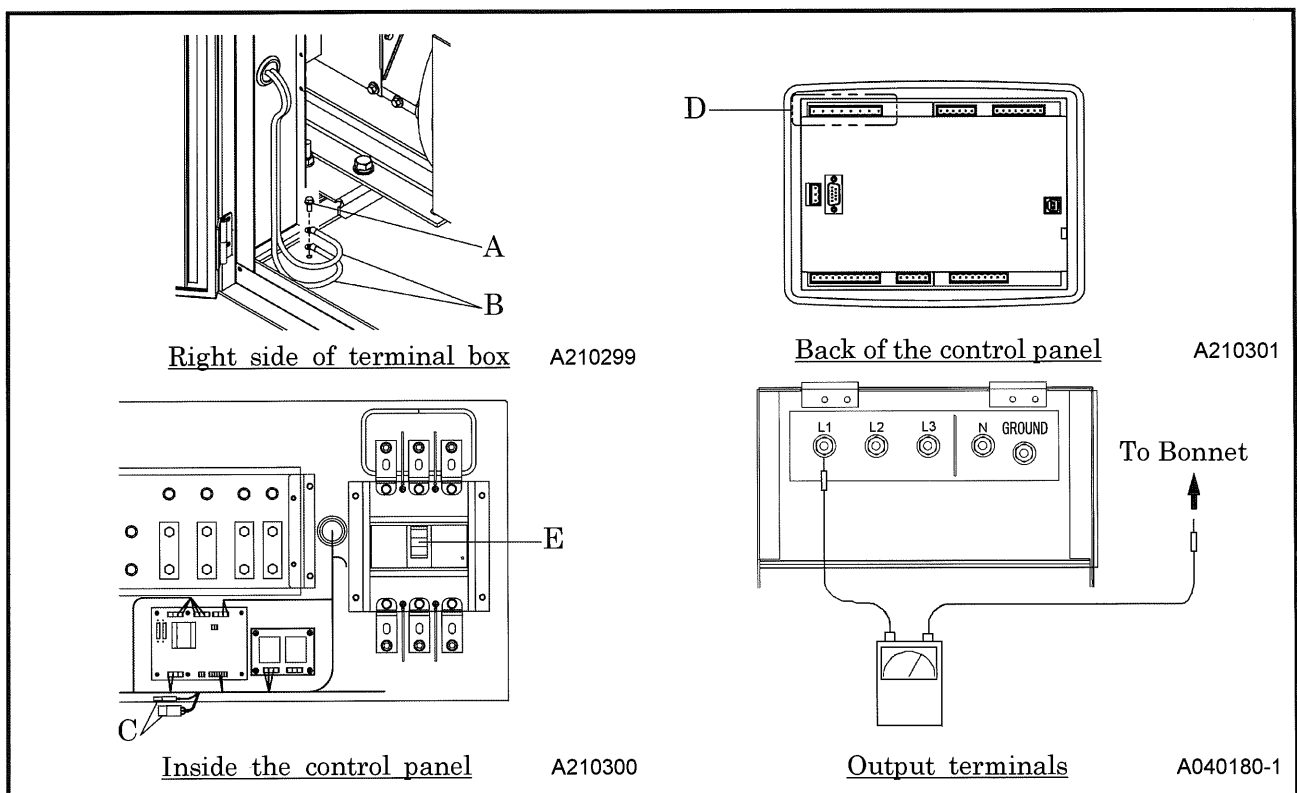
5. Periodic Inspection

5.4.8 Check Insulation Resistance

Every 2 months or 250 Hours

<Procedures>

1. Remove the wire from the load side of the output terminal board.
2. Loosen the mounting bolt (M8)[A] and remove both of the [N] and [GROUND] ground wires.
3. Disconnect the AVR connector [C] inside the control panel.
4. Disconnect the connector [D] from the back of the control panel.
5. Flip the breaker [E] [ON] and measure the insulation resistance between the 3 Phase output terminal L1, L2, L3 and the bonnet.
6. If insulation resistance value measured is greater than $1M\Omega$, it is good.
7. After checking the insulation resistance, reinstall the ground cable [B] between [N] and [GROUND], AVR connector [C], and connector [D] on the back of the control panel.



IMPORTANT

- Insulation resistance should be regularly checked or measured with a 500V Insulation resistance tester. If the insulation resistance drops below $1 M\Omega$, there is a risk of electrical leakage or fire.
- For recovery or improvement of insulation resistance, wipe and clean dust and dirt around output terminals, circuit breaker, generator body outlet port and receptacle and dry them. If the above measures do not resolve the problem, please contact your nearest dealer.

DANGER

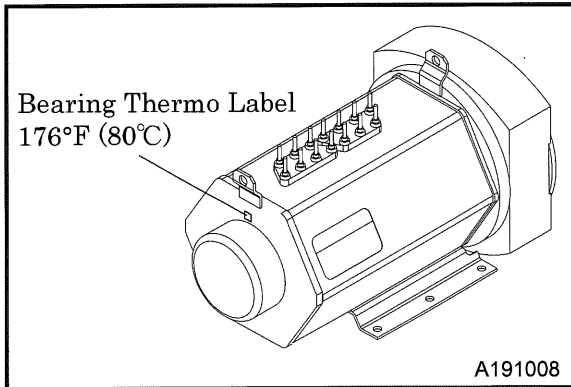
- After making sure that the insulation resistance of the generator is higher than $1 M\Omega$, be sure to re-connect the cable between the terminal [N] and terminal [GROUND] just as it was originally connected. If it is left disconnected, the grounding becomes incomplete and can cause electric shock.

5. Periodic Inspection

5.4.9 Check Thermo Label on the Bearing

Every 2 months or 250 Hours

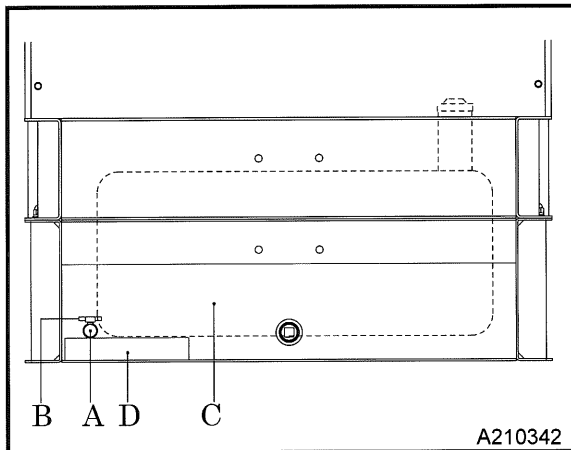
Thermo-label on the rotor bearing irreversibly changes its color from white to blue by reaching or exceeding 176°F (80°C). If discoloration has occurred, check the bearing for abnormal noise or vibration, and contact the dealer immediately.



- If the thermo label has discolored and after all abnormalities have been resolved, replace with a new thermo label.
- For replacement, contact your nearest dealer.

5.4.10 Drain Fuel Tank Condensate

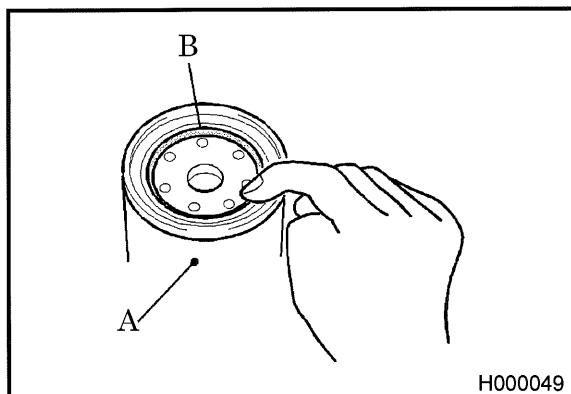
Every 250 Hours



- To drain fuel tank, remove drain plug [A], and open drain valve [B] to drain the condensate accumulated in fuel tank [C].
- After making sure that all condensate is completely drained out, close drain valve firmly and reinstall the drain plug.
- Drain the condensate into a container [D], and then dispose of condensate according to the designated regulations.

5.4.11 Change Fuel Filter Element

Every 500 hours



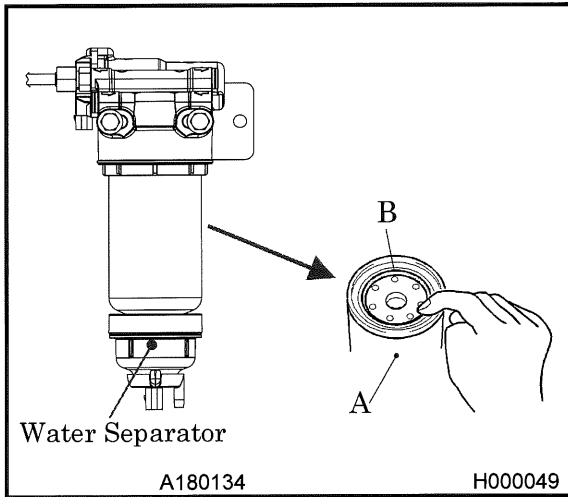
<Procedures>

1. Take out the fuel filter element [A] using a filter wrench.
2. After thinly applying fuel on the new gasket [B], screw it in.
(For part number, See 5.3)
3. After the seal touches the sealing face, tighten another 2/3 turn with a filter wrench.
4. Bleed air from the fuel lines. **(See 3.5.5)**
5. After installing the fuel filter, check for any leak during operation.

5. Periodic Inspection

5.4.12 Change Fuel Pre-Filter Element

Every 500 Hours

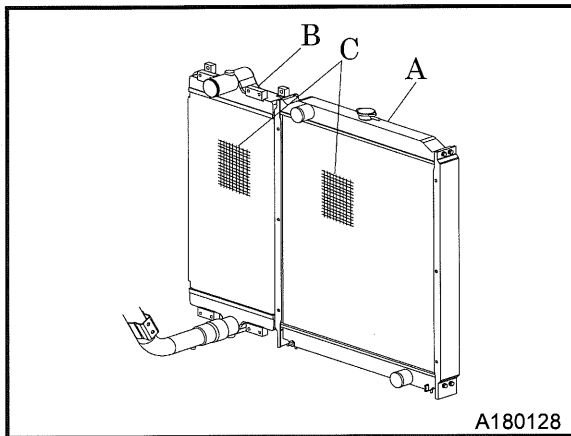


<Procedures>

1. Drain all condensate from the water separator. **(See 3.4.4)**
2. Take out the filter case [A] using a filter wrench.
3. After thinly applying fuel on the new gasket [B], screw it in. **(For part number, See 5.3)**
4. After the seal touches the sealing face, tighten another 2/3 turn with a filter wrench.
5. Bleed air from the fuel lines. **(See 3.5.5)**

5.4.13 Clean Outside of Radiator and Intercooler

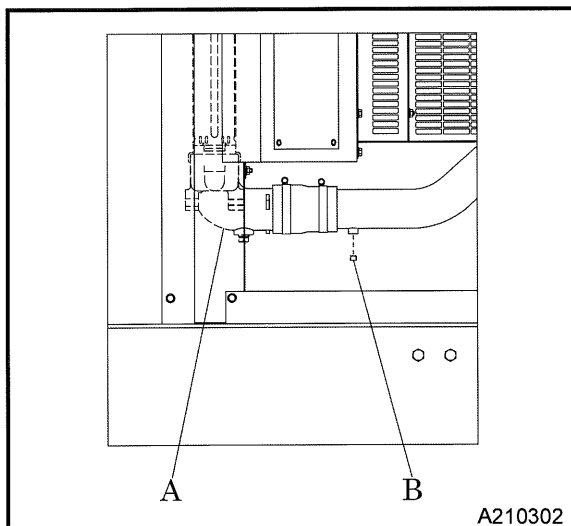
Every 500 Hours



- If the fin tubes [C] of radiator [A] and intercooler [B] are clogged by dust or other foreign materials, the heat exchange efficiency drops and this will raise coolant temperature. These tubes and fins should be cleaned depending on the state of dirt inside the tubes even before maintenance schedule.
- Do not use a high pressure washer for cleaning as it may damage the fin tubes.
- When the unit is used near the ocean or similar salty environment, clean using fresh water more than once a month.

5.4.14 Drain Intercooler Condensate

Every 500 Hours

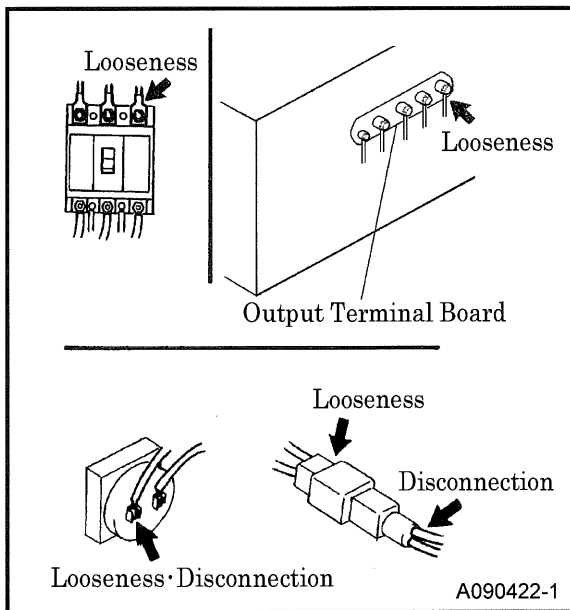


- The drain plug [B] is installed at the bottom of the intercooler piping [A]. Remove the drain plug [B] to drain the condensate.
- After drainage is complete, attach the drain plug.
- Drain the condensate into a container, and then dispose of condensate according to the designated regulations.

5. Periodic Inspection

5.4.15 Check Terminal and Wirings

Every 4 months or 500 Hours



Check for any looseness on the cables, any damage on insulated covers, and disconnection, disconnected cables, or short-circuits etc.

[Inspection points for the electric circuits on the generator side]

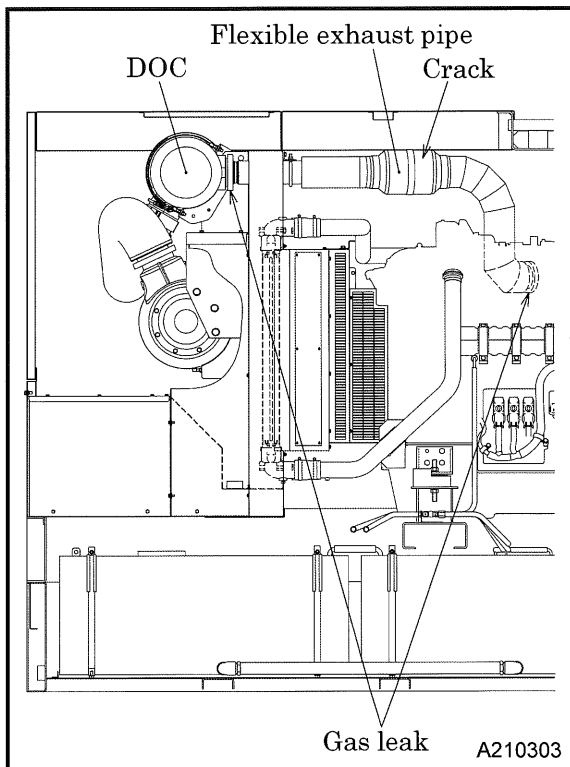
- Terminal connection of 3 Phase output terminal plate.
- Main circuit of circuit breaker.
- Terminal connections inside the control panel.
- Each terminal connection of each instrument.

[Inspection points for the electric circuits on the engine side]

- Engine wiring connectors.
- Check for looseness of terminal connections.
- Rubbing or wear of the wires.

5.4.16 Check Flexible Exhaust Pipe

Every 4 months or 500 Hours

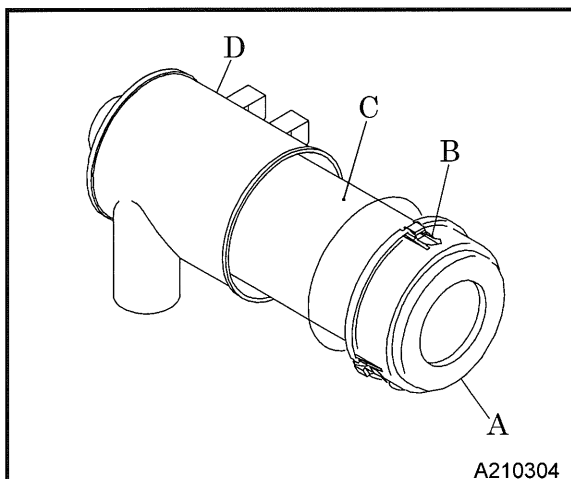


- Check the engine exhaust outlet coupler to the DOC for leaks and check for any cracks in the flexible piping.
- If any leak is found, take care to avoid getting burned by exhaust gas.

5. Periodic Inspection

5.4.17 Change Air Filter Element

Every 1,000 Hours



<Procedures>

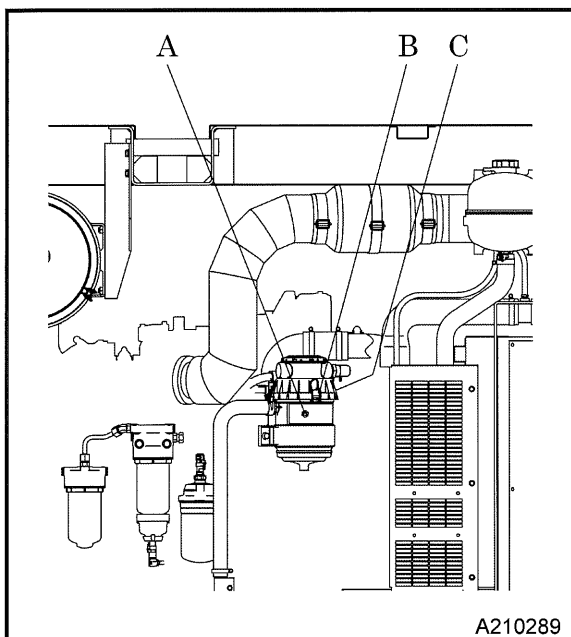
1. After removing the cap [A] by loosening its cap fixing latch [B], clean its interior properly.
2. Replace filter elements [C] with new one.
(For part number, See 5.3)
3. When installing the cap, push the element into the case [D] firmly by hand, and then make sure that the cap fixing latches [B] attach securely to the case [D]. Lastly, tighten the latches.

IMPORTANT

- The air filter is an important part which is crucial to your machine's performance and life. Be sure to use genuine parts.

5.4.18 Change OCV Filter

Every 1,500 Hours



<Procedures>

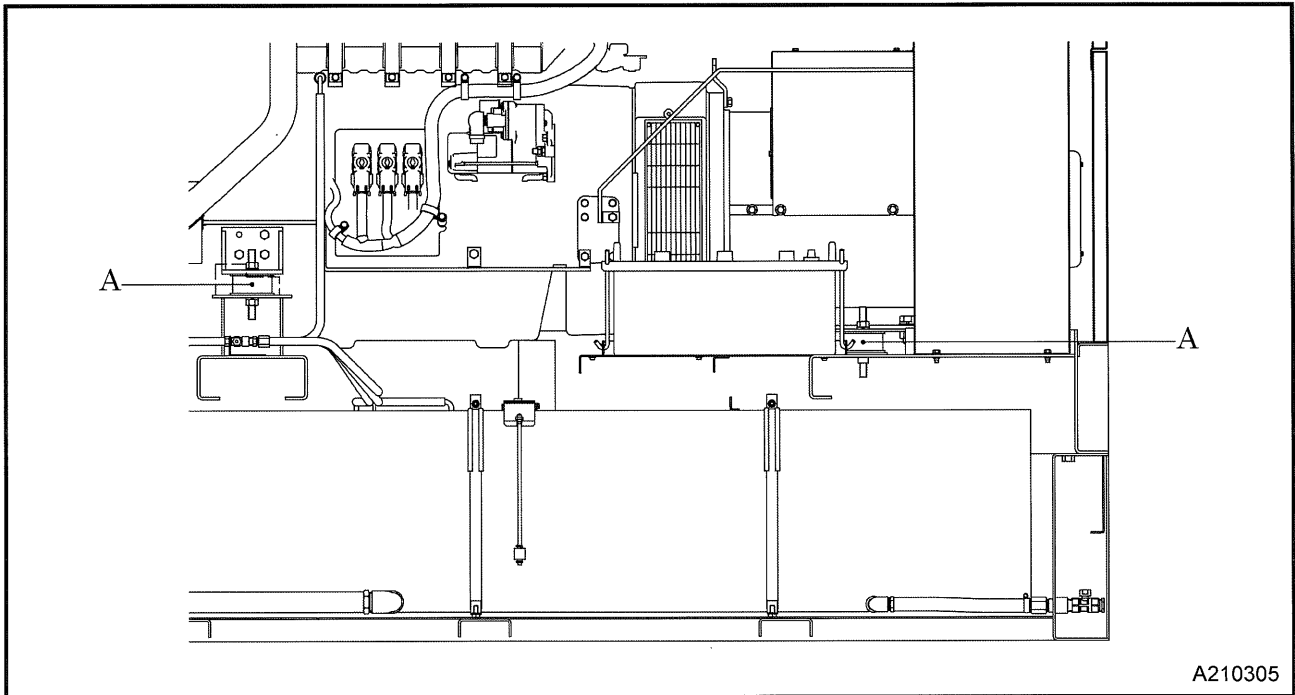
1. Loosen the latch [B] of the OCV filter [A], remove the cap [C] and remove the filter from inside.
2. Install a new filter and then install the cap.
(For part number, See 5.3)

5. Periodic Inspection

5.4.19 Check Anti-Vibration Rubber

Once a year or 1,000 Hours

- The anti-vibration isolation rubbers [A] are used to support the generator and engine. Check the rubber for any damage or deterioration due to oil adhesion.



5.4.20 Check Each Rubber Hose

Once a year or 1,000 Hours

Check all the rubber hoses for hardening, cracks, and fissures.

- If any hardening, cracks, or fissures are found on a hose (air filter, intercooler, radiator, fuel and drain), replace it with a new one.
- Check each hose clamp and if any loose hoses are found, retighten them.
- Even before the maintenance interval comes, replace hoses if hardening, cracks, or fissures are found. For replacement, contact your nearest dealer.

5.4.21 Clean Oil Fence interior and check for rust

Once a year or 1,000 Hours

Expert knowledge is required to clean the inside of the oil fence and to check it for rust. Contact your nearest dealer.

5. Periodic Inspection

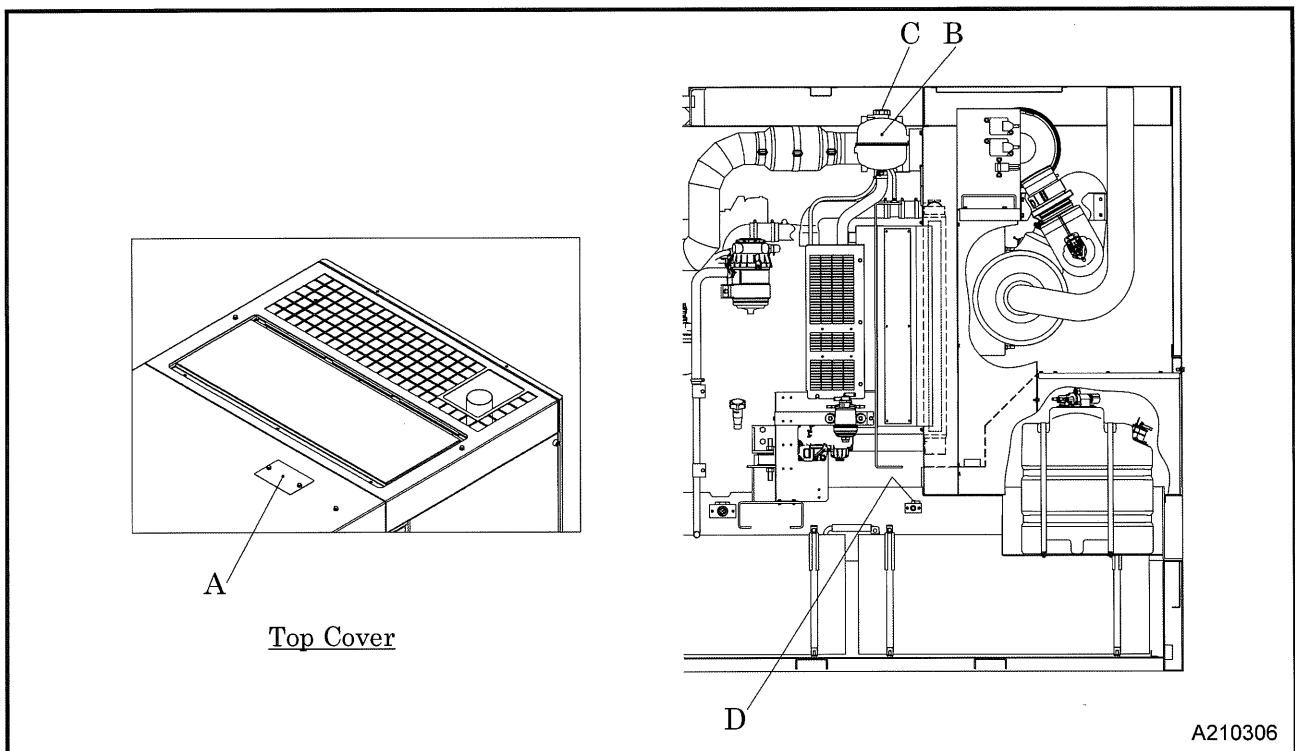
5.4.22 Change Coolant (LLC)

Every 2 years

Before replacing coolant, be sure to stop the machine and to allow sufficient time for the coolant to cool completely.

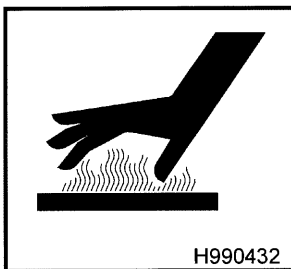
<Procedures>

1. Remove the top cover inspection plate [A]. Remove the pressure cap [C] from the surge tank [B]. Then prepare the drain receptacle and open the drain valve [D] to drain the coolant.
 2. After the coolant has been fully drained, close the drain valve [D] and refill coolant from the surge tank.
 3. After refilling the coolant, install the pressure cap [C] securely and operate the unit for about 2 to 3 minutes with no load.
 4. Stop the machine and allow the coolant to cool before checking the coolant level.
 5. Replenish the coolant if necessary.
- Refer to section 3.4.2 for reserve tank capacity details.



CAUTION

Caution when changing coolant

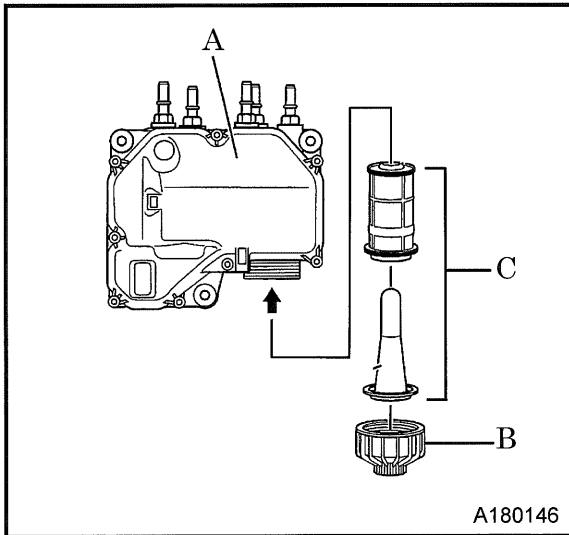


- When removing the pressure cap from the surge tank, be sure to stop operation and allow the coolant to cool sufficiently before removing the pressure cap.
- LLC (antifreeze) is toxic.
- In case of accidental ingestion, do not force vomiting and seek medical attention immediately.
- In case of contact with eyes, rinse with plenty of water and seek medical attention.
- When storing LLC (antifreeze), label it as LLC (antifreeze), seal it, and keep it out of reach of children.
- Beware of flames.

5. Periodic Inspection

5.4.23 Change DEF Dosing Unit Filter

Every 4,500 Hours



<Procedures>

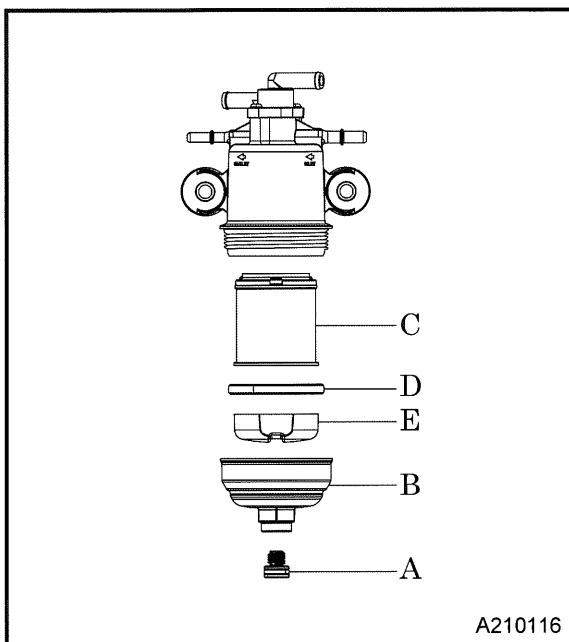
1. Set a container under supply module [A], loosen cover [B], and pull it out together with DEF Dosing Unit Filter [C].
2. Assemble a new DEF Dosing Unit Filter [C].
(For part number, See 5.3)
3. Lastly, secure cover [B].

IMPORTANT

- Reuse of the DEF Dosing Unit Filter may cause trouble. Be sure to replace it with a new one.
- Always replace the DEF Dosing Unit Filter as a set.

5.4.24 Change Inline DEF Filter

Every 8,000 Hours



<Procedures>

1. Remove the drain plug with O-ring [A] and drain the DEF into the receiving tray.
2. Remove the filter housing [B].
3. Replace the filter [C], O-ring [D] and element [E] with new items.
4. Reinstall the filter housing.
5. Install the drain plug with a new O-ring.

6. Storage and Disposal

6.1 Preparation for Long-term Storage

When storing for more than half a year without using the machine, perform the following measures and store it in a dry place with little dust.

- Put the machine in an enclosure if it is stored outside. Avoid leaving the machine outside with a sheet directly on the paint for a long period of time, as this may cause rusting.
- Perform the following measures at least once every three months.

<Procedures>

1. Drain existing lubricant from the engine oil pan. Pour new lubricant in the engine to clean the internals of the engine. After running it for a while, drain it again.
2. Spread lubricant on all moving parts.
3. Completely charge the battery and disconnect grounding wires. If possible, remove the battery from the machine and store it in a dry place. (Charge the battery at least once every month.)
4. Drain coolant and fuel from the machine.
5. Seal air-intake port of engine and other openings like the muffler with a vinyl sheet, packing tape, etc., to prevent moisture and dust from getting in the machine.
6. Measure the insulation resistance of the generator, and make sure that it is greater than 1M Ohms. **(See 5.4.8)**
7. Be sure to repair any trouble and maintain the machine so that it will be ready for the next operation.

6.2 Disposal of Product

Be sure to drain the engine oil, coolant, and fuel before disposing of this machine. If you require any additional information, contact your nearest dealer.

7. Specifications

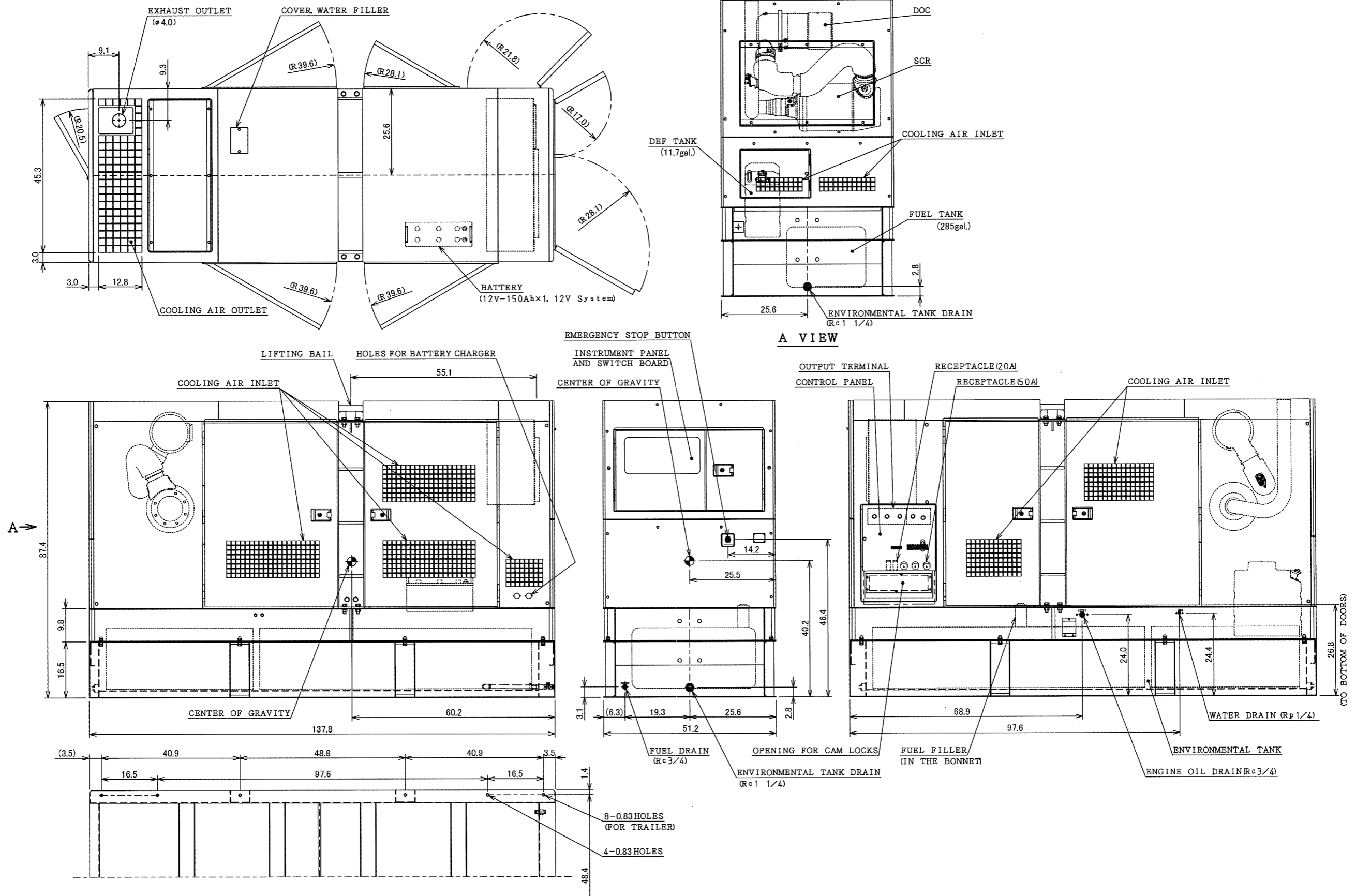
7.1 Specifications

Model		SDG220S-8E1	
Generator	Exciting system		Brushless
	Armature Connection		Star with Neutral
	Phase number		3 Phase – 4 wire
	Power Factor	%	80
	Frequency	Hz	60
	Rated Output	kVA(kW)	220(176)
	Rated voltage	V	240 480
	Amps	A	529 264
Engine	Model		JOHN DEERE 6068HFG06
	Type		4 Cycle, water cooled, direct injection, Turbocharged, EGR
	Aftertreatment		DOC+SCR
	No. of Cylinders		6
	Displacement	cu.in.(L)	415(6.800)
	Rated Output	Hp(kW)	295(220)
	Engine Speed	RPM	1,800
	Lubricating Oil Capacity	gal. (liters)	8.7(33.0)
	Coolant Capacity (including radiator)	gal. (liters)	8.1(30.5)
	Battery		150Ah×1(12V)
	Fuel Tank Capacity	gal. (liters)	285(1,080)
	DEF Tank Capacity	gal. (liters)	11.7(44.2)
Dimensions	Length	in.(mm)	138(3,500)
	Width	in.(mm)	51(1,300)
	Height	in.(mm)	87.4(2,220)
	Dry Weight	lbs.(kg)	7,452(3,380)
	Operating Weight	lbs.(kg)	9,656(4,380)
Others	Oil Fence Capacity	gal. (liters)	119(450)

7. Specifications

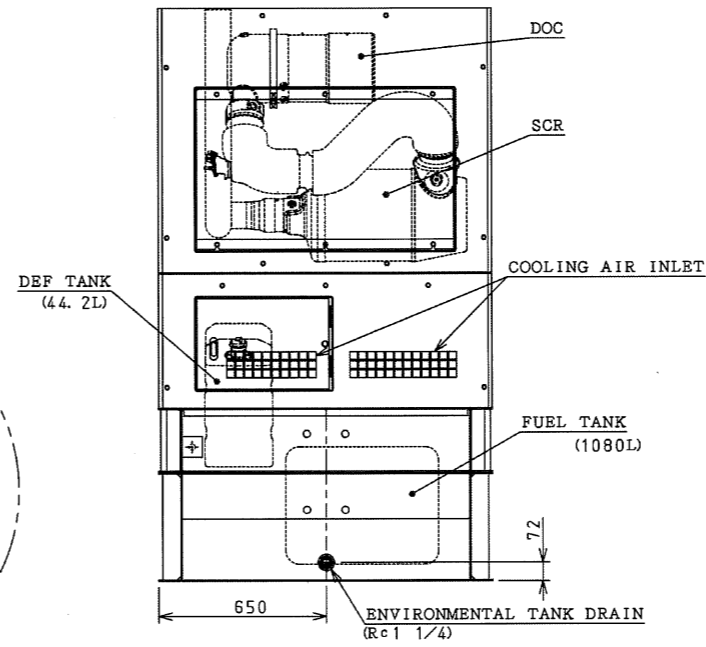
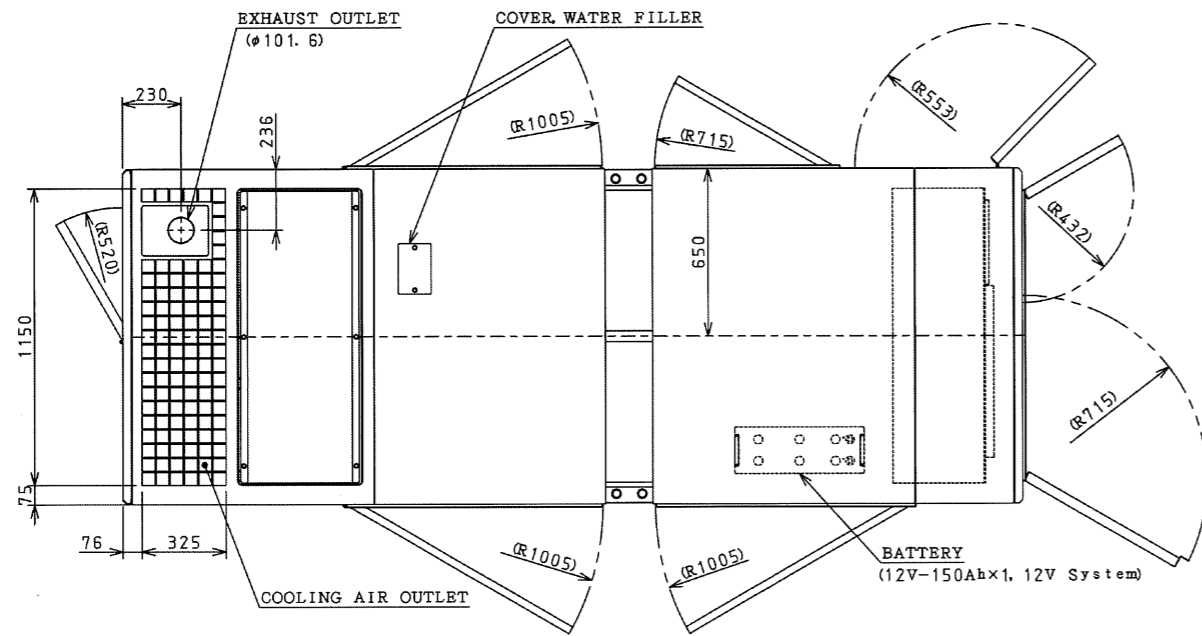
7.2 Outline drawing

[Unit : in.]

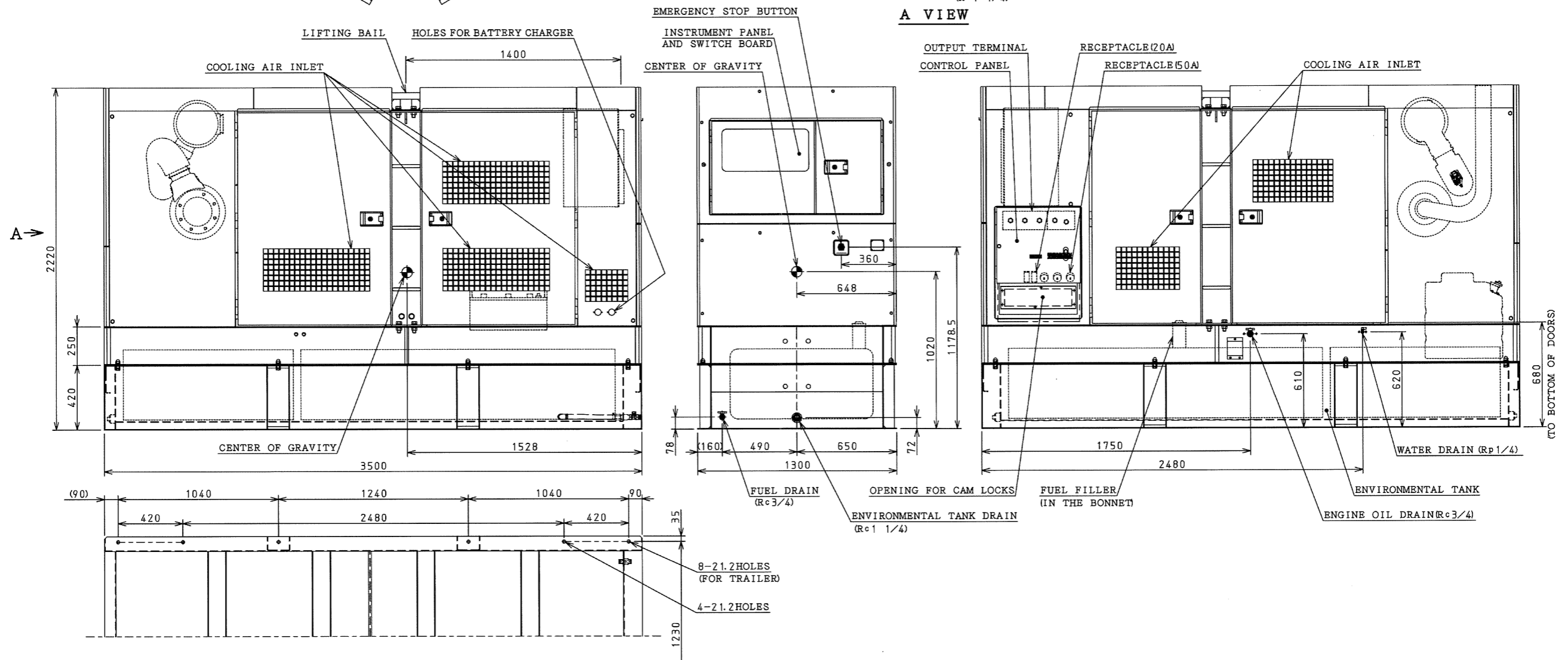


7. Specifications

[Unit : mm]

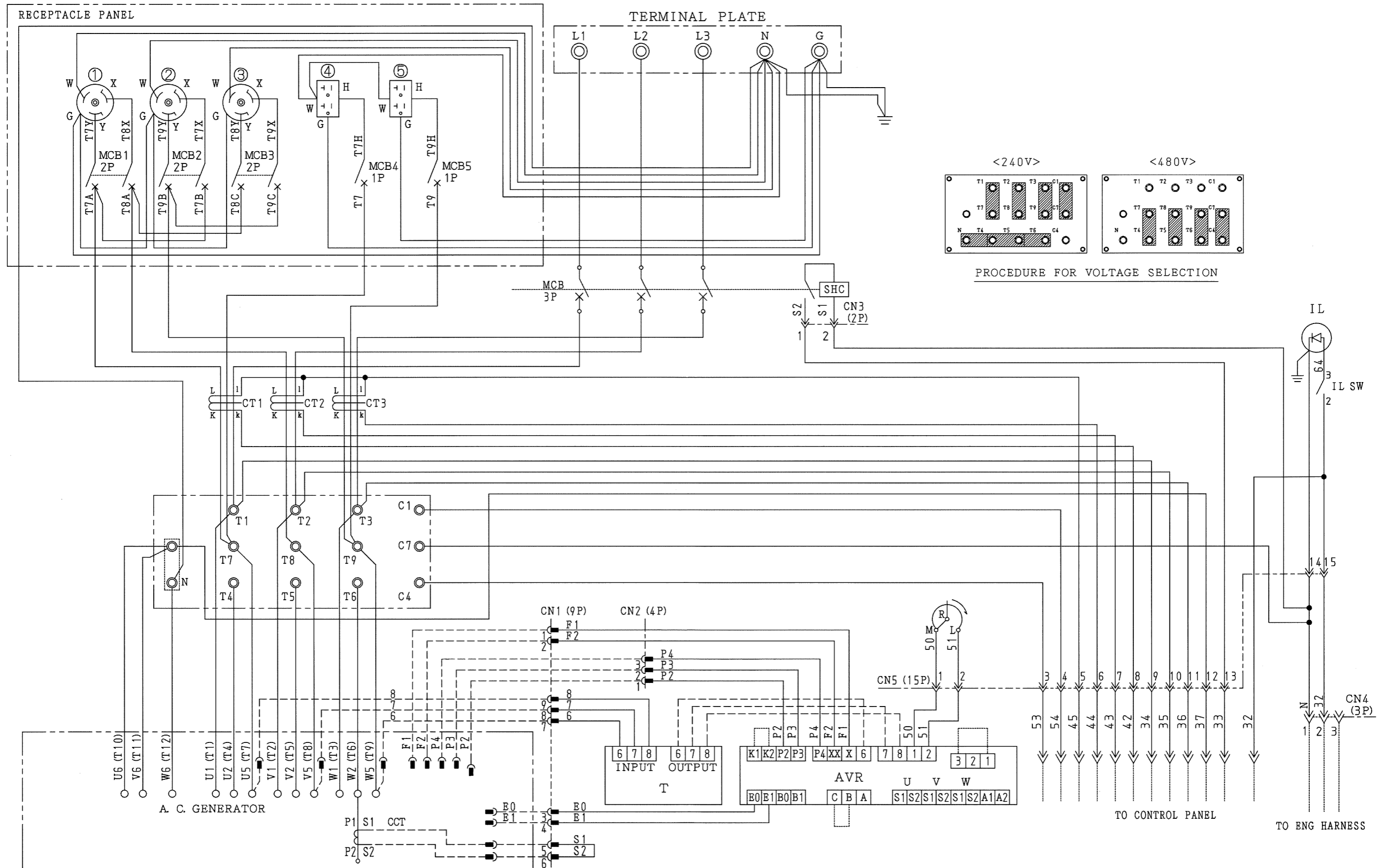


A VIEW



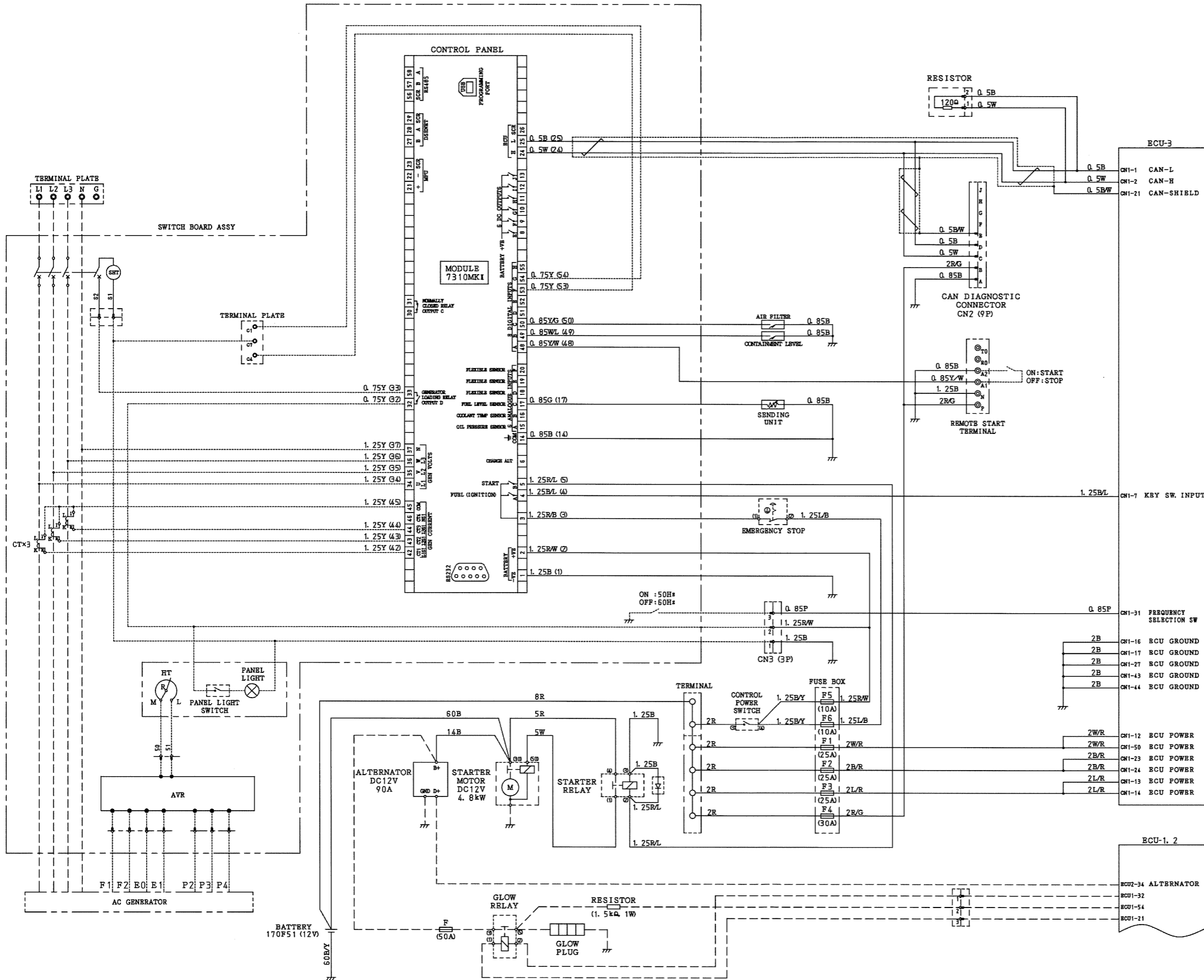
7. Specifications

7.3 Generator Wiring Diagram

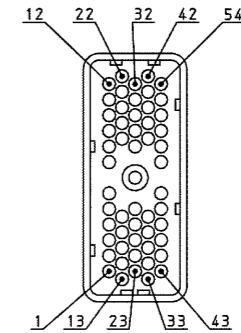


7. Specifications

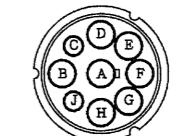
7.4 Engine Wiring Diagram



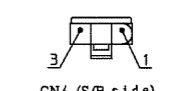
Connector terminal arrangement
The following arrangement is seen from the side of the connector inserting port.



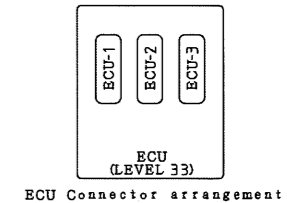
CN1 (ECU-3 side)



CN2 (Diag Tools side)



CN4 (S/B side)



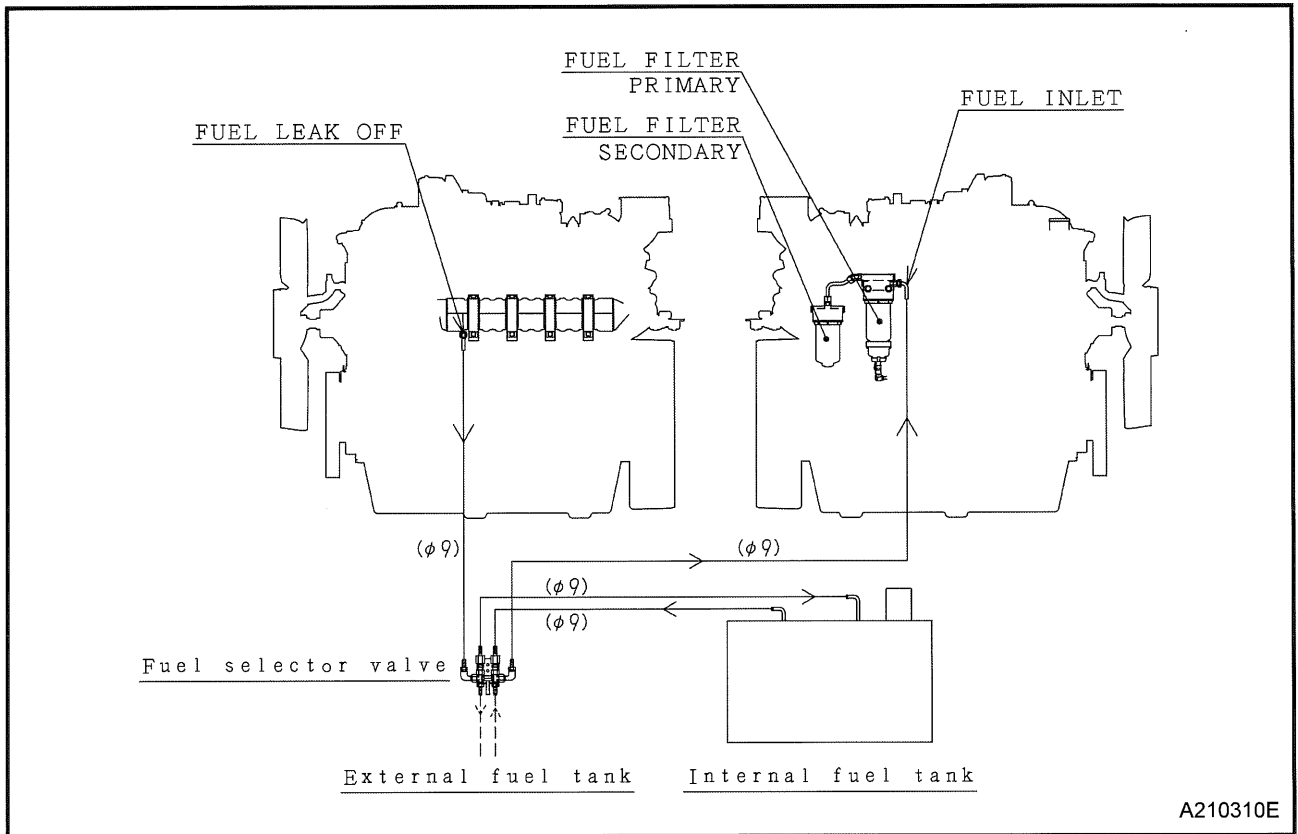
ECU Connector arrangement

- CN1-1 CAN-L
- CN1-2 CAN-H
- CN1-21 CAN-SHIELD
- CN1-7 KBY SW INPUT
- CN1-31 FREQUENCY SELECTION SW
- CN1-16 ECU GROUND
- CN1-17 ECU GROUND
- CN1-27 ECU GROUND
- CN1-43 ECU GROUND
- CN1-44 ECU GROUND
- CN1-12 ECU POWER
- CN1-50 ECU POWER
- CN1-23 ECU POWER
- CN1-24 ECU POWER
- CN1-13 ECU POWER
- CN1-14 ECU POWER

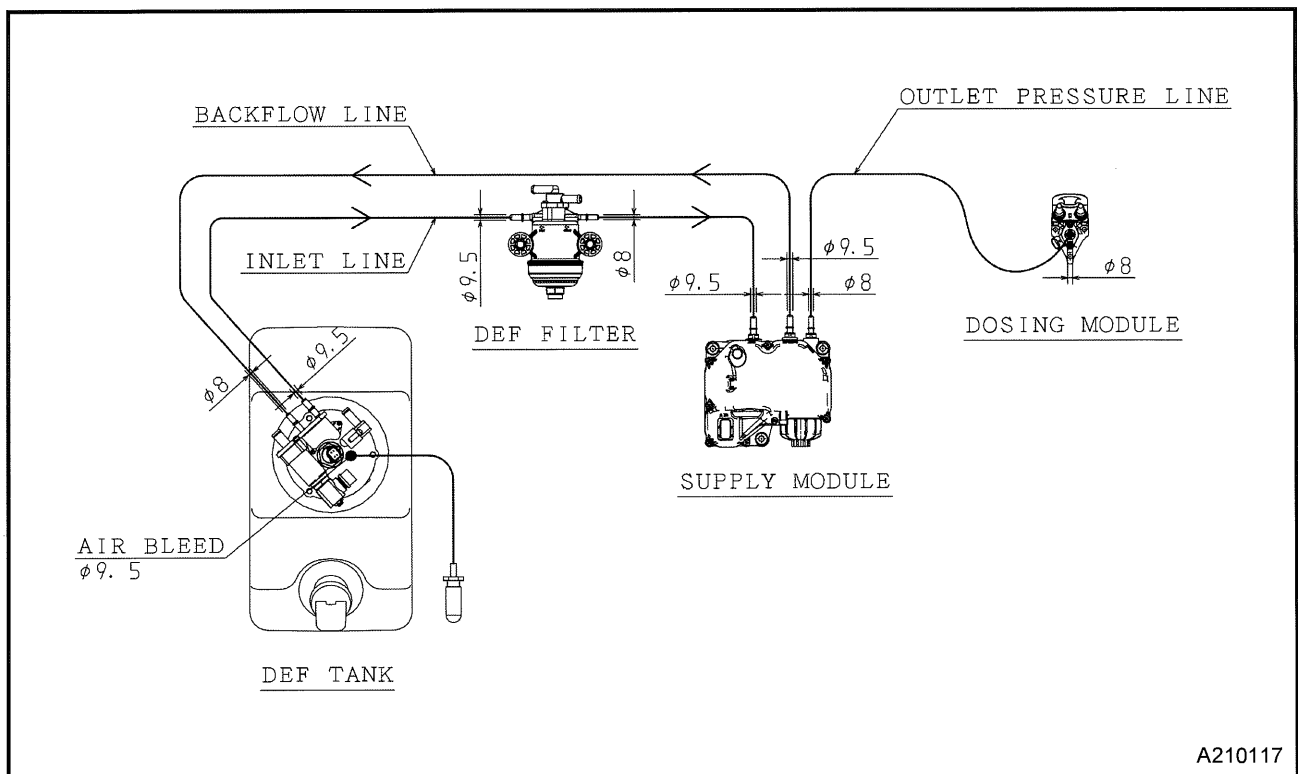
7. Specifications

7.5 Piping Diagram

[Fuel piping]

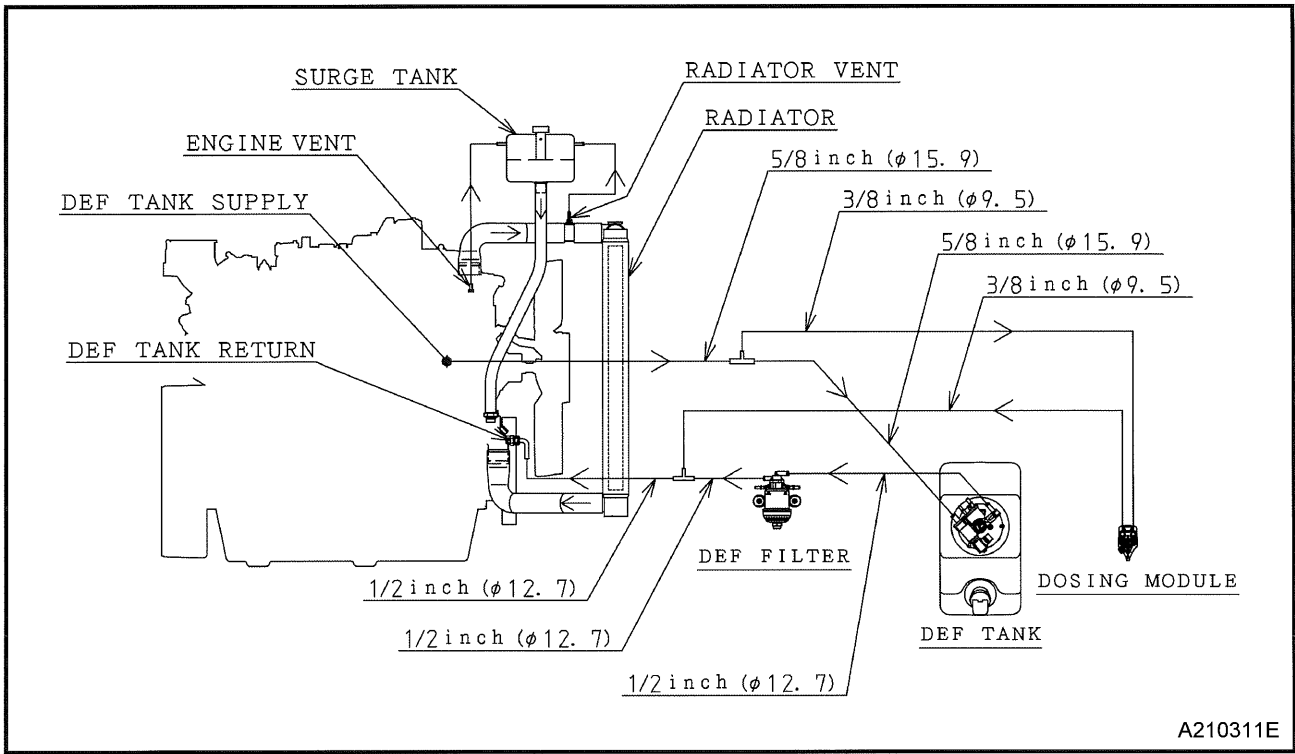


[DEF piping]



7. Specifications

[Coolant piping]



HOKUETSU INDUSTRIES CO., LTD.

8TH FLOOR SHINJUKU SAN-EI BLDG,
22-2 NISHI-SHINJUKU 1-CHOME, SHINJUKU-KU
TOKYO 160-0023 JAPAN
TEL:81-3-3348-7281
FAX:81-3-3348-7289
URL:<http://www.airman.co.jp>

Copyright (C) 2022 HOKUETSU INDUSTRIES CO., LTD. All Rights Reserved.

39600 91140

Printed JAN. 2022

AIRMAN
HOKUETSU INDUSTRIES CO., LTD.