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User's Manual for Generator Control Unit

GCU®(GENERATOR CONTROL UNIT)

MODEL : MP3

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ENGINE GENERATOR CONTROL ENTERPRISE

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Cautions for your safety

1. Please be well informed of user's manual and drawings of the product in order to operate safely.
2. Please follow all safety instructions to prevent potential accidents and dangers.
3. There are two types of cautions; "Warning" and "Caution", where each meaning are as follow:

⚠ Warning	Potential injury or death may arise in case of violation of safety instructions
⚠ Caution	Potential injury or product damage may arise in case of violation of safety instructions

4. Meanings of picture signals appear in the manuals are as follow:

⚠	Please be careful as it may cause product damage
	Please be careful as it may cause electrocution

5. Please keep this manual close to the product

⚠ Warning

1. Please do not perform wiring work when power is on or in operation as it may cause electrocution.
2. Please do not disassemble the product even when power is off, as the charging current inside the product may still cause electrocution.
3. Please do not touch with wet hands as it may cause electrocution.
4. Please do not touch when sheath of electric wire is damaged as it may cause electrocution.
5. Please do grounding of electric wire to prevent electrocution.

⚠ Caution

1. Please permit a correct power supply to prevent product damage and fire
2. Please be sure no foreign substances enter into the product as they may cause short circuit or fire.
3. Please connect wire with correct load to input and output sockets to prevent product damage and fire.
4. Please connect wire as instructed to prevent product damage and fire.
5. Only technicians or properly trained personnel may use this product as irrational use of this product may cause injuries or damages to the product and devices connected to the product.
6. As this product comprises of electrical components, please separate the product before performing the test which requires high voltage such as inner voltage test or insulation resistance test.
7. Please use fuse and electric wire with correct capacity to prevent fire.
8. Please hold this product firmly as it is used for engine generator with high vibration.
9. Please make sure there are no untangled parts before installation.

1. Product Outline

GCU-MP3 is a diesel engine generator controller with engine protection function and ACB control function.

2. Product Features

2.1. Ability to use commercial power or non-electrical interface with automatic operating signal
2.2. Ability to adjust waiting time for start and stop when on automatic operation.
2.3. Double protection of starter motor by detecting engine RPM and oil pressure switch
2.4. Engine warm-up plug for small engine
2.5. Built-in alarm sound
2.6. Stop Solenoid anti burn out design
2.7. High-capacity relay interface for start, stop (15A), ACB input, and block (15A)
2.8. Generator stop function upon no detection of MPU signal or power during normal operation
2.9. Over speed test switch
2.10. RPM METER output.
2.11. Circuit breaker Close / Open Coil anti burn out design
2.12. Easy-to-understand operation lamp
2.13. Circuit protection design regarding to SURGE
2.14. SILICON MODLING for earthquake-proof and waterproof

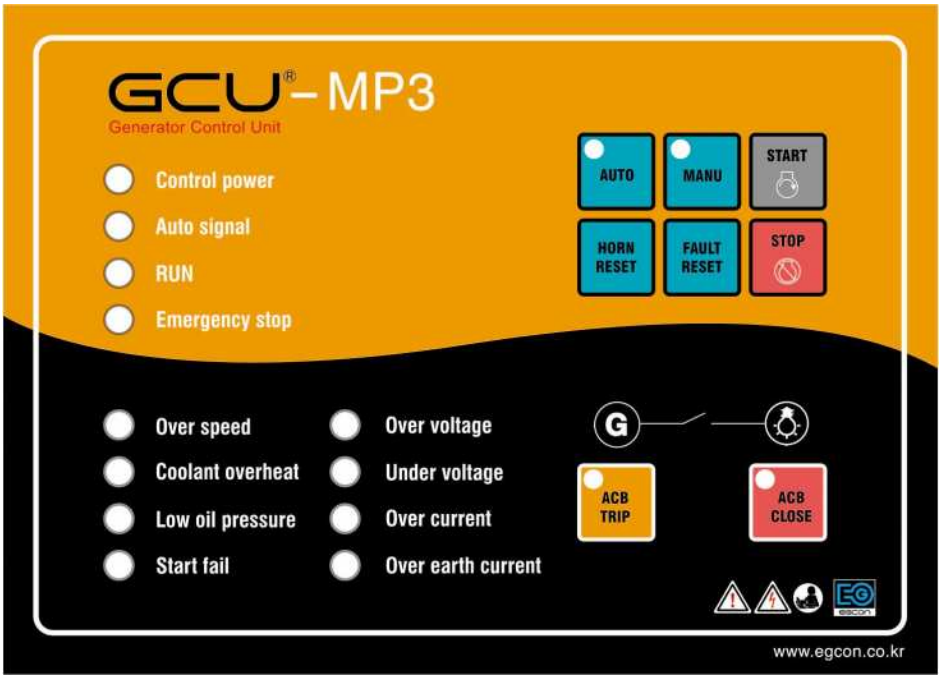
3. Specification and Functions

3.1. Control power supply: 8 ~ 35Vdc, Power consumption: Below 5W on idle, 240W maximum
3.2. Speed sensor: Operating electricity detection method (standard) → 0~75 Hz ,7~300 Vac
MPU detection method → 0~7,000 Hz ,4~30 Vac
3.3. Commercial power voltage: 220 Vac platform
3.4. RPM METER output : 5V, 500uA
3.5. Automatic operation signal: Selection between non-electrical interface and commercial power
3.6. Engine start waiting time : 3, 5, 10, 30 sec.
3.7. Engine stop waiting time : 10sec, 30sec, 1min, 3min.
3.8. 52G Waiting time of automatic input: 3, 5, 10, 30 sec.
3.9. 52G Waiting time automatic block: 3, 5, 10, 30 sec.
3.10. Automatic start and stop time (CYCLE CRANKING TIME) : 7 sec.

4. Conditions of Use

4.1. Operation temperature: -10° ~ 40°C
4.2. Storage temperature: -24° ~ 45°C
4.3. Relative humidity: 0% ~ 90%, non-congelation
4.4. Vibration: amplitude-0.35mm, frequency-0~30Hz
4.5. Maximum operating altitude: 3,000m
4.6. Where to use: Indoor
4.7. Where there is no dust, salt and polluted gas

5. Functions of Control Switches



5.1. LED description

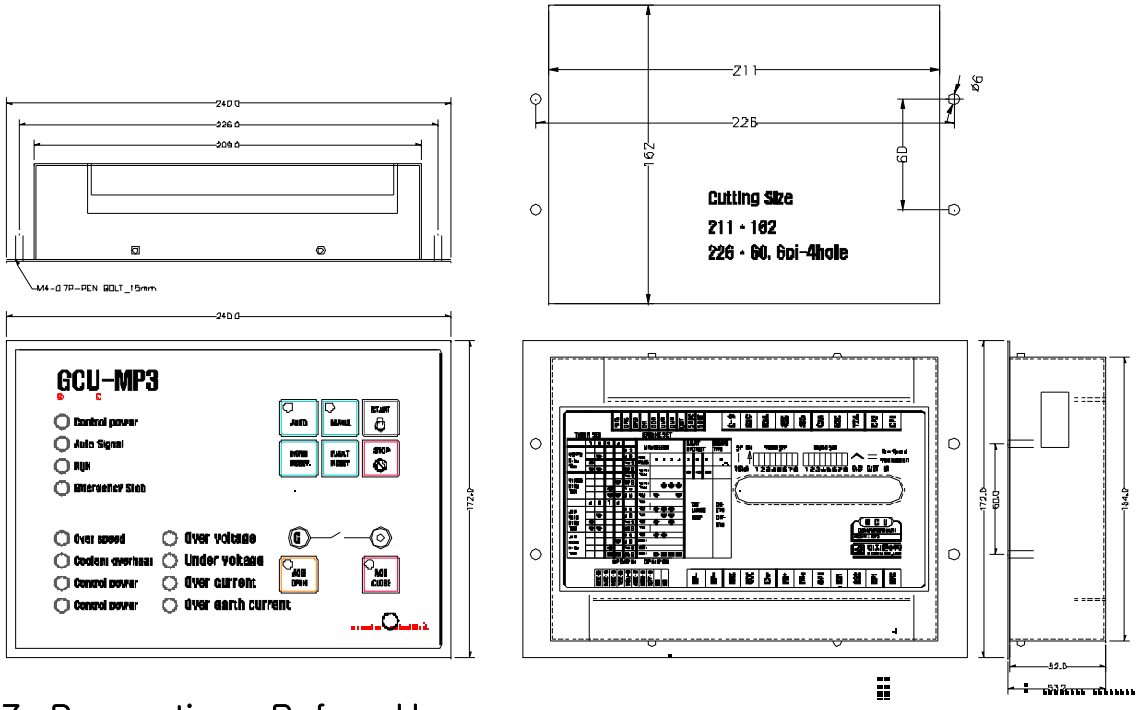
Name	Function	LED Color
Control Power	Light on upon input of active power	GREEN
Commercial Power	Light on upon input of commercial power	GREEN
Generator Power	Light on when engine speed is greater than IDLE SPEED	GREEN
Manual	Light on upon selection of manual mode	GREEN
Automatic	Light on upon selection of automatic mode	GREEN
Block Circuit Breaker	LAMP showing BREAKER OPEN	GREEN
Input of circuit breaker	LAMP showing BREAKER CLOSE	RED
Over speed	Light on when engine speed is above OVER SPEED setting	RED
Over temperature	Light on when engine temperature is too high	RED
Start Failure	Light on when engine does not start after third try of start on AUTO. MODE	RED
Low Oil Pressure	Light on upon low oil pressure in engine	RED
Emergency stop	Light on upon input of emergency stop	RED
Grounding	Light on upon input of signal into GR socket	YELLOW
Over Voltage	Light on upon input of signal into OVR socket	RED
Over Current	Light on upon input of signal into OCR socket	YELLOW
Low Voltage	Light on upon input of signal into UVR socket	YELLOW

6. Structure

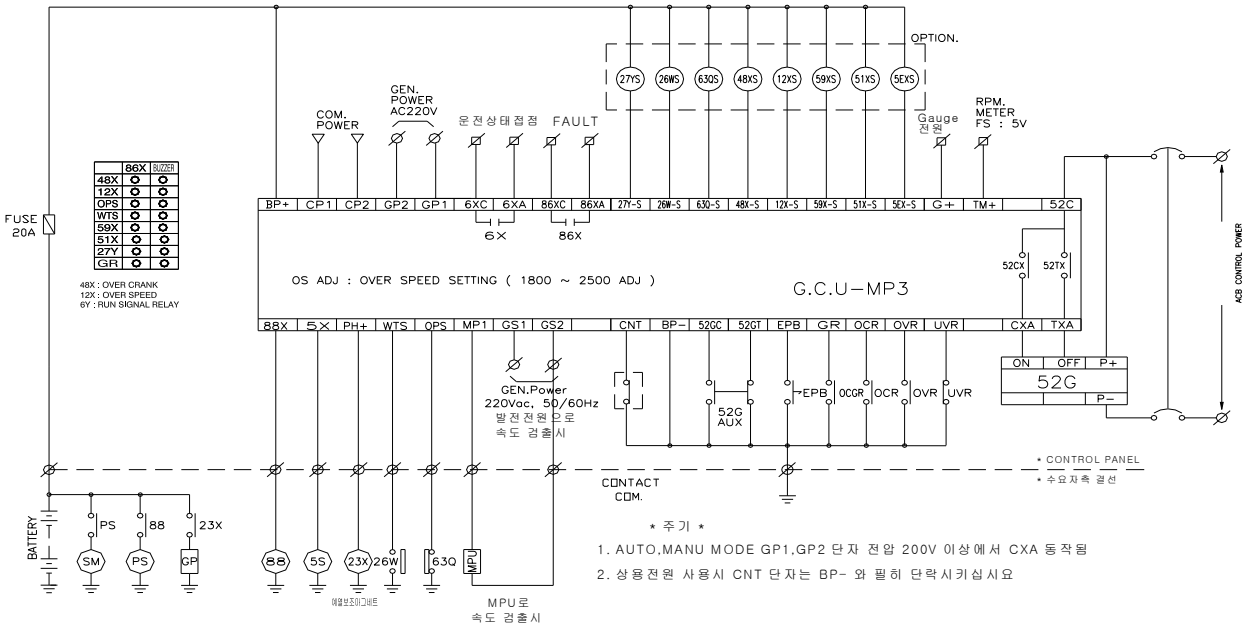
6.1. Dimension : W240 * H172 * D54 (mm)

6.2. Mounting : Cut-out - W211*H162 / Mounting Holes - W226*H60-6pi-4H

6.3. Weight : About 700g



7. Preparations Before Use



[Circuit Diagram 1]

7.1. Connect circuits into input/output sockets of GCU-MP3 by referring to circuit diagram 1.

When directly inputting commercial power, CNT socket must be connected with BP- socket in order to

detect outage signal.

⚠ Warning ※ Upon input of power, control power lamp is on and lamp near wrong wiring flickers.

8. Connection Sockets and Capacity

Socket Name	Description	Rated Capacity
BP+, BP-	Control Power Input	DC 8~35V , 15A
88x	Start Output	BP+ voltage output, Max 15A
5x	Stop Output	BP+ voltage output, Max 15A
PH+	Preheating Output	BP+ voltage output, Max 15A
CP1, CP2	Commercial power input platform	1P 220Vac
GP1, GP2	Generator power input platform	1P 220Vac
GS1, GS2	Input socket when using voltage for engine speed detection	1P 220Vac
MP1, GS2	Engine operation signal input socket	MPU signal
CNT	Automatic start interface(commercial power UVR input)	Automatic mode, work upon connect DC
TM+	RPM METER connection socket	connect RPM METER "+" socket
52C, TXA	Block circuit breaker interface	Dry contact , AC300V, 10A (2sec)
52C, CXA	Input of circuit breaker interface	Dry contact , AC300V, 10A (2sec)
86XA, 86XC	Breakdown display interface	Dry contact , AC300V, 5A
6XA, 6XC	Engine operation display interface	Dry contact , AC300V, 5A
WTS	Input of high temperature switch	NORMAL OPEN , connect DC-
OPS	Input of oil pressure switch	NORMAL CLOSE, connect DC-
EPB	Input of emergency stop switch	NORMAL OPEN , connect DC-
GR	Input of ground over current relay	NORMAL OPEN , connect DC-
OVR	Over voltage input socket	NORMAL OPEN , connect DC-
OCR	Over current input socket	NORMAL OPEN , connect DC-
UVR	Low voltage input socket (works when revolution speed of generator is above 70% of normal revolution speed)	NORMAL CLOSE, connect DC-
52GC	Input of circuit breaker input signal	connect DC-
52GT	Input of circuit breaker blockage signal	connect DC-
G+	Gauge power output above IDLE SPEED	BP+ voltage output, Max 5A
5EX-S	Emergency Stop assistant output	DC- output , below 500mA
51X-S	OCR assistant output	DC- output , below 500mA
59X-S	OVR assistant output	DC- output , below 500mA
12X-S	Over Speed assistant output	DC- output , below 500mA
48X-S	Automatic mode start failure assistant output	DC- output , below 500mA
63Q-S	Low oil pressure failure assistant output	DC- output , below 500mA
26W-S	Over temperature failure assistant output	DC- output , below 500mA
27Y-S	UVR assistant output	DC- output , below 500mA

9. Manual Start Test

9.1. Manual mode lamp is on when selected manual mode by pressing manual mode button

9.2 When pressed start button battery “+” is out from 88X socket and runs 88 (start assistant magnet) to start engine.

(1) Power of starter motor is cut when engine revolution speed is above IDLE SPEED or oil pressure switch is open

(2) RUN lamp is on when engine revolution signal entered to GS1/GS2 socket or MP1/GS2 socket is greater than IDLE SPEED.

(3) When oil pressure switch is not open for more than 5 seconds in IDLE SPEED, low oil pressure

lamp is on and engine stops.

(4) Where there is no engine revolution signal and oil pressure switch is not open start output will be out for 7 seconds and be blocked again.

(5) Where there is no engine revolution signal and oil pressure switch is open output of starter motor is blocked and engine operates normally.

(6) When RUN lamp is on BP+ voltage is out from G+ socket and 6X interface is closed.

9.3. Input of circuit breaker

(1) Check if power of GP1 and GP2 sockets is above AC 200V. (If power of GP1 and GP2 sockets is less than AC 200V, 52C and CXA will not be closed even when pressed input of circuit breaker button.

(2) When input of circuit breaker button is pressed 52C and CXA socket is closed and circuit breaker will be in place and input of circuit breaker lamp will be on (Running time of input of circuit breaker relay - Max 2 seconds)

9.4. Block circuit breaker

(1) When block circuit breaker button is pressed 52C and TXA socket will be closed and circuit breaker will be blocked and block circuit breaker lamp will be on (Running time of block circuit breaker relay- Max 2 seconds)

9.5. Stop engine

(1) Press stop button

ETR: Will operate when power is connected to fuel solenoid and will stop when power is blocked

ETS: Will stop if power is supplied to fuel solenoid when engine is stopped. If oil pressure switch is OFF power output will be blocked and when there is no OFF signal of oil pressure switch power will be out for certain period of time (≒ 20 sec.) and then be blocked.

9.6. Engine will be stopped when pressed EPB or upon operation of engine protection circuit (over speed, over temperature, low oil pressure) or OVR during the normal operation.

10. Automatic Operation Test

10.1. Check if CNT socket and BP- socket are connected together and commercial power of 220Vac is supplied to CP1 and CP2 socket.

10.2 When pressed automatic selection button it becomes automatic mode and automatic lamp will be on.

10.3. When commercial power is in outage (CNT socket CLOSE) engine operates after waiting time for the start

10.4. When commercial power is in outage (CNT socket CLOSE) and it is returned, engine will not start and SDT time will be initialized

10.5. When commercial power is in outage (CNT socket CLOSE), battery “+” output will come from PH+ (engine preheating output) and will be blocked above IDLE SPEED.

10.6. When start output does not reach IDLE SPEED, GCU repeats starting and stopping for 7 seconds. If not starting after third try start failure lamp (OCL) will be on breakdown and stops starting engine.

10.7. When start output is out and oil pressure switch is open start output is blocked.

10.8. RUN LAMP is on when engine operates normally.

10.9. When there is normal detection of generated power supply circuit breaker will be input after waiting time of input of circuit breaker.

10.10. When commercial power is returned (CNT socket OPEN) during normal operation of engine,

engine will stop after blocking circuit breaker and preparing for re-outage during the waiting time of engine cool down.

10.11. If commercial power is in outage (CNT socket CLOSE) while engine cools down, engine cool down time will be initialized and circuit breaker will be input immediately.

10.12 Engine still operates even if circuit breaker is blocked when warning sign is up (low voltage, over current, grounding) during automatic mode (during the input of circuit breaker). The circuit breaker will be back after RESET. When circuit breaker is back and power is returned it operates as described in 11.10.

11. Engine and Generator Protection Device Operation Test(Identical for Both Manual and Automatic Operation)

	Engine Stop	Block Circuit Breaker	86X, BUZZER
Over speed, low oil pressure, high water temperature, start failure, over voltage	○	○	○
Over current, low voltage, grounding	Upon selection	○	○

- It is possible to RESET after protection device operation by performing buzzer stop before RESET

11.1. Emergency Stop (EPB-EMERGENCY PUSH BUTTON)

(1) Start engine.
(2) Check if RUN lamp of GCU is on and whether RPM METER show normal RPM.
(3) Press emergency stop button.
(4) Emergency stop lamp will be on and buzzer will sound and circuit breaker will be blocked and engine will stop.
(5) Press buzzer stop and release emergency stop button and press breakdown reset button.

11.2. Over speed (TEST-OVER SPEED TEST)

(1) Over speed test is possible in any situation.
(2) When pressed OST(Over speed test) button while engine is in operation the buzzer will sound and RPM METER will show OS value that is currently set.
(3) When pressed buzzer stop and changed OS ADJ when changing OS settig value, the value of RPM meter and setting value are changed. Press buzzer stop breakdown reset button.
(4) Changed OS value is applied.

11.3. Low oil pressure (OPL - LOW OIL PRESSURE)

Oil pressure switch has relationship with starter motor and ETS TYPE stop output. When oil pressure switch operates after engine started, output of starter motor is blocked and when oil pressure switch is closed, stop output of ETS TYPE gets blocked after certain period of time (approx. 5 seconds)

(1) Start engine
(2) Check if RUN lamp of GCU is on and whether RPM METER shows normal RPM.
(3) Connect OPS socket.
(4) Low oil pressure lamp will be on and buzzer will sound and circuit breaker will be blocked and engine will be stopped.
(5) Press buzzer stop and press breakdown reset button.

11.4 Over temperature (WTL - HIGH WATER TEMPERATURE)

(1) Start engine

(2) Check if RUN lamp of GCU is on and whether RPM METER shows normal RPM.

(3) Connect WTS socket.

(4) Low oil pressure lamp will be on and buzzer will sound and circuit breaker will be blocked and engine

(5) Press buzzer stop and press breakdown reset button.

11.5 Start failure (OCL - OVER CRANKING) - Only operating in automatic mode

(1) Change mode to automatic

(2) Cut commercial power or connect CNT socket.

(3) After waiting time for start, start output is out.

(4) If engine operation speed is below 30% of normal speed during the 7-second start time, repeat 7-second start and 7-second stop for 3 times.

(5) Start failure lamp will be on and buzzer will sound and engine will stop.

(6) Press buzzer stop and breakdown reset button.

12. Product Setup

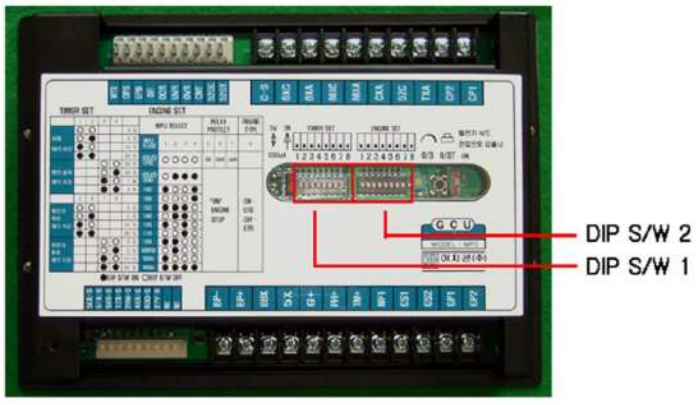
12.1. O/ST : OVER SPEED TEST PUSH BUTTON

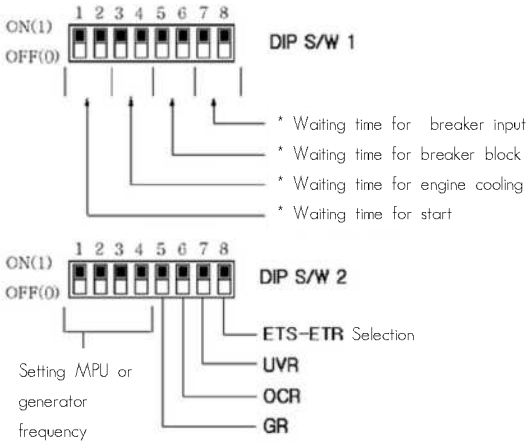
When this button is pressed arbitral over speed will be entered in GCU which will make RPM (Hz) METER to indicate the value above the maximum regardless of the actual speed entered, and over speed circuit of GCU will be active which results in turning over speed lamp on and stopping the engine.

12.2. O/S : Over speed adjustment(OVER SPEED ADJ.)

It is a regulator to regulate the speed of over speed protection circuit. The set value is 70Hz/2100RPM. (Approximately 120% of 1800RPM/60Hz) In order to change the set value, press O/S T to stop the engine and adjust the set value by turning the variable resistor clockwise or anti-clockwise. Once done, press breakdown reset button to save and RPM METER will show the value currently entered.

12.3. DIP SWITCH





12.4. TIMER DIP S/W

Items	DIP S/W order				Time Setup	Item	DIP S/W Order				Time Setup
	1	2	3	4			5	6	7	8	
Waiting time for the start	○	○			3 Sec	Waiting time for blockage of circuit breaker	○	○			3 Sec
	○	●			5 Sec		○	●			5 Sec
	●	○			10 Sec		●	○			10 Sec
	●	●			30 Sec		●	●			30 Sec
Waiting time for engine cool down			○	○	10 Sec	Waiting time for input of circuit breaker			○	○	3 Sec
			○	●	30 Sec				○	●	5 Sec
			●	○	1 Min				●	○	10 Sec
			●	●	3 Min				●	●	30 Sec

12.5. ENGINE SET DIP S/W

	Number of ring gears(Generator Frequency)	DIP S/W Order							
		1	2	3	4	Engine Stop Setup			Engine Type
						5	6	7	8
Set number of ring gears	VOLVO 1242	○	○	○	○	GR	OCR	UVR	ON-ETS OFF-ETR
	VOLVO 1642	○	●	●	●				
	182	●	○	○	●	If set to ON, engine stops when release relay operates.			
	160	●	●	●	○				
	152	○	●	●	○				
	140	●	○	●	○				
	128	○	○	●	○				
	110	●	●	○	○				
Generator frequency setup	400Hz	○	●	○	○				
	50Hz	●	○	○	○				
	60Hz	●	●	●	●				

○ : DIP S/W OFF

● : DIP S/W ON

※Set value may differ from the actual number of ring gears. In such case, please set value to the nearest value.

13. Signal and Marks

- GCU : GENERATOR CONTROL UNIT
- ETS : Supplying power to solenoid when stopped
- ETR : Supplying power to solenoid when in operation
- 86X : Breakdown indicating relay
- 6X : Operation indicating relay
- 23X : Preheating relay
- 52G : ACB
- SM : Starting motor
- PS : Pinion solenoid
- 88 : Start assistant magnet
- IDLE SPEED : Lowest speed of engine without the assistance of engine starting motor
- MPU : MAGNETIC PICKUP
- RPM : Rotating speed indicator
- 5S : Stop solenoid
- 88X : Start output relay
- EPB : Emergency stop button
- OPS : Oil pressure switch
- WTS : Coolant temperature switch
- RPM : Revolution speed meter
- 63Q : Oil pressure switch
- 26W : Coolant temperature switch, relay
- 48X : Start failure relay
- 62X : Operation relay
- 14X : IDLE SPEED relay

14. Cause of Breakdown and Solutions

Symptom	Cause	Solution
When there is no power(Control power lamp is not on)	DC circuit breaker is open	Close DC circuit breaker
	DC fuse is disconnected	Replace fuse with the same capacity
	Wrong wiring	Correct wiring referring to the circuit diagram
	Flat battery	Recharge battery at least 5 hours
Cannot start(starter motor is not working)	Flat battery	Recharge battery at least 5 hours
	Breakdown of start-assistant magnet	Replace start-assistant magnet
	Breakdown of starter motor	Replace starter motor
	Wrong or no wiring	Correct wiring by referring to the circuit diagram
When cannot start(starter motor is working)	Breakdown of preheating plug	Replace preheating plug
	Wrong DIP S/W setting	Correctly select ETR and ETS by inquiring the manufacturer of the engine
When cannot start(stops soon after the start)	Wrong or no OPG wiring	Correct wiring by referring to the circuit diagram
RPM meter is not working while generator is in operation	Wrong or no wiring of PICK-UP	Correct wiring by referring to the circuit diagram
	Wrong or no wiring in generator voltage GS1 or GS2	Correct wiring by referring to the circuit diagram
	Wrong DIP S/W setup for detecting genera색 speed	If used MPU for detecting generator speed set to OFF, or set to ON if used generator voltage.
No automatic operation of generator upon commercial power outage	No connection of DC- into CNT socket	Connect DC- into CNT socket

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ENGINE, GENERATOR CONTROL ENTERPRISE

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엔진, 발전기 제어 전문기업

PRODUCTS ITEM

- □ AVR / 자동전압조정기
- □ ABC / 자동밧데리충전기
- □ GCU / 발전기기제어장치
- □ ECU / 엔진제어장치
- □ ESD / 엔진속도검출기
- □ EPD / 엔진보호장치
- □ SCR / 동기검출기
- □ BCU / ACB 제어장치
- □ ACU / ATS 제어장치
- □ MPU / 속도검출센서
- □ GCP / 발전기 운전반
- □ ECP / 엔진 운전반
- □ ATS / ATS 운전반
- □ FGP / 별치형 운전반

AVR
MODEL : 635/631

ABC
MODEL : SMP

ABC
MODEL : SMF

ECU
MODEL : DG1

GCU
MODEL : MP2

DMM
MODEL : 961

ACU
MODEL : MP3

ETS
MODEL : Y, B TYPE

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