

AIRMAN

INSTRUCTION MANUAL ENGINE GENERATOR

SDG 25S-6A7
SDG 45S-6A6
SDG 65S-6A6
SDG100S-6A6



HOKUETSU INDUSTRIES CO., LTD.

Preface

This manual explains and illustrates proper handling of the unit, method of daily inspection and maintenance to enhance the performance of AIRMAN's generators.

In order to use a machine safely, people with sufficient knowledge and sufficient technology need to deal with it.

Before operating the unit, read the manual carefully, fully understand its operation and maintenance requirement. Maintain "SAFETY OPERATION AND PROPER MAINTENANCE OF THE UNIT".

Be sure to follow safety warnings and cautions given in the manual. Unsafe operation could cause serious injury or death.

For details of handling, maintenance and safety of the engine, see the Engine Operation Manual.

Keep the manual available at all times for the operator or safety supervisor.

If the manual is lost or damaged, place an order with your dealer for another copy.

Be sure that the manual is included with the unit when it is handed over to another user.

There may be some inconsistency in detail between the manual and the actual machine due to improvements of the machine. Ask your dealer if you have any questions or problems.

If you have any questions about the unit, please inform us the model and serial number. A plate stamped with the model and serial number is attached to side of the unit.

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
HOKUETSU INDUSTRIES CO., LTD.	
MADE IN JAPAN	

A040491





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1.Safety

This operation manual explains and illustrates general requirements for safety and cautions for safety.

Please read these safety requirements carefully and fully understand the contents before starting the machine.

For your better recognition, according to the degree of potential danger harmful to a human body, safety messages are classified into three hierarchical categories, namely, , , and  with a caution symbol  - attached to each message.

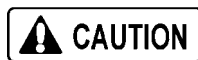
When one of these messages is found, please take preventive measures for safety to carry out “SAFETY OPERATION AND PROPER MAINTENANCE OF THE UNIT”.



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



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 indicates important caution messages for the performance or durability of the unit, which has no concern to injury or accident of or to a human body.

Follow warnings mentioned in this manual. This instruction 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.

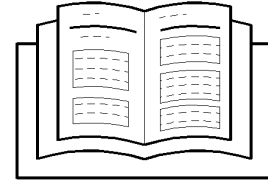
1.Safety

1.1 Caution before Operation

WARNING

Follow the safety instructions

- Read each instruction plate which is displayed in the manual or on the machine carefully, understand its content and follow the indications thereof.
- Keep the Safety Warning labels clean. When they are damaged or missing, apply new ones.
- 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.

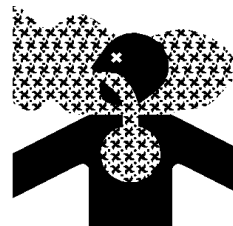


TR0086

WARNING

Ventilation

- Exhaust gas from the engine is poisonous, and could cause casualties when it is inhaled. Avoid using the machine in an insufficiently ventilated building or a tunnel.



PC002

DANGER

Handling battery

- Keep flames away from battery.
- Battery may generate hydrogen gas and may explode.
- Battery electrolyte is dilute sulfuric acid. In case of mishandling, it could cause skin burning.
- Wear protective gloves and safety glasses when handling a battery.
- Dispose of battery, observing local regulations.



D004



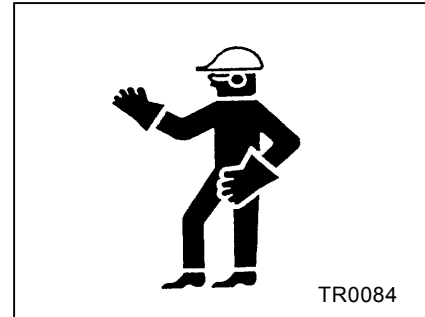
TR0093

1.Safety

WARNING

Safety outfit

- When handling machine, do not wear;
- loose clothes
- clothes with unbuttoned sleeves
- hanging tie or scarf
- dangling jewelry
- Such outfit could be caught in the machine or dragged in the rotating portion of the machine, and could cause a serious injury.



TR0084

WARNING

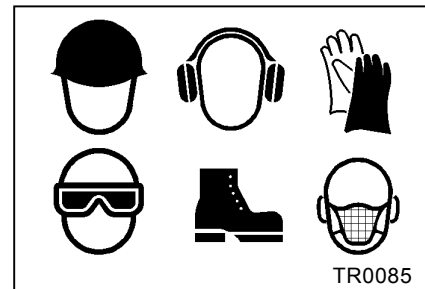
Maintain both physical and mental health

- Do not operate the machine when you are tired or drunk or under the influence of drugs. Otherwise, a hasty conclusion or careless handling may cause unexpected injury or accident. Manage your physical and mental health and be cautious in handling the machine.

CAUTION

Protection equipments

- Please wear protection implements, such as a helmet, protection glasses, earplugs, safety shoes, a glove, and a protection-against-dust mask, according to the contents of work for safety.

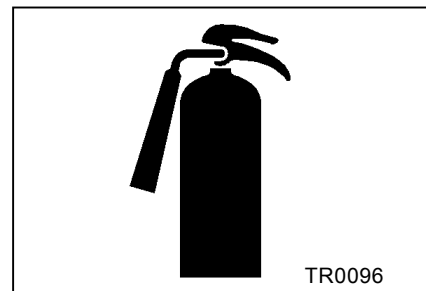


TR0085

CAUTION

Safety fittings

- Have first-aid boxes and fire-extinguishers near the unit ready for emergency situations such as injuries and a fire.
- It is advisable to have a list of phone numbers of doctors, ambulance and the fire department available in case of emergency.



TR0096

CAUTION

Safety around the machine

- Such things as unnecessary equipment and tools, cables, hoods, canvas sheets and pieces of wood which are a hindrance to the job, have to be cleared and removed. This is because operators and personnel nearby may stumble on them and may be injured.

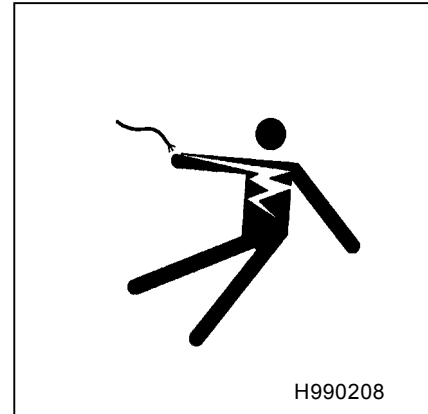
1.Safety

1.2 Caution during Operation

WARNING

Never touch the output terminals and interior of control board

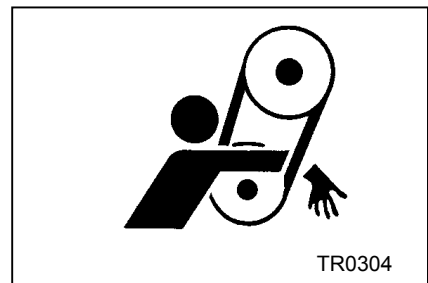
- Never touch the output terminals during operation.
- Notice that the voltage of several hundreds volt is applied to the output terminal.
- When removing or connecting a connecting cable for changing load, be sure to switch OFF the circuit breaker, remove the starter key from the starter switch, then carry out a work. The operator must keep the key during operation.
Neglecting the cautions mentioned above, and a third party starting the machine during operation may cause serious accidents such as electric shock.
- Never touch the interior of the control panel during operation.
- Notice that the voltage of several hundreds volt is applied to the interior of the control board.
- When checking or operating the interior of control panel, be sure to stop the machine, remove the starter key from the starter switch, then carry out a work. The operator must keep the key during operation.



WARNING

Hands off from rotating parts and belts

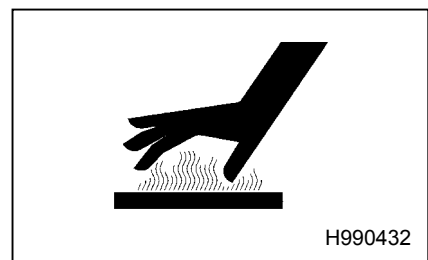
- Keep hands off from the rotating portion or belts while running. It could cause serious injuries if hands should be caught in.



CAUTION

Do not remove radiator cap during operation

- Do not, under any circumstance, open the radiator cap while running or immediately after stopping operation. Otherwise high temperature steam jets out and this could cause scalding.



1.Safety

CAUTION

Do not touch hot parts

- Never work nearby hot portions of the machine while it is running.
- Do not touch hot portions of the machine while inspecting the machine when running.
- Such parts as engine, exhaust manifold, exhaust pipe, muffler, and radiator are especially hot, so never touch those parts, because it could cause scalding.
- Coolant water and engine oil are also very hot and dangerous to touch. Avoid checking or refilling them while the unit is running.



H990432

CAUTION

Fire prevention

- Do not, under any circumstance, bring lit cigarettes or matches near such oils as diesel fuel oil, and engine oil, etc. They are extremely flammable and dangerous, so be careful when handling.
- Refilling oils should be done in an outdoor well-ventilated place.
- Refuel after stopping the engine, and never leave the fuel nearby the machine. Do not spill. It may cause a fire. When it is spilled, wipe it up completely.
- Such parts as muffler and exhaust pipe can be extremely hot. Remove twigs, dried leaves, dried grass and waste paper, etc. from the exhaust outlet of the muffler.
- Keep a fire extinguisher available by the machine in case of unexpected fire.



D004



H990433

WARNING

Draining during operation prohibited

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



PK0028

WARNING

Unbalance of overload and load

- Reduce the load when the circuit breaker actuates frequently during operation.
- When a single-load is used, check the current of each phase, and adjust the load so that each load value should be balanced.
- If the above procedure is neglected during operation, the generator could be burned or it could cause a fire. If the machine is operated with the frequency lower than the rated frequency, it could cause the generator or load motor to be burned.

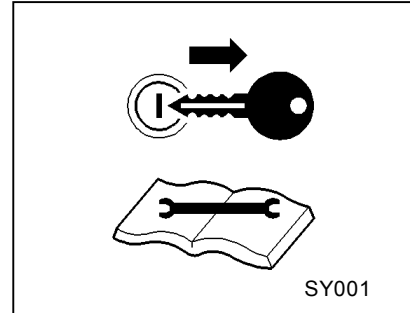
1.Safety

1.3 Cautions during Inspection and Maintenance

WARNING

Hang a "Now Checking and under Maintenance" tag

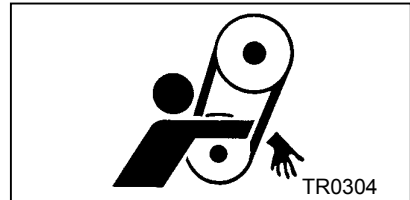
- Before starting inspection, switch off the circuit breaker of this machine, remove the starter key from the starter switch, and then hang a "Now Checking and under Maintenance" tag where it can be easily seen. The checker must keep the key during checking and maintenance.
- Remove the negative (–) 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.



WARNING

Adjusting tension of fan belt

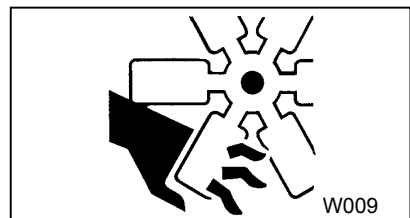
- Be sure to stop the engine and remove the starter key whenever the tension of the fan belt is to be adjusted.
- If the machine is running, it might catch the operator's hand into the fan belts, and this could cause a serious injury.



WARNING

Hands off from cooling fan

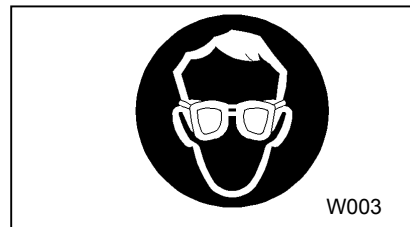
- Be sure to stop the engine and remove the starter key whenever check or maintenance work is carried out near the cooling fan.
- If the cooling fan is rotating, it may catch the operator or part of his body into the fan, and it could cause a serious injury.



WARNING

Cleaning by air-blow

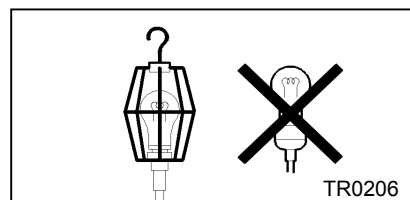
- When cleaning dust accumulated in such devices as the air-filter, etc., by blowing compressed air, wear safety glasses, etc. to protect your eyes.



CAUTION

Lighting apparatus

- It is recommended to use a lamp with safety guard fitted where the site is dark. Operating the machine gropingly or by relying on one's intuition could cause unexpected accidents.
- Any lamps without safety guard are not recommended since they can be broken and they could ignite flammables such as fuel, etc.



1.Safety

CAUTION

Taking off the radiator cap

- Be sure to stop the machine first and then loosen the radiator cap slowly, after the coolant water is sufficiently cooled and the inner pressure is released.
If this procedure is neglected, its inner pressure can blow off the cap, and steam jetting out of the radiator could result in causing scalding. Follow these procedures under all circumstances.

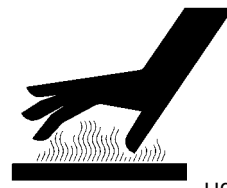


H990432

CAUTION

Opening coolant water drain valve

- 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 cooled enough, hot water could jet out, and it could cause scalding.



H990432

CAUTION

Refilling or draining of engine oil

- After stopping the engine, wait 10 to 20 minutes until the engine oil cools off. Then check the level of the engine oil, or refill or drain the oil.
- During operation or immediately after the engine stops, its oil is extremely hot and pressurized, so it may jet out when the cap is loosened. Be careful not to scald yourself from it.



H990432

CAUTION

Cleaning the unit

- 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.

CAUTION

Disposal of waste liquid, etc.

- 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 the 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.









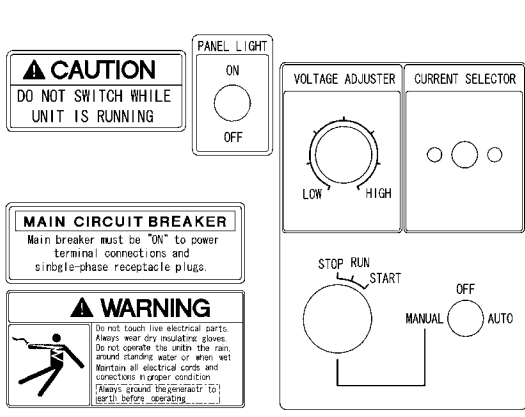
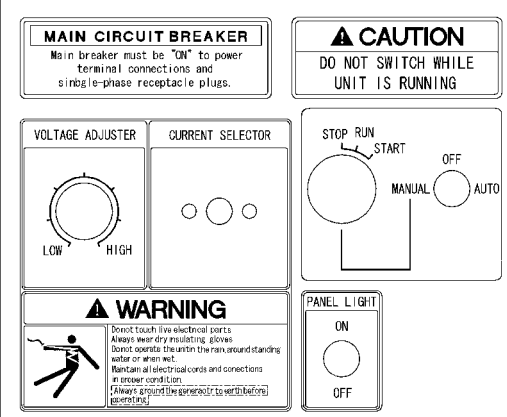
1.Safety

1.4 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.

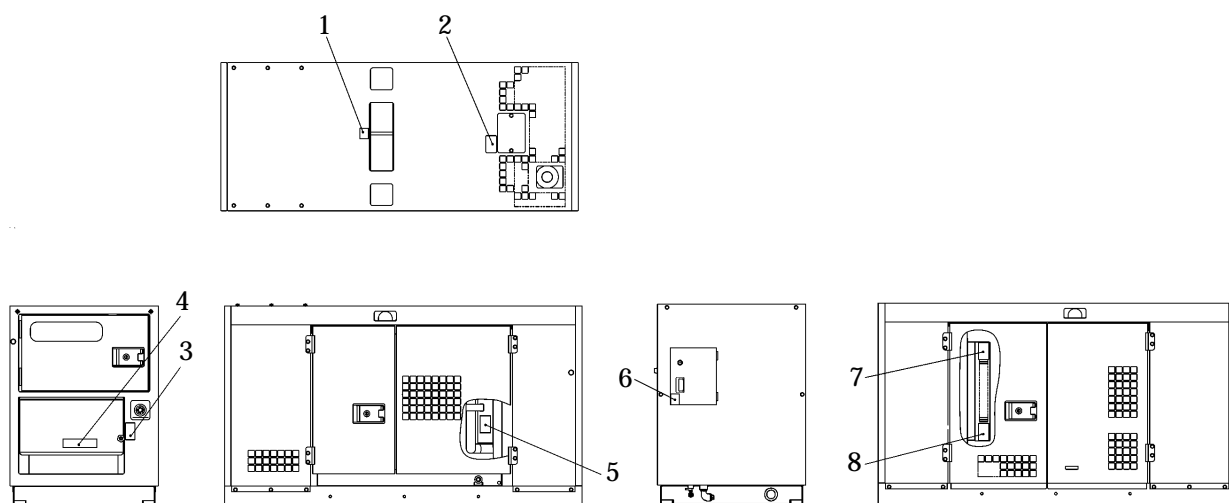
Adhere a new one to the original location.

<p>1</p>  <p>LIFTING BAIL</p> <p>39176 69300</p>	<p>2</p>  <p>CAUTION</p> <p>PREVENT BURNING ACCIDENT</p> <p>Do not open radiator cap while it is still hot.</p> <p>39176 69600</p>	<p>3</p>  <p>WARNING</p> <p>BEWARE OF EXHAUST GASES</p> <p>When you operate machine INDOORS or in TUNNEL, provide good ventilation. Poor ventilation can cause fatal accident.</p> <p>39176 73300</p>	<p>4</p>  <p>WARNING</p> <p>Do not touch live electrical parts. Always wear dry insulating gloves. Do not operate the unit in the rain, around standing water or when wet. Maintain all electrical cords and connections in proper condition. Always ground the generator to earth before operating. See spec.</p>
<p>5</p>  <p>WARNING</p> <p>BEWARE OF ENTANGLEMENT</p> <p>Keep your hands AWAY from fan during operation. Entanglement in the fan can cause serious injury.</p> <p>39176 73500</p>	<p>6</p>  <p>FLAMMABLES</p> <p>39176 35600</p>	<p>7</p>  <p>CAUTION</p> <p>PREVENT BURNING ACCIDENT</p> <p>When work is required near hot parts, wait for the parts to cool down fully before starting work.</p> <p>39176 69500</p>	<p>8</p>  <p>WARNING</p> <p>BEWARE OF ENTANGLEMENT</p> <p>Keep your hands AWAY from moving parts such as V-belts, pulleys etc. Entanglement in them can cause serious injury.</p> <p>39176 73800</p>
<p>9</p> <div style="display: flex; justify-content: space-around;"> <div>  <p>CAUTION DO NOT SWITCH WHILE UNIT IS RUNNING</p> <p>PANEL LIGHT ON OFF</p> <p>VOLTAGE ADJUSTER LOW HIGH</p> <p>CURRENT SELECTOR ● ● ●</p> <p>STOP RUN START</p> <p>MANUAL OFF AUTO</p> <p>MAIN CIRCUIT BREAKER Main breaker must be "ON" to power terminal connections and single-phase receptacle plugs.</p> <p>WARNING Do not touch live electrical parts. Always wear dry insulating gloves. Do not operate the unit in the rain, around standing water or when wet. Maintain all electrical cords and connections in proper condition. Always ground the generator to earth before operating.</p> </div> <div>  <p>MAIN CIRCUIT BREAKER Main breaker must be "ON" to power terminal connections and single-phase receptacle plugs.</p> <p>CAUTION DO NOT SWITCH WHILE UNIT IS RUNNING</p> <p>VOLTAGE ADJUSTER LOW HIGH</p> <p>CURRENT SELECTOR ● ● ●</p> <p>STOP RUN START</p> <p>MANUAL OFF AUTO</p> <p>WARNING Do not touch live electrical parts. Always wear dry insulating gloves. Do not operate the unit in the rain, around standing water or when wet. Maintain all electrical cords and connections in proper condition. Always ground the generator to earth before operating.</p> <p>PANEL LIGHT ON OFF</p> </div> </div>			
<p><u>SDG25S-6A7</u></p>		<p><u>SDG45S-6A6,SDG65S-6A6,SDG100S-6A6</u></p>	

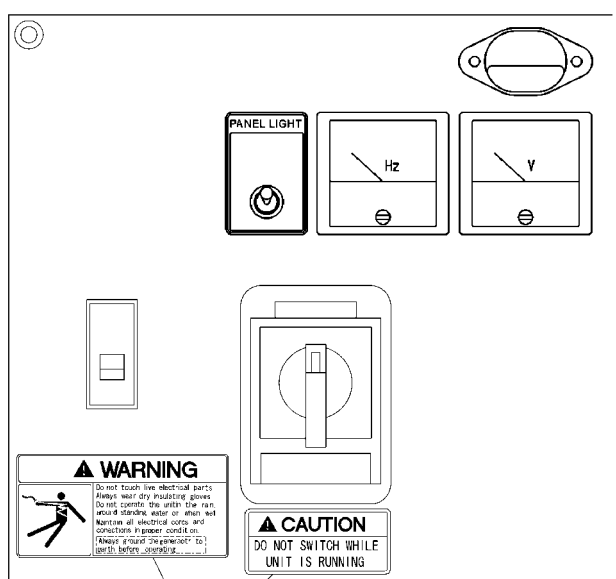
1.Safety

The pasting position of safe warning label is as follows.

SDG25S-6A7



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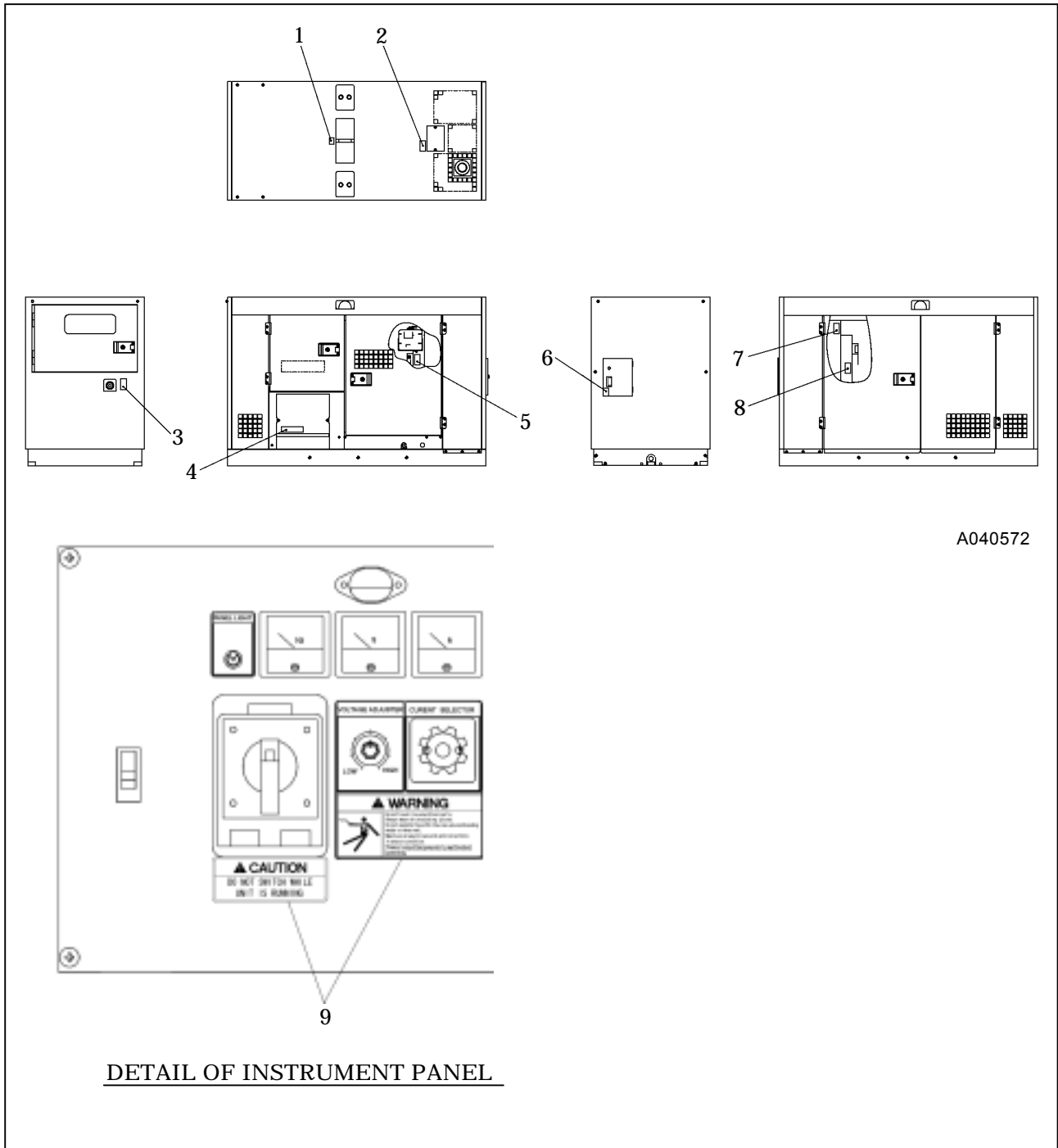


9

DETAIL OF INSTRUMENT PANEL

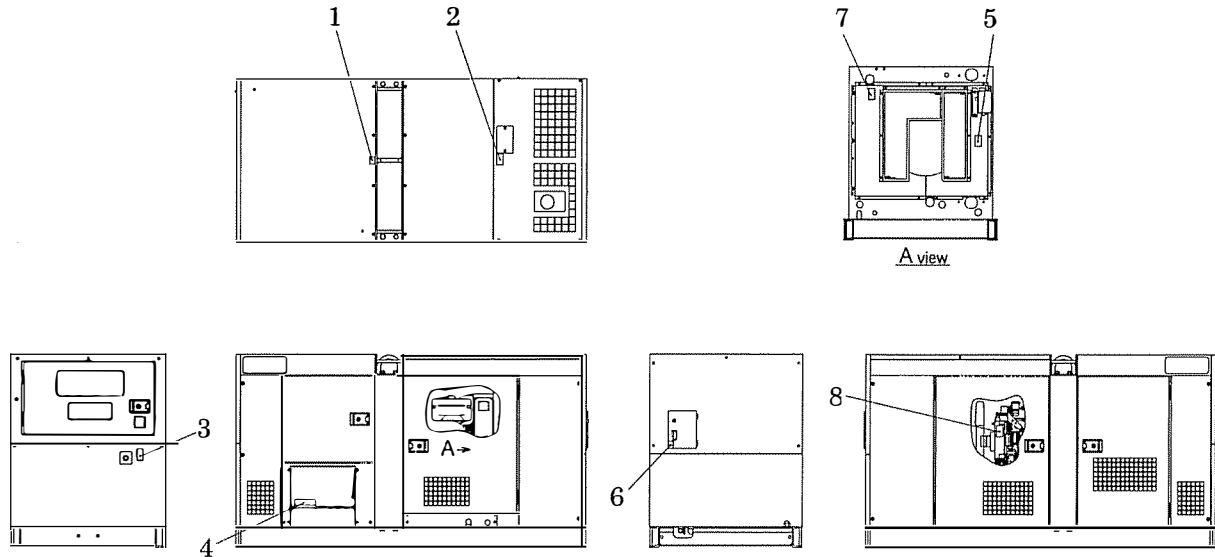
1.Safety

SDG45S-6A6,SDG65S-6A6

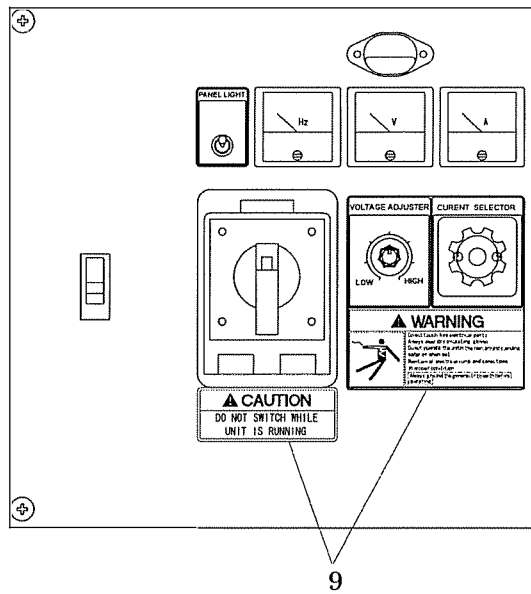


1.Safety

SDG100S-6A6



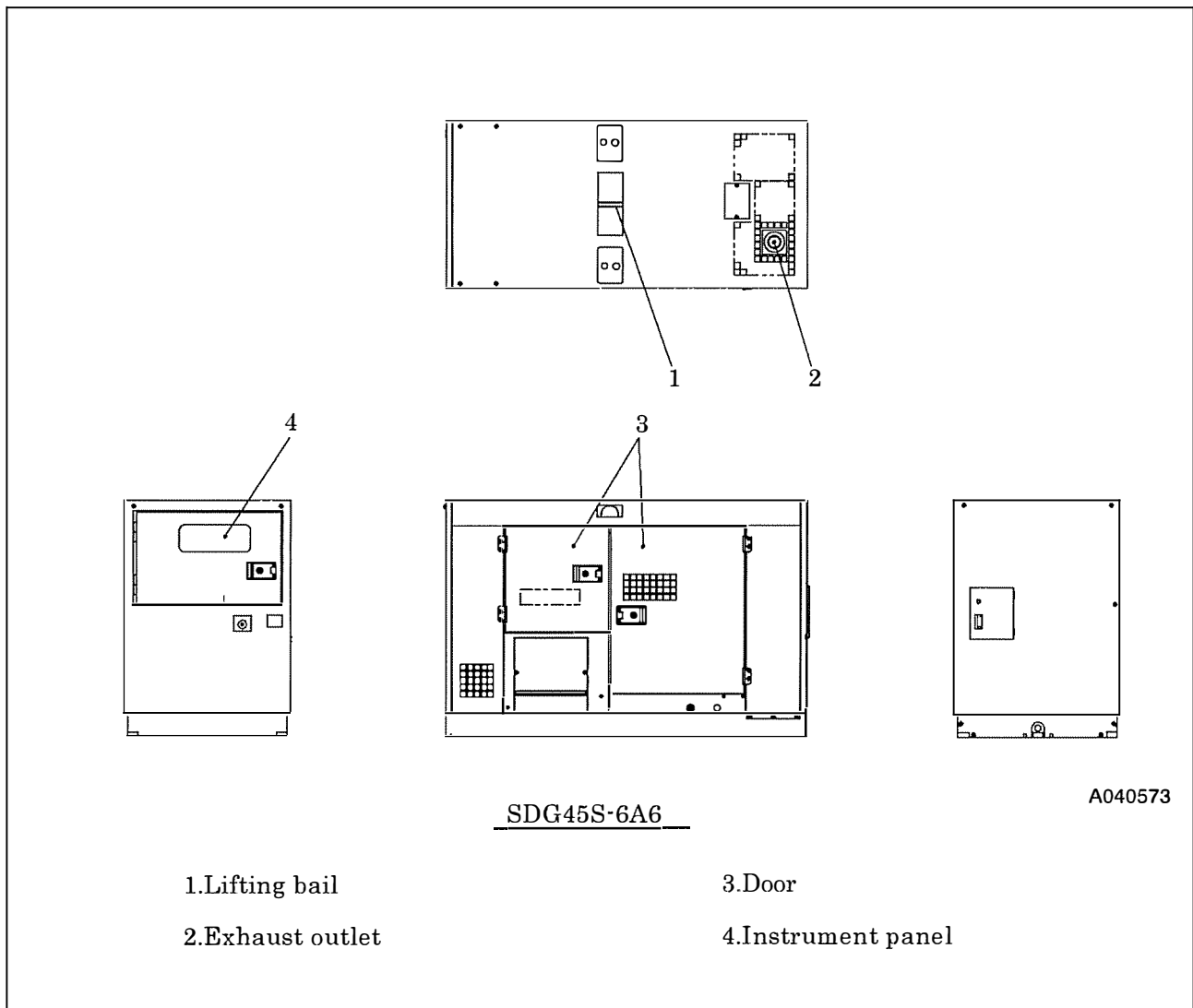
A050011



DETAIL OF INSTRUMENT PANEL

2. Part Names

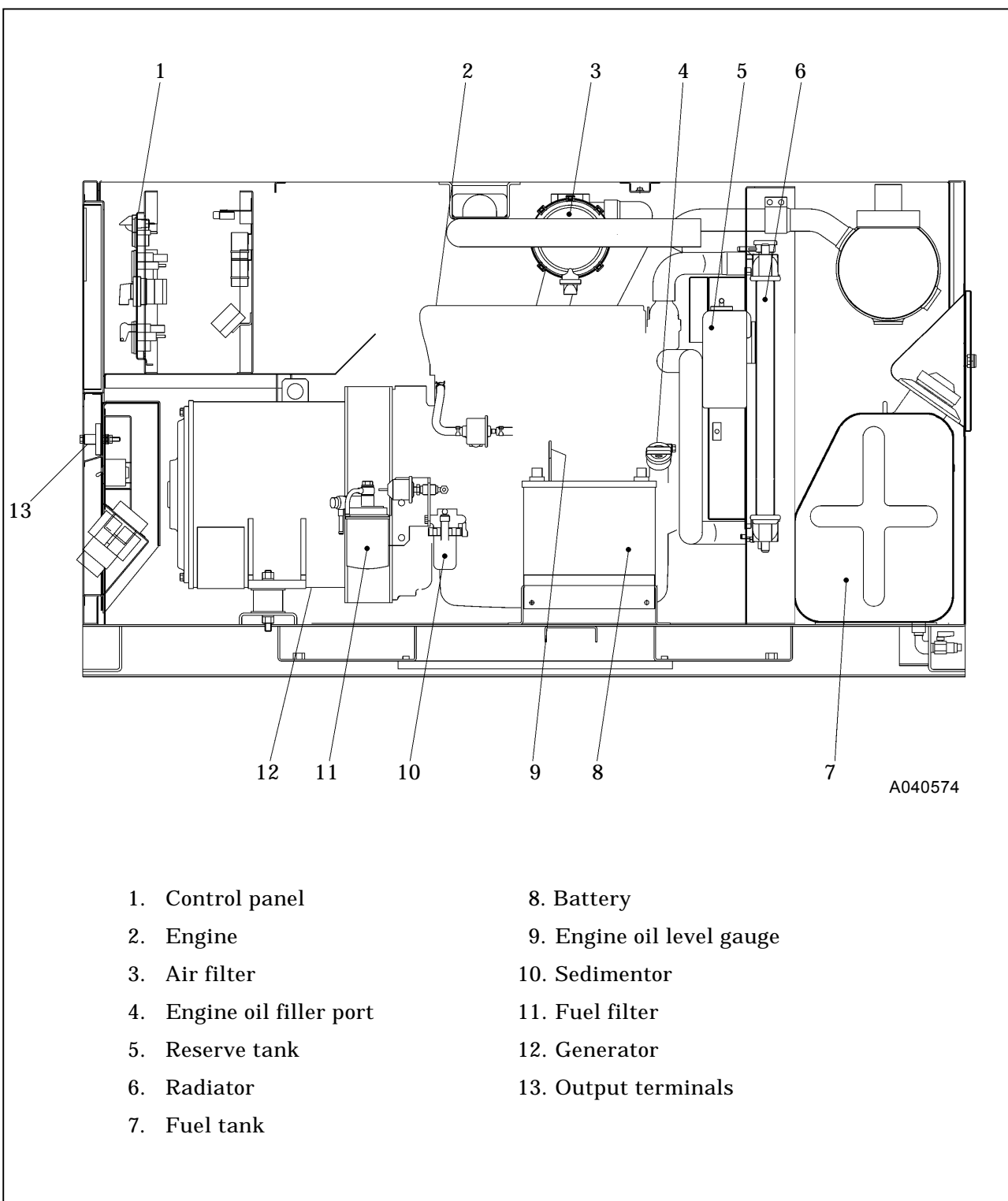
2.1 Unit Appearance and Part Names



2. Part Names

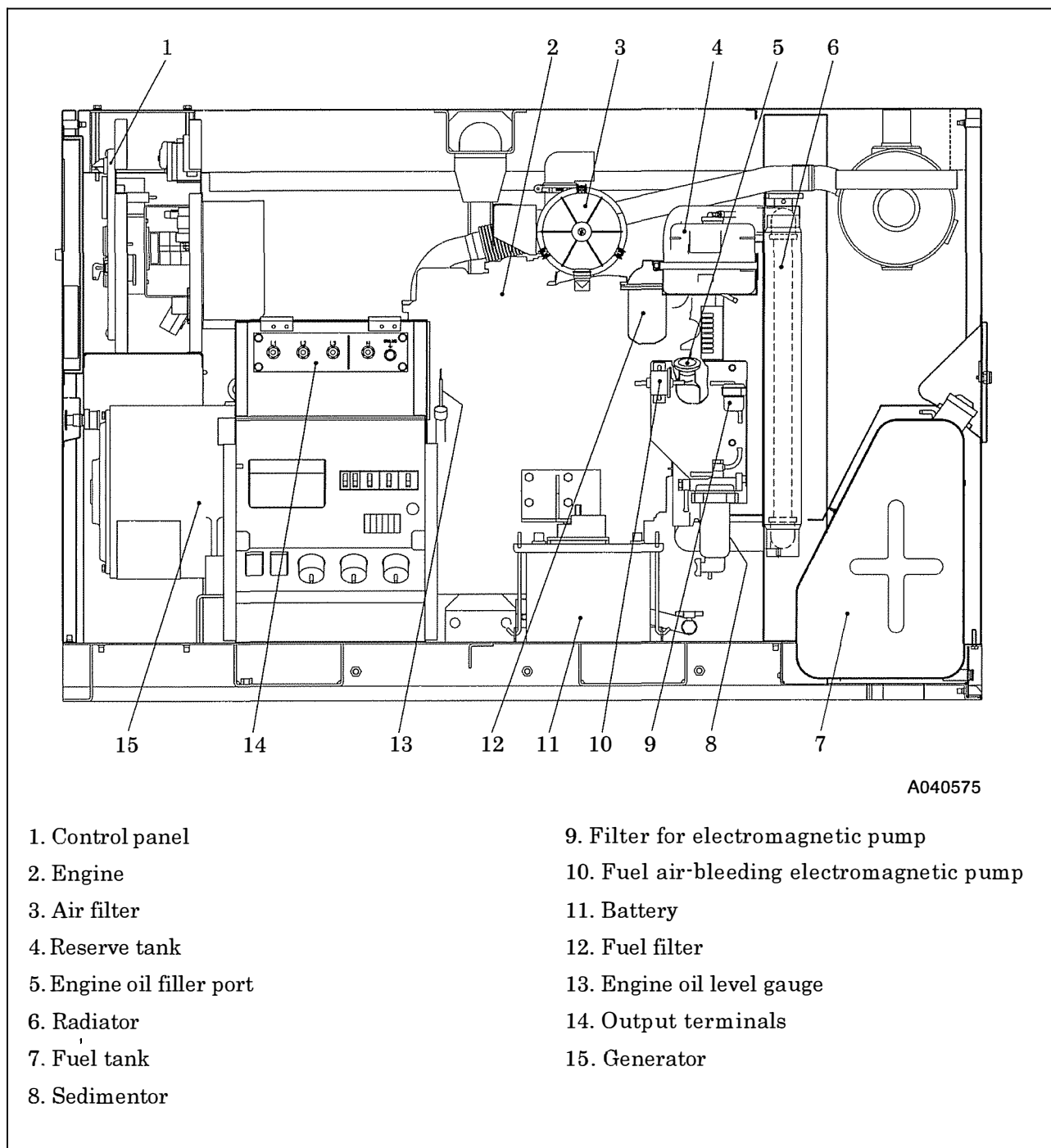
2.2 Internal Components

SDG25S-6A7



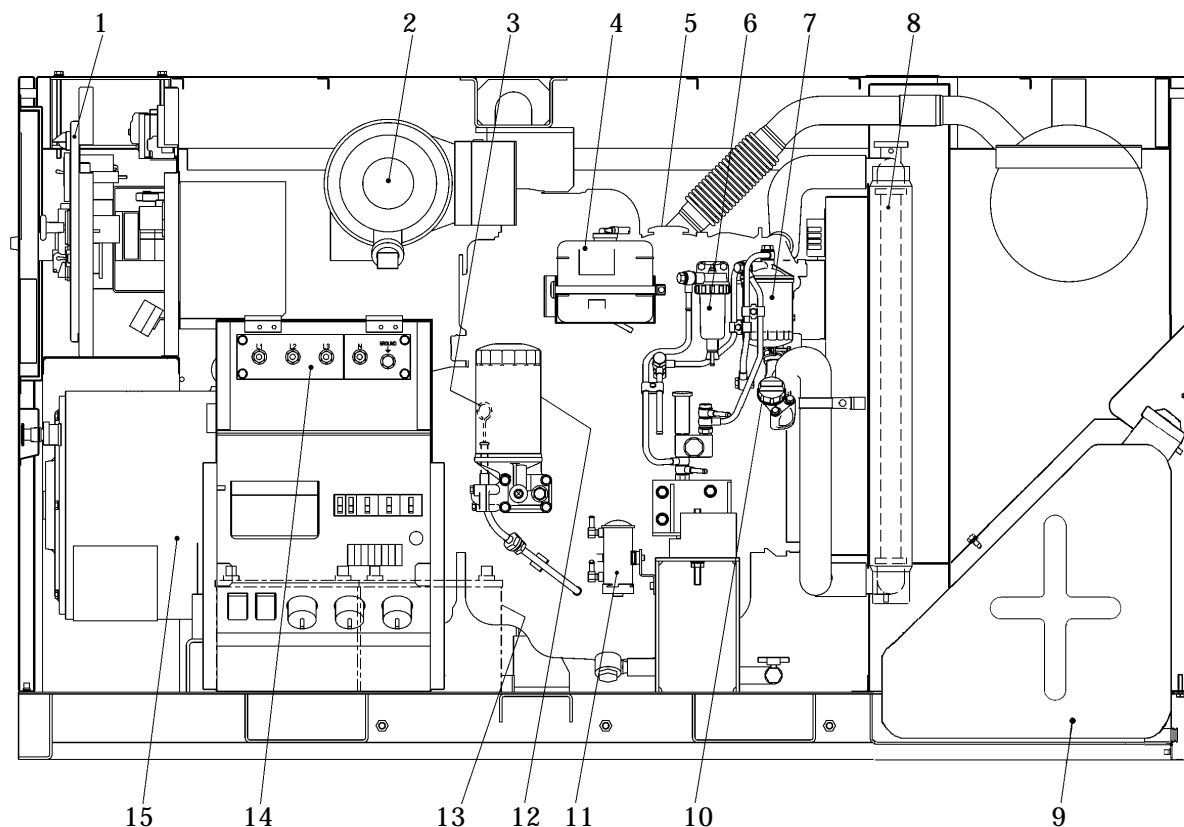
2. Part Names

SDG45S-6A6



2. Part Names

SDG65S-6A6



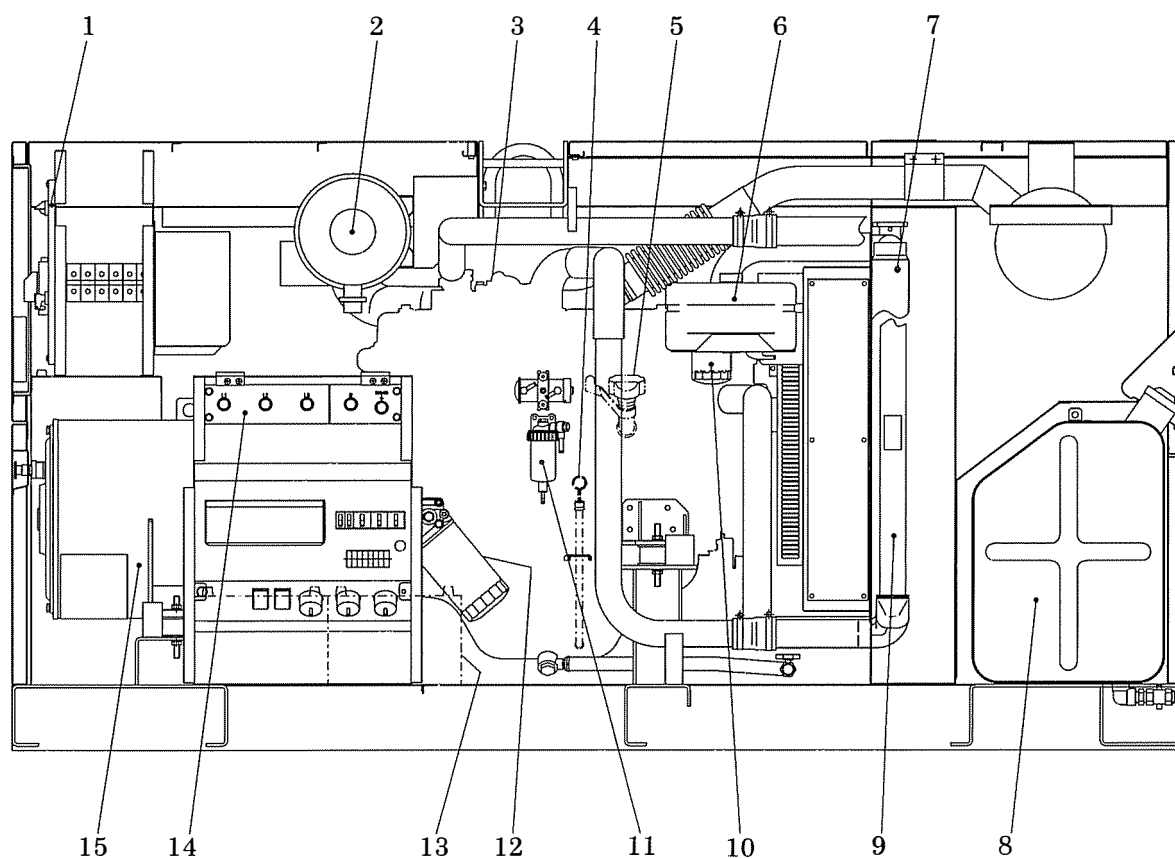
A040576

- | | |
|---------------------------|--|
| 1. Control panel | 9. Fuel tank |
| 2. Air filter | 10. Engine oil filler port |
| 3. Engine oil level gauge | 11. Fuel air-bleeding electromagnetic pump |
| 4. Reserve tank | 12. Engine oil filter |
| 5. Engine | 13. Battery |
| 6. Sedimentor | 14. Output terminals |
| 7. Fuel filter | 15. Generator |
| 8. Radiator | |

Instrument 12 marked “ ” are provided on the other side (opposite side of maintenance).

2. Part Names

SDG100S-6A6



A050016

- | | |
|-----------------------------|-----------------------|
| 1. Control panel | 8. Fuel tank |
| 2. Air filter | 9. Intercooler |
| 3. Engine | 10. Fuel filter |
| 4. Engine oil level gauge ※ | 11. Sedimentor |
| 5. Engine oil filler port ※ | 12. Engine oil filter |
| 6. Reserve tank | 13. Battery ※ |
| 7. Radiator ※ | 14. Output terminals |
| | 15. Generator |

Instrument 4,5,7,13 marked “※” are provided on the other side.
(opposite side of maintenance).

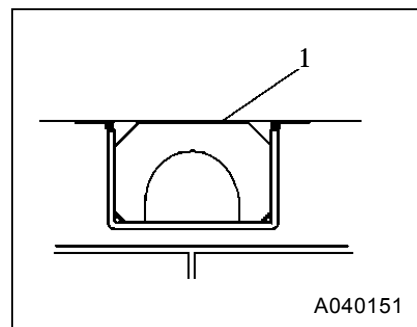
3. Installation

3.1 Transporting Unit

WARNING

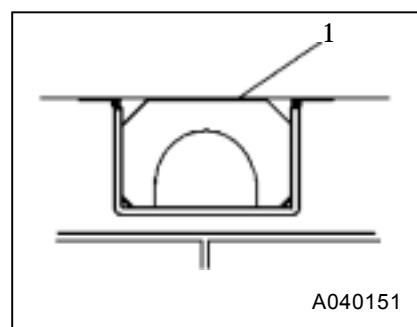
Transportation

- Use the lifting bail “ 1 ” at the center of bonnet for hoisting up and down the machine.
Since the rope hook is not strong enough to be used for hoisting, never use it to prevent falling accident.
- When transporting the machine, be sure to put it on the truck bed and use the rope hooks to secure it with rope
- Do not hoist up the machine while it is running. Otherwise, a fatal trouble or serious accident may occur.



3.1.1 Lifting

- Use the lifting bail “ 1 ” fitted on center of bonnet.
- 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.



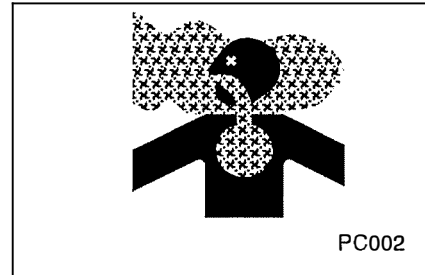
3. Installation

3.2 Place and Conditions of Unit Installation

⚠ WARNING

Ventilation

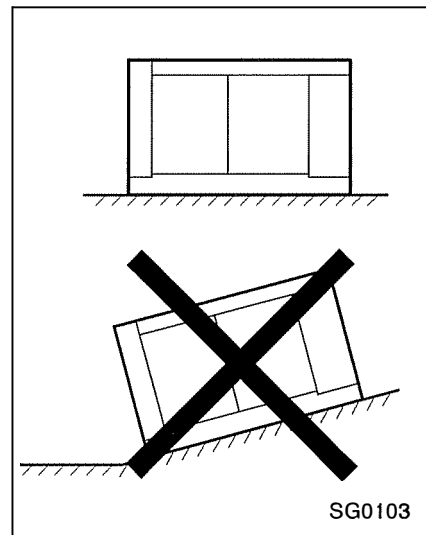
- Exhaust gas from the engine is poisonous, and it could cause casualties when it is inhaled.
Avoid using the machine in an insufficiently ventilated building or a tunnel.



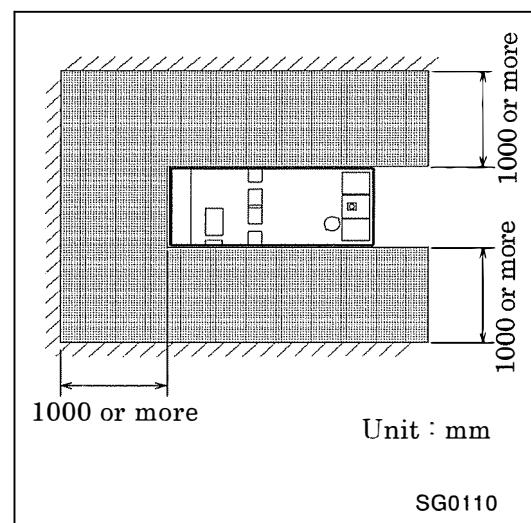
⚠ WARNING

Installation

- The machine has to be installed on dry, firm, and level area.
- Avoid installing the machine in a place such as a damp place or a place where puddles are apt to be formed after rain. Such installation could cause electric shock.
- Do not direct the exhaust gas outlet to people nearby or houses in the vicinity.
- When installing the machine at the sea shore or on a ship, make sure that the machine should not be exposed directly to sea water.
- When installing the machine at a sandy place, make sure that exhaust from the generator or radiator does not blow the sand in the air, or into the machine.



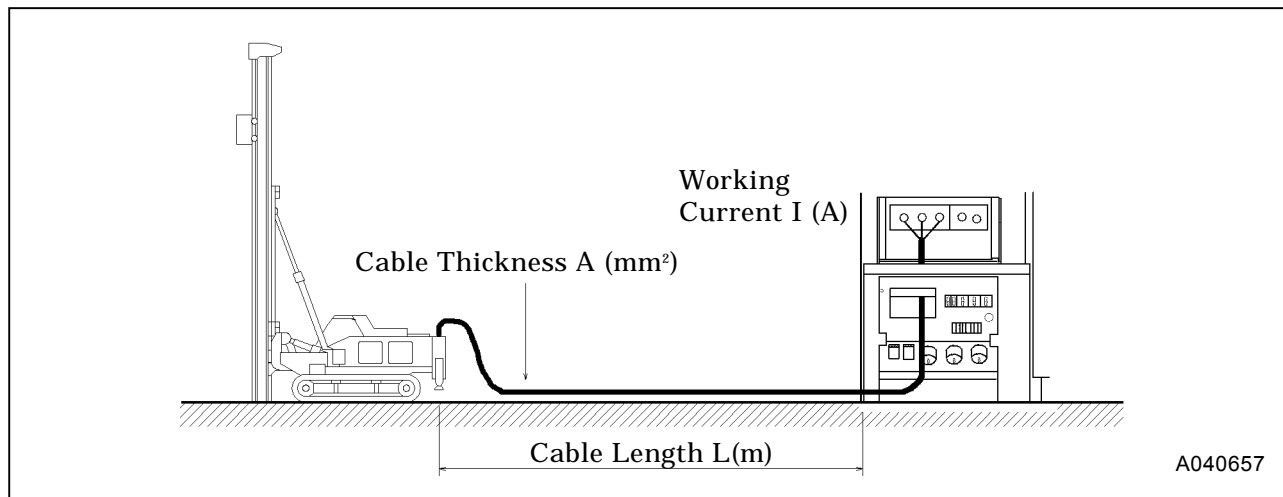
- The machine should be operated in following conditions:
- Ambient temperature -15°C to +40°C
- Humidity Less than 85%
- Altitude Lower than 500 m above sea level
- If more than two machines are placed parallel in operation, keep enough distance so that exhaust air from one machine does not effect the other one.
- Keep enough space around the unit for inspection and maintenance access.



3. Installation

3.3 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 three-phase three-wire formula to seek voltage drop from cable length and working current. Select such a cable length and thickness so that the voltage drop will remain less than 5%.

Output system	Voltage drop	e : Voltage drop(V) e' : Voltage drop between an outside line or one line of each phase, and a neutral line (V)
Three-phase 3-wire Type	$e = \frac{30.8 \times L \times I}{1,000 \times A}$	A : Cable thickness (mm ²) L : Cable length (m) I : Working current (A)
Three-phase 4-wire Type	$e' = \frac{17.8 \times L \times I}{1,000 \times A}$	

- The following tables show the relations between the cabtyre 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 Cabtyre Cable

Unit:mm²

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

Three-Conductor Cabtyre Cable

Unit:mm²

Length Current	50m	75m	100m	125m	150m	200m
50A	14	14	22	22	30	38
100A	38	38	38	50	50	60
150A	22 × 2	22 × 2	38 × 2	38 × 2	38 × 2	50 × 2

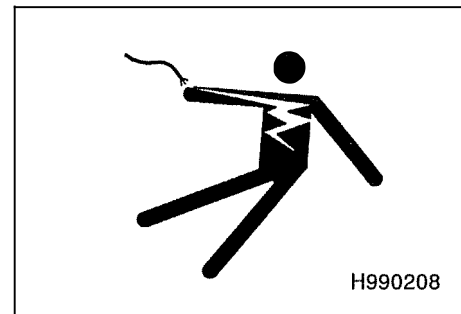
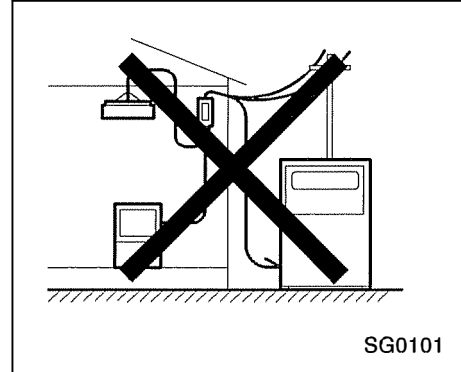
3. Installation

3.4 Connecting Load

WARNING

Electric shock and electric leak

- Make sure not to connect the output terminal of the machine with the commercial power source from electric power company. It may cause an electric shock, machine troubles and even a fire.
 - Make sure to ground the machine and the load. It could cause an electric shock when the machine is installed at a damp place or on a steel frame or a steel plate.
 - Never touch the output terminals during operation.
 - Notice that the voltage of several hundreds volt is applied to the output terminal.
 - When removing or connecting a connecting cable for changing load, be sure to switch OFF the circuit breaker, remove the starter key from the starter switch, then carry out a work. The operator must keep the key during operation.
 - For a connecting cable to 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 be slackened during operation and may cause a fire or an electric shock accident.



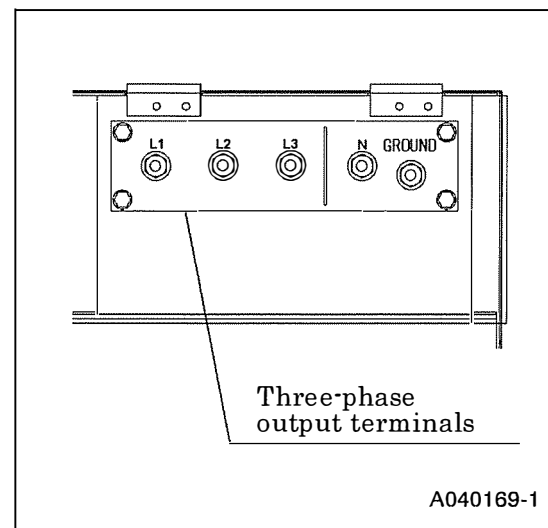
CAUTION

- When using a single-phase load [277V or 139V], see to it that the loads on the different phases will be evenly balanced. Unbalanced loads may cause the generator burning.

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

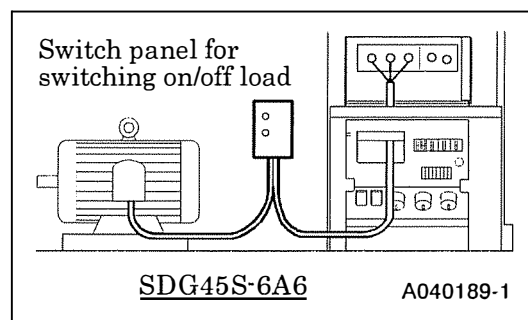
—Terminal size—

	SDG25S	SDG45,60S	SDG100S
Three-phase output (L1,L2,L3,N)	M8	M12	M14
Leakage relay ground terminal(G)	M8	M12	M14



3. Installation

- Install a switch between the output terminal and the load to switch on/off the load. Do not switch the load on/off directly by the circuit-breaker of the generator. It could cause damage to the circuit-breaker.
- Connect the connecting cable to the load so that the output terminals should not touch each other.

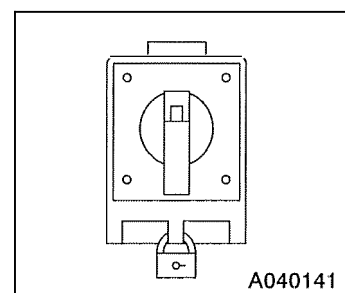


3.4.1 Proper Connection of Three-phase Four-wire Type Terminal

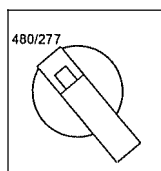
CAUTION

Never use voltage selector switch during operation

- During operation, do not operate voltage selector switch. Voltage selection during operation may cause abnormal voltage on the load side to damage the load and may cause a fire.
- In addition it could cause damage to generator and automatic voltage regulator (AVR).
- Be sure to shut off generator before using voltage selector switch.
- When voltage selection is completed, lock the voltage selector switch in position to prevent anyone from operating it.

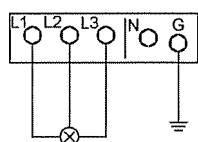


Voltage selector sw.
Three-phase 480/277V



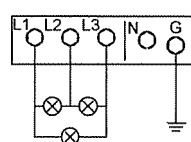
A040250

Output terminals
Three-phase 480V



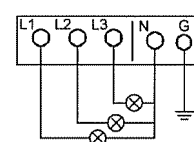
A040153-1

Output terminals
Single-phase 480V



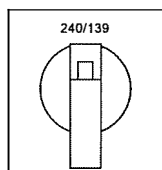
A040154-1

Output terminals
Single-phase 277V



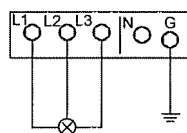
A040155-1

Voltage selector sw.
Three-phase 240/139V



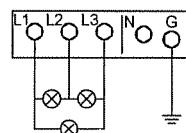
A040251

Output terminals
Three-phase 240V



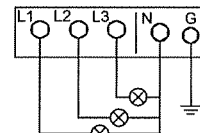
A040156-1

Output terminals
Single-phase 240V



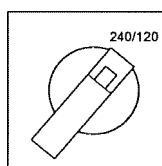
A040157-1

Output terminals
Single-phase 139V



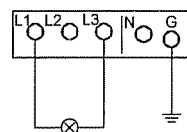
A040158-1

Voltage selector sw.
Single-phase 240/120V



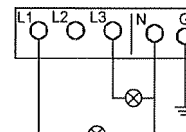
A040161

Output terminals
Single-phase 240V



A040159-1

Output terminals
Single-phase 120V



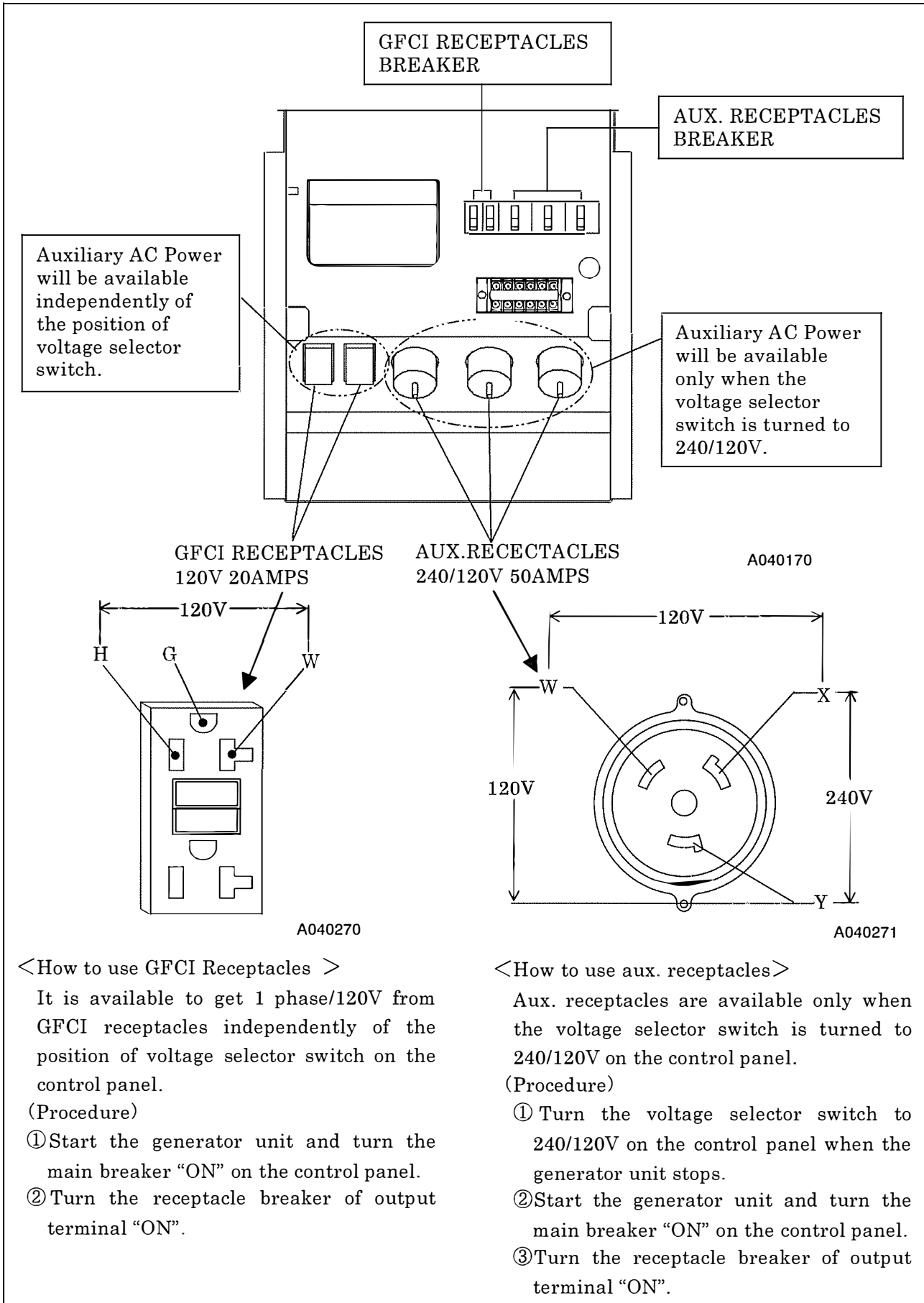
A040160-1

NOTE:

When the voltage selector switch is in the single-phase 240/120V position, place the ammeter change-over switch to the L1 or L3 position to read the output.

3. Installation

3.4.2 Auxiliary AC Power



3. Installation

3.4.3 The Maximum Combined Simultaneous Power Consumption

CAUTION

- Never exceed the maximum combined simultaneous power consumption.

The following chart shows the maximum power available from the 120V-20A GFCI receptacles during simultaneous consumption (main terminals and receptacles) for both single or three phase settings. Values shown in the left column give the maximum current available at the 120V-20A GFCI receptacles compared to the value of the simultaneous current consumption from the main terminals.

Single Phase 120V-20A GFCI Rcept.	SDG25S		SDG45S		SDG60S	
	Three Phase 240/480V	Single Phase 240/120V	Three Phase 240/480V	Single Phase 240/120V	Three Phase 240/480V	Single Phase 240/120V
kW	kVA	kW	kVA	kW	kVA	kW
0.0	25.0	14.4	45.0	26.0	63.0	36.5
1.2	20.8	13.2	40.9	24.8	59.0	35.3
2.4	16.7	12.0	36.7	23.6	54.9	34.1
3.6	12.5	10.8	32.6	22.4	50.7	32.9
4.8	8.4	9.6	28.4	21.2	46.6	31.7

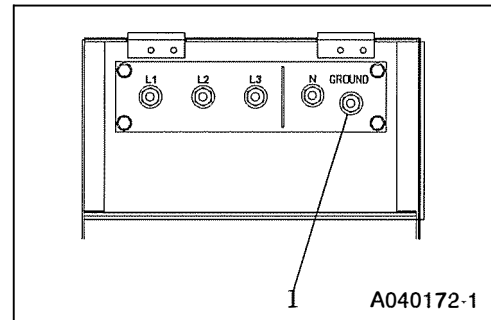
Single Phase 120V-20A GFCI Rcept.	SDG100S	
	Three Phase 240/480V	Single Phase 240/120V
kW	kVA	kW
0.0	100.0	57.7
1.2	96.0	56.5
2.4	91.9	55.3
3.6	87.7	54.1
4.8	83.6	52.9

3. Installation

3.5 Grounding Method

3.5.1 Ground Terminal

The generator ground terminal “1” is connected to the frame of the generator, metal non-current-carrying generator parts and the ground terminals of each receptacle.



3.5.2 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.

WARNING

- 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 contact the lines during a power outage. Consult 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.

3.5.3 Ground 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 is connected to the system ground.

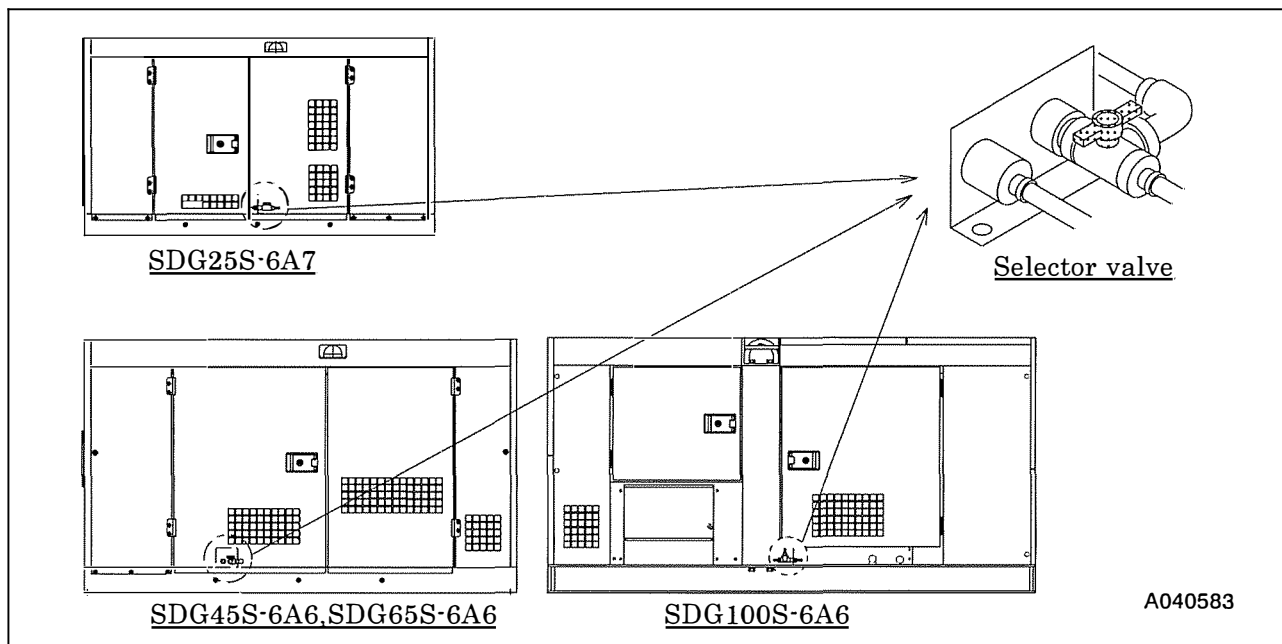
3. Installation

3.6 Selector Valve of Fuel Pipe

3.6.1 Selector valve

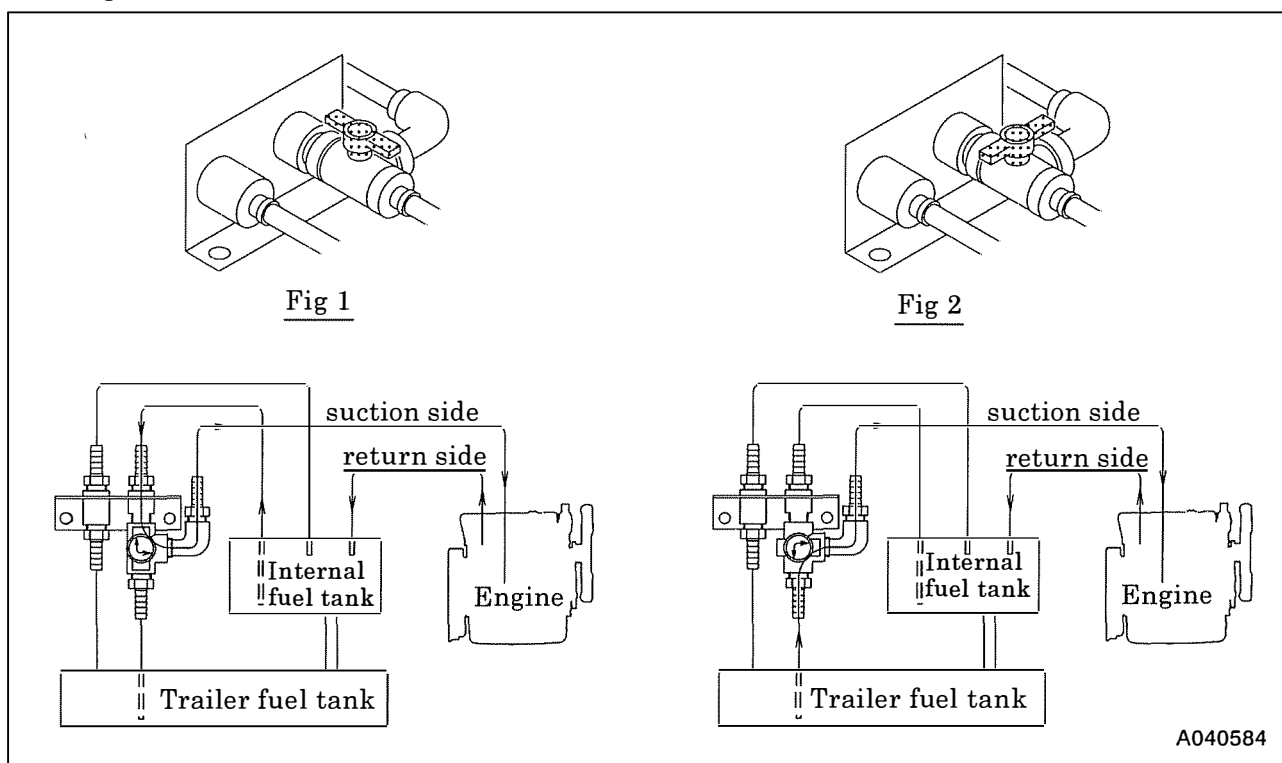
The selector valve is provided to supply fuel to the engine in the following cases.

1. When only the internal fuel tank of generator is used.
2. When both the internal fuel tank and trailer tank are used together.



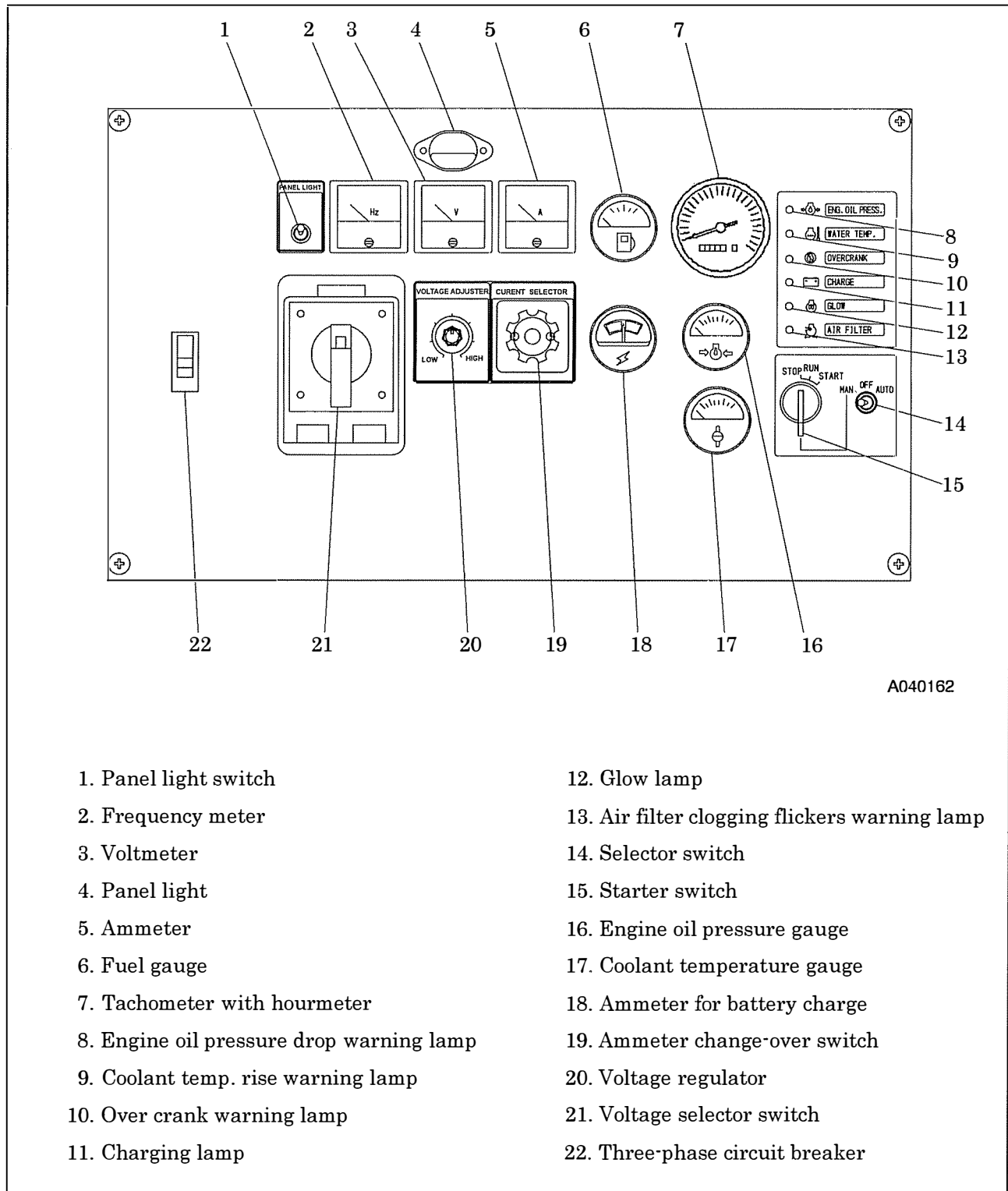
3.6.2 Operation method

1. Select the valve position as Fig. 1 when only the internal fuel tank of generator is used.
2. Select the valve position as Fig. 2 when both the internal fuel tank and trailer tank are used together.



4. Operation

4.1 Instrument panel



A040162

4. Operation

4.2 Protection device

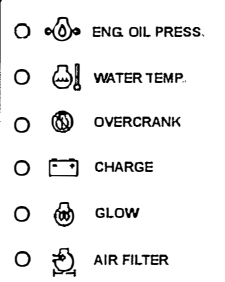


- For prevention of troubles during operation, this machine is provided with various protection devices. If the engine should shut down or circuit-breaker should trip owing to functions of the protection devices, make sure to check and remove such cause of trouble. Then start operation again.

4.2.1 Warning and Emergency Display lamp

Warning and Emergency Display

- When the warning lamp glows, stop the machine immediately and take appropriate measures to recover the situation.

Item	Trouble	Measures	Monitor
Engine oil pressure	Lamp glows when engine oil pressure drops during operation and then engine stops. Operating pressure: SDG25S lower than 15psi (0.1MPa) SDG45S lower than 22psi (0.15MPa) SDG65S lower than 15psi (0.1MPa) SDG100S lower than 15psi (0.1MPa)	See 6.2 Troubleshooting	
Coolant temperature	Lamp glows when coolant temperature reaches and then engine stops: SDG25S more than 230° F (110°C) SDG45S more than 230° F (110°C) SDG65S more than 221° F (105°C) SDG100S more than 221° F (105°C)		
Overcrank	This lamp goes on when operator fails to start engine, during automatic operation mode.		
Charging	Lamp glows when alternator is not charging. The alternator functions properly when the lamp goes out after engine starts.		
Air filter	When air filter gets clogged and differential pressure rises, lamp goes on. Actuating differential pressure : more than 0.9psi(6.2 kPa)		

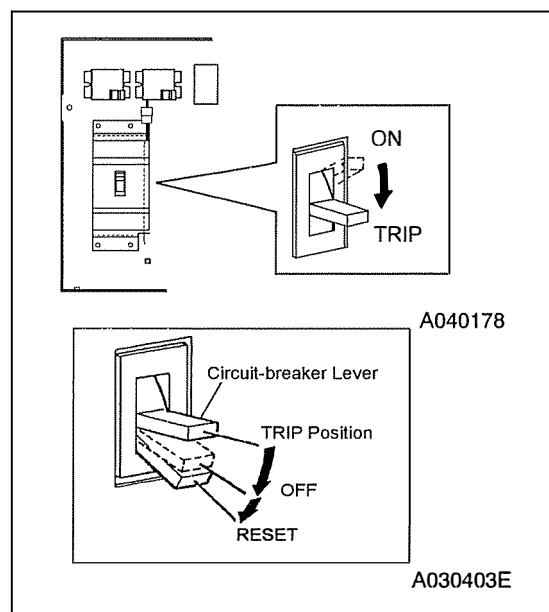
4. Operation

4.2.2 Three-phase circuit-breaker

- In case overload and short-circuited wire connection should occur, the circuit-breaker trips.
- It is impossible to switch ON the circuit-breaker tripped, and so stop the engine to reset the breaker.

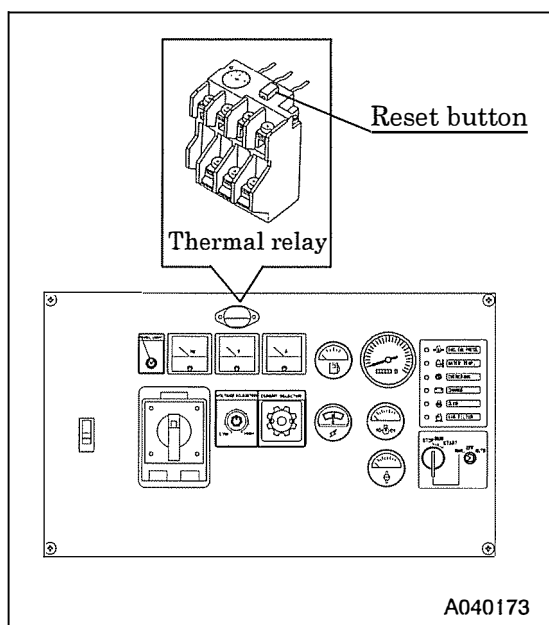
<How to reset>

- In order to reset the lever of circuit-breaker, press hard the lever downward till the lever sounds "click".



4.2.3 Thermal relay

- In case overload or short-circuit should occur to load or load connection cable, this relay functions to trip the circuit-breaker.
- It is not necessary to push the reset button even after the three phase main breaker is tripped since the thermal relay is set automatic return at factory.



4. Operation

4.2.4 GFCI (Ground-fault circuit interrupter) Receptacles



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

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.

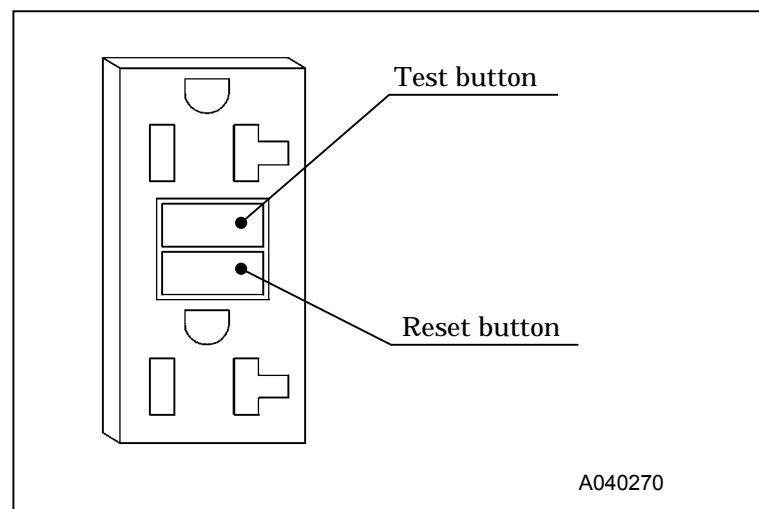
The ground-fault circuit interrupter will not protect against short circuits or overloads. The circuit breaker in the control panel which supplies power to the circuit provides that protection.

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)

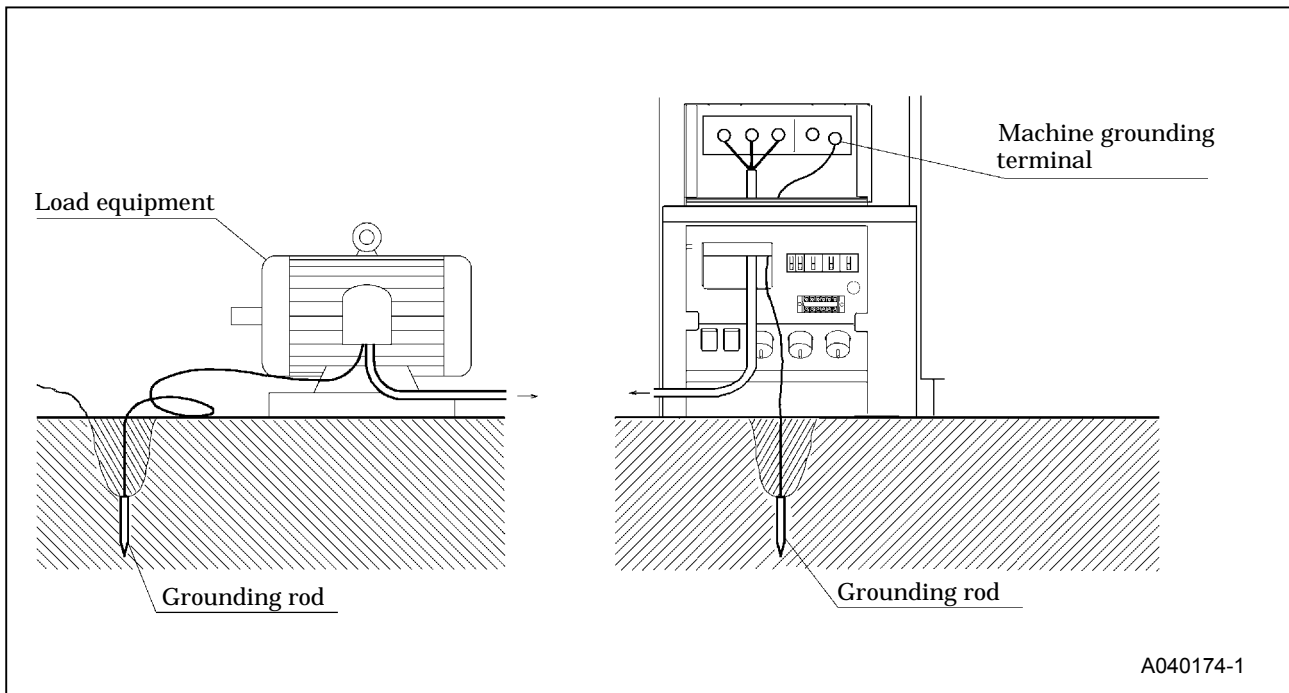
RESET BUTTON: To restore power, depress the “RESET” button.

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.



4. Operation

Grounding method



4.2.5 Circuit protector (CP) for AVR protection

AVR is equipped with circuit-protector (CP) for protection against overcurrent. Under the following cases, it happens to function.

- In case the machine gets overloaded while engine speed is still lower.
- In case the output voltage of generator is increased higher than the specified voltage.

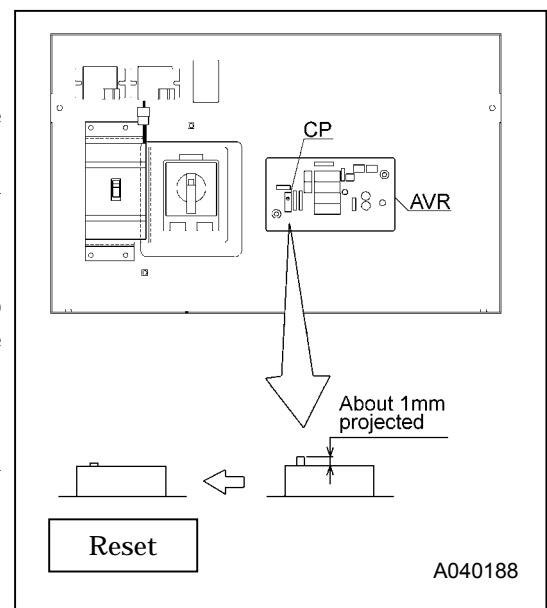
< Symptom >

- When circuit protector functions and load is applied to the machine, such trouble as larger variance of voltage and/or delayed voltage recovery follow.

< How to reset >

- Press the white colored AVR button inside the control panel for resetting the circuit-breaker.

Note: Do not hold the button with such sharply pointed things as a screwdriver, ball point pens etc.



4. Operation

4.3 Check before Starting the Unit



Check before starting the unit

- Be sure to check the unit before operation.
When any abnormality is found, be sure to repair it before starting the unit.
- 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.

4.3.1 Check Engine Oil Level

- Unit should be on level before checking oil level.
- When you check oil level after you have once started operation, wait 10 to 20 minutes after stopping engine, before checking the oil level.

(Procedure)

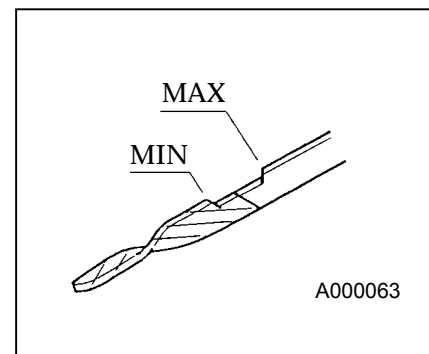
Pull out the engine oil level dipstick, and wipe it with a clean cloth.

Then, re-insert the dipstick fully and pull it out again. If the gauge shows the oil level between MAX and MIN limits, it is normal.

When the oil level is below its MIN, add engine oil.

(See 5.5.1.)

- While checking oil level, check also for contamination. If the oil is found dirty, contaminated, or should be changed according to the periodic inspection list, change the oil.

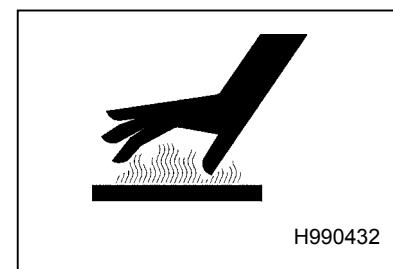


4.3.2 Check Coolant Level

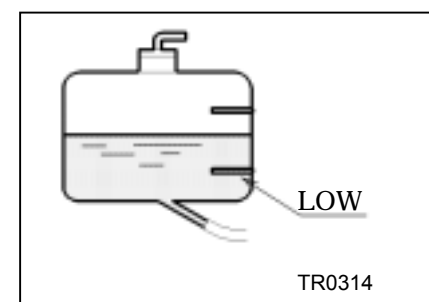


Taking off the radiator cap

- Be sure to stop the machine first and then loosen the radiator cap slowly, after the coolant water is sufficiently cooled and the inner pressure is released.
If this procedure is neglected, its inner pressure can blow off the cap, and steam jetting out of the radiator could cause scalding.



- Check the coolant level in the reserve tank. If it is lower than the limit, open the cap and replenish the coolant.
(Level must be kept above LOW mark)
- If little coolant is left in the reserve tank, replenish the tank and radiator also. (See 5.5.13.)



4. Operation

4.3.3 Check Fuel Level

CAUTION

- Do not, under any circumstance, bring lit cigarettes and/or matches to the fuel.
- The fuel is extremely flammable and dangerous. Be careful of fire because it is very likely to catch fire.
- Refuel only after stopping the engine, and never leave open fuel can near the machine. Do not spill. It could cause a fire. When it is spilt, wipe it up completely.
- Refilling fuel tank should be done in an outdoor well-ventilated place.

Fire prevention



IMPORTANT

— Choose appropriate fuel —

- Be sure to use diesel fuel oil.
(Using other oil will cause low power output or damage the engine.)
- Check fuel level gauge before operation. Replenish enough fuel to prevent fuel shortage during operation.
- Be sure to fasten the fuel tank cap firmly after replenishment. If fuel is spilt, wipe it up completely.

4.3.4 Check V-belt Tension

IMPORTANT

- If V-belt tension too tight, it can cause shaft breakage or shorten the life of a bearing. If too loose, the belt may slip and will cause early breakage or damage to the belt.

- Adjust the fan belt and alternator V-belt by the following procedure:

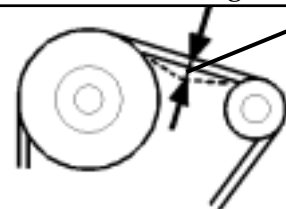
(Procedures)

Unfasten the mounting bolts of the alternator to adjust the alternator.

Visually check the belt for any crack, wear, and other defect.

Loosen the mounting bolt of alternator once. Then adjust it so that the belt deflection will be 8-12 mm [98.1N (10kgf)] when pressing with a finger. Be careful not to leave any grease and LLC on the belt. If any of such material is left, wipe it off completely.

Depress the middle of the belt with a finger.



Then check the deflection of the belt and make sure that it shall be 8 to 12mm.

A010181

4. Operation

4.4 Unit Operation

WARNING

- Keep the door shut and locked when machine is in operation.
- If opening the door is necessary, be careful not to touch rotating or hot parts. Burns or serious injury could result.

IMPORTANT

- After the engine starts up, warm up it under unload for approx. five 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 alarm lamps are off.
- Be sure to operate the generator at a rated frequency, irrespective of the load capacity.
If the machine is operated with a frequency lower than the rated frequency, it could cause the generator or to be burned.

4.4.1 Procedure to Start the Unit

Follow the starting procedure below.

(Manual operation)

Switch "OFF" the circuit breaker on the instrument panel.

Set the selector switch "1" to "MANUAL" operation position.

Turning the starter switch to the "RUN" position, the engine starts preheating automatically.

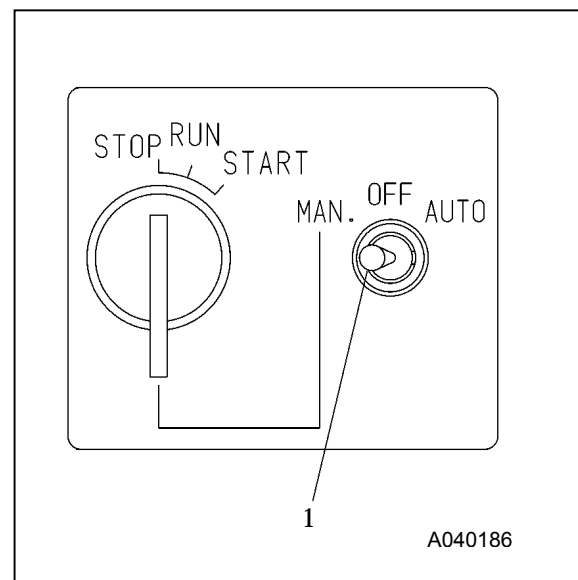
When the preheating lamp goes off, turn the starter switch to "START" position and start the engine.

Once engine has started, let it warm up about five minutes at no-load condition.

Make sure that engine speed at no-load meets 62.5Hz(1.875min⁻¹)

Adjust the voltage to the rated voltage by turning the voltage regulator knob, watching the voltmeter.

Switch the three-phase breaker "ON" to supply generator power. To use auxiliary AC power receptacles, switch the single-phase and three-phase breakers to "ON" for power.



4. Operation

(Automatic operation)



WARNING

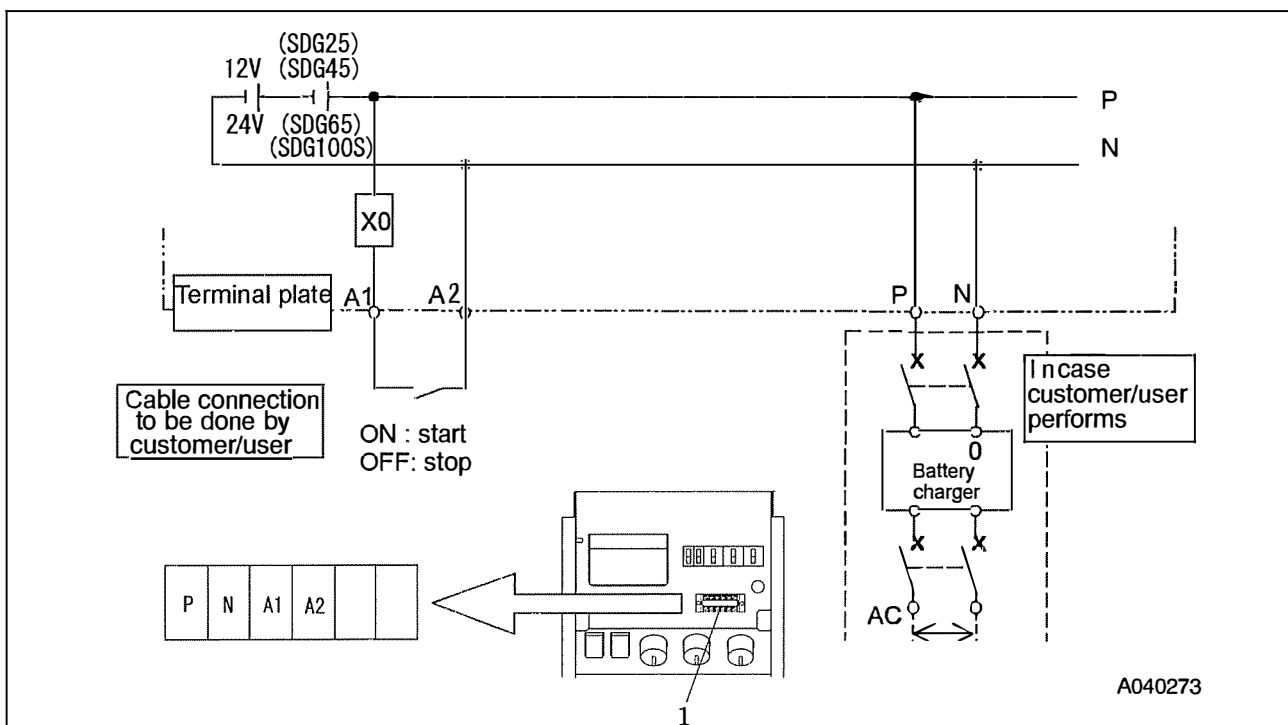
Inspection and maintenance prohibited during automatic operation

- Never put your hands close to the interior of the machine, because the generator can be started when start signal functions even while the machine is in stop position.
- Before starting inspection and maintenance job, make sure to place the selector switch of automatic starting panel to "MAN" position and to hang the tag "Under inspection and maintenance".
- Remove the battery cathode cable terminal.
- Pull out the starter key of the generator and the inspector himself should keep it during inspection and maintenance job. neglect and/or ignoring the above items could cause a serious accident to other persons standing close by the machine when any other person than the inspector himself starts the machine.



1. Cable connection method of remote control switch

The remote control terminal "1" is provided inside the output terminal. Perform cable connection as shown below for remote control operation of the machine. For this cable connection job, make sure to remove the battery cathode cable terminal.



IMPORTANT

— Install the battery charger —

- While the machine is in stand-by conditions during automatic operation, battery discharge occurs. Make sure to charge battery, operating the battery charger.

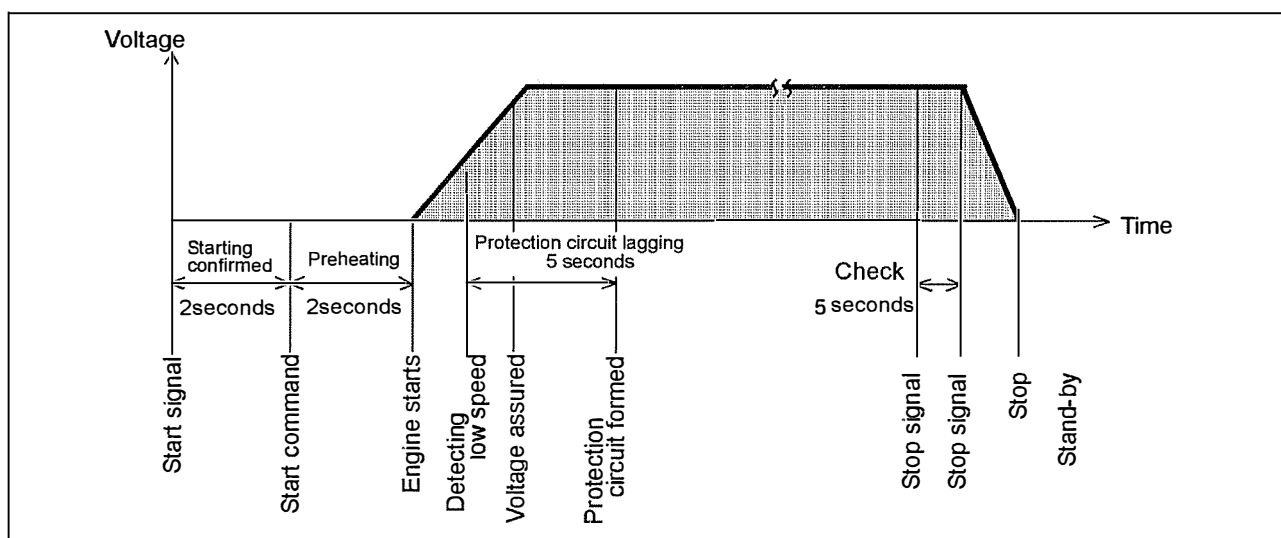
4. Operation

2. Operating procedure

- ① Start the generator unit under the procedure of manual operation and adjust the frequency and voltage.
- ② Turn the starter switch to "STOP" position and stop the engine.
- ③ Turn the circuit breaker of output terminal "ON" after the generator unit stopped when you use the circuit breaker and single phase receptacle on the control panel.
- ④ Turn the operating selector switch to "AUTO" position on the control panel.
- ⑤ The unit will be under stand by and start once the start signal is sensed.

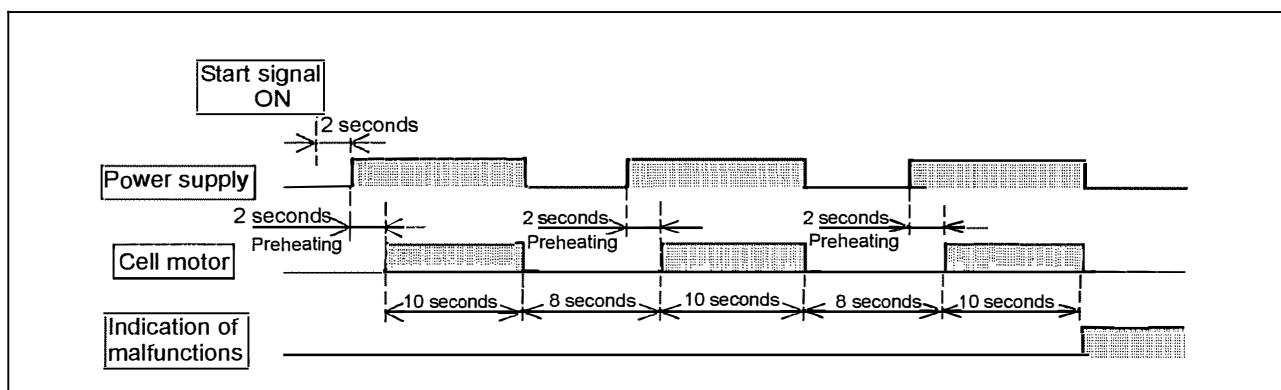
3. Function

When start signal activates in stand-by conditions, it starts the generator engine after preheating. When stop signal activates, it continues 5 seconds cooling down operation to stop engine and the machine is placed again in stand-by conditions.



4. Starting action

Even when the engine will not start even after cranking operation for 10 seconds, stop it 8 seconds and then try cranking operation again. In case the engine will not start even after cranking operation is repeated three times, trouble signal goes on showing difficulty in starting.



IMPORTANT

— Perform periodical inspection and maintenance of the generator —

- For maintenance of the generator, try operation 5 to 10 minutes once a week.

4. Operation



CAUTION

- This machine is so designed for safety that operator may not touch the output terminal during operation. If you open the output terminal cover during operation with three-phase breaker switched “ON”, the three-phase breaker will be “OFF” to cut power supply to the output terminal. When starting operation, make sure that the output terminal cover is closed.

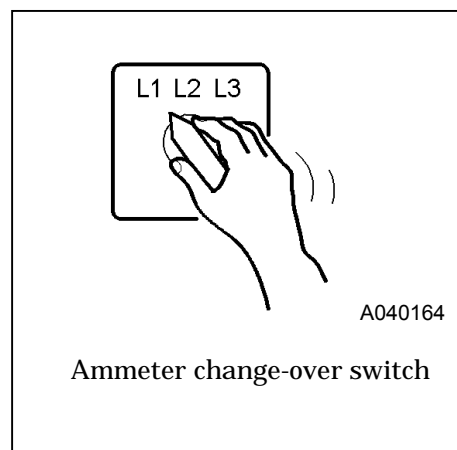
4.4.2 Meter and Indicator Lights while Operating

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 switch.

	Voltmeter (V)	Frequency meter (Hz)	Ammeter (A)	Warning Lamp					Display Lamp
				Oil pressure	Engine temp.	Over crank	Charge	Air filter	Glow
Before Starting up (preheating)	0	0	0	Off	Off	Off	 On	Off	 On
During Operation (Full load)	240 480	60	Less than rated current	Off					Off
During Operation (Unload)	240 480	62.5							

- 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.
- In single-phase load operation, check the current of L1, L2, and L3 phase with the ammeter, by turning the ammeter change-over switch. 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.
- When the voltage selector switch is in the single-phase 240/120V position, place the ammeter change-over switch to the L1 or L3 position to read the output.



4. Operation

4.5 Stopping Procedures

(Procedure)

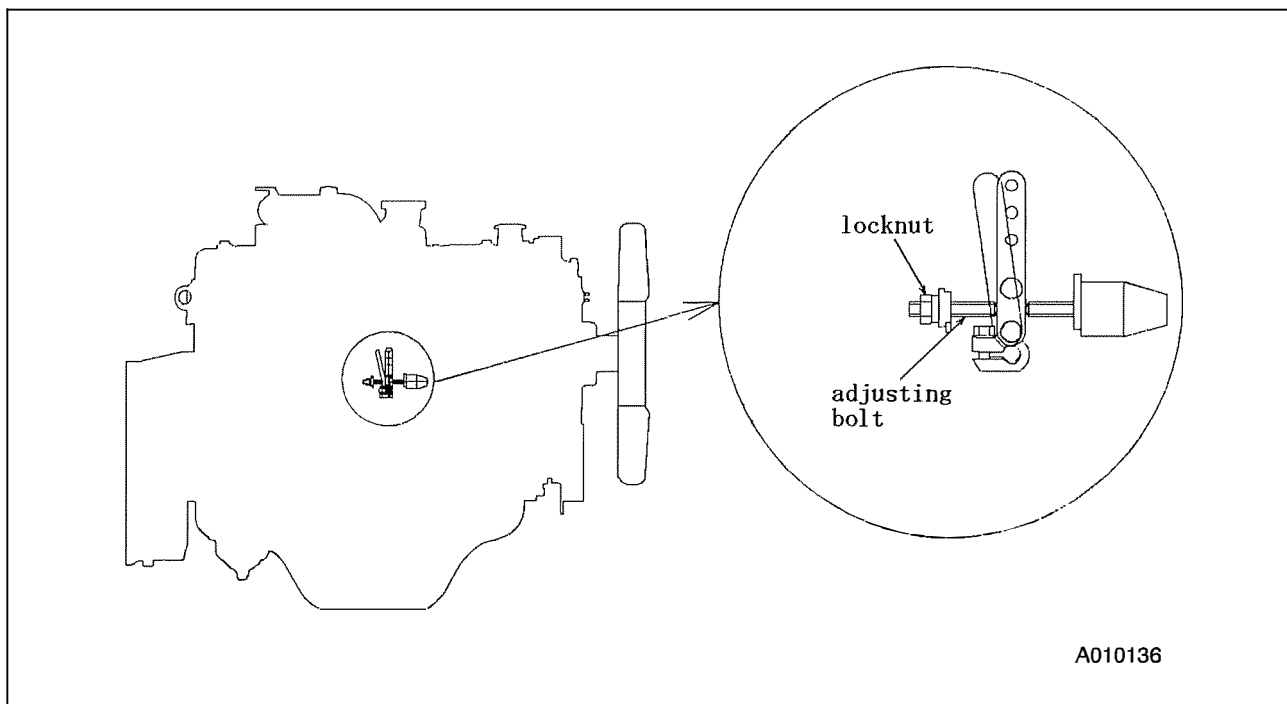
- ① Switch "OFF" the breaker on the operation panel of the generator.
- ② After performing cooling down operation about 5 minutes, place the starter switch to the "STOP" position to stop the engine.
- ③ While the machine is kept unused, keep the operation selector switch placed to the "OFF" position.

4.6 Adjustment of frequency

- When it is necessary to adjust frequency during operation, take the following steps.

(Procedure)

- ① Loosen the locknut of the engine governor adjusting bolt.
- ② Watching the frequency meter, adjust the frequency to the value mentioned in 4.4.1 by turning the adjusting bolt. Turning & screwing in the adjusting bolt to right increases frequency. On the other hand, loosening to the left lowers frequency.
- ③ After this adjustment is finished, be sure to tighten the lock-nut securely so that the nut can be fixed not to get loose during operation.



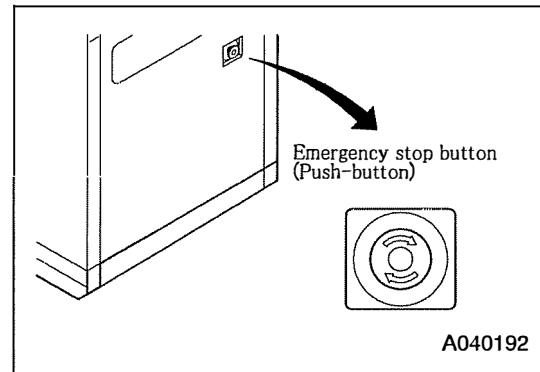
4. Operation

4.7 Emergency Stop

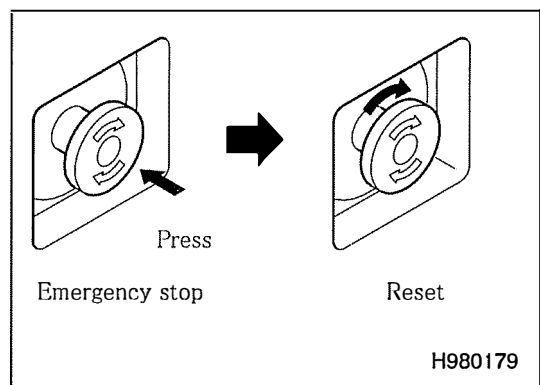


- The Emergency Stop button should be used only for emergency stop.
- Regularly check the operating performance.

- If it is necessary to stop the generator for emergency, press the Emergency Stop button.



- To reset the button, turn the button head in the direction of the arrow. If it is not reset, the machine cannot restart to operate.



4.8 Air Bleeding

Should the machine stop due to the shortage of fuel, perform the air bleeding operation according to the following procedures.

(Procedure)

- ① Replenish fuel.
- ② Place the operation selector switch to the “MANUAL” position.
- ③ Turning the starter switch to “RUN” position, the electromagnet pump functions to bleed the air in fuel pipe system automatically.
- ④ The air bleeding operation can be finished within 20 to 30 seconds.