

Kubota

SERVICE MANUAL

Diesel Engine Generator

GL14000-USA



 **WARNING**

This equipment is designed and built with safety in mind. However, your overall safety can be increased by fully understanding and following the content in this manual.

Read this manual and familiarize yourself with its contents for your safety.

This equipment should only be operated and maintained by trained and qualified personnel.

This equipment is designed for generating a power source for electric tools, home appliances and lights.

Do not install, operate or service this equipment without reading this manual and clearly understanding the information.

This service manual is edited for authorized personnel to perform repair, maintenance and trouble-shooting of diesel engine generators, designated as **GL14000-USA**

Shindaiwa products require necessary maintenance and adjustment to ensure product longevity, safety and desired performance. Fully understand this service manual before operating or performing service.

The information contained in this service manual describes equipment available at the time of publication. While every attempt has been made to provide you the very latest information about your product, there may be some differences between your equipment and the equipment described in this manual. We reserve the right to make changes to equipments without prior notice, and without obligation to make alterations to equipment previously manufactured.

For service of the engine, refer to Workshop (Service) Manual provided by the engine manufacturer described below.

MANUFACTURER	MODEL	REMARKS
KUBOTA	D902-E4B	Tier 4

Table of Contents

1. Attention Statements	1
2. General Safety Instructions	2
3. Specifications	4
4. General	5
4.1 Dimension	5
5. General Parts Description	7
5.1 Serial Number	7
5.2 Main Components	8
6. Service Data	11
6.1 Technical Specification	11
6.2 Generator	12
(1) Exciting Amperage	13
(2) Resistance Value	13
(3) Armature (Main Stator) #1	14
(4) Exciter Winding (Main Stator)	15
(5) Exciter Stator J (Brown) – K (Red)	16
(6) Rotor	17
(7) Inspect Diode	18
(8) Inspect the Transformer	19
(9) Inspect the Volt meter	19
(10) Inspect the Breaker	20
(11) Inspect the Voltage regulator	20
7. Tightening Torque	22
7.1 Specific Torque	22
7.2 General Torque	23
8. Periodical Check for Engine	24
9. Trouble Shooting	25
10. Wiring Diagram	27

1. Attention Statements

- Only technicians with enough knowledge and experience should perform maintenance and operational checks after maintenance.
- Before maintenance, always read this service manual as well as the owner's manual and be familiar with the contents thoroughly before starting the service and maintenance of the equipment. Completely understand the equipment, safety and caution notifications.
- Throughout this manual are special attention statements.



A statement preceded by the triangular attention symbol and the word "WARNING" contains information that should be acted upon to prevent serious bodily injury.



A statement preceded by the triangular attention symbol and the word "CAUTION" contains information that should be acted upon to prevent mechanical damage.

2. General Safety Instructions



WARNING



ELECTRIC SHOCK

⚠ NEVER touch the output terminals during operation

⚠ NEVER touch the output terminal during operation even though the breaker on the load is being set at “OFF” position.

ALWAYS stop engine and make sure it has fully stopped before you connect the loads to the output terminals.



Suffocation by exhaust gas

⚠ NEVER run the engine indoors! Make sure there is always good ventilation. Fumes from engine exhaust cause serious injury.

ALWAYS operate the equipment in a well ventilated area.

When the equipment is used in a tunnel, hall or any other indoor area, ventilation equipment must be used to prevent serious injury caused by suffocation.

⚠ NEVER direct the exhaust fumes to houses nearby. Consider the wind flow direction.

Exhaust gas contains many harmful elements that can cause effects to humans. Prevent suffocation when the equipment is used in poorly ventilated area such as inside of the building.



Entangled Injuries under Moving Component

⚠ NEVER reach or touch moving components during operation!

ALWAYS stop the engine during inspection to prevent serious bodily injury by entangled accident under moving component.



Electric shock/Injuries/Burns

⚠ Never inspect equipment during use.

Never service or inspect when equipment while it is being operated. It may cause electric shock, injuries or burns.

⚠ WARNING-Use good judgment

NEVER run the engine when transporting the equipment.

ALWAYS stop the equipment immediately if it suddenly begins to vibrate or an abnormal noise is heard. Inspect for broken, missing or improperly installed parts.

ALWAYS keep the equipment as clean as practical. Keep it free of loose vegetation, mud, etc.

⚠ DO NOT make unauthorized modifications or alterations to this equipment or any of its components. KUBOTA ENGINE AMERICA must authorize alterations and modifications in writing. Unauthorized modifications or alterations may alter the equipment operation and could jeopardize personal safety during operation.



Work Safely


Generators operate at very high speeds and can do serious damage or injury if they are misused or abused. Never allow a person without training or instruction to operate or service this equipment!

Attention to CAUTION LABEL !

Caution labels are placed on this equipment and require special attention for operation. Make sure to locate the labels and understand the content of the caution.

- Check that caution labels are legible.
Always keep the labels clean or replace them when worn or damaged
- Clean the labels by cloth, water or detergent and never use organic solvent or gasoline which may cause label to peel off.
- Make sure to replace the labels when damaged or illegible.

Before replacing the label(s), make sure to place the new label(s) in the same position.

 **STOP** the equipment immediately when abnormal circumstances are noticed!

STOP the equipment immediately whenever abnormal circumstances are noticed such as unusual noise, smell, vibration and etc.

It may lead to a serious accident or fatal damage of the equipment or properties.


 Inflammables !

Keep the equipment far away from fire such as cigarettes when filling fuel, oil or battery fluid.

NEVER operate or service the equipment nearby fire as the equipment may catch fire.

 No Modification !

NEVER modify the equipment without manufacturer's advanced approval. . It may lead to serious safety issues and damage the equipment.

 Inspect the equipment before engine start for operation and periodical inspection without fail !

Make sure to inspect before starting engine and periodically inspect for safety and longer life of the equipment.

3. Specifications

Model		Unit		GL14000
Alternator	Generator Type	-		Revolving Field Brushless
	Armature Connection	-		ZigZag-W
	Rated Frequency	Hz		60
	Rated Output(Prime)	kVA		12
		kW		12
	Standby Output	kVA		14
		kW		14
	Rated Voltage	V		120/240
	Rated Current	120V	A	50 × 2
		240V	A	50
	Power Factor	-		1.0
	Insulation class	-		F
Excitation	-		Self-Excitation (brushless)	
No. of Poles	-		2	
Engine	Type	-		Vertical Water-Cooled 4-Cycle Diesel
	Model(Manufacturer)	-		D902(KUBOTA)
	No. of Cylinders (bore × stroke)	(in./mm)		3(2.83x3.78/72x73.6)
	Continuous Rated Output	hp		20.7
	Rated Speed	rpm		3,600
	Displacement	cu.in./liters		55/0.898
	Combustion System	-		Indirect Injection
	Cooling Method	-		Water cooled
	Starting Method	-		Electric
	Fuel	-		No.2-D,S15 EPA regulation
	Lubricating Oil	-		API service-type CD class or better
	Fuel Tank Capacity	gal./liters		9.6/36.4
	Lubricant Volume	gal./liters		0.95/3.6
	Coolant Volume	gal./liters		1.1/4.1(including sub-tank 0.16/0.6)
	Starting Motor Capacity	V-kW		12-1.2
	Charging Alternator Capacity	V-W		12-150
Battery Capacity	V-Ah		12-36	
Unit	Length	in./mm		52/1,310
	Width	in./mm		25/640
	Height	in./mm		35/895
	Dry Weight	lbs./kg		904/410
	Net Weight	lbs./kg		1,003/455

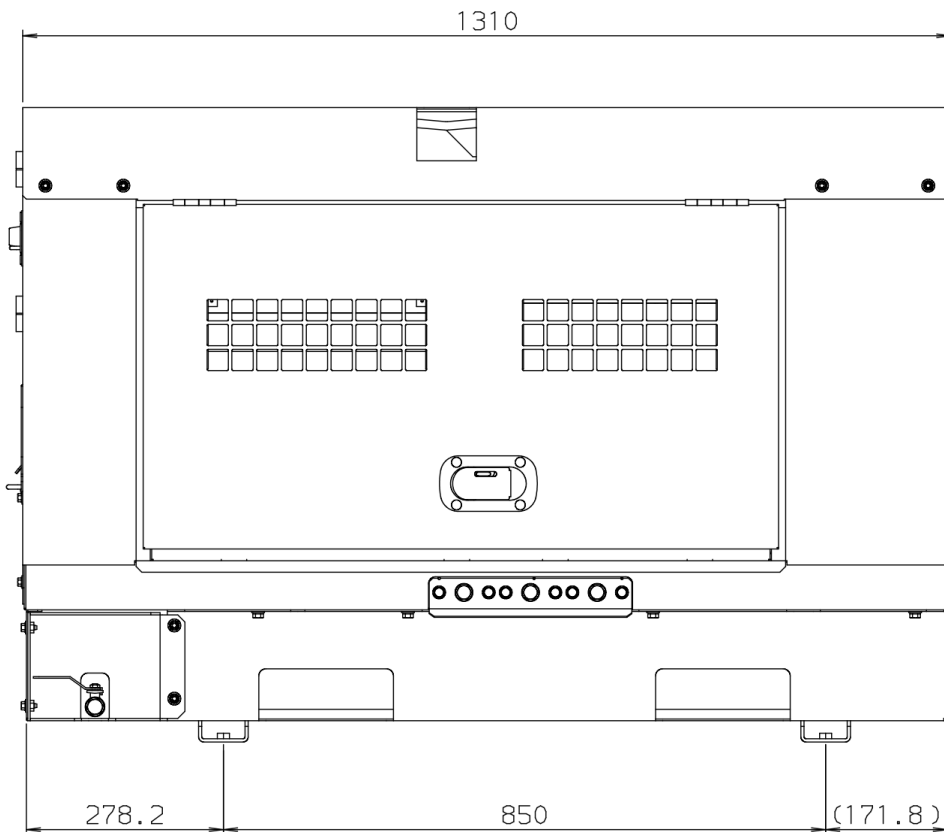
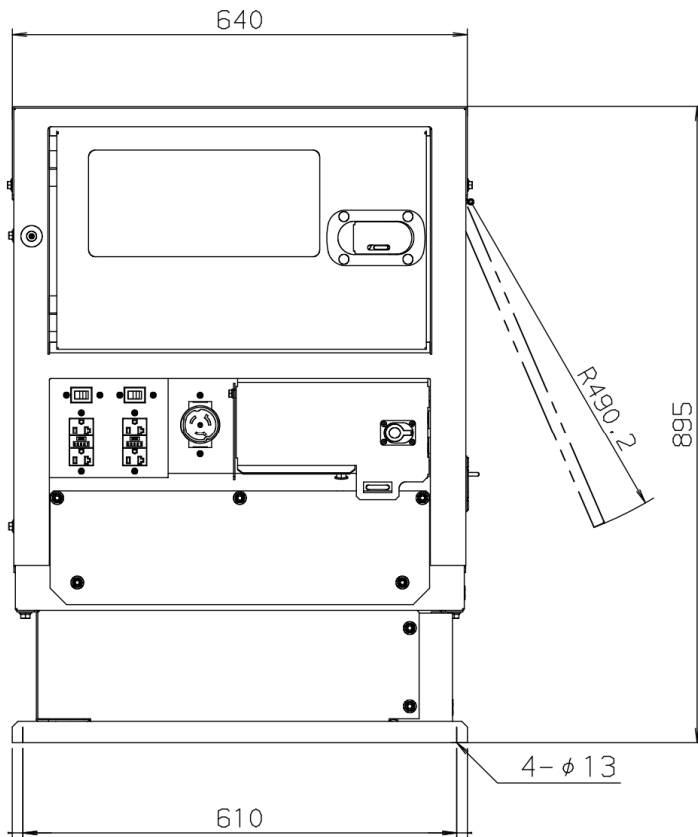
*Specifications subject to change without notice.

Generating application is **60Hz ONLY.

4. General

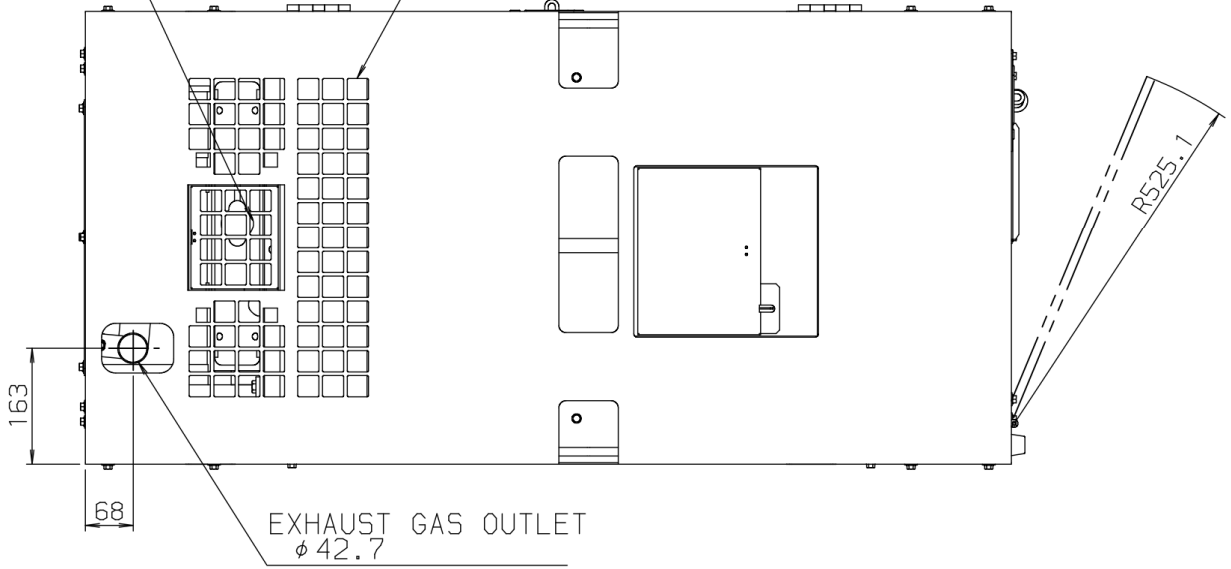
4.1 Dimension

*Unit below is shown by mm.



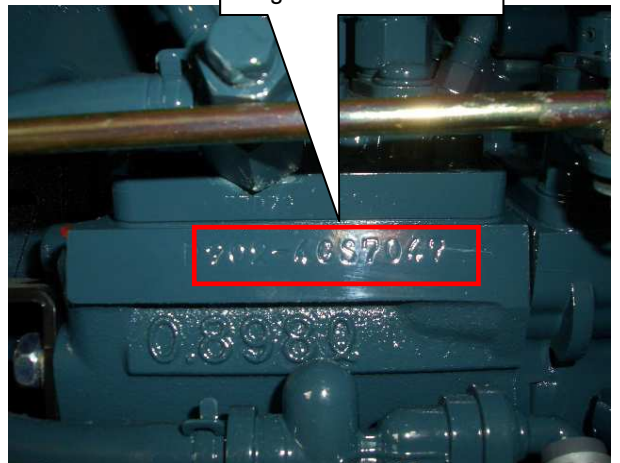
WATER INLET

AIR OUTLET

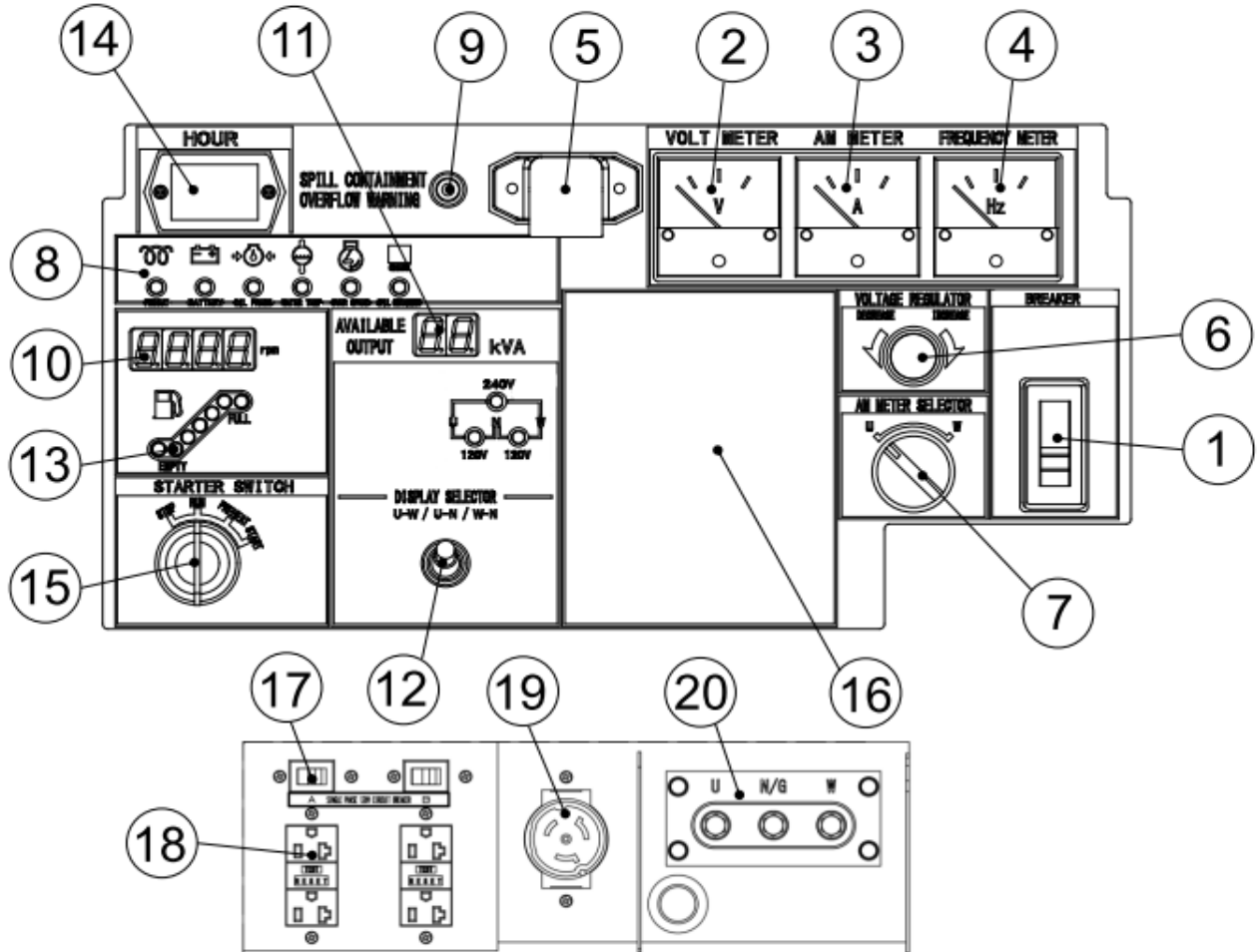


5. General Parts Description

5.1 Serial Number



5.2 Main Components



①	Main Circuit Breaker	⑪	Available Output Monitor
②	Voltmeter	⑫	Display Selector Switch
③	Ammeter	⑬	Fuel Meter
④	Frequency Meter	⑭	Hour Meter
⑤	Pilot Lamp	⑮	Starter Switch
⑥	Voltage Regulator	⑯	240/120V-Receptacle(CS6369)
⑦	Ammeter Selector Switch	⑰	Circuit Breaker
⑧	Warning Indicators	⑱	240/120V-Receptacle(CS6369)
⑨	Spill containment Overflow Warning Indicator	⑳	Output Terminal
⑩	Tachometer		

Front Panel Inside

Printed Circuit Board (Main controller)
 Feature: Adjust voltage and control engine rpm etc.

Transformer
 Feature: Detect engine rpm. and voltage.
 Refer to "inspect the transformer" on page 19 for inspection.



Auto Start Terminal

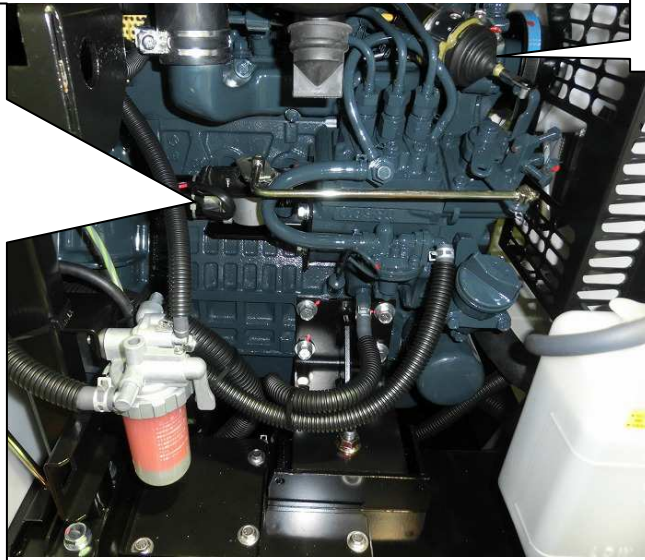
Emergency Relay

Speed Control Motor
 Feature: control engine speed coupled by the governor lever and speed adjusting rod.

To Check

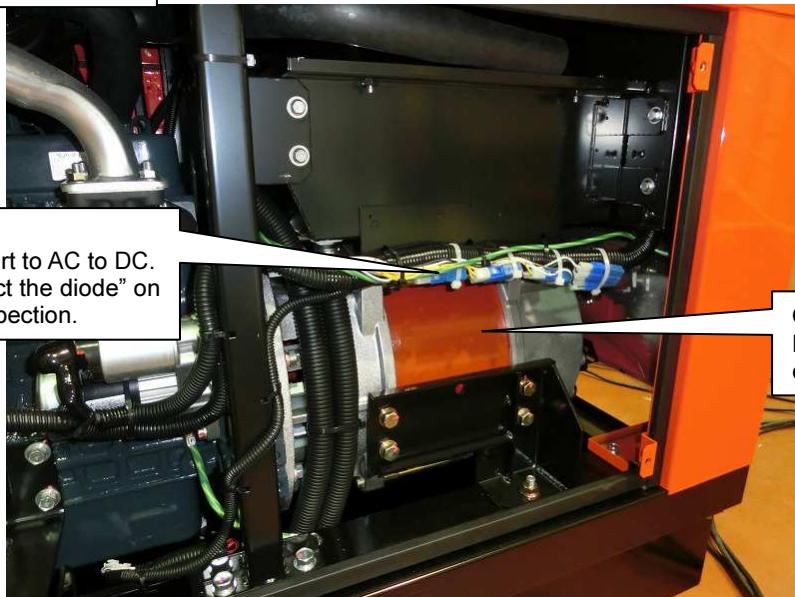
1. Remove the coupler and rod.
2. Supply a DC 12V 220mA from the battery to the coupler, and the motor would rotate one direction.
3. Switch the positive (+) and negative (-) wires from the battery and connect the wires to the coupler in reverse again. The motor shall rotate other direction

Engine Stop Solenoid
 Feature: supply or stop fuel.



Diode
 Feature: Convert to AC to DC.
 Refer to "inspect the diode" on page 18 for inspection.

Generator
 Refer to "trouble shooting" on page 25 for inspection.





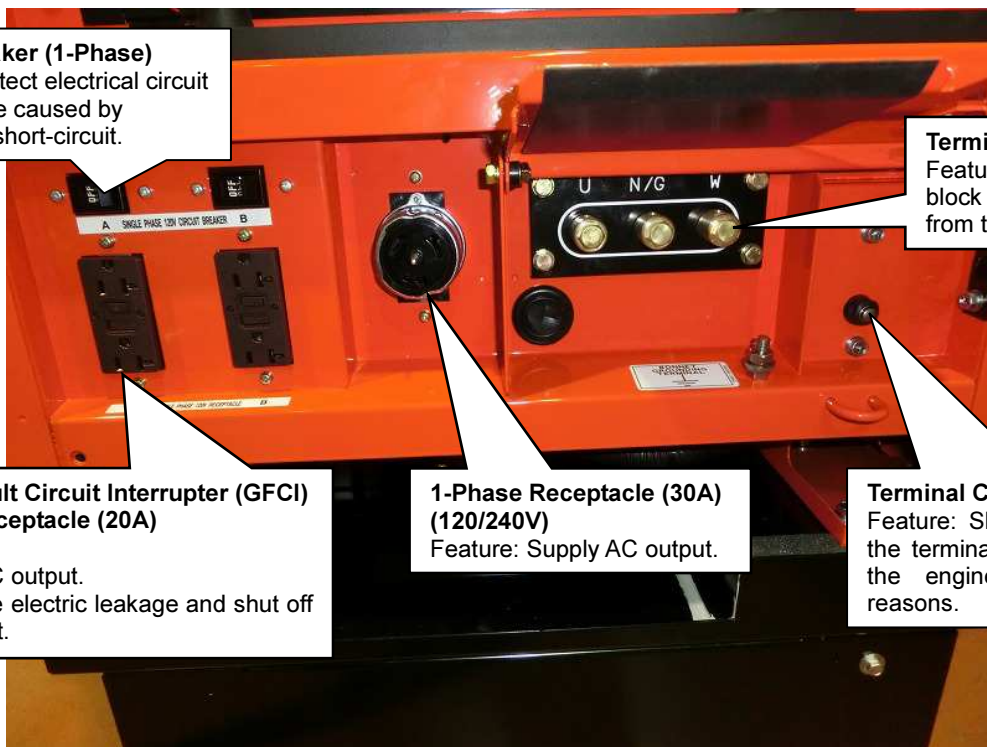
Oil Pan

Feature: accumulate oil used to lubricate the engine accumulates.

Level Switch, spill containment

Feature: detects the liquid volume accumulated in the spill containment.

Output Terminal Cover Inside



Circuit Breaker (1-Phase)

Feature: Protect electrical circuit from damage caused by overload or short-circuit.

Terminal Rest

Feature: Relay terminal block of the power output from the alternator.

**Ground-Fault Circuit Interrupter (GFCI)
1-Phase Receptacle (20A)**

Feature:

1. Supply AC output.
2. Detect the electric leakage and shut off the output.

**1-Phase Receptacle (30A)
(120/240V)**

Feature: Supply AC output.

Terminal Cover Switch

Feature: Shut off the breaker when the terminal cover is opened during the engine operation for safety reasons.

Accessory

Standard Accessory

- ① Owners Manual
- ② Starter Key – 2 sets
- ③ Warranty Statement
- ④ Instruction Manual of the engine

6. Service Data



⚠ WARNING
Never touch the output terminals during operation.

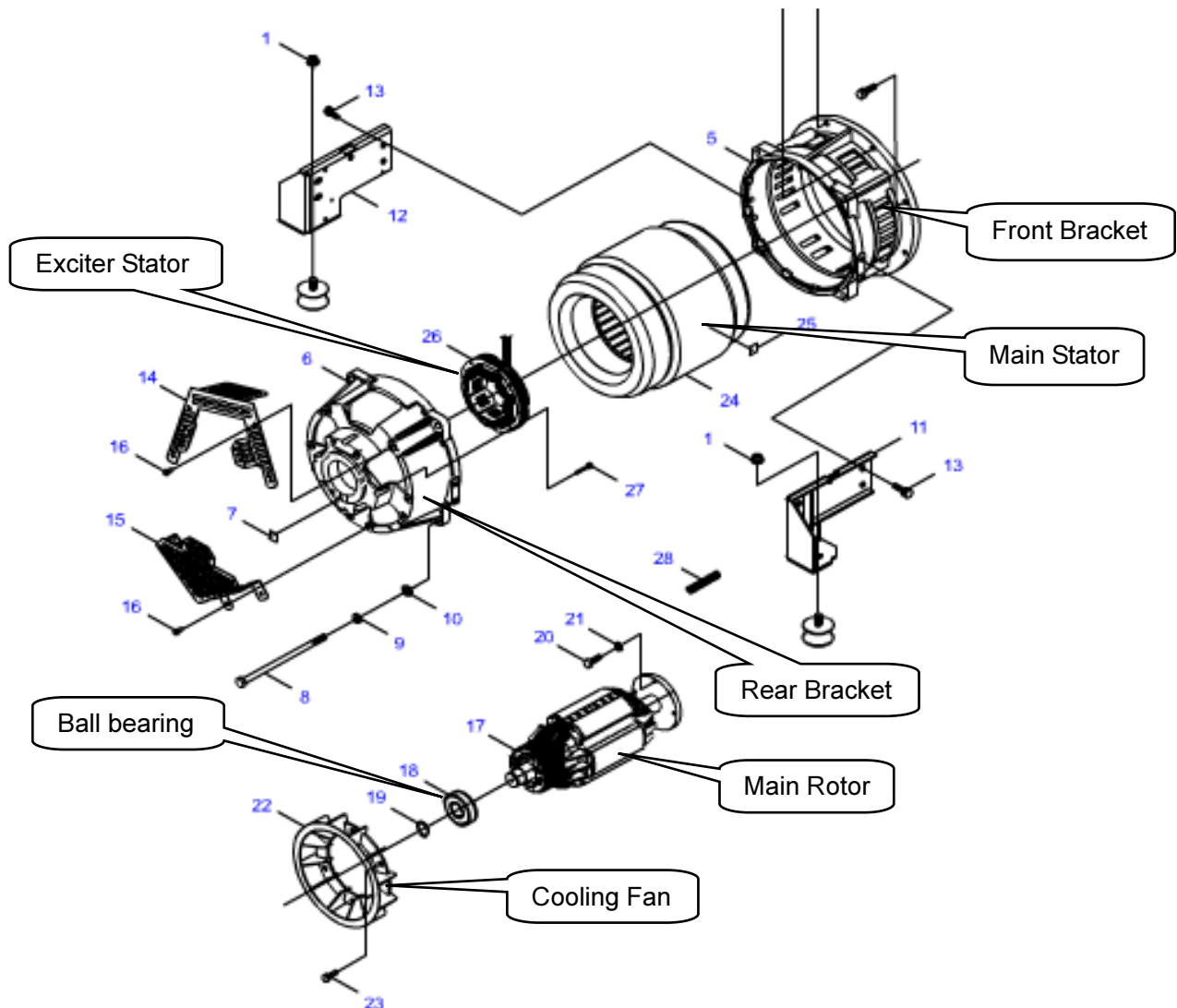
Never touch the output terminal during operation even if the breaker on the load being set is OFF. Be sure to check and confirm the engine is stopped whenever touching terminals to connect loads.

6.1 Technical Specification

Items		Reference Value	Note
Insulation	Armature winding	1MΩ or more	DC500V Megger Tester
	Exciter field		
Preheat time		Preheat time would be approx. 5 sec. when coolant temp. read -15°C and it would be 2 sec. when coolant temp. read 20°C. Glow lamp ON for 10 sec.	Automatic Preheat System
Max. rpm at no load		3600 min ⁻¹	
Lubricant oil pressure		0.1~0.49MPa{1~5kgf/cm ² }	
Coolant temperature		70~100°C	
Frame temperature limit		within 80°C	
Sealed bearing temperature limit		within 60°C	
Speed regulation	Momentary	within 10%	
	Steady-state deviation	within 5%	
Voltage regulation	Momentary	within 20%	
	Steady-state deviation	within 1.0%	
Frequency		Rated: 60 Hz	
Variable voltage		197~255V	
Protective device		Rated value	
Low oil pressure	Working pressure	0.098MPa{1.019±0.2kgf/cm ² }	Engine stop
High water temp.	Working temperature	115±2°C	Engine stop
Over speed	Working speed	4140 min ⁻¹	Engine stop
Charge fault			Engine stop
Terminal cover [open]			Engine stop Breaker shut-off

6.2 Generator

The main parts of the generator consist of rigid casting, and it has superior quality and durability with the features of a powerful damper winding to minimize wave distortion.



Stator

The stator is the external stationary portion of the generator that actually provides the electricity for distribution to the load(s). It is composed of several individual coils of copper wire distributed and wound such that the magnetic field associated with the rotor passes over and around the coils and in turn produces an electric potential (voltage) that is used as the supply voltage to the load(s). This stator also houses the stationary coils used as the exciter stator for the generator field exciter. The stator is bolted directly to the flywheel housing of the engine. The end bracket and end cover are bolted directly to the end of the stator opposite to where the stator is bolted to the flywheel housing.

Rotor

The rotor is the portion of the generator bolted directly to the crankshaft of the engine so that it rotates at the same speed that the engine crankshaft is rotating. The opposite end of the rotor is supported by the generator end bracket using a single ball bearing. The rotor has the field coils attached to it. The amount of current through the field coils determines the strength of the rotating magnetic field being used to generate a potential in the stator and therefore determines the output voltage of the generator. Field coil current is regulated by the exciter output, which is in turn regulated by the automatic voltage regulator. The rotating portion of the exciter is also mounted on the rotor.

(1) Exciting Amperage

Amperage fluctuates based upon the winding temperature. Following is for reference only.

Frequency/Rated Output		Load	Exciting Amperage (Measured)
Single-Phase	60Hz: 12 kW	No load	1.1A
		Full load (power factor=1.0)	1.5A

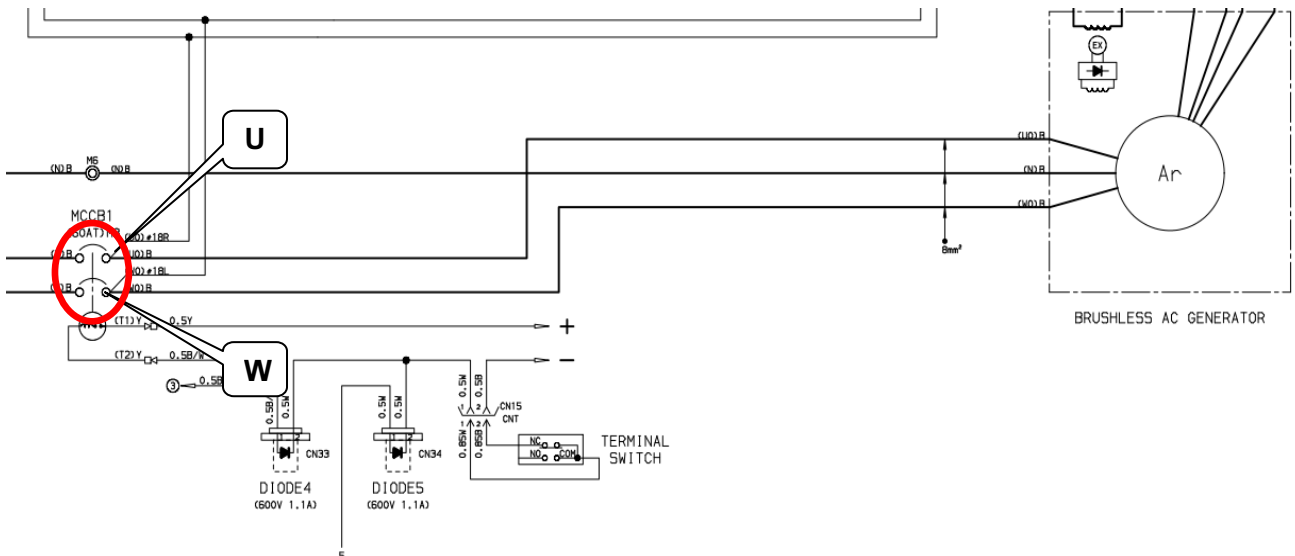
(2) Resistance Value

Nominal resistance of the winding is tolerated within $\pm 10\%$ at 20°C of the ambient temperature. The resistance must be measured by low resistance tester. It cannot be measured by multi-purpose tester due to index error.

Main Stator		Exciter Stator	Rotor	
1	2	3	4	5
Armature	Exciter Winding	J-K	Exciter Field	Armature
Between U-W	A - B B - C C - D	-	-	-
0.14 Ω	0.29 Ω	5.8 Ω	8.60 Ω	0.83 Ω

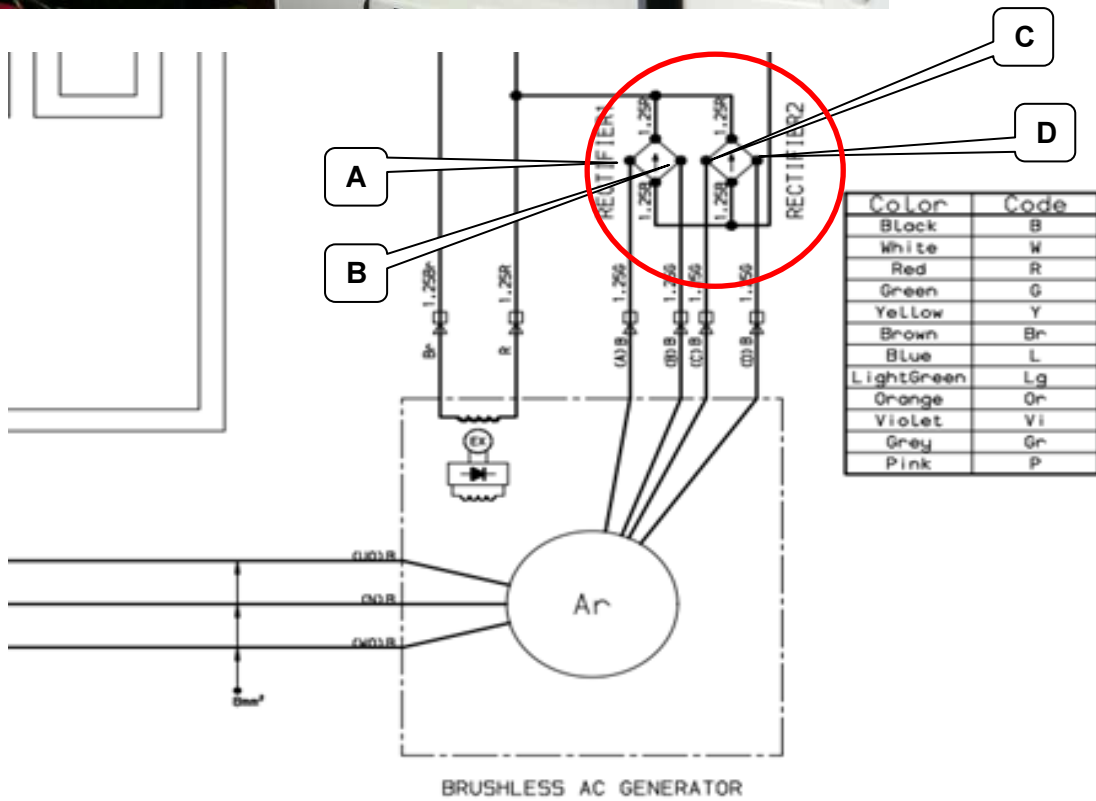
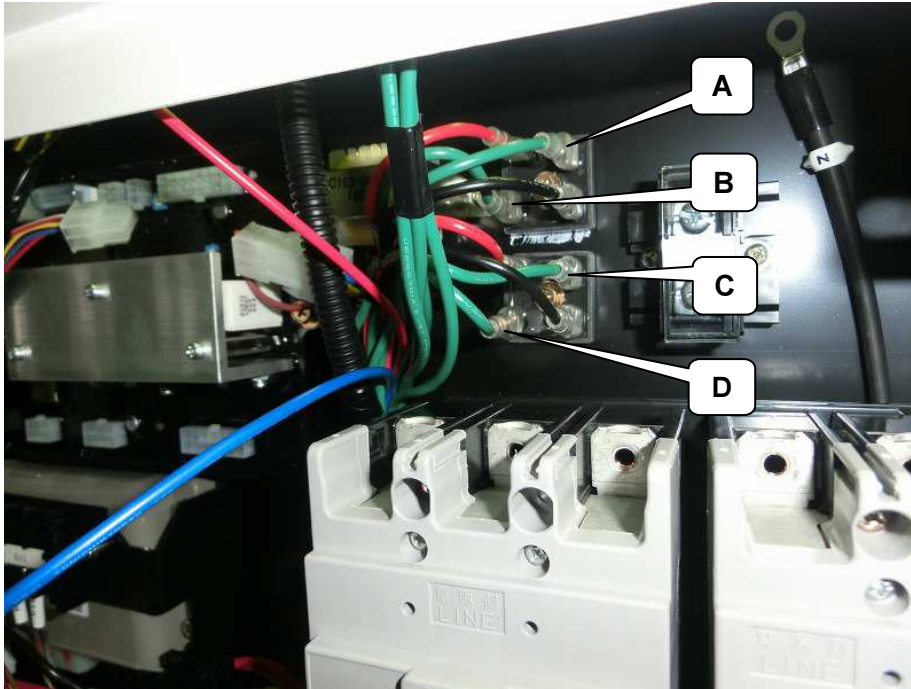
(B)	(W)	(R)	(G)	(Y)	(Br)	(L)	(Or)	(Gr)	(Vi)
Black	White	Red	Green	Yellow	Brown	Blue	Orange	Gray	Violet

(3) Armature (Main Stator) #1



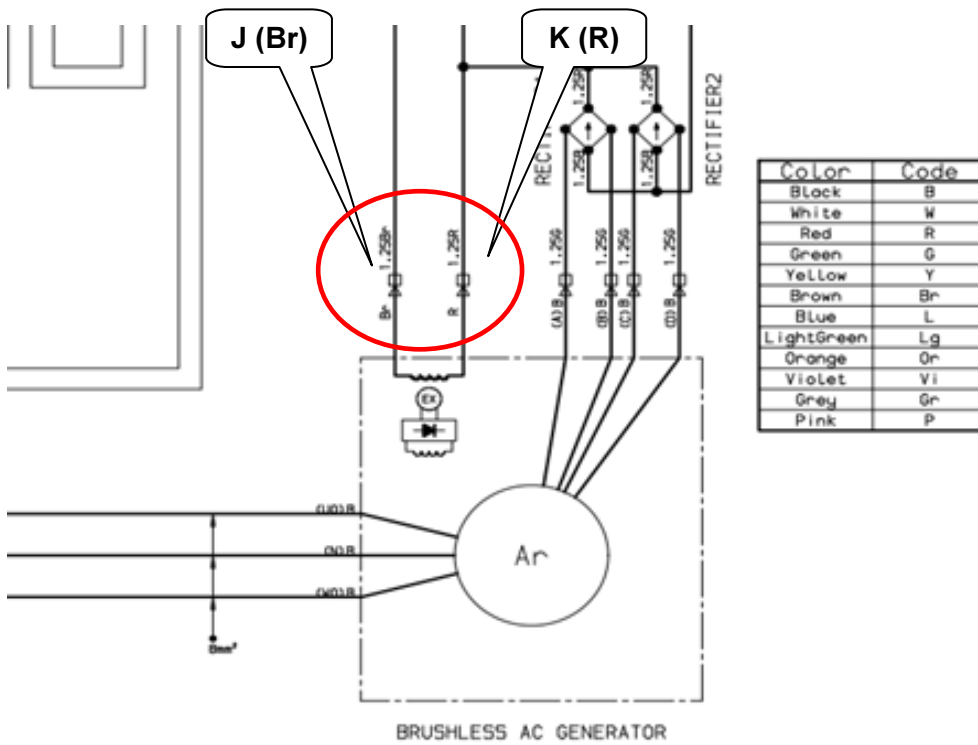
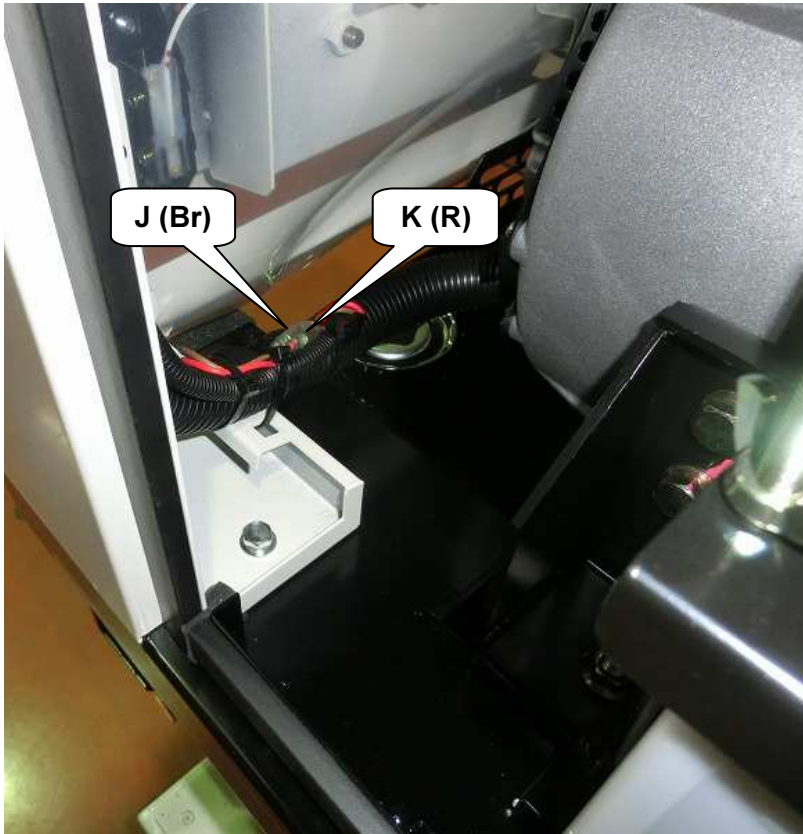
Measure the resistance among the U-W by the low resistance tester. Each shall be 0.14Ω.

(4) Exciter Winding (Main Stator)



The resistance among A~B, B~C and C~D by the low resistance tester. Each shall be 0.29Ω.

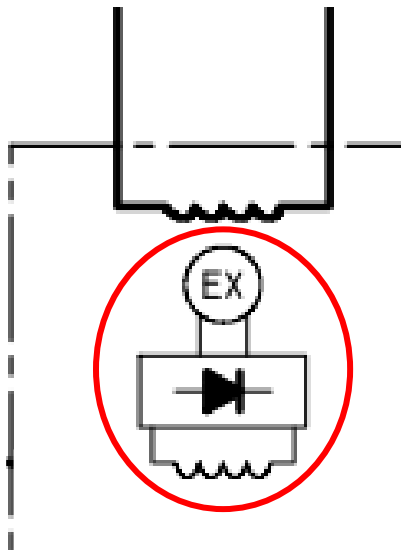
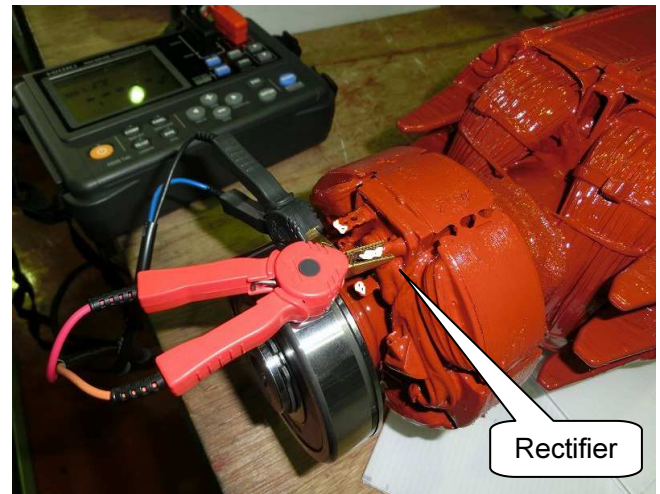
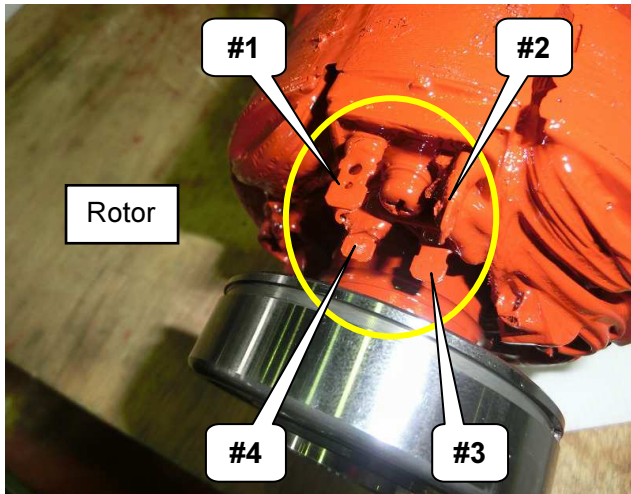
(5) Exciter Stator J (Brown)–K (Red)



Measure resistance among the J~K by the resistance ohm tester. It shall be 5.8Ω.

(6) Rotor

There are two windings in the rotor. Measure the resistance between #1~#3 and #2~#4



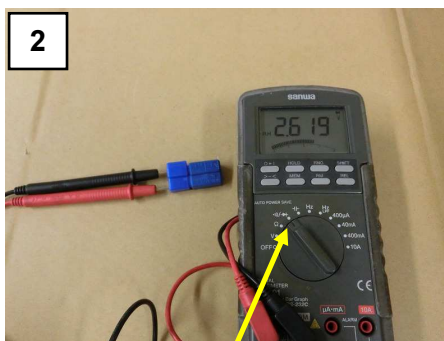
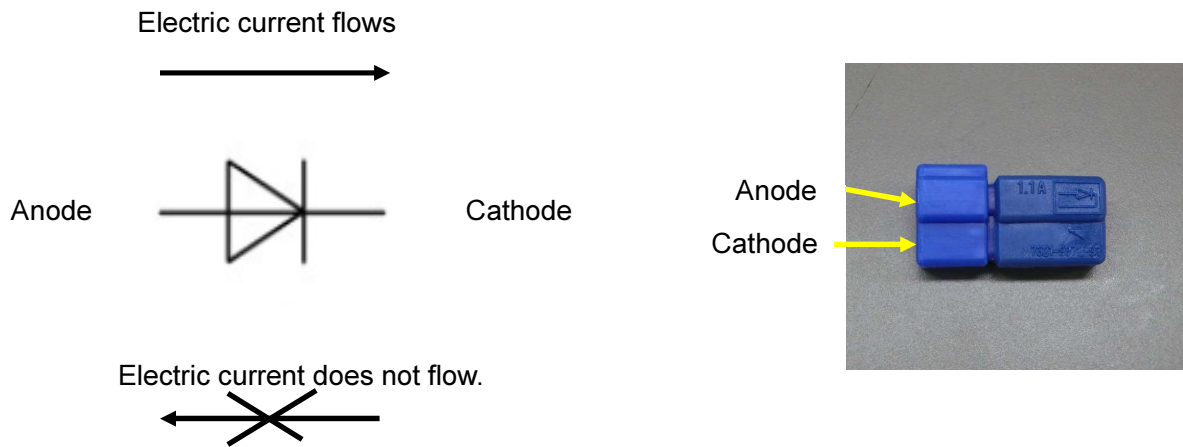
Remove the varnish with sand paper and measure;

Exciter Winding : the resistance among the two points as shown in the photo above by the low resistance tester. It shall be **8.6Ω**.

Field Winding: the resistance among the two points as shown in the photo above by the low resistance tester. It shall be **0.83Ω**.

(7) Inspect Diode

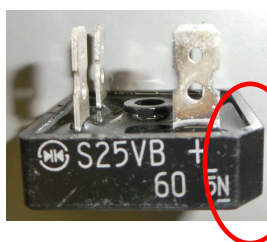
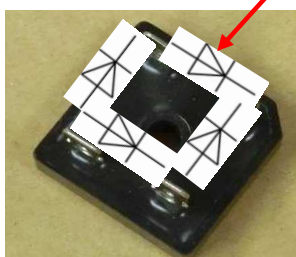
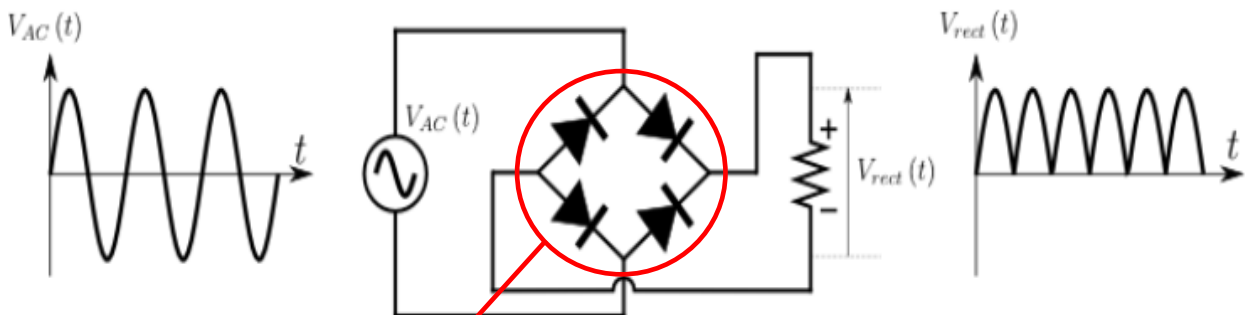
Function: convert AC (alternating current) to DC (direct current).



Measurement ranges for diode.

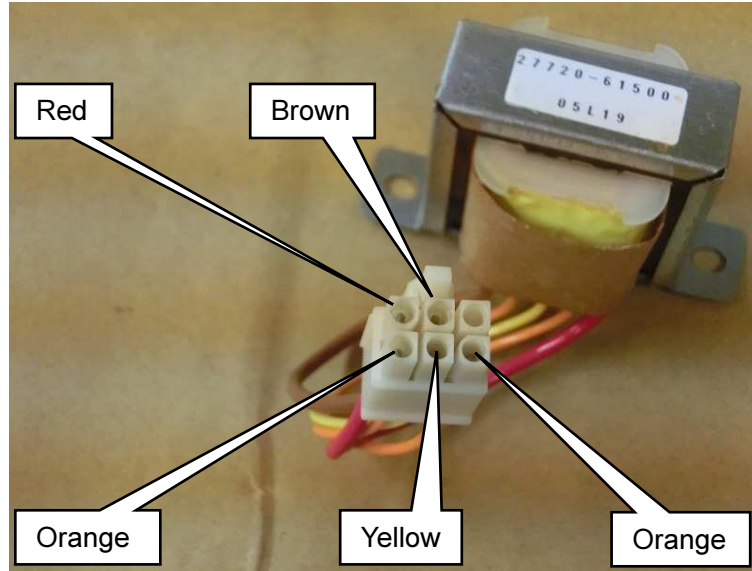
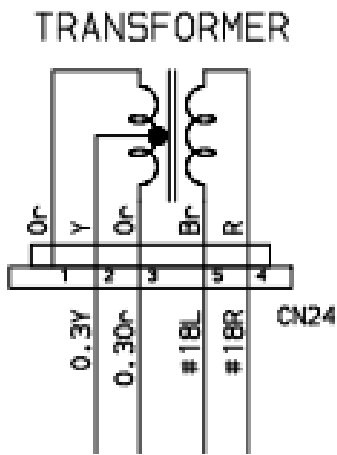
- 1) Insert the red probe, positive (+), to the Anode and the black probe, negative (-), to the Cathode. **Display shall show 0.6V,**
- 2) Insert the black probe, negative (-), to the Anode and the red probe, positive (+), to the Cathode. **Display shall show 2.6V.**

Measure all four diodes molded in the rectifier as per the procedures described above.



The cutout corner is positive (+) as it is indicated in the side, and angled corners are negative (-).

(8) Inspect the Transformer

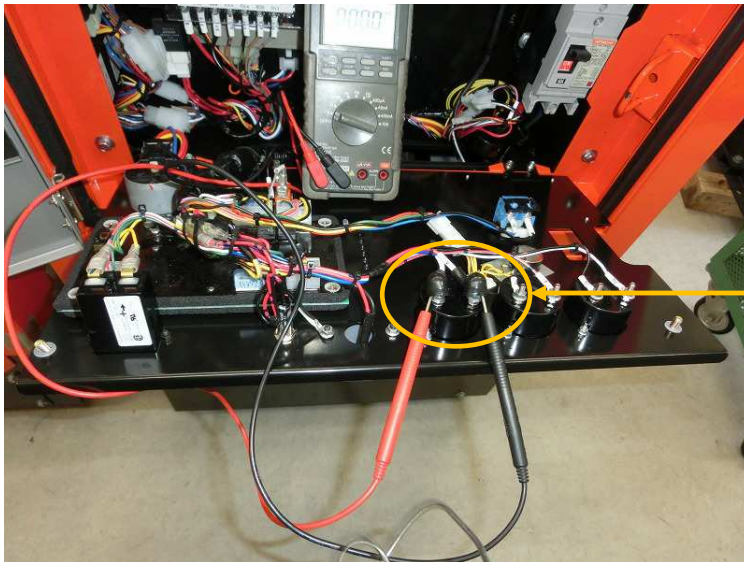


Red~Brown: There shall be conduction.
Orange~Yellow: There shall be conduction.
Red~Yellow: There shall be no conduction.

(9) Inspect the Volt meter

ELECTRIC SHOCK

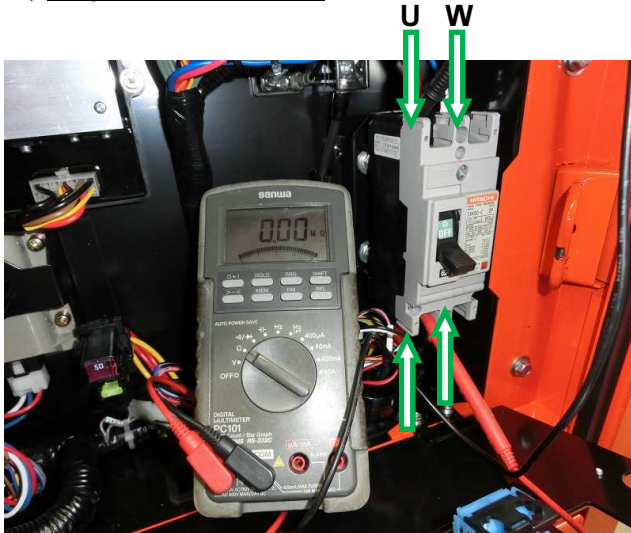
⚠ WARNING
Never touch the terminals during operation.



Measure the voltage of the volt meter.

- 1) Start engine.
- 2) Connect the probe of the tester to the terminals in the back of the volt meter and measure the voltage among the terminals.
- 3) The volt meter is a malfunctioning if the needle of the meter does not deflect.

(10) Inspect the Breaker

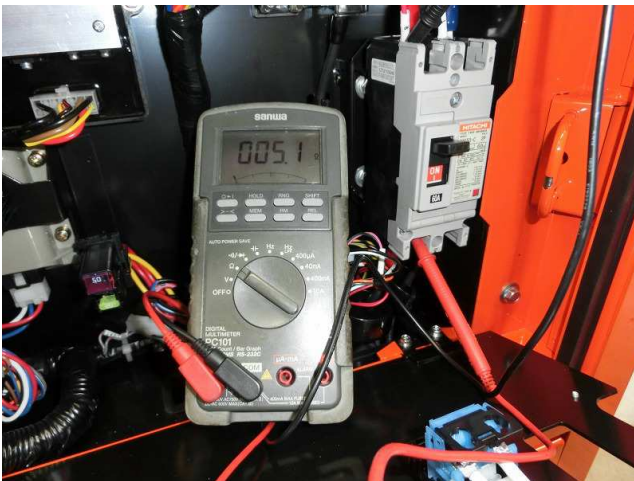


1. **Shut off engine.** Turn the main circuit breaker **OFF**.
2. Check the resistance with a **ohmmeter** between upper terminal and lower terminal of;

Upper Terminal Lower Terminal

U U
W W

The ohmmeter should display the symbol of infinity, ∞ , or similar per the ohmmeter that you may use.



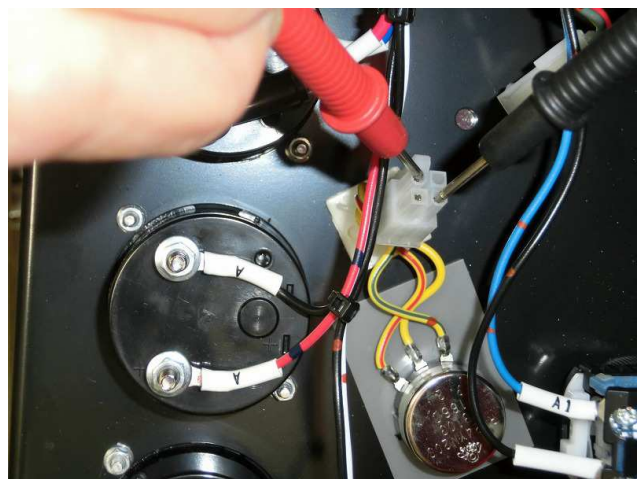
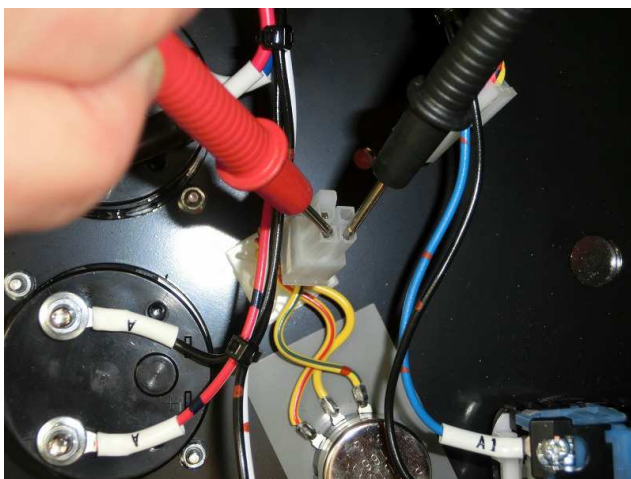
1. **Shut off engine.** Turn the main circuit breaker **ON**.
2. Check the resistance with a **ohmmeter** between upper terminal and lower terminal of;

Upper Terminal Lower Terminal

U U
W W

The ohmmeter should display approx. 1 ohms.

(11) Inspect The Voltage Regulator



1. Measure the resistance among the leads for “yellow and yellow/red” and “yellow and yellow/green” by the ohm tester. (Reading may not be accurate when the low resistance tester is used.)
2. The reading shall be 0~10kΩ when the voltage regulator knob turns.

Adjust as per following when AVR was replaced.

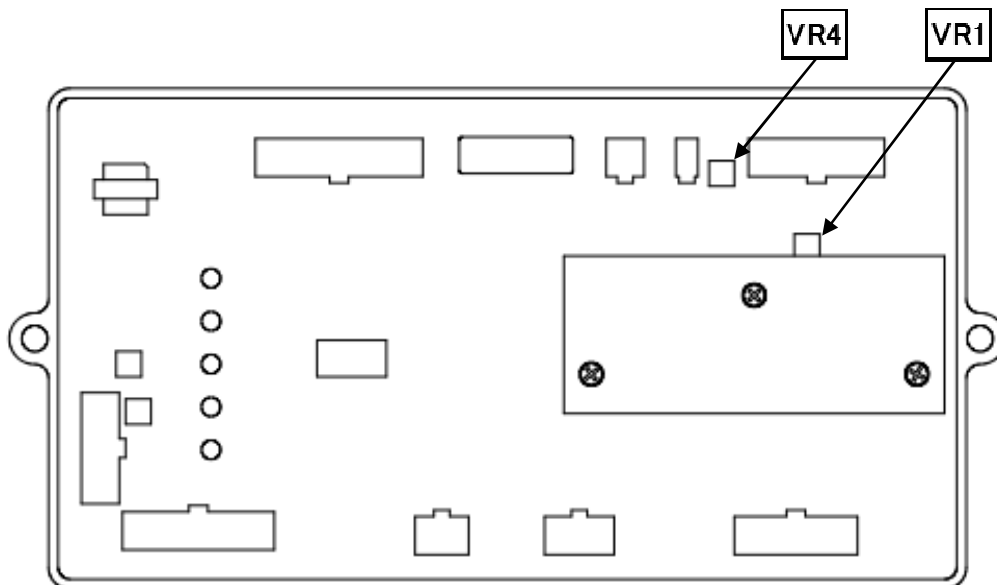
Condition

1. 60 Hz at no load
2. Turn the voltage selector located in the front panel to “MAX” position.
3. Dial the VR4 that locates in the printed circuit to the middle.

Criterion: (U-W, 1-phase) : $255\pm 2V$

Otherwise, adjust the **VR1** volume until it shows $255\pm 2V$.

<Position of the VR1 & VR4 volume>



7. Tightening Torque

7.1 Specific Torque

No.	Assemble (A) to (B)		Part Name	Size	Q'ty	Tightening Torque N · m(kgf · cm)
	PARTS (A)	PARTS (B)				
1	EXCITOR STATOR	HOUSING	BOLT	M5x40	4	3.0- 4.9 (31- 49)
2	REAR HOUSING	FRONT HOUSING	BOLT,12	M12x220	4	29.5-32.3 (301-329)
3	STAY,RIGHT,LEFT	HOUSING,REAR,FRONT	BOLT	M10x30	8	19.7-24.5 (201-249)
4	ROTAR	ENGINE	BOLT	M10x1.25x30	4	40.7-49.5 (416-504)
5	FAN,COOLING	ENGINE	BOLT	M8x25	6	9.9-14.7 (101-149)
6	HOUSING (GENARATOR ASSY)	ENGINE	BOLT,10	M10x1.25x25	8	19.7-24.5 (201-249)
7	STAY,ENGINE	ENGINE	BOLT,10	M10x1.25x25	8	28.5-34.3 (291-349)
8	LEAD	ENGINE	BOLT,10	M10x1.25x20	2	28.5-34.3 (291-349)
9	PLUG,DRAIN	SOCKET	PLUG,DRAIN	M12x1.25x13	3	39.3-49.0 (401-499)
10	PIPE,EXHAUST	ENGINE PIPE,EXHAUST	NUT,8	M8	6	17.7-21.5 (181-219)
11	LEAD	SWITCH,MAGNETIC	NUT	M8	1	9.9-11.7 (101-119)
12	TERMINAL,BATTERY	BATTERY	NUT	M6	2	5.0- 6.0 (51- 61)
13	LEAD	TERMINAL,BATTERY	BOLT	M8	2	6.9- 8.8 (71- 89)
14	HARNESS,WIRE	PLUG,GLOW	NUT	M4	1	1.0- 1.7 (11- 17)
15	HARNESS,WIRE	OIL PRESS SWITCH	BOLT	M4x8	1	1.4- 1.9 (15- 19)
16	STRAINER,FUEL	STAY,BONNET(RIGHT)	BOLT,8	M8x65	1	17.7-21.5 (181-219)
17	BOLT,STUD 8	PLATE,INST	NUT,8	M8	3	13.5-15.3 (138-156)
18	SWITCH,STARTER	PANEL,OPERATION	NUT		1	4.0- 6.0 (41- 61)
19	PLUG,DRAIN	VALVE	PLUG,DRAIN		1	13.0-15.0 (133-152)
20	PANEL	DOOR,FRONT	NUT,5	M5	2	2.0- 2.9 (21- 29)
21	SWITCH	GUARD	NUT	Resin(PF1/8)	2	0.6- 1.0 (7- 10)

7.2 General Torque

Unit: N·m {kgf·cm}

Intensity	4.6, 4.8, 5.6, 5.8, 6.3 (4T, 5T, 6T)			8.8, 9.8, 10.9, 12.9 (7T)		
Nominal Designation	Nominal	Tightening Torque Allowance Limit	Tightening Strength N{kgf}	Nominal	Tightening Torque Allowance Limit	Tightening Strength N{kgf}
M3 × 0.5	0.6 {6}	0.5 ~ 0.8 {5 ~ 8}	845 {86}	1.2 {12}	1.0 ~ 1.5 {11 ~ 15}	1610 {164}
M4 × 0.7	1.5 {15}	1.3 ~ 1.9 {14 ~ 19}	1475 {150}	2.8 {29}	2.8 ~ 4.8 {29 ~ 49}	2810 {287}
M5 × 0.8	3.0 {30}	2.6 ~ 3.8 {27 ~ 39}	2386 {243}	5.7 {58}	4.8 ~ 7.1 {49 ~ 72}	4544 {463}
M6 × 1.0	5.1 {52}	4.3 ~ 6.4 {44 ~ 65}	3377 {344}	9.6 {98}	8.6 ~ 14.4 {88 ~ 147}	6432 {656}
M8 × 1.25	12 {125}	11 ~ 16 {112 ~ 163}	6149 {627}	23 {239}	20 ~ 30 {204 ~ 306}	11712 {1194}
M10 × 1.5	24 {248}	21 ~ 31 {214 ~ 316}	9744 {994}	46 {473}	40 ~ 60 {408 ~ 612}	18560 {1893}
M12 × 1.75	42 {433}	37 ~ 54 {377 ~ 551}	14162 {1444}	81 {825}	70 ~ 100 {714 ~ 1020}	26976 {2751}
M14 × 2.0	68 {690}	60 ~ 85 {612 ~ 867}	19320 {1970}	129 {1313}	110 ~ 160 {1122 ~ 1632}	36800 {3753}
M16 × 2.0	106 {1076}	90 ~ 130 {918 ~ 1326}	26376 {2690}	201 {2049}	170 ~ 250 {1734 ~ 2549}	50240 {5123}
M18 × 2.5	145 {1480}	125 ~ 180 {1275 ~ 1835}	32256 {3289}	276 {2819}	235 ~ 345 {2396 ~ 3518}	61440 {6265}
M20 × 2.5	206 {2099}	175 ~ 260 {1785 ~ 2651}	41160 {4197}	392 {3997}	335 ~ 490 {3416 ~ 4997}	78400 {7995}
M22 × 2.5	280 {2855}	240 ~ 350 {2447 ~ 3569}	50904 {5191}	533 {5438}	455 ~ 665 {4640 ~ 6781}	96960 {9887}
M24 × 3.0	356 {3628}	305 ~ 445 {3110 ~ 4538}	59304 {6047}	678 {6911}	575 ~ 845 {5863 ~ 8617}	112960 {11519}
Material	SS, S××C, SWRM, SWCH			NC, SNCM, SCM (hardening & tempering treated)		

8. Periodical Check for Engine

● Consult Kubota Service Dealer ○ User Check ⊙ Replace Parts

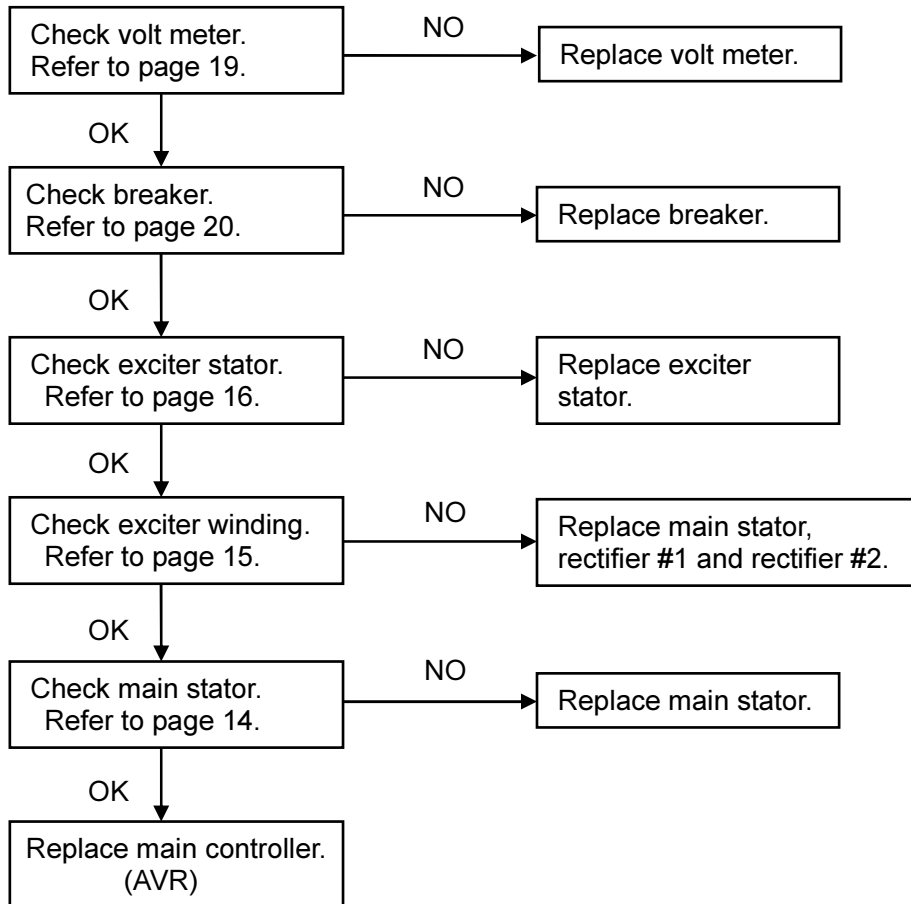
Items	Start up Check	Checking interval					
		At 50hrs	Every 100hrs	Every 200hrs	Every 400hrs	Every 1000hrs	Every 2000hrs
1	Check and Supply Fuel	○					
2	Check and Supply Engine Oil	○					
3	Change Engine Oil		1 st ⊙	2 nd ⊙			
4	Oil Filter Change		1 st ⊙		2 nd ⊙		
5	Check/Add Coolant	○					
6	Coolant Change						○ or 2 years
7	Clean Fuel Filter		1 st ○	2 nd ○			
8	Change Fuel Filter				⊙		
9	Drain Water/Clean Fuel Tank			○			
10	Check Leakage Fuel, Oil, Water	○					
11	Check/Add Battery Liquid	○					
12	Clean Air Element		1 st ○	2 nd ○			
13	Change Air Element				⊙		
14	Adjust tension V-belt		1 st ○	2 nd ○			
15	Change V-belt				⊙ or 2 years		
16	Clean Radiator Fin				○		
17	Clean Radiator inside				○		
18	Change Fuel Hose, Oil Hose, Vibration-absorbing Rubber						⊙ or 2 years
19	Adjust Engine Valve Clearance					● Adjust	● Plane
20	Check/Adjust Injection Nozzle				●		
21	Check/Adjust Injection Pump						●

9. Trouble Shooting

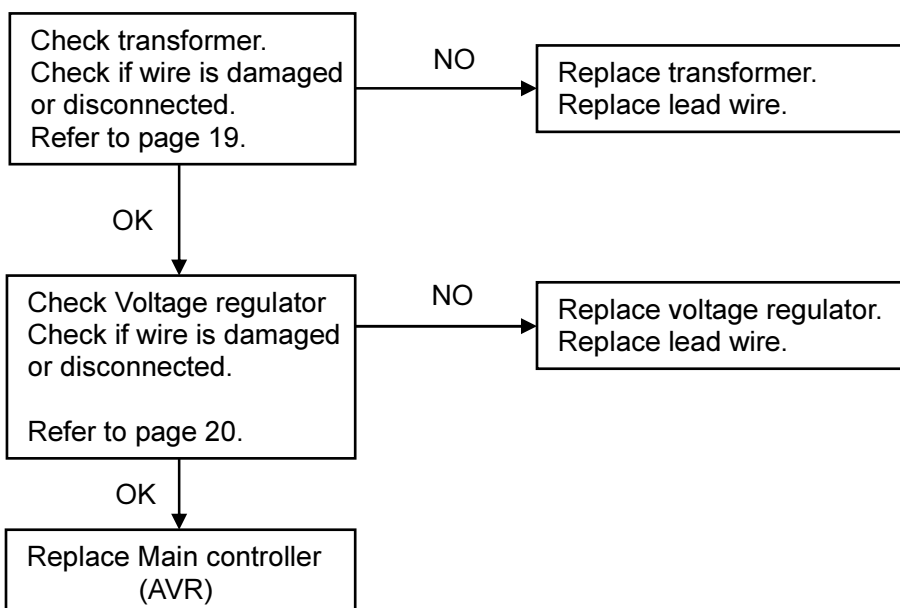
< Pre-check >

Always check the level of oil, coolant and fuel before proceeding to trouble shooting.

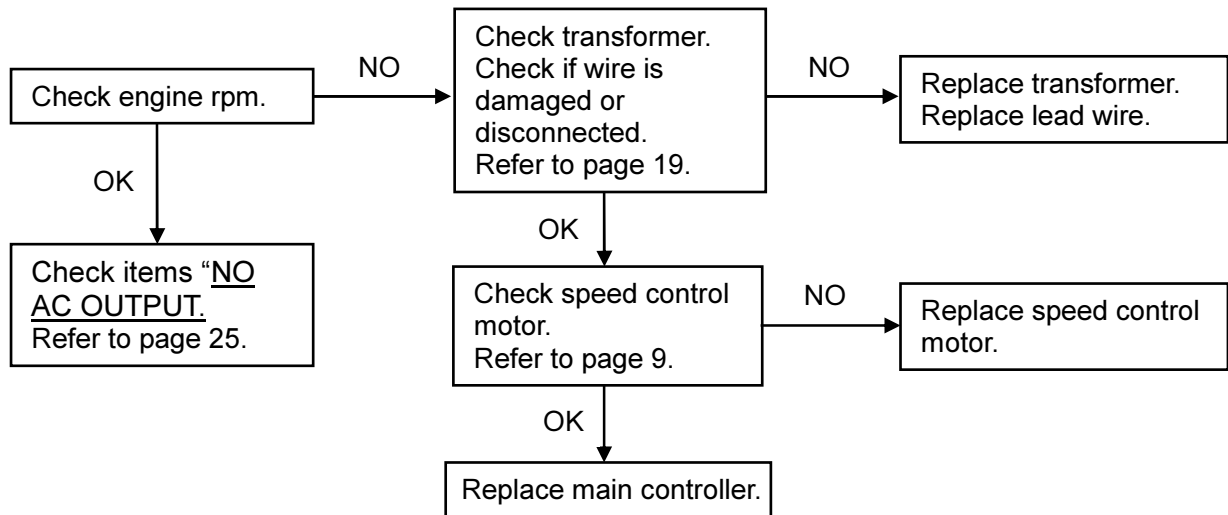
(1) NO AC OUTPUT



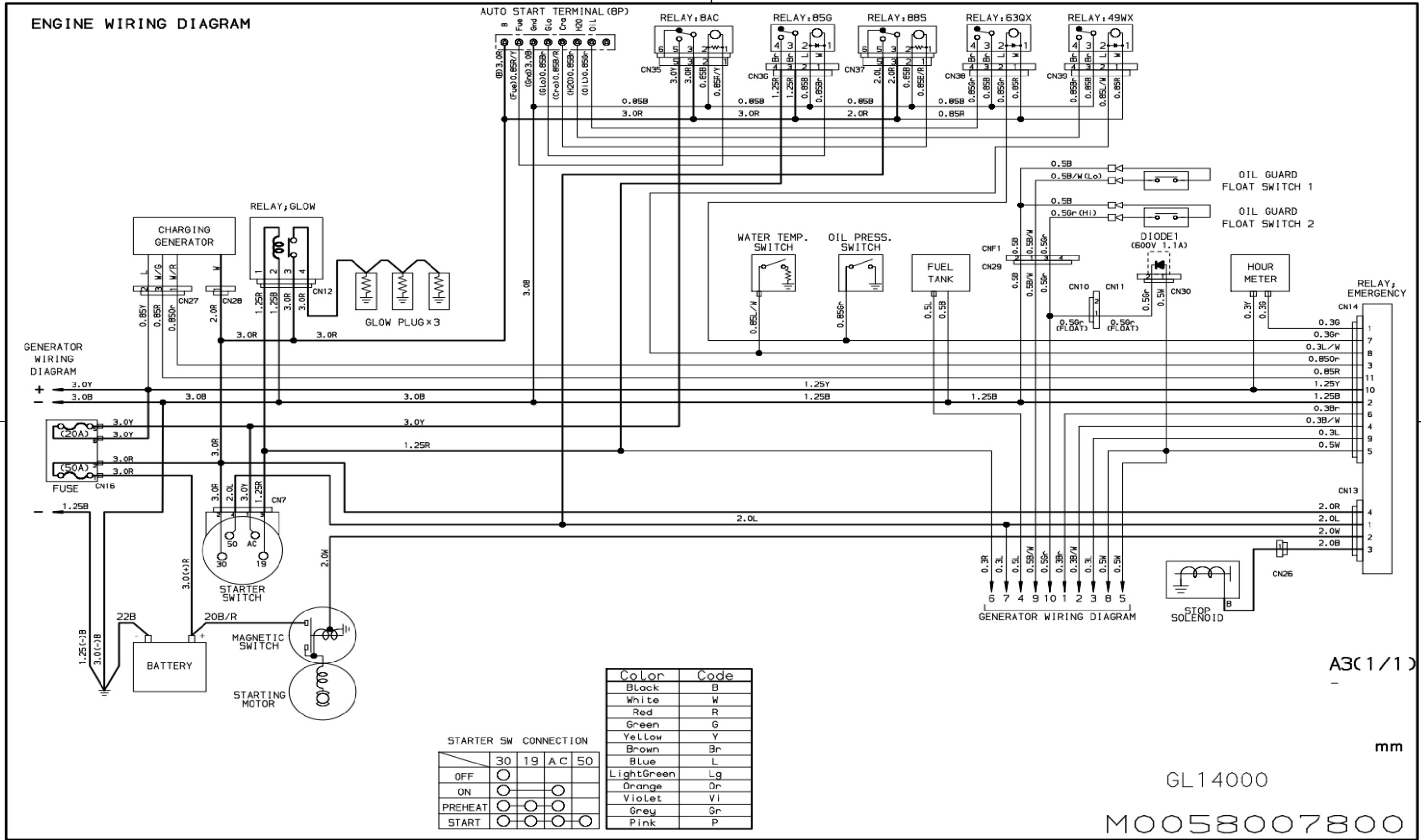
(2) HIGH AC OUTPUT

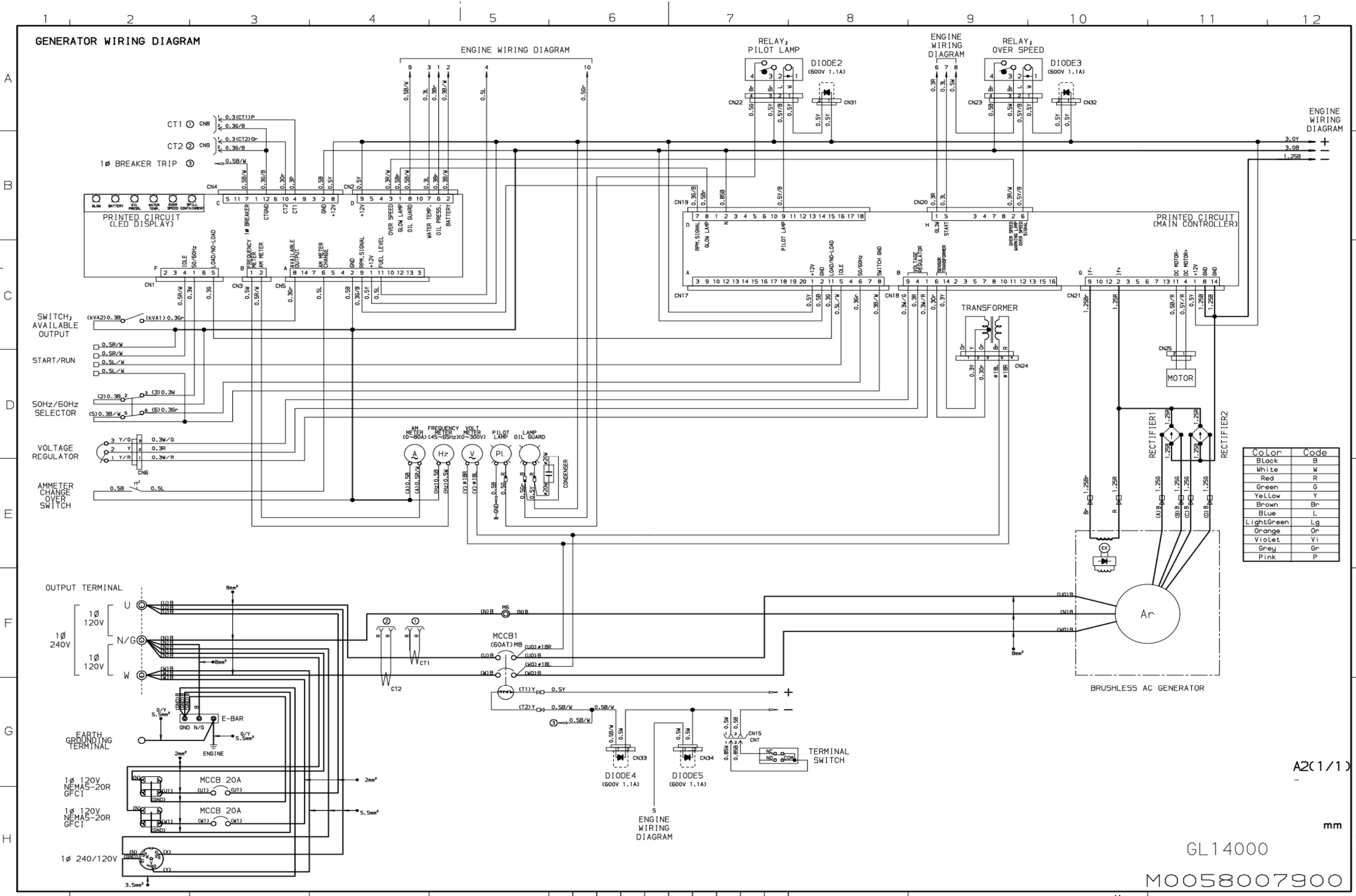


(3) LOW AC OUTPUT or LOW RPM



10. Wiring Diagram





Color	Code
Black	B
White	W
Red	R
Green	G
Yellow	Y
Brown	Br
Blue	L
LightGreen	Lg
Orange	Or
Violet	Vi
Grey	Gr
Pink	P

A2(1/1)
 mm
 GL14000
 M0058007900

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