AIRMAN

INSTRUCTION MANUAL

ENGINE GENERATOR

SDG 25S-3A3
SDG 45S-3A4
SDG 60S-3A2
SDG 75S-3A2
SDG100S-3A2

HOKUETSU INDUSTRIES CO., LTD.

Preface

- This operation manual explains and illustrates proper handling of the unit and the method of daily inspection and maintenance which will enhance the performance of AIRMAN's generators.

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

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

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

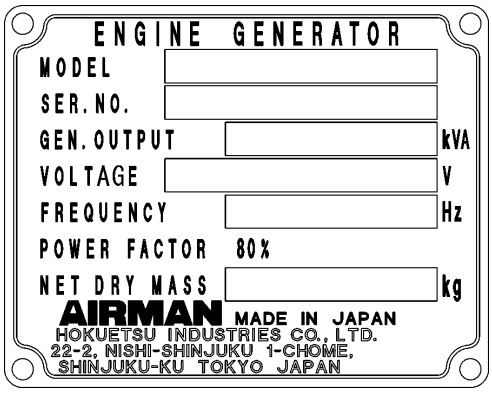
- Make sure that the manual is included with the unit when it is handed over to another user.

- There may be minor 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 need parts or service information about the unit, please give your dealer model and serial number of the unit. A plate stamped with model type and serial number is attached to the right hand side of the instrument panel of the unit.

MODEL: _____

SER. NO.: _____



A010053

⚠ WARNING

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

Table of Contents

1. Safety

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

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

For better understanding, according to the degree of potential danger harmful to a human body, safety messages are classified into three hierarchical categories, namely, DANGER, WARNING, and CAUTION 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.

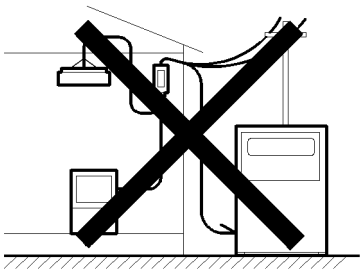
Follow warnings mentioned in this manual. This instruction manual does not describe all safety items. We, therefore, advise you to pay special attention to all items (even though they may not be described in the manual) for your safety.

1.Safety

1.1 Caution before Operation

WARNING

- Make sure not to connect the output terminal of the machine with commercial power source from electric power company. It may cause electric shock, machine problems and even a fire.
- Any source of high voltage is a source of potential LETHAL voltage. Maintain all electrical cords and connections in proper condition. Do not operate the unit in the rain, around standing water or when wet. **Always ground the generator properly before operating.** Never allow untrained or unqualified individuals to operate or remain in the vicinity of the equipment when it is operating.
- When connecting a cable to the load, do not use a cable with damaged covering or with inappropriate insulation.
- Make sure connections between input/output terminals are tight. Otherwise, it may loosen during operation which may cause a fire or electric shock accident.



SG0101

H990208

WARNING

Ventilation

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

PC002

1.Safety

DANGER — ***Handling battery***

- Keep flames away from battery.
- Batteries generate hydrogen gas and may explode.
- Therefore, recharging should be done in a well-ventilated place.
- Do not allow sparks, lighted match, or lit cigarette close to the battery.
- Do not check the battery by short-circuiting the positive and negative terminals with a metallic object.
- Do not charge the frozen battery. Otherwise it may explode. If the battery is frozen, warm it up until the battery temperature becomes 61 °F to 86 °F (16℃ to 30℃).
- Battery electrolyte is diluted sulfuric acid. In case of mishandling, it could cause skin burning.
- Wear protective gloves and safety glasses when handling a battery.
- If battery electrolyte contacts your clothes or skin, rinse with large amounts of water immediately.
- If the battery electrolyte gets into your eyes, rinse immediately with plenty of water and see a doctor at once, because eyesight could be damaged.
- Dispose of battery, observing local regulations.

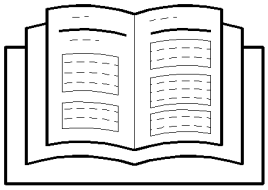
D004

W010

TR0093

WARNING — ***Follow the safety instructions***

- Read each instruction plate which is displayed in the manual and on the unit carefully, understand its content and follow all rules and warnings.
- Keep the Safety Warning labels clean. When they are damaged or missing, apply to your dealer for new ones.
- Do not modify the machine without prior approval. Safety of the machine may be compromised, functions may be deteriorated, or machine life may be shortened.
- Never use the unit for purposes other than power supply. Otherwise, serious accidents may occur.



TR0086

WARNING — ***Maintain both physical and mental health***

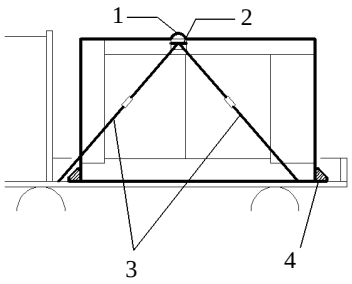
- Do not operate the machine if you are tired, impaired or under the influence of drugs. Otherwise, careless handling may cause an unexpected injury or accident. Manage your physical and mental health and be cautious in handling the machine.

1.Safety

WARNING

Transportation

- Use the lifting bail (1) in the center of bonnet for hoisting up and down the machine. Since the rope hook (2) in 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(3) in the center of bonnet. Apply chocks(4) to fix the machine on the truck bed when necessary.
- Select an appropriate crane and truck by referring to the mass and dimensions shown in “Specifications” in Chapter 9.
- Only the qualified crane operator is allowed to operate a crane.
- Do not hoist up the machine while it is running. Otherwise, a fatal trouble or serious accident may occur to the machine parts.

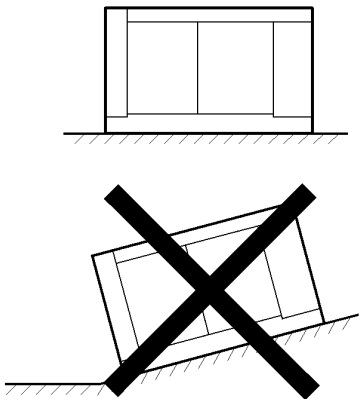


SG0102

WARNING

Installation

- The machine must be installed on dry, firm and level area.
- In case the machine has to be installed on a slope, keep the inclination angle less than 5 degrees.
- Avoid installing the machine in a place such as a damp area or a place where puddles might form after rain. Such an installation could cause electric shock.
- Do not direct the exhaust gas outlet to nearby personnel or houses in the vicinity.
- When installing the machine at salt water areas or on a ship, make sure the machine is not exposed directly to sea water.
- When installing the machine at sandy areas, 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 5 °F to 104 °F (–15℃ to +40℃)
- Humidity Less than 85%
- Altitude Lower than 1,640ft (500 m) above sea level


SG0103

1.Safety

⚠ WARNING — ***Safety around the machine***

- Such things as unnecessary equipment, tools, cables, hoods, covers and wood pieces which are a hindrance to the job, must be cleared and removed. Operators and/or personnel nearby may stumble on them and could be injured.

⚠ CAUTION — ***Check before starting the unit***

- Be sure to check the unit before operation.
  When any abnormality is found, be sure to repair it before restarting the unit.
- Be sure to make daily checks before operation. If the unit is operated without prior checking and a potential problem was not found, operation of the unit may cause seizure of components or cause a fire.

⚠ WARNING — ***Safety outfit***

- When operating the machine, do not wear;
- loose clothes
- clothes with unbuttoned sleeves
- hanging tie or scarf
- loose fitting jewelry

  Such outfit may get caught into the machine rotating parts and this could cause a serious injury.

TR0084

⚠ CAUTION — ***Safety equipment***

- Wear helmet, safety glasses, earplugs, safety shoes, safety gloves and a mask, according to the requirements of each operation.

TR0085

⚠ CAUTION — ***Safety aids***

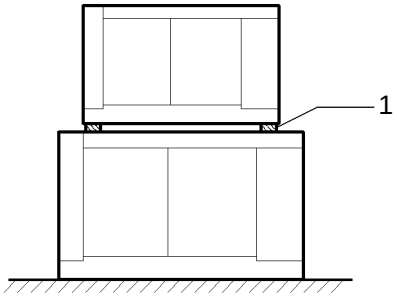
- Have first-aid boxes and fire-extinguishers near the unit ready for emergency situations such as injuries or fire.
- It is advisable to have a list of phone numbers for doctors, ambulance and the fire department available in case of emergency.

TR0096

CAUTION

Stacking up box type machines

- When stacking up the machines for storage, only two units stacking is acceptable.The mass of the lower machine should be larger than that of the upper one.
- Select a leveled floor with sufficient strength for stacking up the units.
- Before stacking the machines up, check the machine for any deformation of bonnet, looseness or missing of bolts, and other parts.
- When stacking the units up, be sure to fix them as shown in the figure so that the balanced weight is applied to each squared lumber (1) for preventing a sideslip or a collapse.
- Never operate the machines with stacking conditions. It is very dangerous.
- It is dangerous to stack the machines, because they could fall down due to sideslip or collapse when an earthquake happens. Pay careful attention to the storage floor for safety.



SG0104

1.2 Caution during Operation

WARNING

Keep away from output terminals

- Never touch the output terminals during operation.
- Pay attention that high voltage is present at the output terminals.
- When removing or connecting a "load" cable, be sure to switch OFF the circuit breaker. Turn off the machine, remove the starter key from the starter switch, then change cables. The operator must hold the key during cable changing.

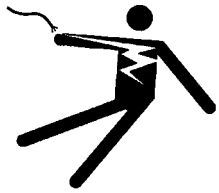
  Neglecting the cautions mentioned above, and a third party starting the machine during operation may cause serious accidents such as electric shock.

H990208

WARNING

Never touch the interior of control panel

- Never touch the interior of the control panel during operation.
- Pay attention that high voltage is present at interior of the control panel.
- Authorized personal only to open control panel.

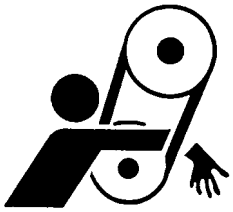


H990208

Hands off from rotating parts and belts

WARNING

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

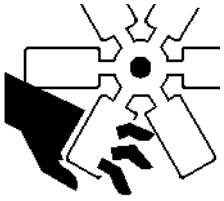


TR0304

Beware of cooling fan

WARNING

- Never put your hand near the engine cooling fan during operation. It could cause serious injury if a hand should be caught.



W009

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 is released and this could cause scalding.

H990432

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.
- Such parts as engine, exhaust manifold, exhaust pipe, muffler, and radiator are especially hot, stay clear of these parts. It could cause serious burns.
- 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 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 area.
- Refuel after stopping the engine, and never leave the fuel nearby the machine. Do not spill. It may cause a fire. If spilled, clean up completely.
- 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 near the machine in case of an unexpected fire.

D004

H990433

WARNING

Draining during operation prohibited

- Do not, under any circumstance, open these during operation:
- Coolant drain valve and plug
- Engine oil drain plug

PK0028

CAUTION

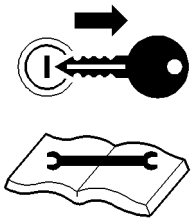
Unbalance of overload and load

- Reduce the load if 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 remains balanced.
- If the above procedure is neglected during operation, the generator could be damaged or cause a fire. If the machine is operated with the frequency lower than the rated frequency, it could cause the generator or load to be damaged.

1.3 Caution during Inspection and Maintenance

WARNING — ***Hang a "Now Checking and under Maintenance" tag***

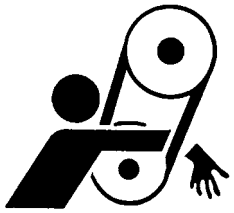
- Before starting inspection, switch off the circuit breaker of the machine, remove the key from the starter key switch, hang a "Now Checking and under Maintenance" tag where it can be easily seen. Operator and service personnel must keep the key during checking and maintenance.
- Remove the negative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



SY001

WARNING — ***Adjusting tension of fan belt***

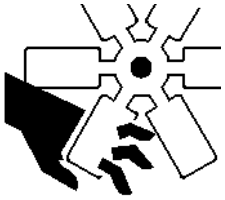
- Be sure to stop the engine and remove the starter key whenever fan belt tension is to be adjusted.
- If the machine is running, it might catch the operator's hand into the fan belts, and this could cause a serious injury.



TR0304

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, which could cause a serious injury.



W009

WARNING — ***Cleaning with compressed air***

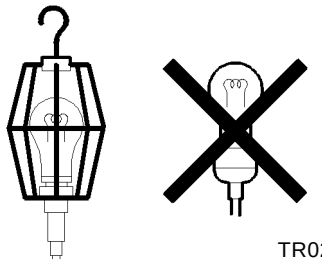
- When cleaning dust accumulated in components such as radiator, air-filter, etc., when blowing compressed air, wear safety glasses, etc. to protect your eyes.

M003

CAUTION

Lighting apparatus

- Do not attempt operating or servicing the machine in the dark.
- It is recommended to use a lamp which has a safety guard. Operating or servicing the machine in the dark may cause unexpected accidents.
- Lamps without safety guards are not recommended since they are easily broken and could ignite flammables such as fuel, etc.



TR0206

CAUTION

Removing radiator cap

- Before removing radiator cap, let machine cool down to a safe temperature and loosen the radiator cap one notch which will release any remaining inner pressure. The coolant must be sufficiently cooled to a safe level and the inner pressure completely released. Then take the cap off.
  If this procedure is not followed, the inner pressure can blow off the cap when turned. Steam jetting out of the radiator could result in 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 jetting out of the drain valve could result in scalding.

H990432

CAUTION

Refilling or draining of engine oil

- After stopping the engine, wait until engine cools down. Then check the level of the engine oil, refill or drain the oil.
- Engine oil is very hot and highly pressurized during or just after engine operation, while draining oil, make sure engine is cool. Hot oil could result in scalding.

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. This will avoid decrease in electrical insulation or other problems to the machine.

CAUTION

Disposal of waste liquid, etc.

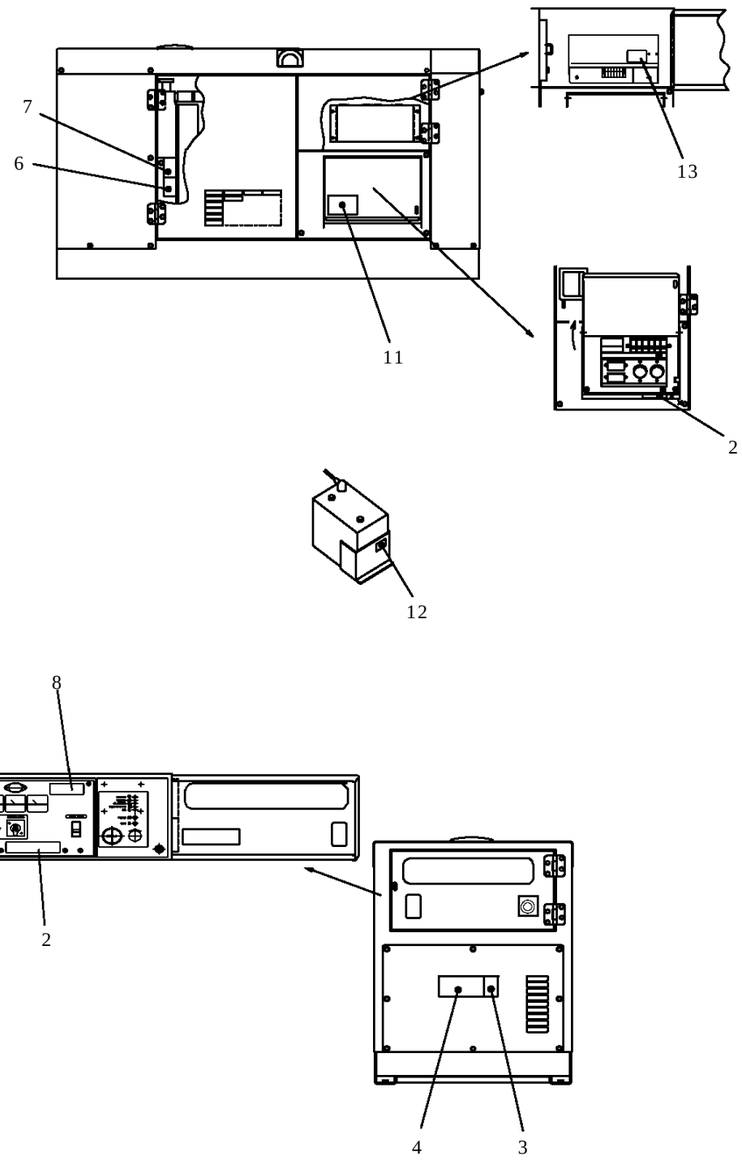
- Waste liquid from the machine contains harmful material. Do not discharge onto the ground, river, lake or sea. Such material will contaminate the environment.
- Use a container to hold the waste liquid taken from the machine.
- Follow designated regulations when disposing of oil, fuel, coolant (antifreeze), battery or other harmful materials.

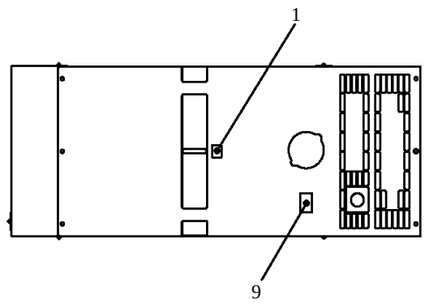
1.4 Safety Warning Labels

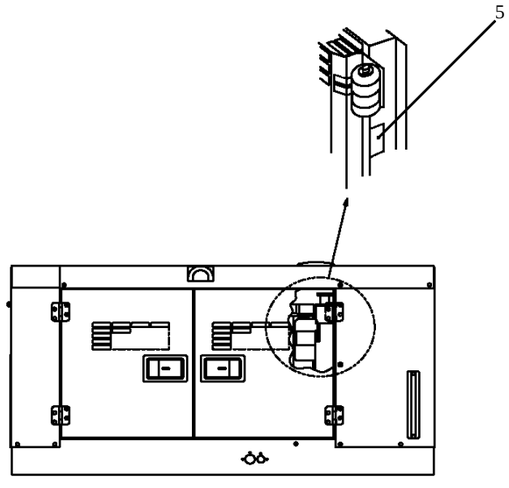
SDG25S

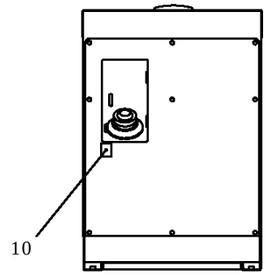
Following labels are attached to the machine.

Keep them clean all the times. If they are damaged or peeled off, immediately place an order with your nearest dealer for replacement., with the numbers indicated on the lower right corner of the label. Adhere a new one to the original place.







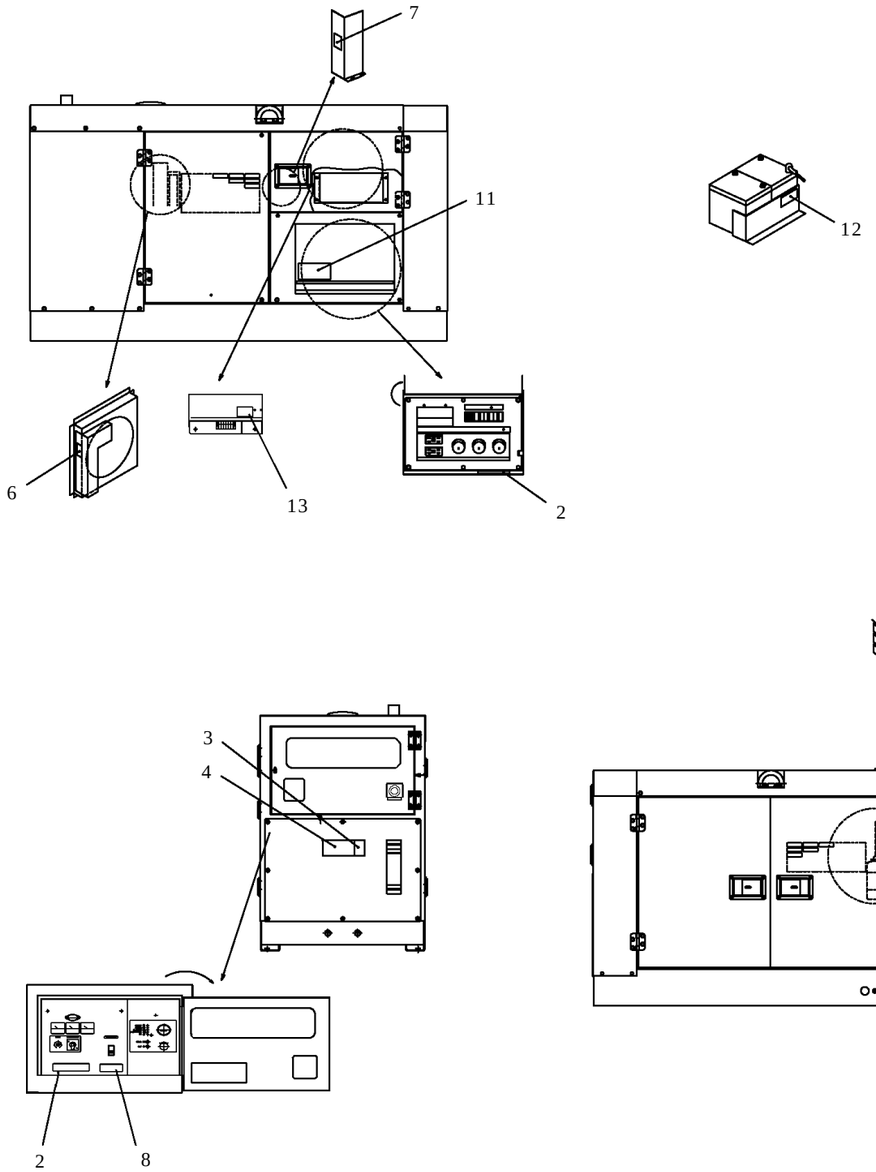


P010037

1. Lifting bail (39176 69300)
2. Caution Do not touch (39176 62900)
3. Caution exhaust gases (39176 73300)
4. Caution, before starting (39176 35701)
5. Caution, cooling fan (39176 73500)
6. Caution, fan belt (39176 73800)
7. Caution, high temp (39176 69500)
8. Caution, open panel (39176 65501)
9. Caution,radiator cap(hot water) (39176 69600)
10. NO Fire (39176 35600)
11. Caution, high voltage (39176 62400)
12. Caution battery (39176 50000)
13. Caution, Do not switch (39176 62700)

SDG45S/60S

Following labels are attached to the machine.
Keep them clean all the times. If they are damaged or peeled off, immediately place an order with your nearest dealer for replacement., with the numbers indicated on the lower right corner of the label. Adhere a new one to the original place.



P010038

1. Lifting bail (39176 69300)
2. Caution Do not touch (39176 62900)
3. Caution exhaust gases (39176 73300)
4. Caution, before starting (39176 35701)
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6. Caution, fan belt (39176 73800)
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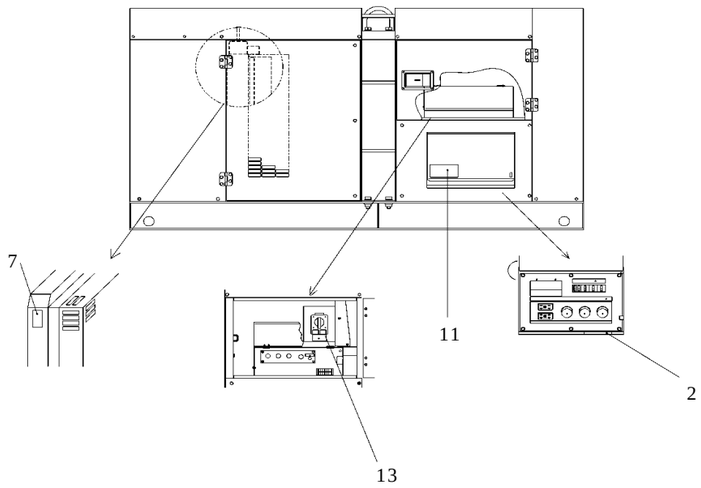
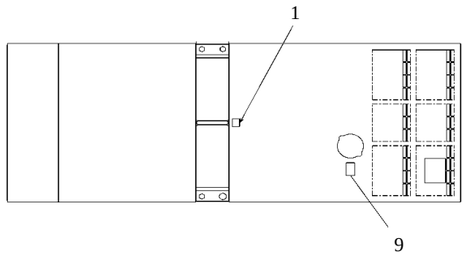
8. Caution, open panel (39176 65501)
9. Caution,radiator cap(hot water) (39176 69600)
10. NO Fire (39176 35600)
11. Caution, high voltage (39176 62400)
12. Caution battery (39176 50000)
13. Caution, Do not switch (39176 62700)

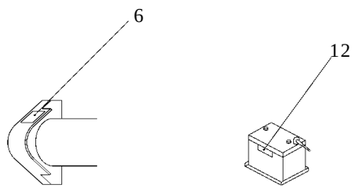
SDG75S/100S

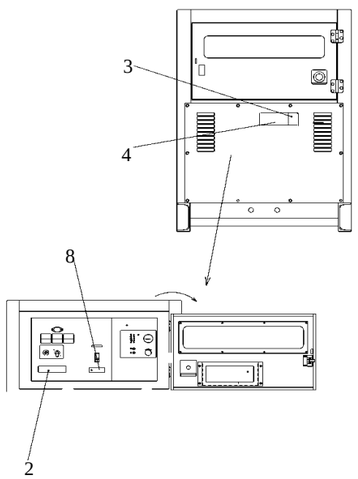
Following labels are attached to the machine.

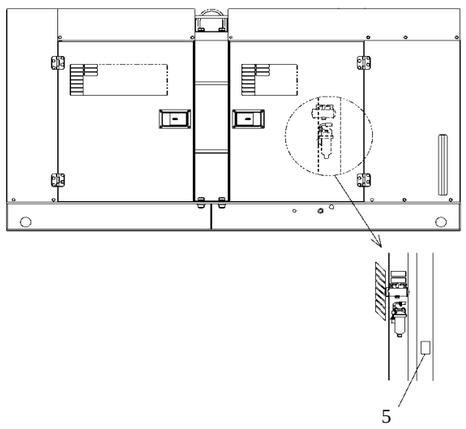
Keep them clean all the times. If they are damaged or peeled off, immediately place an order with your nearest dealer for replacement., with the numbers indicated on the lower right corner of the label. Adhere a new one to the original place.

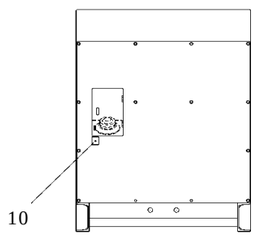










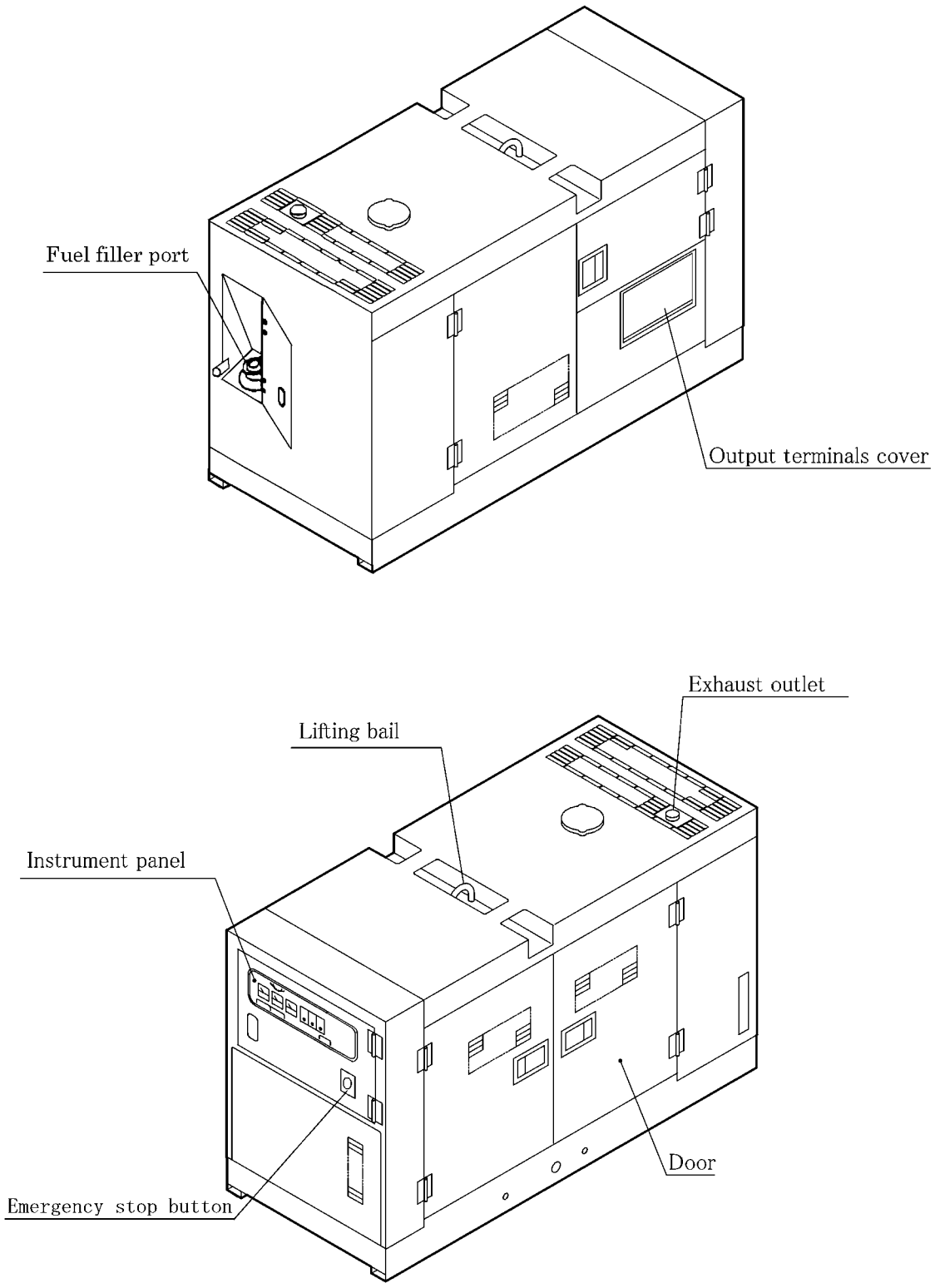


P010039

1. Lifting bail (39176 69300)
2. Caution Do not touch (39176 62900)
3. Caution exhaust gases (39176 73300)
4. Caution, before starting (39176 35701)
5. Caution, cooling fan (39176 73500)
6. Caution, fan belt (39176 73800)
7. Caution, high temp (39176 69500)
8. Caution, open panel (39176 65501)
9. Caution,radiator cap(hot water) (39176 69600)
10. NO Fire (39176 35600)
11. Caution, high voltage (39176 62400)
12. Caution battery (39176 50000)
13. Caution, Do not switch (39176 62700)

2. Names of Components

2.1 Unit Appearance and Part Names

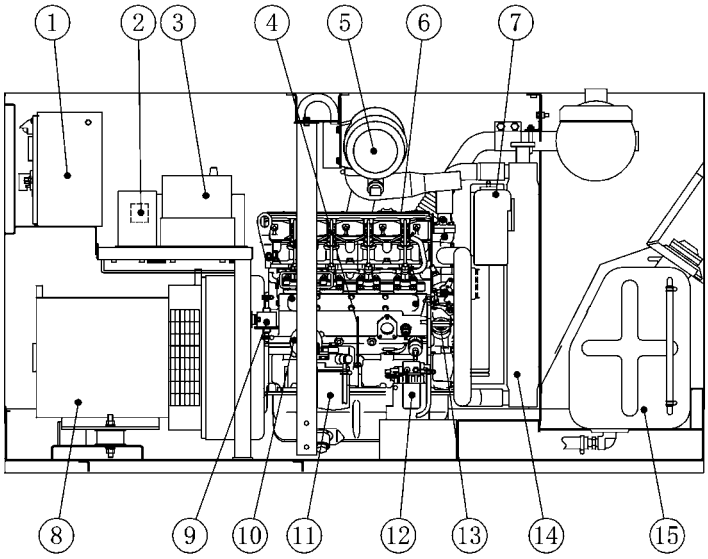


SDG25S

2. Names of Components

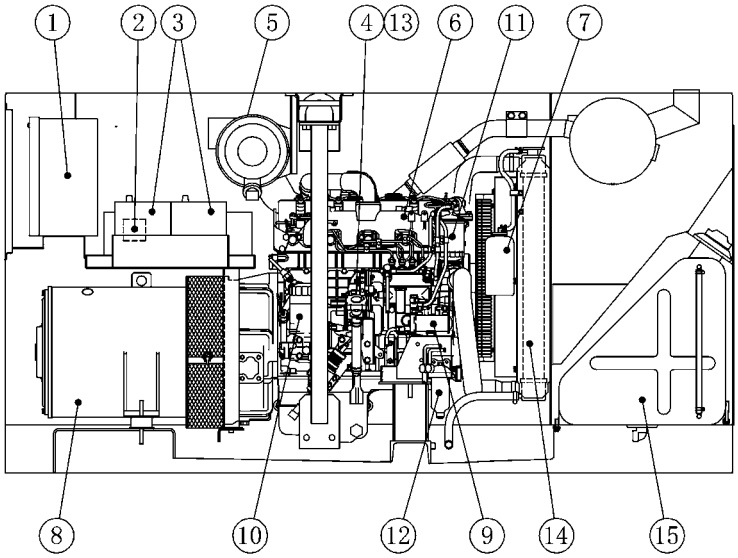
2.2 Main Components and Part Names

SDG25S



H990172

SDG45S/60S

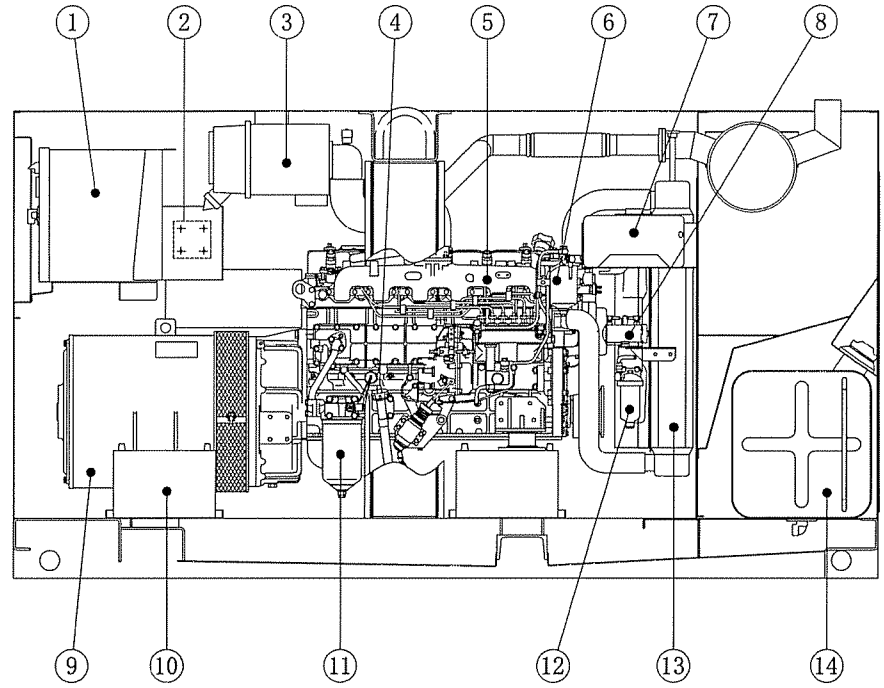


H990173

①Control panel
②Voltage selector switch
③ Battery
④Engine oil dipstick
⑤Air filter
⑥Engine
⑦Reserve tank
⑧Generator
⑨Fuel air-bleeding electromagnetic pump
⑩Engine oil filter
⑪Fuel filter
⑫Sedimenter
⑬Engine oil filler
⑭Radiator
⑮Fuel tank

2. Names of Components

SDG75S/100S

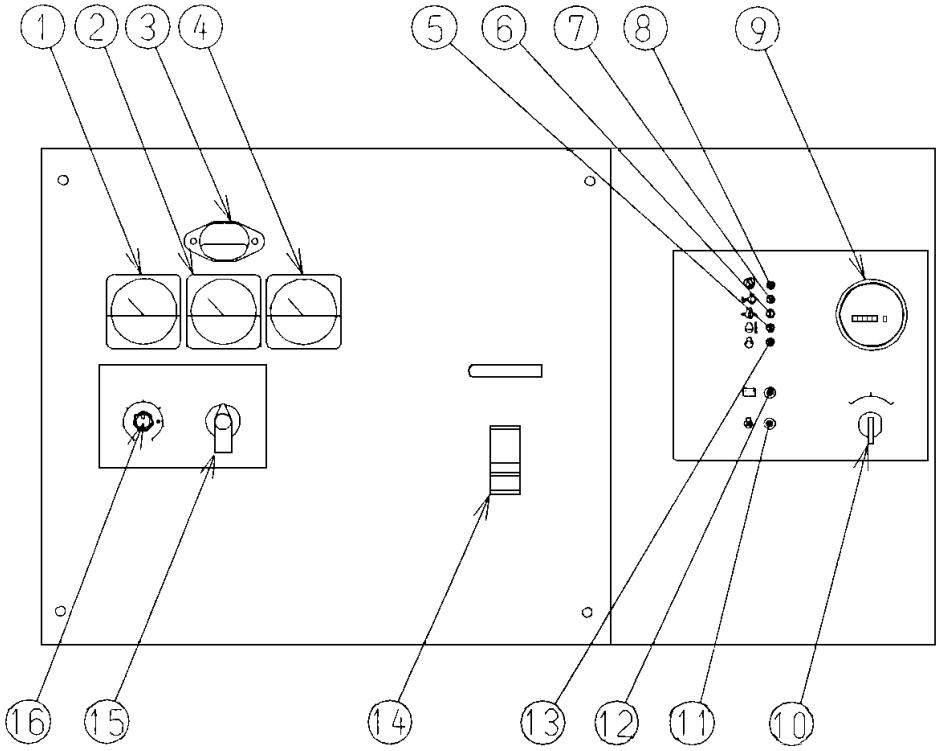


H990338

①Control panel
②Voltage selector switch
③Air filter
④Engine oil filler
(provided with Engine oil dipstick)
⑤Engine
⑥Fuel filter
⑦Reserve tank
⑧Fuel air-bleeding electromagnetic pump
⑨Generator
⑩Battery
⑪Engine oil filter
⑫Sedimenter
⑬Radiator
⑭Fuel tank

2. Names of Components

2.3 Instrument Panel



A010119

①Voltmeter
②Ammeter
③Illumination lamp
④Frequency meter
⑤Warning lamp for high coolant temp
⑥Warning lamp for low engine oil pressure
⑦Warning lamp for overspeed
⑧Warning lamp for overcrank
⑨Hour meter
⑩Starter switch
⑪Glow lamp
⑫Warning lamp for charging
⑬Engine running lamp
⑭Three-phase breaker
⑮Ammeter change-over switch
⑯Voltage regulator

2. Names of Components

2.4 Warning and Emergency Display

Warning and Emergency Display

- When a warning lamp turns on, stop the machine immediately and take appropriate measures to find the cause.

Item	Trouble	Measures	Reference
* Engine oil pressure	Lamp turns on when the engine oil pressure drops. Operating pressure: lower than 15 psi (0.98 bar).	See Troubleshooting.	See 7.4.
* Coolant temperature	<SDG25S> Lamp turns on when coolant temperature reaches 230 °F (110℃). <SDG45S/60S/75S/100S> Lamp turns on when coolant temperature reaches 221 °F (105℃).		
Charging	Lamp turns on when alternator is not charging.		
* Over crank	Lamp goes on when engine will not start at the set speed. (When cranking operation fails three times, the lamp goes on.)	See Troubleshooting	See 7.4.
* Over speed	Lamp goes on when engine speed exceeds the set speed.	See Troubleshooting	See 7.4.

- The machine automatically stops when the lamp turns on of the above items marked with *.

2. Names of Components

2.5 GFCI (GROUND-FAULT CIRCUIT INTERRUPTER) RECEPTACLES

⚠ WARNING

- 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.

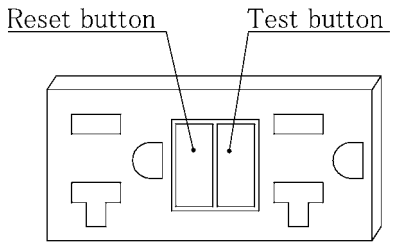
The ground-fault circuit interrupter will not protect against short circuits or overloads. The circuit breaker in the control panel which supplies power to the circuit provides that protection.

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.



H990216

3. Transportation

WARNING

- Use the lifting bail in the center of bonnet for hoisting the machine.
- When towing or transporting the machine from a job site, securely fix it with tie-downs.
- Only qualified personnel should operate a crane.
- If machine is towed with trailer, reduce travelling speed to a safe level.
- When transporting the machine, be sure to put it on the truck bed and securely fix it with tie-downs.
- Select an appropriate crane and truck by referring to the mass and dimensions shown in “Specifications” in Chapter 9.
- Do not hoist the machine while it is running. Otherwise, a fatal or serious accident may occur.

4. Installation

4.1 Place and Conditions of Unit Installation

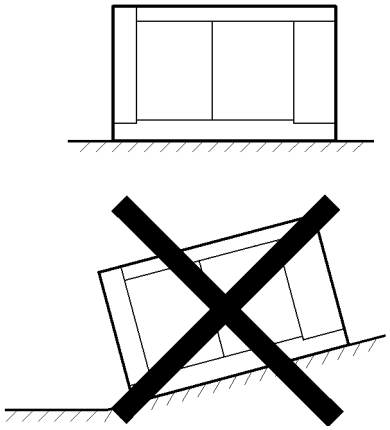
WARNING — ***Ventilation***

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

PC002

WARNING — ***Installation***

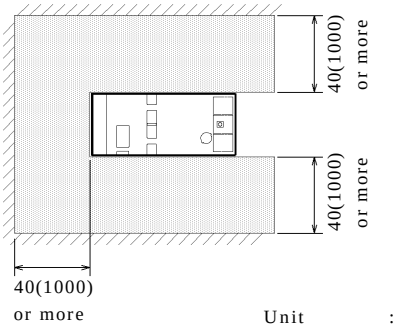
- The machine must be installed on dry, firm and level area.
- In case the machine has to be installed on a slope, keep the inclination angle less than 5 degrees.
- Avoid installing the machine in a place such as a damp area or a place where puddles might form after rain. Such an installation could cause electric shock.
- Do not direct the exhaust gas outlet to nearby personnel or houses in the vicinity.
- When installing the machine at salt water areas or on a ship, make sure the machine is not exposed directly to sea water.
- When installing the machine at sandy area, 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:



SG0103

- Ambient temperature: 5 °F to 104 °F (–15℃ to +40℃)
- Humidity: Less than 85%
- Altitude: Lower than 1,640ft (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.



Unit :

SG0110

4. Installation

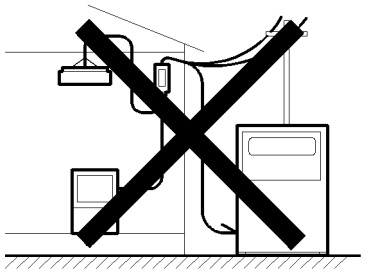
4.2 Selecting Cable

- Select a cable with sufficient diameter by considering the maximum current to be used. The distance from the generator to the load is also a determining factor.
- If the current flowing to the load exceeds the maximum current of the cable, resultant overheating may burn the cable. In addition, if the cable is too small in thickness for the length, the input voltage to the load will be reduced which causes the load input power to drop. As a result, performance of the machine will be reduced.

4.3 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 problems and possibly a fire.
- Any source of high voltage is a source of potential LETHAL voltage. Maintain all electrical cords and connections in proper condition. Do not operate the unit in the rain, around standing water or when wet. **Always ground the generator properly before operating**. Never allow untrained or unqualified individuals to operate or remain in the vicinity of the equipment when it is operating.
- Never touch the output terminals during operation.
- Pay attention that voltage of several hundred volts is applied to the output terminal.
- When removing or connecting a cable for a load circuit, be sure to switch OFF the circuit breaker, remove the starter key from the starter switch, then perform connections. The operator must keep the key with him during this operation.
- When connecting a cable to the load, do not use a cable with damaged covering or with inappropriate insulation.
- Make sure connections between input/output terminals are tight. Otherwise, it may loosen during operation which may cause a fire or electric shock accident.



SG0101

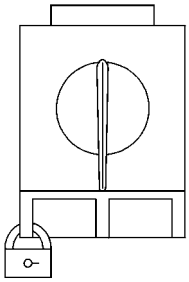
H990208

- Select cable with sufficient diameter by considering the load capacity and the distance from the generator to the load. Use terminals for connections and make sure they are tight.
- After checking phase type and voltage of the load, make sure connections are correct.

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

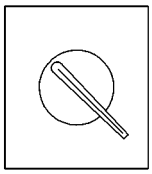
⚠ CAUTION — ***Never use voltage selector switch during operation.***

- 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.



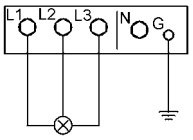
H990305

Voltage selector sw.
Three-phase 480/277V



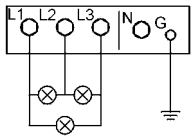
H990181

Output terminals
Three-phase 480V



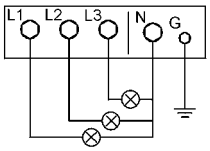
A040153

Output terminals
Single-phase 480V



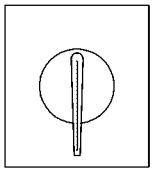
A040154

Output terminals
Single-phase 277V



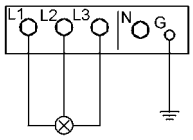
A040155

Voltage selector sw.
Three-phase 240/139V



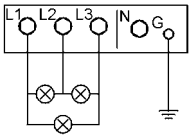
H990177

Output terminals
Three-phase 240V



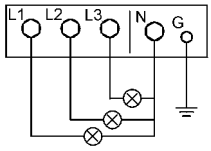
A040156

Output terminals
Single-phase 240V



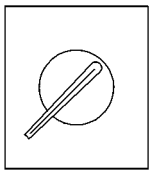
A040157

Output terminals
Single-phase 139V



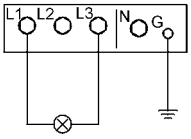
A040158

Voltage selector sw.
Three-phase 240/120V



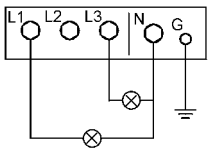
A040161

Output terminals
Single-phase 240V



A040159

Output terminals
Single-phase 120V

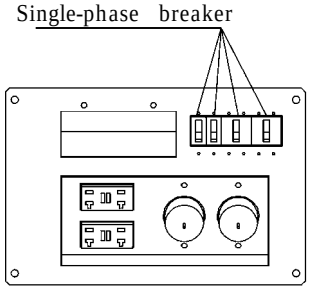


A040160

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.

4.3.2 Auxiliary AC Power

In addition to the AC single-phase power from the output terminals, an auxiliary AC power receptacle panel is provided. To use these receptacles, place the voltage selector switch to the single-phase 240/120V position and adjust the output voltage to 240V with the voltage regulator at the generator control panel.



H990188

4.3.3 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		SDG75S	
	Three Phase 240/480V	Single Phase 240/120V	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	kVA	kW
0.0	25.0	14.4	45.0	26.0	60.0	34.6	75.0	43.5
1.2	20.8	13.2	40.9	24.8	55.8	33.4	70.7	42.3
2.4	16.7	12.0	36.7	23.6	51.7	32.2	66.5	41.1
3.6	12.5	10.8	32.6	22.4	47.5	31.0	62.4	39.9
4.8	8.4	9.6	28.4	21.2	43.4	29.8	58.2	38.7

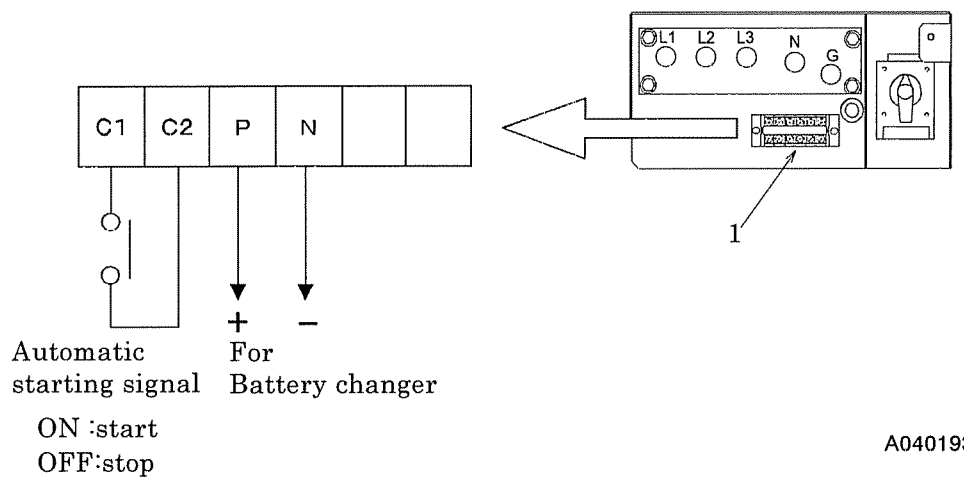
4.3.4 Connection for Automatic Starting

⚠ CAUTION

- As voltage is applied to P.N with battery connected, take care not to cause short-circuit.

A terminal plate (1) for automatic starting is provided at the output terminal. Make cable connection as shown in the figure when this machine is to be controlled by automatic starting mode.

The following connection must be made by customers (users)

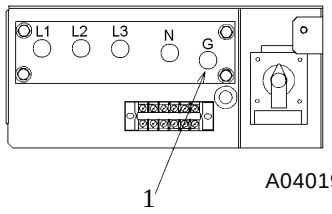


4. Installation

4.4 Grounding Method

4.4.1 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.



SDG25S

4.4.2 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.

4.4.3 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.

5. Operation

5.1 Check before Starting the Unit

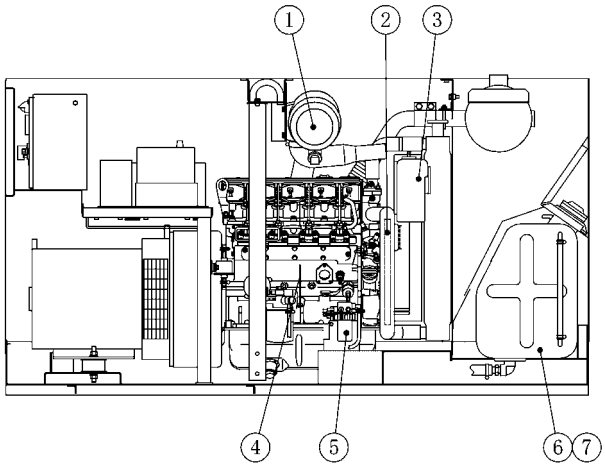
CAUTION

Check before starting the unit

- Be sure to check the unit before operation.
  If any abnormality is found, be sure to repair it before starting the unit.
- Make sure daily checks are done before operation. If the unit is operated without prior checking and abnormality exists, operation could cause seizure of components or may cause a fire.

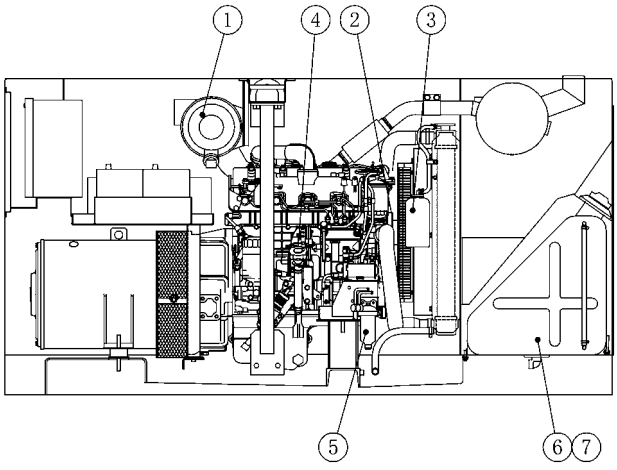
5.1.1 Check Items and Places

SDG25S



H990190

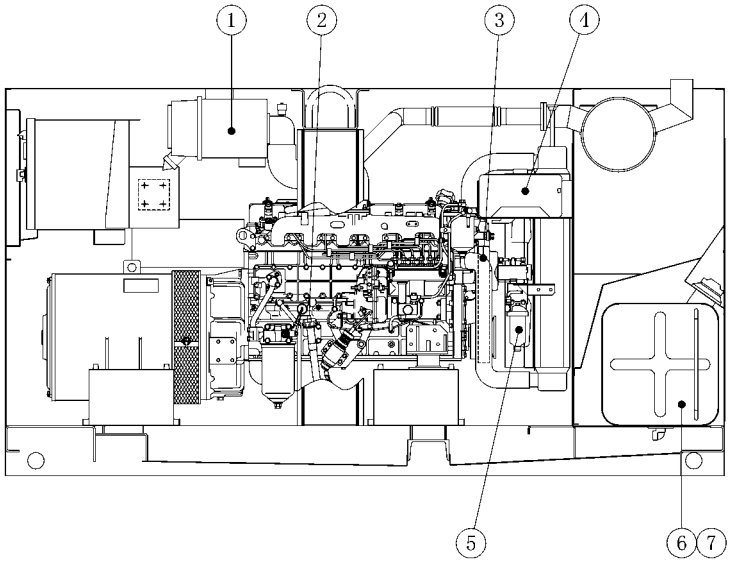
SDG45S/60S



H990191

① Check clogging of air filter element.
② Check V-belt tension.
③ Check coolant level.
④ Check engine oil level.
⑤ Check condensation in water sedimenter.
⑥ Check fuel.
⑦ Drain fuel tank.
● Check wiring of each part.

SDG75S/100S



H990339

①Check clogging of air filter element.
②Check engine oil level.
③Check V-belt tension.
④Check coolant level.
⑤Check condensation in water sedimenter.
⑥Check fuel.
⑦Drain fuel tank.

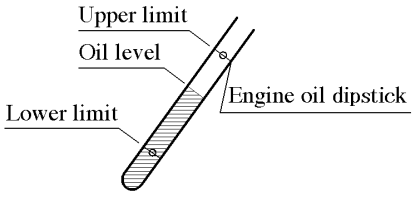
- Check wiring of each part.

5.1.2 Check Engine Oil Level

- Unit should be on level ground 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.

(Procedure)

① Pull out the engine oil dipstick and wipe it with a clean cloth.
② Re-insert the dipstick fully and pull it out again. If the dipstick shows the oil level between upper and lower limits, it is normal.
③ When the oil level is below its lower limit, add engine oil. (See 6.4.1)



H990045

- While checking oil level, check also for contamination. If the oil is found dirty, contaminated, or should it be changed according to the periodic inspection list, change the oil. (See 6.4.1)

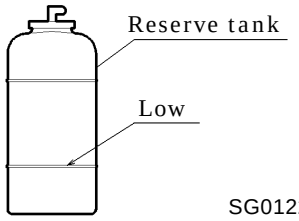
5.1.3 Check Coolant Level

CAUTION — ***Taking off the radiator cap***

- Be sure to stop the machine and allow time to cool. Loosen the radiator cap one notch. After the coolant water is sufficiently cooled and the inner pressure is released, slowly remove the cap.
  If this procedure is neglected, the inner pressure can blow the cap off. Steam jetting out of the radiator could result in a serious scalding injury.

H990432

- 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 radiator with coolant. (See 6.9.1)



SG0122

5.1.4 Check Fuel

CAUTION — ***Fire prevention***

- Do not, under any circumstance, smoke cigarettes or light matches during fueling.
- Fuel is extremely flammable and dangerous. It is, therefore, very easy to start a fire when you handle fuel around flames or sparks.
- Refuel only after stopping the engine, and never leave an open fuel can near the machine. Do not spill. It could cause a fire. If fuel is spilled, clean it up completely.
- Fuel refilling should be done in an outdoor well-ventilated area.

D004

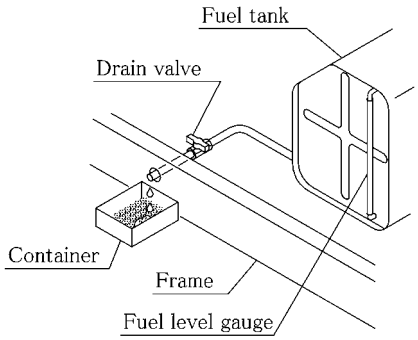
IMPORTANT — ***Choose appropriate fuel***

- Be sure to use diesel fuel oil for diesel engine.
  (Using other oils may cause low power or damage to the engine.)

- Check fuel gauge for low level before operation. Replenish enough fuel to prevent fuel shortage during operation.
- Be sure to fasten the fuel tank cap firmly after refilling. If fuel is spilled, clean it up completely.

5.1.5 Drain Fuel Tank

- Open drain valve at the bottom of the fuel tank to discharge condensation left in the tank.
- With condensation completely drained, firmly close the drain valve.
- Dispose of properly according to designated regulations.



SDG25S H990309

5.1.6 Check Condensation in Water Sedimenter

Check if the red float in the water sedimenter rises up to the water drain level, mark drain water if it is near the maximum drain level.

(1) SDG25S

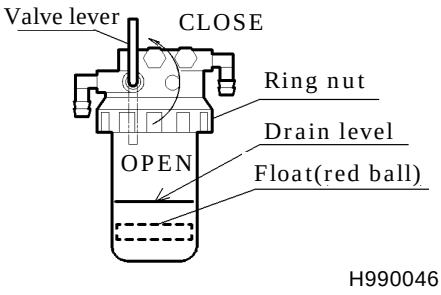
(Procedure)

① Close the valve lever on the upper part of the sedimenter.

② Loosen the ring nut to remove the bowl.
Carefully remove the bowl because it contains fuel.
Be careful not to spill fuel and soil the machine interior.

③ After draining condensation, clean the bowl, and re-install.

④ Turn the valve lever to "OPEN" position to refill fuel and bleed air. (See 5.5)



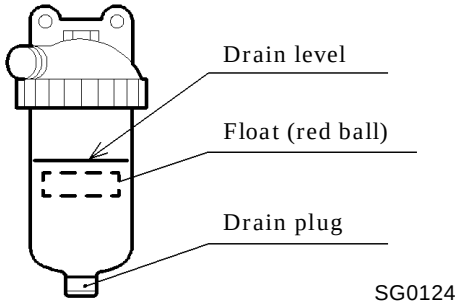
H990046

(2) SDG45S/60S/75S/100S

(Procedure)

① Loosen the drain plug to drain the water from the sedimenter.

② After draining condensation, fasten the drain plug securely.



SG0124

5.1.7 Check Clogging of Air Filter Element

IMPORTANT — ***Be sure to properly clean air filter element*** —

- When an element is clogged or damaged, dust or foreign material will contaminate the engine. This will cause accelerated wear in each sliding part of the engine. Daily checking or cleaning is required to ensure engine long life.
- For servicing the air filter element, see 6.7.2.

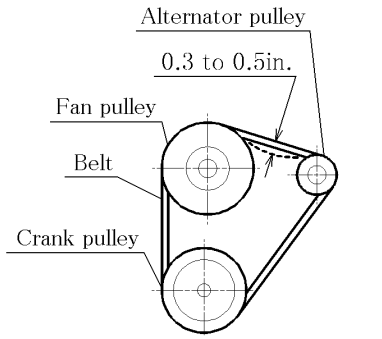
5.1.8 Check V-belt Tension

IMPORTANT

- If V-belt tension is too tight, water pump or alternator bearings may be damaged and possibly shaft broken. If too loose, the belt may slip and cause premature belt damage.
- When replacing belts, change all as a set.

V-belt adjustment procedure:

① Loosen mounting bolts of the alternator to adjust the alternator.
② Visually check the belt for cracks, wear, or other defects.
③ Adjust the belts so that the deflection will be 0.3 to 0.5in. when pressing with a finger.
④ Do not contaminate the belt with grease or LLC (Antifreeze). Be sure it is completely clean.



H980194

5.1.9 Check Wiring of Each Part

Check wiring for loose connections, insulator damage, corrosion or short－circuit.

5. Operation

5.2 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 engine starting, allow five minutes of unloaded warm-up.
- Warming after starting is necessary for smooth engine operation. Do not operate the engine at full load immediately after start up. This will shorten the equipment life.
- During the warm-up operation, check the components for any looseness, leakage of water, oil, fuel, or other problems.
- Make sure that all safety indicator lamps turn off.
- Be sure to operate the generator at the rated frequency, irrespective of the load capacity. If the machine is operated with a frequency lower than rated, the generator may be damaged.

5. Operation

5.2.1 Procedure to Start the Unit

Refer to the following procedure.

<Manual operation>

① Switch "OFF" the circuit breaker (1) on the instrument panel.

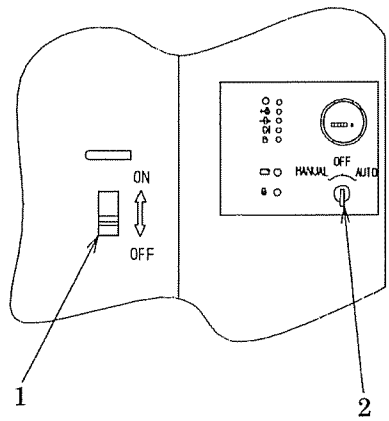
② Set the starter switch (2) to "MANUAL" operation position. Engine will start after being preheated.

③ Once engine has started, let it warm up about five minutes at no-load condition.

④ Make sure that engine speed at no-load meets 62.5Hz(1.875min^{-1})

⑤ Adjust the voltage to the rated voltage by turning the voltage regulator knob, watching the voltmeter.

⑥ 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.



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<Automatic operation>

① Adjust the no-load speed and voltage beforehand by manual operation.

② Set the starter switch (2) to "AUTO" operation position and let the engine stand by.
At the same time, set the circuit breaker (1) "ON"

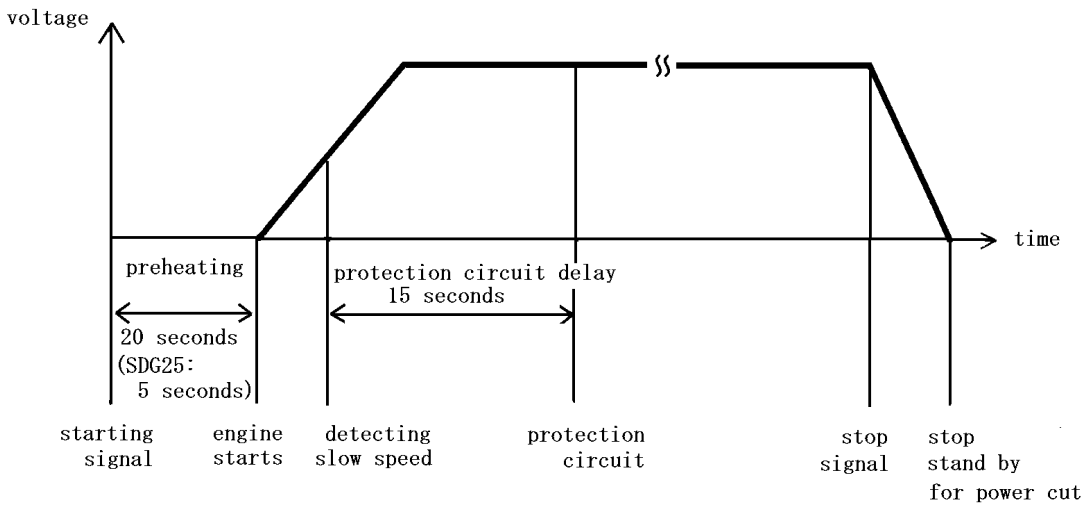
③ When receiving the starting signal, the engine starts after preheating.
Note: When receiving stop signal, the engine stops.

⚠ 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.

5. Operation

- Engine starting time chart



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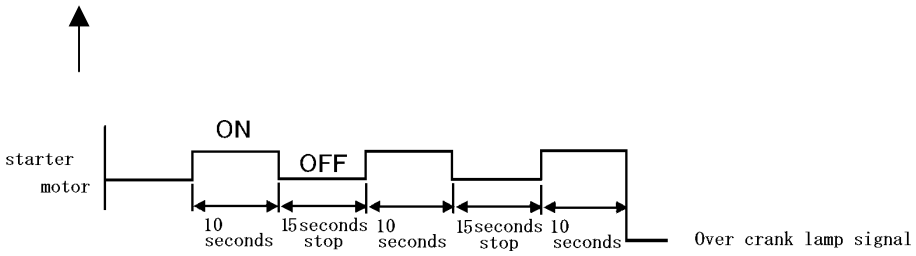


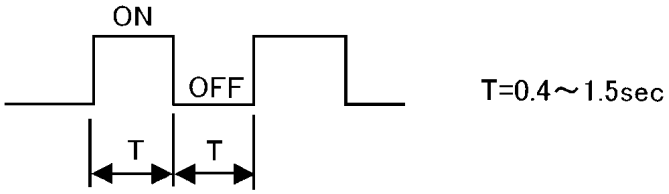
A010138

If the engine will not start even after you have tried to crank the engine three times, it stops starting. In the case, switching off the starter switch, locate such cause of disorder as (shortage of fuel or faulty cable connection etc.) and correct it. Later , try starting procedures again.

- Prevention of starter motor disengaging

When the gear of starter motor does not engage with the engine ring gear, it has such a protection function to operate starter motor again.

(disengaging function)



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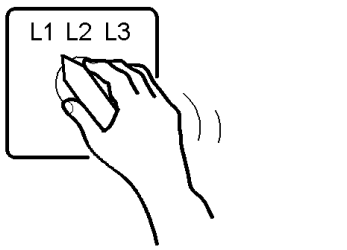
5.2.2 Meter and Indicator Lights while Operating

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	
				Over crank	Over speed	Oil pressure	Engine temperature.	Charge	Run	Glow
Before Starting up (preheating)	0	0	0	● Off	● Off	● Off	● Off	☼ On	● Off	☼ On
During Operation (Full load)	※ 240 480	60	Less than rated current	● Off					☼ On	● 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.



Ammeter change-over switch

5.3 Stopping Procedures(in case of manual operation)

(Procedure)

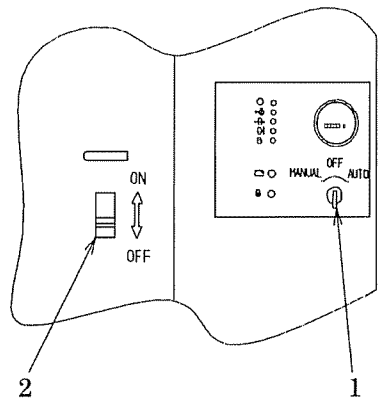
⑦ Set the switch (1) of the load "OFF".

⑧ Set the circuit-breaker (2) on the instrument panel and the auxiliary AC power receptacle panel of the generator to "OFF" position.

⑨ Keep the engine running for approx. 5 minutes to cool down.

⑩ Set the starter switch to the "OFF" position, and the engine is shut off.

⑪ Remove the key from the machine every time you stop the engine. Keep the key with you and be careful not to lose it.



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5.4 Operating Procedures when Engine Fails to Start up on First Attempt

- When the engine fails to start up even after performing start-up procedures of the 5.2.1, do not allow the starter to continue running. Set the starter switch to "STOP" and wait approx. 30 seconds. Then, repeat the start-up procedure again.
- If the repeated procedure does not allow the engine to run, the following causes are suspected. Please check the following:
- No fuel
- Clogging of fuel filter
- Clogging of filter inside the fuel air-bleeding electromagnetic pump.
- Discharge of battery (Low cranking speed)

5.5 Adjustment of frequency

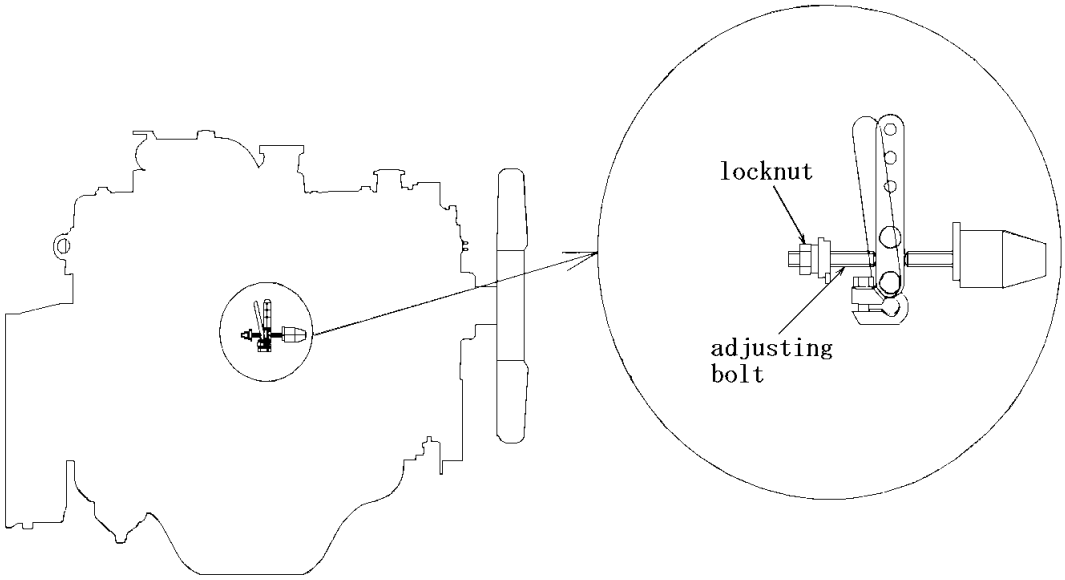
● When it is necessary to adjust frequency during operation, take the following steps.

(Procedure)

① Loosen the locknut of the engine governor adjusting bolt.

② Watching the frequency meter, adjust the frequency to the value mentioned in 5.2.2 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.



A010136

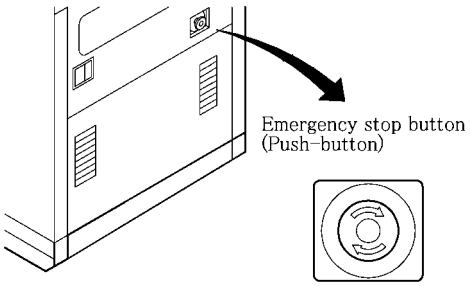
SDG75/100S

5.6 Emergency Stop

CAUTION

- 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.



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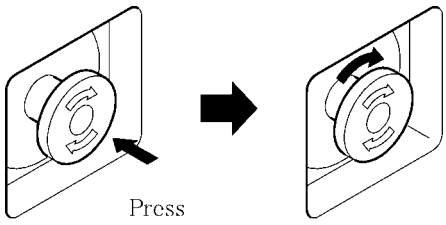
- To reset the button, turn the button head in the direction of the arrow. If it is not reset, the machine cannot restart to operate.



H980179

5.7 Air Bleeding

To restart the engine after it runs out of fuel, perform starting operation with the starter switch positioned at “MANUAL” operation position. After the trapped air in the fuel piping is bled, the engine starts. If it does not start, repeat this operation about one minute later.

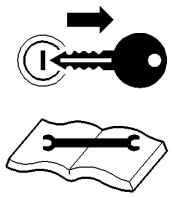
6. Periodic Inspection/Maintenance

6.1 Important Items at Periodic Inspection and Maintenance or after Maintenance

◆ The manual shows proper intervals for periodic inspection and maintenance under normal operating conditions. Inspection and maintenance should be performed more often under extremely harsh conditions.

WARNING — ***Hang a "Now Checking and under Maintenance" tag***

- Remove the starter key from the starter switch before inspection, and hang up a "Now Checking and under Maintenance" tag where it can be easily seen. The service person must keep the key during checking and maintenance.
- Remove the negative (-) side cable from the battery. This will prevent accidental starting of the machine should another person not realize maintenance is being performed.



SY001

IMPORTANT — ***Precautions for check and maintenance*** —

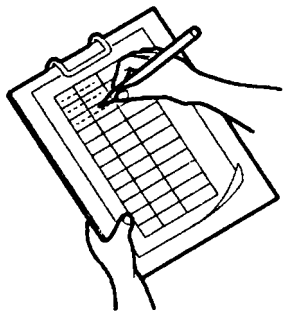
- Be sure to use appropriate tools for inspection and maintenance work. Inappropriate tools could cause unexpected injury.
- Place a container or a pan underneath the oil drain port to receive waste liquid so that such liquid cannot be spilled on the ground or inside the unit.
- Do not discharge waste materials onto the ground and/or into the river and lake. Such liquid will contaminate the environment.
- Be sure to use recommended fuel, oil, grease, and antifreeze.
- Do not disassemble or adjust engine, generator main body, or part(s) for which inspection or maintenance is not referred to in this manual.
- Use only genuine parts for replacement.
- Any breakdown caused by not using genuine parts or by misuse, will be out of the scope of "WARRANTY".
- Keep the generator electric components away from water or steam.

6. Periodic Inspection/Maintenance

6.2 Daily Inspection and Keeping Operation Log

- Carry out daily inspection every morning before operation. See Chapter 5 "Operation" of the manual for details of inspection.
- Pay attention to and carefully observe the following points during daily operation or inspection and maintenance work. If any problem or abnormality is found, immediately investigate the cause and make repairs. If the cause is unknown, or if the trouble involves a part or component not described in the manual, ask your nearest dealer for servicing information.

a) Controls and instruments function properly.
b) Levels and any leaks of water, fuel, and oil or any contamination should be checked.
c) Appearance, abnormal noise or excessive heat should be checked.
d) Loose bolt or nut should be checked.
e) Any damage, wear or missing machine components and parts should be checked.
f) Performance of each part or component should be adequate.



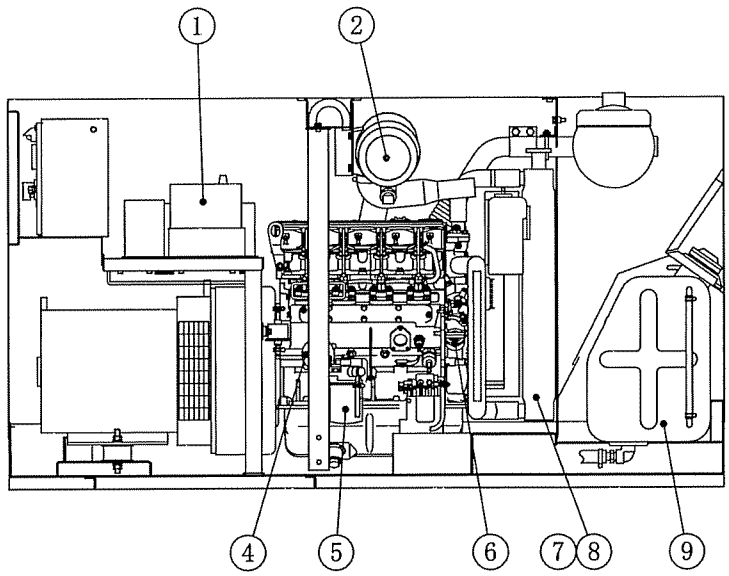
TR0049

- Keep an operation log to record daily inspections of each component. Any trouble of the unit can be easily discovered and preventive measures taken.
  It is very useful to record information such as frequency, temperature, current and maintenance items on a daily log.

6. Periodic Inspection/Maintenance

6.3 Inspection and Location of Components

SDG25S



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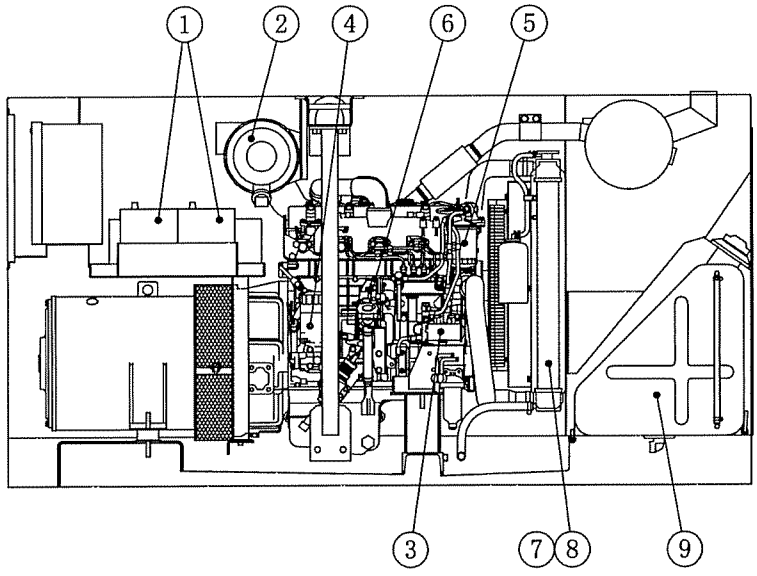
SDG45S/60S



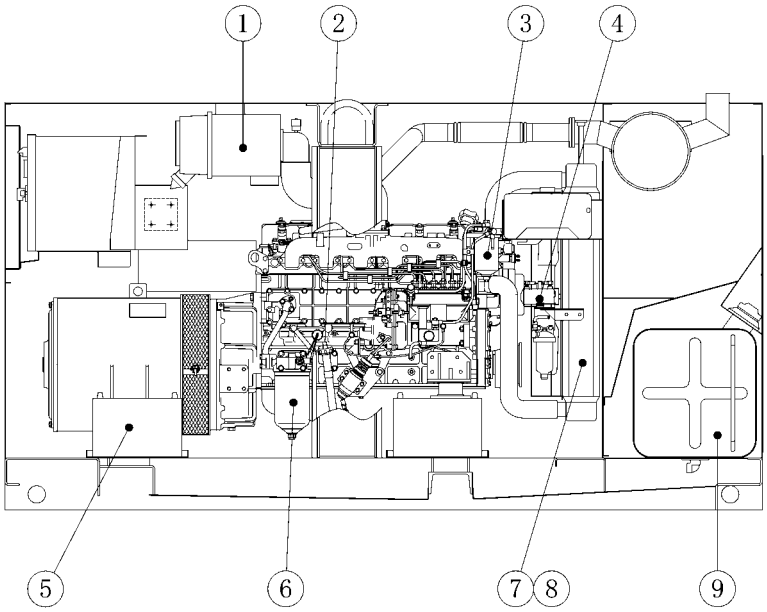
H990196

① Check battery.
② Clean and change air filter element.
※③ Change filter of fuel air-bleed electromagnetic pump.
④ Change engine oil filter
⑤ Change fuel filter.
⑥ Change engine oil.
⑦ Change coolant.
⑧ Clean inside and outside of radiator.
⑨ Clean inside the fuel tank.
● Check generator insulation resistance.

※Provided with SDG45S/60S only

6. Periodic Inspection/Maintenance

SDG75S/100S



H990340

① Clean and change air filter element.
② Change engine oil.
③ Change fuel filter.
④ Change filter of fuel air-bleed electromagnetic pump.
⑤ Check battery.
⑥ Change engine oil filter
⑦ Change coolant.
⑧ Clean inside and outside of radiator.
⑨ Clean inside the fuel tank.
● Check generator insulation resistance.

6.4 First Maintenance at Initial 50 Hours

6.4.1 Change Engine Oil

(At 50 hours for the first change and every 250 hours thereafter)

⚠ CAUTION — ***Refilling or draining engine oil***

- After stopping the engine, be sure to wait 10 to 20 minutes until the engine oil cools down. Then check the level of the engine oil, refill or drain the oil.
- Engine oil is very hot and highly pressurized during or just after the operation. Hot oil could blow out and cause severe injury.

H990432

IMPORTANT — ***How to choose engine oil***

- Viscosity of engine oil greatly affects starting, performance, oil consumption, as well as wear of the moving parts.
- Choose an appropriate oil using the table below according to the ambient air temperature.

Relation between viscosity (SAE) and temperature

SAE Viscosity number	Temperature
10W	−22 °Fto 50 °F(−30℃ to 10℃)
30	14 °Fto 104 °F(−10℃ to 40℃)
40	32 °Fto 122 °F(0℃ to 50℃)
15W/40	−4 °Fto 104 °F(−20℃ to 40℃)

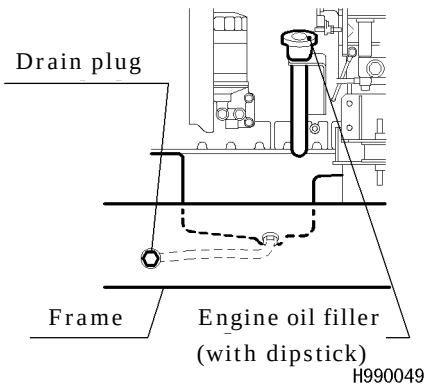
- Use CD class engine oil or superior. (Using poor quality engine oil may shorten the life of the engine.)
- When two or more different brands of oil are mixed, engine performance may be deteriorated. Do not mix oils.

(Procedure)

① Loosen the drain plug located outside the frame to drain the oil.

② After the oil is completely drained, fasten the drain plug firmly and refill with new engine oil through the engine oil filler.

③ After the oil is refilled, install the filler cap tightly.



H990049

SDG45S

6.4.2 Change Engine Oil Filter

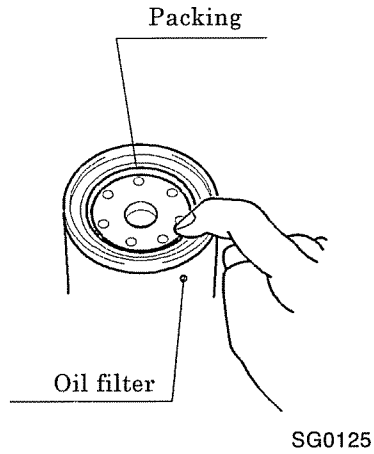
(At 50 hours for the first change and every 500 hours thereafter)

SDG25S/45S/60S

(Procedure)

① Before a new oil filter is installed, spread oil on the packing. Install filter onto the adapter housing by turning clockwise. When the packing touches the sealing surface, further tighten the filter by approx. 3/4 (SDG25S) or 2/3 (SDG45S/60S) turn by hand.

② After the oil filter is assembled, start engine and check for any oil leaks.



Part No. Isuzu Motors genuine

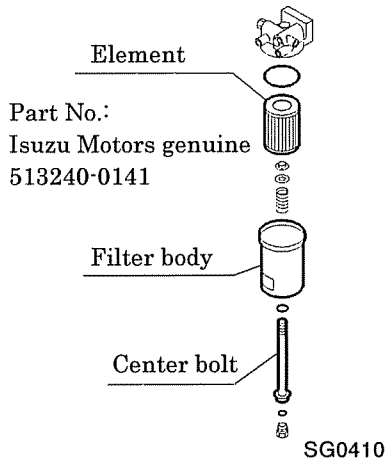
SDG25S	894456 7411
SDG45S/60S	894321 2191

SDG75S/100S

(Procedure)

① Loosen the center bolt, remove the filter body and element together.

② After cleaning the filter body, insert a new element into it and fasten it by the center bolt.



6. Periodic Inspection/Maintenance

6.5 Maintenance Every 250 Hours

6.5.1 Change Engine Oil

Follow the same procedure for changing engine oil as mentioned in 6.4.1.

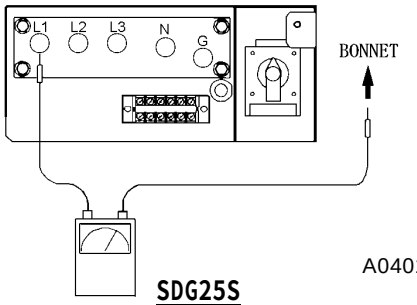
6.5.2 Check Insulation Resistance

IMPORTANT

- When the generator has not been operated for a long time or moisture has entered inside the machine, be sure to measure the insulation resistance. If resistance is lower than 1 MΩ, it could cause an electrical leakage or fire. Dry the generator with compressed air until the resistance exceeds 1 MΩ prior to operating.
- Since the generator insulation may drop when moisture, oil vapor, and dust are stuck, always keep the machine clean.
- Since sealed type ball bearings are used, supplying grease is not necessary.

(Procedure) (Megger tester required)

① Remove the load side cable from the output terminal board.
② Remove the cable between the terminal “N” and terminal “G” which are connected on the back of the output terminal plate.
③ Remove the AVR connector inside the generator control panel.
④ Switch ON the three-phase breaker, measure each insulation resistance between the terminals L1. L2. L3 terminal and bonnet.
⑤ Insulation resistance when measured with a 500 V megger tester must be above 1 MΩ.
⑥ After finishing the measurement of insulation resistance, re-connect the cable between the terminal "N" and terminal "G".



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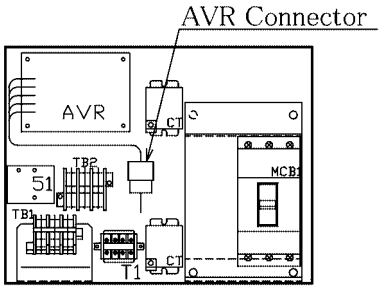
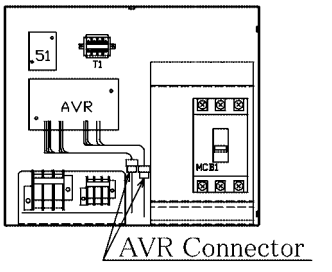
SDG25S



SDG25S
H990311

WARNING

- After making sure that the insulation resistance of the generator is higher than 1 MΩ, be sure to re-connect the cable between the terminal "N" and terminal "G" just as it was originally connected.If it is left disconnected, the grounding becomes imperfect so that it could cause electric shock.



SDG45S/60S/75S/100S
H990312

6.5.3 Check GFCI Receptacles

Check GFCI receptacles monthly or 250 hours operation, whichever comes first.

WARNING

- If the generator is stored outdoors, unprotected from the weather, test the GFCI receptacle before each use.
- In case the GFCI has tripped due to the hazard of ground fault currents, investigate the cause and correct it.

Regularly check the GFCI operation for safety.

(Procedure)

① Unplug all appliances from the generator.

② Start the engine.

③ Turn each single-phase and three-phase breaker ON.

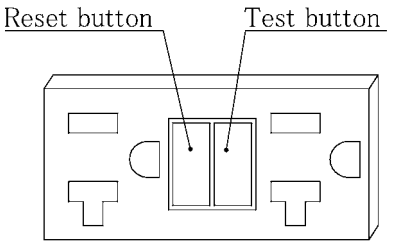
④ Press the TEST BUTTON

- The RESET BUTTON should extend with a click.
- If the RESET BUTTON does not extend, contact your nearest dealer.

⑤ Press the RESET BUTTON

⑥ When the RESET BUTTON extends during operation:

- Unplug all appliances from the GFCI protected receptacle.
- Press the RESET BUTTON:



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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.

6. Periodic Inspection/Maintenance

6.6 Maintenance Every 300 Hours

6.6.1 Check Battery

DANGER

Handling battery

- Keep flames away from the battery.
- Batteries may generate hydrogen gas and may explode.
- Therefore, recharging should be done in a well-ventilated place.
- Do not allow sparks, lighted match, or lit cigarette close to the battery.
- Do not check the battery by short-circuiting the positive and negative terminals with a metallic object.
- Do not charge the frozen battery. Otherwise it may explode. If the battery is frozen, warm it up until the battery temperature becomes 61 °F to 86 °F (16℃ to 30℃).
- Battery electrolyte is diluted sulfuric acid.
  In case of mishandling, it could cause skin burning.
- Wear protective gloves and safety glasses when handling a battery.
- If battery electrolyte contacts your clothes or skin, rinse with large amounts of water immediately.
- If the battery electrolyte gets into your eyes, rinse immediately with plenty of water and see a doctor at once, because eyesight could be damaged.
- Dispose of battery, observing local regulations.

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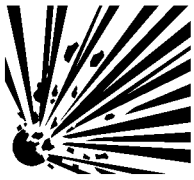

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CAUTION

- If jumper cables must be used or when cables are re-connected at battery replacement, be careful not to connect (+) and (-) terminals backwards. Such a miss-connection will cause a spark or damage each component.

If there seems to be a problem in starting an engine due to a dead battery, carry out checking by following the procedures below:

(1) Enclosed type battery:
Check the indicator on top surface of the battery.
If the indicator shows that charge is needed, recharge the battery immediately.

(2) Ordinary type battery:
Measure specific gravity of battery electrolyte, and if it shows below 1.24, recharge the battery immediately.
Refer to 7.2 for method of specific gravity measurement and recharging the battery.

6. Periodic Inspection/Maintenance

6.7 Maintenance Every 500 Hours

6.7.1 Change Engine Oil Filter

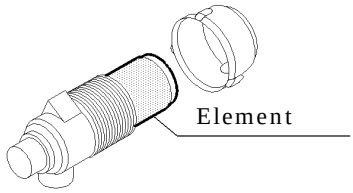
Follow the same procedure for changing engine oil filter as mentioned in 6.4.2.

6.7.2 Clean or Change Air Filter Element (As Required)

IMPORTANT — ***Use genuine parts*** —

- Air filter is a crucial component for the performance and the life of a unit. Use genuine part for replacement.

Even before 500 hours, if the indicator for air filter shows RED, take the element out, check and clean it, or replace it with new one if it can not be serviced.



SG0132

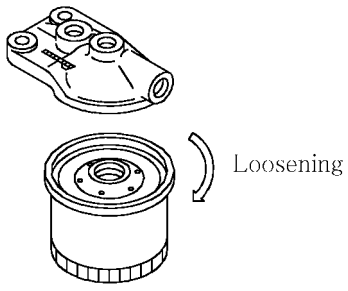
Part No.: AIRMAN genuine

SDG25S	32143 11500
SDG45S	32143 11800
SDG60S/75S	32143 12700
SDG100S	32143 12800

6.7.3 Change Fuel Filter (SDG25S/45S/60S)

(Procedure)

① Remove cartridge by using a filter wrench.
② Spread fuel thinly on packing in a new cartridge, then screw the cartridge into the housing.
③ Screw it in until the packing reaches the seal surface, then give it a approximately 2/3 turn by using hand pressure.
④ Bleed the air of fuel. (See 5.5)
⑤ After new fuel filter is assembled, check for any leak before running engine.



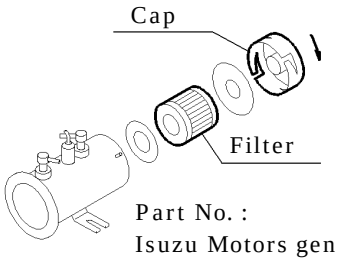
H990141

Part No.: Isuzu Motors genuine

SDG25S	897167 8110
SDG45S/60S	113240 0791

6.7.4 Change Filter of Fuel Air-bleeding Electromagnetic Pump (SDG45S /60S)

- Turn the cap counterclockwise to remove it, change the filter inside.
- As the fuel inside spills out when it is removed, prepare a container to catch fuel.



Part No. :
Isuzu Motors genuine
894337 0220

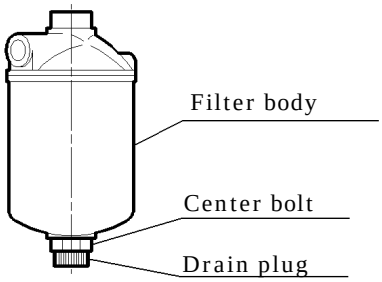
TR0335

6.8 Maintenance Every 600 Hours

6.8.1 Change Fuel Filter (SDG75S/100S)

(Procedures)

① Loosen the center bolt, remove the filter body and element together.
② After cleaning the filter body, insert a new element into it and fasten it by the center bolt.
③ Bleed the air of fuel.(See 5.5)
④ After assembling a fuel filter, check for fuel leakage during operation.



Part No. :
Isuzu Motors genuine
988511-1911

SG0412

6.8.2 Change Filter of Fuel Air-bleeding Electromagenetic Pump (SDG75S/100S)

Follow the same procedure for changing filter of fuel Air-bleeding electromagnetic pump as mentioned in 6.7.4.

6. Periodic Inspection/Maintenance

6.9 Maintenance Every 1000 Hours

6.9.1 Change Coolant

CAUTION

Taking off the radiator cap

- Be sure to stop the machine and allow time to cool. Loosen the radiator cap one notch. After the coolant water is sufficiently cooled and the inner pressure is released, remove the cap.
  If this procedure is neglected, the inner pressure can blow off the cap. Steam jetting out of the radiator could result in serious injury. Follow this procedure under all circumstances.

H990432

CAUTION

How to handle LLC (Antifreeze)

- LLC (Antifreeze) is a toxic material.
- If a person has ingested LLC (Antifreeze) by accident, call poison control and or emergency services immediately.
- If a person gets LLC (Antifreeze) in his eyes, wash eyes with clean running water and call a doctor immediately.
- When LLC (Antifreeze) is stored, put it in a container with an indication saying "LLC (Antifreeze) inside" and seal it up. Keep it in a place away from children.
- Beware of flames around antifreeze.
- Follow the designated regulations to dispose of LLC (Antifreeze) properly.

IMPORTANT

Quality of coolant and antifreeze

- Use soft water of good quality such as distilled water for coolant.
- When dirt, or hard water is used, this will cause deposits inside radiator or on cylinder head, and may cause engine overheating due to poor flow of coolant.
- When the unit is used in a cold region and possible freezing is expected, it is recommended to use LLC (Antifreeze) for the coolant.
- Adjust mixing ratio of LLC (Antifreeze) with water according to the temperature.
- Use LLC (Antifreeze) within the range of its mixing ratio between 35 and 60%.
- If LLC (Antifreeze) in the water exceeds more than 60%, it may decrease its antifreezing effect and could cause overheating.

Reference of LLC (Antifreeze) mixing ratio

Temperature	Mixing ratio
−4 °F (−20℃)	35%
−40 °F(−40℃)	55%

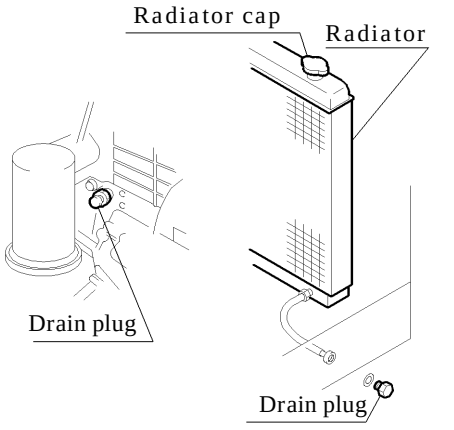
(Procedure)

① To drain coolant, prepare a drain pan, remove the radiator cap, then loosen the drain plug.

② Be sure to also unfasten the drain plug on the engine cylinder block for drainage.

③ When the coolant is completely drained out, close each drain plug, and supply new coolant into the radiator filler port.

④ After changing the coolant, run the engine under unloaded operation for 2 to 3 minutes, then stop it. Check the coolant level again and replenish it if necessary.

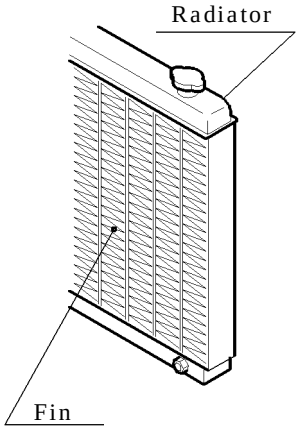


H990142

SDG45S

6.9.2 Clean Outside the Radiator

- When the radiator fins are clogged by dust or other foreign materials, the heat exchange efficiency drops and this will raise coolant temperature. These fins should be cleaned as required when dirty.
- Do not use high pressure washer for cleaning. Fins may be damaged.



SG0134

6. Periodic Inspection/Maintenance

6.10 Maintenance Every 2000 Hours

6.10.1 Clean Inside the Radiator

- When the inside of radiator and water pipings of an engine are dirty with scale and rust, its cooling efficiency will drop. Clean the cooling system periodically.
- Ask you nearest dealer for cooling system cleaning.

6.10.2 Clean Inside the Fuel Tank

Ask your nearest dealer for cleaning the inside of fuel tank.

6. Periodic Inspection/Maintenance

6.11 Periodic Inspection List

● means change △ means check/clean

	Maintenance	Daily	50 hrs	Every 250 hrs	Every 300 hrs	Every 500 hrs	Every 600 hrs	Every 1,000 hrs	Every 2,000 hrs
Generator	Check external box ground.	△							
	Check each meter and warning lamp.	△							
	Check insulation resistance.			△					
	Check GFCI receptacles.			☆△					
Engine	Check air filter clogging.	△							
	Drain condensation from fuel tank. (Including sedimenter)	△							
	Check fuel level.	△							
	Check engine oil level.	△							
	Check coolant level.	△							
	Check looseness in pipe connector terminals and tear in wiring.	△							
	Check V-belt tension.	△							
	Change engine oil.		※●	●					
	Change engine oil filter.		※●			●			
	Check battery.				△				
	Clean or change air-filter element.					△・●			
	Change fuel filter.					● (25S/45S/60S)	● (75S/100S)		
	Change filter of fuel air-bleeding electromagnetic pump.					● (45S/60S)	● (75S/100S)		
	Change coolant.							●	
	Clean outside the radiator. (as required)							△	
	Clean inside the radiator.								△
	Clean inside the fuel tank.								△

- ※ indicates the first changing time.
- The maintenance point marked ☆ shall be checked monthly or 250 hours operation, whichever comes first.
- Refer to engine operation manual for inspection and maintenance of an engine.

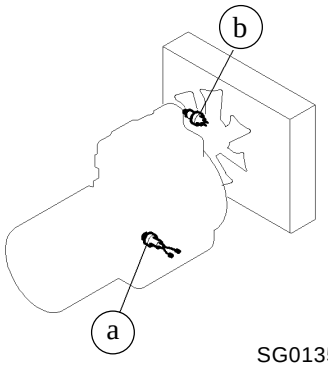
7. Maintenance/Adjustment

7.1 Automatic Shut-Down System

7.1.1 Location of Switches

ⓐ	Engine oil pressure switch
ⓑ	Coolant temperature switch

- Ask your nearest dealer for checking the performance or changing each switch.

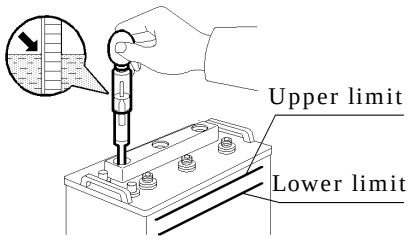


SG0135

7.2 Maintenance of Battery

7.2.1 Measure Specific Gravity (Applicable to standard battery)

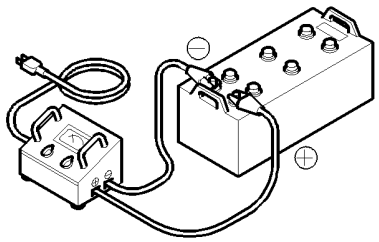
- When the fluid level is found below the lower limit without a trace of electrolyte leakage, refill with distilled water so the level will be between upper and lower limits.
- To compensate for shortage of electrolyte due to spilling, or to measure or change the specific gravity, remove battery cap and measure specific gravity of electrolyte by using a hydrometer.
- Only authorized personnel is allowed for checking and mixing electrolyte.



TR0451

7.2.2 Charge Battery

- Disconnect the cable between battery and the unit. Charge the battery with a 12 V battery charger. Do not charge two batteries at the same time.
- Do not connect (+) and (−) terminals backwards.
- Be sure to read the operation manual of the battery charger before charging.



Battery charger (12V)

TR0452

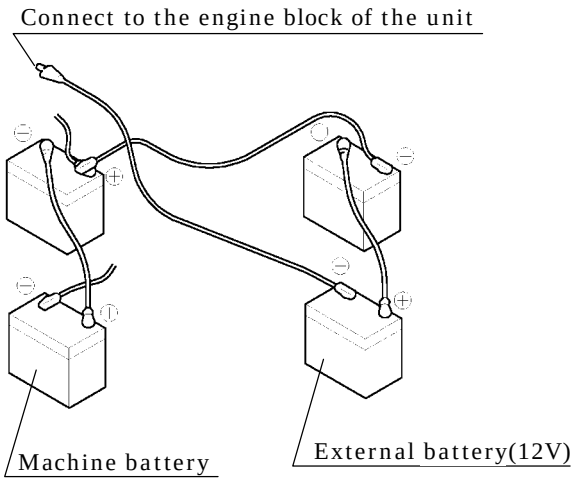
7.2.3 How to Use Jumper Cables

⚠ CAUTION — ***Do not connect the cable reversely***

- If a jumper cables has to be used or when cables are connected at battery replacement, be careful not to connect (+) and (－) terminals backwards. Such a miss-connection will causes a spark or damage to each component.

(Procedure for using a jumper cable)

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



H990050

7.3 Adjusting controller for automatic starting

⚠ CAUTION

- It is not necessary to adjust the controller in an usual case which is pre-adjusted prior to shipment from factor. Never change the set value of the controller.
  If you operate the unit with the set value altered, it could cause burns and damage to the parts and components.

For a controller , please contact our distributor or directly us.

7. Maintenance/Adjustment

7.4 Troubleshooting

- Should any trouble occur during operation, do not disregard the trouble. Investigate the cause and take appropriate measures.
- Read the manual carefully and fully understand what to do in case of trouble.
- The more you understand about the construction and function of the unit, the faster you can find a cause and solution to the problem.
- This chapter describes the state, cause and countermeasures of major problems in detail:

Symptom	Cause	Countermeasures
Starter does not rotate. Low starter revolution speed even when starting.	● Malfunctioning battery	Battery check→ Charge, Change
Warning lamp for over crank goes on.	● Fuel filter clogging ● Filter clogging in fuel air-bleeding electromagnetic pump (SDG45S/60S/75S) ● Malfunctioning fuel cut off solenoid ● No diesel fuel oil ● Air mixing in fuel pipings	● Disassemble, clean, and change ● Change filter ● Change solenoid ● Check connector ● Replenish fuel ● Bleed air
Engine oil pressure warning lamp turns on.	● Engine oil shortage ● Engine oil filter clogging ● Malfunctioning oil pressure switch ● Loosened or disconnected wiring, or connector	● Replenish oil ● Change ● Change ● Check/fasten
Coolant temperature warning lamp turns on.	● Radiator clogging. ● Faulty thermostat ● Faulty coolant temperature switch ● Shortage of coolant ● Slip of fan belt ● Looseness, disconnection of wiring or connectors	● Clean ● Change ● Change ● Replenish ● Adjust tension ● Check/fasten
Charge warning lamp turns on.	● Alternator problem ● Slipping fan belt ● Looseness, disconnection of wiring or connectors	● Check/change ● Fasten/change ● Check/fasten

7. Maintenance/Adjustment

Symptom	Cause	Countermeasures
Even when operated at rated speed, no voltage or low voltage generated.	● Faulty voltmeter ● Poor tightening of terminals ● Broken or short-circuited winding of generator main unit ● Faulty AVR (Automatic Voltage Regulator) ● Faulty silicon rectifier (mounted on generator rotor) ● Faulty exciter ● Broken or short-circuited winding of exciter field	● Check/change ● Check/tighten ● Check/repair ● Check/change ● Check/change ● Check/repair ● Check/repair
High voltage generation when generator rotates at a rated speed. Voltage does not decrease even when the automatic voltage regulator knob is turned.	● Loosened or disconnected wiring, or connector to AVR ● Faulty AVR ● Broken wire or poor contact of AVR variable resistor	● Check/connect ● Check/change ● Repair or change
Unstable voltage generation.	● Poor tightening of each terminal ● Faulty AVR	● Check/tighten ● Check/change
Over speed warning lamp goes on.	● Engine speed too high ● Maladjustment or failure of controller	● Check/adjust ● Replace or adjust
The items in time chart (5.2.1) do not function.	● Maladjustment or failure of controller ● Faulty pickup sensor ● Disconnection, loosening of connectors and cable removal	● Replace or adjust (Contact our distributor or us) ● Check/replace ● Check/retighten
Three-phase breaker will not be switched “ON”	● Output terminal cover is open ● Faulty door switch	● Check/ ● Replace

- Contact your nearest dealer if you find the repair to be difficult.
- Refer to the engine operation manual for trouble concerning the engine.

8. Storage of the Unit

8.1 Preparation for Long-term Storage

When the unit is to be unused in storage for a long time, be sure to follow the preparations below and store the unit in a dry and clean area.

(1) Temporarily cover the unit if it is stored outside. Avoid leaving the unit outside with a sheet cover directly on the paint for a long time, or this will cause rust to the unit.

(2) Run the unit at least 5 minutes once every week to circulate oil to each part of the unit.

(3) When the unit is stored in a place where it is difficult to run it once a week, be sure to follow procedures below:

(Procedure)

① Drain existing lubricant from the engine oil pan. Pour new lubricant in the engine to clean its inside. After running it for a while, drain it again.

② Spread lubricant on each moving part.

③ Completely charge the battery and disconnect grounding wires. Remove the battery from the unit (if possible) and store it in a dry place. (Charge the battery at least once every month.)

④ Discharge coolant and fuel from the unit.

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 unit.

⑥ Be sure to repair any breakdown and maintain the unit so that it will be ready for the next operation.
Replenish the coolant, engine oil and fuel and run the unit at least once every 3 months, even in long term storage.

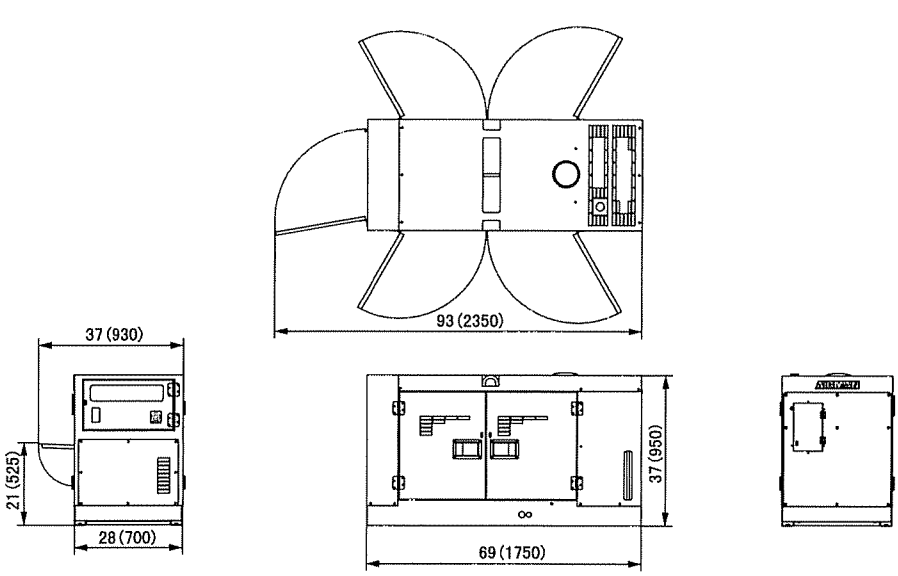
9. Specifications

SDG25S

General Specifications	Overall length	in.(mm)	69(1,750)	Generator	Exciting system		Brushless system
	Overall width	in.(mm)	28(700)		Phase number		Three-phase, four-wire system
	Overall height	in.(mm)	37(950)		Power factor	%	80
	Net dry mass	lb(kg)	1,390(630)		Frequency	Hz	60
	Operating mass	lb(kg)	1,520(690)		Rated output	kVA	25
	Fuel tank capacity	gal.(L)	17.2(65)		Rated output	kW	20
					Voltage	V	240/480
					Current	A	60/30
				Engine	Model		ISUZU 4LE1
					Type		Four-cycle, water-cooled, swirl chamber
					Number of cylinders		4
					Total displacement	cuin.(L)	133(2.179)
					Rated output	hp/rpm (kW/min^{-1})	31.5/1,800(23.5/1,800)
					Number of rotation	rpm(min^{-1})	1,800(1,800)
					Lubricating oil capacity	gal.(L)	2.0(7.5)
					Coolant capacity (including radiator)	gal.(L)	1.6(6)
					Battery		95D31R-MF

Outline drawing

Unit: in.(mm)



H990197

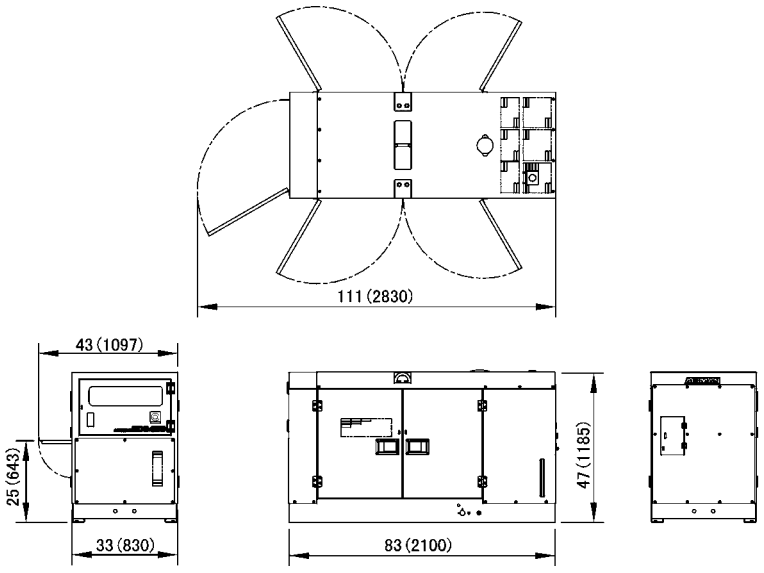
9. Specifications

SDG45S

General Specifications	Overall length	in.(mm)	83(2,100)	Generator	Exciting system		Brushless system
	Overall width	in.(mm)	33(830)		Phase number		Three-phase, four-wire system
	Overall height	in.(mm)	47(1,185)		Power factor	%	80
	Net dry mass	lb(kg)	2,400(1,090)		Frequency	Hz	60
	Operating mass	lb(kg)	2,670(1,210)		Rated output	kVA	45
	Fuel tank capacity	gal.(L)	29(110)		Rated output	kW	36
					Voltage	V	240/480
					Current	A	108/54
				Engine	Model		ISUZU B-4BG1
					Type		Four-cycle, water-cooled, direct injection type
					Number of cylinders		4
					Total displacement	cuin.(L)	264(4.329)
					Rated output	hp/rpm (kW/min^{-1})	55.6/1,800(41.5/1,800)
					Number of rotation	rpm(min^{-1})	1,800(1,800)
					Lubricating oil capacity	gal.(L)	3.4(13)
					Coolant capacity (including radiator)	gal.(L)	4.4(16.5)
					Battery		80D26R-MF×2

Outline drawing

Unit: in.(mm)



H990313

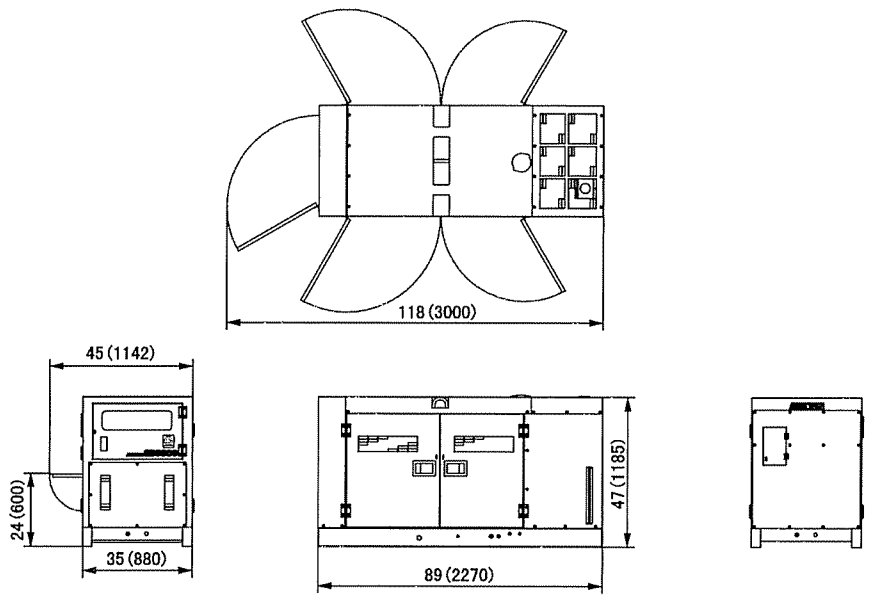
9. Specifications

SDG60S

General Specifications	Overall length	in.(mm)	89(2,270)	Generator	Exciting system		Brushless system
	Overall width	in.(mm)	35(880)		Phase number		Three-phase, four-wire system
	Overall height	in.(mm)	47(1,185)		Power factor	%	80
	Net dry mass	lb(kg)	2,750(1,250)		Frequency	Hz	60
	Operating mass	lb(kg)	3,080(1,400)		Rated output	kVA	60
	Fuel tank capacity	gal.(L)	40(150)		Rated output	kW	48
					Voltage	V	240/480
					Current	A	144/72
				Engine	Model		ISUZU A-4BGIT
					Type		Four-cycle, water-cooled, direct injection type with turbo charger
					Number of cylinders		4
					Total displacement	cuin.(L)	264(4.329)
					Rated output	hp/rpm (kW/min^{-1})	77.9/1,800(58.1/1,800)
					Number of rotation	rpm(min^{-1})	1,800(1,800)
					Lubricating oil capacity	gal.(L)	3.4(13)
					Coolant capacity (including radiator)	gal.(L)	4.4(16.5)
					Battery		80D26R·MF×2

Outline drawing

Unit: in.(mm)



H990199

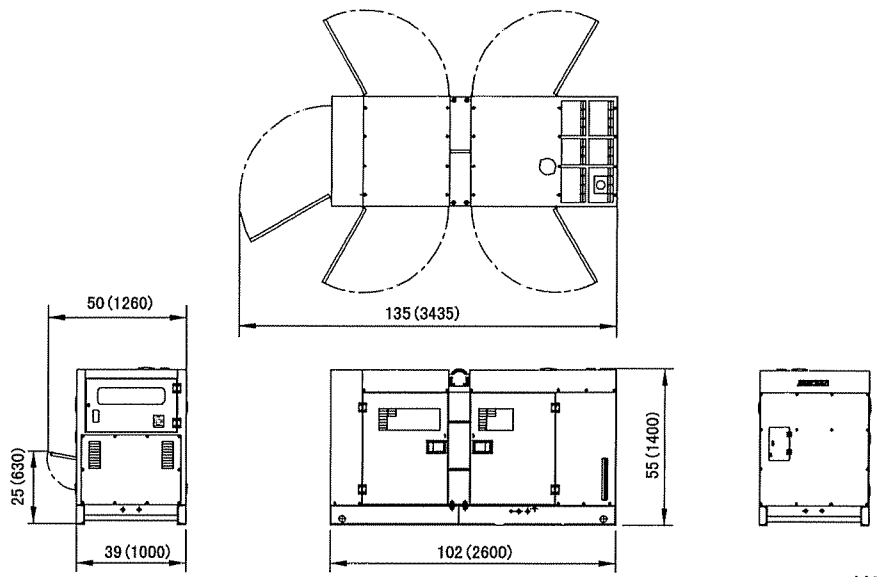
9. Specifications

SDG75S

General Specifications							
	Overall length	in.(mm)	102(2,600)	Generator	Exciting system		Brushless system
	Overall width	in.(mm)	39(1,000)		Phase number		Three-phase, four-wire system
	Overall height	in.(mm)	55(1,400)		Power factor	%	80
	Net dry mass	lb(kg)	3,570(1,620)		Frequency	Hz	60
	Operating mass	lb(kg)	3,950(1,790)		Rated output	kVA	75
	Fuel tank capacity	gal.(L)	42(160)		Rated output	kW	60
					Voltage	V	240/480
					Current	A	180/90
				Engine	Model		ISUZU A-6BG1
					Type		Four-cycle, water-cooled, direct injection type
					Number of cylinders		6
					Total displacement	cuin.(L)	396(6.494)
					Rated output	hp/rpm (kW/min^{-1})	91.7/1,800(68.4/1,800)
					Number of rotation	rpm(min^{-1})	1,800(1,800)
					Lubricating oil capacity	gal.(L)	4.8(18)
					Coolant capacity (including radiator)	gal.(L)	6.6(25)
					Battery		95D31R-MF×2

Outline drawing

Unit: in.(mm)



H990341

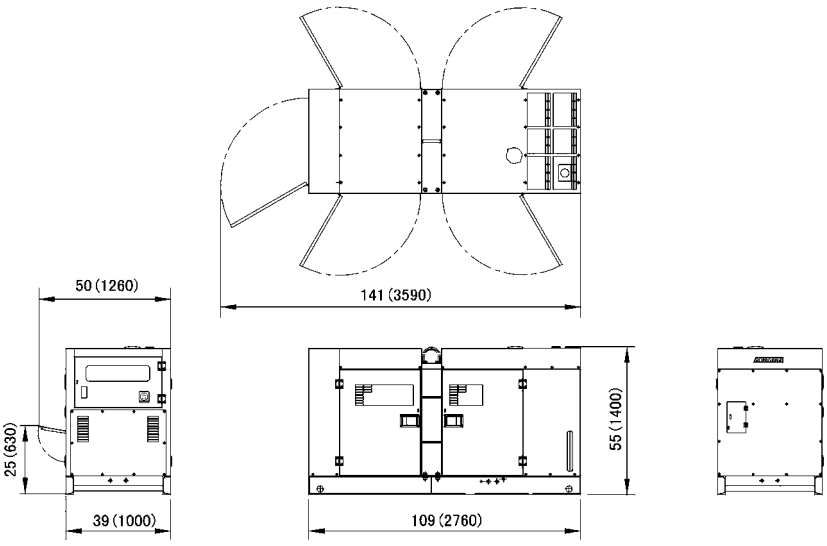
9. Specifications

SDG100S

General Specifications	Overall length	in.(mm)	109(2,760)	Generator	Exciting system		Brushless system
	Overall width	in.(mm)	39(1,000)		Phase number		Three-phase, four-wire system
	Overall height	in.(mm)	55(1,400)		Power factor	%	80
	Net dry mass	lb(kg)	3,815(1,730)		Frequency	Hz	60
	Operating mass	lb(kg)	4,300(1,950)		Rated output	kVA	100
	Fuel tank capacity	gal.(L)	55.5(210)		Rated output	kW	80
					Voltage	V	240/480
					Current	A	241/120
				Engine	Model		ISUZU A-6BG1T
					Type		Four-cycle, water-cooled, direct injection type with turbo charger
					Number of cylinders		6
					Total displacement	cuin.(L)	396(6.494)
					Rated output	hp/rpm (kW/min^{-1})	122.3/1,800(91.2/1,800)
					Number of rotation	rpm(min^{-1})	1,800(1,800)
					Lubricating oil capacity	gal.(L)	4.8(18)
					Coolant capacity (including radiator)	gal.(L)	6.9(26)
					Battery		95D31R-MF×2

Outline drawing

Unit: in.(mm)

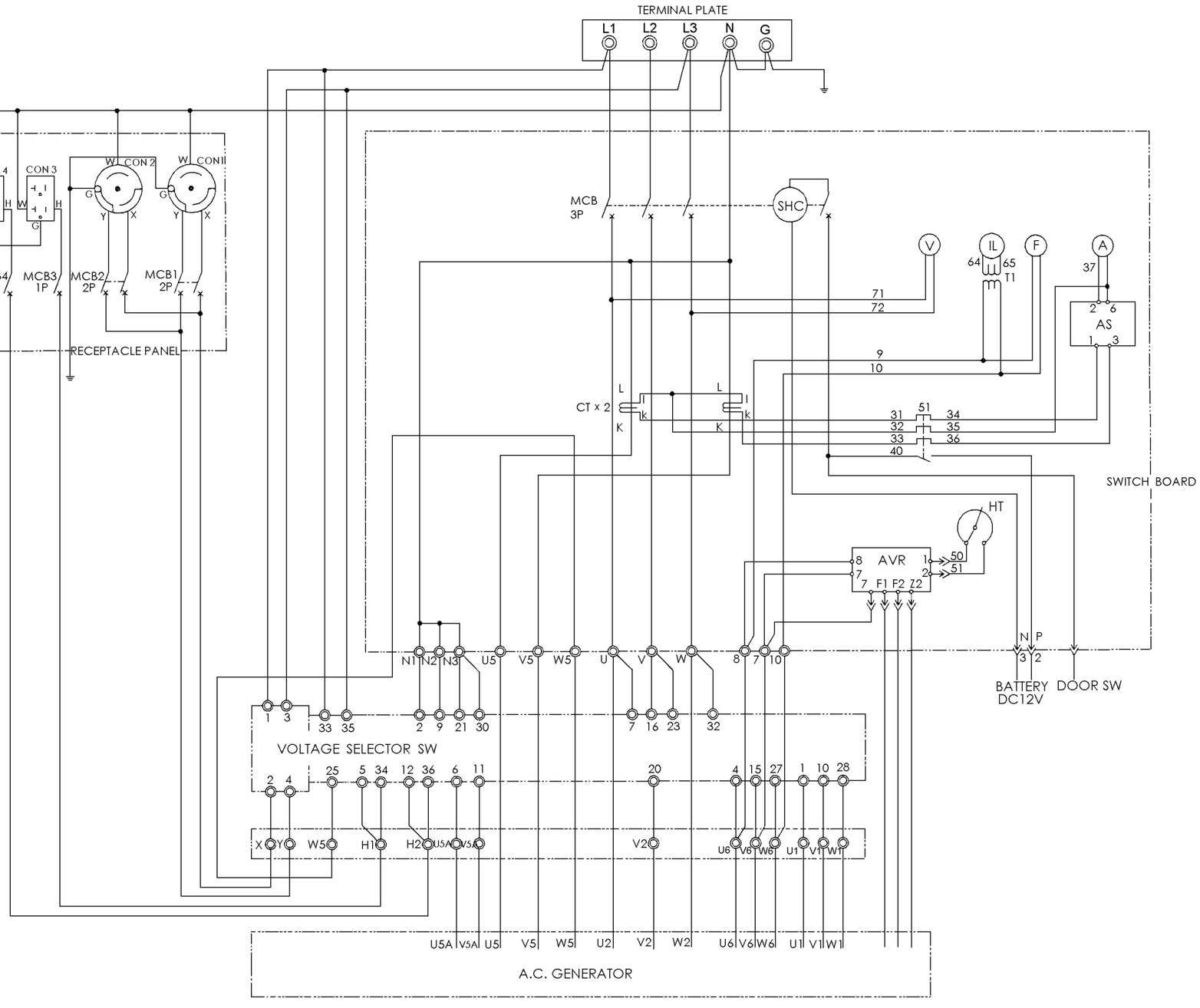


H990438

10. Wiring Diagram

10.1 Generator Wiring Diagram

SDG25S

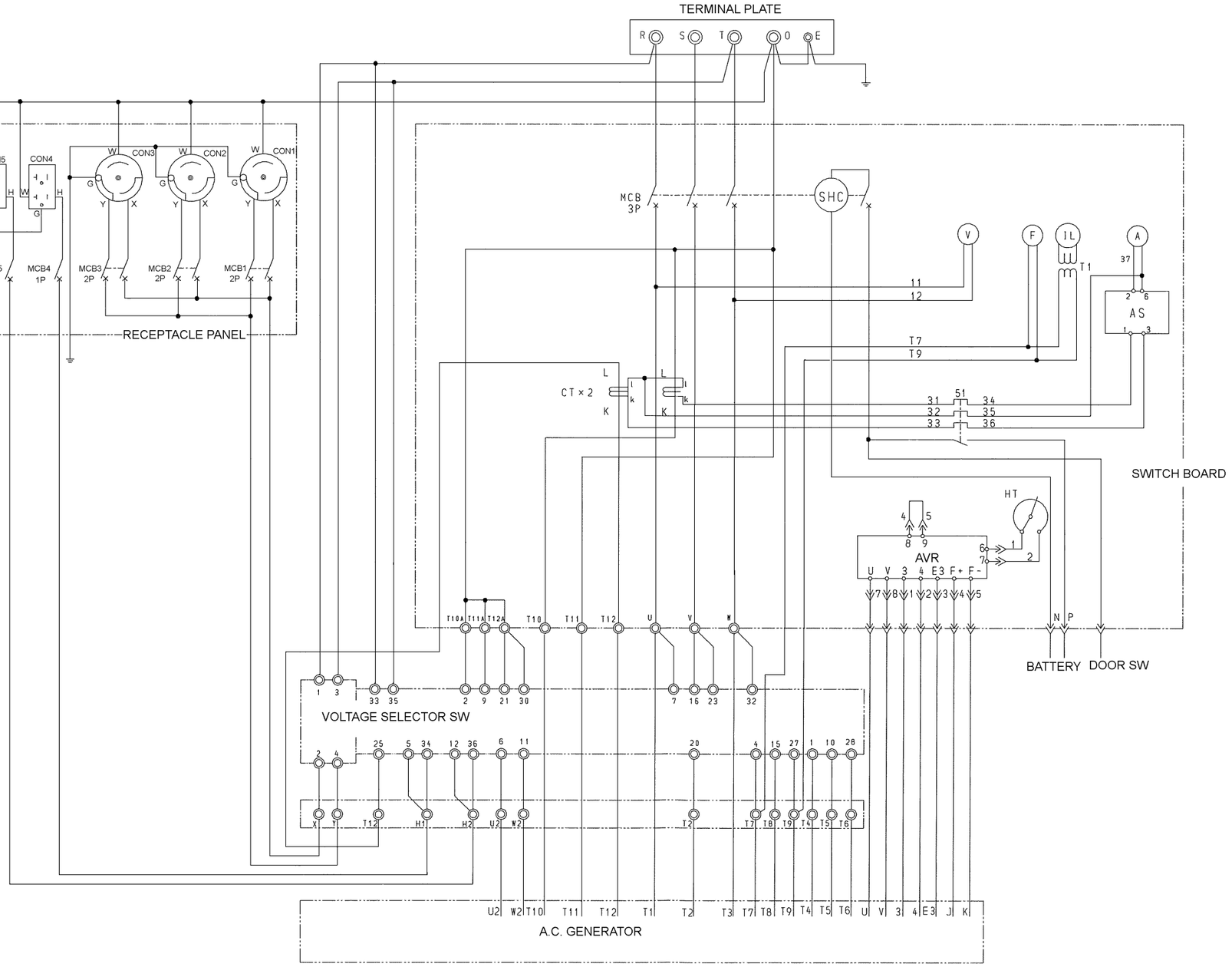


MCB	Molded case circuit breaker (three-phase)
MCB1～4	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over switch

A040196

10. Wiring Diagram

SDG45S/60S

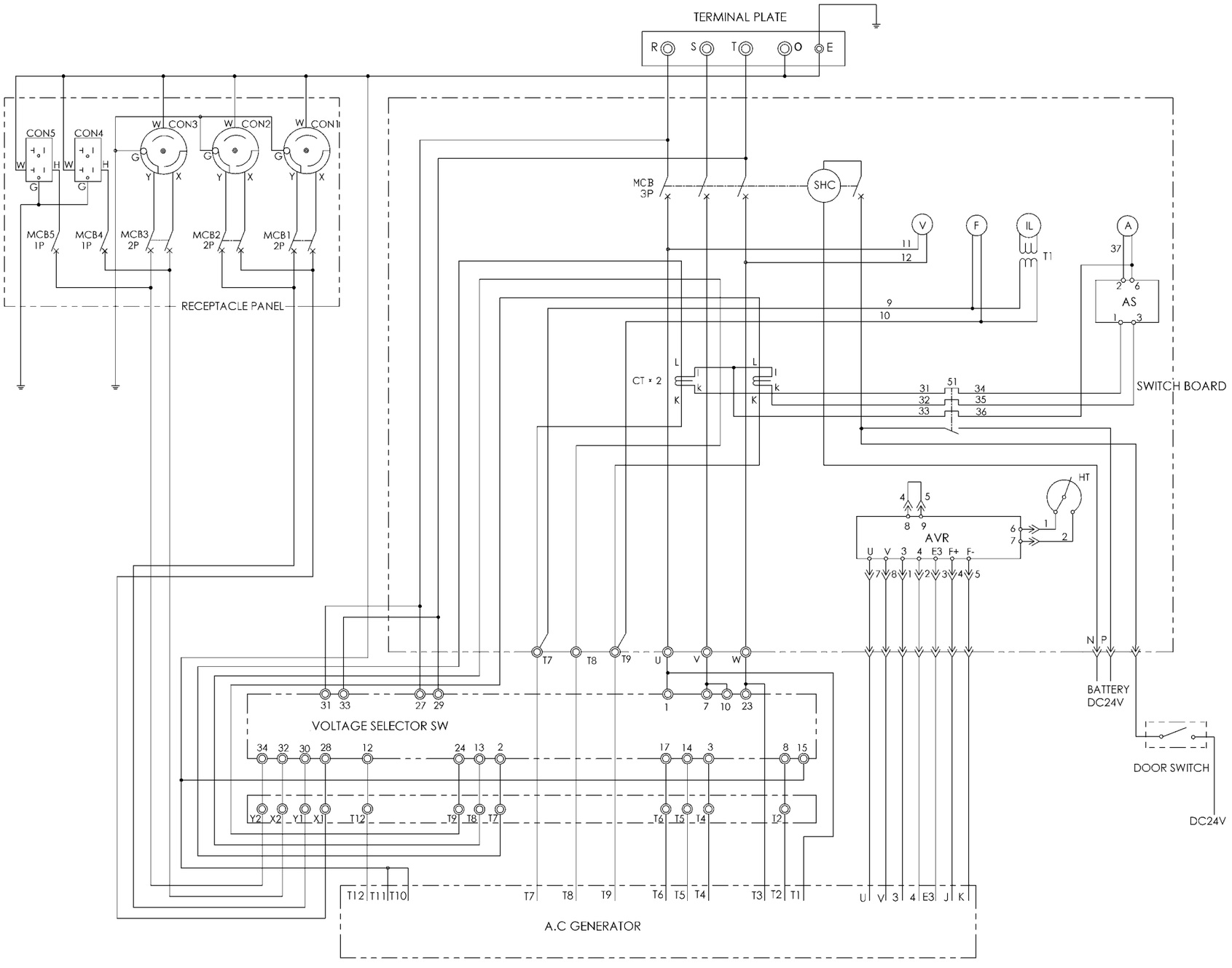


MCB	Molded case circuit breaker (three-phase)
MCB1～5	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over switch

A0300005

10. Wiring Diagram

SDG75S/100S

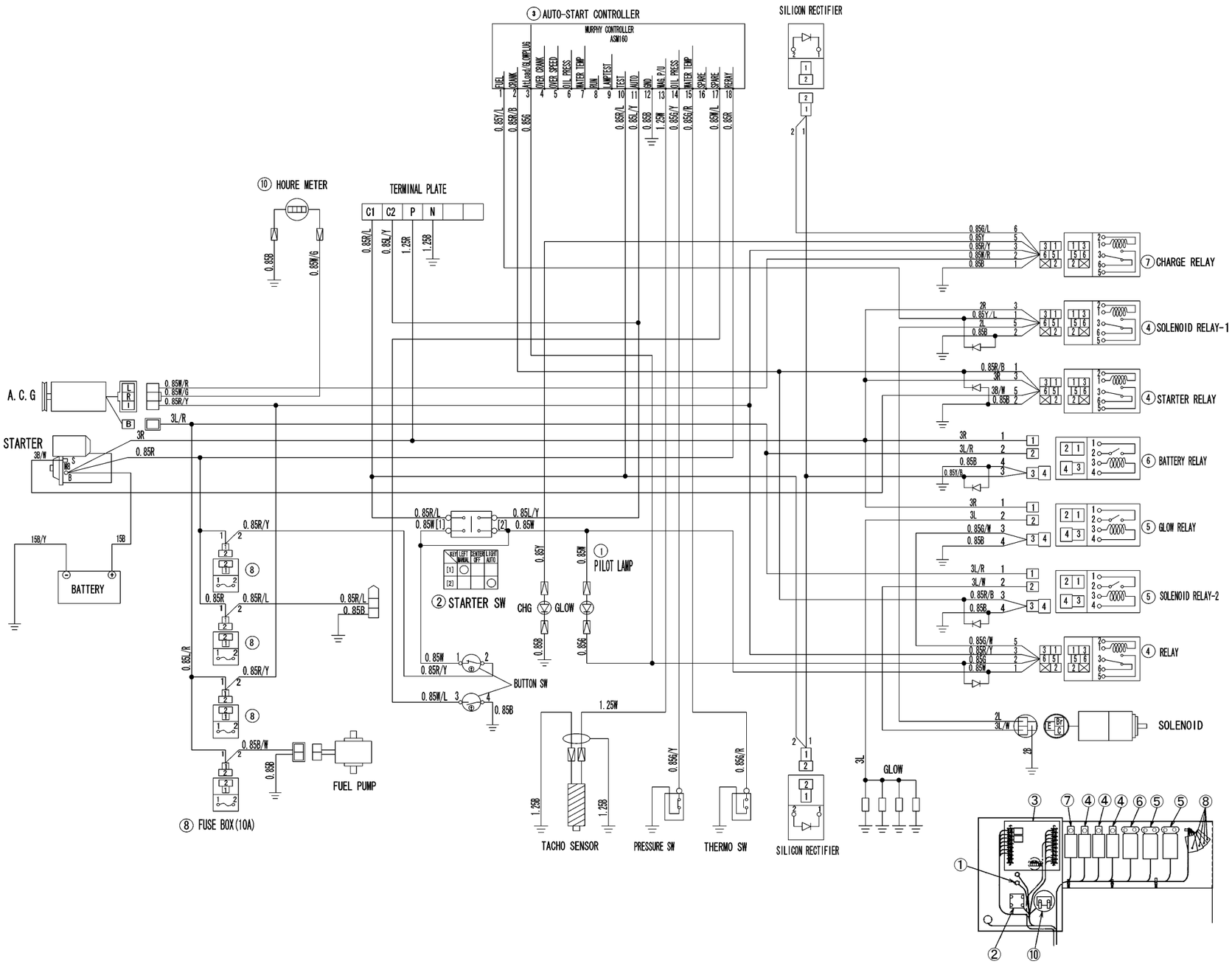


MCB	Molded case circuit breaker (three-phase)
MCB1～5	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over switch

A020249

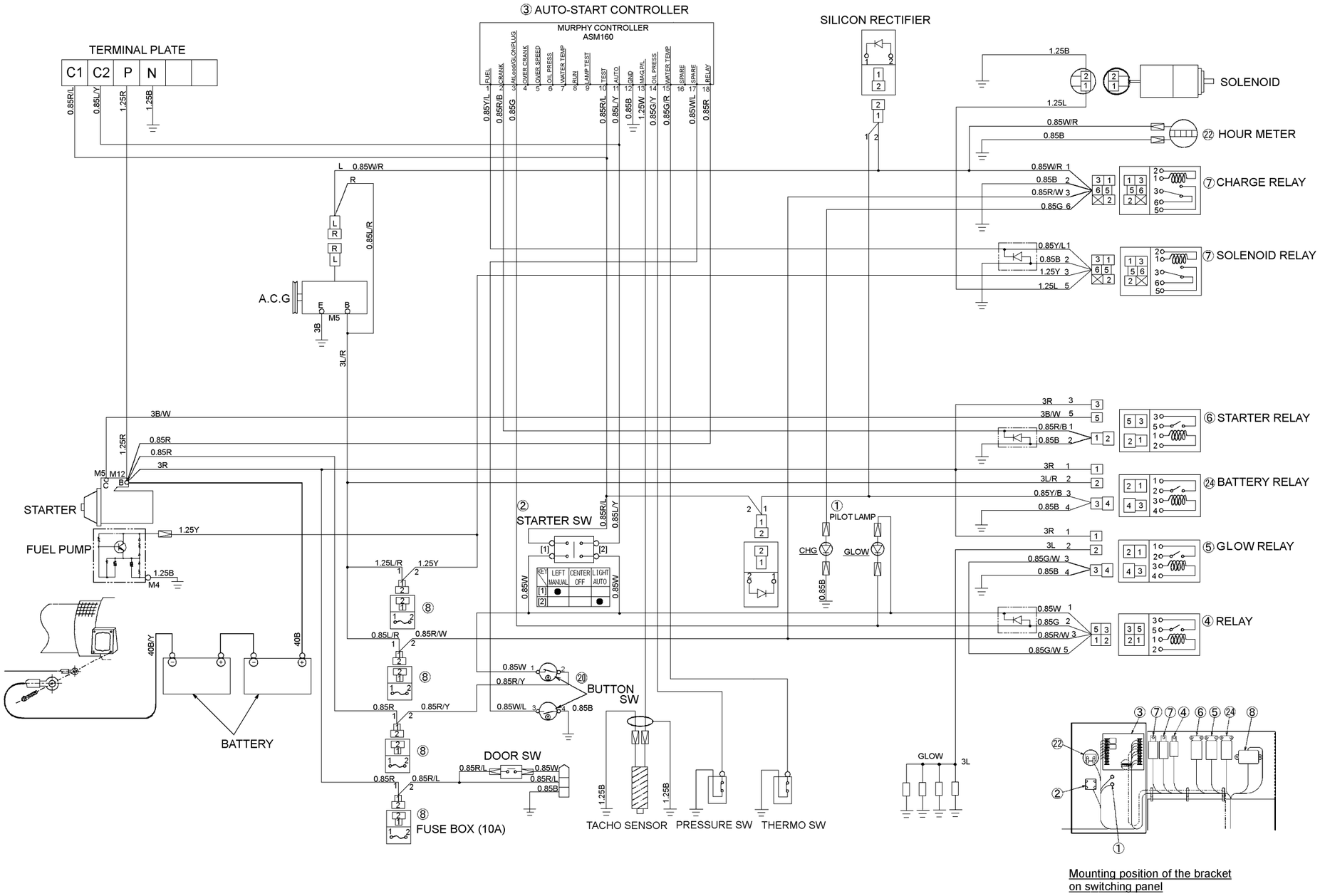
10.2 Engine Wiring Diagram

SDG25S

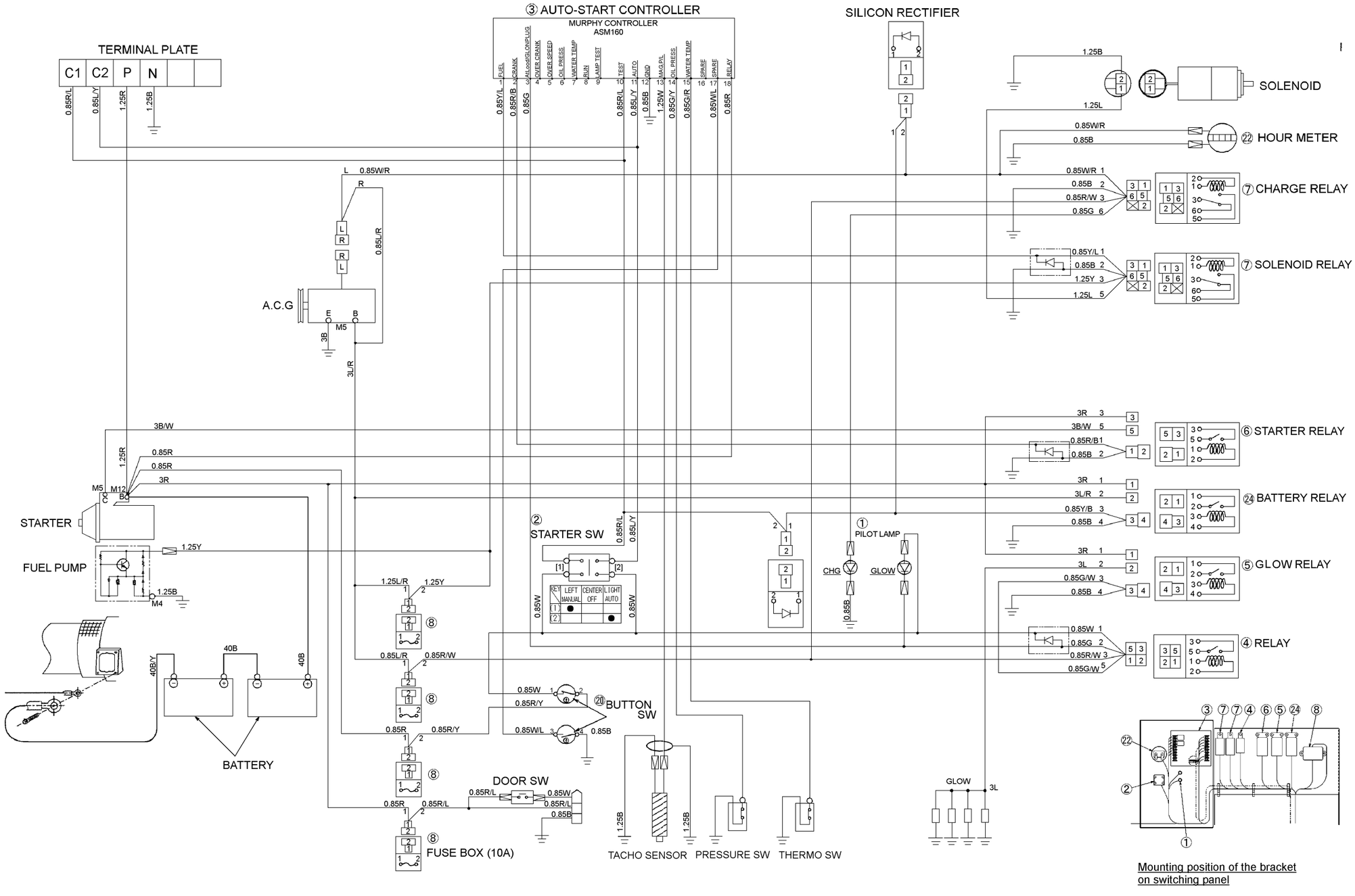


A040197

SDG45S


③ AUTO-START CONTROLLER
MURPHY CONTROLLER
ASM160
SILICON RECTIFIER
TERMINAL PLATE
C1
C2
P
N
SOLENOID
HOUR METER
⑦ CHARGE RELAY
⑦ SOLENOID RELAY
⑥ STARTER RELAY
㉔ BATTERY RELAY
⑤ GLOW RELAY
④ RELAY
A.C.G
STARTER
FUEL PUMP
BATTERY
② STARTER SW
① PILOT LAMP
CHG
GLOW
BUTTON SW
DOOR SW
FUSE BOX (10A)
TACHO SENSOR
PRESSURE SW
THERMO SW
Mounting position of the bracket on switching panel
A030350

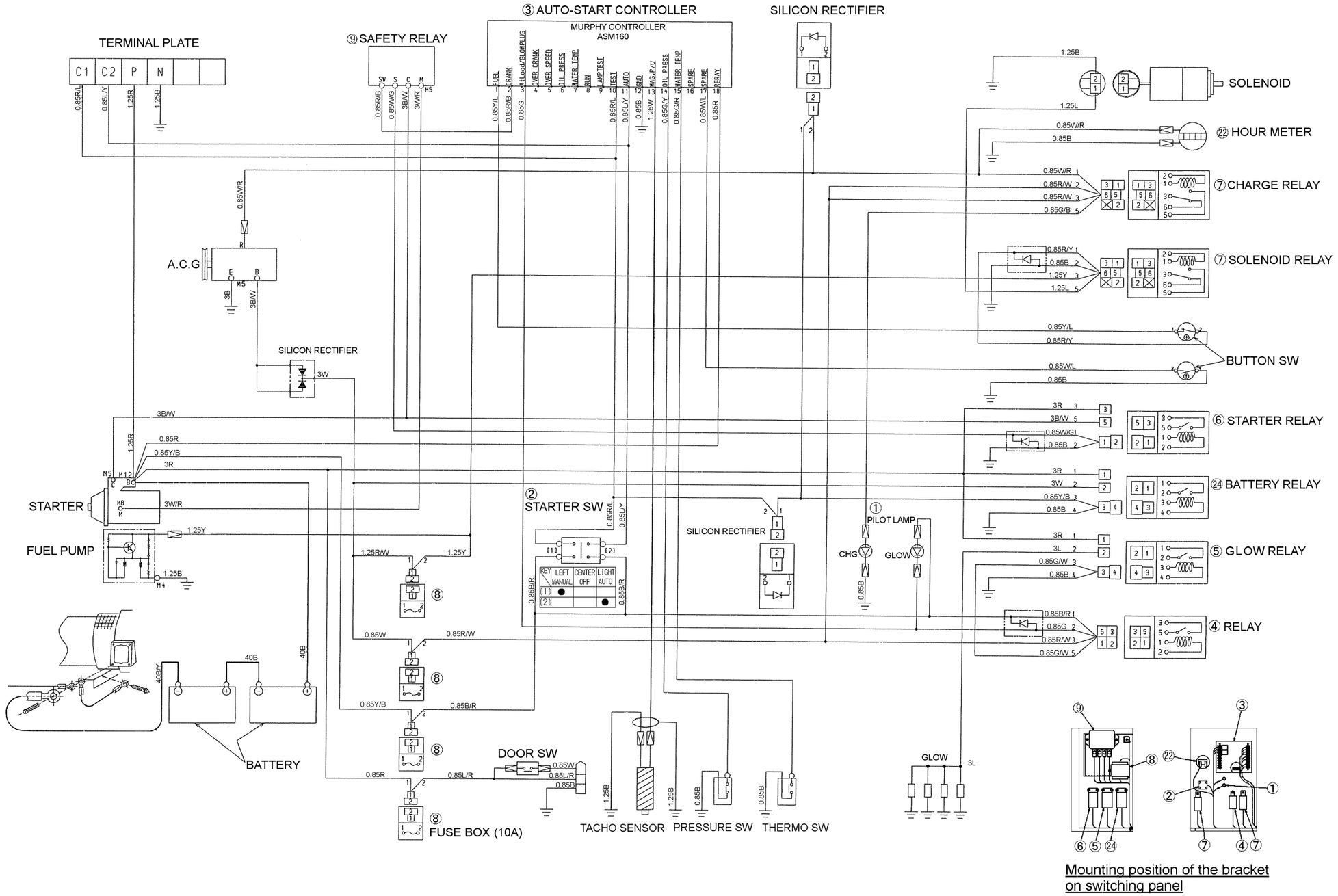
SDG60S



A030351

10. Wiring Diagram

SDG75S/100S



A0300004

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