SERVICE MANUAL

MOBILE GENERATORS

SDG25S-3A3, SDG45S-3A4, SDG60S-3A2, SDG75S-3A2, SDG100S-3A2

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Table of Contents

* For details on operation and installation, refer to the instruction book.

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.

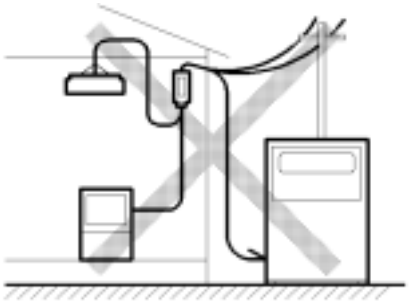
1.Safety

1.1 Caution before Operation

WARNING

Electric shock and electric leak

- 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

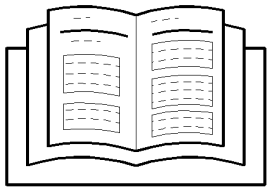
W010

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

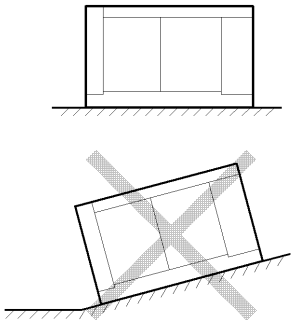
Transportation

- Use the lifting bail 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 set it on a truck bed and fix the machine in place, so it can not shift.
- 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.

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

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.

WARNING

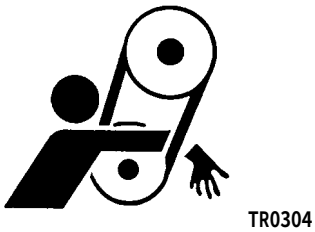
Never touch the interior of control panel

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

WARNING

Hands off from rotating parts and belts

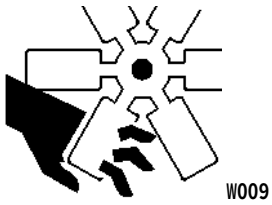
- Keep hands clear from the rotating portion or belts while running. It could cause serious injuries if hands should be caught.



WARNING

Beware of cooling fan

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



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.

W005

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.

W005

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

W004

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

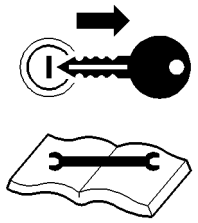
- Reduce the load if the circuit breaker actuates frequently during operation.
- When a single-load is used, check the current of each phase, and adjust the load so that each load value remains balanced.
- If the above procedure is neglected during operation, the generator could be damaged or cause a 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

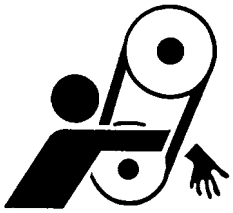
- Before starting inspection, switch off the circuit breaker of the machine, remove the key from the starter key switch, hang a "Now Checking and under Maintenance" tag where it can be easily seen. Operator and service personnel must keep the key during checking and maintenance.
- Remove the negative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

- 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.

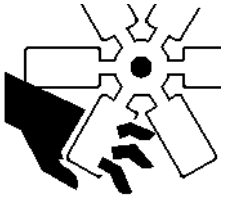


TR0304

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

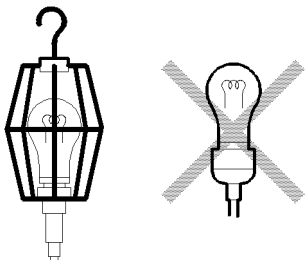
- When cleaning dust accumulated in components such as radiator, air-filter, etc., when blowing compressed air, wear safety glasses, etc. to protect your eyes.

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 then 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.

W005

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.

W005

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.

W005

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.

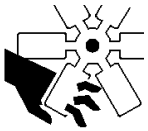
- Waste liquid from the machine contains harmful material. Do not discharge onto the ground, river, lake or sea. Such material will contaminate the environment.
- Use a container to hold the waste liquid taken from the machine.
- Follow designated regulations when disposing of oil, fuel, coolant (antifreeze),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

1.4 Safety Warning Labels

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

※①

WARNING



Keep your hands AWAY from fan during operation. Entanglement in the fan can cause serious injury.

39176 52600 (39176 37900)

②

CAUTION

PREVENT BURNING ACCIDENT

Do not open radiator cap while it is still hot.

39176 35300

③

CAUTION

PREVENT BURNING ACCIDENT

When work is required near hot parts, wait for the parts to cool down fully before starting work.

39176 56400

④

WARNING

BEWARE OF EXHAUST GASES

When you operate machine INDOORS or in TUNNEL, provide good ventilation. Poor ventilation can cause fatal accident.

CAUTION

- Read and understand this operation book before starting operation.
- To avoid electric shock and fire, never connect the generator outlets to an installation which is also connected to the public mains and in-house lines.
- To avoid electric shock or injury, cut off the circuit breaker before starting operation.
- To avoid electric shock, keep the terminal cover locked during operation.
- To avoid electric shock, this product shall be surely grounded.
- To avoid injury, keep the side-door locked during operation.
- To avoid a fire, never operate this product near a location where flammables are present.
- To avoid a fire, refill fuel oil after stopping the engine.
- To avoid injury, never move the product during operation.

39176 52701

⑤

WARNING

Keep your hands AWAY from moving parts such as V-belts, pulleys etc..

Entanglement in them can cause serious injury.

39176 34700

⑥

DANGER

DO NOT OPEN PANEL WHILE UNIT IS RUNNING.

HIGH VOLTAGE

39176 62400

⑦

DANGER **EXPLOSIVE GASES**

Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and training.

KEEP VENT CAPS TIGHT AND LEVEL

POISON **CAUSES SEVERE BURNS**

Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediatery.

KEEP OUT OF REACH OF CHILDREN

39176 50000

⑧

WARNING

Do not touch live electrical parts.
Always wear dry insulating gloves.
Do not operate the unit in the rain, around standing water or when wet.
Maintain all electrical cards and connections in proper condition.
Always around the generator to earth before operating.

39176 62900

※Models SDG25S and 45S,60S,75S,100S are provided with different sizes of warning labels.

The number in parentheses( )indicates part number of warning lable attached to Model

⑨

⚠ CAUTION

LIFTING BAIL

39176 35500

⑩

⚠ CAUTION

DO NOT SWITCH WHILE
UNIT IS RUNNING.

39176 62700

⑪

FLAMMABLES

39176 35600

⑫

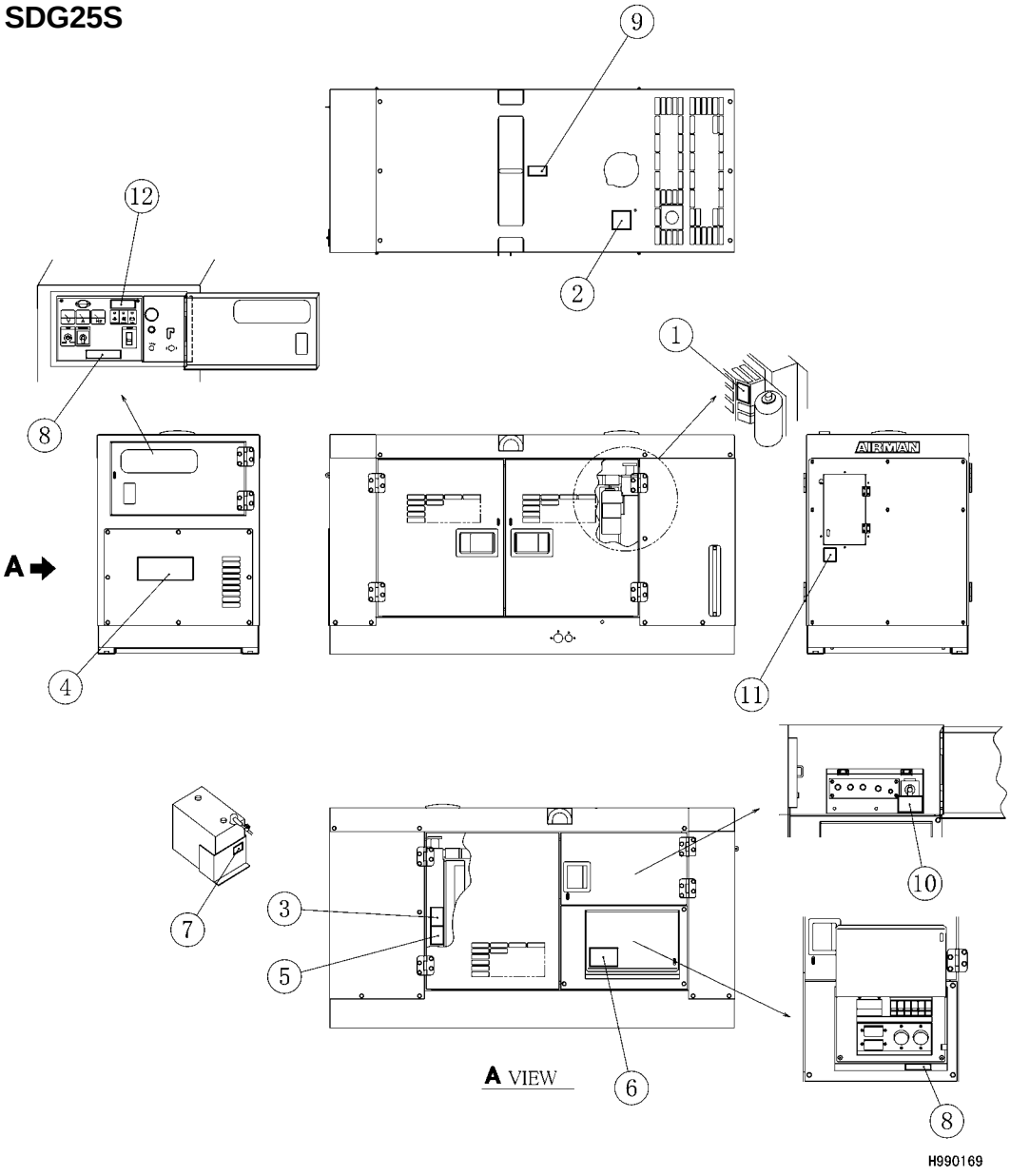
⚠ DANGER

Authorized service personnel
only to open panel.

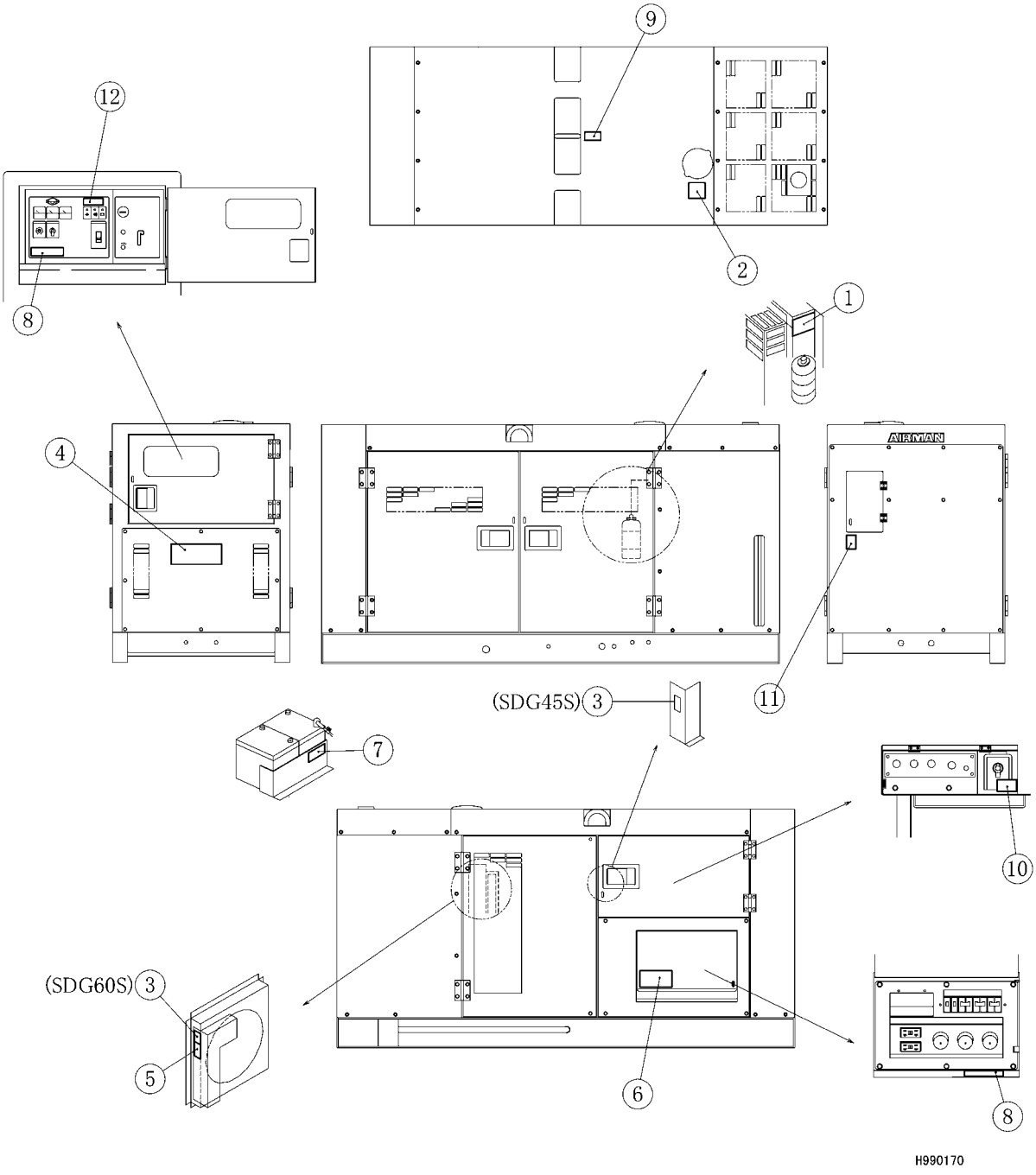
39176 65501

- **Locations of warning labels attached**

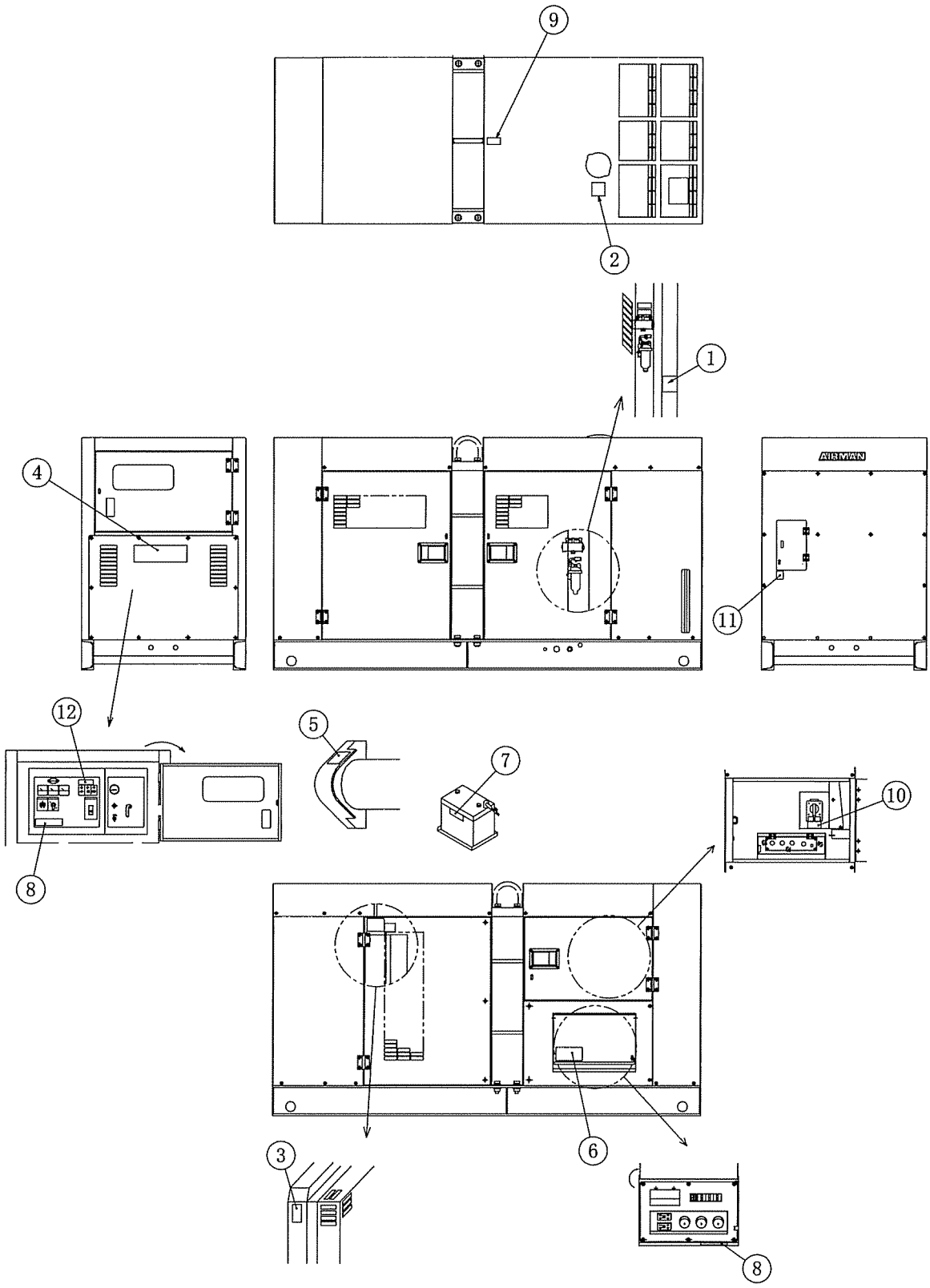
SDG25S



SDG45S/60S



SDG75S/100S



H990337

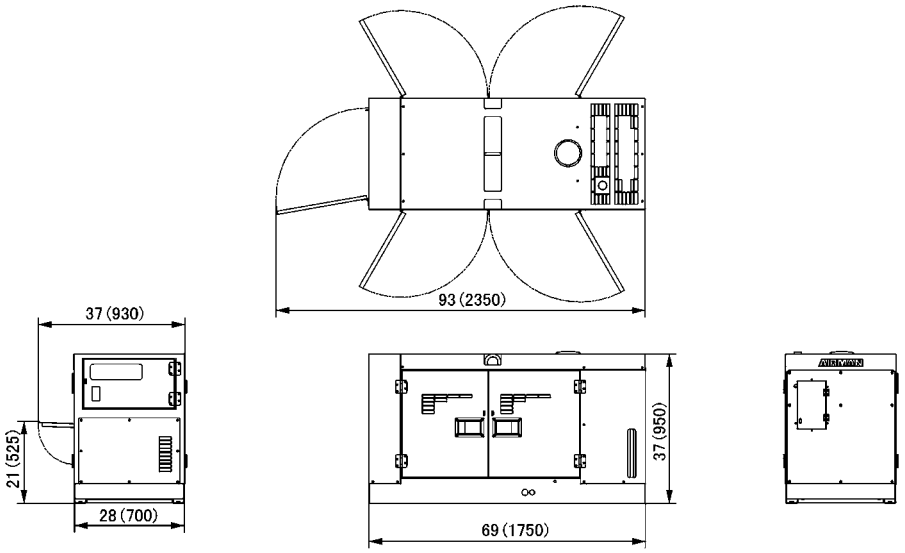
2. Specifications

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
					Number of poles		4P
					Insulation		H class
				Engine	Model		ISUZU 4LE1
					Type		Four-cycle, water-cooled, swirl chamber
					Number of cylinders		4
					Total displacement	cu. in.(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		80D26R-MF

Outline drawing

Unit: in.(mm)



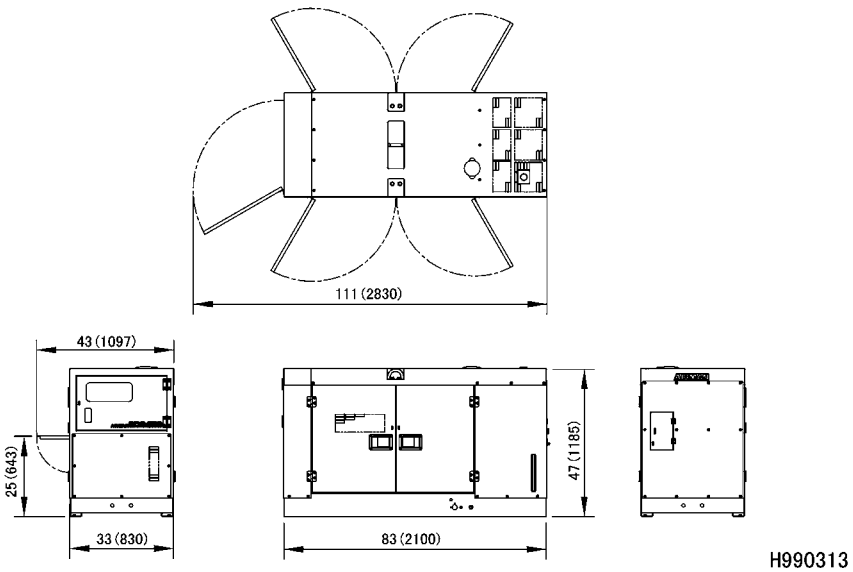
2. Specifications

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
					Number of poles		4P
					Insulation		F class
				Engine	Model		ISUZU B-4BG1
					Type		Four-cycle, water-cooled, direct injection type
					Number of cylinders		4
					Total displacement	cu. in.(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)



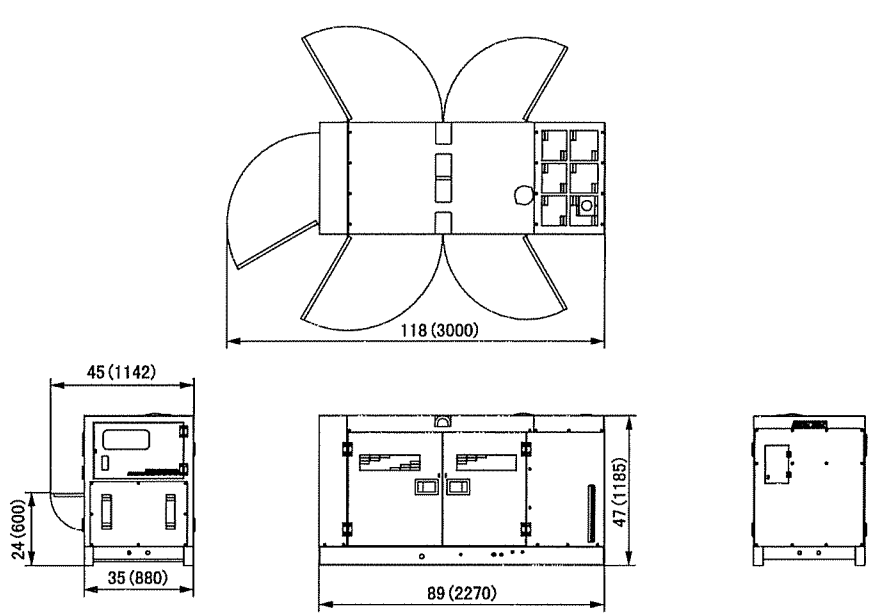
2. Specifications

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
					Number of poles		4P
					Insulation		F class
				Engine	Model		ISUZU A-4BGIT
					Type		Four-cycle, water-cooled, direct injection type with turbo charger
					Number of cylinders		4
					Total displacement	cu. in.(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)



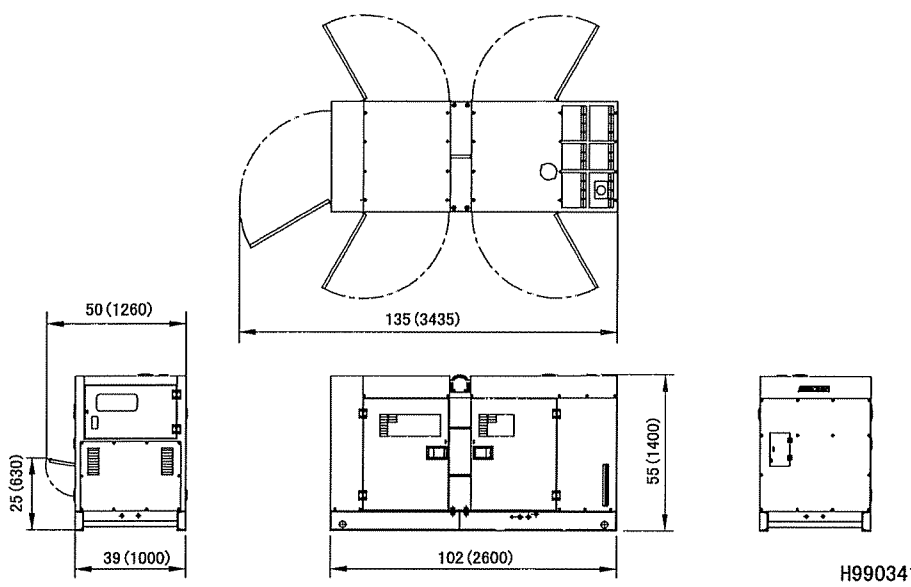
2. Specifications

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
					Number of poles		4P
					Insulation		F class
				Engine	Model		ISUZU A-6BG1
					Type		Four-cycle, water-cooled, direct injection type
					Number of cylinders		6
					Total displacement	cu. in.(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)

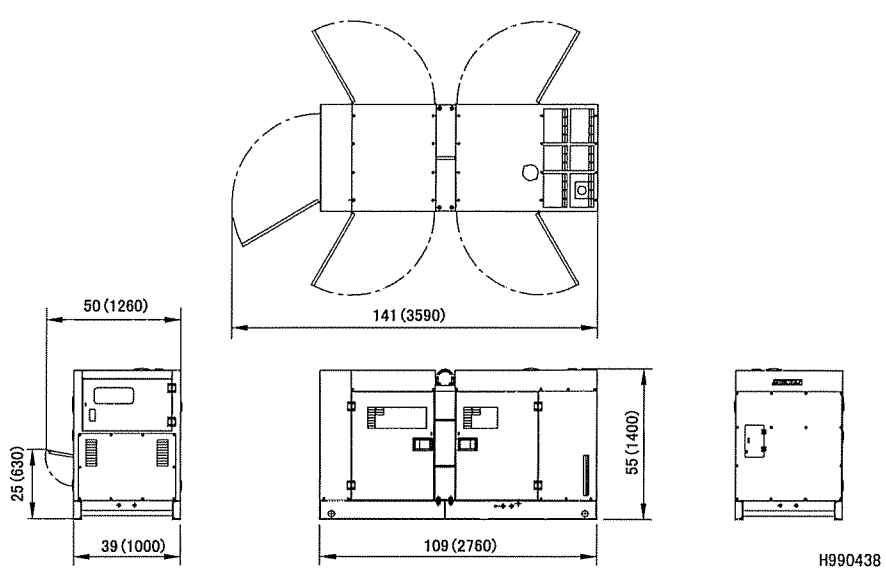


2. Specifications

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
					Number of poles		4P
					Insulation		F class
				Engine	Model		ISUZU A-6BG1T
					Type		Four-cycle, water-cooled, direct injection type with turbo charger
					Number of cylinders		6
					Total displacement	cu. in.(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)



3 Cautions for Overhauling

3.1 Precautions before Starting Work

(1) Work to be performed
It is very important to always plan in advance what facilities, tools, instruments, materials, oil, etc. you will need to use; the exact locations and methods of performing inspection, adjustment, or disassembly; and the key points of any repair work to be performed.

(2) Care not to spill oil
Use a pan to collect used engine oil when changing the oil or attaching or detaching an oil line. If a large volume of oil is expected to flow out make sure to drain any accumulated oil from the engine oil pan in advance.

(3) Care when detaching parts
When disassembling a complicated part, put a matching mark to indicate the position of detached parts for future reference. Make sure that the negative cable is detached from the battery terminals before starting repair work.

(4) Tools to be prepared
1. Measuring instruments (e. g. tester, insulation resistance gauge etc.)
2. Tools
3. Torque wrenches
4. Jigs and specialized tools
5. Solder and soldering iron
6. Sealing tape
7. Molybdenum sulfide (tube type)
8. Lithium-base grease
9. Diesel oil (cleaning solvent)
10. Cleaning cloths
11. Literatures (such as manuals etc.)

3. Cautions for Overhauling

3.2 Disassembly and Assembly

(1) Wash dirt, dust and grime off vinyl tube and fuel hose before removing it, and take necessary steps to cover or tape the openings of vinyl tubes or fuel hoses to prevent any dirt from entering them.

(2) Perform disassembly work in a dust-free location whenever possible.

(3) When disassembling parts, wash their outer surface and place them on a clean sheet of paper or cloth, taking care not to contaminate or damage them.

(4) Wash disassembled parts with diesel oil (cleaning solvent) after checking for contamination or discoloration. However, do not wash rubber parts with diesel oil.

(5) Be careful not to damage disassembled parts, they are precision built.

(6) Replace consumables such as oil seals, O-rings, filters, oil, etc. with new items when reassembling parts.

(7) Apply a coating of clean grease to O-rings when installing them in the machine.

(8) When reassembling parts, place each part in the order of assembly and take care that no parts are missing or misassembled.

(9) When reassembling an assembled part (set part), be sure to replace it as an assembly.

(10) Contamination or rusting may occur due to dust or humidity if parts are left in disassembled or partly disassembled condition for a long time. Therefore, be careful to prevent dust or rust from affecting parts if you have to leave the repair incomplete for a long period of time.

(11) Check tightening torque and clearance when assembling parts.

(12) Check the direction of rotation, speed, and oil leakage after assembly.

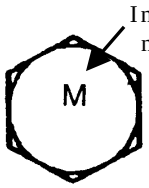
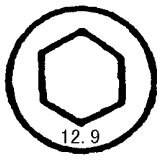
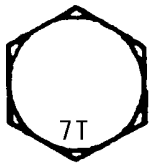
(13) Before starting the machine after disassembly, run it at low idle to check for unusual noises, etc. to prevent engine or generator damage.

3. Cautions for Overhauling

3.3 Tightening Torque

3.3.1 General tightening torque of bolts and nuts

Fasten all the bolts and nuts with the specified tightening torque when assembling.

Type / Strength, classification, and indication example / Torque / Nominal diameter (mm)	Low or medium carbon steel bolt (SS400B, etc.)		High strength steel bolt (SCM435, etc.)	
	4.6－6.8 (4T－6T)  Hexagon headed bolt		8.8－12.9 (7T－12T)  Socket bolt  Hexagon headed bolt	
	lbw･ft	kgf･cm	lbw･ft	kgf･cm
6	3.7	50.5	7.2	100
8	8.9	123.5	18	245
10	18	245	35	485
12	31	425	61	845
14	49	675	98	1350
16	76	1055	152	2100
18	105	1450	210	2900
20	148	2050	297	4100
22	203	2800	405	5600
24	250	3450	514	7100
Applied sections.	For general sections such as bonnet and frame.		For specified sections.	

IMPORTANT

- Each clamping torque listed in the above-mentioned table applies to bolts being used for generators.
- The list shows normal clamping torque. In some sections, special specified torque is required. In such a case, use the specified torque only.
- Make sure to remove rust and dust before tightening.

3.3.2 Tightening torque for terminal plate

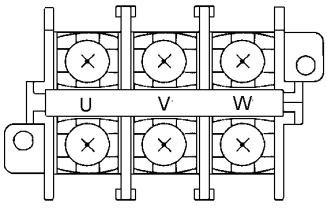
IMPORTANT

- When connecting the output terminals of the generator, it is important to tighten the screws, according to the designated torque.
  Since the terminal is so small, it could be burned or damaged without the proper torque.

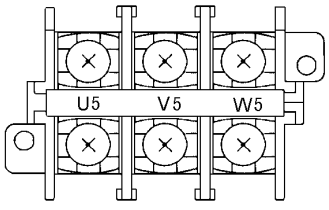
		SDG25S		SDG45S		SDG60S		SDG75S		SDG100S	
		Nominal diameter (mm)	Torque lbw·ft (kgf·cm)	Nominal diameter (mm)	Torque lbw·ft (kgf·cm)	Nominal diameter (mm)	Torque lbw·ft (kgf·cm)	Nominal diameter (mm)	Torque lbw·ft (kgf·cm)	Nominal diameter (mm)	Torque lbw·ft (kgf·cm)
Terminal Plate	①	5	2.1±0.5 (29±7)	6	3.5±0.9 (49±12)	8	6.4±1.6 (89±22)	8	6.4±1.6 (89±22)	10	11.8±3.0 (163±41)
	②	5	2.1±0.5 (29±7)	—	—	—	—	—	—	—	—
	③	—	—	5	2.1±0.5 (29±7)	5	2.1±0.5 (29±7)	6	3.5±0.9 (49±12)	8	6.4±1.6 (89±22)
	④	5	2.3±0.4 (33±5)	8	8.6±1.3 (119±17)	6	3.4±0.5 (47±7)	8	8.6±1.3 (119±17)	8	8.6±1.3 (119±17)
				5	2.3±0.4 (33±5)						
Voltage Selection Switch		6 Screw	1.5±0.1 (20±2)	6 Bolt	6.6±0.7 (92±10)	6 Bolt	8.1±0.7 (112±10)	6 Bolt	6.6±0.7 (92±10)	6 Bolt	8.1±0.7 (112±10)
				6 Screw	1.5±0.1 (20±2)						
MCB1 to 5		5	1.7±0.1 (23±2)	5	1.7±0.1 (23±2)	5	1.7±0.1 (23±2)	5	1.7±0.1 (23±2)	5	1.7±0.1 (23±2)

Terminal Plate

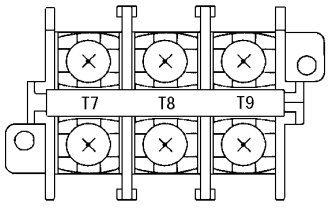
①



②

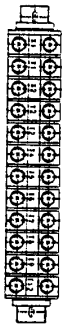


③

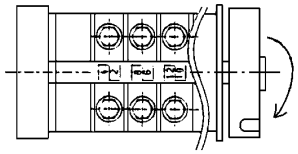


3-4-1

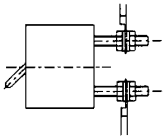
④



Voltage Selection Switch



MCB1 to 5
(Molded circuit breaker)

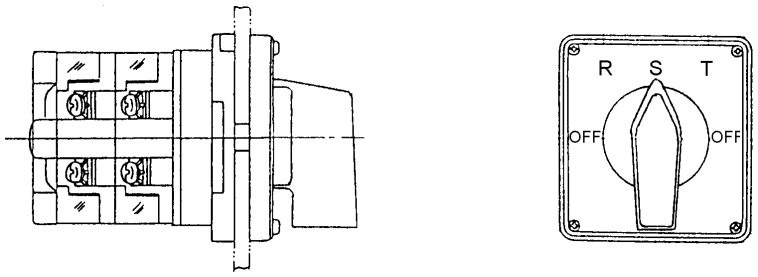


3-4-2

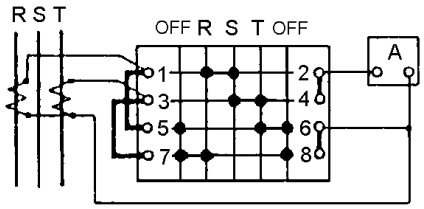
4 Electrical Parts

4.1 Electrical Parts of Generator

4.1.1 AS (Ammeter change-over switch)

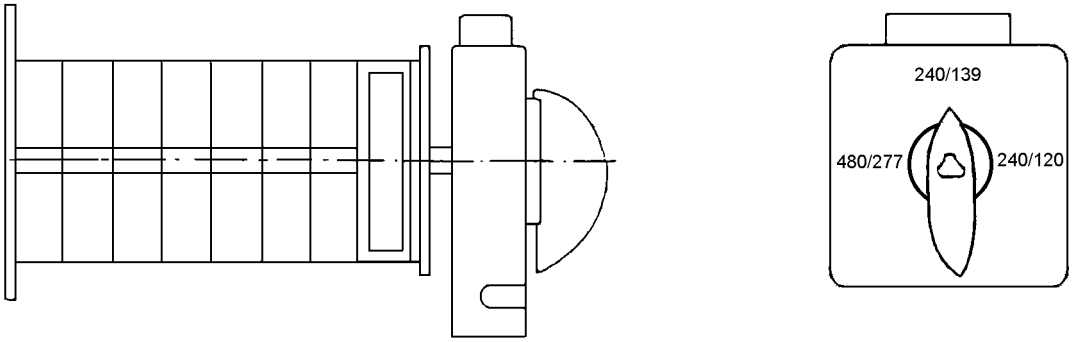


4-1-1



4-1-2

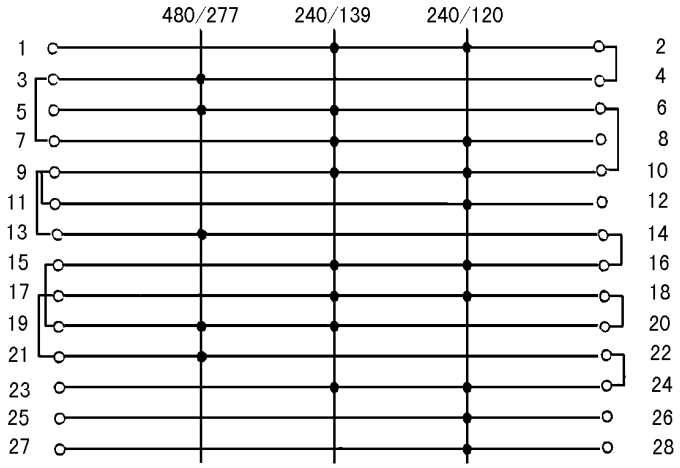
4.1.2 Voltage selection switch



4-1-3

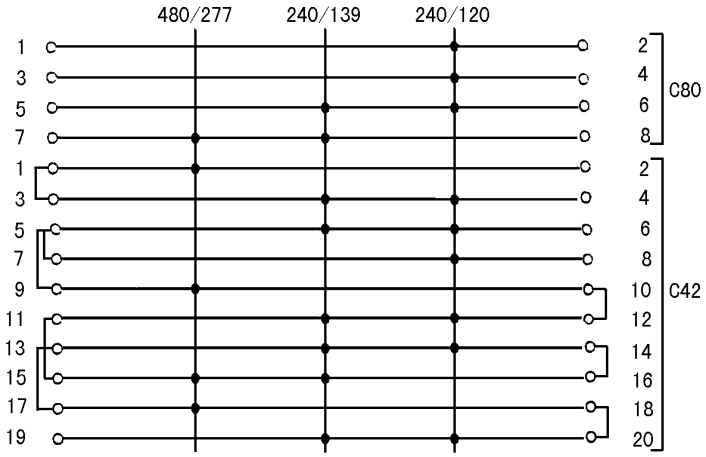
4. Electrical Parts

SDG25S/60S



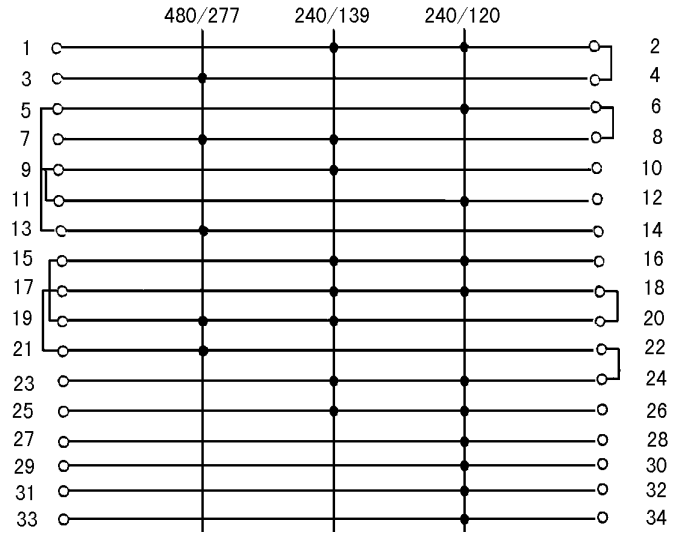
4-2-1

SDG45S



4-2-2

SDG75S/100S



4-2-3

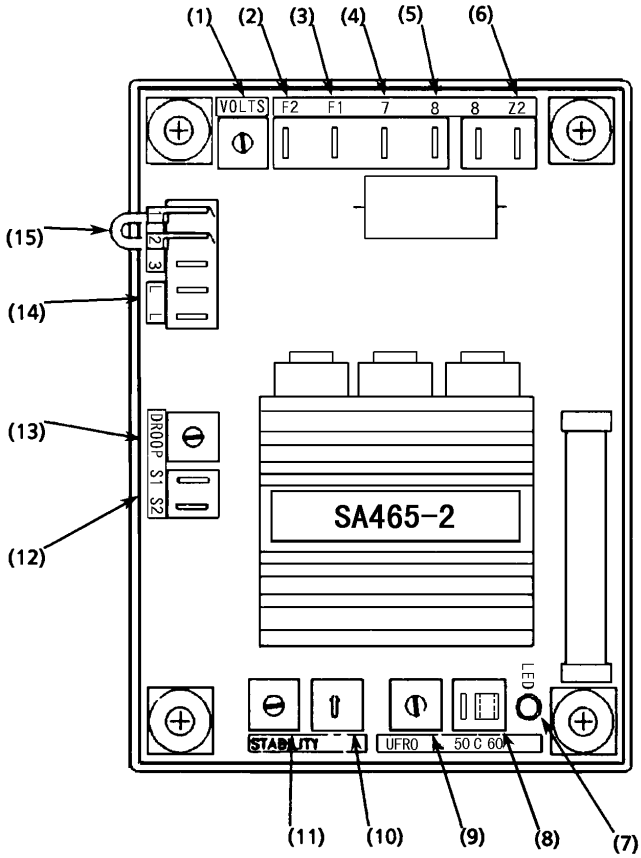
4. Electrical Parts

4.1.3 AVR (Automatic voltage regulator)

CAUTION

- Avoid excessive adjustments, except in a case where the characteristics are changed due to a change in parts.

SDG25S



4-3-1

	Name	Function	Remarks
(1)	VOLTS	Voltage regulator	Factory-adjusted.
(2)	F2	Exciter output	Connected to xx-
(3)	F1	Exciter output	Connected to x+
(4)	7	Detection of output voltage	Connected to V5
(5)	8	Detection of output voltage	Connected to U5
(6)	Z2	Power supply of AVR	Over-excitation protection fuse
(7)	LED	LED indicator	Indication of preventive circuit for low revolutions
(8)	FREQUENCY SELECTION	Frequency selector pin	Pin No.60 and C are short-circuit
(9)	UFRO	Setting of upward shift frequency	
(10)	STABILITY SELECTION	Stability selector switch	Set it to the position 1.
(11)	STABILITY	Setting of stability	
(12)	DROOP INPUT	Drooping control terminal	
(13)	DROOP	Drooping control	
(14)	VOLTAGE OPERATION	Input selection	
(15)	HAND TRIMMER	Voltage regulator	Insert a variable resistor of 1kΩ

4. Electrical Parts

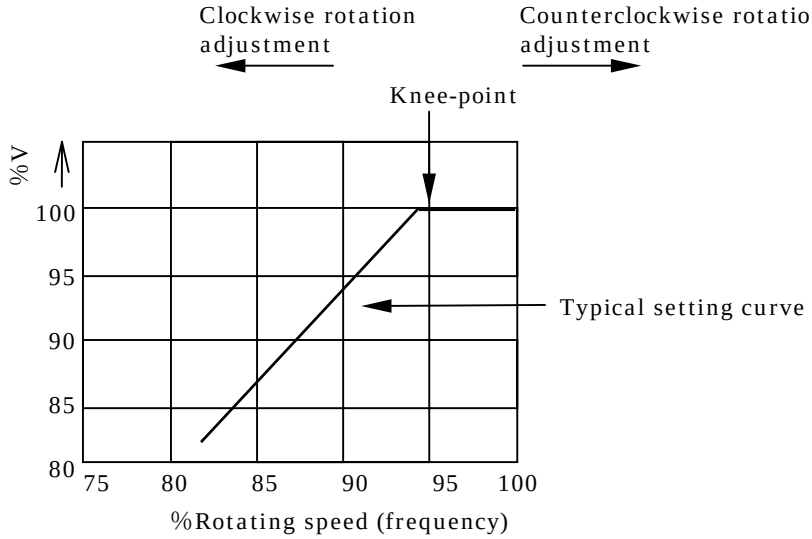
Adjusting AVR (SDG25S) (Set voltage selector switch to middle position 240/139V)

1. Connect the wiring to the AVR. (See generator wiring diagram.)
2. Make sure pin No.60 and C of FREQUENCY SELECTION (8) are short-circuit.
3. Rotate the VOLTS (1) knob fully counterclockwise.
4. After connecting the HAND TRIMMER (15) wiring, set the voltage regulator knob to the maximum position.
5. Set the STABILITY SELECTOR switch (10) to the position 1.
6. Start the engine. (Make sure that the engine revolution is not only normal but also stable in unload operation.)
7. Adjust the frequency to 62.5 Hz. Gradually rotate the VOLTS (1) clockwise to set it to 250V. Make sure that the voltage stays in the specified range of 208-250 V at the time of 60 Hz operation.
8. In the normal condition it is not necessary to adjust the STABILITY (11). (Mid-position setting is normal.) If the voltage is unstable, following adjustment is required:
9. Rotate the STABILITY (11) fully clockwise once, gradually rotate it counterclockwise until the voltage becomes unstable. Slightly rotate it clockwise to set for the best position. A digital multi-meter should be used for measuring voltage.
10. In the initial start-up stage, when the VOLTS and STABLE knobs are completely adjusted, no adjustment of the UFRO knob is required. However, should the voltage regulation function be faulty or the voltage disappear, adjust the UFRO knob as described below.

* UFRO (UNDER FREQUENCY ROLL OFF)

The AVR is provided with a built-in preventive circuit for low revolutions, a generator protection capability.

This circuit provides the following voltage-revolution (frequency) characteristics:



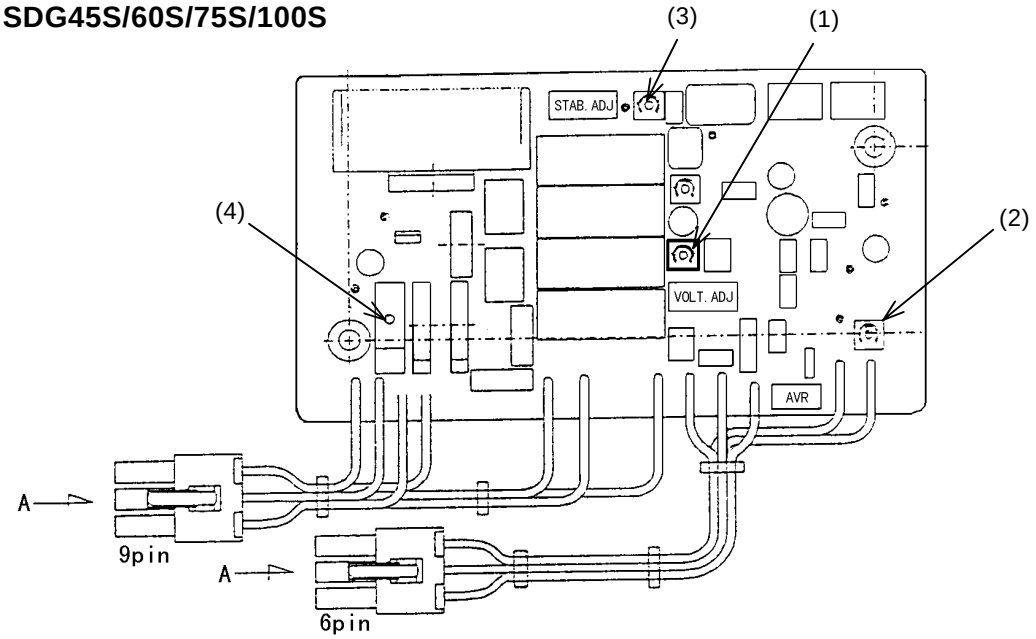
The UFRO (9) knob sets the knee-point.

Improper setting causes LED above the UFRO knob to remain lit when load is applied to the generator, resulting in dead voltage regulation capability during load operation. In other words, the generator will operate on the slanting line of the characteristics curve.

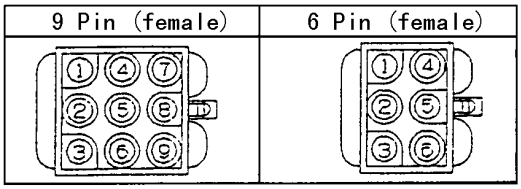
Rotating the UFRO knob clockwise decreases the frequency (revolution) at the "knee- point" to allow the LED go out.

4. Electrical Parts

SDG45S/60S/75S/100S



Connector (VIEW A)



9 Pin(female)			6 Pin(female)	
1:Brown	4:Yellow	7:Purple	1:Brown	4:Yellow
2:Red	5:Green	8:Gray	2:Red	5:Green
3:Orange	6: ／	9: ／	3:Orange	6: ／

	Name	Function
(1)	VOLT. ADJ	Voltage setting variable resistor
(2)	V. F. ADJ	V/Hz adjust variable resistor
(3)	STAB. ADJ	Stability adjust variable resistor
(4)	CPR	Over-excitation protection circuit protector

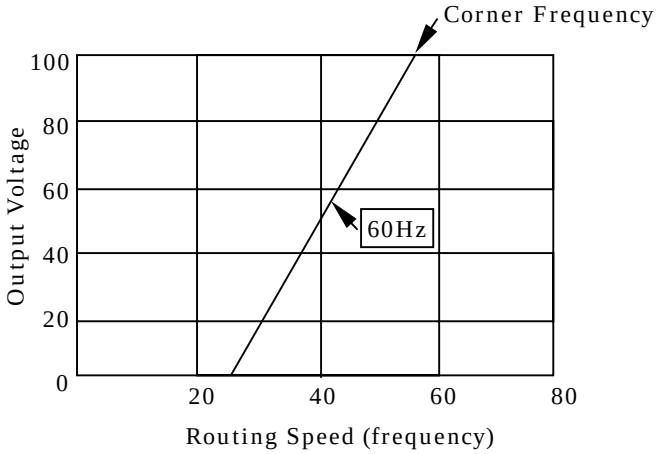
AVR CONNECTOR

		Line color	Connection	Remarks
6 pins (female)	1	Brown	Hand trimmer	Variable resistor 2kΩ 5W
	2	Red	Hand trimmer	
	3	Orange	NIL	
	4	Yellow	No.5 of connector 6P	To get corner frequency 57Hz, No.5 connector 6P and No.4 connector 6P short circuited
	5	Green	No.4 of connector 6P	
	6		NIL	
9 pins (female)	1	Brown	Generator cable No.3	
	2	Red	Generator cable No.4	AVR power supply (Generator cable 3 & 4)
	3	Orange	Generator cable E3	Detect generator output voltage between (4) and (5)
	4	Yellow	Generator cable J	Field winding of exciter
	5	Green	Generator cable K	Field winding of exciter
	6		NIL	
	7		Generator cable U	Auxiliary winding
	8		Generator cable V	Auxiliary winding
	9		NIL	

4. Electrical Parts

Adjusting AVR (SDG45S/60S/75S/100S) (Set voltage selector switch to 480/277V)

1. Turn voltage adjustment (1) counter-clockwise fully.
2. Set hand trimmer (voltage regulator) to maximum position.
3. Start engine.
   (Make sure engine speed is normal and stable at no load.)
4. Adjust 62.5Hz at no load.
5. Turn voltage adjustment (1) clockwise slowly and set on 500V..
6. Make sure the adjustable range of voltage is 416 to 500V by hand trimmer.



a. The above frequency compensation characteristic graph is used to improve the load characteristics by controlling voltage rise which occurs until steady frequency begins.
   - Regarding the unit having 60Hz specifications, in order to obtain corner frequency of 57Hz connector terminal (6 pins) (green) by jumper line.

b. The "corner frequency" of the units of 60Hz can be adjusted by V/Hz adjustment knob of AVR (V. F. ADJ). The frequency can be increased by turning the knob clockwise.
   (1) Before starting generator, fully turn V/Hz adjustment knob (V. F. ADJ) clockwise.
   (2) After starting generator, set the voltage to the rated one by inside voltage adjustment knob (VOLT. ADJ).
   (3) Set the frequency of generator to the required corner frequency.
   (4) Turn V. F. ADJ knob counter-clockwise slowly till output voltage begins to drop, and then set the corner frequency.

4. Electrical Parts

＜STABILLITY ADJUSTMENT KNOB＞

It is possible to adjust the response speed of generator output voltage in case of sudden change of load, using the inside stability adjustment knob (STAB. ADJ).

a. Turning stability adjustment knob clockwise, the response speed drops and voltage overshoot value becomes smaller (stabilized).
b. Turning it counter-clockwise, the response speed rises and voltage overshoot value becomes larger (not stabilized).

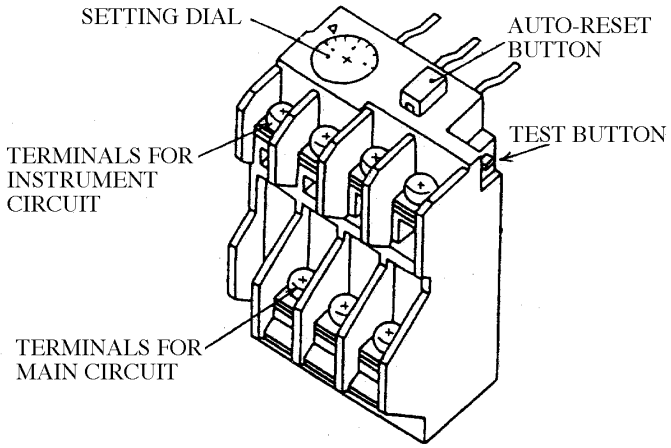
＜OVER-EXCITATION PROTECTION＞

Considering possibilities of incorrect cable connection, cable disconnection and improper cable contact, a circuit protector (CPR)is installed inside AVR power input to prevent AVR from being damaged by over-excitation current.
This protector works to push up the white push button fitted on the top of CPR and it is kept pushed up.
First remove the cause of over-excitation current occurrence, and then release it by depressing the white button on the top of CPR.

4.1.4 Thermal Relay

CAUTION

- Keep the over-current trip reset on auto-reset setting.
- Set the current set value by calculating it on a 60 Hz basis.



4-8-1

Thermal relay set value

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
60 Hz rated current	A	30	54	72	90	120
CT ratio		5/50	5/75	5/100	5/125	5/200
Set value	A	2.8	3.3	3.3	3.3	2.8

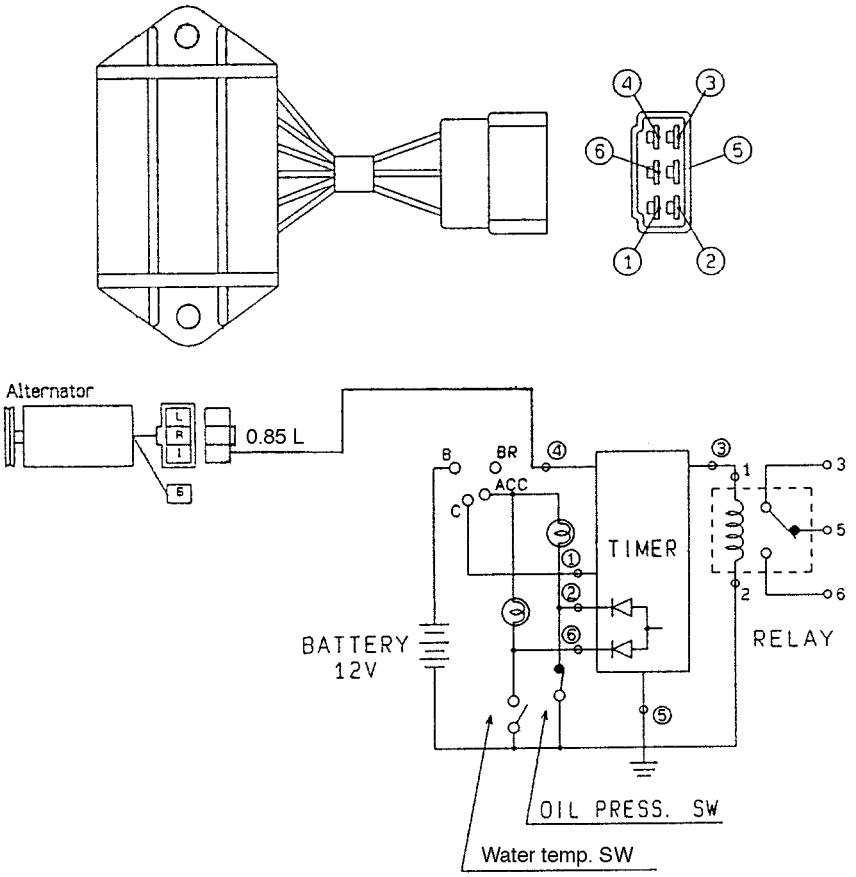
Calculation formula

$$\text{Set value} = \text{Rated current at 60 Hz} \times \text{CT ratio} \times 1.1 \times \frac{1}{1.2}$$

4.2 Electrical Parts of Engine

4.2.1 Time relay

SDG25S



4-9-1

Oil pressure switch [opens at 15PSi (0.98bar) or less]
Water temperature switch [opens at 230°F (110℃) or higher]

Specifications

Rated voltage	12 VDC
Delay time	The contact opens six seconds after 12 VDC applies to the terminal (3).
Contact load	0.5 A or less

Performance

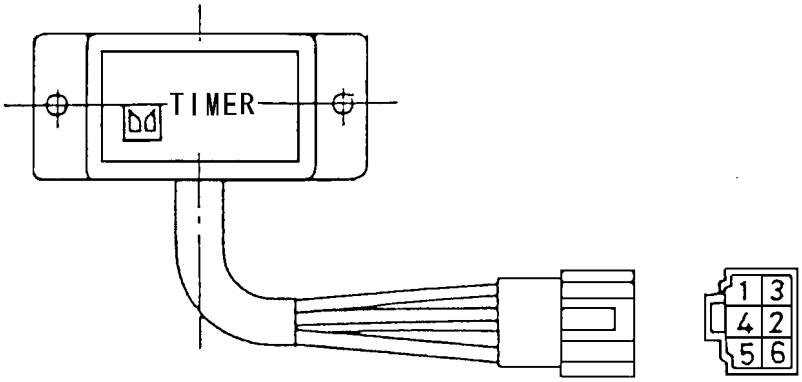
1) In the case of normal oil pressure and water temperature

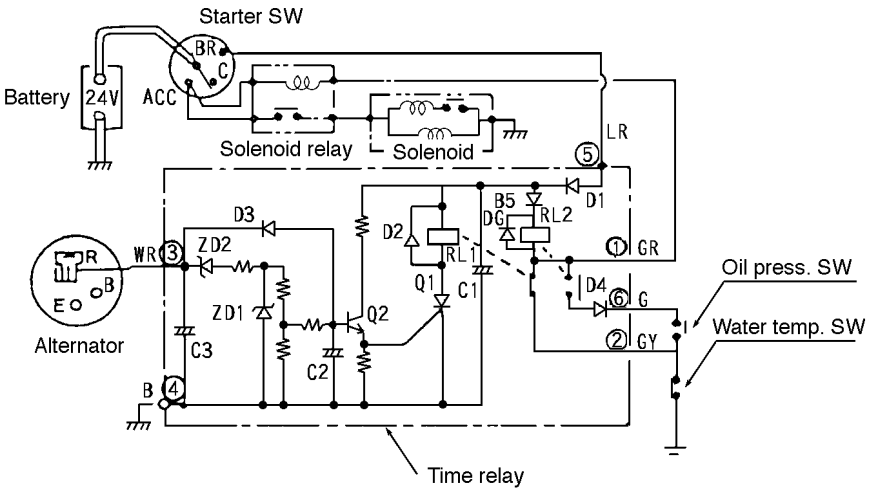
- At the time of engine starting, voltage appears at terminal (3) to energize the solenoid relay coil, allowing the solenoid to activate.
- Once the engine has started, for six seconds after the terminal (4) receives the alternator output voltage, no emergency stop signals can be detected at the oil pressure switch terminal (2) or the temperature switch terminal (6).

2) In the case of abnormal oil pressure and water temperature

- Input voltage applied to the terminal (4) cannot appear at the terminal (3). Therefore, the solenoid relay coil cannot be energized, preventing the solenoid from activating.

SDG45S/60S/75S/100S





4-10-1

Oil pressure switch [opens at 15PSi (0.98bar) or less]
Water temperature switch [opens at 221°F (105℃) or higher]

Specifications

Rated voltage	24 VDC
Delay time	The contact opens five seconds after 24 VDC applies to the terminal (3).
Contact load	0.5 A or less

Performance

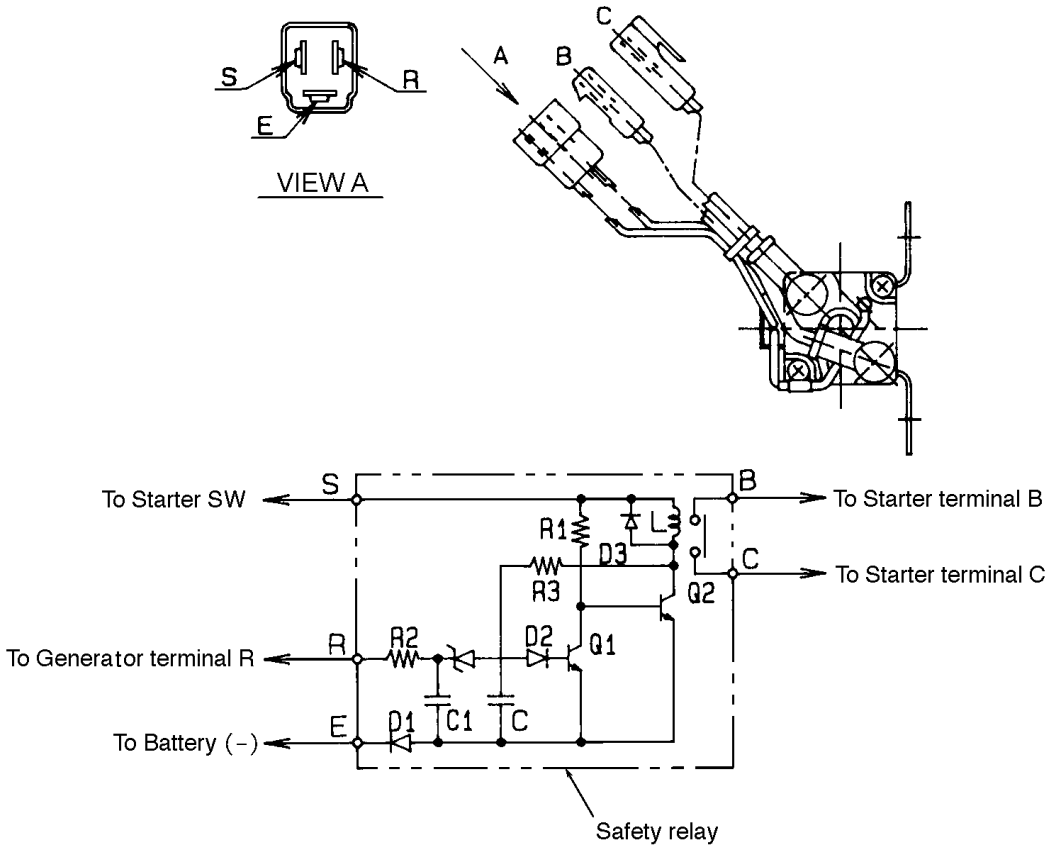
1) In the case of normal oil pressure and water temperature

- At the time of engine starting, the input voltage applied to the terminal (1) appears at the terminal (2) to energize the solenoid relay coil, allowing the solenoid to activate.
- After the engine has started, the alternator output voltage is received at the terminal (3) and the input voltage applied to the terminal (1) appears at the terminal (6) five seconds after the start to energize the solenoid relay coil, allowing the solenoid to activate.

2) In case of abnormal oil pressure and water temperature

- Input voltage applied to the terminal (4) cannot appear at the terminal (2) or (6). Therefore, the solenoid relay coil cannot be energized, preventing the solenoid from activating.

4.2.2 Safety relay (SDG45S/60S/75S/100S only)



4-11-1

Specifications

Rated voltage	24 VDC
Contact allowable current	200 A (instantaneous value) 35A (within 30 seconds)
S terminal current	3 A or less
R terminal current	0.3 A or less

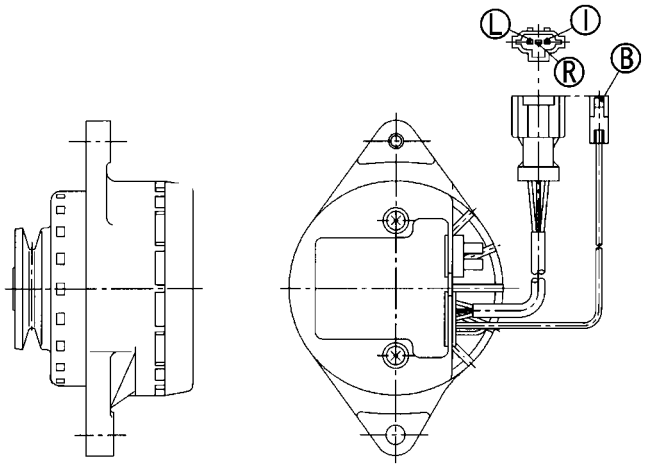
Performance

1) Starting operation at the time of stopping condition
- When the voltage is applied from the starter switch to the terminal S, the input voltage from the terminal B appears at the terminal C to rotate the starter motor, causing the engine to start.
- After the engine has started, when the A.C.G. output of 21.5 VDC is received at the terminal R, the input voltage applied to the terminal B disappears at terminal C to cause the starter motor rotation to stop.

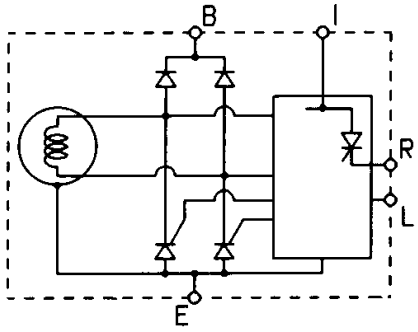
2) Starting operation at the time of running condition
- When the A.C.G. output of 22.5 VDC is received at the terminal R while the engine is running, even the input voltage applied to terminal S from the starter switch cannot appear at the terminal C, preventing the starter motor from rotating.

4.2.3 A.C.G (Alternator)

SDG25S



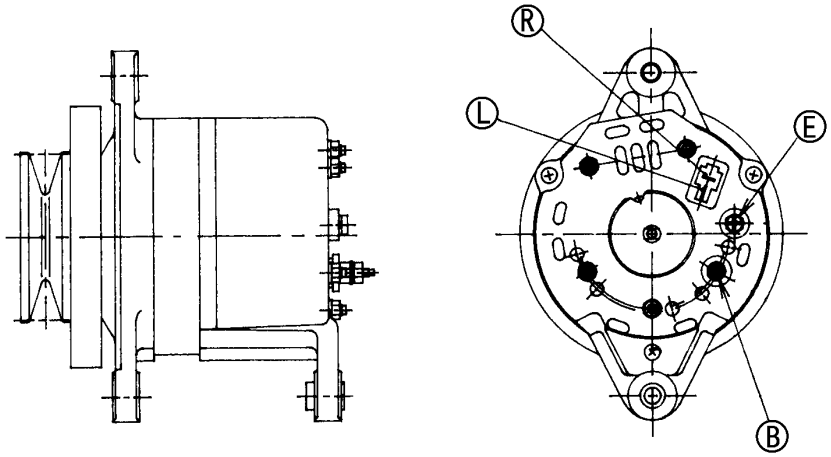
AS-017



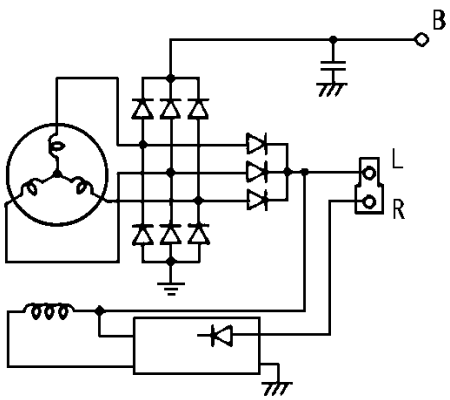
AS-006

Voltage – Current	12V – 20A
Regulator adjusted voltage	13.8V ± 0.5V

SDG45S/60S



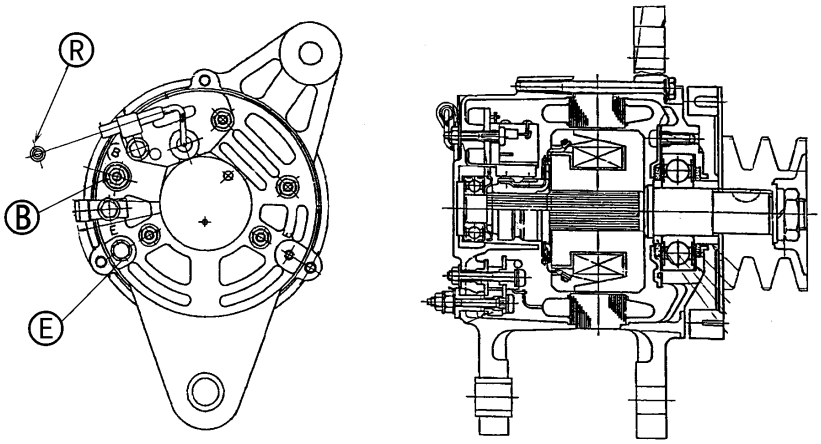
AS-011



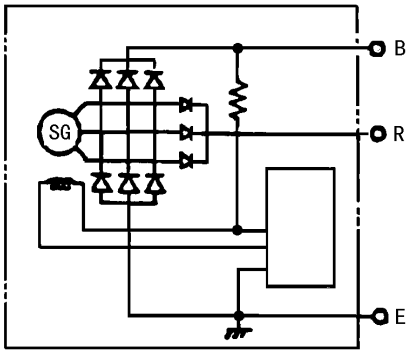
AS-018

Voltage – Current	24V – 20A
Regulator adjusted voltage	28.5V ± 0.5V

SDG75S/100S



4-13-1

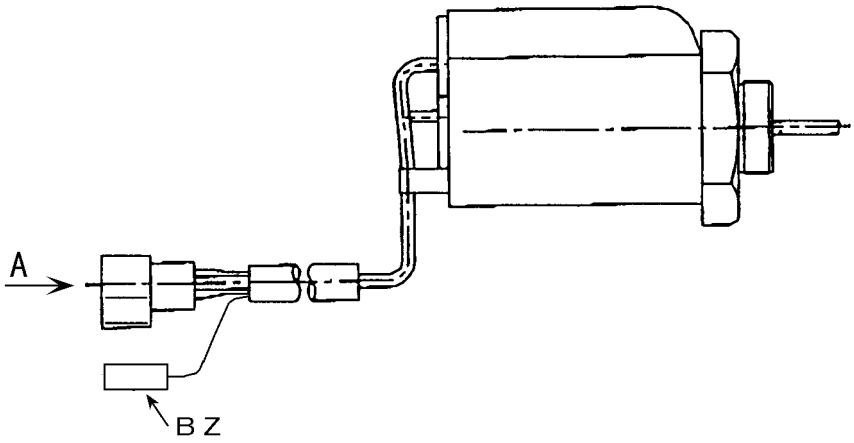


4-13-2

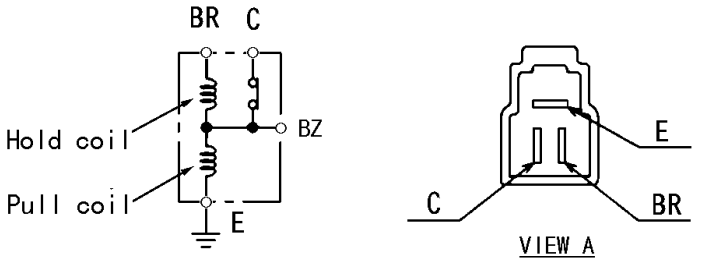
Voltage – Current	24V – 25A
Regulator adjusted voltage	28.5V ± 1V

4.2.4 Solenoid (Fuel cut solenoid)

SDG25S



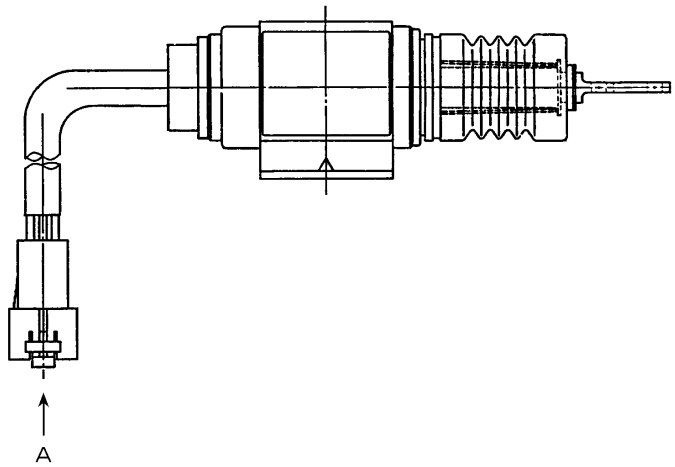
4-14-1



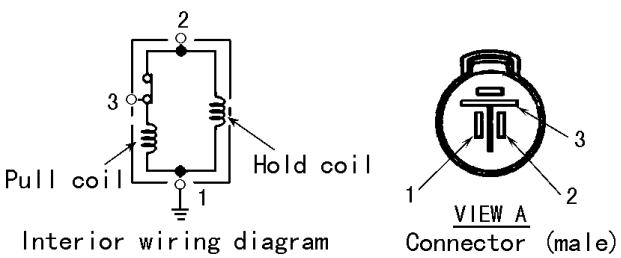
Interior wiring diagram　　Connector (male)

4-14-2

SDG45S/60S/75S/100S



4-14-3



Interior wiring diagram　　Connector (male)

4-14-4

4.2.5 Fuel solenoid pump

	SDG25S	SDG45S/60S/75S/100S
Rated voltage	12 V	24 V
Operating current	1.5 A	1.5 A
Discharge volume	0.8 L/min.	1.4 L/min.
At all pressure	1.7PSi (0.12kgf/cm^2)	2.0PSi (0.14kgf/cm^2)

A built-in filter in the solenoid pump for SDG25S/45S/60S/75S/100S should be periodically replaced with a new one.

5 Periodic Inspection/Maintenance

5.1 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 chassis 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 damaged 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.

5. Periodic Inspection/Maintenance

5.2 Generator Maintenance Standards

5.2.1 Generator's winding wire resistance value [at the temperature of 68°F(20°C)]

			SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Generator armature winding wires	Voltage selection sw. position 480/277V	Ω	0.412 (U–V) (V–W) (W–U)	0.374 (U–V) (V–W) (W–U)	0.233 (U–V) (V–W) (W–U)	0.178 (U–V) (V–W) (W–U)	0.114 (U–V) (V–W) (W–U)
	—	Ω	0.103 (U1–U2) (U5–U6) (V1–V2) (V5–V6) (W1–W2) (W5–W6)	0.0935 (T1–T4) (T7–T10) (T2–T5) (T8–T11) (T3–T6) (T7–T12)	0.0583 (T1–T4) (T7–T10) (T2–T5) (T8–T11) (T3–T6) (T7–T12)	0.0445 (T1–T4) (T7–T10) (T2–T5) (T8–T11) (T3–T6) (T7–T12)	0.0285 (T1–T4) (T7–T10) (T2–T5) (T8–T11) (T3–T6) (T7–T12)
Generator field winding wire		Ω	0.650	2.378	3.024	1.807	2.219
Exciter armature winding wires		Ω	0.210	0.522	0.571	0.415	←
Exciter field winding wire		Ω	8.0	17.652	16.353	19.375	←
Auxiliary winding wire		Ω	2.95	1.54	1.34	1.24	1.15

※See page 6-13. (at 480V)

5.2.2 Generated voltage from forced magnetization [at the temperature of 104°F(40°C)]

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Voltage generated	12V	440V	450V	450V	400V	405V
	24V	–	575V	575V	545V	550V

※See page 6-9. (at 480V)

- Avoid a forced magnetization of SDG25S on 24 V to prevent a dangerous high voltage situation.
- Generated voltages listed in the table above should be used for reference only because of voltage variations with surrounding temperature.

5.3 Engine Maintenance Standards

			SDG25S	SDG45S	SDG75S	SDG60S/100S
Valve clearance Air intake/ discharge (normal temperature)		in. (mm)	0.016 (0.4)	←	←	←
Compression	Standard	PSi (kgf/cm²)	441 (31)	←	←	←
	Working limit	PSi (kgf/cm²)	370 (26)	313 (22)	←	←
Injection timing			B.T.D.C 12°	B.T.D.C 13°	B.T.D.C 14°	B.T.D.C 12°
Nozzle injection pressure		PSi (kgf/cm²)	1920 (135)	2631 (185)	←	←
Belt free play		in. (mm)	0.3–0.5 (8–12)	←	←	←
Thermostat	Temperature for start of release	°F (°C)	180 (82)	←	←	←
	Valve lift	mm	8 (203°F)	10 (203°F)	←	←
Water temperature switch		°F (°C)	230±3.6 (110±2) (b, contacted)	221±3.6 (105±2) (b, contacted)	←	←
Oil pressure switch		PSi (kgf/cm²)	15 (1) (a, contacted)	←	←	←

5. Periodic Inspection/Maintenance

5.4 Key Points for Maintenance Work

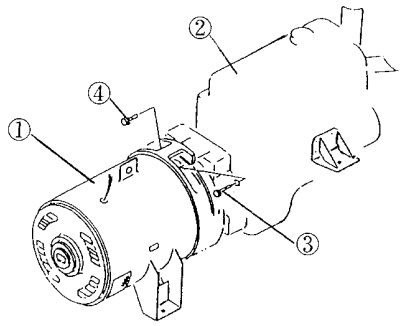
5.4.1 Assembly of main generator unit and engine

⚠ CAUTION

- The main unit of the generator is unilaterally mounted and the clearance is small, so it must be handled with extreme care to avoid the possibility of damage to the rotor or stator.
- Use hoisting equipment of sufficient capacity when it is necessary to lift up the engine and the main body of the generator.

Lifting weight

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Weight of main generator unit	lb (kg)	247 (112)	452 (205)	595 (270)	672 (305)	794 (360)
Weight of engine	lb (kg)	410 (186)	789 (358)	802 (364)	992 (450)	1036 (470)



① Generator unit
② Engine
③ Bolt (for coupling of the engine flywheel and the generator)
④ Bolt (for connection of the engine flywheel housing and the generator frame)

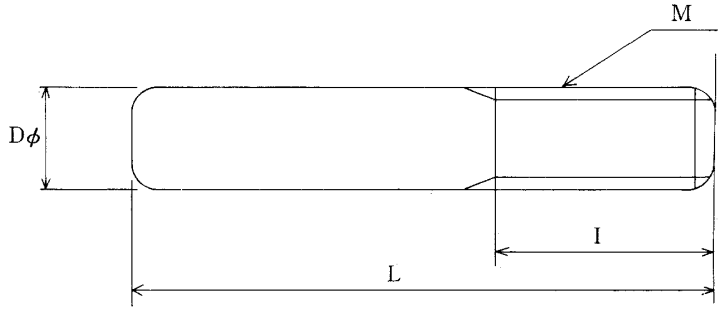
5-3-1

(1) Assembly of engine flywheel and generator coupling

⚠ CAUTION

- The mounting holes are not equally spaced along the circumference. Therefore, position the holes in advance so as to match the coupling counterpart by turning and adjusting the engine flywheel.
- Use guide bolts while centering to mount the assembly.
- Tighten the bolts to the specified torque.

Size of guide bolt



5-4-1

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Dϕ	mm	9.5	←	←	←	←
L	mm	60	←	←	←	←
I	mm	25	←	←	←	←
M	mm	M10×1.5	←	←	←	←

Tightening torque of Bolt No. 3

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Bolt size		M10×1.5-20	M10×1.5-30	M10×1.5-50	←	←
Quantity		8	←	←	9	←
Tightening torque	lbw･ft (kgf･cm)	46 (640)	←	←	←	←

(2) Assembly of flywheel housing and generator frame (stator)

⚠ CAUTION

- Handle the stator with care after fastening the engine flywheel and generator coupling, to avoid damage to either the rotor or stator.
- Tighten the connections to the specified torque.

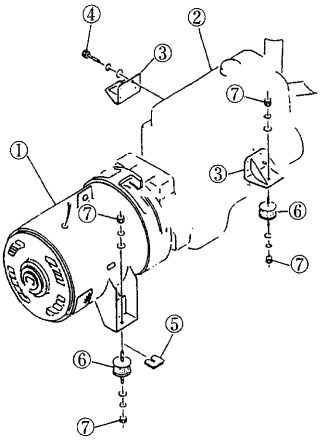
Tightening torque of Bolt No. 4

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Bolt size		M10×1.5-30	M10×1.5-35	M10×1.5-30	←	←
Quantity		12	←	←	←	←
Tightening torque	lbw･ft (kgf･cm)	46 (640)	18 (245)	←	←	←

5.4.2 Mounting of generator and engine on frame

⚠ CAUTION

- Perform centering carefully, to avoid deviation in the horizontal leveling caused by distortion of the frame or inaccurate mounting of the main body and engine.
- Running the machine without accurate centering may cause abnormal vibrations.

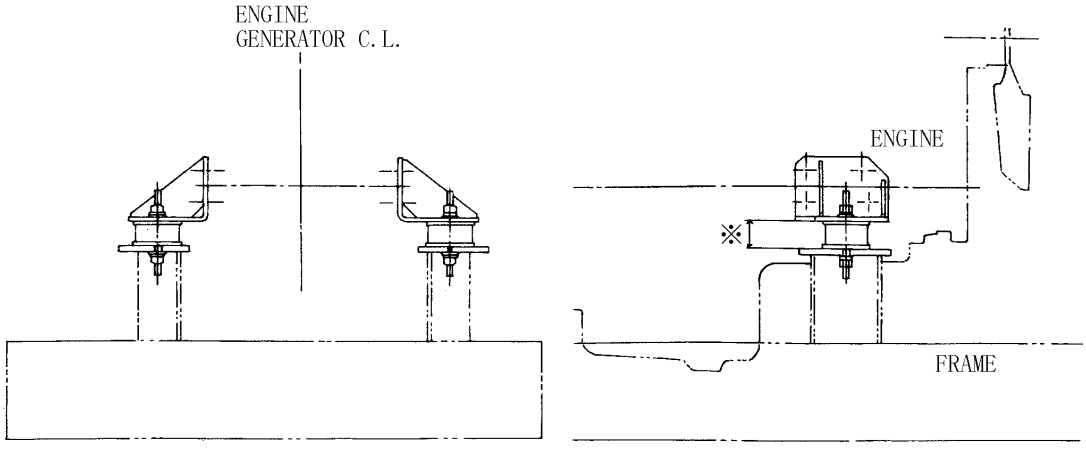


① Generator unit
② Engine
③ Bracket
④ Bolt
⑤ Shim
⑥ Cushion rubber
⑦ Nut

5-5-1

(1) Centering method

1. Mount the brackets on the engine secured to the generator main body.
   (Use only genuine fastening bolts.)
2. Place four assembly level plates ※ on the points for mounting the engine and main body onto the frame.
3. Place the generator main body with the engine mounted onto it on the assembly level plates on the frame.
4. Use shims for adjustment if joint gaps are found at any of the four places where the brackets and assembly level plates are to be fixed.
5. Lift the engine mounted onto the generator main body, leaving the shims in the four places after adjustment.
6. Remove the assembly level plates and place the cushion rubbers in their respective places on the frame.
7. Place the engine with the main body on the cushion rubbers and fasten it with nuts.



5-5-2

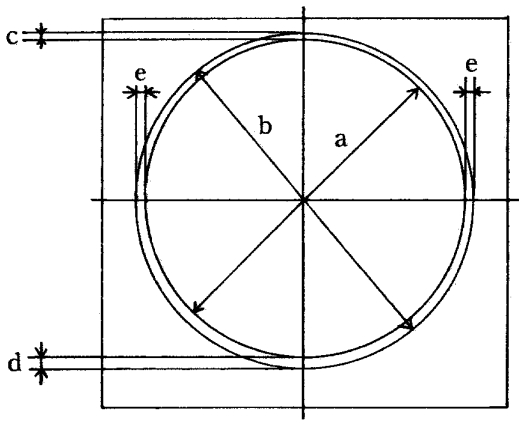
Assembling level plates size

		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Engine side	in. (mm)	1.61 (41)	1.57 (40)	1.54 (39)	1.89 (48)	←
Generator side	in. (mm)	1.61 (41)	1.57 (40)	1.54 (39)	1.85 (47)	←

(2) Check the gap between the cooling fan and fan shroud

⚠ CAUTION

- Maintain an adequate gap in both the vertical and horizontal directions.
- If the fan is mounted incorrectly so that it leans toward one side wall of the shroud, leading to a smaller gap in one direction, the fan may produce abnormal noise due to rubbing against the shroud during starting or stopping and may also overheat.



5-6-1

Gap size

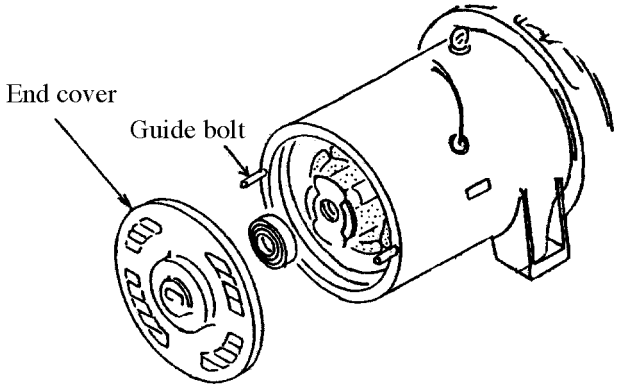
		SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Fan outer diameter (a)	in. (mm)	16.9 (430)	←	19.7 (500)	21.6 (550)	←
Shroud inner diameter (b)	in. (mm)	17.7 (450)	←	20.9 (530)	22.8 (580)	←
Top gap (c)	in. (mm)	0.3 (7)	←	0.5 (12)	←	←
Bottom gap (d)	in. (mm)	0.5 (13)	←	0.7 (18)	←	←
Side gap (e)	in. (mm)	0.4 (10)	←	0.6 (15)	←	←

5.4.3 Generator unit

(1) Mounting and dismounting of bearing shield (end cover)

⚠ CAUTION

- Use guide bolts to avoid the danger of dropping the bearing shield and to prevent the rotor and stator from rubbing against each other. (Use the guide bolts used to mount the main body.)



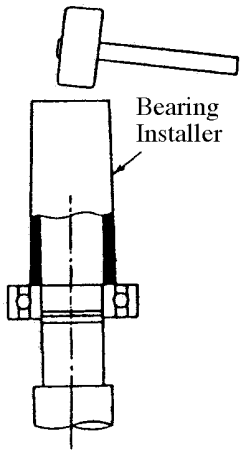
5-7-1

(2) Changing the bearings

⚠ CAUTION

- Do not hit the bearing outer race when installing or the bearing may be damaged.

  There is no need to grease the bearings because they are sealed grease-filled type. The bearings have an expected life of approximately 10,000 hours.



5-7-2

(3) Changing the rotary rectifier

CAUTION

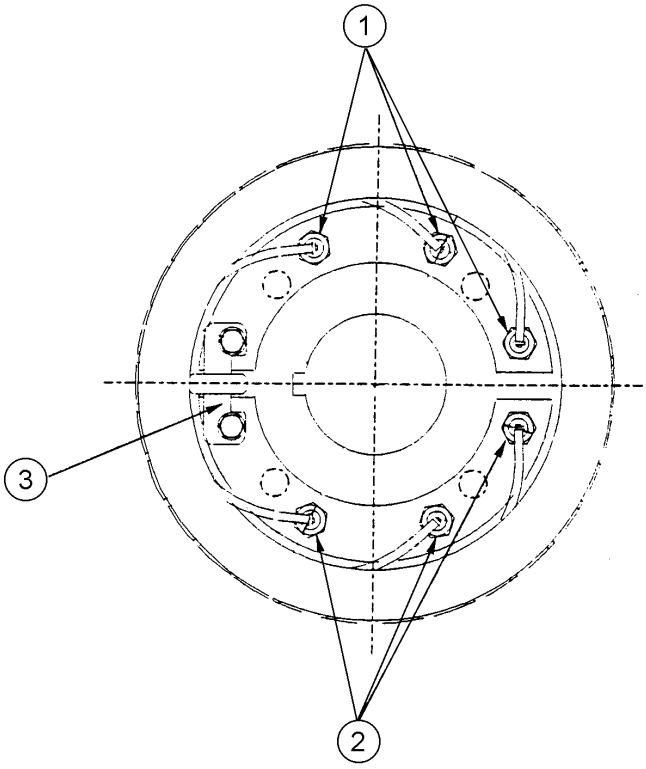
- Care must be taken not to damage the rotary rectifier when mounting it on the conductive plate.
- When a soldering iron must be used on the rotary rectifier, make the contact time as short as possible.
- Apply LOCTITE agent to the portions where tightness is required.
- The surge suppressor is integrated with the insulating plate and cannot be replaced separately.

Tightening torque

			SDG25S	SDG45S	SDG60S	SDG75S	SDG100S
Rotary rectifier	Screw size		M5×0.8	←	←	M6×1.0	←
	Tightening torque	lbw•in (kgf•cm)	18-21 (21-24)	17 (20)	←	35 (40)	←
	Screw-lock agent		Newage No. 030-02318	Three Bond 1402-B	←	←	←
Conductive insulating plate	Screw size		—	M6×1.0	←	←	←
	Tightening torque	lbw•in (kgf•cm)	—	43 (50)	←	←	←
	Screw-lock agent		—	Three Bond 1402-B	←	←	←

* Rotating rectifier of SDG25S is locked to the rotor shaft of the generator by a key.

SDG25S



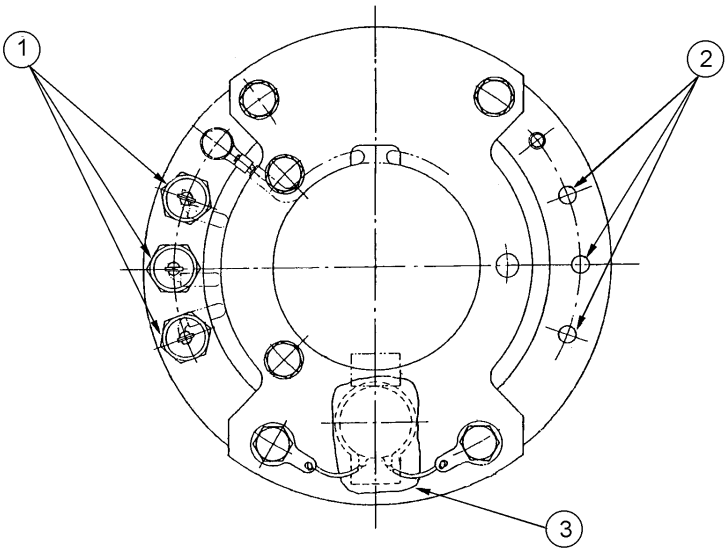
① Forward side of the diode

② Reverse side of the diode

③ Varistor

5-9-1

SDG45S/60S/75S/100S



① Forward side of the diode

② Reverse side of the diode

③ Varistor

5-9-2

6 Troubleshooting

6.1 Repairing Procedures

Perform the following preparatory checks before disassembling the machine.

① Try to find out the following information on the problem directly from the operator / user.

- How and when the machine problem started?
- Had anything abnormal occurred to the machine before this problem took place?
- Is there any other symptom existing in the machine?
- Had this machine experienced any other trouble before? If Yes, which parts or portion were repaired before?
- Had any similar trouble occurred to this machine before this one?

② Next, check and inspect the actual problem on the machine by operating it yourself.

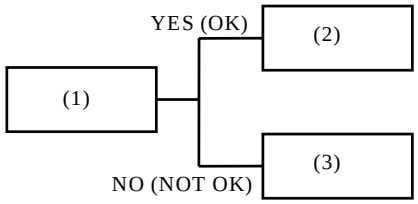
- Judgement of trouble sometimes vary, depending upon the person who assesses it.

So check and confirm it yourself, in accordance with standards for troubleshooting. You may find sound / noise varies widely, depending upon the person who judges it.

- Before operating the machine which is suspected to have a problem, additional care should be taken in case the suspected problem can cause new problems.
- Once the machine is disassembled, it is difficult to reproduce the same trouble conditions when assembled. It is also likely to lose the evidence / cause of the trouble. Therefore, before actually disassembling, it is important to test and locate the cause.
- In case there are several causes to troubleshoot, it is good practice to examine the simple problems first.
- Repair and remove the basic cause completely and consider why such a problem happened.

6.2 Engine Troubleshooting

6.2.1 How to read “Engine Troubleshooting”



After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3) next.

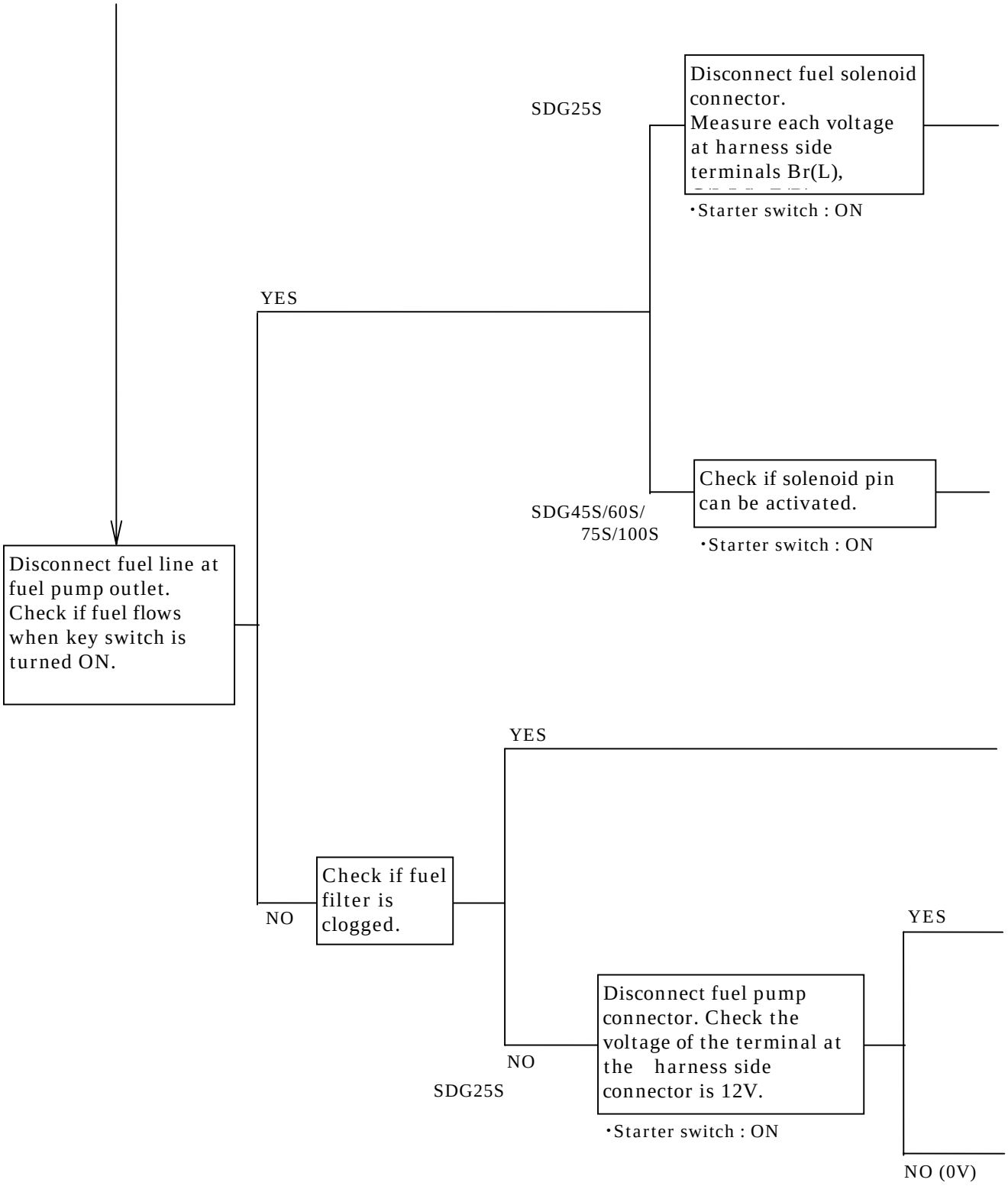
• Starter switch: ON

As shown to the left, measuring methods or items to be referred to are sometimes indicated in the spaces under the box. Be sure to measure or check correctly. Incorrect measuring or checking methods may result in the wrong troubleshooting path and components could be damaged.

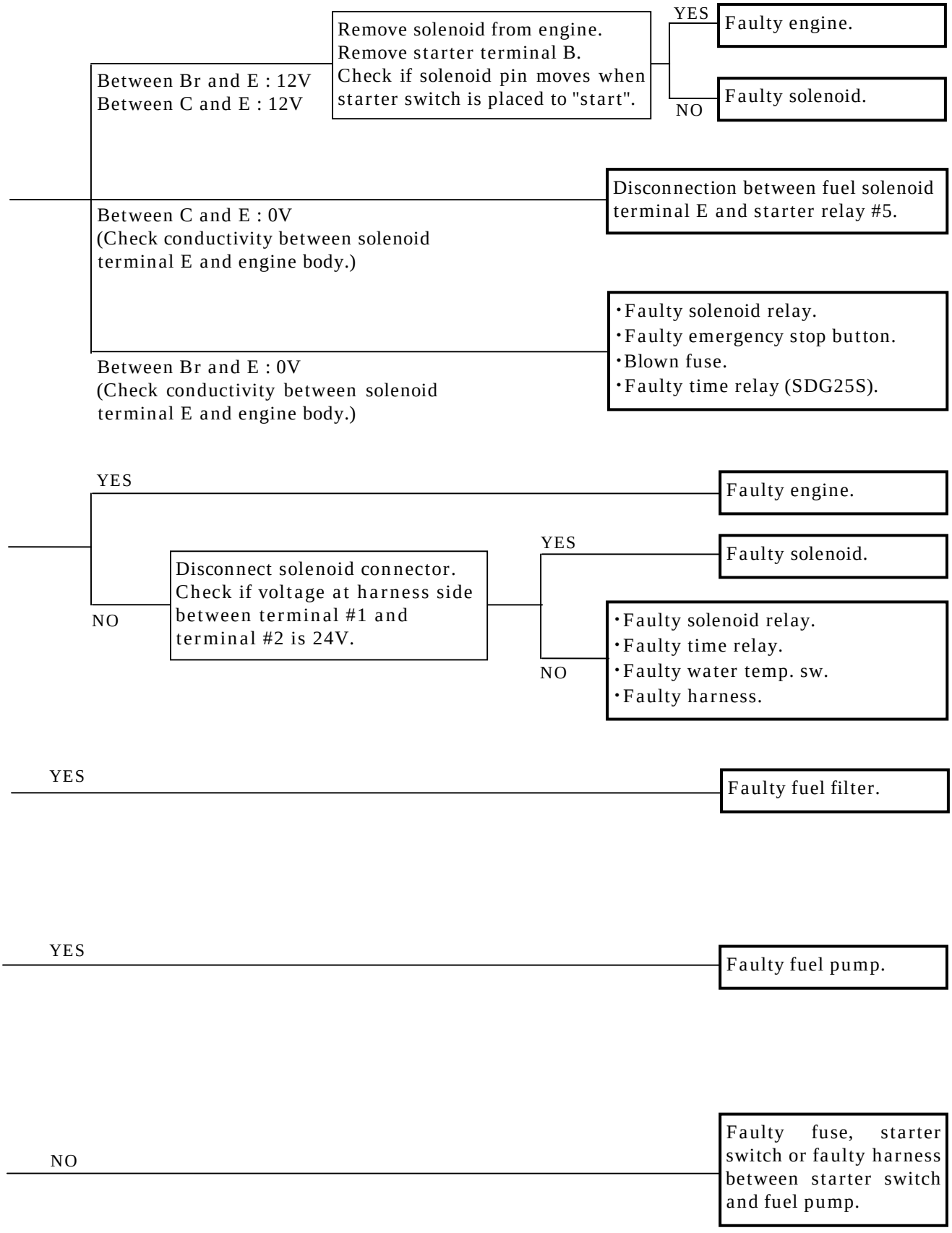
The box with bold lines indicates causes.

6.2.2 Troubleshooting items

Engine rotates but will not start



6. Troubleshooting



6. Troubleshooting

Starter does not rotate

Check if battery voltage and specific gravity are normal.

- Voltage : 12V (24V) or more
- Density : 1.28

YES

With starter switch positioned as shown in the table below, check if each terminal voltage on starter is normal.

NO

Unit: V

Terminal \ Starter switch	OFF	ON	START
B	12 (24)	12 (24)	12 (24)
S (C)	0	0	12 (24)

YES

Voltage at terminal B is lower than 12V (24V).

NO

Voltage at terminal S (C) is lower than 12V (24V).

- Starter switch : START

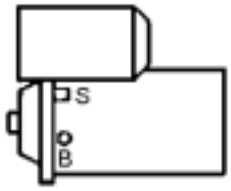
NO

(When starter switch is turned to the START position, if voltage at terminal B is lower than 9 (18) volts, battery may be faulty.)

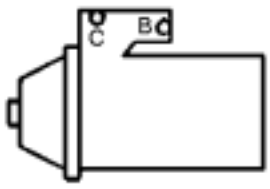
Starter voltage check

1. Turn the starter switch to the ON or START position.
2. Contact the minus (−) probe of a circuit tester to the vehicle ground (ground to unpainted area like bolt head) and the plus (+) probe to terminals on the starter. Then, check voltages with the harness connected.

SDG25S



SDG45S/60S/75S/100S



6. Troubleshooting

YES

Faulty starter.

Faulty or disconnection of harness between battery and starter.

SDG25S:
Measure voltage at terminals #3 and #5 on starter relay.
SDG45S/60S/75S/100S:
Measure voltage at terminals R, B and C on safety relay.

・Starter Switch : START

SDG25S:
Voltage at terminal #3 : 0V
SDG45S/60S/75S/100S
Voltage at terminal R : 0V, B : 0V

SDG25S:
Faulty starter switch or faulty harness between starter switch and star-ter relay connection.
SDG45S/60S/75S/100S:
Faulty starter switch or faulty harness between starter switch and

SDG25S:
Voltage at terminal #3 : 12V
Voltage at terminal #5 : 0V
SDG45S/60S/75S/100S
Voltage at terminal R : 24V
Voltage at terminal C : 0V
Voltage at terminal B : 24V

SDG25S:
Faulty starter relay.
Faulty engine controller.
SDG45S/60S/75S/100S:
Faulty safety relay.

SDG25S
Voltage at terminal #5 : 24V
SDG45S/60S/75S/100S
Voltage at terminal C : 24V

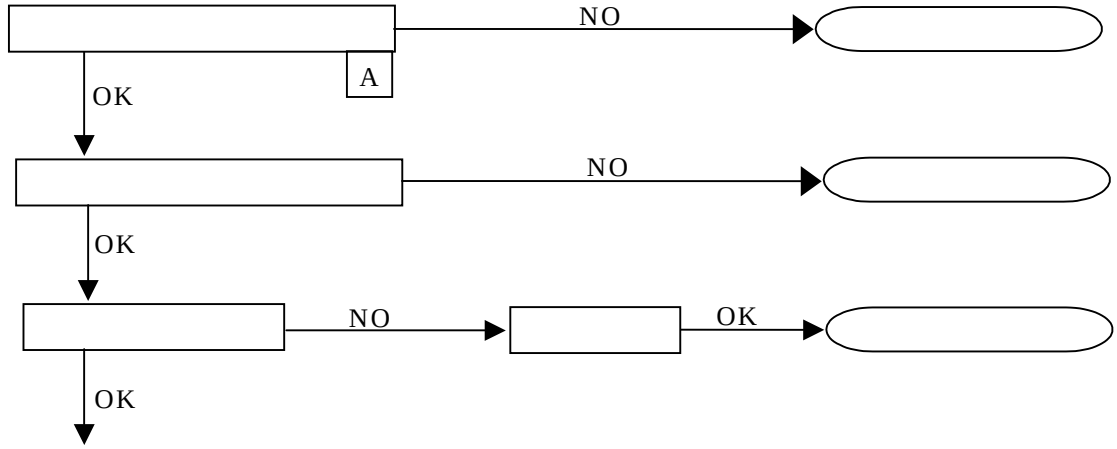
SDG25S:
Faulty harness between terminal #6 on starter relay and terminal S on starter.
SDG45S/60S/75S/100S:
Faulty harness between terminal C on safety relay and terminal C on starter.

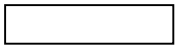
NO

Faulty battery.

6.3 Generator Troubleshooting

6.3.1 How to read “Generator Troubleshooting”



① Checkpoints are mentioned in the rectangular boxes. 

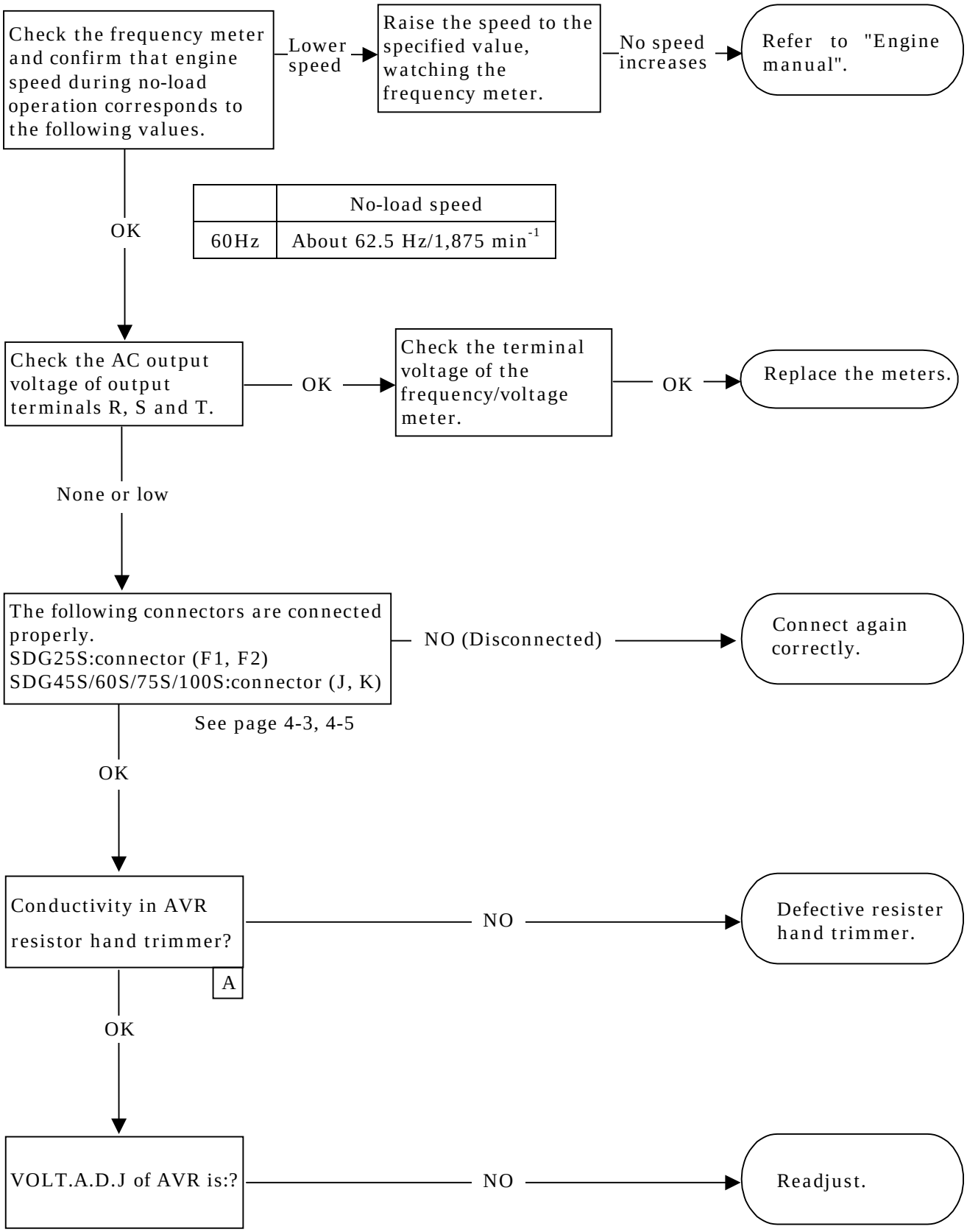
② Items in the round parenthesis show the causes for the checkpoints①.

③ A under each box shows actual way of checking.

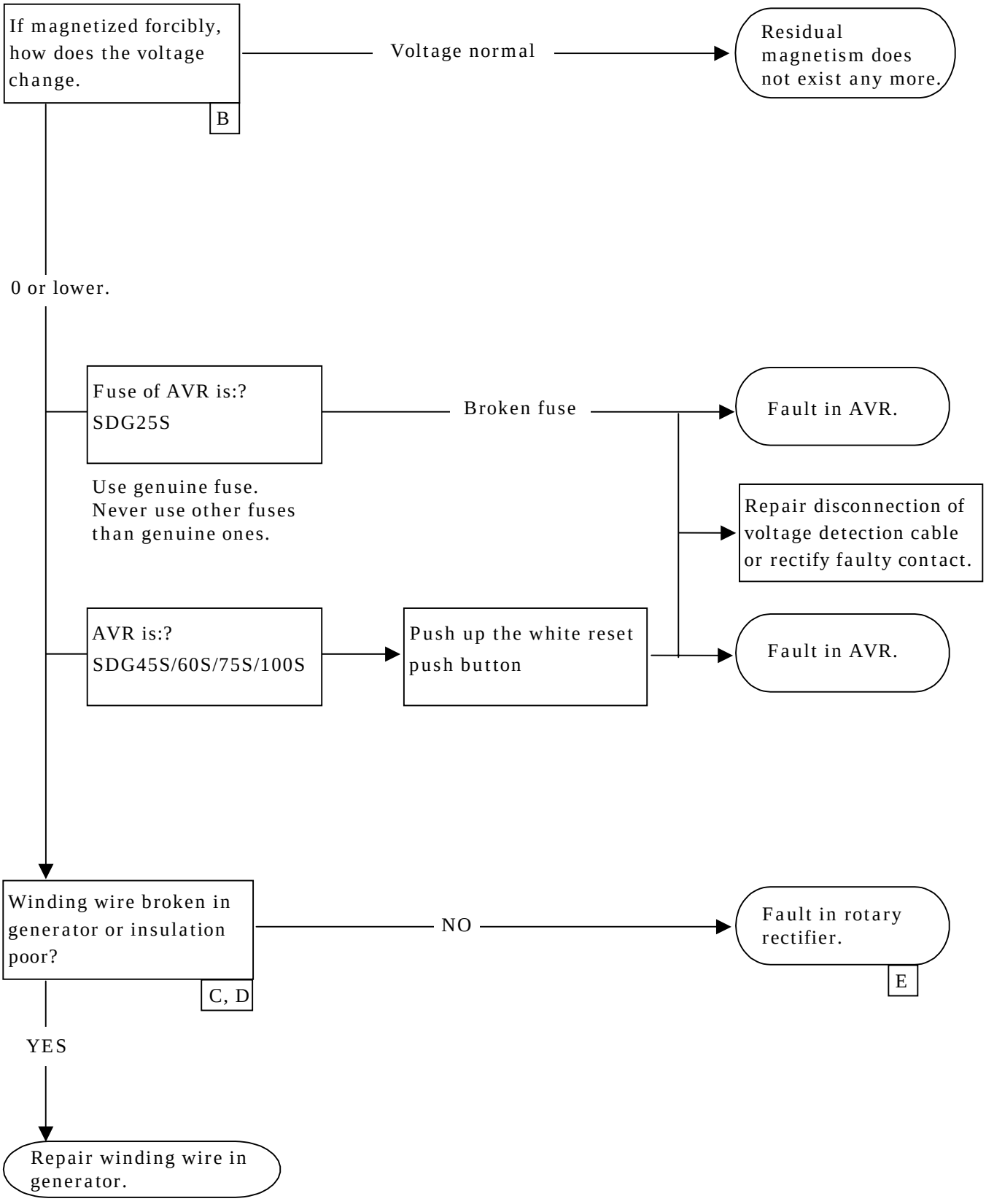
6. Troubleshooting

6.3.2 Troubleshooting items

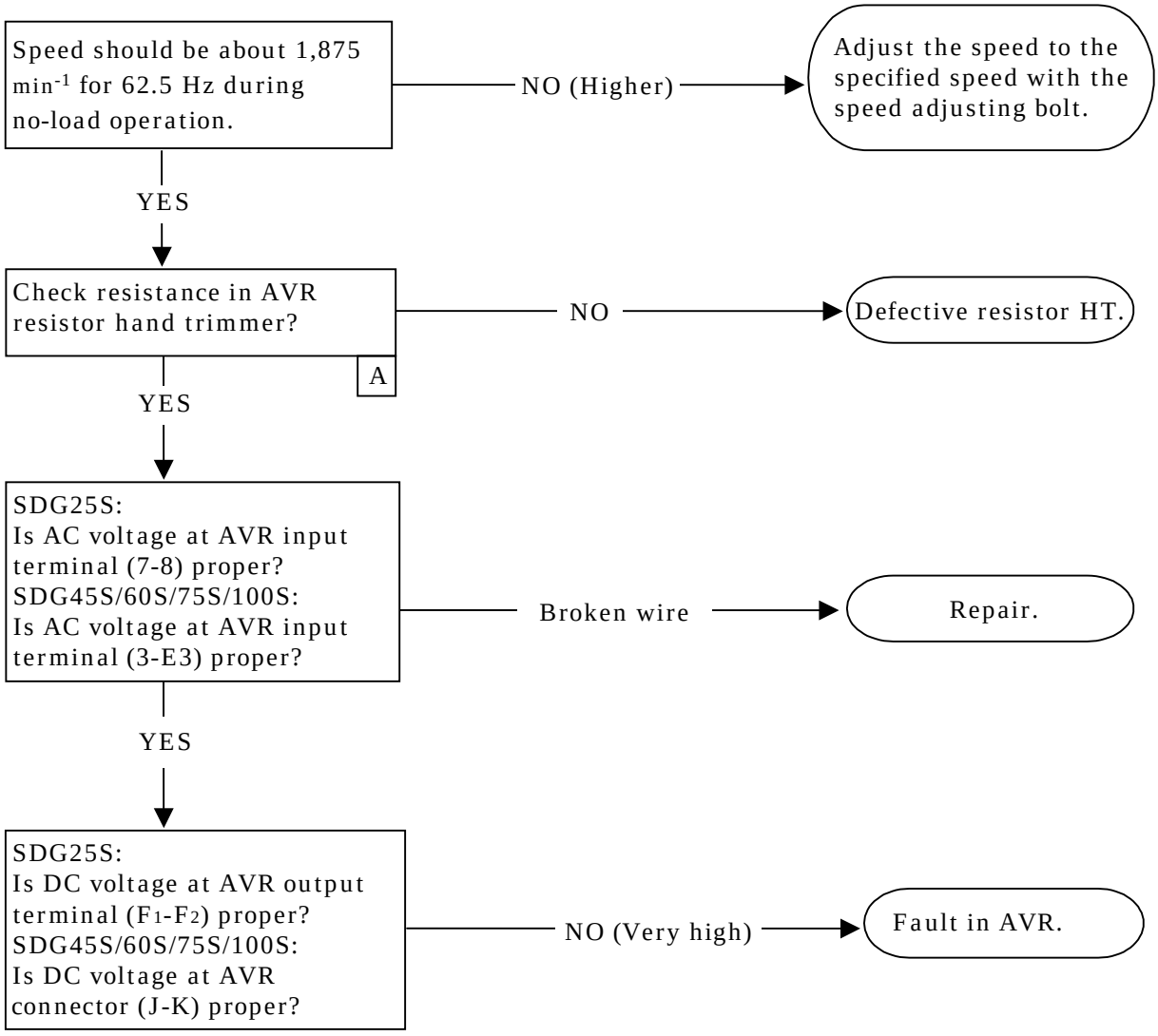
(1) No voltage is generated or voltage too low



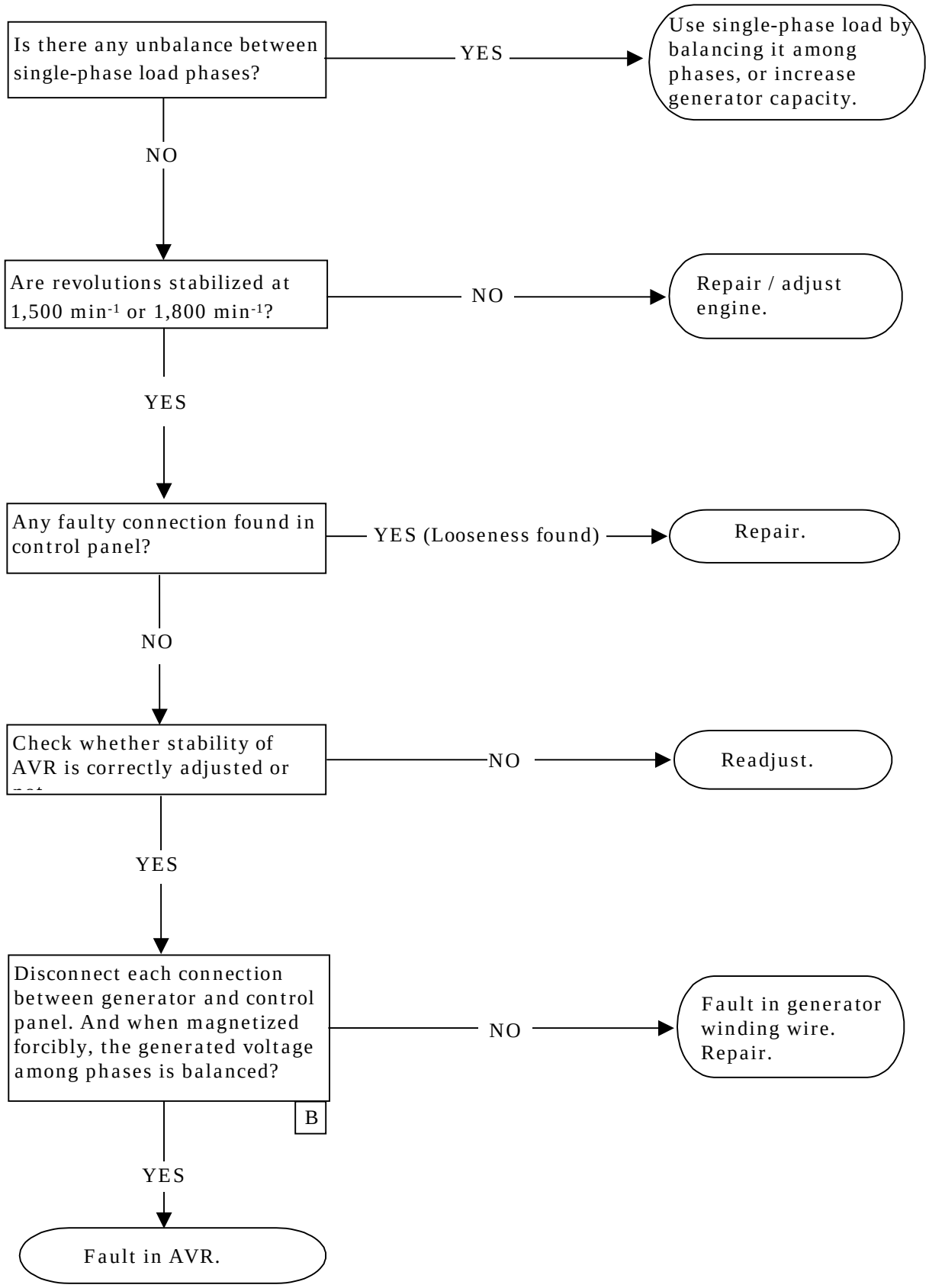
6. Troubleshooting



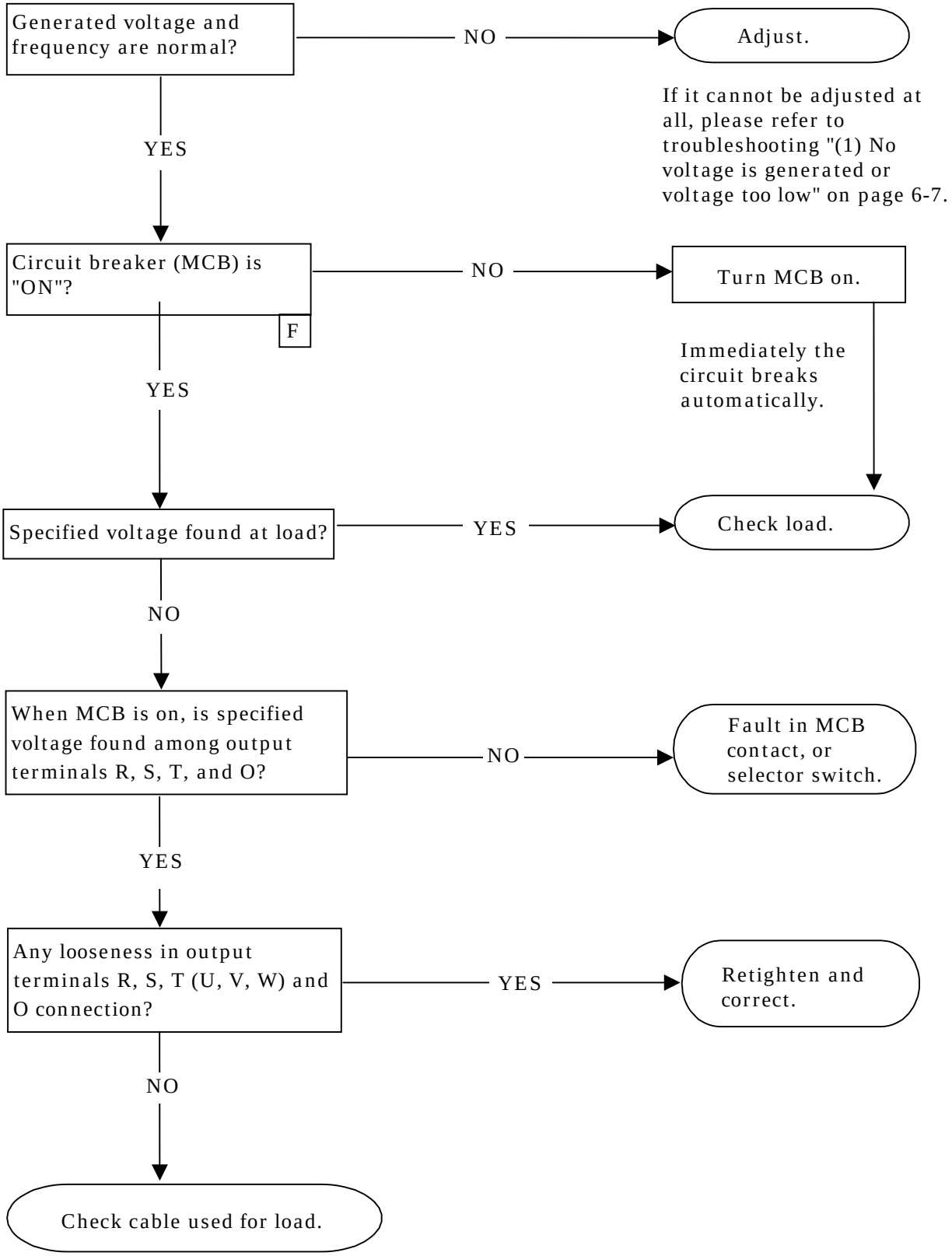
(2) Voltage is very high or it cannot be adjusted



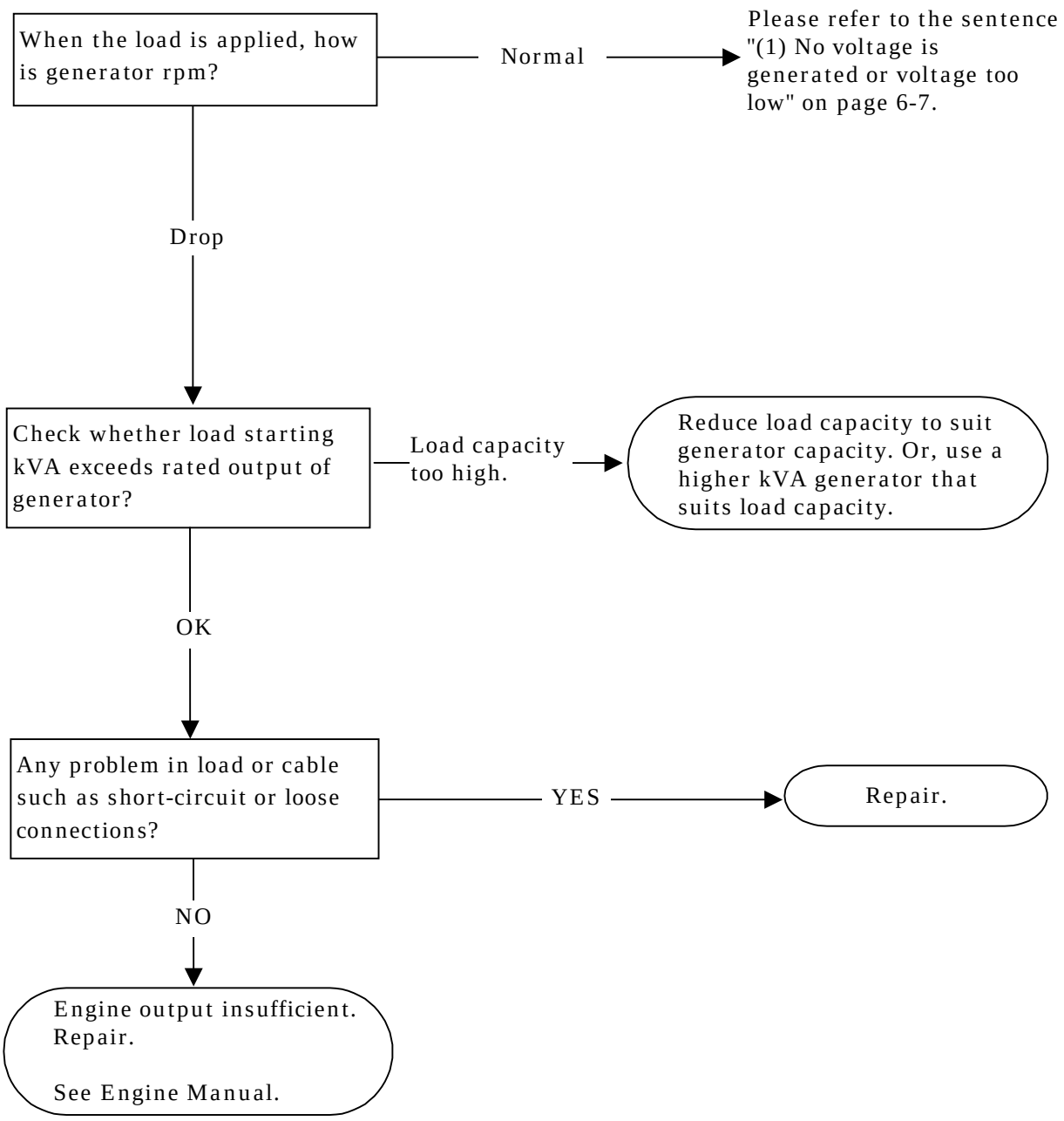
(3) Voltage fluctuates



(4) Load cannot be operated

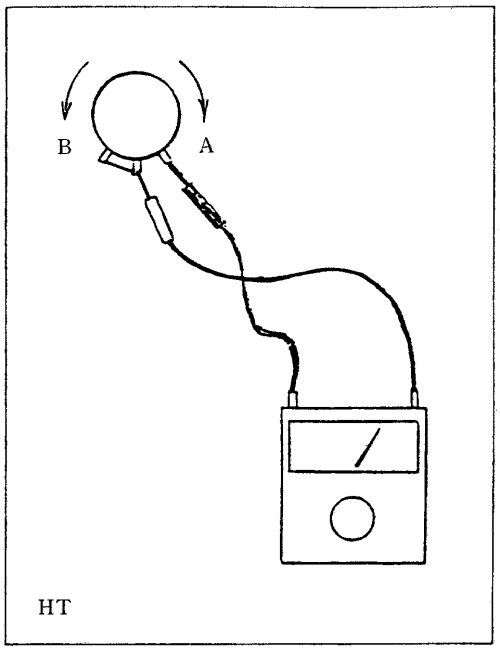


(5) Voltage drops when load is applied.



6.3.3 How to check

[A] Checking for Disconnection of Voltage Adjusting Resistor Hand Trimmer



6-13-1

Turn the knob right and left, and check if the resistance changes. It is normal if the resistance value is within the following ranges.

SDG25S :several Ω-1k Ω

SDG45S/60S/75S/100S:several Ω-5k Ω

The resistance decreases when the knob is turned in the direction of A.

The resistance increases when the knob is turned in the direction of B.

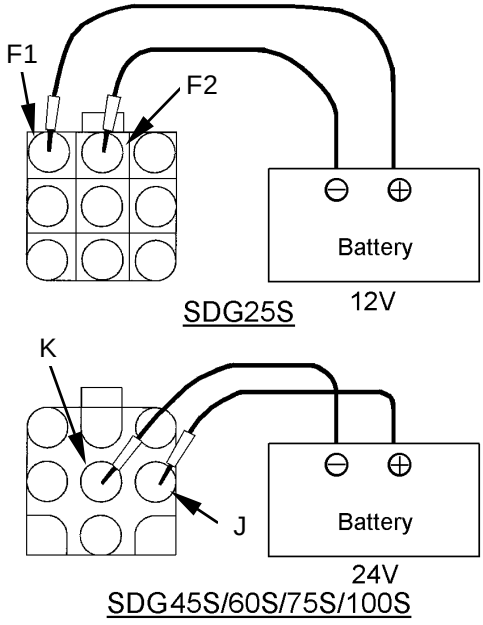
Also make sure resistance varies smoothly.

[B] Forced Excitation Method

1. Run the generator at the rated r.p.m.
2. Disconnect the field connector in the control panel, and apply the battery voltage to the exciter winding wire.

	Portions to be connected
SDG25S	F1 and (+) terminal of battery F2 and (-) terminal of battery
SDG45S/60S/ 75S/100S	J and (+) terminal of battery K and (-) terminal of battery

3. Magnetize for 1 to 2 seconds, then remove the wires and check if voltage is generated.



6-14-1

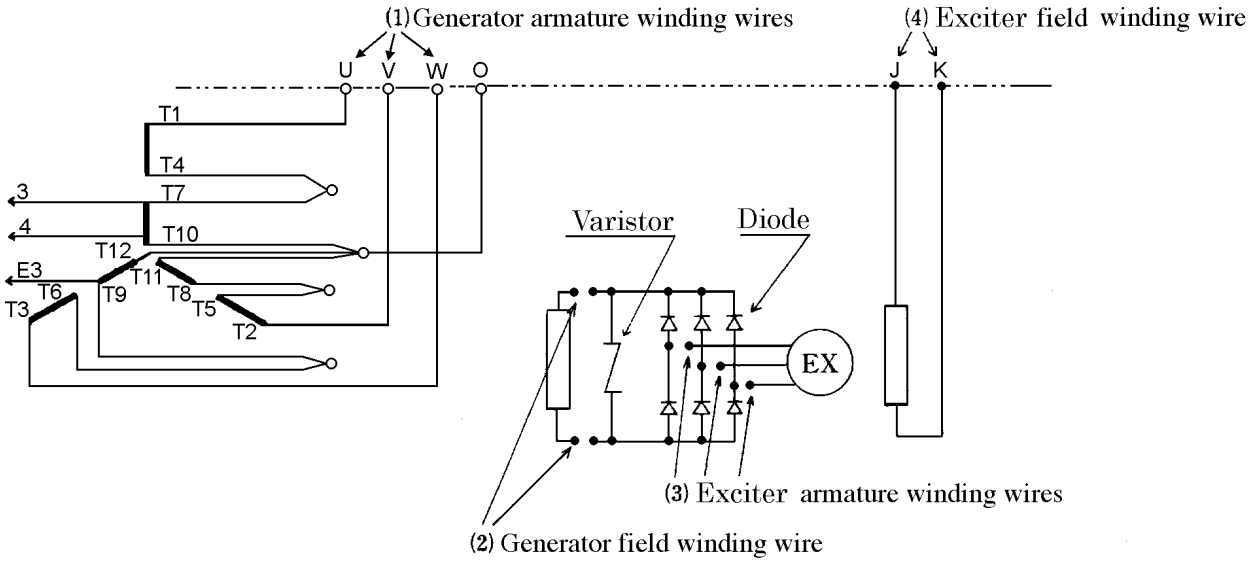
Generated voltage from forced excitation (at 480V) (V)

	Voltage generated (V) [at the temperature of 104°F(40℃)]	
	Battery 12V	Battery 24V
SDG25S	440	—
SDG45S	450	575
SDG60S	450	575
SDG75S	400	545
SDG100S	405	550

* The generating voltage is only for reference because it will change due to the ambient temperature.

[C] Measurement of Generator Winding Wire Resistance

The standard resistance value of each wire includes the generator's winding wire resistance value. (See 5-2 for values)



SDG45S/60S/75S/100S(Voltage selection switch position 480/277V)

6-15-1

(1) Generator armature winding wires

Remove all wires leading to the control panel terminal from the generator, and measure the resistance between the wires on the generator side. (Please explain how to check with voltage selector switch circuit.)

SDG25S

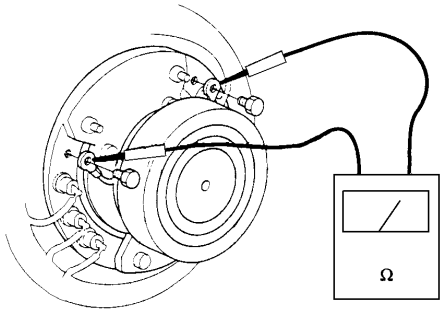
U1 terminal	-	U2 terminal	,	U5 terminal	- U6 terminal
V1 terminal	-	V2 terminal	,	V5 terminal	- V6 terminal
W1 terminal	-	W2 terminal	,	W5 terminal	- W6 terminal

SDG45S/60S/75S/100S

T1 terminal	-	T4 terminal	,	T7 terminal	- T10 terminal
T2 terminal	-	T5 terminal	,	T8 terminal	- T11 terminal
T3 terminal	-	T6 terminal	,	T9 terminal	- T12 terminal

(2) Generator field winding wire

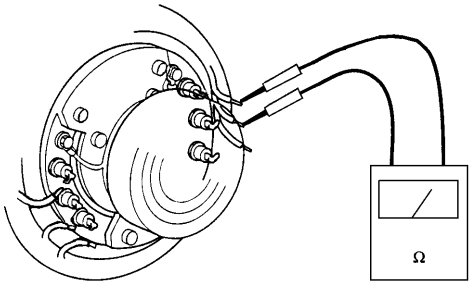
Disconnect the wires leading to the rotary rectifier, then measure the resistance between the wires.



6-15-2

(3) Exciter armature winding wires

Disconnect the wires leading to the rotary rectifier, and measure the resistance between the wires.

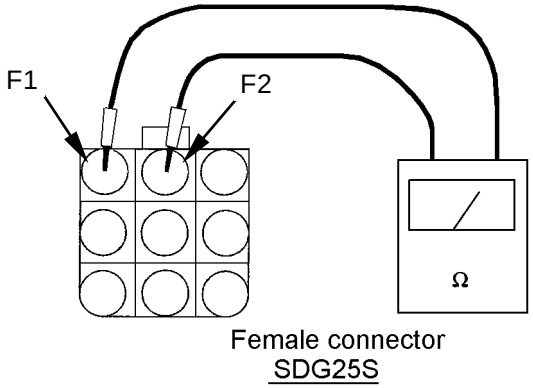


6-15-3

(4) Exciter field winding wire (See 5-2 for values)

Disconnect 9P connector in the control panel, and measure the resistance at the connector on the generator side.

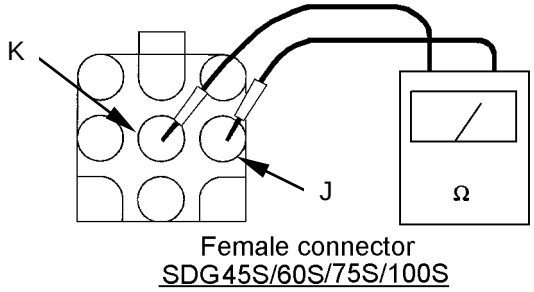
In the case of SDG25S:



F1 terminal- between F2 terminal.

6-16-1

In the case of SDG45S/60S/75S/100S:

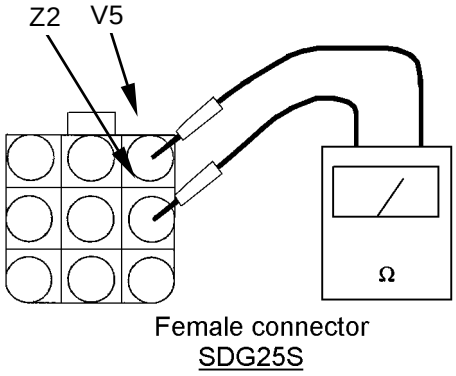


J terminal- between K terminal.

6-16-2

(1) Auxiliary winding wire (SDG25S)

Disconnect the AVR 9P connector in the control panel, and measure the resistance at the connector on the generator side.

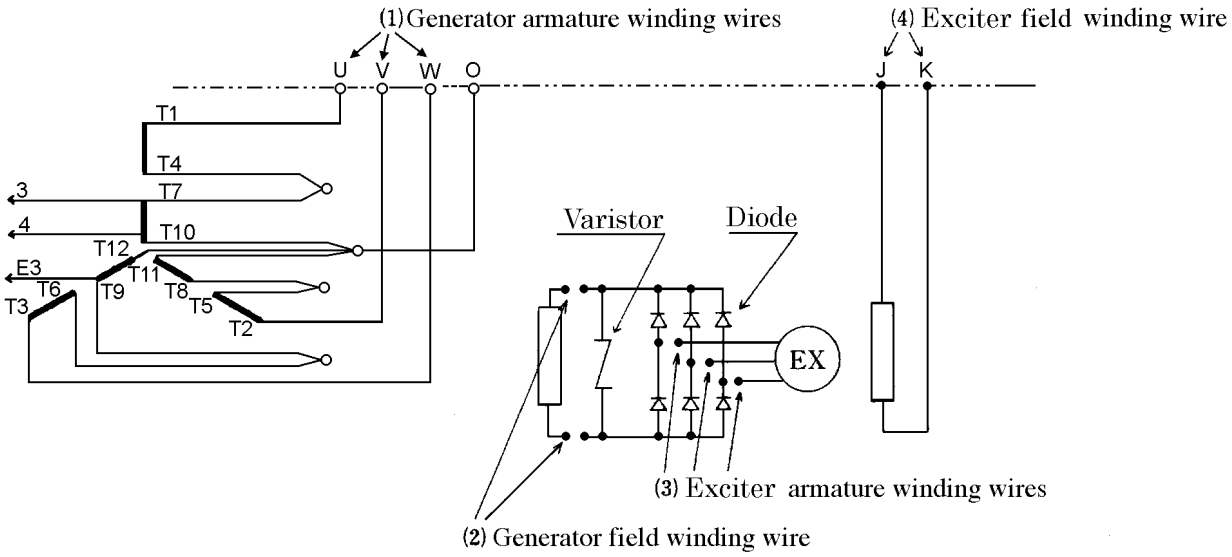


V5 terminal- between Z2 terminal.

6-16-3

[D] Measurement of Insulation Resistance of Generator Winding Wires

Measurement is performed with a 500V megger. The situation is considered to be satisfactory if the measurement produces a result of 1M or more, while a result of less than that value indicates failure.



SDG45S/60S/75S/100S(Voltage selection switch position 480/277V)

6-17-1

(1) Generator armature winding wires

- (Procedure)(Megger tester required)

① Remove the load side cable from the output ter-minal board.

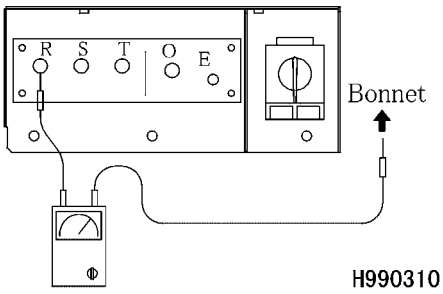
② Remove the cable between the terminal "O" and terminal "E" which are connected on the back of the output terminal plate.

③ Remove the AVR connector inside the generator control panel.

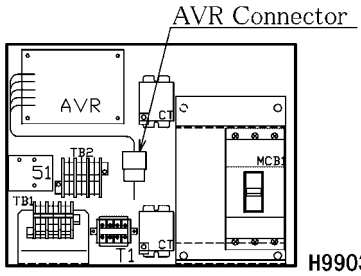
④ Switch ON the three-phase breaker, measure each insulation resistance between the terminals R. S. T terminal and bonnet.

⑤ Insulation resistance when measured with a 500V megger tester must be above 1 MΩ.

⑥ After finishing the measurement of insulation resistance, re-connect the cable between the terminal "O" and terminal "E".



H990310

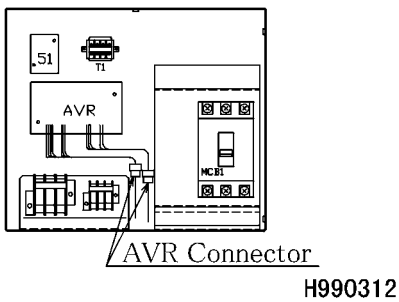


H990311

SDG25S

WARNING

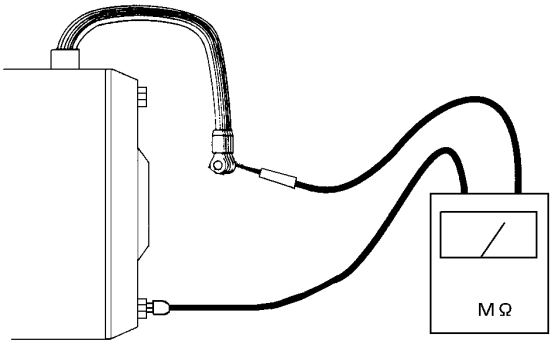
- After making sure that the insulation resistance of the generator is higher than 1 MΩ, be sure to re-connect the cable between the terminal "O" and terminal "E" just as it was originally connected. If it is left disconnected, the grounding becomes imperfect so that it could cause electric shock.



H990312

SDG45S/60S/75S/100S

- Disconnect all wires leading from the generator to the control panel terminals and short-circuit them, then measure the insulation resistance between the wires and the generator body.

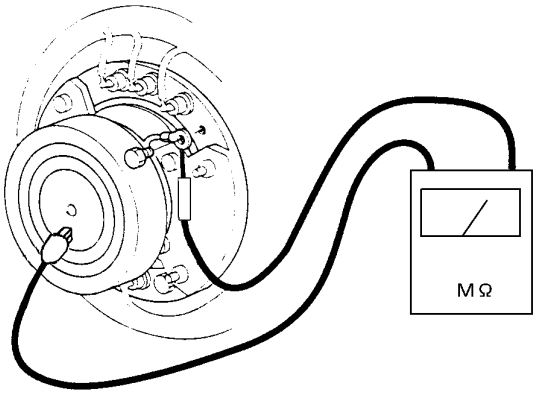


6-18-1

(2) Generator field winding wire

Disconnect the wires leading to the rotary rectifier, then measure the insulation resistance between the disconnected wires and the shaft.

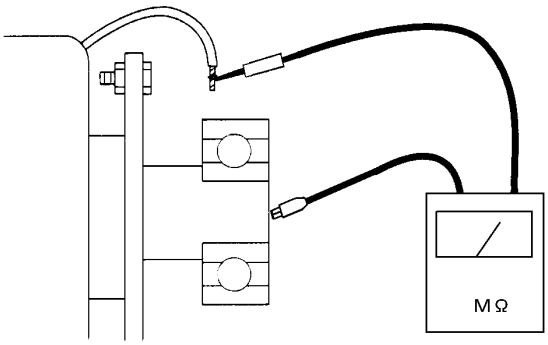
(Do not megger the diodes)



6-18-2

(3) Exciter armature winding wires

Disconnect the wires and short-circuit them, then measure the insulation resistance between these wires and the shaft.

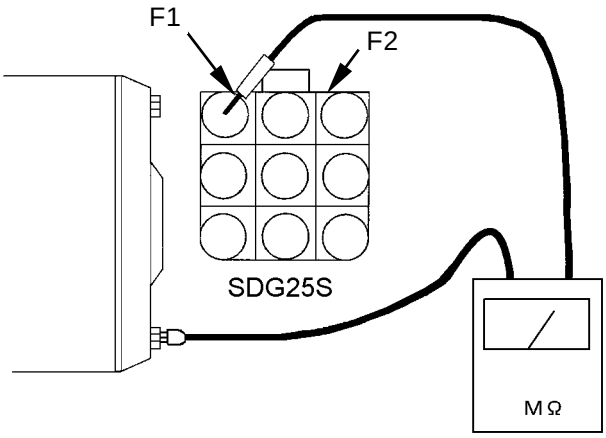


6-18-3

(4) Exciter field winding wire

Disconnect the field connector (J,K) in the control panel, and measure the resistance at the connector on the generator side.

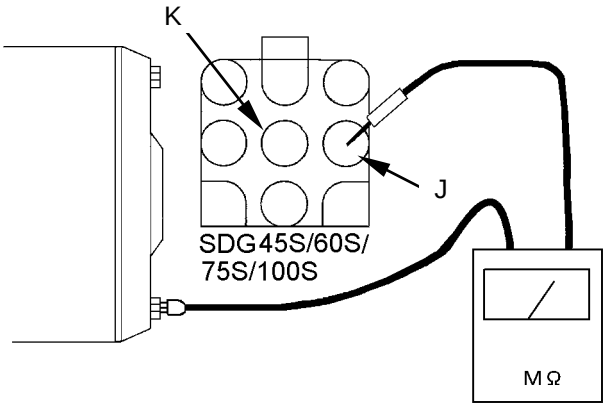
In the case of SDG25S:



F1 terminal or F2 terminal-between body.

6-19-1

In the case of SDG45S/60S/75S/100S:



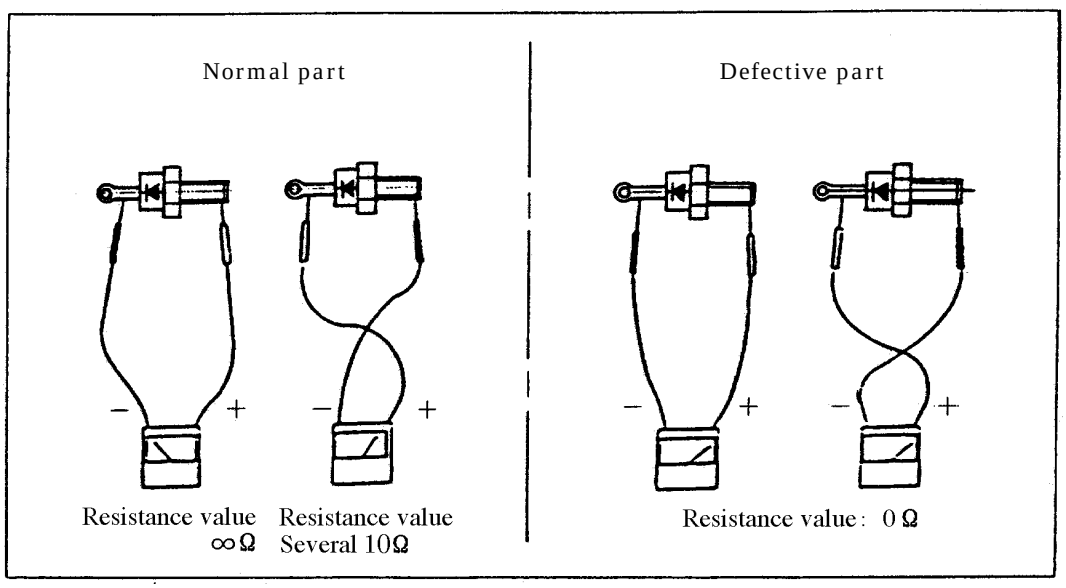
J terminal or K terminal-between body.

6-19-2

[E] Checking Rotary Rectifier (Diode)

Remove the bearing shield at the opposite side of the driving side, or pull out the rotor in accordance with the instructions for changing the bearings and then remove the rectifier components and check them with a tester.

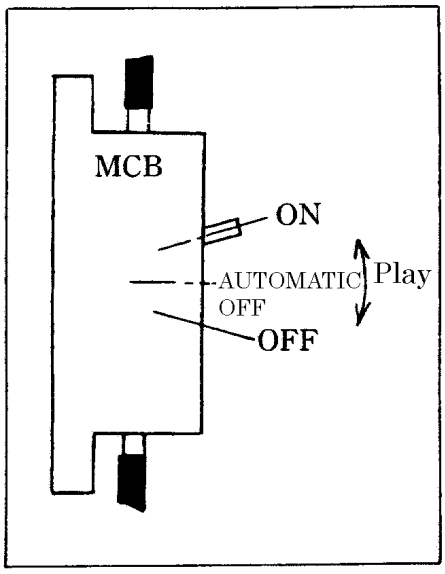
Care should be taken to distinguish between two types of rectifier components. (Positive and negative polarity)



6-20-1

Note: A component with negative polarity has a negative resistance value.

[F] Lever Positions of Circuit Breaker (Molded Circuit Breaker)



6-20-2

The MCB has three lever positions: "ON" "OFF" and "AUTO OFF".

In manual operation, the lever is shifted between "ON" and "OFF" only.

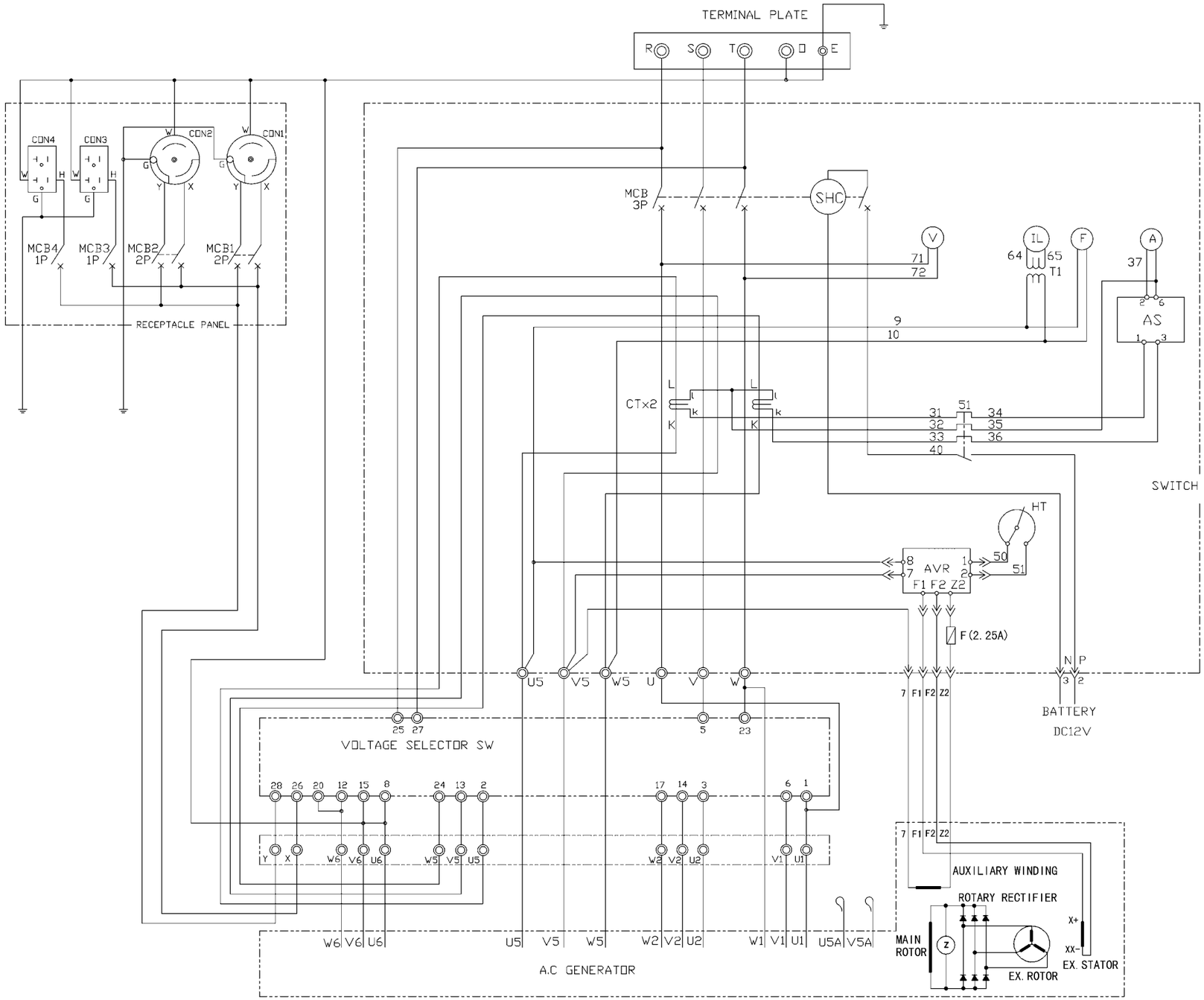
If an overload occurs and the automatic-off switch is on, the lever is automatically shifted to the "AUTO OFF" position and the lever has range of play around this position.

In order to recover the functioning of the MCB from the "AUTO OFF" state, shift the lever down to "OFF" once, then shift it up to "ON" position.

7. Wining Diagram

7.1 Generator Wiring Diagram

SDG25S

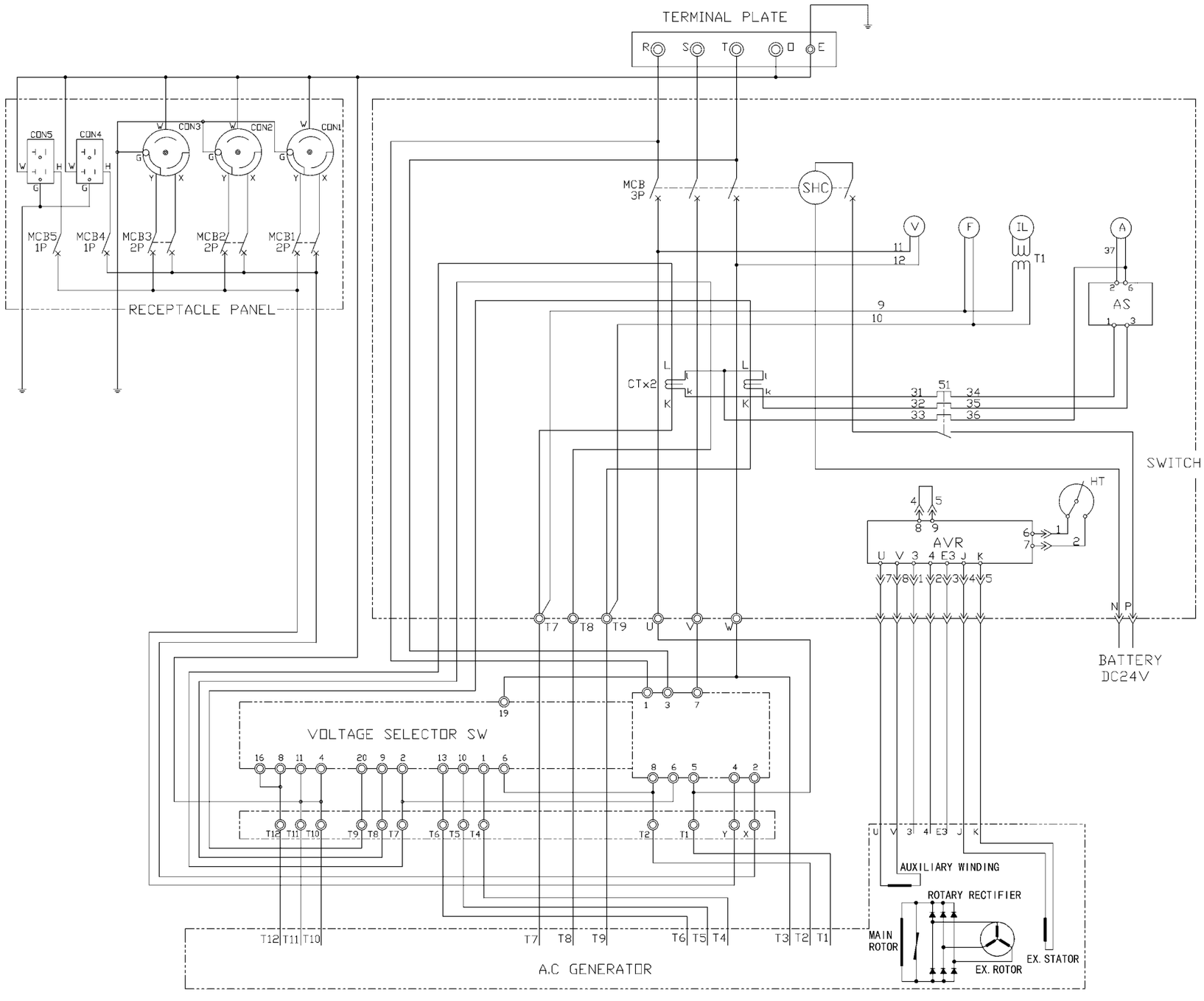


MCB	Molded case circuit breaker (three-phase)
MCB1－4	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over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

Voltage Selector SW	Voltage/Winding Connection
3 Phase 480/277V	3 Phase 4 Wire Series Star
3 Phase 240/139V	3 Phase 4 Wire Parallel star
Single Phase 240/120V	Single Phase 2or 3 Wire Parallel Zig-Zag

7. Wiring Diagram

SDG45S

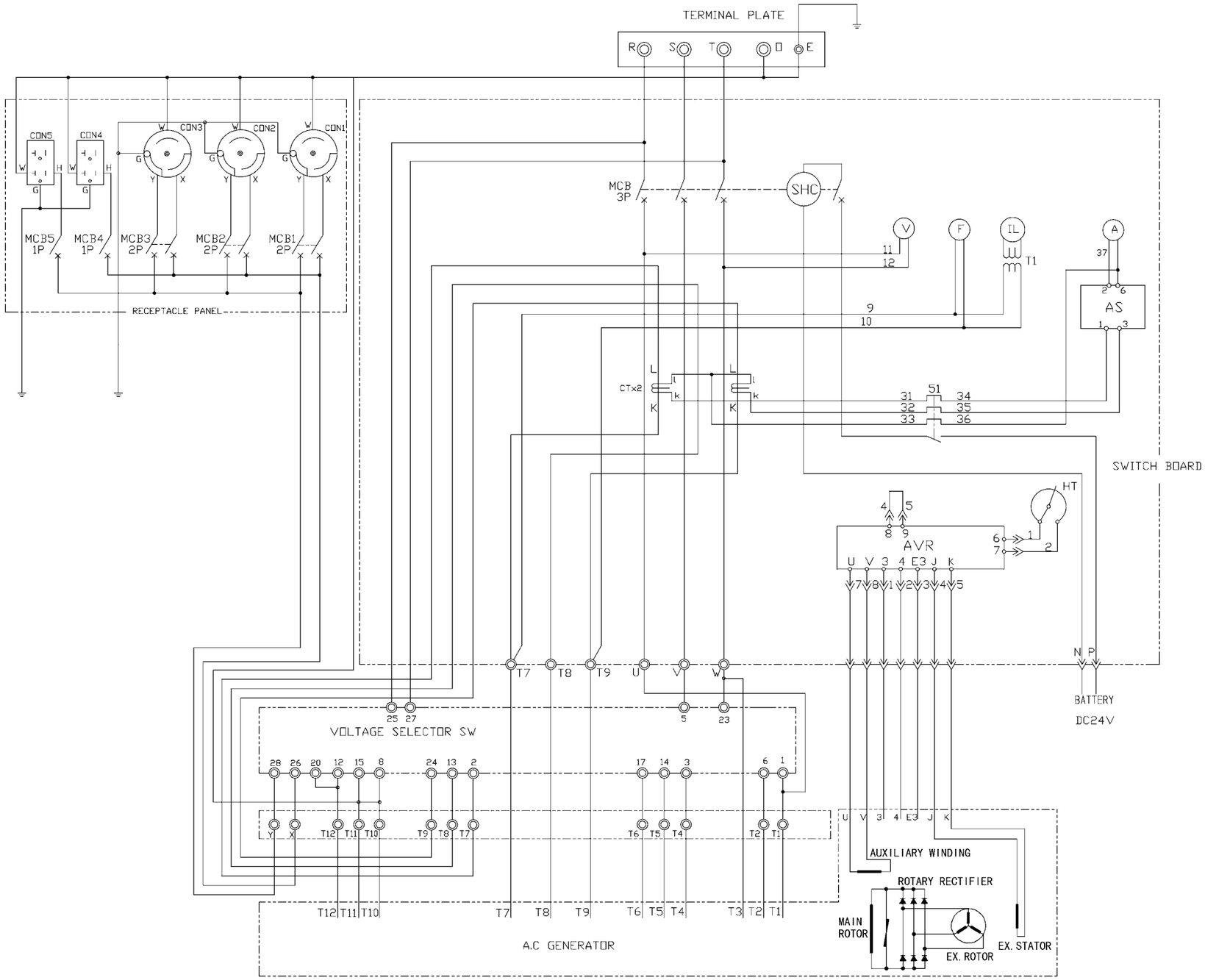


MCB	Molded case circuit breaker (three-phase)
MCB1－5	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over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

Voltage Selector SW	Voltage/Winding Connection
3 Phase 480/277V	3 Phase 4 Wire Series Star
3 Phase 240/139V	3 Phase 4 Wire Parallel star
Single Phase 240/120V	Single Phase 2or 3 Wire Parallel Zig-Zag

7. Wiring Diagram

SDG60S

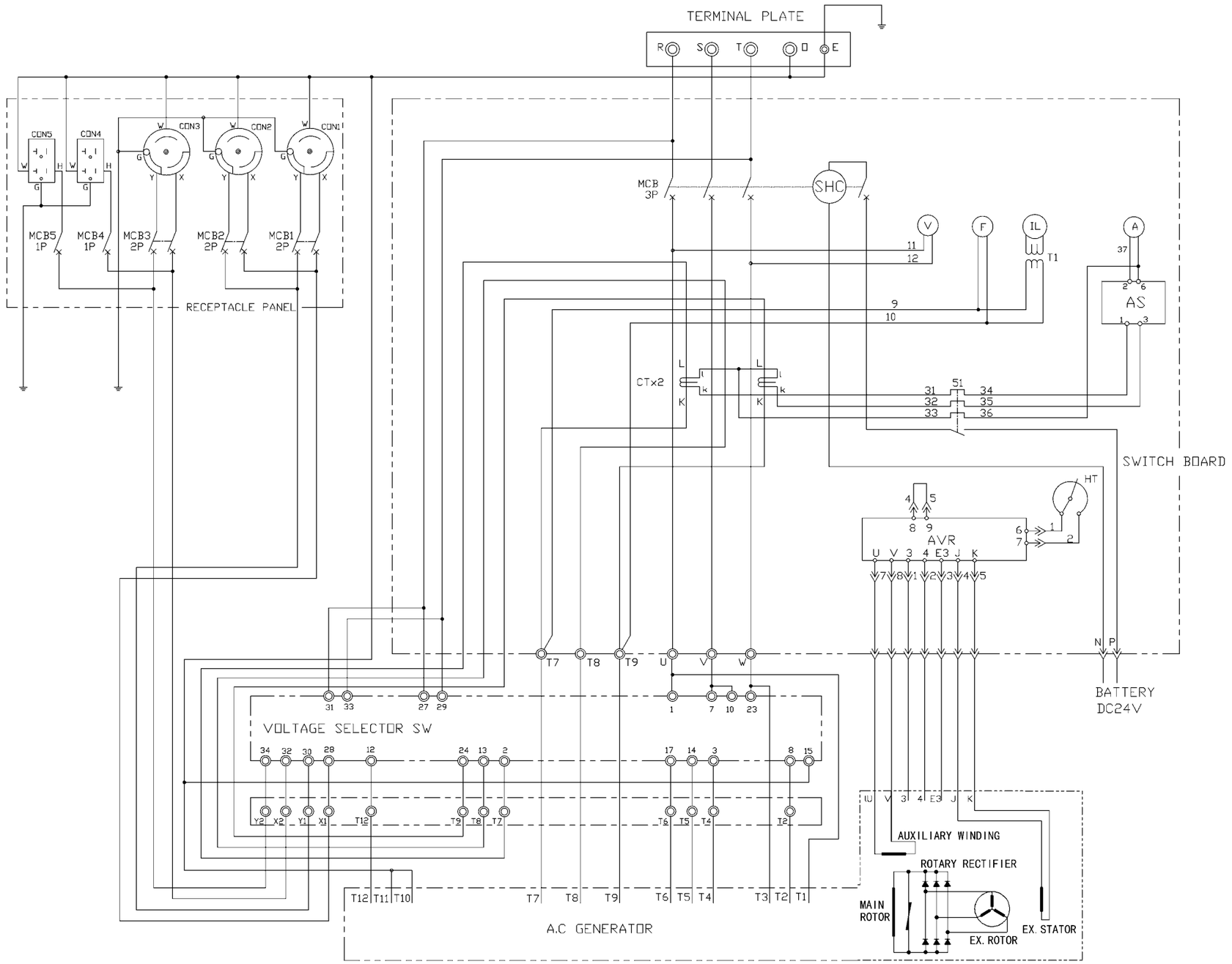


MCB	Molded case circuit breaker (three-phase)
MCB1－5	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over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

Voltage Selector SW	Voltage/Winding Connection
3 Phase 480/277V	3 Phase 4 Wire Series Star
3 Phase 240/139V	3 Phase 4 Wire Parallel star
Single Phase 240/120V	Single Phase 2or 3 Wire Parallel Zig-Zag

7. Wiring Diagram

SDG75S/100S

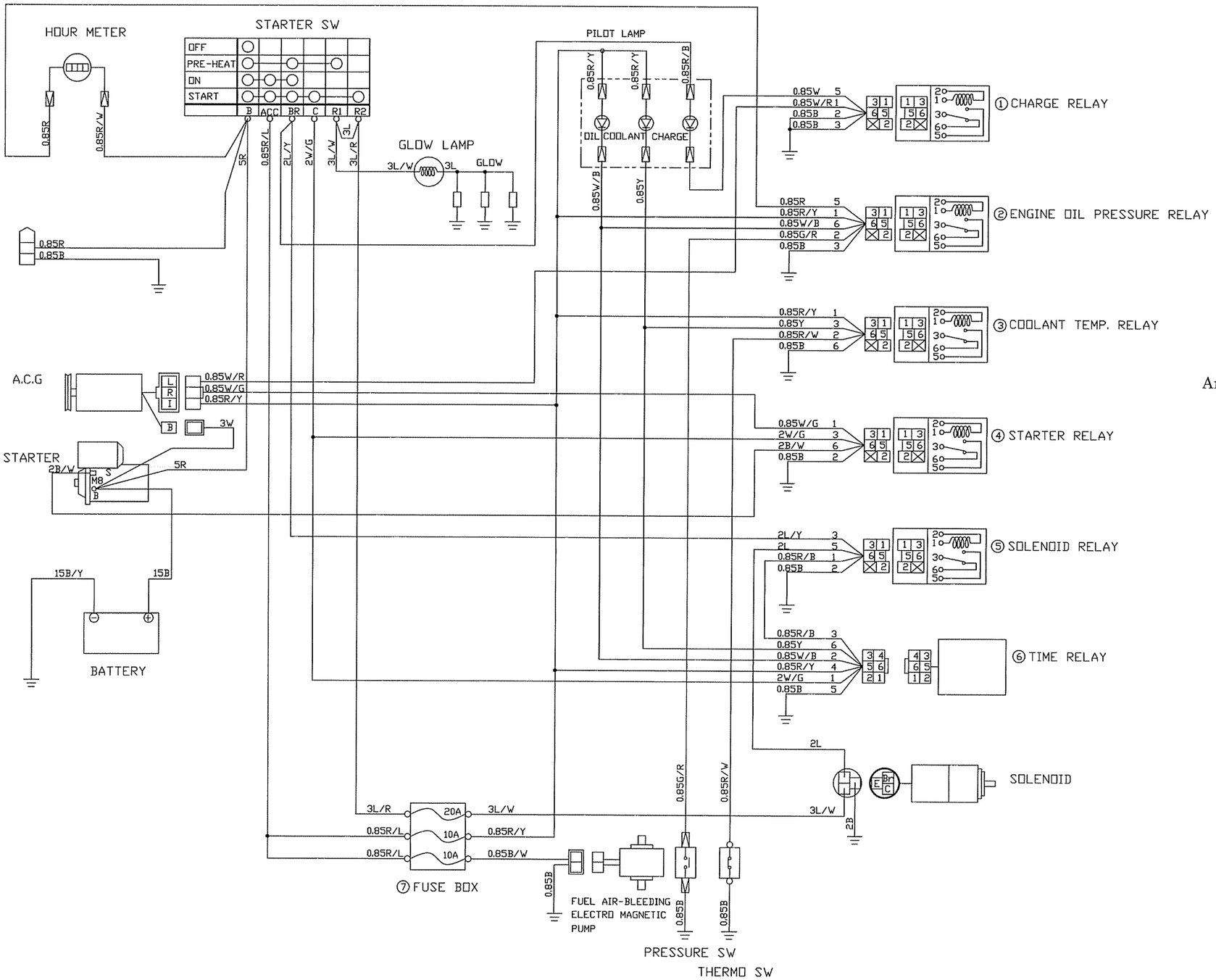


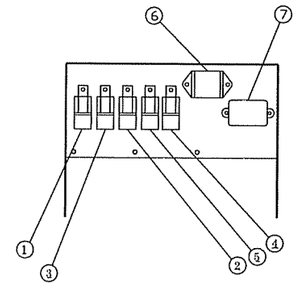
MCB	Molded case circuit breaker (three-phase)
MCB1−5	Molded case circuit breaker (single-phase)
SHC	Shunt coil
A	Ammeter
V	Voltmeter
F	Frequency meter
IL	Illumination lamp
CT	Current transformer
51	Thermal relay
AVR	Automatic voltage regulator
HT	Hand trimmer (voltage regulator)
AS	Ammeter change-over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

Voltage Selector SW	Voltage/Winding Connection
3 Phase 480/277V	3 Phase 4 Wire Series Star
3 Phase 240/139V	3 Phase 4 Wire Parallel star
Single Phase 240/120V	Single Phase 2 or 3 Wire Parallel Zig-Zag

7.2 Engine Wiring Diagram

SDG25S





Mounting position of the bracket on switching panel

An Example

3 R/W

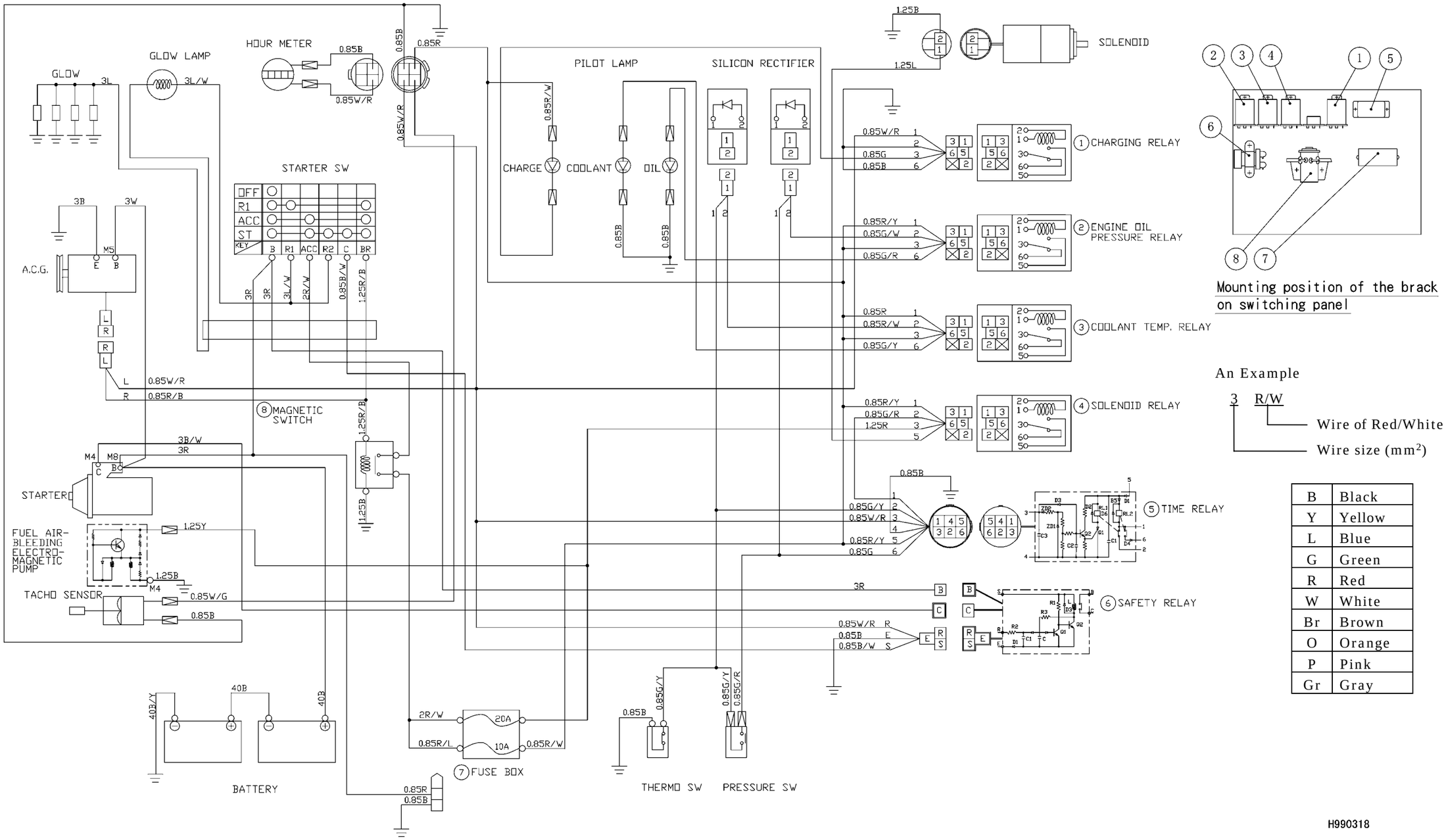
- 3 — Wire size (mm²)
- R/W — Wire of Red/White Line

B	Black
Y	Yellow
L	Blue
G	Green
R	Red
W	White
Br	Brown
O	Orange
P	Pink
Gr	Gray

H990317

7. Wiring Diagram

SDG45S/60S



Mounting position of the brack on switching panel

An Example

3 R/W

Wire of Red/White Line

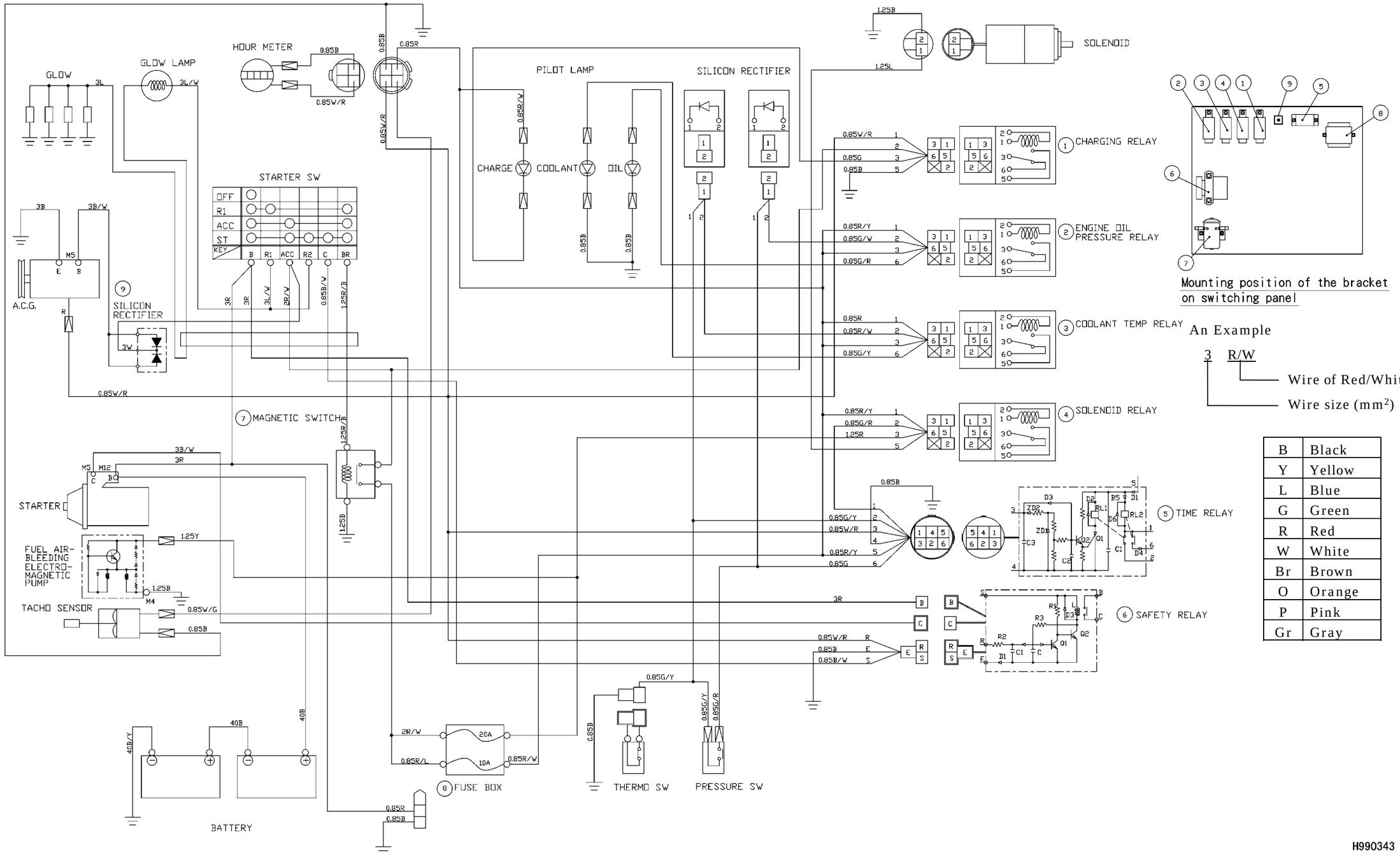
Wire size (mm^2)

B	Black
Y	Yellow
L	Blue
G	Green
R	Red
W	White
Br	Brown
O	Orange
P	Pink
Gr	Gray

H990318

7. Wiring Diagram

SDG75S/100S



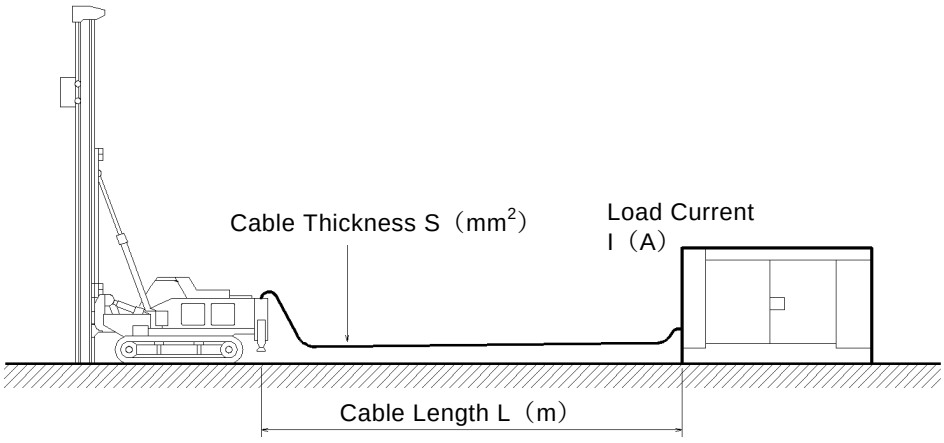
B	Black
Y	Yellow
L	Blue
G	Green
R	Red
W	White
Br	Brown
O	Orange
P	Pink
Gr	Gray

H990343

8. References

8.1 Selecting Cable

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



Simplified three-phase three-wire formula to seek voltage drop from cable length and working current:

$$\text{Voltage drop e (V)} = \frac{1}{58} \times \frac{\text{Length L (m)}}{\text{Thickness S (mm}^2\text{)}} \times \text{Current I (A)} \times \sqrt{3}$$

Select such a cable length and thickness so that the voltage drop will remain less than 5%.

- The table below shows the relationship between cabtire cable length and current and corresponding cable sectional area (nominal).
  The sectional areas in the table are based on the cable (of maximum allowable insulation: 60℃) in an ambient temperature of 30℃ or lower.
  (Based on the condition that working voltage is 400V, with voltage drop of 20V.)

Single-Core Cable (Unit:mm²)

Current \ Length	50mor less	75m	100m	125m	150m	200m
20A	2	3.5	3.5	5.5	5.5	8
30A	3.5	5.5	5.5	8	8	14
60A	8	8	14	14	22	22
100A	22	22	22	22	30	38
150A	38	38	38	38	38	50

Three-Core Cable (Unit:mm²)

Current \ Length	50mor less	75m	100m	125m	150m	200m
20A	3.5	3.5	3.5	5.5	5.5	8
30A	5.5	5.5	5.5	8	8	14
60A	14	14	14	14	22	22
100A	38	38	38	38	38	38
150A	60	60	60	60	60	60